Appointment

From: Cook, Steven [cook.steven@epa.gov]
Sent: 3/31/2020 2:28:16 PM
To: Cook, Steven [cook.steven@epa.gov]; Hilosky, Nick [Hilosky.Nick@epa.gov]; Brooks, Becky [Brooks.Becky@epa.gov]; Hall, Tayoka [Hall.Tayoka@epa.gov]; Salyer, Kathleen [Salyer.Kathleen@epa.gov]; Huggins, Richard [Huggins.Richard@epa.gov]; Elliott, Ross [Elliott.Ross@epa.gov]; Cogliano, Gerain [Cogliano.Gerain@epa.gov]; scott.segal@policyres.com
CC: Breen, Barry [Breen.Barry@epa.gov]; Wright, Peter [wright.peter@epa.gov]; Segal, Scott [scott.segal@bracewell.com]; Mills, Jason [Mills.Jason@epa.gov]; Birchfield, Norman [Birchfield.Norman@epa.gov]; Huff, Mark J [Huff.MarkJ@epa.gov]

Subject: (Outside Guests) CCR Part B - Salt River Project Ex. 6 Personal Privacy (PP)
Location: CALL - Ex. 6 Personal Privacy (PP)

Start: 4/2/2020 3:30:00 PM
End: 4/2/2020 4:15:00 PM
Show Time As: Tentative

Required Attendees: Hilosky, Nick; Brooks, Becky; Hall, Tayoka; Salyer, Kathleen; Huggins, Richard; Elliott, Ross; Cogliano, Gerain; scott.segal@policyres.com
Optional Attendees: Breen, Barry; Wright, Peter; Segal, Scott; Mills, Jason; Birchfield, Norman; MarkJ Huff

POC: Becky Brooks - 566-2762
Teresa Hil - 566-0184 (scheduler)

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(On Constitution between 14th and 13th across from the National Museum of American History)

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SCOTT SEGAL
Partner
scott.segal@policyres.com
T: +1.202.828.5845 | F: +1.800.404.3970

BRACEWELL LLP
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Appointment

From: Michelle Freeark [mfreeark@azgt.coop]
Sent: 11/17/2020 6:19:07 PM
To: Michelle Freeark [mfreeark@azgt.coop]; 'Williamson, Liz' [ewilliamson@williamsmullen.com]; 'Eichenberger, Jason' [jeichenberger@burnsmcd.com]; Long, Michelle [Long.Michelle@epa.gov]; Huggins, Richard [Huggins.Richard@epa.gov]; Mills, Jason [Mills.Jason@epa.gov]; Jackson, Mary [Jackson.Mary@epa.gov]; Capiro, Mirtha [capiro.mirtha@epa.gov]; Celeste, Laurel [celeste.laurel@epa.gov]; Justine McCune [jmccune@azgt.coop]; Nathen Hatch [nhatch@azgt.coop]; Weber, Wayne A [waweber@burnsmcd.com]; Charles S Reece IV [creece@azgt.coop]

Subject: Arizona Electric Power Cooperative, Inc (AEPCO)/EPA meeting on CCR Part B ALD Application
Attachments: image565897.JPG
Location: https://meetings.ringcentral.com/j/ Ex. 6 Personal Privacy (PP)

Start: 11/24/2020 3:00:00 PM
End: 11/24/2020 4:00:00 PM
Show Time As: Busy

Recurrence: (none)

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Dial(for higher quality, dial a number based on your current location):
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Meeting ID: Ex. 6 Personal Privacy (PP)
International numbers available: https://meetings.ringcentral.com/teleconference

Michelle Freeark, Executive Director of Regulatory Affairs and Corporate Services

Arizona G&T Cooperatives

1000 S. Hwy 80 | Benson, AZ 85602
o: 520-586-5122 | m: Ex. 6 Personal Privacy (PP) | mfreeark@azgt.coop

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Appointment

From: Huggins, Richard [Huggins.Richard@epa.gov]
Sent: 3/16/2020 6:56:44 PM
To: Huggins, Richard [Huggins.Richard@epa.gov]; Elliott, Ross [Elliott.Ross@epa.gov]; Mills, Jason [Mills.Jason@epa.gov]; Behan, Frank [Behan.Frank@epa.gov]; Celeste, Laurel [celeste.laurel@epa.gov]; Roewer, James [JRoewer@eei.org]; 'Doug Green' [dhgreen@venable.com]; Chow, Rita [Chow.Rita@epa.gov]; Janjic, Ksenija [Janjic.Ksenija@epa.gov]
CC: Huff, Mark J [Huff.MarkJ@epa.gov]; Birchfield, Norman [Birchfield.Norman@epa.gov]; Fawal, Margaret K. [MKFawal@Venable.com]; HAROLD D. REGISTER JR [HAROLD.REGISTERJR@cmsenergy.com]

Subject: CCR Part B Discussion

Start: 3/19/2020 7:00:00 PM
End: 3/19/2020 8:00:00 PM
Show Time As: Busy

Required Attendees: Huggins, Richard; Ross Elliott; Mills, Jason; Frank Behan; Celeste, Laurel; Roewer, James; 'Doug Green'; Chow, Rita; Janjic, Ksenija
Optional Attendees: MarkJ Huff; Birchfield, Norman; Fawal, Margaret K.; HAROLD D. REGISTER JR

Call in number: (202) 991-0477
ID: Ex. 6 Personal Privacy (PP)

Message

From: Celeste, Laurel [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=8F5194A050CE4B758E02E6835FE0B43D-CELESTE, LAUREL]
Sent: 5/19/2021 6:59:11 PM
To: Green, Douglas H. [DHGreen@venable.com]
Subject: Re: Question

Of course. I should be able to call later this afternoon.

Sent from my iPhone

On May 19, 2021, at 2:41 PM, Green, Douglas H. <DHGreen@venable.com> wrote:

Hi Laurel – if you have a chance, can you give me a call regarding a question I have concerning the CCR Part B rule applications. My mobile is best, as we're still working from home (though slowly migrating back into the office).

Thanks, Doug

Douglas H. Green, Esq. | Venable LLP
t 202.344.4483 | f 202.344.8300 | m Ex. 6 Personal Privacy (PP)
600 Massachusetts Avenue, NW, Washington, DC 20001

DHGreen@Venable.com | www.Venable.com

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Message

From: Huggins, Richard [Huggins.Richard@epa.gov]
Sent: 5/13/2021 3:35:59 PM
To: Roewer, James [JRoewer@eei.org]; Green, Douglas H. [DHGreen@Venable.com]; Fawal, Margaret K. [MKFawal@Venable.com]
CC: Celeste, Laurel [celeste.laurel@epa.gov]
Subject: Part B FAQ

Please see new FAQ at the bottom of the page: https://www.epa.gov/coalash/coal-combustion-residuals-ccr-part-b-implementation

If you have any questions please let me know. Thanks

Richard Huggins Jr., Chief
Energy Recovery and Waste Disposal Branch
Office of Resource Conservation and Recovery
U.S. Environmental Protection Agency
Desk: 703-308-0017 iPhone: [redacted]

Message

From: Roewer, James [JRoewer@eei.org]
Sent: 5/13/2021 6:02:54 PM
To: Huggins, Richard [Huggins.Richard@epa.gov]; Green, Douglas H. [DHGreen@Venable.com]; Fawal, Margaret K. [MKFawal@Venable.com]
CC: Celeste, Laurel [celeste.laurel@epa.gov]
Subject: RE: Part B FAQ

Thanks Richard

From: Huggins, Richard <Huggins.Richard@epa.gov>
Sent: Thursday, May 13, 2021 11:36 AM
To: Roewer, James <JRoewer@eei.org>; Green, Douglas H. <DHGreen@Venable.com>; Fawal, Margaret K. <MKFawal@Venable.com>
Cc: Celeste, Laurel <celeste.laurel@epa.gov>
Subject: Part B FAQ

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Please see new FAQ at the bottom of the page: https://www.epa.gov/coalash/coal-combustion-residuals-ccr-part-b-implementation

If you have any questions please let me know. Thanks

Richard Huggins Jr., Chief
Energy Recovery and Waste Disposal Branch
Office of Resource Conservation and Recovery
U.S. Environmental Protection Agency
Desk: 703-308-0017 iPhone: [redacted]

Message

From: Green, Douglas H. [DHGreen@Venable.com]
Sent: 5/19/2021 6:38:27 PM
To: Celeste, Laurel [celeste.laurel@epa.gov]
Subject: Question

Hi Laurel – if you have a chance, can you give me a call regarding a question I have concerning the CCR Part B rule applications. My mobile is best, as we're still working from home (though slowly migrating back into the office).

Thanks, Doug

Douglas H. Green, Esq. | Venable LLP
t 202.344.4483 | f 202.344.8300 | m Ex. 6 Personal Privacy (PP)
600 Massachusetts Avenue, NW, Washington, DC 20001

DHGreen@Venable.com | www.Venable.com

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Message

From: Green, Douglas H. [DHGreen@Venable.com]
Sent: 5/19/2021 7:01:22 PM
To: Celeste, Laurel [celeste.laurel@epa.gov]
Subject: RE: Question

Thanks Laurel. I appreciate it.

Douglas H. Green, Esq. | Venable LLP
t 202.344.4483 | f 202.344.8300 | m Ex. 6 Personal Privacy (PP)
600 Massachusetts Avenue, NW, Washington, DC 20001

DHGreen@Venable.com | www.Venable.com

From: Celeste, Laurel <celeste.laurel@epa.gov>
Sent: Wednesday, May 19, 2021 2:59 PM
To: Green, Douglas H. <DHGreen@Venable.com>
Subject: Re: Question

Caution: External Email

Of course. I should be able to call later this afternoon.

Sent from my iPhone

On May 19, 2021, at 2:41 PM, Green, Douglas H. <DHGreen@venable.com> wrote:

Hi Laurel – if you have a chance, can you give me a call regarding a question I have concerning the CCR Part B rule applications. My mobile is best, as we're still working from home (though slowly migrating back into the office).

Thanks, Doug

Douglas H. Green, Esq. | Venable LLP
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Message

From: Huggins, Richard [Huggins.Richard@epa.gov]
Sent: 10/27/2020 7:30:19 PM
To: Montalvo Kara M [Kara.Montalvo@srpnet.com]
CC: Klein Maribeth M [Maribeth.Klein@srpnet.com]; Martinez Andrea L [Andrea.Martinez@srpnet.com]; Celeste, Laurel [celeste.laurel@epa.gov]; Mills, Jason [Mills.Jason@epa.gov]; Jackson, Mary [Jackson.Mary@epa.gov]; Long, Michelle [Long.Michelle@epa.gov]; Newton, Mimi [Newton.Mimi@epa.gov]
Subject: RE: Request for "Part B" Pre-Submission Meeting: Salt River Project Coronado Generating Station

Good morning Kara,
Thank you for reaching out. I just sent a calendar invite out for November 12th at 2 PM eastern. Talk to you then. Thanks

Richard Huggins Jr., Chief
Energy Recovery and Waste Disposal Branch
Office of Resource Conservation and Recovery
U.S. Environmental Protection Agency
Desk: 703-308-0017 iPhone: [redacted]

From: Montalvo Kara M <Kara.Montalvo@srpnet.com>
Sent: Thursday, October 22, 2020 11:31 AM
To: Huggins, Richard <Huggins.Richard@epa.gov>; Behan, Frank <Behan.Frank@epa.gov>; Hillyer, Kirsten <hillyer.kirsten@epa.gov>; Anderson, Lydia <Anderson.Lydia@epa.gov>
Cc: Klein Maribeth M <Maribeth.Klein@srpnet.com>; Martinez Andrea L <Andrea.Martinez@srpnet.com>
Subject: Request for "Part B" Pre-Submission Meeting: Salt River Project Coronado Generating Station

Good Morning –

I am contacting you on behalf of Salt River Project to request a pre-submission meeting with EPA to discuss SRP's planned application to make an alternate line demonstration under the recently finalized "Part B" amendments to the 2015 CCR rule. Understanding that the "first step" application submission must occur no later than November 30, 2020, SRP would like to request a virtual 1-hour meeting with EPA the week of November 9. Our preference is a meeting on either November 12 or November 13, but we understand the constraints on EPA's schedule and are willing to meet on an alternate day that week as necessary.

SRP's application is for an existing surface impoundment, more commonly called the "Evaporation Pond" by SRP, at SRP's Coronado Generating Station (CGS) located in St. Johns, Arizona. Planned attendees from SRP for this meeting are as follows:

- Kara Montalvo, Director, Environmental Services
- Maribeth Klein, Senior Attorney
- Andrea Martinez, Manager, Water Quality & Waste Management Services
- Kent Liesemeyer, Senior Environmental Compliance Engineer
- Prabhat Bhargava, Operations & Maintenance Supervisor, CGS
- Mark Prein, Senior Environmental Scientist, CGS
- Mark Nicholls, Haley & Aldrich
- Jason Pokorny, Haley & Aldrich

Please let me know if you need any additional information from SRP to support scheduling of the pre-submission meeting. We are prepared to send EPA meeting materials (e.g., agenda, etc.) at least 2 days in advance of the scheduled meeting date.

Regards,
Kara

Kara M. Montalvo, QEP
Director, Environmental Services
SRP | Environmental Services | PAB359
P.O. Box 52025, Phoenix, AZ 85072-2025
P: (602) 236-5256 | **M**: Ex. 6 Personal Privacy (PP)

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Message

From: Montalvo Kara M [Kara.Montalvo@srpnet.com]
Sent: 11/9/2020 11:32:52 PM
To: Huggins, Richard [Huggins.Richard@epa.gov]; Celeste, Laurel [celeste.laurel@epa.gov]; Jackson, Mary [Jackson.Mary@epa.gov]; Mills, Jason [Mills.Jason@epa.gov]; Long, Michelle [Long.Michelle@epa.gov]; Capiro, Mirtha [capiro.mirtha@epa.gov]; Anderson, Lydia [Anderson.Lydia@epa.gov]; Newton, Mimi [Newton.Mimi@epa.gov]; Gross, Barbara [Gross.Barbara@epa.gov]; Klein Maribeth M [Maribeth.Klein@srpnet.com]; Martinez Andrea L [Andrea.Martinez@srpnet.com]; Pokorny, Jason [JPokorny@haleyaldrich.com]; Bhargava Prabhat [Prabhat.Bhargava@srpnet.com]; Prein Mark G [Mark.Prein@srpnet.com]; Nicholls, Mark [MNicholls@haleyaldrich.com]; Liesemeyer Kent W [Kent.Liesemeyer@srpnet.com]
Subject: RE: CCR Part B Rule Discussion with Salt River Project: Supporting Materials
Attachments: Agenda_SRP-EPA Meeting_11-12-2020.pdf; DRAFT Part B Application_SRP-EPA Meeting_11-12-2020.pdf

Good Afternoon –

To support our scheduled discussion this Thursday, I am providing a proposed agenda for the meeting as well as draft documents related to Salt River Project's (SRP) planned CCR Part B application. As noted in the request to EPA for this meeting, SRP's application is for an existing surface impoundment, more commonly called the "Evaporation Pond" by SRP, at SRP's Coronado Generating Station (CGS) located in St. Johns, Arizona.

The agenda indicates the topics we would like to discuss with EPA on Thursday, and provides application page number and attachment references for EPA's use in document review prior to the meeting. Our draft application document is also attached to this message, while the draft enclosures supporting the draft application document can be accessed using the following link:

https://haleyaldrich.sharefile.com/d-sf1f7a35934e14c4

If you have any issues accessing these materials, please let me know. We look forward to our meeting Thursday.

Regards,
Kara

Kara M. Montalvo, QEP
Director, Environmental Services
SRP | Environmental Services | PAB359
P.O. Box 52025, Phoenix, AZ 85072-2025
P: (602) 236-5256 | **M**: Ex. 6 Personal Privacy (PP)

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-----Original Appointment-----
From: Huggins, Richard <Huggins.Richard@epa.gov>
Sent: Tuesday, October 27, 2020 12:29 PM
To: Huggins, Richard; Celeste, Laurel; Jackson, Mary; Mills, Jason; Long, Michelle; Capiro, Mirtha; Anderson, Lydia; Newton, Mimi; Gross, Barbara; Klein Maribeth M; Martinez Andrea L; Montalvo Kara M; Pokorny, Jason
Subject: CCR Part B Rule Discussion with Salt River Project
When: Thursday, November 12, 2020 2:00 PM-3:00 PM (UTC-05:00) Eastern Time (US & Canada).
Where: Microsoft Teams Meeting

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AGENDA

CCR Part B Application Pre-Submission Meeting
Coronado Generating Station
Evaporation Pond

November 12, 2020

2:00 – 3:00 p.m. EST

1. **Introductions**

2. **Certification Requirements**

3. **Draft Application Review**
   - Content
     - Measured Hydraulic Conductivity (See page 3 of draft; Attachment A)
     - Monitoring Well Network Placement (See pages 4-8 of draft; Attachment B)
     - Alternate Source Demonstration Statistical Analysis (See pages 8-9 of draft; Attachment C)
   - Format
     - Application vs. Attachments

4. **Next Steps**
   - Availability of Alternative Closure Provisions
   - Coordination During Demonstration Development

5. **Adjourn**

SRP Attendees:
- Kara Montalvo, Director, Environmental Services
- Maribeth Klein, Senior Attorney
- Andrea Martinez, Manager, Water Quality & Waste Management Services
- Kent Liesemeyer, Senior Environmental Compliance Engineer
- Prabhat Bhargava, Operations & Maintenance Supervisor, CGS
- Mark Prein, Senior Environmental Engineer, CGS
- Mark Nicholls, Haley & Aldrich
- Jason Pokorny, Haley & Aldrich

Supporting Materials:
- Draft Application Document (transmitted via e-mail 11/9/2020)
- Draft Application Attachments (transmitted via e-mail 11/9/2020)

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Craig R. Larson, Director
Coronado Generating Station
PO Box 1018 Mail Station CGS600
St. Johns, AZ 85936
P: (928) 337-5501 | F: (928) 337-2961

Submitted via electronic mail

Mr. Andrew Wheeler
Administrator, US EPA
US EPA Headquarters
William Jefferson Clinton Building
1200 Pennsylvania Avenue NW
Washington, DC 20460

RE: Application and Notice of Intent to Submit an Alternate Liner Demonstration in Accordance with 40 C.F.R. § 257.71(d)(1)(ii)

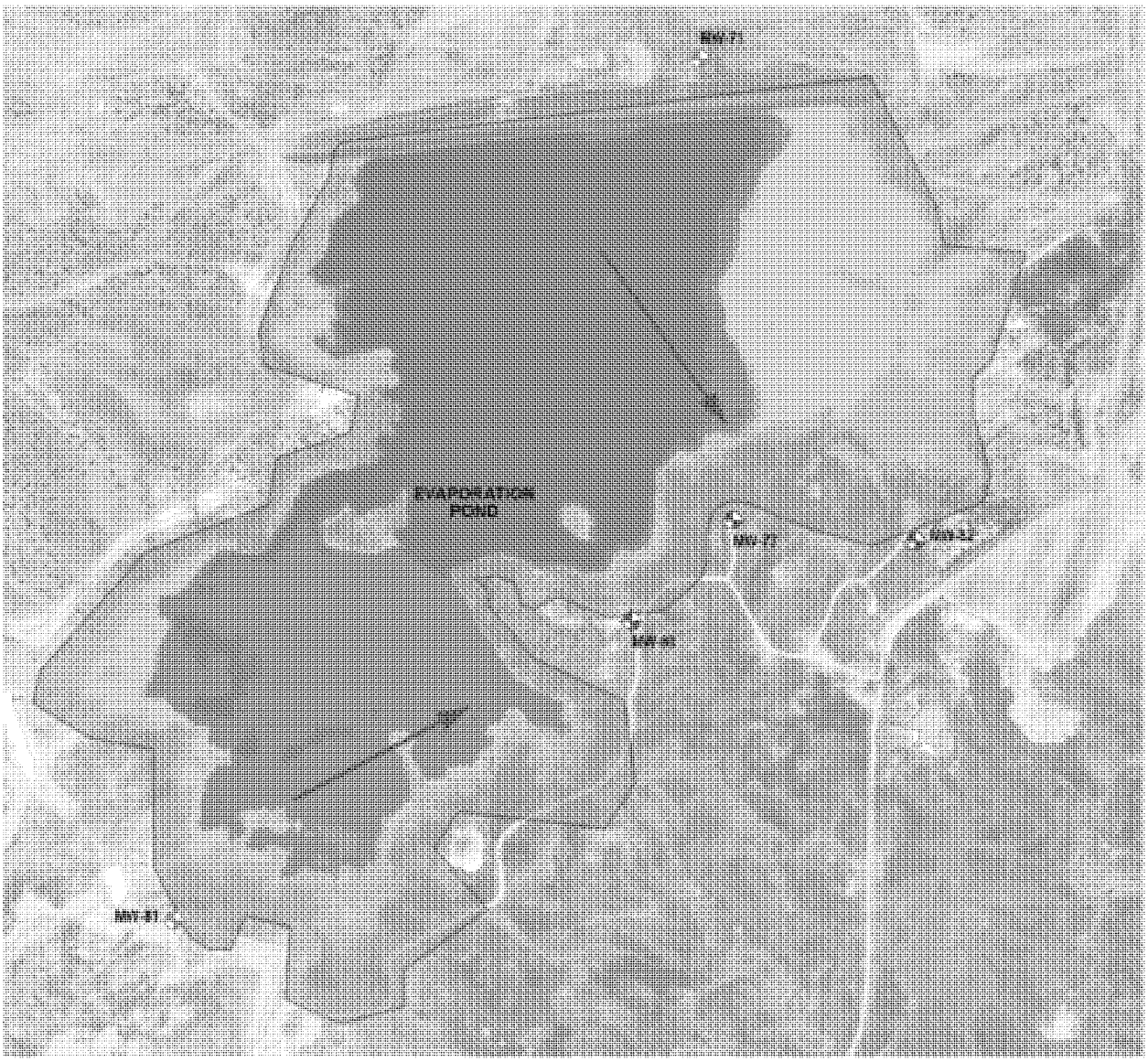
The Salt River Project Agricultural Improvement and Power District ("SRP") is a not-for-profit community-based, public power provider that provides retail electric services to over 1 million residential, commercial, industrial, agricultural and mining customers in Arizona. SRP owns and operates the Coronado Generating Station ("CGS"), a 780 megawatt (net) electricity generating facility located in St. Johns, Apache County, Arizona, that includes two coal-fired generating units that began operation in 1979. Coal combustion residuals ("CCR") generated at the plant are managed by dry placement within an ash disposal landfill, sluicing to a surface impoundment commonly referred to by SRP as the "Evaporation Pond", or through beneficial re-use via sale to third party vendors. The location of the CGS facility and Evaporation Pond are shown on Figure 1[1]. In accordance with 40 C.F.R. § 257.71(d)(1)(i), this letter, the certification herein, and the attached supporting documentation serve as SRP's Application to make an Alternate Liner Demonstration for the CGS Evaporation Pond.

SRP Intends to Make an Alternate Liner Demonstration for the Evaporation Pond Located at the Coronado Generating Station.

As set forth in more detail below, SRP believes the Evaporation Pond is protective of human health and the environment, and thus is eligible for an alternate liner demonstration. The Evaporation Pond meets all the CCR Rule Location Restrictions and is not a source of groundwater contamination exceeding the Rule's groundwater protection standards. 40 C.F.R. §§ 257.60-257.64, 257.101. The 200 to 250 feet of low-permeability clay that underlies the Evaporation Pond provides an effective seepage barrier such that continued operation the unlined impoundment poses no reasonable probability of adverse effects to human health or the environment.
The Evaporation Pond is a 330-acre, unlined surface impoundment that has been receiving

[1] Figures, Attachments and Tables referenced in this Application are included as Enclosures following the text of the Application.

wastewater from CGS since 1980. It is located in a broad valley approximately 1.5 miles southwest of the CGS plant site and has a design capacity of approximately 3,682 acre-feet. (*See insert of* Figure 2 below). Material transported to the Evaporation Pond includes flue gas desulfurization material produced by the power plant's wet scrubber system and non-recyclable process wastewaters. The Evaporation Pond is permitted through the State of Arizona's Aquifer Protection Permit ("APP") program and is regulated by 40 C.F.R. Part 257, Subpart D ("the CCR Rule"). It also qualifies as an "eligible unlined surface impoundment" as defined in 40 C.F.R. § 257.53.



The Little Colorado River is the nearest surface water body to the CGS Evaporation Pond. At the nearest point, the Little Colorado River is approximately 3 miles southwest of the Evaporation Pond, cross-gradient from the Evaporation Pond, and on the opposite side of a topographic divide. Each of the drainages in the vicinity of the Evaporation Pond are unnamed

dry washes that only have flow in response to high intensity precipitation events with no reasonable probability of a direct transport pathway to a surface water body from the CGS Evaporation Pond.

An engineered earthfill embankment dam, located at the northern end of the Evaporation Pond, impounds the evaporating wastewater and CCR. The dam includes design features to block seepage below the dam and relieve internal pressure within the embankment. The compacted core of the dam is keyed directly into the Chinle Formation by a cutoff trench to prevent subsurface foundation seepage. Design features for drainage within the dam (chimney drain, horizontal blanket, and toe drain system to the surface) function to filter seepage within the dam and relieve pressure within the downstream face and toe to enhance dam safety. The Evaporation Pond dam is regulated and periodically inspected by the Arizona Department of Water Resources. Refer to Attachment F for additional dam design details.

The Evaporation Pond is constructed directly on top of a thick sequence of naturally occurring, low hydraulic conductivity clays of the Chinle Formation that act as a barrier to downward migration of water from ground surface and from the Evaporation Pond. As part of the geotechnical investigation conducted in support of the design of the Evaporation Pond dam, Bechtel performed constant head hydraulic conductivity tests in 4 boreholes and 18 packer tests in 6 boreholes along the Evaporation Pond dam axis (Bechtel, 1976). Haley & Aldrich evaluated the Bechtel in-situ permeability testing results, including the test results that were clearly within the Chinle Formation and that did not have reported testing malfunctions. The permeability data generated by Bechtel are included in the Technical Memorandum provided in Attachment A.

Haley & Aldrich conducted a site investigation at the CGS Evaporation Pond between 25 July and 11 August 2016, during which undisturbed tube samples were collected at eight boreholes for index and hydraulic conductivity testing. Four of the tube samples were collected at boreholes located immediately north, south, east, and west of the Evaporation Pond perimeter. The remaining four tube samples were collected in four boreholes drilled within the Inactive Pond located east of the Evaporation Pond. All samples were collected from the Chinle Formation at depths varying between 25 and 67 feet. The permeability data generated from laboratory testing of samples collected by Haley & Aldrich in 2016 are also included in the Technical Memorandum provided in Attachment A.

Based on the combined 1976 Bechtel testing and the 2016 Haley & Aldrich testing, the measured hydraulic conductivity of Chinle Formation clay ranges from 1.5×10^{-5} centimeters per second (cm/s), the minimum hydraulic conductivity is 4.2×10^{-9} cm/s, and the geometric mean of the historic and recent test results is 3.4×10^{-7} cm/s (Attachment A). If SRP's application is approved, SRP anticipates that the additional site characterization that would be undertaken in the demonstration step will further inform hydraulic conductivity within the Chinle Formation.

Certification of Compliance Required by 40 C.F.R. § 257.71(d)(1)(i)(A).

In accordance with 40 C.F.R. § 257.71(d)(1)(i)(A), the undersigned hereby certifies that the Evaporation Pond is in full compliance with the requirements of 40 C.F.R. Part 257, Subpart D except for the requirements in 40 C.F.R. § 257.71(a)(1). In support of this certification, the applicable documentation identified in 40 C.F.R. § 257.71(d)(1)(B) is attached hereto.

Signed: _____

Print Name: _____

Title: _____

Date: _____

Supporting Documentation Required by 40 C.F.R. § 257.71(d)(1)(i)(B).

40 C.F.R. § 257.71(d)(1)(i)(B)(1)

Documentation that the groundwater monitoring network meets all the requirements of § 257.91. This must include documentation that the existing network of groundwater monitoring wells is sufficient to ensure detection of any groundwater contamination resulting from the impoundment, based on direction of flow, well location, screening depth and other relevant factors.

The groundwater monitoring system at the Evaporation Pond, (shown on Figure 2) includes two upgradient and three downgradient monitoring wells in accordance with 40 C.F.R. § 257.91(c). The number, locations, and depths of these wells were determined based on site-specific information including groundwater flow direction, characteristics of unsaturated geologic units overlying the uppermost aquifer, and materials comprising the uppermost aquifer.
As explained more fully below, the existing network is sufficient to identify any releases to groundwater because the groundwater flow beneath the CGS Evaporation Pond flows toward the downgradient monitoring wells and the downgradient monitoring wells are located in the uppermost aquifer as close as feasible to the Evaporation Pond to detect any potential releases.

The sandstone and conglomerate of the Shinarump Member at the base of the Chinle Formation contains sufficient water to support flow to wells and springs and is uppermost saturated strata beneath the CGS Evaporation Pond. The Shinarump Member of the Chinle Formation is hereafter referred to as the uppermost aquifer.

The uppermost aquifer is confined and is first encountered at an approximate depth of 220 to 250 feet below ground surface (bgs) in the vicinity of the CGS Evaporation Pond. Depth to groundwater in the uppermost aquifer ranges between 250 and 291 feet bgs downgradient of the Evaporation Pond, and ranges from 97 to 166 feet bgs upgradient of the Evaporation Pond. In accordance with the CCR Rule, the downgradient wells are located as close as feasible to the

edge of waste and in areas that consistently have a lower piezometric surface than the gradient wells. Groundwater beneath the Evaporation Pond flows consistently in the direction shown on Figure 2. Semi-annual potentiometric surface maps included in Attachment B-1 (Figures B-1 through B-8) show that the groundwater flow direction is consistently toward the downgradient wells through the period of record and during both wet and dry seasons.

SRP conducted a drilling program at the CGS Evaporation Pond during 2015 for the purpose of establishing a CCR Rule compliant groundwater monitoring network. During this drilling program, three wells (MW-77, MW-80, and MW-82) were drilled at the downgradient side of the Evaporation Pond, and one new well (MW-81) was drilled upgradient of the pond. One existing upgradient well (MW-71, drilled in 2011) was also included in the groundwater monitoring network.

Lithologic logs for monitoring wells MW-77, MW-80, MW-81, and MW-82 indicate a mixture of lean and fat clay at each well from near ground surface to depths near the bottom of each borehole. Clayey silt, lean clay, fat clay, or sandy lean clay were encountered in each boring at depths ranging between 240 and 320 feet bgs. The low hydraulic conductivity clays of the Chinle Formation act as a confining layer that consistently holds confining pressure in the uppermost aquifer. Boring lithologic logs and drilling records for monitoring wells MW-77, MW-80, MW-81, and MW-82 are included in Attachment B-2.

The lithologic log for MW-71 shows clay is present to a depth of 160 feet bgs. A lens of fine-grained sand is reported at a depth of 160 to 170 feet bgs, but was reported to be dry, indicating it is isolated from water-bearing strata and ground surface. Below the sand lens, Chinle Formation materials were reported to be clay to a total depth of 240 feet bgs. Material from a depth of 240 to 277 feet bgs include saturated sandstone with interspersed claystone. Water was first encountered in this boring at a depth of 240 feet bgs. The lithologic boring log monitoring well MW-71 is included in Attachment B-2. The isolated sand lens encountered in the MW-71 boring was not observed in borings for monitoring wells MW-77, MW-80, MW-81, or MW-82.

Formation materials overlying the uppermost aquifer consist predominantly of clay that acts as the confining layer holding confined pressure in the uppermost aquifer. Two generalized cross-sections for the Evaporation Pond area are provided in Figure 3 (north to south) and Figure 4 (east to west). Confining conditions were observed during drilling of the Evaporation Pond monitoring wells in 2015 and 2016, and during the drilling program conducted in 2011. During drilling, borehole conditions were observed to be dry down to a depth of 220 to 250 feet bgs. Once the individual boreholes were advanced to this depth and groundwater was encountered, the water level rose within the borehole to a point between 20 and 40 feet above the zone where groundwater was first encountered. The confined aquifer conditions observed at the uppermost aquifer demonstrate that the Chinle Formation clay has sufficient low permeability to hold hydraulic pressure within the aquifer, preventing groundwater from flowing upward into the Chinle Formation under confined pressure, and similarly serves as a barrier to downward seepage. No saturated intervals have been observed above the uppermost aquifer at either upgradient or downgradient wells at the CGS Evaporation Pond.

Based on the foregoing characteristics and analysis, the groundwater monitoring network shown on Figure 2 is sufficient to detect any groundwater contamination resulting from a release from

the CGS Evaporation Pond because:

1. The downgradient monitoring wells are located in areas that consistently have lower piezometric surface than the upgradient wells. This means that groundwater flow beneath the CGS Evaporation Pond flows toward the downgradient monitoring wells.
2. The downgradient monitoring wells are located as close as feasible to the downgradient edge of waste in order to detect any potential releases from the CGS Evaporation Pond.
3. The downgradient wells are screened in the saturated strata nearest to the ground surface and that has sufficient water to support flow to wells and springs, and thus meets the definition of uppermost aquifer.

40 C.F.R. § 257.71(d)(1)(i)(B) (1)(i)

Map(s) of groundwater monitoring well locations in relation to the CCR unit(s) that depict the elevation of the potentiometric surface and the direction(s) of groundwater flow across the site;

Potentiometric surface maps were prepared for the CGS Evaporation Pond groundwater monitoring network during background sampling between April 2017 and September 2020 and have been prepared on a semi-annual frequency thereafter. The potentiometric surface maps included in Attachment B-1 show that the groundwater flow direction beneath the CGS Evaporation Pond is not affected by seasonal influences and flows consistently in the direction shown on Figure 2.

40 C.F.R. § 257.71(d)(1)(i)(B) (1)(ii)

Well construction diagrams and drilling logs for all groundwater monitoring wells;

The groundwater monitoring well network at the CGS Evaporation Pond includes two upgradient wells (MW-71 and MW-81) and three downgradient wells (MW-77, MW-80, and MW-82) as shown on the potentiometric maps included in Attachment B-1. The drilling logs and well construction diagrams for these wells are included in Attachment B-2. Additionally, groundwater monitoring well construction information for the Evaporation Pond is provided in Attachment B-2 as Table B-1.

40 C.F.R. § 257.71(d)(1)(i)(B) (1)(iii)

Maps that characterize the direction of groundwater flow accounting for temporal variations;

The potentiometric surface maps included in Attachment B-1 have been prepared during background sampling and on a semi-annual frequency thereafter and reflect spring and fall water level conditions. These two seasons reflect the wettest and driest times of the year and the periods with the greatest potential for groundwater flow variability. The uppermost aquifer is confined and consequently flow direction is not influenced by surface water interaction or localized recharge. The fact that the aquifer is confined and that there is effectively no local groundwater production from the uppermost aquifer results in a consistent groundwater flow direction within that aquifer.

The potentiometric surface maps included in Attachment B-1 show a consistent groundwater

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flow direction beneath the CGS Evaporation Pond that is not affected by seasonal influences and remains consistently as shown on Figure 2.

40 C.F.R. § 257.71(d)(1)(i)(B) (1)(iv)

Any other data and analyses the owner or operator of the CCR surface impoundment relied upon when determining the design and location of the groundwater monitoring network.

The original geologic studies conducted in support of design and construction of the CGS Evaporation Pond did not include characterization of groundwater or the uppermost aquifer. Two monitoring wells, MW-51 and MW-71, were installed adjacent to the dam at the CGS Evaporation Pond in 1988 and 2011, respectively. At the time, it was believed that these locations would be downgradient to the Evaporation Pond. These monitoring wells were installed for the purpose of detecting possible seepage to the uppermost aquifer from the Evaporation Pond. Construction records for these two wells provided information regarding the depth and composition of the uppermost aquifer which was used to begin the design of the groundwater monitoring network. The lithologic boring logs for monitoring wells MW-51 and MW-71 are included in Attachment B-2.

The CGS Evaporation Pond groundwater monitoring well network was established based on site-specific data and information collected during a multi-phase drilling program conducted starting in 2015. Based on information generated during the construction of monitoring wells MW-51 and MW-71, SRP conducted a two-phase drilling program to identify groundwater flow direction and additional groundwater monitoring well locations to support monitoring as required by the CCR Rule. The first phase of drilling included monitoring wells MW-74 and MW-75. These wells were drilled to target the same saturated interval of the uppermost aquifer monitored by well MW-71. The hydraulic relationship between wells MW-74, MW-75, MW-51, and MW-71 showed that MW-51 and MW-71 are located upgradient of the CGS Evaporation Pond. Monitoring wells MW-74 and MW-75 were not included in the CGS Evaporation Pond monitoring network because they are located too far from the Evaporation Pond to be used as monitoring wells for CCR Rule compliance. The lithologic boring logs for monitoring wells MW-74 and MW-75 are included in Attachment B-2.

In the second phase of drilling, monitoring wells MW-77, MW-80, MW-81, and MW-82 were drilled as candidates for potential downgradient monitoring wells. Each of these wells were drilled to target the uppermost aquifer encountered in wells MW-71, MW-74, and MW-75. The hydraulic relationships demonstrated during the second phase of drilling showed that well MW-81 is in an upgradient location, and MW-77, MW-80, and MW-82 are downgradient of representative potential groundwater flow paths from the CGS Evaporation Pond. The lithologic boring logs for monitoring wells MW-77, MW-80, MW-81, and MW-82 are included in Attachment B-2.

Monitoring well MW-51 was not included in the groundwater monitoring network because it was completed shallower than well MW-71 and does not appear to be in full communication with the uppermost aquifer. Well MW-51 has very low productivity, purges dry when sampled, and takes several years to recover. Well MW-51 was drilled to a depth of approximately 200 feet and appears to be completed at least partly in the Chinle Formation with limited hydraulic connection to the underlying uppermost aquifer. Monitoring Well MW-71 is located relatively close

(approximately 800 feet) to MW-51, was drilled to a depth of 277 feet, and encountered the uppermost aquifer at a depth of 240 feet bgs, and groundwater is measured at 270 feet bgs. Given the proximity of MW-71 to MW-51, and the depth difference of the two wells, it is apparent that MW-51 is not in full communication with the uppermost aquifer and therefore not appropriate to include in the groundwater monitoring network.

The groundwater monitoring network shown on Figure 2 consists of two upgradient and three downgradient monitoring wells screened in the uppermost saturated strata (uppermost aquifer) beneath the Evaporation pond. The downgradient wells are located as close as feasible to the edge of waste and in areas that consistently have lower piezometric surface than the upgradient wells, and the placement of the downgradient monitoring wells are sufficient to detect releases along representative groundwater flow paths from the CGS Evaporation Pond.

40 C.F.R. § 257.71(d)(1)(i)(B)(2)

Documentation that the CCR surface impoundment remains in detection monitoring pursuant to § 257.94 as a precondition for submitting an application. This includes documentation that the groundwater monitoring program meets the requirements of §§ 257.93 and 257.94. Such documentation includes data of constituent concentrations, summarized in table format, at each groundwater monitoring well monitored during each sampling event, and documentation of the most recent statistical tests conducted, analyses of the tests, and the rationale for the methods used in these comparisons. As part of this rationale, the owner or operator of the CCR surface impoundment must provide all data and analyses relied upon to comply with each of the requirements of this part;

The CGS Evaporation Pond remains in detection monitoring pursuant to 40 C.F.R. § 257.94 of the CCR Rule. All background and downgradient monitor wells have been sampled on a semi-annual basis. Detection monitoring data for the period ranging from January 2016 to September 2020 is provided in Table C-1 of Attachment C. These data represent groundwater samples collected from upgradient and downgradient monitor wells in accordance with requirements of 40 C.F.R. §§ 257.93 and 257.94.

Laboratory analytical results from each detection monitoring sampling event are compared to background groundwater quality values for the Evaporation Pond to determine whether a SSI has occurred; the reports are included in Attachment C-1.

A prediction limits statistical method is used to establish concentration limits having a specified confidence level for each constituent. The upper endpoint of the concentration limits is called the upper prediction limit (UPL). Depending on the background data distribution, parametric or non-parametric prediction limits procedures are used to evaluate groundwater monitoring data. Parametric prediction limits are appropriate for normally distributed data or data that are normalized via a transformation. If the data are non-normal and a transformation is not indicated, non-parametric procedures (order statistics or bootstrap methods) are used to calculate the prediction limit. If all the background data are non-detect, a maximum reporting limit may serve as an approximate UPL. Individual sample results at each downgradient well are then compared against the UPLs.

Groundwater data collected from downgradient wells at the CGS Evaporation Pond are normally

distributed and are analyzed using the parametric upper prediction limit method. Inter-well statistical analyses showed elevated calcium concentration at downgradient monitoring wells during baseline and subsequent monitoring. Following completion of an alternate source demonstration, calcium concentration from these well have been analyzed using a parametric upper prediction limit method applied to intra-well analysis. The statistical test certification and rationale for supporting those tests, per 40 C.F.R. § 257.93, are included in Attachment C-2.

Groundwater samples collected from monitoring wells MW-77 and MW-80 at the CGS Evaporation Pond in 2017 had calcium concentrations that were higher than those in the upgradient wells and represented an apparent statistically significant increase (SSI) above background concentrations using inter-well statistical analyses. On behalf of SRP, Haley & Aldrich conducted an analysis of the apparent SSI and determined that the calcium concentrations were within the range of observed natural groundwater variability in the vicinity of the Evaporation Pond. Isotopic analyses and tri-linear water quality analyses completed in support of the ASD conclusively demonstrate that there has been no seepage from the Evaporation Pond to the uppermost aquifer and that there is not a hydraulic connection between the Evaporation Pond and the uppermost aquifer. The ASD is included in Attachment B-3.

The ASD included review of groundwater quality data from wells MW-74 and MW-75, which are geographically separated from the Evaporation Pond and are installed at a location that is known to represent background groundwater quality more than 1 mile from the upgradient wells at the Evaporation Pond. The average calcium concentrations observed in 12 rounds of samples collected from MW-74 and MW-75 exceed the average concentrations observed downgradient of the Evaporation Pond. Average calcium concentrations observed in MW-74 and MW-75 are 249 and 296 mg/L, respectively. The maximum calcium concentrations downgradient of the Evaporation Pond at MW-77 and MW-80 were 178 and 186 mg/L, respectively. This comparison demonstrates that significant variability exists in background calcium concentrations within the uppermost aquifer, and that the concentrations observed downgradient of the CGS Evaporation Pond are within the range of natural variability.

Following the ASD, subsequent statistical analyses have been conducted for calcium using intra-well statistical methods. No SSIs are indicated for calcium at these wells when intra-well statistical methods are applied. The remainder of the statistical analyses conducted on groundwater samples collected from Evaporation Pond monitoring wells are performed using inter-well methods. No apparent SSIs have been identified for other constituents at the CGS Evaporation Pond and the CCR unit remains in detection monitoring.

40 C.F.R. § 257.71(d)(1)(i)(B)(3)

Documentation that the unit meets all the location restrictions under §§ 257.60 through 257.64;

40 C.F.R. § 257.60 Placement Above the Uppermost Aquifer

New CCR landfills, existing and new CCR surface impoundments, and all lateral expansions of CCR units must be constructed with a base that is located no less than 1.52 meters (five feet) above the upper limit of the uppermost aquifer, or must demonstrate that there will not be an intermittent, recurring, or sustained hydraulic connection between any portion of the base of the CCR unit and the uppermost aquifer due to normal fluctuations in groundwater elevations

(including the seasonal high water table).

The Evaporation Pond Dam was constructed between 1977 and 1979. The limits of the toe of the dam along with original topography at the base of the impoundment dike correlate to the natural low point of the original existing grades within the surface impoundment. The lowest natural elevation within the impoundment at the time of construction was along the toe of the dam at an approximate elevation of 5774 feet. The groundwater monitoring program has been certified. Observations of the groundwater elevations of the uppermost aquifer at the Coronado Generating Station beneath the Evaporation Pond have generally been found to range from between approximate elevations of 5,560 feet to 5,685 feet.

As required by 40 C.F.R. § 257.60(a), the base of the Evaporation Pond must be located no less than five feet above the upper limit of the uppermost aquifer. By comparing the lowest elevation of the base of the Evaporation Pond and the highest observed elevation of the uppermost aquifer to date in the CCR Rule groundwater monitoring system, it is demonstrated that the Evaporation Pond has greater than five feet of separation and therefore meets the requirement of 40 C.F.R. § 257.60(a). Additional documentation demonstrating that the CGS Evaporation Pond meets location restriction requirements set forth in 40 C.F.R. § 257.60 (*Placement Above the Uppermost Aquifer)* of the CCR Rule is included in Attachment D-1.

40 C.F.R. § 257.61 Wetlands

New CCR landfills, existing and new CCR surface impoundments, and all lateral expansions of CCR units must not be located in wetlands, as defined in § 232.2 of this chapter, unless the owner or operator demonstrates by the dates specified in paragraph (c) of this section that the CCR unit meets the requirements of paragraphs (a)(1) through (5) of this section.

Based on a review of available data from publicly available resources, in addition to a site-specific wetland evaluation, it was concluded that the Evaporation Pond is not located in wetlands as defined by 40 C.F.R. § 232.2. Documentation demonstrating that the CGS Evaporation Pond meets location restrictions pertaining to wetlands pursuant to 40 C.F.R. § 257.61 (Wetlands) of the CCR Rule is included in Attachment D-2.

40 C.F.R. § 257.62 Fault Areas

New CCR landfills, existing and new CCR surface impoundments, and all lateral expansions of CCR units must not be located within 60 meters (200 feet) of the outermost damage zone of a fault that has had displacement in Holocene time unless the owner or operator demonstrates by the dates specified in paragraph (c) of this section that an alternative setback distance of less than 60 meters (200 feet) will prevent damage to the structural integrity of the CCR unit.

A review of available data from the U.S. Geologic Survey, the Arizona Geological Survey, and other available information was completed for this demonstration. The nearest known fault is located approximately 9.4 miles southwest of the Evaporation Pond and is not known to have any activity within the last 10,000 years. Local depositional characteristics were also evaluated and determined that no active faults or fault zones exist. Based on the published geologic data and information reviewed, there are no active faults or fault damage zones that have had displacement in Holocene time reported or indicated within 200 feet of the Evaporation Pond.

Additional documentation demonstrating that the CGS Evaporation Pond meets location restrictions pertaining to proximity to known faults set forth in 40 C.F.R. § 257.62 (Fault Areas) of the CCR Rule is included in Attachment D-3.

40 C.F.R. § 257.63 Seismic Impact Zones

New CCR landfills, existing and new CCR surface impoundments, and all lateral expansions of a CCR unit must not be located in seismic impact zones unless the owner or operator demonstrates by October 17, 2018 that all structural components including liners, leachate collection and removal systems, and surface water control systems, are designed to resist the maximum horizontal acceleration in lithified earth material for the site.

A Seismic Impact Zone is defined in the CCR Rule as "an area having a 2 percent or greater probability that the maximum expected horizontal acceleration, expressed as a percentage of the earth's gravitational pull (g), will exceed 0.10g in 50 years." The maximum expected horizontal acceleration for the 2 percent in 50 years probability is 0.098g or less. Since the maximum expected horizontal acceleration is less than 0.10g, the Evaporation Pond at CGS has been determined to not be located within a Seismic Impact Zone. Additional documentation demonstrating that the CGS Evaporation Pond meets location restrictions pertaining to proximity to seismic impact zones set forth in 40 C.F.R. § 257.63 (Seismic Impact Zones) of the CCR is included in Attachment D-4.

40 C.F.R. § 257.64 Unstable Areas

An existing or new CCR landfill, existing or new CCR surface impoundment, or any lateral expansion of a CCR unit must not be located in an unstable area unless the owner or operator demonstrates by the dates specified in paragraph (d) of this section that recognized and generally accepted good engineering practices have been incorporated into the design of the CCR unit to ensure that the integrity of the structural components of the CCR unit will not be disrupted.

An unstable area is defined in 40 C.F.R. § 257.53 of the CCR Rule as a location that is susceptible to natural or human-induced events or forces capable of impairing the integrity, including structural components of some or all of the CCR unit that are responsible for preventing releases from such unit. Unstable areas can include poor foundation conditions, areas susceptible to mass movements, and karst terrains. Our evaluation of the unstable area criteria is provided below.

40 C.F.R. § 257.64 (b): The owner or operator must consider all of the following factors, at a minimum, when determining whether an area is unstable:

(1) On-site or local soil conditions that may result in significant differential settling;

Site Specific soil conditions that can contribute to differential settlement include soft/loose foundation soils, unstable slopes, and foundation soils that are susceptible to liquefaction. The Evaporation Pond area is located over the Triassic Chinle Formation. Test borings performed around the perimeter of the impoundment indicate that the underlying Chinle Formation primarily consists of stiff to hard fat CLAY (CH) and very dense clayey SAND (SC) and that soft

compressible foundation soils do not exist.

The original ground surface that supports the Evaporation Pond was mildly sloping with maximum slopes of up to approximately 5 percent and are not generally susceptible to slope instability. In addition, site reconnaissance did not reveal signs of past slope failures or instability.

For soil liquefaction to occur, soils must have a high level of saturation. Review of boring logs and laboratory test data indicate the Chinle Formation soils are generally dry to moist and are not saturated. Similarly, monitoring well records indicate that the static groundwater level below the impoundment ranges approximately 90 to 260 ft below ground surface. Accordingly, the soils have not been determined to be subject to liquefaction.

(2) On-site or local geologic or geomorphologic features;

Local geologic or geomorphologic features that can lead to unstable conditions include landslides and Karst terrain.

Karst terrain refers to an area where karst topography is developed as a result of the dissolution of limestone, dolomite, or other soluble rock. Based on available United States Geological Survey (USGS) information, karst topography does not exist at the CGS site. In addition, no documentation of karst related physiographic features such as sinkholes, vertical shafts, sinking streams, caves, large springs, or blind valleys at the CGS site.

With respect to landslides, the primary concern is the downslope transport of soil and rock material by gravity at, beneath, or adjacent to the Evaporation Pond. To evaluate the susceptibility of landslides, readily available USGS data was assessed and site reconnaissance was performed. Based on this information, the CGS site is in an area of low to moderate landslide incidence. In addition, site reconnaissance did not reveal signs of past landslides. The Evaporation Pond is not located in an area that has high susceptibility to landslides.

(3) On-site or local human-made features or events (both surface and subsurface).

Typical anthropogenic (human-made) activities that could induce instability include mining, cut and fill activities during construction, excessive drawdown of groundwater, and using old landfills/impoundments as the foundation for new impoundments. At the Evaporation Pond, there are no documented surface or subsurface anthropogenic activities that would indicate unstable foundation conditions.

Additional documentation demonstrating that the CGS Evaporation Pond meets location restrictions pertaining to proximity to known unstable areas set forth in 40 C.F.R. § 257.64 (*Unstable Areas)* of the CCR Rule is included in Attachment D-5.

The documents included in Attachment D demonstrate that the CGS Evaporation Pond conforms to siting restrictions set forth in 40 C.F.R. §§ 257.60 through 257.64.

40 C.F.R. § 257.71(d)(1)(i)(B)(4)

The most recent structural stability assessment required at § 257.73(d);

In accordance with 40 C.F.R. § 257.73(d), the owner or operator of a CCR surface impoundment must conduct initial and periodic structural stability assessments to determine whether the design, construction, operation, and maintenance of the CCR unit is consistent with recognized and generally accepted good engineering practices. Haley & Aldrich completed a structural stability assessment of the CCR Evaporation Pond on behalf of SRP in 2016. The 2016 Structural Stability Assessment did not identify any structural stability deficiencies in the Evaporation Pond Dam; the assessment is included in Attachment E.

40 C.F.R. § 257.71(d)(1)(i)(B)(5)

The most recent safety factor assessment required at § 257.73(e).

The Safety Factor Assessment for the Evaporation Pond located at CGS was completed in accordance with 40 C.F.R. § 257.73(e) of the CCR Rule. Haley & Aldrich completed a safety factor assessment of the CGS Evaporation Pond on behalf of SRP in 2016. The 2016 Safety Factor Assessment for the Evaporation Pond is provided in Attachment F.

40 C.F.R. § 257.71(d)(1)(i)(C)

Documentation of the design specifications for any engineered liner components, as well as all data and analyses the owner or operator of the CCR surface impoundment relied on when determining that the materials are suitable for use and that the construction of the liner is of good quality and in-line with proven and accepted engineering practices.

This requirement is not applicable. The CGS Evaporation Pond was constructed on top of a thick sequence of naturally occurring, low hydraulic conductivity clays of the Chinle Formation and was not constructed using engineered liner components.

40 C.F.R. § 257.71(d)(1)(i)(D)

Facilities with CCR surface impoundments located on properties adjacent to a water body must demonstrate that there is no reasonable probability that a complete and direct transport pathway (i.e., not mediated by groundwater) can exist between the impoundment and any nearby water body.

This requirement is not applicable. The CGS Evaporation Pond is not adjacent to, or near, any surface water bodies. The CGS Evaporation Pond does not have any hydraulic influence on surface water bodies, and no surface water bodies have hydraulic influence on the Evaporation Pond.

The CGS Evaporation Pond is situated in an arid, broad valley located southwest of the plant site where the Chinle Formation rises to the south, east and west of the impoundment as depicted in Figure 3 and Figure 4. The engineered earthfill embankment dam is located on the north end of the Evaporation Pond. The Chinle formation is predominately clay with bentonite

content and acts as a barrier to migration of water from the impoundment both laterally and vertically downward.

The Little Colorado River is the nearest surface water body to the CGS Evaporation Pond. At the nearest point, the Little Colorado River is approximately 3 miles southwest of the Evaporation Pond, cross-gradient from the Evaporation Pond, and on the opposite side of a topographic divide. Each of the drainages in the vicinity of the Evaporation Pond are unnamed dry washes that only have flow in response to high intensity precipitation events. One of the washes located downgradient of the Evaporation Pond extends north and northwest from the Evaporation Pond a distance of approximately 4 miles, before it comes to a confluence with Carrizo Wash. Carrizo Wash is an ephemeral drainage that flows more frequently than the unnamed dry wash, but again only flows in response to precipitation events. From the confluence with the unnamed wash, Carrizo Wash extends more than 3 more miles before it comes to a confluence with the Little Colorado River. Therefore, because there is no nearby surface water body, there is no reasonable probability of a direct transport pathway to a surface water body from the CGS Evaporation Pond.

40 C.F.R. § 257.71(d)(1)(i)(E)

Upon submission of the application and any supplemental materials submitted in support of the application to the Administrator or the Participating State Director, the owner or operator must place the complete application in the facility's operating record as required by § 257.105(f)(14).

As of the date of this letter, SRP has placed this Application, including all supporting documents, in the facility's operating record in accordance with 40 C.F.R. §§ 257.105(f)(14) and 257.71(d)(1)(i)(E).

SRP appreciates the U.S. Environmental Protection Agency's consideration of this Application to make an Alternate Liner Demonstration for the CGS Evaporation Pond. Any questions regarding the contents of the Application may be directed to Andrea Martinez at 602-236-2618 or Andrea.Martinez@srpnet.com.

Sincerely,

Craig R. Larson

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Enclosures:

Figure 1	Site Location
Figure 2	Evaporation Pond Groundwater Monitoring Network
Figure 3	Generalized Cross Section A-A'
Figure 4	Generalized Cross Section B-B'

Attachment A	CCR Liner Equivalency Analysis and Report
Attachment B	Groundwater Monitoring Network Documentation
Attachment B-1	Groundwater Potentiometric Surface Maps
Attachment B-2	Well Construction and Boring Logs
Table B-1	Groundwater Monitoring Well Construction Information
Attachment B-3	Alternate Source Demonstration for the Evaporation Pond
Attachment C	Detection Monitoring Documentation
Attachment C-1	Summary of Statistical Analysis
Table C-1	Summary of Analytical Results - Detection Monitoring
Attachment C-2	Certification of Statistical Method Selection for Evaporation Pond Data
Attachment D	Location Restrictions
Attachment D-1	Location Restrictions – Uppermost Aquifer Separation
Attachment D-2	Location Restrictions – Wetlands
Attachment D-3	Location Restrictions – Fault Areas
Attachment D-4	Location Restrictions – Seismic Impact Zones
Attachment D-5	Location Restrictions – Unstable Areas
Attachment E	Structural Stability Assessment
Attachment F	Safety Factor Assessment

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FIGURES

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ATTACHMENT A

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ATTACHMENT B

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Attachment B-1

Groundwater Potentiometric Surface Maps

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Attachment B-2

Well Construction and Boring Logs

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Table B-1

Groundwater Monitoring Well Construction Information

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Attachment B-3

Alternate Source Demonstration for the Evaporation Pond

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ATTACHMENT C

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Attachment C-1

Summary of Statistical Analysis

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Table C-1

Summary of Analytical Results – Detection Monitoring

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Attachment C-2

Certification of Statistical Method Selection for Evaporation Pond Data

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ATTACHMENT D

Draft

Attachment D-1

Location Restrictions – Uppermost Aquifer Separation

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Attachment D-2

Location Restrictions – Wetlands

Draft

Attachment D-3

Location Restrictions – Fault Areas

Draft

Attachment D-4

Location Restrictions – Seismic Impact Zones

Draft

Attachment D-5

Location Restrictions – Unstable Areas

Draft

ATTACHMENT E

Draft

ATTACHMENT F

Draft

Message

From: Christopher P Scieszka [christopher.scieszka@dteenergy.com]
Sent: 11/6/2020 5:51:11 PM
To: Huggins, Richard [Huggins.Richard@epa.gov]; Mills, Jason [Mills.Jason@epa.gov]; Birchfield, Norman [Birchfield.Norman@epa.gov]; Long, Michelle [Long.Michelle@epa.gov]; Jackson, Mary [Jackson.Mary@epa.gov]; Celeste, Laurel [celeste.laurel@epa.gov]; Robert J Lee [robert.j.lee@dteenergy.com]; Christy D Clark [christy.clark@dteenergy.com]; Kelly M Martorano [kelly.martorano@dteenergy.com]; Buening, Vincent [VBuening@trccompanies.com]; Crockford, Graham [GCrockford@trccompanies.com]; Cratsenburg, Kelly [KCratsenburg@trccompanies.com]; John Seymour [JSeymour@Geosyntec.com]; Omer Bozok [OBozok@Geosyntec.com]; Mooney, Susan [mooney.susan@epa.gov]; Schumacher, Jessica [Schumacher.Jessica@epa.gov]
Subject: RE: Part B Discussion with DTE (2 of 3)
Attachments: BRPP DB Part B ALD Application_DRAFT 11.06.2020.pdf

All,

The draft application for the Belle River Power Plant Diversion Basin is attached for our discussion on Monday. The Monroe Power Plant Fly Ash Basin application is forthcoming.

Regards,

Chris Scieszka
Environmental Management & Safety
One Energy Plaza | 410 G.O. | Detroit, MI 48226
(O) 313-235-0153 | (C) Ex. 6 Personal Privacy (PP)
christopher.scieszka@dteenergy.com

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From: Christopher P Scieszka
Sent: Friday, November 06, 2020 12:46 PM
To: 'Huggins, Richard' <Huggins.Richard@epa.gov>; Mills, Jason <Mills.Jason@epa.gov>; Birchfield, Norman <Birchfield.Norman@epa.gov>; Long, Michelle <Long.Michelle@epa.gov>; Jackson, Mary <Jackson.Mary@epa.gov>; Celeste, Laurel <celeste.laurel@epa.gov>; Robert J Lee <robert.j.lee@dteenergy.com>; Christy D Clark <Christy.Clark@dteenergy.com>; Kelly M Martorano <kelly.martorano@dteenergy.com>; Buening, Vincent <VBuening@trccompanies.com>; Crockford, Graham <GCrockford@trccompanies.com>; Cratsenburg, Kelly <KCratsenburg@trccompanies.com>; John Seymour <JSeymour@Geosyntec.com>; Omer Bozok <OBozok@Geosyntec.com>; Mooney, Susan <mooney.susan@epa.gov>; Schumacher, Jessica <Schumacher.Jessica@epa.gov>
Subject: RE: Part B Discussion with DTE (1 of 3)

All,

Please find attached the draft Alternate Liner Demonstration Application for the Belle River Power Plant Bottom Ash Basins, as well as the agenda to drive our discussion on Monday.

The draft applications for the Belle River Power Plant Diversion Basin and the Monroe Power Plant Fly Ash Basin will be sent in separate emails soon.

Regards,

_____

Chris Scieszka
Environmental Management & Safety
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-----Original Appointment-----
From: Huggins, Richard <Huggins.Richard@epa.gov>
Sent: Friday, October 30, 2020 1:08 PM
To: Huggins, Richard; Mills, Jason; Birchfield, Norman; Long, Michelle; Jackson, Mary; Celeste, Laurel; Christopher P Scieszka; Robert J Lee; Christy D Clark; Kelly M Martorano; Buening, Vincent; Crockford, Graham; Cratsenburg, Kelly; John Seymour; Omer Bozok; Mooney, Susan; Schumacher, Jessica
Subject: Part B Discussion with DTE
When: Monday, November 09, 2020 11:00 AM-12:00 PM (UTC-05:00) Eastern Time (US & Canada).
Where: Microsoft Teams Meeting

one for Monroe Power Plant Fly Ash Basin, one for the Belle River Power Plant Bottom Ash Basins, and one for the Belle River Power Plant Diversion Basin

---

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Initial Application for an Alternate Liner Demonstration

Belle River Power Plant Diversion Basin Coal Combustion Residuals Unit

November 2020

Prepared For:

DTE Electric Company
4505 King Road
China Township, Michigan 48054

Prepared By:

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Appendix B Owner Certification of Compliance
Appendix C Well Construction Diagrams and Soil Boring Logs
Appendix D Subsurface Investigation and Foundation Report, Bechtel, 1976

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Executive Summary

TRC, on behalf of DTE Electric Company (DTE Electric), has prepared this Initial Application for an Alternate Liner Demonstration pursuant to the XX, XX, 2020 Hazardous and Solid Waste Management System: Disposal of Coal Combustion Residuals From Electric Utilities; A Holistic Approach to Closure Part B: Alternate Demonstration for Unlined Surface Impoundments (40 CFR § 257.71(d)) (Part B Rule) for the Belle River Plant Diversion Basin (BRPP DB) Coal Combustion Residuals (CCR) Unit.

This application and its attachments demonstrate how DTE Electric qualifies for and should be granted the opportunity to complete and submit an Alternate Liner Demonstration per 40 CFR § 257.71(d)(1)(i) for approval as continued operation of the BRPP DB CCR Unit would pose no reasonable probability of adverse effects to human health or the environment in the future based on the following:

- Compliance with all provisions of the Final Rule: Disposal of CCR from Electric Utilities (CCR Rule); April 15, 2015, 40 CFR part 257 subpart D, including a sufficient groundwater monitoring network under § 257.91;
- The groundwater monitoring program meets the requirements of § 257.93 and § 257.94, and per analytical data collected as part of the program, remains in detection monitoring;
- The presence of a natural geologic barrier (more than 80 feet of native clay-rich soil) that provides the equivalent, or better level of protection from potential migration of contaminants than a composite liner defined in 40 CFR § 257.70(b);
- Sufficient documentation that the unit meets all the location restrictions under § 257.60 through § 257.64, and;
- The BRPP DB CCR Unit is not located adjacent to a surface water body.

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1.0 Regulatory Framework and Site Background

Regulatory Framework - On April 17, 2015, the U.S. EPA issued the Final Rule: Disposal of CCR from Electric Utilities (CCR Rule), 40 CFR 257, Subpart D, to regulate the disposal of CCR materials generated at coal-fired units. The rule is being administered under Subtitle D of the Resource Conservation and Recovery Act (RCRA, 42 U.S.C. § 6901 et seq.). On XXXX XX, 2020, the EPA Administrator issued revisions to the CCR Rule that required all unlined surface impoundments to initiate closure by April 11, 2021, unless an alternative deadline is requested and approved (40 CFR 257.103) or an initial application for an Alternate Liner Demonstration is prepared per 40 CFR § 257.71(d) and submitted by November 30, 2020. The April 11, 2021 deadline to cease receipt of waste and initiate closure will be tolled upon submission of a complete application and until such time that EPA makes a final decision on the application or subsequent demonstration. The initial application for an Alternate Liner Demonstration per § 257.71(d)(1)(i) must include the location of the facility and identify the specific CCR surface impoundment(s) for which the demonstration will be made. The application must also include all the following information:

- **§ 257.71(d)(1)(i)(A)** – A certification signed by the owner or operator that the CCR Unit is in full compliance with this subpart except for § 257.71(a)(1);
- **§ 257.71(d)(1)(i)(B)** – Documentation supporting the certification required under § 257.71(d)(1)(i)(A) which includes the following:
  1. Documentation that the groundwater monitoring network meets the requirements of § 257.91. This must include documentation that the existing network of groundwater monitoring wells is sufficient to ensure detection of any groundwater contamination resulting from the impoundment, based on direction of flow, well location, screening depth and other relevant factors;
  2. Documentation that the CCR surface impoundment remains in detection monitoring pursuant to § 257.94 as a precondition for submitting an application. This includes documentation that the groundwater monitoring program meets the requirements of § 257.93 and § 257.94;
  3. Documentation that the unit meets all the location restrictions under § 257.60 through 257.64;
  4. Documentation of the most recent structural stability assessment required by § 257.73(d); and
  5. Documentation of the most recent safety factor assessment required by § 257.73(e).
- **§ 257.71(d)(1)(i)(C)** – Documentation of the design specifications for any engineered liner components, as well as all data and analyses the owner or operator of the CCR surface impoundment relied on when determining the materials are suitable for use and that the construction of the liner is of good quality and in-line with proven and accepted engineering practices;
- **§ 257.71(d)(1)(i)(D)** – Facilities with CCR surface impoundments located on properties adjacent to a water body must demonstrate that there is no reasonable probability that a complete and direct transport pathway (*i.e.*, not mediated by groundwater) can exist between the impoundment and any nearby water body; and

- **§ 257.71(d)(1)(i)(E)** – Upon submission of the application, and any supplemental materials submitted in support of the application to the Administrator or the Participating State Director, the owner or operator must place the complete application in the facility's operating record as required by § 257.105(f)(14).

The documentation that must be provided to the EPA per § 257.71(d)(1)(i) to demonstrate that the above criteria has been met for an initial Alternate Liner Demonstration is provided within this report.

Site Background - The BRPP is located in Section 13, Township 4 North, Range 16 East at 4505 King Road, China Township in St. Clair County, Michigan (**Figure 1**). The BRPP, including the DB, was constructed in the early 1980s.

The property has been used continuously as a coal fired power plant since the Detroit Edison Company (now DTE Electric) began power plant operations at BRPP in 1984. The DB is designed to manage sluiced bottom ash and has been in operation since the BRPP began operation. The DB is routinely cleaned out and CCR is either beneficially reused or disposed at the Range Road Landfill (RRLF).

The BRPP DB is an incised CCR surface impoundment located west of the BRPP near the Webster Drain. Water flows into the DB from the North and South bottom ash basins (BABs) through a network of pipes and ditches **(Figure 2)**. The DB discharges to the St. Clair River with other site wastewater in accordance with a National Pollution Discharge Elimination System (NPDES) permit. The DB has an approximately 300-foot-long entrance channel that connects to the main portion of the basin that runs approximately north-south. The main portion of the DB is approximately 400 feet long by approximately 120 feet wide with a bottom elevation of approximately 576 feet with the water level being maintained at approximately 580 feet relative to the NAVD 1988. The capacity of the DB is approximately 5.2 million gallons. The DB is approximately 1.55 acres.

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2.0 Natural Clay Liner

Pursuant to Part B, in order to meet the requirements of 40 CFR § 257.71(d)(1), the owner or operator must demonstrate that, without a composite liner, the continued operation of the unit would pose no reasonable probability of adverse effects to human health or the environment. This is demonstrated when the surface impoundment has not and will not result in groundwater concentrations above the relevant GWPS at the unit boundary (health based or background, whichever is higher).

The risks posed by the continued operation of the DB CCR Unit are mitigated by the geologic and hydrogeologic conditions at the site, and through DTE Electric's demonstrated compliance with the CCR rules. The following paragraphs document the existing site conditions, identification of potential receptors, and how potential risks have been mitigated.

Site Geology - The geology of St. Clair County consists of approximately 101 to 400 feet of glacial deposits, primarily lacustrine deposits, till, and, to a lesser extent, sand and gravel outwash, overlying a variety of bedrock surfaces[1]. The thicker glacial deposits, predominantly low permeability clay-rich deposits, are present toward the central portion of the county, including in the area of the BRPP DB CCR Unit. These thick low permeability subsurface conditions are present on a regional basis due to continental glaciation. The *Natural Clay Liner Equivalency Evaluation Report, DTE Electric and Consumers Energy Company Six Southeast Michigan Coal Combustion Residual Units,* previously submitted to the EPA in December of 2018, also contains additional information on the natural clay liner evaluation. This report can be found here: Clay Liner Equivalency Report. Bedrock in the county includes the Michigan Formation, Marshall Sandstone, Coldwater Shale, Sunbury Shale, Berea Sandstone, Bedford Shale, and Antrim Shale.

In the vicinity of the site, the Devonian Bedford and/or Antrim Shale bedrock dips to the northwest and is generally covered by more than 100 feet of unconsolidated clay, silt, sand, and gravel. In this area, generally on the eastern side of the county, the glacial deposits are predominantly silty-clay till and lacustrine deposits with lenses of sand and gravel. Where present, unconsolidated sand and gravel deposits within the till and lacustrine deposits are generally used for water supply throughout the county. Approximately 85 percent of the water supply wells in St. Clair County are completed in the glacial deposits compared to approximately 13 percent installed in bedrock[1].

The current topography of the St. Clair area gently undulates consisting of floodplain, stream terrace, and lakeshore deposits. The St. Clair River is the major surface water body in the county and runs along the eastern boundary of the county. Regional groundwater and surface water flow would be expected to be to the east towards the St. Clair River.

The site subsurface geology is based on information from historical borings advanced during initial design of the BRPP, in addition to the soil boring data collected from around the DB during

[1] Beth A. Apple and Howard W. Reeves, 2007, Summary of Hydrogeologic Conditions by County for the State of Michigan. U.S. Geological Survey Open-File Report 2007-1236, 78 p.

the groundwater monitoring system installation. This information documents that the BRPP DB CCR Unit is underlain by more than 130 feet of vertically thick and laterally continuous silty-clay rich deposits, with the lower confining Bedford Shale generally encountered from 135 to 145 feet-below ground surface (feet-bgs). Although the encountered zone of saturation along the bedrock interface did not yield significant groundwater, it was conservatively interpreted as the first underlying saturated zone that would presumably become affected with CCR constituents. The zone of saturation also exhibited a much higher conductivity than the clay-rich soils between the bottom of the basin and the monitored zone. In addition, the underlying shale does not yield groundwater, rather it is an aquiclude that prevents groundwater flow (i.e., is not an aquifer). Refer to the Groundwater Monitoring Systems Summary Report (GWMS, October 2017) located on the DTE Compliance Data and Information website (BRPP GWMS) and **Figures 3 through 5** for further details on the site geology.

Site Hydrogeology – Based on data collected by TRC from monitoring wells near the DB CCR unit, there is an overall flow potential to the north-northwest with a mean gradient of 0.003 foot/foot from the CCR monitoring wells MW-16-06 through MW-16-08 (up gradient) on the east side of the DB CCR unit towards monitoring wells MW-16-05, MW-16-10 and MW-16-11/11A (down gradient). The GWMS report (BRPP GWMS) contains additional details related to the site hydrogeology.

For the DB CCR unit, assuming an average porosity of 0.4 for the silt in the uppermost aquifer in this area, the mean hydraulic conductivity of 0.2 feet/day and a hydraulic gradient of 0.003 foot/foot for the upper aquifer, the potential horizontal groundwater flow rate to approximately the north-northwest is approximately 0.0015 feet/day or 0.55 feet/year. Given low flow velocity of this zone, inter-well (upgradient to downgradient) statistical tests are inappropriate for detection monitoring of this basin.

In addition, the elevation of CCR-affected water maintained within the BRPP DB is approximately 5 to 15 feet above the potentiometric surface elevations in the uppermost aquifer at the DB CCR unit area. This suggests that if the CCR affected surface water in the DB were able to penetrate the silty clay-rich underlying confining unit head on, that release likely would travel radially away from the DB within the uppermost aquifer. However, with the very thick continuous silty clay-rich confining unit beneath the BRPP it is not possible for the uppermost aquifer to have been affected by CCR from BRPP operations that began in the 1980s (see vertical travel time of travel discussion below).

For further discussion on the site groundwater flow see **Appendix A** for the 2019 Annual Groundwater Monitoring Report (GWMR). The 2018 and 2017 GWMR reports can be located on DTE CCR Compliance Data and Information website (BRPP 2018 GWMR and BRPP 2017 GWMR). Refer to **Figures 6 and 7** for the most recent potentiometric surface maps.

Vertical Flow Potential to Uppermost Aquifer – As stated previously, the BRPP is a natural silty-clay site, and the presence of the natural clay liner has been verified by numerous historical soil borings and confirmed by the twelve soil borings installed as part of the CCR monitoring well installation program at the BABs and DB CCR Units. Therefore, the geology and

hydrogeology of the site provides a very high level of environmental protection of the uppermost aquifer. Based on the site geology and hydrogeology, there is no reasonable probability for the impoundment to have adverse effects to the off-site uppermost aquifer groundwater, human health or the environment given the relatively short duration of continued operation. Groundwater occurring in the deep confined uppermost aquifer is protected from CCR constituents in the DB by a clay-rich aquitard with low hydraulic conductivity that is more than 82 feet thick from the bottom of the DB. Using the hydrogeologic information for the site, the time of travel for water from the base-grade elevation of the DB down to the uppermost aquifer can be calculated using the following formula:

$$V = Ki/Ne$$

Where:

V = Velocity (feet/day)

K = Hydraulic Conductivity (3×10^{-8} cm/s based on high end silty clay-rich data)

i = Downward Vertical Gradient (conservatively assumed to be one foot/foot)

Ne = Effective Porosity (0.5 for clay-rich soil)

From the above formula, the maximum downward flow velocity through the silty-clay confining unit to the uppermost aquifer is 6×10^{-8} cm/sec, or 0.063 feet/year. Therefore, the time of travel for liquid from the base of the DB through 82 feet of silty-clay (thinnest potential section of silty-clay confining unit above the uppermost aquifer at the base of the DB CCR Unit) to the uppermost aquifer is approximately 1,300 years. Therefore, given that BRPP operations began in 1984, and the fact that DTE Electric has publicly announced that it plans to cease operations at the BRPP by 2030 (refer to the 2019 Integrated Resource Plan (IRP) presented to and approved by the Michigan Public Service Commission (IRP)), there is no potential for the uppermost aquifer CCR groundwater monitoring system wells to be affected by the BRPP CCR DB Unit. Therefore, the natural clay-rich soil liner underlying the DB CCR Unit consists of thick, low hydraulic conductivity clay, that provides the same, or better level of protection from potential migration of contaminants than the composite liner defined in 40 CFR § 257.70(b).

Groundwater Use - Water supply wells are present within the sand and/or gravel rich aquifer units within the lacustrine unconsolidated sediments at depths of around 100 feet-bgs within between one-half and one mile to the west and southwest of the BRPP. There is no on-site use of groundwater at the BRPP. Surface water bodies present in the area of the BRPP include the Belle River (as close as 2,000 feet southwest and south of BRPP) and the St. Clair River (as close as one mile to the east of BRPP).

Detection Monitoring - A groundwater monitoring system has been established for the BRPP DB CCR Unit (BRPP GWMS). The detection monitoring well network for the DB CCR Unit currently consists of six monitoring wells that are screened in the uppermost aquifer. The monitoring well locations are shown on **Figure 2.** Detection monitoring at the monitoring well system has been completed since 2017 in accordance with § 257.93 and § 257.94 with

compliance as required in § 257.71(d)(1)(i)(B)(2) being documented in the 2017, 2018 and 2019 Annual Reports prepared in accordance with § 257.90. See **Appendix A** for the 2019 GWMR, and the DTE website for the 2018 and 2017 GWMRs (BRPP 2018 GWMR and BRPP 2017 GWMR).

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3.0 Facility Compliance

DTE Electric has a public repository of documents in accordance with 40 CFR § 257.107 which can be found here: DTE CCR Compliance Data and Information. This repository demonstrates that the BRPP DB facility is in compliance with all record keeping, notification and internet posting requirements as required by 40 CFR 257 Subpart D. DTE Electric audited their records to identify any gaps in compliance and none were noted. As required by § 257.71(d)(1)(i)(A), a certification signed by the owner or operator that the BRPP DB CCR Unit is in full compliance with this subpart, except for § 257.71(a)(1), has been included as **Appendix B**. A summary of the key compliance metrics for the BRPP DB CCR Unit is discussed below.

Groundwater Monitoring System § 257.71(d)(1)(i)(B)(1) – In accordance with 40 CFR § 257.91, a P.E. certified groundwater monitoring system is established for the BRPP DB CCR Unit (BRPP GWMS). The monitoring well network for the DB CCR Unit currently consists of six monitoring wells that are screened in the uppermost aquifer and are sufficient to ensure detection of groundwater contamination resulting from the DB CCR Unit. Given the presence of the thick natural clay-rich liner hydraulic barrier as discussed in Section 2 and the relatively small foot print of the DB, the perimeter groundwater monitoring well network is appropriate to monitor the BRPP DB CCR Unit. The monitoring well locations are shown on **Figure 2**. Well Construction and Soil Boring Logs for the monitoring network are attached as **Appendix C**.

Groundwater elevation data collected during the 2019 sampling events show that groundwater flow conditions within the uppermost aquifer are consistent with previous monitoring events. Groundwater potentiometric elevation summary maps are shown on **Figure 6 and Figure 7**, respectively. Additional figures for 2017 and 2018 can be found in the 2017 and 2018 GWMRs located on the DTE website (BRPP 2018 GWMR and BRPP 2017 GWMR). There is a horizontally extensive clay with substantial vertical thickness of greater than 80 feet that isolates the uppermost aquifer from the BRPP DB CCR Unit (refer to **Figures 3, 4 and 5** for geologic cross sections).

Detection Monitoring and Groundwater Statistical Analysis § 257.71(d)(1)(i)(B)(2) – The groundwater conditions have been consistent through all monitoring events completed since 2017. This continues to demonstrate that the downgradient wells are appropriately positioned to detect the presence of Appendix III parameters that could potentially migrate from the BRPP DB CCR Unit. This additionally demonstrates the unit has been in compliance with detection monitoring performed in accordance with § 257.94 as required in § 257.71(d)(1)(i)(B)(2). This is documented in the 2017 through 2019 Annual Reports prepared as required by 40 CFR § 257.90. The 2019 GWMR is attached as **Appendix A,** 2018 and 2017 GWMRs can be found on the DTE website located here: (BRPP 2018 GWMR and BRPP 2017 GWMR).

Since establishment of the groundwater monitoring system, DTE Electric performs groundwater sampling semi-annually in accordance with the Groundwater Statistical Evaluation Plan (SEP, October 2017) located on the DTE website here: BRPP SEP.

Statistical evaluation of groundwater data is completed each time samples are collected in accordance with 40 CFR § 257.93. Statistical methods for the DB CCR Unit were selected

based on the geology and hydrogeology at the Site (primarily the presence of clay/hydraulic barrier, the relatively small footprint of the DB, and the low vertical and horizontal groundwater flow velocity), in addition to other supporting lines of evidence that the aquifer is unaffected by the CCR Unit (such as the consistency in concentrations of water quality data). Refer to the SEP (October 2017) located on the DTE website here BRPP SEP, for further details on the statistical analysis and the 2019 GWMR attached as **Appendix A** for a summary of groundwater monitoring data and statistical analysis completed at each monitoring location. The 2018 and 2017 GWMRs are located on the DTE website here: (BRPP 2018 GWMR and BRPP 2017 GWMR).

Location Standards § 257.71(d)(1)(i)(B)(3) – The BRPP DB CCR Unit is compliant with the location restrictions of 40 CFR § 257.60-64. The location restriction certification report (LR, October 2018) is available on the DTE website here: BRPP LR.

Structural Stability and Safety Factor Assessments § 257.71(d)(1)(i)(B)(4 and 5) - Structural stability assessment and safety factor assessments, as required per 40 CFR §257.103 (f)(2)(v)(C)(7) and (8), are not required for the BRPP DB incised surface impoundment and have therefore not been included with this submittal.

Documentation of Design Specifications § 257.71(d)(1)(i)(C) – As the BRPP DB relies on the natural clay liner, a design for the liner was not performed. However, prior to the construction of BRPP, a significant geotechnical investigation demonstrated extensive clay deposits across the entire BRPP site as documented in a 1976 *Subsurface Investigation and Foundation Report* by Bechtel. The Bechtel report included an evaluation of the native natural clay soils that were used in construction of the BRPP DB CCR Unit surface impoundment that is incised into the natural clay liner. The evaluation included soil hydraulic conductivity testing showing the native clay soil has a hydraulic conductivity around 2×10^{-8} cm/s. The 1976 Bechtel report is provided in **Appendix D**.

report by Bechtel. Documentation of the BRPP DB natural clay liner assessment, design and as built drawings indicating the DB surface impoundments are incised into the natural clay liner are provided in **Appendix D**.

Facilities with CCR surface impoundments located on properties adjacent to a water body § 257.71(d)(1)(i)(D) – The BRPP DB CCR Unit is not located adjacent to a surface water body.

Alternate Liner Application Placed in the Operating Record - § 257.71(d)(1)(i)(E) - This alternate liner demonstration application and supplemental materials submitted in this application have been placed in the facility's operating record as required by § 257.105(f)(14).

4.0 Conclusions

This document demonstrates how the BRPP DB CCR Unit meets the provisions of the initial application for an alternate liner demonstration by:

- Demonstrating continued compliance with the CCR Rule for all record keeping, notification and internet posting requirements. In addition, detection monitoring is completed at the established groundwater monitoring network as required by 40 CFR § 257.93 and § 257.94 and annual reporting as required by 40 CFR § 257.90 documents compliance with the detection monitoring program;
- Demonstrating the presence of a natural geologic barrier underlying the BRPP DB CCR Unit, that consists of a thick (> 80 feet), low hydraulic conductivity clay, that provides the same, or better level of protection from potential migration of contaminants than the composite liner defined in 40 CFR § 257.70(b);
- Demonstrating that the BRPP DB CCR Unit is compliant with the location restrictions of 40 CFR § 257.60-64 and that the structural stability and safety factor assessments per 40 CFR § 257.103 (f)(2)(v)(C)(7) and (8) are not required;
- Including the BRPP DB impoundment natural clay liner soil assessment performed prior to construction of the DB surface impoundment;
- Documenting the BRPP DB is not located adjacent to a surface water body; and
- Placing this alternate liner demonstration application and supplemental materials submitted in this application in the facility's operating record as required by § 257.105(f)(14).

Therefore, it is requested that the EPA approve DTE Electric's initial application to complete an alternate liner demonstration prepared per 40 CFR § 257.71(d)(i) for the BRPP DB CCR Unit.

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5.0 References

DTE Electric Company website: DTE CCR Compliance Data and Information

TRC Environmental Corporation. January 2020. 2019 Annual Groundwater Monitoring Report - DTE Electric Company Belle River Power Plant Diversion Basin, 4505 King Road, China Township, Michigan 48054 (BRPP 2019 GWMR).

TRC Environmental Corporation. January 2019. 2018 Annual Groundwater Monitoring Report - DTE Electric Company Belle River Power Plant Diversion Basin, 4505 King Road, China Township, Michigan 48054 (BRPP 2018 GWMR).

TRC Environmental Corporation. January 2018. 2017 Annual Groundwater Monitoring Report - DTE Electric Company Belle River Power Plant Diversion Basin, 4505 King Road, China Township, Michigan 48054 (BRPP 2017 GWMR).

TRC Environmental Corporation. October 2017. Groundwater Monitoring Systems Summary Report - DTE Electric Company Belle River Power Plant Diversion Basin, 4505 King Road, China Township, Michigan 48054 (BRPP GWMS).

TRC Environmental Corporation. October 2017. Groundwater Statistical Evaluation Plan - DTE Electric Company Belle River Power Plant Diversion Basin, 4505 King Road, China Township, Michigan 48054 (BRPP SEP).

TRC Environmental Corporation. October 2018. Location Restrictions Demonstrations - DTE Electric Company Belle River Power Plant Diversion Basin, 4505 King Road, China Township, Michigan 48054 (BRPP LR).

TRC Environmental Corporation. December 2018. Natural Clay Liner Equivalency Evaluation Report, DTE Electric and Consumers Energy Company Six Southeast Michigan Coal Combustion Residual Units (Clay Liner Equivalency Report)

Bechtel. August 1976. Subsurface Investigation and Foundation Report – The Detroit Edison Company, Belle River Units 1 & 2.

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Figures

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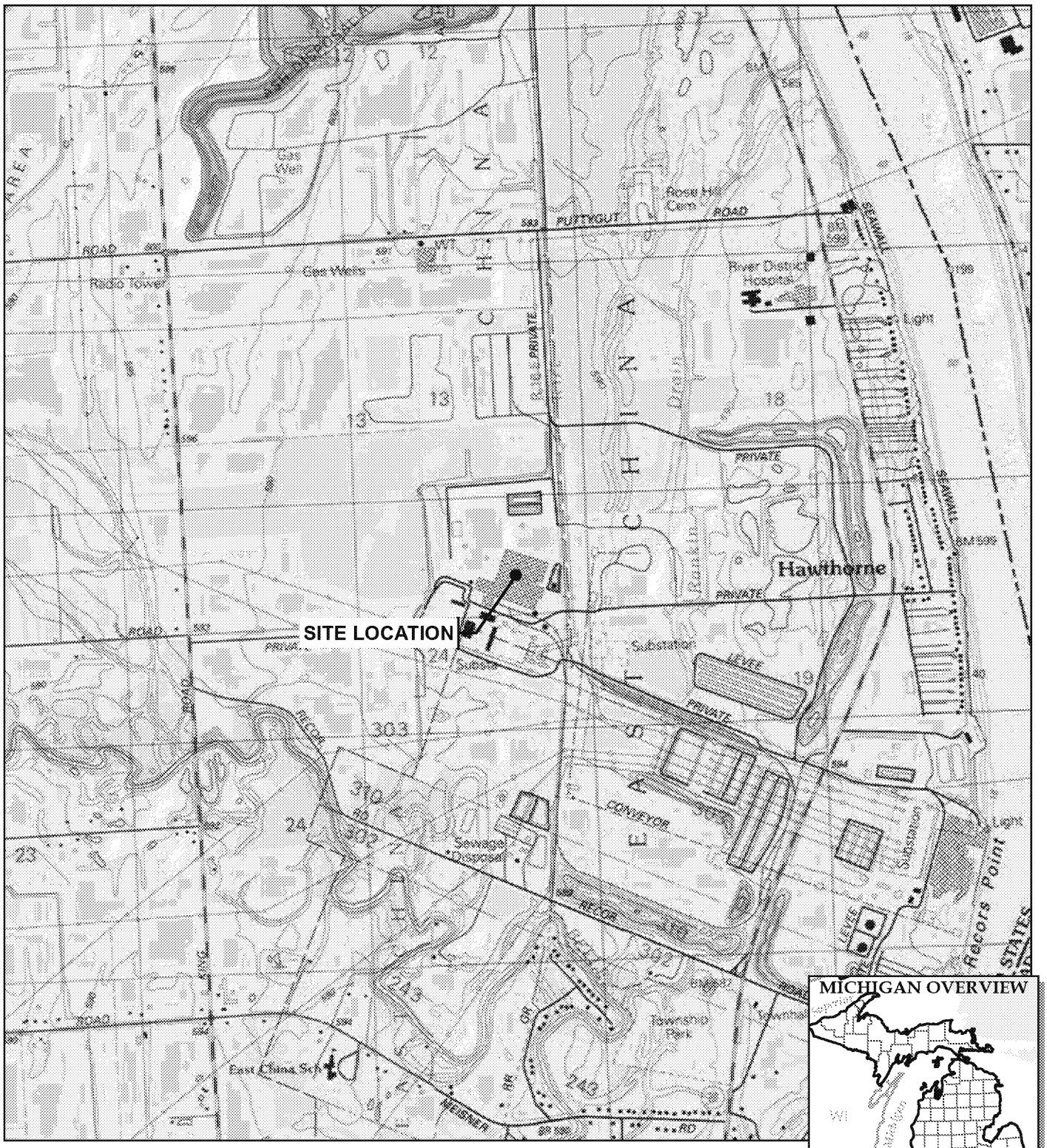

BASE MAP FROM USGS 7.5 MINUTE TOPOGRAPHIC QUADRANGLE SERIES.

N

1" = 2,000'
1:24,000

0 2,000 4,000 FEET

TRC

1540 Eisenhower Place
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TRC - GIS

PROJECT:

DTE ELECTRIC COMPANY
BELLE RIVER POWER PLANT
4505 KING ROAD
CHINA TOWNSHIP, MICHIGAN

TITLE:

SITE LOCATION MAP

DRAWN BY:	S. MAJOR
CHECKED BY:	J. KRENZ
APPROVED BY:	V. BUENING
DATE:	JANUARY 2020
PROJ. NO.:	320511.0003
FILE:	320511-0003-003slmMB.mxd

FIGURE 1

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LEGEND

- SOIL BORING
- MONITORING WELL
- DECOMMISSIONED MONITORING WELL

NOTES

1. BASE MAP IMAGERY FROM GOOGLE EARTH PRO. & PARTNERS, (3/24/2019).
2. WELL LOCATIONS SURVEYED IN MARCH, APRIL, JUNE 2016, AND JUNE 2017 BY BMJ ENGINEERS & SURVEYORS, INC.

N

0 200 400 Feet

1 " = 200 '
1:2,400

PROJECT: DTE ELECTRIC COMPANY
BELLE RIVER POWER PLANT DIVERSION BASIN
4505 KING ROAD
CHINA TOWNSHIP, MICHIGAN

TITLE: SITE PLAN

DRAWN BY:	M. VAPHIADIS	PROJ NO.:	320511.0003.0000 P1 T1
CHECKED BY:	J. KRENZ		FIGURE 2
APPROVED BY:	V. BUENING		
DATE:	JANUARY 2020		

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Plot Date: 1/28/2020, 09:28:33 AM by MVAPHIADIS -- LAYOUT: ANSI B(11"x17")
Path: E:\DTE\CCR_Sites\2017_265996\320511-0003-025.mxd
Coordinate System: NAD 1983 StatePlane Michigan South FIPS 2113 Feet Intl (Foot)
Map Rotation: 0

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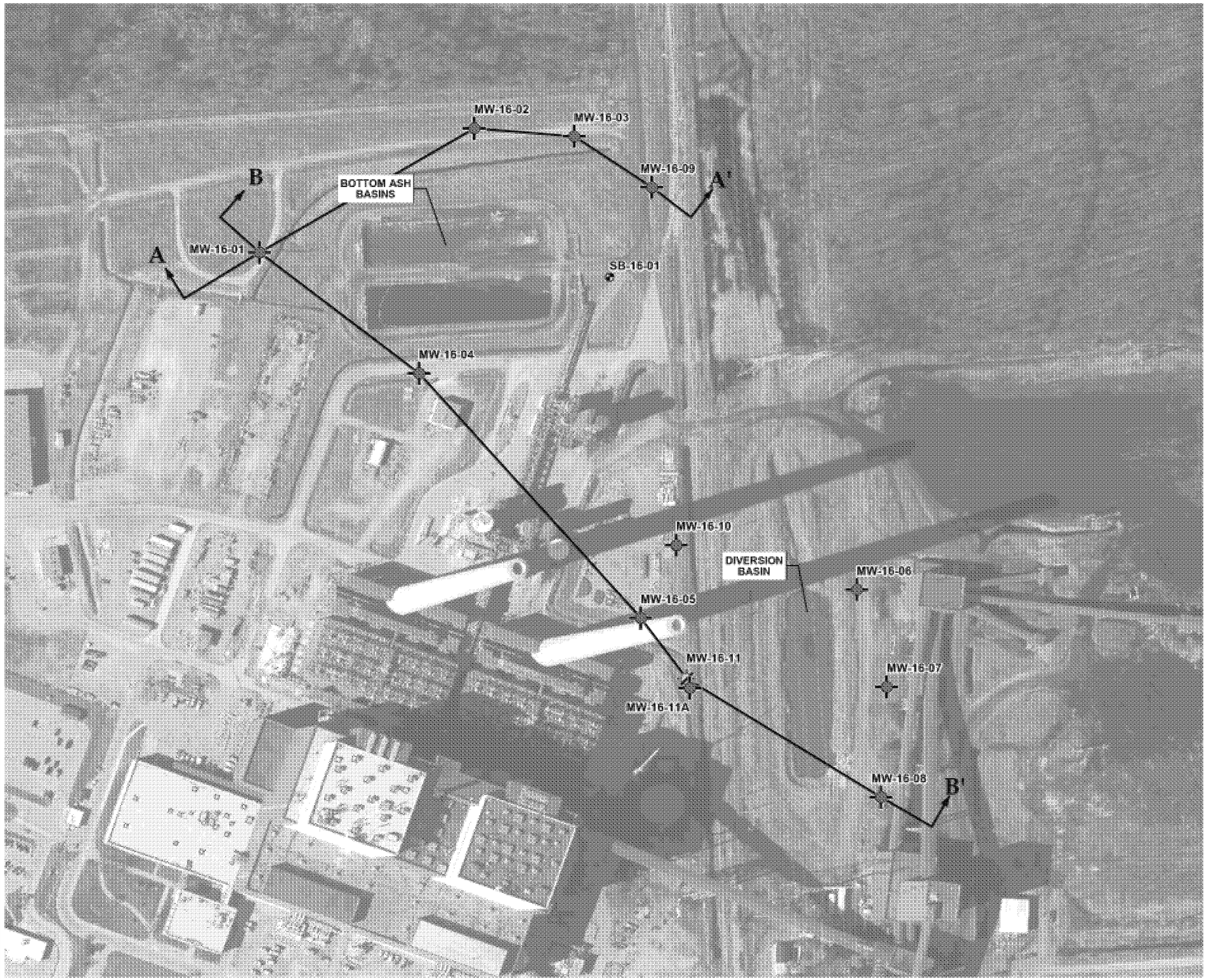

LEGEND

- SOIL BORING
- MONITORING WELL
- DECOMMISSIONED MONITORING WELL
- CROSS SECTIONS

NOTES

1. BASE MAP IMAGERY FROM ST. CLAIR COUNTY INFORMATION TECHNOLOGY DEPARTMENT WEBMAP, 2015.
2. WELL LOCATIONS SURVEYED IN MARCH, APRIL, JUNE 2016, AND JUNE 2017.

N

0 200 400 Feet

1 " = 200 '

1:2,400

PROJECT: DTE ELECTRIC COMPANY
BELLE RIVER POWER PLANT
4505 KING ROAD
CHINA TOWNSHIP, MICHIGAN

TITLE: CROSS SECTION LOCATOR MAP

DRAWN BY:	J. PAPEZ	PROJ NO.:	265996.0003
CHECKED BY:	S. HOLMSTROM		
APPROVED BY:	V. BUENING		
DATE:	OCTOBER 2017		

FIGURE 3

TRC

1540 Eisenhower Place
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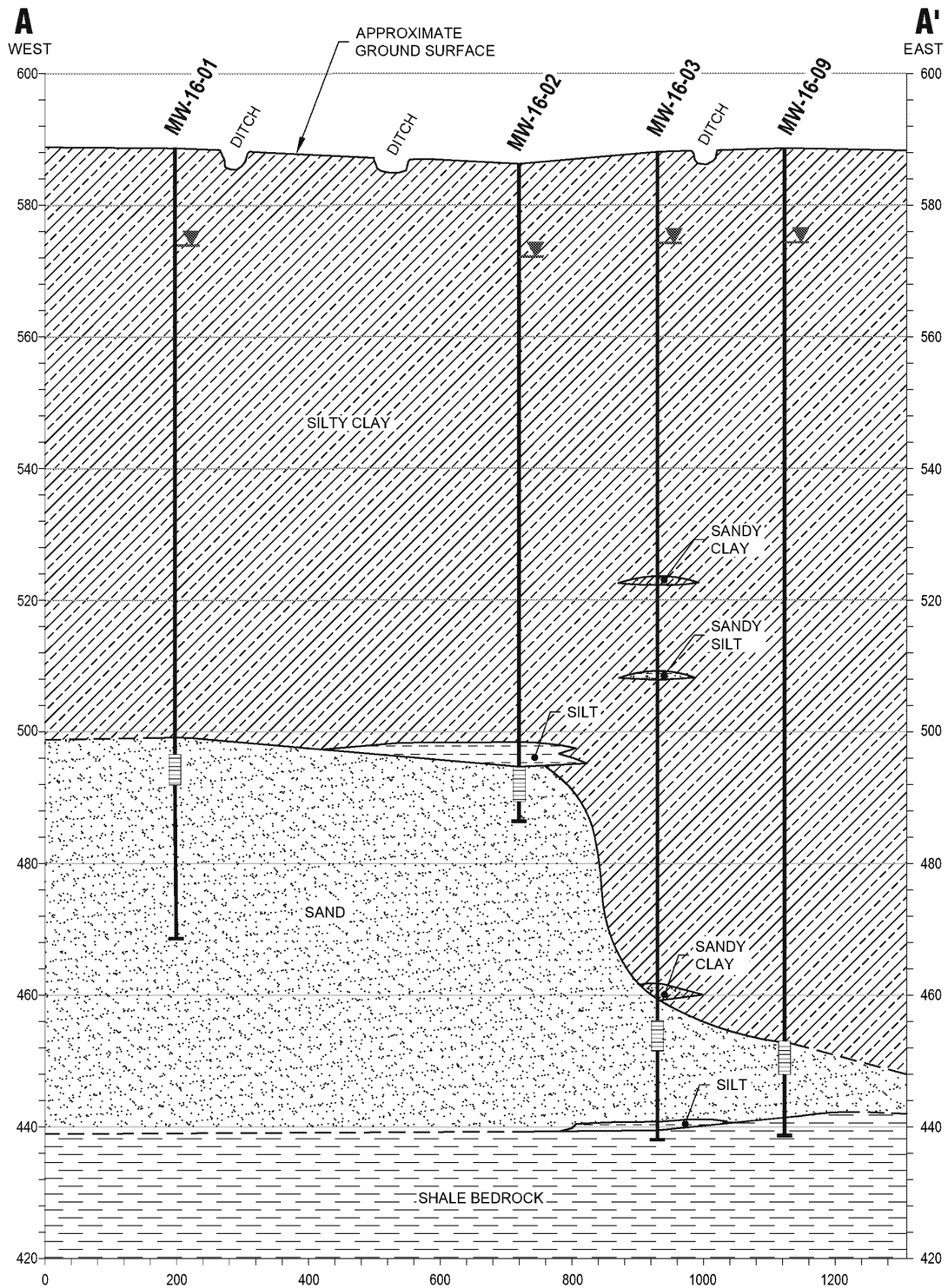
FILE NO.: 265996-0003-011.mxd

Plot Date: 10/9/2017, 15:20:19 PM by BDEEGAN -- LAYOUT: ANSI B(11"x17")
Path: E:\DTE\CCR_Sites\2017_265996\265996-0003-011.mxd

Coordinate System: NAD 1983 StatePlane Michigan South FIPS 2113 Feet Intl (Foot)
Map Rotation: 0

TRC - GIS

GENERALIZED GEOLOGIC CROSS-SECTION A-A'



LEGEND

- STRATEGRAPHIC BOUNDARY (DASHED WHERE INFERRED)
- GROUNDWATER ELEVATION (COLLECTED 02/27/2017)
- SOIL BORING
- WELL SCREEN INTERVAL
- END OF BORING

Lithology Key

- SILTY CLAY
- SAND
- SILT
- SANDY CLAY
- SANDY SILT
- SHALE BEDROCK

SCALE IN FEET

HORIZONTAL 0 200

VERTICAL 0 20

PROJECT:

DTE ELECTRIC COMPANY
BELLE RIVER POWER PLANT
CHINA TOWNSHIP, MICHIGAN

TITLE:

GENERALIZED GEOLOGIC CROSS-SECTION A-A'

DRAWN BY:	D.STEHLE	PROJ NO.:	265996.0003.01
CHECKED BY:	S.HOLMSTROM		**FIGURE 4**
APPROVED BY:	V.BUENING		
DATE:	SEPTEMBER 2017		

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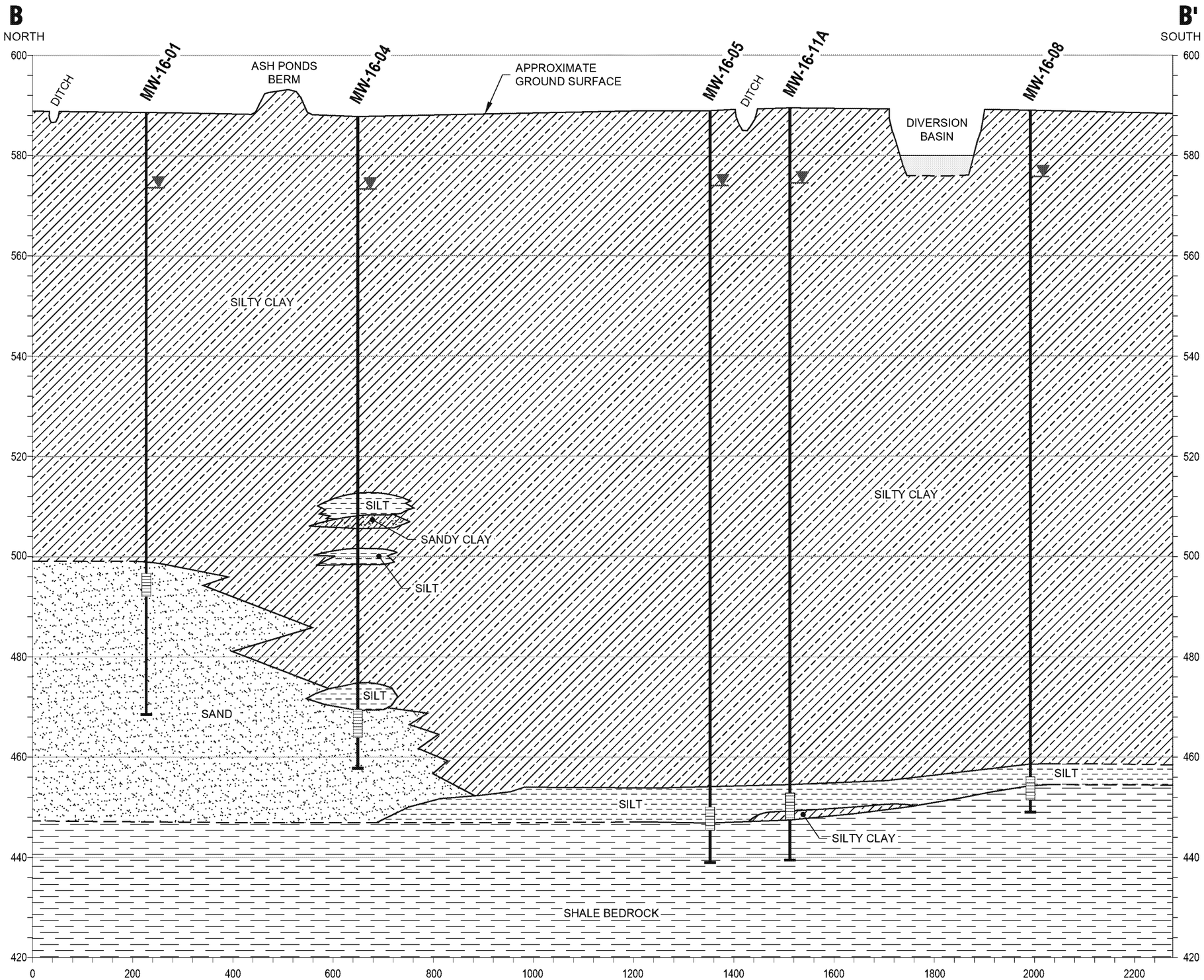
FILE NO.: 265996.0003.01.04-05.dwg

11x17 --- ATTACHED XREF'S: --- ATTACHED IMAGES: DTE BRPP XSs XXXXXXXXXX-02172017092213_Page_1; DTE BRPP XSs XXXXXXXXXX-02172017092213_Page_2; XS aa wells; XS cc wells; XS DD wells;
DRAWING NAME: J:_TRC\DTE\Belle River PP\265996\0003\ 265996.0003.01 04-05.dwg --- PLOT DATE: October 10, 2017 - 6:47AM --- LAYOUT: FIG04 XS AA

GENERALIZED GEOLOGIC CROSS-SECTION B-B'



LEGEND

- STRATEGRAPHIC BOUNDARY (DASHED WHERE INFERRED)
- GROUNDWATER ELEVATION (COLLECTED 02/27/2017)
- SOIL BORING
- WELL SCREEN INTERVAL
- END OF BORING

Lithology Key

- SILTY CLAY
- SAND
- SILT
- SANDY CLAY
- SHALE BEDROCK

SCALE IN FEET

VERTICAL: 0 – 20

HORIZONTAL: 0 – 200

PROJECT:

DTE ELECTRIC COMPANY
BELLE RIVER POWER PLANT
CHINA TOWNSHIP, MICHIGAN

TITLE:

GENERALIZED GEOLOGIC CROSS-SECTION B-B'

DRAWN BY:	D.STEHLE	PROJ NO.:	265996.0003
CHECKED BY:	S.HOLMSTROM		
APPROVED BY:	V.BUENING		**FIGURE 5**
DATE:	SEPTEMBER 2017		

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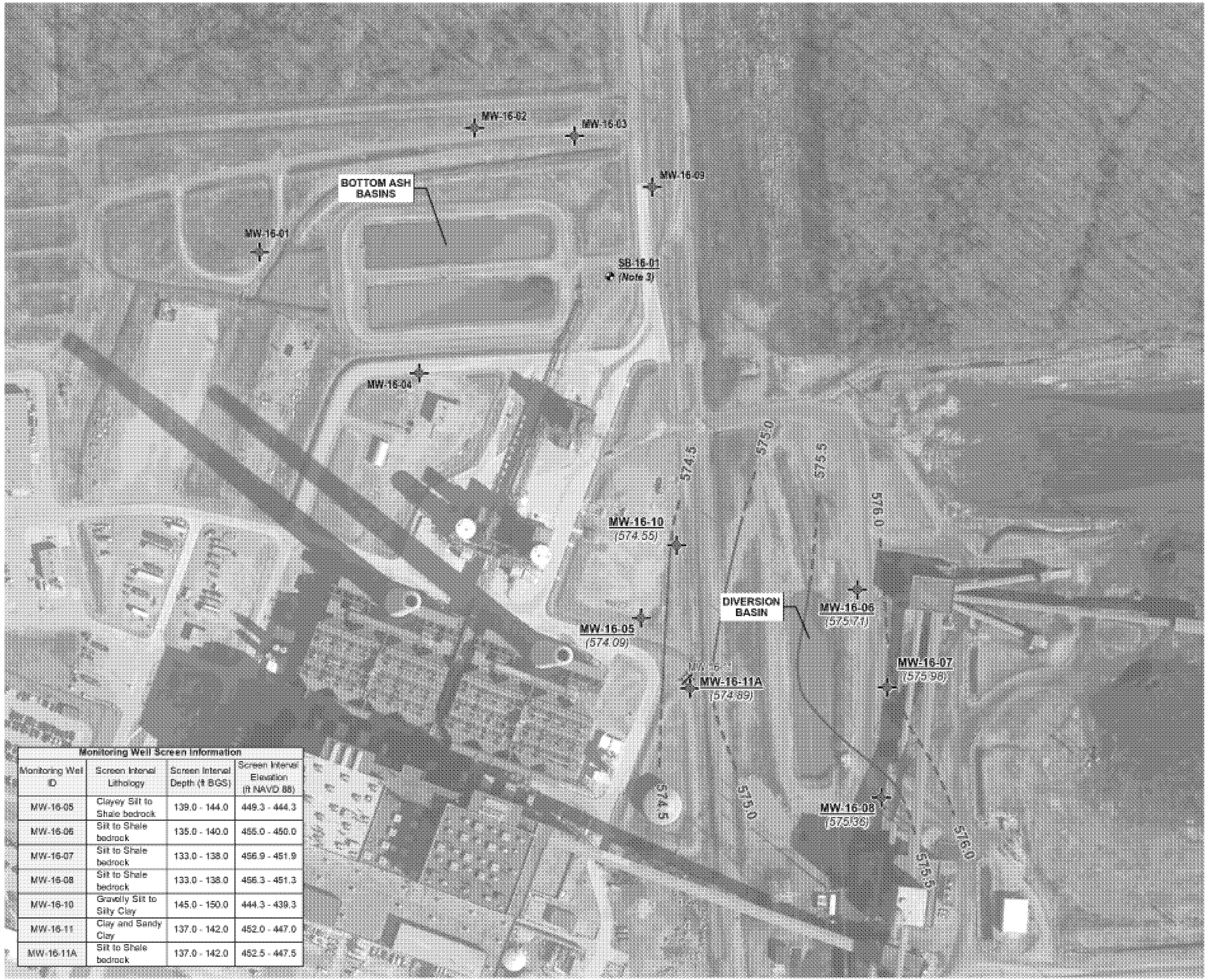
FILE NO.: 265996.0003.01.04-05.dwg

11x17 --- ATTACHED XREF'S: --- ATTACHED IMAGES: DTE BRPP XSs XXXXXXXXXX-021720170922I3_Page_1; DTE BRPP XSs XXXXXXXXXX-021720170922I3_Page_2; XS aa wells; XS cc wells; XS DD wells;
DRAWING NAME: J:_TRC\DTE\Belle River PP\265996\0003\ 265996.0003.01.04-05.dwg --- PLOT DATE: October 10, 2017 - 6:47AM --- LAYOUT: FIG05 XS BB



Monitoring Well Screen Information

Monitoring Well ID	Screen Interval Lithology	Screen Interval Depth (ft BGS)	Screen Interval Elevation (ft NAVD 88)
MW-16-05	Clayey Silt to Shale bedrock	139.0 - 144.0	449.3 - 444.3
MW-16-06	Silt to Shale bedrock	135.0 - 140.0	455.0 - 450.0
MW-16-07	Silt to Shale bedrock	133.0 - 138.0	456.9 - 451.9
MW-16-08	Silt to Shale bedrock	133.0 - 138.0	456.3 - 451.3
MW-16-10	Gravelly Silt to Silty Clay	145.0 - 150.0	444.3 - 439.3
MW-16-11	Clay and Sandy Clay	137.0 - 142.0	452.0 - 447.0
MW-16-11A	Silt to Shale bedrock	137.0 - 142.0	452.5 - 447.5

LEGEND

- SOIL BORING
- MONITORING WELL
- DECOMMISSIONED MONITORING WELL
- (575.47) GROUNDWATER ELEVATION (FT NAVD 88)
- GROUNDWATER ELEVATION CONTOUR (0.5-FT INTERVAL, DASHED WHERE INFERRED)

NOTES

1. BASE MAP IMAGERY FROM GOOGLE EARTH PRO, (3/24/2019).
2. WELL LOCATIONS SURVEYED IN MARCH, APRIL, AND JUNE 2016 BY BMJ ENGINEERS AND SURVEYORS. INC.
3. NO SAND OR GRAVEL UNIT PRESENT ABOVE BEDROCK IN THIS LOCATION.
4. GROUNDWATER ELEVATIONS DISPLAYED IN FEET RELATIVE TO NORTH AMERICAN VERTICAL DATUM OF 1988.

N

0 200 400 Feet

1 " = 200 '
1:2,400

PROJECT: DTE ELECTRIC COMPANY
BELLE RIVER POWER PLANT DIVERSION BASIN
4505 KING ROAD
CHINA TOWNSHIP, MICHIGAN

TITLE: DIVERSION BASIN GROUNDWATER POTENTIOMETRIC SURFACE MAP MARCH 2019

DRAWN BY:	M. VAPHIADIS	PROJ NO.:	386089.0001
CHECKED BY:	J. KRENZ		FIGURE 6
APPROVED BY:	V. BUENING		
DATE:	OCTOBER 2020		

TRC
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Phone: 734.971.7080
www.trccompanies.com

FILE NO.: 386089-0001-006.mxd

Plot Date: 10/29/2020, 16:36:24 PM by AHORRIE -- LAYOUT: ANSI B (11"x17")
Path: E:\DTE\CCR_Sites\2017_265996\386089-0001-006.mxd
Coordinate System: NAD 1983 StatePlane Michigan South FIPS 2113 Feet Intl (Foot)
Map Rotation: 0

TRC - GIS

Monitoring Well Screen Information

Monitoring Well ID	Screen Interval Lithology	Screen Interval Depth (ft BGS)	Screen Interval Elevation (ft NAVD 88)
MW-16-05	Clayey Silt to Shale bedrock	139.0 - 144.0	449.3 - 444.3
MW-16-06	Silt to Shale bedrock	135.0 - 140.0	455.0 - 450.0
MW-16-07	Silt to Shale bedrock	133.0 - 138.0	456.9 - 451.9
MW-16-08	Silt to Shale bedrock	133.0 - 138.0	456.3 - 451.3
MW-16-10	Gravelly Silt to Silty Clay	145.0 - 150.0	444.3 - 439.3
MW-16-11	Clay and Sandy Clay	137.0 - 142.0	452.0 - 447.0
MW-16-11A	Silt to Shale bedrock	137.0 - 142.0	452.5 - 447.5

LEGEND

- SOIL BORING
- MONITORING WELL
- DECOMMISSIONED MONITORING WELL
- (575.47) GROUNDWATER ELEVATION (FT NAVD 88)
- GROUNDWATER ELEVATION CONTOUR (0.5-FT INTERVAL, DASHED WHERE INFERRED)

NOTES

1. BASE MAP IMAGERY FROM GOOGLE EARTH PRO, (3/24/2019).
2. WELL LOCATIONS SURVEYED IN MARCH, APRIL, AND JUNE 2016 BY BMJ ENGINEERS AND SURVEYORS. INC.
3. NO SAND OR GRAVEL UNIT PRESENT ABOVE BEDROCK IN THIS LOCATION.
4. GROUNDWATER ELEVATIONS DISPLAYED IN FEET RELATIVE TO NORTH AMERICAN VERTICAL DATUM OF 1988.

N

0 200 400 Feet

1 " = 200 '
1:2,400

PROJECT: DTE ELECTRIC COMPANY
BELLE RIVER POWER PLANT DIVERSION BASIN
4505 KING ROAD
CHINA TOWNSHIP, MICHIGAN

TITLE: DIVERSION BASIN GROUNDWATER POTENTIOMETRIC SURFACE MAP SEPTEMBER 2019

DRAWN BY:	M. VAPHIADIS	PROJ NO.:	386089.0001
CHECKED BY:	J. KRENZ		FIGURE 7
APPROVED BY:	V. BUENING		
DATE:	OCTOBER 2020		

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FILE NO.: 386089-0001-007.mxd

Plot Date: 10/29/2020, 16:34:09 PM by AHORRIE -- LAYOUT: ANSI B(11"x17")
Path: E:\DTE\CCR_Sites\2017_265996\386089-0001-007.mxd
Coordinate System: NAD 1983 StatePlane Michigan South FIPS 2113 Feet Intl (Foot)
Map Rotation: 0

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Appendix A
2019 Annual Groundwater Monitoring Report

DRAFT

2019 Annual Groundwater Monitoring Report

DTE Electric Company
Belle River Power Plant Diversion Basin

4505 King Road
China Township, Michigan

January 2020

2019 Annual Groundwater Monitoring Report

DTE Electric Company
Belle River Power Plant Diversion Basin

4505 King Road
China Township, Michigan

January 2020

Prepared For
DTE Electric Company

Graham Crockford, C.P.G.
Senior Project Geologist

David B. McKenzie, P.E.
Senior Project Engineer

TRC | DTE Electric Company
Final
X:\WPAAM\PJT2\320511\0003\GMR\DB\R320511.3 BRPP DB.DOCX

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ED_005947A_00014551-00026

Executive Summary

On April 17, 2015, the United States Environmental Protection Agency (USEPA) published the final rule for the regulation and management of Coal Combustion Residuals (CCR) under the Resource Conservation and Recovery Act (RCRA) (the CCR Rule), as amended July 30, 2018. The CCR Rule, which became effective on October 19, 2015 (amendment effective August 29, 2018), applies to the DTE Electric Company (DTE Electric) Belle River Power Plant (BRPP) CCR Diversion Basin (DB) CCR unit. Pursuant to the CCR Rule, no later than January 31, 2018, and annually thereafter, the owner or operator of a CCR unit must prepare an annual groundwater monitoring and corrective action report for the CCR unit documenting the status of groundwater monitoring and corrective action for the preceding year in accordance with §257.90(e). On behalf of DTE Electric, TRC Engineers Michigan, Inc., the engineering entity of TRC Environmental Corporation (TRC), has prepared this Annual Groundwater Monitoring Report for calendar year 2019 activities at the BRPP DB CCR unit.

In the January 31, 2019 *Annual Groundwater Monitoring Report for the Belle River Power Plant Diversion Basin,* covering calendar year 2018 activities potential statistically significant increases (SSIs) over prediction limits were noted for a few Appendix III constituents in one or more downgradient wells during the March and October 2018 monitoring events. However, verification resampling in May and November 2018 did not confirm any of the initial concentrations to be above prediction limits; therefore, the concentrations were not statistically significant, and no SSIs were recorded for either of the 2018 detection monitoring events. As such, DTE Electric continued detection monitoring at the BRPP DB CCR unit pursuant to §257.94 of the CCR Rule.

The semiannual detection monitoring events for 2019 were completed in March and September 2019 and included sampling and analyzing groundwater within the groundwater monitoring system for the indicator parameters listed in Appendix III to the CCR Rule. As part of the statistical evaluation, the data collected during detection monitoring events are evaluated to identify SSIs in detection monitoring parameters to determine if concentrations in detection monitoring well samples exceed background levels. Detection monitoring data that has been collected and evaluated in 2019 are presented in this report.

No SSIs were recorded for the 2019 monitoring period and detection monitoring will be continued at the BRPP DB CCR unit in accordance with §257.94. In addition, with the presence of the vertically and horizontally extensive clay-rich confining till beneath the BRPP DB CCR unit, it is not possible for the uppermost aquifer to have been affected by CCR from operations. Also, due to limitations on CCR Rule implementation timelines, the background data sets are of relatively short duration for capturing the occurrence of natural temporal changes in the aquifer.

Section 1
Introduction

1.1 Program Summary

On April 17, 2015, the United States Environmental Protection Agency (USEPA) published the final rule for the regulation and management of Coal Combustion Residuals (CCR) under the Resource Conservation and Recovery Act (RCRA) (the CCR Rule), as amended July 30, 2018. The CCR Rule, which became effective on October 19, 2015 (amendment effective August 29, 2018), applies to the DTE Electric Company (DTE Electric) Belle River Power Plant (BRPP) Diversion Basin (DB). Pursuant to the CCR Rule, no later than January 31, 2018, and annually thereafter, the owner or operator of a CCR unit must prepare an annual groundwater monitoring and corrective action report for the CCR unit documenting the status of groundwater monitoring and corrective action for the preceding year in accordance with §257.90(e). On behalf of DTE Electric, TRC Engineers Michigan, Inc., the engineering entity of TRC Environmental Corporation (TRC), has prepared this Annual Groundwater Monitoring Report for calendar year 2019 activities at the BRPP DB CCR unit (2019 Annual Report).

In the January 31, 2019 *Annual Groundwater Monitoring Report for the Belle River Power Plant Diversion Basin,* covering calendar year 2018 activities (2018 Annual Report), potential statistically significant increases (SSIs) over prediction limits were noted for a few Appendix III constituents in one or more downgradient wells during the March and October 2018 monitoring events. However, verification resampling in May and November 2018 did not confirm any of the initial concentrations above prediction limits; therefore, the concentrations were not statistically significant, and no SSIs were recorded for either of the 2018 detection monitoring events. As such, DTE Electric continued detection monitoring at the BRPP DB CCR unit in 2019 pursuant to §257.94 of the CCR Rule.

The semiannual detection monitoring events for 2019 were completed in March and September 2019 and included sampling and analyzing groundwater within the groundwater monitoring system for the indicator parameters listed in Appendix III to the CCR Rule. This 2019 Annual Report presents the monitoring results and the statistical evaluation of the detection monitoring parameters (Appendix III to Part 257 of the CCR Rule) for the March and September 2019 semiannual groundwater monitoring events for the BRPP DB CCR unit. Detection monitoring continued to be performed in accordance with the *CCR Groundwater Monitoring and Quality Assurance Project Plan – DTE Electric Company Belle River Power Plant Bottom Ash Basins and Diversion Basin* (QAPP) (TRC, July 2016; revised August 2017) and statistically evaluated per the *Groundwater Statistical Evaluation Plan – Belle River Power Plant Coal Combustion Residual Diversion Basin* (Stats Plan) (TRC, October 2017). As part of the statistical evaluation, the data collected

during detection monitoring events are evaluated to identify SSIs of detection monitoring parameters compared to background levels.

1.2 Site Overview

The BRPP is located in Section 13, Township 4 North, Range 16 East, at 4505 King Road, China Township in St. Clair County, Michigan. The BRPP was constructed in the early 1980s with plant operations beginning in 1984. Prior to Detroit Edison Company's operations commencing in the 1980s, the BRPP property was generally wooded and farmland. The property has been used continuously as a coal fired power plant since Detroit Edison Company (now DTE Electric) began power plant operations at BRPP in 1984 and is generally constructed over a natural clay-rich soil base.

The DB is an incised CCR surface impoundment located east of the BRPP. Water flows into the DB from the North and South bottom ash basins (BABs) through a network of pipes and ditches. The DB discharges to the St. Clair River with other site wastewater in accordance with a National Pollution Discharge Elimination System (NPDES) permit.

1.3 Geology/Hydrogeology

The BRPP DB CCR unit is located approximately one-mile west of the St. Clair River. The BRPP DB CCR unit is underlain by more than 130 feet of unconsolidated sediments, with the lower confining Bedford Shale generally encountered from 135 to 145 feet below ground surface (bgs). In general, the BRPP DB CCR unit is underlain by at least 130 feet of laterally extensive low hydraulic conductivity silty clay-rich deposits. The silty clay-rich till was then underlain by two to seven feet of silt between the till and the underlying shale bedrock (not an aquifer) confining unit. Groundwater was encountered within this silt at the shale bedrock interface representing a potential confined uppermost aquifer in the BRPP DB CCR unit.

A definitive groundwater flow direction to the west-northwest with a mean gradient of 0.003 foot/foot within the uppermost aquifer is evident around the BRPP CCR DB CCR unit using data collected in 2016 through 2018; however, potential groundwater flow within this silt-rich uppermost aquifer is very slow (on the order of one-half foot per year).

In addition, the elevation of CCR-affected water maintained within the BRPP DB is approximately 5 feet above the potentiometric surface elevations in the uppermost aquifer at the DB CCR unit area. This suggests that if the CCR affected surface water in the DB were able to penetrate the silty clay-rich underlying confining unit, then the head on that release likely would travel radially away from the DB within the uppermost aquifer. However, with the very thick continuous silty clay-rich confining unit beneath the BRPP it is not possible for the uppermost aquifer to have been affected by CCR from BRPP operations that began in the 1980s.

Due to the relatively small footprint of the DB, the low vertical and horizontal groundwater flow velocity and radial flow potential outward from the CCR unit, and the fact that the uppermost saturated unit being monitored is isolated by a laterally contiguous silty-clay unit which significantly impedes vertical groundwater flow thus preventing the monitored saturated zone (identified as the potential uppermost aquifer) from potentially being affected by CCR, monitoring of the BRPP DB CCR unit using intrawell statistical methods is appropriate. As such, intrawell statistical approaches are being used during detection monitoring as discussed in the Stats Plan.

Section 2
Groundwater Monitoring

2.1 Monitoring Well Network

A groundwater monitoring system has been established for the BRPP DB CCR unit as detailed in the *Groundwater Monitoring System Summary Report – DTE Electric Company Belle River Power Plant Bottom Ash Basins and Diversion Basin Coal Combustion Residual Units* (GWMS Report) (TRC, October 2017). The detection monitoring well network for the DB CCR unit currently consists of six monitoring wells that are screened in the uppermost aquifer. The monitoring well locations are shown on Figure 2.

As discussed in the Stats Plan, intrawell statistical methods for the DB CCR unit were selected based on the geology and hydrogeology at the Site (primarily the presence of clay/hydraulic barrier, the relatively small footprint of the DB, combined with low vertical and horizontal groundwater flow velocity), in addition to other supporting lines of evidence that the aquifer is unaffected by the CCR unit (such as the consistency in concentrations of water quality data). An intrawell statistical approach requires that each of the downgradient wells doubles as a background and compliance well, where data from each individual well during a detection monitoring event is compared to a statistical limit developed using the background dataset from that same well. Monitoring wells MW-16-05 through MW-16-08, MW-16-10, and MW-16-11A are generally located around the east and west perimeter of the DB and provide data on both background and downgradient groundwater quality that has not been affected by the CCR unit (total of six background/downgradient monitoring wells).

Monitoring well MW-16-11 was found to be damaged in March 2017 and could no longer be used to obtain representative groundwater samples. A casing failure was suspected when grout was observed at the base of the well and confirmed using a downhole camera assessment that identified a crack in the casing 40 feet down. The monitoring well was properly decommissioned on May 11, 2017 and replaced on May 12, 2017, with monitoring well MW-16-11A. The replacement monitoring well is located proximal to MW-16-11 to the south and was installed utilizing procedures consistent with those described in the QAPP.

2.2 Semiannual Groundwater Monitoring

The semiannual monitoring parameters for the detection groundwater monitoring program were selected per the CCR Rule's Appendix III to Part 257 – Constituents for Detection Monitoring. The Appendix III indicator parameters consist of boron, calcium, chloride, fluoride, pH (field reading), sulfate, and total dissolved solids (TDS) and were analyzed in accordance with the

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sampling and analysis plan included within the QAPP. In addition to pH, the collected field parameters included dissolved oxygen, oxidation reduction potential, specific conductivity, temperature, and turbidity.

2.2.1 Data Summary

The first semiannual groundwater detection monitoring event for 2019 was performed during March 18 through 20, 2019 by TRC personnel and samples were analyzed by TestAmerica in accordance with the QAPP. Static water elevation data were collected at all six monitoring well locations. Groundwater samples were collected from the six detection monitoring wells for the Appendix III indicator parameters and field parameters. A summary of the groundwater data collected during the March 2019 event is provided on Table 1 (static groundwater elevation data), Table 2 (field data), and Table 3 (analytical results).

The second semiannual groundwater detection monitoring event for 2019 was performed during September 16 and 17, 2019 by TRC personnel and samples were analyzed by TestAmerica in accordance with the QAPP. Static water elevation data were collected at all six monitoring well locations. Groundwater samples were collected from the six detection monitoring wells for the Appendix III indicator parameters and field parameters. A summary of the groundwater data collected during the September 2019 event is provided on Table 1 (static groundwater elevation data), Table 2 (field data), and Table 4 (analytical results).

2.2.2 Data Quality Review

Data from each round were evaluated for completeness, overall quality and usability, method-specified sample holding times, precision and accuracy, and potential sample contamination. The data were found to be complete and usable for the purposes of the CCR monitoring program. Data quality reviews are summarized in Appendix B.

2.2.3 Groundwater Flow Rate and Direction

The general flow rate and direction from both groundwater monitoring events are similar to that identified in previous monitoring rounds and continues to demonstrate that the downgradient wells are appropriately positioned to detect the presence of Appendix III parameters that could potentially migrate from the BRPP DB CCR unit. Groundwater elevation data collected during the March and September 2019 sampling events show that groundwater within the uppermost aquifer generally flows to the west-northwest across the BRPP DB, consistent with previous events. Groundwater potentiometric surface elevations measured across the BRPP DB during the March and

September 2019 sampling events are provided on Table 1 and were used to construct the groundwater potentiometric surface maps shown on Figures 3 and 4, respectively.

The average hydraulic gradient throughout the BRPP DB during both of the 2019 semiannual events is estimated at approximately 0.003 ft/ft, resulting in an estimated average seepage velocity of approximately 0.002 ft/day or 0.6 ft/year using the average hydraulic conductivity of 0.2 ft/day (TRC, 2017) and an assumed effective porosity of 0.4.

As presented in the GWMS Report, there is a horizontally expansive clay with substantial vertical thickness that isolates the uppermost aquifer from the BRPP DB CCR unit. The general flow direction in the uppermost aquifer is similar to that identified in previous monitoring rounds and continues to demonstrate that the compliance wells are appropriately positioned to detect the presence of Appendix III parameters that could potentially migrate from the BRPP DB CCR unit.

Section 3
Statistical Evaluation

3.1 Establishing Background Limits

Per the Stats Plan, background limits were established for the Appendix III indicator parameters following the collection of at least eight background monitoring events using data collected from each of the six established detection monitoring wells (MW-16-05 through MW-16-08, MW-16-10, and MW-16-11/11A). The statistical evaluation of the background data is presented in the 2017 Annual Report. The Appendix III background limits for each monitoring well will be used throughout the detection monitoring period to determine whether groundwater has been impacted from the BRPP DB CCR unit by comparing concentrations in the detection monitoring wells to their respective background limits for each Appendix III indicator parameter.

3.2 Data Comparison to Background Limits – First 2019 Semiannual Event (March 2019)

The concentrations of the indicator parameters in each of the detection monitoring wells (MW-16-05 through MW-16-08, MW-16-10, and MW-16-11A) were compared to their respective statistical background limits calculated from the background data collected from each individual well (i.e., monitoring data from MW-16-05 is compared to the background limit developed using the background dataset from MW-16-05, and so forth).

The comparisons of the March 2019 monitoring event data to background limits are presented in Table 3. The statistical evaluation of the March 2019 Appendix III indicator parameters showed potential initial SSIs over background for:

- Calcium at MW-16-10.

Verification resampling is recommended per the Stats Plan and the *USEPA's Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities, Unified Guidance* (USEPA, 2009) (Unified Guidance), to achieve performance standards as specified by §257.93(g) in the CCR rules. Per the Stats Plan, if there is an exceedance of a prediction limit for one or more of the parameters, the well(s) of concern will be resampled within 30 days of the completion of the initial statistical analysis. Constituents that have been addressed by an alternative source demonstration (ASD) will not be analyzed for verification purposes.

3.3 Verification Resampling for the First Semiannual Event

Verification resampling for the March 2019 event was conducted on May 8, 2019, by TRC personnel, in accordance with the QAPP. A summary of the groundwater data collected during

ED_005947A_00014551-00034

the verification resampling event is provided on Table 3. The associated data quality review is included in Appendix B.

The calcium verification result is below the prediction limit and no SSI will be recorded from the March 2019 detection monitoring event for this parameter in accordance with the Stats Plan and the Unified Guidance. As such, detection monitoring was continued in accordance with §257.94 of the CCR Rule.

3.4 Data Comparison to Background Limits – Second 2019 Semiannual Event (September 2019)

The comparisons of the September 2019 monitoring event data to background limits are presented in Table 4. The statistical evaluation of the March 2019 Appendix III indicator parameter data shows that there were no concentrations above background limits for any Appendix III indicator parameter during the second 2019 semiannual detection monitoring event.

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Section 4
Conclusions and Recommendations

A potential SSI was noted for calcium at MW-16-10 during the March 2019 monitoring event. This potential SSI was not statistically significant (i.e. verification sampling did not confirm the exceedance). Therefore, no SSIs were recorded for the 2019 monitoring period and detection monitoring will be continued at the BRPP DB CCR unit in accordance with §257.94. As discussed above, and in the GWMS Report, with the presence of the vertically and horizontally extensive clay-rich confining till beneath the BRPP DB CCR unit, it is not possible for the uppermost aquifer to have been affected by CCR from operations. In addition, due to limitations on CCR Rule implementation timelines, the background data sets are of relatively short duration for capturing the occurrence of natural temporal changes in the aquifer. Therefore, detection monitoring will be continued at the BRPP DB CCR unit in accordance with §257.94.

No corrective actions were performed in 2019. The next semiannual monitoring event is scheduled for the second calendar quarter of 2020.

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Section 5
Groundwater Monitoring Report Certification

The U.S. EPA's Disposal of Coal Combustion Residuals from Electric Utilities Final Rule Title 40 CFR Part 257 §257.90(e) requires that the owner or operator of an existing CCR unit prepare an annual groundwater monitoring and corrective action report.

Annual Groundwater Monitoring Report Certification
Belle River Power Plant Diversion Basin
China Township, Michigan

CERTIFICATION

I hereby certify that the annual groundwater and corrective action report presented within this document for the BRPP DB CCR unit has been prepared to meet the requirements of Title 40 CFR §257.90(e) of the Federal CCR Rule. This document is accurate and has been prepared in accordance with good engineering practices, including the consideration of applicable industry standards, and with the requirements of Title 40 CFR §257.90(e).

Name: David B. McKenzie, P.E.	Expiration Date: October 31, 2021	State of Michigan David B. McKenzie Engineer No. 42332 Licensed Professional Engineer Stamp
Company: TRC Engineers Michigan, Inc.	Date: January 30, 2020	

ED_005947A_00014551-00037

Section 6
References

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Tables

ED_005947A_00014551-00039

Table 1

Summary of Groundwater Elevation Data – March and September 2019

Belle River Power Plant Diversion Basin – RCRA CCR Monitoring Program

China Township, Michigan

Well ID	MW-16-05		MW-16-06		MW-16-07		MW-16-08		MW-16-10		MW-16-11A	
Date Installed	3/4/2016		3/11/2016		3/9/2016		3/10/2016		6/6/2016		5/12/2017	
TOC Elevation	590.82		593.21		592.58		591.88		592.26		591.66	
Geologic Unit of Screened Interval	Clayey Silt/Shale Interface		Silt/Shale Interface		Silt/Shale Interface		Silt/Shale Interface		Gravely Silt and Silty Clay		Silt and Silty Clay	
Screened Interval Elevation	449.3 to 444.3		455.0 to 450.0		456.9 to 451.9		456.3 to 451.3		444.3 to 439.3		452.5 to 447.5	
Unit	ft BTOC	ft	ft BTOC	ft	ft BTOC	ft	ft BTOC	ft	ft BTOC	ft	ft BTOC	ft
Measurement Date	Depth to Water	GW Elevation	Depth to Water	GW Elevation	Depth to Water	GW Elevation	Depth to Water	GW Elevation	Depth to Water	GW Elevation	Depth to Water	GW Elevation
3/18/2019	16.73	574.09	17.50	575.71	16.60	575.98	16.52	575.36	17.71	574.55	16.77	574.89
9/16/2019	16.67	574.15	17.43	575.78	16.58	576.00	15.56	576.32	17.64	574.62	16.73	574.93

Notes:

Elevations are reported in feet relative to the North American Vertical Datum of 1988.

ft BTOC - feet Below top of casing.

Table 2

Summary of Field Data – March and September 2019

Belle River Power Plant Diversion Basin – RCRA CCR Monitoring Program

China Township, Michigan

Sample Location	Sample Date	Dissolved Oxygen (mg/L)	Oxidation Reduction Potential (mV)	pH (SU)	Specific Conductivity (umhos/cm)	Temperature (deg C)	Turbidity (NTU)
MW-16-05	3/18/2019	1.4	-203.6	8.0	4,948	9.60	20.6
	9/17/2019	0.39	-251.0	7.9	4,968	17.60	5.00
MW-16-06	3/20/2019	1.26	-226.5	8.0	4,586	11.10	3.71
	9/17/2019	0.19	119.3	8.1	4,683	15.56	4.52
MW-16-07	3/20/2019	1.10	-261.5	8.0	5,032	10.50	77.1
	9/17/2019	0.17	124.2	8.1	5,130	15.30	107.0
MW-16-08	3/19/2019	1.06	-162.5	8.1	4,990	10.80	87.0
	9/17/2019	0.17	34.6	8.2	5,243	12.76	127.0
MW-16-10	3/19/2019	1.09	-230.0	8.0	4,351	10.70	64.0
	9/17/2019	0.50	57.8	8.1	4,620	14.11	80.5
MW-16-11A	3/19/2019	1.15	-135.4	8.0	4,577	10.00	36.2
	9/17/2019	0.43	-170.1	8.1	5,446	12.50	3.98

Notes:

mg/L - milligrams per liter.

mV - milliVolt.

SU - standard unit.

umhos/cm - micro-mhos per centimeter.

deg C - degrees Celcius.

NTU - nephelometric turbidity units.

Table 3

Comparison of Appendix III Results to Background Limits – March and May 2019

Belle River Power Plant Diversion Basin – RCRA CCR Monitoring Program

China Township, Michigan

Sample Location:		MW-16-05		MW-16-06		MW-16-07		MW-16-08		MW-16-10			MW-16-11A	
Sample Date:		3/18/2019	PL	3/20/2019	PL	3/20/2019	PL	3/19/2019	PL	3/19/2019	5/8/2019(1)	PL	3/19/2019	PL
Constituent	Unit	Data		Data		Data		Data		Data			Data	
Appendix III														
Boron	ug/L	1,700	2,000	1,900	2,200	2,000	2,100	1,900	2,300	2,000	--	2,300	1,800	2,000
Calcium	ug/L	35,000	67,000	35,000	45,000	45,000	110,000	48,000	99,000	**35,000**	30,000	34,000	35,000	80,000
Chloride	mg/L	1,500	1,600	1,700	1,800	1,800	1,800	1,900	2,000	1,500	--	1,800	1,700	1,700
Fluoride	mg/L	1.1	1.3	1.1	1.3	1.0	1.2	1.1	1.3	0.96	--	1.2	0.91	1.0
pH, Field	SU	8.0	7.9 - 8.5	8.0	7.5 - 8.4	8.0	7.7 - 8.4	8.1	7.5 - 8.3	8.0	8.1	7.5 - 8.8	8.0	7.6 - 8.6
Sulfate	mg/L	16	20	3.8	20	68	98	2.8	23	140	--	160	2.5	20
Total Dissolved Solids	mg/L	2,600	2,700	2,600	3,000	3,000	3,400	3,100	3,200	2,700	--	3,100	2,900	3,000

Notes:

ug/L - micrograms per liter.

mg/L - milligrams per liter.

SU - standard units; pH is a field parameter.

All metals were analyzed as total unless otherwise specified.

Bold font indicates an exceedance of the Prediction Limit (PL).

(1) - Results shown for verification sampling performed on 5/8/2019.

Table 4

Comparison of Appendix III Results to Background Limits – September 2019

Belle River Power Plant Diversion Basin – RCRA CCR Monitoring Program

China Township, Michigan

Sample Location:		MW-16-05		MW-16-06		MW-16-07		MW-16-08		MW-16-10		MW-16-11A	
Sample Date:		9/17/2019	PL	9/17/2019	PL	9/17/2019	PL	9/17/2019	PL	9/17/2019	PL	9/17/2019	PL
Constituent	Unit	Data		Data		Data		Data		Data		Data	
Appendix III													
Boron	ug/L	1,800	2,000	1,900	2,200	2,000	2,100	1,700	2,300	2,000	2,300	1,700	2,000
Calcium	ug/L	38,000	67,000	40,000	45,000	50,000	110,000	55,000	99,000	29,000	34,000	41,000	80,000
Chloride	mg/L	1,400	1,600	1,500	1,800	1,700	1,800	1,800	2,000	1,500	1,800	1,600	1,700
Fluoride	mg/L	1.1	1.3	1.0	1.3	1.1	1.2	1.1	1.3	1.0	1.2	0.94	1.0
pH, Field	SU	7.9	7.9 - 8.5	8.1	7.5 - 8.4	8.1	7.7 - 8.4	8.2	7.5 - 8.3	8.1	7.5 - 8.8	8.1	7.6 - 8.6
Sulfate	mg/L	15	20	< 5.0	20	67	98	< 5.0	23	57	160	< 5.0	20
Total Dissolved Solids	mg/L	2,500	2,700	2,800	3,000	2,900	3,400	3,000	3,200	2,900	3,100	2,500	3,000

Notes:

ug/L - micrograms per liter.

mg/L - milligrams per liter.

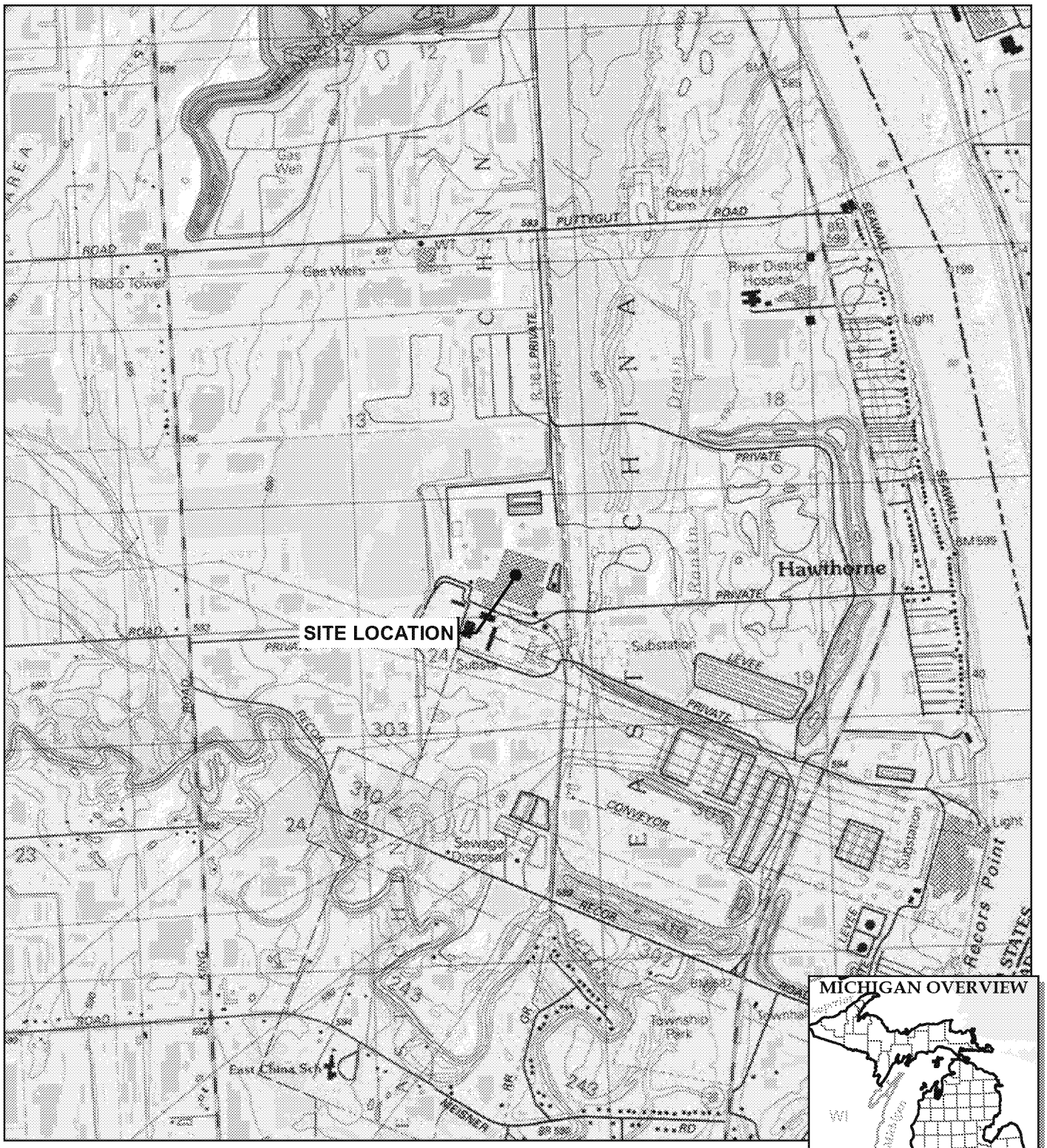
SU - standard units; pH is a field parameter.

All metals were analyzed as total unless otherwise specified.

Bold font indicates an exceedance of the Prediction Limit (PL).

Figures

ED_005947A_00014551-00044



BASE MAP FROM USGS 7.5 MINUTE TOPOGRAPHIC QUADRANGLE SERIES.

N

1 " = 2,000 '
1:24,000

0 2,000 4,000 FEET

TRC

1540 Eisenhower Place
Ann Arbor, MI 48108-3284
Phone: 734.971.7080
www.trccompanies.com

TRC - GIS

PROJECT:

DTE ELECTRIC COMPANY
BELLE RIVER POWER PLANT
4505 KING ROAD
CHINA TOWNSHIP, MICHIGAN

TITLE:

SITE LOCATION MAP

DRAWN BY:	S. MAJOR
CHECKED BY:	J. KRENZ
APPROVED BY:	V. BUENING
DATE:	JANUARY 2020
PROJ. NO.:	320511.0003
FILE:	320511-0003-003slmMB.mxd

FIGURE 1

E:\DTE\CCR_Sites\2017_265996\320511-0003-003slmMB.mxd -- Saved By: MVAPHIADIS on 1/28/2020, 08:50:35 AM

LEGEND

- SOIL BORING
- MONITORING WELL
- DECOMMISSIONED MONITORING WELL

NOTES

1. BASE MAP IMAGERY FROM GOOGLE EARTH PRO. & PARTNERS, (3/24/2019).
2. WELL LOCATIONS SURVEYED IN MARCH, APRIL, JUNE 2016, AND JUNE 2017 BY BMJ ENGINEERS & SURVEYORS, INC.

N

0 200 400 Feet

1 " = 200 '

1:2,400

PROJECT: DTE ELECTRIC COMPANY
BELLE RIVER POWER PLANT DIVERSION BASIN
4505 KING ROAD
CHINA TOWNSHIP, MICHIGAN

TITLE: SITE PLAN

DRAWN BY:	M. VAPHIADIS	PROJ NO.:	320511.0003.0000 P1 T1
CHECKED BY:	J. KRENZ		FIGURE 2
APPROVED BY:	V. BUENING		
DATE:	JANUARY 2020		

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FILE NO.: 320511-0003-025.mxd

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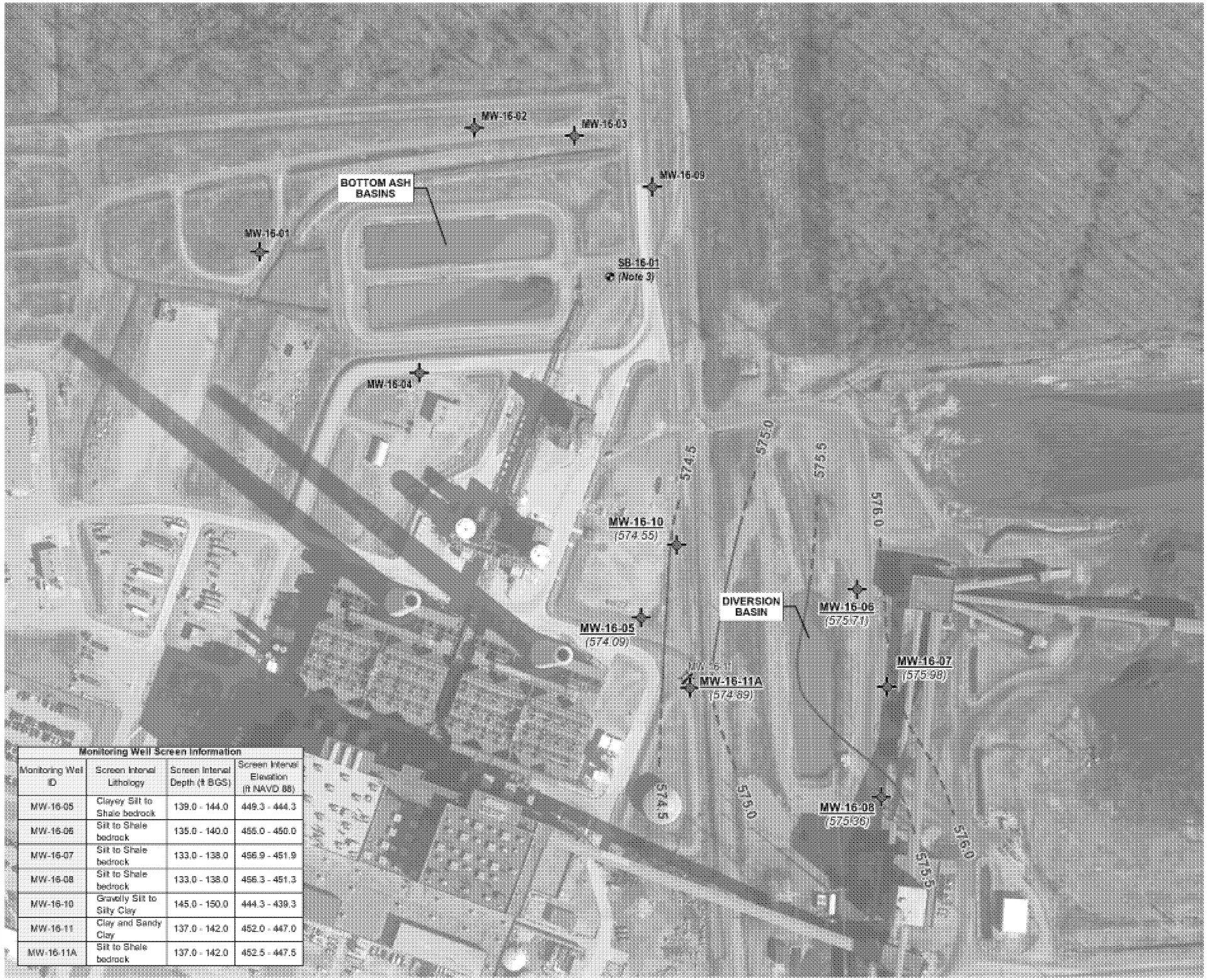
Path: E:\DTE\CCR_Sites\2017_2659961320511-0003-025.mxd

Coordinate System: NAD 1983 StatePlane Michigan South FIPS 2113 Feet Intl (Foot)
Map Rotation: 0

TRC - GIS



Monitoring Well Screen Information

Monitoring Well ID	Screen Interval Lithology	Screen Interval Depth (ft BGS)	Screen Interval Elevation (ft NAVD 88)
MW-16-05	Clayey Silt to Shale bedrock	139.0 - 144.0	449.3 - 444.3
MW-16-06	Silt to Shale bedrock	135.0 - 140.0	455.0 - 450.0
MW-16-07	Silt to Shale bedrock	133.0 - 138.0	456.9 - 451.9
MW-16-08	Silt to Shale bedrock	133.0 - 138.0	456.3 - 451.3
MW-16-10	Gravelly Silt to Silty Clay	145.0 - 150.0	444.3 - 439.3
MW-16-11	Clay and Sandy Clay	137.0 - 142.0	452.0 - 447.0
MW-16-11A	Silt to Shale bedrock	137.0 - 142.0	452.5 - 447.5

LEGEND

- SOIL BORING
- MONITORING WELL
- DECOMMISSIONED MONITORING WELL
- (575.47) GROUNDWATER ELEVATION (FT NAVD 88)
- GROUNDWATER ELEVATION CONTOUR (0.5-FT INTERVAL, DASHED WHERE INFERRED)

NOTES

1. BASE MAP IMAGERY FROM GOOGLE EARTH PRO, (3/24/2019).
2. WELL LOCATIONS SURVEYED IN MARCH, APRIL, AND JUNE 2016 BY BMJ ENGINEERS AND SURVEYORS. INC.
3. NO SAND OR GRAVEL UNIT PRESENT ABOVE BEDROCK IN THIS LOCATION.
4. GROUNDWATER ELEVATIONS DISPLAYED IN FEET RELATIVE TO NORTH AMERICAN VERTICAL DATUM OF 1988.

N

0 200 400 Feet

1 " = 200 '
1:2,400

PROJECT: DTE ELECTRIC COMPANY
BELLE RIVER POWER PLANT DIVERSION BASIN
4505 KING ROAD
CHINA TOWNSHIP, MICHIGAN

TITLE: DIVERSION BASIN GROUNDWATER POTENTIOMETRIC SURFACE MAP MARCH 2019

DRAWN BY:	M. VAPHIADIS	PROJ NO.:	320511.0003
CHECKED BY:	J. KRENZ		FIGURE 3
APPROVED BY:	V. BUENING		
DATE:	JANUARY 2020		

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FILE NO.: 320511-0003-026.mxd

Plot Date: 1/28/2020, 09:35:59 AM by MVAPHIADIS -- LAYOUT: ANSI B(11"x17")
Path: E:\DTE\CCR_Sites\2017_2659961320511-0003-026.mxd
Coordinate System: NAD 1983 StatePlane Michigan South FIPS 2113 Feet Intl (Foot)
Map Rotation: 0

TRC - GIS

Monitoring Well Screen Information			
Monitoring Well ID	Screen Interval Lithology	Screen Interval Depth (ft BGS)	Screen Interval Elevation (ft NAVD 88)
MW-16-05	Clayey Silt to Shale bedrock	139.0 - 144.0	449.3 - 444.3
MW-16-06	Silt to Shale bedrock	135.0 - 140.0	455.0 - 450.0
MW-16-07	Silt to Shale bedrock	133.0 - 138.0	456.9 - 451.9
MW-16-08	Silt to Shale bedrock	133.0 - 138.0	456.3 - 451.3
MW-16-10	Gravelly Silt to Silty Clay	145.0 - 150.0	444.3 - 439.3
MW-16-11	Clay and Sandy Clay	137.0 - 142.0	452.0 - 447.0
MW-16-11A	Silt to Shale bedrock	137.0 - 142.0	452.5 - 447.5

LEGEND

- SOIL BORING
- MONITORING WELL
- DECOMMISSIONED MONITORING
- (575.47) GROUNDWATER ELEVATION (FT NAVD 88)
- GROUNDWATER ELEVATION CONTOUR (0.5-FT INTERVAL, DASHED WHERE INFERRED)

NOTES

1. BASE MAP IMAGERY FROM GOOGLE EARTH PRO, (3/24/2019).
2. WELL LOCATIONS SURVEYED IN MARCH, APRIL, AND JUNE 2016 BY BMJ ENGINEERS AND SURVEYORS. INC.
3. NO SAND OR GRAVEL UNIT PRESENT ABOVE BEDROCK IN THIS LOCATION.
4. GROUNDWATER ELEVATIONS DISPLAYED IN FEET RELATIVE TO NORTH AMERICAN VERTICAL DATUM OF 1988.

N

0 200 400 Feet

1 " = 200 '
1:2,400

PROJECT: DTE ELECTRIC COMPANY
BELLE RIVER POWER PLANT DIVERSION BASIN
4505 KING ROAD
CHINA TOWNSHIP, MICHIGAN

TITLE: DIVERSION BASIN GROUNDWATER POTENTIOMETRIC SURFACE MAP SEPTEMBER 2019

DRAWN BY:	M. VAPHIADIS	PROJ NO.:	320511.0003
CHECKED BY:	J. KRENZ		FIGURE 4
APPROVED BY:	V. BUENING		
DATE:	JANUARY 2020		

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FILE NO.: 320511-0003-028.mxd

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Appendix A
Data Quality Reviews

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Laboratory Data Quality Review
Groundwater Monitoring Event March 2019 (Detection Monitoring)
DTE Electric Company Belle River Power Plant (DTE BRPP)

Groundwater samples were collected by TRC for the March 2019 sampling event for the Diversion Basin at the DTE BRPP. Samples were analyzed for anions, boron, calcium, and total dissolved solids by Test America Laboratories, Inc., (Test America) located in North Canton, Ohio. The laboratory analytical results are reported in laboratory report 240-109798-1.

During the March 2019 sampling event, a groundwater sample was collected from the following wells:

- MW-16-01
- MW-16-02
- MW-16-03
- MW-16-04
- MW-16-05
- MW-16-06
- MW-16-07
- MW-16-08
- MW-16-09
- MW-16-10
- MW-16-11A

Each sample was analyzed for the following constituents:

Analyte Group	Method
Anions (Chloride, Fluoride, Sulfate)	SW846 9056A
Total Boron	SW846 3005A/6010B
Total Calcium	SW846 3005A/6020
Total Dissolved Solids	SM 2540C

TRC reviewed the laboratory data to assess data usability. The following sections summarize the data review procedure and the results of the review.

Data Quality Review Procedure

The analytical data were reviewed using the USEPA National Functional Guidelines for Inorganic Superfund Data Review (USEPA, 2017). The following items were included in the evaluation of the data:

- Sample receipt, as noted in the cover page or case narrative;
- Technical holding times for analyses;
- Reporting limits (RLs) compared to project-required RLs;
- Data for method blanks and equipment blanks. Method blanks are used to assess potential contamination arising from laboratory sample preparation and/or analytical procedures. Equipment blanks are used to assess potential contamination arising from field procedures;

ED_005947A_00014551-00050

- Data for laboratory control samples (LCSs). The LCSs are used to assess the accuracy of the analytical method using a clean matrix;
- Data for matrix spike and matrix spike duplicate samples (MS.MSDs), if applicable. The MS/MSDs are used to assess the accuracy and precision of the analytical method using a sample from the dataset;
- Data for laboratory duplicates, if applicable. The laboratory duplicates are used to assess the precision of the analytical method using a sample from the dataset;
- Data for blind field duplicates. Field duplicate samples are used to assess variability introduced by the sampling and analytical processes; and
- Overall usability of the data.

This data usability report addresses the following items:

- Usability of the data if quality control (QC) results suggest potential problems with all or some of the data;
- Actions regarding specific QC criteria exceedances.

Review Summary

The data quality objectives and laboratory completeness goals for the project were met, and the data are usable for their intended purpose. A summary of the data quality review, including non-conformances and issues identified in this evaluation are noted below.

- The reviewed constituents will be utilized for the purposes of a detection monitoring program.
- Data are usable for the purposes of the detection monitoring program.

QA/QC Sample Summary:

- The holding time for TDS for samples MW-16-01, MW-16-02, MW-16-03, MW-16-04, MW-16-05, DUP-01, and EB-01 exceeded the 7-day holding time criteria by approximately 5-10 hours. These results are estimated and may be biased low.
- Target analytes were not detected in the equipment blank (EB-01_20190318).
- Target analytes were not detected in the method blanks.
- LCS recoveries for all target analytes were within laboratory control limits.
- Sample DUP-01 corresponds with sample MW-16-01. The relative percent differences (RPDs) between the parent and duplicate sample were within the acceptance limits.
- Laboratory duplicate analyses were performed on sample MW-16-01 for TDS; the RPD was within the acceptance limits.

ED_005947A_00014551-00051

- MS/MSD analyses were performed on the following samples:
  - Sample MW-16-01 for boron; the percent recoveries (%Rs) and RPDs were within the acceptance limits.
  - Samples MW-16-02 and DUP-01 for fluoride and sulfate; the %Rs and RPDs were within the acceptance limits.
  - Sample MW-16-02 for calcium; the MS/MSD %Rs (68%/63%) were below the lower QC limit of 75%, but no action was required since the sample result in the parent sample was > 4x the spike added.
- For TDS, the constant weight was not achieved after three drying cycles for sample MW-16-02; there was no impact on data usability.

ED_005947A_00014551-00052

Laboratory Data Quality Review
Groundwater Monitoring Event
May 2019 Verification (Detection Monitoring)
DTE Electric Company Belle River Power Plant (DTE BRPP)

Groundwater samples were collected by TRC for the May 2019 verification sampling event for the Diversion Basin at the DTE BRPP. Samples were analyzed for anions, boron, calcium, and total dissolved solids by Test America Laboratories, Inc., (Test America) located in North Canton, Ohio. The laboratory analytical results are reported in laboratory report 240-109798-1.

During the May 2019 sampling event, a groundwater sample was collected from the following wells:

- MW-16-01
- MW-16-04
- MW-16-10

Each sample was analyzed for the following constituents:

Analyte Group	Method
Anions (Chloride, Fluoride, Sulfate)	SW846 9056A
Total Calcium	SW846 3005A/6020
Total Dissolved Solids	SM 2540C

TRC reviewed the laboratory data to assess data usability. The following sections summarize the data review procedure and the results of the review.

Data Quality Review Procedure

The analytical data were reviewed using the USEPA National Functional Guidelines for Inorganic Superfund Data Review (USEPA, 2017). The following items were included in the evaluation of the data:

- Sample receipt, as noted in the cover page or case narrative;
- Technical holding times for analyses;
- Reporting limits (RLs) compared to project-required RLs;
- Data for method blanks and equipment blanks. Method blanks are used to assess potential contamination arising from laboratory sample preparation and/or analytical procedures. Equipment blanks are used to assess potential contamination arising from field procedures;
- Data for laboratory control samples (LCSs). The LCSs are used to assess the accuracy of the analytical method using a clean matrix;

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- Data for matrix spike and matrix spike duplicate samples (MS/MSDs), if applicable. The MS/MSDs are used to assess the accuracy and precision of the analytical method using a sample from the dataset;
- Data for laboratory duplicates, if applicable. The laboratory duplicates are used to assess the precision of the analytical method using a sample from the dataset;
- Data for blind field duplicates. Field duplicate samples are used to assess variability introduced by the sampling and analytical processes; and
- Overall usability of the data.

This data usability report addresses the following items:

- Usability of the data if quality control (QC) results suggest potential problems with all or some of the data;
- Actions regarding specific QC criteria exceedances.

Review Summary

The data quality objectives and laboratory completeness goals for the project were met, and the data are usable for their intended purpose. A summary of the data quality review, including non-conformances and issues identified in this evaluation are noted below.

- The reviewed constituents will be utilized for the purposes of a detection monitoring program.
- Data are usable for the purposes of the detection monitoring program.

QA/QC Sample Summary:

- All holding times were met for the methods performed on these samples.
- Target analytes were not detected in the equipment blank (EB-01).
- Target analytes were not detected in the method blanks.
- LCS recoveries for all target analytes were within laboratory control limits.
- The field duplicate pair samples were DUP-01 and MW-16-01, DUP-02 and MW-16-04, and DUP-03 and MW-16-10. The relative percent differences (RPDs) between the parent and duplicate samples were within the acceptance limits.
- For TDS, the laboratory reporting limit did not meet the specified limit in the QAPP; however, TDS was detected in the sample (MW-16-01). Therefore, there was no impact on data usability.

ED_005947A_00014551-00054

Laboratory Data Quality Review
Groundwater Monitoring Event September 2019 (Detection Monitoring)
DTE Electric Company Belle River Power Plant (DTE BRPP)

Groundwater samples were collected by TRC for the September 2019 sampling event for the Bottom Ash Basins and Diversion Basin at the DTE BRPP. Samples were analyzed for anions, total boron, total calcium, and total dissolved solids by Eurofins-Test America Laboratories, Inc. (Eurofins-TA), located in North Canton, Ohio. The laboratory analytical results are reported in laboratory report 240-119135-1.

During the September 2019 sampling event, a groundwater sample was collected from each of the following wells:

Bottom Ash Basins:

- MW-16-01
- MW-16-02
- MW-16-03
- MW-16-04
- MW-16-09

Diversion Basin:

- MW-16-05
- MW-16-06
- MW-16-07
- MW-16-08
- MW-16-10
- MW-16-11A

Each sample was analyzed for the following constituents:

Analyte Group	Method
Anions (Chloride, Fluoride, Sulfate)	SW846 9056A
Total Boron	SW846 3005A/6010B
Total Calcium	SW846 3005A/6020
Total Dissolved Solids	SM 2540C

TRC reviewed the laboratory data to assess data usability. The following sections summarize the data review procedure and the results of the review.

The analytical data were reviewed using the USEPA National Functional Guidelines for Inorganic Superfund Data Review (USEPA, 2017). The following items were included in the evaluation of the data:

- Sample receipt, as noted in the cover page or case narrative;
- Technical holding times for analyses;
- Reporting limits (RLs) compared to project-required RLs;

ED_005947A_00014551-00055

- Data for method blanks and equipment blanks, where applicable. Method blanks are used to assess potential contamination arising from laboratory sample preparation and/or analytical procedures. Equipment blanks are used to assess potential contamination arising from field procedures;
- Data for laboratory control samples (LCSs). The LCSs are used to assess the accuracy of the analytical method using a clean matrix;
- Data for matrix spike and matrix spike duplicate samples (MS/MSDs), where applicable. The MS/MSDs are used to assess the accuracy and precision of the analytical method using a sample from the dataset;
- Data for laboratory duplicates, where applicable. The laboratory duplicates are used to assess the precision of the analytical method using a sample from the dataset;
- Data for blind field duplicates. Field duplicate samples are used to assess variability introduced by the sampling and analytical processes; and
- Overall usability of the data.

This data usability report addresses the following items:

- Usability of the data if quality control (QC) results suggest potential problems with all or some of the data;
- Actions regarding specific QC criteria exceedances.

Review Summary

The data quality objectives and laboratory completeness goals for the project were met, and the data are usable for their intended purpose. A summary of the data quality review, including non-conformances and issues identified in this evaluation are noted below.

- Appendix III constituents will be utilized for the purposes of a detection monitoring program.
- Data are usable for the purposes of the detection monitoring program.

QA/QC Sample Summary:

- There was one equipment blank submitted with this dataset (EB-01) which was associated with the low hydraulic conductivity wells (MW-16-08, MW 16-10, and MW-16-11A). Chloride was detected at 1.8 mg/L and TDS was detected at 12 mg/L in this equipment blank. However, these analytes were detected at concentrations greater than five times the blank concentrations in the associated wells; thus, there was no impact on data usability.
- Target analytes were not detected in the method blanks.

ED_005947A_00014551-00056

- LCS recoveries for all target analytes were within laboratory control limits.
- MS/MSD analyses were performed on samples MW-16-01 for boron, MW-16-03 for fluoride and sulfate, and MW-16-02 for calcium; the percent recoveries (%Rs) and relative percent differences (RPDs) were acceptable.
  - MS/MSD analyses were not performed for chloride; per the project QAPP, MS/MSD analyses are required for chloride at a frequency of 1 per 20 samples. It is likely that an MS/MSD was performed on sample MW-16-03 for chloride but not reported by the laboratory since the sample was re-analyzed at a dilution for chloride.
- Laboratory duplicate analyses were not performed for TDS. Per the project QAPP, laboratory duplicate analyses are required for TDS at a frequency of 1 per 20 samples.
- Dup-01 corresponds with MW-16-01; RPDs between the parent and duplicate sample were within the QC limits.
- The nondetect reporting limits (5.0 mg/L) for sulfate in samples MW-16-06, MW-16-08, and MW-16-11A were above the QAPP-specified RL (1.0 mg/L) due to a 5-fold dilution which was likely the result of elevated chloride concentrations.

ED_005947A_00014551-00057

Appendix B
Owner Certification of Compliance

DRAFT

Owner Certification of Site Compliance per 40 CFR 257 Subpart D
Belle River Power Plant Diversion Basin
China Township, Michigan

The United States Environmental Protection Agency (EPA) Hazardous and Solid Waste Management System: Disposal of Coal Combustion Residuals From Electric Utilities; A Holistic Approach to Closure Part B: Alternate Demonstration for Unlined Surface Impoundments (40 CFR §257.71(d)), requires that the owner of an existing CCR unit certify the facility is in compliance with the requirements of the CCR Rules (40 CFR 257 Subpart D) except for §257.71(a)(1).

CERTIFICATION

Based on our review of the CCR Rules, I hereby certify that the subject facility is in compliance with the requirements of 40 CFR 257 Subpart D except for §257.71(a)(1).

SIGNATURE	DATE
PRINT NAME	TITLE
COMPANY NAME	

DRAFT

Appendix C
Well Construction Diagrams and Soil Boring Logs

DRAFT

WELL CONSTRUCTION LOG

TRC

WELL NO. MW-16-01

Facility/Project Name:	Date Drilling Started:	Date Drilling Completed:	Project Number:
DTE Electric Company Belle River Power Plant	2/29/16	2/29/16	231828.0003

Drilling Firm:	Drilling Method:	Surface Elev. (ft)	TOC Elevation (ft)	Total Depth (ft bgs)	Borehole Dia. (in)
Stock Drilling	Sonic	588.17	591.30	120.0	6/4

Boring Location: Approximately 188 feet off road to the S, W of bottom ash basins.
N: 471155.70 E: 13625546.02

Personnel
Logged By - A. Knutson
Driller - A. Goldsmith

Drilling Equipment: TSi 150cc

Civil Town/City/or Village:	County:	State:
China Township	St. Clair	MI

Water Level Observations:
While Drilling: Date/Time Depth (ft bgs)
After Drilling: Date/Time 4/13/16 08:45 Depth (ft bgs) 14.52

SAMPLE NUMBER AND TYPE	RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	WELL DIAGRAM	COMMENTS
				SILTY CLAY WITH GRAVEL mostly clay, little to some silt, little fine to coarse gravel, few fine sand, low plasticity, dark gray (10YR 4/1), moist, medium stiff.	CL-ML			Continuous sampling with 4-inch diameter casing from ground surface to terminus of soil boring, over-drilled with 6-inch diameter casing to install monitoring well. Original boring abandoned due to compromised screen. Redrilled and installed at survey location noted above within 10 feet of original location.
1 CS	60		5	**CLAY** mostly clay, trace fine to coarse gravel, high plasticity, brown (10YR 5/3), moist, stiff. Change to dark gray (10YR 4/1), very stiff at 5.0 feet.				
				Change to soft at 8.0 feet.				
			10	Change to no gravel, dark gray (10YR 4/1) mottled with brown (10YR 5/3), very soft at 10.0 feet.				
2 CS	50		15					
			20	Change to dark gray (10YR 4/1) at 20.0 feet.	CL			
3 CS	100		25					
			30					
4 CS	100		35					
			40					

Signature: Chris Scieszka

Firm: TRC Environmental Corporation
1540 Eisenhower Place Ann Arbor, Michigan
734.971.7080
Fax 734.971.9022

Checked By: C. Scieszka

SOIL BORING WELL CONSTRUCTION LOG 231828.0003.0000.GPJ TRC_CORP.GDT 7/14/16

WELL CONSTRUCTION LOG

TRC

WELL NO. MW-16-01

SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	WELL DIAGRAM	COMMENTS
5 CS	100		45	**CLAY** mostly clay, high plasticity, dark gray (10YR 4/1), moist, soft.				
6 ST	100		50					
7 CS	100		55					
			60					
8 CS	80		65		CL			
			70					
9 CS	100		75					
			80					
10 CS	100		85					
			90	**SAND** mostly fine sand, dark gray (10YR 4/1), saturated.				
11 CS	100		95		SP			
			100	End of boring at 100.0 feet below ground surface.				

WELL CONSTRUCTION LOG

TRC

WELL NO. MW-16-02

Facility/Project Name:	Date Drilling Started:	Date Drilling Completed:	Project Number:
DTE Electric Company Belle River Power Plant	3/14/16	3/15/16	231828.0003

Drilling Firm:	Drilling Method:	Surface Elev. (ft)	TOC Elevation (ft)	Total Depth (ft bgs)	Borehole Dia. (in)
Stock Drilling	Sonic	586.27	588.94	100.0	6/4

Boring Location: 325 feet W of haul road, 5 feet N of road, N of bottom ash basins.
N: 471409.06 E: 13625991.78

Personnel
Logged By - A. Knutson
Driller - A. Goldsmith

Drilling Equipment: TSi 150cc

Civil Town/City/or Village:	County:	State:
China Township	St. Clair	MI

Water Level Observations:
While Drilling: Date/Time Depth (ft bgs)
After Drilling: Date/Time 4/13/16 09:24 Depth (ft bgs) 16.07

SAMPLE NUMBER AND TYPE	RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	WELL DIAGRAM	COMMENTS
1 CS	80		5	**CLAY** mostly clay, few silt, few coarse gravel, medium plasticity, dark gray (10YR 4/1) mottled with brown (10YR 5/3), stiff.	CL			Continuous sampling with 4-inch diameter casing from ground surface to terminus of soil boring, over-drilled with 6-inch diameter casing to install monitoring well.
				Change to no gravel at 7.0 feet.				
			10	Change to high plasticity, dark gray (10YR 4/1), moist, very soft at 10.0 feet.				
2 CS	80		15	▼				
			20					
3 CS	100		25					
			30					
4 CS	90		35					
			40					

SOIL BORING WELL CONSTRUCTION LOG 231828.0003.0000.GPJ TRC_CORP.GDT 7/14/16

Signature: [signature]

Checked By: C. Scieszka

Firm: TRC Environmental Corporation
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WELL CONSTRUCTION LOG

TRC

WELL NO. MW-16-02

SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	WELL DIAGRAM	COMMENTS
5 CS	100		45	**CLAY** mostly clay, few silt, few coarse gravel, high plasticity, dark gray (10YR 4/1), moist, very soft.	CL			
			50	**SILTY CLAY** mostly clay, little to some silt, few fine sand, few fine to coarse gravel, high plasticity, dark gray (10YR 4/1), very soft.				
6 CS	100		55					
			60					
7 CS	50		65		CL-ML			
			70					
8 CS	100		75					
			80					
9 CS	100		85					
			90	**CLAYEY SILT** mostly silt, some clay, few fine sand, few coarse gravel, low plasticity, dark gray (10YR 4/1), moist, very soft.	ML-CL			
10 CS	100		95	**SAND** mostly fine to coarse sand, dark gray (10YR 4/1), saturated. Change to fine sand at 96.0 feet.	SW			
			100	End of boring at 100.0 feet below ground surface.				

SOIL BORING WELL CONSTRUCTION LOG 231828.0003.0000.GPJ TRC_CORP.GDT 7/14/16

WELL CONSTRUCTION LOG

TRC

WELL NO. MW-16-03

Facility/Project Name:	Date Drilling Started:	Date Drilling Completed:	Project Number:
DTE Electric Company Belle River Power Plant	5/25/16	5/31/16	231828.0003

Drilling Firm:	Drilling Method:	Surface Elev. (ft)	TOC Elevation (ft)	Total Depth (ft bgs)	Borehole Dia. (in)
Stock Drilling	Sonic	588.03	590.66	150.0	6/4

Boring Location: Approximately 100 feet W of haul road, N of bottom ash basins.
N: 471391.78 E: 13626202.49

Personnel
Logged By - J. Reed
Driller - A. Goldsmith

Drilling Equipment: TSI 150cc

Civil Town/City/or Village:	County:	State:
China Township	St. Clair	MI

Water Level Observations:
While Drilling: Date/Time Depth (ft bgs)
After Drilling: Date/Time 6/8/16 14:30 Depth (ft bgs) 12.82

SAMPLE NUMBER AND TYPE	RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	WELL DIAGRAM	COMMENTS
				TOPSOIL				
1 CS	100		5	**SILTY CLAY** mostly clay, some silt, few fine to medium sand, trace gravel, low to medium plasticity, dark gray (10YR 4/1) with trace orange mottling, moist, medium stiff to stiff.	CL-ML			Continuous sampling with 4-inch diameter casing from ground surface to terminus of soil boring, over-drilled with 6-inch diameter casing to install monitoring well.
			10	Change to gray (10YR 5/1) at 10.5 feet.				
2 CS	100		15	**CLAY** mostly clay, few silt, trace to few fine to medium sand, medium plasticity, gray (10YR 5/1), moist, soft to medium stiff.				
			20					
3 CS	100		25	Change to trace to few fine to coarse sand at 25.0 feet.	CL			
			30					
4 CS	100		35					
			40	Change to trace fine to coarse sand at 41.5 feet.				

Signature:

Checked By: M. Powers

Firm: TRC Environmental Corporation
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SOIL BORING WELL CONSTRUCTION LOG 231828.0003.0000.GPJ TRC_CORP.GDT 7/14/16

WELL CONSTRUCTION LOG

TRC

WELL NO. MW-16-03

SAMPLE NUMBER AND TYPE	RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	WELL DIAGRAM	COMMENTS
5 CS	100		45	**CLAY** mostly clay, few silt, trace fine to coarse sand, medium plasticity, gray (10YR 5/1), moist, soft to medium stiff.				
			50					
6 CS	90		55		CL			
			60	Change to stiff at 60.5 feet. Change to medium stiff at 62.0 feet.				
7 CS	100		65	**SANDY CLAY** mostly clay, little to some sand, few silt, gray (10YR 5/1), moist, soft to medium stiff.	CL			
				CLAY mostly clay, few silt, few fine to coarse sand, gray (10YR 5/1), moist, stiff. Change to coal fragments present at 67.5 feet. Change to no coal fragments present at 68.0 feet.				
			70		CL			
8 CS	90		75	1-inch thick interval of silty fine to coarse sand at 75.0 feet.				
			80	**SANDY SILT** mostly silt, little to some fine to medium sand, gray (10YR 5/1), moist, medium dense.	ML			
				CLAY mostly clay, few silt, few fine to coarse sand, low to medium plasticity, gray (10YR 5/1), moist, stiff.				
9 CS	100		85					
			90	Change to medium soft at 90.0 feet.	CL			
10 CS	100		95	Change to few fine gravel from 94.0 to 95.0 feet. Change to trace fine gravel, medium stiff to stiff at 95.0 feet.				
			100					

SOIL BORING WELL CONSTRUCTION LOG 231628.0003.0000.GPJ TRC_CORP.GDT 7/14/16

WELL CONSTRUCTION LOG

TRC

WELL NO. MW-16-03

SAMPLE NUMBER AND TYPE	RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	WELL DIAGRAM	COMMENTS
11 CS	100		105	**CLAY** mostly clay, few silt, few fine to coarse sand, trace fine gravel, medium plasticity, gray (10YR 5/1), medium stiff to stiff.				
			110	Change to low plasticity, soft to medium stiff at 111.0 feet.				
12 CS	100		115		CL			
			120					
13 CS	100		125					
				SANDY CLAY mostly clay, little to some fine to medium sand, few silt, trace to few fine gravel, low to medium plasticity, gray (10YR 5/1), moist, medium stiff.	CL			
			130	**SILTY SAND** mostly fine to medium sand, little silt, gray (10YR 5/1), moist, loose.	SM			
14 CS	90		135	**SAND** mostly fine to medium sand, trace silt, gray (10YR 5/1), moist, loose.	SP			
				SILTY SAND mostly fine to medium sand, little silt, few clay, gray (10YR 5/1), moist, loose.	SM			
			140	**SAND** mostly fine to coarse sand, trace to few silt, trace to few clay, dark gray (10YR 4/1), moist to wet, loose.				
15 CS	100		145		SW			
				SILT mostly silt, few clay, trace coarse sand to fine gravel, gray (10YR 5/1), dry to moist, dense to very dense.	ML			
			150	**SHALE** weathered shale bedrock, dark gray.				
				End of boring at 150 feet below ground surface.				
			155					

SOIL BORING WELL CONSTRUCTION LOG 231828.0003.0000.GPJ TRC_CORP.GDT 7/14/16

WELL CONSTRUCTION LOG

TRC

WELL NO. MW-16-04

Facility/Project Name:	Date Drilling Started:	Date Drilling Completed:	Project Number:
DTE Electric Company Belle River Power Plant	3/7/16	3/8/16	231828.0003

Drilling Firm:	Drilling Method:	Surface Elev. (ft)	TOC Elevation (ft)	Total Depth (ft bgs)	Borehole Dia. (in)
Stock Drilling	Sonic	587.50	590.51	130.0	6/4

Boring Location: 200 feet from W corner of road, S of bottom ash basins.

N: 470893.74 E: 13625876.34

Personnel
Logged By - A. Knutson
Driller - A. Goldsmith

Drilling Equipment: TSi 150cc

Civil Town/City/or Village:	County:	State:
China Township	St. Clair	MI

Water Level Observations:
While Drilling: Date/Time Depth (ft bgs)
After Drilling: Date/Time 4/13/16 09:31 Depth (ft bgs) 13.91

SAMPLE NUMBER AND TYPE	RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	WELL DIAGRAM	COMMENTS
1 CS	80		5	**CLAY** mostly clay, few coarse gravel, high plasticity, dark gray (10YR 4/1) mottled with brown (10YR 5/3), very stiff. Change to no gravel at 1.0 feet.	CL			Continuous sampling with 4-inch diameter casing from ground surface to terminus of soil boring, over-drilled with 6-inch diameter casing to install monitoring well.
			10	Change to stiff at 10.5 feet.				
2 CS	100		15	Change to dark gray (10YR 4/1), very soft at 12.0 feet.				
3 CS	100		20					
			25					
4 CS	100		30					
			35					
			40					

SOIL BORING WELL CONSTRUCTION LOG 231828.0003.0000.GPJ TRC_CORP.GDT 7/14/16

Signature: Chris Scieszka

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Checked By: C. Scieszka

WELL CONSTRUCTION LOG

TRC

WELL NO. MW-16-04

SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	WELL DIAGRAM	COMMENTS
5 CS	100		45	**CLAY** mostly clay, high plasticity, dark gray (10YR 4/1), very soft.				
			50					
6 CS	100		55		CL			
			60	Change to few coarse gravel at 60.0 feet.				
7 CS	100		65					
			70					
				SILTY CLAY mostly clay, little to some silt, trace fine sand, medium plasticity, dark gray (10YR 4/1), very stiff.	CL-ML			
8 CS	100		75	**SILT** mostly silt, trace to few fine sand, non plastic, dark gray (10YR 4/1), saturated, stiff.	ML			
			80	**SAND** mostly fine sand, few medium to coarse sand, dark gray (10YR 4/1), moist.	SP			
				SANDY CLAY mostly clay, some fine sand, high plasticity, dark gray (10YR 4/1), moist.	CL			
9 CS	100		85	**SILTY CLAY** mostly clay, some silt, high plasticity, dark gray (10YR 4/1), stiff.	CL-ML			
				CLAYEY SILT mostly silt, some clay, low plasticity, dark gray (10YR 4/1), stiff.	ML-CL			
			90	**SILTY CLAY** mostly clay, some silt, high plasticity, dark gray (10YR 4/1), stiff.				
10 CS	100		95		CL-ML			
			100	**CLAY** mostly clay, high plasticity, dark gray (10YR 4/1), very soft.	CL			

SOIL BORING WELL CONSTRUCTION LOG 231828.0003.0000.GPJ TRC_CORP.GDT 7/14/16

WELL CONSTRUCTION LOG

TRC

WELL NO. MW-16-04

SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	WELL DIAGRAM	COMMENTS
11 CS	100		105	**CLAY** mostly clay, high plasticity, dark gray (10YR 4/1), very soft.	CL			
			110					
12 CS	100		115	**SILT** mostly silt, few fine sand, nonplastic, dark gray (10YR 4/1), saturated, stiff.	ML			
			120	**SAND** mostly fine sand, dark gray (10YR 4/1), saturated.				
13 CS	100		125		SP			
			130	End of boring at 130.0 feet below ground surface.				
			135					
			140					
			145					
			150					
			155					

SOIL BORING WELL CONSTRUCTION LOG 231828.0003.0000.GPJ TRC_CORP.GDT 7/14/15

WELL CONSTRUCTION LOG

TRC

WELL NO. MW-16-05

Facility/Project Name:	Date Drilling Started:	Date Drilling Completed:	Project Number:
DTE Electric Company Belle River Power Plant	3/3/16	3/4/16	231828.0003

Drilling Firm:	Drilling Method:	Surface Elev. (ft)	TOC Elevation (ft)	Total Depth (ft bgs)	Borehole Dia. (in)
Stock Drilling	Sonic	588.32	590.82	150.0	6

Boring Location: S end of haul road, W of diversion basin.

N: 470378.15 E: 13626342.79

Personnel
Logged By - A. Knutson
Driller - A. Goldsmith

Drilling Equipment: TSi 150cc

Civil Town/City/or Village:	County:	State:
China Township	St. Clair	MI

Water Level Observations:
While Drilling: Date/Time Depth (ft bgs)
After Drilling: Date/Time 4/13/16 09:55 Depth (ft bgs) 14.37

SAMPLE NUMBER AND TYPE	RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	WELL DIAGRAM	COMMENTS
				CLAY WITH GRAVEL mostly clay, few to some coarse gravel, high plasticity, dark grayish brown (10YR 4/2), moist, very stiff.	CL			Continuous sampling with 4-inch diameter casing from ground surface to terminus of soil boring, over-drilled with 6-inch diameter casing to install monitoring well.
1 CS	80		5	**CLAY** mostly clay, few fine to coarse gravel, high plasticity, dark gray (10YR 4/1) mottled with brown (10YR 5/3), moist, hard. Change to no gravel, very stiff at 4.0 feet.				
			10	Change to dark gray (10YR 4/1), very soft at 10.0 feet.				
2 CS	100		15					
			20		CL			
3 CS	100		25	Change to medium stiff at 26.0 feet. Change to very soft at 28.0 feet.				
			30					
4 CS	100		35					
			40					

Signature:

Firm: TRC Environmental Corporation 734.971.7080
1540 Eisenhower Place Ann Arbor, Michigan Fax 734.971.9022

Checked By: C. Scieszka

SOIL BORING WELL CONSTRUCTION LOG 231828.0003.0000.GPJ TRC_CORP.GDT 7/14/16

WELL CONSTRUCTION LOG

TRC

WELL NO. MW-16-05

SAMPLE NUMBER AND TYPE	RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	WELL DIAGRAM	COMMENTS
5 CS	100		45	**CLAY** mostly clay, high plasticity, dark gray (10YR 4/1), moist, very soft.	CL			
				SILTY CLAY mostly clay, little to some silt, medium plasticity, dark gray (10YR 4/1), very soft.	CL-ML			
6 ST	100		50	**CLAY** mostly clay, high plasticity, dark gray (10YR 4/1), moist, very soft.				
7 CS	100		55					
			60	Change to few fine to coarse gravel at 60.0 feet.	CL			
8 CS	100		65	Change to medium stiff at 65.0 feet.				
				Change to stiff at 67.5 feet.				
			70	**SILTY CLAY** mostly clay, some silt, few fine to coarse gravel, high plasticity, very dark gray (10YR 3/1), very stiff.				
9 CS	100		75	Change to low plasticity, black (10YR 2/1), hard at 77.0 feet.				
			80		CL-ML			
10 CS	60		85	Change to few to little fine sand at 85.5 feet.				
			90	**CLAY** mostly clay, few coarse gravel, high plasticity, dark gray (10YR 4/1), moist, very soft.				
				Change to medium stiff at 93.5 feet.				
11 CS	100		95		CL			
				Change to soft at 97.5 feet.				
			100					

SOIL BORING WELL CONSTRUCTION LOG 231928.0003.0000.GPJ TRC_CORP.GDT 7/14/16

WELL CONSTRUCTION LOG

TRC

WELL NO. MW-16-05

SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	WELL DIAGRAM	COMMENTS
12 CS	100		105	**CLAY** mostly clay, few coarse gravel, high plasticity, dark gray (10YR 4/1), moist, soft.				
			110					
13 CS	100		115		CL			
			120					
14 CS	100		125					
			130					
15 CS	100		135	**CLAYEY SILT** mostly silt, some clay, medium plasticity, dark gray (10YR 4/1), wet, medium stiff.	ML-CL			
			140					
16 CS	90		145	**SHALE** dark gray (10YR 4/1), dry.				
			150	End of boring at 150.0 feet below ground surface.				
			155					

SOIL BORING WELL CONSTRUCTION LOG 231828.0003.0000.GPJ TRC_CORP.GDT 7/14/16

WELL CONSTRUCTION LOG

TRC

WELL NO. MW-16-06

Facility/Project Name:	Date Drilling Started:	Date Drilling Completed:	Project Number:
DTE Electric Company Belle River Power Plant	3/10/16	3/11/16	231828.0003

Drilling Firm:	Drilling Method:	Surface Elev. (ft)	TOC Elevation (ft)	Total Depth (ft bgs)	Borehole Dia. (in)
Stock Drilling	Sonic	589.98	593.21	140.0	6

Boring Location: 123 feet S of road connecting to haul road, E of diversion basin.	Personnel	Drilling Equipment:
N: 470439.03 E: 13626796.04	Logged By - A. Knutson Driller - A. Goldsmith	TSi 150cc

Civil Town/City/or Village:	County:	State:	Water Level Observations:
China Township	St. Clair	MI	While Drilling: Date/Time Depth (ft bgs) After Drilling: Date/Time 4/13/16 10:01 ▼ Depth (ft bgs) 14.45

SAMPLE NUMBER AND TYPE	RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	WELL DIAGRAM	COMMENTS
				GRAVEL WITH SAND mostly gravel, some fine to coarse sand, brown (10YR 5/3), moist, dense.				Continuous sampling with 4-inch diameter casing from ground surface to terminus of soil boring, over-drilled with 6-inch diameter casing to install monitoring well.
				CLAY mostly clay, high plasticity, dark gray (10YR 4/1) mottled with brown (10YR 5/3), moist, very stiff.				
1 CS	50		5					
			10	Change to few coarse gravel at 10.0 feet.				
				Change to dark gray (10YR 4/1), stiff at 12.0 feet.				
				Change to very soft at 13.0 feet.				
2 CS	100		15					
			20					
					CL			
3 CS	100		25					
			30					
4 CS	100		35					
			40					

SOIL BORING WELL CONSTRUCTION LOG 231828.0003.0000.GPJ TRC_CORP.GDT 7/14/16

Signature: [signature]

Firm: TRC Environmental Corporation 734.971.7080
1540 Eisenhower Place Ann Arbor, Michigan Fax 734.971.9022

Checked By: C. Scieszka

WELL CONSTRUCTION LOG

TRC

WELL NO. MW-16-06

SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	WELL DIAGRAM	COMMENTS
5 CS	100		45	**CLAY** mostly clay, few coarse gravel, high plasticity, dark gray (10YR 4/1), moist, very soft.	CL			
			50					
6 CS	100		55					
			60					
7 CS	100		65					
			70	**SILTY CLAY** mostly clay, some silt, medium plasticity, dark gray (10YR 4/1), moist, medium stiff.	CL-ML			
				SAND mostly fine sand, few coarse sand, dark gray (10YR 4/1), moist.	SP			
8 CS	100		75	**SILTY CLAY** mostly clay, some silt, medium plasticity, dark gray (10YR 4/1), moist, medium stiff.	CL-ML			
			80					
9 CS	80		85					
			90	**CLAY** mostly clay, high plasticity, dark gray (10YR 4/1), moist, very soft.	CL			
10 CS	70		95					
			100					

SOIL BORING WELL CONSTRUCTION LOG 231828.0003.0000.GPJ TRC_CORP.GDT 7/14/16

WELL CONSTRUCTION LOG

TRC

WELL NO. MW-16-06

SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	WELL DIAGRAM	COMMENTS
11 CS	100		105	**CLAY** mostly clay, high plasticity, dark gray (10YR 4/1), moist, very soft.	CL			
			110					
12 CS	100		115					
			120					
13 CS	100		125	**SILTY CLAY** mostly clay, some silt, medium plasticity, dark gray (10YR 4/1), moist, medium stiff.	CL-ML			
			130					
14 CS	100		135	**SILT** mostly silt, dark gray (10YR 4/1), saturated, very soft.	ML			
				SHALE dark gray (10YR 4/1), hard, brittle.				
			140	End of boring at 140.0 feet below ground surface.				
			145					
			150					
			155					

SOIL BORING WELL CONSTRUCTION LOG 231828.0003.0000.GPJ TRC_CORP.GDT 7/14/16

WELL CONSTRUCTION LOG

TRC

WELL NO. MW-16-07

Facility/Project Name:	Date Drilling Started:	Date Drilling Completed:	Project Number:
DTE Electric Company Belle River Power Plant	3/8/16	3/9/16	231828.0003

Drilling Firm:	Drilling Method:	Surface Elev. (ft)	TOC Elevation (ft)	Total Depth (ft bgs)	Borehole Dia. (in)
Stock Drilling	Sonic	589.89	592.58	140.0	6

Boring Location: 326 feet S of road connecting to haul road, E of diversion basin.
N: 470233.47 E: 13626858.79

Personnel
Logged By - A. Knutson
Driller - A. Goldsmith

Drilling Equipment: TSi 150cc

Civil Town/City/or Village:	County:	State:
China Township	St. Clair	MI

Water Level Observations:
While Drilling: Date/Time Depth (ft bgs)
After Drilling: Date/Time 4/13/16 11:56 Depth (ft bgs) 14.13

SAMPLE NUMBER AND TYPE	RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	WELL DIAGRAM	COMMENTS
1 CS	60		5	**CLAY** mostly clay, few coarse gravel, high plasticity, brown (10YR 5/3) mottled with dark gray (10YR 4/1), very stiff. Change to dark gray (10YR 4/1) mottled with brown (10YR 5/3) at 5.0 feet.	CL			Continuous sampling with 4-inch diameter casing from ground surface to terminus of soil boring, over-drilled with 6-inch diameter casing to install monitoring well.
2 CS	100		10 15	Change to dark gray (10YR 4/1) at 11.0 feet. ▼ Change to moist, very soft at 13.0 feet.				
3 CS	100		20 25					
4 CS	100		30 35 40					

Signature: [signature]

Checked By: C. Scieszka

Firm: TRC Environmental Corporation
1540 Eisenhower Place Ann Arbor, Michigan
734.971.7080
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SOIL BORING WELL CONSTRUCTION LOG 231828.0003.0000.GPJ TRC_CORP.GDT 7/14/16

WELL CONSTRUCTION LOG

TRC

WELL NO. MW-16-07

SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	WELL DIAGRAM	COMMENTS
5 CS	100		45	**CLAY** mostly clay, few coarse gravel, high plasticity, dark gray (10YR 4/1), moist, very soft.	CL			
6 ST	100		50					
7 CS	100		55	**SILTY CLAY** mostly clay, little silt, high plasticity, dark gray (10YR 4/1), moist, soft.	CL-ML			
			60					
8 CS	100		65	**CLAYEY SILT** mostly silt, little to some clay, few fine to coarse sand, low plasticity, dark gray (10YR 4/1), moist.	ML-CL			
				SAND mostly fine to coarse sand, dark gray (10YR 4/1), moist, loose.	SW			
				CLAYEY SILT mostly silt, little to some clay, few fine to coarse sand, low plasticity, dark gray (10YR 4/1), moist.	ML-CL			
			70	**SILTY CLAY** mostly clay, little silt, high plasticity, dark gray (10YR 4/1), moist, soft. Change to few coarse gravel at 70.0 feet.				
9 CS	100		75					
			80					
10 CS	100		85		CL-ML			
			90					
11 CS	100		95					
			100					

SOIL BORING WELL CONSTRUCTION LOG 231828.0003.0000.GPJ TRC_CORP.GDT 7/14/16

WELL CONSTRUCTION LOG

TRC

WELL NO. MW-16-07

SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	WELL DIAGRAM	COMMENTS
12 CS	100		105	**SILTY CLAY** mostly clay, little silt, high plasticity, dark gray (10YR 4/1), moist, soft.	CL-ML			
			110					
13 CS	80		115					
			120					
14 CS	100		125					
			130					
				SILT mostly silt, no plasticity, dark gray (10YR 4/1), saturated, loose.	ML			
15 CS	100		135	**SHALE** dark gray (10YR 4/1), brittle, hard.				
			140	End of boring at 140.0 feet below ground surface.				
			145					
			150					
			155					

SOIL BORING WELL CONSTRUCTION LOG 231828.0003.0000.GPJ TRC_CORP.GDT 7/14/16

WELL CONSTRUCTION LOG

TRC

WELL NO. MW-16-08

Facility/Project Name:	Date Drilling Started:	Date Drilling Completed:	Project Number:
DTE Electric Company Belle River Power Plant	3/9/16	3/10/16	231828.0003

Drilling Firm:	Drilling Method:	Surface Elev. (ft)	TOC Elevation (ft)	Total Depth (ft bgs)	Borehole Dia. (in)
Stock Drilling	Sonic	589.31	591.88	140.0	6

Boring Location: 566.6 feet S of road connecting to haul road, E of diversion basin.
N: 470002.90 E: 13626846.85

Personnel
Logged By - A. Knutson
Driller - A. Goldsmith

Drilling Equipment: TSi 150cc

Civil Town/City/or Village:	County:	State:
China Township	St. Clair	MI

Water Level Observations:
While Drilling: Date/Time Depth (ft bgs)
After Drilling: Date/Time 4/13/16 12:00 Depth (ft bgs) 13.19

SAMPLE NUMBER AND TYPE	RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	WELL DIAGRAM	COMMENTS
1 CS	50		5	**CLAY WITH GRAVEL** mostly clay, little coarse gravel, high plasticity, dark gray (10YR 4/1) mottled with brown (10YR 5/3), moist, very stiff.	CL			Continuous sampling with 4-inch diameter casing from ground surface to terminus of soil boring, over-drilled with 6-inch diameter casing to install monitoring well.
2 CS	100		10	**CLAY** mostly clay, high plasticity, dark gray (10YR 4/1) mottled with brown (10YR 5/3), moist, very stiff. Change to dark gray (10YR 4/1), very soft at 10.0 feet.	CL			
3 CS	100		15					
4 CS	100		20					
			25					
			30					
			35					
			40					

SOIL BORING WELL CONSTRUCTION LOG 231828.0003.0000.GPJ TRC_CORP.GDT 7/14/16

Signature: Chris Scieszka

Firm: TRC Environmental Corporation
1540 Eisenhower Place Ann Arbor, Michigan
734.971.7080
Fax 734.971.9022

Checked By: C. Scieszka

WELL CONSTRUCTION LOG

TRC

WELL NO. MW-16-08

SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	WELL DIAGRAM	COMMENTS
5 CS	100		45	**CLAY** mostly clay, high plasticity, dark gray (10YR 4/1), moist, very soft.				
			50					
6 CS	100		55		CL			
			60					
7 CS	80		65					
			70	**SILTY CLAY** mostly clay, some silt, few coarse gravel, high plasticity, dark gray (10YR 4/1), moist, soft.				
8 CS	100		75					
			80					
9 CS	100		85		CL-ML			
			90					
10 CS	60		95					
			100					

SOIL BORING WELL CONSTRUCTION LOG 231828.0003.0000.GPJ TRC_CORP.GDT 7/14/16

WELL CONSTRUCTION LOG

TRC

WELL NO. MW-16-08

SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	WELL DIAGRAM	COMMENTS
				SILTY CLAY mostly clay, some silt, few coarse gravel, high plasticity, dark gray (10YR 4/1), moist, soft.				
11 CS	100		105	Change to few fine sand at 105.5 feet.				
			110	Change to no sand at 110.0 feet.				
12 CS	100		115		CL-ML			
			120					
13 CS	100		125					
			130					
				SILT mostly silt, dark gray (10YR 4/1), saturated, very soft.	ML			
14 CS	100		135	**SHALE** dark gray (10YR 4/1), brittle, hard.				
			140	End of boring at 140.0 feet below ground surface.				
			145					
			150					
			155					

WELL CONSTRUCTION LOG

TRC

WELL NO. MW-16-09

Facility/Project Name:	Date Drilling Started:	Date Drilling Completed:	Project Number:
DTE Electric Company Belle River Power Plant	6/1/16	6/1/16	231828.0003

Drilling Firm:	Drilling Method:	Surface Elev. (ft)	TOC Elevation (ft)	Total Depth (ft bgs)	Borehole Dia. (in)
Stock Drilling	Sonic	588.28	590.80	150.0	6

Boring Location: E of bottom ash basins, E of haul road.
N: 471284.45 E: 13626365.84

Personnel
Logged By - J. Reed
Driller - A. Goldsmith

Drilling Equipment: TSi 150cc

Civil Town/City/or Village:	County:	State:
China Township	St. Clair	MI

Water Level Observations:
While Drilling: Date/Time Depth (ft bgs)
After Drilling: Date/Time 6/9/16 15:13 Depth (ft bgs) 14.36

SAMPLE NUMBER AND TYPE	RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	WELL DIAGRAM	COMMENTS
				TOPSOIL				
1 CS	75		5	**SILTY CLAY** mostly clay, little to some silt, few fine to coarse sand, trace to few fine gravel, low plasticity, dark grayish brown (10YR 4/2), moist, stiff.	CL-ML			Continuous sampling with 4-inch diameter casing from ground surface to terminus of soil boring, over-drilled with 6-inch diameter casing to install monitoring well.
				CLAY mostly clay, few silt, trace to few fine to coarse sand, medium plasticity, gray (10YR 5/1), moist, soft.				
2 CS	85		10					
			15					
3 CS	100		20		CL			
			25					
			30	Change to trace to few fine gravel at 30.0 feet.				
4 CS	100		35					
			40					

SOIL BORING WELL CONSTRUCTION LOG 231828.0003.0000.GPJ TRC_CORP.GDT 7/14/16

Signature:

Firm: TRC Environmental Corporation
1540 Eisenhower Place Ann Arbor, Michigan
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Fax 734.971.9022

Checked By: M. Powers

WELL CONSTRUCTION LOG

TRC

WELL NO. MW-16-09

SAMPLE NUMBER AND TYPE	RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	WELL DIAGRAM	COMMENTS
			45	**CLAY** mostly clay, few silt, trace to few fine to coarse sand, trace to few fine gravel, medium plasticity, gray (10YR 5/1), moist, soft.				
5 CS	100		50	Change to soft to medium stiff at 50.0 feet.				
			55					
			60					
			65					
6 CS	100		70	Change to soft at 70.0 feet.	CL			
			75					
			80	Change to medium stiff to stiff at 80.0 feet.				
			85	Change to stiff at 85.0 feet.				
7 CS	100		90					
			95					
			100					

WELL CONSTRUCTION LOG

TRC

WELL NO. MW-16-09

SAMPLE NUMBER AND TYPE	RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	WELL DIAGRAM	COMMENTS
8 CS	75		105	**CLAY** mostly clay, few silt, trace to few fine to coarse sand, trace to few fine gravel, medium plasticity, gray (10YR 5/1), moist, stiff. Change to medium stiff at 105.0 feet.	CL			
			110					
9 CS	80		115					
			120					
			125					
10 CS	100		130					
			135					
				SAND mostly fine sand, trace silt, dark gray (10YR 4/1), moist, loose.	SP			
			140					
11 CS	80		145	**SAND WITH GRAVEL** mostly fine to coarse sand, little to some fine to medium gravel, trace to few silt, trace to few clay, dark gray (10YR 4/1), moist to wet, loose.	SW			
				SHALE weathered, gray (10YR 5/1), brittle.				
			150	End of boring at 150.0 feet below ground surface.				
			155					

SOIL BORING WELL CONSTRUCTION LOG 231628.0003.0000.GPJ TRC_CORP.GDT 7/14/16

WELL CONSTRUCTION LOG

TRC

WELL NO. MW-16-10

Facility/Project Name:	Date Drilling Started:	Date Drilling Completed:	Project Number:
DTE Electric Company Belle River Power Plant	6/2/16	6/3/16	231828.0003

Drilling Firm:	Drilling Method:	Surface Elev. (ft)	TOC Elevation (ft)	Total Depth (ft bgs)	Borehole Dia. (in)
Stock Drilling	Sonic	589.25	592.26	150.0	6

Boring Location: S end of haul road, W/NW of diversion basin.
N: 470532.54 E: 13626417.00

Personnel
Logged By - J. Reed
Driller - A. Goldsmith

Drilling Equipment: TSi 150cc

Civil Town/City/or Village:	County:	State:
China Township	St. Clair	MI

Water Level Observations:
While Drilling: Date/Time Depth (ft bgs)
After Drilling: Date/Time 6/9/16 07:45 Depth (ft bgs) 15.30

SAMPLE NUMBER AND TYPE	RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	WELL DIAGRAM	COMMENTS
				TOPSOIL				Continuous sampling with 4-inch diameter casing from ground surface to terminus of soil boring, over-drilled with 6-inch diameter casing to install monitoring well.
1 CS	50		5	**CLAY** mostly clay, few silt, trace to few fine to coarse sand, dark grayish brown (10YR 4/2), moist, medium stiff to stiff.				
			10	Change to gray (10YR 5/1) at 11.0 feet. Change to soft to medium stiff at 12.0 feet.				
2 CS	90		15					
			20		CL			
3 CS	95		25	Change to soft at 25.0 feet.				
			30	Change to few fine to coarse sand, medium stiff at 30.0 feet. Change to dark gray (10YR 4/1) at 32.0 feet.				
4 CS	100		35	Change to soft at 35.0 feet.				
			40					

Signature: [signature]

Firm: TRC Environmental Corporation
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Fax 734.971.9022

Checked By: M. Powers

SOIL BORING WELL CONSTRUCTION LOG 231828.0003.0000.GPJ TRC_CORP.GDT 7/14/16

WELL CONSTRUCTION LOG

TRC

WELL NO. MW-16-10

SAMPLE NUMBER AND TYPE	RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	WELL DIAGRAM	COMMENTS
5 CS	100		45	**CLAY** mostly clay, few silt, trace to few fine to coarse sand, dark gray (10YR 4/1), moist, soft.	CL			
			50					
6 CS	100		55					
			60					
7 CS	100		65					
			70	**CLAY WITH SAND** mostly clay, little fine to coarse sand, few silt, trace gravel, dark gray (10YR 4/1), moist, very stiff.	CL			
8 CS	100		75	Change to few to little medium to coarse sand, low to medium plasticity, stiff at 75.0 feet.				
			80	**CLAYEY SAND** mostly fine to coarse sand, some clay, dark grayish brown (10YR 4/2), moist, medium dense.	SC			
9 CS	100		85	**SAND** mostly fine to medium sand, dark grayish brown (10YR 4/2), moist, loose.	SP			
			90	**SANDY CLAY** mostly clay, little to some fine to coarse sand, few silt, medium plasticity, dark grayish brown (10YR 4/2), moist, medium stiff to stiff.	CL			
10 CS	100		95					
			100	**CLAY WITH SAND** mostly clay, little fine to coarse sand, few silt, medium plasticity, dark grayish brown (10YR 4/2), moist, medium stiff to stiff.	CL			

WELL CONSTRUCTION LOG

TRC

WELL NO. MW-16-10

SAMPLE NUMBER AND TYPE	RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	WELL DIAGRAM	COMMENTS
11 CS	100		105	**CLAY WITH SAND** mostly clay, little fine to coarse sand, few silt, medium plasticity, dark grayish brown (10YR 4/2), moist, medium stiff to stiff.	CL			
			110	**SANDY CLAY** mostly clay, little to some fine to coarse sand, few silt, medium plasticity, dark grayish brown (10YR 4/2), moist, medium stiff.	CL			
				SAND mostly medium to coarse sand, dark gray (10YR 4/1), moist, loose.	SP			
12 CS	100		115	**CLAY** mostly clay, little sand, few to little silt, dark gray (10YR 4/1), moist, stiff.				
			120					
13 CS	95		125					
			130		CL			
14 CS	95		135					
			140					
15 CS	50		145	**GRAVELLY SILT** mostly silt, some fine to coarse gravel, few clay, few sand, low to medium plasticity, dark gray (10YR 4/1), moist, soft.	ML			
				SILTY CLAY hard, dark gray (10YR 4/1), hardpan, brittle.	CL-ML			
			150	**SHALE** dark gray.				
				End of boring at 150.0 feet below ground surface.				
			155					
			160					

SOIL BORING WELL CONSTRUCTION LOG 231828.0003.0000.GPJ TRC_CORP.GDT 7/14/16

WELL CONSTRUCTION LOG

TRC

WELL NO. MW-16-11

Facility/Project Name:	Date Drilling Started:	Date Drilling Completed:	Project Number:
DTE Electric Company Belle River Power Plant	6/3/16	6/6/16	231828.0003

Drilling Firm:	Drilling Method:	Surface Elev. (ft)	TOC Elevation (ft)	Total Depth (ft bgs)	Borehole Dia. (in)
Stock Drilling	Sonic	589.03	591.54	150.0	6

Boring Location: S of haul road, W of diversion basin.	Personnel	Drilling Equipment:
N: 470251.34 E: 13626438.92	Logged By - J. Reed Driller - A. Goldsmith	TSi 150cc

Civil Town/City/or Village:	County:	State:	Water Level Observations:
China Township	St. Clair	MI	While Drilling: Date/Time Depth (ft bgs) After Drilling: Date/Time 6/21/16 07:45 ▼ Depth (ft bgs) 14.47

SAMPLE NUMBER AND TYPE	RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	WELL DIAGRAM	COMMENTS
				TOPSOIL				
1 CS	50		5	**CLAY** mostly clay, few silt, trace to few sand, few gravel, low to medium plasticity, dark grayish brown (10YR 4/2), moist, stiff.				Continuous sampling with 4-inch diameter casing from ground surface to terminus of soil boring, over-drilled with 6-inch diameter casing to install monitoring well.
				Change to trace gravel at 8.0 feet.				
			10					
2 CS	70		15	Change to gray (10YR 5/1) at 12.0 feet. ▼ Change to no gravel at 13.0 feet.				
			20					
3 CS	90		25	Change to medium stiff at 21.0 feet.	CL			
			30					
4 CS	90		35	Change to soft to medium stiff at 34.5 feet.				
			40					

SOIL BORING WELL CONSTRUCTION LOG 231828.0003.0000.GPJ TRC_CORP.GDT 7/14/16

Signature: [signature]

Firm: TRC Environmental Corporation
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Checked By: M. Powers

WELL CONSTRUCTION LOG

TRC

WELL NO. MW-16-11

SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	WELL DIAGRAM	COMMENTS
5 CS	90		45	**CLAY** mostly clay, few silt, trace to few sand, medium plasticity, gray (10YR 5/1), moist, soft to medium stiff.				
			50	Change to medium stiff at 49.0 feet.				
6 CS	100		55					
			60	Change to soft at 60.0 feet.				
7 CS	100		65					
			70	Change to trace gravel, soft to medium stiff at 70.0 feet.	CL			
8 CS	100		75	Change to medium stiff at 75.0 feet.				
			80					
9 CS	90		85					
			90					
10 CS	90		95	Change to medium stiff to stiff at 95.0 feet.				
			100					

SOIL BORING WELL CONSTRUCTION LOG 231828.0003.0000.GPJ TRC_CORP.GDT 7/14/16

WELL CONSTRUCTION LOG

TRC

WELL NO. MW-16-11

SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	WELL DIAGRAM	COMMENTS
11 CS	85		105	**CLAY** mostly clay, few silt, trace to few sand, trace gravel, low to medium plasticity, gray (10YR 5/1), moist, medium stiff to stiff.				
			110	Change to medium stiff at 110.0 feet.				
12 CS	80		115					
			120		CL			
13 CS	85		125					
			130					
14 CS	90		135					
			140	**SANDY CLAY** mostly clay, some fine sand, few silt, dark gray (10YR 4/1), moist.	CL			
				CLAY mostly clay, few silt, trace to few sand, trace gravel, low to medium plasticity, gray (10YR 5/1), moist, medium stiff.	CL			
15 CS	90		145	**SHALE** dark gray.				
			150	End of boring 150.0 feet below ground surface.				
			155					

SOIL BORING WELL CONSTRUCTION LOG 231628.0003.0000.GPJ TRC_CORP.GDT 7/14/16

WELL CONSTRUCTION LOG

TRC

WELL NO. MW-16-11A

Facility/Project Name:	Date Drilling Started:	Date Drilling Completed:	Project Number:
DTE Electric Company Belle River Power Plant	5/11/17	5/12/17	231828.0003

Drilling Firm:	Drilling Method:	Surface Elev. (ft)	TOC Elevation (ft)	Total Depth (ft bgs)	Borehole Dia. (in)
Stock Drilling	Sonic	589.5	591.66	142.0	6

Boring Location: North of fuel oil tank number 2, between berm and fence.

Personnel
Logged By - J. Krenz
Driller - A. Goldsmith

Drilling Equipment: TSi 150cc

Civil Town/City/or Village:	County:	State:
China Township	St. Clair	MI

Water Level Observations:
While Drilling: Date/Time Depth (ft bgs)
After Drilling: Date/Time 5/15/17 08:38 Depth (ft bgs) 17.79

SAMPLE NUMBER AND TYPE	RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	WELL DIAGRAM	COMMENTS
1 CS	90			**CLAY** mostly clay, trace gravel, medium plasticity, dark grayish brown (10YR 4/2), mottled with dark yellowish brown (10YR 4/6), medium stiff, moist, plant roots to 0.5 feet.				Continuous sampling with 4-inch diameter casing from ground surface to terminus of soil boring, over-drilled with 6-inch diameter casing to install monitoring well.
			10					
2 CS	60							
				▼				
			20	Change to high plasticity, gray (10YR 5/1), soft at 19.0 feet.				
3 CS	70							
			30		CL			
4 CS	70							
			40					
5 CS	100							
			50					
6 CS	100							
			60					
7								

Signature: [signature]

Firm: TRC Environmental

Fax

Checked By: C. Scieszka

SOIL BORING WELL CONSTRUCTION LOG 231828.0003.0000.GPJ TRC_CORP.GDT 8/21/17

WELL CONSTRUCTION LOG

TRC

WELL NO. MW-16-11A

SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	WELL DIAGRAM	COMMENTS
CS	100			**CLAY** mostly clay, trace fine to medium gravel, high plasticity, gray (10YR 5/1), medium stiff, moist.				
			70	Change to few fine to coarse gravel at 70.0 feet.				
8 CS	100							
			80	Change to trace fine sand at 80.0 feet.				
9 CS	90							
			90					
10 CS	70							
			100		CL			
11 CS	100							
			110					
12 CS	100							
			120					
13 CS	100			Change to trace medium to coarse gravel at 126.0 feet.				
			130					
14 CS	60			**SILT** mostly silt, trace clay, dark gray (10YR 4/1), dense, saturated.	ML			
15 CS	100		140	**SILTY CLAY** mostly clay, some silt, few to little fine to coarse gravel, medium to low plasticity, dark gray (10YR 4/1), moist, medium stiff, inclusions of shale bedrock.	CL-ML			
				BEDROCK shale, weathered, gray (10YR 4/1).				
				End of boring at 142.0 feet below ground surface.				
			150					

SOIL BORING LOG

TRC

BORING NO. SB-16-01

Facility/Project Name:	Date Drilling Started:	Date Drilling Completed:	Project Number:
DTE Electric Company Belle River Power Plant	3/1/16	3/1/16	231828.0003

Drilling Firm:	Drilling Method:	Surface Elev. (ft)	TOC Elevation (ft)	Total Depth (ft bgs)	Borehole Dia. (in)
Stock Drilling	Sonic	588.69	---	150.0	6

Boring Location: Corner of E connecting road off haul road, E of bottom ash basins.	Personnel	Drilling Equipment:
N: 471096.38 E: 13626276.67	Logged By - A. Knutson Driller - A. Goldsmith	TSi 150cc

Civil Town/City/or Village:	County:	State:	Water Level Observations:
China Township	St. Clair	MI	While Drilling: Date/Time Depth (ft bgs) After Drilling: Date/Time Depth (ft bgs)

SAMPLE NUMBER AND TYPE	RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	COMMENTS
				CLAY WITH GRAVEL mostly clay, little fine to coarse gravel, few fine sand, high plasticity, dark gray (10YR 4/1), mottled with brown (10YR 5/3), moist, very stiff.	CL		Continuous sampling with 4-inch diameter casing from ground surface to terminus of soil boring, over-drilled with 6-inch diameter casing to total depth.
1 CS	50		5	**CLAY** mostly clay, trace fine sand, high plasticity, dark gray (10YR 4/1), mottled with brown (10YR 5/3), moist, very stiff.			
			10	Change to stiff at 10.0 feet.			
2 CS	100		15	Change to no sand, dark gray (10YR 4/1), very soft at 13.0 feet.			
			20				
3 CS	100		25		CL		
			30				
4 CS	100		35				
			40				

Signature: [signature]

Firm: TRC Environmental Corporation 734.971.7080
1540 Eisenhower Place Ann Arbor, Michigan Fax 734.971.9022

Checked By: M. Powers

SOIL BORING WELL CONSTRUCTION LOG 231828.0003.0000.GPJ TRC_CORP.GDT 7/14/16

SOIL BORING LOG

TRC

BORING NO. SB-16-01

SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	COMMENTS
5 CS	100		45	**CLAY** mostly clay, high plasticity, dark gray (10YR 4/1), moist, very soft.			
6 ST	100		50		CL		
7 CS	100		55				
				CLAY WITH SAND mostly clay, little fine to coarse sand, high plasticity, dark gray (10YR 4/1), moist, very soft.	CL		
			60	**CLAY** mostly clay, high plasticity, dark gray (10YR 4/1), moist, very soft.	CL		
8 CS	100		65	**SANDY SILT** mostly silt, little to some fine to coarse sand, few clay, low plasticity, dark gray (10YR 4/1), moist, stiff.	ML		
			70	**CLAY** mostly clay, few fine to coarse gravel, dark gray (10YR 4/1), moist, medium stiff. Change to no gravel, soft at 72.5 feet.			
9 CS	100		75				
			80	Change to few coarse gravel at 80.0 feet.			
10 CS	100		85		CL		
			90				
11 CS	100		95				
			100				

SOIL BORING WELL CONSTRUCTION LOG 231828.0003.0000.GPJ TRC_CORP.GDT 7/14/16

SOIL BORING LOG

TRC

BORING NO. SB-16-01

SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	COMMENTS
12 CS	100		105	**CLAY** mostly clay, few coarse gravel, dark gray (10YR 4/1), moist, soft.	CL		
			110				
13 CS	100		115				
			120				
14 CS	100		125				
			130				
15 CS	100		135	**SILT** mostly silt, few fine sand, non plastic, dark gray (10YR 4/1), moist.	ML		
			140				
16 CS	100		145	**SHALE** dark gray (10YR 4/1), dry.			
			150	End of boring at 150.0 feet below ground surface.			
			155				

SOIL BORING WELL CONSTRUCTION LOG 231828.0003.0000.GPJ TRC_CORP.GDT 7/14/16

WELL CONSTRUCTION DIAGRAM

PROJ. NAME: DTE Electric Company Belle River Power Plant		WELL ID:	MW-16-01
PROJ. NO: 231828.0003	DATE INSTALLED: 3/17/2016 INSTALLED BY: A. Knutson		CHECKED BY: C. Scieszka

ELEVATION (BENCHMARK: USGS)	DEPTH BELOW OR ABOVE GROUND SURFACE (FEET)	
590.06	1.8	TOP OF CASING
588.26	0.0	GROUND SURFACE
	1.0	CEMENT SURFACE PLUG
		GROUT/BACKFILL MATERIAL
		BENTONITE SLURRY
		GROUT/BACKFILL METHOD
93.8		TREMIE
	84.0	GROUT
		BENTONITE SEAL MATERIAL
		TIME RELEASE PELLETS
	89.0	BENTONITE SEAL
496.3	92.0	TOP OF SCREEN
5.00		FILTER PACK MATERIAL
		MEDIUM, WASHED SAND
491.3	97.0	BOTTOM OF SCREEN
	97.0	BOTTOM OF FILTER PACK
	NA	BENTONITE PLUG
		BACKFILL MATERIAL
		NATURAL COLLAPSE
488.3	100.0	HOLE BOTTOM

RISER PIPE LENGTH

SCREEN LENGTH

NOTES:

CASING AND SCREEN DETAILS

TYPE OF RISER: 2-INCH PVC

PIPE SCHEDULE: 40

PIPE JOINTS: THREADED O-RINGS

SCREEN TYPE: 2-INCH PVC

SCR. SLOT SIZE: 0.01-INCH

BOREHOLE DIAMETER: 6 IN. FROM 0 TO 97 FT.
4 IN. FROM 97 TO 100 FT.

SURF. CASING DIAMETER: ____ IN. FROM ____ TO ____ FT.
____ IN. FROM ____ TO ____ FT.

WELL DEVELOPMENT

DEVELOPMENT METHOD: AIR LIFT

TIME DEVELOPING: 4 HOURS

WATER REMOVED: 120 GALLONS

WATER ADDED: 0 GALLONS

WATER CLARITY BEFORE / AFTER DEVELOPMENT

CLARITY BEFORE: VERY TURBID

COLOR BEFORE: BROWN /GREY

CLARITY AFTER: CLEAR

COLOR AFTER: NONE

ODOR (IF PRESENT): NONE

WATER LEVEL SUMMARY

MEASUREMENT (FEET)			DATE	TIME
DTB BEFORE DEVELOPING:	98.20	T/PVC	3/21/2016	--
DTB AFTER DEVELOPING:	100.32	T/PVC	4/13/2016	845
SWL BEFORE DEVELOPING:	12.92	T/PVC	3/21/2016	--
SWL AFTER DEVELOPING:	16.32	T/PVC	4/13/2016	845
OTHER SWL:		T/PVC		
OTHER SWL:		T/PVC		

PROTECTIVE CASING DETAILS

PERMANENT, LEGIBLE WELL LABEL ADDED? ☑ YES ☐ NO

PROTECTIVE COVER AND LOCK INSTALLED? ☑ YES ☐ NO

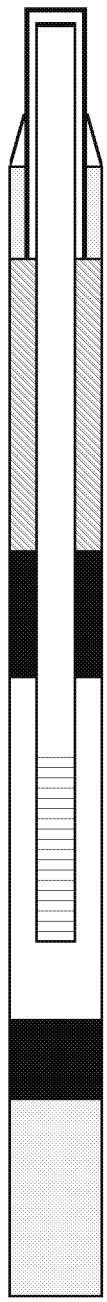
LOCK KEY NUMBER: 3120

REVISED 11/2013

WELL CONSTRUCTION DIAGRAM

PROJ. NAME: DTE Electric Company Belle River Power Plant		WELL ID:	**MW-16-02**
PROJ. NO: 231828.0003	DATE INSTALLED: 3/15/2016 INSTALLED BY: A. Knutson		CHECKED BY: C. Scieszka

ELEVATION (BENCHMARK: USGS)	DEPTH BELOW OR ABOVE GROUND SURFACE (FEET)	
588.94	2.7	TOP OF CASING
586.27	0.0	GROUND SURFACE
	1.0	CEMENT SURFACE PLUG
		GROUT/BACKFILL MATERIAL
		BENTONITE SLURRY
		GROUT/BACKFILL METHOD
94.7		TREMIE
	84.0	GROUT
		BENTONITE SEAL MATERIAL
		TIME RELEASE PELLETS
	89.0	BENTONITE SEAL
494.2	92.0	TOP OF SCREEN
5.00		FILTER PACK MATERIAL
		MEDIUM, WASHED SAND
489.2	97.0	BOTTOM OF SCREEN
	97.0	BOTTOM OF FILTER PACK
	NA	BENTONITE PLUG
		BACKFILL MATERIAL
		NATURAL COLLAPSE
486.2	100.0	HOLE BOTTOM



NOTES:

CASING AND SCREEN DETAILS

TYPE OF RISER: 2-INCH PVC

PIPE SCHEDULE: 40

PIPE JOINTS: THREADED O-RINGS

SCREEN TYPE: 2-INCH PVC

SCR. SLOT SIZE: 0.01-INCH

BOREHOLE DIAMETER: 6 IN. FROM 0 TO 97 FT.
4 IN. FROM 97 TO 100 FT.

SURF. CASING DIAMETER: ____ IN. FROM ____ TO ____ FT.
____ IN. FROM ____ TO ____ FT.

WELL DEVELOPMENT

DEVELOPMENT METHOD: AIR LIFT

TIME DEVELOPING: 4 HOURS

WATER REMOVED: 460 GALLONS

WATER ADDED: 0 GALLONS

WATER CLARITY BEFORE / AFTER DEVELOPMENT

CLARITY BEFORE: VERY TURBID

COLOR BEFORE: BROWN /GREY

CLARITY AFTER: CLEAR

COLOR AFTER: NONE

ODOR (IF PRESENT): NONE

WATER LEVEL SUMMARY

MEASUREMENT (FEET)			DATE	TIME
DTB BEFORE DEVELOPING:	97.07	T/PVC	3/15/2016	--
DTB AFTER DEVELOPING:	100.20	T/PVC	4/13/2016	9:24
SWL BEFORE DEVELOPING:	14.56	T/PVC	3/15/2016	--
SWL AFTER DEVELOPING:	28.28	T/PVC	3/18/2016	--
OTHER SWL:	18.77	T/PVC	4/13/2016	9:24
OTHER SWL:		T/PVC		

PROTECTIVE CASING DETAILS

PERMANENT, LEGIBLE WELL LABEL ADDED? ☑ YES ☐ NO

PROTECTIVE COVER AND LOCK INSTALLED? ☑ YES ☐ NO

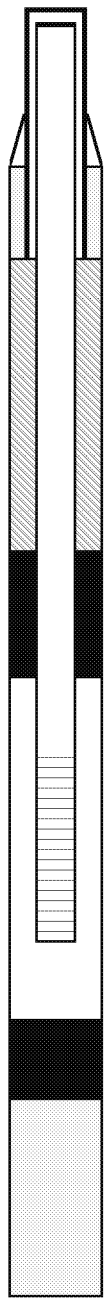
LOCK KEY NUMBER: 3120

REVISED 11/2013

WELL CONSTRUCTION DIAGRAM

PROJ. NAME: DTE Electric Company Belle River Power Plant		WELL ID:	**MW-16-03**
PROJ. NO: 231828.0003	DATE INSTALLED: 6/1/2016 INSTALLED BY: J. Reed		CHECKED BY: M. Powers

ELEVATION (BENCHMARK: USGS)	DEPTH BELOW OR ABOVE GROUND SURFACE (FEET)	
590.66	2.6	TOP OF CASING
588.03	0.0	GROUND SURFACE
	1.0	CEMENT SURFACE PLUG
		GROUT/BACKFILL MATERIAL
		BENTONITE SLURRY
		GROUT/BACKFILL METHOD
134.5		TREMIE
	126.0	GROUT
		BENTONITE SEAL MATERIAL
		TIME RELEASE PELLETS
	129.0	BENTONITE SEAL
456.2	132.0	TOP OF SCREEN
5.00		FILTER PACK MATERIAL
		MEDIUM, WASHED SAND
451.2	137.0	BOTTOM OF SCREEN
	137.0	BOTTOM OF FILTER PACK
	NA	BENTONITE PLUG
		BACKFILL MATERIAL
		NATURAL COLLAPSE
438.2	150.0	HOLE BOTTOM



NOTES:

CASING AND SCREEN DETAILS

TYPE OF RISER: 2-INCH PVC

PIPE SCHEDULE: 40

PIPE JOINTS: THREADED O-RINGS

SCREEN TYPE: 2-INCH PVC

SCR. SLOT SIZE: 0.01-INCH

BOREHOLE DIAMETER: 6 IN. FROM 0 TO 140 FT.
4 IN. FROM 140 TO 150 FT.

SURF. CASING DIAMETER: ____ IN. FROM ____ TO ____ FT.
____ IN. FROM ____ TO ____ FT.

WELL DEVELOPMENT

DEVELOPMENT METHOD: AIR LIFT

TIME DEVELOPING: 4 HOURS

WATER REMOVED: 60 GALLONS

WATER ADDED: 0 GALLONS

WATER CLARITY BEFORE / AFTER DEVELOPMENT

CLARITY BEFORE: TURBID

COLOR BEFORE: LIGHT GRAY

CLARITY AFTER: SLIGHTLY TURBID

COLOR AFTER: VERY LIGHT GRAY

ODOR (IF PRESENT): NONE

WATER LEVEL SUMMARY

MEASUREMENT (FEET)			DATE	TIME
DTB BEFORE DEVELOPING:	140.00	T/PVC	6/8/2016	7:20
DTB AFTER DEVELOPING:	140.00	T/PVC	6/8/2016	14:30
SWL BEFORE DEVELOPING:	16.06	T/PVC	6/8/2016	7:20
SWL AFTER DEVELOPING:	15.32	T/PVC	6/8/2016	14:30
OTHER DTB:	140.41	T/PVC	6/9/2016	10:00
OTHER SWL:		T/PVC		

PROTECTIVE CASING DETAILS

PERMANENT, LEGIBLE WELL LABEL ADDED? ☑ YES ☐ NO

PROTECTIVE COVER AND LOCK INSTALLED? ☑ YES ☐ NO

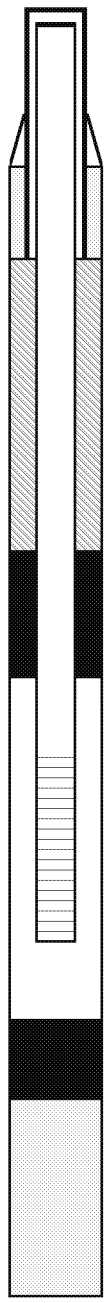
LOCK KEY NUMBER: 3120

REVISED 11/2013

WELL CONSTRUCTION DIAGRAM

PROJ. NAME: DTE Electric Company Belle River Power Plant		WELL ID:	**MW-16-04**
PROJ. NO: 231828.0003	DATE INSTALLED: 3/8/2016 INSTALLED BY: A. Knutson		CHECKED BY: C. Scieszka

ELEVATION (BENCHMARK: USGS)	DEPTH BELOW OR ABOVE GROUND SURFACE (FEET)	
590.51	3.0	TOP OF CASING
587.50	0.0	GROUND SURFACE
	1.0	CEMENT SURFACE PLUG
		GROUT/BACKFILL MATERIAL
		BENTONITE SLURRY
		GROUT/BACKFILL METHOD
122.0		TREMIE
	111.0	GROUT
		BENTONITE SEAL MATERIAL
		TIME RELEASE PELLETS
	116.0	BENTONITE SEAL
468.5	119.0	TOP OF SCREEN
5.00		FILTER PACK MATERIAL
		MEDIUM, WASHED SAND
463.5	124.0	BOTTOM OF SCREEN
	124.0	BOTTOM OF FILTER PACK
	NA	BENTONITE PLUG
		BACKFILL MATERIAL
		NATURAL COLLAPSE
457.5	130.0	HOLE BOTTOM



NOTES:

CASING AND SCREEN DETAILS

TYPE OF RISER: 2-INCH PVC

PIPE SCHEDULE: 40

PIPE JOINTS: THREADED O-RINGS

SCREEN TYPE: 2-INCH PVC

SCR. SLOT SIZE: 0.01-INCH

BOREHOLE DIAMETER: 6 IN. FROM 0 TO 124 FT.
4 IN. FROM 124 TO 130 FT.

SURF. CASING DIAMETER: ____ IN. FROM ____ TO ____ FT.
____ IN. FROM ____ TO ____ FT.

WELL DEVELOPMENT

DEVELOPMENT METHOD: AIR LIFT

TIME DEVELOPING: 4 HOURS

WATER REMOVED: 288 GALLONS

WATER ADDED: 0 GALLONS

WATER CLARITY BEFORE / AFTER DEVELOPMENT

CLARITY BEFORE: VERY TURBID

COLOR BEFORE: BROWN /GREY

CLARITY AFTER: CLEAR

COLOR AFTER: NONE

ODOR (IF PRESENT): NONE

WATER LEVEL SUMMARY

MEASUREMENT (FEET)			DATE	TIME
DTB BEFORE DEVELOPING:	123.97	T/PVC	3/8/2016	--
DTB AFTER DEVELOPING:	126.45	T/PVC	4/13/2016	9:31
SWL BEFORE DEVELOPING:	13.98	T/PVC	3/15/2016	14:30
SWL AFTER DEVELOPING:	13.46	T/PVC	3/18/2016	7:30
OTHER SWL:	16.91	T/PVC	4/13/2016	9:31
OTHER SWL:		T/PVC		

PROTECTIVE CASING DETAILS

PERMANENT, LEGIBLE WELL LABEL ADDED? ☑ YES ☐ NO

PROTECTIVE COVER AND LOCK INSTALLED? ☑ YES ☐ NO

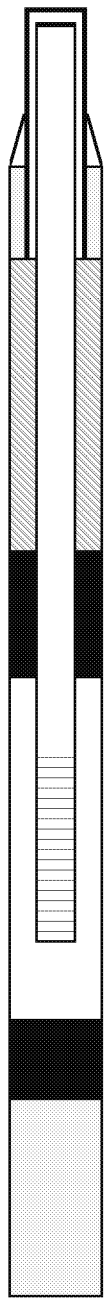
LOCK KEY NUMBER: 3120

REVISED 11/2013

WELL CONSTRUCTION DIAGRAM

PROJ. NAME: DTE Electric Company Belle River Power Plant		WELL ID:	**MW-16-05**
PROJ. NO: 231828.0003	DATE INSTALLED: 3/4/2016 INSTALLED BY: A. Knutson		CHECKED BY: C. Scieszka

ELEVATION (BENCHMARK: USGS)	DEPTH BELOW OR ABOVE GROUND SURFACE (FEET)	
590.82	2.5	TOP OF CASING
588.32	0.0	GROUND SURFACE
	1.0	CEMENT SURFACE PLUG
		GROUT/BACKFILL MATERIAL
		BENTONITE SLURRY
		GROUT/BACKFILL METHOD
141.5		TREMIE
	128.0	GROUT
		BENTONITE SEAL MATERIAL
		TIME RELEASE PELLETS
	133.0	BENTONITE SEAL
449.3	139.0	TOP OF SCREEN
5.00		FILTER PACK MATERIAL
		MEDIUM, WASHED SAND
444.3	144.0	BOTTOM OF SCREEN
	150.0	BOTTOM OF FILTER PACK
	NA	BENTONITE PLUG
		BACKFILL MATERIAL
		WASHED SAND
444.3	150.0	HOLE BOTTOM



NOTES:

CASING AND SCREEN DETAILS

TYPE OF RISER: 2-INCH PVC

PIPE SCHEDULE: 40

PIPE JOINTS: THREADED O-RINGS

SCREEN TYPE: 2-INCH PVC

SCR. SLOT SIZE: 0.01-INCH

BOREHOLE DIAMETER: 6 IN. FROM 0 TO 150 FT.
____ IN. FROM ____ TO ____ FT.

SURF. CASING DIAMETER: ____ IN. FROM ____ TO ____ FT.
____ IN. FROM ____ TO ____ FT.

WELL DEVELOPMENT

DEVELOPMENT METHOD: AIR LIFT

TIME DEVELOPING: 4 HOURS

WATER REMOVED: 300 GALLONS

WATER ADDED: 0 GALLONS

WATER CLARITY BEFORE / AFTER DEVELOPMENT

CLARITY BEFORE: VERY TURBID

COLOR BEFORE: GREY

CLARITY AFTER: CLEAR

COLOR AFTER: NONE

ODOR (IF PRESENT): NONE

WATER LEVEL SUMMARY

MEASUREMENT (FEET)			DATE	TIME
DTB BEFORE DEVELOPING:	144.03	T/PVC	3/4/2016	--
DTB AFTER DEVELOPING:	147.16	T/PVC	4/13/2016	9:55
SWL BEFORE DEVELOPING:	13.71	T/PVC	3/15/2016	--
SWL AFTER DEVELOPING:	14.13	T/PVC	3/18/2016	--
OTHER SWL:	16.87	T/PVC	4/13/2016	9:55
OTHER SWL:		T/PVC		

PROTECTIVE CASING DETAILS

PERMANENT, LEGIBLE WELL LABEL ADDED? ☑ YES ☐ NO

PROTECTIVE COVER AND LOCK INSTALLED? ☑ YES ☐ NO

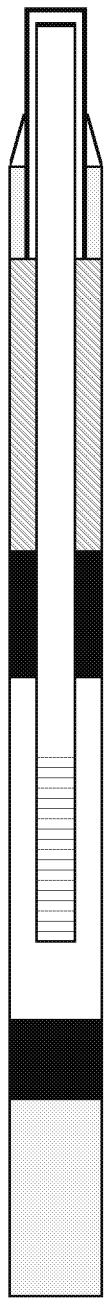
LOCK KEY NUMBER: 3120

REVISED 11/2013

WELL CONSTRUCTION DIAGRAM

PROJ. NAME: DTE Electric Company Belle River Power Plant		WELL ID:	**MW-16-06**
PROJ. NO: 231828.0003	DATE INSTALLED: 3/11/2016 INSTALLED BY: A. Knutson		CHECKED BY: C. Scieszka

ELEVATION (BENCHMARK: USGS)	DEPTH BELOW OR ABOVE GROUND SURFACE (FEET)	
593.21	3.2	TOP OF CASING
589.98	0.0	GROUND SURFACE
	1.0	CEMENT SURFACE PLUG
		GROUT/BACKFILL MATERIAL
		BENTONITE SLURRY
		GROUT/BACKFILL METHOD
138.2		TREMIE
	127.0	GROUT
		BENTONITE SEAL MATERIAL
		TIME RELEASE PELLETS
	132.0	BENTONITE SEAL
455.0	135.0	TOP OF SCREEN
5.00		FILTER PACK MATERIAL
		MEDIUM, WASHED SAND
450.0	140.0	BOTTOM OF SCREEN
	140.0	BOTTOM OF FILTER PACK
	NA	BENTONITE PLUG
		BACKFILL MATERIAL
		NA
450.0	140.0	HOLE BOTTOM



NOTES:

CASING AND SCREEN DETAILS

TYPE OF RISER: 2-INCH PVC

PIPE SCHEDULE: 40

PIPE JOINTS: THREADED O-RINGS

SCREEN TYPE: 2-INCH PVC

SCR. SLOT SIZE: 0.01-INCH

BOREHOLE DIAMETER: 6 IN. FROM 0 TO 140 FT.
____ IN. FROM ____ TO ____ FT.

SURF. CASING DIAMETER: ____ IN. FROM ____ TO ____ FT.
____ IN. FROM ____ TO ____ FT.

WELL DEVELOPMENT

DEVELOPMENT METHOD: AIR LIFT

TIME DEVELOPING: 4 HOURS

WATER REMOVED: 50 GALLONS

WATER ADDED: 0 GALLONS

WATER CLARITY BEFORE / AFTER DEVELOPMENT

CLARITY BEFORE: VERY TURBID

COLOR BEFORE: BROWN /GREY

CLARITY AFTER: CLEAR

COLOR AFTER: NONE

ODOR (IF PRESENT): NOT MEASURED

WATER LEVEL SUMMARY

MEASUREMENT (FEET)			DATE	TIME
DTB BEFORE DEVELOPING:	135.07	T/PVC	3/8/2016	--
DTB AFTER DEVELOPING:	142.85	T/PVC	4/13/2016	10:01
SWL BEFORE DEVELOPING:	19.62	T/PVC	3/15/2016	14:30
SWL AFTER DEVELOPING:	14.90	T/PVC	3/18/2016	7:30
OTHER SWL:	17.65	T/PVC	4/13/2016	10:01
OTHER SWL:		T/PVC		

PROTECTIVE CASING DETAILS

PERMANENT, LEGIBLE WELL LABEL ADDED? ☑ YES ☐ NO

PROTECTIVE COVER AND LOCK INSTALLED? ☑ YES ☐ NO

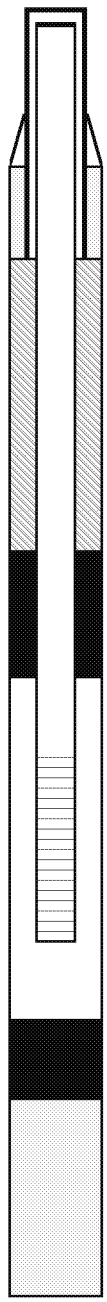
LOCK KEY NUMBER: 3120

REVISED 11/2013

WELL CONSTRUCTION DIAGRAM

PROJ. NAME: DTE Electric Company Belle River Power Plant		WELL ID:	**MW-16-07**
PROJ. NO: 231828.0003	DATE INSTALLED: 3/9/2016 INSTALLED BY: A. Knutson		CHECKED BY: C. Scieszka

ELEVATION (BENCHMARK: USGS)	DEPTH BELOW OR ABOVE GROUND SURFACE (FEET)	
592.58	2.7	TOP OF CASING
589.89	0.0	GROUND SURFACE
	1.0	CEMENT SURFACE PLUG
		GROUT/BACKFILL MATERIAL
		BENTONITE SLURRY
		GROUT/BACKFILL METHOD
135.7		TREMIE
	125.0	GROUT
		BENTONITE SEAL MATERIAL
		TIME RELEASE PELLETS
	130.0	BENTONITE SEAL
456.9	133.0	TOP OF SCREEN
5.00		FILTER PACK MATERIAL
		MEDIUM, WASHED SAND
451.9	138.0	BOTTOM OF SCREEN
	140.0	BOTTOM OF FILTER PACK
	NA	BENTONITE PLUG
		BACKFILL MATERIAL
		WASHED SAND
449.89	140.0	HOLE BOTTOM



NOTES:

CASING AND SCREEN DETAILS

TYPE OF RISER: 2-INCH PVC

PIPE SCHEDULE: 40

PIPE JOINTS: THREADED O-RINGS

SCREEN TYPE: 2-INCH PVC

SCR. SLOT SIZE: 0.01-INCH

BOREHOLE DIAMETER: 6 IN. FROM 0 TO 140 FT.
____ IN. FROM ____ TO ____ FT.

SURF. CASING DIAMETER: ____ IN. FROM ____ TO ____ FT.
____ IN. FROM ____ TO ____ FT.

WELL DEVELOPMENT

DEVELOPMENT METHOD: AIR LIFT

TIME DEVELOPING: 4 HOURS

WATER REMOVED: 120 GALLONS

WATER ADDED: 0 GALLONS

WATER CLARITY BEFORE / AFTER DEVELOPMENT

CLARITY BEFORE: VERY TURBID

COLOR BEFORE: BROWN /GREY

CLARITY AFTER: CLEAR

COLOR AFTER: NONE

ODOR (IF PRESENT): NONE

WATER LEVEL SUMMARY

MEASUREMENT (FEET)			DATE	TIME
DTB BEFORE DEVELOPING:	138.02	T/PVC	3/9/2016	--
DTB AFTER DEVELOPING:	141.19	T/PVC	4/13/2016	11:56
SWL BEFORE DEVELOPING:	14.66	T/PVC	3/15/2016	--
SWL AFTER DEVELOPING:	14.25	T/PVC	3/18/2016	--
OTHER SWL:	16.83	T/PVC	4/13/2016	11:56
OTHER SWL:		T/PVC		

PROTECTIVE CASING DETAILS

PERMANENT, LEGIBLE WELL LABEL ADDED? ☑ YES ☐ NO

PROTECTIVE COVER AND LOCK INSTALLED? ☑ YES ☐ NO

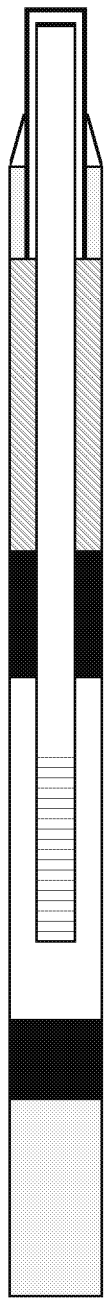
LOCK KEY NUMBER: 3120

REVISED 11/2013

WELL CONSTRUCTION DIAGRAM

PROJ. NAME: DTE Electric Company Belle River Power Plant		WELL ID:	**MW-16-08**
PROJ. NO: 231828.0003	DATE INSTALLED: 3/10/2016 INSTALLED BY: A. Knutson		CHECKED BY: C. Scieszka

ELEVATION (BENCHMARK: USGS)	DEPTH BELOW OR ABOVE GROUND SURFACE (FEET)	
591.88	2.6	TOP OF CASING
589.31	0.0	GROUND SURFACE
	1.0	CEMENT SURFACE PLUG
		GROUT/BACKFILL MATERIAL
		BENTONITE SLURRY
		GROUT/BACKFILL METHOD
135.6		TREMIE
	125.0	GROUT
		BENTONITE SEAL MATERIAL
		TIME RELEASE PELLETS
	130.0	BENTONITE SEAL
456.3	133.0	TOP OF SCREEN
5.00		FILTER PACK MATERIAL
		MEDIUM, WASHED SAND
451.3	138.0	BOTTOM OF SCREEN
	140.0	BOTTOM OF FILTER PACK
	NA	BENTONITE PLUG
		BACKFILL MATERIAL
		WASHED SAND
449.3	140.0	HOLE BOTTOM



NOTES:

CASING AND SCREEN DETAILS

TYPE OF RISER: 2-INCH PVC

PIPE SCHEDULE: 40

PIPE JOINTS: THREADED O-RINGS

SCREEN TYPE: 2-INCH PVC

SCR. SLOT SIZE: 0.01-INCH

BOREHOLE DIAMETER: 6 IN. FROM 0 TO 140 FT.
____ IN. FROM ____ TO ____ FT.

SURF. CASING DIAMETER: ____ IN. FROM ____ TO ____ FT.
____ IN. FROM ____ TO ____ FT.

WELL DEVELOPMENT

DEVELOPMENT METHOD: AIR LIFT

TIME DEVELOPING: 4 HOURS

WATER REMOVED: 125 GALLONS

WATER ADDED: 0 GALLONS

WATER CLARITY BEFORE / AFTER DEVELOPMENT

CLARITY BEFORE: VERY TURBID

COLOR BEFORE: BROWN /GREY

CLARITY AFTER: CLEAR

COLOR AFTER: NONE

ODOR (IF PRESENT): NONE

WATER LEVEL SUMMARY

MEASUREMENT (FEET)			DATE	TIME
DTB BEFORE DEVELOPING:	137.94	T/PVC	3/11/2016	--
DTB AFTER DEVELOPING:	140.80	T/PVC	4/13/2016	12:00
SWL BEFORE DEVELOPING:	14.23	T/PVC	3/15/2016	14:30
SWL AFTER DEVELOPING:	14.23	T/PVC	3/18/2016	7:30
OTHER SWL:	15.79	T/PVC	4/13/2016	12:00
OTHER SWL:		T/PVC		

PROTECTIVE CASING DETAILS

PERMANENT, LEGIBLE WELL LABEL ADDED? ☑ YES ☐ NO

PROTECTIVE COVER AND LOCK INSTALLED? ☑ YES ☐ NO

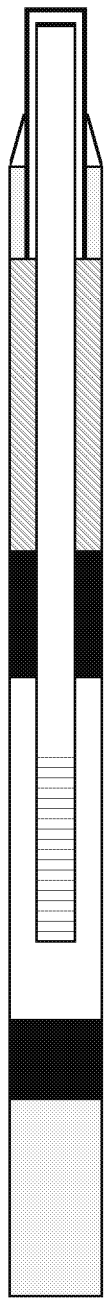
LOCK KEY NUMBER: 3120

REVISED 11/2013

WELL CONSTRUCTION DIAGRAM

PROJ. NAME: DTE Electric Company Belle River Power Plant		WELL ID:	**MW-16-09**
PROJ. NO: 231828.0003	DATE INSTALLED: 6/2/2016 INSTALLED BY: J. Reed		CHECKED BY: M. Powers

ELEVATION (BENCHMARK: USGS)	DEPTH BELOW OR ABOVE GROUND SURFACE (FEET)	
590.80	2.5	TOP OF CASING
588.28	0.0	GROUND SURFACE
	1.0	CEMENT SURFACE PLUG
		GROUT/BACKFILL MATERIAL
		BENTONITE SLURRY
		GROUT/BACKFILL METHOD
138.4		TREMIE
	130.0	GROUT
		BENTONITE SEAL MATERIAL
		TIME RELEASE PELLETS
	133.0	BENTONITE SEAL
452.4	136.0	TOP OF SCREEN
5.00		FILTER PACK MATERIAL
		MEDIUM, WASHED SAND
447.4	141.0	BOTTOM OF SCREEN
	141.0	BOTTOM OF FILTER PACK
	NA	BENTONITE PLUG
		BACKFILL MATERIAL
		NATURAL COLLAPSE
438.4	150.0	HOLE BOTTOM



NOTES:

CASING AND SCREEN DETAILS

TYPE OF RISER: 2-INCH PVC

PIPE SCHEDULE: 40

PIPE JOINTS: THREADED O-RINGS

SCREEN TYPE: 2-INCH PVC

SCR. SLOT SIZE: 0.01-INCH

BOREHOLE DIAMETER: 6 IN. FROM 0 TO 150 FT.
_____ IN. FROM _____ TO _____ FT.

SURF. CASING DIAMETER: _____ IN. FROM _____ TO _____ FT.
_____ IN. FROM _____ TO _____ FT.

WELL DEVELOPMENT

DEVELOPMENT METHOD: AIR LIFT

TIME DEVELOPING: 7 HOURS

WATER REMOVED: 30 GALLONS

WATER ADDED: 0 GALLONS

WATER CLARITY BEFORE / AFTER DEVELOPMENT

CLARITY BEFORE: TURBID

COLOR BEFORE: GRAY

CLARITY AFTER: VERY TURBID

COLOR AFTER: GRAY

ODOR (IF PRESENT): NONE

WATER LEVEL SUMMARY

MEASUREMENT (FEET)			DATE	TIME
DTB BEFORE DEVELOPING:	140.00	T/PVC	6/7/2016	12:00
DTB AFTER DEVELOPING:	140.00	T/PVC	6/8/2016	10:25
SWL BEFORE DEVELOPING:	7.00	T/PVC	6/7/2016	12:00
SWL AFTER DEVELOPING:	117.42	T/PVC	6/8/2016	10:25
OTHER SWL:	16.76	T/PVC	6/9/2016	15:13
OTHER DTB:	144.30	T/PVC	6/9/2016	15:13

PROTECTIVE CASING DETAILS

PERMANENT, LEGIBLE WELL LABEL ADDED? ☑ YES ☐ NO

PROTECTIVE COVER AND LOCK INSTALLED? ☑ YES ☐ NO

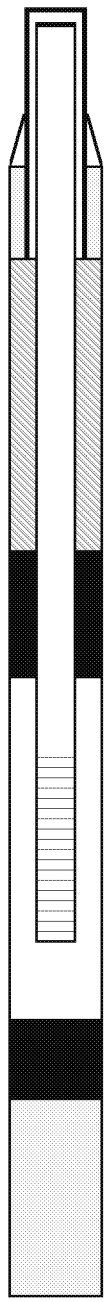
LOCK KEY NUMBER: 3120

REVISED 11/2013

WELL CONSTRUCTION DIAGRAM

PROJ. NAME: DTE Electric Company Belle River Power Plant		WELL ID:	MW-16-10
PROJ. NO: 231828.0003	DATE INSTALLED: 6/6/2016 INSTALLED BY: J. Reed		CHECKED BY: M. Powers

ELEVATION (BENCHMARK: USGS)	DEPTH BELOW OR ABOVE GROUND SURFACE (FEET)	
592.26	3.0	TOP OF CASING
589.25	0.0	GROUND SURFACE
	1.0	CEMENT SURFACE PLUG
		GROUT/BACKFILL MATERIAL
		BENTONITE SLURRY
		GROUT/BACKFILL METHOD
148.0		TREMIE
	137.0	GROUT
		BENTONITE SEAL MATERIAL
		TIME RELEASE PELLETS
	142.0	BENTONITE SEAL
444.3	145.0	TOP OF SCREEN
5.00		FILTER PACK MATERIAL
		MEDIUM, WASHED SAND
439.3	150.0	BOTTOM OF SCREEN
	150.0	BOTTOM OF FILTER PACK
	NA	BENTONITE PLUG
		BACKFILL MATERIAL
		NA
439.3	150.0	HOLE BOTTOM



NOTES:

CASING AND SCREEN DETAILS

TYPE OF RISER: 2-INCH PVC

PIPE SCHEDULE: 40

PIPE JOINTS: THREADED O-RINGS

SCREEN TYPE: 2-INCH PVC

SCR. SLOT SIZE: 0.01-INCH

BOREHOLE DIAMETER: 6 IN. FROM 0 TO 150 FT.
____ IN. FROM ____ TO ____ FT.

SURF. CASING DIAMETER: ____ IN. FROM ____ TO ____ FT.
____ IN. FROM ____ TO ____ FT.

WELL DEVELOPMENT

DEVELOPMENT METHOD: AIR LIFT

TIME DEVELOPING: 4.5 HOURS

WATER REMOVED: 85 GALLONS

WATER ADDED: 60 GALLONS

WATER CLARITY BEFORE / AFTER DEVELOPMENT

CLARITY BEFORE: VERY TURBID

COLOR BEFORE: DARK GRAY

CLARITY AFTER: VERY TURBID

COLOR AFTER: DARK GRAY

ODOR (IF PRESENT): NONE

WATER LEVEL SUMMARY

MEASUREMENT (FEET)			DATE	TIME
DTB BEFORE DEVELOPING:	151.30	T/PVC	6/9/2016	7:45
DTB AFTER DEVELOPING:	152.28	T/PVC	6/9/2016	16:50
SWL BEFORE DEVELOPING:	17.80	T/PVC	6/9/2016	7:45
SWL AFTER DEVELOPING:	59.44	T/PVC	6/9/2016	16:50
OTHER SWL:		T/PVC		
OTHER SWL:		T/PVC		

PROTECTIVE CASING DETAILS

PERMANENT, LEGIBLE WELL LABEL ADDED? ☑ YES ☐ NO

PROTECTIVE COVER AND LOCK INSTALLED? ☑ YES ☐ NO

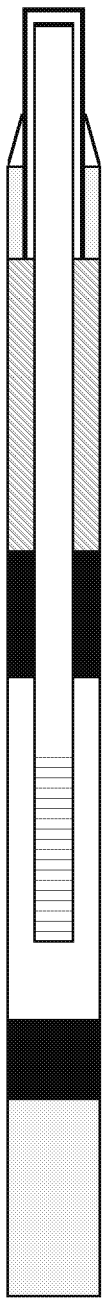
LOCK KEY NUMBER: 3120

REVISED 11/2013

WELL CONSTRUCTION DIAGRAM

PROJ. NAME: DTE Electric Company Belle River Power Plant		WELL ID:	MW-16-11
PROJ. NO: 231828.0003	DATE INSTALLED: 6/7/2016 INSTALLED BY: J. Reed		CHECKED BY: M. Powers

ELEVATION (BENCHMARK: USGS)	DEPTH BELOW OR ABOVE GROUND SURFACE (FEET)	
591.54	2.5	TOP OF CASING
589.03	0.0	GROUND SURFACE
	1.0	CEMENT SURFACE PLUG
		GROUT/BACKFILL MATERIAL
		BENTONITE SLURRY
		GROUT/BACKFILL METHOD
139.5		TREMIE
	130.0	GROUT
		BENTONITE SEAL MATERIAL
		TIME RELEASE PELLETS
	135.0	BENTONITE SEAL
452.0	137.0	TOP OF SCREEN
5.00		FILTER PACK MATERIAL
		MEDIUM, WASHED SAND
447.0	142.0	BOTTOM OF SCREEN
	150.0	BOTTOM OF FILTER PACK
	NA	BENTONITE PLUG
		BACKFILL MATERIAL
		WASHED SAND
447.0	150.0	HOLE BOTTOM



NOTES:

CASING AND SCREEN DETAILS

TYPE OF RISER: 2-INCH PVC

PIPE SCHEDULE: 40

PIPE JOINTS: THREADED O-RINGS

SCREEN TYPE: 2-INCH PVC

SCR. SLOT SIZE: 0.01-INCH

BOREHOLE DIAMETER: 6 IN. FROM 0 TO 150 FT.
_____ IN. FROM _____ TO _____ FT.

SURF. CASING DIAMETER: _____ IN. FROM _____ TO _____ FT.
_____ IN. FROM _____ TO _____ FT.

WELL DEVELOPMENT

DEVELOPMENT METHOD: AIR LIFT

TIME DEVELOPING: 3 HOURS

WATER REMOVED: 84 GALLONS

WATER ADDED: 60 GALLONS

WATER CLARITY BEFORE / AFTER DEVELOPMENT

CLARITY BEFORE: VERY TURBID

COLOR BEFORE: DARK GRAY

CLARITY AFTER: VERY TURBID

COLOR AFTER: GRAY

ODOR (IF PRESENT): NONE

WATER LEVEL SUMMARY

MEASUREMENT (FEET)			DATE	TIME
DTB BEFORE DEVELOPING:	141.36	T/PVC	6/9/2016	12:35
DTB AFTER DEVELOPING:	142.00	T/PVC	6/9/2016	15:45
SWL BEFORE DEVELOPING:	9.65	T/PVC	6/9/2016	12:35
SWL AFTER DEVELOPING:	116.00	T/PVC	6/9/2016	15:45
OTHER SWL:	16.67	T/PVC	6/21/2016	7:45
OTHER SWL:		T/PVC		

PROTECTIVE CASING DETAILS

PERMANENT, LEGIBLE WELL LABEL ADDED? ☑ YES ☐ NO

PROTECTIVE COVER AND LOCK INSTALLED? ☑ YES ☐ NO

LOCK KEY NUMBER: 3120

REVISED 11/2013

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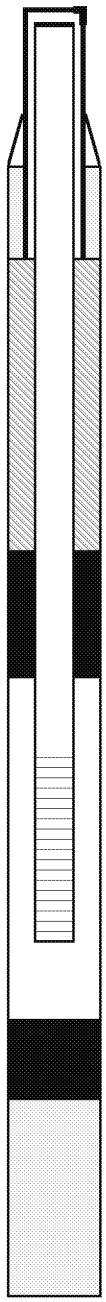
WELL CONSTRUCTION DIAGRAM

PROJ. NAME:	DTE Electric Company Belle River Power Plant	WELL ID:	**MW-16-11A**
PROJ. NO: 265996.0003	DATE INSTALLED: 5/12/2017 INSTALLED BY: Jake Krenz		CHECKED BY: C. Scieszka

ELEVATION (BENCHMARK: USGS)	DEPTH BELOW OR ABOVE GROUND SURFACE (FEET)	
591.66	2.1	TOP OF CASING
589.52	0.0	GROUND SURFACE
	1.5	CEMENT SURFACE PLUG
		GROUT/BACKFILL MATERIAL
		BENTONITE SLURRY
		GROUT/BACKFILL METHOD
139.1		TREMIE
	131.5	GROUT
		BENTONITE SEAL MATERIAL
		PELLETS
	134.0	BENTONITE SEAL
452.5	137.0	TOP OF SCREEN
5'		FILTER PACK MATERIAL
		MEDIUM, WASHED SAND
447.5	142.0	BOTTOM OF SCREEN
	142.0	BOTTOM OF FILTER PACK
	NA	BENTONITE PLUG
		BACKFILL MATERIAL
		NA
447.52	142.0	HOLE BOTTOM



NOTES:

CASING AND SCREEN DETAILS

TYPE OF RISER: 2-INCH PVC

PIPE SCHEDULE: 40

PIPE JOINTS: THREADED O-RINGS

SOLVENT USED? NO

SCREEN TYPE: 2-INCH PVC

SCR. SLOT SIZE: 0.01-INCH

BOREHOLE DIAMETER:	6	IN.	FROM	0	TO	142	FT.
	NA	IN.	FROM	NA	TO	NA	FT.
SURF. CASING DIAMETER:	NA	IN.	FROM	NA	TO	NA	FT.
	NA	IN.	FROM	NA	TO	NA	FT.

WELL DEVELOPMENT

DEVELOPMENT METHOD: AIR LIFT

TIME DEVELOPING: 3 HOURS

WATER REMOVED: 110 GALLONS

WATER ADDED: 0 GALLONS

WATER CLARITY BEFORE / AFTER DEVELOPMENT

CLARITY BEFORE: Very Turbid

COLOR BEFORE: Dark Gray

CLARITY AFTER: Very Turbid

COLOR AFTER: Light Gray

ODOR (IF PRESENT): None

WATER LEVEL SUMMARY

MEASUREMENT (FEET)			DATE	TIME
DTB BEFORE DEVELOPING:	141.98	T/PVC	5/15/2017	0838
DTB AFTER DEVELOPING:	145.45	T/PVC	5/15/2017	1612
SWE BEFORE DEVELOPING:	17.79	T/PVC	5/15/2017	0838
SWE AFTER DEVELOPING:	90.12	T/PVC	5/15/2017	1612
OTHER SWE:		T/PVC		
OTHER SWE:		T/PVC		

PROTECTIVE CASING DETAILS

PERMANENT, LEGIBLE WELL LABEL ADDED? ☑ YES ☐ NO

PROTECTIVE COVER AND LOCK INSTALLED? ☑ YES ☐ NO

LOCK KEY NUMBER: 3120

REVISED 06/2011

Appendix D
Subsurface Investigation and Foundation Report, Bechtel, 1976

DRAFT

SUBSURFACE INVESTIGATION AND FOUNDATION REPORT

THE DETROIT EDISON COMPANY

BELLE RIVER UNITS 1 & 2

JOB 10539

VOLUME 1 OF 2

GEOLOGY AND SOIL PROPERTIES

P. H. COOK
AUG 31 1976

AUGUST 1976

BECHTEL
ANN ARBOR, MICHIG

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SUBSURFACE INVESTIGATION
AND
FOUNDATION REPORT
GEOLOGY AND SOIL PROPERTIES

BELLE RIVER PLANT

UNITS 1 & 2

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THE DETROIT EDISON COMPANY

S. S. Afifi

D. R. Gle

GEOTECHNICAL SERVICES

ANN ARBOR, MI

SUBSURFACE INVESTIGATION
AND
FOUNDATION REPORT
GEOLOGY AND SOIL PROPERTIES

BELLE RIVER PLANT

UNITS 1 & 2

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THE DETROIT EDISON COMPANY

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D. R. Gle

GEOTECHNICAL SERVICES

ANN ARBOR, MI

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ABSTRACT

This report presents the results of an extensive subsurface investigation program for the Detroit Edison Company at the Belle River Project site. The proposed project consists of a two-unit coal fired plant and the associated coal handling facilities. The study was directed at evaluation of the geologic and ground water conditions and the development of soil parameters for design and construction of the proposed facilities.

The evaluations presented in this report consist of a review of previous investigations, a literature review, and detailed subsurface investigation and laboratory testing programs. This investigation confirmed the suitability of the site for the proposed facilities and gave the soil mechanics information necessary for planning, design and construction of plant facilities.

PREFACE

This report was prepared by Geotechnical Services in the Ann Arbor Office of Bechtel. The soils sections of this report were prepared by D.R. Gle and the geology sections by J.V. Mrakovich. J.B. Givens also contributed to the soil data evaluations. The Ann Arbor Office review and approval was by S. Mackay and G.T. LeFevre, Engineering Geology Supervisors, and S.S. Afifi, Soils Engineering Supervisor. The San Francisco H & CF review and approval was by M.J. Adair, Chief Geologist, and W.R. Ferris, Chief Soils Engineer. The report was also reviewed by S.L. Blue, Geotechnical Services Manager, H & CF Division, Ann Arbor, Michigan. The report was collated by A.R. Rossmann, Drafting Supervisor, Ann Arbor.

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NOTATION

$\underline{A}$	Pore pressure parameter (Skempton)
C_c	Compression index
C_r	Swelling index
C_v	Coefficient of consolidation
c	Cohesion intercept for total stresses from Mohr-Coulomb Relationship
c'	Cohesion intercept for effective stresses from Mohr-Coulomb Relationship
$\overline{CU}$	Consolidated-undrained triaxial compression test with pore pressure measurement
D_{50}	Grain size analysis: diameter at which 50% of the sample is finer
E	Young's modulus of elasticity as determined from the initial tangent modulus of the stress-strain curve
e_o	Initial void ratio
k	Permeability
ksf	Kips per square foot
LL	Liquid limit
PI	Plasticity index (LL-PL)
P_c	Preconsolidation pressure
PL	Plastic limit
$\bar{p}$	Effective vertical pressure
$\bar{p}_o$	In-situ effective overburden pressure
p	Stress point, $(\sigma_1 + \sigma_3)/2$
p'	Stress point, $(\bar{\sigma}_1 + \bar{\sigma}_3)/2$

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pcf	Pounds per cubic foot
psf	Pounds per square foot
q	Stress point, $(\sigma_1 - \sigma_3)/2$
Qu	Unconfined compression test
S	Shear strength
SPT	Standard penetration test (ASTM D 1586)
S_u	Undrained shear strength
UU	Unconsolidated-undrained triaxial compression test
W_o	Initial moisture content
W_f	Moisture content after consolidation ($\overline{CU}$ test)
γ_d	Dry density
γ_t	Total density
γ_{tf}	Total density after consolidation ($\overline{CU}$ test)
ε	Axial strain
σ	Total normal stress on failure plane at failure
σ'	Effective normal stress on failure plane at failure
σ_o	Confining pressure (unconsolidated-undrained triaxial test)
$\bar{\sigma}_3$	Effective confining pressure (consolidated-undrained triaxial test)
ϕ	Angle of internal friction for total stresses
ϕ'	Angle of internal friction for effective stresses
τ	Drained shear strength

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1.0 INTRODUCTION

The Detroit Edison Company's proposed Belle River Project consists of a two-unit coal fired power plant and the associated coal handling facilities. The project site is located in St. Clair County, Michigan, between the cities of St. Clair and Marine City. Figure 1 shows the state of Michigan with the site location indicated. This site is just west of the existing Detroit Edison Company St. Clair Power Plant. A general site plan showing all of the existing and proposed facilities is shown in Figure 2.

The coal handling facilities will include a docking facility, transfer houses, radial stackers, underground coal reclaimers and a conveyor system, along with both primary and secondary coal storage areas. The proposed power block will consist of two boiler buildings, two turbine buildings, four precipitators, a smoke stack, service building, administration building, warehouse, and miscellaneous other tanks and treatment basins. Other facilities away from the power block include a switchyard and intake and discharge structures.

The project facilities are superimposed on the boring location plan and are shown in Figure 3. The area proposed

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for fly ash disposal (Figure 4) has also been considered in the evaluations.

Volume 1 of this report contains the final results of the geological evaluations, laboratory soil testing, soil properties evaluations, and the development of the soil engineering parameters to be used for the entire Belle River 1 & 2 Project area. The results of previous investigations supplied by The Detroit Edison Company are given in Appendix A. Bechtel soil/rock borings are presented in Appendix B, along with a tabulated summary and a key to the notation used on the boring logs.

Volume 2 contains Appendices C and D which include all of the laboratory test results. Appendix C contains the results of laboratory tests performed by Goldberg-Zoino and Associates while Appendix D contains the results of laboratory tests conducted by U. W. Stoll and Associates.

The engineering design criteria for the various portions of this project will not be addressed in this report. Design criteria will be addressed upon reactivation of the project when more details are known about the proposed facilities and the final location of structures.

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2.0 SCOPE OF WORK

The purpose of the subsurface investigation and laboratory testing program was to evaluate the soil, rock, and ground water conditions at the site in order to provide sufficient information for planning, design, and construction of the various plant facilities. Upon reactivation of this project, foundation systems and parameters for the various foundation design, construction, and soil structure interaction schemes will be developed based on this information.

This report is based on a review of previous investigations, geologic research, ground water studies, soil and rock drilling and sampling, and a laboratory testing program.

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3.0 SUBSURFACE EXPLORATION

3.1 PREVIOUS EXPLORATION FOR THE EXISTING ST. CLAIR PLANT

Borings were made for various structures and facilities of the St. Clair power plant during 1950, 1959, and 1965. These are contained in a report prepared under the direction of W. S. Housel and the University of Michigan's Office of Research Administration, Soil Mechanics Laboratory for the addition to St. Clair Unit No. 7. The 1950 borings were generally in the area of the main plant while the 1959 and 1965 borings were made for the dock area and yard conveyor, respectively.

Included in the Housel report are the individual boring log profiles of borings made during 1965 and composite subsoil analysis profiles extending to bedrock. It also contains information on comparisons with borings made in the same area during 1950 and 1959. Through 1965, a total of 28 borings were drilled east of M-29 along the shore of the St. Clair River and within the St. Clair plant area. Seven borings were drilled west of M-29 along the yard conveyor. The Housel report and other borings in the area made available to Bechtel are included in Appendix A of this volume.

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3.2 EXPLORATION FOR THE PROPOSED BELLE RIVER PROJECT

3.2.1 General

The existing docking facility was rebuilt to accommodate larger ships approximately 105 feet wide and 1000 feet long having a draft of about 27.5 feet. The existing conveyor system serving the present St. Clair units will remain in place. A new conveyor system will begin at the docking facility and parallel the existing system to Highway M-29, where it will bridge across M-29 and bisect the new primary coal storage area.

From the primary coal storage area, the conveyor system crosses over the Detroit and Port Huron Railroad tracks and turns northward towards the main plant area and the secondary coal storage pile. The conveyor will then split, with one conveyor going west into the main plant and the other going east, over the railroad tracks, to the secondary coal storage area. Also located along the conveyor system are various transfer houses and stacker-reclaimers as shown in Figures 2, 3 and 4.

The primary coal storage area is separated into three storage locations covering an area of approximately 75

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acres. There are two main dead storage piles to the north and south sides of the conveyor, and a smaller live storage pile between the conveyor and the south dead coal storage. An approximate capacity of 2.5 million tons of coal can be stored at these locations.

The secondary coal storage area will consist of a single coal pile located just east of the main plant. This pile will cover an area of approximately 20 acres, and will have a total dead storage capacity of approximately one million tons.

In addition, there will be a large fly ash disposal area to the northwest of the main plant. In general, this area is bounded by the existing Remer Road, King Road, the Detroit and Port Huron Railroad, and a line about one-half mile north of and parallel to Puttygut Road.

3.2.2 Details of Exploration

The subsurface exploration program and foundation evaluation were developed by Bechtel. The drilling, which was done by Raymond International, began in November 1973 and ended in August 1975. Bechtel soil engineer(s) and Bechtel

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engineering geologist(s) supervised field operations and recorded field logs of the drilling, sampling, and field testing of the foundation materials. Logs of all borings were prepared by Bechtel and are included in Appendix B.

In the docking area, ten 5-inch diameter exploratory borings were drilled and sampled to bedrock. In addition, 74 other rotary wash borings were drilled along the conveyor system, the coal storage areas, and the main plant area. A total of 36 borings were drilled in the fly ash disposal area northwest of the main plant. These borings were located on approximately a 1,000 foot grid and extended to depths of from 70 to 140 feet. Undisturbed samples were obtained in selected borings while split spoon samples were obtained in all of the remaining borings to verify the subsurface materials and consistency.

Throughout this investigation, undisturbed samples were generally taken at 10-foot intervals with standard 3-inch O. D. Shelby tubes. From a depth of approximately 15 to 70 feet, some difficulty was encountered in retaining the very soft clayey soils in the standard Shelby tube, and the Osterberg Sampler was used to recover samples within this depth. Generally, this sampler enabled adequate recovery.

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Material in each undisturbed sample was visually classified by the Bechtel field engineer. The tubes were then sealed with a double layer of wax, labeled, and selected tubes were shipped to the laboratory.

Drive samples were obtained at the alternate 10-foot intervals between undisturbed samples using a standard split spoon sampler. This procedure (ASTM D 1586) utilizes a 140-pound hammer falling 30 inches to drive a 1-3/8 inch I.D. split spoon sampler 18 inches. Blows required to advance the sampler through each six inches were recorded. The standard penetration test (SPT) blowcount is the number of blows for the last foot the sampler is driven. Standard penetration test blowcounts are given on the boring logs. In the exceptionally hard materials found at depths of approximately 130 to 135 feet, refusal was considered to have been attained when 100 blows were delivered for any six inch driving increment.

Material recovered in the split spoon sampler was visually classified by the engineer, and a portion of the sample was then stored in a glass jar. Selected jar samples were sent to the testing laboratory for classification.

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Classifications made in the field were compared with the laboratory classification during proofreading of each field log and the appropriate corrections were then made on the final boring log. The unified soil classification for each sample is as shown on the boring logs given in Appendix B.

Rock cores were obtained in areas where the foundation system has a possibility of bearing on bedrock. Specified holes were cored a minimum of 20 feet into rock to assure positive penetration through the overburden and to obtain samples to evaluate the competency of the rock.

Cores were placed in partitioned core boxes (each holding about 15 feet of core), classified, and stored at the site. Bechtel geologists prepared logs of the rock core portions of each hole.

At the completion of the investigation, the remaining sample jars, Shelby tube samples, and rock core samples were stored at the St. Clair Power Plant.

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4.0 SITE CONDITIONS

This section addresses the geology and generalized subsurface soil conditions for this site. The geological studies were based on a literature review, evaluation of site boring logs, and ground water measurements. The soil conditions were developed from an evaluation of the boring logs and laboratory soil tests, along with geologic and ground water evidence and also a review of previous investigations.

4.1 GEOLOGY

4.1.1 Regional Geology

The site is located in the Lower Peninsula of Michigan on the southeastern margin of the Michigan Basin (Figure 5). This basin is a broad, shallow, tectonic structure approximately 300 miles in diameter and containing up to 14,000 feet of Paleozoic sediments in its central portion near Mount Pleasant. Thickening of strata toward the center of the basin indicates that the Lower Peninsula was a region of slow subsidence with almost continuous deposition throughout the Paleozoic. A large part of basin development occurred during Silurian, Middle and Upper Devonian time

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when about two-thirds of the total Paleozoic sequence was deposited. Subsidence apparently ceased at the close of Jurassic time, about 135 million years ago, since no rocks of younger age are known to exist in the region.

During the Pleistocene, continental glaciers advanced and retreated across the region many times, modifying the bedrock topography and covering it with glacial drift, which now comprises almost all natural topographic features at the site and in the Lower Peninsula.

Faulting is not common to the region, and no known faults occur near the site. The nearest mapped faulting occurs in the area of the Chatham Sag in eastern Ontario, about 15 miles southeast of the site; however, it is considered inactive (Ref 1).

The Lower Peninsula of Michigan is an area of low seismic activity where only six earthquakes have been recorded in historic time. None of these earthquakes can be related to mapped faults or tectonic structures in the Michigan Basin. According to the seismic risk map of the U.S. (Ref 2), the site is located in Zone 1 which corresponds to Intensities V and VI (Modified Mercalli Scale of 1931), where only minor damage should be expected.

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4.1.2 Site Geology

The site is located in St. Clair County, Michigan, 3.5 miles south of the city of St. Clair on an intermorainal glacial lake plain (Figure 6) whose ground surface varies little above or below 587 feet in elevation.

These glacial lake deposits vary in thickness from 125 to 170 feet within the explored area of the site where they overlie an irregular bedrock surface (Figure 7). The underlying bedrock consists of about 4,600 feet of Paleozoic sedimentary rocks whose uppermost unit is the Bedford Shale formation of Mississippian-Devonian Age. The Paleozoic rocks are underlain by metamorphic, igneous, and sedimentary rock of Precambrian Age (Ref 3).

Overburden materials consist primarily of unconsolidated gray to brown, soft to stiff silt and silty clays with scattered fine sand lenses. Figure 8 shows overburden thickness contours throughout the site area and the cross sections of Figure 9, A through N, show local detailed descriptions of site material.

The most prominent feature of the bedrock topography is a generally north-south trending erosional channel in the

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vicinity of the proposed plant. Subsurface profiles (Figure 9, A through N), normal to and along the trend of the channel, show an associated sand deposit whose known maximum thickness is about 60 feet. Generally, the sand appears to be in contact with the bedrock surface and thins rapidly, or becomes absent, away from the channel. As evidenced by the drill hole logs, the sand occurs sporadically elsewhere across the site. Sand thickness and top of sand contour maps (Figures 10 and 11, respectively), as well as the cross sections in Figure 9, A through N, show that the location of these sand deposits is controlled mainly by the bedrock surface. The deposits generally fill low areas on this bedrock surface, suggesting the basal sand is glaciofluvial outwash in origin and represents some of the first material deposited on bedrock by meltwaters from nearby glaciers.

Except for the basal glaciofluvial sand, all other glacial material underlying the site appears to be glaciolacustrine silty clays and silts with local sand lenses.

Bedrock at the site is the Bedford Shale formation of Mississippian-Devonian Age. The rock, cored to a maximum depth of 50 feet, consists of light to dark gray shale varying from soft to firm. The soft shale in the upper

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bedrock sequence is generally weathered and highly fractured. The firm shale below is occasionally fractured, but local vein quartz infilling has strengthened the rock by acting as a cementing agent. The estimated top of firm rock (base of the weathered portion) is shown on the subsurface profiles (Figure 9, A through N).

Rock stratigraphy below a depth of 50 feet to the top of the Niagara group was interpreted from logs of five abandoned wildcat oil and gas wells located on the site (Figure 12). The remainder of the Paleozoic interval was interpolated from nearby stratigraphic cross sections (Ref 4) and the Michigan Geological Survey Annual Statistical Summary No. 18, Michigan's Oil and Gas Fields, 1972 (Ref 5). This rock stratigraphy is summarized in the geologic column in Figure 13.

4.1.3 Ground Water

The site is underlain by relatively impermeable glaciolacustrine, silty clays and silts ranging in thickness from 125 to 170 feet with local lenses of glaciofluvial sands. These sand lenses are moderately permeable but are too small to store or transmit much water. Beneath portions

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of the site, a basal, glaciofluvial, compact sand and silty sand is encountered immediately above the bedrock surface. These sands attain a known maximum thickness of about 60 feet in the vicinity of the proposed plant structures. Water losses, occurring in these basal sands during the site exploration drilling program, indicate they are relatively permeable. Locally, throughout the region surrounding the site, these sands yield enough ground water for domestic and farm use (Ref 6).

A zone of highly fractured shale, between the top of rock and the top of firm rock is moderately permeable. The highly fractured shale ranges in thickness from zero feet to over 45 feet in rock cores, and is indicated on subsurface profiles in Figure 9, A through N. The permeable shale zone and the basal glaciofluvial sands probably act as a single aquifer where they are in direct contact with each other.

Yields from most wells in the area, placed either in glacial deposits or in bedrock, are less than ten gallons per minute. Ground water development is primarily for domestic and farm use. Municipal and industrial water is principally obtained from surface water bodies.

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Ground water levels at the site were measured from four observation wells installed during the site exploration program. Hydrographs displaying water level elevations in the four observation wells, with respect to time, are shown in Figure 14. The initial slopes of the hydrographs indicate the time required for water levels in the observation wells to reach a hydrostatic level.

The water level of Observation Well 181, set at Elevation 449.8 near the highly fractured shale bedrock, stabilized 24 hours after installation; whereas, water levels of Observation Wells 7 and 24, set in glaciolacustrine silts at Elevations 450.5 and 452.3 respectively, required several months to stabilize, indicating they are essentially impermeable. The water level of Observation Well 40, placed in a glaciolacustrine silty clay with some sand and gravel, at Elevation 509.1, stabilized in three weeks, also indicating very low permeability.

Ground water contours of the probable water surface beneath the site are shown in Figure 15. Water level data spanning several years, obtained from the Michigan State Geological Survey, was used in constructing the ground water contours.

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This data was used in conjunction with water level readings obtained in June 1974 from observation wells on the site.

Elevation of the ground water varies by about ten feet in the site area, generally increasing toward the St. Clair River. Water movement beneath the site appears to be westward away from the St. Clair River which is probably a recharge area. Approximate ground water levels are also shown on the subsurface profiles (Figure 9, A through N).

Depth to ground water on the site varies from 5 to 15 feet. Seepage of ground water into pits excavated below the zone of water saturation will probably be slow due to the very low permeability of the silty clays and silts that underlie the site. Pits excavated to a depth of 30 to 40 feet for the purpose of fly ash disposal were observed to contain no water from ground water seepage when left open for several days. The low permeability of the glaciolacustrine deposits is also indicated by the slow response of water levels in observation wells placed in either silty clays or silts. In cases where local sand or gravel lenses are encountered during excavations, ground water seepage may be substantial. However, a sump pumping system should be sufficient to control ground water seepage from sand and gravel lenses, since these are generally small in size and cannot store

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much water. When predrilling for piles, water losses may be experienced when drilling through the basal glaciofluvial sand layer.

According to a southeastern Michigan water resources study (Ref 6), ground water from the glacial deposits is of the sodium bicarbonate type. In general, sodium and chloride concentration increase with depth. Water hardness ranges in concentration from 68.4 to 342.0 parts per million calcium carbonate, and iron ranges in concentration from 0.5 to 1.0 parts per million. Water from wells in bedrock varies in chemical composition, usually containing large amounts of calcium, bicarbonate, sulfate, and sodium chloride.

Knutilla's report (Ref 6) also indicates small to moderate supplies of fresh water are available from the highly fractured shale zone, but nearly all water is too highly mineralized for most uses. In general, mineralization of water increases with depth, whether in glacial deposits or bedrock.

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4.1.4 Effects of Man's Activities

4.1.4.1 Presence of Oil and Gas

There are no active producing oil or gas fields in the immediate site area. Ten exploratory wells have been drilled on the site to an average depth of 2,500 feet. All wells were nonproductive except for two oil and gas producing wells located in the northwest corner of the site. These wells, producing from Niagaran reef formations, were abandoned in 1970.

Several oil and gas fields associated with reef structures have been developed in St. Clair County. The size of these fields averages 570 acres and oil production rates in 1971 were about 25 gallons per acre per day. All oil and gas fields surrounding the site appear to be fully developed and no further expansion is expected. Present oil and gas extraction are not expected to present problems to the plant structures. Figure 12 shows the locations of oil and gas wells on the site and in the site vicinity.

Isolated pockets of trapped gas occur in the overburden underlying the site. Gas was encountered in seven exploration borings (Table 1). No odor was detected in any

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of these borings, and in all cases, the gas dissipated after 48 hours. Safety measures for determining the existence of and handling the gas should, however, be included in all earthwork and foundation contracts. No unusual design or construction problems due to the presence of gas are expected.

4.1.4.2 Salt Solution Mining

Thick salt deposits occur in two geologic horizons in Michigan: the Devonian Detroit River group and the Silurian Salina group. Salt beds in the Detroit River group are restricted to the northern half of the Lower Peninsula and do not underlie the site area. However, salt beds in the Salina group have a large areal extent covering the central three-fourths of the Lower Peninsula and occur beneath the site.

Salt solution mining from the Salina group by the Diamond Crystal Salt Company, located approximately one mile north of the site boundary, has been in progress for a number of years. The Salina group underlying the site contains five salt units interbedded with dolomitic shale, limestone, and anhydrite. The aggregate thickness of the salt is about 750 feet with the uppermost and lowermost units occurring,

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respectively, at depths of approximately 1,400 and 2,500 feet below the site.

The potential for surface subsidence due to the collapse of solution cavities was evaluated from criteria used by the U.S. Bureau of Mines (Ref 7). A potential area of subsidence can be obtained by drawing a cone with sides at a 45° angle upward from the cavity. Surface subsidence due to that cavity will be within the area encircled by the cone's intersection with the ground surface.

A cavity at a depth of 2,500 feet will have a potential area of surface subsidence extending outward 2,500 feet from the cavity's edge. At the present location of the Diamond Crystal Salt Company's operations, surface subsidence due to a salt cavity at a depth of 2,500 feet is not expected within the site. It should be emphasized that further solution mining should not be permitted to develop cavities closer than 2,500 feet (horizontally) from any plant structures.

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4.2 SUBSURFACE SOIL CONDITIONS

4.2.1. General

The soil profile at this site may be divided into three major strata. These divisions were based upon field observations combined with results of all laboratory testing. These strata have been designated as the upper, middle, and lower strata and refer to depths of 0 to 20 feet, 20 to 50 feet, and below 50 feet, respectively. Except for the dock, secondary coal storage area, and fly ash disposal areas, the entire site has a surface elevation of about Elevation 586, generally ranging from Elevation 585 to Elevation 590. The dock area is lower at Elevation 580 to Elevation 582, while the secondary coal storage area and fly ash disposal area are higher at approximately Elevation 590 and 600 respectively. Therefore, the depths of the different strata are approximate and are expected to vary within 5 to 15 feet throughout the entire project site. For any particular location, the boring logs should be consulted to associate the soil properties with a particular stratum. Generalized ground surface contours are shown in Figure 16.

Selected subsurface profiles throughout the entire site are shown in Figure 9, A through N. The distribution of

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standard penetration blowcount with depth for various areas is shown in Figure 17.

4.2.2 Upper Stratum (0-20 Feet)

The upper stratum consists primarily of mottled brown and gray, stiff to very stiff, clays (Classification CL-CH) with traces of fine sand and pebbles. Standard penetration blowcounts increased from approximately 5 to 15 at the ground surface to a range of from 10 to 40 at a depth of 10 feet (Figure 17). Below this depth, the blowcounts decreased to a range of from 3 to 12 at a depth of approximately 20 feet. Below 20 feet, there is an observable change in the color and consistency of the clay; therefore, a depth of 20 feet is considered the bottom of the upper stratum at this site.

Laboratory consolidation testing has shown this stratum to be overconsolidated. This preconsolidation was also confirmed by the results of consolidated-undrained triaxial testing, the empirical Skempton relationship as used to determine preconsolidation pressure based on the undrained shear strength of the soil and the liquid limit (Ref 8), and also a comparison of the natural moisture content with the

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Atterberg limits. It is believed that this stratum was preconsolidated by desiccation based on undrained shear strength behavior and other geologic evidence. The estimated preconsolidation pressure ranges between 4,000 to 9,000 psf. This corresponds to an overconsolidation ratio between 4 and 8.

4.2.3 Middle Stratum (20 to 50 Feet)

Below the upper stratum, there is a very soft to soft gray silty clay (Classification CL) which extends from approximately 20 feet below the ground surface to 50 feet below the ground surface. However, this stratum was encountered as close as 11 feet from the ground surface in the dock area.

Standard penetration blowcounts in this stratum ranged between fairly close limits. In all areas except the docking facility, blowcounts ranged from 2 to 7 blows per foot. Generally, the higher blowcounts were noted at the top and bottom of the stratum and decreased in the center. At the docking facility, the average blowcounts remained constant at about 2 blows per foot throughout the entire depth, and the higher blowcounts remained constant at an

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average of 15 blows per foot. Although blowcounts at the docking facility were somewhat lower than other locations, laboratory engineering properties were not significantly different.

Consolidation tests and other empirical evaluations show this stratum to be slightly overconsolidated, with preconsolidation pressures ranging between 3,500 to 4,500 psf. This corresponds to an overconsolidation ratio between 1.3 and 2.0.

4.2.4 Lower Stratum (Below 50 Feet)

This stratum consists primarily of a firm gray plastic silty clay Classification (CL). However, some fine sand seams and silty clays with an appreciable amount of sand (as much as 40%) were encountered at varicus depths as shown in the subsurface profiles (Figure 9, A through N). Significant sand deposits were also found beneath the main plant area as noted in Section 4.1.2.

Blowcounts in this stratum varied depending on the amount of sand present. Typical standard penetration blowcounts

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ranged from 2 to 7 blows per foot at a depth of 50 feet, to 10 to 25 blows per foot at a depth of 70 feet. Below the 70 foot depth, the standard penetration blowcount in the clay scils increased to an average of approximately 20 blows per foot at a depth of 125 feet (range of 5 to 40). Below this depth, the blowcounts in all areas increased until bedrock was encountered at depths of 125 to 145 feet. Within this depth range, clays with high sand content, sand deposits, hardpan, or combinations were encountered above the bedrock. Standard penetration blowcounts in the sandy zones above the bedrock are quite variable, although the average was found to be 40 to 50 blows per foot.

Except where a significant amount of sand was present, this stratum can be subdivided into three layers based on the degree of overconsolidation. These layers are from 50 to 70 feet (transition zone between upper and middle strata), 70 to 90 feet and below 90 feet, respectively.

4.2.4.1 Layer From 50 to 70 Feet (Transition Zone)

The first of these layers is designated as the transition zone and ranges from 50 to 70 feet deep. According to Skempton's statistical relationship and the natural moisture content and plasticity ranges, the soils within this layer

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are slightly overconsolidated. The Skempton empirical procedure was used to evaluate the preconsolidation pressure because of the lack of a sufficient number of consolidation tests for this layer. The estimated preconsolidation pressure for this layer ranges between 4,000 to 8,000 psf. This corresponds to an overconsolidation ratio between 1.0 and 1.6.

4.2.4.2 Layer From 70 to 90 Feet

Based on consolidation tests and the same Skempton relationship, the soils within the depth range of 70 to 90 feet are considered slightly overconsolidated but to a greater degree than the transition zone. Apparently, the normal geological process of deposition of the clay was interrupted at this depth. Since the soil appears to be virtually the same type as that below it, this increased overconsolidation must be due to either additional deposition above 70 feet and then erosion to the 70-foot depth, or desiccation as was noted in the upper layer, followed by deposition to its present elevation. The undrained shear strengths have the general tendency to decrease very slightly with depth below 70 feet, thus the apparent overconsolidation is likely due to desiccation. The estimated preconsolidation pressure for this layer

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ranges between 6,000 and 9,000 psf. This corresponds to an overconsolidation ratio between 1.0 and 2.4.

4.2.4.3 Layer Below 90 Feet

The soil properties below 90 feet are very similar to those immediately above, except for the degree of overconsolidation and undrained shear strength. Consolidation test results and evaluation of the moisture content versus Atterberg limits show these soils to be very slightly overconsolidated to normally consolidated. The estimated preconsolidation pressure for this strata ranges between 6,000 and 9,000 psf. This corresponds to an overconsolidation ratio between 1.0 and 1.2.

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5.0 LABORATORY SOIL TESTING

5.1 INTRODUCTION

The laboratory testing program consisted of the classification and engineering properties tests listed below and further described in this Section. The testing program was developed by Bechtel and conducted by Goldberg-Zoino and Associates and U. W. Stoll and Associates under the direction of Bechtel.

a) Visual and Laboratory Classification

b) Moisture Content and Dry Unit Weight

c) Atterberg Limits

d) Specific Gravity

e) Mechanical Analysis

f) Unconfined Compression Test (Qu)

g) Laboratory Vane Shear Test

h) Unconsolidated-Undrained Triaxial Compression Test (UU)

i) Consolidated-Undrained Triaxial Compression Test With Pore Pressure Measurement ($\overline{CU}$)

j) Consolidation Test

k) Permeability Test

l) Compaction Test

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The majority of testing was carried out by Goldberg-Zoino and Associates of Newton Upper Falls, Massachusetts, from January 1974 through January 1975. Additional tests were made by U. W. Stoll & Associates of Ann Arbor, Michigan, during the summer of 1975. This was to provide more detailed information for the coal reclaim hopper south of Transfer House 5 (Figure 2).

The test data are presented in Appendix C of Volume 2 in the form of tables and figures. Selected properties such as dry density, moisture content, Atterberg limits, and soil cohesion from unconfined compression, unconsolidated-undrained triaxial testing and vane shear tests have also been included on the boring logs presented in Appendix B. Interpretation of test data and development of soil properties for design are presented in Section 6.

5.2 CLASSIFICATION TESTS

Visual classification was in accordance with ASTM D 2488, and laboratory classification was in accordance with ASTM D 2487.

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5.2.1 Moisture Content and Dry Unit Weight

Moisture content and dry unit weight were determined for all undisturbed soil samples selected for any type of testing, along with the moisture contents for other selected split spoon samples. Determination of moisture content was made in accordance with ASTM D 2216 and the unit weight was determined by direct measurement.

5.2.2 Atterberg Limits

Atterberg limits determinations were made in accordance with ASTM D 423 (liquid limit) and ASTM D 424 (plastic limit) on all samples selected for unconfined and triaxial shear testing, consolidation testing, and on other selected plastic soils.

5.2.3 Specific Gravity

Specific gravity tests were made on all samples subjected to consolidation testing, as well as on other selected samples, in accordance with ASTM D 854.

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5.2.4 Mechanical Analysis

Mechanical and hydrometer analysis determinations were made in accordance with ASTM D 422 on selected samples.

5.3 ENGINEERING PROPERTIES TESTS

5.3.1 Unconfined Compression Tests

Unconfined compression tests were performed on representative samples of all strata to evaluate the in situ shear strength. The tests were also performed on remolded samples to evaluate the soil sensitivity and the available shear strength under remolded conditions. All tests were performed in accordance with ASTM D 2166. Stress versus strain curves have also been presented in Appendix C. These allowed an evaluation of the shear strength at different strain levels and also the initial tangent modulus. Dry density, moisture content, and Atterberg limits are also reported for each test. Results for undisturbed samples are summarized in Table 2 while the results for compacted samples are summarized in Table 3.

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5.3.2 Laboratory Vane Shear Tests

Vane shear tests were performed on selected soil samples from the dock area to evaluate both the undisturbed and remolded shear strengths. This was done primarily to determine the degree of sensitivity of the soil and also to compare the results with those of other undrained shear strengths. This data is summarized in Table 4.

5.3.3 Unconsolidated-Undrained Triaxial Compression Tests (UU)

Unconsolidated-undrained triaxial compression tests were made on selected undistrubed samples to compare with the results obtained from the unconfined compression testing. This test is also considered appropriate for cohesive samples which contain appreciable amounts of silt or sand size particles. Procedures utilized were in accordance with ASTM D 2850.

All unconsolidated-undrained triaxial tests were performed at confining pressures approximately equal to the effective overburden pressure at the sample depth. The stress-strain curves, moisture contents, and dry densities are also given

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on the laboratory test result sheets in Appendix C. The results are summarized in Table 5.

5.3.4 Consolidated-Undrained Triaxial Compression Tests with Pore Pressure Measurements ($\overline{CU}$)

Consolidated-undrained triaxial compression tests with pore pressure measurements were made on undisturbed samples from all strata and on selected remolded samples using the Harvard Minature Compaction Method. All samples were saturated by the back pressure method. A minimum of three separate samples at the same approximate depth were then consolidated to confining pressures approximately equal to 0.5, 1.0, and 2.0 times the effective overburden pressure, respectively, before testing. Confining pressures, moisture contents, dry densities, etc. are shown on the test data sheets. Effective and total strength envelopes were obtained for each series tested. Plots of pore water pressure, deviator stress, principal stress ratio, and Skempton's A parameter versus strain are given in Appendix C. All results are summarized in Table 6.

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5.3.5 Consolidation Tests

Consolidation tests on selected soil samples were made by loading test specimens up to applied pressures as high as 24 ksf in accordance with ASTM D 2435. A modification of ASTM D 2435 to provide a rebound-recompression curve near the overburden pressure (Burmister Loop) was also used on selected samples (Ref 9). This modification consisted of loading the test specimens to the approximate in-situ overburden pressure, or slightly above, and then reducing the load to either 2 or 4 ksf. Samples were then reloaded to the maximum pressure and rebounded to zero load. The consolidation bowl was filled with water when the pressure reached the approximate effective confining pressure at the sample depth. Tests on compacted samples were also made. Results of the consolidation tests and a summary of the coefficient of consolidation by both the square root and logarithm of time fitting method are included in Appendix C. The results of undisturbed and compacted samples are summarized in Tables 7 and 8, respectively.

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5.3.6 Permeability Tests

Laboratory permeability tests were performed on representative clay specimens. Specimens were saturated by the back pressure method and tested under a confining pressure equal to the effective overburden pressure. Permeability was determined by using the constant head permeability test as adapted to triaxial equipment. All permeability results are summarized in Table 9.

5.3.7 Compaction Tests

Compaction tests were made in accordance with ASTM D 1557 on selected samples representative of the upper soils that could be excavated and used as a fill material. The curves of dry unit weight versus moisture content are presented, along with the Zero air voids curve in Appendix C.

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6.0 SOIL PROPERTIES FOR DESIGN

6.1 INTRODUCTION

In this section, the results of laboratory tests are discussed along with the ranges and recommended design values of soil properties. The generalized design values are believed to be conservative for the entire site. Higher values may be justified based on a localized evaluation of subsurface conditions and on the nature of the engineering problem under consideration. The recommended design properties of the site soils are compiled in Table 10.

6.2 INTERPRETATION OF LABORATORY TEST DATA

6.2.1 Natural Moisture Content and Dry Unit Weight

The natural moisture content and dry unit weights for the entire site have been plotted in Figure 18. In addition, for each sample, the corresponding total unit weight has also been calculated and presented. Although the figure for moisture content shows a fairly narrow range at all depths, there is considerably more scatter in the measured dry unit

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weight, thus producing a moderate scatter for the total unit weight. The design value for total unit weight versus depth has been based upon the predominant density at each depth with appropriate consideration for the scatter. Generally, as shown in Figure 18, a constant value of total unit weight can be used for each major stratum. Following are the ranges and recommended design values for each major stratum:

Ranges of Natural Properties

Depth (Ft)	Dry Density (PCF)	Moisture Content (%)	Total Density (PCF)	Design Total Density (PCF)
0-20	95-105	22-34	115-133	125
20-50	80-90	30-45	110-125	115
50-110	95-105	15-30	120-130	125
110+	80-100	20-40	110-124	120

The scatter in dry unit weights below a depth of 110 feet as shown in Figure 18, is likely due to the presence of a slightly higher percentage of sand in some of the samples at this depth.

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6.2.2 Atterberg Limits

Atterberg limits results are presented in Figures 19 and 20. Figure 19 contains three plasticity charts showing values of plasticity index (PI) and the liquid limit (LL) for the upper, middle, and lower strata. As shown in this figure, the upper stratum is the most plastic and the lower stratum the least plastic. This is attributed to the higher silt and sand content of the lower stratum. Ranges of liquid limit, plastic limit (PL), and plasticity index were derived for each of the three strata.

Depth	LL	PL	PI
0-20	39-63	17-26	18-39
20-50	35-55	16-25	15-32
50+	20-55	12-25	8-31

Figure 20 shows the plasticity ranges and the corresponding moisture content versus depth for the main plant area, the main coal storage area, and the dock area. The figure shows that the plasticity characteristics of these three areas are similar.

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6.2.3 Mechanical Analysis

This site is predominantly a clay site with the exception of the 60 foot thick sand deposit above rock in the vicinity of the main plant. Localized sand and silt lenses of nominal thickness were also found at variable locations and elevations throughout the site.

Grain size distribution curves for the upper, middle, and lower strata are shown on Figures 21 and 22. Figure 22 further subdivides the grain size distribution curves of the lower stratum for five major areas of the site.

Nearly uniform conditions were encountered in the upper stratum with very little evidence of sand. This is shown in Figure 21 by the very close grouping of the grain size distribution curves within the clay size range.

Below 20 feet, a significantly greater percentage of sand size particles is apparent from Figures 21 and 22. Figures 21 and 22 show that in general, the cohesive soils within the middle and lower strata do not contain more than about 40 percent sand, and most have no more than 20 to 30 percent sand.

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The grain size results for the site are presented in Figure 23 in a different manner. This figure is a presentation of the mean grain diameter D•• versus depth. It shows that, above the 90 to 100 foot depth, the majority of the data points fall within the clay and silt range while, below the 90 to 100 foot depth, the majority of the data points fall within the silt and sand ranges.

6.2.4. Activity of Clay

The activity of a clay is determined by plotting the plasticity index versus the percent of clay size particles less than two microns on an activity chart as shown in Figure 24. The figure shows that the activity values of the different samples represented are generally similar, making it possible to fit a single straight line through all the data. This line has a slope of 0.4 indicating the activity. The values generally ranged between 0.3 and 0.5. These activity values put the clays at the site in the inactive category according to Skempton (Ref 10).

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6.2.5 Undrained Shear Strength

The results of all unconfined and unconsolidated-undrained compression tests along with all of the laboratory vane shear tests are combined in Figure 25. This figure shows the results of each type of test with a different symbol. Other than for the upper stratum where the unconsolidated-undrained shear strengths were somewhat higher, all three types of tests gave comparable results. The shear strength was also evaluated for each major area separately (dock, coal hopper, main plant); however, it was found that the generalized interpretation shown by the dashed line in Figure 25 is conservative and representative for all areas.

The shear strength results from previous borings in the St. Clair Power Plant area are presented in Figure 26. The interpretations of the two sets of data shown in Figures 25 and 26 are superimposed in Figure 27 for comparison. This figure shows that the strength values obtained from the two separate investigations are in good agreement.

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In addition, the empirical Skempton relationship:

$$S_u/P = 0.1 + 0.004\ PI \qquad (1)$$

nas been used to calculate the undrained shear strength (S_u) for known values of plasticity index under two overburden pressure ($\overline{P}$) conditions. One assumption is that $\overline{P}$ is equal to the effective overburden pressure (Figure 28a) and the other assumes that $\overline{P}$ is equal to the overconsolidation pressure determined by Casagrande's Method (Figure 28b). These assumptions give the anticipated upper and lower boundaries of undrained shear strength as determined by this relationship. The range of plasticity index for the soils tested during this investigation (Section 6.2.2) fall within the range of applicability of Equation 1 as shown in Reference 8.

The design recommendations presented below were based on the results shown in Figure 25 with consideration of the results of previous investigations (Figure 26) and the empirical undrained shear strength values obtained from the Skempton relationship (Figure 28).

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Stratum	Depth Below Ground Surface (Feet)	Peak Undrained Shear Strength (psf) Effective Range	Design Value
Upper	0-20	1,100-3,000	550
Middle	20-50	350-1,500	550
Lower	50-90	500-3,000	1,000
	90+	500-1,500	850

The basis for the selection of the design undrained shear strength for the upper stratum is discussed below.

6.2.5.1 Upper Stratum

Based upon the laboratory test results from this investigation, the undrained shear strengths for the upper stratum were found to range between 1,100 and 3,000 psf. The most predominant value of undrained shear strength was approximately 2,000 psf. These undrained shear strengths generally tend to decrease with depth which is indicative of a clay preconsolidated by dessication.

However, it should be emphasized that for preconsolidated clays having overconsolidation ratios of four to eight as in this case, the peak undrained shear strength often cannot be depended upon. The laboratory peak strength for soils of this type will give higher undrained shear strength than

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that which will actually develop in the field under long term conditions. This is because high negative pore pressures develop during shearing of the soil in the laboratory (Ref 11) and these are not expected to develop to the same extent or remain for any long period of time in the field. In addition, as the soil dries out (desiccates), the soil contracts and shrinkage cracks form within the desiccated layer. This allows failure to occur on pre-formed failure planes and the full undrained strength of the soil is not developed. For this situation, the available long term strength is closer to the residual strength (Ref 12).

In evaluating the shear strength to be used for the upper stratum, the typical shape of the stress-strain curves during failure of the sample was also considered. These curves are shown for each sample on pages C-271 through C-341 of Appendix C in Volume 2. The curves show a "brittle" soil which reaches its maximum strength at relatively low strain (2-5%), at which point the strength drops off fairly rapidly. This stratum will reach its maximum strength first with respect to the lower stratum, if subjected to the same strain.

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It should be noted however that the reduction in strength with increasing strain was noted primarily in the unconfined compression tests which represented the majority of available data. This strength reduction is partially caused by the lack of sample confinement inherent in the test.

Considering all of the above factors, a design shear strength of 550 psf is recommended for the upper stratum. This value is approximately one half the lower bound strength predicted from the laboratory tests. Values up to 1100 psf may be justified in some situations.

Comparing the above laboratory test results with the empirical shear strength values obtained by the Skempton procedure, the average undrained shear strength for the stratum would range between 250 psf, for a normally consolidated soil (Figure 28a), to 1,000 psf for an overconsolidated soil (Figure 28b). It should be noted, however, that the values of shear strength are influenced by the effective overburden or preconsolidation pressure substituted into the Skempton relationship. In reality, the shear strength for the upper stratum will be higher than that indicated in Figure 28a for a normally consolidated soil. This is primarily because of the influence of the

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shallow depth and the preconsolidated nature of this stratum. Since this stratum is cverconsolidated, the empirical shear strength value of 1,000 psf, as shown in Figure 28b, should be closer to the actual shear strength.

Although higher shear strengths were obtained from undrained shear strength testing, the higher values cannot be recommended because of the potential pre-formed failure planes and also the relatively high negative pore pressures that develop in testing but do not exist to the same degree in the field. Both of these tend to decrease the measured shear strength, although the amount of decrease cannot be adequately determined. Thus, a value of 550 psf is recommended primarily based upon the residual shear strengths obtained from unconsolidated-undrained shear strength testing and the results of triaxial testing.

6.2.5.2 Middle Stratum

The middle stratum has been found to be the weakest stratum at this site. Undrained shear strengths based on laboratory test results range from 300 to 1,000 psf with the most predominant value being 550 psf. Unlike the upper stratum, the stress-strain curves for this stratum typically peak at

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low strains (about 2%) with only a slight reduction in strength at higher strains. As shown in Figure 25, the shear strength from test results can be taken as approximately constant with depth at 550 psf over the range of 20 to 50 feet. This value is recommended for design. The strength of 550 psf was found to be within the range obtained from the Skempton's relationship utilizing both the effective overburden pressure and preconsolidation pressure (Figure 28a and b, respectively).

If normally consolidated conditions are assumed as shown in Figure 28a, the resulting shear strength is very nearly equal to that obtained by laboratory testing. The figure shows a gradual increase in shear strength with depth ranging from about 400 psf at a depth of 20 feet to about 650 psf at a depth of 50 feet. This increase is imposed by the nature of Skempton's relationship and should be expected for normally consolidated clays if perfect samples are obtained. The laboratory results do not show this trend, and this is an indication of sample disturbance. A slightly higher shear strength is obtained when the preconsolidation pressures are used as shown in Figure 28b: the average shear strength decreases from 900 psf at a depth of 20 feet to 800 psf at a depth of 50 feet. This reduction in strength

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with depth is caused by the reduction in preconsolidation pressure determined from consolidation testing.

6.2.5.3 Lower Stratum

The lower stratum can be taken as beginning at a depth of approximately 50 feet and extending to bedrock at depths ranging from approximately 125 to 145 feet. This stratum may be further subdivided into two layers as far as the undrained shear strength is concerned.

6.2.5.3.1 Layer From 50-90 Feet

As shown in Figure 25, distinctly higher shear strengths were obtained from depths of 50 to 90 feet. The soils in this layer are considered to be moderately overconsolidated. Comparing the natural moisture content and dry unit weight in this layer with the layer below, the natural moisture content did not decrease significantly with increasing depth nor did the dry unit weight increase significantly with increasing depth. Thus, it is possible that this layer was also preconsolidated by desiccation, although the trend in

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shear strength variation with depth does not provide enough evidence to conclude this.

A fairly wide range of laboratory shear strengths was obtained as shown in Figure 25. These values ranged from about 500 to 3,000 psf with approximately two-thirds of the data ranging between 500 and 1,500 psf and the other third between 1,500 and 3,000 psf. The most predominant value between 500 and 1,500 psf was 1,000 psf. As shown in Figure 28, the estimated shear strength at a depth of 50 feet, based on the Skempton statistical procedure, was found to be either 650 or 850 psf, depending on whether normally consolidated or overconsolidated conditions are assumed. Both procedures give a shear strength of approximately 1,000 psf at a depth of 90 feet.

Typical stress-strain curves for soils between 50 and 90 feet either remain constant with strain near the peak stress or drop somewhat as can be seen on pages C-271 thru C-341 of Appendix C in Volume 2. However the drop in stress occurred at a higher strain in the range of 10-12%.

Considering the higher strain at which the peak soil strength occurs and not discounting completely the lower

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shear strengths as predicted by the Skempton procedure, the shear strength of 1,000 psf is recommended for this layer.

6.2.5.3.2 Soils Below 90 Feet

Indications are this layer is normally to very slightly overconsolidated. Based upon the laboratory test results, the shear strength in this layer ranges between 500 and 1,500 psf with an average of approximately 850 psf. The decrease in undrained shear strength, as compared to the layer above, was also noted in the laboratory test results obtained from the previous investigations. Figure 26 shows values of shear strength between 200 and 1,000 psf with an average of 600 psf.

Comparison of the strength predicted from Skempton's equation (Figure 28) and the strength data in Figure 25 shows that the upper bound of the laboratory strength (1,500 psf) is close to the strength predicted by the Skempton equation. However, it should be noted that in this case, the Skempton procedure is alsc influenced by the greater depth (the actual value of the effective vertical pressure), and it is possible that the actual shear strength may be lower than predicted by this method.

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The actual shear strength reduction associated with the soil below 90 feet may be due to several causes, the most plausible of which is sample disturbance. This was borne out by running both undisturbed and remolded unconfined compression tests (at the same moisture content and dry density) on the same sample, see Tables 2 and 3. The ratio between these two tests (undisturbed strength divided by remolded shear strength) is called sensitivity. These tables show that the sensitivity of the site soils was generally between 1.0 and 1.5. This is another indication that, but not necessarily a conclusion that, the samples have been disturbed.

One additional consideration in explaining the reduced strengths at great depths is the amount of sand present (Figures 21, 22, and 23). This could cause a reduction of the laboratory strength in unconfined compression tests.

Since the standard penetration blowcounts do not decrease within this depth (Figure 17), and the Skempton empirical relationship shows a high strength, the average strength of 850 psf obtained from laboratory tests is considered conservative and is recommended for the soils below 90 feet.

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6.2.6 Shear Strength From $\overline{CU}$ Tests

The long term (drained) shear strength has been determined by consolidated-undrained triaxial tests with pore pressure measurements. In addition to the Mohr-Coulomb envelopes for total and effective stresses, the deviator stress, effective stress ratio, change in pore pressure, and Skempton's A parameter have also been plotted versus strain and are included in Appendix C of Volume 2. The failure criteria presented was based on the peak deviator stress. If a maximum stress ratio failure criteria is desired, it can be readily obtained.

In order to evaluate the total and effective stress parameters, the stress point or "p-q" diagram as suggested by Lambe and Whitman (Ref 13) has been used. These diagrams are shown in Figures 29 and 30 for total and effective stress parameters, respectively. These figures show that the "p-q" diagram for effective and total stress can be idealized by two straight lines intersecting at a pressure corresponding to a depth in the range of 55 to 62 feet. This depth also corresponds to the division between the middle and lower stratum. The "p-q" diagrams are used to calculate the effective and total stress parameters required

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to determine shear strength from the Mohr-Coulomb relationships (Ref 13).

The Mohr-Coulomb relationship for effective stresses is given by:

$$\tau = c' + \sigma' \tan \phi' \qquad (2)$$

Where τ = drained shear strength

σ' = effective normal stress on failure plane at failure

c' = cohesion intercept for effective stresses

ϕ' = angle of internal friction for effective stresses,

and the Mohr-Coulomb relationship for total stresses is given by:

$$S = c + \sigma \tan \phi \qquad (3)$$

where S = shear strength

σ = total normal stress on failure plane at failure

c = cohesion intercept for total stresses

ϕ = angle of internal friction for total stresses.

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Recommended values of effective and total stress parameters for each stratum are given below:

	Total Stress Basis		Effective Stress Basis	
Depth (Ft)	ϕ	c (PSF)	ϕ'	c' (PSF)
0-20	13°	450	28°	0
20-50	13°	450	28°	0
50+	10°	700	22°	250

6.2.7 Tangent Modulus of Elasticity

The initial modulus of elasticity has been plotted versus depth on Figure 31 for all of the undrained shear strength tests. Although there is some scatter, a reasonable design value can be determined for each of the three strata. These values are given below and are further discussed in this section.

Stratum	Depth (ft)	Undrained Tangent Modulus E (ksf) Effective Range	Average	Design Values
Upper	0-20	100-200	175	700
Middle	20-50	25-120	65	330
Lower	50+	25-240	100	550

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It has been found that for settlement calculations the values obtained from undrained shear strength tests should be increased by a factor of four to five to give results that agree with measured settlements (Ref 13). The lower measured test values can be attributed to sample disturbance. Bjerrum (Ref 14) has suggested that the modulus can be obtained by multiplying the undrained shear strength by a factor of 400 to 600. However, for this site, the ratio E/S_u has been found to be approximately 100 for all of the soils tested, except the middle stratum which showed a slightly higher ratio of approximately 140. Therefore, the values of E/S_u obtained in this investigation are apparently lower by a factor of four to six than what would be generally expected. Both the modulus of elasticity and the undrained shear strength are apparently lower, with the greater reduction in the modulus of elasticity.

Therefore, an increase in the modulus of elasticity from test results by a factor of as high as four to five is justified in the average modulus of elasticity values as determined from the undrained shear strength tests. Based on this criteria, and the corresponding criteria of 400 to 600 times the undrained shear strength, initial static modulus of elasticity values of 700, 330, and 550 ksf are

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recommended for the upper, middle, and lower strata, respectively.

6.2.8 Consolidation

6.2.8.1 Preconsolidation Pressure

Figure 32 shows the variation of preconsolidation pressure with depth as determined by Casagrande's Procedure. Samples believed to be relatively disturbed based on the shape of the consolidation curve have been designated with a different symbol in Figure 32. Also included in this figure is a plot of moisture content with respect to Atterberg limits versus depth for all of the consolidation tests to assist in estimating the degree of overconsolidation. A natural moisture content near the plastic limit indicates an overconsolidated soil, whereas a natural moisture content near the liquid limit indicates a normally consolidated soil. These data are shown on the left side of Figure 32 for each of the consolidation test results presented. This figure shows the subsurface soils at this site are preconsolidated to some degree, for their entire depth.

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To help determine a design preconsolidation pressure, Skempton's procedure has also been used to estimate the preconsolidation pressure from the plasticity index and the unconfined and unconsolidated-undrained compression tests. This interpretation is shown in Figure 33.

As shown in Figure 32, almost all of the soils at this site, with the exception of the upper stratum soils (0-20 feet) and soils from 50 to 90 feet, can be considered normally to slightly overconsolidated for design purposes. This is because of the relatively slight overconsolidation shown by consolidation tests.

The soils from 0 to 20 feet (upper stratum) have been preconsolidated by desiccation. This judgement is based primarily on the general decrease in shear strength with depth as shown in Figure 25 as opposed to soils preconsolidated by either glaciation or preloading which will have shear strengths increasing with depth.

The design preconsolidation pressure for the upper stratum has been determined by drawing the precompression line along the lower bound of preconsolidation pressure as determined by consolidation test results. This is nearly parallel to

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and slightly lower than the preconsolidation line as determined by the Skempton prccedure (Figure 33).

Preconsolidated soils were also noted between 50 and 90 feet based on consolidation tests and the Skempton equation (Figures 32 and 33). This is also the depth range in which higher undrained shear strengths were obtained from laboratory tests (Figure 25). Although it cannot be said conclusively, it appears that the soil from 50 to 90 feet was also preconsolidated by desiccation as with the upper stratum rather than by glaciation. Since the soils below 90 feet appear to be only slightly overconsolidated at the most, desiccation appears to be the most plausible explanation for the preconsolidation.

Considering the scatter in the preconsolidation pressure based on Casagrande's Method and the predicted preconsolidation pressure based on Skempton's relationship, the recommended design curve for preconsolidation pressure is as shown in Figure 33.

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6.2.8.2 Settlement Parameters

The compression index (C_c), swelling index (C_r), initial void ratio (e_o) and the settlement parameter ($C_c/1+e_o$) all versus depth are shown in Figures 34, 35, 36, and 37. The range of values is small enough that a constant value can be used throughout each major stratum, and the design curves shown are drawn to reflect this. Presented below are the ranges and recommended design values for the various parameters.

Depth (ft)	C_c Range	C_r Range	e_o Range
0-20	0.14-0.16	0.05-0.07	0.65-0.80
20-50	0.33-0.45	0.09-0.10	0.72-1.10
50+	0.18-0.41	0.05-0.08	0.60-1.00

Depth (ft)	$C_c/1+e_o$ Range	$C_c/1+e_o$ Design	$C_r/1+e_o$ Design
0.20	0.10-0.15	0.13	0.04
20-50	0.15-0.24	0.20	0.04
50+	0.11-0.21	0.14	0.04

Values of the compression index (C_c) and the swelling index (C_r) are plotted versus liquid limit, for the soils tested, in Figure 38. The soils from the upper stratum are

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identified with different symbols because of the overconsolidation of this stratum. The empirical relationship:

$$C_c = 0.009\ (LL - 10) \tag{4}$$

and the plus or minus 30 percent upper and lower bounds suggested by Terzaghi and Peck (Ref 12) are superimposed in Figure 38. The compression index values (C_c) measured in this investigation compare favorably with the empirical relationship. The data for the upper stratum fall around the lower bound of this relationship, as should be expected because of the overconsolidation.

Similar results were obtained for the swelling index (C_r) values. Based on the data in Figure 38, the relationship between swelling index and liquid limit for the soils tested can be expressed by the equation:

$$C_r = 0.002\ (LL - 2.5)\,. \tag{5}$$

Figure 38 also shows an upper and lower bound representing a variation of plus or minus 30 percent from the above relationship. It was found that these lines represent good upper and lower bounds for the data.

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6.2.8.3 Coefficient of Consolidation

Figure 39 shows values of the coefficient of consolidation (C_v) versus pressure for the three major strata. The relationship between C_v and the logarithm of pressure is represented by a band and an average curve for each stratum as shown in the figure. These bands and average curves conform to the general relaticnship presented by Lambe (Ref 15). As shown in the figure, the effective range of the coefficient of consolidation is 0.05 to 0.25 square feet per day for all samples tested over the pressures involved. An overall average of 0.15 square feet per day is recommended for design.

6.2.9 Permeability

Constant head permeability tests were performed on samples of silty clay taken from depths ranging from 20 to 90 feet. All samples were saturated in a triaxial cell by back pressure and tested at a confining pressure approximately equal to the effective overburden pressure. The coefficient of permeability was found to range from 1.6×10^{-8} cm/sec to 2.6×10^{-8} cm/sec for void ratios between 0.4 and 0.9. Thus, for any engineering analysis, an average permeability

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of 2 x 10^{-8} cm/sec may be used for the silty clays found at this site.

6.2.10 Compaction

The results of all laboratory compaction tests are shown in Figure 40. The tests were performed on samples from the upper stratum and the results grouped according to soil type. Since the soils below this depth are soft to very soft, only the upper stratum is expected to be used for fill material. The zero air void curves (100% saturation) were plotted assuming specific gravities of 2.70 and 2.75. The two diagrams on the left side of the figure (CL and CH soils) show results from samples taken northwest of the plant site near the intersection of King and Puttygut roads. This is within the proposed fly ash disposal area and is a potential borrow area for the remainder of the plant. The diagram on the right side of this figure (CL-CH soils) shows results from samples taken in the vicinity of the proposed main coal pile.

Since the most predominant natural moisture content for the upper stratum soils is about 26%, this indicates that on the order of 10% to 16% reduction in moisture content will be

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necessary to compact these soils to the maximum dry density, and approximately 6% to 10% reduction will be necessary to obtain 95% of the maximum. Because of the relatively large amount of drying required, compaction of these soils will be difficult.

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7.0 SUMMARY AND CONCLUSIONS

An extensive subsurface investigation program was conducted at the Belle River Project site. The investigation consisted of geologic studies, ground water measurements, soil/rock borings, and laboratory soil testing, along with an evaluation of previous investigations at the site. The subsurface investigation was directed at confirming the suitability of the site and providing generalized soil parameters and information for design of the various plant facilities.

The investigation showed that:

a. Geologic and subsurface soil conditions at the site are suitable for the development of the site.

b. Ground water information, based on four observation wells monitored for a period of one year, have been accumulated and presented.

c. The soil parameters for design and construction evaluations have been developed in the report and are further summarized in the Tables. The

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results are considered to be conservative and are applicable for the entire site. Soil boring logs showing the pertinent soil parameters are also presented in Appendix B.

Depending on the engineering problem under consideration, localized and more extensive evaluations or investigations may be required to expand upon the available information.

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TABLES

TABLE 1

GAS ENCOUNTERED IN DRILL HOLES

Drill Hole No	Depth to Gas Infiltration (ft)	Soil Type	Remarks
12	118.0	Sand	Bubbles in drill fluid, gas dissipated after 24 hours, no odor
20	136.0	Sand	Bubbles in drill fluid, gas dissipated after 24 hours, no odor
30	50.0	Clay	Bubbles in drill fluid, gas dissipated after 48 hours, no odor
50	98.0	Clay	Bubbles in grout after pulling casing, gas dissipated after 24 hours, no odor
52	70.5	Sand	Bubbles in grout after pulling casing, gas dissipated after 24 hours, no odor
59	124.5	Silt	Bubbles in drill fluid, gas dissipated after 24 hours, no odor
131	104.0	Sand	Drill fluid ejected several feet above drill hole, gas dissipated after 6 hours, no odor

TABLE 2

UNCONFINED COMPRESSION TEST RESULTS

UNDISTURBED SAMPLES

BORING & SAMPLE NUMBER	DEPTH (FEET)		UNIFIED SOIL CLASSIFICATION	PARTICLE SIZE ANALYSIS % FINER THAN							SPECIFIC GRAVITY	ATTERBERG LIMITS			NATURAL CONDITIONS			UNCONFINED COMPRESSION TEST RESULTS				REMARKS
	FROM	TO		4	10	20	40	100	200	2μ		LL	PL	PI	W_o %	γ_d PCF	γ_t PCF	S_u PSF	E 10^3 PSF	ε %	E/S_u ——	
15/4	8.6	8.9	CL									44	19	25	32	93	123	1257	156	6.0	127	
15/6	18.1	18.4	CL									42	20	22	34	87	117	508	25	15.0	69	
15/14	59.2	59.6	CL									34	18	16	23	104	128	1067	31	15.2	36	
25/1	4.5	4.8	CH									59	23	36	22	108	132	3456	174	5.0	50	
26/9	39.4	39.7	CL									38	20	18	37	86	118	445	67	1.6	151	
26/17	78.2	78.5	CL									36	20	16	25	101	126	580	22	12.0	38	Sandy
27/4	8.6	8.9	CL-CH									51	23	28	31	94	123	1722	58	15.0	34	
28/3	5.8	6.1	CL									47	23	24	25	100	125	1981	222	4.0	112	
28/9	28.8	29.1	CL									42	20	12	38	84	116	425	57	7.0	134	
38/3	8.7	9.0	CL-CH	--	--	--	--	--	97	61	2.70	49	24	25	24	102	126	2122	267	3.0	126	
38/4	14.3	14.6	CL-CH	--	--	--	--	--	97	61	2.71	46	22	24	29	96	124	1505	125	4.0	83	
38/12	54.2	54.5	CL-CH	--	--	--	--	--	98	55	2.70	44	21	23	33	90	120	985	105	5.0	107	
38/16	73.7	74.0	CL-CH	--	--	--	--	--	97	63	2.72	55	24	31	41	79	111	703	41	4.8	58	
38/18	84.6	84.9	CL	--	--	--	--	--	97	47	2.70	33	19	14	22	104	127	603	33	14.0	55	Gravelly
38/24	114.2	114.5	CL	--	--	--	--	--	99	61	2.70	45	25	20	32	92	121	500	63	6.0	126	
41/2	4.5	4.8	CH	--	--	--	--	--	98	63	2.70	63	28	35	29	94	121	1024	143	5.0	140	
41/7	20.6	20.9	CL-CH	--	--	--	--	--	99	57	2.66	47	24	23	39	83	115	338	357	3.0	1056	
41/9	30.9	31.2	CL-CH									45	21	24	37	86	118	697	67	15.0	96	
41/11	40.6	41.0	CL-SC	--	92	86	80	68	58	17	2.70	20	12	8	16	118	137	647	25	15.0	39	Sample slightly disturbed.
41/23	101.8	102.1	CL	--	--	--	--	--	95	47	2.70	34	20	14	26	99	125	534	67	10.0	125	Sandy
41/29	130.7	131.0	GC-SC	--	96	90	80	65	57	23	2.69	25	17	8	14	124	141	1749	154	8.0	88	
48/2	3.2	3.5	CH									63	24	39	27	97	123	1466	137	3.2	93	
48/14	61.2	61.5	CL									34	16	18	25	100	125	745	22	15.0	30	Sandy
49/4	24.0	24.3	CL									42	22	20	34	90	121	1028	69	6.0	67	
																						Sheet 1 of 3

TABLE 2

UNCONFINED COMPRESSION TEST RESULTS

UNDISTURBED SAMPLES

BORING & SAMPLE NUMBER	DEPTH (FEET)		UNIFIED SOIL CLASSIFICATION	PARTICLE SIZE ANALYSIS % FINER THAN							SPECIFIC GRAVITY	ATTERBERG LIMITS			NATURAL CONDITIONS			UNCONFINED COMPRESSION TEST RESULTS				REMARKS
	FROM	TO		4	10	20	40	100	200	2μ		LL	PL	PI	W_o %	γ_d PCF	γ_t PCF	S_u PSF	E 10^3 PSF	ε %	E/S_u ——	
49/9	73.9	74.3	CL									33	22	11	26	100	126	2254	100	15.0	36	Sandy
50/6	29.3	29.7	CH-CL	--	--	--	--	--	97	53	2.70	51	18	33	46	75	110	197	45	2.4	228	
50/8	38.9	39.2	CH									55	23	32	51	70	106	550	113	2.0	205	
50/10	49.0	49.3	CL	99	96	94	92	86	81	37	2.70	36	16	20	24	99	123	526	39	15.0	74	Sandy
50/12	58.6	58.9	CL									39	18	21	26	99	125	1007	200	9.0	199	
50/16	78.6	78.9	CL									39	20	19	28	95	122	1270	161	10.0	127	
52/3	20.5	20.9	CL-CH									49	20	29	30	92	120	2737	263	4.0	96	
52/4	28.6	28.9	CL									35	18	17	32	94	124	489	61	9.0	125	
52/6	49.2	49.5	CL-ML									22	18	4	25	100	125	317	100	2.5	315	
52/7	59.0	59.3	CL	97	94	87	83	72	58	16	2.70	23	14	9	13	116	131	1798	150	6.0	83	Sandy
52/8	68.2	68.5	CL									24	14	10	14	115	131	1676	133	13.0	79	Sandy
52/10	88.6	88.9	CL									39	18	21	27	97	123	2435	230	8.0	94	Sandy
53/3	19.6	19.9	CL-CH									49	20	29	32	88	116	1155	172	5.0	149	
53/4	29.6	29.9	CL-CH									49	22	27	40	80	112	1006	200	5.0	199	
53/6	49.2	49.5	CL									43	18	25	28	94	120	561	65	15.0	116	
53/9	80.1	80.4	CL									39	21	18	26	99	125	1275	182	6.0	143	
54/5	59.3	59.6	CL									38	17	21	26	99	125	557	114	11.0	205	Sandy
54/7	68.5	68.8	CL									37	18	19	26	98	123	788	58	8.9	74	Sandy
59/3	18.8	19.1	CL-CH									48	20	28	33	90	120	1056	107	6.9	101	
59/5	38.7	39.0	CL									38	18	20	26	99	125	625	104	14.9	166	Sandy
59/7	58.6	58.9	CL									36	18	18	26	98	123	835	200	8.0	240	Sandy
60/3	17.6	18.0	CL	--	--	--	--	--	98	52	2.70	39	21	18	24	105	130	1143	26	15.0	23	
60/5	25.6	25.9	CH									51	22	29	37	86	118	1001	143	4.0	143	
60/6	30.5	30.8	CL-CH									48	25	23	35	88	119	3153	222	3.7	141	
																						Sheet 2 of 3

TABLE 2

UNCONFINED COMPRESSION TEST RESULTS

UNDISTURBED SAMPLES

BORING & SAMPLE NUMBER	DEPTH (FEET)		UNIFIED SOIL CLASSIFICATION	PARTICLE SIZE ANALYSIS % FINER THAN							SPECIFIC GRAVITY	ATTERBERG LIMITS			NATURAL CONDITIONS			UNCONFINED COMPRESSION TEST RESULTS				REMARKS
	FROM	TO		4	10	20	40	100	200	2μ		LL	PL	PI	W_o %	γ_d PCF	γ_t PCF	S_u PSF	E 10^3 PSF	ε %	E/S_u ——	
60/8	40.6	41.0	CL									47	25	22	40	83	116	337	50	3.0	148	
60/10	50.9	51.2	CL									34	16	18	26	100	126	1255	75	15.0	60	
60/11	55.6	56.0	CL	95	89	86	84	79	76	34	2.70	33	18	15	25	103	129	1299	133	15.0	102	Sandy
60/14	75.1	75.4	CL									40	20	20	27	97	123	651	71	5.0	109	
60/19	100.1	100.4	CL									38	20	18	27	101	128	1131	100	7.0	88	Sandy
60/23	119.6	120.0	CL-ML	--	94	90	86	71	61	18	2.70	17	11	6	15	115	132	335	55	6.0	164	Sandy
101/2	8.9	9.2	CL-CH									50	22	28	28	96	123	1828	200	2.4	109	
101/4	19.6	20.2	CL-CH									49	24	25	36	86	117	1014	75	6.0	74	
101/7	34.9	35.2	CL-CH									46	24	22	40	81	113	795	55	2.4	76	
101/10	50.1	50.4	CL-CH									40	22	18	33	90	120	722	71	5.0	89	
101/13	65.2	65.6	CL									36	19	17	27	97	123	1337	43	15.0	32	
101/17	85.2	85.5	CL									37	19	18	25	97	121	1923	102	15.0	53	Sandy
119/9	81.6	81.9	CL									33	20	13	21	107	129	3072	111	15.0	36	Sandy
126/3	8.2	8.6	CL-CH									47	24	23	26	99	125	1725	208	2.4	121	
136/4	8.8	9.2	CL-CH									48	22	26	24	102	126	5446	769	3.0	141	
144/4-1	8.5	8.8	CL-CH									48	21	27	26	97	122	861	192	1.7	223	
144/4-2	8.9	9.2	CL-CH									48	21	27	24	99	123	1002	119	3.0	119	
185/3	7.5	7.8	CL-CH									50	23	27	24	104	129	2947	400	4.0	136	
185/7	18.5	18.8	CL-CH									49	22	27	39	81	113	831	94	2.4	113	
																						Sheet 3 of 3

TABLE 3

UNCONFINED COMPRESSION TEST RESULTS

REMOLDED AND COMPACTED SAMPLES

BORING & SAMPLE NUMBER	DEPTH (FEET)		UNIFIED SOIL CLASSIFICATION	PARTICLE SIZE ANALYSIS % FINER THAN							SPECIFIC GRAVITY	ATTERBERG LIMITS			PRE TEST CONDITIONS			UNCONFINED COMPRESSION STRENGTH TEST			REMARKS
															W_o	γ_d	γ_t	S_u	E	ϵ	
	FROM	TO		4	10	20	40	100	200	2μ		LL	PL	PI	%	PCF	PCF	PSF	10^3 PSF	%	
38/3	8.7	9.0	CL-CH	-	-	-	-	-	97	61	2.71	49	24	25	24	103	128	761	46	7.0	Remolded
38/18	84.6	84.9	CL	-	-	-	-	-	99	61	2.70	33	19	14	22	105	128	547	27	17.4	Remolded
41/2	4.5	4.8	CH	-	-	-	-	-	98	63	2.70	63	28	35	29	95	123	962	80	9.0	Remolded
60/3	17.6	18.0	CL	-	-	-	-	-	98	52	2.70	39	21	18	24	103	128	1,052	13	15.0	Remolded
60/11	55.6	56.0	CL	95	89	86	84	79	76	34	2.70	33	18	15	25	103	129	817	13	15.0	Remolded
127/3	5.6	7.0	CL-CH									49	22	27	14	113	129	9,403	869	3.2	Compacted (97% ASTM D1557)
136/6	13.0	14.6	CL									43	22	21	18	100	118	2,773	400	2.0	Compacted (89% ASTM D1557)
141/2	8.0	10.0	CL-CH									49	23	26	18	103	122	5,558	592	2.0	Compacted (90% ASTM D1557)
144/4	8.0	10.0	CL-CH									-	-	-	24	100	124	1,482	58	15.0	Remolded
146/7	14.0	16.1	CL									46	22	24	17	104	122	3,282	484	2.0	Compacted (85% ASTM D1557)
158/2	7.5	9.7	CL-CH									50	21	29	17	104	122	3,416	481	2.0	Compacted (87% ASTM D1557)

NOTE: Remolded samples run at same dry density and water content as undisturbed samples.

TABLE 4

LABORATORY VANE SHEAR TEST RESULTS

BORING & SAMPLE NUMBER	DEPTH (FEET)		UNIFIED SOIL CLASSIFICATION	ATTERBERG LIMITS			PRETEST CONDITIONS			UNDRAINED STRENGTH UNDISTURBED		UNDRAINED STRENGTH REMOLDED		SENSITIVITY	REMARKS
							W_o	γ_d	γ_t	COHESION	ANGLE OF ROTATION	COHESION	ANGLE OF ROTATION	UNDISTURBED STRENGTH DIVIDED BY REMOLDED STRENGTH	
	FROM	TO		LL	PL	PI	%	PCF	PCF	PSF	DEGREES	PSF	DEGREES		
50/6	28.1	28.3	CL	39	18	21	35	82	111	479	8	178	7	2.7	
50/10	48.1	48.4	CL	36	16	20	26	96	121	520	32	480	52	1.1	
52/4	28.9	29.2	CL	35	18	17	31	89	117	560	10	266	7	2.1	
52/6	49.6	49.8	CL	-	-	-	24	101	125	2,165	30	-	-	-	
52/10	89.1	89.4	CL	39	18	21	26	96	121	1,660	15	1,525	51	1.1	
53/6	49.7	50.0	CL	43	18	25	27	94	119	520	13	312	40	1.2	
53.9	79.5	79.8	CL	39	21	18	28	95	122	1,375	22	-	-	-	
54/5	59.7	60.0	CL	38	17	21	28	92	118	1,200	54	-	-	-	
59/3	18.5	18.8	CL-CH	48	20	28	33	90	120	1,250	15	-	-	-	
59/5	39.4	39.7	CL	38	18	20	26	96	121	640	15	-	-	-	
59/7	59.0	59.3	CL	36	18	18	24	102	127	735	22	-	-	-	

TABLE 5

UNCONSOLIDATED-UNDRAINED TRIAXIAL TEST RESULTS
UNDISTURBED SAMPLES

BORING & SAMPLE NUMBER	DEPTH (FEET)		UNIFIED SOIL CLASSIFICATION	ATTERBERG LIMITS			NATURAL CONDITIONS			UNCONSOLIDATED UNDRAINED STRENGTH TEST					REMARKS
							W_o	γ_d	γ_t	σ_o	S_u	E	ϵ	E/S_u	
	FROM	TO		LL	PL	PI	%	PCF	PCF	PSF	PSF	10^3 PSF	%	——	
15/2	3.7	4.1	CL	45	21	24	25	101	126	475	2386	240	8.0	101	
18/3	20.6	20.9	CL	44	21	23	40	83	116	2448	410	150	4.0	366	
18/6	51.4	51.7	CL	39	18	21	31	92	121	4104	827	100	3.0	121	
18/10	88.8	90.1	CL	29	15	14	17	111	130	6336	2862	240	15.0	84	Sandy
25/10	88.9	89.2	CL	36	19	17	23	104	128	6192	2213	162	11.0	73	
27/2	4.5	4.8	CL-CH	48	24	24	24	103	129	576	2099	121	8.0	58	
41/17	72.9	73.2	CL	25	15	10	20	105	126	8654	453	21	14.0	46	Sandy
48/14	60.8	61.1	CL	34	16	18	26	99	125	4608	746	36	15.0	48	Sandy
50/8	38.1	38.4	CH	55	23	32	46	74	108	3456	643	75	4.0	117	
50/10	49.3	49.6	CL	36	16	20	23	100	123	4320	721	73	15.0	101	Sandy
50/12	59.1	59.4	CL	39	18	21	24	101	125	4608	1132	218	10.0	193	Sandy
52/3	21.2	21.5	CL-CH	49	20	29	31	92	121	2016	1590	157	8.0	99	
52/8	69.0	69.4	CL	24	14	10	16	111	129	5184	1890	127	15.0	66	Sandy
52/9	78.6	78.9	CL	35	18	17	22	105	128	5760	1156	130	14.0	112	
52/12	109.3	109.6	CL	46	22	24	36	87	118	7632	1586	230	3.0	145	
53/3	20.1	20.4	CL-CH	49	20	29	32	91	120	2405	1425	176	8.9	124	
53/4	30.1	30.4	CL-CH	49	22	27	34	88	118	3024	972	200	2.4	206	
54/4	53.2	53.5	ML-CL	21	17	4	24	99	123	4320	533	54	15.0	101	
54/5	59.0	59.3	CL	38	17	21	25	99	124	4464	767	35	15.0	46	Sandy
54/6	63.1	63.4	CL	36	18	18	26	98	123	5040	796	100	13.0	126	Sandy
54/7	68.8	69.1	CL	37	18	19	26	98	123	5112	1148	142	12.0	124	Sandy
101/15	74.6	74.9	CL	36	21	15	23	105	129	5328	1054	44	15.0	42	Sandy
101/19	94.9	95.3	CL	36	20	16	25	100	125	6480	547	32	15.0	59	
101/23	119.8	120.2	CL	44	22	22	37	85	116	7920	721	70	8.0	97	
															Sheet 1 of 2

TABLE 5

UNCONSOLIDATED-UNDRAINED TRIAXIAL TEST RESULTS

UNDISTURBED SAMPLES

BORING & SAMPLE NUMBER	DEPTH (FEET)		UNIFIED SOIL CLASSIFICATION	ATTERBERG LIMITS			NATURAL CONDITIONS			UNCONSOLIDATED UNDRAINED STRENGTH TEST					REMARKS
							W_o	γ_d	γ_t	σ_o	S_u	E	ε	E/S_u	
	FROM	TO		LL	PL	PI	%	PCF	PCF	PSF	PSF	10^3 PSF	%	——	
126/11	49.1	49.4	CH	59	25	34	41	81	114	4032	498	50	4.0	100	
126/23	108.6	108.9	CL	36	20	16	25	96	120	7200	1344	60	15.0	45	
129/3	8.7	9.0	CL-CH	48	23	25	22	108	132	1080	3381	250	6.0	74	
129/15	74.0	74.3	CL	36	21	15	25	101	126	5760	954	62	7.0	65	
129/24	124.1	124.4	CL-CH	46	22	24	31	95	124	7920	679	30	8.0	44	
151A/3	13.0	13.3	CL-CH	48	20	28	28	95	122	1555	2325	167	10.0	72	

Sheet 2 of 2

TABLE 6

CONSOLIDATED-UNDRAINED TEST RESULTS

UNDISTURBED SAMPLES

BORING & SAMPLE NUMBER	DEPTH (FEET)		UNIFIED SOIL CLASSIFICATION	ATTERBERG LIMITS			NATURAL CONDITIONS			CONSOLIDATION CONDITIONS	CONDITIONS AFTER CONSOLIDATION		CONSOLIDATED UNDRAINED STRENGTH TEST			SKEMPTON'S $\frac{A}{}$ PARAMETER (FINAL)	SHEAR STRENGTH PARAMETERS			
																	TOTAL STRESS		EFFECTIVE STRESS	
							W_o	γ_d	γ_t	$\bar{\sigma}_3$	W_f	γ_{tf}	E	$(\sigma_1-\sigma_3)^1$	E/S_u		ϕ	C	ϕ'	C'
	FROM	TO		LL	PL	PI	%	PCF	PCF	PSF	%	PCF	10^3 PSF	PSF	——		deg.	PSF	deg.	PSF
18/12	108	110	CL	46	22	24	35	87	117	3,744	33.7	116	316	3,900	161	0.28	10	900	22	300
							31	92	120	7,488	29.3	119	400	5,200	154	0.68				
							31	92	120	15,120	27.7	117	1,500	8,170	367	1.04				
26/2	3.5	5.5	CL-CH	53	24	29	23	104	127	360	27	132	225	2,200	204	0.15	34	350	27	320
							24	103	128	691	27	131	346	3,450	200	0.19				
							22	108	132	1,296	25	135	450	4,800	187	0.20				
26/5	18	20	CL-CH	--	--	--	35	89	120	1,080	31	116	125	1,350	185	0.23	16	250	27	50
							35	86	116	2,160	31	113	273	1,680	325	0.72				
							36	86	117	5,040	28	110	500	4,350	230	0.56				
26/11	48	50	CL	41	21	20	36	88	120	2,304	34	118	250	1,790	279	0.57	9	400	24	0
							37	86	118	4,608	23	106	666	2,440	546	1.11				
							30	93	121	9,216	24	115	666	4,410	302	1.34				
33/7	28	30.5	CL	46	22	24	39	82	114	1,440	37	112	300	1,480	405	0.39	10	300	24	0
							40	82	115	2,880	37	112	750	1,930	776	0.77				
							38	84	116	5,760	32	111	500	3,040	328	1.17				
33/9	38.0	40.5	CL	43	23	20	37	83	114	7,200	36	113	175	1,600	110	0.51	9	400	22	150
							37	85	116	7,200	34	114	300	2,160	277	0.93				
							36	86	117	12,960	31	113	300	3,320	180	1.31				
48/6	18.0	20.0	CL-CH	47	25	22	33	90	120	1,152	32	119	166	1,860	179	0.05	9	700	21	300
							34	89	119	2,304	33	118	375	2,610	287	0.24				
							36	88	120	4,608	31	115	500	3,160	316	0.78				
48/22	98	100	CL	36	19	17	27	99	126	3,312	25	124	375	4,030	186	0.19	11	1050	25	0
							26	96	121	6,624	24	119	666	5,760	231	0.49				
							28	97	124	13,248	23	119	1,200	8,820	272	0.83				

ED_005947A_00014551-00201

TABLE 6

CONSOLIDATED-UNDRAINED TEST RESULTS
UNDISTURBED SAMPLES

BORING & SAMPLE NUMBER	DEPTH (FEET)		UNIFIED SOIL CLASSIFICATION	ATTERBERG LIMITS			NATURAL CONDITIONS			CONSOLIDATION CONDITIONS	CONDITIONS AFTER CONSOLIDATION		CONSOLIDATED UNDRAINED STRENGTH TEST			SKEMPTON'S A PARAMETER (FINAL)	SHEAR STRENGTH PARAMETERS			
																	TOTAL STRESS		EFFECTIVE STRESS	
							W_o	γ_d	γ_t	$\bar{\sigma}_3$	W_f	γ_{tf}	E	$(\sigma_1-\sigma_3)^1$	E/S_u		ϕ	C	ϕ'	C'
	FROM	TO		LL	PL	PI	%	PCF	PCF	PSF	%	PCF	10^3 PSF	PSF	——		deg.	PSF	deg.	PSF
49/6	43	45	CL-CH	53	22	31	44	78	112	1,872	42	111	158	1,840	172	0.46	9	500	22	200
							46	75	110	3,744	45	109	333	2,710	246	0.70				
							45	77	112	7,488	39	107	583	3,860	311	1.10				
49/13	113.0	115.0	CL	33	22	11	24	100	124	3,816	23	123	400	3,570	223	0.43	10	900	25	0
							29	95	123	7,632	27	121	666	4,850	274	0.87				
							29	93	120	15,264	24	115	857	8,260	207	1.16				
50/6	28.0	30.0	CL	39	18	21	33	88	117	1,440	32	116	250	1,680	296	0.32	11	450	26	100
							33	90	120	2,880	27	114	300	2,100	285	0.74				
							34	86	115	5,760	29	111	500	3,440	291	1.06				
50/18	88.0	90.0	CL	39	23	16	28	97	124	3,456	26	122	214	3,850	111	0.27	10	900	25	200
							28	97	124	6,912	26	122	461	5,180	178	0.69				
							28	96	123	13,824	23	118	461	7,980	115	1.01				
54/4	53.0	55.0	CL	31	18	13	23	102	125	4,320	21	123	500	4,040	247	0.42	15	450	26	0
							23	102	125	8,640	20	122	461	7,730	119	0.50				
							23	101	124	2,160	22	123	285	2,860	199	0.11				
							24	100	124	6,480	20	120	666	5,610	237	0.55				
52/6	48.0	50.5	ML	--	--	--	21	101	122	2,160	22	123	533	30,320	35	0.29	42	4,000	36	0
							23	99	122	4,320	22	121	1,000	35,020	57	0.24				
							22	104	127	8,640	22	127	1,000	55,550	36	0.18				
54/6	63.0	65.0	CL	36	18	18	26	98	123	2,448	26	123	166	2,730	122	0.30	11	700	25	150
							25	98	123	4,896	23	120	562	4,010	280	0.61				
							26	98	123	9,792	22	119	900	5,860	307	1.00				
60/2	8.0	10.0	CH	53	26	27	30	94	118	590	32	124	157	1,060	298	0.01	18	260	22	170
							29	95	123	1,152	31	124	273	1,750	301	0.09				
							29	96	124	2,304	30	125	375	2,670	280	0.16		Sheet 2 of 4		

TABLE 6

CONSOLIDATED-UNDRAINED TEST RESULTS

UNDISTURBED SAMPLES

BORING & SAMPLE NUMBER	DEPTH (FEET)		UNIFIED SOIL CLASSIFICATION	ATTERBERG LIMITS			NATURAL CONDITIONS			CONSOLIDATION CONDITIONS	CONDITIONS AFTER CONSOLIDATION		CONSOLIDATED UNDRAINED STRENGTH TEST			SKEMPTON'S A PARAMETER (FINAL)	SHEAR STRENGTH PARAMETERS			
																	TOTAL STRESS		EFFECTIVE STRESS	
							W_o	γ_d	γ_t	$\bar{\sigma}_3$	W_f	γ_{tf}	E	$(\sigma_1-\sigma_3)^1$	E/S_u		ϕ	C	ϕ'	C'
	FROM	TO		LL	PL	PI	%	PCF	PCF	PSF	%	PCF	10^3 PSF	PSF	——		deg.	PSF	deg.	PSF
Remolded							29	96	124	560	29	124	100	1,750	114	-0.18				
60/2	8.0	10.0	CH	53	26	27	29	99	128	1,152	26	125	187	2,490	150	0.10	19	450	27	125
							29	98	126	2,304	26	123	214	3,500	122	-0.04				
							30	94	122	1,296	31	123	102	2,780	73	-0.09				
60/4	21.0	23.0	CL	43	17	26	31	94	123	5,184	30	122	900	5,130	350	0.37	13	800	24	250
							31	95	124	2,016	30	123	281	3,180	177	0.07				
							27	99	126	2,016	26	125	500	2,530	394	0.24				
60/9	45.0	47.0	CL	38	16	22	27	98	124	4,032	26	123	321	2,990	214	0.72	10	600	25	100
							26	102	129	8,064	23	125	750	5,020	298	0.97				
							24	103	128	2,520	22	126	180	3,890	93	0.12				
							32	91	120	5,040	28	116	462	3,445	268	0.70				
60/13	67.0	69.0	CL-ML	40	19	21	20	104	125	10,080	18	123	923	8,120	227	0.56	13	1,000	25	0
							16	114	132	5,760	15	131	923	9,225	200	0.13				
							21	104	126	8,640	19	124	545	6,357	171	0.72				
							26	99	125	1,152	28	127	113	2,453	92	-0.05				
105/2	9.0	11.0	CL	46	24	22	27	96	122	2,304	28	123	389	4,381	177	-0.05	27	150	25	250
							28	98	125	864	29	126	250	2,377	210	-0.02				
							36	84	114	1,800	35	113	196	2,136	183	0.29				
105/5	40.0	42.5	CL	44	21	23	36	85	116	3,600	34	114	450	2,753	327	0.56	8	700	23	0
							35	85	115	7,200	31	111	900	3,660	491	1.13				
							39	84	117	7,200	33	112	643	3,803	169	1.12				
							28	95	122	576	29	122	245	1,773	138	0.00				
119/2	8.0	10.0	CL-CH	53	26	27	28	99	127	2,304	28	127	450	4,024	223	0.09	22	375	26	290
							29	94	121	1,440	30	122	245	2,481	99	0.17				

TABLE 6

CONSOLIDATED-UNDRAINED TEST RESULTS
UNDISTURBED SAMPLES

BORING & SAMPLE NUMBER	DEPTH (FEET)		UNIFIED SOIL CLASSIFICATION	ATTERBERG LIMITS			NATURAL CONDITIONS			CONSOLIDATION CONDITIONS	CONDITIONS AFTER CONSOLIDATION		CONSOLIDATED UNDRAINED STRENGTH TEST			SKEMPTON'S $\frac{A}{}$ PARAMETER (FINAL)	SHEAR STRENGTH PARAMETERS			
																	TOTAL STRESS		EFFECTIVE STRESS	
							W_o	γ_d	γ_t	$\bar{\sigma}_3$	W_f	γ_{tf}	E	$(\sigma_1-\sigma_3)^1$	E/S_u		ϕ	C	ϕ'	C'
	FROM	TO		LL	PL	PI	%	PCF	PCF	PSF	%	PCF	10^3 PSF	PSF	——		deg.	PSF	deg.	PSF
119/4	30.0	32.0	CL	41	22	19	37	86	118	1,512	35	116	333	1,970	333	0.24	8	700	26	50
							39	85	118	3,024	36	116	500	2,460	406	0.57				
							35	87	117	6,048	30	113	375	3,310	226	1.20				
129/5	18.0	21.0	CL-CH	48	21	27	34	90	121	1,152	33	120	136	2,200	123	-0.03	14	450	24	0
							32	90	119	4,608	--	--	346	4,170	165	0.42				
							33	90	120	2,304	32	119	750	2,550	588	0.26				
129/19	93.0	95.5	CL	41	21	20	24	99	123	3,240	22	121	187	3,035	123	0.45	13	500	26	0
							26	99	125	6,480	23	122	500	6,090	164	0.44				
							27	99	126	12,960	22	121	750	8,900	168	0.81				
141/4	18.0	20.0	CL	45	21	24	36	86	117	1,152	36	117	180	2,079	173	0.15	9	750	21	350
							36	87	118	2,304	35	117	818	2,780	587	0.29				
							*35/37	85/84	115/115	4,608/4,637	31/34	111/113	529/529	3,249/3,251	326/325	0.73/0.79				
158/4	17.5	20.0	CL	46	19	25	38	83	114	1,080	37	114	600	1,569	765	0.17	8	550	21	200
							34	87	117	2,160	32	115	214	1,942	220	0.51				
							37	83	114	4,320	33	110	428	2,593	330	0.95				
101,105 127,128 180,183 Combined Samples	2.0	10.0	CL-CH	--	--	--	15	113	130	1,008	21	137	150	4,261	70	-0.38	34	500	24	250
							16	114	132	2,016	19	136	210	7,531	56	-0.43				
							16	114	132	3,168	18	134	276	10,123	54	-0.39				

NOTES:
[1]At peak stress or at 15% strain, whichever is smaller.
* Two tests run on same sample. Second test run after rebounding first sample to original consolidation pressure.

TABLE 7

CONSOLIDATION TEST RESULTS

UNDISTURBED SAMPLES

BORING & SAMPLE NUMBER	DEPTH (FEET)		UNIFIED SOIL CLASSIFICATION	PARTICLE SIZE ANALYSIS % FINER THAN				SPECIFIC GRAVITY	ATTERBERG LIMITS			NATURAL CONDITIONS				P_c	C_c	C_r	SETTLEMENT PARAMETERS		REMARKS
												W_o	γ_d	γ_t	e_o				$\frac{C_c}{1+e_o}$	$\frac{C_r}{1+e_o}$	
	FROM	TO		40	100	200	2μ		LL	PL	PI	%	PCF	PCF	——	10^3 PSF	——	——			
27/10	34.0	34.5	CL					2.73	41	22	19	39	84	117	1.02	3.4	0.44	0.10	0.22	0.05	
27/24	104.2	104.5	CL					2.74	43	25	18	34	90	121	0.91	8.0	0.31	0.10	0.16	0.05	Silty Clay, Sandy
38/4*	14.6	14.7	CL-CH	-	-	98	60	2.71	46	22	24	29	96	124	0.77	10.0	0.19	0.06	0.11	0.03	
38/16	74.0	74.1	CH	-	-	98	60	2.72	55	24	31	36	87	118	0.94	9.4	0.38	0.06	0.20	0.03	
41/5*	10.8	11.0	CL-CH	-	-	98	57	2.72	46	23	23	30	94	122	0.80	11.9	0.23	0.08	0.13	0.04	
41/7	21.0	21.1	CL-CH					2.70	47	24	23	38	82	113	1.06	2.5	0.34	0.09	0.17	0.04	
41/13	53.0	53.2	CL-CH					2.75	52	25	27	47	77	113	1.24	3.5	0.35	0.10	0.16	0.04	
41/17	73.3	73.5	CL	85	74	65	24	2.68	25	15	10	27	98	124	0.70	5.3	0.21	0.05	0.12	0.03	Silty Clay, Sandy
41/25*	113.0	113.2	CL					2.71	29	19	10	24	103	128	0.64	9.4	0.18	0.05	0.11	0.03	Silty Clay, Sandy
41/29*	130.9	131.1	GC-SC					2.69	25	17	8	11	123	137	0.37	10.0	0.10	0.04	0.07	0.03	Clayey Sand, Gravelly
48/10	39.2	39.4	CL-CH					2.73	47	24	23	39	84	117	1.03	4.0	0.33	0.09	0.16	0.04	
49/3	13.7	14.0	CL-CH					2.72	47	23	24	33	91	121	0.86	6.4	0.26	0.07	0.14	0.04	
49/11*	93.8	94.0	CL					2.68	37	22	15	29	98	126	0.70	5.6	0.20	0.05	0.12	0.03	
50/8	38.5	38.9	CH					2.75	55	23	32	52	72	109	1.38	4.0	0.55	0.12	0.23	0.05	
52/4	29.9	30.2	CL-CH					2.70	49	20	29	41	84	118	1.01	4.4	0.45	0.09	0.22	0.04	
53/5	39.5	39.8	CL	85	76	66	30	2.72	39	20	19	31	91	119	0.87	6.5	0.30	0.09	0.16	0.05	Silty Clay, Sandy
54/6*	63.5	63.8	CL	89	83	77	33	2.71	36	18	18	26	99	125	0.70	6.2	0.24	0.07	0.14	0.04	Silty Clay, Sandy
54/8	73.7	74.0	CL	96	94	92	46	2.73	45	21	24	39	86	120	0.98	5.6	0.41	0.08	0.21	0.04	
60/2*	9.8	10.0	CL-CH	-	-	-	60	2.71	53	26	27	30	94	122	0.79	9.2	0.23	0.07	0.13	0.04	
60/16*	85.2	85.4	CL	83	80	78	34	2.73	40	19	21	28	98	125	0.74	9.0	0.27	0.07	0.16	0.04	
105/1*	5.1	5.4	CH					2.72	53	24	29	24	103	128	0.64	4.0	0.10	0.05	0.06	0.03	
105/8	70.9	71.2	CL					2.70	37	19	18	24	103	128	0.63	7.2	0.21	0.06	0.13	0.04	Sheet 1 of 2
118/5	38.6	38.9	CL					2.70	41	22	19	37	86	118	0.97	4.6	0.39	0.10	0.20	0.05	* INDICATES SAMPLES
118/9*	78.7	79.0	CL					2.70	42	23	19	28	97	124	0.74	8.6	0.24	0.06	0.14	0.03	BELIEVED TO BE
																					RELATIVELY DISTURBED.

TABLE 7

CONSOLIDATION TEST RESULTS

UNDISTURBED SAMPLES

BORING & SAMPLE NUMBER	DEPTH (FEET)		UNIFIED SOIL CLASSIFICATION	PARTICLE SIZE ANALYSIS % FINER THAN				SPECIFIC GRAVITY	ATTERBERG LIMITS			NATURAL CONDITIONS				P_c	C_c	C_r	SETTLEMENT PARAMETERS		REMARKS
												W_o	γ_d	γ_t	e_o				$\frac{C_c}{1+e_o}$	$\frac{C_r}{1+e_o}$	
	FROM	TO		40	100	200	2μ		LL	PL	PI	%	PCF	PCF	—	10^3 PSF	—	—			
129/9	39.1	39.3	CL					2.73	41	22	19	40	82	115	1.08	2.9	0.39	0.09	0.19	0.04	
129/21	103.7	104.0	CL					2.71	39	21	18	28	99	127	0.70	6.4	0.23	0.06	0.14	0.04	Silty Clay, Sandy
142/6	20.1	20.5	CL					2.70	45	22	23	38	83	115	1.02	4.6	0.43	0.05	0.21	0.02	
185/3*	7.9	8.1	CL-CH					2.72	50	23	27	29	96	124	0.76	8.0	0.18	0.04	0.10	0.02	

Sheet 2 of 2

* INDICATES SAMPLES BELIEVED TO BE RELATIVELY DISTURBED.

TABLE 8

CONSOLIDATION TEST RESULTS

REMOLDED SAMPLES

BORING & SAMPLE NUMBER	DEPTH (FEET)		UNIFIED SOIL CLASSIFICATION	SPECIFIC GRAVITY	ATTERBERG LIMITS			PRETEST CONDITIONS				P_c	C_c	C_r	SETTLEMENT PARAMETERS		REMARKS
								W_o	γ_d	γ_t	e_o				$\frac{C_c}{1+e_o}$	$\frac{C_r}{1+e_o}$	
	FROM	TO			LL	PL	PI	%	PCF	PCF	—	10^3 PSF	—	—			
136/6	13.0	14.6	CL	2.74	43	22	21	17	102	119	0.68	2.5	0.18	0.05	0.11	0.03	
146/7	14.0	16.1	CL	2.75	46	22	24	16	102	118	0.68	3.3	0.15	0.06	0.09	0.04	

TABLE 9

PERMEABILITY TEST RESULTS

UNDISTURBED SAMPLES

BORING & SAMPLE NUMBER	DEPTH (FEET)		UNIFIED SOIL CLASSIFICATION	PARTICLE SIZE ANALYSIS % FINER THAN					SPECIFIC GRAVITY	ATTERBERG LIMITS			PRETEST CONDITIONS				CONSOLIDATION PRESSURE	VOID RATIO, e, AFTER CONSOLIDATION	PERMEABILITY
													W_o	γ_d	γ_t	e_o			
	FROM	TO		4	40	100	200	2μ		LL	PL	PI	%	PCF	PCF	——	kg/cm^2		10^{-8} cm/sec.
50/6	28.3	28.5	CL	--	--	--	97	53	2.70	39	18	21	37	84	115	1.00	1.50	0.875	3.0
50/10	48.6	48.8	CL	98	92	86	82	37	2.70	36	16	20	27	97	123	0.73	2.00	0.645	2.6
52/7	58.6	58.9	CL	98	83	72	57	12	2.70	23	14	9	15	119	137	0.41	2.30	0.374	2.2
53/5	39.5	39.8	CL	96	85	77	67	30	2.72	39	20	19	30	104	135	0.73	1.74	0.685	3.5
54/6	63.5	63.8	CL	98	89	83	77	34	2.71	36	18	18	27	98	124	0.72	2.40	0.641	3.0
54/6	73.7	74.0	CL	--	96	93	91	45	2.73	45	21	24	32	90	119	0.85	2.71	0.729	2.3
60/3	18.1	18.3	CL	--	--	--	98	52	2.70	39	21	18	26	103	130	0.71	1.05	0.686	1.6
60/11	56.1	56.4	CL	95	84	79	76	34	2.70	33	18	15	27	98	124	0.73	2.20	0.575	1.8
60/16	85.6	86.1	CL	96	82	80	78	33	2.73	40	19	21	29	96	124	0.75	3.00	0.605	2.6

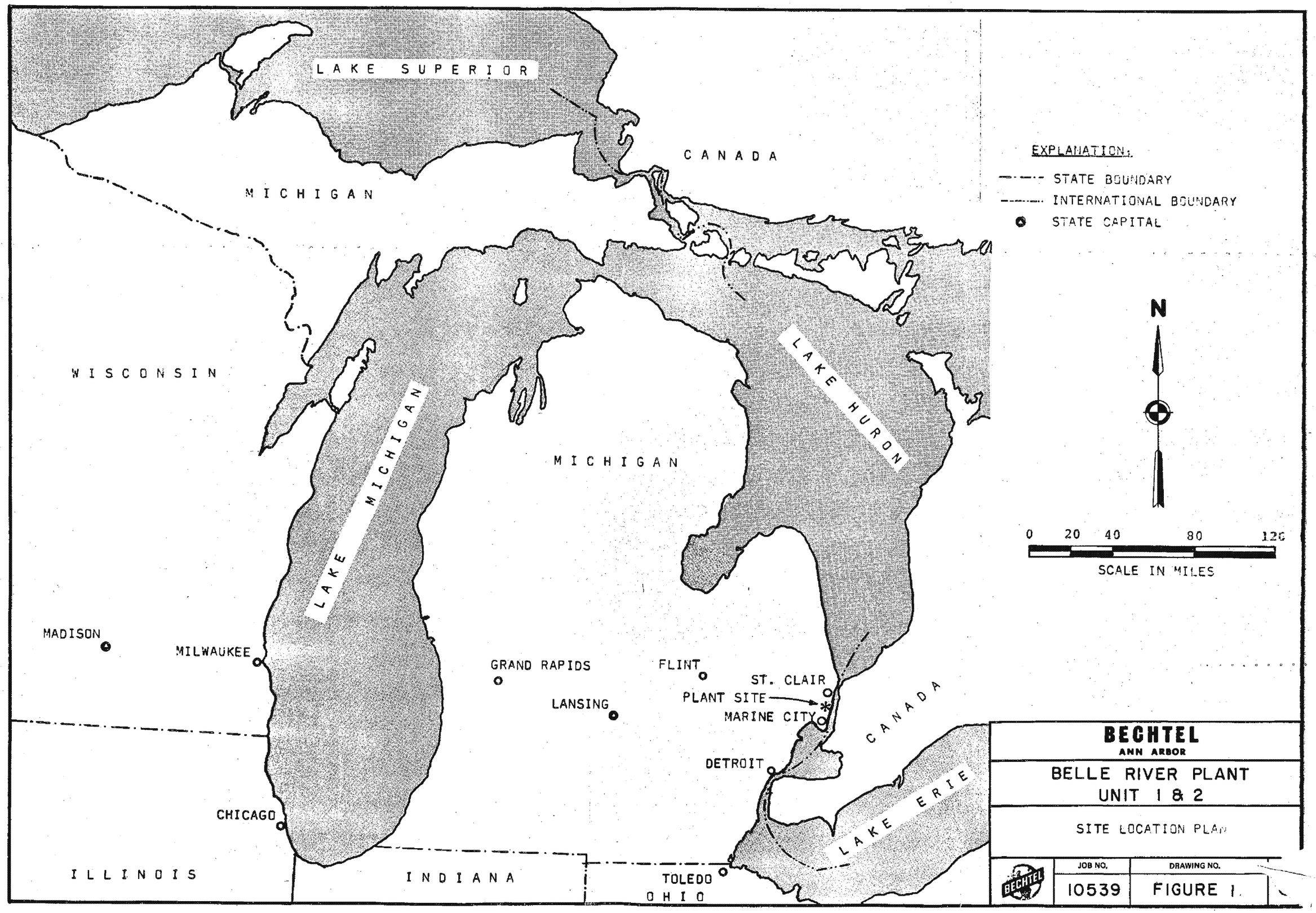
TABLE 10

RECOMMENDED DESIGN PROPERTIES FOR SITE SOILS

Static Properties	Upper Stratum[1] 0 - 20 Ft	Middle Stratum[1] 20 - 50 Ft	Lower Stratum[1] 50 + Ft
In Situ Total Density (PCF)	125	115	125
In Situ Moisture Content (%)	25	35	25
Degree of Saturation (%)	100	100	100
Specific Gravity	2.72	2.72	2.71
Poisson's Ratio[2]			
Drained	0.4	0.4	0.4
Undrained	0.5	0.5	0.5
Initial Modulus of Elasticity (KSF)	700	330	350
Maximum Dry Density per ASTM 1557	118-112[3]	-	-
Optimum Moisture Content	13-16[3]	-	-
Permeability (cm/sec x 10^{-8})	2	2	2
Unconfined Compression Shear Strength			
Cohesion (PSF)	550	550	850
Consolidated Undrained Shear Strength			
Effective Stress Basis			
ϕ' (Deg.)	28	28	25
c' (PSF)	0	0	0
Total Stress Basis			
ϕ (Deg.)	13	13	10
c (PSF)	460	460	710
Settlement Parameter $C_c/1+e_o$	0.13	0.20	0.14
Coefficient of Consolidation (C_v) Ft^2/day	0.15	0.15	0.15

[1]The depths of the different strata are approximate (see text).
[2]Typical values.
[3]Refer to Figure 40 for additional information.

FIGURES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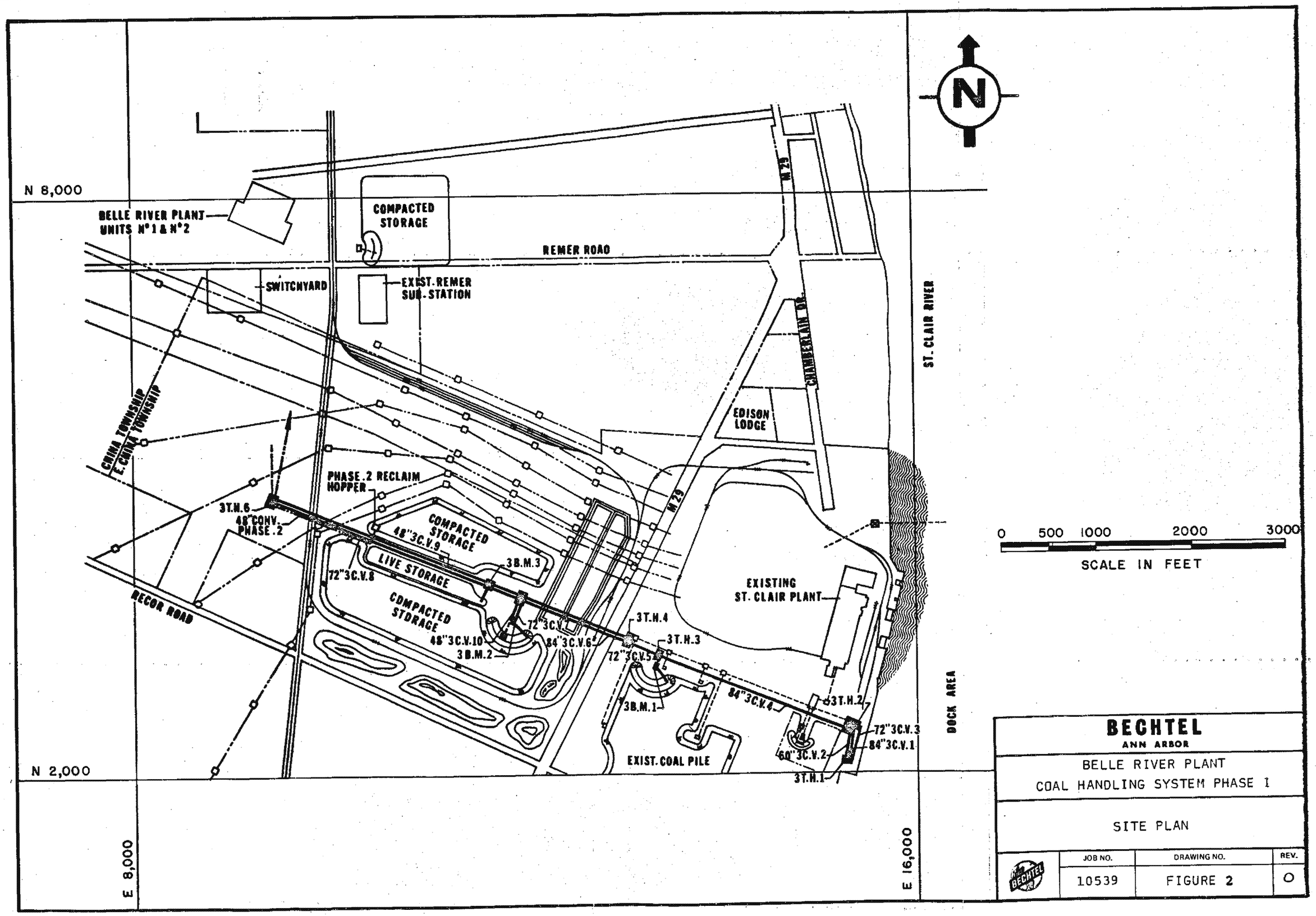
CANADA
MICHIGAN
WISCONSIN
LAKE MICHIGAN
MICHIGAN
LAKE HURON
CANADA
LAKE ERIE
MADISON
MILWAUKEE
CHICAGO
GRAND RAPIDS
LANSING
FLINT
ST. CLAIR
PLANT SITE
MARINE CITY
DETROIT
TOLEDO
ILLINOIS
INDIANA
OHIO
EXPLANATION:
STATE BOUNDARY
INTERNATIONAL BOUNDARY
STATE CAPITAL
N
0 20 40 80 120
SCALE IN MILES
BECHTEL
ANN ARBOR
BELLE RIVER PLANT
UNIT 1 & 2
SITE LOCATION PLAN
JOB NO.
10539
DRAWING NO.
FIGURE 1

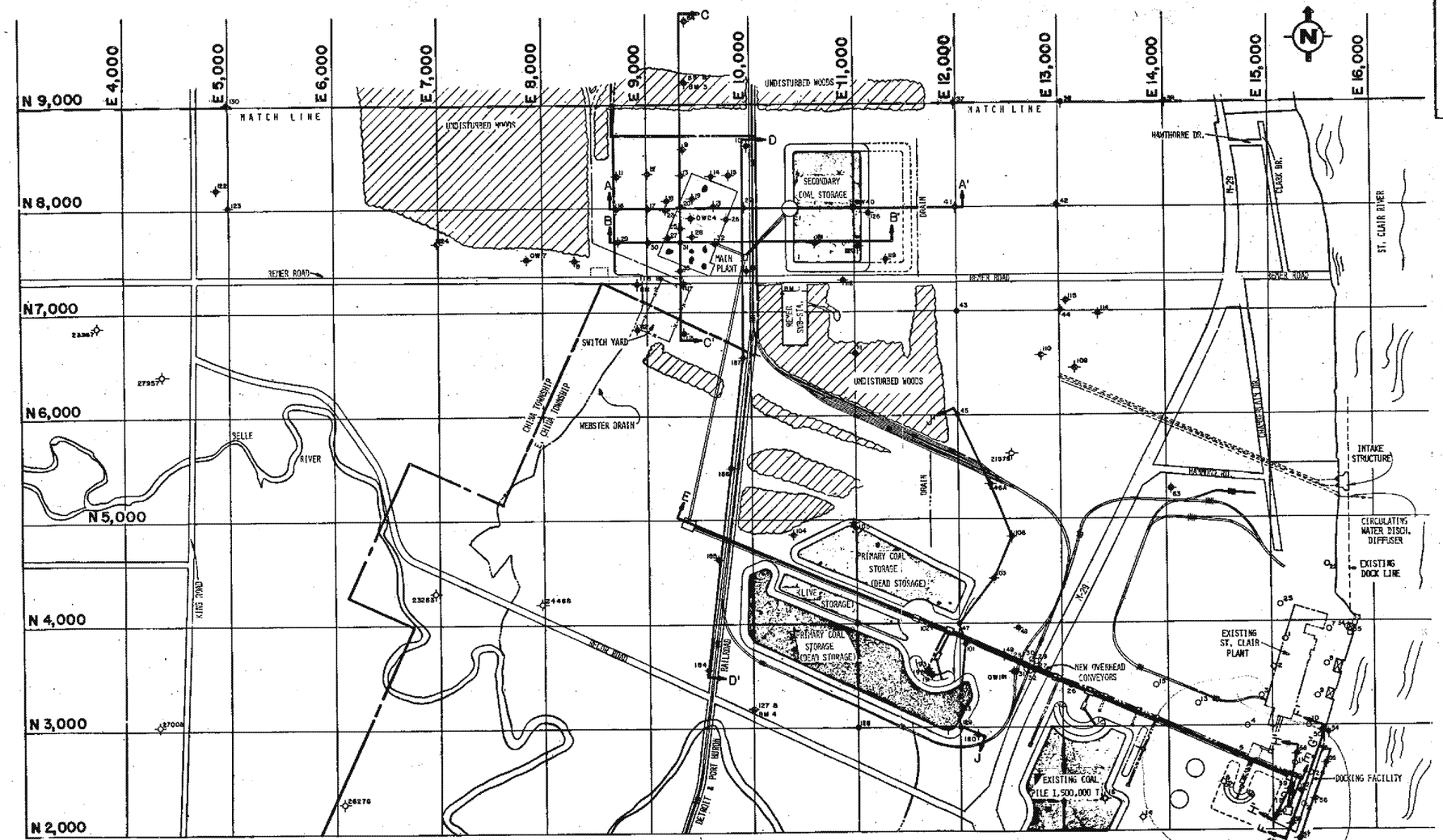


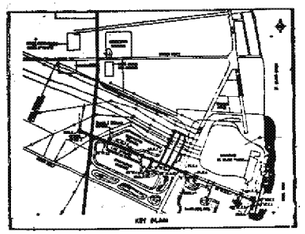
BECHTEL
ANN ARBOR

BELLE RIVER PLANT
COAL HANDLING SYSTEM PHASE I

SITE PLAN

JOB NO.	DRAWING NO.	REV.
10539	FIGURE 2	0





NOTES:

1. FOR SUBSURFACE PROFILES SEE FIGURE 9, A THROUGH H.
2. SECTIONS A, B, AND C ARE BASED ON ORIGINAL PLANT LOCATION.
3. SEE FIGURE 4 FOR ADDITIONAL BORING LOCATIONS.

EXPLANATION

TOWNSHIP BOUNDARY

N N' SUBSURFACE PROFILE N-N'

BORING LOCATION

OW DENOTES OBSERVATION WELL

BM 4 BENCH MARK

BORING LOCATIONS FROM PREVIOUS INVESTIGATIONS FOR ST. CLAIR PLANT

WELLS DRILLED FOR OIL OR GAS EXPLORATION - SHOWING PERMIT NUMBER (ALL HOLES WERE DRY)

0 100 200 400 800 1200 Feet
SCALE

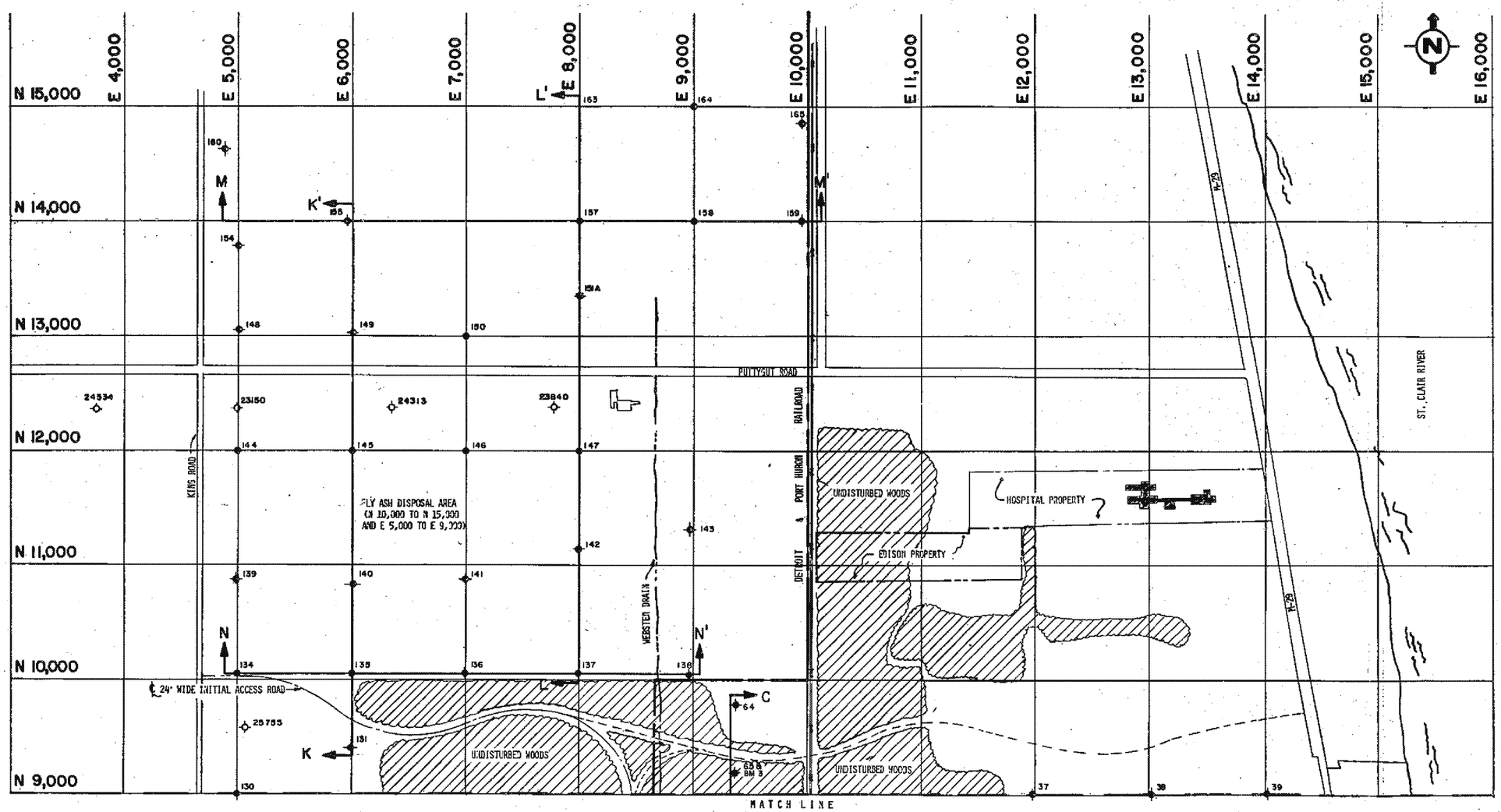
BECHTEL
ANN ARBOR

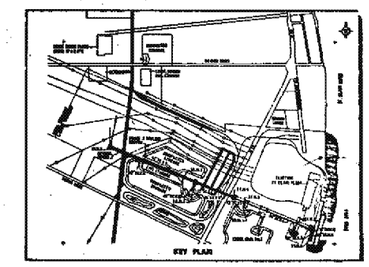
BELLE RIVER PLANT
UNIT 1 & 2

BORING LOCATION PLAN
SOUTH AREA

JOB NO.	DRAWING NO.	REV.
10539	FIGURE 3	2

ED_005947A_00014551-00213





NOTES:

1. FOR SUBSURFACE PROFILES, SEE FIGURE 9, A THROUGH N.
2. SEE FIGURE 3 FOR ADDITIONAL BORING LOCATIONS.

EXPLANATION

TOWNSHIP BOUNDARY

N N' SUBSURFACE PROFILE N-N'

BORING LOCATION FROM THIS INVESTIGATION

BM 5 BENCH MARK

25755 WELLS DRILLED FOR OIL OR GAS EXPLORATION - SHOWING PERMIT NUMBER (ALL HOLES WERE DRY)

0 400 800 1200

SCALE IN FEET

BECHTEL
ANN ARBOR

BELLE RIVER PLANT
UNIT 1 & 2

BORING LOCATION PLAN
NORTH AREA

JOB NO.	DRAWING NO.	REV.
10539	FIGURE 4	1

EXPLANATION

MESOZOIC	JURASSIC	Former "Permo-Carboniferous red beds"; shale, clay and sandy shales.
PALEOZOIC	PENN. SYLVANIAN	Grand River Formation and Saginaw Formation; chiefly sandstone, some shaly limestone and coal.
	MISSISSIPPIAN	Grand Rapids Group, Marshall Sandstone and Coldwater Shale; chiefly shale and dolomitic shale, some limestone and sandstone
		Ellsworth Shale, Bedford Shale, and Antrim Shale; shale with some sandstone.
	DEVONIAN	Traverse Group and Detroit River Group; chiefly limestone and dolomite, some shale, sandstone and salt.
	SILURIAN	Bass Islands Group, Salina Group, Manistique Group, Burnt Bluff Group, and Cataract Group; dolomitic shale, dolomite and limestone, some salt.
	ORDOVICIAN	Undifferentiated; shale, siltstone, limestone and dolomite.
PRE CAMBRIAN	P-€	Undifferentiated; complex sequence of metamorphosed igneous and sedimentary rocks.

N

NOTE:

Geology is generalized from the following:

(1) The Centennial Geologic Map of the Southern Peninsula of Michigan, 1936, Mich. Geol. Survey.
(2) Stratigraphic Succession in Michigan, Chart 1, 1964, Mich. Geol. Survey.
(3) Bedrock of Michigan, Small Scale Map 2, 1968, Mich. Geol. Survey.
(4) Geology of Toronto — Windsor Area, 1989, Geological Survey of Canada.
(5) Geologic Map of North America, 1965, U.S. Geological Survey.

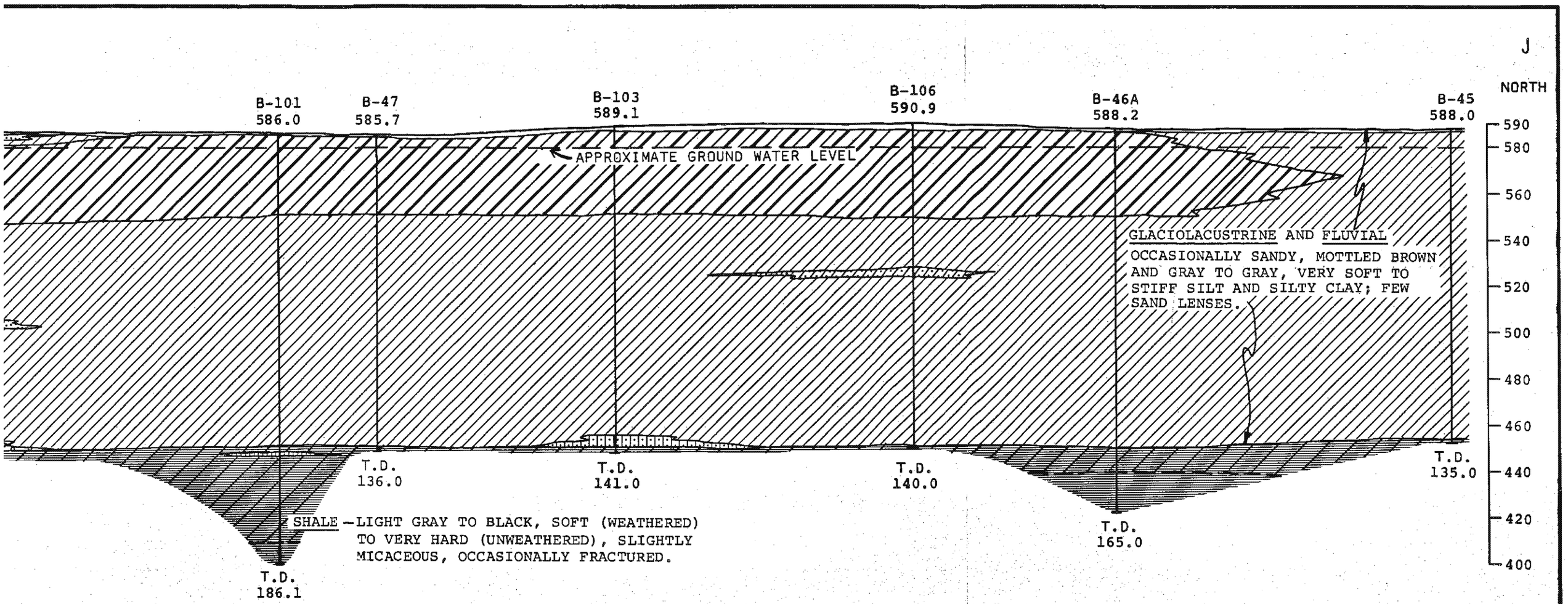
10 0 10 20 30 40 50
SCALE IN MILES

BECHTEL
SAN FRANCISCO

BELLE RIVER POWER PLANT
UNITS 1 & 2

BEDROCK GEOLOGY LOWER PENINSULA MICHIGAN

JOB No.	DRAWING No.	REV.
10539	FIGURE 5	0



ND

- Clayey Sand (SC)
- Silty Sand (SM)
- Silt (ML)
- Shale (weathered)

hale (unweathered)

EXPLANATION

B-187 Bechtel borings (1973-1974)

T.D. Total depth drilled (ft)

0 100 200 400 600

SCALE IN FEET

NOTES:

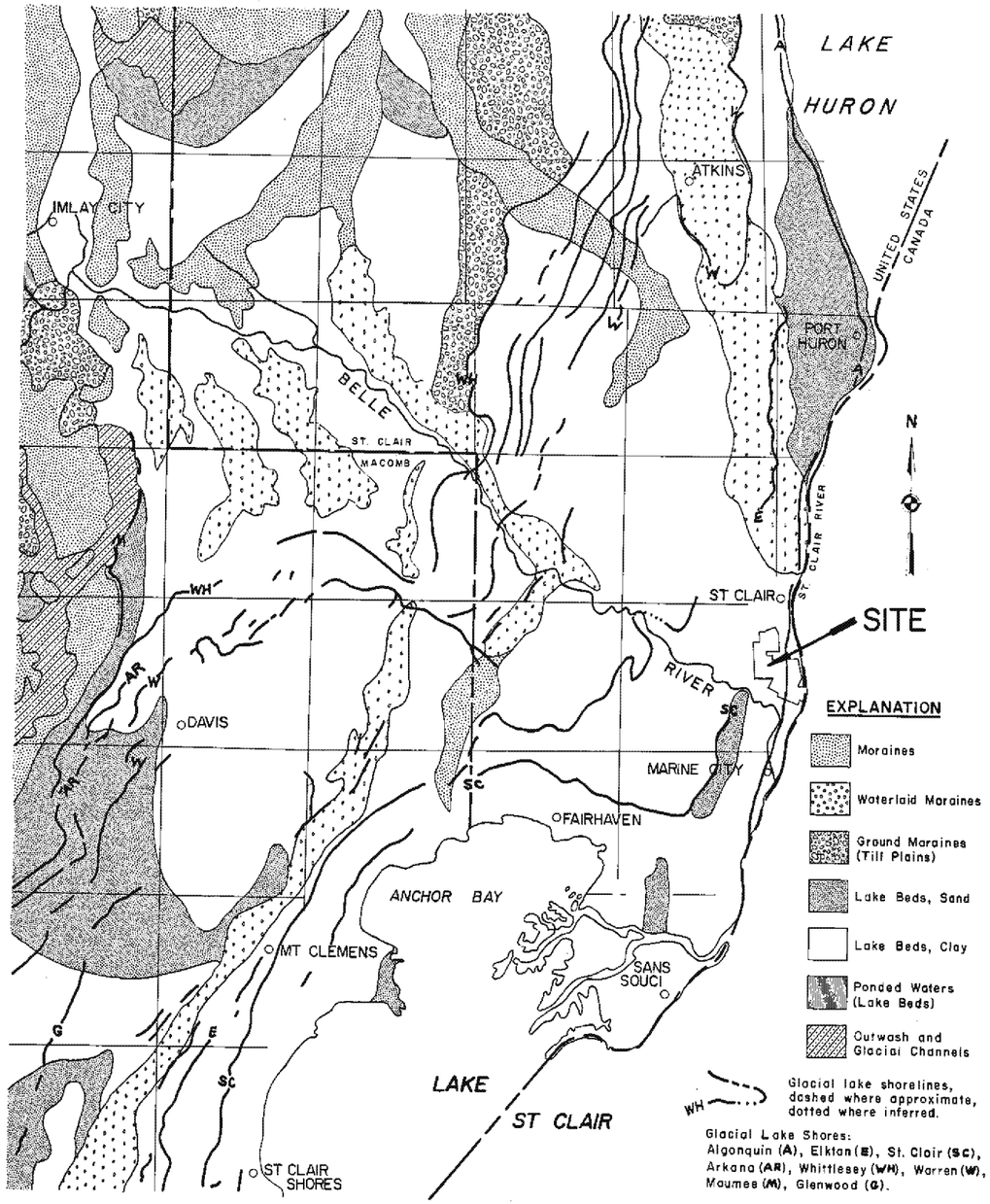
1.) For location of section see Figure 3.
2.) For variation of water table see Section 4.1.3.
3.) For boring logs see Appendix B.
4.) For Geologic description of site see Section 4.1.2.

BECHTEL
ANN ARBOR

BELLE RIVER PLANT
UNIT 1 & 2

SUBSURFACE PROFILE
SECTION J-J'

JOB NO.	DRAWING NO.	REV.
10539	FIGURE 9	0



NOTE:

From Map of Surface Formations of the Southern Peninsula of Michigan, Michigan Department of Conservation, Geologic Survey Division, 1955.

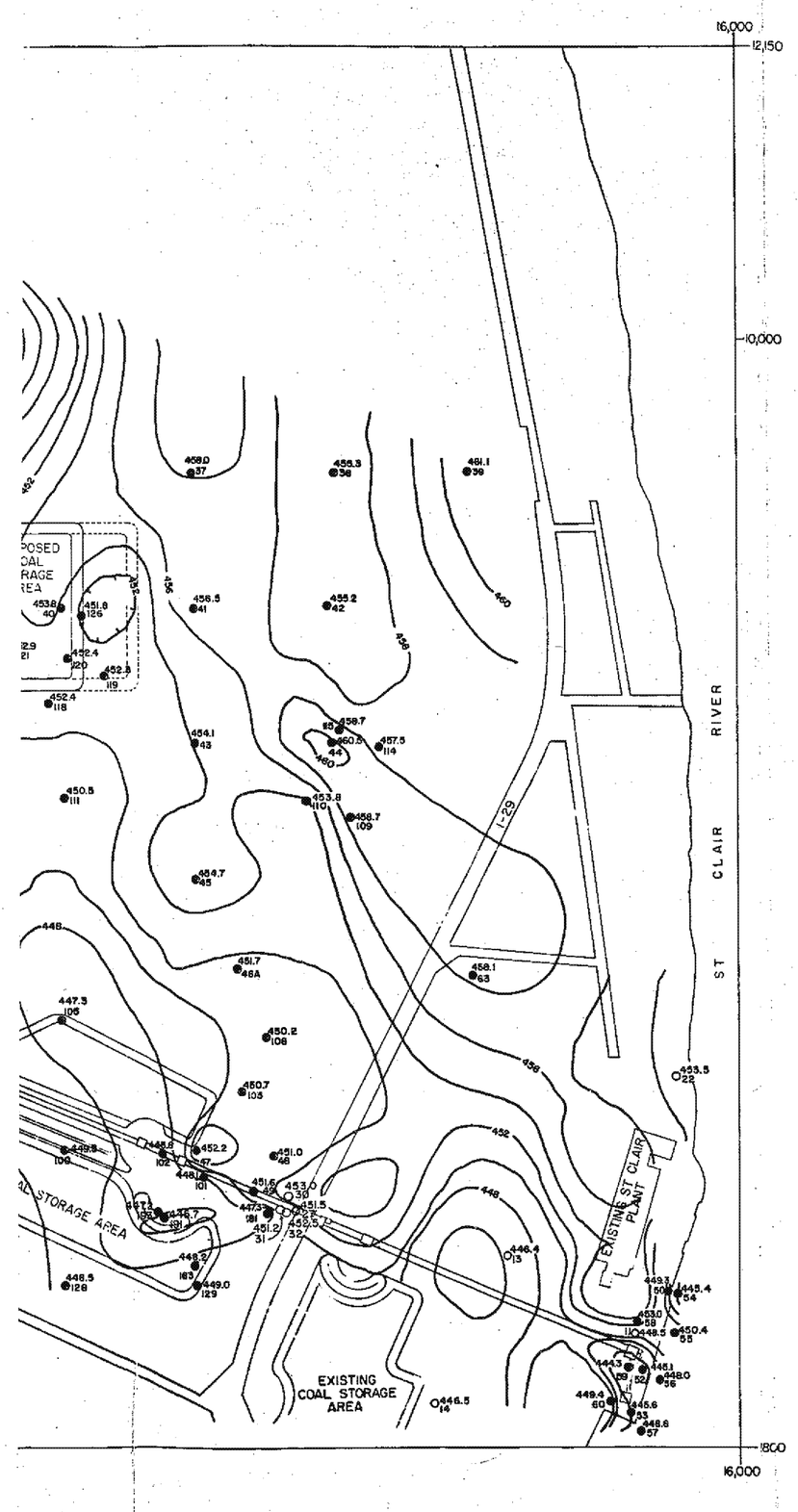
0 1 2 3 4 5
SCALE IN MILES

BECHTEL
ANN ARBOR

BELLE RIVER PLANT
UNIT 1 & 2

SURFICIAL GEOLOGY
ST. CLAIR AND MACOMB COUNTIES

JOB NO.	DRAWING NO.	REV.
10539	FIGURE 6	0



EXPLANATION

434.4 Top of rock elevation (ft)
120 Boring number (present investigation)

452.5 Top of rock elevation (ft)
32 Boring number (previous investigations for St Clair plant)

NOTES:

1. Contours generated from drill hole data by McDonnell Douglas Automation Company's SURMAP computer program.
2. Computer interpretation modified manually to accommodate additional data points.
3. Detail A (plant area) enlarged for clarity, to twice graphic scale shown below.

N

0 200 400 800 1200
SCALE IN FEET

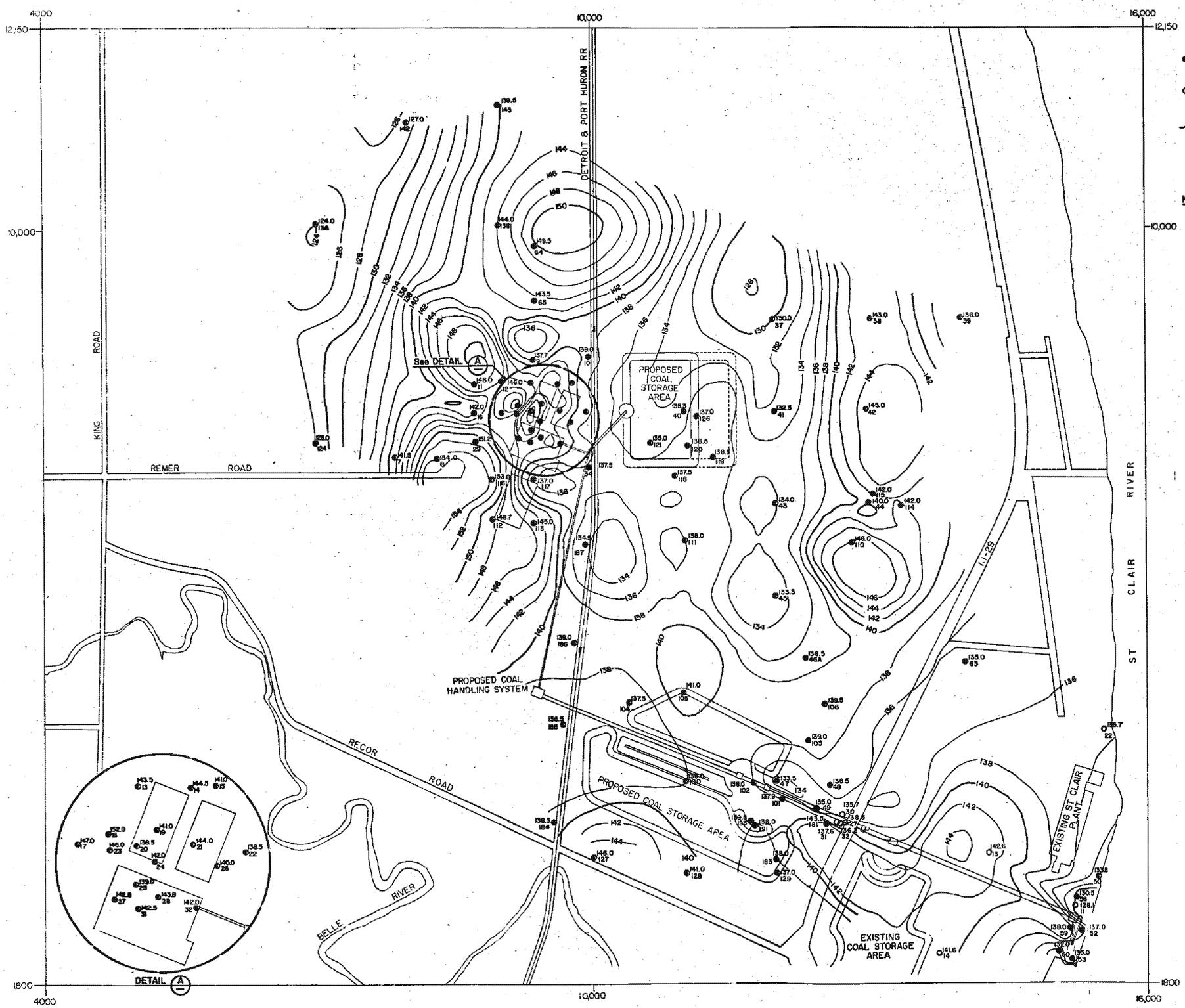
CONTOUR INTERVAL = 2 FT

BECHTEL
ANN ARBOR

BELLE RIVER PLANT
UNIT 1 & 2

TOP OF ROCK CONTOUR MAP

JOB NO.	DRAWING NO.	REV.
10539	FIGURE 7	1



EXPLANATION

- 134.5 / 187 — Overburden thickness (ft) / Boring number (present investigation)
- 156.2 / 32 — Overburden thickness (ft) / Boring number (previous investigations for St. Clair plant)
- 150 — Line through points of equal thickness of overburden in feet

NOTES:

1. Thickness contours generated from drill hole data by McDonnell Douglas Automation Company's SURMAP computer program.
2. Computer interpretation modified manually to accommodate additional data points.
3. Detail A (plant area) enlarged for clarity, to twice graphic scale shown below.

N

0 200 400 800 1200

SCALE IN FEET

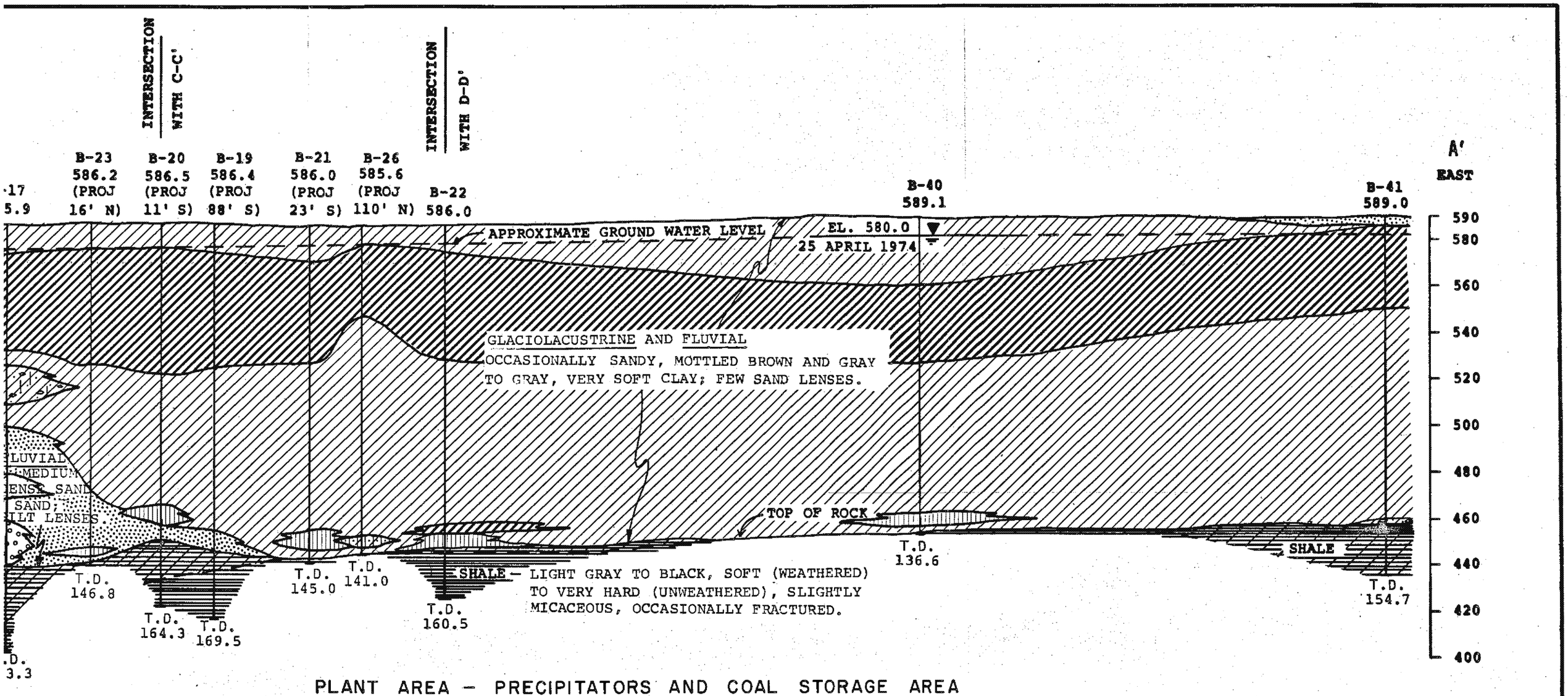
THICKNESS INTERVAL = 2 FT

BECHTEL
ANN ARBOR

BELLE RIVER PLANT
UNIT 1 & 2

OVERBURDEN THICKNESS
CONTOUR MAP

JOB NO.	DRAWING NO.	REV.
10539	FIGURE 8	1



PLANT AREA — PRECIPITATORS AND COAL STORAGE AREA

LEGEND

.)	Clayey Sand (SC)
H)	Silty Sand (SM)
P)	Gravel (GM)
W)	Shale (weathered)
)	Shale (unweathered)

EXPLANATION

B-187 Bechtel borings (1973-1974)

T.D. Total depth drilled (ft)

0 100 200 400 600

SCALE IN FEET

NOTES:

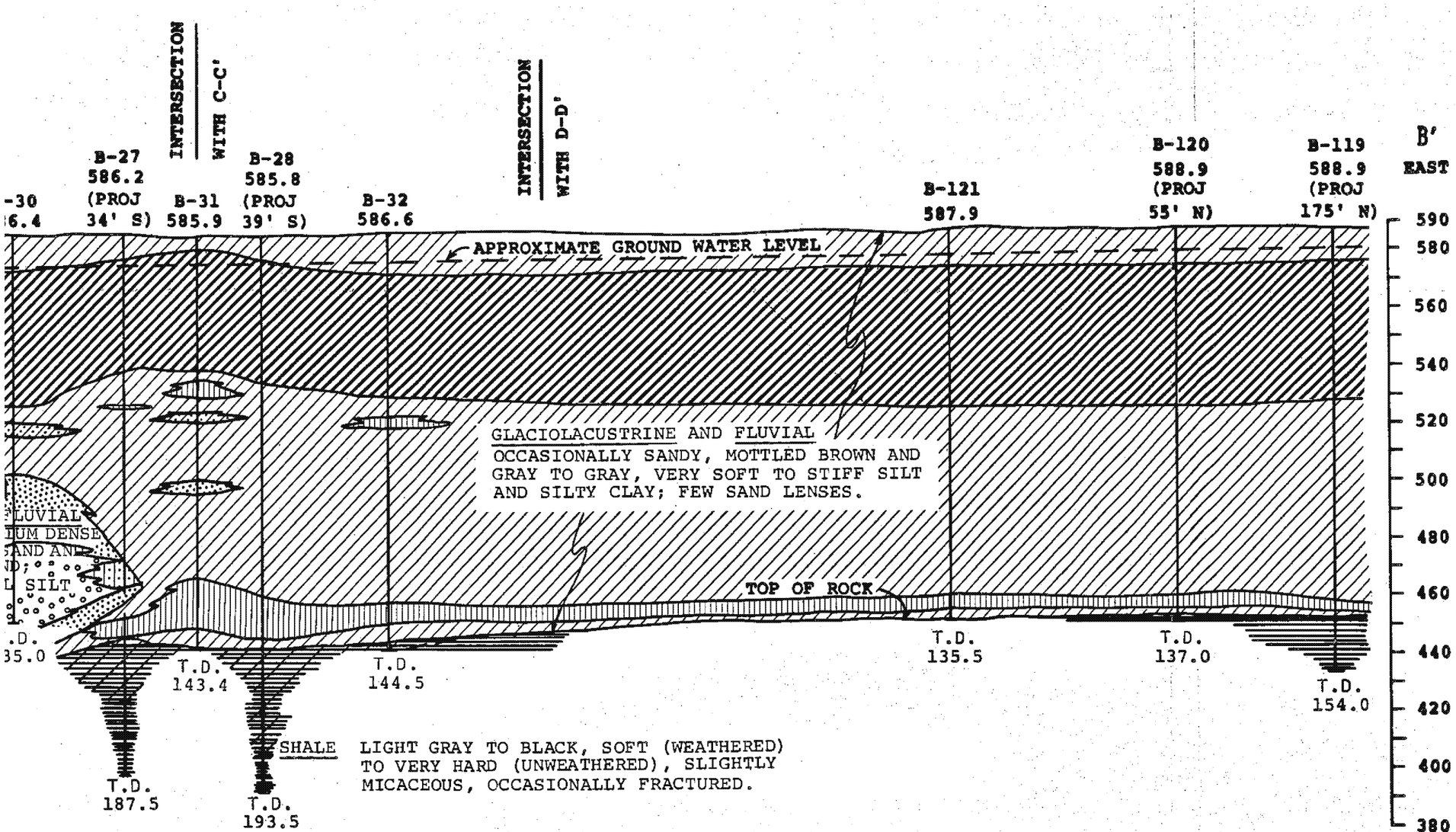
1.) For location of section see Figure 3.
2.) For variation of water table see Section 4.1.3.
3.) For boring logs see Appendix B.
4.) For Geologic description of site see Section 4.1.2.

BECHTEL
ANN ARBOR

BELLE RIVER PLANT
UNIT 1 & 2

SUBSURFACE PROFILE
SECTION A-A'

JOB NO.	DRAWING NO.	REV.
10539	FIGURE 9	0



EXPLANATION

B-187 Bechtel borings (1973-1974)

T.D. Total depth drilled (ft)

0 100 200 400 600

SCALE IN FEET

PLANT AREA — UNITS 1 & 2 COAL STORAGE AREA

LEGEND

- Sand (SW)
- Silt (ML)
- Clayey Sand (SC)
- Silty Sand (SM)
- Shale (weathered)
- Shale (unweathered)

NOTES:

1.) For location of section see Figure 3.

2.) For variation of water table see Section 4.1.3.

3.) For boring logs see Appendix B.

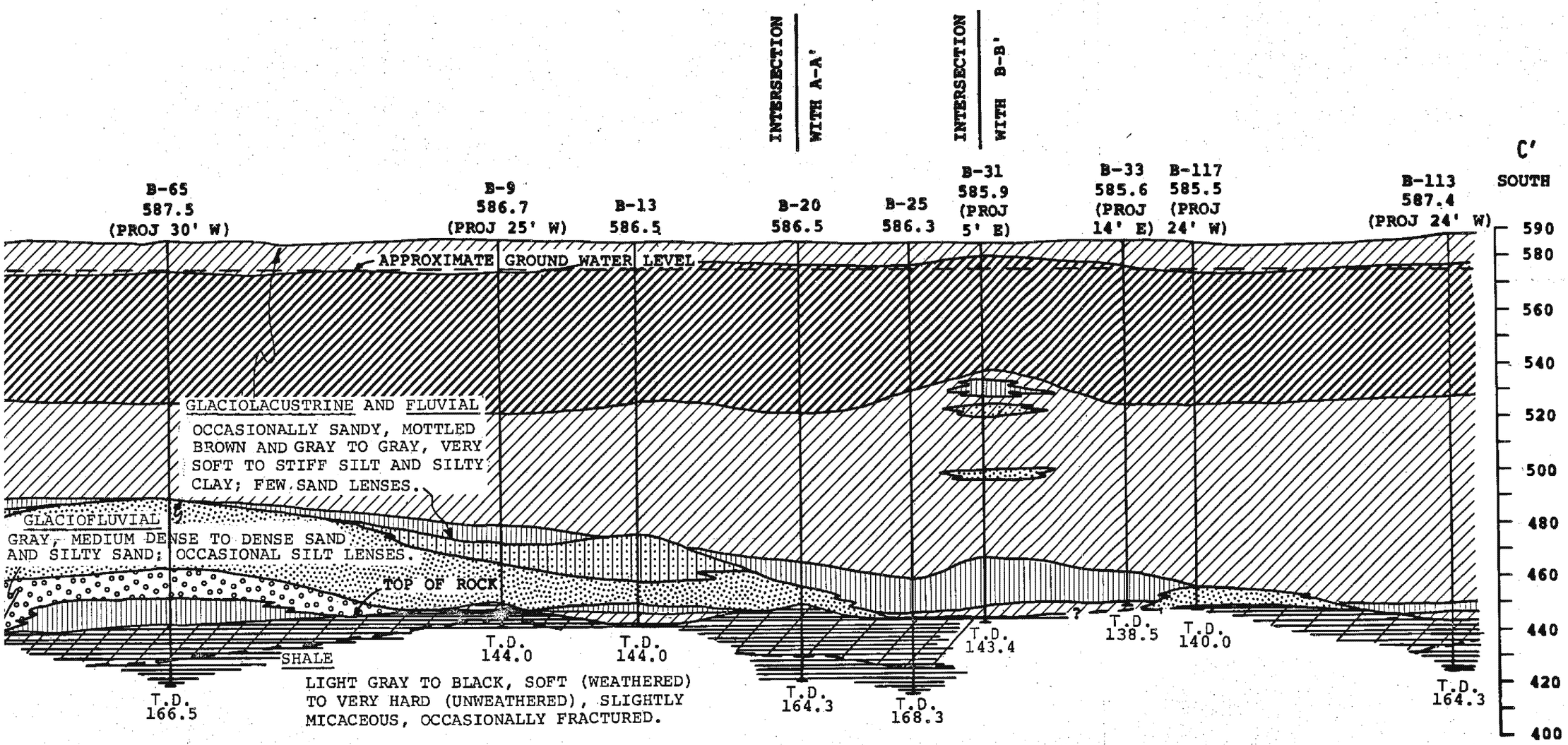
4.) For Geologic description of site see Section 4.1.2.

BECHTEL
ANN ARBOR

BELLE RIVER PLANT
UNIT 1 & 2

SUBSURFACE PROFILE
SECTION B-B'

JOB NO.	DRAWING NO.	REV.
10539	FIGURE 9	0



PLANT AREA - UNIT I AND SWITCHYARD

Silt (ML)

Clayey Sand (SC)

Silty Sand (SM)

Shale (weathered)

Shale (unweathered)

EXPLANATION

B-187 Bechtel borings (1973-1974)

T.D. Total depth drilled (ft)

0 100 200 400 600

SCALE IN FEET

NOTES:

1.) For location of section see Figure 3.

2.) For variation of water table see Section 4.1.3.

3.) For boring logs see Appendix B.

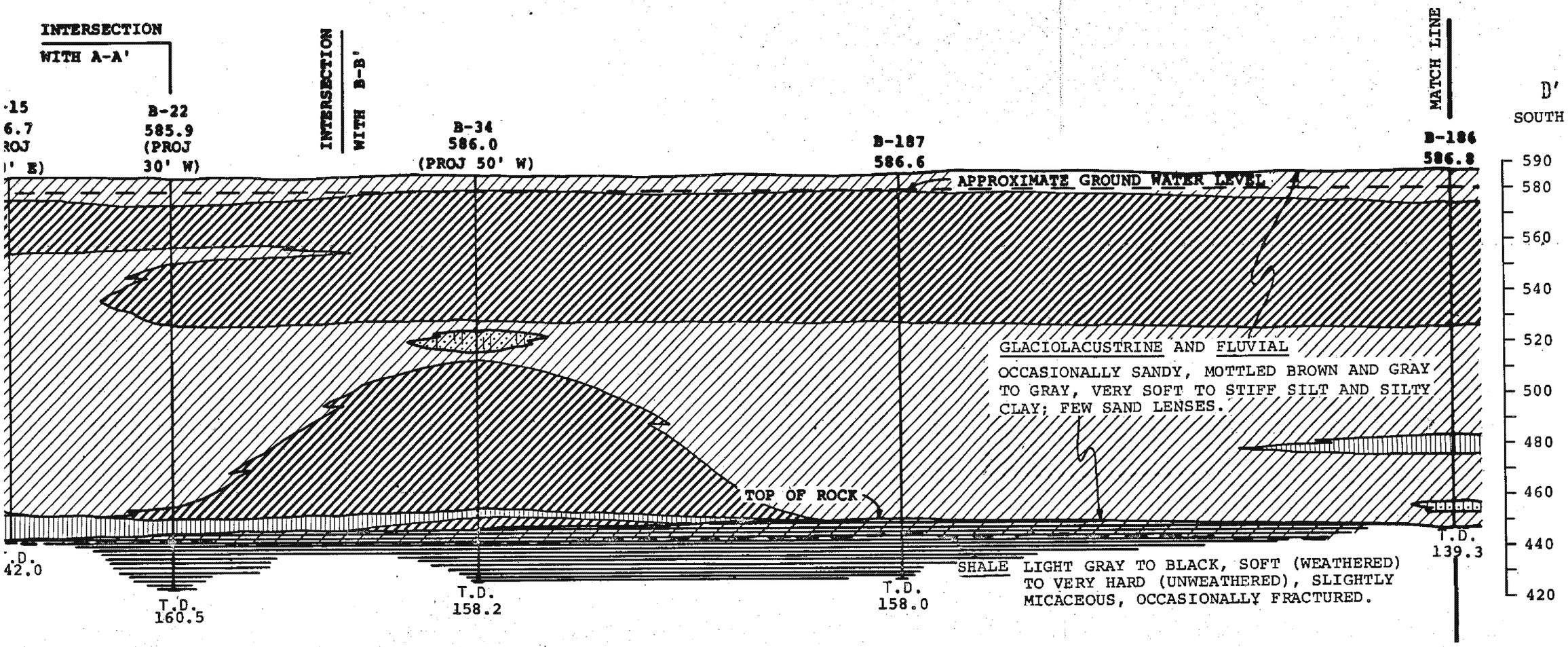
4.) For Geologic description of site see Section 4.1.3.

BECHTEL
ANN ARBOR

BELLE RIVER PLANT
UNIT 1 & 2

SUBSURFACE PROFILE
SECTION C-C'

JOB NO.	DRAWING NO.	REV.
10539	FIGURE 9	0



PLANT AREA AND COAL HANDLING CONVEYOR SYSTEM

Shale (weathered)

Shale (unweathered)

EXPLANATION

B-187 Bechtel borings (1973-1974)

T.D. Total depth drilled (ft)

(SC)

(SM)

0 100 200 400 600

SCALE IN FEET

NOTES:

1.) For location of section see Figure 3.

2.) For variation of water table see Section 4.1.3.

3.) For boring logs see Appendix B.

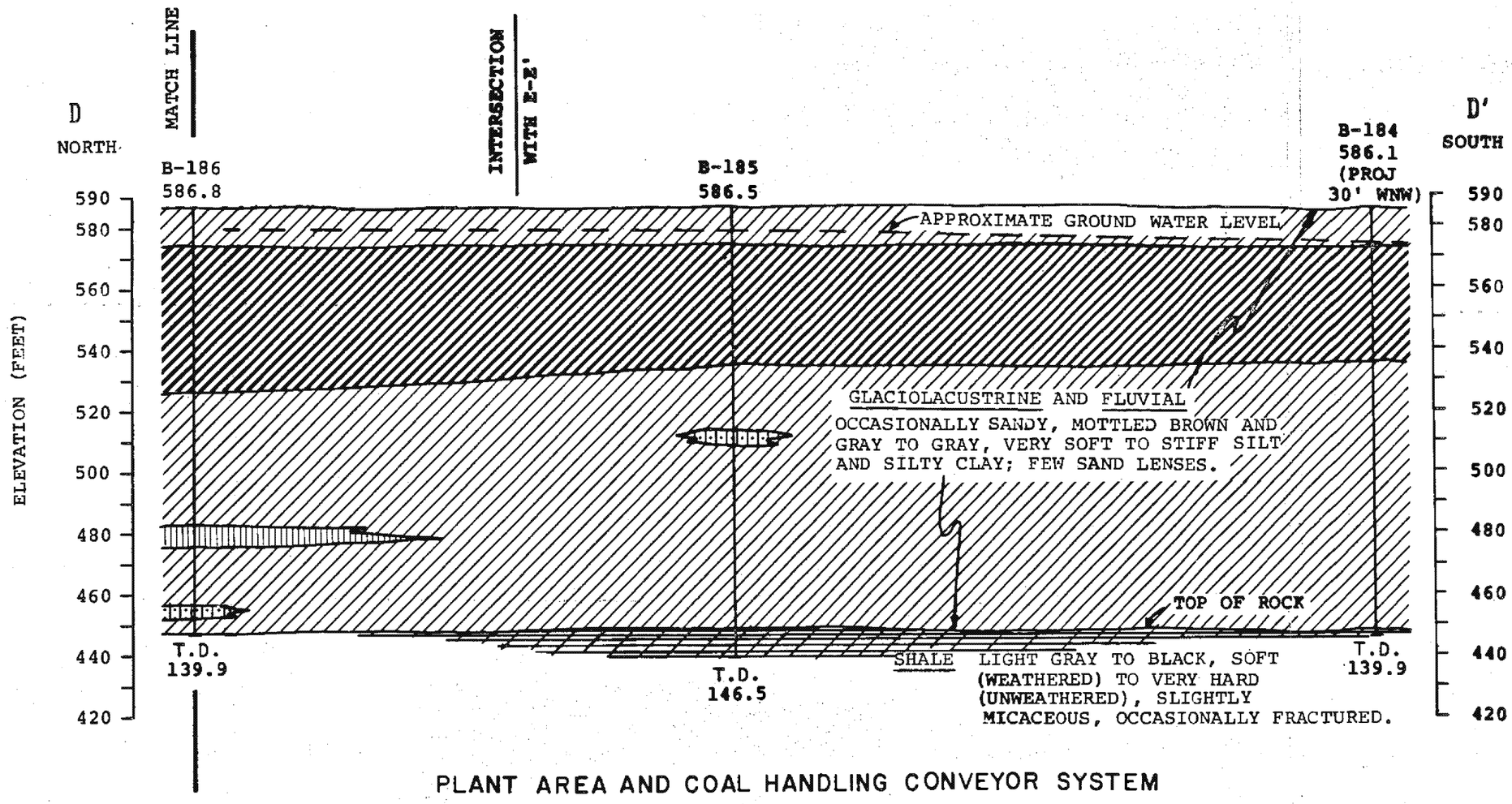
4.) For Geologic description of site see Section 4.1.2.

BECHTEL
ANN ARBOR

BELLE RIVER PLANT
UNIT 1 & 2

SUBSURFACE PROFILE
SECTION D-D'
SHEET 1 OF 2

JOB NO.	DRAWING NO.	REV.
10539	FIGURE 9	0



PLANT AREA AND COAL HANDLING CONVEYOR SYSTEM

LEGEND

- Clay (CL)
- Clay (CH)
- Silt (ML)
- Silty Sand (SM)
- Shale (weathered)

EXPLANATION

B-187 Bechtel borings (1973-1974)

T.D. Total depth drilled (ft)

0 100 200 400 600

SCALE IN FEET

NOTES:

1.) For location of section see Figure 3.

2.) For variation of water table see Section 4.1.3.

3.) For boring logs see Appendix B.

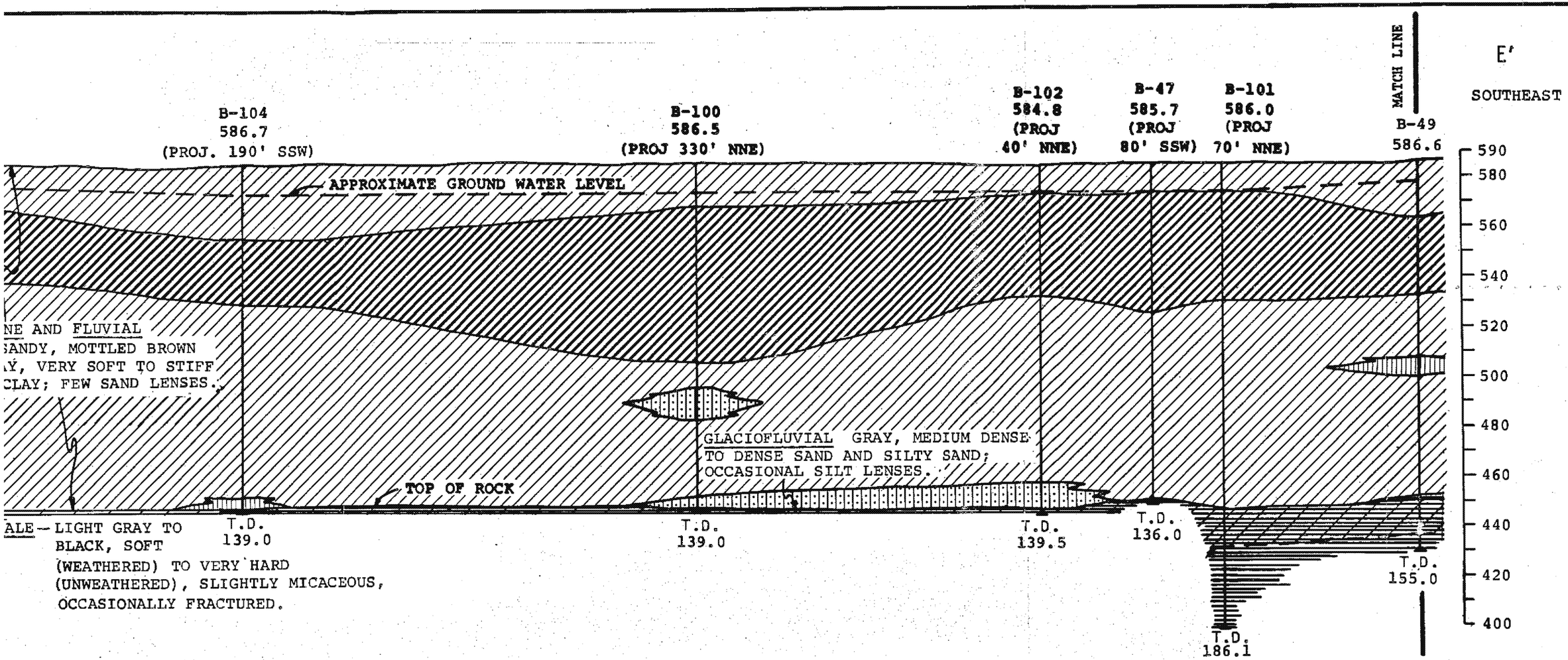
4.) For Geologic description of site see Section 4.1.2.

BECHTEL
ANN ARBOR

BELLE RIVER PLANT
UNIT 1 & 2

SUBSURFACE PROFILE
SECTION D-D'
SHEET 2 OF 2

JOB NO.	DRAWING NO.	REV.
10539	FIGURE 9	0



COAL HANDLING CONVEYOR SYSTEM AND COAL STORAGE AREAS

EXPLANATION

B-187 Bechtel borings (1973-1974)

T.D. Total depth drilled (ft)

l (SM)

thered)

eathered)

0 100 200 400 600

SCALE IN FEET

NOTES:

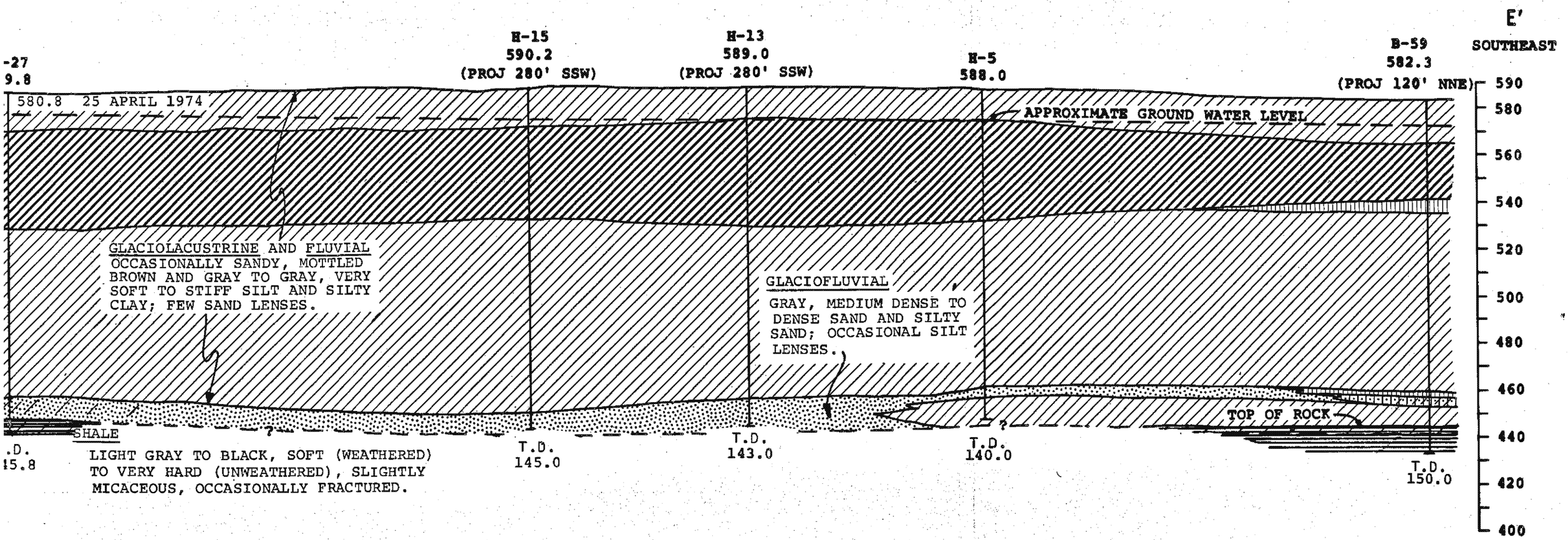
1.) For location of section see Figure 3.
2.) For variation of water table see Section 4.1.3.
3.) For boring logs see Appendix B.
4.) For Geologic description of site see Section 4.1.2.

BECHTEL
ANN ARBOR

BELLE RIVER PLANT
UNIT 1 & 2

SUBSURFACE PROFILE
SECTION E-E'
SHEET 1 OF 2

JOB NO.	DRAWING NO.	REV.
10539	FIGURE 9	0



COAL HANDLING CONVEYOR SYSTEM AND COAL STORAGE AREAS

END

- Clayey Sand (SC)
- Silty Sand (SM)
- Shale (weathered)
- Shale (unweathered)

EXPLANATION

B-187 Bechtel borings (1973-1974)

H-15 Housel borings (1950-1967)

T.D. Total depth drilled (ft)

0 100 200 400 600

SCALE IN FEET

NOTES:

1.) For location of section see Figure 3.

2.) For variation of water table see Section 4.1.3.

3.) For boring logs see Appendix B.

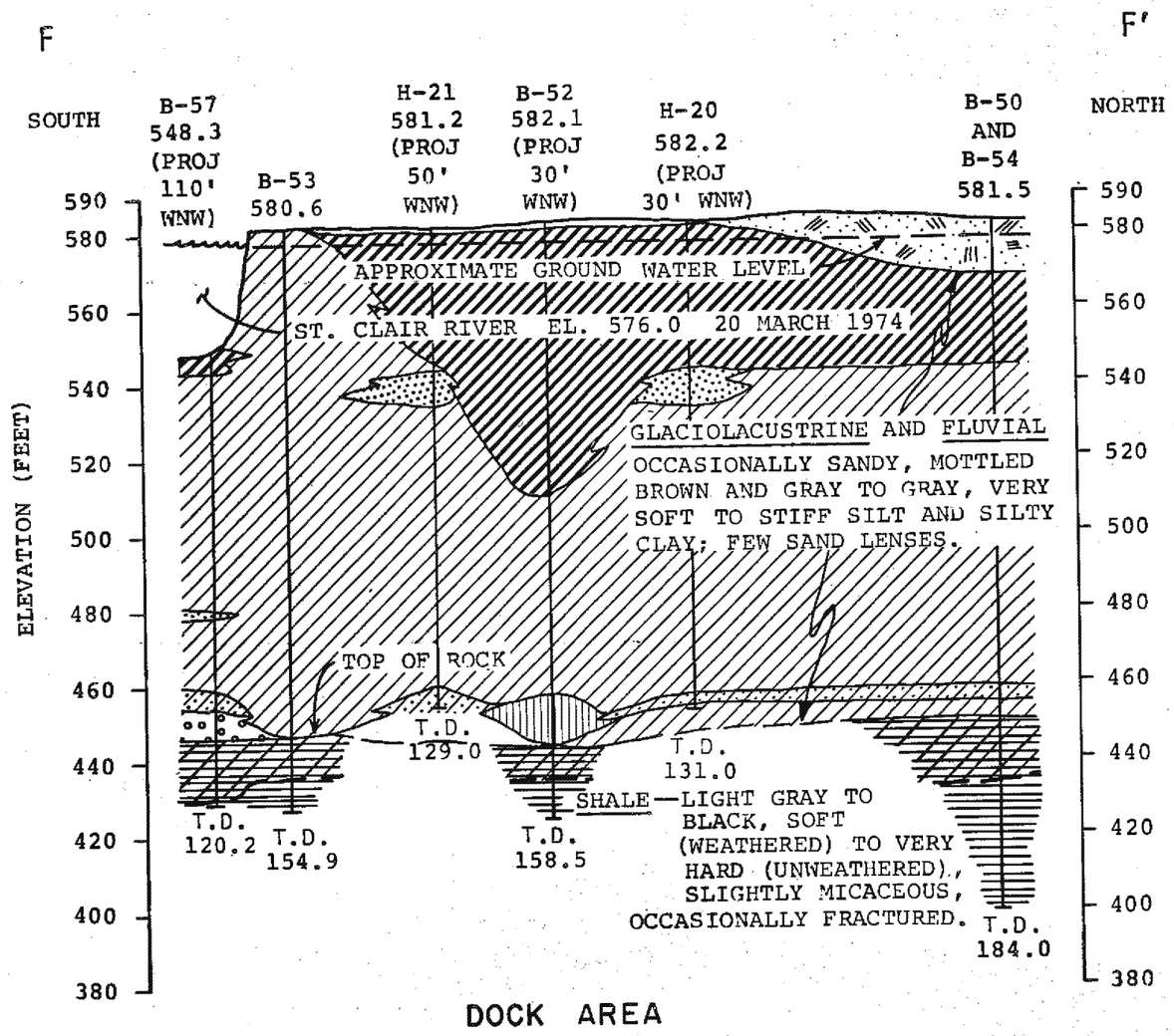
4.) For Geologic description of site see Section 4.1.2.

BECHTEL
ANN ARBOR

BELLE RIVER PLANT
UNIT 1 & 2

SUBSURFACE PROFILE
SECTION E-E'
SHEET 2 OF 2

JOB NO.	DRAWING NO.	REV.
10539	FIGURE 9	0



DOCK AREA

LEGEND

- Clay (CL)
- Clay (CH)
- Sand (SP)
- Sand (SW)
- Silt (ML)
- Clayey Sand (SC)
- Fill
- Shale (weathered)
- Shale (unweathered)

0 100 200 400 600

SCALE IN FEET

NOTES:

1.) For location of section see Figure 3.
2.) For variation of water table see Section 4.1.3.
3.) For boring logs see Appendix B.
4.) For Geologic description of site see Section 4.1.2.

EXPLANATION

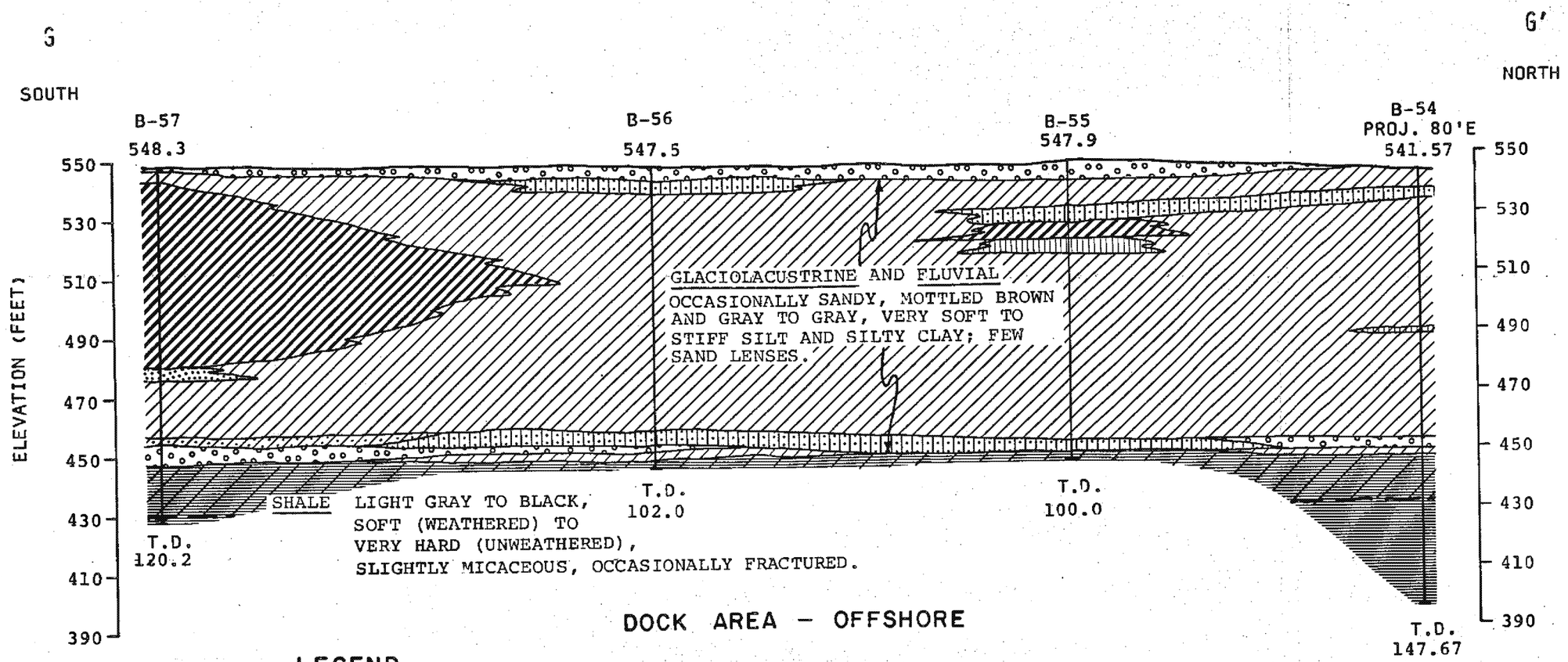
B-187 Bechtel borings (1973-1974)
H-15 Housel borings (1950-1967)
T.D. Total depth drilled (ft)

BECHTEL
ANN ARBOR

BELLE RIVER PLANT
UNIT 1 & 2

SUBSURFACE PROFILE
SECTION F-F'

JOB NO.	DRAWING NO.	REV.
10539	FIGURE 9	0



DOCK AREA – OFFSHORE

LEGEND

- Clay (CL)
- Clay (CH)
- Sand (SP)
- Sand (SW)
- Silt (ML)
- Clayey Sand (SC)
- Silty Sand (SM)
- Shale (weathered)
- Shale (unweathered)

0 50 100 200 300

SCALE IN FEET

EXPLANATION

B-187 Bechtel borings (1973-1974)

T.D. Total depth drilled (ft)

NOTES:

1.) For location of section see Figure 3.

2.) Depth of the St. Clair River water is approximately 31 feet throughout this section.

3.) For boring logs see Appendix B.

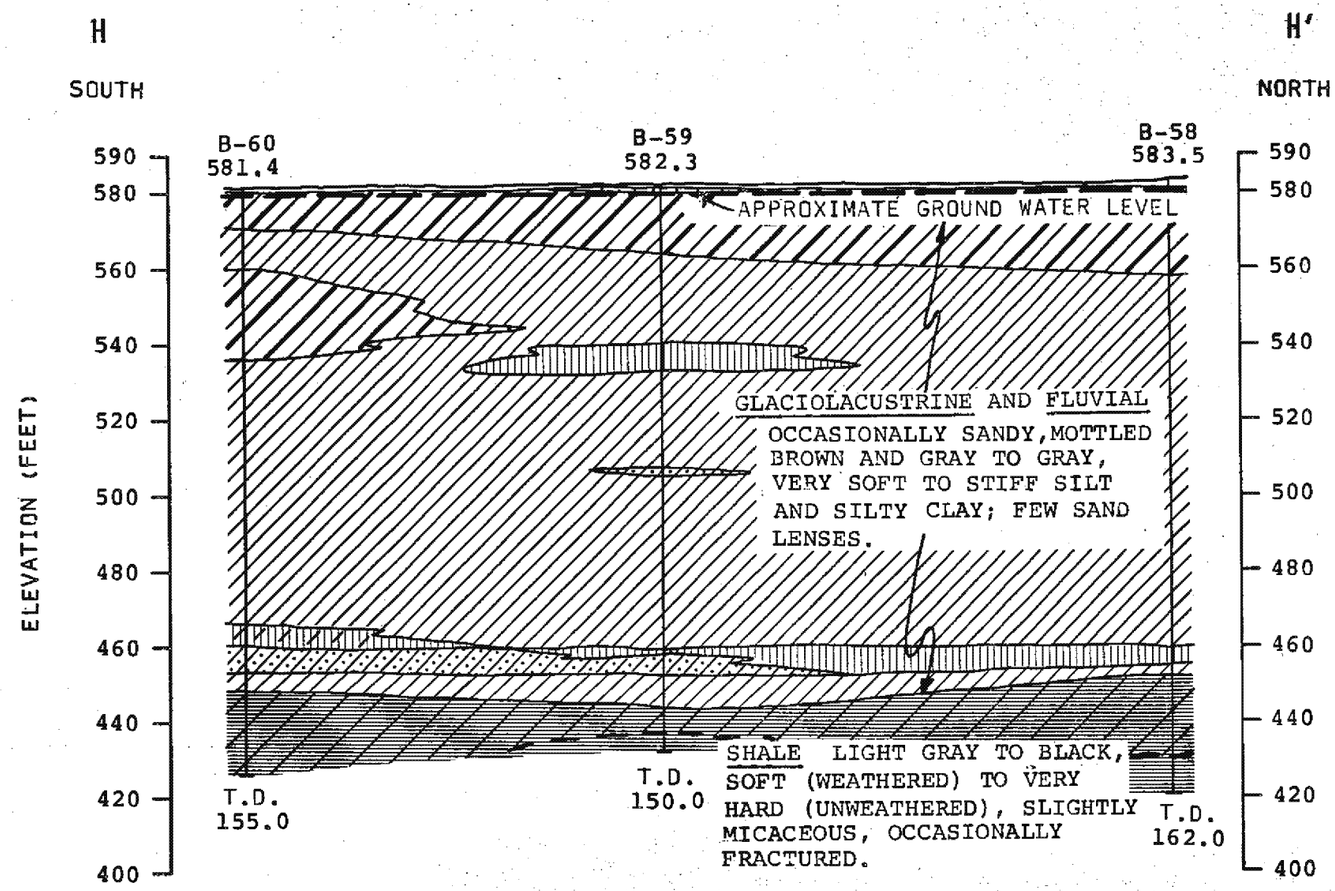
4.) For Geologic description of site see Section 4.1.2.

BECHTEL
ANN ARBOR

BELLE RIVER PLANT
UNIT 1 & 2

SUBSURFACE PROFILE
SECTION G-G'

JOB NO.	DRAWING NO.	REV.
10539	FIGURE 9	0



DOCK AREA – TRANSFER HOUSES 1 & 2

LEGEND

- Clay (CL)
- Clay (CL-CH)
- Clayey Sand (SC)
- Silt (ML)
- Sand (SP)
- Shale (weathered)
- Shale (unweathered)

0 50 100 200 300

SCALE IN FEET

EXPLANATION

B-187 Bechtel borings (1973-1974)

T.D. Total depth drilled (ft)

NOTES:

1.) For location of section see Figure 3.

2.) For variation of water table see Section 4.1.3.

3.) For boring logs see Appendix B.

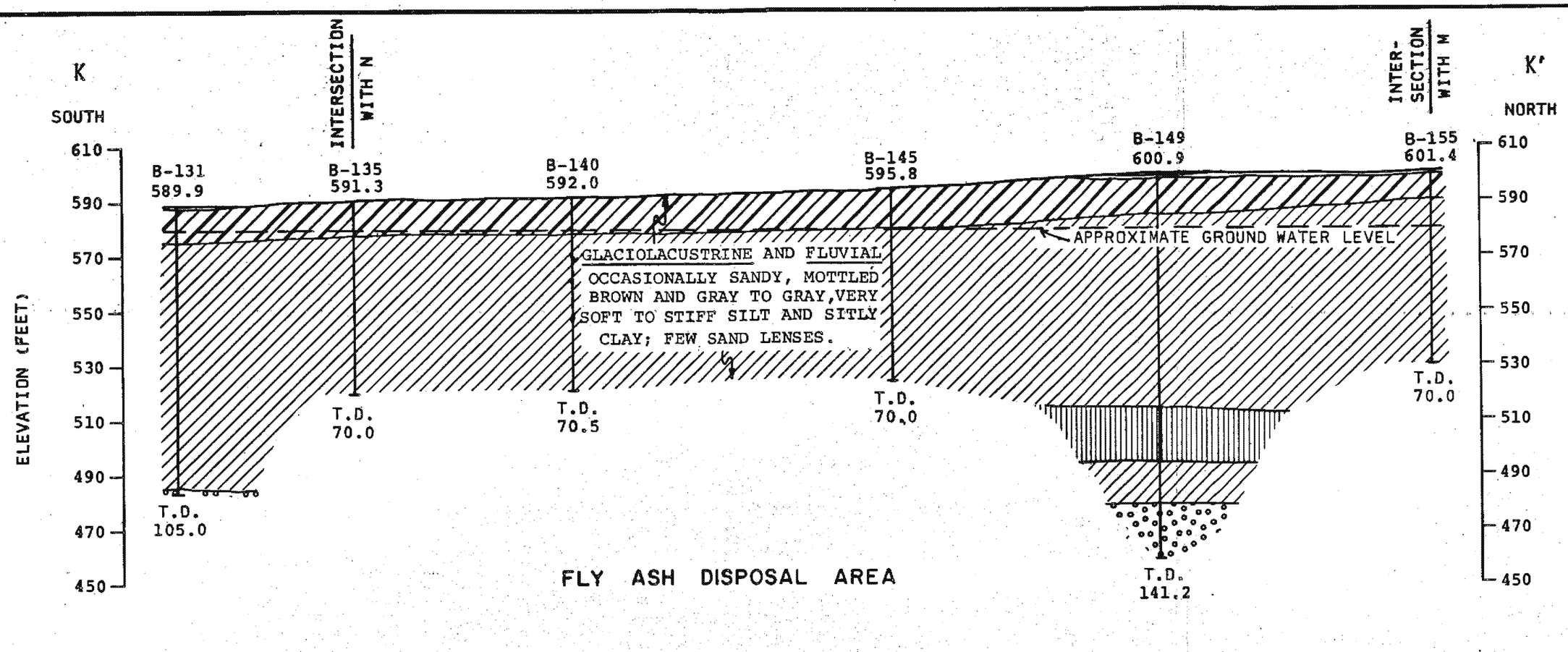
4.) For Geologic description of site see Section 4.1.2.

BECHTEL
ANN ARBOR

BELLE RIVER PLANT
UNIT 1 & 2

SUBSURFACE PROFILE
SECTION H-H'

JOB NO.	DRAWING NO.	REV.
10539	FIGURE 9	0



LEGEND

- Clay (CL)
- Clay (CL-CH)
- Sand (SW)
- Silt (ML)

EXPLANATION

B-187 Bechtel borings (1973-1974)

T.D. Total depth drilled (ft)

0 200 400 800 1200

SCALE IN FEET

NOTES:

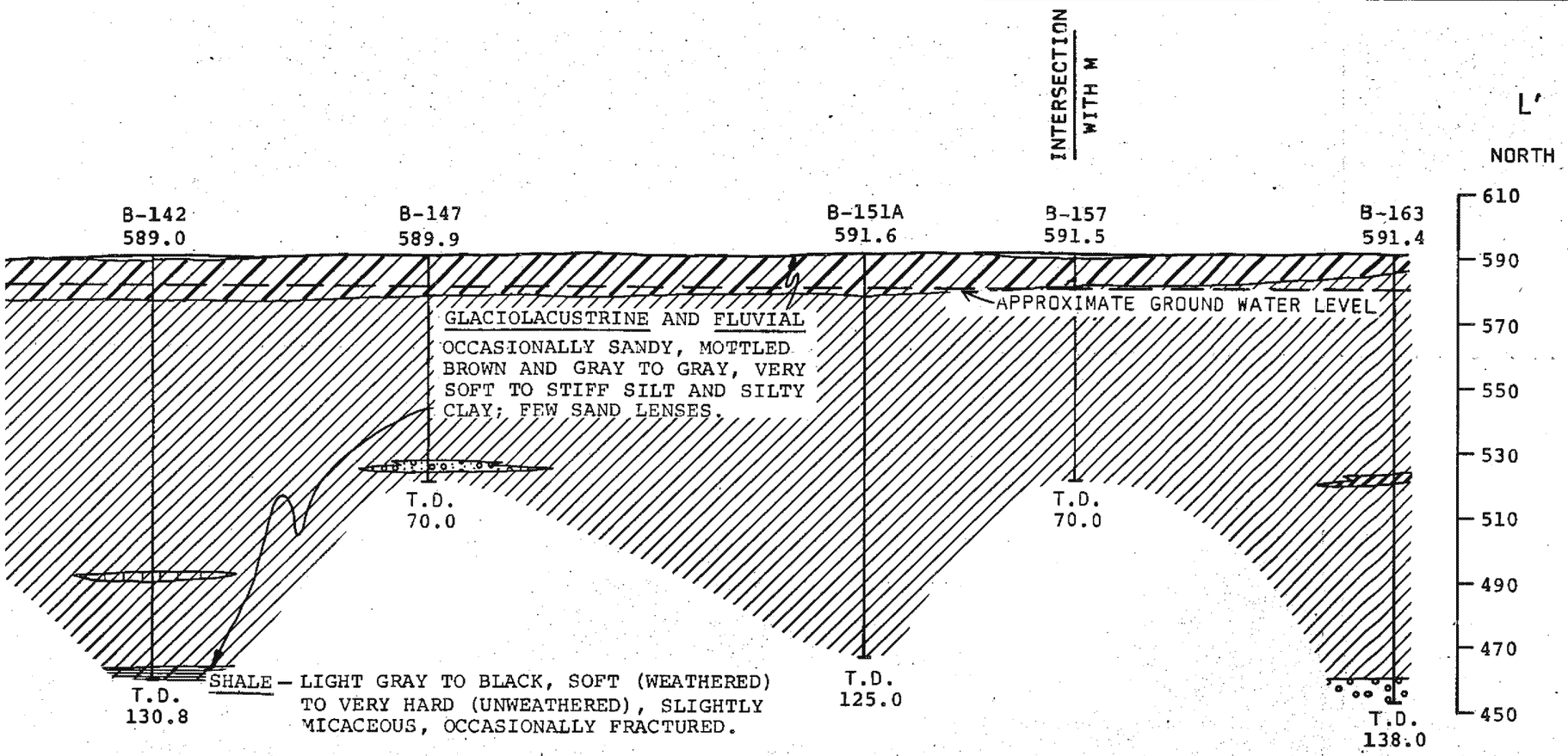
1.) For location of section see Figure 4.
2.) For variation of water table see Section 4.1.3.
3.) For boring logs see Appendix B.
4.) For Geologic description of site see Section 4.1.2.

BECHTEL
ANN ARBOR

BELLE RIVER PLANT
UNIT 1 & 2

SUBSURFACE PROFILE
SECTION K-K'

JOB NO.	DRAWING NO.	REV.
10539	FIGURE 9	0



FLY ASH DISPOSAL AREA

NOTES:

1.) For location of section see Figure 4.
2.) For variation of water table see Section 4.1.3.
3.) For boring logs see Appendix B.
4.) For Geologic description of site see Section 4.1.2.

0 200 400 800 1200

SCALE IN FEET

GEND

Sand (SW)

Silt (ML)

Shale (weathered)

EXPLANATION

B-187 Bechtel borings (1973-1974)

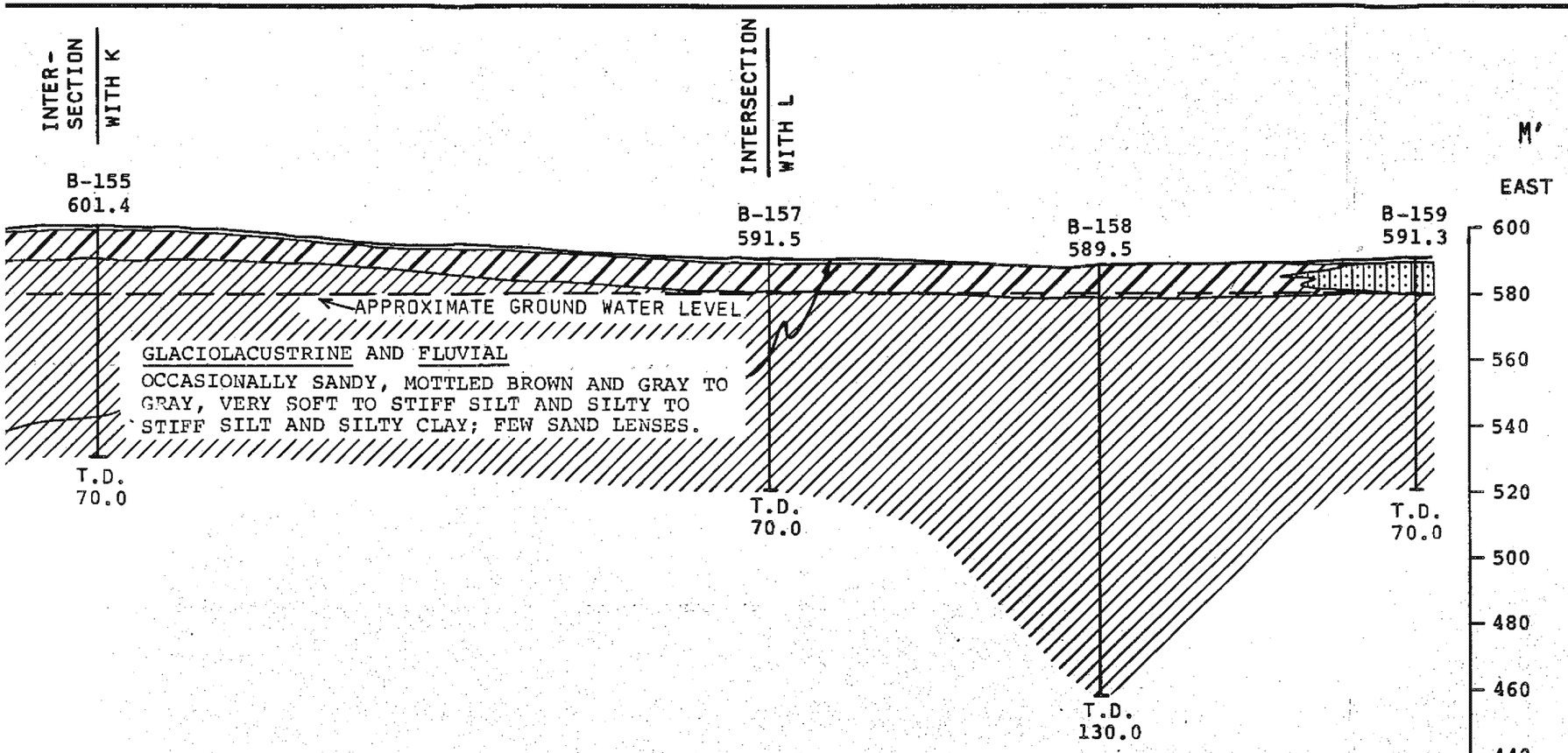
T.D. Total depth drilled (ft)

BECHTEL
ANN ARBOR

BELLE RIVER PLANT
UNIT 1 & 2

SUBSURFACE PROFILE
SECTION L-L'

JOB NO.	DRAWING NO.	REV.
10539	FIGURE 9	0



GRAY TO BLACK, SOFT (WEATHERED)
Y HARD (UNWEATHERED), SLIGHTLY
OUS, OCCASIONALLY FRACTURED.

FLY ASH DISPOSAL AREA

NOTES:

1.) For location of section see Figure 4.
2.) For variation of water table see Section 4.1.3.
3.) For boring logs see Appendix B.
4.) For Geologic description of site see Section 4.1.2.

0 200 400 800 1200
SCALE IN FEET

LEGEND

ay (CL)
ay (CH)
ay (CL-CH)
ind (SP)
Silt (ML)
Silty Sand (SM)
Clayey Sand (SC)
Shale (weathered)

EXPLANATION

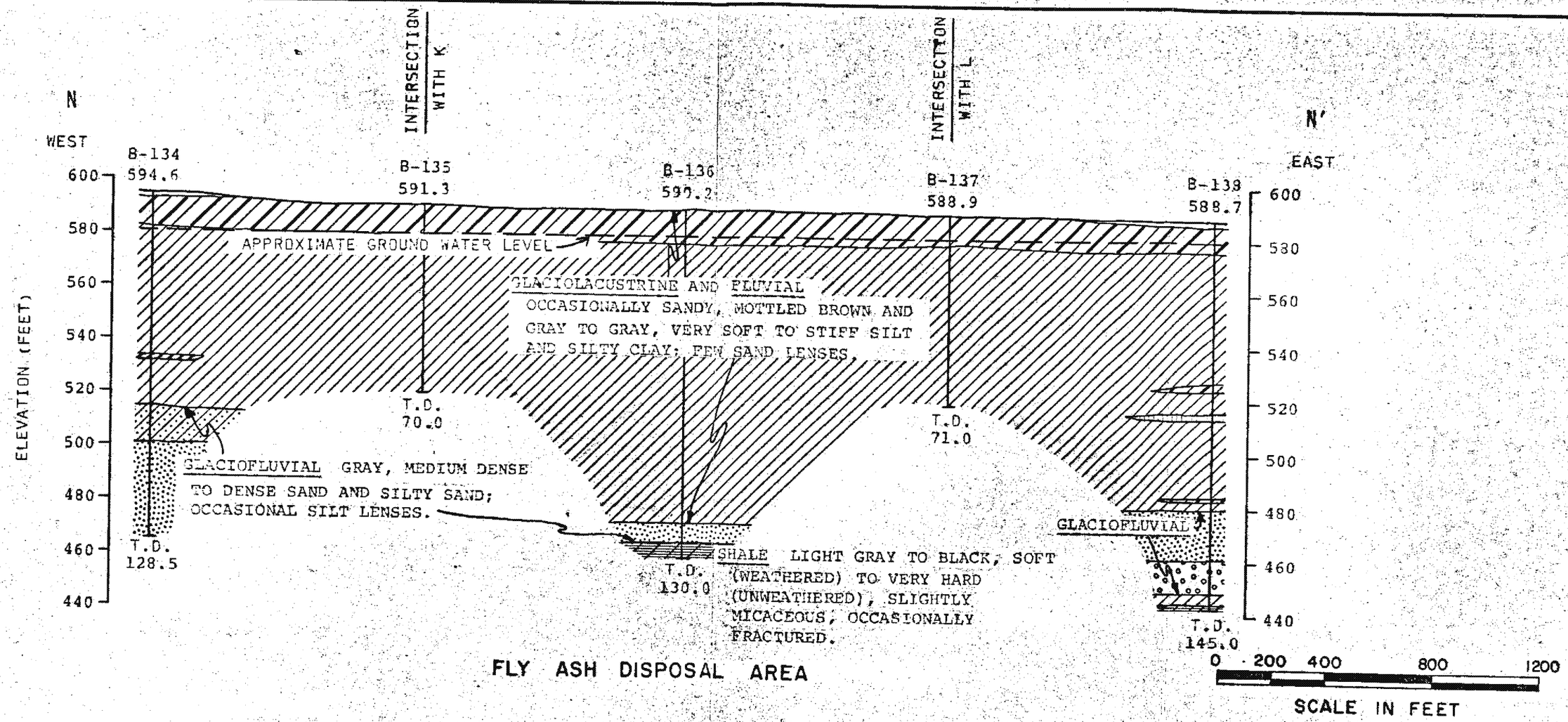
B-187 Bechtel borings (1973-1974)
T.D. Total depth drilled (ft)

BECHTEL
ANN ARBOR

BELLE RIVER PLANT
UNIT 1 & 2

SUBSURFACE PROFILE
SECTION M-M'

JOB NO.	DRAWING NO.	REV.
10539	FIGURE 9	0



FLY ASH DISPOSAL AREA

LEGEND

- Clay (CL)
- Clay (CH)
- Clay (CL-CH)
- Sand (SP)
- Sand (SW)
- Silt (ML)
- Clayey Sand (SC)
- Shale (weathered)

EXPLANATION

B-187 Bechtel borings (1973-1974)

T.D. Total depth drilled (ft)

NOTES:

1.) For location of section see Figure 4.
2.) For variation of water table see Section 4.1.3.
3.) For boring logs see Appendix B.
4.) For Geologic description of site see Section 4.1.2.

NO.	DATE	REVISIONS	BY	CK'D	GROUP SUPV.	ENG'R	PROJ. ENG'R	MICRO FILM
A	8-26-76	ISSUED FOR PROJ USE						
A	6-13-76	ISSUED FOR FINAL EVAL.						

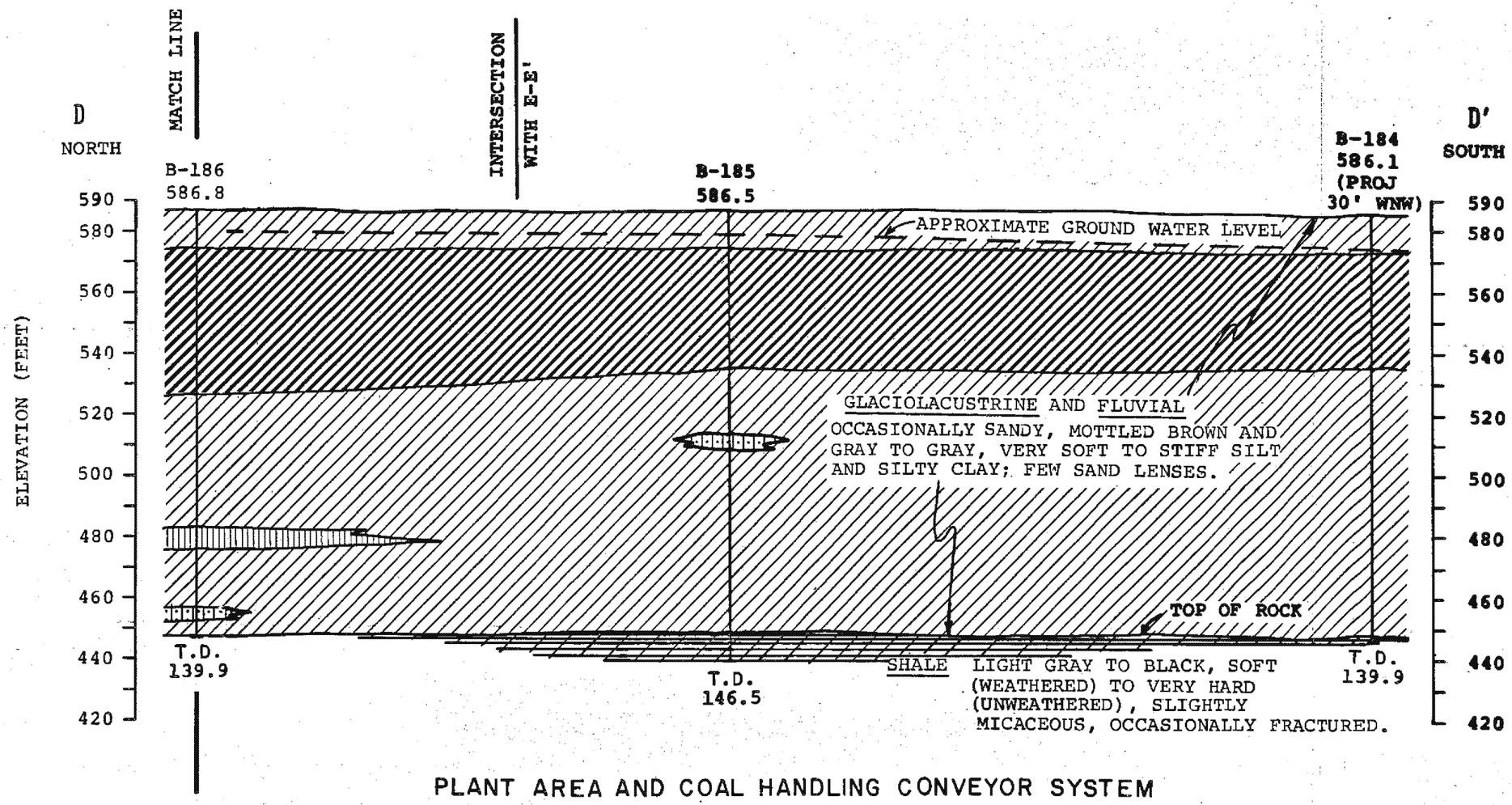
SCALE 1" = 400' DESIGNED DRS/JBG DRAWN ARR

BECHTEL
ANN ARBOR

BELLE RIVER PLANT
UNIT 1 & 2

SUBSURFACE PROFILE
SECTION N-N'

JOB NO.	DRAWING NO.	REV.
10539	FIGURE 9	0



PLANT AREA AND COAL HANDLING CONVEYOR SYSTEM

LEGEND

- Clay (CL)
- Clay (CH)
- Silt (ML)
- Silty Sand (SM)
- Shale (weathered)

EXPLANATION

B-187 Bechtel borings (1973-1974)

T.D. Total depth drilled (ft)

0 100 200 400 600

SCALE IN FEET

NOTES:

1.) For location of section see Figure 3.

2.) For variation of water table see Section 4.1.3.

3.) For boring logs see Appendix B.

4.) For Geologic description of site see Section 4.1.2.

BECHTEL
ANN ARBOR

BELLE RIVER PLANT
UNIT 1 & 2

SUBSURFACE PROFILE
SECTION D-D'
SHEET 2 OF 2

JOB NO.	DRAWING NO.	REV.
10539	FIGURE 9	0

EXPLANATION

- 7 — Basal sand thickness (ft)
- 117 — Boring number (present investigation)
- 3.5 — Basal sand thickness (ft)
- 32 — Boring number (previous investigations for St. Clair Plant)

NOTE:
Detail A (plant area) enlarged for clarity, to twice graphic scale shown below.

N

0 200 400 800 1200
SCALE IN FEET

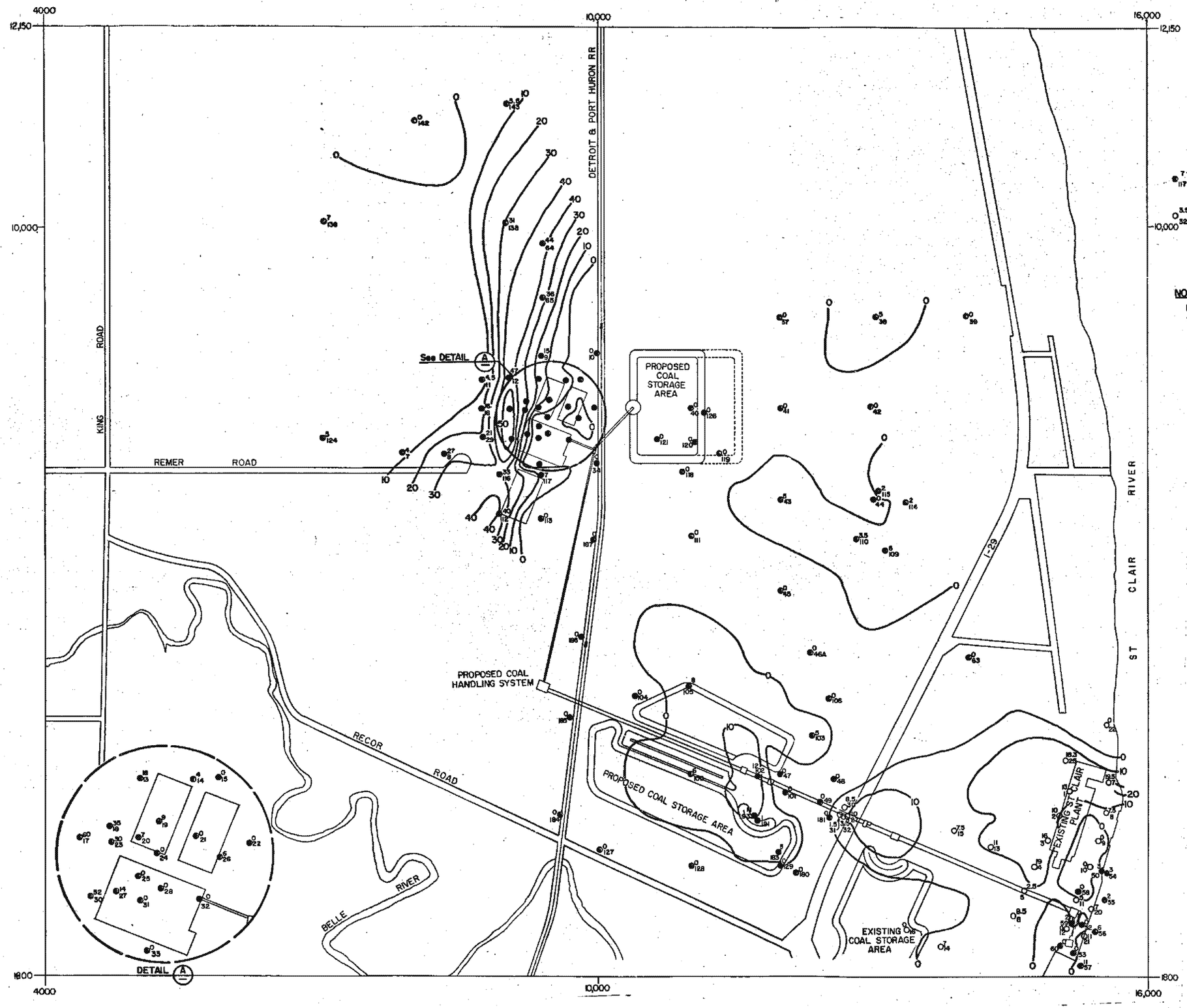
CONTOUR INTERVAL = 10 FT

BECHTEL
ANN ARBOR

BELLE RIVER PLANT
UNIT 1 & 2

BASAL SAND THICKNESS
CONTOUR MAP

JOB NO.	DRAWING NO.	REV.
10539	FIGURE 10	1



EXPLANATION

- 7 — Basal sand thickness (ft)
- 117 — Boring number (present investigation)
- 3.5 — Basal sand thickness (ft)
- 32 — Boring number (previous investigations for St. Clair Plant)

NOTE:
Detail A (plant area) enlarged for clarity, to twice graphic scale shown below.

N

0 200 400 800 1200
SCALE IN FEET

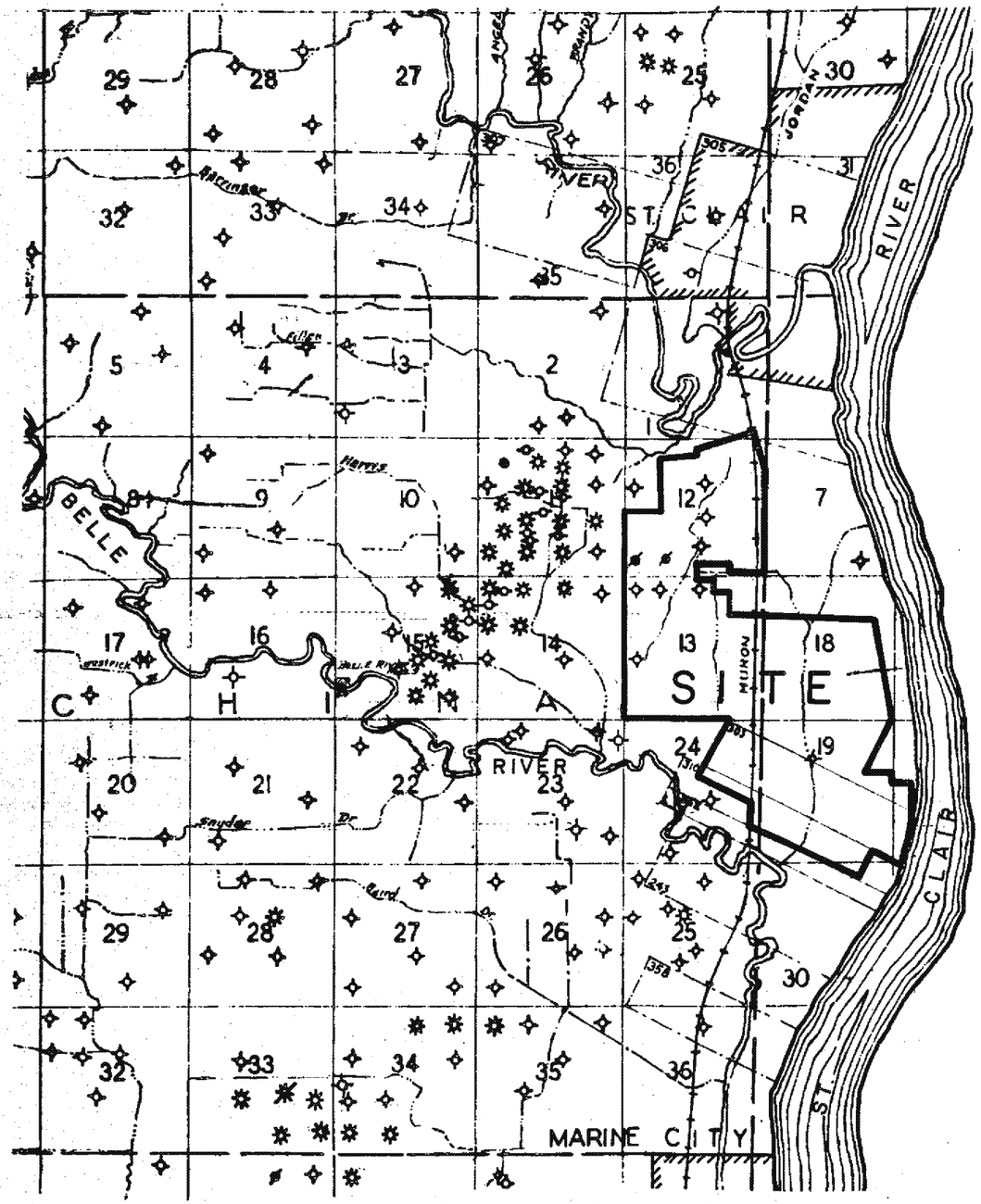
CONTOUR INTERVAL = 10 FT

BECHTEL
ANN ARBOR

BELLE RIVER PLANT
UNIT 1 & 2

BASAL SAND THICKNESS
CONTOUR MAP

JOB NO.	DRAWING NO.	REV.
10539	FIGURE 10	1



EXPLANATION

- Oil Well
- Gas Well
- Dry Hole
- Other
- Abandoned Well

REFERENCE:

Modified from Michigan Geological Survey Oil and Gas Well Map 3689A, St. Clair County.

0 1/2 1 2
SCALE IN MILES

BECHTEL
ANN ARBOR

BELLE RIVER PLANT
UNIT 1 & 2

LOCATION OF OIL AND GAS WELLS

JOB NO.	DRAWING NO.	REV.
10539	FIGURE 12	0

APPROXIMATE DEPTH (FT)	ERA	PERIOD	ROCK GROUPS AND FORMATIONS	GRAPHIC LOG	LITHOLOGY	APPROXIMATE THICKNESS AT SITE
	CENOZOIC ERA	QUATERNARY PERIOD	GLACIAL DRIFT		UNCONSOLIDATED DEPOSITS OF SAND, SILT AND CLAY. TWO MAJOR TYPES OCCUR: GLACIOLACUSTRINE-FLUVIAL CLAYS AND SILTS AND GLACIOFLUVIAL SANDS	133-157 (FT)
	PALEOZOIC	MISS.-DEVONIAN	BEDFORD SHALE		GRAY AND DARK GRAY SHALE	100
			ANTRIM SHALE		BLACK AND DARK BROWN SHALE WITH SOME PYRITE AND MARCASITE	200
		DEVONIAN	TRAVERSE GROUP		GRAY, LIGHT GRAY, AND BROWN CHERTY LIMESTONE WITH BEDS OF GRAY SHALE. GRAY AND BLUE SHALE BELOW WITH MINOR LIMESTONE BEDS	240
			DUNDEE LIMESTONE		BUFF, GRAY, AND BROWNISH-GRAY FINELY CRYSTALLINE LIMESTONE	130
1000			DETROIT RIVER GROUP		BUFF TO WHITE LIMESTONE AND DOLOMITE WITH ANHYDRITE	360
			BOIS BLANC FORMATION		WHITE TO GRAY CHERTY LIMESTONE AND DOLOMITE	90
		SILURIAN	BASS ISLAND GROUP		BUFF TO CREAM DOLOMITE WITH MINOR ANHYDRITE	135
2000			SALINA GROUP		GRAY SHALE WITH SOME DOLOMITE BROWN LIMESTONE AND SALT GRAY SHALE AND SALT BROWN DOLOMITE WITH ANHYDRITE AND SALT	1100
			NIAGARA GROUP		GRAY, TAN, AND BROWN DOLOMITE WITH ANHYDRITE IN TOP SECTION, SHALE BELOW	400
3000			CATARACT GROUP		RED AND BLUE SHALE AND LIGHT GRAY BLUE DOLOMITE	160
		ORDOVICIAN	(UNDIFFERENTIATED)		PRIMARILY DOLOMITE AND SANDSTONE WITH SHALE AND MINOR LIMESTONE	1550
4000		CAMBRIAN	(UNDIFFERENTIATED)		PRIMARILY SANDSTONE WITH LIMESTONE AND DOLOMITE	100
	PRECAMBRIAN				IGNEOUS, METAMORPHIC AND SEDIMENTARY ROCKS	UNKNOWN

EXPLANATION

- Glacial Drift
- Shale
- Limestone
- Cherty Limestone
- Dolomite
- Anhydrite
- Salt
- Sandstone
- Igneous, Metamorphic, and Sedimentary Rock Complex

NOTE:

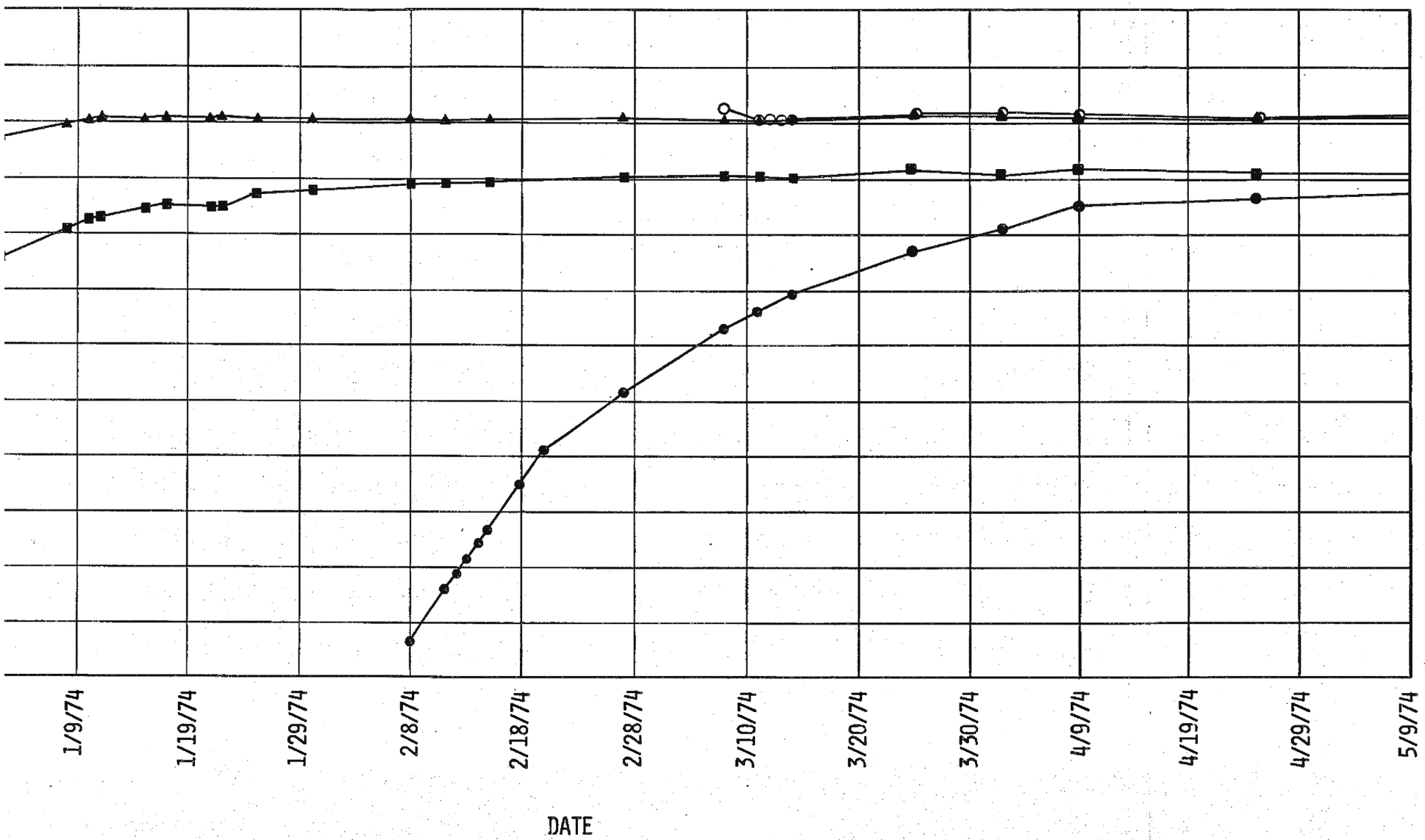
Overburden thickness determined from Bechtel logs. Thickness and description of geologic bedrock units above the Niagara group are based on logs of Wildcat wells drilled in China and East China Townships. These logs are on file with the Michigan Geological Survey in Lansing. Thickness and description of units below the Salina group were interpolated from Stratigraphic Cross-section Michigan Basin, Michigan Basin Geological Society, 1969; and Michigan's Oil and Gas Fields, 1972; Michigan Geological Annual Statistical Summary No. 18, 1973.

BECHTEL
ANN ARBOR

BELLE RIVER PLANT
UNIT 1 & 2

GENERALIZED GEOLOGIC COLUMN
CHINA AND EAST CHINA TOWNSHIPS

JOB NO.	DRAWING NO.	REV.
10539	FIGURE 13	1



EXPLANATION

- ■ Observation Well 7, bottom of screen at Elevation 450.5
- ● Observation Well 24, bottom of screen at Elevation 452.3
- ▲ Observation Well 40, bottom of screen at Elevation 509.1
- ○ Observation Well 181, bottom of screen at Elevation 449.3

NOTE:

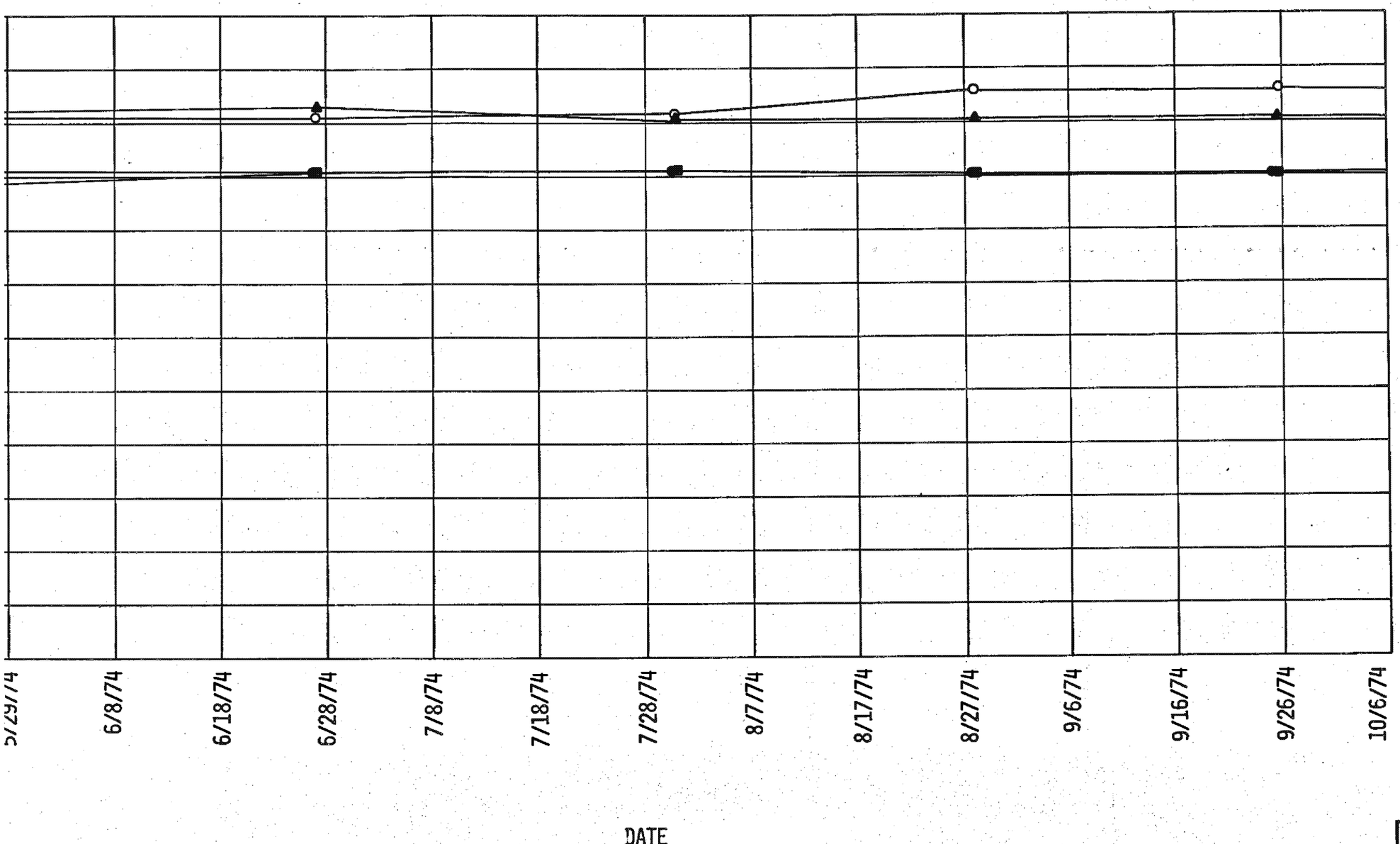
For location of Observation Wells see Figure 3.

BECHTEL
ANN ARBOR

BELLE RIVER PLANT
UNIT 1 & 2

HYDROGRAPHS OF OBSERVATION WELLS
SHEET 1 OF 3

JOB NO.	DRAWING NO.	REV.
10539	FIGURE 14	1



EXPLANATION

- ■ Observation Well 7, bottom of screen at Elevation 450.5
- ● Observation Well 24, bottom of screen at Elevation 452.3
- ▲ Observation Well 40, bottom of screen at Elevation 509.1
- ○ Observation Well 181, bottom of screen at Elevation 449.3

NOTE

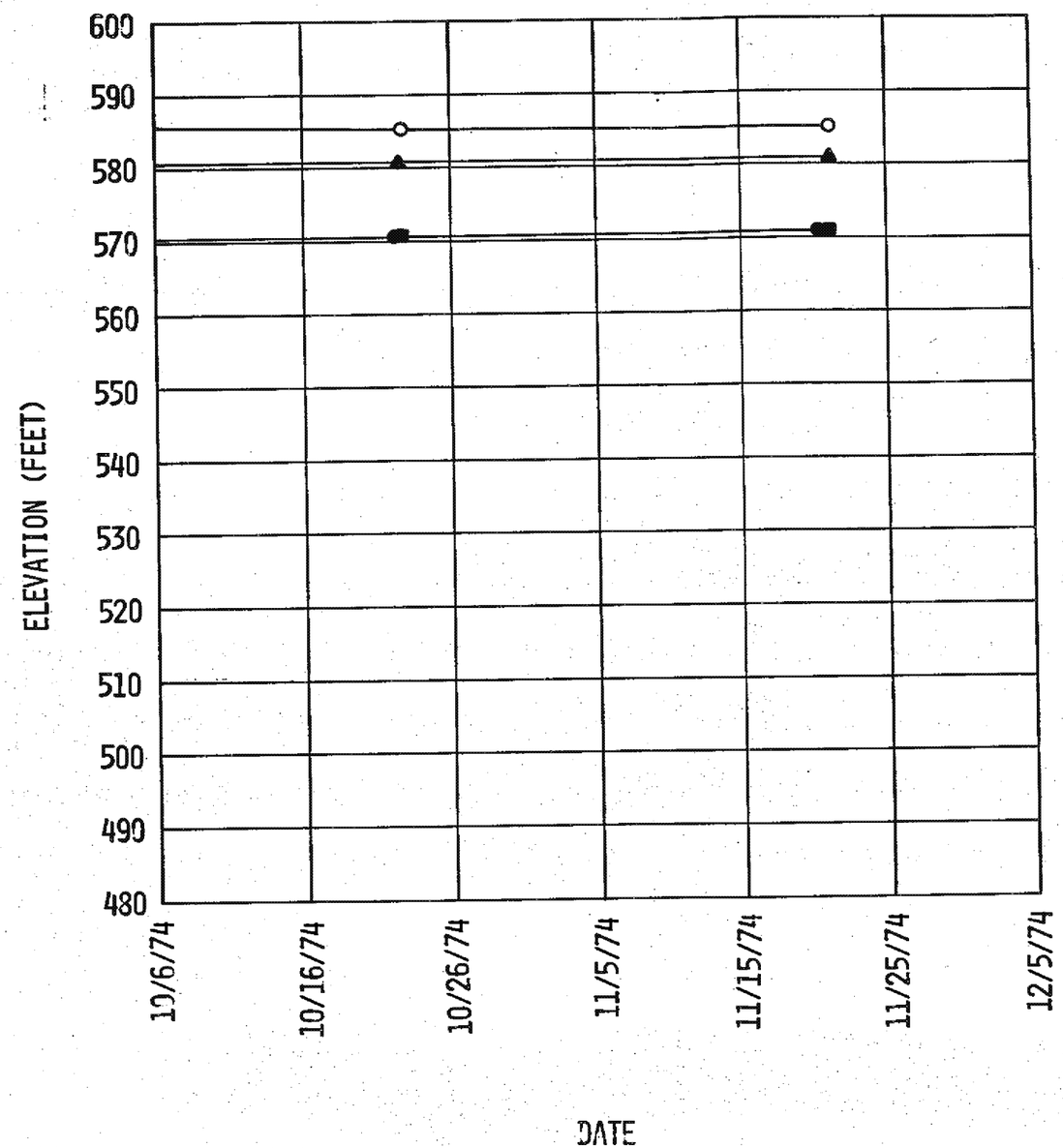
For location of Observation Wells see Figure 3.

BECHTEL
ANN ARBOR

BELLE RIVER PLANT
UNIT 1 & 2

HYDROGRAPHS OF OBSERVATION WELLS
SHEET 2 OF 3

JOB NO.	DRAWING NO.	REV.
10539	FIGURE 14	1



EXPLANATION

- ■ Observation Well 7, bottom of screen at Elevation 450.5
- ● Observation Well 24, bottom of screen at Elevation 452.3
- ▲ Observation Well 40, bottom of screen at Elevation 509.1
- ○ Observation Well 181, bottom of screen at Elevation 449.3

NOTE:

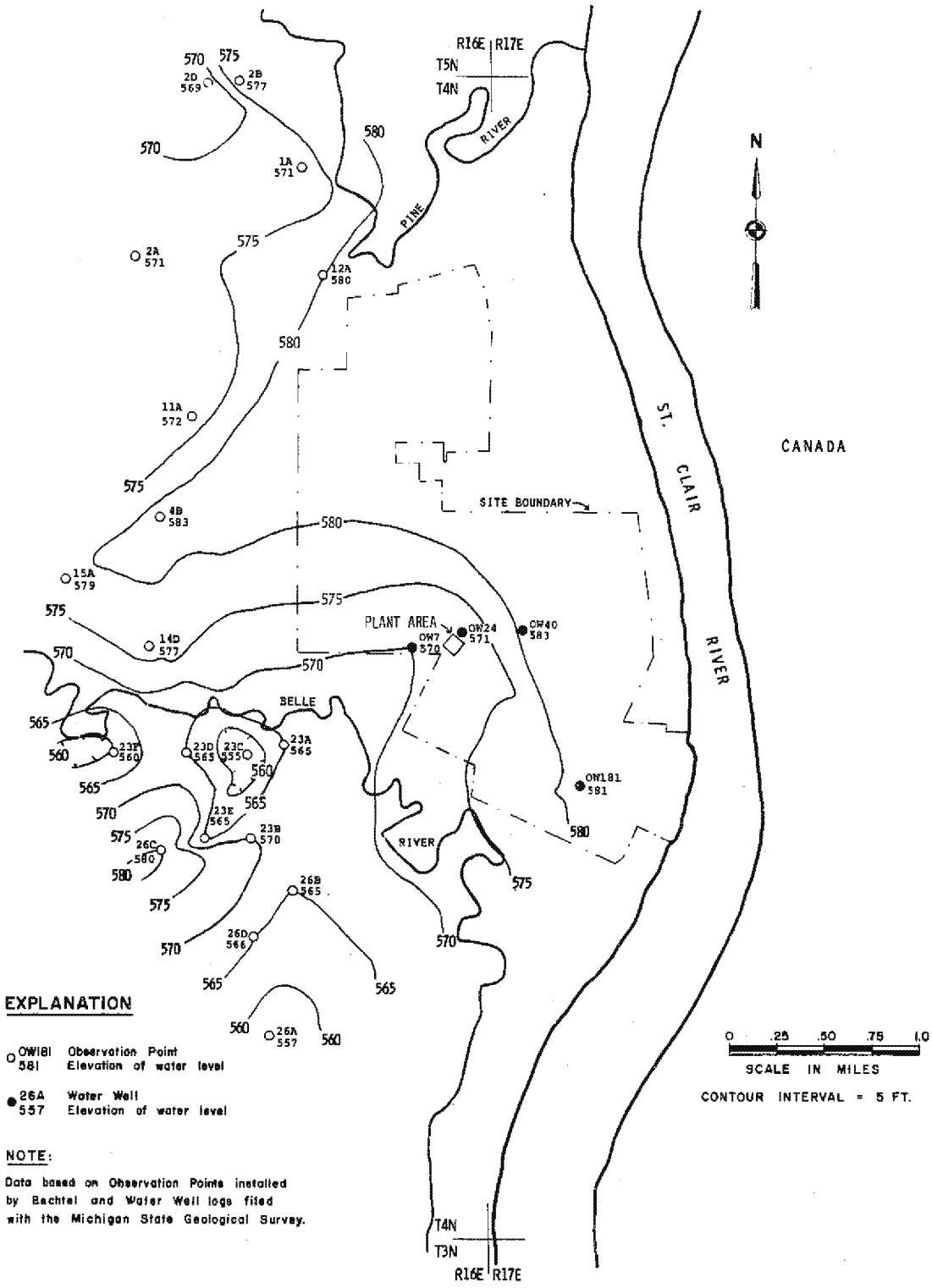
For location of Observation Wells see Figure 3.

BECHTEL
ANN ARBOR

BELLE RIVER PLANT
UNIT 1 & 2

HYDROGRAPHS OF OBSERVATION WELLS
SHEET 3 OF 3

JOB NO.	DRAWING NO.	REV.
10539	FIGURE 14	1



BECHTEL
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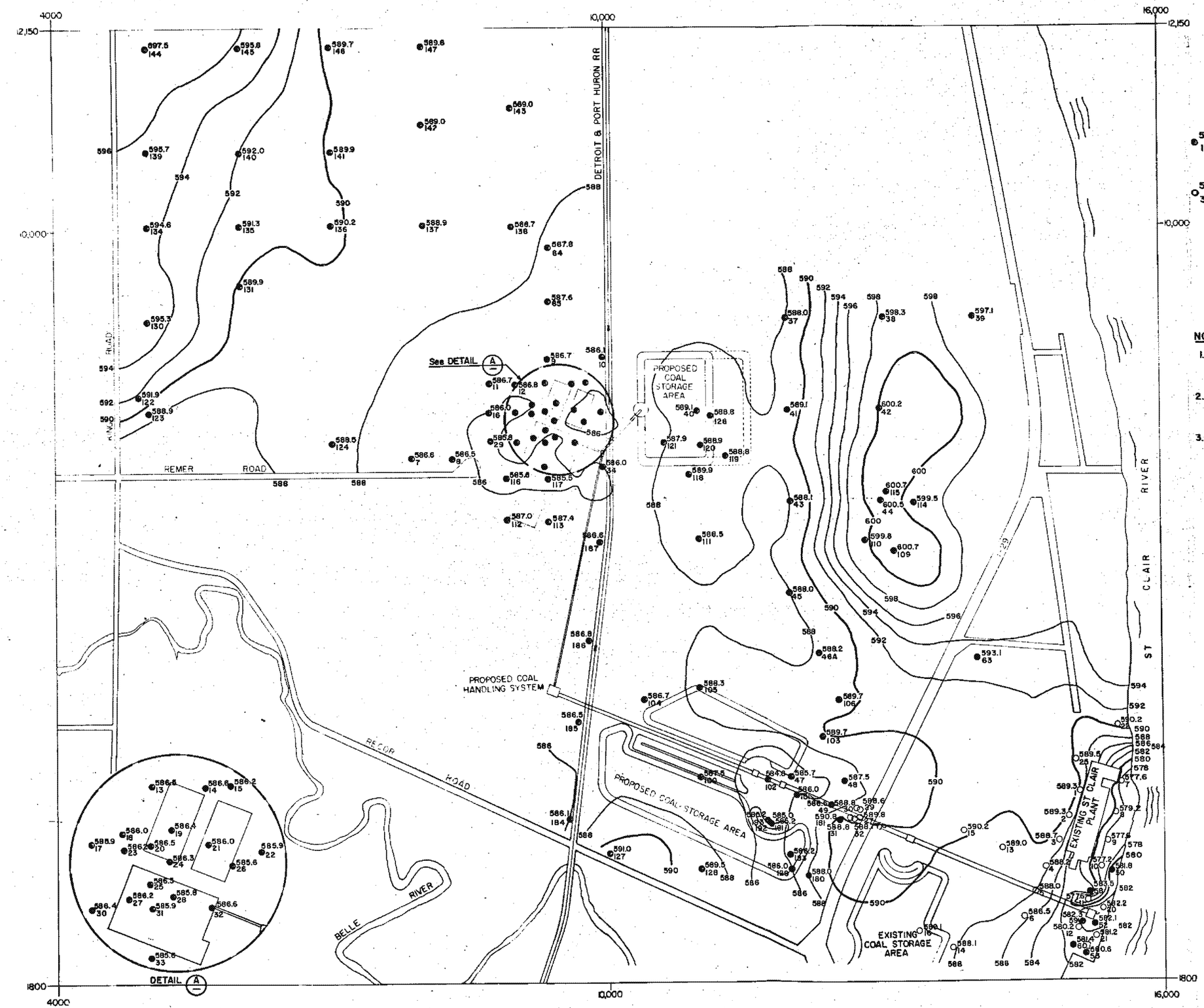
BELLE RIVER PLANT
UNIT 1 & 2

GROUND WATER LEVEL
CONTOUR MAP

JOB NO.	DRAWING NO.	REV.
10539	FIGURE 15	1



EXPLANATION

586.6 / 187 — Ground surface elevation (ft); Boring number (present investigation)

588.7 / 32 — Ground surface elevation (ft); Boring number (previous investigations for St Clair plant)

NOTES:

1. Contours generated from drill hole data by McDonnell Douglas Automation Company's SURMAP computer program.
2. Computer interpretation modified manually to accommodate additional data points.
3. Detail A (plant area) enlarged for clarity, to twice graphic scale shown below.

N

0 200 400 800 1200

SCALE IN FEET

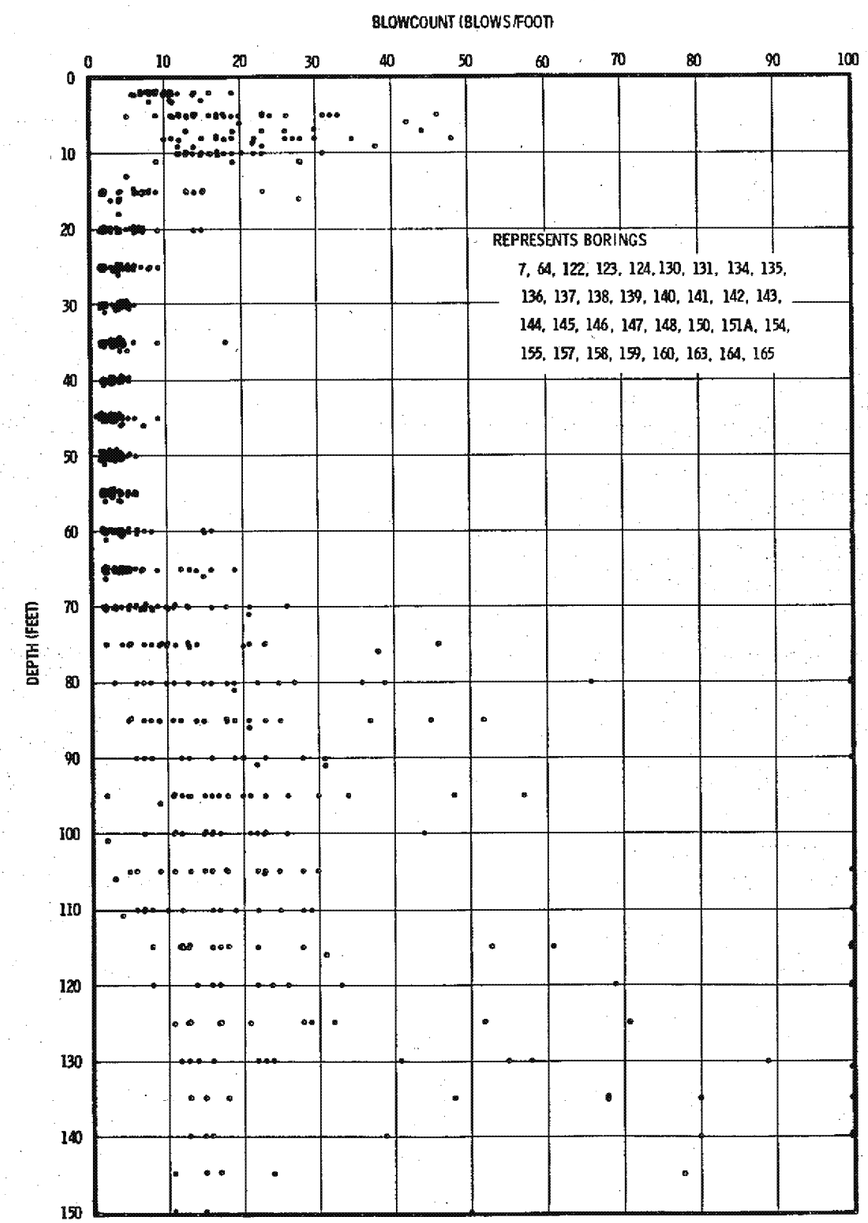
CONTOUR INTERVAL = 2 FT

BECHTEL
ANN ARBOR

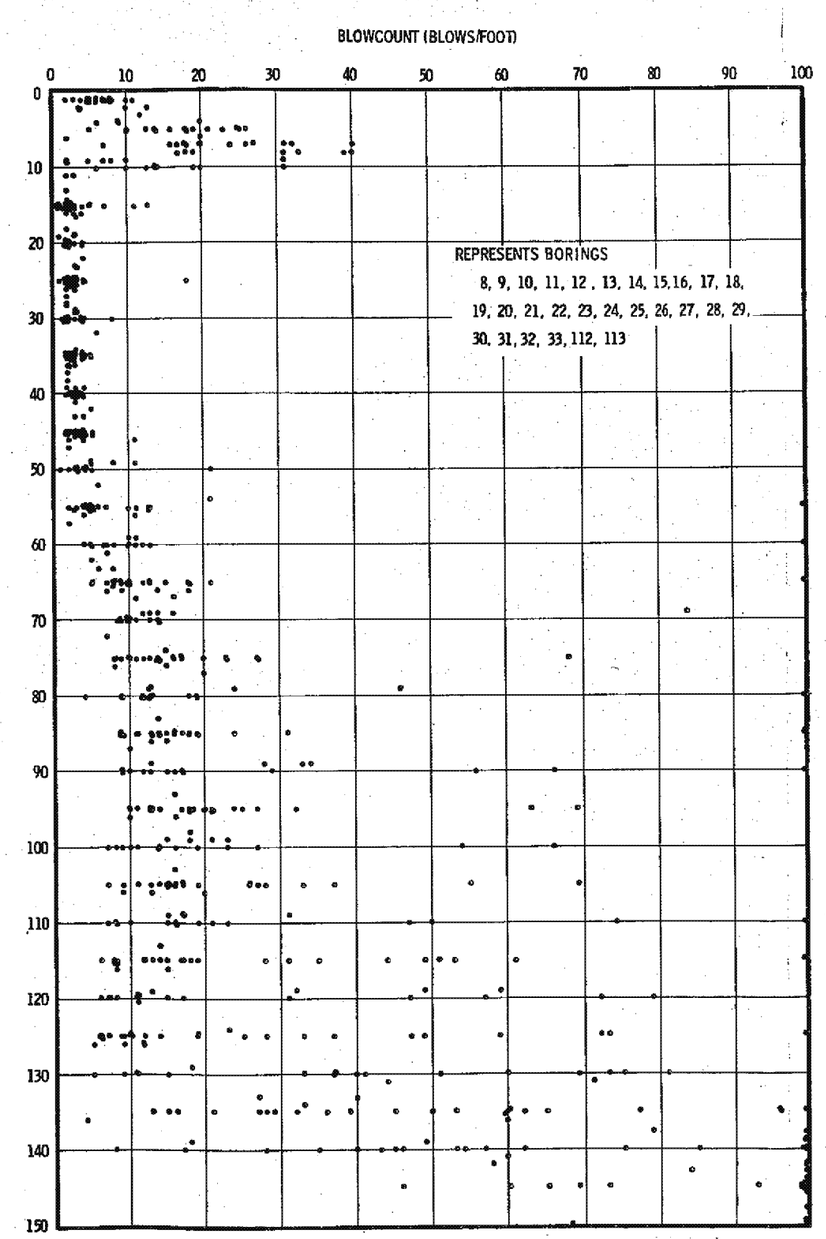
BELLE RIVER PLANT
UNIT 1 & 2

GROUND SURFACE CONTOUR MAP

JOB NO.	DRAWING NO.	REV.
10539	FIGURE 16	1



NORTH AREA



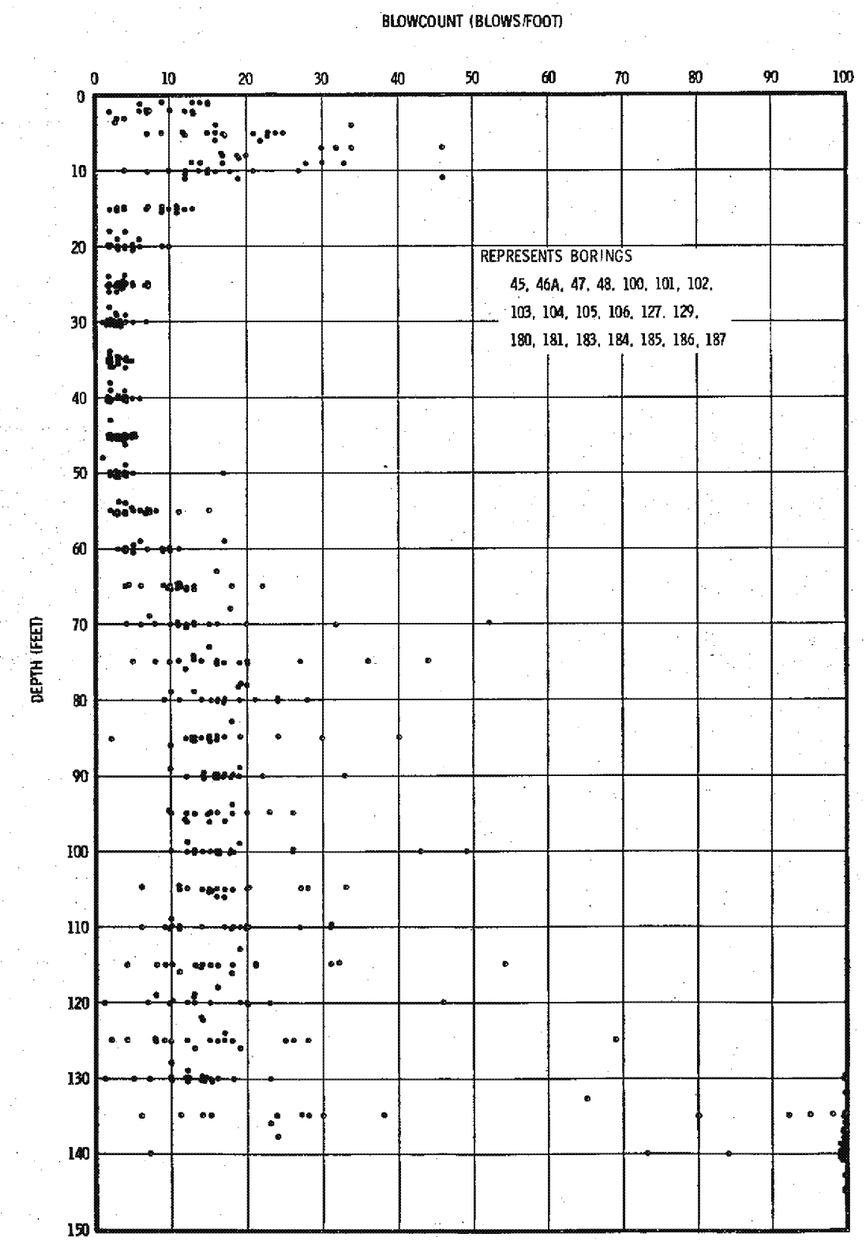
MAIN PLANT AREA

BECHTEL
ANN ARBOR

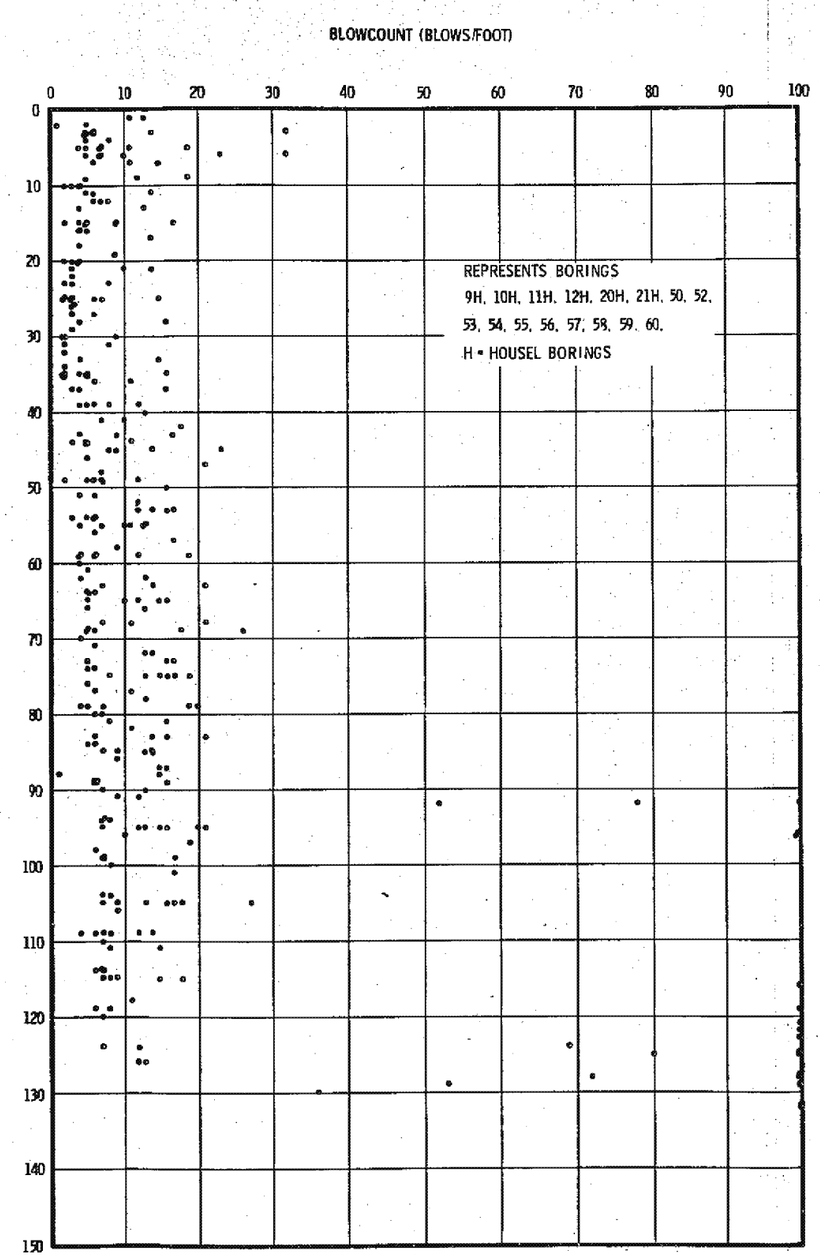
BELLE RIVER PLANT
UNITS 1 & 2

BLOWCOUNT vs DEPTH
SHEET 1 OF 2

JOB No.	DRAWING No.	REV.
10539	FIGURE 17	0



COAL STORAGE AREA



DOCK AREA

BECHTEL
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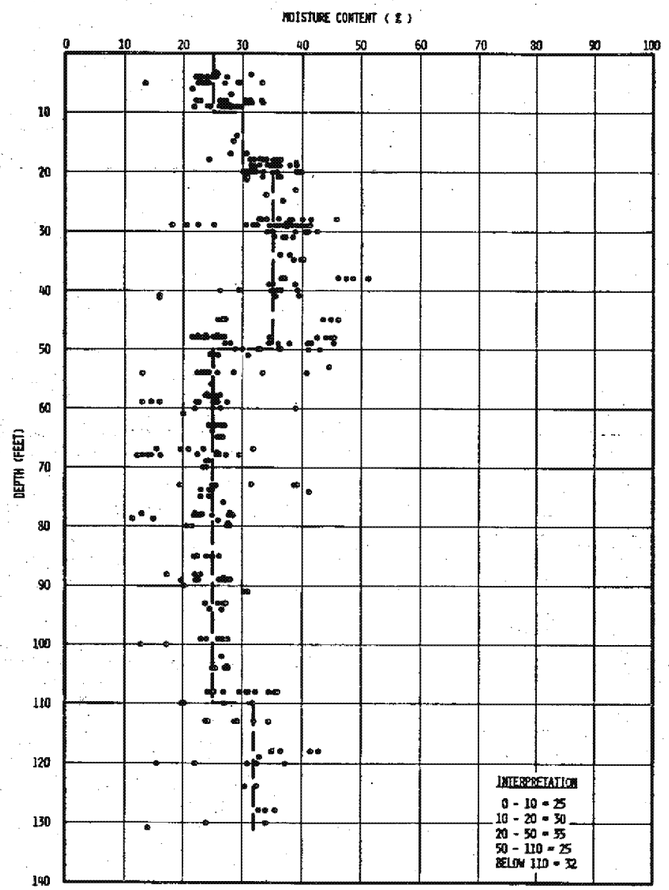
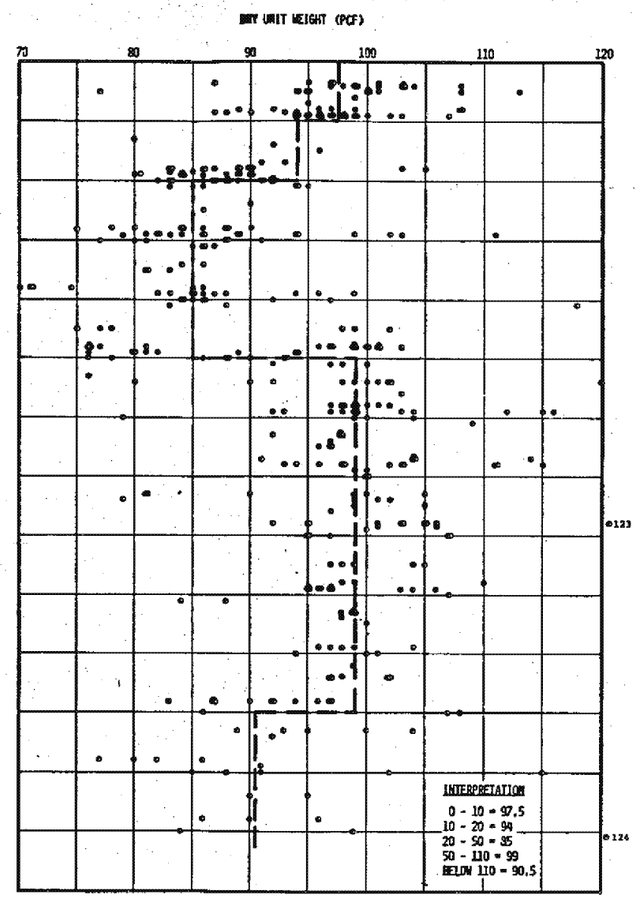
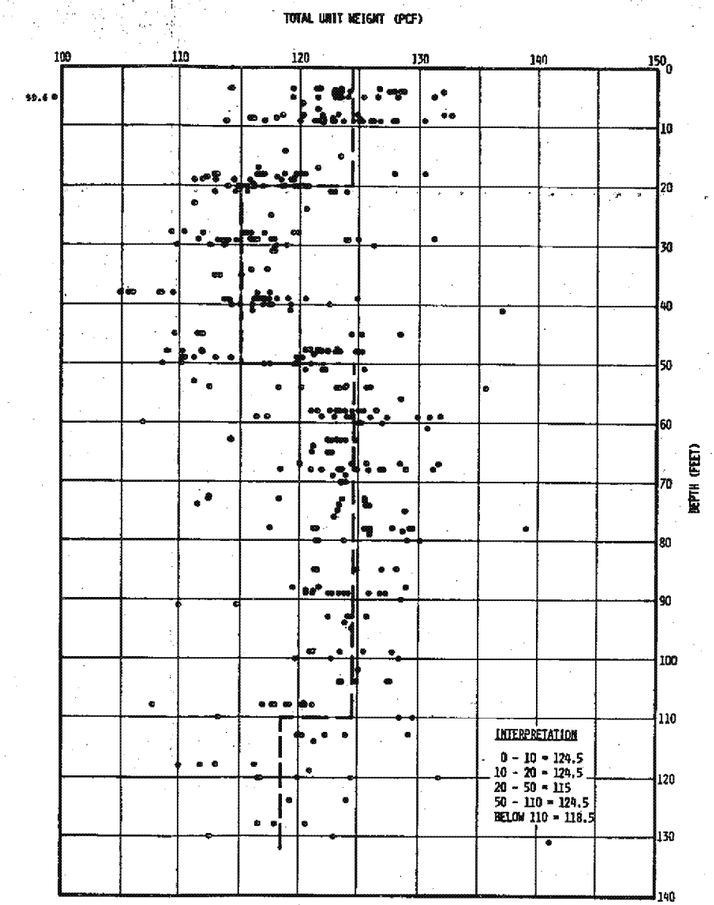
BELLE RIVER PLANT
UNITS 1 & 2

BLOWCOUNT vs DEPTH
SHEET 2 OF 2

JOB No.	DRAWING No.	REV.
10539	FIGURE 17	0







NOTE: DATA INCLUDES RESULTS OF ALL TESTS PERFORMED THROUGHOUT THE ENTIRE SITE.

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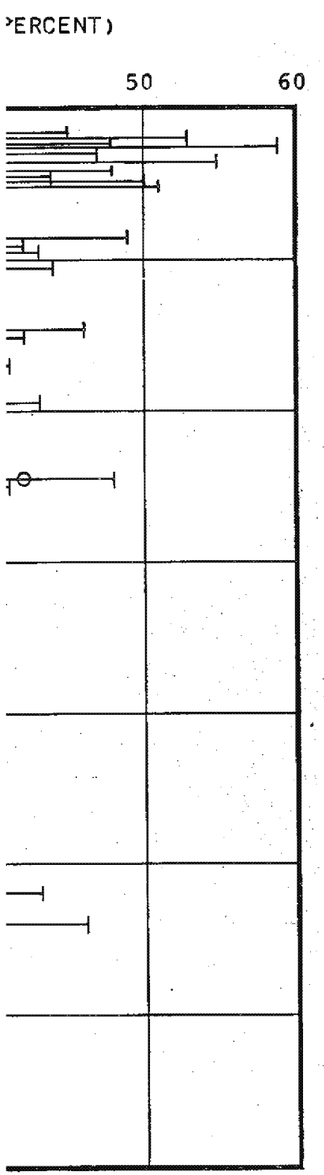
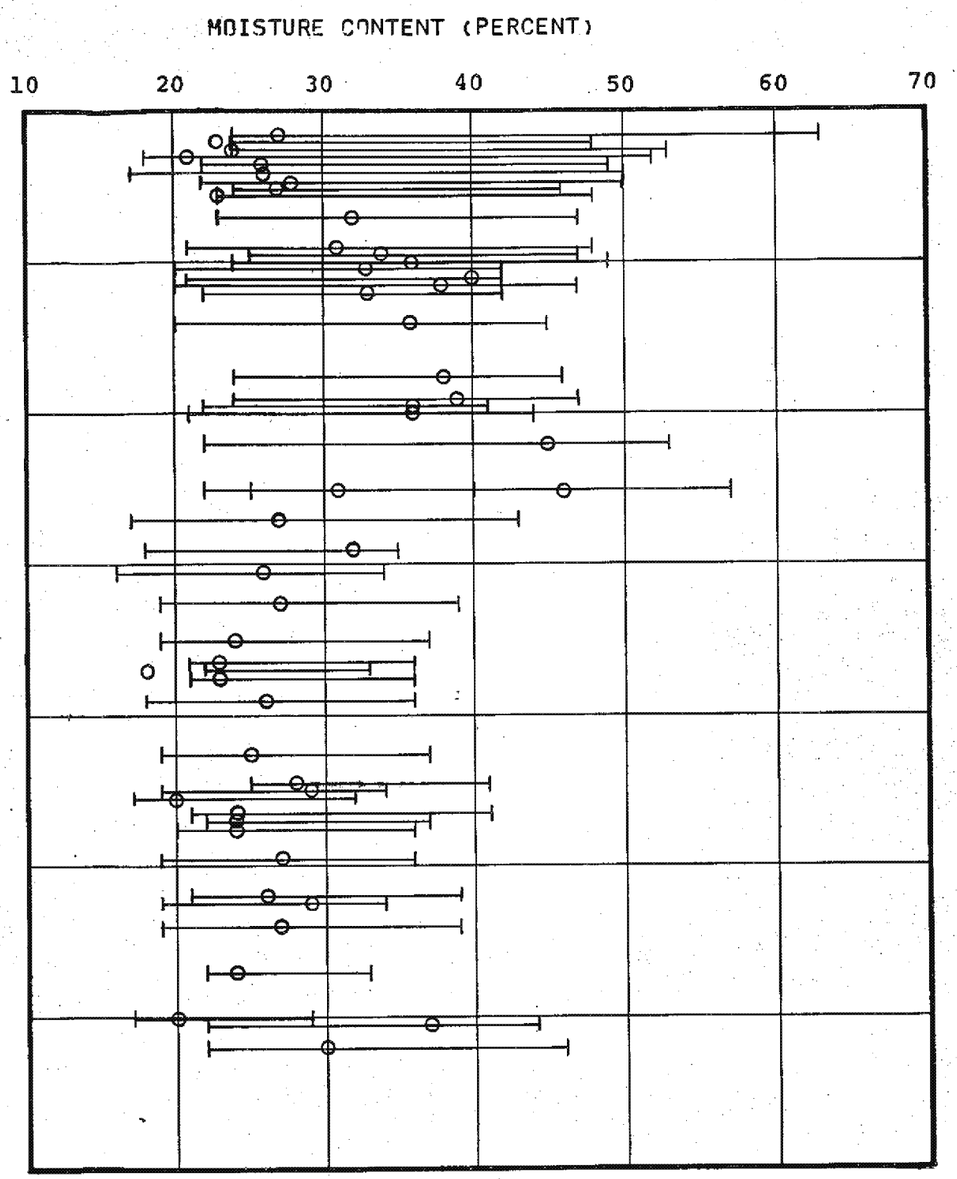
BELLE RIVER PLANT
UNIT 1 & 2

MOISTURE CONTENT, DRY UNIT WEIGHT, AND TOTAL UNIT WEIGHT VS DEPTH

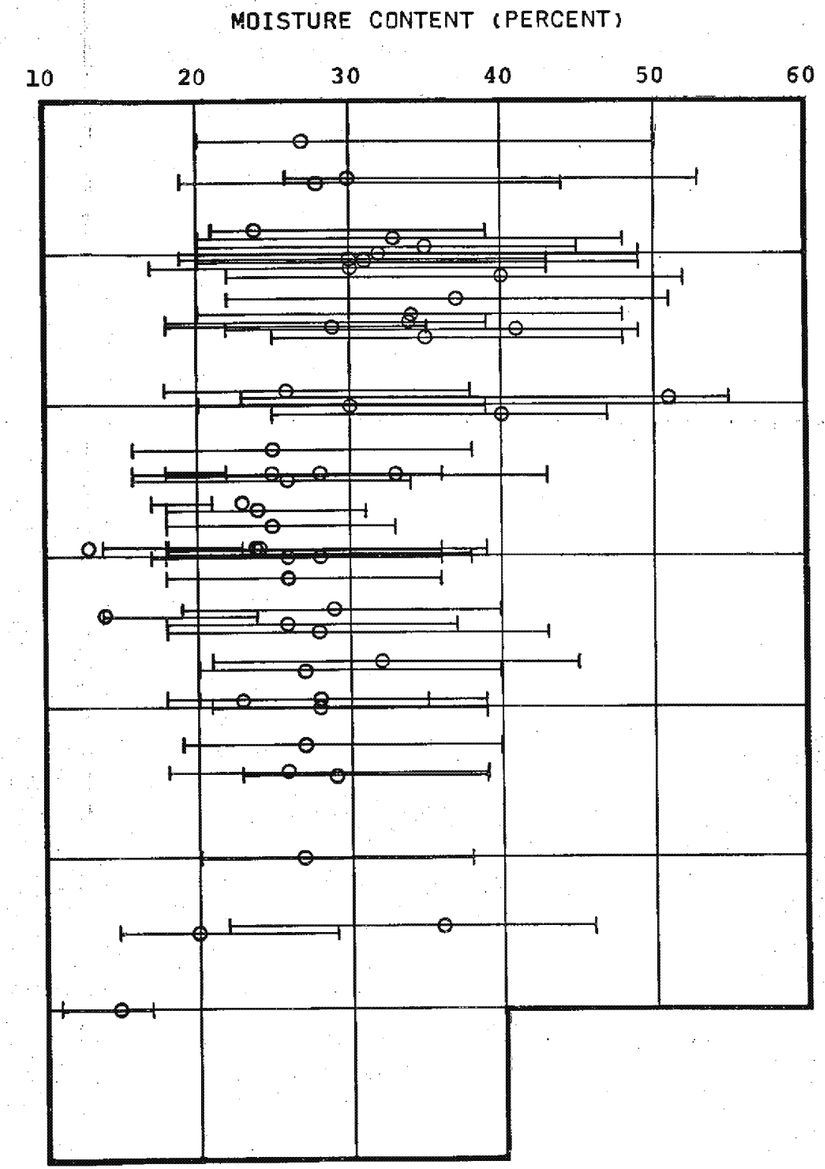
JOB NO.	DRAWING NO.	REV.
10539	FIGURE 18	0



EA



MAIN COAL STORAGE AREA



DOCK AREA

LEGEND

W: NATURAL MOISTURE CONTENT
PL: PLASTIC LIMIT
LL: LIQUID LIMIT

PL —— W —— LL

BECHTEL
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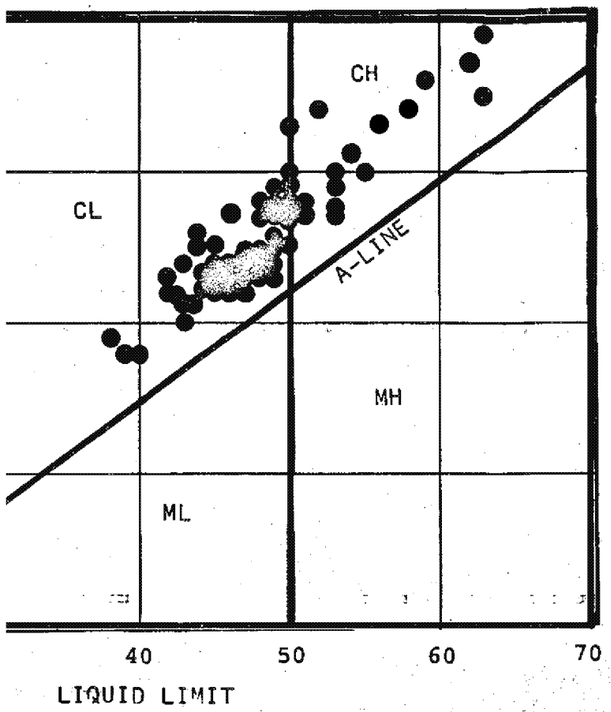
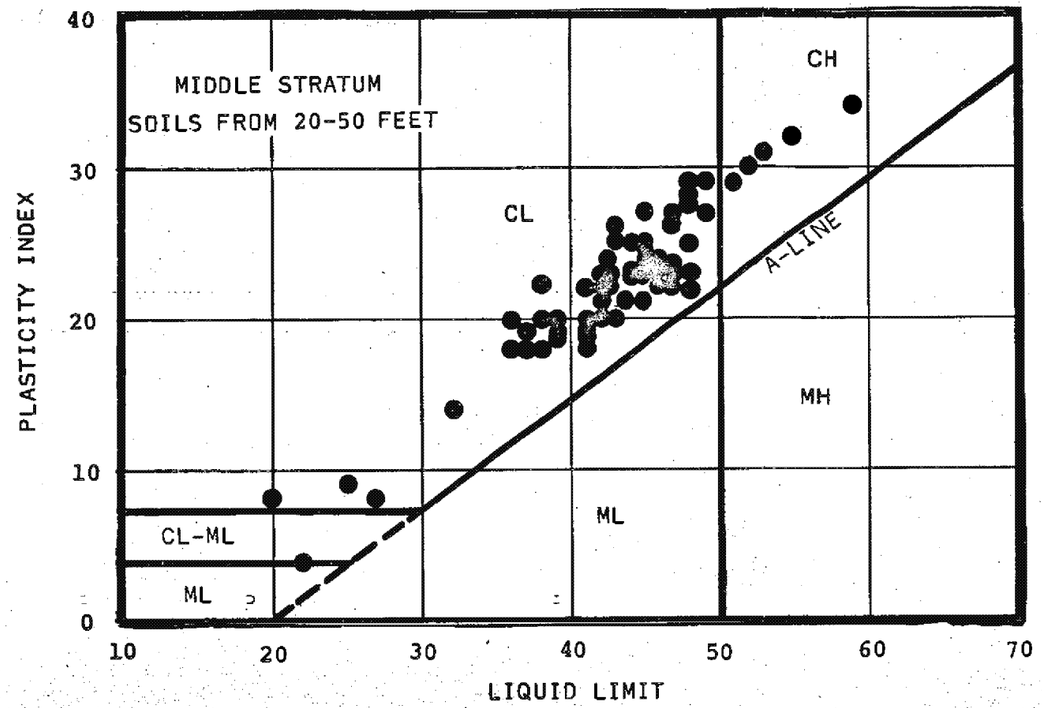
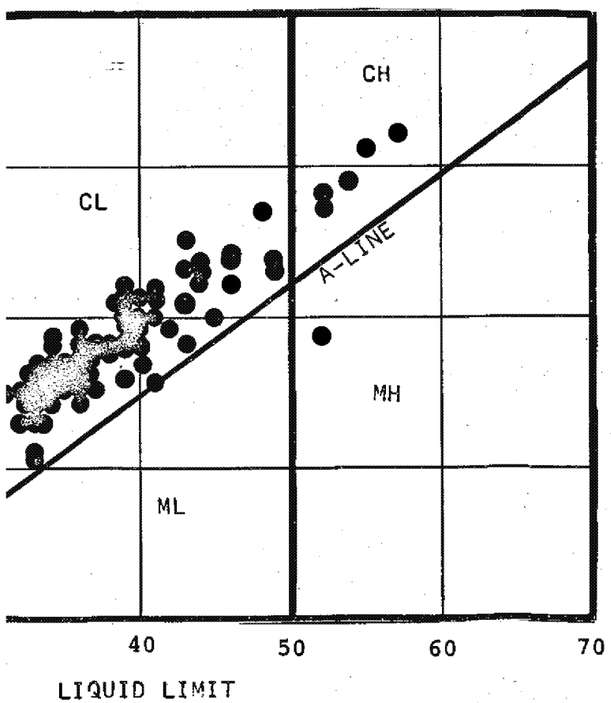
BELLE RIVER PLANT
UNIT 1 & 2

ATTERBERG LIMITS AND NATURAL MOISTURE CONTENT VS DEPTH

JOB NO.	DRAWING NO.	REV.
10539	FIGURE 20	0







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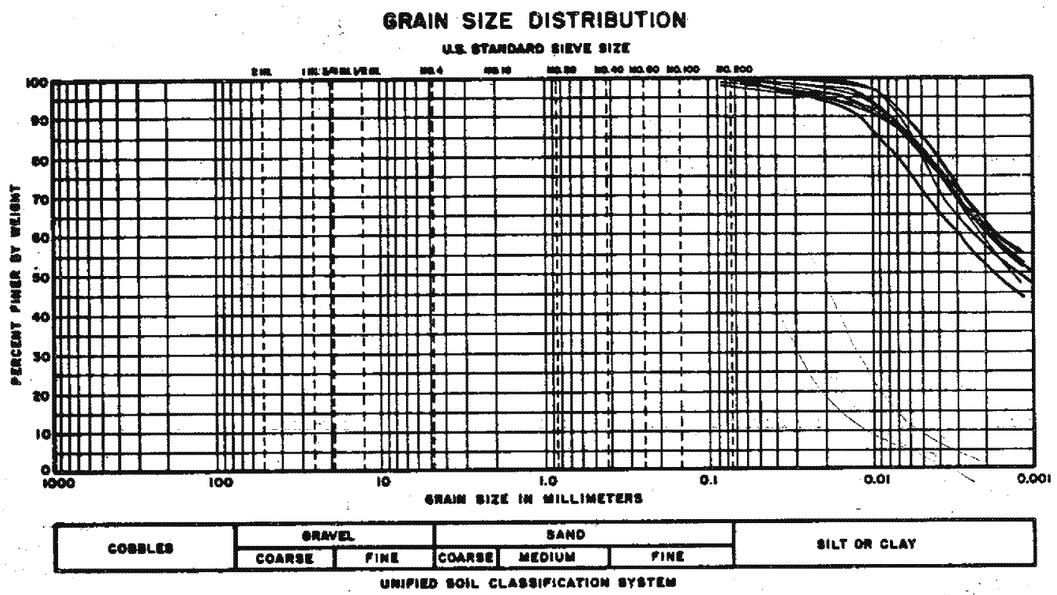
BELLE RIVER PLANT
UNIT 1 & 2

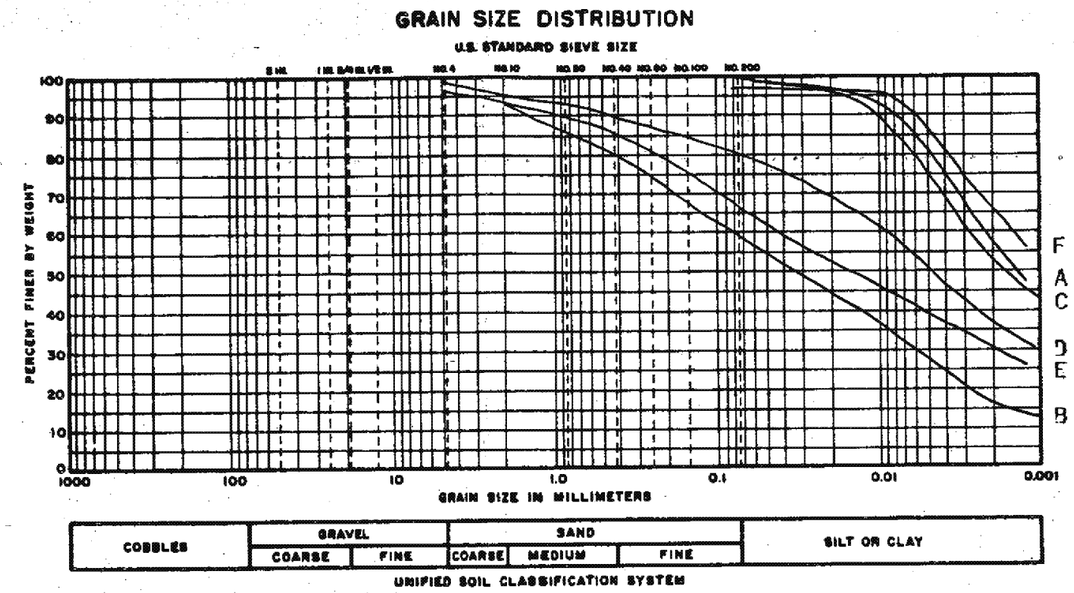
PLASTICITY CHART

JOB NO.	DRAWING NO.	REV.
10539	FIGURE 19	0



UPPER STRATUM (0-20 FEET)

BORING NUMBER	SAMPLE DEPTH (FEET)
38 (CL-CH)	9
38 (CL-CH)	15
41 (CH)	5
48 (CL-CH)	9
60 (CL-CH)	5
60 (CL)	11
60 (CL)	18
60 (CL)	19
137 (CL-CH)	2
144 (CL)	14
151A (CL-CH)	8



MIDDLE STRATUM (20-50 FEET)

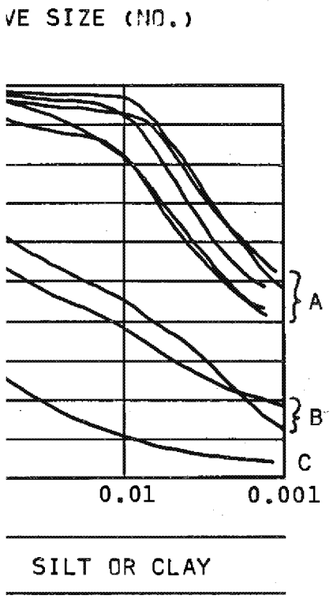
BORING NUMBER	SAMPLE DEPTH (FEET)
A 41 (CL)	20
B 41 (SC)	40
C 50 (CL)	28
D 50 (CL)	48
E 53 (CL)	39
F 60 (CL-CH)	27

BECHTEL
ANN ARBOR

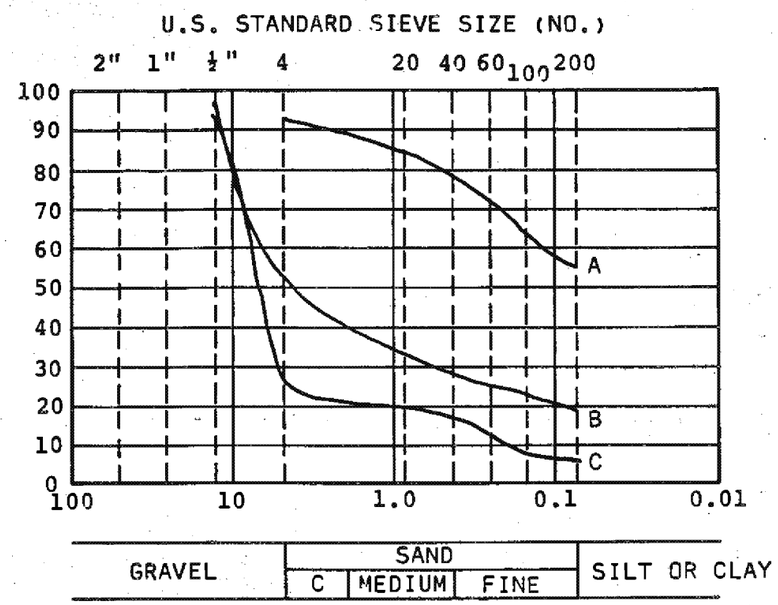
BELLE RIVER PLANT
UNIT 1 & 2

GRAIN SIZE DISTRIBUTION
UPPER AND MIDDLE STRATA

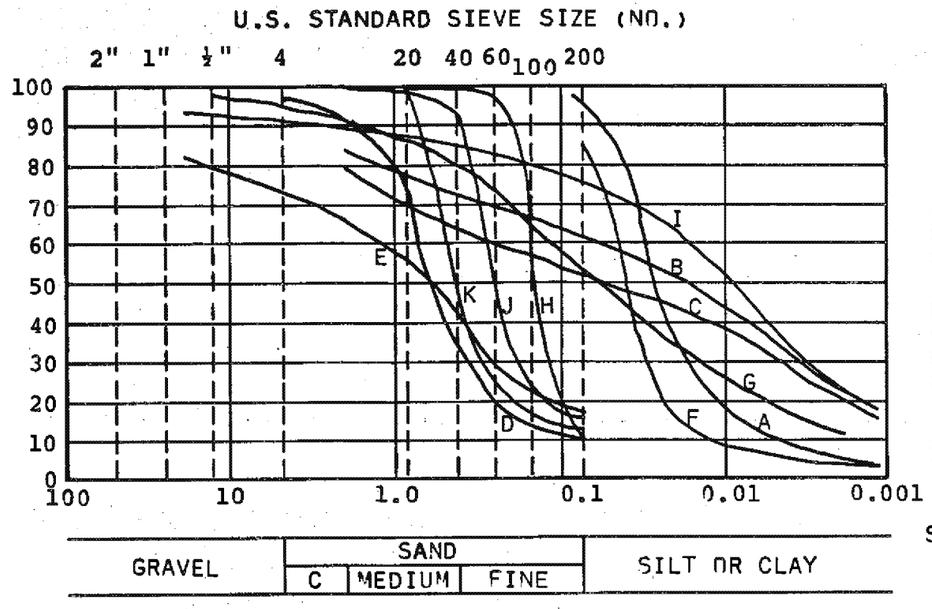
JOB NO.	DRAWING NO.	REV.
10539	FIGURE 21	0



REA EAST OF MAIN PLANT



NORTHWEST FLY ASH DISPOSAL AREA



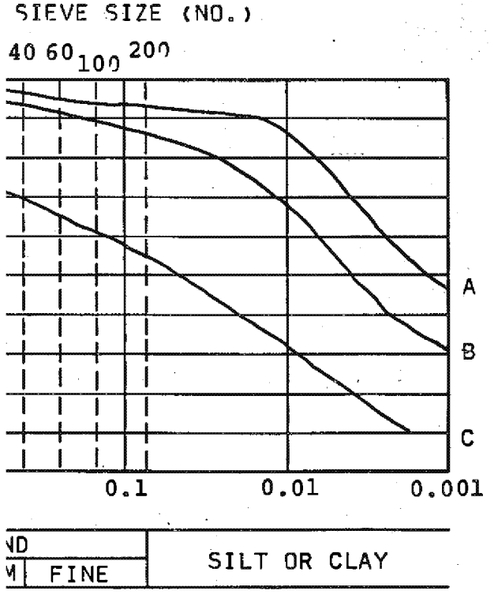
MAIN PLANT AREA

MAIN PLANT AREA

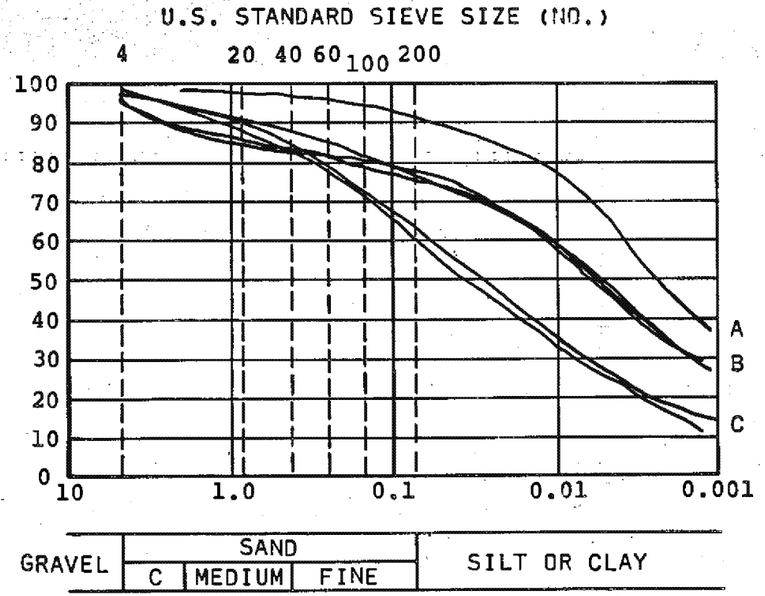
	BORING NUMBER	SAMPLE DEPTH (FEET)
A	7 (CL-ML)	130
B	7 (CL-ML)	139
C	10 (CL-ML)	141
D	18 (SM-SW)	104
E	18 (SM)	140
F	22 (CL-ML)	134
G	27 (CL-ML)	69
H	27 (SM-SP)	114
I	30 (CL)	69
J	30 (SM)	99
K	30 (SM)	119

SECONDARY COAL STORAGE AREA EAST OF MAIN PLANT

	BORING NUMBER	SAMPLE DEPTH (FEET)
A	38 (CL)	54.1
A	38 (CH)	74.0
A	38 (CL)	84.6
A	38 (CL)	114.2
C	38 (SM)	138.5
B	41 (CL-SC)	72.9
A	41 (CL)	101.9
B	41 (GC-SC)	130.7



STORAGE AREA



DOCK AREA

NORTHWEST FLY ASH DISPOSAL AREA

	BORING NUMBER	SAMPLE DEPTH (FEET)
C	139 (GP)	100
B	141 (GM)	115
A	141 (SM-SC)	145

MAIN COAL STORAGE AREA

	BORING NUMBER	SAMPLE DEPTH (FEET)
A	48 (CL)	118
B	49 (CL)	63
C	187 (CL-ML)	59

DOCK AREA

	BORING NUMBER	SAMPLE DEPTH (FEET)
C	52 (CL)	58.6
B	54 (CL)	63.5
A	54 (CL)	73.7
B	60 (CL)	56.1
B	60 (CL)	85.6
C	60 (CL)	119.5

NOTES:

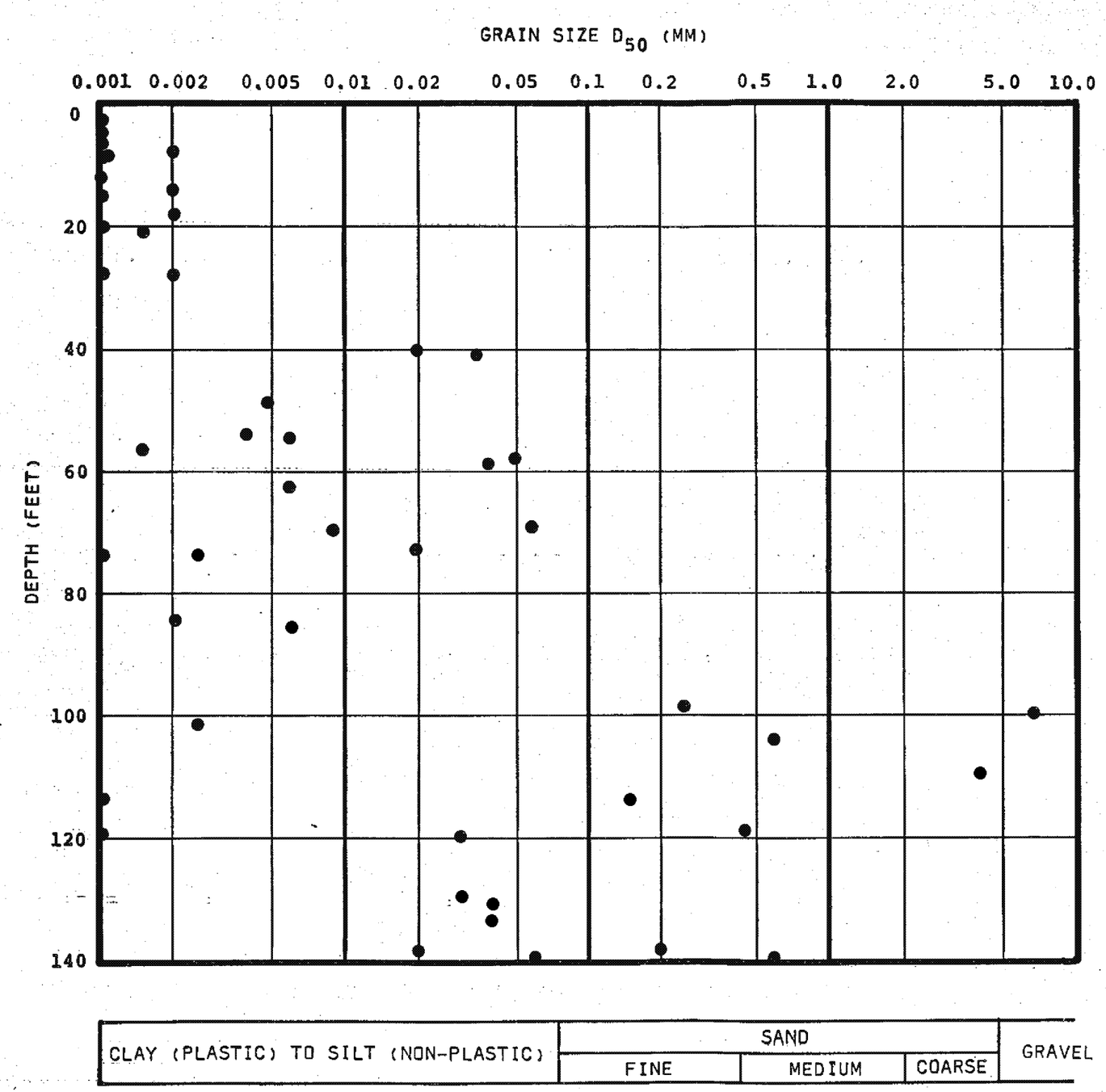
1) ALL SOILS ARE BELOW 50 FEET.
2) SOIL DIVISIONS AS PER UNIFIED SOIL CLASSIFICATION SYSTEM

BECHTEL
ANN ARBOR

BELLE RIVER PLANT
UNIT 1 & 2

GRAIN SIZE DISTRIBUTION
LOWER STRATUM

JOB NO.	DRAWING NO.	REV.
10539	FIGURE 22	0



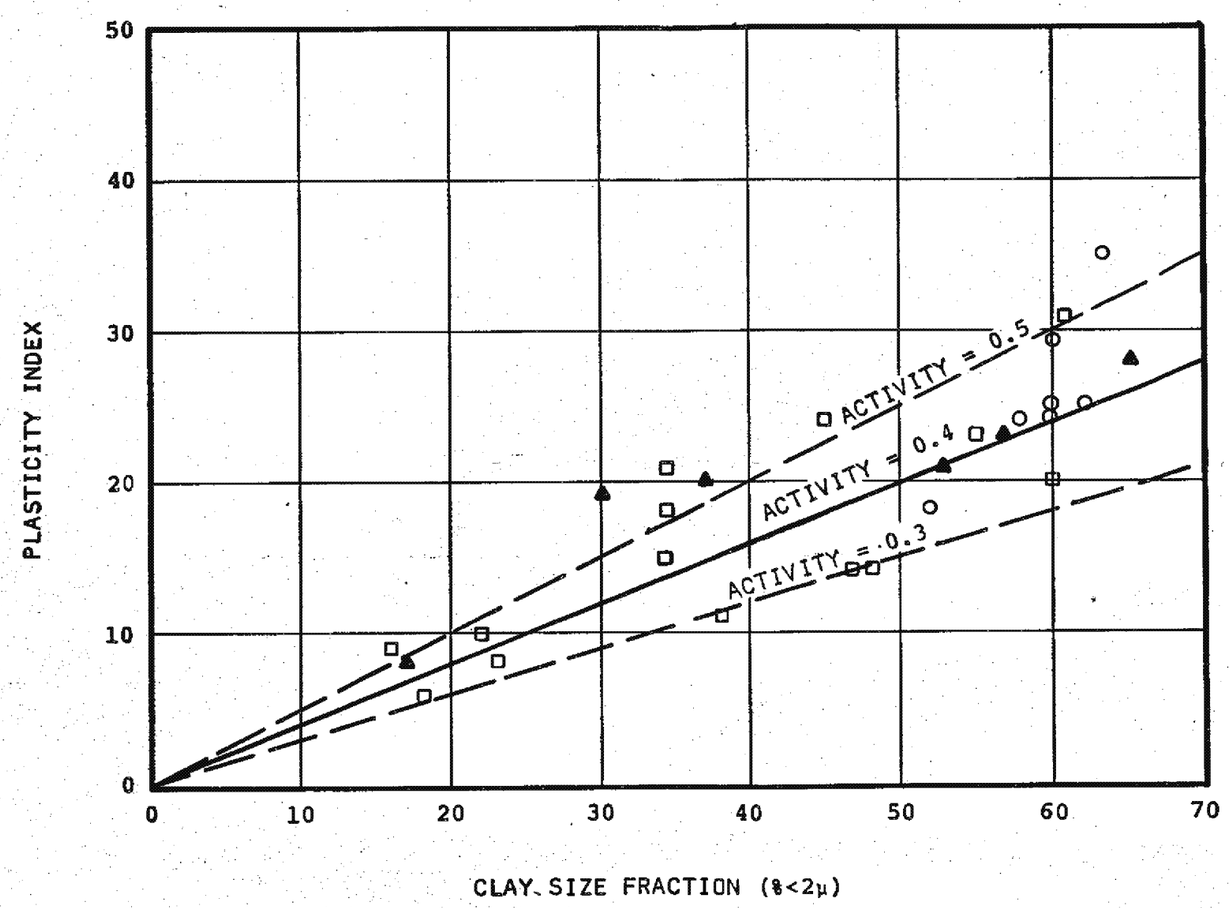
UNIFIED SOIL CLASSIFICATION SYSTEM

BECHTEL
ANN ARBOR

BELLE RIVER PLANT
UNIT 1 & 2

GRAIN SIZE (D_{50}) vs DEPTH

JOB NO.	DRAWING NO.	REV.
10539	FIGURE 23	0



○ SOILS FROM 0-20 FEET

▲ SOILS FROM 20-50 FEET

□ SOILS BELOW 50 FEET

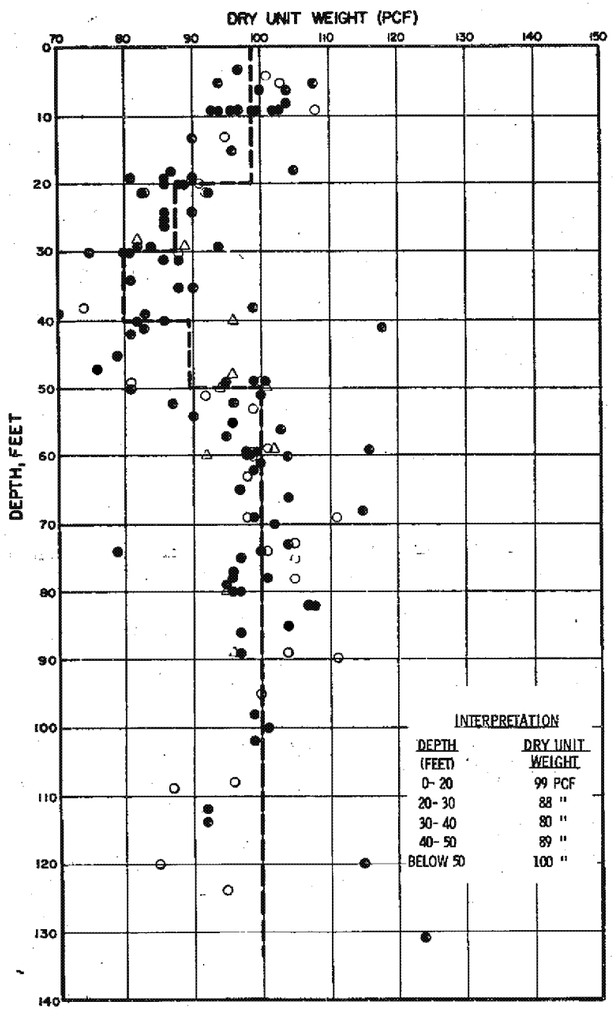
ACTIVITY = PI/%<2μ

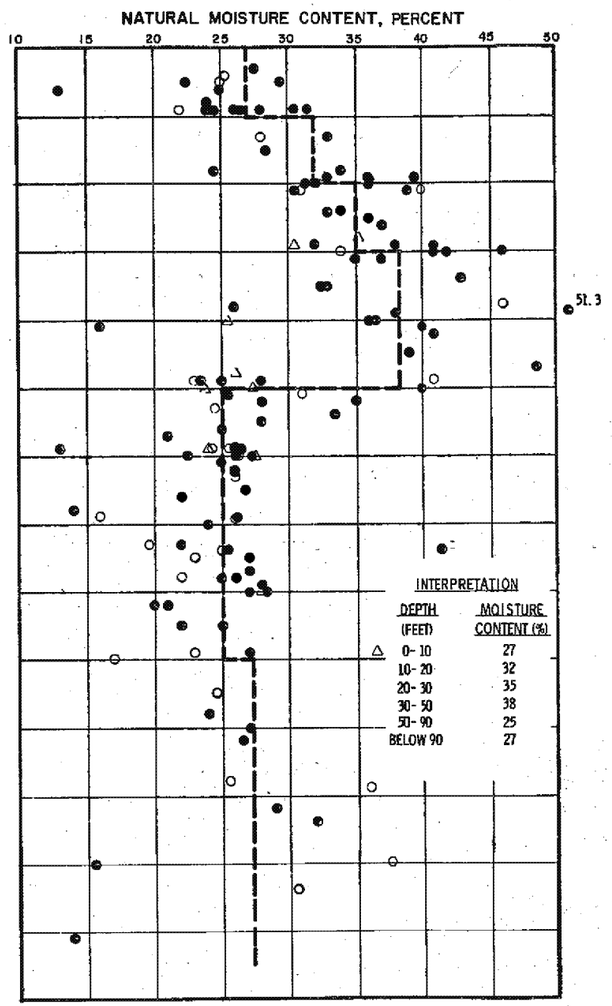
BECHTEL
ANN ARBOR

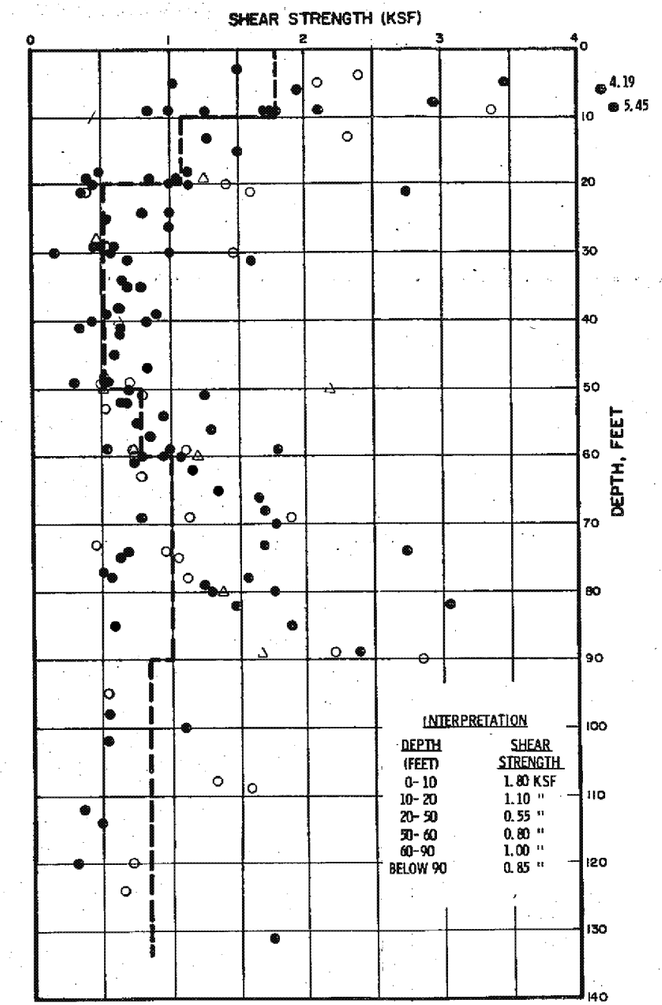
BELLE RIVER PLANT
UNITS 1 & 2

ACTIVITY OF CLAY SOILS

JOB No.	DRAWING No.	REV.
10539	FIGURE 24	C







EXPLANATION

- ● UNCONFINED COMPRESSION TESTS
- ○ UNCONSOLIDATED UNDRAINED TESTS
- △ LABORATORY VANE SHEAR TESTS

NOTES:

1.) ALL VALUES REPRESENT PEAK STRENGTHS.

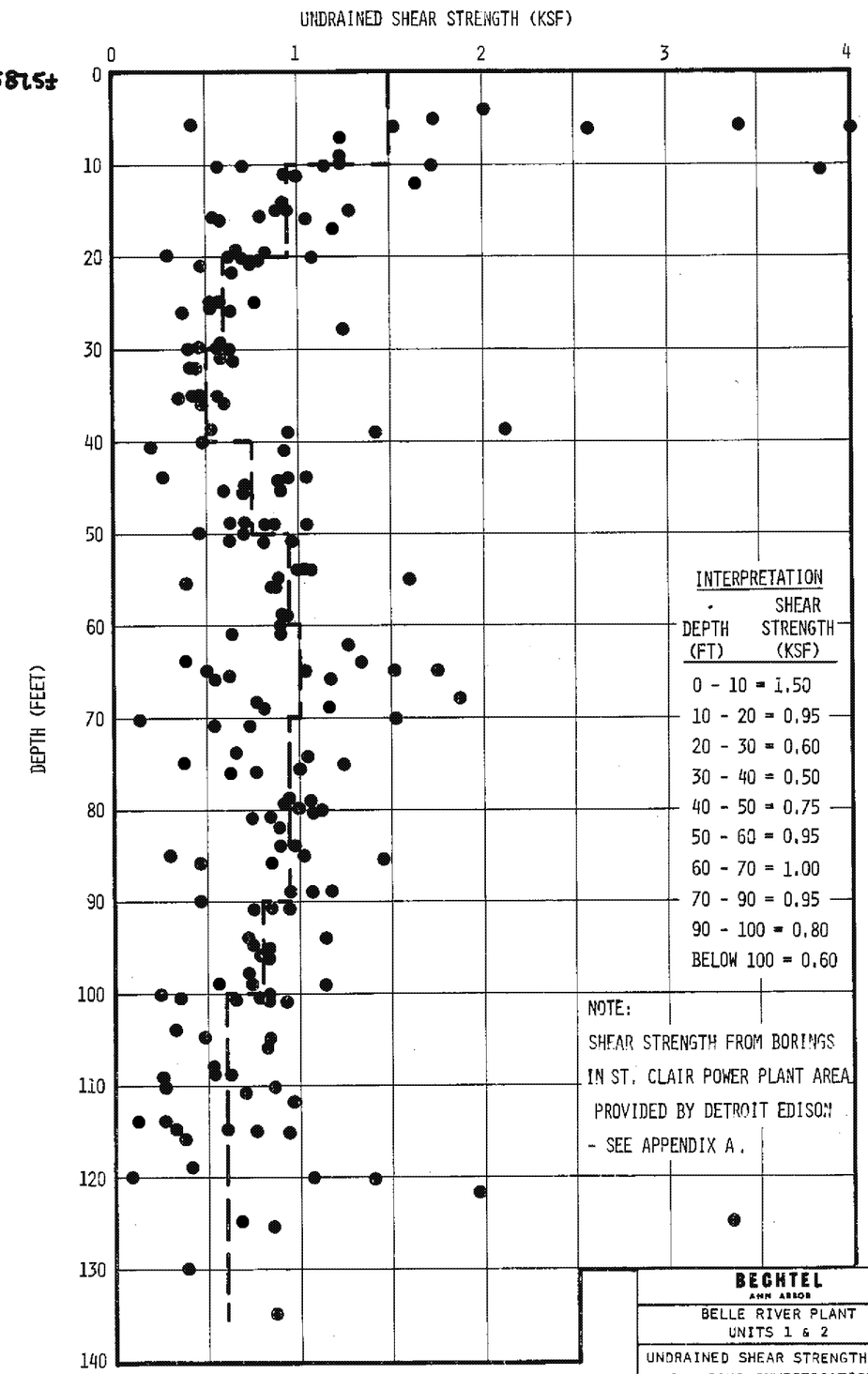
2.) DRY UNIT WEIGHT AND NATURAL MOISTURE CONTENT CORRESPOND TO SHEAR STRENGTH TEST RESULTS.

BECHTEL
ANN ARBOR

BELLE RIVER PLANT
UNIT 1 & 2

DRY UNIT WEIGHT, NATURAL WATER CONTENT, AND SHEAR STRENGTH VS DEPTH, ENTIRE SITE

JOB NO.	DRAWING NO.	REV.
10539	FIGURE 25	0

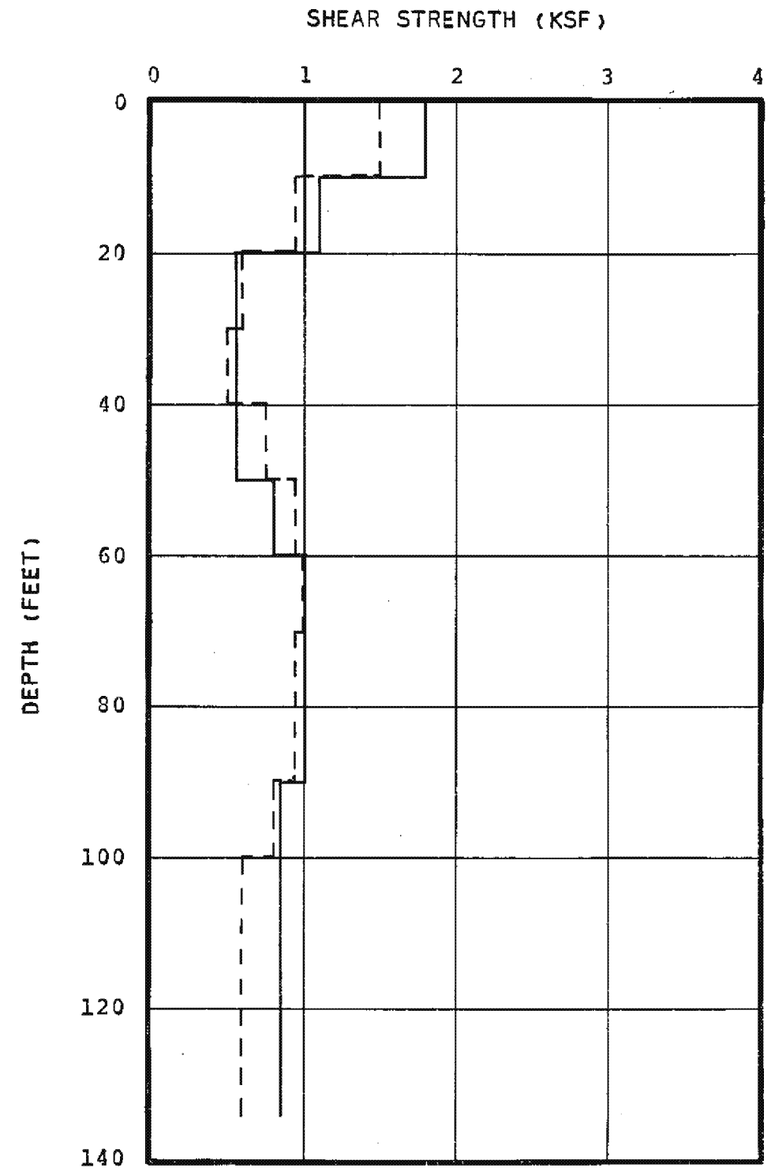


BECHTEL
ANN ARBOR

BELLE RIVER PLANT
UNITS 1 & 2

UNDRAINED SHEAR STRENGTH FROM PREVIOUS INVESTIGATIONS

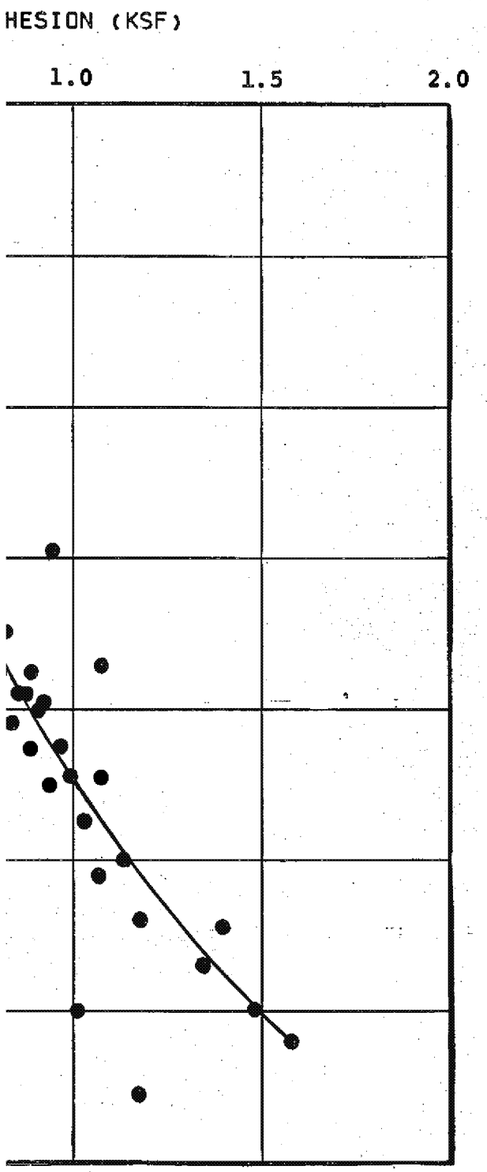
JOB No.	DRAWING No.	REV
10539	FIGURE 26	



— — — HOUSEL UNDRAINED SHEAR STRENGTH DATA (SEE FIG. 26)

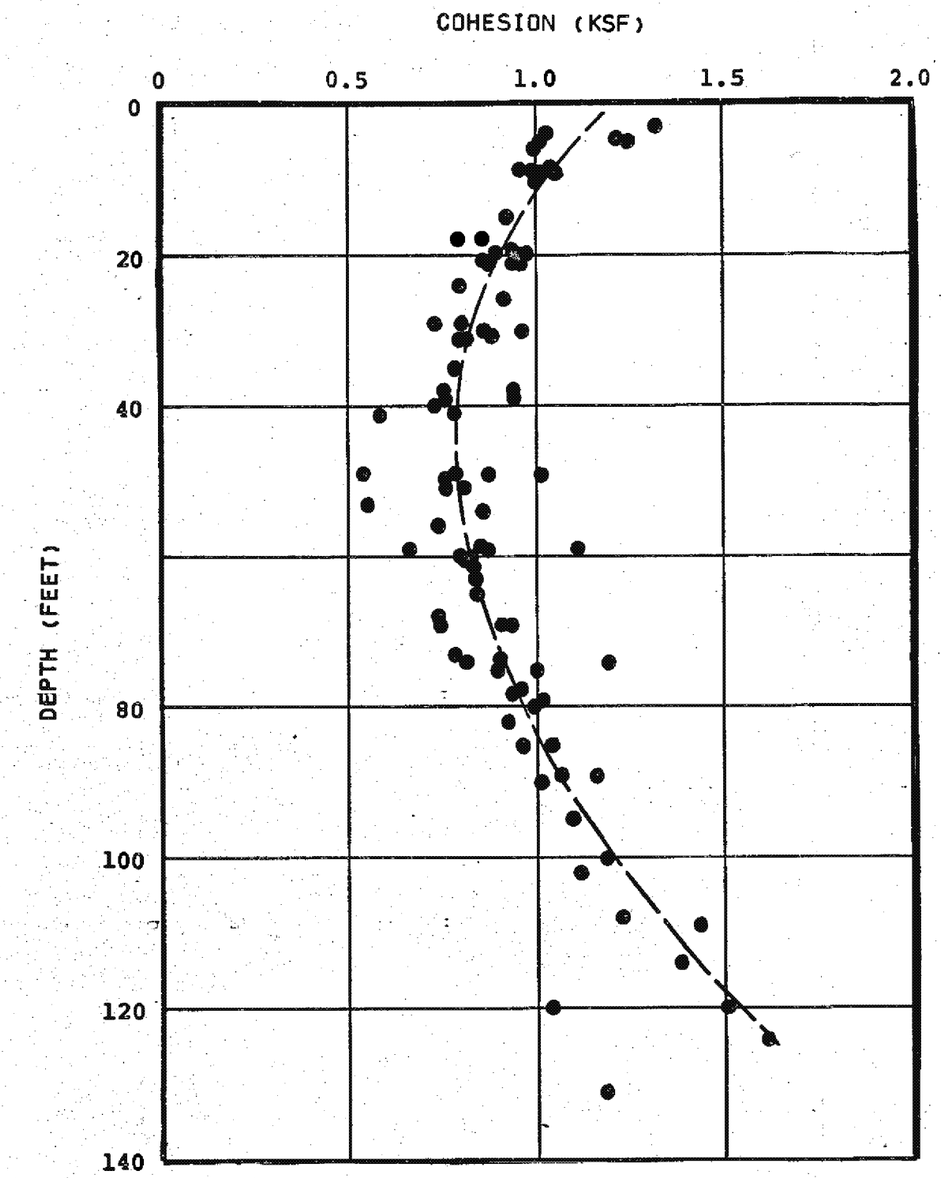
——— BECHTEL UNDRAINED SHEAR STRENGTH DATA (SEE FIG. 25)

BECHTEL ANN ARBOR		
BELLE RIVER PLANT UNITS 1 & 2		
COMPARISON OF HOUSEL AND BECHTEL UNDRAINED SHEAR STRENGTH		
JOB No.	DRAWING No.	REV.
10539	FIGURE 27	0



PRESSURE (P_0) WAS SUBSTITUTED
I RELATIONSHIP
: PI TO OBTAIN COHESION VALUES.

OLIDATED SOILS ASSUMED



NOTE:

PRECONSOLIDATION PRESSURE P_C (CASAGRANDE'S METHOD) WAS SUBSTITUTED FOR $\bar{P}$ IN THE SKEMPTON RELATIONSHIP $C/\bar{P} = 0.11 + 0.0037 \times$ PI TO OBTAIN COHESION VALUES.

B) PRECONSOLIDATED SOILS ASSUMED

SOIL DATA

DEPTH (FT)	TOTAL UNIT WEIGHT (PCF)	EFFECTIVE UNIT WEIGHT (PCF)
0-20	125	63
20-50	115	53
50+	125	63

NOTE:

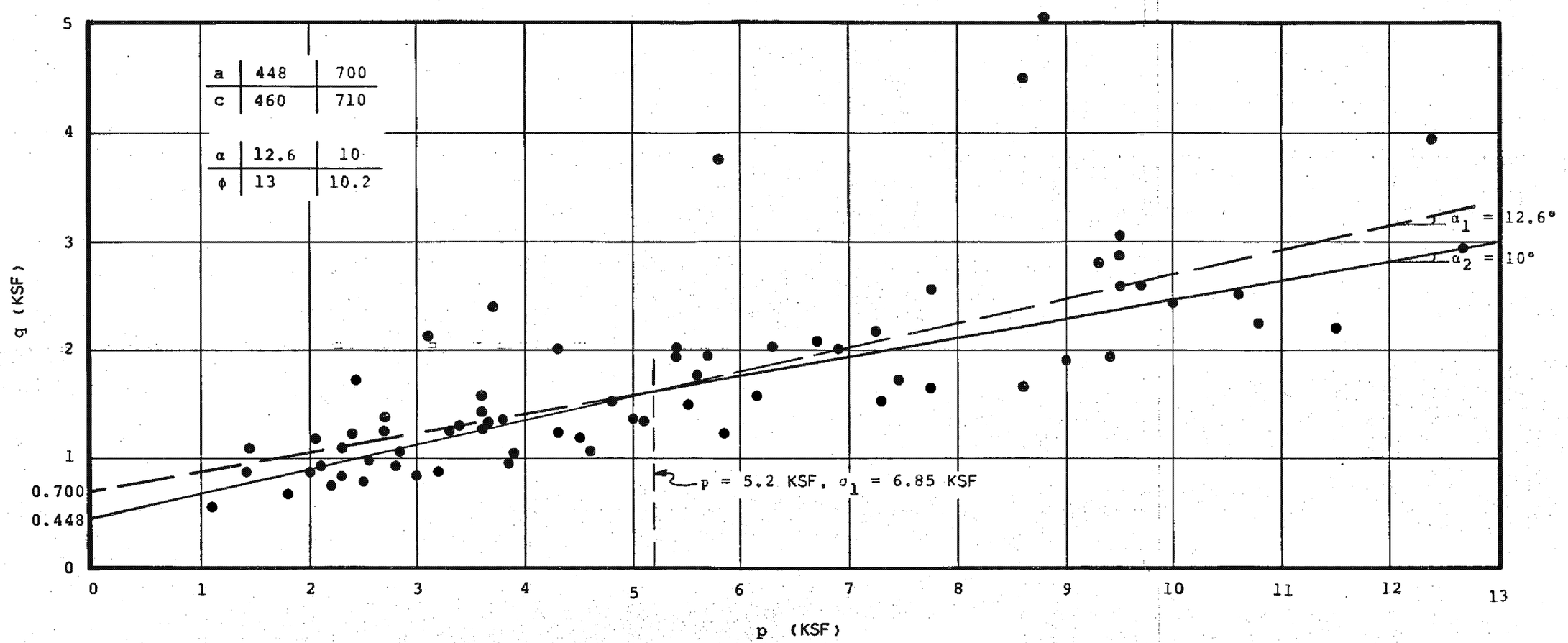
WATER TABLE ASSUMED TO BE AT A DEPTH OF 10 FEET.

BECHTEL
ANN ARBOR

BELLE RIVER PLANT
UNIT 1 & 2

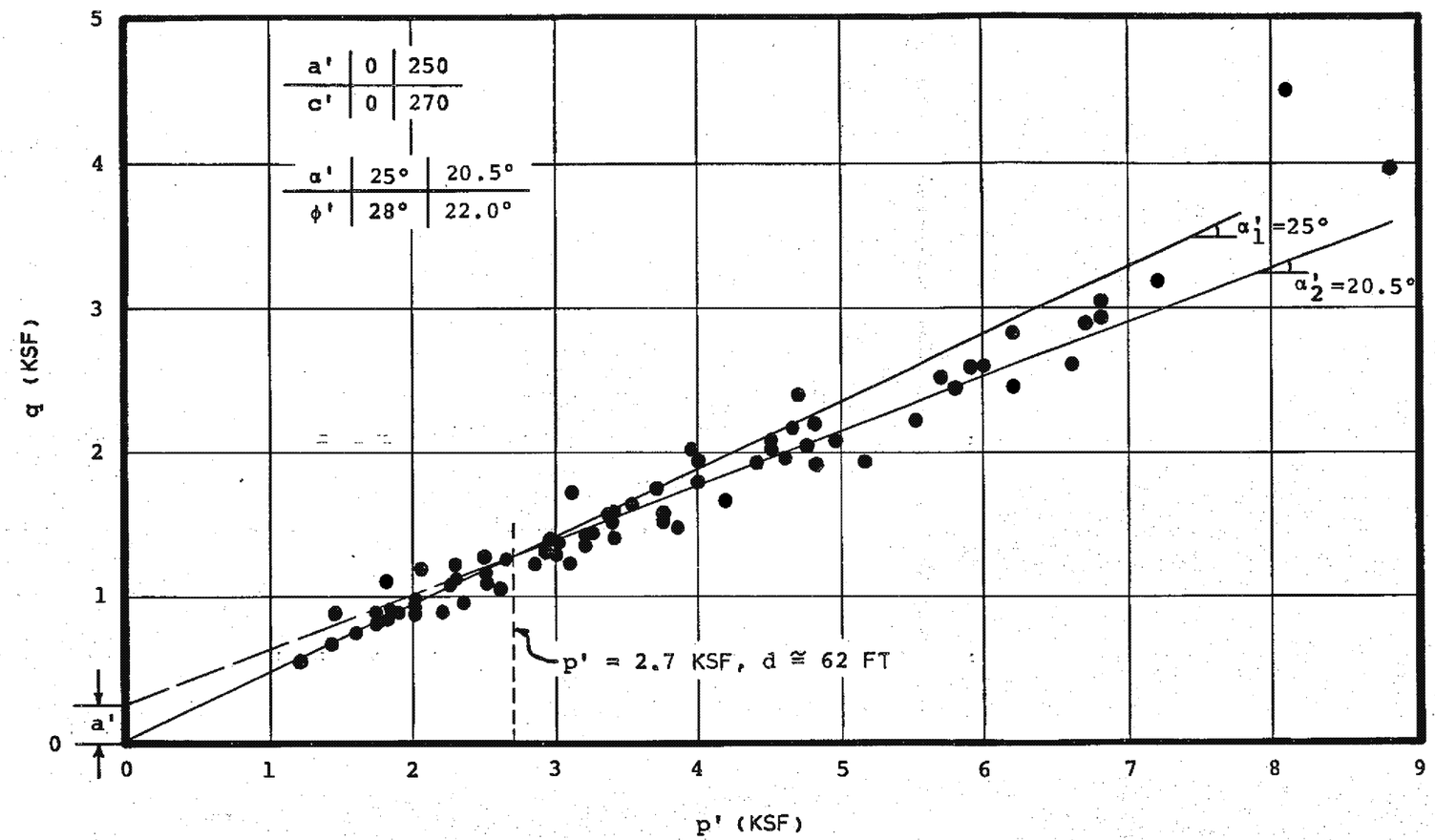
UNDRAINED SHEAR STRENGTH FROM SKEMPTON'S RELATIONSHIP

JOB NO.	DRAWING NO.	REV.
10539	FIGURE 28	0



$$p = \frac{\sigma_1 + \sigma_3}{2} \qquad q = \frac{\sigma_1 - \sigma_3}{2}$$

BECHTEL ANN ARBOR		
BELLE RIVER PLANT UNITS 1 & 2		
p - q DIAGRAM ALL CLAYEY SOILS		
JOB No.	DRAWING No.	REV
10539	FIGURE 29	A



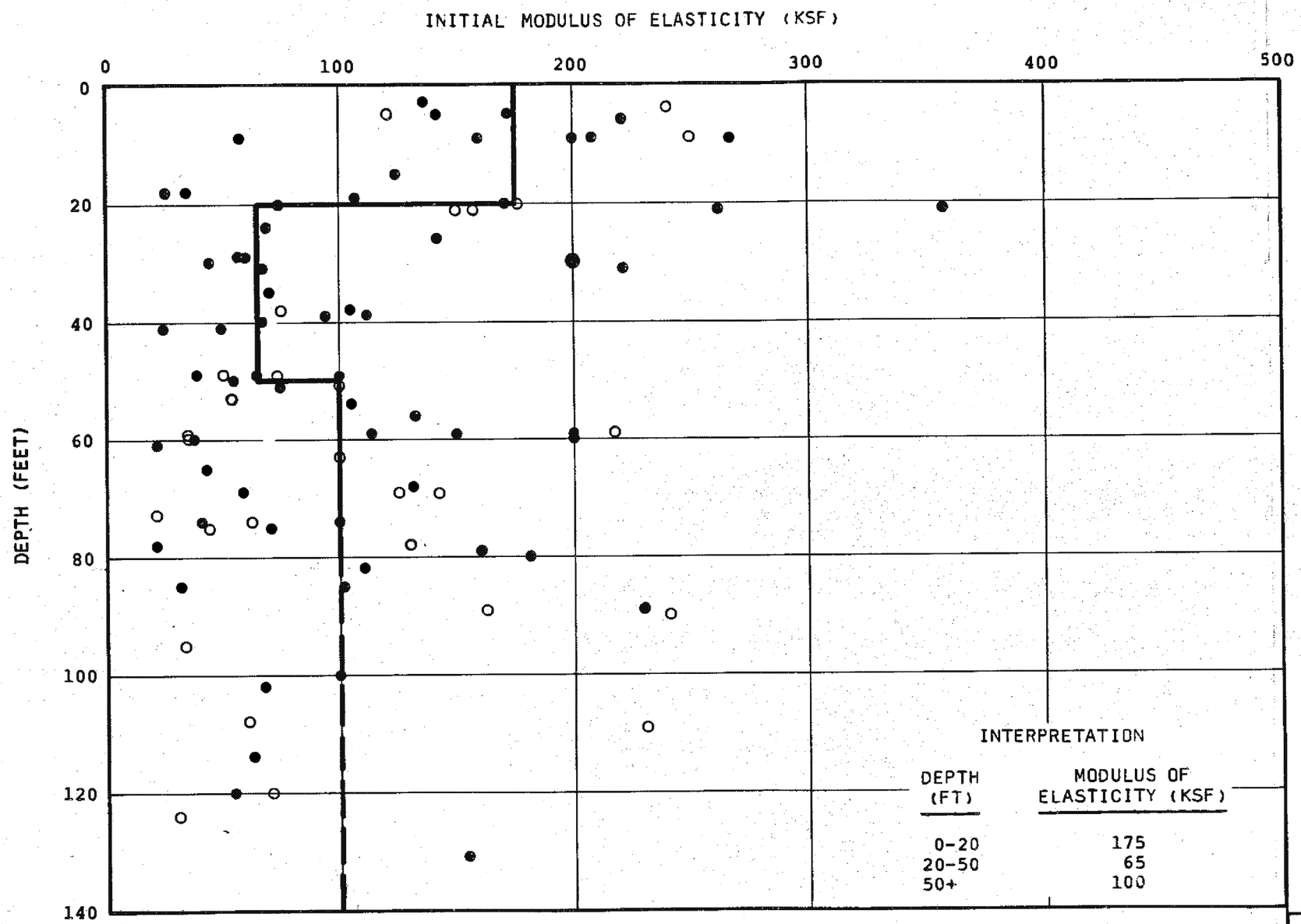
$$p' = \frac{\sigma_1' + \sigma_3'}{2} \qquad q = \frac{\sigma_1' - \sigma_3'}{2}$$

BECHTEL
ANN ARBOR

BELLE RIVER PLANT
UNIT 1 & 2

p' - q DIAGRAM
ALL CLAYEY SOILS

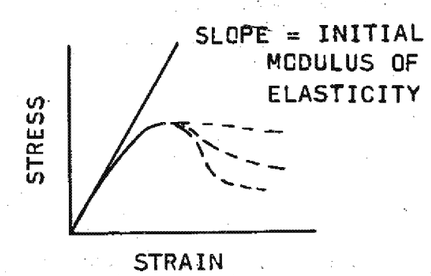
JOB NO.	DRAWING NO.	REV.
10539	FIGURE 30	0



INTERPRETATION

DEPTH (FT)	MODULUS OF ELASTICITY (KSF)
0-20	175
20-50	65
50+	100

DEFINITION



● FROM Qu TEST

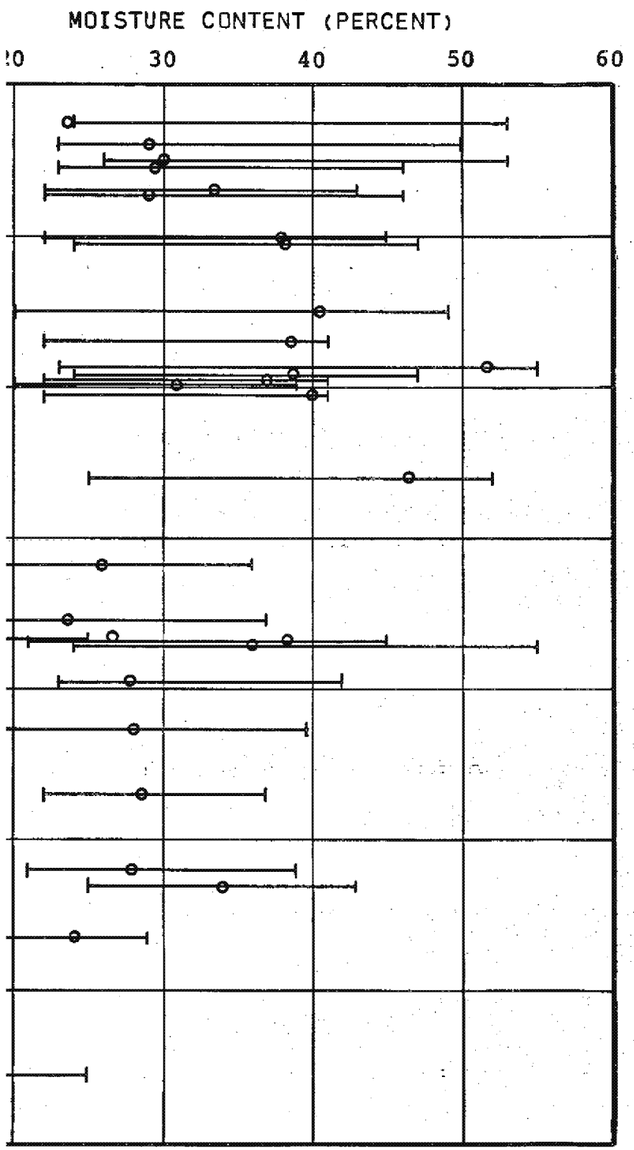
O FROM UU TEST

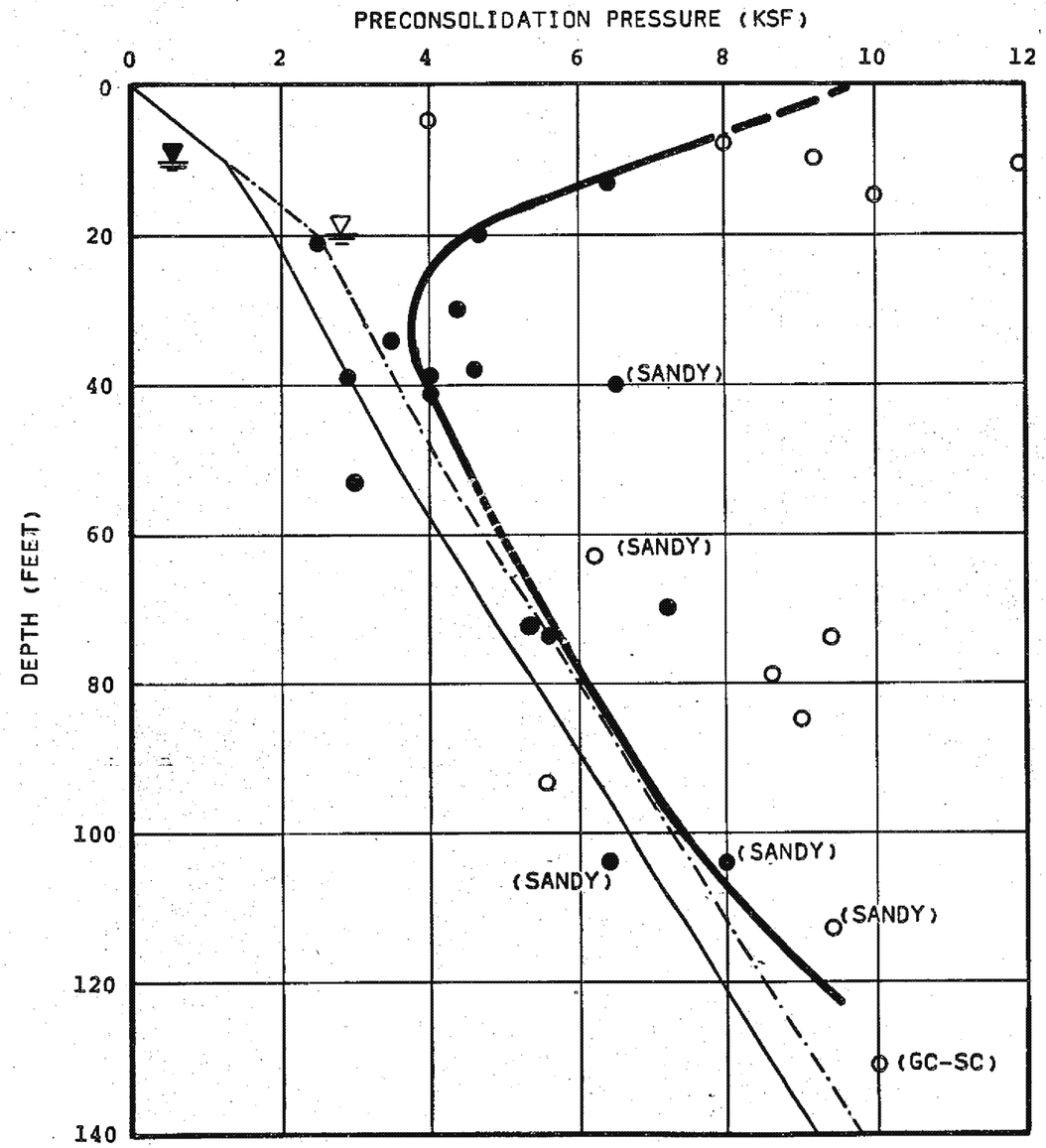
BECHTEL
ANN ARBOR

BELLE RIVER PLANT
UNIT 1 & 2

INITIAL MODULUS OF ELASTICITY VS DEPTH

JOB NO.	DRAWING NO.	REV.
10539	FIGURE 31	0





SOIL DATA

DEPTH (FT)	TOTAL UNIT WEIGHT (PCF)	EFFECTIVE UNIT WEIGHT (PCF)
0-20	125	63
20-50	115	53
50+	125	63

LEGEND

EFFECTIVE OVERBURDEN PRESSURE WITH WATER TABLE AT 10 FOOT DEPTH

EFFECTIVE OVERBURDEN PRESSURE WITH WATER TABLE AT 20 FOOT DEPTH

DESIGN PRECONSOLIDATION PRESSURE

o NATURAL MOISTURE CONTENT

⊣ LL ATTERBERG LIMITS

● PRECONSOLIDATION PRESSURE FROM CONSOLIDATION TEST (CASAGRANDE PROCEDURE)

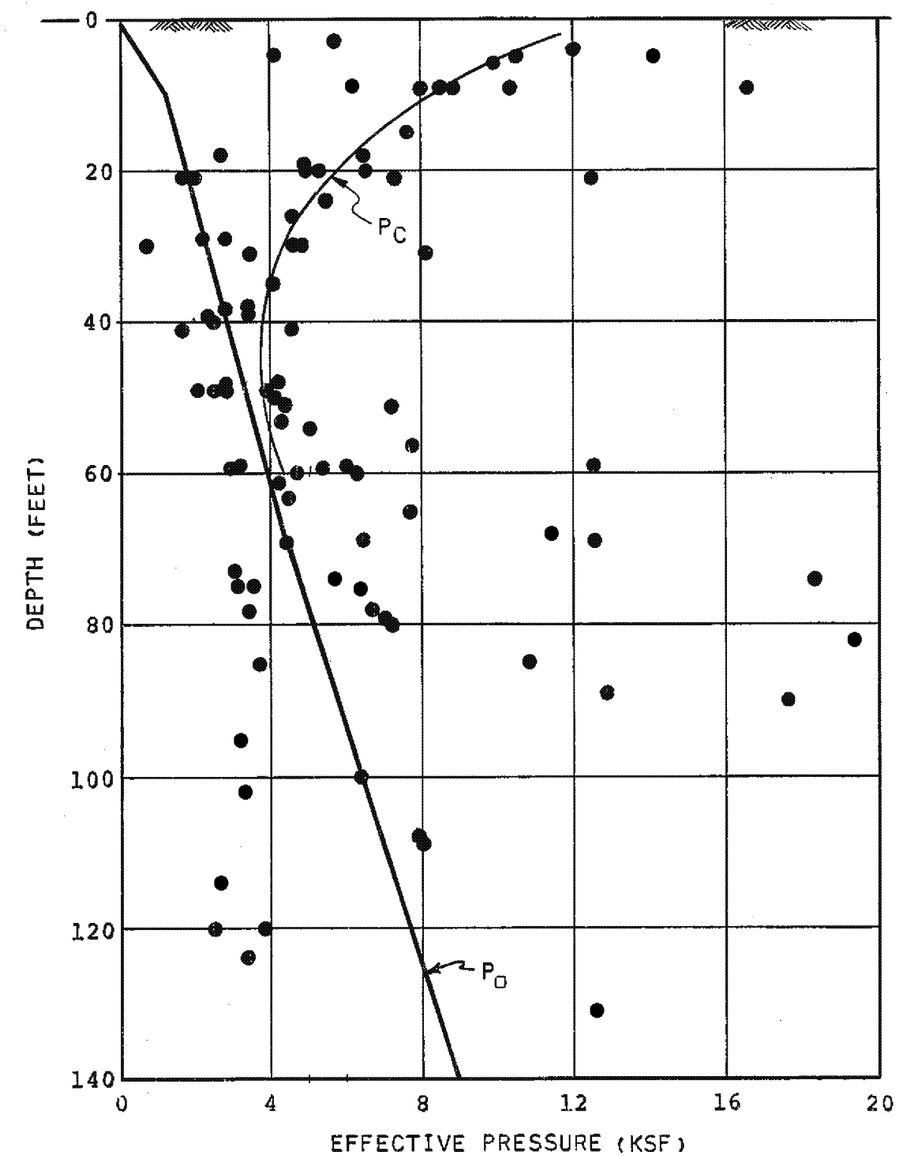
O PRECONSOLIDATION PRESSURE FROM CONSOLIDATION TEST (CASAGRANDE PROCEDURE - SAMPLES BELIEVED TO BE RELATIVELY DISTURBED)

BECHTEL
ANN ARBOR

BELLE RIVER PLANT
UNIT 1 & 2

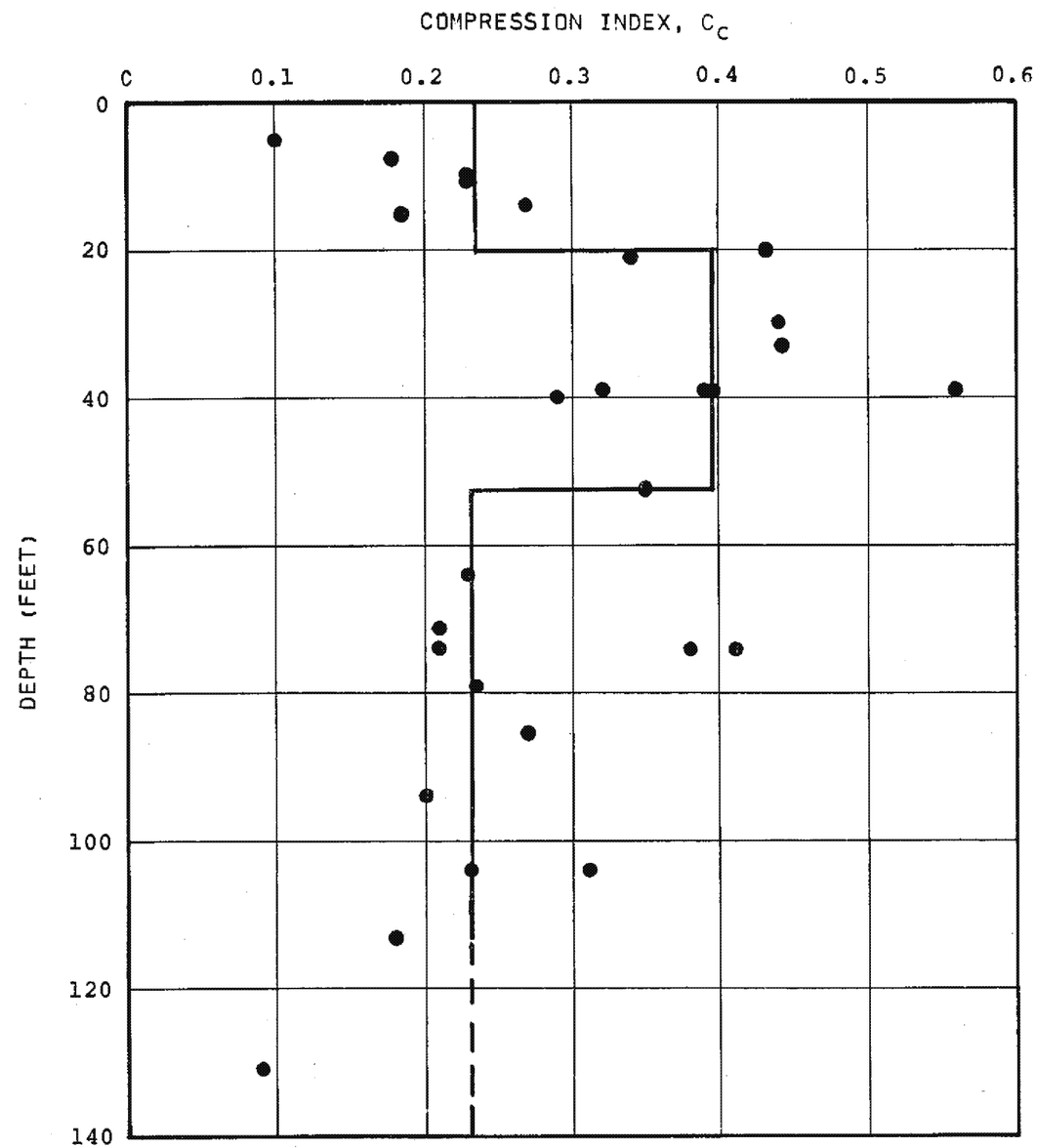
PRECONSOLIDATION PRESSURE
VS DEPTH

JOB NO.	DRAWING NO.	REV.
10539	FIGURE 32	0

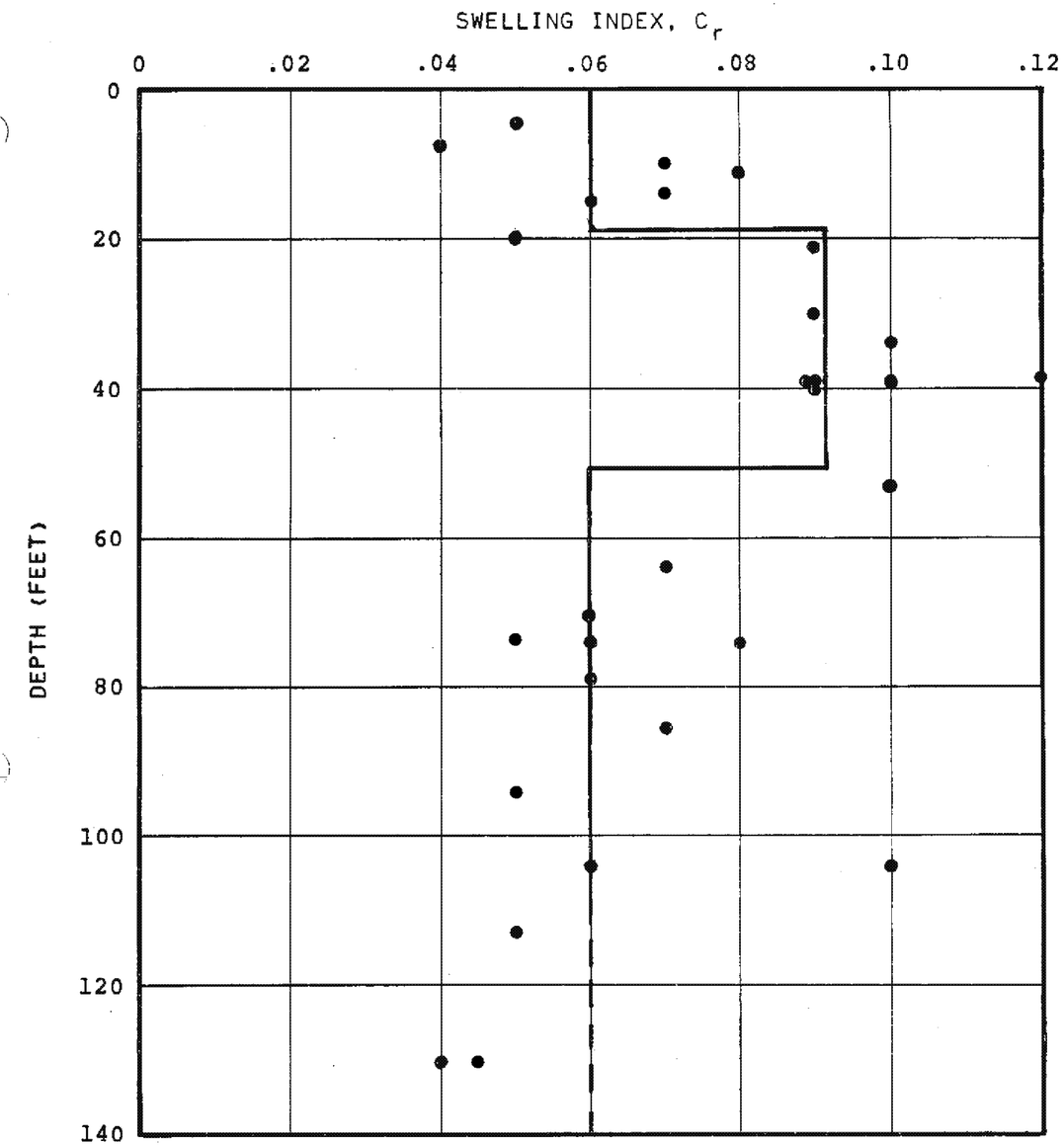


NOTE: COHESION (C) FROM UU & QU TESTS SUBSTITUTED FOR "C" IN SKEMPTON'S RELATIONSHIP $C/\bar{P} = 0.11 + .0037 \times PI$.

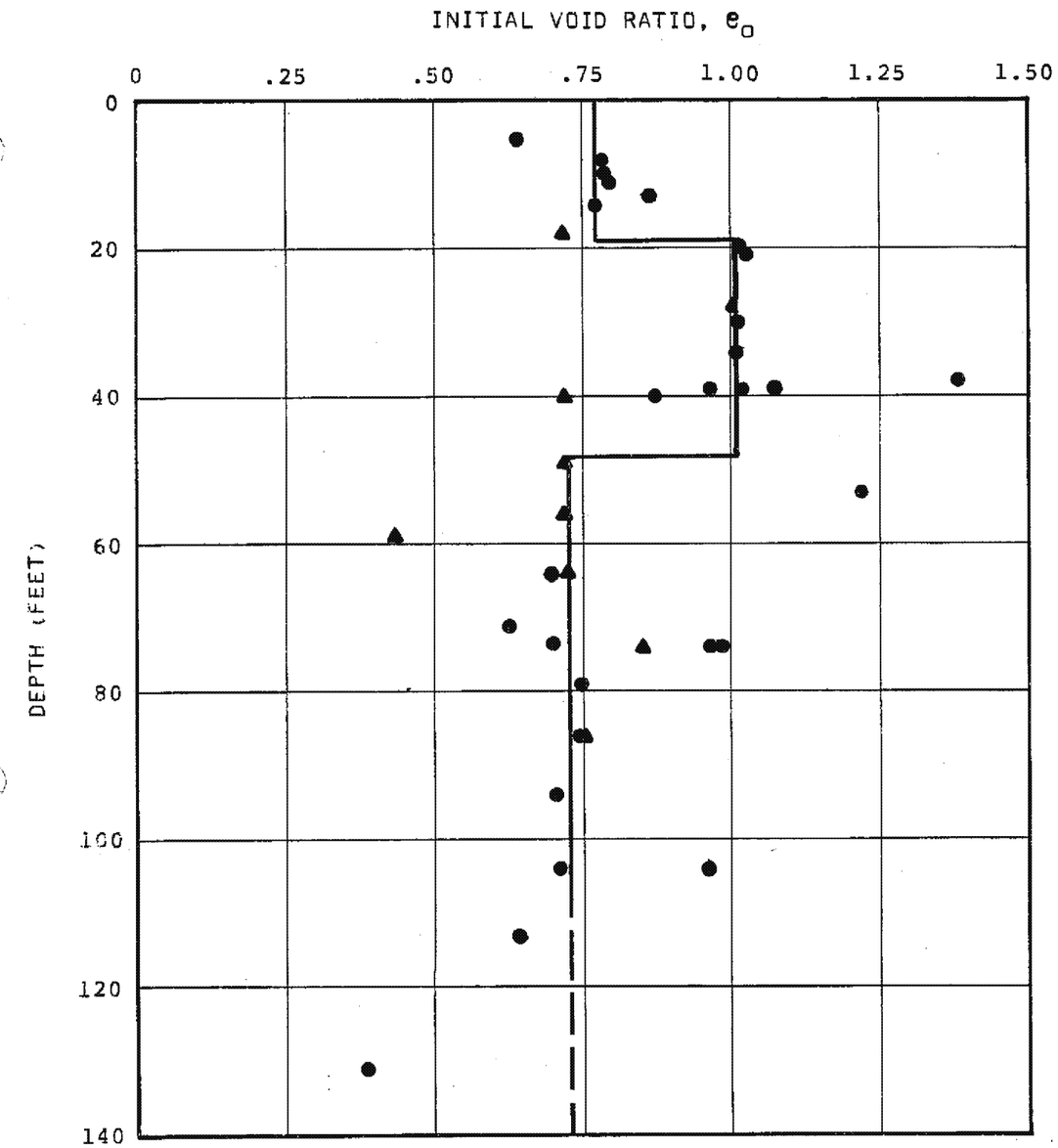
BECHTEL ANN ARBOR			
BELLE RIVER PLANT UNITS 1 & 2			
P_C OBTAINED FROM SKEMPTON'S RELATIONSHIP			
	JOB No.	DRAWING No.	REV.
	10539	FIGURE 33	0



BECHTEL ANN ARBOR			
BELLE RIVER PLANT UNITS 1 & 2			
COMPRESSION INDEX VS DEPTH			
	JOB No.	DRAWING No.	REV
	10539	FIGURE 34	B



BECHTEL ANN ARBOR			
BELLE RIVER PLANT UNITS 1 & 2			
SWELLING INDEX vs DEPTH			
	JOB No.	DRAWING No.	REV.
	10539	FIGURE 35	B

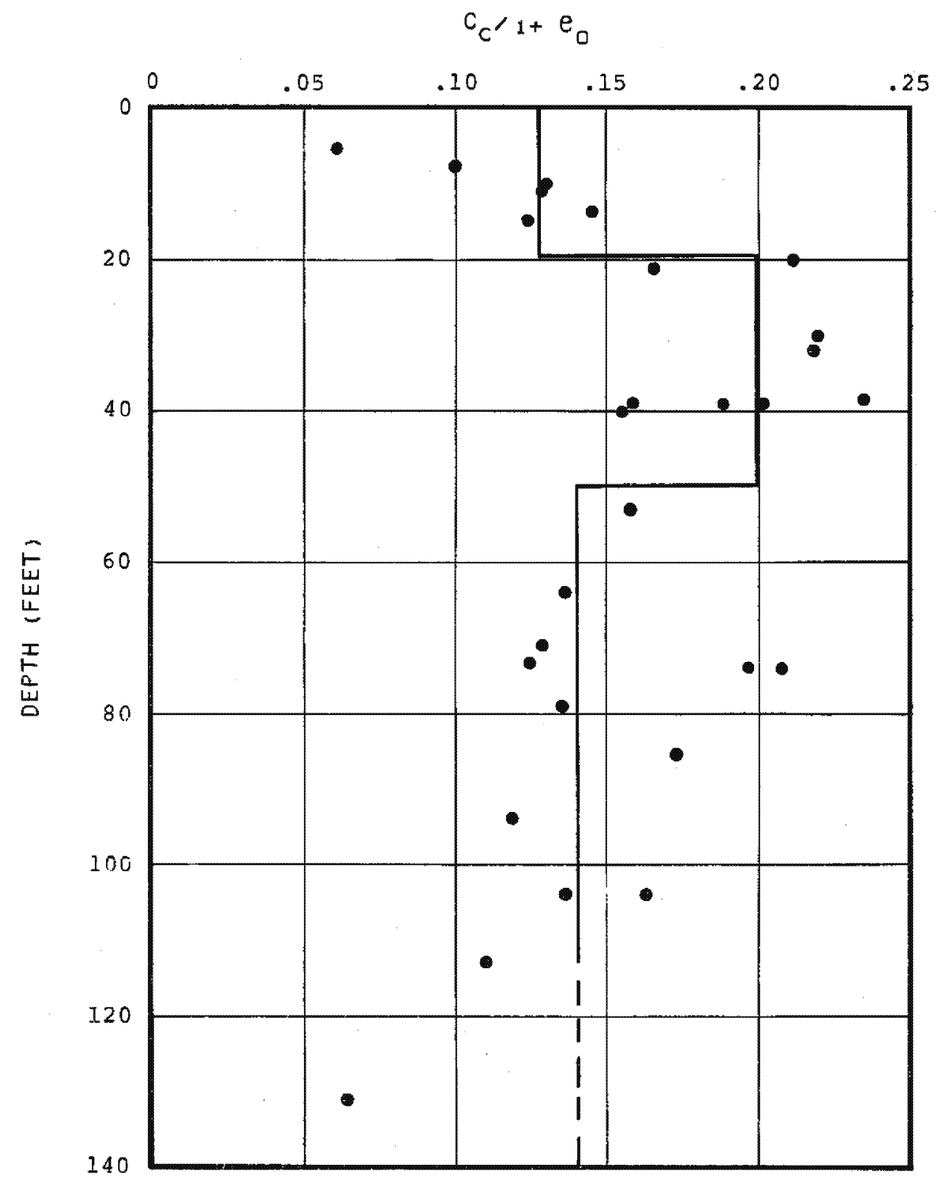


LEGEND

● FROM CONSOLIDATION TEST RESULTS

▲ FROM PERMEABILITY TEST RESULTS

BECHTEL ANN ARBOR			
BELLE RIVER PLANT UNITS 1 & 2			
INITIAL VOID RATIO VS DEPTH			
	JOB No.	DRAWING No.	REV.
	10539	FIGURE 36	B

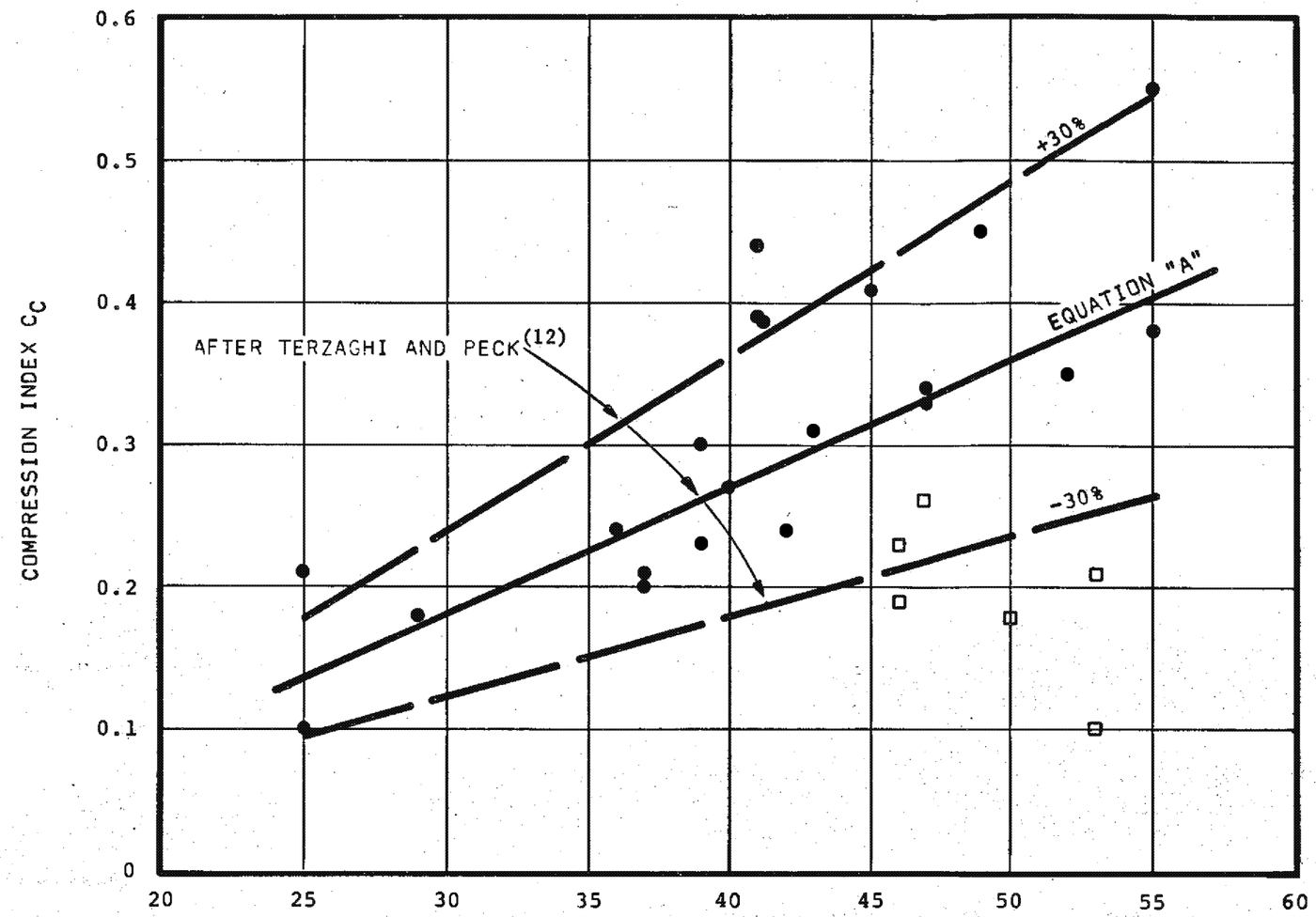


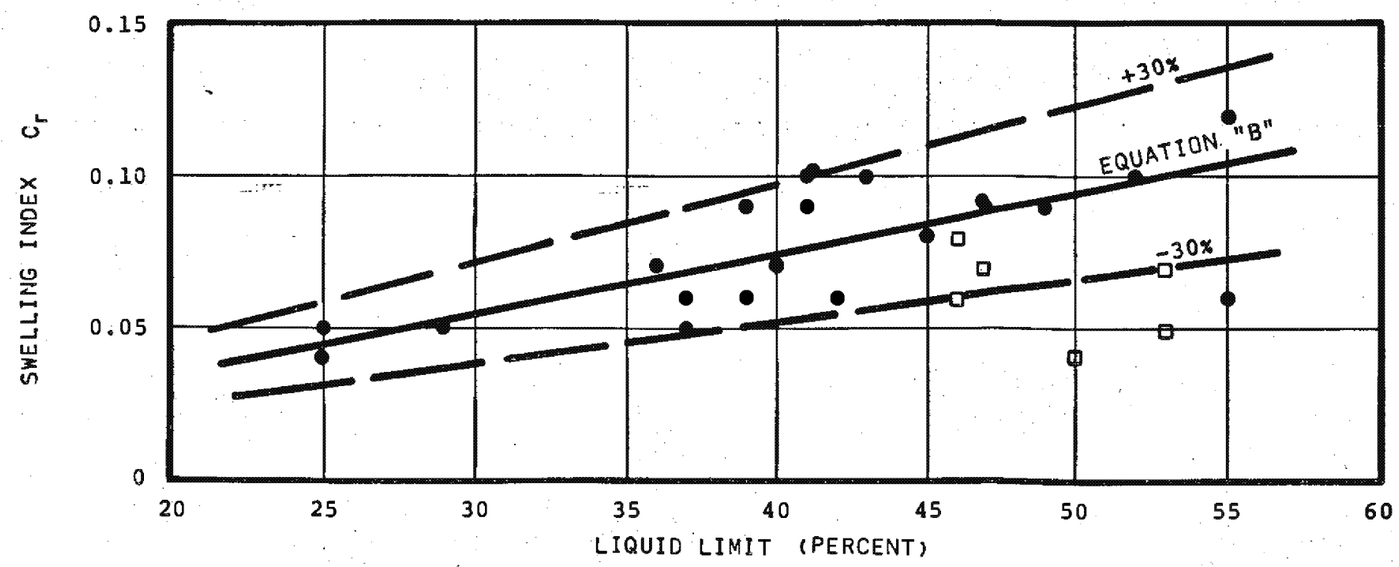
BECHTEL
ANN ARBOR

BELLE RIVER PLANT
UNITS 1 & 2

SETTLEMENT PARAMETER
$C_c/1+e_o$ VS DEPTH

JOB No.	DRAWING No.	REV.
10539	FIGURE 37	B





NOTES:

□ UPPER STRATUM (0-20 FEET) OVERCONSOLIDATION RATIO GREATER THAN 4.

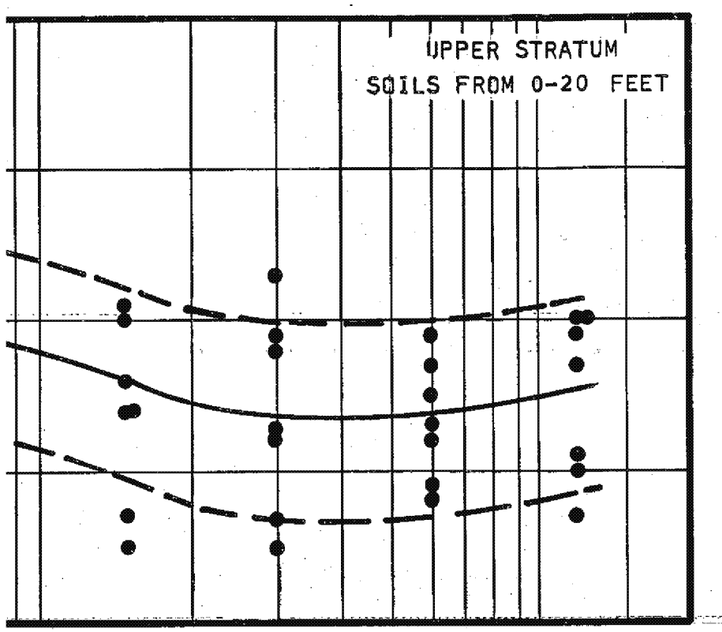
● MIDDLE AND LOWER STRATA (BELOW 20 FEET) OVERCONSOLIDATION RATIO LESS THAN 2.

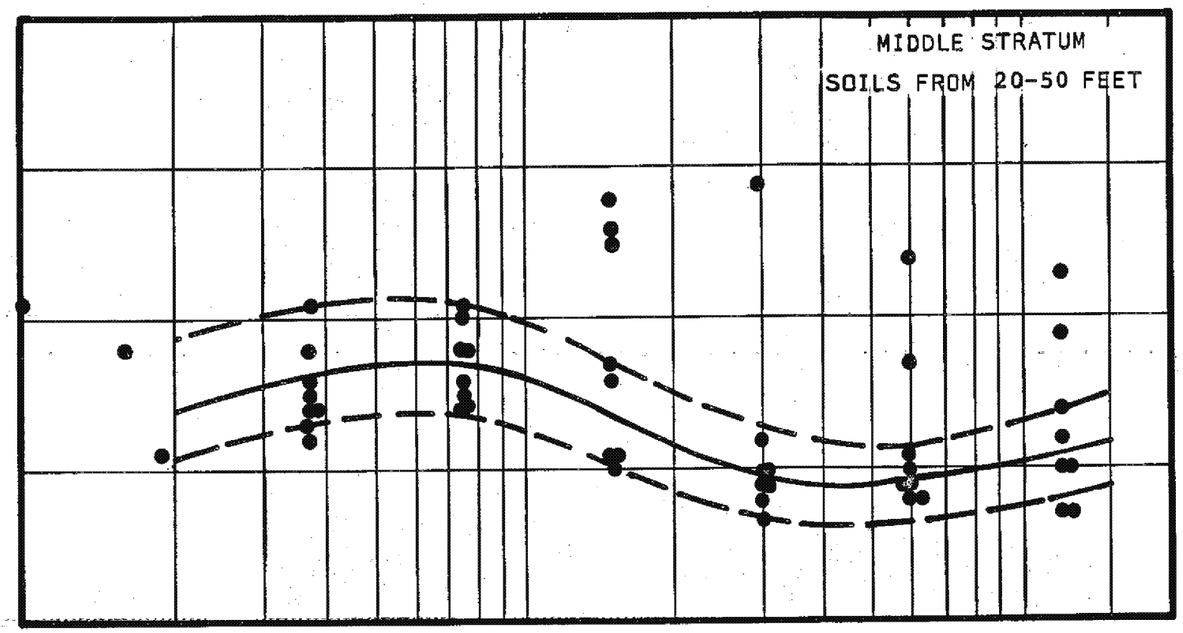
EXPLANATION

EQUATION "A" — COMPRESSION INDEX
$C_c = 0.009(LL-10)$

EQUATION "B" — SWELLING INDEX
$C_r = 0.002(LL-2.5)$

BECHTEL ANN ARBOR			
BELLE RIVER PLANT UNIT 1 & 2			
LIQUID LIMIT vs COMPRESSION AND SWELLING INDICIES			
	JOB NO.	DRAWING NO.	REV.
	10539	FIGURE 38	0





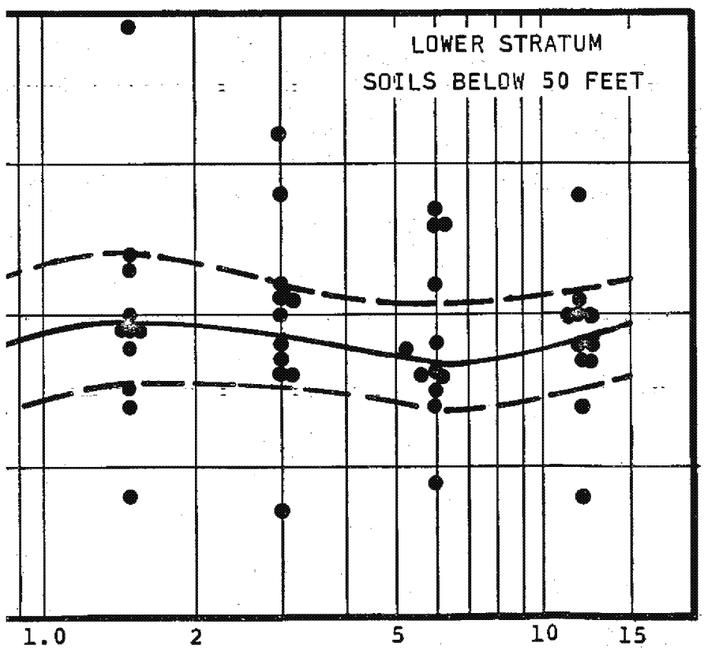
NOTE:

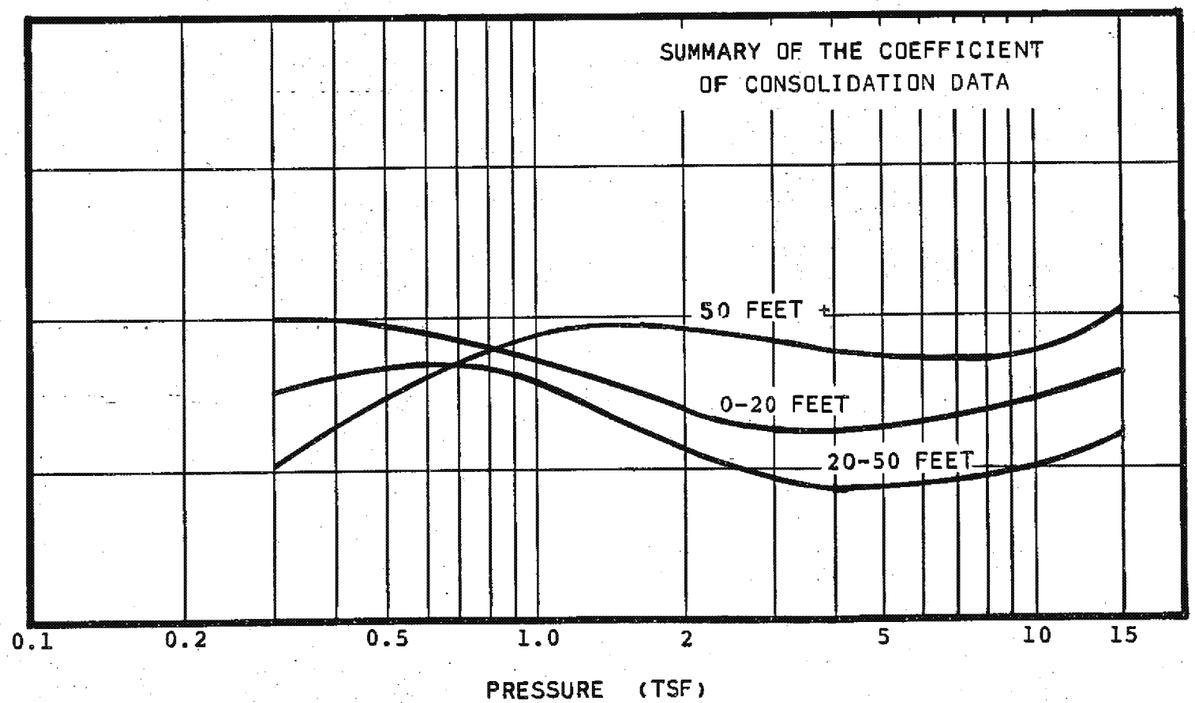
COEFFICIENT OF CONSOLIDATION BASED ON THE SQUARE ROOT OF TIME METHOD.

EXPLANATION:

RANGE OF VALUES

DESIGN CURVE



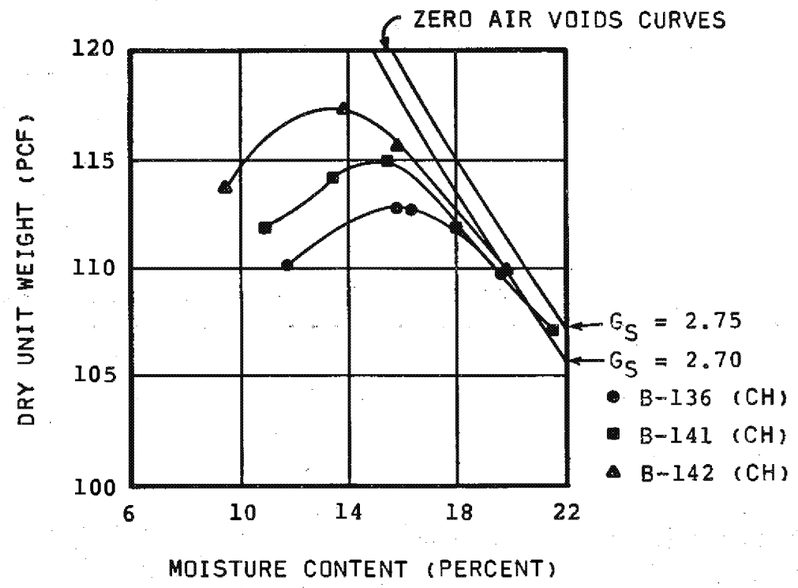


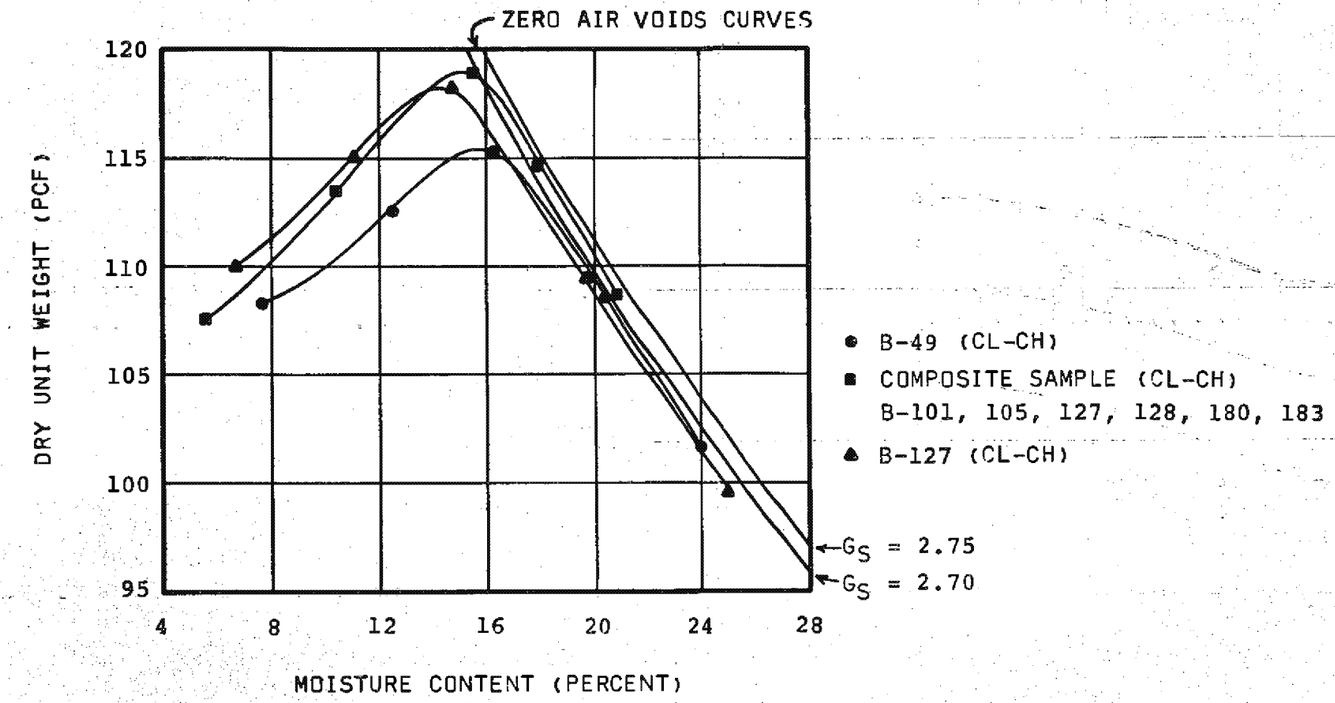
BECHTEL
ANN ARBOR

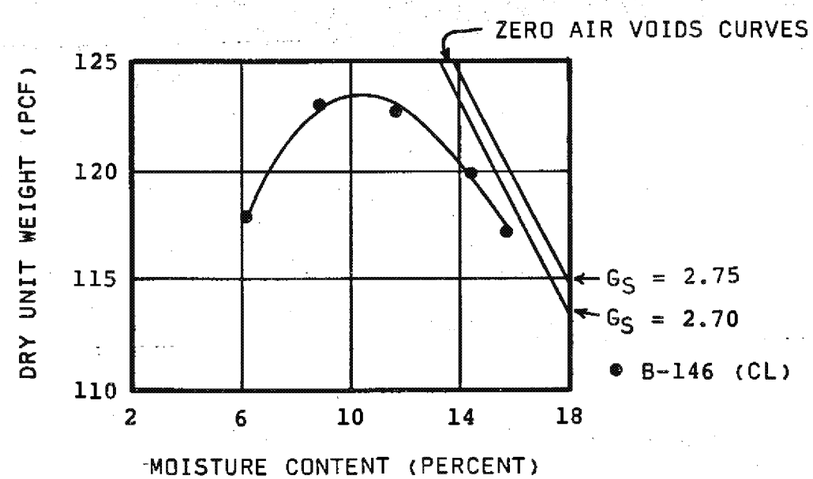
BELLE RIVER PLANT
UNIT 1 & 2

COEFFICIENT OF CONSOLIDATION
VS
PRESSURE

JOB NO.	DRAWING NO.	REV.
10539	FIGURE 39	0







NOTES:

1) ALL TESTS WERE MADE ACCORDING TO ASTM D-1557 METHOD C.

2) THE ZERO AIR VOIDS CURVES HAVE BEEN DRAWN FOR ASSUMED SPECIFIC GRAVITY (G_S) OF 2.70 AND 2.75.

BECHTEL
ANN ARBOR

BELLE RIVER PLANT
UNITS 1 & 2

SUMMARY OF COMPACTION TESTS
UPPER STRATA SOILS

JOB NO.	DRAWING NO.	REV.
10539	FIGURE 40	0

Appendix A

P. O. Box 619
Ann Arbor, Michigan 48107
April 5, 1966

Mr. Joseph Funston
The Detroit Edison Company
Room 604 S.B.
2000 Second Avenue
Detroit 26, Michigan

Re: Soil Investigation at the St. Clair Power Plant

Dear Mr. Funston:

Enclosed you will find two sets of the results of the soil investigation made in connection with the extension of Unit No. 7 and the yard's conveyor area.

Each set includes the individual boring log profile of the 1965 borings (22, 25, and 27), followed by two Composite Subsoil Analysis Profiles. One composite is for the Power House Area. Here, superimposed on the composite chart of the 1965 borings, are both the transverse and compression shearing resistances, together with the ASTM standard penetration values from the 1950 borings. Similarly, the soil investigation results from the 1950 borings (13, 14, 15, and 16) are superimposed on the second composite for the yard's conveyor area. Shown on these two composites are three averages for the shear and penetration values. Dotted lines represent the 1965 borings, red lines the 1950 borings, and heavy lines the average of all borings.

As seen on the two composites, a comparison of the soil resistances of the soil strata encountered between the 1950 and 1965 borings is rather clear. However, two tables were prepared to facilitate reference to such comparison. In general, the soil resistances measured in the 1965 borings are lower than those of the 1950 borings, with few exceptions occurring at the lower strata. However, the averages from all borings which are recommended as design values, are closer to the 1965 borings.

It should not be overlooked that the shear values from the 1965 borings are available only from Borings 22 and 25 for one area, and only

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Boring 27 for the other area. For this reason, only few values were available in each stratum, and the 1965 average alone should not be considered as representative of the area involved. Because more penetration values are available from all of the 1965 borings, the averages are now more representative and closer to the averages of both the 1950 and 1965 borings. A more detailed report of this investigation will be prepared if desired.

Very truly yours,

Georges Selim
For W. S. Housel

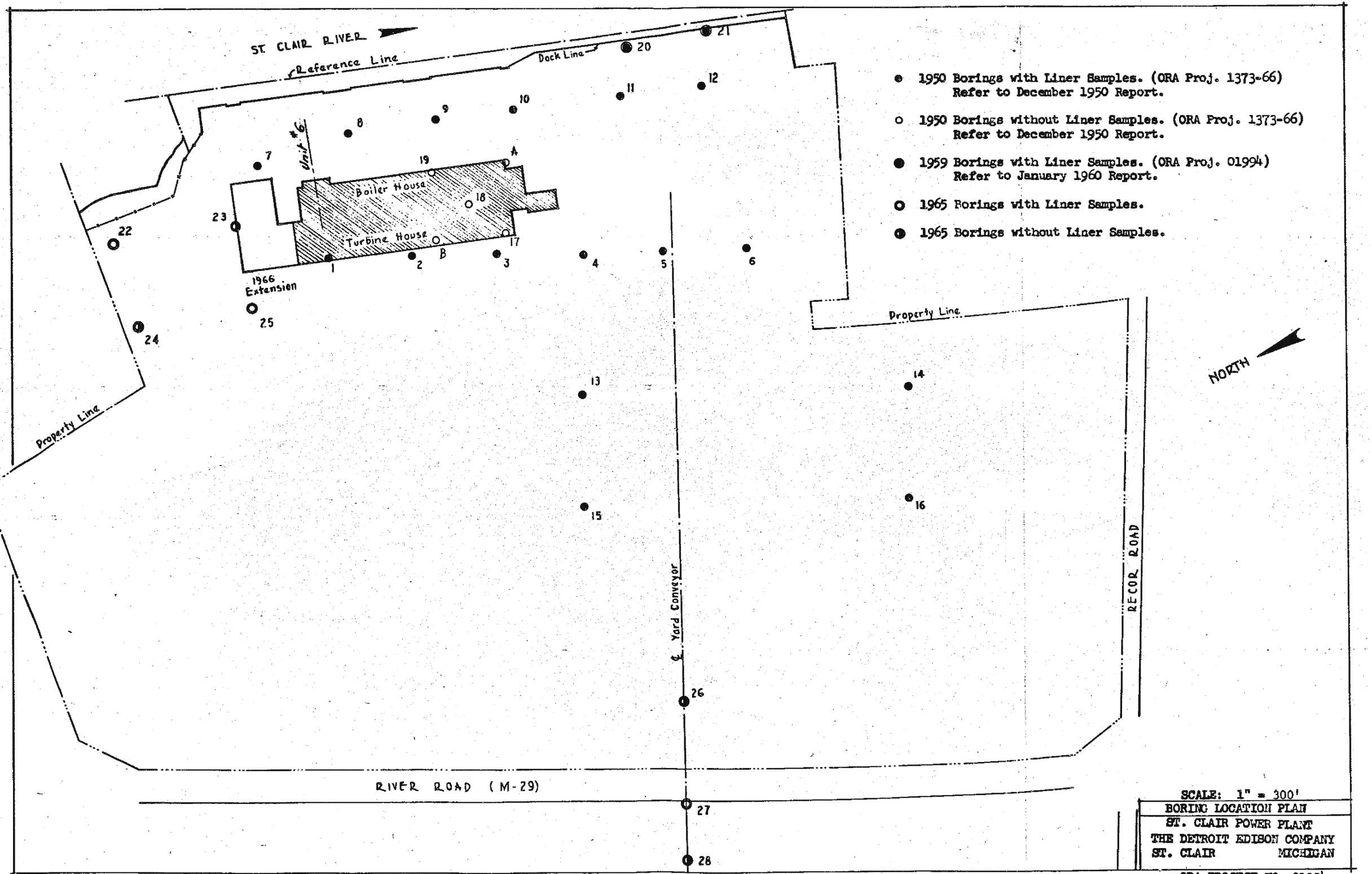
GS:kd
Enclosures

cc: Mr. Robert A. Briggs

ED_005947A_00014551-00270

SOIL INVESTIGATION AT
ST. CLAIR POWER PLANT
THE DETROIT EDISON COMPANY

ED_005947A_00014551-00271



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COMPARISON OF AVERAGE SOIL RESISTANCES BETWEEN
1950 AND 1965 BORINGS IN THE POWER PLANT AREA
ST. CLAIR POWER PLANT

1950 Borings: 1 through 12, 17, 18, and 19
1965 Borings: 22, 23, 24, and 25

Soil Type	S_c PSF			$S_{uc}/4$ PSF			N Blows/Ft.			Elev. Ft.
	1 1950	2 1965	1 & 2 All	1 1950	2 1965	1 & 2 All	3 1950	4 1965	3 & 4 All	
591 Ground Surface										591
Medium to stiff vari-colored clay, trace of gravel.	1500	*	1364	1167	*	1142	14.7	12.8	14.1	577
577 / 575										
Very soft brown-gray clay, trace to some sand.	130	123	151	221	112	201	4.1	2.8	3.9	560
555	100	90	106	118	81	111	2.5	1.8	2.3	545
540		*	154	140	*	137	3.5	3.3	3.2	535
535										
Medium sandy gray clay, trace to some gravel.	150	142	168	186	124	175	4.9 / [12.8]	4.2 / [17.3]	4.8 / [14.7]	515
		122	143	155	155	155	6.4	7.3	6.6	500
		167	172	201	168	195	7.5	8.1	7.7	480
		159	158	151	149	151	7.8	7.4	7.7	465
465 / 458										

(1) Based on shear test from Borings 1 through 12 only.
(2) Based on shear test from Borings 22 and 25 only.
(3) Based on ASTM penetration from Borings 1 through 12, 17, 18 and 19.
(4) Based on ASTM penetration from Borings 22 through 25.
* Only one or two samples available.
[ ] Represent ASTM penetration for the sand layer found in variable thickness in Borings 1, 2, 3, 4, 17, 19, 23, 24, and 25 only between Elevs. 540 and 510.

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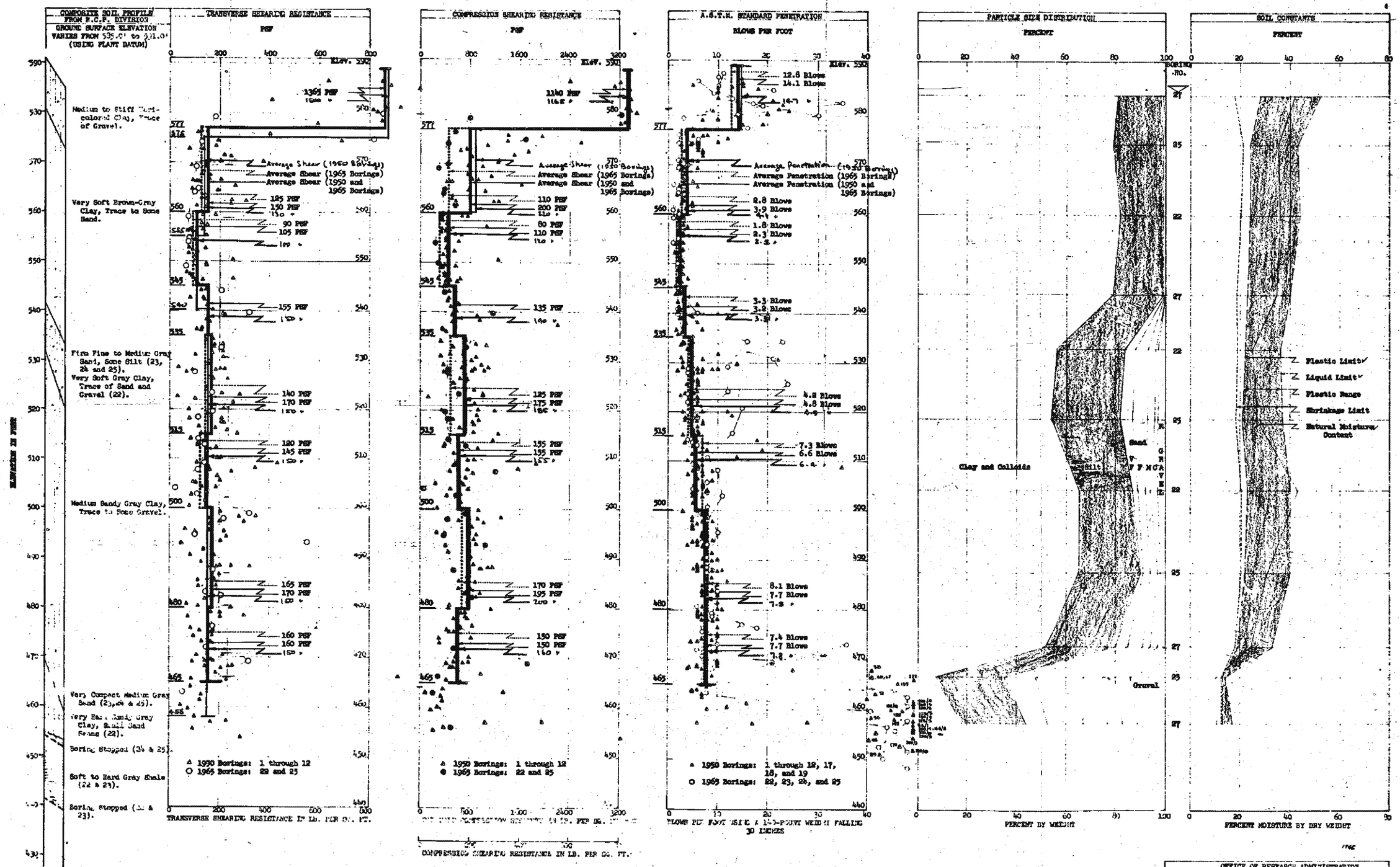


The above Composite Soil Profile is intended only to present average conditions throughout the group of borings represented. See individual Boring Charts for details.

OFFICE OF RESEARCH ADMINISTRATION
SOIL MECHANICS LABORATORY
UNIVERSITY OF MICHIGAN ANN ARBOR, MICHIGAN
COMPOSITE SUBSOIL ANALYSIS OF BORINGS NO. 22,23,24,25
ST. CLAIR POWER PLANT
THE DETROIT EDISON COMPANY
ST. CLAIR MICHIGAN
APPROVED: W. A. Hansel DATE: 4-5-1966
PROJECT: 01994

A-7

LOG OF SOIL PROFILE

BY R.C.P. DIVISION

GROUND SURFACE ELEVATION 590.2 FT. (USING PLANT DATUM)

ELEVATION IN FEET

590 — Cinders. Medium Sandy Brown Clay, Gravel, Vegetation. Stiff Sandy Varicolored Clay, Trace of Gravel.

580 — Hard Sandy Varicolored Clay, Trace of Gravel. Medium Sandy Varicolored Clay.

570 — Soft Gray-Brown Clay, Some Sand.

560

550

540 — Very Soft Gray Clay, Trace of Sand and gravel.

530

520

510

500 — Medium Sandy Gray Clay With Some Gravel.

490

480 — Stiff Sandy Gray Clay, Some Gravel, Few Large Stones.

470 — Medium Sandy Gray Clay.

460 — Very Hard Sandy Gray Clay With Small Sand Seams.

450 — Soft Gray Shale.

Hard Gray Shale. 50% Recovery.

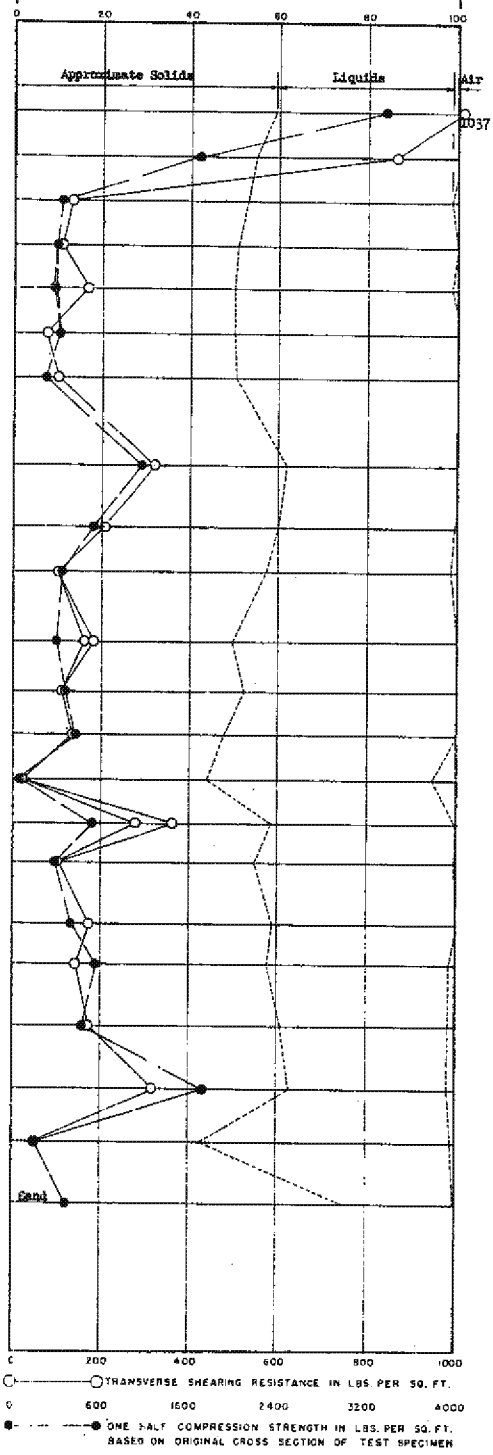
440 — Boring Stopped.

SAMPLE NO.	ELEV	LAB CONSISTENCY	PENETRATION NO. OF BLOWS	PENETRATION DRIVE IN INCHES	% H_2O BY DRY WT	DRY WT LBS PER CU FT.	LABORATORY VISUAL INSPECTION REMARKS
1-BS	587.7	--	10	12			
2-BS	585.2	--	21	12			
3-BS	582.7	--	35	12			
4-LS	580.2	Stiff	14	12	25.8	99.2	4-LS: Uniform. Silty brown-gray laminated clay, trace of gravel.
5-LS	575.2	Plastic to Firm	6	12	33.5	91.8	5-LS: Uniform. Silty brown-gray laminated clay.
6-LS	570.2	Soft	3	12	32.5	88.6	6-LS: Uniform. Gray clay, little silt.
7-LS	565.2	Very Soft	2	12	36.4	84.9	7-LS: Uniform. Gray clay, little silt.
8-LS	560.2	Very Soft	2	12	35.9	84.9	8-LS: Uniform. Gray clay, little silt.
9-LS	555.2	Very Soft	2	12	38.7	83.6	9-LS: Uniform. Gray clay, little silt.
10-LS	550.2	Very Soft	2	12	37.4	84.2	10-LS: Uniform. Gray clay, little silt.
	545.2	--	2	12			
11-LS	540.2	Plastic	6	12	23.9	102.3	11-LS: Uniform. Silty gray clay, trace of very fine sand and fine gravel.
	535.2	--	5	12			
12-LS	533.2	Soft	4	12	25.0	98.9	12-LS: Uniform. Silty gray clay, little sand and trace of fine gravel.
13-LS	528.2	Soft	4	12	27.5	94.2	13-LS: Uniform. Silty gray clay, little sand and trace of fine gravel.
	522.2	--	4	12			
14-LS	520.2	Soft	4	12	38.6	81.7	14-LS: Uniform. Silty gray clay, little sand and trace of fine gravel.
15-LS	514.7	Soft	4	12	34.6	86.1	15-LS: Uniform. Silty gray clay, little sand and trace of fine gravel.
16-LS	509.7	Soft	5	12	41.6	78.6	16-LS: Uniform. Silty gray clay, little sand and trace of fine gravel.
17-LS	504.7	Very Soft	5	12	43.1	73.6	17-LS: Uniform. Silty gray clay, little sand and trace of fine gravel.
18-LS	499.7	Plastic	6	12	26.3	98.0	18-LS: Uniform. Silty gray clay, little sand and trace of fine gravel.
19-LS	495.2	Soft	7	12	30.5	91.7	19-LS: Uniform. Silty gray clay, little sand and trace of fine gravel.
	489.7	--	8	12			
20-LS	488.2	Soft	9	12	26.1	98.6	20-LS: Uniform. Silty gray clay, little sand and trace of fine gravel.
21-LS	483.7	Soft	10	12	26.4	96.7	21-LS: Uniform. Silty gray clay, little sand and trace of fine gravel.
	479.7	--	9	12			
22-LS	476.7	Soft	18	12	23.0	101.7	22-LS: Uniform. Silty gray clay, little sand and trace of fine gravel.
	473.2	--	36	12			
23-LS	469.7	Plastic	21	12	21.1	104.8	23-LS: Uniform. Silty gray clay, little sand and trace of fine gravel.
24-LS	463.7	Very Soft	8	12	49.8	71.1	24-LS: Uniform. Gray clay, some silt.
25-LS	456.7	Compact	117	12	12.1	126.0	25-LS: Uniform. Clayey coarse gray sand.
	450.2	--	100	12			

PENETRATION: Number of blows required to drive core sampler distance given using a 140-pound weight falling 30 inches.

SEE Failure to recover Liner Sample.

SHEARING RESISTANCE & VOLUME OF SOLIDS CURVES



UNIVERSITY OF MICHIGAN RESEARCH INSTITUTE
SOIL MECHANICS LABORATORY
ANN ARBOR MICHIGAN

SUBSOIL ANALYSIS OF BORING NO. 22
ST. CLAIR POWER PLANT
THE DETROIT EDISON COMPANY ST. CLAIR, MICHIGAN
APPROVED: W. A. Housel DATE: 4-5-1966
PROJECT: 01994

Boring Log and all sampling by Raymond Concrete Pile Division of Raymond International, Inc.
Their Job No. C2-4043-D
Date of Boring: 7-31-1965

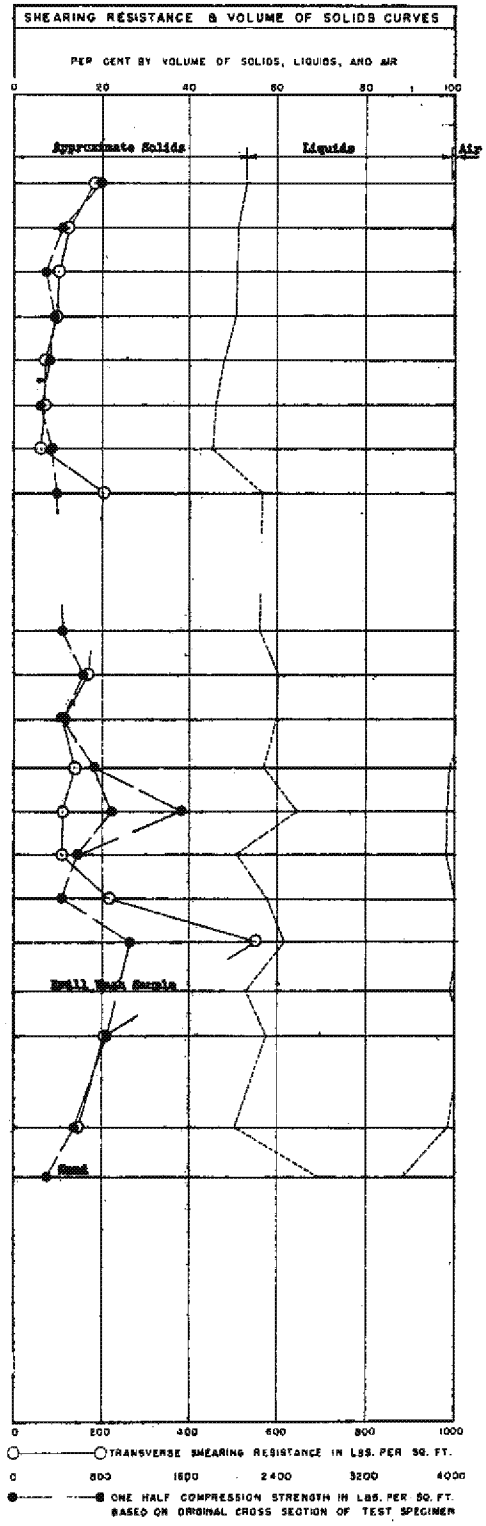
ED_005947A_00014551-00275

LOG OF SOIL PROFILE								
BY R.O.P. DIVISION								
GROUND SURFACE ELEVATION 589.5 FT. (USING PLANT DATUM)								
Medium Sandy Variegated Clay, Some Gravel.								
Stiff Sandy Brown Clay.								
Soft Brown Clay, Some Sand.								
Very Soft Gray Clay, Some Sand, Trace of Gravel.								
Firm Medium to Fine Gray Sand.								
Soft Sandy Gray Clay, Trace of Gravel.								
Medium Sandy Gray Clay, Some Gravel.								
Firm Fine to Medium Gray Sand.								
Medium Sandy Gray Clay.								
Very Compact Medium Gray Sand.								
Very Compact Fine to Medium Gray Sand, Few Seams of Clayey Sand.								
Boring Stopped.								

SOIL SAMPLE							LABORATORY VISUAL INSPECTION
SA. NO.	ELEV.	LAB CONSISTENCY	PENETRATION NO. OF BLOWS	PENETRATION DRIVE IN INCHES	% H_2O BY DRY WT.	DRY WT. LBS. PER CU. FT.	REMARKS
1-38	587.0	—	6	18			
2-38	584.5	—	3	12			
3-38	582.0	—	10	12			
4-18	579.5	Soft	3	12	33.6	89.8	4-18: Uniform. Gray clay, little silt.
5-18	574.5	Very Soft	2	12	35.3	85.3	5-18: Uniform. Gray clay, little silt.
6-18	569.5	Very Soft	2	12	36.8	85.3	6-18: Uniform. Gray clay, little silt.
7-18	564.5	Very Soft	2	12	36.4	84.9	7-18: Uniform. Gray clay, little silt.
8-18	559.5	Very Soft	1	12	41.0	80.4	8-18: Uniform. Gray clay, little silt.
9-18	554.5	Very Soft	1	12	43.8	77.4	9-18: Uniform. Gray clay, little silt.
10-18	549.5	Very Soft	2	12	45.6	76.1	10-18: Uniform. Gray clay, little silt.
11-18	544.5	Soft	3	12	89.4	90.2	11-18: Uniform. Gray Clay, little silt.
12-38	539.5	—	80	12			
13-38	534.5	—	25	12			
14-18	529.0	Soft	4	12	30.3	98.4	14-18: Uniform. Silty gray clay, little sand and trace of fine gravel.
15-18	524.0	Soft	4	12	35.0	99.8	15-18: Uniform. Silty gray clay, little sand and trace of fine gravel.
16-18	519.0	Soft	3	12	37.8	98.2	16-18: Uniform. Silty gray clay, little sand and trace of fine gravel.
17-18	513.5	Soft	6	12	28.1	93.6	17-18: Uniform. Silty gray clay, little sand and trace of fine gravel.
18-18	508.1	Soft to Plastic	10	12	18.6	105.8	18-18: Uniform. Silty gray clay, some sand, trace of gravel.
19-18	503.1	Soft	11	12	24.8	94.8	19-18: Uniform. Silty gray clay, little sand, trace of fine gravel.
20-18	498.1	Soft	8	12	28.7	96.7	20-18: Uniform. Silty gray clay, little sand, trace of fine gravel.
21-18	493.5	Plastic	8	12	25.9	—	21-18: Uniform. Silty gray clay, little sand, trace of fine gravel.
22-18	488.0	Very Soft	8	12	31.0	89.8	22-18: Uniform. Silty gray clay, little sand, trace of fine gravel. Small Wash Sample
23-18	483.0	Soft	8	12	28.4	96.7	23-18: Uniform. Silty gray clay, little sand, trace of fine gravel.
24-38	477.5	—	48	12			
25-18	472.5	Soft	6	12	33.6	84.8	25-18: Uniform. Silty gray clay.
26-18	467.0	Loose	67	12	14.3	116.7	26-18: Uniform. Fine gray sand, trace of clay. Sand
27-38	462.7	—	200	12			
28-38	458.0	—	208	12			

PENETRATION: Number of blows required to drive core sampler distance given using a 140-pound weight falling 30 inches.

Failure to recover Liner Sample.



ELEVATION IN FEET: 580, 570, 560, 550, 540, 530, 520, 510, 500, 490, 480, 470, 460, 450

Boring Log and all sampling by Raymond Concrete Pile Division of Raymond International, Inc.
Thalt Job No. CB-4043-D
Date of Boring: 7-1-1965

UNIVERSITY OF MICHIGAN RESEARCH INSTITUTE
SOIL MECHANICS LABORATORY
ANN ARBOR MICHIGAN

SUBSOIL ANALYSIS OF BORING NO. 25
ST. CLAIR POWER PLANT
THE DETROIT EDISON COMPANY ST. CLAIR, MICHIGAN

APPROVED: W. A. Hansel DATE: 4-5-1966

PROJECT: 01994

ED_005947A_00014551-00276

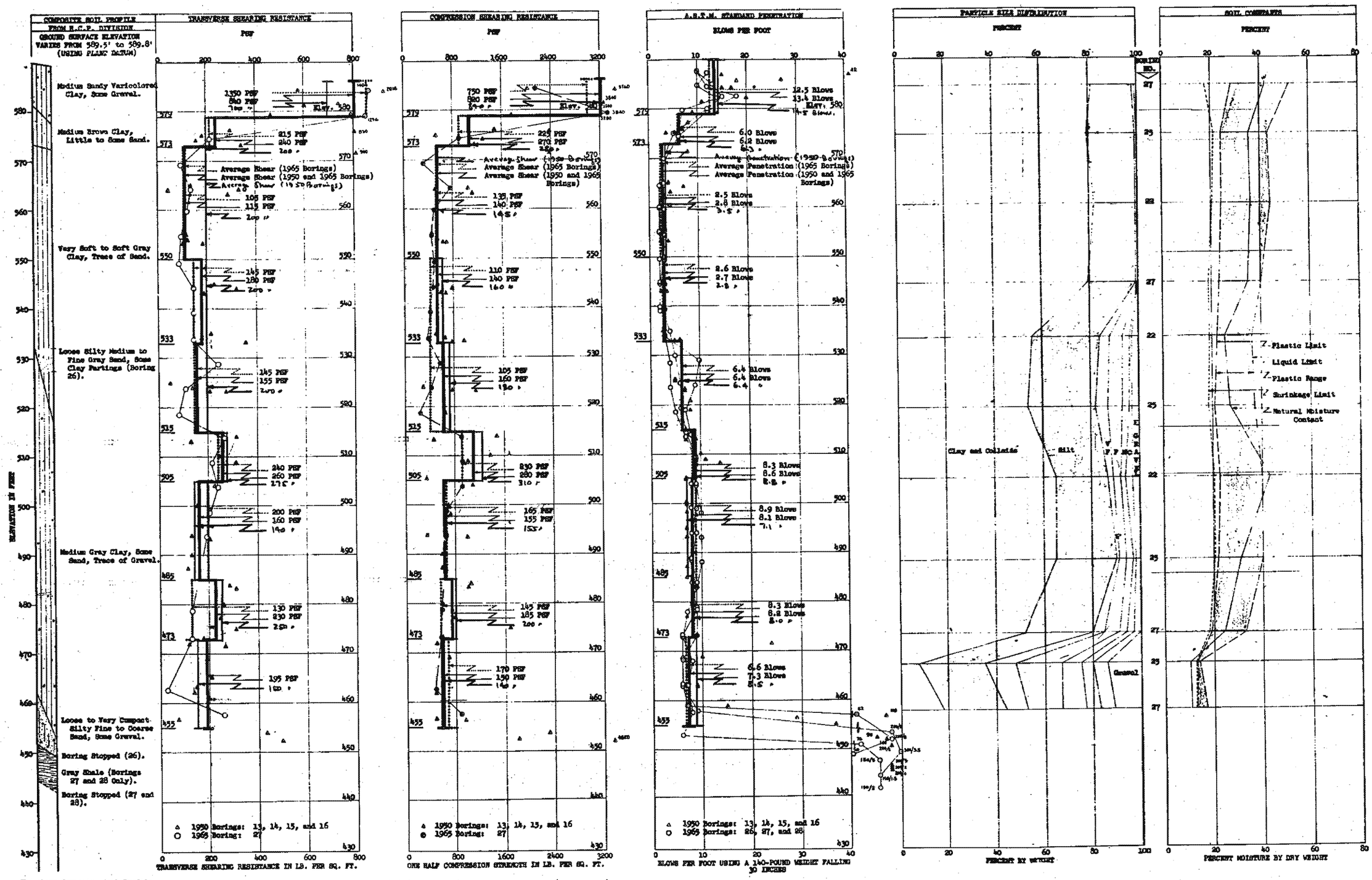
COMPARISON OF AVERAGE SOIL RESISTANCES BETWEEN
1950 AND 1965 BORINGS FOR THE YARD'S CONVEYOR
ST. CLAIR POWER PLANT

1950 Borings: 13, 14, 15, and 16
1965 Borings: 26, 27, and 28

	Soil Type	S_c PSF			$S_{uc}/4$ PSF			N Blows/Ft.			Elev. Ft.
		1950[1]	1965[2]	All[1,2]	1950[1]	1965[2]	All[1,2]	1950[1]	1965[3]	All[1,3]	
590	Ground Surface										590
579	Medium sandy vari-colored clay, some gravel.	700	1350[5]	840	840	750[5]	818	14.5	12.5	13.4	579
573	Medium brown clay, little to some sand.	200	216[4]	241	280	226[4]	270	6.3	6.0	6.2	573
	Very soft to soft gray clay, trace of sand.	200	106	116	144	136	142	3.5	2.5	2.8	550
533		200	144	178	159	108	142	2.8	2.6	2.7	533
	Medium gray clay, some sand, trace of gravel.	200	145	155	182	103	159	6.4	6.4	6.4	515
		275	240	260	312	232	278	8.8	8.3	8.6	505
		140	198[5]	161	154	165[5]	156	7.1	8.9	8.1	485
		250	130[5]	230	202	144[5]	185	8.0	8.3	8.2	473
455		150	259[4]	195	140	170[5]	150	8.5	6.6	7.3	455

(1) Based on shear tests and ASTM penetration values from Borings 13, 14, 15, and 16.
(2) Based on shear tests from Boring 27 only.
(3) Based on ASTM penetration values from Borings 26, 27, and 28.
(4) Based on one shear value only.
(5) Based on two shear values only.

ED_005947A_00014551-00277



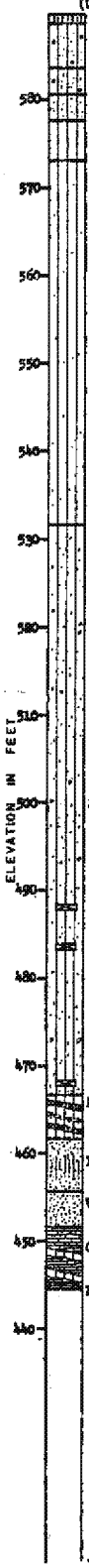
OFFICE OF RESEARCH ADMINISTRATION,
SOIL MECHANICS LABORATORY
UNIVERSITY OF MICHIGAN ANN ARBOR, MICHIGAN
COMPOSITE SUBSOIL ANALYSIS OF BORINGS NO. 26, 27 & 28
ST. CLAIR POWER PLANT
THE DETROIT EDISON COMPANY
ST. CLAIR MICHIGAN
APPROVED W. A. Hansell DATE 4-5-1946
OFFICE OF RESEARCH ADMINISTRATION PROJECT NO. 01994

ED_005947A_00014551-00278

LOG OF SOIL PROFILE

BY R.C.P. DIVISION

GROUND SURFACE ELEVATION 589.8 FT. (USING PLANT DATUM)



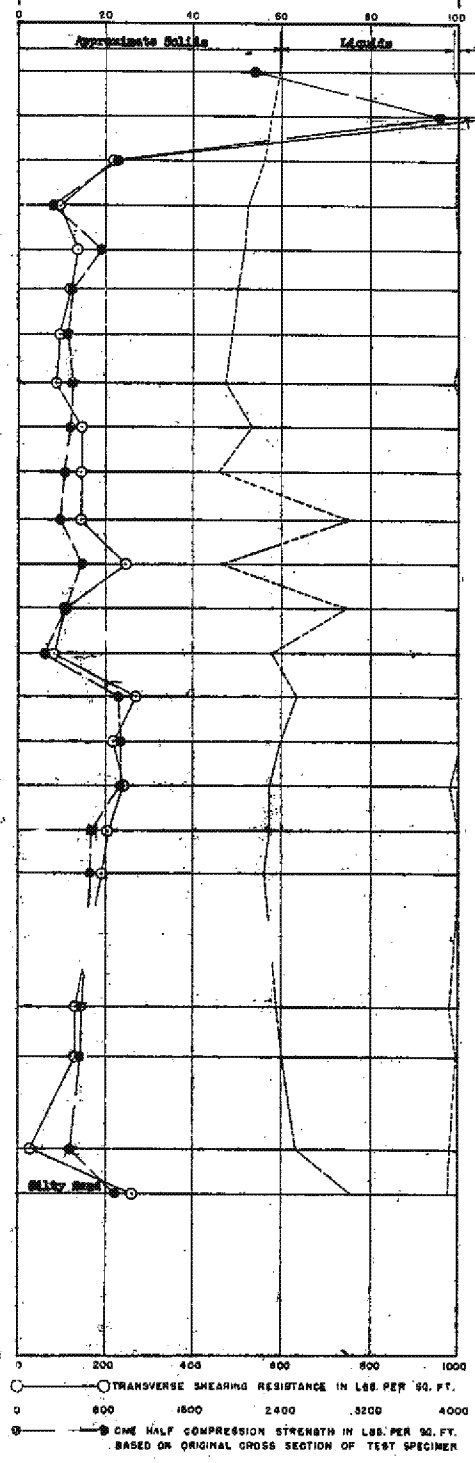
SOIL SAMPLE							LABORATORY VISUAL INSPECTION
SA NO.	ELEV	LAB. CONSISTENCY	PENETRATION NO. OF BLOWS	PENETRATION DRIVE IN INCHES	% H_2O BY DRY WT.	DRY WT. LBS. PER CU. FT.	REMARKS
1-26	587.3	—	10	12			
2-26	584.3	Firm	18	12	24.6	99.8	2-26: Uniform. Brown-gray laminated clay, little silt, trace of sand.
3-26	582.3	—	18	12			
4-26	579.3	Stiff	18	12	28.3	96.7	4-26: Uniform. Brown-gray laminated clay, little silt, trace of sand.
5-26	576.3	Soft	6	12	28.8	94.2	5-26: Uniform. Brown-gray laminated clay, little silt, trace of sand.
6-26	569.3	Soft	3	12	33.3	85.0	6-26: Uniform. Gray clay, little silt, trace of sand.
7-26	564.3	Soft	2	12	34.8	86.7	7-26: Uniform. Gray clay, little silt, trace of sand.
8-26	559.8	Soft	2	12	40.0	84.8	8-26: Uniform. Gray clay, little silt, trace of sand.
9-26	554.8	Soft	2	12	40.0	81.7	9-26: Uniform. Gray clay, little silt, trace of sand.
10-26	549.3	Soft	3	12	40.7	79.8	10-26: Uniform. Gray clay, little silt, trace of sand.
11-26	544.3	Soft	3	12	34.7	89.8	11-26: Uniform. Gray clay, little silt, trace of sand.
12-26	539.3	Soft	3	12	44.0	76.8	12-26: Uniform. Gray clay, little silt, trace of sand.
13-26	533.8	Soft	3	12	12.6	124.5	13-26: Uniform. Silty gray clay, some pockets of fine sand.
14-26	528.8	Soft	10	12	45.0	76.1	14-26: Uniform. Silty gray clay.
15-26	523.8	Soft	9	12	13.0	122.6	15-26: Uniform. Silty gray clay, some pockets and layers of sand.
16-26	518.8	Very Soft	7	12	24.3	99.5	16-26: Uniform. Silty gray clay, little sand.
17-26	513.8	Soft	8	12	26.7	104.2	17-26: Uniform. Silty gray clay, little sand.
18-26	508.8	Soft	9	12	26.0	98.6	18-26: Uniform. Silty gray clay, little sand.
19-26	503.8	Soft	8	12	27.4	94.2	19-26: Uniform. Silty gray clay, little sand.
20-26	498.8	Soft	8	12	28.0	95.5	20-26: Uniform. Silty gray clay, little sand, trace of fine gravel.
21-26	493.8	Soft	9	12	29.1	93.6	21-26: Uniform. Silty gray clay, little sand, trace of fine gravel.
22-26	487.3	—	8	12			
	483.8	—	9	12			
23-26	478.8	Soft	9	12	28.6	98.6	23-26: Uniform. Silty gray clay, little sandy trace of fine gravel.
24-26	473.3	Soft	9	12	28.3	102.3	24-26: Uniform. Silty gray clay, little sand, trace of fine gravel.
25-26	468.3	—	6	12			
26-26	462.8	Very Soft	6	12	30.4	106.1	26-26: Uniform. Silty gray clay homogenized.
27-26	457.8	Soft	9	12	18.8	107.3	27-26: Uniform. Silty gray sand, some clay and gravel.
28-26	453.3	—	200	12			
29-26	449.3	—	330	12			
30-26	444.6	—	190	12			

EXPLANATION: Number of blows required to drive some samples distance given using a 140-pound weight falling 30 inches.

NOTE: Failure to recover 1[illegible] Sample.

Boring Log and all sampling by Raymond Concrete Pile Division of Raymond International, Inc. Their Job No. CB-4043-D
Date of Boring: 7-8-1964

SHEARING RESISTANCE & VOLUME OF SOLIDS CURVES



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ANN ARBOR MICHIGAN

SUBSOIL ANALYSIS OF BORING NO. 27
ST. CLAIR POWER PLANT
THE DETROIT EDISON COMPANY ST. CLAIR, MICHIGAN

APPROVED: W. A. Hansel DATE: 4-5-1966

PROJECT: 01994

A-12

ADDITIONAL St. CLAIR PLANT INFORMATION

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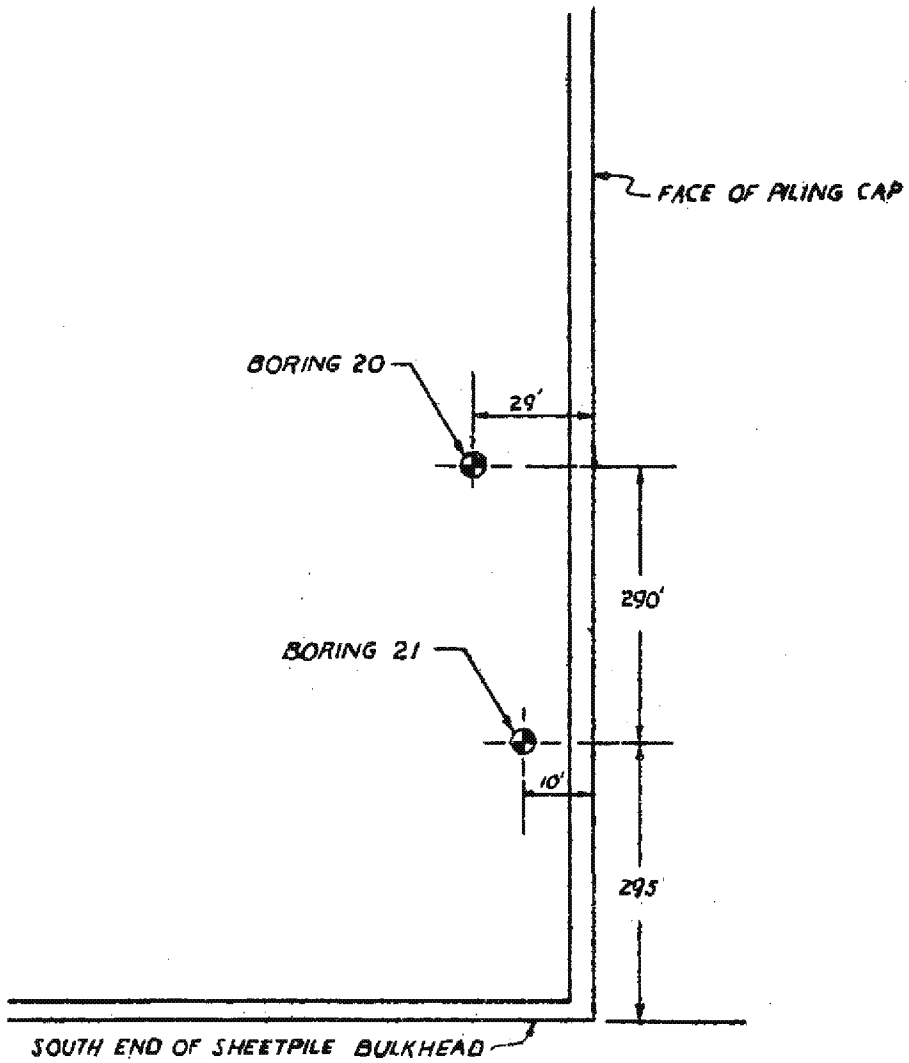
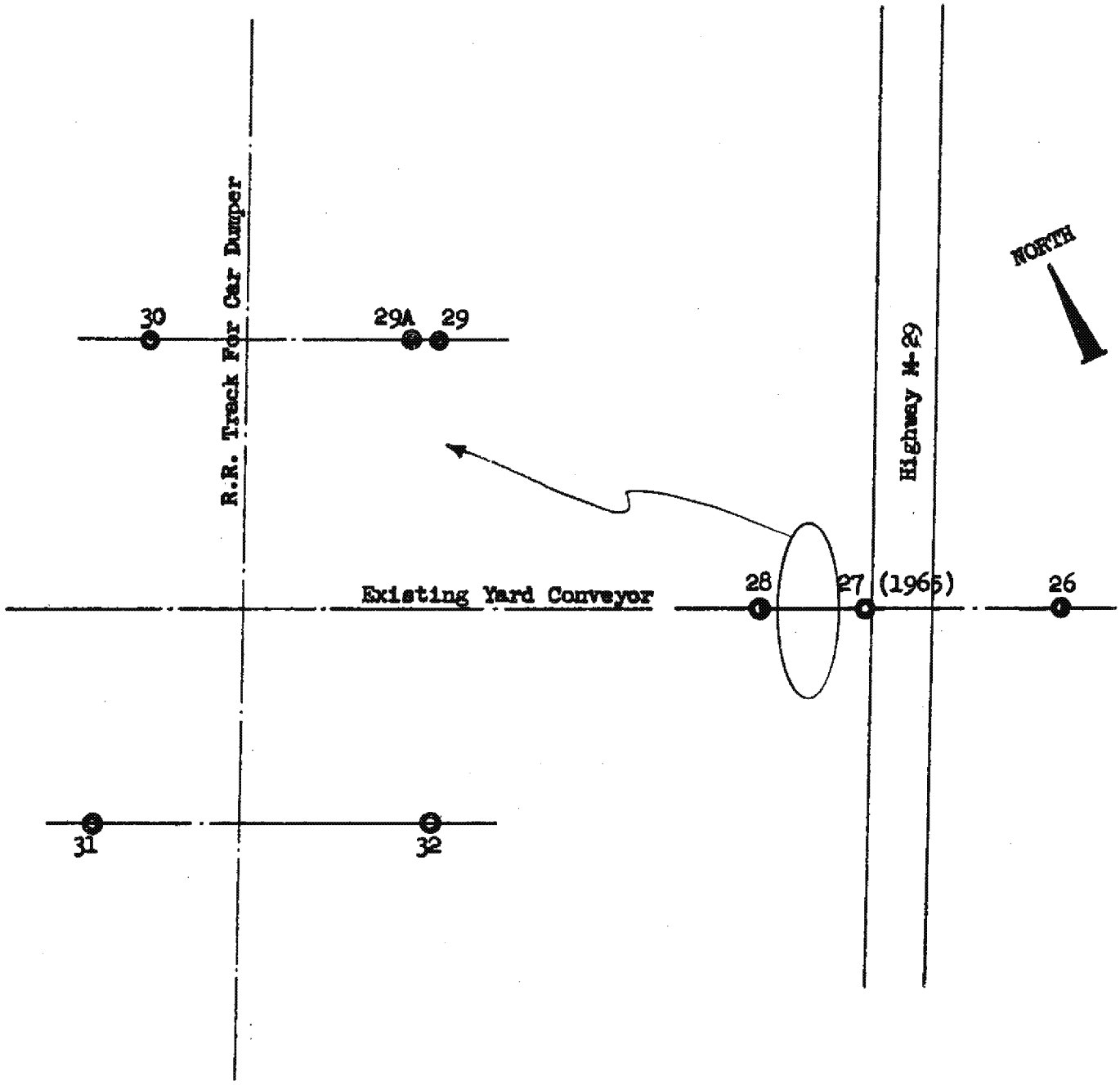


NOT TO SCALE

BORING LOCATION PLAN
ST. CLAIR POWER PLANT
DETROIT EDISON COMPANY
DETROIT MICHIGAN

UNIV. OF MICHIGAN PROJECT 01994



Scale: 1" = 30'

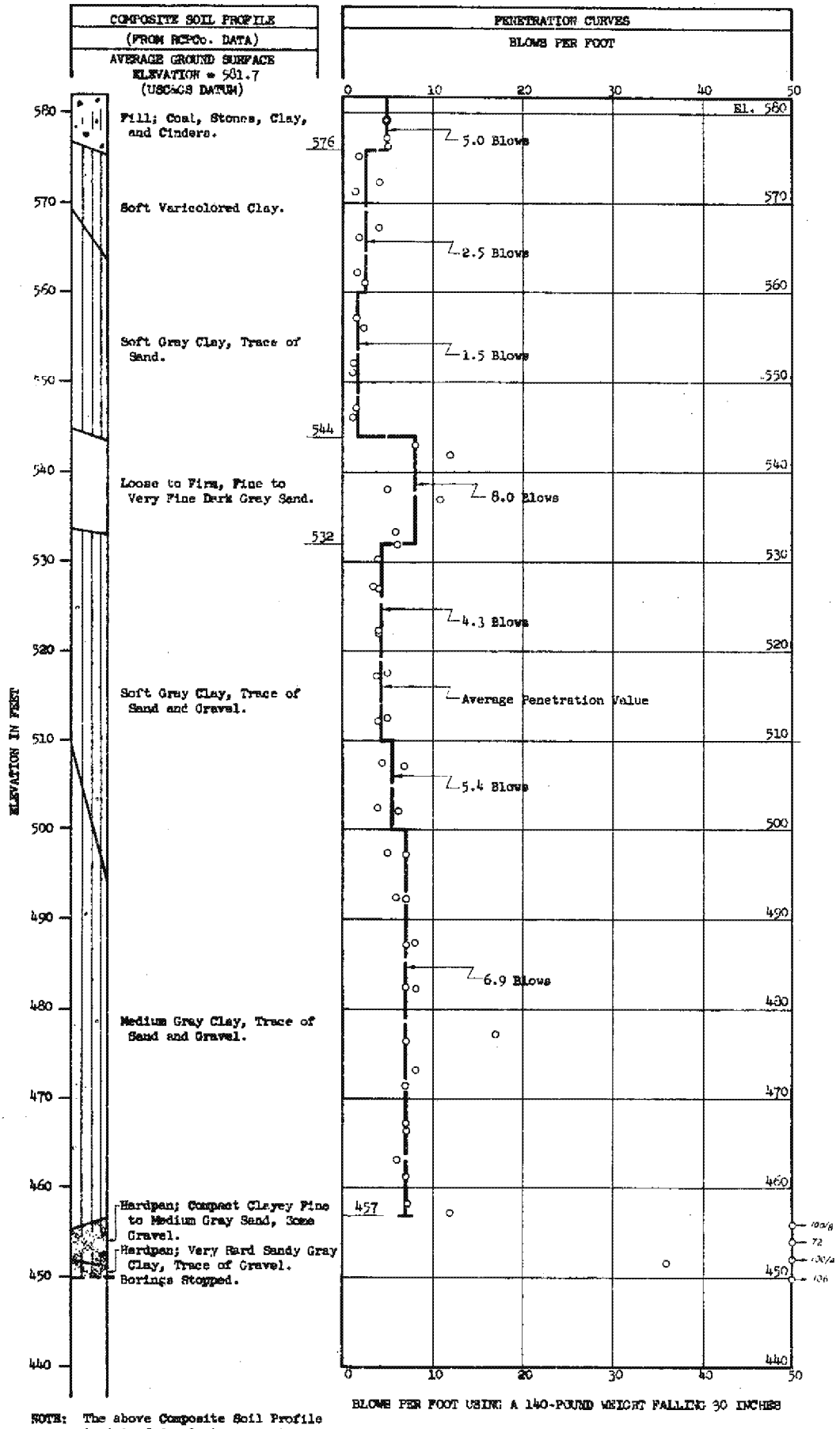
Scale: 1" = 300'

BORING LOCATION PLAN
CAR DUMPER HOUSE ST. CLAIR POWER PLANT THE DETROIT EDISON CO. BELLE RIVER MICHIGAN

● 1965 and 1966 Borings with Liner Samples

◐ 1965 Borings without Liner Samples

CRA PROJECT NO. 01994



NOTE: The above Composite Soil Profile is intended only to present average conditions throughout the group of borings represented. See individual boring charts for details.

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PENETRATION VALUES OF BORINGS NO. 20 and 21
ST. CLAIR POWER PLANT - DETROIT EDISON COMPANY
DETROIT MICHIGAN

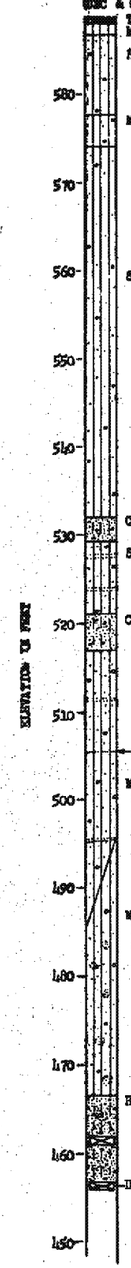
APPROVED: DATE:

Boring Logs

LOG OF SOIL PROFILE

BY RCPCo VISUAL INSPECTION

GROUND SURFACE ELEVATION = 588.7' (USC & GS DATUM)



Topsoil.
Med. V.-Colored Clay.

Hard Vari-Colored Clay, Little Sand, Trace of Gravel.

Med. Vari-Colored Clay, Tr. Sand & Gravel.

Soft Blue Clay, Trace of Sand & Gravel.

Clayey, Med. Dark Sand, Little Gravel.

Soft Blue Clay, Little Sand & Gravel, Seams of Sand.

Clayey, V.Fine, Dark Sand, Little Gravel.

Seam of Clayey, Fine Grey Sand.

Medium Blue Clay, Little Sand & Gravel, Few Sand Seams.

Medium Blue Clay, Little Sand & Gravel. Sand Inclusions.

Hardpan; Compact Clayey Fine Grey Sand, Seams of Clean Sand & Gr., Few Boulders.

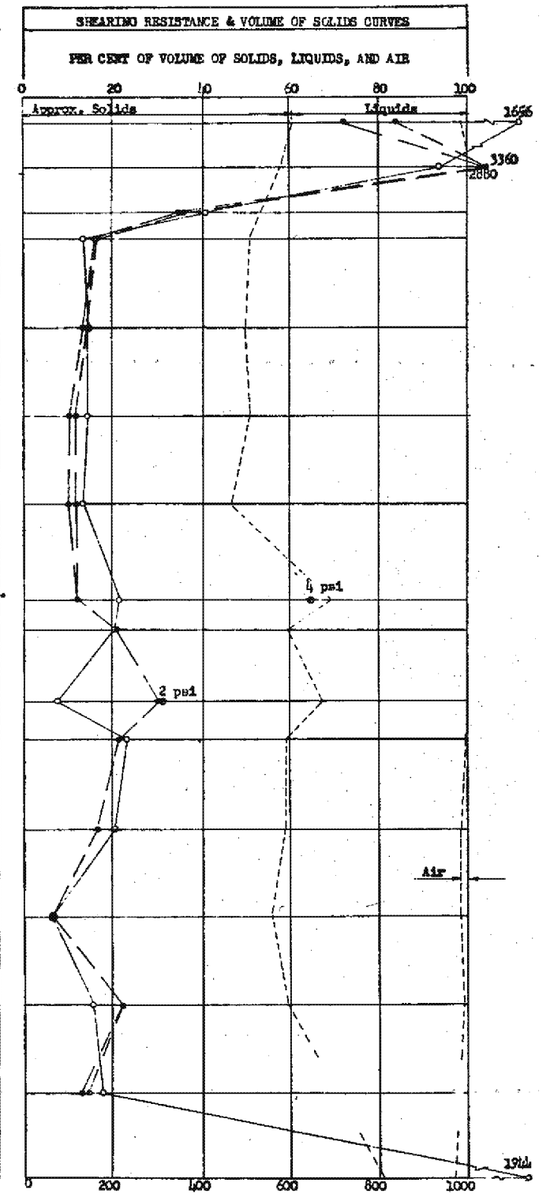
Boring Stopped.

Boring Log and all sampling by Raymond Concrete Pile Company. Their Job No. D-7153-0.

SOIL SAMPLE							LABORATORY VISUAL INSPECTION
SA. NO.	ELEV.	LAB. CONSISTENCY	PENETRATION NO. OF BLOWS	DRIVE IN INCHES	% H_2O BY DRY WT.	DRY WT. LB. PER CU. FT.	REMARKS
1-LS	585.7	Hard	15	12	23.3	101.7	1-LS: Uniform, very fine texture. Smooth vari-colored clay. Little silt. Sl. tr. sand.
2-LS	580.7	V.Stiff	24	12	27.4	97.3	2-LS: Uniform, very fine texture. Smooth vari-colored clay. Little silt.
3-LS	575.7	Stiff	7	12	36.9	86.1	3-LS: Uniform, very fine texture. Smooth vari-colored clay. Little silt.
4-LS	572.7	Soft	3	12	35.8	85.5	4-LS: Uniform, very fine texture. Smooth blue clay. Little silt.
5-LS	562.7	Soft	3	12	38.4	83.6	5-LS: Uniform, very fine texture. V. smooth blue clay. Little silt.
6-LS	552.7	Soft	3	13	36.7	84.9	6-LS: Uniform, very fine texture. V. smooth blue clay. Little silt.
7-LS	542.7	Soft	3	12	43.1	78.0	7-LS: Uniform, very fine texture. V. smooth silty blue clay.
8-LS	531.7	W.C.	10	12	16.9	114.8	8-LS: Uniform, very fine to fine texture. V.f. to f. gray sand. Some cl., little silt.
9-LS	528.4	Soft	5	12	24.8	100.2	9-LS: Uniform, very fine texture. Smooth blue clay. Little silt, tr. sand.
10-LS	520.2	W.C.	12	12	19.0	111.1	10-LS: Uniform, very fine texture. Dark gray clayey silt and very fine sand.
11-LS	515.9	Plastic	7	13	25.6	99.2	11-LS: Uniform, very fine texture. Silty blue clay. Trace sand.
12-LS	505.7	Plastic	7	12	24.7	98.6	12-LS: Uniform, very fine texture. Smooth blue clay with little silt and sand.
13-LS	495.7	V.Soft	8	13	28.0	94.2	13-LS: Uniform, very fine texture. Blue clay with some silt & little sand.
14-LS	485.7	Soft	8	12	25.2	99.2	14-LS: Uniform, very fine texture. Silty blue clay with little sand.
15-LS	475.7	Soft	8	12	42.8	--	15-LS: Uniform, very fine texture. Silty blue clay.
16-LS	466.2	Hard	222	12	7.3	136.0	16-LS: Uniform, very fine texture. Sandy, silty gray clay with pebbles.
	461.4	--	200	6			
	456.5	--	200	4			

PENETRATION NOTE: Number of blows required to drive core sampler distance given using 140-pound weight falling 30 inches.

⊠ Indicates failure to recover Liner Sample.



TRANSVERSE SHEARING RESISTANCE IN LB. PER SQ. FT.

ONE HALF COMPRESSION STRENGTH IN LB. PER SQ. FT. BASED ON ORIGINAL CROSS SECTION OF TEST SPECIMEN.

TRANSVERSE SHEARING RESISTANCE IN LB. PER SQ. FT. UNDER NORMAL PRESSURE AS INDICATED.

ENGINEERING RESEARCH INSTITUTE
SOIL MECHANICS LABORATORY
UNIVERSITY OF MICHIGAN, ANN ARBOR, MICHIGAN

SUBSOIL ANALYSIS OF BORING NO. 3
ST. CLAIR RIVER SITE, MARINE CITY, MICHIGAN
THE DETROIT EDISON COMPANY

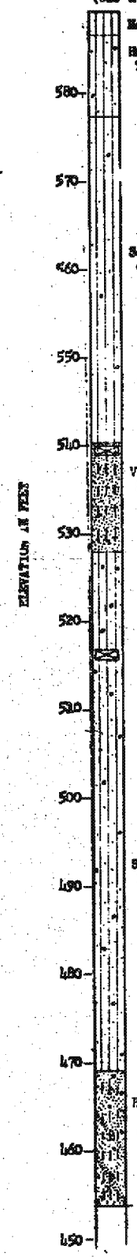
APPROVED: W. J. Housel DATE: 12-13-50

UNIVERSITY OF MICHIGAN PROJECT M373-66

ED_005947A_00014551-00285

LOG OF SOIL PROFILE

BY RMCo VISUAL INSPECTION
GROUND SURFACE
ELEVATION = 589.3'
(USC & GS DATUM)



Medium V.-Colored Clay.

Hard Vari-Colored Clay, Trace of Sand & Gravel.

Soft Blue Clay, Trace of Sand & Gravel.

Very Fine Dark Gray Sand, Trace of Clay.

Soft Blue Clay Little Sand & Gravel.

Hardpan; Very Compact Fine Gray Sand, Little Clay & Gravel.

Boring Stopped.

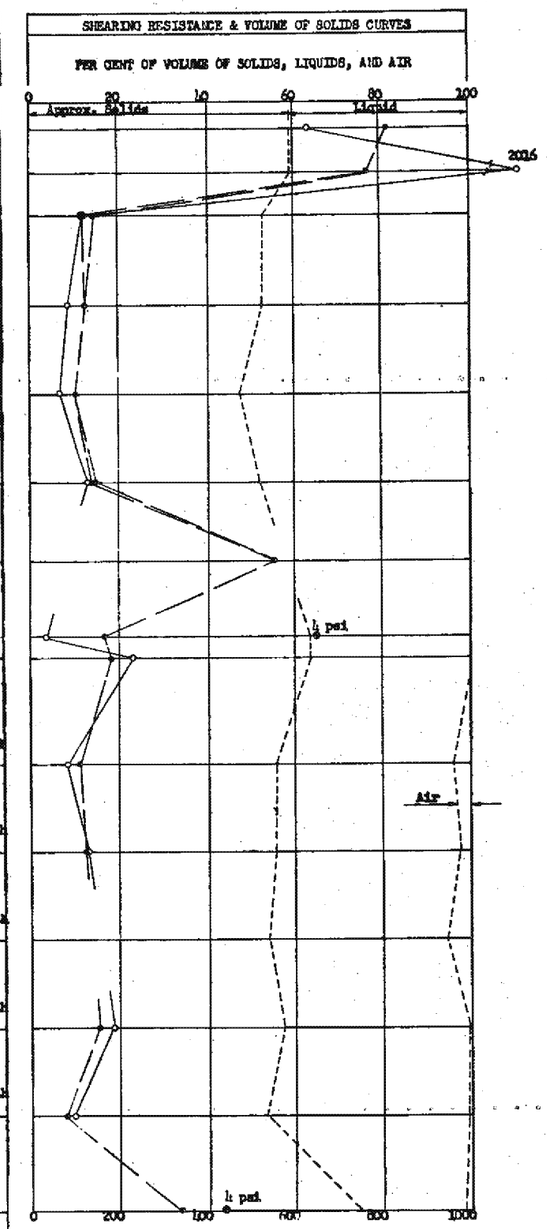
Boring log and all sampling by Raymond Concrete Pile Company. Their Job No. 9-7163-D.

SOIL SAMPLE							LABORATORY VISUAL INSPECTION
SA. NO.	ELEV.	LAB. CONSISTENCY	PENETRATION NO. OF BLOWS	DRIVE IN INCHES	% H_2O BY DRY WT.	DRY WT. LB. PER CU. FT.	REMARKS
1-LS	586.3	V.Stiff	14	12	26.5	99.8	1-LS: Uniform, very fine texture. Silty vari-colored clay with trace organics.
2-LS	581.3	Hard	22	12	26.5	99.2	2-LS: Uniform, very fine texture. Silty vari-colored clay. Trace pebbles.
3-LS	576.5	Soft	4	13	35.5	88.6	3-LS: Uniform, very fine texture. Silty blue clay. Sl. trace sand.
4-LS	566.3	Soft	3	12	34.8	88.0	4-LS: Uniform, very fine texture. Smooth blue clay with little silt.
5-LS	556.3	V.Soft	2	11	42.3	79.2	5-LS: Uniform, very fine texture. Smooth blue clay with little silt.
6-LS	546.3	Soft	2	11	36.0	86.7	6-LS: Uniform, very fine texture. Smooth blue clay with little silt.
	539.5	- -	12	12			
7-LS	537.3	Weakly Coherent	3	12	20.0	- -	7-LS: Uniform, very fine texture. Gray very fine to fine sand with little silt.
8-LS	528.7	Weakly Coherent	7	12	21.8	104.8	8-LS: Uniform, very fine texture. Gray very fine sand with some clay & silt.
9-LS	526.3	Soft	6	12	22.0	106.3	9-LS: Uniform, very fine texture. Blue clay with little silt and sand. Trace.
	516.3	- -	6	12			
10-LS	514.3	V.Soft	7	12	26.9	93.0	10-LS: Uniform, very fine texture. Smooth silty blue clay with little sand.
11-LS	504.3	Soft	8	12	28.1	93.0	11-LS: Uniform, very fine texture. Smooth silty blue clay.
12-LS	494.3	V.Soft	9	12	28.0	90.5	12-LS: Uniform, very fine texture. Smooth silty blue clay.
13-LS	484.3	Soft	9	12	27.6	96.1	13-LS: Uniform, very fine texture. Smooth silty blue clay.
14-LS	474.3	V.Soft	9	12	31.9	89.9	14-LS: Uniform, very fine texture. Smooth silty blue clay.
15-LS	463.5	Weakly Coherent	71	12	11.8	124.8	15-LS: Uniform, v.fine to fine texture. Clayey v.fine to fine gray sand.
16-BS	459.3	Compact	225	5			16-BS: Uniform, v.fine to fine texture. Clayey v.fine to fine gray sand.
	454.3	- -	200	3			

⊠ Indicates failure to recover Liner Sample.

PENETRATION NOTE: Number of blows required to drive core sampler distance given using 140-pound weight falling 30 inches.

SHEARING RESISTANCE & VOLUME OF SOLIDS CURVES



TRANSVERSE SHEARING RESISTANCE IN LB. PER SQ. FT.

0 800 1600 2400 3200 4000

ONE HALF COMPRESSION STRENGTH IN LB. PER SQ. FT. BASED ON ORIGINAL CROSS SECTION OF TEST SPECIMEN.

TRANSVERSE SHEARING RESISTANCE IN LB. PER SQ. FT. UNDER NORMAL PRESSURE OF 4 psi.

ENGINEERING RESEARCH INSTITUTE
SOIL MECHANICS LABORATORY
UNIVERSITY OF MICHIGAN, ANN ARBOR, MICHIGAN

SUBSOIL ANALYSIS OF BORING NO. 1
ST. CLAIR RIVER SITE, MARINE CITY, MICHIGAN
THE DETROIT EDISON COMPANY

APPROVED: W. S. Housel DATE: 12-13-50

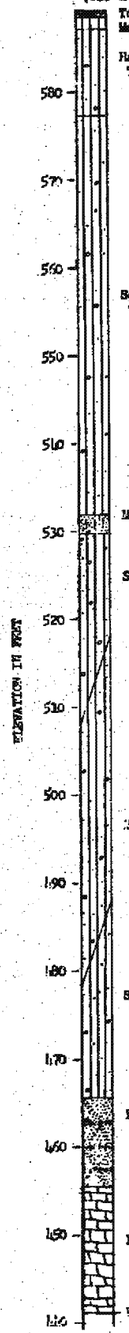
UNIVERSITY OF MICHIGAN PROJECT 4373-66

A-17

LOG OF SOIL PROFILE

BY RCPCo VISUAL INSPECTION

GROUND SURFACE ELEVATION = 589.3' (USC & GS DATUM)

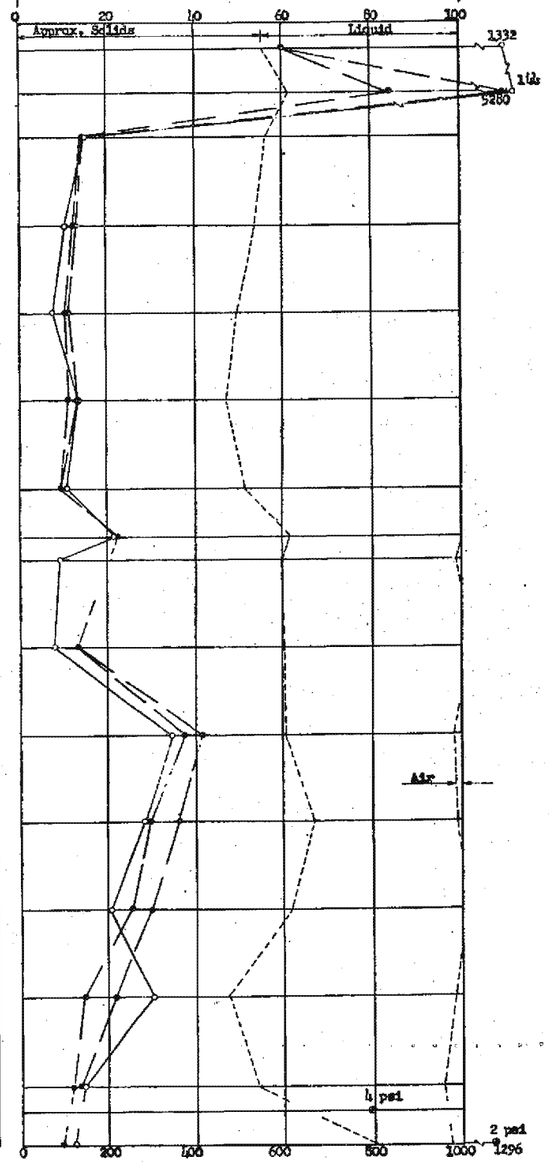


Soil Sample No.	Elev.	Lab. Consistency	Penetration No. of Blows	Penetration Drive in Inches	% H_2O by Dry Wt.	Dry Wt. Lb. per Cu. Ft.	Laboratory Visual Inspection Remarks
							Topsoil. Med. Vari-Colored Clay.
1-LS	586.3	V.Stiff	15	12	29.7	93.6	1-LS: Uniform, very fine texture. Vari-colored with little silt.
							Hard Vari-Colored, Trace of Sand & Gravel.
2-LS	581.3	V.Stiff	14	12	25.2	103.0	2-LS: Uniform, very fine texture. Silty vari-colored clay.
3-LS	576.3	Soft	4	13	29.7	94.2	3-LS: Uniform, very fine texture. Silty blue clay.
4-LS	566.3	Soft	3	12	33.3	90.5	4-LS: Uniform, very fine texture. Silty blue clay.
							Soft Blue Clay, Trace of Sand & Gravel.
5-LS	556.3	Soft	3	13	38.5	83.0	5-LS: Uniform, very fine texture. Silty blue clay.
6-LS	546.3	Soft	3	13	41.3	79.2	6-LS: Uniform, very fine texture. Silty blue clay.
7-LS	536.3	Soft	4	14	34.9	86.1	7-LS: Uniform, very fine texture. Silty blue clay. Trace sand and pebbles.
							Med. to Coarse Sand & Gravel, Little Clay.
8-LS	530.8	Soft to Plastic	22	12	23.8	101.0	8-LS: Uniform, very fine texture. Blue clay with little silt. Tr. sand & pebs.
9-LS	528.3	V.Soft	6	12	23.0	100.5	9-LS: Uniform, very fine texture. Blue clay with little silt. Tr. pebbles.
							Soft Blue Clay, Little Sand & Gravel.
10-LS	518.3	Soft	7	12	26.0	101.1	10-LS: Uniform, very fine texture. Sandy blue clay with some silt. Tr. pebbles.
11-LS	508.3	Plastic to Firm	9	12	23.4	101.1	11-LS: Uniform, very fine texture. Blue clay with some silt. Tr. pebbles.
12-LS	498.3	Plastic	9	12	17.7	112.3	12-LS: Uniform, very fine texture. Silty blue clay.
							Medium Blue Clay, Little Sand & Gravel.
13-LS	488.3	Plastic	11	12	23.8	103.6	13-LS: Uniform, very fine texture. Silty blue clay with pebbles.
14-LS	478.3	Plastic	8	12	40.1	79.9	14-LS: Uniform, very fine texture. Silty blue clay. Tr. sand. Internal voids.
							Soft Blue Clay, Trace of Sand & Gravel.
15-LS	468.3	Plastic	8	12	39.5	78.0	15-LS: Uniform, very fine texture. Silty blue clay. Internal voids.
16-LS	465.4	Non.C.	159	12	--	--	16-LS: Non-uniform. Varies from blue clay to medium gray sand.
17-LS	461.0	W.C.	200	8	7.9	136.0	17-LS: Uniform, coarse texture. Clayey silt and sand with little gravel.
							Hardpan; Compact Fine to Medium Gray Sand, Little Gravel and Clay, Seams of Clayey Sand. Few Boulders.
							Probably Fractured Blue Shale.
							Boring Stopped.

PENETRATION NOTE: Number of blows required to drive core sampler distance given using 140-pound weight falling 30 inches.

Boring Log and all sampling by Raymond Concrete Pile Company. Their Job No. 9-7163-D.

SHEARING RESISTANCE & VOLUME OF SOLIDS CURVES



ENGINEERING RESEARCH INSTITUTE
SOIL MECHANICS LABORATORY
UNIVERSITY OF MICHIGAN, ANN ARBOR, MICHIGAN

SUBSOIL ANALYSIS OF BORING NO. 2
ST. CLAIR RIVER SITE, MARINE CITY, MICHIGAN
THE DETROIT EDISON COMPANY

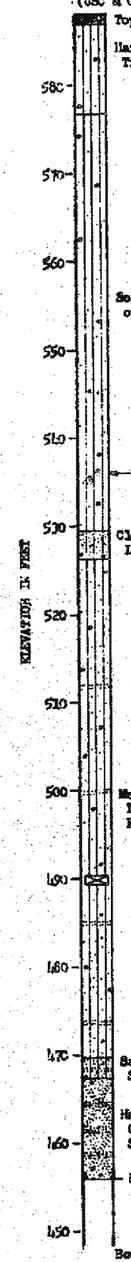
APPROVED: W. J. Housel DATE: 12-15-56

UNIVERSITY OF MICHIGAN PROJECT 4873-66

A-18

LOG OF SOIL PROFILE

BY RCFCo VISUAL INSPECTION
GROUND SURFACE
ELEVATION = 588.2'
(USC & GS DATUM)



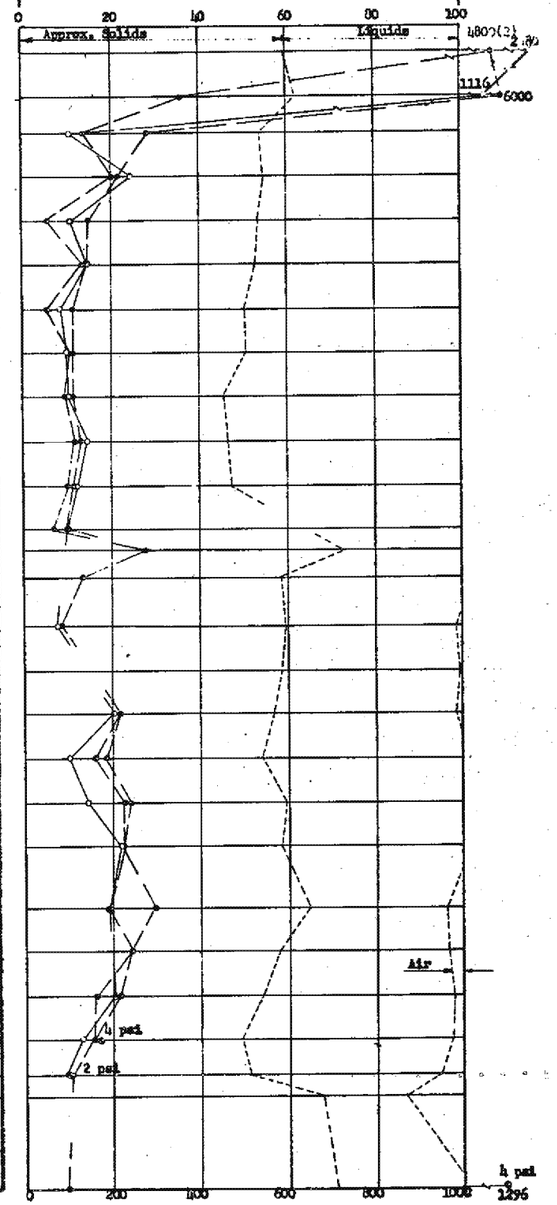
Boring Log and all sampling by Raymond Concrete Pile Company.
Their Job No. B-7453-D.

SOIL SAMPLE							LABORATORY VISUAL INSPECTION
SA. NO.	ELEV.	LAB. CONSIS-TENCY	PENETRATION NO. OF BLOWS	PENETRATION DRIVE IN INCHES	% H_2O BY DRY WT.	DRY WT. LB. PER CU. FT.	REMARKS
1-LS	585.2	Hard	18	12	24.8	99.8	1-LS: Uniform, fine texture. Vari-colored clay with little silt.
2-LS	580.2	V.Stiff	20	12	23.0	104.2	2-LS: Uniform, very fine texture. Silty vari-colored clay. Trace pebbles.
3-LS	576.2	Plastic	4	13	32.4	90.5	3-LS: Uniform, very fine texture. Silty blue clay.
4-LS	571.2	Plastic	3	12	30.6	91.7	4-LS: Uniform, very fine texture. Silty blue clay. Trace of pebbles.
5-LS	566.2	Soft	4	14	32.9	89.2	5-LS: Uniform, very fine texture. Smooth silty blue clay.
6-LS	561.2	Soft	4	13	33.8	88.6	6-LS: Uniform, very fine texture. Blue clay with little silt.
7-LS	556.2	Soft	3	12	38.4	84.2	7-LS: Uniform, very fine texture. Silty blue clay.
8-LS	551.2	Soft	3	14	36.4	85.5	8-LS: Uniform, very fine texture. Silty blue clay.
9-LS	546.2	Soft	3	14	45.3	76.1	9-LS: Uniform, very fine texture. Silty blue clay with little sand.
10-LS	541.2	Soft	3	14	43.3	77.4	10-LS: Uniform, very fine texture. Silty blue clay.
11-LS	536.2	Soft	3	12	42.3	79.2	11-LS: Uniform, very fine texture. Silty blue clay.
12-LS	531.2	Soft	3	13	43.4	--	12-LS: Uniform, very fine texture. Silty blue clay.
13-LS	528.9	W.C.	10	12	14.2	119.8	13-LS: Uniform, fine texture. F. to med. gray clayey sand, tr. of gravel.
14-LS	525.7	V.Soft	6	12	28.1	98.0	14-LS: Uniform, very fine texture. Silty blue clay. Trace pebbles.
15-LS	520.2	V.Soft	7	12	24.6	99.8	15-LS: Uniform, very fine texture. Silty blue clay with tr. of gravel.
16-LS	515.2	V.Soft	8	13	26.4	98.0	16-LS: Uniform, very fine texture. Silty blue clay, little sand. Tr. gr.Disturbed.
17-LS	510.2	V.Soft	7	12	27.1	95.5	17-LS: Uniform, very fine texture. Silty blue clay. Trace pebbles.
18-LS	505.2	V.Soft	7	12	32.7	90.5	18-LS: Uniform, very fine texture. Silty blue clay.
19-LS	500.2	Plastic	8	13	27.8	94.8	19-LS: Uniform, very fine texture. Silty blue clay. Some sand. Trace pebbles.
20-LS	495.2	Plastic	8	12	28.2	97.3	20-LS: Uniform, very fine texture. Silty blue clay. Some sand. Trace pebbles.
	490.2	--	9	12			
21-LS	488.2	Plastic	9	12	18.3	108.6	21-LS: Uniform, very fine texture. Silty blue clay. Some sand. Trace pebbles.
22-LS	483.2	Soft	10	12	25.1	96.7	22-LS: Uniform, very fine texture. Silty blue clay. Little sand. Trace pebbles.
23-LS	478.2	Plastic	9	12	30.1	90.5	23-LS: Uniform, very fine texture. Silty blue clay with little sand.
24-LS	473.2	Soft	8	12	36.8	82.4	24-LS: Uniform, very fine texture. Smooth blue clay with little silt. Int. voids.
25-LS	469.2	Soft	10	12	32.4	86.1	25-LS: Uniform, very fine texture. Clayey gray silt with little sand.
26-LS	466.7	W.C.	60	12	10.3	114.2	26-LS: Uniform, fine texture. Clean v.f. to f. gray sand. Seams silty clay.
27-SS	460.8	Compact	200	5			27-SS: Uniform, fine texture. Silty very fine to fine gray sand.
28-LS	455.8	Hard	320	10	16.5	117.3	28-LS: Uniform, very fine texture. Clean v.f. gray sand and silt. Seams of clay.

⊠ Indicates failure to recover Liner Sample.

PENETRATION NOTE: Number of blows required to drive core sampler distance given using 140-pound weight falling 30 inches.

SHEARING RESISTANCE & VOLUME OF SOLIDS CURVES



TRANSVERSE SHEARING RESISTANCE IN LB. PER SQ. FT.
0 800 1600 2400 3200 4000
ONE HALF COMPRESSION STRENGTH IN LB. PER SQ. FT. BASED ON ORIGINAL CROSS SECTION OF TEST SPECIMEN.

TRANSVERSE SHEARING RESISTANCE IN LB. PER SQ. FT. UNDER NORMAL PRESSURE AS INDICATED.

ENGINEERING RESEARCH INSTITUTE
SOIL MECHANICS LABORATORY
UNIVERSITY OF MICHIGAN, ANN ARBOR, MICHIGAN

SUBSOIL ANALYSIS OF BORING NO. 4
ST. CLAIR RIVER SITE, MARINE CITY, MICHIGAN
THE DETROIT EDISON COMPANY

APPROVED: W. J. Housel DATE: 12-12-50

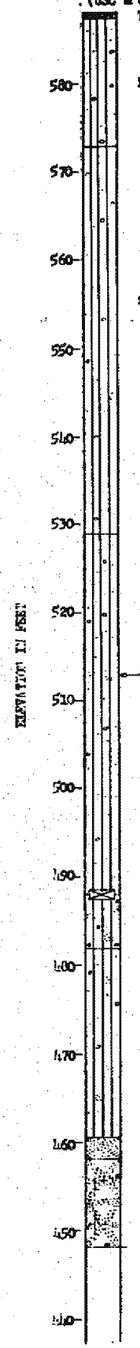
UNIVERSITY OF MICHIGAN PROJECT M373-66

A-20

LOG OF SOIL PROFILE

BY REFCo VISUAL INSPECTION

GROUND SURFACE ELEVATION = 588.f (USC & GS DATUM)



Boring Log and all sampling by Raymond Concrete Pile Company. Their Job No. [illegible].

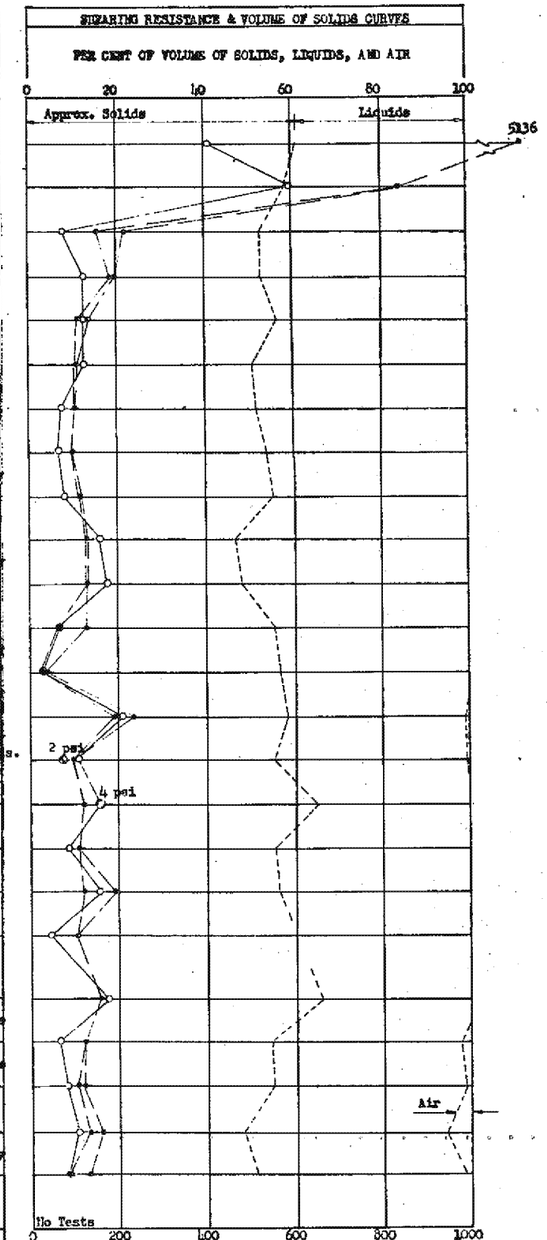
SOIL SAMPLE / LABORATORY VISUAL INSPECTION

Sa. No.	Elev.	Lab. Consistency	Penetration No. of Blows	Drive in Inches	% H_2O by Dry Wt.	Dry Wt. Lb. per Cu. Ft.	Remarks
1-DS	581.5	--	10	12			
2-LS	583.0	F.Stiff	21	12	24.2	102.3	2-LS: Uniform, very fine texture. Vari-colored clay with little silt.
3-LS	578.0	Plastic	15	12	26.8	98.6	3-LS: Uniform, very fine texture. Silty vari-colored clay with tr. pebbles.
4-LS	573.0	Soft	6	12	33.7	88.6	4-LS: Uniform, very fine texture. Silty blue clay.
5-LS	568.0	Soft	4	14	33.0	88.6	5-LS: Uniform, very fine texture. Silty blue clay.
6-LS	563.0	Soft	3	12	28.9	94.8	6-LS: Uniform, very fine texture. Silty blue clay with pebbles.
7-LS	558.0	Soft	3	12	35.3	86.1	7-LS: Uniform, very fine texture. Silty blue clay.
8-LS	553.0	Soft	3	12	35.2	86.4	8-LS: Uniform, very fine texture. Smooth silty blue clay with pebbles.
9-LS	548.0	Soft	3	12	32.5	90.5	9-LS: Uniform, very fine texture. Silty blue clay.
10-LS	543.0	Soft	3	12	31.8	92.4	10-LS: Uniform, very fine texture. Silty blue clay.
11-LS	538.0	Soft to Plastic	4	13	44.2	76.6	11-LS: Uniform, very fine texture. Silty blue clay with little sand.
12-LS	533.0	Soft to Plastic	4	12	39.6	81.1	12-LS: Uniform, very fine texture. Silty blue clay with little sand.
13-LS	528.0	V.Soft	5	12	29.5	93.0	13-LS: Uniform, very fine texture. Blue clay with little silt. Tr. sand & pebs.
14-LS	523.0	V.Soft	6	12	28.5	95.5	14-LS: Uniform, very fine texture. Silty blue clay with little sand. Tr. pebbles.
15-LS	518.0	Soft to Plastic	7	12	25.5	98.5	15-LS: Uniform, very fine texture. Silty blue clay with little sand. Tr. pebbles.
16-LS	513.0	Soft to Plastic	7	12	29.5	93.0	16-LS: Uniform, very fine texture. Silty blue clay. Little sand. Tr.pebs.Int.voids.
17-LS	508.0	Soft	7	12	20.3	108.0	17-LS: Uniform, fine texture. Silty sandy blue clay with pebbles.
18-LS	503.0	Soft	7	12	29.3	93.0	18-LS: Uniform, fine texture. Silty sandy blue clay with pebs. Int. voids.
19-LS	498.0	Soft	7	12	29.0	94.8	19-LS: Uniform, fine texture. Silty sandy blue clay with pebs. Int. voids.
20-LS	493.0	V.Soft	8	13	23.6	99.2	20-LS: Uniform, fine texture. Silty sandy blue clay with pebbles.
	488.0	--	10	12			
21-LS	486.1	Plastic	12	12	19.9	111.7	21-LS: Uniform, fine texture. Blue clay. Some silt. Little sand. Tr. pebs.
22-LS	481.0	Soft	7	12	29.1	91.7	22-LS: Uniform, fine texture. Silty blue clay. Some sand.Tr.pebbles. Int. voids.
23-LS	476.0	Soft to Plastic	8	12	29.6	92.4	23-LS: Uniform, fine texture. Silty blue clay. Some sand.Tr.pebbles. Int. voids.
24-LS	471.0	Soft to Plastic	5	12	35.4	81.1	24-LS: Uniform, fine texture. Silty blue clay with little sand. Int. voids.
25-LS	466.0	Soft	8	12	34.2	86.1	25-LS: Uniform, very fine texture. Silty blue clay with internal voids.
26-LS	456.0	Weakly Coherent	16 100	12 12	13.9	--	26-LS: Uniform, very fine texture. Fine to med. gray sand. Some clay. Tr. pebs.
	447.1	--	225	5			
	446.1	--	200	3			

[illegible] Indicates failure to recover Liner Sample.

PENETRATION NOTE: Number of blows required to drive core sampler distance given using 140-pound weight falling 30 inches.

SHEARING RESISTANCE & VOLUME OF SOLIDS CURVES



TRANSVERSE SHEARING RESISTANCE IN LB. PER SQ. FT.

0 800 1600 2400 3200 4000

ONE HALF COMPRESSION STRENGTH IN LB. PER SQ. FT. BASED ON ORIGINAL CROSS SECTION OF TEST SPECIMEN.

TRANSVERSE SHEARING RESISTANCE IN LB. PER SQ. FT. UNDER NORMAL PRESSURE AS INDICATED.

ENGINEERING RESEARCH INSTITUTE
SOIL MECHANICS LABORATORY
UNIVERSITY OF MICHIGAN, ANN ARBOR, MICHIGAN

SUBSOIL ANALYSIS OF BORING NO. 5
ST. CLAIR RIVER SITE, MARINE CITY, MICHIGAN
THE DETROIT EDISON COMPANY

APPROVED: [illegible] DATE: [illegible]

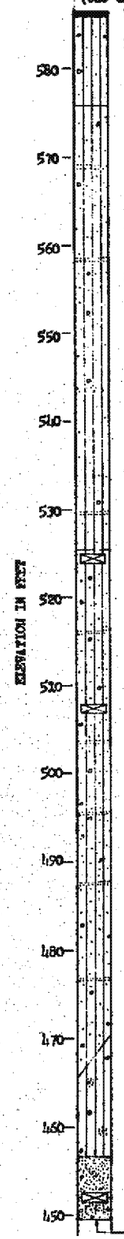
UNIVERSITY OF MICHIGAN PROJECT M973-[illegible]

A-21

LOG OF SOIL PROFILE

BY REPCo VISUAL INSPECTION

GROUND SURFACE ELEVATION = 586.5' (USC & GS DATUM)



Topsoil.

Hard Vari-Colored Clay, Trace of Sand & Gravel.

Soft Blue Clay, Trace of Sand & Gravel, Few Seams of Sand.

Few Sand Inclusions and Seams.

Medium Blue Clay, Little Sand & Gravel, Few Sand Seams.

Medium Blue Clay, Some Sand Inclusions, Trace of Gravel.

Hardpan; Fine to V.Fine Grey Sand, Tr. of Grav.

Hardpan; Compact Clayey Fine Gray Sand, Little Gravel.

Refusal.

Boring Log and all sampling by Raymond Concrete Pile Company. Their Job No. B-7453-D.

SOIL SAMPLE / LABORATORY VISUAL INSPECTION

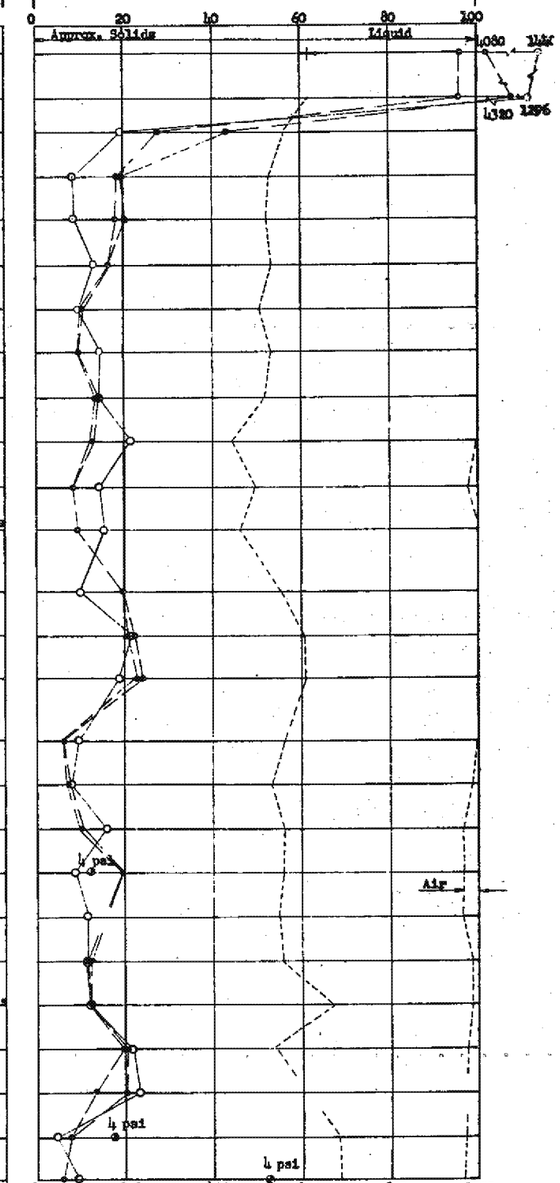
SA. NO.	ELEV.	LAB. CONSISTENCY	PENETRATION NO. OF BLOWS	PENETRATION DRIVE IN INCHES	% H_2O BY DRY WT.	DRY WT. LB. PER CU. FT.	REMARKS
1-LS	583.5	Hard	10	12	23.0	103.0	1-LS: Uniform, fine texture. Vari-colored clay with trace of gravel.
2-LS	578.5	Hard	19	12	24.3	103.0	2-LS: Uniform, very fine texture. Vari-colored clay with little silt.
3-LS	574.5	Soft to Plastic	6	12	30.9	94.2	3-LS: Uniform, very fine texture. Blue clay with little silt.
4-LS	569.5	Soft	3	12	33.9	88.6	4-LS: Uniform, very fine texture. Blue clay with little silt.
5-LS	564.5	Soft	3	12	36.0	87.4	5-LS: Uniform, very fine texture. Blue clay with little silt.
6-LS	559.5	Soft	3	12	33.3	89.2	6-LS: Uniform, very fine texture. Blue clay with little silt.
7-LS	554.5	Soft	3	12	37.5	84.2	7-LS: Uniform, very fine texture. Blue clay with little silt.
8-LS	549.5	Soft	3	12	33.9	89.3	8-LS: Uniform, very fine texture. Silty blue clay.
9-LS	544.5	Soft	3	12	37.0	86.7	9-LS: Uniform, very fine texture. Silty blue clay.
10-LS	539.5	Soft	3	12	46.6	74.3	10-LS: Uniform, very fine texture. Silty blue clay with silt inclusions.
11-LS	534.5	Soft	3	12	36.0	83.0	11-LS: Uniform, very fine texture. Blue clay with little silt. Tr. sand.
12-LS	529.5	Soft	3	12	43.4	77.6	12-LS: Uniform, very fine texture. Blue clay with little silt and silt inclusions
	523.5	--	5	12			
13-LS	522.5	Soft to Plastic	6	12	31.2	92.4	13-LS: Uniform, very fine texture. Silty blue clay with little sand.
14-LS	517.5	Soft to Plastic	6	12	24.7	101.1	14-LS: Uniform, very fine texture. Silty blue clay with little sand.
15-LS	512.5	Plastic	8	12	22.9	102.3	15-LS: Uniform, very fine texture. Silty blue clay with silt inclusions.
	507.5	--	7	12			
16-LS	505.5	Soft	7	12	29.0	94.2	16-LS: Uniform, fine texture. Silty blue clay with pebbles. Int. voids.
17-LS	500.5	Soft	7	12	31.4	89.2	17-LS: Uniform, very fine texture. Blue clay with some silt and sand.
18-LS	495.5	Soft to Plastic	8	12	26.8	94.2	18-LS: Uniform, very fine texture. Blue clay with some silt and sand.
19-LS	490.5	Soft to Plastic	10	12	26.9	93.6	19-LS: Uniform, very fine texture. Blue clay with some silt and sand. Tr. pebs.
20-LS	485.5	V.Soft	10	12	28.3	91.7	20-LS: Uniform, very fine texture. Blue clay with little silt & sand. Tr. pebs.
21-LS	480.5	Soft to Plastic	11	12	29.0	93.0	21-LS: Uniform, very fine texture. Blue clay with little silt & sand. Tr. pebs.
22-LS	475.5	Soft to Plastic	10	12	17.8	111.7	22-LS: Uniform, fine texture. Blue clay with little silt & sand. Int. voids.
23-LS	470.5	Plastic	8	12	30.3	89.9	23-LS: Uniform, fine texture. Blue clay with little silt & sand.
24-LS	465.5	Plastic	7	12	26.4	--	24-LS: Uniform, fine texture. Silty blue clay with some sand. Int. voids.
25-LS	460.5	Soft	8	12	15.8	114.2	25-LS: Uniform, very fine texture. Silty blue clay with some sand.
26-LS	455.5	Non.C.	6 / 75	12 / 12	15.1	114.8	26-LS: Uniform, very fine texture. Fine gray sand and silt.
27-SS	451.3	V.Hard	200	8	--	--	27-SS: Uniform, very fine texture. Silty sandy dark blue clay. Silt partings.

Indicates failure to recover Liner Sample.

PENETRATION NOTE: Number of blows required to drive core sampler distance given using 140-pound weight falling 30 inches.

SHEARING RESISTANCE & VOLUME OF SOLIDS CURVES

PER CENT BY VOLUME OF SOILDS, LIQUIDS, AND AIR



TRANSVERSE SHEARING RESISTANCE IN LB. PER SQ. FT. UNDER NORMAL PRESSURE 4 psi.

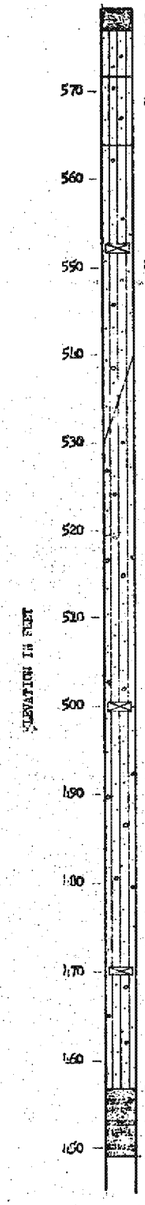
ENGINEERING RESEARCH INSTITUTE
SOIL MECHANICS LABORATORY
UNIVERSITY OF MICHIGAN, ANN ARBOR, MICHIGAN

SUBSOIL ANALYSIS OF BORING NO. 6
ST. CLAIR RIVER SITE, MARINE CITY, MICHIGAN
THE DETROIT EDISON COMPANY

APPROVED: [illegible] DATE: [illegible]

A-22

LOG OF SOIL PROFILE
BY RCPCo VISUAL INSPECTION
GROUND SURFACE ELEVATION = 579.2 (USC & GS DATUM)



Boring Log and all sampling by Raymond Concrete Pile Company. Their Job No. B-7453-P.

SOIL SAMPLE

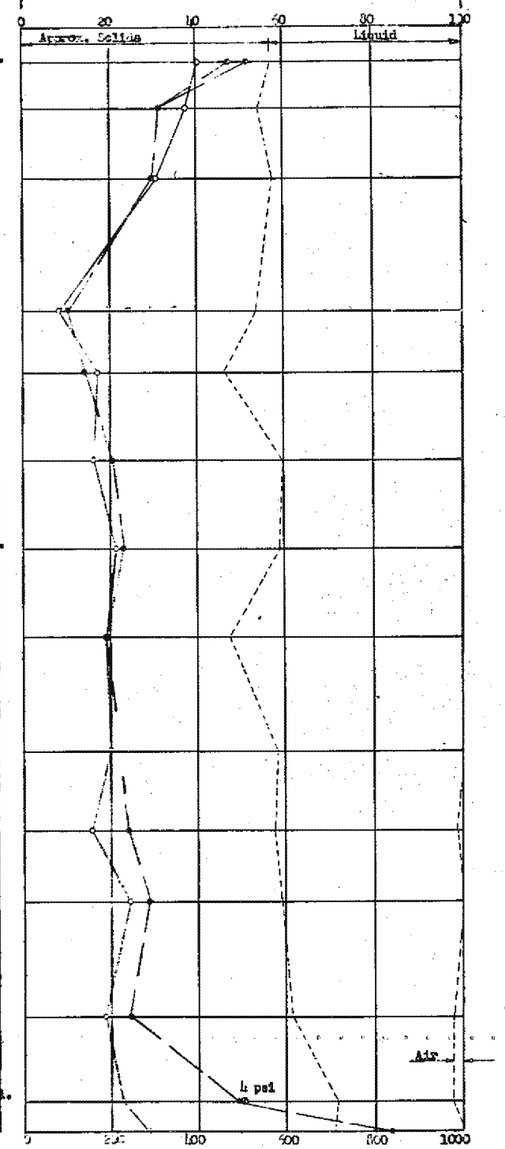
SA. NO.	ELEV.	LAB. CONSISTENCY	PENETRATION NO. OF BLOWS	PENETRATION DRIVE IN INCHES	% H_2O BY DRY WT.	DRY WT. LB. PER CU. FT.	LABORATORY VISUAL INSPECTION REMARKS
1-LS	575.2	Firm	12	12			1-LS: Uniform, very fine texture. V. smooth vari-colored clay with little silt.
2-LS	570.2	Firm	3	14			2-LS: Uniform, very fine texture. V. smooth, silty yellow clay.
3-LS	562.2	Plastic	3	13			3-LS: Uniform, very fine texture. Smooth blue clay with little silt.
	552.2	--	2	15			
4-LS	547.2	Soft	4	12			4-LS: Uniform, very fine texture. V. smooth blue clay with little silt.
5-LS	540.2	Soft to Plastic	2	12			5-LS: Uniform, very fine texture. Smooth silty blue clay with tr. sand & pebbles.
6-LS	530.2	Soft	3	12			6-LS: Uniform, very fine texture. Smooth silty blue clay with tr. sand & pebbles.
7-LS	520.2	Soft to Plastic	3	12			7-LS: Uniform, very fine texture. Smooth blue clay. Some silt, little sand, tr. pebs.
8-LS	510.2	Soft to Plastic	4	12			8-LS: Uniform, very fine texture. Smooth silty blue clay with little sand.
	500.2	--	3	12			
9-LS	497.2	Plastic	5	12			9-LS: Uniform, very fine texture. Blue clay with some silt. Trace sand.
10-LS	488.2	Soft to Plastic	6	12			10-LS: Uniform, very fine texture. Smooth silty blue clay. Little sand.
11-LS	480.2	Soft to Plastic	6	12			11-LS: Uniform, very fine texture. Smooth silty blue clay. Little sand.
	470.2	--	10	12			
12-LS	467.2	Plastic	9	12			12-LS: Uniform, very fine texture. Smooth silty blue clay. Little sand.
13-LS	457.4	Weakly Coherent	17	12			13-LS: Non-uniform, very fine texture. Varies from sdy. silty gray cl. to f. gray sd.
14-LS	454.0	Plastic to Firm	46	12			14-LS: Uniform, v. fine to fine texture. V. dark gray silty clay. Some sd. & grav.

In dicates failure to recover Liner Sample.

PENETRATION NOTE: Number of blows required to drive core sampler distance given using 140-pound weight falling 30 inches.

SHEARING RESISTANCE & VOLUME OF SOLIDS CURVES

PER CENT OF VOLUME OF SOLIDS, LIQUIDS, AND AIR



TRANSVERSE SHEARING RESISTANCE IN LB. PER SQ. FT.
0 800 1600 2400 3200 4000
ONE HALF COMPRESSION STRENGTH IN LB. PER SQ. FT. BASED ON ORIGINAL CROSS SECTION OF TEST SPECIMEN.
TRANSVERSE SHEARING RESISTANCE IN LB. PER SQ. FT. UNDER INITIAL PRESSURE OF 4 psi.

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SOIL MECHANICS LABORATORY
UNIVERSITY OF MICHIGAN, ANN ARBOR, MICHIGAN

SUBSOIL ANALYSIS OF BORING NO. 3
ST. CLAIR RIVER SITE, MARINE CITY, MICHIGAN
THE DETROIT EDISON COMPANY

ATTESTED: [signature] DATE: 12-13-50

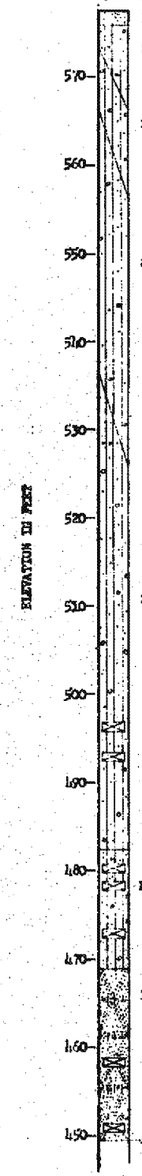
UNIVERSITY OF MICHIGAN PROJECT M373-[illegible]

A-24

ED_005947A_00014551-00291

LOG OF SOIL PROFILE

BY ROPCo VISUAL INSPECTION
GROUND SURFACE
ELEVATION = 577.6' (USC & GS DATUM)



Fine Brown Sand.

Hard Vari-Colored Clay, Trace of Sand & Gravel.

Soft Yellow Clay, Trace of Sand & Gravel.

Soft Blue Clay, Trace of Sand & Gravel.

Soft Blue Clay, Little Sand & Gravel.

Foreman Reports Sandy Clay with Some Gravel.

Hardpan; Compact Fine Gray Sand, Some of Clayey Sand with Some Gravel.

Boring Stopped.

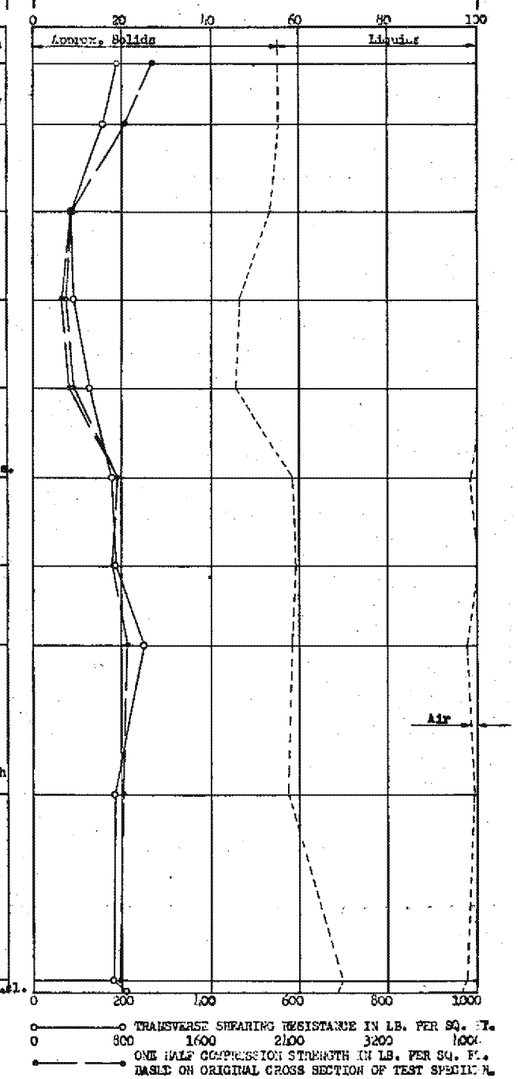
SOIL SAMPLE							LABORATORY VISUAL INSPECTION
SA. NO.	ELEV.	N.B. CONSISTENCY	PENETRATION NO. OF BLOWS	DRIVE IN INCHES	% H_2O BY DRY WT.	DRY WT. LB. PER CU. FT.	REMARKS
1-LS	573.6	Plastic	6	12	29.8	93.0	1-LS: Uniform, very fine texture. Smooth vari-colored clay with little silt.
2-LS	563.6	Soft	3	12	30.1	93.6	2-LS: Uniform, very fine texture. Yellow clay with little silt. Tr. sand & pebs.
3-LS	556.6	V.Soft	2	12	33.0	89.9	3-LS: Uniform, very fine texture. V. smooth blue clay with little silt.
4-LS	546.6	V.Soft	2	12	43.0	78.6	4-LS: Uniform, very fine texture. V. smooth blue clay with little silt.
5-LS	536.6	Soft	2	14	45.4	76.8	5-LS: Uniform, very fine texture. V. smooth blue clay with little silt.
6-LS	526.6	Soft	5	12	25.5	98.0	6-LS: Uniform, very fine texture. Blue clay with some silt, little sd.Sl.tr.pebs.
7-LS	516.6	Soft	5	12	25.8	99.8	7-LS: Uniform, very fine texture. Silty blue clay with little sand.
8-LS	507.6	Plastic	4	12	25.0	98.0	8-LS: Uniform, very fine texture. Silty blue clay with little sand.
	496.6	- -	5	12			
	493.6	- -	4	12			
9-LS	490.6	Plastic	7	12	27.0	96.7	9-LS: Uniform, very fine texture. Smooth blue clay with some silt.
	480.6	- -	10	12			
	478.6	- -	10	12			
	473.6	- -	10	12			
10-LS	469.6	Plastic	21	10	15.0	114.7	10-LS: Uniform, very fine texture. Blue clay with little silt and sand.
11-LS	468.4	W.C.	58	12	15.3	114.8	11-LS: Unif. v.f.text.Gray silty vfs.Tr.sd.
12-SS	458.6	- -	56	12			
13-SS	451.2	- -	89	12			

PENETRATION NOTE: Number of blows required to drive core sampler distance given using 140-pound weight falling 30 inches.

C-2 Indicates failure to recover Liner Sample.

Boring Log and all sampling by Raymond Concrete Pile Company. Their Job No. B-7453-D.

SHEARING RESISTANCE & VOLUME OF SOLIDS CURVES



ENGINEERING RESEARCH INSTITUTE
SOIL MECHANICS LABORATORY
UNIVERSITY OF MICHIGAN, ANN ARBOR, MICHIGAN

SUBSOIL ANALYSIS OF BORING NO. 7
ST. CLAIR RIVER SITE, MARINE CITY, MICHIGAN
THE DETROIT EDISON COMPANY

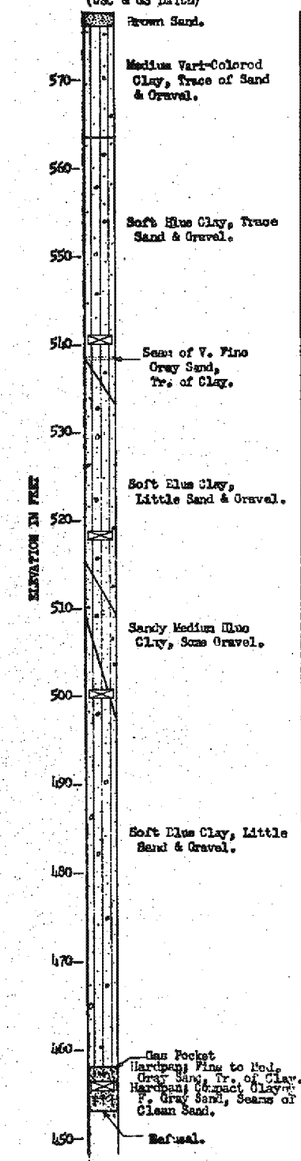
APPROVED: [illegible] DATE: 12-15-50

UNIVERSITY OF MICHIGAN PROJECT M573-66

A-23

LOG OF SOIL PROFILE

BY RCPCo VISUAL INSPECTION
GROUND SURFACE
ELEVATION = 577.6'
(USC & GS DATUM)



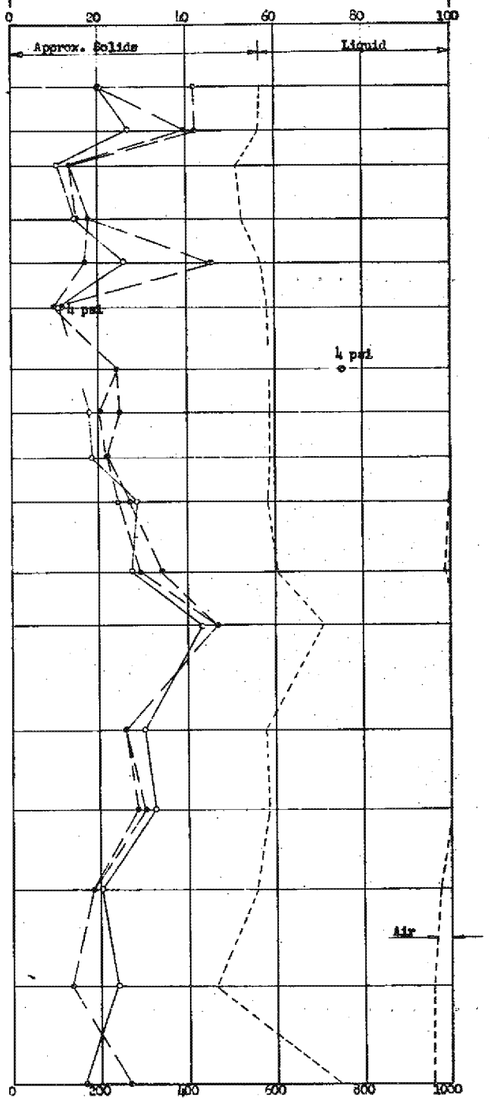
Boring Log and all sampling by Raymond Concrete Pile Company. Their Job No. D-7453-D.

SOIL SAMPLE								LABORATORY VISUAL INSPECTION
SA. NO.	ELEV.	LAB. CONSISTENCY	PENETRATION NO. OF BLOWS	PENETRATION DEPTH IN INCHES	% H_2O BY DRY WT.	DRY WT. LB. PER CU. FT.		REMARKS
1-BS	574.2	- -	6	12				
2-LS	570.6	Plastic	6	12	29.8	95.5		2-LS: Uniform, very fine texture. Silty vari-colored clay.
3-LS	565.6	Plastic	6	12	31.9	94.2		3-LS: Uniform, very fine texture. Silty vari-colored clay.
4-LS	561.6	Soft	5	12	37.5	86.1		4-LS: Uniform, very fine texture. Smooth silty blue clay.
5-LS	555.6	Soft	3	12	34.4	88.0		5-LS: Uniform, very fine texture. Smooth silty blue clay.
6-LS	550.6	Plastic	3	12	29.4	95.5		6-LS: Uniform, very fine texture. Smooth silty blue clay.
7-LS	545.6	Weakly Coherent	2	14	27.3	97.3		7-LS: Uniform, fine texture. Blue clay with some silt. Little sand.
	540.6	- -	3	12				
8-LS	538.6	Non-Coherent	4	13	20.9	107.3		8-LS: Non-uniform, fine texture. Varies from grey silt to silty grey clay.
9-LS	533.6	Plastic	3	13	25.4	99.2		9-LS: Uniform, very fine texture. Silty blue clay with pebbles.
10-LS	528.6	Plastic	2	12	26.1	99.2		10-LS: Uniform, very fine texture. Silty blue clay with pebbles.
11-LS	523.6	Plastic	3	13	26.2	98.0		11-LS: Uniform, very fine texture. Silty blue clay with little sand. Tr. pebbles.
	518.6	- -	4	13				
12-LS	515.6	Plastic	4	14	23.6	101.1		12-LS: Uniform, very fine texture. Silty blue clay. Little sand. Tr.pebs.Int.voids.
13-LS	509.6	Plastic	7	12	16.7	119.2		13-LS: Uniform, very fine texture. Silty blue clay. Little sand.
	500.6	- -	6	12				
14-LS	497.6	Plastic	6	12	26.8	97.3		14-LS: Uniform, very fine texture. Smooth silty blue clay with some silt & sand.
15-LS	488.6	Plastic	6	13	26.4	98.6		15-LS: Uniform, very fine texture. Smooth blue clay. Some silt. Tr. sand & pebs.
16-LS	479.6	Plastic	6	12	27.9	93.6		16-LS: Uniform, very fine texture. Smooth silty blue clay.
17-LS	468.6	Soft to Plastic	4	12	39.6	77.4		17-LS: Uniform, very fine texture. Smooth blue clay. Little silt.
18-LS	457.5	F.Stiff	28	12	10.7	124.8		18-LS: Uniform, very fine texture. Smooth blue clay. Little silt.
19-BS	456.3	- -	160	8	- -	- -		

Indicates failure to recover Liner Sample.
PENETRATION NOTE: Number of blows required to drive core sampler distance given using 140-pound weight falling 30 inches.

SHEARING RESISTANCE & VOLUME OF SOLIDS CURVES

PER CENT OF VOLUME OF SOLIDS, LIQUIDS, AND AIR



TRANSVERSE SHEARING RESISTANCE IN LB. PER SQ. FT.

0 800 1600 2400 3200 4000

ONE HALF COMPRESSION STRENGTH IN LB. PER SQ. FT. BASED ON ORIGINAL CROSS SECTION OF TEST SPECIMEN.

TRANSVERSE SHEARING RESISTANCE IN LB. PER SQ. FT. UNDER NORMAL PRESSURE OF 4 psi.

ENGINEERING RESEARCH INSTITUTE
SOIL MECHANICS LABORATORY
UNIVERSITY OF MICHIGAN, ANN ARBOR, MICHIGAN

SUBSOIL ANALYSIS OF BORING NO. 9
ST. CLAIR RIVER SITE, MARINE CITY, MICHIGAN
THE DETROIT EDISON COMPANY

APPROVED: W. J. Housel DATE 12-13-50

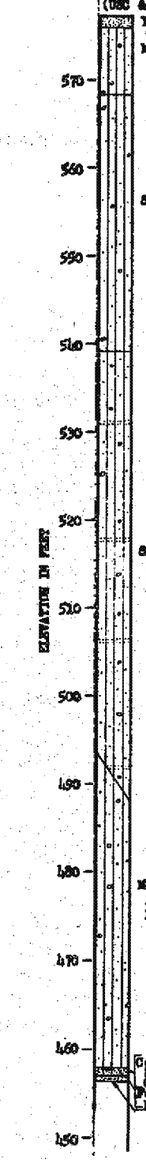
UNIVERSITY OF MICHIGAN PROJECT U373-66

A-25

LOG OF SOIL PROFILE

BY REPCo VISUAL INSPECTION

GROUND SURFACE ELEVATION = 577.2' (USC & GS DATUM)



Yellow Sand.

Medium Yellow Clay, Trace of Sand & Gravel.

Soft Blue Clay, Trace of Sand & Gravel.

Soft Blue Clay, Little Sand & Gravel, Few Sand Seams.

Medium Blue Clay, Little Sand & Gravel, Few Sand Seams.

Gray, Clayey F. Gray Sand, Some Gr. Seams Clean Sand. Foreman Reports Sdy. Hard-Refusal.

Boring Log and all sampling by Raymond Concrete Pile Company. Their Job No. B-7454-D.

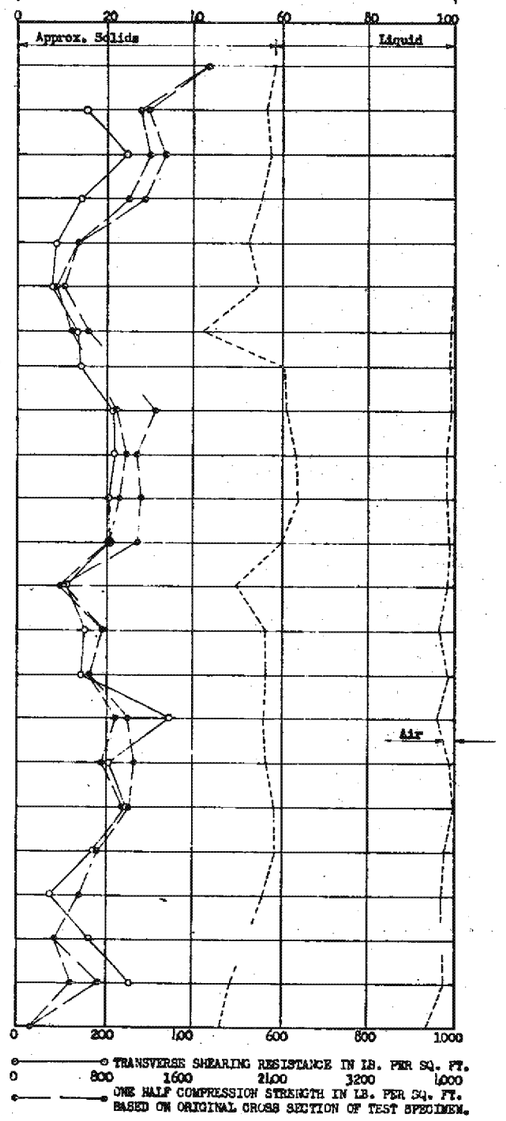
SOIL SAMPLE / LABORATORY VISUAL INSPECTION

SA. NO.	ELEV.	LAB. CONSISTENCY	PENETRATION NO. OF BLOWS	DRIVE IN INCHES	% H_2O BY DRY WT.	DRY WT. LB. PER CU. FT.	REMARKS
1-SS	573.7	- -	6	12			
2-LS	572.2	Plastic	7	12	26.9	98.6	2-LS: Uniform, very fine texture. Silty yellow clay.
3-LS	567.2	Soft to Plastic	3	12	29.6	94.8	3-LS: Uniform, very fine texture. Silty blue clay.
4-LS	562.2	Plastic	5	12	28.4	96.1	4-LS: Uniform, very fine texture. Silty blue clay.
5-LS	557.2	Soft to Plastic	4	12	30.1	93.0	5-LS: Uniform, very fine texture. Silty blue clay.
6-LS	552.2	Soft	3	14	35.2	87.7	6-LS: Uniform, very fine texture. Smooth silty blue clay.
7-LS	547.2	V.Soft	3	14	31.3	91.1	7-LS: Uniform, very fine texture. Smooth silty blue clay.
8-LS	542.2	Soft	2	12	50.0	70.5	8-LS: Uniform, very fine texture. Blue clay with little silt and sand.
9-LS	538.2	Soft	6	12	23.6	101.1	9-LS: Uniform, very fine texture. Blue clay with little silt. V.f.s.incl.Tr.pebs.
10-LS	533.2	Soft to Plastic	5	13	23.2	102.3	10-LS: Uniform, very fine texture. Blue clay with little silt and sand. Tr.pebs.
11-LS	528.2	Plastic	7	12	20.4	106.1	11-LS: Uniform, fine texture. Silty blue clay with little sand and pebbles.
12-LS	523.2	Plastic	6	12	20.4	106.1	12-LS: Uniform, fine texture. Blue clay with some silt, little sd. & pebbles.
13-LS	518.2	Plastic	6	12	24.2	100.5	13-LS: Uniform, very fine texture. Silty blue clay with little sand.
14-LS	513.2	Soft	5	12	37.4	82.4	14-LS: Uniform, very fine texture. V. smooth silty blue clay.
15-LS	508.2	Soft	5	12	26.8	94.2	15-LS: Uniform, very fine texture. Smooth silty blue clay.
16-LS	503.2	Soft	5	12	27.3	94.8	16-LS: Uniform, very fine texture. Silty blue clay with little sand.
17-LS	498.2	Plastic	5	12	26.5	93.6	17-LS: Uniform, very fine texture. Smooth blue clay with some silt.
18-LS	493.2	Plastic	6	12	27.2	95.5	18-LS: Uniform, very fine texture. Smooth silty blue clay with little sand.
19-LS	488.2	Plastic	6	12	26.5	98.0	19-LS: Uniform, very fine texture. Smooth silty blue clay. Little sand, Tr. pebs.
20-LS	483.2	Soft to Plastic	7	12	24.4	98.6	20-LS: Uniform, very fine texture. Smooth silty blue clay.
21-LS	478.2	Soft	7	12	27.2	93.6	21-LS: Uniform, very fine texture. Smooth blue clay with little silt. Tr. pebbles.
22-LS	473.2	Soft	8	12	41.7	73.7	22-LS: Uniform, very fine texture. Smooth blue clay with little silt. Tr. pebbles.
23-LS	468.2	Plastic	7	12	36.3	81.7	23-LS: Uniform, very fine texture. Smooth blue clay with little silt. Tr. pebbles.
24-LS	463.2	V.Soft	7	12	37.7	77.4	24-LS: Uniform, very fine texture. Silty blue clay with some sand. Tr. pebbles.
25-SS	455.7	- -	150 56	9 1			

PENETRATION NOTE: Number of blows required to drive core sampler distance given using 140-pound weight falling 30 inches.

SHEARING RESISTANCE & VOLUME OF SOLIDS CURVES

PER CENT BY VOLUME OF SOLIDS, LIQUIDS, AND AIR



ENGINEERING RESEARCH INSTITUTE
SOIL MECHANICS LABORATORY
UNIVERSITY OF MICHIGAN, ANN ARBOR, MICHIGAN

SUBSOIL ANALYSIS OF BORING NO. 10
ST. CLAIR RIVER SITE, MARINE CITY, MICHIGAN
THE DETROIT EDISON COMPANY

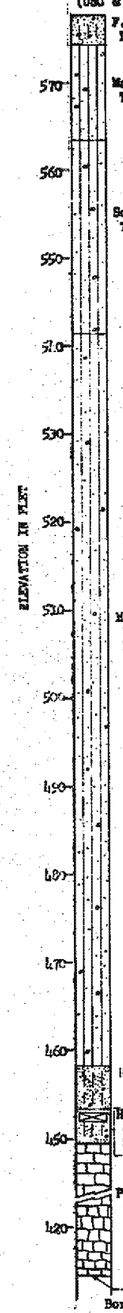
APPROVED: [illegible] DATE: 12-13-52

UNIVERSITY OF MICHIGAN PROJECT M373-66

ED_005947A_00014551-00294

LOG OF SOIL PROFILE

BY RCPCo VISUAL INSPECTION
GROUND SURFACE
ELEVATION = 577.6'
(USC & GS DATUM)



Boring Log and all sampling by Raymond Concrete Pile Company. Their Job No. 9-7453-L.

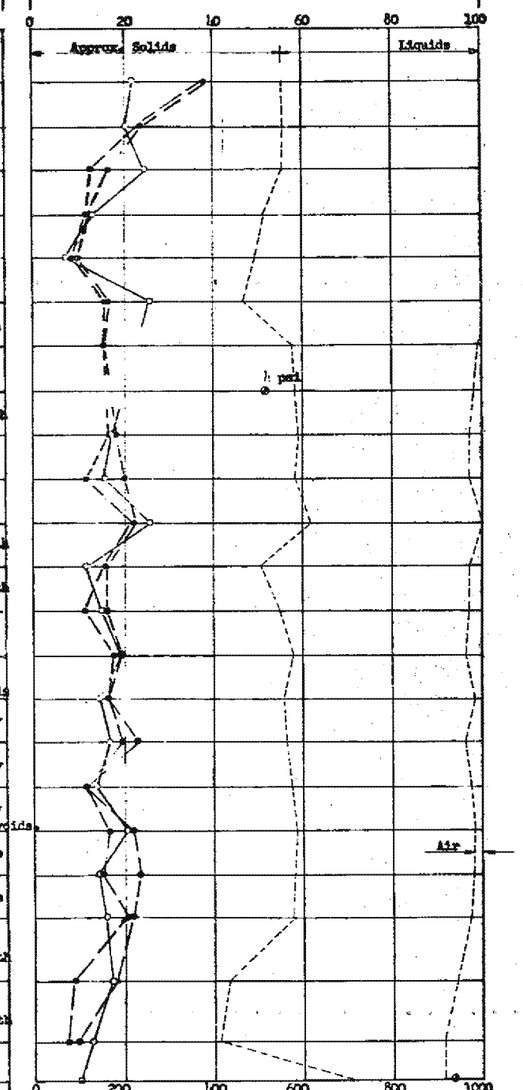
SOIL SAMPLE / LABORATORY VISUAL INSPECTION

SA. NO.	ELEV.	LAB. CONSISTENCY	PENETRATION NO. OF BLOWS	DRIVE INCHES	% H_2O BY DRY WT.	DRY WT. LB. PER CU. FT.	REMARKS
1-BS	574.1	- -	5	12			
2-BS	572.6	- -	7	12			
3-LS	571.6	Plastic	7	19	28.8	93.6	3-LS: Uniform, very fine texture. V. smooth yellow clay with little silt.
4-LS	566.6	Plastic	5	12	29.5	94.2	4-LS: Uniform, very fine texture. V. smooth silty yellow clay.
5-LS	561.6	Plastic	4	12	31.3	93.6	5-LS: Uniform, very fine texture. V. smooth blue clay with little silt.
6-LS	556.6	Soft	3	14	36.5	86.1	6-LS: Uniform, very fine texture. V. smooth blue clay with little silt.
7-LS	551.6	Soft	3	14	38.5	83.0	7-LS: Uniform, very fine texture. V. smooth blue clay with little silt.
8-LS	546.6	Soft to Plastic	2	12	44.2	78.6	8-LS: Uniform, very fine texture. Smooth silty blue clay.
9-LS	541.6	Soft	6	12	27.6	96.1	9-LS: Uniform, very fine texture. Smooth silty blue clay.
10-LS	536.6	Weakly Coherent	7	12	26.2	96.1	10-LS: Uniform, very fine texture. Clayey blue silt and v.f. sand.
11-LS	531.6	Soft to Plastic	5	12	24.2	99.2	11-LS: Uniform, very fine texture. Smooth blue clay with little silt. Tr. sand.
12-LS	526.6	Soft to Plastic	6	12	24.9	98.6	12-LS: Uniform, very fine texture. Blue clay with little silt. Tr. sand.
13-LS	521.6	Plastic	6	12	23.2	103.6	13-LS: Uniform, very fine texture. Blue clay with little silt. Tr. sand.
14-LS	516.6	Soft	5	12	34.0	85.5	14-LS: Uniform, very fine texture. Smooth silty blue clay.
15-LS	511.6	Soft	5	12	28.8	92.4	15-LS: Uniform, very fine texture. Smooth silty blue clay.
16-LS	506.6	Soft to Plastic	6	12	24.9	97.3	16-LS: Uniform, very fine texture. Blue clay with some silt. Internal voids.
17-LS	501.6	Soft	5	12	28.4	93.9	17-LS: Uniform, very fine texture. Blue clay with some silt & pebbles. Int. voids
18-LS	496.6	Soft to Plastic	8	12	26.7	94.2	18-LS: Uniform, very fine texture. Silty blue clay with some sand. Int. voids.
19-LS	491.6	Soft	9	12	26.3	96.1	19-LS: Uniform, very fine texture. Silty blue clay with some sand. Int. voids.
20-LS	486.6	Soft to Plastic	9	12	25.8	97.3	20-LS: Uniform, very fine texture. Silty blue clay with some silt, little sd. Int. voids.
21-LS	481.6	Plastic	10	12	25.7	97.3	21-LS: Uniform, fine texture. Silty blue clay. Little sand and pebbles.
22-LS	476.6	Plastic	10	12	25.9	95.5	22-LS: Uniform, fine texture. Silty blue clay with some sand and pebbles.
	471.6	- -	9	12			
23-LS	469.6	Soft	8	12	43.6	73.0	23-LS: Uniform, very fine texture. Smooth colloidal blue clay. Internal voids.
	464.6	- -	8	12			
24-LS	462.6	Soft	7	12	45.1	69.3	24-LS: Uniform, very fine texture. Smooth colloidal blue clay. Internal voids.
25-LS	458.6	Very Weakly Coherent	16	12	10.9	119.2	25-LS: Uniform, very fine texture. Gray silt and very fine sand. Some clay.
26-BS	452.6	V. Hard	70	12	- -	- -	26-BS: Uniform, very fine texture. V. silty dark blue clay. Some sand & pebs.

Indicates failure to recover Liner Sample.

PENETRATION NOTE: Number of blows required to drive core sampler distance given using 140-pound weight falling 30 inches.

SHEARING RESISTANCE & VOLUME OF SOLIDS CURVES



TRANSVERSE SHEARING RESISTANCE IN LB. PER SQ. FT.

ONE HALF COMPRESSION STRENGTH IN LB. PER SQ. FT. BASED ON ORIGINAL CROSS SECTION OF TEST SPECIMEN.

● TRANSVERSE SHEARING RESISTANCE IN LB. PER SQ. FT. UNDER NORMAL PRESSURE OF 4 psi.

ENGINEERING RESEARCH INSTITUTE
SOIL MECHANICS LABORATORY
UNIVERSITY OF MICHIGAN, ANN ARBOR, MICHIGAN

SUBSOIL ANALYSIS OF BORING NO. 11
ST. CLAIR RIVER SITE, MARINE CITY, MICHIGAN
THE DETROIT EDISON COMPANY

APPROVED: W. A. Housel DATE: 12-17-50

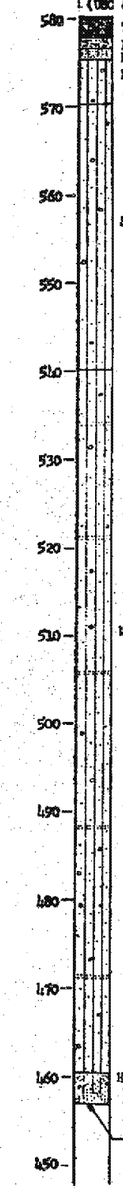
UNIVERSITY OF MICHIGAN PROJECT M373-66

A-27

LOG OF SOIL PROFILE

BY RCWCo VISUAL INSPECTION

GROUND SURFACE ELEVATION = 580.2' (USC & GS DATUM)



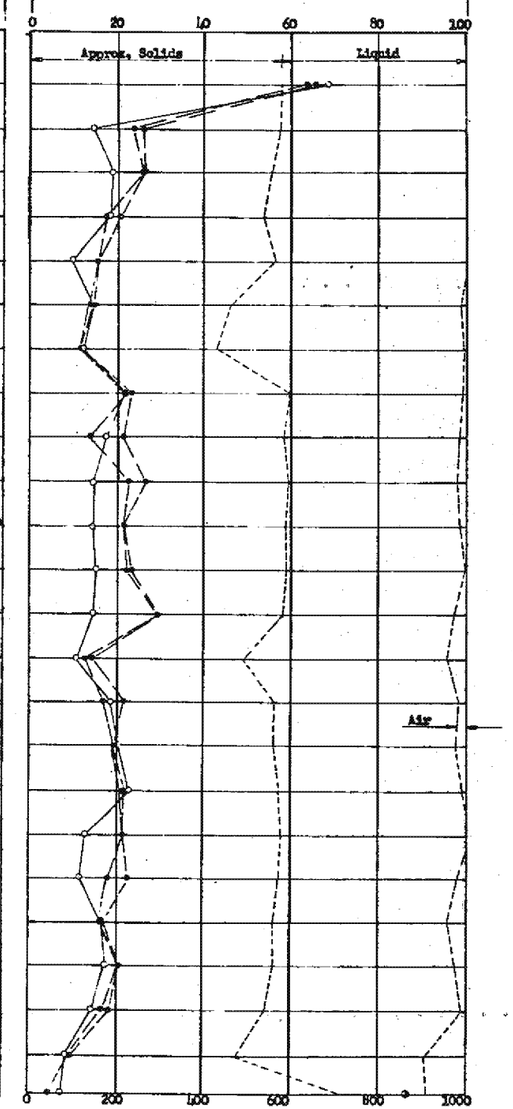
SOIL SAMPLE							LABORATORY VISUAL INSPECTION
SA. NO.	ELEV.	LAB. CONSIS-TENCY	PENETRATION NO. OF BLOWS	PENETRATION DEPTH IN INCHES	% H_2O BY DRY WT.	DRY WT. LB. PER CU. FT.	REMARKS
1-SS	576.7	--	5	12			
2-SS	574.1	--	8	12			
3-LS	574.2	Firm	10	12	27.2	97.3	3-LS: Uniform, very fine texture. Smooth silty yellow clay.
4-LS	569.2	Plastic	6	12	28.5	96.7	4-LS: Uniform, very fine texture. Smooth silty blue clay.
5-LS	564.2	Plastic	4	12	30.2	93.0	5-LS: Uniform, very fine texture. Smooth silty blue clay.
6-LS	559.2	Soft	3	12	33.2	90.5	6-LS: Uniform, very fine texture. Smooth blue clay with little silt.
7-LS	554.2	Soft	3	14	29.4	94.5	7-LS: Uniform, very fine texture. Smooth blue clay with little silt.
8-LS	549.2	Soft	3	14	42.4	77.4	8-LS: Uniform, very fine texture. Silty blue clay.
9-LS	544.2	Soft	2	12	48.9	72.1	9-LS: Uniform, very fine texture. Smooth blue clay with some silt.
10-LS	539.2	Soft to Plastic	5	12	24.4	100.5	10-LS: Uniform, very fine texture. Silty blue clay with little sand and pebbles.
11-LS	534.2	Soft to Plastic	5	12	25.3	98.6	11-LS: Uniform, very fine texture. Silty blue clay with pebbles.
12-LS	529.2	Soft to Plastic	5	12	23.9	99.8	12-LS: Uniform, very fine texture. Blue clay with little silt and sand. Tr.pebs.
13-LS	524.2	Plastic	6	12	25.0	98.9	13-LS: Uniform, very fine texture. Blue clay with some silt. Little sand.Tr.pebs.
14-LS	519.2	Plastic	6	12	25.7	99.2	14-LS: Uniform, very fine texture. Silty blue clay with pebbles.
15-LS	514.2	Soft to Plastic	6	12	24.5	98.6	15-LS: Uniform, very fine texture. Silty blue clay with some sand. Tr. pebs.
16-LS	509.2	Soft to Plastic	6	12	34.9	83.0	16-LS: Uniform, very fine texture. Silty blue clay with some sand. Int. voids.
17-LS	504.2	Soft to Plastic	6	12	27.7	94.8	17-LS: Uniform, very fine texture. Silty blue clay. Internal voids.
18-LS	499.2	Soft to Plastic	7	12	27.6	94.3	18-LS: Uniform, very fine texture. Smooth silty blue clay, some sand. Tr. pebbles.
19-LS	494.2	Plastic	6	12	26.8	96.7	19-LS: Uniform, very fine texture. Silty blue clay.Little sand.Tr.pebs.Int.voids.
20-LS	489.2	Soft to Plastic	6	12	27.7	97.3	20-LS: Uniform, very fine texture. Blue clay with some silt and little sand.
21-LS	484.2	Soft to Plastic	7	12	26.5	96.1	21-LS: Uniform, very fine texture. Blue clay with some silt.Little sd.Int.voids.
22-LS	479.2	Soft to Plastic	7	12	26.6	94.2	22-LS: Uniform, very fine texture. Blue clay with little silt and sand.
23-LS	474.2	Soft to Plastic	7	12	26.8	94.2	23-LS: Uniform, very fine texture. Blue clay with little silt and sand.Int.voids.
24-LS	469.2	Soft	6	12	30.5	91.1	24-LS: Uniform, very fine texture. Blue clay with little sand & silt.
25-LS	464.2	Soft	6	12	34.5	79.2	25-LS: Uniform, very fine texture. Silty blue clay with some sand. Int. voids.
26-LS	459.8	Weakly Coherent	100	12 10	10.1	120.4	26-LS: Uniform, very fine texture. Clayey silt and grey very fine to fine sand.

PENETRATION NOTE: Number of blows required to drive core sampler distance given using 140-pound weight falling 30 inches.

Boring Log and all sampling by Raymond Concrete Pile Company. Their Job No. D-7153-0.

SHEARING RESISTANCE & VOLUME OF SOLIDS CURVES

PER CENT BY VOLUME OF SOLIDS, LIQUIDS, AND AIR



TRANSVERSE SHEARING RESISTANCE IN LB. PER SQ. FT.

0 800 1600 2400 3200 4000

ONE HALF COMPRESSION STRENGTH IN LB. PER SQ. FT. BASED ON ORIGINAL CROSS SECTION OF TEST SPECIMEN.

● TRANSVERSE SHEARING RESISTANCE IN LB. PER SQ. FT. UNDER NORMAL PRESSURE 4 psi.

ENGINEERING RESEARCH INSTITUTE
SOIL MECHANICS LABORATORY
UNIVERSITY OF MICHIGAN, ANN ARBOR, MICHIGAN

SUBSOIL ANALYSIS OF BORING NO. 12
ST. CLAIR RIVER SITE, MARINE CITY, MICHIGAN
THE DETROIT EDISON COMPANY

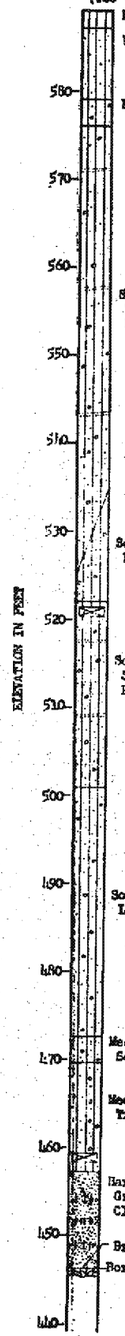
APPROVED: W. E. Housel DATE: 12-13-50

UNIVERSITY OF MICHIGAN PROJECT 2213-16

ED_005947A_00014551-00296

LOG OF SOIL PROFILE

BY RCTCo VISUAL INSPECTION
GROUND SURFACE
ELEVATION = 589.0'
(USC & GS DATUM)



Med. Vari-colored Clay.

Hard Vari-Colored Clay, Trace Sand.

Med. Hard Blue Clay, Trace of Sand & Gravel.

Soft Blue Clay, Trace of Sand & Gravel, Few Sand Seams.

Soft Blue Clay, Little Sand & Gravel.

Soft Blue Clay, Some Sand & Gravel, Few Sand Seams.

Soft Blue Clay, Little Sand & Gravel.

Med. Hard Blue Clay, Some Sand, Little Gr.

Medium Blue Clay, Trace of Sand & Gravel.

Hardpan; Compact Fine Gray Sand, Seams of Clayey Sand & Shale.

Broken Shale.

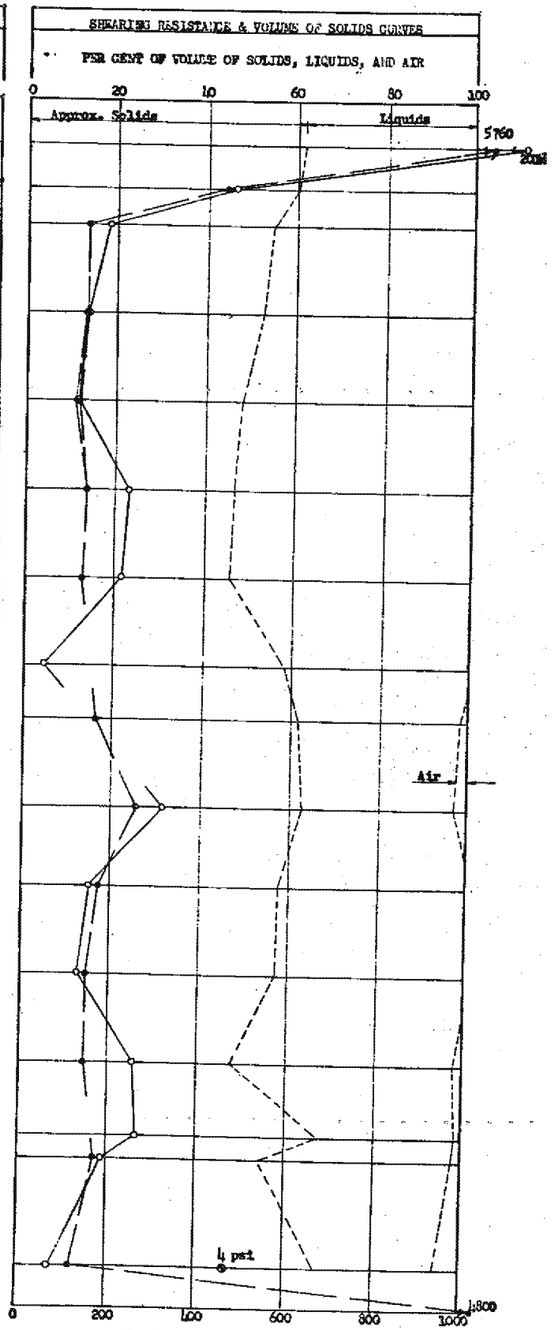
Boring Stopped.

SOIL SAMPLE							LABORATORY VISUAL INSPECTION
SA. NO.	ELEV.	LAB. CONSISTENCY	PENETRATION NO. OF BLOWS	PENETRATION DRIVE IN INCHES	% H_2O BY DRY WT.	DRY WT. LBS. PER CU. FT.	REMARKS
1-DS	585.5	- -	18	12			
2-LS	581.0	Hard	17	12	23.5	103.0	2-LS: Uniform, very fine texture. Smooth vari-colored clay with little silt.
3-LS	579.0	Plastic to Firm	14	12	26.4	101.1	3-LS: Uniform, very fine texture. Smooth blue clay with little silt. Sl. tr. pebbles.
4-LS	575.0	Soft	4	13	32.2	91.7	4-LS: Uniform, very fine texture. Smooth blue clay with little silt. Tr. v. f. s.
5-LS	565.0	Soft	4	12	33.6	88.9	5-LS: Uniform, very fine texture. Smooth silty blue clay. Sl. tr. of pebbles.
6-LS	555.0	Soft	3	13	40.4	81.1	6-LS: Uniform, very fine texture. Smooth blue clay with little silt.
7-LS	545.0	Soft	3	13	43.5	79.2	7-LS: Uniform, very fine texture. Smooth blue clay with little silt.
8-LS	535.0	Soft	3	13	44.6	77.4	8-LS: Uniform, very fine texture. Smooth blue clay with little silt.
9-LS	525.0	V. Soft	5	12	27.5	98.0	9-LS: Uniform, very fine texture. Silty blue clay with little sand.
	521.0	- -	8	12			
10-LS	519.0	Soft	8	12	22.1	103.6	10-LS: Uniform, very fine texture. Silty blue clay with little sand.
11-LS	509.0	Plastic	11	12	20.1	106.1	11-LS: Uniform, very fine texture. Smooth silty blue clay. Trace of sand.
12-LS	500.0	Soft	7	12	28.4	96.7	12-LS: Uniform, very fine texture. Smooth silty blue clay. Trace of sand.
13-LS	490.0	Soft	8	12	28.6	96.7	13-LS: Uniform, very fine texture. Smooth silty blue clay. Trace of sand.
14-LS	480.0	Soft to Plastic	8	12	39.2	79.9	14-LS: Uniform, very fine texture. V. smooth blue clay with little silt.
15-LS	471.7	Plastic	24	12	17.5	112.6	15-LS: Uniform, very fine texture. Blue clay with little silt and sand.
16-LS	469.0	Soft	10	12	30.0	91.1	16-LS: Uniform, very fine texture. Smooth blue clay with little silt.
	459.0	- -	15	12			
17-LS	457.0	Sandy Coherent	108	12	8.3	111.1	17-LS: Uniform, fine texture. Clayey fine to medium gray sand.
18-LS	452.0	Hard	140	12	- -	- -	18-LS: Uniform, very fine texture. Silty dark blue clay.
19-DS	446.8	- -	200	5	- -	- -	

Indicates failure to recover Liner Sample.

PENETRATION NOTE: Number of blows required to drive core sampler distance given using 140-pound weight falling 30 inches.

Boring Log and all sampling by Raymond Concrete Pile Company. Their Job No. B-7453-D.



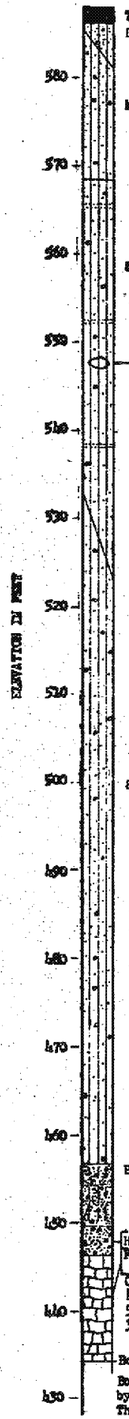
ENGINEERING RESEARCH INSTITUTE
SOIL MECHANICS LABORATORY
UNIVERSITY OF MICHIGAN, ANN ARBOR, MICHIGAN

SUBSOIL ANALYSIS OF BORING NO. 13
ST. CLAIR RIVER SITE, MARINE CITY, MICHIGAN
THE UNIVERSITY OF MICHIGAN

ED_005947A_00014551-00297

LOG OF SOIL PROFILE

BY RCPCo VISUAL INSPECTION
GROUND SURFACE
ELEVATION = 588.1'
(USC & GS DATUM)



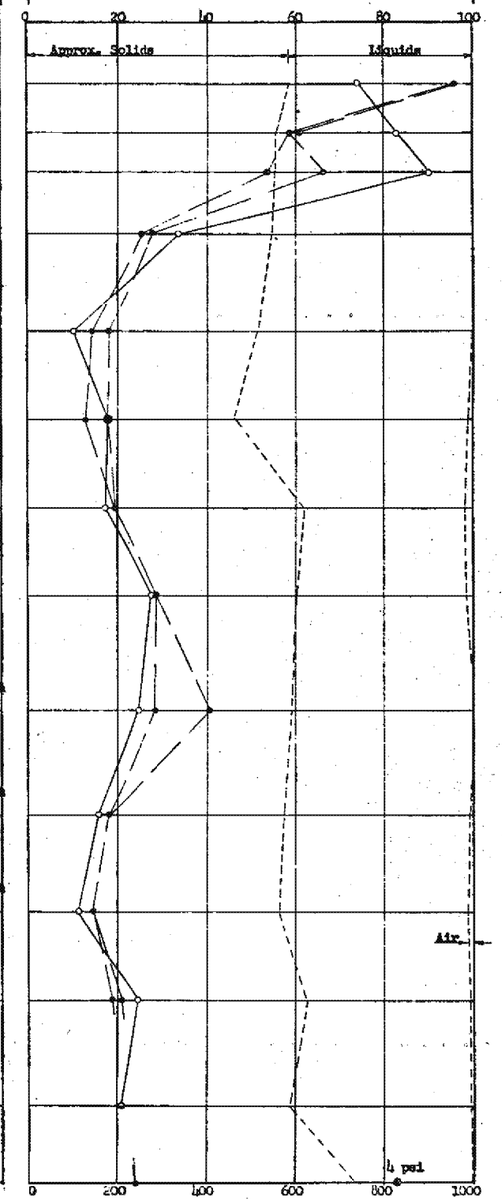
Boring Log and all sampling by Raymond Concrete Pile Company. Their Job No. R-7453-D.

SOIL SAMPLE							LABORATORY VISUAL INSPECTION
SA. NO.	ELEV.	LAB. CONSIS-TENCY	PENETRATION NO. OF BLOWS	DRIVE IN INCHES	% H_2O BY DRY WT.	DRY WT. LB. PER CU. FT.	REMARKS
1-DS	585.6	- -	27	12			
2-LS	581.1	Stiff	11	12	26.8	98.6	2-LS: Uniform, very fine texture. Smooth var-colored clay with little silt. Tr. sd.
3-LS	575.6	Firm to Stiff	7	12	30.4	93.0	3-LS: Uniform, very fine texture. Smooth yellow clay with little silt. Tr. sd.
4-LS	571.1	Stiff	9	13	31.2	93.0	4-LS: Uniform, very fine texture. Smooth yellow clay with little silt. Tr. sd.
5-LS	564.1	Plastic	7	12	31.4	91.7	5-LS: Uniform, very fine texture. Smooth silty blue clay with tr. sand.
6-LS	553.1	Soft	3	14	35.2	86.1	6-LS: Uniform, very fine texture. Smooth blue clay with little silt.
7-LS	543.1	Soft	3	14	42.9	77.4	7-LS: Uniform, very fine texture. Blue clay with some silt and little sand.
8-LS	533.1	Soft	5	12	21.8	104.2	8-LS: Uniform, very fine texture. Smooth blue clay with little silt and tr. sand.
9-LS	523.1	Plastic	7	12	23.8	100.5	9-LS: Uniform, very fine texture. Smooth blue clay with little silt and tr. sand.
	513.1	- -	9	12			
10-LS	510.1	Plastic	10	12	26.4	98.6	10-LS: Uniform, very fine texture. Smooth blue clay with little silt. Tr. sd. & pebs.
	500.1	- -	7	12			
11-LS	498.1	Soft	7	12	27.1	96.1	11-LS: Uniform, very fine texture. Smooth blue clay with some silt.
12-LS	487.1	Soft	7	12	28.0	94.8	12-LS: Uniform, very fine texture. Smooth silty blue clay.
13-LS	477.1	Soft to Plastic	7	12	21.7	105.5	13-LS: Uniform, very fine texture. Silty blue clay with little sand.
	467.1	- -	7	12			
14-LS	465.1	Plastic	7	12	26.1	98.6	14-LS: Uniform, very fine texture. Blue clay with some silt and little sand.
15-LS	456.1	Non-Coherent	29	12	13.1	124.2	15-LS: Uniform, very fine texture. Silty very fine to fine gray sand. Tr. clay.

PENETRATION NOTE: Number of blows required to drive core sampler distance given using 140-pound weight falling 30 inches.

SHEARING RESISTANCE & VOLUME OF SOLIDS CURVES

PER CENT OF VOLUME OF SOLIDS, LIQUIDS, AND AIR



TRANSVERSE SHEARING RESISTANCE IN LB. PER SQ. FT.

0 800 1600 2400 3200 4000

ONE HALF COMPRESSION STRENGTH IN LB. PER SQ. FT. BASED ON ORIGINAL CROSS SECTION OF TEST SPECIMEN.

TRANSVERSE SHEARING RESISTANCE IN LB. PER SQ. FT. UNDER NORMAL PRESSURE OF 4 psi.

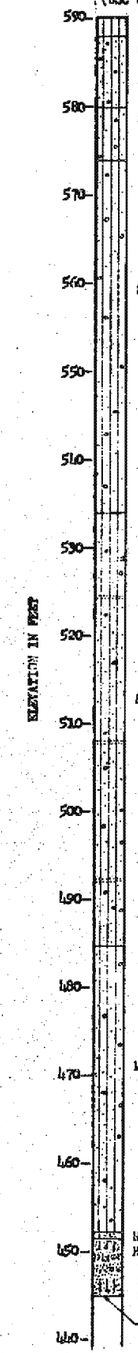
ENGINEERING RESEARCH INSTITUTE
SOIL MECHANICS LABORATORY
UNIVERSITY OF MICHIGAN, ANN ARBOR, MICHIGAN

SUBSOIL ANALYSIS OF BORING NO. 14
ST. CLAIR RIVER SITE, MARINE CITY, MICHIGAN
THE DETROIT EDISON COMPANY

APPROVED: [illegible] DATE: 12-13-50

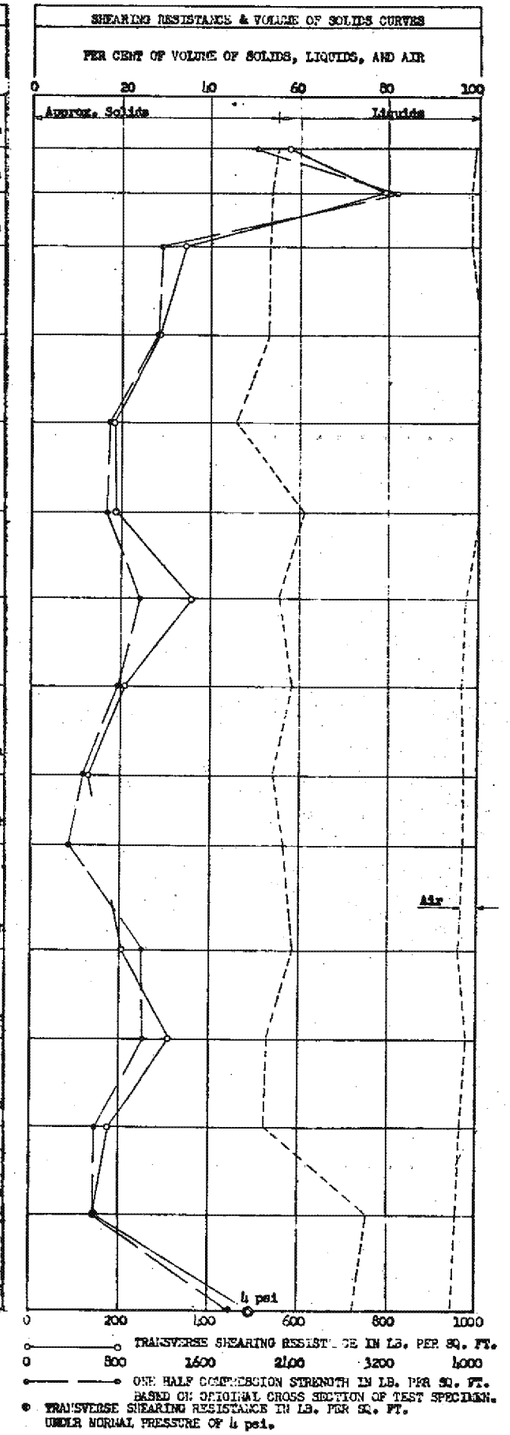
A-30

LOG OF SOIL PROFILE
BY RCPCo VISUAL INSPECTION
GROUND SURFACE
ELEVATION = 590.2'
(USC & GS DATUM)



SOIL SAMPLE							LABORATORY VISUAL INSPECTION
SA. NO.	ELEV.	LAB. CONSISTENCY	PENETRATION NO. OF BLOWS	PENETRATION DRIVE IN INCHES	% H_2O BY DRY WT.	DRY WT. LB. PER CU. FT.	REMARKS
1-BS	586.7	- -	42	12			
2-LS	584.2	Firm	15	12	29.8	93.0	2-LS: Uniform, very fine texture. Smooth vari-colored clay with little silt.
3-LS	579.2	Stiff	9	12	30.7	90.5	3-LS: Uniform, very fine texture. Smooth yellow clay with little silt.
4-LS	573.2	Plastic	6	12	31.2	89.9	4-LS: Uniform, very fine texture. Smooth yellow clay with little silt.
5-LS	563.2	Plastic	5	13	33.0	89.2	5-LS: Uniform, very fine texture. Smooth blue clay with little silt.
6-LS	553.2	Soft	5	14	43.0	77.4	6-LS: Uniform, very fine texture. Smooth blue clay with little silt.
7-LS	543.2	Soft	4	13	36.4	84.9	7-LS: Uniform, very fine texture. Smooth blue clay with little silt.
8-LS	533.2	Plastic	6	12	23.9	102.7	8-LS: Uniform, very fine texture. Blue clay with little silt and tr. of sand.
9-LS	523.2	Soft to Plastic	7	12	28.5	93.0	9-LS: Uniform, very fine texture. Smooth silty blue clay.
10-LS	513.2	Soft	7	12	24.5	98.0	10-LS: Uniform, very fine texture. Smooth silty blue clay.
	508.2	- -	14	12			
11-LS	505.2	V.Soft	7	12	29.4	91.1	11-LS: Uniform, very fine texture. Smooth silty blue clay.
	495.2	- -	7	12			
12-LS	493.2	Plastic	7	12	26.3	95.5	12-LS: Uniform, very fine texture. Smooth silty blue clay with tr. of sand.
13-LS	483.2	Plastic	9	12	23.4	99.2	13-LS: Uniform, very fine texture. Smooth blue clay with little silt.
14-LS	473.2	Soft	9	12	31.3	89.2	14-LS: Uniform, very fine texture. Smooth blue clay with little silt.
15-LS	463.2	Soft	9	12	30.7	88.6	15-LS: Uniform, very fine texture. Smooth silty blue clay.
16-LS	452.3	Firm	90	12	9.9	127.9	16-LS: Uniform, very fine texture. Clayey fine gray sand. Little silt.
17-BS	446.0	- -	200	2	- -	- -	PENETRATION NOTE: Number of blows required to drive core sampler distance given using 140-pound weight falling 30 inches.

SHEARING RESISTANCE & VOLUME OF SOLIDS CURVES



Boring Log and all sampling
by Raymond Concrete Pile Company.
Their Job No. B-7453-D.

ENGINEERING RESEARCH INSTITUTE
SOIL MECHANICS LABORATORY
UNIVERSITY OF MICHIGAN, ANN ARBOR, MICHIGAN

SUBSOIL ANALYSIS OF BORING NO. 15
ST. CLAIR RIVER SITE, MARINE CITY, MICHIGAN
THE DETROIT EDISON COMPANY

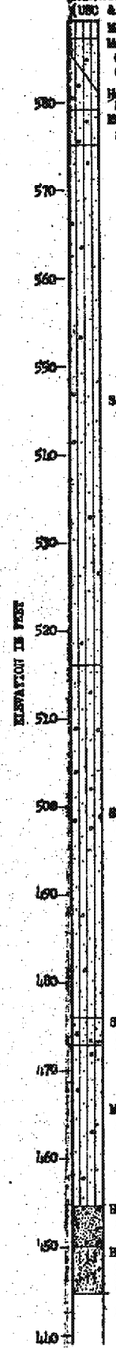
APPROVED: [signature] DATE: 2-13-50
UNIVERSITY OF MICHIGAN PROJECT M373-66

A-31

ED_005947A_00014551-00299

LOG OF SOIL PROFILE

BY ROPCo VISUAL INSPECTION
GROUND SURFACE
ELEVATION = 589.1'
(USC & GS DATUM)



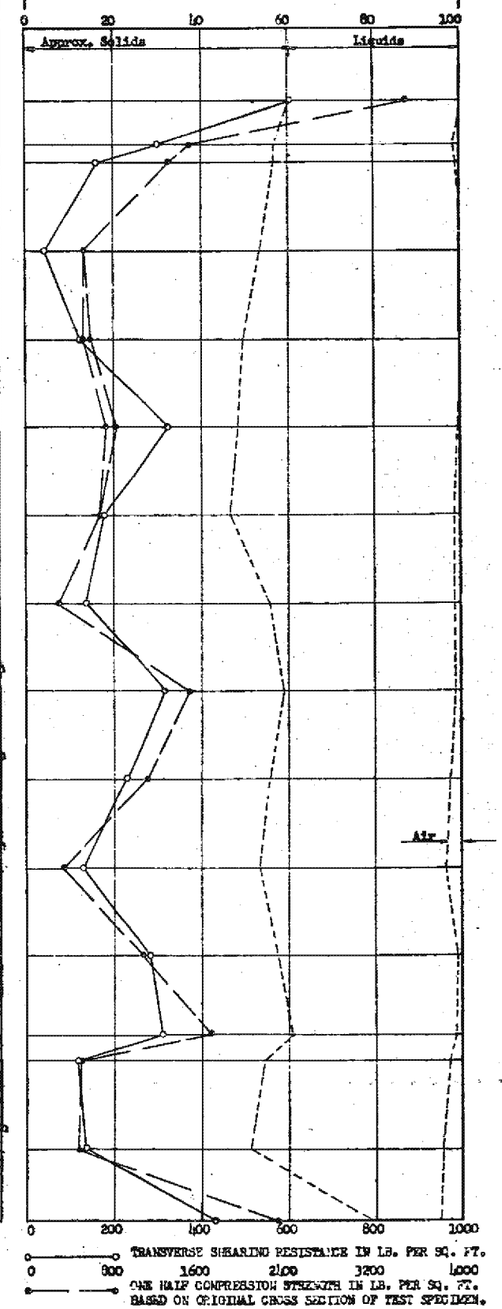
Med. Vari-colored Clay.
Med. Hard V.-Colored Clay, Little Sand & Gravel.
Hard Yellow Clay, Trace Sand & Gravel.
Med. Yellow Clay, Trace Sand & Gravel.
Soft Blue Clay, Trace of Sand & Gravel.
Soft Blue Clay, Little Sand & Gravel.
Sandy Med. Blue Clay, Little Gravel.
Med. Blue Clay, Little Sand & Gravel.
Hardpan; Comp. Clayey F. to C. Gray Sd. & Gr.
Hardpan; V. Comp. Fine Gray Sd., Little Cl. & Gr. Broken Shale in Bottom of Spoon.
Boring Stopped.

SOIL SAMPLE / LABORATORY VISUAL INSPECTION

SA. NO.	ELEV.	LAB. CONSISTENCY	PENETRATION NO. OF BLOWS	PENETRATION DRIVE IN INCHES	% H_2O BY DRY WT.	DRY WT. LB. PER CU. FT.	REMARKS
1-GS	585.6	- -	15	12			
2-LS	581.1	Stiff	20	12	24.4	102.3	2-LS: Uniform, very fine texture. Smooth vari-colored clay with little silt.
3-LS	576.1	Plastic to Firm	8	12	26.9	96.7	3-LS: Uniform, very fine texture. Smooth gray clay with little silt.
4-LS	574.1	S. to Pl.	6	13	27.9	95.5	4-LS: Uniform, very fine texture. Smooth silty blue clay.
5-LS	564.1	V. Soft	4	12	32.8	89.9	5-LS: Uniform, very fine texture. Smooth blue clay with little silt.
6-LS	554.1	Soft	3	12	37.8	83.6	6-LS: Uniform, very fine texture. Smooth blue clay with little silt.
7-LS	544.1	Soft to Plastic	3	13	39.9	81.1	7-LS: Uniform, very fine texture. Smooth blue clay with little silt.
8-LS	534.1	Soft	3	12	41.9	78.0	8-LS: Uniform, very fine texture. Smooth blue clay with little silt.
9-LS	524.1	Soft	5	12	28.5	93.6	9-LS: Uniform, very fine texture. Blue clay with little silt and sand.
10-LS	514.1	Plastic	7	12	25.1	99.2	10-LS: Uniform, very fine texture. Smooth silty blue clay with little sand.
11-LS	504.1	Plastic	7	12	27.8	93.6	11-LS: Uniform, very fine texture. Smooth silty blue clay with little sand.
12-LS	494.1	Soft	7	12	29.7	89.9	12-LS: Uniform, very fine texture. Smooth silty blue clay with little sand.
13-LS	484.1	Plastic	7	12	26.9	96.7	13-LS: Uniform, very fine texture. Blue clay with some silt. Little sand.
14-LS	475.1	Plastic	17	12	23.3	101.7	14-LS: Uniform, very fine texture. Blue clay with some silt. Little sand.
15-LS	472.1	Soft	9	12	29.3	91.1	15-LS: Uniform, very fine texture. Silty blue clay with little sand.
16-LS	462.1	Soft	9	12	32.2	86.1	16-LS: Uniform, very fine texture. Smooth silty blue clay with trace sand.
17-LS	454.2	Firm to Stiff	37	12	7.5	132.9	17-LS: Uniform, very fine texture. Sandy, silty blue clay. Trace pebbles.
18-GS	449.6	- -	200	6			
19-GS	444.8	- -	200	4	- -	- -	

PENETRATION NOTE: Number of blows required to drive core sampler distance given using 140-pound weight falling 30 inches.

SHEARING RESISTANCE & VOLUME OF SOLIDS CURVES



Boring Log and all sampling by Raymond Concrete Pile Company. Their Job No. B-7453-D.

ENGINEERING RESEARCH INSTITUTE
SOIL MECHANICS LABORATORY
UNIVERSITY OF MICHIGAN, ANN ARBOR, MICHIGAN

SUBSOIL ANALYSIS OF BORING NO. 16
ST. CLAIR RIVER SITE, MARINE CITY, MICHIGAN
THE DETROIT EDISON COMPANY

APPROVED: W.S. Housel DATE: 12-13-50

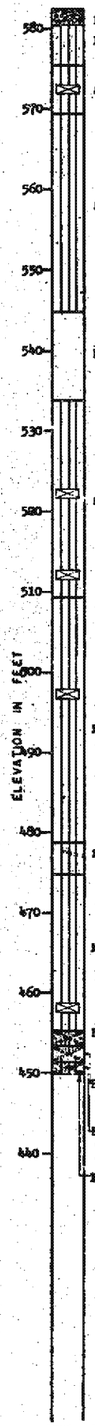
UNIVERSITY OF MICHIGAN PROJECT [illegible]

A-32

LOG OF SOIL PROFILE

BY REPRD. VISUAL INSPECTION

GROUND SURFACE ELEVATION = 582.2 (USCGS DATUM)



Fill; Coal and Stones.

Fill; Medium Varicolored Clay, Some Cinders.

Soft Varicolored Clay.

Soft Gray Clay, Trace of Sand.

Loose Fine to Very Fine Dark Gray Sand.

Soft Gray Clay, Trace of Sand.

Medium Gray Clay, Trace of Sand and Fine Gravel.

Sandy Medium Hard Gray Clay, Few Sand Seams.

Medium Gray Clay, Trace of Sand.

Hardpan; Compact Clayey Fine to Medium Gray Sand, Some Gravel.

Hardpan; Compact Medium to Fine Gray Sand, Little Clay.

Hardpan; Very Hard Sandy Gray Clay, Trace of Gravel.

Boring Stopped.

Boring Log and all sampling by Raymond Concrete Pile Company. Their Job No. B-25056-D.

SOIL SAMPLE / LABORATORY VISUAL INSPECTION

SA NO.	ELEV	LAB. CONSISTENCY	PENETRATION NO OF BLOWS	PENETRATION DRIVE IN INCHES	% H_2O BY DRY WT.	DRY WT LBS PER CU. FT	REMARKS
1-BS	579.2	--	5	12			
2-BS	576.2	--	5	12			
3-BS	572.2	--	4	12			
4-LS	567.2	Plastic	4	12	30.9	91.1	4-LS: Uniform. Gray clay, some silt, trace of sand.
5-LS	562.2	Soft	2	14	32.6	89.2	5-LS: Uniform. Gray clay, some silt, trace of sand.
6-LS	557.2	Soft	2	14	37.1	83.0	6-LS: Uniform. Gray clay, some silt, trace of sand.
7-LS	552.2	Soft	2	16	40.3	80.5	7-LS: Uniform. Gray clay, some silt, trace of sand.
8-LS	547.2	Soft	2	15	45.0	76.1	8-LS: Uniform. Gray clay, some silt, trace of sand.
9-LS	543.2	Plastic	8	12	25.4	95.5	9-LS: Uniform. Clayey gray silt, little sand.
10-LS	538.2	Very Soft	5	12	27.6	93.9	10-LS: Non-uniform. Varies from silty gray clay, trace of sand to clayey gray silt, little sand.
11-LS	533.2	Soft	6	12	23.1	99.2	11-LS: Uniform. Clayey gray silt, little sand.
12-LS	531.2	Plastic	4	12	22.7	101.1	See Note A.
13-LS	527.2	Plastic	4	13	23.3	101.7	13-LS: Uniform. Silty gray clay, some sand, trace of gravel.
14-BS	522.2	--	4	12			
15-LS	517.2	Plastic	5	14	24.9	99.8	15-LS: Uniform. Silty gray clay, some sand, trace of gravel.
	512.2	--	4	12			
16-LS	507.2	Plastic	8	13	25.9	100.5	16-LS: Uniform. Gray clay, some silt, trace of sand and gravel.
17-LS	502.2	Plastic	7	13	28.0	93.0	17-LS: Uniform. Gray clay, some silt, trace of sand and gravel.
	497.2	--	7	12			
18-LS	492.2	Soft	7	12	27.3	94.3	18-LS: Uniform. Gray clay, some silt, trace of sand and gravel.
19-LS	487.2	Soft to Plastic	7	12	26.4	95.5	19-LS: Uniform. Gray clay, some silt, trace of sand and gravel.
20-LS	482.2	Soft to Plastic	8	12	25.7	96.7	20-LS: Uniform. Gray clay, some silt, trace of sand and gravel.
21-LS	477.2	Soft to Plastic	17	12	11.3	123.6	21-LS: Non-uniform. Varies from silty gray clay to clayey silty gray sand.
22-LS	473.2	Very Soft	8	12	33.3	86.1	22-LS: Uniform. Gray clay, some silt, trace of sand and gravel.
23-LS	468.2	Soft	7	12	38.0	82.4	23-LS: Uniform. Gray clay, some silt, trace of sand.
24-LS	463.2	Soft	6	12	45.0	70.5	24-LS: Uniform. Gray clay, trace of silt and sand.
	458.2	--	7	12			
25-BS	454.1	--	72	12			
26-BS	451.7	--	36	12			
27-BS	449.9	--	106	12			

Indicates failure to recover Liner Sample

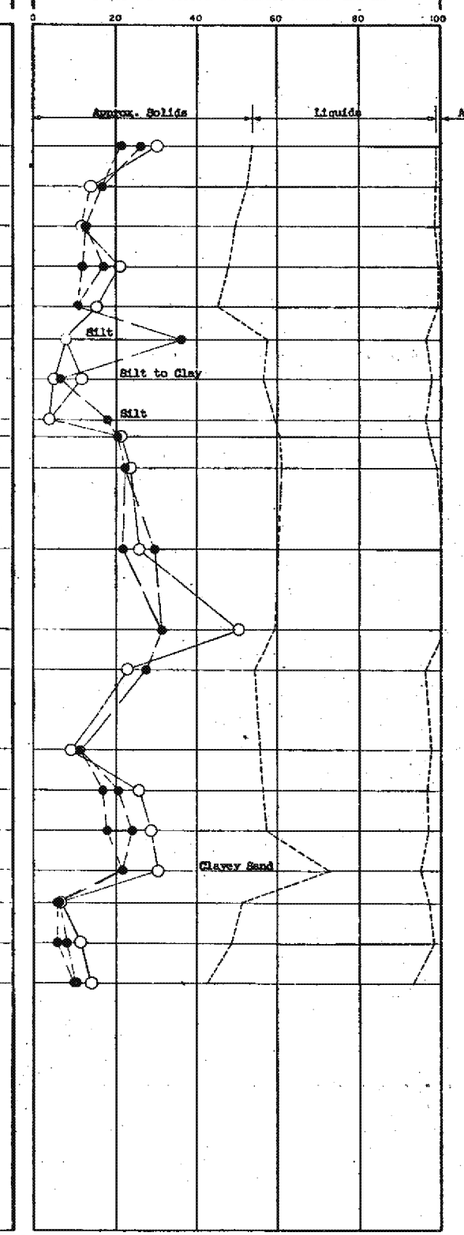
NOTE: Permanent Ground Water Level assumed to be the level of the St. Clair River adjacent to the site.

PENETRATION NOTE: Number of blows required to drive core sampler distance given using a 140-pound weight falling 30 inches.

Note A

12-LS: Uniform. Silty gray clay, some sand, trace of gravel.

SHEARING RESISTANCE & VOLUME OF SOLIDS CURVES



UNIVERSITY OF MICHIGAN RESEARCH INSTITUTE
SOIL MECHANICS LABORATORY
ANN ARBOR MICHIGAN

SUBSOIL ANALYSIS OF BORING NO 20
ST. CLAIR POWER PLANT - DETROIT EDISON COMPANY
DETROIT MICHIGAN

APPROVED: [illegible] DATE: [illegible]-57

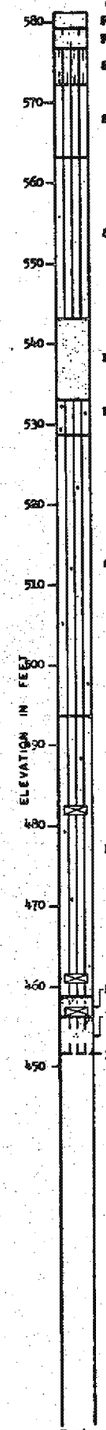
UNIVERSITY OF MICHIGAN RESEARCH INSTITUTE PROJECT 01944

ED_005947A_00014551-00301

LOG OF SOIL PROFILE

BY MERGO. VISUAL INSPECTION

GROUND SURFACE ELEVATION = 581.2 (MERGES DATUM)



Fill; Cinders.

Fill; Clay and Cinders.

Soft Silty Yellow Clay.

Soft Varicolored Clay.

Soft Gray Clay, Trace of Sand.

Firm Fine to Very Fine Dark Gray Sand.

Medium Gray Clay, Some Sand and Gravel.

Soft Gray Clay, Trace of Sand and Gravel.

Medium Gray Clay, Trace of Sand and Gravel.

Firm Fine Gray Sand, Some Clay.

Hardpan; Very Compact Clayey Very Fine to Medium Gray Sand.

Boring Stopped.

Boring Log and all sampling by Raymond Concrete Pile Company. Their Job No. B-25056-D.

SOIL SAMPLE / LABORATORY VISUAL INSPECTION

SA NO.	ELEV.	LAB CONSISTENCY	PENETRATION NO. OF BLOWS	PENETRATION DRIVE IN INCHES	% H_2O BY DRY WT.	DRY WT. LBS PER CU FT.	REMARKS
1-BS	579.2	--	5	12			
2-BS	577.2	--	5	12			
3-LS	575.2	Soft	2	12	38.2	83.0	3-LS: Uniform. Yellow clay, some silt, trace of sand.
4-LS	571.2	Soft	2	15	39.3	81.4	4-LS: Uniform. Yellow clay, some silt, trace of sand.
5-LS	566.2	Soft	2	12	37.9	81.1	See Note A.
6-LS	561.2	Plastic	3	14	30.7	92.4	6-LS: Uniform. Gray clay, some silt, trace of sand.
7-LS	556.2	Soft	3	14	32.6	88.6	7-LS: Uniform. Gray clay, some silt, trace of sand.
8-LS	551.2	Soft	2	18	40.4	81.1	8-LS: Uniform. Gray clay, some silt, trace of sand.
9-LS	546.2	Soft	2	16	42.8	76.8	9-LS: Uniform. Gray clay, some silt, trace of sand.
10-LS	542.1	Firm	18	12	20.2	104.8	10-LS: Uniform. Clayey gray silt, little sand.
11-LS	537.2	Plastic	11	12	20.8	105.5	11-LS: Uniform. Clayey gray silt, little sand.
12-LS	532.2	Plastic	7	13	21.4	103.6	12-LS: Uniform. Clayey gray silt, little sand.
13-LS	527.2	Plastic	5	14	23.2	101.7	13-LS: Uniform. Silty gray clay, some sand, trace of gravel.
14-LS	522.2	Plastic	4	12	24.0	99.2	14-LS: Uniform. Silty gray clay, some sand, trace of gravel.
15-LS	517.2	Plastic	5	12	18.0	109.2	15-LS: Uniform. Silty gray clay, some sand, trace of gravel.
16-LS	512.2	Plastic	5	12	33.8	85.8	16-LS: Uniform. Gray clay, some silt, trace of sand and gravel.
17-LS	507.2	Plastic	5	13	27.2	94.8	17-LS: Uniform. Gray clay, some silt, trace of sand and gravel.
18-LS	502.2	Plastic	4	12	26.7	99.8	18-LS: Uniform. Gray clay, some silt, trace of sand and gravel.
19-LS	497.2	Plastic	5	12	26.1	96.1	19-LS: Uniform. Gray clay, some silt, trace of sand and gravel.
20-LS	492.2	Plastic	6	12	26.0	92.4	20-LS: Uniform. Gray clay, some silt, trace of sand and gravel.
21-LS	487.2	Plastic	8	12	27.2	94.2	21-LS: Uniform. Gray clay, some silt, trace of sand and gravel.
22-BS	482.2	--	7	12			
23-LS	476.2	Soft	7	12	26.5	95.2	23-LS: Uniform. Gray clay, some silt, trace of sand and gravel.
24-LS	471.2	Soft to Plastic	7	12	28.7	91.4	24-LS: Uniform. Gray clay, some silt, trace of sand and gravel.
25-LS	466.2	Soft	7	12	11.8	88.0	25-LS: Uniform. Gray clay, some silt, trace of sand and gravel.
	461.2	--	7	12			
	457.8	--	12	12			
26-BS	455.8	--	100	8			
27-BS	451.9	--	100	4			

Indicates failure to recover Liner Sample

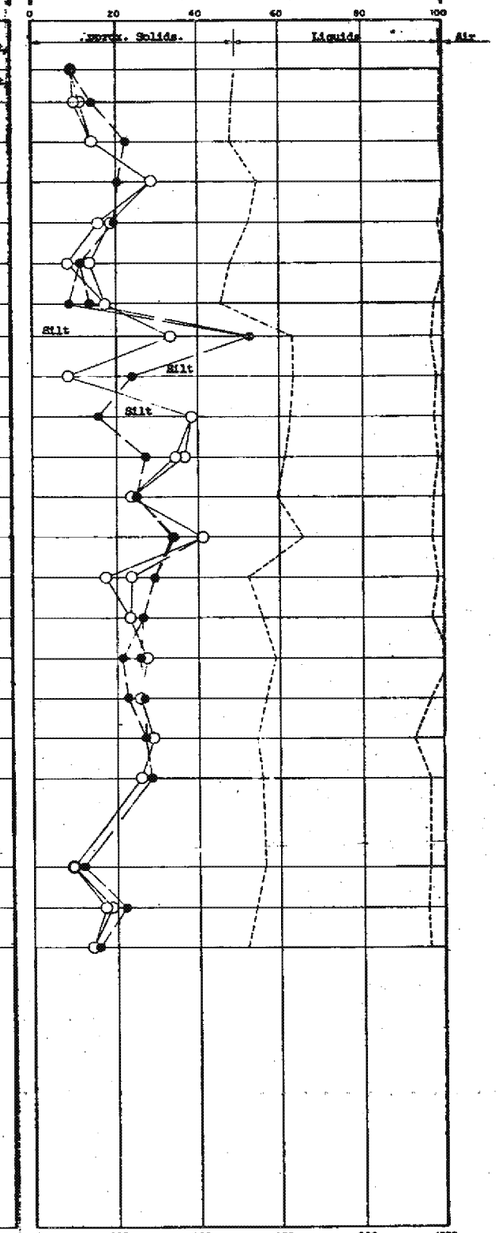
NOTE: Permanent Ground Water Level assumed to be the level of the St. Clair River adjacent to the site.

PENETRATION NOTE: Number of blows required to drive core sampler distance given using a 140-pound weight falling 30 inches.

Note A

5-LS: Uniform. Mottled yellow and gray clay, some silt, trace of sand with pocket of clayey gray silt, trace of organic matter.

SHEARING RESISTANCE & VOLUME OF SOLIDS CURVES



UNIVERSITY OF MICHIGAN RESEARCH INSTITUTE
SOIL MECHANICS LABORATORY
ANN ARBOR MICHIGAN

SUBSOIL ANALYSIS OF BORING NO. 21
ST. CLAIR POWER PLANT - DETROIT EDISON COMPANY
DETROIT MICHIGAN

APPROVED: [signature] DATE: 11-2-59

UNIVERSITY OF MICHIGAN RESEARCH INSTITUTE PROJECT 01994

ED_005947A_00014551-00302

LOG OF SOIL PROFILE

BY R.C.P. DIVISION

GROUND SURFACE ELEVATION = 588.60 Ft.
(USING USC & GS DATUM)

Stiff Sandy Varicolored Clay.

Medium Sandy Brown Clay

Soft Gray Clay, Some Sand, Trace of Gravel

Medium Gray Clay, Some Sand, Trace of Gravel.

Very Compact Medium Clayey Gray Sand. Boring Stopped.

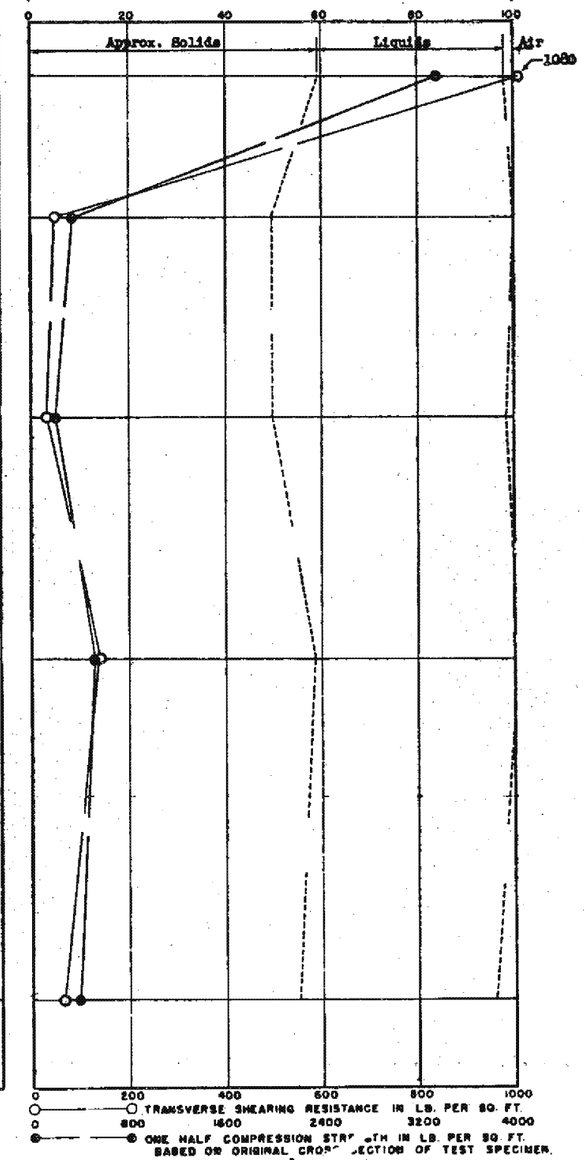
Boring Log and all Sampling by Raymond Concrete Pile Division of Raymond International, Inc.
Their Job No. RCE-11914-D.
Date of Boring: 12-20-66.

SOIL SAMPLE							LABORATORY VISUAL INSPECTION
SA. NO.	ELEV.	LAB CONSIS-TENCY	PENETRATION NO. OF BLOWS	PENETRATION DRIVE IN INCHES	% H_2O BY DRY WT.	DRY WT. LB. PER CU. FT.	REMARKS
1-BS	586.1	--	16	12			
2-LS	583.1	Stiff	15	12	24.2	99.2	2-LS: Uniform. Silty mottled brown-gray clay.
3-BS	578.6	--	10	12			
4-BS	573.1	--	5	12			
W.L. 5-LS	568.6	Very Soft	4	12	37.4	84.2	5-LS: Uniform. Silty gray clay, trace of very fine sand.
6-BS	563.6	--	2	12			
7-BS	558.1	--	2	11			
8-BS	553.1	--	2	11			
9-LS	548.1	Very Soft	3	13	35.0	86.7	9-LS: Uniform. Silty gray clay.
10-BS	543.1	--	2	12			
11-BS	538.1	--	2	12			
12-BS	533.1	--	3	12			
13-BS	528.6	--	6	12			
14-LS	523.1	Soft	9	12	26.8	98.6	14-LS: Uniform. Silty gray clay, trace of sand and gravel.
15-BS	518.6	--	10	12			
16-BS	513.6	--	11	12			
17-BS	508.6	--	12	12			
18-BS	503.6	--	13	12			
19-BS	498.6	--	14	12			
20-BS	493.1	--	11	12			
21-LS	488.1	Very Soft	9	12	27.3	93.0	21-LS: Uniform. Silty gray clay, trace of sand and gravel.
22-BS	483.6	--	10	12			
23-BS	478.6	--	10	12			
24-BS	473.6	--	10	12			
25-BS	468.6	--	10	12			
26-BS	463.6	--	10	12			
27-BS	458.6	--	8	12			
28-BS	453.4	--	100	5			

PENETRATION: Number of blows required to drive core sampler distance given using a 140-pound weight falling 30 inches.

Failure to recover Liner Sample.
WL: Water Level 16 hours after completion.

SHEARING RESISTANCE & VOLUME OF SOLIDS CURVES



ENGINEERING RESEARCH INSTITUTE
SOIL MECHANICS LABORATORY
UNIVERSITY OF MICHIGAN, ANN ARBOR, MICHIGAN

SUBSOIL ANALYSIS OF BORING NO. 29
CAR DUMPER HOUSE - ST. CLAIR POWER PLANT
THE DETROIT EDISON CO. BELLE RIVER, MICHIGAN

APPROVED: W. Housel DATE: 6-14-67

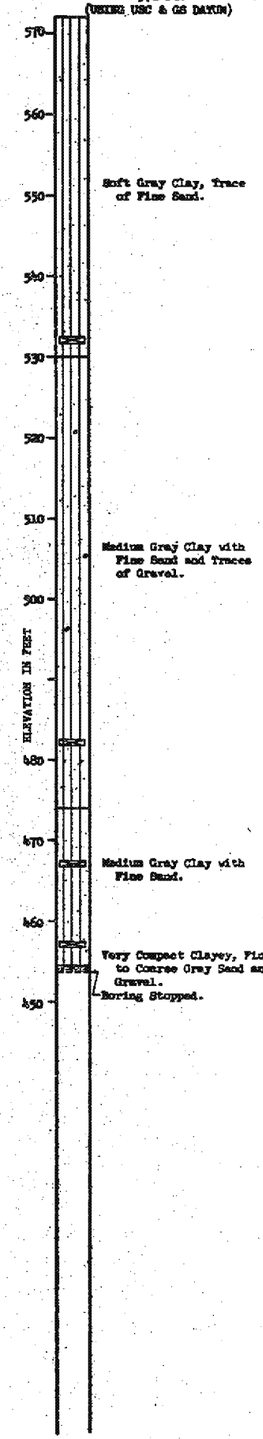
PROJECT: 01994

A-35

LOG OF SOIL PROFILE

BY R.C.F. DIVISION

GROUND SURFACE ELEVATION = 572 Ft. (USING USC & GS DATUM)



SOIL SAMPLE

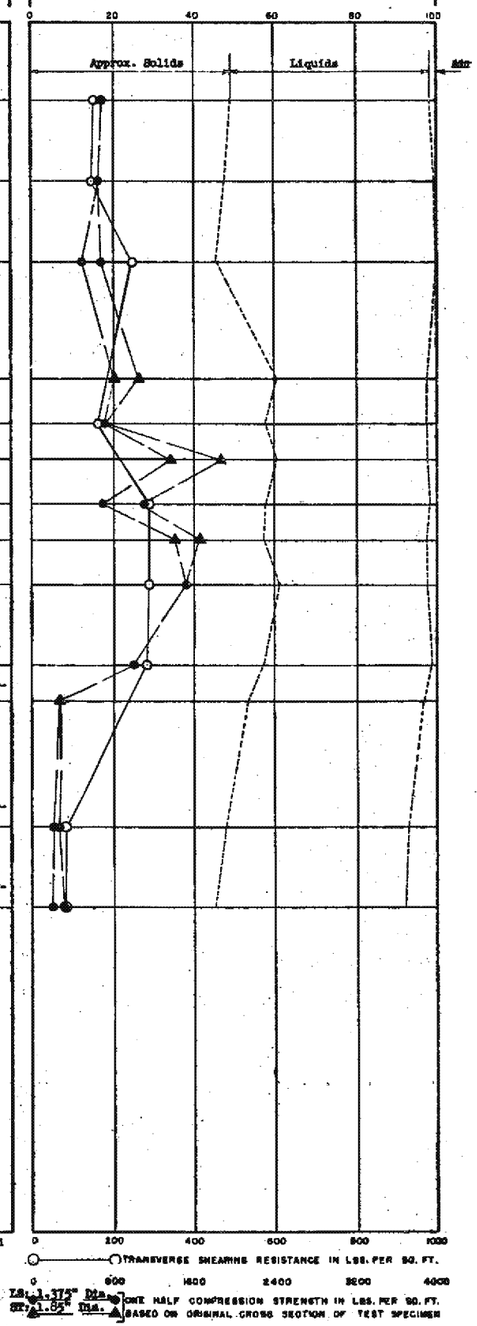
SA NO.	ELEV.	LAB. CONSISTENCY	PENETRATION NO. OF BLOWS	PENETRATION DRIVE IN INCHES	% H_2O BY DRY WT.	DRY WT. LBS PER CU. FT.	LABORATORY VISUAL INSPECTION REMARKS
1-SS	567.0	--	3	12			
2-LS	562.0	Soft	2	12	36.7	84.2	2-LS: Uniform. Silty gray clay, trace of gravel.
Lost SS	557.0	--	2	12			
3-LS	552.0	Soft	2	12	39.5	81.7	3-LS: Uniform. Silty gray clay.
4-SS	547.0	--	2	12			
5-LS	542.0	Soft	3	12	44.3	76.1	5-LS: Uniform. Silty gray clay.
6-SS	537.0	--	3	12			
Lost LS	532.0	--	3	12			
7-ST	527.0	Soft	Pushed		22.6	102.1	7-ST: Uniform. Silty gray clay, trace of gravel. Few sand pockets.
8-LS	522.0	Soft	8	12	25.7	97.3	8-LS: Uniform. Silty gray clay, some fine sand, trace of gravel.
9-ST	517.0	Plastic	Pushed		22.8	102.3	9-ST: Uniform. Silty laminated gray clay, trace of sand and gravel.
10-LS	512.0	Soft to Plastic	9	12	26.2	97.3	10-LS: Uniform. Silty laminated gray clay, some fine sand, trace of gravel.
11-ST	507.0	Plastic	Pushed		25.9	96.7	11-ST: Uniform. Silty laminated gray clay, some fine sand, trace of gravel.
12-LS	502.0	Plastic	13	12	21.9	103.6	12-LS: Uniform. Silty gray clay, some fine sand, trace of gravel.
Lost ST	497.0	--	Pushed				
13-LS	492.0	Plastic	11	12	26.8	96.7	13-LS: Uniform. Silty gray clay, trace of fine sand and gravel.
14-ST	487.0	Very Soft	Pushed		29.7	91.1	14-ST: Uniform. Silty gray clay, trace of fine sand and gravel. Honeycombed.
Lost LS	482.0	--	10	12			
Lost ST	477.0	--	Pushed				
Lost ST	474.0	--	Pushed				
15-LS	472.0	V.Soft	13	12	34.5	81.4	15-LS: Uniform Silty gray clay, trace of fine sand and gravel. Honeycombed.
16-SS	467.0	--	14	12			
17-LS	462.0	Very Soft	14	12	38.2	77.1	17-LS: Uniform. Silty gray clay, trace of fine sand and gravel. Honeycombed.
Lost LS	457.0	--	14	12			
18-SS	453.7	--	100	10			

PENETRATION: Number of blows required to drive core sampler distance given using a 140-pound weight falling 30 inches.

Boring Log and all sampling by Raymond Concrete Pile Division of Raymond International, Inc. under their Job No. RCB-11914-D. Date of Boring: 2-11-67

Failure to recover Liner Sample.
LS: Undisturbed Liner Sample 1.375" diameter.
SS: Disturbed Sample.
ST: Undisturbed Shelby Tube Sample 1.85" diameter.
SS: Standard Spoon Sample.
Water Level Not Given.

SHEARING RESISTANCE & VOLUME OF SOLIDS CURVES



OFFICE OF RESEARCH ADMINISTRATION
SOIL MECHANICS LABORATORY
UNIVERSITY OF MICHIGAN, ANN ARBOR, MICHIGAN

SUBSOIL ANALYSIS OF BORING NO. 29A
GAS BUMPER HOUSE - ST. CLAIR POWER PLANT
DETROIT EDISON COMPANY BELLE RIVER, MICHIGAN

APPROVED: [signature] DATE: 6-14-67

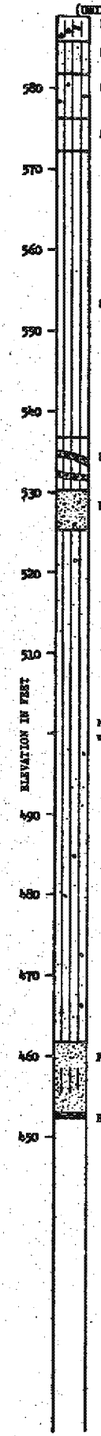
OFFICE OF RESEARCH ADMINISTRATION PROJECT 01994

LOG OF SOIL PROFILE

BY R.C.P. DIVISION

GROUND SURFACE ELEVATION 588.80 Ft.

(USING USC & GS DATUM)



Fill; Soft Varicolored Clay, Limestone.

Medium Varicolored Sandy Clay.

Stiff Varicolored Clay, Trace of Gravel.

Medium Varicolored Clay.

Soft Gray Clay.

Soft Gray Clay, With Seams of Fine Silty Gray Sand.

Firm Coarse Gray Sand, Some Gravel.

Medium Sandy Gray Clay, with Gravel.

Firm Medium Gray Sand, Some Gravel, Clay Binder.

Refusal.

Boring Log and all Sampling by Raymond Concrete Pile Division of Raymond International, Inc. under their Job No. RCB-1191k-F
Date of Boring: 1-13-67

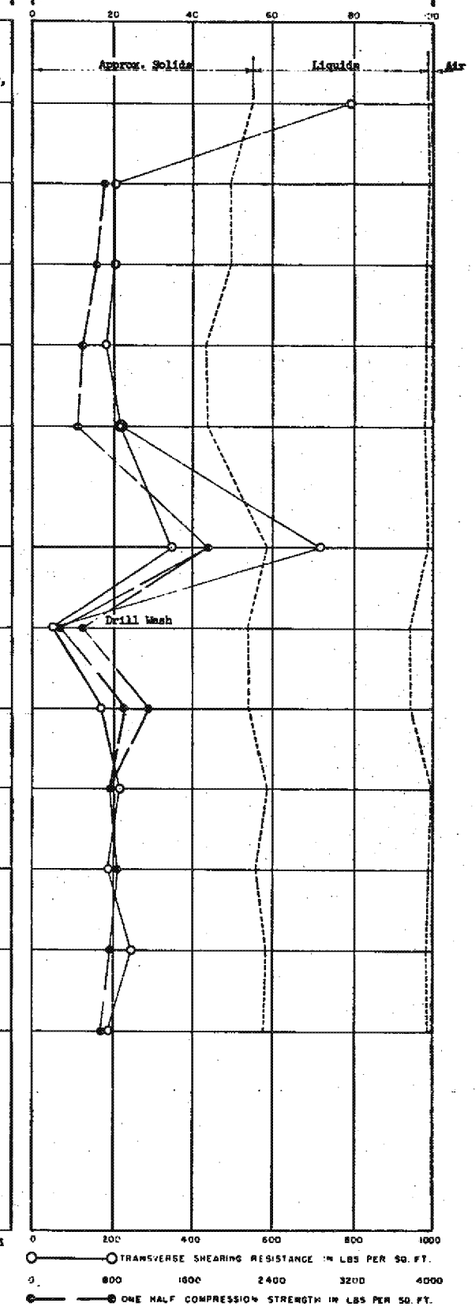
SOIL SAMPLE / LABORATORY VISUAL INSPECTION

Sample No.	Elev.	Lab Consistency	Penetration No. of Blows	Penetration Drive in Inches	% H_2O Dry Wt.	Dry Wt. Lbs. per Cu. Ft.	Remarks
1-BS	586.3	--	4	12			
2-BS	583.3	--	12	12			
3-LS	578.3	Firm to Stiff	16	12	28.8	94.8	3-LS: Uniform. Silty, brown-gray clay, trace of sand.
4-BS	573.8	--	7	12			
5-LS	568.8	Soft	4	12	36.6	84.9	5-LS: Uniform. Silty gray clay, trace of sand.
6-BS	563.8	--	3	12			
7-LS	558.8	Soft	4	12	35.5	85.5	7-LS: Uniform. Silty gray clay, trace of sand.
8-BS	553.8	--	3	12			
9-LS	548.8	Soft	3	12	46.2	74.3	9-LS: Uniform. Silty gray clay.
10-BS	543.8	--	3	12			
11-LS	538.8	Soft	3	12	45.0	75.2	11-LS: Uniform. Silty gray clay.
12-BS	533.8	--	4	12			
13-BS	526.8	--	23	12			
14-LS	523.8	Plastic to Firm	12	12	25.1	99.6	14-LS: Uniform. Silty laminated gray clay, some fine sand, trace of gravel.
15-BS	518.8	--	14	12			
16-LS	513.8	Soft	14	12	27.7	91.2	16-LS: Uniform. Silty gray clay, some fine sand, trace of gravel.
17-BS	508.8	--	14	12			
18-LS	503.8	Soft	14	12	27.6	93.0	18-LS: Uniform. Silty laminated gray clay, some fine sand, trace of gravel
19-BS	498.8	--	13	12			
20-LS	493.8	Soft	11	12	25.8	99.2	20-LS: Uniform. Silty gray clay, some fine sand, trace of gravel.
21-BS	488.8	--	10	12			
22-LS	483.8	Soft	9	12	26.2	94.8	22-LS: Uniform. Silty gray clay, some fine sand, trace of gravel.
23-BS	478.8	--	10	12			
24-LS	473.8	Soft	11	12	25.4	98.6	24-LS: Uniform. Silty laminated gray clay, some fine sand, trace of gravel.
25-BS	468.8	--	10	12			
26-LS	463.8	Soft	10	12	26.2	98.0	27-LS: Uniform. Silty gray clay, some fine sand, trace of gravel. Honeycombed.
27-BS	458.8	--	11	12			
28-BS	453.8	--	10	12			
	452.8	--	100	1			

Water Level not given.

PENETRATION: Number of blows required to drive core sampler distance given using a 140-pound weight falling 30 inches.

SHEARING RESISTANCE & VOLUME OF SOLIDS CURVES



OFFICE OF RESEARCH ADMINISTRATION
SOIL MECHANICS LABORATORY
UNIVERSITY OF MICHIGAN, ANN ARBOR, MICHIGAN

SUBSOIL ANALYSIS OF BORING NO. 30
CAR DUMPER HOUSE - ST. CLAIR POWER PLANT
THE DETROIT EDISON COMPANY — ECORSE RIVER, MICHIGAN

APPROVED: W. Housel DATE: 6-10-67

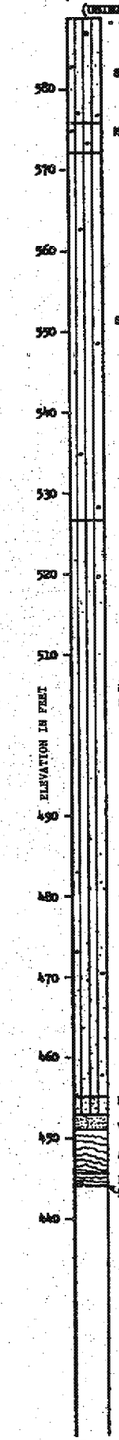
01994

ED_005947A_00014551-00305

LOG OF SOIL PROFILE

BY R.C.P. DIVISION

GROUND SURFACE ELEVATION = 588.80 Ft. (USING USC & GS DATUM)



Stiff Sandy Varicolored Clay, Some Gravel.

Medium Gray Clay, Trace of Gravel.

Soft Gray Clay, Trace of Gravel.

Medium Gray Clay, Some Sand, Trace of Gravel.

Medium Sandy Gray Clay, Some Rouge Streaks.

Very Compact Medium Gray Sand.

Soft Gray Shale.

Hard Gray Shale.

Boring Stopped.

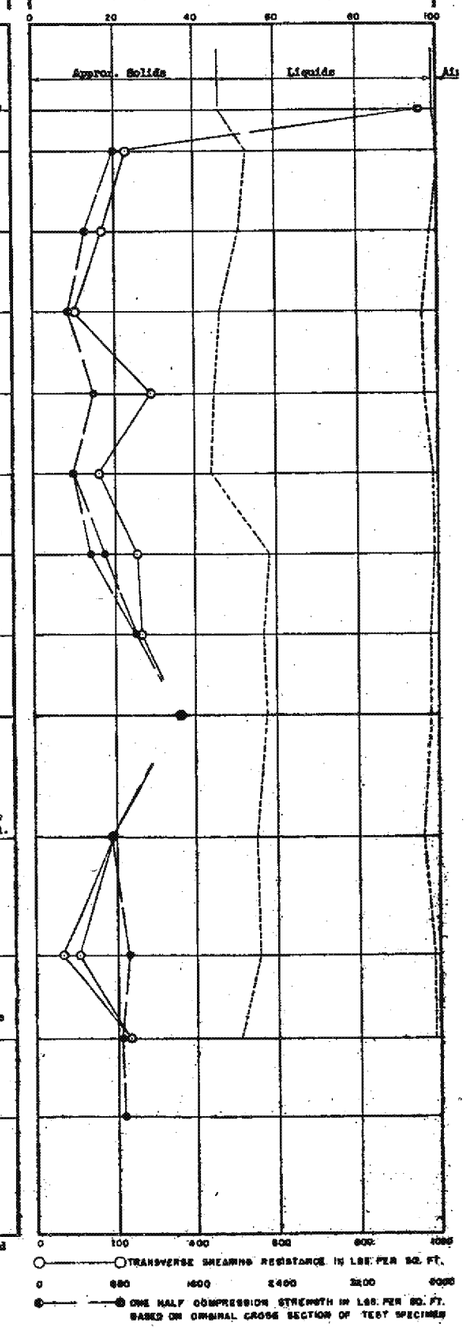
SOIL SAMPLE							LABORATORY VISUAL INSPECTION
SA. NO.	ELEV.	LAB. CONSISTENCY	PENETRATION NO. OF BLOWS	PENETRATION DRIVE IN INCHES	% H_2O BY DRY WT.	DRY WT. LBS. PER CU. FT.	REMARKS
1-BS	586.3	--	21	12			
2-BS	583.8	--	22	12			
3-LS	578.3	Stiff	17	12	41.7	79.2	3-LS: Uniform. Silty varicolored clay.
4-LS	573.3	Soft	5	12	32.5	91.1	4-LS: Uniform. Silty gray clay.
5-BS	568.8	--	3	11			
6-LS	563.3	Soft	3	12	33.3	88.0	6-LS: Uniform. Silty gray clay.
7-BS	558.8	--	3	12			
8-LS	553.3	Very Soft	4	12	38.5	81.1	8-LS: Uniform. Silty gray clay.
9-BS	548.3	--	4	12			
10-LS	543.3	Soft	4	12	42.1	77.4	10-LS: Uniform. Silty gray clay.
11-BS	538.8	--	4	12			
12-LS	533.3	Soft	4	12	45.1	76.1	12-LS: Uniform. Silty gray clay.
13-BS	528.8	--	4	12			
14-LS	523.3	Soft	6	12	25.9	98.6	14-LS: Uniform. Silty gray clay, trace of sand and gravel.
15-BS	518.8	--	9	12			
16-LS	513.3	Plastic	10	12	26.7	96.1	16-LS: Uniform. Silty laminated gray clay, trace of sand and gravel.
17-BS	508.8	--	10	12			
18-LS	503.3	--	11	12	26.6	97.3	18-LS: Uniform. Silty laminated gray clay, trace of sand and gravel.
19-BS	498.8	--	10	12			
	493.3	--	11	12			
20-LS	488.3	Soft to Plastic	9	12	27.7	93.0	20-LS: Uniform. Silty gray clay, trace of sand and gravel. Honeycombed.
	478.8	--	16	12			
21-LS	473.8	Soft	9	12	28.6	94.0	21-LS: Uniform. Silty gray clay, some sand, trace of gravel.
22-BS	468.8	--	14	12			
23-LS	463.3	Soft	8	12	34.7	86.1	23-LS: Uniform. Silty gray clay, trace of sand. Honeycombed.
24-BS	458.8	--	9	12			
25-LS	453.8	Soft	12	12	17.4	--	25-LS: Non-uniform. Silty sandy gray clay. Honeycombed.
26-BS	452.8	--	100	3			
27-BS	448.2	--	200	3			
	444.3	--	200	1			

PENETRATION: Number of blows required to drive core sampler distance given using a 140-pound weight falling 30 inches.

WL: Water Level 24 hours after completion.

Boring Log and all sampling by Raymond Concrete Pile Division of Raymond International, Inc. under their Job No. ECB-11914-D.
Date of Boring: December 1966 to January 1967

SHEARING RESISTANCE & VOLUME OF SOLIDS CURVES



OFFICE OF RESEARCH ADMINISTRATION
SOIL MECHANICS LABORATORY
UNIVERSITY OF MICHIGAN, ANN ARBOR, MICHIGAN

SUBSOIL ANALYSIS OF BORING NO. 31
CAR DUMPER HOUSE - ST. CLAIR POWER PLANT
THE DETROIT EDISON COMPANY BELLE RIVER, MICHIGAN

APPROVED: W. A. Hansel DATE: 6-14-67

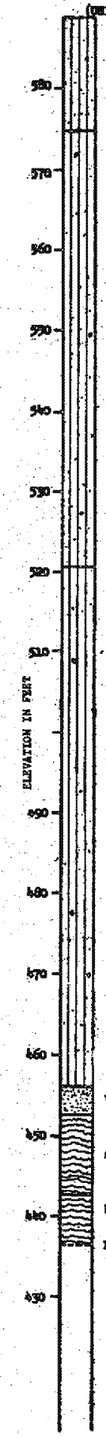
OFFICE OF RESEARCH ADMINISTRATION PROJECT 01994

A-38

LOG OF SOIL PROFILE

BY R.C.P. DIVISION

GROUND SURFACE ELEVATION: 588.70 Ft. (USING USC & GS DATUM)



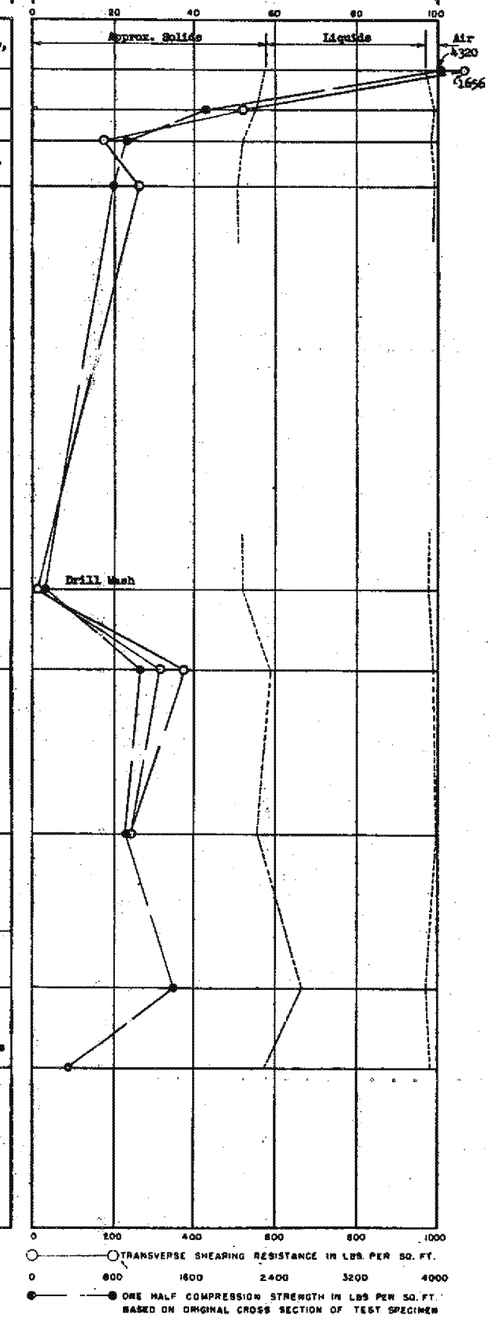
SOIL SAMPLE							LABORATORY VISUAL INSPECTION
SA. NO.	ELEV.	LAB. CONSISTENCY	PENETRATION NO. OF BLOWS	PENETRATION DRIVE IN INCHES	% H_2O BY DRY WT.	DRY WT LBS. PER CU. FT.	REMARKS
1-BS	586.2	--	11	12			
2-LS	582.7	Hard	20	12	24.7	99.2	2-LS: Uniform. Silty varicolored clay, trace of sand.
3-LS	577.7	Plastic	11	12	29.0	94.3	3-LS: Uniform. Silty brown-gray clay.
4-LS	573.7	Soft	5	12	32.5	89.2	4-LS: Uniform. Silty gray clay.
5-LS	568.2	Soft	3	12	35.1	86.1	5-LS: Uniform. Silty gray clay, trace of very fine sand.
6-BS	563.7	--	3	12			
7-BS	558.7	--	3	12			
8-BS	553.7	--	3	11			
9-BS	548.7	--	3	12			
10-BS	543.7	--	3	12			
11-BS	538.7	--	3	11			
12-BS	533.7	--	3	12			
13-BS	528.7	--	4	12			
14-BS	523.7	--	5	12			
15-LS	518.2	Very Soft	6	12	32.6	88.0	15-LS: Uniform. Silty gray clay, some fine sand, trace of gravel.
16-BS	513.7	--	10	12			
17-LS	508.2	Plastic	15	12	24.8	100.2	17-LS: Uniform. Silty gray clay, trace of fine sand and gravel.
18-LS	504.7	--	12	11			
	498.7	--	8	12			
	495.7	--	10	12			
	492.7	--	10	12			
19-LS	487.7	Plastic	12	12	29.1	94.2	19-LS: Uniform. Silty gray clay, trace of fine sand and gravel.
	483.7	--	22	12			
	481.7	--	16	12			
	478.7	--	11	12			
20-LS	475.7	--	14	12	--	--	20-LS: Not Received.
21-LS	468.7	Plastic	16	12	17.0	112.3	21-LS: Uniform. Silty gray clay, some fine sand and gravel. Fine sand pockets.
22-BS	463.7	--	8	12			
23-LS	458.7	Very Soft	12	12	26.1	97.3	23-LS: Uniform. Silty gray clay, layers or lenses of silt.
24-BS	454.0	--	100	9			
25-BS	448.7	--	300	5			
26-BS	444.0	--	200	2			
	439.4	--	200	1/4			

PENETRATION: Number of blows required to drive core sampler distance given using a 140-pound weight falling 30 inches.

WL: Water Level 96 hours after completion.

Boring Log and all Sampling by Raymond Concrete Pile Division of Raymond International, Inc. under their Job No. RCB-11914-D. Date of Boring: January 1967

SHEARING RESISTANCE & VOLUME OF SOLIDS CURVES



OFFICE OF RESEARCH ADMINISTRATION
SOIL MECHANICS LABORATORY
UNIVERSITY OF MICHIGAN, ANN ARBOR, MICHIGAN

SUBSOIL ANALYSIS OF BORING NO. 32
CAR DUMPER HOUSE - ST. CLAIR POWER PLANT
THE DETROIT EDISON COMPANY BELLE RIVER, MICHIGAN

APPROVED: W. J. Housel DATE: 6-14-67

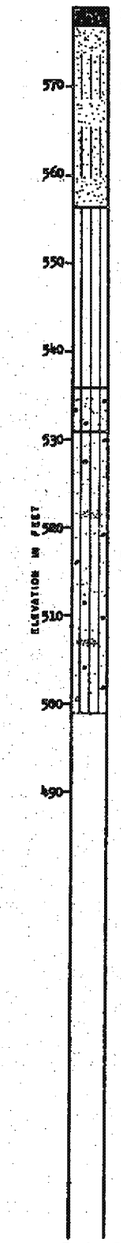
OFFICE OF RESEARCH ADMINISTRATION PROJECT 01994

A-39

LOG OF SOIL PROFILE

BY R.C.P. DIVISION

GROUND SURFACE ELEVATION = 579.0 Ft. (USC & GS DATUM)



Fill; Cinder.

Fill; Soft Clay, Loose Fine Brown Sand.

W.L.

Very Soft Gray Clay.

Medium Gray Clay, Some Fine Sand, Little Gravel.

Medium Sandy Gravelly Gray Clay, Pockets of Fine Sand.

Boring Stopped.

Boring Log and all Sampling by Raymond Concrete Pile Division of Raymond International, Inc.
Their Job No. RCB-12371-D
Date of Boring: April 12, 1967

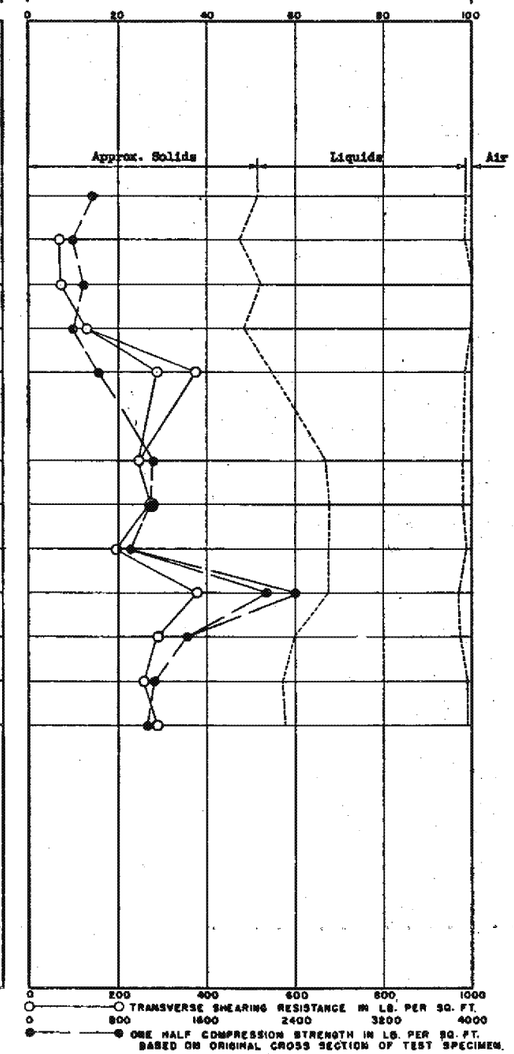
SOIL SAMPLE / LABORATORY VISUAL INSPECTION

SA. NO	ELEV	LAB. CONSISTENCY	PENETRATION NO. OF BLOWS	PENETRATION DRIVE IN INCHES	% H_2O BY DRY WT	DRY WT LB PER CU. FT	REMARKS
1-BS	574.0	--	1	12			
2-BS	569.0	--	2	12			
3-BS	564.0	--	4	12			
4-LS	559.5	Soft	2	12	33.9	[illegible]	4-LS: Uniform. Silty mottled tan clay, trace of fine sand, gravel and organic matter. Laminated.
5-LS	554.5	V.Soft	1	12	40.1	[illegible]	5-LS: Uniform. Silty gray clay.
6-LS	549.5	V.Soft	2	12	34.3	[illegible]	6-LS: Uniform. Silty gray clay.
7-LS	544.5	V.Soft	2	12	39.4	[illegible]	7-LS: Uniform. Silty gray clay.
8-LS	539.5	Soft to Plastic	3	12	29.6	[illegible]	8-LS: Uniform. Silty gray clay, silt pocket, trace of very fine sand.
	534.0	--	5	12			
9-LS	529.5	Soft to Plastic	8	12	17.2	11[illegible]	9-LS: Uniform. Silty gray clay, some sand, trace of gravel.
10-LS	524.5	Soft to Plastic	8	12	16.5	114.2	10-LS: Uniform. Silty gray clay, some sand, trace of gravel.
11-LS	519.5	Soft	8	12	17.5	111.7	11-LS: Uniform. Silty gray clay, some sand, trace of gravel.
12-LS	514.5	Plastic to Firm	8	12	16.1	113.9	12-LS: Uniform. Silty gray clay, some sand, trace of gravel.
13-LS	509.5	Plastic	11	12	23.2	101.1	13-LS: Uniform. Silty gray clay, some very fine sand, trace of gravel. Laminated.
14-LS	504.5	Plastic	10	12	27.4	96.1	14-LS: Uniform. Silty gray clay, some very fine sand, trace of gravel. Laminated.
15-LS	499.5	Plastic	10	12	26.6	97.3	15-LS: Uniform. Silty gray clay, some very fine sand, trace of gravel. Laminated.

W.L. Water Level at Completion.

PENETRATION: Number of blows required to drive core sampler distance given using a 140-pound weight falling 30 inches.

SHEARING RESISTANCE & VOLUME OF SOLIDS CURVES



ENGINEERING RESEARCH INSTITUTE
SOIL MECHANICS LABORATORY
UNIVERSITY OF MICHIGAN, ANN ARBOR, MICHIGAN

SUBSOIL ANALYSIS OF BORING NO. 33
ST. CLAIR POWER PLANT
THE DETROIT EDISON CO. BELLE RIVER, MICHIGAN

APPROVED: W.S. Housel DATE: 6-14-67

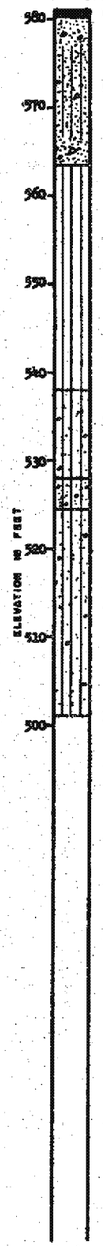
PROJECT NO. 01994

A-40

LOG OF SOIL PROFILE

BY R.C.P. DIVISION

GROUND SURFACE ELEVATION = 581.0 Ft. (USC & GS DATUM)



Fill; Cinder.

Fill; Clay, Sandy Gravel, Concrete. W.L.

Very Soft Gray Clay.

Soft Gray Clay, Trace of Fine Sand and Little Gravel.

Stiff Sandy Gravelly Gray Clay.

Medium Gray Clay, Some Fine Sand and Small Gravel.

Boring Stopped.

SOIL SAMPLE

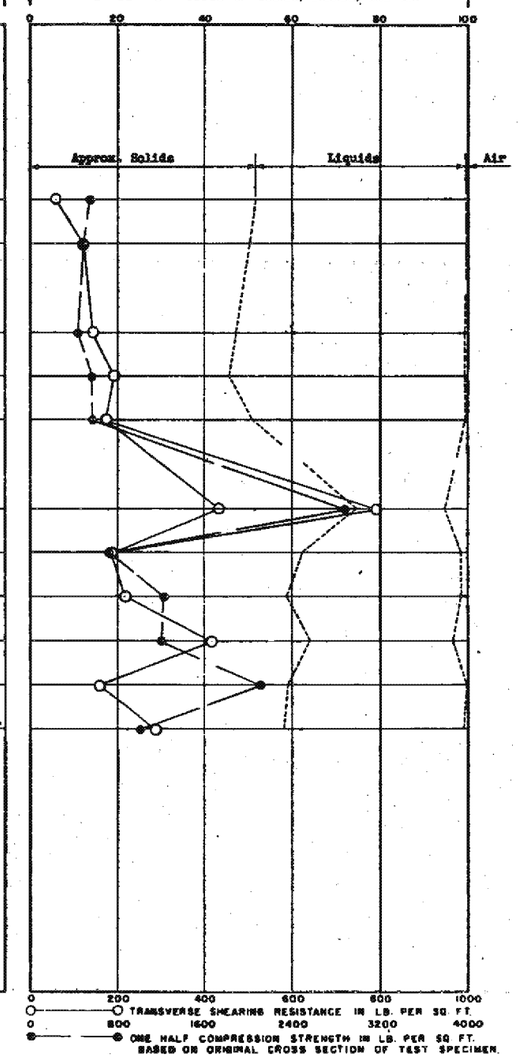
SA NO	ELEV	LAB. CONSISTENCY	PENETRATION NO. OF BLOWS	DRIVE IN INCHES	% H_2O BY DRY WT	DRY WT. LB PER CU FT
1-BS	576.0	--	4	12		
2-BS	571.0	--	8	12		
3-BS	566.0	--	5	12		
4-LS	561.5	V.Soft	3	12	34.7	87.4
5-LS	556.5	V.Soft	2	12	36.3	84.9
	551.0	--	2	12		
6-LS	546.5	Soft	2	12	41.3	79.2
7-LS	541.5	Soft	2	12	43.8	76.8
8-LS	536.5	Soft	4	12	35.6	85.5
	531.0		4	12		
9-LS	526.5	Firm	23	12	9.9	126.0
10-LS	521.5	Soft	7	12	21.6	104.8
11-LS	516.5	Soft to Plastic	8	12	24.9	99.2
12-LS	511.5	Plastic	10	12	18.9	108.0
13-LS	506.5	Plastic	13	12	25.5	99.9
14-LS	501.5	Plastic	10	12	26.2	98.0

LABORATORY VISUAL INSPECTION

REMARKS
4-LS: Uniform. Silty gray clay.
5-LS: Uniform. Silty gray clay.
6-LS: Uniform. Silty gray clay.
7-LS: Uniform. Silty gray clay.
8-LS: Uniform. Silty gray clay, trace of very fine sand.
9-LS: Uniform. Clayey gravelly gray sand to sandy dark gray clay, trace of organic matter.
10-LS: Uniform. Silty gray clay, some sand, trace of gravel.
11-LS: Uniform. Silty gray clay, some sand, trace of gravel.
12-LS: Uniform. Silty gray clay, some sand, trace of gravel.
13-LS: Uniform. Silty gray clay, some sand, trace of gravel.
14-LS: Uniform. Silty gray clay, some sand, trace of gravel. Laminated.

PENETRATION: Number of blows required to drive core sampler distance given using a 140-pound weight falling 30 inches.

SHEARING RESISTANCE & VOLUME OF SOLIDS CURVES



Boring Log and all Sampling by Raymond Concrete Pile Division of Raymond International, Inc.
Their Job No. ECS-12371-D
Date of Boring: April 10, 1967

W.L. Water Level at completion.

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SOIL MECHANICS LABORATORY
UNIVERSITY OF MICHIGAN, ANN ARBOR, MICHIGAN

SUBSOIL ANALYSIS OF BORING NO. 34
ST. CLAIR POWER PLANT
THE DETROIT EDISON CO. BELLE RIVER, MICHIGAN

APPROVED [illegible] DATE 5-14-67

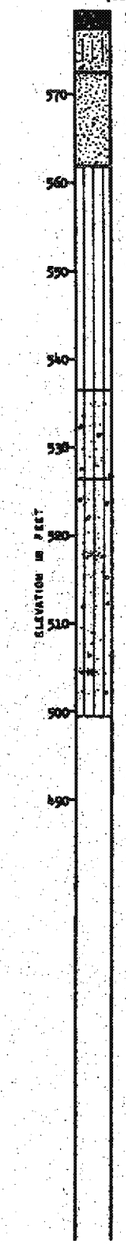
PROJECT NO. 01994

A-41

LOG OF SOIL PROFILE

BY R.C.P. DIVISION

GROUND SURFACE ELEVATION = 579.4 Ft. (USC & GS DATUM)



Fill; Cinder.

Fill; Loose Sand and Clay.

Fill; Loose Fine Sand.

Very Soft Gray Clay.

Soft Gray Clay, Some Fine Sand, Little Gravel.

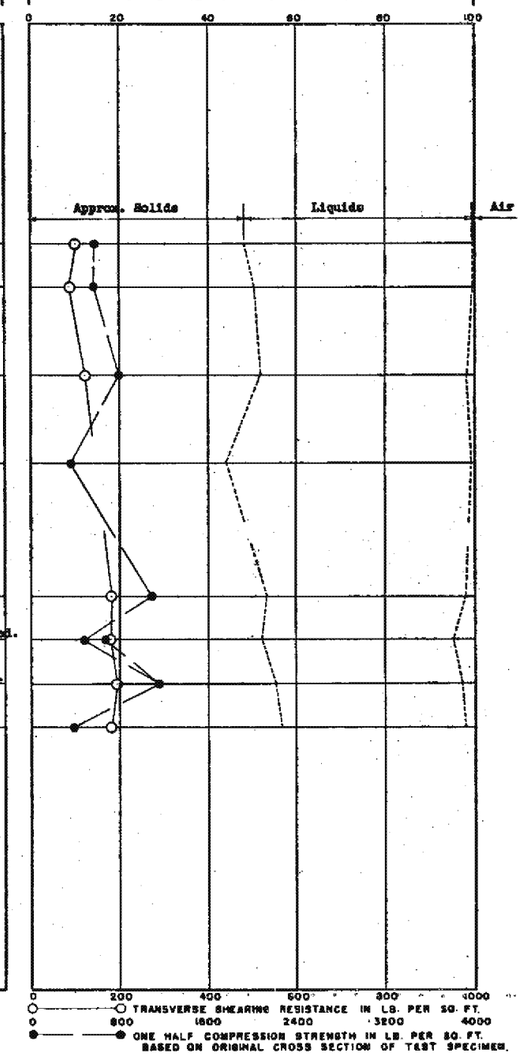
Medium Sandy Gravelly Gray Clay, Pockets of Fine Sand.

Boring Stopped.

SOIL SAMPLE							LABORATORY VISUAL INSPECTION
SA. NO.	ELEV.	LAB. CONSISTENCY	PENETRATION NO. OF DRIVE IN BLOWS IN INCHES		% H_2O BY DRY WT.	DRY WT LB. PER CU FT.	REMARKS
1-BS	574.4	--	3	12			
2-BS	569.4	--	3	12			
3-BS	564.4	--	1	15			
4-BS	559.4	--	2	15			
5-LS	554.9	Soft	2	12	39.6	81.1	5-LS: Uniform. Silty gray clay.
6-LS	549.9	Soft	2	12	36.3	84.9	6-LS: Uniform. Silty gray clay.
	544.4	--	2	12			
7-LS	539.9	Soft	2	12	33.1	87.4	7-LS: Uniform. Silty gray clay, trace of fine sand and silt lenses.
	534.4	--	4	12			
8-LS	529.9	V.Soft	4	12	46.6	74.3	8-LS: Uniform. Silty gray clay, trace of very fine sand.
	524.4	--	8	12			
	521.9	--	8	12			
9-LS	519.4	--	8	12			
10-LS	514.9	Soft	7	12	30.9	89.9	10-LS: Uniform. Silty gray clay, some sand, trace of gravel.
11-LS	509.9	Soft	6	12	30.8	87.7	11-LS: Uniform. Silty gray clay, some sand, trace of gravel. Homeycombed.
12-LS	504.9	Soft	8	12	28.1	93.0	12-LS: Uniform. Silty gray clay, some sand, trace of gravel. Laminated.
13-LS	499.9	Soft	9	12	26.9	95.5	13-LS: Uniform. Silty gray clay, trace of sand.

PENETRATION: Number of blows required to drive core sampler distance given using a 140-pound weight falling 30 inches.

SHEARING RESISTANCE & VOLUME OF SOLIDS CURVES



Boring Log and all Sampling by Raymond Concrete Pile Division of Raymond International, Inc.
Ebasco Job No. EES-12371-D
Date of Boring: April 12, 1967

W.L. Water Level at Completion.

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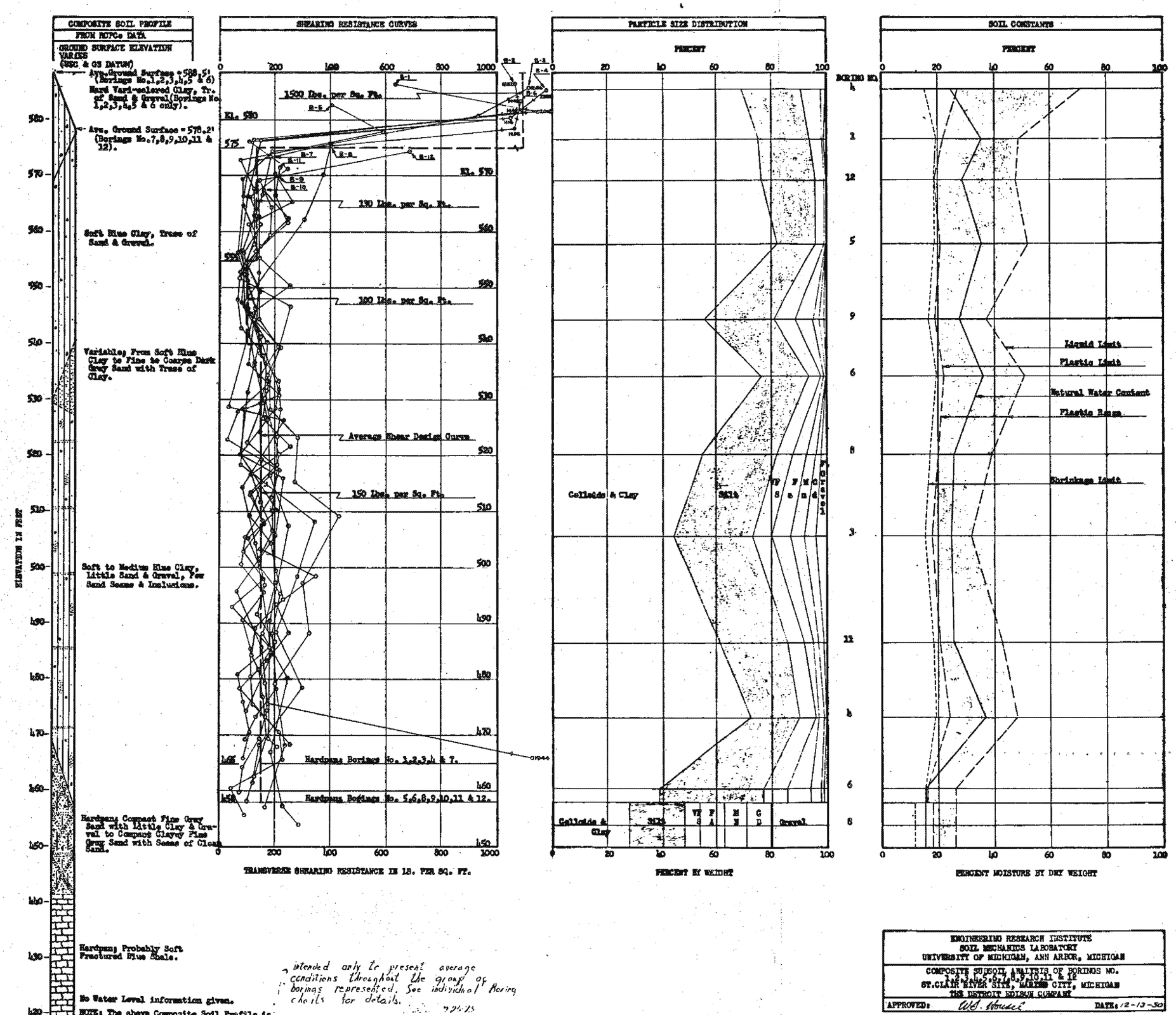
SOIL MECHANICS LABORATORY
UNIVERSITY OF MICHIGAN, ANN ARBOR, MICHIGAN

SUBSOIL ANALYSIS OF BORING NO. 35
ST. CLAIR POWER PLANT
THE DETROIT EDISON CO. BELLE RIVER, MICHIGAN

APPROVED: [illegible] DATE 6-14-67

PROJECT NO. 01994

A-42



intended only to present average conditions throughout the group of borings represented. See individual Boring charts for details.

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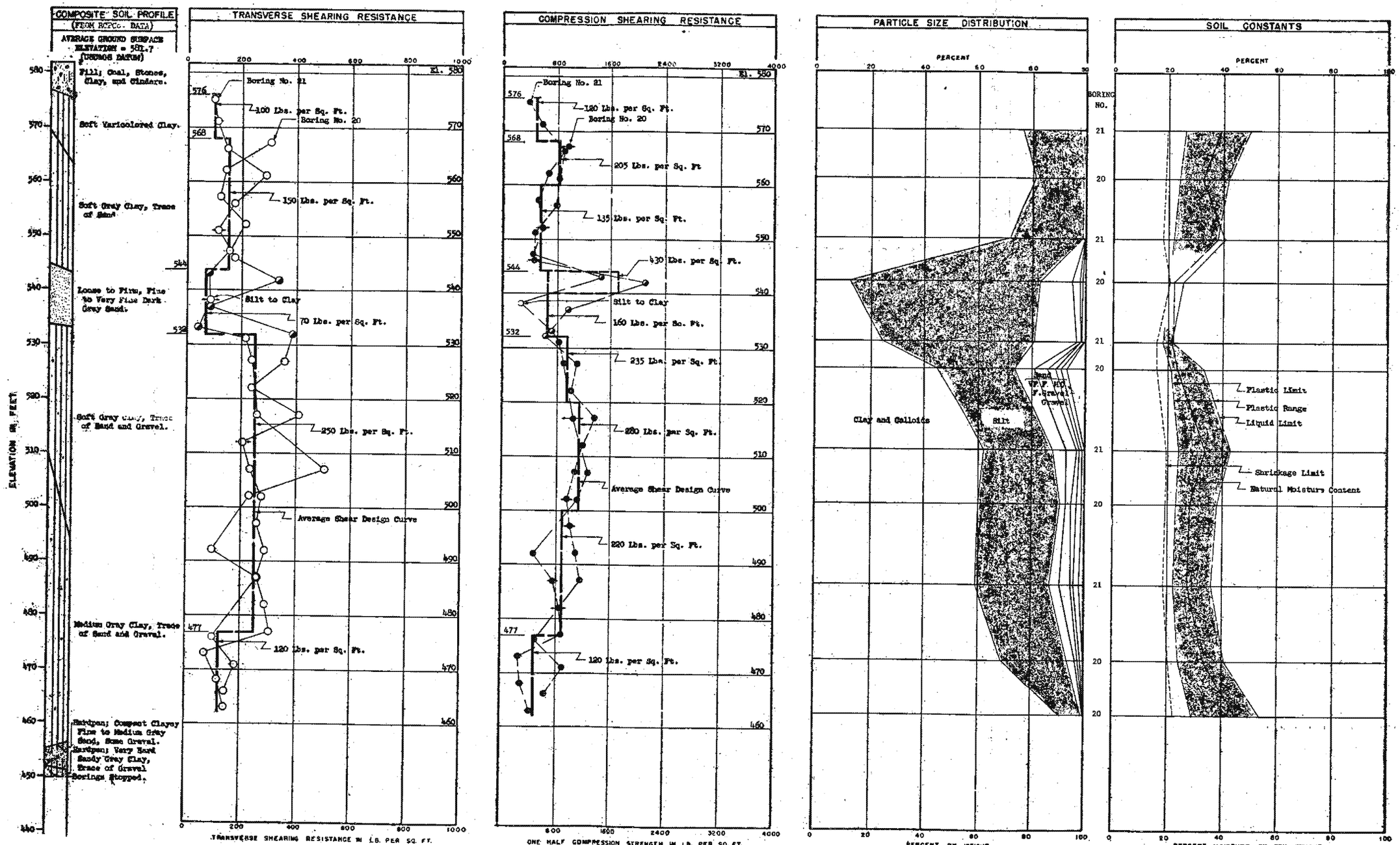
UNIVERSITY OF MICHIGAN, ANN ARBOR, MICHIGAN

COMPOSITE SUBSOIL ANALYSIS OF BORINGS NO. 1,2,3,4,5,6,7,8,9,10,11 & 12
ST. CLAIR RIVER SITE, MARINE CITY, MICHIGAN
THE DETROIT EDISON COMPANY

APPROVED: W. J. Housel DATE: 12-13-50

A-43



NOTE: The above Composite Soil Profile is intended only to present average conditions throughout the group of borings represented. See individual boring charts for details.

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SOIL MECHANICS LABORATORY
UNIVERSITY OF MICHIGAN, ANN ARBOR, MICHIGAN

COMPOSITE SUBSOIL ANALYSIS OF BORINGS NO. 20 and 21
ST. CLAIR POWER PLANT - DETROIT EDISON COMPANY
DETROIT MICHIGAN

APPROVED: [illegible] DATE: 1-2-59

UNIVERSITY OF MICHIGAN RESEARCH INSTITUTE PROJECT 01994

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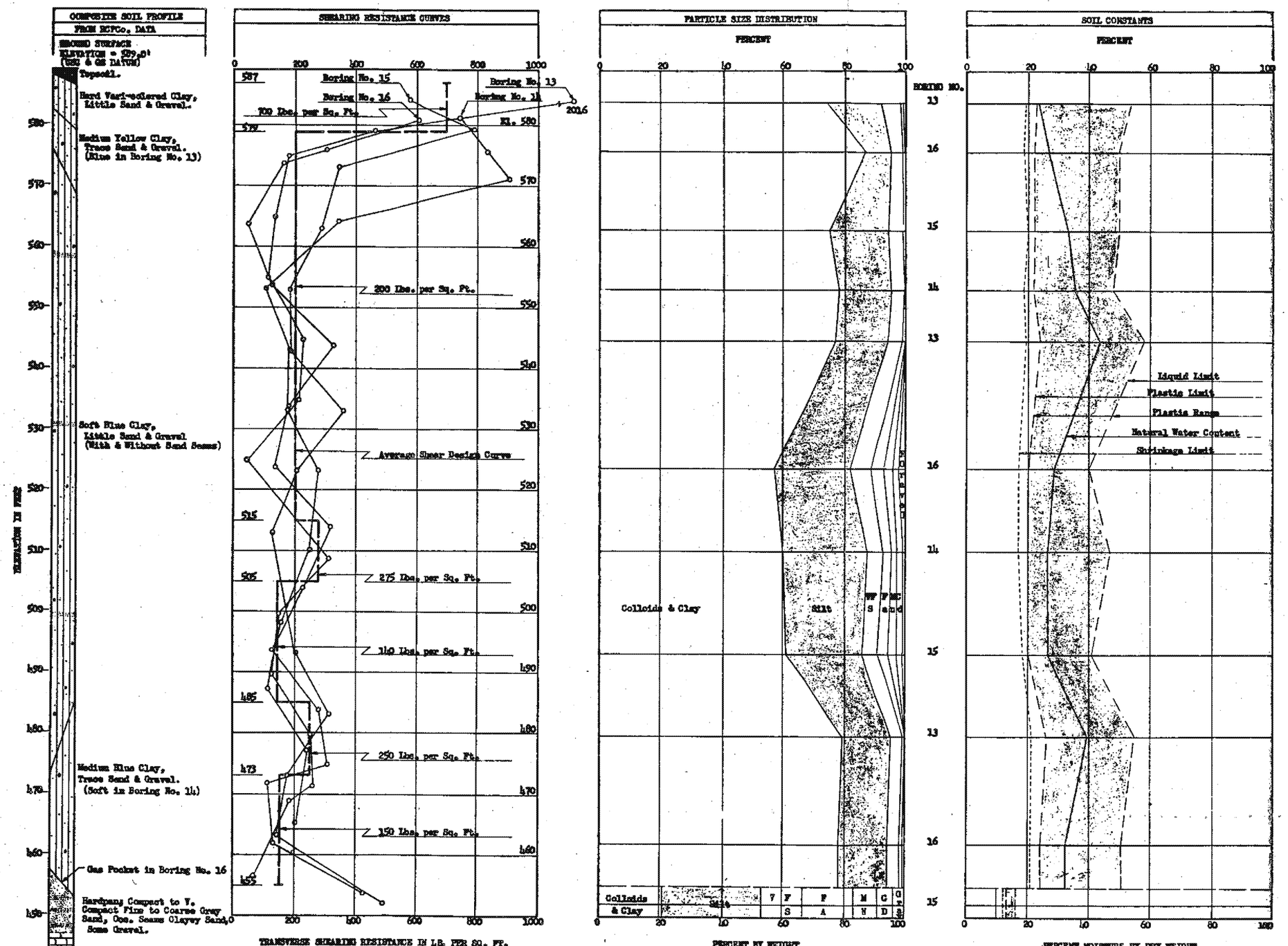


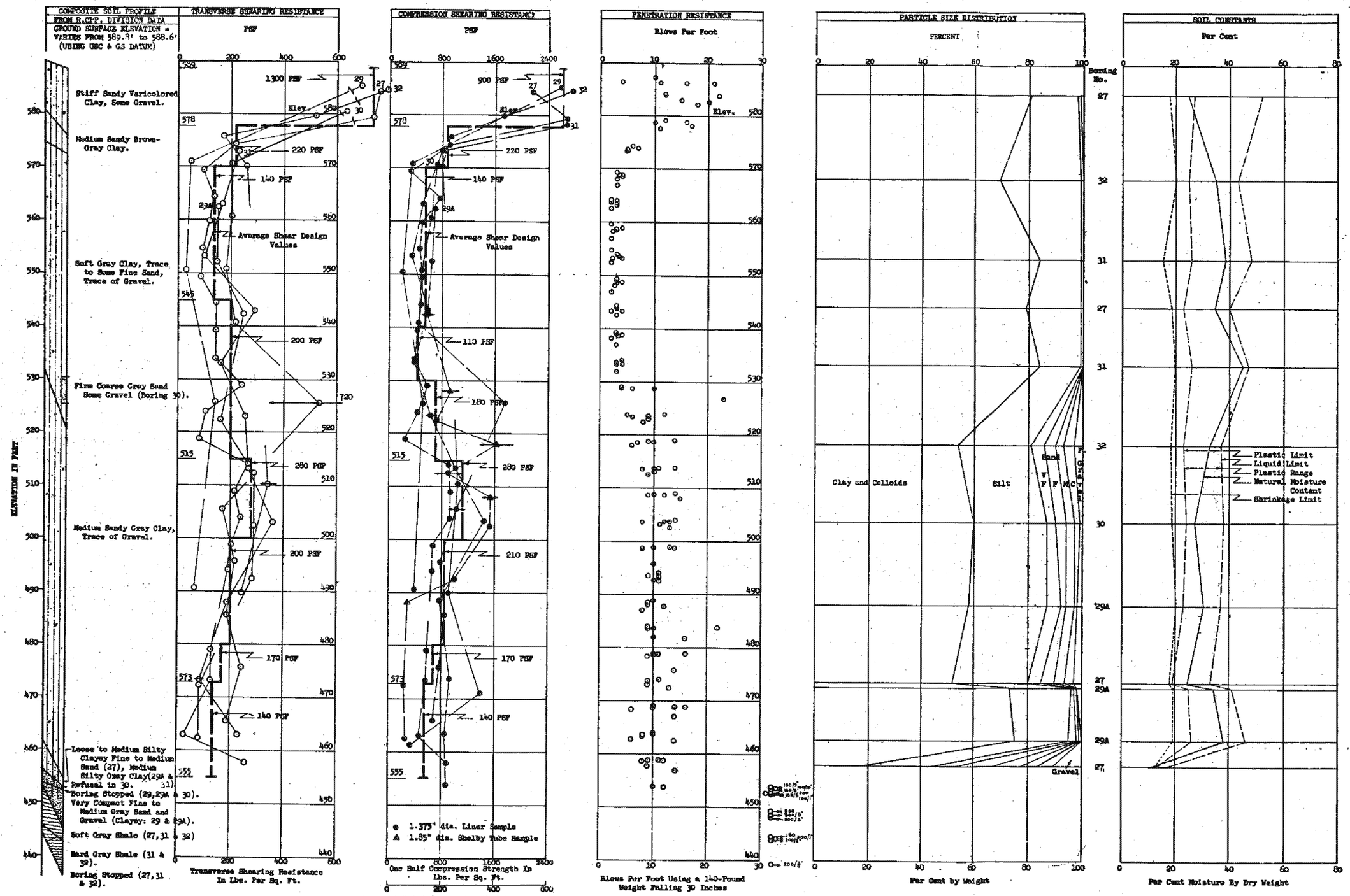
ENGINEERING RESEARCH INSTITUTE
SOIL MECHANICS LABORATORY
UNIVERSITY OF MICHIGAN, ANN ARBOR, MICHIGAN

COMPOSITE SUBSOIL ANALYSIS OF BORINGS NO.13,14,15 & 16
ST. CLAIR RIVER SITE, MARINE CITY, MICHIGAN
THE DETROIT EDISON COMPANY

APPROVED: W.A. Housel DATE: 12-13-50

UNIVERSITY OF MICHIGAN PROJECT M073-66

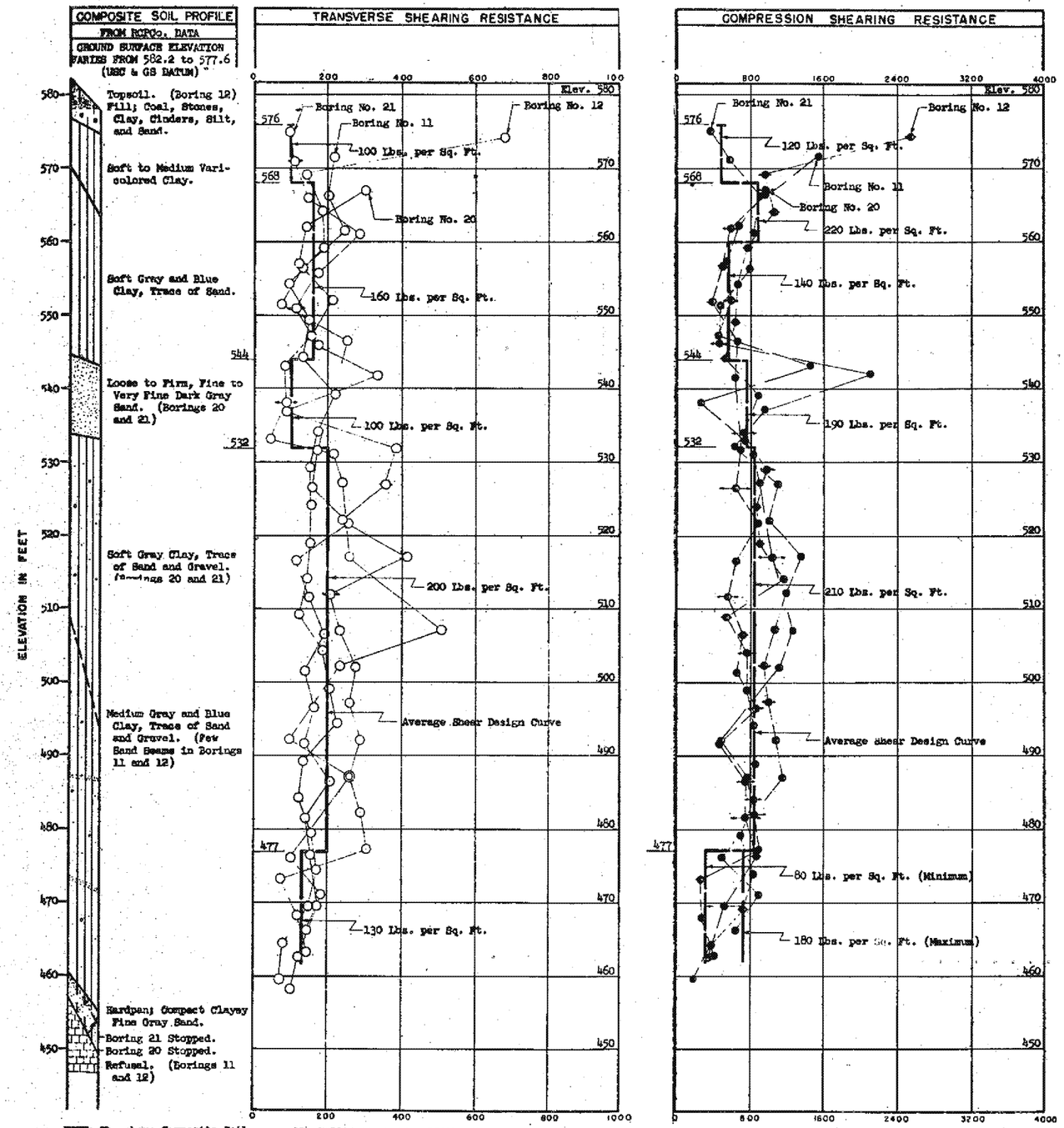
A-40



The above Composite Soil Profile is intended only to present average conditions throughout the group of borings represented. See individual Boring Charts for details.
Date of Borings: December 1966 to February 1967

OFFICE OF RESEARCH ADMINISTRATION
SOIL MECHANICS LABORATORY
ANN ARBOR MICHIGAN
COMPOSITE SUBSOIL ANALYSIS OF BORINGS NOS. 27, 29, 29A, 30, 31 AND 32
CAR DUMPER HOUSE - ST. CLAIR POWER PLANT
THE DETROIT EDISON COMPANY BELLE RIVER, MICH.
APPROVED: DATE: 6-14-67
OFFICE OF RESEARCH ADMINISTRATION PROJECT: 01994

A-47



NOTE: The above Composite Soil Profile is intended only to present average conditions for Borings No. 11, 12, 20, and 21.

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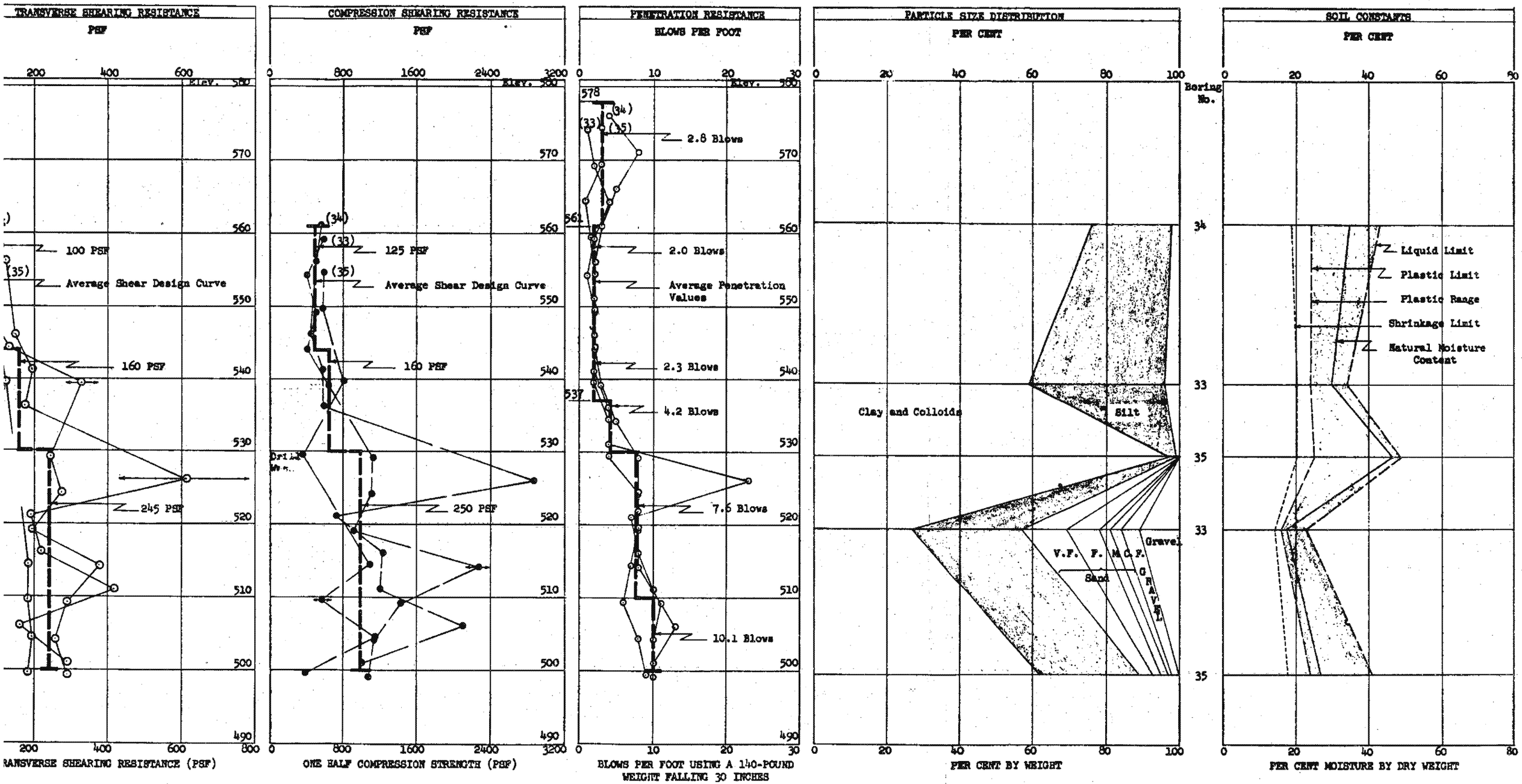
COMPOSITE SUBSOIL ANALYSIS OF BORINGS NO. 11, 12, 20 and 21
ST. CLAIR POWER PLANT -- DETROIT EDISON COMPANY
DETROIT MICHIGAN

APPROVED: DATE:

A-45



COMPRESSION SHEARING RESISTANCE (PSF)

OFFICE OF RESEARCH ADMINISTRATION
SOIL MECHANICS LABORATORY
UNIVERSITY OF MICHIGAN — ANN ARBOR, MICHIGAN
COMPOSITE SUBSOIL ANALYSIS OF BORINGS NOS. 33, 34 & 35
ST. CLAIR POWER PLANT
THE DETROIT EDISON CO. — BELLE RIVER, MICHIGAN
APPROVED: [illegible] — DATE: [illegible]
PROJECT NO. 01994

A-48

TABLE OF DRILL HOLES

Hole No	Location	Depth(ft)	Surface Elevation	Purpose	Type Drilling	Number and Type U.D. Samples Taken	Ground Water Level[1] Depth(ft)	Date
7	N 7,507 E 7,851	143.0	586.6	Observation Well	Rotary Wash, Standard Pen ASTM	None	10.0	4-25-74
8	N 7,495 E 8,304	165.1	586.5	Original Proposed Plant Area	Rotary Wash, Standard Pen ASTM, NX Core	None		
9	N 8,576 E 9,361	144.0	586.7	Proposed Plant Area	Rotary Wash, Standard Pen ASTM	None		
10	N 8,600 E 9,965	155.5	586.1	Proposed Plant Area	Rotary Wash, Standard Pen ASTM, NX Core	None		
11	N 8,316 E 8,715	150.0	586.7	Proposed Plant Area	Rotary Wash, Standard Pen ASTM	None		
12	N 7,884 E 9,005	174.2	586.8	Proposed Plant Area	Rotary Wash, Standard Pen ASTM, NX Core	Shelby 9		
13	N 8,321 E 9,336	144.0	586.5	Proposed Plant Area	Rotary Wash, Standard Pen ASTM	None		
14	N 8,306 E 9,627	145.0	586.6	Proposed Plant Area	Rotary Wash, Standard Pen ASTM, Shelby, Osterberg	Shelby 11 Osterberg 3		
15	N 8,320 E 9,786	142.0	586.2	Proposed Plant Area	Rotary Wash, Standard Pen ASTM, Shelby, Osterberg	Shelby 6 Osterberg 6		
16	N 7,996 E 8,712	143.8	586.0	Proposed Plant Area	Rotary Wash, Standard Pen ASTM	None		
17	N 8,000 E 9,004	183.3	585.9	Proposed Plant Area	Rotary Wash, Standard Pen ASTM, Shelby, NX Core	Shelby 6		

NOTE: Borings 1-6 not drilled.

ED_005947A_00014551-00317

Hole No	Location	Depth(ft)	Surface Elevation	Purpose	Type Drilling	Number and Type U.D. Samples Taken	Ground Water Level[1] Depth(ft)	Date
27	N 7,719 E 9,205	187.5	586.2	Proposed Plant Area	Rotary Wash, Standard Pen ASTM, Shelby, NX Core	Shelby 15		
28	N 7,724 E 9,443	193.5	585.8	Proposed Plant Area	Rotary Wash, Standard Pen ASTM, Shelby, NX Core	Shelby 10		
29	N 7,685 E 8,724	169.0	585.8	Proposed Plant Area	Rotary Wash, Standard Pen ASTM, NX Core	None		
30	N 7,673 E 9,015	135.0	586.4	Proposed Plant Area	Rotary Wash, Standard Pen ASTM	None		
31	N 7,669 E 9,331	143.4	585.9	Proposed Plant Area	Rotary Wash, Standard Pen ASTM	None		
32	N 7,663 E 9,659	144.5	586.6	Proposed Plant Area	Rotary Wash, Standard Pen ASTM	None		
33	N 7,400 E 9,322	138.5	585.6	Proposed Plant Area	Rotary Wash, Standard Pen ASTM, Shelby	Shelby 13		
34	N 7,398 E 9,963	158.17	586.0	Proposed Plant Area	Rotary Wash, Standard Pen ASTM, NX Core	None		
37	N 9,006 E 11,987	133.0	588.0	Original Proposed Coal Storage Area	Rotary Wash, Standard Pen ASTM	None		
38	N 9,007 E 13,035	153.0	598.3	Original Proposed Coal Storage Area	Rotary Wash, Standard Pen ASTM, Shelby, NX Core	Shelby 11		

NOTE: Borings 35&36 not drilled.

ED_005947A_00014551-00318

Hole No	Location	Depth(ft)	Surface Elevation	Purpose	Type Drilling	Number and Type U.D. Samples Taken	Ground Water Level[1] Depth(ft)	Date
49	N 3,695 E 12,440	155.0	586.6	Proposed Conveyor System	Rotary Wash, Standard Pen ASTM, Shelby, NX Core	Shelby 15		
50	N 2,951 E 15,471	153.75	581.8	Proposed Dock Area	Rotary Wash, Standard Pen ASTM, Shelby, NX Core	Shelby 10		
52	N 2,375 E 15,271	158.5	582.1	Proposed Dock Area	Rotary Wash, Standard Pen ASTM, Shelby, Osterberg, NX Core	Shelby 2 Osterberg 11		
53	N 2,052 E 15,176	154.91	580.6	Proposed Dock Area	Rotary Wash, Standard Pen ASTM, Shelby, Osterberg, NX Core	Shelby 8 Osterberg 5		
54	N 2,937 E 15,537	147.67	541.6	Proposed Dock Area	Rotary Wash, Standard Pen ASTM, Shelby, Osterberg, NX Core	Shelby 17 Osterberg 2		
55	N 2,645 E 15,506	100.0	547.9	Proposed Dock Area	Rotary Wash, Standard Pen ASTM	None		
56	N 2,296 E 15,399	102.0	547.5	Proposed Dock Area	Rotary Wash, Standard Pen ASTM	None		
57	N 1,907 E 15,247	120.2	548.3	Proposed Dock Area	Rotary Wash, Standard Pen ASTM, Osterberg, NX Core	Osterberg 1		
58	N 2,725 E 15,224	162.0	583.5	Proposed Dock Area	Rotary Wash, Standard Pen ASTM, NX Core	None		

NOTE: Boring 51 not drilled.

ED_005947A_00014551-00319

Hole No	Location	Depth(ft)	Surface Elevation	Purpose	Type Drilling	Number and Type U.D. Samples Taken	Ground Water Level[1] Depth(ft)	Date
105	N 4,979 E 10,998	160.3	588.3	Proposed Coal Storage Area	Rotary Wash, Standard Pen ASTM, Shelby, Pitcher, Osterberg, NX Core	Shelby 4 Pitcher 2 Osterberg 6		
106	N 4,836 E 12,528	140.0	589.7	Proposed Coal Storage Area	Rotary Wash, Standard Pen ASTM	None		
109	N 6,450 E 13,140	142.7	600.7	Proposed Coal Storage Area	Rotary Wash, Standard Pen ASTM	None		
110	N 6,570 E 12,830	146.3	599.8	Proposed Coal Storage Area	Rotary Wash, Standard Pen ASTM, Shelby, Osterberg	Shelby 12 Osterberg 5		
111	N 6,600 E 11,000	140.0	588.5	Original Proposed Coal Storage Area	Rotary Wash, Standard Pen ASTM	None		
112	N 6,824 E 8,900	160.5	587.0	Original Proposed Switchyard	Rotary Wash, Standard Pen ASTM, Shelby, NX Core	Shelby 3		
113	N 6,800 E 9,360	164.3	587.4	Proposed Switchyard	Rotary Wash, Standard Pen ASTM, Shelby, NX Core	Shelby 3		
114	N 6,980 E 13,360	144.2	599.5	Proposed Coal Storage Area	Rotary Wash, Standard Pen ASTM	None		
115	N 7,100 E 13,060	144.0	600.7	Proposed Coal Storage Area	Rotary Wash, Standard Pen ASTM, Shelby	Shelby 14		
116	N 7275.71 E 8897.94	180.5	585.6	Benchmark	Rotary Wash, Standard Pen ASTM, Shelby, NX Core	Shelby 14		

NOTE: Borings 107&108 not drilled.

ED_005947A_00014551-00320

Hole No	Location	Depth(ft)	Surface Elevation	Purpose	Type Drilling	Number and Type U.D. Samples Taken	Ground Water Level[1] Depth(ft)	Date
128	N 3,000 E 11,000	141.5	589.5	Proposed Coal Storage Area	Rotary Wash, Standard Pen ASTM	None		
129	N 3,000 E 12,000	158.8	586.0	Proposed Coal Storage Area	Rotary Wash, Standard Pen ASTM, Pitcher, Osterberg, NX Core	Pitcher 9 Osterberg 3		
130	N 9,014 E 4,993	145.0	595.3	Proposed Ash Disposal Area	Rotary Wash, Standard Pen ASTM	None		
131	N 9,400 E 6,000	105.0	589.9	Proposed Ash Disposal Area	Rotary Wash, Standard Pen ASTM	None		
134	N 10,050 E 4,995	128.5	594.6	Proposed Ash Disposal Area	Rotary Wash, Standard Pen ASTM	None		
135	N 10,050 E 6,000	70.0	591.3	Proposed Ash Disposal Area	Rotary Wash, Standard Pen ASTM	None		
136	N 10,050 E 7,000	130.0	590.2	Proposed Ash Disposal Area	Rotary Wash, Standard Pen ASTM, Shelby	Shelby 3		
137	N 10,050 E 8,000	71.0	588.9	Proposed Ash Disposal Area	Rotary Wash, Standard Pen ASTM	None		
138	N 10,030 E 8,977	145.0	588.7	Proposed Ash Disposal Area	Rotary Wash, Standard Pen ASTM	None		
139	N 10,866 E 4,990	145.5	595.7	Proposed Ash Disposal Area	Rotary Wash, Standard Pen ASTM	None		
140	N 10,850 E 6,003	70.5	592.0	Proposed Ash Disposal Area	Rotary Wash, Standard Pen ASTM	None		

NOTE: Borings 132&133 not drilled.

ED_005947A_00014551-00321

Hole No	Location	Depth(ft)	Surface Elevation	Purpose	Type Drilling	Number and Type U.D. Samples Taken	Ground Water Level[1] Depth(ft)	Date
154	N 13,785 E 8,000	165.0	599.0	Proposed Ash Disposal Area	Rotary Wash, Standard Pen ASTM	None		
155	N 14,001 E 5,996	70.0	601.4	Proposed Ash Disposal Area	Rotary Wash, Standard Pen ASTM	None		
157	N 14,000 E 8,000	70.0	591.5	Proposed Ash Disposal Area	Rotary Wash, Standard Pen ASTM	None		
158	N 14,000 E 9,000	130.0	589.6	Proposed Ash Disposal Area	Rotary Wash, Standard Pen ASTM, Shelby	Shelby 4		
159	N 14,000 E 9,950	70.0	591.3	Proposed Ash Disposal Area	Rotary Wash, Standard Pen ASTM	None		
160	N 14,522 E 4,880	159.0	595.5	Proposed Ash Disposal Area	Rotary Wash, Standard Pen ASTM	None		
163	N 15,000 E 8,000	138.0	591.4	Proposed Ash Disposal Area	Rotary Wash, Standard Pen ASTM	None		
164	N 15,000 E 9,000	70.0	591.4	Proposed Ash Disposal Area	Rotary Wash, Standard Pen ASTM	None		
165	N 14,830 E 9,938	156.5	594.3	Proposed Ash Disposal Area	Rotary Wash, Standard Pen ASTM	None		
180	N 2,925 E 12,180	140.0	588.0	Proposed Coal Storage Area	Rotary Wash, Standard Pen ASTM	None		
181	N 3,525 E 12,533	144.0	590.8	Observation Well	Rotary Wash, Standard Pen ASTM	None	10.0	4-25-74

NOTE: Borings 152,153,156,161,162 and 165-179 not drilled.

ED_005947A_00014551-00322

CONSISTENCY OF COHESIVE & SEMI-COHESIVE SOILS

V. Soft Almost completely lacks resistance to external forces causing deformation.
Will slump or deform of its own weight.
When squeezed in fist, it will riboon or ooze out between fingers.
Sometimes referred to as "toothpaste" consistency.
Moisture content near or above liquid limit (wet).

Soft Only slightly resistant to external forces causing deformation.
Will support its own weight.
When squeezed in fist, impression of fingers is marked and soil will squeeze between fingers.
Can be molded to any shape without resistance.
Mositure content well above plastic limit (very moist).

Medium (Plastic) May be deformed readily without rupture.
When squeezed in fist, impression by fingers will be pronounced but it will not squeeze.
Can be molded to any shape, but offers some resistance--will probably "check" or crack slightly.
Moisture content slightly above plastic limit (moist).

Firm Moderately resistant to external forces causing rupture.
Lumps or cores can be broken by fingers.
When squeezed in fist, impression by fingers is slight. No tendency to squeeze.
Will rupture and lose structure if molding is attempted from original shape. Once structure is lost, however, it can be molded or "packed."
Moisture content near the plastic limit (damp to moist).

Stiff Resistant to external forces causing deformation.
Lumps or cores can be broken by fingers.
When squeezed in fist, or pressed by thumb, indentation by fingers is only slight regardless of pressure applied.
Cannot be molded from original shape.
Moisture content near the shrinkage limit (damp).

Hard Very resistant to external forces causing deformation.
Lumps or cores can be broken by fingers, but with difficulty.
Cannot be indented by fingers or thumb, but can be scored readily by fingernail.
Moisture content below the shrinkage limit (dry).

V. Hard Extremely resistant to external forces causing deformation.
Lumps or cores cannot be broken by fingers.
Cannot be indented by fingers or thumb; can be scored only slightly by fingernail.
Moisture content below the shrinkage limit (dry).

CONSISTENCY OF GRANULAR SOILS (by standard penetration index)

V. Loose	-- 0-4 blows
Loose	-- 5-10 blows
Medium Compact	-- 11-25 blows
Compact	-- 26-50 blows
V. Compact	-- 50+ blows

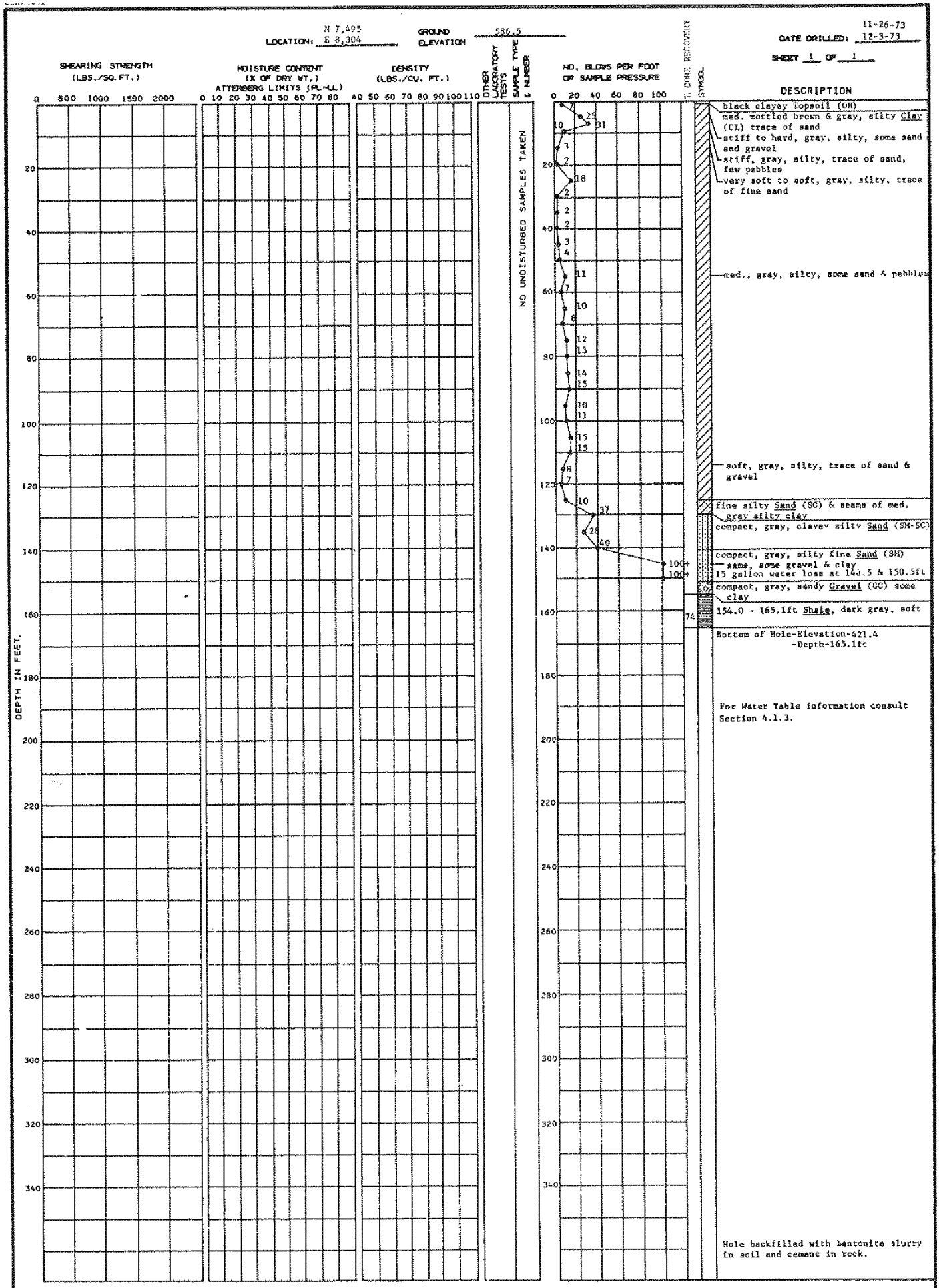
ED_005947A_00014551-00323

LOCATION: N 7,495 / E 8,304

GROUND ELEVATION 586.5

DATE DRILLED: 11-26-73 / 12-3-73

SHEET 1 OF 1



DESCRIPTION

black clayey Topsoil (OH)
med. mottled brown & gray, silty Clay (CL) trace of sand
stiff to hard, gray, silty, some sand and gravel
stiff, gray, silty, trace of sand, few pebbles
very soft to soft, gray, silty, trace of fine sand
med., gray, silty, some sand & pebbles
soft, gray, silty, trace of sand & gravel
fine silty Sand (SC) & seams of med. gray silty clay
compact, gray, clayey silty Sand (SM-SC)
compact, gray, silty fine Sand (SM)
same, some gravel & clay
15 gallon water loss at 140.5 & 150.5ft
compact, gray, sandy Gravel (GC) some clay
154.0 - 165.1ft Shale, dark gray, soft

Bottom of Hole-Elevation-421.4
-Depth-165.1ft

For Water Table information consult Section 4.1.3.

Hole backfilled with bentonite slurry in soil and cement in rock.

SOIL BORING NO. 8

BECHTEL Belle River

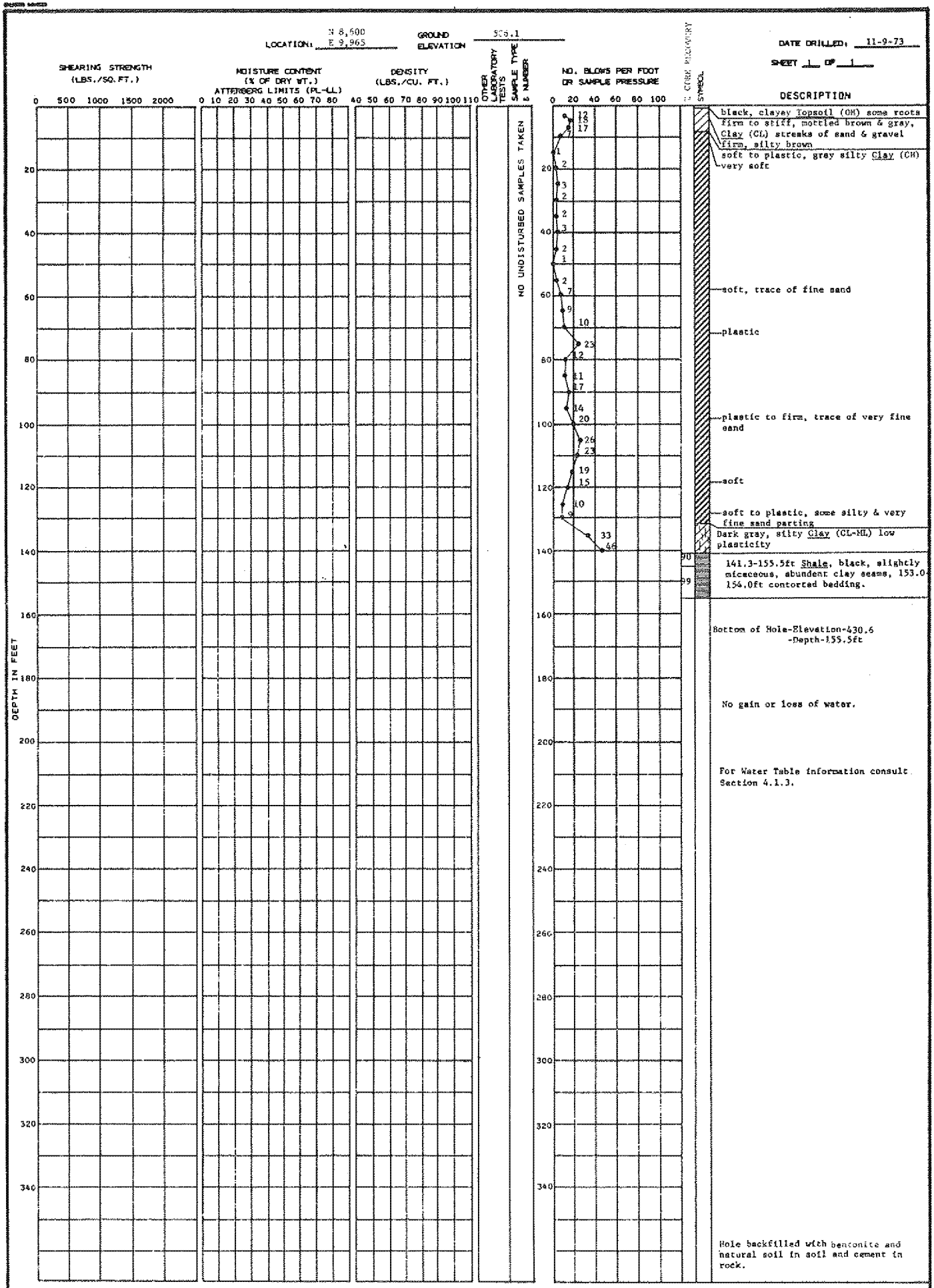
B-15

LOCATION: N 8,600 E 9,965

GROUND ELEVATION 556.1

DATE DRILLED: 11-9-73

SHEET 1 OF 1



SOIL BORING NO. 10

BECHTEL

Belle River

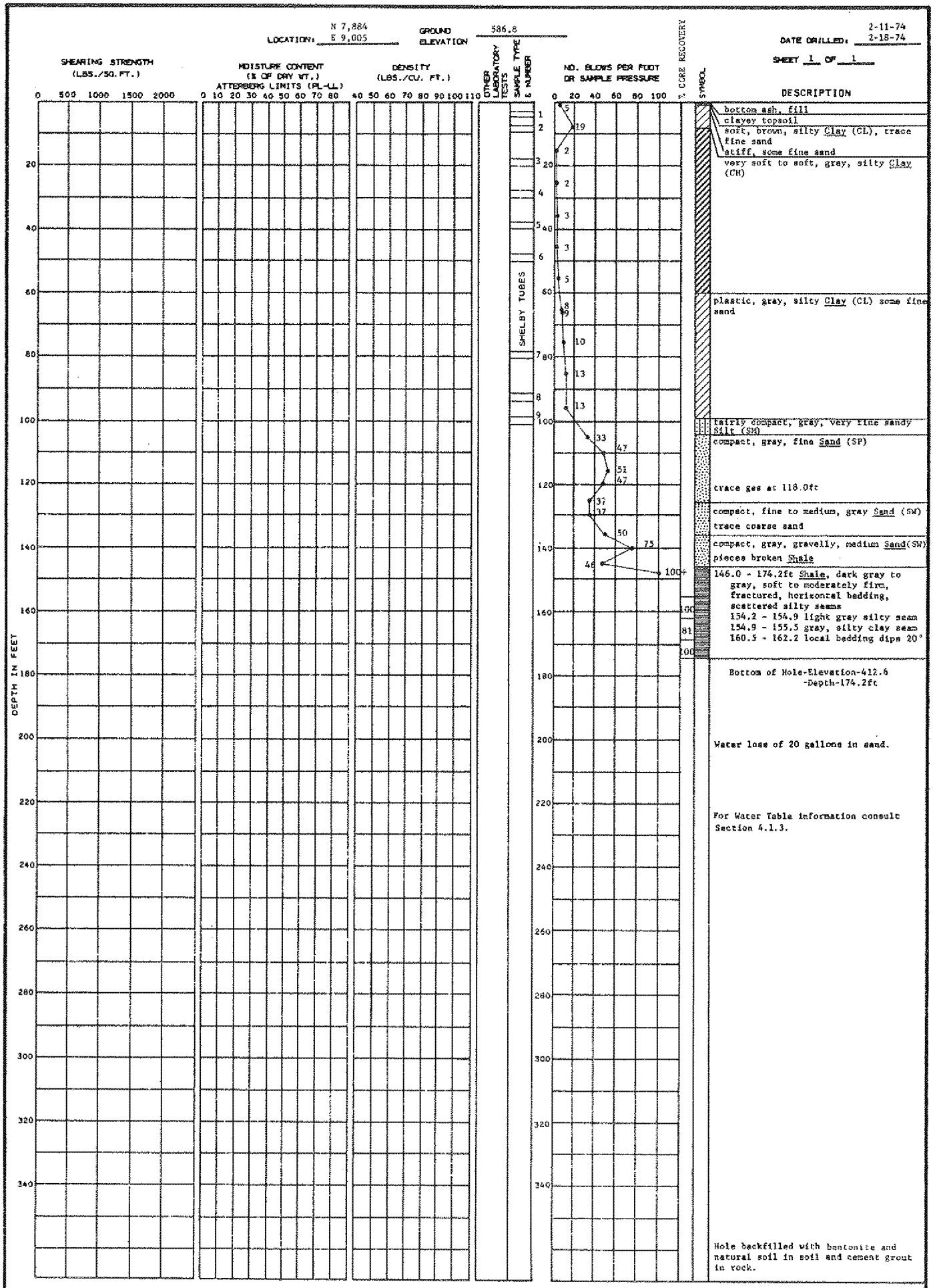
B-17

LOCATION: N 7,884 E 9,005

GROUND ELEVATION 586.8

DATE DRILLED: 2-11-74 2-18-74

SHEET 1 OF 1



SOIL BORING NO. 12

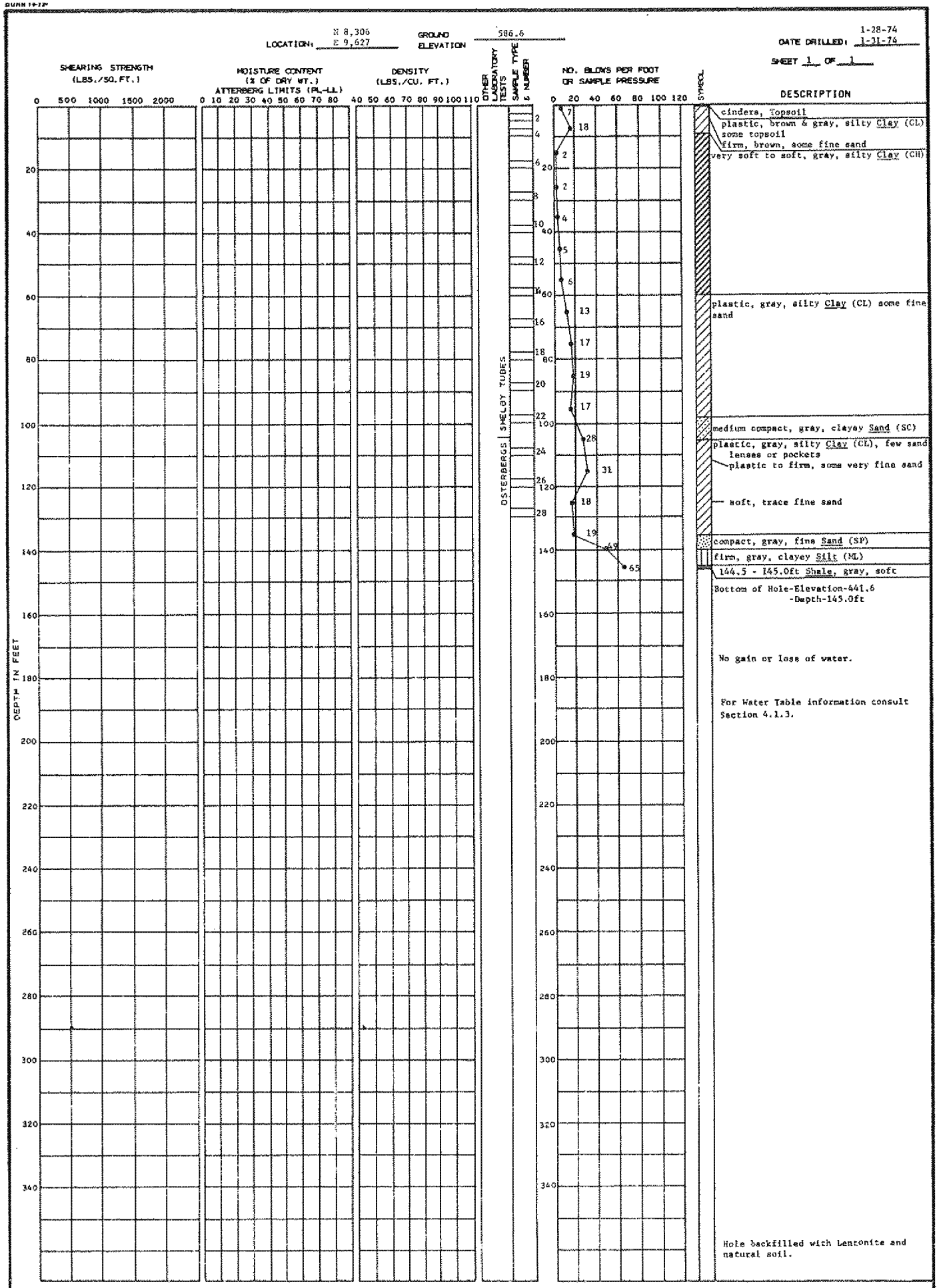
BECHTEL Belle River

LOCATION: N 8,306 E 9,627

GROUND ELEVATION 586.6

DATE DRILLED: 1-28-74 1-31-74

SHEET 1 OF 1



SOIL BORING NO. 14

BECHTEL Bella River

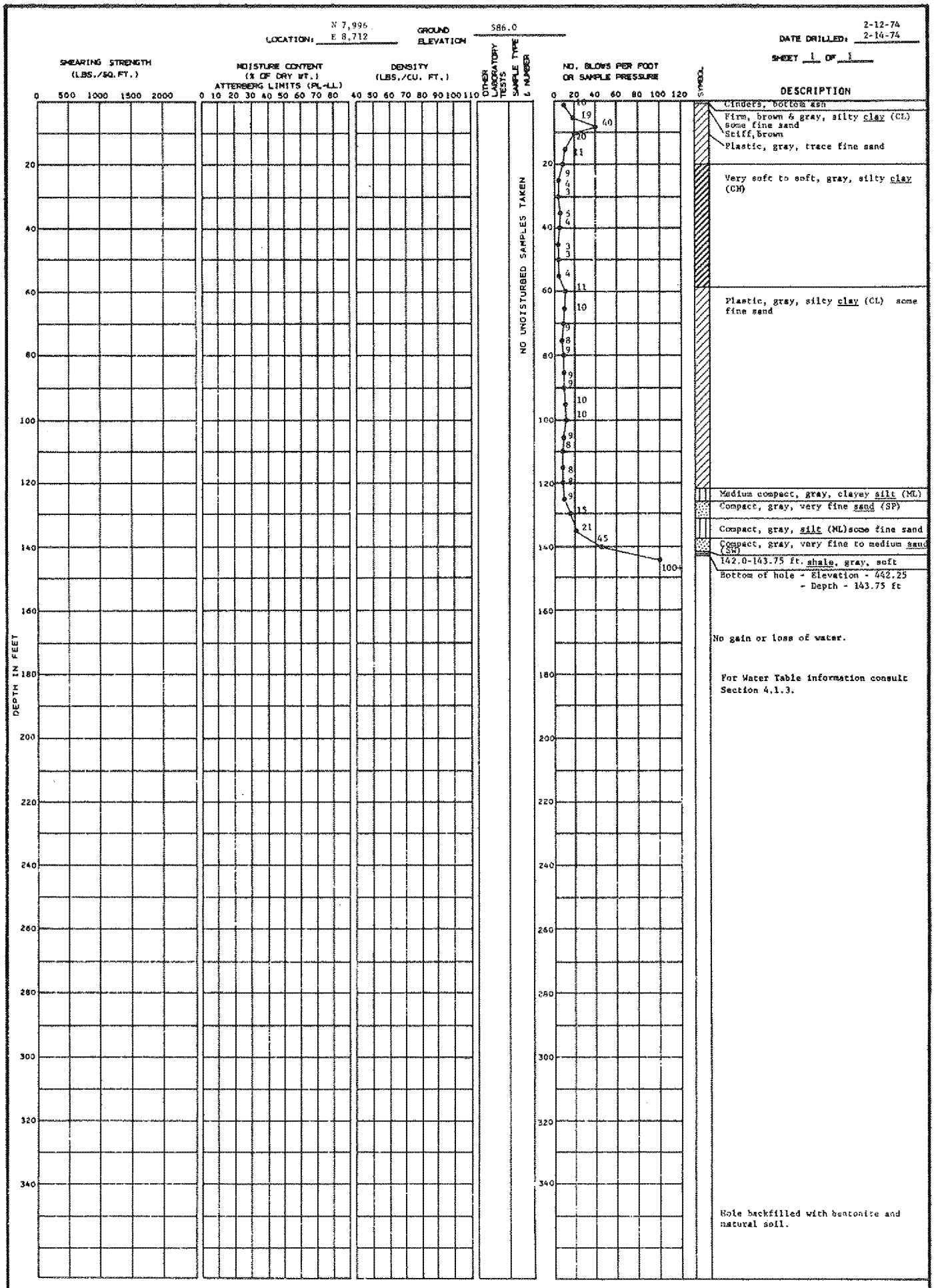
B-21

LOCATION: N 7,996 E 8,712

GROUND ELEVATION 586.0

DATE DRILLED: 2-12-74 2-14-74

SHEET 1 OF 1



SOIL BORING NO. 16

BECHTEL Belle River

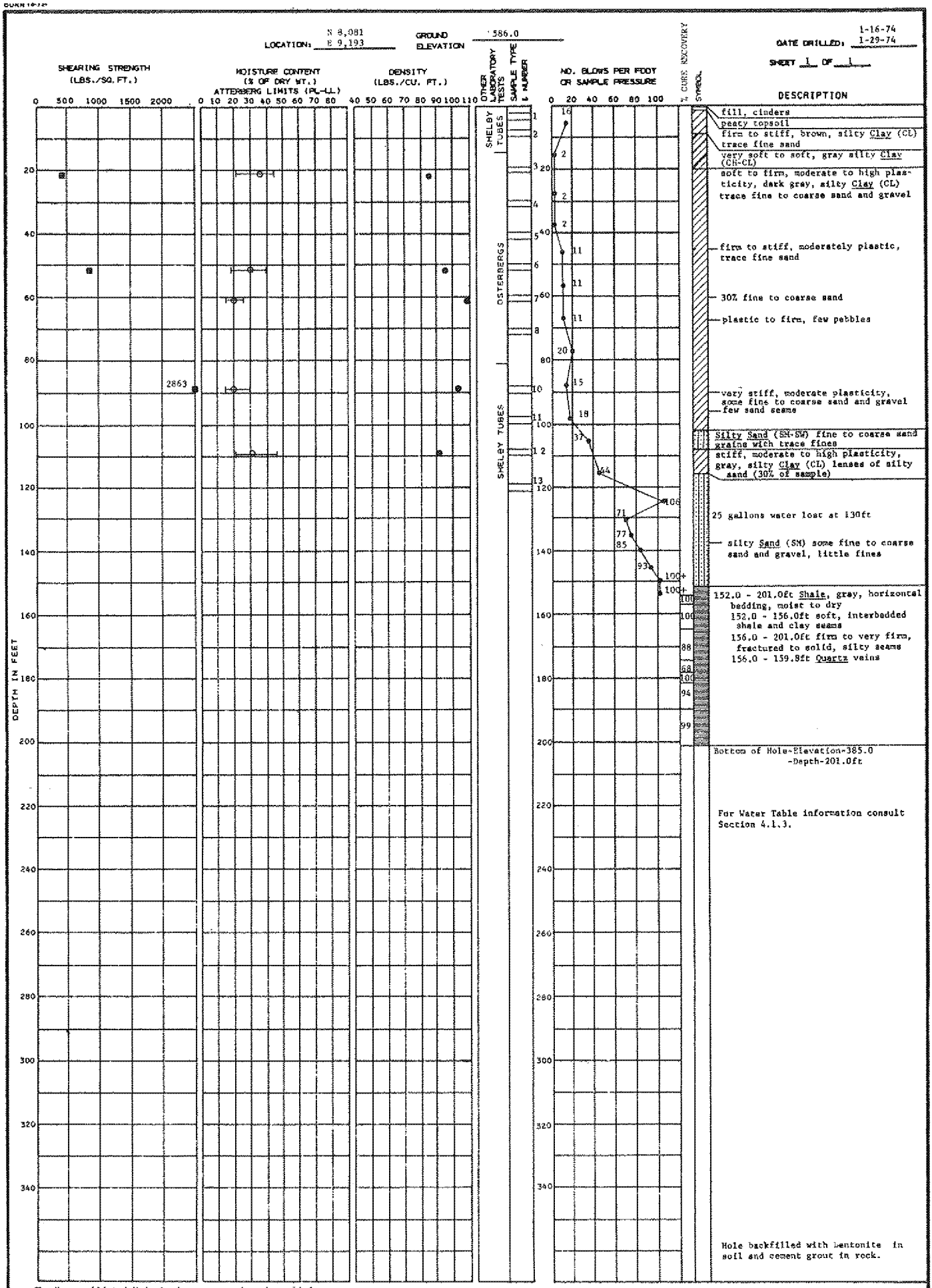
B-23

LOCATION: N 8,081 E 9,193

GROUND ELEVATION 586.0

DATE DRILLED: 1-16-74 1-29-74

SHEET 1 OF 1



SOIL BORING NO. 18

BECHTEL Belle River

B-25

LOCATION: N 8,011 E 9,337

GROUND ELEVATION 586.5

DATE DRILLED: 1-17-74 1-23-74

SHEET 1 OF 1

SHEARING STRENGTH (LBS./SQ.FT.) 0 500 1000 1500 2000

MOISTURE CONTENT (% OF DRY WT.) ATTERBERG LIMITS (PL-LL) 0 10 20 30 40 50 60 70 80

DENSITY (LBS./CU. FT.) 40 50 60 70 80 90 100 110

OTHER LABORATORY TESTS

SAMPLE TYPE & NUMBER

NO. BLOWS PER FOOT OR SAMPLE PRESSURE 0 20 40 60 80 100

% CORE RECOVERY

SYMBOL

DESCRIPTION

DEPTH IN FEET

SHELBY TUBES

bottom ash fill

Topsoil

plastic, brown, silty Clay (CL), trace sand

firm, brown & gray

very soft to soft, gray, silty Clay(CH)

plastic to firm, gray, silty Clay (CL) some fine sand, trace pebbles

firm, few pebbles

plastic, trace fine sand

medium compact, fine sandy Silt (ML), trace clay

medium compact, very fine Sand (SP), trace silt, trace gas at 136.0ft

136.5 - 145.8ft Shale, gray, soft, disintegrated, moist, silty

145.8 - 147.9ft Sand gray, fine to medium grain, clayey

147.0 - 164.3ft Shale, gray, firm, fractured, horizontal bedding, dry 147.0 - 152.8ft soft, fractured to disintegrated

Bottom of Hole-Elevation-422.2 -Depth-164.3ft

No gain or loss of water.

For Water Table information consult Section 4.1.3.

Hole backfilled with bentonite and natural soil in soil and cement grout in rock.

SOIL BORING NO. 20

BECHTEL Belle River

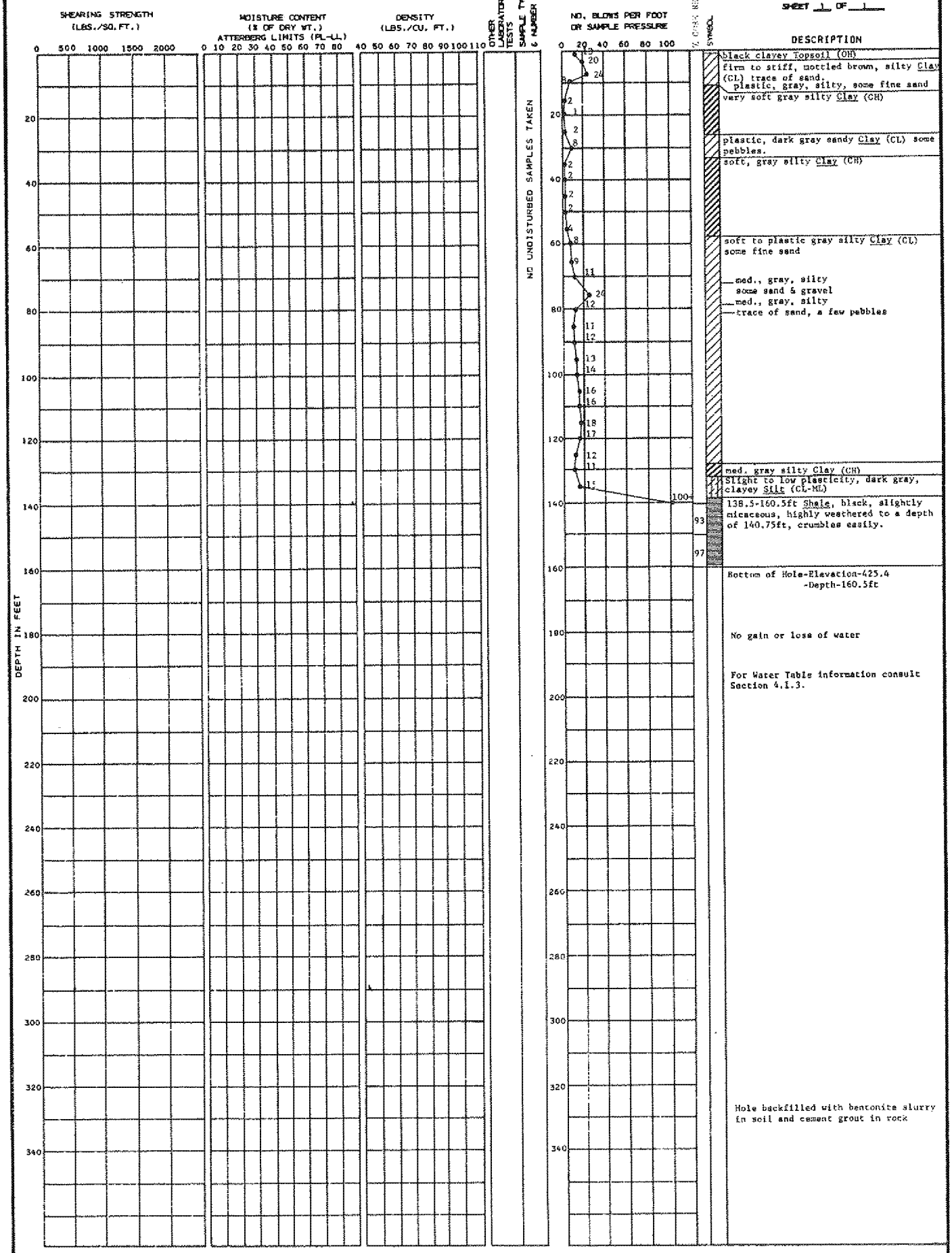
B-27

LOCATION: N.8,002 E.9,943

GROUND ELEVATION 385.9

DATE DRILLED: 11-20-73

SHEET 1 OF 1



DESCRIPTION

black clayey Topsoil (OH)

firm to stiff, mottled brown, silty Clay (CL) trace of sand.

plastic, gray, silty, some fine sand

very soft gray silty Clay (CH)

plastic, dark gray sandy Clay (CL) some pebbles.

soft, gray silty Clay (CH)

soft to plastic gray silty Clay (CL) some fine sand

med., gray, silty some sand & gravel

med., gray, silty trace of sand, a few pebbles

med. gray silty Clay (CH)

Slight to low plasticity, dark gray, clayey Silt (CL-ML)

138.5-160.5ft Shale, black, slightly micaceous, highly weathered to a depth of 140.75ft, crumbles easily.

Bottom of Hole-Elevation-425.4 -Depth-160.5ft

No gain or loss of water

For Water Table information consult Section 4.1.3.

Hole backfilled with bentonite slurry in soil and cement grout in rock

SOIL BORING NO. 22

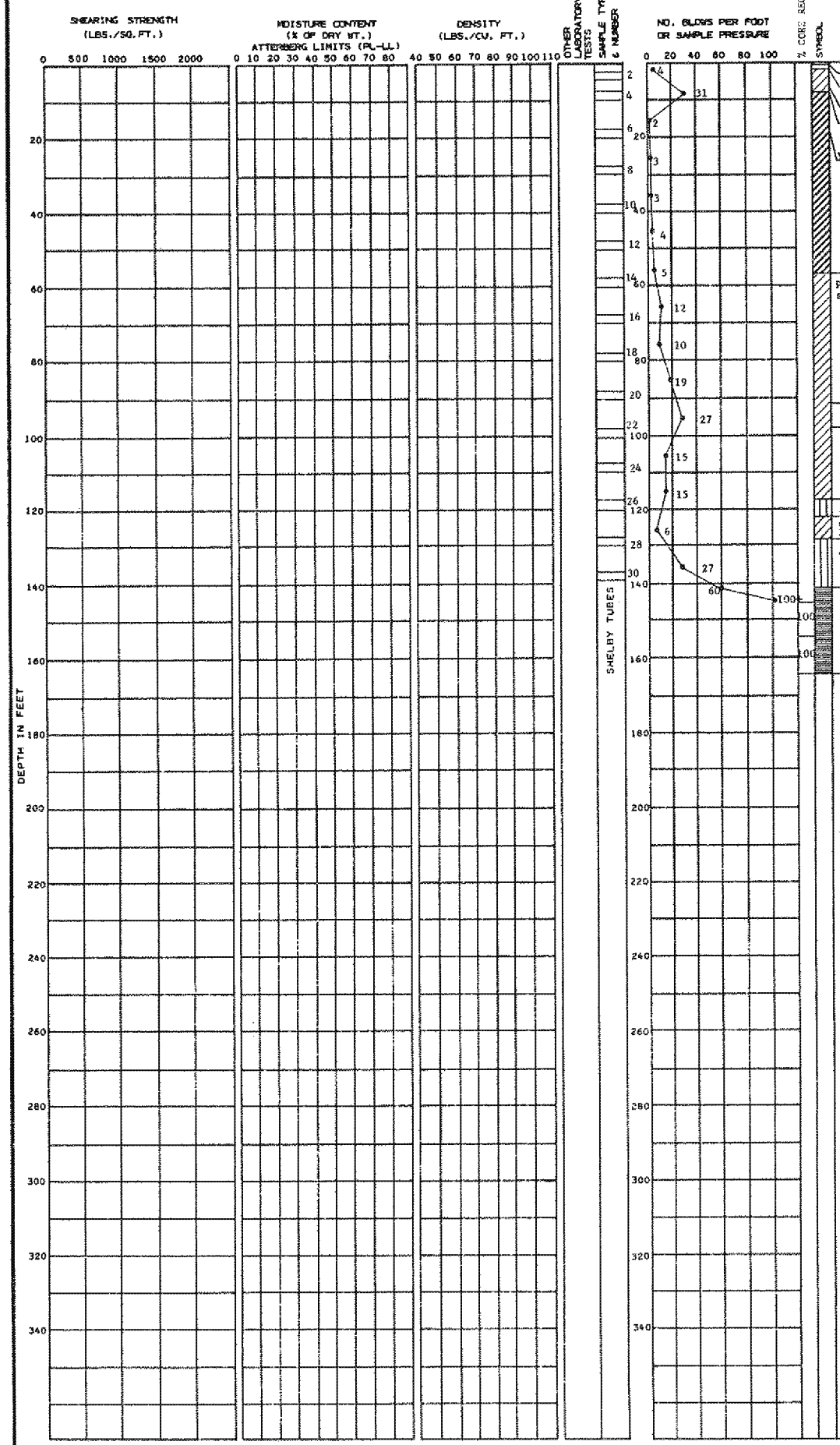
BECHTEL Belle River

LOCATION: N 7,904 E 9,436

GROUND ELEVATION 586.3

DATE DRILLED: 1-30-74 2-5-74

SHEET 1 OF 1



DESCRIPTION

cinders

sand, topsoil

soft, brown & gray, silty Clay (CL) trace very fine sand

stiff, brown, trace fine sand

very soft to soft, gray, silty Clay (CH)

▽ 4-25-74: Elevation of water-566.7 Depth of water-19.6 ft.

plastic, gray, silty Clay (CL) some fine sand

— firm

— soft to plastic

fairly compact, gray, clayey Silt (ML)

plastic, gray, silty Clay (CL) trace very fine sand

compact, gray Silt (ML) some very fine sand

142.0 - 164.0ft Shale, medium to dark gray, soft, disintegrated to fractured, horizontal bedding, with Quartz veins from 145.2 to 147.7, more firm below 154.0ft

Bottom of Hole-Elevation-422.3 -Depth-164.0ft

Piezometer Installation: cement backfill from 164.0' to 139.0', 5.0' of sludge pipe with bentonite around sludge pipe from 139.0' to 134.0', 4.0' of #80 Screen from 134.0' to 130.0' with sand pack around screen, 134.41' of 2" PVC from 130.0' to 4.41' above surface, backfill with bentonite around casing from 130.0' to ground surface.

For Water Table information consult Section 4.1.3.

SOIL BORING NO. 24

BECHTEL Belle River

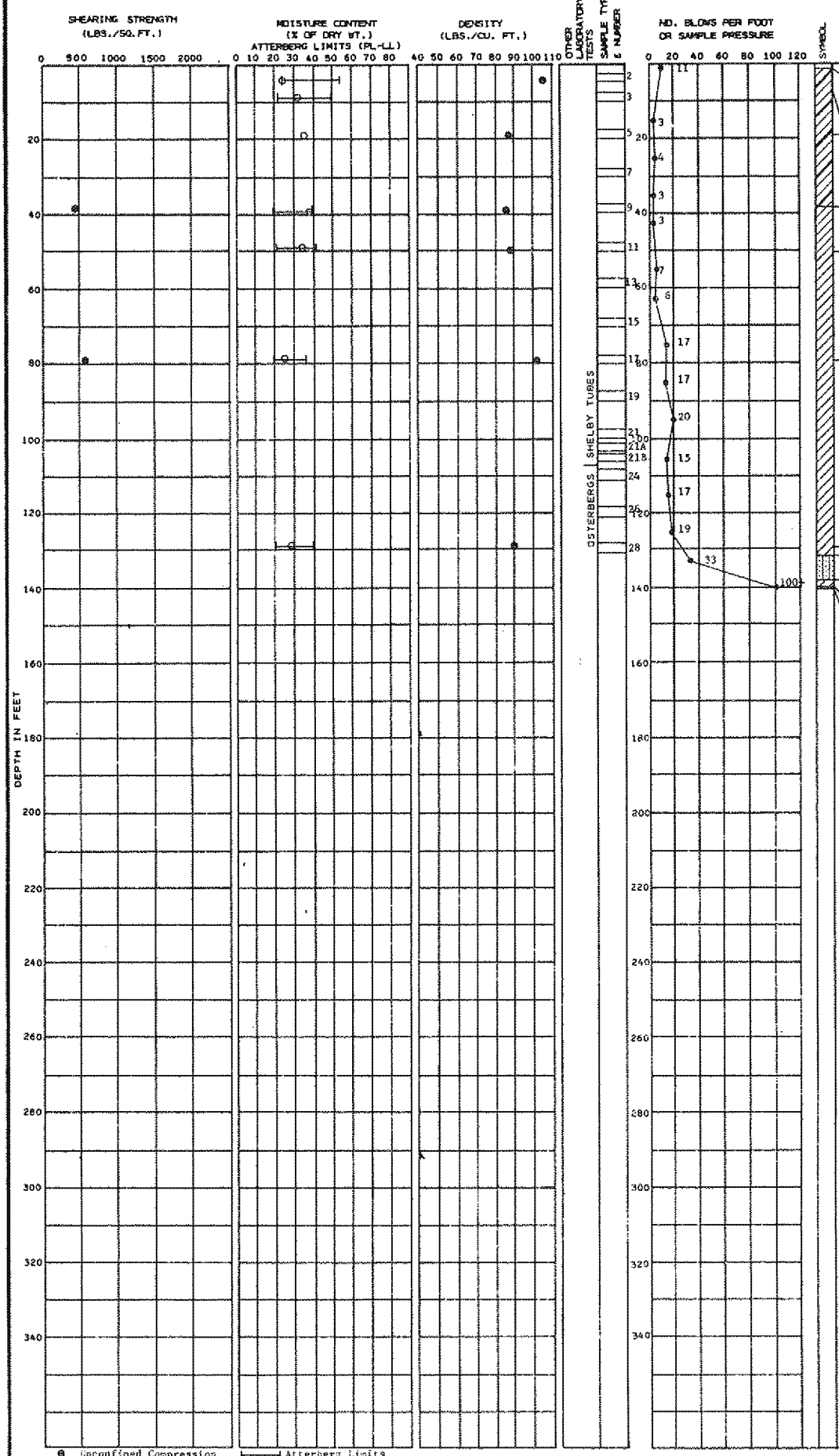
B-31

LOCATION: N 7,890 E 9,763

GROUND ELEVATION 585.6

DATE DRILLED: 12-12-73 12-19-73

SHEET 1 OF 1



DESCRIPTION

Black sandy topsoil

very stiff, moderate to high plasticity brown, silty Clay (CL-CH) some fine to coarse sand and fine gravel

firm, gray

15% fine gravel and coarse sand

Soft to firm, highly plastic, gray, silty Clay (CL)

20% fine to coarse sand

firm to stiff, medium plasticity, 35% sand and gravel

30-40% fine sand & silt in thin layers

compact, gray, silty Sand (SM-SC) some clay

hard, gray Clay (CL) with shale, crumbles easily (Hardpan)

140.0-140.5 ft. Shale, soft, gray

Bottom of Hole - Elevation - 444.6
- Depth - 141.0 ft.

No gain or loss of water

For Water Table information consult Section 4.1.3.

Hole backfilled with bentonite

SOIL BORING NO. 26

BECHTEL Belle River

B-33

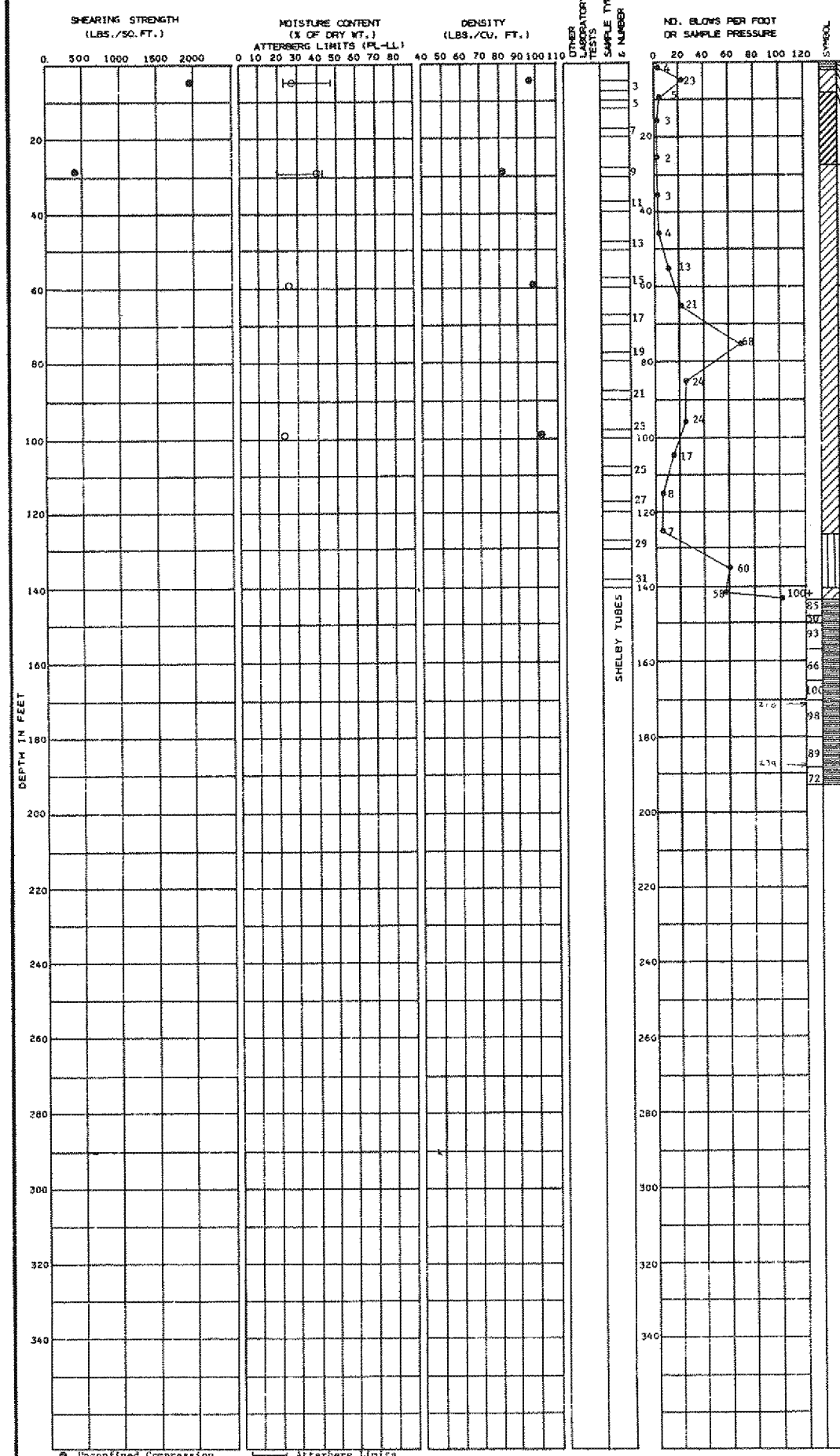
DUNN 14-72F

LOCATION: N 7,724 E 9,443

GROUND ELEVATION 585.8

DATE DRILLED: 1-15-74 1-22-74

SHEET 1 OF 1



DESCRIPTION

- cinders fill
- black sandy Topsoil
- brown, silty, fine Sand (SM)
- medium to stiff, brown & gray, silty Clay (CL) medium to high plasticity
- stiff
- soft, gray, silty Clay (CH)
- soft, medium to high plasticity, gray silty Clay (CL)
- medium to stiff, medium plasticity, 15% fine to coarse sand
- very stiff, gray, silty fine sandy, with seams of fine sand, trace pebbles
- plastic to firm, gray silty, trace of fine sand
- stiff, 15% fine to coarse sand, medium to high plasticity
- med. compact, clayey Silt (ML), trace of fine sand
- hard, very sandy Clay (CL) some pebbles, some decomposed Shale (Hardpan)
- 143.8 - 193.5ft Shale, gray, soft to firm, disintegrated to fractured, moist to dry, horizontal bedding

Bottom of Hole-Elevation-392.3
-Depth-193.5ft

No gain or loss of water.

For Water Table information consult Section 4.1.3.

Hole backfilled with Bentonite and natural soil in soil and cement grout in rock.

SOIL BORING NO. 28

BECHTEL Belle River

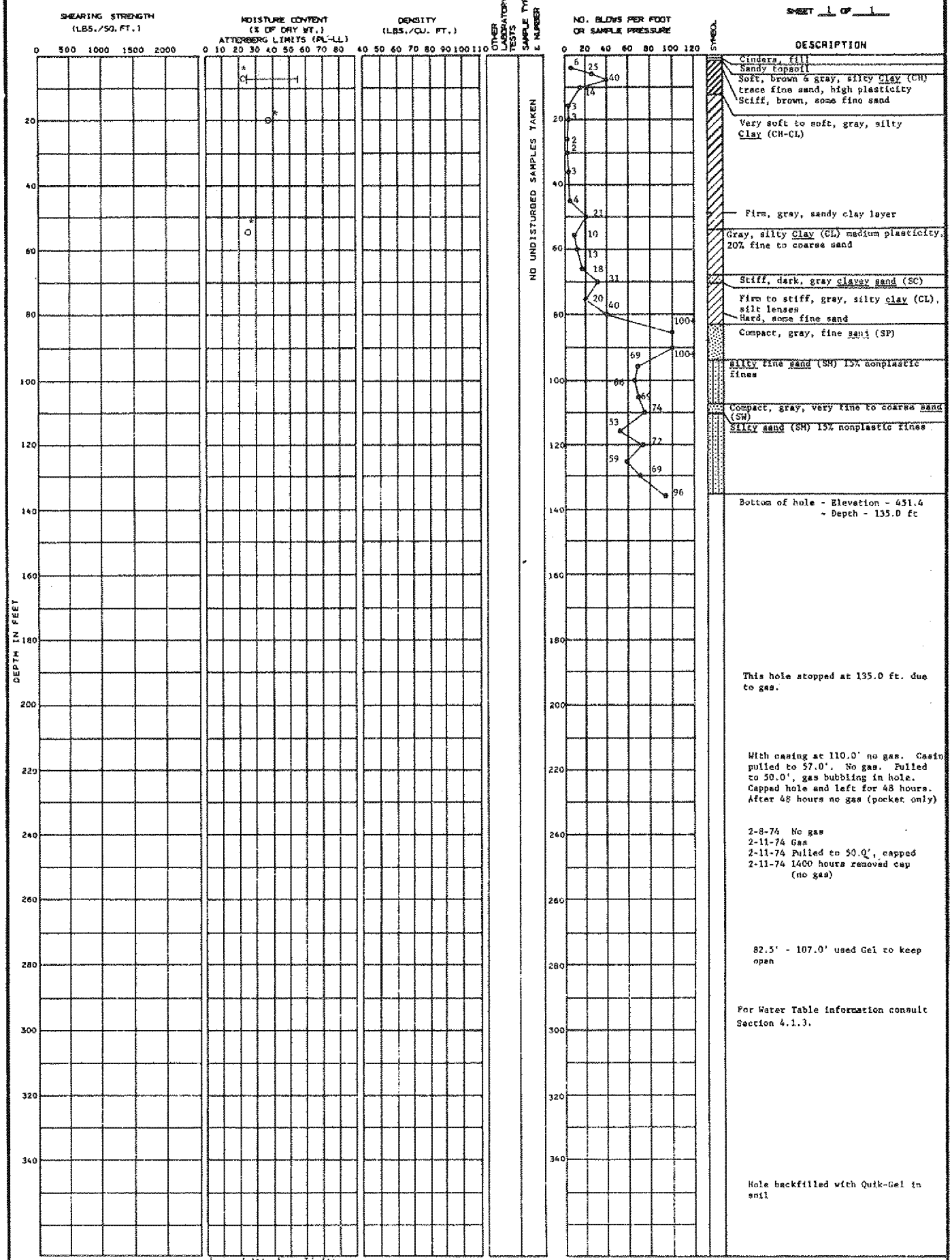
B-35

LOCATION: N 7,673 E 9,015

GROUND ELEVATION 586.4

DATE DRILLED: 2-7-74 2-11-74

SHEET 1 OF 1



DESCRIPTION

Cinders, fill
Sandy topsoil
Soft, brown & gray, silty Clay (CH) trace fine sand, high plasticity
Stiff, brown, some fine sand

Very soft to soft, gray, silty Clay (CH-CL)

Firm, gray, sandy clay layer

Gray, silty Clay (CL) medium plasticity, 20% fine to coarse sand

Stiff, dark, gray clayey sand (SC)

Firm to stiff, gray, silty clay (CL), silt lenses
Hard, some fine sand

Compact, gray, fine sand (SP)

Silty fine sand (SM) 15% nonplastic fines

Compact, gray, very fine to coarse sand (SW)
Silty sand (SM) 15% nonplastic fines

Bottom of hole - Elevation - 451.4
- Depth - 135.0 ft

This hole stopped at 135.0 ft. due to gas.

With casing at 110.0' no gas. Casing pulled to 57.0'. No gas. Pulled to 50.0', gas bubbling in hole. Capped hole and left for 48 hours. After 48 hours no gas (pocket only)

2-8-74 No gas
2-11-74 Gas
2-11-74 Pulled to 50.0', capped
2-11-74 1400 hours removed cap (no gas)

82.5' - 107.0' used Gel to keep open

For Water Table Information consult Section 4.1.3.

Hole backfilled with Quik-Gel in soil

SOIL BORING NO. 30

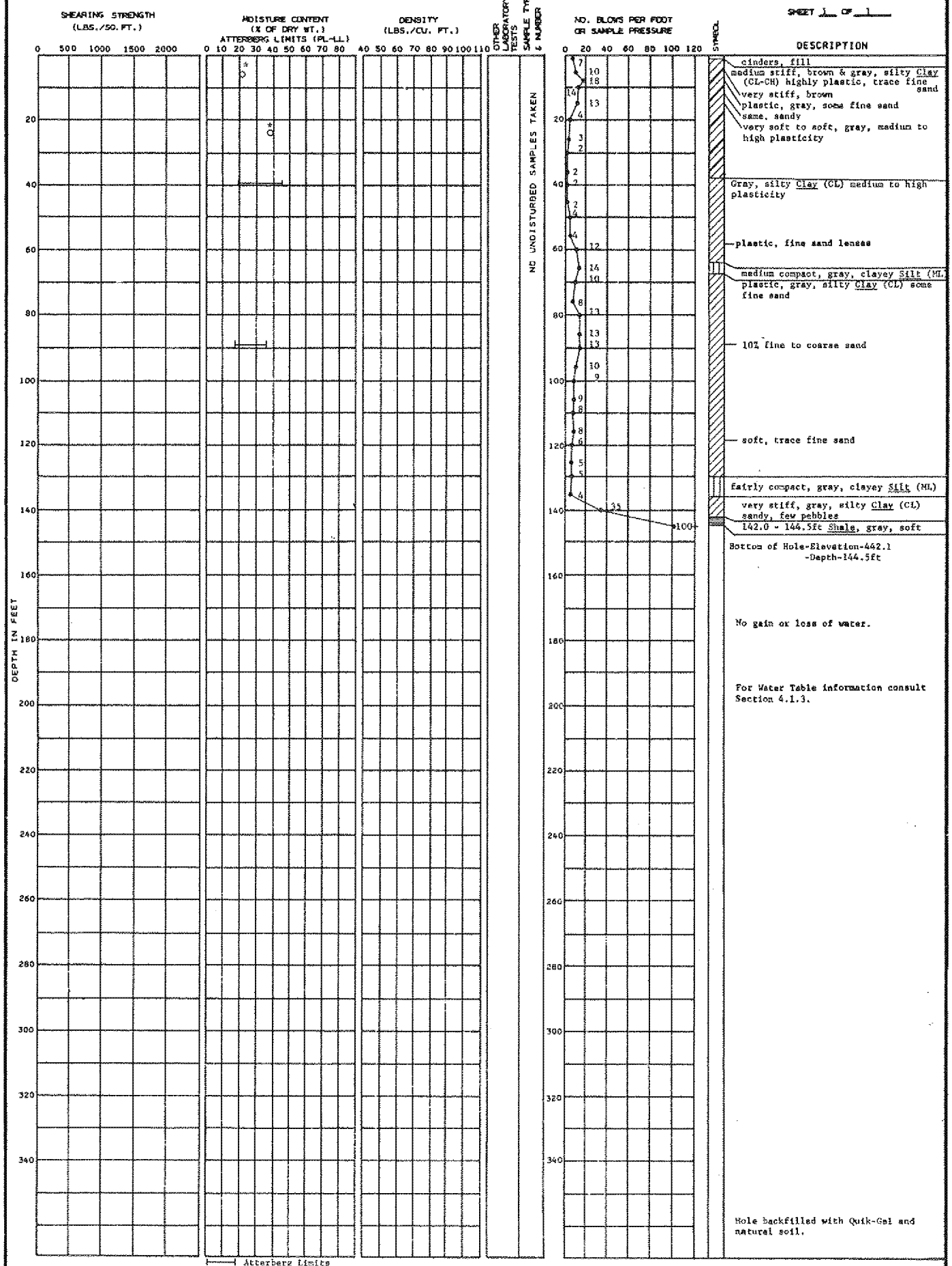
BECHTEL Belle River

LOCATION: N 7,663 E 9,659

GROUND ELEVATION 586.6

DATE DRILLED: 2-6-74 / 2-12-74

SHEET 1 OF 1



SOIL BORING NO. 32

BECHTEL Belle River

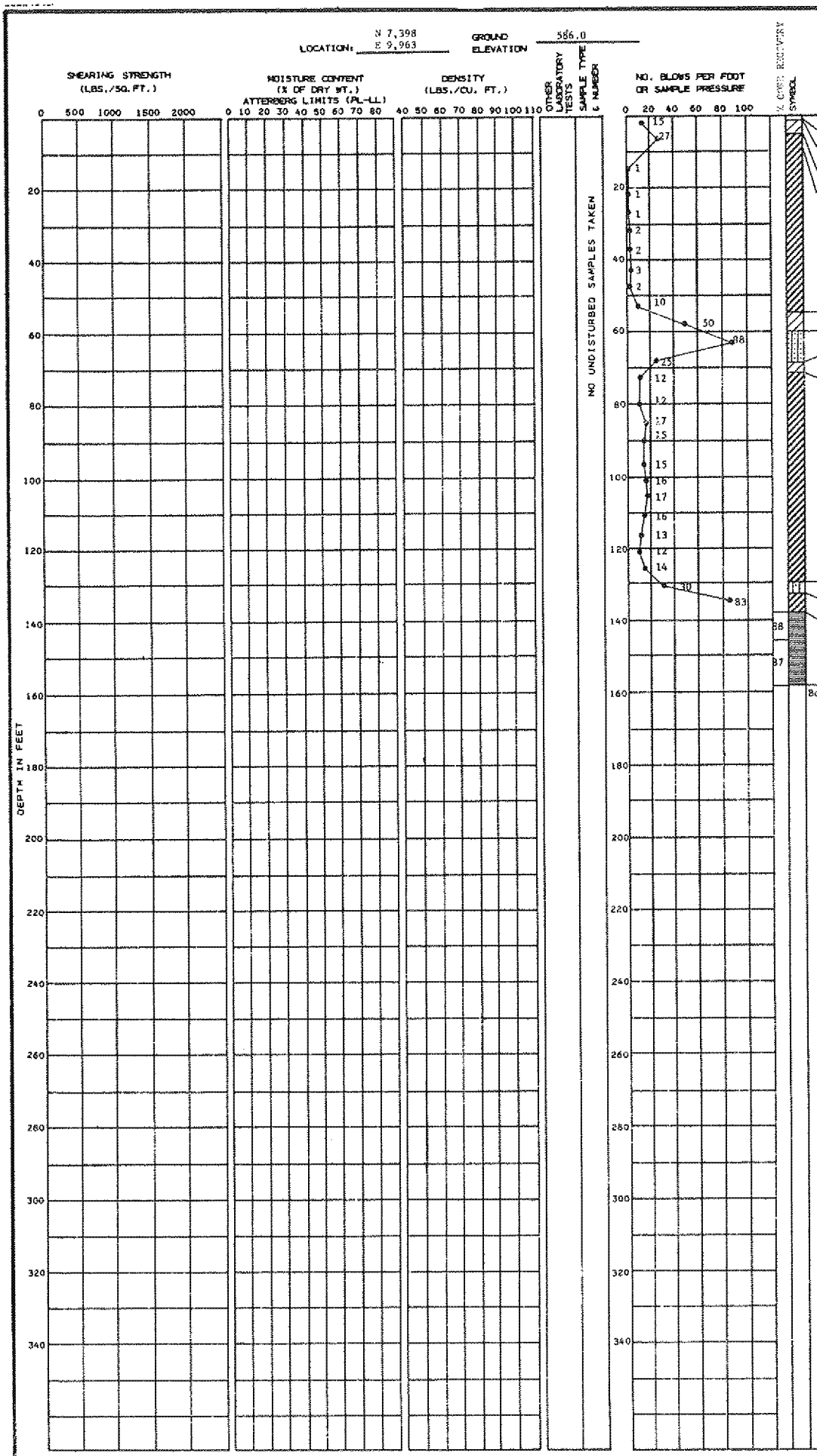
B-39

LOCATION: N 7,398 E 9,963

GROUND ELEVATION 586.0

DATE DRILLED: 11-8-73

SHEET 1 OF 1



DESCRIPTION

black clayey Topsoil (OH) some sand

firm, gray & brown, silty Clay (CL) trace of sand

firm, gray, silty Clay (CH) very soft to soft

firm to stiff, gray, fine sandy Clay (CL) silt seams

compact, gray, medium silty Sand (SM-SC) some silt, trace of clay.

plastic to firm, gray silty Clay (CL) a few sand & silt pockets

soft to plastic, gray, silty Clay (CH) trace of fine sand

medium compact, clayey Silt (ML) some fine sand, trace of pebbles

hard, gray, sandy Clay (CH) trace of shale fragments

137.5-158.2ft Shale, black, slightly micaceous, highly weathered to a depth of 142.5ft, some clay seams.

Bottom of Hole-Elevation-427.83
-Depth-158.17ft

No gain or loss of water.

For Water Table information consult Section 4.1.3.

Hole backfilled with Quik-Gel in soil and cement grout in rock.

SOIL BORING NO. 34

BECHTEL Belle River

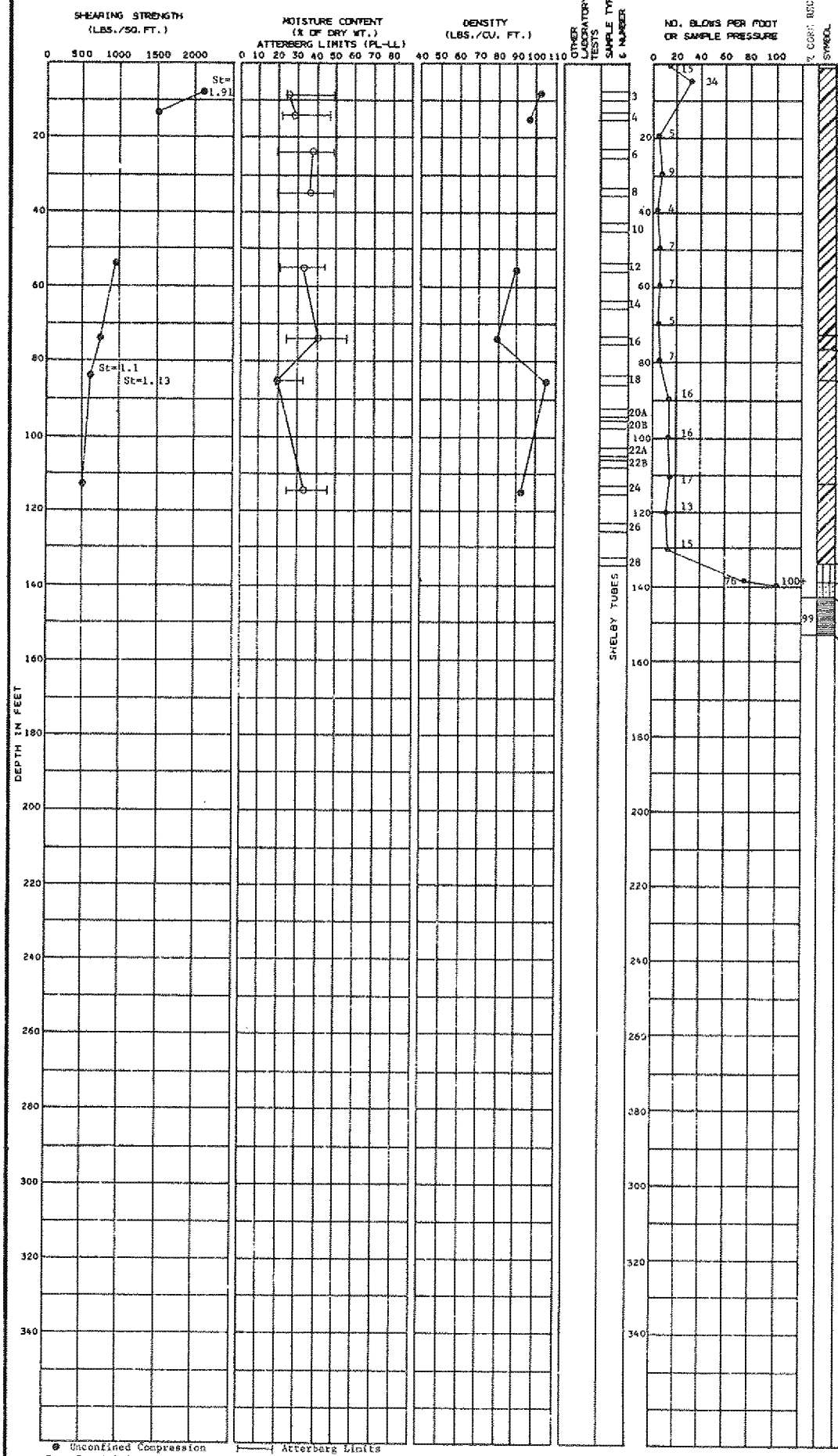
8-41

LOCATION: N 9,007 E 13,035

GROUND ELEVATION 598.3

DATE DRILLED: 12-6-73 12-12-73

SHEET 1 OF 1



DESCRIPTION

- black sandy Topsoil (OH)
- silty Clay (CL-CH)
- firm, brown, some sand
- hard, highly plastic, dark grayish brown mottled, trace sand & fine gravel
- medium to very stiff
- soft, gray
- dark gray, high plastic, (sample greatly disturbed)
- (sample greatly disturbed)
- medium, highly plastic
- medium stiff, dark gray, silty Clay (CH) highly plastic
- plastic, gray, silty Clay (CL-CH) trace sand, few pebbles
- stiff, moderate plasticity, dark gray, silty Clay (CL) 10% medium to coarse sand, 15% gravel
- firm, trace of sand & pebbles
- soft to medium, moderately to highly plastic, gray, silty Clay (CL-CH) trace sand
- compact, gray, fine sandy SILT (ML) some clay
- compact, gray, silty fine Sand (SM) some pebbles, 30% nonplastic fines
- 143.0-153.0ft Shale, black, soft, micaceous, trace of pebbles, crumbles easily

Bottom of Hole-Elevation-445.3 -Depth-153.0ft

No gain or loss of water.

For Water Table information consult Section 4.1.3.

Hole backfilled with Quik-Gel in soil and cement grout in rock.

SOIL BORING NO. 38

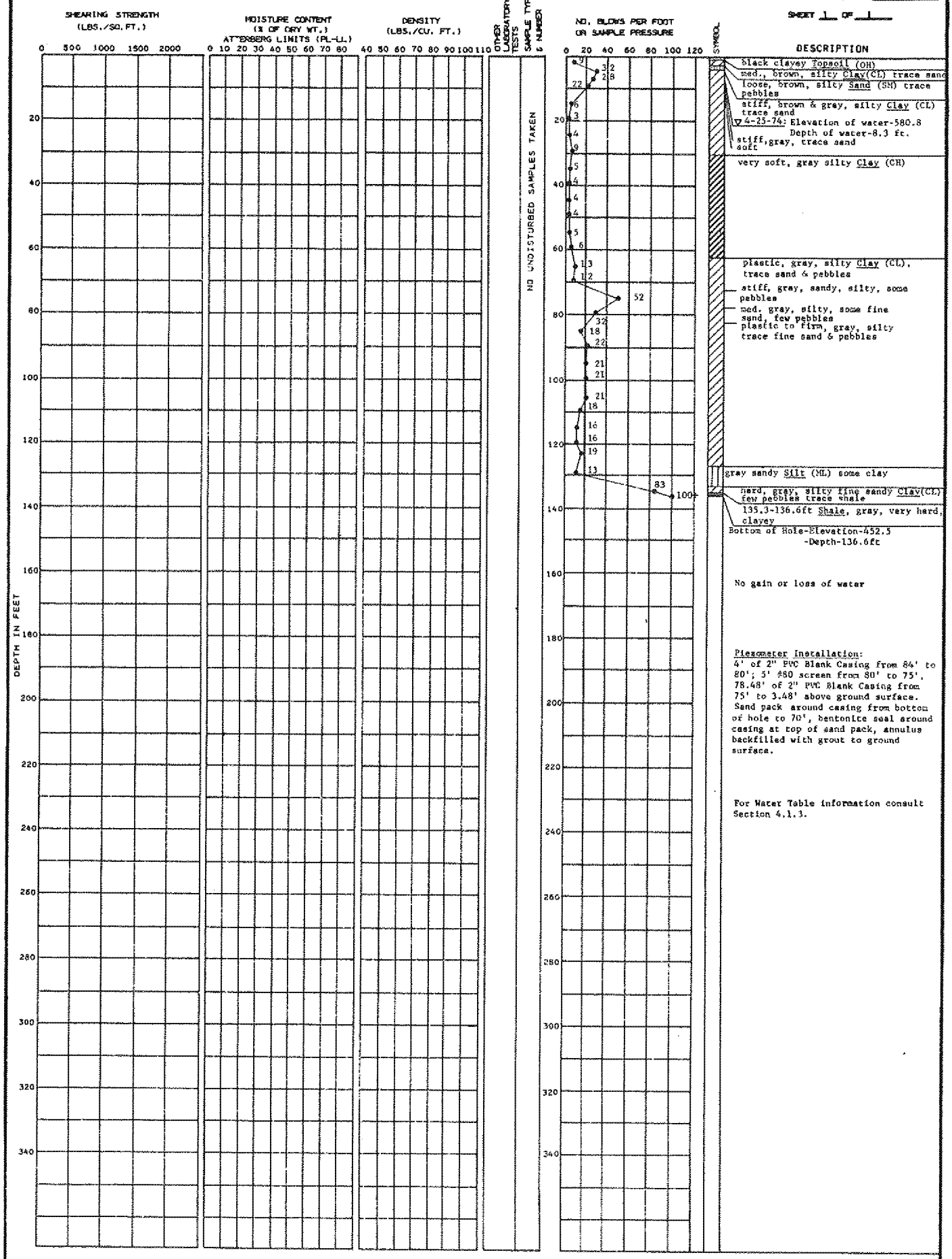
BECHTEL Bells River

B-43

LOCATION: N 8,003 / 510,993 GROUND ELEVATION 589.1

DATE DRILLED: 12-14-73 / 12-18-73

SHEET 1 OF 1



SOIL BORING NO. 40

BECHTEL Belle River

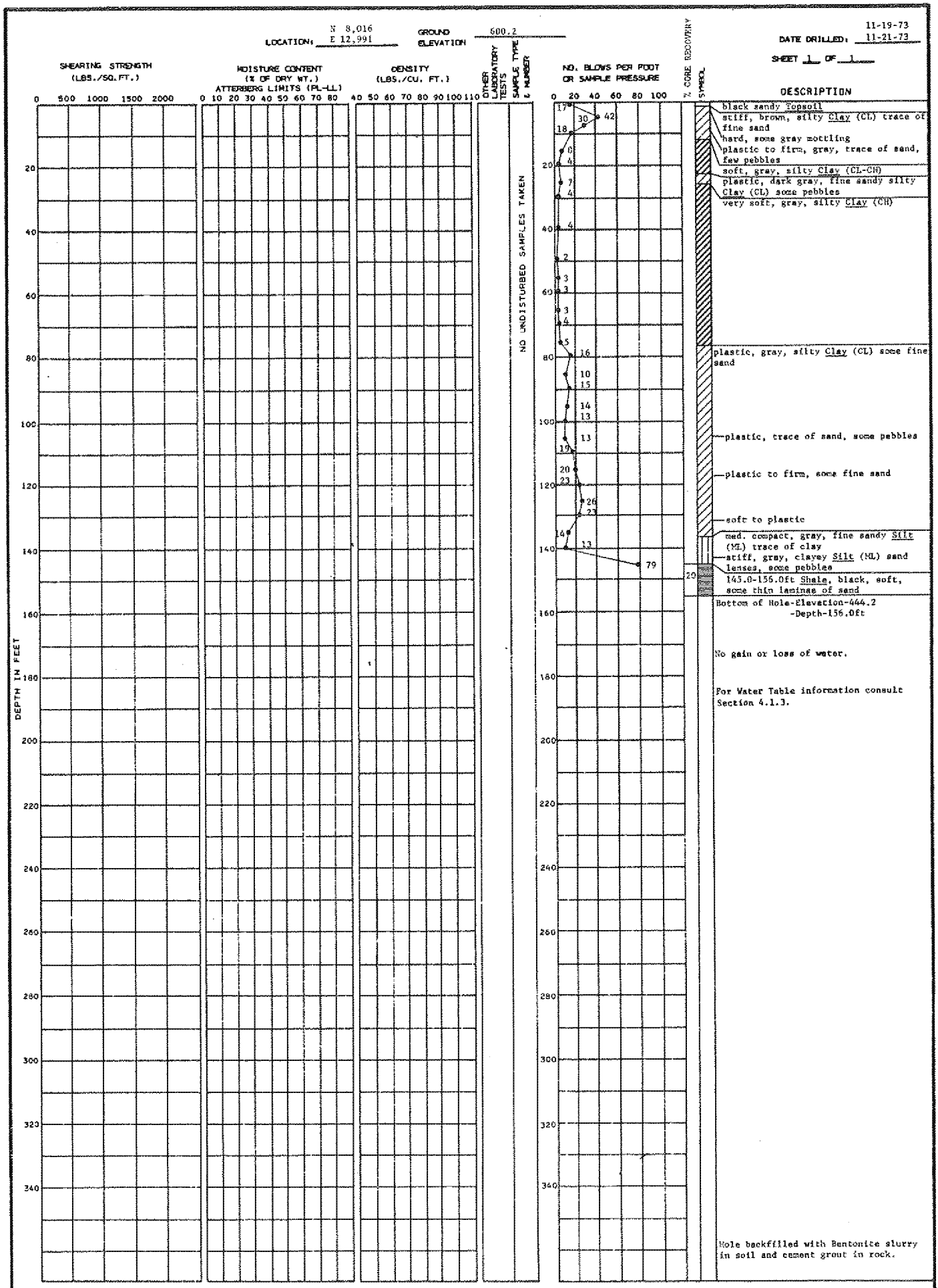
B-45

LOCATION: N 8,016 E 12,991

GROUND ELEVATION 600.2

DATE DRILLED: 11-19-73 11-21-73

SHEET 1 OF 1



SOIL BORING NO. 42

BECHTEL Belle River

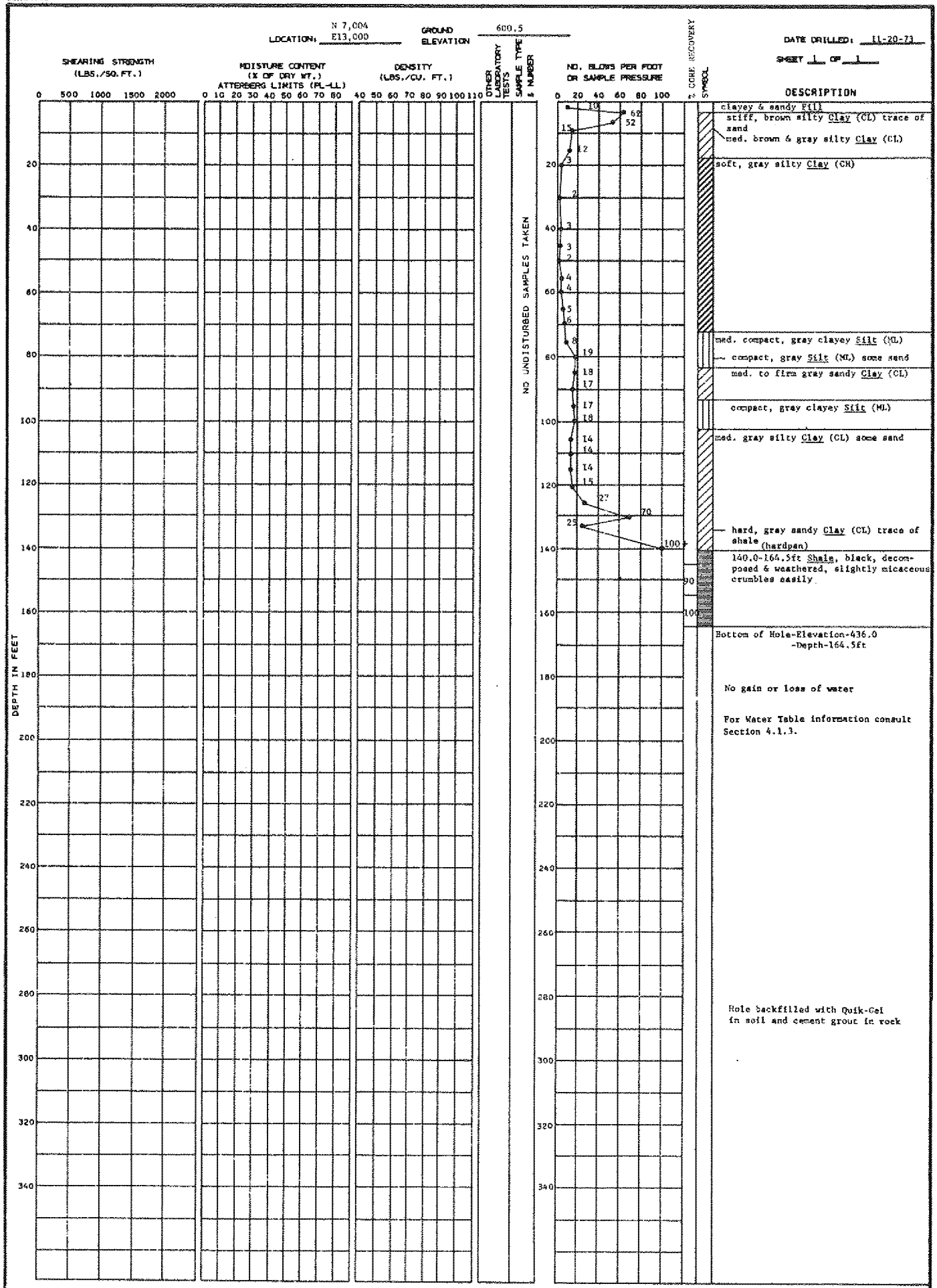
B-47

LOCATION: N 7,004 E13,000

GROUND ELEVATION 600.5

DATE DRILLED: 11-20-73

SHEET 1 OF 1



DESCRIPTION

clayey & sandy Fill

stiff, brown silty Clay (CL) trace of sand

med. brown & gray silty Clay (CL)

soft, gray silty Clay (CH)

med. compact, gray clayey Silt (ML)

compact, gray Silt (ML) some sand

med. to firm gray sandy Clay (CL)

compact, gray clayey Silt (ML)

med. gray silty Clay (CL) some sand

hard, gray sandy Clay (CL) trace of shale (hardpan)

140.0-164.5ft Shale, black, decomposed & weathered, slightly micaceous crumbles easily

Bottom of Hole-Elevation-436.0
-Depth-164.5ft

No gain or loss of water

For Water Table information consult Section 4.1.3.

Hole backfilled with Quik-Gel in soil and cement grout in rock

SOIL BORING NO. 44

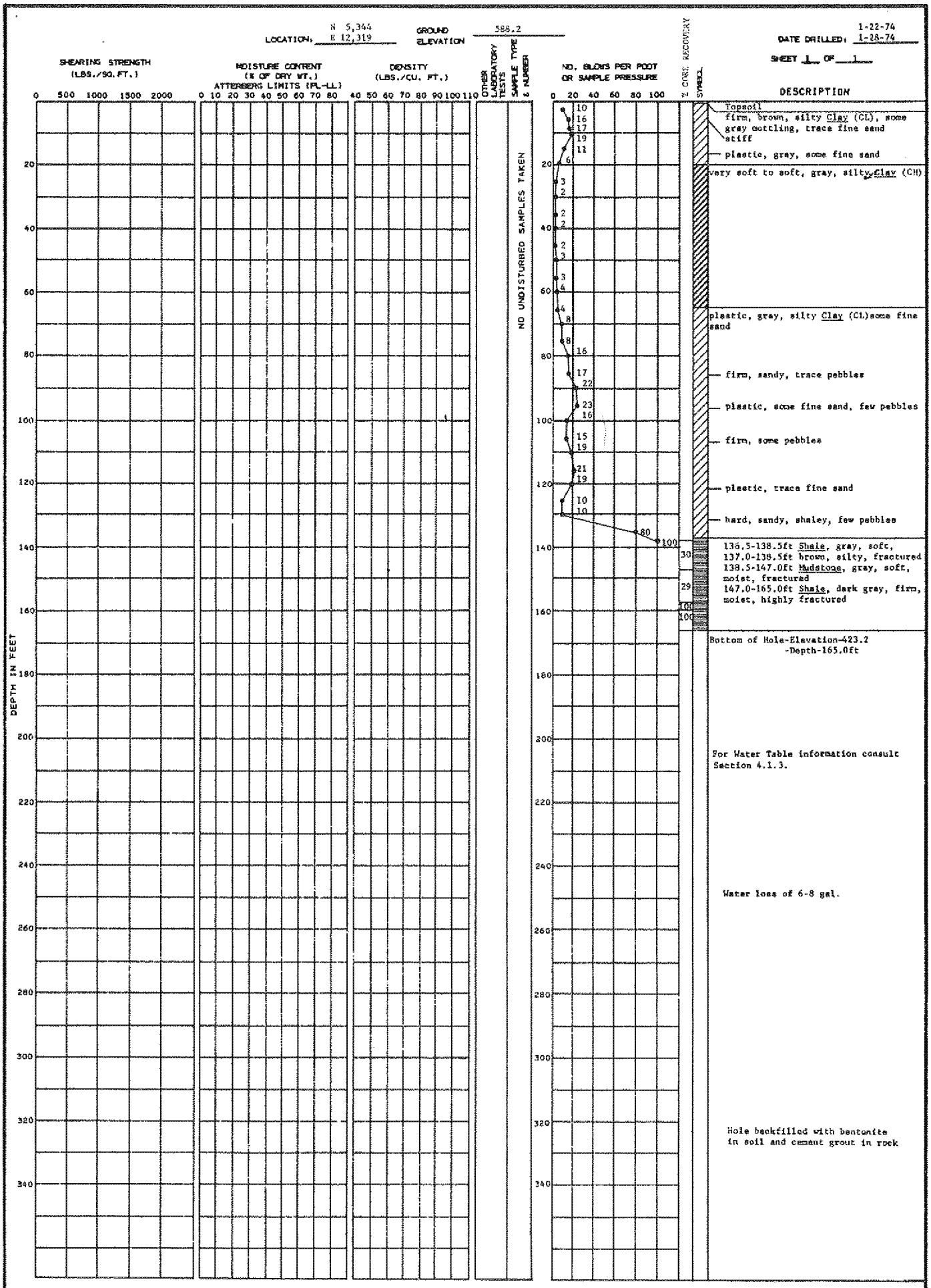
BECHTEL Belle River

LOCATION: N 5,344 E 12,319

GROUND ELEVATION 588.2

DATE DRILLED: 1-22-74 1-28-74

SHEET 1 OF 1



SOIL BORING NO. 46-A

BECHTEL Belle River

B-51

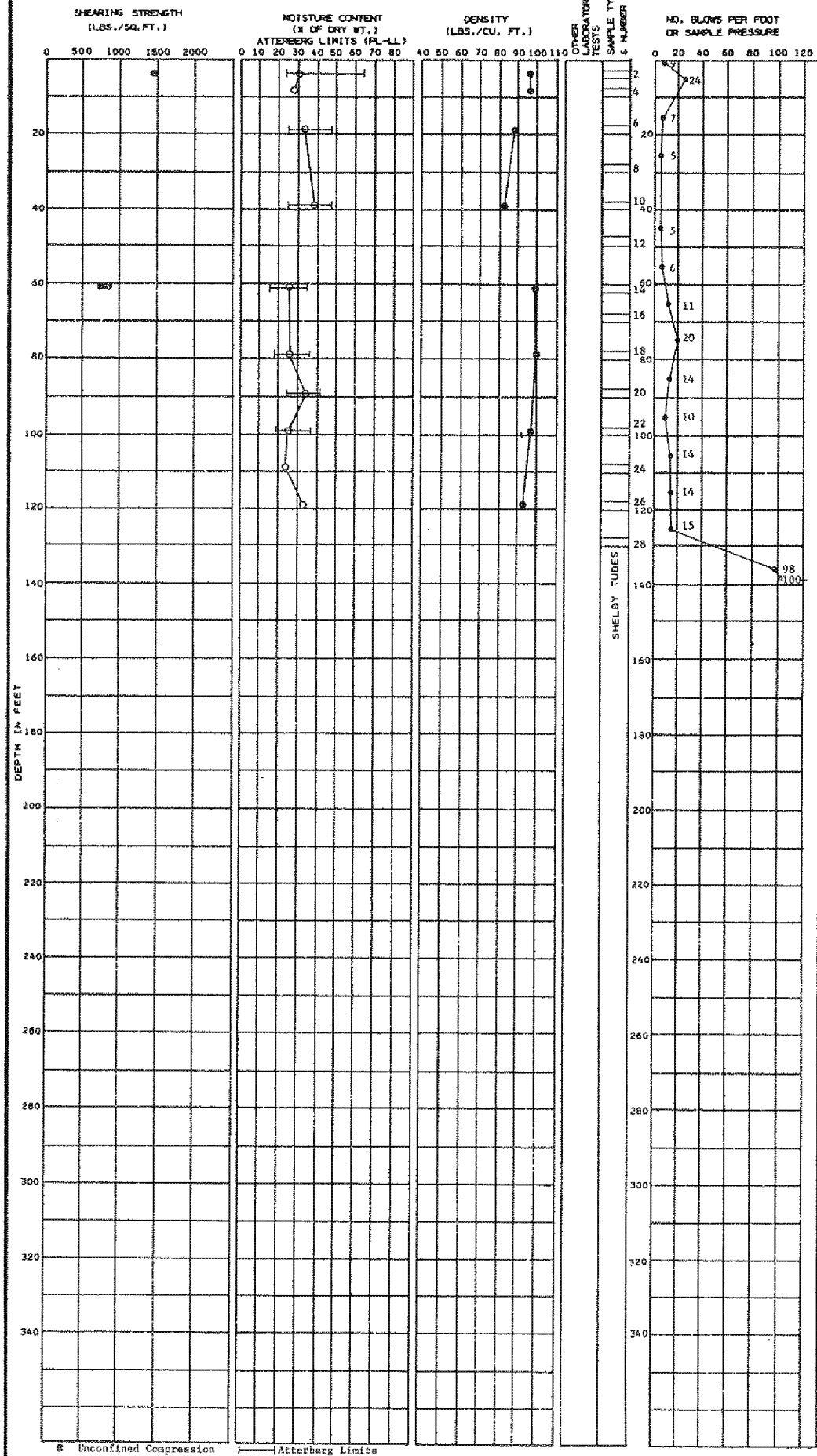
ED_005947A_00014551-00342

LOCATION: N 3,950 E 12,584

GROUND ELEVATION 587.5

DATE DRILLED: 1-14-74 1-23-74

SHEET 1 OF 1



DESCRIPTION

Stiff to very stiff, brown & gray, silty Clay (CH) trace sand, highly plastic

very stiff, brown, medium to high plasticity, silty Clay (CL-CH)

medium, gray, trace sand

soft to medium

soft, dark to very dark gray

Medium stiff, gray, silty Clay (CL) 35% coarse sand and fine gravel

firm, some fine sand

stiff, dark gray, little coarse sand and fine gravel

little fine sand, few pebbles

medium to stiff, little fine sand

soft to medium, dark gray, 20% fine to coarse sand and gravel

medium to stiff, gray, trace fine to coarse sand

fairly compact, gray, clayey Silt (ML), some fine sand

136.5-137.6ft Shale, gray, soft, clayey

Bottom of Hole-Elevation-449.9
-Depth-137.6ft

No gain or loss of water.

For Water Table information consult Section 4.1.3.

Hole backfilled with Bentonite and natural soil.

SOIL BORING NO. 48

BECHTEL Belle River

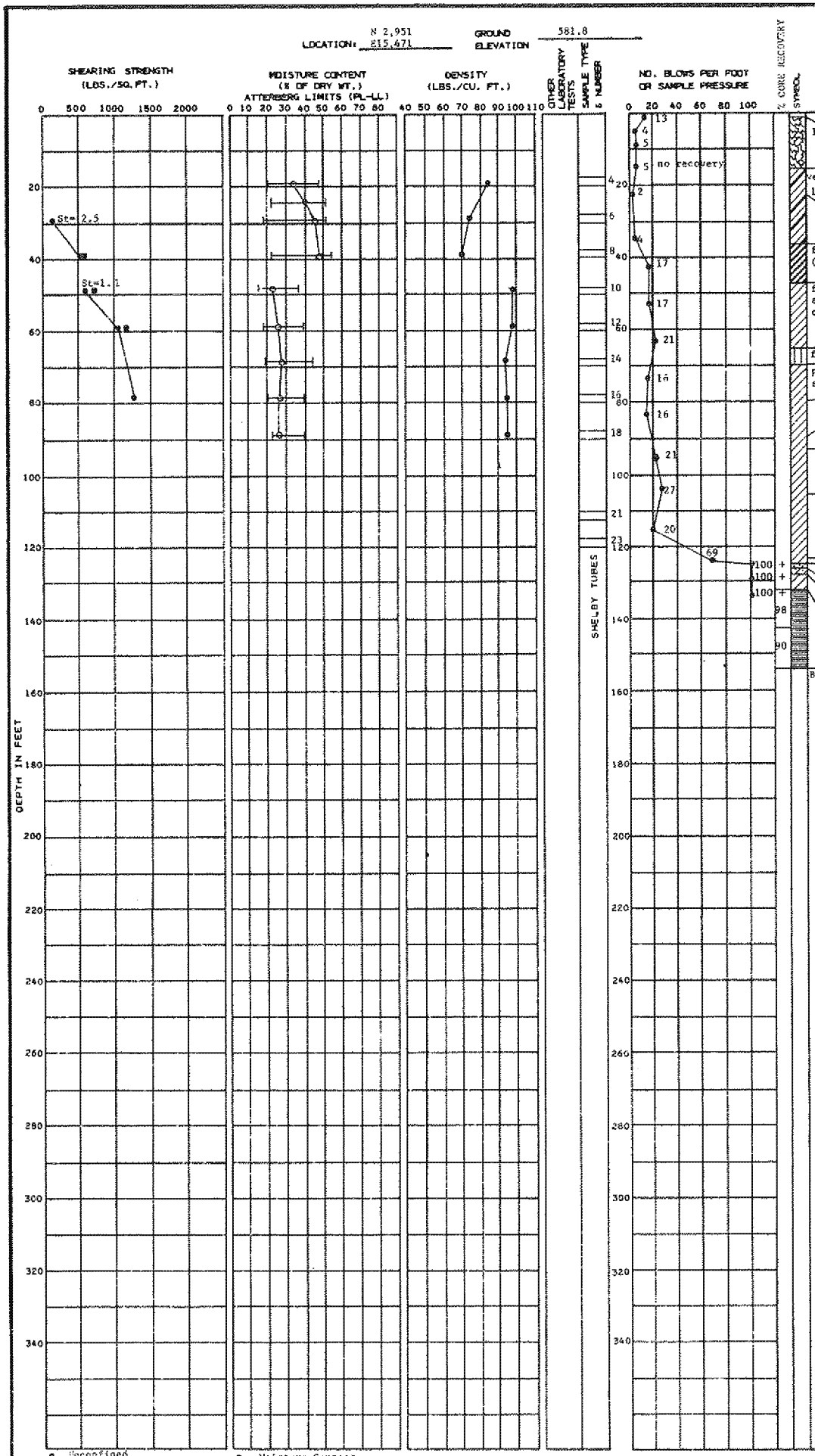
B-53

LOCATION: N 2,951 E15,471

GROUND ELEVATION 581.8

DATE DRILLED: 12-19-73 / 1-8-74

SHEET 1 OF 1



DESCRIPTION

cinders, fly ash Fill

loose, gray, limestone Fill, some sand

very soft, gray, silty Clay (CL-CH) top 16-20' possibly disturbed

highly plastic

firm, highly plastic, gray, silty Clay (CH) some sand, trace pebbles

firm, moderately plastic, gray, sandy, silty Clay (CL) 20 to 25% fine to coarse sand and 10-15% fine gravel

fairly compact, fine sandy Silt (ML)

plastic, gray, silty Clay (CL) some fine sand, trace fine gravel

10-15% fine to coarse sand and fine gravel

20-25% fine to coarse sand and 10% fine gravel

firm, gray, some fine sand, trace pebbles

plastic, gray, trace fine sand

hard, gray, very sandy, few pebbles

compact, very fine Sand(SP) some silt

very hard, gray, clayey fine Sand(SC)

very hard, gray, sandy Clay (CL) (hardpan)

133.8-153.8ft Shale, gray, firm to soft, extremely fragmented and easily broken

Bottom of Hole-Elevation-428.05
-Depth-153.75ft

For Water Table information consult Section 4.1.3.

Water Level
At completion - 40.5'
Water Level
0800 33.5' 1-7-74

Bailed to 67.0'
1130 hours 67.91'
1400 " 66.33'
1600 " 66.08'
1800 " 65.25'
Water Level
0800 60.08' 1-8-74

Encountered gas at 98.0' while grouting casing at 98.0'. Extra precautions taken while grouting hole (slight pressure).

Hole backfilled with bentonite and natural soil in soil and cement grout in rock

● Unconfined
■ Unconsolidated Undrained
St = Sensitivity

○ Moisture Content
⊢—⊣ Atterberg Limits

SOIL BORING NO. 50

BECHTEL Belle River

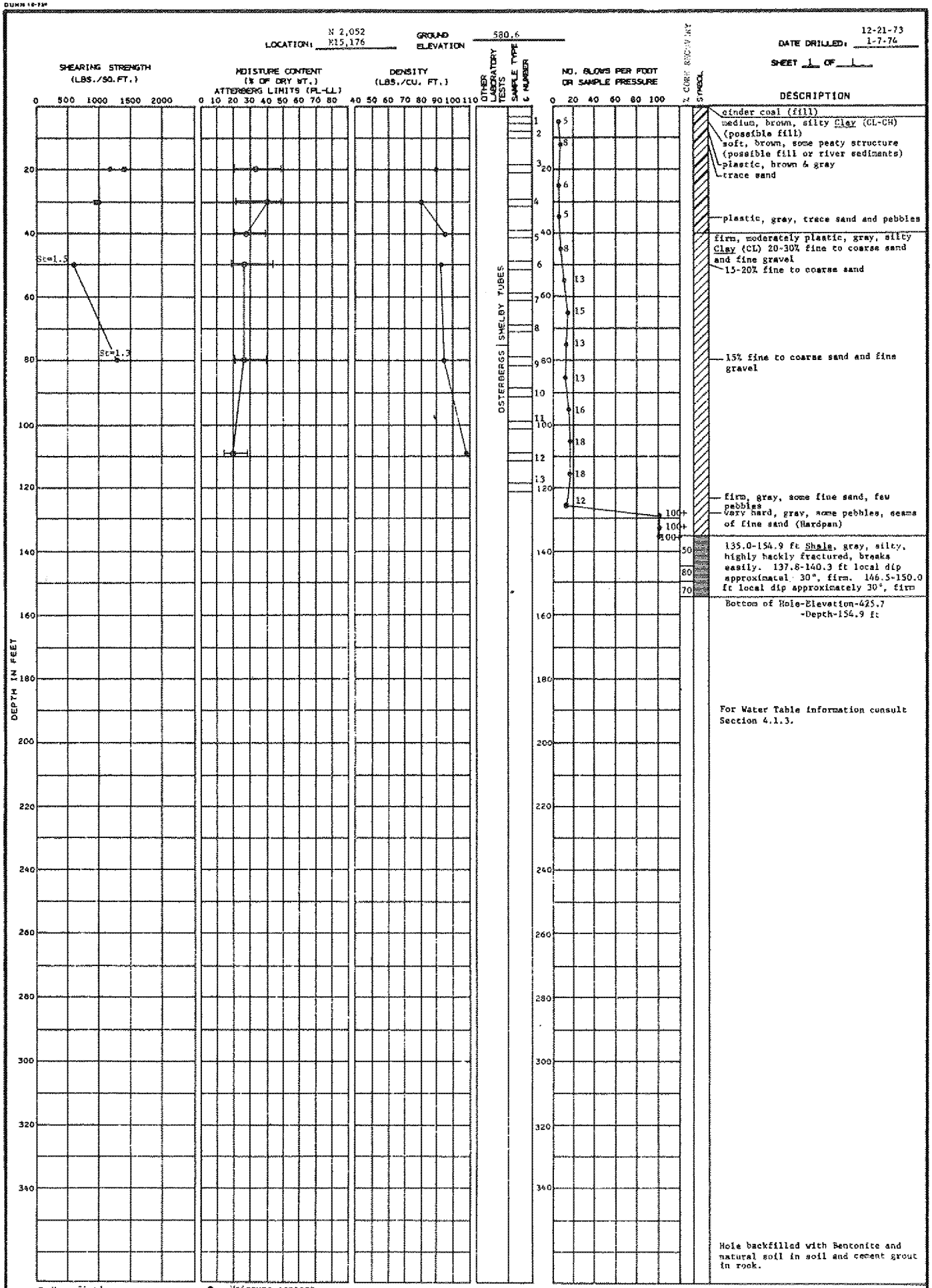
8-55

LOCATION: N 2,052 E15,176

GROUND ELEVATION 580.6

DATE DRILLED: 12-21-73 1-7-74

SHEET 1 OF 1



● Unconfined
■ Unconsolidated Undrained
St = Sensitivity

○ Moisture content
⊢⊣ Atterberg limits

SOIL BORING NO. 53

BECHTEL Belle River

B-57

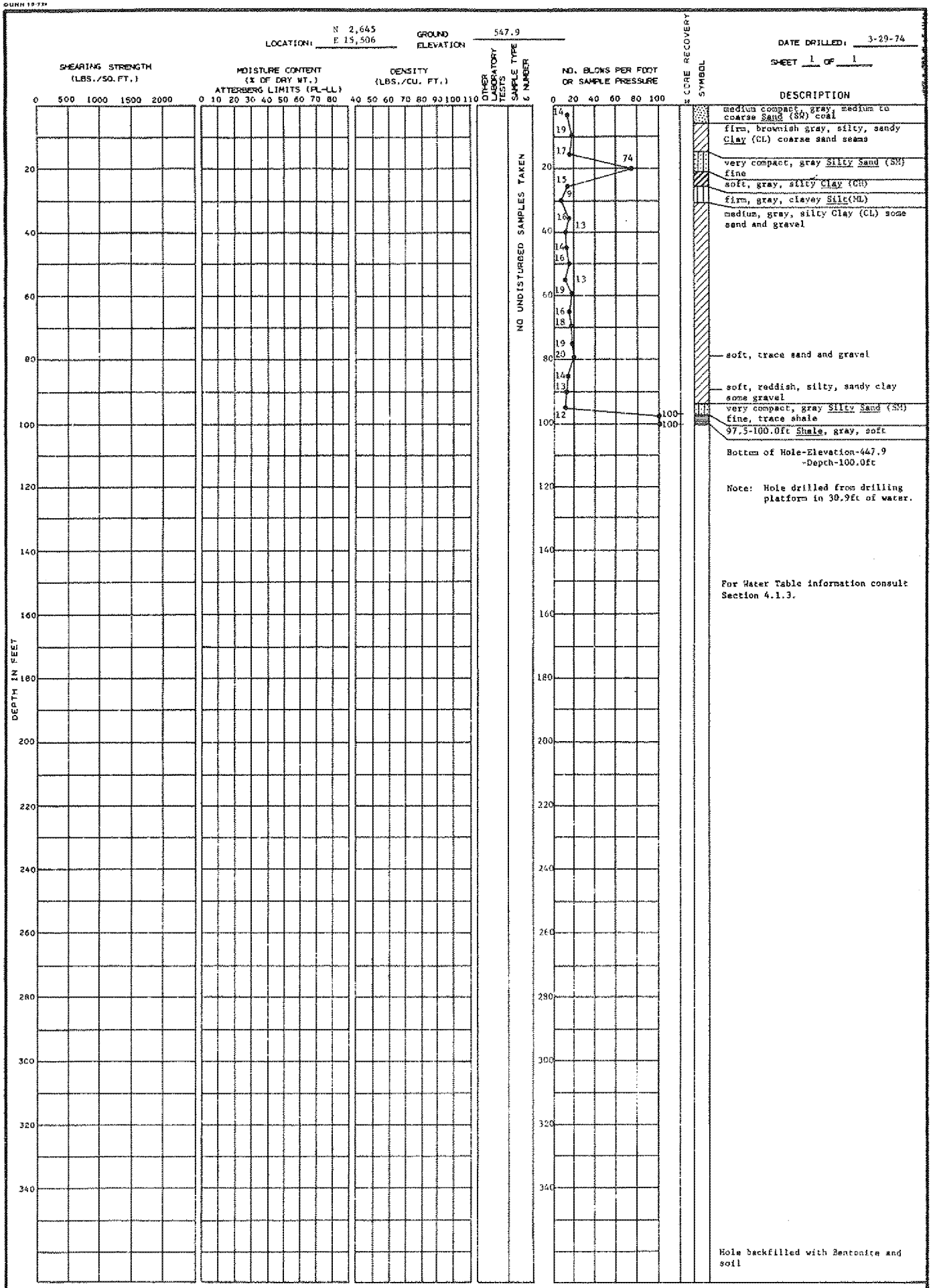
DUNN 19-73

LOCATION: N 2,645 E 15,506

GROUND ELEVATION 547.9

DATE DRILLED: 3-29-74

SHEET 1 OF 1



SOIL BORING NO. 55

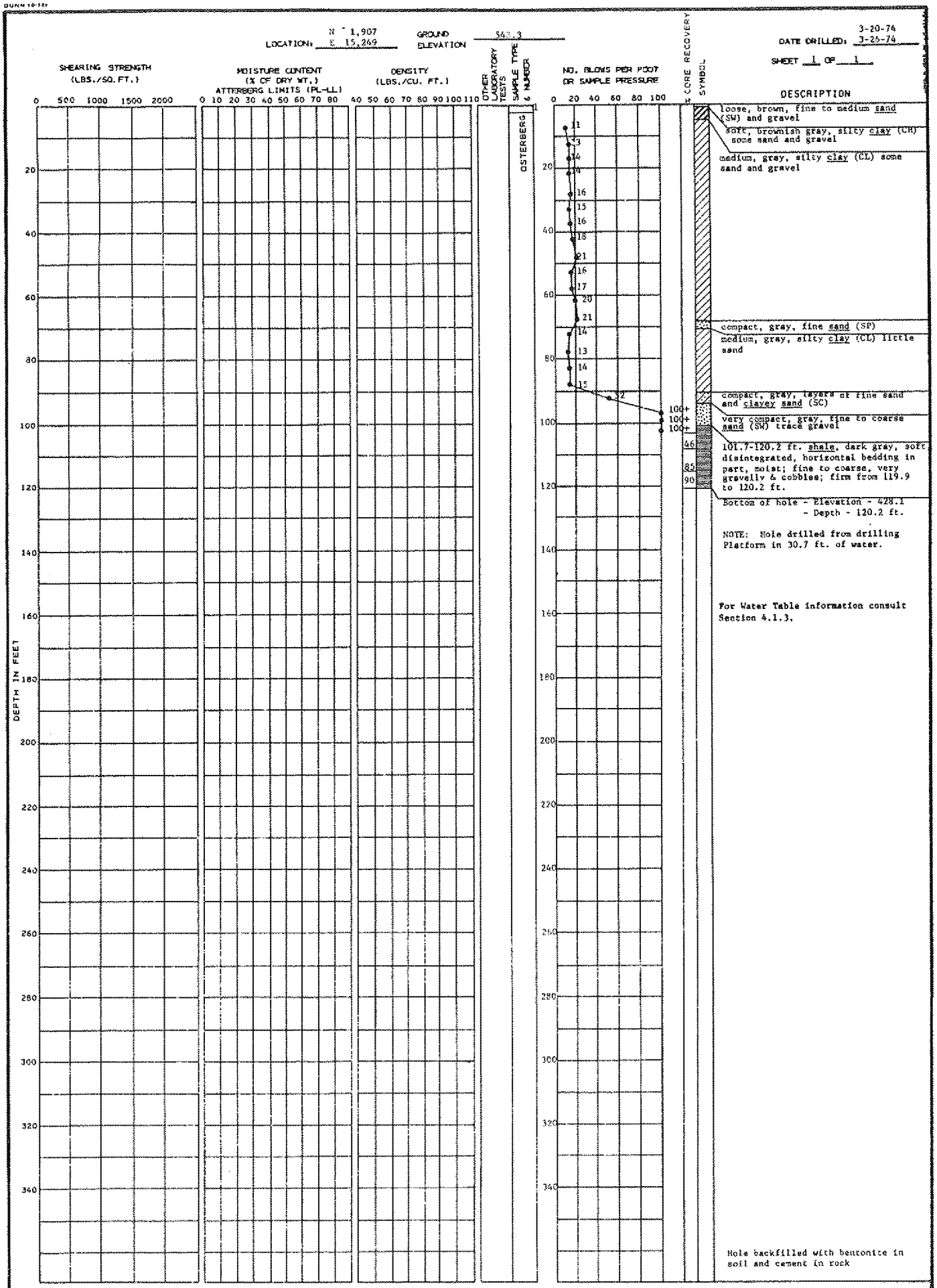
BECHTEL Bella River

LOCATION: N 1,907 E 15,269

GROUND ELEVATION 543.3

DATE DRILLED: 3-20-74 3-26-74

SHEET 1 OF 1



DESCRIPTION

loose, brown, fine to medium sand (SW) and gravel

soft, brownish gray, silty clay (CH) some sand and gravel

medium, gray, silty clay (CL) some sand and gravel

compact, gray, fine sand (SP)

medium, gray, silty clay (CL) little sand

compact, gray, layers of fine sand and clayey sand (SC)

very compact, gray, fine to coarse sand (SW) trace gravel

101.7-120.2 ft. shale, dark gray, soft disintegrated, horizontal bedding in part, moist; fine to coarse, very gravelly & cobbles; firm from 119.9 to 120.2 ft.

Bottom of hole - Elevation - 428.1
- Depth - 120.2 ft.

NOTE: Hole drilled from drilling Platform in 30.7 ft. of water.

For Water Table information consult Section 4.1.3.

Hole backfilled with bentonite in soil and cement in rock

SOIL BORING NO. 57

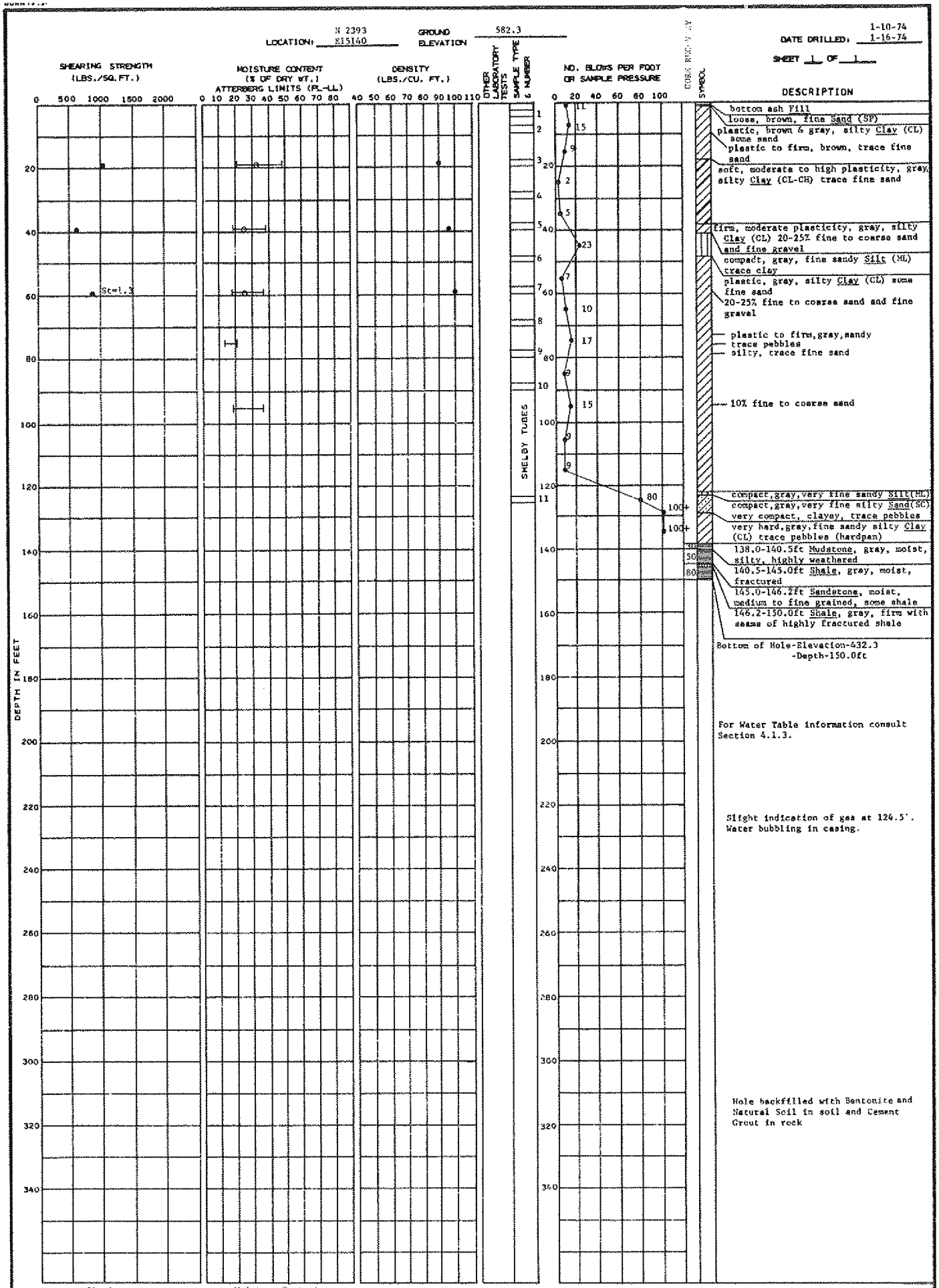
BECHTEL Belle River

LOCATION: N 2393 E15140

GROUND ELEVATION 582.3

DATE DRILLED: 1-10-74 1-16-74

SHEET 1 OF 1



● Unconfined
St. = Sensitivity

O Moisture Content
⊢⊣ Atterberg Limits

SOIL BORING NO. 59

BECHTEL Belle River

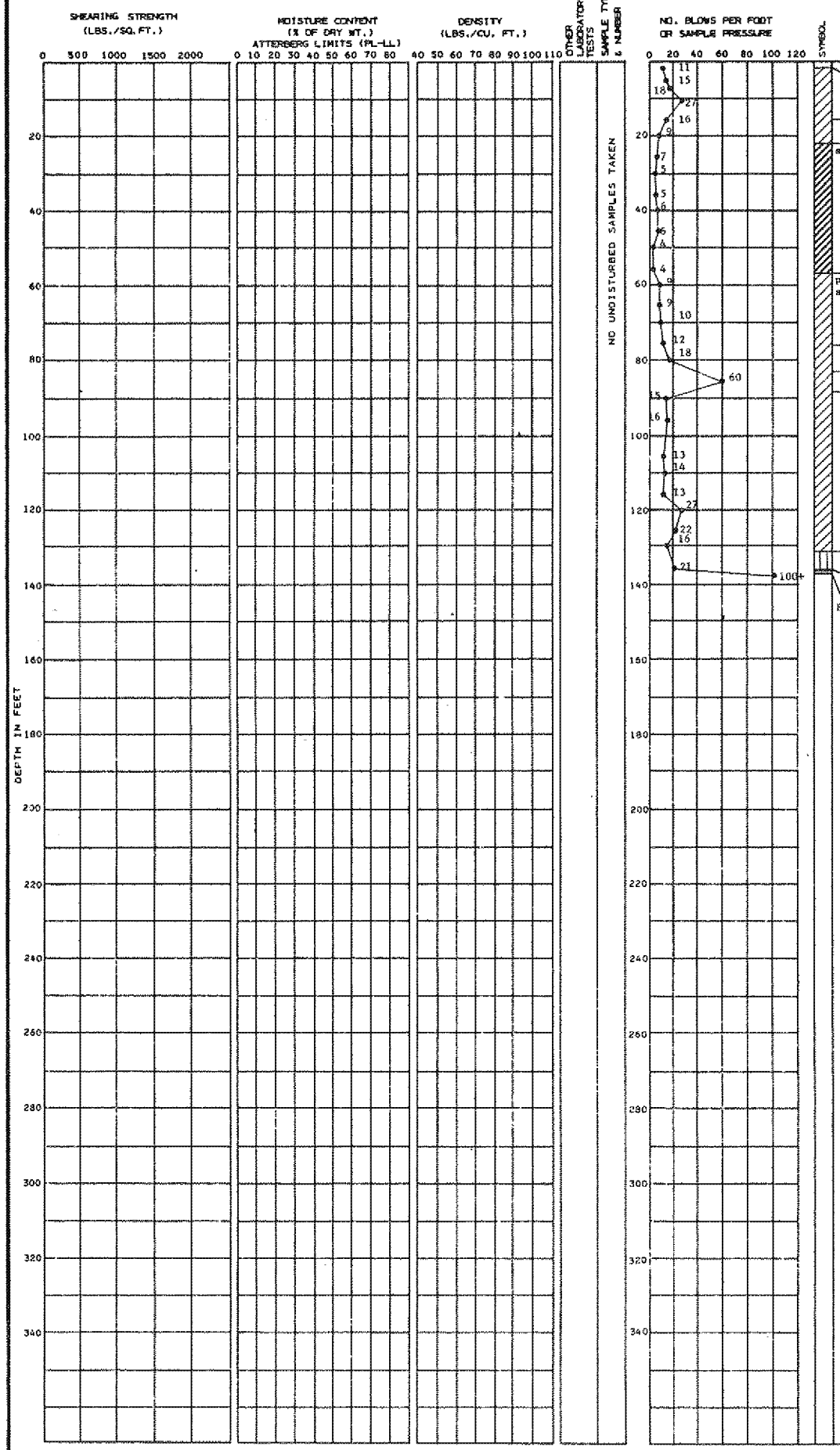
B-63

LOCATION: N 5,283 E 14,042

GROUND ELEVATION 593.1

DATE DRILLED: 1-23-74 1-29-74

SHEET 1 OF 1



DESCRIPTION

fill, cinders, clay, etc.
firm to stiff, brown, silty Clay (CL) trace fine sand
—plastic, gray

soft, gray silty Clay (CH)

plastic, gray silty Clay (CL) trace fine sand, few pebbles
—firm, sandy silty Clay (CL) few pebbles
—stiff, fine sandy silty
—plastic, silty Clay (CL), some fine sand

fairly compact, gray, clayey Silt (ML) trace Shale, pebbles
135.0-136.0ft Shale, gray, soft, weathered with sand seams

Bottom of Hole-Elevation-457.1
-Depth-136.0ft

For Water Table information consult Section 4.1.3.

Hole backfilled with Bentonite and natural soil.

SOIL BORING NO. 63

BECHTEL Belle River

B-65

ED_005947A_00014551-00349

LOCATION: N 9,208.32 E 9,376.12 GROUND ELEVATION 587.6

DATE DRILLED: 2-28-74 3-7-74

SHEET 1 OF 1

SHEARING STRENGTH (LBS./SQ. FT.) 0 500 1000 1500 2000

MOISTURE CONTENT (% OF DRY WT.) ATTERBERG LIMITS (PL-LL) 0 10 20 30 40 50 60 70 80

DENSITY (LBS./CU. FT.) 40 50 60 70 80 90 100 110

OTHER LABORATORY TESTS

SAMPLE TYPE & NUMBER

NO. BLOWS PER FOOT OR SAMPLE PRESSURE 0 20 40 60 80 100

CORE RECOVERY %

SYMBOL

DEPTH IN FEET 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300 320 340

OSTERBERGS

DESCRIPTION

sandy topsoil

plastic, brown, sandy clay (CL) firm to stiff, silty clay, some fine sand

plastic, gray, trace fine sand

very soft to soft, gray, silty clay (CH)

Lost approximately 25 gallons of water between 55.0 - 70.5 ft.

plastic to firm, gray, silty clay (CL) some fine sand

stiff, same, few pebbles

soft to plastic

medium compact, gray sand (SP) fine

compact, gray sand (SW) very fine to medium, few pebbles

medium compact, gray silt (ML) some fine sand

143.5-166.5 ft. shale, gray

143.5-145.5 ft. soft, trace of clay and pebbles

145.5-156.5 ft. soft, highly fractured

155.5-166.5 ft. [illegible] bedded light and dark gray, firm, horizontal bedding, locally contorted, abundant quartz veins

Bottom of hole - Elevation - 421.2
- Depth - 166.5 ft.

BENCH MARK OBR - 3
16.5' of cement grout from 166.5' to 150.0'; 150.0' of 2" PVC blank casing from 150.0' to surface; casing cemented to surface and bench mark plate placed on top.
Benchmark Elev - 588.0

For Water Table information consult Section 4.1.3.

SOIL BORING NO. 65

BECHTEL Belle River

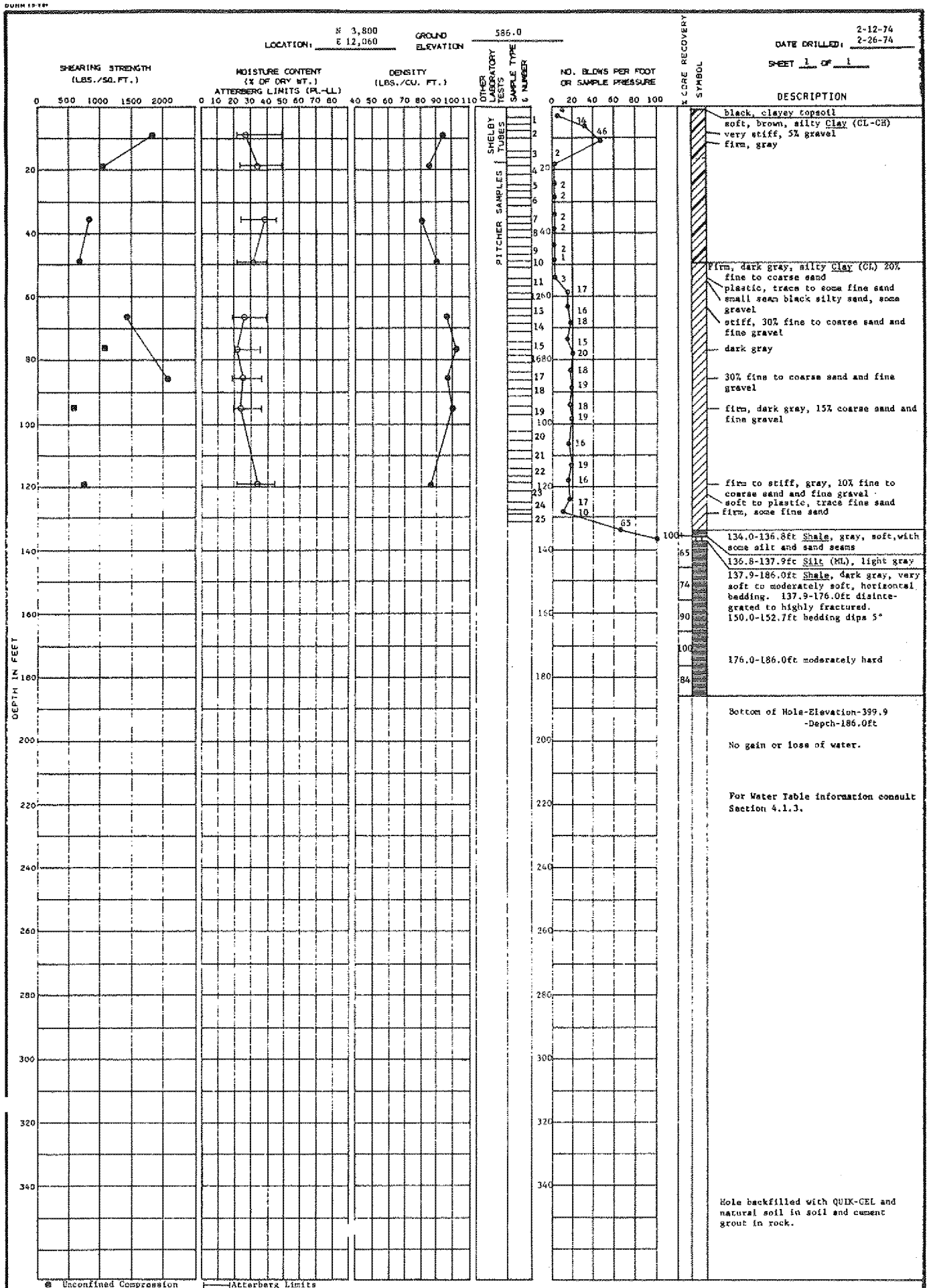
B-07

LOCATION: N 3,800 E 12,060

GROUND ELEVATION 586.0

DATE DRILLED: 2-12-74 2-26-74

SHEET 1 OF 1



SOIL BORING NO. 101

BECHTEL Belle River

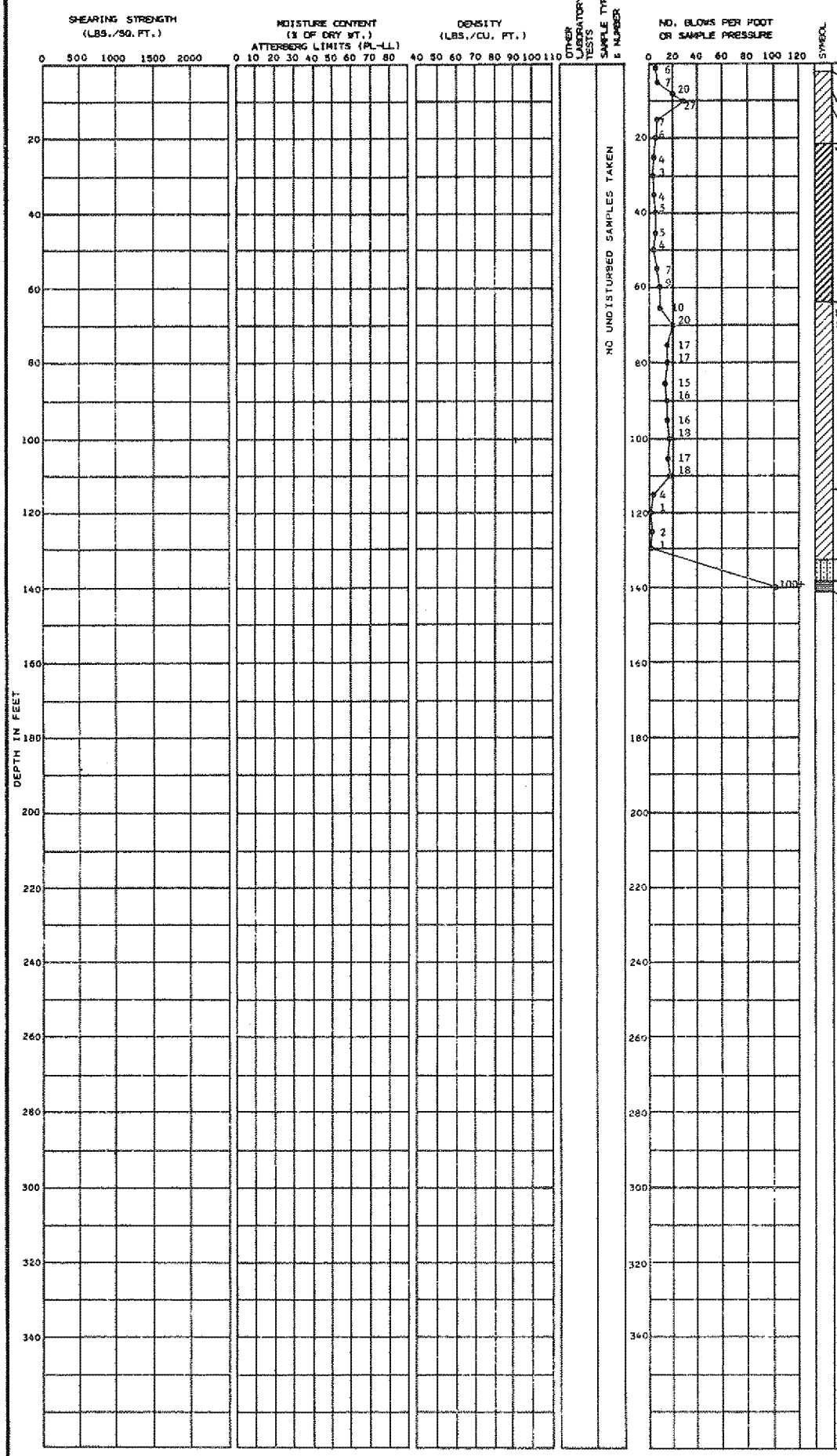
B-69

LOCATION: N 4,435 E 12,350

GROUND ELEVATION 589.7

DATE DRILLED: 2-5-74 2-7-74

SHEET 1 OF 1



DESCRIPTION

clay, wood, cinders, fill

plastic to firm, brown, silty Clay (CL) some gray pockets, trace fine sand

firm

plastic, gray

very soft to soft, gray, silty Clay (CH)

plastic, gray, silty Clay (CL) trace fine sand, few pebbles

soft

compact, gray, silty Sand (SM) with some gravel

139.0-141.0ft Shale, gray, soft

Bottom of Hole-Elevation-448.7
-Depth-141.0ft

No gain or loss of water.

For Water Table information consult Section 4.1.3.

Hole backfilled with Quik-Gel and natural soil.

SOIL BORING NO. 103

BECHTEL Belle River

B-71

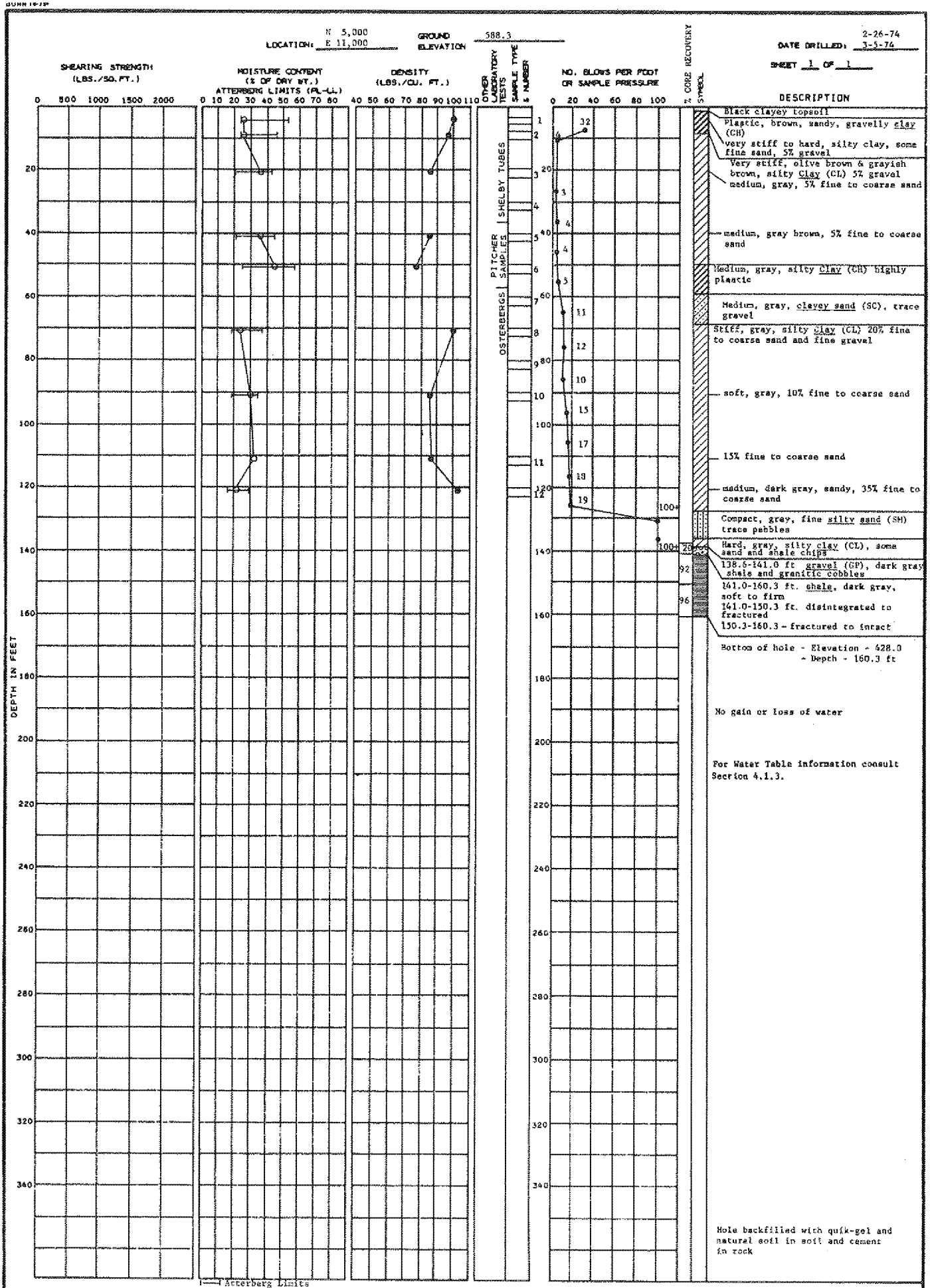
ED_005947A_00014551-00352

LOCATION: N 5,000 E 11,000

GROUND ELEVATION 588.3

DATE DRILLED: 2-26-74 3-5-74

SHEET 1 OF 1



DESCRIPTION

Black clayey topsoil

Plastic, brown, sandy, gravelly clay (CH)

very stiff to hard, silty clay, some fine sand, 5% gravel

Very stiff, olive brown & grayish brown, silty Clay (CL) 5% gravel

medium, gray, 5% fine to coarse sand

medium, gray brown, 5% fine to coarse sand

Medium, gray, silty Clay (CH) highly plastic

Medium, gray, clayey sand (SC), trace gravel

Stiff, gray, silty clay (CL) 20% fine to coarse sand and fine gravel

soft, gray, 10% fine to coarse sand

15% fine to coarse sand

medium, dark gray, sandy, 35% fine to coarse sand

Compact, gray, fine silty sand (SM) trace pebbles

Hard, gray, silty clay (CL), some sand and shale chips

138.5-141.0 ft gravel (GP), dark gray shale and granitic cobbles

141.0-160.3 ft. shale, dark gray, soft to firm

141.0-150.3 ft. disintegrated to fractured

150.3-160.3 - fractured to intact

Bottom of hole - Elevation - 428.0
- Depth - 160.3 ft

No gain or loss of water

For Water Table information consult Section 4.1.3.

Hole backfilled with quik-gel and natural soil in soil and cement in rock

SOIL BORING NO. 105

BECHTEL Belle River

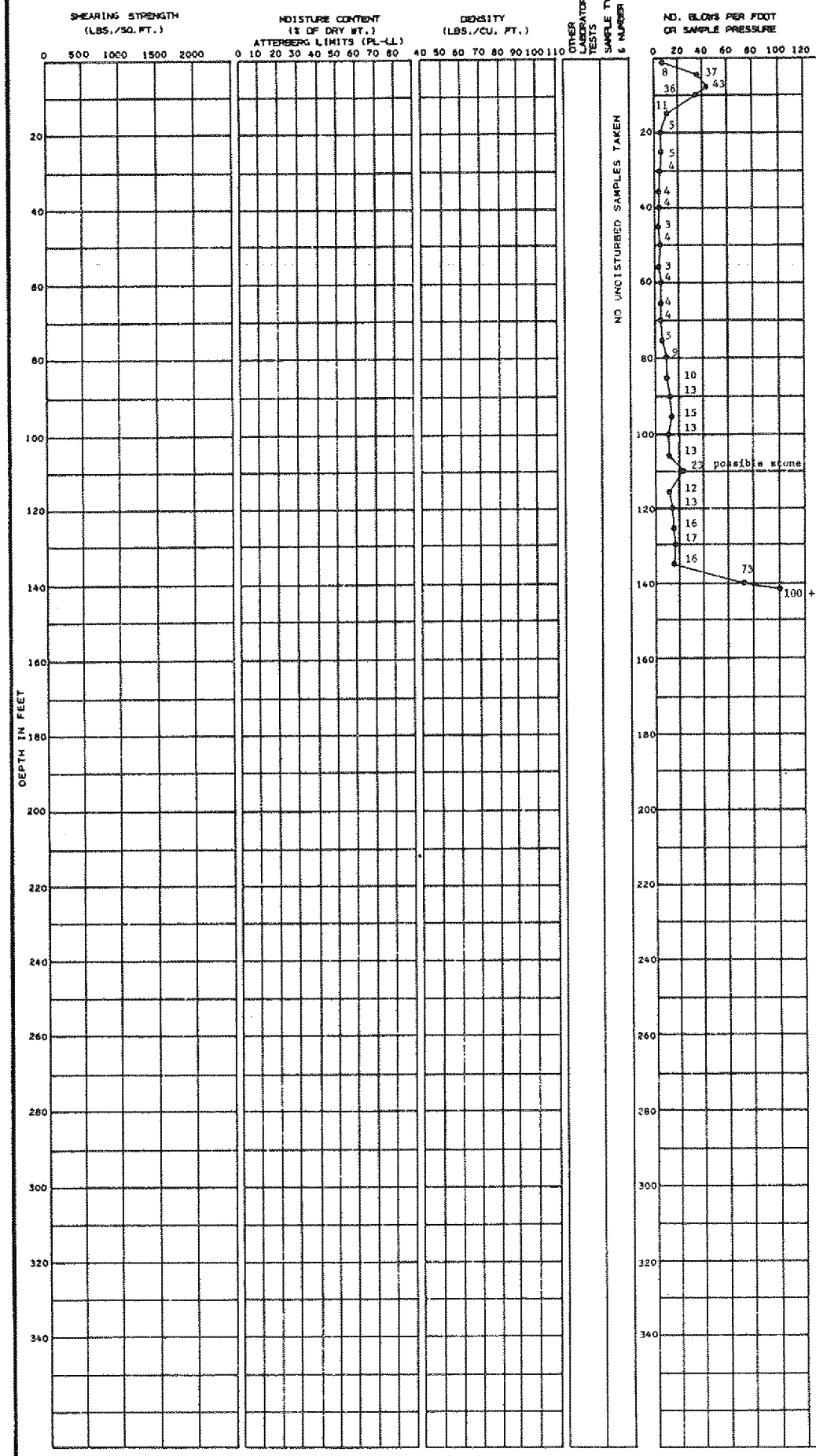
B-73

LOCATION: S 6,450 E 13,140

GROUND ELEVATION 600.7

DATE DRILLED: 2-26-74 3-6-74

SHEET 1 OF 1



SYMBOL

DESCRIPTION

sandy topsoil

medium compact, brown, very fine to medium Sand (SW)

firm, brown, sandy Clay (CL)

stiff, silty clay, some fine sand with gray mottling

plastic, gray, trace very fine sand

soft, gray, silty Clay (CH) slight trace very fine sand

plastic, gray, silty Clay (CL) some very fine sand

plastic to firm, some fine sand 1.5' boulder

compact, gray, very fine Sand and Silt (SM)

142.0 - 142.67ft Shale, soft, gray, broken

Bottom of Hole-Elevation-458.03
-Depth-142.67ft

No gain or loss of water.

For Water Table information consult Section 4.1.3.

Hole backfilled with Quik-Gel and natural soil.

SOIL BORING NO. 109

BECHTEL Belle River

B-75

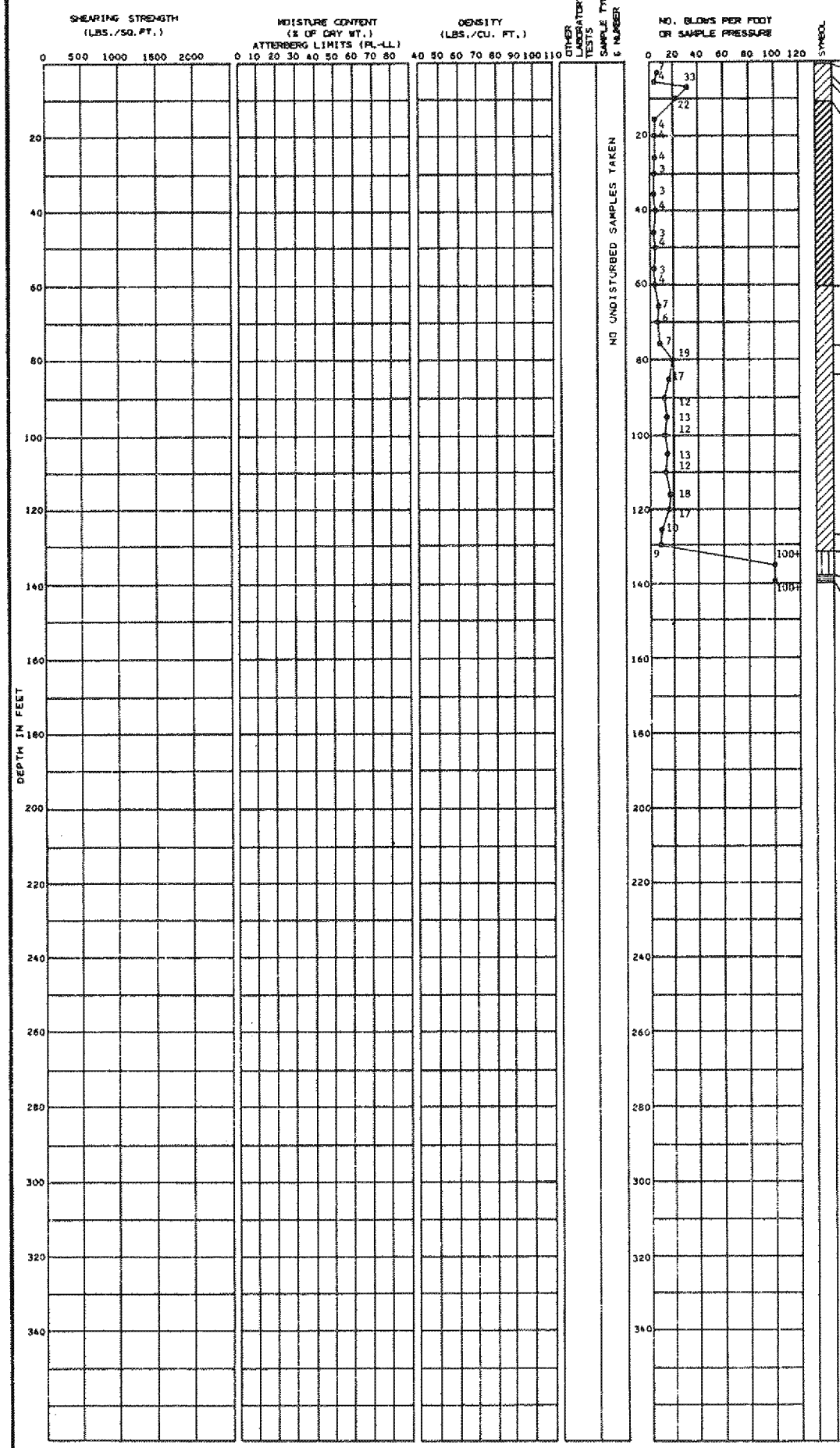
ED_005947A_00014551-00354

LOCATION: N 6,600 / E 11,000

GROUND ELEVATION 588.5

DATE DRILLED: 2-21-74 / 2-26-74

SHEET 1 OF 1



DESCRIPTION

Cinders, fill

Plastic, brown & gray, silty clay (CL)

Firm, some fine sand

Stiff

Very soft to soft, gray, silty clay (CH)

Plastic, gray, silty clay (CL), some fine sand

Firm, few pebbles

Plastic to firm

Soft to plastic

Compact, gray silt (ML), some clay & very fine sand

138.0-140.0 ft shale, gray, soft

Bottom of hole - Elevation - 438.5
Depth - 140.0 ft

No gain or loss of water

For Water Table information consult Section 4.1.3.

Hole backfilled with Quik-Gel and natural soil

SOIL BORING NO. 111

BECHTEL Belle River

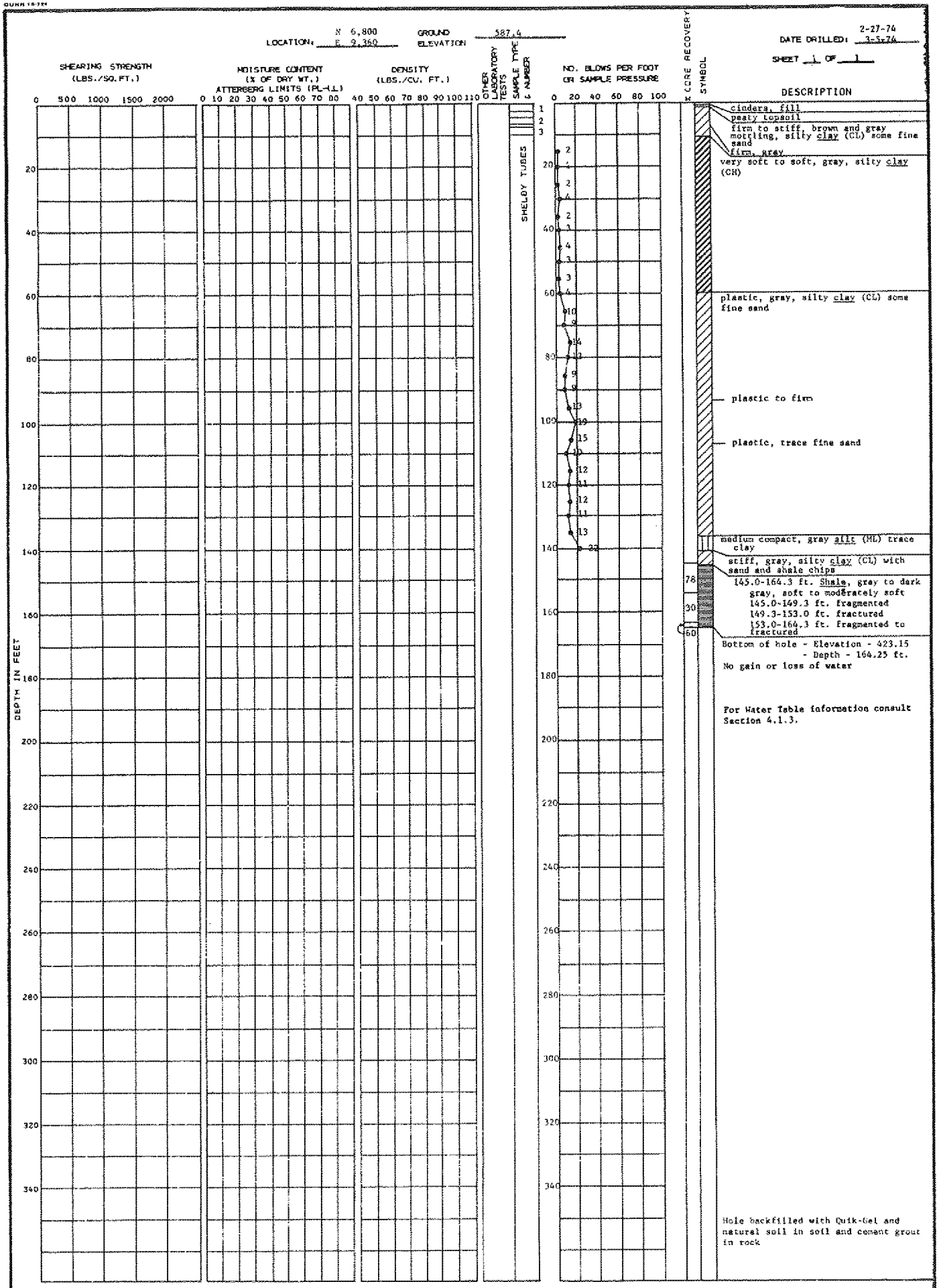
B-77

LOCATION: N 6,800 E 9,360

GROUND ELEVATION 587.6

DATE DRILLED: 2-27-74 3-5-74

SHEET 1 OF 1



SOIL BORING NO. 113

BECHTEL Belle River

B-79

LOCATION: N 7,100 E13,060

GROUND ELEVATION 600.7

DATE DRILLED: 1-30-74 2-6-74

SHEET 1 OF 1

SHEARING STRENGTH (LBS./SQ. FT.) 0 500 1000 1500 2000

MOISTURE CONTENT (% OF DRY WT.) ATTERBERG LIMITS (PL-LL) 0 10 20 30 40 50 60 70 80

DENSITY (LBS./CU. FT.) 40 50 60 70 80 90 100 110

OTHER LABORATORY TESTS

SAMPLE TYPE & NUMBER

NO. BLOWS PER FOOT OR SAMPLE PRESSURE 0 20 40 60 80 100 120

SYMBOL

DEPTH IN FEET

SHELBY TUBES

DESCRIPTION

sandy topsoil

stiff, brown, Clay (CL)

stiff, gray, silty sandy

soft, trace fine sand

very soft to soft, gray, silty Clay(CH)

plastic, gray, silty Clay (CL) some fine sand

compact, gray Silt (ML)

compact, gray, silty, very fine Sand (SM)

142.0-144.0ft Shale, gray, soft

Bottom of Hole-Elevation-456.7
-Depth-144.0ft

For Water Table information consult Section 4.1.3.

No Gain or Loss of Water

Hole Backfilled With Quick-Gel and Natural Soil

SOIL BORING NO. 115

BECHTEL Belle River

B-81

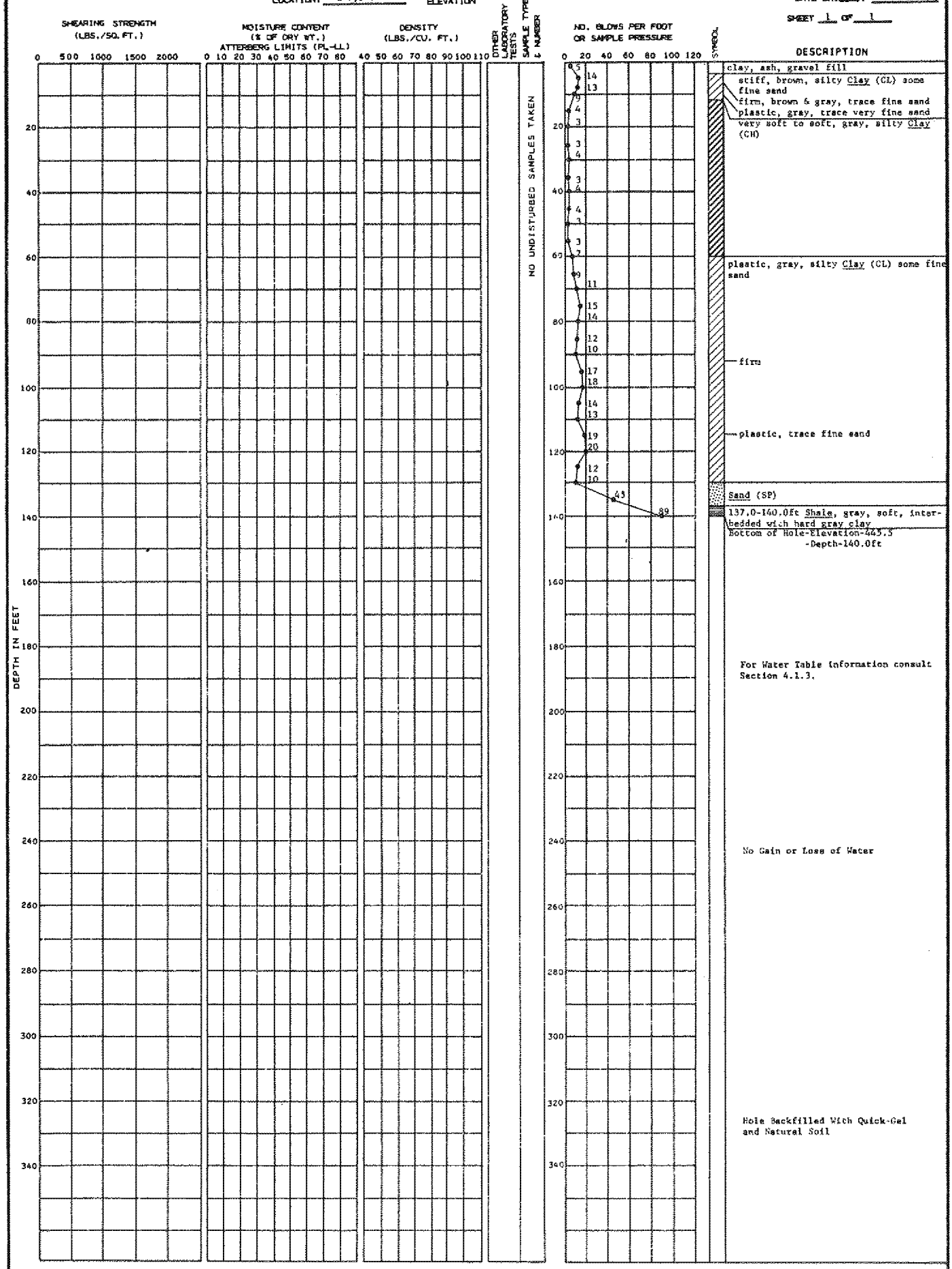
DUNN 10-TP

LOCATION: N 7,270 E 9,360

GROUND ELEVATION 585.5

DATE DRILLED: 2-5-74 2-12-74

SHEET 1 OF 1



SOIL BORING NO. 117

BECHTEL Bella River

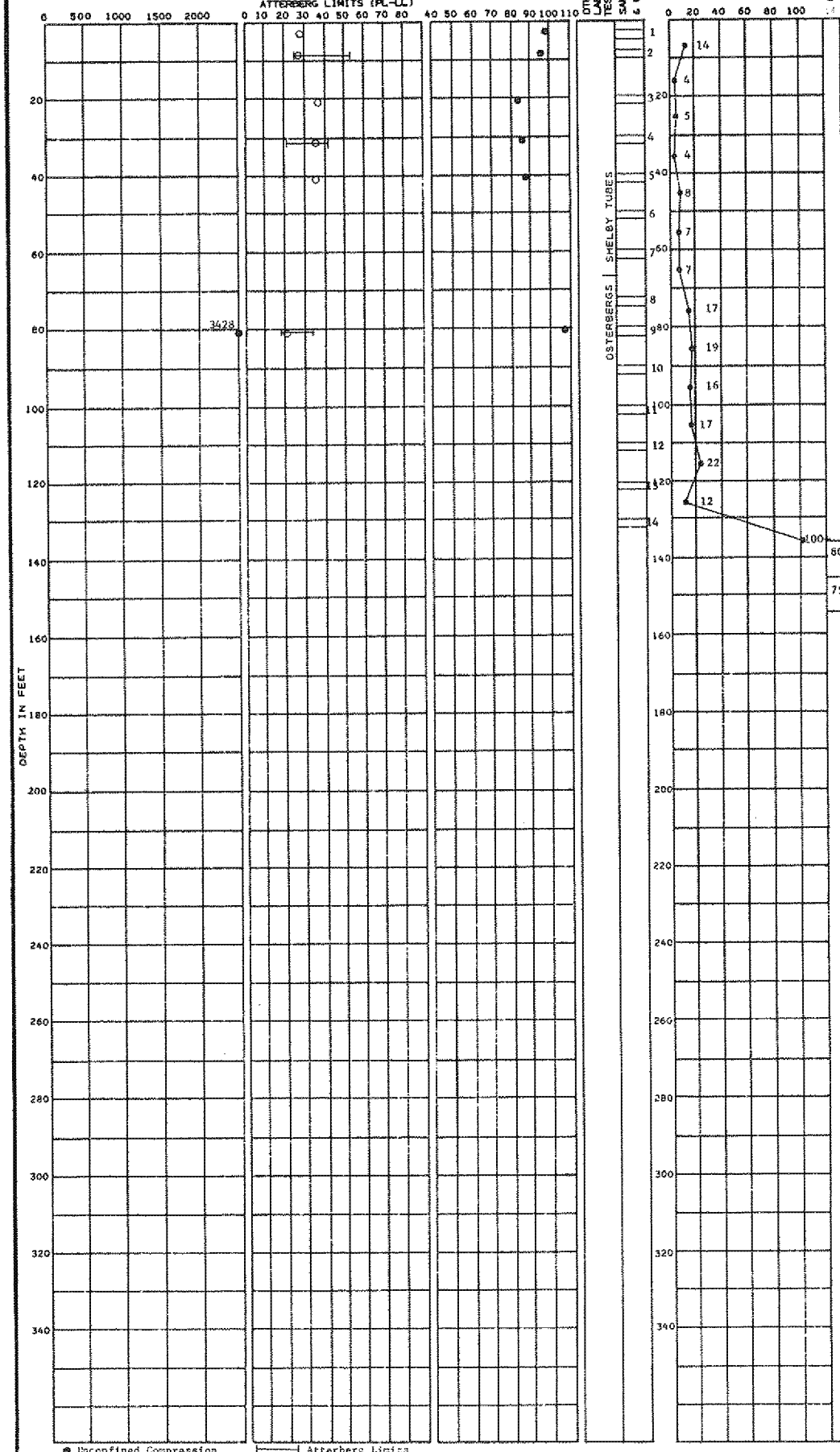
B-83

LOCATION: N 7,510 E11,300

GROUND ELEVATION 588.8

DATE DRILLED: 1-29-74 2-5-74

SHEET 1 OF 1



DESCRIPTION

black, clayey, topsoil & cinder fill

stiff to very stiff, dark grayish brown mottled light olive brown, silty Clay (CL) trace sand

very stiff, 10% coarse sand and fine gravel

firm, dark gray, silty Clay (CL-CH) 5-10% coarse sand

soft to firm, very dark grayish brown, silty Clay (CL) 5% coarse sand and gravel

soft to firm, dark grayish brown, highly plastic, silty Clay (CH-CL)

plastic to firm, gray, silty Clay (CL) some fine sand

stiff, grayish brown, sandy, 25% fine to coarse sand and gravel

slight trace of sand

compact, gray, very fine sandy Silt(ML)

stiff, gray, silty Clay (CL) some very fine sand

136.5-154.0ft Shale, dark gray. 136.5-139.0ft light gray, horizontal and contorted bedding

Bottom of Hole-Elevation-434.8
-Depth-154.0ft

No Gain or Loss of Water

For Water Table information consult Section 4.1.3.

Hole Backfilled With Bentonite and Natural Soil in Soil and Cement Grout in Rock

SOIL BORING NO. 119

BECHTEL Belle River

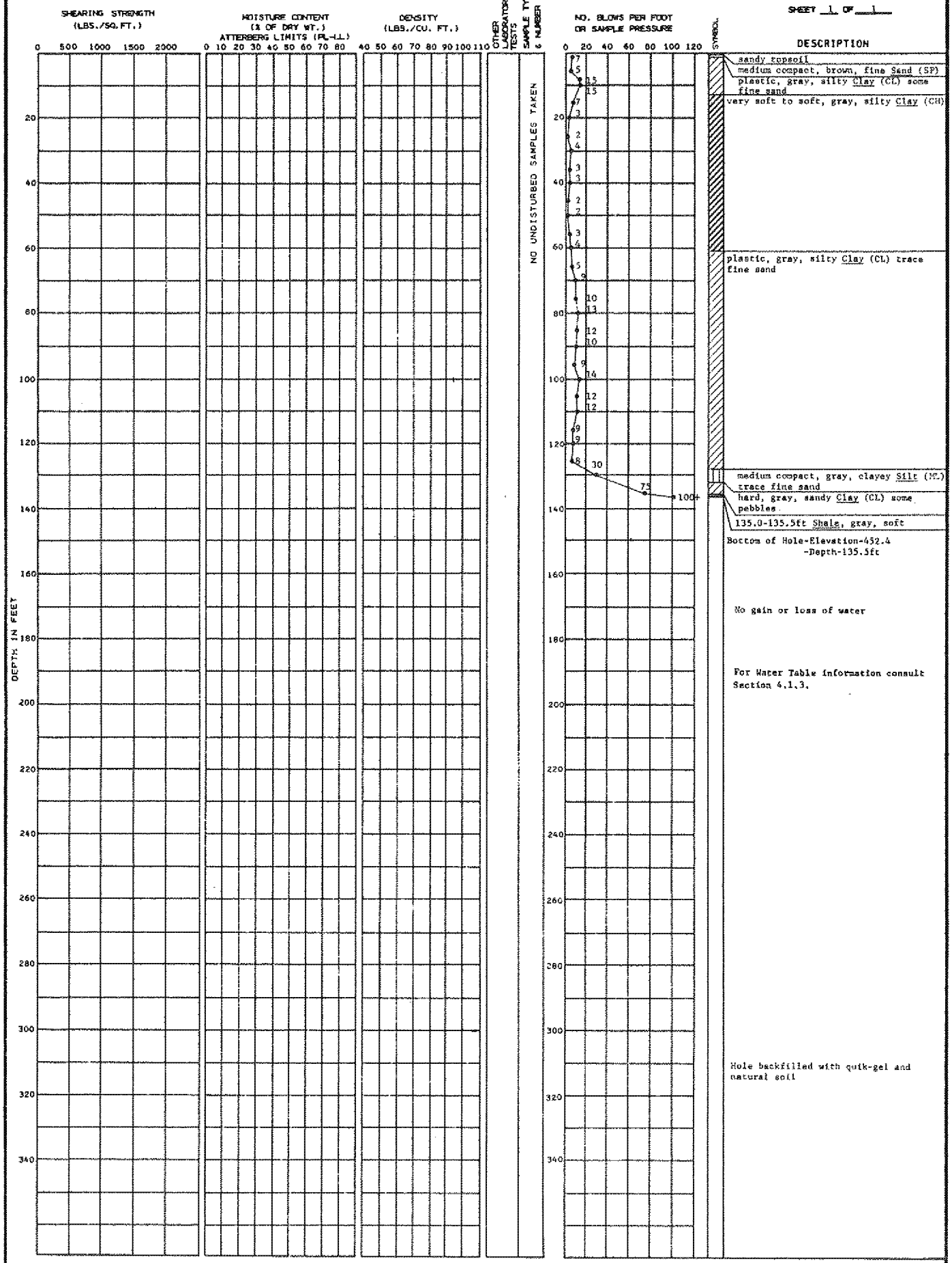
B-85

LOCATION: N 7,660 E 10,630

GROUND ELEVATION 587.9

DATE DRILLED: 2-14-74 2-19-74

SHEET 1 OF 1



DESCRIPTION

sandy topsoil

medium compact, brown, fine Sand (SP)

plastic, gray, silty Clay (CL) some fine sand

very soft to soft, gray, silty Clay (CH)

plastic, gray, silty Clay (CL) trace fine sand

medium compact, gray, clayey Silt (ML) trace fine sand

hard, gray, sandy Clay (CL) some pebbles

135.0-135.5ft Shale, gray, soft

Bottom of Hole-Elevation-452.4
-Depth-135.5ft

No gain or loss of water

For Water Table information consult Section 4.1.3.

Hole backfilled with quik-gel and natural soil

SOIL BORING NO. 121

BECHTEL Belle River

B-87

LOCATION: N 8,017 E 4,999

GROUND ELEVATION 588.9

DATE DRILLED: 3-25-74

SHEET 1 OF 1

SHEARING STRENGTH (LBS./SQ. FT.) 0 500 1000 1500 2000

MOISTURE CONTENT (% OF DRY WT.) ATTERBERG LIMITS (PL-LL) 0 10 20 30 40 50 60 70 80

DENSITY (LBS./CU. FT.) 40 50 60 70 80 90 100 110

OTHER LABORATORY TESTS

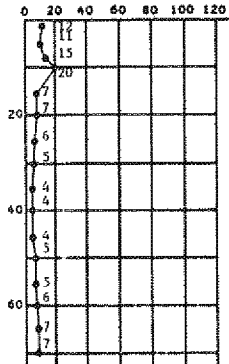
SAMPLE TYPE & NUMBER

NO. BLOWS PER FOOT OR SAMPLE PRESSURE 0 20 40 60 80 100 120

SYMBOL

DEPTH IN FEET

NO UNDISTURBED SAMPLES TAKEN



DESCRIPTION

Gray, silty topsoil

Medium, mottled brown & gray, silty sandy clay (CL), trace of pebbles

Soft, gray, silty clay (CH), trace of sand

Bottom of hole - Elevation - 518.9
- Depth - 70.0 ft

No gain or loss of water

For Water Table information consult Section 4.1.3.

Hole backfilled with Quik-Gel and natural soil

SOIL BORING NO. 123

BECHTEL Belle River

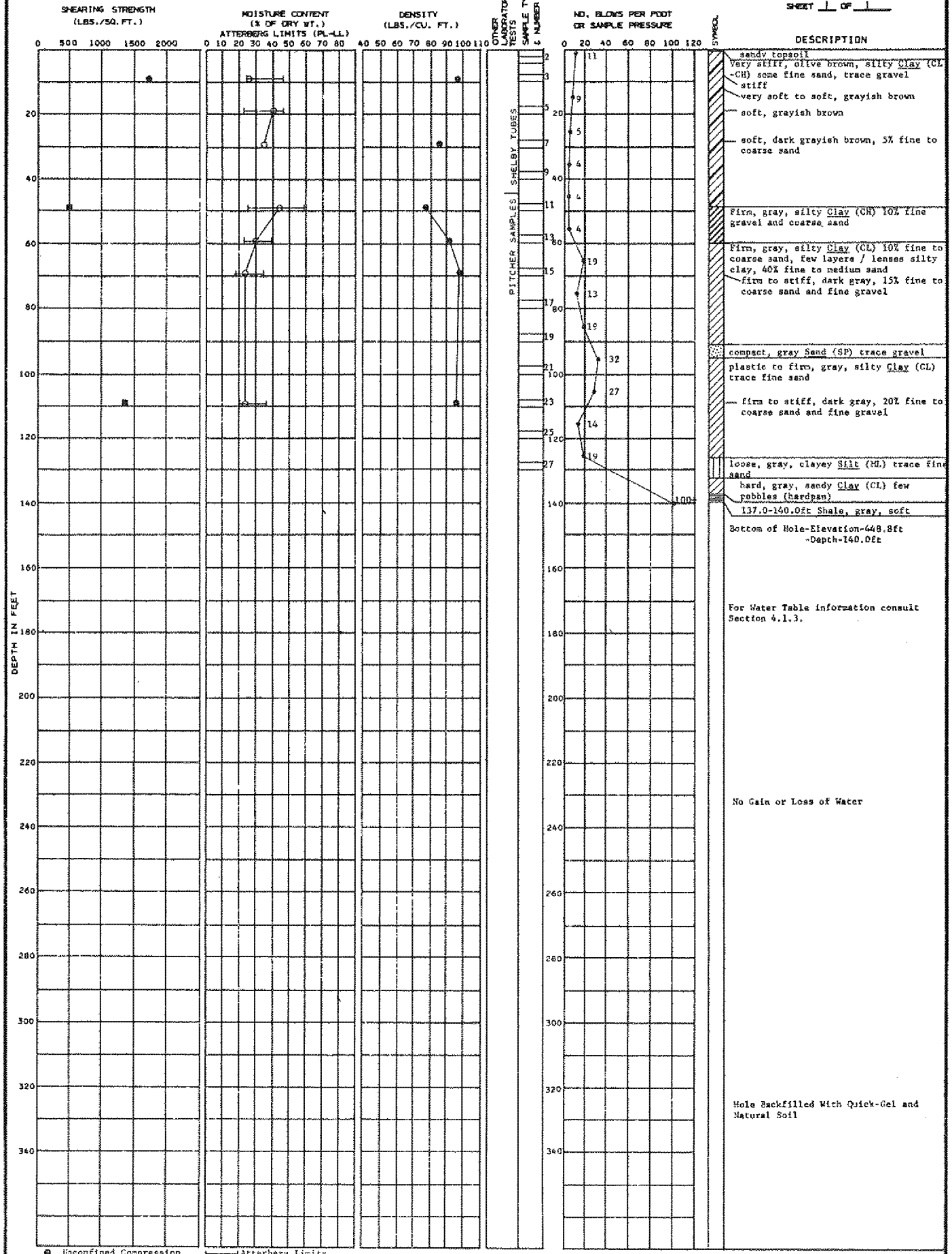
B-89

LOCATION: N 7,950 E 11,140

GROUND ELEVATION 588.8

DATE DRILLED: 2-1-74 2-6-74

SHEET 1 OF 1



SOIL BORING NO. 126

BECHTEL Belle River

B-91

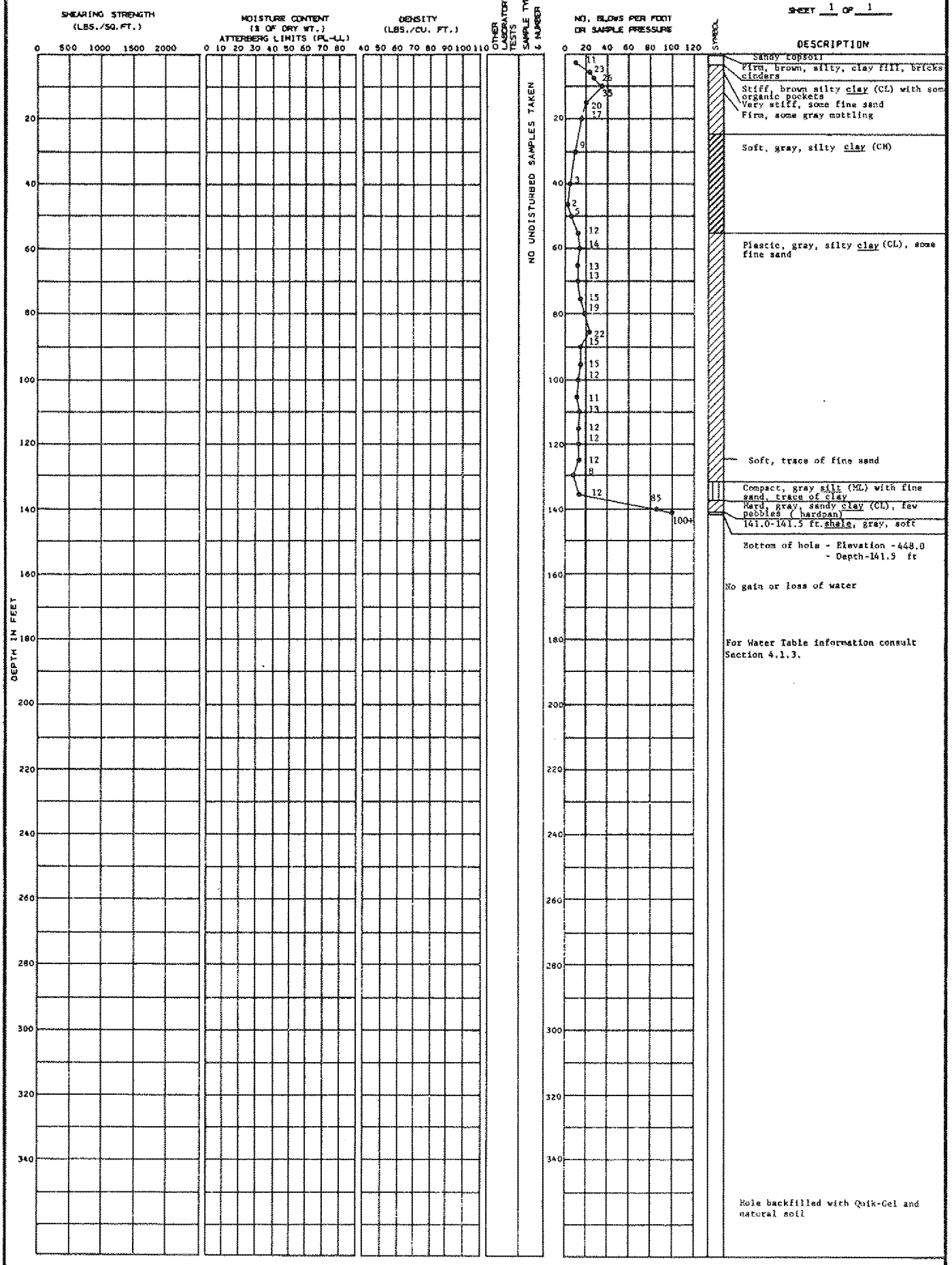
ED_005947A_00014551-00362

LOCATION: N 3,000 E 11,000

GROUND ELEVATION 589.5

DATE DRILLED: 2-7-74 2-13-74

SHEET 1 OF 1



SOIL BORING NO. 128

BECHTEL Belle River

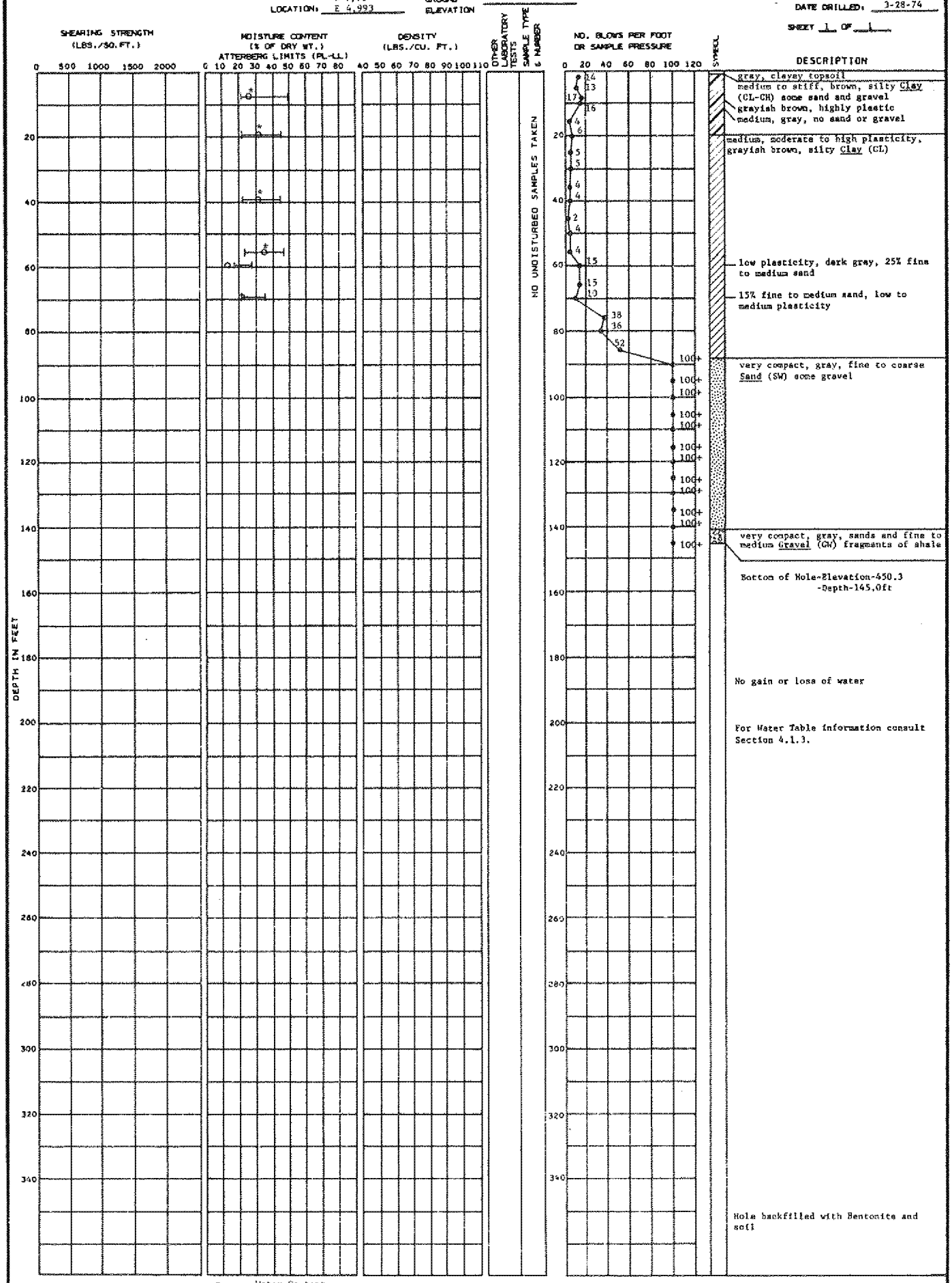
B-93

LOCATION: N 9,014 E 4,993

GROUND ELEVATION 595.3

DATE DRILLED: 3-26-74 3-28-74

SHEET 1 OF 1



O Water Content

Atterburg Limits

* Water content taken from unsealed jar sample.

SOIL BORING NO. 130

BECHTEL Belle River

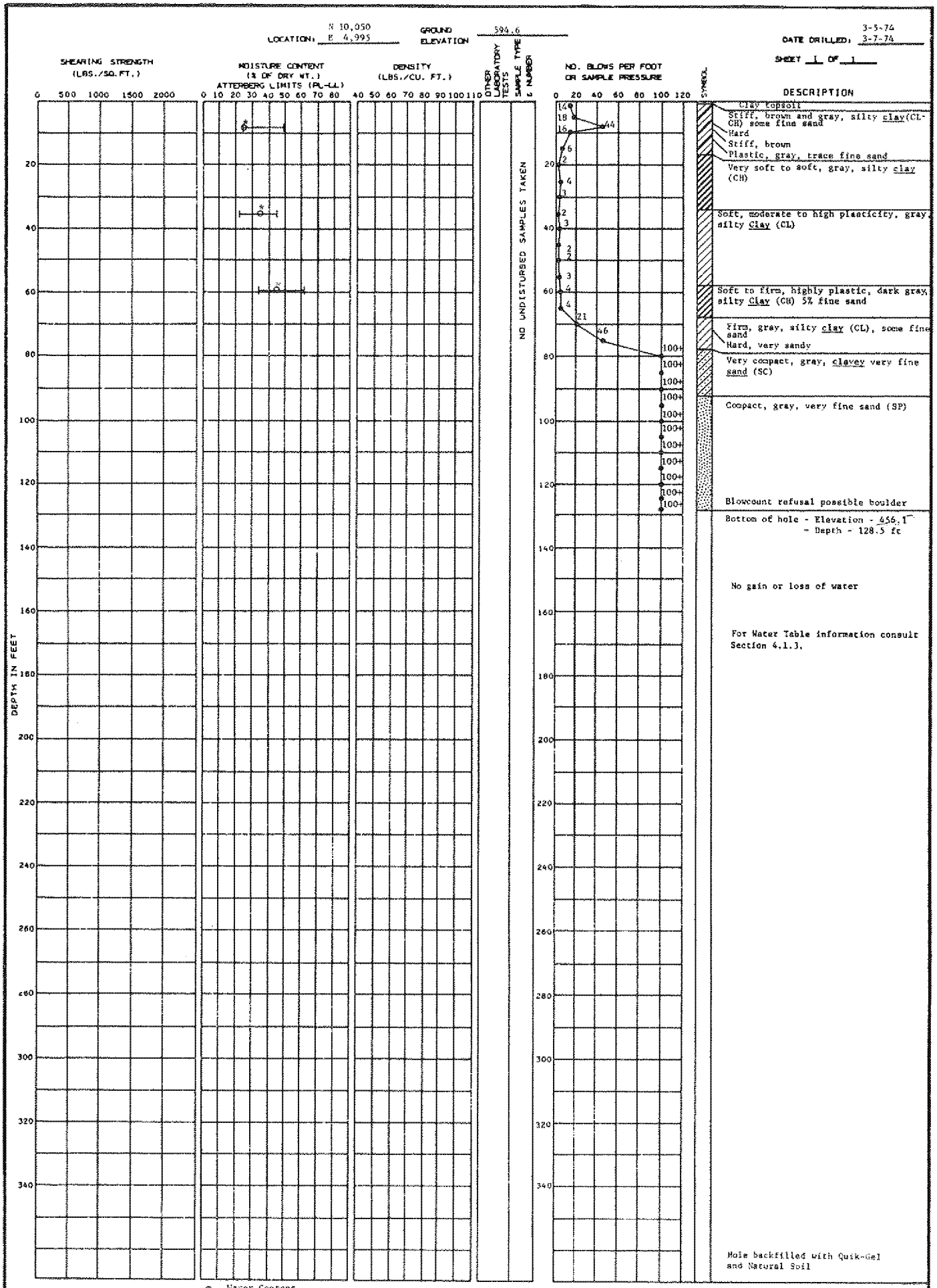
B-95

LOCATION: N 10,050 E 4,995

GROUND ELEVATION 594.6

DATE DRILLED: 3-5-74 3-7-74

SHEET 1 OF 1



O Water Content

Atterburg Limits

* Water content taken from unsealed jar sample.

SOIL BORING NO. 134

BECHTEL Belle River

B-97

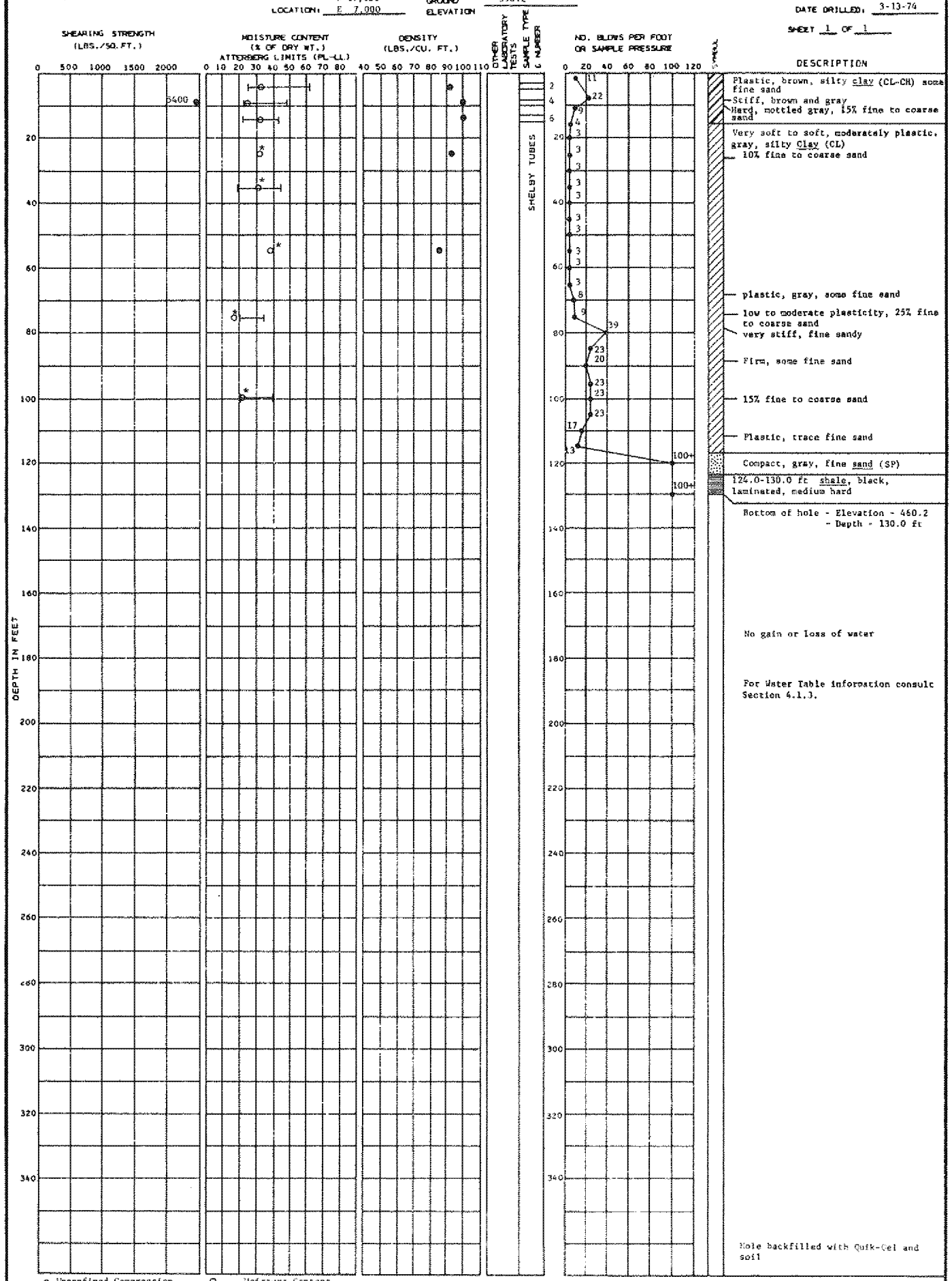
ED_005947A_00014551-00365

LOCATION: N 10,050 E 7,000

GROUND ELEVATION 590.2

DATE DRILLED: 3-8-74 3-13-74

SHEET 1 OF 1



● Unconfined Compression

○ Moisture Content

Atterburg Limits

* Water content taken from unsealed jar sample.

SOIL BORING NO. 136

BECHTEL Belle River

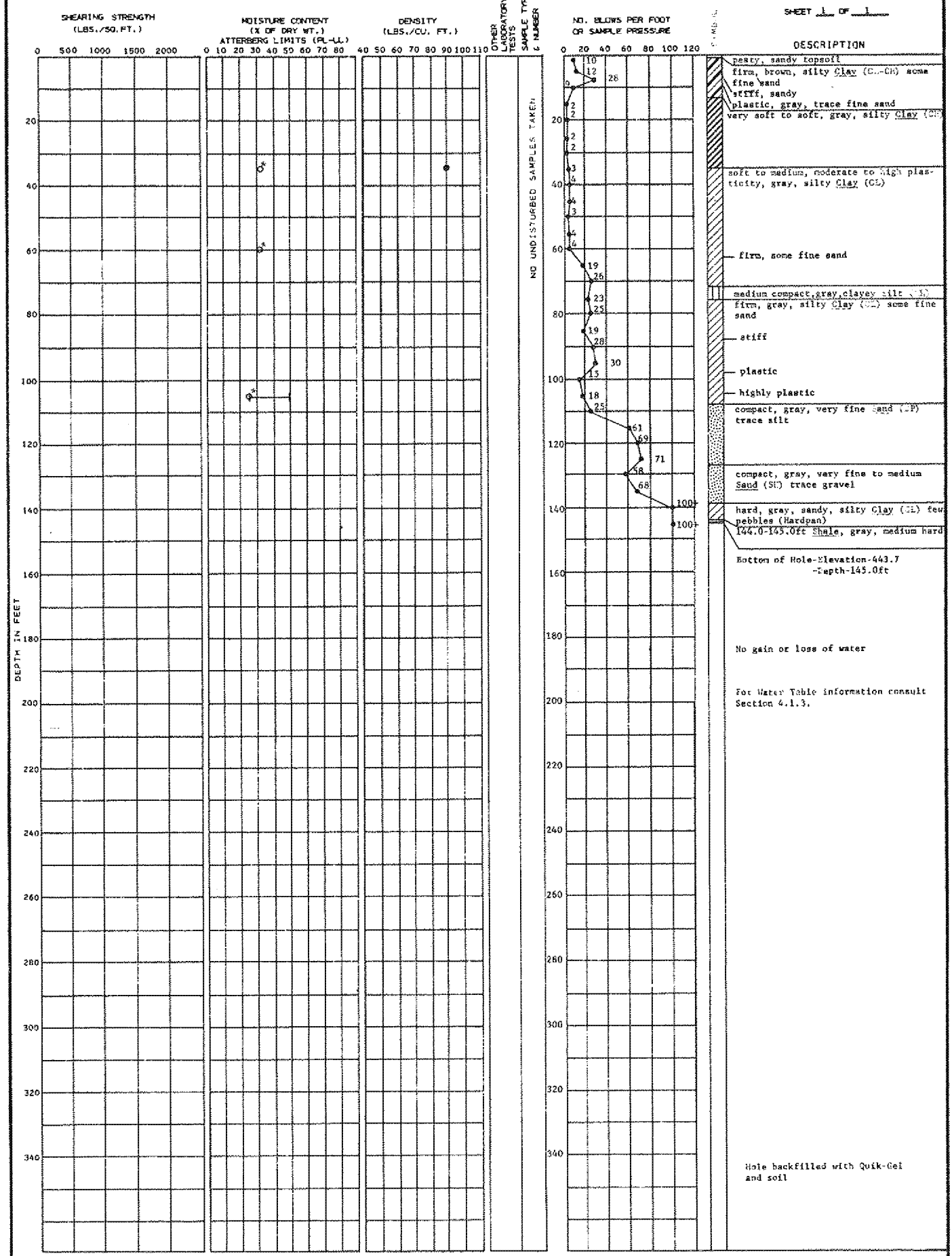
R-90

LOCATION: 10,030 / 5,977

GROUND ELEVATION 588.7

DATE DRILLED: 3-11-74 / 3-14-74

SHEET 1 OF 1



○ Water Content

Atterburg Limits

Water content taken from unsealed jar sample.

SOIL BORING NO. 138

BECHTEL Belle River

B-101

DUNN 14-72

LOCATION: 10,850 / [illegible].003

GROUND ELEVATION: 592.0

DATE DRILLED: 3-19-74 / 3-20-74

SHEET 1 OF 1

SHEARING STRENGTH (LBS./SQ.FT.): 0 500 1000 1500 2000

MOISTURE CONTENT (% OF DRY WT.) ATTERBERG LIMITS (PL-LL): 0 10 20 30 40 50 60 70 80

DENSITY (LBS./CU. FT.): 40 50 60 70 80 90 100 110

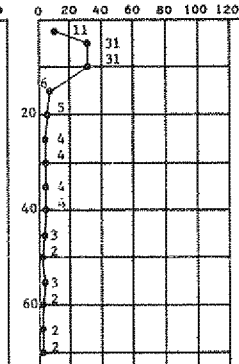
OTHER LABORATORY TESTS

SAMPLE TYPE & NUMBER: NO UNDISTURBED SAMPLES TAKEN

NO. BLOWS PER FOOT OR SAMPLE PRESSURE: 0 20 40 60 80 100 120

SYMBOL

DEPTH IN FEET: 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300 320 340



DESCRIPTION

plastic, brown, silty Clay (CL) trace sand

stiff, some fine sand

soft, gray

very soft to soft, gray, silty Clay (CH)

Bottom of Hole-Elevation 521.5
-Depth-70.5ft

No gain or loss of water

For Water Table information consult Section 4.1.3.

Hole backfilled with Quik-Gel and soil

SOIL BORING NO. 140

BECHTEL Belle River

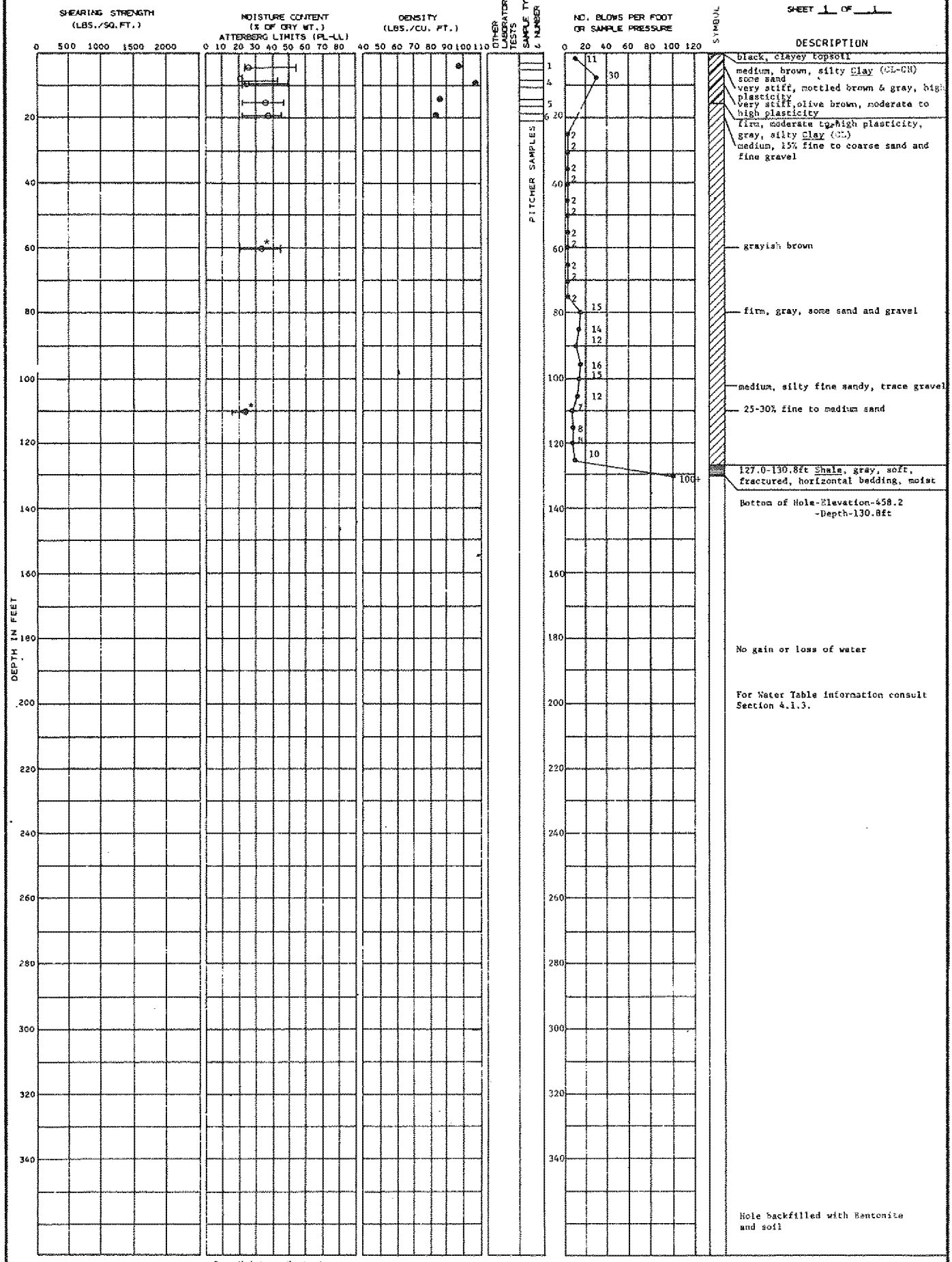
B-103

LOCATION: N 11,146 E 7,995

GROUND ELEVATION 589.0

DATE DRILLED: 3-25-74 3-27-74

SHEET 1 OF 1



○ Moisture Content

⊢—⊣ Atterburg Limits

* Water content taken from unsealed jar sample.

SOIL BORING NO. 142

BECHTEL Belle River

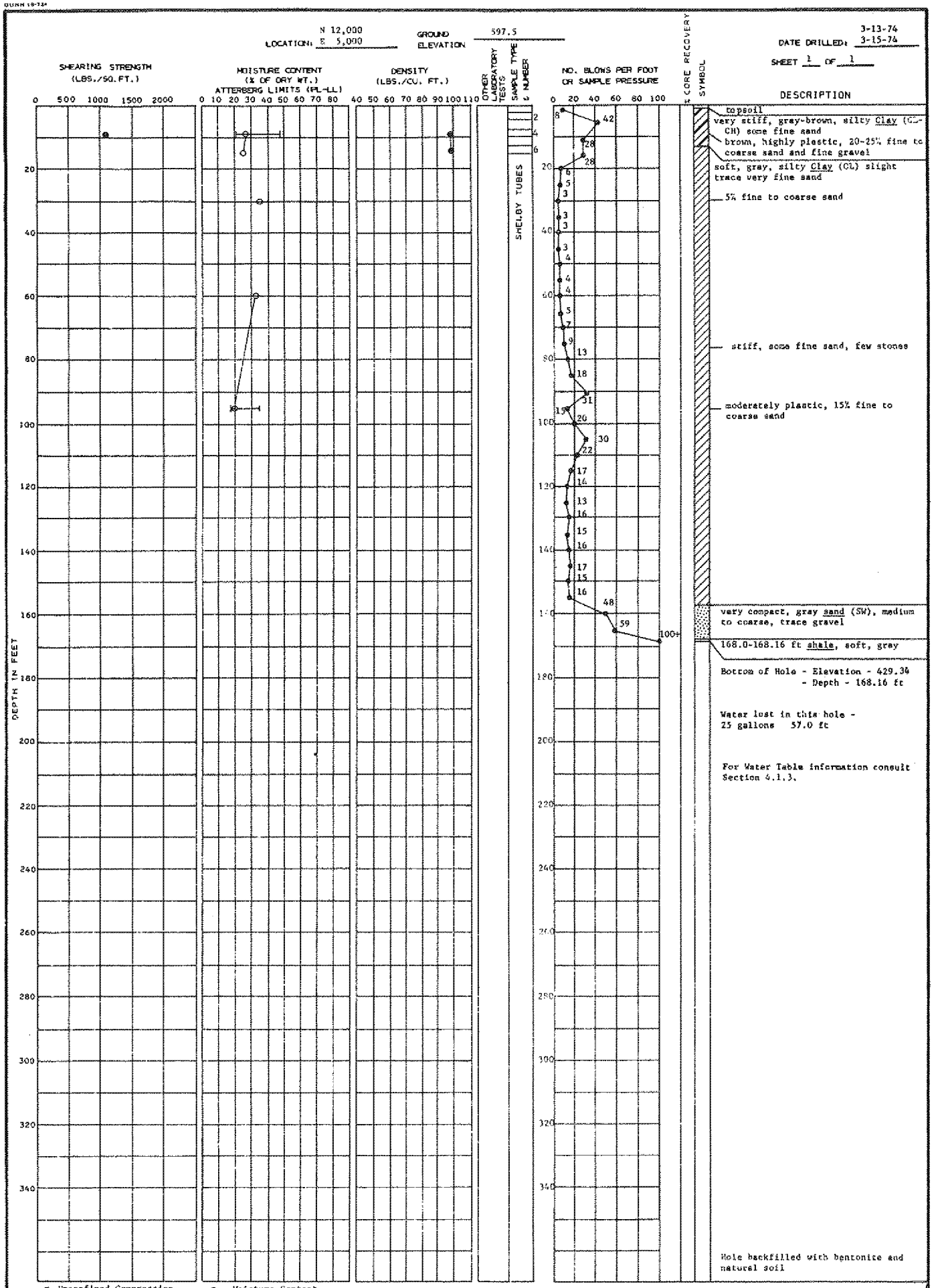
B-105

LOCATION: N 12,000 E 5,000

GROUND ELEVATION 597.5

DATE DRILLED: 3-13-74 3-15-74

SHEET 1 OF 1



SOIL BORING NO. 144

BECHTEL Belle River

B-107

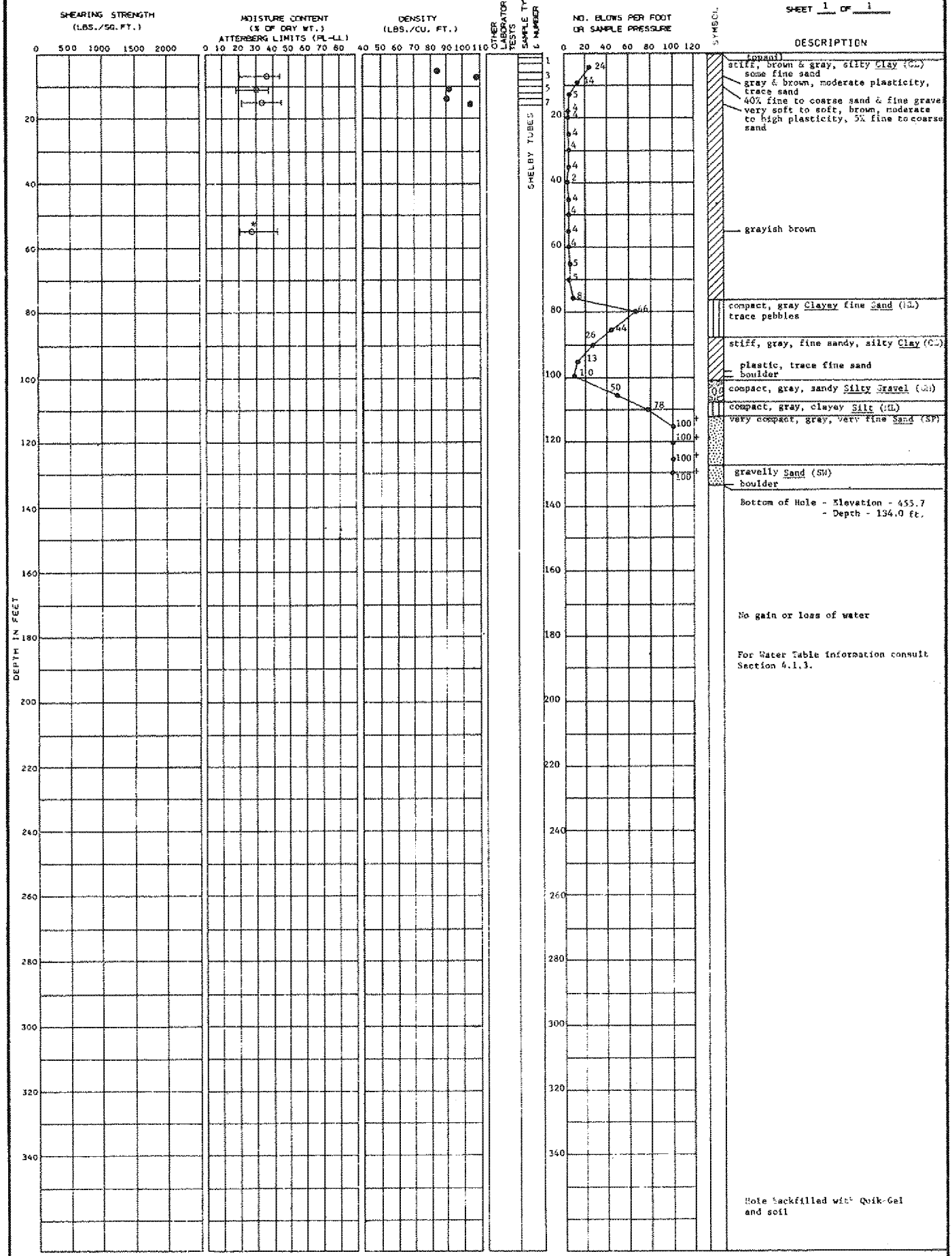
ED_005947A_00014551-00370

LOCATION: N 12,000 E 7,000

GROUND ELEVATION 589.7

DATE DRILLED: 3-18-74 3-19-74

SHEET 1 OF 1



Moisture Content
Atterburg Limits
* Water content taken from unsealed jar sample.

SOIL BORING NO. 146

BECHTEL Belle River

B-109

LOCATION: N 13,061 E 5,006

GROUND ELEVATION 598.6

DATE DRILLED: 3-28-74

SHEET 1 OF 1

SHEARING STRENGTH (LBS./SQ. FT.) 0 500 1000 1500 2000

MOISTURE CONTENT (% OF DRY WT.) ATTERBERG LIMITS (PL-LL) 0 10 20 30 40 50 60 70 80

DENSITY (LBS./CU. FT.) 40 50 60 70 80 90 100 110

OTHER LABORATORY TESTS

SAMPLE TYPE & NUMBER

NO. BLOWS PER FOOT OR SAMPLE PRESSURE 0 20 40 60 80 100 120

SYMBOL

DEPTH IN FEET 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300 320 340

NO UNDISTURBED SAMPLES TAKEN

11 13 12 15 4 4 4 4 2 3 3 3 2 2 2 2

DESCRIPTION

Black, clayey topsoil

Firm, brown & gray, silty, sandy clay (CL), trace of pebbles

Soft, gray, silty clay (CH), trace of sand

Bottom of hole - Elevation - 528.6
- Depth - 70.0 ft

No gain or loss of water

For Water Table information consult Section 4.1.3.

Hole backfilled with Quik-Gel and natural soil

SOIL BORING NO. 148

BECHTEL Belle River

B-111

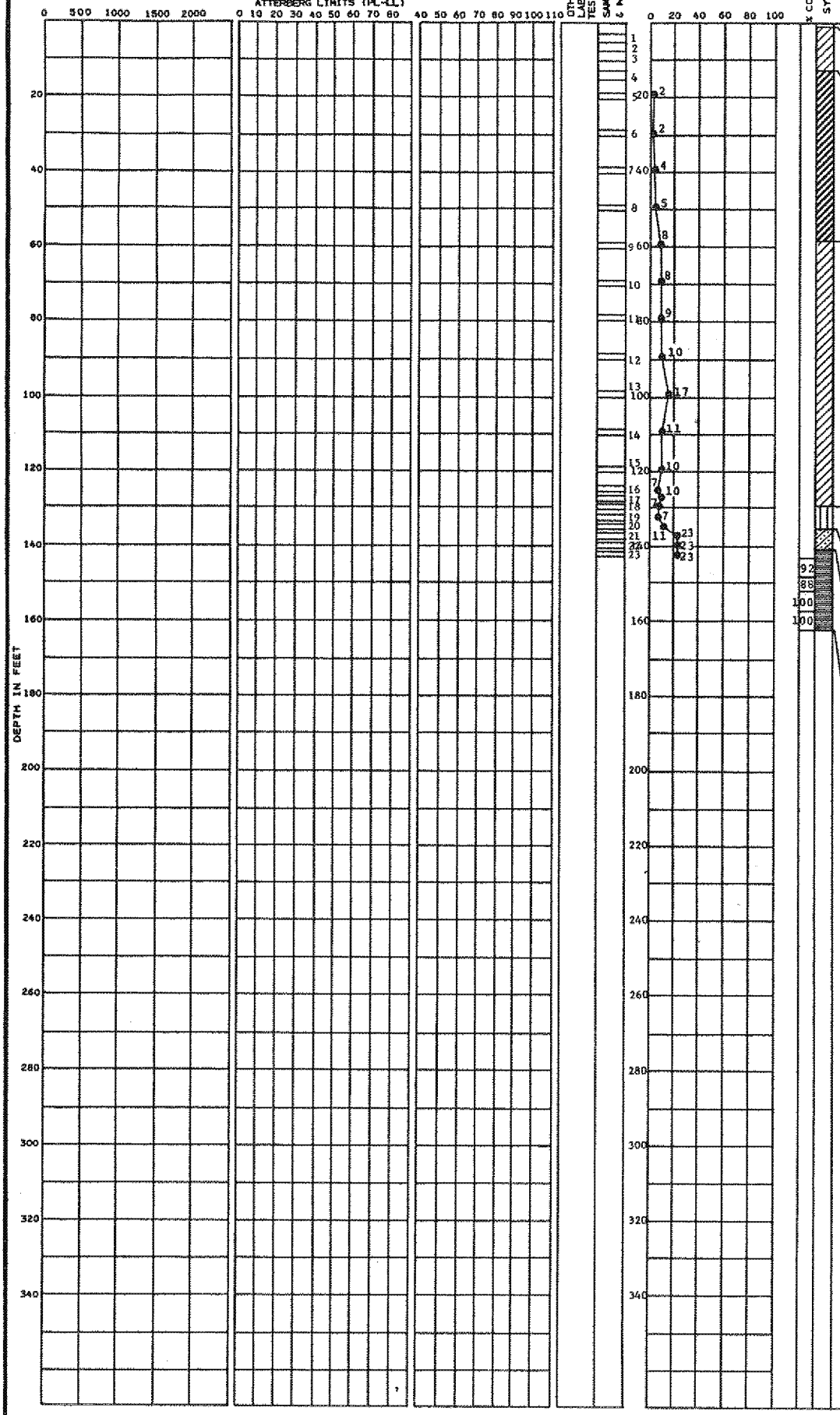
ED_005947A_00014551-00372

LOCATION: N 7455 E 9535

GROUND ELEVATION 585.2

DATE DRILLED: 9/28/77 9/30/77

SHEET 1 OF 1



DESCRIPTION

0-0.7' Topsoil, dark brown, clayey

0.7-12.0' Silty Clay, dark brown, very stiff, med. plasticity, moist, trace wood fragments, trace sand, trace fine gravel (CL)

12.0-58.0' Clay, med. gray, very soft, high plasticity, moist to wet, trace silt, trace sand, trace fine gravel (CH)

38.5'-58.0' Soft

58.0-129.8' Silty Clay, med. gray, med. stiff, med. plasticity, moist, little sand, trace fine to coarse gravel (CL)

98.5-108.5' Very stiff

108.5-118.5' Stiff

118.5-129.8' Trace sand

129.8-136.0' Clayey Silt, med. gray, med. stiff to stiff, wet, with occasional fine-grained sand seams (ML)

136.0-140.5' Clayey Sand, med. gray, med. dense, wet, fine-grained, scattered silt layers, trace fine to med. gravel (SC)

140.5' Top of Rock

140.5-162.0' Shale, med. gray, soft, weathered

144.0-158.7' Firm, scattered soft clay layers

156.0' Irregular bedding

158.7-162.0' Hard, dark gray, occasional soft clay layers

Bottom of Hole: Depth 162.0'
Elevation 423.2

Hole grouted from 162.0' to ground surface.

SOIL BORING NO. B-8

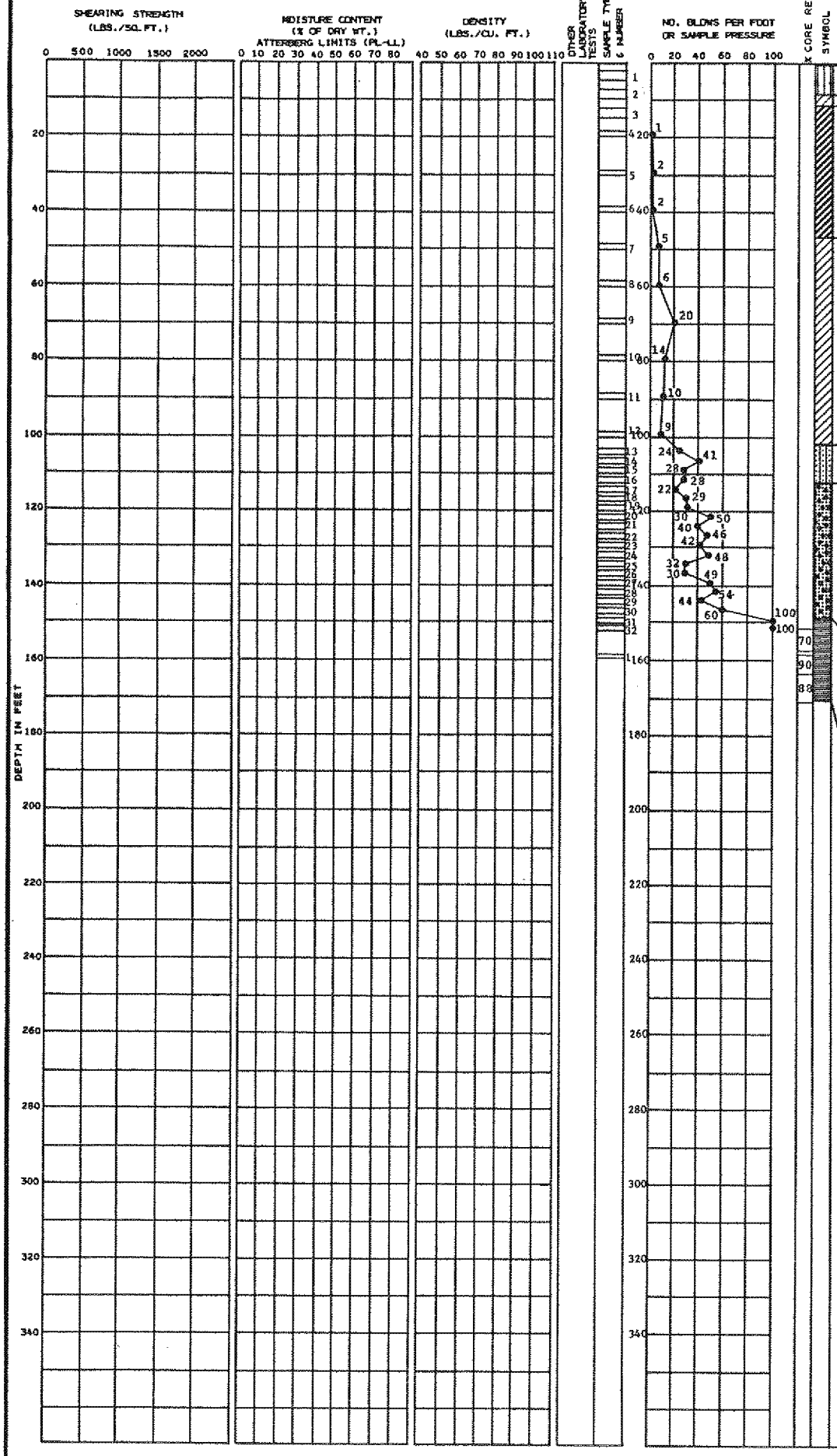
BECHTEL Belle River

LOCATION: N 7675 E 9100

GROUND ELEVATION 585.6

DATE DRILLED: 8/8/77 8/11/77

SHEET 1 OF 1



DESCRIPTION

0-0.3' Topsoil, clayey silt, med. brown, dry

0.3-8.5' Clayey Silt, green brown and med. gray, mottled, slight plasticity, dry, trace wood fragments, trace fine gravel (ML)

8.5-11.5' Silty Clay, med. gray and brown, mottled, high plasticity, wet, trace silt, trace fine gravel (CL)

11.5-46.5' Clay, med. gray, very soft, very high plasticity, wet, trace silt, trace fine gravel (CH)

46.5-101.5' Silty Clay, med. gray, soft to med. stiff, med. plasticity, moist, little sand, trace fine to coarse gravel, occasional cobbles(CL)

48.5-50.0' Seams of clayey sand and silt

68.5-78.5' Very stiff

78.5-88.5' Stiff

83.0-83.5' Cobble

88.5-101.5' Med. stiff

101.5-111.0' Silty Sand, med. gray and brown, med. dense, fine-to med.-grained, wet, with silt seams (SM)

111.0-130.5' Sand, med. gray and brown, med. dense, fine-to coarse-grained, wet, trace silt, trace fine to coarse gravel, very clean, occasional cobbles (SW-SP)

121.0-133.5' Fine-to med.-grained

128.5-133.5' Silty

133.5-148.5' Med.-to coarse-grained

143.0-148.5' Some fine to coarse gravel

148.5-150.5' Fine-to med.-grained

150.5' Top of Rock

150.5-171.0' Shale, med. gray to dark gray, soft to moderately hard

150.5-158.9' Soft, weathered, mechanically fractured

158.9-171.0' Moderately hard, occasional mechanical fractures at 45° angle, occasional soft shale seams

163.5-164.0' Fissile, core broken every 1/4"

Bottom of Hole: Depth 171.0'
Elevation 414.6

Hole caved in from 171.0' to 145.0'.

Hole grouted from 145.0' to ground surface.

SOIL BORING NO. B-9

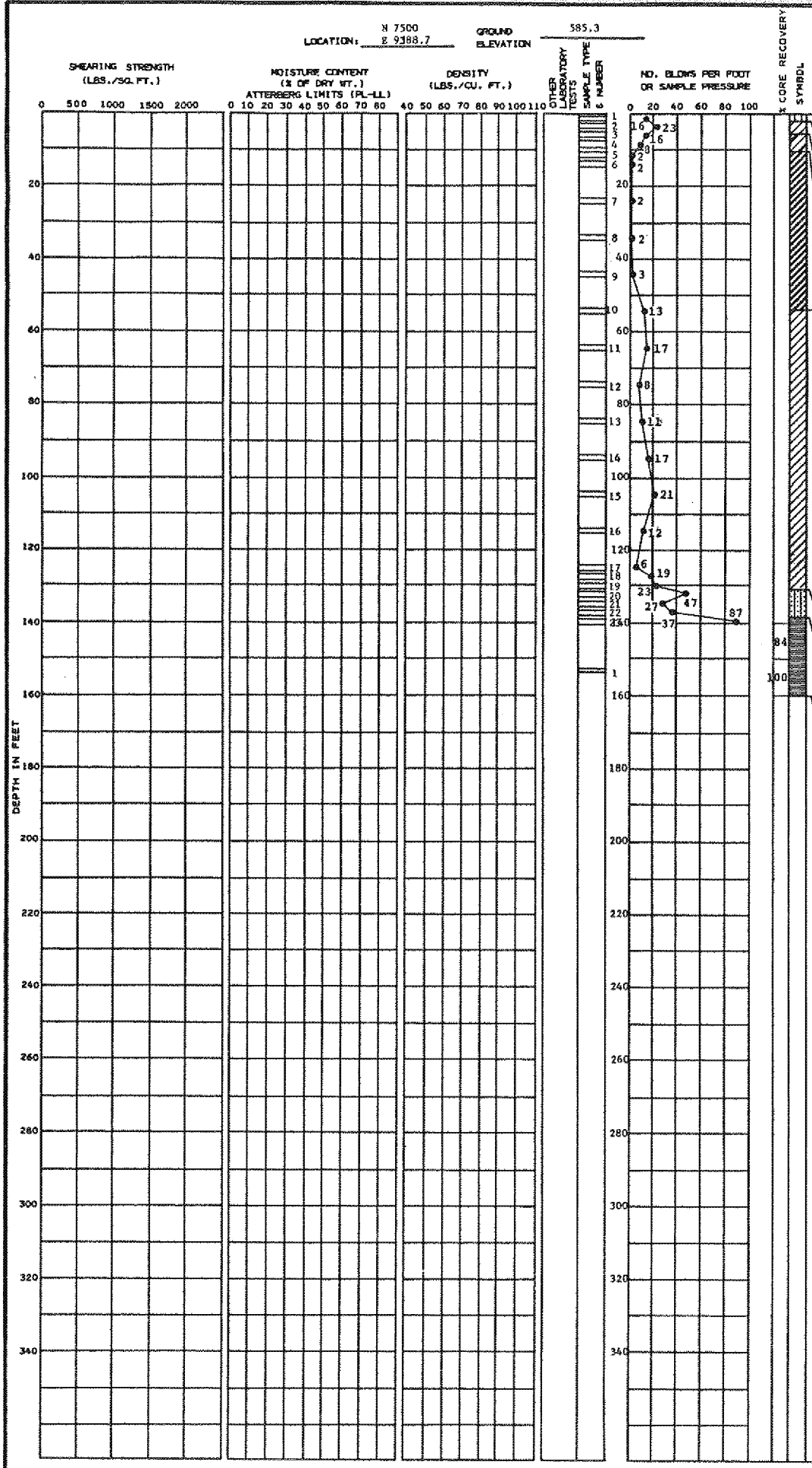
BECHTEL Belle River

LOCATION: N 7500 E 9388.7

GROUND ELEVATION 585.3

DATE DRILLED: 7/21/77 7/25/77

SHEET 1 OF 1



DESCRIPTION

0-1.0' Clayey Silt, topsoil, light gray to dark brown, med. dense, dry, with wood fragments (ML)

1.0-6.0' Silty Clay, med. brown and light gray, mottled, very stiff, med. plasticity, moist, trace sand (CL)

6.0-11.0' Clay, med. brown, very stiff, med. plasticity, moist, trace silt, trace sand (CL-CH)

7.5-11.0' Light gray, med. stiff, high plasticity

11.0-54.0' Clay, light gray, very soft, very high plasticity, wet (CH)

54.0-131.0' Silty Clay, med. gray, stiff, high plasticity, moist, trace sand, trace cobble (CL)

63.5-73.5' Very stiff

73.5-83.5' Med. stiff

83.5-93.5' Stiff, trace fine to coarse gravel

93.5-113.5' Very stiff

100.5-123.5' Med. plasticity, little sand

113.5-126.0' Stiff

123.5-124.0' Fine-grained clayey sand seam

126.0-131.0' Very stiff

126.5-127.0' Fine-grained silty sand seam

131.0-138.0' Silty Sand, med. gray, dense, wet, fine-grained (SM)

Cobble on top of rock

138.0' Top of Rock

138.0-160.0' Shale, dark gray, soft to firm, fissile mechanically fractured in areas

138.0-141.4' Soft, weathered

141.4-160.0' Hard, fissil

Bottom of Hole: Depth 160.0'
Elevation 425.3

Hole grouted from 160.0' to ground surface.

SOIL BORING NO. B-12

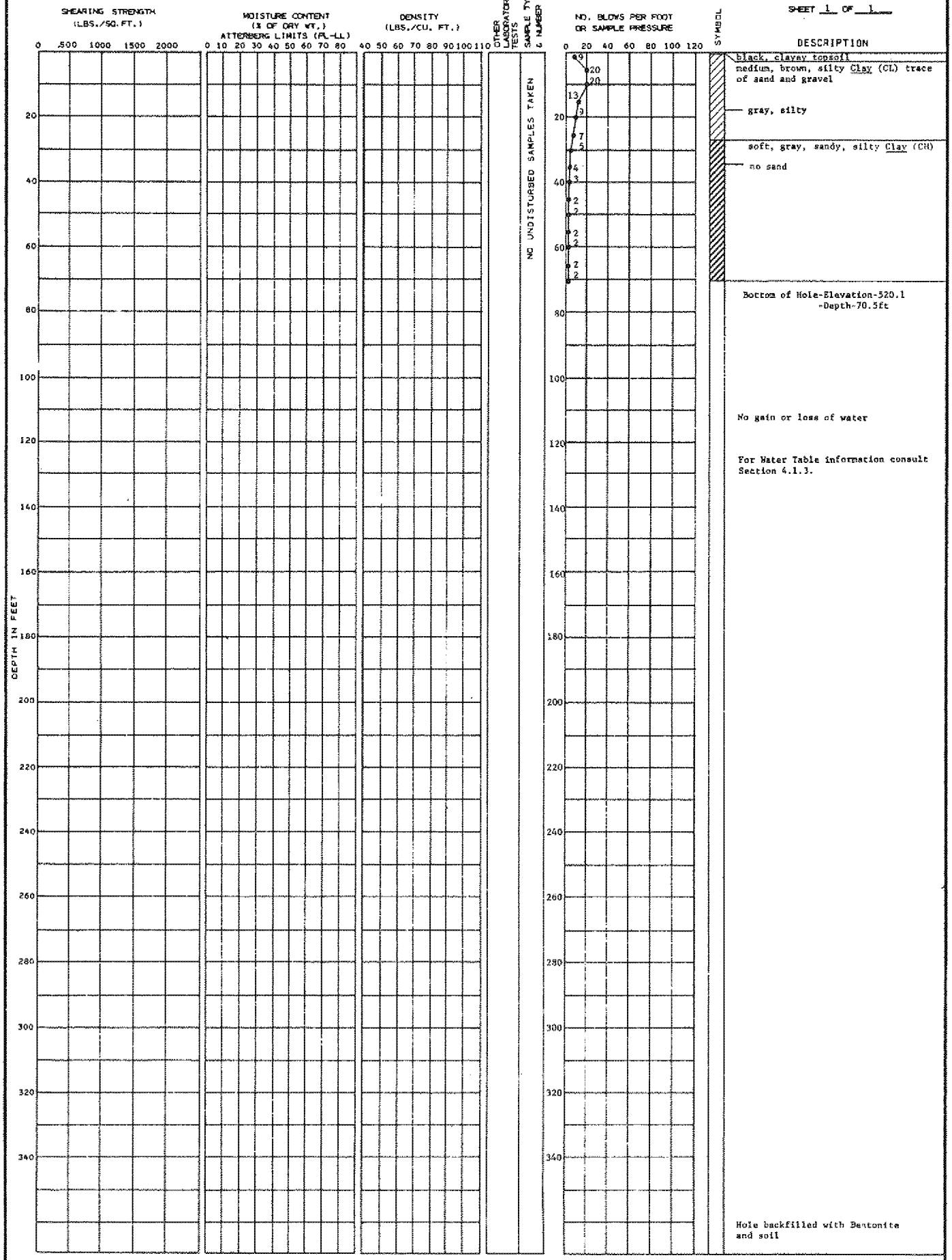
BECHTEL Bella River

LOCATION: N 13,000 E 7,000

GROUND ELEVATION 530.6

DATE DRILLED: 3-27-74 3-28-74

SHEET 1 OF 1



DESCRIPTION

black, clayey topsoil

medium, brown, silty Clay (CL) trace of sand and gravel

gray, silty

soft, gray, sandy, silty Clay (CH)

no sand

Bottom of Hole-Elevation-520.1
-Depth-70.5ft

No gain or loss of water

For Water Table information consult Section 4.1.3.

Hole backfilled with Bentonite and soil

SOIL BORING NO. 150

BECHTEL Belle River

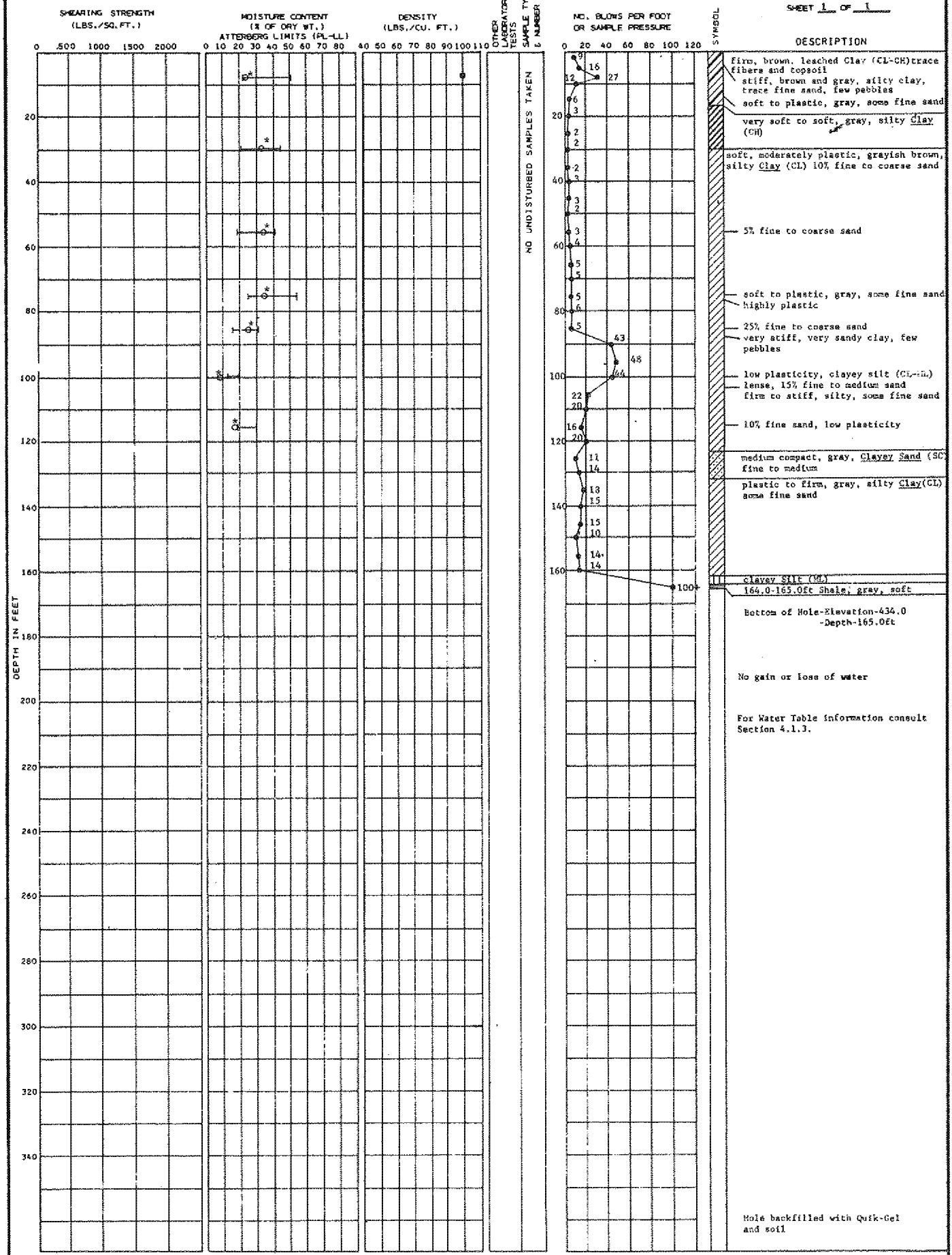
B-113

LOCATION: N 13,785 E 5,006

GROUND ELEVATION 599.0

DATE DRILLED: 3-7-74 3-14-74

SHEET 1 OF 1



o Moisture Content

|—| Atterburg Limits

* Water content taken from unsealed jar sample.

SOIL BORING NO. 154

BECHTEL Belle River

B-115

LOCATION: N 14,000 E 8,000

GROUND ELEVATION 591.5

DATE DRILLED: 4-5-74

SHEET 1 OF 1

SHEARING STRENGTH (LBS./SQ.FT.) 0 500 1000 1500 2000

MOISTURE CONTENT (% OF DRY WT.) ATTERBERG LIMITS (PL-LL) 0 10 20 30 40 50 60 70 80

DENSITY (LBS./CU. FT.) 40 50 60 70 80 90 100 110

OTHER LABORATORY TESTS

SAMPLE TYPE & NUMBER

NO UNDISTURBED SAMPLES TAKEN

NO. BLOWS PER FOOT OR SAMPLE PRESSURE 0 20 40 60 80 100 120

SYMBOL

DEPTH IN FEET 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300 320 340

DESCRIPTION

topsoil

firm to stiff, brown, silty clay (CL)

very stiff, trace gravel

plastic to firm, gray

soft, gray, silty clay (CH)

Bottom of Hole - Elevation - 521.5
- Depth - 70.0 ft.

No gain or loss of water

For Water Table information consult Section 4.1.3.

Hole backfilled with Quik-Gel and soil

SOIL BORING NO. 157

BECHTEL Belle River

B-117

LOCATION: N 14,000 E 9,950

GROUND ELEVATION 591.3

DATE DRILLED: 4-3-74

SHEET 1 OF 1

SHEARING STRENGTH (LBS./SQ. FT.) 0 500 1000 1500 2000

MOISTURE CONTENT (% OF DRY WT.) AFTERBERG LIMITS (PL-LL) 0 10 20 30 40 50 60 70 80

DENSITY (LBS./CU. FT.) 40 50 60 70 80 90 100 110

OTHER LABORATORY TESTS

SAMPLE TYPE & NUMBER

NO UNDISTURBED SAMPLES TAKEN

NO. BLOWS PER FOOT OR SAMPLE PRESSURE 0 20 40 60 80 100 120

SYMBOL

DEPTH IN FEET 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300 320 340

DESCRIPTION

gray silt (ML)

loose to medium compact, brown to gray, silty sand (SM) fine to medium

firm, gray, silty clay (CL)

soft, gray, silty clay (CH)

Bottom of Hole - Elevation - 521.3
- Depth - 70.0 ft.

No gain or loss of water

For Water Table information consult Section 4.1.3.

Hole backfilled with Quik-Gel in soil

SOIL BORING NO. 159

BECHTEL Belle River

B-119

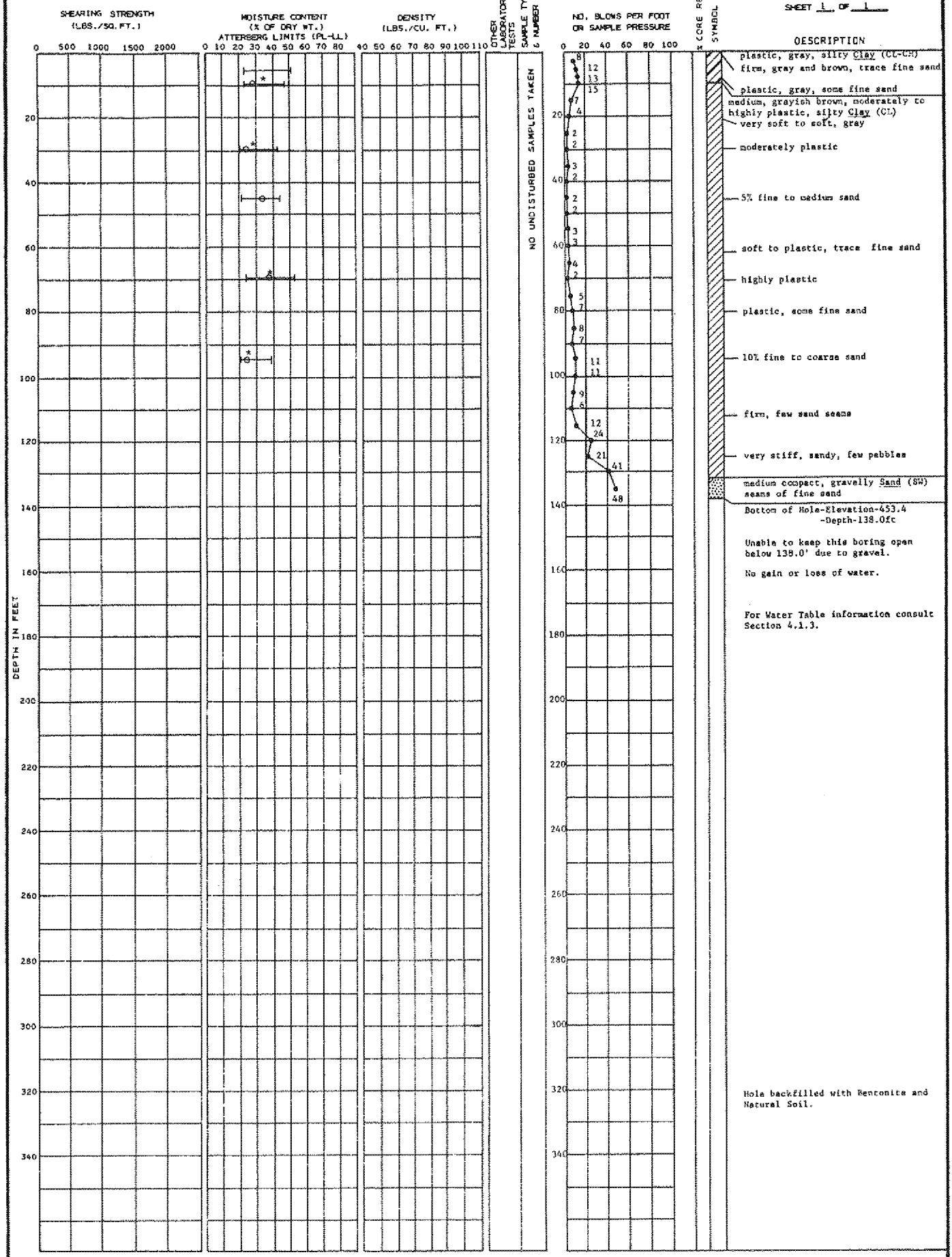
ED_005947A_00014551-00379

LOCATION: N 15,000 E 8,000

GROUND ELEVATION 591.4

DATE DRILLED: 4-8-74

SHEET 1 OF 1



O Moisture Content

⊢—⊣ Atterburg Limits

* Water content taken from unsealed jar sample

SOIL BORING NO. 163

BECHTEL Belle River

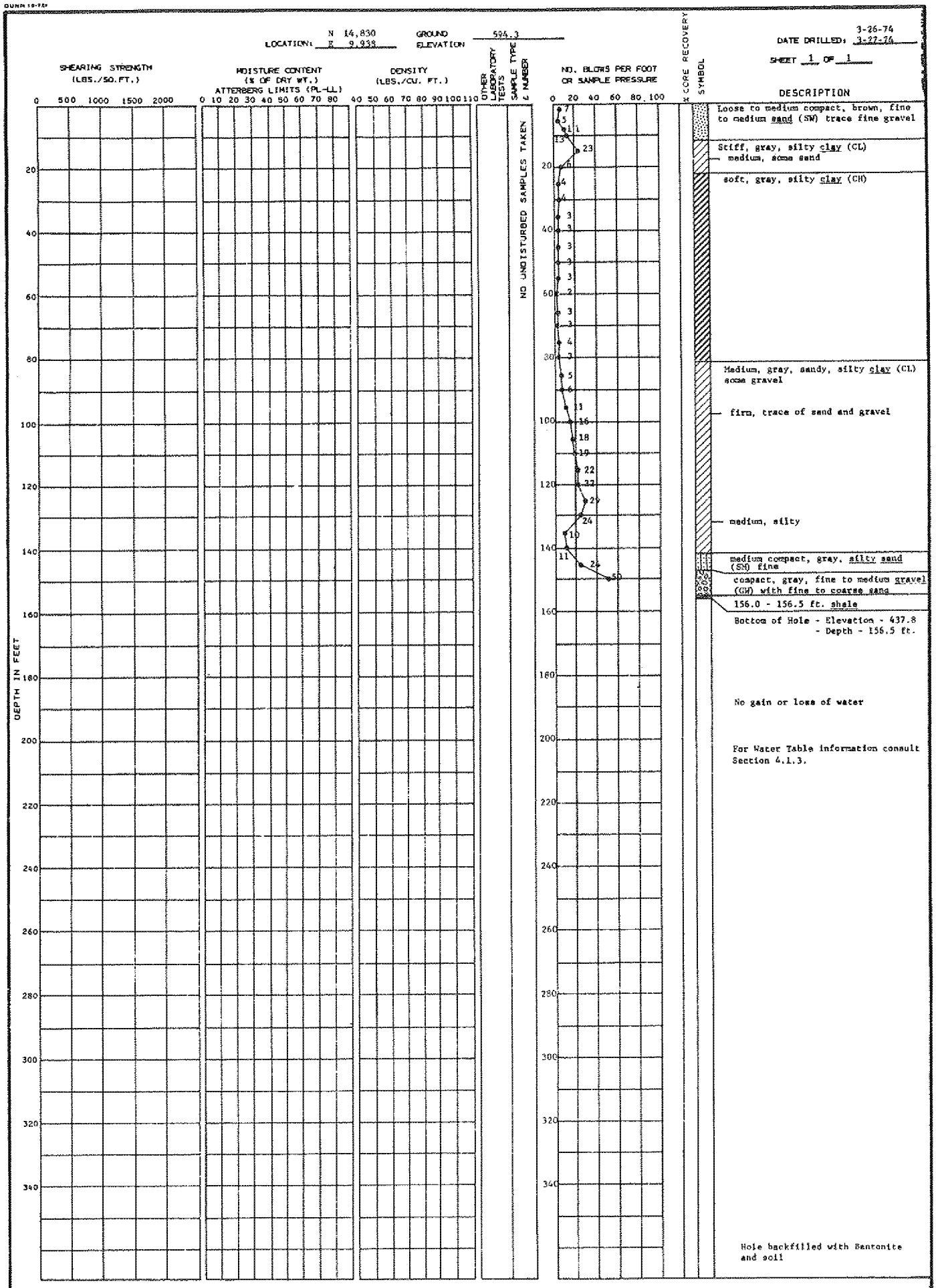
B-121

LOCATION: N 14,830 E 9,938

GROUND ELEVATION 594.3

DATE DRILLED: 3-26-74 3-27-74

SHEET 1 OF 1



SOIL BORING NO. 165

BECHTEL Belle River

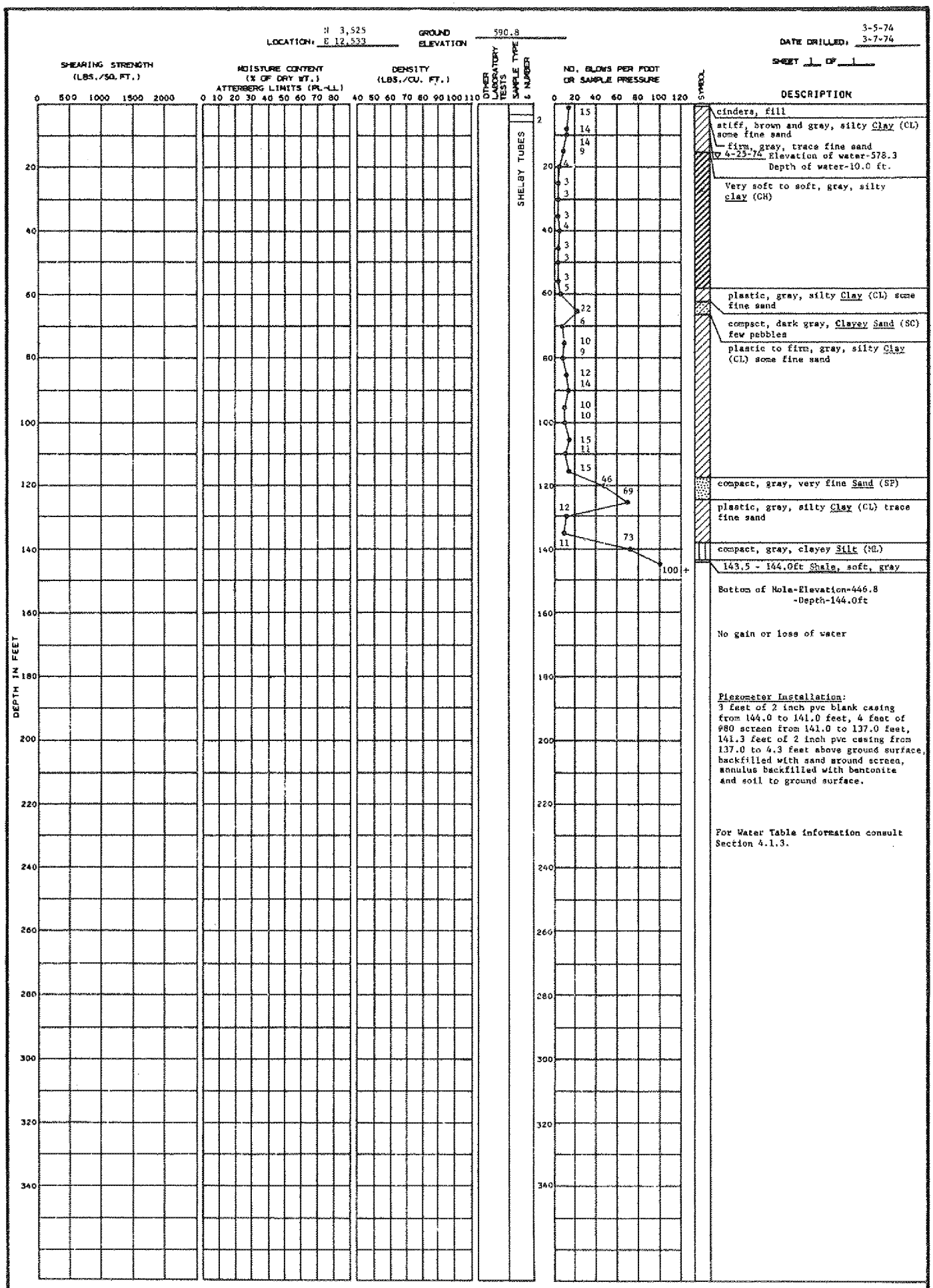
B-123

LOCATION: N 3,525 E 12,533

GROUND ELEVATION 590.8

DATE DRILLED: 3-5-74 3-7-74

SHEET 1 OF 1



DESCRIPTION

Bottom of Hole-Elevation-446.8
-Depth-144.0ft

No gain or loss of water

Piezometer Installation:
3 feet of 2 inch pvc blank casing from 144.0 to 141.0 feet, 4 feet of #80 screen from 141.0 to 137.0 feet, 141.3 feet of 2 inch pvc casing from 137.0 to 4.3 feet above ground surface, backfilled with sand around screen, annulus backfilled with bentonite and soil to ground surface.

For Water Table information consult Section 4.1.3.

SOIL BORING NO. 181

BECHTEL Belle River

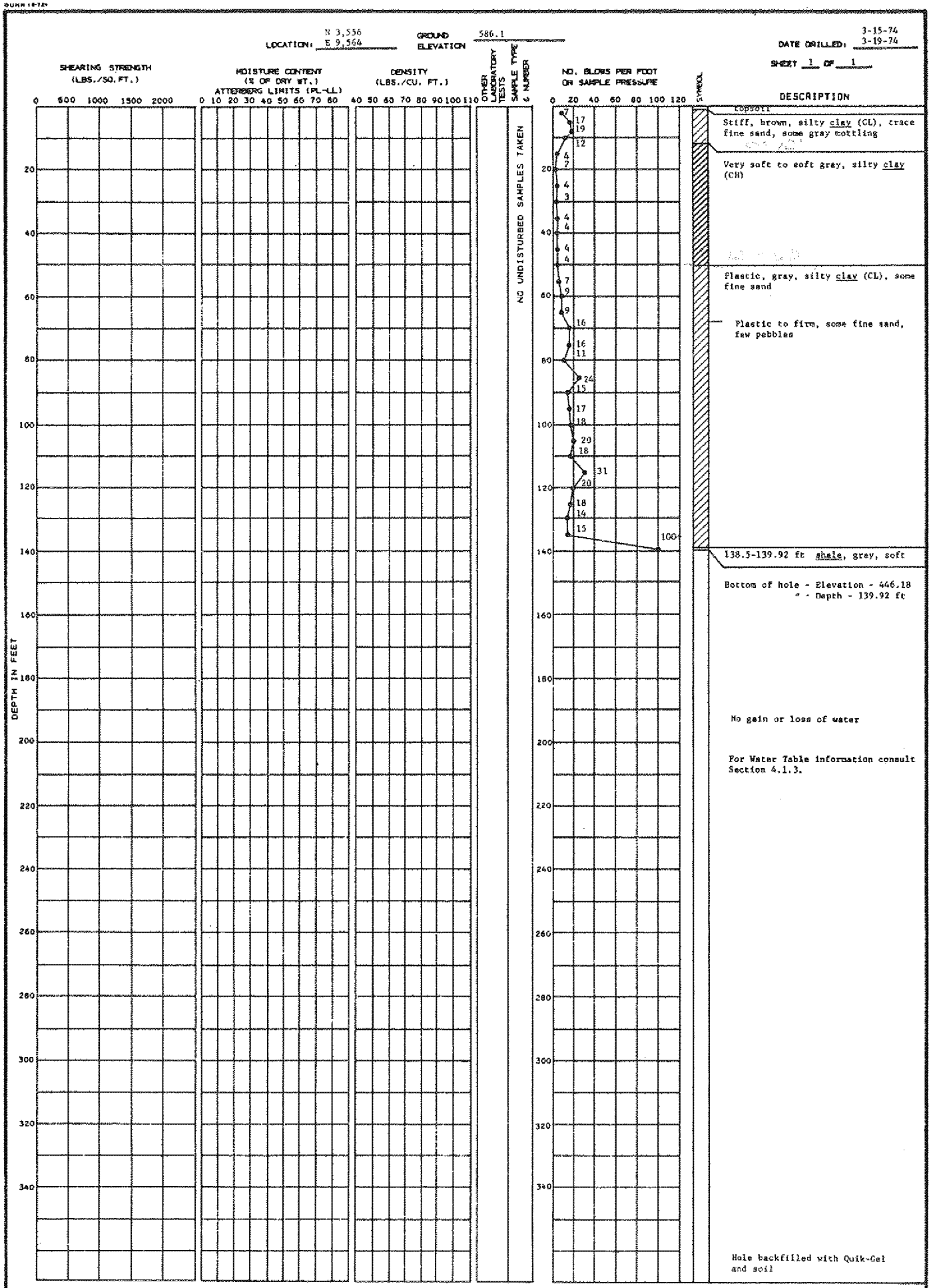
B-125

LOCATION: N 3,556 E 9,564

GROUND ELEVATION 586.1

DATE DRILLED: 3-15-74 3-19-74

SHEET 1 OF 1



DESCRIPTION

Topsoil

Stiff, brown, silty clay (CL), trace fine sand, some gray mottling

Very soft to soft gray, silty clay (CH)

Plastic, gray, silty clay (CL), some fine sand

Plastic to firm, some fine sand, few pebbles

138.5-139.92 ft shale, grey, soft

Bottom of hole - Elevation - 446.18
" - Depth - 139.92 ft

No gain or loss of water

For Water Table information consult Section 4.1.3.

Hole backfilled with Quik-Gel and soil

SOIL BORING NO. 184

BECHTEL Belle River

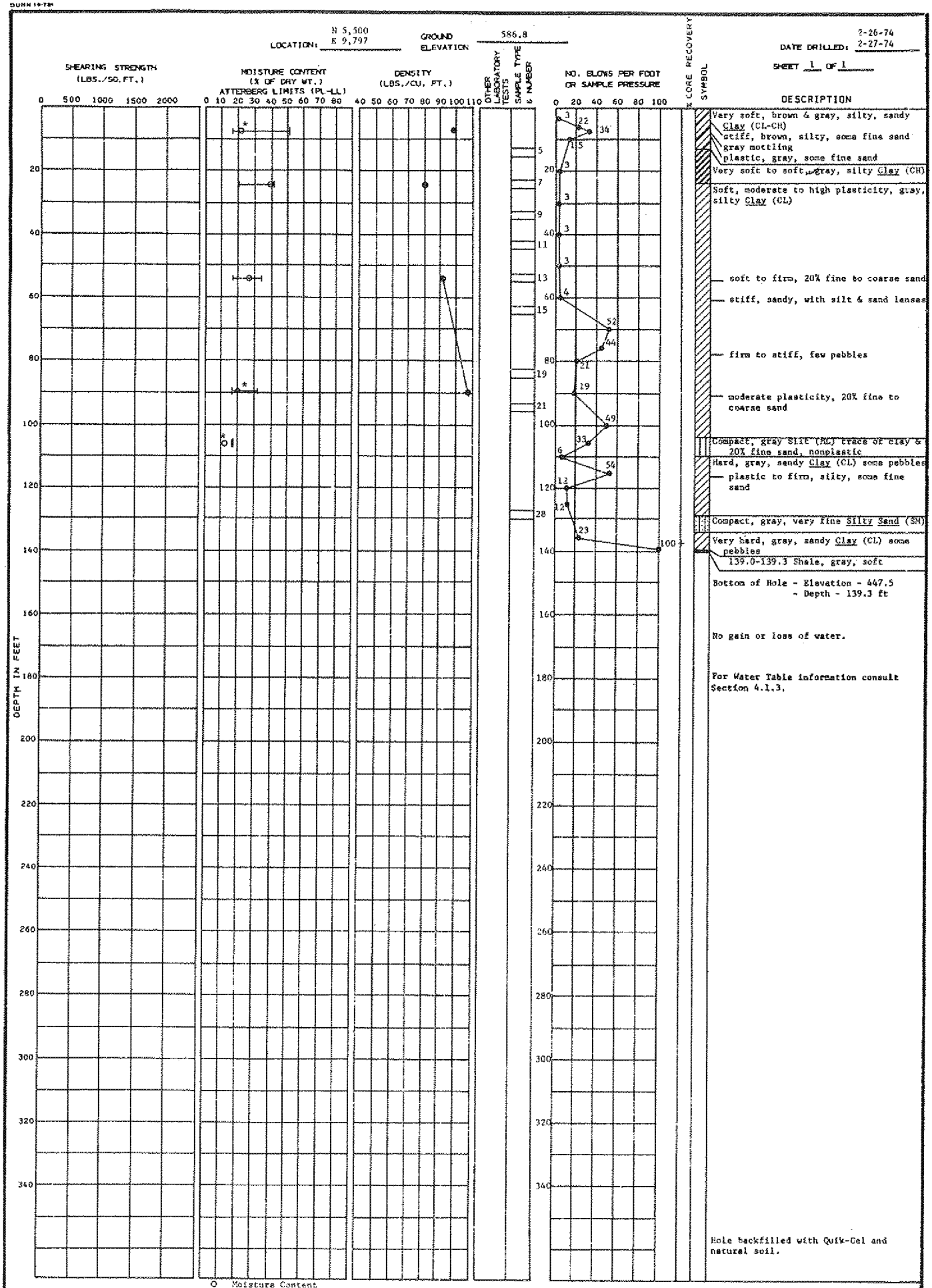
B-127

LOCATION: N 5,500 E 9,797

GROUND ELEVATION 586.8

DATE DRILLED: 2-26-74 2-27-74

SHEET 1 OF 1



SOIL BORING NO. 186

BECHTEL Belle River

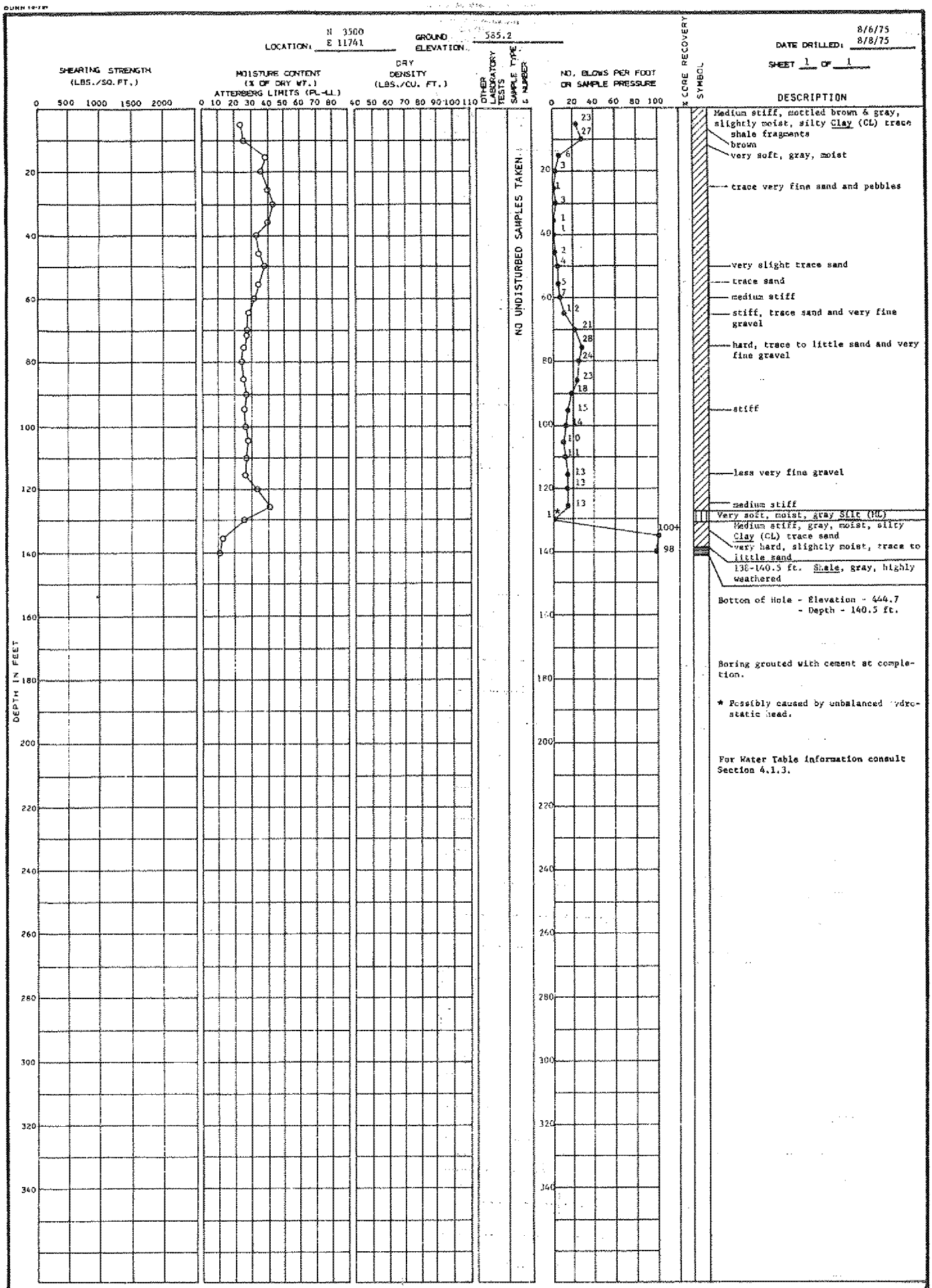
B-129

LOCATION: N 3500 E 11741

GROUND ELEVATION: 585.2

DATE DRILLED: 8/6/75 8/8/75

SHEET 1 OF 1



SOIL BORING NO. 191

BECHTEL BELLE RIVER

R-171

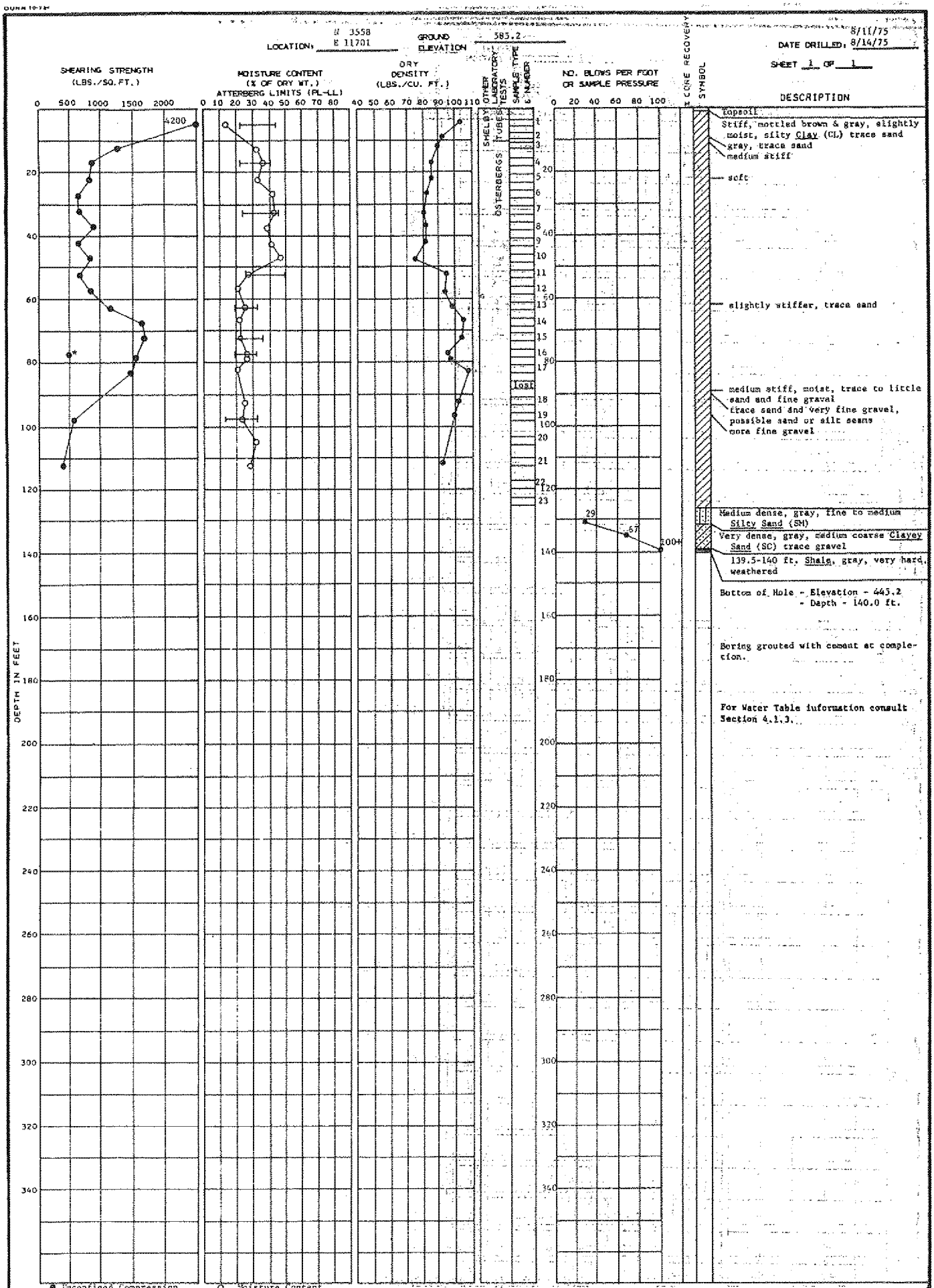
ED_005947A_00014551-00385

LOCATION: N 3558 E 11701

GROUND ELEVATION 585.2

DATE DRILLED: 8/11/75 8/14/75

SHEET 1 OF 1



DESCRIPTION

Topsoil

Stiff, mottled brown & gray, slightly moist, silty Clay (CL) trace sand

gray, trace sand

medium stiff

soft

slightly stiffer, trace sand

medium stiff, moist, trace to little sand and fine gravel

trace sand and very fine gravel, possible sand or silt seams

more fine gravel

Medium dense, gray, fine to medium Silty Sand (SM)

Very dense, gray, medium coarse Clayey Sand (SC) trace gravel

139.5-140 ft. Shale, gray, very hard, weathered

Bottom of Hole - Elevation - 445.2
- Depth - 140.0 ft.

Boring grouted with cement at completion.

For Water Table information consult Section 4.1.3.

● Unconfined Compression
* Sample contained sand seams.

○ Moisture Content
⊢⊣ Atterberg Limits

SOIL BORING NO. 193

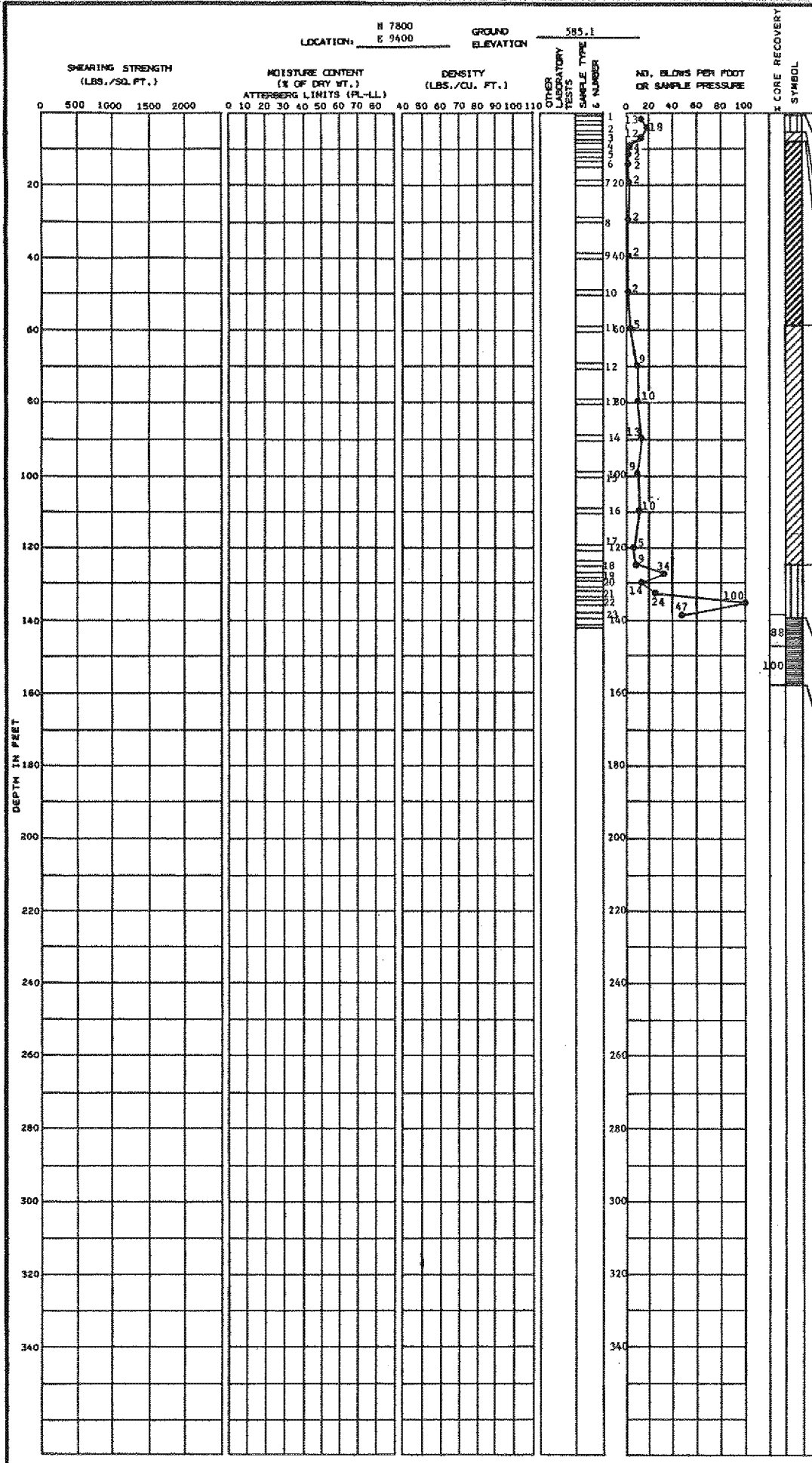
BECHTEL BELLE RIVER

LOCATION: N 7800 E 9400

GROUND ELEVATION 585.1

DATE DRILLED: 8/17/77 8/22/77

SHEET 1 OF 1



DESCRIPTION

0-0.5' Topsoil, silty, dark brown, roots

0.5-5.5' Clayey Silt, brown and med. gray, mottled, med. dense, slight plasticity, dry, trace fine to med. gravel (ML)

5.5-8.0' Silty Clay, med. gray, stiff, med. plasticity, moist, trace sand, trace fine gravel (CL)

8.0-58.5' Clay, med. gray, very soft, high plasticity, wet, trace silt, trace fine sand (CH)

58.5-125.5' Silty Clay, med. gray, soft, med. plasticity, moist, trace to little sand, trace fine gravel(CL)
58.5-88.5' Little sand
68.5-88.5' Med. Stiff

88.5-98.5' Stiff
88.5-118.5' Trace sand

98.5-125.5' Med. stiff

105.5-106.0' Small cobbles

118.5-125.5' Occasional fine-grained sand seams

125.5-138.8' Clayey Silt, med. gray, med. dense to dense, moist, with fine-grained sand seams (ML)
127.5-128.3' Fine gravel
134.5-136.3' Boulder
138.1-138.8' Boulder

138.8' Top of Rock
138.8-157.5' Shale, dark gray, soft, friable, slightly fissile, occasional mechanically fractured
149.8-157.5' Harder, scattered, thin black shale stringers

Bottom of Hole: Depth 157.5'
Elevation 427.6

Hole grouted from 157.5' to ground surface.

SOIL BORING NO. B-1

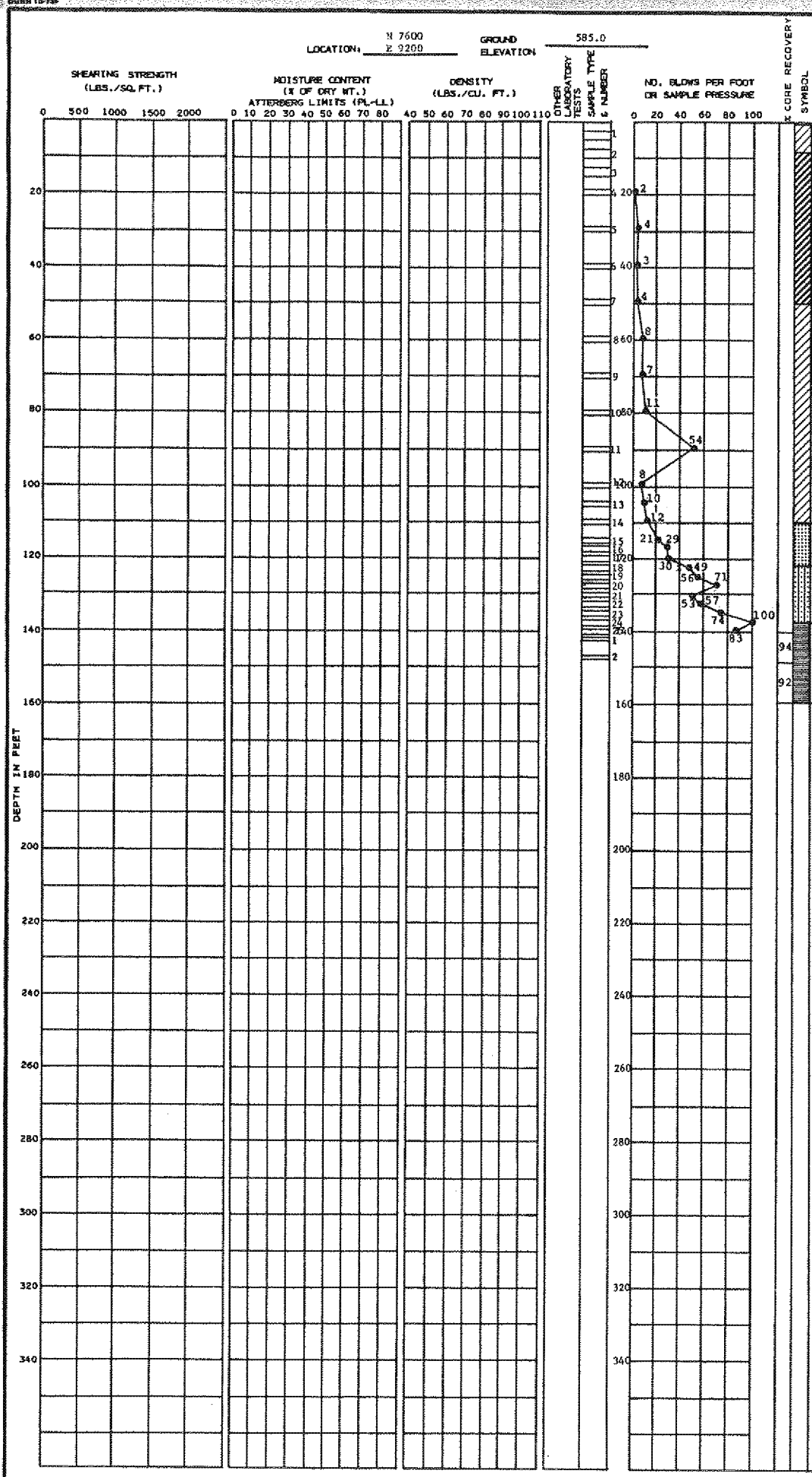
BECHTEL Belle River

LOCATION: N 7600 E 9200

GROUND ELEVATION: 585.0

DATE DRILLED: 8/23/77 8/25/77

SHEET 1 OF 1



DESCRIPTION

0-0.5' Topsoil, silty, dark brown, dry

0.5-8.0' Silty Clay, brown and gray, mottled, slight to med. plasticity, moist, trace roots, trace fine to coarse gravel (CL)

8.0-49.5' Clay, med. gray, very soft to soft, high plasticity, wet, trace silt, trace fine gravel (CH)

49.5-109.5' Silty Clay, med. gray, med. stiff, med. plasticity, moist, little sand, trace fine gravel (CL)

78.5-88.5' Stiff

88.5-98.5' Hard

109.5-121.0' Sand, med. gray, med. dense, wet, fine-to med.-grained, trace silt (SP)

121.0-136.5' Silty Sand, med. gray, dense to very dense, moist, fine-grained, trace fine gravel, scattered thin silt seams (SM)

135.5-136.5' Med. gray silt with thin fine-grained sand seams

Cobble on top of rock

136.5' Top of Rock

136.5-158.5' Shale, dark gray, soft, silty, fractures easily, air slakes readily

145.0-148.6' Moderately hard with occasional soft silty layers

148.5-158.5' Hard, massive

150.9-153.5' Very fine-grained, hard, irregularly bedded sandy layers interbedded with shale

156.6-157.5' Soft

Bottom of Hole: Depth 158.5'
Elevation 426.5

Hole grouted from 158.5' to ground surface.

SOIL BORING NO. B-2

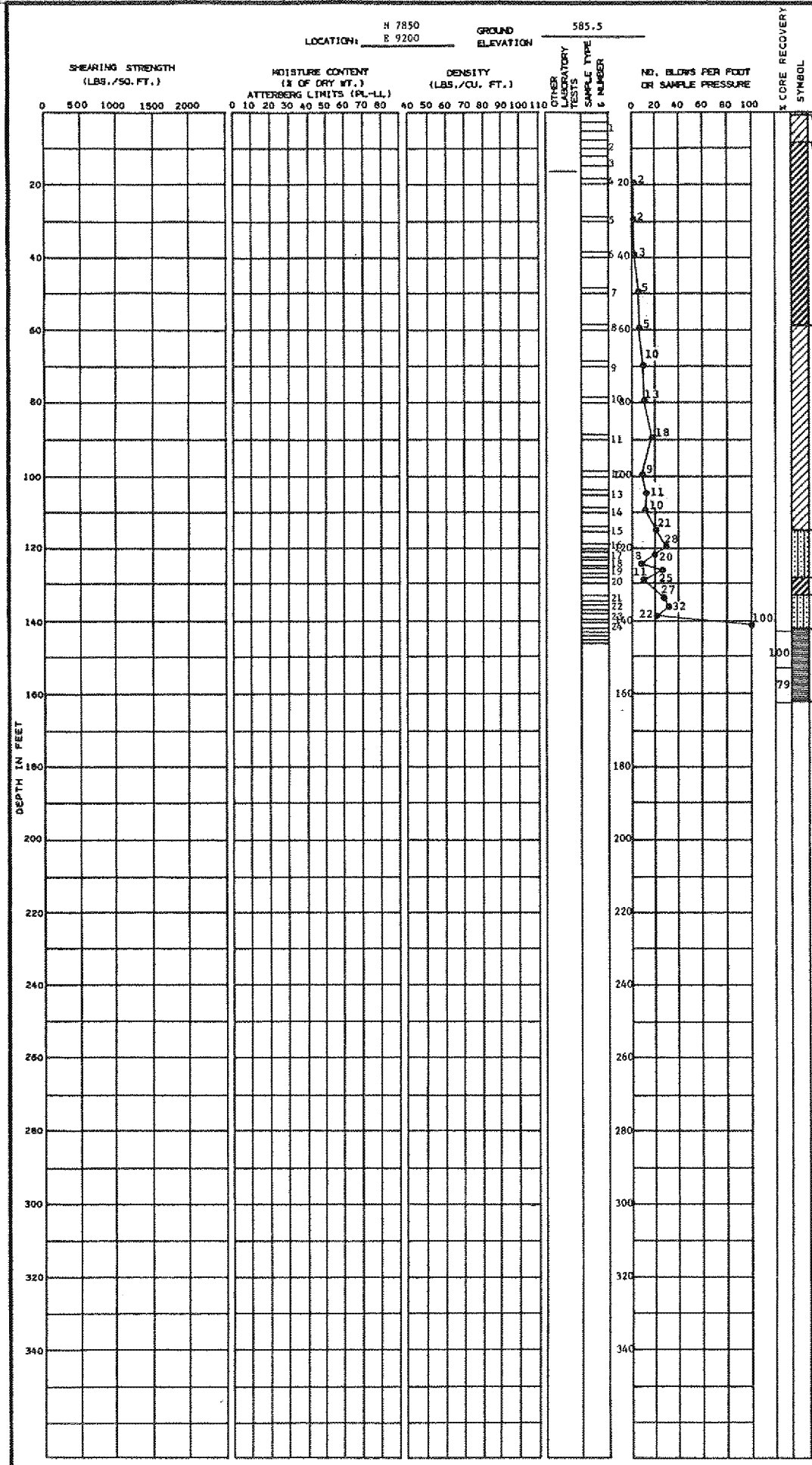
BECHTEL Belle River

LOCATION: N 7850 E 9200

GROUND ELEVATION 585.5

DATE DRILLED: 8/2/77 8/4/77

SHEET 1 OF 1



DESCRIPTION

0-1.0' Topsoil, clayey silt, dark brown to light brown, dry, wood fragments and roots (ML)

1.0-8.5' (?) Silty Clay, med. brown, med. plasticity, moist, trace fine to coarse gravel (CL)

8.5-58.5' Clay, med. gray, very soft, very high plasticity, wet, trace silt, trace fine angular gravel (CH)

46.5-58.5' Soft

58.5-114.5' Silty Clay, med. gray, soft to med. stiff, high plasticity, moist to wet, trace to little fine sand, trace fine to coarse gravel(CL)

78.5-88.5' Stiff

88.5-98.5' Very stiff

98.5-114.5' Stiff to med. stiff
103.5 Less sand, occasional 1/4" pits of red clay
104.0' 1/2" light gray, fine-grained, sand pit
113.5' Trace silt, trace sand

114.5-128.5' Silty Sand, med. gray, med. dense, moist to wet, fine-grained with thin seams of silt and clay(SM)
123.5-125.0' Loose

128.5-133.3' Clay, med. gray, stiff, high plasticity, wet, trace silt, trace fine gravel, occasional pits of red clay (CH)

133.3-142.0' Silty Sand, med. gray, med. dense to dense, moist to wet, fine-grained, occasional silt and clay seams (SM)
141.7-142.0' Coarse sand seam

142.0' Top of Rock
142.0-162.5' Shale, dark gray, soft, massive, friable
155.0-162.5' Hard
159.0-160.5' Core mechanically fractured

Bottom of Hole: Depth 162.5'
Elevation 423.0

Hole grouted from 162.5' to ground surface.

SOIL BORING NO. B-4

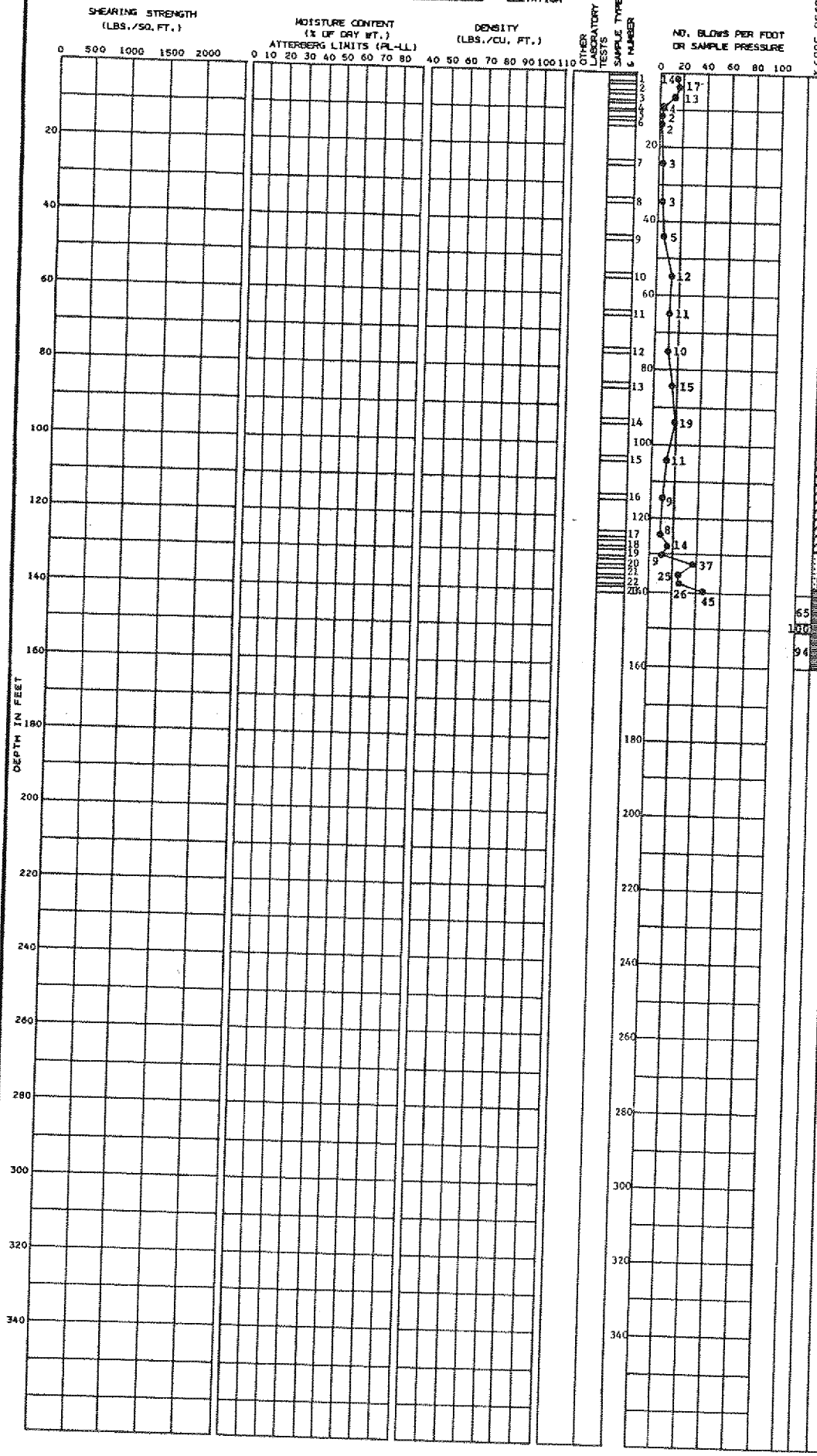
BECHTEL Bella River

LOCATION: N 7600 E 9400

GROUND ELEVATION 584.8

DATE DRILLED: 7/26/77 8/1/77

SHEET 1 OF 1



DESCRIPTION

0-1.0' Silty Clay, topsoil, dark brown to green brown, stiff, slight plasticity, moist, trace sand, with roots and wood fragments (CL)

1.0-6.0' Clayey Silt, light brown to gray, med. dense, dry, trace sand, trace fine gravel (ML)

6.0-8.5' Clay, dark brown, stiff, med. plasticity, moist, trace silt (CL)

8.5-54.0' Clay, med. gray, soft to very soft, very high plasticity, wet, trace fine angular gravel (CH)

54.0-127.5' Silty Clay, med. gray, stiff, med. plasticity, moist, trace sand, trace fine to coarse gravel (CL)

73.5-75.0' Med. stiff

93.5-103.5' Very stiff

103.5-113.5 Stiff

113.5-126.0' Med. stiff

123.5-124.4' Clay seam, high plasticity

124.4-125.0' Silty sand seam, fine-grained, wet

126.0-127.5' Stiff, some sand

127.5-137.8' Silt and Sand, med. gray, med. dense to dense, wet, sand fine-grained (ML and SM)

137.8' Top of Rock

137.8-160.0' Shale, dark blue gray to black, soft, fissile, dry

142.6-144.2' and 154.5-160.0' Core completely fractured into 1/4" or less pieces

150.5-153.0' Core fractured into 1/4" to 4" pieces

Bottom of Hole: Depth 160.0'
Elevation 424.8

Hole grouted from 160.0' to ground surface.

SOIL BORING NO. B-5

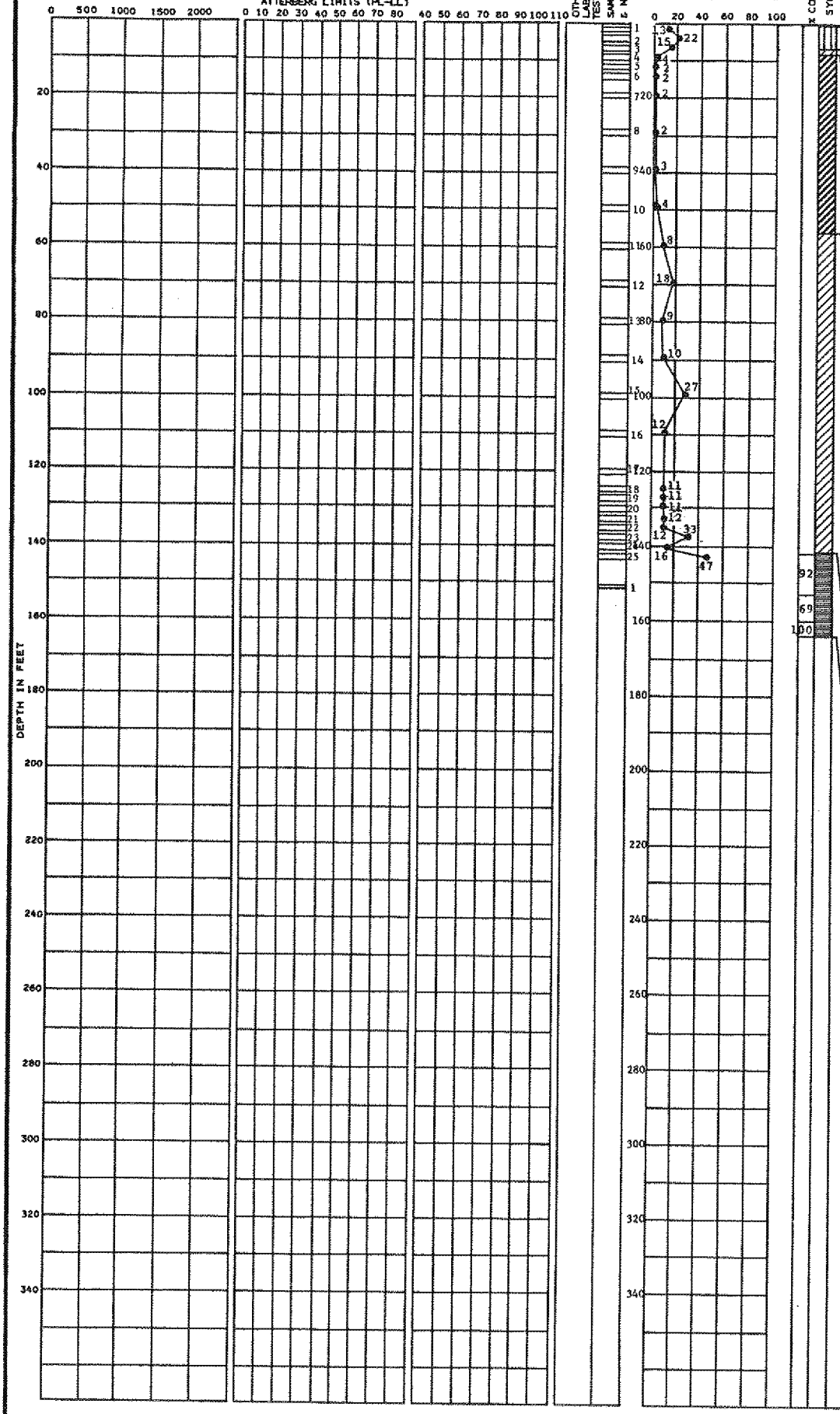
BECHTEL Belle River

LOCATION: N 7650 E 9550

GROUND ELEVATION 585.7

DATE DRILLED: 8/25/77 8/31/77

SHEET 1 OF 1



DESCRIPTION

0-0.3' Topsoil, dark brown, silty, dry

0.3-7.0' Clayey Silt, brown and gray, mottled, med. dense, none to slight plasticity, dry, abundant wood fragments, trace fine gravel (ML)

7.0-8.5' Silty Clay, med. gray, med. stiff, med. plasticity, moist, trace sand, trace fine gravel (CL)

8.5-56.0' Clay, med. gray, very soft, high plasticity, moist to wet, trace silt, trace sand, trace fine gravel (CH)

11.0-56.0' Wet

48.5-56.0' Soft

56.0-141.0' Silty Clay, med. gray, med. stiff, med. plasticity, moist, little sand, trace fine gravel (CL)

68.5-78.5' Very stiff

78.5-88.5' Trace sand

88.5-118.5' Little sand

98.5-108.5' Very stiff

108.5-136.0' Stiff

123.5-125.0' Scattered, fine-grained sand seams

130.5-133.5' Scattered silt and fine-grained sand seams

133.5-136.0' Silt with silty clay seams, wet

136.0-138.5' Dense, fine-grained silty sand, wet, trace med. gravel

138.5-141.0' Very stiff clayey silt with fine-grained sand seams, wet

141.0' Top of Rock

141.0-163.5' Shale, med. gray, soft to firm, massive to slightly fissile, occasional interbeds of soft clay, shale air slakes rapidly, core mechanically fractured.

150.0-158.8' Hard, with very thin sandy interbeds

Bottom of Hole: Depth 163.5'
Elevation 422.2

Hole grouted from 163.5' to ground surface.

SOIL BORING NO. B-6

BECHTEL Belle River

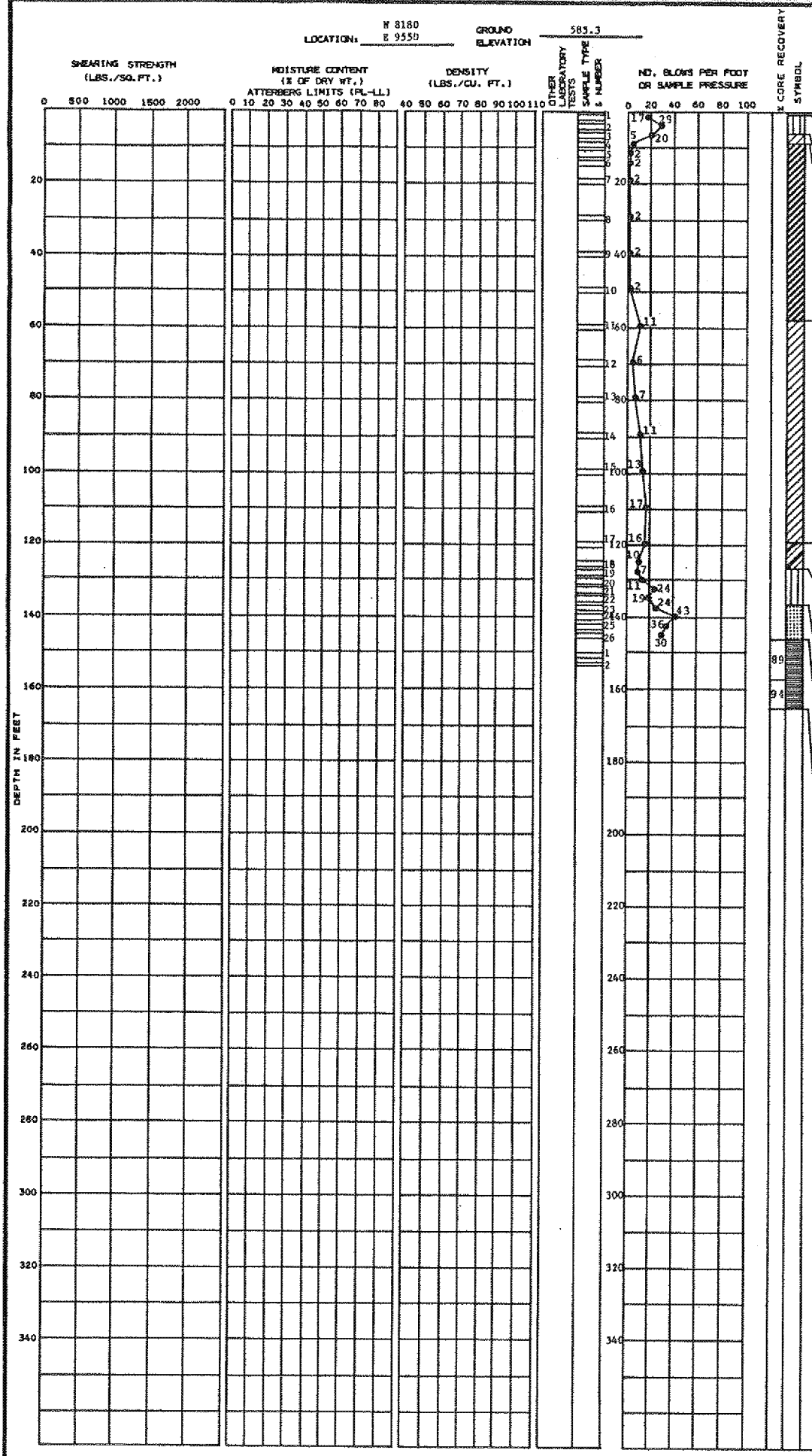
ED_005947A_00014551-00391

LOCATION: N 8180 E 9550

GROUND ELEVATION 583.3

DATE DRILLED: 8/12/77 8/17/77

SHEET 1 OF 1



DESCRIPTION

0-0.5' Topsoil, silty dark brown

0.5-6.0' Clayey Silt, light gray and med. brown, mottled, med. dense, slight plasticity, dry, trace fine gravel, roots (ML)

6.0-8.5' Silty Clay, med. brown, very stiff, med. plasticity, very stiff, med. plasticity, moist, trace fine gravel (CL)

8.5-57.0' Clay, med. gray, soft to very soft, high plasticity, wet, trace silt (CH)

48.5' Trace fine to med. gravel

57.0-118.5' Silty Clay, med. gray, stiff, med. plasticity, moist, trace to little sand, trace fine gravel (CL)

68.5-88.5' Med. stiff

78.5-118.5' Little fine sand

108.5-118.5' Very stiff

118.5-125.5' Clay, med. gray, very stiff, med. plasticity, moist, trace silt (CL-CH)

123.5-125.5' Med. stiff

125.5-135.5' Clayey Silt, med. gray, loose to med. dense, wet, trace sand occasional fine to med.-grained sand seams (ML)

128.5-131.0' Sandy silt

131.0-132.0' Fine-grained silty sand seam

135.5-143.0' Sand, gray and brown, med. dense to dense, wet, fine-to med. grained, trace silt (SP)

143.5-144.5' Clayey sand

145.0' Top of Rock

145.0-164.0' Shale, green-gray, hard, occasional irregular bedding with very fine black coal stringers, predominately massive

148.7-149.3' Very fine-grained, hard, irregularly bedded sandy layers interbedded with shale

162.7-164.0' Soft dark gray, dry, friable

Bottom of Hole: Depth 164.0'
Elevation 421.3

Hole grouted from 164.0' to ground surface.

SOIL BORING NO. B-13

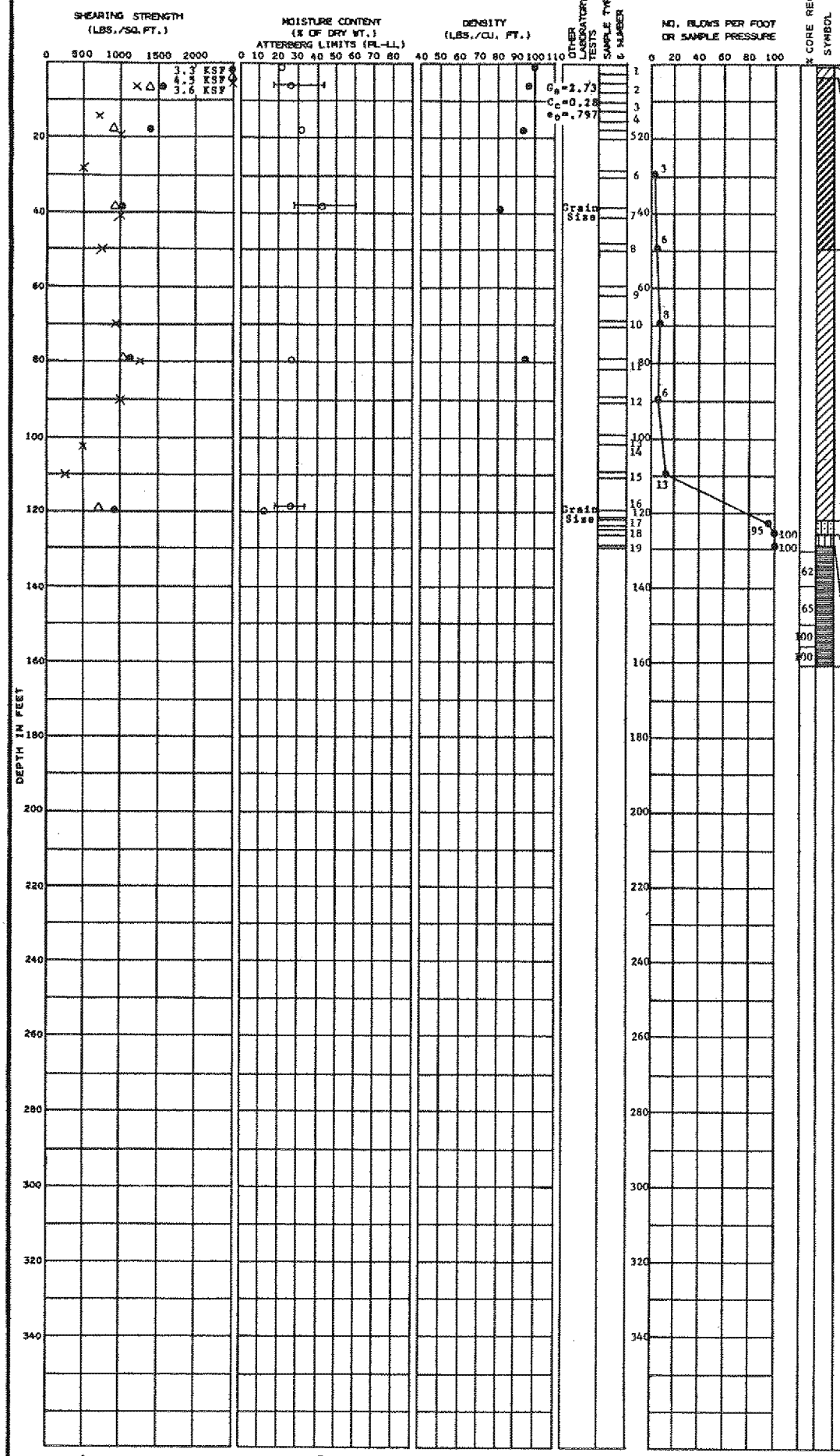
BECHTEL Belle River

LOCATION: N 5270 E 15660

GROUND ELEVATION 580.0

DATE DRILLED: 9/7/77 9/14/77

SHEET 1 OF 1



DESCRIPTION

0-0.5' Topsoil, dark brown, dry

0.5-3.0' Silty Clay, med. brown, gray and black, mottled, slight to med. plasticity, moist, trace fine gravel (CL)

3.0-48.5' Clay, med. gray, very soft, high plasticity, moist to wet, trace silt (CH)

48.5-120.5' Silty Clay, dark gray, med. stiff, med. plasticity, moist, little sand, trace fine to med. gravel (CL)

108.5-120.5' Stiff, trace sand

118.5'-120.4' Seams of silt, clayey sand, and silty sand

120.5-124.6' Silty Sand, med. gray, very dense, moist, fine to med.-grained, trace fine gravel, occasional silt seams (SM)

124.6-128.0' Clayey Silt, med. gray, very dense, dry, trace fine gravel (ML)

128.0' Top of Rock

128.0-159.5' Shale, dark gray, soft, weathered, fragments as abstracted from core barrel

151.3' Slightly harder with soft lenses, splits easily

155.0' Moderately hard core broken every 1"-2"

Bottom of Hole: Depth 159.5'
Elevation 420.5

Hole grouted from 159.5' to ground surface.

Discovered gas in hole when removing casing.

△ Torvane
○ Unconsolidated Undrained
● Unconfined Compression
⊢⊣ Atterberg Limits
G_s Specific Gravity
C_c Compression Index
e_o Initial Void Ratio
× Pocket Penetrometer

SOIL BORING NO. B-17

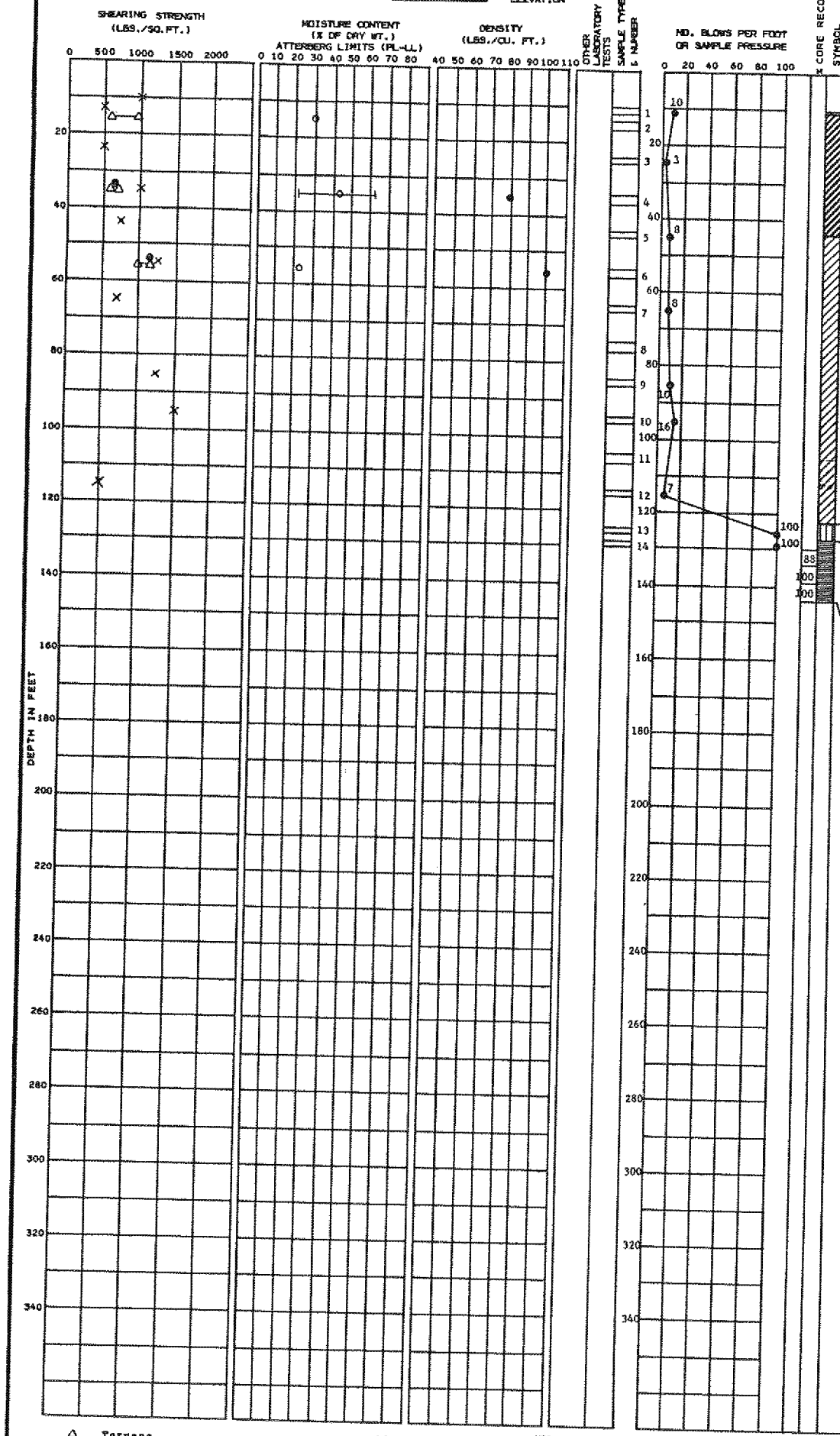
BECHTEL Belle River

LOCATION: N 5163 E 15744

GROUND ELEVATION 577.5 (Top of Water)

DATE DRILLED: 9/21/77 9/27/77

SHEET 1 OF 1



DESCRIPTION

0-10.0' Water

10.0-10.3' Sandy Clay, dark gray to black, very soft, wet, trace fine to coarse gravel (CL)

10.3-43.5' Clay, gray-brown, med. stiff, high plasticity, moist to wet, trace silt (CH)

18.0-43.5' Very soft

43.5-122.0' Silty Clay, med. gray, med. stiff, med. plasticity, moist, trace to little sand, trace fine gravel (CL)

93.5-113.5' Very stiff, trace sand

113.5-122.0' Med. stiff, trace silt, trace sand

122.0-127.0' Silt, light gray, very dense, dry, with fine sand (ML)

127.0' Top of Rock

127.0-144.0' Shale, med. gray, soft, weathered

131.7-144.0' Moderately hard with soft clay interbeds

139.0-144.0' Occasional soft clay layers

Bottom of Hole: Depth 144.0'
Elevation 433.5

Hole grouted from 127.0' to ground surface.

△ Torvane
⊢⊣ Atterberg Limits
● Unconfined Compression
○ Unconsolidated Undrained
× Pocket Penetrometer

SOIL BORING NO. B-22

BECHTEL Belle River

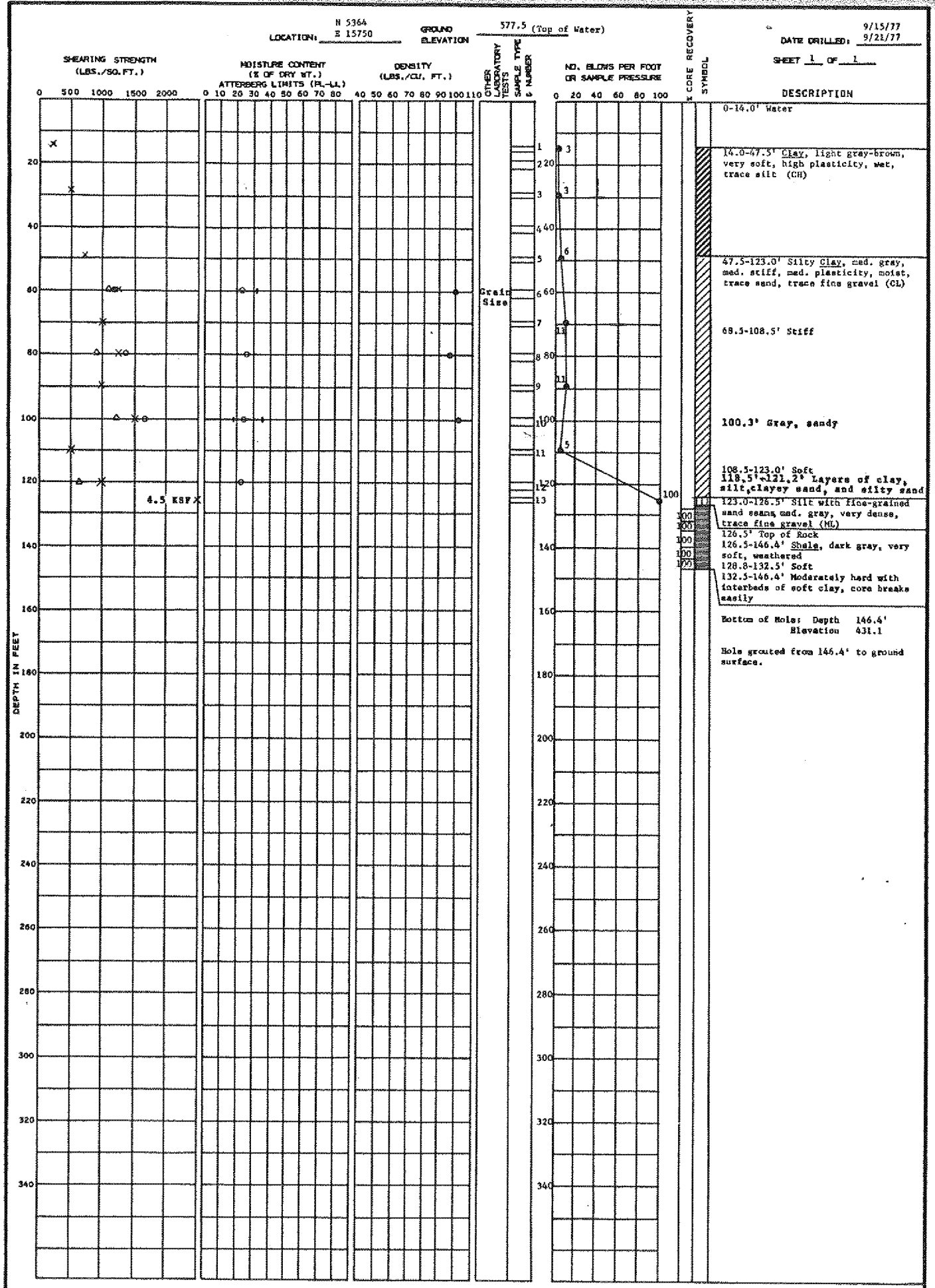
ED_005947A_00014551-00394

LOCATION: N 5364 E 15750

GROUND ELEVATION 577.5 (Top of Water)

DATE DRILLED: 9/15/77 9/21/77

SHEET 1 OF 1



DESCRIPTION

0-14.0' Water

14.0-47.5' Clay, light gray-brown, very soft, high plasticity, wet, trace silt (CH)

47.5-123.0' Silty Clay, med. gray, med. stiff, med. plasticity, moist, trace sand, trace fine gravel (CL)

68.5-108.5' Stiff

100.3' Gray, sandy

108.5-123.0' Soft

118.5'-121.2' Layers of clay, silt, clayey sand, and silty sand

123.0-126.5' Silt with fine-grained sand seams, med. gray, very dense, trace fine gravel (ML)

126.5' Top of Rock

126.5-146.4' Shale, dark gray, very soft, weathered

128.8-132.5' Soft

132.5-146.4' Moderately hard with interbeds of soft clay, core breaks easily

Bottom of Hole: Depth 146.4'
Elevation 431.1

Hole grouted from 146.4' to ground surface.

Δ Torvane
O Unconsolidated Undrained
● Unconfined Compression
⊢⊣ Atterberg Limits
X Pocket Penetrometer

SOIL BORING NO. B-23

BECHTEL Belle River

LOCATION: N 7113 E 11039

GROUND ELEVATION 558.5

DATE DRILLED: 9/1/77 9/1/77

SHEET 1 OF 1

SHEARING STRENGTH (LBS./SQ.FT.) 0 500 1000 1500 2000

MOISTURE CONTENT (% OF DRY WT.) ATTERBERG LIMITS (PL-LL) 0 10 20 30 40 50 60 70 80

DENSITY (LBS./CU. FT.) 40 50 60 70 80 90 100 110

OTHER LABORATORY TESTS

SAMPLE TYPE & NUMBER

NO. BLOWS PER FOOT OR SAMPLE PRESSURE 0 20 40 60 80 100

% CORE RECOVERY

SYMBOL

DEPTH IN FEET

DESCRIPTION

0-0.8' Topsoil, dk. brown, dry

0.8-4.0' Clayey Silt, yellow to med. brown, med. dense, dry, trace sand, trace fine to coarse gravel, roots (ML)

4.0-17.0' Silty Clay, dk. brown and gray, mottled, med. stiff to very stiff, med. plasticity, moist, trace sand, trace fine to coarse gravel (CL)

9.0' Med. brown

13.5' Med. gray

17.0-30.0' Clay, med. gray, soft, high plasticity, moist to wet, trace silt, trace sand, trace fine gravel (CH)

Bottom of Hole: Depth 30.0'
Elevation 558.5

Hole backfilled with cuttings.

SOIL BORING NO. B-24

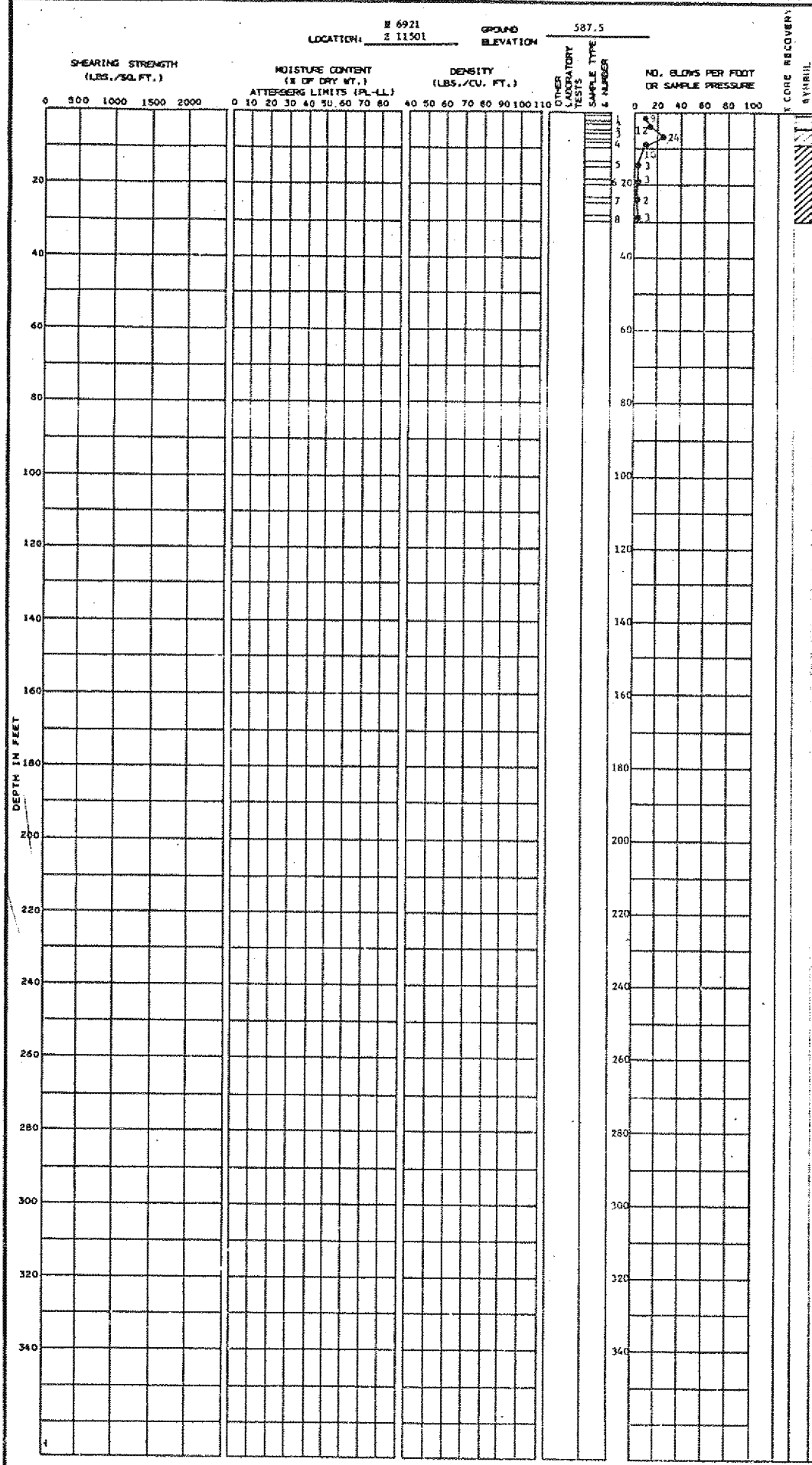
BECHTEL Belle River

LOCATION: N 6921 E 11501

GROUND ELEVATION 587.5

DATE DRILLED: 9/1/77 9/1/77

SHEET 1 OF 1



DESCRIPTION

0-0.7' Topsoil, dk. brown, dry

0.7-4.5' Silty Sand, tan and yellow, mottled, loose, damp, fine-grained (SM)

4.5-9.0' Silty Clay, brown and gray, mottled, stiff to very stiff, med. plasticity, moist, trace sand, trace fine to coarse gravel (CL)

9.0-30.0' Clay, med. gray, very soft, high plasticity, moist to wet, trace sand, trace fine gravel, trace silt (CH)

Bottom of Hole: Depth 30.0'
Elevation 557.5

Hole backfilled with cuttings.

SOIL BORING NO. B-26

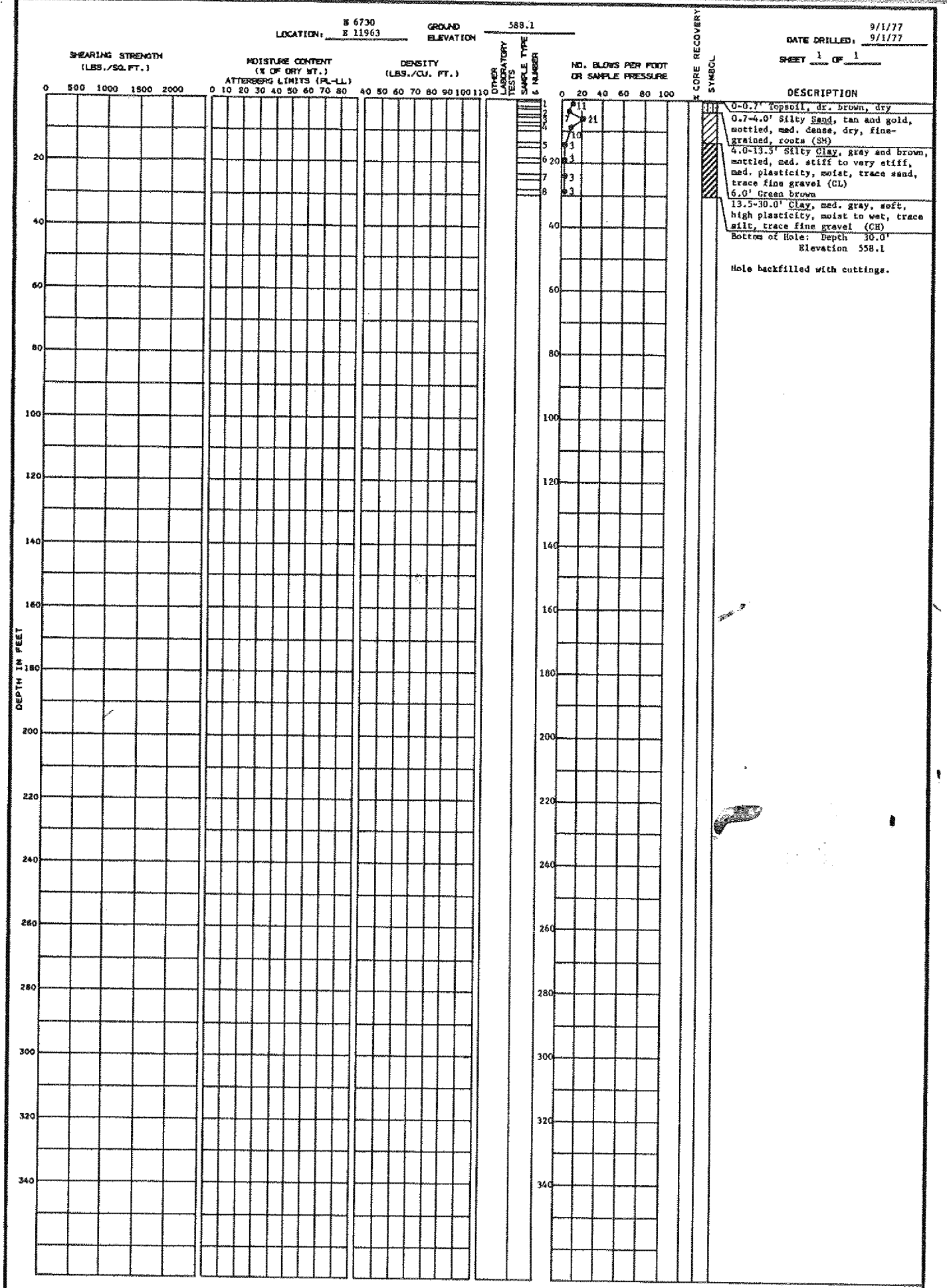
BECHTEL Belle River

LOCATION: N 6730 E 11963

GROUND ELEVATION 588.1

DATE DRILLED: 9/1/77 9/1/77

SHEET 1 OF 1



DESCRIPTION

0-0.7' Topsoil, dr. brown, dry

0.7-4.0' Silty Sand, tan and gold, mottled, med. dense, dry, fine-grained, roots (SM)

4.0-13.5' Silty Clay, gray and brown, mottled, med. stiff to very stiff, med. plasticity, moist, trace sand, trace fine gravel (CL)

6.0' Green brown

13.5-30.0' Clay, med. gray, soft, high plasticity, moist to wet, trace silt, trace fine gravel (CH)

Bottom of Hole: Depth 30.0'
Elevation 558.1

Hole backfilled with cuttings.

SOIL BORING NO. B-28

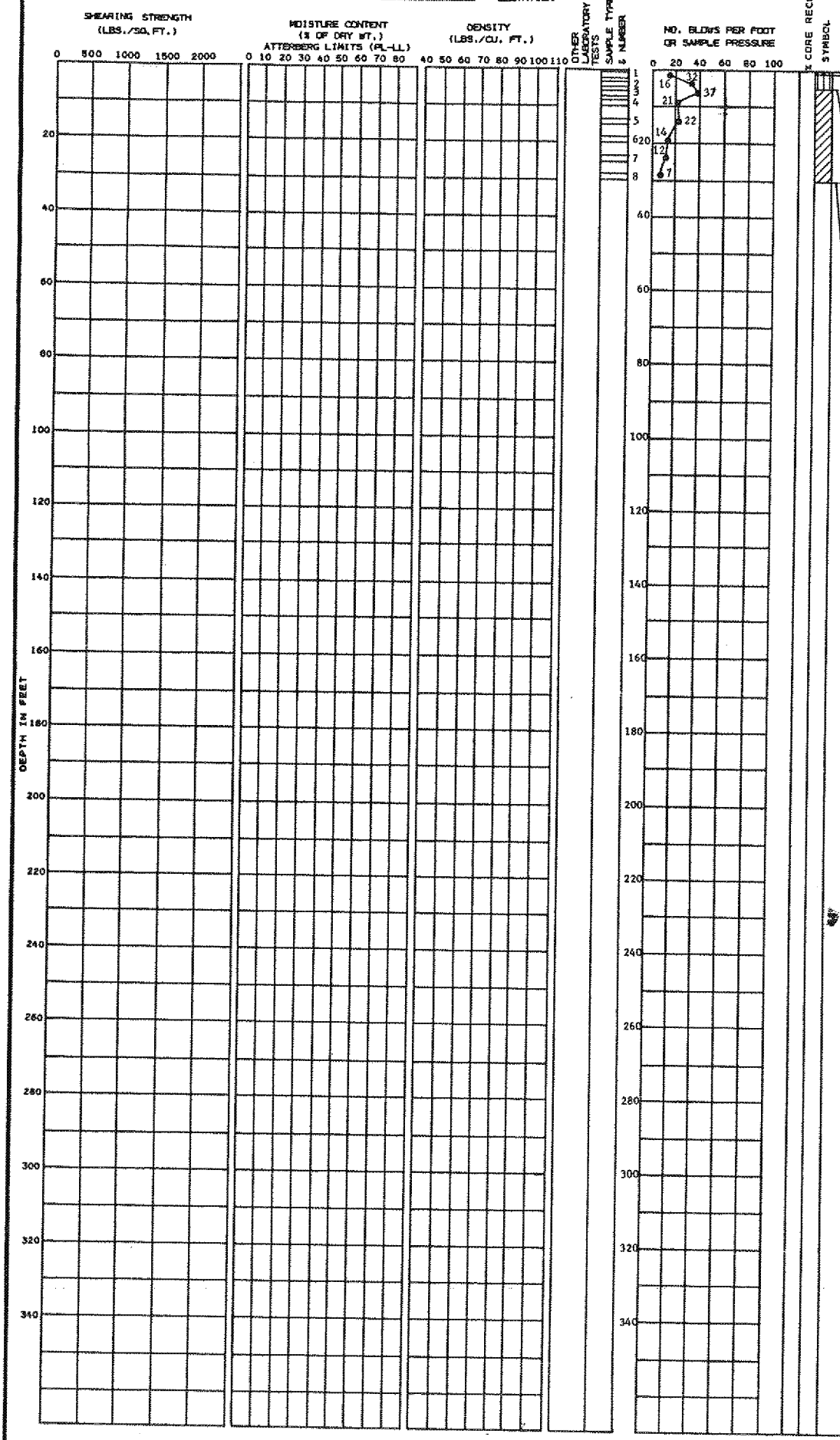
BECHTEL Belle River

LOCATION: N 6539 E 12425

GROUND ELEVATION 588.2

DATE DRILLED: 9/2/77 9/2/77

SHEET 1 OF 1



DESCRIPTION

0-1.0' Topsoil, dk. brown, silty, fine to med. gravel, dry (GM)

1.0-5.0' Clayey Silt, dk. brown, med. dense to dense, dry, trace sand, trace fine gravel (ML)

5.0-30.0' Silty Clay, dk. brown, hard to very stiff, dry, med. plasticity, trace sand, trace fine to med. gravel (CL)

13.5' Moist, dipping parting in sample, med. brown with med. gray filling, with roots

19.0-28.5' Med. gray, stiff

23.5' green-brown and gray, mottled

28.5-30.0' Med. gray, med. stiff

Bottom of Hole: Depth 30.0'
Elevation 558.2

Hole backfilled with cuttings.

SOIL BORING NO. B-30

BECHTEL Belle River

LOCATION: N 6348 E 12890

GROUND ELEVATION 600.0

DATE DRILLED: 9/1/77 9/1/77

SHEET 1 OF 1

SHEARING STRENGTH (LBS./SQ.FT.) 0 500 1000 1500 2000

MOISTURE CONTENT (% OF DRY WT.) ATTERBERG LIMITS (PL-LL) 0 10 20 30 40 50 60 70 80

DENSITY (LBS./CU. FT.) 40 50 60 70 80 90 100 110

OTHER LABORATORY TESTS

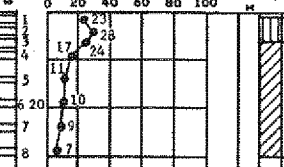
SAMPLE TYPE & NUMBER

NO. BLOWS PER FOOT OR SAMPLE PRESSURE 0 20 40 60 80 100

% CORE RECOVERY

SYMBOL

DEPTH IN FEET 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300 320 340



DESCRIPTION

0-1.0' Topsoil, dk. brown, silty, dry, sandy fill with coarse gravel

1.0-6.0' Clayey Silt, green brown, med. dense, dry, trace sand (ML)

6.0-30.0' Silty Clay, green brown, very stiff, slight plasticity, moist, trace sand, trace fine gravel (CL)

13.5' Med. gray, stiff to med. stiff, med. plasticity

28.5-30.0' Med. to high plasticity

Bottom of Hole: Depth 30.0'
Elevation 570.0

Hole backfilled with cuttings.

SOIL BORING NO. B-32

BECHTEL Belle River

LOCATION: N 6156 E 13249

GROUND ELEVATION 598.8

DATE DRILLED: 9/2/77 9/2/77

SHEET 1 OF 1

SHEARING STRENGTH (LBS./SQ.FT.) 0 500 1000 1500 2000

MOISTURE CONTENT (% OF DRY WT.) ATTERBERG LIMITS (PL-LL) 0 10 20 30 40 50 60 70 80

DENSITY (LBS./CU. FT.) 40 50 60 70 80 90 100 110

OTHER LABORATORY TESTS

SAMPLE TYPE & NUMBER

NO. BLOWS PER FOOT OR SAMPLE PRESSURE 0 20 40 60 80 100

X CORE RECOVERY

SYMBOL

DEPTH IN FEET 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300 320 340

DESCRIPTION

0-0.3' Topsoil, dk. brown, dry

0.3-3.5' Clayey Silt, light brown and gray, mottled, med. dense, none to slight plasticity, dry, trace sand, trace fine to coarse gravel (ML)

3.5-23.5' Silty Clay, med. brown and gray, lightly mottled, very stiff to hard, med. plasticity, moist, trace sand, trace fine gravel (CL)

13.5-23.5' Med. gray, med. stiff

23.5-30.0' Clay, med. gray, soft to very soft, high plasticity, moist, trace silt (CH)

Bottom of Hole: Depth 30.0'
Elevation 568.8

Hole backfilled with cuttings.

SOIL BORING NO. B-34

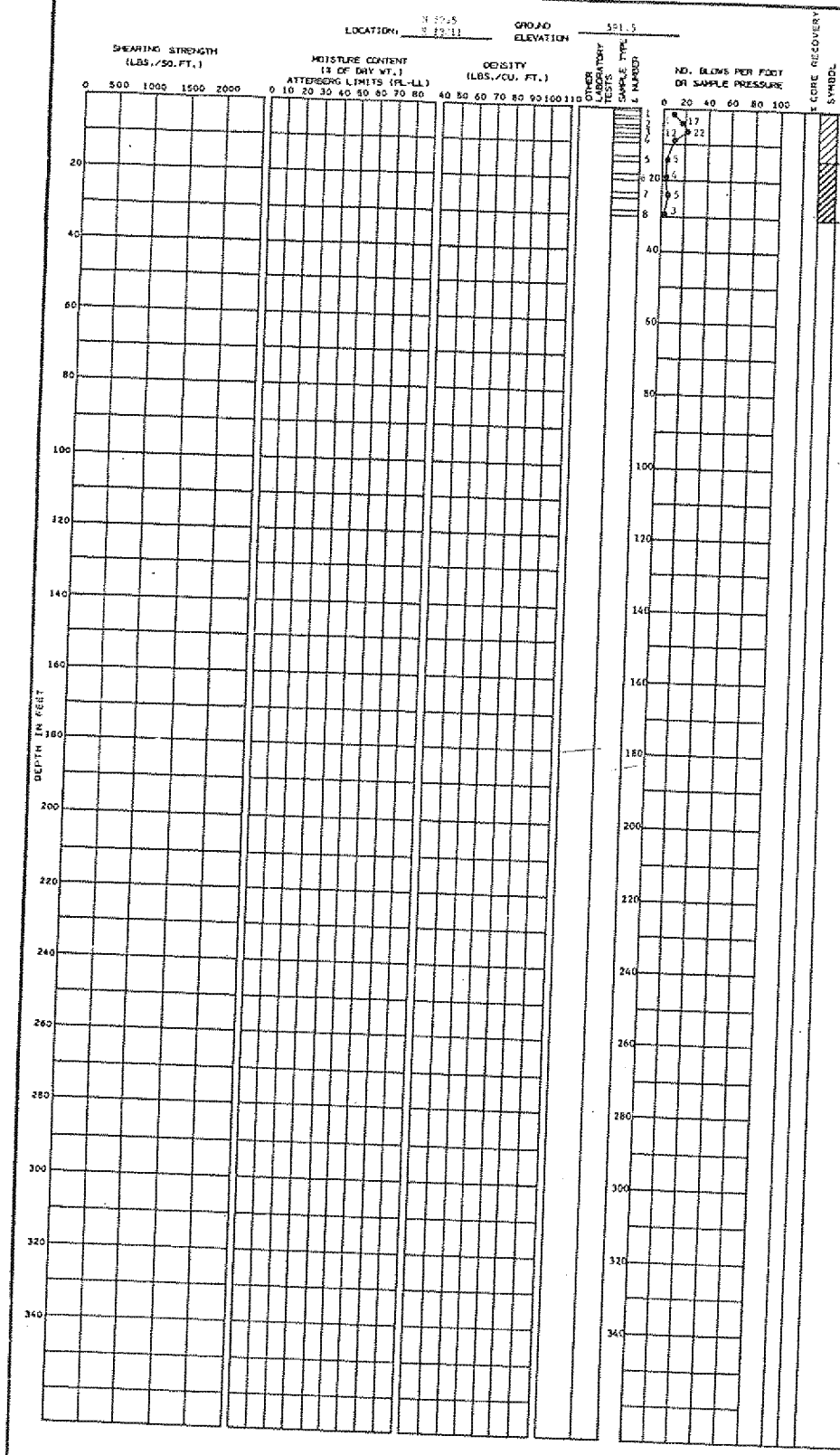
BECHTEL Belle River

LOCATION: N 5945 W 12/11

GROUND ELEVATION 591.5

DATE DRILLED: 9/2/77 9/2/77

SHEET 1 OF 1



DESCRIPTION

0-0.4' Topsoil, dk. brown, dry

0.4-14.0' Silty Clay, dk. brown and gray, mottled, very stiff to med. stiff, slight plasticity, moist, trace sand, trace fine gravel (CL)

3.5-5.0' Scattered stringers of calcium carbonate

8.5-14.0' Med. brown

14.0-30.0' Clay, med. gray, soft to very soft, high plasticity, moist, trace silt (CH)

Bottom of Hole: Depth 30.0'
Elevation 561.5

Hole backfilled with cuttings.

SOIL BORING NO. B-36

BECHTEL Belle River

LOCATION: N 5774 E 14272

GROUND ELEVATION: 591.2

DATE DRILLED: 9/6/77 9/6/77

SHEET 1 OF 1

SHEARING STRENGTH (LBS./SQ.FT.) 0 500 1000 1500 2000

MOISTURE CONTENT (% OF DRY WT.) ATTERBERG LIMITS (PL-LL) 0 10 20 30 40 50 60 70 80

DENSITY (LBS./CU. FT.) 40 50 60 70 80 90 100 110

OTHER LABORATORY TESTS

SAMPLE TYPE & NUMBER

NO. BLOWS PER FOOT OR SAMPLE PRESSURE 0 20 40 60 80 100

% CORE RECOVERY

SYMBOL

DEPTH IN FEET

DESCRIPTION

0-0.3' Topsoil, dk. brown, moist
0.3-13.5' Silty Clay, med. brown and gray, mottled, med. stiff, med. plasticity, trace sand, trace fine gravel (CL)
6.0-8.5' Med. brown, very stiff
8.5-13.5' Med. brown, stiff
13.5-30.0' Clay, med. gray, med. stiff, high plasticity, moist, trace silt (CH)
23.5-28.5' Very soft, moist to wet
28.5-30.0' Soft
Bottom of Hole: Depth 30.0'
Elevation 561.2

Hole backfilled with cuttings.

SOIL BORING NO. B-38

BECHTEL Belle River

LOCATION: N 5582 E 14735

GROUND ELEVATION 590.2

DATE DRILLED: 9/6/77 9/6/77

SHEET 1 OF 1

SHEARING STRENGTH (LBS./SQ.FT.) 0 500 1000 1500 2000

MOISTURE CONTENT (% OF DRY WT.) ATTERBERG LIMITS (PL-LL) 0 10 20 30 40 50 60 70 80

DENSITY (LBS./CU. FT.) 40 50 60 70 80 90 100 110

OTHER LABORATORY TESTS

SAMPLE TYPE & NUMBER

NO. BLOWS PER FOOT OR SAMPLE PRESSURE 0 20 40 60 80 100

% CORE RECOVERY

SYMBOL

DEPTH IN FEET 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300 320 340

DESCRIPTION
0-0.4' Topsoil, dk. brown, dry
0.4-13.5' Silty Clay, med. brown, med. stiff to very stiff, med. plasticity, moist, trace sand, trace fine gravel (CL)
13.5-30.0' Clay, med. gray, soft to very soft, high plasticity, moist to wet, trace silt (CH)

Bottom of Hole: Depth 30.0'
Elevation 560.2

Hole backfilled with cuttings.

SOIL BORING NO. B-48

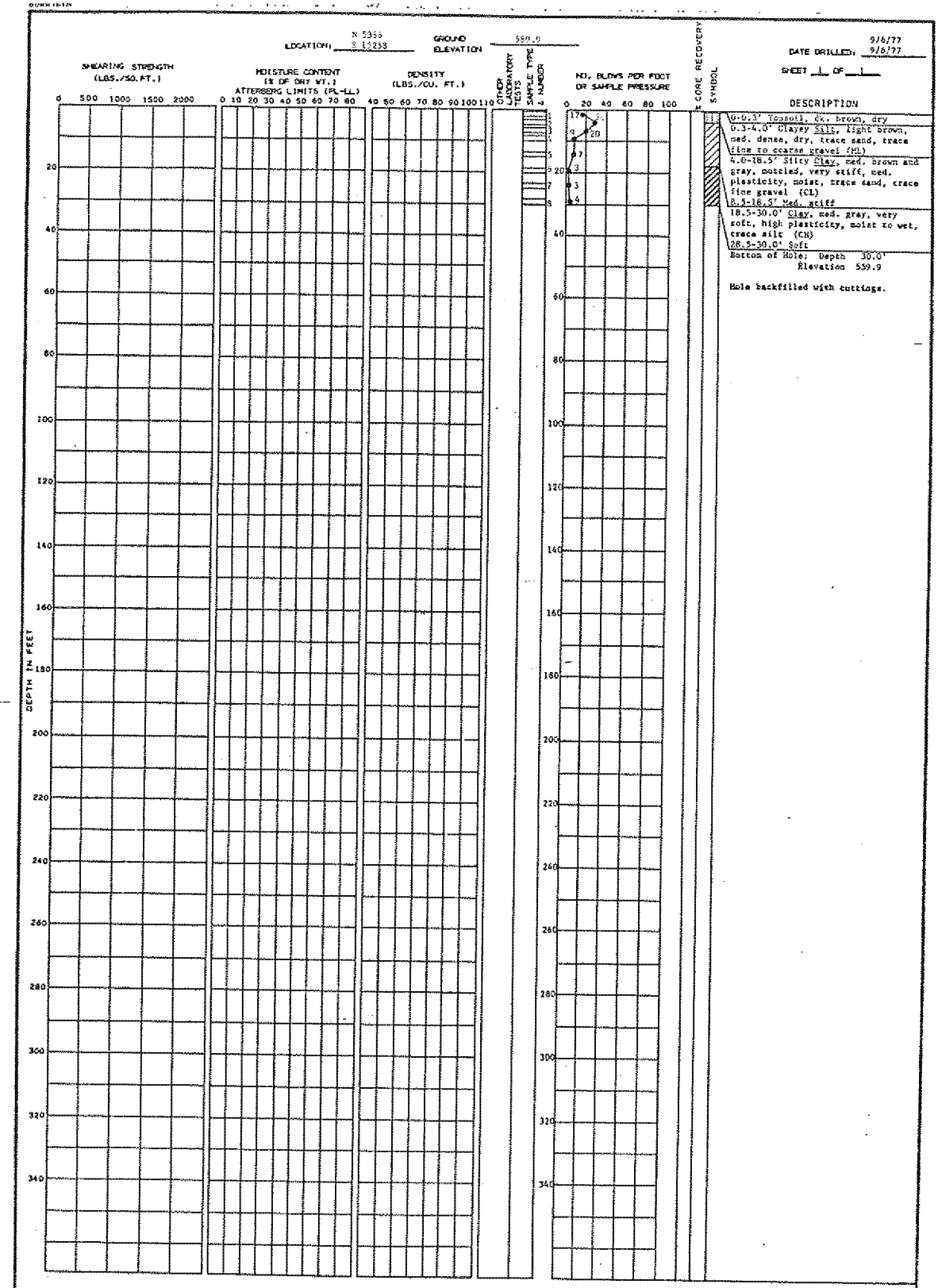
BECHTEL Falls River

LOCATION: N 5359 E 15253

GROUND ELEVATION: 589.9

DATE DRILLED: 9/6/77 9/6/77

SHEET 1 OF 1



DESCRIPTION

0-0.3' Topsoil, dk. brown, dry

0.3-4.0' Clayey Silt, light brown, med. dense, dry, trace sand, trace fine to coarse gravel (ML)

4.0-18.5' Silty Clay, med. brown and gray, mottled, very stiff, med. plasticity, moist, trace sand, trace fine gravel (CL)

18.5-16.5' Med. stiff

18.5-30.0' Clay, med. gray, very soft, high plasticity, moist to wet, trace silt (CH)

28.5-30.0' Soft

Bottom of Hole: Depth 30.0'
Elevation 559.9

Hole backfilled with cuttings.

SOIL BORING NO. B-42

BECHTEL Belle River

Message

From: Christopher P Scieszka [christopher.scieszka@dteenergy.com]
Sent: 11/6/2020 8:08:01 PM
To: Huggins, Richard [Huggins.Richard@epa.gov]; Mills, Jason [Mills.Jason@epa.gov]; Birchfield, Norman [Birchfield.Norman@epa.gov]; Long, Michelle [Long.Michelle@epa.gov]; Jackson, Mary [Jackson.Mary@epa.gov]; Celeste, Laurel [celeste.laurel@epa.gov]; Robert J Lee [robert.j.lee@dteenergy.com]; Christy D Clark [christy.clark@dteenergy.com]; Kelly M Martorano [kelly.martorano@dteenergy.com]; Buening, Vincent [VBuening@trccompanies.com]; Crockford, Graham [GCrockford@trccompanies.com]; Cratsenburg, Kelly [KCratsenburg@trccompanies.com]; John Seymour [JSeymour@Geosyntec.com]; Omer Bozok [OBozok@Geosyntec.com]; Mooney, Susan [mooney.susan@epa.gov]; Schumacher, Jessica [Schumacher.Jessica@epa.gov]
Subject: RE: Part B Discussion with DTE (3 of 3)
Attachments: MONPP FAB VEL Part B ALD Application_DRAFT 11.06.2020.pdf

All,

The draft application for the Monroe Power Plant Fly Ash Basin is attached for our discussion on Monday. Looking forward to our conversation.

Chris Scieszka
Environmental Management & Safety
One Energy Plaza | 410 G.O. | Detroit, MI 48226
(O) 313-235-0153 | (C) Ex. 6 Personal Privacy (PP)
christopher.scieszka@dteenergy.com

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From: Christopher P Scieszka
Sent: Friday, November 06, 2020 12:51 PM
To: Huggins, Richard <Huggins.Richard@epa.gov>; Mills, Jason <Mills.Jason@epa.gov>; Birchfield, Norman <Birchfield.Norman@epa.gov>; Long, Michelle <Long.Michelle@epa.gov>; Jackson, Mary <Jackson.Mary@epa.gov>; Celeste, Laurel <celeste.laurel@epa.gov>; Robert J Lee <robert.j.lee@dteenergy.com>; Christy D Clark <Christy.Clark@dteenergy.com>; Kelly M Martorano <kelly.martorano@dteenergy.com>; Buening, Vincent <VBuening@trccompanies.com>; Crockford, Graham <GCrockford@trccompanies.com>; Cratsenburg, Kelly <KCratsenburg@trccompanies.com>; John Seymour <JSeymour@Geosyntec.com>; Omer Bozok <OBozok@Geosyntec.com>; Mooney, Susan <mooney.susan@epa.gov>; Schumacher, Jessica <Schumacher.Jessica@epa.gov>
Subject: RE: Part B Discussion with DTE (2 of 3)

All,

The draft application for the Belle River Power Plant Diversion Basin is attached for our discussion on Monday. The Monroe Power Plant Fly Ash Basin application is forthcoming.

Regards,

Chris Scieszka
Environmental Management & Safety
One Energy Plaza | 410 G.O. | Detroit, MI 48226
(O) 313-235-0153 | (C) Ex. 6 Personal Privacy (PP)
christopher.scieszka@dteenergy.com

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From: Christopher P Scieszka
Sent: Friday, November 06, 2020 12:46 PM
To: 'Huggins, Richard' <Huggins.Richard@epa.gov>; Mills, Jason <Mills.Jason@epa.gov>; Birchfield, Norman <Birchfield.Norman@epa.gov>; Long, Michelle <Long.Michelle@epa.gov>; Jackson, Mary <Jackson.Mary@epa.gov>; Celeste, Laurel <celeste.laurel@epa.gov>; Robert J Lee <robert.j.lee@dteenergy.com>; Christy D Clark <Christy.Clark@dteenergy.com>; Kelly M Martorano <kelly.martorano@dteenergy.com>; Buening, Vincent <VBuening@trccompanies.com>; Crockford, Graham <GCrockford@trccompanies.com>; Cratsenburg, Kelly <KCratsenburg@trccompanies.com>; John Seymour <JSeymour@Geosyntec.com>; Omer Bozok <OBozok@Geosyntec.com>; Mooney, Susan <mooney.susan@epa.gov>; Schumacher, Jessica <Schumacher.Jessica@epa.gov>
Subject: RE: Part B Discussion with DTE (1 of 3)

All,

Please find attached the draft Alternate Liner Demonstration Application for the Belle River Power Plant Bottom Ash Basins, as well as the agenda to drive our discussion on Monday.

The draft applications for the Belle River Power Plant Diversion Basin and the Monroe Power Plant Fly Ash Basin will be sent in separate emails soon.

Regards,

Chris Scieszka
Environmental Management & Safety
One Energy Plaza | 410 G.O. | Detroit, MI 48226
(O) 313-235-0153 | (C) Ex. 6 Personal Privacy (PP)
christopher.scieszka@dteenergy.com

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-----Original Appointment-----
From: Huggins, Richard <Huggins.Richard@epa.gov>
Sent: Friday, October 30, 2020 1:08 PM
To: Huggins, Richard; Mills, Jason; Birchfield, Norman; Long, Michelle; Jackson, Mary; Celeste, Laurel; Christopher P Scieszka; Robert J Lee; Christy D Clark; Kelly M Martorano; Buening, Vincent; Crockford, Graham; Cratsenburg, Kelly; John Seymour; Omer Bozok; Mooney, Susan; Schumacher, Jessica
Subject: Part B Discussion with DTE
When: Monday, November 09, 2020 11:00 AM-12:00 PM (UTC-05:00) Eastern Time (US & Canada).
Where: Microsoft Teams Meeting

one for Monroe Power Plant Fly Ash Basin, one for the Belle River Power Plant Bottom Ash Basins, and one for the Belle River Power Plant Diversion Basin

---

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Initial Application for an Alternate Liner Demonstration

Monroe Power Plant
Fly Ash Basin Coal Combustion Residuals Unit

November 2020

Prepared For:

DTE Electric Company
7955 East Dunbar Road
Monroe, Michigan 48161

Prepared By:

TRC
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Ann Arbor, Michigan 48108

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Sr. Project Hydrogeologist

Vincent E. Buening, CPG
Sr. Project Manager/Hydrogeologist

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CCR Program Manager/Unit Leader ECC-E

DRAFT

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Figure 3 Cross Section Locator Map
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Figure 6 Potentiometric Surface Map – March 2019
Figure 7 Potentiometric Surface Map – September 2019

APPENDICES

Appendix A 2019 Annual Groundwater Monitoring Report
Appendix B Owner Certification of Compliance
Appendix C Well Construction Diagrams and Soil Boring Logs
Appendix D Effectiveness of the Underlying Clay Soil as a Natural Barrier On-Site, Ash Disposal Basin, Monroe Power Plant Technical Report, Detroit Edison Design Engineering, 1995
Appendix E Documentation of Design Specifications Documentation of Source Material and Construction Quality, Geosyntec, November 2020

DRAFT

Executive Summary

TRC, on behalf of DTE Electric Company (DTE Electric), has prepared this Initial Application for an Alternate Liner Demonstration pursuant to the XX, XX, 2020 Hazardous and Solid Waste Management System: Disposal of Coal Combustion Residuals From Electric Utilities; A Holistic Approach to Closure Part B: Alternate Demonstration for Unlined Surface Impoundments (40 CFR § 257.71(d)) (Part B Rule) for the Monroe Power Plant Fly Ash Basin (MONPP FAB Coal Combustion Residuals (CCR) Unit.

This application and its attachments demonstrate how DTE Electric qualifies for and should be granted the opportunity to complete and submit an Alternate Liner Demonstration per 40 CFR § 257.71(d)(1)(i) for approval as continued operation of the MONPP FAB CCR Unit would pose no reasonable probability of adverse effects to human health or the environment in the future based on the following:

- Compliance with all provisions of the Final Rule: Disposal of CCR from Electric Utilities (CCR Rule); April 15, 2015, 40 CFR part 257 subpart D, including a sufficient groundwater monitoring network under § 257.91;
- The groundwater monitoring program meets the requirements of § 257.93 and § 257.94, and per analytical data collected as part of the program, remains in detection monitoring;
- The presence of a natural geologic barrier (more than 23 feet of native clay-rich soil) that provides the equivalent, or better level of protection from potential migration of contaminants than a composite liner defined in 40 CFR § 257.70(b), and;
- Sufficient documentation that the unit meets all the location restrictions under § 257.60 through § 257.64.

DRAFT

1.0 Regulatory Framework and Site Background

Regulatory Framework - On April 17, 2015, the U.S. EPA issued the Final Rule: Disposal of CCR from Electric Utilities (CCR Rule), 40 CFR 257, Subpart D, to regulate the disposal of CCR materials generated at coal-fired units. The rule is being administered under Subtitle D of the Resource Conservation and Recovery Act (RCRA, 42 U.S.C. § 6901 et seq.). On XXXX XX, 2020, the EPA Administrator issued revisions to the CCR Rule that required all unlined surface impoundments to initiate closure by April 11, 2021, unless an alternative deadline is requested and approved (40 CFR 257.103) or an initial application for an Alternate Liner Demonstration is prepared per 40 CFR § 257.71(d), and submitted by November 30, 2020. The April 11, 2021 deadline to cease receipt of waste and initiate closure will be tolled upon submission of a complete application and until such time that EPA makes a final decision on the application or subsequent demonstration. The initial application for an Alternate Liner Demonstration per § 257.71(d)(1)(i) must include the location of the facility and identify the specific CCR surface impoundment(s) for which the demonstration will be made. The application must also include all the following information:

- **§ 257.71(d)(1)(i)(A)** – A certification signed by the owner or operator that the CCR Unit is in full compliance with this subpart except for § 257.71(a)(1);
- **§ 257.71(d)(1)(i)(B)** – Documentation supporting the certification required under § 257.71(d)(1)(i)(A) which includes the following:
  1. Documentation that the groundwater monitoring network meets the requirements of § 257.91. This must include documentation that the existing network of groundwater monitoring wells is sufficient to ensure detection of any groundwater contamination resulting from the impoundment, based on direction of flow, well location, screening depth and other relevant factors;
  2. Documentation that the CCR surface impoundment remains in detection monitoring pursuant to § 257.94 as a precondition for submitting an application. This includes documentation that the groundwater monitoring program meets the requirements of § 257.93 and § 257.94;
  3. Documentation that the unit meets all the location restrictions under § 257.60 through 257.64;
  4. Documentation of the most recent structural stability assessment required by § 257.73(d); and
  5. Documentation of the most recent safety factor assessment required by § 257.73(e).
- **§ 257.71(d)(1)(i)(C)** – Documentation of the design specifications for any engineered liner components, as well as all data and analyses the owner or operator of the CCR surface impoundment relied on when determining the materials are suitable for use and that the construction of the liner is of good quality and in-line with proven and accepted engineering practices;
- **§ 257.71(d)(1)(i)(D)** – Facilities with CCR surface impoundments located on properties adjacent to a water body must demonstrate that there is no reasonable probability that a complete and direct transport pathway (*i.e.*, not mediated by groundwater) can exist between the impoundment and any nearby water body; and

ED_005947A_00014554-00004

- **§ 257.71(d)(1)(i)(E)** – Upon submission of the application, and any supplemental materials submitted in support of the application to the Administrator or the Participating State Director, the owner or operator must place the complete application in the facility's operating record as required by § 257.105(f)(14).

The documentation that must be provided to the EPA per § 257.71(d)(1)(i) to demonstrate that the above criteria has been met for an initial Alternate Liner Demonstration is provided within this report.

Site Background - The MONPP is located in Section 16, Township 7 South, Range 9 East, at 7955 East Dunbar Road, Monroe, in Monroe County Michigan (**Figure 1**). The MONPP, including the FAB, was constructed in the early 1970s.

The property has been used continuously as a coal fired power plant since the Detroit Edison Company (now DTE Electric) began power plant operations at MONPP in 1975. The FAB was completed in 1975 and accepts coal ash from the MONPP operations.

The MONPP FAB CCR unit is approximately 410-acres with an original design storage capacity of 18,500 acre-feet at a maximum elevation of 614 feet relative to the National Geodetic Vertical Datum of 1929 (NGVD 29) (**Figure 2**). The FAB consists of an earthen clay-rich soil embankment (raised surface impoundment) with a crest perimeter length of approximately 18,200 feet and a general height (from the lowest toe elevation to the top of embankment) of approximately 40 feet, with a maximum height of 44 feet. A road along the top of the crest has a width of approximately 15 feet and an elevation of approximately 614 feet NGVD 29 with the typical water operational level being between 608 and 609 feet NGVD 29.

The FAB base is keyed into the existing natural clay-rich soil ground surface at an elevation of 563.4 feet. This natural low permeability clay-rich soil base serves as an underlying hydraulic barrier, forming a natural liner of at least 23 feet of natural clay-rich soil below the base of the FAB.

The Fly Ash Basin has a structural height of approximately 50.6 feet. The outer slope of the embankment has a slope generally ranging from approximately 2.3 horizontal to 1 vertical (2H:1V) to 3H:1V. The inner slope of the embankment where the coal ash slurry is stored has a slope of approximately 2H:1V. CCRs are placed into the FAB by use of a "wet" (sluiced) disposal method. In 2015, DTE Electric added a 79-acre "dry" disposal area vertical extension landfill (VEL) located on top of a portion of the FAB that had been filled to approximate final grade with CCR.

2.0 Natural Clay Liner

Pursuant to Part B, in order to meet the requirements of 40 CFR § 257.71(d)(1), the owner or operator must demonstrate that, without a composite liner, the continued operation of the unit would pose no reasonable probability of adverse effects to human health or the environment. This is demonstrated when the surface impoundment has not and will not result in groundwater concentrations above the relevant GWPS at the unit boundary (health based or background, whichever is higher).

The risks posed by the continued operation of the FAB CCR Unit are mitigated by the geologic and hydrogeologic conditions at the site, and through DTE Electric's demonstrated compliance with the CCR rules. The following paragraphs document the existing site conditions, identification of potential receptors, and how potential risks have been mitigated.

Site Geology - The geology of Monroe County consists of primarily unconsolidated alluvium and glacial deposits overlying bedrock. The unconsolidated material consists of shallow/surficial alluvium deposits (sand and gravel) on top of clay-rich glacial till with some sporadic glaciofluvial deposits that range from not present to more than 150 feet thick, with an average thickness of about 50 feet. Bedrock in Monroe County is predominantly Devonian and Silurian-aged carbonates and includes the Antrim Shale, Traverse Group, Dundee Formation (limestone and some dolostone), Detroit River Group, Sylvania Sandstone, Bass Islands Group, and Salina Group. There is a potential for uppermost aquifers to be within the overlying alluvium (4%); however, the majority of drinking water wells in the county (91%) are installed in bedrock. The bedrock surface is highest in the central and southwestern portion of the county and dips to the southeast and northwest due to erosion. Monroe County's eastern boundary is Lake Erie, and in general, regional groundwater flow is to the east towards Lake Erie. Much of the carbonate bedrock aquifer in Monroe County is generally confined and naturally artesian.

Historical borings advanced when designing the MONPP FAB in the 1970s and recent work performed to install monitoring wells MW-16-01 through MW-16-07 documented that the MONPP FAB overlies more than 35 feet of unconsolidated clay-rich glacial till and/or lacustrine deposits. These thick low permeability subsurface conditions are present on a regional basis due to continental glaciation and are discussed further in The *Natural Clay Liner Equivalency Evaluation Report, DTE Electric and Consumers Energy Company Six Southeast Michigan Coal Combustion Residual Units,* previously submitted to the EPA in December of 2018. This report contains information on the natural clay liner evaluation at the MONPP FAB CCR Unit. This report can be found here: Clay Liner Equivalency Report.

Saturated limestone bedrock of the Bass Islands Group is generally encountered from 37 to 53.5 feet below ground surface (feet-bgs). The Bass Island Group can be as thick as 350 feet in Monroe County. Two modes of groundwater movement through the carbonate bedrock are: (i) through pore spaces in the rock (primary porosity), and (ii) along an intersecting system of fractures, joints, and bedding planes, collectively referred to as secondary porosity. Groundwater flow in the carbonate bedrock aquifer in Monroe County is primarily through secondary porosity consisting of fractures often evident along bedding-plane partings.

The limestone aquifer encountered at the site is generally artesian except in the area of monitoring well MW-16-01. Monitoring well MW-16-01 is located within several hundred feet of several off-site domestic residential water supply wells located to the north along Dunbar Road adjacent to Plum Creek that likely lower the hydraulic head in the area of MW-16-01.

Surface water bodies present in the area of the MONPP FAB include the Plum Creek a wide shallow creek (as close as 200 feet north and northeast of the MONPP FAB), Lake Erie (immediately adjacent to a portion of the MONPP FAB to the south) and the LaPlaisance Creek (approximately 2,000 feet south of the MONPP FAB).

Refer to the Groundwater Monitoring Systems Summary Report (GWMS, October 2017) located on the DTE Compliance Data and Information website (MONPP GWMS), and **Figures 3 through 5** for further details on the site geology.

Site Hydrogeology – Based on data collected by TRC, the general flow potential within the uppermost aquifer at the site is to the northeast towards Plum Creek. Wells located hydraulically upgradient of the CCR unit include MW-16-03, MW-16-04 and MW-16-05 on the southwestern and southern part of the FAB. These wells exhibit potentiometric elevations (generally 10 to 15 feet above ground surface) resulting in flowing conditions. Downgradient monitoring wells MW-16-01, MW-16-05 and MW 16-06 range from slightly artesian to not artesian.

The average hydraulic gradient to the northeast ranges from 0.002 to 0.0025 foot/foot along the eastern part of the FAB to 0.004 to 0.005 foot/foot in the center and northwestern part of the FAB, with an overall mean of 0.004 foot/foot.

The surface water elevation within the FAB raised surface impoundment is at least 5 to more than 30 feet above the potentiometric surface elevations in the uppermost aquifer limestone, and more than 60 feet above the base of the underlying clay-rich confining unit that isolates groundwater within the limestone aquifer. Therefore, flow potential from the CCR unit to the surrounding area would be radially outward from the FAB. However, there is no hydraulic communication between the uppermost aquifer and the FAB due to the continuous silty clay-rich confining unit beneath the MONPP FAB.

A mean hydraulic conductivity of approximately 4.3 feet/day was measured from the CCR monitoring wells using single well hydraulic conductivity tests (e.g., slug tests) performed in 2016. This result of 5 feet/day is consistent with other sources for the hydraulic conductivity of the Bass Island Group.

Using the groundwater potentiometric surface elevations measured at the MONPP FAB unit in 2016 and 2017, the horizontal gradient has varied from approximately 0.002 to 0.005 with an average gradient of approximately 0.004 foot/foot to the northeast. Assuming an average porosity of 0.1 for the limestone in the uppermost aquifer, a mean hydraulic conductivity of 5 feet/day, and a hydraulic gradient of 0.004 for the limestone aquifer the potential horizontal groundwater flow rate to the northeast is approximately 0.2 feet/day or 73 feet/year.

Based on the artesian conditions, the low permeability of the underlying natural soils, and the calculated time of travel for groundwater to flow vertically from the FAB to the uppermost aquifer, it is not possible for the uppermost aquifer to be affected by CCR from FAB operations that began in 1975 (see vertical time of travel discussion below).

For further discussion on the site groundwater flow, see the GWMS found on the DTE website (MONPP GWMS) and **Appendix A** for the 2019 Annual Groundwater Monitoring Report (GWMR). The 2018 and 2017 GWMR reports can be located on the DTE website (MONPP 2018 GWMR and MONPP 2017 GWMR) . Refer to **Figures 6 and 7** for the most recent potentiometric surface maps.

Vertical Flow Potential to Uppermost Aquifer – The MONPP FAB CCR unit was constructed in an area that consists of a naturally occurring silty-clay rich soil. This naturally deposited soil barrier has been verified by numerous historical soil borings, and also confirmed by TRC during completion of the seven soil borings installed as part of the CCR monitoring well installation program. Consequently, the geology and hydrogeology of the site provides a very high level of environmental protection of the uppermost aquifer. Based on the site geology and hydrogeology, there is extremely low potential for the landfill to affect the uppermost aquifer groundwater in the future. Groundwater occurring in the deep confined uppermost limestone aquifer is protected from CCR constituents by the thick clay-rich aquitard with low hydraulic conductivity.

Using the hydrogeologic information for the site, the time of travel for water from the base-grade elevation of the MONPP FAB down to the uppermost aquifer has previously been calculated to be 308 years assuming a maximum silty-clay hydraulic conductivity of 6.5 x 10-8 cm/s and 23 feet of silty-clay present between the bottom of the MONPP FAB CCR unit and the limestone bedrock surface. Therefore, given that the MONPP FAB operations began in the 1970s, and DTE Electric plans to cease placing CCR and initiate closure of the FAB in late 2023, there is no reasonable probability for the impoundment to have adverse effects to the uppermost aquifer groundwater, human health or the environment given the relatively short duration of continued operation. The natural clay-rich soil liner underlying the FAB CCR Unit consists of thick, low hydraulic conductivity clay, that provides the same, or better level of protection from potential migration of contaminants than the composite liner defined in 40 CFR § 257.70(b).

Groundwater Use - Water supply wells are present within the limestone aquifer unit within several hundred feet of the CCR groundwater system wells at MONPP. There is no on-site use of groundwater at the MONPP. Surface water bodies present in the area of the MONPP FAB include the Plum Creek a wide shallow creek (as close as 200 feet north and northeast of the MONPP FAB), Lake Erie (immediately adjacent to a portion of the MONPP FAB to the south) and the LaPlaisance Creek (approximately 2,000 feet south of the MONPP FAB).

Detection Monitoring - A groundwater monitoring system has been established for the MONPP FAB CCR Unit (MONPP GWMS). The detection monitoring well network for the FAB CCR Unit currently consists of seven monitoring wells that are screened in the uppermost aquifer. The monitoring well locations are shown on **Figure 2.** Detection monitoring at the

monitoring well system has been completed since 2017 in accordance with § 257.93 and § 257.94 with compliance, as required in § 257.71(d)(1)(i)(B)(2), being documented in the 2017, 2018 and 2019 Annual Reports prepared in accordance with § 257.90. See **Appendix A** for the 2019 GWMR, and the DTE website for the 2018 and 2017 GWMRs (MONPP 2018 GWMR and MONPP 2017 GWMR).

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3.0 Facility Compliance

DTE Electric has a public repository of documents in accordance with 40 CFR § 257.107 which can be found here: DTE CCR Compliance Data and Information. This repository demonstrates that the MONPP facility is in compliance with all record keeping, notification and internet posting requirements as required by 40 CFR 257 Subpart D. DTE Electric audited their records to identify any gaps in compliance and none were noted. As required by § 257.71(d)(1)(i)(A), a certification signed by the owner or operator that the MONPP FAB CCR Unit is in full compliance with this subpart, except for § 257.71(a)(1), has been included as **Appendix B**. A summary of the key compliance metrics for the MONPP FAB is discussed below.

Groundwater Monitoring System § 257.71(d)(1)(i)(B)(1) – In accordance with 40 CFR § 257.91, a P.E. certified groundwater monitoring system is established for the MONPP FAB CCR Unit (MONPP GWMS). The monitoring well network for the FAB CCR Unit currently consists of seven monitoring wells that are screened in the uppermost aquifer and are sufficient to ensure detection of groundwater contamination resulting from the FAB CCR Unit. Given the presence of the thick natural clay-rich liner hydraulic barrier as discussed in Section 2, the perimeter groundwater monitoring well network is appropriate to monitor the MONPP FAB CCR Unit. The monitoring well locations are shown on **Figure 2**. Well Construction and Soil Boring Logs for the monitoring network are attached as **Appendix C**.

Groundwater elevation data collected during the 2019 sampling events show that groundwater flow conditions within the uppermost aquifer are consistent with previous monitoring events. Groundwater potentiometric elevation summary maps are shown on **Figure 6 and Figure 7**, respectively. Additional figures for 2017 and 2018 can be found in the 2017 and 2018 GWMRs located on the DTE website (MONPP 2018 GWMR and MONPP 2017 GWMR). There is a horizontally extensive clay with substantial vertical thickness of greater than 23 feet that isolates the uppermost aquifer from the MONPP FAB CCR Unit (refer to **Figures 3, 4 and 5** for geologic cross sections).

Detection Monitoring and Groundwater Statistical Analysis § 257.71(d)(1)(i)(B)(2) – The groundwater conditions have been consistent through all monitoring events completed since 2017. This continues to demonstrate that the downgradient wells are appropriately positioned to detect the presence of Appendix III parameters that could potentially migrate from the MONPP FAB CCR Unit. This additionally demonstrates the unit has been in compliance with detection monitoring performed in accordance with § 257.94 as required in § 257.71(d)(1)(i)(B)(2). This is documented in the 2017 through 2019 Annual Reports prepared as required by 40 CFR § 257.90. The 2019 GWMR is attached as **Appendix A,** 2018 and 2017 GWMRs can be found on the DTE website (MONPP 2018 GWMR and MONPP 2017 GWMR).

Since establishment of the groundwater monitoring system, DTE Electric performs groundwater sampling semi-annually in accordance with the Groundwater Statistical Evaluation Plan (SEP, October 2017) located on the DTE website (MONPP SEP).

Statistical evaluation of groundwater data is completed each time samples are collected in accordance with 40 CFR § 257.93. Statistical methods for the FAB CCR Unit were selected

based on the geology and hydrogeology at the Site (primarily the presence of clay/hydraulic barrier and the low vertical and horizontal groundwater flow velocity), in addition to other supporting lines of evidence that the aquifer is unaffected by the CCR Unit (such as the consistency in concentrations of water quality data). Refer to the SEP (October 2017) located on the DTE website (MONPP SEP), for further details on the statistical analysis and the 2019 GWMR attached as **Appendix A** for a summary of groundwater monitoring data and statistical analysis completed at each monitoring location. The 2018 and 2017 GWMRs can be located on the DTE website (MONPP 2018 GWMR and MONPP 2017 GWMR).

Location Standards § 257.71(d)(1)(i)(B)(3) – The MONPP FAB CCR Unit is compliant with the location restrictions of 40 CFR § 257.60-64. The location restriction certification report (LR, October 2018) is available on the DTE website (MONPP LR).

Structural Stability and Safety Factor Assessments § 257.71(d)(1)(i)(B)(4 and 5) - Structural stability assessment and safety factor assessments, as required per 40 CFR §257.103 (f)(2)(v)(C)(7) and (8), are required for the MONPP FAB surface impoundment, have been completed and meet all criteria. Further information can be located on the DTE Electric website (MONPP SS and MONPP SF).

Documentation of Design Specifications § 257.71(d)(1)(i)(C) – The liner is comprised of two components: natural clay deposits and the compacted clay embankment for the side liner. Geotechnical investigations completed in 1970, 1973, 1974 and 1994 and for monitoring well installations in 2016 demonstrate extensive clay deposits that act as an effective natural clay liner across the MONPP FAB CCR Unit. This is documented in the *Effectiveness of the Underlying Clay Soil as a Natural Barrier On-Site, Ash Disposal Basin, Monroe Power Plant* technical report, prepared in 1995 by the Detroit Edison Design Engineering Power Generation Organization. This report is attached as **Appendix D**.

Prior to construction, a formal embankment design for the FAB was performed. A review of the FAB construction quality was completed by Geosyntec Consultants (Geosyntec). The results of the review are provided in an Alternate Liner Demonstration Application Support for DTE Monroe Power Plant Fly Ash Basin in Monroe, MI Documentation of Source Material and Construction Quality memorandum dated November 5, 2020. This memorandum is attached as **Appendix E.** The memorandum documents that the FAB clay embankment was constructed using state of the practice specifications and construction methods. This has been confirmed and documented by many investigations in the embankment after construction. Further, the embankment has been made wider through a slope flattening program where the embankment was constructed under state of the practice specifications and a well-documented construction quality assurance (CQA) program. The embankment (liner) construction is of good quality and in line with proven and accepted engineering practices.

Facilities with CCR surface impoundments located on properties adjacent to a water body § 257.71(d)(1)(i)(D) – The MONPP FAB CCR Unit is located adjacent to surface water bodies, however, based on historic borings and construction documentation, the unit is separated from the water bodies by an extensive clay unit and an extensive 40 or more-foot-high perimeter clay berm. Therefore, there is no reasonable potential for a non-groundwater release..

Alternate Liner Application Placed in the Operating Record - § 257.71(d)(1)(i)(E) - This alternate liner demonstration application and supplemental materials submitted in this application have been placed in the facility's operating record as required by § 257.105(f)(14).

DRAFT

4.0 Conclusions

This document demonstrates how the MONPP FAB CCR Unit meets the provisions of the initial application for an alternate liner demonstration by:

- Demonstrating continued compliance with the CCR Rule for all record keeping, notification and internet posting requirements. In addition, detection monitoring is completed at the established groundwater monitoring network as required by 40 CFR § 257.93 and § 257.94 and annual reporting as required by 40 CFR § 257.90 documents compliance with the detection monitoring program;
- Demonstrating the presence of a natural geologic barrier underlying the MONPP FAB CCR Unit, that consists of a thick (> 23 feet), low hydraulic conductivity clay, that provides the same, or better level of protection from potential migration of contaminants than the composite liner defined in 40 CFR § 257.70(b);
- Demonstrating that the MONPP FAB CCR Unit is compliant with the location restrictions of 40 CFR § 257.60-64 and the structural stability and safety factor assessments as required per 40 CFR § 257.103 (f)(2)(v)(C)(7) and (8);
- Including the MONPP FAB impoundment natural clay liner effectiveness evaluations performed in 2018, and;
- Placing this alternate liner demonstration application and supplemental materials submitted in this application in the facility's operating record as required by § 257.105(f)(14).

Therefore, it is requested that the EPA approve DTE Electric's initial application to complete an alternate liner demonstration prepared per 40 CFR § 257.71(d)(i) for the MONPP FAB CCR Unit.

DRAFT

5.0 References

DTE Electric Company website: DTE CCR Compliance Data and Information

TRC Environmental Corporation. January 2020. 2019 Annual Groundwater Monitoring Report - DTE Electric Company Monroe Power Plant Fly Ash Basin and Vertical Extension Landfill, 7955 East Dunbar Road, Monroe, Michigan 48161 (MONPP 2019 GWMR)

TRC Environmental Corporation. January 2019. 2018 Annual Groundwater Monitoring Report - DTE Electric Company Monroe Power Plant Fly Ash Basin and Vertical Extension Landfill, 7955 East Dunbar Road, Monroe, Michigan 48161 (MONPP 2018 GWMR)

TRC Environmental Corporation. January 2018. 2017 Annual Groundwater Monitoring Report - DTE Electric Company Monroe Power Plant Fly Ash Basin and Vertical Extension Landfill, 7955 East Dunbar Road, Monroe, Michigan 48161 (MONPP 2017 GWMR)

TRC Environmental Corporation. October 2017. Groundwater Monitoring Systems Summary Report - DTE Electric Company Monroe Power Plant Fly Ash Basin and Vertical Extension Landfill, 7955 East Dunbar, Road Monroe, Michigan 48161 (MONPP GWMS).

TRC Environmental Corporation. October 2017. Groundwater Statistical Evaluation Plan - DTE Electric Company Monroe Power Plant Fly Ash Basin and Vertical Extension Landfill, 7955 East Dunbar Road, Monroe, Michigan 48161 (MONPP SEP)

TRC Environmental Corporation. October 2018. Location Restrictions Demonstrations - DTE Electric Company Monroe Power Plant Fly Ash Basin and Vertical Extension Landfill, 7955 East Dunbar Road, Monroe, Michigan 48161 (MONPP LR)

TRC Environmental Corporation. December 2018. Natural Clay Liner Equivalency Evaluation Report, DTE Electric and Consumers Energy Company Six Southeast Michigan Coal Combustion Residual Units (Clay Liner Equivalency Report)

Geosyntec Consultants. November 5, 2020. Alternate Liner Demonstration Application Support for DTE Monroe Power Plant Fly Ash Basin in Monroe, MI Documentation of Source Material and Construction Quality.

Detroit Edison, Design Engineering, Power Generation Organization. March 1995. Effectiveness of the Underlying Clay Soil as a Natural Barrier On-Site, Ash Disposal Basin, Monroe Power Plant.

Figures

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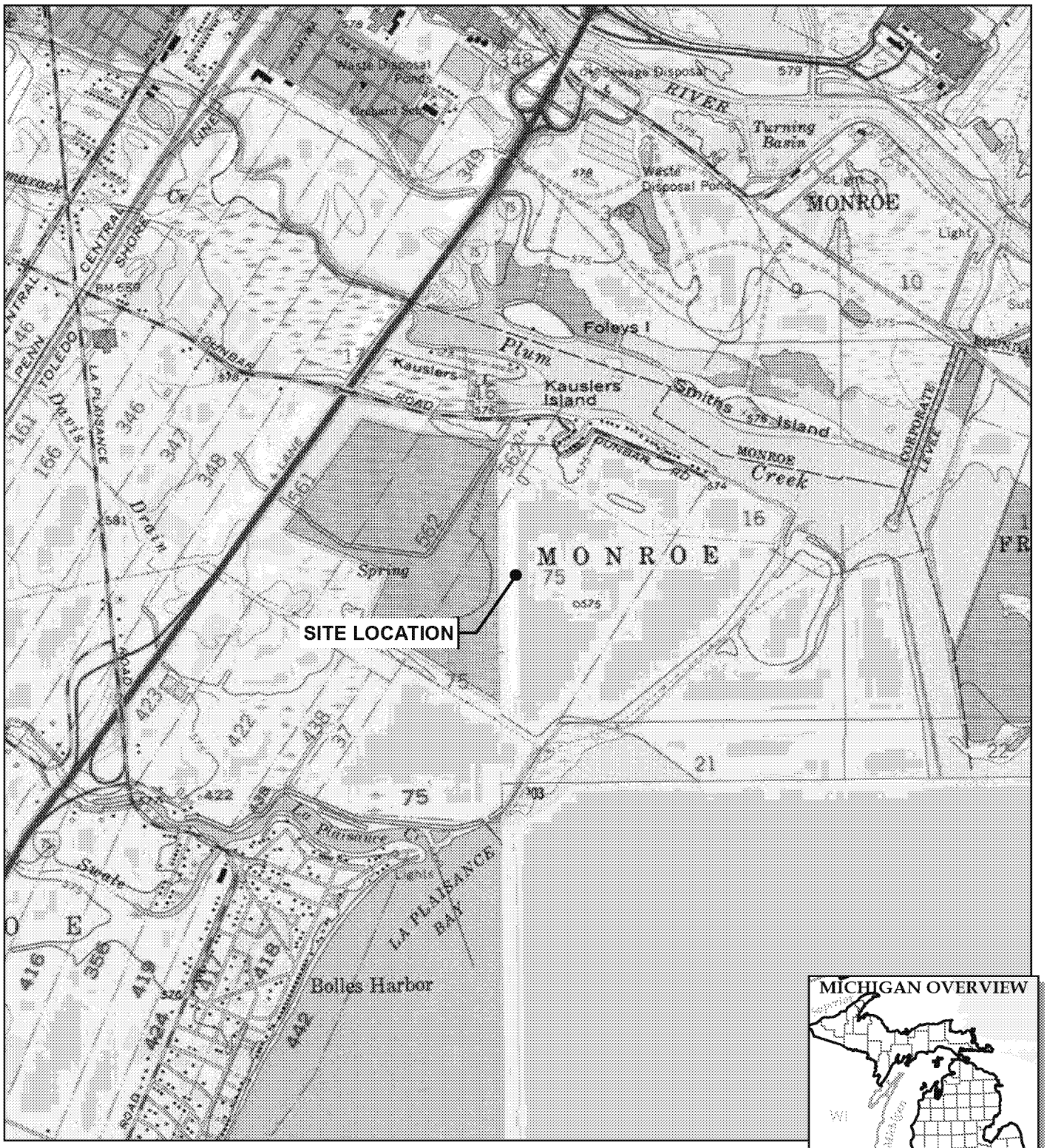

BASE MAP FROM USGS 7.5 MINUTE TOPOGRAPHIC QUADRANGLE SERIES.

N

1" = 2,000'
1:24,000

0 2,000 4,000 FEET

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PROJECT:

DTE ELECTRIC COMPANY
MONROE POWER PLANT
FLY ASH BASIN AND VERTICAL EXTENSION LANDFILL
7955 EAST DUNBAR ROAD
MONROE, MICHIGAN

TITLE:

SITE LOCATION MAP

DRAWN BY:	S.MAJOR
CHECKED BY:	B. YELEN
APPROVED BY:	V. BUENING
DATE:	JANUARY 2020
PROJ. NO.:	320511.0001
FILE:	320511-0001-008SLM-MPP-Fig01.mxd

FIGURE 1

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LEGEND

- MONITORING WELLS
- APPROXIMATE BOUNDARY OF FLY ASH
- APPROXIMATE BOUNDARY OF VERTICAL EXTENSION LANDFILL

NOTES

1. BASE MAP IMAGERY FROM GOOGLE EARTH PRO, 2018.
2. WELL LOCATIONS SURVEYED BY BMJ ENGINEERS AND SURVEYORS INC. IN MARCH AND MAY 2016.

N

0 600 1,200 Feet

1 " = 600 '
1:7,200

PROJECT: DTE ELECTRIC COMPANY
MONROE POWER PLANT
FLY ASH BASIN AND VERTICAL EXTENSION LANDFILL
7955 EAST DUNBAR ROAD
MONROE, MICHIGAN

TITLE: MONITORING NETWORK AND SITE PLAN

DRAWN BY:	M. VAPHIADIS	PROJ NO.:	320511.0001
CHECKED BY:	J. KRENZ		FIGURE 2
APPROVED BY:	V. BUENING		
DATE:	JANUARY 2020		

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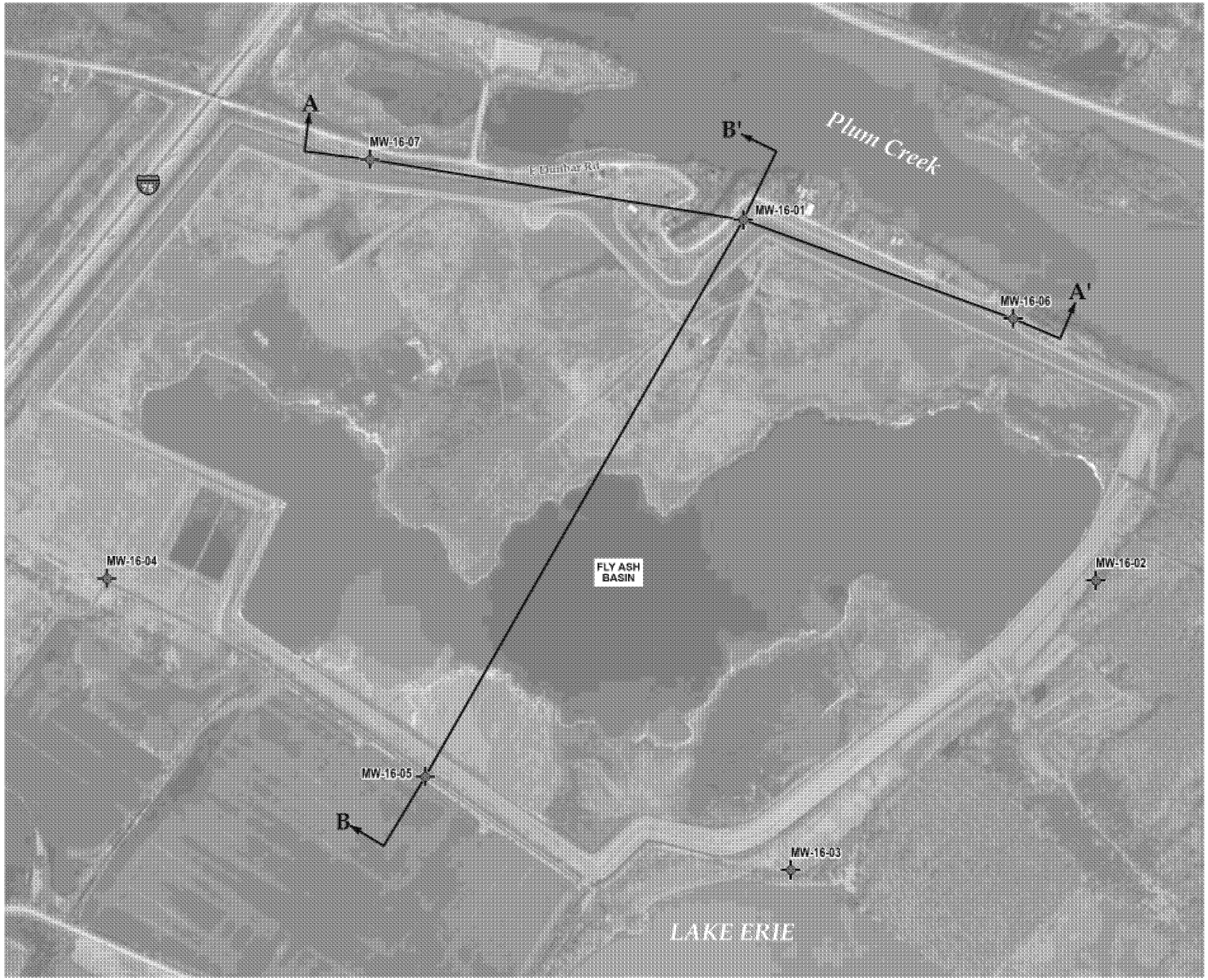
TRC - GIS



LEGEND

- MONITORING WELLS
- APPROXIMATE BOUNDARY OF FLY ASH
- CROSS SECTIONS

NOTES

1. BASE MAP IMAGERY FROM ESRI/MICROSOFT, "WORLD IMAGERY", WEB BASEMAP SERVICE LAYER.
2. WELL LOCATIONS SURVEYED BY BMJ ENGINEERS AND SURVEYORS INC. IN MARCH AND MAY 2016.

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1 " = 600 '
1:7,200

PROJECT:
DTE ELECTRIC COMPANY
MONROE POWER PLANT FLY ASH BASIN
7955 EAST DUNBAR ROAD
MONROE, MICHIGAN

TITLE:
CROSS SECTION LOCATOR MAP

DRAWN BY:	J. PAPEZ	PROJ NO:	265996.0001
CHECKED BY:	S. HOLMSTROM		
APPROVED BY:	V. BUENING		**FIGURE 3**
DATE:	OCTOBER 2017		

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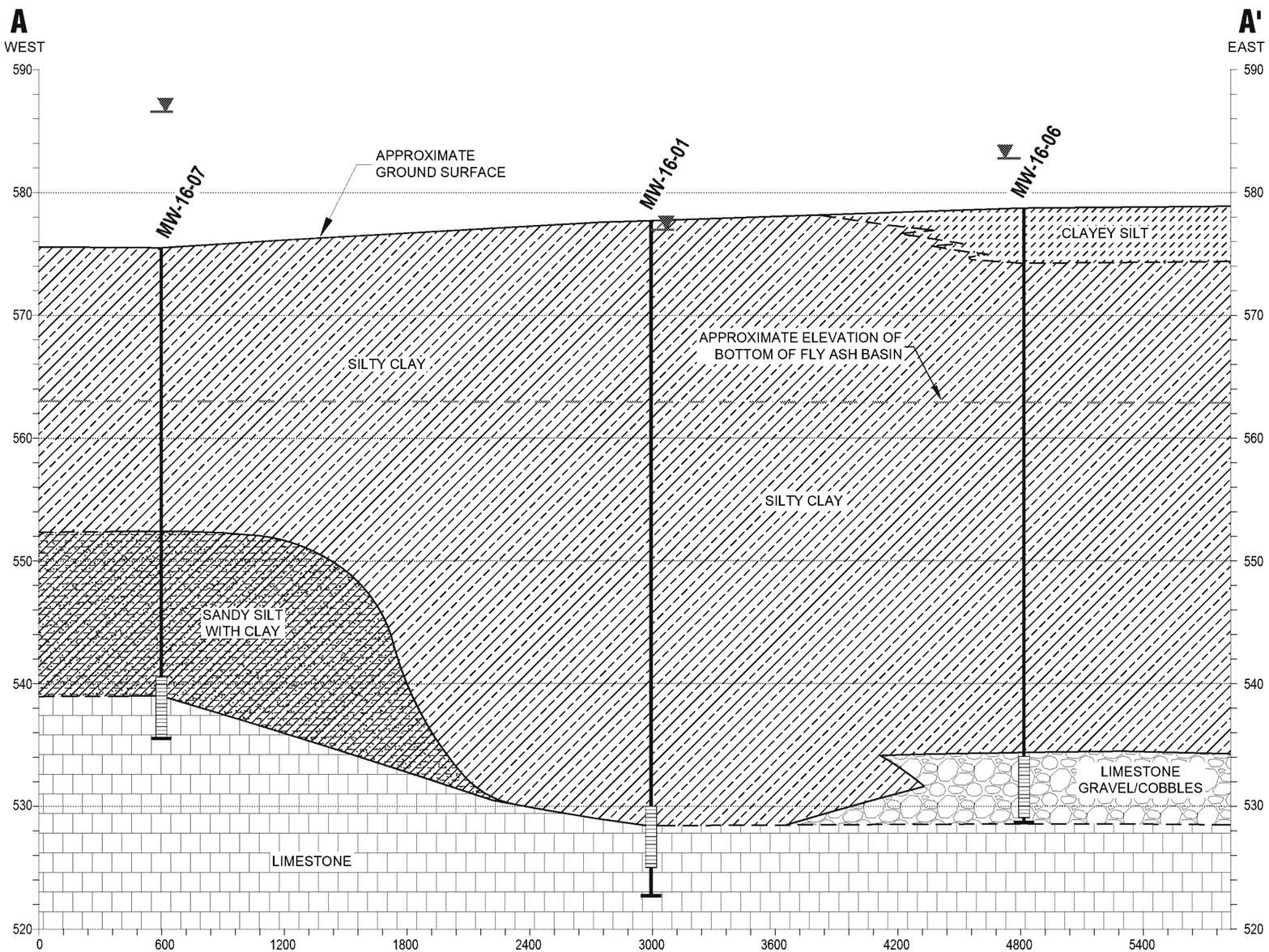
Map Rotation: 0

TRC -- GIS

GENERALIZED GEOLOGIC CROSS-SECTION A-A'



LEGEND

- STRATEGRAPHIC BOUNDARY (DASHED WHERE INFERRED)
- GROUNDWATER ELEVATION (COLLECTED ON 03/06/2017)
- SOIL BORING
- WELL SCREEN INTERVAL
- END OF BORING

Lithology Key

- CLAYEY SILT
- SILTY CLAY
- SANDY SILT WITH CLAY
- LIMESTONE GRAVEL / COBBLES
- LIMESTONE BEDROCK

SCALE IN FEET

VERTICAL: 0 – 10

HORIZONTAL: 0 – 600

PROJECT:

DTE ELECTRIC COMPANY
MONROE POWER PLANT - FLY ASH BASIN
MONROE, MICHIGAN

TITLE:

GENERALIZED GEOLOGIC CROSS-SECTION A-A'

DRAWN BY:	D.STEHLE	PROJ NO.:	265996.0001.01
CHECKED BY:	S.HOLMSTROM		**FIGURE 4**
APPROVED BY:	V.BUENING		
DATE:	SEPTEMBER 2017		

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FILE NO.: 265996.0001.01.01.04-05.dwg

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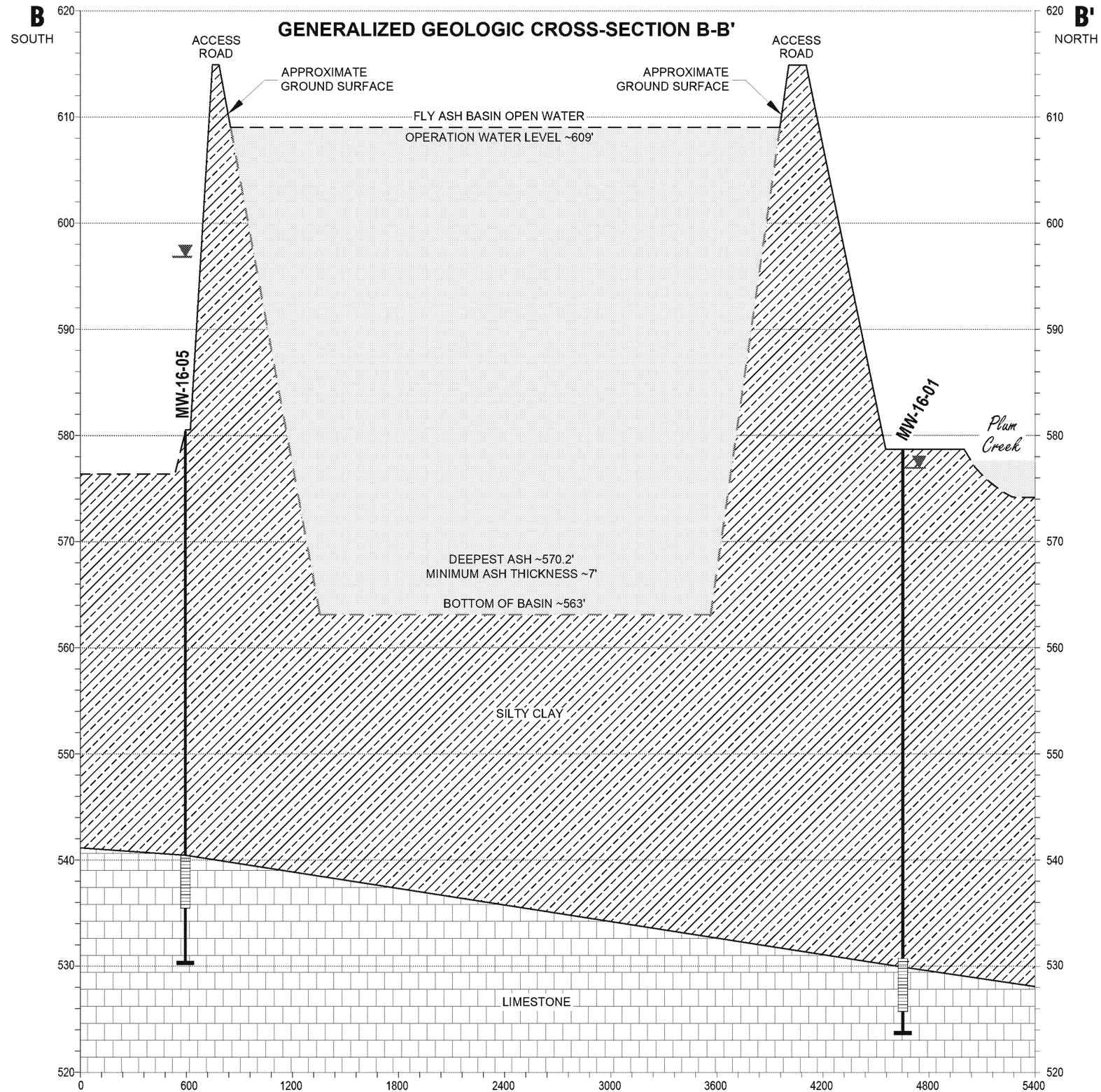

LEGEND

- STRATEGRAPHIC BOUNDARY (DASHED WHERE INFERRED)
- GROUNDWATER ELEVATION (COLLECTED 03/06/2017)
- SOIL BORING
- WELL SCREEN INTERVAL
- END OF BORING

Lithology Key

- SILTY CLAY
- LIMESTONE BEDROCK

SCALE IN FEET

VERTICAL: 0 – 10

HORIZONTAL: 0 – 600

PROJECT:
DTE ELECTRIC COMPANY
MONROE POWER PLANT - FLY ASH BASIN
MONROE, MICHIGAN

TITLE:
GENERALIZED GEOLOGIC CROSS-SECTION B-B'

DRAWN BY:	D.Stehle	PROJ NO.:	265996.0001.01.01
CHECKED BY:	S.HOLMSTROM		**FIGURE 5**
APPROVED BY:	V.BUENING		
DATE:	MAY 2017		

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LEGEND

- MONITORING WELL
- APPROXIMATE BOUNDARY OF FLY ASH BASIN
- APPROXIMATE BOUNDARY OF VERTICAL EXTENSION LANDFILL
- POTENTIOMETRIC SURFACE CONTOUR LINE (5-FT INTERVAL,DASHED WHERE INFERRED)
- (582.84) STATIC WATER ELEVATION IN FEET (NAVD, 1988)

NOTES

1. BASE MAP IMAGERY FROM GOOGLE & PARTNERS GOOGLE EARTH PRO, 04/2018.
2. WELL LOCATIONS SURVEYED BY BMJ ENGINEERS AND SURVEYORS INC. IN MARCH AND MAY 2016.
3. GROUNDWATER ELEVATIONS DISPLAYED IN FEET RELATIVE TO NORTH AMERICAN VERTICAL DATUM OF 1988

N

0 600 1,200 Feet

1 " = 600 '
1:7,200

PROJECT: DTE ELECTRIC COMPANY
MONROE POWER PLANT
FLY ASH BASIN AND VERTICAL EXTENSION LANDFILL
7955 EAST DUNBAR ROAD
MONROE, MICHIGAN

TITLE: POTENTIOMETRIC SURFACE MAP
MARCH 2019

DRAWN BY:	M. VAPHIADIS	PROJ NO:	320511.0001
CHECKED BY:	J. KRENZ		FIGURE 6
APPROVED BY:	V. BUENING		
DATE:	JANUARY 2020		

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Map Rotation: 0

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LEGEND

- MONITORING WELL
- APPROXIMATE BOUNDARY OF FLY ASH BASIN
- APPROXIMATE BOUNDARY OF VERTICAL EXTENSION LANDFILL
- POTENTIOMETRIC SURFACE CONTOUR LINE (5-FT INTERVAL,DASHED WHERE INFERRED)
- (582.69) STATIC WATER ELEVATION IN FEET (NAVD, 1988)

NOTES

1. BASE MAP IMAGERY FROM GOOGLE EARTH PRO, 2018.
2. WELL LOCATIONS SURVEYED BY BMJ ENGINEERS AND SURVEYORS INC. IN MARCH AND MAY 2016.
3. GROUNDWATER ELEVATIONS DISPLAYED IN FEET RELATIVE TO NORTH AMERICAN VERTICAL DATUM OF 1988.
4. NM = NOT MEASURED; MW-16-05 WAS DAMAGED AT THE TIME OF SAMPLING.

N

0 600 1,200 Feet

1 " = 600 '
1:7,200

PROJECT:
DTE ELECTRIC COMPANY
MONROE POWER PLANT
FLY ASH BASIN AND VERTICAL EXTENSION LANDFILL
7955 EAST DUNBAR ROAD
MONROE, MICHIGAN

TITLE:
POTENTIOMETRIC SURFACE MAP SEPTEMBER 2019

DRAWN BY:	M. VAPHIADIS	PROJ NO.:	386089.0002
CHECKED BY:	J. KRENZ		
APPROVED BY:	V. BUENING		FIGURE 7
DATE:	OCTOBER 2020		

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Coordinate System: NAD 1983 UTM Zone 17N (Meter)
Map Rotation: 0

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Appendix A
2019 Annual Groundwater Monitoring Report

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2019 Annual Groundwater Monitoring Report

DTE Electric Company
Monroe Power Plant Fly Ash Basin and Vertical Extension Landfill
Coal Combustion Residual Unit

January 2020

2019 Annual Groundwater Monitoring Report

DTE Electric Company
Monroe Power Plant Fly Ash Basin and Vertical Extension Landfill
Coal Combustion Residual Unit

7955 East Dunbar Road
Monroe, Michigan

January 2020

Prepared For
DTE Electric Company

Graham Crockford, C.P.G.
Senior Project Geologist

David B. McKenzie, P.E.
Senior Project Engineer

TRC | DTE Electric Company
Final
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Executive Summary

On April 17, 2015, the United States Environmental Protection Agency (USEPA) published the final rule for the regulation and management of Coal Combustion Residuals (CCR) under the Resource Conservation and Recovery Act (RCRA) (the CCR Rule), as amended July 30, 2018. The CCR Rule, which became effective on October 19, 2015 (amendment effective August 29, 2018), applies to the DTE Electric Company (DTE Electric) Monroe Power Plant (MONPP) Coal Combustion Residual Fly Ash Basin and Vertical Extension Landfill (FAB & VEL) CCR unit. Pursuant to the CCR Rule, no later than January 31, 2018, and annually thereafter, the owner or operator of a CCR unit must prepare an annual groundwater monitoring and corrective action report for the CCR unit documenting the status of groundwater monitoring and corrective action for the preceding year in accordance with §257.90(e). On behalf of DTE Electric, TRC Engineers Michigan, Inc., the engineering entity of TRC Environmental Corporation (TRC), has prepared this Annual Groundwater Monitoring Report for calendar year 2019 activities at the MONPP FAB & VEL CCR unit.

The semiannual detection monitoring events for 2019 were completed in March and September 2019 and included sampling and analyzing groundwater within the groundwater monitoring system for the indicator parameters listed in Appendix III to the CCR Rule. As part of the statistical evaluation, the data collected during detection monitoring events are evaluated to identify statistically significant increases (SSIs) in detection monitoring parameters to determine if concentrations in detection monitoring well samples exceed background levels. Detection monitoring data that has been collected and evaluated in 2019 are presented in this report.

SSIs for Appendix III constituents were confirmed for total dissolved solids (TDS) in September 2019 in one or more downgradient wells during the September 2019 monitoring event. TRC performed an alternate source demonstration (ASD) and determined the observation of TDS above background was a result of natural variability in groundwater quality and not attributable to the MONPP FAB & VEL CCR unit. Therefore, no SSIs were recorded that were not addressed by an ASD for the 2019 monitoring period and detection monitoring will be continued at the MONPP FAB & VEL CCR unit in accordance with §257.94. In addition, based on the artesian conditions, the low permeability of the underlying natural soils, and the calculated time of travel for groundwater to flow vertically from the MONPP FAB & VEL to the uppermost aquifer, it is not possible for the uppermost aquifer to have been affected by CCR from FAB & VEL operations that began in 1975. Also, due to limitations on CCR Rule implementation timelines, the background data sets are of relatively short duration for capturing the occurrence of natural temporal changes in the aquifer.

ED_005947A_00014554-00028

Section 1
Introduction

1.1 Program Summary

On April 17, 2015, the United States Environmental Protection Agency (USEPA) published the final rule for the regulation and management of Coal Combustion Residuals (CCR) under the Resource Conservation and Recovery Act (RCRA) (the CCR Rule), as amended July 30, 2018. The CCR Rule, which became effective on October 19, 2015 (amendment effective August 29, 2018), applies to the DTE Electric Company (DTE Electric) Monroe Power Plant (MONPP) Coal Combustion Residual Fly Ash Basin and Vertical Extension Landfill (FAB & VEL) CCR unit. Pursuant to the CCR Rule, no later than January 31, 2018, and annually thereafter, the owner or operator of a CCR unit must prepare an annual groundwater monitoring and corrective action report for the CCR unit documenting the status of groundwater monitoring and corrective action for the preceding year in accordance with §257.90(e). On behalf of DTE Electric, TRC Engineers Michigan, Inc., the engineering entity of TRC Environmental Corporation (TRC), has prepared this Annual Groundwater Monitoring Report for calendar year 2019 activities at the MONPP FAB & VEL CCR unit (2019 Annual Report).

In the January 31, 2018 *Annual Groundwater Monitoring Report for the Monroe Power Plant Fly Ash Basin CCR* Unit, covering calendar year 2017 activities (2017 Annual Report), DTE Electric reported that the pH observed within groundwater at one or more downgradient wells was outside background limits. Based on the results of the resampling, the pH was within the prediction limits and no statistically significant increase (SSI) or decrease exists for pH in accordance with the Stats. Therefore, DTE Electric continued detection monitoring at the MONPP FAB & VEL CCR unit pursuant to §257.94 of the CCR Rule. No potential SSIs were noted in the 2018 semiannual detection monitoring events (TRC, January 2019).

This 2019 Annual Report presents the monitoring results and the statistical evaluation of the detection monitoring parameters (Appendix III to Part 257 of the CCR Rule) for the March and September 2019 semiannual groundwater monitoring events for the MONPP FAB & VEL CCR unit. Detection monitoring for these events continued to be performed in accordance with the *CCR Groundwater Monitoring and Quality Assurance Project Plan – DTE Electric Company Monroe Power Plant Coal Combustion Residual Fly Ash Basin* (QAPP) (TRC, August 2016; revised March 2017) and statistically evaluated per the Stats Plan. As part of the statistical evaluation, the data collected during detection monitoring events are evaluated to identify SSIs of detection monitoring parameters compared to background levels.

1.2 Site Overview

The MONPP FAB & VEL is located about one mile southwest of the MONPP in Section 16, Township 7 South, Range 9 East at 7955 East Dunbar Road, Monroe, Monroe County, Michigan (Figure 1). The MONPP FAB & VEL is bounded by Dunbar Road and Plum Creek to the north and northeast, Interstate 75 to the northwest, a 200-acre peninsula into Lake Erie to the east and southeast, Lake Erie to the south, and a large open field to the southwest (Figure 2).

The property has been used continuously for the operation of the MONPP FAB & VEL since approximately 1975 and is constructed over a natural clay-rich soil base. The MONPP FAB & VEL and landfill is a Type III solid waste disposal facility owned by DTE Electric, which currently accepts coal ash from DTE Electric's MONPP. The MONPP FAB & VEL is operated in accordance with Michigan Part 115 of the Natural Resources and Environmental Protection Act (NREPA), PA 451 of 1994, as amended, and the current operating license number 9579.

1.3 Geology/Hydrogeology

The MONPP FAB & VEL CCR unit is located within 200 feet southwest of Plum Creek and immediately north of Lake Erie. The MONPP FAB & VEL CCR unit uppermost aquifer consists of saturated limestone present beneath at least 37 feet and up to 53.5 feet of thick contiguous silty clay-rich soil that serves as a natural confining hydraulic barrier that isolates the underlying uppermost aquifer. The limestone bedrock aquifer is artesian in every location except MW-16-01, where the static water level was approximately 1 to 2 feet below ground surface (ft bgs).

Potentiometric groundwater elevation data from 2016 through 2019 suggest that there is horizontal groundwater flow potential within the upper aquifer unit generally to the northeast towards Plum Creek. The average hydraulic gradient to the northeast is on the order of 0.002 foot/foot along the eastern part of the MONPP FAB & VEL to 0.004 to 0.005 foot/foot in the center and northwestern part of the FAB & VEL, with an overall mean of 0.004 foot/foot.

The surface water elevation within the FAB & VEL raised surface impoundment is at least 5 to more than 30 feet above the potentiometric surface elevations in the uppermost aquifer limestone, and more than 60 feet above the base of the underlying clay-rich confining unit that isolates groundwater within the limestone aquifer. Therefore, flow potential from the CCR unit to the surrounding area would be radially outward from the FAB & VEL. However, there is no hydraulic communication between the uppermost aquifer and the FAB & VEL due to the continuous silty clay-rich confining unit beneath the MONPP FAB & VEL. Based on the artesian conditions, the low permeability of the underlying natural soils, and the calculated time of travel for groundwater to flow vertically from the FAB & VEL to the uppermost aquifer, it is

not possible for the uppermost aquifer to have been affected by CCR from FAB & VEL operations that began in 1975.

The MONPP FAB & VEL CCR unit uses intrawell statistical methods because the saturated unit being monitored is isolated by a laterally contiguous silty clay unit which significantly impedes vertical groundwater flow thus preventing the monitored saturated zone from potentially being affected by CCR. In addition, the flow potential of liquid within the FAB & VEL is radially outward relative to the uppermost aquifer due to the elevation water is maintained within the FAB & VEL CCR unit. Based on these hydrogeologic conditions, intrawell statistical approaches are likely a more appropriate method to evaluate groundwater data statistically. Consequently, intrawell statistical tests are being used during detection monitoring as outlined in the Stats Plan.

Section 2
Groundwater Monitoring

2.1 Monitoring Well Network

A groundwater monitoring system has been established for the MONPP FAB & VEL CCR unit as detailed in the *Groundwater Monitoring System Summary Report – Monroe Power Plant Coal Combustion Residual Fly Ash Basin* (GWMS Report) (TRC, October 2017). The detection monitoring well network for the MONPP FAB & VEL CCR unit currently consists of seven monitoring wells that are screened in the uppermost aquifer. The monitoring well locations are shown on Figure 2.

As discussed in the Stats Plan, intrawell statistical methods for MONPP FAB & VEL were selected based on the geology and hydrogeology at the Site (primarily the presence of clay/hydraulic barrier and the hydraulic separation between the CCR unit and underlying uppermost aquifer), in addition to other supporting lines of evidence that the aquifer is unaffected by the CCR unit (such as the consistency in concentrations of water quality data). An intrawell statistical approach requires that each of the downgradient wells doubles as a background and compliance well, where data from each individual well during a detection monitoring event is compared to a statistical limit developed using the background dataset from that same well. Monitoring wells MW-16-01 through MW-16-07 are located around the perimeter of the MONPP FAB & VEL and provide data on both background and downgradient groundwater quality that has not been affected by the CCR unit (total of seven background/downgradient monitoring wells).

Site construction activities damaged the top of the MW-16-05 casing prior to the September 2019 semiannual monitoring event, therefore no static water level was collected during the 2019 second semiannual detection monitoring event. However, a representative groundwater sample was able to be collected in the September 2019 semiannual detection monitoring event from the artesian monitoring well MW-16-05. The well casing was subsequently repaired in late 2019 and the top of casing elevation was resurveyed.

2.2 Semiannual Groundwater Monitoring

The semiannual monitoring parameters for the detection groundwater monitoring program were selected per the CCR Rule's Appendix III to Part 257 – Constituents for Detection Monitoring. The Appendix III indicator parameters consist of boron, calcium, chloride, fluoride, pH (field reading), sulfate, and total dissolved solids (TDS) and were analyzed in accordance with the sampling and analysis plan included within the QAPP. In addition to pH, the collected field

parameters included dissolved oxygen, oxidation reduction potential, specific conductivity, temperature, and turbidity.

2.2.1 Data Summary

The first semiannual groundwater detection monitoring event for 2019 was performed during March 25 to March 26, 2019 by TRC personnel and samples were analyzed by Eurofins TestAmerica in accordance with the QAPP. Static water elevation data were collected at all seven monitoring well locations. Groundwater samples were collected from the seven detection monitoring wells for the Appendix III indicator parameters and field parameters. A summary of the groundwater data collected during the March 2019 event is provided on Table 1 (static groundwater elevation data), Table 2 (field data), and Table 3 (analytical results).

The second semiannual groundwater detection monitoring event for 2019 was performed on September 23 and September 25, 2019 by TRC personnel and samples were analyzed by Eurofins TestAmerica in accordance with the QAPP. Static water elevation data were collected at all seven monitoring well locations. Groundwater samples were collected from the seven detection monitoring wells for the Appendix III indicator parameters and field parameters. A summary of the groundwater data collected during the September 2019 event is provided on Table 1 (static groundwater elevation data), Table 2 (field data), and Table 4 (analytical results).

2.2.2 Data Quality Review

Data from each round were evaluated for completeness, overall quality and usability, method-specified sample holding times, precision and accuracy, and potential sample contamination. The data were found to be complete and usable for the purposes of the CCR monitoring program. Data quality reviews are summarized in Appendix B.

2.2.3 Groundwater Flow Rate and Direction

Groundwater elevation data collected during the March and September 2019 sampling events continue to show that groundwater within the uppermost aquifer generally flows to the northeast across the Site. Groundwater potentiometric surface elevations measured across the Site during the March and September 2019 sampling events are provided on Table 1 and were used to construct the groundwater potentiometric surface maps shown on Figure 3 and Figure 4, respectively.

The groundwater flow rate and direction is consistent with previous monitoring events. The average groundwater hydraulic gradient throughout the Site during both 2019 monitoring events is approximately 0.004 ft/ft with an average seepage velocity of 0.2

ft/day (70 ft/year), using the average hydraulic conductivity of 5 ft/day (TRC, 2017) and an assumed effective porosity of 0.1.

The general flow rate and direction from both events are similar to that identified in previous monitoring rounds and continues to demonstrate that the downgradient wells are appropriately positioned to detect the presence of Appendix III parameters that could potentially migrate from the MONPP FAB & VEL CCR unit.

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Section 3
Statistical Evaluation

3.1 Establishing Background Limits

Per the Stats Plan, background limits were established for the Appendix III indicator parameters following the collection of at least eight background monitoring events using data collected from each of the seven established detection monitoring wells (MW-16-01 through MW-16-07). The statistical evaluation of the background data is presented in the 2017 Annual Report. The Appendix III background limits for each monitoring well will be used throughout the detection monitoring period to determine whether groundwater has been impacted from the MONPP FAB & VEL CCR unit by comparing concentrations in the detection monitoring wells to their respective background limits for each Appendix III indicator parameter.

3.2 Data Comparison to Background Limits – First 2019 Semiannual Event (March 2019)

The concentrations of the indicator parameters in each of the detection monitoring wells (MW-16-01 through MW-16-07) were compared to their respective statistical background limits calculated from the background data collected from each individual well (i.e., monitoring data from MW-16-01 is compared to the background limit developed using the background dataset from MW-16-01, and so forth).

The comparisons for the March 2019 detection monitoring event are presented on Table 3. The statistical evaluation of the March 2019 Appendix III indicator parameters shows all of the results are below their respective background limits and, therefore, there are no SSIs over background.

3.3 Data Comparison to Background Limits – Second 2019 Semiannual Event (September 2019)

The data comparisons for the September 2019 groundwater monitoring event are presented on Table 4. Based on the statistical evaluation of the September 2019 Appendix III indicator parameters a resample of the following was collected in accordance with the Stats Plan:

- Total Dissolved Solids at MW-16-03 and MW-16-04.

3.4 Verification Resampling for the Second 2019 Semiannual Event

Verification resampling is performed per the Stats Plan and the *USEPA's Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities, Unified Guidance* (Unified Guidance, USEPA, 2009) to achieve performance standards as specified by §257.93(g) in the CCR rules. Per the

Stats Plan, if there is an exceedance of a prediction limit for one or more of the parameters, the well(s) of concern will be resampled within 30 days of the completion of the initial statistical analysis. Constituents that have been addressed through an alternative source demonstration (ASD) will not be analyzed for verification purposes.

Verification resampling was conducted on November 6, 2019, by TRC personnel. Groundwater samples were collected for TDS at monitoring wells MW-16-03 and MW-16-04 in accordance with the QAPP. A summary of the groundwater data collected during the verification resampling event is provided on Table 4. The associated data quality review is included in Appendix A.

The November 2019 verification sampling confirmed the SSI for TDS at monitoring well MW-16-04. TRC reviewed the data and determined that TDS is a result of natural variability in groundwater quality and not attributable to the MONPP FAB & VEL CCR unit as presented in the *Alternate Source Demonstration: 2019 Second Semiannual Detection Monitoring Sampling Event for the Monroe Power Plant Coal Combustion Residual Fly Ash Basin and Vertical Extent Landfill, Monroe, Michigan*, dated January 30, 2020 (January 2020 ASD) (Appendix B).

The MW-16-03 TDS verification results were within the prediction limits and no SSI exists from the September 2019 event for this parameter in accordance with the Stats Plan and the Unified Guidance. As no SSIs were found that were not addressed within an ASD, detection monitoring will be continued at the MONPP FAB & VEL CCR unit in accordance with §257.94 of the CCR Rule.

Section 4
Conclusions and Recommendations

Potential SSIs over background limits were noted for one Appendix III constituent in two downgradient wells during the September 2019 monitoring event. These potential SSIs were either not statistically significant (i.e. verification resampling did not confirm the exceedance) or were addressed through an ASD that demonstrated the observed concentrations were a result of natural variability in groundwater quality and not attributable to the MONPP FAB & VEL CCR unit. Therefore, no SSIs were recorded that were not addressed by an ASD for the 2019 monitoring period and detection monitoring will be continued at the MONPP FAB & VEL in accordance with §257.94.

In addition, as discussed above, and in the GWMS Report, based on the artesian conditions, the low permeability of the underlying natural soils, and the calculated time of travel for groundwater to flow vertically from the MONPP FAB & VEL to the uppermost aquifer, it is not possible for the uppermost aquifer to have been affected by CCR from FAB & VEL operations that began in 1975. Also, due to limitations on CCR Rule implementation timelines, the background data sets are of relatively short duration for capturing the occurrence of natural temporal changes in the aquifer.

No corrective actions were performed in 2019. The next semiannual monitoring event at the MONPP FAB & VEL CCR unit is scheduled for the second calendar quarter of 2020.

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Section 5
Groundwater Monitoring Report Certification

The U.S. EPA's Disposal of Coal Combustion Residuals from Electric Utilities Final Rule Title 40 CFR Part 257 §257.90(e) requires that the owner or operator of an existing CCR unit prepare an annual groundwater monitoring and corrective action report.

Annual Groundwater Monitoring Report Certification
Monroe Power Plant Fly Ash Basin and Vertical Extension Landfill
Monroe, Michigan

CERTIFICATION

I hereby certify that the annual groundwater and corrective action report presented within this document for the MONPP FAB & VEL CCR unit has been prepared to meet the requirements of Title 40 CFR §257.90(e) of the Federal CCR Rule. This document is accurate and has been prepared in accordance with good engineering practices, including the consideration of applicable industry standards, and with the requirements of Title 40 CFR §257.90(e).

Name: David B. McKenzie, P.E.	Expiration Date: October 31, 2021	State of Michigan David B. McKenzie Engineer No. 42332 Licensed Professional Engineer Stamp
Company: TRC Engineers Michigan, Inc.	Date: January 30, 2020	

ED_005947A_00014554-00038

Section 6
References

TRC Environmental Corporation. August 2016; Revised March 2017. CCR Groundwater Monitoring and Quality Assurance Project Plan – DTE Electric Company Monroe Power Plant Coal Combustion Residual Fly Ash Basin, 7955 East Dunbar Road, Monroe, Michigan. Prepared for DTE Electric Company.

TRC Environmental Corporation. October 2017. Groundwater Monitoring System Summary Report – Monroe Power Plant Coal Combustion Residual Fly Ash Basin, 7955 East Dunbar Road, Monroe, Michigan. Prepared for DTE Electric Company.

TRC Environmental Corporation. October 2017. Groundwater Statistical Evaluation Plan – Monroe Power Plant Coal Combustion Residual Fly Ash Basin, 7955 East Dunbar Road, Monroe, Michigan. Prepared for DTE Electric Company.

TRC Environmental Corporation. January 2018. Annual Groundwater Monitoring Report – DTE Electric Company Monroe Power Plant Fly Ash Basin Coal Combustion Residual Unit, 7955 East Dunbar Road, Monroe, Michigan. Prepared for DTE Electric Company.

TRC Environmental Corporation. April 12, 2018. Alternate Source Demonstration: 2017 Initial Detection Monitoring Sampling Event Monroe Power Plant Coal Combustion Residual Fly Ash Basin, Monroe, Michigan. Prepared for DTE Electric Company.

TRC Environmental Corporation. January 30, 2020. Alternate Source Demonstration: 2019 Second Semiannual Detection Monitoring Sampling Event for the Monroe Power Plant Coal Combustion Residual Fly Ash Basin and Vertical Extension Landfill, Monroe, Michigan. Prepared for DTE Electric Company.

USEPA. 2009. Statistical Analysis of Groundwater Monitoring Data at RCRA facilities, Unified Guidance. Office of Conservation and Recovery. EPA 530/R-09-007.

USEPA. April 2015. 40 CFR Parts 257 and 261. Hazardous and Solid Waste Management System: Disposal of Coal Combustion Residuals from Electric Utilities; Final Rule. 80 Federal Register 74 (April 17, 2015), pp. 21301-21501 (80 FR 21301).

USEPA. July 2018. 40 CFR Part 257. Hazardous and Solid Waste Management System: Disposal of Coal Combustion Residuals from Electric Utilities; Amendments to the National Minimum Criteria (Phase One, Part One); Final Rule. 83 Federal Register 146 (July 30, 2018), pp. 36435-36456 (83 FR 36435).

USEPA. April 2018. Barnes Johnson (Office of Resource Conservation and Recovery) to James Roewer (c/o Edison Electric Institute) and Douglas Green, Margaret Fawal (Venable LLP). Re: Coal Combustion Residuals Rule Groundwater Monitoring Requirements. April 30, 2018. United States Environmental Protection Agency, Washington, D.C. 20460. Office of Solid Waste and Emergency Response, now the Office of Land and Emergency Management.

Tables

ED_005947A_00014554-00041

Table 1

Summary of Groundwater Elevation Data – March and September 2019

Monroe Power Plant FAB and VEL – RCRA CCR Monitoring Program

Monroe, Michigan

Well ID	MW-16-01		MW-16-02		MW-16-03		MW-16-04		MW-16-05		MW-16-06		MW-16-07	
Date Installed	2/17/2016		2/18/2016		2/16/2016		2/15/2016		4/13/2016		4/13/2016		4/14/2016	
TOC Elevation	581.74		581.81		579.95		585.54		583.25		581.94		578.40	
Geologic Unit of Screened Interval	Silt/Limestone Interface		Silt/Limestone Interface		Sand & Silty Clay Limestone Interface		Silty Sand and Gravel		Limestone		Gravel and Cobbles		Silt/Limestone Interface	
Screened Interval Elevation	530.9 to 525.9		526.4 to 521.4		540.3 to 535.3		541.6 to 536.6		540.5 to 535.5		534.2 to 529.2		540.4 to 535.4	
Unit	ft BTOC	ft	ft BTOC	ft	ft BTOC	ft	ft BTOC	ft	ft BTOC	ft	ft BTOC	ft	ft BTOC	ft
Measurement Date	Depth to Water	GW Elevation	Depth to Water	GW Elevation	Depth to Water	GW Elevation	Depth to Water	GW Elevation	Depth to Water	GW Elevation	Depth to Water	GW Elevation	Depth to Water	GW Elevation
3/25/2019	4.45	577.29	-3.20	585.01	-10.00	589.95	-15.30	600.84	-12.70	595.95	-0.90	582.84	-7.30	585.70
9/23/2019	4.74	577.00	-2.05	583.86	-10.50	590.45	-15.00	600.54	NM	--	-0.10	582.04	-6.10	584.50

Notes:

Negative depth to water measurement indicates artesian conditions, actual measured water level is above the top of casing.

Elevations are reported in feet relative to the North American Vertical Datum of 1988.

ft BTOC - feet below top of casing

NM = Not measured. The top of casing of monitoring well MW-16-05 was damaged at the time of sampling.

FAB - Fly Ash Basin.

VEL - Vertical Extension Landfill.

Table 2
Summary of Field Parameters – March and September 2019
Monroe Power Plant FAB and VEL – RCRA CCR Monitoring Program
Monroe, Michigan

Sample Location	Sample Date	Dissolved Oxygen (mg/L)	Oxidation Reduction Potential (mV)	pH (SU)	Specific Conductivity (umhos/cm)	Temperature (deg C)	Turbidity (NTU)
MW-16-01	3/26/2019	0.52	89.7	7.1	1,637	9.21	5.07
	9/23/2019	0.39	69.0	7.2	1,891	15.10	2.90
MW-16-02	3/25/2019	0.07	60.8	7.1	1,698	10.61	37.9
	9/23/2019	0.20	63.3	7.2	1,850	12.89	3.12
MW-16-03	3/25/2019	0.46	179.8	6.7	190	11.08	9.61
	9/23/2019	0.17	58.5	7.1	1,913	13.49	4.26
MW-16-04	3/25/2019	0.08	71.2	7.0	1,683	11.11	4.11
	9/23/2019	0.17	23.0	7.2	1,781	12.73	2.90
MW-16-05	3/25/2019	0.07	51.8	6.9	1,682	11.69	6.40
	9/25/2019	0.09	34.2	7.0	1,729	12.34	22.2
MW-16-06	3/25/2019	0.46	45.2	7.0	1,692	11.08	16.9
	9/23/2019	0.16	76.6	7.1	1,884	14.39	4.02
MW-16-07	3/26/2019	1.36	9.3	7.1	1,713	11.73	4.90
	9/23/2019	0.11	73.3	7.2	1,789	13.40	2.08

Notes:
mg/L - milligrams per liter.
mV - milliVolt.
SU - standard unit.
umhos/cm - micro-mhos per centimeter.
deg C - degrees celcius.
NTU - nephelometric turbidity units.
FAB - Fly Ash Basin
VEL - Vertical Extension Landfill.

Table 3

Comparison of Appendix III Parameter Results to Background Limits – March 2019

Monroe Power Plant FAB and VEL – RCRA CCR Monitoring Program

Monroe, Michigan

	Sample Location:	MW-16-01		MW-16-02		MW-16-03		MW-16-04		MW-16-05		MW-16-06		MW-16-07	
	Sample Date:	3/26/2019	PL	3/25/2019	PL	3/25/2019	PL	3/25/2019	PL	3/25/2019	PL	3/25/2019	PL	3/26/2019	PL
Constituent	Unit	Data		Data		Data		Data		Data		Data		Data	
Appendix III															
Boron	ug/L	270	310	420	470	460	510	170	210	230	280	350	400	210	280
Calcium	ug/L	390,000	450,000	400,000	430,000	400,000	490,000	510,000	610,000	400,000	440,000	400,000	420,000	400,000	440,000
Chloride	mg/L	10	14	13	15	18	20	33	39	11	12	12	12	7.8	13
Fluoride	mg/L	1.7	2.1	1.5	1.8	1.5	1.8	0.95	1.1	1.5	1.7	1.5	1.8	1.5	1.8
pH, Field	SU	7.1	6.3 - 9.0	7.1	6.9 - 7.3	6.7	6.7 - 7.3	7.0	7.0 - 7.5	6.9	6.6 - 7.7	7.0	7.0 - 7.3	7.1	6.9 - 7.4
Sulfate	mg/L	1,400	1,500	1,500	1,700	1,600	1,700	1,400	1,500	1,500	1,600	1,500	1,600	1,400	1,600
Total Dissolved Solids	mg/L	2,200	2,200	2,200	2,300	2,200	2,300	2,100	2,200	2,200	2,200	2,100	2,300	2,100	2,200

Notes:

ug/L - micrograms per liter.

mg/L - milligrams per liter.

SU - standard units; pH is a field parameter.

All metals were analyzed as total unless otherwise specified.

Bold font indicates an exceedance of the Prediction Limit (PL).

FAB - Fly Ash Basin.

VEL - Vertical Extension Landfill.

Table 4

Comparison of Appendix III Parameter Results to Background Limits – September 2019 and November 2019

Monroe Power Plant FAB and VEL – RCRA CCR Monitoring Program

Monroe, Michigan

Sample Location:		MW-16-01		MW-16-02		MW-16-03			MW-16-04			MW-16-05		MW-16-06		MW-16-07	
Sample Date:		9/23/2019	PL	9/23/2019	PL	9/23/2019	11/6/2019	PL	9/23/2019	11/6/2019(1)	PL	9/25/2019	PL	9/23/2019	PL	9/23/2019	PL
Constituent	Unit	Data		Data		Data			Data			Data		Data		Data	
Appendix III																	
Boron	ug/L	250	310	380	470	440	--	510	160	--	210	220	280	310	400	190	280
Calcium	ug/L	400,000	450,000	380,000	430,000	410,000	--	490,000	520,000	--	610,000	370,000	440,000	380,000	420,000	390,000	440,000
Chloride	mg/L	9.9	14	13	15	18	--	20	32	--	39	11	12	11	12	7.5	13
Fluoride	mg/L	1.7	2.1	1.5	1.8	1.5	--	1.8	0.95	--	1.1	1.4	1.7	1.5	1.8	1.4	1.8
pH, Field	SU	7.2	6.3 - 9.0	7.2	6.9 - 7.3	7.1	7.2	6.7 - 7.3	7.2	7.2	7.0 - 7.5	7.0	6.6 - 7.7	7.1	7.0 - 7.3	7.2	6.9 - 7.4
Sulfate	mg/L	1,500	1,500	1,600	1,700	1,600	--	1,700	1,400	--	1,500	1,400	1,600	1,500	1,600	1,500	1,600
Total Dissolved Solids	mg/L	2,200	2,200	2,200	2,300	**2,500**	2,300	2,300	**2,300**	**2,300**(2)	2,200	2,100	2,200	2,300	2,300	2,100	2,200

Notes:

ug/L - micrograms per liter.

mg/L - milligrams per liter.

SU - standard units; pH is a field parameter.

-- - not analyzed.

FAB - Fly Ash Basin.

VEL - Vertical Extension Landfill.

All metals were analyzed as total unless otherwise specified.

Bold font indicates an exceedance of the Prediction Limit (PL).

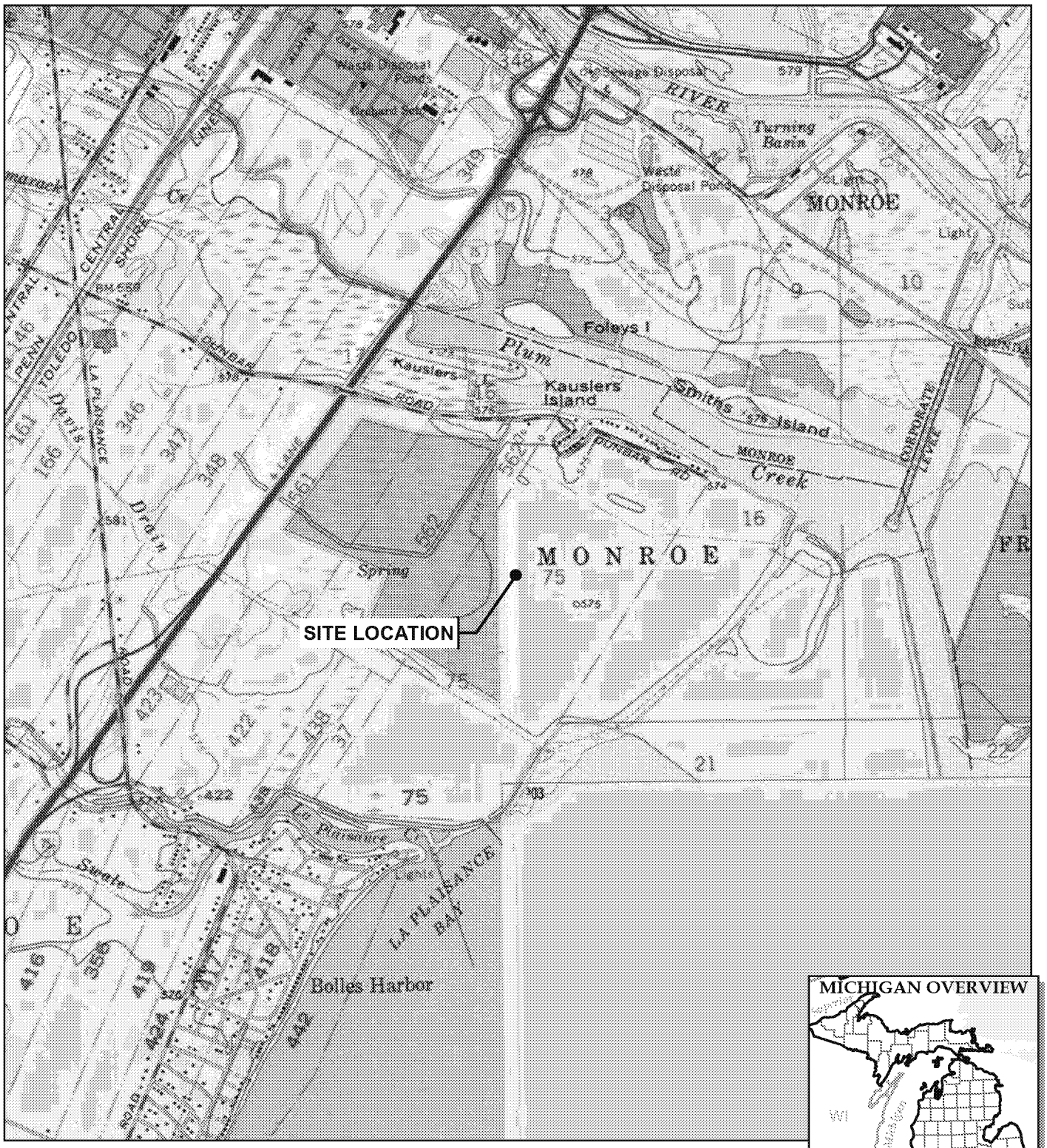
RESULT Shading and bold font indicates a confirmed exceedance of the Prediction Limit (PL).

(1) - Results shown for verification sampling performed on 11/6/2019.

(2) - New successful alternative source demonstration was completed following confirmation of the intial statistically significant exceedance.

Figures

ED_005947A_00014554-00046



BASE MAP FROM USGS 7.5 MINUTE TOPOGRAPHIC QUADRANGLE SERIES.

N

1 " = 2,000 '
1:24,000

0 2,000 4,000 FEET

TRC

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TRC - GIS

PROJECT:

DTE ELECTRIC COMPANY
MONROE POWER PLANT
FLY ASH BASIN AND VERTICAL EXTENSION LANDFILL
7955 EAST DUNBAR ROAD
MONROE, MICHIGAN

TITLE:

SITE LOCATION MAP

DRAWN BY:	S.MAJOR
CHECKED BY:	B. YELEN
APPROVED BY:	V. BUENING
DATE:	JANUARY 2020
PROJ. NO.:	320511.0001
FILE:	320511-0001-008SLM-MPP-Fig01.mxd

FIGURE 1

E:\DTE\CCR_Sites\2017_265996\320511-0001-008SLM-MPP-Fig01.mxd -- Saved By: MVAPHIADIS on 1/28/2020, 11:58:35 AM

LEGEND

- MONITORING WELLS
- APPROXIMATE BOUNDARY OF FLY ASH
- APPROXIMATE BOUNDARY OF VERTICAL EXTENSION LANDFILL

NOTES

1. BASE MAP IMAGERY FROM GOOGLE EARTH PRO, 2018.
2. WELL LOCATIONS SURVEYED BY BMJ ENGINEERS AND SURVEYORS INC. IN MARCH AND MAY 2016.

N

0 600 1,200 Feet

1 " = 600 '
1:7,200

PROJECT: DTE ELECTRIC COMPANY
MONROE POWER PLANT
FLY ASH BASIN AND VERTICAL EXTENSION LANDFILL
7955 EAST DUNBAR ROAD
MONROE, MICHIGAN

TITLE: MONITORING NETWORK AND SITE PLAN

DRAWN BY:	M. VAPHIADIS	PROJ NO.:	320511.0001
CHECKED BY:	J. KRENZ		FIGURE 2
APPROVED BY:	V. BUENING		
DATE:	JANUARY 2020		

TRC

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FILE NO.: 320511-0001-017-MPP-Fig02.mxd

Plot Date: 1/28/2020, 11:41:53 AM by MVAPHIADIS -- LAYOUT: ANSI B(11"x17")
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Coordinate System: NAD 1983 UTM Zone 17N (Meter)
Map Rotation: 0

TRC - GIS

LEGEND

- MONITORING WELL
- APPROXIMATE BOUNDARY OF FLY ASH BASIN
- APPROXIMATE BOUNDARY OF VERTICAL EXTENSION LANDFILL
- POTENTIOMETRIC SURFACE CONTOUR LINE (5-FT INTERVAL,DASHED WHERE INFERRED)
- (582.84) STATIC WATER ELEVATION IN FEET (NAVD, 1988)

NOTES

1. BASE MAP IMAGERY FROM GOOGLE & PARTNERS GOOGLE EARTH PRO, 04/2018.
2. WELL LOCATIONS SURVEYED BY BMJ ENGINEERS AND SURVEYORS INC. IN MARCH AND MAY 2016.
3. GROUNDWATER ELEVATIONS DISPLAYED IN FEET RELATIVE TO NORTH AMERICAN VERTICAL DATUM OF 1988

N

0 600 1,200 Feet

1 " = 600 '
1:7,200

PROJECT:
DTE ELECTRIC COMPANY
MONROE POWER PLANT
FLY ASH BASIN AND VERTICAL EXTENSION LANDFILL
7955 EAST DUNBAR ROAD
MONROE, MICHIGAN

TITLE:
POTENTIOMETRIC SURFACE MAP MARCH 2019

DRAWN BY:	M. VAPHIADIS	PROJ NO.:	320511.0001
CHECKED BY:	J. KRENZ		
APPROVED BY:	V. BUENING		
DATE:	JANUARY 2020		

FIGURE 3

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FILE NO.: 320511-0001-018-MPP-Fig03.mxd

Plot Date: 1/28/2020, 11:49:05 AM by MVAPHIADIS -- LAYOUT: ANSI B(11"x17")
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Coordinate System: NAD 1983 UTM Zone 17N (Meter)
Map Rotation: 0
TRC - GIS

LEGEND

- MONITORING WELL
- APPROXIMATE BOUNDARY OF FLY ASH BASIN
- APPROXIMATE BOUNDARY OF VERTICAL EXTENSION LANDFILL
- POTENTIOMETRIC SURFACE CONTOUR LINE (5-FT INTERVAL,DASHED WHERE INFERRED)
- (582.69) STATIC WATER ELEVATION IN FEET (NAVD, 1988)

NOTES

1. BASE MAP IMAGERY FROM GOOGLE EARTH PRO, 2018.
2. WELL LOCATIONS SURVEYED BY BMJ ENGINEERS AND SURVEYORS INC. IN MARCH AND MAY 2016.
3. GROUNDWATER ELEVATIONS DISPLAYED IN FEET RELATIVE TO NORTH AMERICAN VERTICAL DATUM OF 1988.
4. NM = NOT MEASURED; MW-16-05 WAS DAMAGED AT THE TIME OF SAMPLING.

N

0 600 1,200 Feet

1 " = 600 '
1:7,200

PROJECT:
DTE ELECTRIC COMPANY
MONROE POWER PLANT
FLY ASH BASIN AND VERTICAL EXTENSION LANDFILL
7955 EAST DUNBAR ROAD
MONROE, MICHIGAN

TITLE:
POTENTIOMETRIC SURFACE MAP SEPTEMBER 2019

DRAWN BY:	M. VAPHIADIS	PROJ NO.:	320511.0001
CHECKED BY:	J. KRENZ		
APPROVED BY:	V. BUENING		FIGURE 4
DATE:	JANUARY 2020		

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FILE NO.: 320511-0001-019-MPP-Fig04.mxd

Plot Date: 1/28/2020, 11:54:08 AM by MVAPHIADIS -- LAYOUT: ANSI B(11"x17")
Path: E:\DTE\CCR_Sites\2017_2659963\320511-0001-019-MPP-Fig04.mxd
Coordinate System: NAD 1983 UTM Zone 17N (Meter)
Map Rotation: 0

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Appendix A
Alternate Source Demonstration

ED_005947A_00014554-00051

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Technical Memorandum

Date: January 30, 2020

To: Christopher P. Scieszka
DTE Electric Company

From: Graham Crockford, TRC
David McKenzie, TRC

Project No.: 320511.0001.0000 Phase 001, Task 001

Subject: Alternate Source Demonstration: 2019 Second Semiannual Detection Monitoring Sampling Event Monroe Power Plant Coal Combustion Residual Fly Ash Basin and Vertical Extension Landfill, Monroe, Michigan

Introduction

On April 17, 2015, the United States Environmental Protection Agency (USEPA) published the final rule for the regulation and management of Coal Combustion Residuals (CCR) under the Resource Conservation and Recovery Act (RCRA) (the CCR Rule). The CCR Rule, which became effective on October 19, 2015, applies to the DTE Electric Company (DTE Electric) Monroe Power Plant (MONPP) Coal Combustion Residual Fly Ash Basin and Vertical Extent Landfill (FAB & VEL) CCR unit.

TRC Engineers Michigan, Inc. (TRC) conducted the second semiannual 2019 detection groundwater monitoring event for the MONPP FAB & VEL CCR unit on behalf of DTE Electric on September 23 and 25, 2019 in accordance with the *CCR Groundwater Monitoring and Quality Assurance Project Plan – DTE Electric Company Monroe Power Plant Fly Ash Basin* (QAPP) (TRC, August 2016; revised March 2017). . The semiannual groundwater monitoring event included the statistical evaluation of the detection monitoring parameters (Appendix III to Part 257 of the CCR Rule) for the MONPP FAB & VEL CCR unit. This event was the fifth detection monitoring event performed to comply with §257.94. As part of the statistical evaluation, the data collected during detection monitoring events are evaluated to identify statistically significant increases (SSIs) in detection monitoring parameters to determine if concentrations in detection monitoring well samples exceed background levels. The statistical analysis was performed pursuant to §257.93(f) and (g), and in accordance with the Groundwater Statistical Evaluation Plan (Stats Plan) (TRC, 2017).

The statistical evaluation of the September 2019 Appendix III indicator parameters showed potential SSIs over background for:

ED_005947A_00014554-00052

- Total Dissolved Solids (TDS) at MW-16-03 and MW-16-04

Verification sampling conducted in November 2019 only confirmed the SSI for TDS at MW-16-04. All other Appendix III constituents were within the statistical background limits. In accordance with §257.94(e)(2), DTE Electric may demonstrate that a source other than the CCR unit caused the SSI or that the SSI resulted from error in sampling, analysis, statistical evaluation, or natural variation in groundwater quality. This Alternate Source Demonstration (ASD) has been prepared to address the potential SSIs identified in the September 2019 detection monitoring event.

Background

The MONPP is located in Monroe in Monroe County, Michigan. The MONPP FAB & VEL is bounded by Dunbar Road and Plum Creek to the north and northeast, Interstate 75 to the northwest, a 200-acre peninsula into Lake Erie to the east and southeast, Lake Erie to the south and a large open field to the southwest. The property has been used continuously for the operation of the MONPP FAB & VEL since approximately 1975 and is constructed over a natural clay-rich soil base. The MONPP FAB & VEL is a Type III solid waste disposal facility owned by DTE Electric, which currently accepts coal ash from DTE Electric's MONPP. The MONPP FAB & VEL is operated in accordance with Michigan Part 115 of the Natural Resources and Environmental Protection Act (NREPA), PA 451 of 1994, as amended, and the current operating license number 9579.

The MONPP FAB & VEL CCR unit uppermost aquifer consists of saturated limestone present beneath at least 37 feet and up to 53.5 feet of thick contiguous silty clay-rich soil that serves as a natural confining hydraulic barrier that isolates the underlying uppermost aquifer. The limestone bedrock aquifer is artesian in every location except MW-16-01, where the static water level was approximately 1 to 2 feet below ground surface (bgs).

The detection monitoring well network for the MONPP FAB & VEL CCR unit currently consists of seven monitoring wells that are screened in the uppermost aquifer. The MONPP FAB & VEL CCR unit uses intrawell statistical methods because the saturated unit being monitored is isolated by a laterally contiguous silty clay unit which significantly impedes vertical groundwater flow thus preventing the monitored saturated zone from potentially being affected by CCR. In addition, the flow potential of liquid within the FAB is radially outward relative to the uppermost aquifer due to the elevation that water is maintained within the FAB CCR unit. Based on these hydrogeologic conditions, intrawell statistical tests are used during detection monitoring as outlined in the Stats Plan.

Alternate Source Demonstration

Verification resampling was performed as recommended per the Stats Plan and the USEPA's Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities, Unified Guidance (Unified

Guidance, USEPA, 2009) to achieve performance standards as specified by §257.93(g) in the CCR rules. Per the Stats Plan, if there is an exceedance of a prediction limit for one or more of the parameters, the well(s) of concern will be resampled within 30 days of the completion of the initial statistical analysis. Only those constituents that initially exceed their statistical limit (i.e., have no previously recorded SSIs) will be analyzed for verification purposes. As such, verification resampling was conducted on November 6, 2019, by TRC personnel. Groundwater samples were collected for TDS at monitoring wells MW-16-03 and MW-16-04 in accordance with the Quality Assurance Project Plan (TRC, August 2016; Revised March 2017). A summary of the groundwater data collected during the verification resampling event is provided on Table 1. The associated data quality review is included in Attachment A.

The TDS verification result for MW-16-03 are within the prediction limits; consequently, the initial SSI from the September 2019 event is not confirmed. Therefore, in accordance with the Stats Plan and the Unified Guidance, the initial exceedance at MW-16-03 is not statistically significant and no SSI will be recorded for this well during the September 2019 monitoring event. However, the verification resampling confirmed the TDS exceedance at MW-16-04 during the November 2019 verification sampling event. The following discussion presents the ASD for the confirmed prediction limit exceedance at MW-16-04.

TDS at MW-16-04: The SSI of TDS at MW-16-04, shown graphically as data points greater than the prediction limit in Figure 3, are likely the result of natural spatial variability in groundwater quality at the site and not the result of a release from the MONPP FAB & VEL CCR unit. Multiple lines of evidence are provided in support of this conclusion and are as follows:

- **Insufficient background sampling timeline to account for long-term trends** – Variability in TDS concentrations observed in the groundwater at MONPP FAB during the background sampling events provides evidence of the heterogeneity of this constituent in groundwater. The short duration of the background sampling events limits the ability of the statistical analysis to capture the natural temporal trends in the groundwater quality at the MONPP FAB & VEL. This is a limitation of the CCR Rule implementation timeline.
- **Lack of similar increase in other indicator parameters** – The lack of SSIs for any other parameters within the same monitoring well, and across the other wells within the monitoring well network, also suggests a source other than CCR leachate for the observed TDS SSI at this location.
- **Time of travel analysis** – The clay formation immediately beneath the MONPP FAB & VEL CCR unit provides a natural geologic barrier to migration of CCR constituents to the underlying aquifer. The vertical extent of the clay layer beneath the CCR unit is shown in Figures 5 and 6 as cross-sections. Figure 4 shows the cross-section locations in plan view. Conservatively calculating a time of travel for liquid from the base of the MONPP FAB & VEL CCR unit through a minimum of 23 feet of silty clay, to the underlying upper aquifer, yields approximately 308 years of travel time (TRC, October 2017). The MONPP FAB & VEL CCR unit began accepting coal ash in

approximately 1975, so, based on this analysis, there is no potential for indicator parameters to have migrated to the upper aquifer.

Conclusions and Recommendations

The information provided in this report serves as the ASD for the DTE Electric MONPP FAB & VEL CCR unit. This report was prepared in accordance with 40 CFR 257.94(e)(2) of the CCR Rule, and demonstrates that the TDS SSI detected at MW-16-04 during the second semiannual detection monitoring event performed in 2019 is not due to a release of CCR leachate into the groundwater. In addition, based on the results of the verification resampling, the initial exceedance for TDS at monitoring well MW-16-03is not statistically significant. Therefore, no SSIs are recorded for this fifth detection monitoring event.

In addition, as discussed in the Annual Report, based on the artesian conditions, the low permeability of the underlying natural soils, and the calculated time of travel for groundwater to flow vertically from the MONPP FAB to the uppermost aquifer, it is not possible for the uppermost aquifer to have been affected by CCR from FAB operations that began in 1975. Due to limitations on CCR Rule implementation timelines, the background data sets are of relatively short duration for capturing the occurrence of natural temporal changes in the aquifer.

Since no confirmed SSIs over background limits that were not addressed with an ASD were identified for any of the Appendix III parameters during the September 2019 monitoring event, DTE Electric will continue with the detection monitoring program at MONPP FAB & VEL CCR unit. The next semiannual monitoring event is scheduled for the second calendar quarter of 2020.

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Certification Statement

I hereby certify that the alternative source demonstration presented within this document for the MONPP FAB & VEL CCR unit has been prepared to meet the requirements of Title 40 CFR §257.94(e) 2 of the Federal CCR Rule. This document is accurate and has been prepared in accordance with good engineering practices, including the consideration of applicable industry standards, and with the requirements of Title 40 CFR §257.94(e) 2.

Name: David B. McKenzie, P.E.	Expiration Date: October 31, 2021	State of Michigan David B. McKenzie Engineer No. 42332 Licensed Professional Engineer Stamp
Company: TRC Engineers Michigan, Inc.	Date: January 30, 2020	

References

TRC Environmental Corporation. August 2016; Revised March 2017. CCR Groundwater Monitoring and Quality Assurance Project Plan – DTE Electric Company Monroe Power Plant Coal Combustion Residual Fly Ash Basin, 7955 East Dunbar Road, Monroe, Michigan. Prepared for DTE Electric Company.

TRC Environmental Corporation. October 2017. Groundwater Monitoring System Summary Report –Monroe Power Plant Coal Combustion Residual Fly Ash Basin, 7955 East Dunbar Road, Monroe, Michigan. Prepared for DTE Electric Company.

TRC Environmental Corporation. October 2017. Groundwater Statistical Evaluation Plan – Monroe Power Plant Coal Combustion Residual Fly Ash Basin, 7955 East Dunbar Road, Monroe, Michigan. Prepared for DTE Electric Company.

TRC Environmental Corporation. January 2018. Annual Groundwater Monitoring Report – Monroe Power Plant Coal Combustion Residual Fly Ash Basin, 7955 East Dunbar Road, Monroe, Michigan. Prepared for DTE Electric Company.

TRC Environmental Corporation. January 2019. 2018 Annual Groundwater Monitoring Report – Monroe Power Plant Coal Combustion Residual Fly Ash Basin, 7955 East Dunbar Road, Monroe, Michigan. Prepared for DTE Electric Company.

USEPA. 2009. Statistical Analysis of Groundwater Monitoring Data at RCRA facilities, Unified Guidance. Office of Conservation and Recovery. EPA 530/R-09-007.

ED_005947A_00014554-00056

Attachments

Table 1. Comparison of Verification Sampling Results to Background Limits

Figure 1. Site Location Map
Figure 2. Monitoring Network and Site Plan
Figure 3. MW-16-04 Total Dissolved Solids Timer Series Plot
Figure 4. Cross Section Location Map
Figure 5. Generalized Geologic Cross-Section A-A′
Figure 6. Generalized Geologic Cross-Section B-B′

Attachment A. Data Quality Review

Table 1

Table 1

Comparison of Verification Sampling Results to Background Limits

Monroe Power Plant Fly Ash Basin and Vertical Extension Landfill – RCRA CCR Monitoring Program

Monroe, Michigan

Sample Location:		MW-16-03		MW-16-04	
Sample Date:		11/6/2019		11/6/2019	
Constituent	Unit	Data	PL	Data	PL
Appendix III					
Total Dissolved Solids	mg/L	2,300	2,300	**2,300**	2,200

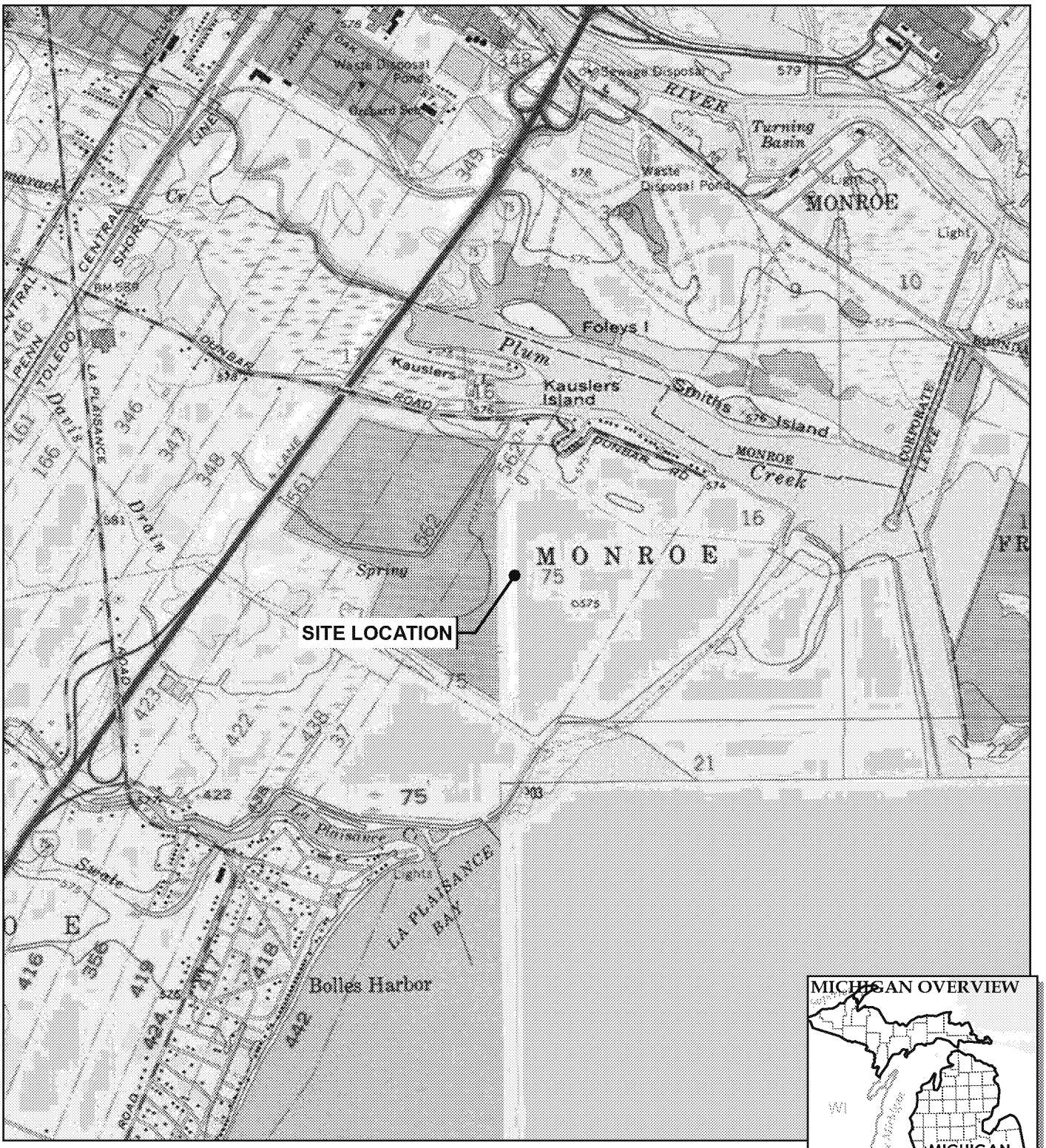
Notes:

mg/L - milligrams per liter

RESULT Shading and bold font indicates a confirmed exceedance of the Prediction Limits (PL).

Figures

ED_005947A_00014554-00060



BASE MAP FROM USGS 7.5 MINUTE TOPOGRAPHIC QUADRANGLE SERIES.

N

1 " = 2,000 '
1:24,000

0 2,000 4,000 FEET

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TRC - GIS

PROJECT:

DTE ELECTRIC COMPANY
MONROE POWER PLANT
FLY ASH BASIN AND VERTICAL EXTENSION LANDFILL
7955 EAST DUNBAR ROAD
MONROE, MICHIGAN

TITLE:

SITE LOCATION MAP

DRAWN BY:	S.MAJOR
CHECKED BY:	
APPROVED BY:	
DATE:	OCTOBER 2019
PROJ. NO.:	320511.0001
FILE:	320511-0001-007SLM.mxd

FIGURE 1

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LEGEND

- MONITORING WELLS
- APPROXIMATE BOUNDARY OF FLY ASH
- APPROXIMATE BOUNDARY OF VERTICAL EXTENSION LANDFILL

NOTES

1. BASE MAP IMAGERY FROM GOOGLE EARTH PRO, 2018.
2. WELL LOCATIONS SURVEYED BY BMJ ENGINEERS AND SURVEYORS INC. IN MARCH AND MAY 2016.

N

0 600 1,200 Feet

1 " = 600 '
1:7,200

PROJECT: DTE ELECTRIC COMPANY
MONROE POWER PLANT
FLY ASH BASIN AND VERTICAL EXTENSION LANDFILL
7955 EAST DUNBAR ROAD
MONROE, MICHIGAN

TITLE: MONITORING NETWORK AND SITE PLAN

DRAWN BY:	M. VAPHIADIS	PROJ NO.:	320511.0001
CHECKED BY:	J. KRENZ		FIGURE 2
APPROVED BY:	V. BUENING		
DATE:	JANUARY 2020		

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Coordinate System: NAD 1983 UTM Zone 17N (Meter)
Map Rotation: 0

TRC - GIS

FIGURE 3

MW-16-04 TOTAL DISSOLVED SOLIDS TIME SERIES PLOT

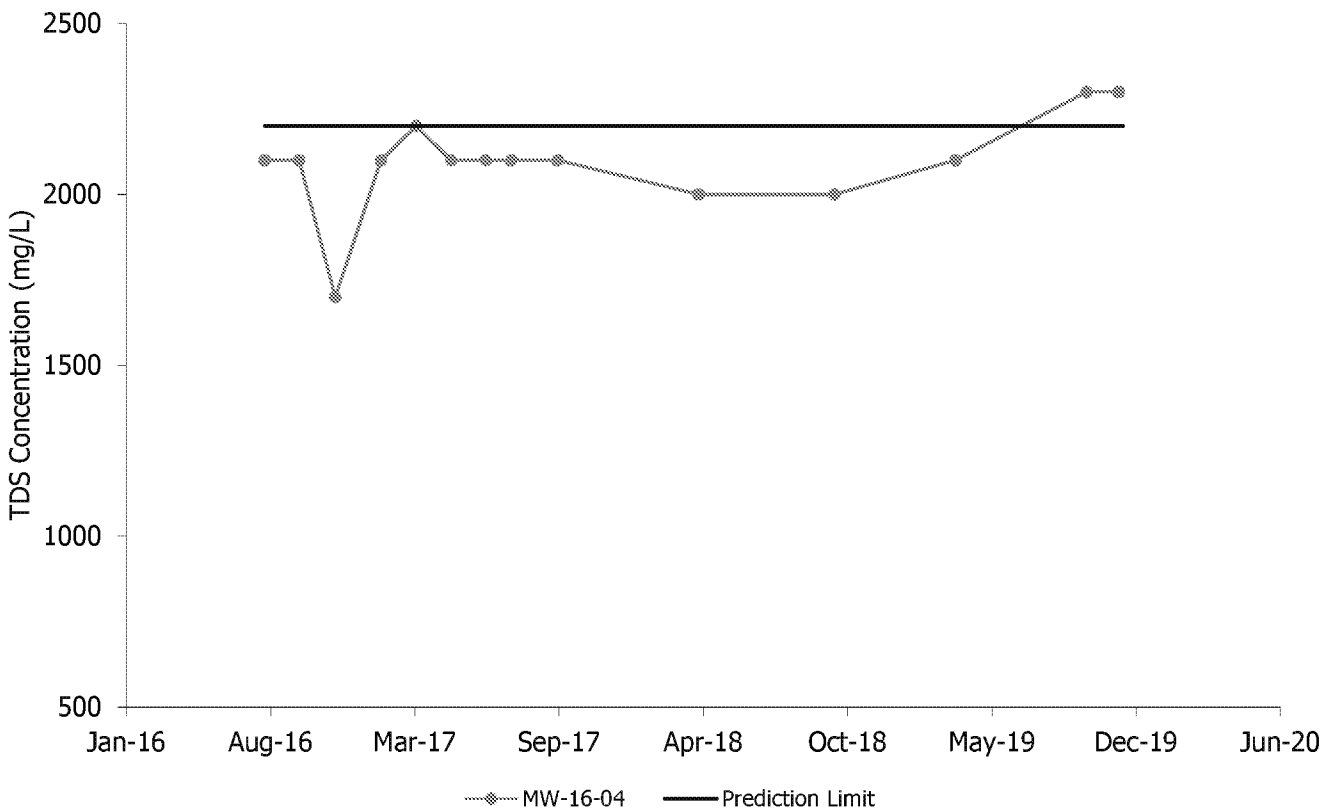
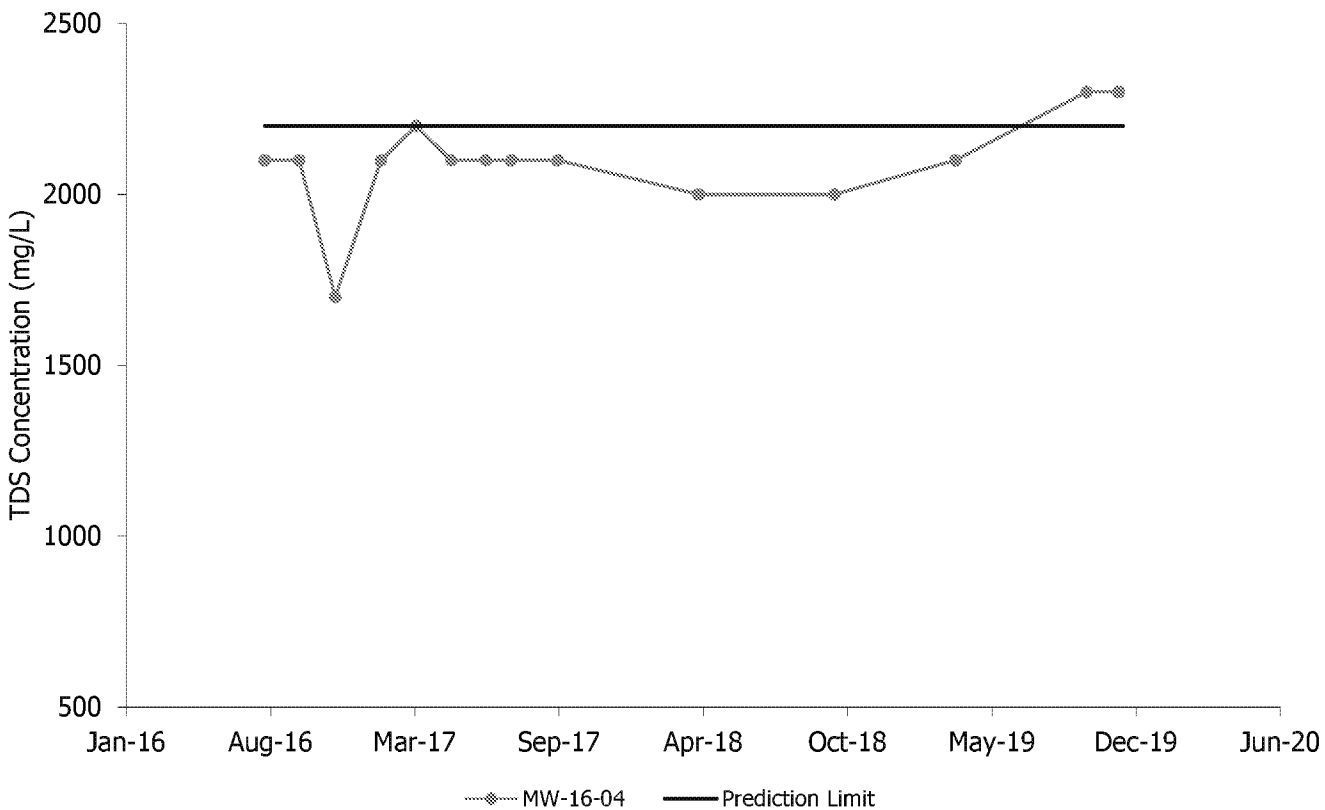


FIGURE 3

MW-16-04 TOTAL DISSOLVED SOLIDS TIME SERIES PLOT



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X:\WPAAM\PJT2\320511\0001\00001\Appendix\A\Figures\Figure 3

January 2020

LEGEND

- MONITORING WELLS
- APPROXIMATE BOUNDARY OF FLY ASH BASIN
- CROSS SECTIONS

NOTES

1. BASE MAP IMAGERY FROM GOOGLE & PARTNERS GOOGLE EARTH PRO, 2018.
2. WELL LOCATIONS SURVEYED BY BMJ ENGINEERS AND SURVEYORS INC. IN MARCH AND MAY 2016.

N

0 600 1,200 Feet

1 " = 600 '

1:7,200

PROJECT:

DTE ELECTRIC COMPANY
MONROE POWER PLANT FLY ASH BASIN
7955 EAST DUNBAR ROAD
MONROE, MICHIGAN

TITLE:

CROSS SECTION LOCATOR MAP

DRAWN BY:	M. VAPHIADIS	PROJ NO.:	320511.0001
CHECKED BY:	B. YELEN		
APPROVED BY:	V. BUENING		
DATE:	JANUARY 2020		

FIGURE 4

TRC

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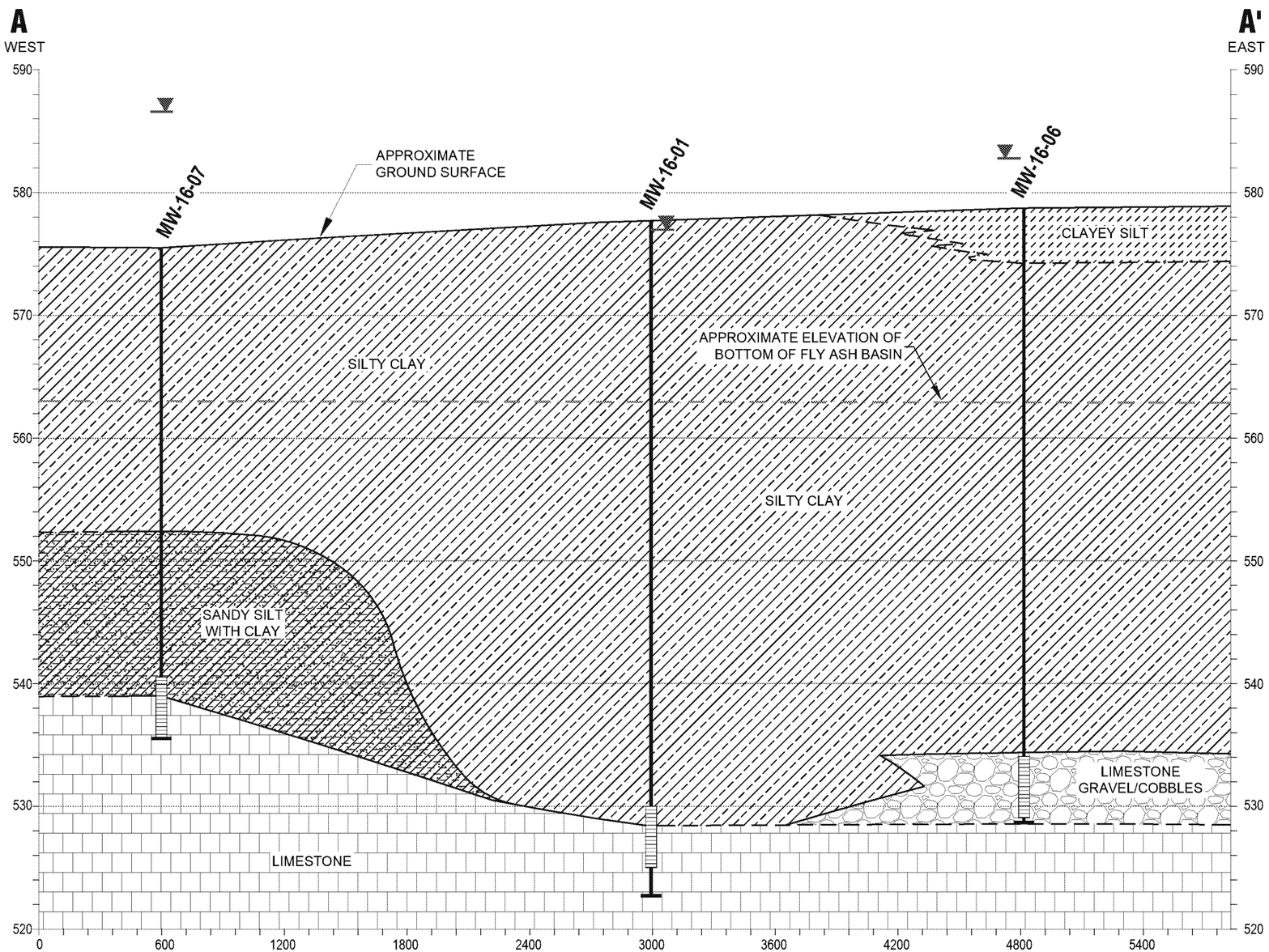
Path: E:\DTE\CCR_Sites\2017_265996\320511-0001-013.mxd

Coordinate System: NAD 1983 UTM Zone 17N (Meter)
Map Rotation: 0

TRC - GIS

GENERALIZED GEOLOGIC CROSS-SECTION A-A'



LEGEND

- STRATEGRAPHIC BOUNDARY (DASHED WHERE INFERRED)
- GROUNDWATER ELEVATION (COLLECTED ON 03/06/2017)
- SOIL BORING
- WELL SCREEN INTERVAL
- END OF BORING

Lithology Key

- CLAYEY SILT
- SILTY CLAY
- SANDY SILT WITH CLAY
- LIMESTONE GRAVEL / COBBLES
- LIMESTONE BEDROCK

SCALE IN FEET

VERTICAL: 0 – 10

HORIZONTAL: 0 – 600

PROJECT:	DTE ELECTRIC COMPANY MONROE POWER PLANT FLY ASH BASIN AND VERTICAL EXTENSION LANDFILL MONROE, MICHIGAN
TITLE:	GENERALIZED GEOLOGIC CROSS-SECTION A-A'
DRAWN BY: D.STEHLE	PROJ NO.: 320511.0001.01.01
CHECKED BY: S.HOLMSTROM	FIGURE 5
APPROVED BY: V.BUENING	
DATE: JANUARY 2020	

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FILE NO.: 320511.0001.01.01.05-06 ASD.dwg

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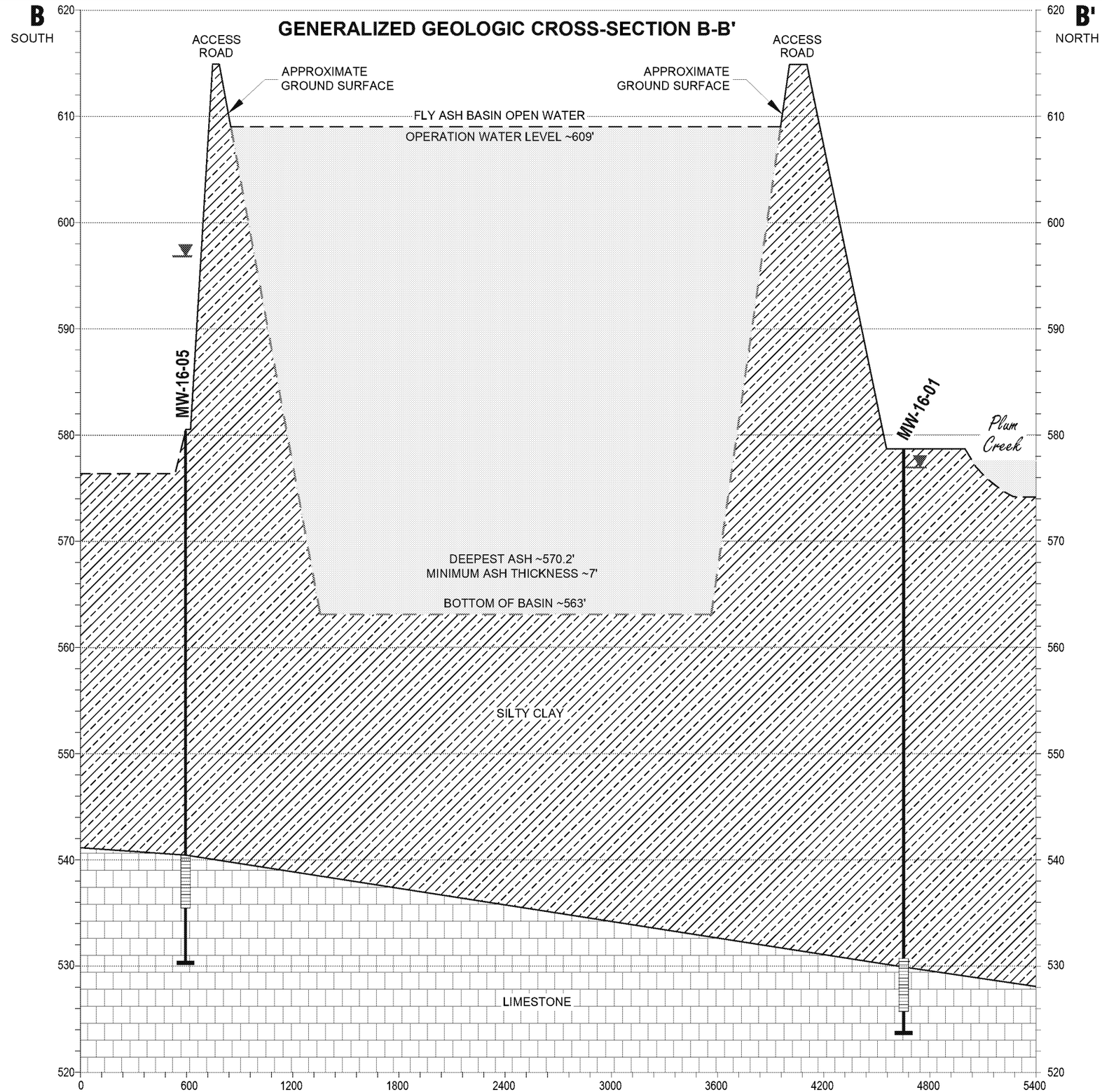

LEGEND

- STRATEGRAPHIC BOUNDARY (DASHED WHERE INFERRED)
- GROUNDWATER ELEVATION (COLLECTED 03/06/2017)
- SOIL BORING
- WELL SCREEN INTERVAL
- END OF BORING

Lithology Key

- SILTY CLAY
- LIMESTONE BEDROCK

SCALE IN FEET

VERTICAL: 0 – 10

HORIZONTAL: 0 – 600

PROJECT:	DTE ELECTRIC COMPANY MONROE POWER PLANT FLY ASH BASIN AND VERTICAL EXTENSION LANDFILL MONROE, MICHIGAN
TITLE:	GENERALIZED GEOLOGIC CROSS-SECTION B-B'

DRAWN BY:	D.STEHLE	PROJ NO.:	320511.0001.01.01
CHECKED BY:	S.HOLMSTROM		FIGURE 6
APPROVED BY:	V.BUENING		
DATE:	JANUARY 2020		

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FILE NO.: 320511.0001.01.01.05-06 ASD.dwg

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Attachment A

Laboratory Data Quality Review
Groundwater Monitoring Event November 2019 (Verification Sampling)
DTE Electric Company Monroe Power Plant Fly Ash Basin and Vertical Extension Landfill (DTE MONPP FAB & VEL)

Groundwater samples were collected by TRC for the November 2019 verification sampling event. Samples were analyzed for anions, total metals, and total dissolved solids by Test America Laboratories, Inc. (Test America), located in North Canton, Ohio. The laboratory analytical results are reported in laboratory report 240-121974-1.

During the November 2019 verification sampling event, a groundwater sample was collected from each of the following wells on November 6, 2019:

- MW-16-03
- MW-16-04

Each sample was analyzed for the following constituents:

Analyte Group	Method
Total Dissolved Solids	SM 2540C

TRC reviewed the laboratory data to assess data usability. The following sections summarize the data review procedure and the results of the review.

Data Quality Review Procedure

The analytical data were reviewed using the USEPA National Functional Guidelines for Inorganic Superfund Data Review (USEPA, 2017). The following items were included in the evaluation of the data:

- Sample receipt, as noted in the cover page or case narrative;
- Technical holding times for analyses;
- Reporting limits (RLs) compared to project-required RLs;
- Data for method blanks and equipment blanks. Method blanks are used to assess potential contamination arising from laboratory sample preparation and/or analytical procedures. Equipment blanks are used to assess potential contamination arising from field procedures;
- Data for laboratory control samples (LCSs). The LCSs are used to assess the accuracy of the analytical method using a clean matrix;

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- Data for matrix spike and matrix spike duplicate samples (MS.MSDs). The MS/MSDs are used to assess the accuracy and precision of the analytical method using a sample from the dataset;
- Data for laboratory duplicates. The laboratory duplicates are used to assess the precision of the analytical method using a sample from the dataset;
- Data for blind field duplicates. Field duplicate samples are used to assess variability introduced by the sampling and analytical processes; and
- Overall usability of the data.

This data usability report addresses the following items:

- Usability of the data if quality control (QC) results suggest potential problems with all or some of the data;
- Actions regarding specific QC criteria exceedances.

Review Summary

The data quality objectives and laboratory completeness goals for the project were met, and the data are usable for their intended purpose. A summary of the data quality review, including non-conformances and issues identified in this evaluation are noted below.

- Appendix III constituents will be utilized for the purposes of a detection monitoring program.
- Data are usable for the purposes of the detection monitoring program.

QA/QC Sample Summary:

- Target analytes were not detected in the method blanks.
- LCS recoveries for all target analytes were within laboratory control limits.
- MS/MSD analyses were not performed on a sample from the data set.
- DUP-01 corresponds with MW-16-04; RPDs between the parent and duplicate sample were within the QC limits.

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Appendix B
Data Quality Reviews

ED_005947A_00014554-00071

Laboratory Data Quality Review
Groundwater Monitoring Event March 2019 (Detection Monitoring)
DTE Electric Company Monroe Power Plant Fly Ash Basin and Vertical Extension Landfill (DTE MONPP FAB & VEL)

Groundwater samples were collected by TRC for the March 2019 sampling event. Samples were analyzed for anions, total metals, and total dissolved solids by Test America Laboratories, Inc. (Test America), located in North Canton, Ohio. The laboratory analytical results are reported in laboratory report 240-110058-1.

During the March 2019 sampling event, a groundwater sample was collected from each of the following wells:

- MW-16-01
- MW-16-02
- MW-16-03
- MW-16-04
- MW-16-05
- MW-16-06
- MW-16-07

Each sample was analyzed for the following constituents:

Analyte Group	Method
Anions (Chloride, Fluoride, Sulfate)	SW846 9056A
Total Boron	SW846 3005A/6010B
Total Calcium	SW846 3005A/6020
Total Dissolved Solids	SM 2540C

TRC reviewed the laboratory data to assess data usability. The following sections summarize the data review procedure and the results of the review.

Data Quality Review Procedure

The analytical data were reviewed using the USEPA National Functional Guidelines for Inorganic Superfund Data Review (USEPA, 2017). The following items were included in the evaluation of the data:

- Sample receipt, as noted in the cover page or case narrative;
- Technical holding times for analyses;
- Reporting limits (RLs) compared to project-required RLs;
- Data for method blanks and equipment blanks. Method blanks are used to assess potential contamination arising from laboratory sample preparation and/or analytical procedures. Equipment blanks are used to assess potential contamination arising from field procedures;

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- Data for laboratory control samples (LCSs). The LCSs are used to assess the accuracy of the analytical method using a clean matrix;
- Data for matrix spike and matrix spike duplicate samples (MS.MSDs), if applicable. The MS/MSDs are used to assess the accuracy and precision of the analytical method using a sample from the dataset;
- Data for laboratory duplicates, if applicable. The laboratory duplicates are used to assess the precision of the analytical method using a sample from the dataset;
- Data for blind field duplicates. Field duplicate samples are used to assess variability introduced by the sampling and analytical processes; and
- Overall usability of the data.

This data usability report addresses the following items:

- Usability of the data if quality control (QC) results suggest potential problems with all or some of the data;
- Actions regarding specific QC criteria exceedances.

Review Summary

The data quality objectives and laboratory completeness goals for the project were met, and the data are usable for their intended purpose. A summary of the data quality review, including non-conformances and issues identified in this evaluation are noted below.

- Appendix III constituents will be utilized for the purposes of a detection monitoring program.
- Data are usable for the purposes of the detection monitoring program.

QA/QC Sample Summary:

- The holding time for TDS for sample MW-16-01 exceeded the 7-day holding time criteria by approximately 3 hours. This result is estimated and may be biased low.
- An equipment blank was not included with this data set per the project QAPP.
- Target analytes were not detected in the method blanks.
- LCS recoveries for all target analytes were within laboratory control limits.
- Sample Dup-01 corresponds with sample MW-16-03; relative percent differences (RPDs) between the parent and duplicate sample were within the QC limits.
- MS/MSD analyses were not performed for boron, calcium, and anions in this SDG, however MS/MSD alaysis were performed on other client samples in the batch in accordance with the labs QA/QC program at a rate of 1 per 20 samples

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- Laboratory duplicate analyses were performed on sample MW-16-06 for TDS; the RPDs were within the acceptance limits.

Laboratory Data Quality Review
Groundwater Monitoring Event September 2019 (Detection Monitoring)
DTE Electric Company Monroe Power Plant Fly Ash Basin and Vertical Extension Landfill (DTE MONPP FAB & VEL)

Groundwater samples were collected by TRC for the September 2019 sampling event. Samples were analyzed for anions, total boron, total calcium, and total dissolved solids by Eurofins-Test America Laboratories, Inc. (Eurofins-TA), located in North Canton, Ohio. The laboratory analytical results are reported in laboratory reports 240-119636-1 and 240-119702-1.

During the September 2019 sampling event, a groundwater sample was collected from each of the following wells:

- MW-16-01
- MW-16-02
- MW-16-03
- MW-16-04
- MW-16-05
- MW-16-06
- MW-16-07

Each sample was analyzed for the following constituents:

Analyte Group	Method
Anions (Chloride, Fluoride, Sulfate)	SW846 9056A
Total Boron	SW846 3005A/6010B
Total Calcium	SW846 3005A/6020
Total Dissolved Solids	SM 2540C

TRC reviewed the laboratory data to assess data usability. The following sections summarize the data review procedure and the results of the review.

Data Quality Review Procedure

The analytical data were reviewed using the USEPA National Functional Guidelines for Inorganic Superfund Data Review (USEPA, 2017). The following items were included in the evaluation of the data:

- Sample receipt, as noted in the cover page or case narrative;
- Technical holding times for analyses;
- Reporting limits (RLs) compared to project-required RLs;
- Data for method blanks and equipment blanks, where applicable. Method blanks are used to assess potential contamination arising from laboratory sample preparation and/or

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analytical procedures. Equipment blanks are used to assess potential contamination arising from field procedures;

- Data for laboratory control samples (LCSs). The LCSs are used to assess the accuracy of the analytical method using a clean matrix;
- Data for matrix spike and matrix spike duplicate samples (MS/MSDs), where applicable. The MS/MSDs are used to assess the accuracy and precision of the analytical method using a sample from the dataset;
- Data for laboratory duplicates, where applicable. The laboratory duplicates are used to assess the precision of the analytical method using a sample from the dataset;
- Data for blind field duplicates. Field duplicate samples are used to assess variability introduced by the sampling and analytical processes; and
- Overall usability of the data.

This data usability report addresses the following items:

- Usability of the data if quality control (QC) results suggest potential problems with all or some of the data;
- Actions regarding specific QC criteria exceedances.

Review Summary

The data quality objectives and laboratory completeness goals for the project were met, and the data are usable for their intended purpose. A summary of the data quality review, including non-conformances and issues identified in this evaluation are noted below.

- Appendix III constituents will be utilized for the purposes of a detection monitoring program.
- Data are usable for the purposes of the detection monitoring program.

QA/QC Sample Summary:

- The holding time for TDS for samples MW-16-02, MW-16-03, and MW-16-04 exceeded the 7-day holding time criteria by approximately 20 minutes, one hour, and one hour and 30 minutes, respectively. These results should be considered estimated and may be biased low as noted in the attached table.
- Target analytes were not detected in the method blanks.
- LCS recoveries for all target analytes were within laboratory control limits.
- MS/MSD analyses were not performed for anions, boron, and calcium. Per the project QAPP, MS/MSD analyses are required for these analyses at a frequency of 1 per 20 samples.

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- Laboratory duplicate analysis was not performed for TDS. Per the project QAPP, laboratory duplicate analyses are required for TDS at a frequency of 1 per 20 samples.
- Dup-01 corresponds with MW-16-02; relative percent differences (RPDs) between the parent and duplicate sample were within the QC limits.

Laboratory Data Quality Review
Groundwater Monitoring Event November 2019 (Verification Sampling)
DTE Electric Company Monroe Power Plant Fly Ash Basin and Vertical Extension Landfill (DTE MONPP FAB & VEL)

Groundwater samples were collected by TRC for the November 2019 verification sampling event. Samples were analyzed for anions, total metals, and total dissolved solids by Test America Laboratories, Inc. (Test America), located in North Canton, Ohio. The laboratory analytical results are reported in laboratory report 240-121974-1.

During the November 2019 verification sampling event, a groundwater sample was collected from each of the following wells on November 6, 2019:

- MW-16-03
- MW-16-04

Each sample was analyzed for the following constituents:

Analyte Group	Method
Total Dissolved Solids	SM 2540C

TRC reviewed the laboratory data to assess data usability. The following sections summarize the data review procedure and the results of the review.

Data Quality Review Procedure

The analytical data were reviewed using the USEPA National Functional Guidelines for Inorganic Superfund Data Review (USEPA, 2017). The following items were included in the evaluation of the data:

- Sample receipt, as noted in the cover page or case narrative;
- Technical holding times for analyses;
- Reporting limits (RLs) compared to project-required RLs;
- Data for method blanks and equipment blanks. Method blanks are used to assess potential contamination arising from laboratory sample preparation and/or analytical procedures. Equipment blanks are used to assess potential contamination arising from field procedures;
- Data for laboratory control samples (LCSs). The LCSs are used to assess the accuracy of the analytical method using a clean matrix;

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- Data for matrix spike and matrix spike duplicate samples (MS.MSDs). The MS/MSDs are used to assess the accuracy and precision of the analytical method using a sample from the dataset;
- Data for laboratory duplicates. The laboratory duplicates are used to assess the precision of the analytical method using a sample from the dataset;
- Data for blind field duplicates. Field duplicate samples are used to assess variability introduced by the sampling and analytical processes; and
- Overall usability of the data.

This data usability report addresses the following items:

- Usability of the data if quality control (QC) results suggest potential problems with all or some of the data;
- Actions regarding specific QC criteria exceedances.

Review Summary

The data quality objectives and laboratory completeness goals for the project were met, and the data are usable for their intended purpose. A summary of the data quality review, including non-conformances and issues identified in this evaluation are noted below.

- Appendix III constituents will be utilized for the purposes of a detection monitoring program.
- Data are usable for the purposes of the detection monitoring program.

QA/QC Sample Summary:

- Target analytes were not detected in the method blanks.
- LCS recoveries for all target analytes were within laboratory control limits.
- MS/MSD analyses were not performed on a sample from the data set.
- DUP-01 corresponds with MW-16-04; RPDs between the parent and duplicate sample were within the QC limits.

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Appendix B
Owner Certification of Compliance

DRAFT

Owner Certification of Site Compliance per 40 CFR 257 Subpart D
Monroe Power Plant Fly Ash Basin
Monroe, Michigan

The United States Environmental Protection Agency (EPA) Hazardous and Solid Waste Management System: Disposal of Coal Combustion Residuals From Electric Utilities; A Holistic Approach to Closure Part B: Alternate Demonstration for Unlined Surface Impoundments (40 CFR §257.71(d)), requires that the owner of an existing CCR unit certify the facility is in compliance with the requirements of the CCR Rules (40 CFR 257 Subpart D) except for §257.71(a)(1).

CERTIFICATION

Based on our review of the CCR Rules, I hereby certify that the subject facility is in compliance with the requirements of 40 CFR 257 Subpart D except for §257.71(a)(1).

SIGNATURE	DATE
PRINT NAME	TITLE
COMPANY NAME	

DRAFT

Appendix C
Well Construction Diagrams and Soil Boring Logs

DRAFT

WELL CONSTRUCTION LOG

TRC

WELL NO. MW-16-01

Facility/Project Name:	Date Drilling Started:	Date Drilling Completed:	Project Number:
DTE EC: Monroe FAB	2/17/16	2/17/16	231828.0001.0000

Drilling Firm:	Drilling Method:	Surface Elev. (ft)	TOC Elevation (ft)	Total Depth (ft bgs)	Borehole Dia. (in)
Stock Drilling	Sonic	578.91	581.74	60.0	6

Boring Location: SW of fly ash basin.
N: 143121.86 E: 13394675.84

Personnel
Logged By - Jennifer Reed
Driller - Austin Goldsmith

Drilling Equipment: TerraSonic

Civil Town/City/or Village:	County:	State:
Monroe, MI	Monroe	Michigan

Water Level Observations:
While Drilling: Date/Time Depth (ft bgs)
After Drilling: Date/Time 3/17/16 08:45 Depth (ft bgs) 2.00

SAMPLE NUMBER AND TYPE	RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	WELL DIAGRAM	COMMENTS
1 CS	65			**SILTY CLAY** mostly clay, some silt, low plasticity, very dark gray (7.5YR 3/1), no odor, moist, medium stiff, high organic content, roots and grass. Change to no roots at 3.5 feet. Change to hard at 5.0 feet. Change to medium stiff at 5.5 feet. Change to trace to few gravel at 6.0 feet.				
			10					
2 CS	95			Change to medium plasticity, dark gray (10YR 4/1) mottled with yellowish brown (10YR 5/6), at 12.5 feet. Change to dark gray (10YR 4/1), very stiff at 17.5 feet.				
3 ST	60		20					
4 CS	100				CL-ML			
			30					
5 CS	100			Change to weathered limestone appearance, light gray (10YR 7/1), slight odor, stiff at 32.5 feet.				
			40					
6 CS	95			Change to not cohesive at 42.5 feet. Change to little silt, few coarse sand at 43.5 feet. Change to some silt, trace coarse sand at 45.0 feet. Grades to wet from 40 to 48 feet. Change to bedrock fragments encountered, wet at 48.0 feet.				
			50					
7 CS	100			**LIMESTONE** very weathered, light gray (10YR 7/1), moist, medium dense, similar to silt.				
				End of boring at 55.0 feet below ground surface.				

Signature: Reed

Firm: TRC Environmental Corporation 734-971-7080
1540 Eisenhower Place Ann Arbor, Michigan Fax 734-971-9022

SOIL BORING WELL CONSTRUCTION LOG 231828.0001.GPJ TRC_CORP.GDT 231828.0001.0000 5/16/16

WELL CONSTRUCTION LOG

TRC

WELL NO. MW-16-02

Facility/Project Name:	Date Drilling Started:	Date Drilling Completed:	Project Number:
DTE EC: Monroe FAB	2/18/16	2/18/16	231828.0001.0000

Drilling Firm:	Drilling Method:	Surface Elev. (ft)	TOC Elevation (ft)	Total Depth (ft bgs)	Borehole Dia. (in)
Stock Drilling	Sonic	579.44	581.81	55.0	6

Boring Location: S of fly ash basin.

N: 140938.78 E: 13396986.03

Personnel
Logged By - Jennifer Reed
Driller - Austin Goldsmith

Drilling Equipment: TerraSonic

Civil Town/City/or Village:	County:	State:
Monroe, MI	Monroe	Michigan

Water Level Observations:
While Drilling: Date/Time Depth (ft bgs)
After Drilling: Date/Time 3/17/16 09:30 Depth (ft bgs) -4.82

SAMPLE NUMBER AND TYPE	RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	WELL DIAGRAM	COMMENTS
1 CS	90			**SILTY CLAY** mostly clay, some silt, trace to few sand, trace to few gravel, low plasticity, dark brown (10YR 3/3), no odor, moist, hard. Change to dry at 3.25 feet. Change to dark gray (10YR 4/1) at 5.0 feet.				Artesian well conditions present.
2 CS	95		10	Change to moist at 9.5 feet Change to very stiff at 10.5 feet. Change to dark gray (10YR 4/1), mottled with light reddish brown (5YR 6/3) at 12.0 feet.				
3 ST	65		20		CL-ML			
4 CS	100			Change to no mottling at 25.0 feet.				
5 ST	95		30					
6 CS	100							
7 CS	100		40	**SILTY CLAY WITH SAND** mostly clay, some silt, little fine to coarse sand, low plasticity, dark gray (10YR 4/1), no odor, moist, very stiff. Change to light gray (10YR 7/1), slight odor at 42.5 feet.	CL-ML			
8 CS	100		50	**SILTY CLAY** mostly clay, some silt, few gravel, very low plasticity, light gray (10YR 7/1), slight odor, moist, hard. Change to dry, not cohesive at 51.5 feet.	CL-ML			
				LIMESTONE weathered, slight odor, saturated.				
			60	End of boring at 60.0 feet below ground surface.				

Signature: Reed

Firm: TRC Environmental Corporation
1540 Eisenhower Place Ann Arbor, Michigan
734-971-7080
Fax 734-971-9022

SOIL BORING WELL CONSTRUCTION LOG 231828.0001.GPJ TRC_CORP.GDT 231828.0001.0000 5/18/16

WELL CONSTRUCTION LOG

TRC

WELL NO. MW-16-03

Facility/Project Name:	Date Drilling Started:	Date Drilling Completed:	Project Number:
DTE EC: Monroe FAB	2/16/16	2/16/16	231828.0001.0000

Drilling Firm:	Drilling Method:	Surface Elev. (ft)	TOC Elevation (ft)	Total Depth (ft bgs)	Borehole Dia. (in)
Stock Drilling	Sonic	577.29	579.95	50.0	6

Boring Location: E of fly ash basin.
N: 139040.68 E: 13395136.56

Personnel
Logged By - Chris Scieszka
Driller - Austin Goldsmith

Drilling Equipment: TerraSonic

Civil Town/City/or Village:	County:	State:
Monroe, MI	Monroe	Michigan

Water Level Observations:
While Drilling: Date/Time Depth (ft bgs)
After Drilling: Date/Time 3/17/16 09:25 Depth (ft bgs) -13.95

SAMPLE NUMBER AND TYPE	RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	WELL DIAGRAM	COMMENTS
1 CS	70			**SILTY CLAY** mostly clay, some silt, low plasticity, very dark brown (10YR 2/2), no odor, moist, medium stiff (2.0 tsf), high organics, roots. Change to no roots, trace fine gravel at 2.5 feet. Change to wood fragments present at 8.0 feet.				Artesian well conditions present.
2 CS	60		10	Change to medium to high plasticity, dark gray (10YR 4/1), mottled with yellowish brown (10YR 5/6) and light reddish brown (5YR 6/3), no organics at 10.0 feet. Change to trace to few fine to coarse sand, trace to few fine gravel low plasticity, yellowish brown (10YR 5/4), at 12.0 feet. Change to dark gray (10YR 4/1), very stiff (3.0 tsf) at 17.0 feet.	CL-ML			
3 ST	100		20					
4 CS	100							
5 CS	100		30	Change to hard (>4.0 tsf) at 30.0 feet.				
6 CS	100		40	**SAND** mostly fine to coarse sand, trace to few silt, very dark gray (10YR 3/1), no odor, moist, loose.	SP			
				SILTY CLAY mostly clay, some silt, low plasticity, dark gray (10YR 4/1), no odor, moist, very stiff (3.0 tsf).	CL-ML			
				LIMESTONE light gray (10YR 7/1), slight odor, weathered, saturated. Change to very weathered, moist at 41.0 feet. Change to competent, dry.				
			50	End of boring at 50.0 feet below ground surface.				

Signature:

Firm: TRC Environmental Corporation
1540 Eisenhower Place Ann Arbor, Michigan
734-971-7080
Fax 734-971-9022

SOIL BORING WELL CONSTRUCTION LOG 231828.0001.GPJ TRC_CORP.GDT 231828.0001.0000 5/16/16

WELL CONSTRUCTION LOG

TRC

WELL NO. MW-16-04

Facility/Project Name:	Date Drilling Started:	Date Drilling Completed:	Project Number:
DTE EC: Monroe FAB	2/15/16	2/15/16	231828.0001.0000

Drilling Firm:	Drilling Method:	Surface Elev. (ft)	TOC Elevation (ft)	Total Depth (ft bgs)	Borehole Dia. (in)
Stock Drilling	Sonic	582.64	585.54	50.0	6

Boring Location: N of fly ash basin.
N: 140704.67 E: 13390758.97

Personnel
Logged By - Chris Scieszka
Driller - Austin Goldsmith

Drilling Equipment: TerraSonic

Civil Town/City/or Village:	County:	State:
Monroe, MI	Monroe	Michigan

Water Level Observations:
While Drilling: Date/Time Depth (ft bgs)
After Drilling: Date/Time 3/17/16 10:15 Depth (ft bgs) -19.40

SAMPLE NUMBER AND TYPE	RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	WELL DIAGRAM	COMMENTS
1 CS	20			**SILTY CLAY** mostly clay, little to some silt, trace to few fine to coarse sand, trace to few fine to coarse gravel, low plasticity, dark brown (10YR 3/3), no odor, dry, hard (>4.0 tsf).				Artesian well conditions present.
			10	Change to soft (0.5 tsf) at 10.0 feet.				
2 CS	100			Change to very stiff (3 to 4 tsf) at 15.0 feet.				
3 ST	80		20	Change to dark gray (10YR 4/1) at 19.0 feet.	CL-ML			
				Change to very stiff to hard (3 to >4 tsf) at 22.0 feet.				
4 CS	100							
			30	Change to cobble present at 29.5 feet.				
				Change to hard (>4.0 tsf) at 31.0 feet.				
5 CS	100							
			40	**SILTY GRAVEL** mostly fine to coarse gravel, little to some silt, few fine to coarse sand, gray (10YR 5/1), no odor, saturated, medium dense to dense.	GM			
6 CS	80			**SILTY SAND** mostly fine to medium sand, little to some silt, gray (10YR 5/1), no odor, moist to saturated, dense to very dense.	SM			
				SILT mostly silt, trace to few fine sand, no plasticity, dark grayish brown (10YR 4/2), no odor, dry, very dense.	ML			
			50	**LIMESTONE** gray (10YR 5/1) to dark gray (10 R 4/1), dry, competent but fractured.				
				End of boring at 50.0 feet below ground surface.				

Signature:

Firm: TRC Environmental Corporation
1540 Eisenhower Place Ann Arbor, Michigan
734-971-7080
Fax 734-971-9022

SOIL BORING WELL CONSTRUCTION LOG 231828.0001.GPJ TRC_CORP.GDT 231828.0001.0000 5/16/16

WELL CONSTRUCTION LOG

TRC

WELL NO. MW-16-05

Facility/Project Name:	Date Drilling Started:	Date Drilling Completed:	Project Number:
DTE EC: Monroe FAB	4/12/16	4/13/16	231828.0001.0000

Drilling Firm:	Drilling Method:	Surface Elev. (ft)	TOC Elevation (ft)	Total Depth (ft bgs)	Borehole Dia. (in)
Stock Drilling	Sonic	580.51	583.25	50.0	6

Boring Location:	Personnel	Drilling Equipment:
S edge of fly ash basin, along farm field edge. N: 139537.14 E: 13392810.51	Logged By - Jennifer Reed Driller - Austin Goldsmith	TerraSonic

Civil Town/City/or Village:	County:	State:	Water Level Observations:		
Monroe, MI	Monroe	Michigan	While Drilling:	Date/Time	Depth (ft bgs)
			After Drilling:	Date/Time 5/5/16 12:47	Depth (ft bgs) -16.70

SAMPLE NUMBER AND TYPE	RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	WELL DIAGRAM	COMMENTS
1 CS	75			**SILTY CLAY** mostly clay, little to some silt, low plasticity, very dark brown (10YR 2/2), no odor, moist, medium stiff, organic material present, roots and grass. Change to few to little fine to coarse sand at 2.5 feet. Change to brown (10YR 5/3), very stiff, no organic material at 5.0 feet. Change to trace to few gravel, gray (10YR 5/1) at 7.5 feet.				Artesian well conditions present.
2 CS	100		10					
3 CS	100		20		CL-ML			
4 CS	100		30	Change to no to trace fine to medium sand, no gravel, dark gray (10YR 4/1), hard at 30 feet.				
5 CS	100		40	**LIMESTONE** weathered, light gray (10YR 7/1), slight odor, moist to dry. Change to competent at 46.5 feet.				
			50	End of boring at 50.0 feet below ground surface.				

SOIL BORING WELL CONSTRUCTION LOG 231828.0001.GPJ TRC_CORP.GDT 231828.0001.0000 5/16/16

Signature:

Firm: TRC Environmental Corporation
1540 Eisenhower Place Ann Arbor, Michigan
734-971-7080
Fax 734-971-9022

WELL CONSTRUCTION LOG

TRC

WELL NO. MW-16-06

Facility/Project Name:	Date Drilling Started:	Date Drilling Completed:	Project Number:
DTE EC: Monroe FAB	4/13/16	4/13/16	231828.0001.0000

Drilling Firm:	Drilling Method:	Surface Elev. (ft)	TOC Elevation (ft)	Total Depth (ft bgs)	Borehole Dia. (in)
Stock Drilling	Sonic	579.20	581.94	50.0	6

Boring Location: NE of fly ash basin, along the river's edge.

N: 142566.72 E: 13396398.37

Personnel
Logged By - Jennifer Reed
Driller - Austin Goldsmith

Drilling Equipment: TerraSonic

Civil Town/City/or Village:	County:	State:
Monroe, MI	Monroe	Michigan

Water Level Observations:
While Drilling: Date/Time — Depth (ft bgs)
After Drilling: Date/Time 5/5/16 09:30 — Depth (ft bgs) -3.45

SAMPLE NUMBER AND TYPE	RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	WELL DIAGRAM	COMMENTS
1 CS	98			**CLAYEY SILT WITH SAND** mostly silt, few to little fine to coarse sand, few to little clay, black (10YR 2/1), no odor, moist, medium stiff, high organic content, roots and grass. Change to very dark gray (10YR 3/1) at 2.5 feet.	ML-CL			Artesian well conditions present.
				SILTY CLAY mostly clay, some silt, few to little fine to coarse sand, light yellowish brown (10YR 6/4), moist, medium stiff. Change to brown (10YR 5/3), very stiff to hard at 7.0 feet.				
			10		CL-ML			
2 CS	100			Change to dark gray (10YR 4/1), hard at 11.5 feet. Change to no to trace sand at 15.0 feet.				
				SILTY CLAY WITH SAND mostly clay, some silt, little fine to coarse sand, dark gray (10YR 4/1), moist, hard.				
			20					
3 CS	100							
			30		CL-ML			
4 CS	100							
			40					
5 CS	100			**GRAVEL AND COBBLES** large broken limestone boulders, and cobbles, saturated.	GP			
			50	End of boring at 50.0 feet below ground surface.				

SOIL BORING WELL CONSTRUCTION LOG 231828.0001.GPJ TRC_CORP.GDT 231828.0001.0000 5/19/16

Signature: Reed

Firm: TRC Environmental Corporation
1540 Eisenhower Place Ann Arbor, Michigan
734-971-7080
Fax 734-971-9022

WELL CONSTRUCTION LOG

TRC

WELL NO. MW-16-07

Facility/Project Name:	Date Drilling Started:	Date Drilling Completed:	Project Number:
DTE EC: Monroe FAB	4/14/16	4/14/16	231828.0001.0000

Drilling Firm:	Drilling Method:	Surface Elev. (ft)	TOC Elevation (ft)	Total Depth (ft bgs)	Borehole Dia. (in)
Stock Drilling	Sonic	575.41	578.40	40.0	6

Boring Location: N of fly ash basin, S of E Dunbar Road, W of main gate.
N: 143408.82 E: 13392311.01

Personnel
Logged By - Jennifer Reed
Driller - Austin Goldsmith

Drilling Equipment: TerraSonic

Civil Town/City/or Village:	County:	State:
Monroe, MI	Monroe	Michigan

Water Level Observations:
While Drilling: Date/Time Depth (ft bgs)
After Drilling: Date/Time 5/5/16 10:44 Depth (ft bgs)

SAMPLE NUMBER AND TYPE	RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	WELL DIAGRAM	COMMENTS
				TOPSOIL				
1 CS	95			**SILTY CLAY** mostly clay, some silt, few to little sand, brown (10YR 5/3) to gray (10YR 5/1), no odor, moist, medium stiff.				Artesian well conditions present.
			10	Change to dark gray (10YR 4/1) at 9.5 feet.	CL-ML			
2 CS	100							
			20					
3 CS	100			**SANDY SILT WITH CLAY** mostly silt, little sand, little clay, dark gray (10YR 4/1), moist, medium to very stiff. Change to little to some sand at 25.0 feet.				
			30	Change to gray (GLEY1 5/N), crumbly at 28.5 feet.	ML-CL			
4 CS	100			Change to wet at 35.0 feet.				
				LIMESTONE weathered, light gray (10YR 7/1), slight odor, wet.				
			40	Change to saturated at 39.5 feet.				
				End of boring at 40.0 feet below ground surface.				
			50					

SOIL BORING WELL CONSTRUCTION LOG 231828.0001.GPJ TRC_CORP.GDT 231828.0001.0000 6/6/16

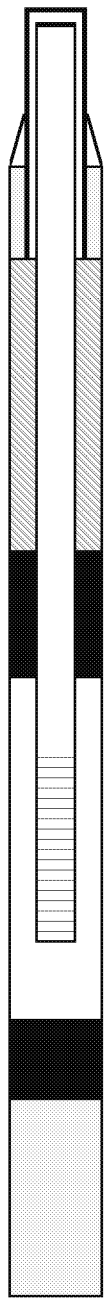
Signature: [signature] for J Reed

Firm: TRC Environmental Corporation
1540 Eisenhower Place Ann Arbor, Michigan
734-971-7080
Fax 734-971-9022

WELL CONSTRUCTION DIAGRAM

PROJ. NAME: DTE EC: MFAB CCR MW Installation		WELL ID:	**MW-16-01**
PROJ. NO: 231828.0001	DATE INSTALLED: 2/17/2016 INSTALLED BY: J. REED		CHECKED BY: C. Scieszka

ELEVATION (BENCHMARK: USGS)	DEPTH BELOW OR ABOVE GROUND SURFACE (FEET)	
581.74	2.8	TOP OF CASING
578.91	0.0	GROUND SURFACE
	1.0	CEMENT SURFACE PLUG
		GROUT/BACKFILL MATERIAL
		GROUT SLURRY
		GROUT/BACKFILL METHOD
50.8		TREMIE
	39.5	GROUT
		BENTONITE SEAL MATERIAL
		PELLETS
	44.0	BENTONITE SEAL
530.9	48.0	TOP OF SCREEN
		FILTER PACK MATERIAL
5.0		MEDIUM, WASHED SAND
525.9	53.0	BOTTOM OF SCREEN
	53.0	BOTTOM OF FILTER PACK
	NA	BENTONITE PLUG
		BACKFILL MATERIAL
		WASHED SAND
523.91	55.0	HOLE BOTTOM



NOTES:

CASING AND SCREEN DETAILS

TYPE OF RISER: 2-INCH PVC

PIPE SCHEDULE: 40

PIPE JOINTS: THREADED O-RINGS

SCREEN TYPE: 2-INCH PVC

SCR. SLOT SIZE: 0.01-INCH

BOREHOLE DIAMETER: 6 IN. FROM 0 TO 55 FT.
____ IN. FROM ____ TO ____ FT.

SURF. CASING DIAMETER: ____ IN. FROM ____ TO ____ FT.
____ IN. FROM ____ TO ____ FT.

WELL DEVELOPMENT

DEVELOPMENT METHOD: SURGE AND PUMP

TIME DEVELOPING: 50 MINUTES

WATER REMOVED: 100 GALLONS

WATER ADDED: 0 GALLONS

WATER CLARITY BEFORE / AFTER DEVELOPMENT

CLARITY BEFORE: VERY TURBID

COLOR BEFORE: DARK GRAY

CLARITY AFTER: CLEAR

COLOR AFTER: NONE

ODOR (IF PRESENT): NONE

WATER LEVEL SUMMARY

MEASUREMENT (FEET)			DATE	TIME
DTB BEFORE DEVELOPING:	--	T/PVC	--	--
DTB AFTER DEVELOPING:	57.30	T/PVC	2/19/2016	11:00
SWL BEFORE DEVELOPING:	4.69	T/PVC	2/19/2016	10:00
SWL AFTER DEVELOPING:	4.80	T/PVC	3/17/2016	8:45
OTHER SWL:		T/PVC		
OTHER SWL:		T/PVC		

PROTECTIVE CASING DETAILS

PERMANENT, LEGIBLE WELL LABEL ADDED? ☑ YES ☐ NO

PROTECTIVE COVER AND LOCK INSTALLED? ☑ YES ☐ NO

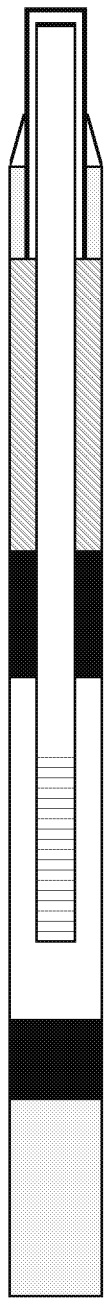
LOCK KEY NUMBER: 3120

REVISED 11/2013

WELL CONSTRUCTION DIAGRAM

PROJ. NAME: DTE EC: MFAB CCR MW Installation		WELL ID:	**MW-16-02**
PROJ. NO: 231828.0001	DATE INSTALLED: 2/18/2016 INSTALLED BY: J. REED		CHECKED BY: C. Scieszka

ELEVATION (BENCHMARK: USGS)	DEPTH BELOW OR ABOVE GROUND SURFACE (FEET)	
581.81	2.4	TOP OF CASING
579.44	0.0	GROUND SURFACE
	1.0	CEMENT SURFACE PLUG
		GROUT/BACKFILL MATERIAL
		CEMENT/GROUT SLURRY
		GROUT/BACKFILL METHOD
55.4		TREMIE
	40.0	GROUT
		BENTONITE SEAL MATERIAL
		PELLETS
	44.0	BENTONITE SEAL
526.4	53.0	TOP OF SCREEN
5.0		FILTER PACK MATERIAL
		MEDIUM, WASHED SAND
521.4	58.0	BOTTOM OF SCREEN
	60.0	BOTTOM OF FILTER PACK
	NA	BENTONITE PLUG
		BACKFILL MATERIAL
		WASHED SAND
519.44	60.0	HOLE BOTTOM



NOTES:
ARTESIAN MONITORING WELL

CASING AND SCREEN DETAILS

TYPE OF RISER: 2-INCH PVC

PIPE SCHEDULE: 40

PIPE JOINTS: THREADED O-RINGS

SCREEN TYPE: 2-INCH PVC

SCR. SLOT SIZE: 0.01-INCH

BOREHOLE DIAMETER: 6 IN. FROM 0 TO 60 FT.
____ IN. FROM ____ TO ____ FT.

SURF. CASING DIAMETER: ____ IN. FROM ____ TO ____ FT.
____ IN. FROM ____ TO ____ FT.

WELL DEVELOPMENT

DEVELOPMENT METHOD: ARTESIAN WELL

TIME DEVELOPING: 24 HOURS

WATER REMOVED: 2,880 GALLONS

WATER ADDED: 0 GALLONS

WATER CLARITY BEFORE / AFTER DEVELOPMENT

CLARITY BEFORE: SLIGHTLY CLOUDY TO CLOUDY

COLOR BEFORE: LIGHT GRAY

CLARITY AFTER: CLEAR

COLOR AFTER: NONE

ODOR (IF PRESENT): NONE

WATER LEVEL SUMMARY

MEASUREMENT (FEET)			DATE	TIME
DTB BEFORE DEVELOPING:	--	T/PVC	--	--
DTB AFTER DEVELOPING:	61.03	T/PVC	3/17/2016	9:30
SWL BEFORE DEVELOPING:	--	T/PVC	--	--
SWL AFTER DEVELOPING:	2.42	ATOC	3/17/2016	9:30
OTHER SWL:		T/PVC		
OTHER SWL:		T/PVC		

PROTECTIVE CASING DETAILS

PERMANENT, LEGIBLE WELL LABEL ADDED? ☑ YES ☐ NO

PROTECTIVE COVER AND LOCK INSTALLED? ☑ YES ☐ NO

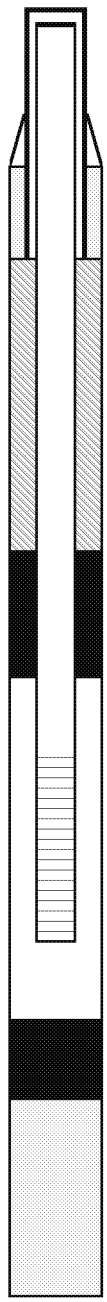
LOCK KEY NUMBER: 3120

REVISED 11/2013

WELL CONSTRUCTION DIAGRAM

PROJ. NAME: DTE EC: MFAB CCR MW Installation		WELL ID:	**MW-16-03**
PROJ. NO: 231828.0001	DATE INSTALLED: 2/16/2016 INSTALLED BY: J. REED		CHECKED BY: C. Scieszka

ELEVATION (BENCHMARK: USGS)	DEPTH BELOW OR ABOVE GROUND SURFACE (FEET)	
579.95	2.7	TOP OF CASING
577.29	0.0	GROUND SURFACE
	1.0	CEMENT SURFACE PLUG
		GROUT/BACKFILL MATERIAL
		CEMENT/GROUT SLURRY
		GROUT/BACKFILL METHOD
39.7		TREMIE
	28.0	GROUT
		BENTONITE SEAL MATERIAL
		PELLETS
	32.0	BENTONITE SEAL
540.3	37.0	TOP OF SCREEN
5.0		FILTER PACK MATERIAL
		PEA STONE
535.3	42.0	BOTTOM OF SCREEN
	50.0	BOTTOM OF FILTER PACK
	NA	BENTONITE PLUG
		BACKFILL MATERIAL
		WASHED SAND
527.29	50.0	HOLE BOTTOM



NOTES:
ARTESIAN MONITORING WELL

CASING AND SCREEN DETAILS

TYPE OF RISER: 2-INCH PVC

PIPE SCHEDULE: 40

PIPE JOINTS: THREADED O-RINGS

SCREEN TYPE: 2-INCH PVC

SCR. SLOT SIZE: 0.01-INCH

BOREHOLE DIAMETER: 6 IN. FROM 0 TO 50 FT.
____ IN. FROM ____ TO ____ FT.

SURF. CASING DIAMETER: ____ IN. FROM ____ TO ____ FT.
____ IN. FROM ____ TO ____ FT.

WELL DEVELOPMENT

DEVELOPMENT METHOD: ARTESIAN WELL

TIME DEVELOPING: 16 HOURS

WATER REMOVED: 7,200 GALLONS

WATER ADDED: 0 GALLONS

WATER CLARITY BEFORE / AFTER DEVELOPMENT

CLARITY BEFORE: VERY TURBID

COLOR BEFORE: DARK GRAY

CLARITY AFTER: CLEAR

COLOR AFTER: NONE

ODOR (IF PRESENT): SULFUR

WATER LEVEL SUMMARY

MEASUREMENT (FEET)			DATE	TIME
DTB BEFORE DEVELOPING:	--	T/PVC	--	--
DTB AFTER DEVELOPING:	44.65	T/PVC	3/17/2016	9:25
SWL BEFORE DEVELOPING:	--	T/PVC	--	--
SWL AFTER DEVELOPING:	11.20	ATOC	3/17/2016	9:25
OTHER SWL:		T/PVC		
OTHER SWL:		T/PVC		

PROTECTIVE CASING DETAILS

PERMANENT, LEGIBLE WELL LABEL ADDED? ☑ YES ☐ NO

PROTECTIVE COVER AND LOCK INSTALLED? ☑ YES ☐ NO

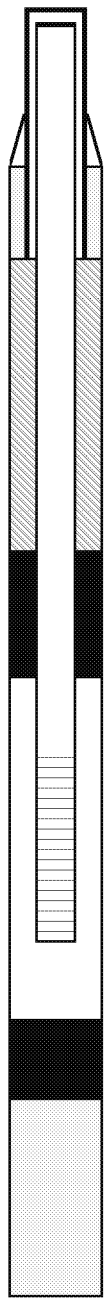
LOCK KEY NUMBER: 3120

REVISED 11/2013

WELL CONSTRUCTION DIAGRAM

PROJ. NAME: DTE EC: MFAB CCR MW Installation		WELL ID:	**MW-16-04**
PROJ. NO: 231828.0001	DATE INSTALLED: 2/15/2016 INSTALLED BY: C. Scieszka		CHECKED BY: C. Scieszka

ELEVATION (BENCHMARK: USGS)	DEPTH BELOW OR ABOVE GROUND SURFACE (FEET)	
585.54	2.9	TOP OF CASING
582.64	0.0	GROUND SURFACE
	1.0	CEMENT SURFACE PLUG
		GROUT/BACKFILL MATERIAL
		CEMENT/GROUT SLURRY
		GROUT/BACKFILL METHOD
43.9		TREMIE
	32.0	GROUT
		BENTONITE SEAL MATERIAL
		PELLETS
	36.0	BENTONITE SEAL
541.6	41.0	TOP OF SCREEN
		FILTER PACK MATERIAL
5.0		PEA STONE
536.6	46.0	BOTTOM OF SCREEN
	50.0	BOTTOM OF FILTER PACK
	NA	BENTONITE PLUG
		BACKFILL MATERIAL
		WASHED SAND
532.64	50.0	HOLE BOTTOM



NOTES:
ARTESIAN MONITORING WELL

CASING AND SCREEN DETAILS

TYPE OF RISER: 2-INCH PVC

PIPE SCHEDULE: 40

PIPE JOINTS: THREADED O-RINGS

SCREEN TYPE: 2-INCH PVC

SCR. SLOT SIZE: 0.01-INCH

BOREHOLE DIAMETER: 6 IN. FROM 0 TO 50 FT.
____ IN. FROM ____ TO ____ FT.

SURF. CASING DIAMETER: ____ IN. FROM ____ TO ____ FT.
____ IN. FROM ____ TO ____ FT.

WELL DEVELOPMENT

DEVELOPMENT METHOD: ARTESIAN WELL

TIME DEVELOPING: 16 HOURS

WATER REMOVED: 28,900 GALLONS

WATER ADDED: 0 GALLONS

WATER CLARITY BEFORE / AFTER DEVELOPMENT

CLARITY BEFORE: VERY TURBID

COLOR BEFORE: DARK GRAY

CLARITY AFTER: CLEAR

COLOR AFTER: NONE

ODOR (IF PRESENT): SULFUR

WATER LEVEL SUMMARY

MEASUREMENT (FEET)			DATE	TIME
DTB BEFORE DEVELOPING:	--	T/PVC	--	--
DTB AFTER DEVELOPING:	49.45	T/PVC	3/17/2016	10:15
SWL BEFORE DEVELOPING:	--	T/PVC	--	--
SWL AFTER DEVELOPING:	16.50	ATOC	3/17/2016	10:15
OTHER SWL:		T/PVC		
OTHER SWL:		T/PVC		

PROTECTIVE CASING DETAILS

PERMANENT, LEGIBLE WELL LABEL ADDED? ☑ YES ☐ NO

PROTECTIVE COVER AND LOCK INSTALLED? ☑ YES ☐ NO

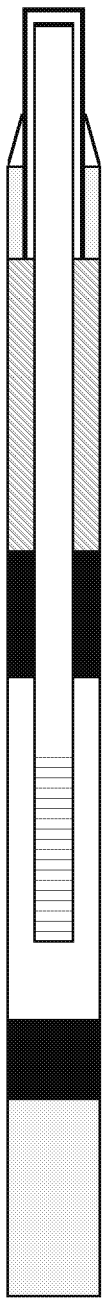
LOCK KEY NUMBER: 3120

REVISED 11/2013

WELL CONSTRUCTION DIAGRAM

PROJ. NAME: DTE EC: MFAB CCR MW Installation		WELL ID:	**MW-16-05**
PROJ. NO: 231828.0001	DATE INSTALLED: 4/13/2016 INSTALLED BY: J. REED		CHECKED BY: C. Scieszka

ELEVATION (BENCHMARK: USGS)	DEPTH BELOW OR ABOVE GROUND SURFACE (FEET)	
583.25	2.7	TOP OF CASING
580.51	0.0	GROUND SURFACE
	1.0	CEMENT SURFACE PLUG
		GROUT/BACKFILL MATERIAL
		CEMENT/GROUT SLURRY
		GROUT/BACKFILL METHOD
42.7		TREMIE
	33.0	GROUT
		BENTONITE SEAL MATERIAL
		PELLETS
	35.0	BENTONITE SEAL
540.5	40.0	TOP OF SCREEN
5.0		FILTER PACK MATERIAL
		PEA STONE
535.5	45.0	BOTTOM OF SCREEN
	45.0	BOTTOM OF FILTER PACK
	NA	BENTONITE PLUG
		BACKFILL MATERIAL
		PEA STONE
530.51	50.0	HOLE BOTTOM



NOTES:

CASING AND SCREEN DETAILS

TYPE OF RISER: 2-INCH PVC

PIPE SCHEDULE: 40

PIPE JOINTS: THREADED O-RINGS

SCREEN TYPE: 2-INCH PVC

SCR. SLOT SIZE: 0.01-INCH

BOREHOLE DIAMETER: 6 IN. FROM 0 TO 50 FT.
____ IN. FROM ____ TO ____ FT.

SURF. CASING DIAMETER: ____ IN. FROM ____ TO ____ FT.
____ IN. FROM ____ TO ____ FT.

WELL DEVELOPMENT

DEVELOPMENT METHOD: ARTESIAN WELL

TIME DEVELOPING: 12 HOURS

WATER REMOVED: 120 GALLONS

WATER ADDED: 0 GALLONS

WATER CLARITY BEFORE / AFTER DEVELOPMENT

CLARITY BEFORE: SLIGHTLY CLOUDY

COLOR BEFORE: VERY LIGHT GRAY

CLARITY AFTER: CLEAR

COLOR AFTER: NONE

ODOR (IF PRESENT): VERY SLIGHT TO NONE SULFUR

WATER LEVEL SUMMARY

MEASUREMENT (FEET)			DATE	TIME
DTB BEFORE DEVELOPING:	--	T/PVC	--	--
DTB AFTER DEVELOPING:	--	T/PVC	--	--
SWL BEFORE DEVELOPING:	--	T/PVC	--	--
SWL AFTER DEVELOPING:	14.00	ATOC	5/5/2016	12:47
OTHER SWL:		T/PVC		
OTHER SWL:		T/PVC		

PROTECTIVE CASING DETAILS

PERMANENT, LEGIBLE WELL LABEL ADDED? ☑ YES ☐ NO

PROTECTIVE COVER AND LOCK INSTALLED? ☑ YES ☐ NO

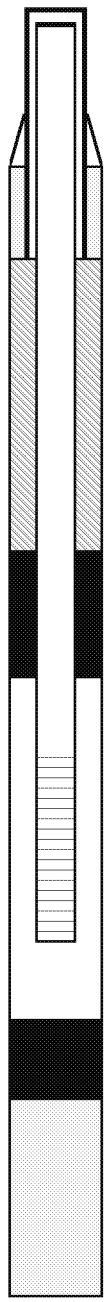
LOCK KEY NUMBER: 3120

REVISED 11/2013

WELL CONSTRUCTION DIAGRAM

PROJ. NAME: DTE EC: MFAB CCR MW Installation		WELL ID:	**MW-16-06**
PROJ. NO: 231828.0001	DATE INSTALLED: 4/13/2016 INSTALLED BY: J. REED		CHECKED BY: C. Scieszka

ELEVATION (BENCHMARK: USGS)	DEPTH BELOW OR ABOVE GROUND SURFACE (FEET)	
581.94	2.7	TOP OF CASING
579.20	0.0	GROUND SURFACE
	1.0	CEMENT SURFACE PLUG
		GROUT/BACKFILL MATERIAL
		CEMENT/GROUT SLURRY
		GROUT/BACKFILL METHOD
47.7		TREMIE
	38.0	GROUT
		BENTONITE SEAL MATERIAL
		PELLETS
	40.0	BENTONITE SEAL
534.20	45.0	TOP OF SCREEN
		FILTER PACK MATERIAL
5.0		PEA STONE
529.20	50.0	BOTTOM OF SCREEN
	50.0	BOTTOM OF FILTER PACK
	NA	BENTONITE PLUG
		BACKFILL MATERIAL
		NA
529.20	50.0	HOLE BOTTOM



NOTES:

CASING AND SCREEN DETAILS

TYPE OF RISER: 2-INCH PVC

PIPE SCHEDULE: 40

PIPE JOINTS: THREADED O-RINGS

SCREEN TYPE: 2-INCH PVC

SCR. SLOT SIZE: 0.01-INCH

BOREHOLE DIAMETER: 6 IN. FROM 0 TO 50 FT.
____ IN. FROM ____ TO ____ FT.

SURF. CASING DIAMETER: ____ IN. FROM ____ TO ____ FT.
____ IN. FROM ____ TO ____ FT.

WELL DEVELOPMENT

DEVELOPMENT METHOD: ARTESIAN WELL

TIME DEVELOPING: 24 HOURS

WATER REMOVED: 240-250 GALLONS

WATER ADDED: 0 GALLONS

WATER CLARITY BEFORE / AFTER DEVELOPMENT

CLARITY BEFORE: SLIGHTLY CLOUDY

COLOR BEFORE: SLIGHTLY LIGHT GRAY

CLARITY AFTER: CLEAR

COLOR AFTER: NONE

ODOR (IF PRESENT): NONE

WATER LEVEL SUMMARY

MEASUREMENT (FEET)			DATE	TIME
DTB BEFORE DEVELOPING:	--	T/PVC	--	--
DTB AFTER DEVELOPING:	--	T/PVC	--	--
SWL BEFORE DEVELOPING:	--	T/PVC	--	--
SWL AFTER DEVELOPING:	0.75	ATOC	5/5/2016	9:30
OTHER SWL:		T/PVC		
OTHER SWL:		T/PVC		

PROTECTIVE CASING DETAILS

PERMANENT, LEGIBLE WELL LABEL ADDED? ☑ YES ☐ NO

PROTECTIVE COVER AND LOCK INSTALLED? ☑ YES ☐ NO

LOCK KEY NUMBER: 3120

REVISED 11/2013

WELL CONSTRUCTION DIAGRAM

PROJ. NAME: DTE EC: MFAB CCR MW Installation		WELL ID:	MW-16-07
PROJ. NO: 231828.0001	DATE INSTALLED: 4/14/2016 INSTALLED BY: J. REED		CHECKED BY: C. Scieszka

ELEVATION (BENCHMARK: USGS)	DEPTH BELOW OR ABOVE GROUND SURFACE (FEET)	
578.40	3.0	TOP OF CASING
575.41	0.0	GROUND SURFACE
	1.0	CEMENT SURFACE PLUG
		GROUT/BACKFILL MATERIAL
		CEMENT/GROUT SLURRY
		GROUT/BACKFILL METHOD
38.0		TREMIE
	27.0	GROUT
		BENTONITE SEAL MATERIAL
		PELLETS
	30.0	BENTONITE SEAL
540.4	35.0	TOP OF SCREEN
5.0		FILTER PACK MATERIAL
		PEA STONE
535.4	40.0	BOTTOM OF SCREEN
	40.0	BOTTOM OF FILTER PACK
	NA	BENTONITE PLUG
		BACKFILL MATERIAL
		NA
535.41	40.0	HOLE BOTTOM

RISER PIPE LENGTH

SCREEN LENGTH

NOTES:

CASING AND SCREEN DETAILS

TYPE OF RISER: 2-INCH PVC

PIPE SCHEDULE: 40

PIPE JOINTS: THREADED O-RINGS

SCREEN TYPE: 2-INCH PVC

SCR. SLOT SIZE: 0.01-INCH

BOREHOLE DIAMETER: 6 IN. FROM 0 TO 40 FT.
____ IN. FROM ____ TO ____ FT.

SURF. CASING DIAMETER: ____ IN. FROM ____ TO ____ FT.
____ IN. FROM ____ TO ____ FT.

WELL DEVELOPMENT

DEVELOPMENT METHOD: ARTESIAN WELL

TIME DEVELOPING: 24 HOURS

WATER REMOVED: 240 GALLONS

WATER ADDED: 0 GALLONS

WATER CLARITY BEFORE / AFTER DEVELOPMENT

CLARITY BEFORE: SLIGHTLY CLOUDY

COLOR BEFORE: SLIGHTLY LIGHT GRAY

CLARITY AFTER: CLEAR

COLOR AFTER: NONE

ODOR (IF PRESENT): NONE

WATER LEVEL SUMMARY

MEASUREMENT (FEET)			DATE	TIME
DTB BEFORE DEVELOPING:	--	T/PVC	--	--
DTB AFTER DEVELOPING:	--	T/PVC	--	--
SWL BEFORE DEVELOPING:	--	T/PVC	--	--
SWL AFTER DEVELOPING:	8.80	ATOC	5/5/2016	10:44
OTHER SWL:	.	T/PVC		
OTHER SWL:		T/PVC		

PROTECTIVE CASING DETAILS

PERMANENT, LEGIBLE WELL LABEL ADDED? ☑ YES ☐ NO

PROTECTIVE COVER AND LOCK INSTALLED? ☑ YES ☐ NO

LOCK KEY NUMBER: 3120

REVISED 11/2013

Appendix D
Effectiveness of the Underlying Clay Soil as a Natural Barrier On-Site, Ash Disposal Basin, Monroe Power Plant Technical Report, Detroit Edison Design Engineering, 1995

DRAFT

Technical Report No. 242

Title MONPP - Effectivenes of the Underlying Clay Soil as a Natural Barrier On-Site Ash Disposal Basin

Author(s) J R Decator, Jr P E

Date March 1995

128-015

Design Engineering

Power Generation Organization

Detroit
Edison

DISTRIBUTION

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ED_005947A_00014554-00099

EFFECTIVENESS OF THE UNDERLYING CLAY SOIL AS A NATURAL BARRIER

ON-SITE ASH DISPOSAL BASIN

MONROE POWER PLANT

TECHNICAL REPORT No 0695-242

APPROVALS

	Date
W. M. Street	3/15/95
W M Street Supervising Engineer Architectural-Civil Engineering	
[illegible]	3-16-95
S H Noetzel Director, Design Engineering Power Generation	

ED_005947A_00014554-00100

EXECUTIVE SUMMARY

Monroe Power Plant's On-Site Fly Ash Disposal Basin has an expected 45-year active life as a waste management facility, through the Year 2020 The underlying clay soil has been analyzed and found to serve as an effective natural barrier against the steady-state seepage of leachate from the facility to the hydrogeologic environment No migration of leachate from the facility is predicted to occur during its active life and the ensuing 30-year post closure period Therefore, application will be made to secure a waiver with respect to the groundwater monitoring well requirements of the Michigan Solid Waste Management Act for the facility

ED_005947A_00014554-00101

EFFECTIVENESS OF THE UNDERLYING CLAY SOIL AS A NATURAL BARRIER

ON-SITE ASH DISPOSAL BASIN

MONROE POWER PLANT

TECHNICAL REPORT No 0695-242

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D Engineering Properties of Clay Soils Underlying the On-Site Ash Basin	
E Elevations of Underlying Bedrock	

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INTRODUCTION

Monroe Power Plant's On-Site Fly Ash Disposal Basin was constructed during 1973 - 1974 for the disposal of slurried fly ash produced as a waste product from the plant Deposition of slurried fly ash into the facility began in January, 1975 Approximately 12 6 million cubic yards of fly ash have been deposited into the facility during the past 20 years, about 47% of the total basin capacity Based on current projections of the rate of deposition of slurried fly ash into the facility, the basin is expected to have an active life of 45 years, and to be closed in the Year 2020

The On-Site Fly Ash Disposal Basin is classified as a Type III Landfill and is subject to the Michigan Solid Waste Management Act with respect to construction, operation, maintenance and closure This Act requires the installation of groundwater monitoring wells around the perimeter of a licensed waste management facility unless, under Rule 299 4318, data can be presented demonstrating that no migration of leachate from the waste management facility will occur during its active life plus the ensuing 30-year post closure period

A Work Plan was developed to assess the effectiveness of the clay soil underlying the basin as a natural barrier between the impounded waste material and the hydrogeologic environment, by limiting the steady-state seepage from the facility The plan consisted of new soil borings and laboratory testing of soil specimens to develop additional data to supplement earlier geotechnical information obtained for the site The Work Plan was approved by the Michigan Department of Natural Resources in July, 1994

The purpose of this Technical Report is to review the geotechnical data obtained and established for Monroe Power Plant's On-Site Fly Ash Disposal Basin, and to present both a transit time prediction of the rate of seepage with time, and the time for leachate to seep through the underlying natural clay barrier to the hydrogeologic environment

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SUMMARY AND CONCLUSIONS

The On-Site Fly Ash Disposal Basin was constructed during 1973 - 1974 for the disposal of slurried fly ash from Monroe Power Plant Deposition of slurried ash into the facility began in January, 1975. The On-Site Ash Disposal Basin is expected to have an active life of 45 years, and to be closed in the Year 2020

Engineering properties of the underlying clay soils determined in 1994 correlate well with earlier investigations made in 1970 and 1973 - 74 Both the brown silty clay and the gray silty clay soils prevalent at the site exhibit hard to very hard consistencies and suitable levels of moisture contents and porosity Hydraulic conductivity values for "undisturbed" samples were all found to be less than 10^{-7} cm/sec

A method of transit time analysis for steady-state conditions was used to predict both the rate of seepage with time and the time it would take for contaminants to migrate through the natural clay barrier underlying the basin The Darcian flux was determined to be 1 0 x 10^{-7} cm^3/cm^2-sec The predicted time for contaminants to migrate from the basin to the hydrogeologic environment is a minimum of 308 years

The minimum thickness of a natural clay barrier to inhibit the migration of leachate from the basin for a period of 75 years, equal to the expected active life plus a 30-year post closure period, is 10 feet This minimum thickness is significantly less than the range of thicknesses determined in the field, which are between 22 feet and 37 feet
It is concluded that the underlying natural clay soil is an effective barrier against the steady-state seepage of leachate from Monroe Power Plant's On-Site Ash Disposal Basin to the hydrogeologic environment, and that no migration of leachate will occur during the expected 45-year active life and the ensuing 30-year post closure period of the facility

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DISCUSSION

Site Description

Planning of Monroe Power Plant's On-Site Fly Ash Disposal Basin began about 1969 when a nearby site of about 400 acres was identified and acquired The site is bounded by I-75 on the west, LaPlaisance Creek on the south, and Plum Creek on the north and east Monroe Power Plant is immediately east of the site, on the other side of Plum Creek

A topographic map was prepared, and became the basis for subsequent exploration and design development work Original site characteristics and topography are summarized by the following

1 The ground site was relatively flat, but not level The ground surface sloped eastward away from I-75, falling from about Elevation 577 feet on the west to about Elevation 565 feet on the east

2 Portions of the site were below the level of Lake Erie, which under conditions of high water can rise above Elevation 569 feet Previous owners had constructed a dike along the east side to keep the lake water out and permit the land to be farmed

Lacustrine clay soils, or glacial till, are those soil deposits laid down by the advances and retreats of the North American continental ice sheets The soil deposits came directly from the glacial ice with little or no sorting by moving water The glacial till is generally a matrix of fine silt and clay, often with embedded rock fragments and boulders Discontinuous lenses and seams of sand and gravel are frequently encountered within the matrix The result is a dense soil of low permeability and considerable shear strength

The eastern half of Monroe County, Michigan, is noted for the occurrence and consistency of its impermeable lacustrine clay soil The clay soil is encountered immediately below the topsoil, and extends down to the underlying bedrock surface Groundwater is usually encountered in the upper portion of the fragmented bedrock

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Generalized Site Geology

Fifty-two (52) soil borings were made at the site in 1970 Of these, ten (10) extended fully down through the overburden to the underlying bedrock and included rock core samples Locations of seventeen (17) of these soil borings, including all of those made to bedrock, are plotted on the map included as Exhibit A, and copies of the boring logs are included as Exhibit B An additional sixty-four (64) soil borings of 15 to 20 foot depth were made in 1973 and 1974 to fill in data gaps and discontinuities Copies of all soil boring logs and data are preserved in Design Engineering's files

For all borings made in the 1970's, a "spoon" sampler was driven into the soil using a "drop" hammer to collect representative samples at 5-foot intervals Samples of the clay soil were collected using a 1 75-inch liner, and 2 0-inch heavy wall samplers were used to obtain rock core samples Results of these earlier investigations are summarized by the following

1 The overburden was found to consist of

   a Topsoil, consisting of fertile organic and mineral material
   b Weathered brown silty clay, with traces of sand and gravel, below the topsoil
   c Unweathered gray silty clay, with traces of sand and gravel, between the brown silty clay and bedrock

2 Within the gray silty clay stratum, rock fragments and boulders were encountered between about Elevation 551 feet and the surface of bedrock, about 15 to 20 feet below It was sometimes necessary to 'drill" through the rock fragments and boulders to enable the soil borings to be advanced down to the bedrock surface

3 The high shear strengths of the brown and gray silty clays confirmed their suitability for use for construction of an impoundment to hold slurried fly ash

4 The bedrock surface is variable across the site A "ridge" at about elevation 539 feet bisects the site from approximately the midpoint of the north side, to the southeast corner Elevations in the northeast corner and the southwest corner of the basin are 10 to 15 feet lower

5 Rock core samples indicated that bedrock consisted of 5 to 10 feet of fragmented limestone overlying gray weathered shale All of the bedrock to the depths cored was interlaced with water

6 Artesian water was found at a number of the borings made to bedrock. The differing heads of water recorded varied from 5 to 20 feet above grade

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Construction of the ash disposal basin proceeded throughout 1973 and 1974 Topsoil material was stripped and stockpiled at the site for future use The interior of the basin was excavated uniformly to Elevation 562 feet, and the brown and gray silty clay soil material was used to construct the perimeter embankments The earthen embankments are keyed into the underlying gray clay stratum, and have a top elevation of 613 feet

Ten (10) additional soil borings were made around the perimeter of the On-Site Ash Basin in the Fall of 1994 using the Central Mine Equipment "Continuous Sample Tube System " This sampling method employed a 3-inch diameter removable liner within a sampler barrel, which is mounted within the lead section of a hollow stem auger column The soil boring is advanced by augering into the soil, and filling the liner After advancing 30 inches, the length of the sample tube, the entire assembly is withdrawn and the "filled" liner removed After a new liner is installed in the sampler barrel, the procedure is repeated for the full depth of the boring By sampling continuously, a picture of the soil is provided for the full depth of the test hole, and seams and lenses of sand and gravel are detected which might be missed if samples were obtained at some prescribed interval In addition, the specimens of soil collected in the liner are "undisturbed," and the resulting laboratory analyses better depict the "in situ" condition of the soil

Locations of the ten (10) soil borings made in 1994 are plotted on the map included as Exhibit A, and copies of the boring logs are included as Exhibit C Soil specimens collected from five of the soil borings underwent a rigorous testing and analysis program in the laboratory, including determination of hydraulic conductivity The specimens from the other five borings were retained for testing in the event that anomalies were detected The report prepared by Soil and Material Engineers, dated January 30, 1995, will be retained in Design Engineering's files

It was anticipated that the continuous soil coring procedure used to make the 1994 soil borings would have difficulty achieving full depth penetration of the stiff to very stiff gray clay stratum because of the presence of many rock fragments and boulders Consequently, many of the 1994 soil borings were strategically located in close proximity to the earlier 1970 borings to permit correlation of results Very little variation in the descriptions and engineering properties of the clay soil native to the site is noted

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Site-Specific Engineering Properties of the Clay Soils

The engineering properties of soils are as varied as their chemical compositions, modes of formation, and past and present environmental settings A wide assortment of test procedures have been developed and are used to predict the engineering performance of a soil (index tests) or to measure the soil performance directly with respect to parameters of concern (e g , permeability and shear strength)

The various engineering properties of the clay soils as determined by the laboratory tests performed in 1994 are included as Exhibit D Brief descriptions of the each of the engineering properties, and the range of values measured, follow

Moisture Content A fundamental property of any soil, it is expressed as a percentage of the weight of water in a given soil mass to the weight of solid particles

Brown Silty Clay	12 % to 25 %
Gray Silty Clay	7 % to 16 %

Dry Unit Weight· The mass per unit volume, in pounds per cubic foot (pcf)

Brown Silty Clay	102 to 126 pcf
Gray Silty Clay	118 to 136 pcf

Specific Gravity The ratio of the density of the solid particles to the density of distilled water

Brown Silty Clay	2 71 to 2 75
Gray Silty Clay	2 68 to 2 78

Void Ratio· The ratio of the volume of voids to the volume of solids in a given mass of soil

Brown Silty Clay	0 34 to 0 68
Gray Silty Clay	0 24 to 0 40

Porosity The ratio of the total volume of the voids of a given mass of soil to the total volume of the soil mass, expressed as a percentage

Brown Silty Clay	25 % to 40 %
Gray Silty Clay	19 % to 28 5 %

Atterberg Limits The consistency of a cohesive soil may range from that of a viscous liquid to that of a hard solid This range of consistency is arbitrarily divided into four stages, referred to as "limits " The "Liquid Limit" is the point at which, when the moisture content is reduced below it, the clay soil ceases to behave as a liquid and begins to acquire the properties of a deformable "plastic" solid As the moisture content is reduced further, the "Plastic Limit" is the point at which the plastic clay soil ceases being deformable and enters a semi-solid state The Plasticity Index is the numerical difference between the Liquid Limit and the Plastic Limit, and represents the range of moisture within which the soil remains plastic

Brown Silty Clay	Classification "CL"	
	Liquid Limit	23 to 36
	Plasticity Index	8 to 19

Gray Silty Clay	Classification "CL"	
	Liquid Limit	20 to 32
	Plasticity Index	9 to 17

Grain Size Distribution Well-graded soils have a good representation of all particle sizes over a fairly broad size range Poorly-graded soil have an excess or deficiency of particles within a certain size range (gap-graded or skip-graded), or all the particles occur within a fairly narrow range The Brown Silty Clay and the Gray Silty Clay specimens tested at the site were found to be well-graded

Shear Strength A soil mass is a compressible matrix of solid particles and voids, partially or fully filled with moisture Both the upper stratum of brown silty clay and the lower stratum of gray silty clay exhibited very stiff to hard consistencies

Brown Silty Clay	3 0 to 4 5 kips/square foot
Gray Silty Clay	2 5 to 4 5 kips/square foot

Hydraulic Conductivity· A measure of how rapidly a permeant fluid can move through a porous soil matrix under a hydraulic gradient, also referred to as permeability Flow through clay soils has been found to obey Darcy's Law

Although the numerical value for hydraulic conductivity is often expressed in the dimensions of a velocity (cm/sec), the true dimensions are cm^3/cm^2-sec (i e volume per unit area per unit time) Darcy's Law assumes a direct proportionality between the hydraulic gradient and the flow rate

Brown Silty Clay	$2\ 2 \times 10^{-8}$ to $7\ 4 \times 10^{-8}$ cm^3/cm^2-sec
Gray Silty Clay	$1\ 3 \times 10^{-8}$ to $6\ 5 \times 10^{-8}$ cm^3/cm^2-sec

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Transit Time Analysis

Although clay soils have low hydraulic conductivity, they are nonetheless a complex matrix of permeable porous media The purpose of transit time prediction is to determine both the rate of seepage with time, and the time it will take for leachate to seep through a clay barrier, under steady-state conditions

A key assumption in making the transit time prediction is that a vertical flow regime is sufficient to describe the leachate flow This assumption is appropriate because the ratio of the width of the clay barrier to its thickness is very large

The general form of the equation which is used to describe the vertical flow of fluid through a flow domain also includes parameters to account for retardation and axial dispersion The retardation factor is dependent on the attenuation capacity of the soil medium, and must be determined experimentally The axial dispersion coefficient consists of both hydrodynamic dispersion and molecular dispersion, and is very difficult to determine Conservatively, for the transit time analysis for the natural clay barrier underlying the ash basin, a retardation factor of unity (i e no attenuation) is assumed and the effect of diffusion or dispersion is neglected (i e. solute transport is by advection only)

The steady-state Darcian velocity and flux, assuming linear potential gradient, is given by

$$v = K * [(H/D) + 1]$$

where
- v = Darcian flux (cm^3/cm^2-sec)
- K = Saturated Hydraulic Conductivity
- H = Hydrostatic Head
- D = Thickness of Clay Barrier

A migratory downward flow from the On-Site Ash Basin must overcome the "head" of the artesian water in order to reach the underlying aquifer For this analysis, "H" is taken as the difference between the water level in the basin, Elevation 610 feet, and the level of Lake Erie, Elevation 568 feet, or 42 feet This is a conservative assumption because the soil borings drilled down to bedrock prior to the construction of the ash basin recorded levels of artesian water of 5 to 20 feet above grade, and therefore higher than the level of Lake Erie

Although the basin was uniformly excavated to Elevation 562 feet, the thickness "D" of the natural clay barrier underlying the basin varies because of the variability of the bedrock surface Elevations of the bedrock surface as determined by soil test borings are presented in Exhibit E An elevation of 539 feet is selected as representative of the higher elevations of the bedrock surface underlying the site Therefore, ' D", is taken as the difference between Elevation 562 feet and Elevation 539 feet, or 23 feet

Borings made within the limits of the ash basin indicated that the gray silty clay stratum typically began at about Elevation 562 feet, the same level as the bottom of the basin Therefore, the hydraulic conductivity parameter "K" is assumed as the upper value recorded during the testing of the samples of the gray silty clay, or 6 5 x 10^{-8} cm/sec

Inserting the above parameters and solving the equation, the Darcian flux "v" is

$$v = (6\ 5 \times 10^{-8}) \times [(23/42) + 1]$$

$$= \underline{1\ 0 \times 10^{-7}\ cm^3/cm^2\text{-}sec}$$

Because the clay barrier is assumed to be saturated for its full depth, the seepage flux is assumed to be established in the basin as soon as the impoundment head was established Therefore, the time taken by the leachate to migrate downward through the natural clay barrier under steady-state conditions is given by

$$t = [(1 - \phi) \times D] / v$$

where t = Transit Time
ϕ = Porosity of Clay Barrier

The porosity of the gray silty clay varied between 19% and 28 5 % An average value of 24 % is assumed for this analysis

Therefore, the transit time for leachate to migrate downward through the natural clay barrier under steady-state conditions is

$$t = [(1 - 0\ 24) \times (42 \times 12 \times 2\ 54)] / (1\ 0 \times 10^{-7})$$

$$= 9\ 7 \times 10^{9}\ sec$$

$$= \underline{308\ years}$$

The above-described formula can be re-arranged and solved to determine the minimum thickness of a clay liner needed to inhibit the migratory flow of leachate for a certain time period For a period of 75 years, and using the above-listed values of "K", "v", "H", and "ϕ" , the following minimum thickness is determined

$$D_{min} = [75 \times (365 \times 24 \times 60 \times 60)] \times 1\ 0 \times 10^{-7} / 0\ 76$$

$$= 311\ cm$$

$$= \underline{10\ 2\ feet}$$

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U S Environmental Protection Agency, Design, Construction and Evaluation of Clay Liners for Waste Management Facilities, by NUS Corporation and Research Triangle Institute for Hazardous Waste Engineering Research Laboratory, EPA/530-SW-86-007-F, 1986

EXHIBIT A

SITE MAP

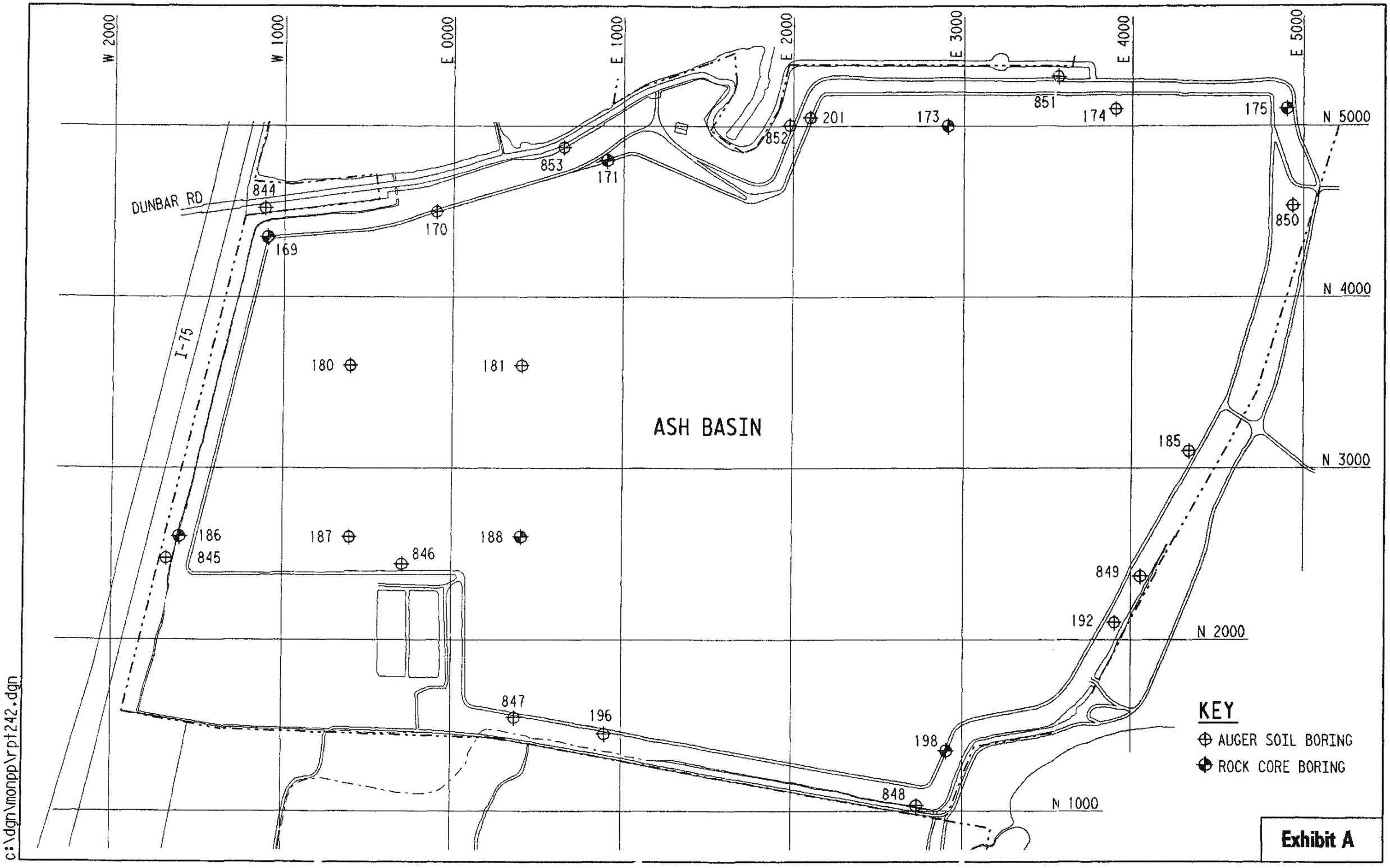
AND

SOIL BORING LOCATION PLAN

ON-SITE ASH DISPOSAL BASIN

MONROE POWER PLANT

Reports\TR242 ACE
031595 1007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KEY
AUGER SOIL BORING
ROCK CORE BORING
Exhibit A
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EXHIBIT C

1995 SOIL BORING LOGS

PREPARED BY

SOIL AND MATERIAL ENGINEERS INC

ON-SITE ASH DISPOSAL BASIN

MONROE POWER PLANT

Reports\TR242 ACE
031595 1007

soil and materials engineers, inc.

MON 844

JOB NAME: VERIFICATION OF SOIL BARRIER
JOB LOCATION: MONROE, MICHIGAN
OWNER: DETROIT EDISON

A/E:
BY SDN DATE 9/12/94
JOB NUMBER: PG22087

BORING TB1
SHEET 1

DRILLER: JH | RIG: 26

ELEVATION (FEET) | SYMBOLIC PROFILE | PROFILE DESCRIPTION | SAMPLE TYPE, NUMBER & INTERVAL

GROUND SURFACE ELEVATION = 577

575 — Silty Clay Fill-Trace Sand, Gravel and Topsoil-Brown-Hard (CL-Fill)

570 — Silty Clay-Some Sand-Trace Gravel-with Occasional Silt & Sand Seams & Layers-Mottled Brown-Hard (CL)

565

560 — Silty Clay-Some Sand-Trace Gravel-Gray-Hard (CL)

555

550 — Silty Clay-Trace Sand & Gravel-with Fine Sand Layer from 24 to 25 feet-Gray-Hard (CL)

545 — Driller reported 1.5 feet of layered Shale & Limestone

540

535

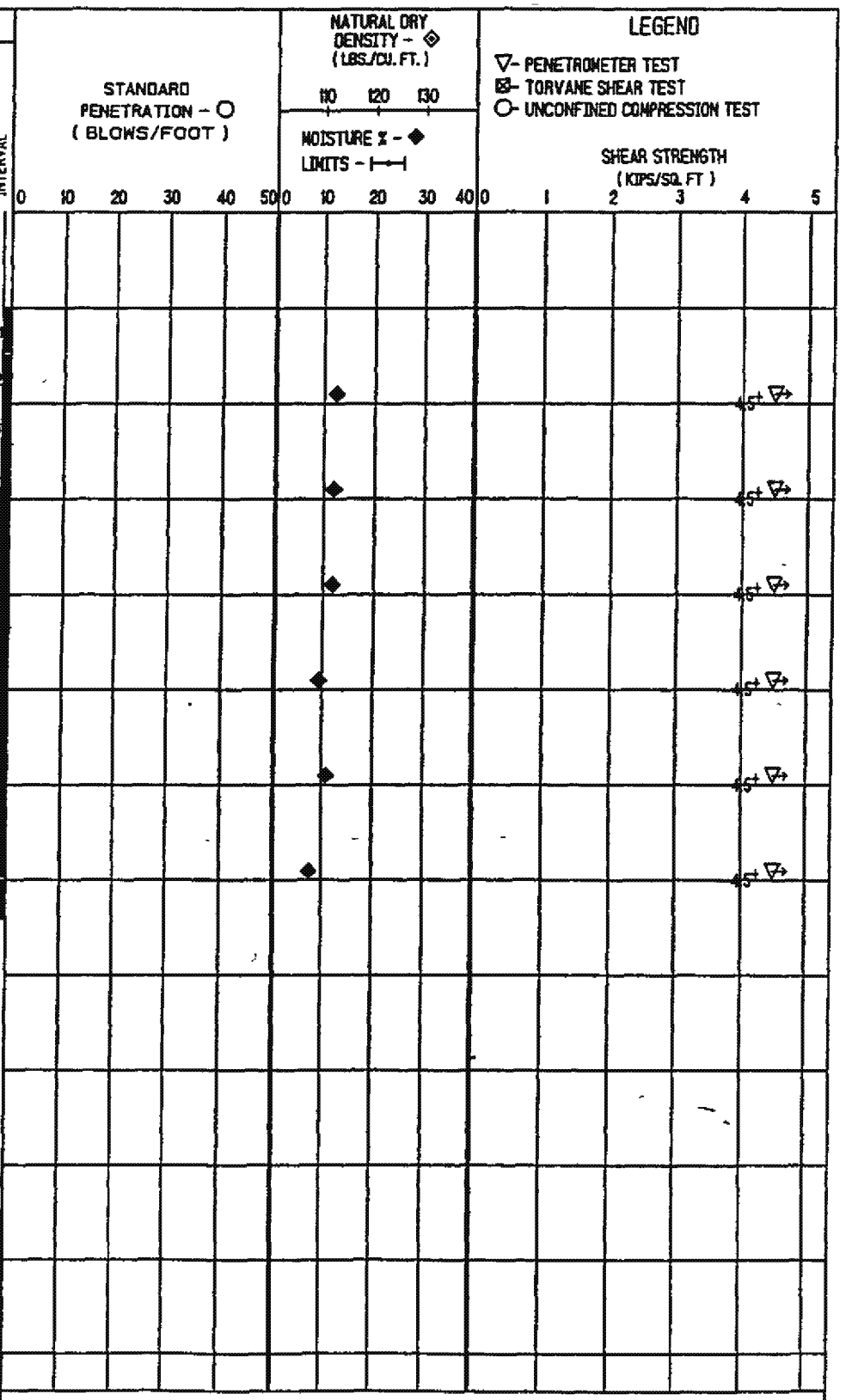
530

525

520

Notes:

1. Soil boring location 4519.60 North and -1114.24 East.
2. End of boring at 24 feet (elevation 543 feet).
3. Groundwater was not observed after completion of the drilling operations.



WATER LEVEL OBSERVATIONS

▼ GROUNDWATER ENCOUNTERED DURING DRILLING

NOTES
1. THE INDICATED STRATIFICATION LINES ARE APPROXIMATE IN SITU, THE TRANSITION BETWEEN MATERIALS MAY BE GRADUAL.
2. BORING BACKFILLED WITH NATURAL SOILS UNLESS OTHERWISE NOTED

soil and materials engineers, inc.

MON 845

JOB NAME: VERIFICATION OF SOIL BARRIER
JOB LOCATION: MONROE, MICHIGAN
OWNER: DETROIT EDISON

A/E.
BY. SDN DATE 9/20/94 BORING TB2
JOB NUMBER: PG22087 SHEET 1

DRILLER: JH RIG 28

ELEVATION (FEET) | SYMBOLIC PROFILE | PROFILE DESCRIPTION | SAMPLE TYPE, NUMBER & INTERVAL | STANDARD PENETRATION - ○ (BLOWS/FOOT) | NATURAL DRY DENSITY - ◇ (LBS/CU. FT.) | MOISTURE % - ◆ LIMITS - ⊢⊣ | SHEAR STRENGTH (KIPS/SQ. FT)

LEGEND
▽- PENETROMETER TEST
⊠- TORVANE SHEAR TEST
○- UNCONFINED COMPRESSION TEST

GROUND SURFACE ELEVATION = 578

575 — Silty Clay Fill-Trace Sand, Gravel, Topsoil and Brick Pieces- Brown-Hard to Very Stiff (CL-Fill)

570 — Silty Clay-Some Sand-Trace Gravel-Brown-Hard (CL)

565

560 — Silty Clay-Some Sand-Trace Gravel-Gray-Hard (CL)

555

550

545 — Limestone

540

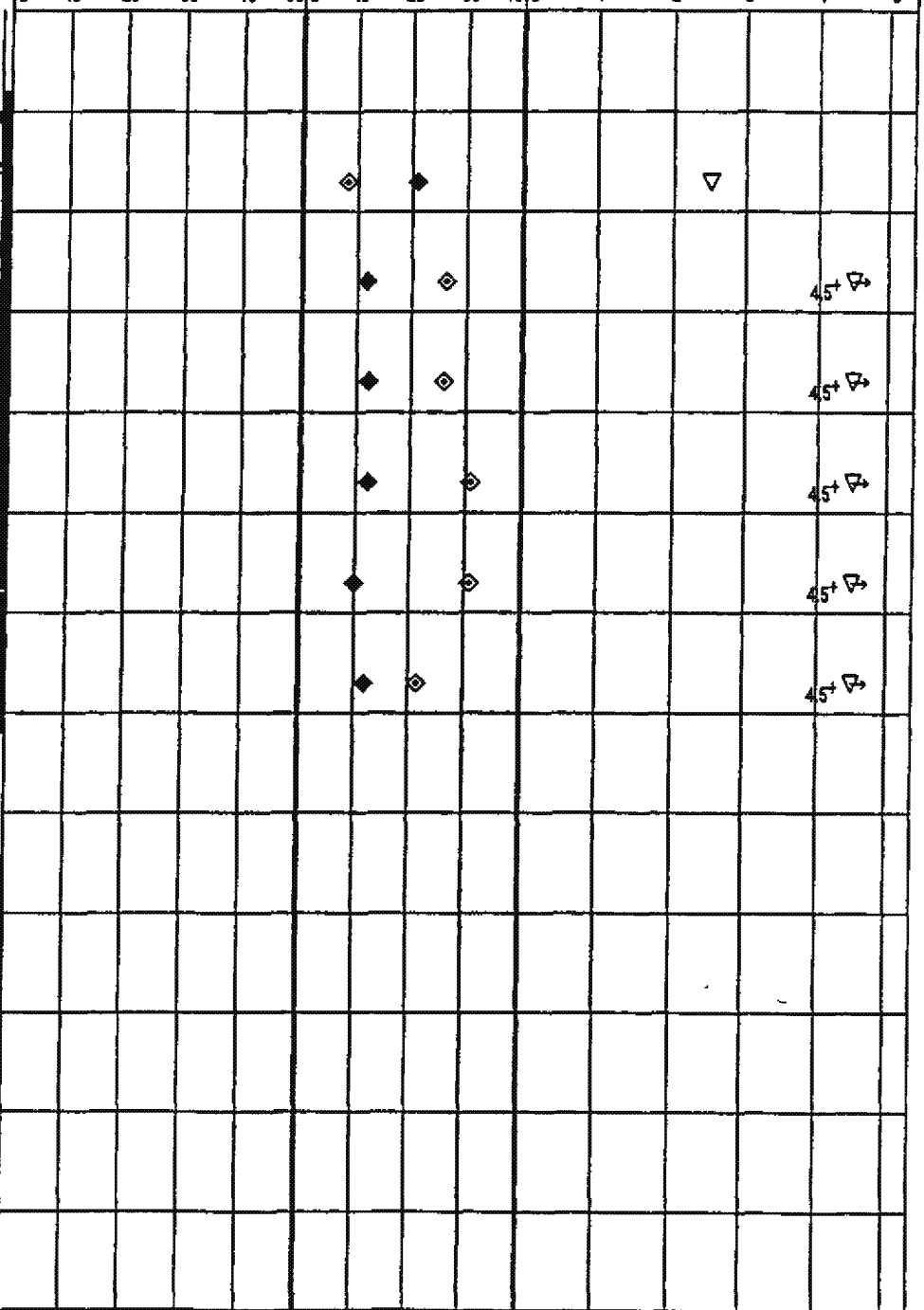
535

530

525

520

515



Notes:

1. Artesian water encountered at 32 feet (elevation 546 feet) Groundwater observed 1 foot above ground surface immediately after completion of drilling.
2. Soil boring location 2473.92 North and -1876.06 East.
3. End of boring at 33 feet (elevation 545 feet)

WATER LEVEL OBSERVATIONS

▼ GROUNDWATER ENCOUNTERED DURING DRILLING
▽ GROUNDWATER 0 HOURS AFTER DRILLING

NOTES.
1. THE INDICATED STRATIFICATION LINES ARE APPROXIMATE IN SITU, THE TRANSITION BETWEEN MATERIALS MAY BE GRADUAL.
2. BORING BACKFILLED WITH NATURAL SOILS UNLESS OTHERWISE NOTED.

soil and materials engineers, inc.

MON 846

JOB NAME: VERIFICATION OF SOIL BARRIER
JOB LOCATION: MONROE, MICHIGAN
OWNER: DETROIT EDISON

A/E:
BY: SDN DATE: 9/19/94 BORING TB3
JOB NUMBER: PG22087 SHEET 1

DRILLER: JH RIG 26

PROFILE DESCRIPTION

GROUND SURFACE ELEVATION = 602

Silty Clay Fill-Trace Sand and Gravel-Brown and Gray-Very Stiff (CL-Fill)

Silty Clay-Some Sand-Trace Gravel-Brown-Hard (CL)

Silty Clay-Some Sand-Trace Gravel-Gray-with Hardpan Layer from 48 to 50 feet-Gray-Hard (CL)

ELEVATION (FEET): 600, 595, 590, 585, 580, 575, 570, 565, 560, 555, 550, 545, 540

SAMPLE TYPE, NUMBER & INTERVAL: CS1, CS2, CS3, CS4, CS5, CS6, CS7, CS8, CS9, CS10, CS11, CS12, CS13, CS14, CS15, CS16, CS17, CS18, CS19, CS20, CS21, CS22, CS23, CS24

STANDARD PENETRATION - ○ (BLOWS/FOOT) 0 10 20 30 40 50

NATURAL DRY DENSITY - ◇ (LBS/CU FT.) 110 120 130

MOISTURE % - ◆

LIMITS - ⊢⊣

LEGEND
▽- PENETROMETER TEST
⊠- TORVANE SHEAR TEST
○- UNCONFINED COMPRESSION TEST

SHEAR STRENGTH (KIPS/SQ. FT.) 0 1 2 3 4 5

WATER LEVEL OBSERVATIONS

▼ GROUNDWATER ENCOUNTERED DURING DRILLING

NOTES: 1. THE INDICATED STRATIFICATION LINES ARE APPROXIMATE. IN SITU, THE TRANSITION BETWEEN MATERIALS MAY BE GRADUAL.

soil and materials engineers, inc.

JOB NAME: VERIFICATION OF SOIL BARRIER
JOB LOCATION: MONROE, MICHIGAN
OWNER: DETROIT EDISON

A/E:
BY: SDN DATE: 9/19/94
JOB NUMBER: PG22087

BORING TB3
SHEET 2

DRILLER: JH RIG 28

ELEVATION (FEET)	SYMBOLIC PROFILE	PROFILE DESCRIPTION	SAMPLE TYPE, NUMBER & INTERVAL
		GROUND SURFACE ELEVATION = 802	
		Weathered Limestone	CS25

Notes

1. Soil boring location 244L20 North and -29L12 East.
2. End of boring at 63 feet (elevation 539 feet)

STANDARD PENETRATION - ○ (BLOWS/FOOT): 0 10 20 30 40 50

NATURAL DRY DENSITY - ◇ (LBS./CU FT): 110 120 130

MOISTURE % - ◆

LIMITS - ⊢—⊣: 0 10 20 30 40

LEGEND
▽ - PENETROMETER TEST
⊠ - TORVANE SHEAR TEST
○ - UNCONFINED COMPRESSION TEST

SHEAR STRENGTH (KIPS/SQ. FT): 0 1 2 3 4 5

535 530 525 520 515 510 505 500 495 490 485 480 475

WATER LEVEL OBSERVATIONS

▼ GROUNDWATER ENCOUNTERED DURING DRILLING

NOTES 1. THE INDICATED STRATIFICATION LINES ARE APPROXIMATE IN SITU, THE TRANSITION BETWEEN MATERIALS MAY BE GRADUAL.

soil and materials engineers, inc.

MON 847

JOB NAME:	VERIFICATION OF SOIL BARRIER	A/E:		
JOB LOCATION:	MONROE, MICHIGAN	BY: SDN	DATE: 9/16/94	BORING TB4
OWNER:	DETROIT EDISON	JOB NUMBER:	PG22087	SHEET 1

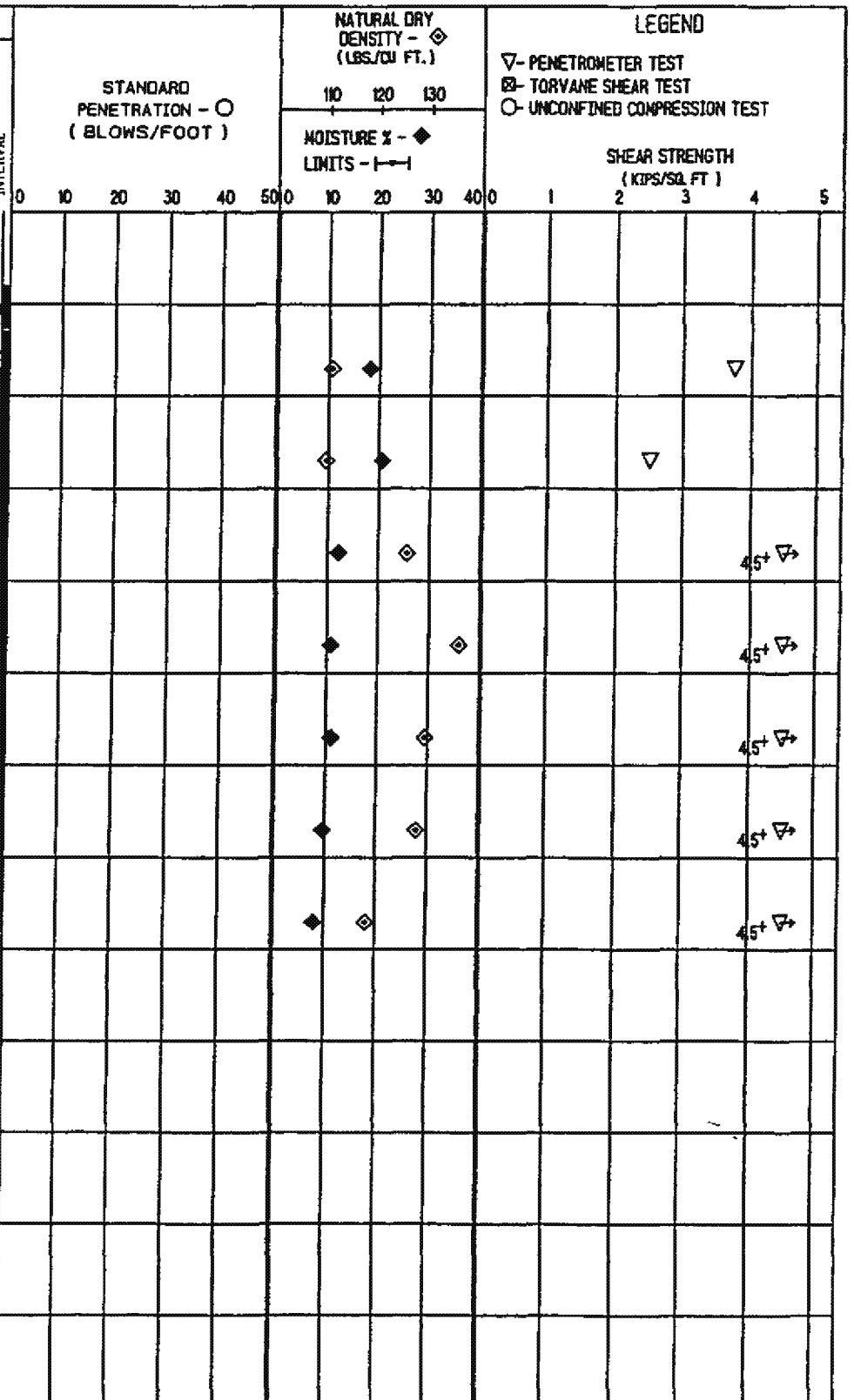
DRILLER: JH | RIG 26

GROUND SURFACE ELEVATION = 578

ELEVATION (FEET)	PROFILE DESCRIPTION	SAMPLE TYPE, NUMBER & INTERVAL
575	Silty Clay Fill-Trace to Some Sand, Trace of Gravel, Topsoil and Roots -Brown-Hard to Very Stiff (CL-Fill)	CS1, CS2, CS3, CS4
570		
565	Silty Clay-Some Sand-Trace Gravel-Mottled Brown-Hard (CL)	CS5, CS6
560	Silty Clay-Some Sand-Trace Gravel-Gray-Hard (CL)	CS7, CS8, CS9, CS10, CS11
555		
550		
545	Silty Clay-Trace to Some Sand-Trace Gravel-Gray-Hard (CL)	CS12, CS13, CS14
540	Driller reported 1 foot of Limestone	
535		
530		
525		
520		
515		

Notes:

1. Soil boring location 1544 94 North and 368 61 East.
2. Artesian water encountered at 37 feet (elevation 541 feet).
3. End of boring at 38 feet (elevation 540 feet)



WATER LEVEL OBSERVATIONS

↧ GROUNDWATER ENCOUNTERED DURING DRILLING

NOTES
1. THE INDICATED STRATIFICATION LINES ARE APPROXIMATE IN SITU, THE TRANSITION BETWEEN MATERIALS MAY BE GRADUAL.
2. BORING BACKFILLED WITH NATURAL SOILS UNLESS OTHERWISE NOTED.

soil and materials engineers, inc.

MON 848

JOB NAME: VERIFICATION OF SOIL BARRIER
JOB LOCATION: MONROE, MICHIGAN
OWNER: DETROIT EDISON

A/E
BY: SDN DATE 9/15/94
JOB NUMBER: PG22087

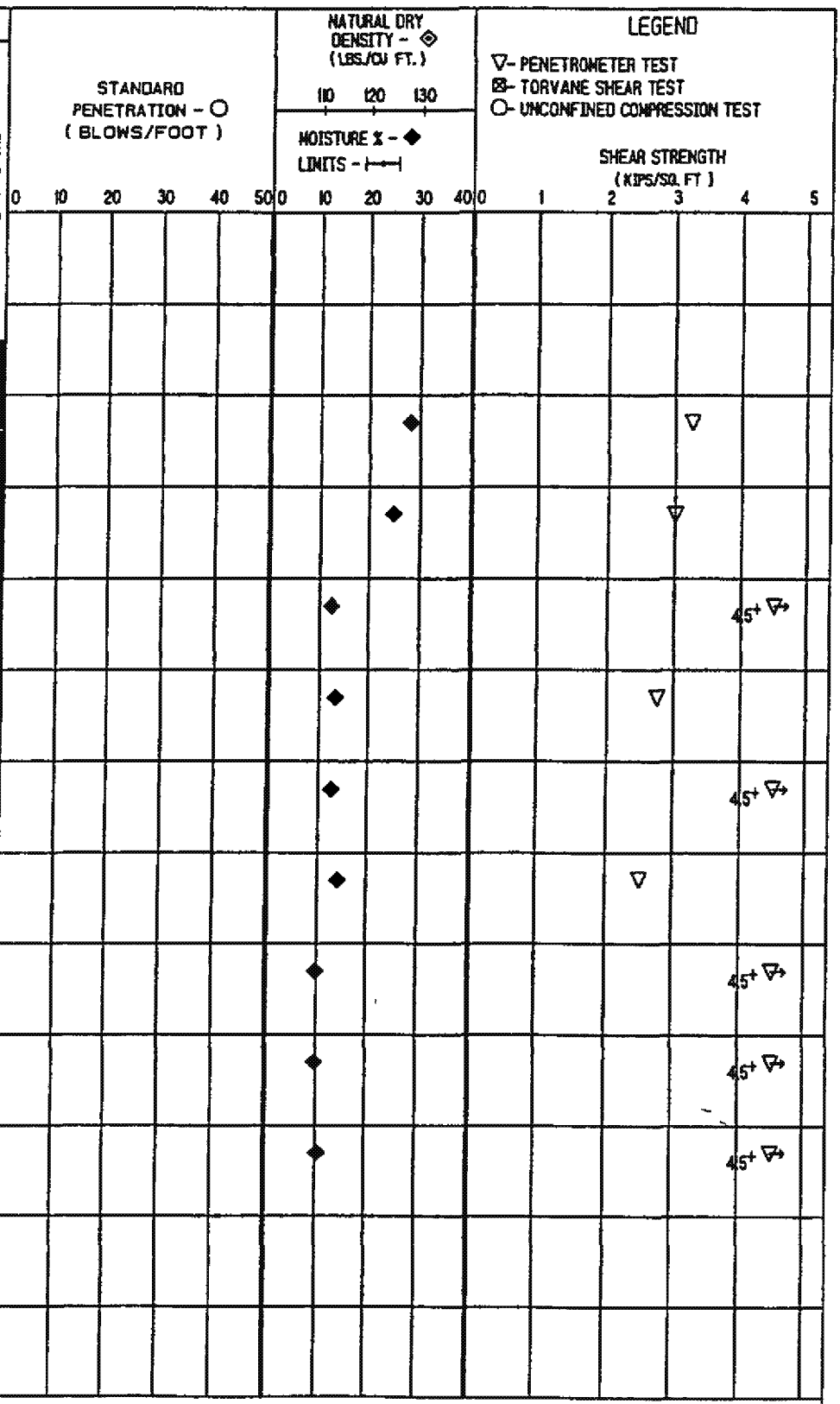
BORING TB5
SHEET 1

DRILLER JH | RIG 26

GROUND SURFACE ELEVATION = 575

ELEVATION (FEET)	PROFILE DESCRIPTION
575	Silty Clay Fill-Trace Gravel, Silt, Topsoil, Roots and Slag- Dark Gray-Very Stiff (CL-Fill)
570	
565	Silty Clay-Some Sand-Trace Gravel-Mottled Brown-Very Stiff (CL)
560	
555	Silty Clay-Some Sand-Trace Gravel-Gray-Very Stiff to Hard (CL)
550	
545	
540	
535	Silty Clay-Some Sand-Trace of Gravel-Gray-Hard (CL)
530	
	Driller reported 2.5 feet of Limestone
525	
520	
515	

SAMPLE TYPE, NUMBER & INTERVAL: CS1, CS2, CS3, CS4, CS5, CS6, CS7, CS8, CS9, CS10, CS11, CS12, CS13, CS14, CS15, CS16, CS17, CS18, CS19



Notes

1. Soil boring location 1032.95 North & 2728.92 East.
2. End of boring at 49.5 feet (elevation 525.5 feet)

WATER LEVEL OBSERVATIONS

▼ GROUNDWATER ENCOUNTERED DURING DRILLING
▼ GROUNDWATER 0 HOURS AFTER DRILLING

NOTES
1. THE INDICATED STRATIFICATION LINES ARE APPROXIMATE IN SITU, THE TRANSITION BETWEEN MATERIALS MAY BE GRADUAL.
2. BORING BACKFILLED WITH NATURAL SOILS UNLESS OTHERWISE NOTED

soil and materials engineers, inc.

MON 849

JOB NAME: VERIFICATION OF SOIL BARRIER
JOB LOCATION: MONROE, MICHIGAN
OWNER: DETROIT EDISON

A/E:
BY SDN DATE 9/14/94
JOB NUMBER: PG22087

BORING TB6
SHEET 1

DRILLER: JH | RIG 28

ELEVATION (FEET) | SYMBOLIC PROFILE | PROFILE DESCRIPTION | SAMPLE TYPE, NUMBER & INTERVAL

GROUND SURFACE ELEVATION = 587

Driller reported 1.0 feet of Bottom Ash (Fill)

Silty Clay-Some Sand-Trace Gravel-Brown-Hard (CL)

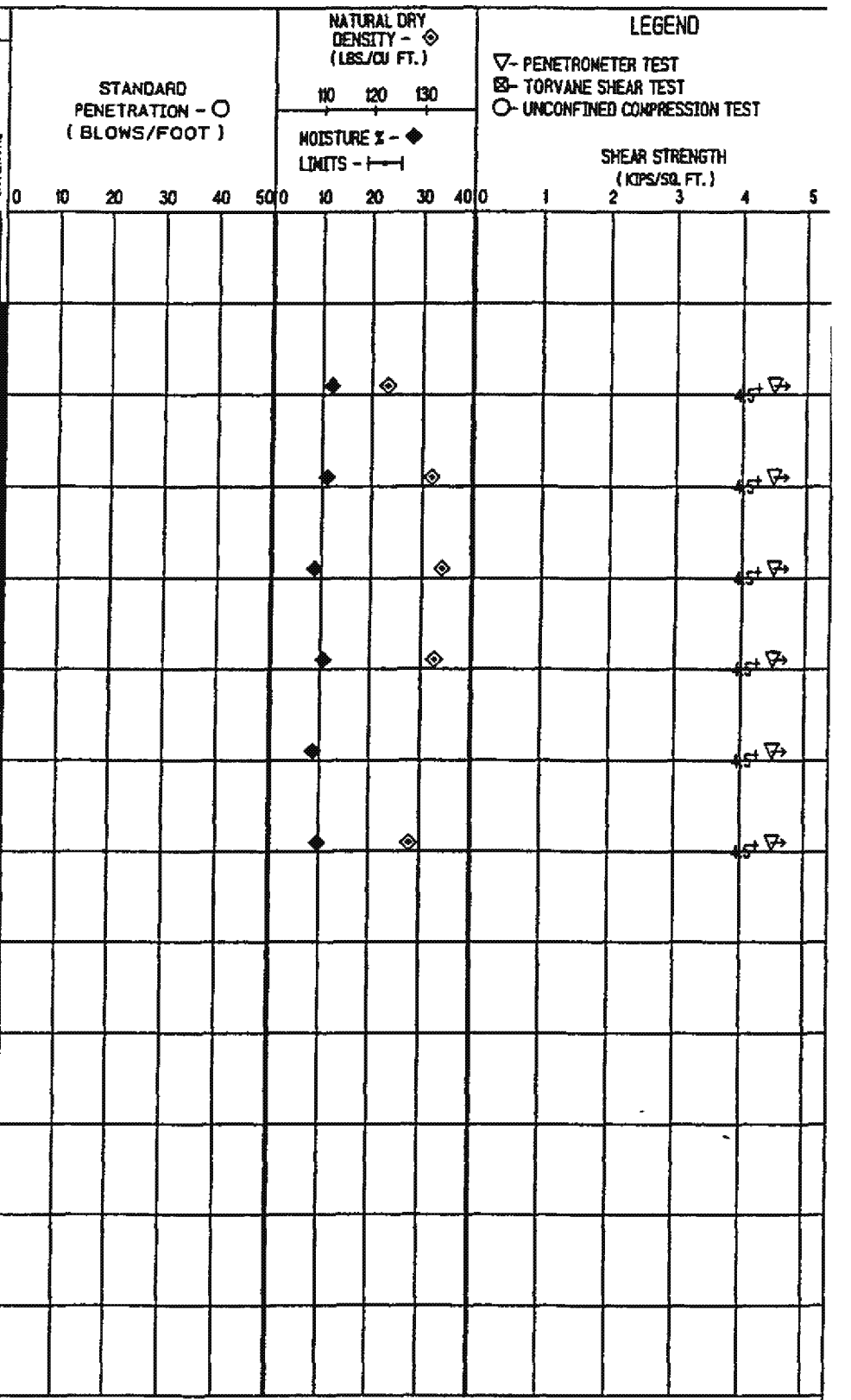
Silty Clay-Some Sand-Trace of Gravel-with Occasional Fine Sand Seams & Sand Layer from 22 to 23 feet-Gray-Hard (CL)

Silty Clay-Trace to Some Sand-Trace of Gravel-Gray-Hard (CL)

Driller reported 2 feet of Limestone

Notes.

1. Soil boring location 2389.89 North and 4053.28 East.
2. End of boring at 33 feet (elevation 534 feet).



WATER LEVEL OBSERVATIONS

GROUNDWATER ENCOUNTERED DURING DRILLING

GROUNDWATER 0 HOURS AFTER DRILLING

NOTES:
1. THE INDICATED STRATIFICATION LINES ARE APPROXIMATE IN SITU, THE TRANSITION BETWEEN MATERIALS MAY BE GRADUAL.
2. BORING BACKFILLED WITH NATURAL SOILS UNLESS OTHERWISE NOTED.

soil and materials engineers, inc.

MON 850

JOB NAME: VERIFICATION OF SOIL BARRIER
JOB LOCATION: MONROE, MICHIGAN
OWNER: DETROIT EDISON

A/E.
BY. SDN DATE. 9/13/94 BORING TB7
JOB NUMBER: PG22087 SHEET. 1

DRILLER: JH RIG: 26

ELEVATION (FEET) | SYMBOLIC PROFILE | PROFILE DESCRIPTION | SAMPLE TYPE, NUMBER & INTERVAL

GROUND SURFACE ELEVATION = 574

Driller reported 1.5 feet of Bottom Ash (Fill)

Silty Clay Fill-Trace Sand, Gravel, Topsoil & Roots-Brown-Stiff (CL-Fill)

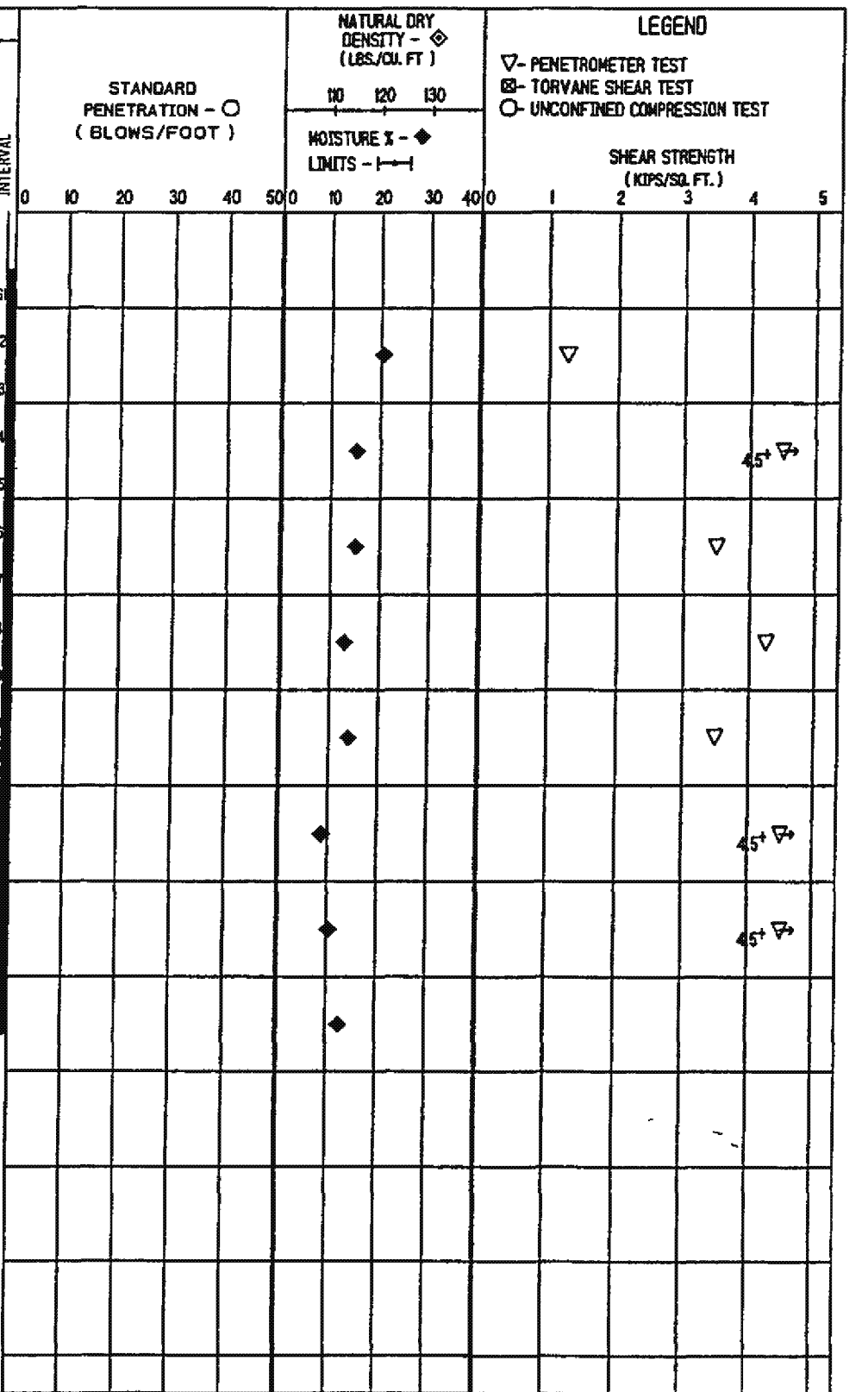
Silty Clay-Some Sand-Trace Gravel-with Occasional Seams & Layers of Sand-Mottled Brown-Hard to Very Stiff (CL)

Silty Clay-Some Sand-Trace Gravel-with Occasional Layers of Hardpan-Gray-Very Stiff to Hard (CL)

Driller reported 1 foot of fractured Shale

Notes

1. Soil boring location 4532.59 North and 4935.74 East.
2. End of boring at 42 feet (elevation 532 feet)



WATER LEVEL OBSERVATIONS

▼ GROUNDWATER ENCOUNTERED DURING DRILLING
▼ GROUNDWATER 24 HOURS AFTER DRILLING

NOTES.
1. THE INDICATED STRATIFICATION LINES ARE APPROXIMATE IN SITU, THE TRANSITION BETWEEN MATERIALS MAY BE GRADUAL.
2. BORING BACKFILLED WITH NATURAL SOILS UNLESS OTHERWISE NOTED.

soil and materials engineers, inc.

MON 851

JOB NAME: VERIFICATION OF SOIL BARRIER
JOB LOCATION: MONROE, MICHIGAN
OWNER: DETROIT EDISON

A/E:
BY LMJ/SDN DATE 9/13/94
JOB NUMBER: PG22087

BORING TB8
SHEET 1

DRILLER: JH RIG: 26

ELEVATION (FEET) | SYMBOLIC PROFILE | PROFILE DESCRIPTION | SAMPLE TYPE, NUMBER & INTERVAL

GROUND SURFACE ELEVATION = 578

575 — Silty Clay Fill-Trace Sand, Gravel and Brick-Brown-Very Stiff to Stiff (CL-Fill)

570 — Silty Clay-Trace Sand and Gravel-with Occasional Sand Seams- Mottled Brown-Hard (CL)

565

560 — Silty Clay-Some Sand-Trace of Gravel-with Occasional Sand Seams- Gray-Hard (CL)

555

550

545 — Silty Clay-Some Sand-Trace of Gravel-with Occasional Silt Layers- Gray-Hard (CL)

540

535 — Weathered Shale-with Occasional Silt & Sand Layers

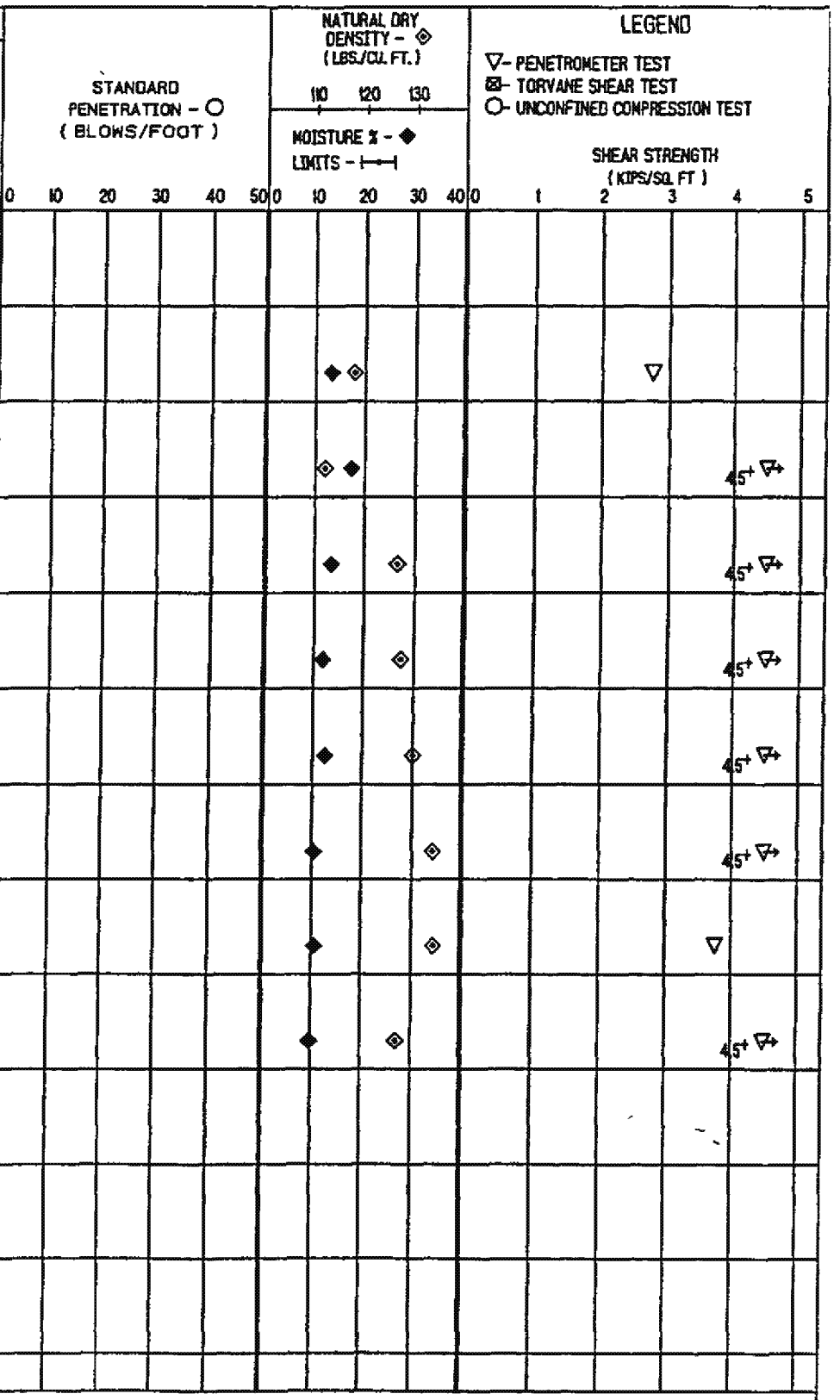
530

525

520

Notes:

1. Soil boring location 5291.48 North and 3558.45 East.
2. End of boring at 46 feet (elevation 532 feet)



WATER LEVEL OBSERVATIONS

▼ GROUNDWATER ENCOUNTERED DURING DRILLING
▼ GROUNDWATER 0 HOURS AFTER DRILLING

NOTES:
1. THE INDICATED STRATIFICATION LINES ARE APPROXIMATE IN SITU, THE TRANSITION BETWEEN MATERIALS MAY BE GRADUAL.
2. BORING BACKFILLED WITH NATURAL SOILS UNLESS OTHERWISE NOTED.

soil and materials engineers, inc.

MON 852

JOB NAME: VERIFICATION OF SOIL BARRIER
JOB LOCATION: MONROE, MICHIGAN
OWNER: DETROIT EDISON

A/E
BY SDN DATE 9/12/94
JOB NUMBER: PG22087

BORING TB9
SHEET 1

DRILLER: JH | RIG 26

ELEVATION (FEET) | SYMBOLIC PROFILE | PROFILE DESCRIPTION | SAMPLE TYPE, NUMBER & INTERVAL

GROUND SURFACE ELEVATION = 579

575 — Silty Clay Fill-Trace Sand, Gravel, Topsoil, Roots and Brick Pieces-Brown-Very Stiff (CL-Fill)

570 — Silty Clay-Some Sand-Trace Gravel-Brown-Hard (CL)

565

560 — Silty Clay-Some Sand-Trace Gravel-Gray-Hard (CL)

555 — Fine Sand-Trace to Some Silt-Trace Gravel-with Occasional Clay Layers-Gray-Wet-Medium Dense (SP)

550 — Driller reported 8 feet of Sandy Clay (Hardpan)-Trace to Some Gravel (CL)

545 — Driller reported 1.5 feet of Shale and Limestone

540

535

530

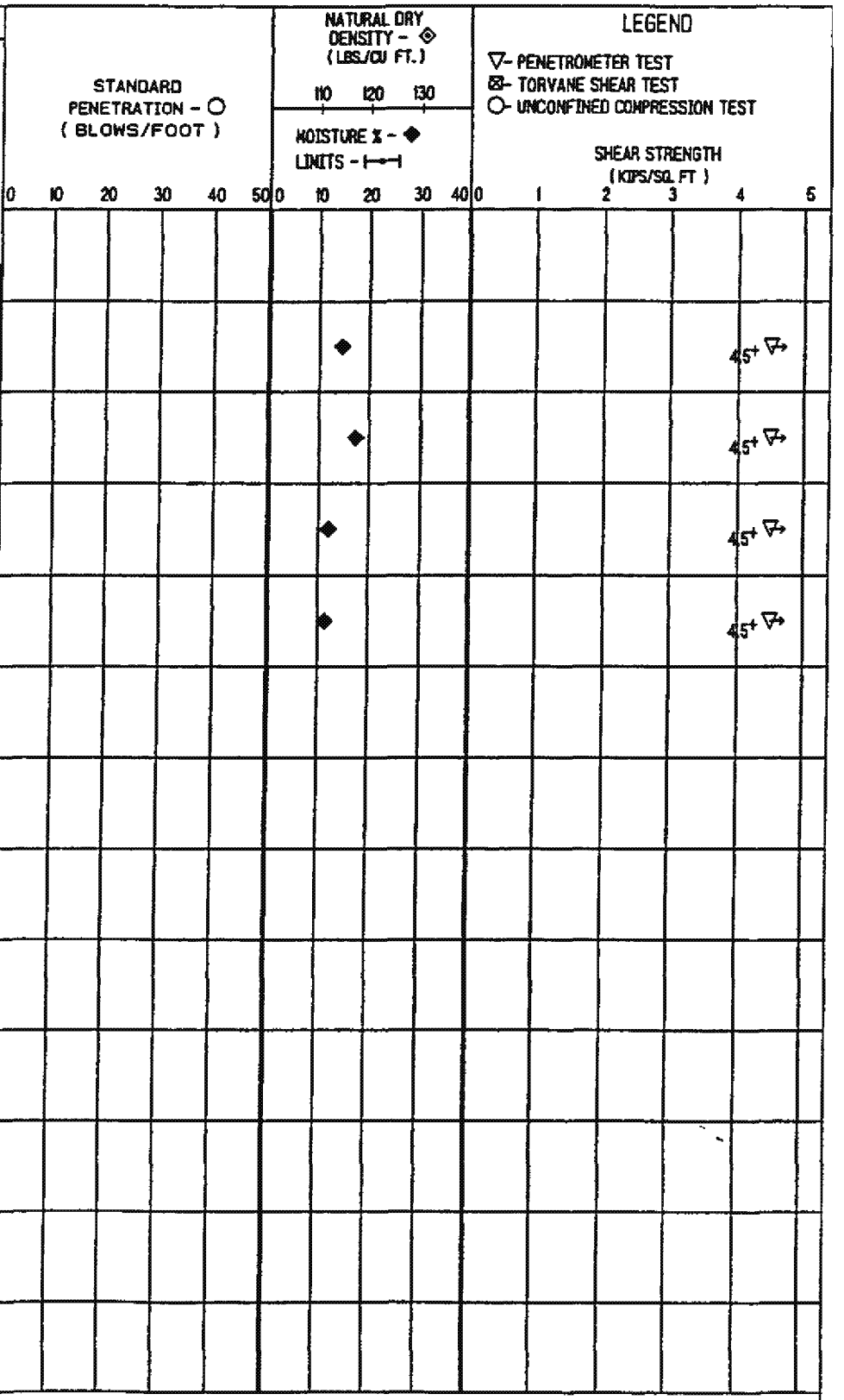
525

520

515

Notes

1. Soil boring location 5004.06 North and 1977.59 East.
2. Installed PVC well at depth of 27 ft., (elevation 552 feet), backfilled with sand to 20 ft, placed 1 foot of bentonite & grouted to surface.
3. End of boring at 35.5 feet (elevation 543.5 feet)



WATER LEVEL OBSERVATIONS

▼ GROUNDWATER ENCOUNTERED DURING DRILLING
▽ GROUNDWATER 0 HOURS AFTER DRILLING

NOTES.
1. THE INDICATED STRATIFICATION LINES ARE APPROXIMATE IN SITU, THE TRANSITION BETWEEN MATERIALS MAY BE GRADUAL.
2. BORING BACKFILLED WITH NATURAL SOILS UNLESS OTHERWISE NOTED.

soil and materials engineers, inc.

MON 853

JOB NAME: VERIFICATION OF SOIL BARRIER
JOB LOCATION: MONROE, MICHIGAN
OWNER: DETROIT EDISON

A/E:
BY: SDN DATE: 9/9/94 BORING TB10
JOB NUMBER: PG22087 SHEET 1

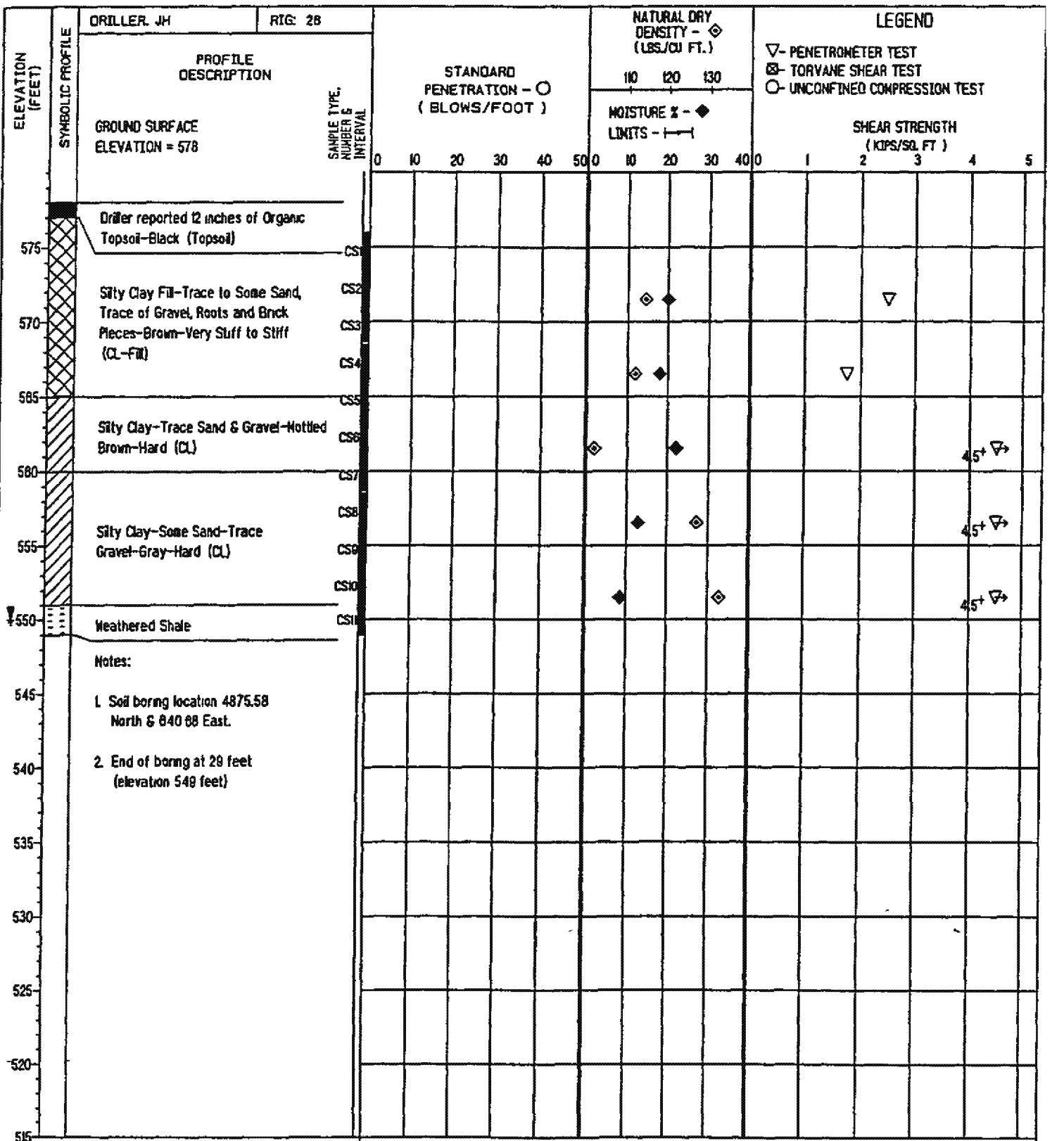
DRILLER: JH RIG: 28

GROUND SURFACE ELEVATION = 578

PROFILE DESCRIPTION	SAMPLE TYPE, NUMBER & INTERVAL
Driller reported 12 inches of Organic Topsoil-Black (Topsoil)	CS1
Silty Clay Fill-Trace to Some Sand, Trace of Gravel, Roots and Brick Pieces-Brown-Very Stiff to Stiff (CL-Fill)	CS2, CS3, CS4
Silty Clay-Trace Sand & Gravel-Mottled Brown-Hard (CL)	CS5, CS6, CS7
Silty Clay-Some Sand-Trace Gravel-Gray-Hard (CL)	CS8, CS9, CS10
Weathered Shale	CS11

Notes:

1. Soil boring location 4875.58 North & 840.68 East.
2. End of boring at 29 feet (elevation 549 feet)



WATER LEVEL OBSERVATIONS

▼ GROUNDWATER ENCOUNTERED DURING DRILLING

NOTES:
1. THE INDICATED STRATIFICATION LINES ARE APPROXIMATE IN SITU, THE TRANSITION BETWEEN MATERIALS MAY BE GRADUAL.
2. BORING BACKFILLED WITH NATURAL SOILS UNLESS OTHERWISE NOTED.

EXHIBIT D

ENGINEERING PROPERTIES OF CLAY SOILS

UNDERLYING THE

ON-SITE ASH DISPOSAL BASIN

MONROE POWER PLANT

Reports\TR242 ACE
031595 1007

LABORATORY TEST RESULTS
VERIFICATION OF NATURAL SOIL BARRIER - MONROE ASH BASIN
SME PROJECT NO. PG-22087

BORING NO.	SAMPLE NO.	DEPTH (feet)	CLASSIFICATION SYMBOL	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	SPECIFIC GRAVITY	VOID RATIO (calculated)	ATTERBERG LIMITS			PARTICLE SIZE DISTRIBUTION (%)						COEFFICIENT OF PERMEABILITY (cm/sec)
								LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	GRAVEL	COARSE SAND	MEDIUM SAND	FINE SAND	SILT	CLAY	
B2	CS2	6.5	CL	21	108	2.73	0.58	42	17	25	0	0	2	5	36	57	3.3E-08
B2	CS4	11.5	CL	12	126	2.68	0.33	23	15	8	0	0	8	18	39	35	5.8E-08
B2	CS6	16.5	CL	12	126	2.72	0.35	23	14	9	0	0	8	16	40	36	1.3E-08
B2	CS8	21.5	CL	12	127	2.72	0.34	24	13	11	0	0	8	17	38	37	1.5E-08
B2	CS10	26.5	CL	10	131	2.75	0.31	20	11	9	0	0	9	24	34	33	2.0E-08
B2	CS12	31.5	CL	12	122	2.73	0.40	32	15	17	0	0	5	9	39	47	2.0E-08
B4	CS2	6.5	CL	18	111	2.73	0.53	45	19	26	0	0	2	8	37	53	6.6E-08
B4	CS4	11.5	CL	21	109	2.73	0.56	43	17	26	0	0	3	11	36	50	2.1E-08
B4	CS6	16.5	CL	12	126	2.71	0.34	24	13	11	0	0	8	17	41	34	4.7E-08
B4	CS8	21.5	CL	11	136	2.70	0.24	23	13	10	0	0	8	18	37	37	2.1E-08
B4	CS10	26.5	CL	11	130	2.73	0.31	23	14	9	0	0	8	17	38	37	3.0E-08
B4	CS12	31.5	CL	10	128	2.71	0.32	25	14	11	0	0	4	11	44	41	1.8E-08
B4	CS14	36.5	CL	8	118	2.73	0.44	24	13	11	0	0	13	23	44	20	*
B6	CS2	6.5	CL	12	123	2.70	0.37	27	15	12	0	0	8	17	39	36	7.4E-08
B6	CS4	11.5	CL	11	132	2.72	0.29	23	13	10	0	0	8	17	39	36	1.8E-08
B6	CS6	16.5	CL	8	134	2.72	0.27	21	12	9	0	0	7	22	38	33	4.0E-08
B6	CS8	21.5	CL	11	133	2.75	0.29	21	12	9	0	0	7	21	37	35	6.5E-08
B6	CS10	26.5	CL	9	125	2.71	0.35	26	14	12	0	0	5	13	39	43	*
B6	CS12	31.5	CL	10	128	2.74	0.34	26	15	11	0	0	11	17	33	39	*
B8	CS2	6.5	CL	13	118	2.73	0.44	41	15	26	0	0	3	12	35	50	1.5E-08
B8	CS4	11.5	CL	17	112	2.73	0.52	34	17	17	0	0	7	17	38	38	2.2E-08
B8	CS6	16.5	CL	13	127	2.73	0.34	26	15	11	0	0	9	19	38	34	4.8E-08
B8	CS8	21.5	CL	12	129	2.74	0.33	24	14	10	0	0	8	17	40	35	1.6E-08
B8	CS10	26.5	CL	13	130	2.76	0.32	25	14	11	0	0	7	18	36	39	1.7E-08
B8	CS12	31.5	CL	10	134	2.73	0.27	20	11	9	0	0	10	24	41	25	4.7E-08
B8	CS14	36.5	CL	11	135	2.75	0.27	23	12	11	0	0	11	24	31	34	3.8E-08
B8	CS16	41.5	CL	10	127	2.78	0.37	23	13	10	0	0	15	19	46	20	1.9E-07

LABORATORY TEST RESULTS
VERIFICATION OF NATURAL SOIL BARRIER - MONROE ASH BASIN
SME PROJECT NO. PG-22087

BORING NO.	SAMPLE NO.	DEPTH (feet)	CLASSIFICATION SYMBOL	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	SPECIFIC GRAVITY	VOID RATIO (calculated)	ATTERBERG LIMITS			PARTICLE SIZE DISTRIBUTION (%)						COEFFICIENT OF PERMEABILITY (cm/sec)
								LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	GRAVEL	COARSE SAND	MEDIUM SAND	FINE SAND	SILT	CLAY	
B10	CS2	6.5	CL	20	114	2.72	0.49	40	15	25	0	0	3	13	35	49	3.6E-08
B10	CS4	11.5	CL	18	112	2.75	0.53	35	15	20	0	0	2	9	39	50	1.2E-08
B10	CS6	16.5	CL	22	102	2.74	0.68	36	17	19	0	0	1	2	37	60	3.3E-08
B10	CS8	21.5	CL	13	127	2.71	0.33	25	14	11	0	0	8	17	37	38	3.7E-08
B10	CS10	26.5	CL	10	133	2.74	0.29	23	14	9	0	0	7	17	39	37	1.5E-08

NOTE:
* Sample too small or disturbed to run test.

EXHIBIT E

ELEVATIONS OF TOP OF BEDROCK

ON-SITE ASH DISPOSAL BASIN

MONROE POWER PLANT

Boring Number	Elevation Recorded
MON-169	Elevation 531 0 feet
MON-171	Elevation 539 0 feet
MON-173	Elevation 529 4 feet
MON-175	Elevation 526 6 feet
MON-183	Elevation 531 2 feet
MON-185	Elevation 528 3 feet
MON-186	Elevation 524 7 feet
MON-188	Elevation 532 4 feet
MON-196	Elevation 524 9 feet
MON-198	Elevation 539 5 feet

NOTE Refer to Exhibit A for the location of the above-listed soil borings

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031595 1007

Appendix E
Documentation of Design Specifications
Documentation of Source Material and Construction Quality, Geosyntec, November 2020

DRAFT

Geosyntec consultants

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Memorandum

Date: November 5, 2020

To: Chris Scieszka, DTE Electric Company (DTE)

Copies to: Robert Lee, DTE

From: John Seymour, P.E., Omer Bozok, P.E. and Rachel Thompson, P.E., Geosyntec Consultants of Michigan (Geosyntec)

Subject: Alternate Liner Demonstration Application Support for DTE Monroe Power Plant Fly Ash Basin in Monroe, MI
Documentation of Source Material and Construction Quality

DRAFT

INTRODUCTION

This memorandum was prepared by Geosyntec Consultants of Michigan, Inc. (Geosyntec) for the DTE Electric Company (DTE) in support of the Alternate Liner Demonstration (ALD) application for the Monroe Power Plant (MONPP) Fly Ash Basin (FAB) embankment in Monroe, MI. Specifically, it provides the documentation of source material and construction quality for the engineered FAB embankment in accordance with 40 Code of Federal Regulations (CFR) §257.71(d)(1)(i)(C). Per the Rule, "*…facilities are required to provide documentation of the design specifications for any engineered liner components (e.g., manufactured geomembrane, mechanically compacted soil), as well as all data and analyses the facility relied on when determining that the materials are suitable for use and that the construction of the liner is of good quality and in line with proven and accepted engineering practices.*"

Purpose

The purpose of this memorandum is to document the original construction and restoration activities for the FAB embankment to fulfill the requirements of 40 CFR §257.71(d)(1)(i)(C) for the FAB ALD application. This memorandum demonstrates the following:

- The source material is suitable for use as a compacted low permeability liner; and

- The construction quality is good and in-line with proven and accepted engineering practices.

Site Location

The FAB is located about one mile southwest of the MONPP near Monroe, Michigan and covers an area of approximately 410 acres. The FAB perimeter is comprised of a clay fill embankment, approximately 3.5-miles long. Fly ash (ash) is sluiced from MONPP to the FAB using four, above grade, steel pipelines from the Plant to the FAB that feed into polyethylene pipes to distribute sluiced ash.

The FAB is bounded on the east by Lake Erie and the MONPP discharge canal, on the west by Interstate Highway 75 (I-75), on the south by an agricultural field, and on the north by residential property and Plum Creek. The FAB overview is provided in Figure 1.

Construction History

The embankment was constructed between 1973 and 1974 using existing onsite low plasticity clay excavated from within the FAB footprint. The embankment clay was excavated from the upper 10 ft below ground surface (bgs) such that sufficient soil material remained in-place to resist uplift pressures from existing artesian groundwater conditions (DTE, 1977). The bottom of the FAB is at approximately El. 563 ft[1].

The original embankment crest elevation is at approximately El. 615 ft and was constructed with 2 horizontal to 1 vertical (2H:1V) interior and exterior side slopes. Compacted clay was specified for the embankment as discussed in the following sections.

During the service life of the ash basin surface sloughs were observed at several locations caused by reduction of shear strength of the near surface soils (upper 2 to 3 ft bgs) from infiltration of surface water and seasonal freeze-thaw cycles. To address surficial sloughs, and to increase global factor of safety for slope stabilization, 88 percent of the perimeter embankment was flattened from approximately 2H:1V to between 2.3H:1V to 3H:1V. The extent of flattened slopes are provided in Figure 1. Geosyntec designed and provided construction quality assurance (CQA) services for construction activities at the embankment between 2009 and 2019. Figure 2 provides a cross section schematic across the FAB.

[1] Elevations in this report are referenced to the National Geodetic Vertical Datum of 1929 (NGVD29), unless otherwise noted. NGVD29 is 1.5 ft higher than the local MONPP datum.

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Regulatory Background

The FAB is regulated as an existing coal combustion residual (CCR) surface impoundment in accordance with 40 CFR § 257 published on April 17, 2015, and as amended on July 30, 2018 and October 15, 2020 (CCR Rule) and is a licensed coal ash landfill in accordance with Michigan Part 115 solid waste regulations. The embankment is an engineered structure and considered to be an engineered bottom (side portion) liner per the CCR Rule.

ORIGINAL EMBANKMENT CONSTRUCTION

Documentation of Source Material

Pre-Construction Investigation

A pre-design geotechnical investigation was performed by Soil and Foundations Associates (SAFA) of Southfield, MI between 1970 and 1971. The boring logs and laboratory test results from this investigation were reviewed by Geosyntec. In general, the overburden was measured to be 40 to 50-ft thick and generally consists of three stratigraphic units:

- Topsoil material in the upper 1 to 2 ft;
- Soft to medium stiff lean clay (approximately 10 ft thick);
- Stiff to very stiff lean clay (approximately 15-ft thick)
- Hard silty clay down to bedrock (approximately 20-ft thick).

The following laboratory tests were performed for disturbed samples collected from the pre-construction investigation:

- Moisture content;
- Determination of maximum dry unit weight and optimum moisture content using modified Proctor (ASTM D1557);
- Atterberg limits; and
- Particle size distribution.

Laboratory results from this investigation are summarized in **Table 1**.

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In general, the soils in the upper 10 ft bgs that were used to construct the embankment were classified as silty clay (CL-ML) to lean clay (CL) in accordance with the Unified Soil Classification System (USCS). The fines content (by dry weight) of the samples ranged from about 70 to 90 percent (%) with clay content (i.e., particle diameter less than 0.005 mm) of between 34% and 55%. The measured liquid limits of the samples ranged from 22 to 38 with a mean value of 29. The plasticity indices ranged from 8 to 20 with a mean value of 12.

The measured maximum dry unit weight from the modified Proctor tests ranged from about 120 to 133 pounds per cubic foot (pcf) with a mean value of 126 pcf. The optimum moisture content ranged from 9% to 13% with a mean value of 10.9%. The mean natural moisture content of the samples was 13.2%.

Construction Materials

Laboratory testing of embankment material was performed by SAFA during construction in 1973 and 1974, as conformance testing. The same suite of laboratory testing was performed as for the pre-construction investigation except that Atterberg limits and particle size were not measured for all samples. The test results are summarized in **Table 2**.

Review of Original Construction Specifications

The construction specifications for the original FAB embankment construction are included in DTE, (1977). The following requirements from the specifications indicate that the design of the embankment was prepared in accordance with generally accepted engineering principles and practice for clay embankments.

Inspection

All work for the embankment construction was specified to be performed under the inspection and to the satisfaction of DTE and/or it's designated Engineer.

Embankment Material

The material specifications for the FAB embankment clay fill were as follows:

- Maximum dry unit weight of at least 112 pcf per ASTM D1557;
- Liquid limit of 25% or greater per ASTM D4318; and
- Soil fraction finer than 0.005 mm, by dry weight, of 35% or greater.

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Materials that were unsuitable as embankment fill were specified to be removed from the excavation and embankment areas and disposed of in designated onsite areas. Unsuitable materials included marl, sand and gravel, construction debris, rubble, rubbish, organic material, vegetation, and surplus topsoil.

Subgrade Preparation

The exposed horizontal surface to be used as the embankment subgrade was specified to meet the compaction requirements for the embankment material to a depth of two (2) ft bgs. In areas where unsuitable embankment material was encountered at the proposed embankment base, the material was required to be undercut along the full width of the embankment. The areas to be undercut were delineated in the field by the Engineer as excavation proceeded.

In areas where an undercut was not performed, a foundation key was specified with a width of 16 ft and a depth as established in the field by the Engineer as excavation proceeded.

Material Placement and Compaction

The material used for embankment construction was specified to be placed in horizontal lifts with loose thicknesses between 12 and 18 inches. The Contractor was required to demonstrate that the compaction specifications would be consistently met using the selected lift thickness.

Embankment material was specified to be compacted to at least 95% of the maximum dry unit weight at a moisture content within +1% to -2% of the optimum moisture content as determined by ASTM D1557. The material was specified to be moisture conditioned, as required to meet the specification, prior to compaction. Each lift was required to be uniformly compacted prior to the placement of subsequent lifts.

The specified compaction equipment was sheepsfoot rollers, either static or vibratory, providing foot pressures of at least 700 pounds per square inch (psi). Smooth-surface compaction equipment was only allowed to seal off the fill surface from moisture.

Vegetation

Topsoil from onsite was stockpiled during excavation and reused for stabilization at the embankment crest and exterior side slopes (except in areas that received gravel roadbed). Topsoil thickness was specified to be three inches. Seed, mulch, and fertilizer were also specified in areas that received topsoil.

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Documentation of Construction Quality

Construction Observations

During construction, compaction requirements were reported to have been achieved by compacting material in 10-inch thick loose lifts using 8 passes of a "Hyster tamping foot compactor, moving 10 miles per hour," (DTE, 1977).

Marl material was encountered in some areas and was deemed unsuitable for subgrade or embankment material. Generally, where it was in juxtaposition with the embankment foundation, the marl was removed and disposed. However, thicker marl was encountered at the proposed southwest corner of the FAB embankment, and rather than excavate and replace the marl, the embankment was detoured inward and around the critical area (DTE, 1977).

Embankment Material

Investigation locations on the embankment are provided in Figure 2.

Measurements of in-situ moisture content and unit weight of the embankment material were collected in 1975 during an investigation by U.W. Stoll & Associates. Three soils borings were advanced through the embankment crest in the northwest corner of the FAB. Laboratory test results for each sample were not available for this investigation. However, a summary of the results from 10 samples was presented by DTE (1977) and indicated: (i) in-situ moisture content of the clay fill was generally between 9% and 12% with a maximum value of 14%; and (ii) dry unit weight generally ranged from 121 to 127 pcf with a minimum value of 119 pcf.

Thin-walled tube samples were collected during a 1994 investigation of the embankment performed by Soil and Materials Engineers, Inc. of Plymouth, MI (SME, 1995). A summary of these results is provided in **Table 3**. The soils were classified as lean clay (CL). The fines content (by dry weight) of the samples ranged from about 64% to 97% with clay content (i.e., particle diameter less than 0.005 mm) of between 20% and 60%. The measured liquid limits of the samples ranged from about 20 to 45 with a mean value of 28. The plasticity indices ranged from about 8 to 26 with a mean value of 14. The measured in-situ dry unit weight ranged from about 102 to 136 pcf with a mean value of 124 pcf. The in-situ moisture content ranged from 8% to 22% with a mean value of 13%.

Geosyntec performed laboratory testing of embankment materials between 2009 and 2012 (Geosyntec, 2012a). A summary of these results is provided in **Table 4**. The soils were classified as lean clay (CL). The fines content (by dry weight) of the samples ranged from about 67% to 92%

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with clay content (i.e., particle diameter less than 0.005 mm) of between 38% and 57%. The measured liquid limits of the samples ranged from about 24 to 44 with a mean value of 36. The plasticity indices ranged from about 10 to 30 with a mean value of 18. The measured in-situ dry unit weight ranged from about 103 to 123 pcf with a mean value of 117 pcf. The in-situ moisture content ranged from 8% to 25% with a mean value of 16%. In general, the lower dry unit weight and higher water content values corresponded to the sections of the embankment closer to the ground surface and is consistent with the results from SME (1995).

Geosyntec performed flexible wall permeameter testing (ASTM D5084) on an undisturbed sample collected from the embankment. Four tests were performed at effective consolidation pressures of 5 psi, 10 psi, 15 psi, and 20 psi. Measured hydraulic conductivity values ranged from approximately $2x10^{-8}$ cm/s to $6x10^{-9}$ cm/s. This is an indication that the embankment was adequately compacted.

Essentially all results indicate that the embankment meets the requirements of the construction specifications.

EMBANKMENT RESTORATION ACTIVITIES

Geosyntec designed and provided construction quality assurance (CQA) services for restoration construction activities at the exterior embankment slopes between 2009 and 2019 as described in the following sections and documented in construction completion reports for each construction season (Geosyntec, 2010-2020).

Restoration of sloughed surface soils on the slope was performed by stripping the topsoil, excavating sloughed materials, and placing new fill to flatten the slopes from about 2H:1V to between 2.3H:1V to 3H:1V.

Documentation of Source Material

Clay fill for slope flattening was sourced from the Stoneco Denniston and Newport Quarries, Aggregate Industries Dundee Quarry, and Great Lakes Aggregates, LLC (a.k.a., Sylvania Materials, LLC) South Rockwood Quarry. Samples of the materials were collected and tested for pre-qualification and specified to meet the following material requirements:

- Natural soils that are relatively homogenous and free of debris, foreign objects, rock fragments, roots, and organic material.

- Maximum particle size/diameter of 3 inches and no less than 40 percent, by weight, passing through the standard U.S. No. 200 sieve per ASTM D6913 and ASTM D7928;
- Plasticity index between 8 and 30 per ASTM D4318; and
- Classification of SC or CL material in accordance with the USCS.

Conformance sampling and laboratory testing was also performed for clay fill sources at a frequency of at least one test per 5,000 cubic yards. The results of the CQA laboratory testing indicated that the clay fill from offsite sources met the requirements of the material specifications.

Documentation of Construction Quality

CQA testing and observations from the restoration construction at the FAB embankment indicates that the clay fill materials used for slough mitigation and slope flattening met the requirements of the construction specifications. In addition, the material was reported to have been placed and compacted in substantial accordance with the construction specifications.

Clay fill was specified to be placed and compacted for slope flattening as follows:

- Place in horizontal lifts in bench fashion with a loose thickness of not more than 9 inches or compacted thickness not more than 6 inches, using approved equipment in accordance with the Contractor's work plan.
- Scarify the surface of each lift prior to the placement of subsequent clay fill lifts.
- In-place moisture content shall be -2% to +3% of optimum moisture content (-2% to +2% in 2010) as determined by ASTM D1557. The lift shall be moisture-conditioned such that uniform moisture conditions are achieved.
- Clay fill shall meet a minimum of 90% of the maximum dry unit weight (95% in 2009 through 2013) as determined from ASTM D1557.

CQA testing was performed during construction for in-situ moisture content and unit weight using nuclear methods in accordance with ASTM D6938. The testing frequency was the greater of every 200 cubic yards of material placed or at least one test per lift for each 200 lineal feet of constructed clay bench. The CQA in-situ testing indicated the clay fill met the specifications for placement and compaction on the exterior embankment slopes.

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Construction Observations

Geosyntec CQA personnel did not observe wet spots or indications of seeps below the excavated surface soils during the restoration activities that exposed approximately 88% of the surface of the embankment. This indicates that the embankment is homogenous, well compacted and without permeable features such as sand seams or higher permeability clay soils.

Construction completion reports were documented by Geosyntec (Geosyntec, 2010-2020).

SUMMARY AND CONCLUSIONS

The FAB is regulated as an existing CCR surface impoundment in accordance with the CCR Rule and the embankment is characterized as an engineered liner. Documentation of the source material and construction quality is required for submittal of an application to perform an ALD for the FAB, in accordance with 40 Code of Federal Regulations (CFR) §257.71(d)(i)(C).

The embankment materials are suitable for their intended use and the construction quality of the embankment is of good quality and in-line with proven and accepted engineering practices based upon a review of the documentation throughout the construction history and service duration of the FAB. The FAB embankment engineered liner meets the requirements of 40 CFR §257.71(d)(i)(C).

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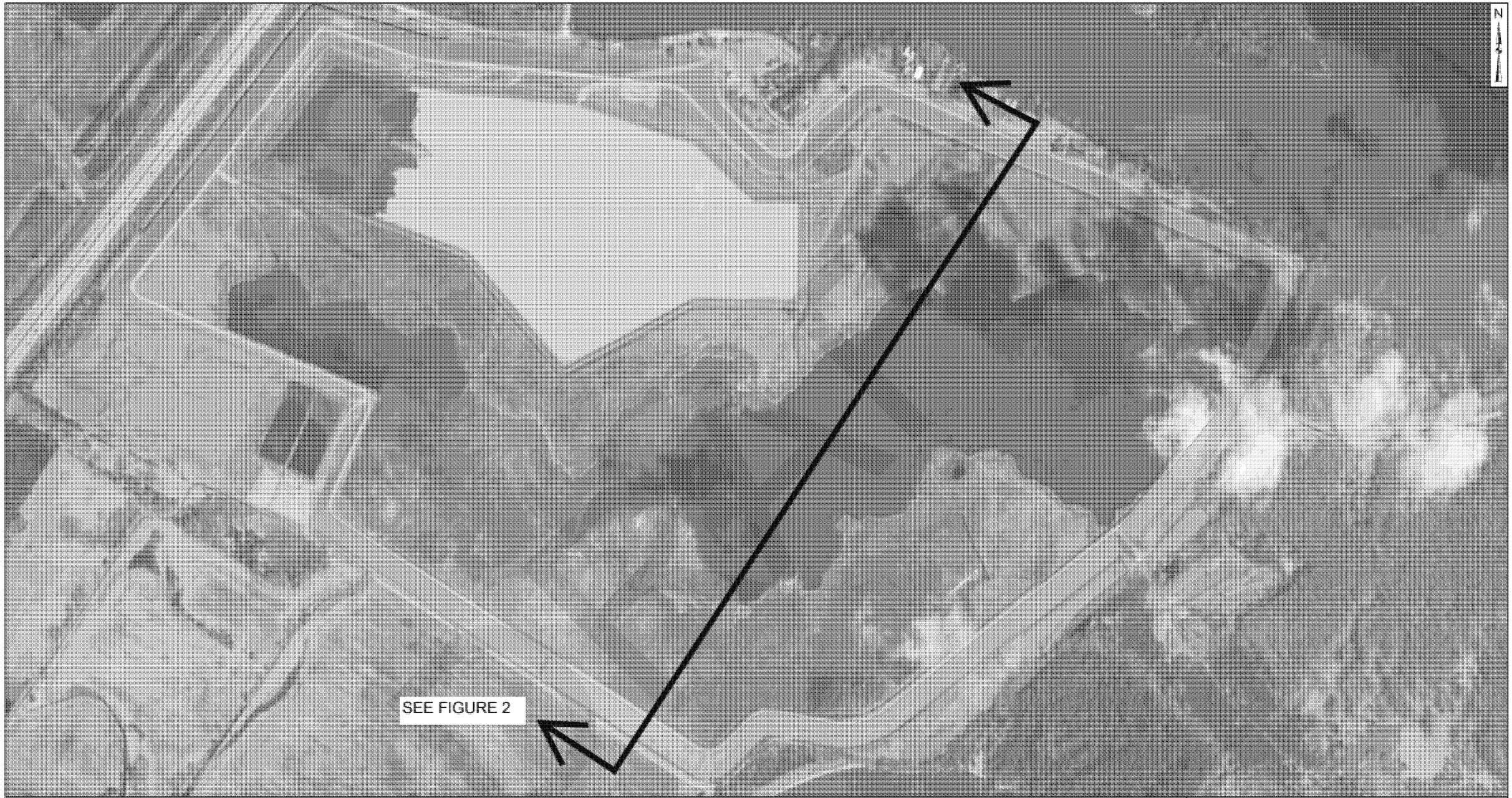


Flattened slopes

Notes:
1) Slope flattening included topsoil removal, slough removal, embankment construction with compacted clay fill, topsoil replacement and vegetation.
2) Construction completion certification reports are on file.

1,000 500 0 1,000 Feet

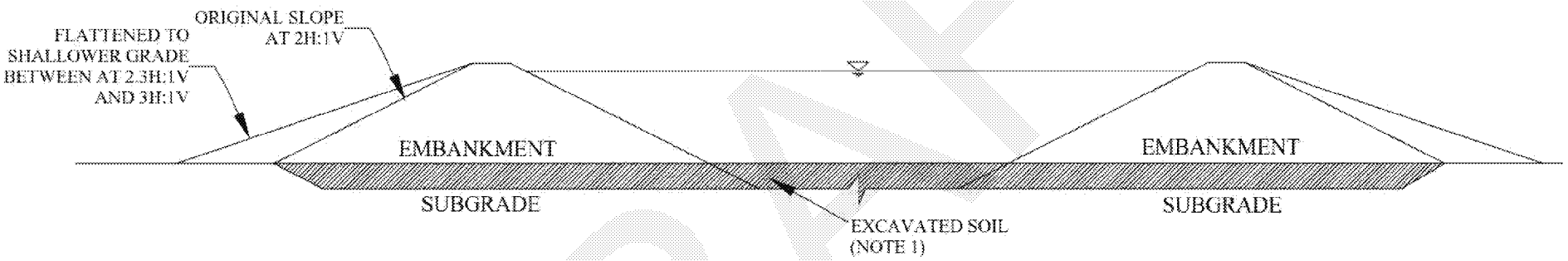
Monroe Ash Basin Overview and the Extent of Flattened Slopes

DTE Monroe Power Plant
Monroe, MI

Geosyntec consultants

Ann Arbor, Michigan | 2020/11/05

Figure 1



NOTES: 1) APPROXIMATELY 10 FT OF SOIL WAS EXCAVATED FROM THE SUBGRADE AND WAS UTILIZED FOR CONSTRUCTION OF THE EMBANKMENT.

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Monroe Ash Basin Cross Section Schematic

DTE Monroe Power Plant
Monroe, MI

Geosyntec consultants

Ann Arbor, MI | 2020/11/02

Figure 2

G:\CWP\GLP8014 - Monroe Ash Basin Beneficial Reuse and Geotech Investigation\500 - Technical\556 - CCR Rule Part B Investigation\ALD Application Support\[Figure 3.xlsx]

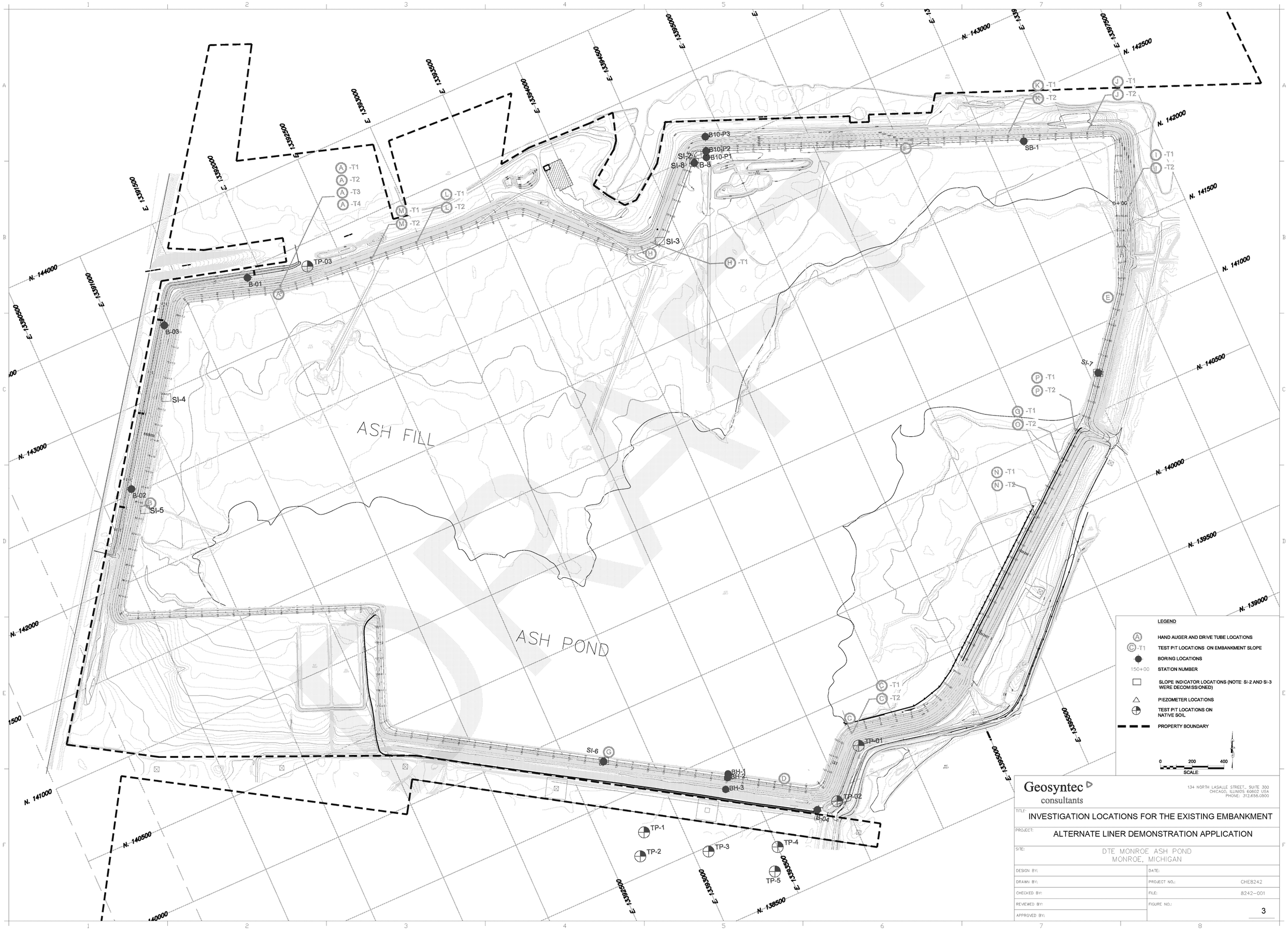
ASH FILL
ASH POND
B-01
B-02
B-03
TP-03
SI-4
SI-5
SI-3
SI-2
SI-8
B-8
B10-P3
B10-P2
B10-P1
SB-1
SI-7
SI-6
BH-1
BH-2
BH-3
TP-01
TP-02
TP-04
TP-1
TP-2
TP-3
TP-4
TP-5
0+00
N. 144000
N. 143000
N. 142500
N. 142000
N. 141500
N. 141000
N. 140500
N. 140000
N. 139500
N. 139000
N. 138500
E. 1338500
E. 1338600
E. 1338700
E. 1338800
E. 1338900
E. 1339000
E. 1339100
E. 1339200
E. 1339300
E. 1339400
E. 1339500
E. 1339600
E. 1339700
LEGEND
HAND AUGER AND DRIVE TUBE LOCATIONS
TEST PIT LOCATIONS ON EMBANKMENT SLOPE
BORING LOCATIONS
STATION NUMBER
SLOPE INDICATOR LOCATIONS (NOTE: SI-2 AND SI-3 WERE DECOMISSIONED)
PIEZOMETER LOCATIONS
TEST PIT LOCATIONS ON NATIVE SOIL
PROPERTY BOUNDARY
0 200 400
SCALE:
Geosyntec consultants
134 NORTH LASALLE STREET, SUITE 300
CHICAGO, ILLINOIS 60602 USA
PHONE: 312.658.0500
TITLE: INVESTIGATION LOCATIONS FOR THE EXISTING EMBANKMENT
PROJECT: ALTERNATE LINER DEMONSTRATION APPLICATION
SITE: DTE MONROE ASH POND
MONROE, MICHIGAN
DESIGN BY:
DATE:
DRAWN BY:
PROJECT NO.: CHE8242
CHECKED BY:
FILE: 8242-001
REVIEWED BY:
FIGURE NO.: 3
APPROVED BY:

Table 1. Pre-Construction Investigation Laboratory Test Results Summary
MONPP FAB ALD Application Support

Boring ID	Elevation, NGVD29 (ft)	Sample No.	Modified Proctor (ASTM D1557)		Natural Moisture Content, NMC (%)	Atterberg Limits			USCS Classification	Particle Size Distribution, by dry weight				
			Max. Dry Unit Weight, γ_d (pcf)	Opt. Moisture Content (%)		Liquid Limit, LL (%)	Plastic Limit, PL (%)	Plasticity Index, PI (%)		% Gravel (>4.75 mm)	% Sand (<4.75 mm; >0.075 mm)	% Silt (<0.075 mm; >0.005 mm)	% Clay (<0.005 mm)	% Fines (<0.075 mm)
TB-27	569-567	70665	122.2	12.0	12.0	30.3	18.4	11.9	CL	0	17	36	47	83
	567-563	70666	130.5	9.6	12.2	22.7	15.7	7.0	CL-ML	0	26	36	38	74
TB-46	575-569	70717	120.0	13.4	13.8	38.0	19.1	18.9	CL	0	15	30	55	85
SJ	574-570	70871	127.8	10.3	11.9	25.5	17.0	8.5	CL	1	23	38	38	76
	570-566	70872	129.4	9.8	11.3	24.8	16.1	8.7	CL	1	28	35	36	71
	563-558	70873	133.0	9.2	9.8	21.8	13.9	7.9	CL	3	28	35	34	69
SK	573-569	70874	119.8	12.4	20.2	38.2	18.1	20.1	CL	0	8	43	49	92
SL	569-566	70878	128.0	10.5	14.1	29.0	17.0	12.0	CL	1	24	37	38	75

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Table 2. Construction Material Laboratory Test Results Summary
MONPP FAB ALD Application Support

Boring ID	Depth (ft bgs)	Sample No.	Modified Proctor (ASTM D1557) Max. Dry Unit Weight, γ_d (pcf)	Modified Proctor (ASTM D1557) Opt. Moisture Content (%)	Natural Moisture Content, NMC (%)	Atterberg Limits Liquid Limit, LL (%)	Atterberg Limits Plastic Limit, PL (%)	Atterberg Limits Plasticity Index, PI (%)	Particle Size Distribution, by dry weight % Gravel (>4.75 mm)	% Sand (<4.75 mm; >0.075 mm)	% Silt (<0.075 mm; >0.005 mm)	% Clay (<0.005 mm)	% Fines (<0.075 mm)
TB C-1	1.5-4.5	73106	119.0	13.6	22.3	44.2	19.5	24.7	0	10	43	47	90
	5.5-8.5	73193	128.1	9.6	16.2	N/A			N/A				
TB C-2	5.5-8.0	73112	126.7	11.6	N/A	32.0	18.1	13.9	N/A				
TB C-3	1.3-2.5	73512	118.4	11.7	25.3	45.1	21.7	23.4	0	11	44	45	89
	3.0-4.5	73513	119.6	11.8	24.5	N/A			N/A				
TB C-4	3.0-4.5	73437	122.8	11.4	23.9	N/A			N/A				
	8.5-10.0	73439	130.9	9.1	16.6	N/A			N/A				
TB C-5	1.0-7.5	73195	120.9	13.2	20.8	N/A			N/A				
TB C-6	10.0-12.0	73119	127.4	10.5	16.8	N/A			N/A				
TB C-7	0-5.0	73134	119.6	13.1	22.0	N/A			N/A				
	6.0-10.1	73135	129.3	9.8	14.5	N/A			N/A				
TB C-26	0-2.0	73362	120.9	13.2	25.5	N/A			N/A				
	2.0-4.0	73363	119.7	12.0	26.5	N/A			N/A				
	5.0-7.0	73364	117.2	12.8	26.1	N/A			N/A				
	7.0-9.0	73365	124.8	10.8	22.1	N/A			N/A				
TB C-27	0.5-3.0	73369	119.6	12.6	25.1	N/A			N/A				
	6.0-7.0	73370	125.8	10.4	17.5	N/A			N/A				
TB C-29	5.0-6.0	73124	123.4	11.1	28.4	N/A			N/A				
TB C-30	1.5-5.5	73137	120.8	12.0	19.8	N/A			N/A				
	5.5-9.0	71378	127.0	9.3	N/A	N/A			N/A				
TB C-31	1.0-4.5	73130	122.5	10.6	20.8	N/A			N/A				
	6.5-9.0	73131	129.9	9.1	14.9	N/A			N/A				
TB C-32	6.5-9.5	73142	125.1	10.9	21.8	N/A			N/A				
TB C-33	4.0-7.0	73201	121.6	11.2	23.9	N/A			N/A				
TB C-34	1.5-4.0	73198	117.2	13.1	26.3	N/A			N/A				
	8.0-10.0	73202	128.8	9.7	18.5	N/A			N/A				
TB C-35	1.0-5.5	73827	120.3	12.0	24.5	N/A			N/A				
	6.0-8.5	73828	127.8	9.6	N/A	N/A			N/A				
TB C-36	1.5-5.0	73373	121.6	12.0	18.5	N/A			N/A				
	5.0-8.5	73374	129.4	9.6	14.0	N/A			N/A				
TB C-37	1.0-4.5	73161	119.8	12.5	16.3	N/A			N/A				
	5.0-8.0	73162	127.9	9.9	18.7	N/A			N/A				
TB C-38	5.0-10.0	73166	120.0	12.0	23.1	N/A			N/A				

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Table 2. Construction Material Laboratory Test Results Summary
MONPP FAB ALD Application Support

Boring ID	Depth (ft bgs)	Sample No.	Modified Proctor (ASTM D1557)		Natural Moisture Content, NMC (%)	Atterberg Limits			Particle Size Distribution, by dry weight				
			Max. Dry Unit Weight, γ_d (pcf)	Opt. Moisture Content (%)		Liquid Limit, LL (%)	Plastic Limit, PL (%)	Plasticity Index, PI (%)	% Gravel (>4.75 mm)	% Sand (<4.75 mm; >0.075 mm)	% Silt (<0.075 mm; >0.005 mm)	% Clay (<0.005 mm)	% Fines (<0.075 mm)
TB C-39	1.5-5.0	73168	120.0	12.8	15.3	44.5	19.1	25.4	0	12	44	44	88
	5.0-8.0	73169	124.9	10.3	16.9	N/A			N/A				
TB C-40	1.5-4.0	73174	122.9	10.6	25.1	N/A			N/A				
	8.0-15.0	73176	131.2	9.2	12.5	N/A			N/A				
TB C-41	3.0-8.0	73183	119.7	12.8	24.2	N/A			N/A				
	9.0-13.0	73184	131.0	9.2	13.3	N/A			N/A				

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Table 3. In-Situ Embankment Material Laboratory Test Results (SME, 1995)
MONPP FAB ALD Application Support

Boring ID	Sample ID	Depth (ft bgs)	USCS Classification	Natural Moisture Content, NMC (%)	Dry Density, γ_d (pcf)	Specific Gravity, Gs	Atterberg Limits			Particle Size Distribution, by dry weight				
							Liquid Limit, LL (%)	Plastic Limit, PL (%)	Plasticity Index, PI (%)	% Gravel (>4.75 mm)	% Sand (<4.75 mm; >0.075 mm)	% Silt (<0.075 mm; >0.005 mm)	% Clay (<0.005 mm)	% Fines (<0.075 mm)
B2	CS2	6.5	CL	21	108	2.73	42	17	25	0	7	36	57	93
	CS4	11.5	CL	12	126	2.68	23	15	8	0	26	39	35	74
	CS6	16.5	CL	12	126	2.72	23	14	9	0	24	40	36	76
	CS8	21.5	CL	12	127	2.72	24	13	11	0	25	38	37	75
	CS10	26.5	CL	10	131	2.75	20	11	9	0	33	34	33	67
	CS12	31.5	CL	12	122	2.73	32	15	17	0	14	39	47	86
B4	CS2	6.5	CL	18	111	2.73	45	19	26	0	10	37	53	90
	CS4	11.5	CL	21	109	2.73	43	17	26	0	14	36	50	86
	CS6	16.5	CL	12	126	2.71	24	13	11	0	25	41	34	75
	CS8	21.5	CL	11	136	2.70	23	13	10	0	26	37	37	74
	CS10	26.5	CL	11	130	2.73	23	14	9	0	25	38	37	75
	CS12	31.5	CL	10	128	2.71	25	14	11	0	15	44	41	85
	CS14	36.5	CL	8	118	2.73	24	13	11	0	36	44	20	64
B6	CS2	6.5	CL	12	123	2.70	27	15	12	0	25	39	36	75
	CS4	11.5	CL	11	132	2.72	23	10	13	0	25	39	36	75
	CS6	16.5	CL	8	134	2.72	21	12	9	0	29	38	33	71
	CS8	21.5	CL	11	133	2.75	21	12	9	0	28	37	35	72
	CS10	26.5	CL	9	125	2.71	26	14	12	0	18	39	43	82
	CS12	31.5	CL	10	128	2.74	26	15	11	0	28	33	39	72
B8	CS2	6.5	CL	13	118	2.73	41	15	26	0	15	35	50	85
	CS4	11.5	CL	17	112	2.73	34	17	17	0	24	38	38	76
	CS6	16.5	CL	13	127	2.73	26	15	11	0	28	38	34	72
	CS8	21.5	CL	12	129	2.74	24	14	10	0	28	38	34	72
	CS10	26.5	CL	13	130	2.76	25	14	11	0	25	40	35	75
	CS12	31.5	CL	10	134	2.73	20	11	9	0	34	41	25	66
	CS14	36.5	CL	11	135	2.75	23	12	11	0	35	31	34	65
	CS16	41.5	CL	10	127	2.78	23	13	10	0	34	46	20	66
B10	CS2	6.5	CL	20	114	2.72	40	15	25	0	16	35	49	84
	CS4	11.5	CL	18	112	2.75	35	15	20	0	11	39	50	89
	CS6	16.5	CL	22	102	2.74	36	17	19	0	3	37	60	97
	CS8	21.5	CL	13	127	2.71	25	14	11	0	25	37	38	75
	CS10	26.5	CL	10	133	2.74	23	14	9	0	24	39	37	76

Table 4. In-Situ Embankment Material Laboratory Test Results (Geosyntec, 2012a)
MONPP FAB ALD Application Support

	Sample ID	Location	Depth (ft bgs)	ASTM D2487	ASTM D2216	ASTM D7263 (from triaxial testing)			ASTM D422 or ASM D1140					Atterberg Limits (ASTM D4318)			
				USCS Classification	Moisture Content (%)	In-situ Dry Unit Weight (pcf)			% Gravel (>4.75 mm)	% Sand (<4.75 mm; >0.075 mm)	% Silt (<0.075 mm; >0.005 mm)	% Clay (<0.005 mm)	% Fines (<0.075 mm)	Liquid Limit, LL (%)	Plastic Limit, PL (%)	Plasticity Index, PI (%)	Liquidity Index, LI (%)
2009 Field Investigation	09-A-1	62+20	0-1		19.6	98.0											
	09-A-4	62+20	2-3	CL	19.3				3.1	16	29.9	51.0	80.9	43	19	24	0.01
	09-A-6	62+20	2-3		17.2	105.0											
	09-A-T1 & T2	62+20	0-3	CL	18.7	114.7	113.6	110.3	3.2	18			78.8	36	19	17	-0.02
	09-A-T3 & T4	62+20	3.5-6	CL	16.9	111.3	115.8	115.4	6	23.7			70.3	40	19	21	-0.10
	09-B-1	80+88	1-2		21.4	101.3											
	09-B-5	80+88	0-3	CL	16.6				3.2	25.4	33.1	38.3	71.4	30	15	15	0.11
	09-C-T2	143+66	2-4		14.9	122.5											
	09-C-3	143+66	3-4		18.6	104.7											
	09-C-5	143+66	2-3	CL	17.1				2.2	19.1	33.8	44.9	78.7	35	17	18	0.01
	09-D-6	136+5	4		19.9	101.5											
	09-E-6	176+80	2-3		18.2	107.7											
	09-F-6	17+90	2-3		17.8	104.0											
	09-G-1	126+60	0-1		15.2	106.1											
	09-G-5	126+60	0-4		14.8				7.7	23.4			68.9				
	09-H-1	37+90	1-2		22.6	97.8											
	09-H-4	37+90	0-4	CL	24.7				0.2	13			86.8	43	19	24	0.24
	09-H-5	37+90	0-4	CL	24.7				0.3	13	29.5	57.3	86.8	43	19	24	0.24
	09-H-T1	37+90	0-3	CL	14.7-22.8	120.4	103.2		4.5	26			69.5	44	21	23	
	Mix-01			CL	14.5	119.0	119.3	119.8	2.7	17.2			80.1	34	16	18	-0.08
	SB-1	10+00	13.5-17.5	CL	15.8	119.7	113.6	114.2	2.5	25			72.5	34	18	16	-0.14
2009 Slope Inclinometer Installation	SI-6	125+00	15-19	CL	15.9	118.8	116.8		1.5	20.2			78.3	33	15	18	0.05
	SI-7	172+00	15-19	CL	14.5	121.6	122.5	121.3	5.9	19.4			74.7	31	15	16	-0.03
2010 Field Investigation Study	B-03-2010 (5-6)	69+75	5-6		20.5									41	21	30	-0.03
	B-04-2010 (8-10)	138+50	8-10		13.8-14.3	124.1	121.5	121.2						30	17	13	
2010 Slope Inclinometer Installation	B-08-SS-02 & 03	31+06	8.5-10/12.5-13.5	CL	12.9-16.8				0.6	32.5	27.4	39.5	66.9	34	16	18	
	B-08-SS-08 & 09	31+06	38.5-40/43.5-45	CL	17.8-19.2				0.2	15.2	31.8	52.8	84.6	44	23	21	
	B-08-SS-10 & 11	31+06	48.5-50/53.5-55	CL	12.0-12.2				1.2	20.3	35.6	43.0	78.6	28	15	13	
2010 Piezometer Installation	B10-P1-SS-04	30+00	18.5-20	CL	15.3				1	23.5	33.7	41.8	75.5	35	19	16	-0.23
	B10-P1-SS-07	30+00	33.5-35	CL	15.3				1.6	13.5	37.4	47.5	84.9	37	20	17	-0.28
	B10-P2-SS-01	30+00	3.5-5		8.0									29	15	14	-0.50
	B10-P3-SS-01	30+00	3.5-5		19.9									41	22	19	-0.11
	B10-P3-SS-02	30+00	8.5-10	CL	20.5				0.1	9.1	41.1	49.7	90.8	40	18	22	0.11
2011 Piezometer Installation	BH-1-SS-6	133+00	23.5-25	CL	15.0				1.5	8.4	40.2	49.9	90.1	31	15	16	0.00
	BH-2-SS-5	133+00	18.5-20		12.6									30	16	14	-0.24
	BH-3-SS-15	133+00	22-23.5		12.8									24	14	10	-0.12
	BH-1-ST-2	133+00	29-31		18.4	112.1											
	BH-2-ST-2	133+00	29-31		16.3 & 20.7	114.0	110.8										
	BH-3-ST-1	133+00	23.5-25.5		11.9-16.3	126.6	118.1	113.9									
2011 Field Investigation Study	I-T1	0+00	0.5		13.1	115.6							80.2	39	20	19	-0.36
	I-T1	0+00	1.5		13.7	112.8											
	I-T1	0+00	2.5		11.4	118.5											
	I-T2	0+00	0.5		14.4	113.2											
	I-T2	0+00	1.5		15.7&15.3	115.3	115.0										
	I-T2	0+00	2.5		10.9	125.8											
	J-T1	6+00	0.5		16.7	109.6							73.7	29	17	12	-0.03
	J-T1	6+00	1.5		15.5	113.0											
	J-T1	6+00	2.5		15.5	113.3											
	J-T2	6+00	0.5		13.9	114.6											
	J-T2	6+00	1.5		14.7	111.2											

Table 4. In-Situ Embankment Material Laboratory Test Results (Geosyntec, 2012a)
MONPP FAB ALD Application Support

	Sample ID	Location	Depth (ft bgs)	ASTM D2487	ASTM D2216	ASTM D7263 (from triaxial testing)			ASTM D422 or ASM D1140					Atterberg Limits (ASTM D4318)			
				USCS Classification	Moisture Content (%)	In-situ Dry Unit Weight (pcf)			% Gravel (>4.75 mm)	% Sand (<4.75 mm; >0.075 mm)	% Silt (<0.075 mm; >0.005 mm)	% Clay (<0.005 mm)	% Fines (<0.075 mm)	Liquid Limit, LL (%)	Plastic Limit, PL (%)	Plasticity Index, PI (%)	Liquidity Index, LI (%)
2011 Field Investigation Study	J-T2	6+00	2.5		14.2	107.7							84.7	34	17	17	
	K-T1	11+00	0.5		13.5	115.2											
	K-T1	11+00	1.5		13.9	117.1											
	K-T1	11+00	2.5		16.4	109.9											
	K-T2	11+00	0.5		18.0	104.7											
	K-T2	11+00	1.5		16.5 & 13.1	113.7	111.4										
	K-T2	11+00	2.5		15.5	115.8											
	L-T1	53+00	0.5		14.4	111.4							77.1	38	16	22	-0.07
	L-T1	53+00	1.5		15.0 & 15.5	108.4	106.6										
	L-T1	53+00	2.5		15.3	105.7											
	L-T2	53+00	0.5		12.8	114.0											
	L-T2	53+00	1.5		14.9 & 16.0	107.8	104.3										
	L-T2	53+00	2.5		13.5	114.4											
	M-T1	56+00	0.5		13.0	112.0							73.6	34	18	16	-0.31
	M-T1	56+00	1.5		13.4 & 14.9	115.7	114.8										
	M-T1	56+00	2.5		18.2	108.1											
	M-T2	56+00	0.5		14.2	116.5											
	M-T2	56+00	1.5		18.4 & 17.5	107.9	108.7										
	M-T2	56+00	2.5		12.6	112.6											
	N-T1	161+75	1		16.3 & 16.0	110.1	104.9						81.3	41	20	21	-0.19
	N-T1	161+75	2		11.7	107.4											
	N-T1	161+75	3		9.4	119.5											
	N-T2	161+75	1		17.2	104.8											
	N-T2	161+75	1.5		16.9 & 16.5	106.7	107.6										
	N-T2	161+75	2		15.3	107.5											
2011 Field Investigation Study	N-T2	161+75	3		14.5	111.5											
	O-T1	165+50	1		15.3	106.4							76.5	34	15	19	0.02
	O-T1	165+50	1.5		16.5 & 17.3	105.0	103.8										
	O-T1	165+50	2		13.0	119.6											
	O-T1	165+50	3		14.4	114.1											
	O-T2	165+50	0.5		16.7	105.1											
	O-T2	165+50	1.5		18.8 & 18.6	104.0	103.5										
	O-T2	165+50	2.5		15.2	109.1											
	P-T1	167+50	1		14.6	105.9							81.2	37	19	18	-0.24
	P-T1	167+50	1.5		11.3 & 11.9	114.5	112.2										
	P-T1	167+50	2		12.4	111.5											
	P-T1	167+50	3		11.2	117.4											
	P-T2	167+50	0.5		18.8	104.7											
	P-T2	167+50	1.5		19.1 & 18.6	105.2	103.5										
	P-T2	167+50	2.5		15.8	109.5											

Message

From: Christopher P Scieszka [christopher.scieszka@dteenergy.com]
Sent: 11/6/2020 5:47:19 PM
To: Huggins, Richard [Huggins.Richard@epa.gov]; Mills, Jason [Mills.Jason@epa.gov]; Birchfield, Norman [Birchfield.Norman@epa.gov]; Long, Michelle [Long.Michelle@epa.gov]; Jackson, Mary [Jackson.Mary@epa.gov]; Celeste, Laurel [celeste.laurel@epa.gov]; Robert J Lee [robert.j.lee@dteenergy.com]; Christy D Clark [christy.clark@dteenergy.com]; Kelly M Martorano [kelly.martorano@dteenergy.com]; Buening, Vincent [VBuening@trccompanies.com]; Crockford, Graham [GCrockford@trccompanies.com]; Cratsenburg, Kelly [KCratsenburg@trccompanies.com]; John Seymour [JSeymour@Geosyntec.com]; Omer Bozok [OBozok@Geosyntec.com]; Mooney, Susan [mooney.susan@epa.gov]; Schumacher, Jessica [Schumacher.Jessica@epa.gov]
Subject: RE: Part B Discussion with DTE (1 of 3)
Attachments: BRPP BABs Part B ALD Application_DRAFT 11.06.2020.pdf; BRPP BABs DB and MONPP FAB Part B ALD Apps - Meeting Agenda 11.09.2020_DRAFT_w 11.5.2020 add.docx

All,

Please find attached the draft Alternate Liner Demonstration Application for the Belle River Power Plant Bottom Ash Basins, as well as the agenda to drive our discussion on Monday.

The draft applications for the Belle River Power Plant Diversion Basin and the Monroe Power Plant Fly Ash Basin will be sent in separate emails soon.

Regards,

_____
Chris Scieszka
Environmental Management & Safety
One Energy Plaza | 410 G.O. | Detroit, MI 48226
(O) 313-235-0153 | (C) Ex. 6 Personal Privacy (PP)
christopher.scieszka@dteenergy.com

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-----Original Appointment-----
From: Huggins, Richard <Huggins.Richard@epa.gov>
Sent: Friday, October 30, 2020 1:08 PM
To: Huggins, Richard; Mills, Jason; Birchfield, Norman; Long, Michelle; Jackson, Mary; Celeste, Laurel; Christopher P Scieszka; Robert J Lee; Christy D Clark; Kelly M Martorano; Buening, Vincent; Crockford, Graham; Cratsenburg, Kelly; John Seymour; Omer Bozok; Mooney, Susan; Schumacher, Jessica
Subject: Part B Discussion with DTE
When: Monday, November 09, 2020 11:00 AM-12:00 PM (UTC-05:00) Eastern Time (US & Canada).
Where: Microsoft Teams Meeting

one for Monroe Power Plant Fly Ash Basin, one for the Belle River Power Plant Bottom Ash Basins, and one for the Belle River Power Plant Diversion Basin

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Initial Application for an Alternate Liner Demonstration

Belle River Power Plant
Bottom Ash Basins Coal Combustion Residuals Unit

November 2020

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Appendix D Subsurface Investigation and Foundation Report, Bechtel, 1976

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Executive Summary

TRC, on behalf of DTE Electric Company (DTE Electric), has prepared this Initial Application for an Alternate Liner Demonstration pursuant to the XX, XX, 2020 Hazardous and Solid Waste Management System: Disposal of Coal Combustion Residuals From Electric Utilities; A Holistic Approach to Closure Part B: Alternate Demonstration for Unlined Surface Impoundments (40 CFR § 257.71(d)) (Part B Rule) for the Belle River Plant Bottom Ash Basins (BRPP BABs) Coal Combustion Residuals (CCR) Unit.

This application and its attachments demonstrate how DTE Electric qualifies for and should be granted the opportunity to complete and submit an Alternate Liner Demonstration per 40 CFR § 257.71(d)(1)(i) for approval as continued operation of the BRPP BABs CCR Unit would pose no reasonable probability of adverse effects to human health or the environment in the future based on the following:

- Compliance with all provisions of the Final Rule: Disposal of CCR from Electric Utilities (CCR Rule); April 15, 2015, 40 CFR part 257 subpart D, including a sufficient groundwater monitoring network under § 257.91;
- The groundwater monitoring program meets the requirements of § 257.93 and § 257.94, and per analytical data collected as part of the program, remains in detection monitoring;
- The presence of a natural geologic barrier (more than 80 feet of native clay-rich soil) that provides the equivalent, or better level of protection from potential migration of contaminants than a composite liner defined in 40 CFR § 257.70(b);
- Sufficient documentation that the unit meets all the location restrictions under § 257.60 through § 257.64, and;
- The BRPP BABs CCR Unit is not located adjacent to a surface water body.

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1.0 Regulatory Framework and Site Background

Regulatory Framework - On April 17, 2015, the U.S. EPA issued the Final Rule: Disposal of CCR from Electric Utilities (CCR Rule), 40 CFR 257, Subpart D, to regulate the disposal of CCR materials generated at coal-fired units. The rule is being administered under Subtitle D of the Resource Conservation and Recovery Act (RCRA, 42 U.S.C. § 6901 et seq.). On XXXX XX, 2020, the EPA Administrator issued revisions to the CCR Rule that required all unlined surface impoundments to initiate closure by April 11, 2021, unless an alternative deadline is requested and approved (40 CFR 257.103) or an initial application for an Alternate Liner Demonstration is prepared per 40 CFR § 257.71(d) and submitted by November 30, 2020. The April 11, 2021 deadline to cease receipt of waste and initiate closure will be tolled upon submission of a complete application, and until such time that EPA makes a final decision on the application or subsequent demonstration. The initial application for an Alternate Liner Demonstration per § 257.71(d)(1)(i) must include the location of the facility and identify the specific CCR surface impoundment(s) for which the demonstration will be made. The application must also include all the following information:

- **§ 257.71(d)(1)(i)(A)** – A certification signed by the owner or operator that the CCR Unit is in full compliance with this subpart except for § 257.71(a)(1);
- **§ 257.71(d)(1)(i)(B)** – Documentation supporting the certification required under § 257.71(d)(1)(i)(A) which includes the following:
  1. Documentation that the groundwater monitoring network meets the requirements of § 257.91. This must include documentation that the existing network of groundwater monitoring wells is sufficient to ensure detection of any groundwater contamination resulting from the impoundment, based on direction of flow, well location, screening depth and other relevant factors;
  2. Documentation that the CCR surface impoundment remains in detection monitoring pursuant to § 257.94 as a precondition for submitting an application. This includes documentation that the groundwater monitoring program meets the requirements of § 257.93 and § 257.94;
  3. Documentation that the unit meets all the location restrictions under § 257.60 through 257.64;
  4. Documentation of the most recent structural stability assessment required by § 257.73(d); and
  5. Documentation of the most recent safety factor assessment required by § 257.73(e).
- **§ 257.71(d)(1)(i)(C)** – Documentation of the design specifications for any engineered liner components, as well as all data and analyses the owner or operator of the CCR surface impoundment relied on when determining the materials are suitable for use and that the construction of the liner is of good quality and in-line with proven and accepted engineering practices;
- **§ 257.71(d)(1)(i)(D)** – Facilities with CCR surface impoundments located on properties adjacent to a water body must demonstrate that there is no reasonable probability that a complete and direct transport pathway (*i.e.*, not mediated by groundwater) can exist between the impoundment and any nearby water body; and

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- **§ 257.71(d)(1)(i)(E)** – Upon submission of the application, and any supplemental materials submitted in support of the application to the Administrator or the Participating State Director, the owner or operator must place the complete application in the facility's operating record as required by § 257.105(f)(14).

The documentation that must be provided to the EPA per § 257.71(d)(1)(i) to demonstrate that the above criteria has been met for an initial Alternate Liner Demonstration is provided within this report.

Site Background - The BRPP is located in Section 13, Township 4 North, Range 16 East at 4505 King Road, China Township in St. Clair County, Michigan (**Figure 1**). The BRPP, including the BABs, were constructed in the early 1980s.

The property has been used continuously as a coal fired power plant since the Detroit Edison Company (now DTE Electric) began power plant operations at BRPP in 1984. The BABs are designed to manage sluiced bottom ash and have been in operation since the BRPP began operation. The BABs are routinely cleaned out and CCR is either beneficially reused or disposed at the Range Road Landfill (RRLF).

The BRPP BABs are two adjacent physical sedimentation basins that are slightly raised CCR surface impoundments referred to as the North and South BABs, located north of the BRPP near the Webster Drain **(Figure 2)**. The BABs receive sluiced bottom ash and other process flow water from the power plant. Discharge water from each BAB flows over an outlet weir that gravity flows to a site storm water conveyance network of ditches and pipes, then flows into the diversion basin (DB) CCR Unit. The North and South BABs are located north of the BRPP main building and run roughly east to west approximately 420 feet long by 120 feet wide with bottom elevations of approximately 580 feet relative to the North American Vertical Datum (NAVD) 1988, with outflow weir elevations of approximately 590.25 feet relative to the NAVD 1988. The capacity of the North BAB is approximately 2.4 million gallons and the capacity of the South BAB is approximately 2.5 million gallons. The BABs are approximately 0.88 and 0.87 acres, respectively.

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2.0 Natural Clay Liner

Pursuant to Part B, in order to meet the requirements of 40 CFR § 257.71(d)(1), the owner or operator must demonstrate that, without a composite liner, the continued operation of the unit would pose no reasonable probability of adverse effects to human health or the environment. This is demonstrated when the surface impoundment has not and will not result in groundwater concentrations above the relevant GWPS at the unit boundary (health based or background, whichever is higher).

The risks posed by the continued operation of the BABs CCR Unit are mitigated by the geologic and hydrogeologic conditions at the site, and through DTE Electric's demonstrated compliance with the CCR rules. The following paragraphs document the existing site conditions, identification of potential receptors, and how potential risks have been mitigated.

Site Geology - The geology of St. Clair County consists of approximately 101 to 400 feet of glacial deposits, primarily lacustrine deposits, till, and, to a lesser extent, sand and gravel outwash, overlying a variety of bedrock surfaces[1]. The thicker glacial deposits, predominantly low permeability clay-rich deposits, are present toward the central portion of the county, including in the area of the BRPP BABs CCR Unit. These thick low permeability subsurface conditions are present on a regional basis due to continental glaciation. The *Natural Clay Liner Equivalency Evaluation Report, DTE Electric and Consumers Energy Company Six Southeast Michigan Coal Combustion Residual Units,* previously submitted to the EPA in December of 2018 also contains additional information on the natural clay liner evaluation. This report can be found here: Clay Liner Equivalency Report. Bedrock in the county includes the Michigan Formation, Marshall Sandstone, Coldwater Shale, Sunbury Shale, Berea Sandstone, Bedford Shale, and Antrim Shale.

In the vicinity of the site, the Devonian Bedford and/or Antrim Shale bedrock dips to the northwest and is generally covered by more than 100 feet of unconsolidated clay, silt, sand, and gravel. In this area, generally on the eastern side of the county, the glacial deposits are predominantly silty-clay till and lacustrine deposits with lenses of sand and gravel. Where present, unconsolidated sand and gravel deposits within the till and lacustrine deposits are generally used for water supply throughout the county. Approximately 85 percent of the water supply wells in St. Clair County are completed in the glacial deposits compared to approximately 13 percent installed in bedrock[1].

The current topography of the St. Clair area gently undulates consisting of floodplain, stream terrace, and lakeshore deposits. The St. Clair River is the major surface water body in the county and runs along the eastern boundary of the county. Regional groundwater and surface water flow would be expected to be to the east towards the St. Clair River.

The site subsurface geology is based on information from historical borings advanced during initial design of the BRPP, in addition to the soil boring data collected from around the BABs

[1] Beth A. Apple and Howard W. Reeves, 2007, Summary of Hydrogeologic Conditions by County for the State of Michigan. U.S. Geological Survey Open-File Report 2007-1236, 78 p.

during the groundwater monitoring system installation. This information documents that the BRPP BABs CCR Unit is underlain by more than 130 feet of vertically thick and laterally continuous silty-clay rich deposits, with some discontinuous sand-rich deposits encountered no shallower than 86 feet-below ground surface (feet-bgs) with the lower confining Bedford Shale generally encountered from 135 to 145 feet-bgs. However, along the southeastern portion of the BRPP BABs CCR Unit, clay-rich deposits extend to the top of the Bedford shale and no aquifer is present beneath this portion of the CCR Unit (refer to the Groundwater Monitoring Systems Summary Report (GWMS, October 2017) located on the DTE Compliance Data and Information website (BRPP GWMS) and **Figures 3 through 6**.

Site Hydrogeology – A definitive groundwater flow direction is not evident around the BABs in 15 rounds of groundwater monitoring which is likely due to:

- The fact that the screened intervals of these monitoring wells and the top of the uppermost aquifer elevation encountered within each of the BABs CCR Unit monitoring wells varies up to 46 feet vertically; and
- The degree of interconnection is limited (specifically around MW-16-02).

Therefore, given the horizontally expansive clay with substantial vertical thickness, the heterogeneity of the glacial deposits (with the top of the uppermost aquifer elevation across the BABs, where present varying up to 46 feet vertically), the no flow boundary where no sand or gravel is present in the southeastern portion of the BABs CCR Unit area, and the lack of hydraulic interconnectedness of the uppermost aquifer encountered at the BABs in some areas, it is not appropriate to infer horizontal flow direction or gradients across the BABs CCR Unit. The GWMS report (BRPP GWMS) contains additional details related to the site hydrogeology.

Hydraulic conductivities measured within the CCR monitoring wells set within the upper portion of the uppermost aquifer across BRPP were evaluated using single well hydraulic conductivity tests (e.g., slug tests) performed in 2016. The calculated hydraulic conductivity of the uppermost aquifer is approximately 0.5 feet/day in the BABs CCR Unit area. This low hydraulic conductivity further demonstrates the low groundwater yield potential across the conservatively interpreted, potential uppermost aquifer encountered at the site. A definitive horizontal flow direction in the BABs CCR Unit area is not present; therefore, it is not appropriate to estimate the horizontal time of travel. Because there is no clear flow direction, inter-well statistical tests are inappropriate for detection monitoring of this basin.

For further discussion on the site groundwater flow, see **Appendix A** for the 2019 Annual Groundwater Monitoring Report (GWMR). The 2018 and 2017 GWMR reports can be located on the DTE CCR Compliance Data and Information website (BRPP 2018 GWMR and BRPP 2017 GWMR). Refer to **Figures 7 and 8** for the most recent potentiometric surface maps.

Vertical Flow Potential to Uppermost Aquifer – As stated previously, the BRPP is a natural silty-clay site, and the presence of the natural clay liner has been verified by numerous historical soil borings and confirmed by the twelve soil borings installed as part of the CCR monitoring well installation program at the BABs and DB CCR Units. Therefore, the geology and hydrogeology of the site provides a very high level of environmental protection of the uppermost

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aquifer. Based on the site geology and hydrogeology, there is no reasonable probability for the impoundments to have adverse effects to the off-site uppermost aquifer groundwater, human health or the environment given the relatively short duration of continued operation. Groundwater occurring in the deep confined uppermost aquifer is protected from CCR constituents in the BABs by a clay-rich aquitard with low hydraulic conductivity that is 82 or more feet thick from the bottom of the BABs. Using the hydrogeologic information for the site, the time of travel for water from the base-grade elevation of the BABs down to the uppermost aquifer can be calculated using the following formula:

$$V = Ki/Ne$$

Where:

V = Velocity (feet/day)

K = Hydraulic Conductivity (3×10^{-8} cm/s based on high end silty clay-rich data)

i = Downward Vertical Gradient (conservatively assumed to be one foot/foot)

Ne = Effective Porosity (0.5 for clay-rich soil)

From the above formula, the maximum downward flow velocity through the silty-clay confining unit to the uppermost aquifer is 6×10^{-8} cm/sec, or 0.063 feet/year. Therefore, the time of travel for liquid from the base of the BABs through 82 feet of silty-clay (thinnest potential section of silty-clay confining unit above the uppermost aquifer at the base of the BABs CCR Unit) to the uppermost aquifer is approximately 1,300 years. Therefore, given that BRPP operations began in 1984, and the fact that DTE Electric has publicly announced that it plans to cease operations at the BRPP by 2030 (refer to the 2019 Integrated Resource Plan (IRP) presented to and approved by the Michigan Public Service Commission (IRP)), there is no potential for the uppermost aquifer CCR groundwater monitoring system wells to be affected by the BRPP CCR BABs Unit. Therefore, the natural clay-rich soil liner underlying the BABs CCR Unit consists of thick, low hydraulic conductivity clay, that provides the same, or better level of protection from potential migration of contaminants than the composite liner defined in 40 CFR § 257.70(b).

Groundwater Use - Water supply wells are present within the sand and/or gravel rich aquifer units within the lacustrine unconsolidated sediments at depths of around 100 feet-bgs within between one-half and one mile to the west and southwest of the BRPP. There is no on-site use of groundwater at the BRPP. Surface water bodies present in the area of the BRPP include the Belle River (as close as 2,000 feet southwest and south of BRPP) and the St. Clair River (as close as one mile to the east of BRPP).

Detection Monitoring - A groundwater monitoring system has been established for the BRPP BABs CCR Unit (BRPP GWMS). The detection monitoring well network for the BABs CCR Unit currently consists of five monitoring wells that are screened in the uppermost aquifer. The monitoring well locations are shown on Figure 2. Detection monitoring at the monitoring well system has been completed since 2017 in accordance with § 257.93 and § 257.94 with compliance as required in § 257.71(d)(1)(i)(B)(2) being documented in the 2017, 2018 and 2019

Annual Reports prepared in accordance with § 257.90. See Appendix A for the 2019 GWMR, and the DTE website for the 2018 and 2017 GWMRs (BRPP 2018 GWMR and BRPP 2017 GWMR).

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3.0 Facility Compliance

DTE Electric has a public repository of documents in accordance with 40 CFR § 257.107 which can be found here: DTE CCR Compliance Data and Information. This repository demonstrates that the BRPP facility is in compliance with all record keeping, notification and internet posting requirements as required by 40 CFR 257 Subpart D. DTE Electric audited their records to identify any gaps in compliance and none were noted. As required by § 257.71(d)(1)(i)(A), a certification signed by the owner or operator that the BRPP BABs CCR Unit is in full compliance with this subpart, except for § 257.71(a)(1), has been included as **Appendix B**. A summary of the key compliance metrics for the BRPP BABs is discussed below.

Groundwater Monitoring System § 257.71(d)(1)(i)(B)(1) – In accordance with 40 CFR § 257.91, a P.E. certified groundwater monitoring system is established for the BRPP BABs CCR Unit (BRPP GWMS). The monitoring well network for the BABs CCR Unit currently consists of five monitoring wells that are screened in the uppermost aquifer and are sufficient to ensure detection of groundwater contamination resulting from the BABs CCR Unit. Given the presence of the thick natural clay-rich liner hydraulic barrier as discussed in Section 2 and the relatively small foot print of the BABs, the perimeter groundwater monitoring well network is appropriate to monitor the BRPP BABs CCR Unit. The monitoring well locations are shown on **Figure 2**. It should be noted that the uppermost aquifer is not present in the southeastern portion of the BABs CCR Unit. Well Construction and Soil Boring Logs for the monitoring network are attached as **Appendix C**.

Groundwater elevation data collected during the 2019 sampling events show that groundwater flow conditions within the uppermost aquifer are consistent with previous monitoring events. Groundwater potentiometric elevation summary maps are shown on **Figure 7 and Figure 8**, respectively. Additional figures for 2017 and 2018 can be found on the DTE website located here: BRPP 2018 GWMR and BRPP 2017 GWMR. There is a horizontally extensive clay with substantial vertical thickness of greater than 80 feet that isolates the uppermost aquifer from the BRPP BABs CCR Unit (refer to **Figures 3through 6** for geologic cross sections).

Detection Monitoring and Groundwater Statistical Analysis § 257.71(d)(1)(i)(B)(2) – The groundwater conditions have been consistent through all monitoring events completed since 2017. This continues to demonstrate that the downgradient wells are appropriately positioned to detect the presence of Appendix III parameters that could potentially migrate from the BRPP BABs CCR Unit. This additionally demonstrates the unit has been in compliance with detection monitoring performed in accordance with § 257.94 as required in § 257.71(d)(1)(i)(B)(2). This is documented in the 2017 through 2019 Annual Reports prepared as required by 40 CFR § 257.90. The 2019 GWMR is attached as **Appendix A**, 2018 and 2017 GWMRs can be found on the DTE website located here: BRPP 2018 GWMR and BRPP 2017 GWMR.

Since establishment of the groundwater monitoring system, DTE Electric performs groundwater sampling semi-annually in accordance with the Groundwater Statistical Evaluation Plan (SEP, October 2017) located on the DTE website here: BRPP SEP.

Statistical evaluation of groundwater data is completed each time samples are collected in accordance with 40 CFR § 257.93. Statistical methods for the BABs CCR Unit were selected based on the geology and hydrogeology at the Site (primarily the presence of clay/hydraulic barrier, the relatively small footprint of the BABs, and the low vertical and horizontal groundwater flow velocity), in addition to other supporting lines of evidence that the aquifer is unaffected by the CCR Unit (such as the consistency in concentrations of water quality data). Refer to the SEP (October 2017) located on the DTE website here: BRPP SEP, for further details on the statistical analysis and the 2019 GWMR attached as **Appendix A** for a summary of groundwater monitoring data and statistical analysis completed at each monitoring location. The 2018 and 2017 GWMRs are located on the DTE website here: BRPP 2018 GWMR and BRPP 2017 GWMR.

Location Standards § 257.71(d)(1)(i)(B)(3) – The BRPP BABs CCR Unit is compliant with the location restrictions of 40 CFR § 257.60-64. The location restriction certification report (LR, October 2018) is available on the DTE website here: BRPP LR.

Structural Stability and Safety Factor Assessments § 257.71(d)(1)(i)(B)(4 and 5) - Structural stability assessment and safety factor assessments, as required per 40 CFR §257.103 (f)(2)(v)(C)(7) and (8), are not required for the BRPP BABs surface impoundments and have therefore not been included with this submittal.

Documentation of Design Specifications § 257.71(d)(1)(i)(C) – As the BRPP BABs rely on the natural clay liner, a design for the liner was not performed. However, prior to the construction of BRPP, a significant geotechnical investigation demonstrated extensive clay deposits across the entire BRPP site as documented in a 1976 *Subsurface Investigation and Foundation Report* by Bechtel. The Bechtel report included an evaluation of the native clay soils that were used in construction of the BRPP BABs CCR Unit surface impoundments, which are incised into the natural clay liner. The evaluation included soil hydraulic conductivity testing showing the native clay soil has a hydraulic conductivity of around 2×10^{-8} cm/s. The 1976 Bechtel report is provided in **Appendix D**.

Facilities with CCR surface impoundments located on properties adjacent to a water body § 257.71(d)(1)(i)(D) – The BRPP BABs CCR Unit is not located adjacent to a surface water body.

Alternate Liner Application Placed in the Operating Record - § 257.71(d)(1)(i)(E) - This alternate liner demonstration application and supplemental materials submitted in this application have been placed in the facility's operating record as required by § 257.105(f)(14).

4.0 Conclusions

This document demonstrates how the BRPP BAB CCR Unit meets the provisions of the initial application for an alternate liner demonstration by:

- Demonstrating continued compliance with the CCR Rule for all record keeping, notification and internet posting requirements. In addition, detection monitoring is completed at the established groundwater monitoring network as required by 40 CFR § 257.93 and § 257.94 and annual reporting as required by 40 CFR § 257.90 documents compliance with the detection monitoring program;
- Demonstrating the presence of a natural geologic barrier underlying the BRPP BABs CCR Unit, that consists of a thick (> 80 feet), low hydraulic conductivity clay, that provides the same, or better level of protection from potential migration of contaminants than the composite liner defined in 40 CFR § 257.70(b);
- Demonstrating that the BRPP BABs CCR Unit is compliant with the location restrictions of 40 CFR § 257.60-64 and that the structural stability and safety factor assessments as required per 40 CFR § 257.103 (f)(2)(v)(C)(7) and (8) are not required;
- Including the BRPP BABs impoundment natural clay liner soil assessment performed prior to construction of the BABs surface impoundments;
- Documenting the BRPP BABs are not located adjacent to a surface water body; and
- Placing this alternate liner demonstration application and supplemental materials submitted in this application in the facility's operating record as required by § 257.105(f)(14).

Therefore, it is requested that the EPA approve DTE Electric's initial application to complete an alternate liner demonstration prepared per 40 CFR § 257.71(d)(i) for the BRPP BABs CCR Unit.

DRAFT

5.0 References

DTE Electric Company website: DTE CCR Compliance Data and Information

TRC Environmental Corporation. January 2020. 2019 Annual Groundwater Monitoring Report - DTE Electric Company Belle River Power Plant Bottom Ash Basins, 4505 King Road, China Township, Michigan 48054 (BRPP 2019 GWMR).

TRC Environmental Corporation. January 2019. 2018 Annual Groundwater Monitoring Report - DTE Electric Company Belle River Power Plant Bottom Ash Basins, 4505 King Road, China Township, Michigan 48054 (BRPP 2018 GWMR).

TRC Environmental Corporation. January 2018. 2017 Annual Groundwater Monitoring Report - DTE Electric Company Belle River Power Plant Bottom Ash Basins, 4505 King Road, China Township, Michigan 48054 (BRPP 2017 GWMR).

TRC Environmental Corporation. October 2017. Groundwater Monitoring Systems Summary Report - DTE Electric Company Belle River Power Plant Bottom Ash Basins, 4505 King Road, China Township, Michigan 48054 (BRPP GWMS).

TRC Environmental Corporation. October 2017. Groundwater Statistical Evaluation Plan - DTE Electric Company Belle River Power Plant Bottom Ash Basins, 4505 King Road, China Township, Michigan 48054 (BRPP SEP).

TRC Environmental Corporation. October 2018. Location Restrictions Demonstrations - DTE Electric Company Belle River Power Plant Bottom Ash Basins, 4505 King Road, China Township, Michigan 48054 (BRPP LR).

TRC Environmental Corporation. December 2018. Natural Clay Liner Equivalency Evaluation Report, DTE Electric and Consumers Energy Company Six Southeast Michigan Coal Combustion Residual Units (Clay Liner Equivalency Report).

Bechtel. August 1976. Subsurface Investigation and Foundation Report – The Detroit Edison Company, Belle River Units 1 & 2.

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Figures

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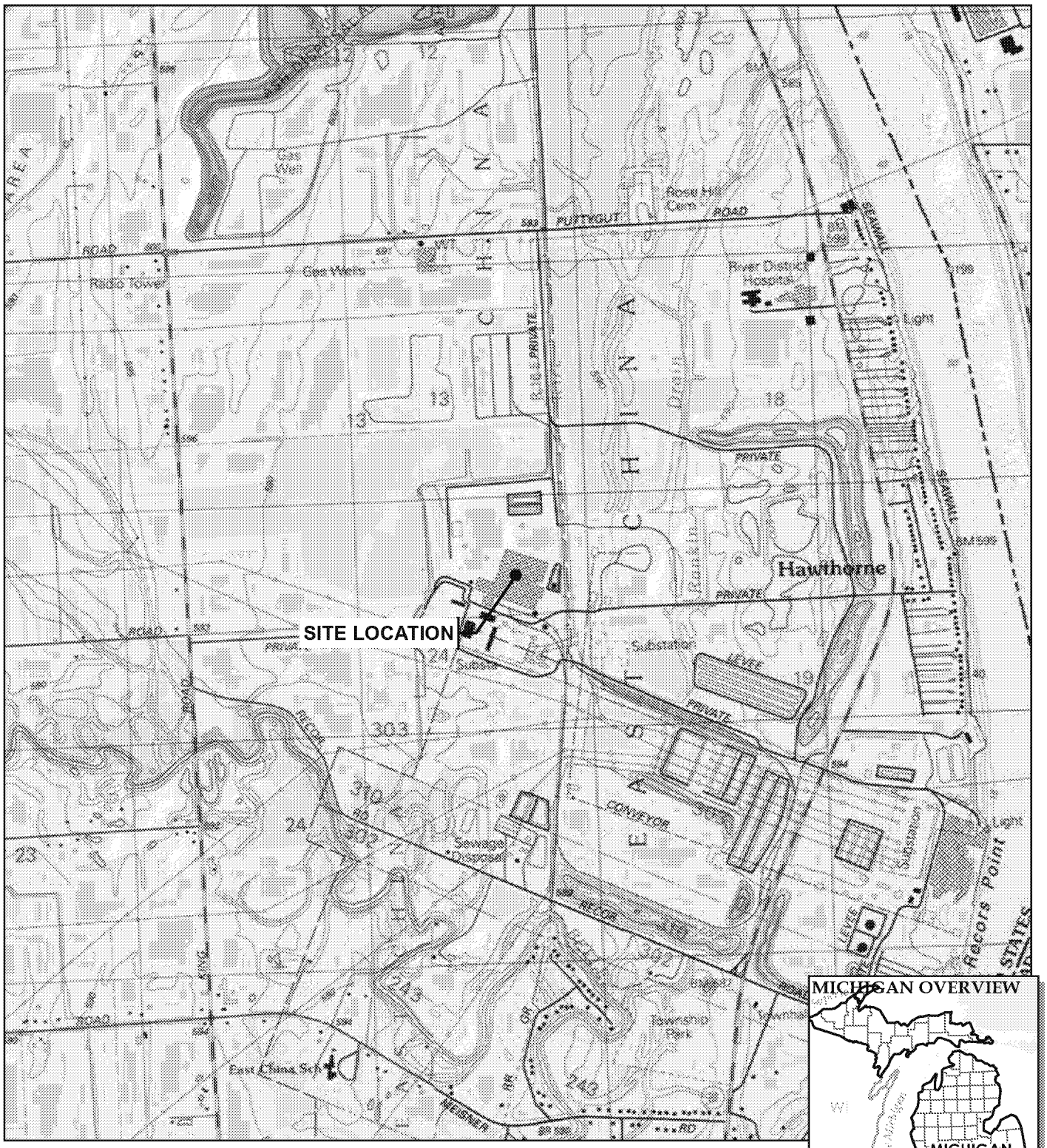

BASE MAP FROM USGS 7.5 MINUTE TOPOGRAPHIC QUADRANGLE SERIES.

N

1 " = 2,000 '
1:24,000

0 2,000 4,000 FEET

TRC

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Phone: 734.971.7080

TRC - GIS

PROJECT:

DTE ELECTRIC COMPANY
BELLE RIVER POWER PLANT
4505 KING ROAD
CHINA TOWNSHIP, MICHIGAN

TITLE:

WORKING COPY

SITE LOCATION MAP

DRAWN BY:	S. MAJOR
CHECKED BY:	
APPROVED BY:	
DATE:	DECEMBER 2019
PROJ. NO.:	320511.0003
FILE:	320511-0003-001slmMB.mxd

FIGURE 1

E:\DTE\CCR_Sites\2017_265996\320511-0003-001slmMB.mxd -- Saved By: SMAJOR on 12/3/2019, 15:54:02 PM

LEGEND

- SOIL BORING
- MONITORING WELL
- DECOMMISSIONED MONITORING WELL

NOTES

1. BASE MAP IMAGERY FROM GOOGLE EARTH PRO. & PARTNERS, (3/24/2019).
2. WELL LOCATIONS SURVEYED IN MARCH, APRIL, JUNE 2016, AND JUNE 2017 BY BMJ ENGINEERS & SURVEYORS, INC.
3. NO SAND, GRAVEL OR OTHER SATURATED ZONE WAS ENCOUNTERED ABOVE THE SHALE BEDROCK IN THIS LOCATION. THEREFORE, AN AQUIFER WAS NOT ENCOUNTERED AND A MONITORING WELL WAS NOT INSTALLED.

N

0 200 400 Feet

1 " = 200 '
1:2,400

PROJECT: **DTE ELECTRIC COMPANY**
BELLE RIVER POWER PLANT BOTTOM ASH BASIN
4505 KING ROAD
CHINA TOWNSHIP, MICHIGAN

TITLE: **SITE PLAN**

DRAWN BY:	M. VAPHIADIS	PROJ NO.	320511.0003.0000 P1 T1
CHECKED BY:	K. CRATSENBURG		**FIGURE 2**
APPROVED BY:	V. BUENING		
DATE:	NOVEMBER 2020		

TRC

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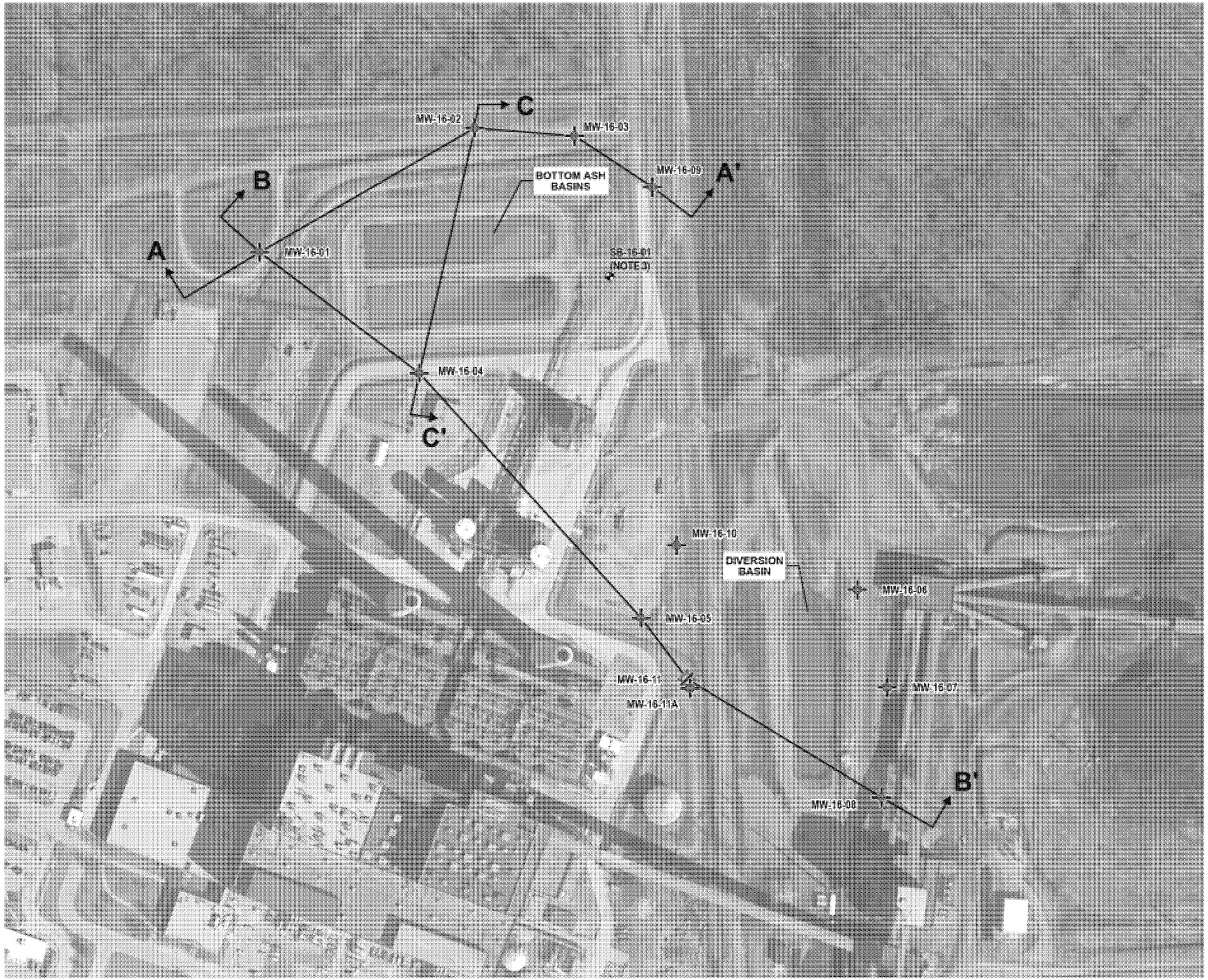
Map Rotation: 0

TRC -- GIS



LEGEND

- SOIL BORING
- MONITORING WELL
- DECOMMISSIONED MONITORING WELL
- CROSS SECTIONS

NOTES

1. BASE MAP IMAGERY FROM GOOGLE EARTH PRO, (3/23/2019).
2. WELL LOCATIONS SURVEYED IN MARCH, APRIL AND JUNE 2016 AND JUNE 2017 BY BMJ ENGINEERS & SURVEYORS, INC.
3. NO SAND, GRAVEL OR OTHER SATURATED ZONE WAS ENCOUNTERED ABOVE THE SHALE BEDROCK IN THIS LOCATION. THEREFORE, AN AQUIFER WAS NOT ENCOUNTERED AND A MONITORING WELL WAS NOT INSTALLED.

N

0 200 400 Feet

1 " = 200 '
1:2,400

PROJECT: DTE ELECTRIC COMPANY
BELLE RIVER POWER PLANT BOTTOM ASH BASIN
4505 KING ROAD
CHINA TOWNSHIP, MICHIGAN

TITLE: CROSS SECTION LOCATOR MAP

DRAWN BY:	A. ADAIR	PROJ NO.:	370029.0003
CHECKED BY:	K. CRATSENBURG		FIGURE 3
APPROVED BY:	V. BUENING		
DATE:	NOVEMBER 2020		

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FILE NO.: 370029-0003-003.mxd

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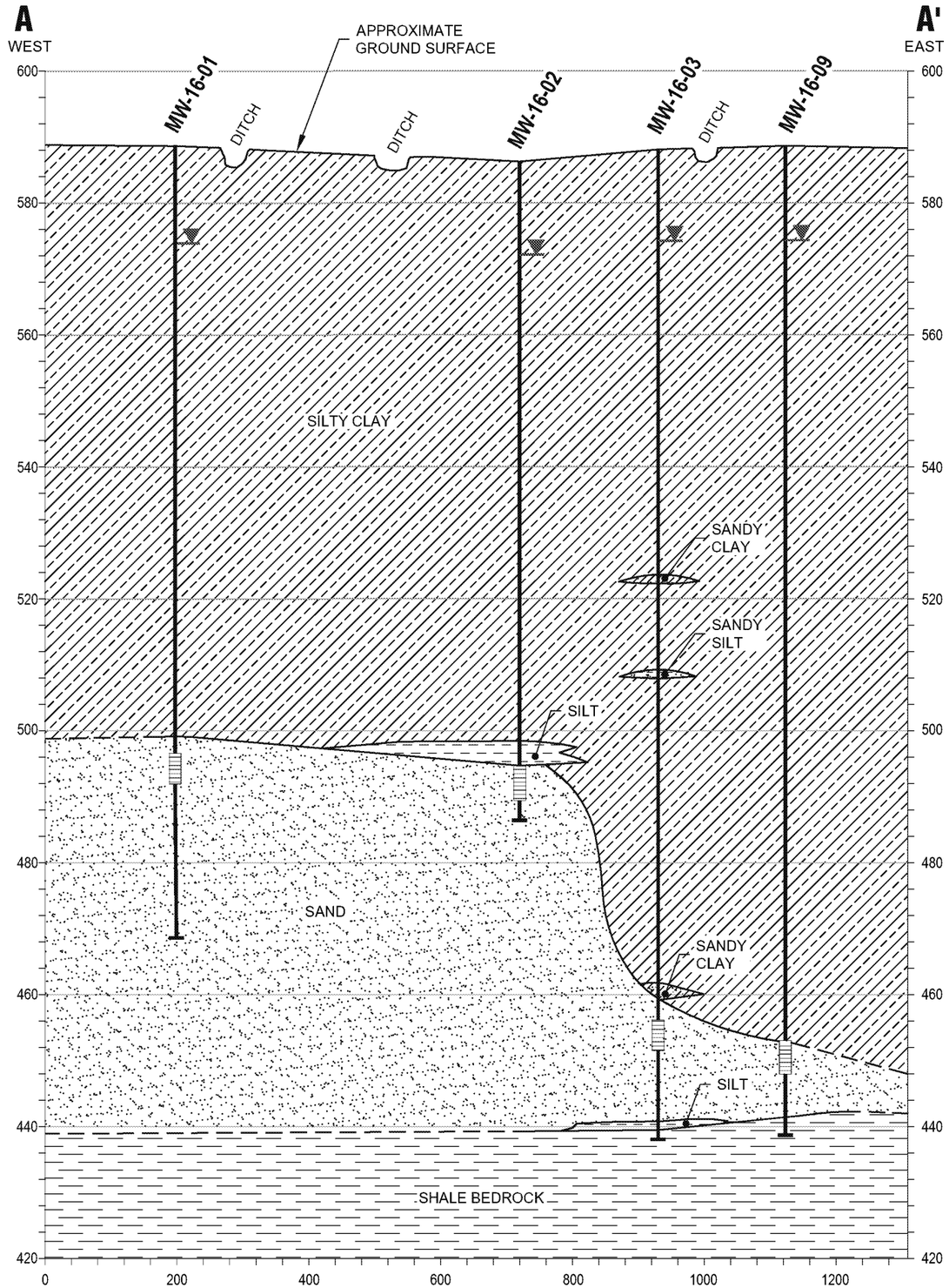
Map Rotation: 0

TRC -- GIS

GENERALIZED GEOLOGIC CROSS-SECTION A-A'



LEGEND

- STRATEGRAPHIC BOUNDARY (DASHED WHERE INFERRED)
- GROUNDWATER ELEVATION (COLLECTED 02/27/2017)
- SOIL BORING
- WELL SCREEN INTERVAL
- END OF BORING

Lithology Key

- SILTY CLAY
- SAND
- SILT
- SANDY CLAY
- SANDY SILT
- SHALE BEDROCK

SCALE IN FEET

VERTICAL: 0 – 20

HORIZONTAL: 0 – 200

PROJECT:

DTE ELECTRIC COMPANY
BELLE RIVER POWER PLANT
CHINA TOWNSHIP, MICHIGAN

TITLE:

GENERALIZED GEOLOGIC CROSS-SECTION A-A'

DRAWN BY:	D.STEHLE	PROJ NO.:	370029.0003.01.01
CHECKED BY:	S.HOLMSTROM		
APPROVED BY:	V.BUENING		**FIGURE 4**
DATE:	JULY 2020		

TRC

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FILE NO.: 370029.0003.01.01.04-05.dwg

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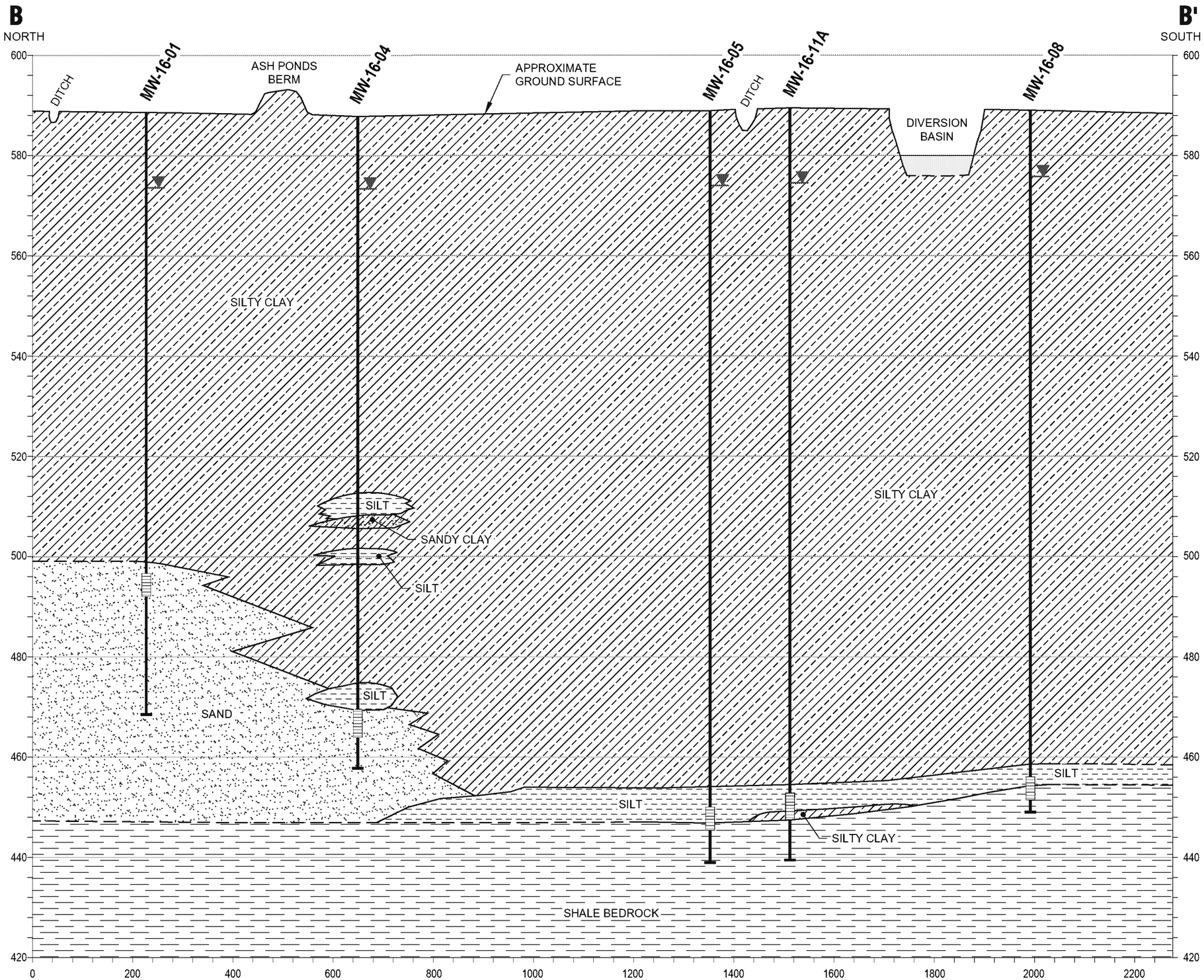
GENERALIZED GEOLOGIC CROSS-SECTION B-B'



LEGEND

- STRATEGRAPHIC BOUNDARY (DASHED WHERE INFERRED)
- GROUNDWATER ELEVATION (COLLECTED 02/27/2017)
- SOIL BORING
- WELL SCREEN INTERVAL
- END OF BORING

Lithology Key

- SILTY CLAY
- SAND
- SILT
- SANDY CLAY
- SHALE BEDROCK

SCALE IN FEET

VERTICAL: 0 – 20

HORIZONTAL: 0 – 200

PROJECT:

DTE ELECTRIC COMPANY
BELLE RIVER POWER PLANT
CHINA TOWNSHIP, MICHIGAN

TITLE:

GENERALIZED GEOLOGIC CROSS-SECTION B-B'

DRAWN BY:	D.STEHLE	PROJ NO.:	370029.0003.01.01
CHECKED BY:	S.HOLMSTROM		
APPROVED BY:	V.BUENING		**FIGURE 5**
DATE:	JULY 2020		

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FILE NO.: 370029.0003.01.01.04-05.dwg

11x17 --- ATTACHED XREF'S: --- ATTACHED IMAGES: DTE BRPP XSs XXXXXXXXXX-02172017092213_Page_2; XS aa wells; XS cc wells; XS DD wells;
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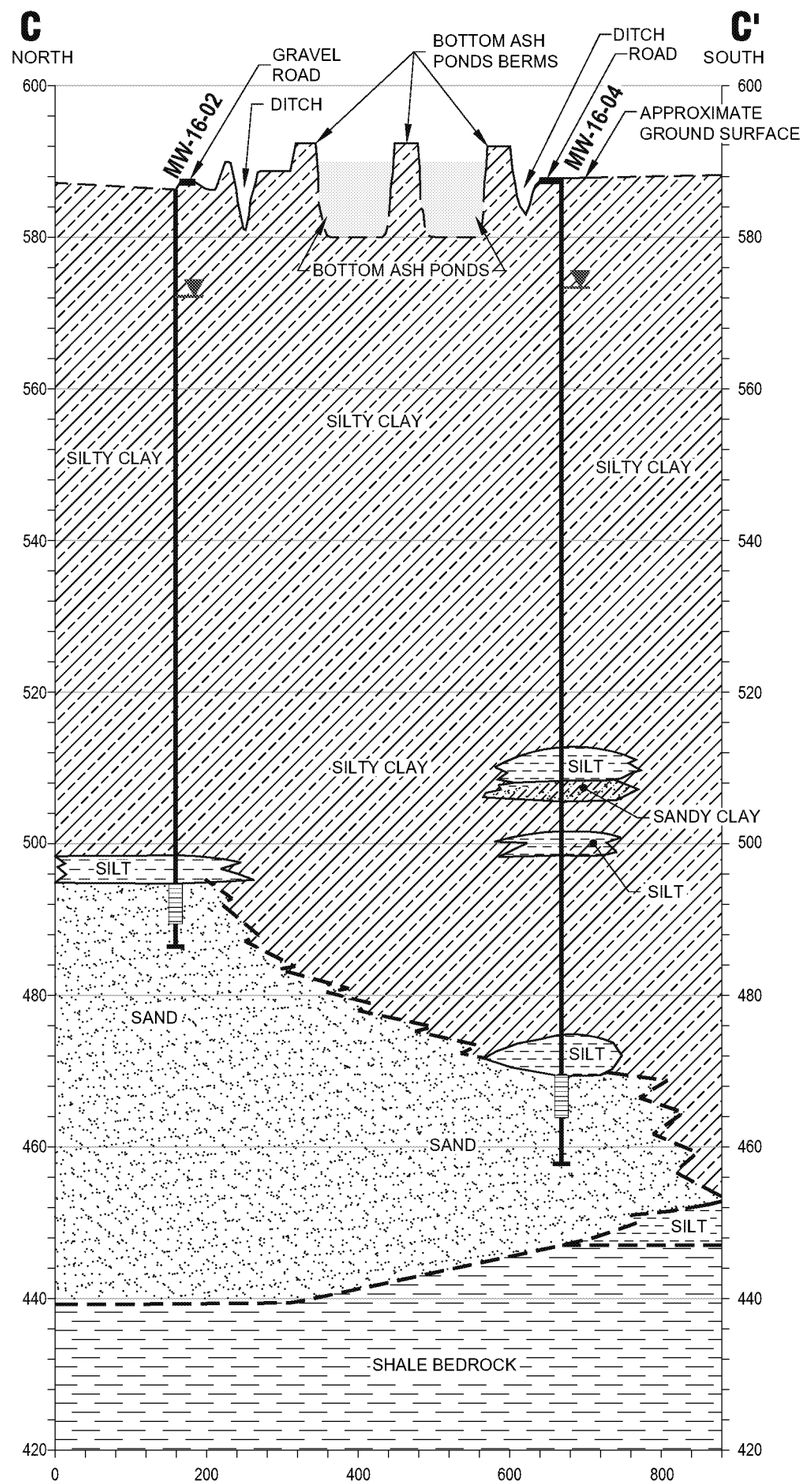
GENERALIZED GEOLOGIC CROSS-SECTION C-C'



LEGEND

- STRATEGRAPHIC BOUNDARY (DASHED WHERE INFERRED)
- GROUNDWATER ELEVATION (COLLECTED 02/27/2017)
- SOIL BORING
- WELL SCREEN INTERVAL
- END OF BORING

Lithology Key

- SILTY CLAY
- SAND
- SILT
- SANDY CLAY
- SHALE BEDROCK
- WATER

SCALE IN FEET

VERTICAL: 0, 20

HORIZONTAL: 0, 200

PROJECT:
DTE ELECTRIC COMPANY
BELLE RIVER POWER PLANT
CHINA TOWNSHIP, MICHIGAN

TITLE:
GENERALIZED GEOLOGIC CROSS-SECTION C-C'

WORKING COPY

DRAWN BY:	D.STEHLE	PROJ NO.:	370029.0003.01.01
CHECKED BY:	K.CRATSENBURG		
APPROVED BY:			FIGURE 6
DATE:	NOVEMBER 2020		

TRC

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Phone: 734.971.7080
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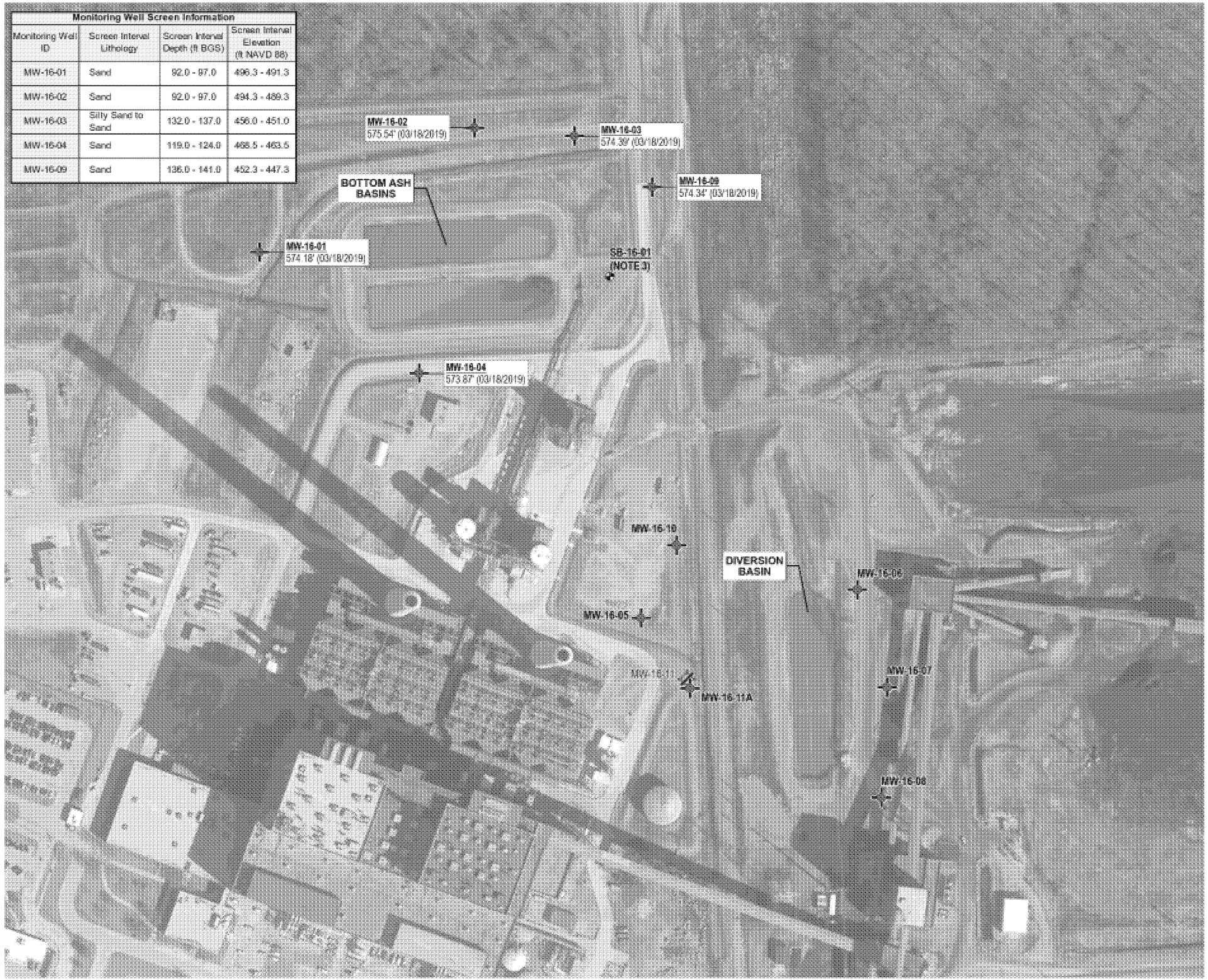
FILE NO.: 370029.0003.01.01.06.dwg

11x17 --- ATTACHED XREF'S: --- ATTACHED IMAGES: DTE BRPP XSs XXXXXXXXXX-02172017092213_Page_1; DTE BRPP XSs XXXXXXXXXX-02172017092213_Page_1; XS aa wells; XS cc wells; XS DD wells;
DRAWING NAME: \\Annarbor-fp2\cad\PJT\00_TRC\DTE\Belle River PP\370029\0003\01\01_2020 HMP\ 370029.0003.01.01.06.dwg --- PLOT DATE: November 03, 2020 - 3:55AM --- LAYOUT: FIG06 XS CC

Monitoring Well Screen Information			
Monitoring Well ID	Screen Interval Lithology	Screen Interval Depth (ft BGS)	Screen Interval Elevation (ft NAVD 88)
MW-16-01	Sand	92.0 - 97.0	496.3 - 491.3
MW-16-02	Sand	92.0 - 97.0	494.3 - 489.3
MW-16-03	Silty Sand to Sand	132.0 - 137.0	456.0 - 451.0
MW-16-04	Sand	119.0 - 124.0	468.5 - 463.5
MW-16-09	Sand	136.0 - 141.0	452.3 - 447.3



LEGEND

- SOIL BORING
- MONITORING WELL
- DECOMMISSIONED MONITORING WELL

MW ID
GROUNDWATER ELEVATION (DATE)
GROUNDWATER ELEVATION (DATE)
etc...

FT BGS
FEET BELOW GROUND SURFACE
FT NAVD 88
ELEVATION RELATIVE TO THE NORTH AMERICAN VERTICAL DATUM OF 1988

NOTES

1. BASE MAP IMAGERY FROM GOOGLE EARTH PRO, (3/23/2019).
2. WELL LOCATIONS SURVEYED IN MARCH, APRIL AND JUNE 2016 AND JUNE 2017 BY BMJ ENGINEERS & SURVEYORS, INC.
3. NO SAND, GRAVEL OR OTHER SATURATED ZONE WAS ENCOUNTERED ABOVE THE SHALE BEDROCK IN THIS LOCATION. THEREFORE, AN AQUIFER WAS NOT ENCOUNTERED AND A MONITORING WELL WAS NOT INSTALLED.

N

0 200 400 Feet

1 " = 200 '
1:2,400

PROJECT: DTE ELECTRIC COMPANY
BELLE RIVER POWER PLANT BOTTOM ASH BASIN
4505 KING ROAD
CHINA TOWNSHIP, MICHIGAN

TITLE: BOTTOM ASH BASINS
GROUNDWATER POTENTIOMETRIC
ELEVATION SUMMARY MARCH 2019

DRAWN BY:	M. VAPHIADIS	PROJ NO.	320511.0003
CHECKED BY:	K. CRATSENBURG		FIGURE 7
APPROVED BY:	V. BUENING		
DATE:	NOVEMBER 2020		

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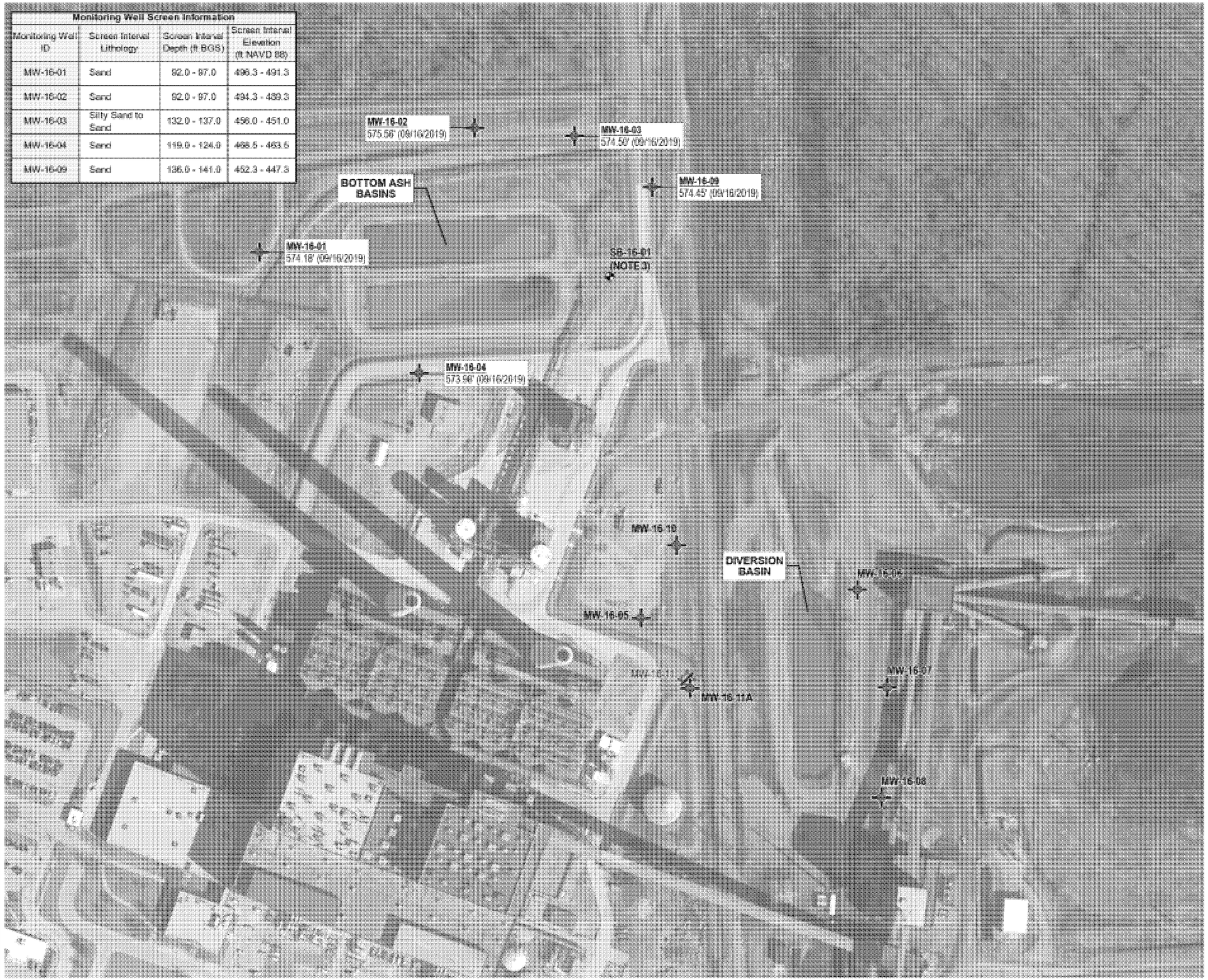
Coordinate System: NAD 1983 StatePlane Michigan South FIPS 2113 Feet Intl (Foot)
Map Rotation: 0

TRC -- GIS

Monitoring Well Screen Information			
Monitoring Well ID	Screen Interval Lithology	Screen Interval Depth (ft BGS)	Screen Interval Elevation (ft NAVD 88)
MW-16-01	Sand	92.0 - 97.0	496.3 - 491.3
MW-16-02	Sand	92.0 - 97.0	494.3 - 489.3
MW-16-03	Silty Sand to Sand	132.0 - 137.0	456.0 - 451.0
MW-16-04	Sand	119.0 - 124.0	468.5 - 463.5
MW-16-09	Sand	136.0 - 141.0	452.3 - 447.3



LEGEND

- SOIL BORING
- MONITORING WELL
- DECOMMISSIONED MONITORING WELL

MW ID
GROUNDWATER ELEVATION (DATE)
GROUNDWATER ELEVATION (DATE)
etc...

FT BGS
FEET BELOW GROUND SURFACE
FT NAVD 88
ELEVATION RELATIVE TO THE NORTH AMERICAN VERTICAL DATUM OF 1988

NOTES

1. BASE MAP IMAGERY FROM GOOGLE EARTH PRO, (3/23/2019).
2. WELL LOCATIONS SURVEYED IN MARCH, APRIL AND JUNE 2016 AND JUNE 2017 BY BMJ ENGINEERS & SURVEYORS, INC.
3. NO SAND, GRAVEL OR OTHER SATURATED ZONE WAS ENCOUNTERED ABOVE THE SHALE BEDROCK IN THIS LOCATION. THEREFORE, AN AQUIFER WAS NOT ENCOUNTERED AND A MONITORING WELL WAS NOT INSTALLED.

N

0 200 400 Feet

1 " = 200 '
1:2,400

PROJECT: DTE ELECTRIC COMPANY
BELLE RIVER POWER PLANT BOTTOM ASH BASIN
4505 KING ROAD
CHINA TOWNSHIP, MICHIGAN

TITLE: BOTTOM ASH BASINS
GROUNDWATER POTENTIOMETRIC
ELEVATION SUMMARY SEPTEMBER 2019

DRAWN BY:	M. VAPHIADIS	PROJ NO.	320511.0003
CHECKED BY:	K. CRATSENBURG		FIGURE 8
APPROVED BY:	V. BUENING		
DATE:	NOVEMBER 2020		

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FILE NO.: 320511-0007-019.mxd

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Map Rotation: 0

TRC -- GIS

Appendix A
2019 Annual Groundwater Monitoring Report

DRAFT

2019 Annual Groundwater Monitoring Report

DTE Electric Company
Belle River Power Plant Bottom Ash Basins

4505 King Road
China Township, Michigan

January 2020

2019 Annual Groundwater Monitoring Report

DTE Electric Company
Belle River Power Plant Bottom Ash Basins

4505 King Road
China Township, Michigan

January 2020

Prepared For
DTE Electric Company

Graham Crockford, C.P.G.
Senior Project Geologist

David B. McKenzie, P.E.
Senior Project Engineer

TRC | DTE Electric Company
Final
X:\WPAAM\PJT2\320511\0003\GMR\BABS\R320511.3 BRPP BABS.DOCX

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- 2.2 Semiannual Groundwater Monitoring 2-1
  - 2.2.1 Data Summary 2-1
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Executive Summary

On April 17, 2015, the United States Environmental Protection Agency (USEPA) published the final rule for the regulation and management of Coal Combustion Residuals (CCR) under the Resource Conservation and Recovery Act (RCRA) (the CCR Rule), as amended July 30, 2018. The CCR Rule, which became effective on October 19, 2015 (amendment effective August 29, 2018), applies to the DTE Electric Company (DTE Electric) Belle River Power Plant (BRPP) CCR Bottom Ash Basins (BABs) CCR unit. Pursuant to the CCR Rule, no later than January 31, 2018, and annually thereafter, the owner or operator of a CCR unit must prepare an annual groundwater monitoring and corrective action report for the CCR unit documenting the status of groundwater monitoring and corrective action for the preceding year in accordance with §257.90(e). On behalf of DTE Electric, TRC Engineers Michigan, Inc., the engineering entity of TRC Environmental Corporation (TRC), has prepared this Annual Groundwater Monitoring Report for calendar year 2019 activities at the BRPP BABs CCR unit.

The groundwater sampling results were below prediction limits for Appendix III indicator parameters during both the March and October 2018 semiannual monitoring events; therefore, no statistically significant increases (SSIs) were reported for the Belle River Power Plant Bottom Ash Basins (BRPP BABs) CCR unit. As such, DTE Electric continued detection monitoring at the BRPP BABs CCR Unit in 2019 pursuant to §257.94 of the CCR Rule.

The semiannual detection monitoring events for 2019 were completed in March and September 2019 and included sampling and analyzing groundwater within the groundwater monitoring system for the indicator parameters listed in Appendix III to the CCR Rule. As part of the statistical evaluation, the data collected during detection monitoring events are evaluated to identify SSIs in detection monitoring parameters to determine if concentrations in detection monitoring well samples exceed prediction limits. Detection monitoring data that have been collected and evaluated in 2019 are presented in this report.

Potential SSIs over prediction limits were noted for a few Appendix III constituents in one or more downgradient wells during the March and September 2019 monitoring events. These potential SSIs were either not statistically significant (i.e. verification resampling did not confirm the exceedance) or were evaluated and determined to be a result of natural variability in groundwater quality as documented in an alternative source demonstration (ASD) and not attributable to the BRPP BABs CCR unit. With the very thick continuous silty clay-rich confining unit beneath the BRPP BABs CCR unit, it is not possible for the uppermost aquifer to have been affected by CCR from BRPP operations that began in the 1980s. Therefore, detection monitoring will be continued at the BRPP BABs CCR unit in accordance with §257.94 of the CCR Rule.

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Section 1
Introduction

1.1 Program Summary

On April 17, 2015, the United States Environmental Protection Agency (USEPA) published the final rule for the regulation and management of Coal Combustion Residuals (CCR) under the Resource Conservation and Recovery Act (RCRA) (the CCR Rule), as amended July 30, 2018. The CCR Rule, which became effective on October 19, 2015 (amendment effective August 29, 2018), applies to the DTE Electric Company (DTE Electric) Belle River Power Plant (BRPP) CCR Bottom Ash Basins (BABs). Pursuant to the CCR Rule, no later than January 31, 2018, and annually thereafter, the owner or operator of a CCR unit must prepare an annual groundwater monitoring and corrective action report for the CCR unit documenting the status of groundwater monitoring and corrective action for the preceding year in accordance with §257.90(e). On behalf of DTE Electric, TRC Engineers Michigan, Inc., the engineering entity of TRC Environmental Corporation (TRC), has prepared this Annual Groundwater Monitoring Report for calendar year 2019 activities at the BRPP BABs CCR unit (2019 Annual Report).

The groundwater sampling results were below background limits for Appendix III indicator parameters during both the March and October 2018 semiannual monitoring events; therefore, no statistically significant increases (SSIs) were reported for the Belle River Power Plant Bottom Ash Basins (BRPP BABs) CCR unit. As such, DTE Electric continued detection monitoring at the BRPP BABs CCR Unit in 2019 pursuant to §257.94 of the CCR Rule. This 2019 Annual Report presents the monitoring results and the statistical evaluation of the detection monitoring parameters (Appendix III to Part 257 of the CCR Rule) for the March and September 2019 semiannual groundwater monitoring events for the BRPP BABs CCR unit. Detection monitoring for these events continued to be performed in accordance with the *CCR Groundwater Monitoring and Quality Assurance Project Plan – DTE Electric Company Belle River Power Plant Bottom Ash Basins and Diversion Basin* (QAPP) (TRC, July 2016; revised August 2017) and statistically evaluated per the Stats Plan (TRC, October 2017). As part of the statistical evaluation, the data collected during detection monitoring events are evaluated to identify SSIs of detection monitoring parameters compared to background levels.

1.2 Site Overview

The BRPP is located in Section 13, Township 4 North, Range 16 East, at 4505 King Road, China Township in St. Clair County, Michigan. The BRPP was constructed in the early 1980s with plant operations beginning in 1984. Prior to Detroit Edison Company's operations commencing in the 1980s, the BRPP property was generally wooded and farmland. The property has been

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used continuously as a coal fired power plant since Detroit Edison Company (now DTE Electric) began power plant operations at BRPP in 1984 and is generally constructed over a natural clay-rich soil base. The BABs have been in use with the BRPP since it began operation and have collected CCR bottom ash that is periodically cleaned out and either sold for beneficial reuse or disposed of at the Range Road Landfill (RRLF).

The BRPP BABs are two adjacent physical sedimentation basins that are slightly raised CCR surface impoundments referred to as the North and South BABs, located north of the BRPP. These are considered one CCR unit. The BABs receive sluiced bottom ash and other process flow water from the power plant. Discharge water from each BAB flows over an outlet weir that gravity flows to a site storm water conveyance network of ditches and pipes, then flows into the diversion basin (DB) CCR unit, which is monitored as a separate CCR unit in accordance with the CCR Rule and addressed in a separate 2019 Annual Report.

The DB is an incised CCR surface impoundment located east of the BRPP. Water flows into the DB from the North and South BABs through a network of pipes and ditches. The DB discharges to the St. Clair River with other site wastewater in accordance with a National Pollution Discharge Elimination System (NPDES) permit.

1.3 Geology/Hydrogeology

The BRPP BABs CCR unit is located approximately one-mile west of the St. Clair River. The BRPP BABs CCR unit is underlain by more than 130 feet of unconsolidated sediments, with the lower confining Bedford Shale generally encountered from 135 to 145 feet below ground surface (bgs). In general, the BRPP BABs CCR unit is initially underlain by at least 90 to as much as 136 feet of laterally extensive low hydraulic conductivity silty clay-rich deposits. The depth to the top of the confined sand-rich uppermost aquifer encountered immediately beneath the silty clay-rich deposits varies up to 46 feet within the monitoring well network and rapidly thins to the south and east of the BABs and pinches out (e.g., no longer present) to the southeast in the vicinity of SB-16-01 (Figure 1). Consequently, the uppermost aquifer is not laterally contiguous across the entire BRPP BABs CCR unit, and not present beneath the southeastern corner of the BABs.

The variability in the depth to the uppermost aquifer is a consequence of the heterogeneity of the glacial deposits and is driven by the lateral discontinuity of the sand outwash within the encapsulating fine-grained, silty clay till that confines the uppermost aquifer. There is an apparent lack of interconnection and/or significant vertical variation between the uppermost aquifer sand unit(s) encountered across the BRPP BABs CCR unit as demonstrated by the extensive amount of time (months) it took for water levels in monitoring well MW-16-02 to reach equilibrium after well construction and development (TRC, 2017).

Given the horizontally expansive clay with substantial vertical thickness that isolates the uppermost aquifer from the BRPP BABs CCR unit, the heterogeneity of the glacial deposits (with the top of the uppermost aquifer elevation across the BABs, where present varying up to 46 feet vertically), the no flow boundary where no sand or gravel is present in the southeastern portion of the BABs CCR unit area, and the apparent lack of hydraulic interconnectedness of the uppermost aquifer encountered at the BABs in some areas, it is not appropriate to infer horizontal flow direction or gradients across the BRPP BABs CCR unit.

In addition, the elevation of CCR-affected water maintained within the BRPP BABs is approximately 5 feet above the potentiometric surface elevations in the uppermost aquifer at the BABs CCR unit area. This suggests that if the CCR affected surface water in the BABs were able to penetrate the silty clay-rich underlying confining unit that the head on that release likely would travel radially away from the BABs within the uppermost aquifer. However, with the very thick continuous silty clay-rich confining unit beneath the BRPP it is not possible for the uppermost aquifer to have been affected by CCR from BRPP operations that began in the 1980s.

Due to the relatively small footprint of the BABs, the low vertical and horizontal groundwater flow velocity, the potential for radial flow, and the fact that the saturated unit being monitored is isolated by a laterally contiguous silty-clay unit, which significantly impedes vertical groundwater flow thus preventing the monitored saturated zone from potentially being affected by CCR, monitoring of the BRPP BABs CCR unit using intrawell statistical methods is appropriate. In addition, because the uppermost aquifer is not uniformly present across the BABs CCR unit, there are no clear upgradient wells. As such, intrawell statistical approaches are being used during detection monitoring as discussed in the Stats Plan.

Section 2
Groundwater Monitoring

2.1 Monitoring Well Network

A groundwater monitoring system has been established for the BRPP BABs CCR unit as detailed in the *Groundwater Monitoring System Summary Report – DTE Electric Company Belle River Power Plant Bottom Ash Basins and Diversion Basin Coal Combustion Residual Units* (GWMS Report) (TRC, October 2017). The detection monitoring well network for the BABs CCR unit currently consists of five monitoring wells that are screened in the uppermost aquifer. The monitoring well locations are shown on Figure 2.

As discussed in the Stats Plan, intrawell statistical methods for the BABs CCR unit were selected based on the geology and hydrogeology at the Site (primarily the presence of clay/hydraulic barrier, the variability in the presence of the uppermost aquifer across the site, and presence of no flow boundary on the southeast side of the aquifer), in addition to other supporting lines of evidence that the aquifer is unaffected by the CCR unit (such as the consistency in concentrations of water quality data). An intrawell statistical approach requires that each of the downgradient wells doubles as a background and compliance well, where data from each individual well during a detection monitoring event is compared to a statistical limit developed using the background dataset from that same well. Monitoring wells MW-16-01 through MW-16-04 and MW-16-09 are located around the north, east and south perimeter of the BABs and provide data on both background and downgradient groundwater quality that has not been affected by the CCR unit (total of five background/downgradient monitoring wells).

2.2 Semiannual Groundwater Monitoring

The semiannual monitoring parameters for the detection groundwater monitoring program were selected per the CCR Rule's Appendix III to Part 257 – Constituents for Detection Monitoring. The Appendix III indicator parameters consist of boron, calcium, chloride, fluoride, pH (field reading), sulfate, and total dissolved solids (TDS) and were analyzed in accordance with the sampling and analysis plan included within the QAPP. In addition to pH, the collected field parameters included dissolved oxygen, oxidation reduction potential, specific conductivity, temperature, and turbidity.

2.2.1 Data Summary

The first semiannual groundwater detection monitoring event for 2019 was performed during March 18 to 20, 2019 by TRC personnel and samples were analyzed by TestAmerica in accordance with the QAPP. Static water elevation data were collected at all five monitoring well locations. Groundwater samples were collected from the five

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detection monitoring wells for the Appendix III indicator parameters and field parameters. A summary of the groundwater data collected during the March 2019 event is provided on Table 1 (static groundwater elevation data), Table 2 (field data), and Table 3 (analytical results).

The second semiannual groundwater detection monitoring event for 2019 was performed during September 16 to 17, 2019 by TRC personnel and samples were analyzed by TestAmerica in accordance with the QAPP. Static water elevation data were collected at all five monitoring well locations. Groundwater samples were collected from the five detection monitoring wells for the Appendix III indicator parameters and field parameters. A summary of the groundwater data collected during the October 2018 event is provided on Table 1 (static groundwater elevation data), Table 2 (field data), and Table 4 (analytical results).

2.2.2 Data Quality Review

Data from each round were evaluated for completeness, overall quality and usability, method-specified sample holding times, precision and accuracy, and potential sample contamination. The data were found to be complete and usable for the purposes of the CCR monitoring program. Data quality reviews are summarized in Appendix B.

2.2.3 Groundwater Flow Rate and Direction

As presented in the GWMS Report, and mentioned above, given the horizontally expansive clay with substantial vertical thickness that isolates the uppermost aquifer from the BRPP BABs CCR unit; the heterogeneity of the glacial deposits (with the top of the uppermost aquifer elevation across the BABs; where present, varying up to 46 feet vertically); the no flow boundary where no sand or gravel is present in the southeastern portion of the BRPP BABs CCR unit area; and the apparent lack of hydraulic interconnectedness of the uppermost aquifer encountered at the BABs in some areas, it is not appropriate to infer horizontal flow direction or gradients across the site. Groundwater elevations measured across the Site during the March 2019 sampling event are provided on Table 1 and are summarized in plan view on Figure 3. Groundwater elevations measured across the Site during the September 2019 sampling event are provided on Table 1 and are summarized in plan view on Figure 4.

Groundwater elevation data collected during the 2019 sampling events show that groundwater conditions within the uppermost aquifer are consistent with previous monitoring events and continue to demonstrate that the downgradient wells are appropriately positioned to detect the presence of Appendix III parameters that could potentially migrate from the BRPP BABs CCR unit.

Section 3
Statistical Evaluation

3.1 Establishing Background Limits

Per the Stats Plan, background limits were established for the Appendix III indicator parameters following the collection of at least eight background monitoring events using data collected from each of the five established detection monitoring wells (MW-16-01 through MW-16-04 and MW-16-09). The statistical evaluation of the background data is presented in the 2017 Annual Report. The Appendix III background limits for each monitoring well will be used throughout the detection monitoring period to determine whether groundwater has been impacted from the BRPP BABs CCR unit by comparing concentrations in the detection monitoring wells to their respective background limits for each Appendix III indicator parameter.

3.2 Data Comparison to Background Limits – First Semiannual Event (March 2019)

The concentrations of the indicator parameters in each of the detection monitoring wells (MW-16-01 through MW-16-04 and MW-16-09) were compared to their respective statistical background limits calculated from the background data collected from each individual well (i.e., monitoring data from MW-16-01 is compared to the background limit developed using the background dataset from MW-16-01, and so forth).

The comparisons of the March 2019 monitoring event data to background limits are presented on Table 3. The statistical evaluation of the March 2019 Appendix III indicator parameters showed potential initial SSIs over background for:

- Total dissolved solids (TDS) at MW-16-01; and
- Sulfate at MW-16-04.

3.3 Verification Resampling for the First Semiannual Event

Verification resampling is recommended per the Stats Plan and the *USEPA's Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities, Unified Guidance* (Unified Guidance, USEPA, 2009) to achieve performance standards as specified by §257.93(g) in the CCR Rule. Per the Stats Plan, if there is an exceedance of a prediction limit for one or more of the parameters, the well(s) of concern will be resampled within 30 days of the completion of the initial statistical analysis. Only constituents that initially exceed their statistical limit (i.e., have no previously recorded SSIs) will be analyzed for verification purposes.

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Verification resampling for the March 2019 event was conducted on May 9, 2019 by TRC personnel. Groundwater samples were collected for total dissolved solids at MW-16-01 and sulfate at MW-16-04, In accordance with the QAPP. A summary of the analytical results collected during the May 2019 resampling event is provided on Table 3. The associated data quality review is included in Appendix A.

The verification results for TDS (MW-16-01) and sulfate (MW-16-04) are above the prediction limits, consequently the initial potential SSIs from the March 2019 event are confirmed at these locations.

According to §257.94(e), in the event that the facility determines, pursuant to §257.93(h), that there is a SSI over background levels for one or more of the Appendix III constituents, the facility will, within 90 days of detecting a SSI, demonstrate that a source other than the CCR unit caused the SSI, or the SSI resulted from error in sampling, analysis, statistical evaluation, or natural variation in groundwater quality. If an alternate source demonstration (ASD) is not completed within the 90-day period, the owner or operator of the CCR unit must initiate an assessment monitoring program as required under §257.95. If an ASD is completed, a certification from a qualified professional engineer is required, and the CCR unit may continue with detection monitoring. The facility must also include the ASD in the annual groundwater monitoring and corrective action report required by §257.90(e), in addition to the certification by a qualified professional engineer.

DTE Electric prepared an ASD dated August 8, 2019, *Alternate Source Demonstration: 2019 First Semi Annual Detection Monitoring Sampling Event Bell River Power Plant Coal Combustion Residual Bottom Ash Basins* (April 2019 ASD). This ASD demonstrates that the SSIs confirmed above are from natural variability in groundwater quality and not from a release of the BRPP BABs CCR unit and is provided in Appendix A. As such, detection monitoring continued at the BRPP BABs CCR unit in 2019.

3.4 Data Comparison to Background Limits – Second Semiannual Event (September 2019)

The concentrations of the indicator parameters in each of the detection monitoring wells (MW-16-01 through MW-16-04 and MW-16-09) were compared to their respective statistical background limits calculated from the background data collected from each individual well (i.e., monitoring data from MW-16-01 is compared to the background limit developed using the background dataset from MW-16-01, and so forth).The comparisons of the September 2019 monitoring event are presented on Table 4. The statistical evaluation of the September 2019 Appendix III indicator parameters showed potential initial SSIs over background for:

- Calcium at MW-16-03;

- Chloride at MW-16-03; and
- Sulfate at MW-16-04

The sulfate concentration at MW-16-04 is a continued exceedance of the prediction limit that has been demonstrated to be from natural variability and is not from a release from the CCR unit as presented in the August 2019 ASD (Appendix A).

3.5 Verification Resampling for the Second Semiannual Event

Verification resampling for the September 2019 event was conducted on November 11, 2019 by TRC personnel. Groundwater samples were collected for calcium and chloride at MW-16-03, in accordance with the QAPP. A summary of the analytical results collected during the November 2019 resampling event is provided on Table 4. The associated data quality review is included in Appendix B.

The calcium and chloride verification results are below the prediction limits, consequently the initial potential SSIs from the September 2019 event are not confirmed. Therefore, in accordance with the Stats Plan and the Unified Guidance, the initial exceedances are not statistically significant, and no SSIs will be recorded for the September 2019 monitoring event.

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Section 4
Conclusions and Recommendations

Potential SSIs over background limits were noted for a few Appendix III constituents in one or more downgradient wells during the March and September 2019 monitoring events. These potential SSIs were either not statistically significant (i.e. verification sampling did not confirm the exceedance) or were evaluated and determined to be a result of natural variability in groundwater quality as documented in an ASD (Appendix A) and not attributable to the BRPP BABs CCR unit. As discussed above and in the GWMS Report, with the presence of the vertically and horizontally extensive clay-rich confining till beneath the BRPP BABs CCR unit, it is not possible for the uppermost aquifer to have been affected by CCR from operations. In addition, due to limitations on CCR Rule implementation timelines, the background data sets are of relatively short duration for capturing the occurrence of natural temporal changes in the aquifer. Therefore, detection monitoring will be continued at the BRPP BABs CCR unit in accordance with §257.94. No corrective actions were performed in 2019. The next semiannual monitoring event is scheduled for the second calendar quarter of 2020.

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Section 5
Groundwater Monitoring Report Certification

The U.S. EPA's Disposal of Coal Combustion Residuals from Electric Utilities Final Rule Title 40 CFR Part 257 §257.90(e) requires that the owner or operator of an existing CCR unit prepare an annual groundwater monitoring and corrective action report.

Annual Groundwater Monitoring Report Certification
Belle River Power Plant Bottom Ash Basins
China Township, Michigan

CERTIFICATION

I hereby certify that the annual groundwater and corrective action report presented within this document for the BRPP BABs CCR unit has been prepared to meet the requirements of Title 40 CFR §257.90(e) of the Federal CCR Rule. This document is accurate and has been prepared in accordance with good engineering practices, including the consideration of applicable industry standards, and with the requirements of Title 40 CFR §257.90(e).

Name: David B. McKenzie, P.E.	Expiration Date: October 31, 2021	State of Michigan David B. McKenzie Engineer No. 42332 Licensed Professional Engineer Stamp
Company: TRC Engineers Michigan, Inc.	Date: January 30, 2020	

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Section 6
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Tables

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Table 1

Summary of Groundwater Elevation Data – March and September 2019

Belle River Power Plant Bottom Ash Basins – RCRA CCR Monitoring Program

China Township, Michigan

Well ID	MW-16-01		MW-16-02		MW-16-03		MW-16-04		MW-16-09	
Date Installed	3/17/2016		3/15/2016		6/1/2016		3/8/2016		6/2/2016	
TOC Elevation	590.06		588.94		590.66		590.51		590.80	
Geologic Unit of Screened Interval	Sand		Sand		Silty Sand		Sand		Sand	
Screened Interval Elevation	496.3 to 491.3		494.3 to 489.3		456.0 to 451.0		468.5 to 463.5		452.3 to 447.3	
Unit	ft BTOC	ft	ft BTOC	ft	ft BTOC	ft	ft BTOC	ft	ft BTOC	ft
Measurement Date	Depth to Water	GW Elevation	Depth to Water	GW Elevation	Depth to Water	GW Elevation	Depth to Water	GW Elevation	Depth to Water	GW Elevation
3/18/2019	15.88	574.18	13.40	575.54	16.27	574.39	16.64	573.87	16.46	574.34
9/16/2019	15.88	574.18	13.38	575.56	16.16	574.50	16.53	573.98	16.35	574.45

Notes:

Elevations are reported in feet relative to the North American Vertical Datum of 1988.

ft BTOC - feet Below top of casing.

Table 2
Summary of Field Data – March and September 2019
Belle River Power Plant Bottom Ash Basins – RCRA CCR Monitoring Program
China Township, Michigan

Sample Location	Sample Date	Dissolved Oxygen (mg/L)	Oxidation Reduction Potential (mV)	pH (SU)	Specific Conductivity (umhos/cm)	Temperature (deg C)	Turbidity (NTU)
MW-16-01	3/18/2019	0.17	-134.9	7.6	1,822	10.30	2.42
	9/16/2019	0.16	-172.1	7.6	1,614	13.44	2.06
MW-16-02	3/18/2019	1.34	-116.3	7.6	1,428	10.90	2.13
	9/16/2019	0.33	-167.1	7.5	1,267	15.49	1.57
MW-16-03	3/18/2019	1.14	-163.4	7.9	2,088	10.50	1.13
	9/16/2019	0.16	-194.2	7.6	1,840	14.89	0.96
MW-16-04	3/18/2019	1.34	-168.7	7.9	1,899	10.00	45.3
	9/16/2019	0.14	-211.2	7.8	1,676	16.06	50.2
MW-16-09	3/20/2019	1.17	-237.8	8.0	2,933	10.80	68.7
	9/17/2019	0.14	21.1	8.0	2,994	14.34	120

Notes:
mg/L - milligrams per liter.
mV - milliVolt.
SU - standard unit.
umhos/cm - micro-mhos per centimeter.
deg C - degrees Celcius.
NTU - nephelometric turbidity units.

Table 3

Comparison of Appendix III Parameter Results to Background Limits – March and May 2019

Belle River Power Plant Bottom Ash Basins – RCRA CCR Monitoring Program

China Township, Michigan

Sample Location:		MW-16-01			MW-16-02		MW-16-03		MW-16-04			MW-16-09	
Sample Date:		3/18/2019	5/9/2019[1]	PL	3/18/2019	PL	3/18/2019	PL	3/18/2019	5/9/2019[1]	PL	3/20/2019	PL
Constituent	Unit	Data			Data		Data		Data			Data	
Appendix III													
Boron	ug/L	1,200	--	1,300	1,200	1,300	1,200	1,300	1,000	--	1,100	1,600	1,900
Calcium	ug/L	41,000	--	45,000	54,000	59,000	33,000	36,000	42,000	--	64,000	32,000	41,000
Chloride	mg/L	480	--	530	370	400	570	690	500	--	520	960	1,100
Fluoride	mg/L	1.6	--	1.9	1.1	1.3	1.6	1.9	1.6	--	1.9	1.3	1.8
pH, Field	SU	7.6	7.7	7.6 - 8.1	7.6	7.4 - 8.0	7.9	7.5 - 8.3	7.9	7.7	7.5 - 8.4	8.0	7.7 - 8.7
Sulfate	mg/L	5.8	--	8.1	4.8	20	2.4	14	**27**	**24**[2]	18	18	40
Total Dissolved Solids	mg/L	**960**	**970**[2]	950	730	890	1,100	1,100	990	--	1,100	1,700	2,000

Notes:

ug/L - micrograms per liter.

mg/L - milligrams per liter.

SU - standard units; pH is a field parameter.

All metals were analyzed as total unless otherwise specified.

Bold font indicates an exceedance of the Prediction Limit (PL).

RESULT Shading and bold font indicates a confirmed exceedance of the Prediction Limit (PL).

(1) - Results shown for verification sampling performed on 5/9/2019.

(2) - New successful alternative source demonstration was completed following confirmation of the initial statistically significant exceedance.

Table 4

Comparison of Appendix III Parameter Results to Background Limits – September and November 2019

Belle River Power Plant Bottom Ash Basins – RCRA CCR Monitoring Program

China Township, Michigan

Sample Location:		MW-16-01		MW-16-02		MW-16-03			MW-16-04		MW-16-09	
Sample Date:		9/16/2019	PL	9/16/2019	PL	9/16/2019	11/11/2019(1)	PL	9/16/2019	PL	9/17/2019	PL
Constituent	Unit	Data		Data		Data			Data		Data	
Appendix III												
Boron	ug/L	1,000	1,300	1,100	1,300	1,100	--	1,300	1,000	1,100	1,500	1,900
Calcium	ug/L	43,000	45,000	58,000	59,000	**38,000**	20,000	36,000	47,000	64,000	37,000	41,000
Chloride	mg/L	460	530	350	400	**1,000**	600	690	480	520	920	1,100
Fluoride	mg/L	1.8	1.9	1.1	1.3	1.8	--	1.9	1.7	1.9	1.4	1.8
pH, Field	SU	7.6	7.6 - 8.1	7.5	7.4 - 8.0	7.6	7.8	7.5 - 8.3	7.8	7.5 - 8.4	8.0	7.7 - 8.7
Sulfate	mg/L	7.5	8.1	5.8	20	1.7	--	14	**20**(2)	18	12	40
Total Dissolved Solids	mg/L	950	950	770	890	1,000	--	1,100	970	1,100	1,800	2,000

Notes:

ug/L - micrograms per liter.

mg/L - milligrams per liter.

SU - standard units; pH is a field parameter.

-- = not analyzed.

All metals were analyzed as total unless otherwise specified.

Bold font indicates an exceedance of the Prediction Limit (PL).

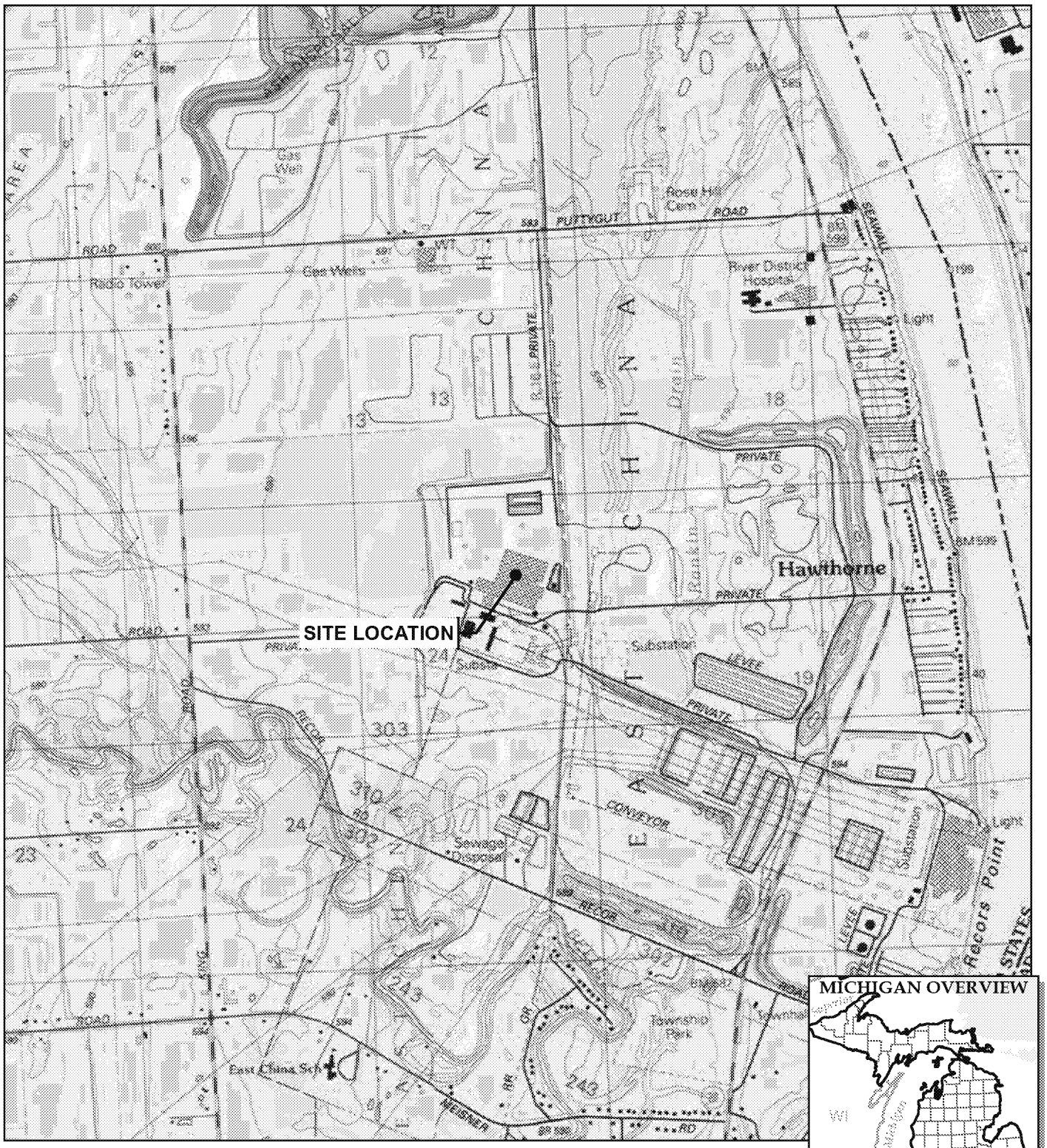
RESULT	Shading and bold font indicates a confirmed exceedance of the Prediction Limit (PL).

(1) - Results shown for verification sampling performed on 11/11/2019.

(2) - Concentration addressed through first 2019 Semiannual alternative source demonstration.

Figures

ED_005947A_00014556-00046



BASE MAP FROM USGS 7.5 MINUTE TOPOGRAPHIC QUADRANGLE SERIES.

N

1 " = 2,000 '
1:24,000

0 2,000 4,000 FEET

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PROJECT:

DTE ELECTRIC COMPANY
BELLE RIVER POWER PLANT
4505 KING ROAD
CHINA TOWNSHIP, MICHIGAN

TITLE:

SITE LOCATION MAP

DRAWN BY:	S. MAJOR
CHECKED BY:	J. KRENZ
APPROVED BY:	V. BUENING
DATE:	JANUARY 2020
PROJ. NO.:	320511.0003
FILE:	320511-0003-003slmMB.mxd

FIGURE 1

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LEGEND

- SOIL BORING
- MONITORING WELL
- DECOMMISSIONED MONITORING WELL

NOTES

1. BASE MAP IMAGERY FROM GOOGLE EARTH PRO. & PARTNERS, (3/24/2019).
2. WELL LOCATIONS SURVEYED IN MARCH, APRIL, JUNE 2016, AND JUNE 2017 BY BMJ ENGINEERS & SURVEYORS, INC.

N

0 200 400 Feet

1 " = 200 '
1:2,400

PROJECT: DTE ELECTRIC COMPANY
BELLE RIVER POWER PLANT BOTTOM ASH BASIN
4505 KING ROAD
CHINA TOWNSHIP, MICHIGAN

TITLE: SITE PLAN

DRAWN BY:	M. VAPHIADIS	PROJ NO.	320511.0003.0000 P1 T1
CHECKED BY:	J. KRENZ		FIGURE 2
APPROVED BY:	V. BUENING		
DATE:	JANUARY 2020		

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Map Rotation: 0

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Coordinate System: NAD 1983 StatePlane Michigan South FIPS 2113 Feet Intl (Foot)
Map Rotation: 0

Monitoring Well Screen Information

Monitoring Well ID	Screen Interval Lithology	Screen Interval Depth (ft BGS)	Screen Interval Elevation (ft NAVD 88)
MW-16-01	Sand	92.0 - 97.0	496.3 - 491.3
MW-16-02	Sand	92.0 - 97.0	494.3 - 489.3
MW-16-03	Silty Sand to Sand	132.0 - 137.0	456.0 - 451.0
MW-16-04	Sand	119.0 - 124.0	468.5 - 463.5
MW-16-09	Sand	136.0 - 141.0	452.3 - 447.3

LEGEND

- SOIL BORING
- MONITORING WELL
- DECOMMISSIONED MONITORING WELL

MW ID
GROUNDWATER ELEVATION (DATE)
GROUNDWATER ELEVATION (DATE)
etc...

FT BGS
FEET BELOW GROUND SURFACE
FT NAVD 88
ELEVATION RELATIVE TO THE NORTH AMERICAN VERTICAL DATUM OF 1988

NOTES

1. BASE MAP IMAGERY FROM GOOGLE EARTH PRO, (3/23/2019).
2. WELL LOCATIONS SURVEYED IN MARCH, APRIL AND JUNE 2016 AND JUNE 2017 BY BMJ ENGINEERS & SURVEYORS, INC.
3. NO SAND OR GRAVEL UNIT PRESENT ABOVE BEDROCK IN THIS LOCATION.

N

0 200 400 Feet

1 " = 200 '
1:2,400

PROJECT: DTE ELECTRIC COMPANY
BELLE RIVER POWER PLANT BOTTOM ASH BASIN
4505 KING ROAD
CHINA TOWNSHIP, MICHIGAN

TITLE: BOTTOM ASH BASINS
GROUNDWATER POTENTIOMETRIC
ELEVATION SUMMARY MARCH 2019

DRAWN BY:	M. VAPHIADIS	PROJ NO.	320511.0003
CHECKED BY:	J. KRENZ		FIGURE 3
APPROVED BY:	V. BUENING		
DATE:	JANUARY 2020		

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Coordinate System: NAD 1983 StatePlane Michigan South FIPS 2113 Feet Intl (Foot)
Map Rotation: 0

Monitoring Well Screen Information

Monitoring Well ID	Screen Interval Lithology	Screen Interval Depth (ft BGS)	Screen Interval Elevation (ft NAVD 88)
MW-16-01	Sand	92.0 - 97.0	496.3 - 491.3
MW-16-02	Sand	92.0 - 97.0	494.3 - 489.3
MW-16-03	Silty Sand to Sand	132.0 - 137.0	456.0 - 451.0
MW-16-04	Sand	119.0 - 124.0	468.5 - 463.5
MW-16-09	Sand	136.0 - 141.0	452.3 - 447.3

LEGEND

- SOIL BORING
- MONITORING
- DECOMMISSIONED MONITORING WELL

MW ID
GROUNDWATER ELEVATION (DATE)
GROUNDWATER ELEVATION (DATE)
etc...

FT BGS
FEET BELOW GROUND SURFACE
FT NAVD 88
ELEVATION RELATIVE TO THE NORTH AMERICAN VERTICAL DATUM OF 1988

NOTES

1. BASE MAP IMAGERY FROM GOOGLE EARTH PRO, (3/23/2019).
2. WELL LOCATIONS SURVEYED IN MARCH, APRIL AND JUNE 2016 AND JUNE 2017 BY BMJ ENGINEERS & SURVEYORS, INC.
3. NO SAND OR GRAVEL UNIT PRESENT ABOVE BEDROCK IN THIS LOCATION.

N

0 200 400 Feet

1 " = 200 '
1:2,400

PROJECT: DTE ELECTRIC COMPANY
BELLE RIVER POWER PLANT BOTTOM ASH BASIN
4505 KING ROAD
CHINA TOWNSHIP, MICHIGAN

TITLE: BOTTOM ASH BASINS
GROUNDWATER POTENTIOMETRIC
ELEVATION SUMMARY SEPTEMBER 2019

DRAWN BY:	M. VAPHIADIS	PROJ NO.	320511.0003
CHECKED BY:	J. KRENZ		FIGURE 4
APPROVED BY:	V. BUENING		
DATE:	JANUARY 2020		

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Appendix A
Alternative Source Demonstration: First 2019 Semiannual Detection Monitoring Sampling Event

ED_005947A_00014556-00051

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Technical Memorandum

Date: August 8, 2019

To: Christopher P. Scieszka
DTE Electric Company

From: Graham Crockford, TRC
David McKenzie, TRC

Project No.: 320511.0003.0000 Phase 001, Task 001

Subject: Alternate Source Demonstration: 2019 First Semi Annual Detection Monitoring Sampling Event Belle River Power Plant Coal Combustion Residual Bottom Ash Basins

Introduction

On April 17, 2015, the United States Environmental Protection Agency (USEPA) published the final rule for the regulation and management of Coal Combustion Residuals (CCR) under the Resource Conservation and Recovery Act (RCRA) (the CCR Rule). The CCR Rule, which became effective on October 19, 2015, applies to the DTE Electric Company (DTE Electric) Belle River Power Plant (BRPP) CCR Bottom Ash Basins (BABs) CCR unit.

TRC Engineers Michigan, Inc. (TRC) conducted the first semiannual 2019 detection monitoring event for the BRPP BABs CCR unit on behalf of DTE Electric on March 18 through March 20, 2019 in accordance with the *CCR Groundwater Monitoring and Quality Assurance Project Plan – DTE Electric Company Belle River Power Plant Bottom Ash Basins and Diversion Basin* (QAPP) (TRC, July 2016; revised March and August 2017). The semiannual groundwater monitoring event included the statistical evaluation of the detection monitoring parameters (Appendix III to Part 257 of the CCR Rule) for the BRPP BABs CCR unit. This event is the fourth detection monitoring event performed to comply with §257.94. As part of the statistical evaluation, the data collected during detection monitoring events are evaluated to identify statistically significant increases (SSIs) in detection monitoring parameters to determine if concentrations in detection monitoring well samples exceed background levels. The statistical analysis was performed pursuant to §257.93(f) and (g), and in accordance with the Groundwater Statistical Evaluation Plan (Stats Plan) (TRC, 2017).

The statistical evaluation of the March 2019 Appendix III indicator parameters showed potential SSIs over background for:

- Total Dissolved Solids (TDS) at MW-16-01; and
- Sulfate at MW-16-04

All other Appendix III constituents were within the statistical background limits.

In accordance with §257.94(3)(2), DTE Electric may demonstrate that a source other than the CCR unit caused the SSI or that the SSI resulted from error in sampling, analysis, statistical evaluation, or natural variation in groundwater quality. This Alternate Source Demonstration (ASD) has been prepared to evaluate the potential SSIs identified in the March 2019 detection monitoring event.

Background

The BRPP is located in China Township in St. Clair County, Michigan. The site location is shown in Figure 1. The BRPP was constructed in the early 1980s with plant operations beginning in 1984. The property has been used continuously as a coal fired power plant since Detroit Edison Company (now DTE Electric) began power plant operations at BRPP in 1984 and is generally constructed over a natural clay rich soil base. The BABs have been in use with the BRPP since it began operation and have collected CCR bottom ash that is periodically cleaned out and either sold for beneficial reuse or disposed of at the Range Road Landfill (RRLF).

The BRPP BABs are two adjacent physical sedimentation basins that are slightly raised CCR surface impoundments referred to as the North and South BABs, located north of the BRPP. These are considered one CCR unit. The BABs receive sluiced bottom ash and other process flow water from the power plant. Discharge water from each BAB gravity flows over an outlet weir to a conveyance network of ditches and pipes, then flows into the diversion basin (DB) CCR unit, which is monitored as a separate CCR unit in accordance with the CCR Rule.

The BRPP BABs CCR unit is located approximately one-mile west of the St. Clair River. The BRPP BABs CCR unit is underlain by more than 130 feet of unconsolidated sediments, with the lower confining Bedford Shale generally encountered from 135 to 145 feet below ground surface (bgs). In general, the BRPP BABs CCR unit is initially underlain by at least 90 to as much as 136 feet of laterally extensive low hydraulic conductivity silty clay-rich deposits. The depth to the top of the confined sand-rich uppermost aquifer encountered immediately beneath the silty clay-rich deposits varies up to 46 feet within the monitoring well network and rapidly thins to the south and east of the BABs and pinches out (e.g., no longer present) to the southeast. Consequently, the uppermost aquifer is not laterally contiguous across the entire BRPP BABs CCR unit, and not present in the southeastern corner of the BABs.

The detection monitoring well network for the BABs CCR unit currently consists of five monitoring wells that are screened in the uppermost aquifer. As discussed in the Stats Plan, intrawell statistical methods for the BABs CCR unit were selected based on the geology and hydrogeology at the Site (primarily the presence of clay/hydraulic barrier, the variability in the presence of the uppermost aquifer across the site, and presence of no flow boundary on the southeast side of the aquifer), in addition to other supporting lines of evidence that the aquifer is unaffected by the CCR unit (such as the consistency in concentrations of water quality data). Monitoring wells MW-16-01 through MW-16-04 and MW-16-09 are located around the north, east and south perimeter of the BABs and provide data on both background and downgradient groundwater quality that has not been affected

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by the CCR unit (total of five background/downgradient monitoring wells). The monitoring well locations are shown in Figure 2. The *Groundwater Monitoring System Summary Report – DTE Electric Company Belle River Power Plant Bottom Ash Basins and Diversion Basin Coal Combustion Residual Units*, (GWMS Report) details the groundwater monitoring system (TRC, October 2017).

Alternate Source Demonstration

Verification resampling was performed as recommended per the Stats Plan and the USEPA's Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities, Unified Guidance (Unified Guidance, USEPA, 2009) to achieve performance standards as specified by §257.93(g) in the CCR rules. Per the Stats Plan, if there is an exceedance of a prediction limit for one or more of the parameters, the well(s) of concern will be resampled within 30 days of the completion of the initial statistical analysis. Only constituents that initially exceed their statistical limit (i.e., have no previously recorded SSIs) will be analyzed for verification purposes. As such, verification resampling was conducted on May 9, 2019, by TRC personnel. Groundwater samples were collected for TDS at monitoring well MW-16-01 and sulfate at monitoring well MW-16-04 in accordance with the Quality Assurance Project Plan (TRC, July 2016, revised in March and August 2017). A summary of the groundwater data collected during the verification resampling event is provided on Table 1. The associated data quality review is included in Attachment A.

The verification resampling confirmed the TDS exceedance at MW-16-01 and the sulfate exceedance at MW-16-04 during the May 2019 verification sampling event. The following discussion presents the ASD for the confirmed prediction limit exceedances.

TDS at MW-16-01: The TDS concentrations at MW-16-01, shown graphically as data points greater than the prediction limit in Figure 3, are likely the result of natural spatial variability in groundwater quality at the site and a statistical false positive, and not the result of a release from the BRPP BABs CCR unit. Multiple lines of evidence are provided in support of this conclusion and are as follows:

- **Spatial variability in groundwater quality** – After 8 background sampling events, the prediction limits calculated for each of the 5 monitoring wells range from 890 mg/L to 2,000 mg/L. This variability in groundwater quality across the site, shows that the TDS concentrations vary spatially throughout the uppermost aquifer and suggests the confirmed TDS SSI at MW-16-01 could be attributed to spatial variability rather than the CCR unit.
- **Insufficient background sampling timeline to account for long-term trends** – Variability in TDS concentrations observed in the groundwater at BRPP BABs CCR unit during the background sampling events provides evidence of the heterogeneity of this constituent in groundwater. The short duration of the background sampling events limits the ability of the statistical analysis to capture the natural temporal trends in the groundwater quality at the BRPP BABs CCR unit. This is a limitation of the CCR Rule implementation timeline.

ED_005947A_00014556-00054

- **Lack of similar increase in other indicator parameters** – The lack of SSIs for any other parameters within the same monitoring well, and across the other wells within the monitoring well network, also suggests a source other than CCR leachate for the observed TDS SSI at this location.
- **Time of travel analysis** – The clay formation immediately beneath the BRPP BABs CCR unit provides a natural geologic barrier to migration of CCR constituents to the underlying aquifer. The vertical extent of the clay layer beneath the CCR unit is shown in Figures 6 and 7 as cross-sections. Figure 5 shows the cross-section locations in plan view. Conservatively calculating a time of travel for liquid from the base of the BRPP BABs CCR unit through a minimum of 82 feet of clay, to the underlying upper aquifer, yields approximately 1,300 years of travel time (TRC, October 2017). The BRPP BABs CCR unit began accepting coal ash in approximately 1984, so, based on this analysis, there is no potential for indicator parameters to have migrated to the upper aquifer.

Sulfate at MW-16-04: The sulfate concentrations at MW-16-04, shown graphically as data points greater than the prediction limit in Figure 4, are likely the result of natural spatial variability in groundwater quality at the site and a statistical false positive, and not the result of a release from the BRPP BABs CCR unit. Multiple lines of evidence are provided in support of this conclusion and are as follows:

- **Spatial variability in groundwater quality** – After 8 background sampling events, the prediction limits calculated for each of the 5 monitoring wells range from 8.1 mg/L to 40 mg/L. This variability in groundwater quality across the site, shows that the sulfate concentrations vary spatially throughout the uppermost aquifer and suggests the confirmed sulfate SSI at MW-16-04 could be attributed to spatial variability rather than the CCR unit.
- **Insufficient background sampling timeline to account for long-term trends** – Variability in sulfate concentrations observed in the groundwater at BRPP during the background sampling events provides evidence of the heterogeneity of this constituent in groundwater. The short duration of the background sampling events limits the ability of the statistical analysis to capture the natural temporal trends in the groundwater quality at the BRPP. This is a limitation of the CCR Rule implementation timeline.
- **Lack of similar increase in other indicator parameters** – The lack of SSIs for any other parameters within the same monitoring well, and across the other wells within the monitoring well network, also suggests a source other than CCR leachate for the observed sulfate SSI at this location.
- **Time of travel analysis** – The clay formation immediately beneath the BRPP BABs CCR unit provides a natural geologic barrier to migration of CCR constituents to the underlying aquifer. The vertical extent of the clay layer beneath the CCR unit is shown in Figures 6 and 7 as cross-sections. Figure 5 shows the cross-section locations in plan view. Conservatively calculating a time of travel for liquid from the base of the BRPP BABs CCR unit through a minimum of 82 feet of clay, to the underlying upper aquifer, yields approximately 1,300 years of travel time (TRC, October 2017). The BRPP BABs CCR unit began accepting coal ash in approximately 1984, so,

based on this analysis, there is no potential for indicator parameters to have migrated to the upper aquifer.

Conclusions and Recommendations

The information provided in this report serves as the ASD for the DTE Electric BRPP BABs CCR unit, was prepared in accordance with 40 CFR 257.94(e)(2) of the CCR Rule, and demonstrates that the TDS SSI and sulfate SSI determined based on the first semiannual detection monitoring event performed in 2019 are not due to a release of CCR leachate into the groundwater. Therefore, based on the information provided in this ASD, DTE Electric will continue detection monitoring as per 40 CFR 257.94 at the BRPP BABs CCR unit.

Certification Statement

I hereby certify that the alternative source demonstration presented within this document for the BRPP BAB CCR unit has been prepared to meet the requirements of Title 40 CFR §257.94(e) 2 of the Federal CCR Rule. This document is accurate and has been prepared in accordance with good engineering practices, including the consideration of applicable industry standards, and with the requirements of Title 40 CFR §257.94(e) 2.

Name: David B. McKenzie, P.E.	Expiration Date: October 31, 2019	State of Michigan David B. McKenzie Engineer No. 42332 Licensed Professional Engineer Stamp
Company: TRC Engineers Michigan, Inc.	Date: 8/8/19	

References

TRC Environmental Corporation. July 2016; Revised March and August 2017. CCR Groundwater Monitoring and Quality Assurance Project Plan – DTE Electric Company Belle River Power Plant Bottom Ash Basins and Diversion Basin, 4505 King Road, China Township, Michigan. Prepared for DTE Electric Company.

TRC Environmental Corporation. October 2017. Groundwater Monitoring System Summary Report – DTE Electric Company Belle River Power Plant Bottom Ash Basins and Diversion Basin Coal Combustion Residual Units, 4505 King Road, China Township, Michigan. Prepared for DTE Electric Company.

TRC Environmental Corporation. October 2017. Groundwater Statistical Evaluation Plan – DTE Electric Company Belle River Power Plant Coal Combustion Residual Bottom Ash Basins, 4505 King Road, China Township, Michigan. Prepared for DTE Electric Company.

USEPA. 2009. Statistical Analysis of Groundwater Monitoring Data at RCRA facilities, Unified Guidance. Office of Conservation and Recovery. EPA 530/R-09-007.

Attachments

Table 1. Comparison of Verification Sampling Results to Background Limits

Figure 1. Site Location Map
Figure 2. Monitoring Network and Site Plan
Figure 3. MW-16-01 TDS Time Series Plot
Figure 4. MW-16-04 Sulfate Time Series Plot
Figure 5. Cross Section Locator Map
Figure 6. Generalized Geologic Cross-Section A-A′
Figure 7. Generalized Geologic Cross-Section B-B′

Attachment A. Data Quality Review

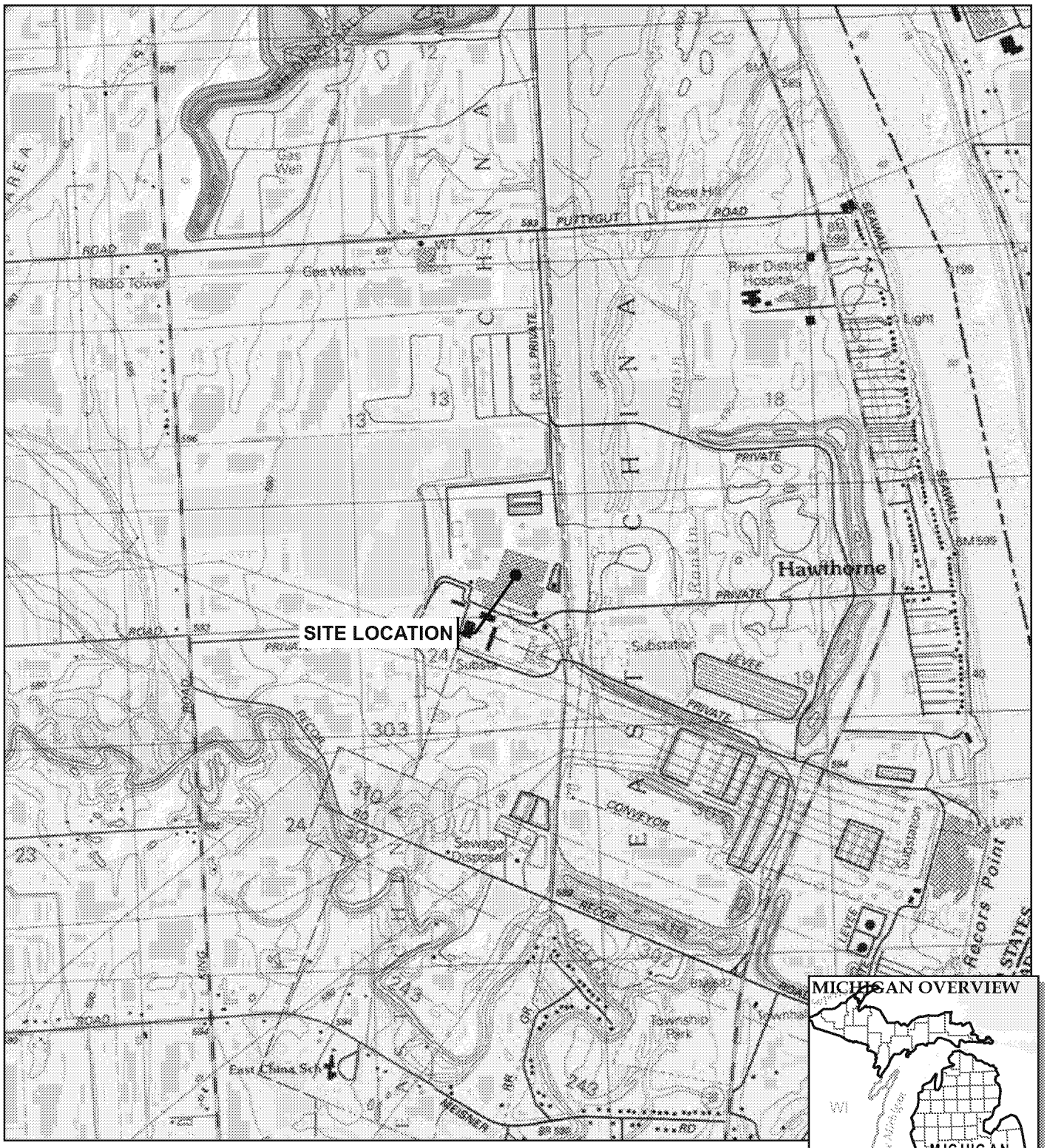
Table 1

Table 1
Comparison of Verification Sampling Results to Background Limits
Belle River Power Plant BABs - RCRA CCR Monitoring Program
China Township, Michigan

Sample Location:		MW-16-01		MW-16-04	
Sample Date:		5/9/2019		5/9/2019	
Constituent	Unit	Data	PL	Data	PL
Appendix III					
Sulfate	mg/L	--	8.1	**24**	18
Total Dissolved Solids	mg/L	**970**	950	--	1,100

Notes:
mg/L - milligrams per liter.
RESULT Shading and bold font indicates a confirmed exceedance of the Prediction Limit (PL).

Figures



BASE MAP FROM USGS 7.5 MINUTE TOPOGRAPHIC QUADRANGLE SERIES.

N

1 " = 2,000 '
1:24,000

0 2,000 4,000
FEET

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PROJECT:

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BELLE RIVER POWER PLANT
4505 KING ROAD
CHINA TOWNSHIP, MICHIGAN

TITLE:

SITE LOCATION MAP

DRAWN BY:	J PAPEZ
CHECKED BY:	S HOLMSTROM
APPROVED BY:	V BUENING
DATE:	AUGUST 2019
PROJ. NO.:	320511.0003.0000 P1 T1
FILE:	320511-0003-001slmMB.mxd

FIGURE 1

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LEGEND

- SOIL BORING
- MONITORING WELL
- DECOMMISSIONED MONITORING WELL

NOTES

1. BASE MAP IMAGERY FROM GOOGLE EARTH PRO. & PARTNERS, (3/24/2019).
2. WELL LOCATIONS SURVEYED IN MARCH, APRIL, JUNE 2016, AND JUNE 2017 BY BMJ ENGINEERS & SURVEYORS, INC.

N

0 200 400 Feet

1 " = 200 '
1:2,400

PROJECT	DTE ELECTRIC COMPANY BELLE RIVER POWER PLANT 4505 KING ROAD CHINA TOWNSHIP, MICHIGAN
TITLE	SITE PLAN
DRAWN BY: R SUEMNICHT	PROJ NO. 320511.0003.0000 P1 T1
CHECKED BY: S HOLMSTROM	FIGURE 2
APPROVED BY: V BUENING	
DATE: AUGUST 2019	

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Coordinate System: NAD 1983 StatePlane Michigan South FIPS 2113 Feet Intl (Foot)
Map Rotation: 0

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Figure 3
MW-16-01 TDS Time Series Plot
Belle River Power Plant Bottom Ash Basins - RCRA CCR Monitoring Program

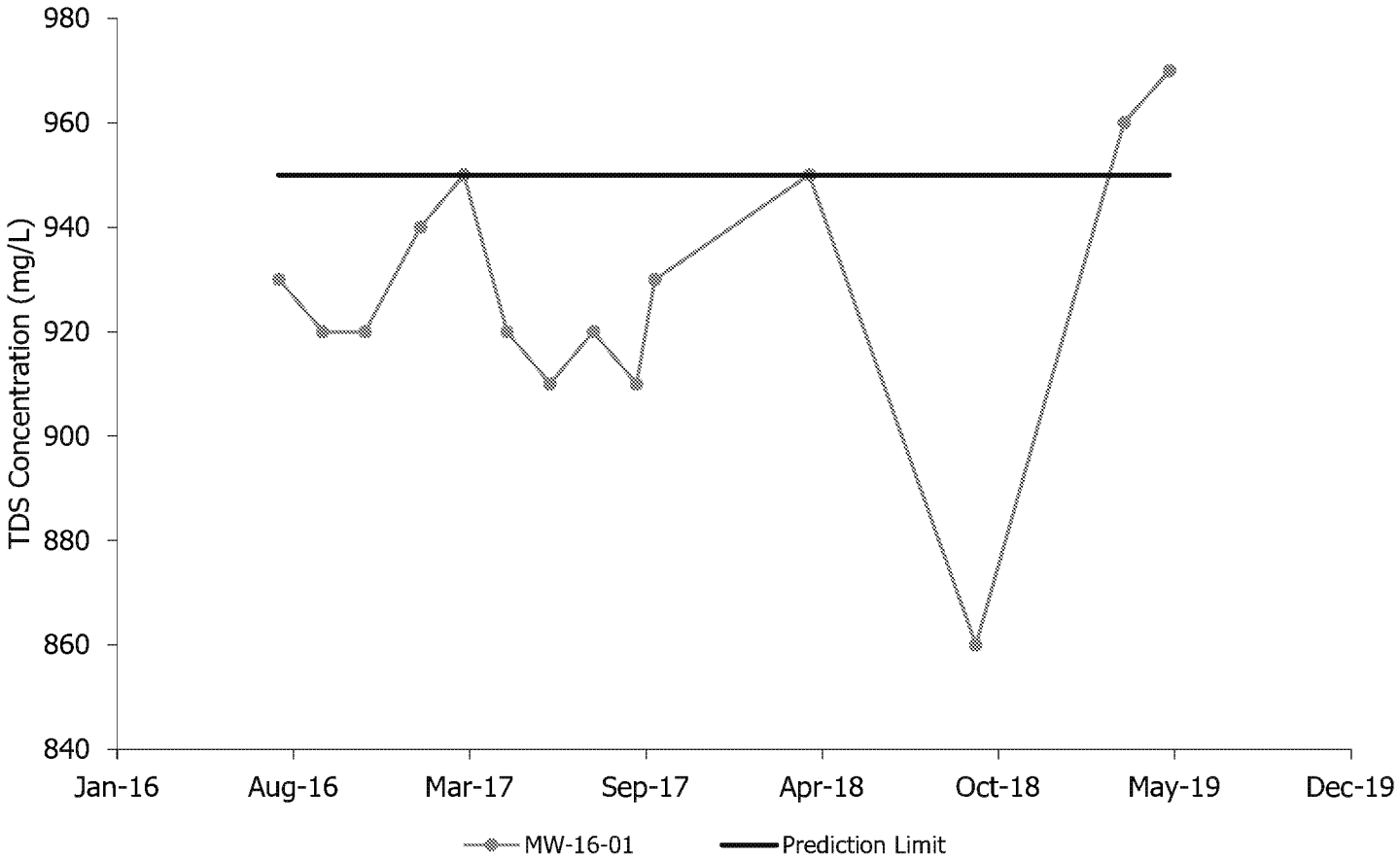
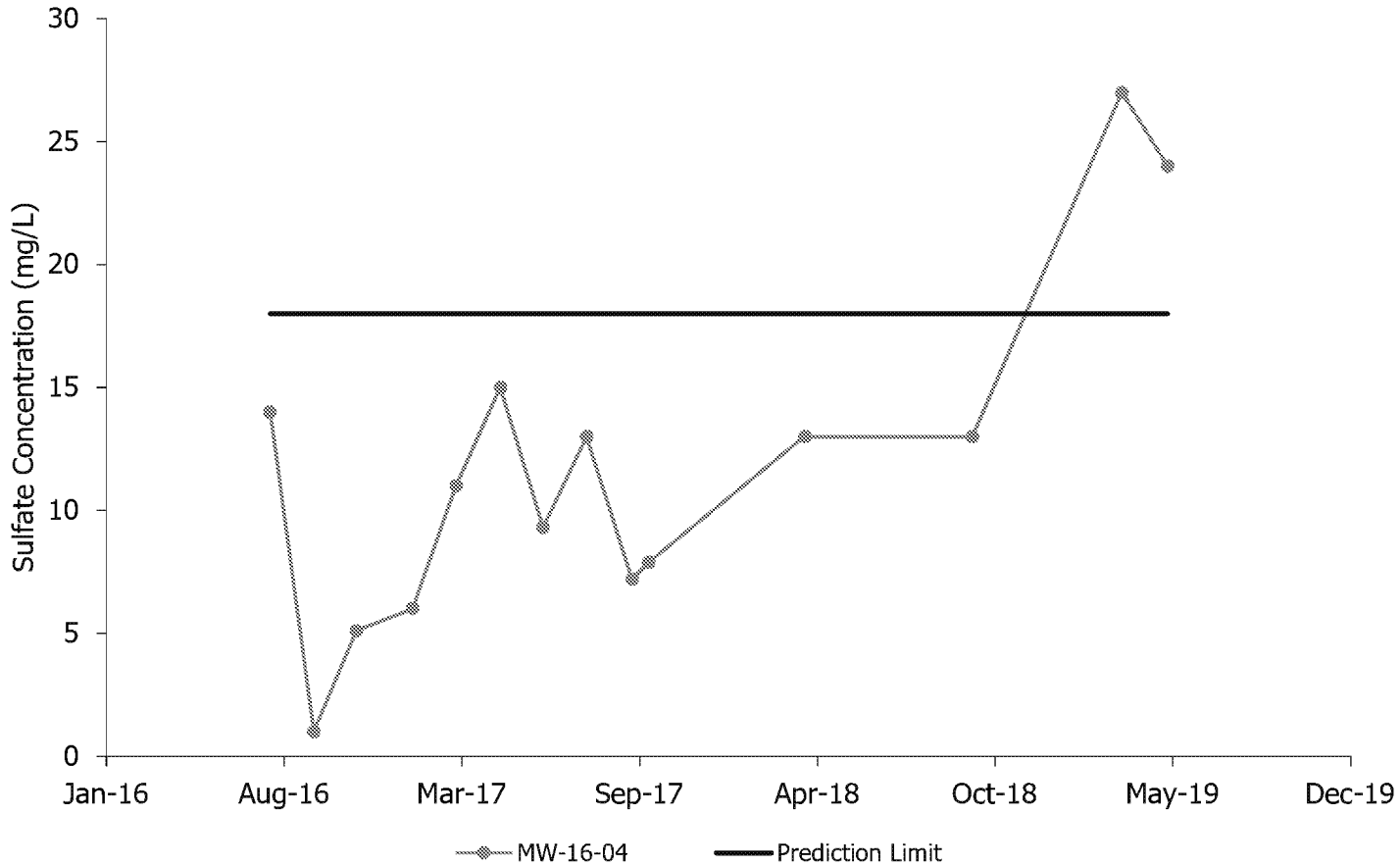


Figure 4
MW-16-04 Sulfate Time Series Plot
Belle River Power Plant Bottom Ash Basins - RCRA CCR Monitoring Program



TRC | DTE Electric Company
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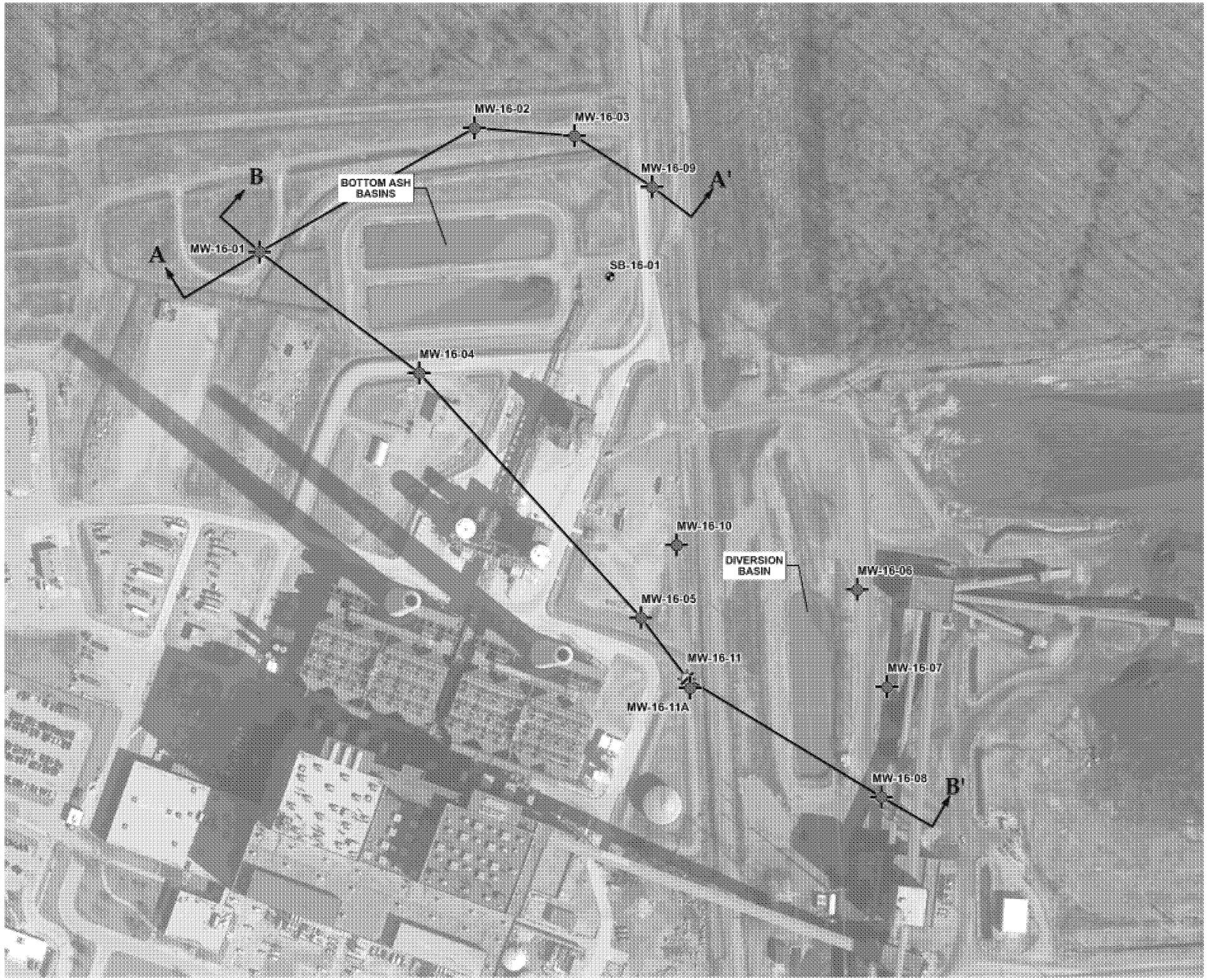
August 2019



LEGEND

- SOIL BORING
- MONITORING WELL
- DECOMMISSIONED MONITORING WELL
- CROSS SECTIONS

NOTES

1. BASE MAP IMAGERY FROM GOOGLE EARTH PRO. & PARTNERS, (3/24/2019).
2. WELL LOCATIONS SURVEYED IN MARCH, APRIL, JUNE 2016, AND JUNE 2017.

N

0 200 400 Feet

1 " = 200 '
1:2,400

PROJECT: DTE ELECTRIC COMPANY
BELLE RIVER POWER PLANT
4505 KING ROAD
CHINA TOWNSHIP, MICHIGAN

TITLE: CROSS SECTION LOCATOR MAP

DRAWN BY:	J. PAPEZ	PROJ NO.:	320511.0003.0000 P1 T1
CHECKED BY:	S. HOLMSTROM		FIGURE 5
APPROVED BY:	V. BUENING		
DATE:	AUGUST 2019		

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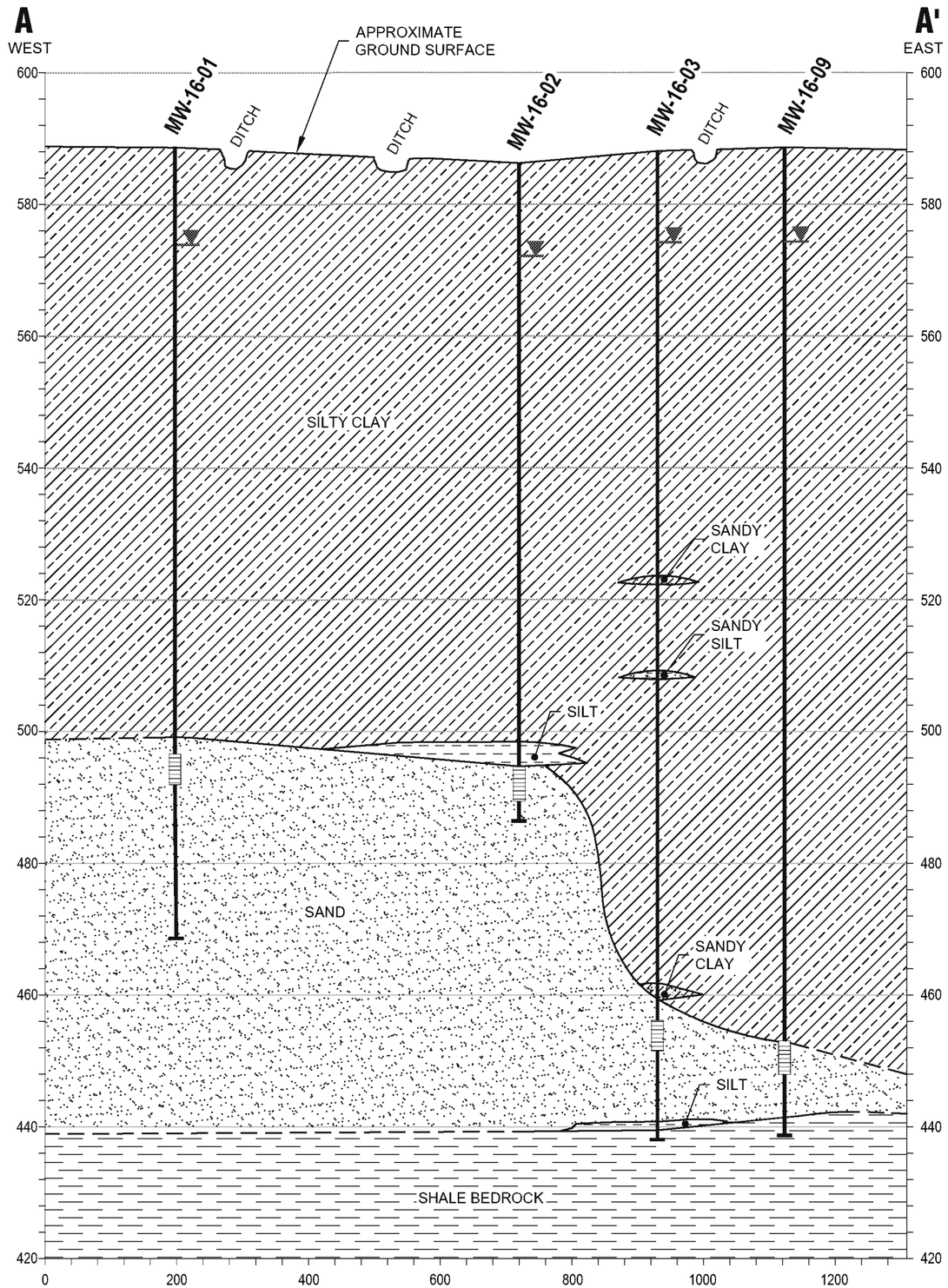
Coordinate System: NAD 1983 StatePlane Michigan South FIPS 2113 Feet Intl (Foot)
Map Rotation: 0

TRC - GIS

GENERALIZED GEOLOGIC CROSS-SECTION A-A'



LEGEND

- STRATEGRAPHIC BOUNDARY (DASHED WHERE INFERRED)
- GROUNDWATER ELEVATION (COLLECTED 02/27/2017)
- SOIL BORING
- WELL SCREEN INTERVAL
- END OF BORING

Lithology Key

- SILTY CLAY
- SAND
- SILT
- SANDY CLAY
- SANDY SILT
- SHALE BEDROCK

SCALE IN FEET

VERTICAL: 0 – 20

HORIZONTAL: 0 – 200

PROJECT:

DTE ELECTRIC COMPANY
BELLE RIVER POWER PLANT
CHINA TOWNSHIP, MICHIGAN

TITLE:

GENERALIZED GEOLOGIC CROSS-SECTION A-A'

DRAWN BY:	D.STEHLE	PROJ NO.:	320511.0003.01.01
CHECKED BY:	S.HOLMSTROM		
APPROVED BY:	V.BUENING		**FIGURE 6**
DATE:	AUGUST 2019		

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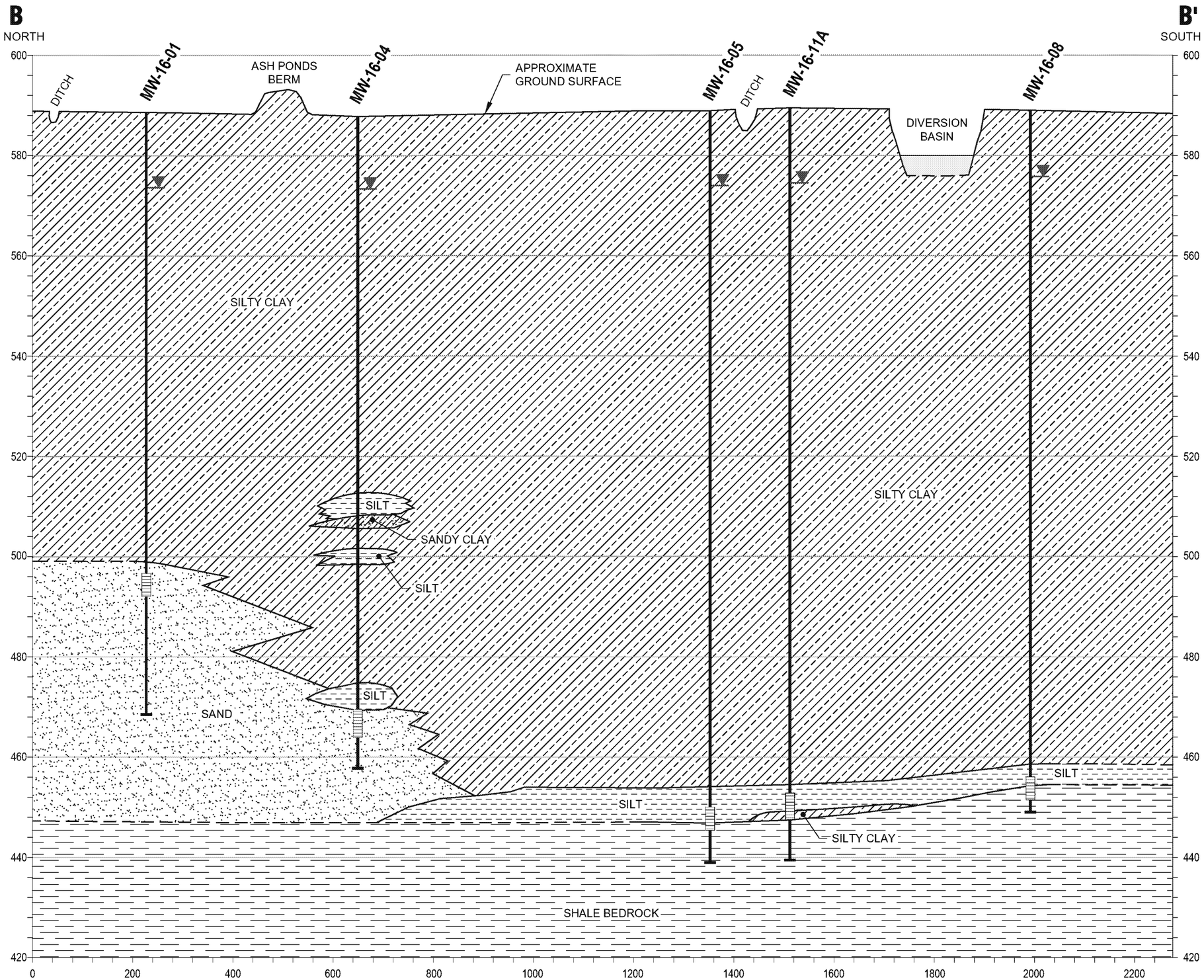
FILE NO.: 320511.0003.01.01.06-07.dwg

11x17 --- ATTACHED XREF'S: --- ATTACHED IMAGES:
DRAWING NAME: J:_TRC\DTE\Belle River PP\320511\0003\01\01\320511.0003.01.01.06-07.dwg --- PLOT DATE: August 07, 2019 - 9:42AM --- LAYOUT: FIG06 XS AA

GENERALIZED GEOLOGIC CROSS-SECTION B-B'



LEGEND

- STRATEGRAPHIC BOUNDARY (DASHED WHERE INFERRED)
- GROUNDWATER ELEVATION (COLLECTED 02/27/2017)
- SOIL BORING
- WELL SCREEN INTERVAL
- END OF BORING

Lithology Key

- SILTY CLAY
- SAND
- SILT
- SANDY CLAY
- SHALE BEDROCK

SCALE IN FEET

VERTICAL: 0 – 20

HORIZONTAL: 0 – 200

PROJECT:

DTE ELECTRIC COMPANY
BELLE RIVER POWER PLANT
CHINA TOWNSHIP, MICHIGAN

TITLE:

GENERALIZED GEOLOGIC CROSS-SECTION B-B'

DRAWN BY:	D.STEHLE	PROJ NO.:	320511.0003.01.01
CHECKED BY:	S.HOLMSTROM		
APPROVED BY:	V.BUENING		**FIGURE 7**
DATE:	AUGUST 2019		

TRC

1540 Eisenhower Place
Ann Arbor, MI 48108
Phone: 734.971.7080
www.trcsolutions.com

FILE NO.: 320511.0003.01.01.06-07.dwg

11x17 --- ATTACHED XREF'S: --- ATTACHED IMAGES:
DRAWING NAME: J:_TRC\DTE\Belle River PP\320511\0003\01\01\320511.0003.01.01.06-07.dwg --- PLOT DATE: August 07, 2019 - 9:41AM --- LAYOUT: FIG07 XS BB

Attachment A
Data Quality Review

Laboratory Data Quality Review
Groundwater Monitoring Event May 2019 (Verification Resampling)
DTE Electric Company Belle River Power Plant (DTE BRPP)

On May 9, 2019, TRC Environmental Corporation (TRC) collected groundwater samples at MW-16-01 and MW-16-04 to verify analytical results that were outside of the prediction limits during the March 2019 detection monitoring event. Samples were analyzed by Test America Laboratories, Inc. (Test America), located in Canton, Ohio for anions (SW846 6020/9056A) and total dissolved solids (TDS) (SM 2540C). The laboratory analytical results are reported in laboratory report J112501-1.

TRC reviewed the laboratory data to assess data usability. The following sections summarize the data review procedure and the results of the review.

Data Quality Review Procedure

The analytical data were reviewed using the USEPA National Functional Guidelines for Inorganic Superfund Data Review (USEPA, 2017). The following items were included in the evaluation of the data:

- Sample receipt, as noted in the cover page or case narrative;
- Technical holding times for analyses;
- Data for method blanks. Method blanks are used to assess potential contamination arising from laboratory sample preparation and/or analytical procedures;
- Reporting limits (RLs) compared to project-required RLs;
- Data for blind field duplicates. Field duplicate samples are used to assess variability introduced by the sampling and analytical processes;
- Data for laboratory control samples (LCSs). The LCSs are used to assess the accuracy of the analytical method using a clean matrix;
- Data for laboratory duplicates. The laboratory duplicates are replicate analyses of one sample and are used to assess the precision of the analytical method; and
- Overall usability of the data.

This data usability report addresses the following items:

- Usability of the data if quality control (QC) results suggest potential problems with all or some of the data;
- Actions regarding specific QC criteria exceedances.

Review Summary

The data quality objectives and laboratory completeness goals for the project were met, and the data are usable for their intended purpose. A summary of the data quality review, including non-conformances and issues identified in this evaluation are noted below.

QA/QC Sample Summary:

- Target analytes were not detected in associated method blanks.
- LCS recoveries were within laboratory control limits.
- Dup-01 corresponds with MW-16-01 and Dup-02 corresponds with MW-16-04; relative percent differences (RPDs) between the parent and duplicate sample were within the QC limits.
- Data are usable for purposes of verification sampling.

ED_005947A_00014556-00070

Appendix B
Data Quality Reviews

ED_005947A_00014556-00071

Laboratory Data Quality Review
Groundwater Monitoring Event March 2019 (Detection Monitoring)
DTE Electric Company Belle River Power Plant (DTE BRPP)

Groundwater samples were collected by TRC for the March 2019 sampling event for the Diversion Basin at the DTE BRPP. Samples were analyzed for anions, boron, calcium, and total dissolved solids by Test America Laboratories, Inc., (Test America) located in North Canton, Ohio. The laboratory analytical results are reported in laboratory report 240-109798-1.

During the March 2019 sampling event, a groundwater sample was collected from the following wells:

- MW-16-01
- MW-16-02
- MW-16-03
- MW-16-04
- MW-16-05
- MW-16-06
- MW-16-07
- MW-16-08
- MW-16-09
- MW-16-10
- MW-16-11A

Each sample was analyzed for the following constituents:

Analyte Group	Method
Anions (Chloride, Fluoride, Sulfate)	SW846 9056A
Total Boron	SW846 3005A/6010B
Total Calcium	SW846 3005A/6020
Total Dissolved Solids	SM 2540C

TRC reviewed the laboratory data to assess data usability. The following sections summarize the data review procedure and the results of the review.

Data Quality Review Procedure

The analytical data were reviewed using the USEPA National Functional Guidelines for Inorganic Superfund Data Review (USEPA, 2017). The following items were included in the evaluation of the data:

- Sample receipt, as noted in the cover page or case narrative;
- Technical holding times for analyses;
- Reporting limits (RLs) compared to project-required RLs;
- Data for method blanks and equipment blanks. Method blanks are used to assess potential contamination arising from laboratory sample preparation and/or analytical procedures. Equipment blanks are used to assess potential contamination arising from field procedures;

ED_005947A_00014556-00072

- Data for laboratory control samples (LCSs). The LCSs are used to assess the accuracy of the analytical method using a clean matrix;
- Data for matrix spike and matrix spike duplicate samples (MS.MSDs), if applicable. The MS/MSDs are used to assess the accuracy and precision of the analytical method using a sample from the dataset;
- Data for laboratory duplicates, if applicable. The laboratory duplicates are used to assess the precision of the analytical method using a sample from the dataset;
- Data for blind field duplicates. Field duplicate samples are used to assess variability introduced by the sampling and analytical processes; and
- Overall usability of the data.

This data usability report addresses the following items:

- Usability of the data if quality control (QC) results suggest potential problems with all or some of the data;
- Actions regarding specific QC criteria exceedances.

Review Summary

The data quality objectives and laboratory completeness goals for the project were met, and the data are usable for their intended purpose. A summary of the data quality review, including non-conformances and issues identified in this evaluation are noted below.

- The reviewed constituents will be utilized for the purposes of a detection monitoring program.
- Data are usable for the purposes of the detection monitoring program.

QA/QC Sample Summary:

- The holding time for TDS for samples MW-16-01, MW-16-02, MW-16-03, MW-16-04, MW-16-05, DUP-01, and EB-01 exceeded the 7-day holding time criteria by approximately 5-10 hours. These results are estimated and may be biased low.
- Target analytes were not detected in the equipment blank (EB-01_20190318).
- Target analytes were not detected in the method blanks.
- LCS recoveries for all target analytes were within laboratory control limits.
- Sample DUP-01 corresponds with sample MW-16-01. The relative percent differences (RPDs) between the parent and duplicate sample were within the acceptance limits.
- Laboratory duplicate analyses were performed on sample MW-16-01 for TDS; the RPD was within the acceptance limits.

ED_005947A_00014556-00073

- MS/MSD analyses were performed on the following samples:
  - Sample MW-16-01 for boron; the percent recoveries (%Rs) and RPDs were within the acceptance limits.
  - Samples MW-16-02 and DUP-01 for fluoride and sulfate; the %Rs and RPDs were within the acceptance limits.
  - Sample MW-16-02 for calcium; the MS/MSD %Rs (68%/63%) were below the lower QC limit of 75%, but no action was required since the sample result in the parent sample was > 4x the spike added.
- For TDS, the constant weight was not achieved after three drying cycles for sample MW-16-02; there was no impact on data usability.

ED_005947A_00014556-00074

Laboratory Data Quality Review
Groundwater Monitoring Event September 2019 (Detection Monitoring)
DTE Electric Company Belle River Power Plant (DTE BRPP)

Groundwater samples were collected by TRC for the September 2019 sampling event for the Bottom Ash Basins and Diversion Basin at the DTE BRPP. Samples were analyzed for anions, total boron, total calcium, and total dissolved solids by Eurofins-Test America Laboratories, Inc. (Eurofins-TA), located in North Canton, Ohio. The laboratory analytical results are reported in laboratory report 240-119135-1.

During the September 2019 sampling event, a groundwater sample was collected from each of the following wells:

Bottom Ash Basins:

- MW-16-01
- MW-16-02
- MW-16-03
- MW-16-04
- MW-16-09

Diversion Basin:

- MW-16-05
- MW-16-06
- MW-16-07
- MW-16-08
- MW-16-10
- MW-16-11A

Each sample was analyzed for the following constituents:

Analyte Group	Method
Anions (Chloride, Fluoride, Sulfate)	SW846 9056A
Total Boron	SW846 3005A/6010B
Total Calcium	SW846 3005A/6020
Total Dissolved Solids	SM 2540C

TRC reviewed the laboratory data to assess data usability. The following sections summarize the data review procedure and the results of the review.

The analytical data were reviewed using the USEPA National Functional Guidelines for Inorganic Superfund Data Review (USEPA, 2017). The following items were included in the evaluation of the data:

- Sample receipt, as noted in the cover page or case narrative;
- Technical holding times for analyses;
- Reporting limits (RLs) compared to project-required RLs;

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- Data for method blanks and equipment blanks, where applicable. Method blanks are used to assess potential contamination arising from laboratory sample preparation and/or analytical procedures. Equipment blanks are used to assess potential contamination arising from field procedures;
- Data for laboratory control samples (LCSs). The LCSs are used to assess the accuracy of the analytical method using a clean matrix;
- Data for matrix spike and matrix spike duplicate samples (MS/MSDs), where applicable. The MS/MSDs are used to assess the accuracy and precision of the analytical method using a sample from the dataset;
- Data for laboratory duplicates, where applicable. The laboratory duplicates are used to assess the precision of the analytical method using a sample from the dataset;
- Data for blind field duplicates. Field duplicate samples are used to assess variability introduced by the sampling and analytical processes; and
- Overall usability of the data.

This data usability report addresses the following items:

- Usability of the data if quality control (QC) results suggest potential problems with all or some of the data;
- Actions regarding specific QC criteria exceedances.

Review Summary

The data quality objectives and laboratory completeness goals for the project were met, and the data are usable for their intended purpose. A summary of the data quality review, including non-conformances and issues identified in this evaluation are noted below.

- Appendix III constituents will be utilized for the purposes of a detection monitoring program.
- Data are usable for the purposes of the detection monitoring program.

QA/QC Sample Summary:

- There was one equipment blank submitted with this dataset (EB-01) which was associated with the low hydraulic conductivity wells (MW-16-08, MW 16-10, and MW-16-11A). Chloride was detected at 1.8 mg/L and TDS was detected at 12 mg/L in this equipment blank. However, these analytes were detected at concentrations greater than five times the blank concentrations in the associated wells; thus, there was no impact on data usability.

- Target analytes were not detected in the method blanks.

- LCS recoveries for all target analytes were within laboratory control limits.

ED_005947A_00014556-00076

- MS/MSD analyses were performed on samples MW-16-01 for boron, MW-16-03 for fluoride and sulfate, and MW-16-02 for calcium; the percent recoveries (%Rs) and relative percent differences (RPDs) were acceptable.
  - MS/MSD analyses were not performed for chloride; per the project QAPP, MS/MSD analyses are required for chloride at a frequency of 1 per 20 samples. It is likely that an MS/MSD was performed on sample MW-16-03 for chloride but not reported by the laboratory since the sample was re-analyzed at a dilution for chloride.

- Laboratory duplicate analyses were not performed for TDS. Per the project QAPP, laboratory duplicate analyses are required for TDS at a frequency of 1 per 20 samples.

- Dup-01 corresponds with MW-16-01; RPDs between the parent and duplicate sample were within the QC limits.

- The nondetect reporting limits (5.0 mg/L) for sulfate in samples MW-16-06, MW-16-08, and MW-16-11A were above the QAPP-specified RL (1.0 mg/L) due to a 5-fold dilution which was likely the result of elevated chloride concentrations.

ED_005947A_00014556-00077

Laboratory Data Quality Review
Groundwater Monitoring Event
November Verification (Detection Monitoring)
DTE Electric Company Belle River Power Plant (DTE BRPP)

One groundwater sample was collected by TRC for the November 2019 sampling event for the Bottom Ash Basin at the DTE BRPP. The sample was analyzed for calcium and chloride by Test America Laboratories, Inc. (Test America), located in North Canton, Ohio. The laboratory analytical results are reported in laboratory report 240-122291-1

During the November 2019 sampling event, a groundwater sample was collected from the following well:

Bottom Ash Basin:

- MW-16-03

The sample was analyzed for the following constituents:

Analyte Group	Method
Chloride	SW846 9056A
Total Recoverable Calcium	SW846 3005A/6020

TRC reviewed the laboratory data to assess data usability. The following sections summarize the data review procedure and the results of the review.

The analytical data were reviewed using the USEPA National Functional Guidelines for Inorganic Superfund Data Review (USEPA, 2017). The following items were included in the evaluation of the data:

- Sample receipt, as noted in the cover page or case narrative;
- Technical holding times for analyses;
- Reporting limits (RLs) compared to project-required RLs;
- Data for method blanks and equipment blanks. Method blanks are used to assess potential contamination arising from laboratory sample preparation and/or analytical procedures. Equipment blanks are used to assess potential contamination arising from field procedures;
- Data for laboratory control samples (LCSs). The LCSs are used to assess the accuracy of the analytical method using a clean matrix;
- Data for matrix spike and matrix spike duplicate samples (MS/MSDs). The MS/MSDs are used to assess the accuracy and precision of the analytical method using a sample from the dataset;

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- Data for laboratory duplicates. The laboratory duplicates are used to assess the precision of the analytical method using a sample from the dataset;
- Data for blind field duplicates. Field duplicate samples are used to assess variability introduced by the sampling and analytical processes; and
- Overall usability of the data.

This data usability report addresses the following items:

- Usability of the data if quality control (QC) results suggest potential problems with all or some of the data;
- Actions regarding specific QC criteria exceedances.

Review Summary

The data quality objectives and laboratory completeness goals for the project were met, and the data are usable for their intended purpose. A summary of the data quality review, including non-conformances and issues identified in this evaluation are noted below.

- Appendix III constituents will be utilized for the purposes of a detection monitoring program.
- Data are usable for the purposes of the detection monitoring program.

QA/QC Sample Summary:

- Target analytes were not detected in the method blanks.

- LCS recoveries for all target analytes were within laboratory control limits.

- MS/MSD analyses were not performed on the sample in this data set.

- DUP-01_20191111 corresponds with MW-16-03_20191111; the RPD between the parent and duplicate sample were within the QC limits for chloride; the RPD of 51.9% exceeded the QC limits for calcium and potential uncertainty exists for calcium in all groundwater samples, as summarized in the attached table, Appendix B.

ED_005947A_00014556-00079

Appendix B
Owner Certification of Compliance

DRAFT

Owner Certification of Site Compliance per 40 CFR 257 Subpart D
Belle River Power Plant Bottom Ash Basins
China Township, Michigan

The United States Environmental Protection Agency (EPA) Hazardous and Solid Waste Management System: Disposal of Coal Combustion Residuals From Electric Utilities; A Holistic Approach to Closure Part B: Alternate Demonstration for Unlined Surface Impoundments (40 CFR §257.71(d)), requires that the owner of an existing CCR unit certify the facility is in compliance with the requirements of the CCR Rules (40 CFR 257 Subpart D) except for §257.71(a)(1).

CERTIFICATION

Based on our review of the CCR Rules, I hereby certify that the subject facility is in compliance with the requirements of 40 CFR 257 Subpart D except for §257.71(a)(1).

SIGNATURE	DATE
PRINT NAME	TITLE
COMPANY NAME	

DRAFT

Appendix C
Well Construction Diagrams and Soil Boring Logs

DRAFT

WELL CONSTRUCTION LOG

TRC

WELL NO. MW-16-01

Facility/Project Name:	Date Drilling Started:	Date Drilling Completed:	Project Number:
DTE Electric Company Belle River Power Plant	2/29/16	2/29/16	231828.0003

Drilling Firm:	Drilling Method:	Surface Elev. (ft)	TOC Elevation (ft)	Total Depth (ft bgs)	Borehole Dia. (in)
Stock Drilling	Sonic	588.17	591.30	120.0	6/4

Boring Location: Approximately 188 feet off road to the S, W of bottom ash basins.
N: 471155.70 E: 13625546.02

Personnel
Logged By - A. Knutson
Driller - A. Goldsmith

Drilling Equipment: TSi 150cc

Civil Town/City/or Village:	County:	State:
China Township	St. Clair	MI

Water Level Observations:
While Drilling: Date/Time Depth (ft bgs)
After Drilling: Date/Time 4/13/16 08:45 Depth (ft bgs) 14.52

SAMPLE NUMBER AND TYPE	RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	WELL DIAGRAM	COMMENTS
				SILTY CLAY WITH GRAVEL mostly clay, little to some silt, little fine to coarse gravel, few fine sand, low plasticity, dark gray (10YR 4/1), moist, medium stiff.	CL-ML			Continuous sampling with 4-inch diameter casing from ground surface to terminus of soil boring, over-drilled with 6-inch diameter casing to install monitoring well. Original boring abandoned due to compromised screen. Redrilled and installed at survey location noted above within 10 feet of original location.
1 CS	60		5	**CLAY** mostly clay, trace fine to coarse gravel, high plasticity, brown (10YR 5/3), moist, stiff. Change to dark gray (10YR 4/1), very stiff at 5.0 feet.				
				Change to soft at 8.0 feet.				
			10	Change to no gravel, dark gray (10YR 4/1) mottled with brown (10YR 5/3), very soft at 10.0 feet.				
2 CS	50		15					
			20	Change to dark gray (10YR 4/1) at 20.0 feet.	CL			
3 CS	100		25					
			30					
4 CS	100		35					
			40					

Signature: Chris Scieszka

Firm: TRC Environmental Corporation
1540 Eisenhower Place Ann Arbor, Michigan
734.971.7080
Fax 734.971.9022

Checked By: C. Scieszka

SOIL BORING WELL CONSTRUCTION LOG 231828.0003.0000.GPJ TRC_CORP.GDT 7/14/16

WELL CONSTRUCTION LOG

TRC

WELL NO. MW-16-01

SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	WELL DIAGRAM	COMMENTS
5 CS	100		45	**CLAY** mostly clay, high plasticity, dark gray (10YR 4/1), moist, soft.				
6 ST	100		50					
7 CS	100		55					
			60					
8 CS	80		65		CL			
			70					
9 CS	100		75					
			80					
10 CS	100		85					
			90	**SAND** mostly fine sand, dark gray (10YR 4/1), saturated.				
11 CS	100		95		SP			
			100	End of boring at 100.0 feet below ground surface.				

SOIL BORING WELL CONSTRUCTION LOG 231828.0003.0000.GPJ TRC_CORP.GDT 7/14/16

WELL CONSTRUCTION LOG

TRC

WELL NO. MW-16-02

Facility/Project Name:	Date Drilling Started:	Date Drilling Completed:	Project Number:
DTE Electric Company Belle River Power Plant	3/14/16	3/15/16	231828.0003

Drilling Firm:	Drilling Method:	Surface Elev. (ft)	TOC Elevation (ft)	Total Depth (ft bgs)	Borehole Dia. (in)
Stock Drilling	Sonic	586.27	588.94	100.0	6/4

Boring Location: 325 feet W of haul road, 5 feet N of road, N of bottom ash basins.
N: 471409.06 E: 13625991.78

Personnel
Logged By - A. Knutson
Driller - A. Goldsmith

Drilling Equipment: TSi 150cc

Civil Town/City/or Village:	County:	State:
China Township	St. Clair	MI

Water Level Observations:
While Drilling: Date/Time Depth (ft bgs)
After Drilling: Date/Time 4/13/16 09:24 Depth (ft bgs) 16.07

SAMPLE NUMBER AND TYPE	RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	WELL DIAGRAM	COMMENTS
1 CS	80		5	**CLAY** mostly clay, few silt, few coarse gravel, medium plasticity, dark gray (10YR 4/1) mottled with brown (10YR 5/3), stiff.				Continuous sampling with 4-inch diameter casing from ground surface to terminus of soil boring, over-drilled with 6-inch diameter casing to install monitoring well.
				Change to no gravel at 7.0 feet.				
2 CS	80		10	Change to high plasticity, dark gray (10YR 4/1), moist, very soft at 10.0 feet.				
			15	▼				
3 CS	100		20		CL			
			25					
4 CS	90		30					
			35					
			40					

SOIL BORING WELL CONSTRUCTION LOG 231828.0003.0000.GPJ TRC_CORP.GDT 7/14/16

Signature: [signature]

Checked By: C. Scieszka

Firm: TRC Environmental Corporation
1540 Eisenhower Place Ann Arbor, Michigan
734.971.7080
Fax 734.971.9022

WELL CONSTRUCTION LOG

TRC

WELL NO. MW-16-02

SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	WELL DIAGRAM	COMMENTS
5 CS	100		45	**CLAY** mostly clay, few silt, few coarse gravel, high plasticity, dark gray (10YR 4/1), moist, very soft.	CL			
			50	**SILTY CLAY** mostly clay, little to some silt, few fine sand, few fine to coarse gravel, high plasticity, dark gray (10YR 4/1), very soft.				
6 CS	100		55					
			60					
7 CS	50		65		CL-ML			
			70					
8 CS	100		75					
			80					
9 CS	100		85					
			90	**CLAYEY SILT** mostly silt, some clay, few fine sand, few coarse gravel, low plasticity, dark gray (10YR 4/1), moist, very soft.	ML-CL			
10 CS	100		95	**SAND** mostly fine to coarse sand, dark gray (10YR 4/1), saturated. Change to fine sand at 96.0 feet.	SW			
			100	End of boring at 100.0 feet below ground surface.				

SOIL BORING WELL CONSTRUCTION LOG 231828.0003.0000.GPJ TRC_CORP.GDT 7/14/16

WELL CONSTRUCTION LOG

TRC

WELL NO. MW-16-03

Facility/Project Name:	Date Drilling Started:	Date Drilling Completed:	Project Number:
DTE Electric Company Belle River Power Plant	5/25/16	5/31/16	231828.0003

Drilling Firm:	Drilling Method:	Surface Elev. (ft)	TOC Elevation (ft)	Total Depth (ft bgs)	Borehole Dia. (in)
Stock Drilling	Sonic	588.03	590.66	150.0	6/4

Boring Location: Approximately 100 feet W of haul road, N of bottom ash basins.
N: 471391.78 E: 13626202.49

Personnel
Logged By - J. Reed
Driller - A. Goldsmith

Drilling Equipment: TSI 150cc

Civil Town/City/or Village:	County:	State:
China Township	St. Clair	MI

Water Level Observations:
While Drilling: Date/Time Depth (ft bgs)
After Drilling: Date/Time 6/8/16 14:30 Depth (ft bgs) 12.82

SAMPLE NUMBER AND TYPE	RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	WELL DIAGRAM	COMMENTS
				TOPSOIL				
1 CS	100		5	**SILTY CLAY** mostly clay, some silt, few fine to medium sand, trace gravel, low to medium plasticity, dark gray (10YR 4/1) with trace orange mottling, moist, medium stiff to stiff.	CL-ML			Continuous sampling with 4-inch diameter casing from ground surface to terminus of soil boring, over-drilled with 6-inch diameter casing to install monitoring well.
			10	Change to gray (10YR 5/1) at 10.5 feet.				
2 CS	100		15	**CLAY** mostly clay, few silt, trace to few fine to medium sand, medium plasticity, gray (10YR 5/1), moist, soft to medium stiff.				
			20					
3 CS	100		25	Change to trace to few fine to coarse sand at 25.0 feet.	CL			
			30					
4 CS	100		35					
			40	Change to trace fine to coarse sand at 41.5 feet.				

Signature:

Checked By: M. Powers

Firm: TRC Environmental Corporation
1540 Eisenhower Place Ann Arbor, Michigan
734.971.7080
Fax 734.971.9022

SOIL BORING WELL CONSTRUCTION LOG 231828.0003.0000.GPJ TRC_CORP.GDT 7/14/16

WELL CONSTRUCTION LOG

TRC

WELL NO. MW-16-03

SAMPLE NUMBER AND TYPE	RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	WELL DIAGRAM	COMMENTS
5 CS	100		45	**CLAY** mostly clay, few silt, trace fine to coarse sand, medium plasticity, gray (10YR 5/1), moist, soft to medium stiff.				
			50					
6 CS	90		55		CL			
			60	Change to stiff at 60.5 feet.				
				Change to medium stiff at 62.0 feet.				
7 CS	100		65	**SANDY CLAY** mostly clay, little to some sand, few silt, gray (10YR 5/1), moist, soft to medium stiff.	CL			
				CLAY mostly clay, few silt, few fine to coarse sand, gray (10YR 5/1), moist, stiff. Change to coal fragments present at 67.5 feet.				
			70	Change to no coal fragments present at 68.0 feet.				
					CL			
8 CS	90		75	1-inch thick interval of silty fine to coarse sand at 75.0 feet.				
			80	**SANDY SILT** mostly silt, little to some fine to medium sand, gray (10YR 5/1), moist, medium dense.	ML			
				CLAY mostly clay, few silt, few fine to coarse sand, low to medium plasticity, gray (10YR 5/1), moist, stiff.				
9 CS	100		85					
			90	Change to medium soft at 90.0 feet.	CL			
10 CS	100		95	Change to few fine gravel from 94.0 to 95.0 feet. Change to trace fine gravel, medium stiff to stiff at 95.0 feet.				
			100					

SOIL BORING WELL CONSTRUCTION LOG 231628.0003.0000.GPJ TRC_CORP.GDT 7/14/16

WELL CONSTRUCTION LOG

TRC

WELL NO. MW-16-03

SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	WELL DIAGRAM	COMMENTS
11 CS	100		105	**CLAY** mostly clay, few silt, few fine to coarse sand, trace fine gravel, medium plasticity, gray (10YR 5/1), medium stiff to stiff.				
			110	Change to low plasticity, soft to medium stiff at 111.0 feet.				
12 CS	100		115		CL			
			120					
13 CS	100		125					
				SANDY CLAY mostly clay, little to some fine to medium sand, few silt, trace to few fine gravel, low to medium plasticity, gray (10YR 5/1), moist, medium stiff.	CL			
			130	**SILTY SAND** mostly fine to medium sand, little silt, gray (10YR 5/1), moist, loose.	SM			
14 CS	90		135	**SAND** mostly fine to medium sand, trace silt, gray (10YR 5/1), moist, loose.	SP			
				SILTY SAND mostly fine to medium sand, little silt, few clay, gray (10YR 5/1), moist, loose.	SM			
			140	**SAND** mostly fine to coarse sand, trace to few silt, trace to few clay, dark gray (10YR 4/1), moist to wet, loose.				
15 CS	100		145		SW			
				SILT mostly silt, few clay, trace coarse sand to fine gravel, gray (10YR 5/1), dry to moist, dense to very dense.	ML			
			150	**SHALE** weathered shale bedrock, dark gray.				
				End of boring at 150 feet below ground surface.				
			155					

SOIL BORING WELL CONSTRUCTION LOG 231828.0003.0000.GPJ TRC_CORP.GDT 7/14/16

WELL CONSTRUCTION LOG

TRC

WELL NO. MW-16-04

Facility/Project Name:	Date Drilling Started:	Date Drilling Completed:	Project Number:
DTE Electric Company Belle River Power Plant	3/7/16	3/8/16	231828.0003

Drilling Firm:	Drilling Method:	Surface Elev. (ft)	TOC Elevation (ft)	Total Depth (ft bgs)	Borehole Dia. (in)
Stock Drilling	Sonic	587.50	590.51	130.0	6/4

Boring Location: 200 feet from W corner of road, S of bottom ash basins.
N: 470893.74 E: 13625876.34

Personnel
Logged By - A. Knutson
Driller - A. Goldsmith

Drilling Equipment: TSi 150cc

Civil Town/City/or Village:	County:	State:
China Township	St. Clair	MI

Water Level Observations:
While Drilling: Date/Time Depth (ft bgs)
After Drilling: Date/Time 4/13/16 09:31 Depth (ft bgs) 13.91

SAMPLE NUMBER AND TYPE	RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	WELL DIAGRAM	COMMENTS
1 CS	80		5	**CLAY** mostly clay, few coarse gravel, high plasticity, dark gray (10YR 4/1) mottled with brown (10YR 5/3), very stiff. Change to no gravel at 1.0 feet.	CL			Continuous sampling with 4-inch diameter casing from ground surface to terminus of soil boring, over-drilled with 6-inch diameter casing to install monitoring well.
			10	Change to stiff at 10.5 feet.				
2 CS	100		15	Change to dark gray (10YR 4/1), very soft at 12.0 feet.				
			20					
3 CS	100		25					
			30					
4 CS	100		35					
			40					

SOIL BORING WELL CONSTRUCTION LOG 231828.0003.0000.GPJ TRC_CORP.GDT 7/14/16

Signature: Chris Scieszka

Firm: TRC Environmental Corporation
1540 Eisenhower Place Ann Arbor, Michigan
734.971.7080
Fax 734.971.9022

Checked By: C. Scieszka

WELL CONSTRUCTION LOG

TRC

WELL NO. MW-16-04

SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	WELL DIAGRAM	COMMENTS
5 CS	100		45	**CLAY** mostly clay, high plasticity, dark gray (10YR 4/1), very soft.				
			50					
6 CS	100		55		CL			
			60	Change to few coarse gravel at 60.0 feet.				
7 CS	100		65					
			70					
				SILTY CLAY mostly clay, little to some silt, trace fine sand, medium plasticity, dark gray (10YR 4/1), very stiff.	CL-ML			
8 CS	100		75	**SILT** mostly silt, trace to few fine sand, non plastic, dark gray (10YR 4/1), saturated, stiff.	ML			
			80	**SAND** mostly fine sand, few medium to coarse sand, dark gray (10YR 4/1), moist.	SP			
				SANDY CLAY mostly clay, some fine sand, high plasticity, dark gray (10YR 4/1), moist.	CL			
9 CS	100		85	**SILTY CLAY** mostly clay, some silt, high plasticity, dark gray (10YR 4/1), stiff.	CL-ML			
				CLAYEY SILT mostly silt, some clay, low plasticity, dark gray (10YR 4/1), stiff.	ML-CL			
			90	**SILTY CLAY** mostly clay, some silt, high plasticity, dark gray (10YR 4/1), stiff.				
10 CS	100		95		CL-ML			
			100	**CLAY** mostly clay, high plasticity, dark gray (10YR 4/1), very soft.	CL			

WELL CONSTRUCTION LOG

TRC

WELL NO. MW-16-04

SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	WELL DIAGRAM	COMMENTS
11 CS	100		105	**CLAY** mostly clay, high plasticity, dark gray (10YR 4/1), very soft.	CL			
			110					
12 CS	100		115	**SILT** mostly silt, few fine sand, nonplastic, dark gray (10YR 4/1), saturated, stiff.	ML			
			120	**SAND** mostly fine sand, dark gray (10YR 4/1), saturated.				
13 CS	100		125		SP			
			130	End of boring at 130.0 feet below ground surface.				
			135					
			140					
			145					
			150					
			155					

SOIL BORING WELL CONSTRUCTION LOG 231828.0003.0000.GPJ TRC_CORP.GDT 7/14/15

WELL CONSTRUCTION LOG

TRC

WELL NO. MW-16-05

Facility/Project Name:	Date Drilling Started:	Date Drilling Completed:	Project Number:
DTE Electric Company Belle River Power Plant	3/3/16	3/4/16	231828.0003

Drilling Firm:	Drilling Method:	Surface Elev. (ft)	TOC Elevation (ft)	Total Depth (ft bgs)	Borehole Dia. (in)
Stock Drilling	Sonic	588.32	590.82	150.0	6

Boring Location: S end of haul road, W of diversion basin.

N: 470378.15 E: 13626342.79

Personnel
Logged By - A. Knutson
Driller - A. Goldsmith

Drilling Equipment: TSi 150cc

Civil Town/City/or Village:	County:	State:
China Township	St. Clair	MI

Water Level Observations:
While Drilling: Date/Time Depth (ft bgs)
After Drilling: Date/Time 4/13/16 09:55 Depth (ft bgs) 14.37

SAMPLE NUMBER AND TYPE	RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	WELL DIAGRAM	COMMENTS
				CLAY WITH GRAVEL mostly clay, few to some coarse gravel, high plasticity, dark grayish brown (10YR 4/2), moist, very stiff.	CL			Continuous sampling with 4-inch diameter casing from ground surface to terminus of soil boring, over-drilled with 6-inch diameter casing to install monitoring well.
1 CS	80		5	**CLAY** mostly clay, few fine to coarse gravel, high plasticity, dark gray (10YR 4/1) mottled with brown (10YR 5/3), moist, hard. Change to no gravel, very stiff at 4.0 feet.				
			10	Change to dark gray (10YR 4/1), very soft at 10.0 feet.				
2 CS	100		15					
			20		CL			
3 CS	100		25	Change to medium stiff at 26.0 feet. Change to very soft at 28.0 feet.				
			30					
4 CS	100		35					
			40					

Signature:

Firm: TRC Environmental Corporation
1540 Eisenhower Place Ann Arbor, Michigan
734.971.7080
Fax 734.971.9022

Checked By: C. Scieszka

SOIL BORING WELL CONSTRUCTION LOG 231828.0003.0000.GPJ TRC_CORP.GDT 7/14/16

WELL CONSTRUCTION LOG

TRC

WELL NO. MW-16-05

SAMPLE NUMBER AND TYPE	RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	WELL DIAGRAM	COMMENTS
5 CS	100		45	**CLAY** mostly clay, high plasticity, dark gray (10YR 4/1), moist, very soft.	CL			
				SILTY CLAY mostly clay, little to some silt, medium plasticity, dark gray (10YR 4/1), very soft.	CL-ML			
6 ST	100		50	**CLAY** mostly clay, high plasticity, dark gray (10YR 4/1), moist, very soft.				
7 CS	100		55					
			60	Change to few fine to coarse gravel at 60.0 feet.	CL			
8 CS	100		65	Change to medium stiff at 65.0 feet.				
				Change to stiff at 67.5 feet.				
			70	**SILTY CLAY** mostly clay, some silt, few fine to coarse gravel, high plasticity, very dark gray (10YR 3/1), very stiff.				
9 CS	100		75	Change to low plasticity, black (10YR 2/1), hard at 77.0 feet.				
			80		CL-ML			
10 CS	60		85	Change to few to little fine sand at 85.5 feet.				
			90	**CLAY** mostly clay, few coarse gravel, high plasticity, dark gray (10YR 4/1), moist, very soft.				
				Change to medium stiff at 93.5 feet.				
11 CS	100		95		CL			
				Change to soft at 97.5 feet.				
			100					

SOIL BORING WELL CONSTRUCTION LOG 231928.0003.0000.GPJ TRC_CORP.GDT 7/14/16

WELL CONSTRUCTION LOG

TRC

WELL NO. MW-16-05

SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	WELL DIAGRAM	COMMENTS
12 CS	100		105	**CLAY** mostly clay, few coarse gravel, high plasticity, dark gray (10YR 4/1), moist, soft.				
			110					
13 CS	100		115		CL			
			120					
14 CS	100		125					
			130					
15 CS	100		135	**CLAYEY SILT** mostly silt, some clay, medium plasticity, dark gray (10YR 4/1), wet, medium stiff.	ML-CL			
			140					
16 CS	90		145	**SHALE** dark gray (10YR 4/1), dry.				
			150	End of boring at 150.0 feet below ground surface.				
			155					

SOIL BORING WELL CONSTRUCTION LOG 231828.0003.0000.GPJ TRC_CORP.GDT 7/14/16

WELL CONSTRUCTION LOG

TRC

WELL NO. MW-16-06

Facility/Project Name:	Date Drilling Started:	Date Drilling Completed:	Project Number:
DTE Electric Company Belle River Power Plant	3/10/16	3/11/16	231828.0003

Drilling Firm:	Drilling Method:	Surface Elev. (ft)	TOC Elevation (ft)	Total Depth (ft bgs)	Borehole Dia. (in)
Stock Drilling	Sonic	589.98	593.21	140.0	6

Boring Location: 123 feet S of road connecting to haul road, E of diversion basin.	Personnel	Drilling Equipment:
N: 470439.03 E: 13626796.04	Logged By - A. Knutson Driller - A. Goldsmith	TSi 150cc

Civil Town/City/or Village:	County:	State:	Water Level Observations:
China Township	St. Clair	MI	While Drilling: Date/Time Depth (ft bgs) After Drilling: Date/Time 4/13/16 10:01 ▼ Depth (ft bgs) 14.45

SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	WELL DIAGRAM	COMMENTS
				GRAVEL WITH SAND mostly gravel, some fine to coarse sand, brown (10YR 5/3), moist, dense.				Continuous sampling with 4-inch diameter casing from ground surface to terminus of soil boring, over-drilled with 6-inch diameter casing to install monitoring well.
1 CS	50		5	**CLAY** mostly clay, high plasticity, dark gray (10YR 4/1) mottled with brown (10YR 5/3), moist, very stiff.				
			10	Change to few coarse gravel at 10.0 feet.				
2 CS	100		15	Change to dark gray (10YR 4/1), stiff at 12.0 feet. Change to very soft at 13.0 feet. ▼				
			20		CL			
3 CS	100		25					
			30					
4 CS	100		35					
			40					

SOIL BORING WELL CONSTRUCTION LOG 231828.0003.0000.GPJ TRC_CORP.GDT 7/14/16

Signature: [signature]

Firm: TRC Environmental Corporation 734.971.7080
1540 Eisenhower Place Ann Arbor, Michigan Fax 734.971.9022

Checked By: C. Scieszka

WELL CONSTRUCTION LOG

TRC

WELL NO. MW-16-06

SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	WELL DIAGRAM	COMMENTS
5 CS	100		45	**CLAY** mostly clay, few coarse gravel, high plasticity, dark gray (10YR 4/1), moist, very soft.	CL			
			50					
6 CS	100		55					
			60					
7 CS	100		65					
			70	**SILTY CLAY** mostly clay, some silt, medium plasticity, dark gray (10YR 4/1), moist, medium stiff.	CL-ML			
				SAND mostly fine sand, few coarse sand, dark gray (10YR 4/1), moist.	SP			
8 CS	100		75	**SILTY CLAY** mostly clay, some silt, medium plasticity, dark gray (10YR 4/1), moist, medium stiff.	CL-ML			
			80					
9 CS	80		85					
			90	**CLAY** mostly clay, high plasticity, dark gray (10YR 4/1), moist, very soft.	CL			
10 CS	70		95					
			100					

SOIL BORING WELL CONSTRUCTION LOG 231828.0003.0000.GPJ TRC_CORP.GDT 7/14/16

WELL CONSTRUCTION LOG

TRC

WELL NO. MW-16-06

SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	WELL DIAGRAM	COMMENTS
11 CS	100		105	**CLAY** mostly clay, high plasticity, dark gray (10YR 4/1), moist, very soft.	CL			
			110					
12 CS	100		115					
			120					
13 CS	100		125	**SILTY CLAY** mostly clay, some silt, medium plasticity, dark gray (10YR 4/1), moist, medium stiff.	CL-ML			
			130					
14 CS	100		135	**SILT** mostly silt, dark gray (10YR 4/1), saturated, very soft.	ML			
				SHALE dark gray (10YR 4/1), hard, brittle.				
			140	End of boring at 140.0 feet below ground surface.				
			145					
			150					
			155					

SOIL BORING WELL CONSTRUCTION LOG 231828.0003.0000.GPJ TRC_CORP.GDT 7/14/16

WELL CONSTRUCTION LOG

TRC

WELL NO. MW-16-07

Facility/Project Name:	Date Drilling Started:	Date Drilling Completed:	Project Number:
DTE Electric Company Belle River Power Plant	3/8/16	3/9/16	231828.0003

Drilling Firm:	Drilling Method:	Surface Elev. (ft)	TOC Elevation (ft)	Total Depth (ft bgs)	Borehole Dia. (in)
Stock Drilling	Sonic	589.89	592.58	140.0	6

Boring Location: 326 feet S of road connecting to haul road, E of diversion basin.
N: 470233.47 E: 13626858.79

Personnel
Logged By - A. Knutson
Driller - A. Goldsmith

Drilling Equipment: TSi 150cc

Civil Town/City/or Village:	County:	State:
China Township	St. Clair	MI

Water Level Observations:
While Drilling: Date/Time Depth (ft bgs)
After Drilling: Date/Time 4/13/16 11:56 Depth (ft bgs) 14.13

SAMPLE NUMBER AND TYPE	RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	WELL DIAGRAM	COMMENTS
1 CS	60		5	**CLAY** mostly clay, few coarse gravel, high plasticity, brown (10YR 5/3) mottled with dark gray (10YR 4/1), very stiff. Change to dark gray (10YR 4/1) mottled with brown (10YR 5/3) at 5.0 feet.	CL			Continuous sampling with 4-inch diameter casing from ground surface to terminus of soil boring, over-drilled with 6-inch diameter casing to install monitoring well.
2 CS	100		10 15	Change to dark gray (10YR 4/1) at 11.0 feet. ▼ Change to moist, very soft at 13.0 feet.				
3 CS	100		20 25					
4 CS	100		30 35 40					

Signature: [signature]

Checked By: C. Scieszka

Firm: TRC Environmental Corporation
1540 Eisenhower Place Ann Arbor, Michigan
734.971.7080
Fax 734.971.9022

SOIL BORING WELL CONSTRUCTION LOG 231828.0003.0000.GPJ TRC_CORP.GDT 7/14/16

WELL CONSTRUCTION LOG

TRC

WELL NO. MW-16-07

SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	WELL DIAGRAM	COMMENTS
5 CS	100		45	**CLAY** mostly clay, few coarse gravel, high plasticity, dark gray (10YR 4/1), moist, very soft.	CL			
6 ST	100		50					
7 CS	100		55	**SILTY CLAY** mostly clay, little silt, high plasticity, dark gray (10YR 4/1), moist, soft.	CL-ML			
			60					
8 CS	100		65	**CLAYEY SILT** mostly silt, little to some clay, few fine to coarse sand, low plasticity, dark gray (10YR 4/1), moist.	ML-CL			
				SAND mostly fine to coarse sand, dark gray (10YR 4/1), moist, loose.	SW			
				CLAYEY SILT mostly silt, little to some clay, few fine to coarse sand, low plasticity, dark gray (10YR 4/1), moist.	ML-CL			
			70	**SILTY CLAY** mostly clay, little silt, high plasticity, dark gray (10YR 4/1), moist, soft. Change to few coarse gravel at 70.0 feet.				
9 CS	100		75					
			80					
10 CS	100		85		CL-ML			
			90					
11 CS	100		95					
			100					

SOIL BORING WELL CONSTRUCTION LOG 231828.0003.0000.GPJ TRC_CORP.GDT 7/14/16

WELL CONSTRUCTION LOG

TRC

WELL NO. MW-16-07

SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	WELL DIAGRAM	COMMENTS
12 CS	100		105	**SILTY CLAY** mostly clay, little silt, high plasticity, dark gray (10YR 4/1), moist, soft.	CL-ML			
			110					
13 CS	80		115					
			120					
14 CS	100		125					
			130					
				SILT mostly silt, no plasticity, dark gray (10YR 4/1), saturated, loose.	ML			
15 CS	100		135	**SHALE** dark gray (10YR 4/1), brittle, hard.				
			140	End of boring at 140.0 feet below ground surface.				
			145					
			150					
			155					

SOIL BORING WELL CONSTRUCTION LOG 231828.0003.0000.GPJ TRC_CORP.GDT 7/14/16

WELL CONSTRUCTION LOG

TRC

WELL NO. MW-16-08

Facility/Project Name:	Date Drilling Started:	Date Drilling Completed:	Project Number:
DTE Electric Company Belle River Power Plant	3/9/16	3/10/16	231828.0003

Drilling Firm:	Drilling Method:	Surface Elev. (ft)	TOC Elevation (ft)	Total Depth (ft bgs)	Borehole Dia. (in)
Stock Drilling	Sonic	589.31	591.88	140.0	6

Boring Location: 566.6 feet S of road connecting to haul road, E of diversion basin.
N: 470002.90 E: 13626846.85

Personnel
Logged By - A. Knutson
Driller - A. Goldsmith

Drilling Equipment: TSi 150cc

Civil Town/City/or Village:	County:	State:
China Township	St. Clair	MI

Water Level Observations:
While Drilling: Date/Time Depth (ft bgs)
After Drilling: Date/Time 4/13/16 12:00 ▼ Depth (ft bgs) 13.19

SAMPLE NUMBER AND TYPE	RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	WELL DIAGRAM	COMMENTS
1 CS	50		0–5	**CLAY WITH GRAVEL** mostly clay, little coarse gravel, high plasticity, dark gray (10YR 4/1) mottled with brown (10YR 5/3), moist, very stiff.	CL			Continuous sampling with 4-inch diameter casing from ground surface to terminus of soil boring, over-drilled with 6-inch diameter casing to install monitoring well.
			5	**CLAY** mostly clay, high plasticity, dark gray (10YR 4/1) mottled with brown (10YR 5/3), moist, very stiff.	CL			
2 CS	100		10–15	Change to dark gray (10YR 4/1), very soft at 10.0 feet. ▼				
3 CS	100		20–25					
4 CS	100		30–35					
			40					

Signature: [signature]

Firm: TRC Environmental Corporation
1540 Eisenhower Place Ann Arbor, Michigan
734.971.7080
Fax 734.971.9022

Checked By: C. Scieszka

SOIL BORING WELL CONSTRUCTION LOG 231828.0003.0000.GPJ TRC_CORP.GDT 7/14/16

WELL CONSTRUCTION LOG

TRC

WELL NO. MW-16-08

SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	WELL DIAGRAM	COMMENTS
5 CS	100		45	**CLAY** mostly clay, high plasticity, dark gray (10YR 4/1), moist, very soft.				
			50					
6 CS	100		55		CL			
			60					
7 CS	80		65					
			70	**SILTY CLAY** mostly clay, some silt, few coarse gravel, high plasticity, dark gray (10YR 4/1), moist, soft.				
8 CS	100		75					
			80					
9 CS	100		85		CL-ML			
			90					
10 CS	60		95					
			100					

WELL CONSTRUCTION LOG

TRC

WELL NO. MW-16-08

SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	WELL DIAGRAM	COMMENTS
				SILTY CLAY mostly clay, some silt, few coarse gravel, high plasticity, dark gray (10YR 4/1), moist, soft.				
11 CS	100		105	Change to few fine sand at 105.5 feet.				
			110	Change to no sand at 110.0 feet.				
12 CS	100		115		CL-ML			
			120					
13 CS	100		125					
			130					
				SILT mostly silt, dark gray (10YR 4/1), saturated, very soft.	ML			
14 CS	100		135	**SHALE** dark gray (10YR 4/1), brittle, hard.				
			140	End of boring at 140.0 feet below ground surface.				
			145					
			150					
			155					

WELL CONSTRUCTION LOG

TRC

WELL NO. MW-16-09

Facility/Project Name:	Date Drilling Started:	Date Drilling Completed:	Project Number:
DTE Electric Company Belle River Power Plant	6/1/16	6/1/16	231828.0003

Drilling Firm:	Drilling Method:	Surface Elev. (ft)	TOC Elevation (ft)	Total Depth (ft bgs)	Borehole Dia. (in)
Stock Drilling	Sonic	588.28	590.80	150.0	6

Boring Location: E of bottom ash basins, E of haul road.
N: 471284.45 E: 13626365.84

Personnel
Logged By - J. Reed
Driller - A. Goldsmith

Drilling Equipment: TSi 150cc

Civil Town/City/or Village:	County:	State:
China Township	St. Clair	MI

Water Level Observations:
While Drilling: Date/Time Depth (ft bgs)
After Drilling: Date/Time 6/9/16 15:13 Depth (ft bgs) 14.36

SAMPLE NUMBER AND TYPE	RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	WELL DIAGRAM	COMMENTS
				TOPSOIL				
1 CS	75		5	**SILTY CLAY** mostly clay, little to some silt, few fine to coarse sand, trace to few fine gravel, low plasticity, dark grayish brown (10YR 4/2), moist, stiff.	CL-ML			Continuous sampling with 4-inch diameter casing from ground surface to terminus of soil boring, over-drilled with 6-inch diameter casing to install monitoring well.
				CLAY mostly clay, few silt, trace to few fine to coarse sand, medium plasticity, gray (10YR 5/1), moist, soft.				
2 CS	85		10					
			15					
			20					
3 CS	100		25		CL			
			30	Change to trace to few fine gravel at 30.0 feet.				
4 CS	100		35					
			40					

Signature: [signature]

Firm: TRC Environmental Corporation
1540 Eisenhower Place Ann Arbor, Michigan
734.971.7080
Fax 734.971.9022

Checked By: M. Powers

SOIL BORING WELL CONSTRUCTION LOG 231828.0003.0000.GPJ TRC_CORP.GDT 7/14/16

WELL CONSTRUCTION LOG

TRC

WELL NO. MW-16-09

SAMPLE NUMBER AND TYPE	RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	WELL DIAGRAM	COMMENTS
			45	**CLAY** mostly clay, few silt, trace to few fine to coarse sand, trace to few fine gravel, medium plasticity, gray (10YR 5/1), moist, soft.				
5 CS	100		50	Change to soft to medium stiff at 50.0 feet.				
			55					
			60					
			65					
6 CS	100		70	Change to soft at 70.0 feet.	CL			
			75					
			80	Change to medium stiff to stiff at 80.0 feet.				
			85	Change to stiff at 85.0 feet.				
7 CS	100		90					
			95					
			100					

WELL CONSTRUCTION LOG

TRC

WELL NO. MW-16-09

SAMPLE NUMBER AND TYPE	RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	WELL DIAGRAM	COMMENTS
8 CS	75		105	**CLAY** mostly clay, few silt, trace to few fine to coarse sand, trace to few fine gravel, medium plasticity, gray (10YR 5/1), moist, stiff. Change to medium stiff at 105.0 feet.	CL			
			110					
9 CS	80		115					
			120					
			125					
10 CS	100		130					
			135					
				SAND mostly fine sand, trace silt, dark gray (10YR 4/1), moist, loose.	SP			
			140					
11 CS	80		145	**SAND WITH GRAVEL** mostly fine to coarse sand, little to some fine to medium gravel, trace to few silt, trace to few clay, dark gray (10YR 4/1), moist to wet, loose.	SW			
				SHALE weathered, gray (10YR 5/1), brittle.				
			150	End of boring at 150.0 feet below ground surface.				
			155					

SOIL BORING WELL CONSTRUCTION LOG 231628.0003.0000.GPJ TRC_CORP.GDT 7/14/16

WELL CONSTRUCTION LOG

TRC

WELL NO. MW-16-10

Facility/Project Name:	Date Drilling Started:	Date Drilling Completed:	Project Number:
DTE Electric Company Belle River Power Plant	6/2/16	6/3/16	231828.0003

Drilling Firm:	Drilling Method:	Surface Elev. (ft)	TOC Elevation (ft)	Total Depth (ft bgs)	Borehole Dia. (in)
Stock Drilling	Sonic	589.25	592.26	150.0	6

Boring Location: S end of haul road, W/NW of diversion basin.
N: 470532.54 E: 13626417.00

Personnel
Logged By - J. Reed
Driller - A. Goldsmith

Drilling Equipment: TSi 150cc

Civil Town/City/or Village:	County:	State:
China Township	St. Clair	MI

Water Level Observations:
While Drilling: Date/Time Depth (ft bgs)
After Drilling: Date/Time 6/9/16 07:45 Depth (ft bgs) 15.30

SAMPLE NUMBER AND TYPE	RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	WELL DIAGRAM	COMMENTS
				TOPSOIL				Continuous sampling with 4-inch diameter casing from ground surface to terminus of soil boring, over-drilled with 6-inch diameter casing to install monitoring well.
1 CS	50		5	**CLAY** mostly clay, few silt, trace to few fine to coarse sand, dark grayish brown (10YR 4/2), moist, medium stiff to stiff.				
			10	Change to gray (10YR 5/1) at 11.0 feet. Change to soft to medium stiff at 12.0 feet.				
2 CS	90		15					
			20		CL			
3 CS	95		25	Change to soft at 25.0 feet.				
			30	Change to few fine to coarse sand, medium stiff at 30.0 feet. Change to dark gray (10YR 4/1) at 32.0 feet.				
4 CS	100		35	Change to soft at 35.0 feet.				
			40					

Signature: [signature]

Firm: TRC Environmental Corporation
1540 Eisenhower Place Ann Arbor, Michigan
734.971.7080
Fax 734.971.9022

Checked By: M. Powers

SOIL BORING WELL CONSTRUCTION LOG 231828.0003.0000.GPJ TRC_CORP.GDT 7/14/16

WELL CONSTRUCTION LOG

TRC

WELL NO. MW-16-10

SAMPLE NUMBER AND TYPE	RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	WELL DIAGRAM	COMMENTS
5 CS	100		45	**CLAY** mostly clay, few silt, trace to few fine to coarse sand, dark gray (10YR 4/1), moist, soft.	CL			
			50					
6 CS	100		55					
			60					
7 CS	100		65					
			70	**CLAY WITH SAND** mostly clay, little fine to coarse sand, few silt, trace gravel, dark gray (10YR 4/1), moist, very stiff.				
8 CS	100		75	Change to few to little medium to coarse sand, low to medium plasticity, stiff at 75.0 feet.	CL			
			80	**CLAYEY SAND** mostly fine to coarse sand, some clay, dark grayish brown (10YR 4/2), moist, medium dense.	SC			
9 CS	100		85	**SAND** mostly fine to medium sand, dark grayish brown (10YR 4/2), moist, loose.	SP			
			90	**SANDY CLAY** mostly clay, little to some fine to coarse sand, few silt, medium plasticity, dark grayish brown (10YR 4/2), moist, medium stiff to stiff.	CL			
10 CS	100		95					
			100	**CLAY WITH SAND** mostly clay, little fine to coarse sand, few silt, medium plasticity, dark grayish brown (10YR 4/2), moist, medium stiff to stiff.	CL			

WELL CONSTRUCTION LOG

TRC

WELL NO. MW-16-10

SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	WELL DIAGRAM	COMMENTS
11 CS	100		105	**CLAY WITH SAND** mostly clay, little fine to coarse sand, few silt, medium plasticity, dark grayish brown (10YR 4/2), moist, medium stiff to stiff.	CL			
			110	**SANDY CLAY** mostly clay, little to some fine to coarse sand, few silt, medium plasticity, dark grayish brown (10YR 4/2), moist, medium stiff.	CL			
				SAND mostly medium to coarse sand, dark gray (10YR 4/1), moist, loose.	SP			
12 CS	100		115	**CLAY** mostly clay, little sand, few to little silt, dark gray (10YR 4/1), moist, stiff.				
			120					
13 CS	95		125					
			130		CL			
14 CS	95		135					
			140					
15 CS	50		145	**GRAVELLY SILT** mostly silt, some fine to coarse gravel, few clay, few sand, low to medium plasticity, dark gray (10YR 4/1), moist, soft.	ML			
				SILTY CLAY hard, dark gray (10YR 4/1), hardpan, brittle.	CL-ML			
			150	**SHALE** dark gray.				
				End of boring at 150.0 feet below ground surface.				
			155					
			160					

SOIL BORING WELL CONSTRUCTION LOG 231828.0003.0000.GPJ TRC_CORP.GDT 7/14/16

WELL CONSTRUCTION LOG

TRC

WELL NO. MW-16-11

Facility/Project Name:	Date Drilling Started:	Date Drilling Completed:	Project Number:
DTE Electric Company Belle River Power Plant	6/3/16	6/6/16	231828.0003

Drilling Firm:	Drilling Method:	Surface Elev. (ft)	TOC Elevation (ft)	Total Depth (ft bgs)	Borehole Dia. (in)
Stock Drilling	Sonic	589.03	591.54	150.0	6

Boring Location: S of haul road, W of diversion basin.

N: 470251.34 E: 13626438.92

Personnel
Logged By - J. Reed
Driller - A. Goldsmith

Drilling Equipment: TSi 150cc

Civil Town/City/or Village:	County:	State:
China Township	St. Clair	MI

Water Level Observations:
While Drilling: Date/Time Depth (ft bgs)
After Drilling: Date/Time 6/21/16 07:45 Depth (ft bgs) 14.47

SAMPLE NUMBER AND TYPE	RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	WELL DIAGRAM	COMMENTS
				TOPSOIL				
1 CS	50		5	**CLAY** mostly clay, few silt, trace to few sand, few gravel, low to medium plasticity, dark grayish brown (10YR 4/2), moist, stiff.				Continuous sampling with 4-inch diameter casing from ground surface to terminus of soil boring, over-drilled with 6-inch diameter casing to install monitoring well.
				Change to trace gravel at 8.0 feet.				
			10					
2 CS	70		15	Change to gray (10YR 5/1) at 12.0 feet. Change to no gravel at 13.0 feet.				
			20					
3 CS	90		25	Change to medium stiff at 21.0 feet.	CL			
			30					
4 CS	90		35	Change to soft to medium stiff at 34.5 feet.				
			40					

SOIL BORING WELL CONSTRUCTION LOG 231828.0003.0000.GPJ TRC_CORP.GDT 7/14/16

Signature: [signature]

Firm: TRC Environmental Corporation
1540 Eisenhower Place Ann Arbor, Michigan
734.971.7080
Fax 734.971.9022

Checked By: M. Powers

WELL CONSTRUCTION LOG

TRC

WELL NO. MW-16-11

SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	WELL DIAGRAM	COMMENTS
5 CS	90		45	**CLAY** mostly clay, few silt, trace to few sand, medium plasticity, gray (10YR 5/1), moist, soft to medium stiff.				
			50	Change to medium stiff at 49.0 feet.				
6 CS	100		55					
			60	Change to soft at 60.0 feet.				
7 CS	100		65					
			70	Change to trace gravel, soft to medium stiff at 70.0 feet.	CL			
8 CS	100		75	Change to medium stiff at 75.0 feet.				
			80					
9 CS	90		85					
			90					
10 CS	90		95	Change to medium stiff to stiff at 95.0 feet.				
			100					

SOIL BORING WELL CONSTRUCTION LOG 231828.0003.0000.GPJ TRC_CORP.GDT 7/14/16

WELL CONSTRUCTION LOG

TRC

WELL NO. MW-16-11

SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	WELL DIAGRAM	COMMENTS
11 CS	85		105	**CLAY** mostly clay, few silt, trace to few sand, trace gravel, low to medium plasticity, gray (10YR 5/1), moist, medium stiff to stiff.				
			110	Change to medium stiff at 110.0 feet.				
12 CS	80		115					
			120		CL			
13 CS	85		125					
			130					
14 CS	90		135					
			140	**SANDY CLAY** mostly clay, some fine sand, few silt, dark gray (10YR 4/1), moist.	CL			
				CLAY mostly clay, few silt, trace to few sand, trace gravel, low to medium plasticity, gray (10YR 5/1), moist, medium stiff.	CL			
15 CS	90		145	**SHALE** dark gray.				
			150	End of boring 150.0 feet below ground surface.				
			155					

SOIL BORING WELL CONSTRUCTION LOG 231628.0003.0000.GPJ TRC_CORP.GDT 7/14/16

WELL CONSTRUCTION LOG

TRC

WELL NO. MW-16-11A

Facility/Project Name:	Date Drilling Started:	Date Drilling Completed:	Project Number:
DTE Electric Company Belle River Power Plant	5/11/17	5/12/17	231828.0003

Drilling Firm:	Drilling Method:	Surface Elev. (ft)	TOC Elevation (ft)	Total Depth (ft bgs)	Borehole Dia. (in)
Stock Drilling	Sonic	589.5	591.66	142.0	6

Boring Location: North of fuel oil tank number 2, between berm and fence.

Personnel
Logged By - J. Krenz
Driller - A. Goldsmith

Drilling Equipment: TSi 150cc

Civil Town/City/or Village:	County:	State:
China Township	St. Clair	MI

Water Level Observations:
While Drilling: Date/Time Depth (ft bgs)
After Drilling: Date/Time 5/15/17 08:38 Depth (ft bgs) 17.79

SAMPLE NUMBER AND TYPE	RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	WELL DIAGRAM	COMMENTS
1 CS	90			**CLAY** mostly clay, trace gravel, medium plasticity, dark grayish brown (10YR 4/2), mottled with dark yellowish brown (10YR 4/6), medium stiff, moist, plant roots to 0.5 feet.				Continuous sampling with 4-inch diameter casing from ground surface to terminus of soil boring, over-drilled with 6-inch diameter casing to install monitoring well.
			10					
2 CS	60							
			20	Change to high plasticity, gray (10YR 5/1), soft at 19.0 feet.				
3 CS	70							
			30		CL			
4 CS	70							
			40					
5 CS	100							
			50					
6 CS	100							
			60					
7								

Signature: [signature] Firm: TRC Environmental Fax

Checked By: C. Scieszka

SOIL BORING WELL CONSTRUCTION LOG 231828.0003.0000.GPJ TRC_CORP.GDT 8/21/17

WELL CONSTRUCTION LOG

TRC

WELL NO. MW-16-11A

SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	WELL DIAGRAM	COMMENTS
CS	100			**CLAY** mostly clay, trace fine to medium gravel, high plasticity, gray (10YR 5/1), medium stiff, moist.				
			70	Change to few fine to coarse gravel at 70.0 feet.				
8 CS	100							
			80	Change to trace fine sand at 80.0 feet.				
9 CS	90							
			90					
10 CS	70							
			100		CL			
11 CS	100							
			110					
12 CS	100							
			120					
13 CS	100			Change to trace medium to coarse gravel at 126.0 feet.				
			130					
14 CS	60			**SILT** mostly silt, trace clay, dark gray (10YR 4/1), dense, saturated.	ML			
15 CS	100		140	**SILTY CLAY** mostly clay, some silt, few to little fine to coarse gravel, medium to low plasticity, dark gray (10YR 4/1), moist, medium stiff, inclusions of shale bedrock.	CL-ML			
				BEDROCK shale, weathered, gray (10YR 4/1).				
				End of boring at 142.0 feet below ground surface.				
			150					

SOIL BORING LOG

TRC

BORING NO. SB-16-01

Facility/Project Name:	Date Drilling Started:	Date Drilling Completed:	Project Number:
DTE Electric Company Belle River Power Plant	3/1/16	3/1/16	231828.0003

Drilling Firm:	Drilling Method:	Surface Elev. (ft)	TOC Elevation (ft)	Total Depth (ft bgs)	Borehole Dia. (in)
Stock Drilling	Sonic	588.69	---	150.0	6

Boring Location: Corner of E connecting road off haul road, E of bottom ash basins.	Personnel	Drilling Equipment:
N: 471096.38 E: 13626276.67	Logged By - A. Knutson Driller - A. Goldsmith	TSi 150cc

Civil Town/City/or Village:	County:	State:	Water Level Observations:
China Township	St. Clair	MI	While Drilling: Date/Time Depth (ft bgs) After Drilling: Date/Time Depth (ft bgs)

SAMPLE NUMBER AND TYPE	RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	COMMENTS
				CLAY WITH GRAVEL mostly clay, little fine to coarse gravel, few fine sand, high plasticity, dark gray (10YR 4/1), mottled with brown (10YR 5/3), moist, very stiff.	CL		Continuous sampling with 4-inch diameter casing from ground surface to terminus of soil boring, over-drilled with 6-inch diameter casing to total depth.
1 CS	50		5	**CLAY** mostly clay, trace fine sand, high plasticity, dark gray (10YR 4/1), mottled with brown (10YR 5/3), moist, very stiff.			
			10	Change to stiff at 10.0 feet.			
2 CS	100		15	Change to no sand, dark gray (10YR 4/1), very soft at 13.0 feet.			
			20				
3 CS	100		25		CL		
			30				
4 CS	100		35				
			40				

Signature: [signature]

Checked By: M. Powers

Firm: TRC Environmental Corporation
1540 Eisenhower Place Ann Arbor, Michigan
734.971.7080
Fax 734.971.9022

SOIL BORING WELL CONSTRUCTION LOG 231828.0003.0000.GPJ TRC_CORP.GDT 7/14/16

SOIL BORING LOG

TRC

BORING NO. SB-16-01

SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	COMMENTS
5 CS	100		45	**CLAY** mostly clay, high plasticity, dark gray (10YR 4/1), moist, very soft.			
6 ST	100		50		CL		
7 CS	100		55				
				CLAY WITH SAND mostly clay, little fine to coarse sand, high plasticity, dark gray (10YR 4/1), moist, very soft.	CL		
			60	**CLAY** mostly clay, high plasticity, dark gray (10YR 4/1), moist, very soft.	CL		
8 CS	100		65	**SANDY SILT** mostly silt, little to some fine to coarse sand, few clay, low plasticity, dark gray (10YR 4/1), moist, stiff.	ML		
			70	**CLAY** mostly clay, few fine to coarse gravel, dark gray (10YR 4/1), moist, medium stiff. Change to no gravel, soft at 72.5 feet.			
9 CS	100		75				
			80	Change to few coarse gravel at 80.0 feet.			
10 CS	100		85		CL		
			90				
11 CS	100		95				
			100				

SOIL BORING WELL CONSTRUCTION LOG 231828.0003.0000.GPJ TRC_CORP.GDT 7/14/16

SOIL BORING LOG

TRC

BORING NO. SB-16-01

SAMPLE NUMBER AND TYPE	RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	COMMENTS
12 CS	100		105	**CLAY** mostly clay, few coarse gravel, dark gray (10YR 4/1), moist, soft.	CL		
			110				
13 CS	100		115				
			120				
14 CS	100		125				
			130				
15 CS	100		135	**SILT** mostly silt, few fine sand, non plastic, dark gray (10YR 4/1), moist.	ML		
			140				
16 CS	100		145	**SHALE** dark gray (10YR 4/1), dry.			
			150	End of boring at 150.0 feet below ground surface.			
			155				

SOIL BORING WELL CONSTRUCTION LOG 231828.0003.0000.GPJ TRC_CORP.GDT 7/14/16

WELL CONSTRUCTION DIAGRAM

PROJ. NAME: DTE Electric Company Belle River Power Plant		WELL ID:	**MW-16-01**
PROJ. NO: 231828.0003	DATE INSTALLED: 3/17/2016 INSTALLED BY: A. Knutson		CHECKED BY: C. Scieszka

ELEVATION (BENCHMARK: USGS)	DEPTH BELOW OR ABOVE GROUND SURFACE (FEET)	
590.06	1.8	TOP OF CASING
588.26	0.0	GROUND SURFACE
	1.0	CEMENT SURFACE PLUG
		GROUT/BACKFILL MATERIAL
		BENTONITE SLURRY
		GROUT/BACKFILL METHOD
93.8		TREMIE
	84.0	GROUT
		BENTONITE SEAL MATERIAL
		TIME RELEASE PELLETS
	89.0	BENTONITE SEAL
496.3	92.0	TOP OF SCREEN
5.00		FILTER PACK MATERIAL
		MEDIUM, WASHED SAND
491.3	97.0	BOTTOM OF SCREEN
	97.0	BOTTOM OF FILTER PACK
	NA	BENTONITE PLUG
		BACKFILL MATERIAL
		NATURAL COLLAPSE
488.3	100.0	HOLE BOTTOM

RISER PIPE LENGTH

SCREEN LENGTH

NOTES:

CASING AND SCREEN DETAILS

TYPE OF RISER: 2-INCH PVC

PIPE SCHEDULE: 40

PIPE JOINTS: THREADED O-RINGS

SCREEN TYPE: 2-INCH PVC

SCR. SLOT SIZE: 0.01-INCH

BOREHOLE DIAMETER: 6 IN. FROM 0 TO 97 FT.
4 IN. FROM 97 TO 100 FT.

SURF. CASING DIAMETER: ____ IN. FROM ____ TO ____ FT.
____ IN. FROM ____ TO ____ FT.

WELL DEVELOPMENT

DEVELOPMENT METHOD: AIR LIFT

TIME DEVELOPING: 4 HOURS

WATER REMOVED: 120 GALLONS

WATER ADDED: 0 GALLONS

WATER CLARITY BEFORE / AFTER DEVELOPMENT

CLARITY BEFORE: VERY TURBID

COLOR BEFORE: BROWN /GREY

CLARITY AFTER: CLEAR

COLOR AFTER: NONE

ODOR (IF PRESENT): NONE

WATER LEVEL SUMMARY

MEASUREMENT (FEET)			DATE	TIME
DTB BEFORE DEVELOPING:	98.20	T/PVC	3/21/2016	--
DTB AFTER DEVELOPING:	100.32	T/PVC	4/13/2016	845
SWL BEFORE DEVELOPING:	12.92	T/PVC	3/21/2016	--
SWL AFTER DEVELOPING:	16.32	T/PVC	4/13/2016	845
OTHER SWL:		T/PVC		
OTHER SWL:		T/PVC		

PROTECTIVE CASING DETAILS

PERMANENT, LEGIBLE WELL LABEL ADDED? ☑ YES ☐ NO

PROTECTIVE COVER AND LOCK INSTALLED? ☑ YES ☐ NO

LOCK KEY NUMBER: 3120

REVISED 11/2013

WELL CONSTRUCTION DIAGRAM

PROJ. NAME: DTE Electric Company Belle River Power Plant		WELL ID:	**MW-16-02**
PROJ. NO: 231828.0003	DATE INSTALLED: 3/15/2016 INSTALLED BY: A. Knutson		CHECKED BY: C. Scieszka

ELEVATION (BENCHMARK: USGS)	DEPTH BELOW OR ABOVE GROUND SURFACE (FEET)	
588.94	2.7	TOP OF CASING
586.27	0.0	GROUND SURFACE
	1.0	CEMENT SURFACE PLUG
		GROUT/BACKFILL MATERIAL
		BENTONITE SLURRY
		GROUT/BACKFILL METHOD
94.7		TREMIE
	84.0	GROUT
		BENTONITE SEAL MATERIAL
		TIME RELEASE PELLETS
	89.0	BENTONITE SEAL
494.2	92.0	TOP OF SCREEN
5.00		FILTER PACK MATERIAL
		MEDIUM, WASHED SAND
489.2	97.0	BOTTOM OF SCREEN
	97.0	BOTTOM OF FILTER PACK
	NA	BENTONITE PLUG
		BACKFILL MATERIAL
		NATURAL COLLAPSE
486.2	100.0	HOLE BOTTOM

RISER PIPE LENGTH

SCREEN LENGTH

NOTES:

CASING AND SCREEN DETAILS

TYPE OF RISER: 2-INCH PVC

PIPE SCHEDULE: 40

PIPE JOINTS: THREADED O-RINGS

SCREEN TYPE: 2-INCH PVC

SCR. SLOT SIZE: 0.01-INCH

BOREHOLE DIAMETER: 6 IN. FROM 0 TO 97 FT.
4 IN. FROM 97 TO 100 FT.

SURF. CASING DIAMETER: ____ IN. FROM ____ TO ____ FT.
____ IN. FROM ____ TO ____ FT.

WELL DEVELOPMENT

DEVELOPMENT METHOD: AIR LIFT

TIME DEVELOPING: 4 HOURS

WATER REMOVED: 460 GALLONS

WATER ADDED: 0 GALLONS

WATER CLARITY BEFORE / AFTER DEVELOPMENT

CLARITY BEFORE: VERY TURBID

COLOR BEFORE: BROWN /GREY

CLARITY AFTER: CLEAR

COLOR AFTER: NONE

ODOR (IF PRESENT): NONE

WATER LEVEL SUMMARY

MEASUREMENT (FEET)			DATE	TIME
DTB BEFORE DEVELOPING:	97.07	T/PVC	3/15/2016	--
DTB AFTER DEVELOPING:	100.20	T/PVC	4/13/2016	9:24
SWL BEFORE DEVELOPING:	14.56	T/PVC	3/15/2016	--
SWL AFTER DEVELOPING:	28.28	T/PVC	3/18/2016	--
OTHER SWL:	18.77	T/PVC	4/13/2016	9:24
OTHER SWL:		T/PVC		

PROTECTIVE CASING DETAILS

PERMANENT, LEGIBLE WELL LABEL ADDED? ☑ YES ☐ NO

PROTECTIVE COVER AND LOCK INSTALLED? ☑ YES ☐ NO

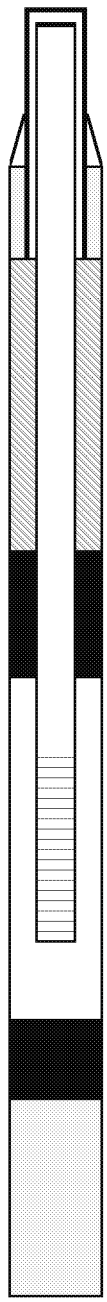
LOCK KEY NUMBER: 3120

REVISED 11/2013

WELL CONSTRUCTION DIAGRAM

PROJ. NAME: DTE Electric Company Belle River Power Plant		WELL ID:	**MW-16-03**
PROJ. NO: 231828.0003	DATE INSTALLED: 6/1/2016 INSTALLED BY: J. Reed		CHECKED BY: M. Powers

ELEVATION (BENCHMARK: USGS)	DEPTH BELOW OR ABOVE GROUND SURFACE (FEET)	
590.66	2.6	TOP OF CASING
588.03	0.0	GROUND SURFACE
	1.0	CEMENT SURFACE PLUG
		GROUT/BACKFILL MATERIAL
		BENTONITE SLURRY
		GROUT/BACKFILL METHOD
134.5		TREMIE
	126.0	GROUT
		BENTONITE SEAL MATERIAL
		TIME RELEASE PELLETS
	129.0	BENTONITE SEAL
456.2	132.0	TOP OF SCREEN
5.00		FILTER PACK MATERIAL
		MEDIUM, WASHED SAND
451.2	137.0	BOTTOM OF SCREEN
	137.0	BOTTOM OF FILTER PACK
	NA	BENTONITE PLUG
		BACKFILL MATERIAL
		NATURAL COLLAPSE
438.2	150.0	HOLE BOTTOM



NOTES:

CASING AND SCREEN DETAILS

TYPE OF RISER: 2-INCH PVC

PIPE SCHEDULE: 40

PIPE JOINTS: THREADED O-RINGS

SCREEN TYPE: 2-INCH PVC

SCR. SLOT SIZE: 0.01-INCH

BOREHOLE DIAMETER: 6 IN. FROM 0 TO 140 FT.
4 IN. FROM 140 TO 150 FT.

SURF. CASING DIAMETER: ____ IN. FROM ____ TO ____ FT.
____ IN. FROM ____ TO ____ FT.

WELL DEVELOPMENT

DEVELOPMENT METHOD: AIR LIFT

TIME DEVELOPING: 4 HOURS

WATER REMOVED: 60 GALLONS

WATER ADDED: 0 GALLONS

WATER CLARITY BEFORE / AFTER DEVELOPMENT

CLARITY BEFORE: TURBID

COLOR BEFORE: LIGHT GRAY

CLARITY AFTER: SLIGHTLY TURBID

COLOR AFTER: VERY LIGHT GRAY

ODOR (IF PRESENT): NONE

WATER LEVEL SUMMARY

MEASUREMENT (FEET)			DATE	TIME
DTB BEFORE DEVELOPING:	140.00	T/PVC	6/8/2016	7:20
DTB AFTER DEVELOPING:	140.00	T/PVC	6/8/2016	14:30
SWL BEFORE DEVELOPING:	16.06	T/PVC	6/8/2016	7:20
SWL AFTER DEVELOPING:	15.32	T/PVC	6/8/2016	14:30
OTHER DTB:	140.41	T/PVC	6/9/2016	10:00
OTHER SWL:		T/PVC		

PROTECTIVE CASING DETAILS

PERMANENT, LEGIBLE WELL LABEL ADDED? ☑ YES ☐ NO

PROTECTIVE COVER AND LOCK INSTALLED? ☑ YES ☐ NO

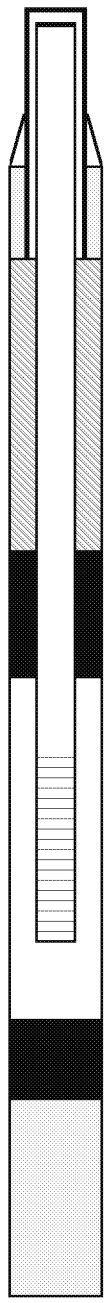
LOCK KEY NUMBER: 3120

REVISED 11/2013

WELL CONSTRUCTION DIAGRAM

PROJ. NAME: DTE Electric Company Belle River Power Plant		WELL ID:	**MW-16-04**
PROJ. NO: 231828.0003	DATE INSTALLED: 3/8/2016 INSTALLED BY: A. Knutson		CHECKED BY: C. Scieszka

ELEVATION (BENCHMARK: USGS)	DEPTH BELOW OR ABOVE GROUND SURFACE (FEET)	
590.51	3.0	TOP OF CASING
587.50	0.0	GROUND SURFACE
	1.0	CEMENT SURFACE PLUG
		GROUT/BACKFILL MATERIAL
		BENTONITE SLURRY
		GROUT/BACKFILL METHOD
122.0		TREMIE
	111.0	GROUT
		BENTONITE SEAL MATERIAL
		TIME RELEASE PELLETS
	116.0	BENTONITE SEAL
468.5	119.0	TOP OF SCREEN
5.00		FILTER PACK MATERIAL
		MEDIUM, WASHED SAND
463.5	124.0	BOTTOM OF SCREEN
	124.0	BOTTOM OF FILTER PACK
	NA	BENTONITE PLUG
		BACKFILL MATERIAL
		NATURAL COLLAPSE
457.5	130.0	HOLE BOTTOM



NOTES:

CASING AND SCREEN DETAILS

TYPE OF RISER: 2-INCH PVC

PIPE SCHEDULE: 40

PIPE JOINTS: THREADED O-RINGS

SCREEN TYPE: 2-INCH PVC

SCR. SLOT SIZE: 0.01-INCH

BOREHOLE DIAMETER: 6 IN. FROM 0 TO 124 FT.
4 IN. FROM 124 TO 130 FT.

SURF. CASING DIAMETER: ____ IN. FROM ____ TO ____ FT.
____ IN. FROM ____ TO ____ FT.

WELL DEVELOPMENT

DEVELOPMENT METHOD: AIR LIFT

TIME DEVELOPING: 4 HOURS

WATER REMOVED: 288 GALLONS

WATER ADDED: 0 GALLONS

WATER CLARITY BEFORE / AFTER DEVELOPMENT

CLARITY BEFORE: VERY TURBID

COLOR BEFORE: BROWN /GREY

CLARITY AFTER: CLEAR

COLOR AFTER: NONE

ODOR (IF PRESENT): NONE

WATER LEVEL SUMMARY

MEASUREMENT (FEET)			DATE	TIME
DTB BEFORE DEVELOPING:	123.97	T/PVC	3/8/2016	--
DTB AFTER DEVELOPING:	126.45	T/PVC	4/13/2016	9:31
SWL BEFORE DEVELOPING:	13.98	T/PVC	3/15/2016	14:30
SWL AFTER DEVELOPING:	13.46	T/PVC	3/18/2016	7:30
OTHER SWL:	16.91	T/PVC	4/13/2016	9:31
OTHER SWL:		T/PVC		

PROTECTIVE CASING DETAILS

PERMANENT, LEGIBLE WELL LABEL ADDED? ☑ YES ☐ NO

PROTECTIVE COVER AND LOCK INSTALLED? ☑ YES ☐ NO

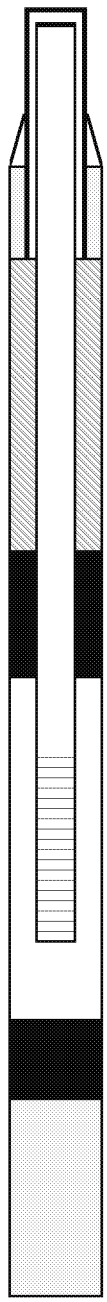
LOCK KEY NUMBER: 3120

REVISED 11/2013

WELL CONSTRUCTION DIAGRAM

PROJ. NAME: DTE Electric Company Belle River Power Plant		WELL ID:	**MW-16-05**
PROJ. NO: 231828.0003	DATE INSTALLED: 3/4/2016 INSTALLED BY: A. Knutson		CHECKED BY: C. Scieszka

ELEVATION (BENCHMARK: USGS)	DEPTH BELOW OR ABOVE GROUND SURFACE (FEET)	
590.82	2.5	TOP OF CASING
588.32	0.0	GROUND SURFACE
	1.0	CEMENT SURFACE PLUG
		GROUT/BACKFILL MATERIAL
		BENTONITE SLURRY
		GROUT/BACKFILL METHOD
141.5		TREMIE
	128.0	GROUT
		BENTONITE SEAL MATERIAL
		TIME RELEASE PELLETS
	133.0	BENTONITE SEAL
449.3	139.0	TOP OF SCREEN
5.00		FILTER PACK MATERIAL
		MEDIUM, WASHED SAND
444.3	144.0	BOTTOM OF SCREEN
	150.0	BOTTOM OF FILTER PACK
	NA	BENTONITE PLUG
		BACKFILL MATERIAL
		WASHED SAND
444.3	150.0	HOLE BOTTOM



NOTES:

CASING AND SCREEN DETAILS

TYPE OF RISER: 2-INCH PVC

PIPE SCHEDULE: 40

PIPE JOINTS: THREADED O-RINGS

SCREEN TYPE: 2-INCH PVC

SCR. SLOT SIZE: 0.01-INCH

BOREHOLE DIAMETER: 6 IN. FROM 0 TO 150 FT.
____ IN. FROM ____ TO ____ FT.

SURF. CASING DIAMETER: ____ IN. FROM ____ TO ____ FT.
____ IN. FROM ____ TO ____ FT.

WELL DEVELOPMENT

DEVELOPMENT METHOD: AIR LIFT

TIME DEVELOPING: 4 HOURS

WATER REMOVED: 300 GALLONS

WATER ADDED: 0 GALLONS

WATER CLARITY BEFORE / AFTER DEVELOPMENT

CLARITY BEFORE: VERY TURBID

COLOR BEFORE: GREY

CLARITY AFTER: CLEAR

COLOR AFTER: NONE

ODOR (IF PRESENT): NONE

WATER LEVEL SUMMARY

MEASUREMENT (FEET)			DATE	TIME
DTB BEFORE DEVELOPING:	144.03	T/PVC	3/4/2016	--
DTB AFTER DEVELOPING:	147.16	T/PVC	4/13/2016	9:55
SWL BEFORE DEVELOPING:	13.71	T/PVC	3/15/2016	--
SWL AFTER DEVELOPING:	14.13	T/PVC	3/18/2016	--
OTHER SWL:	16.87	T/PVC	4/13/2016	9:55
OTHER SWL:		T/PVC		

PROTECTIVE CASING DETAILS

PERMANENT, LEGIBLE WELL LABEL ADDED? ☑ YES ☐ NO

PROTECTIVE COVER AND LOCK INSTALLED? ☑ YES ☐ NO

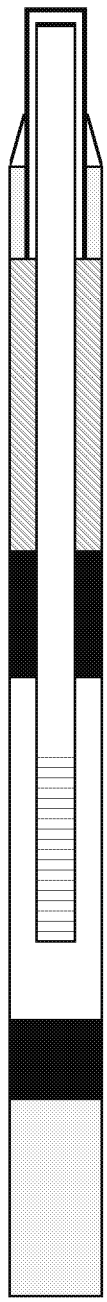
LOCK KEY NUMBER: 3120

REVISED 11/2013

WELL CONSTRUCTION DIAGRAM

PROJ. NAME: DTE Electric Company Belle River Power Plant		WELL ID:	**MW-16-06**
PROJ. NO: 231828.0003	DATE INSTALLED: 3/11/2016 INSTALLED BY: A. Knutson		CHECKED BY: C. Scieszka

ELEVATION (BENCHMARK: USGS)	DEPTH BELOW OR ABOVE GROUND SURFACE (FEET)	
593.21	3.2	TOP OF CASING
589.98	0.0	GROUND SURFACE
	1.0	CEMENT SURFACE PLUG
		GROUT/BACKFILL MATERIAL
		BENTONITE SLURRY
		GROUT/BACKFILL METHOD
138.2		TREMIE
	127.0	GROUT
		BENTONITE SEAL MATERIAL
		TIME RELEASE PELLETS
	132.0	BENTONITE SEAL
455.0	135.0	TOP OF SCREEN
5.00		FILTER PACK MATERIAL
		MEDIUM, WASHED SAND
450.0	140.0	BOTTOM OF SCREEN
	140.0	BOTTOM OF FILTER PACK
	NA	BENTONITE PLUG
		BACKFILL MATERIAL
		NA
450.0	140.0	HOLE BOTTOM



NOTES:

CASING AND SCREEN DETAILS

TYPE OF RISER: 2-INCH PVC

PIPE SCHEDULE: 40

PIPE JOINTS: THREADED O-RINGS

SCREEN TYPE: 2-INCH PVC

SCR. SLOT SIZE: 0.01-INCH

BOREHOLE DIAMETER: 6 IN. FROM 0 TO 140 FT.
____ IN. FROM ____ TO ____ FT.

SURF. CASING DIAMETER: ____ IN. FROM ____ TO ____ FT.
____ IN. FROM ____ TO ____ FT.

WELL DEVELOPMENT

DEVELOPMENT METHOD: AIR LIFT

TIME DEVELOPING: 4 HOURS

WATER REMOVED: 50 GALLONS

WATER ADDED: 0 GALLONS

WATER CLARITY BEFORE / AFTER DEVELOPMENT

CLARITY BEFORE: VERY TURBID

COLOR BEFORE: BROWN /GREY

CLARITY AFTER: CLEAR

COLOR AFTER: NONE

ODOR (IF PRESENT): NOT MEASURED

WATER LEVEL SUMMARY

MEASUREMENT (FEET)			DATE	TIME
DTB BEFORE DEVELOPING:	135.07	T/PVC	3/8/2016	--
DTB AFTER DEVELOPING:	142.85	T/PVC	4/13/2016	10:01
SWL BEFORE DEVELOPING:	19.62	T/PVC	3/15/2016	14:30
SWL AFTER DEVELOPING:	14.90	T/PVC	3/18/2016	7:30
OTHER SWL:	17.65	T/PVC	4/13/2016	10:01
OTHER SWL:		T/PVC		

PROTECTIVE CASING DETAILS

PERMANENT, LEGIBLE WELL LABEL ADDED? ☑ YES ☐ NO

PROTECTIVE COVER AND LOCK INSTALLED? ☑ YES ☐ NO

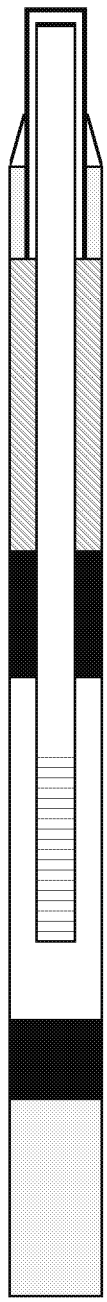
LOCK KEY NUMBER: 3120

REVISED 11/2013

WELL CONSTRUCTION DIAGRAM

PROJ. NAME: DTE Electric Company Belle River Power Plant		WELL ID:	**MW-16-07**
PROJ. NO: 231828.0003	DATE INSTALLED: 3/9/2016 INSTALLED BY: A. Knutson		CHECKED BY: C. Scieszka

ELEVATION (BENCHMARK: USGS)	DEPTH BELOW OR ABOVE GROUND SURFACE (FEET)	
592.58	2.7	TOP OF CASING
589.89	0.0	GROUND SURFACE
	1.0	CEMENT SURFACE PLUG
		GROUT/BACKFILL MATERIAL
		BENTONITE SLURRY
		GROUT/BACKFILL METHOD
135.7		TREMIE
	125.0	GROUT
		BENTONITE SEAL MATERIAL
		TIME RELEASE PELLETS
	130.0	BENTONITE SEAL
456.9	133.0	TOP OF SCREEN
5.00		FILTER PACK MATERIAL
		MEDIUM, WASHED SAND
451.9	138.0	BOTTOM OF SCREEN
	140.0	BOTTOM OF FILTER PACK
	NA	BENTONITE PLUG
		BACKFILL MATERIAL
		WASHED SAND
449.89	140.0	HOLE BOTTOM



NOTES:

CASING AND SCREEN DETAILS

TYPE OF RISER: 2-INCH PVC

PIPE SCHEDULE: 40

PIPE JOINTS: THREADED O-RINGS

SCREEN TYPE: 2-INCH PVC

SCR. SLOT SIZE: 0.01-INCH

BOREHOLE DIAMETER: 6 IN. FROM 0 TO 140 FT.
____ IN. FROM ____ TO ____ FT.

SURF. CASING DIAMETER: ____ IN. FROM ____ TO ____ FT.
____ IN. FROM ____ TO ____ FT.

WELL DEVELOPMENT

DEVELOPMENT METHOD: AIR LIFT

TIME DEVELOPING: 4 HOURS

WATER REMOVED: 120 GALLONS

WATER ADDED: 0 GALLONS

WATER CLARITY BEFORE / AFTER DEVELOPMENT

CLARITY BEFORE: VERY TURBID

COLOR BEFORE: BROWN /GREY

CLARITY AFTER: CLEAR

COLOR AFTER: NONE

ODOR (IF PRESENT): NONE

WATER LEVEL SUMMARY

MEASUREMENT (FEET)			DATE	TIME
DTB BEFORE DEVELOPING:	138.02	T/PVC	3/9/2016	--
DTB AFTER DEVELOPING:	141.19	T/PVC	4/13/2016	11:56
SWL BEFORE DEVELOPING:	14.66	T/PVC	3/15/2016	--
SWL AFTER DEVELOPING:	14.25	T/PVC	3/18/2016	--
OTHER SWL:	16.83	T/PVC	4/13/2016	11:56
OTHER SWL:		T/PVC		

PROTECTIVE CASING DETAILS

PERMANENT, LEGIBLE WELL LABEL ADDED? ☑ YES ☐ NO

PROTECTIVE COVER AND LOCK INSTALLED? ☑ YES ☐ NO

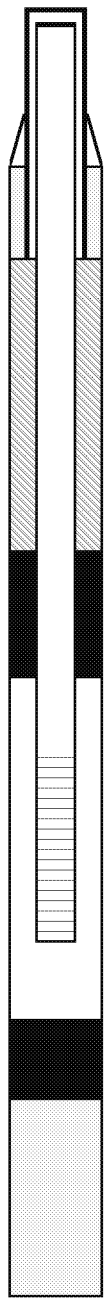
LOCK KEY NUMBER: 3120

REVISED 11/2013

WELL CONSTRUCTION DIAGRAM

PROJ. NAME: DTE Electric Company Belle River Power Plant		WELL ID:	**MW-16-08**
PROJ. NO: 231828.0003	DATE INSTALLED: 3/10/2016 INSTALLED BY: A. Knutson		CHECKED BY: C. Scieszka

ELEVATION (BENCHMARK: USGS)	DEPTH BELOW OR ABOVE GROUND SURFACE (FEET)	
591.88	2.6	TOP OF CASING
589.31	0.0	GROUND SURFACE
	1.0	CEMENT SURFACE PLUG
		GROUT/BACKFILL MATERIAL
		BENTONITE SLURRY
		GROUT/BACKFILL METHOD
135.6		TREMIE
	125.0	GROUT
		BENTONITE SEAL MATERIAL
		TIME RELEASE PELLETS
	130.0	BENTONITE SEAL
456.3	133.0	TOP OF SCREEN
5.00		FILTER PACK MATERIAL
		MEDIUM, WASHED SAND
451.3	138.0	BOTTOM OF SCREEN
	140.0	BOTTOM OF FILTER PACK
	NA	BENTONITE PLUG
		BACKFILL MATERIAL
		WASHED SAND
449.3	140.0	HOLE BOTTOM



NOTES:

CASING AND SCREEN DETAILS

TYPE OF RISER: 2-INCH PVC

PIPE SCHEDULE: 40

PIPE JOINTS: THREADED O-RINGS

SCREEN TYPE: 2-INCH PVC

SCR. SLOT SIZE: 0.01-INCH

BOREHOLE DIAMETER: 6 IN. FROM 0 TO 140 FT.
____ IN. FROM ____ TO ____ FT.

SURF. CASING DIAMETER: ____ IN. FROM ____ TO ____ FT.
____ IN. FROM ____ TO ____ FT.

WELL DEVELOPMENT

DEVELOPMENT METHOD: AIR LIFT

TIME DEVELOPING: 4 HOURS

WATER REMOVED: 125 GALLONS

WATER ADDED: 0 GALLONS

WATER CLARITY BEFORE / AFTER DEVELOPMENT

CLARITY BEFORE: VERY TURBID

COLOR BEFORE: BROWN /GREY

CLARITY AFTER: CLEAR

COLOR AFTER: NONE

ODOR (IF PRESENT): NONE

WATER LEVEL SUMMARY

MEASUREMENT (FEET)			DATE	TIME
DTB BEFORE DEVELOPING:	137.94	T/PVC	3/11/2016	--
DTB AFTER DEVELOPING:	140.80	T/PVC	4/13/2016	12:00
SWL BEFORE DEVELOPING:	14.23	T/PVC	3/15/2016	14:30
SWL AFTER DEVELOPING:	14.23	T/PVC	3/18/2016	7:30
OTHER SWL:	15.79	T/PVC	4/13/2016	12:00
OTHER SWL:		T/PVC		

PROTECTIVE CASING DETAILS

PERMANENT, LEGIBLE WELL LABEL ADDED? ☑ YES ☐ NO

PROTECTIVE COVER AND LOCK INSTALLED? ☑ YES ☐ NO

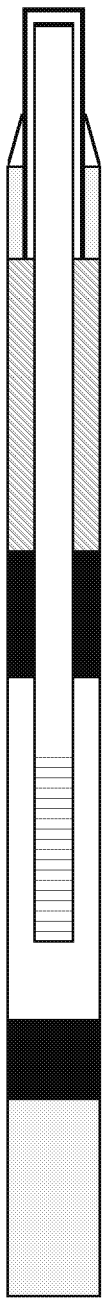
LOCK KEY NUMBER: 3120

REVISED 11/2013

WELL CONSTRUCTION DIAGRAM

PROJ. NAME: DTE Electric Company Belle River Power Plant		WELL ID:	**MW-16-09**
PROJ. NO: 231828.0003	DATE INSTALLED: 6/2/2016 INSTALLED BY: J. Reed		CHECKED BY: M. Powers

ELEVATION (BENCHMARK: USGS)	DEPTH BELOW OR ABOVE GROUND SURFACE (FEET)	
590.80	2.5	TOP OF CASING
588.28	0.0	GROUND SURFACE
	1.0	CEMENT SURFACE PLUG
		GROUT/BACKFILL MATERIAL
		BENTONITE SLURRY
		GROUT/BACKFILL METHOD
138.4		TREMIE
	130.0	GROUT
		BENTONITE SEAL MATERIAL
		TIME RELEASE PELLETS
	133.0	BENTONITE SEAL
452.4	136.0	TOP OF SCREEN
5.00		FILTER PACK MATERIAL
		MEDIUM, WASHED SAND
447.4	141.0	BOTTOM OF SCREEN
	141.0	BOTTOM OF FILTER PACK
	NA	BENTONITE PLUG
		BACKFILL MATERIAL
		NATURAL COLLAPSE
438.4	150.0	HOLE BOTTOM



NOTES:

CASING AND SCREEN DETAILS

TYPE OF RISER: 2-INCH PVC

PIPE SCHEDULE: 40

PIPE JOINTS: THREADED O-RINGS

SCREEN TYPE: 2-INCH PVC

SCR. SLOT SIZE: 0.01-INCH

BOREHOLE DIAMETER: 6 IN. FROM 0 TO 150 FT.
____ IN. FROM ____ TO ____ FT.

SURF. CASING DIAMETER: ____ IN. FROM ____ TO ____ FT.
____ IN. FROM ____ TO ____ FT.

WELL DEVELOPMENT

DEVELOPMENT METHOD: AIR LIFT

TIME DEVELOPING: 7 HOURS

WATER REMOVED: 30 GALLONS

WATER ADDED: 0 GALLONS

WATER CLARITY BEFORE / AFTER DEVELOPMENT

CLARITY BEFORE: TURBID

COLOR BEFORE: GRAY

CLARITY AFTER: VERY TURBID

COLOR AFTER: GRAY

ODOR (IF PRESENT): NONE

WATER LEVEL SUMMARY

MEASUREMENT (FEET)			DATE	TIME
DTB BEFORE DEVELOPING:	140.00	T/PVC	6/7/2016	12:00
DTB AFTER DEVELOPING:	140.00	T/PVC	6/8/2016	10:25
SWL BEFORE DEVELOPING:	7.00	T/PVC	6/7/2016	12:00
SWL AFTER DEVELOPING:	117.42	T/PVC	6/8/2016	10:25
OTHER SWL:	16.76	T/PVC	6/9/2016	15:13
OTHER DTB:	144.30	T/PVC	6/9/2016	15:13

PROTECTIVE CASING DETAILS

PERMANENT, LEGIBLE WELL LABEL ADDED? ☑ YES ☐ NO

PROTECTIVE COVER AND LOCK INSTALLED? ☑ YES ☐ NO

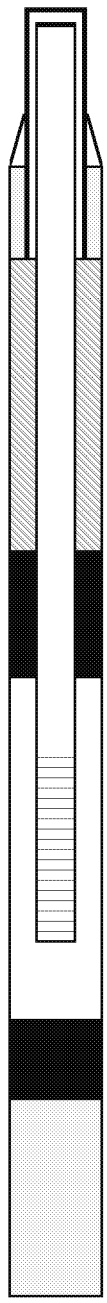
LOCK KEY NUMBER: 3120

REVISED 11/2013

WELL CONSTRUCTION DIAGRAM

PROJ. NAME: DTE Electric Company Belle River Power Plant		WELL ID:	**MW-16-10**
PROJ. NO: 231828.0003	DATE INSTALLED: 6/6/2016 INSTALLED BY: J. Reed		CHECKED BY: M. Powers

ELEVATION (BENCHMARK: USGS)	DEPTH BELOW OR ABOVE GROUND SURFACE (FEET)	
592.26	3.0	TOP OF CASING
589.25	0.0	GROUND SURFACE
	1.0	CEMENT SURFACE PLUG
		GROUT/BACKFILL MATERIAL
		BENTONITE SLURRY
		GROUT/BACKFILL METHOD
148.0		TREMIE
	137.0	GROUT
		BENTONITE SEAL MATERIAL
		TIME RELEASE PELLETS
	142.0	BENTONITE SEAL
444.3	145.0	TOP OF SCREEN
5.00		FILTER PACK MATERIAL
		MEDIUM, WASHED SAND
439.3	150.0	BOTTOM OF SCREEN
	150.0	BOTTOM OF FILTER PACK
	NA	BENTONITE PLUG
		BACKFILL MATERIAL
		NA
439.3	150.0	HOLE BOTTOM



NOTES:

CASING AND SCREEN DETAILS

TYPE OF RISER: 2-INCH PVC

PIPE SCHEDULE: 40

PIPE JOINTS: THREADED O-RINGS

SCREEN TYPE: 2-INCH PVC

SCR. SLOT SIZE: 0.01-INCH

BOREHOLE DIAMETER: 6 IN. FROM 0 TO 150 FT.
____ IN. FROM ____ TO ____ FT.

SURF. CASING DIAMETER: ____ IN. FROM ____ TO ____ FT.
____ IN. FROM ____ TO ____ FT.

WELL DEVELOPMENT

DEVELOPMENT METHOD: AIR LIFT

TIME DEVELOPING: 4.5 HOURS

WATER REMOVED: 85 GALLONS

WATER ADDED: 60 GALLONS

WATER CLARITY BEFORE / AFTER DEVELOPMENT

CLARITY BEFORE: VERY TURBID

COLOR BEFORE: DARK GRAY

CLARITY AFTER: VERY TURBID

COLOR AFTER: DARK GRAY

ODOR (IF PRESENT): NONE

WATER LEVEL SUMMARY

MEASUREMENT (FEET)			DATE	TIME
DTB BEFORE DEVELOPING:	151.30	T/PVC	6/9/2016	7:45
DTB AFTER DEVELOPING:	152.28	T/PVC	6/9/2016	16:50
SWL BEFORE DEVELOPING:	17.80	T/PVC	6/9/2016	7:45
SWL AFTER DEVELOPING:	59.44	T/PVC	6/9/2016	16:50
OTHER SWL:		T/PVC		
OTHER SWL:		T/PVC		

PROTECTIVE CASING DETAILS

PERMANENT, LEGIBLE WELL LABEL ADDED? ☑ YES ☐ NO

PROTECTIVE COVER AND LOCK INSTALLED? ☑ YES ☐ NO

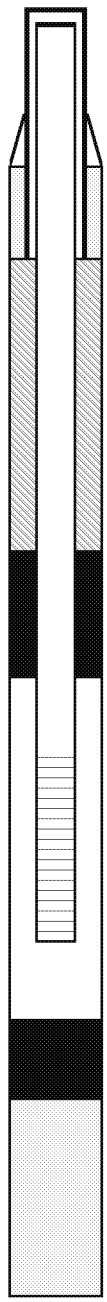
LOCK KEY NUMBER: 3120

REVISED 11/2013

WELL CONSTRUCTION DIAGRAM

PROJ. NAME: DTE Electric Company Belle River Power Plant		WELL ID:	MW-16-11
PROJ. NO: 231828.0003	DATE INSTALLED: 6/7/2016 INSTALLED BY: J. Reed		CHECKED BY: M. Powers

ELEVATION (BENCHMARK: USGS)	DEPTH BELOW OR ABOVE GROUND SURFACE (FEET)	
591.54	2.5	TOP OF CASING
589.03	0.0	GROUND SURFACE
	1.0	CEMENT SURFACE PLUG
		GROUT/BACKFILL MATERIAL
		BENTONITE SLURRY
		GROUT/BACKFILL METHOD
139.5		TREMIE
	130.0	GROUT
		BENTONITE SEAL MATERIAL
		TIME RELEASE PELLETS
	135.0	BENTONITE SEAL
452.0	137.0	TOP OF SCREEN
5.00		FILTER PACK MATERIAL
		MEDIUM, WASHED SAND
447.0	142.0	BOTTOM OF SCREEN
	150.0	BOTTOM OF FILTER PACK
	NA	BENTONITE PLUG
		BACKFILL MATERIAL
		WASHED SAND
447.0	150.0	HOLE BOTTOM



NOTES:

CASING AND SCREEN DETAILS

TYPE OF RISER: 2-INCH PVC

PIPE SCHEDULE: 40

PIPE JOINTS: THREADED O-RINGS

SCREEN TYPE: 2-INCH PVC

SCR. SLOT SIZE: 0.01-INCH

BOREHOLE DIAMETER: 6 IN. FROM 0 TO 150 FT.
____ IN. FROM ____ TO ____ FT.

SURF. CASING DIAMETER: ____ IN. FROM ____ TO ____ FT.
____ IN. FROM ____ TO ____ FT.

WELL DEVELOPMENT

DEVELOPMENT METHOD: AIR LIFT

TIME DEVELOPING: 3 HOURS

WATER REMOVED: 84 GALLONS

WATER ADDED: 60 GALLONS

WATER CLARITY BEFORE / AFTER DEVELOPMENT

CLARITY BEFORE: VERY TURBID

COLOR BEFORE: DARK GRAY

CLARITY AFTER: VERY TURBID

COLOR AFTER: GRAY

ODOR (IF PRESENT): NONE

WATER LEVEL SUMMARY

MEASUREMENT (FEET)			DATE	TIME
DTB BEFORE DEVELOPING:	141.36	T/PVC	6/9/2016	12:35
DTB AFTER DEVELOPING:	142.00	T/PVC	6/9/2016	15:45
SWL BEFORE DEVELOPING:	9.65	T/PVC	6/9/2016	12:35
SWL AFTER DEVELOPING:	116.00	T/PVC	6/9/2016	15:45
OTHER SWL:	16.67	T/PVC	6/21/2016	7:45
OTHER SWL:		T/PVC		

PROTECTIVE CASING DETAILS

PERMANENT, LEGIBLE WELL LABEL ADDED? ☑ YES ☐ NO

PROTECTIVE COVER AND LOCK INSTALLED? ☑ YES ☐ NO

LOCK KEY NUMBER: 3120

REVISED 11/2013

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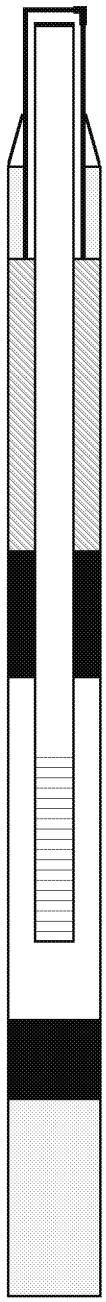
WELL CONSTRUCTION DIAGRAM

PROJ. NAME:	DTE Electric Company Belle River Power Plant	WELL ID:	**MW-16-11A**
PROJ. NO: 265996.0003	DATE INSTALLED: 5/12/2017 INSTALLED BY: Jake Krenz		CHECKED BY: C. Scieszka

ELEVATION (BENCHMARK: USGS)	DEPTH BELOW OR ABOVE GROUND SURFACE (FEET)	
591.66	2.1	TOP OF CASING
589.52	0.0	GROUND SURFACE
	1.5	CEMENT SURFACE PLUG
		GROUT/BACKFILL MATERIAL
		BENTONITE SLURRY
		GROUT/BACKFILL METHOD
139.1		TREMIE
	131.5	GROUT
		BENTONITE SEAL MATERIAL
		PELLETS
	134.0	BENTONITE SEAL
452.5	137.0	TOP OF SCREEN
5'		FILTER PACK MATERIAL
		MEDIUM, WASHED SAND
447.5	142.0	BOTTOM OF SCREEN
	142.0	BOTTOM OF FILTER PACK
	NA	BENTONITE PLUG
		BACKFILL MATERIAL
		NA
447.52	142.0	HOLE BOTTOM



NOTES:

CASING AND SCREEN DETAILS

TYPE OF RISER: 2-INCH PVC

PIPE SCHEDULE: 40

PIPE JOINTS: THREADED O-RINGS

SOLVENT USED? NO

SCREEN TYPE: 2-INCH PVC

SCR. SLOT SIZE: 0.01-INCH

BOREHOLE DIAMETER:	6	IN.	FROM	0	TO	142	FT.
	NA	IN.	FROM	NA	TO	NA	FT.
SURF. CASING DIAMETER:	NA	IN.	FROM	NA	TO	NA	FT.
	NA	IN.	FROM	NA	TO	NA	FT.

WELL DEVELOPMENT

DEVELOPMENT METHOD: AIR LIFT

TIME DEVELOPING: 3 HOURS

WATER REMOVED: 110 GALLONS

WATER ADDED: 0 GALLONS

WATER CLARITY BEFORE / AFTER DEVELOPMENT

CLARITY BEFORE: Very Turbid

COLOR BEFORE: Dark Gray

CLARITY AFTER: Very Turbid

COLOR AFTER: Light Gray

ODOR (IF PRESENT): None

WATER LEVEL SUMMARY

MEASUREMENT (FEET)			DATE	TIME
DTB BEFORE DEVELOPING:	141.98	T/PVC	5/15/2017	0838
DTB AFTER DEVELOPING:	145.45	T/PVC	5/15/2017	1612
SWE BEFORE DEVELOPING:	17.79	T/PVC	5/15/2017	0838
SWE AFTER DEVELOPING:	90.12	T/PVC	5/15/2017	1612
OTHER SWE:		T/PVC		
OTHER SWE:		T/PVC		

PROTECTIVE CASING DETAILS

PERMANENT, LEGIBLE WELL LABEL ADDED? ☑ YES ☐ NO

PROTECTIVE COVER AND LOCK INSTALLED? ☑ YES ☐ NO

LOCK KEY NUMBER: 3120

REVISED 06/2011

Appendix D
Subsurface Investigation and Foundation Report, Bechtel, 1976.

DRAFT

SUBSURFACE INVESTIGATION AND FOUNDATION REPORT

THE DETROIT EDISON COMPANY

BELLE RIVER UNITS 1 & 2

JOB 10539

VOLUME 1 OF 2

GEOLOGY AND SOIL PROPERTIES

P. H. COOK
AUG 31 1976

AUGUST 1976

BECHTEL
ANN ARBOR, MICHIG

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SUBSURFACE INVESTIGATION
AND
FOUNDATION REPORT
GEOLOGY AND SOIL PROPERTIES

BELLE RIVER PLANT

UNITS 1 & 2

JOB 10539

THE DETROIT EDISON COMPANY

S. S. Afifi

D. R. Gle

GEOTECHNICAL SERVICES

ANN ARBOR, MI

SUBSURFACE INVESTIGATION
AND
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GEOTECHNICAL SERVICES

ANN ARBOR, MI

Volume 1 of 2

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ABSTRACT

This report presents the results of an extensive subsurface investigation program for the Detroit Edison Company at the Belle River Project site. The proposed project consists of a two-unit coal fired plant and the associated coal handling facilities. The study was directed at evaluation of the geologic and ground water conditions and the development of soil parameters for design and construction of the proposed facilities.

The evaluations presented in this report consist of a review of previous investigations, a literature review, and detailed subsurface investigation and laboratory testing programs. This investigation confirmed the suitability of the site for the proposed facilities and gave the soil mechanics information necessary for planning, design and construction of plant facilities.

PREFACE

This report was prepared by Geotechnical Services in the Ann Arbor Office of Bechtel. The soils sections of this report were prepared by D.R. Gle and the geology sections by J.V. Mrakovich. J.B. Givens also contributed to the soil data evaluations. The Ann Arbor Office review and approval was by S. Mackay and G.T. LeFevre, Engineering Geology Supervisors, and S.S. Afifi, Soils Engineering Supervisor. The San Francisco H & CF review and approval was by M.J. Adair, Chief Geologist, and W.R. Ferris, Chief Soils Engineer. The report was also reviewed by S.L. Blue, Geotechnical Services Manager, H & CF Division, Ann Arbor, Michigan. The report was collated by A.R. Rossmann, Drafting Supervisor, Ann Arbor.

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NOTATION

$\underline{A}$	Pore pressure parameter (Skempton)
C_c	Compression index
C_r	Swelling index
C_v	Coefficient of consolidation
c	Cohesion intercept for total stresses from Mohr-Coulomb Relationship
c'	Cohesion intercept for effective stresses from Mohr-Coulomb Relationship
$\overline{CU}$	Consolidated-undrained triaxial compression test with pore pressure measurement
D_{50}	Grain size analysis: diameter at which 50% of the sample is finer
E	Young's modulus of elasticity as determined from the initial tangent modulus of the stress-strain curve
e_o	Initial void ratio
k	Permeability
ksf	Kips per square foot
LL	Liquid limit
PI	Plasticity index (LL-PL)
P_c	Preconsolidation pressure
PL	Plastic limit
$\bar{p}$	Effective vertical pressure
$\bar{p}_o$	In-situ effective overburden pressure
p	Stress point, $(\sigma_1 + \sigma_3)/2$
p'	Stress point, $(\bar{\sigma}_1 + \bar{\sigma}_3)/2$

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pcf	Pounds per cubic foot
psf	Pounds per square foot
q	Stress point, $(\sigma_1 - \sigma_3)/2$
Qu	Unconfined compression test
S	Shear strength
SPT	Standard penetration test (ASTM D 1586)
S_u	Undrained shear strength
UU	Unconsolidated-undrained triaxial compression test
W_o	Initial moisture content
W_f	Moisture content after consolidation ($\overline{CU}$ test)
γ_d	Dry density
γ_t	Total density
γ_{tf}	Total density after consolidation ($\overline{CU}$ test)
ε	Axial strain
σ	Total normal stress on failure plane at failure
σ'	Effective normal stress on failure plane at failure
σ_o	Confining pressure (unconsolidated-undrained triaxial test)
$\bar{\sigma}_3$	Effective confining pressure (consolidated-undrained triaxial test)
ϕ	Angle of internal friction for total stresses
ϕ'	Angle of internal friction for effective stresses
τ	Drained shear strength

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1.0 INTRODUCTION

The Detroit Edison Company's proposed Belle River Project consists of a two-unit coal fired power plant and the associated coal handling facilities. The project site is located in St. Clair County, Michigan, between the cities of St. Clair and Marine City. Figure 1 shows the state of Michigan with the site location indicated. This site is just west of the existing Detroit Edison Company St. Clair Power Plant. A general site plan showing all of the existing and proposed facilities is shown in Figure 2.

The coal handling facilities will include a docking facility, transfer houses, radial stackers, underground coal reclaimers and a conveyor system, along with both primary and secondary coal storage areas. The proposed power block will consist of two boiler buildings, two turbine buildings, four precipitators, a smoke stack, service building, administration building, warehouse, and miscellaneous other tanks and treatment basins. Other facilities away from the power block include a switchyard and intake and discharge structures.

The project facilities are superimposed on the boring location plan and are shown in Figure 3. The area proposed

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for fly ash disposal (Figure 4) has also been considered in the evaluations.

Volume 1 of this report contains the final results of the geological evaluations, laboratory soil testing, soil properties evaluations, and the development of the soil engineering parameters to be used for the entire Belle River 1 & 2 Project area. The results of previous investigations supplied by The Detroit Edison Company are given in Appendix A. Bechtel soil/rock borings are presented in Appendix B, along with a tabulated summary and a key to the notation used on the boring logs.

Volume 2 contains Appendices C and D which include all of the laboratory test results. Appendix C contains the results of laboratory tests performed by Goldberg-Zoino and Associates while Appendix D contains the results of laboratory tests conducted by U. W. Stoll and Associates.

The engineering design criteria for the various portions of this project will not be addressed in this report. Design criteria will be addressed upon reactivation of the project when more details are known about the proposed facilities and the final location of structures.

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2.0 SCOPE OF WORK

The purpose of the subsurface investigation and laboratory testing program was to evaluate the soil, rock, and ground water conditions at the site in order to provide sufficient information for planning, design, and construction of the various plant facilities. Upon reactivation of this project, foundation systems and parameters for the various foundation design, construction, and soil structure interaction schemes will be developed based on this information.

This report is based on a review of previous investigations, geologic research, ground water studies, soil and rock drilling and sampling, and a laboratory testing program.

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3.0 SUBSURFACE EXPLORATION

3.1 PREVIOUS EXPLORATION FOR THE EXISTING ST. CLAIR PLANT

Borings were made for various structures and facilities of the St. Clair power plant during 1950, 1959, and 1965. These are contained in a report prepared under the direction of W. S. Housel and the University of Michigan's Office of Research Administration, Soil Mechanics Laboratory for the addition to St. Clair Unit No. 7. The 1950 borings were generally in the area of the main plant while the 1959 and 1965 borings were made for the dock area and yard conveyor, respectively.

Included in the Housel report are the individual boring log profiles of borings made during 1965 and composite subsoil analysis profiles extending to bedrock. It also contains information on comparisons with borings made in the same area during 1950 and 1959. Through 1965, a total of 28 borings were drilled east of M-29 along the shore of the St. Clair River and within the St. Clair plant area. Seven borings were drilled west of M-29 along the yard conveyor. The Housel report and other borings in the area made available to Bechtel are included in Appendix A of this volume.

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3.2 EXPLORATION FOR THE PROPOSED BELLE RIVER PROJECT

3.2.1 General

The existing docking facility was rebuilt to accommodate larger ships approximately 105 feet wide and 1000 feet long having a draft of about 27.5 feet. The existing conveyor system serving the present St. Clair units will remain in place. A new conveyor system will begin at the docking facility and parallel the existing system to Highway M-29, where it will bridge across M-29 and bisect the new primary coal storage area.

From the primary coal storage area, the conveyor system crosses over the Detroit and Port Huron Railroad tracks and turns northward towards the main plant area and the secondary coal storage pile. The conveyor will then split, with one conveyor going west into the main plant and the other going east, over the railroad tracks, to the secondary coal storage area. Also located along the conveyor system are various transfer houses and stacker-reclaimers as shown in Figures 2, 3 and 4.

The primary coal storage area is separated into three storage locations covering an area of approximately 75

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acres. There are two main dead storage piles to the north and south sides of the conveyor, and a smaller live storage pile between the conveyor and the south dead coal storage. An approximate capacity of 2.5 million tons of coal can be stored at these locations.

The secondary coal storage area will consist of a single coal pile located just east of the main plant. This pile will cover an area of approximately 20 acres, and will have a total dead storage capacity of approximately one million tons.

In addition, there will be a large fly ash disposal area to the northwest of the main plant. In general, this area is bounded by the existing Remer Road, King Road, the Detroit and Port Huron Railroad, and a line about one-half mile north of and parallel to Puttygut Road.

3.2.2 Details of Exploration

The subsurface exploration program and foundation evaluation were developed by Bechtel. The drilling, which was done by Raymond International, began in November 1973 and ended in August 1975. Bechtel soil engineer(s) and Bechtel

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engineering geologist(s) supervised field operations and recorded field logs of the drilling, sampling, and field testing of the foundation materials. Logs of all borings were prepared by Bechtel and are included in Appendix B.

In the docking area, ten 5-inch diameter exploratory borings were drilled and sampled to bedrock. In addition, 74 other rotary wash borings were drilled along the conveyor system, the coal storage areas, and the main plant area. A total of 36 borings were drilled in the fly ash disposal area northwest of the main plant. These borings were located on approximately a 1,000 foot grid and extended to depths of from 70 to 140 feet. Undisturbed samples were obtained in selected borings while split spoon samples were obtained in all of the remaining borings to verify the subsurface materials and consistency.

Throughout this investigation, undisturbed samples were generally taken at 10-foot intervals with standard 3-inch O. D. Shelby tubes. From a depth of approximately 15 to 70 feet, some difficulty was encountered in retaining the very soft clayey soils in the standard Shelby tube, and the Osterberg Sampler was used to recover samples within this depth. Generally, this sampler enabled adequate recovery.

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Material in each undisturbed sample was visually classified by the Bechtel field engineer. The tubes were then sealed with a double layer of wax, labeled, and selected tubes were shipped to the laboratory.

Drive samples were obtained at the alternate 10-foot intervals between undisturbed samples using a standard split spoon sampler. This procedure (ASTM D 1586) utilizes a 140-pound hammer falling 30 inches to drive a 1-3/8 inch I.D. split spoon sampler 18 inches. Blows required to advance the sampler through each six inches were recorded. The standard penetration test (SPT) blowcount is the number of blows for the last foot the sampler is driven. Standard penetration test blowcounts are given on the boring logs. In the exceptionally hard materials found at depths of approximately 130 to 135 feet, refusal was considered to have been attained when 100 blows were delivered for any six inch driving increment.

Material recovered in the split spoon sampler was visually classified by the engineer, and a portion of the sample was then stored in a glass jar. Selected jar samples were sent to the testing laboratory for classification.

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Classifications made in the field were compared with the laboratory classification during proofreading of each field log and the appropriate corrections were then made on the final boring log. The unified soil classification for each sample is as shown on the boring logs given in Appendix B.

Rock cores were obtained in areas where the foundation system has a possibility of bearing on bedrock. Specified holes were cored a minimum of 20 feet into rock to assure positive penetration through the overburden and to obtain samples to evaluate the competency of the rock.

Cores were placed in partitioned core boxes (each holding about 15 feet of core), classified, and stored at the site. Bechtel geologists prepared logs of the rock core portions of each hole.

At the completion of the investigation, the remaining sample jars, Shelby tube samples, and rock core samples were stored at the St. Clair Power Plant.

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4.0 SITE CONDITIONS

This section addresses the geology and generalized subsurface soil conditions for this site. The geological studies were based on a literature review, evaluation of site boring logs, and ground water measurements. The soil conditions were developed from an evaluation of the boring logs and laboratory soil tests, along with geologic and ground water evidence and also a review of previous investigations.

4.1 GEOLOGY

4.1.1 Regional Geology

The site is located in the Lower Peninsula of Michigan on the southeastern margin of the Michigan Basin (Figure 5). This basin is a broad, shallow, tectonic structure approximately 300 miles in diameter and containing up to 14,000 feet of Paleozoic sediments in its central portion near Mount Pleasant. Thickening of strata toward the center of the basin indicates that the Lower Peninsula was a region of slow subsidence with almost continuous deposition throughout the Paleozoic. A large part of basin development occurred during Silurian, Middle and Upper Devonian time

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when about two-thirds of the total Paleozoic sequence was deposited. Subsidence apparently ceased at the close of Jurassic time, about 135 million years ago, since no rocks of younger age are known to exist in the region.

During the Pleistocene, continental glaciers advanced and retreated across the region many times, modifying the bedrock topography and covering it with glacial drift, which now comprises almost all natural topographic features at the site and in the Lower Peninsula.

Faulting is not common to the region, and no known faults occur near the site. The nearest mapped faulting occurs in the area of the Chatham Sag in eastern Ontario, about 15 miles southeast of the site; however, it is considered inactive (Ref 1).

The Lower Peninsula of Michigan is an area of low seismic activity where only six earthquakes have been recorded in historic time. None of these earthquakes can be related to mapped faults or tectonic structures in the Michigan Basin. According to the seismic risk map of the U.S. (Ref 2), the site is located in Zone 1 which corresponds to Intensities V and VI (Modified Mercalli Scale of 1931), where only minor damage should be expected.

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4.1.2 Site Geology

The site is located in St. Clair County, Michigan, 3.5 miles south of the city of St. Clair on an intermorainal glacial lake plain (Figure 6) whose ground surface varies little above or below 587 feet in elevation.

These glacial lake deposits vary in thickness from 125 to 170 feet within the explored area of the site where they overlie an irregular bedrock surface (Figure 7). The underlying bedrock consists of about 4,600 feet of Paleozoic sedimentary rocks whose uppermost unit is the Bedford Shale formation of Mississippian-Devonian Age. The Paleozoic rocks are underlain by metamorphic, igneous, and sedimentary rock of Precambrian Age (Ref 3).

Overburden materials consist primarily of unconsolidated gray to brown, soft to stiff silt and silty clays with scattered fine sand lenses. Figure 8 shows overburden thickness contours throughout the site area and the cross sections of Figure 9, A through N, show local detailed descriptions of site material.

The most prominent feature of the bedrock topography is a generally north-south trending erosional channel in the

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vicinity of the proposed plant. Subsurface profiles (Figure 9, A through N), normal to and along the trend of the channel, show an associated sand deposit whose known maximum thickness is about 60 feet. Generally, the sand appears to be in contact with the bedrock surface and thins rapidly, or becomes absent, away from the channel. As evidenced by the drill hole logs, the sand occurs sporadically elsewhere across the site. Sand thickness and top of sand contour maps (Figures 10 and 11, respectively), as well as the cross sections in Figure 9, A through N, show that the location of these sand deposits is controlled mainly by the bedrock surface. The deposits generally fill low areas on this bedrock surface, suggesting the basal sand is glaciofluvial outwash in origin and represents some of the first material deposited on bedrock by meltwaters from nearby glaciers.

Except for the basal glaciofluvial sand, all other glacial material underlying the site appears to be glaciolacustrine silty clays and silts with local sand lenses.

Bedrock at the site is the Bedford Shale formation of Mississippian-Devonian Age. The rock, cored to a maximum depth of 50 feet, consists of light to dark gray shale varying from soft to firm. The soft shale in the upper

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bedrock sequence is generally weathered and highly fractured. The firm shale below is occasionally fractured, but local vein quartz infilling has strengthened the rock by acting as a cementing agent. The estimated top of firm rock (base of the weathered portion) is shown on the subsurface profiles (Figure 9, A through N).

Rock stratigraphy below a depth of 50 feet to the top of the Niagara group was interpreted from logs of five abandoned wildcat oil and gas wells located on the site (Figure 12). The remainder of the Paleozoic interval was interpolated from nearby stratigraphic cross sections (Ref 4) and the Michigan Geological Survey Annual Statistical Summary No. 18, Michigan's Oil and Gas Fields, 1972 (Ref 5). This rock stratigraphy is summarized in the geologic column in Figure 13.

4.1.3 Ground Water

The site is underlain by relatively impermeable glaciolacustrine, silty clays and silts ranging in thickness from 125 to 170 feet with local lenses of glaciofluvial sands. These sand lenses are moderately permeable but are too small to store or transmit much water. Beneath portions

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of the site, a basal, glaciofluvial, compact sand and silty sand is encountered immediately above the bedrock surface. These sands attain a known maximum thickness of about 60 feet in the vicinity of the proposed plant structures. Water losses, occurring in these basal sands during the site exploration drilling program, indicate they are relatively permeable. Locally, throughout the region surrounding the site, these sands yield enough ground water for domestic and farm use (Ref 6).

A zone of highly fractured shale, between the top of rock and the top of firm rock is moderately permeable. The highly fractured shale ranges in thickness from zero feet to over 45 feet in rock cores, and is indicated on subsurface profiles in Figure 9, A through N. The permeable shale zone and the basal glaciofluvial sands probably act as a single aquifer where they are in direct contact with each other.

Yields from most wells in the area, placed either in glacial deposits or in bedrock, are less than ten gallons per minute. Ground water development is primarily for domestic and farm use. Municipal and industrial water is principally obtained from surface water bodies.

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Ground water levels at the site were measured from four observation wells installed during the site exploration program. Hydrographs displaying water level elevations in the four observation wells, with respect to time, are shown in Figure 14. The initial slopes of the hydrographs indicate the time required for water levels in the observation wells to reach a hydrostatic level.

The water level of Observation Well 181, set at Elevation 449.8 near the highly fractured shale bedrock, stabilized 24 hours after installation; whereas, water levels of Observation Wells 7 and 24, set in glaciolacustrine silts at Elevations 450.5 and 452.3 respectively, required several months to stabilize, indicating they are essentially impermeable. The water level of Observation Well 40, placed in a glaciolacustrine silty clay with some sand and gravel, at Elevation 509.1, stabilized in three weeks, also indicating very low permeability.

Ground water contours of the probable water surface beneath the site are shown in Figure 15. Water level data spanning several years, obtained from the Michigan State Geological Survey, was used in constructing the ground water contours.

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This data was used in conjunction with water level readings obtained in June 1974 from observation wells on the site.

Elevation of the ground water varies by about ten feet in the site area, generally increasing toward the St. Clair River. Water movement beneath the site appears to be westward away from the St. Clair River which is probably a recharge area. Approximate ground water levels are also shown on the subsurface profiles (Figure 9, A through N).

Depth to ground water on the site varies from 5 to 15 feet. Seepage of ground water into pits excavated below the zone of water saturation will probably be slow due to the very low permeability of the silty clays and silts that underlie the site. Pits excavated to a depth of 30 to 40 feet for the purpose of fly ash disposal were observed to contain no water from ground water seepage when left open for several days. The low permeability of the glaciolacustrine deposits is also indicated by the slow response of water levels in observation wells placed in either silty clays or silts. In cases where local sand or gravel lenses are encountered during excavations, ground water seepage may be substantial. However, a sump pumping system should be sufficient to control ground water seepage from sand and gravel lenses, since these are generally small in size and cannot store

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much water. When predrilling for piles, water losses may be experienced when drilling through the basal glaciofluvial sand layer.

According to a southeastern Michigan water resources study (Ref 6), ground water from the glacial deposits is of the sodium bicarbonate type. In general, sodium and chloride concentration increase with depth. Water hardness ranges in concentration from 68.4 to 342.0 parts per million calcium carbonate, and iron ranges in concentration from 0.5 to 1.0 parts per million. Water from wells in bedrock varies in chemical composition, usually containing large amounts of calcium, bicarbonate, sulfate, and sodium chloride.

Knutilla's report (Ref 6) also indicates small to moderate supplies of fresh water are available from the highly fractured shale zone, but nearly all water is too highly mineralized for most uses. In general, mineralization of water increases with depth, whether in glacial deposits or bedrock.

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4.1.4 Effects of Man's Activities

4.1.4.1 Presence of Oil and Gas

There are no active producing oil or gas fields in the immediate site area. Ten exploratory wells have been drilled on the site to an average depth of 2,500 feet. All wells were nonproductive except for two oil and gas producing wells located in the northwest corner of the site. These wells, producing from Niagaran reef formations, were abandoned in 1970.

Several oil and gas fields associated with reef structures have been developed in St. Clair County. The size of these fields averages 570 acres and oil production rates in 1971 were about 25 gallons per acre per day. All oil and gas fields surrounding the site appear to be fully developed and no further expansion is expected. Present oil and gas extraction are not expected to present problems to the plant structures. Figure 12 shows the locations of oil and gas wells on the site and in the site vicinity.

Isolated pockets of trapped gas occur in the overburden underlying the site. Gas was encountered in seven exploration borings (Table 1). No odor was detected in any

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of these borings, and in all cases, the gas dissipated after 48 hours. Safety measures for determining the existence of and handling the gas should, however, be included in all earthwork and foundation contracts. No unusual design or construction problems due to the presence of gas are expected.

4.1.4.2 Salt Solution Mining

Thick salt deposits occur in two geologic horizons in Michigan: the Devonian Detroit River group and the Silurian Salina group. Salt beds in the Detroit River group are restricted to the northern half of the Lower Peninsula and do not underlie the site area. However, salt beds in the Salina group have a large areal extent covering the central three-fourths of the Lower Peninsula and occur beneath the site.

Salt solution mining from the Salina group by the Diamond Crystal Salt Company, located approximately one mile north of the site boundary, has been in progress for a number of years. The Salina group underlying the site contains five salt units interbedded with dolomitic shale, limestone, and anhydrite. The aggregate thickness of the salt is about 750 feet with the uppermost and lowermost units occurring,

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respectively, at depths of approximately 1,400 and 2,500 feet below the site.

The potential for surface subsidence due to the collapse of solution cavities was evaluated from criteria used by the U.S. Bureau of Mines (Ref 7). A potential area of subsidence can be obtained by drawing a cone with sides at a 45° angle upward from the cavity. Surface subsidence due to that cavity will be within the area encircled by the cone's intersection with the ground surface.

A cavity at a depth of 2,500 feet will have a potential area of surface subsidence extending outward 2,500 feet from the cavity's edge. At the present location of the Diamond Crystal Salt Company's operations, surface subsidence due to a salt cavity at a depth of 2,500 feet is not expected within the site. It should be emphasized that further solution mining should not be permitted to develop cavities closer than 2,500 feet (horizontally) from any plant structures.

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4.2 SUBSURFACE SOIL CONDITIONS

4.2.1. General

The soil profile at this site may be divided into three major strata. These divisions were based upon field observations combined with results of all laboratory testing. These strata have been designated as the upper, middle, and lower strata and refer to depths of 0 to 20 feet, 20 to 50 feet, and below 50 feet, respectively. Except for the dock, secondary coal storage area, and fly ash disposal areas, the entire site has a surface elevation of about Elevation 586, generally ranging from Elevation 585 to Elevation 590. The dock area is lower at Elevation 580 to Elevation 582, while the secondary coal storage area and fly ash disposal area are higher at approximately Elevation 590 and 600 respectively. Therefore, the depths of the different strata are approximate and are expected to vary within 5 to 15 feet throughout the entire project site. For any particular location, the boring logs should be consulted to associate the soil properties with a particular stratum. Generalized ground surface contours are shown in Figure 16.

Selected subsurface profiles throughout the entire site are shown in Figure 9, A through N. The distribution of

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standard penetration blowcount with depth for various areas is shown in Figure 17.

4.2.2 Upper Stratum (0-20 Feet)

The upper stratum consists primarily of mottled brown and gray, stiff to very stiff, clays (Classification CL-CH) with traces of fine sand and pebbles. Standard penetration blowcounts increased from approximately 5 to 15 at the ground surface to a range of from 10 to 40 at a depth of 10 feet (Figure 17). Below this depth, the blowcounts decreased to a range of from 3 to 12 at a depth of approximately 20 feet. Below 20 feet, there is an observable change in the color and consistency of the clay; therefore, a depth of 20 feet is considered the bottom of the upper stratum at this site.

Laboratory consolidation testing has shown this stratum to be overconsolidated. This preconsolidation was also confirmed by the results of consolidated-undrained triaxial testing, the empirical Skempton relationship as used to determine preconsolidation pressure based on the undrained shear strength of the soil and the liquid limit (Ref 8), and also a comparison of the natural moisture content with the

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Atterberg limits. It is believed that this stratum was preconsolidated by desiccation based on undrained shear strength behavior and other geologic evidence. The estimated preconsolidation pressure ranges between 4,000 to 9,000 psf. This corresponds to an overconsolidation ratio between 4 and 8.

4.2.3 Middle Stratum (20 to 50 Feet)

Below the upper stratum, there is a very soft to soft gray silty clay (Classification CL) which extends from approximately 20 feet below the ground surface to 50 feet below the ground surface. However, this stratum was encountered as close as 11 feet from the ground surface in the dock area.

Standard penetration blowcounts in this stratum ranged between fairly close limits. In all areas except the docking facility, blowcounts ranged from 2 to 7 blows per foot. Generally, the higher blowcounts were noted at the top and bottom of the stratum and decreased in the center. At the docking facility, the average blowcounts remained constant at about 2 blows per foot throughout the entire depth, and the higher blowcounts remained constant at an

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average of 15 blows per foot. Although blowcounts at the docking facility were somewhat lower than other locations, laboratory engineering properties were not significantly different.

Consolidation tests and other empirical evaluations show this stratum to be slightly overconsolidated, with preconsolidation pressures ranging between 3,500 to 4,500 psf. This corresponds to an overconsolidation ratio between 1.3 and 2.0.

4.2.4 Lower Stratum (Below 50 Feet)

This stratum consists primarily of a firm gray plastic silty clay Classification (CL). However, some fine sand seams and silty clays with an appreciable amount of sand (as much as 40%) were encountered at varicus depths as shown in the subsurface profiles (Figure 9, A through N). Significant sand deposits were also found beneath the main plant area as noted in Section 4.1.2.

Blowcounts in this stratum varied depending on the amount of sand present. Typical standard penetration blowcounts

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ranged from 2 to 7 blows per foot at a depth of 50 feet, to 10 to 25 blows per foot at a depth of 70 feet. Below the 70 foot depth, the standard penetration blowcount in the clay soils increased to an average of approximately 20 blows per foot at a depth of 125 feet (range of 5 to 40). Below this depth, the blowcounts in all areas increased until bedrock was encountered at depths of 125 to 145 feet. Within this depth range, clays with high sand content, sand deposits, hardpan, or combinations were encountered above the bedrock. Standard penetration blowcounts in the sandy zones above the bedrock are quite variable, although the average was found to be 40 to 50 blows per foot.

Except where a significant amount of sand was present, this stratum can be subdivided into three layers based on the degree of overconsolidation. These layers are from 50 to 70 feet (transition zone between upper and middle strata), 70 to 90 feet and below 90 feet, respectively.

4.2.4.1 Layer From 50 to 70 Feet (Transition Zone)

The first of these layers is designated as the transition zone and ranges from 50 to 70 feet deep. According to Skempton's statistical relationship and the natural moisture content and plasticity ranges, the soils within this layer

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are slightly overconsolidated. The Skempton empirical procedure was used to evaluate the preconsolidation pressure because of the lack of a sufficient number of consolidation tests for this layer. The estimated preconsolidation pressure for this layer ranges between 4,000 to 8,000 psf. This corresponds to an overconsolidation ratio between 1.0 and 1.6.

4.2.4.2 Layer From 70 to 90 Feet

Based on consolidation tests and the same Skempton relationship, the soils within the depth range of 70 to 90 feet are considered slightly overconsolidated but to a greater degree than the transition zone. Apparently, the normal geological process of deposition of the clay was interrupted at this depth. Since the soil appears to be virtually the same type as that below it, this increased overconsolidation must be due to either additional deposition above 70 feet and then erosion to the 70-foot depth, or desiccation as was noted in the upper layer, followed by deposition to its present elevation. The undrained shear strengths have the general tendency to decrease very slightly with depth below 70 feet, thus the apparent overconsolidation is likely due to desiccation. The estimated preconsolidation pressure for this layer

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ranges between 6,000 and 9,000 psf. This corresponds to an overconsolidation ratio between 1.0 and 2.4.

4.2.4.3 Layer Below 90 Feet

The soil properties below 90 feet are very similar to those immediately above, except for the degree of overconsolidation and undrained shear strength. Consolidation test results and evaluation of the moisture content versus Atterberg limits show these soils to be very slightly overconsolidated to normally consolidated. The estimated preconsolidation pressure for this strata ranges between 6,000 and 9,000 psf. This corresponds to an overconsolidation ratio between 1.0 and 1.2.

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5.0 LABORATORY SOIL TESTING

5.1 INTRODUCTION

The laboratory testing program consisted of the classification and engineering properties tests listed below and further described in this Section. The testing program was developed by Bechtel and conducted by Goldberg-Zoino and Associates and U. W. Stoll and Associates under the direction of Bechtel.

a) Visual and Laboratory Classification

b) Moisture Content and Dry Unit Weight

c) Atterberg Limits

d) Specific Gravity

e) Mechanical Analysis

f) Unconfined Compression Test (Qu)

g) Laboratory Vane Shear Test

h) Unconsolidated-Undrained Triaxial Compression Test (UU)

i) Consolidated-Undrained Triaxial Compression Test With Pore Pressure Measurement ($\overline{CU}$)

j) Consolidation Test

k) Permeability Test

l) Compaction Test

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The majority of testing was carried out by Goldberg-Zoino and Associates of Newton Upper Falls, Massachusetts, from January 1974 through January 1975. Additional tests were made by U. W. Stoll & Associates of Ann Arbor, Michigan, during the summer of 1975. This was to provide more detailed information for the coal reclaim hopper south of Transfer House 5 (Figure 2).

The test data are presented in Appendix C of Volume 2 in the form of tables and figures. Selected properties such as dry density, moisture content, Atterberg limits, and soil cohesion from unconfined compression, unconsolidated-undrained triaxial testing and vane shear tests have also been included on the boring logs presented in Appendix B. Interpretation of test data and development of soil properties for design are presented in Section 6.

5.2 CLASSIFICATION TESTS

Visual classification was in accordance with ASTM D 2488, and laboratory classification was in accordance with ASTM D 2487.

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5.2.1 Moisture Content and Dry Unit Weight

Moisture content and dry unit weight were determined for all undisturbed soil samples selected for any type of testing, along with the moisture contents for other selected split spoon samples. Determination of moisture content was made in accordance with ASTM D 2216 and the unit weight was determined by direct measurement.

5.2.2 Atterberg Limits

Atterberg limits determinations were made in accordance with ASTM D 423 (liquid limit) and ASTM D 424 (plastic limit) on all samples selected for unconfined and triaxial shear testing, consolidation testing, and on other selected plastic soils.

5.2.3 Specific Gravity

Specific gravity tests were made on all samples subjected to consolidation testing, as well as on other selected samples, in accordance with ASTM D 854.

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5.2.4 Mechanical Analysis

Mechanical and hydrometer analysis determinations were made in accordance with ASTM D 422 on selected samples.

5.3 ENGINEERING PROPERTIES TESTS

5.3.1 Unconfined Compression Tests

Unconfined compression tests were performed on representative samples of all strata to evaluate the in situ shear strength. The tests were also performed on remolded samples to evaluate the soil sensitivity and the available shear strength under remolded conditions. All tests were performed in accordance with ASTM D 2166. Stress versus strain curves have also been presented in Appendix C. These allowed an evaluation of the shear strength at different strain levels and also the initial tangent modulus. Dry density, moisture content, and Atterberg limits are also reported for each test. Results for undisturbed samples are summarized in Table 2 while the results for compacted samples are summarized in Table 3.

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5.3.2 Laboratory Vane Shear Tests

Vane shear tests were performed on selected soil samples from the dock area to evaluate both the undisturbed and remolded shear strengths. This was done primarily to determine the degree of sensitivity of the soil and also to compare the results with those of other undrained shear strengths. This data is summarized in Table 4.

5.3.3 Unconsolidated-Undrained Triaxial Compression Tests (UU)

Unconsolidated-undrained triaxial compression tests were made on selected undistrubed samples to compare with the results obtained from the unconfined compression testing. This test is also considered appropriate for cohesive samples which contain appreciable amounts of silt or sand size particles. Procedures utilized were in accordance with ASTM D 2850.

All unconsolidated-undrained triaxial tests were performed at confining pressures approximately equal to the effective overburden pressure at the sample depth. The stress-strain curves, moisture contents, and dry densities are also given

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on the laboratory test result sheets in Appendix C. The results are summarized in Table 5.

5.3.4 Consolidated-Undrained Triaxial Compression Tests with Pore Pressure Measurements ($\overline{CU}$)

Consolidated-undrained triaxial compression tests with pore pressure measurements were made on undisturbed samples from all strata and on selected remolded samples using the Harvard Minature Compaction Method. All samples were saturated by the back pressure method. A minimum of three separate samples at the same approximate depth were then consolidated to confining pressures approximately equal to 0.5, 1.0, and 2.0 times the effective overburden pressure, respectively, before testing. Confining pressures, moisture contents, dry densities, etc. are shown on the test data sheets. Effective and total strength envelopes were obtained for each series tested. Plots of pore water pressure, deviator stress, principal stress ratio, and Skempton's A parameter versus strain are given in Appendix C. All results are summarized in Table 6.

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5.3.5 Consolidation Tests

Consolidation tests on selected soil samples were made by loading test specimens up to applied pressures as high as 24 ksf in accordance with ASTM D 2435. A modification of ASTM D 2435 to provide a rebound-recompression curve near the overburden pressure (Burmister Loop) was also used on selected samples (Ref 9). This modification consisted of loading the test specimens to the approximate in-situ overburden pressure, or slightly above, and then reducing the load to either 2 or 4 ksf. Samples were then reloaded to the maximum pressure and rebounded to zero load. The consolidation bowl was filled with water when the pressure reached the approximate effective confining pressure at the sample depth. Tests on compacted samples were also made. Results of the consolidation tests and a summary of the coefficient of consolidation by both the square root and logarithm of time fitting method are included in Appendix C. The results of undisturbed and compacted samples are summarized in Tables 7 and 8, respectively.

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5.3.6 Permeability Tests

Laboratory permeability tests were performed on representative clay specimens. Specimens were saturated by the back pressure method and tested under a confining pressure equal to the effective overburden pressure. Permeability was determined by using the constant head permeability test as adapted to triaxial equipment. All permeability results are summarized in Table 9.

5.3.7 Compaction Tests

Compaction tests were made in accordance with ASTM D 1557 on selected samples representative of the upper soils that could be excavated and used as a fill material. The curves of dry unit weight versus moisture content are presented, along with the Zero air voids curve in Appendix C.

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6.0 SOIL PROPERTIES FOR DESIGN

6.1 INTRODUCTION

In this section, the results of laboratory tests are discussed along with the ranges and recommended design values of soil properties. The generalized design values are believed to be conservative for the entire site. Higher values may be justified based on a localized evaluation of subsurface conditions and on the nature of the engineering problem under consideration. The recommended design properties of the site soils are compiled in Table 10.

6.2 INTERPRETATION OF LABORATORY TEST DATA

6.2.1 Natural Moisture Content and Dry Unit Weight

The natural moisture content and dry unit weights for the entire site have been plotted in Figure 18. In addition, for each sample, the corresponding total unit weight has also been calculated and presented. Although the figure for moisture content shows a fairly narrow range at all depths, there is considerably more scatter in the measured dry unit

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weight, thus producing a moderate scatter for the total unit weight. The design value for total unit weight versus depth has been based upon the predominant density at each depth with appropriate consideration for the scatter. Generally, as shown in Figure 18, a constant value of total unit weight can be used for each major stratum. Following are the ranges and recommended design values for each major stratum:

Ranges of Natural Properties

Depth (Ft)	Dry Density (PCF)	Moisture Content (%)	Total Density (PCF)	Design Total Density (PCF)
0-20	95-105	22-34	115-133	125
20-50	80-90	30-45	110-125	115
50-110	95-105	15-30	120-130	125
110+	80-100	20-40	110-124	120

The scatter in dry unit weights below a depth of 110 feet as shown in Figure 18, is likely due to the presence of a slightly higher percentage of sand in some of the samples at this depth.

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6.2.2 Atterberg Limits

Atterberg limits results are presented in Figures 19 and 20. Figure 19 contains three plasticity charts showing values of plasticity index (PI) and the liquid limit (LL) for the upper, middle, and lower strata. As shown in this figure, the upper stratum is the most plastic and the lower stratum the least plastic. This is attributed to the higher silt and sand content of the lower stratum. Ranges of liquid limit, plastic limit (PL), and plasticity index were derived for each of the three strata.

Depth	LL	PL	PI
0-20	39-63	17-26	18-39
20-50	35-55	16-25	15-32
50+	20-55	12-25	8-31

Figure 20 shows the plasticity ranges and the corresponding moisture content versus depth for the main plant area, the main coal storage area, and the dock area. The figure shows that the plasticity characteristics of these three areas are similar.

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6.2.3 Mechanical Analysis

This site is predominantly a clay site with the exception of the 60 foot thick sand deposit above rock in the vicinity of the main plant. Localized sand and silt lenses of nominal thickness were also found at variable locations and elevations throughout the site.

Grain size distribution curves for the upper, middle, and lower strata are shown on Figures 21 and 22. Figure 22 further subdivides the grain size distribution curves of the lower stratum for five major areas of the site.

Nearly uniform conditions were encountered in the upper stratum with very little evidence of sand. This is shown in Figure 21 by the very close grouping of the grain size distribution curves within the clay size range.

Below 20 feet, a significantly greater percentage of sand size particles is apparent from Figures 21 and 22. Figures 21 and 22 show that in general, the cohesive soils within the middle and lower strata do not contain more than about 40 percent sand, and most have no more than 20 to 30 percent sand.

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The grain size results for the site are presented in Figure 23 in a different manner. This figure is a presentation of the mean grain diameter D•• versus depth. It shows that, above the 90 to 100 foot depth, the majority of the data points fall within the clay and silt range while, below the 90 to 100 foot depth, the majority of the data points fall within the silt and sand ranges.

6.2.4. Activity of Clay

The activity of a clay is determined by plotting the plasticity index versus the percent of clay size particles less than two microns on an activity chart as shown in Figure 24. The figure shows that the activity values of the different samples represented are generally similar, making it possible to fit a single straight line through all the data. This line has a slope of 0.4 indicating the activity. The values generally ranged between 0.3 and 0.5. These activity values put the clays at the site in the inactive category according to Skempton (Ref 10).

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6.2.5 Undrained Shear Strength

The results of all unconfined and unconsolidated-undrained compression tests along with all of the laboratory vane shear tests are combined in Figure 25. This figure shows the results of each type of test with a different symbol. Other than for the upper stratum where the unconsolidated-undrained shear strengths were somewhat higher, all three types of tests gave comparable results. The shear strength was also evaluated for each major area separately (dock, coal hopper, main plant); however, it was found that the generalized interpretation shown by the dashed line in Figure 25 is conservative and representative for all areas.

The shear strength results from previous borings in the St. Clair Power Plant area are presented in Figure 26. The interpretations of the two sets of data shown in Figures 25 and 26 are superimposed in Figure 27 for comparison. This figure shows that the strength values obtained from the two separate investigations are in good agreement.

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In addition, the empirical Skempton relationship:

$$S_u/P = 0.1 + 0.004\ PI \qquad (1)$$

nas been used to calculate the undrained shear strength (S_u) for known values of plasticity index under two overburden pressure ($\overline{P}$) conditions. One assumption is that $\overline{P}$ is equal to the effective overburden pressure (Figure 28a) and the other assumes that $\overline{P}$ is equal to the overconsolidation pressure determined by Casagrande's Method (Figure 28b). These assumptions give the anticipated upper and lower boundaries of undrained shear strength as determined by this relationship. The range of plasticity index for the soils tested during this investigation (Section 6.2.2) fall within the range of applicability of Equation 1 as shown in Reference 8.

The design recommendations presented below were based on the results shown in Figure 25 with consideration of the results of previous investigations (Figure 26) and the empirical undrained shear strength values obtained from the Skempton relationship (Figure 28).

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Stratum	Depth Below Ground Surface (Feet)	Peak Undrained Shear Strength (psf) Effective Range	Design Value
Upper	0-20	1,100-3,000	550
Middle	20-50	350-1,500	550
Lower	50-90	500-3,000	1,000
	90+	500-1,500	850

The basis for the selection of the design undrained shear strength for the upper stratum is discussed below.

6.2.5.1 Upper Stratum

Based upon the laboratory test results from this investigation, the undrained shear strengths for the upper stratum were found to range between 1,100 and 3,000 psf. The most predominant value of undrained shear strength was approximately 2,000 psf. These undrained shear strengths generally tend to decrease with depth which is indicative of a clay preconsolidated by dessication.

However, it should be emphasized that for preconsolidated clays having overconsolidation ratios of four to eight as in this case, the peak undrained shear strength often cannot be depended upon. The laboratory peak strength for soils of this type will give higher undrained shear strength than

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that which will actually develop in the field under long term conditions. This is because high negative pore pressures develop during shearing of the soil in the laboratory (Ref 11) and these are not expected to develop to the same extent or remain for any long period of time in the field. In addition, as the soil dries out (desiccates), the soil contracts and shrinkage cracks form within the desiccated layer. This allows failure to occur on pre-formed failure planes and the full undrained strength of the soil is not developed. For this situation, the available long term strength is closer to the residual strength (Ref 12).

In evaluating the shear strength to be used for the upper stratum, the typical shape of the stress-strain curves during failure of the sample was also considered. These curves are shown for each sample on pages C-271 through C-341 of Appendix C in Volume 2. The curves show a "brittle" soil which reaches its maximum strength at relatively low strain (2-5%), at which point the strength drops off fairly rapidly. This stratum will reach its maximum strength first with respect to the lower stratum, if subjected to the same strain.

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It should be noted however that the reduction in strength with increasing strain was noted primarily in the unconfined compression tests which represented the majority of available data. This strength reduction is partially caused by the lack of sample confinement inherent in the test.

Considering all of the above factors, a design shear strength of 550 psf is recommended for the upper stratum. This value is approximately one half the lower bound strength predicted from the laboratory tests. Values up to 1100 psf may be justified in some situations.

Comparing the above laboratory test results with the empirical shear strength values obtained by the Skempton procedure, the average undrained shear strength for the stratum would range between 250 psf, for a normally consolidated soil (Figure 28a), to 1,000 psf for an overconsolidated soil (Figure 28b). It should be noted, however, that the values of shear strength are influenced by the effective overburden or preconsolidation pressure substituted into the Skempton relationship. In reality, the shear strength for the upper stratum will be higher than that indicated in Figure 28a for a normally consolidated soil. This is primarily because of the influence of the

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shallow depth and the preconsolidated nature of this stratum. Since this stratum is cverconsolidated, the empirical shear strength value of 1,000 psf, as shown in Figure 28b, should be closer to the actual shear strength.

Although higher shear strengths were obtained from undrained shear strength testing, the higher values cannot be recommended because of the potential pre-formed failure planes and also the relatively high negative pore pressures that develop in testing but do not exist to the same degree in the field. Both of these tend to decrease the measured shear strength, although the amount of decrease cannot be adequately determined. Thus, a value of 550 psf is recommended primarily based upon the residual shear strengths obtained from unconsolidated-undrained shear strength testing and the results of triaxial testing.

6.2.5.2 Middle Stratum

The middle stratum has been found to be the weakest stratum at this site. Undrained shear strengths based on laboratory test results range from 300 to 1,000 psf with the most predominant value being 550 psf. Unlike the upper stratum, the stress-strain curves for this stratum typically peak at

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low strains (about 2%) with only a slight reduction in strength at higher strains. As shown in Figure 25, the shear strength from test results can be taken as approximately constant with depth at 550 psf over the range of 20 to 50 feet. This value is recommended for design. The strength of 550 psf was found to be within the range obtained from the Skempton's relationship utilizing both the effective overburden pressure and preconsolidation pressure (Figure 28a and b, respectively).

If normally consolidated conditions are assumed as shown in Figure 28a, the resulting shear strength is very nearly equal to that obtained by laboratory testing. The figure shows a gradual increase in shear strength with depth ranging from about 400 psf at a depth of 20 feet to about 650 psf at a depth of 50 feet. This increase is imposed by the nature of Skempton's relationship and should be expected for normally consolidated clays if perfect samples are obtained. The laboratory results do not show this trend, and this is an indication of sample disturbance. A slightly higher shear strength is obtained when the preconsolidation pressures are used as shown in Figure 28b: the average shear strength decreases from 900 psf at a depth of 20 feet to 800 psf at a depth of 50 feet. This reduction in strength

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with depth is caused by the reduction in preconsolidation pressure determined from consolidation testing.

6.2.5.3 Lower Stratum

The lower stratum can be taken as beginning at a depth of approximately 50 feet and extending to bedrock at depths ranging from approximately 125 to 145 feet. This stratum may be further subdivided into two layers as far as the undrained shear strength is concerned.

6.2.5.3.1 Layer From 50-90 Feet

As shown in Figure 25, distinctly higher shear strengths were obtained from depths of 50 to 90 feet. The soils in this layer are considered to be moderately overconsolidated. Comparing the natural moisture content and dry unit weight in this layer with the layer below, the natural moisture content did not decrease significantly with increasing depth nor did the dry unit weight increase significantly with increasing depth. Thus, it is possible that this layer was also preconsolidated by desiccation, although the trend in

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shear strength variation with depth does not provide enough evidence to conclude this.

A fairly wide range of laboratory shear strengths was obtained as shown in Figure 25. These values ranged from about 500 to 3,000 psf with approximately two-thirds of the data ranging between 500 and 1,500 psf and the other third between 1,500 and 3,000 psf. The most predominant value between 500 and 1,500 psf was 1,000 psf. As shown in Figure 28, the estimated shear strength at a depth of 50 feet, based on the Skempton statistical procedure, was found to be either 650 or 850 psf, depending on whether normally consolidated or overconsolidated conditions are assumed. Both procedures give a shear strength of approximately 1,000 psf at a depth of 90 feet.

Typical stress-strain curves for soils between 50 and 90 feet either remain constant with strain near the peak stress or drop somewhat as can be seen on pages C-271 thru C-341 of Appendix C in Volume 2. However the drop in stress occurred at a higher strain in the range of 10-12%.

Considering the higher strain at which the peak soil strength occurs and not discounting completely the lower

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shear strengths as predicted by the Skempton procedure, the shear strength of 1,000 psf is recommended for this layer.

6.2.5.3.2 Soils Below 90 Feet

Indications are this layer is normally to very slightly overconsolidated. Based upon the laboratory test results, the shear strength in this layer ranges between 500 and 1,500 psf with an average of approximately 850 psf. The decrease in undrained shear strength, as compared to the layer above, was also noted in the laboratory test results obtained from the previous investigations. Figure 26 shows values of shear strength between 200 and 1,000 psf with an average of 600 psf.

Comparison of the strength predicted from Skempton's equation (Figure 28) and the strength data in Figure 25 shows that the upper bound of the laboratory strength (1,500 psf) is close to the strength predicted by the Skempton equation. However, it should be noted that in this case, the Skempton procedure is alsc influenced by the greater depth (the actual value of the effective vertical pressure), and it is possible that the actual shear strength may be lower than predicted by this method.

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The actual shear strength reduction associated with the soil below 90 feet may be due to several causes, the most plausible of which is sample disturbance. This was borne out by running both undisturbed and remolded unconfined compression tests (at the same moisture content and dry density) on the same sample, see Tables 2 and 3. The ratio between these two tests (undisturbed strength divided by remolded shear strength) is called sensitivity. These tables show that the sensitivity of the site soils was generally between 1.0 and 1.5. This is another indication that, but not necessarily a conclusion that, the samples have been disturbed.

One additional consideration in explaining the reduced strengths at great depths is the amount of sand present (Figures 21, 22, and 23). This could cause a reduction of the laboratory strength in unconfined compression tests.

Since the standard penetration blowcounts do not decrease within this depth (Figure 17), and the Skempton empirical relationship shows a high strength, the average strength of 850 psf obtained from laboratory tests is considered conservative and is recommended for the soils below 90 feet.

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6.2.6 Shear Strength From CU Tests

The long term (drained) shear strength has been determined by consolidated-undrained triaxial tests with pore pressure measurements. In addition to the Mohr-Coulomb envelopes for total and effective stresses, the deviator stress, effective stress ratio, change in pore pressure, and Skempton's A parameter have also been plotted versus strain and are included in Appendix C of Volume 2. The failure criteria presented was based on the peak deviator stress. If a maximum stress ratio failure criteria is desired, it can be readily obtained.

In order to evaluate the total and effective stress parameters, the stress point or "p-q" diagram as suggested by Lambe and Whitman (Ref 13) has been used. These diagrams are shown in Figures 29 and 30 for total and effective stress parameters, respectively. These figures show that the "p-q" diagram for effective and total stress can be idealized by two straight lines intersecting at a pressure corresponding to a depth in the range of 55 to 62 feet. This depth also corresponds to the division between the middle and lower stratum. The "p-q" diagrams are used to calculate the effective and total stress parameters required

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to determine shear strength from the Mohr-Coulomb relationships (Ref 13).

The Mohr-Coulomb relationship for effective stresses is given by:

$$\tau = c' + \sigma' \tan \phi' \qquad (2)$$

Where τ = drained shear strength

σ' = effective normal stress on failure plane at failure

c' = cohesion intercept for effective stresses

ϕ' = angle of internal friction for effective stresses,

and the Mohr-Coulomb relationship for total stresses is given by:

$$S = c + \sigma \tan \phi \qquad (3)$$

where S = shear strength

σ = total normal stress on failure plane at failure

c = cohesion intercept for total stresses

ϕ = angle of internal friction for total stresses.

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Recommended values of effective and total stress parameters for each stratum are given below:

	Total Stress Basis		Effective Stress Basis	
Depth (Ft)	ϕ	c (PSF)	ϕ'	c' (PSF)
0-20	13°	450	28°	0
20-50	13°	450	28°	0
50+	10°	700	22°	250

6.2.7 Tangent Modulus of Elasticity

The initial modulus of elasticity has been plotted versus depth on Figure 31 for all of the undrained shear strength tests. Although there is some scatter, a reasonable design value can be determined for each of the three strata. These values are given below and are further discussed in this section.

Stratum	Depth (ft)	Undrained Tangent Modulus E (ksf) Effective Range	Average	Design Values
Upper	0-20	100-200	175	700
Middle	20-50	25-120	65	330
Lower	50+	25-240	100	550

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It has been found that for settlement calculations the values obtained from undrained shear strength tests should be increased by a factor of four to five to give results that agree with measured settlements (Ref 13). The lower measured test values can be attributed to sample disturbance. Bjerrum (Ref 14) has suggested that the modulus can be obtained by multiplying the undrained shear strength by a factor of 400 to 600. However, for this site, the ratio E/S_u has been found to be approximately 100 for all of the soils tested, except the middle stratum which showed a slightly higher ratio of approximately 140. Therefore, the values of E/S_u obtained in this investigation are apparently lower by a factor of four to six than what would be generally expected. Both the modulus of elasticity and the undrained shear strength are apparently lower, with the greater reduction in the modulus of elasticity.

Therefore, an increase in the modulus of elasticity from test results by a factor of as high as four to five is justified in the average modulus of elasticity values as determined from the undrained shear strength tests. Based on this criteria, and the corresponding criteria of 400 to 600 times the undrained shear strength, initial static modulus of elasticity values of 700, 330, and 550 ksf are

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recommended for the upper, middle, and lower strata, respectively.

6.2.8 Consolidation

6.2.8.1 Preconsolidation Pressure

Figure 32 shows the variation of preconsolidation pressure with depth as determined by Casagrande's Procedure. Samples believed to be relatively disturbed based on the shape of the consolidation curve have been designated with a different symbol in Figure 32. Also included in this figure is a plot of moisture content with respect to Atterberg limits versus depth for all of the consolidation tests to assist in estimating the degree of overconsolidation. A natural moisture content near the plastic limit indicates an overconsolidated soil, whereas a natural moisture content near the liquid limit indicates a normally consolidated soil. These data are shown on the left side of Figure 32 for each of the consolidation test results presented. This figure shows the subsurface soils at this site are preconsolidated to some degree, for their entire depth.

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To help determine a design preconsolidation pressure, Skempton's procedure has also been used to estimate the preconsolidation pressure from the plasticity index and the unconfined and unconsolidated-undrained compression tests. This interpretation is shown in Figure 33.

As shown in Figure 32, almost all of the soils at this site, with the exception of the upper stratum soils (0-20 feet) and soils from 50 to 90 feet, can be considered normally to slightly overconsolidated for design purposes. This is because of the relatively slight overconsolidation shown by consolidation tests.

The soils from 0 to 20 feet (upper stratum) have been preconsolidated by desiccation. This judgement is based primarily on the general decrease in shear strength with depth as shown in Figure 25 as opposed to soils preconsolidated by either glaciation or preloading which will have shear strengths increasing with depth.

The design preconsolidation pressure for the upper stratum has been determined by drawing the precompression line along the lower bound of preconsolidation pressure as determined by consolidation test results. This is nearly parallel to

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and slightly lower than the preconsolidation line as determined by the Skempton prccedure (Figure 33).

Preconsolidated soils were also noted between 50 and 90 feet based on consolidation tests and the Skempton equation (Figures 32 and 33). This is also the depth range in which higher undrained shear strengths were obtained from laboratory tests (Figure 25). Although it cannot be said conclusively, it appears that the soil from 50 to 90 feet was also preconsolidated by desiccation as with the upper stratum rather than by glaciation. Since the soils below 90 feet appear to be only slightly overconsolidated at the most, desiccation appears to be the most plausible explanation for the preconsolidation.

Considering the scatter in the preconsolidation pressure based on Casagrande's Method and the predicted preconsolidation pressure based on Skempton's relationship, the recommended design curve for preconsolidation pressure is as shown in Figure 33.

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6.2.8.2 Settlement Parameters

The compression index (C_c), swelling index (C_r), initial void ratio (e_o) and the settlement parameter ($C_c/1+e_o$) all versus depth are shown in Figures 34, 35, 36, and 37. The range of values is small enough that a constant value can be used throughout each major stratum, and the design curves shown are drawn to reflect this. Presented below are the ranges and recommended design values for the various parameters.

Depth (ft)	C_c Range	C_r Range	e_o Range
0-20	0.14-0.16	0.05-0.07	0.65-0.80
20-50	0.33-0.45	0.09-0.10	0.72-1.10
50+	0.18-0.41	0.05-0.08	0.60-1.00

Depth (ft)	$C_c/1+e_o$ Range	$C_c/1+e_o$ Design	$C_r/1+e_o$ Design
0.20	0.10-0.15	0.13	0.04
20-50	0.15-0.24	0.20	0.04
50+	0.11-0.21	0.14	0.04

Values of the compression index (C_c) and the swelling index (C_r) are plotted versus liquid limit, for the soils tested, in Figure 38. The soils from the upper stratum are

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identified with different symbols because of the overconsolidation of this stratum. The empirical relationship:

$$C_c = 0.009\ (LL - 10) \tag{4}$$

and the plus or minus 30 percent upper and lower bounds suggested by Terzaghi and Peck (Ref 12) are superimposed in Figure 38. The compression index values (C_c) measured in this investigation compare favorably with the empirical relationship. The data for the upper stratum fall around the lower bound of this relationship, as should be expected because of the overconsolidation.

Similar results were obtained for the swelling index (C_r) values. Based on the data in Figure 38, the relationship between swelling index and liquid limit for the soils tested can be expressed by the equation:

$$C_r = 0.002\ (LL - 2.5)\,. \tag{5}$$

Figure 38 also shows an upper and lower bound representing a variation of plus or minus 30 percent from the above relationship. It was found that these lines represent good upper and lower bounds for the data.

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6.2.8.3 Coefficient of Consolidation

Figure 39 shows values of the coefficient of consolidation (C_v) versus pressure for the three major strata. The relationship between C_v and the logarithm of pressure is represented by a band and an average curve for each stratum as shown in the figure. These bands and average curves conform to the general relaticnship presented by Lambe (Ref 15). As shown in the figure, the effective range of the coefficient of consolidation is 0.05 to 0.25 square feet per day for all samples tested over the pressures involved. An overall average of 0.15 square feet per day is recommended for design.

6.2.9 Permeability

Constant head permeability tests were performed on samples of silty clay taken from depths ranging from 20 to 90 feet. All samples were saturated in a triaxial cell by back pressure and tested at a confining pressure approximately equal to the effective overburden pressure. The coefficient of permeability was found to range from 1.6×10^{-8} cm/sec to 2.6×10^{-8} cm/sec for void ratios between 0.4 and 0.9. Thus, for any engineering analysis, an average permeability

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of 2 x 10^{-8} cm/sec may be used for the silty clays found at this site.

6.2.10 Compaction

The results of all laboratory compaction tests are shown in Figure 40. The tests were performed on samples from the upper stratum and the results grouped according to soil type. Since the soils below this depth are soft to very soft, only the upper stratum is expected to be used for fill material. The zero air void curves (100% saturation) were plotted assuming specific gravities of 2.70 and 2.75. The two diagrams on the left side of the figure (CL and CH soils) show results from samples taken northwest of the plant site near the intersection of King and Puttygut roads. This is within the proposed fly ash disposal area and is a potential borrow area for the remainder of the plant. The diagram on the right side of this figure (CL-CH soils) shows results from samples taken in the vicinity of the proposed main coal pile.

Since the most predominant natural moisture content for the upper stratum soils is about 26%, this indicates that on the order of 10% to 16% reduction in moisture content will be

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necessary to compact these soils to the maximum dry density, and approximately 6% to 10% reduction will be necessary to obtain 95% of the maximum. Because of the relatively large amount of drying required, compaction of these soils will be difficult.

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7.0 SUMMARY AND CONCLUSIONS

An extensive subsurface investigation program was conducted at the Belle River Project site. The investigation consisted of geologic studies, ground water measurements, soil/rock borings, and laboratory soil testing, along with an evaluation of previous investigations at the site. The subsurface investigation was directed at confirming the suitability of the site and providing generalized soil parameters and information for design of the various plant facilities.

The investigation showed that:

a. Geologic and subsurface soil conditions at the site are suitable for the development of the site.

b. Ground water information, based on four observation wells monitored for a period of one year, have been accumulated and presented.

c. The soil parameters for design and construction evaluations have been developed in the report and are further summarized in the Tables. The

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results are considered to be conservative and are applicable for the entire site. Soil boring logs showing the pertinent soil parameters are also presented in Appendix B.

Depending on the engineering problem under consideration, localized and more extensive evaluations or investigations may be required to expand upon the available information.

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TABLES

TABLE 1

GAS ENCOUNTERED IN DRILL HOLES

Drill Hole No	Depth to Gas Infiltration (ft)	Soil Type	Remarks
12	118.0	Sand	Bubbles in drill fluid, gas dissipated after 24 hours, no odor
20	136.0	Sand	Bubbles in drill fluid, gas dissipated after 24 hours, no odor
30	50.0	Clay	Bubbles in drill fluid, gas dissipated after 48 hours, no odor
50	98.0	Clay	Bubbles in grout after pulling casing, gas dissipated after 24 hours, no odor
52	70.5	Sand	Bubbles in grout after pulling casing, gas dissipated after 24 hours, no odor
59	124.5	Silt	Bubbles in drill fluid, gas dissipated after 24 hours, no odor
131	104.0	Sand	Drill fluid ejected several feet above drill hole, gas dissipated after 6 hours, no odor

TABLE 2

UNCONFINED COMPRESSION TEST RESULTS

UNDISTURBED SAMPLES

BORING & SAMPLE NUMBER	DEPTH (FEET)		UNIFIED SOIL CLASSIFICATION	PARTICLE SIZE ANALYSIS % FINER THAN							SPECIFIC GRAVITY	ATTERBERG LIMITS			NATURAL CONDITIONS			UNCONFINED COMPRESSION TEST RESULTS				REMARKS
	FROM	TO		4	10	20	40	100	200	2μ		LL	PL	PI	W_o %	γ_d PCF	γ_t PCF	S_u PSF	E 10^3 PSF	ε %	E/S_u ——	
15/4	8.6	8.9	CL									44	19	25	32	93	123	1257	156	6.0	127	
15/6	18.1	18.4	CL									42	20	22	34	87	117	508	25	15.0	69	
15/14	59.2	59.6	CL									34	18	16	23	104	128	1067	31	15.2	36	
25/1	4.5	4.8	CH									59	23	36	22	108	132	3456	174	5.0	50	
26/9	39.4	39.7	CL									38	20	18	37	86	118	445	67	1.6	151	
26/17	78.2	78.5	CL									36	20	16	25	101	126	580	22	12.0	38	Sandy
27/4	8.6	8.9	CL-CH									51	23	28	31	94	123	1722	58	15.0	34	
28/3	5.8	6.1	CL									47	23	24	25	100	125	1981	222	4.0	112	
28/9	28.8	29.1	CL									42	20	12	38	84	116	425	57	7.0	134	
38/3	8.7	9.0	CL-CH	--	--	--	--	--	97	61	2.70	49	24	25	24	102	126	2122	267	3.0	126	
38/4	14.3	14.6	CL-CH	--	--	--	--	--	97	61	2.71	46	22	24	29	96	124	1505	125	4.0	83	
38/12	54.2	54.5	CL-CH	--	--	--	--	--	98	55	2.70	44	21	23	33	90	120	985	105	5.0	107	
38/16	73.7	74.0	CL-CH	--	--	--	--	--	97	63	2.72	55	24	31	41	79	111	703	41	4.8	58	
38/18	84.6	84.9	CL	--	--	--	--	--	97	47	2.70	33	19	14	22	104	127	603	33	14.0	55	Gravelly
38/24	114.2	114.5	CL	--	--	--	--	--	99	61	2.70	45	25	20	32	92	121	500	63	6.0	126	
41/2	4.5	4.8	CH	--	--	--	--	--	98	63	2.70	63	28	35	29	94	121	1024	143	5.0	140	
41/7	20.6	20.9	CL-CH	--	--	--	--	--	99	57	2.66	47	24	23	39	83	115	338	357	3.0	1056	
41/9	30.9	31.2	CL-CH									45	21	24	37	86	118	697	67	15.0	96	
41/11	40.6	41.0	CL-SC	--	92	86	80	68	58	17	2.70	20	12	8	16	118	137	647	25	15.0	39	Sample slightly disturbed.
41/23	101.8	102.1	CL	--	--	--	--	--	95	47	2.70	34	20	14	26	99	125	534	67	10.0	125	Sandy
41/29	130.7	131.0	GC-SC	--	96	90	80	65	57	23	2.69	25	17	8	14	124	141	1749	154	8.0	88	
48/2	3.2	3.5	CH									63	24	39	27	97	123	1466	137	3.2	93	
48/14	61.2	61.5	CL									34	16	18	25	100	125	745	22	15.0	30	Sandy
49/4	24.0	24.3	CL									42	22	20	34	90	121	1028	69	6.0	67	

Sheet 1 of 3

TABLE 2

UNCONFINED COMPRESSION TEST RESULTS

UNDISTURBED SAMPLES

BORING & SAMPLE NUMBER	DEPTH (FEET)		UNIFIED SOIL CLASSIFICATION	PARTICLE SIZE ANALYSIS % FINER THAN							SPECIFIC GRAVITY	ATTERBERG LIMITS			NATURAL CONDITIONS			UNCONFINED COMPRESSION TEST RESULTS				REMARKS
	FROM	TO		4	10	20	40	100	200	2μ		LL	PL	PI	W_o %	γ_d PCF	γ_t PCF	S_u PSF	E 10^3 PSF	ε %	E/S_u ——	
49/9	73.9	74.3	CL									33	22	11	26	100	126	2254	100	15.0	36	Sandy
50/6	29.3	29.7	CH-CL	--	--	--	--	--	97	53	2.70	51	18	33	46	75	110	197	45	2.4	228	
50/8	38.9	39.2	CH									55	23	32	51	70	106	550	113	2.0	205	
50/10	49.0	49.3	CL	99	96	94	92	86	81	37	2.70	36	16	20	24	99	123	526	39	15.0	74	Sandy
50/12	58.6	58.9	CL									39	18	21	26	99	125	1007	200	9.0	199	
50/16	78.6	78.9	CL									39	20	19	28	95	122	1270	161	10.0	127	
52/3	20.5	20.9	CL-CH									49	20	29	30	92	120	2737	263	4.0	96	
52/4	28.6	28.9	CL									35	18	17	32	94	124	489	61	9.0	125	
52/6	49.2	49.5	CL-ML									22	18	4	25	100	125	317	100	2.5	315	
52/7	59.0	59.3	CL	97	94	87	83	72	58	16	2.70	23	14	9	13	116	131	1798	150	6.0	83	Sandy
52/8	68.2	68.5	CL									24	14	10	14	115	131	1676	133	13.0	79	Sandy
52/10	88.6	88.9	CL									39	18	21	27	97	123	2435	230	8.0	94	Sandy
53/3	19.6	19.9	CL-CH									49	20	29	32	88	116	1155	172	5.0	149	
53/4	29.6	29.9	CL-CH									49	22	27	40	80	112	1006	200	5.0	199	
53/6	49.2	49.5	CL									43	18	25	28	94	120	561	65	15.0	116	
53/9	80.1	80.4	CL									39	21	18	26	99	125	1275	182	6.0	143	
54/5	59.3	59.6	CL									38	17	21	26	99	125	557	114	11.0	205	Sandy
54/7	68.5	68.8	CL									37	18	19	26	98	123	788	58	8.9	74	Sandy
59/3	18.8	19.1	CL-CH									48	20	28	33	90	120	1056	107	6.9	101	
59/5	38.7	39.0	CL									38	18	20	26	99	125	625	104	14.9	166	Sandy
59/7	58.6	58.9	CL									36	18	18	26	98	123	835	200	8.0	240	Sandy
60/3	17.6	18.0	CL	--	--	--	--	--	98	52	2.70	39	21	18	24	105	130	1143	26	15.0	23	
60/5	25.6	25.9	CH									51	22	29	37	86	118	1001	143	4.0	143	
60/6	30.5	30.8	CL-CH									48	25	23	35	88	119	3153	222	3.7	141	
																						Sheet 2 of 3

TABLE 2

UNCONFINED COMPRESSION TEST RESULTS

UNDISTURBED SAMPLES

BORING & SAMPLE NUMBER	DEPTH (FEET)		UNIFIED SOIL CLASSIFICATION	PARTICLE SIZE ANALYSIS % FINER THAN							SPECIFIC GRAVITY	ATTERBERG LIMITS			NATURAL CONDITIONS			UNCONFINED COMPRESSION TEST RESULTS				REMARKS
	FROM	TO		4	10	20	40	100	200	2μ		LL	PL	PI	W_o %	γ_d PCF	γ_t PCF	S_u PSF	E 10^3 PSF	ε %	E/S_u ——	
60/8	40.6	41.0	CL									47	25	22	40	83	116	337	50	3.0	148	
60/10	50.9	51.2	CL									34	16	18	26	100	126	1255	75	15.0	60	
60/11	55.6	56.0	CL	95	89	86	84	79	76	34	2.70	33	18	15	25	103	129	1299	133	15.0	102	Sandy
60/14	75.1	75.4	CL									40	20	20	27	97	123	651	71	5.0	109	
60/19	100.1	100.4	CL									38	20	18	27	101	128	1131	100	7.0	88	Sandy
60/23	119.6	120.0	CL-ML	--	94	90	86	71	61	18	2.70	17	11	6	15	115	132	335	55	6.0	164	Sandy
101/2	8.9	9.2	CL-CH									50	22	28	28	96	123	1828	200	2.4	109	
101/4	19.6	20.2	CL-CH									49	24	25	36	86	117	1014	75	6.0	74	
101/7	34.9	35.2	CL-CH									46	24	22	40	81	113	795	55	2.4	76	
101/10	50.1	50.4	CL-CH									40	22	18	33	90	120	722	71	5.0	89	
101/13	65.2	65.6	CL									36	19	17	27	97	123	1337	43	15.0	32	
101/17	85.2	85.5	CL									37	19	18	25	97	121	1923	102	15.0	53	Sandy
119/9	81.6	81.9	CL									33	20	13	21	107	129	3072	111	15.0	36	Sandy
126/3	8.2	8.6	CL-CH									47	24	23	26	99	125	1725	208	2.4	121	
136/4	8.8	9.2	CL-CH									48	22	26	24	102	126	5446	769	3.0	141	
144/4-1	8.5	8.8	CL-CH									48	21	27	26	97	122	861	192	1.7	223	
144/4-2	8.9	9.2	CL-CH									48	21	27	24	99	123	1002	119	3.0	119	
185/3	7.5	7.8	CL-CH									50	23	27	24	104	129	2947	400	4.0	136	
185/7	18.5	18.8	CL-CH									49	22	27	39	81	113	831	94	2.4	113	
																						Sheet 3 of 3

TABLE 3

UNCONFINED COMPRESSION TEST RESULTS

REMOLDED AND COMPACTED SAMPLES

BORING & SAMPLE NUMBER	DEPTH (FEET)		UNIFIED SOIL CLASSIFICATION	PARTICLE SIZE ANALYSIS % FINER THAN							SPECIFIC GRAVITY	ATTERBERG LIMITS			PRE TEST CONDITIONS			UNCONFINED COMPRESSION STRENGTH TEST			REMARKS
															W_o	γ_d	γ_t	S_u	E	ϵ	
	FROM	TO		4	10	20	40	100	200	2μ		LL	PL	PI	%	PCF	PCF	PSF	10^3 PSF	%	
38/3	8.7	9.0	CL-CH	-	-	-	-	-	97	61	2.71	49	24	25	24	103	128	761	46	7.0	Remolded
38/18	84.6	84.9	CL	-	-	-	-	-	99	61	2.70	33	19	14	22	105	128	547	27	17.4	Remolded
41/2	4.5	4.8	CH	-	-	-	-	-	98	63	2.70	63	28	35	29	95	123	962	80	9.0	Remolded
60/3	17.6	18.0	CL	-	-	-	-	-	98	52	2.70	39	21	18	24	103	128	1,052	13	15.0	Remolded
60/11	55.6	56.0	CL	95	89	86	84	79	76	34	2.70	33	18	15	25	103	129	817	13	15.0	Remolded
127/3	5.6	7.0	CL-CH									49	22	27	14	113	129	9,403	869	3.2	Compacted (97% ASTM D1557)
136/6	13.0	14.6	CL									43	22	21	18	100	118	2,773	400	2.0	Compacted (89% ASTM D1557)
141/2	8.0	10.0	CL-CH									49	23	26	18	103	122	5,558	592	2.0	Compacted (90% ASTM D1557)
144/4	8.0	10.0	CL-CH									-	-	-	24	100	124	1,482	58	15.0	Remolded
146/7	14.0	16.1	CL									46	22	24	17	104	122	3,282	484	2.0	Compacted (85% ASTM D1557)
158/2	7.5	9.7	CL-CH									50	21	29	17	104	122	3,416	481	2.0	Compacted (87% ASTM D1557)

NOTE: Remolded samples run at same dry density and water content as undisturbed samples.

TABLE 4

LABORATORY VANE SHEAR TEST RESULTS

BORING & SAMPLE NUMBER	DEPTH (FEET)		UNIFIED SOIL CLASSIFICATION	ATTERBERG LIMITS			PRETEST CONDITIONS			UNDRAINED STRENGTH UNDISTURBED		UNDRAINED STRENGTH REMOLDED		SENSITIVITY	REMARKS
							W_o	γ_d	γ_t	COHESION	ANGLE OF ROTATION	COHESION	ANGLE OF ROTATION	UNDISTURBED STRENGTH DIVIDED BY REMOLDED STRENGTH	
	FROM	TO		LL	PL	PI	%	PCF	PCF	PSF	DEGREES	PSF	DEGREES		
50/6	28.1	28.3	CL	39	18	21	35	82	111	479	8	178	7	2.7	
50/10	48.1	48.4	CL	36	16	20	26	96	121	520	32	480	52	1.1	
52/4	28.9	29.2	CL	35	18	17	31	89	117	560	10	266	7	2.1	
52/6	49.6	49.8	CL	-	-	-	24	101	125	2,165	30	-	-	-	
52/10	89.1	89.4	CL	39	18	21	26	96	121	1,660	15	1,525	51	1.1	
53/6	49.7	50.0	CL	43	18	25	27	94	119	520	13	312	40	1.2	
53.9	79.5	79.8	CL	39	21	18	28	95	122	1,375	22	-	-	-	
54/5	59.7	60.0	CL	38	17	21	28	92	118	1,200	54	-	-	-	
59/3	18.5	18.8	CL-CH	48	20	28	33	90	120	1,250	15	-	-	-	
59/5	39.4	39.7	CL	38	18	20	26	96	121	640	15	-	-	-	
59/7	59.0	59.3	CL	36	18	18	24	102	127	735	22	-	-	-	

TABLE 5

UNCONSOLIDATED-UNDRAINED TRIAXIAL TEST RESULTS
UNDISTURBED SAMPLES

BORING & SAMPLE NUMBER	DEPTH (FEET)		UNIFIED SOIL CLASSIFICATION	ATTERBERG LIMITS			NATURAL CONDITIONS			UNCONSOLIDATED UNDRAINED STRENGTH TEST					REMARKS
							W_o	γ_d	γ_t	σ_o	S_u	E	ϵ	E/S_u	
	FROM	TO		LL	PL	PI	%	PCF	PCF	PSF	PSF	10^3 PSF	%	——	
15/2	3.7	4.1	CL	45	21	24	25	101	126	475	2386	240	8.0	101	
18/3	20.6	20.9	CL	44	21	23	40	83	116	2448	410	150	4.0	366	
18/6	51.4	51.7	CL	39	18	21	31	92	121	4104	827	100	3.0	121	
18/10	88.8	90.1	CL	29	15	14	17	111	130	6336	2862	240	15.0	84	Sandy
25/10	88.9	89.2	CL	36	19	17	23	104	128	6192	2213	162	11.0	73	
27/2	4.5	4.8	CL-CH	48	24	24	24	103	129	576	2099	121	8.0	58	
41/17	72.9	73.2	CL	25	15	10	20	105	126	8654	453	21	14.0	46	Sandy
48/14	60.8	61.1	CL	34	16	18	26	99	125	4608	746	36	15.0	48	Sandy
50/8	38.1	38.4	CH	55	23	32	46	74	108	3456	643	75	4.0	117	
50/10	49.3	49.6	CL	36	16	20	23	100	123	4320	721	73	15.0	101	Sandy
50/12	59.1	59.4	CL	39	18	21	24	101	125	4608	1132	218	10.0	193	Sandy
52/3	21.2	21.5	CL-CH	49	20	29	31	92	121	2016	1590	157	8.0	99	
52/8	69.0	69.4	CL	24	14	10	16	111	129	5184	1890	127	15.0	66	Sandy
52/9	78.6	78.9	CL	35	18	17	22	105	128	5760	1156	130	14.0	112	
52/12	109.3	109.6	CL	46	22	24	36	87	118	7632	1586	230	3.0	145	
53/3	20.1	20.4	CL-CH	49	20	29	32	91	120	2405	1425	176	8.9	124	
53/4	30.1	30.4	CL-CH	49	22	27	34	88	118	3024	972	200	2.4	206	
54/4	53.2	53.5	ML-CL	21	17	4	24	99	123	4320	533	54	15.0	101	
54/5	59.0	59.3	CL	38	17	21	25	99	124	4464	767	35	15.0	46	Sandy
54/6	63.1	63.4	CL	36	18	18	26	98	123	5040	796	100	13.0	126	Sandy
54/7	68.8	69.1	CL	37	18	19	26	98	123	5112	1148	142	12.0	124	Sandy
101/15	74.6	74.9	CL	36	21	15	23	105	129	5328	1054	44	15.0	42	Sandy
101/19	94.9	95.3	CL	36	20	16	25	100	125	6480	547	32	15.0	59	
101/23	119.8	120.2	CL	44	22	22	37	85	116	7920	721	70	8.0	97	
															Sheet 1 of 2

TABLE 5

UNCONSOLIDATED-UNDRAINED TRIAXIAL TEST RESULTS

UNDISTURBED SAMPLES

BORING & SAMPLE NUMBER	DEPTH (FEET)		UNIFIED SOIL CLASSIFICATION	ATTERBERG LIMITS			NATURAL CONDITIONS			UNCONSOLIDATED UNDRAINED STRENGTH TEST					REMARKS
							W_o	γ_d	γ_t	σ_o	S_u	E	ε	E/S_u	
	FROM	TO		LL	PL	PI	%	PCF	PCF	PSF	PSF	10^3 PSF	%	——	
126/11	49.1	49.4	CH	59	25	34	41	81	114	4032	498	50	4.0	100	
126/23	108.6	108.9	CL	36	20	16	25	96	120	7200	1344	60	15.0	45	
129/3	8.7	9.0	CL-CH	48	23	25	22	108	132	1080	3381	250	6.0	74	
129/15	74.0	74.3	CL	36	21	15	25	101	126	5760	954	62	7.0	65	
129/24	124.1	124.4	CL-CH	46	22	24	31	95	124	7920	679	30	8.0	44	
151A/3	13.0	13.3	CL-CH	48	20	28	28	95	122	1555	2325	167	10.0	72	

Sheet 2 of 2

TABLE 6

CONSOLIDATED-UNDRAINED TEST RESULTS

UNDISTURBED SAMPLES

BORING & SAMPLE NUMBER	DEPTH (FEET)		UNIFIED SOIL CLASSIFICATION	ATTERBERG LIMITS			NATURAL CONDITIONS			CONSOLIDATION CONDITIONS	CONDITIONS AFTER CONSOLIDATION		CONSOLIDATED UNDRAINED STRENGTH TEST			SKEMPTON'S $\frac{A}{}$ PARAMETER (FINAL)	SHEAR STRENGTH PARAMETERS			
																	TOTAL STRESS		EFFECTIVE STRESS	
							W_o	γ_d	γ_t	$\bar{\sigma}_3$	W_f	γ_{tf}	E	$(\sigma_1-\sigma_3)^1$	E/S_u		ϕ	C	ϕ'	C'
	FROM	TO		LL	PL	PI	%	PCF	PCF	PSF	%	PCF	10^3 PSF	PSF	——		deg.	PSF	deg.	PSF
18/12	108	110	CL	46	22	24	35	87	117	3,744	33.7	116	316	3,900	161	0.28	10	900	22	300
							31	92	120	7,488	29.3	119	400	5,200	154	0.68				
							31	92	120	15,120	27.7	117	1,500	8,170	367	1.04				
26/2	3.5	5.5	CL-CH	53	24	29	23	104	127	360	27	132	225	2,200	204	0.15	34	350	27	320
							24	103	128	691	27	131	346	3,450	200	0.19				
							22	108	132	1,296	25	135	450	4,800	187	0.20				
26/5	18	20	CL-CH	--	--	--	35	89	120	1,080	31	116	125	1,350	185	0.23	16	250	27	50
							35	86	116	2,160	31	113	273	1,680	325	0.72				
							36	86	117	5,040	28	110	500	4,350	230	0.56				
26/11	48	50	CL	41	21	20	36	88	120	2,304	34	118	250	1,790	279	0.57	9	400	24	0
							37	86	118	4,608	23	106	666	2,440	546	1.11				
							30	93	121	9,216	24	115	666	4,410	302	1.34				
33/7	28	30.5	CL	46	22	24	39	82	114	1,440	37	112	300	1,480	405	0.39	10	300	24	0
							40	82	115	2,880	37	112	750	1,930	776	0.77				
							38	84	116	5,760	32	111	500	3,040	328	1.17				
33/9	38.0	40.5	CL	43	23	20	37	83	114	7,200	36	113	175	1,600	110	0.51	9	400	22	150
							37	85	116	7,200	34	114	300	2,160	277	0.93				
							36	86	117	12,960	31	113	300	3,320	180	1.31				
48/6	18.0	20.0	CL-CH	47	25	22	33	90	120	1,152	32	119	166	1,860	179	0.05	9	700	21	300
							34	89	119	2,304	33	118	375	2,610	287	0.24				
							36	88	120	4,608	31	115	500	3,160	316	0.78				
48/22	98	100	CL	36	19	17	27	99	126	3,312	25	124	375	4,030	186	0.19	11	1050	25	0
							26	96	121	6,624	24	119	666	5,760	231	0.49				
							28	97	124	13,248	23	119	1,200	8,820	272	0.83				

TABLE 6

CONSOLIDATED-UNDRAINED TEST RESULTS

UNDISTURBED SAMPLES

BORING & SAMPLE NUMBER	DEPTH (FEET)		UNIFIED SOIL CLASSIFICATION	ATTERBERG LIMITS			NATURAL CONDITIONS			CONSOLIDATION CONDITIONS	CONDITIONS AFTER CONSOLIDATION		CONSOLIDATED UNDRAINED STRENGTH TEST			SKEMPTON'S $\frac{A}{}$ PARAMETER (FINAL)	SHEAR STRENGTH PARAMETERS			
																	TOTAL STRESS		EFFECTIVE STRESS	
							W_o	γ_d	γ_t	$\bar{\sigma}_3$	W_f	γ_{tf}	E	$(\sigma_1-\sigma_3)^1$	E/S_u		ϕ	C	ϕ'	C'
	FROM	TO		LL	PL	PI	%	PCF	PCF	PSF	%	PCF	10^3 PSF	PSF	——		deg.	PSF	deg.	PSF
49/6	43	45	CL-CH	53	22	31	44	78	112	1,872	42	111	158	1,840	172	0.46	9	500	22	200
							46	75	110	3,744	45	109	333	2,710	246	0.70				
							45	77	112	7,488	39	107	583	3,860	311	1.10				
49/13	113.0	115.0	CL	33	22	11	24	100	124	3,816	23	123	400	3,570	223	0.43	10	900	25	0
							29	95	123	7,632	27	121	666	4,850	274	0.87				
							29	93	120	15,264	24	115	857	8,260	207	1.16				
50/6	28.0	30.0	CL	39	18	21	33	88	117	1,440	32	116	250	1,680	296	0.32	11	450	26	100
							33	90	120	2,880	27	114	300	2,100	285	0.74				
							34	86	115	5,760	29	111	500	3,440	291	1.06				
50/18	88.0	90.0	CL	39	23	16	28	97	124	3,456	26	122	214	3,850	111	0.27	10	900	25	200
							28	97	124	6,912	26	122	461	5,180	178	0.69				
							28	96	123	13,824	23	118	461	7,980	115	1.01				
54/4	53.0	55.0	CL	31	18	13	23	102	125	4,320	21	123	500	4,040	247	0.42	15	450	26	0
							23	102	125	8,640	20	122	461	7,730	119	0.50				
							23	101	124	2,160	22	123	285	2,860	199	0.11				
							24	100	124	6,480	20	120	666	5,610	237	0.55				
52/6	48.0	50.5	ML	--	--	--	21	101	122	2,160	22	123	533	30,320	35	0.29	42	4,000	36	0
							23	99	122	4,320	22	121	1,000	35,020	57	0.24				
							22	104	127	8,640	22	127	1,000	55,550	36	0.18				
54/6	63.0	65.0	CL	36	18	18	26	98	123	2,448	26	123	166	2,730	122	0.30	11	700	25	150
							25	98	123	4,896	23	120	562	4,010	280	0.61				
							26	98	123	9,792	22	119	900	5,860	307	1.00				
60/2	8.0	10.0	CH	53	26	27	30	94	118	590	32	124	157	1,060	298	0.01	18	260	22	170
							29	95	123	1,152	31	124	273	1,750	301	0.09				
							29	96	124	2,304	30	125	375	2,670	280	0.16		Sheet 2 of 4		

TABLE 6

CONSOLIDATED-UNDRAINED TEST RESULTS

UNDISTURBED SAMPLES

BORING & SAMPLE NUMBER	DEPTH (FEET)		UNIFIED SOIL CLASSIFICATION	ATTERBERG LIMITS			NATURAL CONDITIONS			CONSOLIDATION CONDITIONS	CONDITIONS AFTER CONSOLIDATION		CONSOLIDATED UNDRAINED STRENGTH TEST			SKEMPTON'S A PARAMETER (FINAL)	SHEAR STRENGTH PARAMETERS			
																	TOTAL STRESS		EFFECTIVE STRESS	
							W_o	γ_d	γ_t	$\bar{\sigma}_3$	W_f	γ_{tf}	E	$(\sigma_1-\sigma_3)^1$	E/S_u		ϕ	C	ϕ'	C'
	FROM	TO		LL	PL	PI	%	PCF	PCF	PSF	%	PCF	10^3 PSF	PSF	——		deg.	PSF	deg.	PSF
Remolded							29	96	124	560	29	124	100	1,750	114	-0.18				
60/2	8.0	10.0	CH	53	26	27	29	99	128	1,152	26	125	187	2,490	150	0.10	19	450	27	125
							29	98	126	2,304	26	123	214	3,500	122	-0.04				
							30	94	122	1,296	31	123	102	2,780	73	-0.09				
60/4	21.0	23.0	CL	43	17	26	31	94	123	5,184	30	122	900	5,130	350	0.37	13	800	24	250
							31	95	124	2,016	30	123	281	3,180	177	0.07				
							27	99	126	2,016	26	125	500	2,530	394	0.24				
60/9	45.0	47.0	CL	38	16	22	27	98	124	4,032	26	123	321	2,990	214	0.72	10	600	25	100
							26	102	129	8,064	23	125	750	5,020	298	0.97				
							24	103	128	2,520	22	126	180	3,890	93	0.12				
							32	91	120	5,040	28	116	462	3,445	268	0.70				
60/13	67.0	69.0	CL-ML	40	19	21	20	104	125	10,080	18	123	923	8,120	227	0.56	13	1,000	25	0
							16	114	132	5,760	15	131	923	9,225	200	0.13				
							21	104	126	8,640	19	124	545	6,357	171	0.72				
							26	99	125	1,152	28	127	113	2,453	92	-0.05				
105/2	9.0	11.0	CL	46	24	22	27	96	122	2,304	28	123	389	4,381	177	-0.05	27	150	25	250
							28	98	125	864	29	126	250	2,377	210	-0.02				
							36	84	114	1,800	35	113	196	2,136	183	0.29				
105/5	40.0	42.5	CL	44	21	23	36	85	116	3,600	34	114	450	2,753	327	0.56	8	700	23	0
							35	85	115	7,200	31	111	900	3,660	491	1.13				
							39	84	117	7,200	33	112	643	3,803	169	1.12				
							28	95	122	576	29	122	245	1,773	138	0.00				
119/2	8.0	10.0	CL-CH	53	26	27	28	99	127	2,304	28	127	450	4,024	223	0.09	22	375	26	290
							29	94	121	1,440	30	122	245	2,481	99	0.17				

TABLE 6

CONSOLIDATED-UNDRAINED TEST RESULTS
UNDISTURBED SAMPLES

BORING & SAMPLE NUMBER	DEPTH (FEET)		UNIFIED SOIL CLASSIFICATION	ATTERBERG LIMITS			NATURAL CONDITIONS			CONSOLIDATION CONDITIONS	CONDITIONS AFTER CONSOLIDATION		CONSOLIDATED UNDRAINED STRENGTH TEST			SKEMPTON'S $\frac{A}{}$ PARAMETER (FINAL)	SHEAR STRENGTH PARAMETERS			
																	TOTAL STRESS		EFFECTIVE STRESS	
							W_o	γ_d	γ_t	$\bar{\sigma}_3$	W_f	γ_{tf}	E	$(\sigma_1-\sigma_3)^1$	E/S_u		ϕ	C	ϕ'	C'
	FROM	TO		LL	PL	PI	%	PCF	PCF	PSF	%	PCF	10^3 PSF	PSF	——		deg.	PSF	deg.	PSF
119/4	30.0	32.0	CL	41	22	19	37	86	118	1,512	35	116	333	1,970	333	0.24	8	700	26	50
							39	85	118	3,024	36	116	500	2,460	406	0.57				
							35	87	117	6,048	30	113	375	3,310	226	1.20				
129/5	18.0	21.0	CL-CH	48	21	27	34	90	121	1,152	33	120	136	2,200	123	-0.03	14	450	24	0
							32	90	119	4,608	--	--	346	4,170	165	0.42				
							33	90	120	2,304	32	119	750	2,550	588	0.26				
129/19	93.0	95.5	CL	41	21	20	24	99	123	3,240	22	121	187	3,035	123	0.45	13	500	26	0
							26	99	125	6,480	23	122	500	6,090	164	0.44				
							27	99	126	12,960	22	121	750	8,900	168	0.81				
141/4	18.0	20.0	CL	45	21	24	36	86	117	1,152	36	117	180	2,079	173	0.15	9	750	21	350
							36	87	118	2,304	35	117	818	2,780	587	0.29				
							*35/37	85/84	115/115	4,608/4,637	31/34	111/113	529/529	3,249/3,251	326/325	0.73/0.79				
158/4	17.5	20.0	CL	46	19	25	38	83	114	1,080	37	114	600	1,569	765	0.17	8	550	21	200
							34	87	117	2,160	32	115	214	1,942	220	0.51				
							37	83	114	4,320	33	110	428	2,593	330	0.95				
101,105 127,128 180,183 Combined Samples	2.0	10.0	CL-CH	--	--	--	15	113	130	1,008	21	137	150	4,261	70	-0.38	34	500	24	250
							16	114	132	2,016	19	136	210	7,531	56	-0.43				
							16	114	132	3,168	18	134	276	10,123	54	-0.39				

NOTES:
[1]At peak stress or at 15% strain, whichever is smaller.
* Two tests run on same sample. Second test run after rebounding first sample to original consolidation pressure.

TABLE 7

CONSOLIDATION TEST RESULTS

UNDISTURBED SAMPLES

BORING & SAMPLE NUMBER	DEPTH (FEET)		UNIFIED SOIL CLASSIFICATION	PARTICLE SIZE ANALYSIS % FINER THAN				SPECIFIC GRAVITY	ATTERBERG LIMITS			NATURAL CONDITIONS				P_c	C_c	C_r	SETTLEMENT PARAMETERS		REMARKS
												W_o	γ_d	γ_t	e_o				$\frac{C_c}{1+e_o}$	$\frac{C_r}{1+e_o}$	
	FROM	TO		40	100	200	2μ		LL	PL	PI	%	PCF	PCF	——	10^3 PSF	——	——			
27/10	34.0	34.5	CL					2.73	41	22	19	39	84	117	1.02	3.4	0.44	0.10	0.22	0.05	
27/24	104.2	104.5	CL					2.74	43	25	18	34	90	121	0.91	8.0	0.31	0.10	0.16	0.05	Silty Clay, Sandy
38/4*	14.6	14.7	CL-CH	-	-	98	60	2.71	46	22	24	29	96	124	0.77	10.0	0.19	0.06	0.11	0.03	
38/16	74.0	74.1	CH	-	-	98	60	2.72	55	24	31	36	87	118	0.94	9.4	0.38	0.06	0.20	0.03	
41/5*	10.8	11.0	CL-CH	-	-	98	57	2.72	46	23	23	30	94	122	0.80	11.9	0.23	0.08	0.13	0.04	
41/7	21.0	21.1	CL-CH					2.70	47	24	23	38	82	113	1.06	2.5	0.34	0.09	0.17	0.04	
41/13	53.0	53.2	CL-CH					2.75	52	25	27	47	77	113	1.24	3.5	0.35	0.10	0.16	0.04	
41/17	73.3	73.5	CL	85	74	65	24	2.68	25	15	10	27	98	124	0.70	5.3	0.21	0.05	0.12	0.03	Silty Clay, Sandy
41/25*	113.0	113.2	CL					2.71	29	19	10	24	103	128	0.64	9.4	0.18	0.05	0.11	0.03	Silty Clay, Sandy
41/29*	130.9	131.1	GC-SC					2.69	25	17	8	11	123	137	0.37	10.0	0.10	0.04	0.07	0.03	Clayey Sand, Gravelly
48/10	39.2	39.4	CL-CH					2.73	47	24	23	39	84	117	1.03	4.0	0.33	0.09	0.16	0.04	
49/3	13.7	14.0	CL-CH					2.72	47	23	24	33	91	121	0.86	6.4	0.26	0.07	0.14	0.04	
49/11*	93.8	94.0	CL					2.68	37	22	15	29	98	126	0.70	5.6	0.20	0.05	0.12	0.03	
50/8	38.5	38.9	CH					2.75	55	23	32	52	72	109	1.38	4.0	0.55	0.12	0.23	0.05	
52/4	29.9	30.2	CL-CH					2.70	49	20	29	41	84	118	1.01	4.4	0.45	0.09	0.22	0.04	
53/5	39.5	39.8	CL	85	76	66	30	2.72	39	20	19	31	91	119	0.87	6.5	0.30	0.09	0.16	0.05	Silty Clay, Sandy
54/6*	63.5	63.8	CL	89	83	77	33	2.71	36	18	18	26	99	125	0.70	6.2	0.24	0.07	0.14	0.04	Silty Clay, Sandy
54/8	73.7	74.0	CL	96	94	92	46	2.73	45	21	24	39	86	120	0.98	5.6	0.41	0.08	0.21	0.04	
60/2*	9.8	10.0	CL-CH	-	-	-	60	2.71	53	26	27	30	94	122	0.79	9.2	0.23	0.07	0.13	0.04	
60/16*	85.2	85.4	CL	83	80	78	34	2.73	40	19	21	28	98	125	0.74	9.0	0.27	0.07	0.16	0.04	
105/1*	5.1	5.4	CH					2.72	53	24	29	24	103	128	0.64	4.0	0.10	0.05	0.06	0.03	
105/8	70.9	71.2	CL					2.70	37	19	18	24	103	128	0.63	7.2	0.21	0.06	0.13	0.04	Sheet 1 of 2
118/5	38.6	38.9	CL					2.70	41	22	19	37	86	118	0.97	4.6	0.39	0.10	0.20	0.05	* INDICATES SAMPLES
118/9*	78.7	79.0	CL					2.70	42	23	19	28	97	124	0.74	8.6	0.24	0.06	0.14	0.03	BELIEVED TO BE
																					RELATIVELY DISTURBED.

TABLE 7

CONSOLIDATION TEST RESULTS

UNDISTURBED SAMPLES

BORING & SAMPLE NUMBER	DEPTH (FEET)		UNIFIED SOIL CLASSIFICATION	PARTICLE SIZE ANALYSIS % FINER THAN				SPECIFIC GRAVITY	ATTERBERG LIMITS			NATURAL CONDITIONS				P_c	C_c	C_r	SETTLEMENT PARAMETERS		REMARKS
												W_o	γ_d	γ_t	e_o				$\frac{C_c}{1+e_o}$	$\frac{C_r}{1+e_o}$	
	FROM	TO		40	100	200	2μ		LL	PL	PI	%	PCF	PCF	—	10^3 PSF	—	—			
129/9	39.1	39.3	CL					2.73	41	22	19	40	82	115	1.08	2.9	0.39	0.09	0.19	0.04	
129/21	103.7	104.0	CL					2.71	39	21	18	28	99	127	0.70	6.4	0.23	0.06	0.14	0.04	Silty Clay, Sandy
142/6	20.1	20.5	CL					2.70	45	22	23	38	83	115	1.02	4.6	0.43	0.05	0.21	0.02	
185/3*	7.9	8.1	CL-CH					2.72	50	23	27	29	96	124	0.76	8.0	0.18	0.04	0.10	0.02	

Sheet 2 of 2

* INDICATES SAMPLES BELIEVED TO BE RELATIVELY DISTURBED.

TABLE 8

CONSOLIDATION TEST RESULTS

REMOLDED SAMPLES

BORING & SAMPLE NUMBER	DEPTH (FEET)		UNIFIED SOIL CLASSIFICATION	SPECIFIC GRAVITY	ATTERBERG LIMITS			PRETEST CONDITIONS				P_c	C_c	C_r	SETTLEMENT PARAMETERS		REMARKS
								W_o	γ_d	γ_t	e_o				$\frac{C_c}{1+e_o}$	$\frac{C_r}{1+e_o}$	
	FROM	TO			LL	PL	PI	%	PCF	PCF	—	10^3 PSF	—	—			
136/6	13.0	14.6	CL	2.74	43	22	21	17	102	119	0.68	2.5	0.18	0.05	0.11	0.03	
146/7	14.0	16.1	CL	2.75	46	22	24	16	102	118	0.68	3.3	0.15	0.06	0.09	0.04	

TABLE 9

PERMEABILITY TEST RESULTS

UNDISTURBED SAMPLES

BORING & SAMPLE NUMBER	DEPTH (FEET)		UNIFIED SOIL CLASSIFICATION	PARTICLE SIZE ANALYSIS % FINER THAN					SPECIFIC GRAVITY	ATTERBERG LIMITS			PRETEST CONDITIONS				CONSOLIDATION PRESSURE	VOID RATIO, e, AFTER CONSOLIDATION	PERMEABILITY
													W_o	γ_d	γ_t	e_o			
	FROM	TO		4	40	100	200	2μ		LL	PL	PI	%	PCF	PCF	——	kg/cm^2		10^{-8} cm/sec.
50/6	28.3	28.5	CL	--	--	--	97	53	2.70	39	18	21	37	84	115	1.00	1.50	0.875	3.0
50/10	48.6	48.8	CL	98	92	86	82	37	2.70	36	16	20	27	97	123	0.73	2.00	0.645	2.6
52/7	58.6	58.9	CL	98	83	72	57	12	2.70	23	14	9	15	119	137	0.41	2.30	0.374	2.2
53/5	39.5	39.8	CL	96	85	77	67	30	2.72	39	20	19	30	104	135	0.73	1.74	0.685	3.5
54/6	63.5	63.8	CL	98	89	83	77	34	2.71	36	18	18	27	98	124	0.72	2.40	0.641	3.0
54/6	73.7	74.0	CL	--	96	93	91	45	2.73	45	21	24	32	90	119	0.85	2.71	0.729	2.3
60/3	18.1	18.3	CL	--	--	--	98	52	2.70	39	21	18	26	103	130	0.71	1.05	0.686	1.6
60/11	56.1	56.4	CL	95	84	79	76	34	2.70	33	18	15	27	98	124	0.73	2.20	0.575	1.8
60/16	85.6	86.1	CL	96	82	80	78	33	2.73	40	19	21	29	96	124	0.75	3.00	0.605	2.6

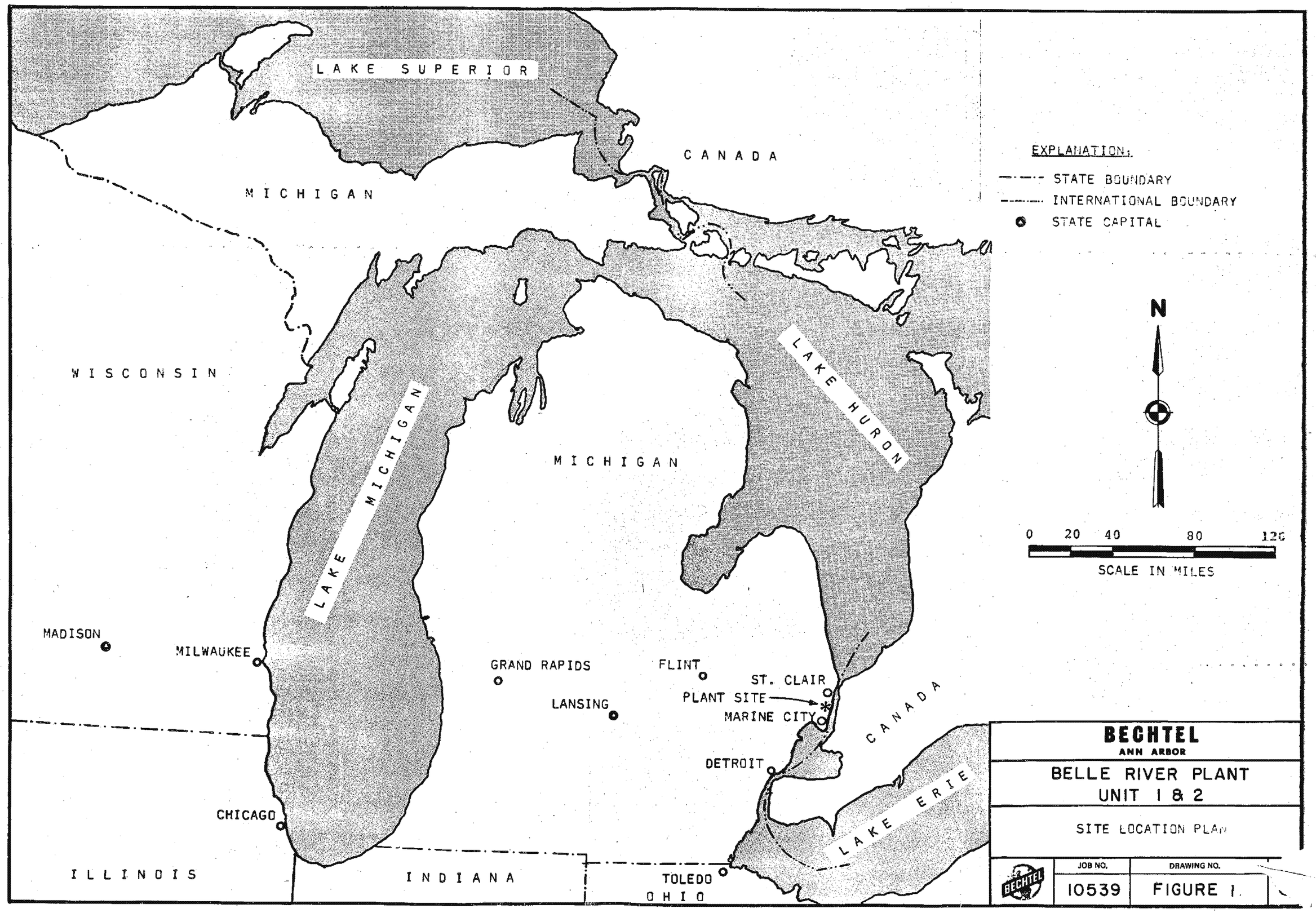
TABLE 10

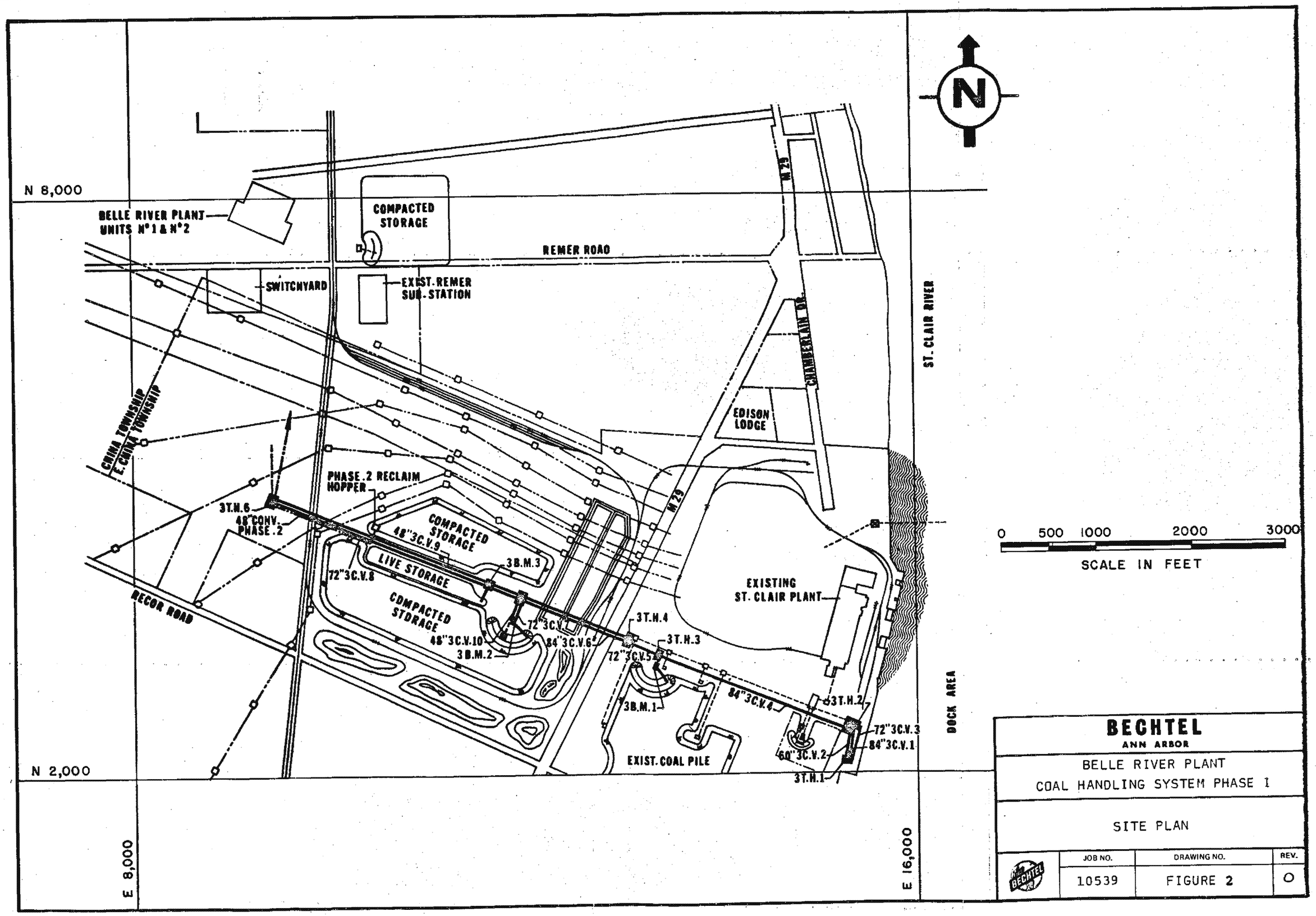
RECOMMENDED DESIGN PROPERTIES FOR SITE SOILS

Static Properties	Upper Stratum[1] 0 - 20 Ft	Middle Stratum[1] 20 - 50 Ft	Lower Stratum[1] 50 + Ft
In Situ Total Density (PCF)	125	115	125
In Situ Moisture Content (%)	25	35	25
Degree of Saturation (%)	100	100	100
Specific Gravity	2.72	2.72	2.71
Poisson's Ratio[2]			
Drained	0.4	0.4	0.4
Undrained	0.5	0.5	0.5
Initial Modulus of Elasticity (KSF)	700	330	350
Maximum Dry Density per ASTM 1557	118-112[3]	-	-
Optimum Moisture Content	13-16[3]	-	-
Permeability (cm/sec x 10^{-8})	2	2	2
Unconfined Compression Shear Strength			
Cohesion (PSF)	550	550	850
Consolidated Undrained Shear Strength			
Effective Stress Basis			
ϕ' (Deg.)	28	28	25
c' (PSF)	0	0	0
Total Stress Basis			
ϕ (Deg.)	13	13	10
c (PSF)	460	460	710
Settlement Parameter $C_c/1+e_o$	0.13	0.20	0.14
Coefficient of Consolidation (C_v) Ft^2/day	0.15	0.15	0.15

[1]The depths of the different strata are approximate (see text).
[2]Typical values.
[3]Refer to Figure 40 for additional information.

FIGURES


LAKE SUPERIOR
CANADA
MICHIGAN
WISCONSIN
LAKE MICHIGAN
MICHIGAN
LAKE HURON
CANADA
LAKE ERIE
MADISON
MILWAUKEE
CHICAGO
GRAND RAPIDS
LANSING
FLINT
ST. CLAIR
PLANT SITE
MARINE CITY
DETROIT
TOLEDO
OHIO
ILLINOIS
INDIANA
EXPLANATION:
STATE BOUNDARY
INTERNATIONAL BOUNDARY
STATE CAPITAL
N
0 20 40 80 120
SCALE IN MILES
BECHTEL
ANN ARBOR
BELLE RIVER PLANT
UNIT 1 & 2
SITE LOCATION PLAN
JOB NO.
10539
DRAWING NO.
FIGURE 1

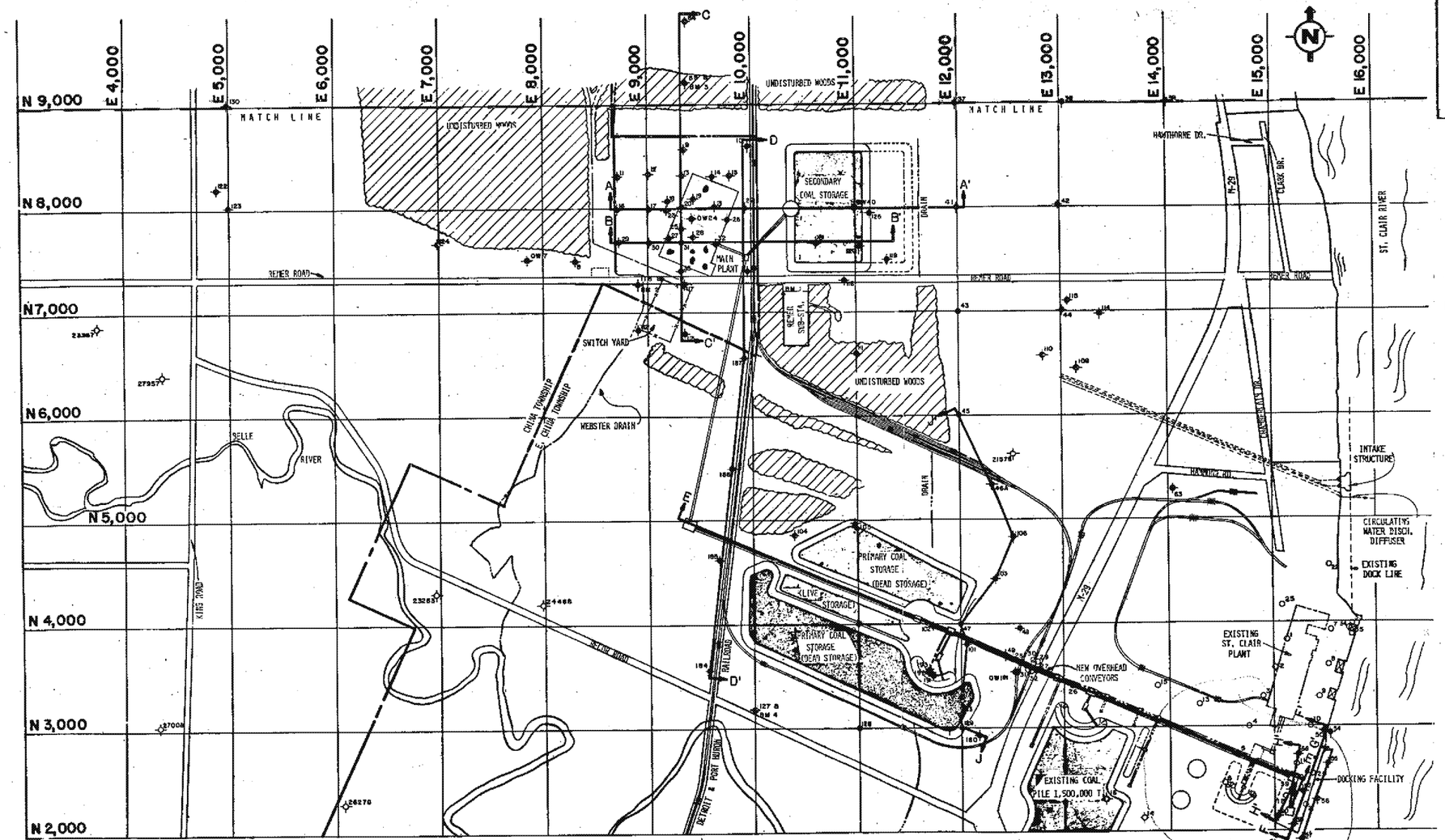


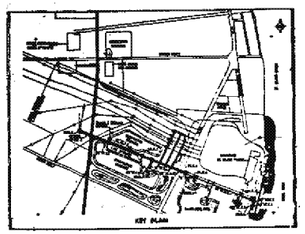
BECHTEL
ANN ARBOR

BELLE RIVER PLANT
COAL HANDLING SYSTEM PHASE I

SITE PLAN

JOB NO.	DRAWING NO.	REV.
10539	FIGURE 2	0





NOTES:

1. FOR SUBSURFACE PROFILES SEE FIGURE 9, A THROUGH H.
2. SECTIONS A, B, AND C ARE BASED ON ORIGINAL PLANT LOCATION.
3. SEE FIGURE 4 FOR ADDITIONAL BORING LOCATIONS.

EXPLANATION

TOWNSHIP BOUNDARY

N N' SUBSURFACE PROFILE N-N'

BORING LOCATION

OW DENOTES OBSERVATION WELL

BM 4 BENCH MARK

BORING LOCATIONS FROM PREVIOUS INVESTIGATIONS FOR ST. CLAIR PLANT

WELLS DRILLED FOR OIL OR GAS EXPLORATION - SHOWING PERMIT NUMBER (ALL HOLES WERE DRY)

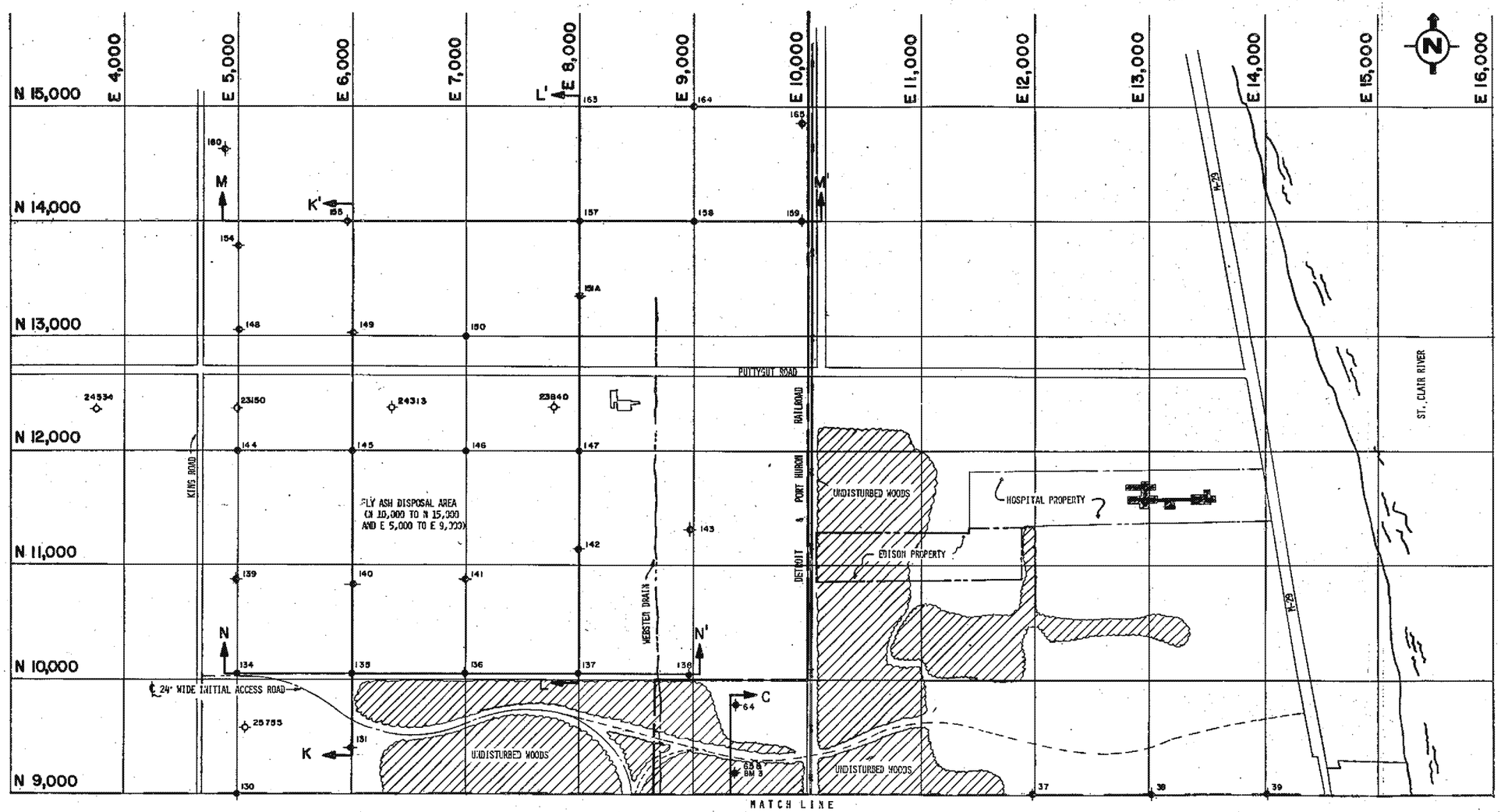
0 100 200 400 800 1200 Feet
SCALE

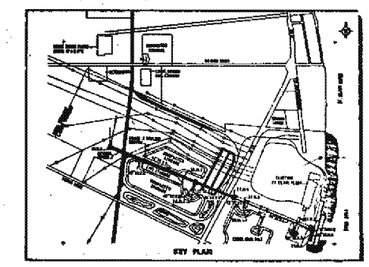
BECHTEL
ANN ARBOR

BELLE RIVER PLANT
UNIT 1 & 2

BORING LOCATION PLAN
SOUTH AREA

JOB NO.	DRAWING NO.	REV.
10539	FIGURE 3	2





NOTES:

1. FOR SUBSURFACE PROFILES, SEE FIGURE 9, A THROUGH N.
2. SEE FIGURE 3 FOR ADDITIONAL BORING LOCATIONS.

EXPLANATION

TOWNSHIP BOUNDARY

SUBSURFACE PROFILE N-N'

BORING LOCATION FROM THIS INVESTIGATION

BM 5 BENCH MARK

25755 WELLS DRILLED FOR OIL OR GAS EXPLORATION - SHOWING PERMIT NUMBER (ALL HOLES WERE DRY)

0 400 800 1200

SCALE IN FEET

BECHTEL
ANN ARBOR

BELLE RIVER PLANT
UNIT 1 & 2

BORING LOCATION PLAN
NORTH AREA

JOB NO.	DRAWING NO.	REV.
10539	FIGURE 4	1

EXPLANATION

MESOZOIC	JURASSIC	Former "Permo-Carboniferous red beds"; shale, clay and sandy shales.
PALEOZOIC	PENN. SYLVANIAN	Grand River Formation and Saginaw Formation; chiefly sandstone, some shaly limestone and coal.
	MISSISSIPPIAN	Grand Rapids Group, Marshall Sandstone and Coldwater Shale; chiefly shale and dolomitic shale, some limestone and sandstone.
		Ellsworth Shale, Bedford Shale, and Antrim Shale; shale with some sandstone.
	DEVONIAN	Traverse Group and Detroit River Group; chiefly limestone and dolomite, some shale, sandstone and salt.
	SILURIAN	Bass Islands Group, Salina Group, Manistique Group, Burnt Bluff Group, and Cataract Group; dolomitic shale, dolomite and limestone, some salt.
	ORDOVICIAN	Undifferentiated; shale, siltstone, limestone and dolomite.
PRE CAMBRIAN	P-€	Undifferentiated; complex sequence of metamorphosed igneous and sedimentary rocks.

N

NOTE:

Geology is generalized from the following:

(1) The Centennial Geologic Map of the Southern Peninsula of Michigan, 1936, Mich. Geol. Survey.
(2) Stratigraphic Succession in Michigan, Chart I, 1964, Mich. Geol. Survey.
(3) Bedrock of Michigan, Small Scale Map 2, 1968, Mich. Geol. Survey.
(4) Geology of Toronto — Windsor Area, 1989, Geological Survey of Canada.
(5) Geologic Map of North America, 1965, U.S. Geological Survey.

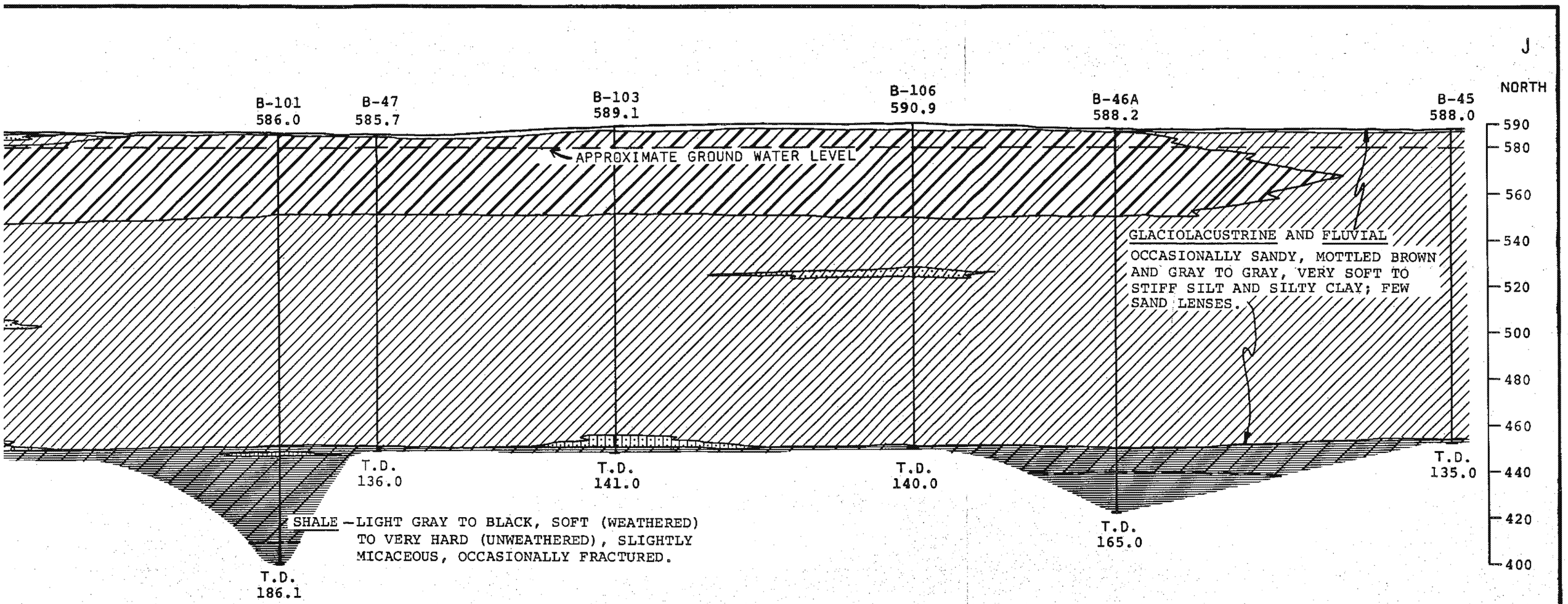
10 0 10 20 30 40 50
SCALE IN MILES

BECHTEL
SAN FRANCISCO

BELLE RIVER POWER PLANT
UNITS 1 & 2

BEDROCK GEOLOGY LOWER PENINSULA MICHIGAN

JOB No.	DRAWING No.	REV.
10539	FIGURE 5	0



ND

- Clayey Sand (SC)
- Silty Sand (SM)
- Silt (ML)
- Shale (weathered)

hale (unweathered)

EXPLANATION

B-187 Bechtel borings (1973-1974)

T.D. Total depth drilled (ft)

0 100 200 400 600

SCALE IN FEET

NOTES:

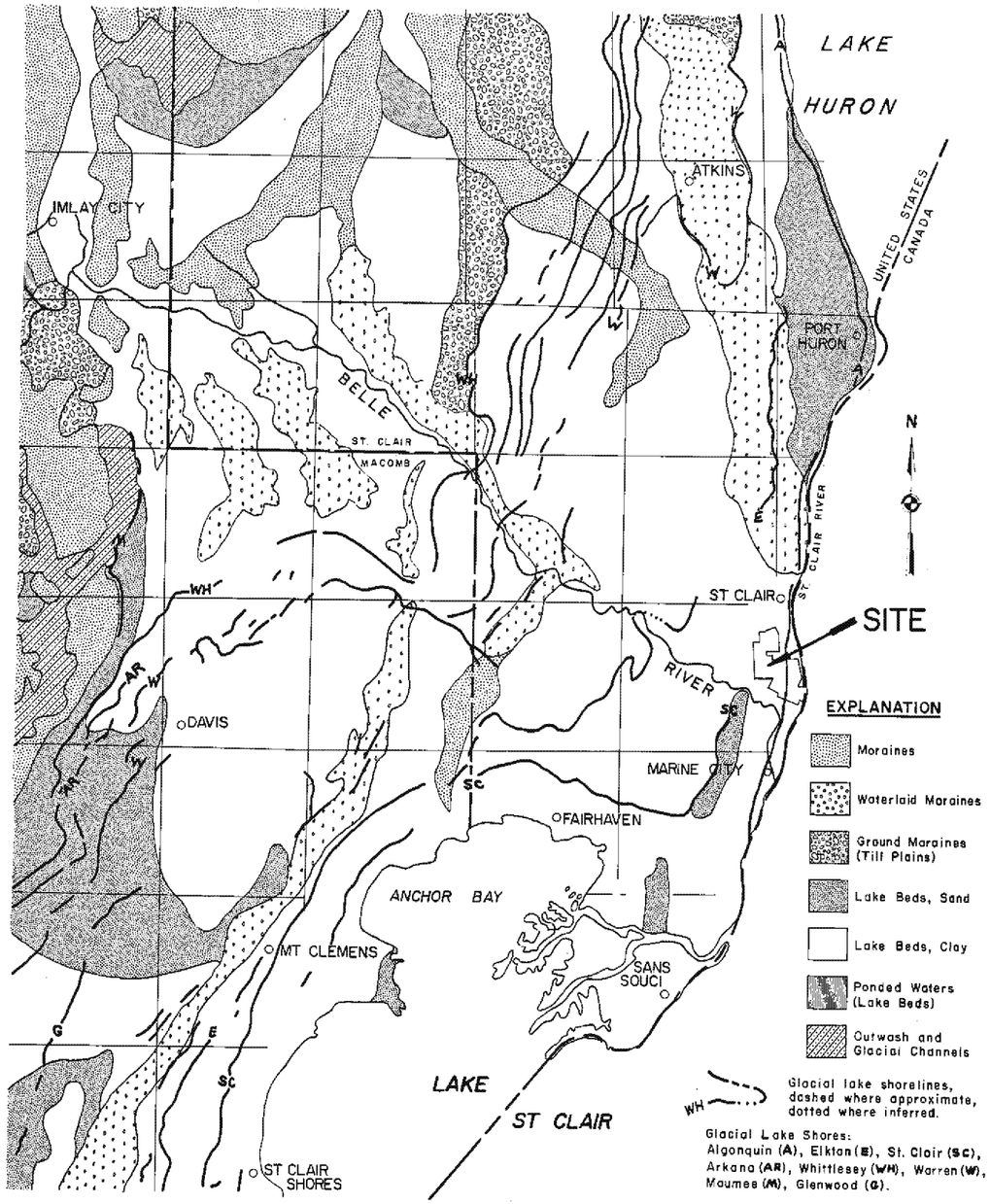
1.) For location of section see Figure 3.
2.) For variation of water table see Section 4.1.3.
3.) For boring logs see Appendix B.
4.) For Geologic description of site see Section 4.1.2.

BECHTEL
ANN ARBOR

BELLE RIVER PLANT
UNIT 1 & 2

SUBSURFACE PROFILE
SECTION J-J'

JOB NO.	DRAWING NO.	REV.
10539	FIGURE 9	0



NOTE:

From Map of Surface Formations of the Southern Peninsula of Michigan, Michigan Department of Conservation, Geologic Survey Division, 1955.

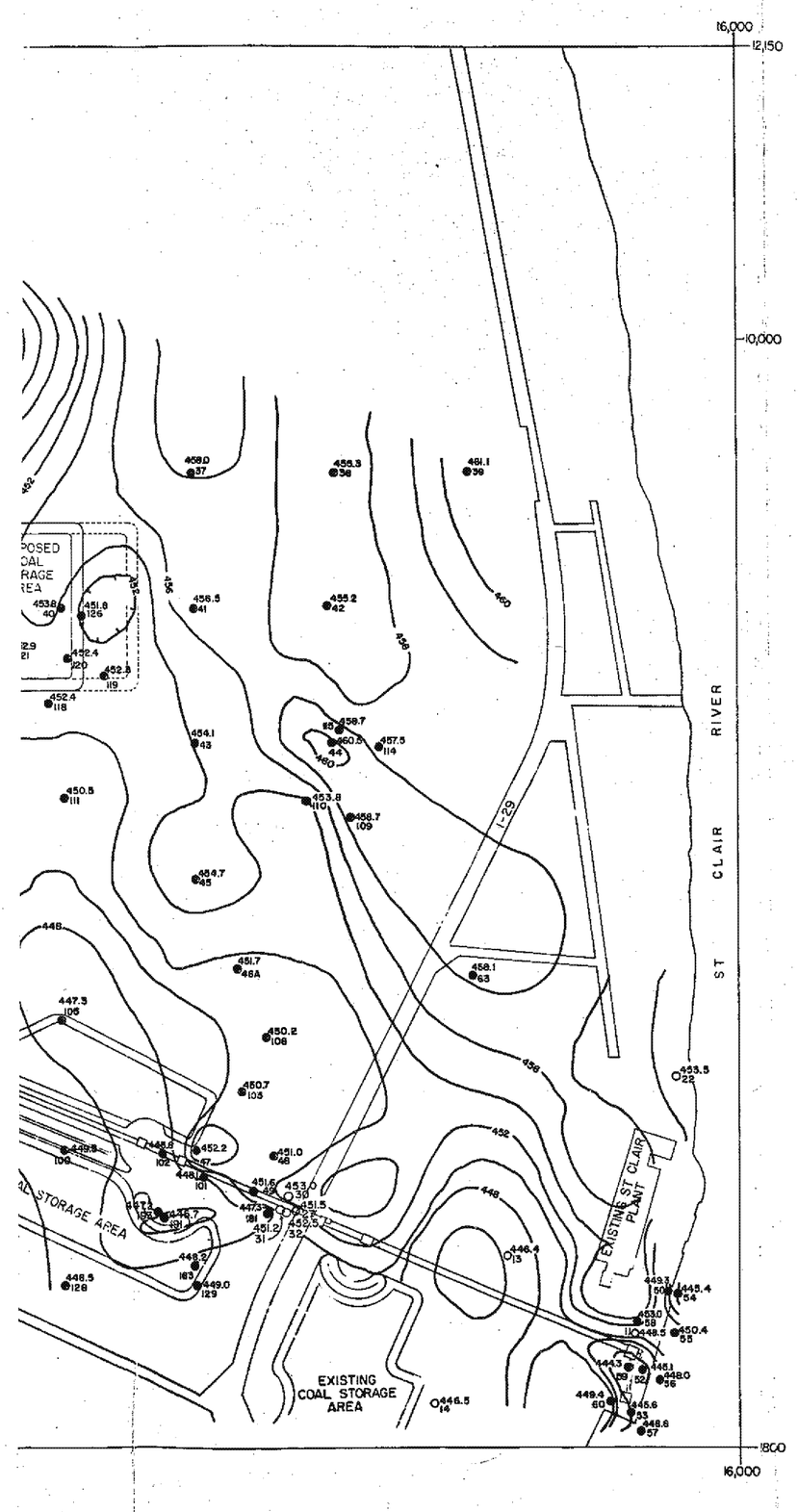
0 1 2 3 4 5
SCALE IN MILES

BECHTEL
ANN ARBOR

BELLE RIVER PLANT
UNIT 1 & 2

SURFICIAL GEOLOGY
ST. CLAIR AND MACOMB COUNTIES

JOB NO.	DRAWING NO.	REV.
10539	FIGURE 6	0



EXPLANATION

434.4 Top of rock elevation (ft)
120 Boring number (present investigation)

452.5 Top of rock elevation (ft)
32 Boring number (previous investigations for St Clair plant)

NOTES:

1. Contours generated from drill hole data by McDonnell Douglas Automation Company's SURMAP computer program.
2. Computer interpretation modified manually to accommodate additional data points.
3. Detail A (plant area) enlarged for clarity, to twice graphic scale shown below.

N

0 200 400 800 1200
SCALE IN FEET

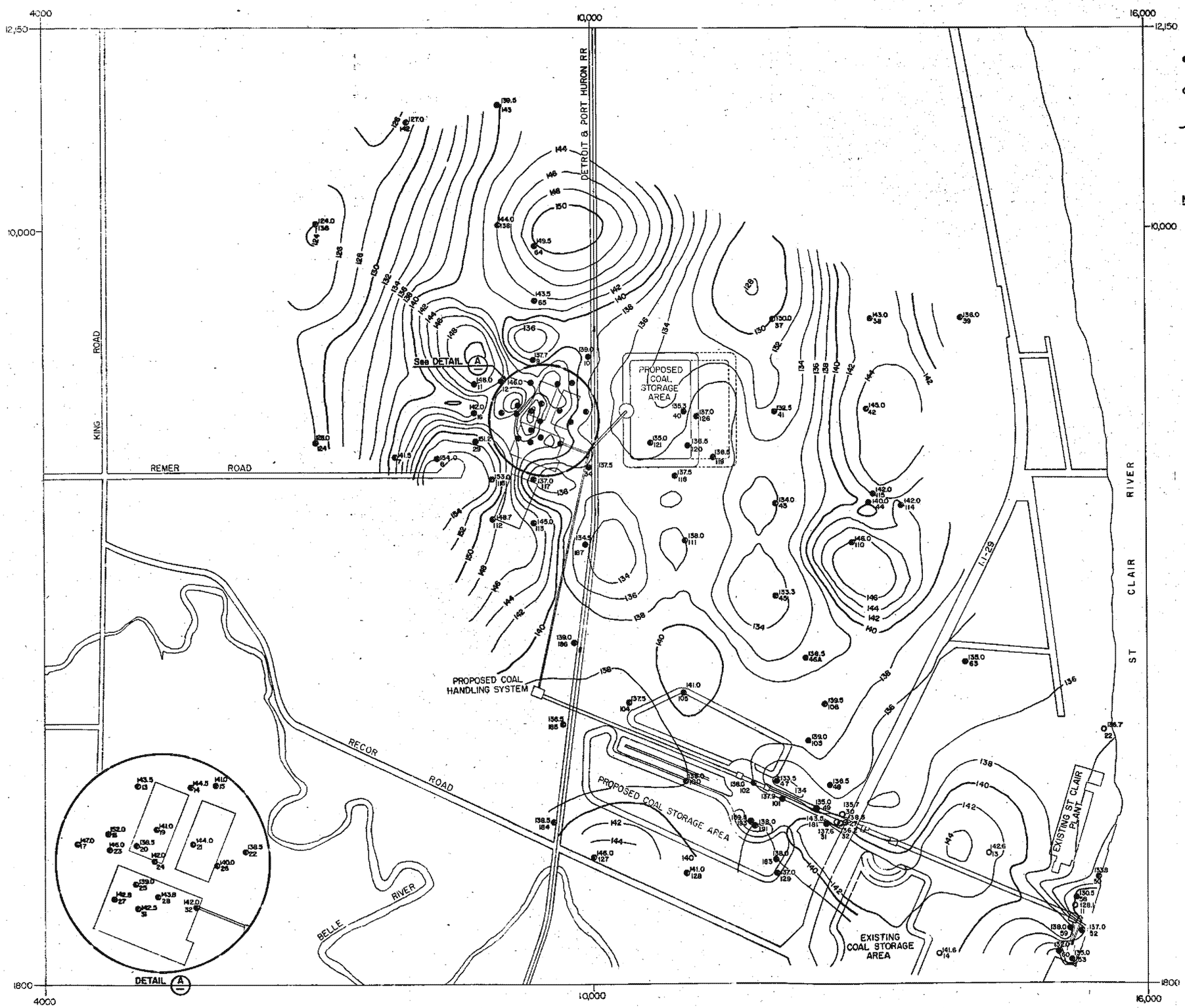
CONTOUR INTERVAL = 2 FT

BECHTEL
ANN ARBOR

BELLE RIVER PLANT
UNIT 1 & 2

TOP OF ROCK CONTOUR MAP

JOB NO.	DRAWING NO.	REV.
10539	FIGURE 7	1



EXPLANATION

- 134.5 / 187 — Overburden thickness (ft) / Boring number (present investigation)
- 156.2 / 32 — Overburden thickness (ft) / Boring number (previous investigations for St. Clair plant)
- 150 — Line through points of equal thickness of overburden in feet

NOTES:

1. Thickness contours generated from drill hole data by McDonnell Douglas Automation Company's SURMAP computer program.
2. Computer interpretation modified manually to accommodate additional data points.
3. Detail A (plant area) enlarged for clarity, to twice graphic scale shown below.

N

0 200 400 800 1200

SCALE IN FEET

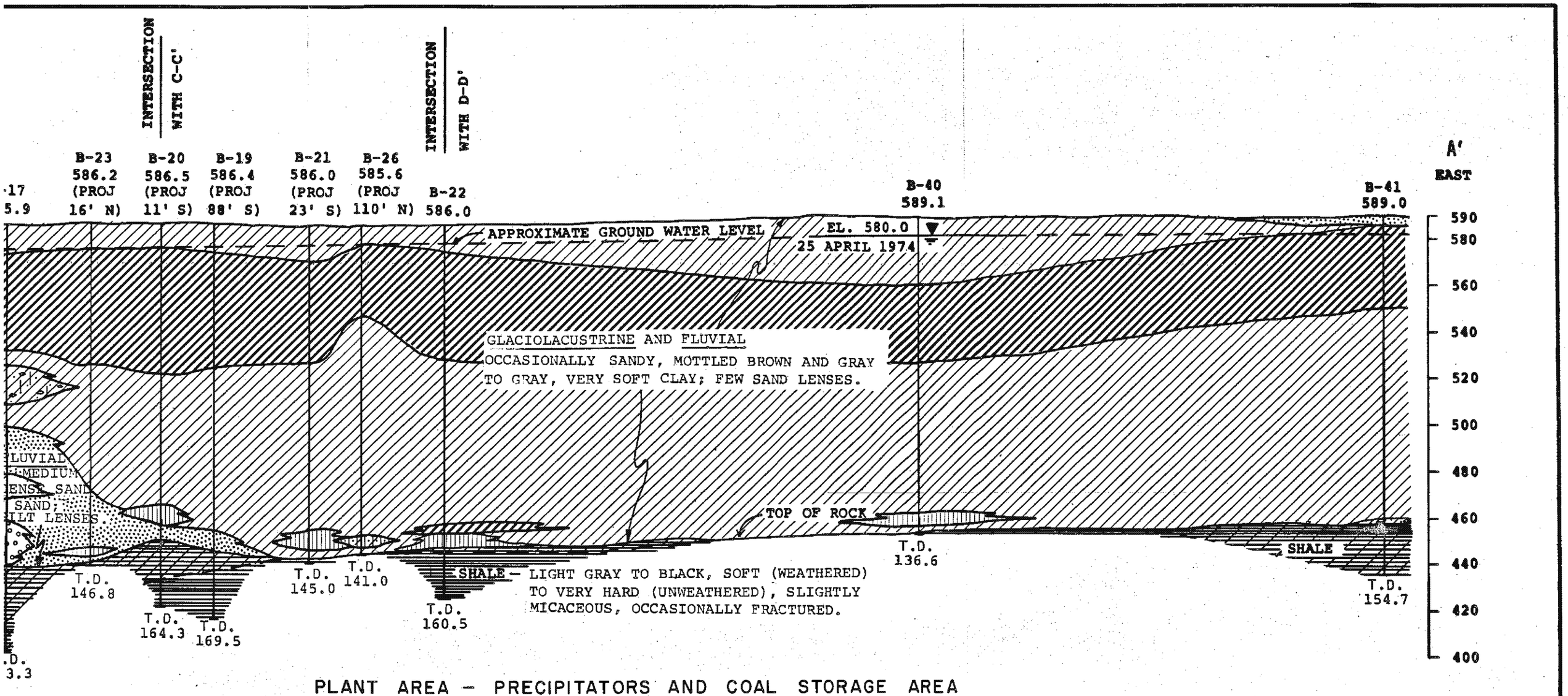
THICKNESS INTERVAL = 2 FT

BECHTEL
ANN ARBOR

BELLE RIVER PLANT
UNIT 1 & 2

OVERBURDEN THICKNESS
CONTOUR MAP

JOB NO.	DRAWING NO.	REV.
10539	FIGURE 8	1



PLANT AREA — PRECIPITATORS AND COAL STORAGE AREA

LEGEND

.)	Clayey Sand (SC)
H)	Silty Sand (SM)
P)	Gravel (GM)
W)	Shale (weathered)
)	Shale (unweathered)

EXPLANATION

B-187 Bechtel borings (1973-1974)

T.D. Total depth drilled (ft)

0 100 200 400 600

SCALE IN FEET

NOTES:

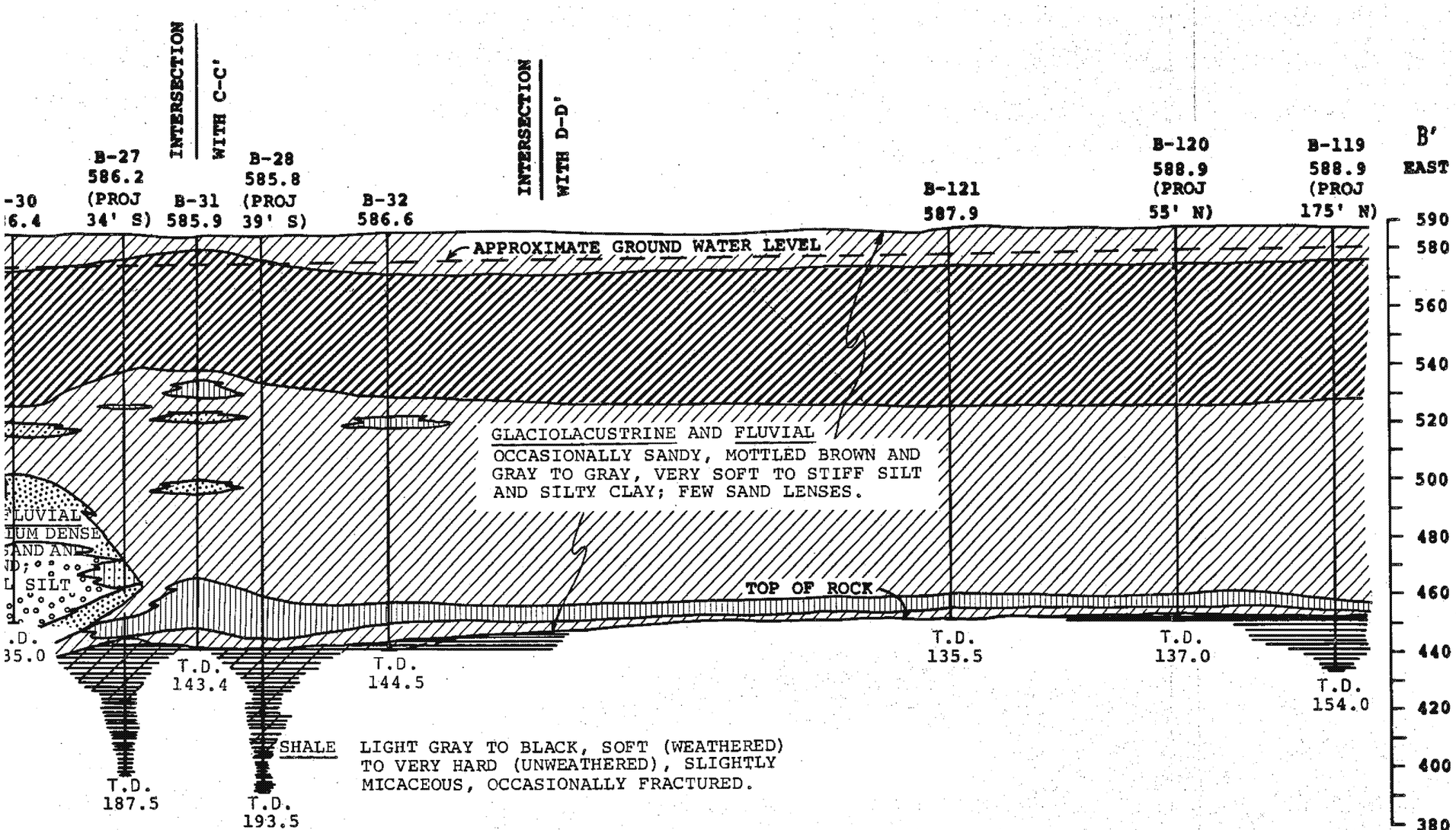
1.) For location of section see Figure 3.
2.) For variation of water table see Section 4.1.3.
3.) For boring logs see Appendix B.
4.) For Geologic description of site see Section 4.1.2.

BECHTEL
ANN ARBOR

BELLE RIVER PLANT
UNIT 1 & 2

SUBSURFACE PROFILE
SECTION A-A'

JOB NO.	DRAWING NO.	REV.
10539	FIGURE 9	0



EXPLANATION

B-187 Bechtel borings (1973-1974)

T.D. Total depth drilled (ft)

0 100 200 400 600

SCALE IN FEET

PLANT AREA — UNITS 1 & 2 COAL STORAGE AREA

LEGEND

- Sand (SW)
- Silt (ML)
- Clayey Sand (SC)
- Silty Sand (SM)
- Shale (weathered)
- Shale (unweathered)

NOTES:

1.) For location of section see Figure 3.

2.) For variation of water table see Section 4.1.3.

3.) For boring logs see Appendix B.

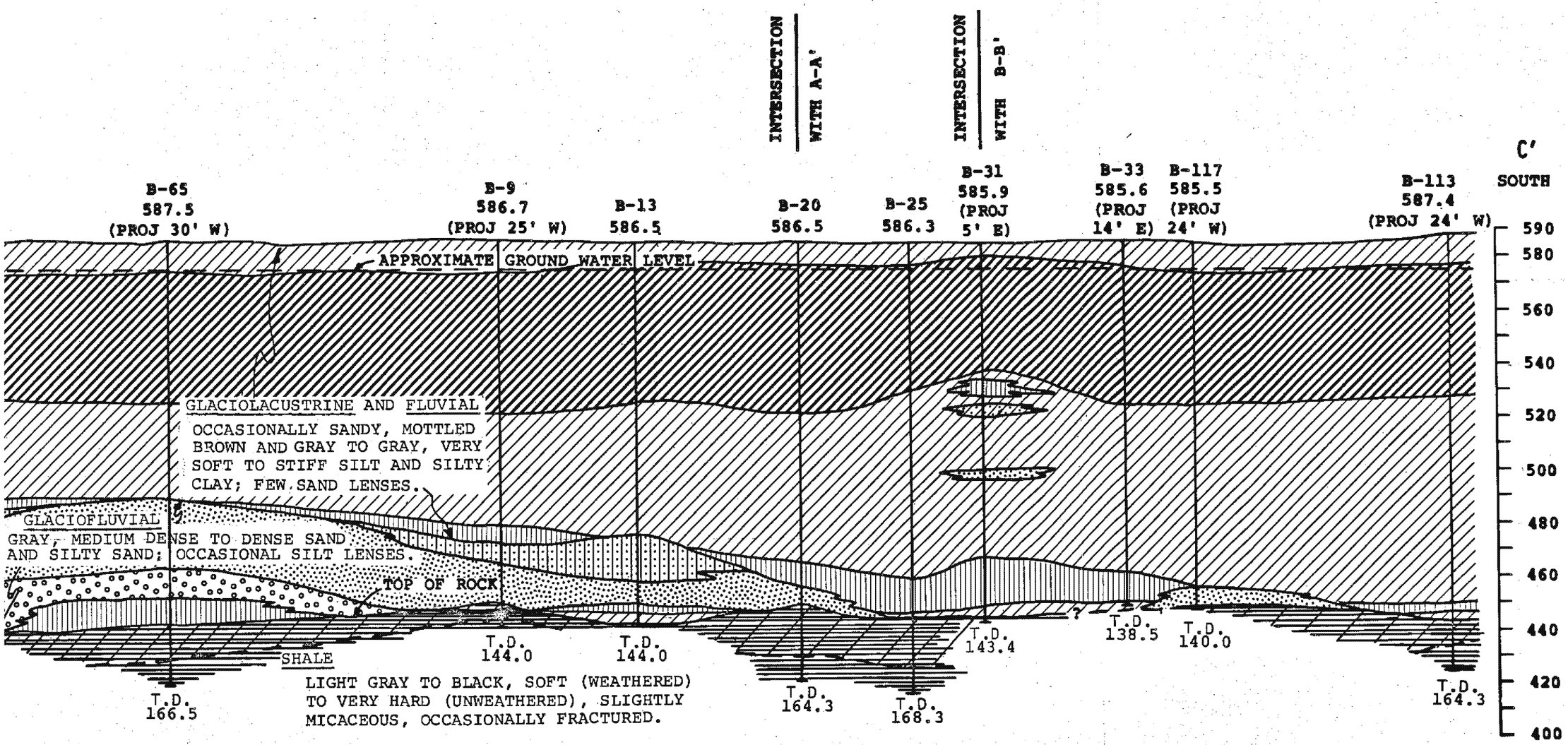
4.) For Geologic description of site see Section 4.1.2.

BECHTEL
ANN ARBOR

BELLE RIVER PLANT
UNIT 1 & 2

SUBSURFACE PROFILE
SECTION B-B'

JOB NO.	DRAWING NO.	REV.
10539	FIGURE 9	0



PLANT AREA - UNIT I AND SWITCHYARD

Silt (ML)

Clayey Sand (SC)

Silty Sand (SM)

Shale (weathered)

Shale (unweathered)

EXPLANATION

B-187 Bechtel borings (1973-1974)

T.D. Total depth drilled (ft)

0 100 200 400 600

SCALE IN FEET

NOTES:

1.) For location of section see Figure 3.

2.) For variation of water table see Section 4.1.3.

3.) For boring logs see Appendix B.

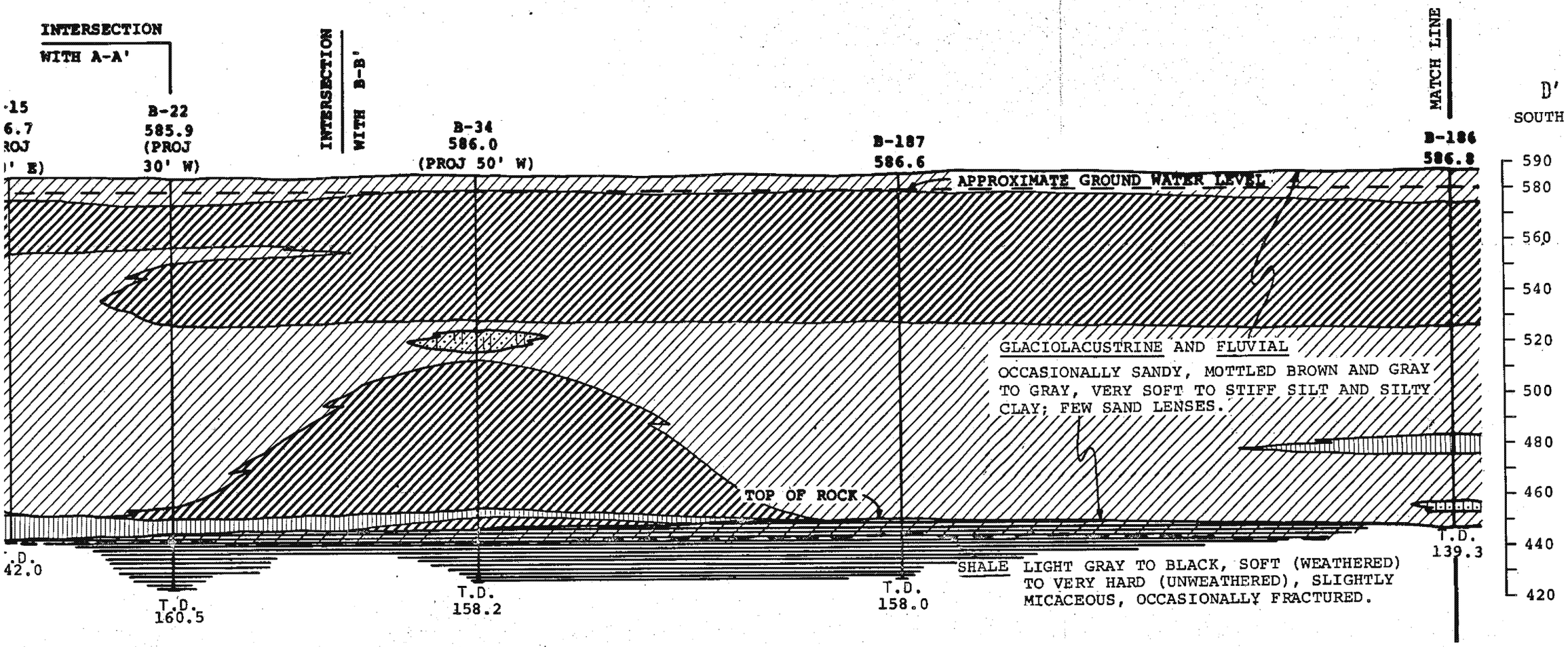
4.) For Geologic description of site see Section 4.1.3.

BECHTEL
ANN ARBOR

BELLE RIVER PLANT
UNIT 1 & 2

SUBSURFACE PROFILE
SECTION C-C'

JOB NO.	DRAWING NO.	REV.
10539	FIGURE 9	0



PLANT AREA AND COAL HANDLING CONVEYOR SYSTEM

Shale (weathered)

Shale (unweathered)

EXPLANATION

B-187 Bechtel borings (1973-1974)

T.D. Total depth drilled (ft)

(SC)

(SM)

0 100 200 400 600

SCALE IN FEET

NOTES:

1.) For location of section see Figure 3.

2.) For variation of water table see Section 4.1.3.

3.) For boring logs see Appendix B.

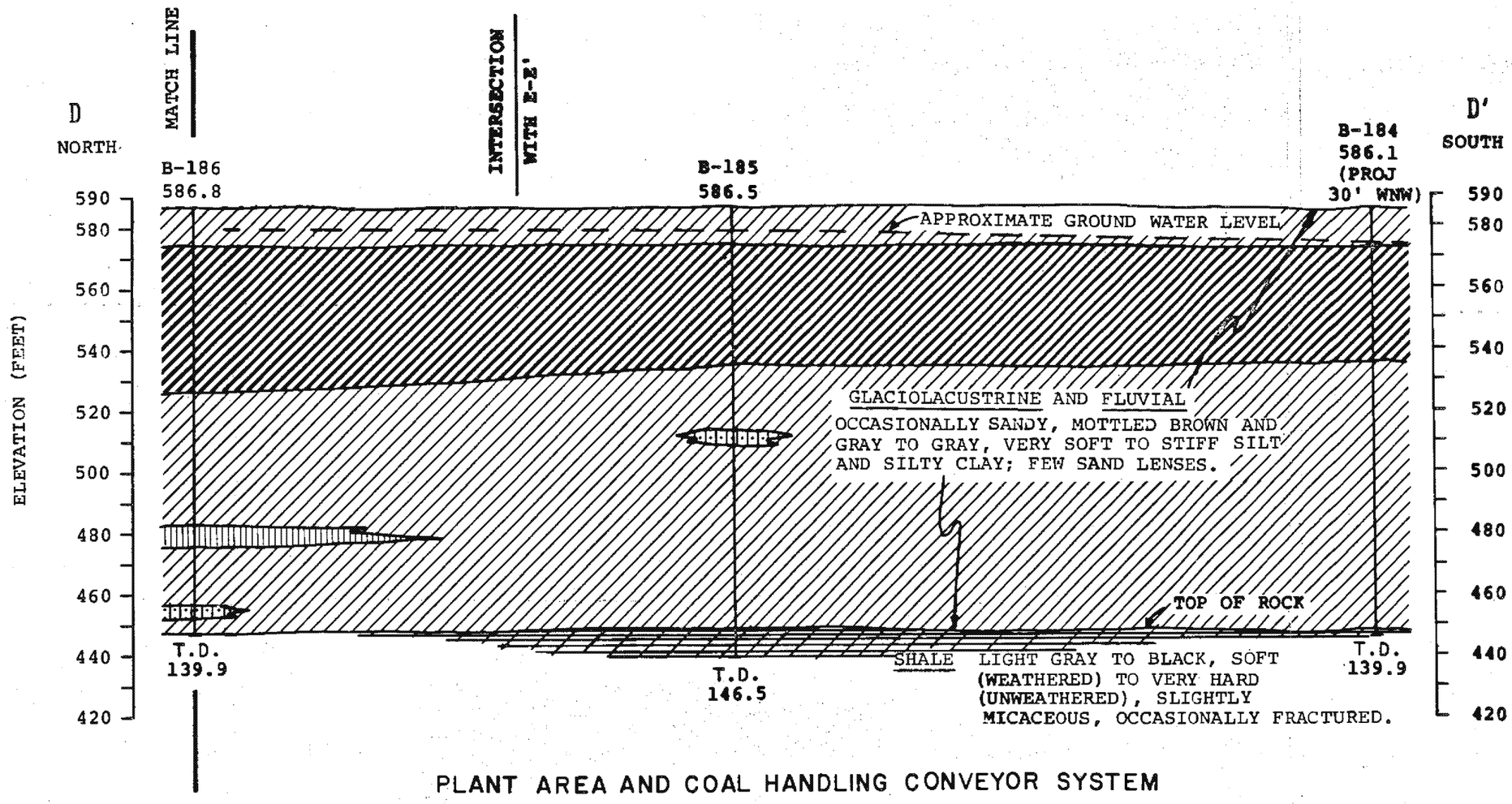
4.) For Geologic description of site see Section 4.1.2.

BECHTEL
ANN ARBOR

BELLE RIVER PLANT
UNIT 1 & 2

SUBSURFACE PROFILE
SECTION D-D'
SHEET 1 OF 2

JOB NO.	DRAWING NO.	REV.
10539	FIGURE 9	0



PLANT AREA AND COAL HANDLING CONVEYOR SYSTEM

LEGEND

- Clay (CL)
- Clay (CH)
- Silt (ML)
- Silty Sand (SM)
- Shale (weathered)

EXPLANATION

B-187 Bechtel borings (1973-1974)

T.D. Total depth drilled (ft)

0 100 200 400 600

SCALE IN FEET

NOTES:

1.) For location of section see Figure 3.

2.) For variation of water table see Section 4.1.3.

3.) For boring logs see Appendix B.

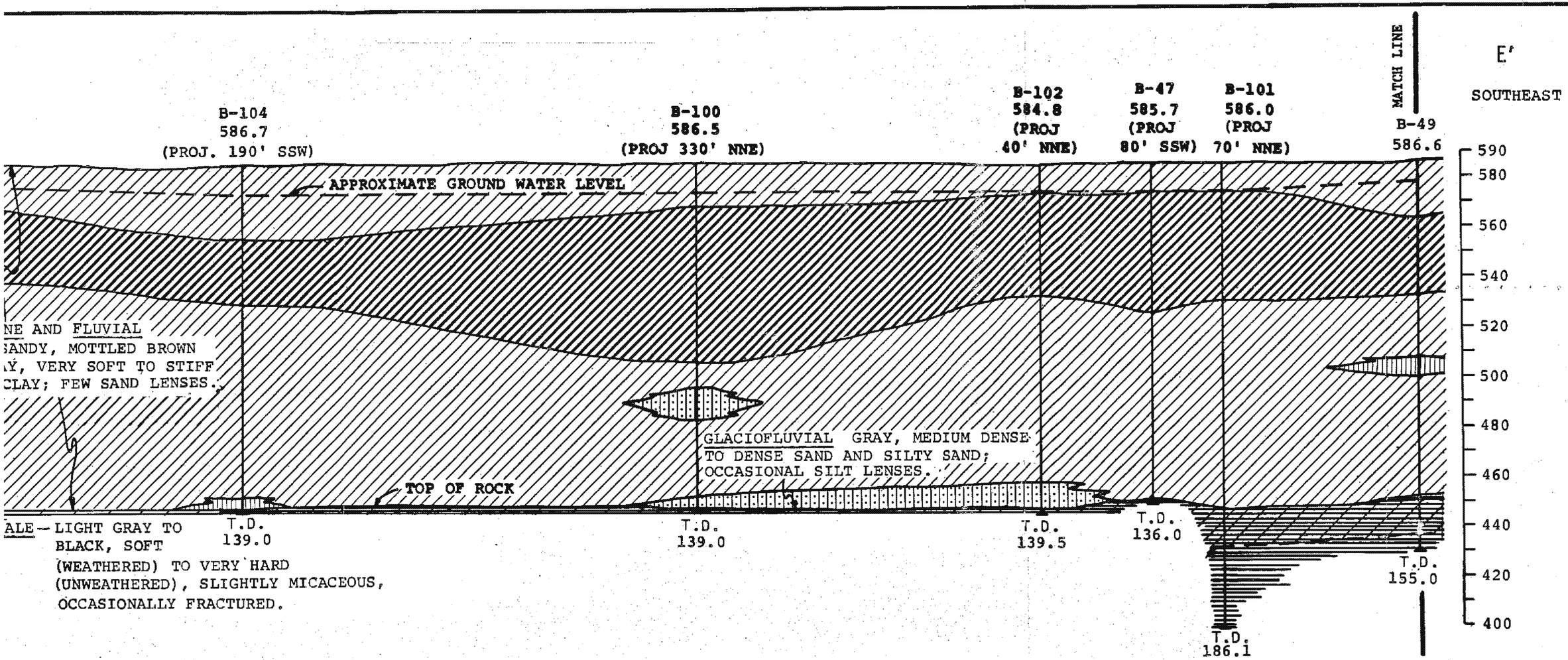
4.) For Geologic description of site see Section 4.1.2.

BECHTEL
ANN ARBOR

BELLE RIVER PLANT
UNIT 1 & 2

SUBSURFACE PROFILE
SECTION D-D'
SHEET 2 OF 2

JOB NO.	DRAWING NO.	REV.
10539	FIGURE 9	0



COAL HANDLING CONVEYOR SYSTEM AND COAL STORAGE AREAS

EXPLANATION

B-187 Bechtel borings (1973-1974)

T.D. Total depth drilled (ft)

l (SM)

thered)

eathered)

0 100 200 400 600

SCALE IN FEET

NOTES:

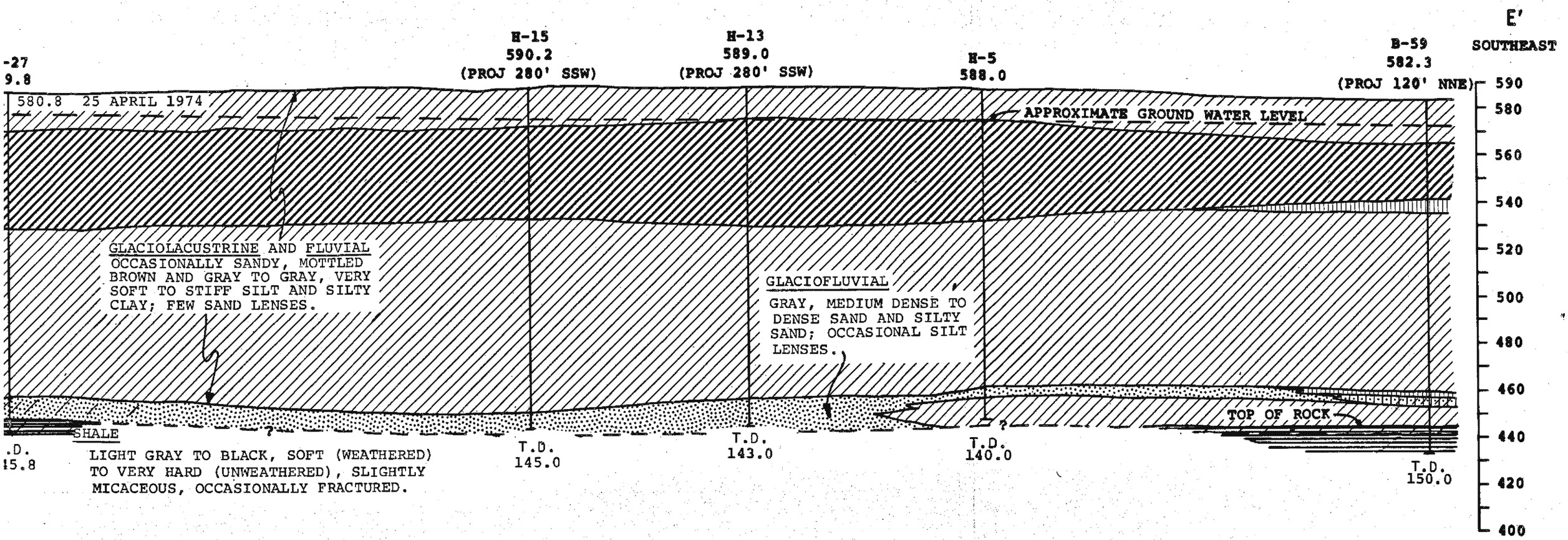
1.) For location of section see Figure 3.
2.) For variation of water table see Section 4.1.3.
3.) For boring logs see Appendix B.
4.) For Geologic description of site see Section 4.1.2.

BECHTEL
ANN ARBOR

BELLE RIVER PLANT
UNIT 1 & 2

SUBSURFACE PROFILE
SECTION E-E'
SHEET 1 OF 2

JOB NO.	DRAWING NO.	REV.
10539	FIGURE 9	0



COAL HANDLING CONVEYOR SYSTEM AND COAL STORAGE AREAS

END

- Clayey Sand (SC)
- Silty Sand (SM)
- Shale (weathered)
- Shale (unweathered)

EXPLANATION

B-187 Bechtel borings (1973-1974)

H-15 Housel borings (1950-1967)

T.D. Total depth drilled (ft)

0 100 200 400 600

SCALE IN FEET

NOTES:

1.) For location of section see Figure 3.

2.) For variation of water table see Section 4.1.3.

3.) For boring logs see Appendix B.

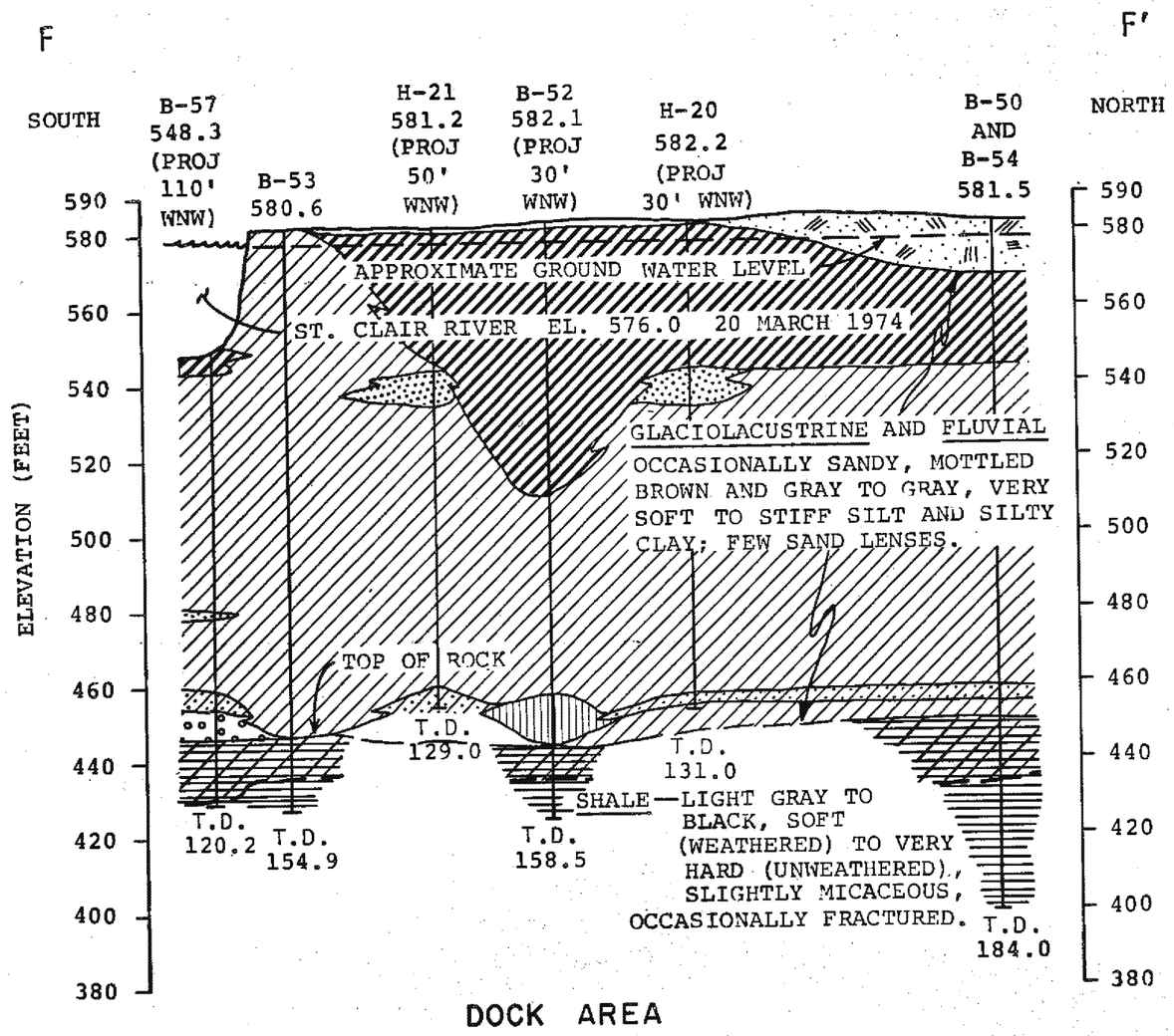
4.) For Geologic description of site see Section 4.1.2.

BECHTEL
ANN ARBOR

BELLE RIVER PLANT
UNIT 1 & 2

SUBSURFACE PROFILE
SECTION E-E'
SHEET 2 OF 2

JOB NO.	DRAWING NO.	REV.
10539	FIGURE 9	0



DOCK AREA

LEGEND

- Clay (CL)
- Clay (CH)
- Sand (SP)
- Sand (SW)
- Silt (ML)
- Clayey Sand (SC)
- Fill
- Shale (weathered)
- Shale (unweathered)

0 100 200 400 600

SCALE IN FEET

NOTES:

1.) For location of section see Figure 3.
2.) For variation of water table see Section 4.1.3.
3.) For boring logs see Appendix B.
4.) For Geologic description of site see Section 4.1.2.

EXPLANATION

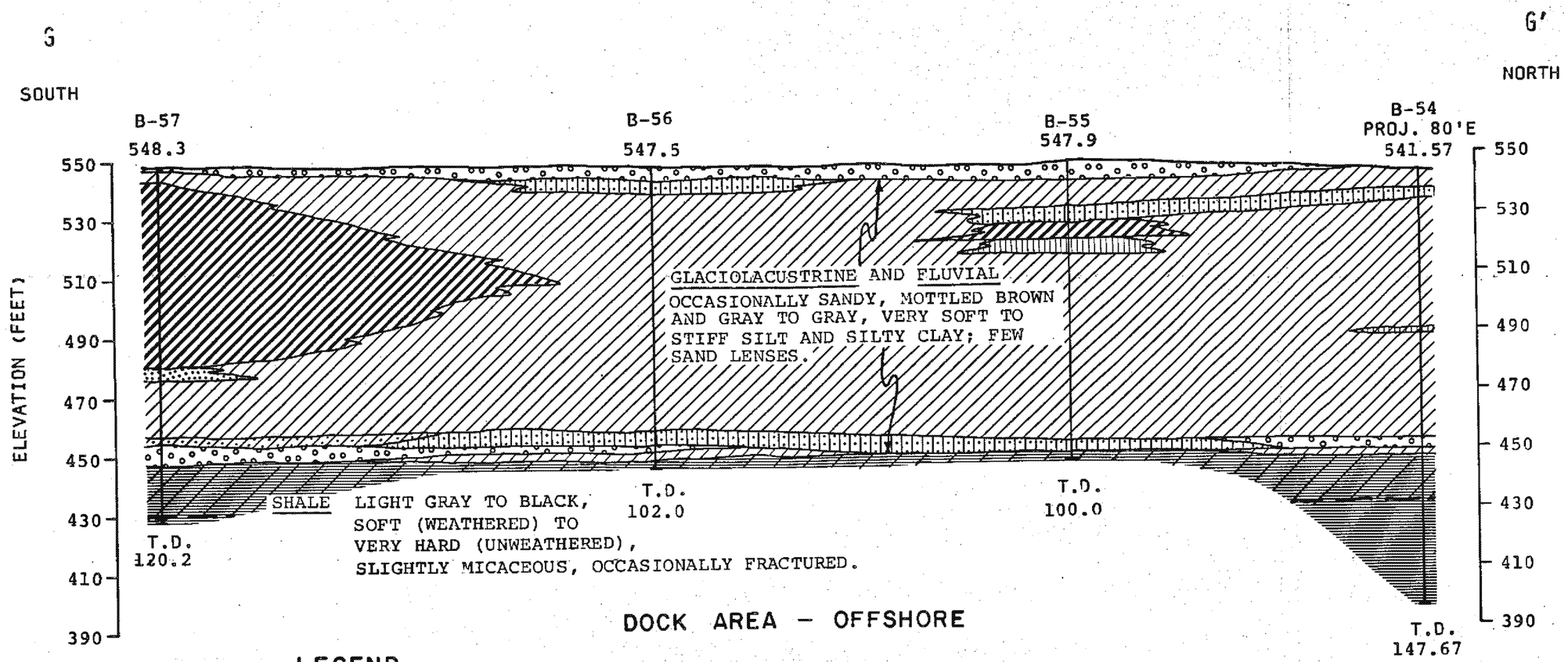
B-187	Bechtel borings (1973-1974)
H-15	Housel borings (1950-1967)
T.D.	Total depth drilled (ft)

BECHTEL
ANN ARBOR

BELLE RIVER PLANT
UNIT 1 & 2

SUBSURFACE PROFILE
SECTION F-F'

JOB NO.	DRAWING NO.	REV.
10539	FIGURE 9	0



DOCK AREA – OFFSHORE

LEGEND

- Clay (CL)
- Clay (CH)
- Sand (SP)
- Sand (SW)
- Silt (ML)
- Clayey Sand (SC)
- Silty Sand (SM)
- Shale (weathered)
- Shale (unweathered)

0 50 100 200 300

SCALE IN FEET

EXPLANATION

B-187 Bechtel borings (1973-1974)

T.D. Total depth drilled (ft)

NOTES:

1.) For location of section see Figure 3.

2.) Depth of the St. Clair River water is approximately 31 feet throughout this section.

3.) For boring logs see Appendix B.

4.) For Geologic description of site see Section 4.1.2.

BECHTEL
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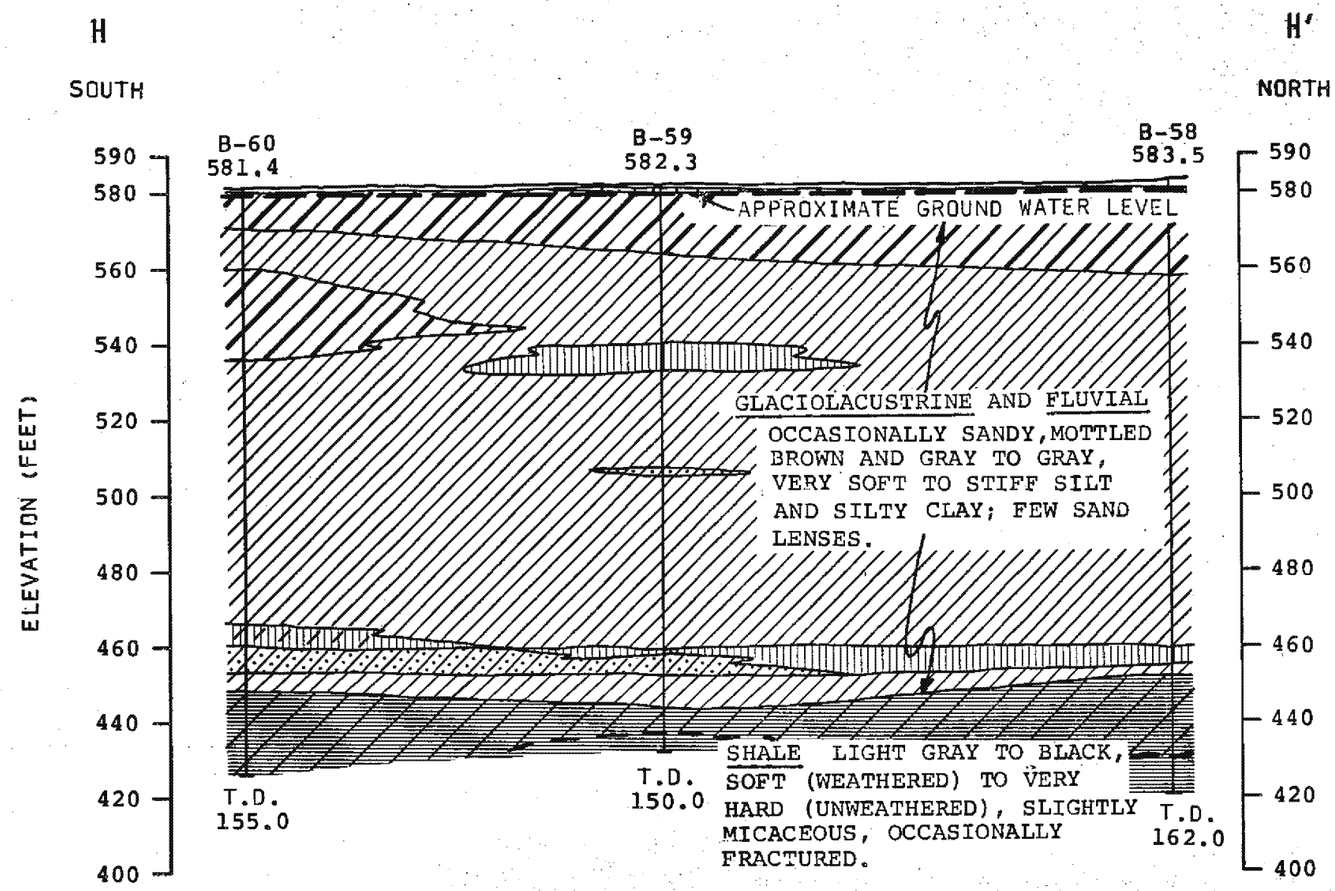
BELLE RIVER PLANT
UNIT 1 & 2

SUBSURFACE PROFILE
SECTION G-G'

JOB NO.	DRAWING NO.	REV.
10539	FIGURE 9	0



DOCK AREA – TRANSFER HOUSES 1 & 2

LEGEND

- Clay (CL)
- Clay (CL-CH)
- Clayey Sand (SC)
- Silt (ML)
- Sand (SP)
- Shale (weathered)
- Shale (unweathered)

0 50 100 200 300

SCALE IN FEET

EXPLANATION

B-187 Bechtel borings (1973-1974)

T.D. Total depth drilled (ft)

NOTES:

1.) For location of section see Figure 3.

2.) For variation of water table see Section 4.1.3.

3.) For boring logs see Appendix B.

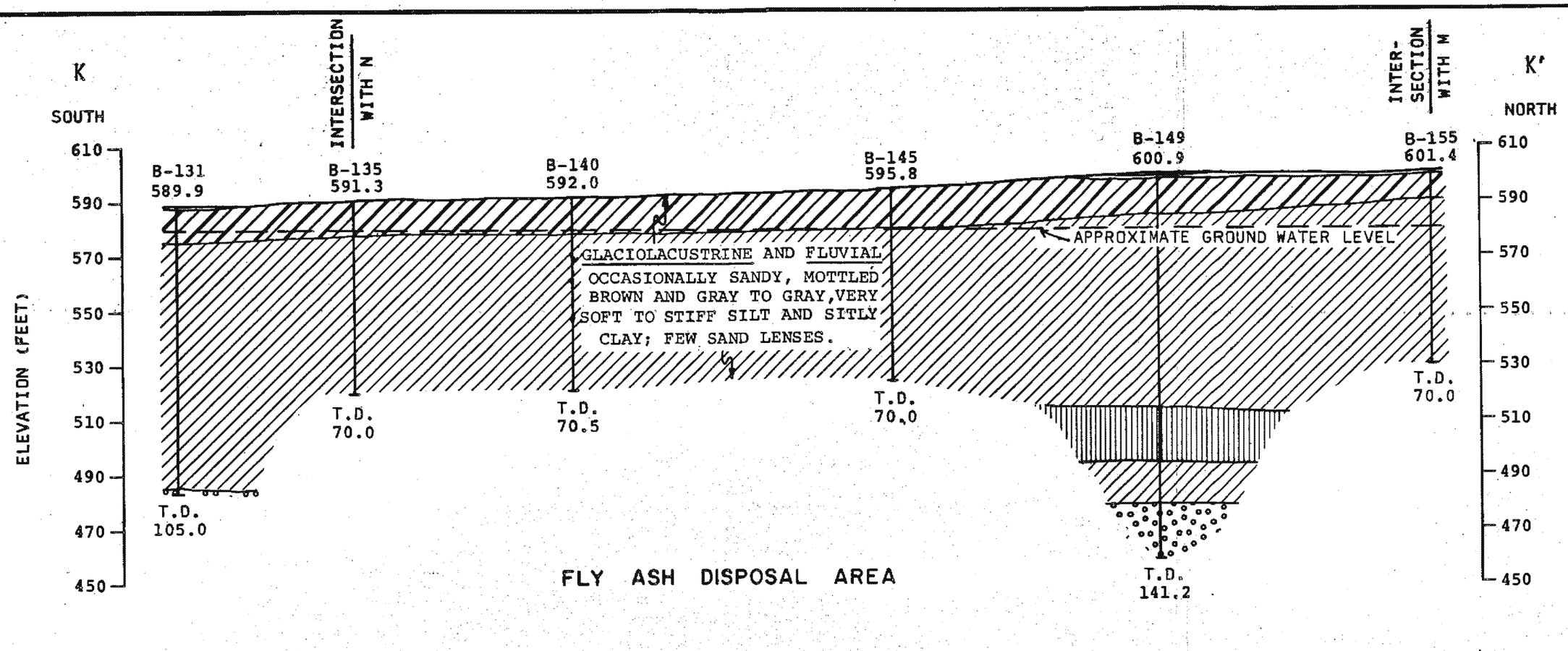
4.) For Geologic description of site see Section 4.1.2.

BECHTEL
ANN ARBOR

BELLE RIVER PLANT
UNIT 1 & 2

SUBSURFACE PROFILE
SECTION H-H'

JOB NO.	DRAWING NO.	REV.
10539	FIGURE 9	0



LEGEND

- Clay (CL)
- Clay (CL-CH)
- Sand (SW)
- Silt (ML)

EXPLANATION

B-187 Bechtel borings (1973-1974)

T.D. Total depth drilled (ft)

0 200 400 800 1200

SCALE IN FEET

NOTES:

1.) For location of section see Figure 4.
2.) For variation of water table see Section 4.1.3.
3.) For boring logs see Appendix B.
4.) For Geologic description of site see Section 4.1.2.

BECHTEL
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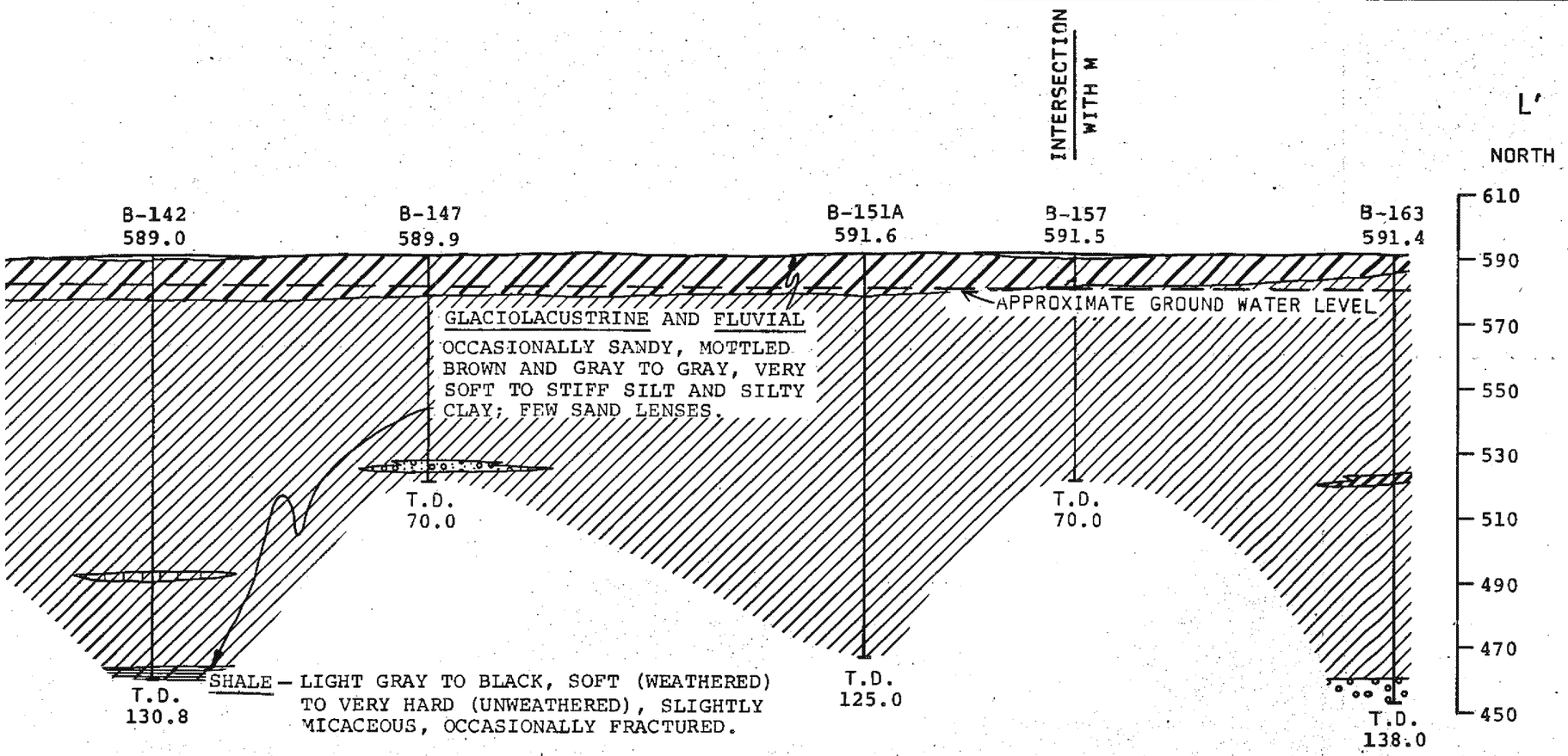
BELLE RIVER PLANT
UNIT 1 & 2

SUBSURFACE PROFILE
SECTION K-K'

JOB NO.	DRAWING NO.	REV.
10539	FIGURE 9	0



FLY ASH DISPOSAL AREA

NOTES:

1.) For location of section see Figure 4.
2.) For variation of water table see Section 4.1.3.
3.) For boring logs see Appendix B.
4.) For Geologic description of site see Section 4.1.2.

0 200 400 800 1200

SCALE IN FEET

GEND

Sand (SW)

Silt (ML)

Shale (weathered)

EXPLANATION

B-187 Bechtel borings (1973-1974)

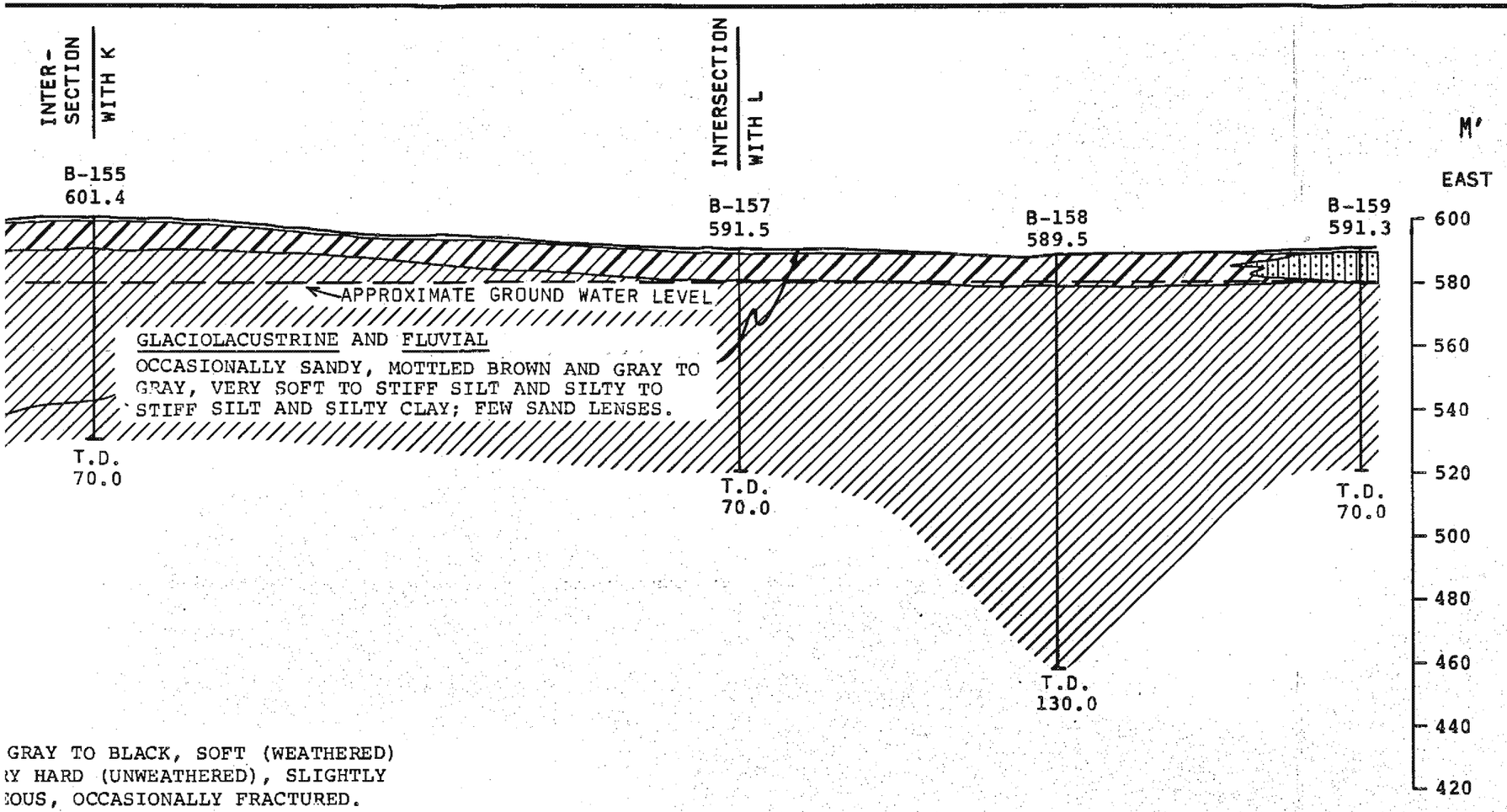
T.D. Total depth drilled (ft)

BECHTEL
ANN ARBOR

BELLE RIVER PLANT
UNIT 1 & 2

SUBSURFACE PROFILE
SECTION L-L'

JOB NO.	DRAWING NO.	REV.
10539	FIGURE 9	0



FLY ASH DISPOSAL AREA

NOTES:

1.) For location of section see Figure 4.
2.) For variation of water table see Section 4.1.3.
3.) For boring logs see Appendix B.
4.) For Geologic description of site see Section 4.1.2.

0 200 400 800 1200

SCALE IN FEET

LEGEND

ay (CL)
ay (CH)
ay (CL-CH)
ind (SP)
Silt (ML)
Silty Sand (SM)
Clayey Sand (SC)
Shale (weathered)

EXPLANATION

B-187 Bechtel borings (1973-1974)

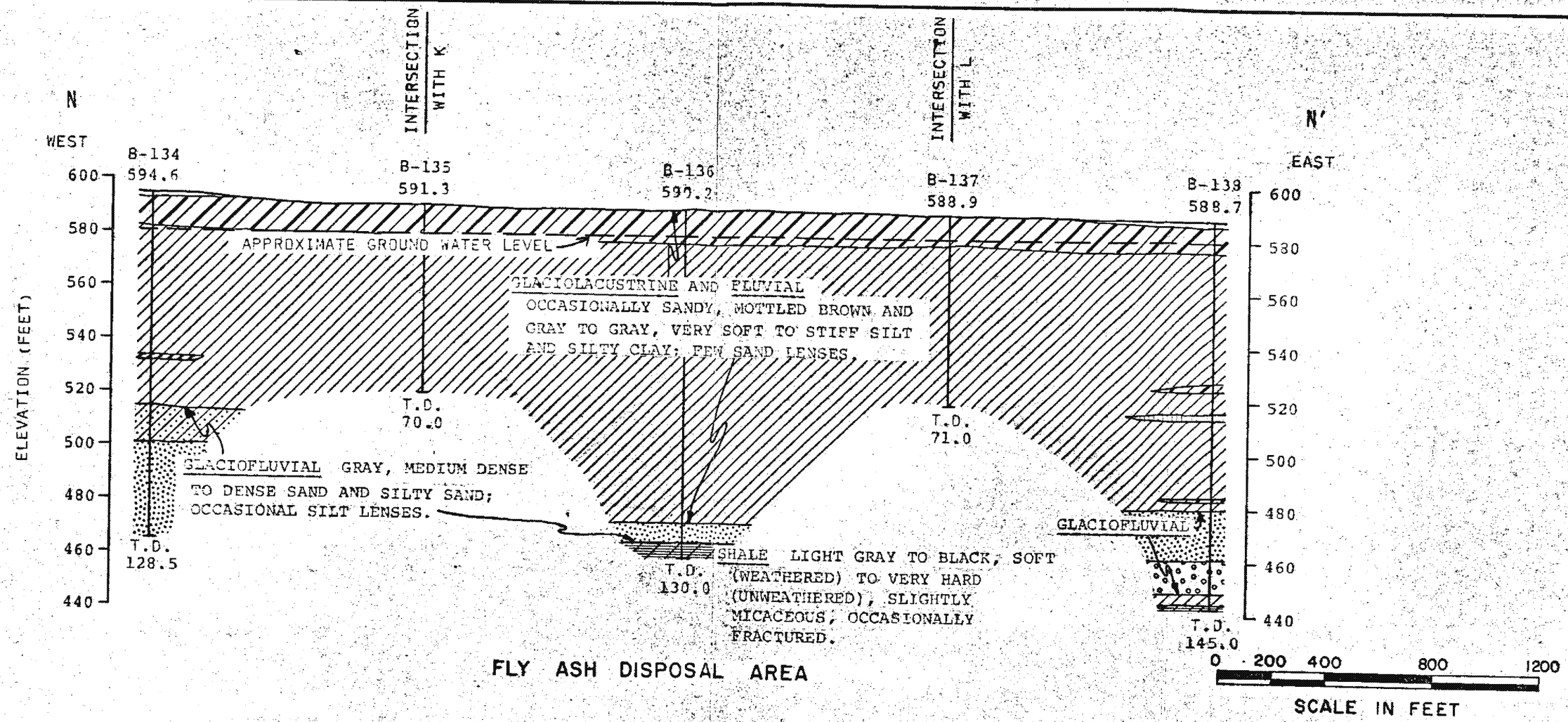
T.D. Total depth drilled (ft)

BECHTEL
ANN ARBOR

BELLE RIVER PLANT
UNIT 1 & 2

SUBSURFACE PROFILE
SECTION M-M'

JOB NO.	DRAWING NO.	REV.
10539	FIGURE 9	0



FLY ASH DISPOSAL AREA

LEGEND

- Clay (CL)
- Clay (CH)
- Clay (CL-CH)
- Sand (SP)
- Sand (SW)
- Silt (ML)
- Clayey Sand (SC)
- Shale (weathered)

EXPLANATION

B-187 Bechtel borings (1973-1974)

T.D. Total depth drilled (ft)

NOTES:

1.) For location of section see Figure 4.
2.) For variation of water table see Section 4.1.3.
3.) For boring logs see Appendix B.
4.) For Geologic description of site see Section 4.1.2.

NO.	DATE	REVISIONS	BY	CK'D	GROUP SUPV.	ENG'R	PROJ. ENG'R	MICRO FILM
A	8-26-76	ISSUED FOR PROJ USE						
A	6-13-76	ISSUED FOR FINAL EVAL.						

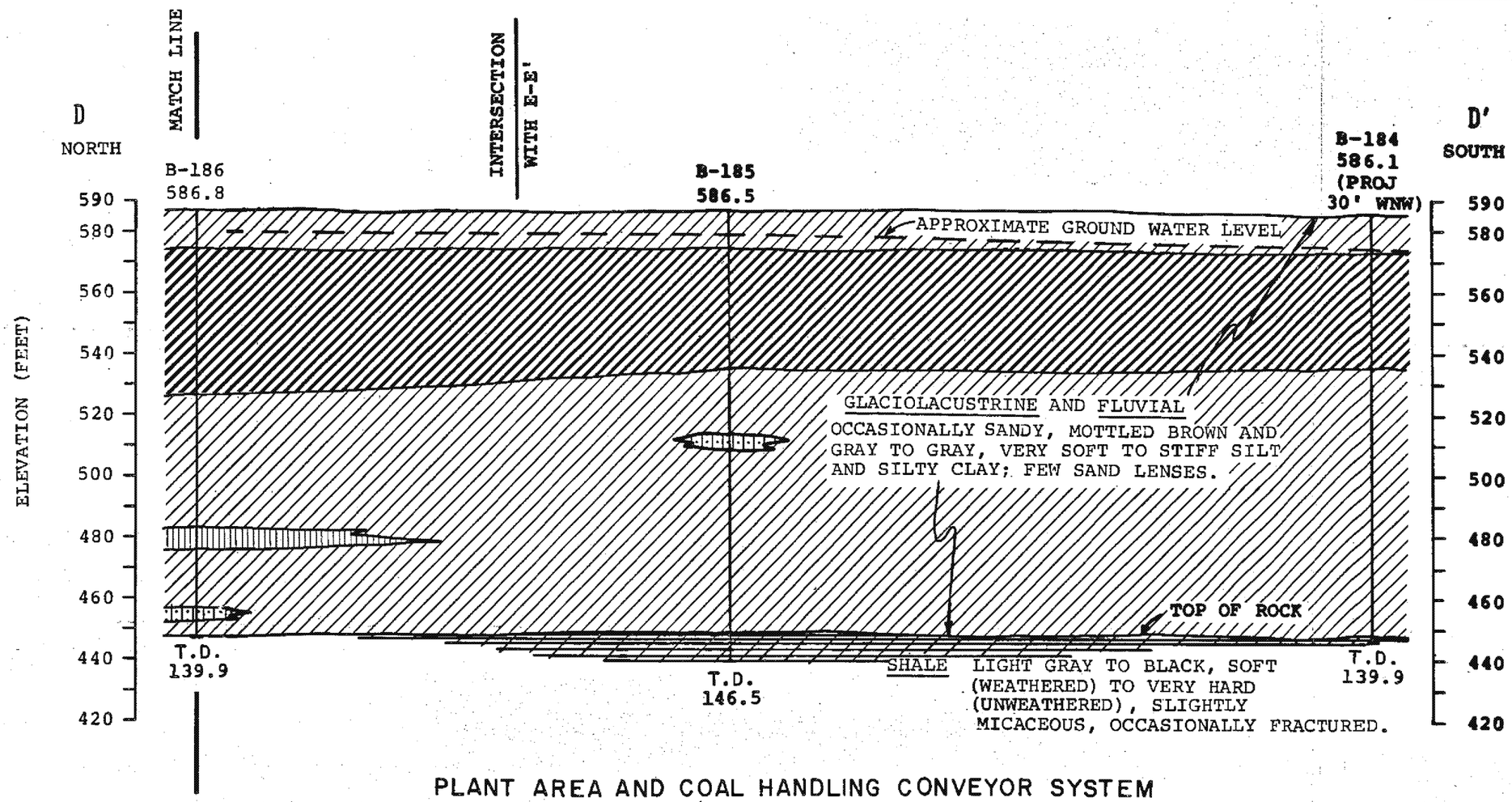
SCALE 1" = 400' DESIGNED DRS/JBG DRAWN ARR

BECHTEL
ANN ARBOR

BELLE RIVER PLANT
UNIT 1 & 2

SUBSURFACE PROFILE
SECTION N-N'

JOB NO.	DRAWING NO.	REV.
10539	FIGURE 9	0



PLANT AREA AND COAL HANDLING CONVEYOR SYSTEM

LEGEND

- Clay (CL)
- Clay (CH)
- Silt (ML)
- Silty Sand (SM)
- Shale (weathered)

EXPLANATION

B-187 Bechtel borings (1973-1974)

T.D. Total depth drilled (ft)

0 100 200 400 600

SCALE IN FEET

NOTES:

1.) For location of section see Figure 3.

2.) For variation of water table see Section 4.1.3.

3.) For boring logs see Appendix B.

4.) For Geologic description of site see Section 4.1.2.

BECHTEL
ANN ARBOR

BELLE RIVER PLANT
UNIT 1 & 2

SUBSURFACE PROFILE
SECTION D-D'
SHEET 2 OF 2

JOB NO.	DRAWING NO.	REV.
10539	FIGURE 9	0

EXPLANATION

- 7 — Basal sand thickness (ft)
- 117 — Boring number (present investigation)
- 3.5 — Basal sand thickness (ft)
- 32 — Boring number (previous investigations for St. Clair Plant)

NOTE:
Detail A (plant area) enlarged for clarity, to twice graphic scale shown below.

N

0 200 400 800 1200
SCALE IN FEET

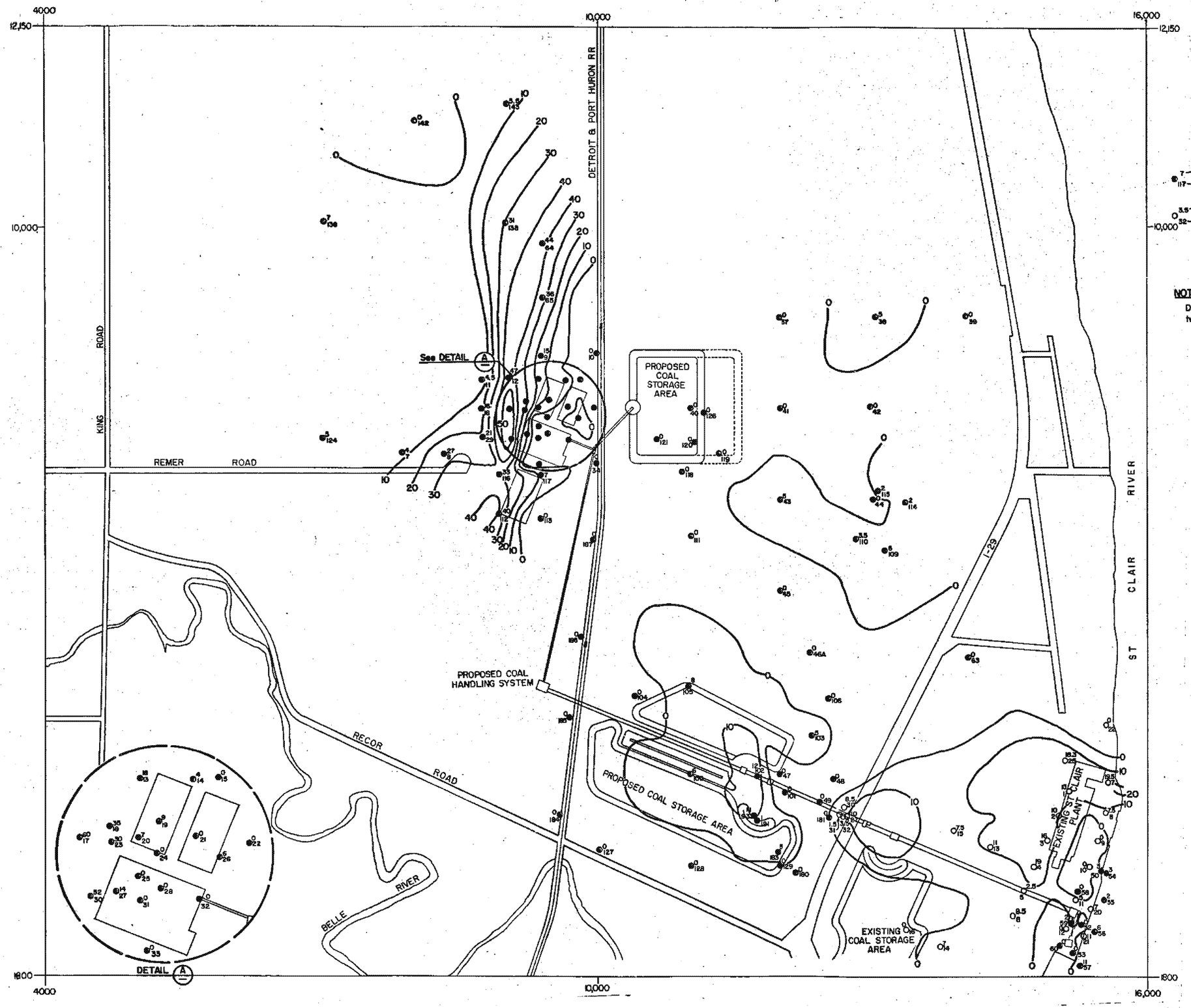
CONTOUR INTERVAL = 10 FT

BECHTEL
ANN ARBOR

BELLE RIVER PLANT
UNIT 1 & 2

BASAL SAND THICKNESS
CONTOUR MAP

JOB NO.	DRAWING NO.	REV.
10539	FIGURE 10	1



EXPLANATION

- 7 — Basal sand thickness (ft)
- 117 — Boring number (present investigation)
- 3.5 — Basal sand thickness (ft)
- 32 — Boring number (previous investigations for St. Clair Plant)

NOTE:
Detail A (plant area) enlarged for clarity, to twice graphic scale shown below.

N

0 200 400 800 1200
SCALE IN FEET

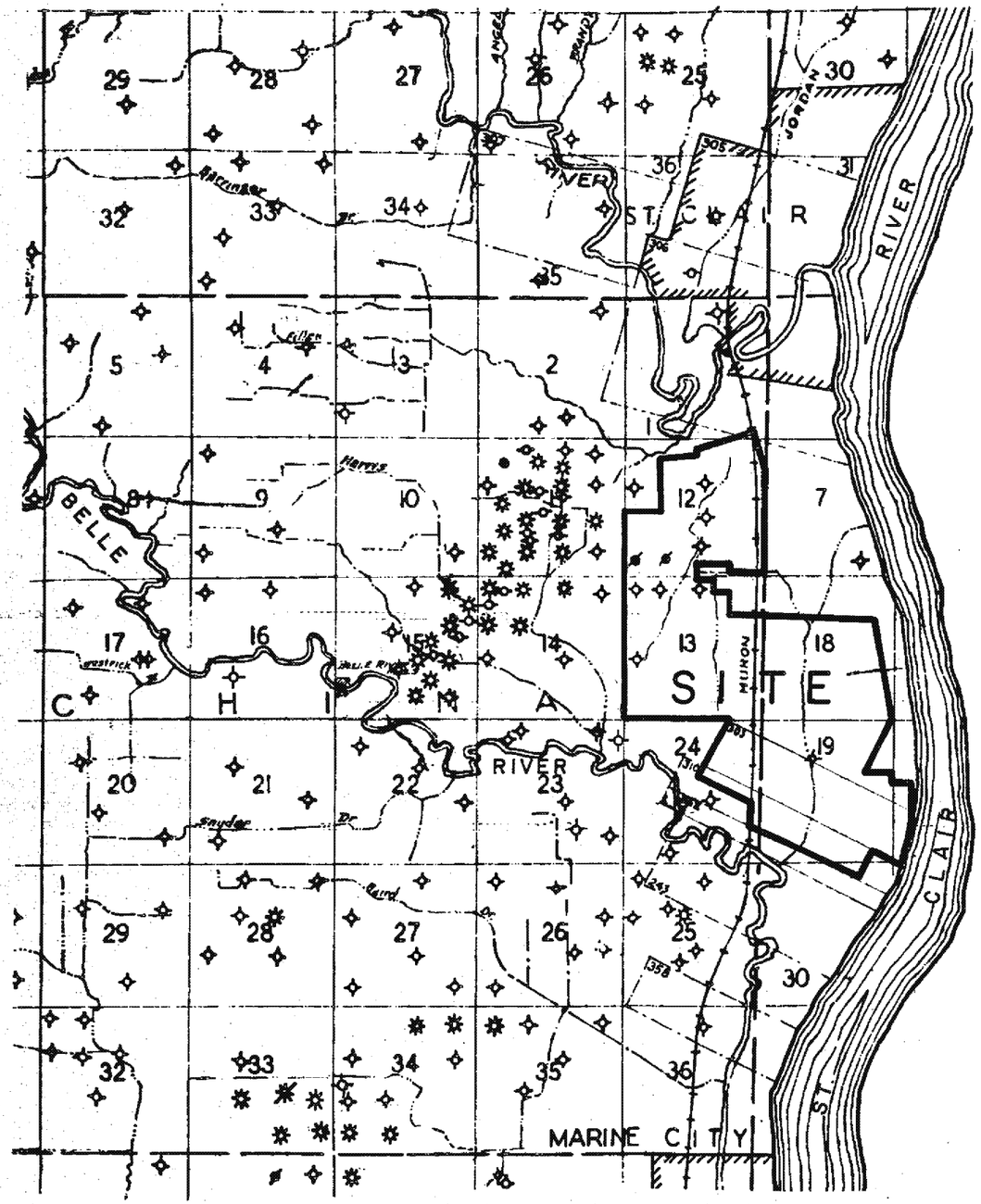
CONTOUR INTERVAL = 10 FT

BECHTEL
ANN ARBOR

BELLE RIVER PLANT
UNIT 1 & 2

BASAL SAND THICKNESS
CONTOUR MAP

JOB NO.	DRAWING NO.	REV.
10539	FIGURE 10	1



EXPLANATION

- Oil Well
- Gas Well
- Dry Hole
- Other
- Abandoned Well

REFERENCE:

Modified from Michigan Geological Survey Oil and Gas Well Map 3689A, St. Clair County.

0 1/2 1 2
SCALE IN MILES

BECHTEL
ANN ARBOR

BELLE RIVER PLANT
UNIT 1 & 2

LOCATION OF OIL AND GAS WELLS

JOB NO.	DRAWING NO.	REV.
10539	FIGURE 12	0

APPROXIMATE DEPTH (FT)	ERA	PERIOD	ROCK GROUPS AND FORMATIONS	GRAPHIC LOG	LITHOLOGY	APPROXIMATE THICKNESS AT SITE
	CENOZOIC ERA	QUATERNARY PERIOD	GLACIAL DRIFT		UNCONSOLIDATED DEPOSITS OF SAND, SILT AND CLAY. TWO MAJOR TYPES OCCUR: GLACIOLACUSTRINE-FLUVIAL CLAYS AND SILTS AND GLACIOFLUVIAL SANDS	133-157 (FT)
	PALEOZOIC	MISS.-DEVONIAN	BEDFORD SHALE		GRAY AND DARK GRAY SHALE	100
			ANTRIM SHALE		BLACK AND DARK BROWN SHALE WITH SOME PYRITE AND MARCASITE	200
		DEVONIAN	TRAVERSE GROUP		GRAY, LIGHT GRAY, AND BROWN CHERTY LIMESTONE WITH BEDS OF GRAY SHALE. GRAY AND BLUE SHALE BELOW WITH MINOR LIMESTONE BEDS	240
			DUNDEE LIMESTONE		BUFF, GRAY, AND BROWNISH-GRAY FINELY CRYSTALLINE LIMESTONE	130
1000			DETROIT RIVER GROUP		BUFF TO WHITE LIMESTONE AND DOLOMITE WITH ANHYDRITE	360
			BOIS BLANC FORMATION		WHITE TO GRAY CHERTY LIMESTONE AND DOLOMITE	90
		SILURIAN	BASS ISLAND GROUP		BUFF TO CREAM DOLOMITE WITH MINOR ANHYDRITE	135
2000			SALINA GROUP		GRAY SHALE WITH SOME DOLOMITE BROWN LIMESTONE AND SALT GRAY SHALE AND SALT BROWN DOLOMITE WITH ANHYDRITE AND SALT	1100
			NIAGARA GROUP		GRAY, TAN, AND BROWN DOLOMITE WITH ANHYDRITE IN TOP SECTION, SHALE BELOW	400
3000			CATARACT GROUP		RED AND BLUE SHALE AND LIGHT GRAY BLUE DOLOMITE	160
		ORDOVICIAN	(UNDIFFERENTIATED)		PRIMARILY DOLOMITE AND SANDSTONE WITH SHALE AND MINOR LIMESTONE	1550
4000		CAMBRIAN	(UNDIFFERENTIATED)		PRIMARILY SANDSTONE WITH LIMESTONE AND DOLOMITE	100
	PRECAMBRIAN				IGNEOUS, METAMORPHIC AND SEDIMENTARY ROCKS	UNKNOWN

EXPLANATION

- Glacial Drift
- Shale
- Limestone
- Cherty Limestone
- Dolomite
- Anhydrite
- Salt
- Sandstone
- Igneous, Metamorphic, and Sedimentary Rock Complex

NOTE:

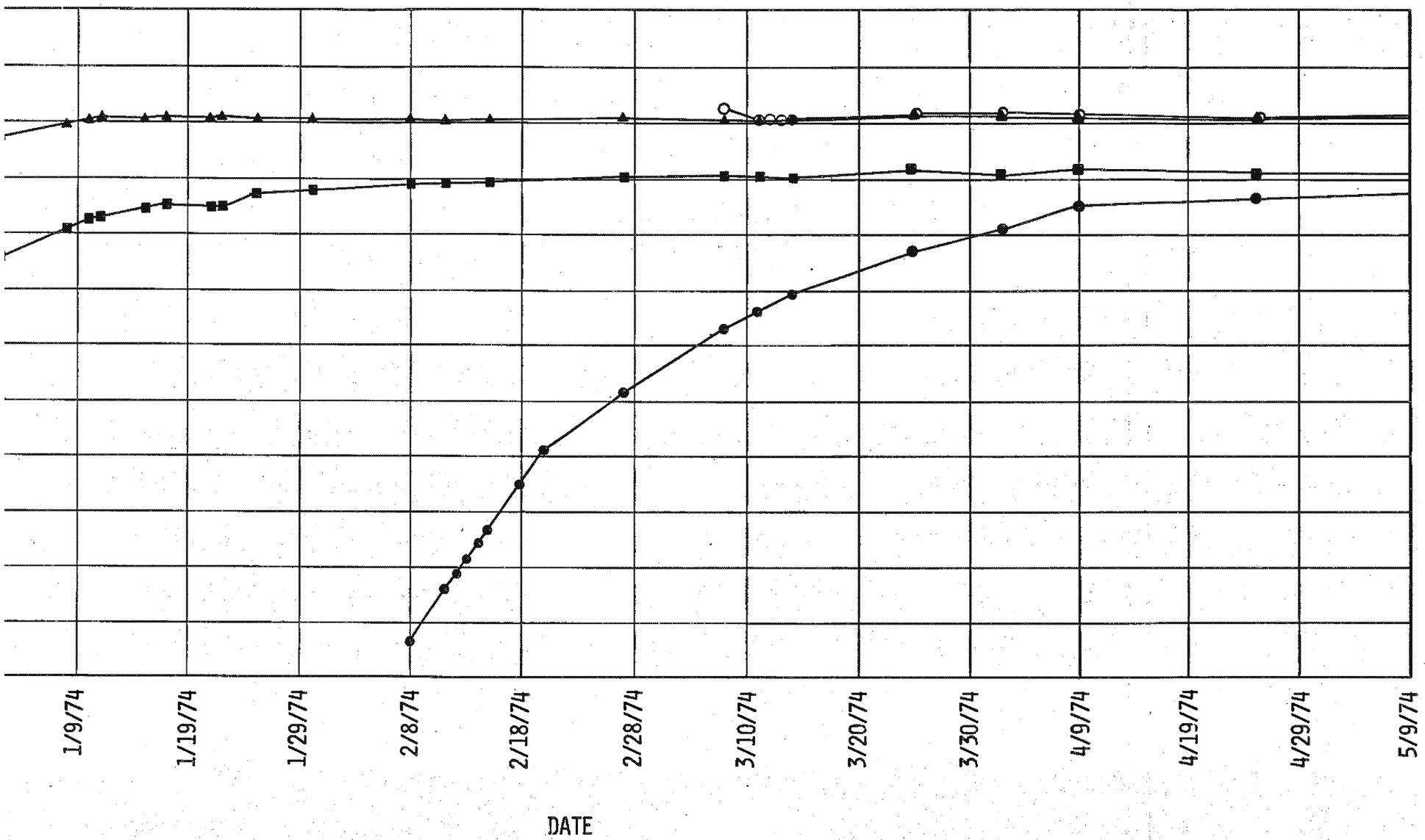
Overburden thickness determined from Bechtel logs. Thickness and description of geologic bedrock units above the Niagara group are based on logs of Wildcat wells drilled in China and East China Townships. These logs are on file with the Michigan Geological Survey in Lansing. Thickness and description of units below the Salina group were interpolated from Stratigraphic Cross-section Michigan Basin, Michigan Basin Geological Society, 1969; and Michigan's Oil and Gas Fields, 1972; Michigan Geological Annual Statistical Summary No. 18, 1973.

BECHTEL
ANN ARBOR

BELLE RIVER PLANT
UNIT 1 & 2

GENERALIZED GEOLOGIC COLUMN
CHINA AND EAST CHINA TOWNSHIPS

JOB NO.	DRAWING NO.	REV.
10539	FIGURE 13	1



EXPLANATION

- ■ Observation Well 7, bottom of screen at Elevation 450.5
- ● Observation Well 24, bottom of screen at Elevation 452.3
- ▲ Observation Well 40, bottom of screen at Elevation 509.1
- ○ Observation Well 181, bottom of screen at Elevation 449.3

NOTE:

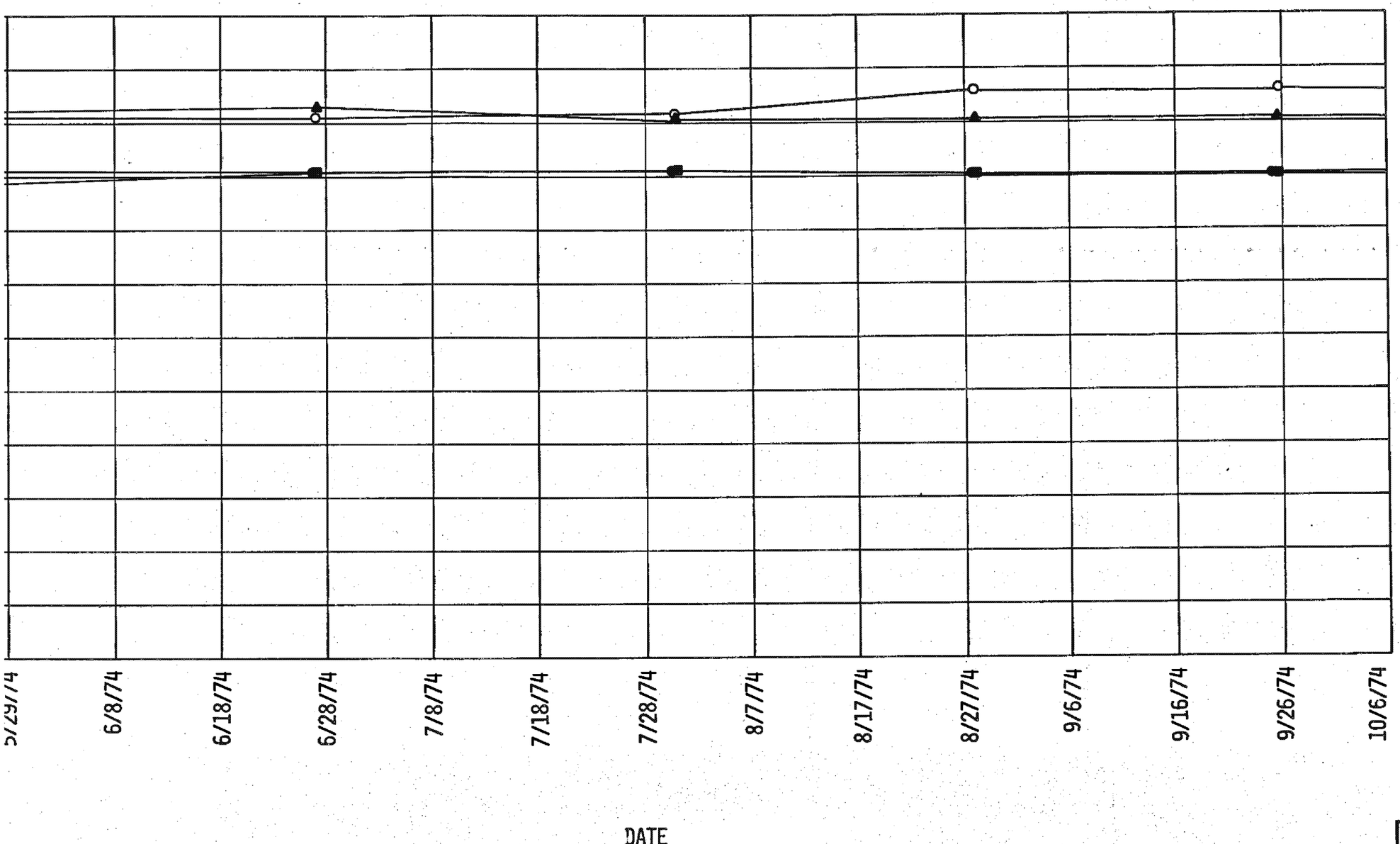
For location of Observation Wells see Figure 3.

BECHTEL
ANN ARBOR

BELLE RIVER PLANT
UNIT 1 & 2

HYDROGRAPHS OF OBSERVATION WELLS
SHEET 1 OF 3

JOB NO.	DRAWING NO.	REV.
10539	FIGURE 14	1



EXPLANATION

- ■ Observation Well 7, bottom of screen at Elevation 450.5
- ● Observation Well 24, bottom of screen at Elevation 452.3
- ▲ Observation Well 40, bottom of screen at Elevation 509.1
- ○ Observation Well 181, bottom of screen at Elevation 449.3

NOTE

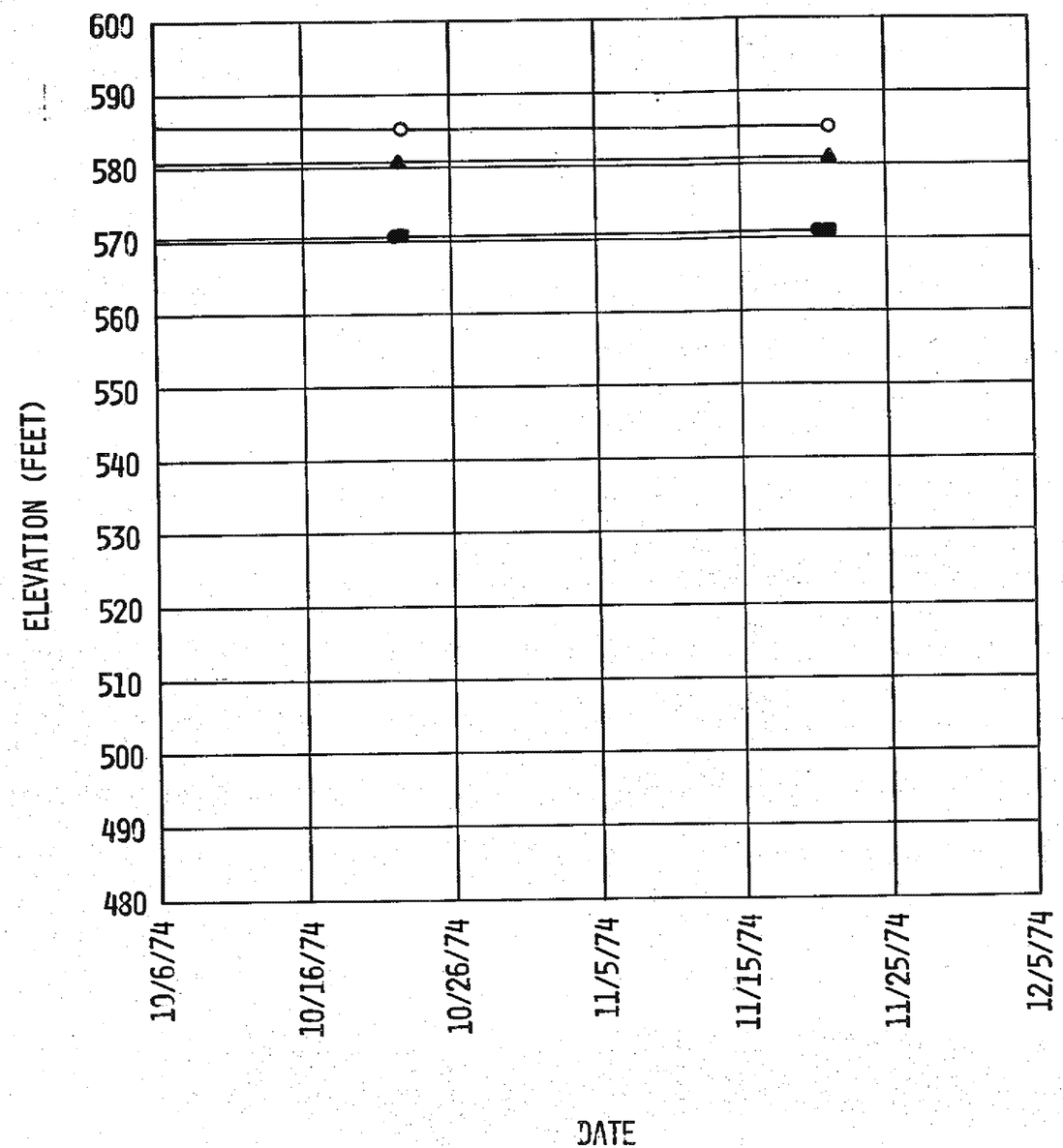
For location of Observation Wells see Figure 3.

BECHTEL
ANN ARBOR

BELLE RIVER PLANT
UNIT 1 & 2

HYDROGRAPHS OF OBSERVATION WELLS
SHEET 2 OF 3

JOB NO.	DRAWING NO.	REV.
10539	FIGURE 14	1



EXPLANATION

- ■ Observation Well 7, bottom of screen at Elevation 450.5
- ● Observation Well 24, bottom of screen at Elevation 452.3
- ▲ Observation Well 40, bottom of screen at Elevation 509.1
- ○ Observation Well 181, bottom of screen at Elevation 449.3

NOTE:

For location of Observation Wells see Figure 3.

BECHTEL
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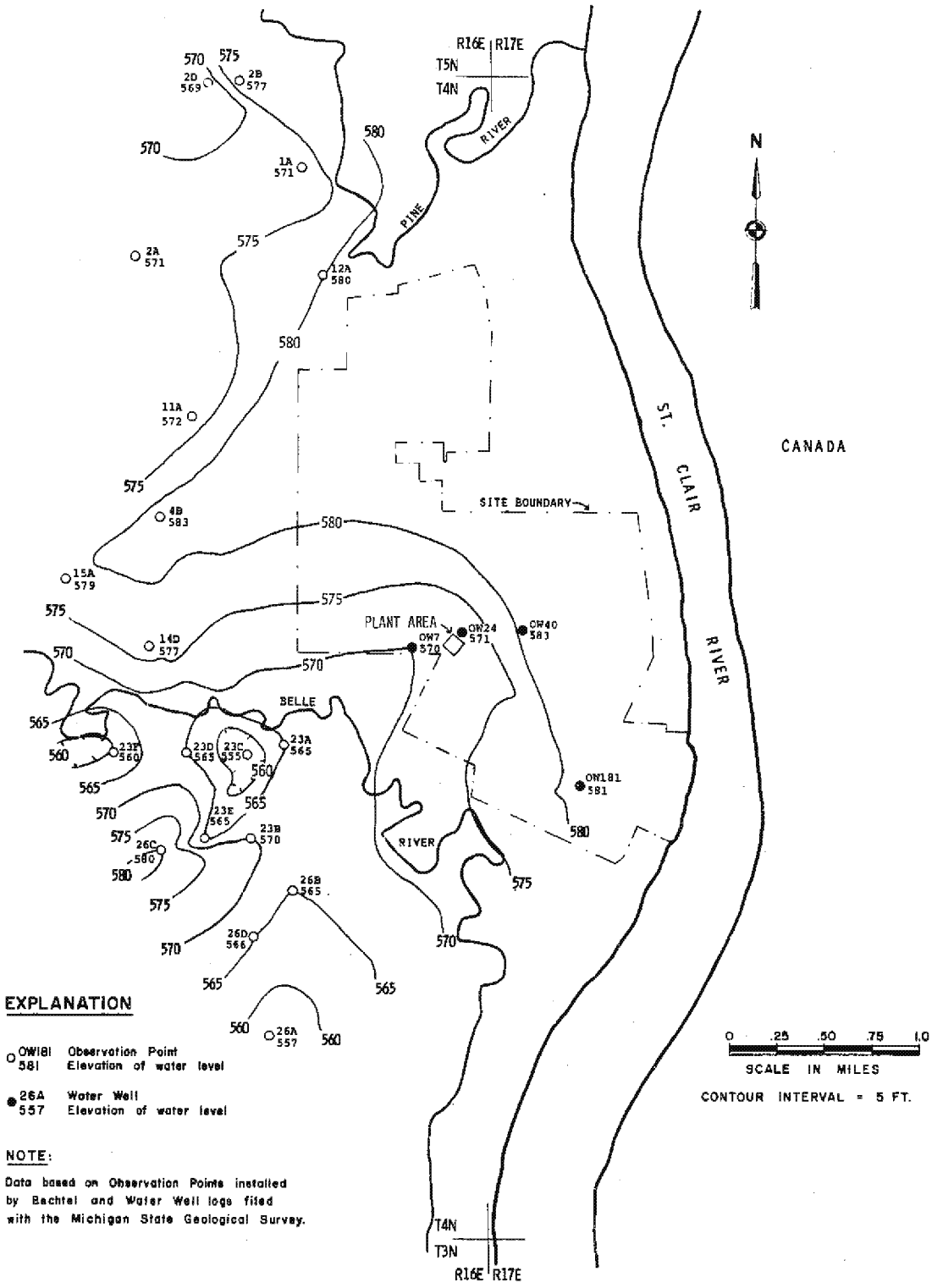
BELLE RIVER PLANT
UNIT 1 & 2

HYDROGRAPHS OF OBSERVATION WELLS
SHEET 3 OF 3

JOB NO.	DRAWING NO.	REV.
10539	FIGURE 14	1



EXPLANATION

○ OW181 Observation Point
581 Elevation of water level

● 26A Water Well
557 Elevation of water level

NOTE:

Data based on Observation Points installed by Bechtel and Water Well logs filed with the Michigan State Geological Survey.

BECHTEL
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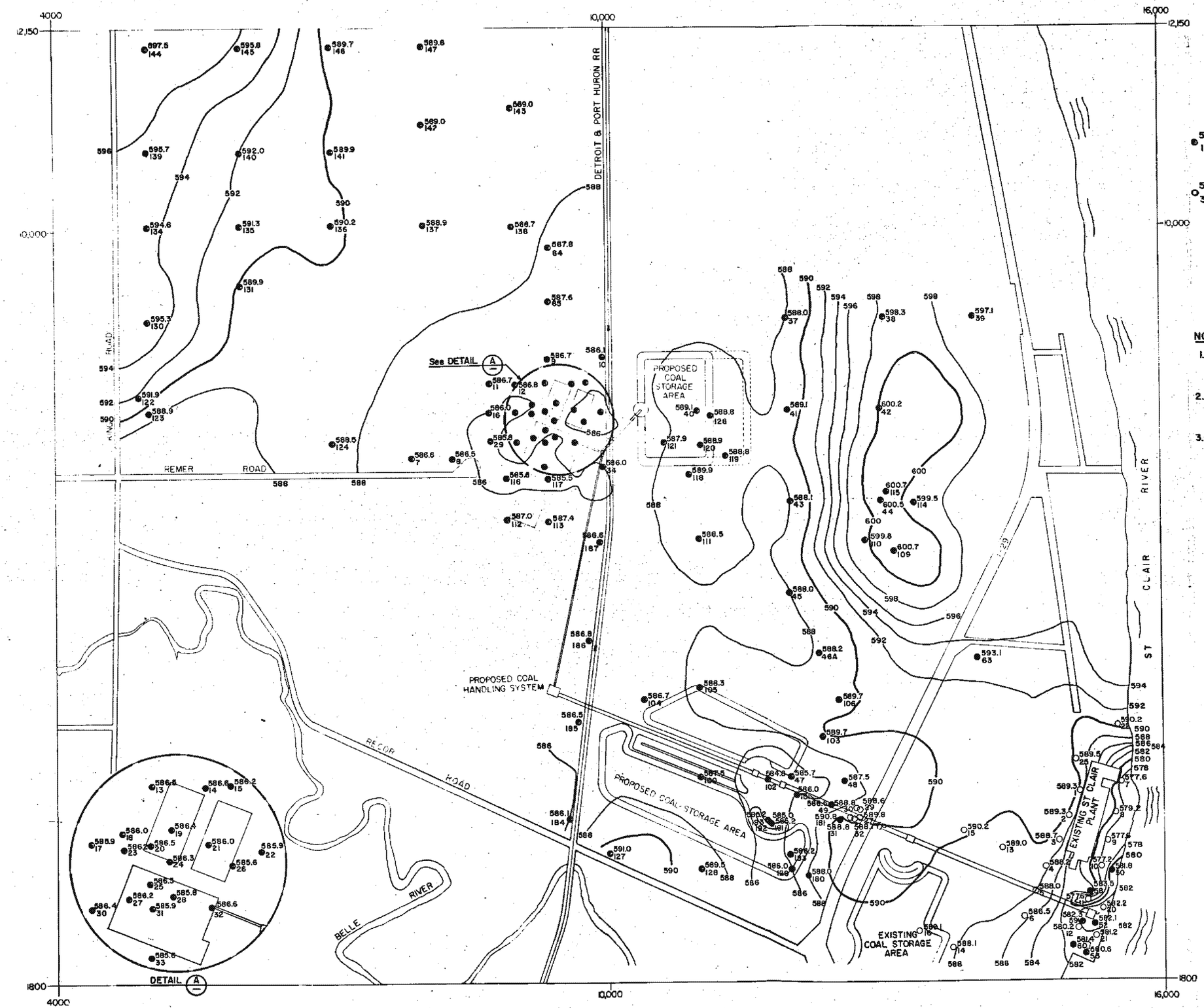
BELLE RIVER PLANT
UNIT 1 & 2

GROUND WATER LEVEL
CONTOUR MAP

JOB NO.	DRAWING NO.	REV.
10539	FIGURE 15	1



EXPLANATION

586.6 / 187 — Ground surface elevation (ft); Boring number (present investigation)

588.7 / 32 — Ground surface elevation (ft); Boring number (previous investigations for St Clair plant)

NOTES:

1. Contours generated from drill hole data by McDonnell Douglas Automation Company's SURMAP computer program.
2. Computer interpretation modified manually to accommodate additional data points.
3. Detail A (plant area) enlarged for clarity, to twice graphic scale shown below.

N

0 200 400 800 1200

SCALE IN FEET

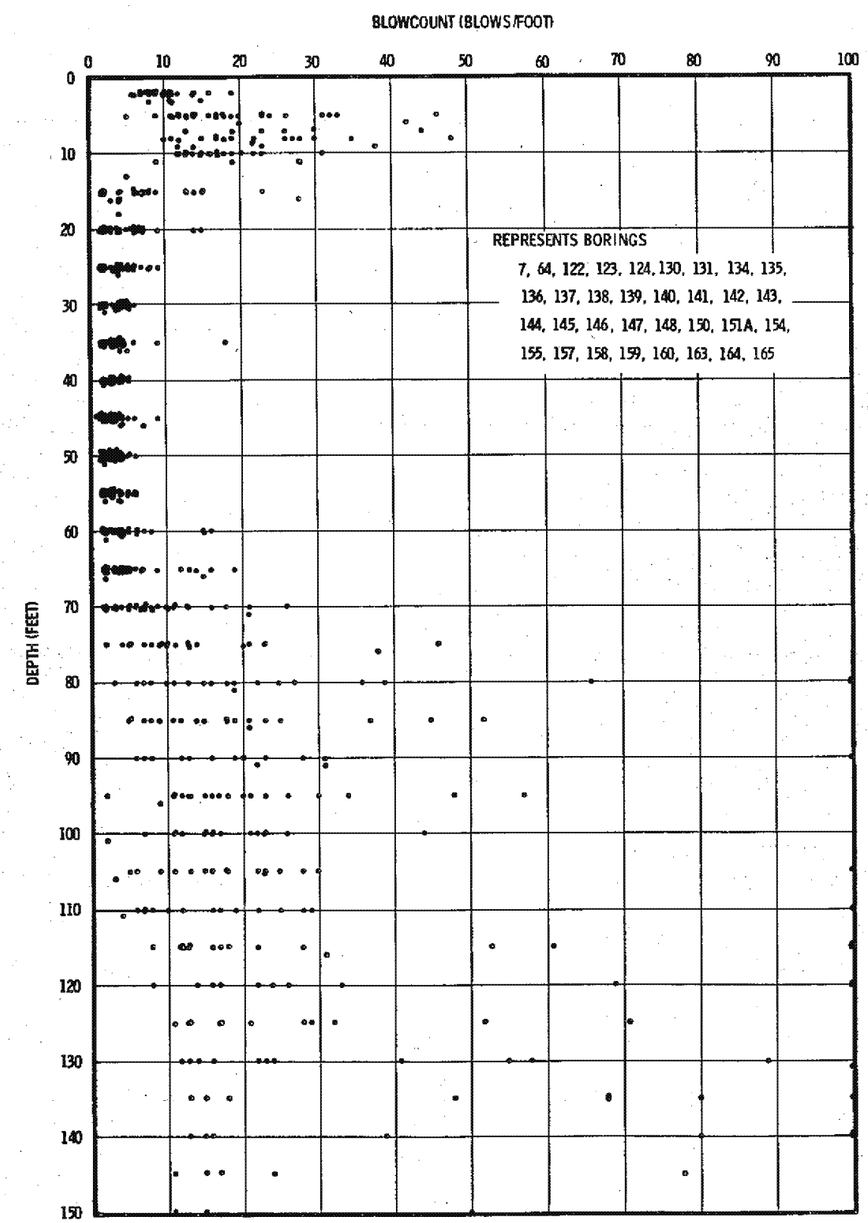
CONTOUR INTERVAL = 2 FT

BECHTEL
ANN ARBOR

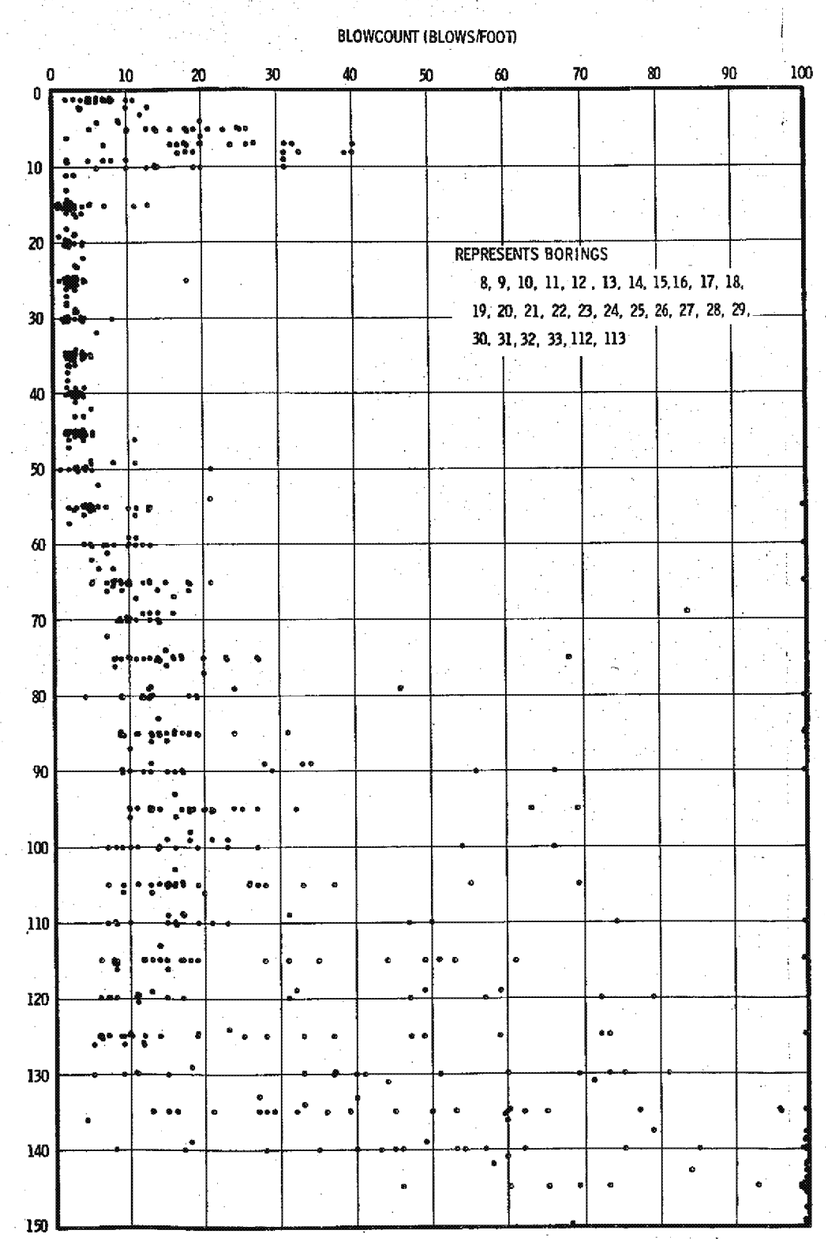
BELLE RIVER PLANT
UNIT 1 & 2

GROUND SURFACE CONTOUR MAP

JOB NO.	DRAWING NO.	REV.
10539	FIGURE 16	1



NORTH AREA



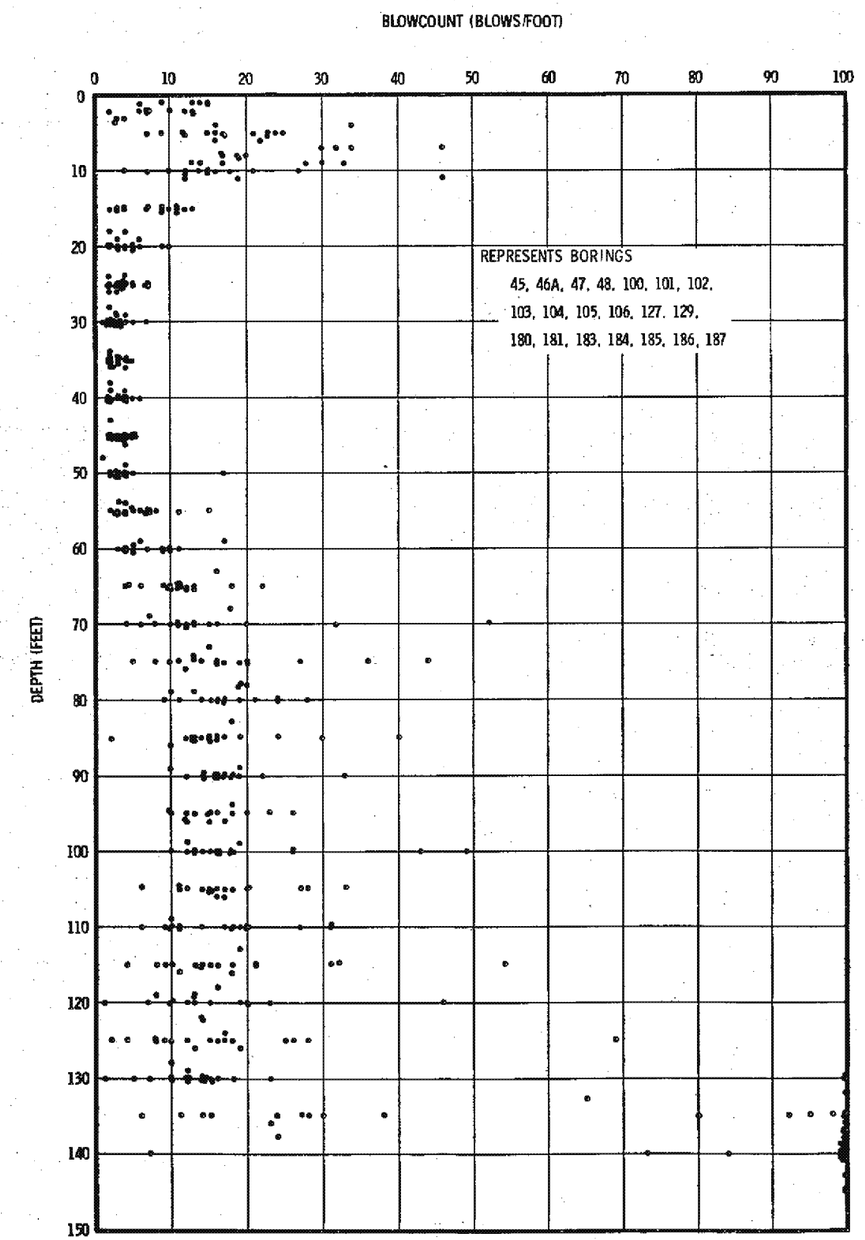
MAIN PLANT AREA

BECHTEL
ANN ARBOR

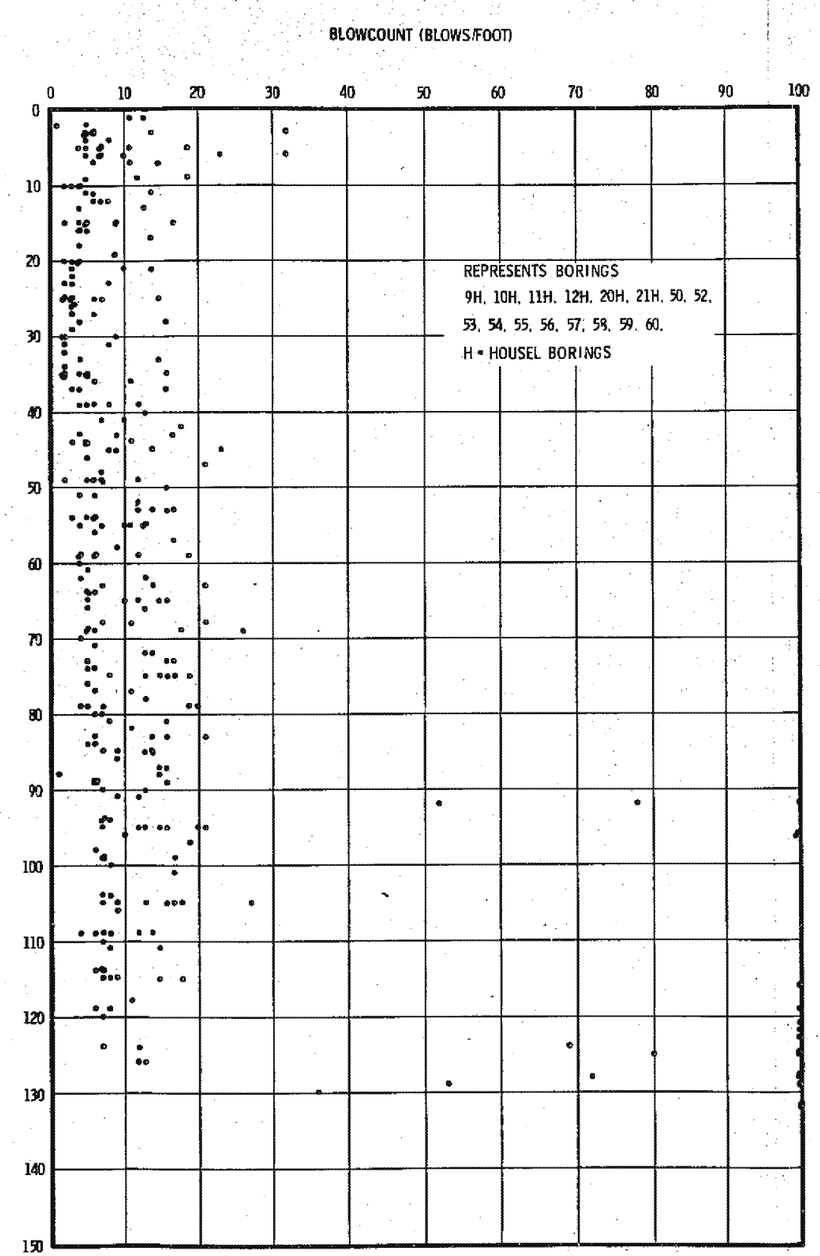
BELLE RIVER PLANT
UNITS 1 & 2

BLOWCOUNT vs DEPTH
SHEET 1 OF 2

JOB No.	DRAWING No.	REV.
10539	FIGURE 17	0



COAL STORAGE AREA



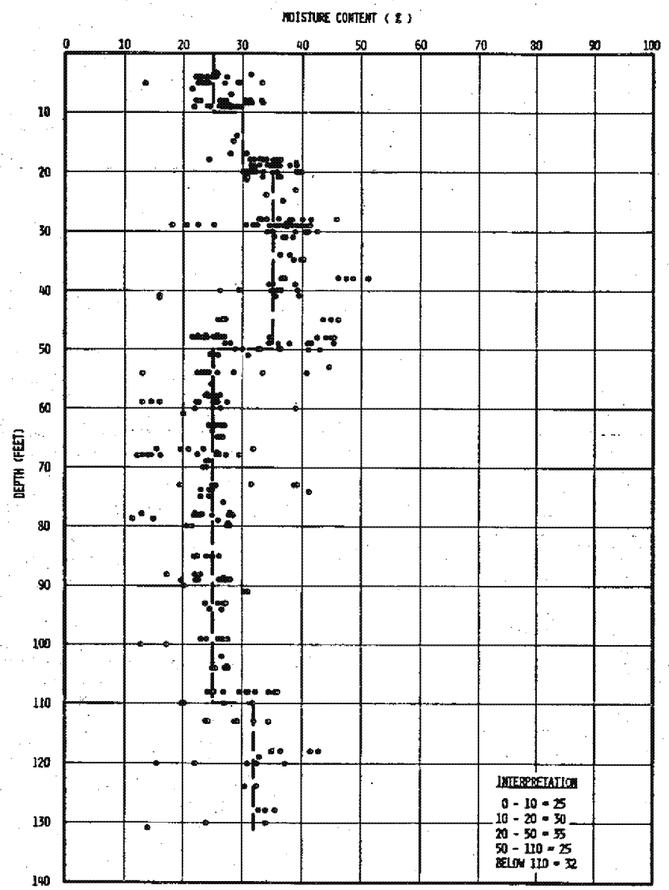
DOCK AREA

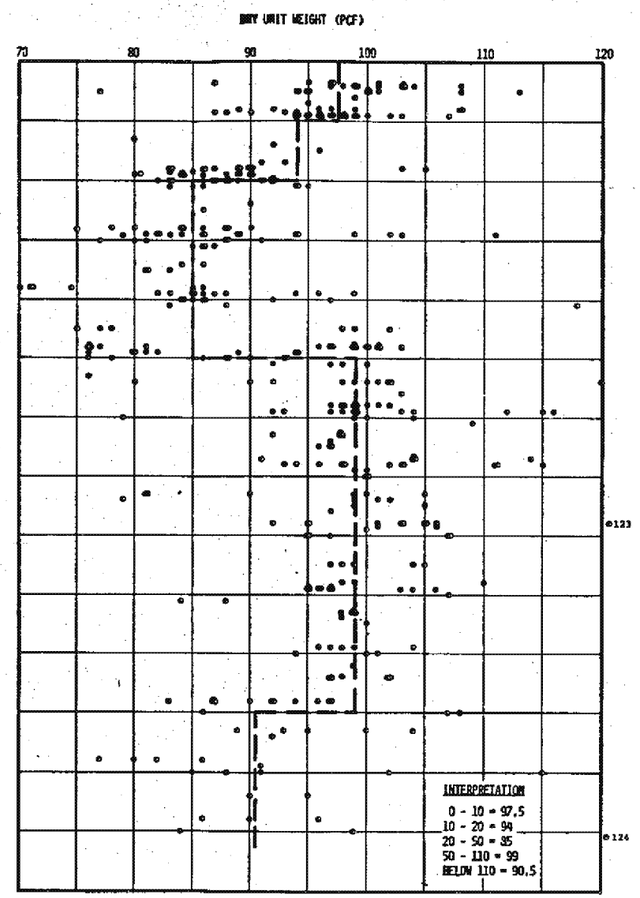
BECHTEL
ANN ARBOR

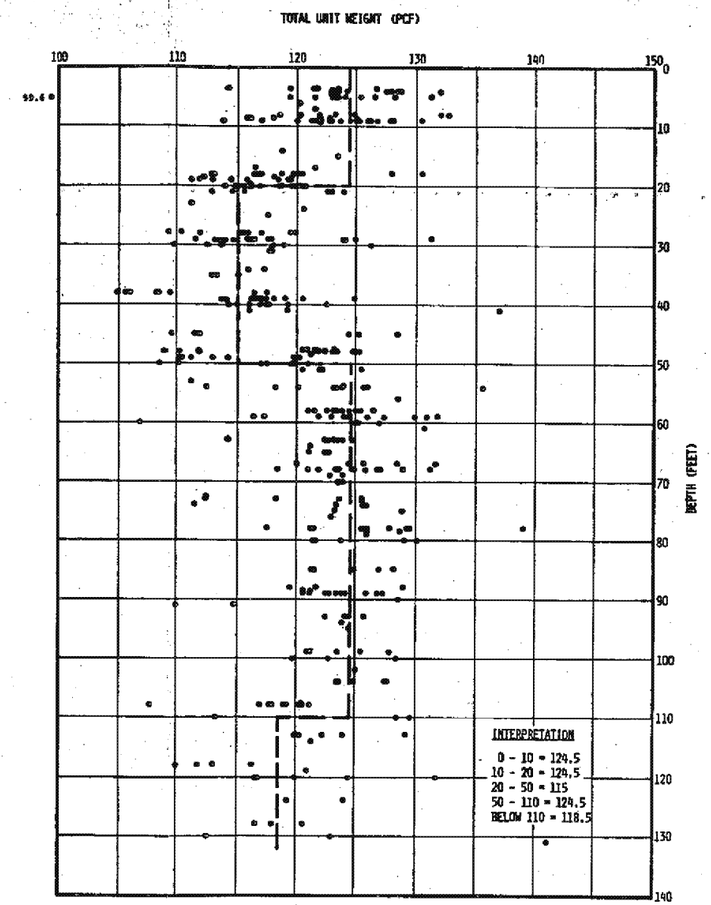
BELLE RIVER PLANT
UNITS 1 & 2

BLOWCOUNT vs DEPTH
SHEET 2 OF 2

JOB No.	DRAWING No.	REV.
10539	FIGURE 17	0







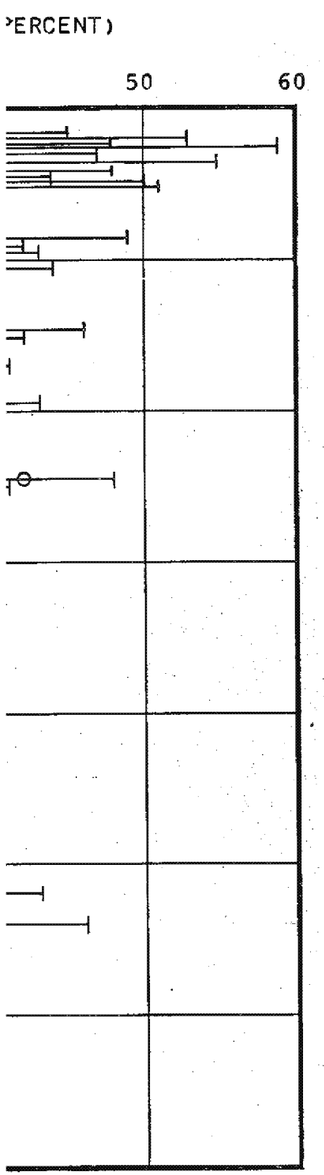
NOTE: DATA INCLUDES RESULTS OF ALL TESTS PERFORMED THROUGHOUT THE ENTIRE SITE.

BECHTEL
ANN ARBOR

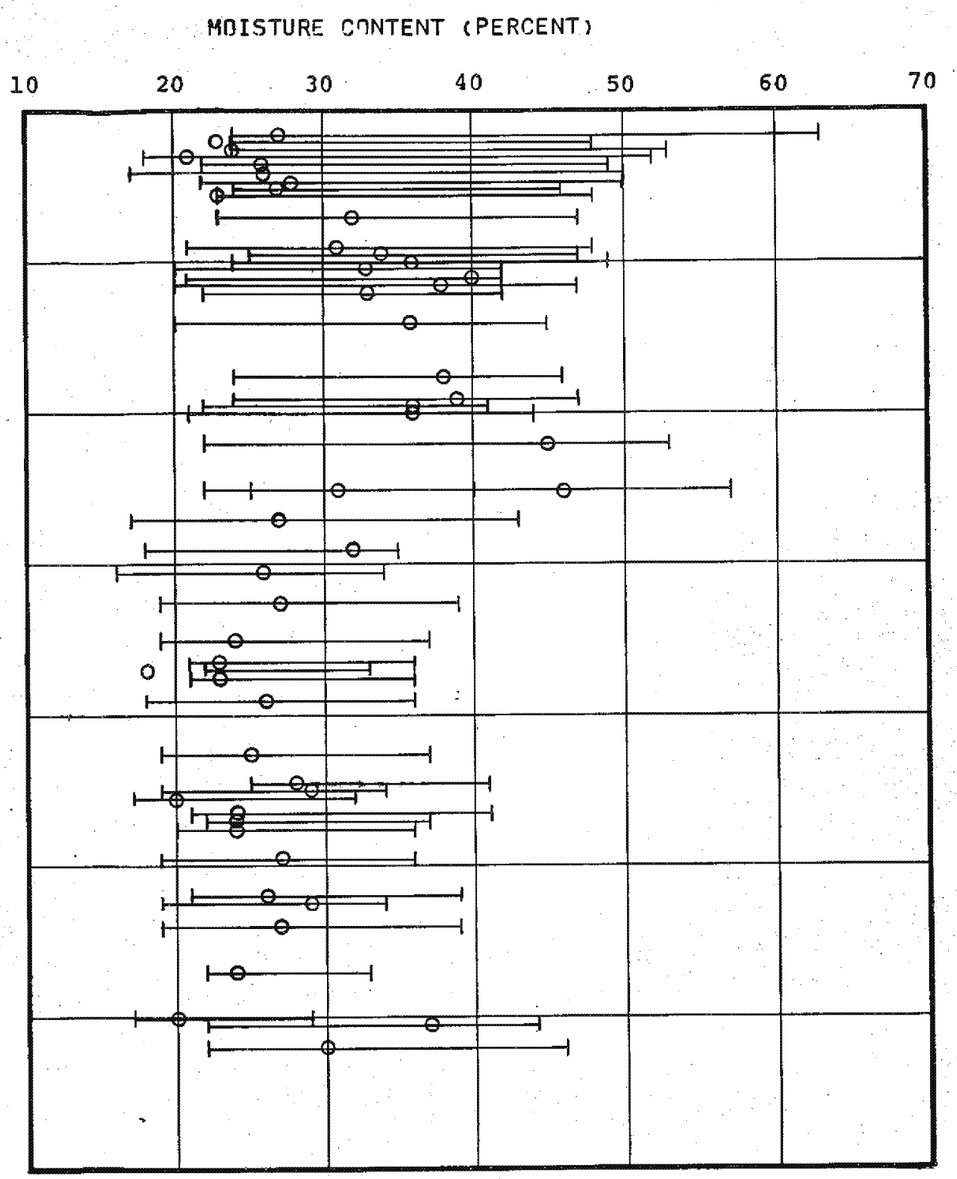
BELLE RIVER PLANT
UNIT 1 & 2

MOISTURE CONTENT, DRY UNIT WEIGHT, AND TOTAL UNIT WEIGHT VS DEPTH

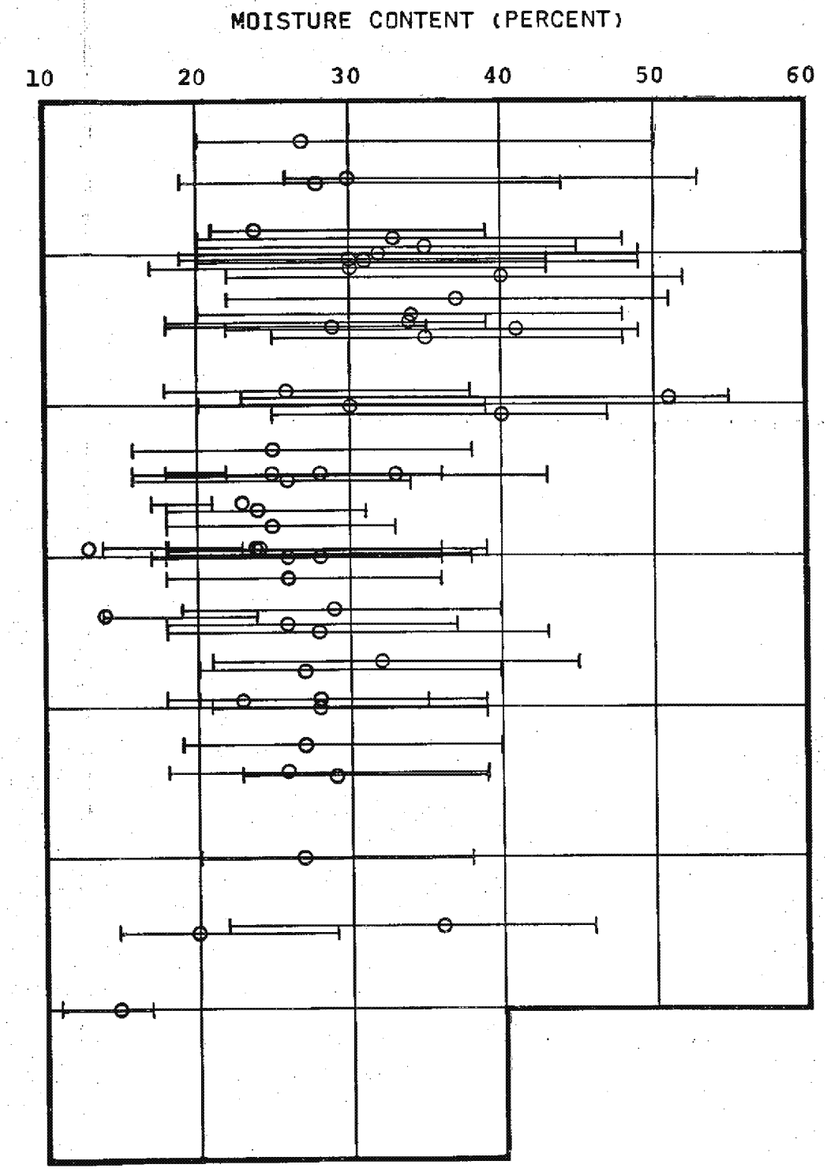
JOB NO.	DRAWING NO.	REV.
10539	FIGURE 18	0



EA



MAIN COAL STORAGE AREA



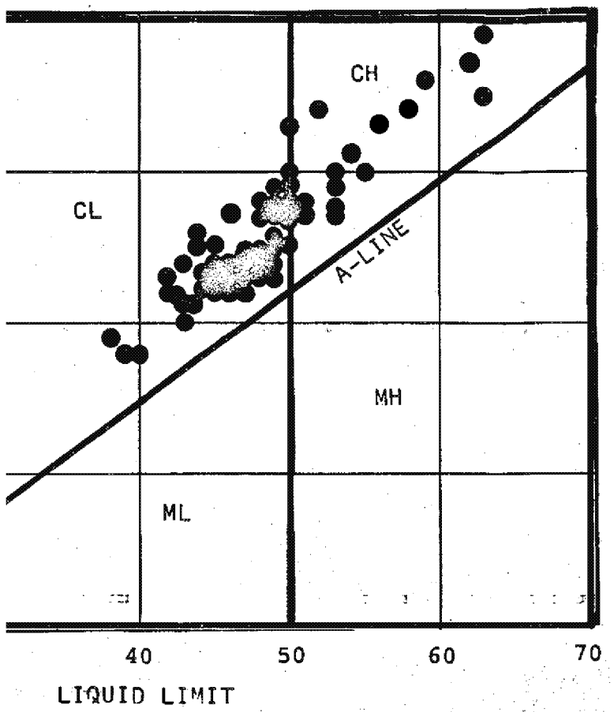
DOCK AREA

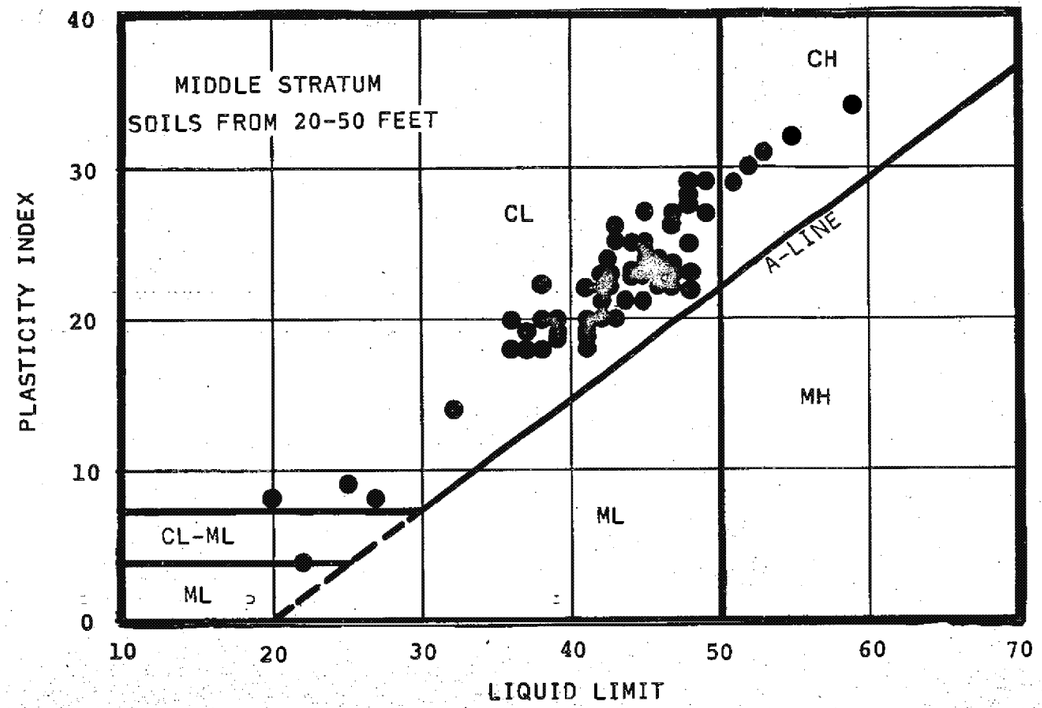
LEGEND

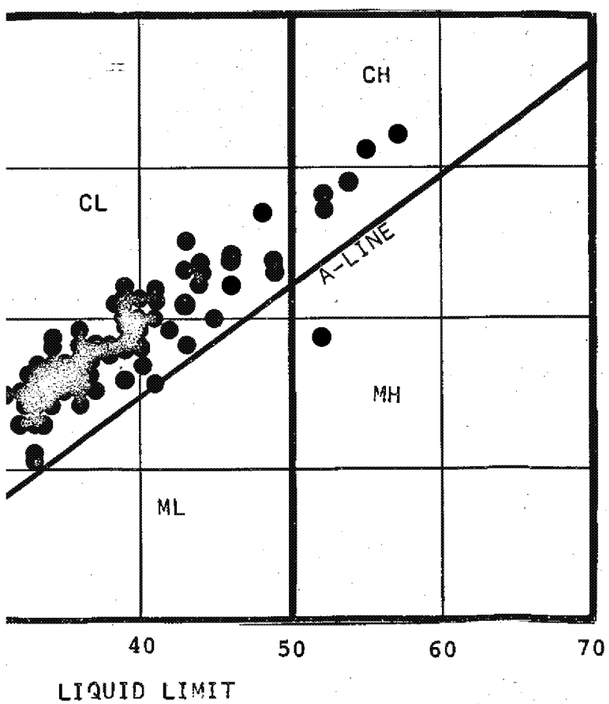
W: NATURAL MOISTURE CONTENT
PL: PLASTIC LIMIT
LL: LIQUID LIMIT

PL — W — LL

BECHTEL ANN ARBOR			
BELLE RIVER PLANT UNIT 1 & 2			
ATTERBERG LIMITS AND NATURAL MOISTURE CONTENT VS DEPTH			
	JOB NO.	DRAWING NO.	REV.
	10539	FIGURE 20	0







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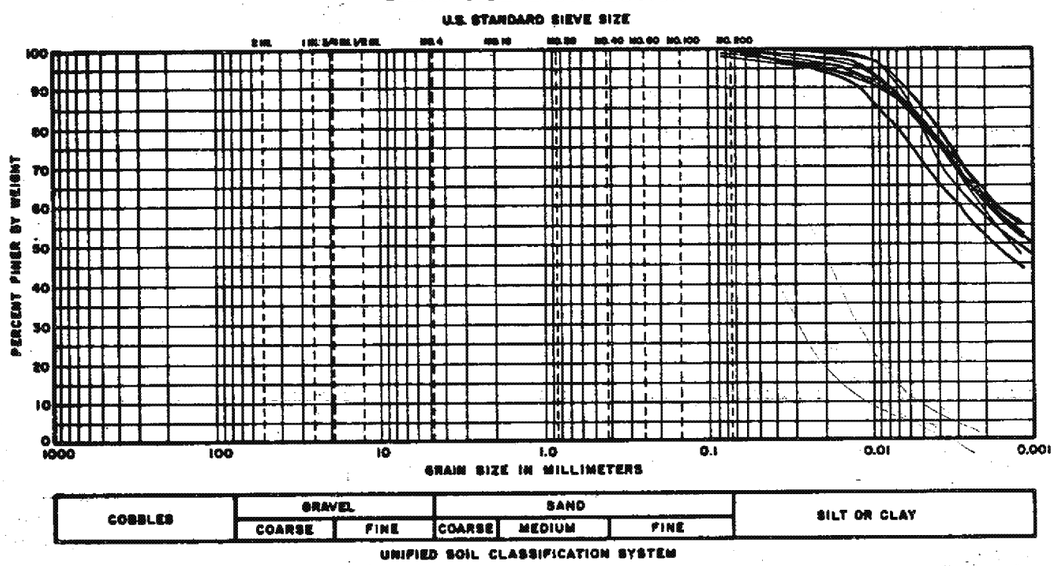
BELLE RIVER PLANT
UNIT 1 & 2

PLASTICITY CHART

JOB NO.	DRAWING NO.	REV.
10539	FIGURE 19	0

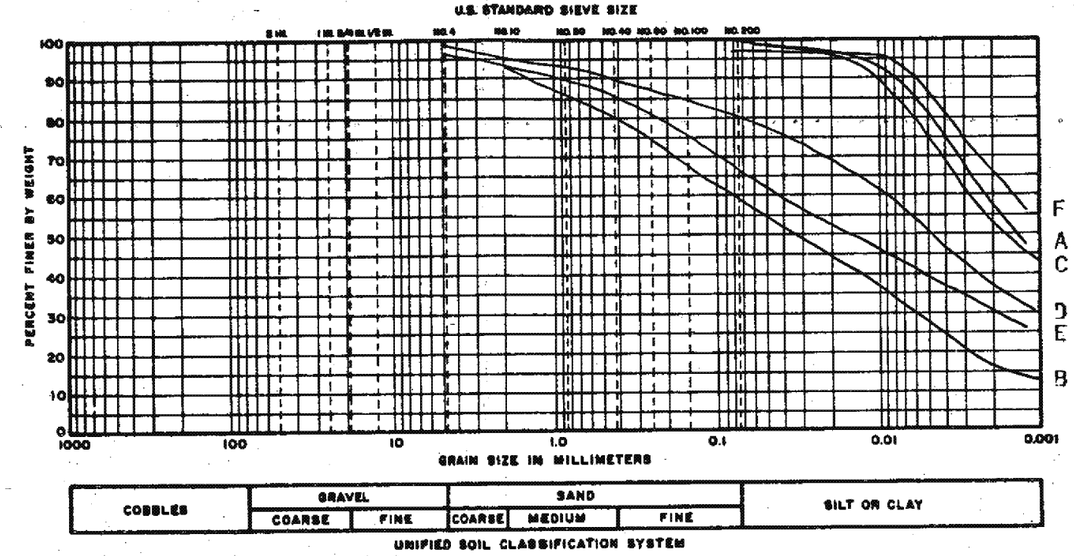
GRAIN SIZE DISTRIBUTION



UPPER STRATUM (0-20 FEET)

BORING NUMBER	SAMPLE DEPTH (FEET)
38 (CL-CH)	9
38 (CL-CH)	15
41 (CH)	5
48 (CL-CH)	9
60 (CL-CH)	5
60 (CL)	11
60 (CL)	18
60 (CL)	19
137 (CL-CH)	2
144 (CL)	14
151A (CL-CH)	8

GRAIN SIZE DISTRIBUTION



MIDDLE STRATUM (20-50 FEET)

BORING NUMBER	SAMPLE DEPTH (FEET)
A 41 (CL)	20
B 41 (SC)	40
C 50 (CL)	28
D 50 (CL)	48
E 53 (CL)	39
F 60 (CL-CH)	27

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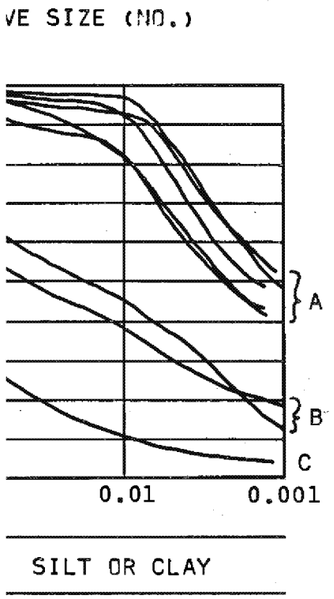
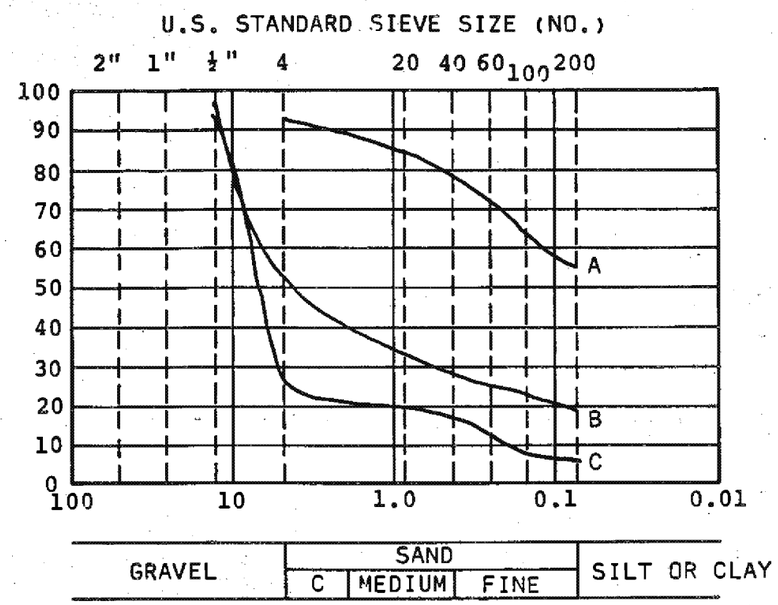
BELLE RIVER PLANT
UNIT 1 & 2

GRAIN SIZE DISTRIBUTION
UPPER AND MIDDLE STRATA

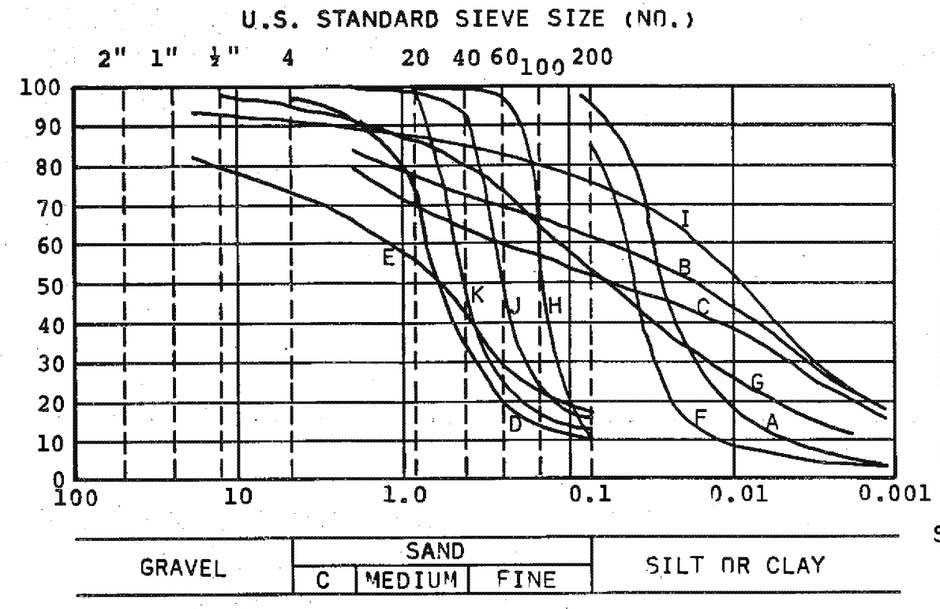
JOB NO.	DRAWING NO.	REV.
10539	FIGURE 21	0



REA EAST OF MAIN PLANT



NORTHWEST FLY ASH DISPOSAL AREA



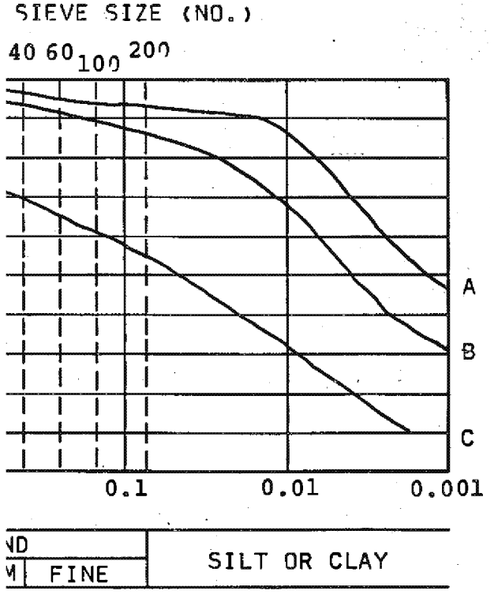
MAIN PLANT AREA

MAIN PLANT AREA

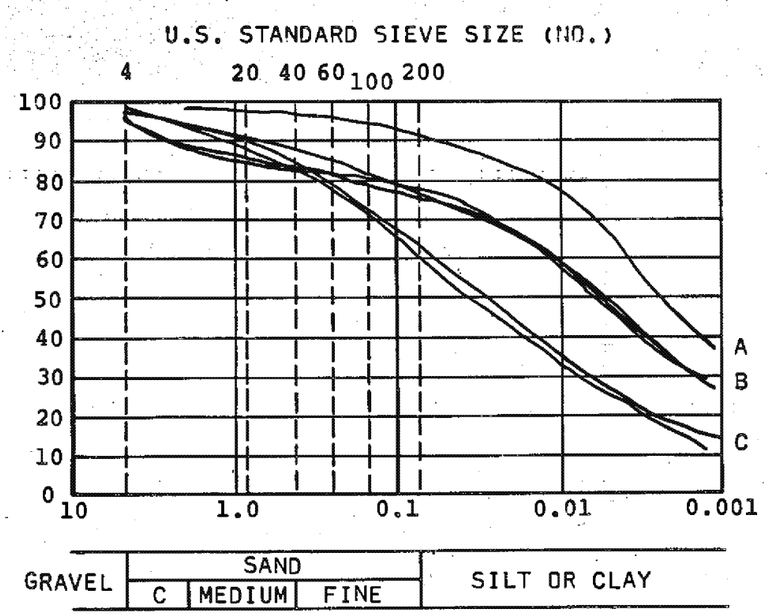
	BORING NUMBER	SAMPLE DEPTH (FEET)
A	7 (CL-ML)	130
B	7 (CL-ML)	139
C	10 (CL-ML)	141
D	18 (SM-SW)	104
E	18 (SM)	140
F	22 (CL-ML)	134
G	27 (CL-ML)	69
H	27 (SM-SP)	114
I	30 (CL)	69
J	30 (SM)	99
K	30 (SM)	119

SECONDARY COAL STORAGE AREA EAST OF MAIN PLANT

	BORING NUMBER	SAMPLE DEPTH (FEET)
A	38 (CL)	54.1
A	38 (CH)	74.0
A	38 (CL)	84.6
A	38 (CL)	114.2
C	38 (SM)	138.5
B	41 (CL-SC)	72.9
A	41 (CL)	101.9
B	41 (GC-SC)	130.7



STORAGE AREA



DOCK AREA

NORTHWEST FLY ASH DISPOSAL AREA

	BORING NUMBER	SAMPLE DEPTH (FEET)
C	139 (GP)	100
B	141 (GM)	115
A	141 (SM-SC)	145

MAIN COAL STORAGE AREA

	BORING NUMBER	SAMPLE DEPTH (FEET)
A	48 (CL)	118
B	49 (CL)	63
C	187 (CL-ML)	59

DOCK AREA

	BORING NUMBER	SAMPLE DEPTH (FEET)
C	52 (CL)	58.6
B	54 (CL)	63.5
A	54 (CL)	73.7
B	60 (CL)	56.1
B	60 (CL)	85.6
C	60 (CL)	119.5

NOTES:

1) ALL SOILS ARE BELOW 50 FEET.
2) SOIL DIVISIONS AS PER UNIFIED SOIL CLASSIFICATION SYSTEM

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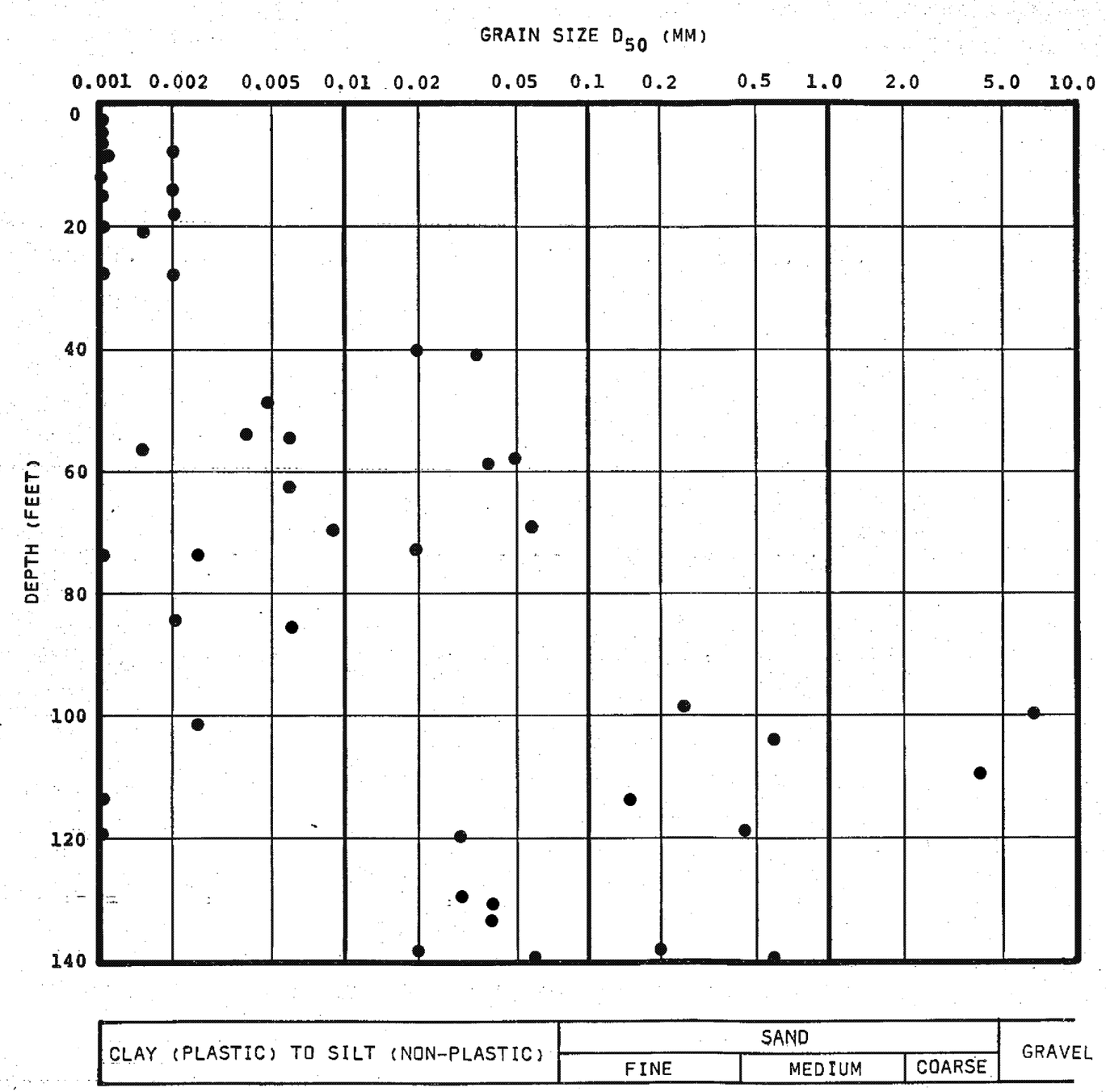
BELLE RIVER PLANT
UNIT 1 & 2

GRAIN SIZE DISTRIBUTION
LOWER STRATUM

JOB NO.	DRAWING NO.	REV.
10539	FIGURE 22	0



UNIFIED SOIL CLASSIFICATION SYSTEM

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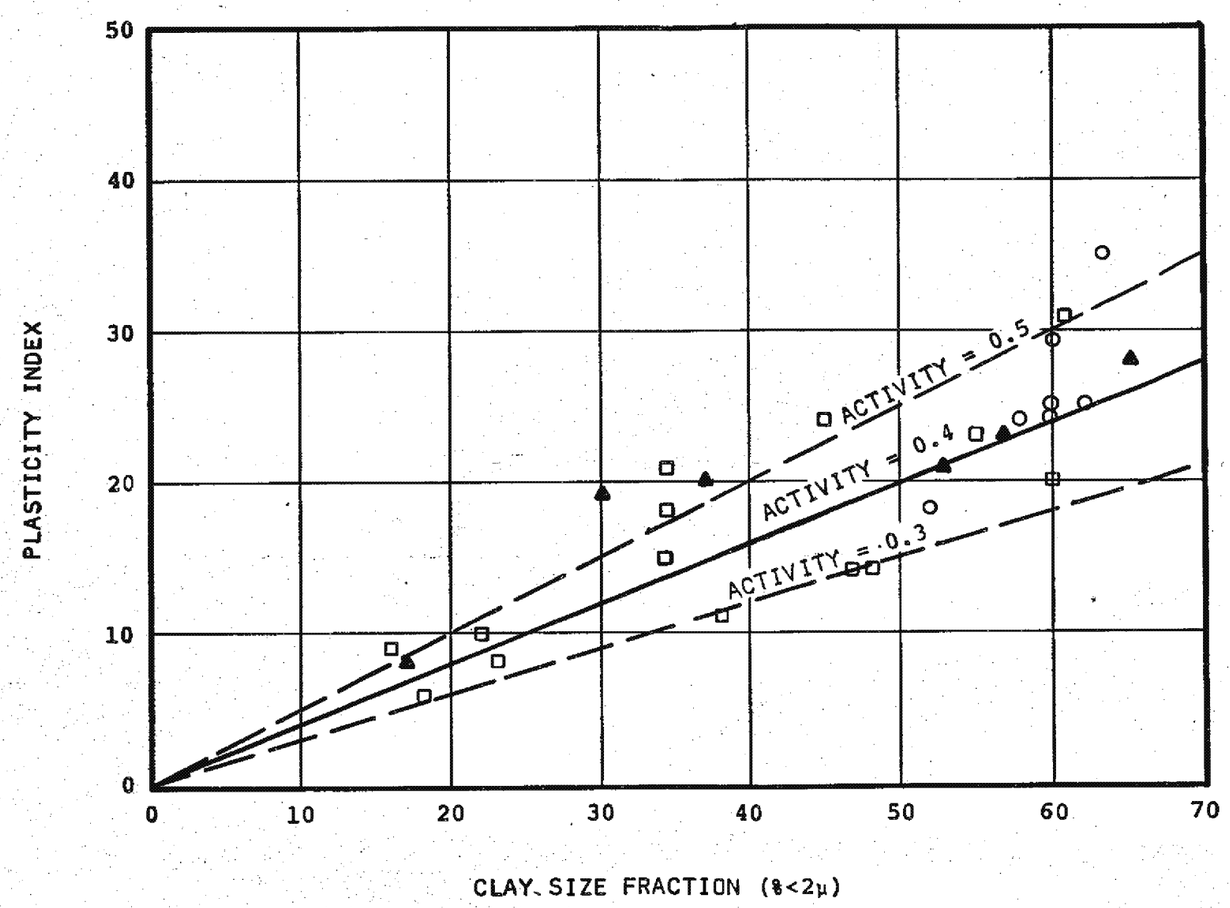
BELLE RIVER PLANT
UNIT 1 & 2

GRAIN SIZE (D_{50}) vs DEPTH

JOB NO.	DRAWING NO.	REV.
10539	FIGURE 23	0



○ SOILS FROM 0-20 FEET

▲ SOILS FROM 20-50 FEET

□ SOILS BELOW 50 FEET

ACTIVITY = PI/%<2μ

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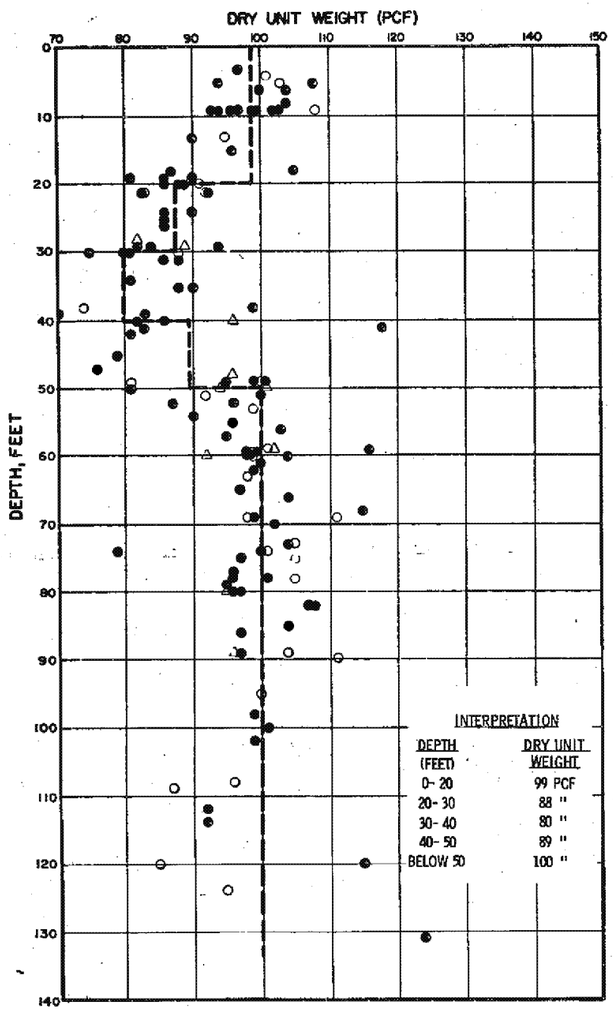
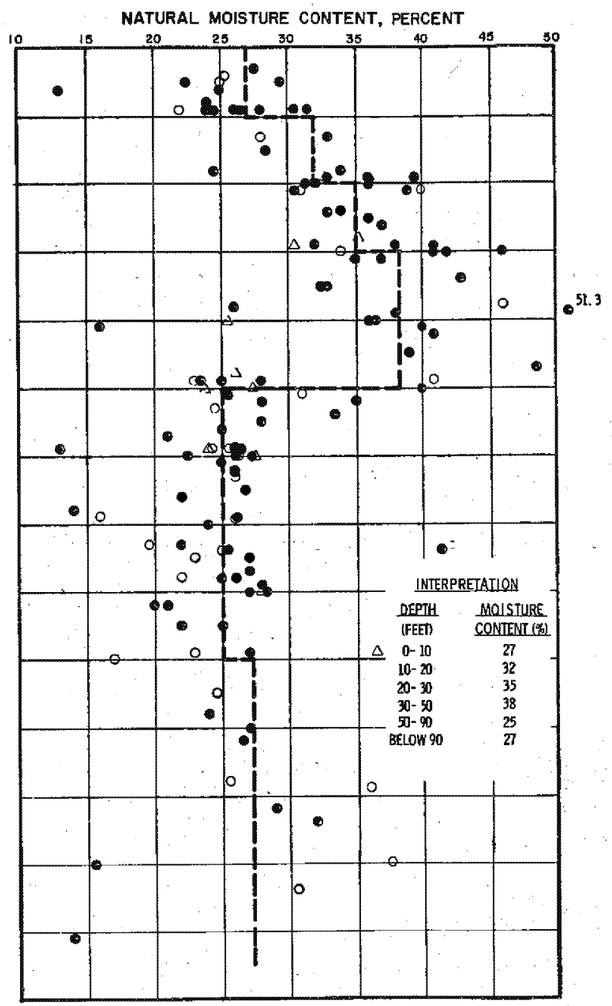
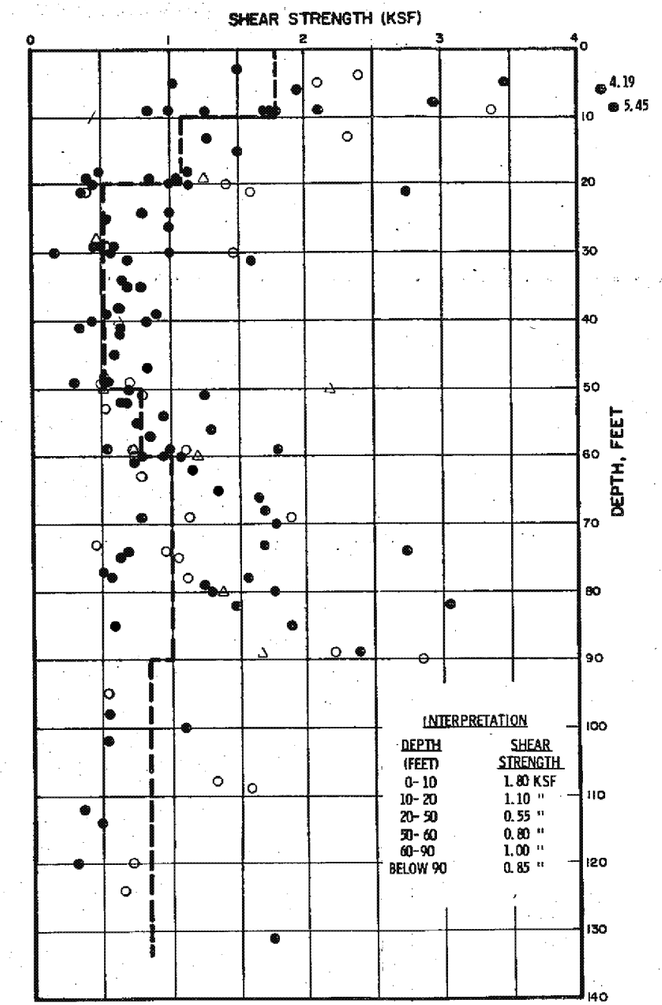
BELLE RIVER PLANT UNITS 1 & 2		
ACTIVITY OF CLAY SOILS		
JOB No. 10539	DRAWING No. FIGURE 24	REV. C







EXPLANATION

- ● UNCONFINED COMPRESSION TESTS
- ○ UNCONSOLIDATED UNDRAINED TESTS
- △ LABORATORY VANE SHEAR TESTS

NOTES:

1.) ALL VALUES REPRESENT PEAK STRENGTHS.

2.) DRY UNIT WEIGHT AND NATURAL MOISTURE CONTENT CORRESPOND TO SHEAR STRENGTH TEST RESULTS.

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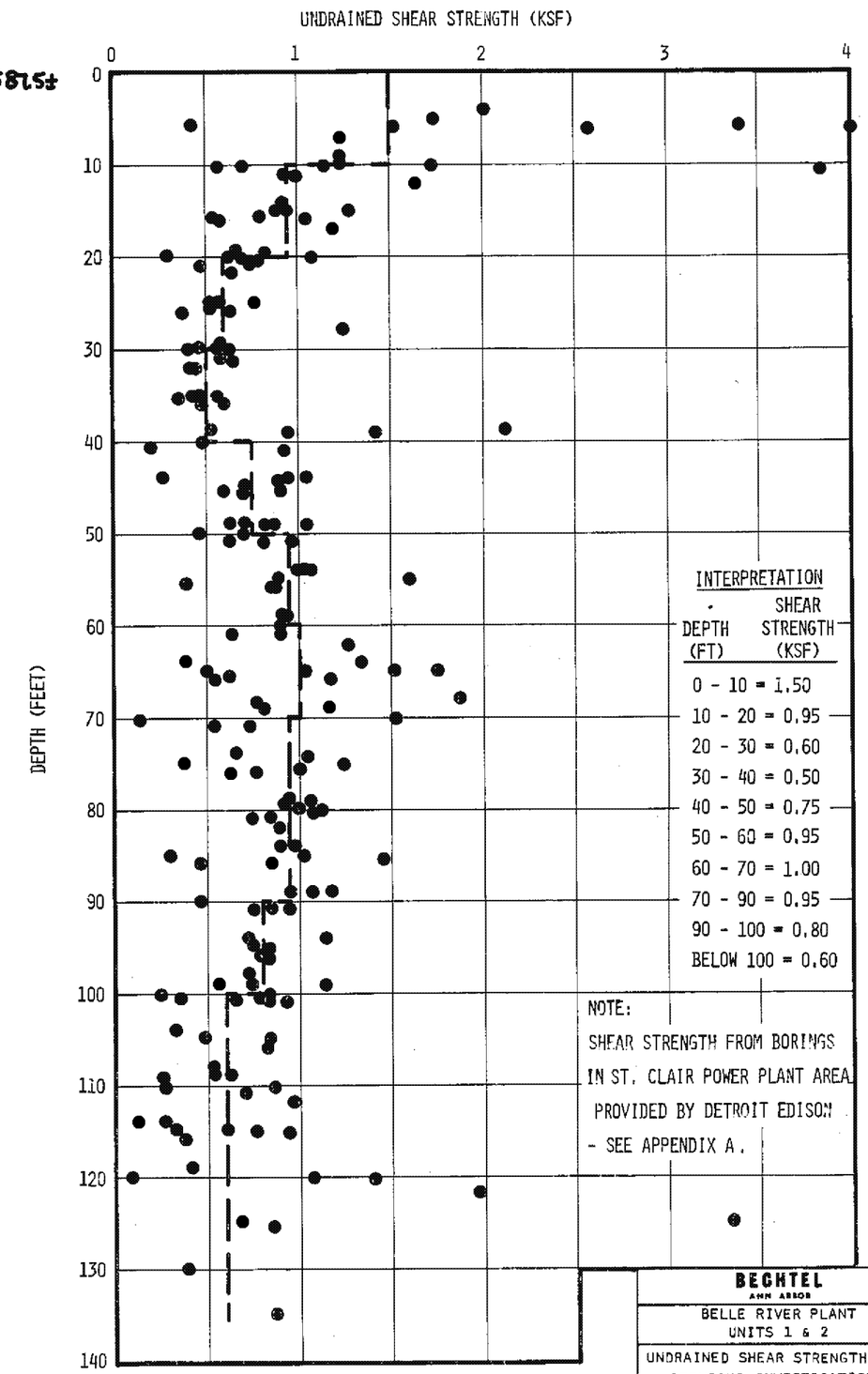
BELLE RIVER PLANT
UNIT 1 & 2

DRY UNIT WEIGHT, NATURAL WATER CONTENT, AND SHEAR STRENGTH VS DEPTH, ENTIRE SITE

JOB NO.	DRAWING NO.	REV.
10539	FIGURE 25	0



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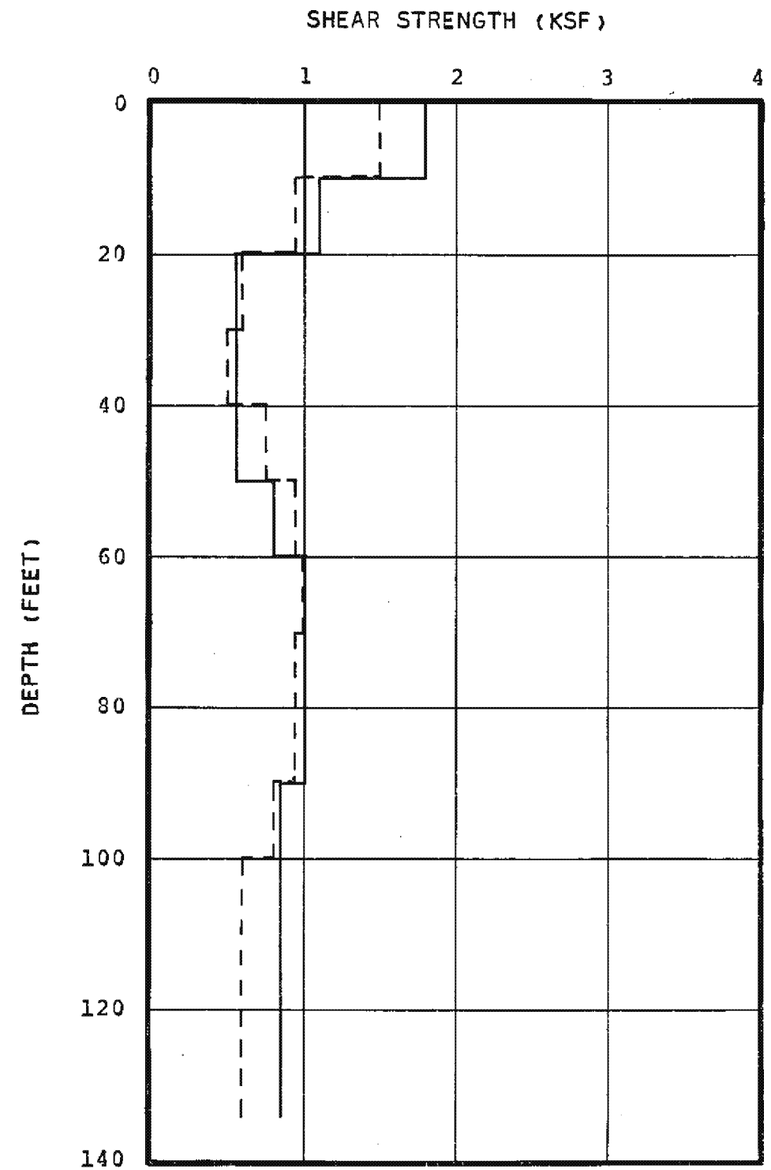
BELLE RIVER PLANT
UNITS 1 & 2

UNDRAINED SHEAR STRENGTH FROM
PREVIOUS INVESTIGATIONS

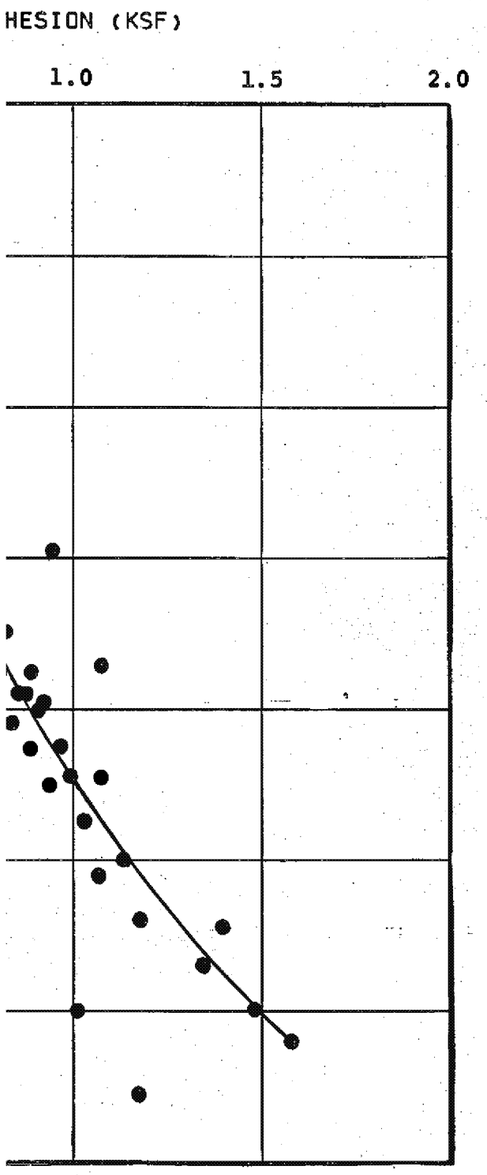
JOB No.	DRAWING No.	REV
10539	FIGURE 26	



— — — HOUSEL UNDRAINED SHEAR STRENGTH DATA (SEE FIG. 26)

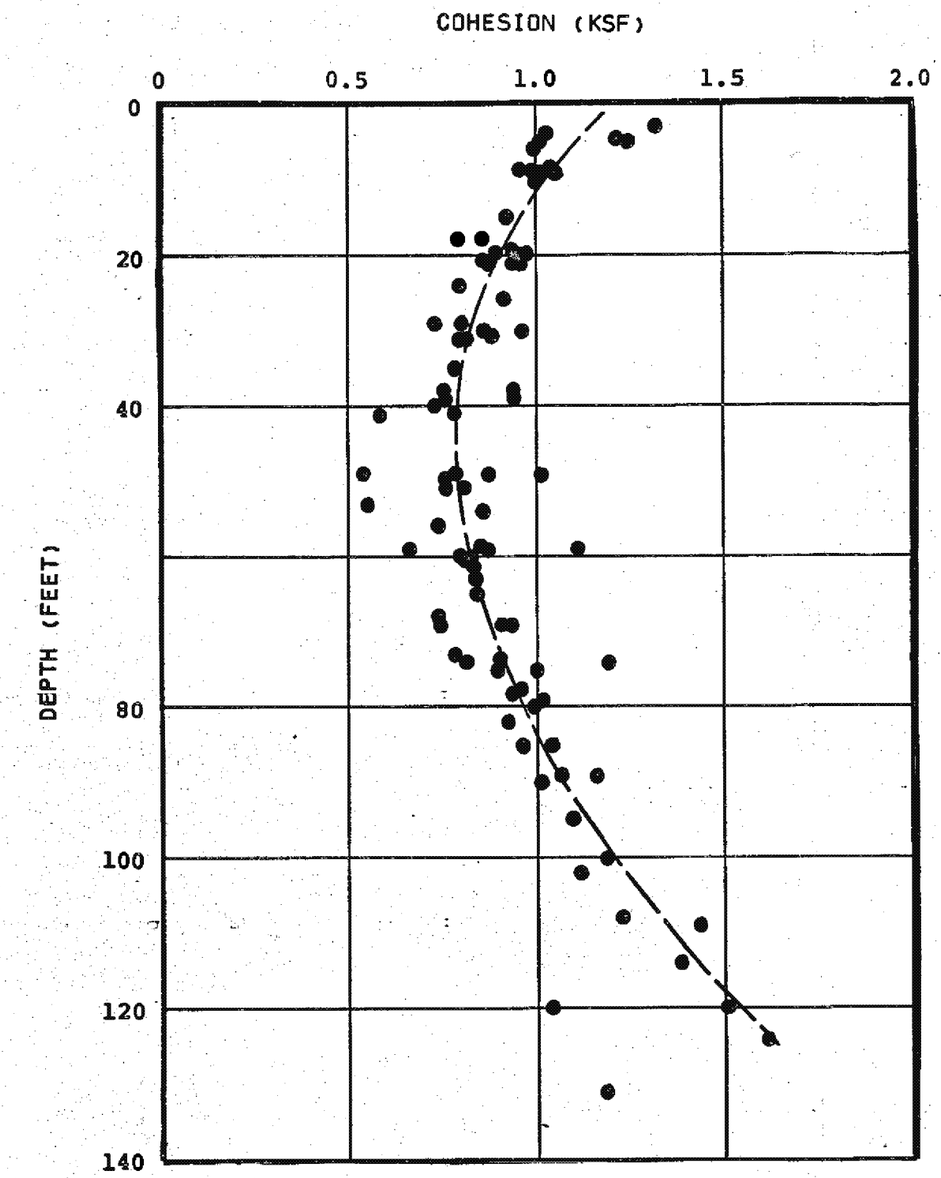
——— BECHTEL UNDRAINED SHEAR STRENGTH DATA (SEE FIG. 25)

BECHTEL ANN ARBOR		
BELLE RIVER PLANT UNITS 1 & 2		
COMPARISON OF HOUSEL AND BECHTEL UNDRAINED SHEAR STRENGTH		
JOB No.	DRAWING No.	REV.
10539	FIGURE 27	0



PRESSURE (P_0) WAS SUBSTITUTED
I RELATIONSHIP
: PI TO OBTAIN COHESION VALUES.

OLIDATED SOILS ASSUMED



NOTE:

PRECONSOLIDATION PRESSURE P_C (CASAGRANDE'S METHOD) WAS SUBSTITUTED FOR $\bar{P}$ IN THE SKEMPTON RELATIONSHIP $C/\bar{P} = 0.11 + 0.0037 \times$ PI TO OBTAIN COHESION VALUES.

B) PRECONSOLIDATED SOILS ASSUMED

SOIL DATA

DEPTH (FT)	TOTAL UNIT WEIGHT (PCF)	EFFECTIVE UNIT WEIGHT (PCF)
0-20	125	63
20-50	115	53
50+	125	63

NOTE:

WATER TABLE ASSUMED TO BE AT A DEPTH OF 10 FEET.

BECHTEL
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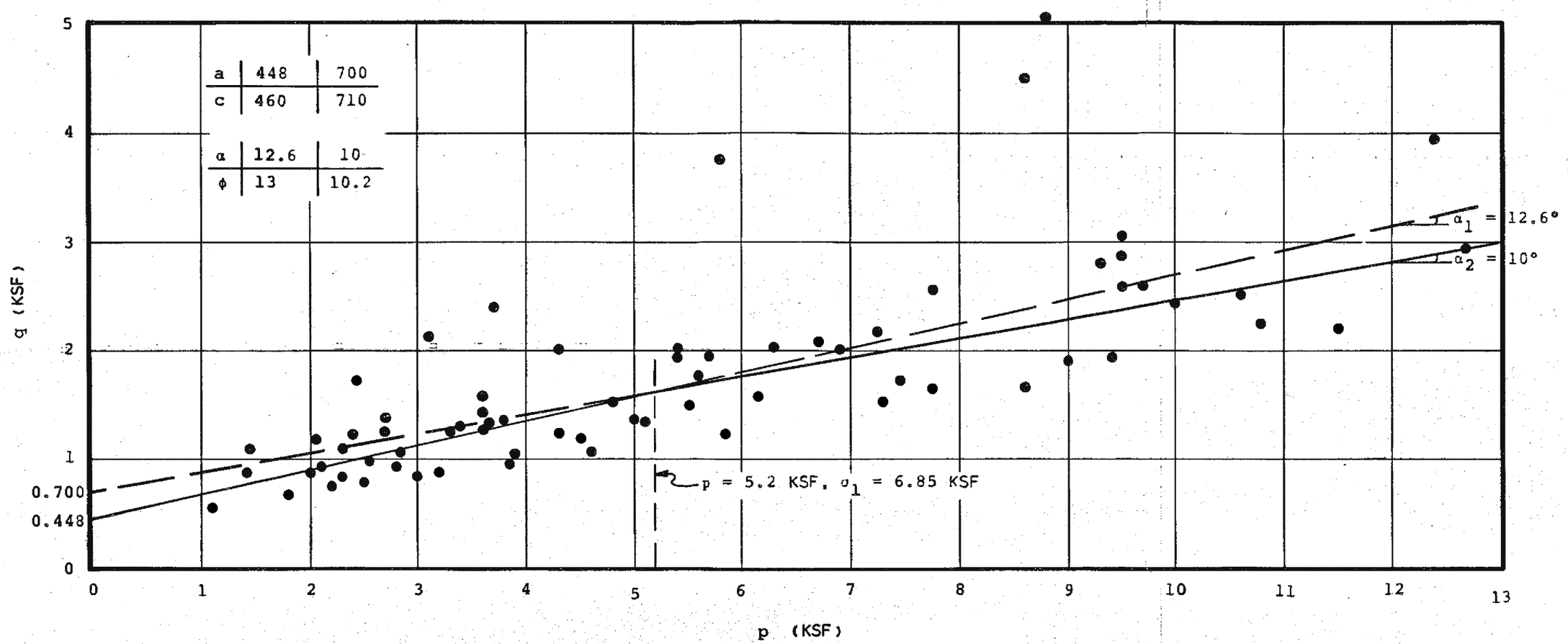
BELLE RIVER PLANT
UNIT 1 & 2

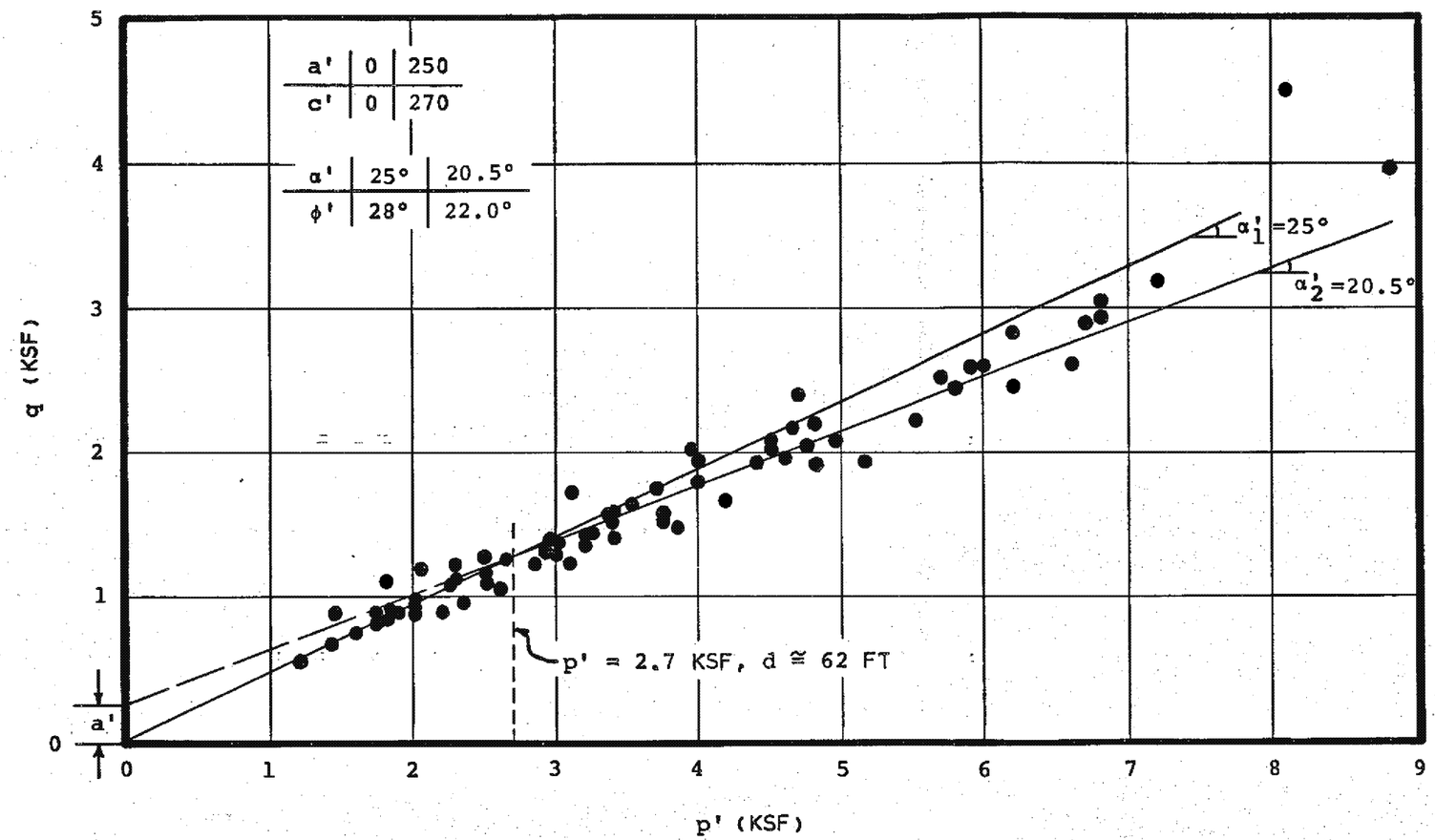
UNDRAINED SHEAR STRENGTH FROM SKEMPTON'S RELATIONSHIP

JOB NO.	DRAWING NO.	REV.
10539	FIGURE 28	0



$$p = \frac{\sigma_1 + \sigma_3}{2} \qquad q = \frac{\sigma_1 - \sigma_3}{2}$$

BECHTEL ANN ARBOR		
BELLE RIVER PLANT UNITS 1 & 2		
p - q DIAGRAM ALL CLAYEY SOILS		
JOB No.	DRAWING No.	REV
10539	FIGURE 29	A



$$p' = \frac{\sigma_1' + \sigma_3'}{2} \qquad q = \frac{\sigma_1' - \sigma_3'}{2}$$

BECHTEL
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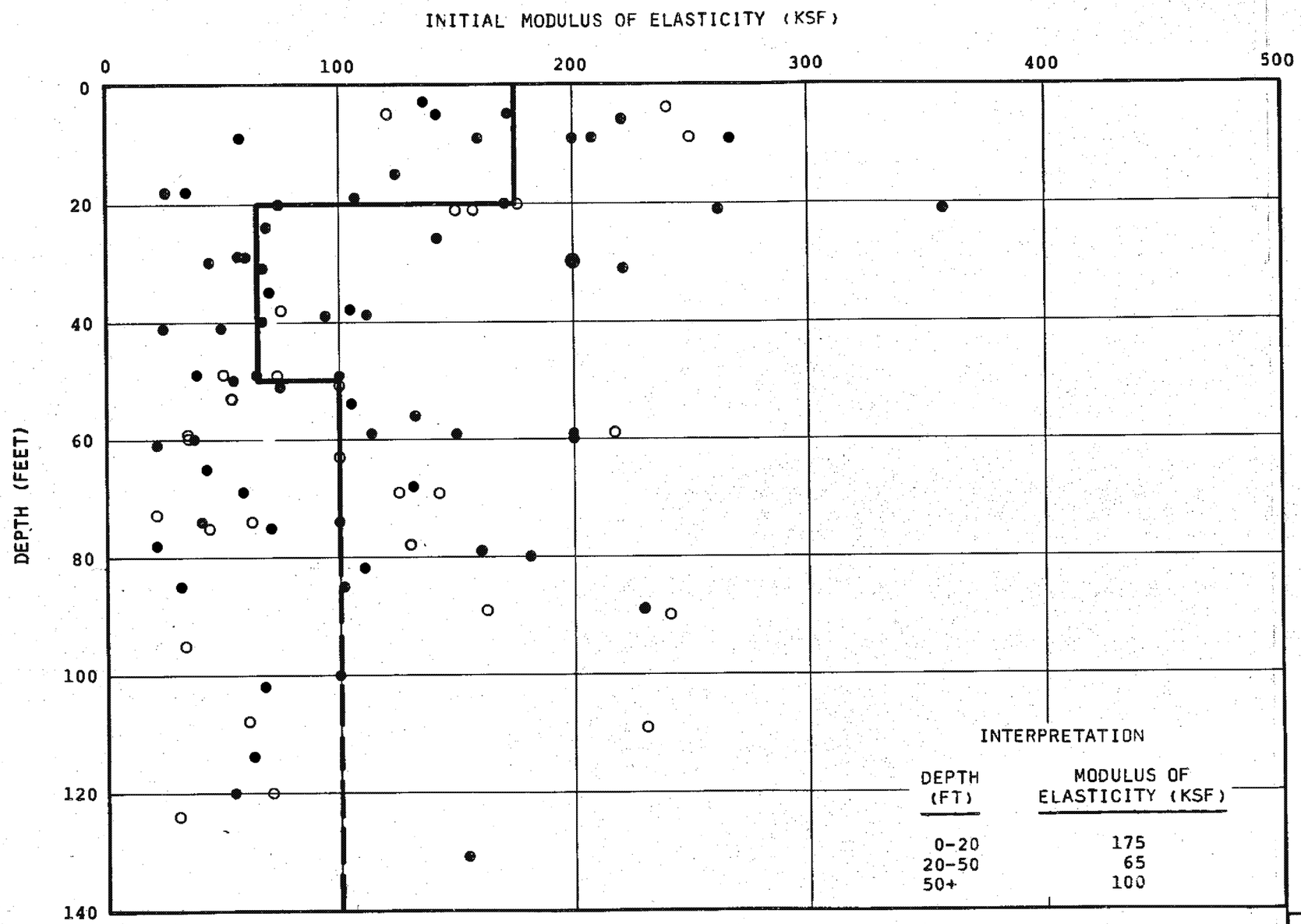
BELLE RIVER PLANT
UNIT 1 & 2

p' - q DIAGRAM
ALL CLAYEY SOILS

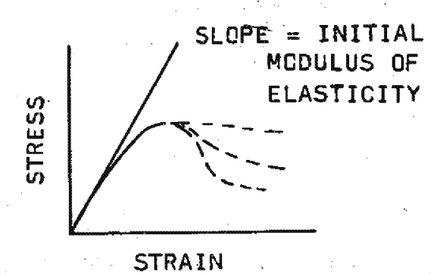
JOB NO.	DRAWING NO.	REV.
10539	FIGURE 30	0



INTERPRETATION

DEPTH (FT)	MODULUS OF ELASTICITY (KSF)
0-20	175
20-50	65
50+	100

DEFINITION



● FROM Qu TEST

O FROM UU TEST

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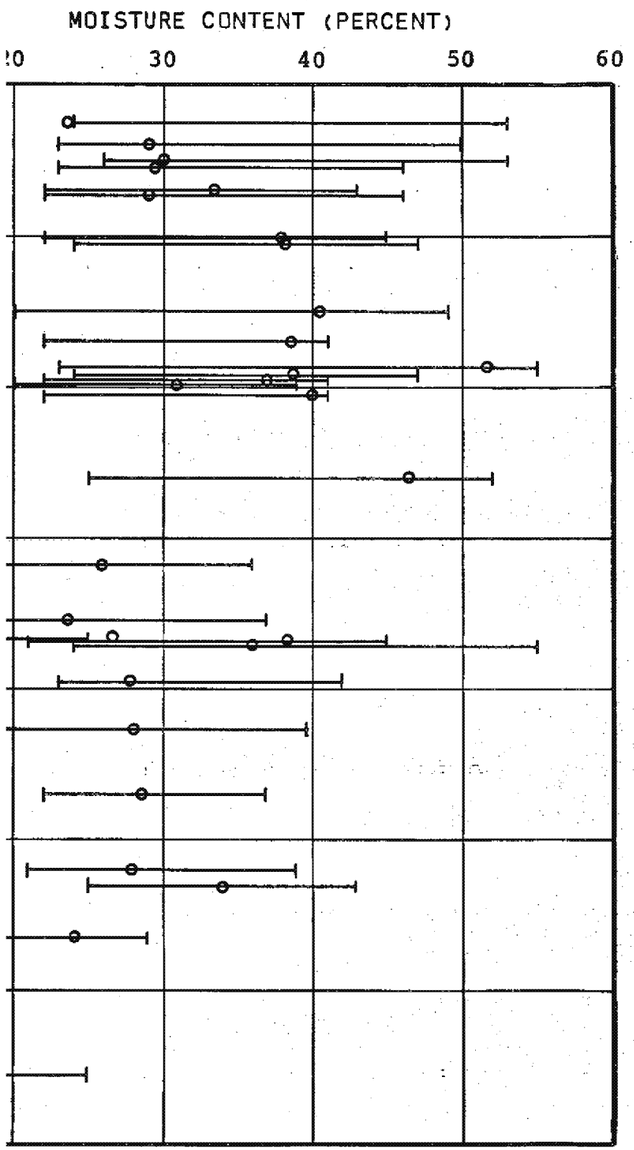
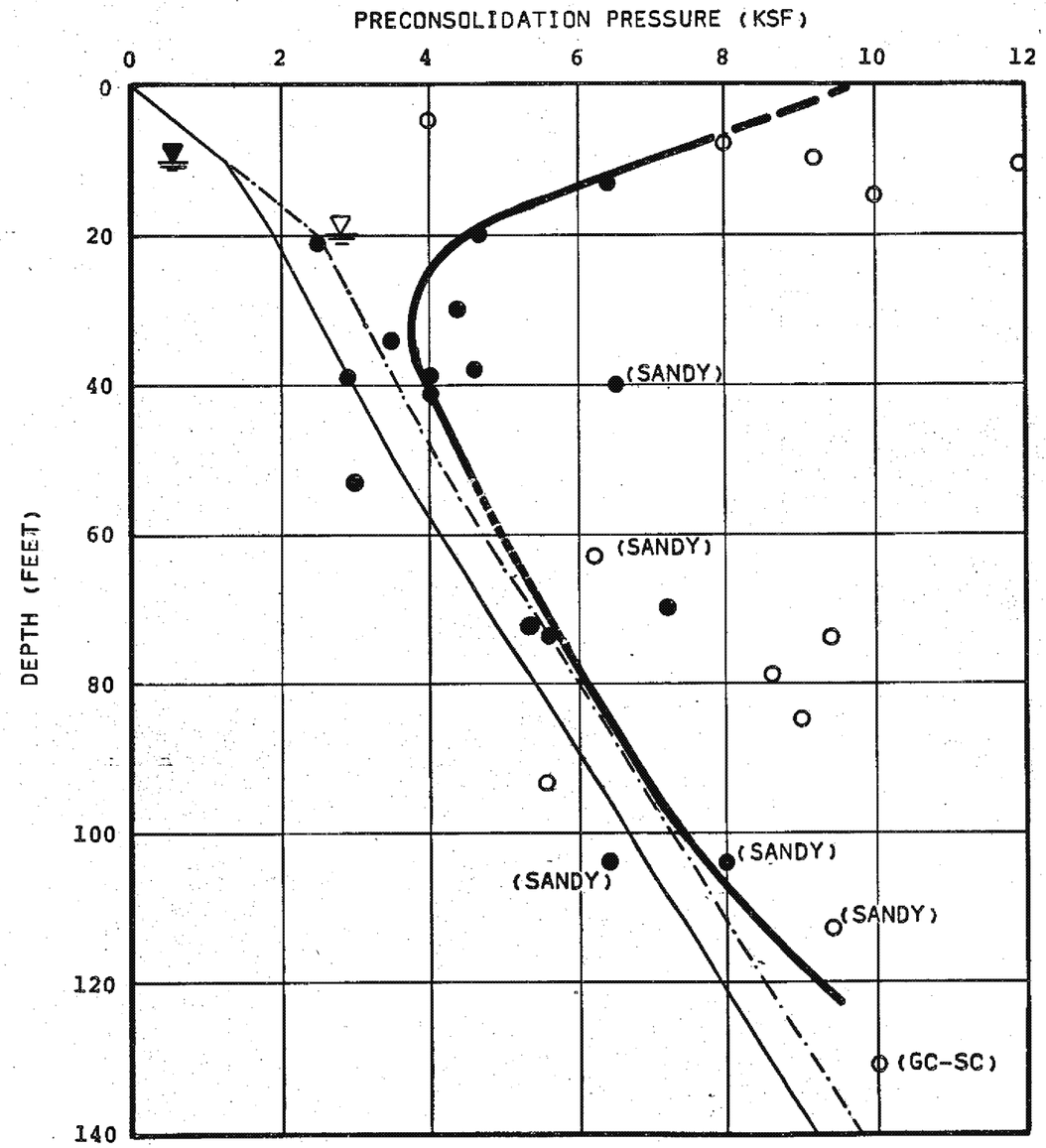
BELLE RIVER PLANT
UNIT 1 & 2

INITIAL MODULUS OF ELASTICITY VS DEPTH

JOB NO.	DRAWING NO.	REV.
10539	FIGURE 31	0





SOIL DATA

DEPTH (FT)	TOTAL UNIT WEIGHT (PCF)	EFFECTIVE UNIT WEIGHT (PCF)
0-20	125	63
20-50	115	53
50+	125	63

LEGEND

EFFECTIVE OVERBURDEN PRESSURE WITH WATER TABLE AT 10 FOOT DEPTH

EFFECTIVE OVERBURDEN PRESSURE WITH WATER TABLE AT 20 FOOT DEPTH

DESIGN PRECONSOLIDATION PRESSURE

o NATURAL MOISTURE CONTENT

⊣ LL ATTERBERG LIMITS

● PRECONSOLIDATION PRESSURE FROM CONSOLIDATION TEST (CASAGRANDE PROCEDURE)

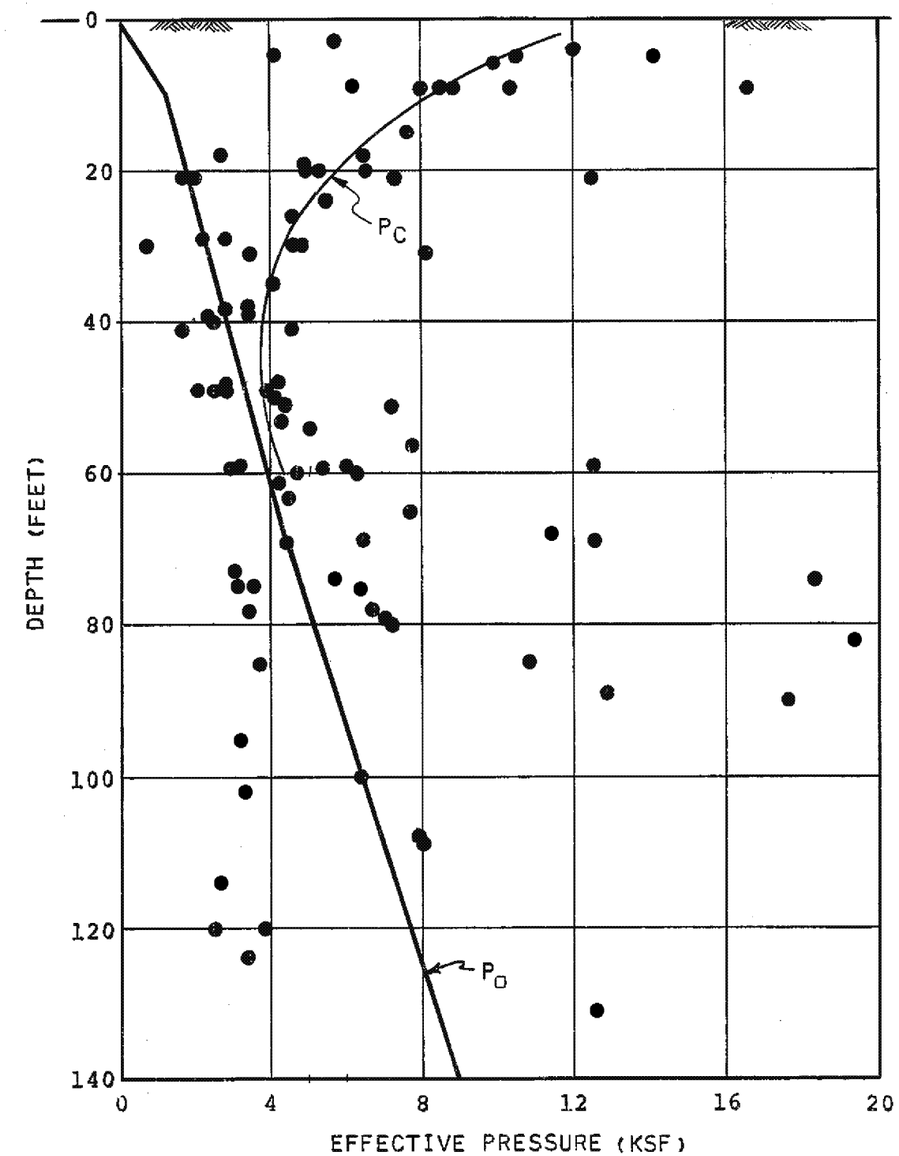
O PRECONSOLIDATION PRESSURE FROM CONSOLIDATION TEST (CASAGRANDE PROCEDURE - SAMPLES BELIEVED TO BE RELATIVELY DISTURBED)

BECHTEL
ANN ARBOR

BELLE RIVER PLANT
UNIT 1 & 2

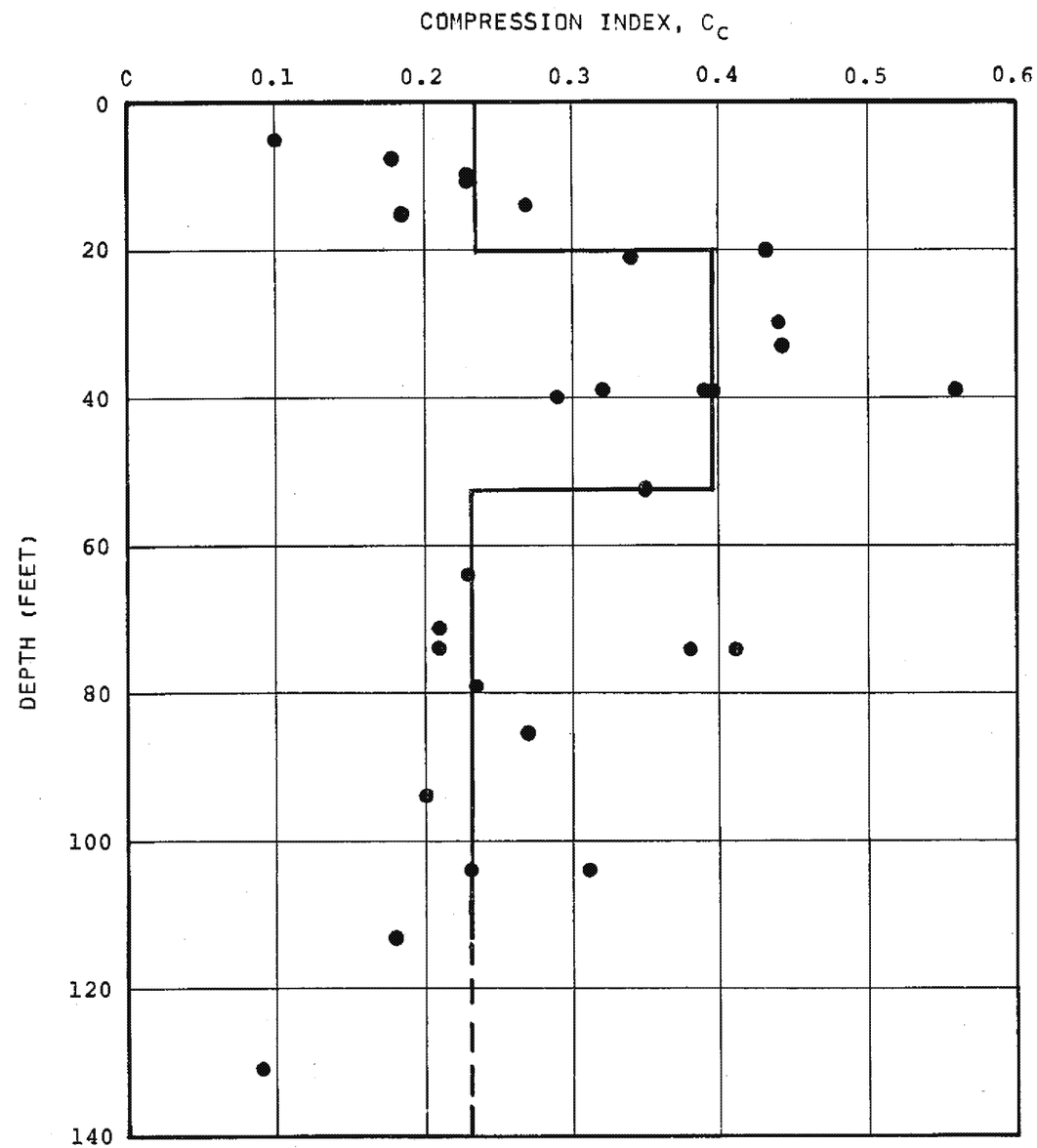
PRECONSOLIDATION PRESSURE
VS DEPTH

JOB NO.	DRAWING NO.	REV.
10539	FIGURE 32	0

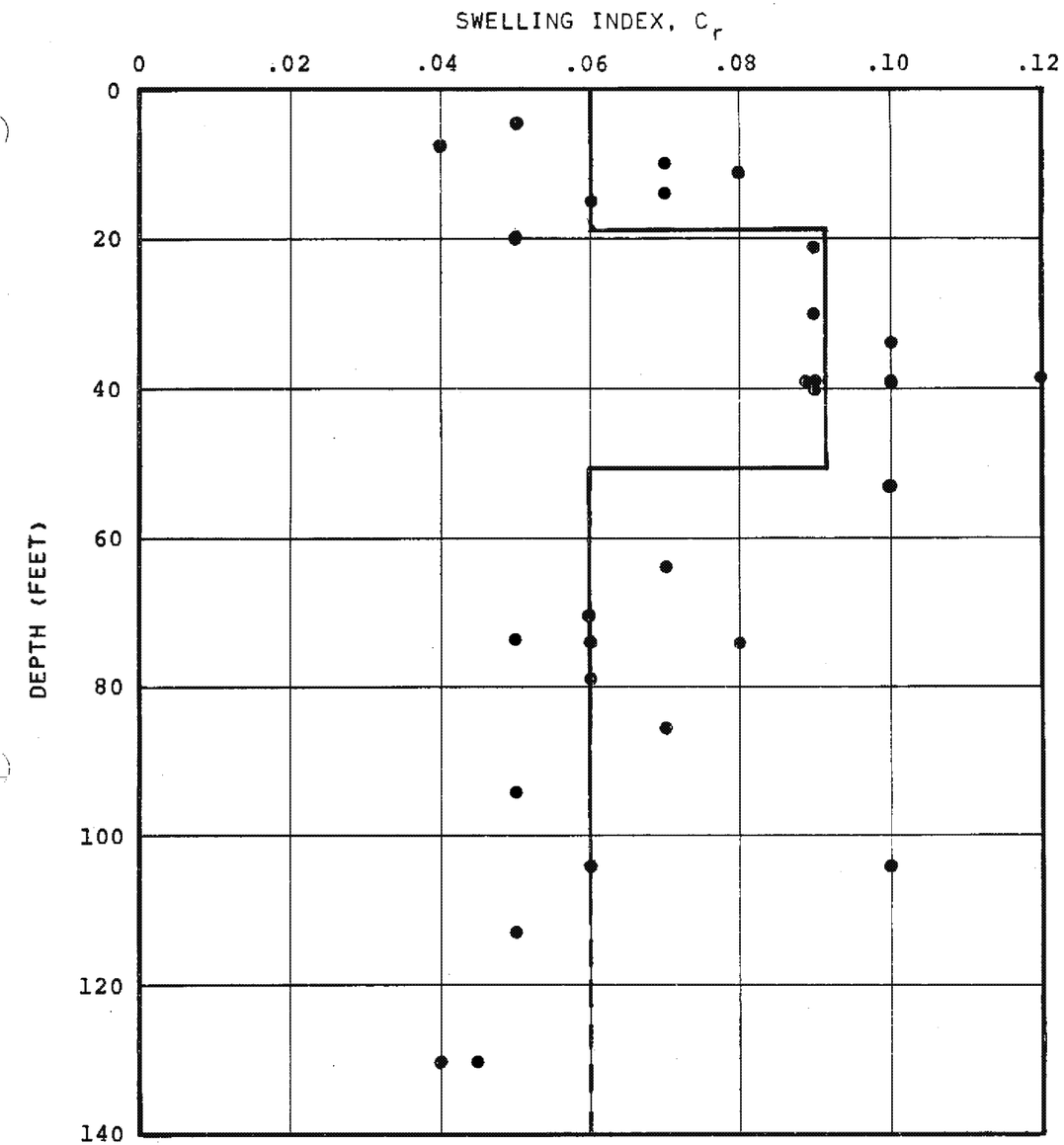


NOTE: COHESION (C) FROM UU & QU TESTS SUBSTITUTED FOR "C" IN SKEMPTON'S RELATIONSHIP $C/\bar{P} = 0.11 + .0037 \times PI$.

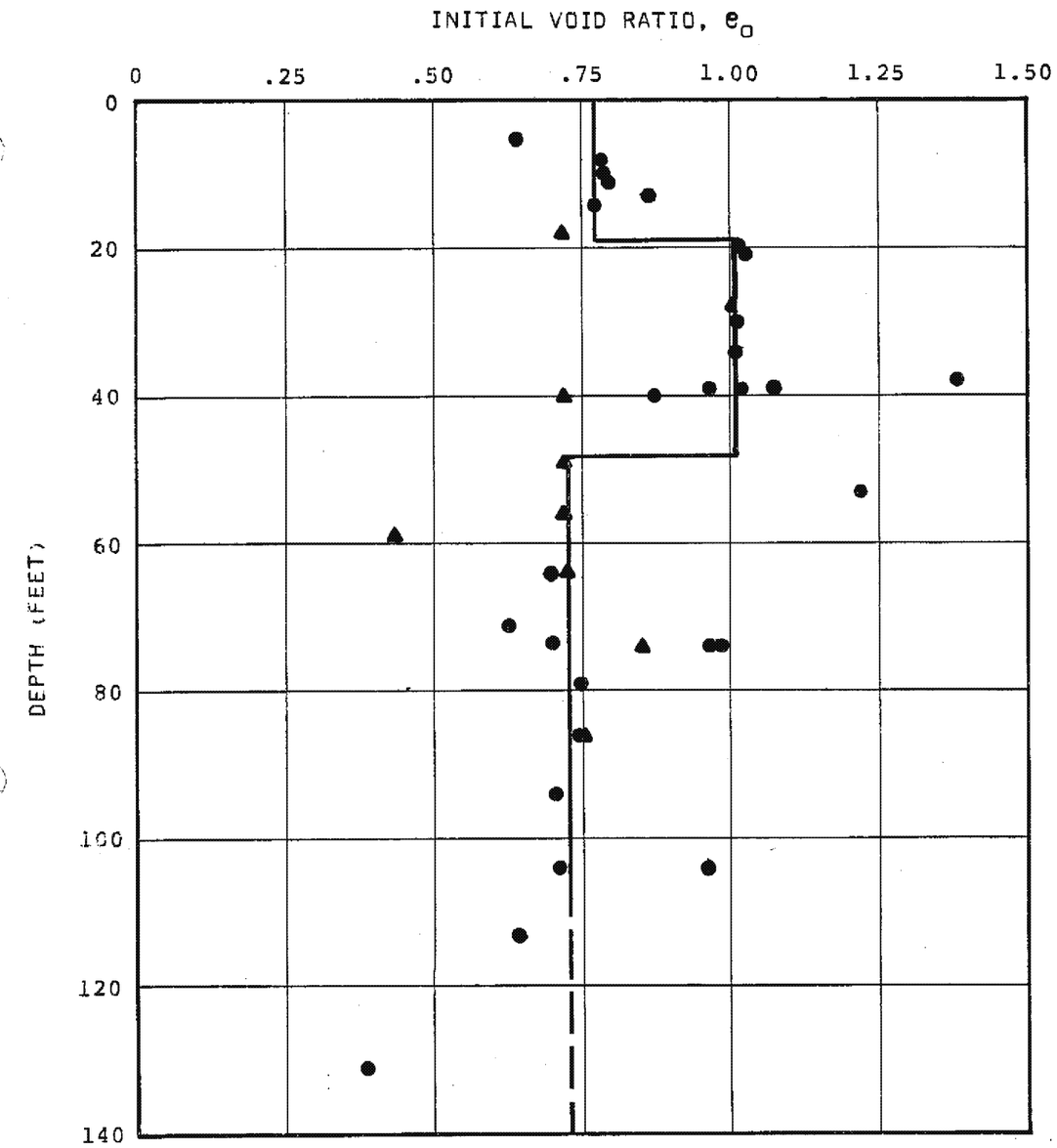
BECHTEL ANN ARBOR			
BELLE RIVER PLANT UNITS 1 & 2			
P_C OBTAINED FROM SKEMPTON'S RELATIONSHIP			
	JOB No.	DRAWING No.	REV.
	10539	FIGURE 33	0



BECHTEL ANN ARBOR			
BELLE RIVER PLANT UNITS 1 & 2			
COMPRESSION INDEX VS DEPTH			
	JOB No.	DRAWING No.	REV
	10539	FIGURE 34	B



BECHTEL ANN ARBOR			
BELLE RIVER PLANT UNITS 1 & 2			
SWELLING INDEX vs DEPTH			
	JOB No.	DRAWING No.	REV.
	10539	FIGURE 35	B

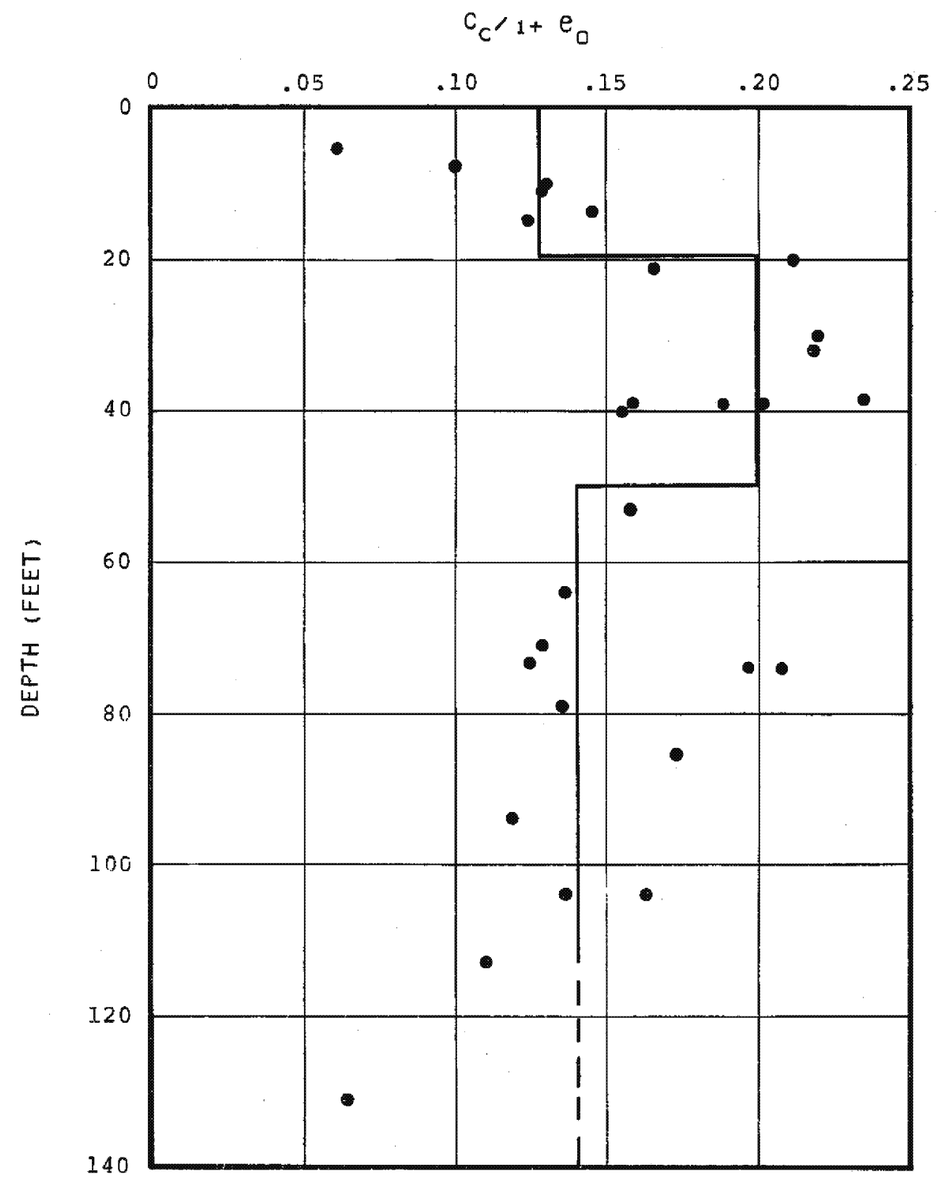


LEGEND

● FROM CONSOLIDATION TEST RESULTS

▲ FROM PERMEABILITY TEST RESULTS

BECHTEL ANN ARBOR		
BELLE RIVER PLANT UNITS 1 & 2		
INITIAL VOID RATIO VS DEPTH		
JOB No.	DRAWING No.	REV.
10539	FIGURE 36	B



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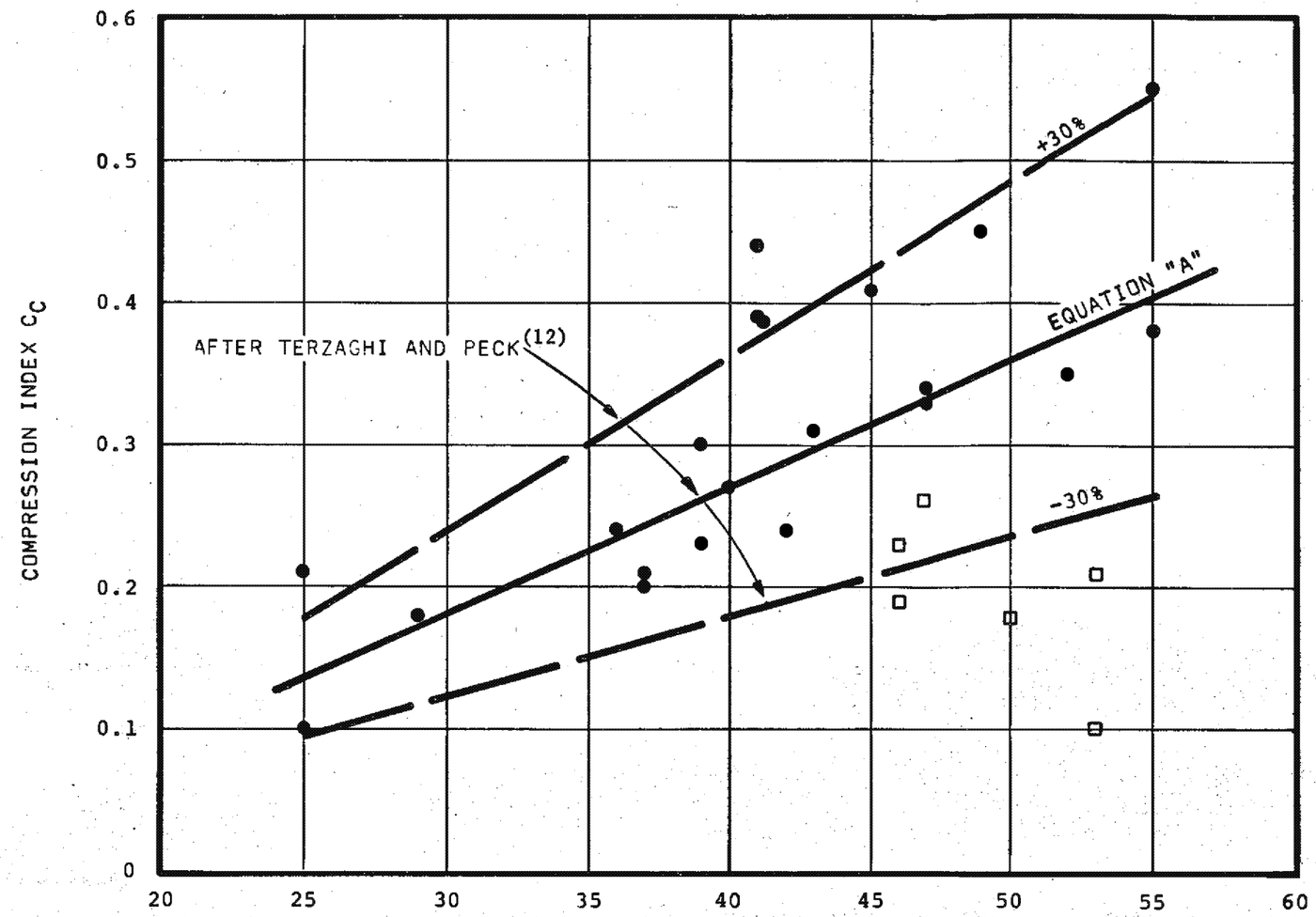
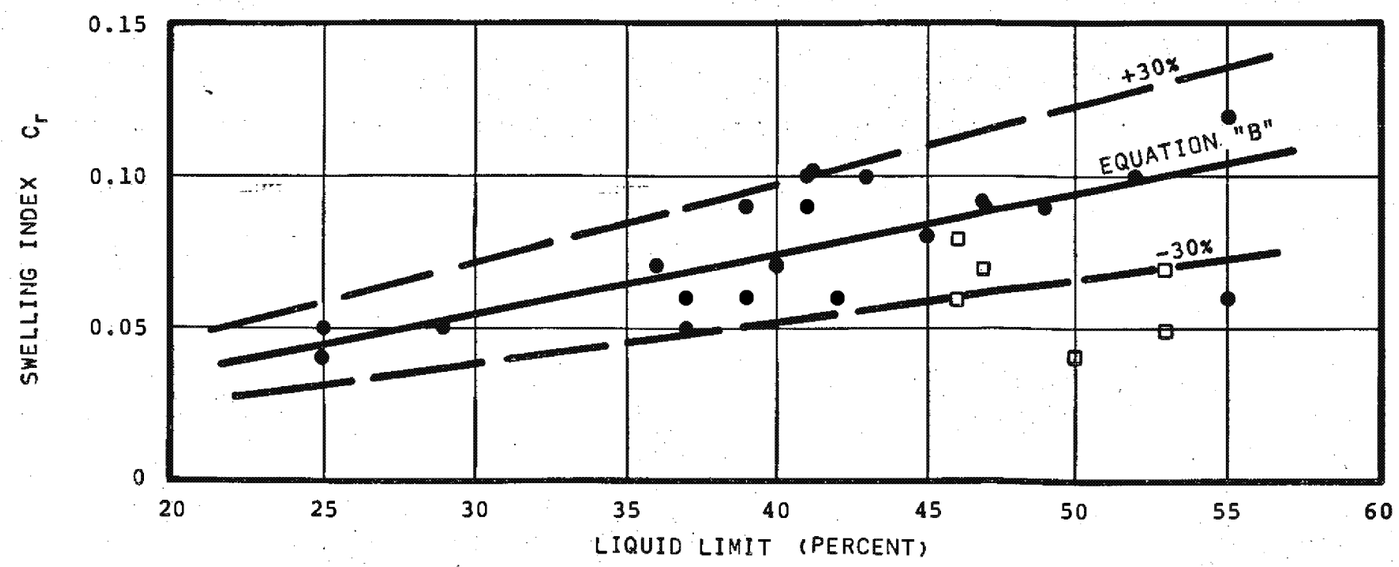
ANN ARBOR

BELLE RIVER PLANT
UNITS 1 & 2

SETTLEMENT PARAMETER
$C_c/1+e_o$ VS DEPTH

JOB No.	DRAWING No.	REV.
10539	FIGURE 37	B





NOTES:

□ UPPER STRATUM (0-20 FEET) OVERCONSOLIDATION RATIO GREATER THAN 4.

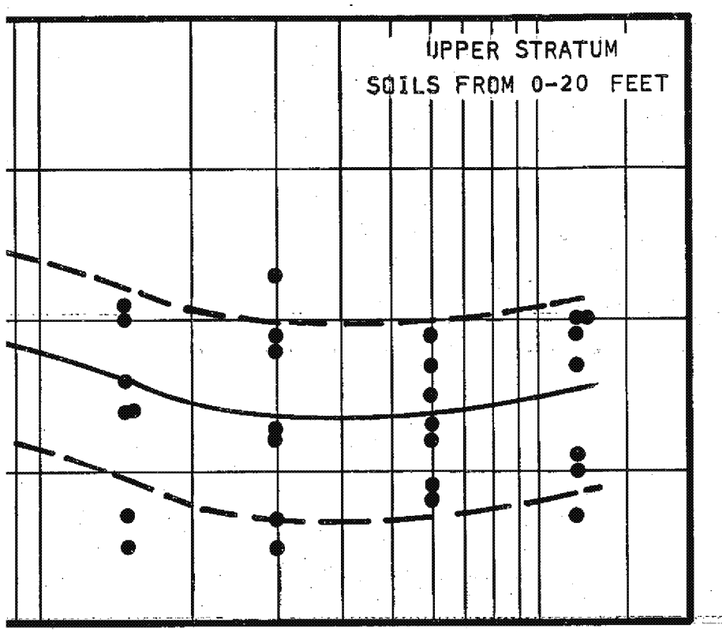
● MIDDLE AND LOWER STRATA (BELOW 20 FEET) OVERCONSOLIDATION RATIO LESS THAN 2.

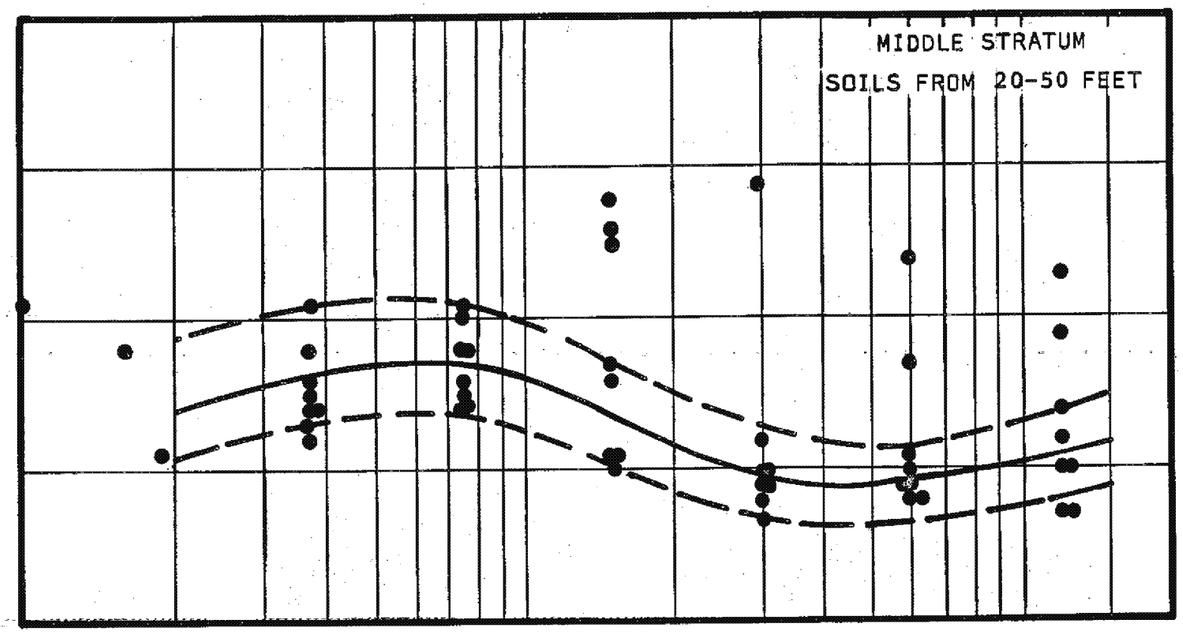
EXPLANATION

EQUATION "A" — COMPRESSION INDEX
$C_c = 0.009(LL-10)$

EQUATION "B" — SWELLING INDEX
$C_r = 0.002(LL-2.5)$

BECHTEL ANN ARBOR			
BELLE RIVER PLANT UNIT 1 & 2			
LIQUID LIMIT vs COMPRESSION AND SWELLING INDICIES			
	JOB NO.	DRAWING NO.	REV.
	10539	FIGURE 38	0





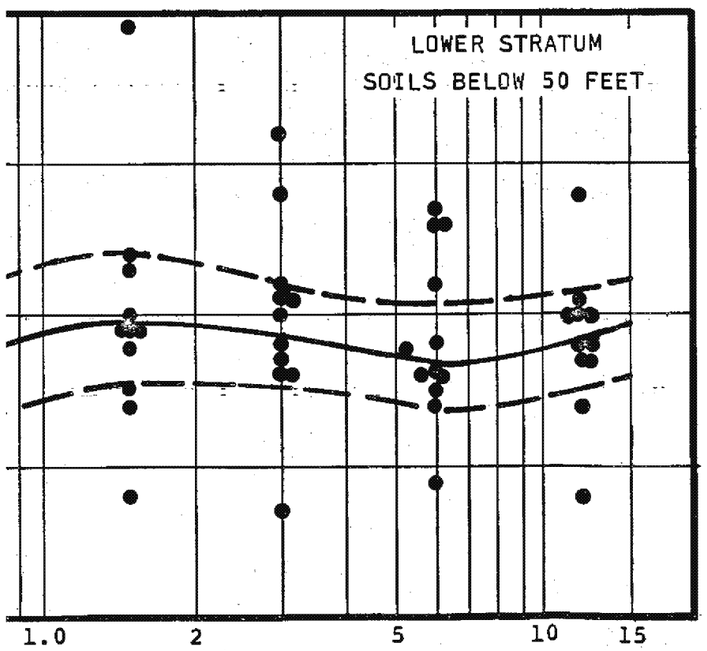
NOTE:

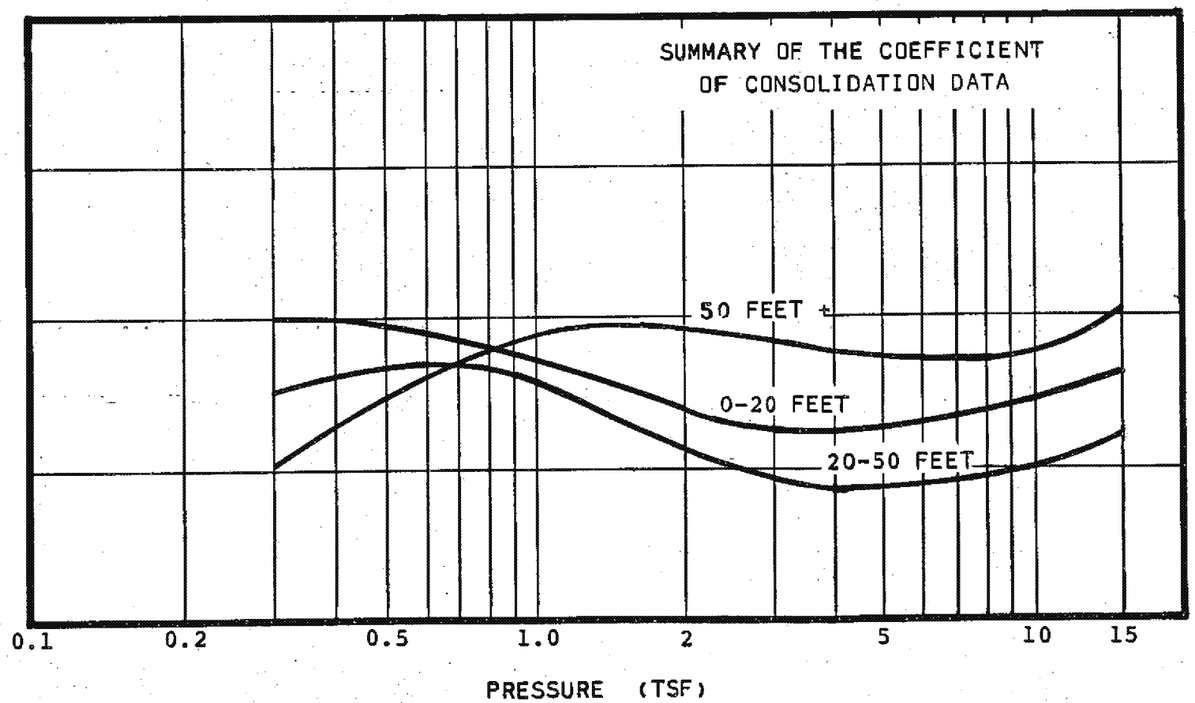
COEFFICIENT OF CONSOLIDATION BASED ON THE SQUARE ROOT OF TIME METHOD.

EXPLANATION:

RANGE OF VALUES

DESIGN CURVE



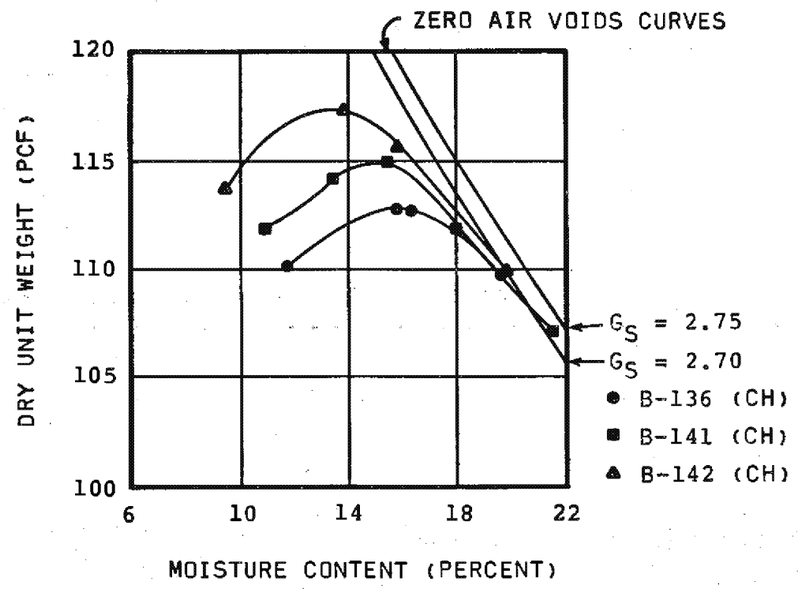


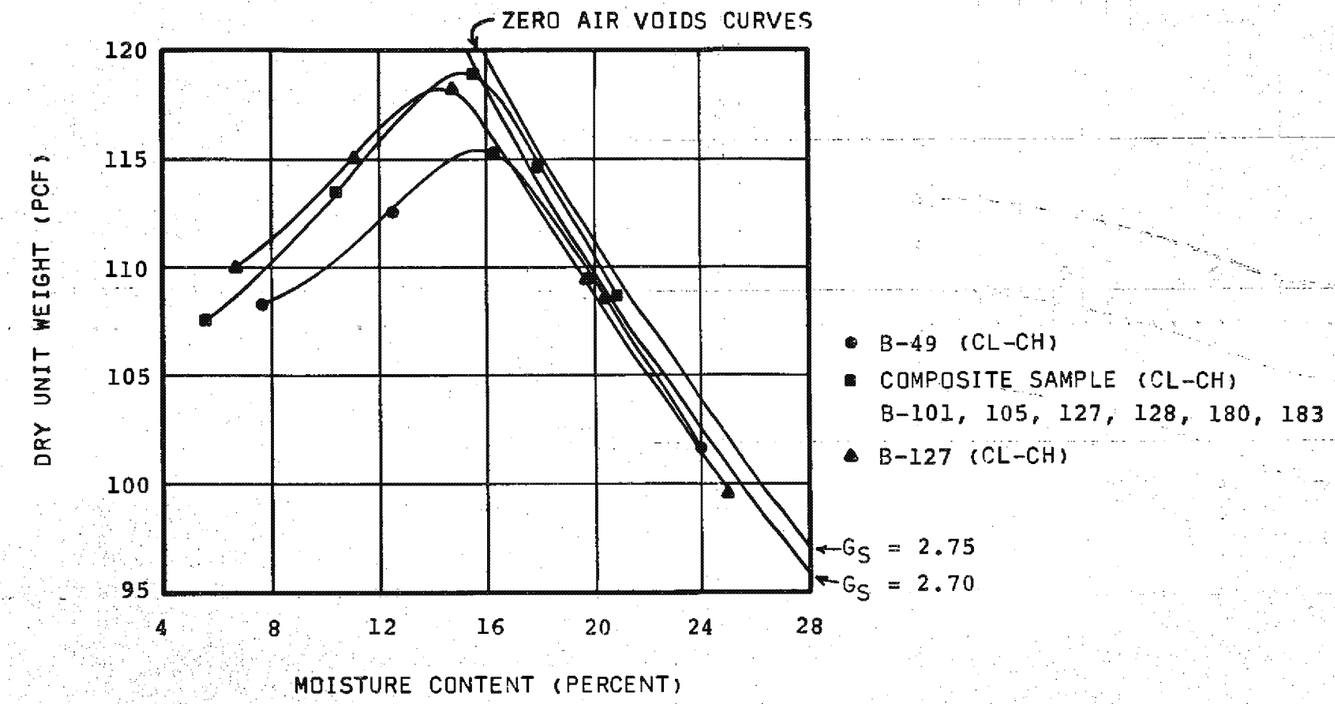
BECHTEL
ANN ARBOR

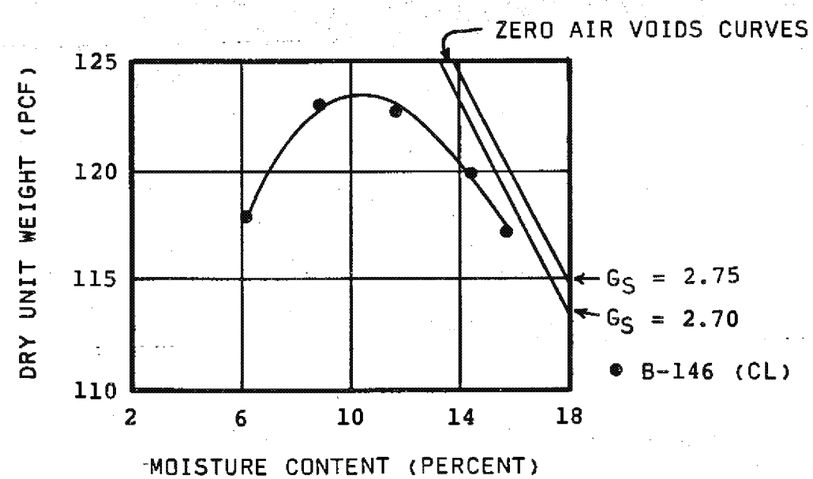
BELLE RIVER PLANT
UNIT 1 & 2

COEFFICIENT OF CONSOLIDATION
VS
PRESSURE

JOB NO.	DRAWING NO.	REV.
10539	FIGURE 39	0







NOTES:

1) ALL TESTS WERE MADE ACCORDING TO ASTM D-1557 METHOD C.

2) THE ZERO AIR VOIDS CURVES HAVE BEEN DRAWN FOR ASSUMED SPECIFIC GRAVITY (G_S) OF 2.70 AND 2.75.

BECHTEL
ANN ARBOR

BELLE RIVER PLANT
UNITS 1 & 2

SUMMARY OF COMPACTION TESTS
UPPER STRATA SOILS

JOB NO.	DRAWING NO.	REV.
10539	FIGURE 40	0

Appendix A

P. O. Box 619
Ann Arbor, Michigan 48107
April 5, 1966

Mr. Joseph Funston
The Detroit Edison Company
Room 604 S.B.
2000 Second Avenue
Detroit 26, Michigan

Re: Soil Investigation at the St. Clair Power Plant

Dear Mr. Funston:

Enclosed you will find two sets of the results of the soil investigation made in connection with the extension of Unit No. 7 and the yard's conveyor area.

Each set includes the individual boring log profile of the 1965 borings (22, 25, and 27), followed by two Composite Subsoil Analysis Profiles. One composite is for the Power House Area. Here, superimposed on the composite chart of the 1965 borings, are both the transverse and compression shearing resistances, together with the ASTM standard penetration values from the 1950 borings. Similarly, the soil investigation results from the 1950 borings (13, 14, 15, and 16) are superimposed on the second composite for the yard's conveyor area. Shown on these two composites are three averages for the shear and penetration values. Dotted lines represent the 1965 borings, red lines the 1950 borings, and heavy lines the average of all borings.

As seen on the two composites, a comparison of the soil resistances of the soil strata encountered between the 1950 and 1965 borings is rather clear. However, two tables were prepared to facilitate reference to such comparison. In general, the soil resistances measured in the 1965 borings are lower than those of the 1950 borings, with few exceptions occurring at the lower strata. However, the averages from all borings which are recommended as design values, are closer to the 1965 borings.

It should not be overlooked that the shear values from the 1965 borings are available only from Borings 22 and 25 for one area, and only

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Boring 27 for the other area. For this reason, only few values were available in each stratum, and the 1965 average alone should not be considered as representative of the area involved. Because more penetration values are available from all of the 1965 borings, the averages are now more representative and closer to the averages of both the 1950 and 1965 borings. A more detailed report of this investigation will be prepared if desired.

Very truly yours,

Georges Selim
For W. S. Housel

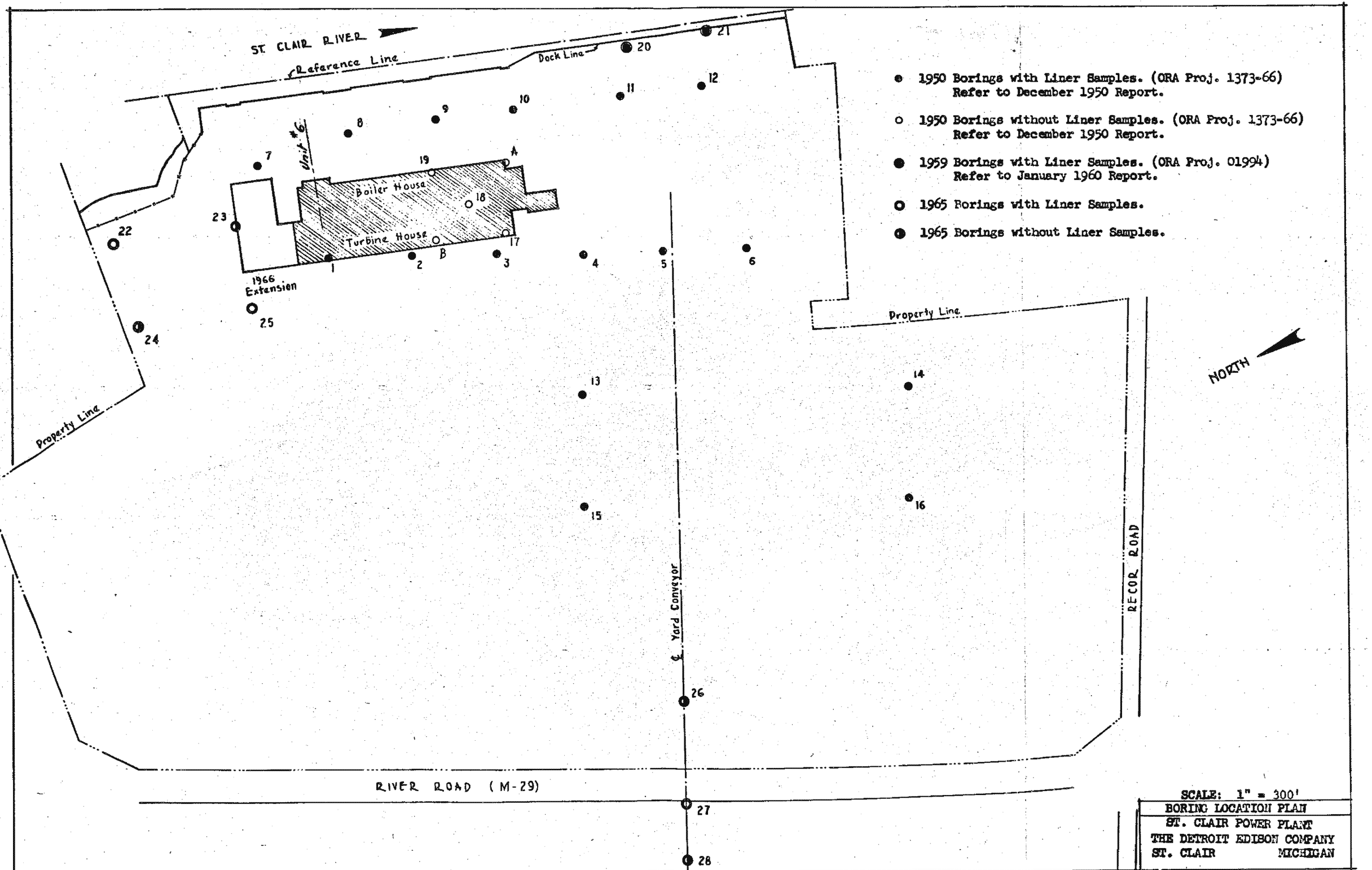
GS:kd
Enclosures

cc: Mr. Robert A. Briggs

ED_005947A_00014556-00292

SOIL INVESTIGATION AT
ST. CLAIR POWER PLANT
THE DETROIT EDISON COMPANY

ED_005947A_00014556-00293



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COMPARISON OF AVERAGE SOIL RESISTANCES BETWEEN
1950 AND 1965 BORINGS IN THE POWER PLANT AREA
ST. CLAIR POWER PLANT

1950 Borings: 1 through 12, 17, 18, and 19
1965 Borings: 22, 23, 24, and 25

Soil Type	S_c PSF			$S_{uc}/4$ PSF			N Blows/Ft.			Elev. Ft.
	1 1950	2 1965	1 & 2 All	1 1950	2 1965	1 & 2 All	3 1950	4 1965	3 & 4 All	
591 Ground Surface										591
Medium to stiff vari-colored clay, trace of gravel.	1500	*	1364	1167	*	1142	14.7	12.8	14.1	577
577 / 575										
Very soft brown-gray clay, trace to some sand.	130	123	151	221	112	201	4.1	2.8	3.9	560
555	100	90	106	118	81	111	2.5	1.8	2.3	545
540		*	154	140	*	137	3.5	3.3	3.2	535
535										
Medium sandy gray clay, trace to some gravel.	150	142	168	186	124	175	4.9 / [12.8]	4.2 / [17.3]	4.8 / [14.7]	515
		122	143	155	155	155	6.4	7.3	6.6	500
		167	172	201	168	195	7.5	8.1	7.7	480
		159	158	151	149	151	7.8	7.4	7.7	465
465 / 458										

(1) Based on shear test from Borings 1 through 12 only.
(2) Based on shear test from Borings 22 and 25 only.
(3) Based on ASTM penetration from Borings 1 through 12, 17, 18 and 19.
(4) Based on ASTM penetration from Borings 22 through 25.
* Only one or two samples available.
[ ] Represent ASTM penetration for the sand layer found in variable thickness in Borings 1, 2, 3, 4, 17, 19, 23, 24, and 25 only between Elevs. 540 and 510.

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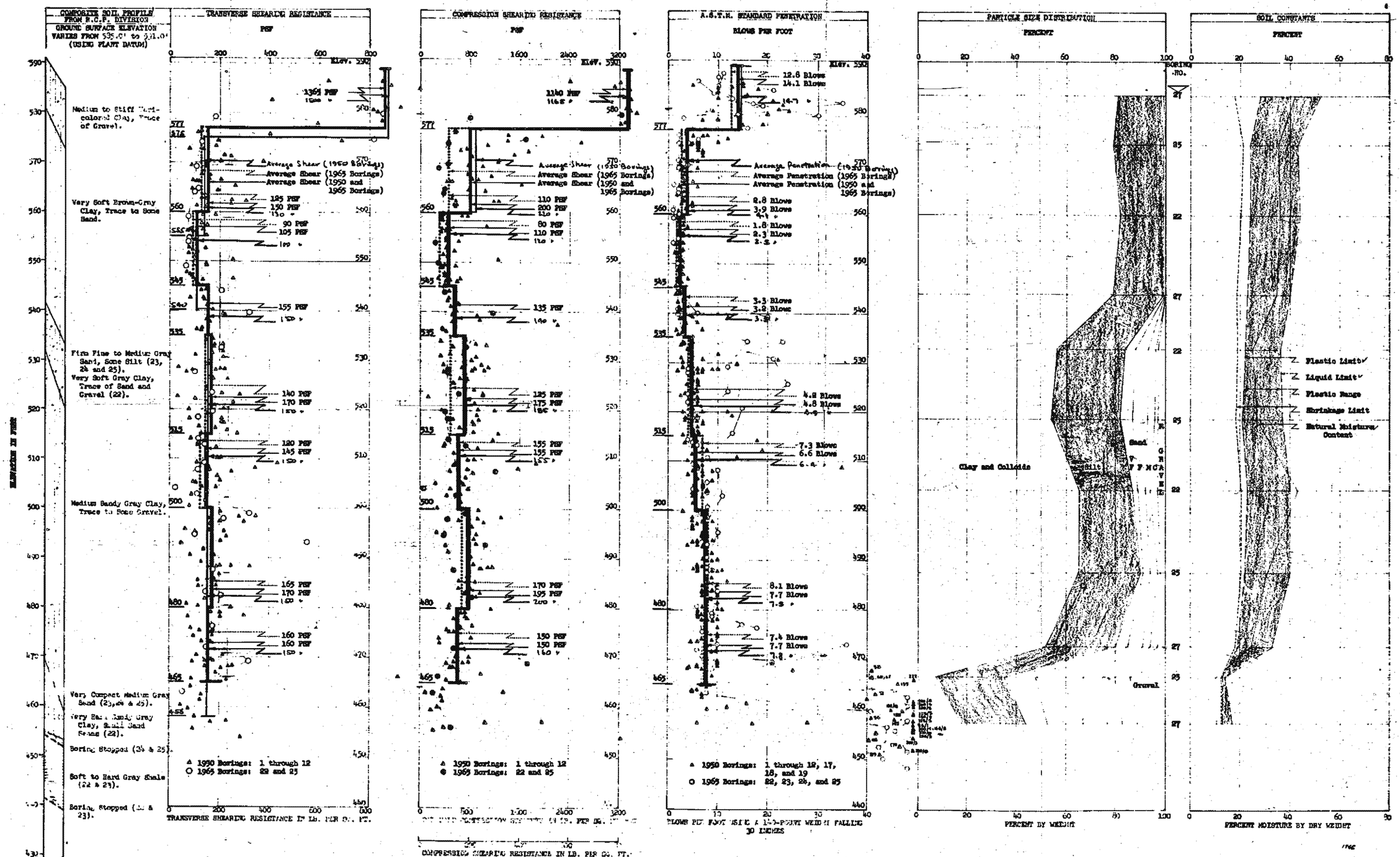


The above Composite Soil Profile is intended only to present average conditions throughout the group of borings represented. See individual Boring Charts for details.

OFFICE OF RESEARCH ADMINISTRATION
SOIL MECHANICS LABORATORY
UNIVERSITY OF MICHIGAN ANN ARBOR, MICHIGAN
COMPOSITE SUBSOIL ANALYSIS OF BORINGS NO. 22,23,24,25
ST. CLAIR POWER PLANT
THE DETROIT EDISON COMPANY
ST. CLAIR MICHIGAN
APPROVED: W. A. Hansel DATE: 4-5-1966
PROJECT: 01994

A-7

LOG OF SOIL PROFILE

BY R.C.P. DIVISION

GROUND SURFACE ELEVATION 590.2 FT. (USING PLANT DATUM)

ELEVATION IN FEET: 590, 580, 570, 560, 550, 540, 530, 520, 510, 500, 490, 480, 470, 460, 450, 440

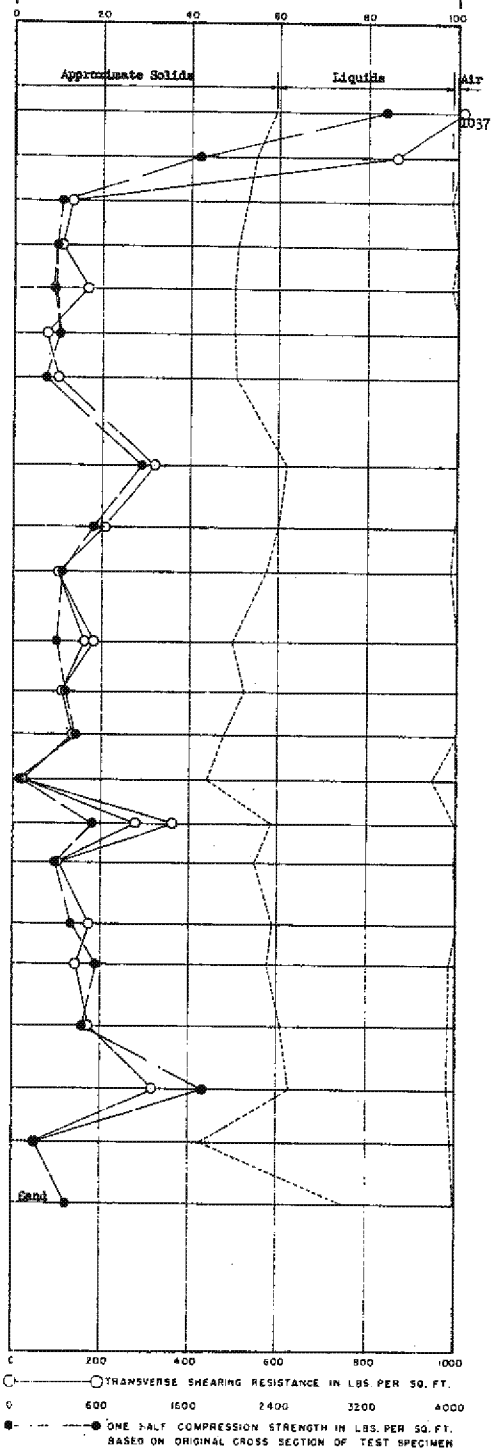
- Cinders.
- Medium Sandy Brown Clay, Gravel, Vegetation.
- Stiff Sandy Varicolored Clay, Trace of Gravel.
- Hard Sandy Varicolored Clay, Trace of Gravel.
- Medium Sandy Varicolored Clay.
- Soft Gray-Brown Clay, Some Sand.
- Very Soft Gray Clay, Trace of Sand and gravel.
- Medium Sandy Gray Clay With Some Gravel.
- Stiff Sandy Gray Clay, Some Gravel, Few Large Stones.
- Medium Sandy Gray Clay.
- Very Hard Sandy Gray Clay With Small Sand Seams.
- Soft Gray Shale.
- Hard Gray Shale. 50% Recovery.
- Boring Stopped.

SA NO.	ELEV	LAB CONSISTENCY	PENETRATION NO. OF BLOWS	PENETRATION DRIVE IN INCHES	% H_2O BY DRY WT	DRY WT LBS PER CU FT.	LABORATORY VISUAL INSPECTION REMARKS
1-BS	587.7	--	10	12			
2-BS	585.2	--	21	12			
3-BS	582.7	--	35	12			
4-LS	580.2	Stiff	14	12	25.8	99.2	4-LS: Uniform. Silty brown-gray laminated clay, trace of gravel.
5-LS	575.2	Plastic to Firm	6	12	33.5	91.8	5-LS: Uniform. Silty brown-gray laminated clay.
6-LS	570.2	Soft	3	12	32.5	88.6	6-LS: Uniform. Gray clay, little silt.
7-LS	565.2	Very Soft	2	12	36.4	84.9	7-LS: Uniform. Gray clay, little silt.
8-LS	560.2	Very Soft	2	12	35.9	84.9	8-LS: Uniform. Gray clay, little silt.
9-LS	555.2	Very Soft	2	12	38.7	83.6	9-LS: Uniform. Gray clay, little silt.
10-LS	550.2	Very Soft	2	12	37.4	84.2	10-LS: Uniform. Gray clay, little silt.
	545.2	--	2	12			
11-LS	540.2	Plastic	6	12	23.9	102.3	11-LS: Uniform. Silty gray clay, trace of very fine sand and fine gravel.
	535.2	--	5	12			
12-LS	533.2	Soft	4	12	25.0	98.9	12-LS: Uniform. Silty gray clay, little sand and trace of fine gravel.
13-LS	528.2	Soft	4	12	27.5	94.2	13-LS: Uniform. Silty gray clay, little sand and trace of fine gravel.
	522.2	--	4	12			
14-LS	520.2	Soft	4	12	38.6	81.7	14-LS: Uniform. Silty gray clay, little sand and trace of fine gravel.
15-LS	514.7	Soft	4	12	34.6	86.1	15-LS: Uniform. Silty gray clay, little sand and trace of fine gravel.
16-LS	509.7	Soft	5	12	41.6	78.6	16-LS: Uniform. Silty gray clay, little sand and trace of fine gravel.
17-LS	504.7	Very Soft	5	12	43.1	73.6	17-LS: Uniform. Silty gray clay, little sand and trace of fine gravel.
18-LS	499.7	Plastic	6	12	26.3	98.0	18-LS: Uniform. Silty gray clay, little sand and trace of fine gravel.
19-LS	495.2	Soft	7	12	30.5	91.7	19-LS: Uniform. Silty gray clay, little sand and trace of fine gravel.
	489.7	--	8	12			
20-LS	488.2	Soft	9	12	26.1	98.6	20-LS: Uniform. Silty gray clay, little sand and trace of fine gravel.
21-LS	483.7	Soft	10	12	26.4	96.7	21-LS: Uniform. Silty gray clay, little sand and trace of fine gravel.
	479.7	--	9	12			
22-LS	476.7	Soft	18	12	23.0	101.7	22-LS: Uniform. Silty gray clay, little sand and trace of fine gravel.
	473.2	--	36	12			
23-LS	469.7	Plastic	21	12	21.1	104.8	23-LS: Uniform. Silty gray clay, little sand and trace of fine gravel.
24-LS	463.7	Very Soft	8	12	49.8	71.1	24-LS: Uniform. Gray clay, some silt.
25-LS	456.7	Compact	117	12	12.1	126.0	25-LS: Uniform. Clayey coarse gray sand.
	450.2	--	100	12			

PENETRATION: Number of blows required to drive core sampler distance given using a 140-pound weight falling 30 inches.

SEE Failure to recover Liner Sample.

SHEARING RESISTANCE & VOLUME OF SOLIDS CURVES



UNIVERSITY OF MICHIGAN RESEARCH INSTITUTE
SOIL MECHANICS LABORATORY
ANN ARBOR MICHIGAN

SUBSOIL ANALYSIS OF BORING NO. 22
ST. CLAIR POWER PLANT
THE DETROIT EDISON COMPANY ST. CLAIR, MICHIGAN
APPROVED: W. A. Housel DATE: 4-5-1966
PROJECT: 01994

Boring Log and all sampling by Raymond Concrete Pile Division of Raymond International, Inc.
Their Job No. C2-4043-D
Date of Boring: 7-31-1965

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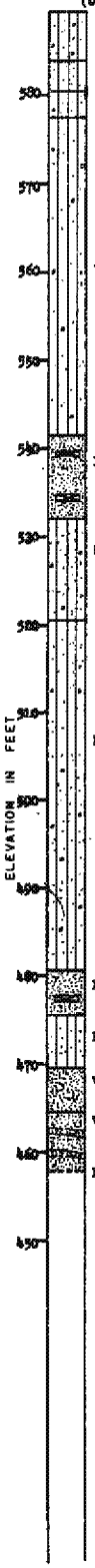
LOG OF SOIL PROFILE

BY R.O.P. DIVISION

GROUND SURFACE ELEVATION 589.5 FT. (USING PLANT DATUM)



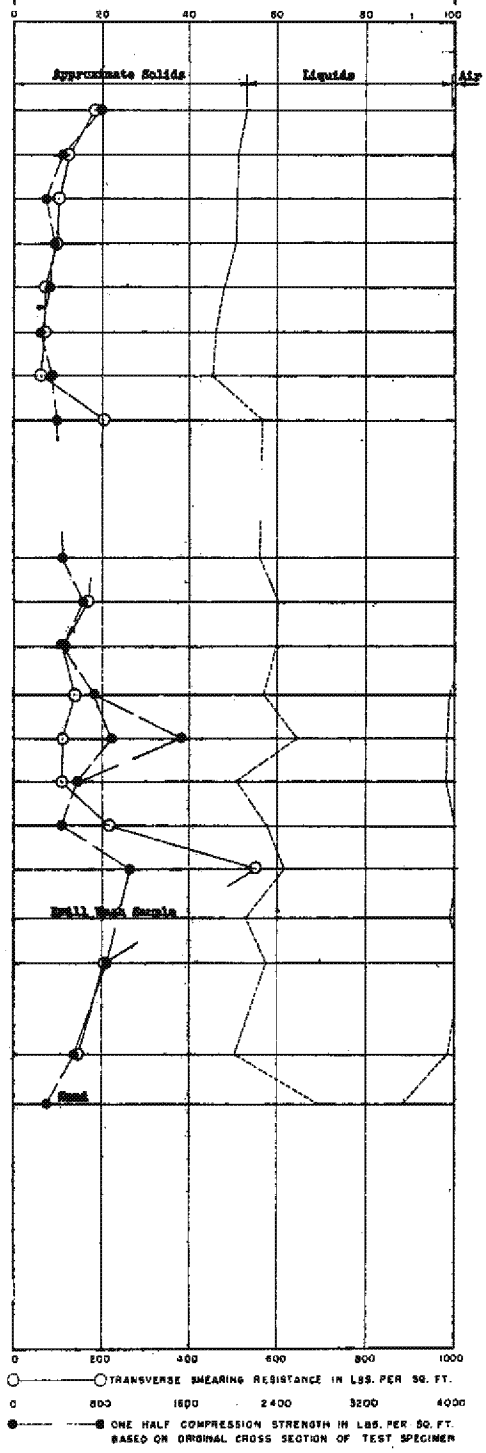
SOIL SAMPLE

SA. NO.	ELEV.	LAB CONSISTENCY	PENETRATION NO. OF BLOWS	PENETRATION DRIVE IN INCHES	% H_2O BY DRY WT.	DRY WT. LBS. PER CU. FT.	LABORATORY VISUAL INSPECTION REMARKS
1-38	587.0	—	6	18			
2-38	584.5	—	9	12			
3-38	582.0	—	10	12			
4-18	579.5	Soft	3	12	33.6	89.8	4-18: Uniform. Gray clay, little silt.
5-18	574.5	Very Soft	2	12	35.3	85.3	5-18: Uniform. Gray clay, little silt.
6-18	569.5	Very Soft	2	12	36.8	85.3	6-18: Uniform. Gray clay, little silt.
7-18	564.5	Very Soft	2	12	36.4	84.9	7-18: Uniform. Gray clay, little silt.
8-18	559.5	Very Soft	1	12	41.0	80.4	8-18: Uniform. Gray clay, little silt.
9-18	554.5	Very Soft	1	12	43.8	77.4	9-18: Uniform. Gray clay, little silt.
10-18	549.5	Very Soft	2	12	45.6	76.1	10-18: Uniform. Gray clay, little silt.
11-18	544.5	Soft	3	12	39.4	80.8	11-18: Uniform. Gray clay, little silt.
12-38	539.5	—	80	12			
13-38	534.5	—	25	12			
14-18	529.0	Soft	4	12	30.3	98.4	14-18: Uniform. Silty gray clay, little sand and trace of fine gravel.
15-18	524.0	Soft	4	12	35.0	99.8	15-18: Uniform. Silty gray clay, little sand and trace of fine gravel.
16-18	519.0	Soft	3	12	37.8	98.2	16-18: Uniform. Silty gray clay, little sand and trace of fine gravel.
17-18	513.5	Soft	6	12	28.1	93.6	17-18: Uniform. Silty gray clay, little sand and trace of fine gravel.
18-18	508.1	Soft to Plastic	10	12	18.6	105.8	18-18: Uniform. Silty gray clay, some sand, trace of gravel.
19-18	503.1	Soft	11	12	24.8	94.8	19-18: Uniform. Silty gray clay, little sand, trace of fine gravel.
20-18	498.1	Soft	8	12	28.7	96.7	20-18: Uniform. Silty gray clay, little sand, trace of fine gravel.
21-18	493.5	Plastic	8	12	25.9	—	21-18: Uniform. Silty gray clay, little sand, trace of fine gravel.
22-18	488.0	Very Soft	8	12	31.0	89.8	22-18: Uniform. Silty gray clay, little sand, trace of fine gravel. Small Wash Sample
23-18	483.0	Soft	8	12	28.4	96.7	23-18: Uniform. Silty gray clay, little sand, trace of fine gravel.
24-38	477.5	—	48	12			
25-18	472.5	Soft	6	12	33.6	84.8	25-18: Uniform. Silty gray clay.
26-18	467.0	Loose	67	12	14.3	116.7	26-18: Uniform. Fine gray sand, trace of clay. Sand
27-38	462.7	—	200	12			
28-38	458.0	—	200	12			

PENETRATION: Number of blows required to drive core sampler distance given using a 140-pound weight falling 30 inches.

Failure to recover Liner Sample.

SHEARING RESISTANCE & VOLUME OF SOLIDS CURVES



UNIVERSITY OF MICHIGAN RESEARCH INSTITUTE
SOIL MECHANICS LABORATORY
ANN ARBOR MICHIGAN

SUBSOIL ANALYSIS OF BORING NO. 25
ST. CLAIR POWER PLANT
THE DETROIT EDISON COMPANY ST. CLAIR, MICHIGAN

APPROVED: W. A. Hansel DATE: 4-5-1966

PROJECT: 01994

Boring Log and all sampling by Raymond Concrete Pile Division of Raymond International, Inc. Thalt Job No. CB-4043-D
Date of Boring: 7-1-1965

A-9

COMPARISON OF AVERAGE SOIL RESISTANCES BETWEEN
1950 AND 1965 BORINGS FOR THE YARD'S CONVEYOR
ST. CLAIR POWER PLANT

1950 Borings: 13, 14, 15, and 16
1965 Borings: 26, 27, and 28

	Soil Type	S_c PSF			$S_{uc}/4$ PSF			N Blows/Ft.			Elev. Ft.
		1950[1]	1965[2]	All[1,2]	1950[1]	1965[2]	All[1,2]	1950[1]	1965[3]	All[1,3]	
590	Ground Surface										590
579	Medium sandy vari-colored clay, some gravel.	700	1350[5]	840	840	750[5]	818	14.5	12.5	13.4	579
573	Medium brown clay, little to some sand.	200	216[4]	241	280	226[4]	270	6.3	6.0	6.2	573
	Very soft to soft gray clay, trace of sand.	200	106	116	144	136	142	3.5	2.5	2.8	550
533		200	144	178	159	108	142	2.8	2.6	2.7	533
	Medium gray clay, some sand, trace of gravel.	200	145	155	182	103	159	6.4	6.4	6.4	515
		275	240	260	312	232	278	8.8	8.3	8.6	505
		140	198[5]	161	154	165[5]	156	7.1	8.9	8.1	485
		250	130[5]	230	202	144[5]	185	8.0	8.3	8.2	473
455		150	259[4]	195	140	170[5]	150	8.5	6.6	7.3	455

(1) Based on shear tests and ASTM penetration values from Borings 13, 14, 15, and 16.
(2) Based on shear tests from Boring 27 only.
(3) Based on ASTM penetration values from Borings 26, 27, and 28.
(4) Based on one shear value only.
(5) Based on two shear values only.

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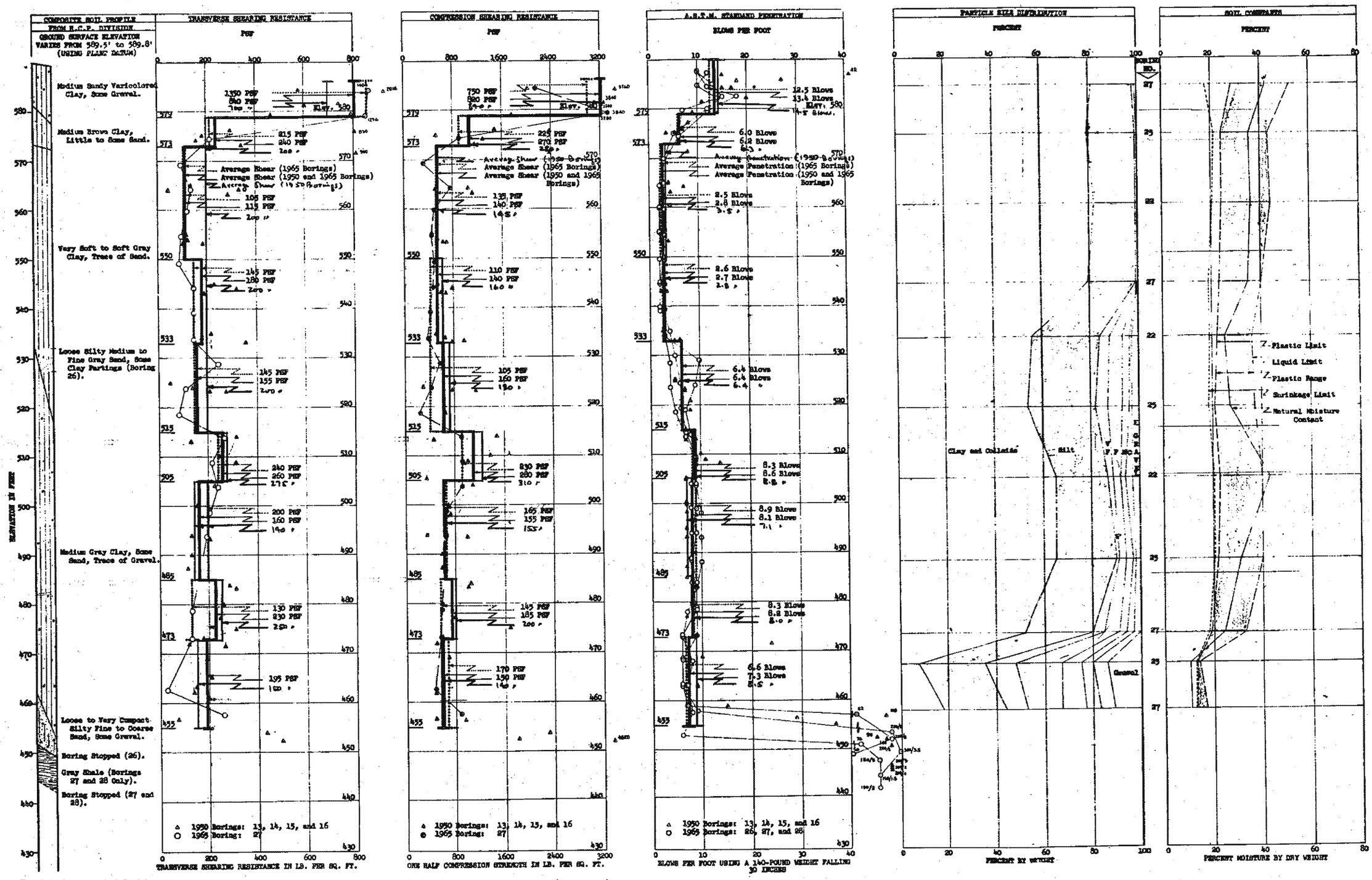

OFFICE OF RESEARCH ADMINISTRATION,
SOIL MECHANICS LABORATORY
UNIVERSITY OF MICHIGAN ANN ARBOR, MICHIGAN
COMPOSITE SUBSOIL ANALYSIS OF BORINGS NO. 26, 27 & 28
ST. CLAIR POWER PLANT
THE DETROIT EDISON COMPANY
ST. CLAIR MICHIGAN
APPROVED W. A. Hansell DATE 4-5-1966
OFFICE OF RESEARCH ADMINISTRATION PROJECT NO. 01994

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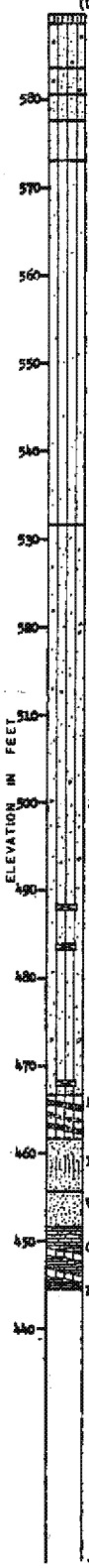
LOG OF SOIL PROFILE

BY R.C.P. DIVISION

GROUND SURFACE ELEVATION 589.8 FT. (USING PLANT DATUM)



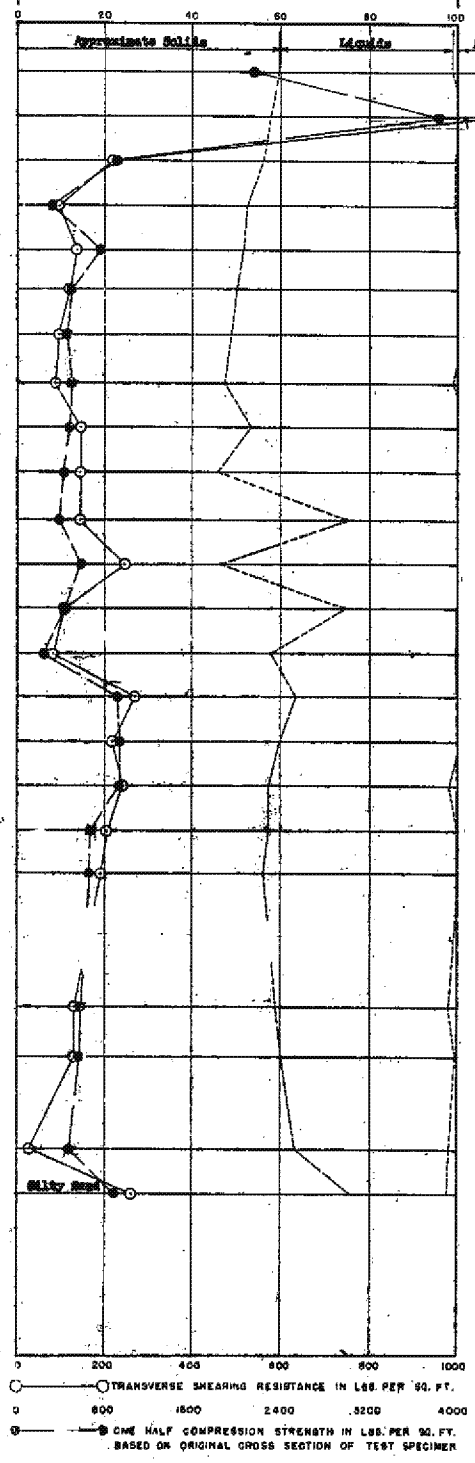
SOIL SAMPLE							LABORATORY VISUAL INSPECTION
SA NO.	ELEV	LAB. CONSISTENCY	PENETRATION NO. OF BLOWS	PENETRATION DRIVE IN INCHES	% H_2O BY DRY WT.	DRY WT. LBS. PER CU. FT.	REMARKS
1-26	587.3	—	10	12			
2-26	584.3	Firm	18	12	24.6	99.8	2-26: Uniform. Brown-gray laminated clay, little silt, trace of sand.
3-26	582.3	—	18	12			
4-26	579.3	Stiff	18	12	22.3	96.7	4-26: Uniform. Brown-gray laminated clay, little silt, trace of sand.
5-26	576.3	Soft	6	12	22.8	94.2	5-26: Uniform. Brown-gray laminated clay, little silt, trace of sand.
6-26	569.3	Soft	3	12	33.3	85.0	6-26: Uniform. Gray clay, little silt, trace of sand.
7-26	564.3	Soft	2	12	34.8	86.7	7-26: Uniform. Gray clay, little silt, trace of sand.
8-26	559.8	Soft	2	12	40.0	84.8	8-26: Uniform. Gray clay, little silt, trace of sand.
9-26	554.8	Soft	2	12	40.0	81.7	9-26: Uniform. Gray clay, little silt, trace of sand.
10-26	549.3	Soft	3	12	40.7	79.8	10-26: Uniform. Gray clay, little silt, trace of sand.
11-26	544.3	Soft	3	12	34.7	89.8	11-26: Uniform. Gray clay, little silt, trace of sand.
12-26	539.3	Soft	3	12	44.0	76.8	12-26: Uniform. Gray clay, little silt, trace of sand.
13-26	533.8	Soft	3	12	12.6	124.5	13-26: Uniform. Silty gray clay, some pockets of fine sand.
14-26	528.8	Soft	10	12	45.0	76.1	14-26: Uniform. Silty gray clay.
15-26	523.8	Soft	9	12	13.0	122.6	15-26: Uniform. Silty gray clay, some pockets and layers of sand.
16-26	518.8	Very Soft	7	12	24.3	99.5	16-26: Uniform. Silty gray clay, little sand.
17-26	513.8	Soft	8	12	26.7	104.2	17-26: Uniform. Silty gray clay, little sand.
18-26	508.8	Soft	9	12	26.0	98.6	18-26: Uniform. Silty gray clay, little sand.
19-26	503.8	Soft	8	12	27.4	94.2	19-26: Uniform. Silty gray clay, little sand.
20-26	498.8	Soft	8	12	28.0	95.5	20-26: Uniform. Silty gray clay, little sand, trace of fine gravel.
21-26	493.8	Soft	9	12	29.1	93.6	21-26: Uniform. Silty gray clay, little sand, trace of fine gravel.
22-26	487.3	—	8	12			
	483.8	—	9	12			
23-26	478.8	Soft	9	12	28.6	98.6	23-26: Uniform. Silty gray clay, little sandy trace of fine gravel.
24-26	473.3	Soft	9	12	28.3	102.3	24-26: Uniform. Silty gray clay, little sand, trace of fine gravel.
25-26	468.3	—	6	12			
26-26	462.8	Very Soft	6	12	30.4	106.1	26-26: Uniform. Silty gray clay homogenized.
27-26	457.8	Soft	9	12	18.8	107.3	27-26: Uniform. Silty gray sand, some clay and gravel.
28-26	453.3	—	200	12			
29-26	449.3	—	330	12			
30-26	444.6	—	190	12			

EXPLANATION: Number of blows required to drive some sampler distance given using a 140-pound weight falling 30 inches.

NOTE: Failure to recover 12-26 Sample.

Boring Log and all sampling by Raymond Concrete Pile Division of Raymond International, Inc. Their Job No. CB-4043-D
Date of Boring: 7-8-1964

SHEARING RESISTANCE & VOLUME OF SOLIDS CURVES



UNIVERSITY OF MICHIGAN RESEARCH INSTITUTE
SOIL MECHANICS LABORATORY
ANN ARBOR MICHIGAN

SUBSOIL ANALYSIS OF BORING NO. 27
ST. CLAIR POWER PLANT
THE DETROIT EDISON COMPANY ST. CLAIR, MICHIGAN

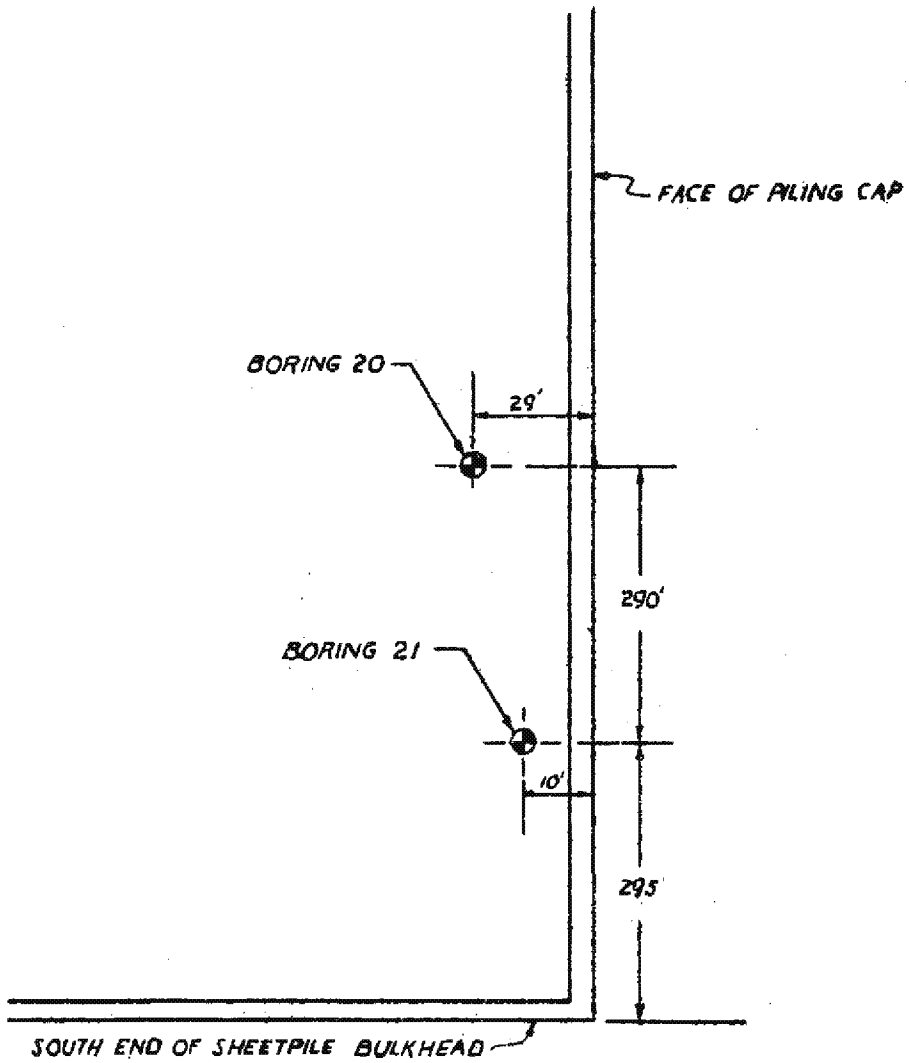
APPROVED: W. A. Hansel DATE: 4-5-1966

PROJECT: 01994

A-12

ADDITIONAL St. CLAIR PLANT INFORMATION

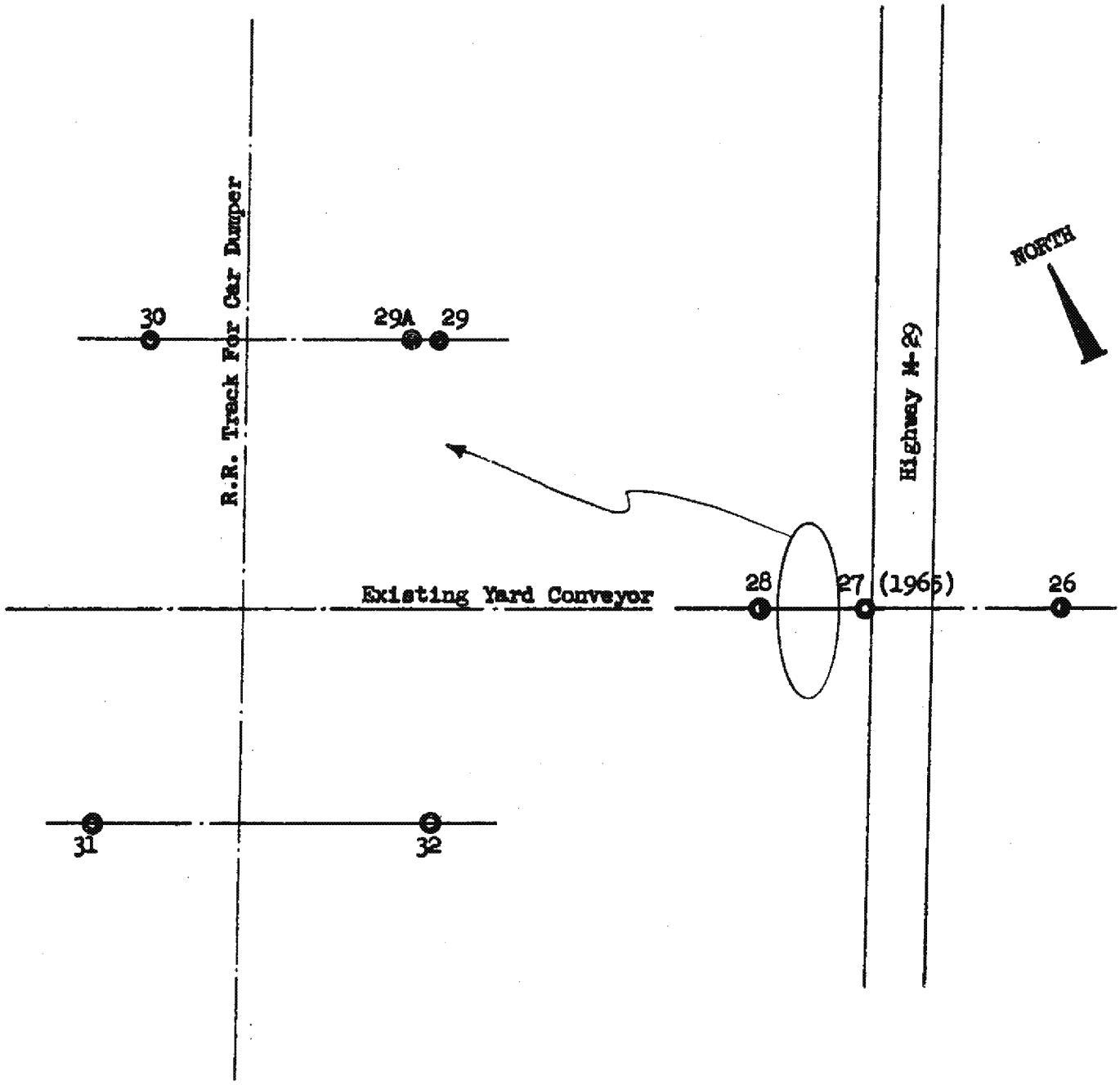
ED_005947A_00014556-00302



NOT TO SCALE

BORING LOCATION PLAN
ST. CLAIR POWER PLANT
DETROIT EDISON COMPANY
DETROIT MICHIGAN

UNIV. OF MICHIGAN PROJECT 01994



Scale: 1" = 30'

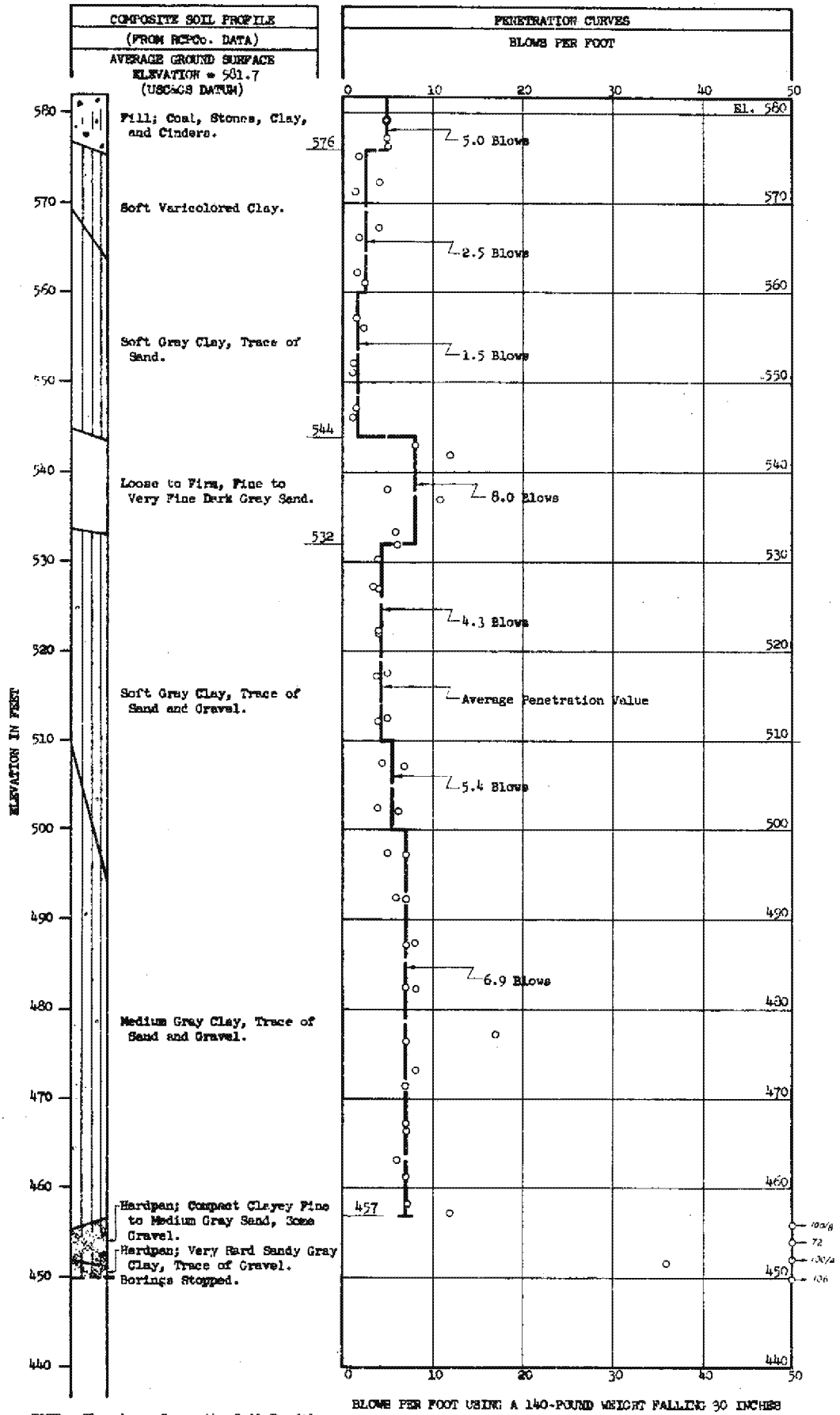
Scale: 1" = 300'

BORING LOCATION PLAN
CAR DUMPER HOUSE ST. CLAIR POWER PLANT THE DETROIT EDISON CO. BELLE RIVER MICHIGAN

● 1965 and 1966 Borings with Liner Samples

◐ 1965 Borings without Liner Samples

CRA PROJECT NO. 01994



NOTE: The above Composite Soil Profile is intended only to present average conditions throughout the group of borings represented. See individual boring charts for details.

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ANN ARBOR MICHIGAN

PENETRATION VALUES OF BORINGS NO. 20 and 21
ST. CLAIR POWER PLANT - DETROIT EDISON COMPANY

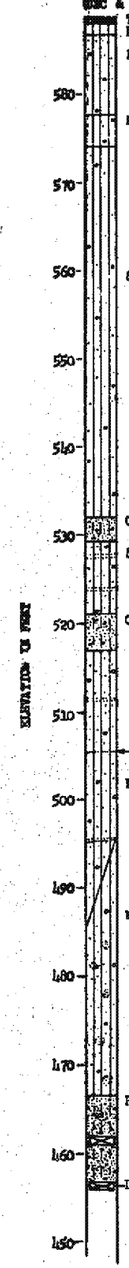
DETROIT MICHIGAN

APPROVED: DATE:

Boring Logs

LOG OF SOIL PROFILE
BY RCPCo VISUAL INSPECTION

GROUND SURFACE ELEVATION = 588.7' (USC & GS DATUM)



SOIL SAMPLE							LABORATORY VISUAL INSPECTION
SA. NO.	ELEV.	LAB. CONSISTENCY	PENETRATION NO. OF BLOWS	DRIVE IN INCHES	% H_2O BY DRY WT.	DRY WT. LB. PER CU. FT.	REMARKS
1-LS	585.7	Hard	15	12	23.3	101.7	1-LS: Uniform, very fine texture. Smooth vari-colored clay. Little silt. Sl. tr. sand.
2-LS	580.7	V.Stiff	24	12	27.4	97.3	2-LS: Uniform, very fine texture. Smooth vari-colored clay. Little silt.
3-LS	575.7	Stiff	7	12	36.9	86.1	3-LS: Uniform, very fine texture. Smooth vari-colored clay. Little silt.
4-LS	572.7	Soft	3	12	35.8	85.5	4-LS: Uniform, very fine texture. Smooth blue clay. Little silt.
5-LS	562.7	Soft	3	12	38.4	83.6	5-LS: Uniform, very fine texture. V. smooth blue clay. Little silt.
6-LS	552.7	Soft	3	13	36.7	84.9	6-LS: Uniform, very fine texture. V. smooth blue clay. Little silt.
7-LS	542.7	Soft	3	12	43.1	78.0	7-LS: Uniform, very fine texture. V. smooth silty blue clay.
8-LS	531.7	W.C.	10	12	16.9	114.8	8-LS: Uniform, very fine to fine texture. V.f. to f. gray sand. Some cl., little silt.
9-LS	528.4	Soft	5	12	24.8	100.2	9-LS: Uniform, very fine texture. Smooth blue clay. Little silt, tr. sand.
10-LS	520.2	W.C.	12	12	19.0	111.1	10-LS: Uniform, very fine texture. Dark gray clayey silt and very fine sand.
11-LS	515.9	Plastic	7	13	25.6	99.2	11-LS: Uniform, very fine texture. Silty blue clay. Trace sand.
12-LS	505.7	Plastic	7	12	24.7	98.6	12-LS: Uniform, very fine texture. Smooth blue clay with little silt and sand.
13-LS	495.7	V.Soft	8	13	28.0	94.2	13-LS: Uniform, very fine texture. Blue clay with some silt & little sand.
14-LS	485.7	Soft	8	12	25.2	99.2	14-LS: Uniform, very fine texture. Silty blue clay with little sand.
15-LS	475.7	Soft	8	12	42.8	--	15-LS: Uniform, very fine texture. Silty blue clay.
16-LS	466.2	Hard	222	12	7.3	136.0	16-LS: Uniform, very fine texture. Sandy, silty gray clay with pebbles.
	461.4	--	200	6			
	456.5	--	200	4			

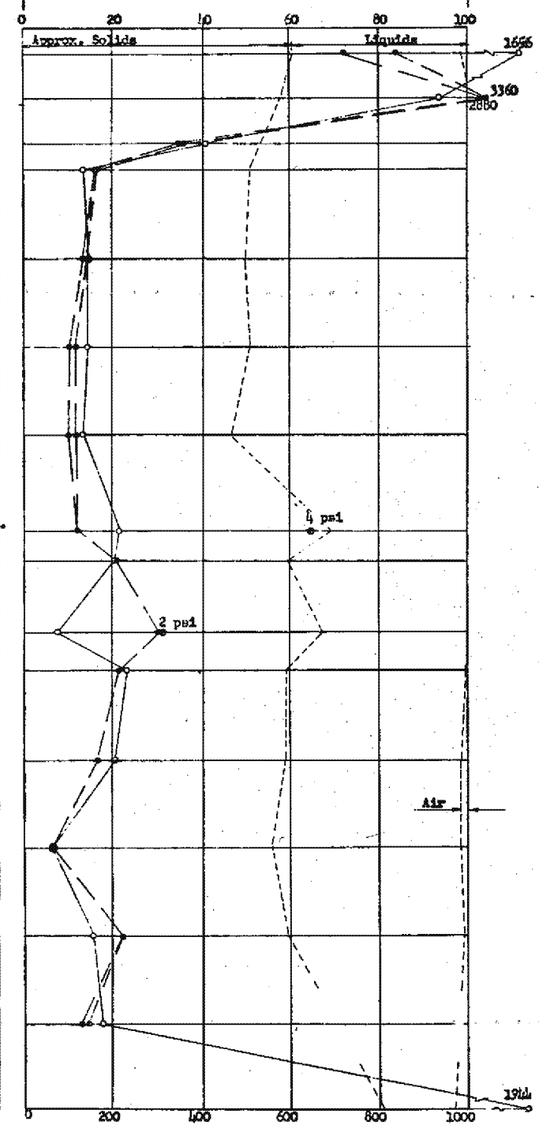
PENETRATION NOTE: Number of blows required to drive core sampler distance given using 140-pound weight falling 30 inches.

⊠ Indicates failure to recover Liner Sample.

Boring Log and all sampling by Raymond Concrete Pile Company. Their Job No. D-7153-0.

SHEARING RESISTANCE & VOLUME OF SOLIDS CURVES

PER CENT OF VOLUME OF SOLIDS, LIQUIDS, AND AIR



TRANSVERSE SHEARING RESISTANCE IN LB. PER SQ. FT.

ONE HALF COMPRESSION STRENGTH IN LB. PER SQ. FT. BASED ON ORIGINAL CROSS SECTION OF TEST SPECIMEN.

TRANSVERSE SHEARING RESISTANCE IN LB. PER SQ. FT. UNDER NORMAL PRESSURE AS INDICATED.

ENGINEERING RESEARCH INSTITUTE
SOIL MECHANICS LABORATORY
UNIVERSITY OF MICHIGAN, ANN ARBOR, MICHIGAN

SUBSOIL ANALYSIS OF BORING NO. 3
ST. CLAIR RIVER SITE, MARINE CITY, MICHIGAN
THE DETROIT EDISON COMPANY

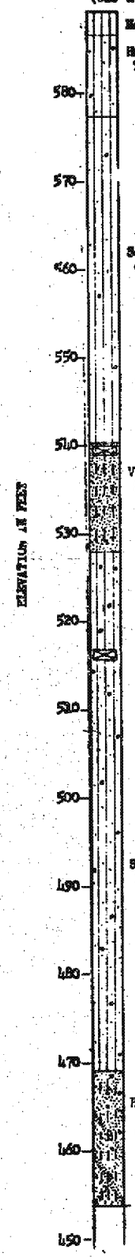
APPROVED: W. W. Housel DATE: 12-13-50

UNIVERSITY OF MICHIGAN PROJECT M373-66

ED_005947A_00014556-00307

LOG OF SOIL PROFILE

BY RMCo VISUAL INSPECTION
GROUND SURFACE
ELEVATION = 589.3'
(USC & GS DATUM)



Medium V.-Colored Clay.

Hard Vari-Colored Clay, Trace of Sand & Gravel.

Soft Blue Clay, Trace of Sand & Gravel.

Very Fine Dark Gray Sand, Trace of Clay.

Soft Blue Clay Little Sand & Gravel.

Hardpan; Very Compact Fine Gray Sand, Little Clay & Gravel.

Boring Stopped.

Boring log and all sampling by Raymond Concrete Pile Company. Their Job No. 9-7163-D.

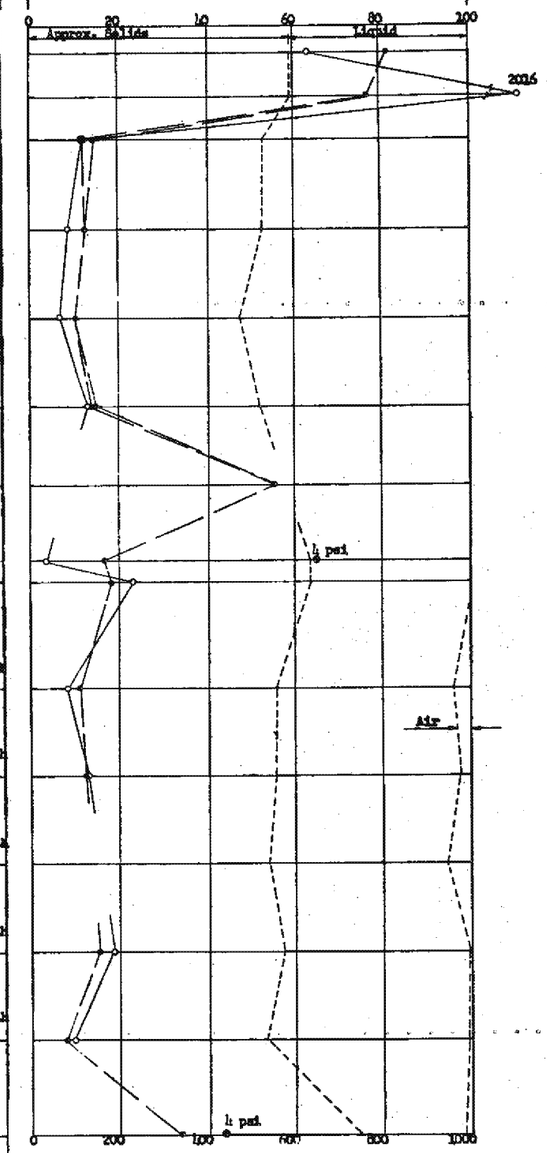
SOIL SAMPLE							LABORATORY VISUAL INSPECTION
SA. NO.	ELEV.	LAB. CONSISTENCY	PENETRATION NO. OF BLOWS	DRIVE IN INCHES	% H_2O BY DRY WT.	DRY WT. LB. PER CU. FT.	REMARKS
1-LS	586.3	V.Stiff	14	12	26.5	99.8	1-LS: Uniform, very fine texture. Silty vari-colored clay with trace organics.
2-LS	581.3	Hard	22	12	26.5	99.2	2-LS: Uniform, very fine texture. Silty vari-colored clay. Trace pebbles.
3-LS	576.5	Soft	4	13	35.5	88.6	3-LS: Uniform, very fine texture. Silty blue clay. Sl. trace sand.
4-LS	566.3	Soft	3	12	34.8	88.0	4-LS: Uniform, very fine texture. Smooth blue clay with little silt.
5-LS	556.3	V.Soft	2	11	42.3	79.2	5-LS: Uniform, very fine texture. Smooth blue clay with little silt.
6-LS	546.3	Soft	2	11	36.0	86.7	6-LS: Uniform, very fine texture. Smooth blue clay with little silt.
	539.5	- -	12	12			
7-LS	537.3	Weakly Coherent	3	12	20.0	- -	7-LS: Uniform, very fine texture. Gray very fine to fine sand with little silt.
8-LS	528.7	Weakly Coherent	7	12	21.8	104.8	8-LS: Uniform, very fine texture. Gray very fine sand with some clay & silt.
9-LS	526.3	Soft	6	12	22.0	106.3	9-LS: Uniform, very fine texture. Blue clay with little silt and sand. Trace.
	516.3	- -	6	12			
10-LS	514.3	V.Soft	7	12	26.9	93.0	10-LS: Uniform, very fine texture. Smooth silty blue clay with little sand.
11-LS	504.3	Soft	8	12	28.1	93.0	11-LS: Uniform, very fine texture. Smooth silty blue clay.
12-LS	494.3	V.Soft	9	12	28.0	90.5	12-LS: Uniform, very fine texture. Smooth silty blue clay.
13-LS	484.3	Soft	9	12	27.6	96.1	13-LS: Uniform, very fine texture. Smooth silty blue clay.
14-LS	474.3	V.Soft	9	12	31.9	89.9	14-LS: Uniform, very fine texture. Smooth silty blue clay.
15-LS	463.5	Weakly Coherent	71	12	11.8	124.8	15-LS: Uniform, v.fine to fine texture. Clayey v.fine to fine gray sand.
16-SS	459.3	Compact	225	5			16-SS: Uniform, v.fine to fine texture. Clayey v.fine to fine gray sand.
	454.3	- -	200	3			

⊠ Indicates failure to recover Liner Sample.

PENETRATION NOTE: Number of blows required to drive core sampler distance given using 140-pound weight falling 30 inches.

SHEARING RESISTANCE & VOLUME OF SOLIDS CURVES

PER CENT OF VOLUME OF SOLIDS, LIQUIDS, AND AIR



○——○ TRANSVERSE SHEARING RESISTANCE IN LB. PER SQ. FT.

0 800 1600 2400 3200 4000

●——● ONE HALF COMPRESSION STRENGTH IN LB. PER SQ. FT. BASED ON ORIGINAL CROSS SECTION OF TEST SPECIMEN.

● TRANSVERSE SHEARING RESISTANCE IN LB. PER SQ. FT. UNDER NORMAL PRESSURE OF 4 psi.

ENGINEERING RESEARCH INSTITUTE
SOIL MECHANICS LABORATORY
UNIVERSITY OF MICHIGAN, ANN ARBOR, MICHIGAN

SUBSOIL ANALYSIS OF BORING NO. 1
ST. CLAIR RIVER SITE, MARINE CITY, MICHIGAN
THE DETROIT EDISON COMPANY

APPROVED: W. S. Housel DATE: 12-13-50

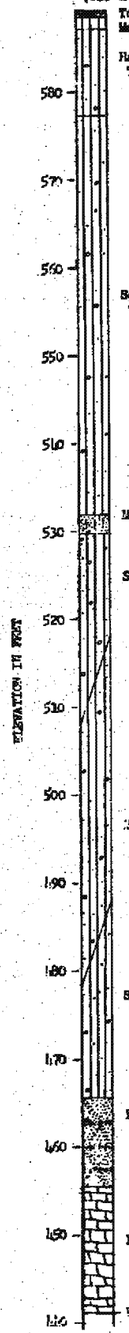
UNIVERSITY OF MICHIGAN PROJECT 4373-66

A-17

LOG OF SOIL PROFILE

BY RCPCo VISUAL INSPECTION

GROUND SURFACE ELEVATION = 589.3' (USC & GS DATUM)



Topsoil.

Med. Vari-Colored Clay.

Hard Vari-Colored, Trace of Sand & Gravel.

Soft Blue Clay, Trace of Sand & Gravel.

Med. to Coarse Sand & Gravel, Little Clay.

Soft Blue Clay, Little Sand & Gravel.

Medium Blue Clay, Little Sand & Gravel.

Soft Blue Clay, Trace of Sand & Gravel.

Hardpan; Compact Fine to Medium Gray Sand, Little Gravel and Clay, Seams of Clayey Sand. Few Boulders.

Probably Fractured Blue Shale.

Boring Stopped.

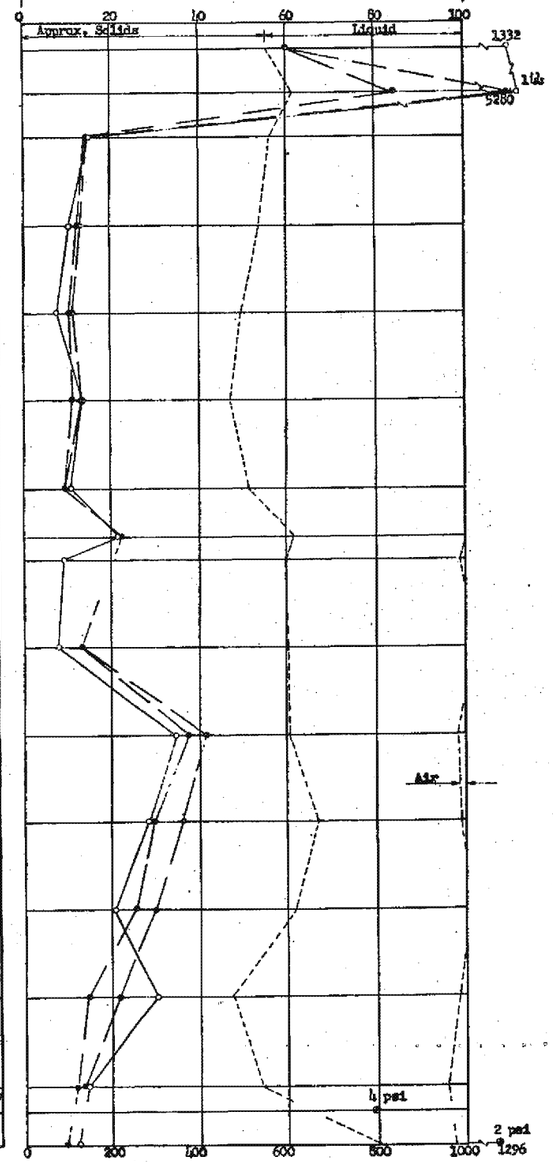
Boring Log and all sampling by Raymond Concrete Pile Company. Their Job No. 9-7163-D.

SOIL SAMPLE						LABORATORY VISUAL INSPECTION
SA. NO.	ELEV.	LAB. CONSISTENCY	PENETRATION NO. OF BLOWS	PENETRATION DRIVE IN INCHES	% H_2O BY DRY WT.	DRY WT. LB. PER CU. FT.	REMARKS
1-LS	586.3	V.Stiff	15	12	29.7	93.6	1-LS: Uniform, very fine texture. Vari-colored with little silt.
2-LS	581.3	V.Stiff	14	12	25.2	103.0	2-LS: Uniform, very fine texture. Silty vari-colored clay.
3-LS	576.3	Soft	4	13	29.7	94.2	3-LS: Uniform, very fine texture. Silty blue clay.
4-LS	566.3	Soft	3	12	33.3	90.5	4-LS: Uniform, very fine texture. Silty blue clay.
5-LS	556.3	Soft	3	13	38.5	83.0	5-LS: Uniform, very fine texture. Silty blue clay.
6-LS	546.3	Soft	3	13	41.3	79.2	6-LS: Uniform, very fine texture. Silty blue clay.
7-LS	536.3	Soft	4	14	34.9	86.1	7-LS: Uniform, very fine texture. Silty blue clay. Trace sand and pebbles.
8-LS	530.8	Soft to Plastic	22	12	23.8	101.0	8-LS: Uniform, very fine texture. Blue clay with little silt. Tr. sand & pebs.
9-LS	528.3	V.Soft	6	12	23.0	100.5	9-LS: Uniform, very fine texture. Blue clay with little silt. Tr. pebbles.
10-LS	518.3	Soft	7	12	26.0	101.1	10-LS: Uniform, very fine texture. Sandy blue clay with some silt. Tr. pebbles.
11-LS	508.3	Plastic to Firm	9	12	23.4	101.1	11-LS: Uniform, very fine texture. Blue clay with some silt. Tr. pebbles.
12-LS	498.3	Plastic	9	12	17.7	112.3	12-LS: Uniform, very fine texture. Silty blue clay.
13-LS	488.3	Plastic	11	12	23.8	103.6	13-LS: Uniform, very fine texture. Silty blue clay with pebbles.
14-LS	478.3	Plastic	8	12	40.1	79.9	14-LS: Uniform, very fine texture. Silty blue clay. Tr. sand. Internal voids.
15-LS	468.3	Plastic	8	12	39.5	78.0	15-LS: Uniform, very fine texture. Silty blue clay. Internal voids.
16-LS	465.4	Non.C.	159	12	--	--	16-LS: Non-uniform. Varies from blue clay to medium gray sand.
17-LS	461.0	W.C.	200	8	7.9	136.0	17-LS: Uniform, coarse texture. Clayey silt and sand with little gravel.

PENETRATION NOTE: Number of blows required to drive core sampler distance given using 140-pound weight falling 30 inches.

SHEARING RESISTANCE & VOLUME OF SOLIDS CURVES

PER CENT OF VOLUME OF SOLIDS, LIQUIDS, AND AIR



ENGINEERING RESEARCH INSTITUTE
SOIL MECHANICS LABORATORY
UNIVERSITY OF MICHIGAN, ANN ARBOR, MICHIGAN

SUBSOIL ANALYSIS OF BORING NO. 2
ST. CLAIR RIVER SITE, MARINE CITY, MICHIGAN
THE DETROIT EDISON COMPANY

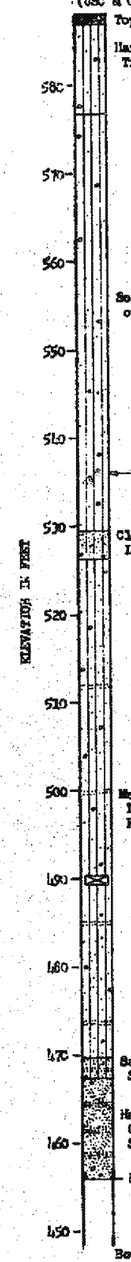
APPROVED: W. J. Housel DATE: 12-15-50

UNIVERSITY OF MICHIGAN PROJECT 4873-66

A-18

LOG OF SOIL PROFILE

BY RCFCo VISUAL INSPECTION
GROUND SURFACE
ELEVATION = 588.2'
(USC & GS DATUM)



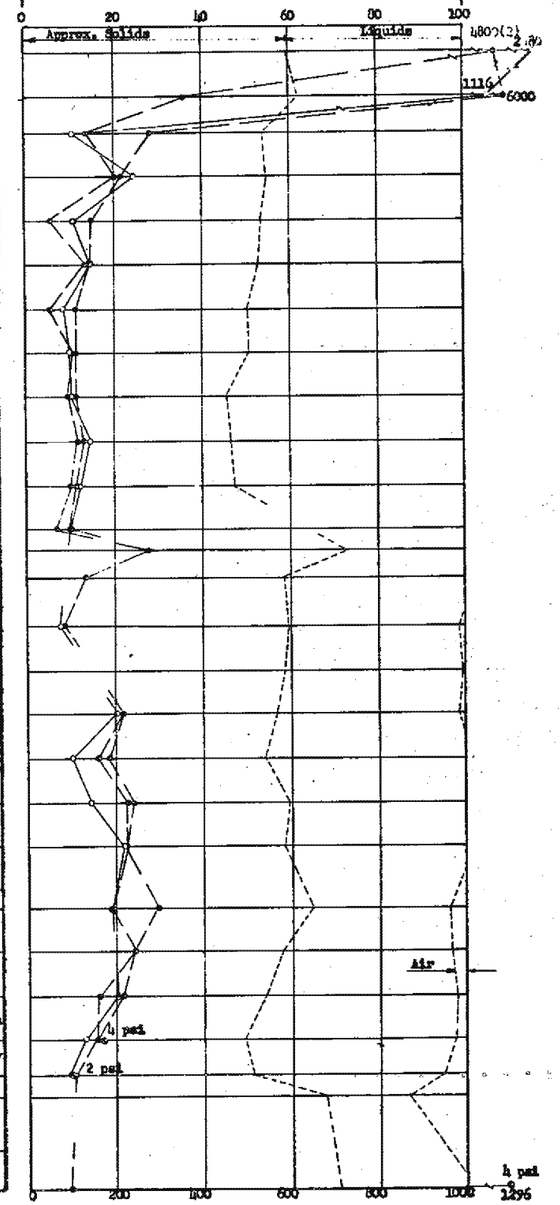
Boring Log and all sampling by Raymond Concrete Pile Company.
Their Job No. B-7453-D.

SOIL SAMPLE							LABORATORY VISUAL INSPECTION
SA. NO.	ELEV.	LAB. CONSIS-TENCY	PENETRATION NO. OF BLOWS	PENETRATION DRIVE IN INCHES	% H_2O BY DRY WT.	DRY WT. LB. PER CU. FT.	REMARKS
1-LS	585.2	Hard	18	12	24.8	99.8	1-LS: Uniform, fine texture. Vari-colored clay with little silt.
2-LS	580.2	V.Stiff	20	12	23.0	104.2	2-LS: Uniform, very fine texture. Silty vari-colored clay. Trace pebbles.
3-LS	576.2	Plastic	4	13	32.4	90.5	3-LS: Uniform, very fine texture. Silty blue clay.
4-LS	571.2	Plastic	3	12	30.6	91.7	4-LS: Uniform, very fine texture. Silty blue clay. Trace of pebbles.
5-LS	566.2	Soft	4	14	32.9	89.2	5-LS: Uniform, very fine texture. Smooth silty blue clay.
6-LS	561.2	Soft	4	13	33.8	88.6	6-LS: Uniform, very fine texture. Blue clay with little silt.
7-LS	556.2	Soft	3	12	38.4	84.2	7-LS: Uniform, very fine texture. Silty blue clay.
8-LS	551.2	Soft	3	14	36.4	85.5	8-LS: Uniform, very fine texture. Silty blue clay.
9-LS	546.2	Soft	3	14	45.3	76.1	9-LS: Uniform, very fine texture. Silty blue clay with little sand.
10-LS	541.2	Soft	3	14	43.3	77.4	10-LS: Uniform, very fine texture. Silty blue clay.
11-LS	536.2	Soft	3	12	42.3	79.2	11-LS: Uniform, very fine texture. Silty blue clay.
12-LS	531.2	Soft	3	13	43.4	--	12-LS: Uniform, very fine texture. Silty blue clay.
13-LS	528.9	W.C.	10	12	14.2	119.8	13-LS: Uniform, fine texture. F. to med. gray clayey sand, tr. of gravel.
14-LS	525.7	V.Soft	6	12	28.1	98.0	14-LS: Uniform, very fine texture. Silty blue clay. Trace pebbles.
15-LS	520.2	V.Soft	7	12	24.6	99.8	15-LS: Uniform, very fine texture. Silty blue clay with tr. of gravel.
16-LS	515.2	V.Soft	8	13	26.4	98.0	16-LS: Uniform, very fine texture. Silty blue clay, little sand. Tr. gr.Disturbed.
17-LS	510.2	V.Soft	7	12	27.1	95.5	17-LS: Uniform, very fine texture. Silty blue clay. Trace pebbles.
18-LS	505.2	V.Soft	7	12	32.7	90.5	18-LS: Uniform, very fine texture. Silty blue clay.
19-LS	500.2	Plastic	8	13	27.8	94.8	19-LS: Uniform, very fine texture. Silty blue clay. Some sand. Trace pebbles.
20-LS	495.2	Plastic	8	12	28.2	97.3	20-LS: Uniform, very fine texture. Silty blue clay. Some sand. Trace pebbles.
	490.2	--	9	12			
21-LS	488.2	Plastic	9	12	18.3	108.6	21-LS: Uniform, very fine texture. Silty blue clay. Some sand. Trace pebbles.
22-LS	483.2	Soft	10	12	25.1	96.7	22-LS: Uniform, very fine texture. Silty blue clay. Little sand. Trace pebbles.
23-LS	478.2	Plastic	9	12	30.1	90.5	23-LS: Uniform, very fine texture. Silty blue clay with little sand.
24-LS	473.2	Soft	8	12	36.8	82.4	24-LS: Uniform, very fine texture. Smooth blue clay with little silt. Int. voids.
25-LS	469.2	Soft	10	12	32.4	86.1	25-LS: Uniform, very fine texture. Clayey gray silt with little sand.
26-LS	466.7	W.C.	60	12	10.3	114.2	26-LS: Uniform, fine texture. Clean v.f. to f. gray sand. Seams silty clay.
27-SS	460.8	Compact	200	5			27-SS: Uniform, fine texture. Silty very fine to fine gray sand.
28-LS	455.8	Hard	320	10	16.5	117.3	28-LS: Uniform, very fine texture. Clean v.f. gray sand and silt. Seams of clay.

☒ Indicates failure to recover Liner Sample.

PENETRATION NOTE: Number of blows required to drive core sampler distance given using 140-pound weight falling 30 inches.

SHEARING RESISTANCE & VOLUME OF SOLIDS CURVES



TRANSVERSE SHEARING RESISTANCE IN LB. PER SQ. FT.
0 800 1600 2400 3200 4000
ONE HALF COMPRESSION STRENGTH IN LB. PER SQ. FT. BASED ON ORIGINAL CROSS SECTION OF TEST SPECIMEN.
TRANSVERSE SHEARING RESISTANCE IN LB. PER SQ. FT. UNDER NORMAL PRESSURE AS INDICATED.

ENGINEERING RESEARCH INSTITUTE
SOIL MECHANICS LABORATORY
UNIVERSITY OF MICHIGAN, ANN ARBOR, MICHIGAN

SUBSOIL ANALYSIS OF BORING NO. 4
ST. CLAIR RIVER SITE, MARINE CITY, MICHIGAN
THE DETROIT EDISON COMPANY

APPROVED: W. S. Housel DATE: 12-12-50

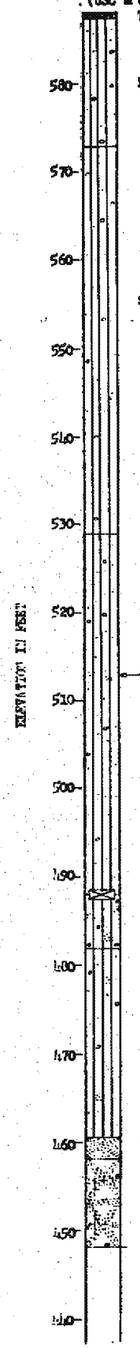
UNIVERSITY OF MICHIGAN PROJECT M373-66

A-20

LOG OF SOIL PROFILE

BY REPCo VISUAL INSPECTION

GROUND SURFACE ELEVATION = 588.f (USC & GS DATUM)



Boring Log and all sampling by Raymond Concrete Pile Company. Their Job No. [illegible].

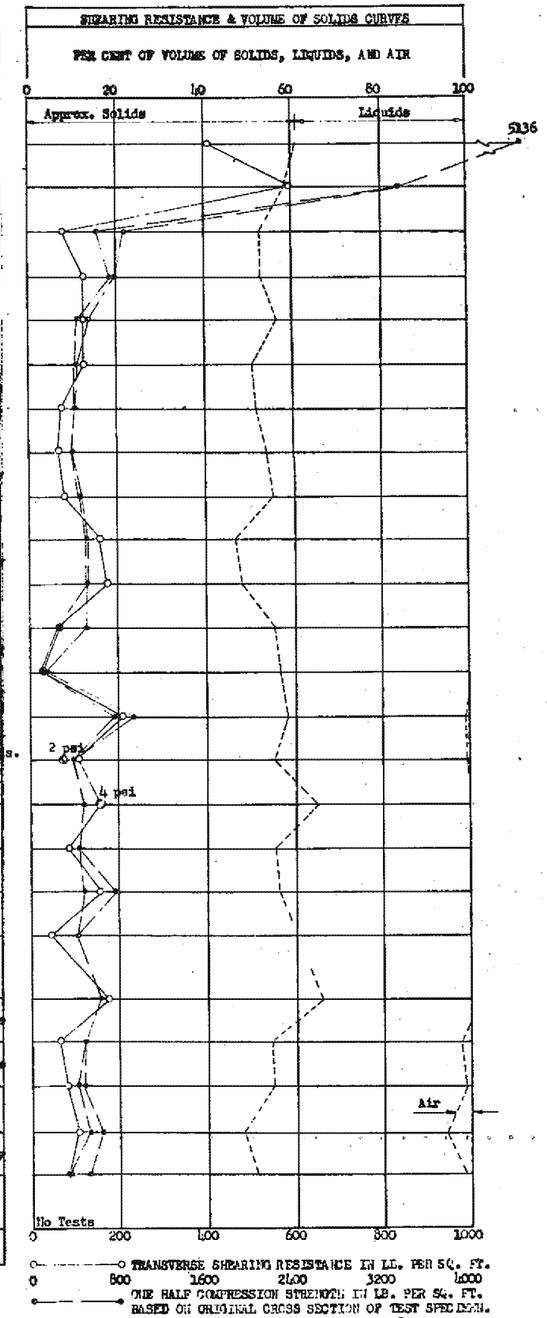
SOIL SAMPLE / LABORATORY VISUAL INSPECTION

Sa. No.	Elev.	Lab. Consistency	Penetration No. of Blows	Drive in Inches	% H_2O by Dry Wt.	Dry Wt. Lb. per Cu. Ft.	Remarks
1-DS	581.5	--	10	12			
2-LS	583.0	F.Stiff	21	12	24.2	102.3	2-LS: Uniform, very fine texture. Vari-colored clay with little silt.
3-LS	578.0	Plastic	15	12	26.8	98.6	3-LS: Uniform, very fine texture. Silty vari-colored clay with tr. pebbles.
4-LS	573.0	Soft	6	12	33.7	88.6	4-LS: Uniform, very fine texture. Silty blue clay.
5-LS	568.0	Soft	4	14	33.0	88.6	5-LS: Uniform, very fine texture. Silty blue clay.
6-LS	563.0	Soft	3	12	28.9	94.8	6-LS: Uniform, very fine texture. Silty blue clay with pebbles.
7-LS	558.0	Soft	3	12	35.3	86.1	7-LS: Uniform, very fine texture. Silty blue clay.
8-LS	553.0	Soft	3	12	35.2	86.4	8-LS: Uniform, very fine texture. Smooth silty blue clay with pebbles.
9-LS	548.0	Soft	3	12	32.5	90.5	9-LS: Uniform, very fine texture. Silty blue clay.
10-LS	543.0	Soft	3	12	31.8	92.4	10-LS: Uniform, very fine texture. Silty blue clay.
11-LS	538.0	Soft to Plastic	4	13	44.2	76.6	11-LS: Uniform, very fine texture. Silty blue clay with little sand.
12-LS	533.0	Soft to Plastic	4	12	39.6	81.1	12-LS: Uniform, very fine texture. Silty blue clay with little sand.
13-LS	528.0	V.Soft	5	12	29.5	93.0	13-LS: Uniform, very fine texture. Blue clay with little silt. Tr. sand & pebs.
14-LS	523.0	V.Soft	6	12	28.5	95.5	14-LS: Uniform, very fine texture. Silty blue clay with little sand. Tr. pebbles.
15-LS	518.0	Soft to Plastic	7	12	25.5	98.5	15-LS: Uniform, very fine texture. Silty blue clay with little sand. Tr. pebbles.
16-LS	513.0	Soft to Plastic	7	12	29.5	93.0	16-LS: Uniform, very fine texture. Silty blue clay. Little sand. Tr.pebs.Int.voids.
17-LS	508.0	Soft	7	12	20.3	108.0	17-LS: Uniform, fine texture. Silty sandy blue clay with pebbles.
18-LS	503.0	Soft	7	12	29.3	93.0	18-LS: Uniform, fine texture. Silty sandy blue clay with pebs. Int. voids.
19-LS	498.0	Soft	7	12	29.0	94.8	19-LS: Uniform, fine texture. Silty sandy blue clay with pebs. Int. voids.
20-LS	493.0	V.Soft	8	13	23.6	99.2	20-LS: Uniform, fine texture. Silty sandy blue clay with pebbles.
	488.0	--	10	12			
21-LS	486.1	Plastic	12	12	19.9	111.7	21-LS: Uniform, fine texture. Blue clay. Some silt. Little sand. Tr. pebs.
22-LS	481.0	Soft	7	12	29.1	91.7	22-LS: Uniform, fine texture. Silty blue clay. Some sand.Tr.pebbles. Int. voids.
23-LS	476.0	Soft to Plastic	8	12	29.6	92.4	23-LS: Uniform, fine texture. Silty blue clay. Some sand.Tr.pebbles. Int. voids.
24-LS	471.0	Soft to Plastic	5	12	35.4	81.1	24-LS: Uniform, fine texture. Silty blue clay with little sand. Int. voids.
25-LS	466.0	Soft	8	12	34.2	86.1	25-LS: Uniform, very fine texture. Silty blue clay with internal voids.
26-LS	456.0	Weakly Coherent	16	12	13.9	--	26-LS: Uniform, very fine texture. Fine to med. gray sand. Some clay. Tr. pebs.
	447.1	--	100	12			
	446.1	--	225	5			
		--	200	3			

[illegible] Indicates failure to recover Liner Sample.

PENETRATION NOTE: Number of blows required to drive core sampler distance given using 140-pound weight falling 30 inches.

SHEARING RESISTANCE & VOLUME OF SOLIDS CURVES



ENGINEERING RESEARCH INSTITUTE
SOIL MECHANICS LABORATORY
UNIVERSITY OF MICHIGAN, ANN ARBOR, MICHIGAN

SUBSOIL ANALYSIS OF BORING NO. 5
ST. CLAIR RIVER SITE, MARINE CITY, MICHIGAN
THE DETROIT EDISON COMPANY

APPROVED: [illegible] DATE: [illegible]

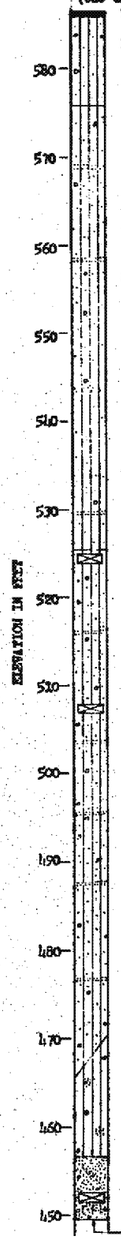
UNIVERSITY OF MICHIGAN PROJECT M973-[illegible]

A-21

LOG OF SOIL PROFILE

BY REPCo VISUAL INSPECTION

GROUND SURFACE ELEVATION = 586.5' (USC & GS DATUM)



Topsoil.

Hard Vari-Colored Clay, Trace of Sand & Gravel.

Soft Blue Clay, Trace of Sand & Gravel, Few Seams of Sand.

Few Sand Inclusions and Seams.

Medium Blue Clay, Little Sand & Gravel, Few Sand Seams.

Medium Blue Clay, Some Sand Inclusions, Trace of Gravel.

Hardpan; Fine to V.Fine Grey Sand, Tr. of Grav.

Hardpan; Compact Clayey Fine Gray Sand, Little Gravel.

Refusal.

SA. NO.	ELEV.	SOIL SAMPLE: CONSISTENCY (LAB.)	PENETRATION: NO. OF BLOWS	PENETRATION: DRIVE IN INCHES	% H_2O BY DRY WT.	DRY WT. LB. PER CU. FT.	LABORATORY VISUAL INSPECTION: REMARKS
1-LS	583.5	Hard	10	12	23.0	103.0	1-LS: Uniform, fine texture. Vari-colored clay with trace of gravel.
2-LS	578.5	Hard	19	12	24.3	103.0	2-LS: Uniform, very fine texture. Vari-colored clay with little silt.
3-LS	574.5	Soft to Plastic	6	12	30.9	94.2	3-LS: Uniform, very fine texture. Blue clay with little silt.
4-LS	569.5	Soft	3	12	33.9	88.6	4-LS: Uniform, very fine texture. Blue clay with little silt.
5-LS	564.5	Soft	3	12	36.0	87.4	5-LS: Uniform, very fine texture. Blue clay with little silt.
6-LS	559.5	Soft	3	12	33.3	89.2	6-LS: Uniform, very fine texture. Blue clay with little silt.
7-LS	554.5	Soft	3	12	37.5	84.2	7-LS: Uniform, very fine texture. Blue clay with little silt.
8-LS	549.5	Soft	3	12	33.9	89.3	8-LS: Uniform, very fine texture. Silty blue clay.
9-LS	544.5	Soft	3	12	37.0	86.7	9-LS: Uniform, very fine texture. Silty blue clay.
10-LS	539.5	Soft	3	12	46.6	74.3	10-LS: Uniform, very fine texture. Silty blue clay with silt inclusions.
11-LS	534.5	Soft	3	12	36.0	83.0	11-LS: Uniform, very fine texture. Blue clay with little silt. Tr. sand.
12-LS	529.5	Soft	3	12	43.4	77.6	12-LS: Uniform, very fine texture. Blue clay with little silt and silt inclusions
	523.5	--	5	12			
13-LS	522.5	Soft to Plastic	6	12	31.2	92.4	13-LS: Uniform, very fine texture. Silty blue clay with little sand.
14-LS	517.5	Soft to Plastic	6	12	24.7	101.1	14-LS: Uniform, very fine texture. Silty blue clay with little sand.
15-LS	512.5	Plastic	8	12	22.9	102.3	15-LS: Uniform, very fine texture. Silty blue clay with silt inclusions.
	507.5	--	7	12			
16-LS	505.5	Soft	7	12	29.0	94.2	16-LS: Uniform, fine texture. Silty blue clay with pebbles. Int. voids.
17-LS	500.5	Soft	7	12	31.4	89.2	17-LS: Uniform, very fine texture. Blue clay with some silt and sand.
18-LS	495.5	Soft to Plastic	8	12	26.8	94.2	18-LS: Uniform, very fine texture. Blue clay with some silt and sand.
19-LS	490.5	Soft to Plastic	10	12	26.9	93.6	19-LS: Uniform, very fine texture. Blue clay with some silt and sand. Tr. pebs.
20-LS	485.5	V.Soft	10	12	28.3	91.7	20-LS: Uniform, very fine texture. Blue clay with little silt & sand. Tr. pebs.
21-LS	480.5	Soft to Plastic	11	12	29.0	93.0	21-LS: Uniform, very fine texture. Blue clay with little silt & sand. Tr. pebs.
22-LS	475.5	Soft to Plastic	10	12	17.8	111.7	22-LS: Uniform, fine texture. Blue clay with little silt & sand. Int. voids.
23-LS	470.5	Plastic	8	12	30.3	89.9	23-LS: Uniform, fine texture. Blue clay with little silt & sand.
24-LS	465.5	Plastic	7	12	26.4	--	24-LS: Uniform, fine texture. Silty blue clay with some sand. Int. voids.
25-LS	460.5	Soft	8	12	15.8	114.2	25-LS: Uniform, very fine texture. Silty blue clay with some sand.
26-LS	455.5	Non.C.	6 / 75	12 / 12	15.1	114.8	26-LS: Uniform, very fine texture. Fine gray sand and silt.
27-SS	451.3	V.Hard	200	8	--	--	27-SS: Uniform, very fine texture. Silty sandy dark blue clay. Silt partings.

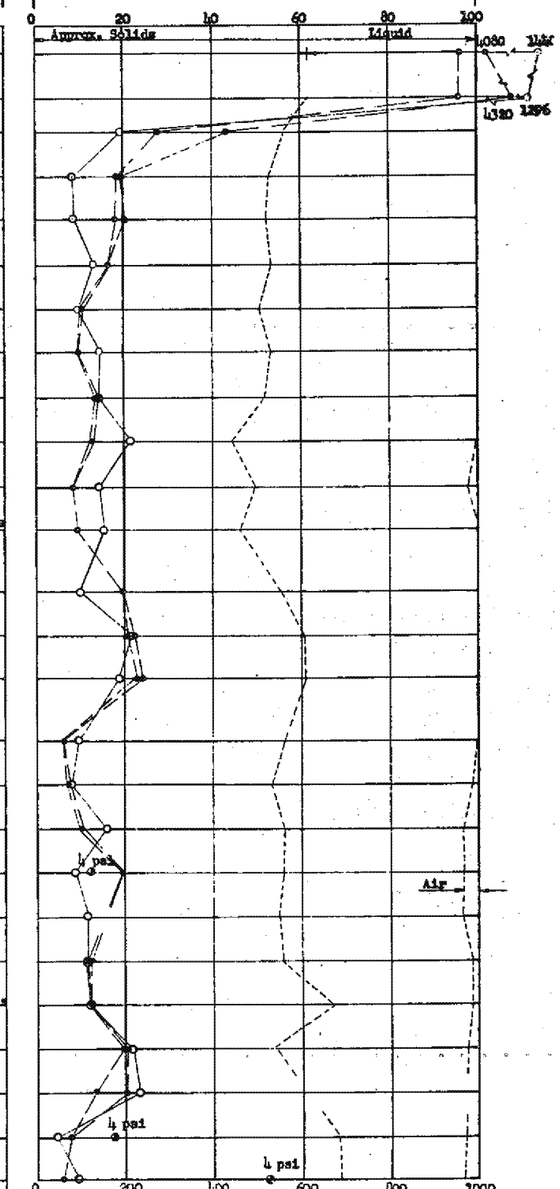
Indicates failure to recover Liner Sample.

PENETRATION NOTE: Number of blows required to drive core sampler distance given using 140-pound weight falling 30 inches.

Boring Log and all sampling by Raymond Concrete Pile Company. Their Job No. B-7453-D.

SHEARING RESISTANCE & VOLUME OF SOLIDS CURVES

PER CENT BY VOLUME OF SOILDS, LIQUIDS, AND AIR

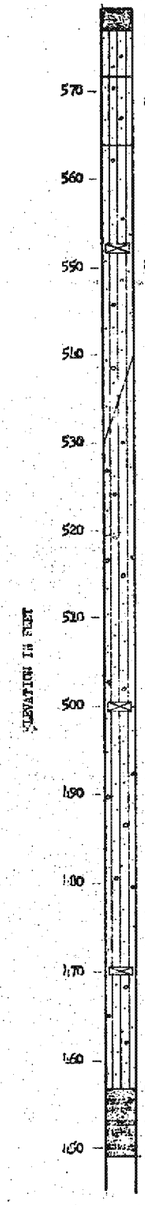


ENGINEERING RESEARCH INSTITUTE
SOIL MECHANICS LABORATORY
UNIVERSITY OF MICHIGAN, ANN ARBOR, MICHIGAN

SUBSOIL ANALYSIS OF BORING NO. 6
ST. CLAIR RIVER SITE, MARINE CITY, MICHIGAN
THE DETROIT EDISON COMPANY

APPROVED: [illegible] DATE: [illegible]

LOG OF SOIL PROFILE
BY RCPCo VISUAL INSPECTION
GROUND SURFACE ELEVATION = 579.2 (USC & GS DATUM)



Boring Log and all sampling by Raymond Concrete Pile Company. Their Job No. B-7453-P.

SOIL SAMPLE

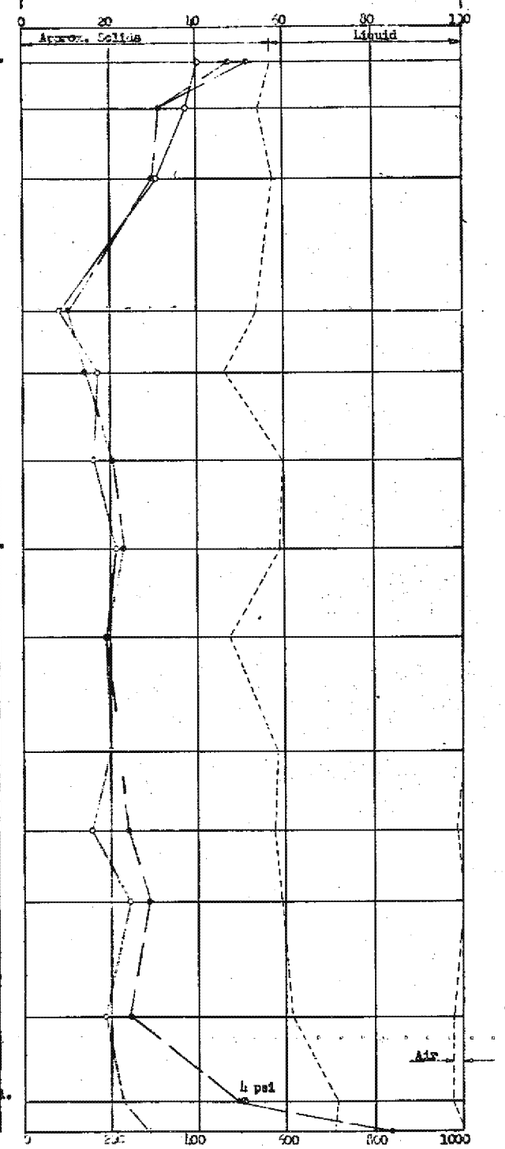
SA. NO.	ELEV.	LAB. CONSISTENCY	PENETRATION NO. OF BLOWS	PENETRATION DRIVE IN INCHES	% H_2O BY DRY WT.	DRY WT. LB. PER CU. FT.	LABORATORY VISUAL INSPECTION REMARKS
1-LS	575.2	Firm	12	12			1-LS: Uniform, very fine texture. V. smooth vari-colored clay with little silt.
2-LS	570.2	Firm	3	14			2-LS: Uniform, very fine texture. V. smooth, silty yellow clay.
3-LS	562.2	Plastic	3	13			3-LS: Uniform, very fine texture. Smooth blue clay with little silt.
	552.2	--	2	15			
4-LS	547.2	Soft	4	12			4-LS: Uniform, very fine texture. V. smooth blue clay with little silt.
5-LS	540.2	Soft to Plastic	2	12			5-LS: Uniform, very fine texture. Smooth silty blue clay with tr. sand & pebbles.
6-LS	530.2	Soft	3	12			6-LS: Uniform, very fine texture. Smooth silty blue clay with tr. sand & pebbles.
7-LS	520.2	Soft to Plastic	3	12			7-LS: Uniform, very fine texture. Smooth blue clay. Some silt, little sand, tr. pebs.
8-LS	510.2	Soft to Plastic	4	12			8-LS: Uniform, very fine texture. Smooth silty blue clay with little sand.
	500.2	--	3	12			
9-LS	497.2	Plastic	5	12			9-LS: Uniform, very fine texture. Blue clay with some silt. Trace sand.
10-LS	488.2	Soft to Plastic	6	12			10-LS: Uniform, very fine texture. Smooth silty blue clay. Little sand.
11-LS	480.2	Soft to Plastic	6	12			11-LS: Uniform, very fine texture. Smooth silty blue clay. Little sand.
	470.2	--	10	12			
12-LS	467.2	Plastic	9	12			12-LS: Uniform, very fine texture. Smooth silty blue clay. Little sand.
13-LS	457.4	Weakly Coherent	17	12			13-LS: Non-uniform, very fine texture. Varies from sdy. silty gray cl. to f. gray sd.
14-LS	454.0	Plastic to Firm	46	12			14-LS: Uniform, v. fine to fine texture. V. dark gray silty clay. Some sd. & grav.

In dicates failure to recover Liner Sample.

PENETRATION NOTE: Number of blows required to drive core sampler distance given using 140-pound weight falling 30 inches.

SHEARING RESISTANCE & VOLUME OF SOLIDS CURVES

PER CENT OF VOLUME OF SOLIDS, LIQUIDS, AND AIR



TRANSVERSE SHEARING RESISTANCE IN LB. PER SQ. FT.
0 800 1600 2400 3200 4000
ONE HALF COMPRESSION STRENGTH IN LB. PER SQ. FT. BASED ON ORIGINAL CROSS SECTION OF TEST SPECIMEN.
TRANSVERSE SHEARING RESISTANCE IN LB. PER SQ. FT. UNDER NORMAL PRESSURE OF 4 psi.

ENGINEERING RESEARCH INSTITUTE
SOIL MECHANICS LABORATORY
UNIVERSITY OF MICHIGAN, ANN ARBOR, MICHIGAN

SUBSOIL ANALYSIS OF BORING NO. 3
ST. CLAIR RIVER SITE, MARINE CITY, MICHIGAN
THE DETROIT EDISON COMPANY

ATTESTED: W. D. Horsell DATE: 12-13-50

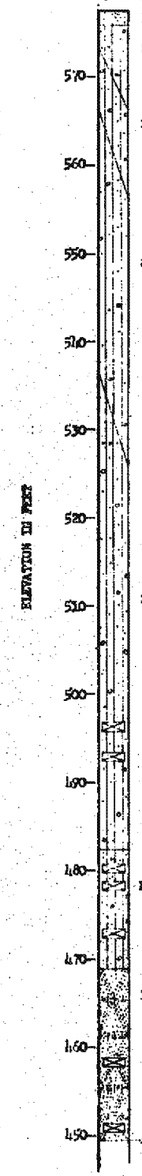
UNIVERSITY OF MICHIGAN PROJECT M373-[illegible]

A-24

ED_005947A_00014556-00313

LOG OF SOIL PROFILE

BY ROPCo VISUAL INSPECTION
GROUND SURFACE
ELEVATION = 577.6' (USC & GS DATUM)



Fine Brown Sand.

Hard Vari-Colored Clay, Trace of Sand & Gravel.

Soft Yellow Clay, Trace of Sand & Gravel.

Soft Blue Clay, Trace of Sand & Gravel.

Soft Blue Clay, Little Sand & Gravel.

Foreman Reports Sandy Clay with Some Gravel.

Hardpan; Compact Fine Gray Sand, Some of Clayey Sand with Some Gravel.

Boring Stopped.

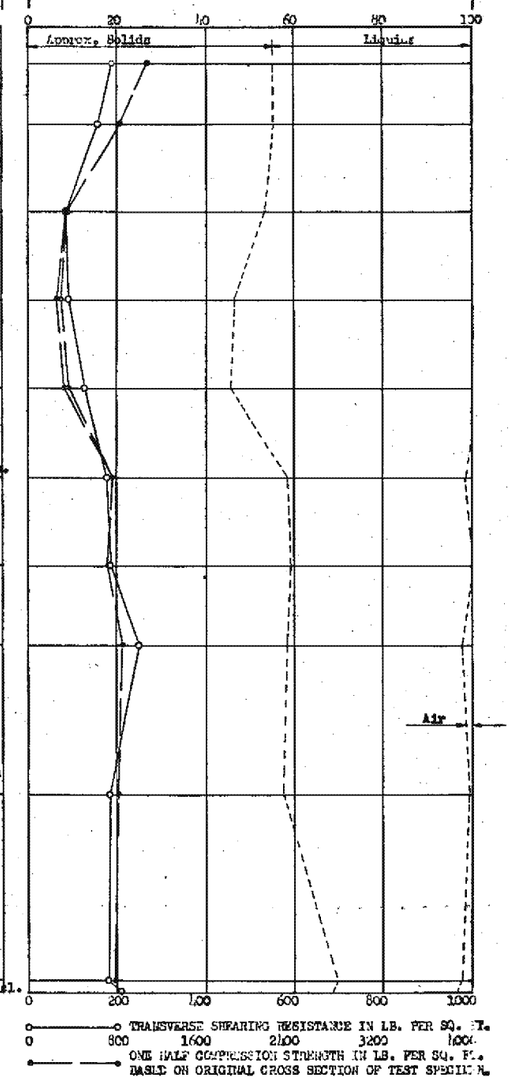
SOIL SAMPLE							LABORATORY VISUAL INSPECTION
SA. NO.	ELEV.	IN. CONSISTENCY	PENETRATION NO. OF BLOWS	DRIVE IN INCHES	% H_2O BY DRY WT.	DRY WT. LB. PER CU. FT.	REMARKS
1-LS	573.6	Plastic	6	12	29.8	93.0	1-LS: Uniform, very fine texture. Smooth vari-colored clay with little silt.
2-LS	563.6	Soft	3	12	30.1	93.6	2-LS: Uniform, very fine texture. Yellow clay with little silt. Tr. sand & pebs.
3-LS	556.6	V.Soft	2	12	33.0	89.9	3-LS: Uniform, very fine texture. V. smooth blue clay with little silt.
4-LS	546.6	V.Soft	2	12	43.0	78.6	4-LS: Uniform, very fine texture. V. smooth blue clay with little silt.
5-LS	536.6	Soft	2	14	45.4	76.8	5-LS: Uniform, very fine texture. V. smooth blue clay with little silt.
6-LS	526.6	Soft	5	12	25.5	98.0	6-LS: Uniform, very fine texture. Blue clay with some silt, little sd.Sl.tr.pebs.
7-LS	516.6	Soft	5	12	25.8	99.8	7-LS: Uniform, very fine texture. Silty blue clay with little sand.
8-LS	507.6	Plastic	4	12	25.0	98.0	8-LS: Uniform, very fine texture. Silty blue clay with little sand.
	496.6	--	5	12			
	493.6	--	4	12			
9-LS	490.6	Plastic	7	12	27.0	96.7	9-LS: Uniform, very fine texture. Smooth blue clay with some silt.
	480.6	--	10	12			
	478.6	--	10	12			
	473.6	--	10	12			
10-LS	469.6	Plastic	21	10	15.0	114.7	10-LS: Uniform, very fine texture. Blue clay with little silt and sand.
11-LS	468.4	W.C.	58	12	15.3	114.8	11-LS: Unif. v.f.text.Gray silty vfs.Tr.sl.
12-SS	458.6	--	56	12			
13-SS	451.2	--	89	12			

PENETRATION NOTE: Number of blows required to drive core sampler distance given using 140-pound weight falling 30 inches.

--- Indicates failure to recover Liner Sample.

Boring Log and all sampling by Raymond Concrete Pile Company. Their Job No. B-7453-0.

SHEARING RESISTANCE & VOLUME OF SOLIDS CURVES



ENGINEERING RESEARCH INSTITUTE
SOIL MECHANICS LABORATORY
UNIVERSITY OF MICHIGAN, ANN ARBOR, MICHIGAN

SUBSOIL ANALYSIS OF BORING NO. 7
ST. CLAIR RIVER SITE, MARINE CITY, MICHIGAN
THE DETROIT EDISON COMPANY

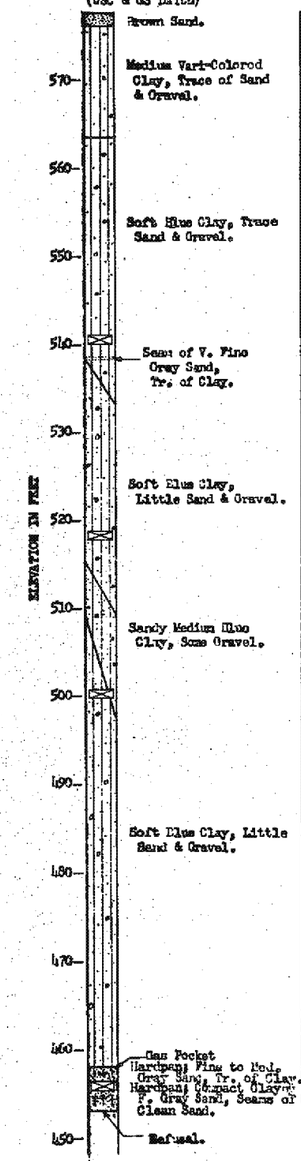
APPROVED: [signature] DATE: 12-15-50

UNIVERSITY OF MICHIGAN PROJECT M573-66

A-23

LOG OF SOIL PROFILE

BY MCPCo VISUAL INSPECTION
GROUND SURFACE
ELEVATION = 577.6'
(USC & GS DATUM)



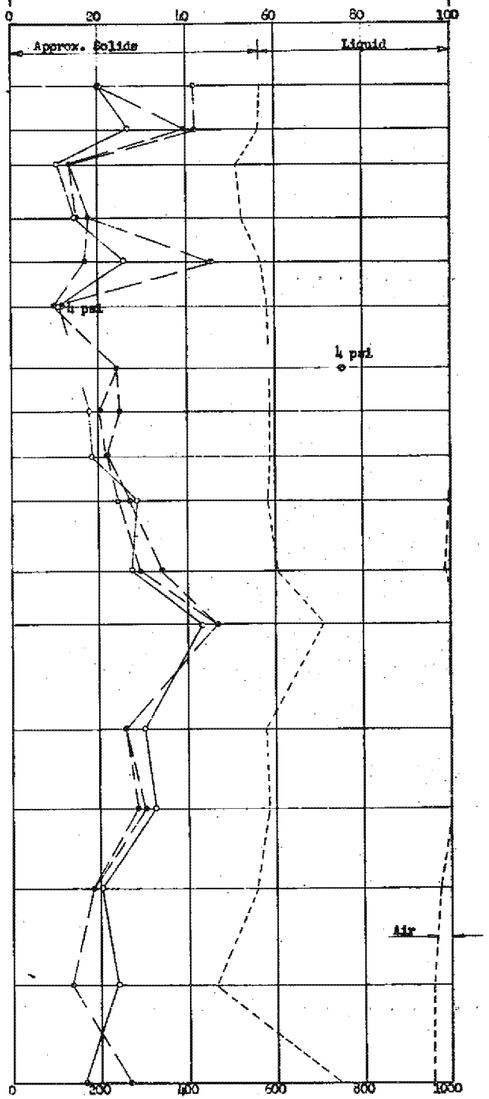
Boring Log and all sampling by Raymond Concrete Pile Company. Their Job No. D-7453-D.

SOIL SAMPLE							LABORATORY VISUAL INSPECTION
SA. NO.	ELEV.	LAB. CONSISTENCY	PENETRATION NO. OF BLOWS	PENETRATION DEPTH IN INCHES	% H_2O BY DRY WT.	DRY WT. LB. PER CU. FT.	REMARKS
1-BS	574.2	- -	6	12			
2-LS	570.6	Plastic	6	12	29.8	95.5	2-LS: Uniform, very fine texture. Silty vari-colored clay.
3-LS	565.6	Plastic	6	12	31.9	94.2	3-LS: Uniform, very fine texture. Silty vari-colored clay.
4-LS	561.6	Soft	5	12	37.5	86.1	4-LS: Uniform, very fine texture. Smooth silty blue clay.
5-LS	555.6	Soft	3	12	34.4	88.0	5-LS: Uniform, very fine texture. Smooth silty blue clay.
6-LS	550.6	Plastic	3	12	29.4	95.5	6-LS: Uniform, very fine texture. Smooth silty blue clay.
7-LS	545.6	Weakly Coherent	2	14	27.3	97.3	7-LS: Uniform, fine texture. Blue clay with some silt. Little sand.
	540.6	- -	3	12			
8-LS	538.6	Non-Coherent	4	13	20.9	107.3	8-LS: Non-uniform, fine texture. Varies from grey silt to silty grey clay.
9-LS	533.6	Plastic	3	13	25.4	99.2	9-LS: Uniform, very fine texture. Silty blue clay with pebbles.
10-LS	528.6	Plastic	2	12	26.1	99.2	10-LS: Uniform, very fine texture. Silty blue clay with pebbles.
11-LS	523.6	Plastic	3	13	26.2	98.0	11-LS: Uniform, very fine texture. Silty blue clay with little sand. Tr. pebbles.
	518.6	- -	4	13			
12-LS	515.6	Plastic	4	14	23.6	101.1	12-LS: Uniform, very fine texture. Silty blue clay. Little sand. Tr.pebs.Int.voids.
13-LS	509.6	Plastic	7	12	16.7	119.2	13-LS: Uniform, very fine texture. Silty blue clay. Little sand.
	500.6	- -	6	12			
14-LS	497.6	Plastic	6	12	26.8	97.3	14-LS: Uniform, very fine texture. Smooth silty blue clay with some silt & sand.
15-LS	488.6	Plastic	6	13	26.4	98.6	15-LS: Uniform, very fine texture. Smooth blue clay. Some silt. Tr. sand & pebs.
16-LS	479.6	Plastic	6	12	27.9	93.6	16-LS: Uniform, very fine texture. Smooth silty blue clay.
17-LS	468.6	Soft to Plastic	4	12	39.6	77.4	17-LS: Uniform, very fine texture. Smooth blue clay. Little silt.
18-LS	457.5	F.Stiff	28	12	10.7	124.8	18-LS: Uniform, very fine texture. Smooth blue clay. Little silt.
19-BS	456.3	- -	160	8	- -	- -	

Indicates failure to recover Liner Sample.
PENETRATION NOTE: Number of blows required to drive core sampler distance given using 140-pound weight falling 30 inches.

SHEARING RESISTANCE & VOLUME OF SOLIDS CURVES

PER CENT OF VOLUME OF SOLIDS, LIQUIDS, AND AIR



TRANSVERSE SHEARING RESISTANCE IN LB. PER SQ. FT.

0 800 1600 2400 3200 4000

ONE HALF COMPRESSION STRENGTH IN LB. PER SQ. FT. BASED ON ORIGINAL CROSS SECTION OF TEST SPECIMEN.

TRANSVERSE SHEARING RESISTANCE IN LB. PER SQ. FT. UNDER NORMAL PRESSURE OF 4 psi.

ENGINEERING RESEARCH INSTITUTE
SOIL MECHANICS LABORATORY
UNIVERSITY OF MICHIGAN, ANN ARBOR, MICHIGAN

SUBSOIL ANALYSIS OF BORING NO. 9
ST. CLAIR RIVER SITE, MARINE CITY, MICHIGAN
THE DETROIT EDISON COMPANY

APPROVED: W. J. Housel DATE 12-13-50

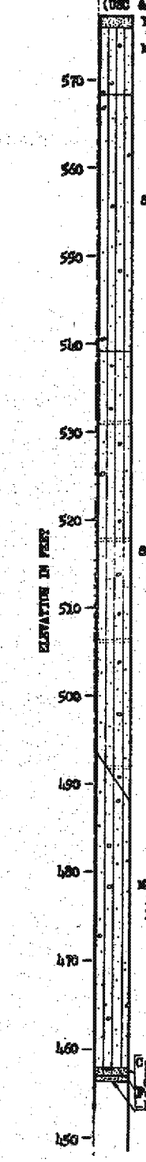
UNIVERSITY OF MICHIGAN PROJECT U373-66

A-25

LOG OF SOIL PROFILE

BY REPCo VISUAL INSPECTION

GROUND SURFACE ELEVATION = 577.2' (USC & GS DATUM)



Yellow Sand.

Medium Yellow Clay, Trace of Sand & Gravel.

Soft Blue Clay, Trace of Sand & Gravel.

Soft Blue Clay, Little Sand & Gravel, Few Sand Seams.

Medium Blue Clay, Little Sand & Gravel, Few Sand Seams.

Gray, Clayey F. Gray Sand, Some Gr. Seams Clean Sand. Foreman Reports Sdy. Hard-Refusal.

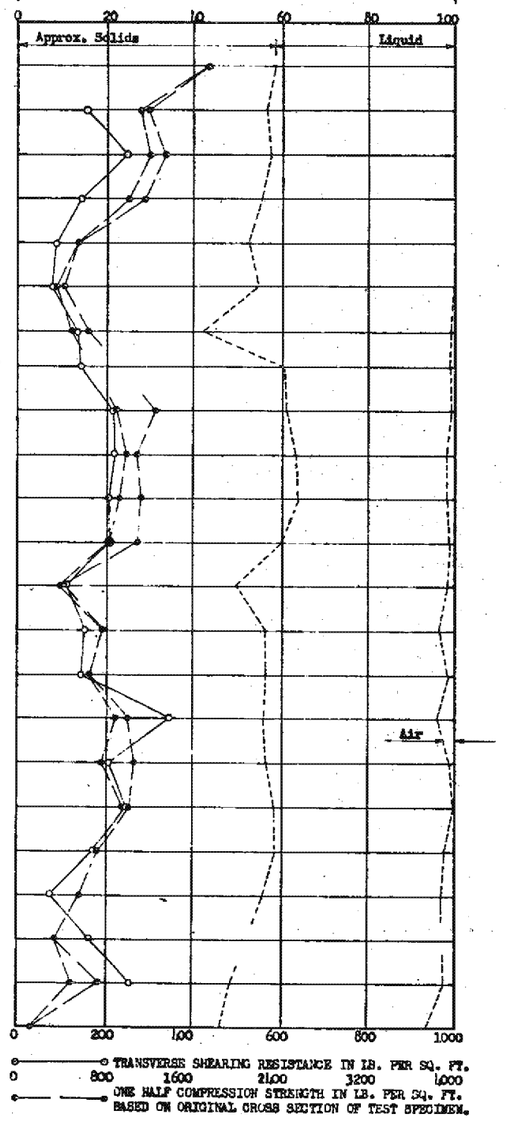
Boring Log and all sampling by Raymond Concrete Pile Company. Their Job No. B-7454-D.

SOIL SAMPLE							LABORATORY VISUAL INSPECTION
SA. NO.	ELEV.	LAB. CONSISTENCY	PENETRATION NO. OF BLOWS	DRIVE IN INCHES	% H_2O BY DRY WT.	DRY WT. LB. PER CU. FT.	REMARKS
1-BS	573.7	- -	6	12			
2-LS	572.2	Plastic	7	12	26.9	98.6	2-LS: Uniform, very fine texture. Silty yellow clay.
3-LS	567.2	Soft to Plastic	3	12	29.6	94.8	3-LS: Uniform, very fine texture. Silty blue clay.
4-LS	562.2	Plastic	5	12	28.4	96.1	4-LS: Uniform, very fine texture. Silty blue clay.
5-LS	557.2	Soft to Plastic	4	12	30.1	93.0	5-LS: Uniform, very fine texture. Silty blue clay.
6-LS	552.2	Soft	3	14	35.2	87.7	6-LS: Uniform, very fine texture. Smooth silty blue clay.
7-LS	547.2	V.Soft	3	14	31.3	91.1	7-LS: Uniform, very fine texture. Smooth silty blue clay.
8-LS	542.2	Soft	2	12	50.0	70.5	8-LS: Uniform, very fine texture. Blue clay with little silt and sand.
9-LS	538.2	Soft	6	12	23.6	101.1	9-LS: Uniform, very fine texture. Blue clay with little silt. V.f.s.incl.Tr.pebs.
10-LS	533.2	Soft to Plastic	5	13	23.2	102.3	10-LS: Uniform, very fine texture. Blue clay with little silt and sand. Tr.pebs.
11-LS	528.2	Plastic	7	12	20.4	106.1	11-LS: Uniform, fine texture. Silty blue clay with little sand and pebbles.
12-LS	523.2	Plastic	6	12	20.4	106.1	12-LS: Uniform, fine texture. Blue clay with some silt, little sd. & pebbles.
13-LS	518.2	Plastic	6	12	24.2	100.5	13-LS: Uniform, very fine texture. Silty blue clay with little sand.
14-LS	513.2	Soft	5	12	37.4	82.4	14-LS: Uniform, very fine texture. V. smooth silty blue clay.
15-LS	508.2	Soft	5	12	26.8	94.2	15-LS: Uniform, very fine texture. Smooth silty blue clay.
16-LS	503.2	Soft	5	12	27.3	94.8	16-LS: Uniform, very fine texture. Silty blue clay with little sand.
17-LS	498.2	Plastic	5	12	26.5	93.6	17-LS: Uniform, very fine texture. Smooth blue clay with some silt.
18-LS	493.2	Plastic	6	12	27.2	95.5	18-LS: Uniform, very fine texture. Smooth silty blue clay with little sand.
19-LS	488.2	Plastic	6	12	26.5	98.0	19-LS: Uniform, very fine texture. Smooth silty blue clay. Little sand, Tr. pebs.
20-LS	483.2	Soft to Plastic	7	12	24.4	98.6	20-LS: Uniform, very fine texture. Smooth silty blue clay.
21-LS	478.2	Soft	7	12	27.2	93.6	21-LS: Uniform, very fine texture. Smooth blue clay with little silt. Tr. pebbles.
22-LS	473.2	Soft	8	12	41.7	73.7	22-LS: Uniform, very fine texture. Smooth blue clay with little silt. Tr. pebbles.
23-LS	468.2	Plastic	7	12	36.3	81.7	23-LS: Uniform, very fine texture. Smooth blue clay with little silt. Tr. pebbles.
24-LS	463.2	V.Soft	7	12	37.7	77.4	24-LS: Uniform, very fine texture. Silty blue clay with some sand. Tr. pebbles.
25-BS	455.7	- -	150 56	9 1			

PENETRATION NOTE: Number of blows required to drive core sampler distance given using 140-pound weight falling 30 inches.

SHEARING RESISTANCE & VOLUME OF SOLIDS CURVES

PER CENT BY VOLUME OF SOLIDS, LIQUIDS, AND AIR



ENGINEERING RESEARCH INSTITUTE
SOIL MECHANICS LABORATORY
UNIVERSITY OF MICHIGAN, ANN ARBOR, MICHIGAN

SUBSOIL ANALYSIS OF BORING NO. 10
ST. CLAIR RIVER SITE, MARINE CITY, MICHIGAN
THE DETROIT EDISON COMPANY

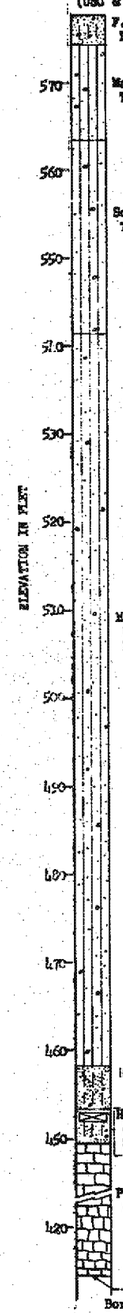
APPROVED: [illegible] DATE: 12-13-52

UNIVERSITY OF MICHIGAN PROJECT M373-66

ED_005947A_00014556-00316

LOG OF SOIL PROFILE

BY RCPCo VISUAL INSPECTION
GROUND SURFACE
ELEVATION = 577.6'
(USC & GS DATUM)



Boring Log and all sampling by Raymond Concrete Pile Company. Their Job No. 9-7453-L.

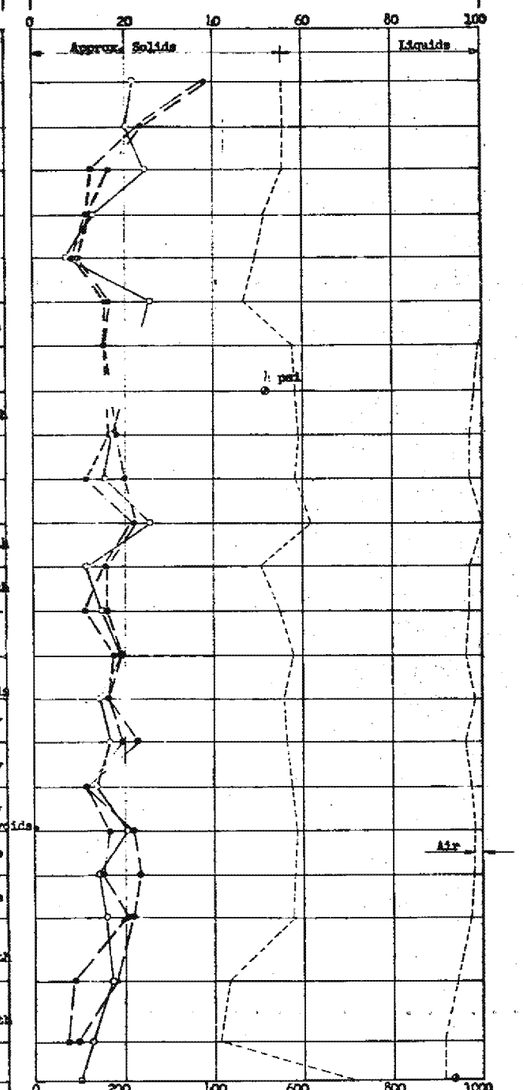
SOIL SAMPLE / LABORATORY VISUAL INSPECTION

SA. NO.	ELEV.	LAB. CONSISTENCY	PENETRATION NO. OF BLOWS	DRIVE INCHES	% H_2O BY DRY WT.	DRY WT. LB. PER CU. FT.	REMARKS
1-BS	574.1	--	5	12			
2-BS	572.6	--	7	12			
3-LS	571.6	Plastic	7	19	28.8	93.6	3-LS: Uniform, very fine texture. V. smooth yellow clay with little silt.
4-LS	566.6	Plastic	5	12	29.5	94.2	4-LS: Uniform, very fine texture. V. smooth silty yellow clay.
5-LS	561.6	Plastic	4	12	31.3	93.6	5-LS: Uniform, very fine texture. V. smooth blue clay with little silt.
6-LS	556.6	Soft	3	14	36.5	86.1	6-LS: Uniform, very fine texture. V. smooth blue clay with little silt.
7-LS	551.6	Soft	3	14	38.5	83.0	7-LS: Uniform, very fine texture. V. smooth blue clay with little silt.
8-LS	546.6	Soft to Plastic	2	12	44.2	78.6	8-LS: Uniform, very fine texture. Smooth silty blue clay.
9-LS	543.6	Soft	6	12	27.6	96.1	9-LS: Uniform, very fine texture. Smooth silty blue clay.
10-LS	536.6	Weakly Coherent	7	12	26.2	96.1	10-LS: Uniform, very fine texture. Clayey blue silt and v.f. sand.
11-LS	531.6	Soft to Plastic	5	12	24.2	99.2	11-LS: Uniform, very fine texture. Smooth blue clay with little silt. Tr. sand.
12-LS	526.6	Soft to Plastic	6	12	24.9	98.6	12-LS: Uniform, very fine texture. Blue clay with little silt. Tr. sand.
13-LS	521.6	Plastic	6	12	23.2	103.6	13-LS: Uniform, very fine texture. Blue clay with little silt. Tr. sand.
14-LS	516.6	Soft	5	12	34.0	85.5	14-LS: Uniform, very fine texture. Smooth silty blue clay.
15-LS	511.6	Soft	5	12	28.8	92.4	15-LS: Uniform, very fine texture. Smooth silty blue clay.
16-LS	506.6	Soft to Plastic	6	12	24.9	97.3	16-LS: Uniform, very fine texture. Blue clay with some silt. Internal voids.
17-LS	501.6	Soft	5	12	28.4	93.9	17-LS: Uniform, very fine texture. Blue clay with some silt & pebbles. Int. voids
18-LS	496.6	Soft to Plastic	8	12	26.7	94.2	18-LS: Uniform, very fine texture. Silty blue clay with some sand. Int. voids.
19-LS	491.6	Soft	9	12	26.3	96.1	19-LS: Uniform, very fine texture. Silty blue clay with some sand. Int. voids.
20-LS	486.6	Soft to Plastic	9	12	25.8	97.3	20-LS: Uniform, very fine texture. Silty blue clay with some silt, little sd. Int. voids.
21-LS	481.6	Plastic	10	12	25.7	97.3	21-LS: Uniform, fine texture. Silty blue clay. Little sand and pebbles.
22-LS	476.6	Plastic	10	12	25.9	95.5	22-LS: Uniform, fine texture. Silty blue clay with some sand and pebbles.
	471.6	--	9	12			
23-LS	469.6	Soft	8	12	43.6	73.0	23-LS: Uniform, very fine texture. Smooth colloidal blue clay. Internal voids.
	464.6	--	8	12			
24-LS	462.6	Soft	7	12	45.1	69.3	24-LS: Uniform, very fine texture. Smooth colloidal blue clay. Internal voids.
25-LS	458.6	Very Weakly Coherent	16	12	10.9	119.2	25-LS: Uniform, very fine texture. Gray silt and very fine sand. Some clay.
26-BS	452.6	V. Hard	70	12	--	--	26-BS: Uniform, very fine texture. V. silty dark blue clay. Some sand & pebs.

Indicates failure to recover Liner Sample.

PENETRATION NOTE: Number of blows required to drive core sampler distance given using 140-pound weight falling 30 inches.

SHEARING RESISTANCE & VOLUME OF SOLIDS CURVES



TRANSVERSE SHEARING RESISTANCE IN LB. PER SQ. FT.

0 800 1600 2400 3200 4000 ONE HALF COMPRESSION STRENGTH IN LB. PER SQ. FT. BASED ON ORIGINAL CROSS SECTION OF TEST SPECIMEN.

● TRANSVERSE SHEARING RESISTANCE IN LB. PER SQ. FT. UNDER NORMAL PRESSURE OF 4 psi.

ENGINEERING RESEARCH INSTITUTE
SOIL MECHANICS LABORATORY
UNIVERSITY OF MICHIGAN, ANN ARBOR, MICHIGAN

SUBSOIL ANALYSIS OF BORING NO. 11
ST. CLAIR RIVER SITE, MARINE CITY, MICHIGAN
THE DETROIT EDISON COMPANY

APPROVED: W. A. Housel DATE: 12-17-50

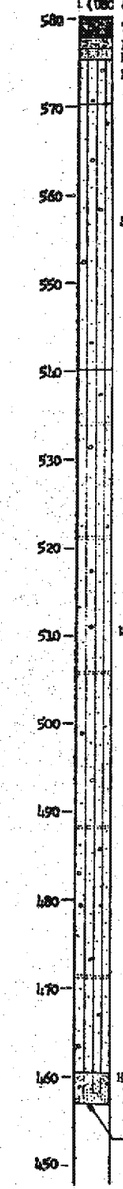
UNIVERSITY OF MICHIGAN PROJECT M373-66

A-27

LOG OF SOIL PROFILE

BY RCWCo VISUAL INSPECTION

GROUND SURFACE ELEVATION = 580.2' (USC & GS DATUM)



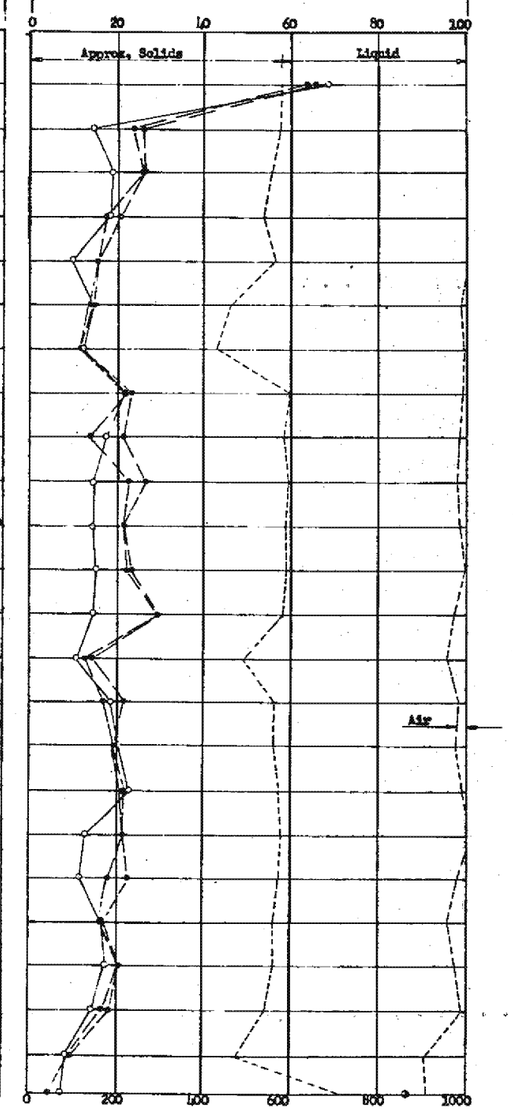
SOIL SAMPLE							LABORATORY VISUAL INSPECTION
SA. NO.	ELEV.	LAB. CONSIS-TENCY	PENETRATION NO. OF BLOWS	PENETRATION DEPTH IN INCHES	% H_2O BY DRY WT.	DRY WT. LB. PER CU. FT.	REMARKS
1-SS	576.7	--	5	12			
2-SS	574.1	--	8	12			
3-LS	574.2	Firm	10	12	27.2	97.3	3-LS: Uniform, very fine texture. Smooth silty yellow clay.
4-LS	569.2	Plastic	6	12	28.5	96.7	4-LS: Uniform, very fine texture. Smooth silty blue clay.
5-LS	564.2	Plastic	4	12	30.2	93.0	5-LS: Uniform, very fine texture. Smooth silty blue clay.
6-LS	559.2	Soft	3	12	33.2	90.5	6-LS: Uniform, very fine texture. Smooth blue clay with little silt.
7-LS	554.2	Soft	3	14	29.4	94.5	7-LS: Uniform, very fine texture. Smooth blue clay with little silt.
8-LS	549.2	Soft	3	14	42.4	77.4	8-LS: Uniform, very fine texture. Silty blue clay.
9-LS	544.2	Soft	2	12	48.9	72.1	9-LS: Uniform, very fine texture. Smooth blue clay with some silt.
10-LS	539.2	Soft to Plastic	5	12	24.4	100.5	10-LS: Uniform, very fine texture. Silty blue clay with little sand and pebbles.
11-LS	534.2	Soft to Plastic	5	12	25.3	98.6	11-LS: Uniform, very fine texture. Silty blue clay with pebbles.
12-LS	529.2	Soft to Plastic	5	12	23.9	99.8	12-LS: Uniform, very fine texture. Blue clay with little silt and sand. Tr.pebs.
13-LS	524.2	Plastic	6	12	25.0	98.9	13-LS: Uniform, very fine texture. Blue clay with some silt. Little sand.Tr.pebs.
14-LS	519.2	Plastic	6	12	25.7	99.2	14-LS: Uniform, very fine texture. Silty blue clay with pebbles.
15-LS	514.2	Soft to Plastic	6	12	24.5	98.6	15-LS: Uniform, very fine texture. Silty blue clay with some sand. Tr. pebs.
16-LS	509.2	Soft to Plastic	6	12	34.9	83.0	16-LS: Uniform, very fine texture. Silty blue clay with some sand. Int. voids.
17-LS	504.2	Soft to Plastic	6	12	27.7	94.8	17-LS: Uniform, very fine texture. Silty blue clay. Internal voids.
18-LS	499.2	Soft to Plastic	7	12	27.6	94.3	18-LS: Uniform, very fine texture. Smooth silty blue clay, some sand. Tr. pebbles.
19-LS	494.2	Plastic	6	12	26.8	96.7	19-LS: Uniform, very fine texture. Silty blue clay.Little sand.Tr.pebs.Int.voids.
20-LS	489.2	Soft to Plastic	6	12	27.7	97.3	20-LS: Uniform, very fine texture. Blue clay with some silt and little sand.
21-LS	484.2	Soft to Plastic	7	12	26.5	96.1	21-LS: Uniform, very fine texture. Blue clay with some silt.Little sd.Int.voids.
22-LS	479.2	Soft to Plastic	7	12	26.6	94.2	22-LS: Uniform, very fine texture. Blue clay with little silt and sand.
23-LS	474.2	Soft to Plastic	7	12	26.8	94.2	23-LS: Uniform, very fine texture. Blue clay with little silt and sand.Int.voids.
24-LS	469.2	Soft	6	12	30.5	91.1	24-LS: Uniform, very fine texture. Blue clay with little sand & silt.
25-LS	464.2	Soft	6	12	34.5	79.2	25-LS: Uniform, very fine texture. Silty blue clay with some sand. Int. voids.
26-LS	459.8	Weakly Coherent	100	12 10	10.1	120.4	26-LS: Uniform, very fine texture. Clayey silt and grey very fine to fine sand.

PENETRATION NOTE: Number of blows required to drive core sampler distance given using 140-pound weight falling 30 inches.

Boring Log and all sampling by Raymond Concrete Pile Company. Their Job No. D-7153-0.

SHEARING RESISTANCE & VOLUME OF SOLIDS CURVES

PER CENT BY VOLUME OF SOLIDS, LIQUIDS, AND AIR



TRANSVERSE SHEARING RESISTANCE IN LB. PER SQ. FT.

0 800 1600 2400 3200 4000

ONE HALF COMPRESSION STRENGTH IN LB. PER SQ. FT. BASED ON ORIGINAL CROSS SECTION OF TEST SPECIMEN.

● TRANSVERSE SHEARING RESISTANCE IN LB. PER SQ. FT. UNDER NORMAL PRESSURE 4 psi.

ENGINEERING RESEARCH INSTITUTE
SOIL MECHANICS LABORATORY
UNIVERSITY OF MICHIGAN, ANN ARBOR, MICHIGAN

SUBSOIL ANALYSIS OF BORING NO. 12
ST. CLAIR RIVER SITE, MARINE CITY, MICHIGAN
THE DETROIT EDISON COMPANY

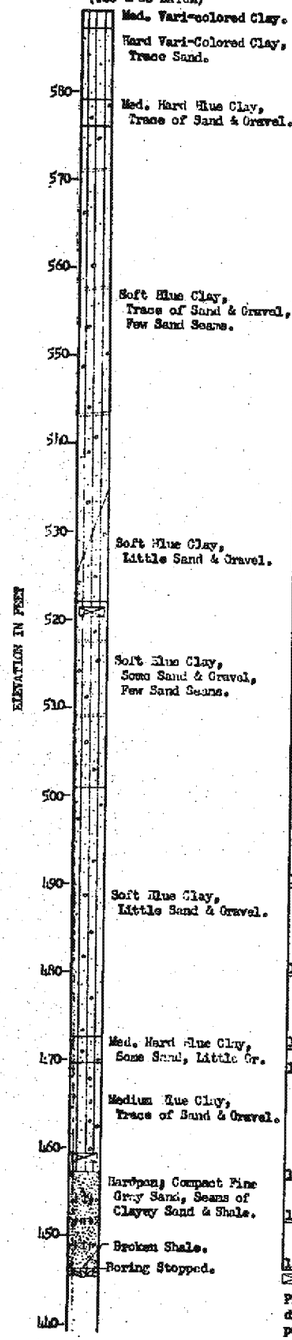
APPROVED: W. E. Housel DATE: 12-13-50

UNIVERSITY OF MICHIGAN PROJECT 2213-16

ED_005947A_00014556-00318

LOG OF SOIL PROFILE

BY RCTCo VISUAL INSPECTION
GROUND SURFACE
ELEVATION = 589.0'
(USC & GS DATUM)

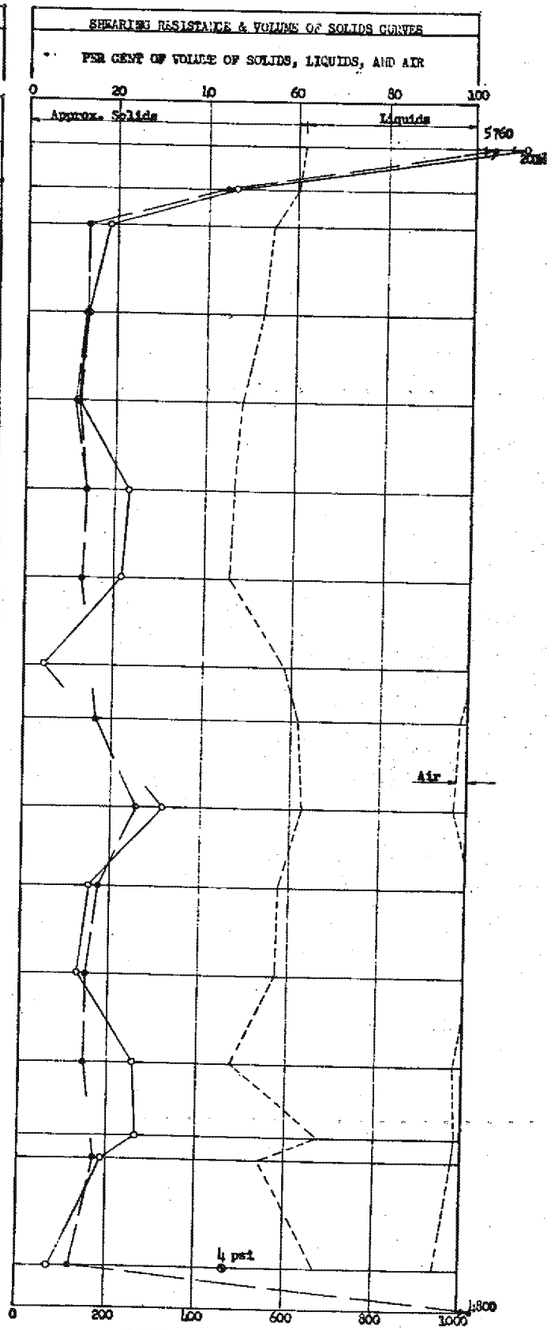


SOIL SAMPLE							LABORATORY VISUAL INSPECTION
SA. NO.	ELEV.	LAB. CONSISTENCY	PENETRATION NO. OF BLOWS	PENETRATION DRIVE FT. INCHES	% H_2O BY DRY WT.	DRY WT. LBS. PER CU. FT.	REMARKS
1-DS	585.5	- -	18	12			
2-LS	581.0	Hard	17	12	23.5	103.0	2-LS: Uniform, very fine texture. Smooth vari-colored clay with little silt.
3-LS	579.0	Plastic to Firm	14	12	26.4	101.1	3-LS: Uniform, very fine texture. Smooth blue clay with little silt. Sl. tr. pebbles.
4-LS	575.0	Soft	4	13	32.2	91.7	4-LS: Uniform, very fine texture. Smooth blue clay with little silt. Tr. v. f. s.
5-LS	565.0	Soft	4	12	33.6	88.9	5-LS: Uniform, very fine texture. Smooth silty blue clay. Sl. tr. of pebbles.
6-LS	555.0	Soft	3	13	40.4	81.1	6-LS: Uniform, very fine texture. Smooth blue clay with little silt.
7-LS	545.0	Soft	3	13	43.5	79.2	7-LS: Uniform, very fine texture. Smooth blue clay with little silt.
8-LS	535.0	Soft	3	13	44.6	77.4	8-LS: Uniform, very fine texture. Smooth blue clay with little silt.
9-LS	525.0	V. Soft	5	12	27.5	98.0	9-LS: Uniform, very fine texture. Silty blue clay with little sand.
	521.0	- -	8	12			
10-LS	519.0	Soft	8	12	22.1	103.6	10-LS: Uniform, very fine texture. Silty blue clay with little sand.
11-LS	509.0	Plastic	11	12	20.1	106.1	11-LS: Uniform, very fine texture. Smooth silty blue clay. Trace of sand.
12-LS	500.0	Soft	7	12	28.4	96.7	12-LS: Uniform, very fine texture. Smooth silty blue clay. Trace of sand.
13-LS	490.0	Soft	8	12	28.6	96.7	13-LS: Uniform, very fine texture. Smooth silty blue clay. Trace of sand.
14-LS	480.0	Soft to Plastic	8	12	39.2	79.9	14-LS: Uniform, very fine texture. V. smooth blue clay with little silt.
15-LS	471.7	Plastic	24	12	17.5	112.6	15-LS: Uniform, very fine texture. Blue clay with little silt and sand.
16-LS	469.0	Soft	10	12	30.0	91.1	16-LS: Uniform, very fine texture. Smooth blue clay with little silt.
	459.0	- -	15	12			
17-LS	457.0	Sandy Coherent	108	12	8.3	111.1	17-LS: Uniform, fine texture. Clayey fine to medium gray sand.
18-LS	452.0	Hard	140	12	- -	- -	18-LS: Uniform, very fine texture. Silty dark blue clay.
19-DS	446.8	- -	200	5	- -	- -	

Indicates failure to recover Liner Sample.

PENETRATION NOTE: Number of blows required to drive core sampler distance given using 140-pound weight falling 30 inches.

Boring Log and all sampling by Raymond Concrete Pile Company. Their Job No. B-7453-D.



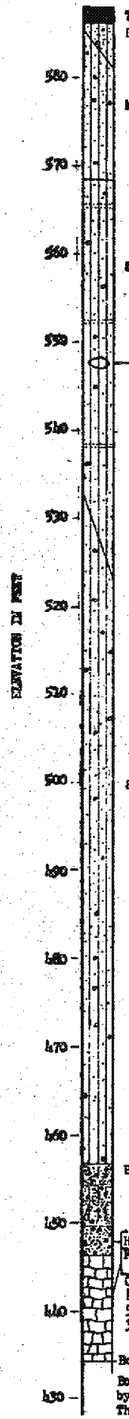
ENGINEERING RESEARCH INSTITUTE
SOIL MECHANICS LABORATORY
UNIVERSITY OF MICHIGAN, ANN ARBOR, MICHIGAN

SUBSOIL ANALYSIS OF BORING NO. 13
ST. CLAIR RIVER SITE, MARINE CITY, MICHIGAN
THE DETROIT EDISON COMPANY

ED_005947A_00014556-00319

LOG OF SOIL PROFILE

BY RCPCo VISUAL INSPECTION
GROUND SURFACE
ELEVATION = 588.1'
(USC & GS DATUM)



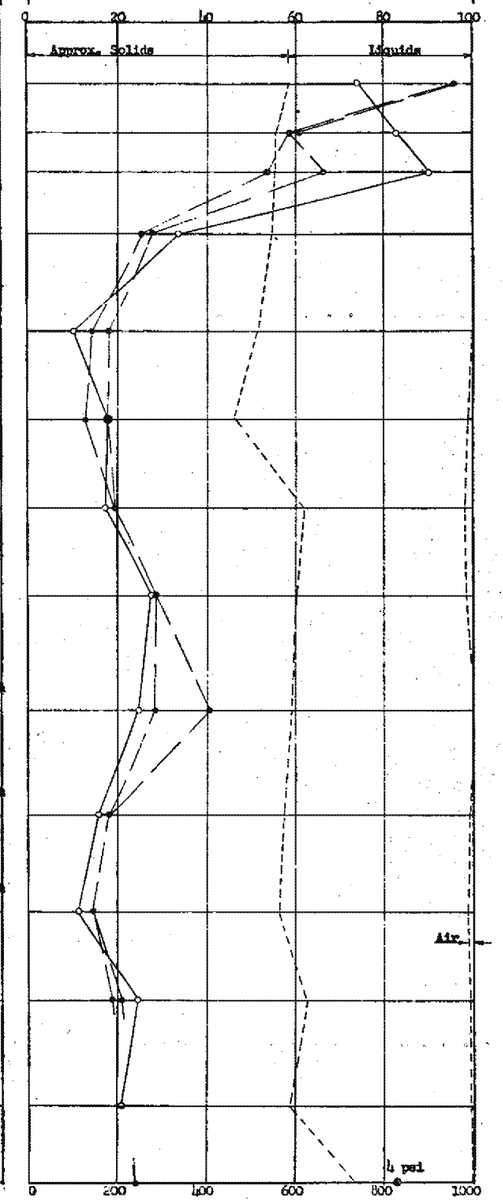
Boring Log and all sampling by Raymond Concrete Pile Company. Their Job No. R-7453-D.

SOIL SAMPLE							LABORATORY VISUAL INSPECTION
SA. NO.	ELEV.	LAB. CONSIS-TENCY	PENETRATION NO. OF BLOWS	DRIVE IN INCHES	% H_2O BY DRY WT.	DRY WT. LB. PER CU. FT.	REMARKS
1-DS	585.6	- -	27	12			
2-LS	581.1	Stiff	11	12	26.8	98.6	2-LS: Uniform, very fine texture. Smooth var-colored clay with little silt. Tr. sd.
3-LS	575.6	Firm to Stiff	7	12	30.4	93.0	3-LS: Uniform, very fine texture. Smooth yellow clay with little silt. Tr. sd.
4-LS	571.1	Stiff	9	13	31.2	93.0	4-LS: Uniform, very fine texture. Smooth yellow clay with little silt. Tr. sd.
5-LS	564.1	Plastic	7	12	31.4	91.7	5-LS: Uniform, very fine texture. Smooth silty blue clay with tr. sand.
6-LS	553.1	Soft	3	14	35.2	86.1	6-LS: Uniform, very fine texture. Smooth blue clay with little silt.
7-LS	543.1	Soft	3	14	42.9	77.4	7-LS: Uniform, very fine texture. Blue clay with some silt and little sand.
8-LS	533.1	Soft	5	12	21.8	104.2	8-LS: Uniform, very fine texture. Smooth blue clay with little silt and tr. sand.
9-LS	523.1	Plastic	7	12	23.8	100.5	9-LS: Uniform, very fine texture. Smooth blue clay with little silt and tr. sand.
	513.1	- -	9	12			
10-LS	510.1	Plastic	10	12	26.4	98.6	10-LS: Uniform, very fine texture. Smooth blue clay with little silt. Tr. sd. & pebs.
	500.1	- -	7	12			
11-LS	498.1	Soft	7	12	27.1	96.1	11-LS: Uniform, very fine texture. Smooth blue clay with some silt.
12-LS	487.1	Soft	7	12	28.0	94.8	12-LS: Uniform, very fine texture. Smooth silty blue clay.
13-LS	477.1	Soft to Plastic	7	12	21.7	105.5	13-LS: Uniform, very fine texture. Silty blue clay with little sand.
	467.1	- -	7	12			
14-LS	465.1	Plastic	7	12	26.1	98.6	14-LS: Uniform, very fine texture. Blue clay with some silt and little sand.
15-LS	456.1	Non-Coherent	29	12	13.1	124.2	15-LS: Uniform, very fine texture. Silty very fine to fine gray sand. Tr. clay.

PENETRATION NOTE: Number of blows required to drive core sampler distance given using 140-pound weight falling 30 inches.

SHEARING RESISTANCE & VOLUME OF SOLIDS CURVES

PER CENT OF VOLUME OF SOLIDS, LIQUIDS, AND AIR



TRANSVERSE SHEARING RESISTANCE IN LB. PER SQ. FT.

0 800 1600 2400 3200 4000

ONE HALF COMPRESSION STRENGTH IN LB. PER SQ. FT. BASED ON ORIGINAL CROSS SECTION OF TEST SPECIMEN.

TRANSVERSE SHEARING RESISTANCE IN LB. PER SQ. FT. UNDER NORMAL PRESSURE OF 4 psi.

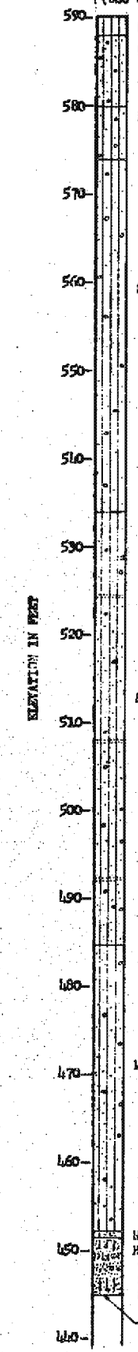
ENGINEERING RESEARCH INSTITUTE
SOIL MECHANICS LABORATORY
UNIVERSITY OF MICHIGAN, ANN ARBOR, MICHIGAN

SUBSOIL ANALYSIS OF BORING NO. 14
ST. CLAIR RIVER SITE, MARINE CITY, MICHIGAN
THE DETROIT EDISON COMPANY

APPROVED: [illegible] DATE: 12-13-50

A-30

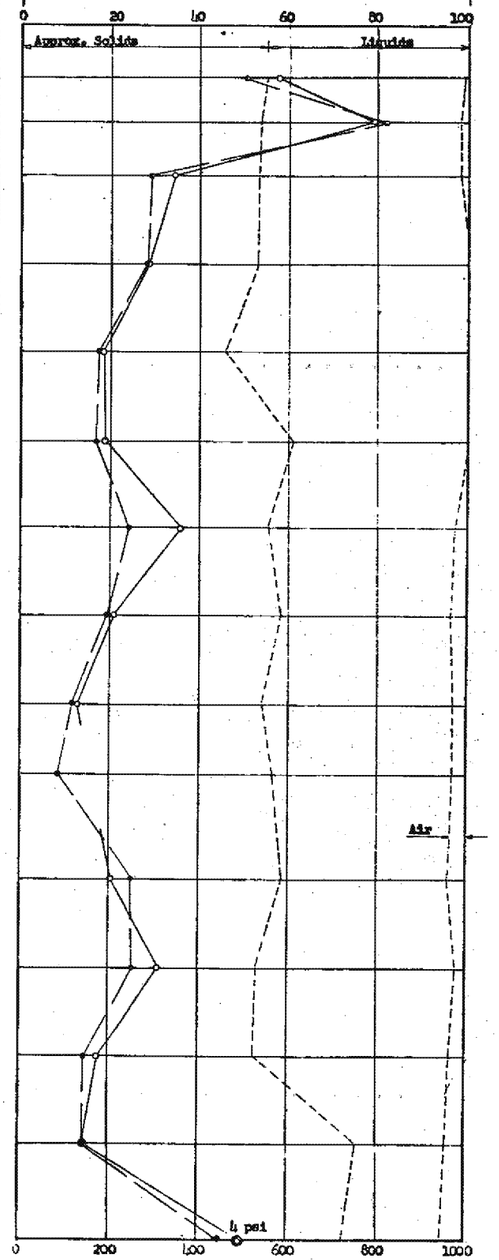
LOG OF SOIL PROFILE
BY RCPCo VISUAL INSPECTION
GROUND SURFACE
ELEVATION = 590.2'
(USC & GS DATUM)



SOIL SAMPLE							LABORATORY VISUAL INSPECTION
SA. NO.	ELEV.	LAB. CONSISTENCY	PENETRATION NO. OF BLOWS	PENETRATION DRIVE IN INCHES	% H_2O BY DRY WT.	DRY WT. LB. PER CU. FT.	REMARKS
1-BS	586.7	- -	42	12			
2-LS	584.2	Firm	15	12	29.8	93.0	2-LS: Uniform, very fine texture. Smooth vari-colored clay with little silt.
3-LS	579.2	Stiff	9	12	30.7	90.5	3-LS: Uniform, very fine texture. Smooth yellow clay with little silt.
4-LS	573.2	Plastic	6	12	31.2	89.9	4-LS: Uniform, very fine texture. Smooth yellow clay with little silt.
5-LS	563.2	Plastic	5	13	33.0	89.2	5-LS: Uniform, very fine texture. Smooth blue clay with little silt.
6-LS	553.2	Soft	5	14	43.0	77.4	6-LS: Uniform, very fine texture. Smooth blue clay with little silt.
7-LS	543.2	Soft	4	13	36.4	84.9	7-LS: Uniform, very fine texture. Smooth blue clay with little silt.
8-LS	533.2	Plastic	6	12	23.9	102.7	8-LS: Uniform, very fine texture. Blue clay with little silt and tr. of sand.
9-LS	523.2	Soft to Plastic	7	12	28.5	93.0	9-LS: Uniform, very fine texture. Smooth silty blue clay.
10-LS	513.2	Soft	7	12	24.5	98.0	10-LS: Uniform, very fine texture. Smooth silty blue clay.
	508.2	- -	14	12			
11-LS	505.2	V.Soft	7	12	29.4	91.1	11-LS: Uniform, very fine texture. Smooth silty blue clay.
	495.2	- -	7	12			
12-LS	493.2	Plastic	7	12	26.3	95.5	12-LS: Uniform, very fine texture. Smooth silty blue clay with tr. of sand.
13-LS	483.2	Plastic	9	12	23.4	99.2	13-LS: Uniform, very fine texture. Smooth blue clay with little silt.
14-LS	473.2	Soft	9	12	31.3	89.2	14-LS: Uniform, very fine texture. Smooth blue clay with little silt.
15-LS	463.2	Soft	9	12	30.7	88.6	15-LS: Uniform, very fine texture. Smooth silty blue clay.
16-LS	452.3	Firm	90	12	9.9	127.9	16-LS: Uniform, very fine texture. Clayey fine gray sand. Little silt.
17-BS	446.0	- -	200	2	- -	- -	

PENETRATION NOTE: Number of blows required to drive core sampler distance given using 140-pound weight falling 30 inches.

SHEARING RESISTANCE & VOLUME OF SOLIDS CURVES



Boring Log and all sampling
by Raymond Concrete Pile Company.
Their Job No. B-7453-D.

ENGINEERING RESEARCH INSTITUTE
SOIL MECHANICS LABORATORY
UNIVERSITY OF MICHIGAN, ANN ARBOR, MICHIGAN

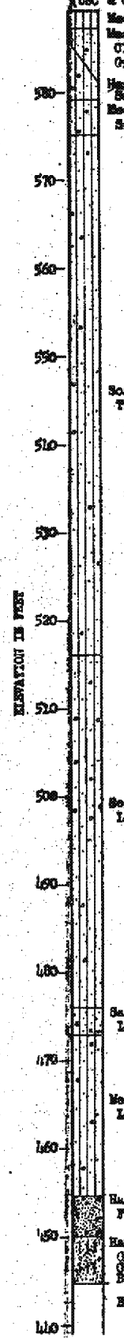
SUBSOIL ANALYSIS OF BORING NO. 15
ST. CLAIR RIVER SITE, MARINE CITY, MICHIGAN
THE DETROIT EDISON COMPANY

APPROVED: [signature] DATE: 2-13-50
UNIVERSITY OF MICHIGAN PROJECT M373-66

A-31

LOG OF SOIL PROFILE

BY ROPCo VISUAL INSPECTION
GROUND SURFACE
ELEVATION = 589.1'
(USC & GS DATUM)



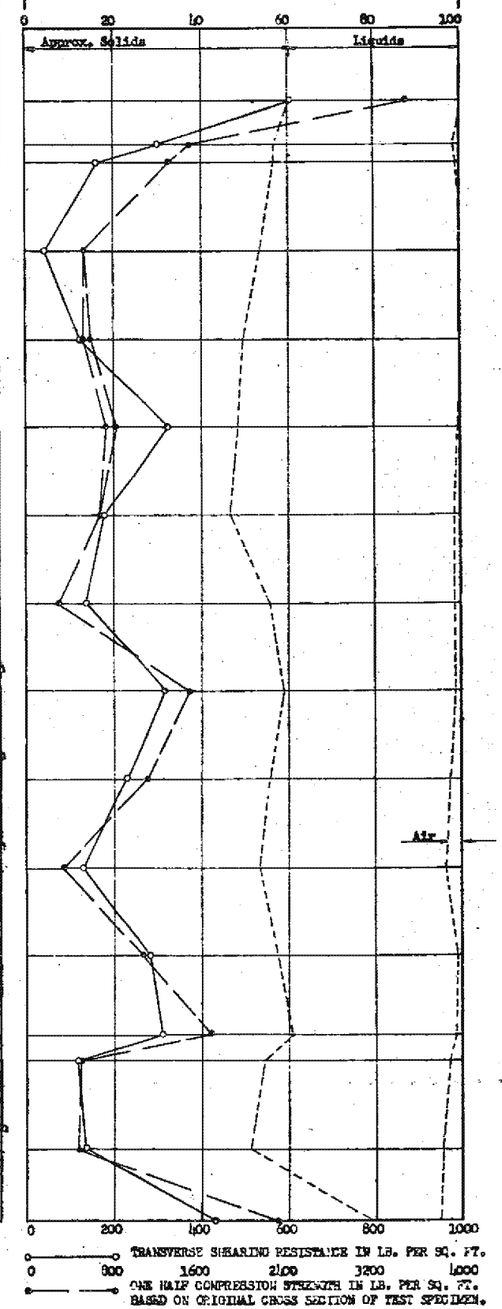
Med. Vari-colored Clay.
Med. Hard V.-Colored Clay, Little Sand & Gravel.
Hard Yellow Clay, Trace Sand & Gravel.
Med. Yellow Clay, Trace Sand & Gravel.
Soft Blue Clay, Trace of Sand & Gravel.
Soft Blue Clay, Little Sand & Gravel.
Sandy Med. Blue Clay, Little Gravel.
Med. Blue Clay, Little Sand & Gravel.
Hardpan; Comp. Clayey F. to C. Gray Sd. & Gr.
Hardpan; V. Comp. Fine Gray Sd., Little Cl. & Gr. Broken Shale in Bottom of Spoon.
Boring Stopped.

SOIL SAMPLE / LABORATORY VISUAL INSPECTION

SA. NO.	ELEV.	LAB. CONSISTENCY	PENETRATION NO. OF BLOWS	PENETRATION DRIVE IN INCHES	% H_2O BY DRY WT.	DRY WT. LB. PER CU. FT.	REMARKS
1-GS	585.6	- -	15	12			
2-LS	581.1	Stiff	20	12	24.4	102.3	2-LS: Uniform, very fine texture. Smooth vari-colored clay with little silt.
3-LS	576.1	Plastic to Firm	8	12	26.9	96.7	3-LS: Uniform, very fine texture. Smooth gray clay with little silt.
4-LS	574.1	S. to Pl.	6	13	27.9	95.5	4-LS: Uniform, very fine texture. Smooth silty blue clay.
5-LS	564.1	V. Soft	4	12	32.8	89.9	5-LS: Uniform, very fine texture. Smooth blue clay with little silt.
6-LS	554.1	Soft	3	12	37.8	83.6	6-LS: Uniform, very fine texture. Smooth blue clay with little silt.
7-LS	544.1	Soft to Plastic	3	13	39.9	81.1	7-LS: Uniform, very fine texture. Smooth blue clay with little silt.
8-LS	534.1	Soft	3	12	41.9	78.0	8-LS: Uniform, very fine texture. Smooth blue clay with little silt.
9-LS	524.1	Soft	5	12	28.5	93.6	9-LS: Uniform, very fine texture. Blue clay with little silt and sand.
10-LS	514.1	Plastic	7	12	25.1	99.2	10-LS: Uniform, very fine texture. Smooth silty blue clay with little sand.
11-LS	504.1	Plastic	7	12	27.8	93.6	11-LS: Uniform, very fine texture. Smooth silty blue clay with little sand.
12-LS	494.1	Soft	7	12	29.7	89.9	12-LS: Uniform, very fine texture. Smooth silty blue clay with little sand.
13-LS	484.1	Plastic	7	12	26.9	96.7	13-LS: Uniform, very fine texture. Blue clay with some silt. Little sand.
14-LS	475.1	Plastic	17	12	23.3	101.7	14-LS: Uniform, very fine texture. Blue clay with some silt. Little sand.
15-LS	472.1	Soft	9	12	29.3	91.1	15-LS: Uniform, very fine texture. Silty blue clay with little sand.
16-LS	462.1	Soft	9	12	32.2	86.1	16-LS: Uniform, very fine texture. Smooth silty blue clay with trace sand.
17-LS	454.2	Firm to Stiff	37	12	7.5	132.9	17-LS: Uniform, very fine texture. Sandy, silty blue clay. Trace pebbles.
18-GS	449.6	- -	200	6			
19-GS	444.8	- -	200	4	- -	- -	

PENETRATION NOTE: Number of blows required to drive core sampler distance given using 140-pound weight falling 30 inches.

SHEARING RESISTANCE & VOLUME OF SOLIDS CURVES



Boring Log and all sampling by Raymond Concrete Pile Company. Their Job No. B-7453-D.

ENGINEERING RESEARCH INSTITUTE
SOIL MECHANICS LABORATORY
UNIVERSITY OF MICHIGAN, ANN ARBOR, MICHIGAN

SUBSOIL ANALYSIS OF BORING NO. 16
ST. CLAIR RIVER SITE, MARINE CITY, MICHIGAN
THE DETROIT EDISON COMPANY

APPROVED: W.S. Housel DATE: 12-13-50

UNIVERSITY OF MICHIGAN PROJECT [illegible]

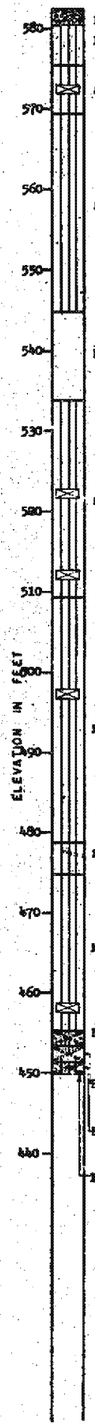
A-32

ED_005947A_00014556-00322

LOG OF SOIL PROFILE

BY REMOD. VISUAL INSPECTION

GROUND SURFACE ELEVATION = 582.2 (USCGS DATUM)



Fill; Coal and Stones.

Fill; Medium Varicolored Clay, Some Cinders.

Soft Varicolored Clay.

Soft Gray Clay, Trace of Sand.

Loose Fine to Very Fine Dark Gray Sand.

Soft Gray Clay, Trace of Sand.

Medium Gray Clay, Trace of Sand and Fine Gravel.

Sandy Medium Hard Gray Clay, Few Sand Seams.

Medium Gray Clay, Trace of Sand.

Hardpan; Compact Clayey Fine to Medium Gray Sand, Some Gravel.

Hardpan; Compact Medium to Fine Gray Sand, Little Clay.

Hardpan; Very Hard Sandy Gray Clay, Trace of Gravel.

Boring Stopped.

Boring Log and all sampling by Raymond Concrete Pile Company. Their Job No. B-25056-D.

SOIL SAMPLE / LABORATORY VISUAL INSPECTION

SA NO.	ELEV	LAB. CONSISTENCY	PENETRATION NO OF BLOWS	PENETRATION DRIVE IN INCHES	% H_2O BY DRY WT.	DRY WT LBS PER CU. FT	REMARKS
1-BS	579.2	--	5	12			
2-BS	576.2	--	5	12			
3-BS	572.2	--	4	12			
4-LS	567.2	Plastic	4	12	30.9	91.1	4-LS: Uniform. Gray clay, some silt, trace of sand.
5-LS	562.2	Soft	2	14	32.6	89.2	5-LS: Uniform. Gray clay, some silt, trace of sand.
6-LS	557.2	Soft	2	14	37.1	83.0	6-LS: Uniform. Gray clay, some silt, trace of sand.
7-LS	552.2	Soft	2	16	40.3	80.5	7-LS: Uniform. Gray clay, some silt, trace of sand.
8-LS	547.2	Soft	2	15	45.0	76.1	8-LS: Uniform. Gray clay, some silt, trace of sand.
9-LS	543.2	Plastic	8	12	25.4	95.5	9-LS: Uniform. Clayey gray silt, little sand.
10-LS	538.2	Very Soft	5	12	27.6	93.9	10-LS: Non-uniform. Varies from silty gray clay, trace of sand to clayey gray silt, little sand.
11-LS	533.2	Soft	6	12	23.1	99.2	11-LS: Uniform. Clayey gray silt, little sand.
12-LS	531.2	Plastic	4	12	22.7	101.1	See Note A.
13-LS	527.2	Plastic	4	13	23.3	101.7	13-LS: Uniform. Silty gray clay, some sand, trace of gravel.
14-BS	522.2	--	4	12			
15-LS	517.2	Plastic	5	14	24.9	99.8	15-LS: Uniform. Silty gray clay, some sand, trace of gravel.
	512.2	--	4	12			
16-LS	507.2	Plastic	8	13	25.9	100.5	16-LS: Uniform. Gray clay, some silt, trace of sand and gravel.
17-LS	502.2	Plastic	7	13	28.0	93.0	17-LS: Uniform. Gray clay, some silt, trace of sand and gravel.
	497.2	--	7	12			
18-LS	492.2	Soft	7	12	27.3	94.3	18-LS: Uniform. Gray clay, some silt, trace of sand and gravel.
19-LS	487.2	Soft to Plastic	7	12	26.4	95.5	19-LS: Uniform. Gray clay, some silt, trace of sand and gravel.
20-LS	482.2	Soft to Plastic	8	12	25.7	96.7	20-LS: Uniform. Gray clay, some silt, trace of sand and gravel.
21-LS	477.2	Soft to Plastic	17	12	11.3	123.6	21-LS: Non-uniform. Varies from silty gray clay to clayey silty gray sand.
22-LS	473.2	Very Soft	8	12	33.3	86.1	22-LS: Uniform. Gray clay, some silt, trace of sand and gravel.
23-LS	468.2	Soft	7	12	38.0	82.4	23-LS: Uniform. Gray clay, some silt, trace of sand.
24-LS	463.2	Soft	6	12	45.0	70.5	24-LS: Uniform. Gray clay, trace of silt and sand.
	458.2	--	7	12			
25-BS	454.1	--	72	12			
26-BS	451.7	--	36	12			
27-BS	449.9	--	106	12			

Indicates failure to recover Liner Sample

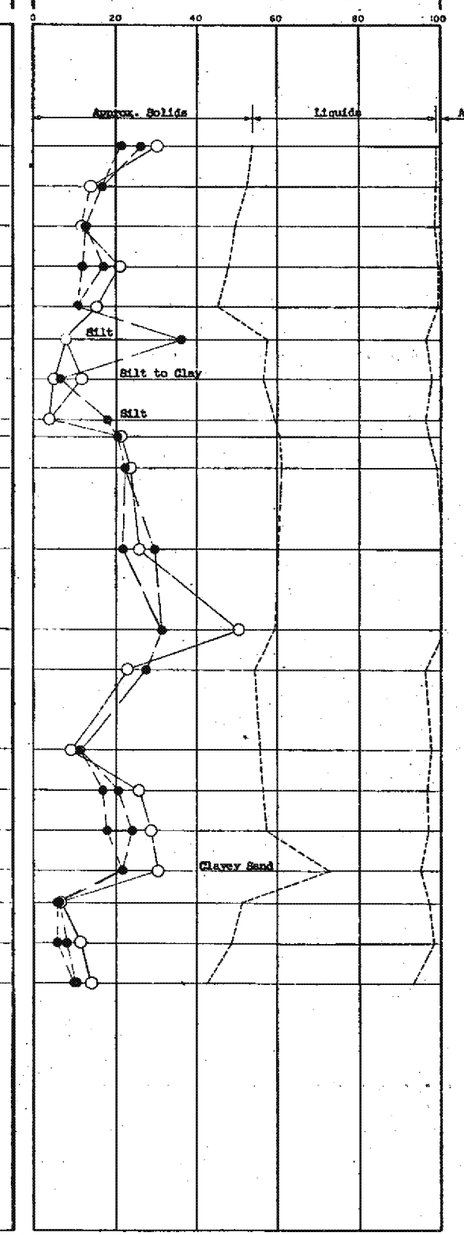
NOTE: Permanent Ground Water Level assumed to be the level of the St. Clair River adjacent to the site.

PENETRATION NOTE: Number of blows required to drive core sampler distance given using a 140-pound weight falling 30 inches.

Note A

12-LS: Uniform. Silty gray clay, some sand, trace of gravel.

SHEARING RESISTANCE & VOLUME OF SOLIDS CURVES



UNIVERSITY OF MICHIGAN RESEARCH INSTITUTE
SOIL MECHANICS LABORATORY
ANN ARBOR MICHIGAN

SUBSOIL ANALYSIS OF BORING NO 20
ST. CLAIR POWER PLANT - DETROIT EDISON COMPANY
DETROIT MICHIGAN

APPROVED: [illegible] DATE: [illegible]-57

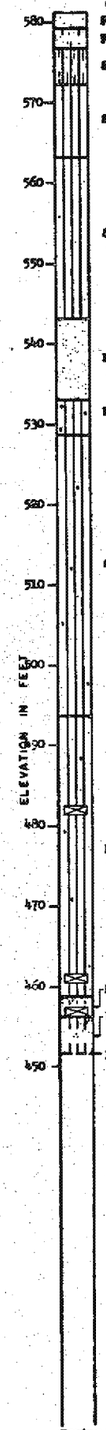
UNIVERSITY OF MICHIGAN RESEARCH INSTITUTE PROJECT 01944

ED_005947A_00014556-00323

LOG OF SOIL PROFILE

BY MERGO. VISUAL INSPECTION

GROUND SURFACE ELEVATION = 581.2 (MERGES DATUM)



Fill; Cinders.

Fill; Clay and Cinders.

Soft Silty Yellow Clay.

Soft Varicolored Clay.

Soft Gray Clay, Trace of Sand.

Firm Fine to Very Fine Dark Gray Sand.

Medium Gray Clay, Some Sand and Gravel.

Soft Gray Clay, Trace of Sand and Gravel.

Medium Gray Clay, Trace of Sand and Gravel.

Firm Fine Gray Sand, Some Clay.

Hardpan; Very Compact Clayey Very Fine to Medium Gray Sand.

Boring Stopped.

Boring Log and all sampling by Raymond Concrete Pile Company. Their Job No. B-25056-D.

SOIL SAMPLE / LABORATORY VISUAL INSPECTION

SA NO.	ELEV.	LAB CONSISTENCY	PENETRATION NO. OF BLOWS	PENETRATION DRIVE IN INCHES	% H_2O BY DRY WT.	DRY WT. LBS PER CU FT.	REMARKS
1-BS	579.2	--	5	12			
2-BS	577.2	--	5	12			
3-LS	575.2	Soft	2	12	38.2	83.0	3-LS: Uniform. Yellow clay, some silt, trace of sand.
4-LS	571.2	Soft	2	15	39.3	81.4	4-LS: Uniform. Yellow clay, some silt, trace of sand.
5-LS	566.2	Soft	2	12	37.9	81.1	See Note A.
6-LS	561.2	Plastic	3	14	30.7	92.4	6-LS: Uniform. Gray clay, some silt, trace of sand.
7-LS	556.2	Soft	3	14	32.6	88.6	7-LS: Uniform. Gray clay, some silt, trace of sand.
8-LS	551.2	Soft	2	18	40.4	81.1	8-LS: Uniform. Gray clay, some silt, trace of sand.
9-LS	546.2	Soft	2	16	42.8	76.8	9-LS: Uniform. Gray clay, some silt, trace of sand.
10-LS	542.1	Firm	18	12	20.2	104.8	10-LS: Uniform. Clayey gray silt, little sand.
11-LS	537.2	Plastic	11	12	20.8	105.5	11-LS: Uniform. Clayey gray silt, little sand.
12-LS	532.2	Plastic	7	13	21.4	103.6	12-LS: Uniform. Clayey gray silt, little sand.
13-LS	527.2	Plastic	5	14	23.2	101.7	13-LS: Uniform. Silty gray clay, some sand, trace of gravel.
14-LS	522.2	Plastic	4	12	24.0	99.2	14-LS: Uniform. Silty gray clay, some sand, trace of gravel.
15-LS	517.2	Plastic	5	12	18.0	109.2	15-LS: Uniform. Silty gray clay, some sand, trace of gravel.
16-LS	512.2	Plastic	5	12	33.8	85.8	16-LS: Uniform. Gray clay, some silt, trace of sand and gravel.
17-LS	507.2	Plastic	5	13	27.2	94.8	17-LS: Uniform. Gray clay, some silt, trace of sand and gravel.
18-LS	502.2	Plastic	4	12	26.7	99.8	18-LS: Uniform. Gray clay, some silt, trace of sand and gravel.
19-LS	497.2	Plastic	5	12	26.1	96.1	19-LS: Uniform. Gray clay, some silt, trace of sand and gravel.
20-LS	492.2	Plastic	6	12	26.0	92.4	20-LS: Uniform. Gray clay, some silt, trace of sand and gravel.
21-LS	487.2	Plastic	8	12	27.2	94.2	21-LS: Uniform. Gray clay, some silt, trace of sand and gravel.
22-BS	482.2	--	7	12			
23-LS	476.2	Soft	7	12	26.5	95.2	23-LS: Uniform. Gray clay, some silt, trace of sand and gravel.
24-LS	471.2	Soft to Plastic	7	12	28.7	91.4	24-LS: Uniform. Gray clay, some silt, trace of sand and gravel.
25-LS	466.2	Soft	7	12	11.8	88.0	25-LS: Uniform. Gray clay, some silt, trace of sand and gravel.
	461.2	--	7	12			
	457.8	--	12	12			
26-BS	455.8	--	100	8			
27-BS	451.9	--	100	4			

Indicates failure to recover Liner Sample

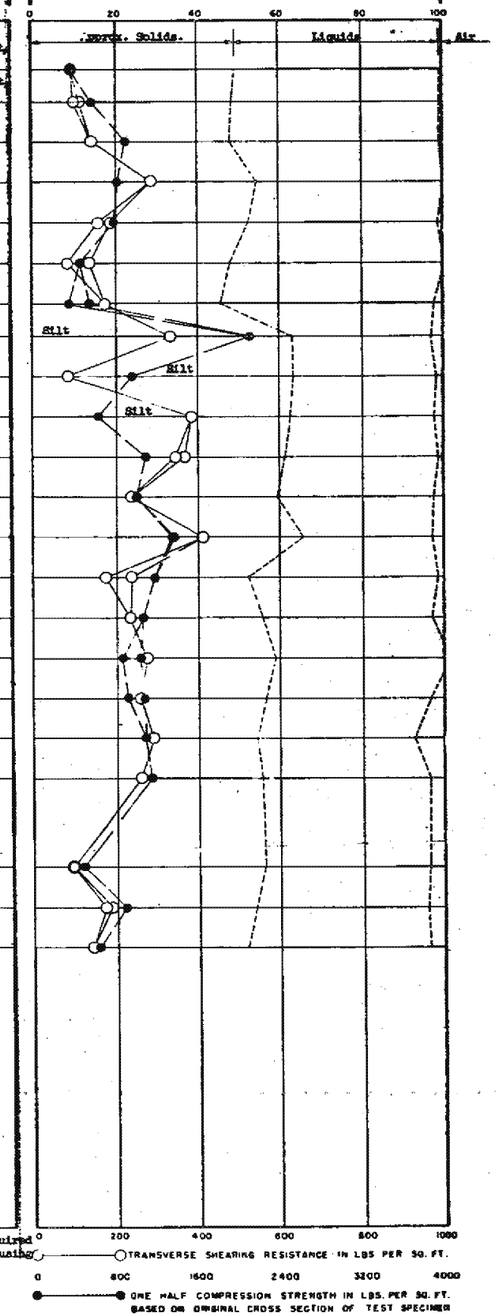
NOTE: Permanent Ground Water Level assumed to be the level of the St. Clair River adjacent to the site.

PENETRATION NOTE: Number of blows required to drive core sampler distance given using a 140-pound weight falling 30 inches.

Note A

5-LS: Uniform. Mottled yellow and gray clay, some silt, trace of sand with pocket of clayey gray silt, trace of organic matter.

SHEARING RESISTANCE & VOLUME OF SOLIDS CURVES



UNIVERSITY OF MICHIGAN RESEARCH INSTITUTE
SOIL MECHANICS LABORATORY
ANN ARBOR MICHIGAN

SUBSOIL ANALYSIS OF BORING NO. 21
ST. CLAIR POWER PLANT - DETROIT EDISON COMPANY
DETROIT MICHIGAN

APPROVED: [signature] DATE: 11-2-59

UNIVERSITY OF MICHIGAN RESEARCH INSTITUTE PROJECT 01994

ED_005947A_00014556-00324

LOG OF SOIL PROFILE

BY R.C.P. DIVISION

GROUND SURFACE ELEVATION = 588.60 Ft.
(USING USC & GS DATUM)

Stiff Sandy Varicolored Clay.

Medium Sandy Brown Clay

Soft Gray Clay, Some Sand, Trace of Gravel

Medium Gray Clay, Some Sand, Trace of Gravel.

Very Compact Medium Clayey Gray Sand. Boring Stopped.

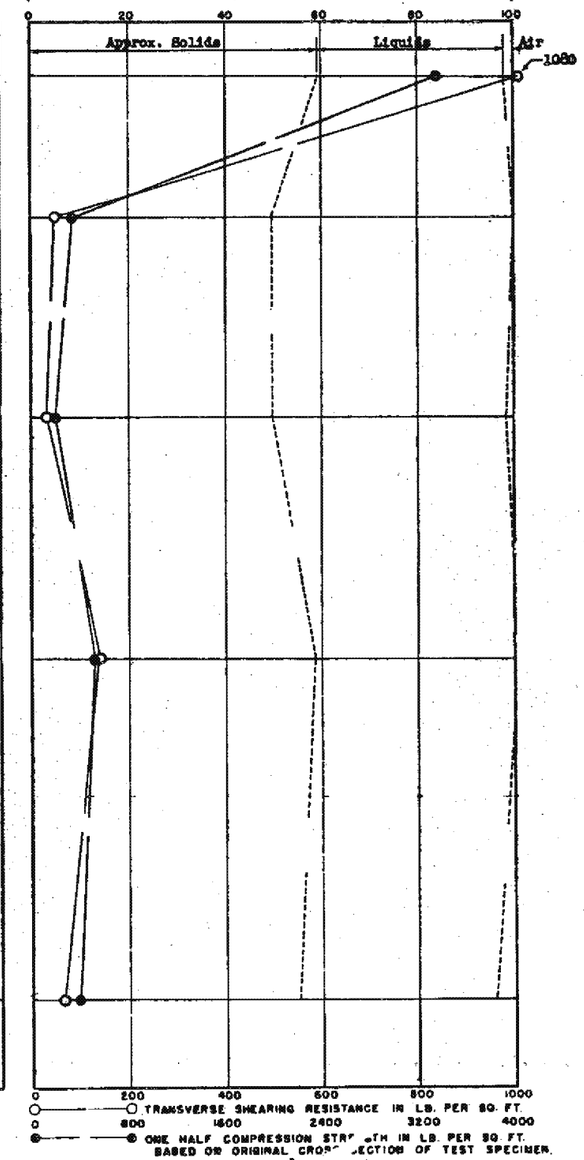
Boring Log and all Sampling by Raymond Concrete Pile Division of Raymond International, Inc.
Their Job No. RCE-11914-D.
Date of Boring: 12-20-66.

SOIL SAMPLE							LABORATORY VISUAL INSPECTION
SA. NO.	ELEV.	LAB CONSIS-TENCY	PENETRATION NO. OF BLOWS	PENETRATION DRIVE IN INCHES	% H_2O BY DRY WT.	DRY WT. LB. PER CU. FT.	REMARKS
1-BS	586.1	--	16	12			
2-LS	583.1	Stiff	15	12	24.2	99.2	2-LS: Uniform. Silty mottled brown-gray clay.
3-BS	578.6	--	10	12			
4-BS	573.1	--	5	12			
W.L. 5-LS	568.6	Very Soft	4	12	37.4	84.2	5-LS: Uniform. Silty gray clay, trace of very fine sand.
6-BS	563.6	--	2	12			
7-BS	558.1	--	2	11			
8-BS	553.1	--	2	11			
9-LS	548.1	Very Soft	3	13	35.0	86.7	9-LS: Uniform. Silty gray clay.
10-BS	543.1	--	2	12			
11-BS	538.1	--	2	12			
12-BS	533.1	--	3	12			
13-BS	528.6	--	6	12			
14-LS	523.1	Soft	9	12	26.8	98.6	14-LS: Uniform. Silty gray clay, trace of sand and gravel.
15-BS	518.6	--	10	12			
16-BS	513.6	--	11	12			
17-BS	508.6	--	12	12			
18-BS	503.6	--	13	12			
19-BS	498.6	--	14	12			
20-BS	493.1	--	11	12			
21-LS	488.1	Very Soft	9	12	27.3	93.0	21-LS: Uniform. Silty gray clay, trace of sand and gravel.
22-BS	483.6	--	10	12			
23-BS	478.6	--	10	12			
24-BS	473.6	--	10	12			
25-BS	468.6	--	10	12			
26-BS	463.6	--	10	12			
27-BS	458.6	--	8	12			
28-BS	453.4	--	100	5			

PENETRATION: Number of blows required to drive core sampler distance given using a 140-pound weight falling 30 inches.

Failure to recover Liner Sample.
WL: Water Level 16 hours after completion.

SHEARING RESISTANCE & VOLUME OF SOLIDS CURVES



ENGINEERING RESEARCH INSTITUTE
SOIL MECHANICS LABORATORY
UNIVERSITY OF MICHIGAN, ANN ARBOR, MICHIGAN

SUBSOIL ANALYSIS OF BORING NO. 29
CAR DUMPER HOUSE - ST. CLAIR POWER PLANT
THE DETROIT EDISON CO. BELLE RIVER, MICHIGAN

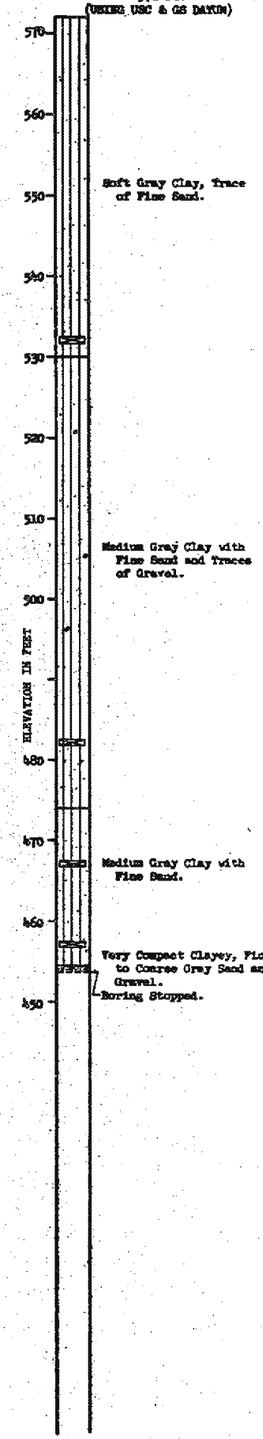
APPROVED: W. Housel DATE: 6-14-67
PROJECT: 01994

A-35

LOG OF SOIL PROFILE

BY R.C.F. DIVISION

GROUND SURFACE ELEVATION = 572 Ft. (USING USC & GS DATUM)

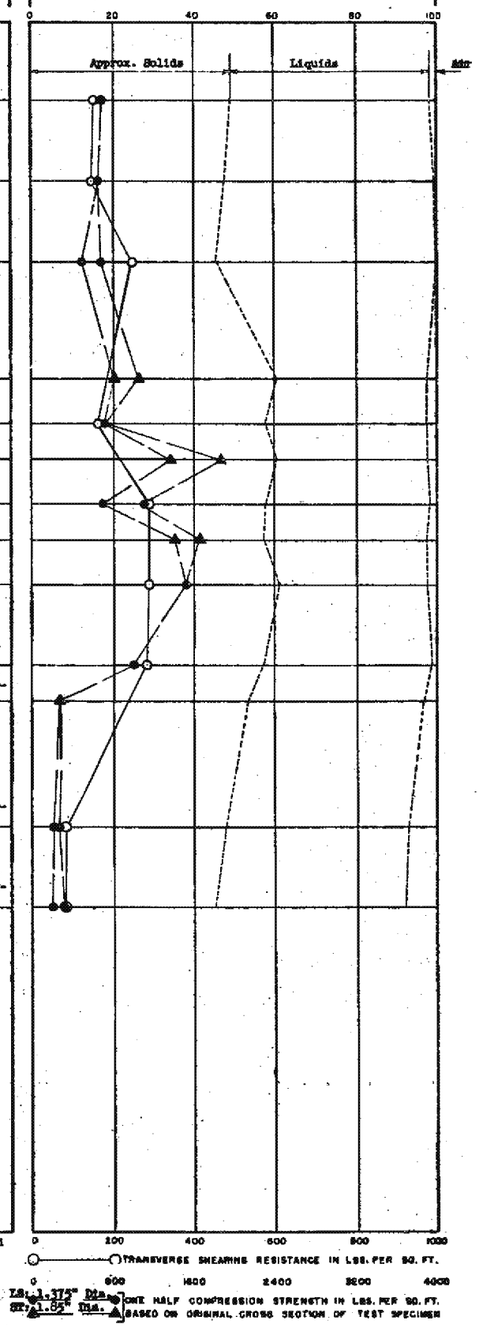


SOIL SAMPLE

SA NO.	ELEV.	LAB. CONSISTENCY	PENETRATION NO. OF BLOWS	PENETRATION DRIVE IN INCHES	% H_2O BY DRY WT.	DRY WT. LBS PER CU. FT.	REMARKS
1-SS	567.0	--	3	12			
2-LS	562.0	Soft	2	12	36.7	84.2	2-LS: Uniform. Silty gray clay, trace of gravel.
Lost SS	557.0	--	2	12			
3-LS	552.0	Soft	2	12	39.5	81.7	3-LS: Uniform. Silty gray clay.
4-SS	547.0	--	2	12			
5-LS	542.0	Soft	3	12	44.3	76.1	5-LS: Uniform. Silty gray clay.
6-SS	537.0	--	3	12			
Lost LS	532.0	--	3	12			
7-ST	527.0	Soft	Pushed		22.6	102.1	7-ST: Uniform. Silty gray clay, trace of gravel. Few sand pockets.
8-LS	522.0	Soft	8	12	25.7	97.3	8-LS: Uniform. Silty gray clay, some fine sand, trace of gravel.
9-ST	517.0	Plastic	Pushed		22.8	102.3	9-ST: Uniform. Silty laminated gray clay, trace of sand and gravel.
10-LS	512.0	Soft to Plastic	9	12	26.2	97.3	10-LS: Uniform. Silty laminated gray clay, some fine sand, trace of gravel.
11-ST	507.0	Plastic	Pushed		25.9	96.7	11-ST: Uniform. Silty laminated gray clay, some fine sand, trace of gravel.
12-LS	502.0	Plastic	13	12	21.9	103.6	12-LS: Uniform. Silty gray clay, some fine sand, trace of gravel.
Lost ST	497.0	--	Pushed				
13-LS	492.0	Plastic	11	12	26.8	96.7	13-LS: Uniform. Silty gray clay, trace of fine sand and gravel.
14-ST	487.0	Very Soft	Pushed		29.7	91.1	14-ST: Uniform. Silty gray clay, trace of fine sand and gravel. Honeycombed.
Lost LS	482.0	--	10	12			
Lost ST	477.0	--	Pushed				
Lost ST	474.0	--	Pushed				
15-LS	472.0	V.Soft	13	12	34.5	81.4	15-LS: Uniform Silty gray clay, trace of fine sand and gravel. Honeycombed.
16-SS	467.0	--	14	12			
17-LS	462.0	Very Soft	14	12	38.2	77.1	17-LS: Uniform. Silty gray clay, trace of fine sand and gravel. Honeycombed.
Lost LS	457.0	--	14	12			
18-SS	453.7	--	100	10			

PENETRATION: Number of blows required to drive core sampler distance given using a 140-pound weight falling 30 inches.

SHEARING RESISTANCE & VOLUME OF SOLIDS CURVES



Boring Log and all sampling by Raymond Concrete Pile Division of Raymond International, Inc. under their Job No. RCB-11914-D. Date of Boring: 2-11-67

Failure to recover Liner Sample.
LS: Undisturbed Liner Sample 1.375" diameter.
SS: Disturbed Sample.
ST: Undisturbed Shelby Tube Sample 1.85" diameter.
SS: Standard Spoon Sample.
Water Level Not Given.

OFFICE OF RESEARCH ADMINISTRATION
SOIL MECHANICS LABORATORY
UNIVERSITY OF MICHIGAN, ANN ARBOR, MICHIGAN

SUBSOIL ANALYSIS OF BORING NO. 29A
GAS BUMPER HOUSE - ST. CLAIR POWER PLANT
DETROIT EDISON COMPANY BELLE RIVER, MICHIGAN

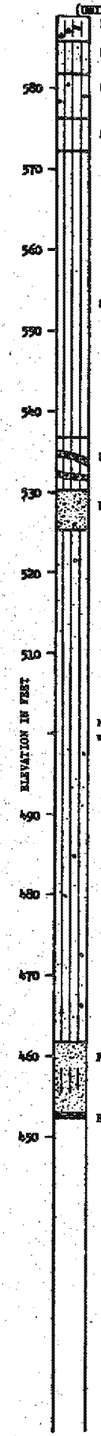
APPROVED: [signature] DATE: 6-14-67

OFFICE OF RESEARCH ADMINISTRATION PROJECT 01994

LOG OF SOIL PROFILE

BY R.C.P. DIVISION

GROUND SURFACE ELEVATION = 588.80 Ft.
(USING USC & GS DATUM)



Fill; Soft Varicolored Clay, Limestone.

Medium Varicolored Sandy Clay.

Stiff Varicolored Clay, Trace of Gravel.

Medium Varicolored Clay.

Soft Gray Clay.

Soft Gray Clay, With Seams of Fine Silty Gray Sand.

Firm Coarse Gray Sand, Some Gravel.

Medium Sandy Gray Clay, with Gravel.

Firm Medium Gray Sand, Some Gravel, Clay Binder.

Refusal.

Boring Log and all Sampling by Raymond Concrete Pile Division of Raymond International, Inc. under their Job No. ECB-11914-F
Date of Boring: 1-13-67

SOIL SAMPLE

SA NO	ELEV	LAB CONSISTENCY	PENETRATION NO OF BLOWS	PENETRATION DRIVE IN INCHES	% H_2O BY DRY WT	DRY WT LBS PER CU FT.
1-BS	586.3	--	4	12		
2-BS	583.8	--	12	12		
3-LS	578.8	Firm to Stiff	16	12	28.8	94.8
4-BS	573.8	--	7	12		
5-LS	568.8	Soft	4	12	36.6	84.9
6-BS	563.8	--	3	12		
7-LS	558.8	Soft	4	12	35.5	85.5
8-BS	553.8	--	3	12		
9-LS	548.8	Soft	3	12	46.2	74.3
10-BS	543.8	--	3	12		
11-LS	538.8	Soft	3	12	45.0	75.2
12-BS	533.8	--	4	12		
13-BS	526.8	--	23	12		
14-LS	523.8	Plastic to Firm	12	12	25.1	99.6
15-BS	518.8	--	14	12		
16-LS	513.8	Soft	14	12	27.7	91.2
17-BS	508.8	--	14	12		
18-LS	503.8	Soft	14	12	27.6	93.0
19-BS	498.8	--	13	12		
20-LS	493.8	Soft	11	12	25.8	99.2
21-BS	488.8	--	10	12		
22-LS	483.8	Soft	9	12	28.2	94.8
23-BS	478.8	--	10	12		
24-LS	473.8	Soft	11	12	25.4	98.6
25-BS	468.8	--	10	12		
26-LS	463.8	Soft	10	12	26.2	98.0
27-BS	458.8	--	11	12		
28-BS	453.8	--	10	12		
	452.6	--	100	1		

Water Level not given.

LABORATORY VISUAL INSPECTION

REMARKS

3-LS: Uniform. Silty, brown-gray clay, trace of sand.

5-LS: Uniform. Silty gray clay, trace of sand.

7-LS: Uniform. Silty gray clay, trace of sand.

9-LS: Uniform. Silty gray clay.

11-LS: Uniform. Silty gray clay.

14-LS: Uniform. Silty laminated gray clay, some fine sand, trace of gravel.

16-LS: Uniform. Silty gray clay, some fine sand, trace of gravel.

18-LS: Uniform. Silty laminated gray clay, some fine sand, trace of gravel

20-LS: Uniform. Silty gray clay, some fine sand, trace of gravel.

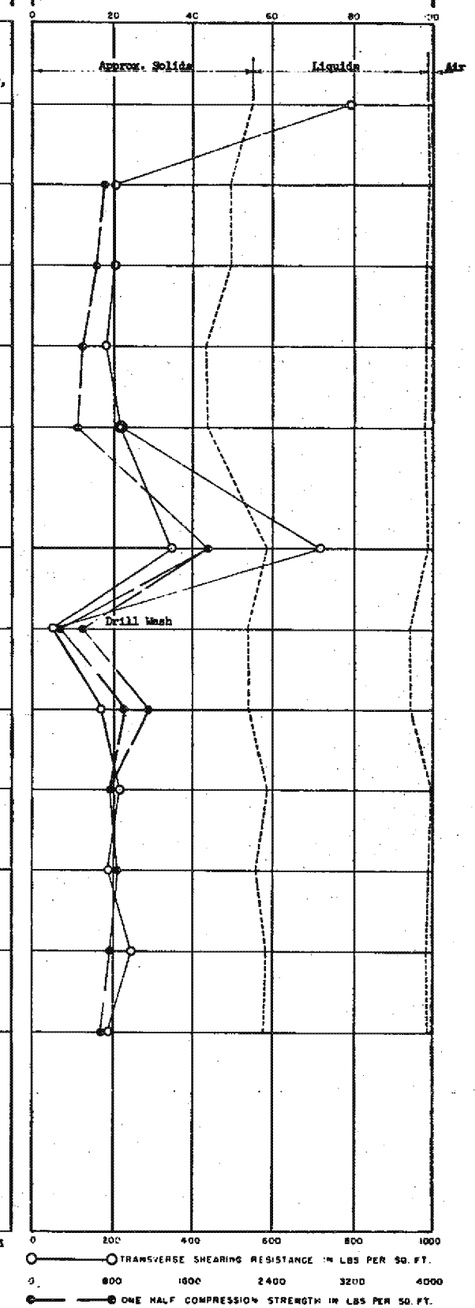
22-LS: Uniform. Silty gray clay, some fine sand, trace of gravel.

24-LS: Uniform. Silty laminated gray clay, some fine sand, trace of gravel.

27-LS: Uniform. Silty gray clay, some fine sand, trace of gravel. Honeycombed.

PENETRATION: Number of blows required to drive core sampler distance given using a 140-pound weight falling 30 inches.

SHEARING RESISTANCE & VOLUME OF SOLIDS CURVES



OFFICE OF RESEARCH ADMINISTRATION
SOIL MECHANICS LABORATORY
UNIVERSITY OF MICHIGAN, ANN ARBOR, MICHIGAN

SUBSOIL ANALYSIS OF BORING NO. 30
CAR DUMPER HOUSE - ST. CLAIR POWER PLANT
THE DETROIT EDISON COMPANY BELLE RIVER, MICHIGAN

APPROVED: W.H. Housel DATE: 6-14-67

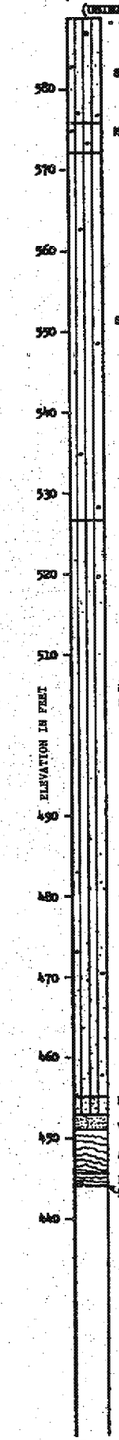
OFFICE OF RESEARCH ADMINISTRATION PROJECT 01994

ED_005947A_00014556-00327

LOG OF SOIL PROFILE

BY R.C.P. DIVISION

GROUND SURFACE ELEVATION = 588.80 Ft. (USING USC & GS DATUM)



Stiff Sandy Varicolored Clay, Some Gravel.

Medium Gray Clay, Trace of Gravel.

Soft Gray Clay, Trace of Gravel.

Medium Gray Clay, Some Sand, Trace of Gravel.

Medium Sandy Gray Clay, Some Rouge Streaks.

Very Compact Medium Gray Sand.

Soft Gray Shale.

Hard Gray Shale.

Boring Stopped.

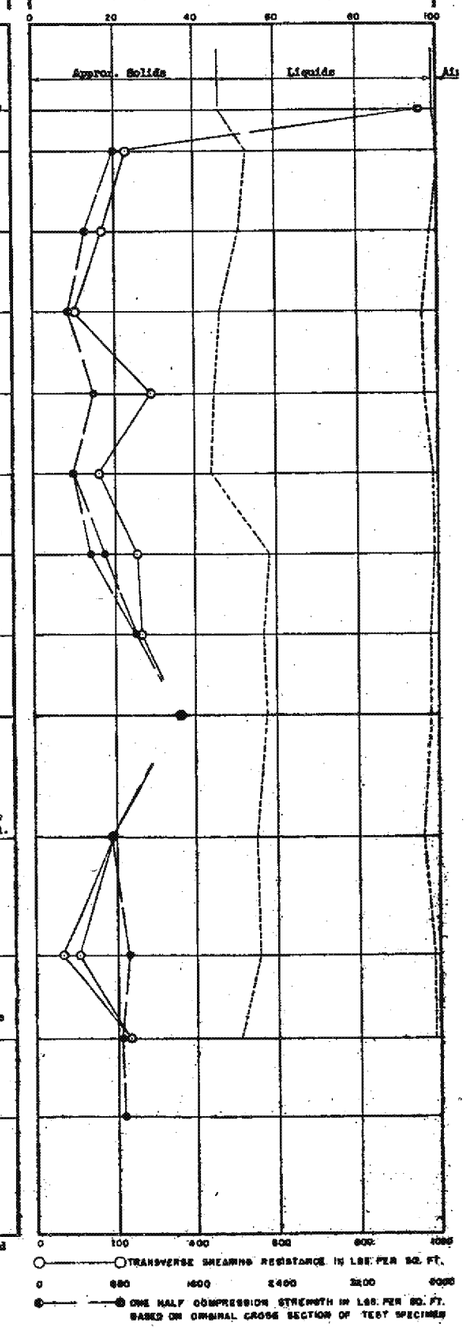
Boring Log and all sampling by Raymond Concrete Pile Division of Raymond International, Inc. under their Job No. ECB-11914-D.
Date of Boring: December 1966 to January 1967

SOIL SAMPLE							LABORATORY VISUAL INSPECTION
SA. NO.	ELEV.	LAB. CONSIS-TENCY	PENETRATION NO. OF BLOWS	PENETRATION DRIVE IN INCHES	% H_2O BY DRY WT.	DRY WT. LBS. PER CU. FT.	REMARKS
1-BS	586.3	--	21	12			
2-BS	583.8	--	22	12			
3-LS	578.3	Stiff	17	12	41.7	79.2	3-LS: Uniform. Silty varicolored clay.
4-LS	573.3	Soft	5	12	32.5	91.1	4-LS: Uniform. Silty gray clay.
5-BS	568.8	--	3	11			
6-LS	563.3	Soft	3	12	33.3	88.0	6-LS: Uniform. Silty gray clay.
7-BS	558.8	--	3	12			
8-LS	553.3	Very Soft	4	12	38.5	81.1	8-LS: Uniform. Silty gray clay.
9-BS	548.3	--	4	12			
10-LS	543.3	Soft	4	12	42.1	77.4	10-LS: Uniform. Silty gray clay.
11-BS	538.8	--	4	12			
12-LS	533.3	Soft	4	12	45.1	76.1	12-LS: Uniform. Silty gray clay.
13-BS	528.8	--	4	12			
14-LS	523.3	Soft	6	12	25.9	98.6	14-LS: Uniform. Silty gray clay, trace of sand and gravel.
15-BS	518.8	--	9	12			
16-LS	513.3	Plastic	10	12	26.7	96.1	16-LS: Uniform. Silty laminated gray clay, trace of sand and gravel.
17-BS	508.8	--	10	12			
18-LS	503.3	--	11	12	26.6	97.3	18-LS: Uniform. Silty laminated gray clay, trace of sand and gravel.
19-BS	498.8	--	10	12			
	493.3	--	11	12			
20-LS	488.3	Soft to Plastic	9	12	27.7	93.0	20-LS: Uniform. Silty gray clay, trace of sand and gravel. Honeycombed.
	478.8	--	16	12			
21-LS	473.8	Soft	9	12	28.6	94.0	21-LS: Uniform. Silty gray clay, some sand, trace of gravel.
22-BS	468.8	--	14	12			
23-LS	463.3	Soft	8	12	34.7	86.1	23-LS: Uniform. Silty gray clay, trace of sand. Honeycombed.
24-BS	458.8	--	9	12			
25-LS	453.8	Soft	12	12	17.4	--	25-LS: Non-uniform. Silty sandy gray clay. Honeycombed.
26-BS	452.8	--	100	3			
27-BS	448.2	--	200	3			
	444.3	--	200	1			

U.L.: Water Level 24 hours after completion.

PENETRATION: Number of blows required to drive core sampler distance given using a 140-pound weight falling 30 inches.

SHEARING RESISTANCE & VOLUME OF SOLIDS CURVES



OFFICE OF RESEARCH ADMINISTRATION
SOIL MECHANICS LABORATORY
UNIVERSITY OF MICHIGAN, ANN ARBOR, MICHIGAN

SUBSOIL ANALYSIS OF BORING NO. 31
CAB HOPPER BOOM - ST. CLAIR POWER PLANT
THE DETROIT EDISON COMPANY BELLE RIVER, MICHIGAN

APPROVED: W. A. Hansel DATE: 6-14-67

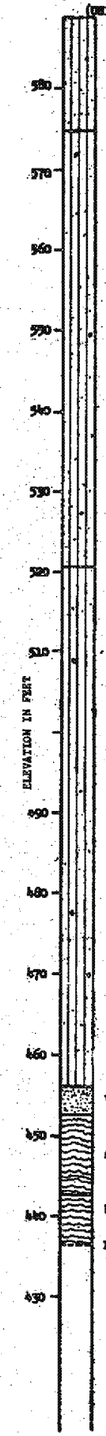
OFFICE OF RESEARCH ADMINISTRATION PROJECT 01994

A-38

LOG OF SOIL PROFILE

BY R.C.P. DIVISION

GROUND SURFACE ELEVATION: 588.70 Ft. (USING USC & GS DATUM)



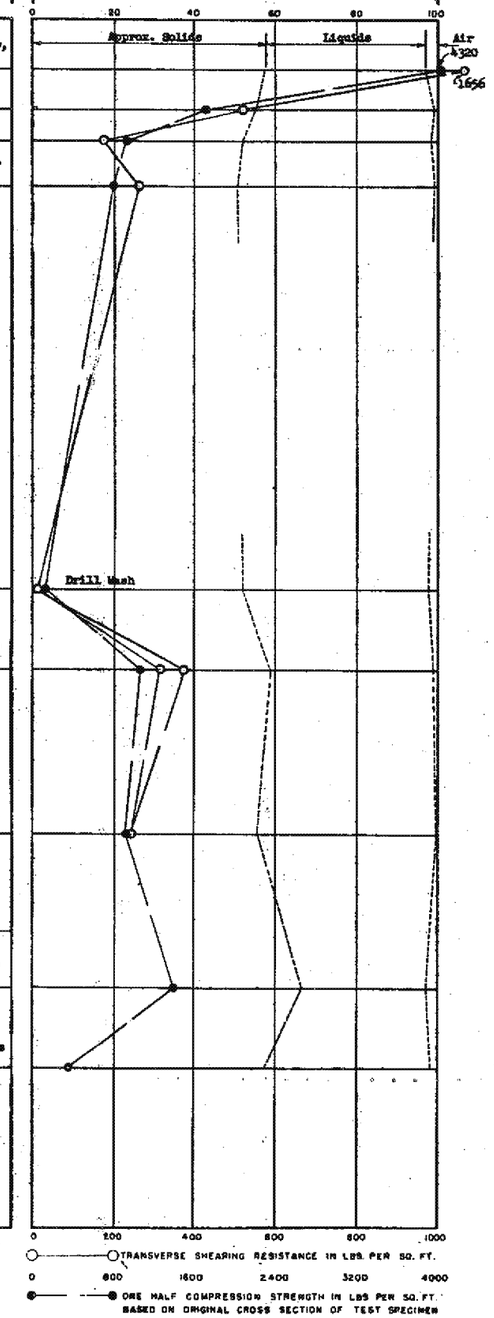
SOIL SAMPLE							LABORATORY VISUAL INSPECTION
SA. NO.	ELEV.	LAB. CONSISTENCY	PENETRATION NO. OF BLOWS	PENETRATION DRIVE IN INCHES	% H_2O BY DRY WT.	DRY WT LBS. PER CU. FT.	REMARKS
1-BS	586.2	--	11	12			
2-LS	582.7	Hard	20	12	24.7	99.2	2-LS: Uniform. Silty varicolored clay, trace of sand.
3-LS	577.7	Plastic	11	12	29.0	94.3	3-LS: Uniform. Silty brown-gray clay.
4-LS	573.7	Soft	5	12	32.5	89.2	4-LS: Uniform. Silty gray clay.
5-LS	568.2	Soft	3	12	35.1	86.1	5-LS: Uniform. Silty gray clay, trace of very fine sand.
6-BS	563.7	--	3	12			
7-BS	558.7	--	3	12			
8-BS	553.7	--	3	11			
9-BS	548.7	--	3	12			
10-BS	543.7	--	3	12			
11-BS	538.7	--	3	11			
12-BS	533.7	--	3	12			
13-BS	528.7	--	4	12			
14-BS	523.7	--	5	12			
15-LS	518.2	Very Soft	6	12	32.6	88.0	15-LS: Uniform. Silty gray clay, some fine sand, trace of gravel.
16-BS	513.7	--	10	12			
17-LS	508.2	Plastic	15	12	24.8	100.2	17-LS: Uniform. Silty gray clay, trace of fine sand and gravel.
18-LS	504.7	--	12	11			
	498.7	--	8	12			
	495.7	--	10	12			
	492.7	--	10	12			
19-LS	487.7	Plastic	12	12	29.1	94.2	19-LS: Uniform. Silty gray clay, trace of fine sand and gravel.
	483.7	--	22	12			
	481.7	--	16	12			
	478.7	--	11	12			
20-LS	475.7	--	14	12	--	--	20-LS: Not Received.
21-LS	468.7	Plastic	16	12	17.0	112.3	21-LS: Uniform. Silty gray clay, some fine sand and gravel. Fine sand pockets.
22-BS	463.7	--	8	12			
23-LS	458.7	Very Soft	12	12	26.1	97.3	23-LS: Uniform. Silty gray clay, layers or lenses of silt.
24-BS	454.0	--	100	9			
25-BS	448.7	--	300	5			
26-BS	444.0	--	200	2			
	439.4	--	200	1/4			

PENETRATION: Number of blows required to drive core sampler distance given using a 140-pound weight falling 30 inches.

W.L.: Water Level 96 hours after completion.

Boring Log and all Sampling by Raymond Concrete Pile Division of Raymond International, Inc. under their Job No. ECR-11914-D. Date of Boring: January 1967

SHEARING RESISTANCE & VOLUME OF SOLIDS CURVES



OFFICE OF RESEARCH ADMINISTRATION
SOIL MECHANICS LABORATORY
UNIVERSITY OF MICHIGAN, ANN ARBOR, MICHIGAN

SUBSOIL ANALYSIS OF BORING NO. 32
CAR DUMPER HOUSE - ST. CLAIR POWER PLANT
THE DETROIT EDISON COMPANY BELLE RIVER, MICHIGAN

APPROVED: A. J. Boresi DATE: 6-14-67

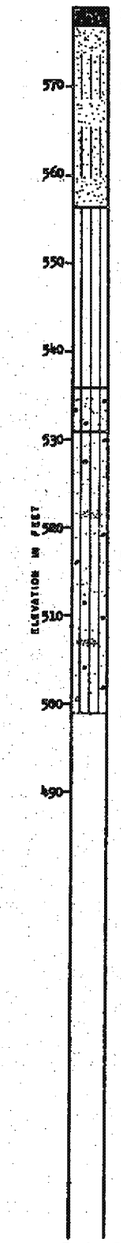
OFFICE OF RESEARCH ADMINISTRATION PROJECT 01994

A-39

LOG OF SOIL PROFILE

BY R.C.P. DIVISION

GROUND SURFACE ELEVATION = 579.0 Ft. (USC & GC DATUM)



Fill; Cinder.

Fill; Soft Clay, Loose Fine Brown Sand.

Very Soft Gray Clay.

Medium Gray Clay, Some Fine Sand, Little Gravel.

Medium Sandy Gravelly Gray Clay, Pockets of Fine Sand.

Boring Stopped.

Boring Log and all Sampling by Raymond Concrete Pile Division of Raymond International, Inc.
Their Job No. RCB-12371-D
Date of Boring: April 12, 1967

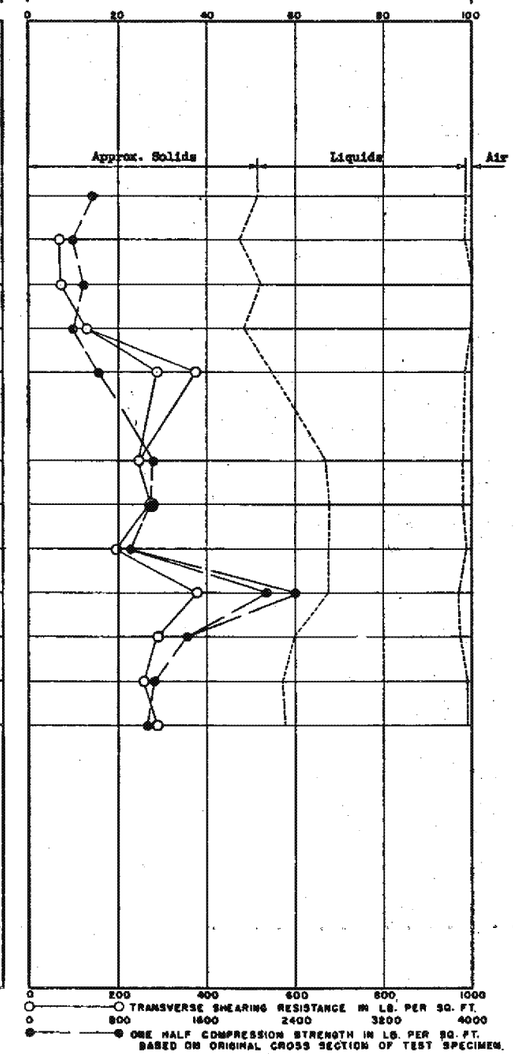
SOIL SAMPLE / LABORATORY VISUAL INSPECTION

SA. NO	ELEV	LAB. CONSIS-TENCY	PENETRATION NO. OF BLOWS	PENETRATION DRIVE IN INCHES	% H_2O BY DRY WT	DRY WT LB PER CU. FT	REMARKS
1-BS	574.0	--	1	12			
2-BS	569.0	--	2	12			
3-BS	564.0	--	4	12			
4-LS	559.5	Soft	2	12	33.9	[illegible]	4-LS: Uniform. Silty mottled tan clay, trace of fine sand, gravel and organic matter. Laminated.
5-LS	554.5	V.Soft	1	12	40.1	[illegible]	5-LS: Uniform. Silty gray clay.
6-LS	549.5	V.Soft	2	12	34.3	[illegible]	6-LS: Uniform. Silty gray clay.
7-LS	544.5	V.Soft	2	12	39.4	[illegible]	7-LS: Uniform. Silty gray clay.
8-LS	539.5	Soft to Plastic	3	12	29.6	[illegible]	8-LS: Uniform. Silty gray clay, silt pocket, trace of very fine sand.
	534.0	--	5	12			
9-LS	529.5	Soft to Plastic	8	12	17.2	11[illegible]	9-LS: Uniform. Silty gray clay, some sand, trace of gravel.
10-LS	524.5	Soft to Plastic	8	12	16.5	114.2	10-LS: Uniform. Silty gray clay, some sand, trace of gravel.
11-LS	519.5	Soft	8	12	17.5	111.7	11-LS: Uniform. Silty gray clay, some sand, trace of gravel.
12-LS	514.5	Plastic to Firm	8	12	16.1	113.9	12-LS: Uniform. Silty gray clay, some sand, trace of gravel.
13-LS	509.5	Plastic	11	12	23.2	101.1	13-LS: Uniform. Silty gray clay, some very fine sand, trace of gravel. Laminated.
14-LS	504.5	Plastic	10	12	27.4	96.1	14-LS: Uniform. Silty gray clay, some very fine sand, trace of gravel. Laminated.
15-LS	499.5	Plastic	10	12	26.6	97.3	15-LS: Uniform. Silty gray clay, some very fine sand, trace of gravel. Laminated.

W.L. Water Level at Completion.

PENETRATION: Number of blows required to drive core sampler distance given using a 140-pound weight falling 30 inches.

SHEARING RESISTANCE & VOLUME OF SOLIDS CURVES



ENGINEERING RESEARCH INSTITUTE
SOIL MECHANICS LABORATORY
UNIVERSITY OF MICHIGAN, ANN ARBOR, MICHIGAN

SUBSOIL ANALYSIS OF BORING NO. 33
ST. CLAIR POWER PLANT
THE DETROIT EDISON CO. BELLE RIVER, MICHIGAN

APPROVED: W. W. Housel DATE: 6-14-67

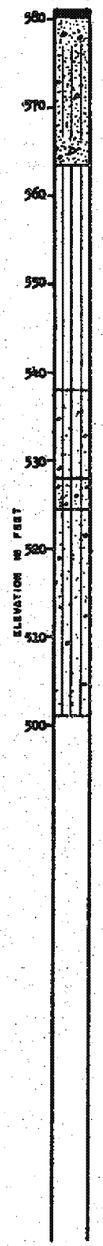
PROJECT NO. 01994

A-40

LOG OF SOIL PROFILE

BY R.C.P. DIVISION

GROUND SURFACE ELEVATION = 581.0 Ft. (USC & GS DATUM)



Fill; Cinder.

Fill; Clay, Sandy Gravel, Concrete. W.L.

Very Soft Gray Clay.

Soft Gray Clay, Trace of Fine Sand and Little Gravel.

Stiff Sandy Gravelly Gray Clay.

Medium Gray Clay, Some Fine Sand and Small Gravel.

Boring Stopped.

SOIL SAMPLE

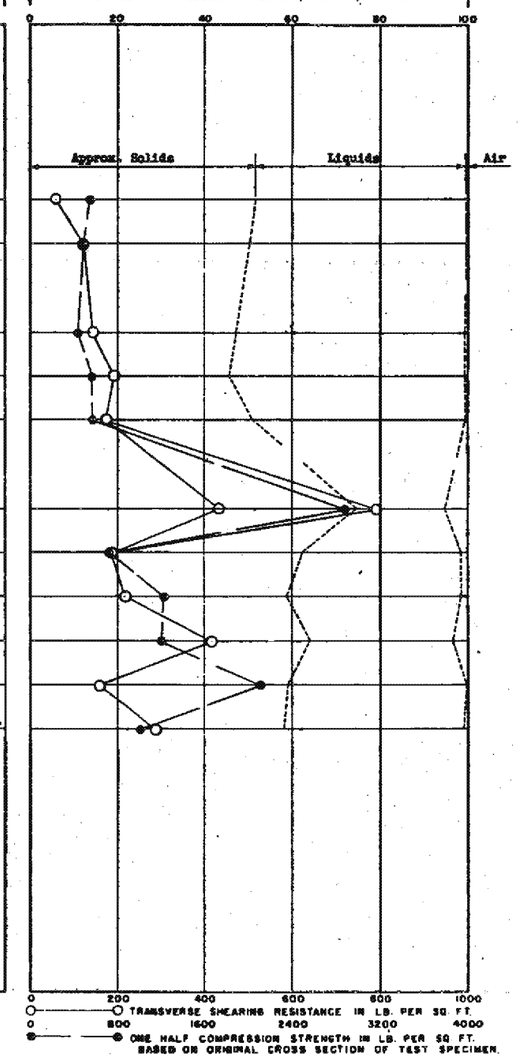
SA NO	ELEV	LAB. CONSISTENCY	PENETRATION NO. OF BLOWS	DRIVE IN INCHES	% H_2O BY DRY WT	DRY WT. LB PER CU FT
1-BS	576.0	--	4	12		
2-BS	571.0	--	8	12		
3-BS	566.0	--	5	12		
4-LS	561.5	V.Soft	3	12	34.7	87.4
5-LS	556.5	V.Soft	2	12	36.3	84.9
	551.0	--	2	12		
6-LS	546.5	Soft	2	12	41.3	79.2
7-LS	541.5	Soft	2	12	43.8	76.8
8-LS	536.5	Soft	4	12	35.6	85.5
	531.0		4	12		
9-LS	526.5	Firm	23	12	9.9	126.0
10-LS	521.5	Soft	7	12	21.6	104.8
11-LS	516.5	Soft to Plastic	8	12	24.9	99.2
12-LS	511.5	Plastic	10	12	18.9	108.0
13-LS	506.5	Plastic	13	12	25.5	99.9
14-LS	501.5	Plastic	10	12	26.2	98.0

LABORATORY VISUAL INSPECTION

REMARKS
4-LS: Uniform. Silty gray clay.
5-LS: Uniform. Silty gray clay.
6-LS: Uniform. Silty gray clay.
7-LS: Uniform. Silty gray clay.
8-LS: Uniform. Silty gray clay, trace of very fine sand.
9-LS: Uniform. Clayey gravelly gray sand to sandy dark gray clay, trace of organic matter.
10-LS: Uniform. Silty gray clay, some sand, trace of gravel.
11-LS: Uniform. Silty gray clay, some sand, trace of gravel.
12-LS: Uniform. Silty gray clay, some sand, trace of gravel.
13-LS: Uniform. Silty gray clay, some sand, trace of gravel.
14-LS: Uniform. Silty gray clay, some sand, trace of gravel. Laminated.

PENETRATION: Number of blows required to drive core sampler distance given using a 140-pound weight falling 30 inches.

SHEARING RESISTANCE & VOLUME OF SOLIDS CURVES



Boring Log and all Sampling by Raymond Concrete Pile Division of Raymond International, Inc.
Their Job No. ECS-12371-D
Date of Boring: April 10, 1967

W.L. Water Level at completion.

ENGINEERING RESEARCH INSTITUTE
SOIL MECHANICS LABORATORY
UNIVERSITY OF MICHIGAN, ANN ARBOR, MICHIGAN

SUBSOIL ANALYSIS OF BORING NO. 34
ST. CLAIR POWER PLANT
THE DETROIT EDISON CO. BELLE RIVER, MICHIGAN

APPROVED [illegible] DATE 5-14-67

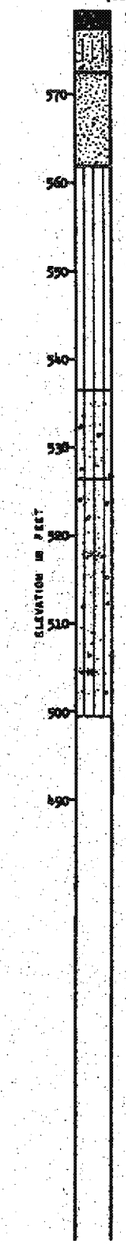
PROJECT NO. 01994

A-41

LOG OF SOIL PROFILE

BY R.C.P. DIVISION

GROUND SURFACE ELEVATION = 579.4 Ft. (USC & GS DATUM)



Fill; Cinder.

Fill; Loose Sand and Clay.

Fill; Loose Fine Sand.

Very Soft Gray Clay.

Soft Gray Clay, Some Fine Sand, Little Gravel.

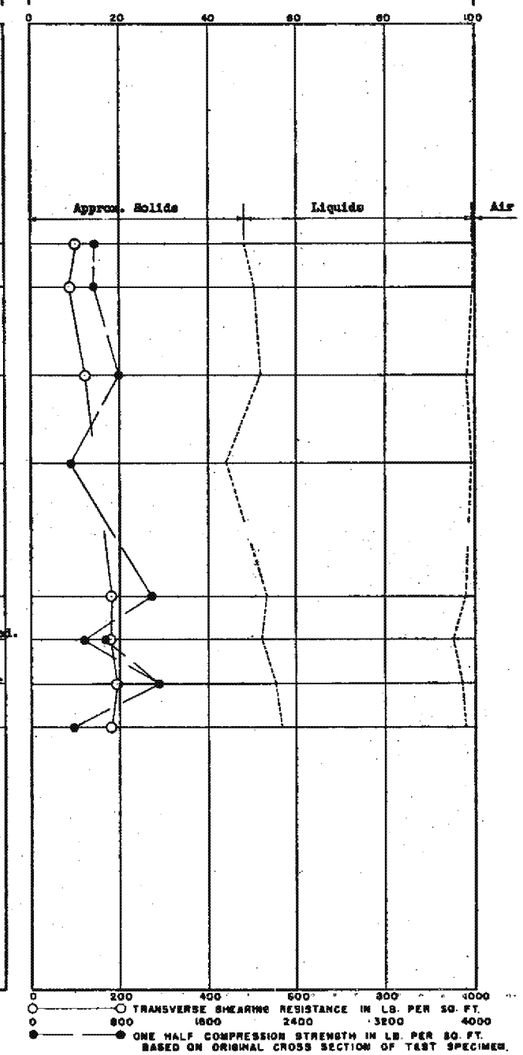
Medium Sandy Gravelly Gray Clay, Pockets of Fine Sand.

Boring Stopped.

SOIL SAMPLE							LABORATORY VISUAL INSPECTION
SA. NO.	ELEV.	LAB. CONSISTENCY	PENETRATION NO. OF DRIVE IN BLOWS IN INCHES		% H_2O BY DRY WT.	DRY WT LB. PER CU FT.	REMARKS
1-BS	574.4	--	3	12			
2-BS	569.4	--	3	12			
3-BS	564.4	--	1	15			
4-BS	559.4	--	2	15			
5-LS	554.9	Soft	2	12	39.6	81.1	5-LS: Uniform. Silty gray clay.
6-LS	549.9	Soft	2	12	36.3	84.9	6-LS: Uniform. Silty gray clay.
	544.4	--	2	12			
7-LS	539.9	Soft	2	12	33.1	87.4	7-LS: Uniform. Silty gray clay, trace of fine sand and silt lenses.
	534.4	--	4	12			
8-LS	529.9	V.Soft	4	12	46.6	74.3	8-LS: Uniform. Silty gray clay, trace of very fine sand.
	524.4	--	8	12			
	521.9	--	8	12			
9-LS	519.4	--	8	12			
10-LS	514.9	Soft	7	12	30.9	89.9	10-LS: Uniform. Silty gray clay, some sand, trace of gravel.
11-LS	509.9	Soft	6	12	30.8	87.7	11-LS: Uniform. Silty gray clay, some sand, trace of gravel. Homeycombed.
12-LS	504.9	Soft	8	12	28.1	93.0	12-LS: Uniform. Silty gray clay, some sand, trace of gravel. Laminated.
13-LS	499.9	Soft	9	12	26.9	95.5	13-LS: Uniform. Silty gray clay, trace of sand.

PENETRATION: Number of blows required to drive core sampler distance given using a 140-pound weight falling 30 inches.

SHEARING RESISTANCE & VOLUME OF SOLIDS CURVES



Boring Log and all Sampling by Raymond Concrete Pile Division of Raymond International, Inc.
Ebasco Job No. EES-12371-D
Date of Boring: April 12, 1967

W.L. Water Level at Completion.

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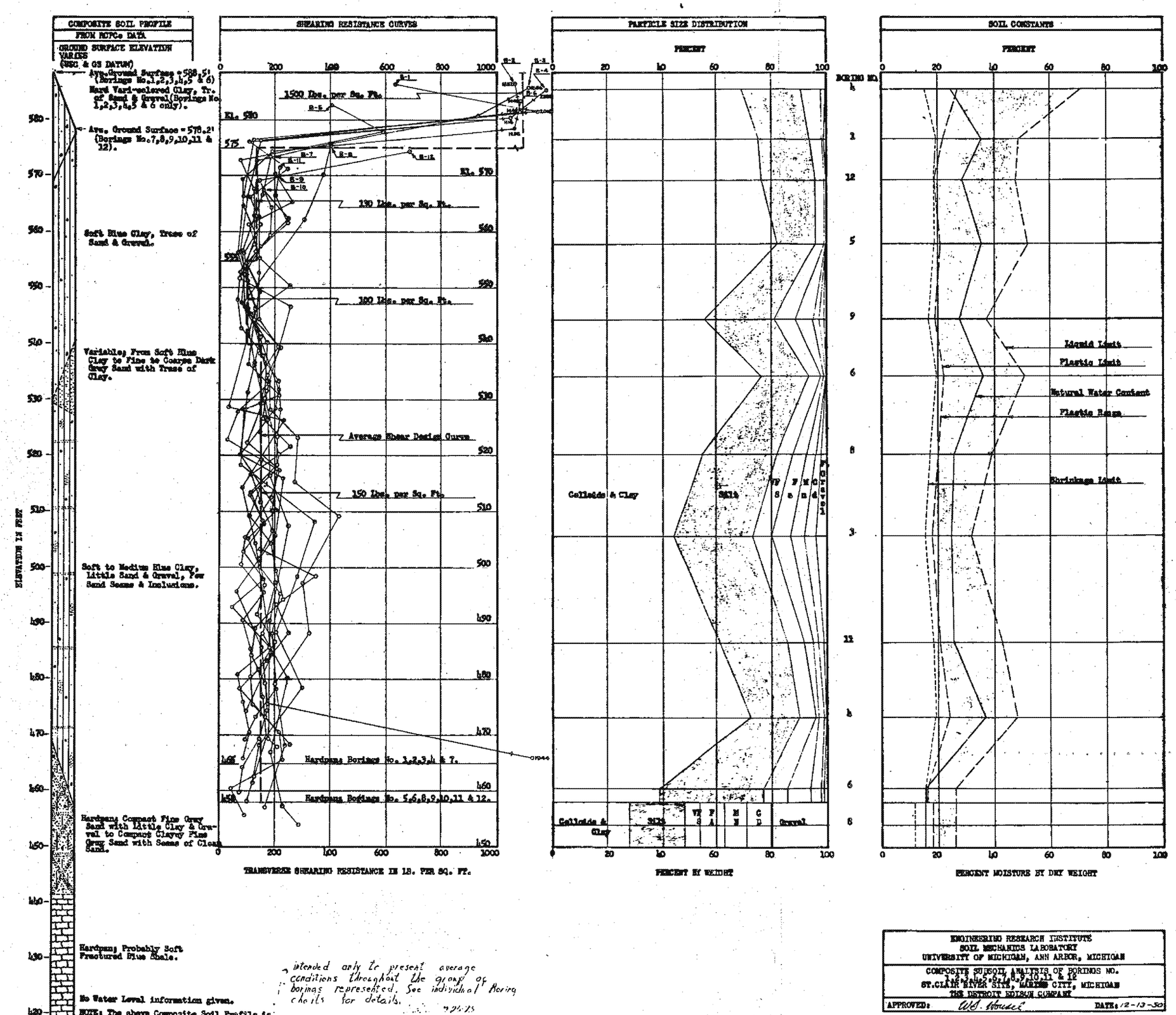
SUBSOIL ANALYSIS OF BORING NO. 35
ST. CLAIR POWER PLANT
THE DETROIT EDISON CO. BELLE RIVER, MICHIGAN

APPROVED: [illegible] DATE 6-14-67

PROJECT NO. 01994

A-42



intended only to present average conditions throughout the group of borings represented. See individual Boring charts for details.

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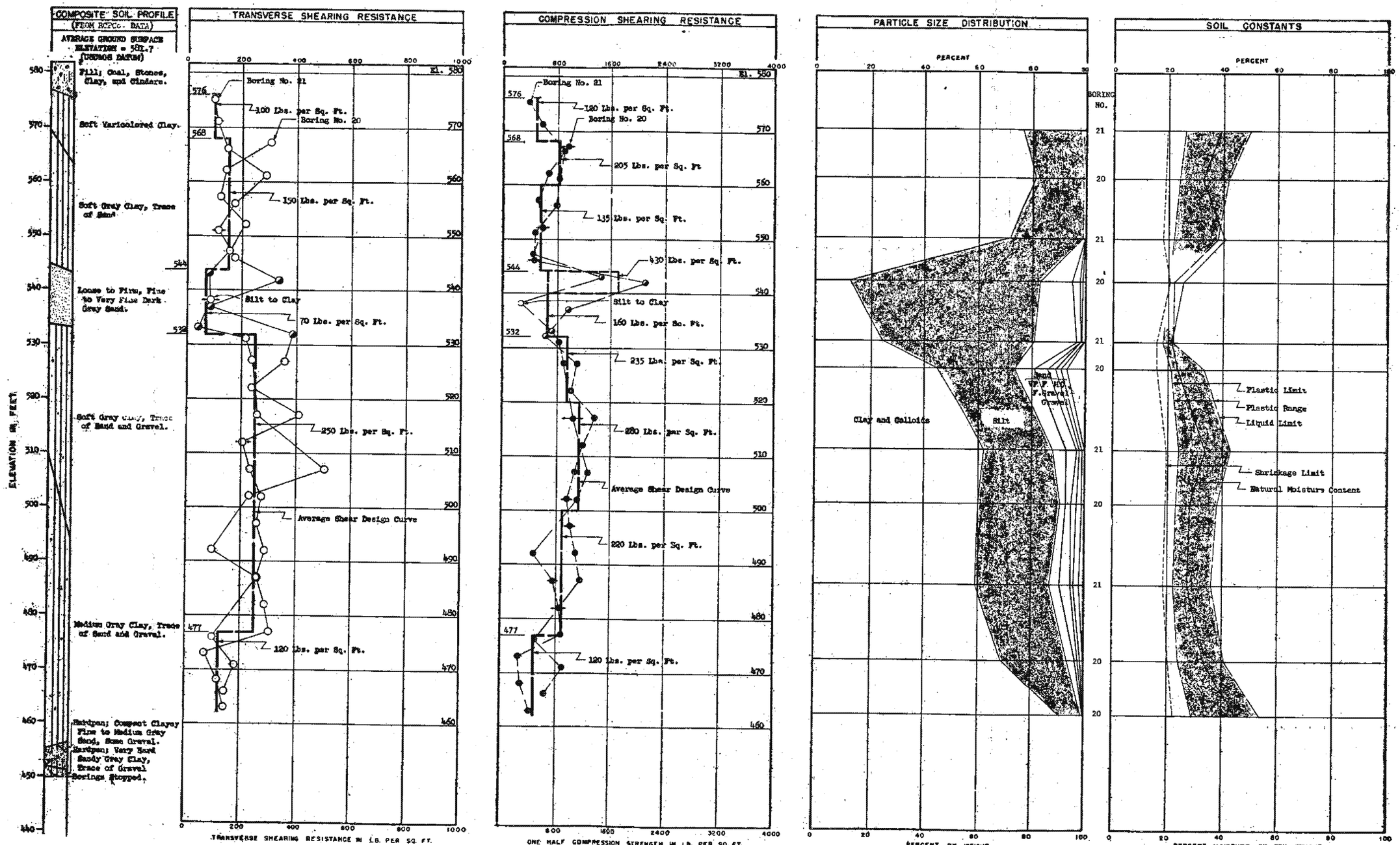
COMPOSITE SUBSOIL ANALYSIS OF BORINGS NO. 1,2,3,4,5,6,7,8,9,10,11 & 12
ST. CLAIR RIVER SITE, MARINE CITY, MICHIGAN
THE DETROIT EDISON COMPANY

APPROVED: W. J. Housel DATE: 12-13-50

A-43



NOTE: The above Composite Soil Profile is intended only to present average conditions throughout the group of borings represented. See individual boring charts for details.

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UNIVERSITY OF MICHIGAN, ANN ARBOR, MICHIGAN

COMPOSITE SUBSOIL ANALYSIS OF BORINGS NO. 20 and 21
ST. CLAIR POWER PLANT - DETROIT EDISON COMPANY
DETROIT MICHIGAN

APPROVED: [illegible] DATE: 1-2-59

UNIVERSITY OF MICHIGAN RESEARCH INSTITUTE PROJECT 01994

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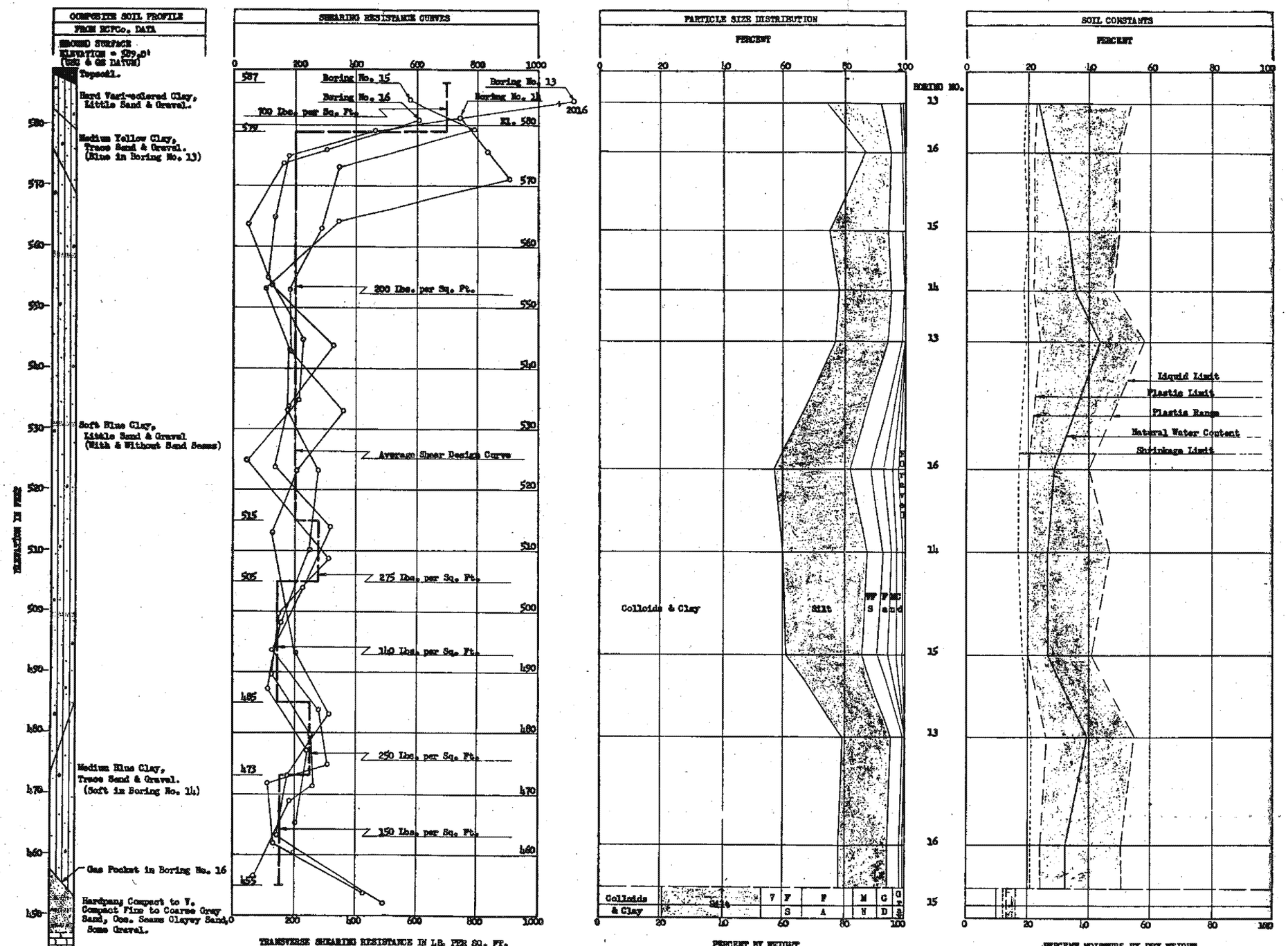

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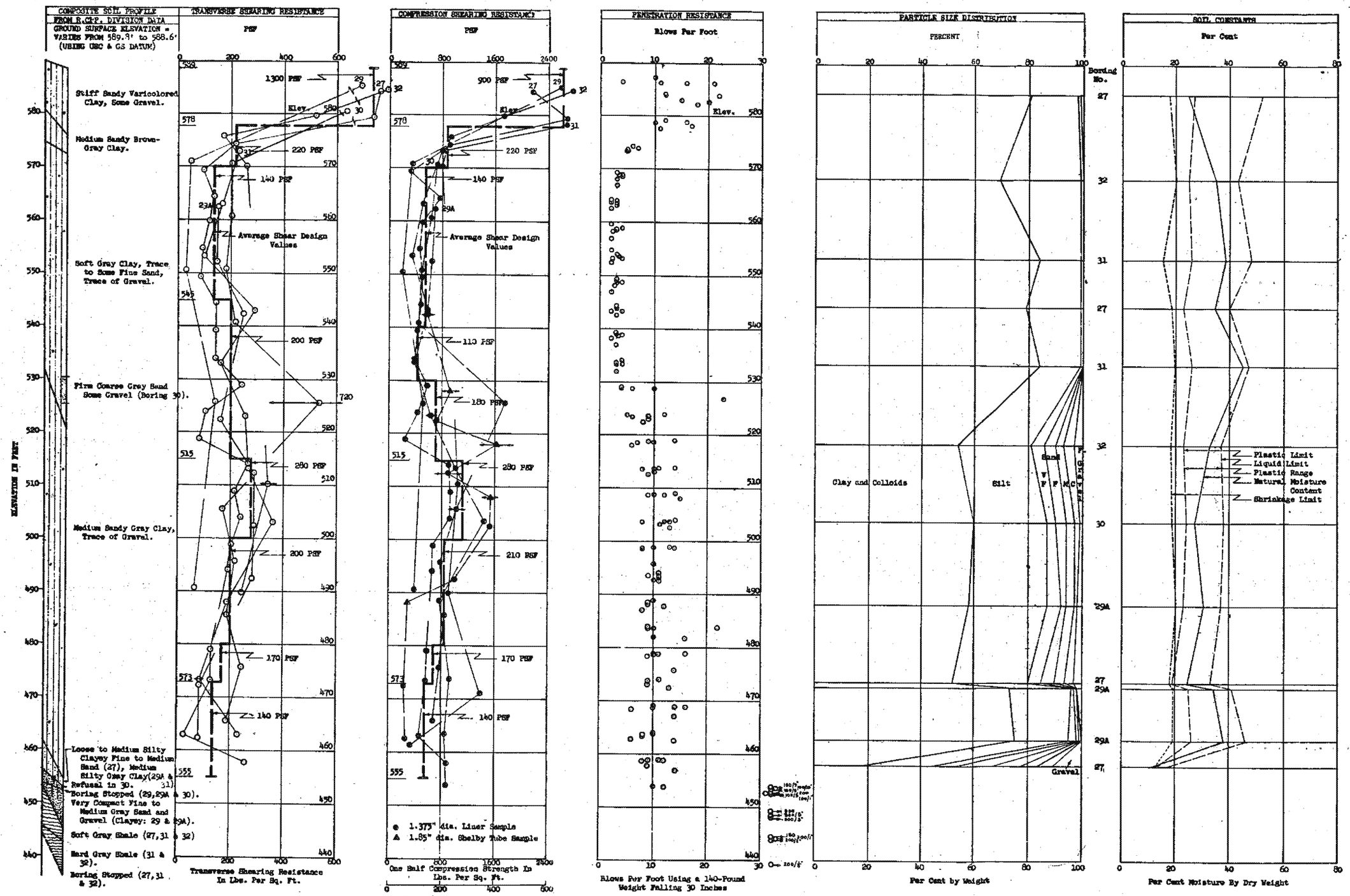
UNIVERSITY OF MICHIGAN, ANN ARBOR, MICHIGAN

COMPOSITE SUBSOIL ANALYSIS OF BORINGS NO.13,14,15 & 16
ST. CLAIR RIVER SITE, MARINE CITY, MICHIGAN
THE DETROIT EDISON COMPANY

APPROVED: W.A. Housel DATE: 12-13-50

UNIVERSITY OF MICHIGAN PROJECT M073-66

A-40



The above Composite Soil Profile is intended only to present average conditions throughout the group of borings represented. See individual Boring Charts for details.
Date of Borings: December 1966 to February 1967

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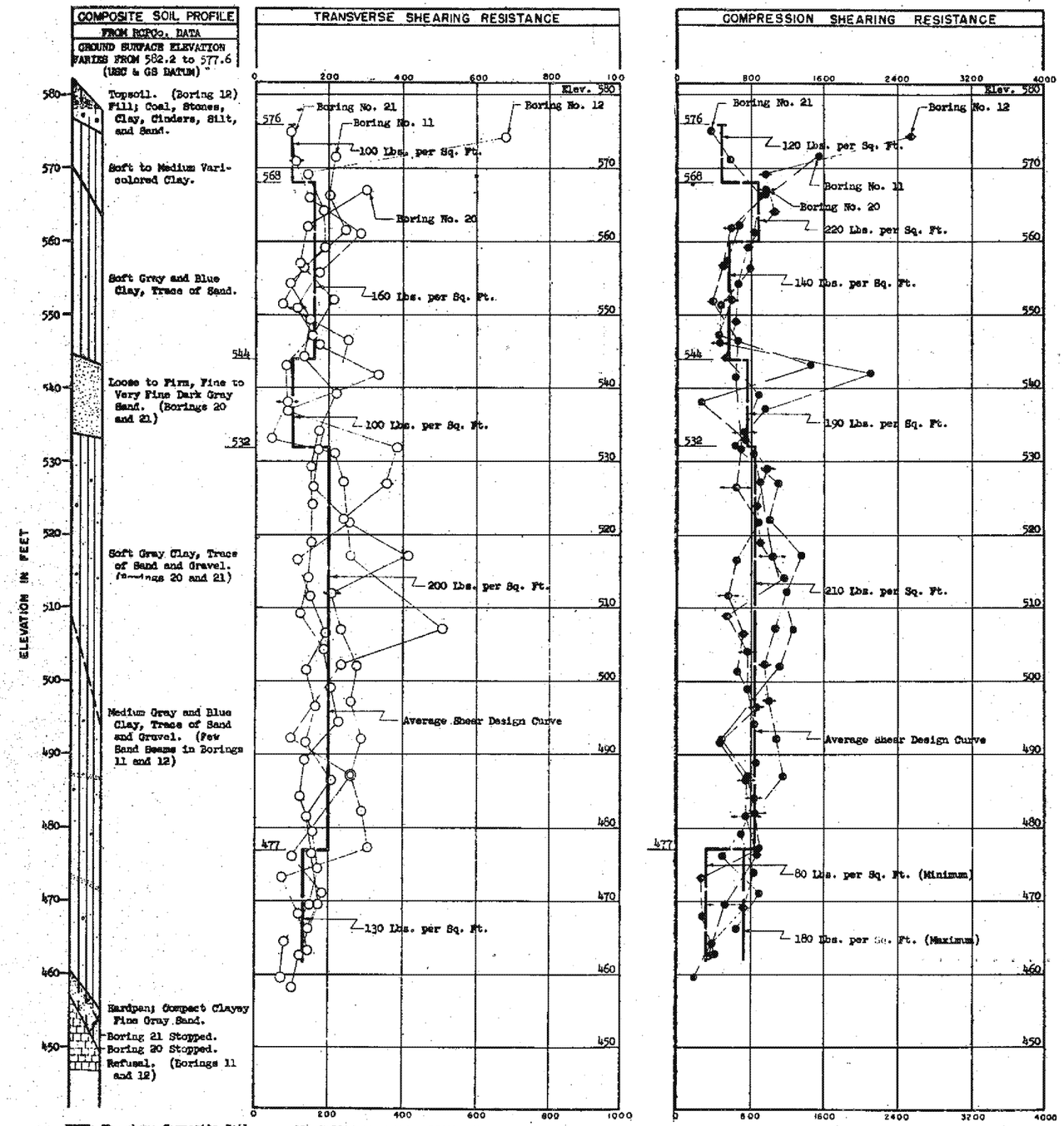
ANN ARBOR MICHIGAN
COMPOSITE SUBSOIL ANALYSIS OF BORINGS NOS. 27, 29, 29A, 30, 31 AND 32
CAR DUMPER HOUSE - ST. CLAIR POWER PLANT
THE DETROIT EDISON COMPANY BELLE RIVER, MICH.
APPROVED: DATE:
OFFICE OF RESEARCH ADMINISTRATION PROJECT: 01994

A-47



NOTE: The above Composite Soil Profile is intended only to present average conditions for Borings No. 11, 12, 20, and 21.

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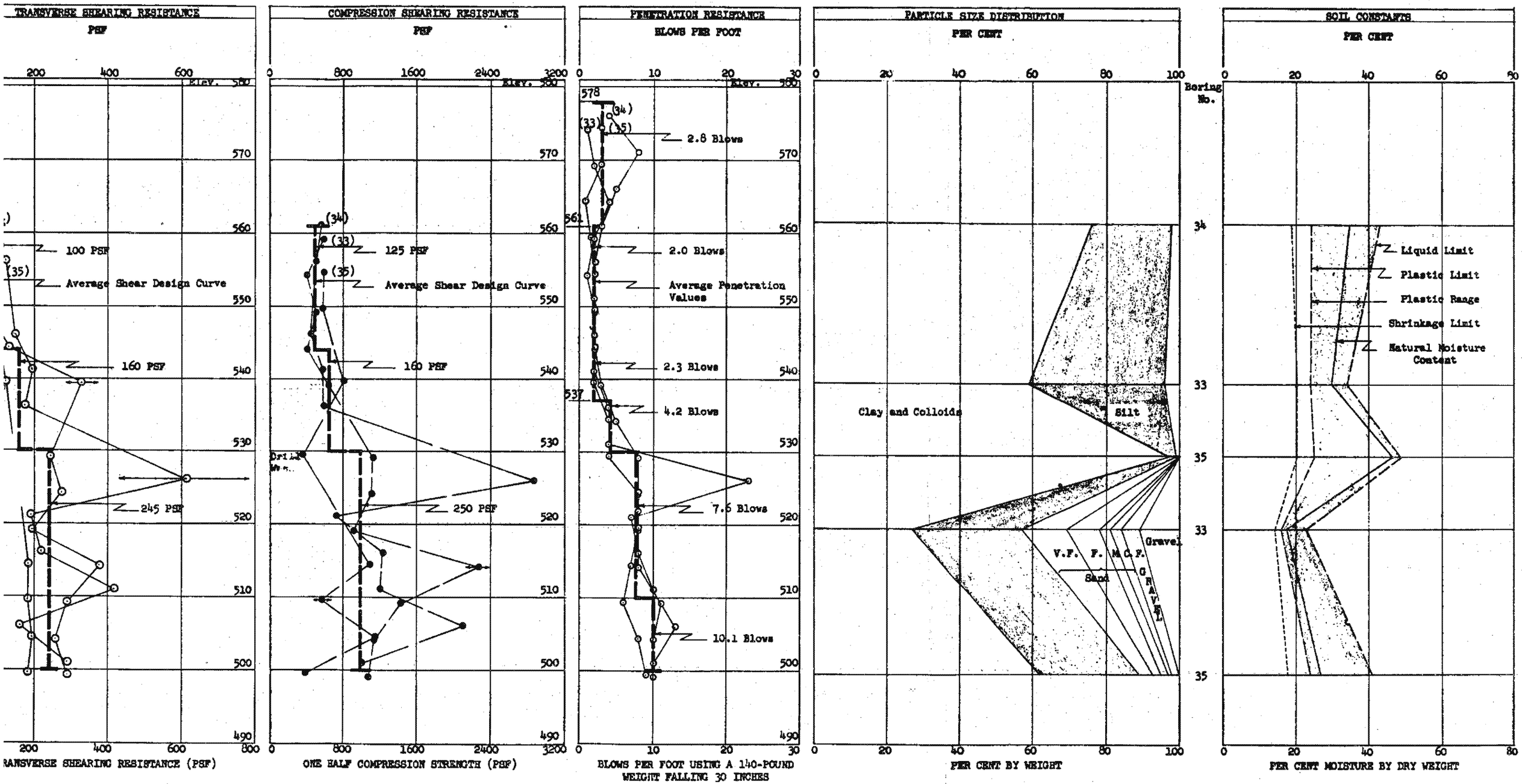
SOIL MECHANICS LABORATORY
UNIVERSITY OF MICHIGAN, ANN ARBOR, MICHIGAN

COMPOSITE SUBSOIL ANALYSIS OF BORINGS NO. 11, 12, 20 and 21
ST. CLAIR POWER PLANT -- DETROIT EDISON COMPANY
DETROIT MICHIGAN

APPROVED: DATE:

A-45



COMPRESSION SHEARING RESISTANCE (PSF)

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COMPOSITE SUBSOIL ANALYSIS OF BORINGS NOS. 33, 34 & 35
ST. CLAIR POWER PLANT
THE DETROIT EDISON CO. — BELLE RIVER, MICHIGAN
APPROVED: [illegible] — DATE: [illegible]
PROJECT NO. 01994

A-48

TABLE OF DRILL HOLES

Hole No	Location	Depth(ft)	Surface Elevation	Purpose	Type Drilling	Number and Type U.D. Samples Taken	Ground Water Level[1] Depth(ft)	Date
7	N 7,507 E 7,851	143.0	586.6	Observation Well	Rotary Wash, Standard Pen ASTM	None	10.0	4-25-74
8	N 7,495 E 8,304	165.1	586.5	Original Proposed Plant Area	Rotary Wash, Standard Pen ASTM, NX Core	None		
9	N 8,576 E 9,361	144.0	586.7	Proposed Plant Area	Rotary Wash, Standard Pen ASTM	None		
10	N 8,600 E 9,965	155.5	586.1	Proposed Plant Area	Rotary Wash, Standard Pen ASTM, NX Core	None		
11	N 8,316 E 8,715	150.0	586.7	Proposed Plant Area	Rotary Wash, Standard Pen ASTM	None		
12	N 7,884 E 9,005	174.2	586.8	Proposed Plant Area	Rotary Wash, Standard Pen ASTM, NX Core	Shelby 9		
13	N 8,321 E 9,336	144.0	586.5	Proposed Plant Area	Rotary Wash, Standard Pen ASTM	None		
14	N 8,306 E 9,627	145.0	586.6	Proposed Plant Area	Rotary Wash, Standard Pen ASTM, Shelby, Osterberg	Shelby 11 Osterberg 3		
15	N 8,320 E 9,786	142.0	586.2	Proposed Plant Area	Rotary Wash, Standard Pen ASTM, Shelby, Osterberg	Shelby 6 Osterberg 6		
16	N 7,996 E 8,712	143.8	586.0	Proposed Plant Area	Rotary Wash, Standard Pen ASTM	None		
17	N 8,000 E 9,004	183.3	585.9	Proposed Plant Area	Rotary Wash, Standard Pen ASTM, Shelby, NX Core	Shelby 6		

NOTE: Borings 1-6 not drilled.

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Hole No	Location	Depth(ft)	Surface Elevation	Purpose	Type Drilling	Number and Type U.D. Samples Taken	Ground Water Level[1] Depth(ft)	Date
27	N 7,719 E 9,205	187.5	586.2	Proposed Plant Area	Rotary Wash, Standard Pen ASTM, Shelby, NX Core	Shelby 15		
28	N 7,724 E 9,443	193.5	585.8	Proposed Plant Area	Rotary Wash, Standard Pen ASTM, Shelby, NX Core	Shelby 10		
29	N 7,685 E 8,724	169.0	585.8	Proposed Plant Area	Rotary Wash, Standard Pen ASTM, NX Core	None		
30	N 7,673 E 9,015	135.0	586.4	Proposed Plant Area	Rotary Wash, Standard Pen ASTM	None		
31	N 7,669 E 9,331	143.4	585.9	Proposed Plant Area	Rotary Wash, Standard Pen ASTM	None		
32	N 7,663 E 9,659	144.5	586.6	Proposed Plant Area	Rotary Wash, Standard Pen ASTM	None		
33	N 7,400 E 9,322	138.5	585.6	Proposed Plant Area	Rotary Wash, Standard Pen ASTM, Shelby	Shelby 13		
34	N 7,398 E 9,963	158.17	586.0	Proposed Plant Area	Rotary Wash, Standard Pen ASTM, NX Core	None		
37	N 9,006 E 11,987	133.0	588.0	Original Proposed Coal Storage Area	Rotary Wash, Standard Pen ASTM	None		
38	N 9,007 E 13,035	153.0	598.3	Original Proposed Coal Storage Area	Rotary Wash, Standard Pen ASTM, Shelby, NX Core	Shelby 11		

NOTE: Borings 35&36 not drilled.

ED_005947A_00014556-00340

Hole No	Location	Depth(ft)	Surface Elevation	Purpose	Type Drilling	Number and Type U.D. Samples Taken	Ground Water Level[1] Depth(ft)	Date
49	N 3,695 E 12,440	155.0	586.6	Proposed Conveyor System	Rotary Wash, Standard Pen ASTM, Shelby, NX Core	Shelby 15		
50	N 2,951 E 15,471	153.75	581.8	Proposed Dock Area	Rotary Wash, Standard Pen ASTM, Shelby, NX Core	Shelby 10		
52	N 2,375 E 15,271	158.5	582.1	Proposed Dock Area	Rotary Wash, Standard Pen ASTM, Shelby, Osterberg, NX Core	Shelby 2 Osterberg 11		
53	N 2,052 E 15,176	154.91	580.6	Proposed Dock Area	Rotary Wash, Standard Pen ASTM, Shelby, Osterberg, NX Core	Shelby 8 Osterberg 5		
54	N 2,937 E 15,537	147.67	541.6	Proposed Dock Area	Rotary Wash, Standard Pen ASTM, Shelby, Osterberg, NX Core	Shelby 17 Osterberg 2		
55	N 2,645 E 15,506	100.0	547.9	Proposed Dock Area	Rotary Wash, Standard Pen ASTM	None		
56	N 2,296 E 15,399	102.0	547.5	Proposed Dock Area	Rotary Wash, Standard Pen ASTM	None		
57	N 1,907 E 15,247	120.2	548.3	Proposed Dock Area	Rotary Wash, Standard Pen ASTM, Osterberg, NX Core	Osterberg 1		
58	N 2,725 E 15,224	162.0	583.5	Proposed Dock Area	Rotary Wash, Standard Pen ASTM, NX Core	None		

NOTE: Boring 51 not drilled.

ED_005947A_00014556-00341

Hole No	Location	Depth(ft)	Surface Elevation	Purpose	Type Drilling	Number and Type U.D. Samples Taken	Ground Water Level[1] Depth(ft)	Date
105	N 4,979 E 10,998	160.3	588.3	Proposed Coal Storage Area	Rotary Wash, Standard Pen ASTM, Shelby, Pitcher, Osterberg, NX Core	Shelby 4 Pitcher 2 Osterberg 6		
106	N 4,836 E 12,528	140.0	589.7	Proposed Coal Storage Area	Rotary Wash, Standard Pen ASTM	None		
109	N 6,450 E 13,140	142.7	600.7	Proposed Coal Storage Area	Rotary Wash, Standard Pen ASTM	None		
110	N 6,570 E 12,830	146.3	599.8	Proposed Coal Storage Area	Rotary Wash, Standard Pen ASTM, Shelby, Osterberg	Shelby 12 Osterberg 5		
111	N 6,600 E 11,000	140.0	588.5	Original Proposed Coal Storage Area	Rotary Wash, Standard Pen ASTM	None		
112	N 6,824 E 8,900	160.5	587.0	Original Proposed Switchyard	Rotary Wash, Standard Pen ASTM, Shelby, NX Core	Shelby 3		
113	N 6,800 E 9,360	164.3	587.4	Proposed Switchyard	Rotary Wash, Standard Pen ASTM, Shelby, NX Core	Shelby 3		
114	N 6,980 E 13,360	144.2	599.5	Proposed Coal Storage Area	Rotary Wash, Standard Pen ASTM	None		
115	N 7,100 E 13,060	144.0	600.7	Proposed Coal Storage Area	Rotary Wash, Standard Pen ASTM, Shelby	Shelby 14		
116	N 7275.71 E 8897.94	180.5	585.6	Benchmark	Rotary Wash, Standard Pen ASTM, Shelby, NX Core	Shelby 14		

NOTE: Borings 107&108 not drilled.

ED_005947A_00014556-00342

Hole No	Location	Depth(ft)	Surface Elevation	Purpose	Type Drilling	Number and Type U.D. Samples Taken	Ground Water Level[1] Depth(ft)	Date
128	N 3,000 E 11,000	141.5	589.5	Proposed Coal Storage Area	Rotary Wash, Standard Pen ASTM	None		
129	N 3,000 E 12,000	158.8	586.0	Proposed Coal Storage Area	Rotary Wash, Standard Pen ASTM, Pitcher, Osterberg, NX Core	Pitcher 9 Osterberg 3		
130	N 9,014 E 4,993	145.0	595.3	Proposed Ash Disposal Area	Rotary Wash, Standard Pen ASTM	None		
131	N 9,400 E 6,000	105.0	589.9	Proposed Ash Disposal Area	Rotary Wash, Standard Pen ASTM	None		
134	N 10,050 E 4,995	128.5	594.6	Proposed Ash Disposal Area	Rotary Wash, Standard Pen ASTM	None		
135	N 10,050 E 6,000	70.0	591.3	Proposed Ash Disposal Area	Rotary Wash, Standard Pen ASTM	None		
136	N 10,050 E 7,000	130.0	590.2	Proposed Ash Disposal Area	Rotary Wash, Standard Pen ASTM, Shelby	Shelby 3		
137	N 10,050 E 8,000	71.0	588.9	Proposed Ash Disposal Area	Rotary Wash, Standard Pen ASTM	None		
138	N 10,030 E 8,977	145.0	588.7	Proposed Ash Disposal Area	Rotary Wash, Standard Pen ASTM	None		
139	N 10,866 E 4,990	145.5	595.7	Proposed Ash Disposal Area	Rotary Wash, Standard Pen ASTM	None		
140	N 10,850 E 6,003	70.5	592.0	Proposed Ash Disposal Area	Rotary Wash, Standard Pen ASTM	None		

NOTE: Borings 132&133 not drilled.

ED_005947A_00014556-00343

Hole No	Location	Depth(ft)	Surface Elevation	Purpose	Type Drilling	Number and Type U.D. Samples Taken	Ground Water Level[1] Depth(ft)	Date
154	N 13,785 E 8,000	165.0	599.0	Proposed Ash Disposal Area	Rotary Wash, Standard Pen ASTM	None		
155	N 14,001 E 5,996	70.0	601.4	Proposed Ash Disposal Area	Rotary Wash, Standard Pen ASTM	None		
157	N 14,000 E 8,000	70.0	591.5	Proposed Ash Disposal Area	Rotary Wash, Standard Pen ASTM	None		
158	N 14,000 E 9,000	130.0	589.6	Proposed Ash Disposal Area	Rotary Wash, Standard Pen ASTM, Shelby	Shelby 4		
159	N 14,000 E 9,950	70.0	591.3	Proposed Ash Disposal Area	Rotary Wash, Standard Pen ASTM	None		
160	N 14,522 E 4,880	159.0	595.5	Proposed Ash Disposal Area	Rotary Wash, Standard Pen ASTM	None		
163	N 15,000 E 8,000	138.0	591.4	Proposed Ash Disposal Area	Rotary Wash, Standard Pen ASTM	None		
164	N 15,000 E 9,000	70.0	591.4	Proposed Ash Disposal Area	Rotary Wash, Standard Pen ASTM	None		
165	N 14,830 E 9,938	156.5	594.3	Proposed Ash Disposal Area	Rotary Wash, Standard Pen ASTM	None		
180	N 2,925 E 12,180	140.0	588.0	Proposed Coal Storage Area	Rotary Wash, Standard Pen ASTM	None		
181	N 3,525 E 12,533	144.0	590.8	Observation Well	Rotary Wash, Standard Pen ASTM	None	10.0	4-25-74

NOTE: Borings 152,153,156,161,162 and 165-179 not drilled.

ED_005947A_00014556-00344

CONSISTENCY OF COHESIVE & SEMI-COHESIVE SOILS

V. Soft Almost completely lacks resistance to external forces causing deformation.
Will slump or deform of its own weight.
When squeezed in fist, it will riboon or ooze out between fingers.
Sometimes referred to as "toothpaste" consistency.
Moisture content near or above liquid limit (wet).

Soft Only slightly resistant to external forces causing deformation.
Will support its own weight.
When squeezed in fist, impression of fingers is marked and soil will squeeze between fingers.
Can be molded to any shape without resistance.
Mositure content well above plastic limit (very moist).

Medium (Plastic) May be deformed readily without rupture.
When squeezed in fist, impression by fingers will be pronounced but it will not squeeze.
Can be molded to any shape, but offers some resistance--will probably "check" or crack slightly.
Moisture content slightly above plastic limit (moist).

Firm Moderately resistant to external forces causing rupture.
Lumps or cores can be broken by fingers.
When squeezed in fist, impression by fingers is slight. No tendency to squeeze.
Will rupture and lose structure if molding is attempted from original shape. Once structure is lost, however, it can be molded or "packed."
Moisture content near the plastic limit (damp to moist).

Stiff Resistant to external forces causing deformation.
Lumps or cores can be broken by fingers.
When squeezed in fist, or pressed by thumb, indentation by fingers is only slight regardless of pressure applied.
Cannot be molded from original shape.
Moisture content near the shrinkage limit (damp).

Hard Very resistant to external forces causing deformation.
Lumps or cores can be broken by fingers, but with difficulty.
Cannot be indented by fingers or thumb, but can be scored readily by fingernail.
Moisture content below the shrinkage limit (dry).

V. Hard Extremely resistant to external forces causing deformation.
Lumps or cores cannot be broken by fingers.
Cannot be indented by fingers or thumb; can be scored only slightly by fingernail.
Moisture content below the shrinkage limit (dry).

CONSISTENCY OF GRANULAR SOILS (by standard penetration index)

V. Loose	-- 0-4 blows
Loose	-- 5-10 blows
Medium Compact	-- 11-25 blows
Compact	-- 26-50 blows
V. Compact	-- 50+ blows

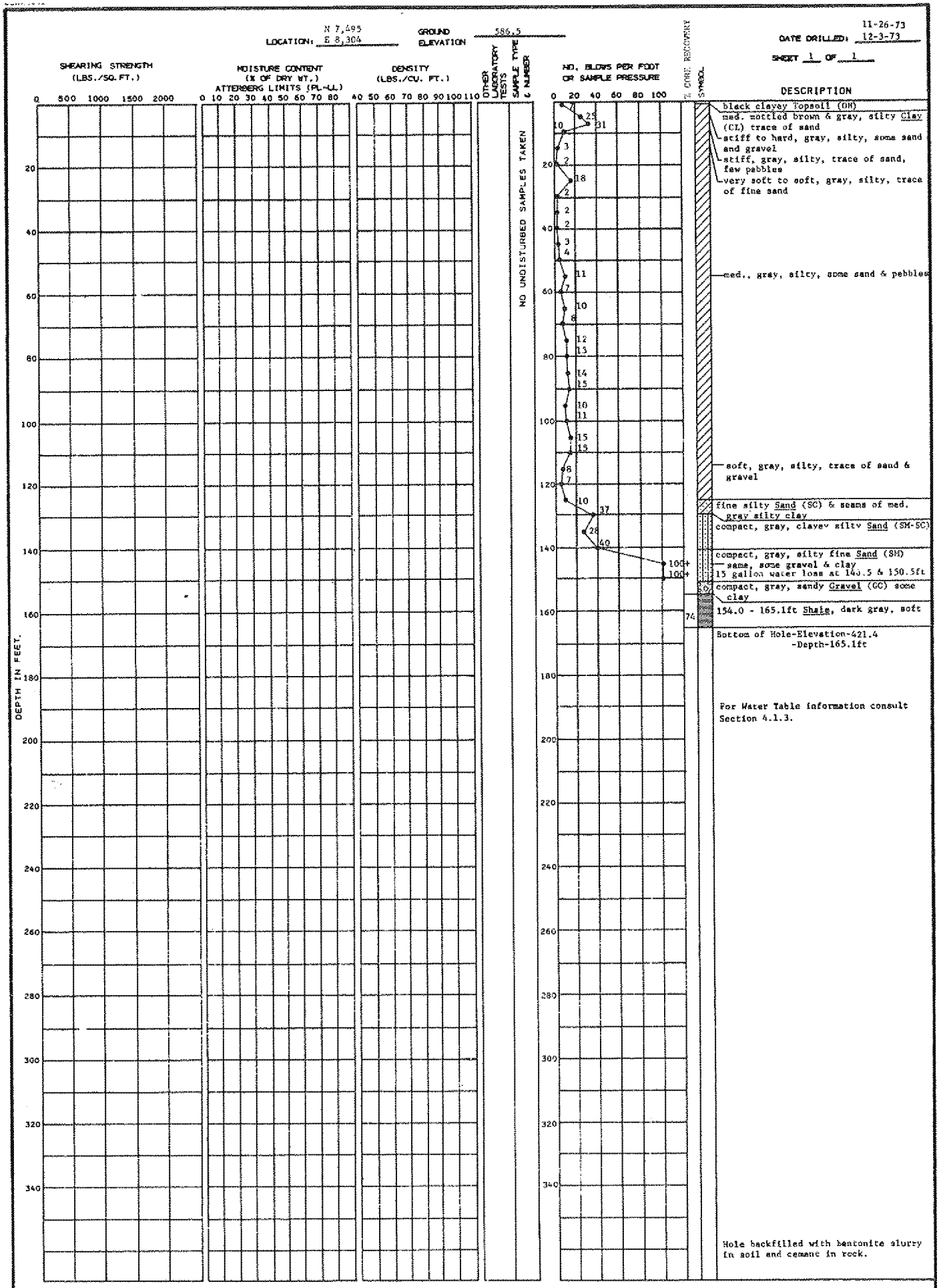
ED_005947A_00014556-00345

LOCATION: N 7,495 / E 8,304

GROUND ELEVATION 586.5

DATE DRILLED: 11-26-73 / 12-3-73

SHEET 1 OF 1



DESCRIPTION

black clayey Topsoil (OH)

med. mottled brown & gray, silty Clay (CL) trace of sand

stiff to hard, gray, silty, some sand and gravel

stiff, gray, silty, trace of sand, few pebbles

very soft to soft, gray, silty, trace of fine sand

med., gray, silty, some sand & pebbles

soft, gray, silty, trace of sand & gravel

fine silty Sand (SC) & seams of med. gray silty clay

compact, gray, clayey silty Sand (SM-SC)

compact, gray, silty fine Sand (SM)

same, some gravel & clay

15 gallon water loss at 140.5 & 150.5ft

compact, gray, sandy Gravel (GC) some clay

154.0 - 165.1ft Shale, dark gray, soft

Bottom of Hole-Elevation-421.4
-Depth-165.1ft

For Water Table information consult Section 4.1.3.

Hole backfilled with bentonite slurry in soil and cemant in rock.

SOIL BORING NO. 8

BECHTEL Belle River

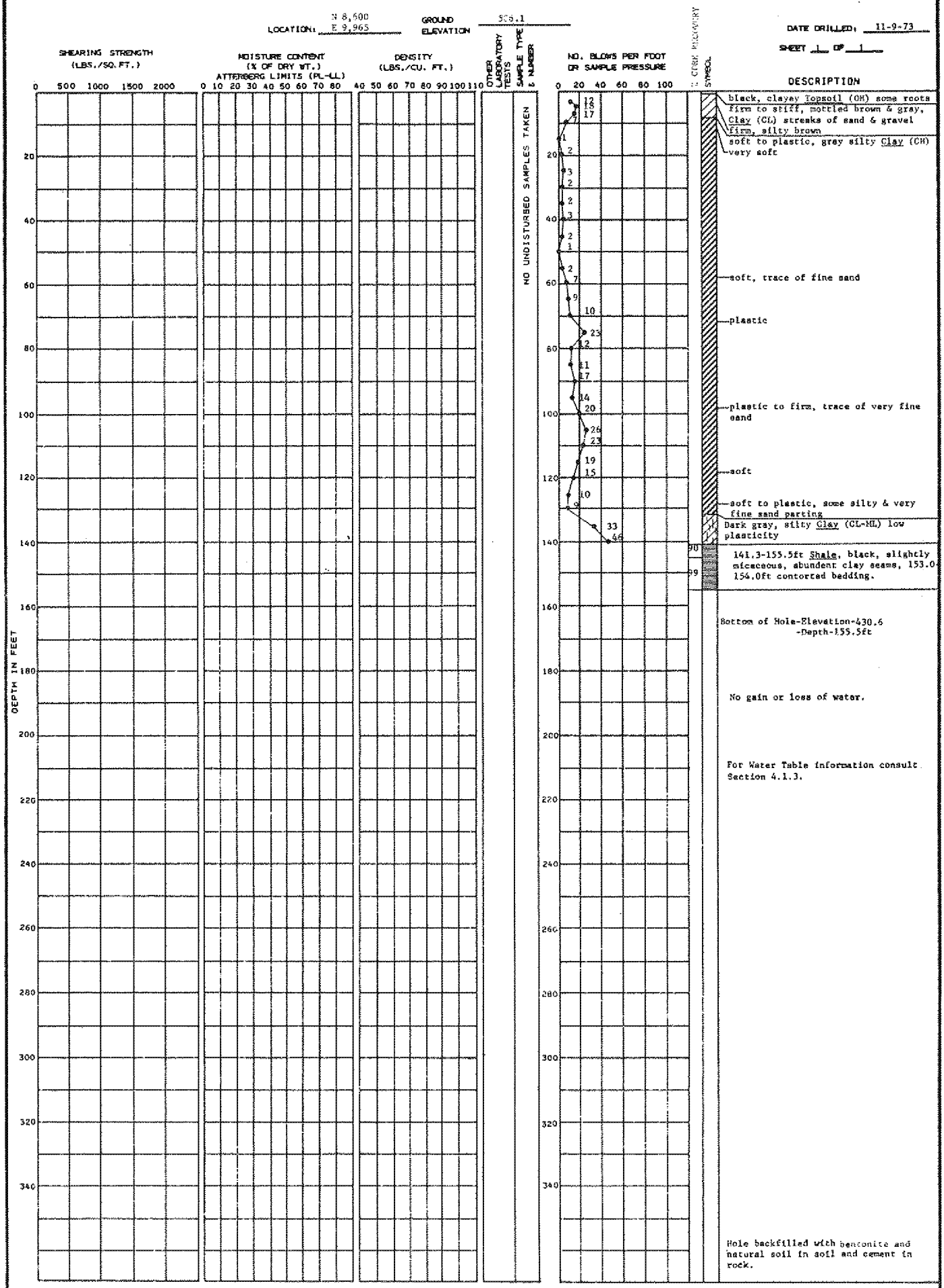
B-15

LOCATION: N 8,600 E 9,965

GROUND ELEVATION 556.1

DATE DRILLED: 11-9-73

SHEET 1 OF 1



SOIL BORING NO. 10

BECHTEL

Belle River

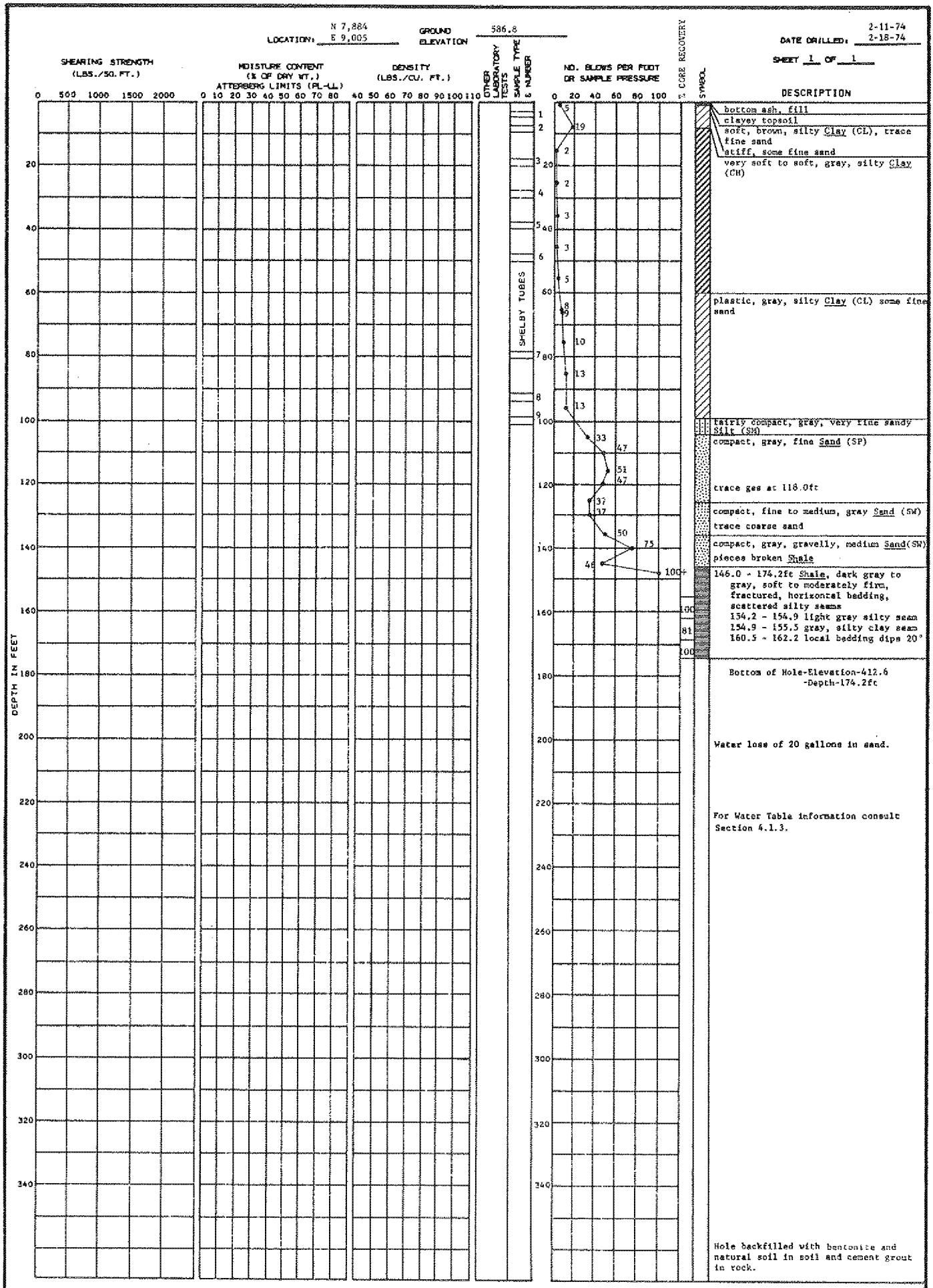
B-17

LOCATION: N 7,884 E 9,005

GROUND ELEVATION 586.8

DATE DRILLED: 2-11-74 2-18-74

SHEET 1 OF 1



SOIL BORING NO. 12

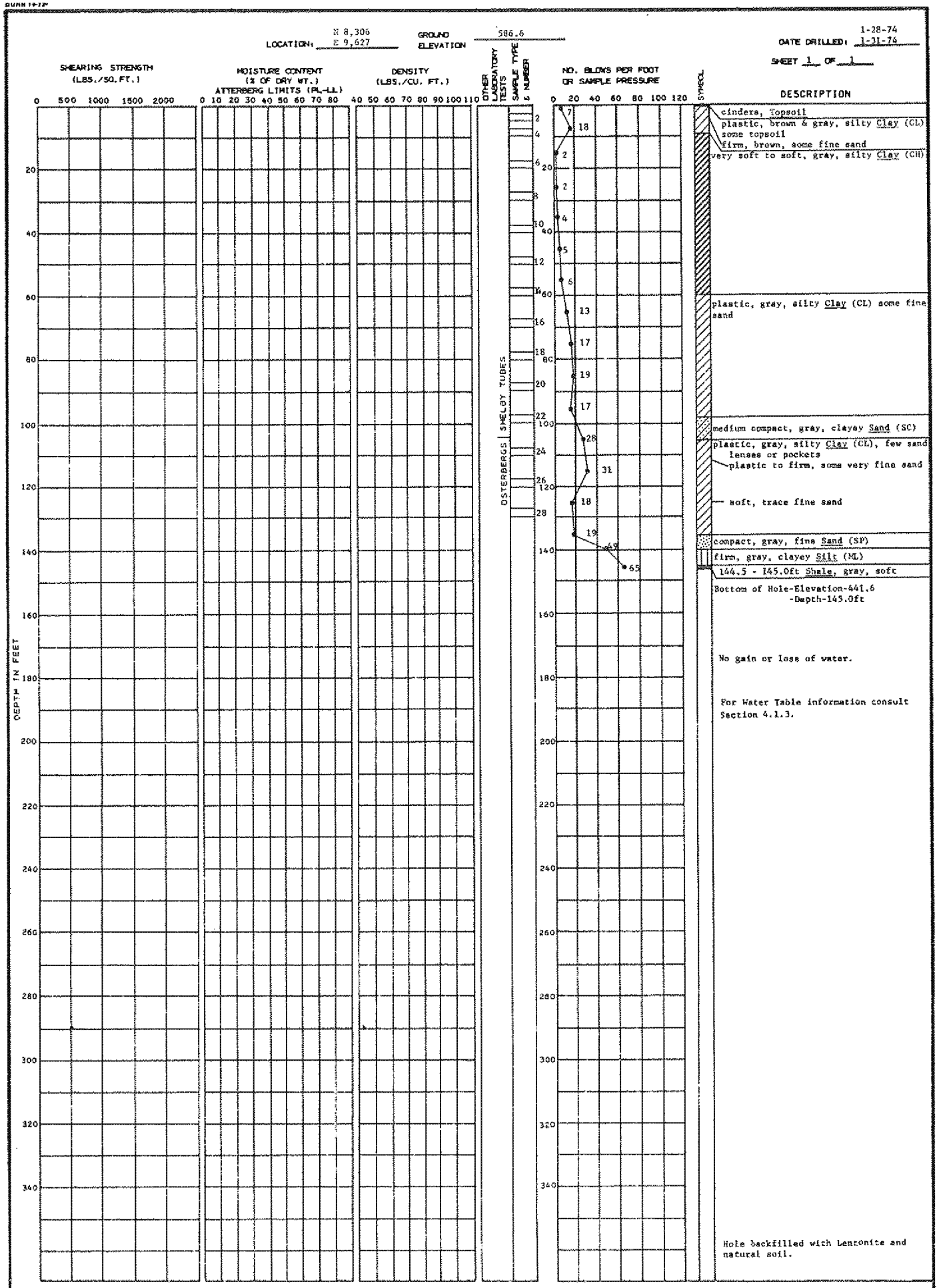
BECHTEL Belle River

LOCATION: N 8,306 E 9,627

GROUND ELEVATION 586.6

DATE DRILLED: 1-28-74 1-31-74

SHEET 1 OF 1



SOIL BORING NO. 14

BECHTEL Bella River

B-21

LOCATION: N 7,996 E 8,712

GROUND ELEVATION 586.0

DATE DRILLED: 2-12-74 2-14-74

SHEET 1 OF 1

SHEARING STRENGTH (LBS./SQ.FT.) 0 500 1000 1500 2000

MOISTURE CONTENT (% OF DRY WT.) ATTERBERG LIMITS (PL-LL) 0 10 20 30 40 50 60 70 80

DENSITY (LBS./CU. FT.) 40 50 60 70 80 90 100 110

OTHER LABORATORY TESTS

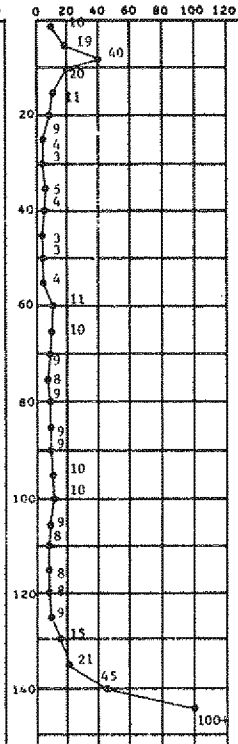
SAMPLE TYPE & NUMBER

NO UNDISTURBED SAMPLES TAKEN

NO. BLOWS PER FOOT OR SAMPLE PRESSURE 0 20 40 60 80 100 120

SYMBOL

DEPTH IN FEET 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300 320 340



DESCRIPTION

Cinders, bottom ash

Firm, brown & gray, silty clay (CL) some fine sand

Stiff, brown

Plastic, gray, trace fine sand

Very soft to soft, gray, silty clay (CH)

Plastic, gray, silty clay (CL) some fine sand

Medium compact, gray, clayey silt (ML)

Compact, gray, very fine sand (SP)

Compact, gray, silt (ML) some fine sand

Compact, gray, very fine to medium sand (SW)

142.0-143.75 ft. shale, gray, soft

Bottom of hole - Elevation - 442.25
- Depth - 143.75 ft

No gain or loss of water.

For Water Table information consult Section 4.1.3.

Hole backfilled with bentonite and natural soil.

SOIL BORING NO. 16

BECHTEL Belle River

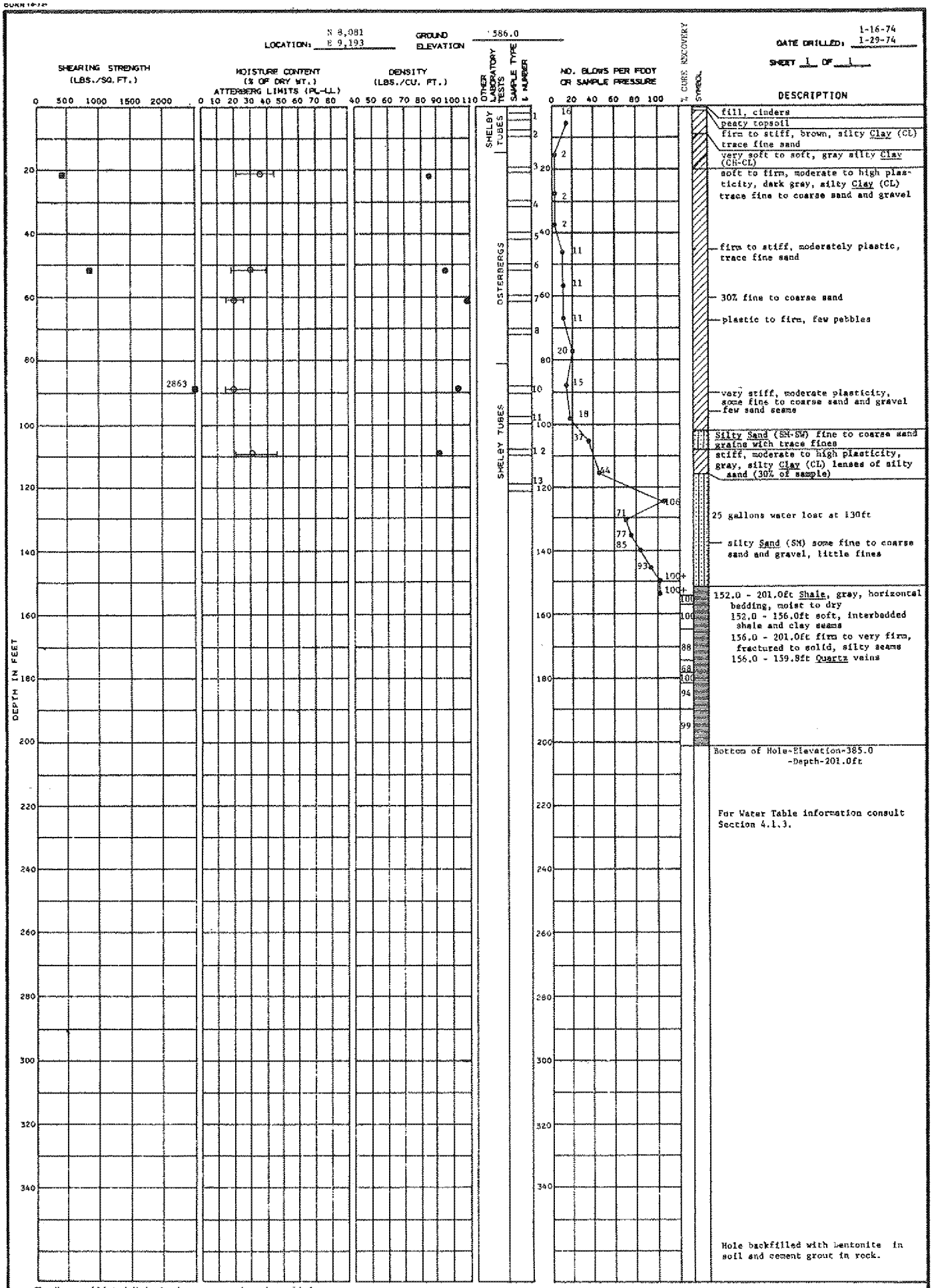
B-23

LOCATION: N 8,081 E 9,193

GROUND ELEVATION 586.0

DATE DRILLED: 1-16-74 1-29-74

SHEET 1 OF 1



SOIL BORING NO. 18

BECHTEL Belle River

B-25

LOCATION: N 8,011 E 9,337

GROUND ELEVATION 586.5

DATE DRILLED: 1-17-74 1-23-74

SHEET 1 OF 1

SHEARING STRENGTH (LBS./SQ.FT.) 0 500 1000 1500 2000

MOISTURE CONTENT (% OF DRY WT.) ATTERBERG LIMITS (PL-LL) 0 10 20 30 40 50 60 70 80

DENSITY (LBS./CU. FT.) 40 50 60 70 80 90 100 110

OTHER LABORATORY TESTS

SAMPLE TYPE & NUMBER

NO. BLOWS PER FOOT OR SAMPLE PRESSURE 0 20 40 60 80 100

% CORE RECOVERY

SYMBOL

DESCRIPTION

DEPTH IN FEET

SHELBY TUBES

bottom ash fill

Topsoil

plastic, brown, silty Clay (CL), trace sand

firm, brown & gray

very soft to soft, gray, silty Clay(CH)

plastic to firm, gray, silty Clay (CL) some fine sand, trace pebbles

firm, few pebbles

plastic, trace fine sand

medium compact, fine sandy Silt (ML), trace clay

medium compact, very fine Sand (SP), trace silt, trace gas at 136.0ft

136.5 - 145.8ft Shale, gray, soft, disintegrated, moist, silty

145.8 - 147.9ft Sand gray, fine to medium grain, clayey

147.0 - 164.3ft Shale, gray, firm, fractured, horizontal bedding, dry 147.0 - 152.8ft soft, fractured to disintegrated

Bottom of Hole-Elevation-422.2 -Depth-164.3ft

No gain or loss of water.

For Water Table information consult Section 4.1.3.

Hole backfilled with bentonite and natural soil in soil and cement grout in rock.

SOIL BORING NO. 20

BECHTEL Belle River

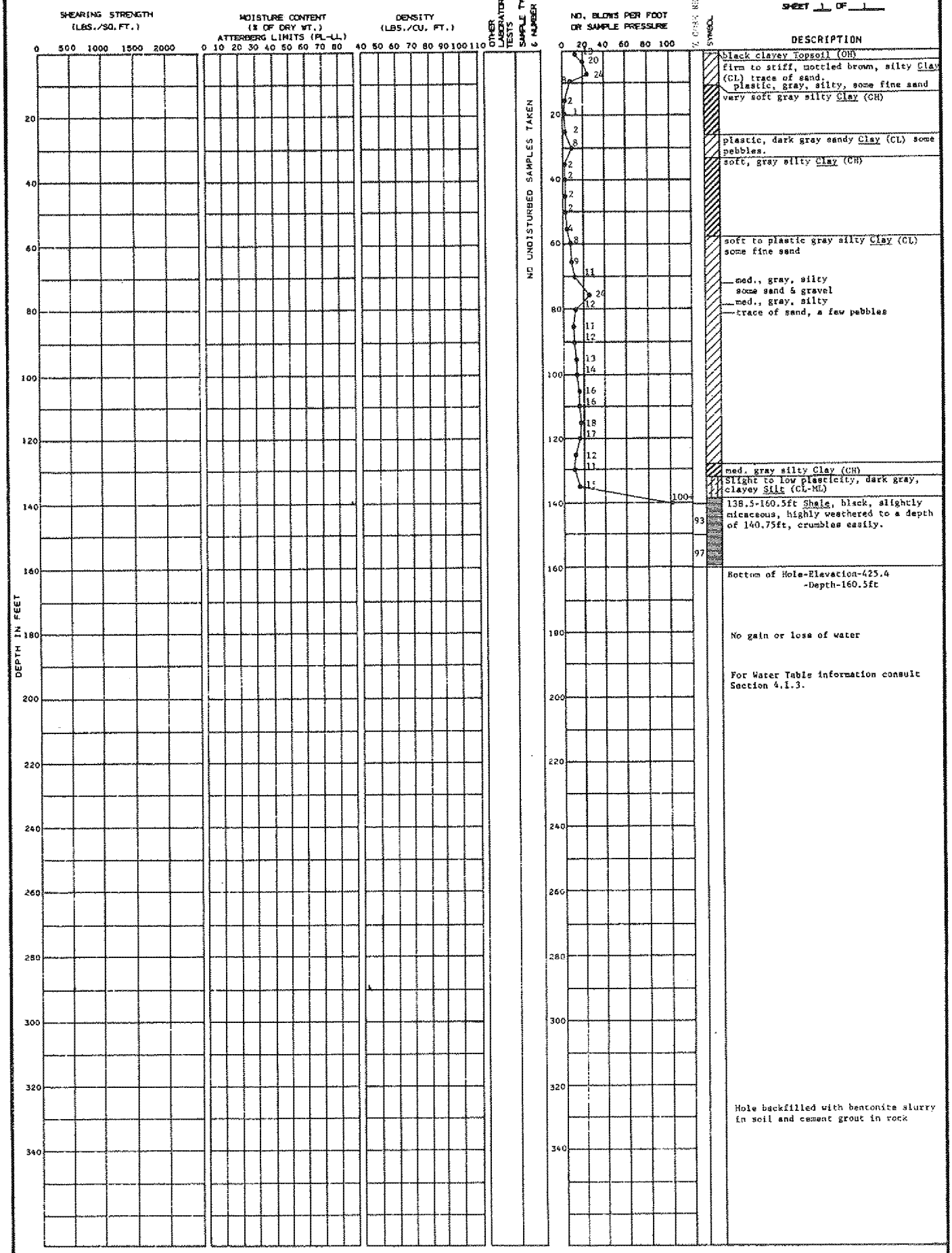
B-27

LOCATION: N.8,002 E.9,943

GROUND ELEVATION 385.9

DATE DRILLED: 11-20-73

SHEET 1 OF 1



DESCRIPTION

black clayey Topsoil (OH)

firm to stiff, mottled brown, silty Clay (CL) trace of sand.

plastic, gray, silty, some fine sand

very soft gray silty Clay (CH)

plastic, dark gray sandy Clay (CL) some pebbles.

soft, gray silty Clay (CH)

soft to plastic gray silty Clay (CL) some fine sand

med., gray, silty some sand & gravel

med., gray, silty trace of sand, a few pebbles

med. gray silty Clay (CH)

Slight to low plasticity, dark gray, clayey Silt (CL-ML)

138.5-160.5ft Shale, black, slightly micaceous, highly weathered to a depth of 140.75ft, crumbles easily.

Bottom of Hole-Elevation-425.4 -Depth-160.5ft

No gain or loss of water

For Water Table information consult Section 4.1.3.

Hole backfilled with bentonite slurry in soil and cement grout in rock

SOIL BORING NO. 22

BECHTEL Belle River

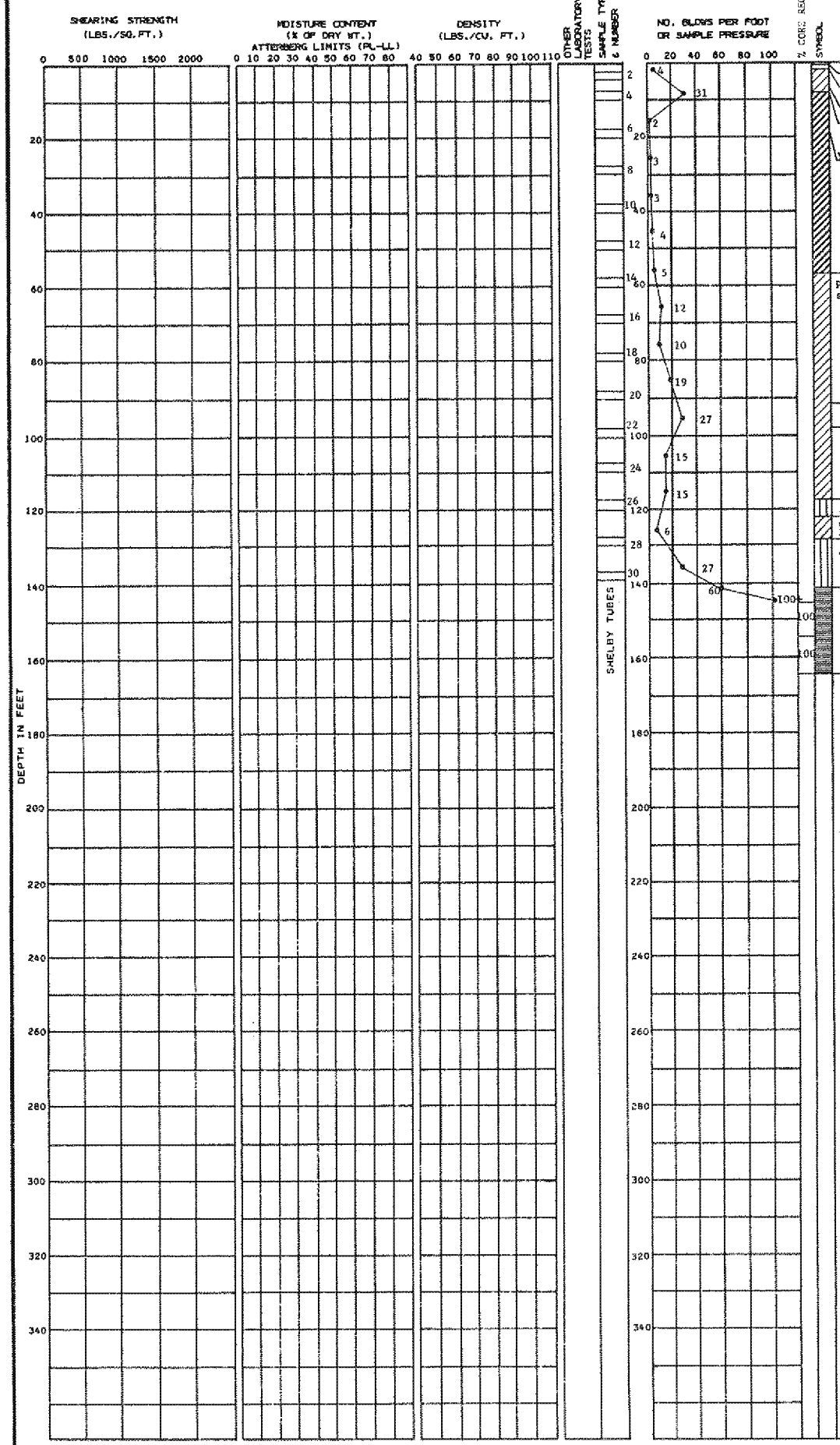
ED_005947A_00014556-00353

LOCATION: N 7,904 E 9,436

GROUND ELEVATION 586.3

DATE DRILLED: 1-30-74 2-5-74

SHEET 1 OF 1



DESCRIPTION

cinders

sand, topsoil

soft, brown & gray, silty Clay (CL) trace very fine sand

stiff, brown, trace fine sand

very soft to soft, gray, silty Clay (CH)

▽ 4-25-74: Elevation of water-566.7
Depth of water-19.6 ft.

plastic, gray, silty Clay (CL) some fine sand

— firm

— soft to plastic

fairly compact, gray, clayey Silt (ML)

plastic, gray, silty Clay (CL) trace very fine sand

compact, gray Silt (ML) some very fine sand

142.0 - 164.0ft Shale, medium to dark gray, soft, disintegrated to fractured, horizontal bedding, with Quartz veins from 145.2 to 147.7, more firm below 154.0ft

Bottom of Hole-Elevation-422.3
-Depth-164.0ft

Piezometer Installation:
cement backfill from 164.0' to 139.0', 5.0' of sludge pipe with bentonite around sludge pipe from 139.0' to 134.0', 4.0' of #80 Screen from 134.0' to 130.0' with sand pack around screen, 134.41' of 2" PVC from 130.0' to 4.41' above surface, backfill with bentonite around casing from 130.0' to ground surface.

For Water Table information consult Section 4.1.3.

SOIL BORING NO. 24

BECHTEL Belle River

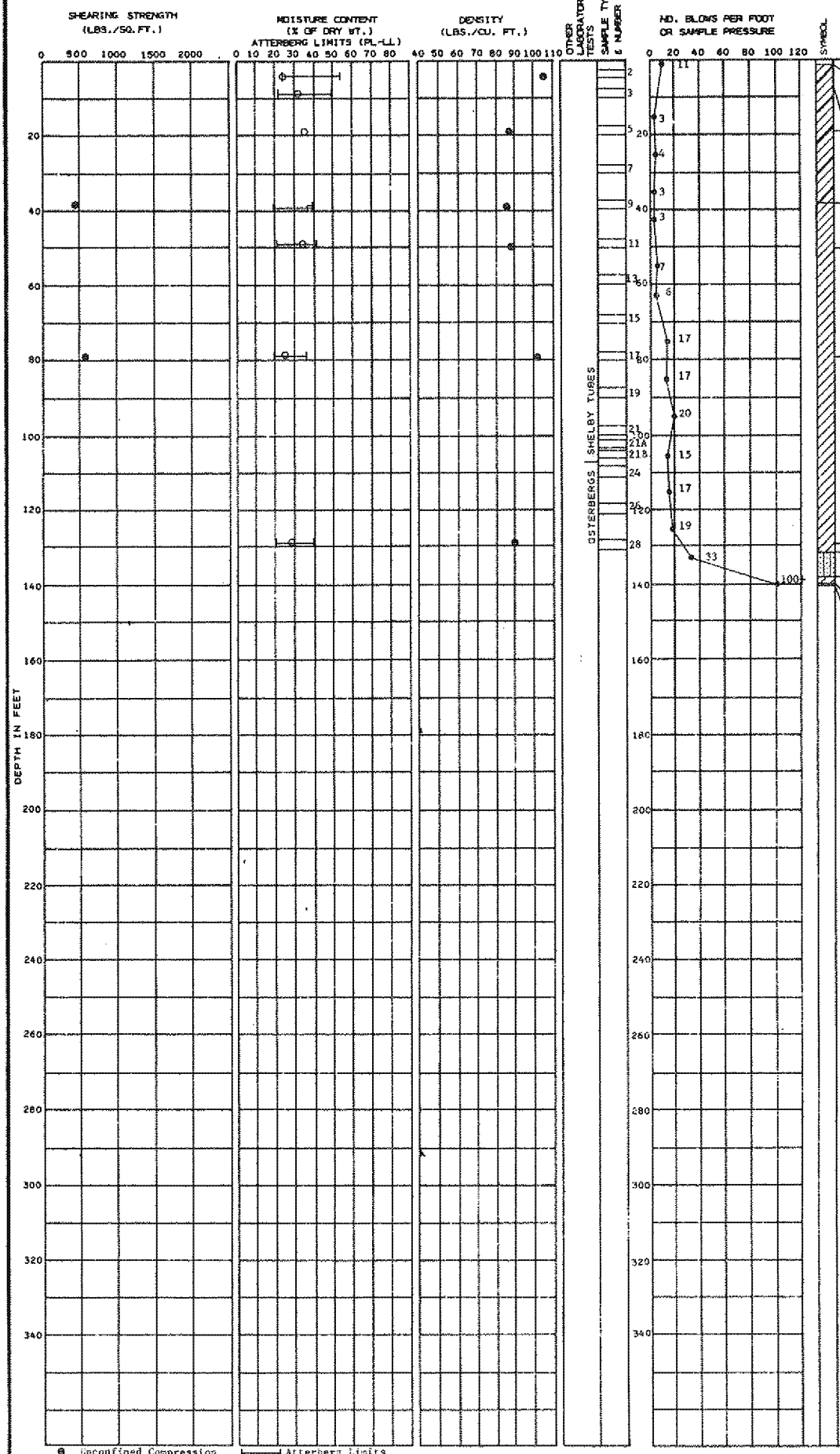
B-31

LOCATION: N 7,890 E 9,763

GROUND ELEVATION 585.6

DATE DRILLED: 12-12-73 12-19-73

SHEET 1 OF 1



DESCRIPTION

Black sandy topsoil

very stiff, moderate to high plasticity brown, silty Clay (CL-CH) some fine to coarse sand and fine gravel

firm, gray

15% fine gravel and coarse sand

Soft to firm, highly plastic, gray, silty Clay (CL)

20% fine to coarse sand

firm to stiff, medium plasticity, 35% sand and gravel

30-40% fine sand & silt in thin layers

compact, gray, silty Sand (SM-SC) some clay

hard, gray Clay (CL) with shale, crumbles easily (Hardpan)

140.0-140.5 ft. Shale, soft, gray

Bottom of Hole - Elevation - 444.6
- Depth - 141.0 ft.

No gain or loss of water

For Water Table information consult Section 4.1.3.

Hole backfilled with bentonite

● Unconfined Compression

Atterberg Limits

○ Moisture Content

SOIL BORING NO. 26

BECHTEL Belle River

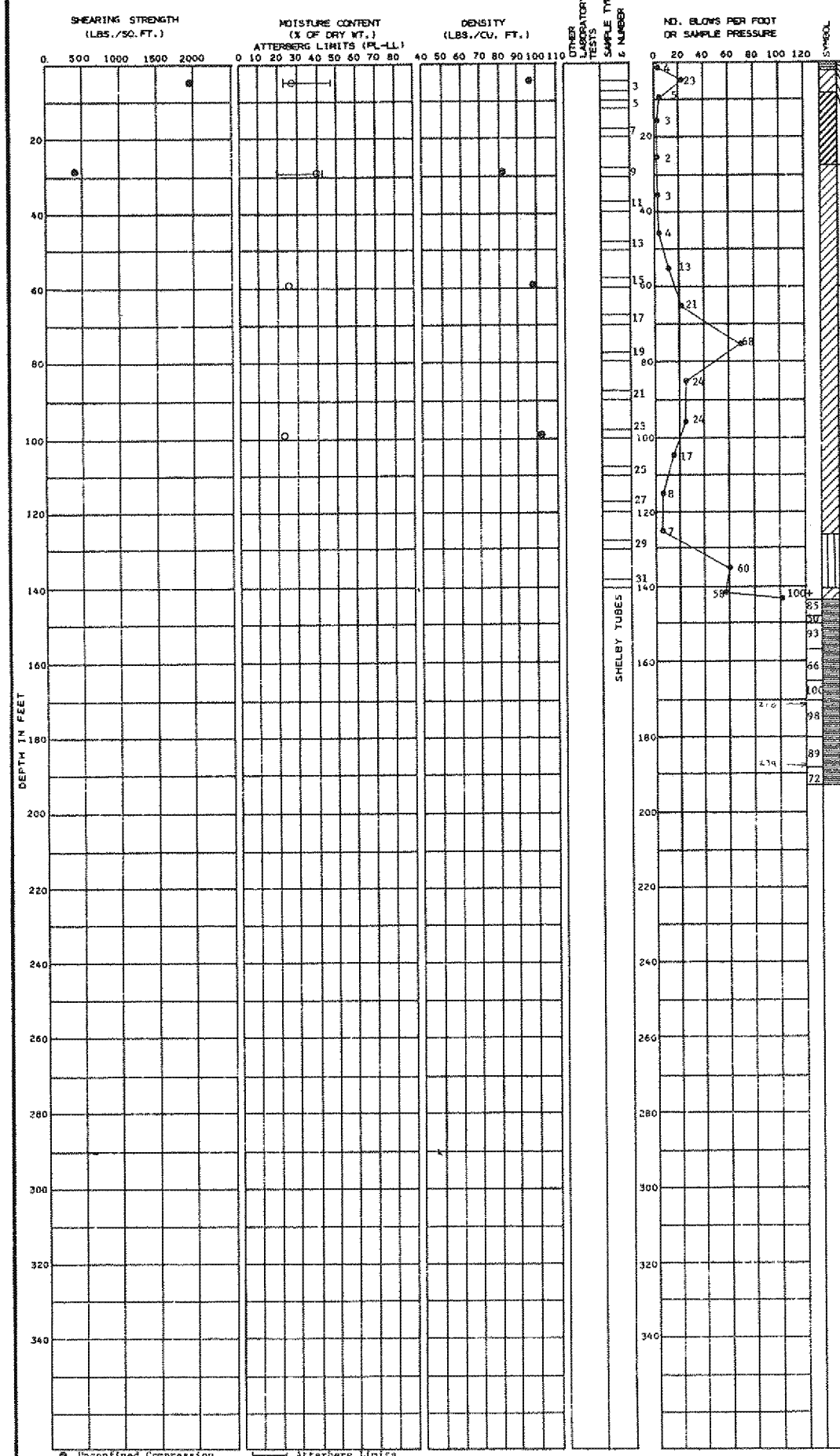
DUNN 14-72F

LOCATION: N 7,724 E 9,443

GROUND ELEVATION 585.8

DATE DRILLED: 1-15-74 1-22-74

SHEET 1 OF 1



DESCRIPTION

- cinders fill
- black sandy Topsoil
- brown, silty, fine Sand (SM)
- medium to stiff, brown & gray, silty Clay (CL) medium to high plasticity
- stiff
- soft, gray, silty Clay (CH)
- soft, medium to high plasticity, gray silty Clay (CL)
- medium to stiff, medium plasticity, 15% fine to coarse sand
- very stiff, gray, silty fine sandy, with seams of fine sand, trace pebbles
- plastic to firm, gray silty, trace of fine sand
- stiff, 15% fine to coarse sand, medium to high plasticity
- med. compact, clayey Silt (ML), trace of fine sand
- hard, very sandy Clay (CL) some pebbles, some decomposed Shale (Hardpan)
- 143.8 - 193.5ft Shale, gray, soft to firm, disintegrated to fractured, moist to dry, horizontal bedding

Bottom of Hole-Elevation-392.3
-Depth-193.5ft

No gain or loss of water.

For Water Table information consult Section 4.1.3.

Hole backfilled with Bentonite and natural soil in soil and cement grout in rock.

SOIL BORING NO. 28

BECHTEL Belle River

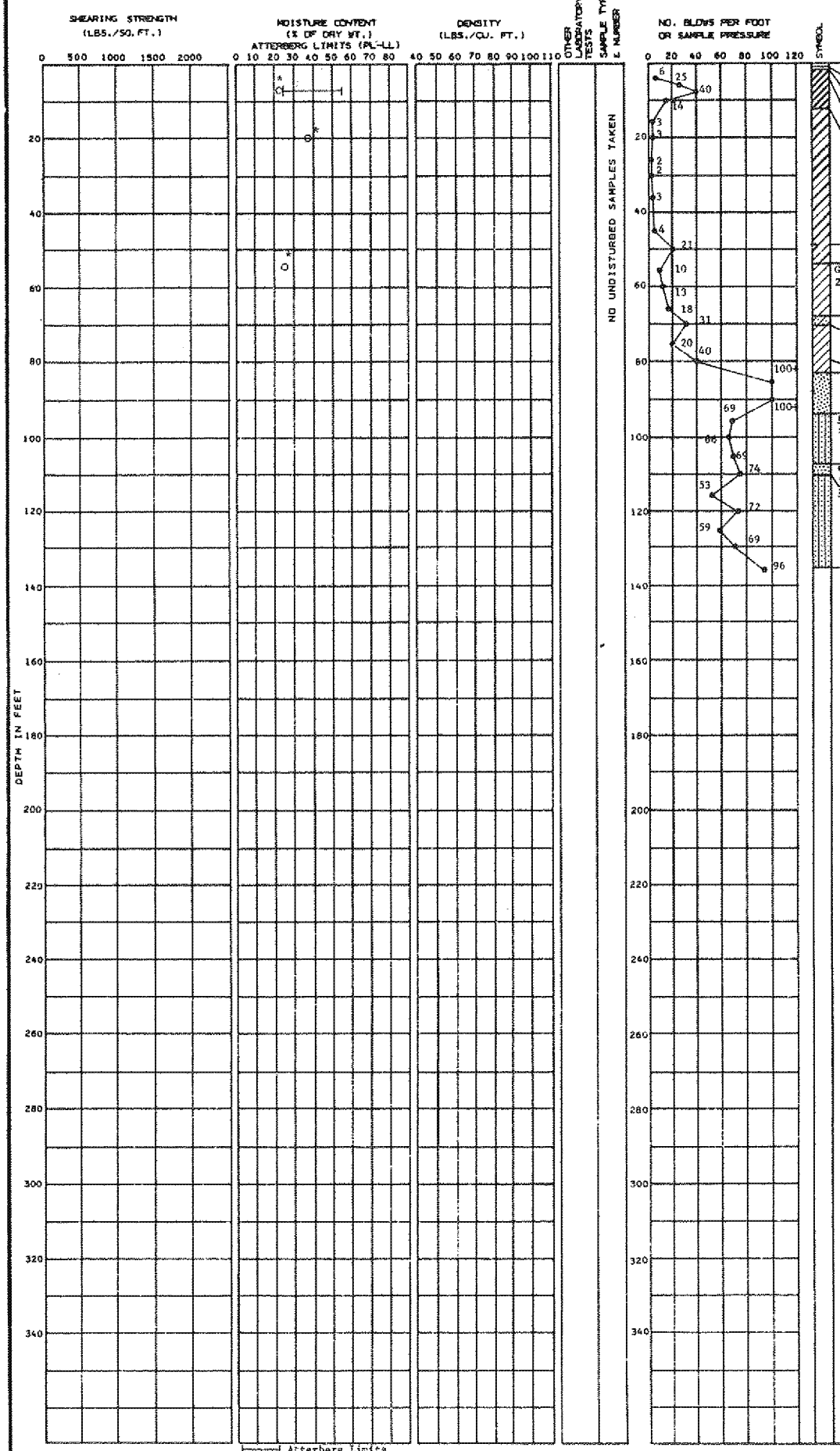
B-35

LOCATION: N 7,673 E 9,015

GROUND ELEVATION 586.4

DATE DRILLED: 2-7-74 2-11-74

SHEET 1 OF 1



Atterberg Limits
O Moisture Content
* Sample Jar Unsealed

DESCRIPTION

Cinders, fill
Sandy topsoil
Soft, brown & gray, silty Clay (CH) trace fine sand, high plasticity
Stiff, brown, some fine sand

Very soft to soft, gray, silty Clay (CH-CL)

Firm, gray, sandy clay layer

Gray, silty Clay (CL) medium plasticity, 20% fine to coarse sand

Stiff, dark, gray clayey sand (SC)

Firm to stiff, gray, silty clay (CL), silt lenses
Hard, some fine sand

Compact, gray, fine sand (SP)

Silty fine sand (SM) 15% nonplastic fines

Compact, gray, very fine to coarse sand (SW)
Silty sand (SM) 15% nonplastic fines

Bottom of hole - Elevation - 451.4
- Depth - 135.0 ft

This hole stopped at 135.0 ft. due to gas.

With casing at 110.0' no gas. Casing pulled to 57.0'. No gas. Pulled to 50.0', gas bubbling in hole. Capped hole and left for 48 hours. After 48 hours no gas (pocket only)

2-8-74 No gas
2-11-74 Gas
2-11-74 Pulled to 50.0', capped
2-11-74 1400 hours removed cap (no gas)

82.5' - 107.0' used Gel to keep open

For Water Table Information consult Section 4.1.3.

Hole backfilled with Quik-Gel in soil

SOIL BORING NO. 30

BECHTEL Belle River

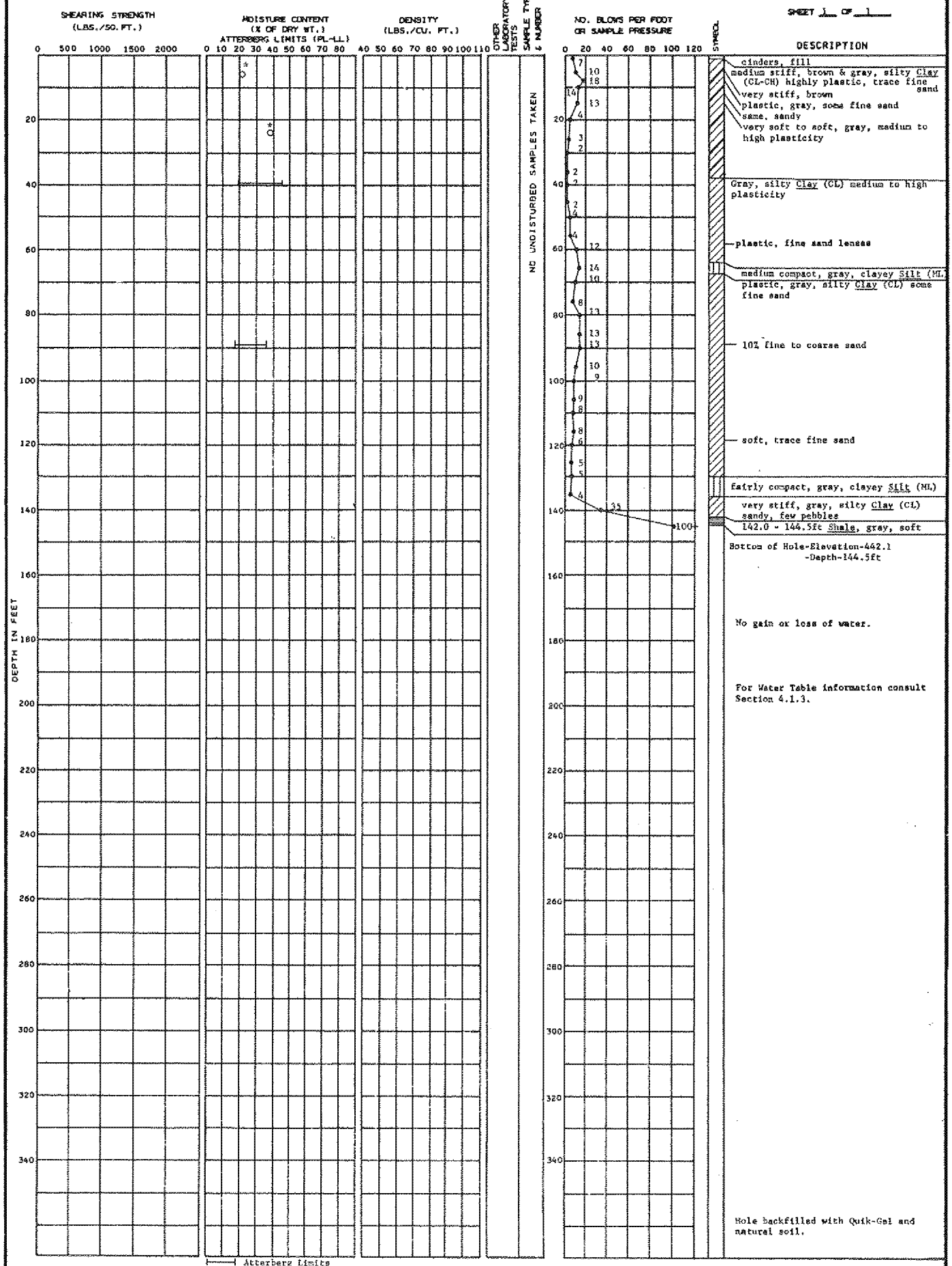
B-37

LOCATION: N 7,663 E 9,659

GROUND ELEVATION 586.6

DATE DRILLED: 2-6-74 / 2-12-74

SHEET 1 OF 1



DESCRIPTION

cinders, fill

medium stiff, brown & gray, silty Clay (CL-CH) highly plastic, trace fine sand

very stiff, brown

plastic, gray, some fine sand

same, sandy

very soft to soft, gray, medium to high plasticity

Gray, silty Clay (CL) medium to high plasticity

plastic, fine sand lenses

medium compact, gray, clayey Silt (ML)

plastic, gray, silty Clay (CL) some fine sand

10% fine to coarse sand

soft, trace fine sand

fairly compact, gray, clayey Silt (ML)

very stiff, gray, silty Clay (CL) sandy, few pebbles

142.0 - 144.5ft Shale, gray, soft

Bottom of Hole-Elevation-442.1
-Depth-144.5ft

No gain or loss of water.

For Water Table information consult Section 4.1.3.

Hole backfilled with Quik-Gel and natural soil.

SOIL BORING NO. 32

BECHTEL Belle River

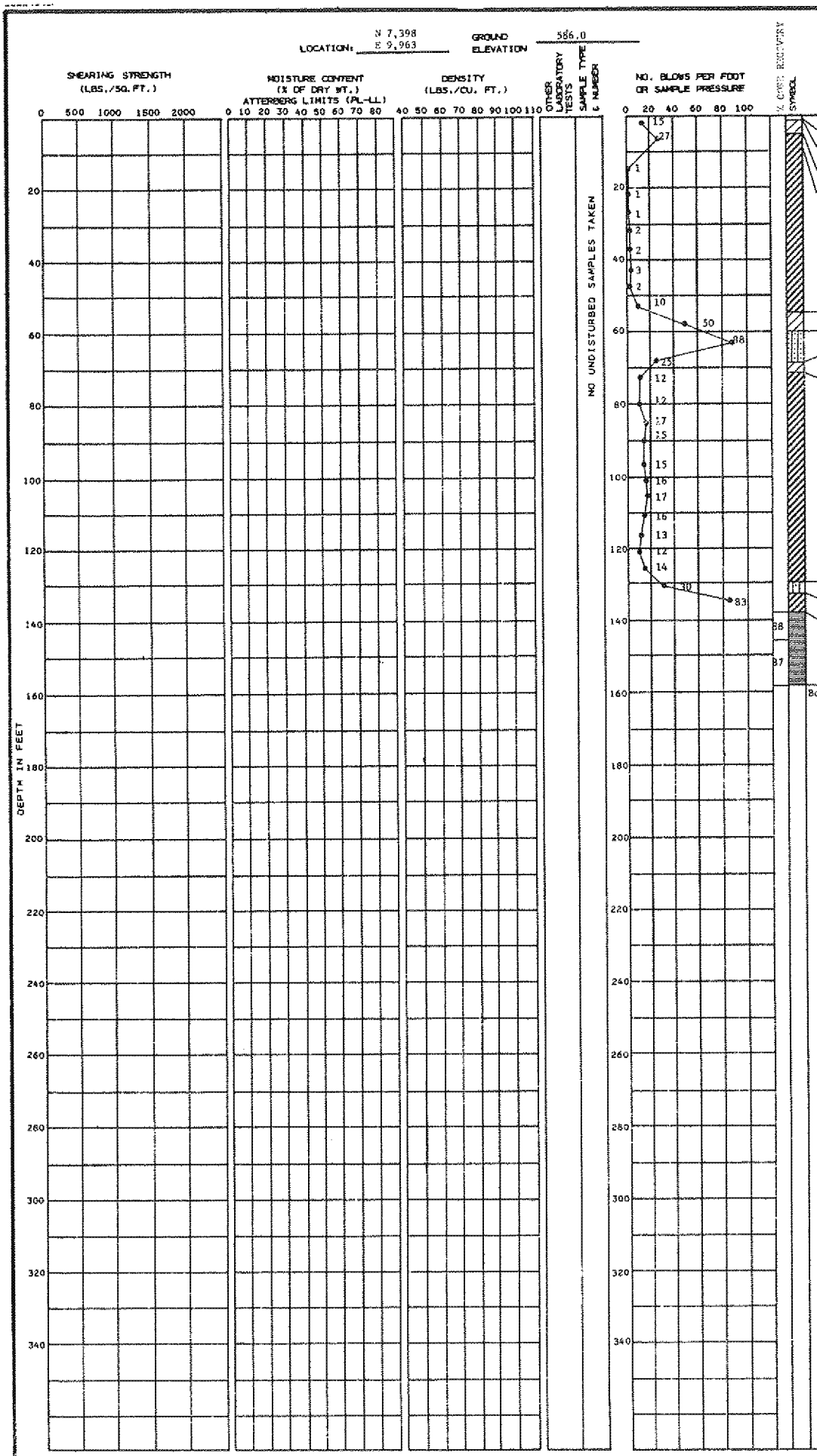
B-39

LOCATION: N 7,398 E 9,963

GROUND ELEVATION 586.0

DATE DRILLED: 11-8-73

SHEET 1 OF 1



DESCRIPTION

black clayey Topsoil (OH) some sand

firm, gray & brown, silty Clay (CL) trace of sand

firm, gray, silty Clay (CH) very soft to soft

firm to stiff, gray, fine sandy Clay (CL) silt seams

compact, gray, medium silty Sand (SM-SC) some silt, trace of clay.

plastic to firm, gray silty Clay (CL) a few sand & silt pockets

soft to plastic, gray, silty Clay (CH) trace of fine sand

medium compact, clayey Silt (ML) some fine sand, trace of pebbles

hard, gray, sandy Clay (CH) trace of shale fragments

137.5-158.2ft Shale, black, slightly micaceous, highly weathered to a depth of 142.5ft, some clay seams.

Bottom of Hole-Elevation-427.83
-Depth-158.17ft

No gain or loss of water.

For Water Table information consult Section 4.1.3.

Hole backfilled with Quik-Gel in soil and cement grout in rock.

SOIL BORING NO. 34

BECHTEL Belle River

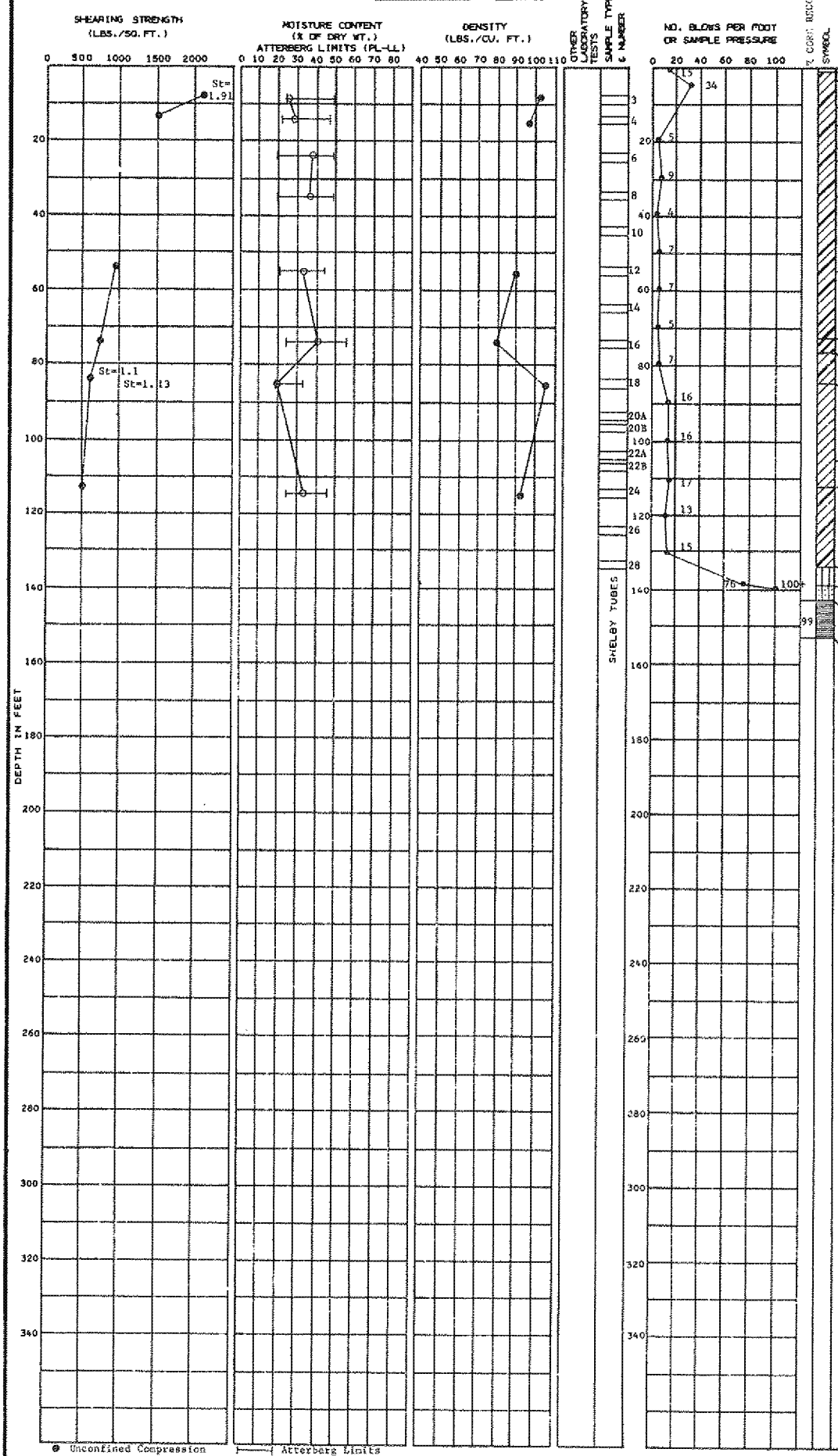
8-41

LOCATION: N 9,007 E 13,035

GROUND ELEVATION 598.3

DATE DRILLED: 12-6-73 12-12-73

SHEET 1 OF 1



DESCRIPTION

- black sandy Topsoil (OH)
- silty Clay (CL-CH)
- firm, brown, some sand
- hard, highly plastic, dark grayish brown mottled, trace sand & fine gravel
- medium to very stiff
- soft, gray
- dark gray, high plastic, (sample greatly disturbed)
- (sample greatly disturbed)
- medium, highly plastic
- medium stiff, dark gray, silty Clay (CH) highly plastic
- plastic, gray, silty Clay (CL-CH) trace sand, few pebbles
- stiff, moderate plasticity, dark gray, silty Clay (CL) 10% medium to coarse sand, 15% gravel
- firm, trace of sand & pebbles
- soft to medium, moderately to highly plastic, gray, silty Clay (CL-CH) trace sand
- compact, gray, fine sandy SILT (ML) some clay
- compact, gray, silty fine Sand (SM) some pebbles, 30% nonplastic fines
- 143.0-153.0ft Shale, black, soft, micaceous, trace of pebbles, crumbles easily

Bottom of Hole-Elevation-445.3 -Depth-153.0ft

No gain or loss of water.

For Water Table information consult Section 4.1.3.

Hole backfilled with Quik-Gel in soil and cement grout in rock.

SOIL BORING NO. 38

BECHTEL Bells River

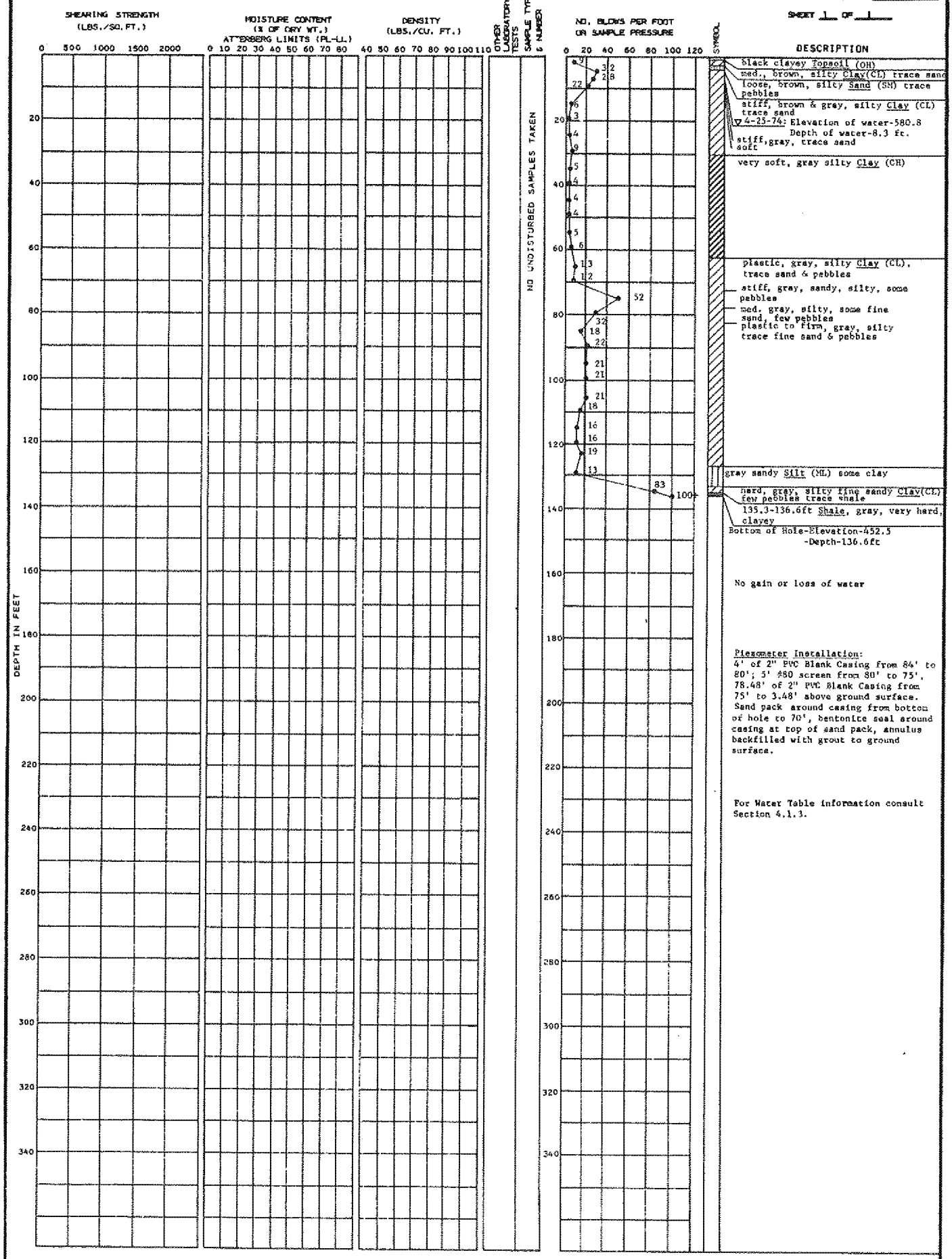
B-43

LOCATION: N 8,003 / 510,993

GROUND ELEVATION 589.1

DATE DRILLED: 12-14-73 / 12-18-73

SHEET 1 OF 1



SOIL BORING NO. 40

BECHTEL Belle River

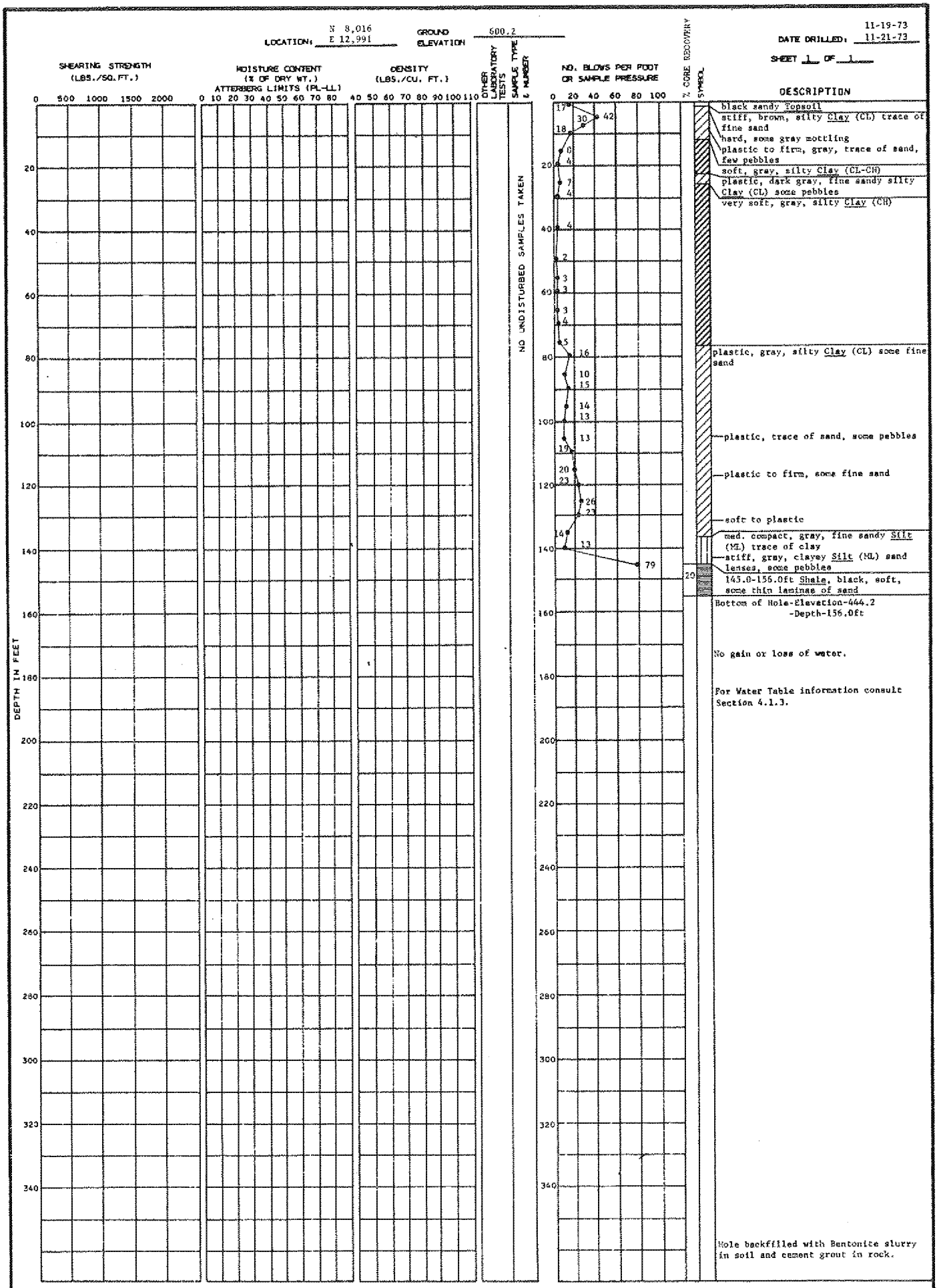
B-45

LOCATION: N 8,016 E 12,991

GROUND ELEVATION 600.2

DATE DRILLED: 11-19-73 11-21-73

SHEET 1 OF 1



SOIL BORING NO. 42

BECHTEL Belle River

B-47

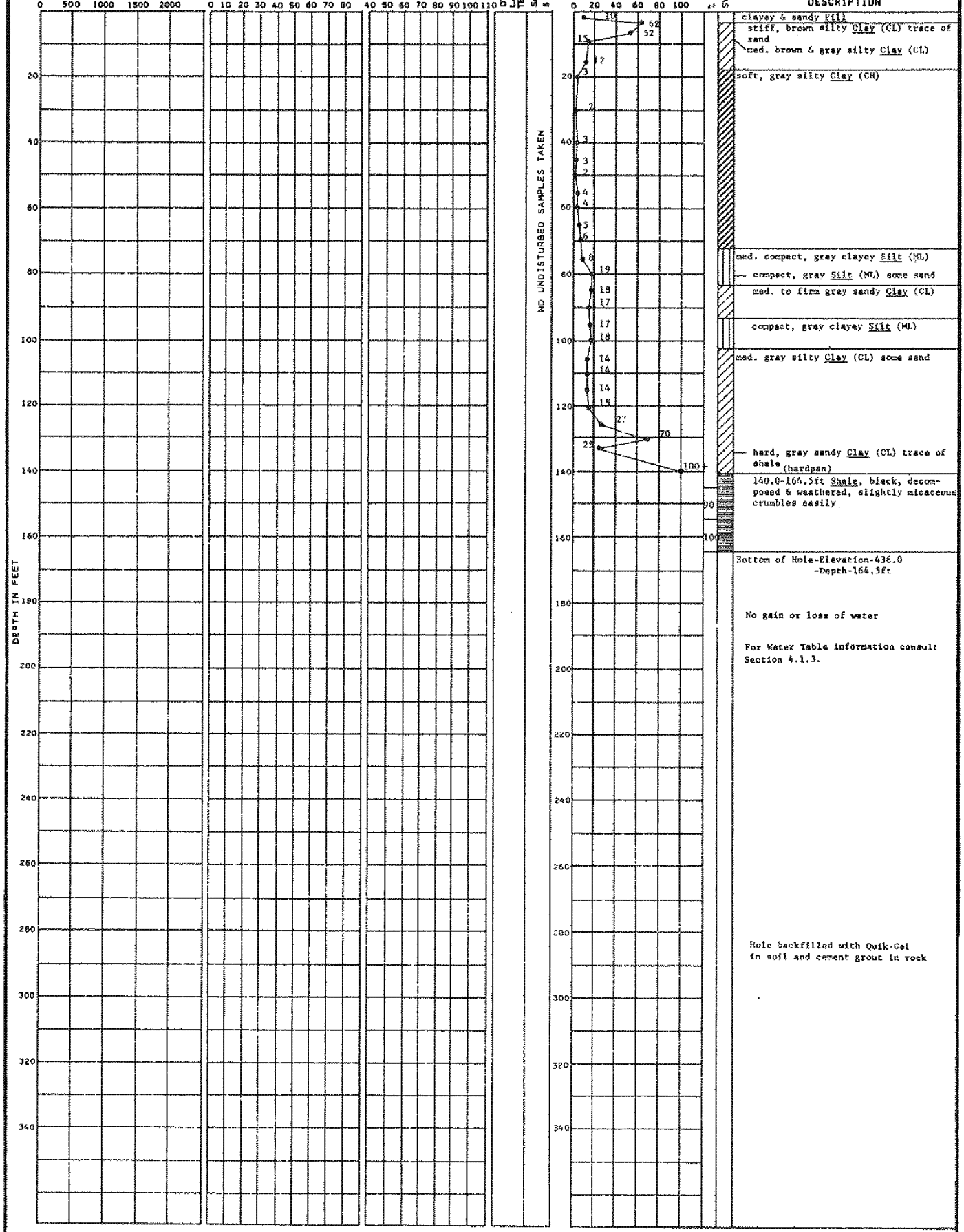
ED_005947A_00014556-00362

LOCATION: N 7,004 E13,000

GROUND ELEVATION 600.5

DATE DRILLED: 11-20-73

SHEET 1 OF 1



DESCRIPTION

SOIL BORING NO. 44

BECHTEL Belle River

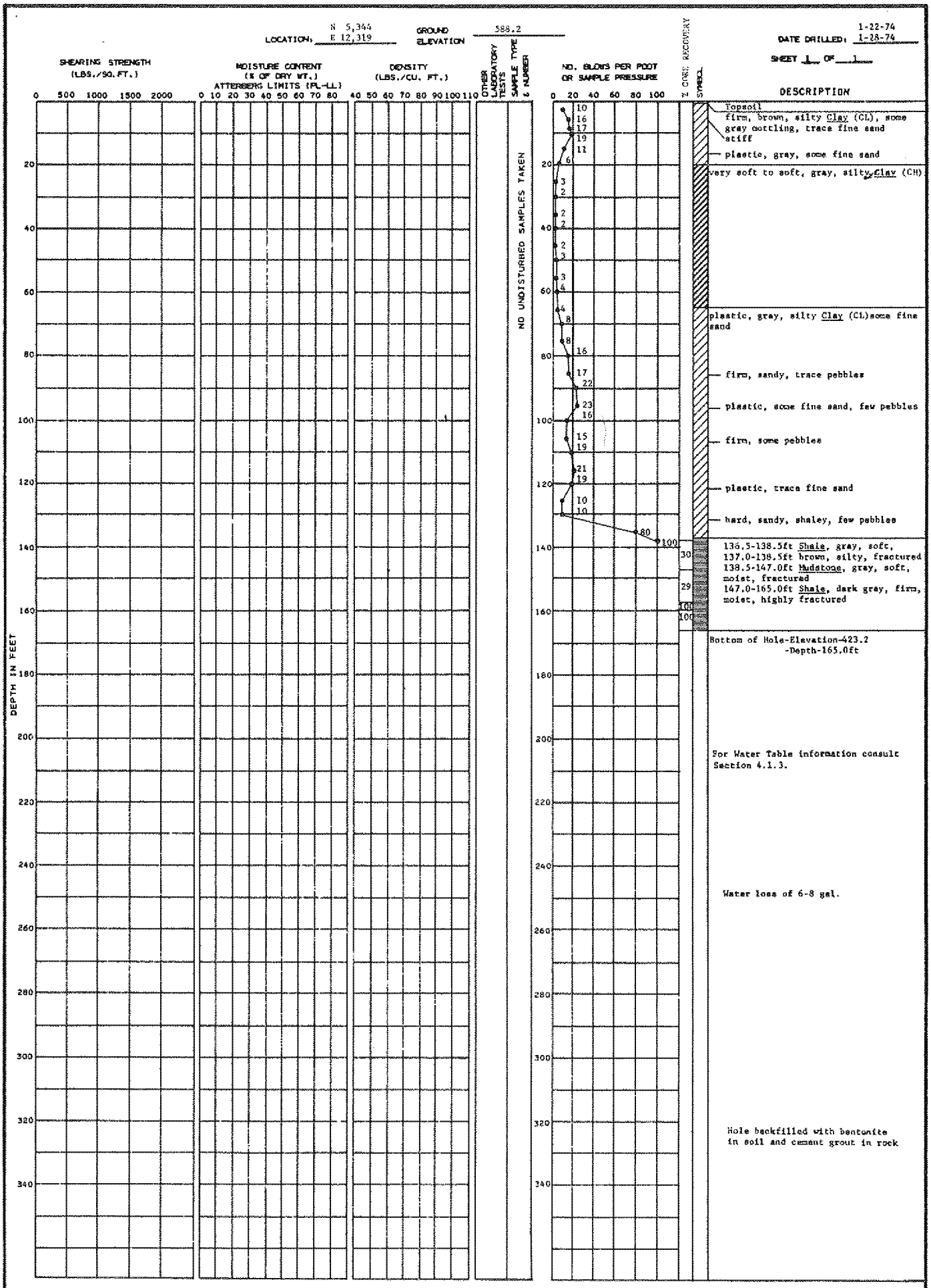
B-49

LOCATION: N 5,344 E 12,319

GROUND ELEVATION 588.2

DATE DRILLED: 1-22-74 1-28-74

SHEET 1 OF 1



SOIL BORING NO. 46-A

BECHTEL Belle River

B-51

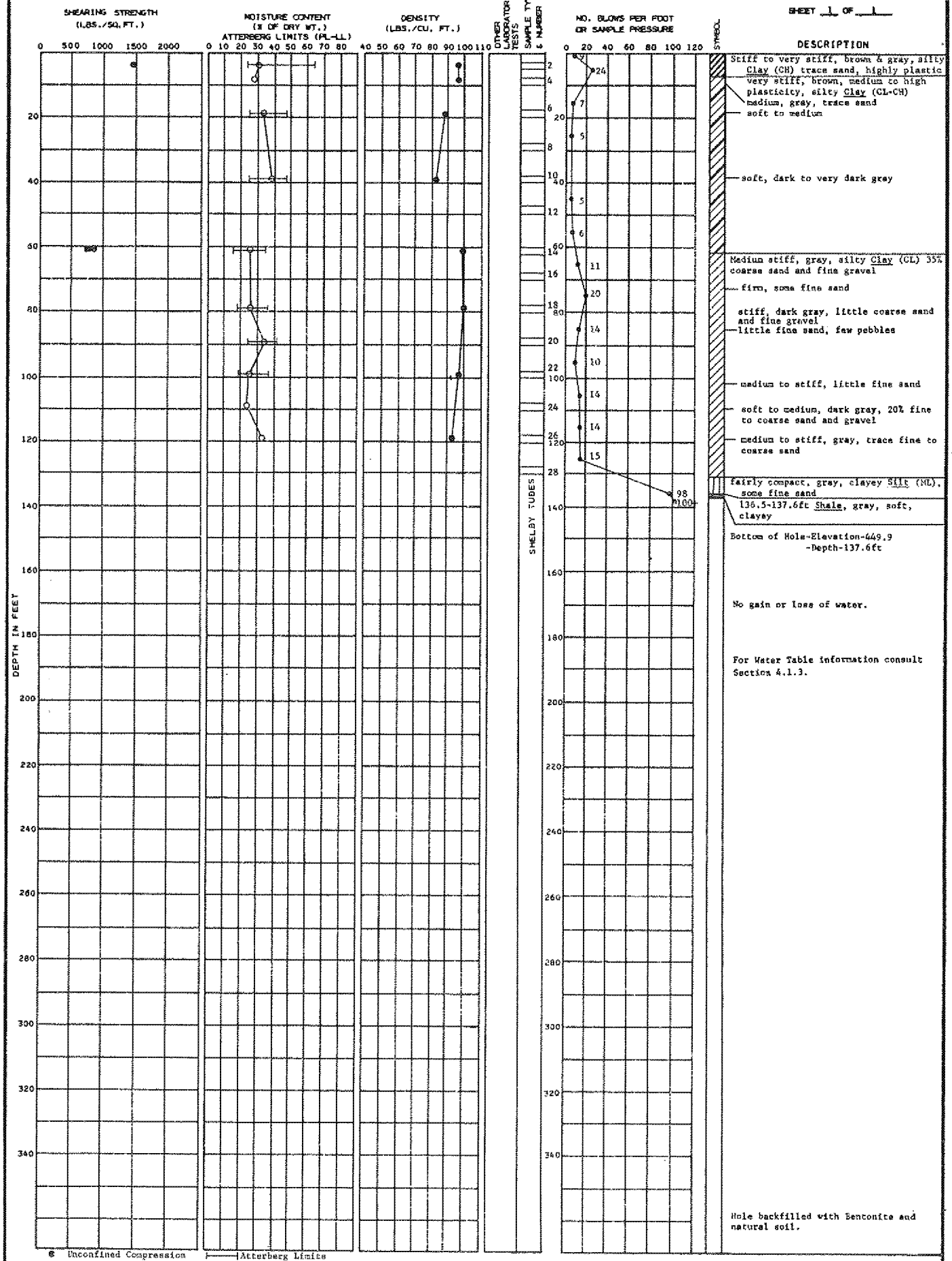
ED_005947A_00014556-00364

LOCATION: N 3,950 E 12,584

GROUND ELEVATION 587.5

DATE DRILLED: 1-14-74 1-23-74

SHEET 1 OF 1



DESCRIPTION

Stiff to very stiff, brown & gray, silty Clay (CH) trace sand, highly plastic

very stiff, brown, medium to high plasticity, silty Clay (CL-CH)

medium, gray, trace sand

soft to medium

soft, dark to very dark gray

Medium stiff, gray, silty Clay (CL) 35% coarse sand and fine gravel

firm, some fine sand

stiff, dark gray, little coarse sand and fine gravel

little fine sand, few pebbles

medium to stiff, little fine sand

soft to medium, dark gray, 20% fine to coarse sand and gravel

medium to stiff, gray, trace fine to coarse sand

fairly compact, gray, clayey Silt (ML), some fine sand

136.5-137.6ft Shale, gray, soft, clayey

Bottom of Hole-Elevation-449.9
-Depth-137.6ft

No gain or loss of water.

For Water Table information consult Section 4.1.3.

Hole backfilled with Bentonite and natural soil.

SOIL BORING NO. 48

BECHTEL Belle River

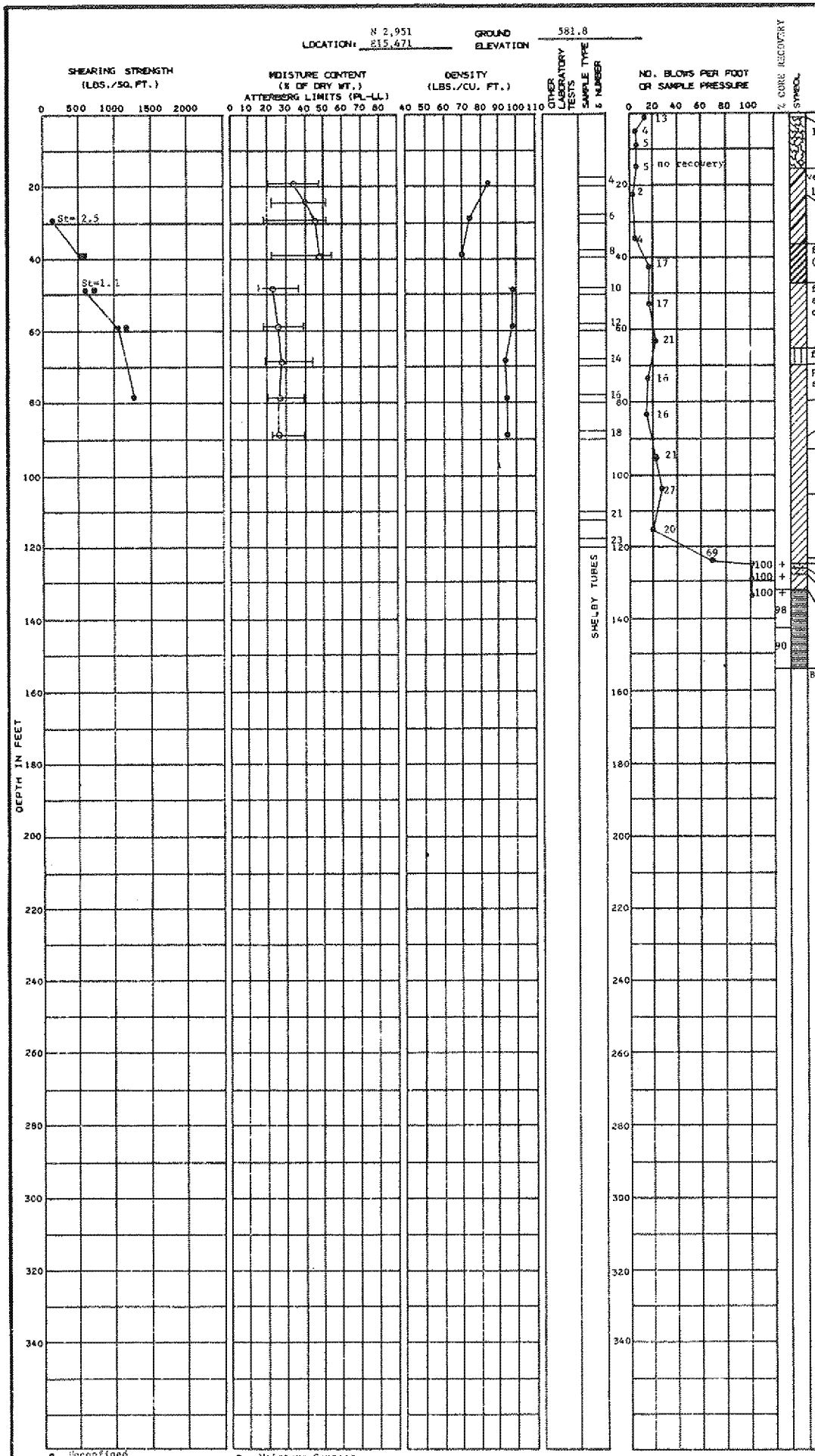
B-53

LOCATION: N 2,951 E15,471

GROUND ELEVATION 581.8

DATE DRILLED: 12-19-73 / 1-8-74

SHEET 1 OF 1



DESCRIPTION

cinders, fly ash Fill

loose, gray, limestone Fill, some sand

very soft, gray, silty Clay (CL-CH) top 16-20' possibly disturbed

highly plastic

firm, highly plastic, gray, silty Clay (CH) some sand, trace pebbles

firm, moderately plastic, gray, sandy, silty Clay (CL) 20 to 25% fine to coarse sand and 10-15% fine gravel

fairly compact, fine sandy Silt (ML)

plastic, gray, silty Clay (CL) some fine sand, trace fine gravel

10-15% fine to coarse sand and fine gravel

20-25% fine to coarse sand and 10% fine gravel

firm, gray, some fine sand, trace pebbles

plastic, gray, trace fine sand

hard, gray, very sandy, few pebbles

compact, very fine Sand(SP) some silt

very hard, gray, clayey fine Sand(SC)

very hard, gray, sandy Clay (CL) (hardpan)

133.8-153.8ft Shale, gray, firm to soft, extremely fragmented and easily broken

Bottom of Hole-Elevation-428.05
-Depth-153.75ft

For Water Table information consult Section 4.1.3.

Water Level
At completion - 40.5'
Water Level
0800 33.5' 1-7-74

Bailed to 67.0'
1130 hours 67.91'
1400 " 66.33'
1600 " 66.08'
1800 " 65.25'
Water Level
0800 60.08' 1-8-74

Encountered gas at 98.0' while grouting casing at 98.0'. Extra precautions taken while grouting hole (slight pressure).

Hole backfilled with bentonite and natural soil in soil and cement grout in rock

● Unconfined
■ Unconsolidated Undrained
St = Sensitivity

○ Moisture Content
⊢—⊣ Atterberg Limits

SOIL BORING NO. 50

BECHTEL Belle River

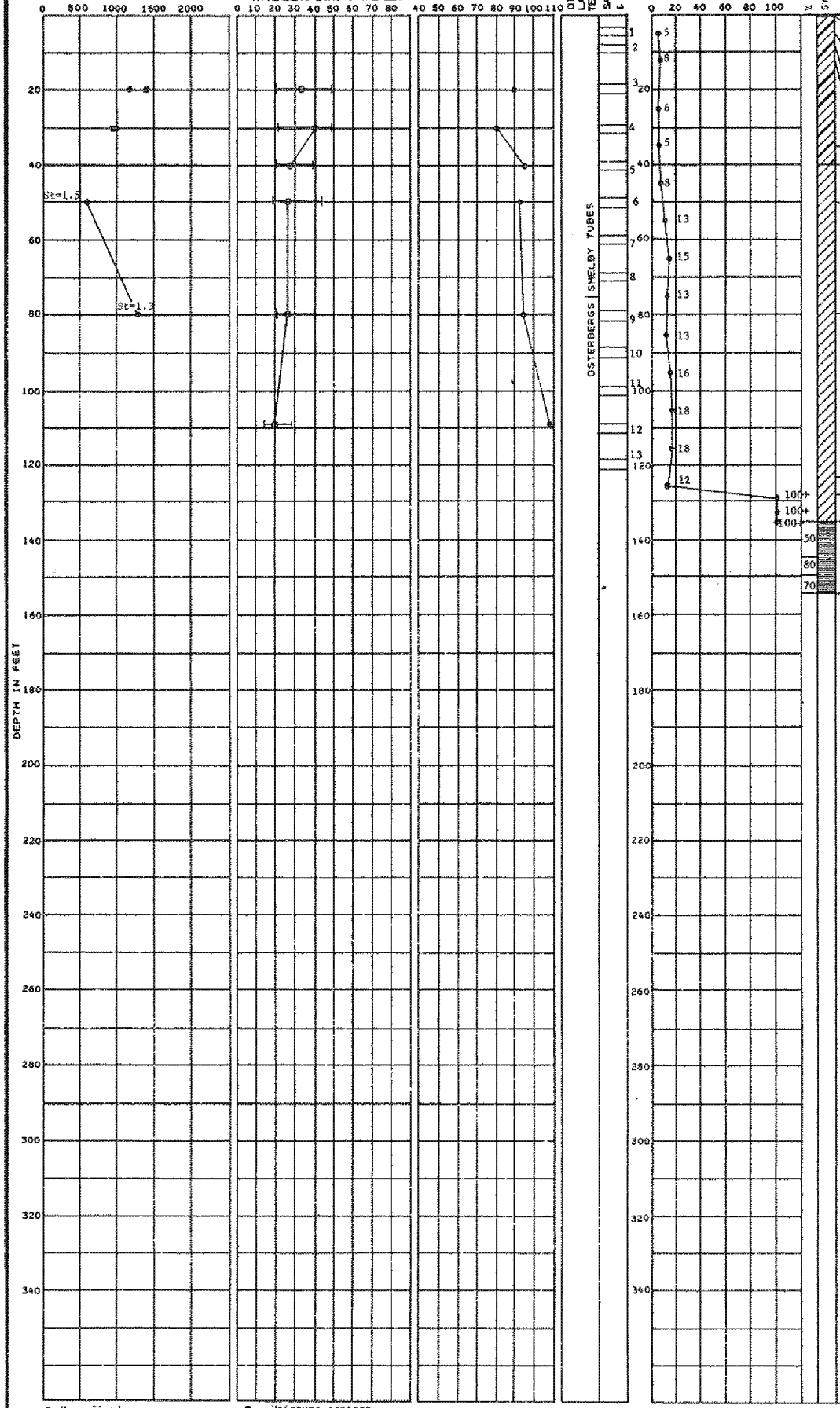
8-55

LOCATION: N 2,052 E15,176

GROUND ELEVATION 580.6

DATE DRILLED: 12-21-73 1-7-74

SHEET 1 OF 1



DESCRIPTION

cinder coal (fill)
medium, brown, silty Clay (CL-CH) (possible fill)
soft, brown, some peaty structure (possible fill or river sediments)
plastic, brown & gray
trace sand

plastic, gray, trace sand and pebbles

firm, moderately plastic, gray, silty Clay (CL) 20-30% fine to coarse sand and fine gravel
15-20% fine to coarse sand

15% fine to coarse sand and fine gravel

firm, gray, some fine sand, few pebbles
Very hard, gray, some pebbles, seams of fine sand (Hardpan)

135.0-154.9 ft Shale, gray, silty, highly hackly fractured, breaks easily. 137.8-140.3 ft local dip approximatel 30°, firm. 146.5-150.0 ft local dip approximately 30°, firm

Bottom of Hole-Elevation-425.7
-Depth-154.9 ft

For Water Table information consult Section 4.1.3.

Hole backfilled with Bentonite and natural soil in soil and cement grout in rock.

● Unconfined
■ Unconsolidated Undrained
St = Sensitivity

○ Moisture content
⊢⊣ Atterberg limits

SOIL BORING NO. 53

BECHTEL Belle River

B-57

DUNN 19-73

LOCATION: N 2,645 E 15,506

GROUND ELEVATION 547.9

DATE DRILLED: 3-29-74

SHEET 1 OF 1

SHEARING STRENGTH (LBS./SQ.FT.) 0 500 1000 1500 2000

MOISTURE CONTENT (% OF DRY WT.) ATTERBERG LIMITS (PL-LL) 0 10 20 30 40 50 60 70 80

DENSITY (LBS./CU. FT.) 40 50 60 70 80 90 100 110

OTHER LABORATORY TESTS

SAMPLE TYPE & NUMBER

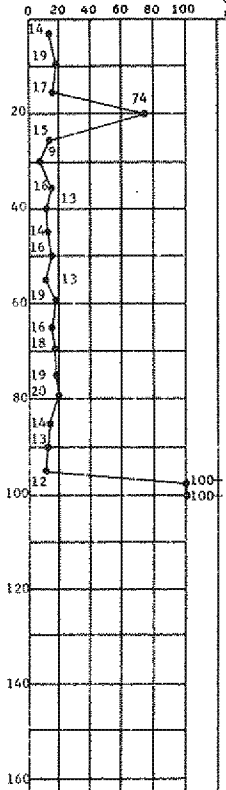
NO. BLOWS PER FOOT OR SAMPLE PRESSURE 0 20 40 60 80 100

CORE RECOVERY

SYMBOL

DEPTH IN FEET 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300 320 340

NO UNDISTURBED SAMPLES TAKEN



DESCRIPTION

medium compact, gray, medium to coarse Sand (SW) coal

firm, brownish gray, silty, sandy Clay (CL) coarse sand seams

very compact, gray Silty Sand (SM) fine

soft, gray, silty Clay (CH)

firm, gray, clayey Silt(ML)

medium, gray, silty Clay (CL) some sand and gravel

soft, trace sand and gravel

soft, reddish, silty, sandy clay some gravel

very compact, gray Silty Sand (SM) fine, trace shale

97.5-100.0ft Shale, gray, soft

Bottom of Hole-Elevation-447.9
-Depth-100.0ft

Note: Hole drilled from drilling platform in 30.9ft of water.

For Water Table information consult Section 4.1.3.

Hole backfilled with Bentonite and soil

SOIL BORING NO. 55

BECHTEL Bella River

B-59

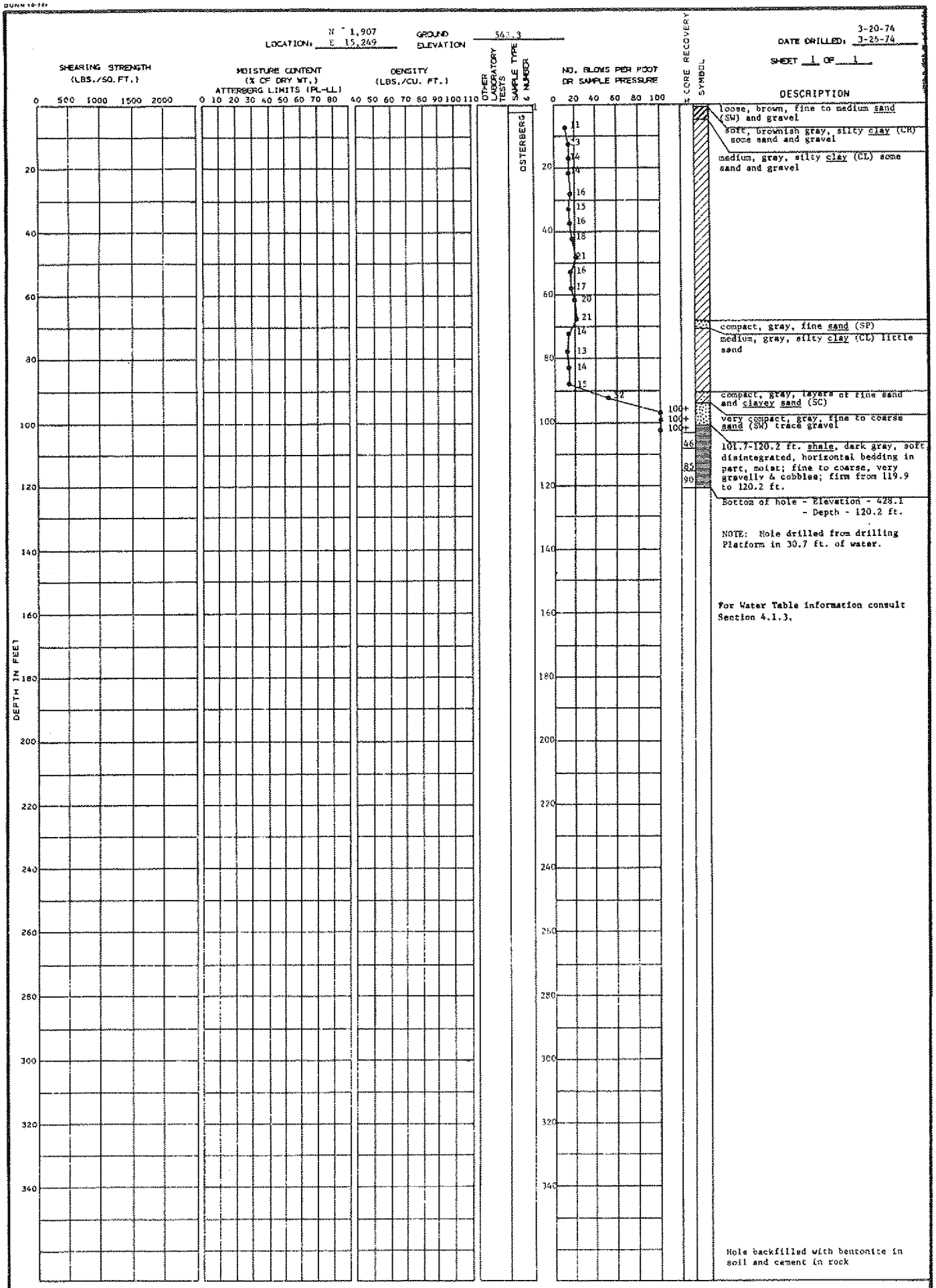
ED_005947A_00014556-00368

LOCATION: N 1,907 E 15,269

GROUND ELEVATION 543.3

DATE DRILLED: 3-20-74 3-26-74

SHEET 1 OF 1



SOIL BORING NO. 57

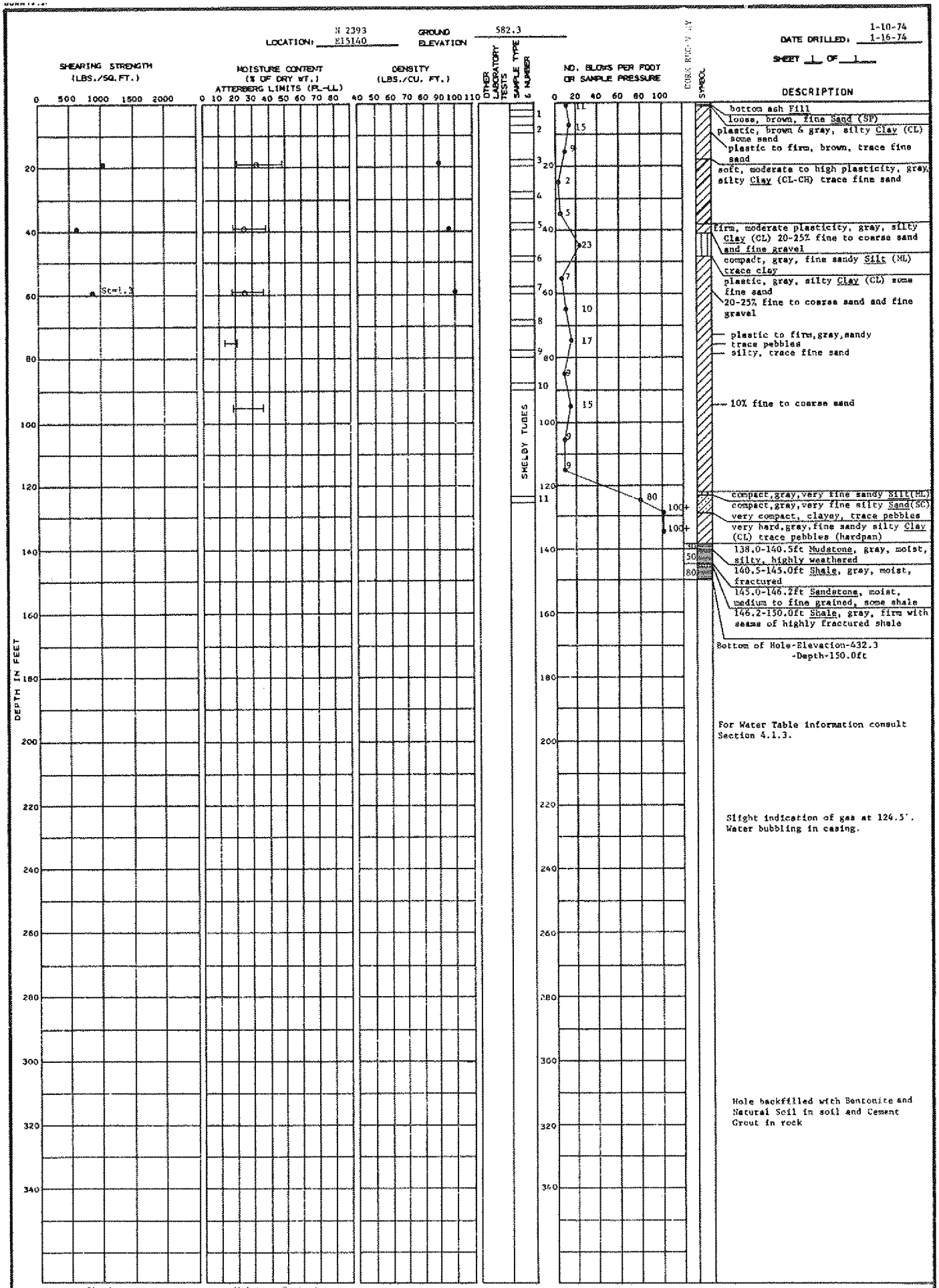
BECHTEL Belle River

LOCATION: N 2393 E15140

GROUND ELEVATION 582.3

DATE DRILLED: 1-10-74 1-16-74

SHEET 1 OF 1



● Unconfined
St. = Sensitivity

O Moisture Content
⊢⊣ Atterberg Limits

SOIL BORING NO. 59

BECHTEL Belle River

B-63

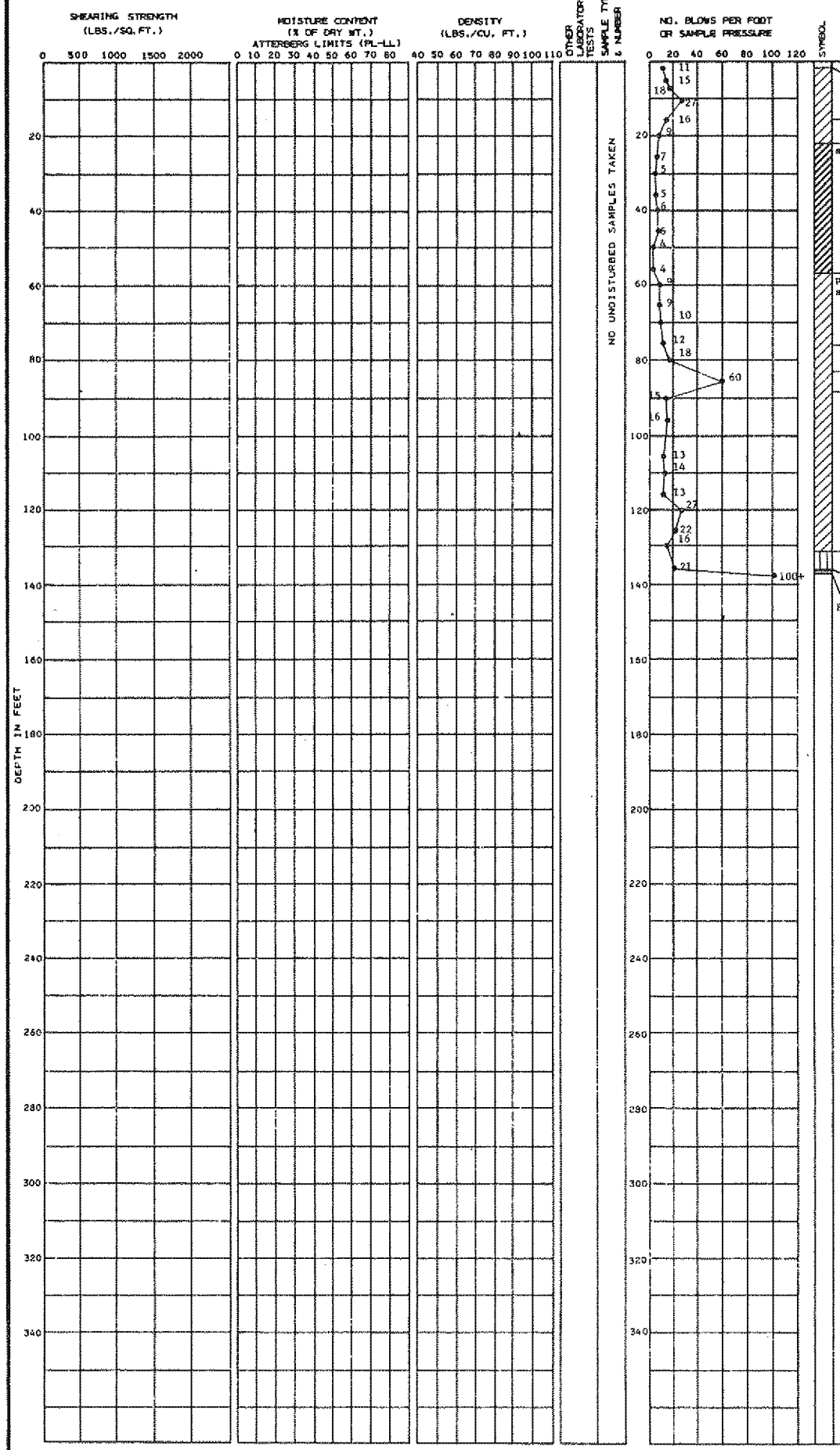
ED_005947A_00014556-00370

LOCATION: N 5,283 E 14,042

GROUND ELEVATION 593.1

DATE DRILLED: 1-23-74 1-29-74

SHEET 1 OF 1



DESCRIPTION

fill, cinders, clay, etc.
firm to stiff, brown, silty Clay (CL) trace fine sand
—plastic, gray

soft, gray silty Clay (CH)

plastic, gray silty Clay (CL) trace fine sand, few pebbles
—firm, sandy silty Clay (CL) few pebbles
—stiff, fine sandy silty
—plastic, silty Clay (CL), some fine sand

fairly compact, gray, clayey Silt (ML) trace Shale, pebbles
135.0-136.0ft Shale, gray, soft, weathered with sand seams
Bottom of Hole-Elevation-457.1
-Depth-136.0ft

For Water Table information consult Section 4.1.3.

Hole backfilled with Bentonite and natural soil.

SOIL BORING NO. 63

BECHTEL Belle River

B-65

LOCATION: N 9,208.32 E 9,376.12 GROUND ELEVATION 587.6

DATE DRILLED: 2-28-74 3-7-74

SHEET 1 OF 1

SHEARING STRENGTH (LBS./SQ. FT.) 0 500 1000 1500 2000

MOISTURE CONTENT (% OF DRY WT.) ATTERBERG LIMITS (PL-LL) 0 10 20 30 40 50 60 70 80

DENSITY (LBS./CU. FT.) 40 50 60 70 80 90 100 110

OTHER LABORATORY TESTS

SAMPLE TYPE & NUMBER

NO. BLOWS PER FOOT OR SAMPLE PRESSURE 0 20 40 60 80 100

CORE RECOVERY %

SYMBOL

DEPTH IN FEET 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300 320 340

OSTERBERGS

DESCRIPTION

sandy topsoil

plastic, brown, sandy clay (CL) firm to stiff, silty clay, some fine sand

plastic, gray, trace fine sand

very soft to soft, gray, silty clay (CH)

Lost approximately 25 gallons of water between 55.0 - 70.5 ft.

plastic to firm, gray, silty clay (CL) some fine sand

stiff, same, few pebbles

soft to plastic

medium compact, gray sand (SP) fine

compact, gray sand (SW) very fine to medium, few pebbles

medium compact, gray silt (ML) some fine sand

143.5-166.5 ft. shale, gray

143.5-145.5 ft. soft, trace of clay and pebbles

145.5-156.5 ft. soft, highly fractured

155.5-166.5 ft. [illegible] bedded light and dark gray, firm, horizontal bedding, locally contorted, abundant quartz veins

Bottom of hole - Elevation - 421.2
- Depth - 166.5 ft.

BENCH MARK OBR - 3
16.5' of cement grout from 166.5' to 150.0'; 150.0' of 2" PVC blank casing from 150.0' to surface; casing cemented to surface and bench mark plate placed on top.
Benchmark Elev - 588.0

For Water Table information consult Section 4.1.3.

SOIL BORING NO. 65

BECHTEL Belle River

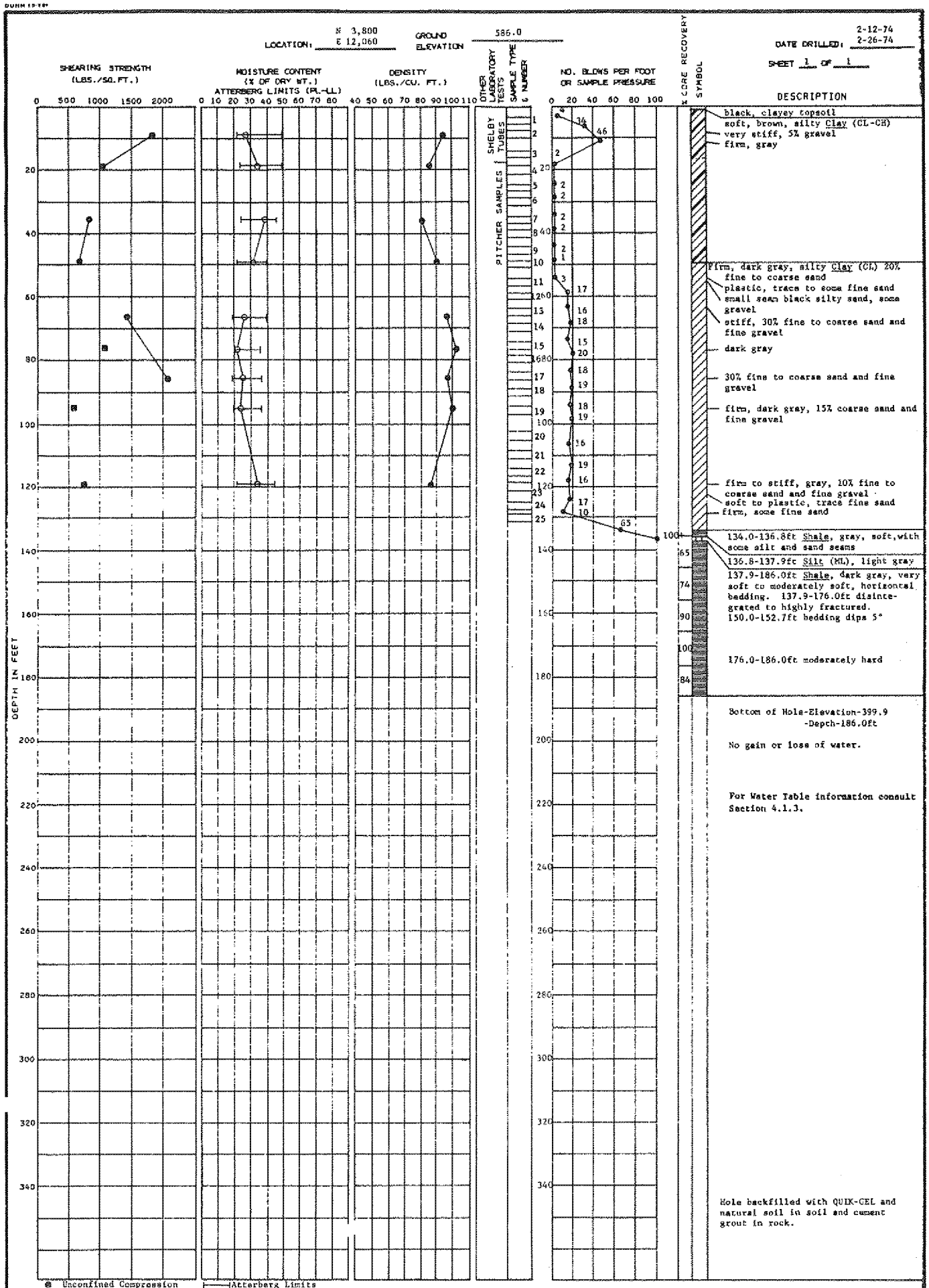
B-07

LOCATION: N 3,800 E 12,060

GROUND ELEVATION 586.0

DATE DRILLED: 2-12-74 2-26-74

SHEET 1 OF 1



Bottom of Hole-Elevation-399.9
-Depth-186.0ft

No gain or loss of water.

For Water Table information consult Section 4.1.3.

Hole backfilled with QUIK-GEL and natural soil in soil and cement grout in rock.

SOIL BORING NO. 101

BECHTEL Belle River

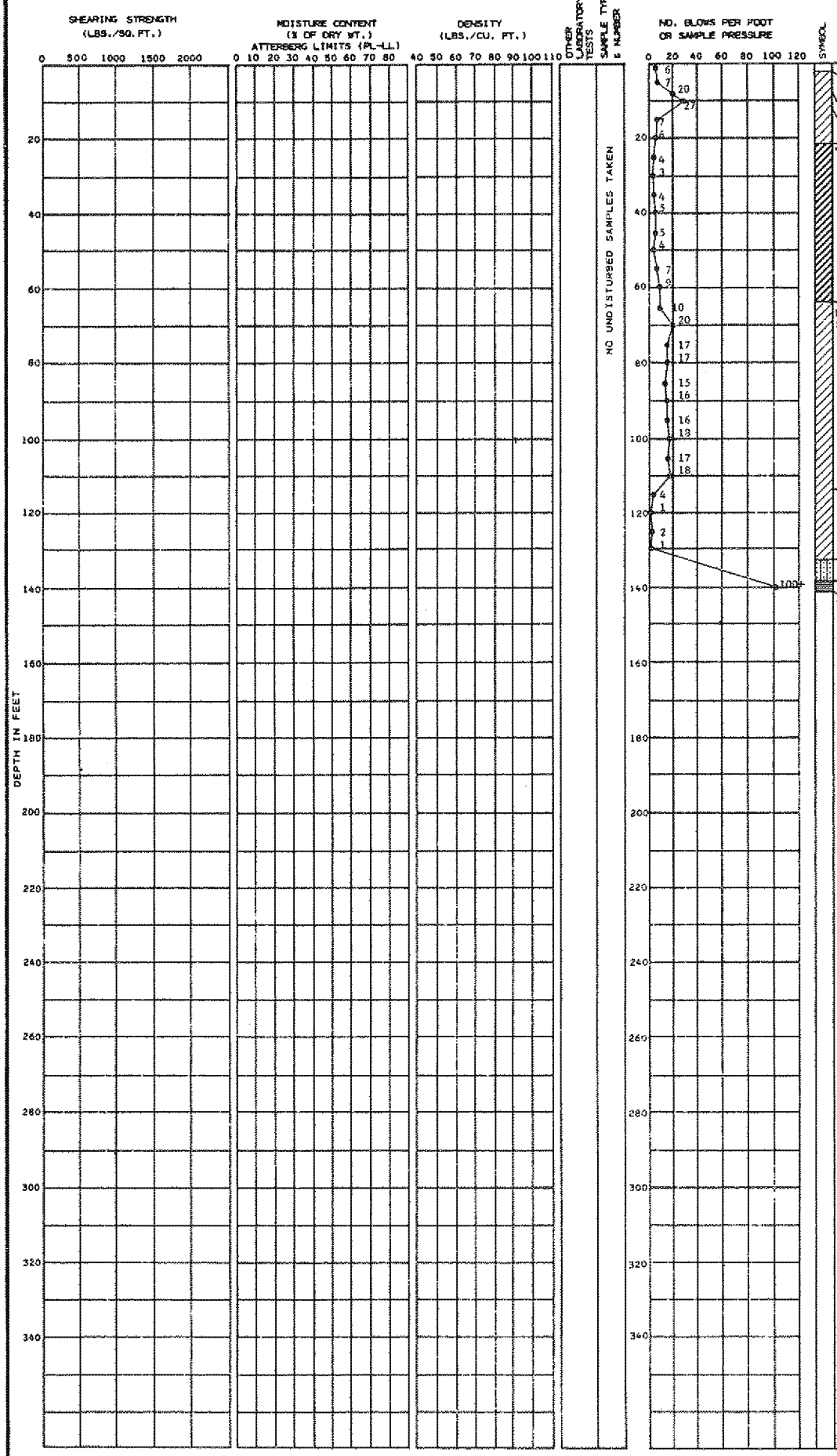
B-69

LOCATION: N 4,435 E 12,350

GROUND ELEVATION 589.7

DATE DRILLED: 2-5-74 2-7-74

SHEET 1 OF 1



DESCRIPTION

clay, wood, cinders, fill

plastic to firm, brown, silty Clay (CL) some gray pockets, trace fine sand

firm

plastic, gray

very soft to soft, gray, silty Clay (CH)

plastic, gray, silty Clay (CL) trace fine sand, few pebbles

soft

compact, gray, silty Sand (SM) with some gravel

139.0-141.0ft Shale, gray, soft

Bottom of Hole-Elevation-448.7
-Depth-141.0ft

No gain or loss of water.

For Water Table information consult Section 4.1.3.

Hole backfilled with Quik-Gel and natural soil.

SOIL BORING NO. 103

BECHTEL Belle River

B-71

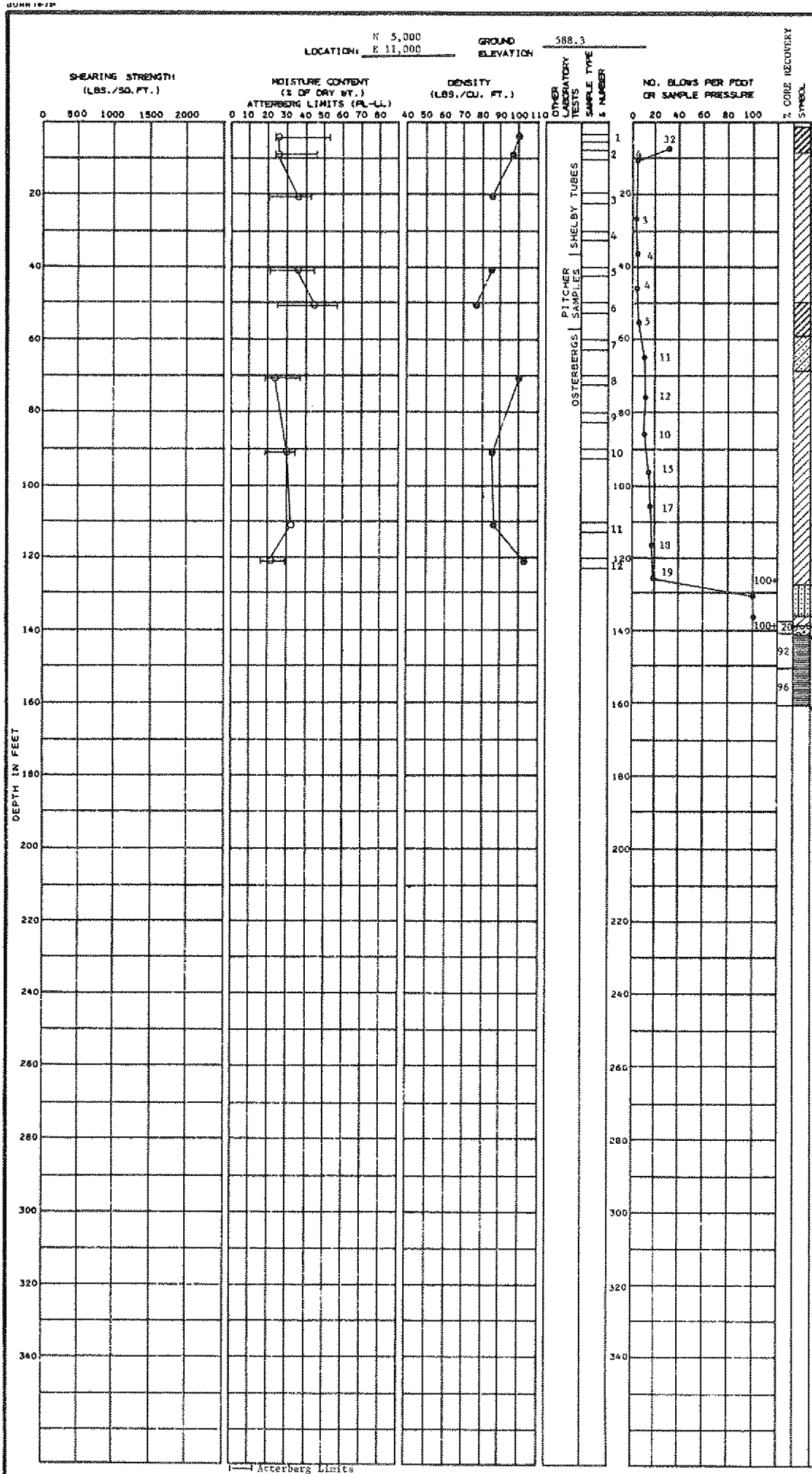
ED_005947A_00014556-00374

LOCATION: N 5,000 E 11,000

GROUND ELEVATION 588.3

DATE DRILLED: 2-26-74 3-5-74

SHEET 1 OF 1



DESCRIPTION

Black clayey topsoil

Plastic, brown, sandy, gravelly clay (CH)

very stiff to hard, silty clay, some fine sand, 5% gravel

Very stiff, olive brown & grayish brown, silty Clay (CL) 5% gravel

medium, gray, 5% fine to coarse sand

medium, gray brown, 5% fine to coarse sand

Medium, gray, silty Clay (CH) highly plastic

Medium, gray, clayey sand (SC), trace gravel

Stiff, gray, silty clay (CL) 20% fine to coarse sand and fine gravel

soft, gray, 10% fine to coarse sand

15% fine to coarse sand

medium, dark gray, sandy, 35% fine to coarse sand

Compact, gray, fine silty sand (SM) trace pebbles

Hard, gray, silty clay (CL), some sand and shale chips

138.5-141.0 ft gravel (GP), dark gray shale and granitic cobbles

141.0-160.3 ft. shale, dark gray, soft to firm

141.0-150.3 ft. disintegrated to fractured

150.3-160.3 - fractured to intact

Bottom of hole - Elevation - 428.0
- Depth - 160.3 ft

No gain or loss of water

For Water Table information consult Section 4.1.3.

Hole backfilled with quik-gel and natural soil in soil and cement in rock

SOIL BORING NO. 105

BECHTEL Belle River

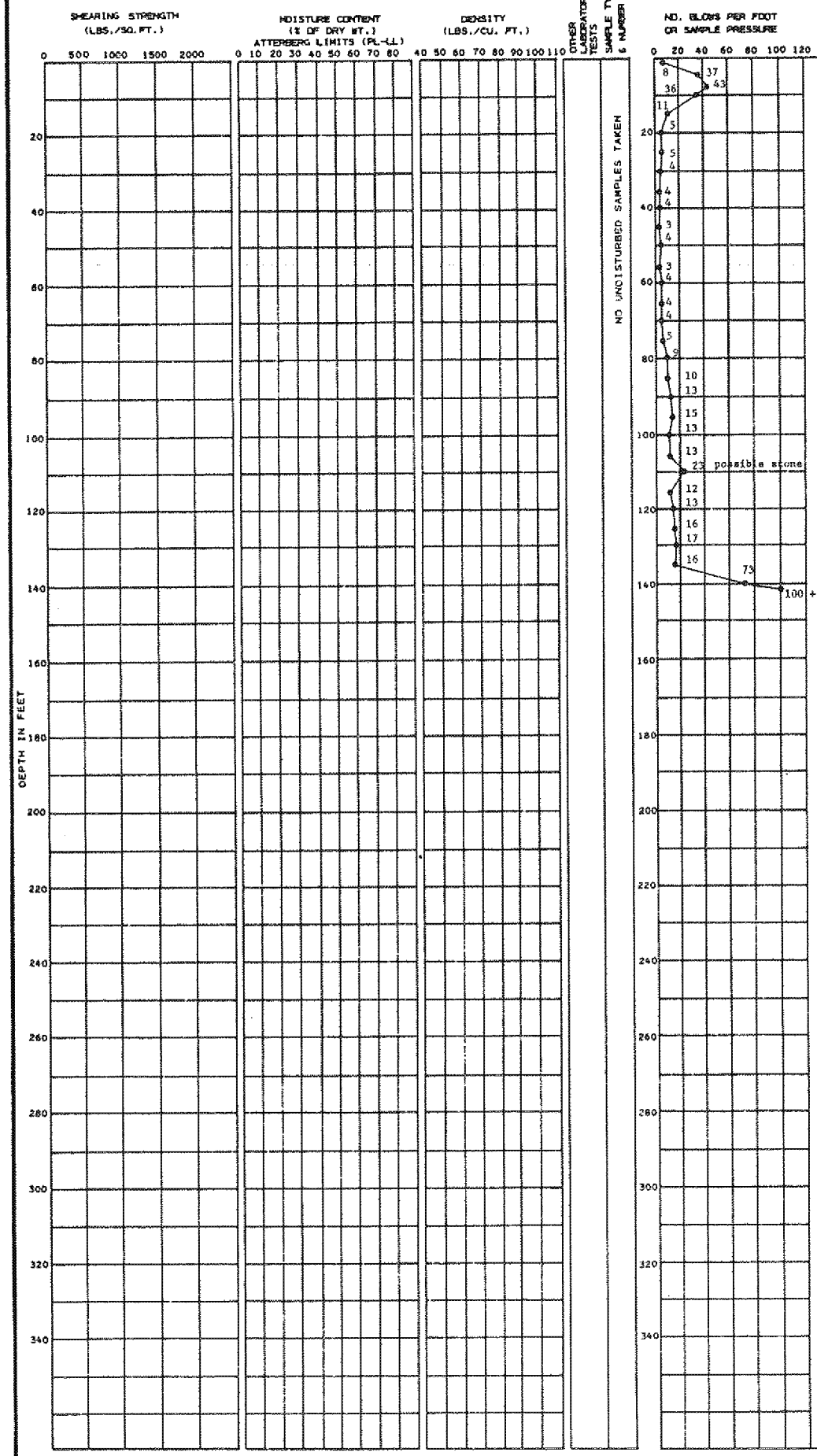
B-73

LOCATION: S 6,450 E 13,140

GROUND ELEVATION 600.7

DATE DRILLED: 2-26-74 3-6-74

SHEET 1 OF 1



SYMBOL

DESCRIPTION

sandy topsoil

medium compact, brown, very fine to medium Sand (SW)

firm, brown, sandy Clay (CL)

stiff, silty clay, some fine sand with gray mottling

plastic, gray, trace very fine sand

soft, gray, silty Clay (CH) slight trace very fine sand

plastic, gray, silty Clay (CL) some very fine sand

plastic to firm, some fine sand 1.3' boulder

compact, gray, very fine Sand and Silt (SM)

142.0 - 142.67ft Shale, soft, gray, broken

Bottom of Hole-Elevation-458.03
-Depth-142.67ft

No gain or loss of water.

For Water Table information consult Section 4.1.3.

Hole backfilled with Quik-Gel and natural soil.

SOIL BORING NO. 109

BECHTEL Belle River

B-75

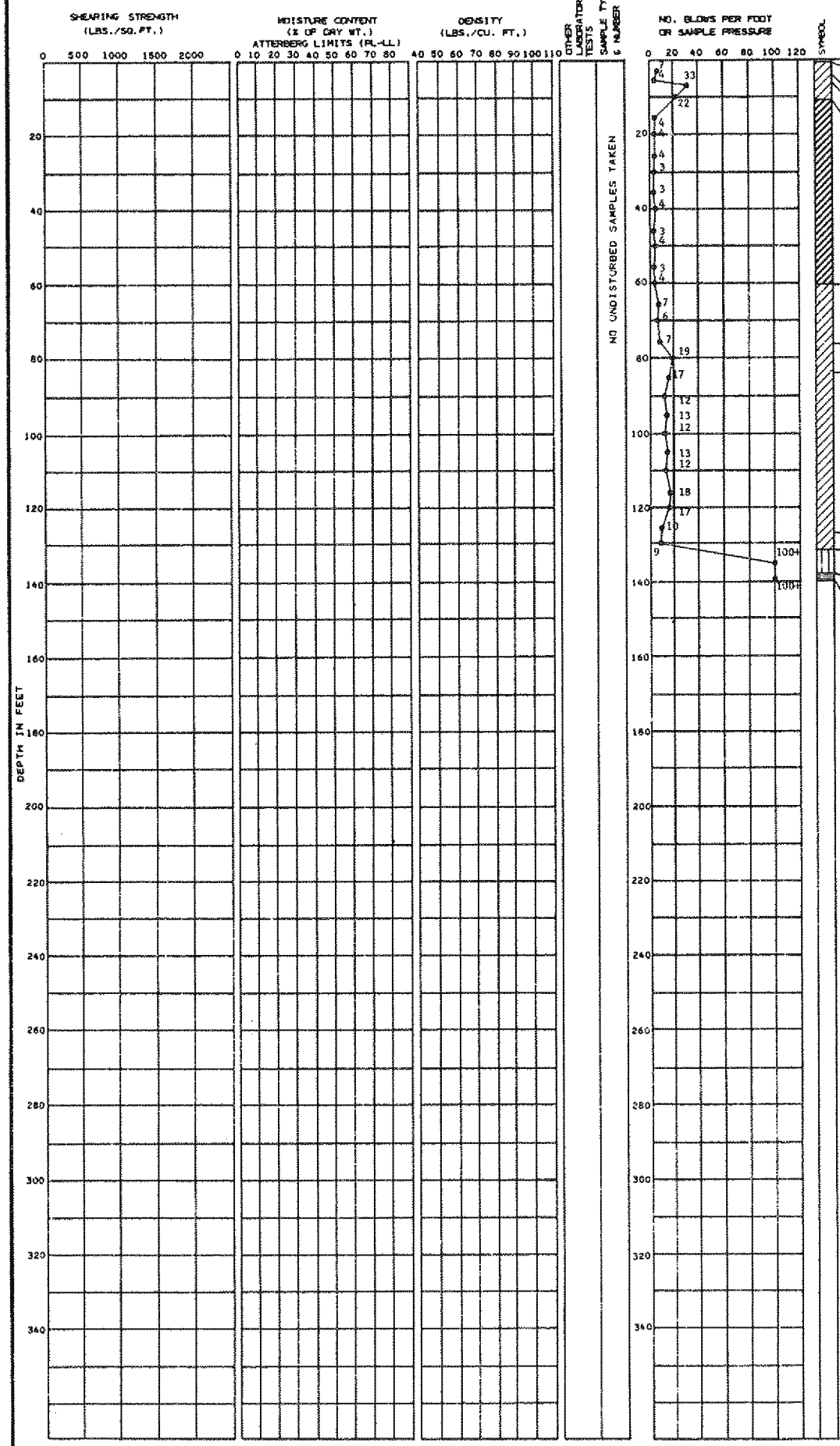
ED_005947A_00014556-00376

LOCATION: N 6,600 / E 11,000

GROUND ELEVATION 588.5

DATE DRILLED: 2-21-74 / 2-26-74

SHEET 1 OF 1



DESCRIPTION

Cinders, fill

Plastic, brown & gray, silty clay (CL)

Firm, some fine sand

Stiff

Very soft to soft, gray, silty clay (CH)

Plastic, gray, silty clay (CL), some fine sand

Firm, few pebbles

Plastic to firm

Soft to plastic

Compact, gray silt (ML), some clay & very fine sand

138.0-140.0 ft shale, gray, soft

Bottom of hole - Elevation - 438.5
Depth - 140.0 ft

No gain or loss of water

For Water Table information consult Section 4.1.3.

Hole backfilled with Quik-Gel and natural soil

SOIL BORING NO. 111

BECHTEL Belle River

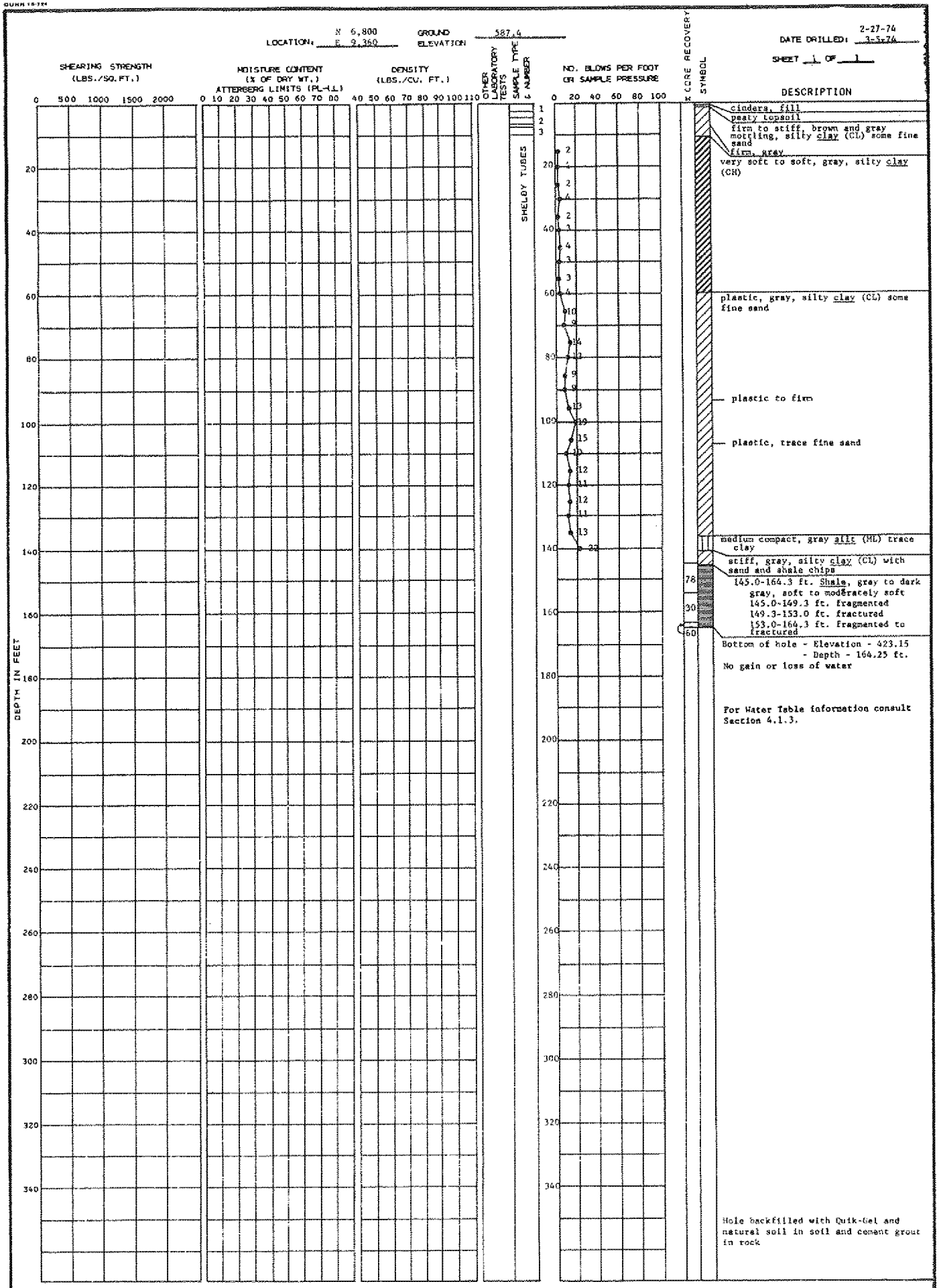
B-77

LOCATION: N 6,800 E 9,360

GROUND ELEVATION 587.6

DATE DRILLED: 2-27-74 3-5-74

SHEET 1 OF 1



SOIL BORING NO. 113

BECHTEL Belle River

B-79

LOCATION: N 7,100 E13,060

GROUND ELEVATION 600.7

DATE DRILLED: 1-30-74 2-6-74

SHEET 1 OF 1

SHEARING STRENGTH (LBS./SQ. FT.) 0 500 1000 1500 2000

MOISTURE CONTENT (% OF DRY WT.) ATTERBERG LIMITS (PL-LL) 0 10 20 30 40 50 60 70 80

DENSITY (LBS./CU. FT.) 40 50 60 70 80 90 100 110

OTHER LABORATORY TESTS

SAMPLE TYPE & NUMBER

NO. BLOWS PER FOOT OR SAMPLE PRESSURE 0 20 40 60 80 100 120

SYMBOL

DEPTH IN FEET 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300 320 340

SHELBY TUBES 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

16 33 7 5 5 4 4 4 7 10 8 10 13 15 14 100+ 100+

DESCRIPTION

sandy topsoil

stiff, brown, Clay (CL)

stiff, gray, silty sandy

soft, trace fine sand

very soft to soft, gray, silty Clay(CH)

plastic, gray, silty Clay (CL) some fine sand

compact, gray Silt (ML)

compact, gray, silty, very fine Sand (SM)

142.0-144.0ft Shale, gray, soft

Bottom of Hole-Elevation-456.7
-Depth-144.0ft

For Water Table information consult Section 4.1.3.

No Gain or Loss of Water

Hole Backfilled With Quick-Gel and Natural Soil

SOIL BORING NO. 115

BECHTEL Belle River

B-81

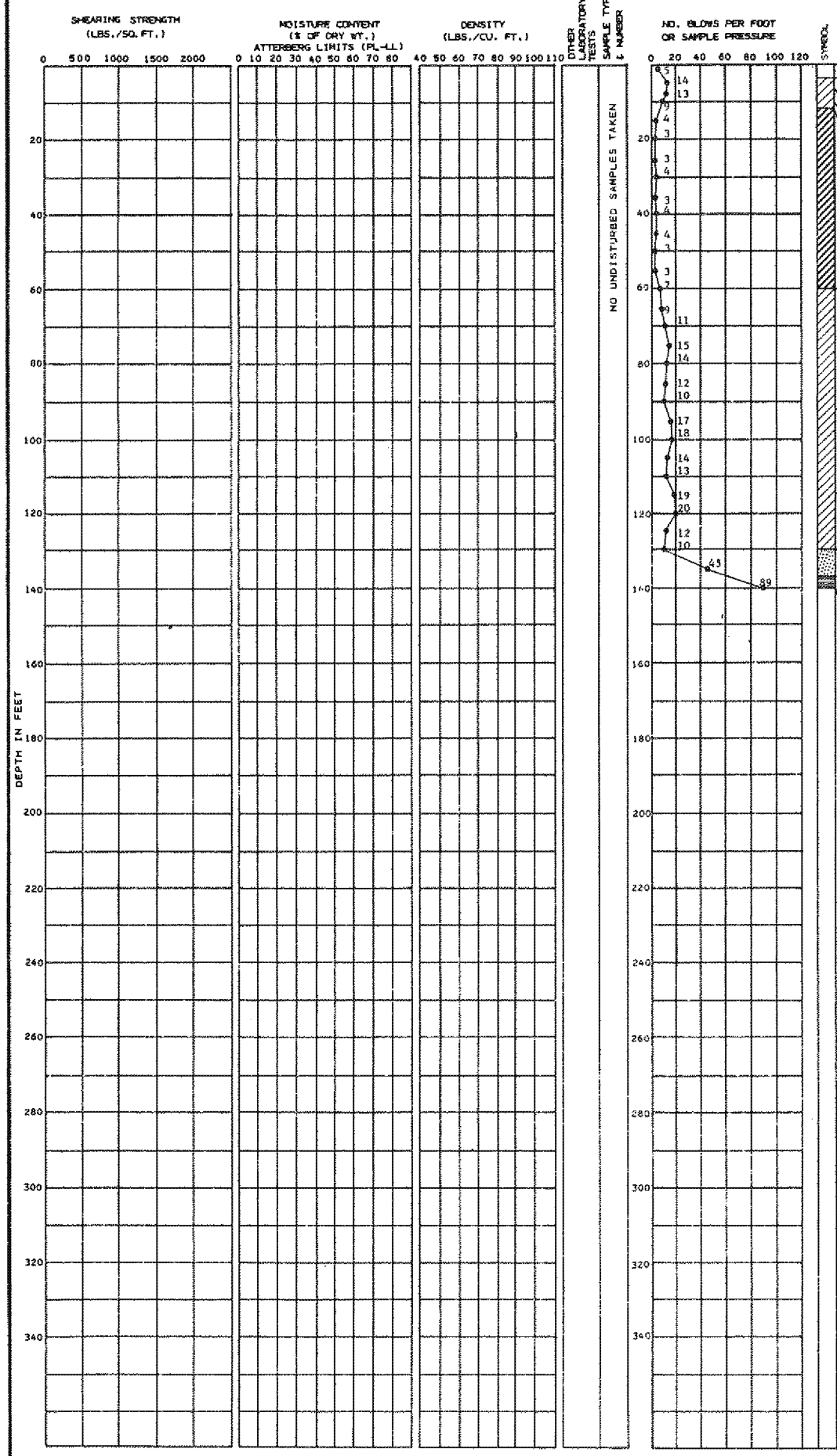
DUNN 10-TP

LOCATION: N 7,270 E 9,360

GROUND ELEVATION 585.5

DATE DRILLED: 2-5-74 2-12-74

SHEET 1 OF 1



SYMBOL

DESCRIPTION

clay, ash, gravel fill

stiff, brown, silty Clay (CL) some fine sand

firm, brown & gray, trace fine sand

plastic, gray, trace very fine sand

very soft to soft, gray, silty Clay (CH)

plastic, gray, silty Clay (CL) some fine sand

firm

plastic, trace fine sand

Sand (SP)

137.0-140.0ft Shale, gray, soft, interbedded with hard gray clay

Bottom of Hole-Elevation-445.5
-Depth-140.0ft

For Water Table information consult Section 4.1.3.

No Gain or Loss of Water

Hole Backfilled With Quick-Gel and Natural Soil

SOIL BORING NO. 117

BECHTEL Bella River

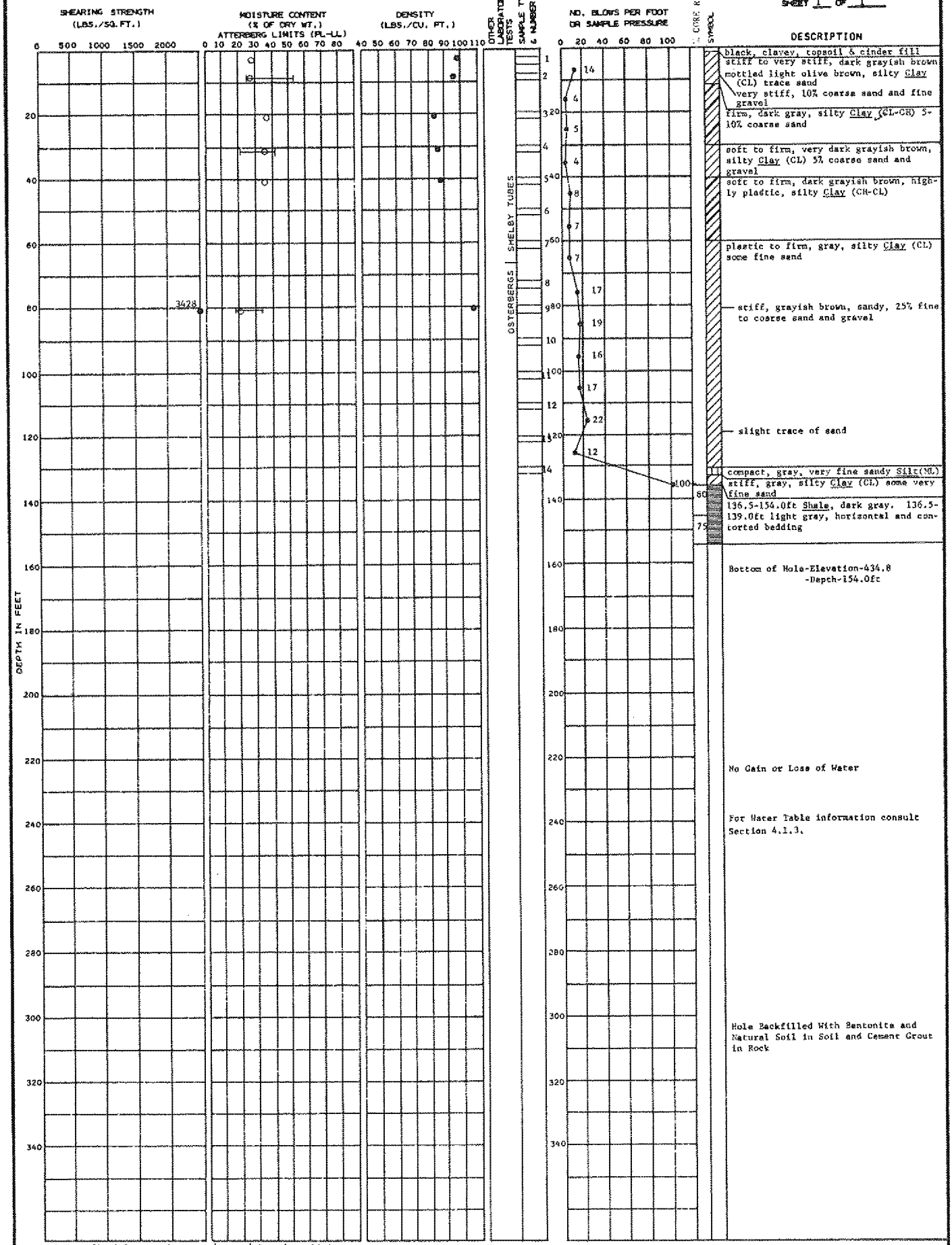
B-83

LOCATION: N 7,510 E11,300

GROUND ELEVATION 588.8

DATE DRILLED: 1-29-74 2-5-74

SHEET 1 OF 1



SOIL BORING NO. 119

BECHTEL Belle River

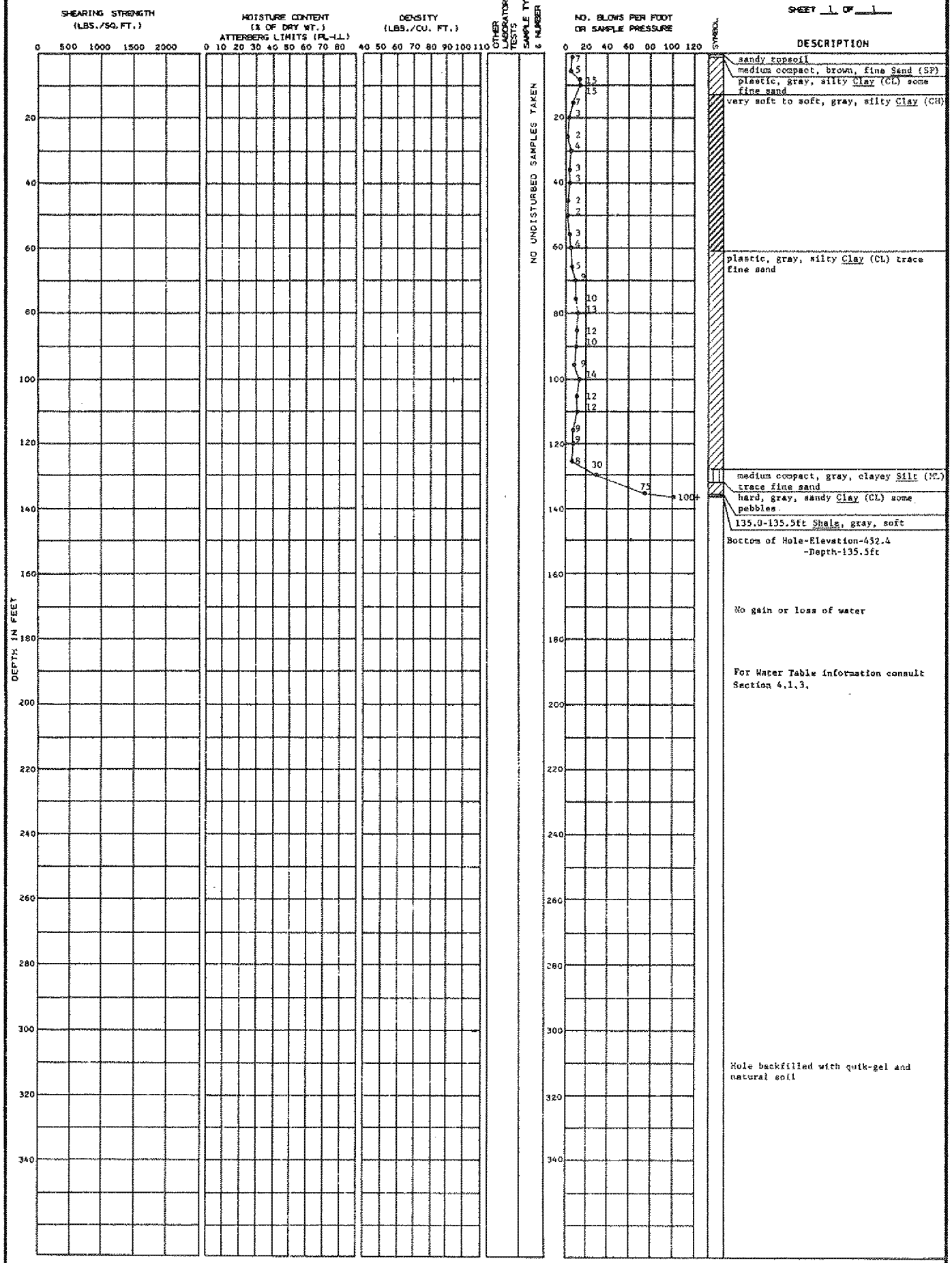
B-85

LOCATION: N 7,660 E 10,630

GROUND ELEVATION 587.9

DATE DRILLED: 2-14-74 2-19-74

SHEET 1 OF 1



DESCRIPTION

sandy topsoil

medium compact, brown, fine Sand (SP)

plastic, gray, silty Clay (CL) some fine sand

very soft to soft, gray, silty Clay (CH)

plastic, gray, silty Clay (CL) trace fine sand

medium compact, gray, clayey Silt (ML) trace fine sand

hard, gray, sandy Clay (CL) some pebbles

135.0-135.5ft Shale, gray, soft

Bottom of Hole-Elevation-452.4
-Depth-135.5ft

No gain or loss of water

For Water Table information consult Section 4.1.3.

Hole backfilled with quik-gel and natural soil

SOIL BORING NO. 121

BECHTEL Belle River

B-87

LOCATION: N 8,017 E 4,999

GROUND ELEVATION 588.9

DATE DRILLED: 3-25-74

SHEET 1 OF 1

SHEARING STRENGTH (LBS./SQ. FT.) 0 500 1000 1500 2000

MOISTURE CONTENT (% OF DRY WT.) ATTERBERG LIMITS (PL-LL) 0 10 20 30 40 50 60 70 80

DENSITY (LBS./CU. FT.) 40 50 60 70 80 90 100 110

OTHER LABORATORY TESTS

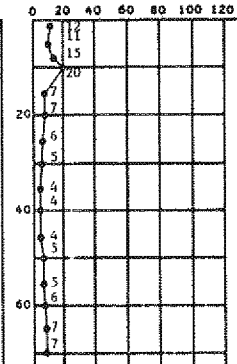
SAMPLE TYPE & NUMBER

NO. BLOWS PER FOOT OR SAMPLE PRESSURE 0 20 40 60 80 100 120

SYMBOL

DEPTH IN FEET 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300 320 340

NO UNDISTURBED SAMPLES TAKEN



DESCRIPTION

Gray, silty topsoil

Medium, mottled brown & gray, silty sandy clay (CL), trace of pebbles

Soft, gray, silty clay (CH), trace of sand

Bottom of hole - Elevation - 518.9
- Depth - 70.0 ft

No gain or loss of water

For Water Table information consult Section 4.1.3.

Hole backfilled with Quik-Gel and natural soil

SOIL BORING NO. 123

BECHTEL Belle River

B-89

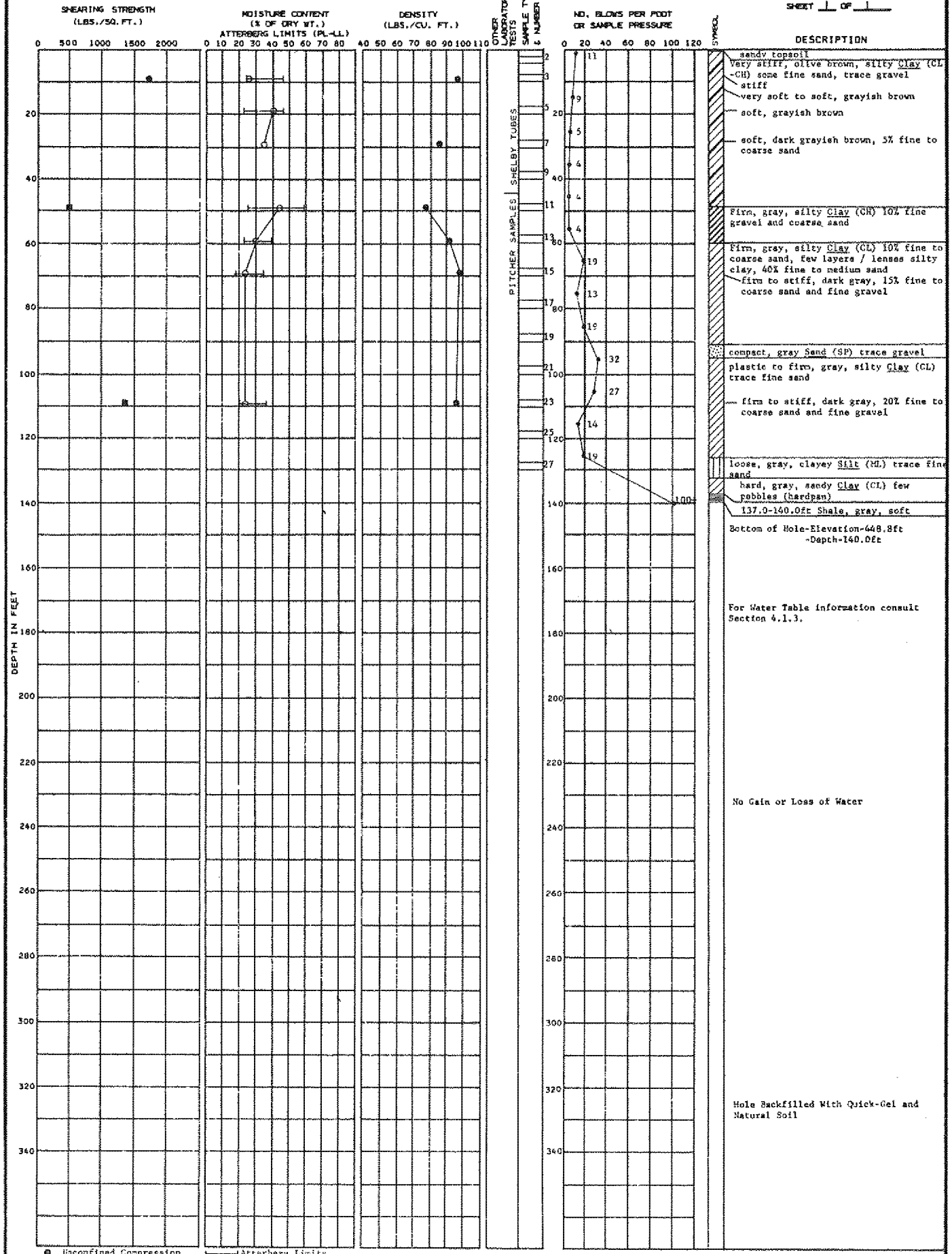
ED_005947A_00014556-00383

LOCATION: N 7,950 E 11,140

GROUND ELEVATION 588.8

DATE DRILLED: 2-1-74 2-6-74

SHEET 1 OF 1



DESCRIPTION

SOIL BORING NO. 126

BECHTEL Belle River

B-91

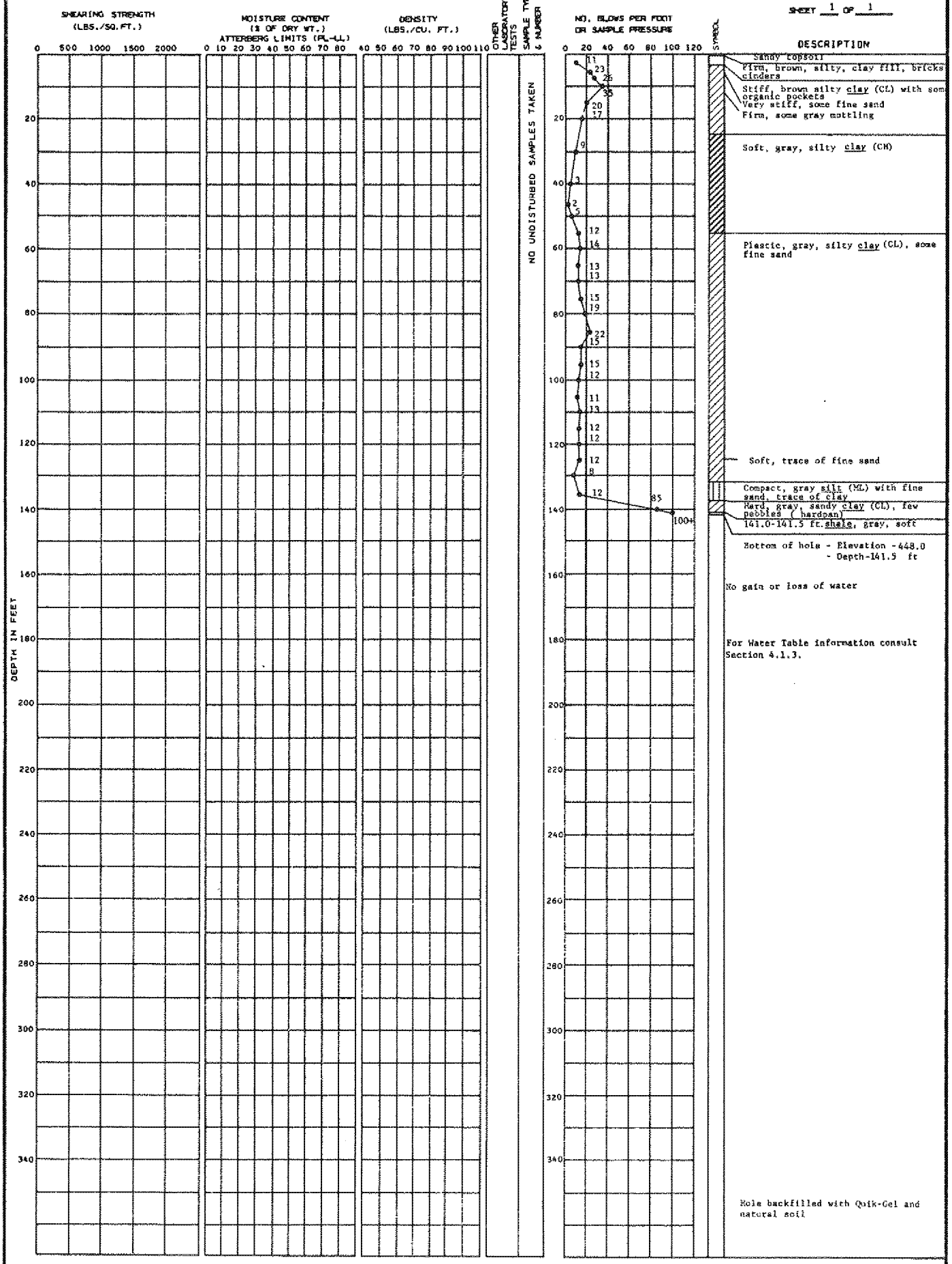
ED_005947A_00014556-00384

LOCATION: N 3,000 / E 11,000

GROUND ELEVATION 589.5

DATE DRILLED: 2-7-74 / 2-13-74

SHEET 1 OF 1



SOIL BORING NO. 128

BECHTEL Belle River

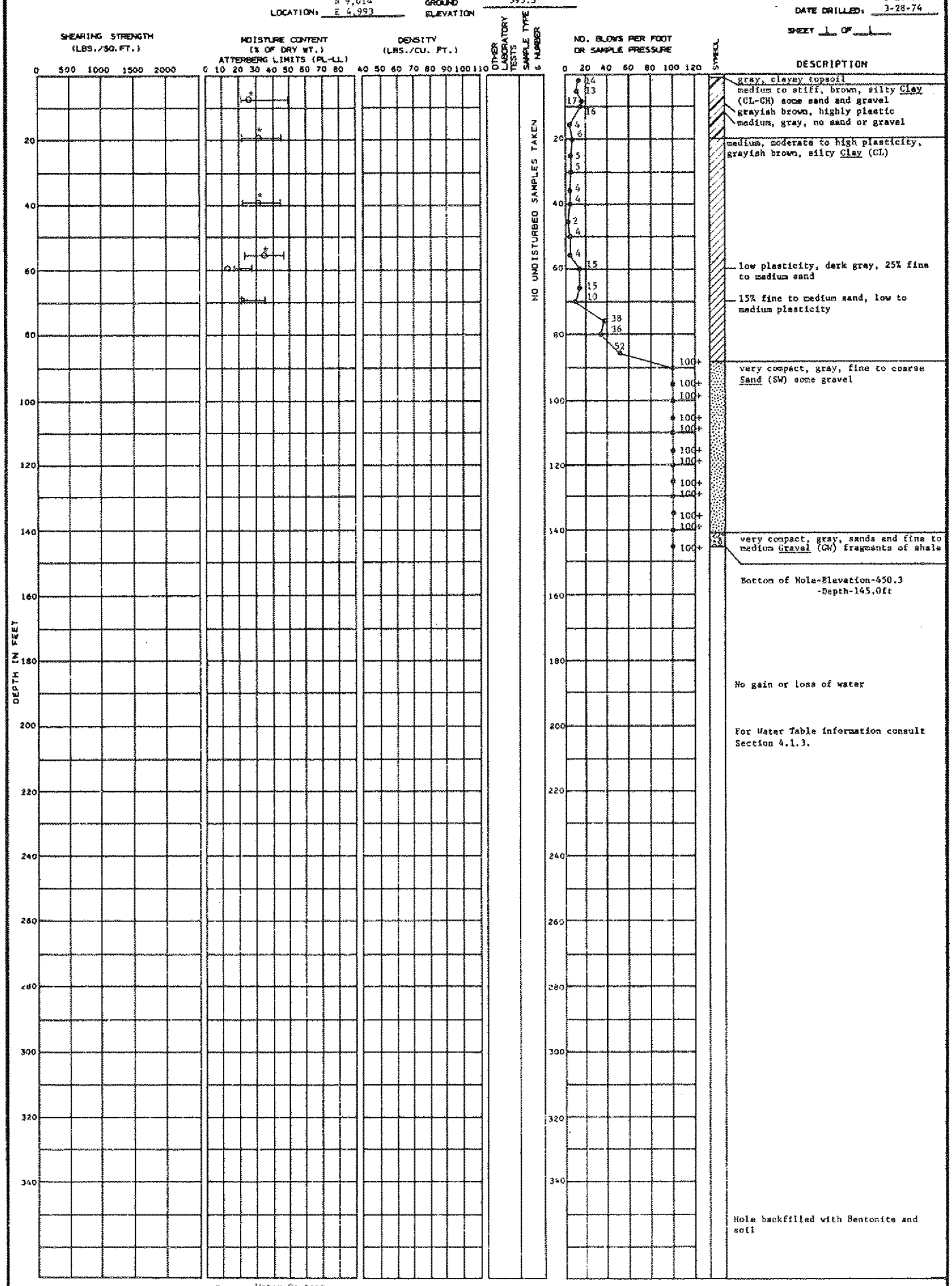
B-93

LOCATION: N 9,014 E 4,993

GROUND ELEVATION 595.3

DATE DRILLED: 3-26-74 3-28-74

SHEET 1 OF 1



○ Water Content

|—| Atterburg Limits

* Water content taken from unsealed jar sample.

SOIL BORING NO. 130

BECHTEL Belle River

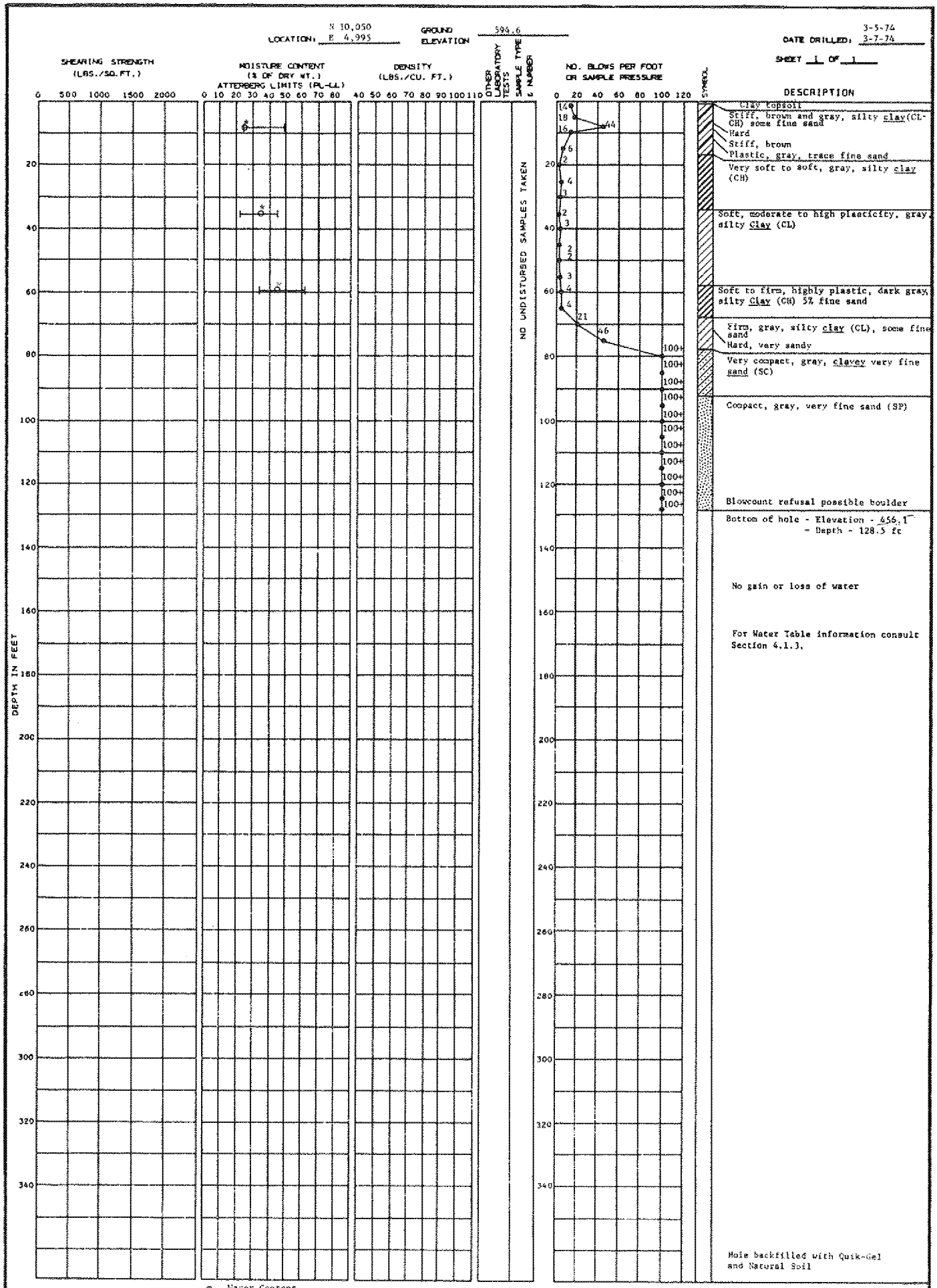
B-95

LOCATION: N 10,050 E 4,995

GROUND ELEVATION 594.6

DATE DRILLED: 3-5-74 3-7-74

SHEET 1 OF 1



SOIL BORING NO. 134

BECHTEL Belle River

B-97

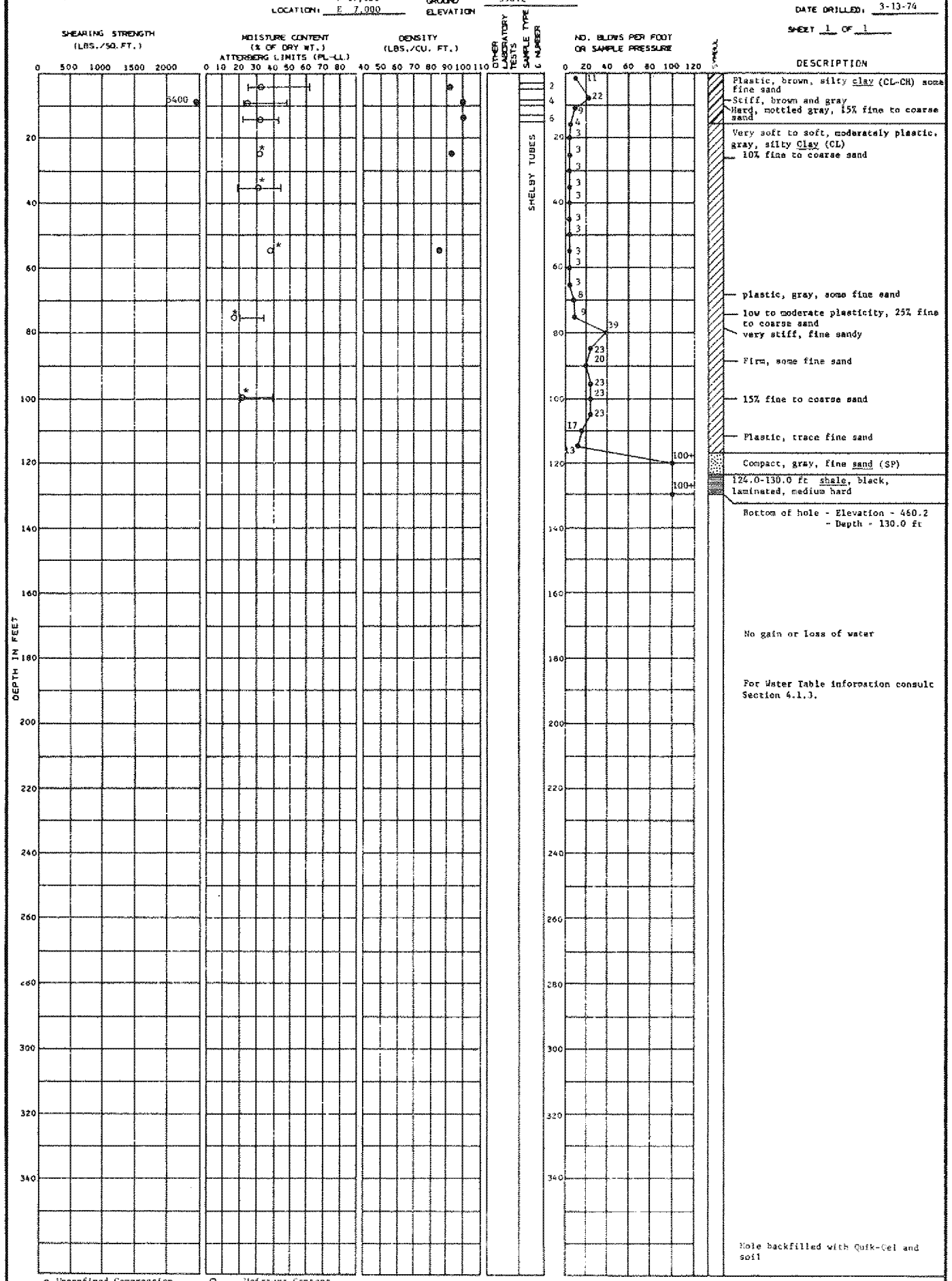
ED_005947A_00014556-00387

LOCATION: N 10,050 E 7,000

GROUND ELEVATION 590.2

DATE DRILLED: 3-8-74 3-13-74

SHEET 1 OF 1



SOIL BORING NO. 136

BECHTEL Belle River

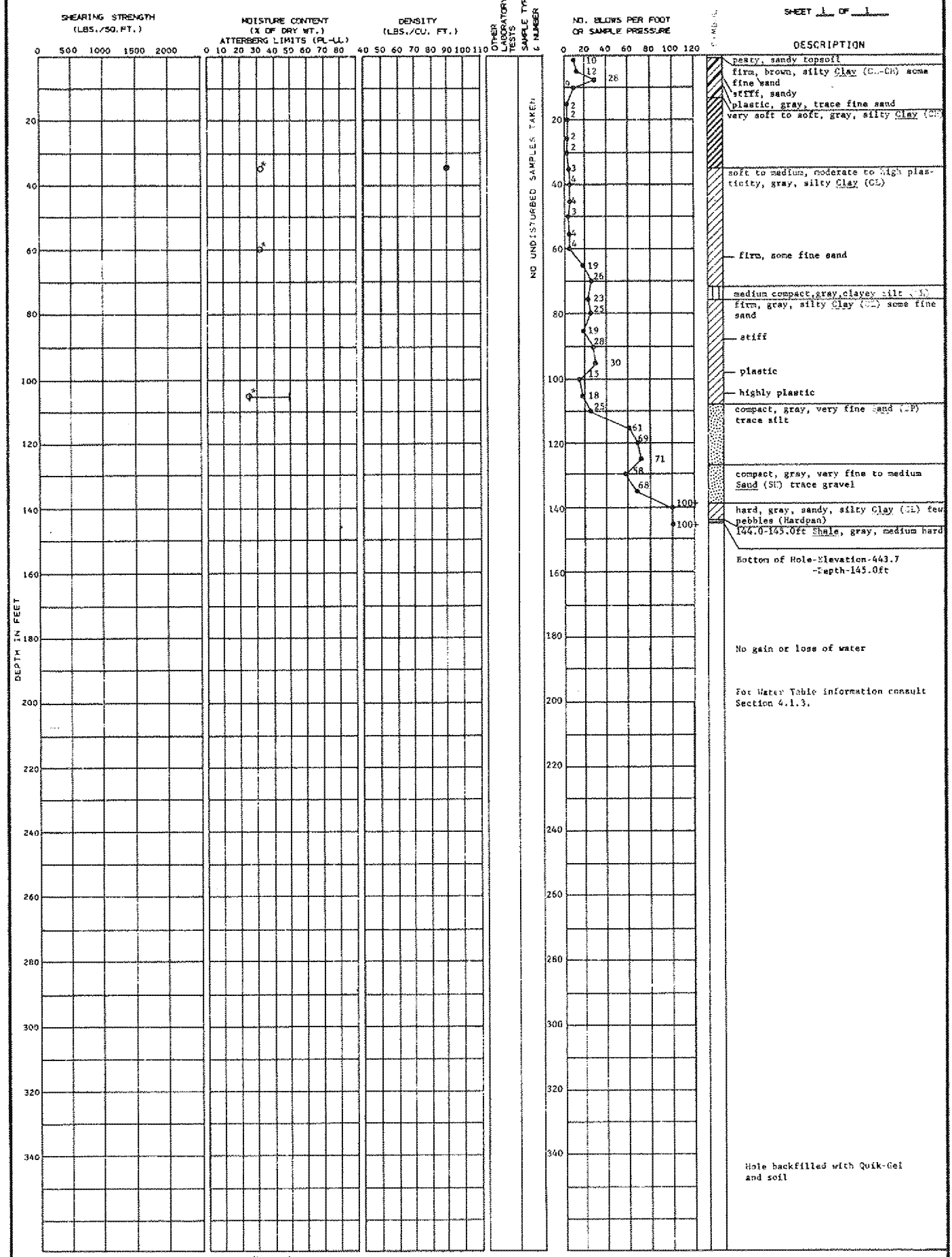
R-90

LOCATION: 10,030 / 5,977

GROUND ELEVATION 588.7

DATE DRILLED: 3-11-74 / 3-14-74

SHEET 1 OF 1



o Water Content

Atterburg Limits

Water content taken from unsealed jar sample.

SOIL BORING NO. 138

BECHTEL Belle River

B-101

DUNN 14-72

LOCATION: 10,850 / [illegible].003

GROUND ELEVATION: 592.0

DATE DRILLED: 3-19-74 / 3-20-74

SHEET 1 OF 1

SHEARING STRENGTH (LBS./SQ.FT.): 0 500 1000 1500 2000

MOISTURE CONTENT (% OF DRY WT.) ATTERBERG LIMITS (PL-LL): 0 10 20 30 40 50 60 70 80

DENSITY (LBS./CU. FT.): 40 50 60 70 80 90 100 110

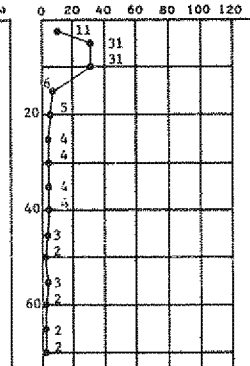
OTHER LABORATORY TESTS

SAMPLE TYPE & NUMBER: NO UNDISTURBED SAMPLES TAKEN

NO. BLOWS PER FOOT OR SAMPLE PRESSURE: 0 20 40 60 80 100 120

SYMBOL

DEPTH IN FEET: 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300 320 340



DESCRIPTION

plastic, brown, silty Clay (CL) trace sand

stiff, some fine sand

soft, gray

very soft to soft, gray, silty Clay (CH)

Bottom of Hole-Elevation 521.5
-Depth-70.5ft

No gain or loss of water

For Water Table information consult Section 4.1.3.

Hole backfilled with Quik-Gel and soil

SOIL BORING NO. 140

BECHTEL Belle River

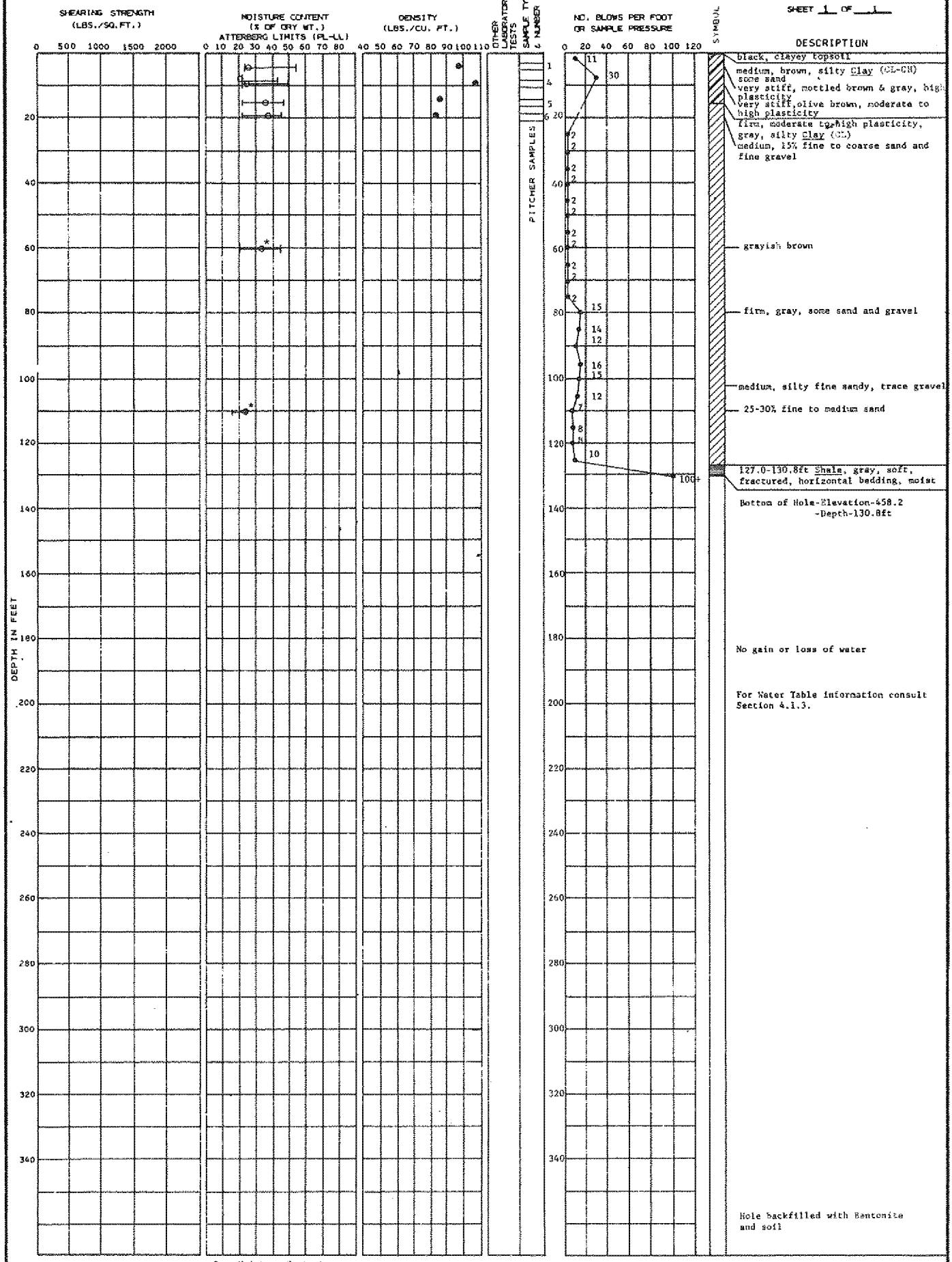
B-103

LOCATION: N 11,146 E 7,995

GROUND ELEVATION 589.0

DATE DRILLED: 3-25-74 3-27-74

SHEET 1 OF 1



○ Moisture Content

⊢—⊣ Atterburg Limits

* Water content taken from unsealed jar sample.

SOIL BORING NO. 142

BECHTEL Belle River

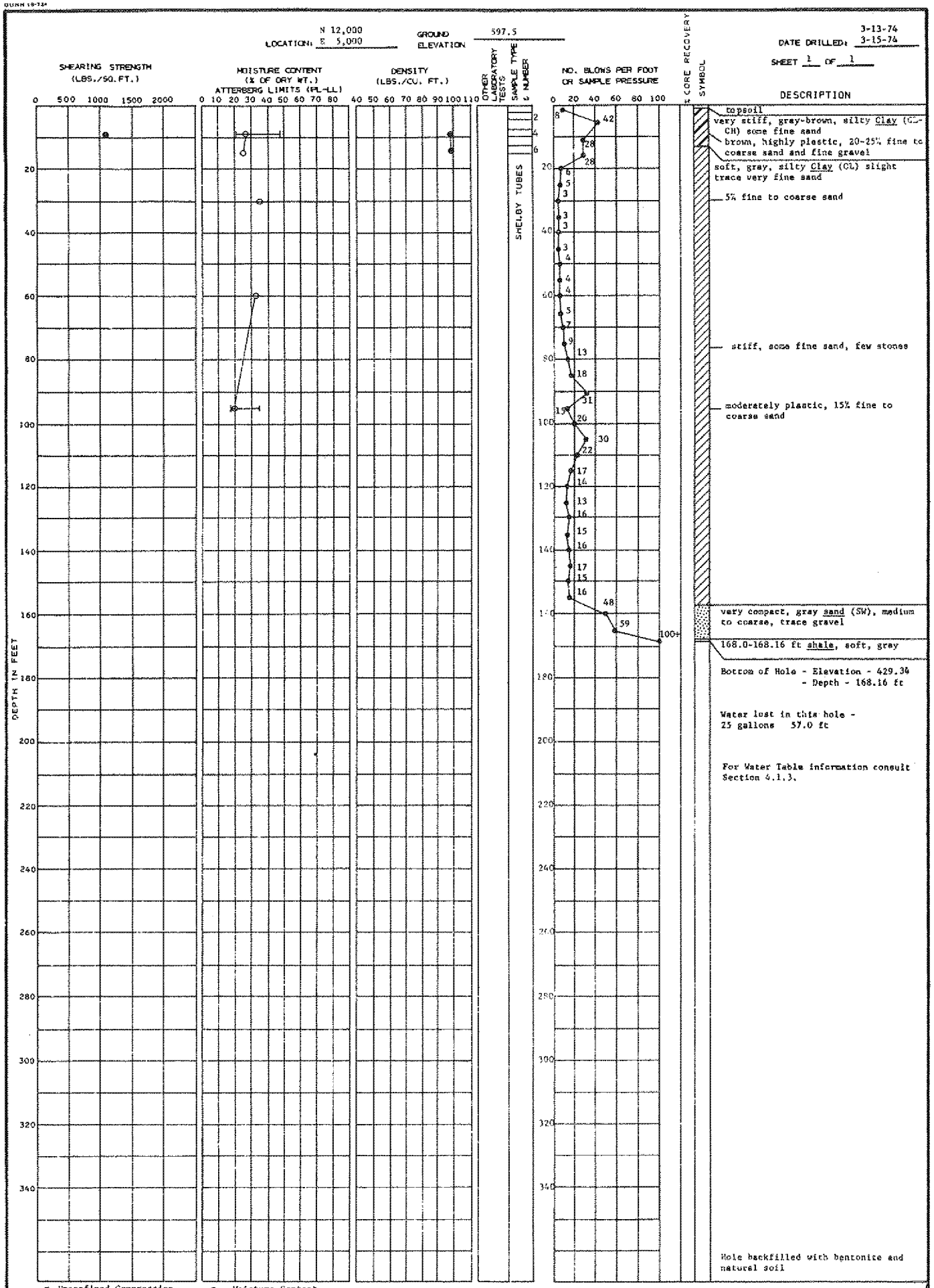
B-105

LOCATION: N 12,000 E 5,000

GROUND ELEVATION 597.5

DATE DRILLED: 3-13-74 3-15-74

SHEET 1 OF 1



SOIL BORING NO. 144

BECHTEL Belle River

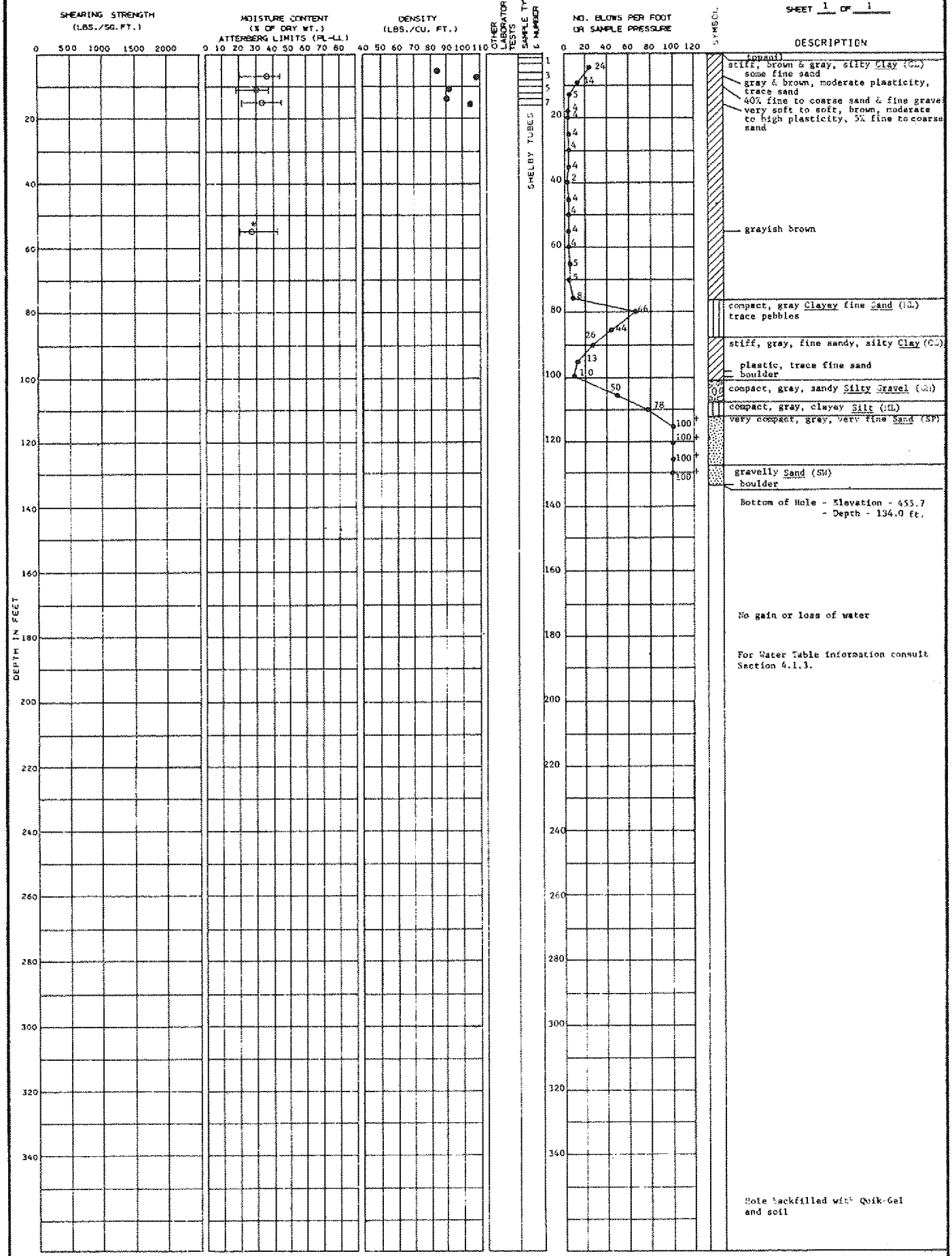
B-107

LOCATION: N 12,000 E 7,000

GROUND ELEVATION 589.7

DATE DRILLED: 3-18-74 3-19-74

SHEET 1 OF 1



Moisture Content
Atterburg Limits
* Water content taken from unsealed jar sample.

SOIL BORING NO. 146

BECHTEL elle i er

B-109

LOCATION: N 13,061 E 5,006

GROUND ELEVATION 598.6

DATE DRILLED: 3-28-74

SHEET 1 OF 1

SHEARING STRENGTH (LBS./SQ. FT.) 0 500 1000 1500 2000

MOISTURE CONTENT (% OF DRY WT.) ATTERBERG LIMITS (PL-LL) 0 10 20 30 40 50 60 70 80

DENSITY (LBS./CU. FT.) 40 50 60 70 80 90 100 110

OTHER LABORATORY TESTS

SAMPLE TYPE & NUMBER

NO. BLOWS PER FOOT OR SAMPLE PRESSURE 0 20 40 60 80 100 120

SYMBOL

DEPTH IN FEET 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300 320 340

NO UNDISTURBED SAMPLES TAKEN

11 13 12 15 4 4 4 4 2 3 3 3 2 2 2 2

DESCRIPTION

Black, clayey topsoil

Firm, brown & gray, silty, sandy clay (CL), trace of pebbles

Soft, gray, silty clay (CH), trace of sand

Bottom of hole - Elevation - 528.6
- Depth - 70.0 ft

No gain or loss of water

For Water Table information consult Section 4.1.3.

Hole backfilled with Quik-Gel and natural soil

SOIL BORING NO. 148

BECHTEL Belle River

B-111

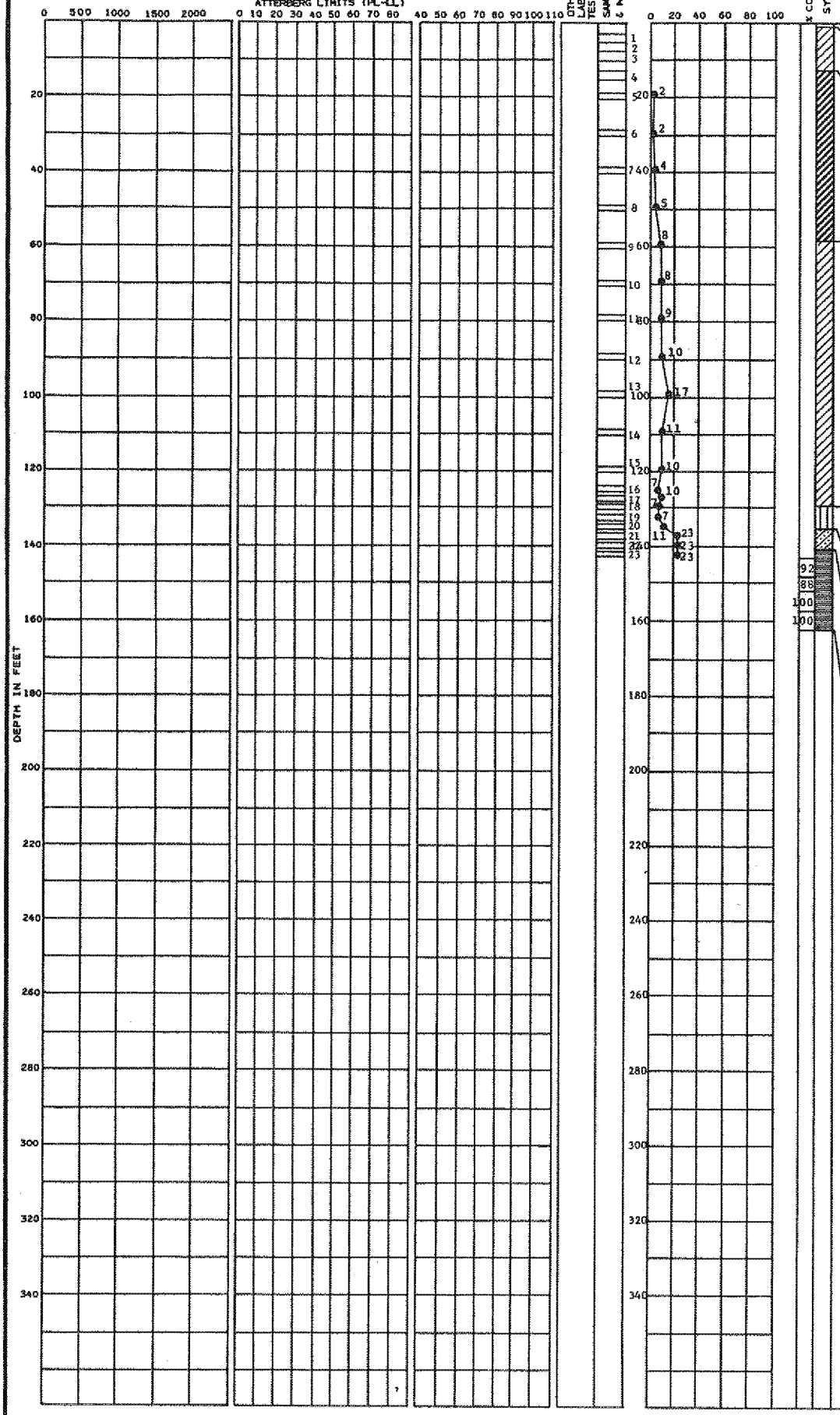
ED_005947A_00014556-00394

LOCATION: N 7455 E 9535

GROUND ELEVATION 585.2

DATE DRILLED: 9/28/77 9/30/77

SHEET 1 OF 1



DESCRIPTION

0-0.7' Topsoil, dark brown, clayey

0.7-12.0' Silty Clay, dark brown, very stiff, med. plasticity, moist, trace wood fragments, trace sand, trace fine gravel (CL)

12.0-58.0' Clay, med. gray, very soft, high plasticity, moist to wet, trace silt, trace sand, trace fine gravel (CH)

38.5'-58.0' Soft

58.0-129.8' Silty Clay, med. gray, med. stiff, med. plasticity, moist, little sand, trace fine to coarse gravel (CL)

98.5-108.5' Very stiff

108.5-118.5' Stiff

118.5-129.8' Trace sand

129.8-136.0' Clayey Silt, med. gray, med. stiff to stiff, wet, with occasional fine-grained sand seams (ML)

136.0-140.5' Clayey Sand, med. gray, med. dense, wet, fine-grained, scattered silt layers, trace fine to med. gravel (SC)

140.5' Top of Rock

140.5-162.0' Shale, med. gray, soft, weathered

144.0-158.7' Firm, scattered soft clay layers

156.0' Irregular bedding

158.7-162.0' Hard, dark gray, occasional soft clay layers

Bottom of Hole: Depth 162.0'
Elevation 423.2

Hole grouted from 162.0' to ground surface.

SOIL BORING NO. B-8

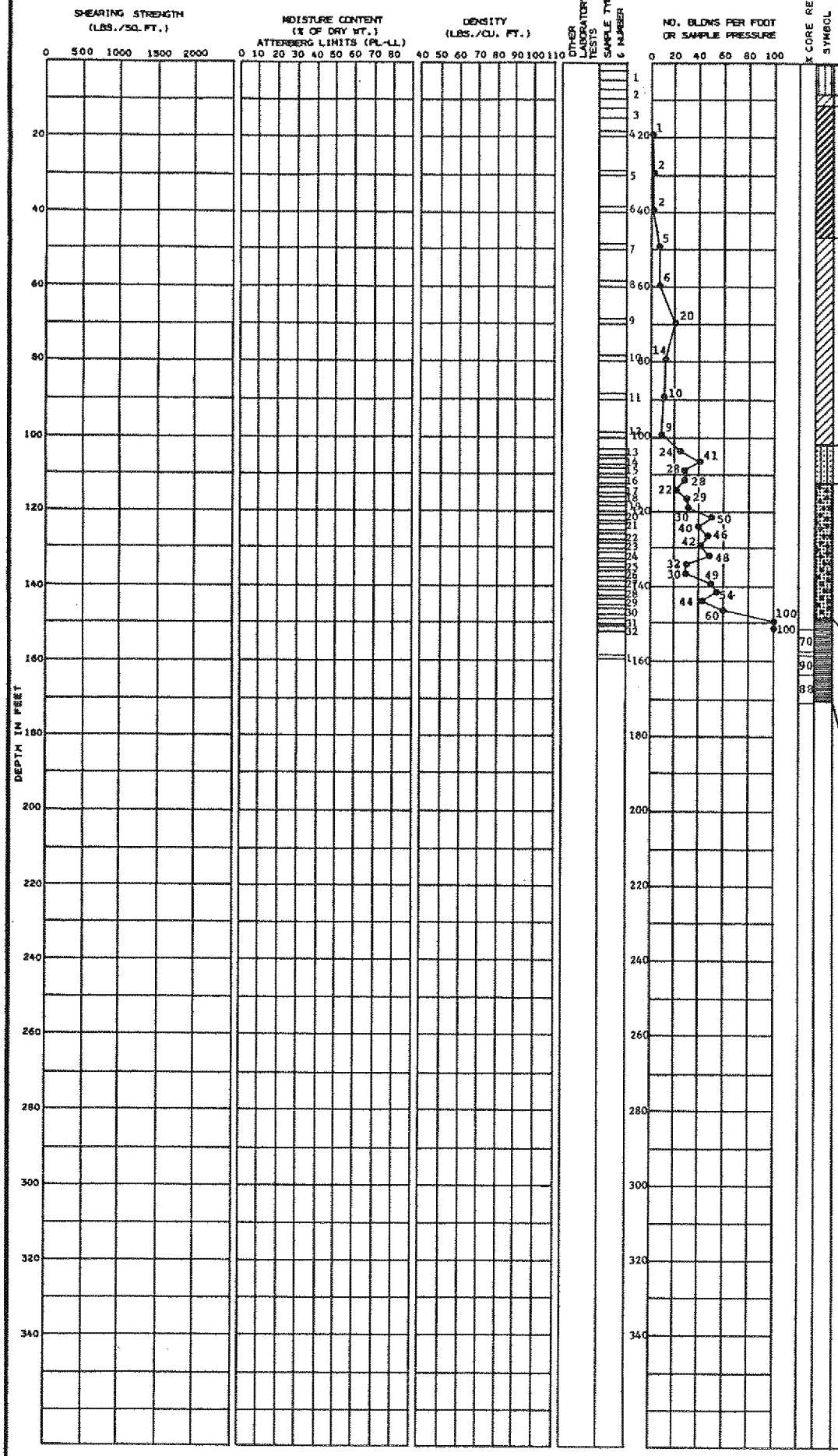
BECHTEL Belle River

LOCATION: N 7675 E 9100

GROUND ELEVATION 585.6

DATE DRILLED: 8/8/77 8/11/77

SHEET 1 OF 1



DESCRIPTION

0-0.3' Topsoil, clayey silt, med. brown, dry

0.3-8.5' Clayey Silt, green brown and med. gray, mottled, slight plasticity, dry, trace wood fragments, trace fine gravel (ML)

8.5-11.5' Silty Clay, med. gray and brown, mottled, high plasticity, wet, trace silt, trace fine gravel (CL)

11.5-46.5' Clay, med. gray, very soft, very high plasticity, wet, trace silt, trace fine gravel (CH)

46.5-101.5' Silty Clay, med. gray, soft to med. stiff, med. plasticity, moist, little sand, trace fine to coarse gravel, occasional cobbles(CL)

48.5-50.0' Seams of clayey sand and silt

68.5-78.5' Very stiff

78.5-88.5' Stiff

83.0-83.5' Cobble

88.5-101.5' Med. stiff

101.5-111.0' Silty Sand, med. gray and brown, med. dense, fine-to med.-grained, wet, with silt seams (SM)

111.0-130.5' Sand, med. gray and brown, med. dense, fine-to coarse-grained, wet, trace silt, trace fine to coarse gravel, very clean, occasional cobbles (SW-SP)

121.0-133.5' Fine-to med.-grained

128.5-133.5' Silty

133.5-148.5' Med.-to coarse-grained

143.0-148.5' Some fine to coarse gravel

148.5-150.5' Fine-to med.-grained

150.5' Top of Rock

150.5-171.0' Shale, med. gray to dark gray, soft to moderately hard

150.5-158.9' Soft, weathered, mechanically fractured

158.9-171.0' Moderately hard, occasional mechanical fractures at 45° angle, occasional soft shale seams

163.5-164.0' Fissile, core broken every 1/4"

Bottom of Hole: Depth 171.0'
Elevation 414.6

Hole caved in from 171.0' to 145.0'.

Hole grouted from 145.0' to ground surface.

SOIL BORING NO. B-9

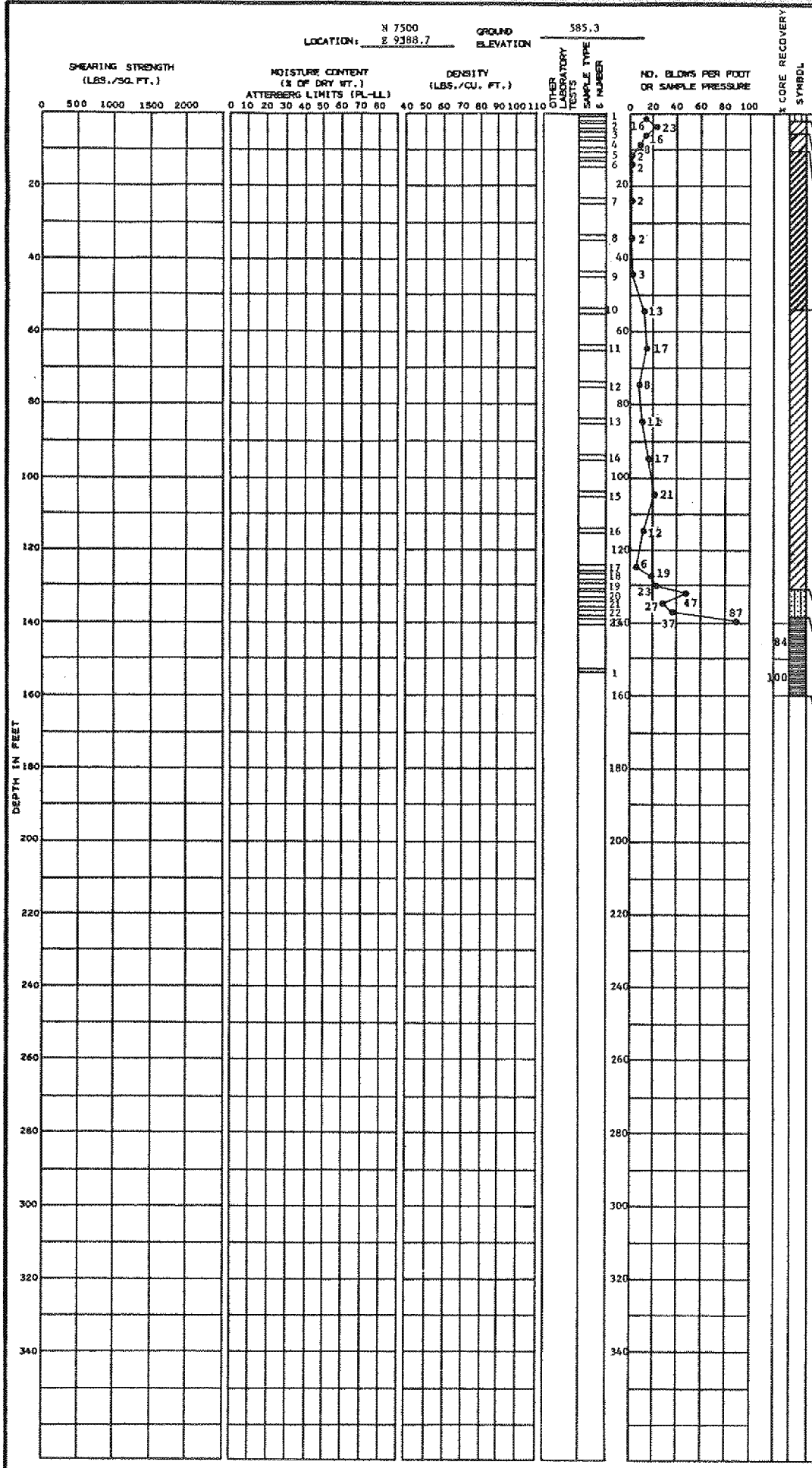
BECHTEL Belle River

LOCATION: N 7500 E 9388.7

GROUND ELEVATION 585.3

DATE DRILLED: 7/21/77 7/25/77

SHEET 1 OF 1



DESCRIPTION

0-1.0' Clayey Silt, topsoil, light gray to dark brown, med. dense, dry, with wood fragments (ML)

1.0-6.0' Silty Clay, med. brown and light gray, mottled, very stiff, med. plasticity, moist, trace sand (CL)

6.0-11.0' Clay, med. brown, very stiff, med. plasticity, moist, trace silt, trace sand (CL-CH)

7.5-11.0' Light gray, med. stiff, high plasticity

11.0-54.0' Clay, light gray, very soft, very high plasticity, wet (CH)

54.0-131.0' Silty Clay, med. gray, stiff, high plasticity, moist, trace sand, trace cobble (CL)

63.5-73.5' Very stiff

73.5-83.5' Med. stiff

83.5-93.5' Stiff, trace fine to coarse gravel

93.5-113.5' Very stiff

100.5-123.5' Med. plasticity, little sand

113.5-126.0' Stiff

123.5-124.0' Fine-grained clayey sand seam

126.0-131.0' Very stiff

126.5-127.0' Fine-grained silty sand seam

131.0-138.0' Silty Sand, med. gray, dense, wet, fine-grained (SM)

Cobble on top of rock

138.0' Top of Rock

138.0-160.0' Shale, dark gray, soft to firm, fissile mechanically fractured in areas

138.0-141.4' Soft, weathered

141.4-160.0' Hard, fissil

Bottom of Hole: Depth 160.0'
Elevation 425.3

Hole grouted from 160.0' to ground surface.

SOIL BORING NO. B-12

BECHTEL Bella River

LOCATION: N 13,000 E 7,000

GROUND ELEVATION 530.6

DATE DRILLED: 3-27-74 3-28-74

SHEET 1 OF 1

SHEARING STRENGTH (LBS./SQ. FT.) 0 500 1000 1500 2000

MOISTURE CONTENT (% OF DRY WT.) ATTERBERG LIMITS (PL-LL) 0 10 20 30 40 50 60 70 80

DENSITY (LBS./CU. FT.) 40 50 60 70 80 90 100 110

OTHER LABORATORY TESTS

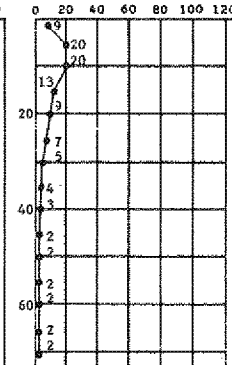
SAMPLE TYPE & NUMBER

NO UNDISTURBED SAMPLES TAKEN

NO. BLOWS PER FOOT OR SAMPLE PRESSURE 0 20 40 60 80 100 120

SYMBOL

DEPTH IN FEET 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300 320 340



DESCRIPTION

black, clayey topsoil

medium, brown, silty Clay (CL) trace of sand and gravel

gray, silty

soft, gray, sandy, silty Clay (CH)

no sand

Bottom of Hole-Elevation-520.1
-Depth-70.5ft

No gain or loss of water

For Water Table information consult Section 4.1.3.

Hole backfilled with Bentonite and soil

SOIL BORING NO. 150

BECHTEL Belle River

B-113

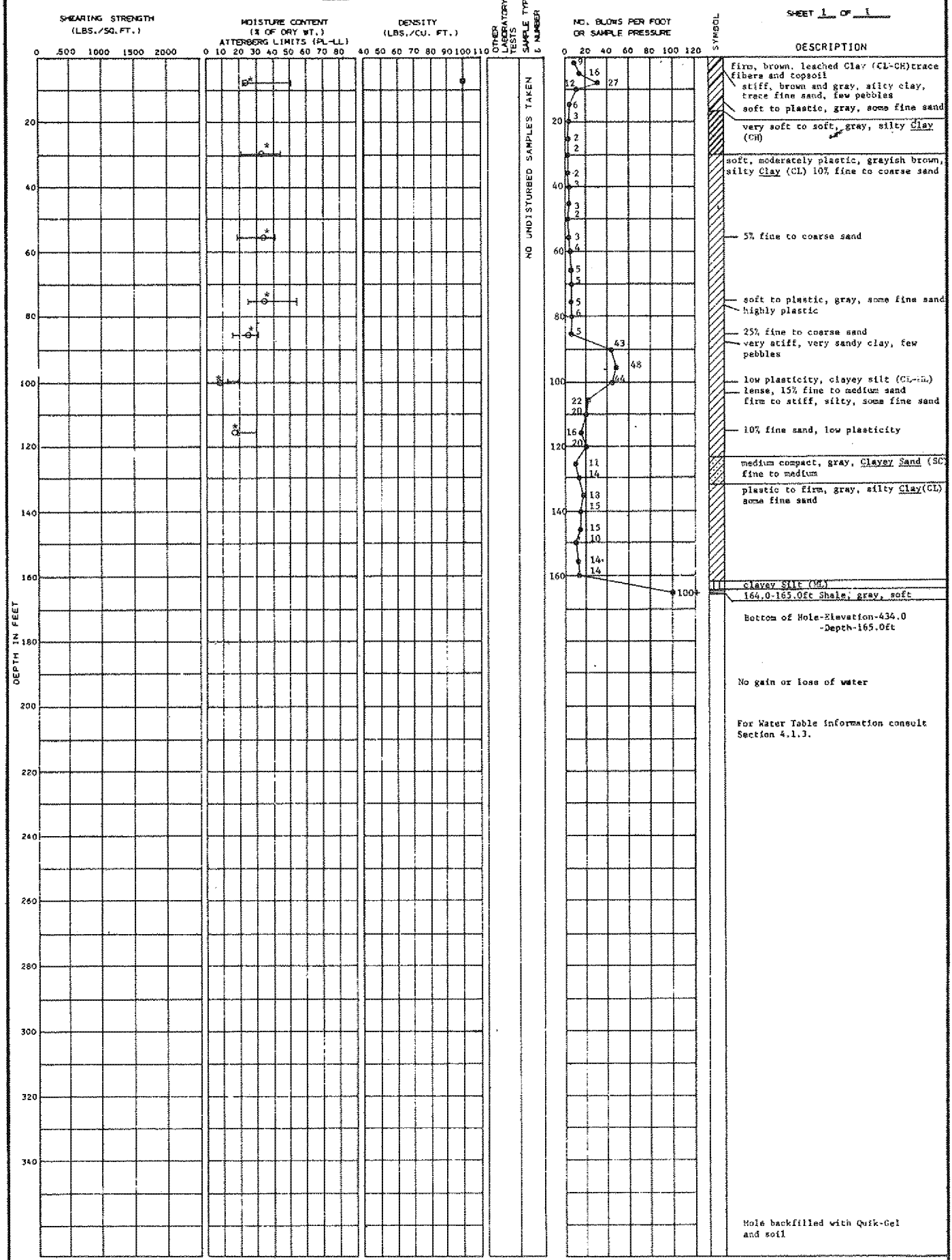
ED_005947A_00014556-00398

LOCATION: N 13,785 E 5,006

GROUND ELEVATION 599.0

DATE DRILLED: 3-7-74 3-14-74

SHEET 1 OF 1



o Moisture Content

|—| Atterburg Limits

* Water content taken from unsealed jar sample.

SOIL BORING NO. 154

BECHTEL Belle River

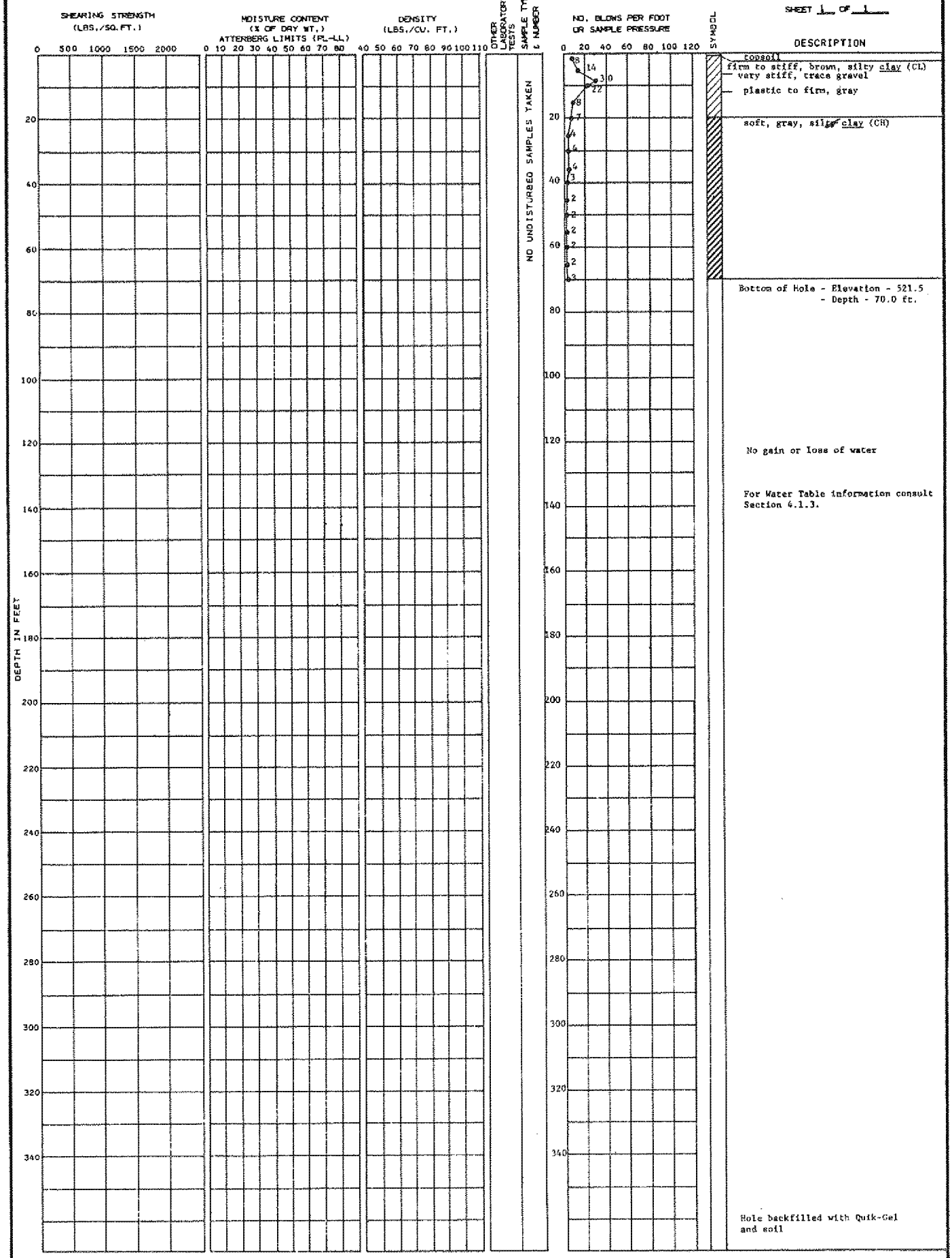
B-115

LOCATION: N 14,000 E 8,000

GROUND ELEVATION 591.5

DATE DRILLED: 4-5-74

SHEET 1 OF 1



DESCRIPTION

topsoil

firm to stiff, brown, silty clay (CL)

very stiff, trace gravel

plastic to firm, gray

soft, gray, silty clay (CH)

Bottom of Hole - Elevation - 521.5
- Depth - 70.0 ft.

No gain or loss of water

For Water Table information consult Section 4.1.3.

Hole backfilled with Quik-Gel and soil

SOIL BORING NO. 157

BECHTEL Belle River

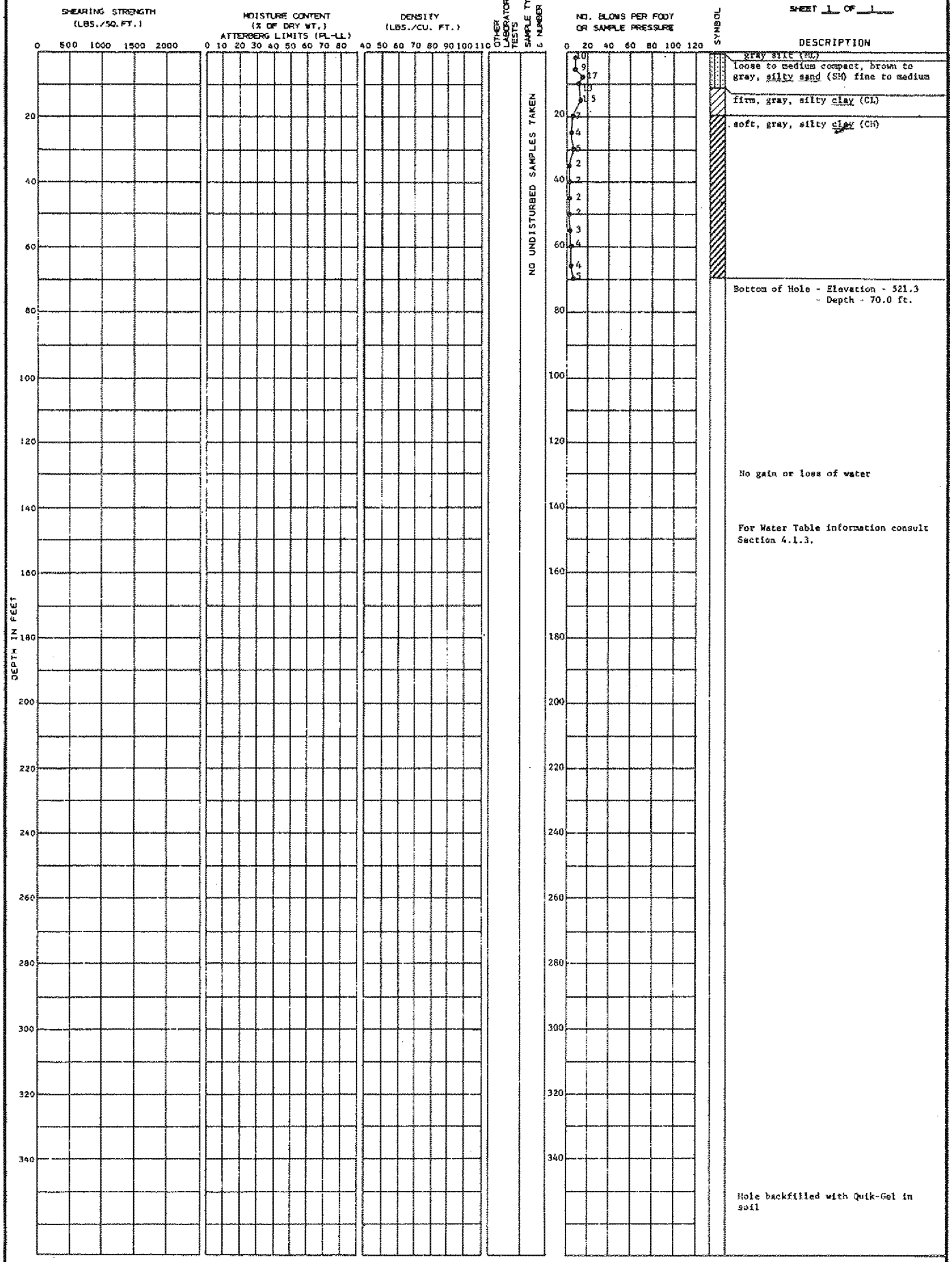
B-117

LOCATION: N 14,000 E 9,950

GROUND ELEVATION 591.3

DATE DRILLED: 4-3-74

SHEET 1 OF 1



SOIL BORING NO. 159

BECHTEL Belle River

B-119

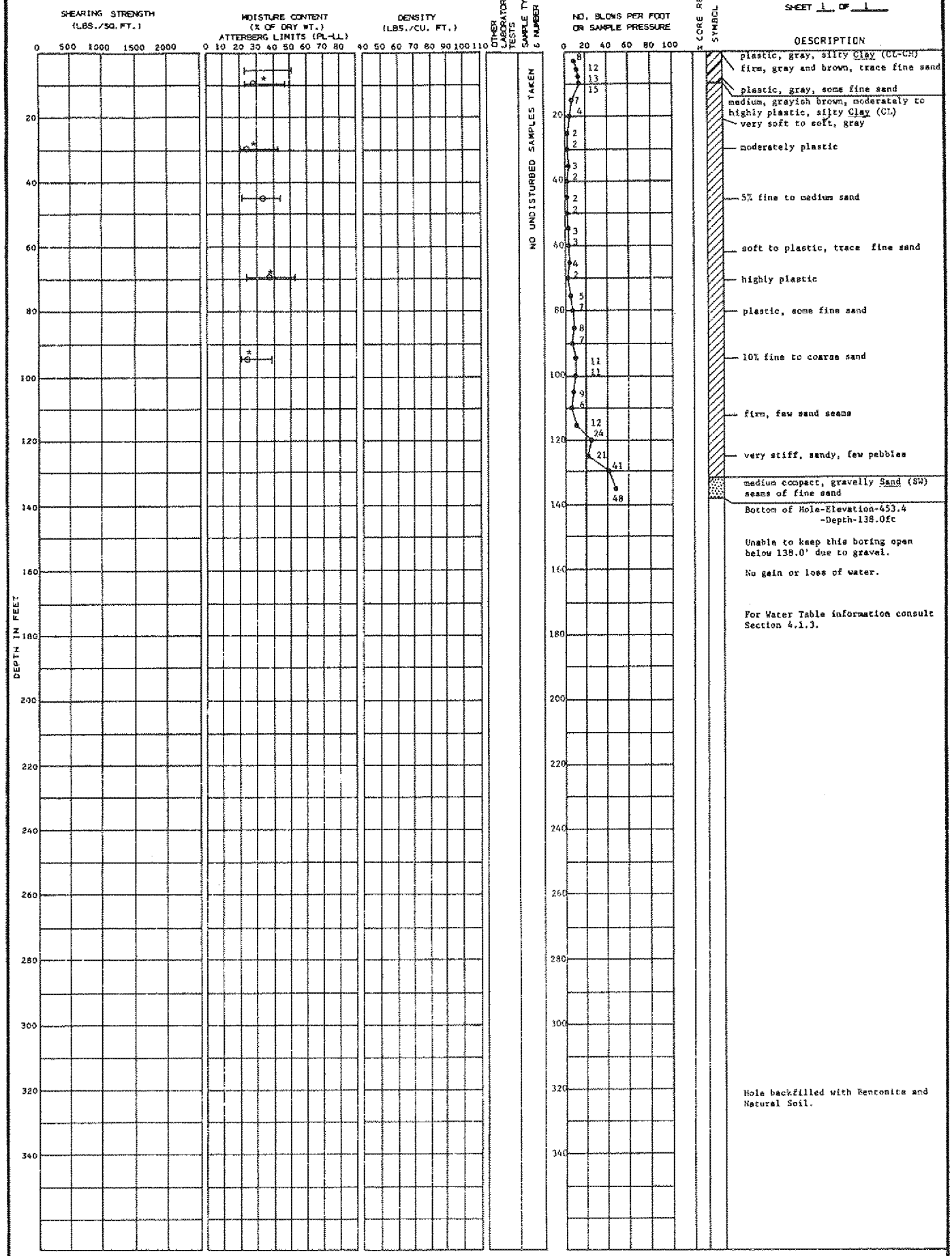
ED_005947A_00014556-00401

LOCATION: N 15,000 E 8,000

GROUND ELEVATION 591.4

DATE DRILLED: 4-8-74

SHEET 1 OF 1



O Moisture Content

⊢—⊣ Atterburg Limits

* Water content taken from unsealed jar sample

SOIL BORING NO. 163

BECHTEL Belle River

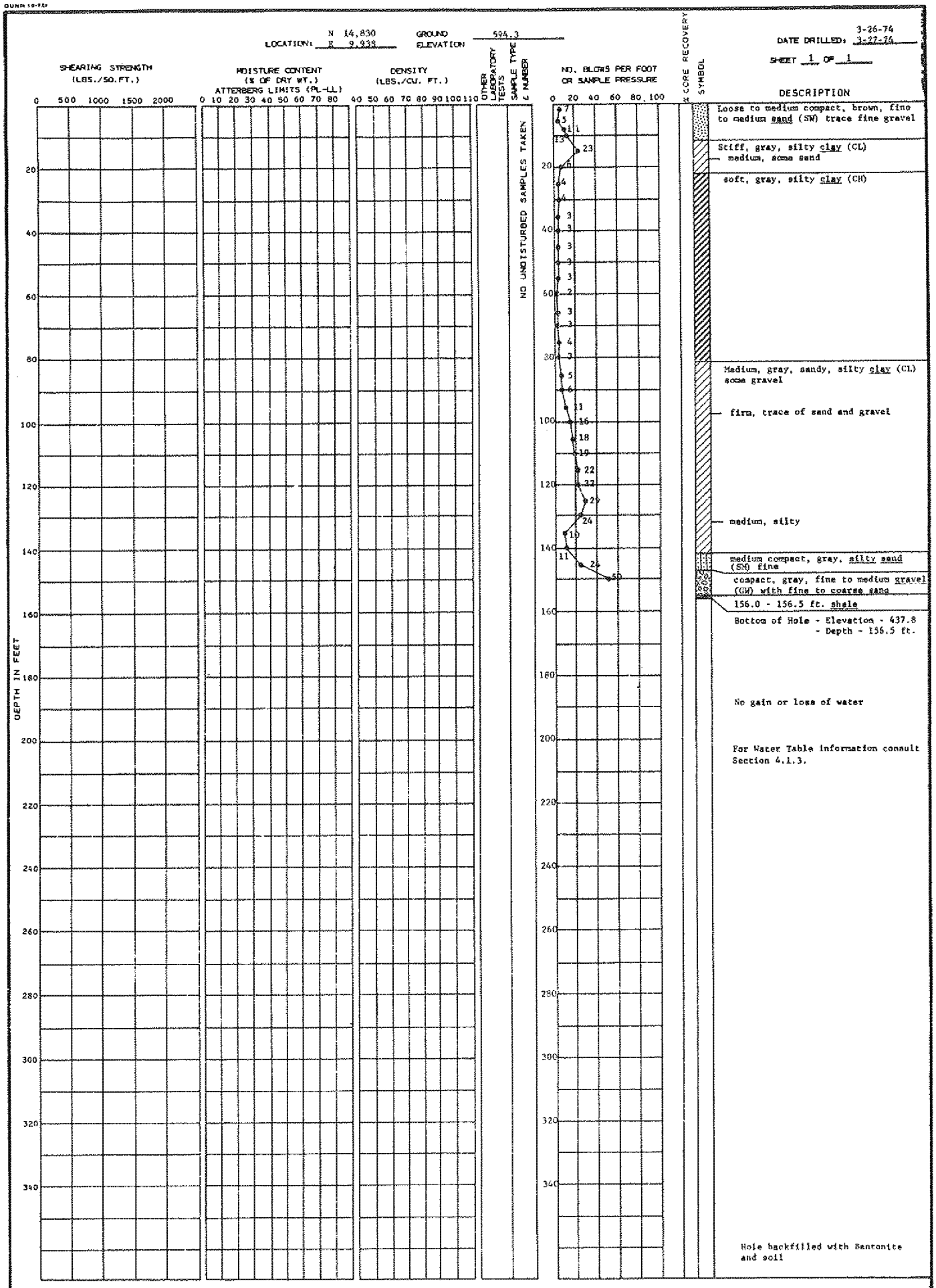
B-121

LOCATION: N 14,830 E 9,938

GROUND ELEVATION 594.3

DATE DRILLED: 3-26-74 3-27-74

SHEET 1 OF 1



SOIL BORING NO. 165

BECHTEL Belle River

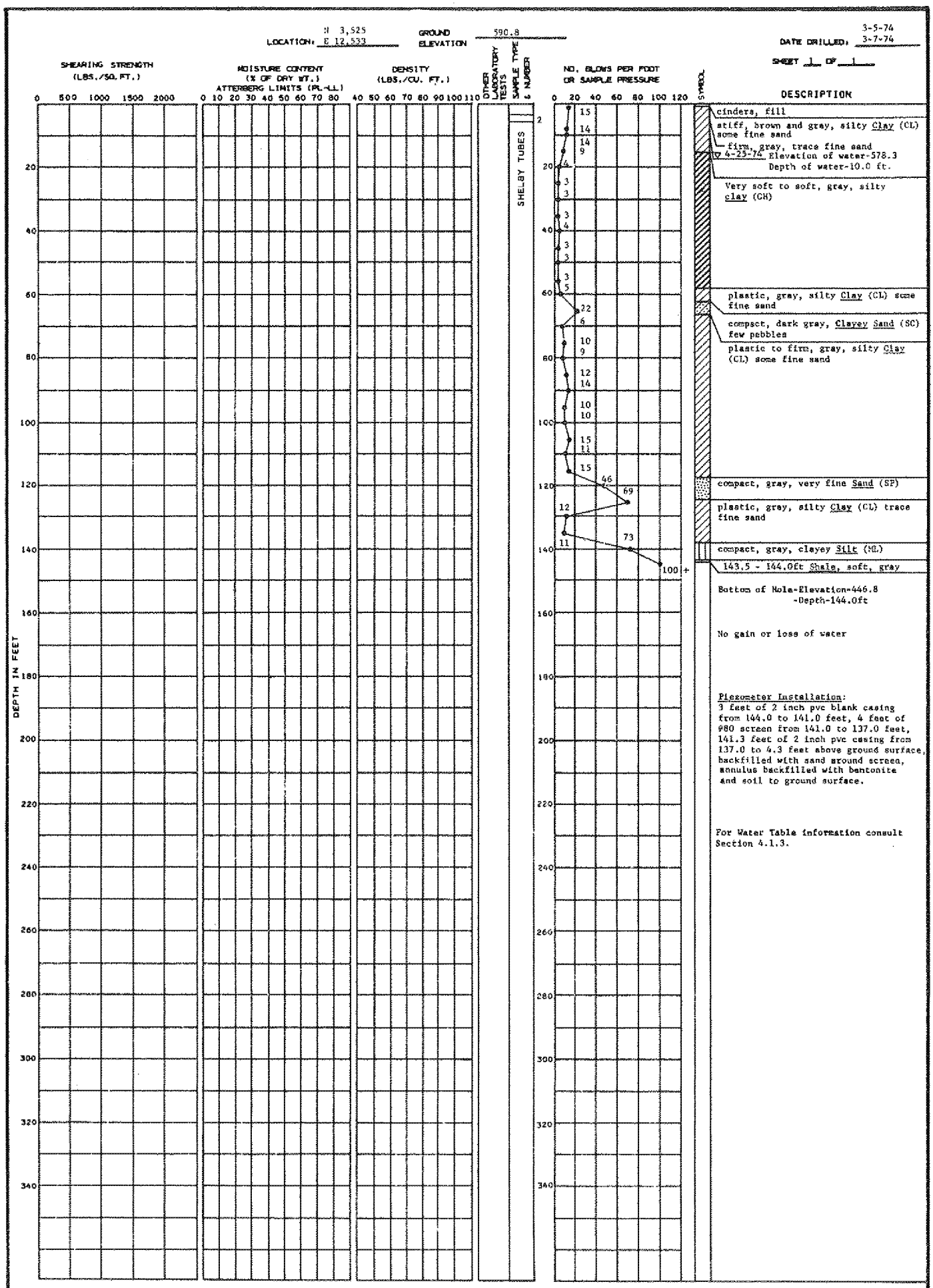
B-123

LOCATION: N 3,525 E 12,533

GROUND ELEVATION 590.8

DATE DRILLED: 3-5-74 3-7-74

SHEET 1 OF 1



SOIL BORING NO. 181

BECHTEL Belle River

B-125

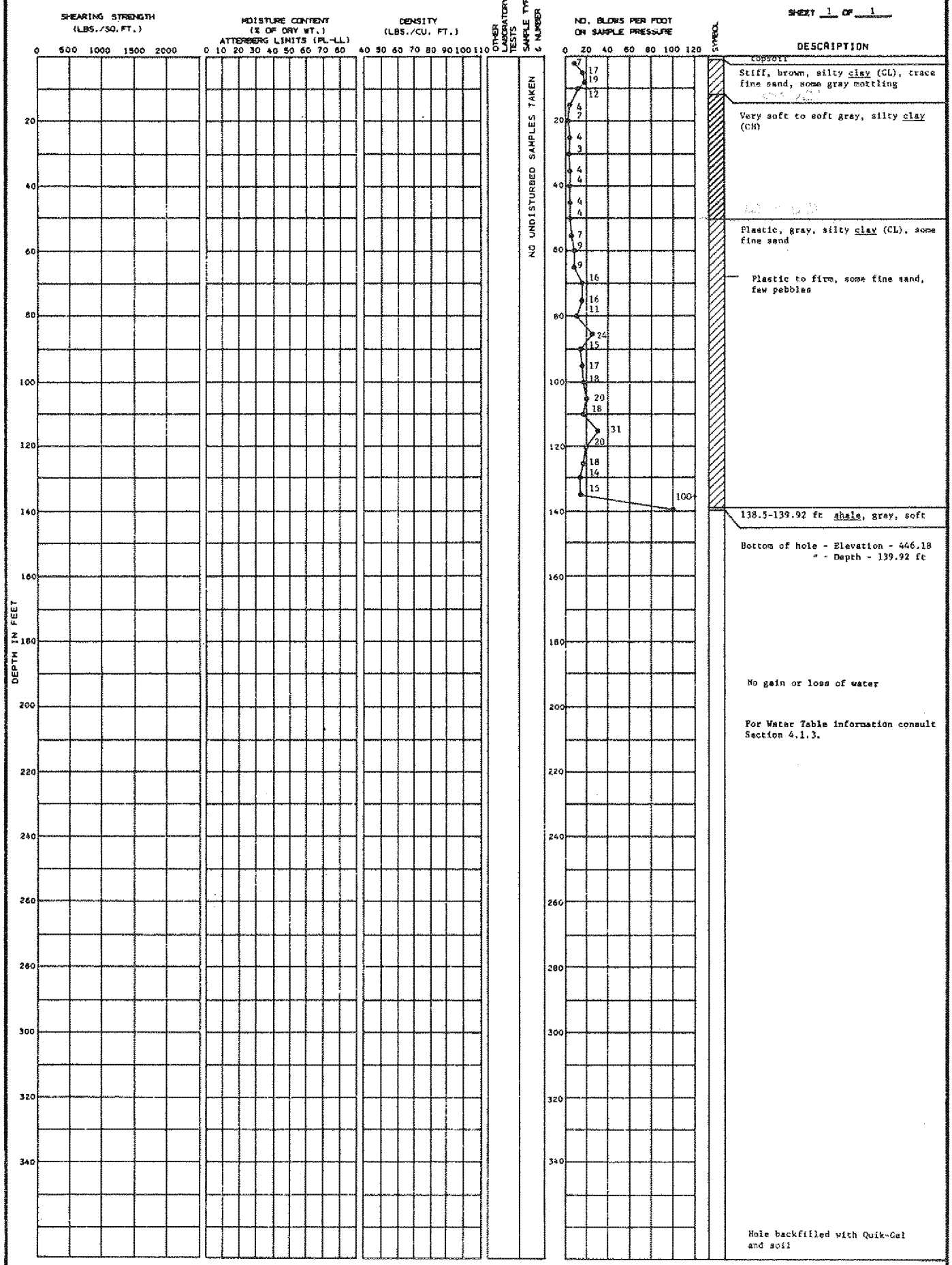
ED_005947A_00014556-00404

LOCATION: N 3,556 E 9,564

GROUND ELEVATION 586.1

DATE DRILLED: 3-15-74 3-19-74

SHEET 1 OF 1



DESCRIPTION

Topsoil

Stiff, brown, silty clay (CL), trace fine sand, some gray mottling

Very soft to soft gray, silty clay (CH)

Plastic, gray, silty clay (CL), some fine sand

Plastic to firm, some fine sand, few pebbles

138.5-139.92 ft shale, grey, soft

Bottom of hole - Elevation - 446.18
" - Depth - 139.92 ft

No gain or loss of water

For Water Table information consult Section 4.1.3.

Hole backfilled with Quik-Gel and soil

SOIL BORING NO. 184

BECHTEL Belle River

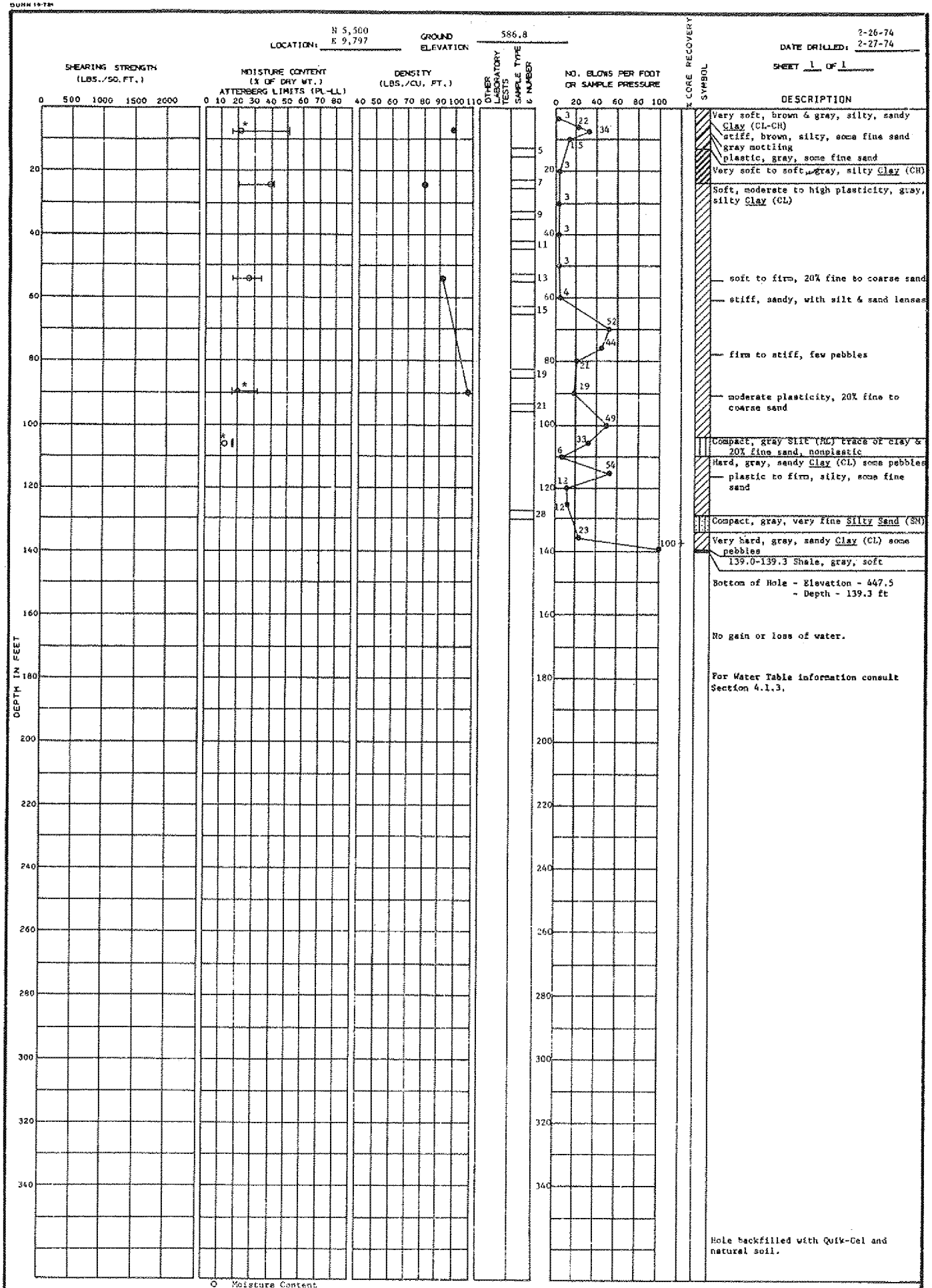
B-127

LOCATION: N 5,500 E 9,797

GROUND ELEVATION 586.8

DATE DRILLED: 2-26-74 2-27-74

SHEET 1 OF 1



O Moisture Content

Atterburg Limits

* Water content taken from unsealed jar sample.

SOIL BORING NO. 186

BECHTEL Belle River

B-129

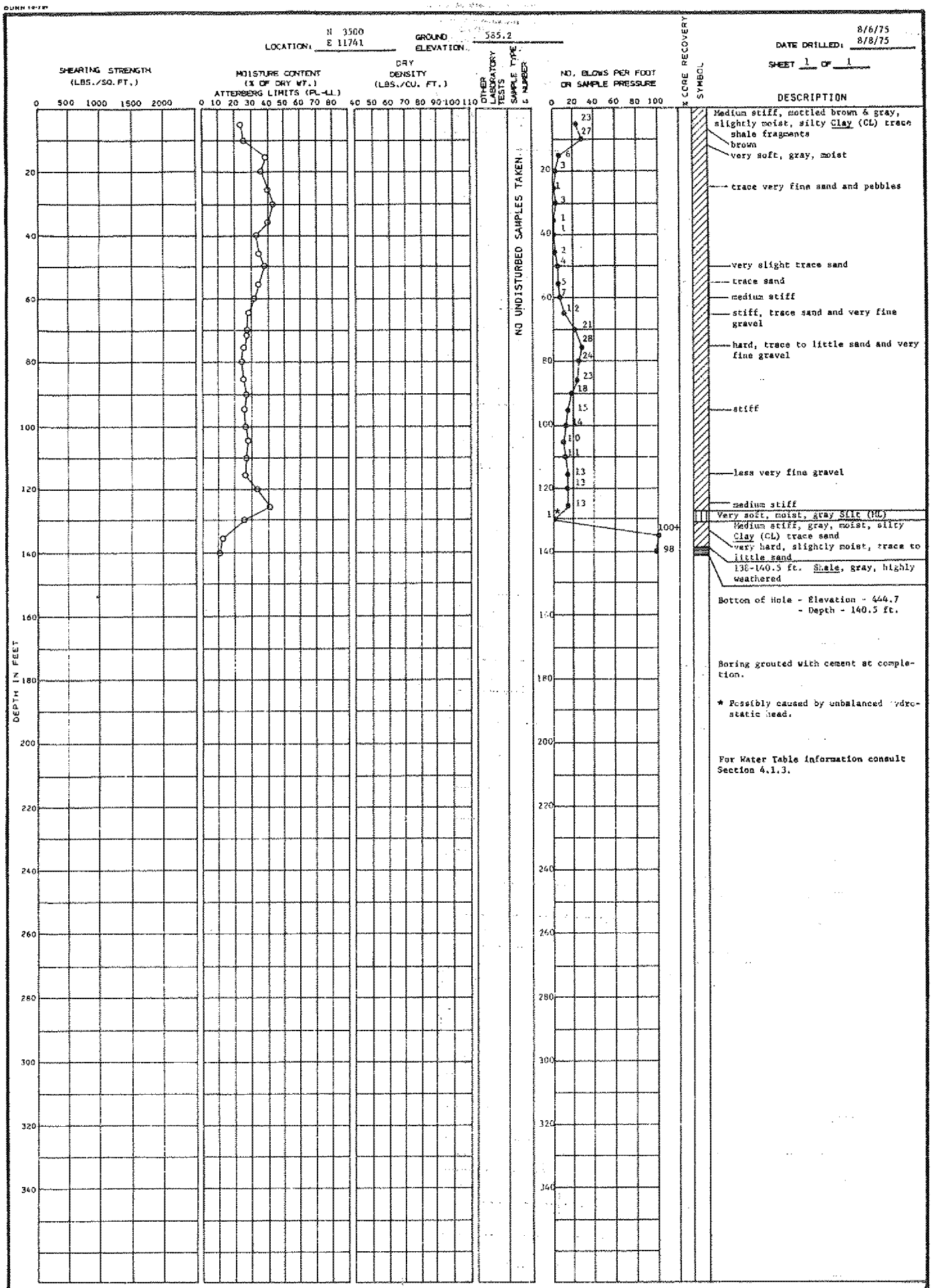
ED_005947A_00014556-00406

LOCATION: N 3500 E 11741

GROUND ELEVATION: 585.2

DATE DRILLED: 8/6/75 8/8/75

SHEET 1 OF 1



SOIL BORING NO. 191

BECHTEL BELLE RIVER

R-171

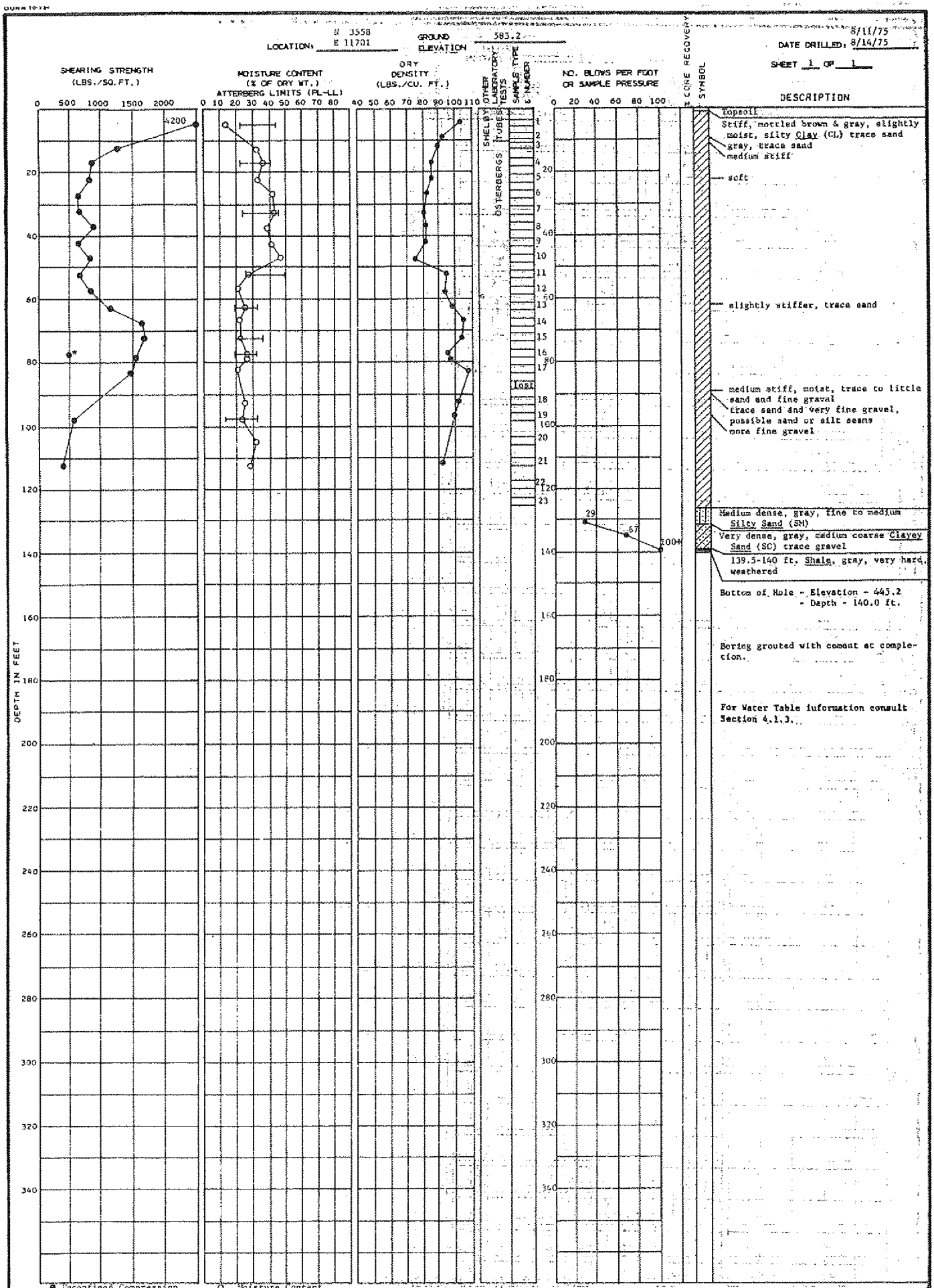
ED_005947A_00014556-00407

LOCATION: N 3558 E 11701

GROUND ELEVATION 585.2

DATE DRILLED: 8/11/75 8/14/75

SHEET 1 OF 1



SOIL BORING NO. 193

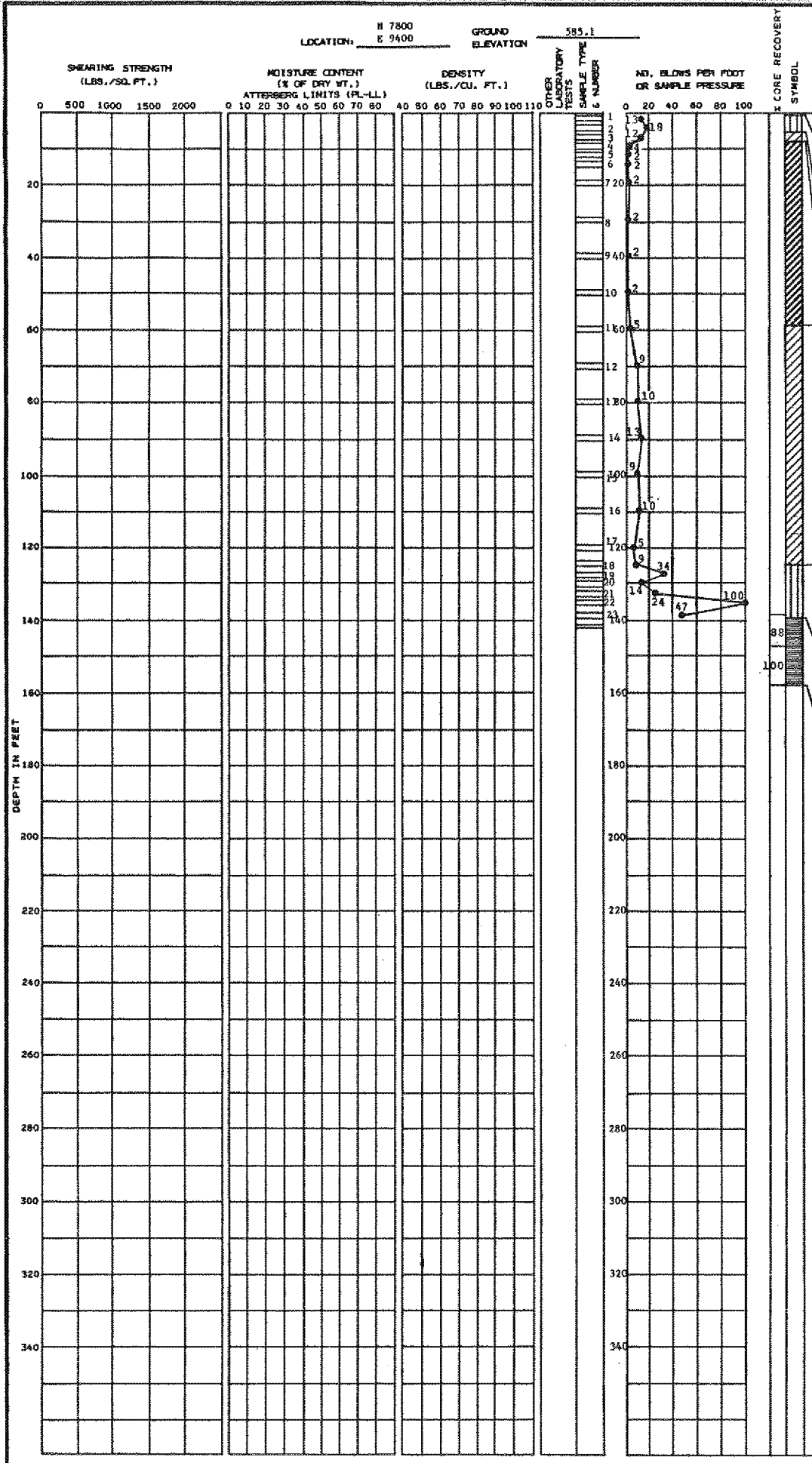
BECHTEL BELLE RIVER

LOCATION: N 7800 E 9400

GROUND ELEVATION 585.1

DATE DRILLED: 8/17/77 8/22/77

SHEET 1 OF 1



DESCRIPTION

0-0.5' Topsoil, silty, dark brown, roots

0.5-5.5' Clayey Silt, brown and med. gray, mottled, med. dense, slight plasticity, dry, trace fine to med. gravel (ML)

5.5-8.0' Silty Clay, med. gray, stiff, med. plasticity, moist, trace sand, trace fine gravel (CL)

8.0-58.5' Clay, med. gray, very soft, high plasticity, wet, trace silt, trace fine sand (CH)

58.5-125.5' Silty Clay, med. gray, soft, med. plasticity, moist, trace to little sand, trace fine gravel(CL)
58.5-88.5' Little sand
68.5-88.5' Med. Stiff

88.5-98.5' Stiff
88.5-118.5' Trace sand

98.5-125.5' Med. stiff

105.5-106.0' Small cobbles

118.5-125.5' Occasional fine-grained sand seams

125.5-138.8' Clayey Silt, med. gray, med. dense to dense, moist, with fine-grained sand seams (ML)
127.5-128.3' Fine gravel
134.5-136.3' Boulder
138.1-138.8' Boulder

138.8' Top of Rock
138.8-157.5' Shale, dark gray, soft, friable, slightly fissile, occasional mechanically fractured
149.8-157.5' Harder, scattered, thin black shale stringers

Bottom of Hole: Depth 157.5'
Elevation 427.6

Hole grouted from 157.5' to ground surface.

SOIL BORING NO. B-1

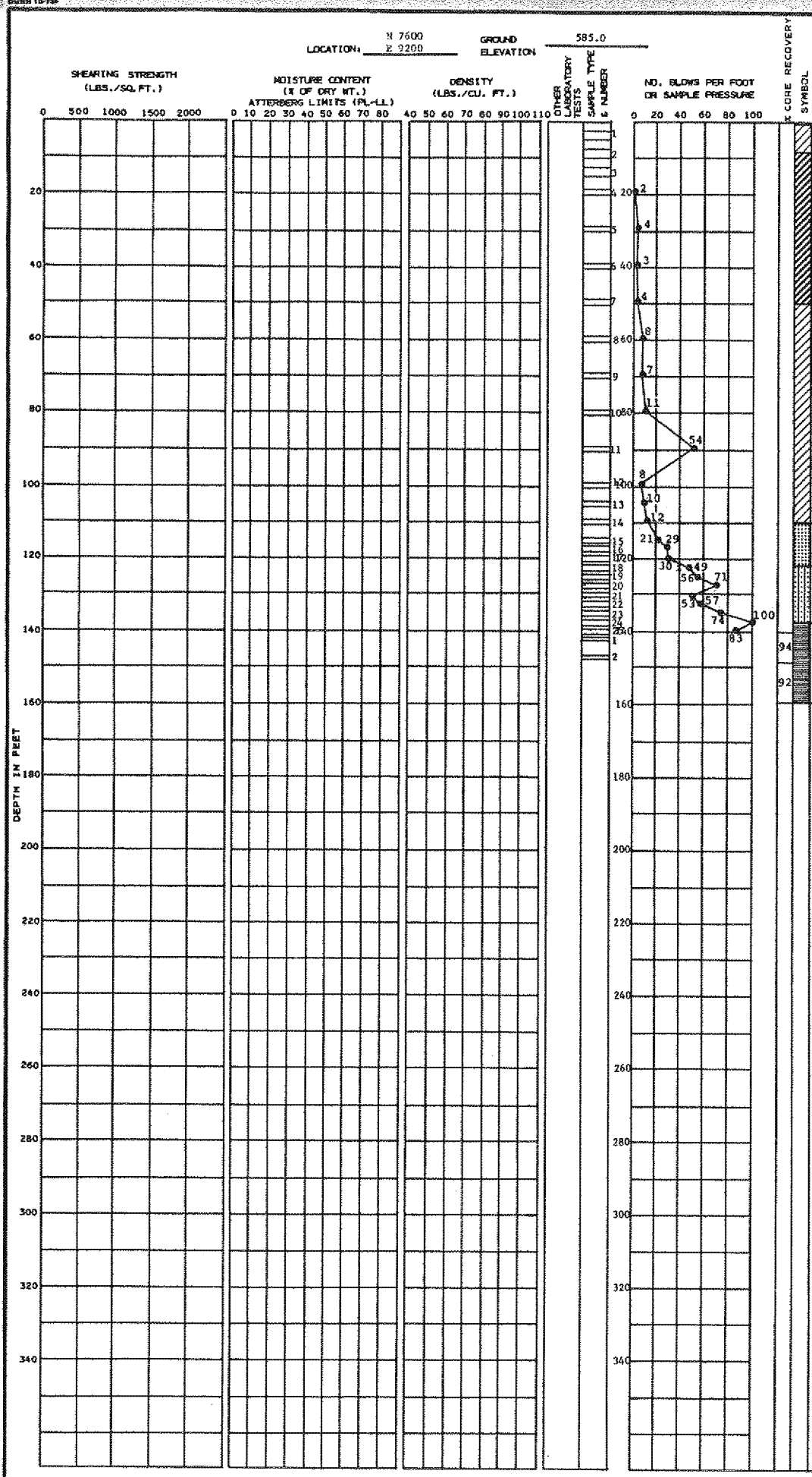
BECHTEL Belle River

LOCATION: N 7600 E 9200

GROUND ELEVATION: 585.0

DATE DRILLED: 8/23/77 8/25/77

SHEET 1 OF 1



DESCRIPTION

0-0.5' Topsoil, silty, dark brown, dry

0.5-8.0' Silty Clay, brown and gray, mottled, slight to med. plasticity, moist, trace roots, trace fine to coarse gravel (CL)

8.0-49.5' Clay, med. gray, very soft to soft, high plasticity, wet, trace silt, trace fine gravel (CH)

49.5-109.5' Silty Clay, med. gray, med. stiff, med. plasticity, moist, little sand, trace fine gravel (CL)

78.5-88.5' Stiff

88.5-98.5' Hard

109.5-121.0' Sand, med. gray, med. dense, wet, fine-to med.-grained, trace silt (SP)

121.0-136.5' Silty Sand, med. gray, dense to very dense, moist, fine-grained, trace fine gravel, scattered thin silt seams (SM)

135.5-136.5' Med. gray silt with thin fine-grained sand seams

Cobble on top of rock

136.5' Top of Rock

136.5-158.5' Shale, dark gray, soft, silty, fractures easily, air slakes readily

145.0-148.6' Moderately hard with occasional soft silty layers

148.5-158.5' Hard, massive

150.9-153.5' Very fine-grained, hard, irregularly bedded sandy layers interbedded with shale

156.6-157.5' Soft

Bottom of Hole: Depth 158.5'
Elevation 426.5

Hole grouted from 158.5' to ground surface.

SOIL BORING NO. B-2

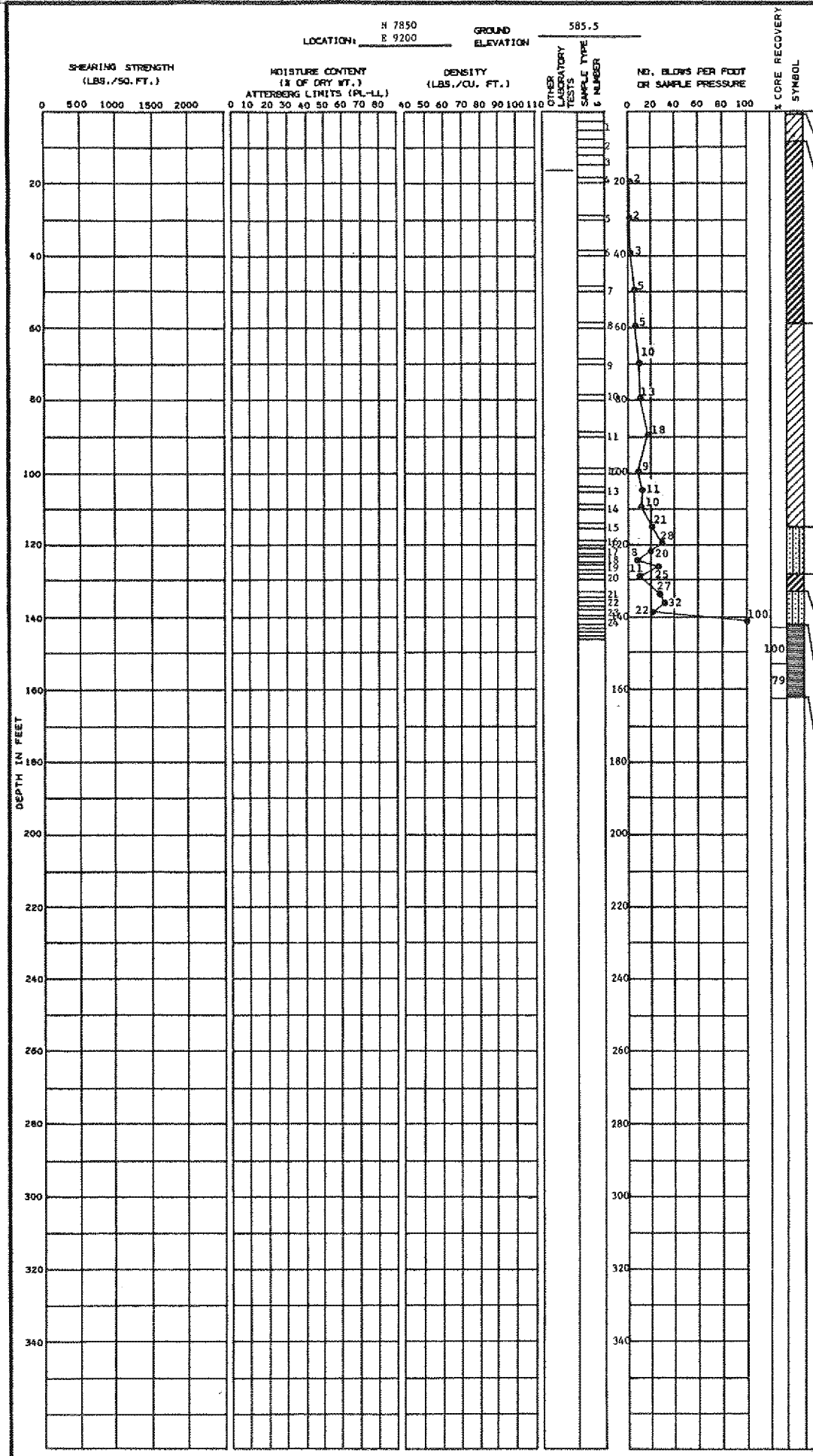
BECHTEL Belle River

LOCATION: N 7850 E 9200

GROUND ELEVATION 585.5

DATE DRILLED: 8/2/77 8/4/77

SHEET 1 OF 1



DESCRIPTION

0-1.0' Topsoil, clayey silt, dark brown to light brown, dry, wood fragments and roots (ML)

1.0-8.5' (?) Silty Clay, med. brown, med. plasticity, moist, trace fine to coarse gravel (CL)

8.5-58.5' Clay, med. gray, very soft, very high plasticity, wet, trace silt, trace fine angular gravel (CH)

46.5-58.5' Soft

58.5-114.5' Silty Clay, med. gray, soft to med. stiff, high plasticity, moist to wet, trace to little fine sand, trace fine to coarse gravel(CL)

78.5-88.5' Stiff

88.5-98.5' Very stiff

98.5-114.5' Stiff to med. stiff
103.5 Less sand, occasional 1/4" pits of red clay
104.0' 1/2" light gray, fine-grained, sand pit
113.5' Trace silt, trace sand

114.5-128.5' Silty Sand, med. gray, med. dense, moist to wet, fine-grained with thin seams of silt and clay(SM)
123.5-125.0' Loose

128.5-133.3' Clay, med. gray, stiff, high plasticity, wet, trace silt, trace fine gravel, occasional pits of red clay (CH)

133.3-142.0' Silty Sand, med. gray, med. dense to dense, moist to wet, fine-grained, occasional silt and clay seams (SM)
141.7-142.0' Coarse sand seam

142.0' Top of Rock
142.0-162.5' Shale, dark gray, soft, massive, friable
155.0-162.5' Hard
159.0-160.5' Core mechanically fractured

Bottom of Hole: Depth 162.5'
Elevation 423.0

Hole grouted from 162.5' to ground surface.

SOIL BORING NO. B-4

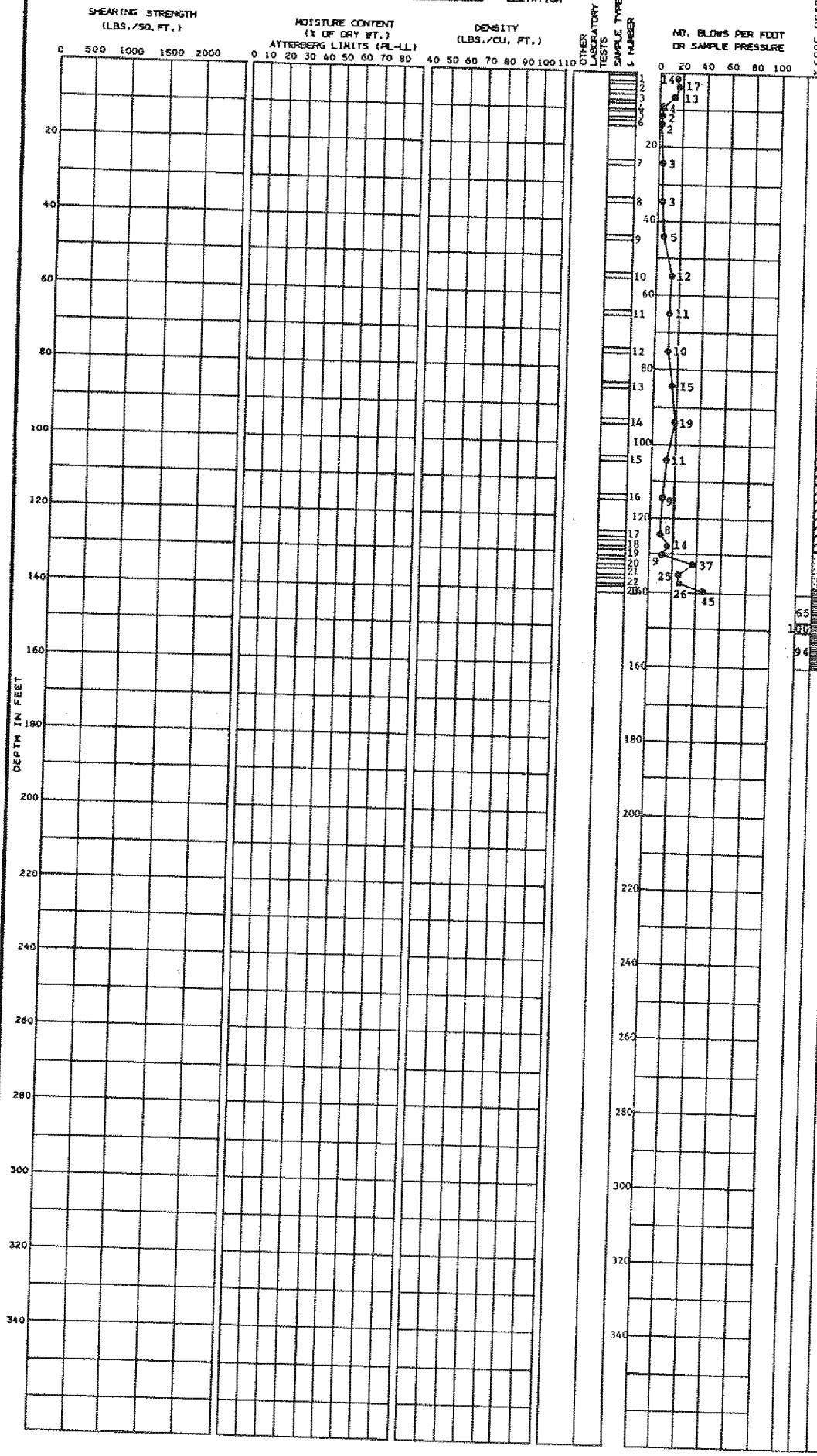
BECHTEL Bella River

LOCATION: N 7600 E 9400

GROUND ELEVATION 584.8

DATE DRILLED: 7/26/77 8/1/77

SHEET 1 OF 1



DESCRIPTION

0-1.0' Silty Clay, topsoil, dark brown to green brown, stiff, slight plasticity, moist, trace sand, with roots and wood fragments (CL)

1.0-6.0' Clayey Silt, light brown to gray, med. dense, dry, trace sand, trace fine gravel (ML)

6.0-8.5' Clay, dark brown, stiff, med. plasticity, moist, trace silt (CL)

8.5-54.0' Clay, med. gray, soft to very soft, very high plasticity, wet, trace fine angular gravel (CH)

54.0-127.5' Silty Clay, med. gray, stiff, med. plasticity, moist, trace sand, trace fine to coarse gravel (CL)

73.5-75.0' Med. stiff

93.5-103.5' Very stiff

103.5-113.5 Stiff

113.5-126.0' Med. stiff

123.5-124.4' Clay seam, high plasticity

124.4-125.0' Silty sand seam, fine-grained, wet

126.0-127.5' Stiff, some sand

127.5-137.8' Silt and Sand, med. gray, med. dense to dense, wet, sand fine-grained (ML and SM)

137.8' Top of Rock

137.8-160.0' Shale, dark blue gray to black, soft, fissile, dry

142.6-144.2' and 154.5-160.0' Core completely fractured into 1/4" or less pieces

150.5-153.0' Core fractured into 1/4" to 4" pieces

Bottom of Hole: Depth 160.0'
Elevation 424.8

Hole grouted from 160.0' to ground surface.

SOIL BORING NO. B-5

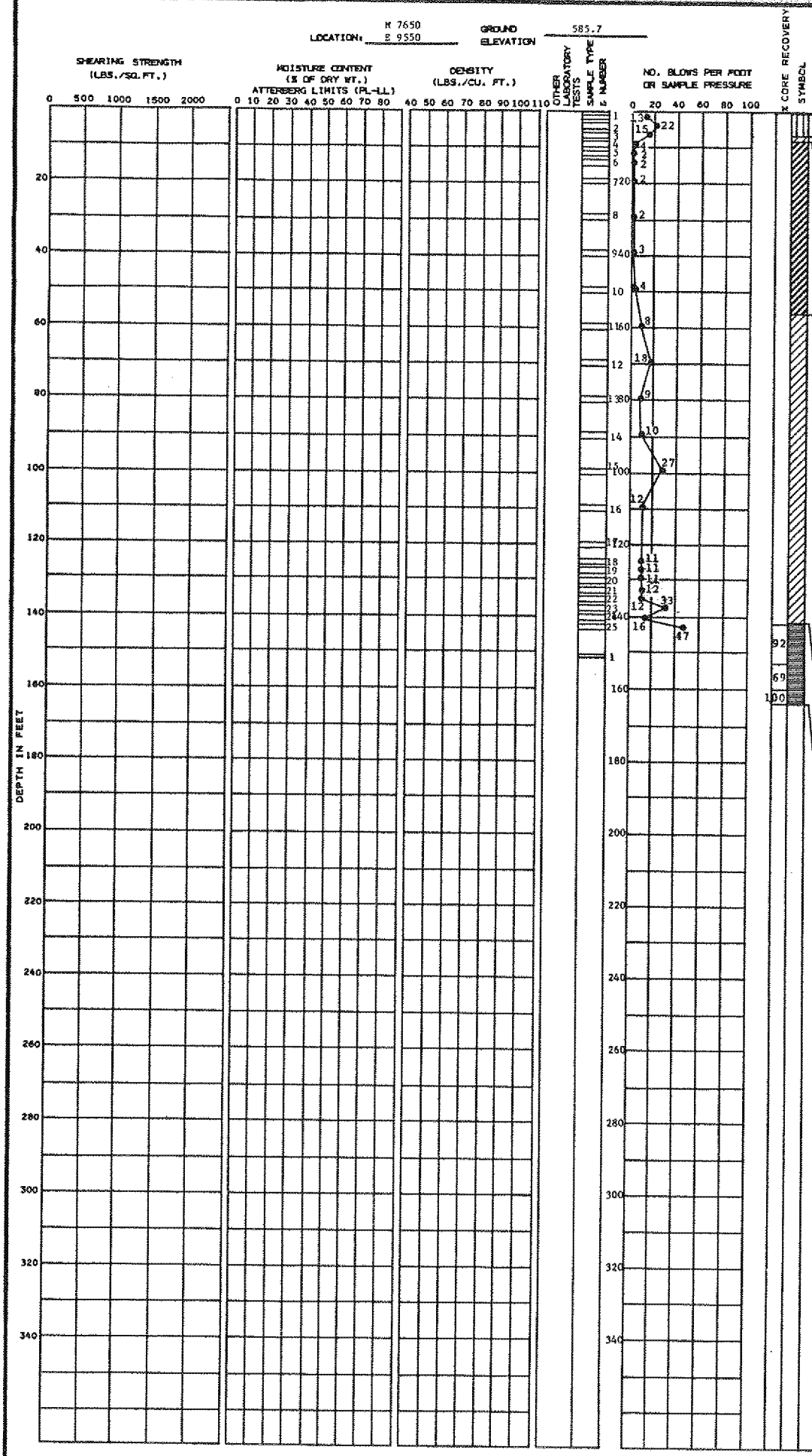
BECHTEL Belle River

LOCATION: N 7650 E 9550

GROUND ELEVATION 585.7

DATE DRILLED: 8/25/77 8/31/77

SHEET 1 OF 1



DESCRIPTION

0-0.3' Topsoil, dark brown, silty, dry

0.3-7.0' Clayey Silt, brown and gray, mottled, med. dense, none to slight plasticity, dry, abundant wood fragments, trace fine gravel (ML)

7.0-8.5' Silty Clay, med. gray, med. stiff, med. plasticity, moist, trace sand, trace fine gravel (CL)

8.5-56.0' Clay, med. gray, very soft, high plasticity, moist to wet, trace silt, trace sand, trace fine gravel (CH)

11.0-56.0' Wet

48.5-56.0' Soft

56.0-141.0' Silty Clay, med. gray, med. stiff, med. plasticity, moist, little sand, trace fine gravel (CL)

68.5-78.5' Very stiff

78.5-88.5' Trace sand

88.5-118.5' Little sand

98.5-108.5' Very stiff

108.5-136.0' Stiff

123.5-125.0' Scattered, fine-grained sand seams

130.5-133.5' Scattered silt and fine-grained sand seams

133.5-136.0' Silt with silty clay seams, wet

136.0-138.5' Dense, fine-grained silty sand, wet, trace med. gravel

138.5-141.0' Very stiff clayey silt with fine-grained sand seams, wet

141.0' Top of Rock

141.0-163.5' Shale, med. gray, soft to firm, massive to slightly fissile, occasional interbeds of soft clay, shale air slakes rapidly, core mechanically fractured.

150.0-158.8' Hard, with very thin sandy interbeds

Bottom of Hole: Depth 163.5'
Elevation 422.2

Hole grouted from 163.5' to ground surface.

SOIL BORING NO. B-6

BECHTEL Belle River

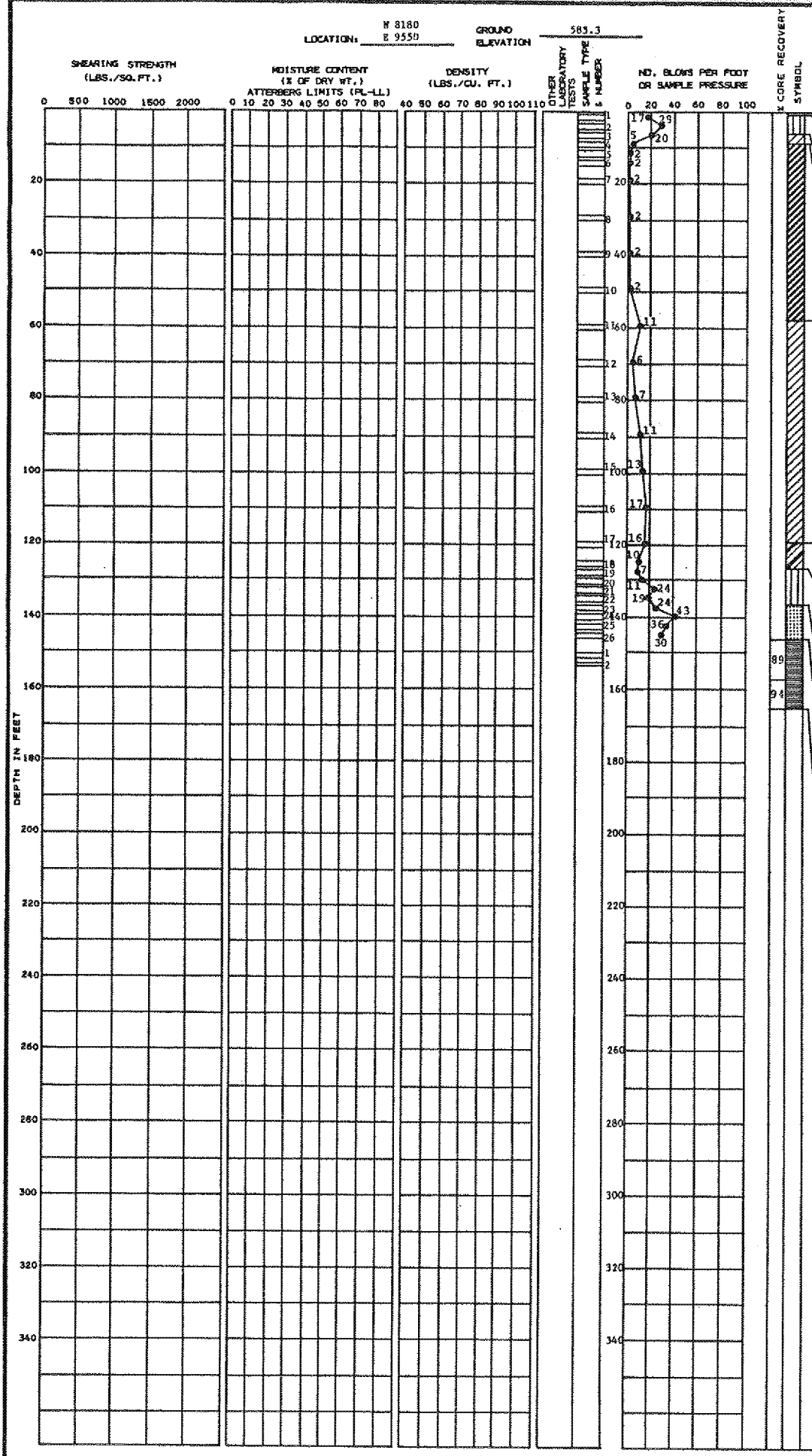
ED_005947A_00014556-00413

LOCATION: N 8180 E 9550

GROUND ELEVATION 583.3

DATE DRILLED: 8/12/77 8/17/77

SHEET 1 OF 1



DESCRIPTION

0-0.5' Topsoil, silty dark brown

0.5-6.0' Clayey Silt, light gray and med. brown, mottled, med. dense, slight plasticity, dry, trace fine gravel, roots (ML)

6.0-8.5' Silty Clay, med. brown, very stiff, med. plasticity, very stiff, med. plasticity, moist, trace fine gravel (CL)

8.5-57.0' Clay, med. gray, soft to very soft, high plasticity, wet, trace silt (CH)

48.5' Trace fine to med. gravel

57.0-118.5' Silty Clay, med. gray, stiff, med. plasticity, moist, trace to little sand, trace fine gravel (CL)

68.5-88.5' Med. stiff

78.5-118.5' Little fine sand

108.5-118.5' Very stiff

118.5-125.5' Clay, med. gray, very stiff, med. plasticity, moist, trace silt (CL-CH)

123.5-125.5' Med. stiff

125.5-135.5' Clayey Silt, med. gray, loose to med. dense, wet, trace sand occasional fine to med.-grained sand seams (ML)

128.5-131.0' Sandy silt

131.0-132.0' Fine-grained silty sand seam

135.5-143.0' Sand, gray and brown, med. dense to dense, wet, fine-to med. grained, trace silt (SP)

143.5-144.5' Clayey sand

145.0' Top of Rock

145.0-164.0' Shale, green-gray, hard, occasional irregular bedding with very fine black coal stringers, predominately massive

148.7-149.3' Very fine-grained, hard, irregularly bedded sandy layers interbedded with shale

162.7-164.0' Soft dark gray, dry, friable

Bottom of Hole: Depth 164.0'
Elevation 421.3

Hole grouted from 164.0' to ground surface.

SOIL BORING NO. B-13

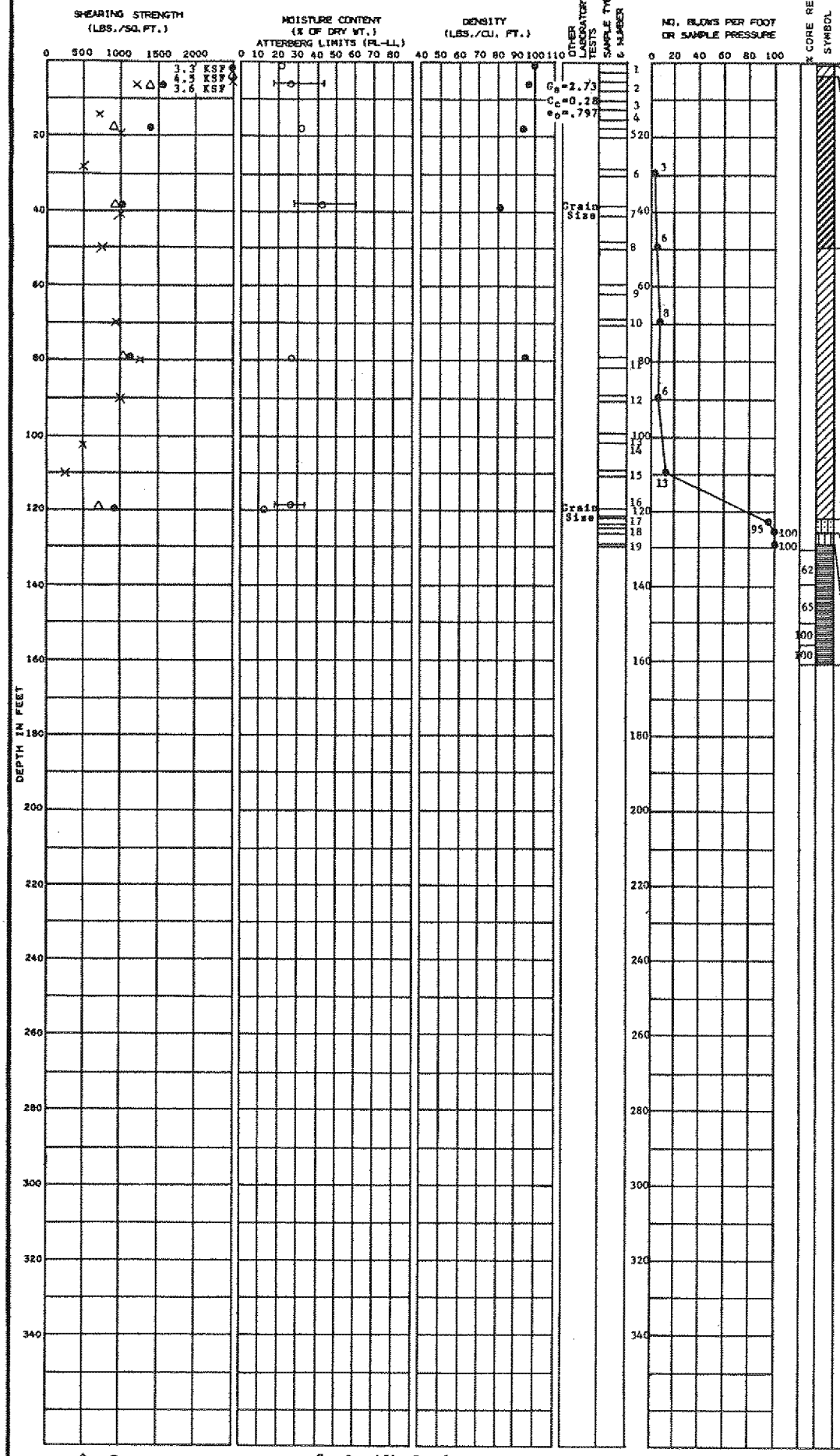
BECHTEL Belle River

LOCATION: N 5270 E 15660

GROUND ELEVATION 580.0

DATE DRILLED: 9/7/77 9/14/77

SHEET 1 OF 1



DESCRIPTION

0-0.5' Topsoil, dark brown, dry

0.5-3.0' Silty Clay, med. brown, gray and black, mottled, slight to med. plasticity, moist, trace fine gravel (CL)

3.0-48.5' Clay, med. gray, very soft, high plasticity, moist to wet, trace silt (CH)

48.5-120.5' Silty Clay, dark gray, med. stiff, med. plasticity, moist, little sand, trace fine to med. gravel (CL)

108.5-120.5' Stiff, trace sand

118.5'-120.4' Seams of silt, clayey sand, and silty sand

120.5-124.6' Silty Sand, med. gray, very dense, moist, fine to med.-grained, trace fine gravel, occasional silt seams (SM)

124.6-128.0' Clayey Silt, med. gray, very dense, dry, trace fine gravel (ML)

128.0' Top of Rock

128.0-159.5' Shale, dark gray, soft, weathered, fragments as abstracted from core barrel

151.3' Slightly harder with soft lenses, splits easily

155.0' Moderately hard core broken every 1"-2"

Bottom of Hole: Depth 159.5'
Elevation 420.5

Hole grouted from 159.5' to ground surface.

Discovered gas in hole when removing casing.

△ Torvane
○ Unconsolidated Undrained
● Unconfined Compression
⊢⊣ Atterberg Limits
G_s Specific Gravity
C_c Compression Index
e_o Initial Void Ratio
× Pocket Penetrometer

SOIL BORING NO. B-17

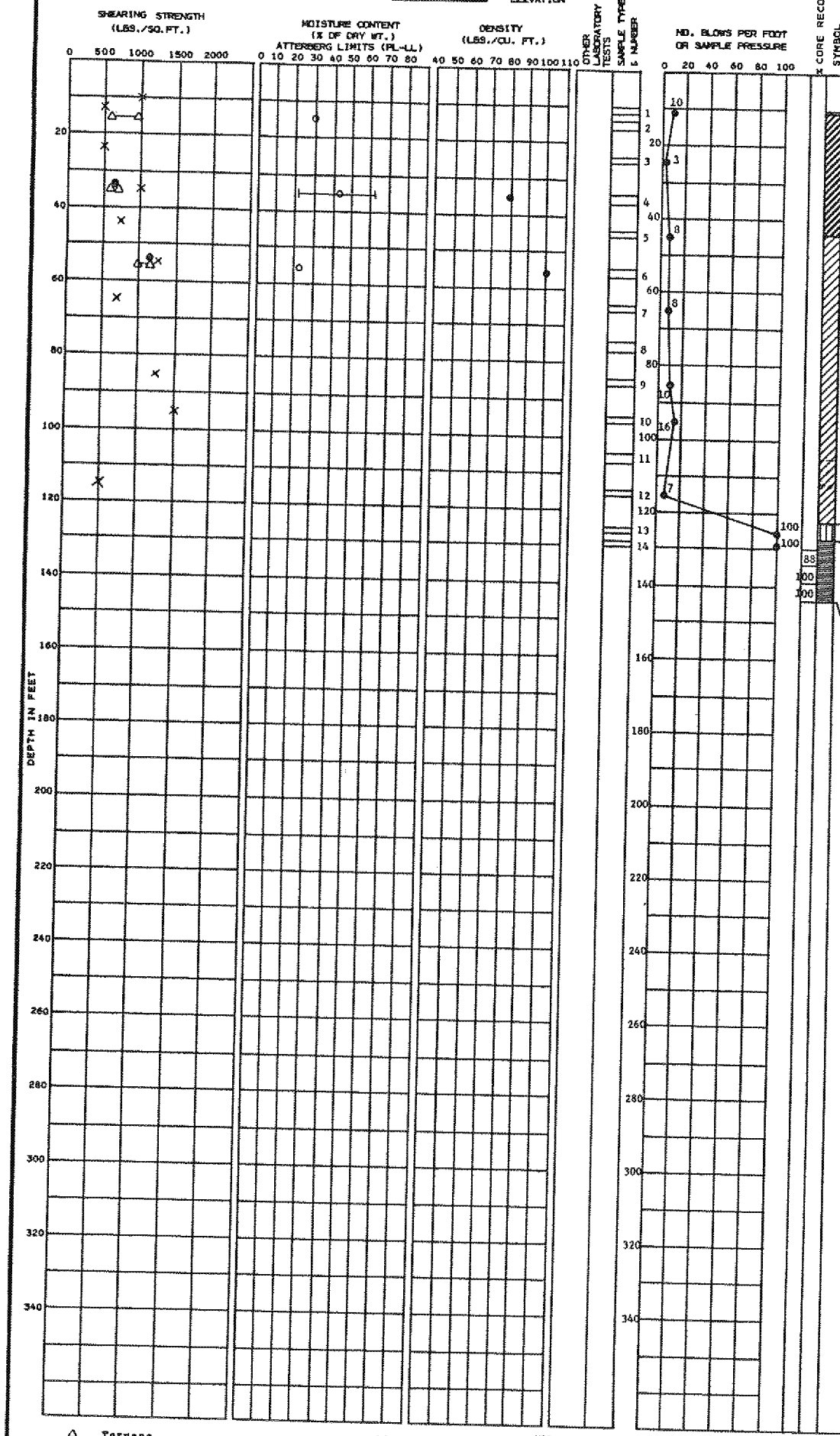
BECHTEL Belle River

LOCATION: N 5163 E 15744

GROUND ELEVATION 577.5 (Top of Water)

DATE DRILLED: 9/21/77 9/27/77

SHEET 1 OF 1



DESCRIPTION

0-10.0' Water

10.0-10.3' Sandy Clay, dark gray to black, very soft, wet, trace fine to coarse gravel (CL)

10.3-43.5' Clay, gray-brown, med. stiff, high plasticity, moist to wet, trace silt (CH)

18.0-43.5' Very soft

43.5-122.0' Silty Clay, med. gray, med. stiff, med. plasticity, moist, trace to little sand, trace fine gravel (CL)

93.5-113.5' Very stiff, trace sand

113.5-122.0' Med. stiff, trace silt, trace sand

122.0-127.0' Silt, light gray, very dense, dry, with fine sand (ML)

127.0' Top of Rock

127.0-144.0' Shale, med. gray, soft, weathered

131.7-144.0' Moderately hard with soft clay interbeds

139.0-144.0' Occasional soft clay layers

Bottom of Hole: Depth 144.0'
Elevation 433.5

Hole grouted from 127.0' to ground surface.

SOIL BORING NO. B-22

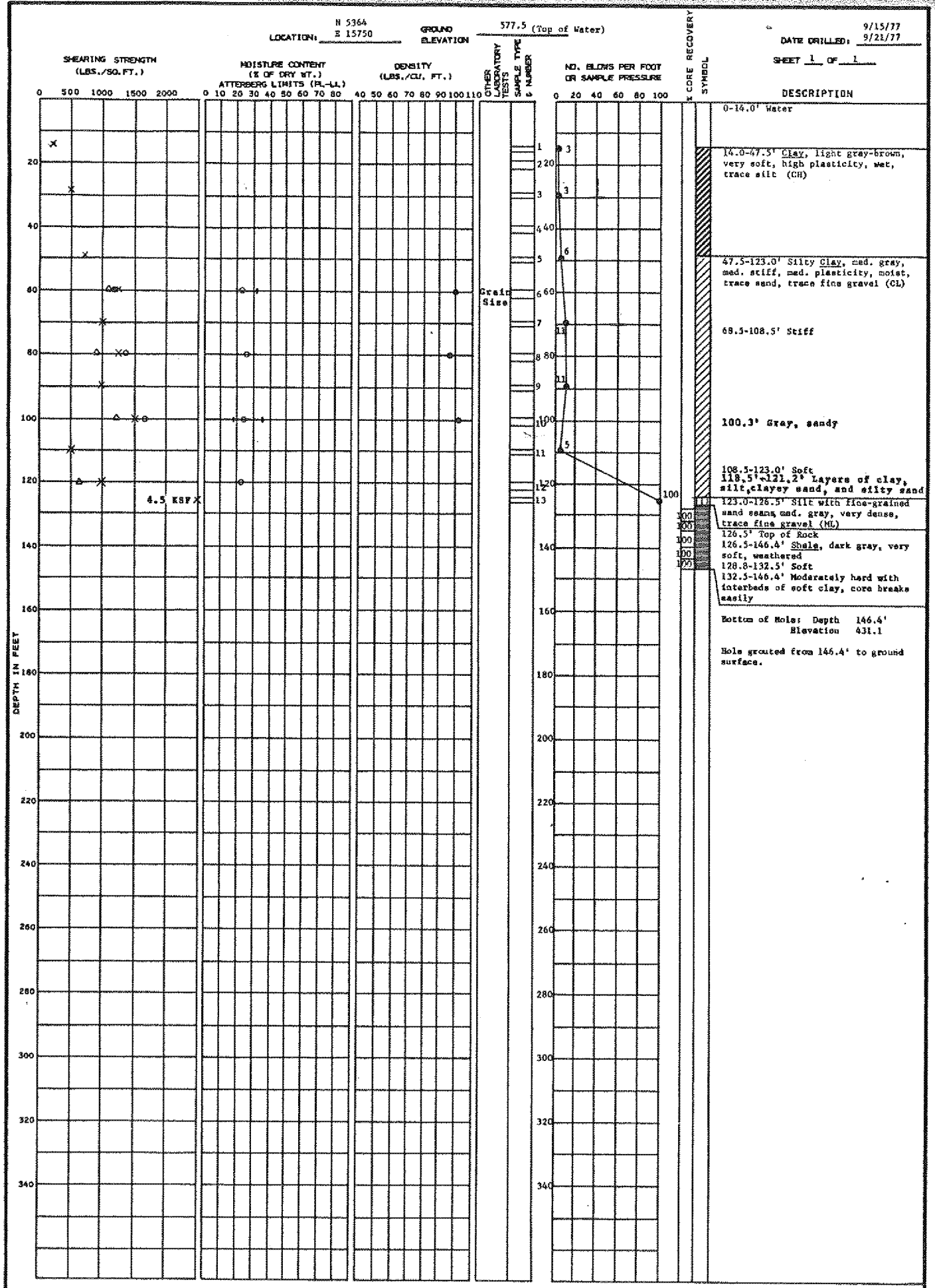
BECHTEL Belle River

LOCATION: N 5364 E 15750

GROUND ELEVATION 577.5 (Top of Water)

DATE DRILLED: 9/15/77 9/21/77

SHEET 1 OF 1



DESCRIPTION

0-14.0' Water

14.0-47.5' Clay, light gray-brown, very soft, high plasticity, wet, trace silt (CH)

47.5-123.0' Silty Clay, med. gray, med. stiff, med. plasticity, moist, trace sand, trace fine gravel (CL)

68.5-108.5' Stiff

100.3' Gray, sandy

108.5-123.0' Soft

118.5'-121.2' Layers of clay, silt, clayey sand, and silty sand

123.0-126.5' Silt with fine-grained sand seams, med. gray, very dense, trace fine gravel (ML)

126.5' Top of Rock

126.5-146.4' Shale, dark gray, very soft, weathered

128.8-132.5' Soft

132.5-146.4' Moderately hard with interbeds of soft clay, core breaks easily

Bottom of Hole: Depth 146.4'
Elevation 431.1

Hole grouted from 146.4' to ground surface.

SOIL BORING NO. B-23

BECHTEL Belle River

ED_005947A_00014556-00417

LOCATION: N 7113 / [illegible] GROUND ELEVATION 558.5

DATE DRILLED: 9/1/77 / 9/1/77

SHEET 1 OF 1

SHEARING STRENGTH (LBS./SQ.FT.) 0 500 1000 1500 2000

MOISTURE CONTENT (% OF DRY WT.) ATTERBERG LIMITS (PL-LL) 0 10 20 30 40 50 60 70 80

DENSITY (LBS./CU. FT.) 40 50 60 70 80 90 100 110

OTHER LABORATORY TESTS

SAMPLE TYPE & NUMBER

NO. BLOWS PER FOOT OR SAMPLE PRESSURE 0 20 40 60 80 100

% CORE RECOVERY

SYMBOL

DEPTH IN FEET 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300 320 340

DESCRIPTION

0-0.8' Topsoil, dk. brown, dry

0.8-4.0' Clayey Silt, yellow to med. brown, med. dense, dry, trace sand, trace fine to coarse gravel, roots (ML)

4.0-17.0' Silty Clay, dk. brown and gray, mottled, med. stiff to very stiff, med. plasticity, moist, trace sand, trace fine to coarse gravel (CL)

9.0' Med. brown

13.5' Med. gray

17.0-30.0' Clay, med. gray, soft, high plasticity, moist to wet, trace silt, trace sand, trace fine gravel (CH)

Bottom of Hole: Depth 30.0'
Elevation 558.5

Hole backfilled with cuttings.

SOIL BORING NO. B-24

BECHTEL Belle River

LOCATION: N 6921 E 11501

GROUND ELEVATION 587.5

DATE DRILLED: 9/1/77 9/1/77

SHEET 1 OF 1

SHEARING STRENGTH (LBS./SQ.FT.) 0 500 1000 1500 2000

MOISTURE CONTENT (% OF DRY WT.) ATTERBERG LIMITS (PL-LL) 0 10 20 30 40 50 60 70 80

DENSITY (LBS./CU. FT.) 40 50 60 70 80 90 100 110

OTHER LABORATORY TESTS

SAMPLE TYPE & NUMBER

NO. BLOWS PER FOOT OR SAMPLE PRESSURE 0 20 40 60 80 100

% CORE RECOVERY

SYMBOL

DEPTH IN FEET 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300 320 340

DESCRIPTION

0-0.7' Topsoil, dk. brown, dry

0.7-4.5' Silty Sand, tan and yellow, mottled, loose, damp, fine-grained (SM)

4.5-9.0' Silty Clay, brown and gray, mottled, stiff to very stiff, med. plasticity, moist, trace sand, trace fine to coarse gravel (CL)

9.0-30.0' Clay, med. gray, very soft, high plasticity, moist to wet, trace sand, trace fine gravel, trace silt (CH)

Bottom of Hole: Depth 30.0'
Elevation 557.5

Hole backfilled with cuttings.

SOIL BORING NO. B-26

BECHTEL Belle River

LOCATION: N 6730 E 11963

GROUND ELEVATION 588.1

DATE DRILLED: 9/1/77 9/1/77

SHEET 1 OF 1

SHEARING STRENGTH (LBS./SQ.FT.) 0 500 1000 1500 2000

MOISTURE CONTENT (% OF DRY WT.) ATTERBERG LIMITS (PL-LL) 0 10 20 30 40 50 60 70 80

DENSITY (LBS./CU. FT.) 40 50 60 70 80 90 100 110

OTHER LABORATORY TESTS

SAMPLE TYPE & NUMBER

NO. BLOWS PER FOOT OR SAMPLE PRESSURE 0 20 40 60 80 100

% CORE RECOVERY

SYMBOL

DEPTH IN FEET 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300 320 340

DESCRIPTION

0-0.7' Topsoil, dr. brown, dry

0.7-4.0' Silty Sand, tan and gold, mottled, med. dense, dry, fine-grained, roots (SM)

4.0-13.5' Silty Clay, gray and brown, mottled, med. stiff to very stiff, med. plasticity, moist, trace sand, trace fine gravel (CL)

6.0' Green brown

13.5-30.0' Clay, med. gray, soft, high plasticity, moist to wet, trace silt, trace fine gravel (CH)

Bottom of Hole: Depth 30.0'
Elevation 558.1

Hole backfilled with cuttings.

SOIL BORING NO. B-28

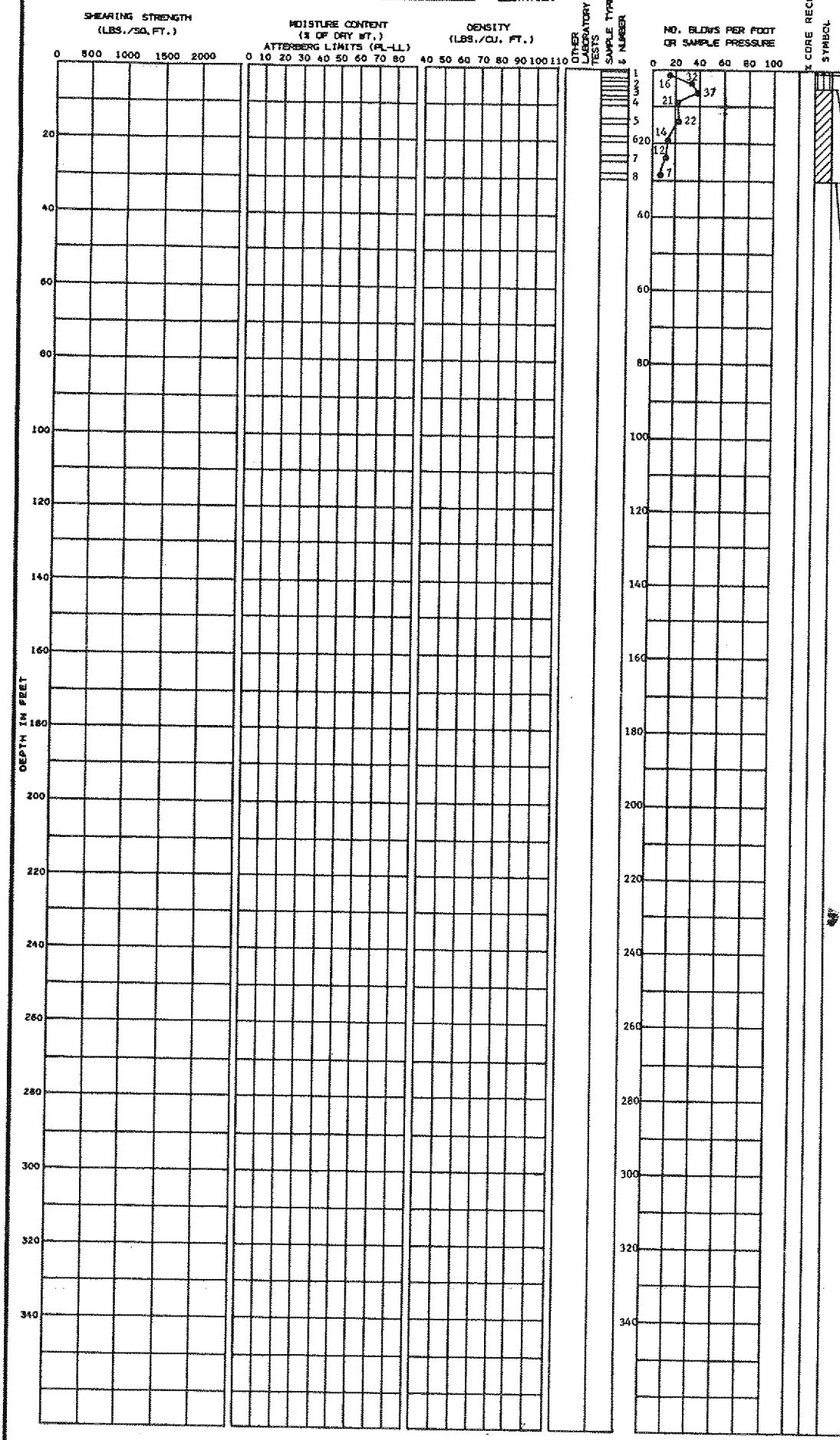
BECHTEL Belle River

LOCATION: N 6539 E 12425

GROUND ELEVATION 588.2

DATE DRILLED: 9/2/77 9/2/77

SHEET 1 OF 1



DESCRIPTION

0-1.0' Topsoil, dk. brown, silty, fine to med. gravel, dry (GM)

1.0-5.0' Clayey Silt, dk. brown, med. dense to dense, dry, trace sand, trace fine gravel (ML)

5.0-30.0' Silty Clay, dk. brown, hard to very stiff, dry, med. plasticity, trace sand, trace fine to med. gravel (CL)

13.5' Moist, dipping parting in sample, med. brown with med. gray filling, with roots

19.0-28.5' Med. gray, stiff

23.5' green-brown and gray, mottled

28.5-30.0' Med. gray, med. stiff

Bottom of Hole: Depth 30.0'
Elevation 558.2

Hole backfilled with cuttings.

SOIL BORING NO. B-30

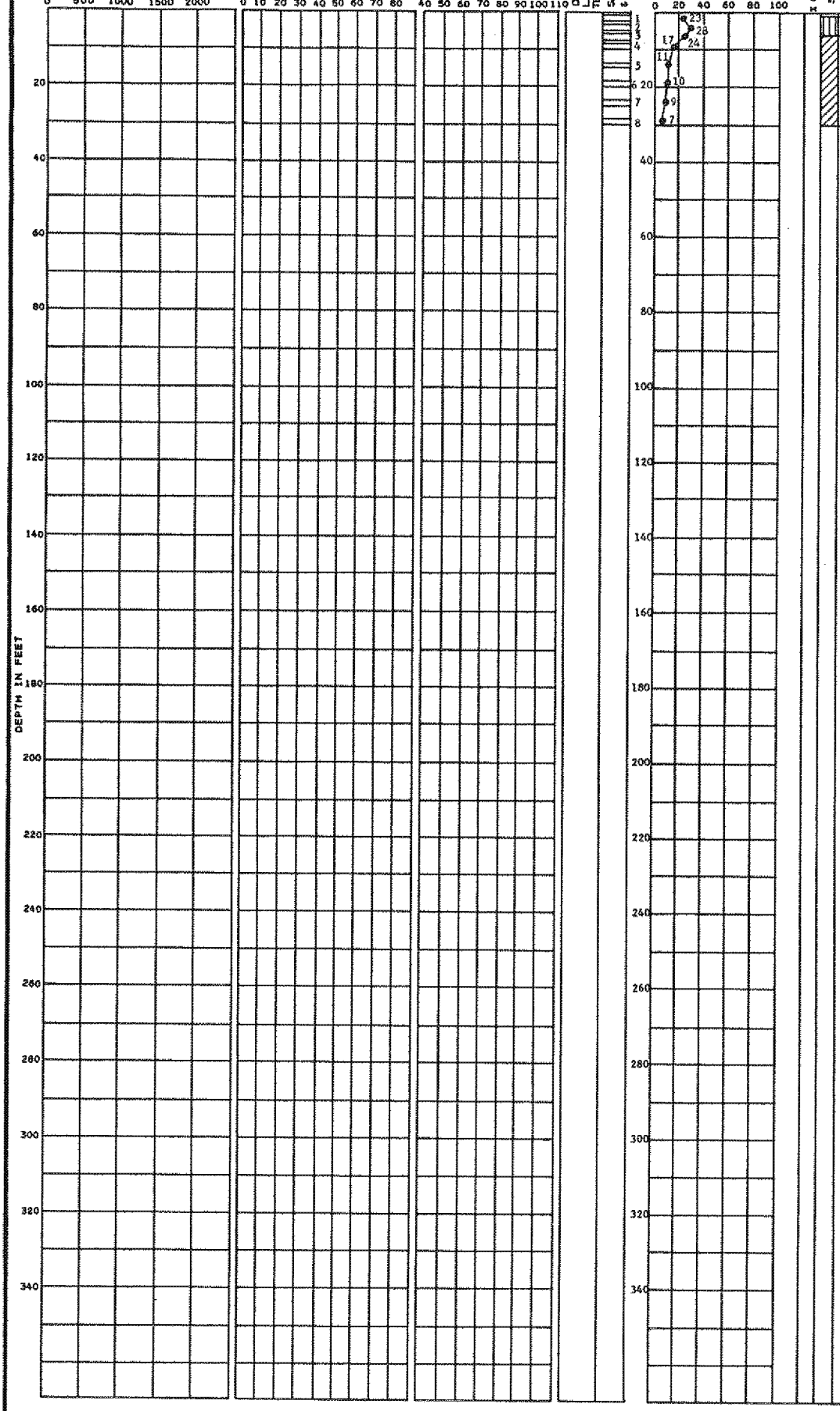
BECHTEL Belle River

LOCATION: N 6348 E 12890

GROUND ELEVATION 600.0

DATE DRILLED: 9/1/77 9/1/77

SHEET 1 OF 1



DESCRIPTION

0-1.0' Topsoil, dk. brown, silty, dry, sandy fill with coarse gravel

1.0-6.0' Clayey Silt, green brown, msd. dense, dry, trace sand (ML)

6.0-30.0' Silty Clay, green brown, very stiff, slight plasticity, moist, trace sand, trace fine gravel (CL)

13.5' Med. gray, stiff to msd. stiff, msd. plasticity

28.5-30.0' Med. to high plasticity

Bottom of Hole: Depth 30.0'
Elevation 570.0

Hole backfilled with cuttings.

SOIL BORING NO. B-32

BECHTEL Belle River

LOCATION: N 6156 E 13249

GROUND ELEVATION 598.8

DATE DRILLED: 9/2/77 9/2/77

SHEET 1 OF 1

SHEARING STRENGTH (LBS./SQ.FT.) 0 500 1000 1500 2000

MOISTURE CONTENT (% OF DRY WT.) ATTERBERG LIMITS (PL-LL) 0 10 20 30 40 50 60 70 80

DENSITY (LBS./CU. FT.) 40 50 60 70 80 90 100 110

OTHER LABORATORY TESTS

SAMPLE TYPE & NUMBER

NO. BLOWS PER FOOT OR SAMPLE PRESSURE 0 20 40 60 80 100

X CORE RECOVERY

SYMBOL

DEPTH IN FEET 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300 320 340

DESCRIPTION

0-0.3' Topsoil, dk. brown, dry

0.3-3.5' Clayey Silt, light brown and gray, mottled, med. dense, none to slight plasticity, dry, trace sand, trace fine to coarse gravel (ML)

3.5-23.5' Silty Clay, med. brown and gray, lightly mottled, very stiff to hard, med. plasticity, moist, trace sand, trace fine gravel (CL)

13.5-23.5' Med. gray, med. stiff

23.5-30.0' Clay, med. gray, soft to very soft, high plasticity, moist, trace silt (CH)

Bottom of Hole: Depth 30.0'
Elevation 568.8

Hole backfilled with cuttings.

SOIL BORING NO. B-34

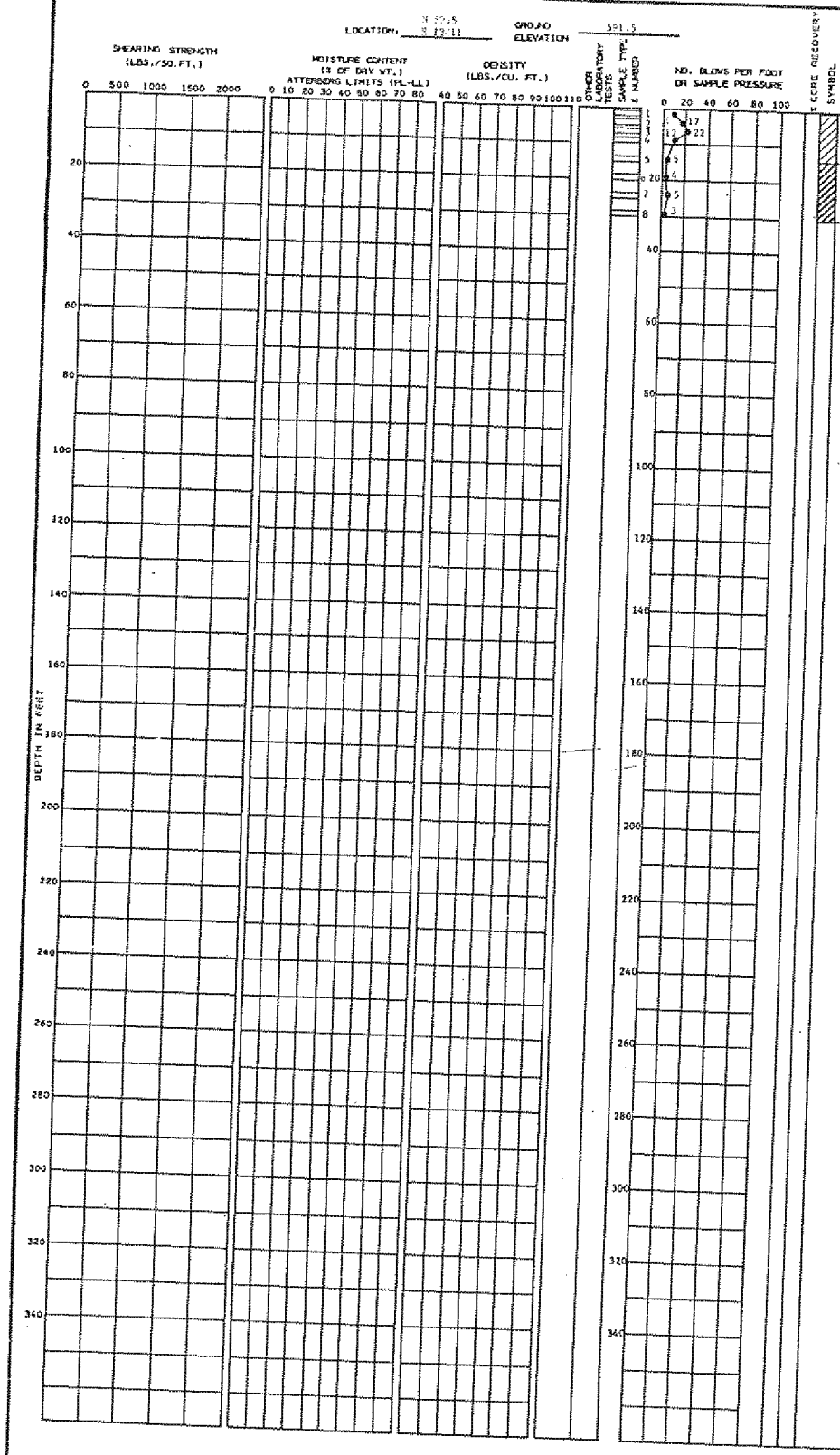
BECHTEL Belle River

LOCATION: N 5945 W 12/11

GROUND ELEVATION 591.5

DATE DRILLED: 9/2/77 9/2/77

SHEET 1 OF 1



DESCRIPTION

6-0.4' Topsoil, dk. brown, dry

0.4-14.0' Silty Clay, dk. brown and gray, mottled, very stiff to med. stiff, slight plasticity, moist, trace sand, trace fine gravel (CL)

3.5-5.0' Scattered stringers of calcium carbonate

8.5-14.0' Med. brown

14.0-30.0' Clay, med. gray, soft to very soft, high plasticity, moist, trace silt (CH)

Bottom of Hole: Depth 30.0'
Elevation 561.5

Hole backfilled with cuttings.

SOIL BORING NO. B-36

BECHTEL Belle River

LOCATION: N 5774 E 14272

GROUND ELEVATION: 591.2

DATE DRILLED: 9/6/77 9/6/77

SHEET 1 OF 1

SHEARING STRENGTH (LBS./SQ.FT.) 0 500 1000 1500 2000

MOISTURE CONTENT (% OF DRY WT.) ATTERBERG LIMITS (PL-LL) 0 10 20 30 40 50 60 70 80

DENSITY (LBS./CU. FT.) 40 50 60 70 80 90 100 110

OTHER LABORATORY TESTS

SAMPLE TYPE & NUMBER

NO. BLOWS PER FOOT OR SAMPLE PRESSURE 0 20 40 60 80 100

% CORE RECOVERY

SYMBOL

DEPTH IN FEET 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300 320 340

DESCRIPTION

0-0.3' Topsoil, dk. brown, moist
0.3-13.5' Silty Clay, med. brown and gray, mottled, med. stiff, med. plasticity, trace sand, trace fine gravel (CL)
6.0-8.5' Med. brown, very stiff
8.5-13.5' Med. brown, stiff
13.5-30.0' Clay, med. gray, med. stiff, high plasticity, moist, trace silt (CH)
23.5-28.5' Very soft, moist to wet
28.5-30.0' Soft
Bottom of Hole: Depth 30.0'
Elevation 561.2

Hole backfilled with cuttings.

SOIL BORING NO. B-38

BECHTEL Belle River

LOCATION: N 5582 E 14735

GROUND ELEVATION 590.2

DATE DRILLED: 9/6/77 9/6/77

SHEET 1 OF 1

SHEARING STRENGTH (LBS./SQ.FT.) 0 500 1000 1500 2000

MOISTURE CONTENT (% OF DRY WT.) ATTERBERG LIMITS (PL-LL) 0 10 20 30 40 50 60 70 80

DENSITY (LBS./CU. FT.) 40 50 60 70 80 90 100 110

OTHER LABORATORY TESTS

SAMPLE TYPE & NUMBER

NO. BLOWS PER FOOT OR SAMPLE PRESSURE 0 20 40 60 80 100

% CORE RECOVERY

SYMBOL

DEPTH IN FEET 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300 320 340

DESCRIPTION
0-0.4' Topsoil, dk. brown, dry
0.4-13.5' Silty Clay, med. brown, med. stiff to very stiff, med. plasticity, moist, trace sand, trace fine gravel (CL)
13.5-30.0' Clay, med. gray, soft to very soft, high plasticity, moist to wet, trace silt (CH)

Bottom of Hole: Depth 30.0'
Elevation 560.2

Hole backfilled with cuttings.

SOIL BORING NO. B-48

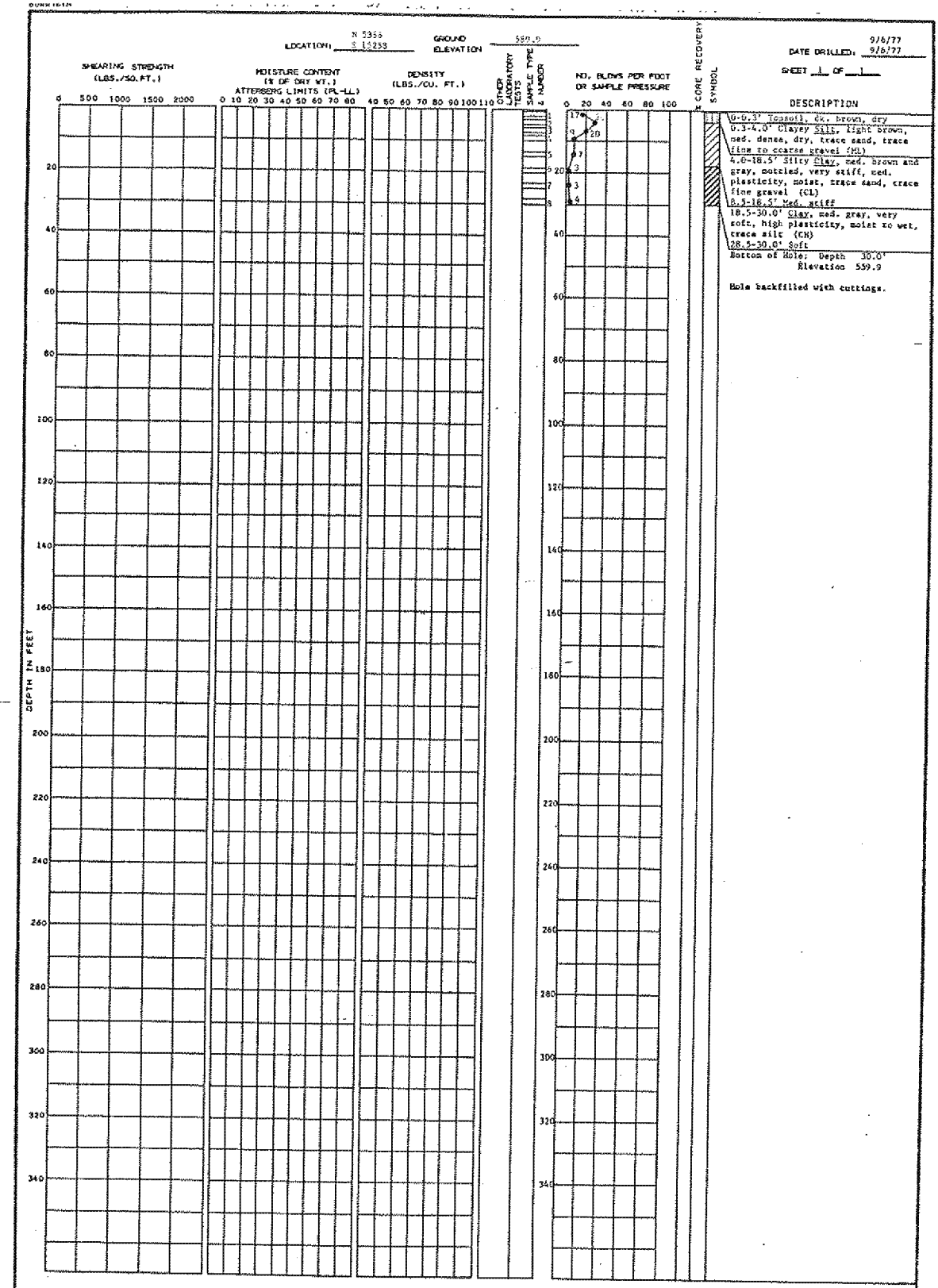
BECHTEL Falls River

LOCATION: N 5359 E 15253

GROUND ELEVATION: 589.9

DATE DRILLED: 9/6/77 9/6/77

SHEET 1 OF 1



DESCRIPTION

0-0.3' Topsoil, dk. brown, dry

0.3-4.0' Clayey Silt, light brown, med. dense, dry, trace sand, trace fine to coarse gravel (ML)

4.0-18.5' Silty Clay, med. brown and gray, mottled, very stiff, med. plasticity, moist, trace sand, trace fine gravel (CL)

18.5-16.5' Med. stiff

18.5-30.0' Clay, med. gray, very soft, high plasticity, moist to wet, trace silt (CH)

28.5-30.0' Soft

Bottom of Hole: Depth 30.0'
Elevation 559.9

Hole backfilled with cuttings.

SOIL BORING NO. B-42

BECHTEL Belle River

MEETING AGENDA
DTE Electric Company
Belle River Power Plant Bottom Ash Basins and Diversion Basin
Monroe Power Plant Fly Ash Basin
Part B Initial Alternate Liner Demonstration Applications Discussion

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Meeting Date: **November 9, 2020, 11:00 AM – 12:00 PM ET.**

Invitees: **EPA – R. Huggins, J. Mills, N. Birchfield, M. Long, M. Jackson, L. Celeste, S. Mooney, J. Schumacher**
DTE – C. Scieszka, R. Lee, C. Clark, K. Martorano
TRC – G. Crockford, V. Buening, K. Cratsenburg
Geosyntec – J. Seymour, O. Bozok

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1) **Introductions and Meeting Objectives (DTE)**

2) **Background for the Belle River Power Plant (BRPP) Bottom Ash Basins (BABs) and Diversion Basin (DB) (TRC)**
   - BRPP BABs and DB Construction/History
   - BABs and DB Hydrogeologic Setting
   - BABs and DB Facility Compliance
   - BABs and DB Detection Monitoring

3) **Discussion on BRPP BABs and DB Draft Part B Initial Alternate Liner Demonstration (ALD) Applications (EPA, DTE and TRC)**
   - Initial EPA feedback and questions on the initial draft of the Part B BRPP BABs & DB Initial Alternate Liner Demonstration Applications provided and discussed with DTE/TRC.

4) **Background for the Monroe Power Plant (MONPP) Fly Ash Basin (FAB) Initial ALD Application (TRC and Geosyntec)**
   - MONPP FAB Construction/History
   - FAB Hydrogeologic Setting
   - FAB Facility Compliance
   - FAB Detection Monitoring

5) **Discussion on MONPPP FAB Draft Part B Initial ALD Application (EPA, DTE, TRC and Geosyntec)**
   - Initial EPA feedback and questions on the initial draft of the Part B MONPP FAB Initial Alternate Liner Demonstration Application provided and discussed with DTE/TRC/Geosyntec.

MEETING AGENDA
DTE Electric Company
Belle River Power Plant Bottom Ash Basins and Diversion Basin
Monroe Power Plant Fly Ash Basin
Part B Initial Alternate Liner Demonstration Applications Discussion

6) DTE/TRC/Geosyntec Questions

- Use of attachments vs. direct links to reports/information online. Which is preferred in the Part B ALD applications?
- Additional items that should be added to or expanded within the Part B ALD applications that is not in the initial drafts?
- Is there an opportunity when implementing the Part B demonstration(s) to discuss the planned scope with EPA in a separate call prior to initiating the field work to ensure alignment?
- Does the EPA have feedback on who the signatory for these submittals should be?
- Can the EPA confirm that a P.E. does not need to certify these submittals?
- Other items that arise from the EPA feedback and/or questions.

7) Wrap Up/Adjourn

Message

From: Long, Michelle [Long.Michelle@epa.gov]
Sent: 11/17/2020 6:12:54 PM
To: Michelle Freeark [mfreeark@azgt.coop]; Huggins, Richard [Huggins.Richard@epa.gov]
CC: Mills, Jason [Mills.Jason@epa.gov]; Jackson, Mary [Jackson.Mary@epa.gov]; Capiro, Mirtha [capiro.mirtha@epa.gov]; Celeste, Laurel [celeste.laurel@epa.gov]
Subject: RE: Arizona Electric Power Cooperative, Inc (AEPCO) meeting request on CCR Part B ALD Demonstration

Hi Michelle,

Yes, that sounds good. I have copied everyone from EPA who should be included on the meeting invite. Please send an agenda and any meeting materials at least 2 days before our meeting to everyone copied on this email. Thanks and we look forward to speaking with you.

Michelle Long
Biologist
U.S. Environmental Protection Agency
Office of Resource Conservation and Recovery
Materials Recovery and Waste Management Division
(703) 347-8953

From: Michelle Freeark <mfreeark@azgt.coop>
Sent: Tuesday, November 17, 2020 1:10 PM
To: Long, Michelle <Long.Michelle@epa.gov>; Huggins, Richard <Huggins.Richard@epa.gov>
Cc: Mills, Jason <Mills.Jason@epa.gov>; Jackson, Mary <Jackson.Mary@epa.gov>
Subject: RE: Arizona Electric Power Cooperative, Inc (AEPCO) meeting request on CCR Part B ALD Demonstration

Michelle,

Our preference is to use our virtual meeting platform, Ring Central, which has worked extremely well since March.

I can send the invite and you can forward to EPA attendees if that is ok?

Thanks,
Michelle

Michelle Freeark, Executive Director of Regulatory Affairs and Corporate Services

Arizona G&T Cooperatives

1000 S. Hwy 80 | Benson, AZ 85602
o: 520-586-5122 | m: Ex. 6 Personal Privacy (PP) **mfreeark@azgt.coop**

From: Long, Michelle <Long.Michelle@epa.gov>
Sent: Tuesday, November 17, 2020 6:39 AM
To: Michelle Freeark <mfreeark@azgt.coop>; Huggins, Richard <Huggins.Richard@epa.gov>

Cc: Mills, Jason <Mills.Jason@epa.gov>; Jackson, Mary <Jackson.Mary@epa.gov>
Subject: RE: Arizona Electric Power Cooperative, Inc (AEPCO) meeting request on CCR Part B ALD Demonstration

Hi Michelle,

Let's go for 10-11am ET. That looks like it works best for all of us. Would you like me to set up a MS Teams meeting or do you want to set up the meeting? Thanks.

Michelle Long
Biologist
U.S. Environmental Protection Agency
Office of Resource Conservation and Recovery
Materials Recovery and Waste Management Division
(703) 347-8953

From: Michelle Freeark <mfreeark@azgt.coop>
Sent: Tuesday, November 17, 2020 8:33 AM
To: Long, Michelle <Long.Michelle@epa.gov>; Huggins, Richard <Huggins.Richard@epa.gov>
Cc: Mills, Jason <Mills.Jason@epa.gov>; Jackson, Mary <Jackson.Mary@epa.gov>
Subject: RE: Arizona Electric Power Cooperative, Inc (AEPCO) meeting request on CCR Part B ALD Demonstration

Good morning Michelle,

In our email request we asked for a meeting on Tuesday, November 24th. Our only request is that it is after 8:30 am EDT, other than that we have no preference.

Thanks,
Michelle

Michelle Freeark, Executive Director of Regulatory Affairs and Corporate Services

Arizona G&T Cooperatives

1000 S. Hwy 80 | Benson, AZ 85602
o: 520-586-5122 | m: Ex. 6 Personal Privacy (PP) **mfreeark@azgt.coop**

-------- Original message --------
From: "Long, Michelle" <Long.Michelle@epa.gov>
Date: 11/17/20 8:28 AM (GMT-05:00)
To: Michelle Freeark <mfreeark@azgt.coop>, "Huggins, Richard" <Huggins.Richard@epa.gov>
Cc: "Mills, Jason" <Mills.Jason@epa.gov>, "Jackson, Mary" <Jackson.Mary@epa.gov>
Subject: RE: Arizona Electric Power Cooperative, Inc (AEPCO) meeting request on CCR Part B ALD Demonstration

Hi Michelle,

Do you have any preferred meeting dates and times? If you can offer a few times, I'll check our calendars and find a time that would work for us. Thanks.

Michelle Long

Biologist
U.S. Environmental Protection Agency
Office of Resource Conservation and Recovery
Materials Recovery and Waste Management Division
(703) 347-8953

From: Michelle Freeark <mfreeark@azgt.coop>
Sent: Tuesday, November 17, 2020 8:25 AM
To: Huggins, Richard <Huggins.Richard@epa.gov>
Cc: Long, Michelle <Long.Michelle@epa.gov>; Behan, Frank <Behan.Frank@epa.gov>; Hillyer, Kirsten <hillyer.kirsten@epa.gov>; Anderson, Lydia <Anderson.Lydia@epa.gov>
Subject: RE: Arizona Electric Power Cooperative, Inc (AEPCO) meeting request on CCR Part B ALD Demonstration

Thank you Richard!

Michelle Freeark, Executive Director of Regulatory Affairs and Corporate Services

1000 S. Hwy 80 | Benson, AZ 85602
o: 520-586-5122 | m: Ex. 6 Personal Privacy (PP) | **mfreeark@azgt.coop**

-------- Original message --------
From: "Huggins, Richard" <Huggins.Richard@epa.gov>
Date: 11/16/20 4:07 PM (GMT-05:00)
To: Michelle Freeark <mfreeark@azgt.coop>
Cc: "Long, Michelle" <Long.Michelle@epa.gov>, "Behan, Frank" <Behan.Frank@epa.gov>, "Hillyer, Kirsten" <hillyer.kirsten@epa.gov>, "Anderson, Lydia" <Anderson.Lydia@epa.gov>
Subject: RE: Arizona Electric Power Cooperative, Inc (AEPCO) meeting request on CCR Part B ALD Demonstration

Good afternoon,
Sorry for the delay Michelle. I have asked Michelle Long (Part B rule coordinator), to work with you to get this meeting on our calendar. She will be reaching out tomorrow.

Look forward to the meeting,
Richard

Richard Huggins Jr., Chief
Energy Recovery and Waste Disposal Branch
Office of Resource Conservation and Recovery
U.S. Environmental Protection Agency
Desk: 703-308-0017 iPhone: [redacted]

From: Michelle Freeark <mfreeark@azgt.coop>
Sent: Monday, November 16, 2020 3:54 PM
To: Huggins, Richard <Huggins.Richard@epa.gov>; Behan, Frank <Behan.Frank@epa.gov>; Hillyer, Kirsten

<hillyer.kirsten@epa.gov>; Anderson, Lydia <Anderson.Lydia@epa.gov>
Subject: RE: Arizona Electric Power Cooperative, Inc (AEPCO) meeting request on CCR Part B ALD Demonstration

Good afternoon,

I am following up on our meeting request that was sent via email last Thursday. Knowing how extremely busy you have been, I thought I would reach out to ensure our email request was received and is being considered.

Respectfully,
Michelle Freeark

Michelle Freeark, Executive Director of Regulatory Affairs and Corporate Services

1000 S. Hwy 80 | Benson, AZ 85602
o: 520-586-5122 | m: Ex. 6 Personal Privacy (PP) | mfreeark@azgt.coop

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From: Michelle Freeark
Sent: Thursday, November 12, 2020 7:52 AM
To: 'Huggins.Richard@epa.gov' <Huggins.Richard@epa.gov>; 'Behan.Frank@epa.gov' <Behan.Frank@epa.gov>; 'Hillyer.Kirsten@epa.gov' <Hillyer.Kirsten@epa.gov>; 'anderson.lydia@epa.gov' <anderson.lydia@epa.gov>
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From: Michelle Freeark [mfreeark@azgt.coop]
Sent: 11/20/2020 12:09:46 PM
To: Long, Michelle [Long.Michelle@epa.gov]; Huggins, Richard [Huggins.Richard@epa.gov]
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Arizona G&T Cooperatives

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Biologist
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(703) 347-8953

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Look forward to the meeting,
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CC: 'Williamson, Liz' [ewilliamson@williamsmullen.com]; Eichenberger, Jason [jeichenberger@burnsmcd.com]; 'Weber, Wayne A' [waweber@burnsmcd.com]; Justine McCune [jmccune@azgt.coop]; Nathen Hatch [nhatch@azgt.coop]; Charles S Reece IV [creece@azgt.coop]
Subject: Arizona Electric Power Cooperative, Inc (AEPCO)/EPA meeting on CCR Part B ALD Application on November 24, 2020
Attachments: AEPCO - EPA Agenda November 24 2020.pdf; AEPCO - Draft ALD Application (11-21-20).pdf

Good evening,

In advance of the scheduled meeting between EPA and Arizona Electric Power Cooperative, Inc. (AEPCO) on Tuesday, November 24, 2020 at 10 am EDT, AEPCO is providing the attached documents.

First, an agenda that provides an outline for Tuesday's discussion.

Second, AEPCO's ***Draft*** ALD Application for discussion proposes.

We know EPA staff time is incredibly pressed at this time and we greatly appreciate the time you have given to meet with us.

AEPCO looks forward to our meeting on Tuesday,

Very respectfully,

Michelle Freeark

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AGENDA
AEPCO/EPA MEETING ON DRAFT ALD APPLICATION
https://meetings.ringcentral.com/j/1498053268
November 24, 2020
10:00 am – 11:00 am EDT

1) Welcome *(M. Freeark, AEPCO)*

2) Introductions *(All)*

a. AEPCO attendees include:
   i. Ms. Michelle R. Freeark, Executive Director of Regulatory Affairs & Corporate Services
   ii. Ms. Justine McCune, Environmental Specialist
   iii. Mr. Nathen Hatch, Generation Engineering Manager
   iv. Mr. Charles Reece, Principal Engineer
   v. Ms. Liz Williamson, Partner, Williams Mullen
   vi. Mr. Wayne Weber, Burns & McDonnell
   vii. Mr. Jason Eichenberger, Burns & McDonnell
b. EPA attendees

3) Apache Generating Station Site Overview *(M. Freeark, AEPCO)*
a. AEPCO as an electric cooperative
b. Facility and CCR Units
c. Significance of this ALD to AEPCO and its Members
d. CCR Unit Composite Liner
e. Unique regional setting and geology
f. Regulatory and Technical oversight of the CCR Units

4) Overview of Draft ALD Application *(J. Eichenberger/W. Weber, Burns & McDonnell)*
a. Review of basic Application Elements
b. Identify supportive documentation
c. Informal discussion concerning Application

5) ALD Application Submittal Logistics *(L. Williamson, Williams Mullen)*
a. Anticipated Submittal of Final ALD Application and Attachments on November 30, 2020
b. Discuss EPA share file or email size constraints and preferences
c. Opportunity to provide additional documentation prior to December 14, 2020 at either AEPCO's or EPA's initiative
d. Other EPA formatting or logistical submittal preferences

6) Closing *(M. Freeark)*

BURNS McDONNELL

DRAFT Apache CCR Surface Impoundments Application for Alternative Liner Demonstration

Arizona G&T Cooperatives

Tucson Electric Power Cooperatives

Arizona Electric Power Cooperative, Inc.

Apache Generating Station
Project No. 126052

Revision A
November 21, 2020

DRAFT

DRAFT Apache CCR Surface Impoundments Application for Alternative Liner Demonstration

Prepared for

Arizona Electric Power Cooperative, Inc.
Apache Generating Station
Project No. 126052

Cochise, Arizona

Revision A
November 21, 2020

Prepared by

Burns & McDonnell Engineering Company, Inc.
Kansas City, Missouri

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LIST OF ABBREVIATIONS

Abbreviation	Term/Phrase/Name
Apache	Apache Generating Station
ADEQ	Arizona Department of Environmental Quality
AEPCO	Arizona Electric Power Cooperative, Inc
APP	Aquifer Protection Permit
ASTM	ASTM International
BAT	BAT Geosystems AB
bgs	Below ground surface
CCR	Coal Combustion Residuals
CFRC.F.R.	Code of Federal Regulations
CY	Cubic yards
CWDF	Combustion Waste Disposal Facility
EEC	Engineering and Environmental Consultants
ELG	Effluent Limitations Guidelines and Standards for the Steam Electric Power Generating Point Source Category
EPA	U. S. Environmental Protection Agency
EGUs	Electric Generating Units
FGD	Flue Gas Desulfurization
gpm	Gallon per minute
GCL	Geosynthetic Clay Liner
GWPS	Groundwater Protection Standards
HDPE	High Density Polyethylene
RCRA	Resource Conservation and Recovery Act

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Abbreviation	Term/Phrase/Name
SAP	Sampling and Analysis Plan
PPA	Purchase Power Agreements
SSI(s)	Statistically Significant Increases
SSL(s)	Statistically Significant Levels
TDS	Total Dissolved Solids
USACE	U. S. Army Corps of Engineers

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1.0 INTRODUCTION

On April 17, 2015, the U.S. Environmental Protection Agency (EPA) issued the federal Coal Combustion Residual (CCR) Rule, 40 C.F.R. Part 257, Subpart D, to regulate the disposal of CCR materials generated at coal-fueled electric generating units. The rule is being administered under Subtitle D of the Resource Conservation and Recovery Act (RCRA, 42 U.S.C. § 6901 *et seq.*).

- On August 28, 2020, the EPA Administrator issued revisions to the CCR Rule that require all unlined surface impoundments to cease receipt of CCR and non-CCR waste and initiate closure by April 11, 2021, unless an alternative deadline is requested and approved. 40 C.F.R. § 257.101(a)(1), (b)(1) (85 Fed. Reg. 53516 (Aug. 28, 2020)). Prior to *USWAG*, facilities, such as Apache, that are not considered lined by the CCR Rule but are not impacting groundwater were not subject to closure. To mitigate from this harsh outcome for sufficiently protective lined CCR Units, EPA made further revisions, promulgating "Hazardous and Solid Waste Management System: Disposal of CCR; A Holistic Approach to Closure Part B: Alternate Demonstration for Unlined Surface Impoundments" (Closure Part B) on November 12, 2020. 85 Fed. Reg. 72506 (Nov. 12, 2020). The Closure Part B Rule finalized a process for unlined impoundments to operate with an alternate liner approved by EPA or a Participating State Director as part of an Alternate Liner Demonstration (ALD).*Id.* Specifically, owners and operators of a CCR surface impoundment may submit an ALD to the Administrator or the Participating State Director to demonstrate that, based on the construction of the unit and surrounding site conditions, there is no reasonable probability that continued operation of the surface impoundment will result in adverse effects to human health or the environment. 85 Fed. Reg. at 72539-42 (adding 40 C.F.R. § 257.71(d)). To make this demonstration, the facility is required to submit an initial application intended to show whether a unit meets certain minimum requirements before embarking on a comprehensive ALD. This first step must be submitted no later than November 30, 2020, although the effective date of the Closure Part B Rule is December 14, 2020. If the application is approved, facilities perform field work and analysis to prepare a comprehensive final ALD package. The ALD package is due no later than November 30, 2021. This document services as AEPCO's Applications for an ALD pursuant to 40 C.F.R. § 257.71(d)(1) for the CCR surface impoundments within the combustion waste disposal facility (CWDF) at the Apache Generating Station (Apache), an electric generation station located in Cochise, Arizona. Specifically, AEPCO submits an ALD Application for Scrubber Pond No. 2 and an ALD Application for the Apache Ash Ponds (Ash Ponds 1-4).

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As discussed *infra*, Scrubber Pond No. 2 has a single unit monitoring well network to address the regional aquifer. The ash ponds have a separate monitoring well network to address the perched aquifer. Therefore, AEPCO provides the required information under Section 257.71(d) concerning both monitoring well networks in this submittal, noting that some information pertaining to both monitoring well networks is combined where appropriate.

To qualify to submit an ALD package, facilities must submit an application with the following components:

- § 257.71(d)(1)(i)(A) – A certification by the owner or operator that the CCR unit is in full compliance with Subpart D: Standards for the Disposal of Coal Combustion Residuals in Landfills and Surface Impoundments, except for § 257.71(A)(1);
- § 257.71(d)(1)(i)(B) – Documentation supporting the certification under § 257.71(d)(1)(i)(A) that includes:
    - § 257.71(d)(1)(i)(B)(*1*) – Documentation that the groundwater monitoring network meets all the requirements of § 257.91, including at a minimum:
        - Map(s) of groundwater monitoring well locations in relation to the CCR unit(s) that depict the elevation of the potentiometric surface and the direction(s) of groundwater flow across the site
        - Well construction diagrams and drilling logs for all groundwater monitoring wells;
        - Maps that characterize the direction of groundwater flow accounting for temporal variations - § 257.71(d)(i)(B)(*1*)(*iii*); and
        - Any other data and analyses the owner or operator of the CCR surface impoundment relied upon when determining the design and location of the groundwater monitoring network);
    - § 257.71(d)(1)(i)(B)(*2*) – Documentation that the CCR surface impoundment remains in detection monitoring pursuant to § 257.94, including documentation that the groundwater monitoring program meets the requirements of § 257.93 and § 257.94;
    - § 257.71(d)(1)(i)(B)(*3*) – Documentation that the unit meets all the location restrictions under §§ 257.60 through 257.64;
    - § 257.71(d)(1)(i)(B)(*4*) – The most recent structural stability assessment required at § 257.73(d); and
    - § 257.71(d)(1)(i)(B)(*5*) – The most recent safety factor assessment required at § 257.73(e).

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- § 257.71(d)(1)(i)(C) – Documentation of the design specifications for any engineered liner components including data and analyses for supporting liner material suitability and construction quality; and
- § 257.71(d)(1)(i)(D) – Documentation that there is no reasonable probability that a complete and direct transport pathway exists between the impoundment and any nearby water body.

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2.0 BACKGROUND

Arizona Electric Power Cooperative, Inc. (AEPCO) is a rural, member-owned generation and transmission electric cooperative formed in 1961 to provide electric generation service to local rural, member-owned electric distribution cooperatives in Arizona and California. As a not-for-profit cooperative, AEPCO is fully owned by its members. AEPCO has six "Class A" members, who participate in and rely on AEPCO's electric generation services, and five "Class D" members that participate in AEPCO's power and energy services. Together, AEPCO's Class A members serve more than 160,000 meters, representing approximately 400,000 individual residential, commercial, agricultural, and industrial consumers. The electric service base is heavily skewed toward rural residential use, with relatively little commercial or industrial load. A substantial proportion of AEPCO's end-users are low income residents.

AEPCO owns and operates only one generating facility (Apache Generating Station or Apache). AEPCO also procures power through renewable facilities and long-term purchase power agreements (PPAs), but these power commitments are relatively small when compared with AEPCO's owned generation units. In the summertime, the collective load of AEPCO's members exceeds the long-term resources AEPCO holds, and to otherwise meet the remaining member needs, AEPCO must purchase power during the peak season. Apache is a key asset because AEPCO has no generation shifting opportunities should Apache close, even for a temporary period. As such, the CCR impoundment closure deadlines are crucial, given AEPCO's cost sensitive end-user base and Apache's importance to reliably meet the power needs of AEPCO's members.

Apache's only coal unit is a critical asset for several reasons and must be kept operational during summer seasons. First, AEPCO's transmission system has a limited import capacity from the neighboring electric markets. If one of Apache's largest generators were to be offline during the summer season, it would engender a substantial reduction in reliability, as the loss of a second generator would not allow AEPCO to meet its peak electric load obligations. Further, if this unit were offline, it would materially increase AEPCO's market reliance, particularly in periods with significant electric market volatility. For these reasons, any prolonged interruption of this coal unit's operation would pose a severe detriment to AEPCO's members and cost sensitive end-user base, both in the areas of reliability and affordability of power.

AEPCO owns and operates Apache Generating Station. Apache is located in Cochise, Arizona, about 80 miles east of Tucson and about 25 miles northeast of Benson, Arizona. AEPCO operates seven electric

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generating units (EGUs) at Apache. Two coal units were commissioned in 1978 and 1979. One of the coal units was converted to fire only natural gas in late 2017 in response to compliance with Regional Haze. Apache therefore has just one coal-fired steam EGU. Ash from coal combustion and scrubber sludge from the flue gas desulfurization system (FGD), a SO2 reduction control device, discharge into the existing combustion waste disposal facility (CWDF). The current operations of the CWDF return water back to the ash sluice pumps and co-mingle all of the CCR and non-CCR flows into one water source used for CCR sluicing. As a result, Apache does not discharge effluent. The CWDF is composed of four ash ponds (Ash Ponds 1-4) and a Scrubber Sludge Pond (Scrubber Pond No. 2) that are subject to the CCR Rule. Ash Ponds 3 and 4 have never received CCR materials but may do so in the future, or could remain in service for receipt of non-CCR flows only. Scrubber Pond No. 1 did not contain liquids on the effective date of the CCR Rule, and has not received CCR material or liquids since that date. The evaporation pond does not receive CCR material. Therefore, Scrubber Pond No. 1 and the evaporation pond are not subject to the CCR Rule. A large portion of the fly ash from Apache is beneficially used by a third-party rather than deposited in the CWDF.

The CWDF was constructed in the early 1990s with a composite liner system consisting of a compacted clay layer overlain with a high-density polyethylene (HDPE) geomembrane liner that is 60-mil thickness at the bottom and 80-mil on the side slopes of each pond at the CWDF. The existing clay layer is a minimum of 8 inches thick and has a permeability of 1 x 10-6 cm/sec, which does not meet the criteria established in Section 257.70(b) or (c) of the CCR Rule. AEPCO has therefore published that the impoundments are considered unlined under the CCR Rule even though they are equipped with a composite liner system and a membrane that meets the rule requirements.

2.1 Hydrogeologic Setting

Apache is located in Sulphur Springs Valley, a large northwest-trending intermontane trough in southeast Arizona. A low divide near Sunsites separates the northern portion of Sulphur Springs Valley, known as the Willcox Basin, from the southern portion of Sulphur Springs Valley, known as the Douglas Basin. The Willcox Basin is bounded by the Pinaleno Mountains and Winchester Mountains on the north, the Little Dragoon and Dragoon Mountains on the west and the Dos Cabezas and Chiricahua Mountains on the east. The Willcox basin is a closed basin; the lowest portion of the basin is occupied by the Willcox Playa.

Apache and the CWDF are situated near the western margin of the Willcox Playa, near the western limit of ancient Lake Cochise. The mountains surrounding the Willcox Basin are primarily comprised of igneous and sedimentary rocks. Erosion of the mountains and transportation of the eroded materials into

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the Willcox Basin resulted in the formation of thick alluvial fans along the mountain fronts. As part of the transportation and depositional process, coarser materials (primarily cobbles, gravels and sands) were deposited near the base of the mountains (the proximal facies of the alluvial fans), whereas finer materials (primarily silts and clays) were deposited farther from the mountain fronts (the medial and distal facies of alluvial fans). The finest materials were deposited within what is now the playa.

The size and shape of ancient Lake Cochise has changed through geologic time as the basin filled with sediment. Martin (1963) indicates that greater volumes of sediment were produced from the Dos Cabezas and Chiricahua Mountains on the east side of the basin than were produced from the Gunnison Hills and Dragoon Mountains on the west side of the basin. This caused Lake Cochise (and subsequently the Willcox Playa) to be pushed toward the western portion of the basin. At one time, ancient Lake Cochise may have occupied an area of roughly 120 square miles, more than twice the size of the present-day Willcox Playa, and may have been on the order of 35 feet deep, deep enough for deposition of lacustrine deposits and for beaches to form around the margins of the lake (Robinson 1965).

The presence of stratified lenses and braided deposits of predominantly fine-grained materials has resulted in a complex groundwater system in the upper several hundred feet of the subsurface profile. This portion of the profile includes the presence of aquitards and water bearing zones that typically yield less than 10 gallons per minute (gpm) of water to wells and locally less than one gpm. Higher yielding zones do not generally occur until depths of several hundred feet below the ground surface. These higher yielding zones extend to depths greater than 1,000 feet and can yield thousands of gallons per minute of water to wells.

Groundwater movement through the alluvial basin materials, and playa conditions at pre-development groundwater flow discharge locations, has resulted in high concentrations of ions, minor metals and trace elements (such as fluoride, selenium and arsenic) that impact water quality in the groundwater at and adjacent to the playa. The playa edge and surface, and phreatophyte vegetation adjacent to the playa, were the primary pre-development discharge point for groundwater flow through the basin (Brown and Schumann, 1969). Evaporation of that pre-development discharge left these dissolved constituents at or near the playa surface. These constituents became increasingly concentrated with time. Groundwater samples from Croton Springs yielded a fluoride concentration of 13.5 ppm in 1962 (Brown and others, 1963), and Croton Springs was mapped as a local fluoride concentration maximum (Kister and others, 1966). Tertiary volcanics, including the hills to the southeast and a large portion of the Chiricahua Mountains to the east, are an important source of minor metals and trace elements.

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Given mineralization in mid-Cenozoic (mid-Tertiary) volcanic rocks as the source, groundwater flow as the transport mechanism, and playa discharge and evaporation as the concentrating mechanism, high concentrations of dissolved mobile metals and trace elements at and near the playa should be anticipated from the natural hydrogeologic setting.

Since the early 1950s, groundwater extraction has been significantly greater than natural recharge and several estimates of annual recharge and discharge rates for the Willcox Basin have been made. Brown and Schumann (1969) estimated annual recharge and discharge rates of 54,000 and 75,000 acre-feet, respectively. Freethey and Anderson (1986) estimated that the annual pre-development inflow to the Willcox Bains was about 45,000 acre-feet per year, and that inflow and outflow were balanced primarily by evaporation from the Willcox Playa.

Groundwater pumping, and predominantly agricultural pumping, is the primary cause of groundwater level decline in the Willcox Basin. Agricultural pumping in the entire Willcox Basin (Oram, 1993) was less than 10,000 acre-feet per year until the mid-1940s. Agricultural pumping then increased rapidly. By 1960, the annual rate was nearly 200,000 acre-feet, and by 1970 the annual rate was averaging about 300,000 acre-feet. Between 1976 to 1983, agricultural pumping dropped dramatically, due to reduced agricultural demand, to about 90,000 acre-feet per year. Subsequently, groundwater pumping gradually increased to an annual rate of more than 176,000 acre-feet by 2005 (ADWR, 2015). Over 90 percent of the historical groundwater pumping has been, and continues to be, for agricultural use. Water supply pumping at the Station averaged about 3,400 acre-feet per year between 1979 and 1988, and about 5,500 acre-feet per year between 1989 and 2014.

Golder Associates, Inc. (Golder) completed a more recent study of the Willcox Playa that reviewed historical reports addressing the area. *Willcox Playa Background Water Quality Report* (Golder 2015) was prepared in support of AEPCO's Aquifer Protection Permit (APP) to document the water quality of the Willcox Playa and how the playa could impact groundwater quality in the vicinity of Apache Generating Station. Golder's findings from this report are summarized as follows.

The regional water quality of the Willcox Basin was first described by the United States Geological Survey (USGS). Groundwater samples from 120 wells and springs were collected and analyzed in 1910 as part of a comprehensive report on the geology and water resources of the Sulphur Springs Valley (Meinzer et al. 1913). The results of the investigation were presented on four water quality maps showing concentrations of total dissolved solids (TDS), chloride, sulfate, and bicarbonate. The highest concentration of those constituents was in the vicinity of the Willcox Playa where TDS concentrations

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were greater than 500 mg/L, chloride and sulfate concentrations were greater than 100 mg/L, and bicarbonate concentrations exceed 300 mg/L.

Further studies completed by USGS included a more complete suite of general chemistry analytes including TDS, chloride, sulfate, bicarbonate, calcium, magnesium, sodium, potassium, fluoride, and nitrate. The results of this study noted that the area of "highly mineralized groundwater surrounding the Willcox Playa" has expanded toward the southwest toward Apache. Groundwater quality maps of the Willcox Basin from 1962 and 1975 presented TDS values greater than 1,000 mg/L within the Willcox Playa and greater than 500 mg/L in the area of Apache (Kister et al. 1966; Mann et al. 1978).

Groundwater quality data presented as Stiff diagrams of the Willcox Basin from 1987 to 1990 indicated that groundwater with high TDS concentrations located near the Willcox Playa are dominated by sodium or total alkalinity, and either chloride or sulfate (Oram 1993).

A groundwater quality investigation performed in 1987 included sampling of 12 water supply wells within a 2-mile radius of the town of Cochise, which is downgradient from the Willcox Playa (SEAGO 1988). The samples were analyzed for major ions, fluoride, nitrate, and 12 metals including lead. The results indicate that TDS concentrations range from 1,140 to 3,520 mg/L, sulfate concentrations range from 174 to 733 mg/L, chloride concentrations range from 200 to 1,025 mg/L, and hardness (as $CaCO_3$) ranges from 290 to 1,490 mg/L.

Arizona Department of Environmental Quality (ADEQ) performed a groundwater quality study of the Willcox Basin in 1999 (Towne and Freark 2001). Results of this investigation indicate that calcium bicarbonate changes to sodium bicarbonate moving westward, then further west to either a mixed sodium or mixed bicarbonate type. TDS concentrations near Apache range from 250 to 499 mg/L and exceed 1,000 mg/L near Cochise. Hardness (as $CaCO_3$) near Apache and Cochise exceeds 300 mg/L.

Engineering and Environmental Consultants Inc. (EEC) collected groundwater samples in 2008 in support of their hydrogeologic assessment for the Apache APP (EEC 2008). A total of 31 wells were sampled to characterize groundwater quality as a part of this investigation. The results indicate that TDS concentrations ranged from 230 to 9,500 mg/L, sulfate concentrations ranged from 5 to 3,900 mg/L, and chloride concentrations ranged from 8 to 2,200 mg/L.

The Willcox Playa is immediately upgradient of Apache. Groundwater quality data collected over the past 100 years indicates elevated concentrations of major ions, such as TDS, chloride, sulfate, bicarbonate, calcium, magnesium, sodium, potassium, fluoride, and nitrate. The groundwater chemistry beneath the

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Apache property is anticipated to change as groundwater migrates west-southwest from the Playa, across the Apache property. Further, the slow groundwater recharge in the area suggests that ion concentrations in the aquifers are not diluted by precipitation infiltration. The groundwater quality impacts from the Willcox Playa impact both the perched and regional aquifers at the site. Both aquifers, although distinct from one another and separated by a substantial confining unit, extend into the subsurface of the Playa. Therefore, the ion concentrations from the Willcox Playa migrate west-southwest from the Playa across the Apache property in the perched and regional aquifers. Similarities in groundwater sampling results, discussed *infra*, further support this conclusion.

2.2 CWDF Groundwater Monitoring Systems

Two separate groundwater monitoring systems have been established for the CWDF: 1) the perched aquifer underlying the Ash Pond Multi-Unit system comprised of Ash Ponds 1-4; and 2) the regional aquifer underlying the Scrubber Pond No. 2 Single-Unit System. There is a laterally extensive clay bed (aquitard) beneath the ash ponds which is encountered at a depth of approximately 90 feet below ground surface (bgs), which has resulted in the presence of a perched groundwater zone beneath the entire footprint of the ash ponds. A regional groundwater aquifer is present beneath the entire CWDF starting at depths of approximately 300 to 400 feet bgs. Because the perched groundwater zone does not extend beneath Scrubber Pond No. 2 and intermediate water bearing units below (between the perched aquifer and regional aquifer) are not considered a usable aquifer, the regional aquifer is the uppermost aquifer beneath Scrubber Pond No. 2. The regional aquifer is a confined system.

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3.0 CERTIFICATION OF COMPLIANCE AND SUPPORTING DOCUMENTATION

The following certification and documentation are submitted pursuant to 40 C.F.R. § 257.71(d)(1)(i)(A) and 40 C.F.R. § 257.71(d)(1)(i)(B) to demonstrate that the CCR surface impoundments at Apache are in compliance with the CCR Rule except for § 257.71(a)(1).

3.1 Owner's Certification of Compliance - § 257.71(d)(1)(i)(A)

In accordance with 40 C.F.R. § 257.71(d)(i)(A), I hereby certify that, based on my knowledge and inquiry of relevant AEPCO personnel, the CCR Units subject to the CCR Rule at Apache are in full compliance with the requirements contained in 40 C.F.R. Part 257, Subpart D – Standards for the Disposal of Coal Combustion Residuals in Landfills and Surface Impoundments, except for § 257.71(a)(1).

On behalf of AEPCO:

_____
(Signature)

_____
(Printed Name)

_____
(Title)

_____
(Date)

3.2 Groundwater Monitoring Network Requirements Pursuant to Section 257.91 - § 257.71(d)(1)(i)(B)(*1*)

This section documents and supports the conclusion that the existing network of groundwater monitoring wells for the Perched Aquifer and for the Regional Aquifer is sufficient to ensure detection of any groundwater contamination resulting from the impoundments, based on direction of flow, well location, screening depth and other relevant factors.

As required by 40 C.F.R. § 257.91(f), AEPCO has obtained certification by a qualified professional engineer stating that the groundwater monitoring systems have been designed and constructed to meet the requirements of § 257.91. This certification has previously been posted to AEPCO's publicly accessible Internet site and is included as Appendix A. As discussed in Section 2.2, two separate groundwater monitoring systems have been established for the CWDF. The following sections describe the

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characteristics of the multi-unit groundwater monitoring system for the uppermost groundwater beneath Ash Ponds 1-4 (i.e., the perched groundwater zone) and the single-unit groundwater monitoring system for the uppermost groundwater beneath Scrubber Pond No. 2 (i.e., the regional or deep groundwater zone).

3.2.1 Perched Aquifer Groundwater Monitoring System

The perched aquifer is monitored by three downgradient wells (Well-B, Well-C, and Well-K) and one upgradient well (Well-L) which are screened in the perched aquifer. The groundwater monitoring network for the perched aquifer was certified in October 2017 by Golder (Appendix A). The monitoring network consists of a sufficient number of wells, including one upgradient and three downgradient monitoring wells, that are installed at appropriate locations and depths to yield groundwater samples from the uppermost aquifer that will accurately represent the quality of background groundwater that has not been affected by leakage from Ash Ponds 1-4. The downgradient monitoring network is installed at the waste boundary to ensure detection of groundwater contamination in the uppermost aquifer and all potential pathways are monitored. The approximate well locations are shown on Appendix B, Figure 1, Perched Aquifer Ash Pond Multi-Unit System (AP 1-4) Potentiometric Surface Elevation Contour Map – April 2020. Groundwater flow in the perched aquifer system is to the southwest, using static water level measurements collected during April 2020 from the perched aquifer system monitoring wells (Figure 1).

Depth to groundwater at the perched (unconfined) aquifer system wells (Well-B, Well-C, Well-K, and Well-L) ranges from approximately 80 feet bgs (Well-L) to approximately 125 feet bgs (Well-C) as shown on the hydrograph (data from April 2016 through September 2020) included as Appendix B, Figure 2, Composite Perched Aquifer Hydrograph. The hydrograph also indicates that groundwater elevations measured in the perched aquifer wells have been generally trending down over time. Additional groundwater potentiometric surface maps (demonstrating temporal variability) for the perched aquifer system at the CWDF are included as Appendix B, Figure 3, Perched Aquifer Ash Pond Multi-Unit System (AP 1-4) Potentiometric Surface Elevation Contour Map – April 2019 and Appendix B, Figure 4, Perched Aquifer Ash Pond Multi-Unit System (AP 1-4) Potentiometric Surface Elevation Contour Map – September 2019. As shown on these Figures, the direction of groundwater flow appears to remain consistent over time.

Consistent with the requirements of § 257.71(d)(1)(i)(B)(*1*)(*i*) – (*iii*), AEPCO has attached the following items to this Application for the Perched Aquifer Groundwater Monitoring System:

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- Map(s) of groundwater monitoring well locations in relation to the CCR unit(s) that depict the elevation of the potentiometric surface and the direction(s) of groundwater flow across the site (Appendix B, Figure 1)
- Well construction diagrams and drilling logs for all groundwater monitoring wells (Well B, Well C, Well K, and Well L) (Appendix C)
- Maps that characterize the direction of groundwater flow accounting for temporal variations (Appendix B, Figures 1 - 4)

3.2.2 Regional Aquifer Groundwater Monitoring System

The regional aquifer underlies Scrubber Pond No. 2 and is considered the uppermost aquifer at this area of the facility. The certified groundwater monitoring network consists of three downgradient monitoring wells (Well-E, Well-G, Well-I) and one background monitoring well (Well-J) which are screened in the regional aquifer system. The groundwater monitoring network for the perched aquifer was certified in October 2017 by Golder (Appendix A). The monitoring network consists of a sufficient number of wells, including one upgradient and three downgradient monitoring wells, that are installed at appropriate locations and depths to yield groundwater samples from the uppermost aquifer that will accurately represent the quality of background groundwater that has not been affected by leakage from Scrubber Pond No. 2. The downgradient monitoring network is installed at the waste boundary to ensure detection of groundwater contamination in the uppermost aquifer and all potential pathways are monitored. The approximate well locations are shown on Appendix B, Figure 5, Regional Aquifer Scrubber Pond No. 2 Single-Unit System Potentiometric Surface Elevation Contour Map – April 2020. Appendix B, Figure 5 depicts a western groundwater flow in the regional aquifer system (data collected during April 2020).

The regional aquifer system is confined, with potentiometric groundwater surface ranging from approximately 240 feet bgs (Well-J) to approximately 285 feet bgs (Well-G) (data from April 2016 through October 2020) as shown on Appendix B, Figure 6, Composite Regional Deep Aquifer Hydrograph. As stated on the included boring logs (Appendix D), the top of saturation within the regional aquifer system while installing Well-E, Well-G, Well-I, and Well-J was encountered at approximately 300 to 400 feet bgs. Additionally, groundwater elevations measured in the regional aquifer system wells have been generally trending down over time. Further, the groundwater elevation measured in Well-J is lowered by approximately 30 feet during seasonal pumping of the irrigation well (Well 61), which usually occurs during dry summer months.

The Regional Aquifer has shown temporal fluctuations, as documented by historical studies, and as observed during the history of the CCR groundwater monitoring program at the CWDF. Seasonal

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pumping activities from an irrigation well (Well 61) located at the northern property boundary of the facility (near Well-J) and screened in the regional deep aquifer, results in a small cone of depression affecting the groundwater flow direction (creating a slight southern flow component) on a local scale. Additional groundwater potentiometric surface maps (demonstrating temporal variability) for the regional aquifer system at the CWDF are included as Appendix B, Figure 7, Regional Aquifer Scrubber Pond No. 2 Single-Unit System Potentiometric Surface Elevation Contour Map – April 2019 and Appendix B, Figure 8, Regional Aquifer Scrubber Pond No. 2 Single-Unit System Potentiometric Surface Elevation Contour Map – September 2019. The approximate cone of depression resulting from pumping of the irrigation well (Well 61), based on water levels recorded from Well J and pumping volumes provided by Apache, is depicted on Appendix B, Figure 8 and indicates that when the irrigation well is active, regional aquifer Well-J is hydraulically downgradient of Scrubber Pond No. 2. Well-J may not be hydraulically upgradient of the CCR unit throughout the entire year, however; analysis of the network performance and ASDs have documented no impact by the unit, as further discussed *infra*, and therefore, Well-J is considered an appropriate background well for statistical analyses pursuant to 40 C.F.R. § 257.91(a)(1)(ii), even during sampling events when it is not upgradient from Scrubber Pond No. 2.

Consistent with the requirements of § 257.71(d)(1)(i)(B)(*1*)(*i*) – (*iii*), AEPCO has attached the following items to this application for the Regional Aquifer Groundwater Monitoring System:

- Map(s) of groundwater monitoring well locations in relation to the CCR unit(s) that depict the elevation of the potentiometric surface and the direction(s) of groundwater flow across the site (Appendix B, Figure 5)
- Well construction diagrams and drilling logs for all groundwater monitoring wells (Well E, Well G, Well I, and Well J) (Appendix D)
- Maps that characterize the direction of groundwater flow accounting for temporal variations (Appendix B, Figures 5-8)

3.3 CCR Detection Monitoring Data, Analysis and Documentation - § 257.71(d)(1)(i)(B)(2)

The Apache Statistical Analysis Plan (SAP) was developed in accordance with 40 C.F.R. § 257.93 and includes procedures for sample collection, preservation, analytical procedures, chain-of-custody control, and quality assurance/quality control. As required by 40 C.F.R. § 257.93(f)(6), AEPCO has obtained certification by a qualified professional engineer stating that the selected statistical method is appropriate for evaluating the groundwater monitoring data for the CWDF. The current certification is included in the

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Statistical Analysis Plan prepared by Golder dated July 12, 2019 has previously been posted to AEPCO's publicly accessible Internet site and is included as Appendix E.

Section 257.71(d)(2) requires AEPCO to present data with constituent concentrations, summarized in table format, for each monitoring well and for each sampling event. The attached table provides this information in Appendix F.

AEPCO also references the 2017, 2018, and 2019 Annual Groundwater Monitoring and Corrective Action Reports prepared in accordance with § 257.90(e) as further support that AEPCO has met the requirements of §§ 257.93 and 257.94. The 2019 Annual Groundwater Monitoring and Corrective Action Report is included in Appendix G. AEPCO has also provided groundwater monitoring data generated since completion of the 2019 Annual Groundwater Monitoring and Corrective Action Report - including second 2020 semi-annual detection monitoring event data, statistical analysis, and ASDs for both monitoring well networks.

The selected statistical method for the CWDF was developed in accordance with 40 C.F.R. § 257.93(f) using methodology presented in Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities: Unified Guidance, March 2009, EPA 530/R-09-007. As discussed in the 2019 Statistical Analysis Plan, intrawell prediction limits compare the results from a particular well to statistical limits calculated from historical background groundwater quality measurements at the same well. In general, intrawell statistical methods are preferred over interwell methods because they tend to produce more reasonable (i.e., more conservative) statistical limits and result in fewer false positives. According to the Unified Guidance, one important advantage (for intrawell testing) is that confounding results due to spatial variability are eliminated, since all data used in an intrawell test are obtained from the same location. Intrawell comparisons should always be used when predisposal data are available (Gibbons, 2000). Because predisposal groundwater monitoring data is available for the CWDF that shows no evidence of a previous release, groundwater quality data will be evaluated through use of parametric (if data is normally distributed) or nonparametric (if data is not normally distributed) intrawell prediction limits, combined with a 1-of-2 resampling strategy for detection monitoring constituents listed in Appendix III of 40 C.F.R. §257. While intrawell testing is the current preferred statistical method the statistical method certification allows for the use of either interwell or intrawell statistical methods as appropriate.

Attached also as Appendix H is the Second Semi-Annual 2020 Groundwater Monitoring Event Statistical Summary, which is the most recent statistical test conducted at Apache.

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Since the inception of the CCR groundwater monitoring program at Apache (September 2017), samples collected from the perched aquifer monitoring wells and the regional aquifer monitoring wells, have shown Statistically Significant Increases (SSIs) for calcium, chloride, fluoride, sulfate, and TDS in both monitoring networks. The detection monitoring SSIs that have been identified over background levels for the Ash Ponds 1-4 Multi-Unit System and the Scrubber Pond No. 2 Single-Unit System are the result of an alternative source and an Alternate Source Demonstration (ASD) has been provided. As such, the facility has remained in detection monitoring pursuant to 40 C.F.R. § 257.94(e)(2).

AEPCO has prepared the following successful ASDs for the Perched Aquifer Monitoring Well Network (Ash Ponds 1-4):

- *Alternate Source Demonstration, Perched Aquifer Ash Pond Multi-Unit System (AP1-4)*, dated December 28, 2018 (August 2018 sampling event) (the 2018 ASD) for the following SSIs:
  - Well B (Calcium, Chloride, Sulfate); Well C (Calcium, Chloride, Sulfate); Well K (Calcium, Chloride, Sulfate)
- *Alternate Source Demonstration, Perched Aquifer Ash Pond Multi-Unit System (AP1-4), Second 2018 Semi-Annual Detection Monitoring Event*, dated February 28, 2019, (November 2018 sampling event) for the following SSIs:
  - Well B (Calcium, Chloride, Sulfate); Well C (Calcium, Chloride, Sulfate); Well K (Calcium, Chloride, Sulfate)
- *Alternate Source Demonstration, Perched Aquifer Ash Pond Multi-Unit System (AP 1-4), Second Semi-Annual 2019 Monitoring Event*, dated December 20, 2019, (September 2019 sampling event) for the following SSIs:
  - Well L (Calcium, Chloride)
- *Alternate Source Demonstration, Perched Aquifer Ash Pond Multi-Unit System (AP 1-4), First Semi-Annual 2020 Monitoring Event*, dated August 4, 2020 (February 2020 sampling event) for the following SSIs:
  - Well K (Sulfate, TDS)
- *Alternate Source Demonstration, Perched Aquifer Ash Pond Multi-Unit System (AP 1-4), Second Semi-Annual 2020 Monitoring Event*, dated November 25, 2020 [1](July 2020 sampling event) for the following SSIs:
  - Well K (Sulfate, TDS)

[1] This is the anticipated date to finalize the Second Semi-Annual 2020 Monitoring Event ASD

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AEPCO has prepared the following successful ASDs for the Regional Aquifer Monitoring Well Network (Scrubber Pond No. 2):

- *Alternate Source Demonstration, Regional Aquifer Scrubber Pond No.2 Single-Unit System*, dated December 28, 2018 (August 2018 sampling event) (the 2018 ASD) for the following SSIs:
  - Wells E, G, and I (Calcium, Chloride, Sulfate, TDS)
- *Alternate Source Demonstration, Regional Aquifer Scrubber Pond No.2 Single-Unit System, Second 2018 Semi-Annual Detection Monitoring Event*, dated February 28, 2019 (November 2018 sampling event) for the following SSIs:
  - Wells E, G, and I (Calcium, Chloride, Sulfate, TDS)
- *Alternate Source Demonstration, Regional Aquifer Scrubber Pond No.2 Single-Unit System (First Semi-Annual 2019 Monitoring Event)*, dated October 8, 2019 (April 2019 sampling event) for the following SSIs:
  - Well E (Chloride); Well G (Calcium); Well I (Fluoride)
- *Alternate Source Demonstration, Regional Aquifer Scrubber Pond No.2 Single-Unit System (Second Semi-Annual 2019 Monitoring Event)*, dated December 20, 2019, (September 2019 sampling event) for the following SSIs:
  - Well E (Chloride, Sulfate); Well G (Calcium)
- *Alternate Source Demonstration, Regional Aquifer Scrubber Pond No.2 Single-Unit System (First Semi-Annual 2020 Monitoring Event)*, dated August 4, 2020, (February 2020 sampling event) for the following SSIs:
  - Well J (TDS)
- *Alternate Source Demonstration, Regional Aquifer Scrubber Pond No.2 Single-Unit System - Second Semi-Annual 2020 Monitoring Event*, dated November 25, 2020 (July 2020 sampling event) for the following SSIs:
  - Well J (TDS); Well E (Calcium, Chloride); Well G (Fluoride); Well I (Fluoride)

Since the original ASD was prepared, groundwater quality data collected has been evaluated for trends and confirmation that the findings in the 2018 ASD, which was analyzed and updated in subsequent ASDs, remain applicable to all of the SSIs and that no impact to groundwater as a result of the CCR unit is identified. The Willcox Playa, spatial variability due the site's geology, and the overall ion-rich groundwater quality in the region is the cause of the SSIs observed at the CDWF. The following sections provide a summary of the work performed in conjunction with the initial ASDs prepared in 2018 for both the perched aquifer (AP 1-4) and the regional aquifer (Scrubber Pond No. 2) and how subsequent

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groundwater monitoring results and ASDs are consistent with this finding. Copies of the ASDs can be found in the Appendices of the AEPCO's Annual Groundwater Monitoring and Corrective Action Reports. Attached as Appendix I are the ASDs completed in 2020, which will be attached to AEPCO's forthcoming Annual Report for 2020.

3.3.1 AP 1-4 (Perched Aquifer)

Several lines of evidence are available that indicate the SSIs identified at Apache are not the result of a release from Ash Ponds 1-4, but rather an alternate source. These lines of evidence include geochemical fingerprinting, regional groundwater quality data, and the site wide background dataset.

Geochemical Fingerprinting (2018)

During the second 2018 semi-annual detection monitoring event conducted in November 2018, major cation and anion concentrations were analyzed for select groundwater samples from the CCR monitoring network as well as additional on-site wells. These data were used to compare major ion chemistry from wells situated both upgradient and downgradient of AP 1 – 4. Data were used to plot diagrams to evaluate the geochemical signatures of site groundwater.

Groundwater major ion abundance in the form of a Piper diagram shown below on Figure 3-1 was used to determine if the ash ponds could be the cause of the calcium, chloride and sulfate SSIs identified in downgradient groundwater at wells Well-B, Well-C, and Well-K. In the ternary and quaternary diagrams such as those included in the Piper diagram, mixtures (e.g., downgradient groundwater) consisting of two end-member solutions, such as upgradient groundwater and a discrete source, would roughly fall on a straight line between the two end member compositions.

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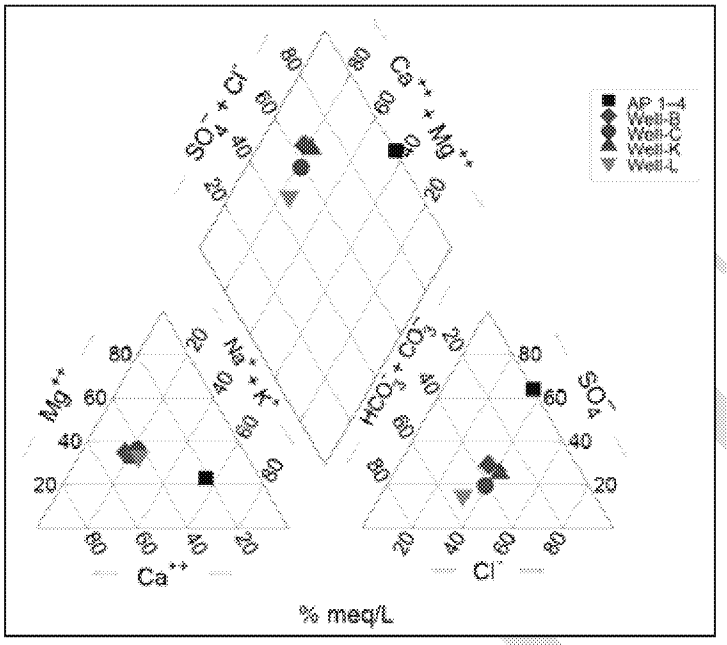
Figure 3-1: AP 1 – 4 Piper Diagram



Major ion relative abundance indicates that groundwater from the downgradient monitoring wells (Well-B, Well-C, and Well-K) was geochemically closely related to the upgradient groundwater seen in Well-L, especially for major relative cation abundance (Figure 3-1: AP1 – 4 Piper Diagram). Calcium (Ca^{++}), chloride (Cl^-), and sulfate (SO_4^-) relative abundance in downgradient groundwater samples is within 10% of upgradient groundwater samples, which also indicate a similar provenance.

Conversely, the grab sample collected from AP 1 – 4 contains a much higher relative abundance of sodium and potassium ($Na^+ + K^+$) and is sulfate (SO_4^-)-dominated, compared to both downgradient and upgradient groundwater samples.

In addition, both calcium (Ca++) and sodium (Na+) concentrations measured in grab samples from AP 1 - 4 are over an order of magnitude higher than concentrations measured in samples from the downgradient wells. Calcium and sodium occur in a ratio of 3.5:10 in AP 1 - 4. However, calcium to sodium ratios in downgradient wells range from 17:10 to 25:10. This is also true when comparing the sulfate to chloride ratio where downgradient wells (6.7 to 11:10) closer resemble the background ratio of 5.8:10 rather than that of AP 1- 4 water (23:10). Given the generally conservative properties of sodium, the inversion of this ratio indicates that the calcium concentrations in downgradient wells that triggered the SSIs are not likely a result of water from AP 1 - 4 mixing with ambient groundwater. Similarly, the SSIs for chloride and sulfate are not likely a result of water from AP 1 - 4 mixing with ambient groundwater based on how the results plot in the Piper Diagram.

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Regional Groundwater Quality (Anthropogenic Sources)

Geochemical fingerprinting analysis concludes that AP 1 - 4 is not the source of the SSIs in the downgradient wells, so further investigation of the site and surrounding area must be undertaken to evaluate potential alternate sources.

Golder examined historic studies of the geology of the area and groundwater quality collected over the past 100 years. Golder also took into consideration recent studies, such as the water quality study performed by ADEQ of the Willcox Basin and its own groundwater analysis in 2015. These studies led overwhelmingly to the same conclusion: There are elevated concentrations of TDS and major ions, including calcium, chloride and sulfate in the groundwater encompassing the Willcox Playa area and including the area in which the CWDF is located. This is further demonstrated by the fact that the SSIs observed in both the perched and regional aquifers are the same constituents. As groundwater migrates west-southwest from the Playa toward the cones of depression and across the Apache property there is an increase in calcium, chloride, sulfate and TDS concentrations. The historical data from the area supports the conclusion that groundwater chemistry beneath the Apache property is different than the groundwater chemistry under the Playa. The difference in these groundwater chemistries and variability of concentrations suggests that the natural conditions present in the aquifer, not the CCR units, are the likely cause of the SSIs; the regional groundwater quality resulting from the presence of the Playa is contributing to the observed SSIs at groundwater samples collected for Apache. Based on the information presented here, the Willcox Playa is the source of elevated concentrations of calcium, chloride, sulfate and TDS in the regional aquifers. In summary, groundwater quality data collected over the past 100 years indicate elevated concentrations of TDS and major ions including calcium, chloride and sulfate in the groundwater encompassing the Willcox Playa area. The groundwater chemistry beneath the Apache property is anticipated to change as groundwater migrates west-southwest from the Playa toward the cones of depression and across the Apache property, with an increase in TDS and major ion concentrations. This is further demonstrated by the fact that the SSIs observed in both the perched and regional aquifers are the same constituents. As a result, based on review of regional water quality data, the source of elevated calcium, chloride and sulfate in monitoring wells downgradient of Apache is due to the Willcox Playa and not a release from the CCR units.

Since the original ASD was prepared, groundwater quality data collected has been evaluated for trends and confirmation that the ASD remains applicable and that no impact to groundwater as a result of the CCR unit is identified.

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3.3.2 Scrubber Pond No. 2 (Regional Aquifer)

Several lines of evidence are available that indicate the SSIs identified at Apache are not the result of a release from Scrubber Pond No.2, but rather an alternate source. These lines of evidence include geochemical fingerprinting, regional groundwater quality data, length of travel time analysis, and the site wide background dataset.

Geochemical Fingerprinting (2018 and 2020)

During the second 2018 semi-annual detection monitoring event conducted in November 2018, major cation and anion concentrations were analyzed from select groundwater samples from the CCR monitoring network. These data were used to compare major ion chemistry from wells situated both upgradient and downgradient of Scrubber Pond No. 2. Data were used to plot diagrams to evaluate the geochemical signatures of site groundwater.

Groundwater major ion abundance in the form of a Piper diagram shown on Figure 3-2 was used to determine if Scrubber Pond No. 2 could be the cause of the calcium, chloride, sulfate, and TDS SSIs identified in downgradient groundwater at wells Well-E, Well-G, and Well-I. In the ternary and quaternary diagrams such as those included in the Piper diagram, mixtures (e.g., downgradient groundwater) consisting of two end-member solutions, such as upgradient groundwater and a discrete source, would roughly fall on a straight line between the two end member compositions. Review of Figure 3-2 shows the end-member compositions (i.e., Well J and SCRUB-2) do not plot in a line with the downgradient monitoring wells (Well-E, Well-G and Well-I). This indicates that mixing of the pond water and upgradient groundwater is unlikely.

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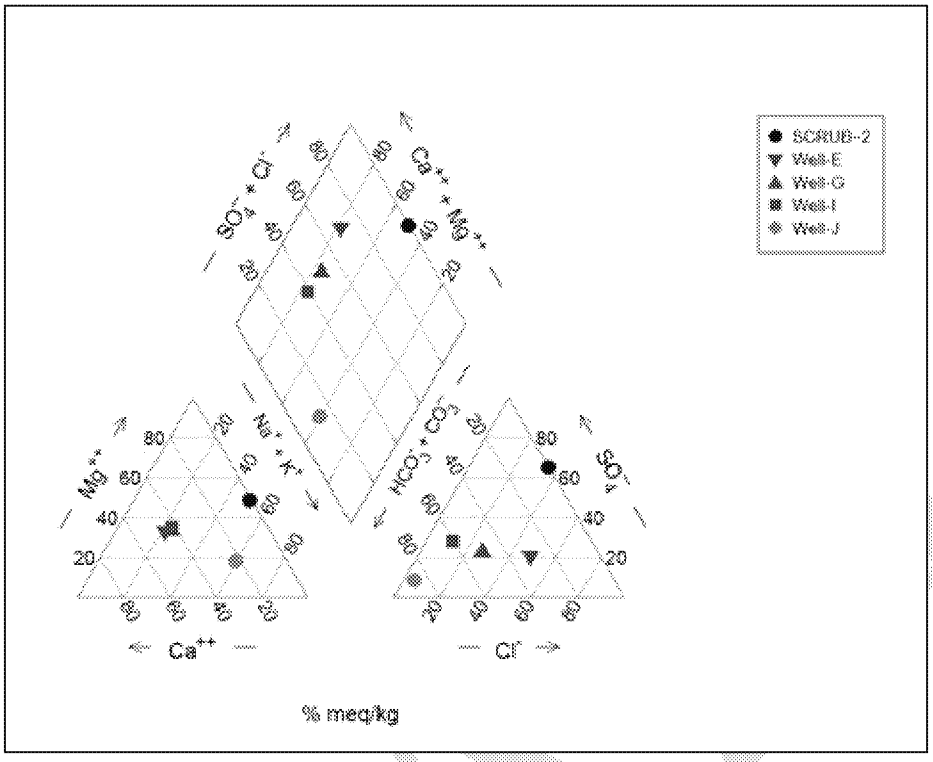
Figure 3-2: Scrubber Pond No. 2 Piper Diagram



In summary, review of The Piper Diagram results for the deep regional aquifer monitoring wells indicates that Scrubber Pond No. 2 is not the likely source of elevated concentrations of TDS, calcium, chloride and sulfate in site monitoring wells, given the differences between the downgradient samples in comparison with the grab samples but rather is the result of natural spatial variability in groundwater chemistry.

Calcium (Ca^{++}) and TDS data (shown graphically as a black circle on Figure 3-3: Scrubber Pond No. 2 Ternary Diagram), along with two major CCR source water constituents, sodium (Na^{+}) and sulfate (SO_4^{-}), were also evaluated to discern possible influences of Scrubber Pond No. 2 on groundwater quality. Ion abundance in groundwater measured in downgradient monitoring wells (Well-E, Well-G, and Well-I) demonstrated a higher relative abundance of calcium (Ca^{++}) and lower relative abundance of sodium (Na^{+}) and sulfate (SO_4^{--}) than in the grab sample collected from Scrubber Pond No. 2 (shown on Figure 3-3: Scrubber Pond No. 2 Ternary Diagram), despite the fact that the sodium (Na^{+}) concentration of 14,000 milligrams per liter (mg/L) and sulfate (SO_4^{--}) concentration of 35,000 mg/L in the Scrubber Pond No. 2 sample are at least two orders of magnitude higher than concentrations measured in the downgradient CCR monitoring wells.

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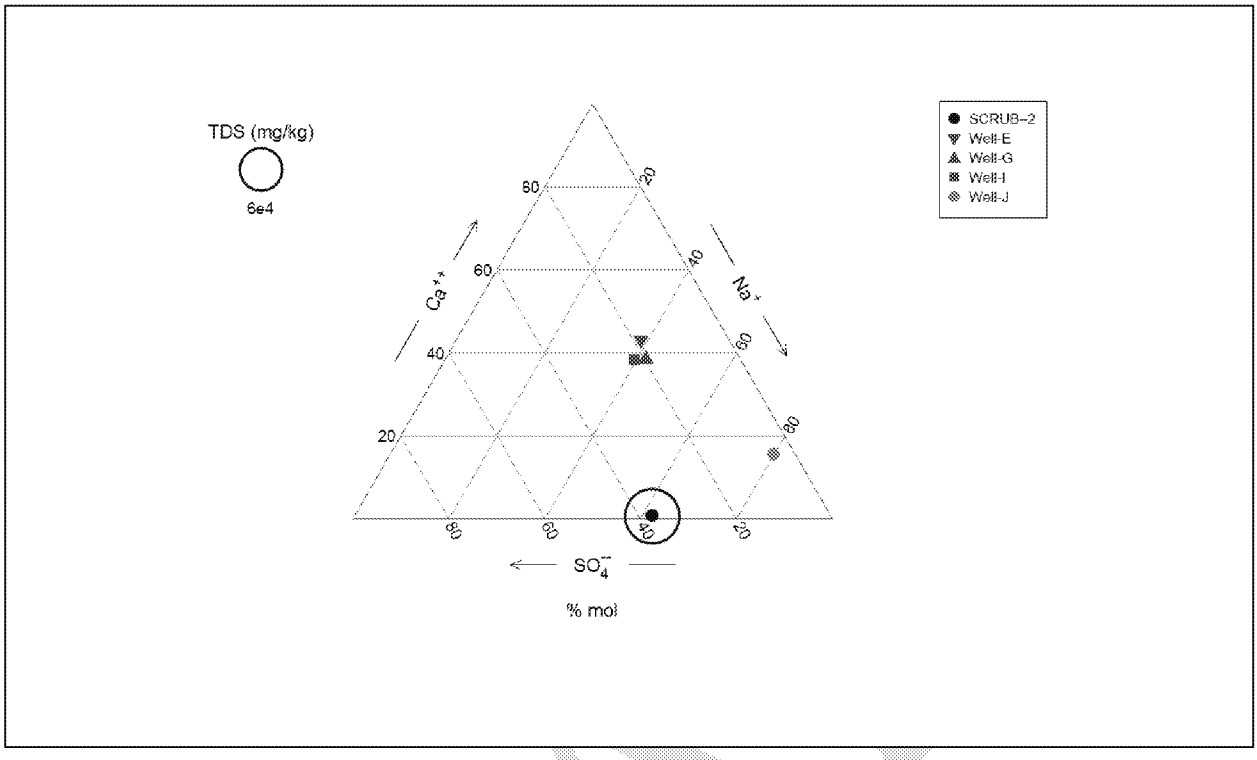
Figure 3-3: Scrubber Pond No. 2 Ternary Diagram



Given the unlikely formation of sodium (Na^+)-bearing minerals from groundwater and the close proximity of the CCR monitoring wells, the observed difference in calcium (Ca^{++}) between upgradient and downgradient CCR monitoring wells is unrelated to the presence of Scrubber Pond No. 2. TDS measurements in downgradient CCR monitoring wells further support the conclusion that Scrubber Pond No. 2 is not the source of the difference. The TDS concentrations in downgradient groundwater samples collected from Well-E, Well-G, and Well-I are higher than that of upgradient groundwater concentrations measured in Well-J (560 mg/L, 400 mg/L, and 360 mg/L downgradient vs. 280 mg/L upgradient). The calcium (Ca^{++}) concentrations observed in the downgradient groundwater (85 mg/L, 58 mg/L, and 52 mg/L in Well-E, Well-G, and Well-I are also elevated compared to upgradient groundwater (23 mg/L in Well-J). Although we observe the downgradient concentrations of TDS and calcium are elevated compared to the upgradient concentrations, we can conclude that the concentrations that triggered the SSIs are not a result of water from Scrubber Pond No. 2 mixing with ambient groundwater. The differing concentration of groundwater constituents observed upgradient and downgradient of the facility is likely the result of spatial variability in groundwater chemistry as a result of geologic formation.

During the second semi-annual detection monitoring event in 2020, major cation and anion concentrations were again analyzed to evaluate for trends to confirm the results from 2018. The piper diagram indicates that differing concentrations of groundwater constituents can be observed upgradient and downgradient of

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the facility, which is likely the result of spatial variability in groundwater chemistry as a result of the geologic formation. Geochemical fingerprinting completed in 2020 confirms the original demonstration and no discernible trend is noted.

Thus, based on relative ion abundance and the TDS concentration of groundwater measured in downgradient CCR monitoring wells, the water from Scrubber Pond No. 2 is not the cause of the calcium, chloride, sulfate and TDS SSIs in downgradient monitoring wells.

Regional Groundwater Quality (Anthropogenic Sources)

Golder examined historic studies of the geology of the area and groundwater quality collected over the past 100 years. [2]Golder also took into consideration recent studies, such as the water quality study performed by ADEQ of the Willcox Basin and its own groundwater analysis in 2015. These studies led overwhelmingly to the same conclusion: There are elevated concentrations of TDS and major ions, including calcium, chloride and sulfate in the groundwater encompassing the Willcox Playa area and including the area in which the CWDF is located. This is further demonstrated by the fact that the SSIs observed in both the perched and regional aquifers are the same constituents. As groundwater migrates west-southwest from the Playa toward the cones of depression and across Apache property there is an increase in calcium, chloride, sulfate and TDS concentrations. The historical data from the area supports the conclusion that groundwater chemistry beneath Apache property is different than the groundwater chemistry under the Playa. The difference in these groundwater chemistries and variability of concentrations suggests that the natural conditions present in the aquifer, not the CCR units, are the likely cause of the SSIs; the regional groundwater quality resulting from the presence of the Playa is contributing to the observed SSIs at groundwater samples collected for Apache. Based on the information presented here, the Willcox Playa is the source of elevated concentrations of calcium, chloride, sulfate and TDS in the regional aquifers.

Time of Travel

Although the Geochemical fingerprinting and studies of regional groundwater quality provide conclusive evidence that Scrubber Pond No. 2 is not leaking, Golder performed a Time of Travel analysis as part of the initial ASD in 2018 as further proof for the Regional Aquifer. As discussed above, analysis of geochemical fingerprinting and regional groundwater quality data demonstrates that the SSIs in

[2] It looks like this is the same section but for the other aquifer. I am fine to leave it as is for now and then shorten and improve it before the final submittal unless you want to take a stab at it.

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downgradient CCR monitoring wells Well-E, Well-G, and Well-I are not the result of a release from Scrubber Pond No. 2. Regardless, if, arguably, there was a release, Golder has evaluated the likelihood that it would reach the groundwater aquifer based on the time of travel through the low permeability confining unit beneath the CCR unit.

Using the hydrogeologic data and information for the site, the time of travel from Scrubber Pond No. 2 to the top of the Regional Aquifer, (the uppermost water-bearing unit) can be estimated using Darcy's Equation as shown below.

$$V = \frac{K * i}{n_e}$$

Given the following assumptions:

- V is the estimated vertical groundwater velocity based on Darcy's Equation
- K is the hydraulic conductivity or permeability - 0.00007 ft/day reported from geotechnical laboratory soil sampling data collected by AMEC from Well-E soil sample (AMEC 2017a)
- i is the hydraulic gradient - 1800 feet laterally and approximately 270 feet down to the top of the regional aquifer
- n_e is the effective porosity - 0.21 for regional aquifer (AMEC 2017a)

From the above, the calculated maximum downward flow velocity through the low permeability clays to the underlying water-bearing silty sand zone is 0.0022 ft/day (0.81 feet per year). Therefore, the time of travel for a theoretical release of leachate from the base of Scrubber Pond No. 2 through approximately 270 feet of clay and fine-grained sediment into the underlying water-bearing silt/sand unit is over 300 years. This is a very conservative time of travel, as the actual flow gradient potential from the top of the regional aquifer to the base of the CCR unit is upward, not downward, as the time of travel calculation assumes. This time travel analysis further eliminates the possibility that the cause of the SSIs from the downgradient wells is the CCR unit, given that Scrubber Pond No. 2 has only been in operation since 1995. This analysis suggests that such a hypothetical release would not reach the aquifer until at least the year 2295. It is simply not possible for a release from the CCR unit to travel to the regional aquifer during the current CCR impoundment life span from 1995 to 2020.

Fluoride Analysis

An initial SSI for fluoride occurred at Well-I in the April 2019 sampling event and was not verified during the September 2019 sampling event. An initial SSI of fluoride was identified at Well-I and Well-

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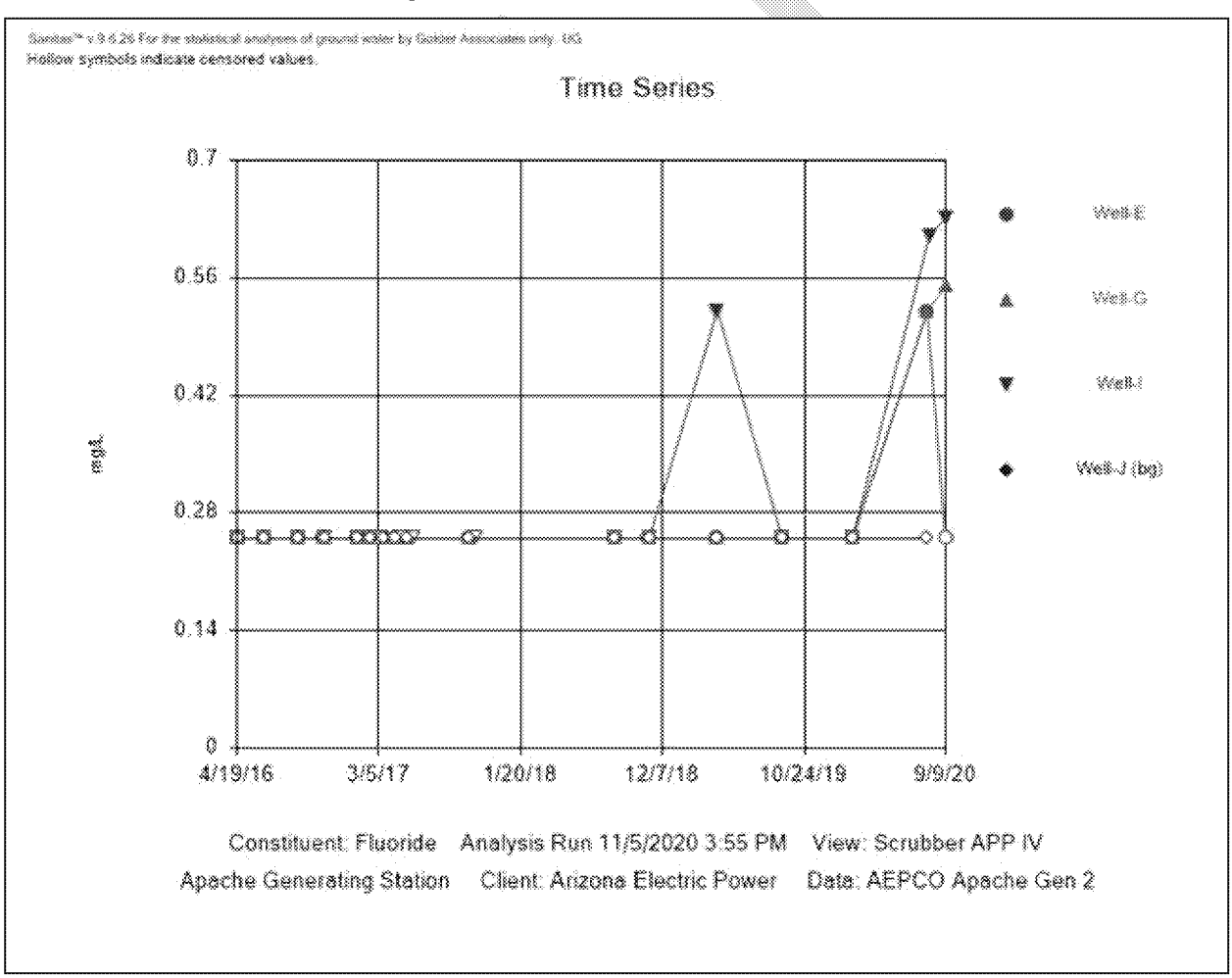
G following the July/August 2020 sampling event. Resampling was conducted in September 2020. The reported concentrations at Well-I (0.61, 0.63 mg/L) and Well-G (0.52, 0.55 mg/L) are slightly above the laboratory analytical detection limit (0.50 mg/L) and the statistical prediction limit (0.50 mg/L) Review of Figure 3-4 shows that the background data set for fluoride is below laboratory reporting limits. As a result, any detection above the reporting limit will trigger a statistical limit exceedance.

ADEQ performed a groundwater quality study of the Willcox Basin in 1999 (Towne and Freark 2001). Results of this investigation indicate that the Willcox Playa and the general area around the Wilcox Playa in the Willcox Basin have recorded fluoride concentrations of up to 10 mg/L. Based on these considerations the SSIs of fluoride at Well-I are the result of natural variability in groundwater chemistry caused by the Willcox Playa and are not caused by Scrubber Pond No. 2.

Time series plots presenting this groundwater quality data for fluoride is shown in Figure 3-4.

Figure 3-4: Fluoride Time Series Plot



Therefore, based on the background data set and groundwater quality studies referencing fluoride concentrations on the area, natural groundwater variability is the alternate source of fluoride in Well G and Well I. This conclusion is further supported by the Time of Travel analysis performed in conjunction with the 2018 ASD.

3.4 Location Restrictions Requirements - § 257.71(d)(1)(i)(B)(3)

As required by 40 C.F.R. §§ 257.60 through 257.64, AEPCO previously completed demonstrations that Scrubber Pond No. 2 and Ash Ponds 1-4 meet the location restrictions for placement above the uppermost aquifer (§ 257.60), wetlands (§ 257.61), fault areas (§ 257.62), seismic impact zones, (§ 257.63), and unstable areas (§ 257.64). These demonstrations are included in the 2018 Location Restrictions Report posted to AEPCO's publicly accessible Internet site and included as Appendix J.

§ 257.60 – The uppermost groundwater beneath Ash Ponds 1- 4 consists of a perched water zone within the alluvium first encountered at depths ranging from approximately 85 to 120 feet beneath the base of the ash ponds. This shallower uppermost aquifer ceases to exist west of Ash Pond 2 and 3. For Scrubber Pond No. 2, the uppermost groundwater consists of a confined regional aquifer with groundwater encountered at depths ranging from approximately 245 to 275 feet below the base of Scrubber Pond No. 2. Both the perched and regional groundwater zones meet the requirement that depth to the uppermost groundwater is greater than five feet below the pond bases and meet this location restriction requirement.

§ 257.61 – A desktop study was conducted consisting of a review of aerial photography, the U.S. Fish and Wildlife Service's National Wetlands Inventory (NWI) website (USF&W 2015), and U.S. Geological Survey (USGS 1985) topographic maps for Apache. It was concluded that based on the results of the desktop review, an onsite wetland evaluations or formal wetland delineations was not needed to determine that the CCR surface impoundments meet the wetlands requirement. Although the NWI identified Ash Pond 1 and Ash Pond 2 as freshwater ponds with wetland features, there is no connection with natural waterway or wetland and are by definition excluded from regulation. It was concluded that the CCR surface impoundments meet the wetlands location restriction requirement.

§ 257.62 – The CCR Rule states that landfills and surface impoundments must be located at least 200 feet from any fault. A review of appropriate reference identified no evidence of Holocene faults of tectonic origin in the vicinity of Apache. Therefore, no faults are located at or within 60 meters (200 feet) of the CCR units. The Apache CCR units meet the seismic impact zone location restriction requirement.

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§ 257.63 – The CCR Rule requires that if an existing CCR impoundments are located in a seismic zone, the impoundments must be designed to withstand maximum horizontal acceleration forces. A review of relevant resources indicated that Apache is within a seismic impact zone with a 2 percent probability, 50-year period horizontal acceleration of 0.165g. Based on third party engineering analyses, the CCR impoundments have sufficient safety factors greater than 1, the minimum acceptable safety factor seismic impacts.

§ 257.64 – A review of potential unstable area factors was completed through a review of applicable reference documents and prior subsurface investigations at Apache. The review did not find evidence to support the presence of unstable areas at Apache.

3.5 Most Recent Structural Stability Assessment - § 257.71(d)(1)(i)(B)(*4*)

As required by 40 C.F.R. § 257.73(d), AEPCO previously completed the initial structural stability assessment. This assessment is described in the 2016 Initial Structural Stability Assessment Report and includes the required certification from a qualified professional engineer stating that the initial assessment was conducted in accordance with the requirements of § 257.73(d). The 2016 Initial Structural Stability Assessment Report was previously posted to AEPCO's publicly accessible Internet site and included as Appendix K.

The initial structural stability assessment included stability analysis of two foundation conditions, one for a clayey soil and one for a sandier soil. Seepage analyses for the critical sections were performed for the embankments at maximum storage pool and maximum surcharge pool during maximum storm event. The resulting exit gradients were below the maximum permitted gradient referenced in in U. S. Army Corps of Engineers (USACE) Design Manual No. EM-1110-2-1913 (2001). Slope failure analyses were performed for both static and pseudo-static conditions with calculated safety factor for all conditions being greater than 1. Review of construction records indicated that soils at the site were not susceptible to liquefaction. The assessment also included evaluation of additional criteria and requirements found in § 257.73(d) and concluded that the CCR impoundment met the applicable requirements. As required for compliance, another stability assessment will be completed in October 2021.

3.6 Most Recent Safety Factor Assessment - § 257.71(d)(1)(i)(B)(*5*)

As required by 40 C.F.R. § 257.73(e), AEPCO previously completed the initial safety factor assessment. This assessment is described in the 2016 Initial Safety Factor Assessment Report and includes the required certification from a qualified professional engineer stating that the initial assessment was

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conducted in accordance with the requirements of § 257.73(e). The 2016 Initial Safety Factor Assessment Report is posted to AEPCO's publicly accessible Internet site and included as Appendix L.

This report described the geotechnical investigations, laboratory testing and engineering analyses that were used in the safety factor assessment, presented the results of the assessment, and presented supporting documentation. Similar to the structural stability assessment, this assessment included steady-state seepage analysis, slope stability analyses, evaluation of liquefaction potential, and potential damage to concrete structures. The assessment concluded that the embankments for the CCR surface impoundments are stable with calculated safety factors that exceed the minimum required and that there were no visible indications of deterioration. As required for compliance, another stability assessment will be completed in October 2021.

3.7 Engineered Liner Documentation - § 257.71(d)(1)(i)(C)

The CWDF was constructed in the early 1990s with a composite liner system consisting of a compacted clay layer overlain with a high-density polyethylene (HDPE) geomembrane liner that is 60-mil thickness at the bottom and 80-mil on the side slopes of each pond at the CWDF. The existing clay layer is a minimum of eight (8) inches thick layer of select fill clay material with 95% compaction at optimum moisture and a maximum hydraulic conductivity of 1 x 10-6 centimeter per second (cm/s). The impoundment composite liner system at Apache Station is shown in Figure 3-5, with the clay material specified as select fill. The CCR rule requires a composite liner with an upper layer consisting of a geomembrane with a minimum of 30-mil thickness, or a minimum 60-mil thickness if (high-density polyethylene) HDPE is used. The current upper layer of the Apache composite liner is consistent with the thickness specifications of the CCR rules on the bottom (60 mil HDPE), and is more protective on the sides (80 mil HDPE) than required by the Rule.

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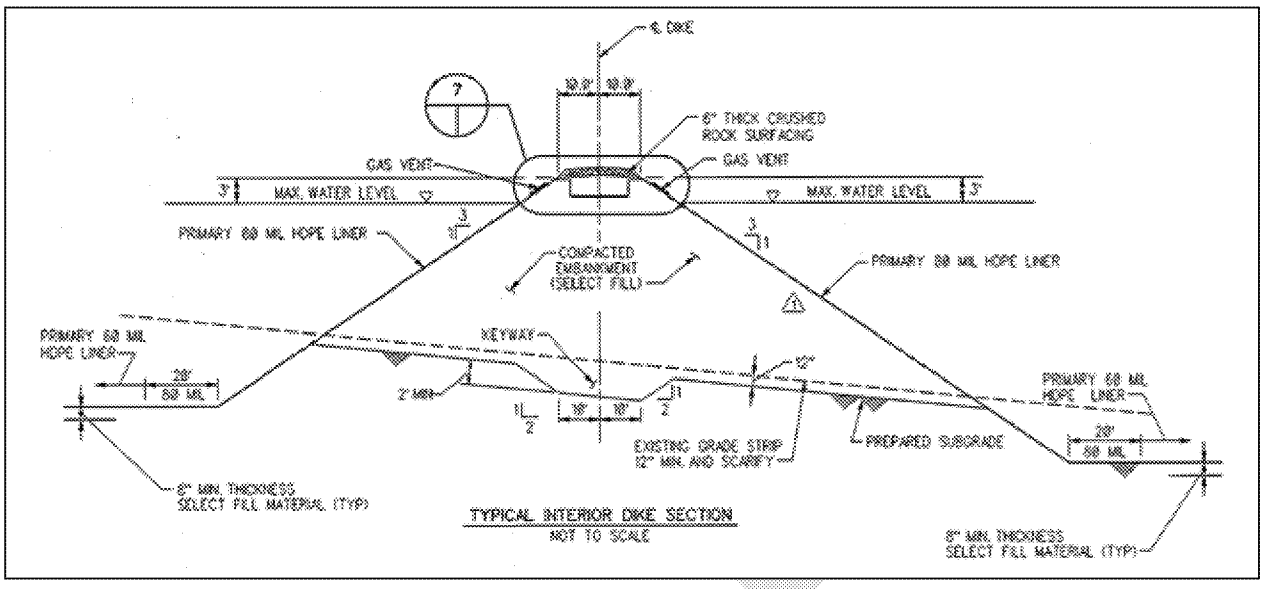
Figure 3-5: Typical liner section for the Apache CWDF (from Burns & McDonnell design drawing Y12 Rev 2)



This facility was designed and permitted to comply with the extensive Arizona Department of Environmental Quality (ADEQ) Aquifer Protection Program (APP).The APP requires compliance with two key requirements 1) meet Aquifer Water Quality Standards at the Point of Compliance; and 2) demonstrate Best Available Demonstrated Control Technology (BADCT). The purpose of BADCT is to employ engineering controls, processes, operating methods, or other alternatives, including site-specific characteristics; to reduce discharge of pollutants to the greatest degree achievable before they reach the aquifer; or to prevent pollutants from reaching the aquifer.

The APP permit was issued to AEPCO in 1994. The impoundments became operational in 1995. The APP groundwater monitoring systems were installed with the impoundments and were monitored. The groundwater monitoring results were required to be submitted to ADEQ including annual written reports that confirm compliance with permit requirements. In September 2019, Arizona finalized a rulemaking exempting CCR Units from the APP program. *See* AAC R18-9-103.5. Up until this exemption took effect, the CWDF met ongoing APP and Arizona Department of Water Resources (ADWR) requirements with no reported impacts to public health or the environment.

Documentation of the design specifications for the engineered liner components of the Apache Station CCR surface impoundments was previously posted to AEPCO's publicly accessible Internet site and included the 2016 Liner Design Criteria and Design Drawings (Y1 through Y6, Y8 through Y13, Y15, Y21, and Y22) that are included as Appendix M.

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Third party construction quality assurance (CQA) for the CWDF was completed by Vector Engineering, Inc. (Vector). Vector prepared CQA report following construction dated January 1996. This report included documentation of the CQA activities including the following:

- Density test data for the liner subgrade & fill materials (over 1,000 field density tests were completed);
- Laboratory testing & classification of fill materials (approximately 120 conformance tests for fill);
- Laboratory testing & classification for select fill materials used for liner construction (approximately 50 conformance tests for select fill);
- Liner subgrade field density test data (over 300 field density tests for Ash Ponds 1-4 and over 130 for Scrubber Pond No. 2);
- Laboratory and field permeability test for compacted select clay fill liner (16 field tests and 25 laboratory tests);
- Quality assurance certifications for HDPE liner resins and constructed liner rolls;
- Third party HDPE liner resin conformance testing;
- HDPE liner subgrade acceptance forms by the liner installer;
- HDPE liner seaming logs, non-destructive seam test logs, and destructive seam test logs;
- Geomembrane Panel Acceptance Forms completed by Vector (CQA Contractor) following installation of HPDE liner.

The results of the BAT Geosystems AB (BAT) field permeability and ASTM International (ASTM) D5084 (Standard Test Methods for Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter) laboratory permeability testing for the select compacted clay fill liner subgrade for the HDPE liner:

- Ash Pond 1
  - Five BAT field permeability tests with an average result of 4.1×10^{-7} cm/s
  - Five ASTM 5084 laboratory permeability tests with an average result of 2.7×10^{-8} cm/s
- Ash Pond 2
  - Three BAT field permeability tests with an average result of 6.2×10^{-8} cm/s
  - Six ASTM 5084 laboratory permeability tests with an average result of 2.1×10^{-7} cm/s
- Ash Pond 3
  - Five BAT field permeability tests with an average result of 9.0×10^{-7} cm/s
  - Six ASTM 5084 laboratory permeability tests with an average result of 1.5×10^{-7} cm/s

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- Ash Pond 4
  - Three BAT field permeability tests with an average result of 9.6 x 10^{-8} cm/s
  - Six ASTM 5084 laboratory permeability tests with an average result of 2.2 x 10^{-6} cm/s
- Scrubber Pond No. 2
  - Seven BAT field permeability tests with an average result of 4.6 x 10^{-7} cm/s
  - Eleven ASTM 5084 laboratory permeability tests with an average result of 5.1 x 10^{-7} cm/s

3.8 Additional Release Pathway Documentation - § 257.71(d)(1)(i)(D)

Section 257.71(d)(1)(D) requires that Facilities with CCR impoundments located on properties adjacent to a water body demonstrate that there is no reasonable probability that a complete and direct transport pathway (i.e., not mediated by groundwater) can exist between the impoundment and any nearby water body. The preamble to the proposed Part B Rule described a possible additional, site-specific release for an unlined impoundment that extends above grade, is adjacent to a water body, and is underlain by a low-conductivity soil. In that instance, lateral subsurface transport of leachate from the impoundment directly into the surface water body driven in part by the hydrostatic head within the impoundment could occur. As further described, AEPCO has confirmed that the CCR impoundments are not located on properties adjacent to a water body, nor is there any possibility for transport via hydrostatic lead or otherwise to any surface body in the region.

Apache is a zero effluent discharge facility. There are no water bodies on the property or contiguous to the property, and no seepage identified in the weekly or annual inspections completed to date. Although the CCR surface impoundment is classified as unlined according to the CCR Rule, as discussed in Section 3.7, the CWDF impoundments are constructed with a composite liner on both the floor and side slopes of the impoundments. Therefore, the scenario for an additional release pathway in the Part B Rule preamble is not applicable to Apache.

To provide a comprehensive response to this requirement, AEPCO examined the location of more remote water bodies in the area. A review of the U.S. Geological Survey (USGS, 1985) topographic maps indicates that Big Draw, an ephemeral stream, is closest nearby water body. Big Draw is located approximately 0.5 mile south of the impoundments and is topographically upgradient from the surface impoundments. Given this distance, there is no reasonable probability that a complete and direct transport pathway exists between the Apache CCR surface impoundments and Big Draw. These lines of evidence support the conclusion that there is no reasonable probability that a complete and direct transport pathway exist between the Apache CCR surface impoundments and any nearby water body.

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4.0 CONCLUSION

AEPCO is applying for ALD eligibility for Scrubber Pond No. 2 (Regional Aquifer) and for ALD eligibility for Ash Ponds 1-4 (Perched Aquifer). In these ALD Applications, AEPCO has: (1) submitted the required certification and documentation required to demonstrate compliance with requirements contained in 40 C.F.R. Part 257, Subpart D – Standards for the Disposal of Coal Combustion Residuals in Landfills and Surface Impoundments, except for § 257.71(a)(1); (2) submitted documentation supporting that the current engineered liner system is designed and constructed with suitable materials of good quality in-line with accepted engineering practices; and (3) demonstrated that Apache does not trigger any requirements that would preclude completion of an ALD (e.g., Apache remains in detection monitoring and there is no reasonable probability of a complete and direct transport pathway to nearby water body from the CCR impoundments at Apache).

In accordance with § 257.71(d)(i)(E), AEPCO will place this application and any supplemental materials submitted in support of this application in the facility's operating record as required by § 257.105(f)(14).

Therefore, AEPCO requests that EPA approve both Applications and allow AEPCO to proceed with the development and submittal of ALD Packages for the Scrubber Pond No. 2 and for the Ash Ponds (1-4) in accordance with § 257.71(d)(ii).

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APPENDIX A – AQUIFER GROUNDWATER MONITORING NETWORK CERTIFICATION

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APPENDIX B – FIGURES

APPENDIX C – PERCHED AQUIFER WELL CONSTRUCTION DIAGRAMS AND DRILLING LOGS

DRAFT

APPENDIX D – REGIONAL AQUIFER WELL CONSTRUCTION DIAGRAMS AND DRILLING LOGS

DRAFT

APPENDIX E – STATISTICAL ANALYSIS PLAN

DRAFT

APPENDIX F – CONSTITUENT CONCENTRATION TABLE

DRAFT

APPENDIX G – 2019 ANNUAL GROUNDWATER MONITORING AND CORRECTIVE ACTION REPORT

DRAFT

APPENDIX H – SECOND SEMI-ANNUAL 2020 GROUNDWATER MONITORING EVENT STATISTICAL SURVEY

DRAFT

APPENDIX I – 2020 ASD REPORTS

DRAFT

APPENDIX J – 2018 LOCATION RESTRICTIONS REPORT

DRAFT

APPENDIX K – 2016 INITIAL STRUCTURAL STABILITY ASSESSMENT REPORT

DRAFT

APPENDIX L – 2016 INITIAL SAFETY FACTOR ASSESSMENT REPORT

DRAFT

APPENDIX M – 2016 LINER DESIGN CRITERIA AND DESIGN DRAWINGS

DRAFT

BURNS McDONNELL

CREATE AMAZING.

DRAFT

Burns & McDonnell World Headquarters
9400 Ward Parkway
Kansas City, MO 64114
O 816-333-9400
F 816-333-3690
www.burnsmcd.com

Message

From: Michelle Freeark [mfreeark@azgt.coop]
Sent: 11/23/2020 3:41:02 PM
To: Huggins, Richard [Huggins.Richard@epa.gov]; Long, Michelle [Long.Michelle@epa.gov]
CC: Mills, Jason [Mills.Jason@epa.gov]; Jackson, Mary [Jackson.Mary@epa.gov]; Capiro, Mirtha [capiro.mirtha@epa.gov]; Celeste, Laurel [celeste.laurel@epa.gov]
Subject: RE: Arizona Electric Power Cooperative, Inc (AEPCO) meeting request on CCR Part B ALD Demonstration

Good morning Richard,

I apologize for some reason this email never came through, I restarted my Outlook this morning after an issue and several emails from Friday appeared.

I sent our agenda and draft ALD Application Saturday night.

Thanks,
Michelle

Michelle Freeark, Executive Director of Regulatory Affairs and Corporate Services

Arizona G&T Cooperatives

1000 S. Hwy 80 | Benson, AZ 85602
o: 520-586-5122 | m: Ex. 6 Personal Privacy (PP) **mfreeark@azgt.coop**

From: Huggins, Richard <Huggins.Richard@epa.gov>
Sent: Friday, November 20, 2020 8:42 AM
To: Michelle Freeark <mfreeark@azgt.coop>; Long, Michelle <Long.Michelle@epa.gov>
Cc: Mills, Jason <Mills.Jason@epa.gov>; Jackson, Mary <Jackson.Mary@epa.gov>; Capiro, Mirtha <capiro.mirtha@epa.gov>; Celeste, Laurel <celeste.laurel@epa.gov>
Subject: RE: Arizona Electric Power Cooperative, Inc (AEPCO) meeting request on CCR Part B ALD Demonstration

Good morning, that is correct we would like to receive the materials today. EPA email can receive attachments up to 150 MB. Thank you

Richard Huggins Jr., Chief
Energy Recovery and Waste Disposal Branch
Office of Resource Conservation and Recovery
U.S. Environmental Protection Agency
Desk: 703-308-0017 iPhone: [redacted]

From: Michelle Freeark <mfreeark@azgt.coop>
Sent: Friday, November 20, 2020 7:10 AM
To: Long, Michelle <Long.Michelle@epa.gov>; Huggins, Richard <Huggins.Richard@epa.gov>
Cc: Mills, Jason <Mills.Jason@epa.gov>; Jackson, Mary <Jackson.Mary@epa.gov>; Capiro, Mirtha <capiro.mirtha@epa.gov>; Celeste, Laurel <celeste.laurel@epa.gov>
Subject: RE: Arizona Electric Power Cooperative, Inc (AEPCO) meeting request on CCR Part B ALD Demonstration

Good morning,

Given our meeting is on Tuesday we are assuming your 2 days for materials is business days and you need to have our materials today, Friday 11/20. Please confirm.

If the files are too large to email, do you have the portal to upload to?

Thank you for your time and assistance this morning,

Michelle

Michelle Freeark, Executive Director of Regulatory Affairs and Corporate Services

Arizona G&T Cooperatives

1000 S. Hwy 80 | Benson, AZ 85602
o: 520-586-5122 | m: Ex. 6 Personal Privacy (PP) **mfreeark@azgt.coop**

-------- Original message --------
From: "Long, Michelle" <Long.Michelle@epa.gov>
Date: 11/17/20 1:12 PM (GMT-05:00)
To: Michelle Freeark <mfreeark@azgt.coop>, "Huggins, Richard" <Huggins.Richard@epa.gov>
Cc: "Mills, Jason" <Mills.Jason@epa.gov>, "Jackson, Mary" <Jackson.Mary@epa.gov>, "Capiro, Mirtha" <capiro.mirtha@epa.gov>, "Celeste, Laurel" <celeste.laurel@epa.gov>
Subject: RE: Arizona Electric Power Cooperative, Inc (AEPCO) meeting request on CCR Part B ALD Demonstration

Hi Michelle,

Yes, that sounds good. I have copied everyone from EPA who should be included on the meeting invite. Please send an agenda and any meeting materials at least 2 days before our meeting to everyone copied on this email. Thanks and we look forward to speaking with you.

Michelle Long
Biologist
U.S. Environmental Protection Agency
Office of Resource Conservation and Recovery
Materials Recovery and Waste Management Division
(703) 347-8953

From: Michelle Freeark <mfreeark@azgt.coop>
Sent: Tuesday, November 17, 2020 1:10 PM
To: Long, Michelle <Long.Michelle@epa.gov>; Huggins, Richard <Huggins.Richard@epa.gov>
Cc: Mills, Jason <Mills.Jason@epa.gov>; Jackson, Mary <Jackson.Mary@epa.gov>
Subject: RE: Arizona Electric Power Cooperative, Inc (AEPCO) meeting request on CCR Part B ALD Demonstration

Michelle,

Our preference is to use our virtual meeting platform, Ring Central, which has worked extremely well since March.

I can send the invite and you can forward to EPA attendees if that is ok?

Thanks,
Michelle

Michelle Freeark, Executive Director of Regulatory Affairs and Corporate Services

Arizona G&T Cooperatives

1000 S. Hwy 80 | Benson, AZ 85602
o: 520-586-5122 | m: Ex. 6 Personal Privacy (PP) mfreeark@azgt.coop

---

From: Long, Michelle <Long.Michelle@epa.gov>
Sent: Tuesday, November 17, 2020 6:39 AM
To: Michelle Freeark <mfreeark@azgt.coop>; Huggins, Richard <Huggins.Richard@epa.gov>
Cc: Mills, Jason <Mills.Jason@epa.gov>; Jackson, Mary <Jackson.Mary@epa.gov>
Subject: RE: Arizona Electric Power Cooperative, Inc (AEPCO) meeting request on CCR Part B ALD Demonstration

Hi Michelle,

Let's go for 10-11am ET. That looks like it works best for all of us. Would you like me to set up a MS Teams meeting or do you want to set up the meeting? Thanks.

Michelle Long
Biologist
U.S. Environmental Protection Agency
Office of Resource Conservation and Recovery
Materials Recovery and Waste Management Division
(703) 347-8953

From: Michelle Freeark <mfreeark@azgt.coop>
Sent: Tuesday, November 17, 2020 8:33 AM
To: Long, Michelle <Long.Michelle@epa.gov>; Huggins, Richard <Huggins.Richard@epa.gov>
Cc: Mills, Jason <Mills.Jason@epa.gov>; Jackson, Mary <Jackson.Mary@epa.gov>
Subject: RE: Arizona Electric Power Cooperative, Inc (AEPCO) meeting request on CCR Part B ALD Demonstration

Good morning Michelle,

In our email request we asked for a meeting on Tuesday, November 24th. Our only request is that it is after 8:30 am EDT, other than that we have no preference.

Thanks,
Michelle

Michelle Freeark, Executive Director of Regulatory Affairs and Corporate Services

Arizona G&T Cooperatives

1000 S. Hwy 80 | Benson, AZ 85602
o: 520-586-5122 | m: Ex. 6 Personal Privacy (PP) **mfreeark@azgt.coop**

-------- Original message --------
From: "Long, Michelle" <Long.Michelle@epa.gov>
Date: 11/17/20 8:28 AM (GMT-05:00)
To: Michelle Freeark <mfreeark@azgt.coop>, "Huggins, Richard" <Huggins.Richard@epa.gov>
Cc: "Mills, Jason" <Mills.Jason@epa.gov>, "Jackson, Mary" <Jackson.Mary@epa.gov>
Subject: RE: Arizona Electric Power Cooperative, Inc (AEPCO) meeting request on CCR Part B ALD Demonstration

Hi Michelle,

Do you have any preferred meeting dates and times? If you can offer a few times, I'll check our calendars and find a time that would work for us. Thanks.

Michelle Long
Biologist
U.S. Environmental Protection Agency
Office of Resource Conservation and Recovery
Materials Recovery and Waste Management Division
(703) 347-8953

From: Michelle Freeark <mfreeark@azgt.coop>
Sent: Tuesday, November 17, 2020 8:25 AM
To: Huggins, Richard <Huggins.Richard@epa.gov>
Cc: Long, Michelle <Long.Michelle@epa.gov>; Behan, Frank <Behan.Frank@epa.gov>; Hillyer, Kirsten <hillyer.kirsten@epa.gov>; Anderson, Lydia <Anderson.Lydia@epa.gov>
Subject: RE: Arizona Electric Power Cooperative, Inc (AEPCO) meeting request on CCR Part B ALD Demonstration

Thank you Richard!

Michelle Freeark, Executive Director of Regulatory Affairs and Corporate Services

1000 S. Hwy 80 | Benson, AZ 85602
o: 520-586-5122 | m: Ex. 6 Personal Privacy (PP) **mfreeark@azgt.coop**

-------- Original message --------
From: "Huggins, Richard" <Huggins.Richard@epa.gov>
Date: 11/16/20 4:07 PM (GMT-05:00)
To: Michelle Freeark <mfreeark@azgt.coop>
Cc: "Long, Michelle" <Long.Michelle@epa.gov>, "Behan, Frank" <Behan.Frank@epa.gov>, "Hillyer, Kirsten" <hillyer.kirsten@epa.gov>, "Anderson, Lydia" <Anderson.Lydia@epa.gov>

Subject: RE: Arizona Electric Power Cooperative, Inc (AEPCO) meeting request on CCR Part B ALD Demonstration

Good afternoon,
Sorry for the delay Michelle. I have asked Michelle Long (Part B rule coordinator), to work with you to get this meeting on our calendar. She will be reaching out tomorrow.

Look forward to the meeting,
Richard

Richard Huggins Jr., Chief
Energy Recovery and Waste Disposal Branch
Office of Resource Conservation and Recovery
U.S. Environmental Protection Agency
Desk: 703-308-0017 iPhone: [redacted]

From: Michelle Freeark <mfreeark@azgt.coop>
Sent: Monday, November 16, 2020 3:54 PM
To: Huggins, Richard <Huggins.Richard@epa.gov>; Behan, Frank <Behan.Frank@epa.gov>; Hillyer, Kirsten <hillyer.kirsten@epa.gov>; Anderson, Lydia <Anderson.Lydia@epa.gov>
Subject: RE: Arizona Electric Power Cooperative, Inc (AEPCO) meeting request on CCR Part B ALD Demonstration

Good afternoon,

I am following up on our meeting request that was sent via email last Thursday. Knowing how extremely busy you have been, I thought I would reach out to ensure our email request was received and is being considered.

Respectfully,
Michelle Freeark

Michelle Freeark, Executive Director of Regulatory Affairs and Corporate Services

1000 S. Hwy 80 | Benson, AZ 85602
o: 520-586-5122 | m: Ex. 6 Personal Privacy (PP) **mfreeark@azgt.coop**

Notice: This message and any attachments are for the sole and confidential use of the intended recipients and may contain proprietary and/or confidential information which may be privileged or otherwise protected from disclosure.

From: Michelle Freeark
Sent: Thursday, November 12, 2020 7:52 AM
To: 'Huggins.Richard@epa.gov' <Huggins.Richard@epa.gov>; 'Behan.Frank@epa.gov' <Behan.Frank@epa.gov>; 'Hillyer.Kirsten@epa.gov' <Hillyer.Kirsten@epa.gov>; 'anderson.lydia@epa.gov' <anderson.lydia@epa.gov>
Subject: Arizona Electric Power Cooperative, Inc (AEPCO) meeting request on CCR Part B ALD Demonstration

Good morning,

Arizona Electric Power Cooperative, Inc. (AEPCO) is hereby requesting a virtual meeting with EPA staff to discuss AEPCO's Alternative Liner Demonstration (ALD) application submittal in accordance with 40 C.F.R. § 257.71(d)(1)(i).

AEPCO owns and operates the Apache Generating Station (Apache Station), an electric generation station located in Cochise, Arizona about 80 miles east of Tucson, Arizona and about 25 miles northeast of Benson, Arizona. AEPCO is a rural, consumer-owned generation and transmission electric cooperative that provides electric generation service to local rural, consumer-owned electric distribution cooperatives in Arizona and California. As a not-for-profit cooperative, AEPCO is fully owned by its members. AEPCO has six "Class A" members. Together, AEPCO's Class A members serve more than 160,000 meters, representing approximately 400,000 individual residential, commercial, agricultural and industrial consumers. The electric service base is heavily skewed toward rural residential use, with relatively little commercial or industrial load. A substantial proportion of AEPCO's end-users are low income residents.

As the owner and operator of Apache Station, which includes one coal-fired steam electric generating unit (EGU), AEPCO is subject to the CCR Rule. Apache Station is AEPCO's only generating plant.

AEPCO respectfully requests the meeting to be held on Tuesday, November 24th. AEPCO intends to have staff, outside legal counsel and its consultant, Burns & McDonnell participate in the meeting. AEPCO will provide EPA with a draft ALD application prior to the meeting.

AEPCO certainly understands the high demand for meetings with EPA and greatly appreciate your time to consider a meeting with AEPCO, particularly in light of the upcoming deadline for the ALD application.

Thanks,
Michelle

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EXTERNAL EMAIL: Do not open attachments/click links if source is unknown. Please report all phishing attempts to phishing@azgt.coop
EXTERNAL EMAIL: Do not open attachments/click links if source is unknown. Please report all phishing attempts to phishing@azgt.coop

Message

From: Christopher P Scieszka [christopher.scieszka@dteenergy.com]
Sent: 11/25/2020 5:09:11 PM
To: Long, Michelle [Long.Michelle@epa.gov]; Huggins, Richard [Huggins.Richard@epa.gov]; Mills, Jason [Mills.Jason@epa.gov]; Birchfield, Norman [Birchfield.Norman@epa.gov]; Jackson, Mary [Jackson.Mary@epa.gov]; Celeste, Laurel [celeste.laurel@epa.gov]; Robert J Lee [robert.j.lee@dteenergy.com]; Christy D Clark [christy.clark@dteenergy.com]; Kelly M Martorano [kelly.martorano@dteenergy.com]; John Seymour [JSeymour@Geosyntec.com]; Omer Bozok [OBozok@Geosyntec.com]; Mooney, Susan [mooney.susan@epa.gov]; Schumacher, Jessica [Schumacher.Jessica@epa.gov]
CC: dsw@rti.org; Lillys, Ted [tlillys@rti.org]
Subject: RE: Part B Discussion with DTE
Attachments: Supplementary Documents for Belle River Investigation Discussion.pdf; Supplementary Documents for Monroe Ash Basin Investigation Discussion.pdf

All,

Supplemental information for our discussion is attached.

Hope everyone has an enjoyable Thanksgiving!

Regards,

Chris Scieszka
Environmental Management & Safety
One Energy Plaza | 410 G.O. | Detroit, MI 48226
(O) 313-235-0153 | (C) Ex. 6 Personal Privacy (PP)
christopher.scieszka@dteenergy.com

CONFIDENTIAL OR PRIVILEGED COMMUNICATION
This communication may contain privileged or confidential information protected by legal rules. It is solely for the use of the intended recipient named above. Any review, dissemination, distribution, forwarding, or copying of this communication by someone other than the intended recipient, or the employee responsible for delivering this communication to the intended recipient, is prohibited. If you have received this communication in error, please immediately notify us by phone or reply to the sender via email, then destroy the original message. Thank you.

-----Original Appointment-----
From: Christopher P Scieszka
Sent: Tuesday, November 24, 2020 4:54 PM
To: Christopher P Scieszka; Long, Michelle; Huggins, Richard; Mills, Jason; Birchfield, Norman; Jackson, Mary; Celeste, Laurel; Robert J Lee; Christy D Clark; Kelly M Martorano; John Seymour; Omer Bozok; Mooney, Susan; Schumacher, Jessica
Cc: Womack, Donna; Lillys, Ted
Subject: Part B Discussion with DTE
When: Tuesday, December 01, 2020 11:00 AM-12:00 PM (UTC-05:00) Eastern Time (US & Canada).
Where: Microsoft Teams Meeting

Materials to supplement our discussion are forthcoming. Thank you for taking the time to meet with us.

Microsoft Teams meeting

Join on your computer or mobile app
Click here to join the meeting

Or call in (audio only)

Ex. 6 Personal Privacy (PP)

Find a local number | Reset PIN

Learn More | Meeting options

From: Long, Michelle <Long.Michelle@epa.gov>
Sent: Monday, November 23, 2020 11:35 AM
To: Christopher P Scieszka <christopher.scieszka@dteenergy.com>; Huggins, Richard <Huggins.Richard@epa.gov>; Mills, Jason <Mills.Jason@epa.gov>; Birchfield, Norman <Birchfield.Norman@epa.gov>; Jackson, Mary <Jackson.Mary@epa.gov>; Celeste, Laurel <celeste.laurel@epa.gov>; Robert J Lee <robert.j.lee@dteenergy.com>; Christy D Clark <christy.clark@dteenergy.com>; Kelly M Martorano <kelly.martorano@dteenergy.com>; John Seymour <JSeymour@Geosyntec.com>; Omer Bozok <OBozok@Geosyntec.com>; Mooney, Susan <mooney.susan@epa.gov>; Schumacher, Jessica <Schumacher.Jessica@epa.gov>
Subject: [EXTERNAL] RE: Part B Discussion with DTE

Hi Chris,

Either of those times would work for most of us. Let's meet on Tuesday 12/1 from 11-12am. Please send materials at least 2 days before our meeting, but this week would be great if possible. Thanks.

Michelle Long
Biologist
U.S. Environmental Protection Agency
Office of Resource Conservation and Recovery
Materials Recovery and Waste Management Division
(703) 347-8953

From: Christopher P Scieszka <christopher.scieszka@dteenergy.com>
Sent: Thursday, November 19, 2020 2:41 PM
To: Long, Michelle <Long.Michelle@epa.gov>; Huggins, Richard <Huggins.Richard@epa.gov>; Mills, Jason <Mills.Jason@epa.gov>; Birchfield, Norman <Birchfield.Norman@epa.gov>; Jackson, Mary <Jackson.Mary@epa.gov>; Celeste, Laurel <celeste.laurel@epa.gov>; Robert J Lee <robert.j.lee@dteenergy.com>; Christy D Clark <christy.clark@dteenergy.com>; Kelly M Martorano <kelly.martorano@dteenergy.com>; John Seymour <JSeymour@Geosyntec.com>; Omer Bozok <OBozok@Geosyntec.com>; Mooney, Susan <mooney.susan@epa.gov>; Schumacher, Jessica <Schumacher.Jessica@epa.gov>
Subject: RE: Part B Discussion with DTE

Hi Michelle,

I understand you are all very busy right now. Thank you for taking the time to set up this discussion.

Proposed timeframes (EST):
12/1: 11-12 AM
12/2: 3-4 PM

Please let us know what works best for you.

Thank you,

Chris Scieszka
Environmental Management & Safety
One Energy Plaza | 410 G.O. | Detroit, MI 48226
(O) 313-235-0153 | (C) Ex. 6 Personal Privacy (PP)
christopher.scieszka@dteenergy.com

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From: Long, Michelle <Long.Michelle@epa.gov>
Sent: Wednesday, November 18, 2020 8:40 AM
To: Christopher P Scieszka <christopher.scieszka@dteenergy.com>; Huggins, Richard <Huggins.Richard@epa.gov>; Mills, Jason <Mills.Jason@epa.gov>; Birchfield, Norman <Birchfield.Norman@epa.gov>; Jackson, Mary <Jackson.Mary@epa.gov>; Celeste, Laurel <celeste.laurel@epa.gov>; Robert J Lee <robert.j.lee@dteenergy.com>; Christy D Clark <christy.clark@dteenergy.com>; Kelly M Martorano <kelly.martorano@dteenergy.com>; John Seymour <JSeymour@Geosyntec.com>; Omer Bozok <OBozok@Geosyntec.com>; Mooney, Susan <mooney.susan@epa.gov>; Schumacher, Jessica <Schumacher.Jessica@epa.gov>
Subject: [EXTERNAL] RE: Part B Discussion with DTE

Chris,

Due to many other meetings for the Part A demonstrations and other work we are doing, plus the holiday, we won't be able to meet until December 1 or 2. Would a time one of those days work for DTE?

Michelle Long
Biologist
U.S. Environmental Protection Agency
Office of Resource Conservation and Recovery
Materials Recovery and Waste Management Division
(703) 347-8953

From: Christopher P Scieszka <christopher.scieszka@dteenergy.com>
Sent: Monday, November 16, 2020 3:17 PM
To: Huggins, Richard <Huggins.Richard@epa.gov>; Mills, Jason <Mills.Jason@epa.gov>; Birchfield, Norman

<Birchfield.Norman@epa.gov>; Long, Michelle <Long.Michelle@epa.gov>; Jackson, Mary <Jackson.Mary@epa.gov>; Celeste, Laurel <celeste.laurel@epa.gov>; Robert J Lee <robert.j.lee@dteenergy.com>; Christy D Clark <christy.clark@dteenergy.com>; Kelly M Martorano <kelly.martorano@dteenergy.com>; John Seymour <JSeymour@Geosyntec.com>; Omer Bozok <OBozok@Geosyntec.com>; Mooney, Susan <mooney.susan@epa.gov>; Schumacher, Jessica <Schumacher.Jessica@epa.gov>
Subject: RE: Part B Discussion with DTE

Hi Richard and EPA team,

Continuing our conversation from last Monday, we are hoping to schedule a meeting to discuss our approach for the alternate liner demonstration field investigations we intend to conduct in the near future (December).

We have the following times (EST) available in the next couple of days:

- Wednesday 11/18: 8-11 AM or 2-3:30
- Thursday 11/19: 10-12:30

We'd like to discuss the following agenda:

- Monroe Fly Ash Basin
  - Boring locations
  - Drilling methods
- Belle River Bottom Ash Basins and Diversion Basin
  - Boring locations
  - Drilling methods
  - Permeant collection/analysis

Please let me know if we can book an hour with your team.

Thank you!

_____

Chris Scieszka
Environmental Management & Safety
One Energy Plaza | 410 G.O. | Detroit, MI 48226
(O) 313-235-0153 | (C) Ex. 6 Personal Privacy (PP)
christopher.scieszka@dteenergy.com

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-----Original Appointment-----
From: Huggins, Richard <Huggins.Richard@epa.gov>
Sent: Friday, October 30, 2020 1:08 PM
To: Huggins, Richard; Mills, Jason; Birchfield, Norman; Long, Michelle; Jackson, Mary; Celeste, Laurel; Christopher P Scieszka; Robert J Lee; Christy D Clark; Kelly M Martorano; Buening, Vincent; Crockford, Graham; Cratsenburg, Kelly; John Seymour; Omer Bozok; Mooney, Susan; Schumacher, Jessica
Subject: Part B Discussion with DTE

When: Monday, November 09, 2020 11:00 AM-12:00 PM (UTC-05:00) Eastern Time (US & Canada).
Where: Microsoft Teams Meeting

one for Monroe Power Plant Fly Ash Basin, one for the Belle River Power Plant Bottom Ash Basins, and one for the Belle River Power Plant Diversion Basin

---

Microsoft Teams meeting

Join on your computer or mobile app
Click here to join the meeting

Or call in (audio only)

Ex. 6 Personal Privacy (PP)

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Learn More | Meeting options

Legend

- Monitoring Well
- Soil Boring
- Proposed Sonic Boring
- Proposed Cone Penetration Test
- Proposed Temporary Monitoring Well

Notes

- World imagery provided by DigitalGlobe and dated 7/20/2019.
- Existing soil boring and monitoring wells provided by TRC Companies, Inc.
- Proposed boring and well locations are approximate.

400 200 0 400 Feet

Site Plan

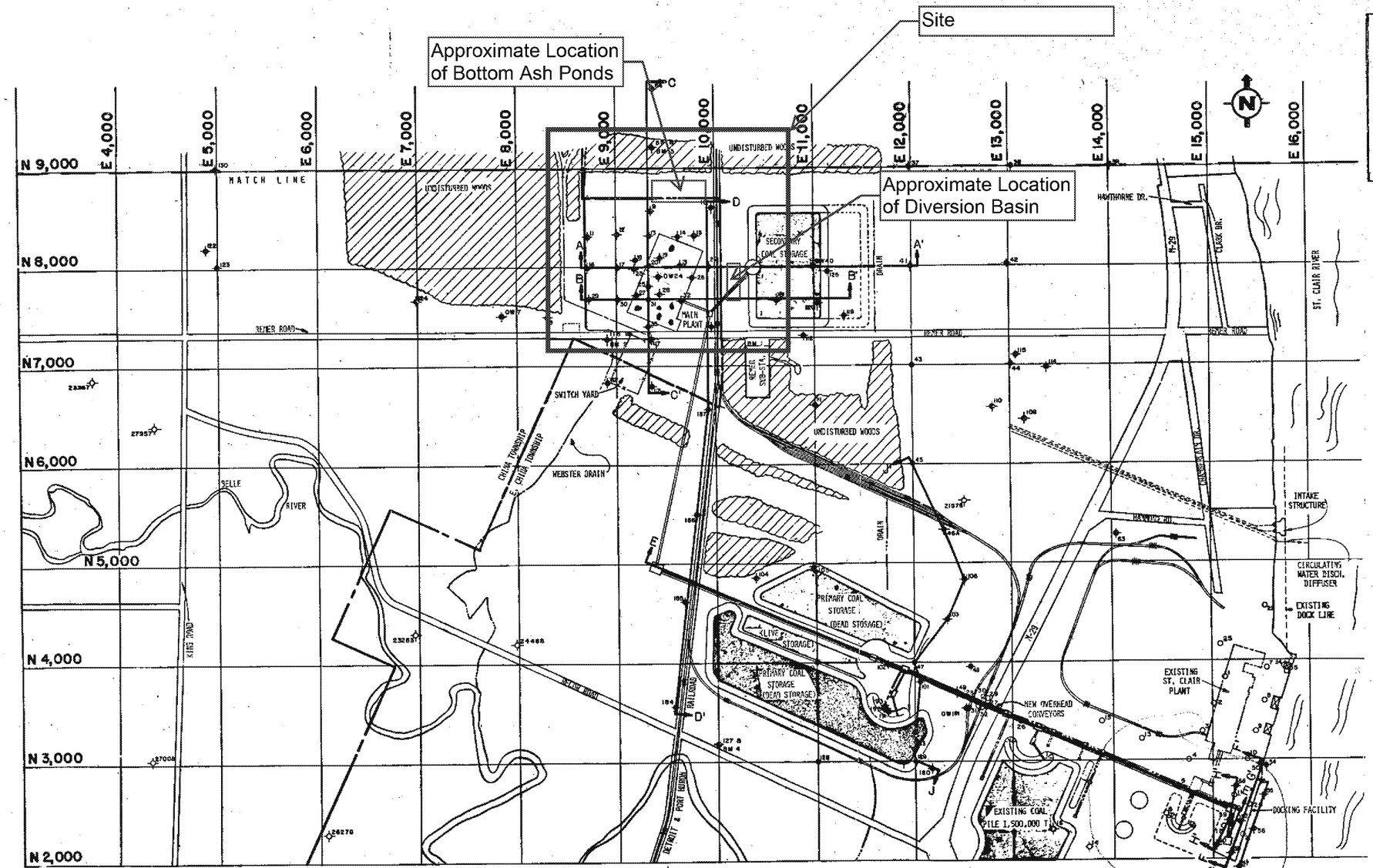
DTE Energy
Belle River Power Plant
4505 King Road
China Township, Michigan

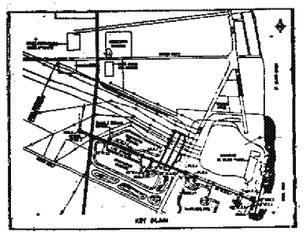
Geosyntec consultants

Ann Arbor, Michigan | 2020/11/06

Figure 2

C:\Users\SKarely\Documents\DTE Mannor\Belle River\BRPP Figure 2 - Site Plan.mxd, SKarely, 11/6/2020, Project/Phase/Task.





NOTES:

1. FOR SUBSURFACE PROFILES SEE FIGURE 9, A THROUGH H.
2. SECTIONS A, B, AND C ARE BASED ON ORIGINAL PLANT LOCATION.
3. SEE FIGURE 4 FOR ADDITIONAL BORING LOCATIONS.

EXPLANATION

TOWNSHIP BOUNDARY

N N' SUBSURFACE PROFILE N-N'

BORING LOCATION

OW DENOTES OBSERVATION WELL

BM 4 BENCH MARK

BORING LOCATIONS FROM PREVIOUS INVESTIGATIONS FOR ST. CLAIR PLANT

WELLS DRILLED FOR OIL OR GAS EXPLORATION - SHOWING PERMIT NUMBER (ALL HOLES WERE DRY)

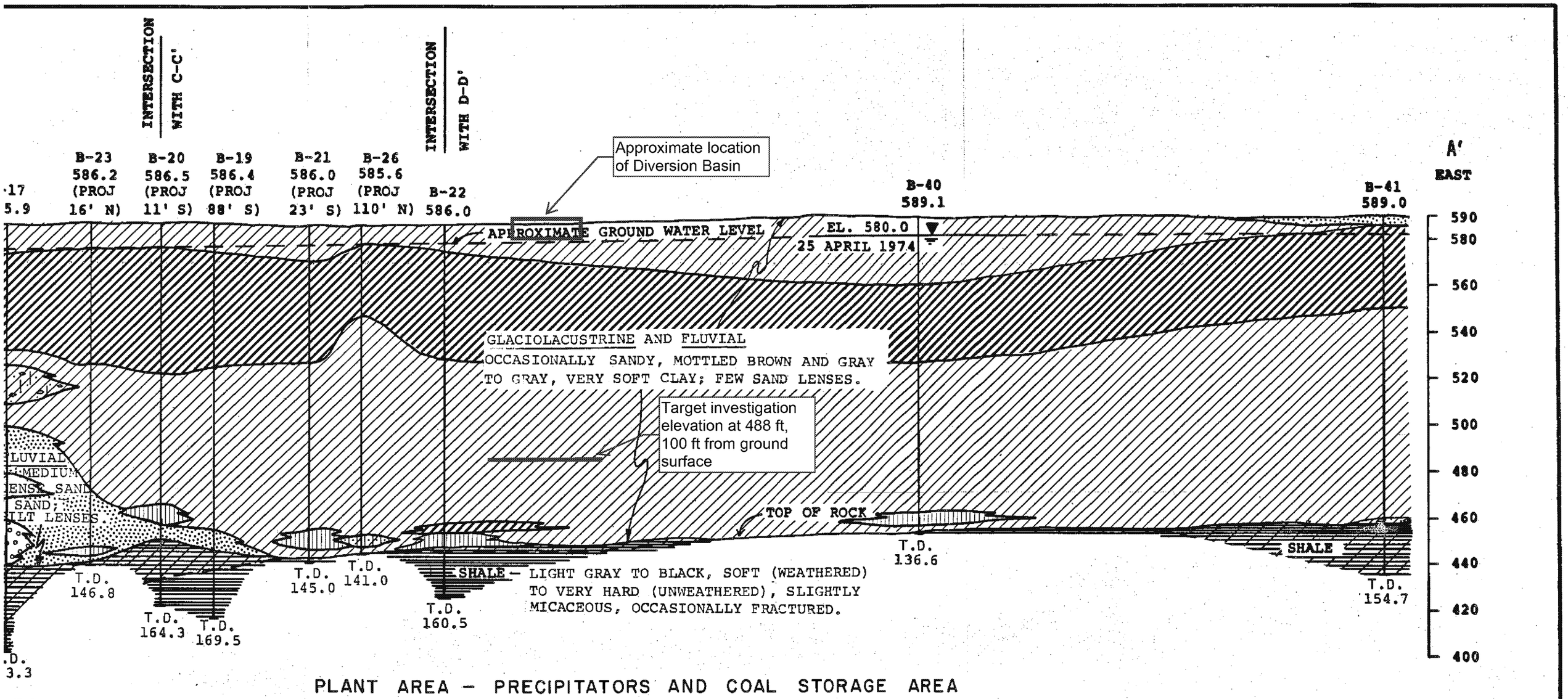
0 100 200 400 800 1200 Feet
SCALE

BECHTEL
ANN ARBOR

BELLE RIVER PLANT
UNIT 1 & 2

BORING LOCATION PLAN
SOUTH AREA

JOB NO.	DRAWING NO.	REV.
10539	FIGURE 3	2



PLANT AREA – PRECIPITATORS AND COAL STORAGE AREA

LEGEND

.)	Clayey Sand (SC)
H)	Silty Sand (SM)
P)	Gravel (GM)
W)	Shale (weathered)
)	Shale (unweathered)

EXPLANATION

B-187 Bechtel borings (1973-1974)

T.D. Total depth drilled (ft)

0 100 200 400 600

SCALE IN FEET

NOTES:

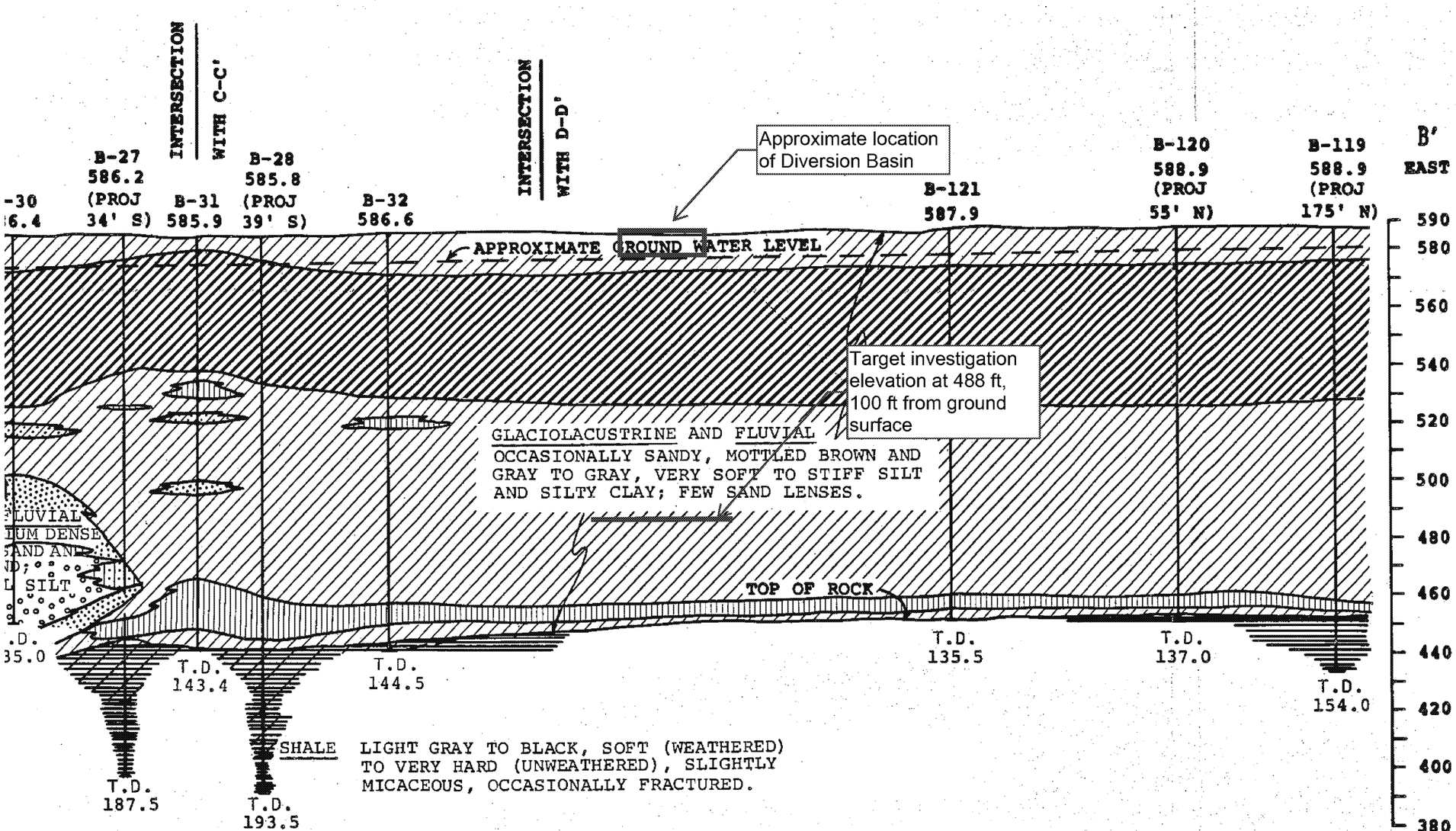
1.) For location of section see Figure 3.
2.) For variation of water table see Section 4.1.3.
3.) For boring logs see Appendix B.
4.) For Geologic description of site see Section 4.1.2.

BECHTEL
ANN ARBOR

BELLE RIVER PLANT
UNIT 1 & 2

SUBSURFACE PROFILE
SECTION A-A'

JOB NO.	DRAWING NO.	REV.
10539	FIGURE 9	0



EXPLANATION

B-187 Bechtel borings (1973-1974)

T.D. Total depth drilled (ft)

0 100 200 400 600

SCALE IN FEET

PLANT AREA – UNITS 1 & 2 COAL STORAGE AREA

LEGEND

- Sand (SW)
- Silt (ML)
- Clayey Sand (SC)
- Silty Sand (SM)
- Shale (weathered)
- Shale (unweathered)

NOTES:

1.) For location of section see Figure 3.

2.) For variation of water table see Section 4.1.3.

3.) For boring logs see Appendix B.

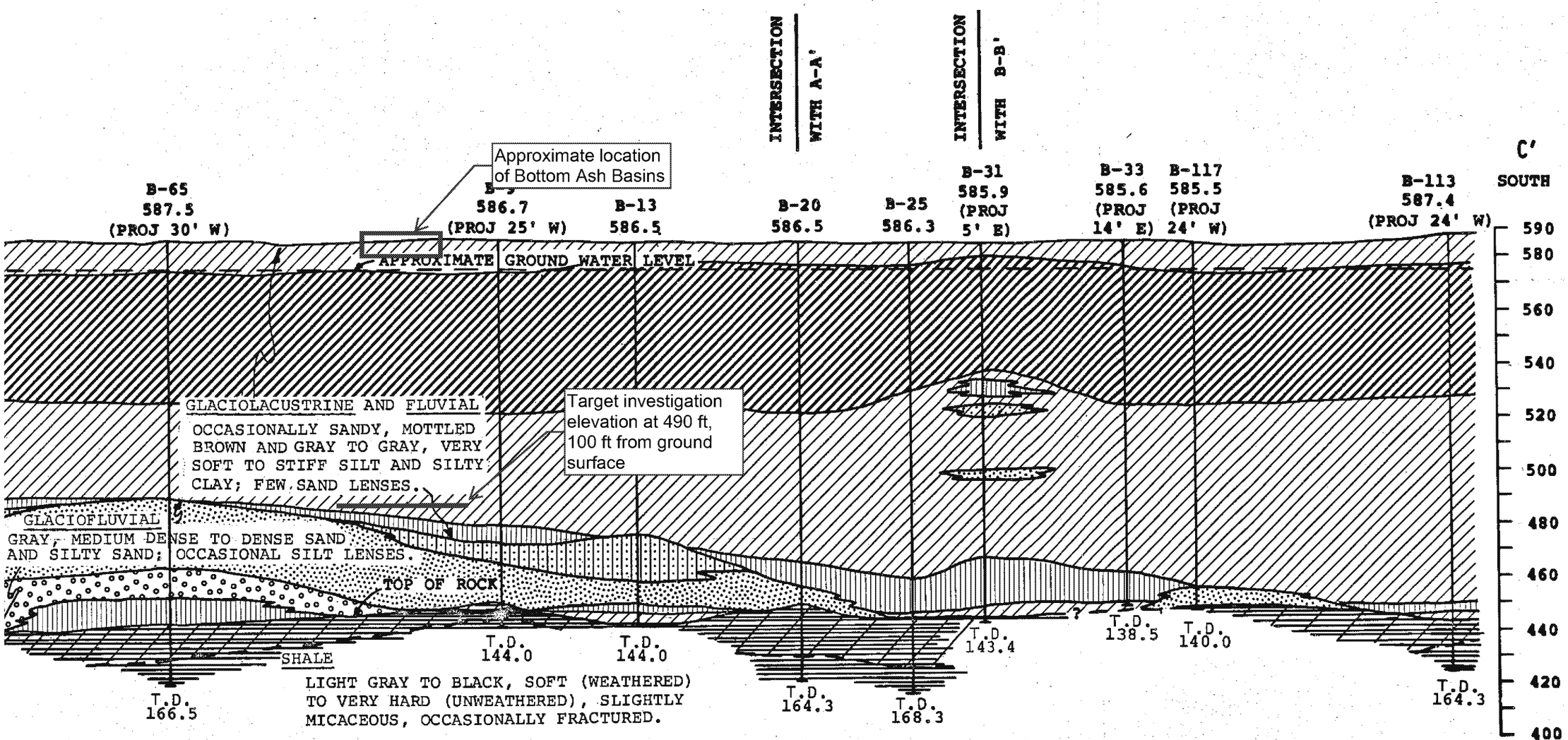
4.) For Geologic description of site see Section 4.1.2.

BECHTEL
ANN ARBOR

BELLE RIVER PLANT
UNIT 1 & 2

SUBSURFACE PROFILE
SECTION B-B'

JOB NO.	DRAWING NO.	REV.
10539	FIGURE 9	0



PLANT AREA - UNIT I AND SWITCHYARD

EXPLANATION

- Silt (ML)
- Clayey Sand (SC)
- Silty Sand (SM)
- Shale (weathered)
- Shale (unweathered)

B-187 Bechtel borings (1973-1974)

T.D. Total depth drilled (ft)

0 100 200 400 600

SCALE IN FEET

NOTES:

1.) For location of section see Figure 3.

2.) For variation of water table see Section 4.1.3.

3.) For boring logs see Appendix B.

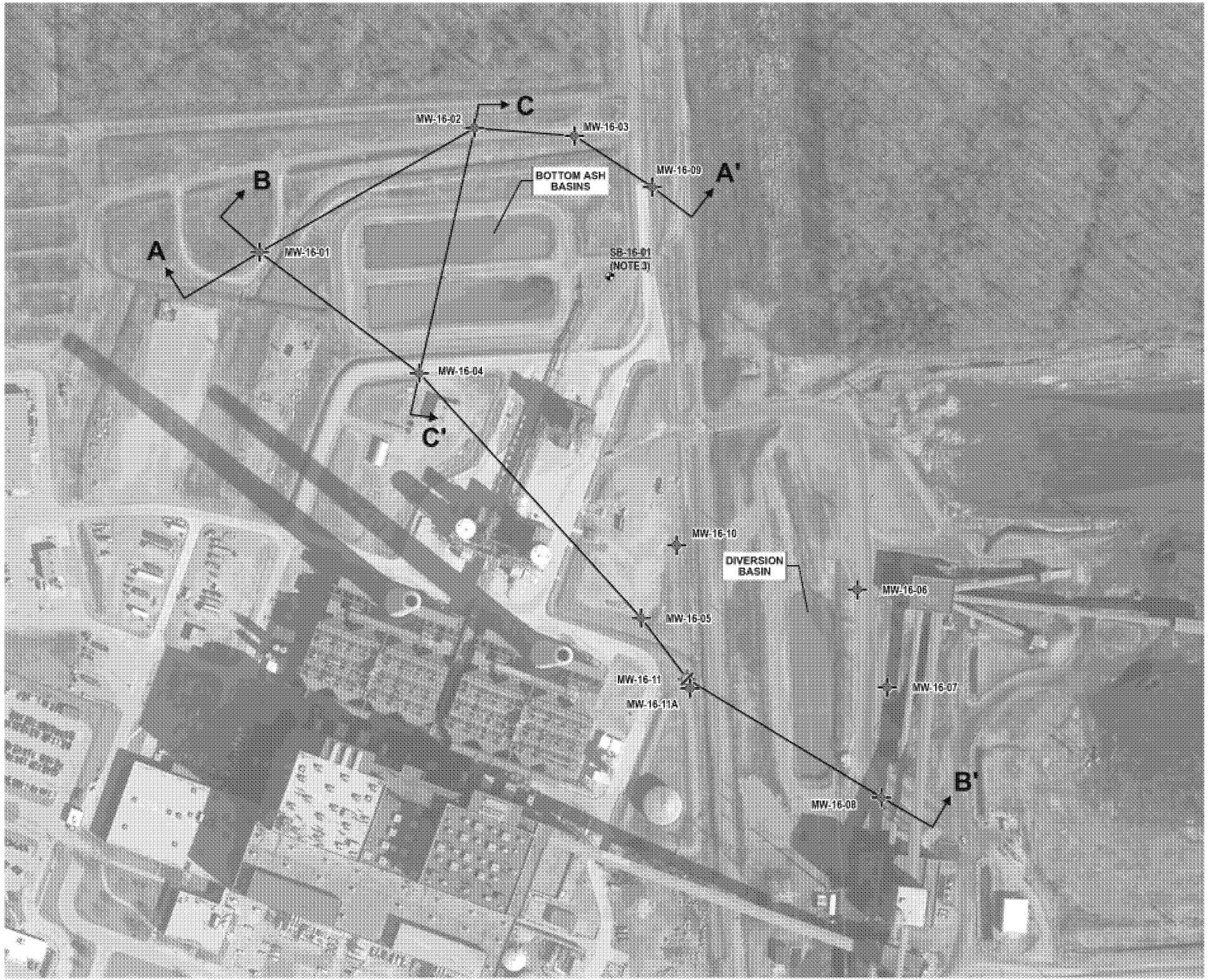
4.) For Geologic description of site see Section 4.1.3.

BECHTEL
ANN ARBOR

BELLE RIVER PLANT
UNIT 1 & 2

SUBSURFACE PROFILE
SECTION C-C'

JOB NO.	DRAWING NO.	REV.
10539	FIGURE 9	0



LEGEND

- SOIL BORING
- MONITORING WELL
- DECOMMISSIONED MONITORING WELL
- CROSS SECTIONS

NOTES

1. BASE MAP IMAGERY FROM GOOGLE EARTH PRO, (3/23/2019).
2. WELL LOCATIONS SURVEYED IN MARCH, APRIL AND JUNE 2016 AND JUNE 2017 BY BMJ ENGINEERS & SURVEYORS, INC.
3. NO SAND, GRAVEL OR OTHER SATURATED ZONE WAS ENCOUNTERED ABOVE THE SHALE BEDROCK IN THIS LOCATION. THEREFORE, AN AQUIFER WAS NOT ENCOUNTERED AND A MONITORING WELL WAS NOT INSTALLED.

N

0 200 400 Feet

1 " = 200 '
1:2,400

PROJECT: DTE ELECTRIC COMPANY
BELLE RIVER POWER PLANT BOTTOM ASH BASIN
4505 KING ROAD
CHINA TOWNSHIP, MICHIGAN

TITLE: CROSS SECTION LOCATOR MAP

DRAWN BY:	A. ADAIR	PROJ NO.:	370029.0003
CHECKED BY:	K. CRATSENBURG		FIGURE 3
APPROVED BY:	V. BUENING		
DATE:	NOVEMBER 2020		

TRC

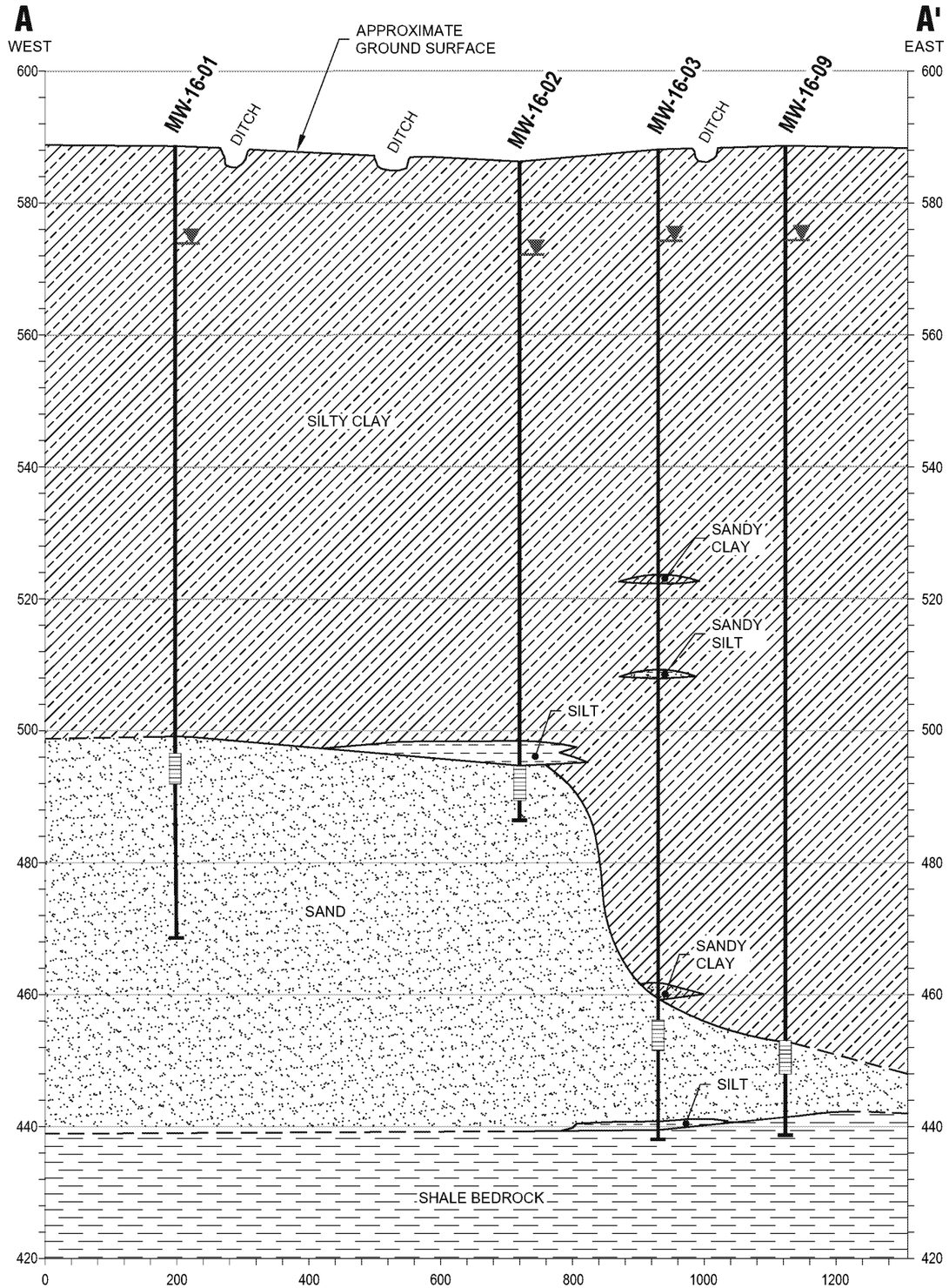
1540 Eisenhower Place
Ann Arbor, MI 48108-3284
Phone: 734.971.7080
www.trccompanies.com

FILE NO.: 370029-0003-003.mxd

Plot Date: 11/3/2020, 11:46:22 AM by AADAIR -- LAYOUT: ANSI B (11"x17")
Path: E:\DTE\CCR_Sites\2017_265996\370029-0003-003.mxd
Coordinate System: NAD 1983 StatePlane Michigan South FIPS 2113 Feet Intl (Foot)
Map Rotation: 0

TRC -- GIS

GENERALIZED GEOLOGIC CROSS-SECTION A-A'



LEGEND

- STRATEGRAPHIC BOUNDARY (DASHED WHERE INFERRED)
- GROUNDWATER ELEVATION (COLLECTED 02/27/2017)
- SOIL BORING
- WELL SCREEN INTERVAL
- END OF BORING

Lithology Key

- SILTY CLAY
- SAND
- SILT
- SANDY CLAY
- SANDY SILT
- SHALE BEDROCK

SCALE IN FEET

VERTICAL: 0 – 20

HORIZONTAL: 0 – 200

PROJECT:

DTE ELECTRIC COMPANY
BELLE RIVER POWER PLANT
CHINA TOWNSHIP, MICHIGAN

TITLE:

GENERALIZED GEOLOGIC CROSS-SECTION A-A'

DRAWN BY:	D.STEHLE	PROJ NO.:	370029.0003.01.01
CHECKED BY:	S.HOLMSTROM		
APPROVED BY:	V.BUENING		**FIGURE 4**
DATE:	JULY 2020		

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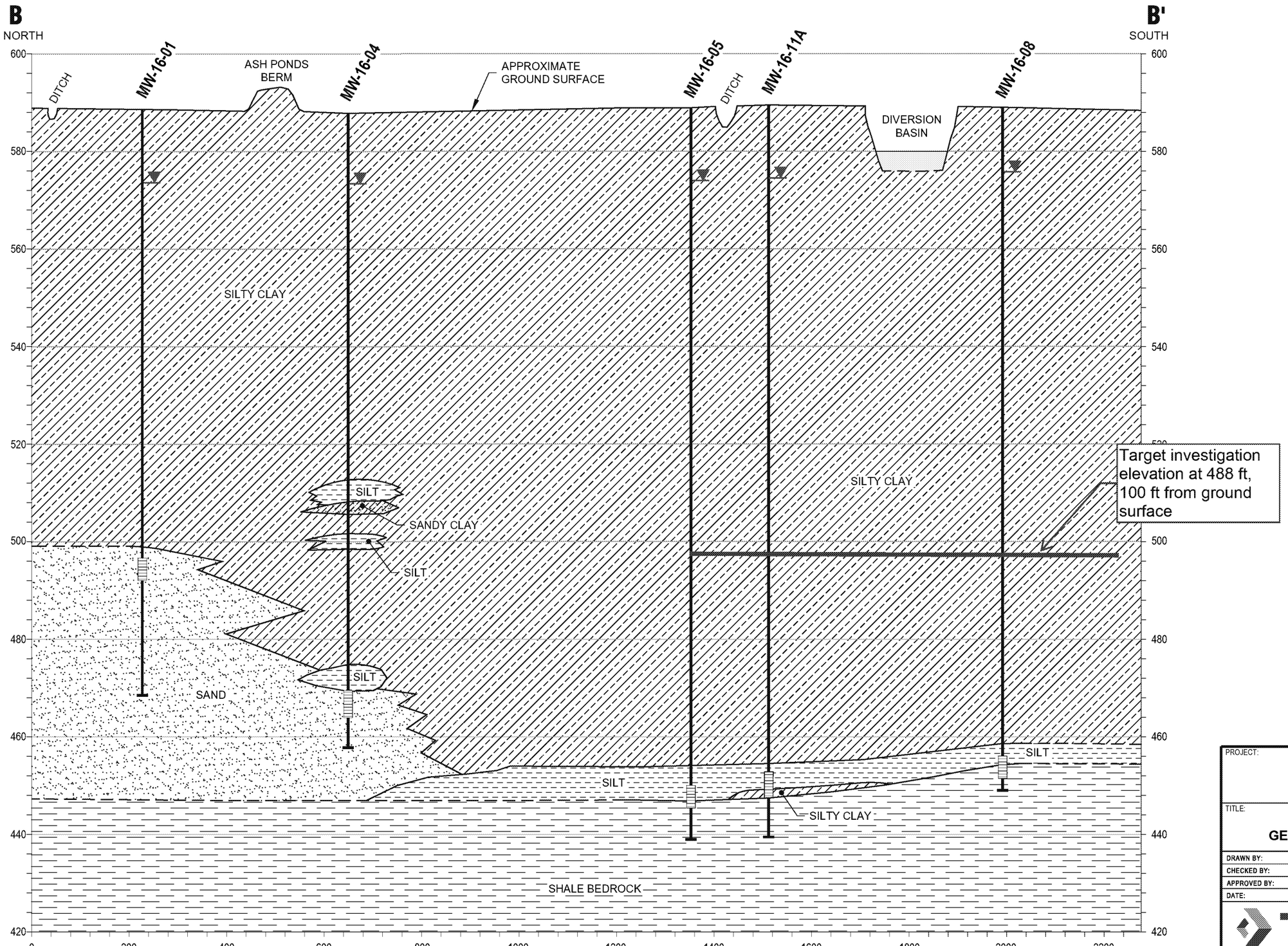
Phone: 734.971.7080
www.trccompanies.com

FILE NO.: 370029.0003.01.01.04-05.dwg

11x17 --- ATTACHED XREFS: --- ATTACHED IMAGES: DTE BRPP XSs XXXXXXXXXX-021720170922 13_Page_2; XS aa wells; XS cc wells; XS DD wells;
DRAWING NAME: J:_TRC\DTE\Belle River PP\370029\0003\01\01_2020 HMP\ 370029.0003.01.01.04-05.dwg --- PLOT DATE: July 28, 2020 - 6:55AM --- LAYOUT: FIG04 XS AA

GENERALIZED GEOLOGIC CROSS-SECTION B-B'



LEGEND

- STRATEGRAPHIC BOUNDARY (DASHED WHERE INFERRED)
- GROUNDWATER ELEVATION (COLLECTED 02/27/2017)
- SOIL BORING
- WELL SCREEN INTERVAL
- END OF BORING

Lithology Key

- SILTY CLAY
- SAND
- SILT
- SANDY CLAY
- SHALE BEDROCK

SCALE IN FEET

VERTICAL: 0 – 20

HORIZONTAL: 0 – 200

PROJECT:
DTE ELECTRIC COMPANY
BELLE RIVER POWER PLANT
CHINA TOWNSHIP, MICHIGAN

TITLE:
GENERALIZED GEOLOGIC CROSS-SECTION B-B'

DRAWN BY:	D.STEHLE	PROJ NO.:	370029.0003.01.01
CHECKED BY:	S.HOLMSTROM		
APPROVED BY:	V.BUENING		**FIGURE 5**
DATE:	JULY 2020		

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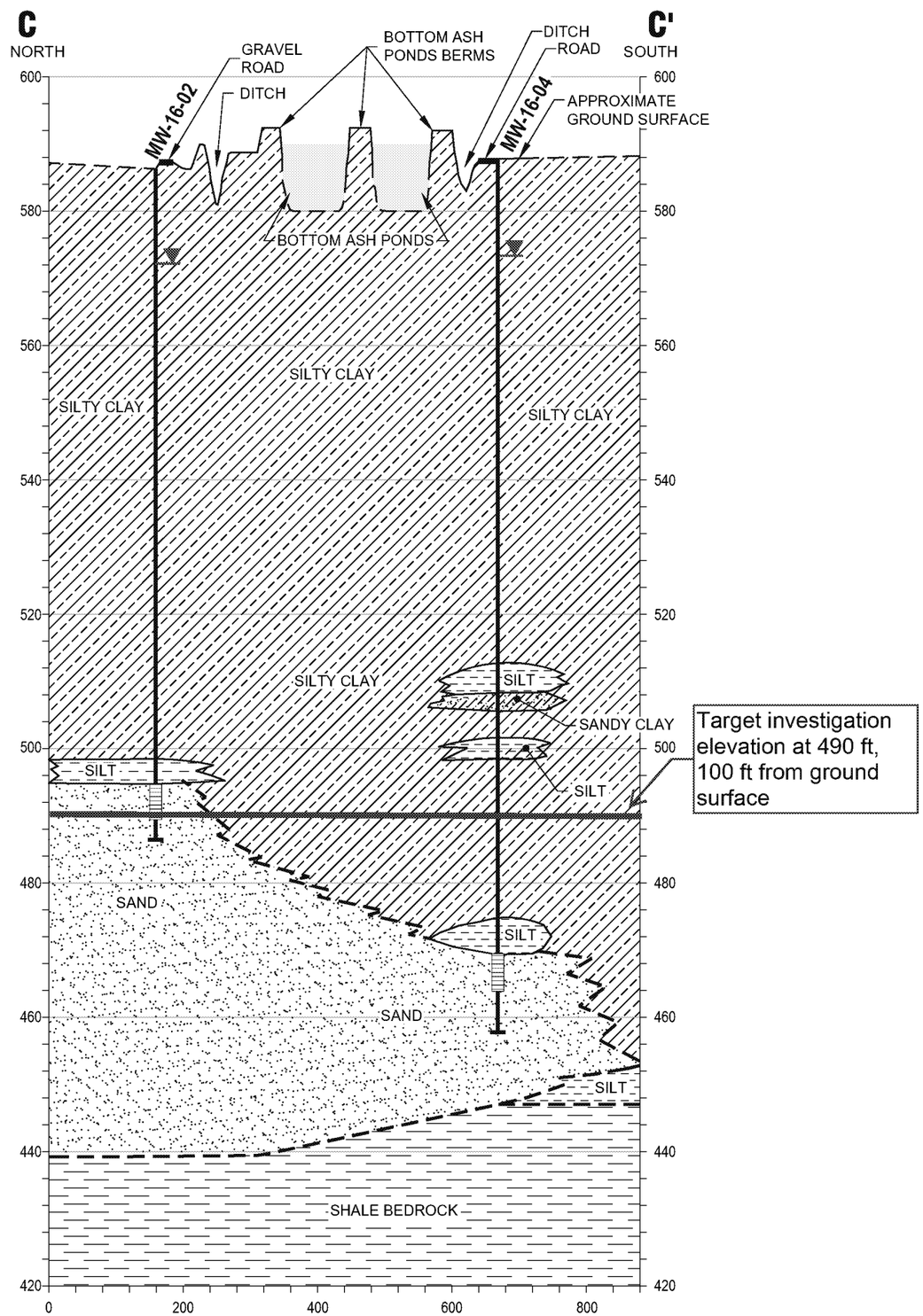
FILE NO.: 370029.0003.01.01.04-05.dwg

11x17 --- ATTACHED XREFS: --- ATTACHED IMAGES: DTE BRPP XSs XXXXXXXXXX-021720170922 13_Page_2; XS aa wells; XS cc wells; XS DD wells;
DRAWING NAME: J:_TRC\DTE\Belle River PP\370029\0003\01\01_2020 HMP\ 370029.0003.01.01.04-05.dwg --- PLOT DATE: July 28, 2020 - 6:55AM --- LAYOUT: FIG05 XS BB

GENERALIZED GEOLOGIC CROSS-SECTION C-C'



LEGEND

- STRATEGRAPHIC BOUNDARY (DASHED WHERE INFERRED)
- GROUNDWATER ELEVATION (COLLECTED 02/27/2017)
- SOIL BORING
- WELL SCREEN INTERVAL
- END OF BORING

Lithology Key

- SILTY CLAY
- SAND
- SILT
- SANDY CLAY
- SHALE BEDROCK
- WATER

SCALE IN FEET

VERTICAL: 0, 20

HORIZONTAL: 0, 200

PROJECT:
DTE ELECTRIC COMPANY
BELLE RIVER POWER PLANT
CHINA TOWNSHIP, MICHIGAN

TITLE:
GENERALIZED GEOLOGIC CROSS-SECTION C-C'

WORKING COPY

DRAWN BY:	D.STEHLE	PROJ NO.:	370029.0003.01.01
CHECKED BY:	K.CRATSENBURG		
APPROVED BY:			FIGURE 6
DATE:	NOVEMBER 2020		

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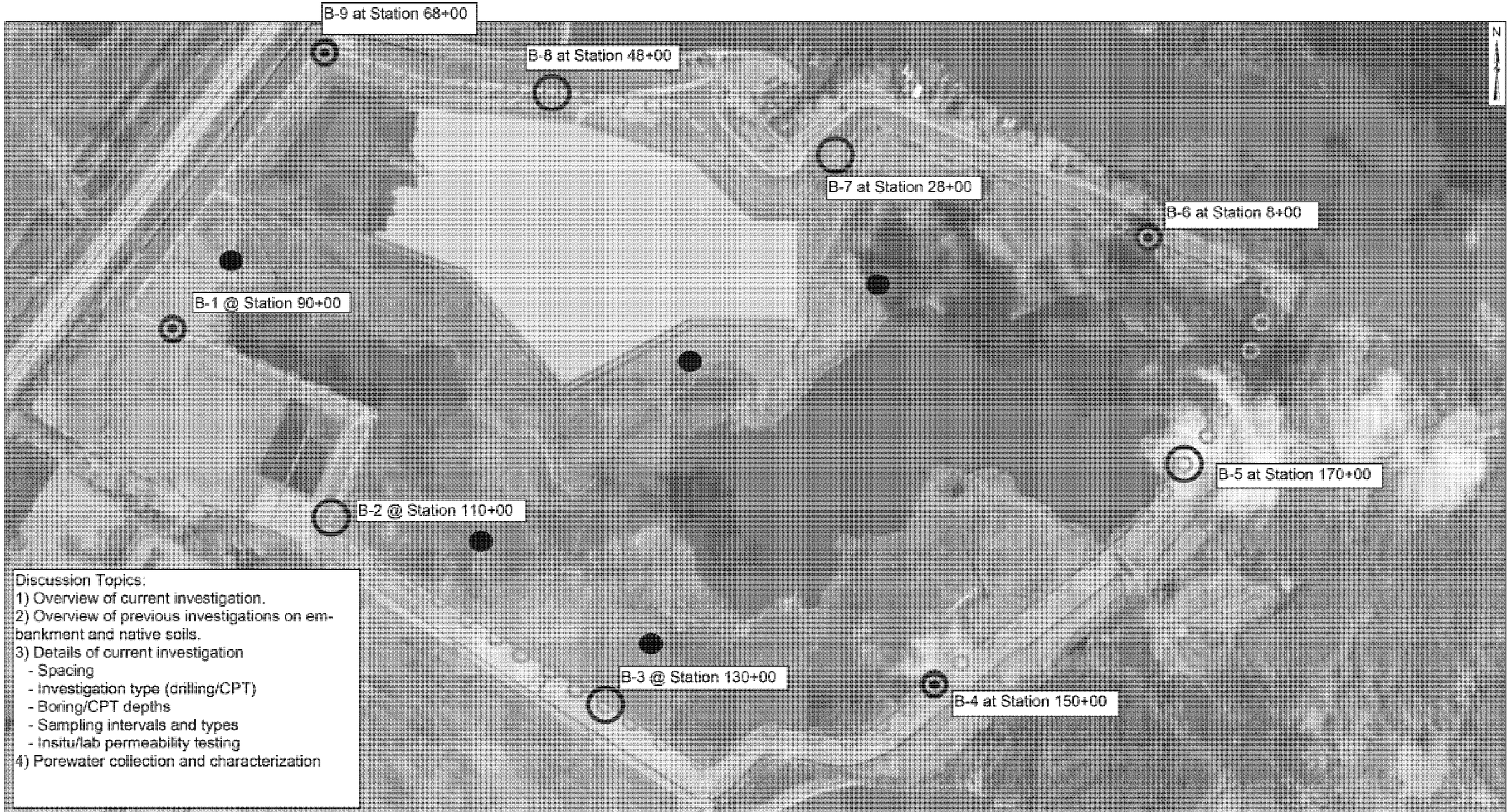
Ann Arbor, MI 48108
Phone: 734.971.7080
www.trccompanies.com

FILE NO.: 370029.0003.01.01.06.dwg

11x17 --- ATTACHED XREF'S: --- ATTACHED IMAGES: DTE BRPP XSs XXXXXXXXXX-02172017092213_Page_1; DTE BRPP XSs XXXXXXXXXX-02172017092213_Page_2; XS aa wells; XS cc wells; XS DD wells;
DRAWING NAME: \\Annarbor-fp2\cad\PJT\00_TRC\DTE\Belle River PP\370029\0003\01\01_2020 HMP\ 370029.0003.01.01.06.dwg --- PLOT DATE: November 03, 2020 - 3:55AM --- LAYOUT: FIG06 XS CC



Sonic Boring with Undisturbed Samples Collected from Embankment and Native Soils

Cone Penetration Testing (CPT) for Embankment and Native Soils

Supplementary Boring for CPT

Existing wells within the ash

1,000 500 0 1,000 Feet

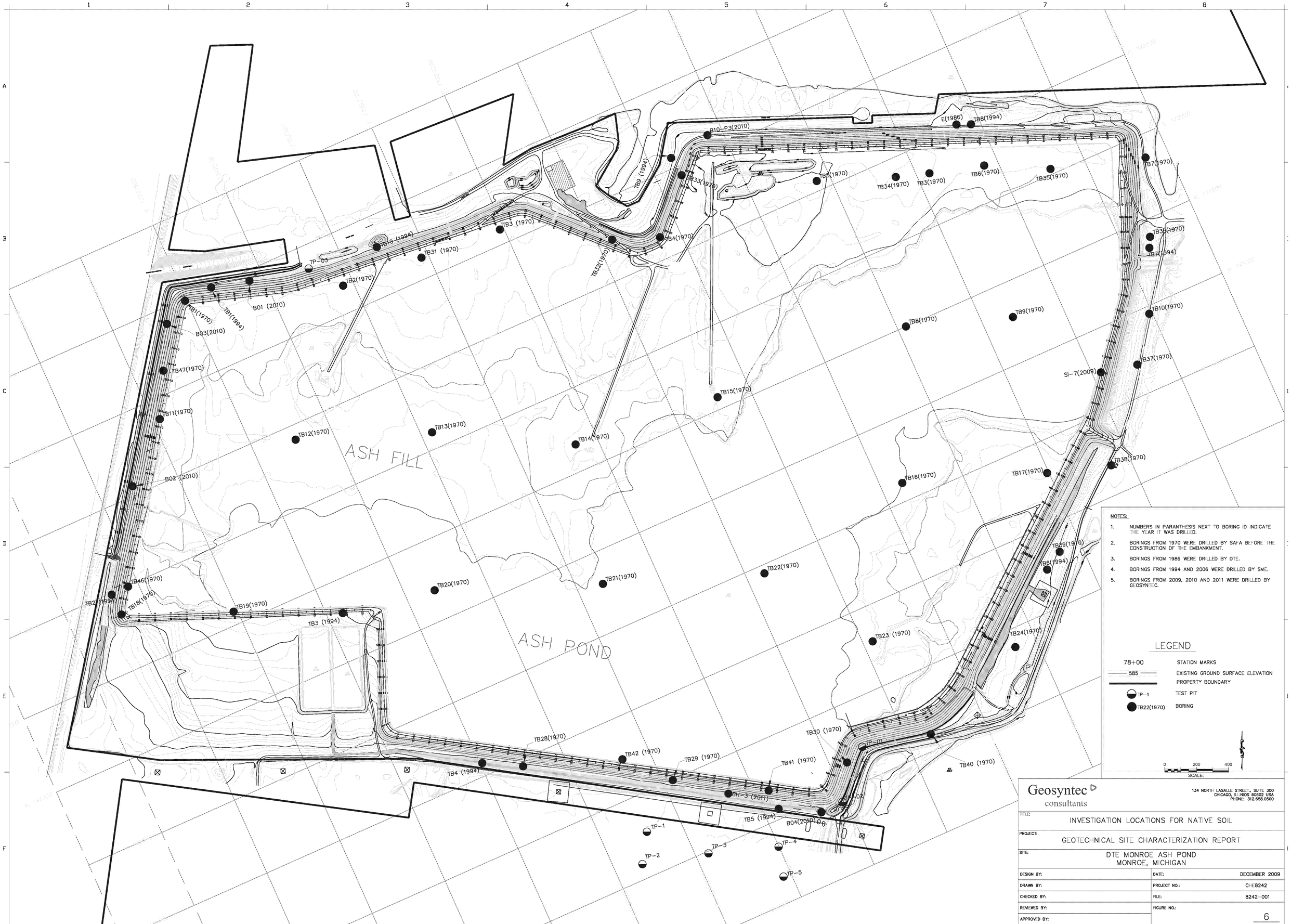
Monroe Ash Basin Investigation Plan

DTE Monroe Power Plant
Monroe, MI

Geosyntec consultants

Ann Arbor, Michigan | 2020/11/02

Figure 1



NOTES:

1. NUMBERS IN PARANTHESIS NEXT TO BORING ID INDICATE THE YEAR IT WAS DRILLED.
2. BORINGS FROM 1970 WERE DRILLED BY SAFA BEFORE THE CONSTRUCTION OF THE EMBANKMENT.
3. BORINGS FROM 1986 WERE DRILLED BY DTE.
4. BORINGS FROM 1994 AND 2006 WERE DRILLED BY SME.
5. BORINGS FROM 2009, 2010 AND 2011 WERE DRILLED BY GEOSYNTEC.

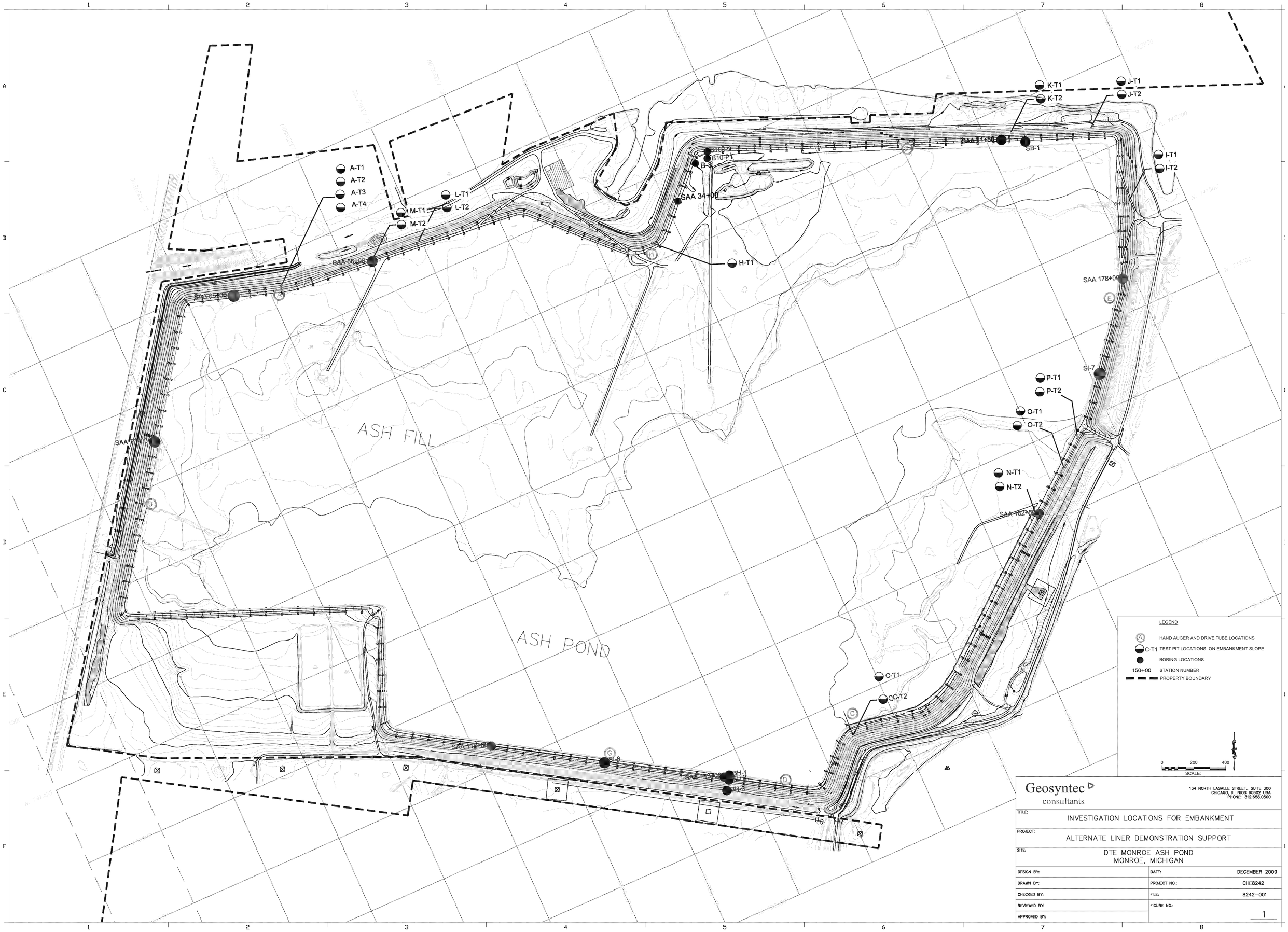
LEGEND

78+00	STATION MARKS
585	EXISTING GROUND SURFACE ELEVATION
	PROPERTY BOUNDARY
TP-1	TEST PIT
TB22(1970)	BORING

SCALE: 0 200 400

Geosyntec consultants
134 NORTH LASALLE STREET, SUITE 300
CHICAGO, ILLINOIS 60602 USA
PHONE: 312.658.0500

TITLE: INVESTIGATION LOCATIONS FOR NATIVE SOIL	
PROJECT: GEOTECHNICAL SITE CHARACTERIZATION REPORT	
SITE: DTE MONROE ASH POND MONROE, MICHIGAN	
DESIGN BY:	DATE: DECEMBER 2009
DRAWN BY:	PROJECT NO.: CHE8242
CHECKED BY:	FILE: 8242-001
REVIEWED BY:	FIGURE NO.: 6
APPROVED BY:	



Geosyntec consultants

134 NORTH LASALLE STREET., SUITE 300
CHICAGO, ILLINOIS 60602 USA
PHONE: 312.658.0500

TITLE: INVESTIGATION LOCATIONS FOR EMBANKMENT	
PROJECT: ALTERNATE LINER DEMONSTRATION SUPPORT	
SITE: DTE MONROE ASH POND MONROE, MICHIGAN	
DESIGN BY:	DATE: DECEMBER 2009
DRAWN BY:	PROJECT NO.: CHE8242
CHECKED BY:	FILE: 8242-001
REVIEWED BY:	FIGURE NO.: 1
APPROVED BY:	

LEGEND

- MONITORING WELLS
- APPROXIMATE BOUNDARY OF FLY ASH BASIN
- CROSS SECTIONS

NOTES

1. BASE MAP IMAGERY FROM GOOGLE & PARTNERS GOOGLE EARTH PRO, 2018.
2. WELL LOCATIONS SURVEYED BY BMJ ENGINEERS AND SURVEYORS INC. IN MARCH AND MAY 2016.

N

0 600 1,200 Feet

1 " = 600 '

1:7,200

PROJECT:

DTE ELECTRIC COMPANY
MONROE POWER PLANT FLY ASH BASIN
7955 EAST DUNBAR ROAD
MONROE, MICHIGAN

TITLE:

CROSS SECTION LOCATOR MAP

DRAWN BY:	M. VAPHIADIS	PROJ NO.:	320511.0001
CHECKED BY:	B. YELEN		
APPROVED BY:	V. BUENING		
DATE:	JANUARY 2020		

FIGURE 4

TRC

1540 Eisenhower Place
Ann Arbor, MI 48108-3284
Phone: 734.971.7080
www.trccompanies.com

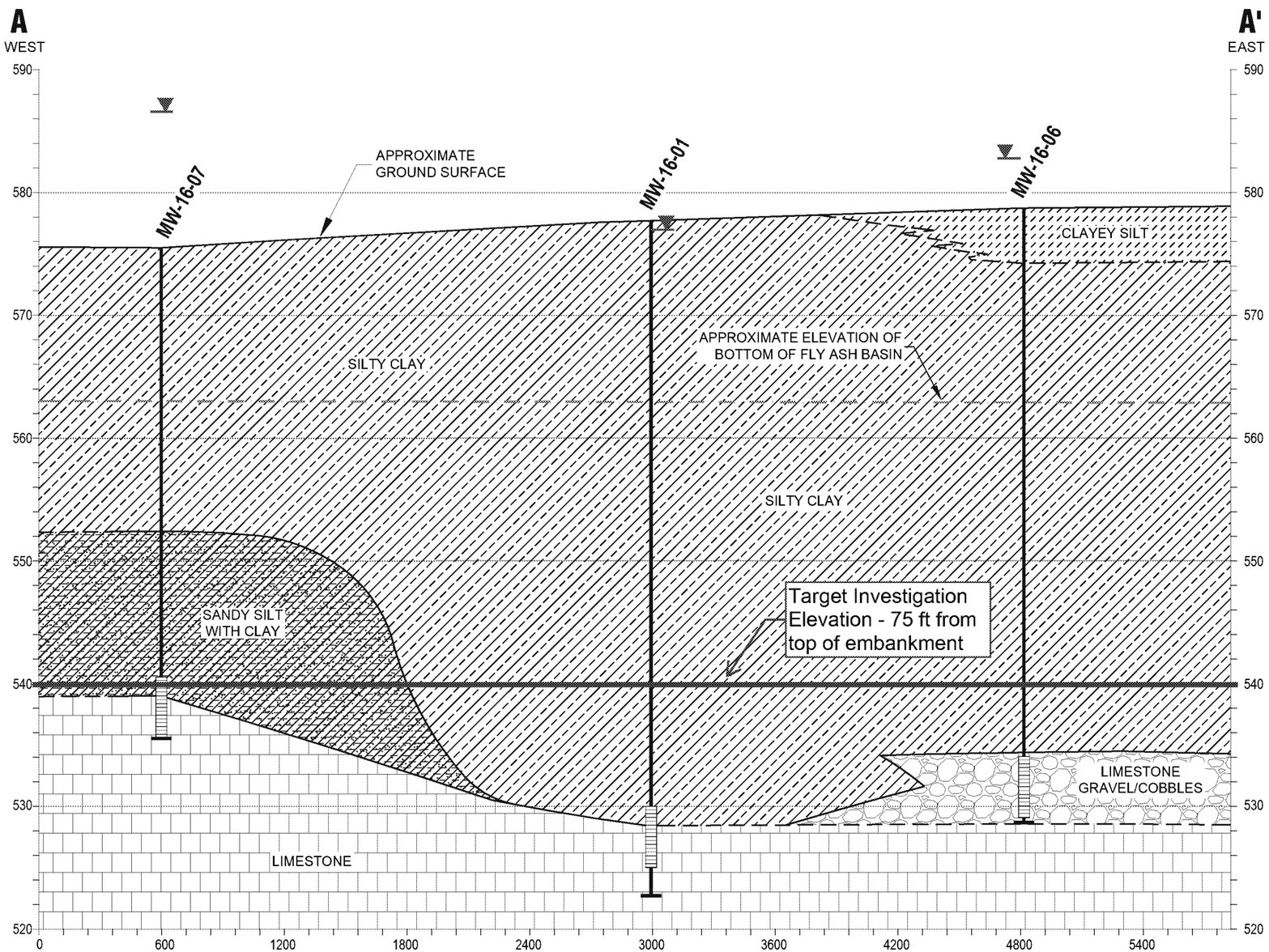
FILE NO.: 320511-0001-013.mxd

Plot Date: 1/10/2020, 11:18:06 AM by MVAPHIADIS -- LAYOUT: ANSI B(11"x17")
Path: E:\DTE\CCR_Sites\2017_265996\320511-0001-013.mxd

Coordinate System: NAD 1983 UTM Zone 17N (Meter)
Map Rotation: 0

TRC - GIS

GENERALIZED GEOLOGIC CROSS-SECTION A-A'



LEGEND

- STRATEGRAPHIC BOUNDARY (DASHED WHERE INFERRED)
- GROUNDWATER ELEVATION (COLLECTED ON 03/06/2017)
- SOIL BORING
- WELL SCREEN INTERVAL
- END OF BORING

Lithology Key

- CLAYEY SILT
- SILTY CLAY
- SANDY SILT WITH CLAY
- LIMESTONE GRAVEL / COBBLES
- LIMESTONE BEDROCK

SCALE IN FEET

VERTICAL: 0 – 10

HORIZONTAL: 0 – 600

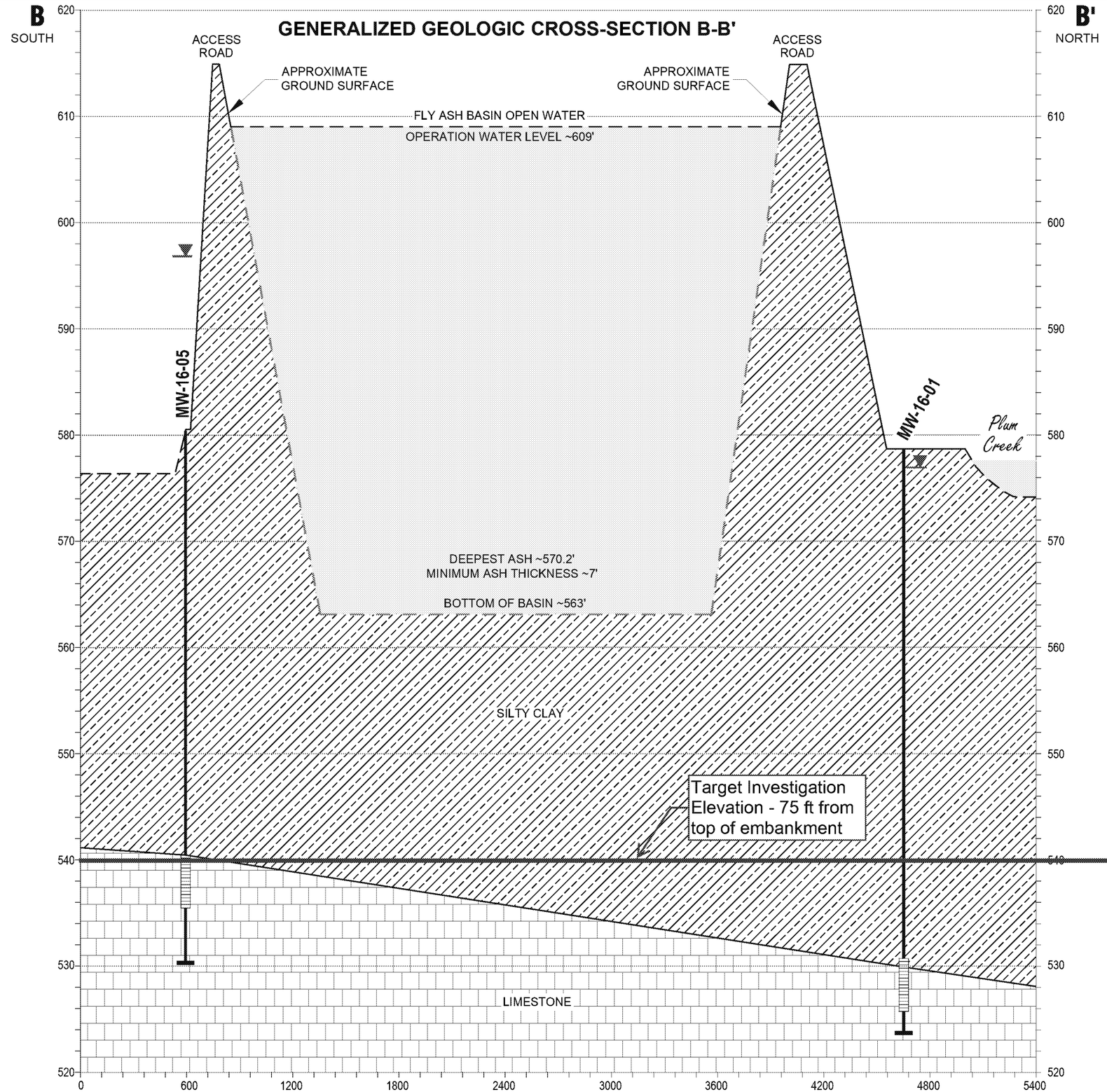
PROJECT:	DTE ELECTRIC COMPANY MONROE POWER PLANT FLY ASH BASIN AND VERTICAL EXTENSION LANDFILL MONROE, MICHIGAN
TITLE:	GENERALIZED GEOLOGIC CROSS-SECTION A-A'
DRAWN BY:	D.STEHLE
CHECKED BY:	S.HOLMSTROM
APPROVED BY:	V.BUENING
DATE:	JANUARY 2020
PROJ NO.:	320511.0001.01.01
	FIGURE 5

TRC

1540 Eisenhower Place
Ann Arbor, MI 48108
Phone: 734.971.7080
www.trccompanies.com

FILE NO.: 320511.0001.01.01.05-06 ASD.dwg

11x17 --- ATTACHED XREF'S: --- ATTACHED IMAGES:
DRAWING NAME: J:_TRC\DTE\Monroe PP\320511\0001\01_ASD Rpt\ 320511.0001.01.01.05-06 ASD.dwg --- PLOT DATE: January 10, 2020 - 9:31AM --- LAYOUT: FIG05 XS AA



LEGEND

- STRATEGRAPHIC BOUNDARY (DASHED WHERE INFERRED)
- GROUNDWATER ELEVATION (COLLECTED 03/06/2017)
- SOIL BORING
- WELL SCREEN INTERVAL
- END OF BORING

Lithology Key

- SILTY CLAY
- LIMESTONE BEDROCK

SCALE IN FEET

VERTICAL: 0, 10

HORIZONTAL: 0, 600

PROJECT:	DTE ELECTRIC COMPANY MONROE POWER PLANT FLY ASH BASIN AND VERTICAL EXTENSION LANDFILL MONROE, MICHIGAN
TITLE:	GENERALIZED GEOLOGIC CROSS-SECTION B-B'
DRAWN BY: D.STEHLE	PROJ NO.: 320511.0001.01.01
CHECKED BY: S.HOLMSTROM	FIGURE 6
APPROVED BY: V.BUENING	
DATE: JANUARY 2020	

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DRAWING NAME: J:_TRC\DTE\Monroe PP\320511\0001\01\01_ASD Rpt\ 320511.0001.01.01.05-06 ASD.dwg --- PLOT DATE: January 10, 2020 - 9:30AM --- LAYOUT: FIG06 XS BB

Message

From: Segal, Scott [scott.segal@bracewell.com]
Sent: 3/9/2020 5:46:17 PM
To: Cook, Steven [cook.steven@epa.gov]; Brooks, Becky [Brooks.Becky@epa.gov]
Subject: RE: Part B - Alternative Liner Rule MEETING

Great and thanks.

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Marybeth Klein, Senior Attorney, SRP
Andrea Martinez, Manager, Water Quality & Waste Management Services, SRP
Mark Nicholls, Lead Hydrogeologist, Haley & Aldritch (Phoenix office)
Scott Segal, Partner, Bracewell LLP, Washington, DC
Thanks, ss/

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Partner
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Sent: Monday, March 9, 2020 1:31 PM
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Cc: Brooks, Becky <Brooks.Becky@epa.gov>
Subject: Re: Part B - Alternative Liner Rule MEETING

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Sent from my iPhone

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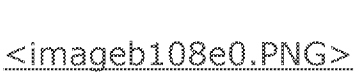

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From: Brooks, Becky [Brooks.Becky@epa.gov]
Sent: 3/9/2020 6:10:04 PM
To: 'Segal, Scott' [scott.segal@bracewell.com]; Cook, Steven [cook.steven@epa.gov]
Subject: RE: Part B - Alternative Liner Rule MEETING

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Becky Brooks
Special Assistant
Office of Land and Emergency Management
U.S. Environmental Protection Agency
ph. 202-566-2762

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Sent: 3/9/2020 7:29:18 PM
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Subject: RE: Part B - Alternative Liner Rule MEETING

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From: Segal, Scott [scott.segal@bracewell.com]
Sent: 3/12/2020 8:17:51 PM
To: Brooks, Becky [Brooks.Becky@epa.gov]; Cook, Steven [cook.steven@epa.gov]
Subject: RE: Part B - Alternative Liner Rule MEETING

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Message

From: Brooks, Becky [Brooks.Becky@epa.gov]
Sent: 3/12/2020 10:27:52 PM
To: 'Segal, Scott' [scott.segal@bracewell.com]; Cook, Steven [cook.steven@epa.gov]
Subject: RE: Part B - Alternative Liner Rule MEETING

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From: Segal, Scott <scott.segal@bracewell.com>
Sent: Thursday, March 12, 2020 4:18 PM
To: Brooks, Becky <Brooks.Becky@epa.gov>; Cook, Steven <cook.steven@epa.gov>
Subject: RE: Part B - Alternative Liner Rule MEETING

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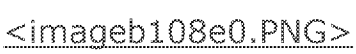

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To: 'Segal, Scott' [scott.segal@bracewell.com]
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Totally understandable. We can always change it to a conference call, if need be.

Becky Brooks
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Sent: Thursday, March 12, 2020 6:30 PM
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Subject: Re: Part B - Alternative Liner Rule MEETING

I believe it would let me check. Assuming there is still air travel at that point - if not, might make a good time for phone or video.

Sent from my iPhone

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Subject: Re: Part B - Alternative Liner Rule MEETING

Scott -

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Steven

Sent from my iPhone

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Partner
scott.segal@policyres.com
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Message

From: Segal, Scott [scott.segal@bracewell.com]
Sent: 3/12/2020 10:30:20 PM
To: Brooks, Becky [Brooks.Becky@epa.gov]
CC: Cook, Steven [cook.steven@epa.gov]
Subject: Re: Part B - Alternative Liner Rule MEETING

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Becky Brooks
Special Assistant
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U.S. Environmental Protection Agency
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To: Brooks, Becky [Brooks.Becky@epa.gov]
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Checking on maps and data, ss/

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On Mar 19, 2020, at 5:11 PM, Cook, Steven <cook.steven@epa.gov> wrote:

Scott –

We will have this converted to a call. If there are maps or data to share, we should think through how to handle that as well.

Thanks for the interest.

Steven

From: Segal, Scott <scott.segal@bracewell.com>
Sent: Thursday, March 19, 2020 12:10 PM
To: Brooks, Becky <Brooks.Becky@epa.gov>

Cc: Cook, Steven <cook.steven@epa.gov>
Subject: RE: Part B - Alternative Liner Rule MEETING

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From: Cook, Steven [mailto:cook.steven@epa.gov]
Sent: Monday, March 9, 2020 1:31 PM
To: Segal, Scott <scott.segal@bracewell.com>
Cc: Brooks, Becky <Brooks.Becky@epa.gov>
Subject: Re: Part B - Alternative Liner Rule MEETING

Scott -

We are taking meetings. Schedules are a bit in flux. Please work with Becky to find some time.

Steven

Sent from my iPhone

> On Mar 9, 2020, at 7:16 AM, Segal, Scott <scott.segal@bracewell.com> wrote:
>
> Steven – are you folks taking live meetings, particularly on this topic? Folks from Arizona could be present to meet with you March 23-25. Any time at that time? L:ess preferred would be April 1-3. Thanks, ss/
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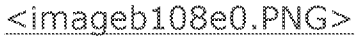

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Message

From: Brooks, Becky [Brooks.Becky@epa.gov]
Sent: 3/25/2020 7:07:50 PM
To: 'Segal, Scott' [scott.segal@bracewell.com]; Cook, Steven [cook.steven@epa.gov]
Subject: RE: Part B - Alternative Liner Rule MEETING

Hi Scott – The conference call line is included in the subject line of the calendar notice. I've cut and pasted it here for quick reference:
202-991-0477 conf id Ex. 6 Personal Privacy (PP)

Becky Brooks
Special Assistant
Office of Land and Emergency Management
U.S. Environmental Protection Agency
ph. 202-566-2762

From: Segal, Scott <scott.segal@bracewell.com>
Sent: Wednesday, March 25, 2020 2:57 PM
To: Cook, Steven <cook.steven@epa.gov>; Brooks, Becky <Brooks.Becky@epa.gov>
Subject: RE: Part B - Alternative Liner Rule MEETING

Hope you are both well. Do we have a call-in number for this yet? Also, are the CCR comment periods sticking or potentially slipping? Thanks! ss

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From: Cook, Steven [mailto:cook.steven@epa.gov]
Sent: Thursday, March 19, 2020 5:11 PM
To: Segal, Scott <scott.segal@bracewell.com>; Brooks, Becky <Brooks.Becky@epa.gov>
Subject: RE: Part B - Alternative Liner Rule MEETING

Scott –

We will have this converted to a call. If there are maps or data to share, we should think through how to handle that as well.

Thanks for the interest.

Steven

From: Segal, Scott <scott.segal@bracewell.com>
Sent: Thursday, March 19, 2020 12:10 PM
To: Brooks, Becky <Brooks.Becky@epa.gov>
Cc: Cook, Steven <cook.steven@epa.gov>
Subject: RE: Part B - Alternative Liner Rule MEETING

Howdy Becky and Steven – hope you both are doing well in these trying times. The team at SRP is still interested in touching base on April 2, but under current circumstances, it seems like we should convert to a conference call. Does that still work for the OLEM team? Thanks, and please let me know when you can. Meanwhile, stay safe! Ss/

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From: Brooks, Becky [mailto:Brooks.Becky@epa.gov]
Sent: Friday, March 13, 2020 9:17 AM
To: Segal, Scott <scott.segal@bracewell.com>
Cc: Cook, Steven <cook.steven@epa.gov>
Subject: Re: Part B - Alternative Liner Rule MEETING

Ok. Will get a calendar notice out momentarily.

Sent from my iPhone

> On Mar 12, 2020, at 9:06 PM, Segal, Scott <scott.segal@bracewell.com> wrote:
>
> Just to confirm - the date and time you propose works just fine. Thanks! ss/

Sent from my iPhone

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On Mar 12, 2020, at 6:30 PM, Segal, Scott <scott.segal@bracewell.com> wrote:

I believe it would let me check. Assuming there is still air travel at that point - if not, might make a good time for phone or video.

Sent from my iPhone

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On Mar 12, 2020, at 6:27 PM, Brooks, Becky <Brooks.Becky@epa.gov> wrote:

Hi Scott – Does April 2 at 11:30 work for you and the others?

Becky Brooks
Special Assistant
Office of Land and Emergency Management
U.S. Environmental Protection Agency
ph. 202-566-2762

From: Segal, Scott <scott.segal@bracewell.com>
Sent: Thursday, March 12, 2020 4:18 PM
To: Brooks, Becky <Brooks.Becky@epa.gov>; Cook, Steven <cook.steven@epa.gov>
Subject: RE: Part B - Alternative Liner Rule MEETING

Howdy Becky – just checking in on the possible scheduling for April.

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From: Segal, Scott
Sent: Monday, March 9, 2020 3:29 PM
To: 'Brooks, Becky' <Brooks.Becky@epa.gov>; Cook, Steven <cook.steven@epa.gov>
Subject: RE: Part B - Alternative Liner Rule MEETING

Let's do – thanks!

From: Brooks, Becky [mailto:Brooks.Becky@epa.gov]
Sent: Monday, March 9, 2020 2:10 PM
To: Segal, Scott <scott.segal@bracewell.com>; Cook, Steven

<cook.steven@epa.gov>
Subject: RE: Part B - Alternative Liner Rule MEETING

Scott – At this time, Steven will be on travel the week of March 23. Do you want us to check times for April 1-3?

Becky Brooks
Special Assistant
Office of Land and Emergency Management
U.S. Environmental Protection Agency
ph. 202-566-2762

From: Segal, Scott <scott.segal@bracewell.com>
Sent: Monday, March 09, 2020 1:46 PM
To: Cook, Steven <cook.steven@epa.gov>; Brooks, Becky <Brooks.Becky@epa.gov>
Subject: RE: Part B - Alternative Liner Rule MEETING

Great and thanks.

Becky – here is our request:

Topic: Disposal Regulation Revisions & Permitting Program; procedures to allow facilities to request approval to use an alternate liner for CCR surface impoundments; specifics related to Salt River Project (SRP) location (Arizona).
Hoping to meet with Steven Cook and his designees.
Proposed dates: March 23, 24, or 25. One hour would be preferable.
Attendees: Renee Eastman, Senior Director, Federal Affairs, SRP
Kara Montalvo, Director, Environmental Services, SRP
Marybeth Klein, Senior Attorney, SRP
Andrea Martinez, Manager, Water Quality & Waste Management Services, SRP
Mark Nicholls, Lead Hydrogeologist, Haley & Aldritch (Phoenix office)
Scott Segal, Partner, Bracewell LLP, Washington, DC
Thanks, ss/

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From: Cook, Steven [mailto:cook.steven@epa.gov]
Sent: Monday, March 9, 2020 1:31 PM
To: Segal, Scott <scott.segal@bracewell.com>
Cc: Brooks, Becky <Brooks.Becky@epa.gov>
Subject: Re: Part B - Alternative Liner Rule MEETING

Scott -

We are taking meetings. Schedules are a bit in flux. Please work with Becky to find some time.

Steven

Sent from my iPhone

> On Mar 9, 2020, at 7:16 AM, Segal, Scott <scott.segal@bracewell.com> wrote:
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> Steven – are you folks taking live meetings, particularly on this topic? Folks from Arizona could be present to meet with you March 23-25. Any time at that time? L:ess preferred would be April 1-3. Thanks, ss/
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Message

From: Brooks, Becky [Brooks.Becky@epa.gov]
Sent: 4/21/2020 1:50:50 PM
To: 'Stephen Fotis' [scf@vnf.com]
CC: Cook, Steven [cook.steven@epa.gov]; Huggins, Richard [Huggins.Richard@epa.gov]
Subject: RE: Santee Cooper's Filed Comments on the Proposed Part B CCR Closure Rule

Hi Stephen – I sent out the calendar notice. It is set up for skype; however, if you don't have that capability, you can join by phone at the number and conference code below. Steven asked that Richard Huggins of ORCR join him on the call.

Join by phone

Toll number: **Ex. 6 Personal Privacy (PP)**

Becky Brooks
Special Assistant
Office of Land and Emergency Management
U.S. Environmental Protection Agency
ph. 202-566-2762

From: Stephen Fotis <scf@vnf.com>
Sent: Monday, April 20, 2020 6:16 PM
To: Brooks, Becky <Brooks.Becky@epa.gov>
Subject: RE: Santee Cooper's Filed Comments on the Proposed Part B CCR Closure Rule

Hi Becky – Thanks for getting back to me. 4 PM on Thursday, April 23 works perfect for me.
Take care,
Stephen

Stephen Fotis
Partner
Van Ness Feldman LLP
scf@vnf.com
(202) 298-1908

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From: Brooks, Becky [mailto:Brooks.Becky@epa.gov]
Sent: Monday, April 20, 2020 5:15 PM
To: Stephen Fotis
Subject: Re: Santee Cooper's Filed Comments on the Proposed Part B CCR Closure Rule

Caution: External Email.

Hi Stephen — Does 4:00 on Thursday, April 23 work for you? If so, I will send out a calendar invitation.

Sent from my iPhone

On Apr 20, 2020, at 2:46 PM, Stephen Fotis <scf@vnf.com> wrote:

Thank you!
Stephen

Stephen Fotis
Partner
Van Ness Feldman LLP
scf@vnf.com
(202) 298-1908

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From: Cook, Steven [mailto:cook.steven@epa.gov]
Sent: Monday, April 20, 2020 2:46 PM
To: Stephen Fotis
Cc: Brooks, Becky
Subject: RE: Santee Cooper's Filed Comments on the Proposed Part B CCR Closure Rule

Caution: External Email.

Becky –

Please find some time on the calendar for a call this week.

Thanks

Steven

From: Stephen Fotis <scf@vnf.com>
Sent: Monday, April 20, 2020 12:54 PM
To: Cook, Steven <cook.steven@epa.gov>
Subject: RE: Santee Cooper's Filed Comments on the Proposed Part B CCR Closure Rule

Steven – Thanks for your response. What is your availability to talk this week regarding a number of process issues relating to the beneficial use issue raised in the Santee Cooper comments filed on the proposed Part B closure rule. I really only need a few minutes and since my questions are focused on process issues, I am not requesting teleconference that would also include your staff – but of course this is your decision.
Hope all is well with you.
Best,
Stephen

Stephen Fotis
Partner
Van Ness Feldman LLP
scf@vnf.com
(202) 298-1908

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From: Cook, Steven [mailto:cook.steven@epa.gov]
Sent: Thursday, April 16, 2020 7:34 PM
To: Stephen Fotis
Subject: RE: Santee Cooper's Filed Comments on the Proposed Part B CCR Closure Rule

Caution: External Email.

Stephen –

Thanks for bringing to my attention.

Steven

From: Stephen Fotis <scf@vnf.com>
Sent: Thursday, April 16, 2020 5:14 PM
To: Cook, Steven <cook.steven@epa.gov>
Subject: Santee Cooper's Filed Comments on the Proposed Part B CCR Closure Rule

Hi Steven – I am sending for your review the comments that Santee Cooper, a coal-fired electric utility in South Carolina, filed yesterday in the EPA docket on the proposed Part B CCR closure rule. Although the Santee Cooper comments are generally supportive of the proposed rule, there is one issue that I want to bring to your attention relating to the five-year deadline for completing closure by removal at unlined surface impoundments that are subject to forced closure under the current CCR regulations. This is an issue that we have discussed before, but wanted to let you know that it is specifically raised in the attached Santee Cooper comments, with a brief summary of the issue provided below in this email. This is an issue that I would like to find a time to talk with you about to see how it might be addressed either in the proposed Part B closure rule or, if this is not possible, discuss how it might be addressed in the next EPA rulemaking that is coming up with the CCR requirements.

I hope that you're doing well and managing the many challenge of COVID-19 pandemic. Since we're all working remotely during these crazy times, the best way to reach me is by email (scf@vnf.com) or my mobile phone at Ex. 6 Personal Privacy (PP)
Many thanks,
Stephen

Summary of Closure Issue for Beneficial Use of CCR from Unlined Surface Impoundments
An important related closure issue of concern to Santee Cooper is the inflexible five-year deadline for completing closure of surface impoundments that are subject to the forced closure requirements under §257.101. In particular, these impoundments must complete closure within the five-year deadline established in §257.102(f) and do not get the benefit of extending the closure period if the CCR materials are being removed for the purpose of beneficial use under §257.102(e)(1), (2). The imposition of this requirement has the effect of preventing beneficial use of the CCR in the case of those impoundments for which there is an active program to recycle the CCR, but that program

cannot be fully implemented within the five-year closure period. Such an outcome is contrary to RCRA's overarching goal of conserving natural resources through the beneficial reuse of waste materials whenever possible. Nor are these prescriptive closure deadlines necessary to protect human health and environment. Many of the unlined surface impoundments subject to forced closure under the *USWAG* decision (which exceeds 500 impoundments) are not violating any groundwater protection standard for an Appendix IV constituent and therefore are not having any adverse groundwater impacts. Furthermore, even in the case of those unlined impoundments that may happen to be exceeding a groundwater protection standard, any potential risk to human health and the environmental can be effectively mitigated through the current CCR rule requirements for groundwater monitoring and corrective action that would apply during the extended closure period. Finally, this approach would have the counterproductive environmental effect of precluding the clean closure of the impoundments or at least greatly reducing the impacted area by arbitrarily cutting short the time that is available to remove the CCR from the impoundments. For these reasons, Santee Cooper is requesting that EPA remove the current inflexible five-year deadline for completing closure of impoundments undergoing forced closure. In its place, EPA should establish rules that allow for the extension of the closure period in the case of those impoundments for which the CCR materials are being removed for the purpose of beneficial use under an active beneficial use program.

More details on this issue, as well as suggested fix to the problem, are provided in the Santee Cooper's attached comments that were filed in the EPA docket on April 15.

Stephen Fotis
Partner
Van Ness Feldman LLP
scf@vnf.com
(202) 298-1908

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Message

From: Segal, Scott [scott.segal@bracewell.com]
Sent: 3/31/2020 10:02:22 PM
To: Cook, Steven [cook.steven@epa.gov]
CC: Brooks, Becky [Brooks.Becky@epa.gov]
Subject: EPA/SRP Call on Thurs - materials
Attachments: Salt River Project, EPA Part B Discussion, 4-2-2020.pdf; Salt River Project, EPA Part B Discussion, 4-2-2020.pptx

Steven (and Becky) -- attached for your review and distribution as appropriate is an SRP slide deck for the conference call on Thursday, 4/2, at 11:30amET. We included it as a pdf and as a power point, depending on your preference. Thanks, ss/

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Coronado Generating Station Part B Alternate Demonstration for Unlined Surface Impoundments

Kara Montalvo, Andrea Martinez, Mark Nicholls

April 2, 2020

Delivering water and power™

Agenda

- Site Overview
- Part B Application
- Hydrogeological Setting
- Site Conceptual Model
- Characterization of Site Hydrogeology
- Potential for Infiltration
- Performance-based Alternative Liner Demonstration

Today's Presenters

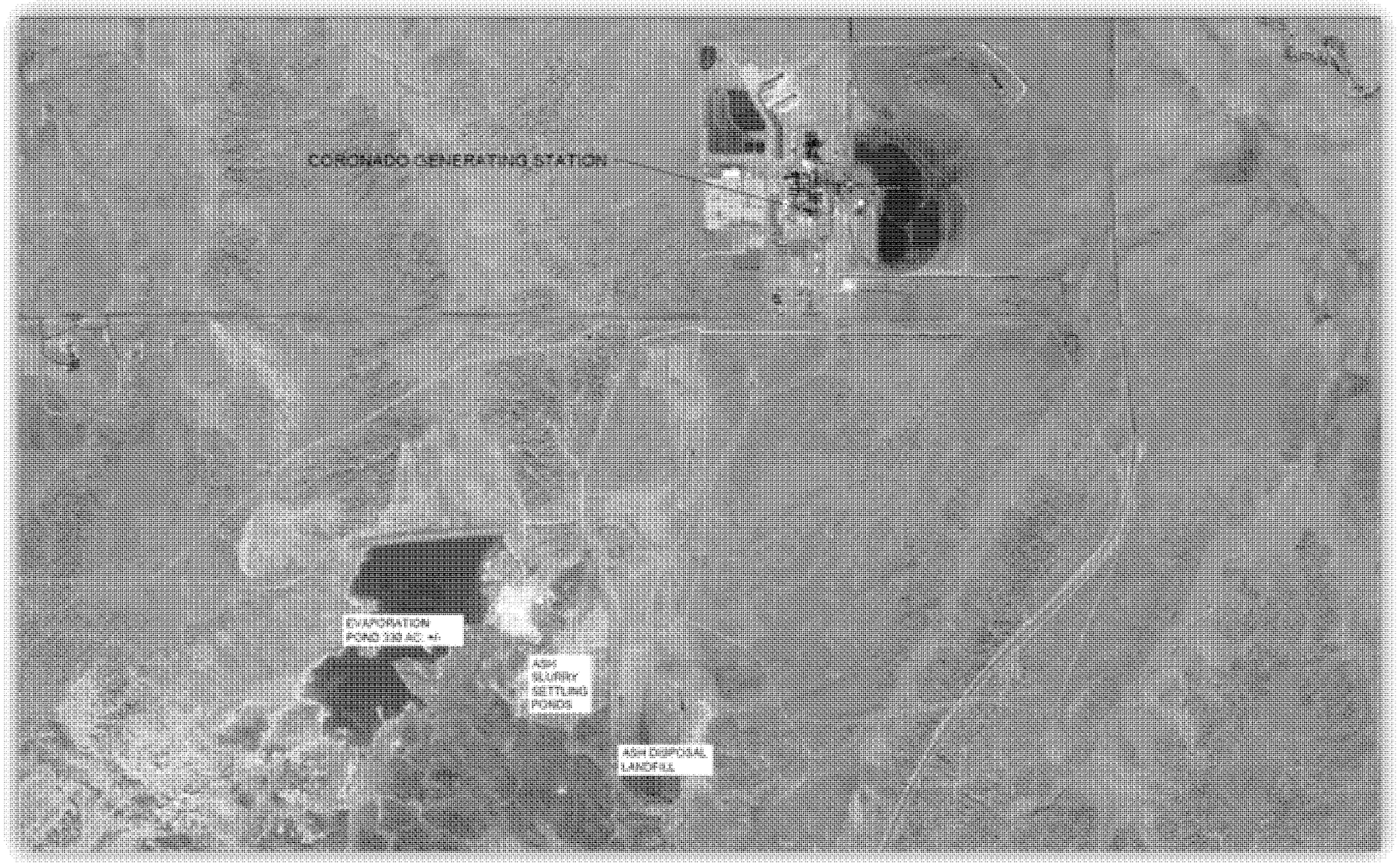
- Salt River Project
  - Kara Montalvo, Environmental Services Director
  - Andrea Martinez, Water Quality & Waste Management Services Manager
- Haley & Aldrich, Inc.
  - Mark D. Nicholls, Lead Hydrogeologist

ED_005947A_00018992-00003

Coronado Generating Station Evaporation Pond Overview

- In operation since 1979
- Permitted by Arizona under Aquifer Protection Permit Program
- Pond inflow is approximately 500,000 gallons per day of CCR and non-CCR materials
- Approximately 330 acres
- Design capacity of 3,682 acre-feet
- Located in a broad valley 1.5 miles southwest of the CGS Plant site
- Does not have an engineered liner system

Coronado Generating Station CCR Disposal Units



Evaporation Pond Geologic Setting

- Evaporation Pond is sited directly on top of Chinle Formation
- Chinle is composed of claystone, mudstone, siltstone, and with documented sandstone and conglomerate members at the base of the Formation
- Chinle is 220 and 250 feet thick beneath Evaporation Pond
- Hydraulic conductivity ranges from $1x10^{-5}$ to $4x10^{-9}$ cm/s
- Average hydraulic conductivity is $3.4x10^{-7}$ cm/s
- The scattered sand lenses encountered during drilling at the Evaporation Pond were found to be dry

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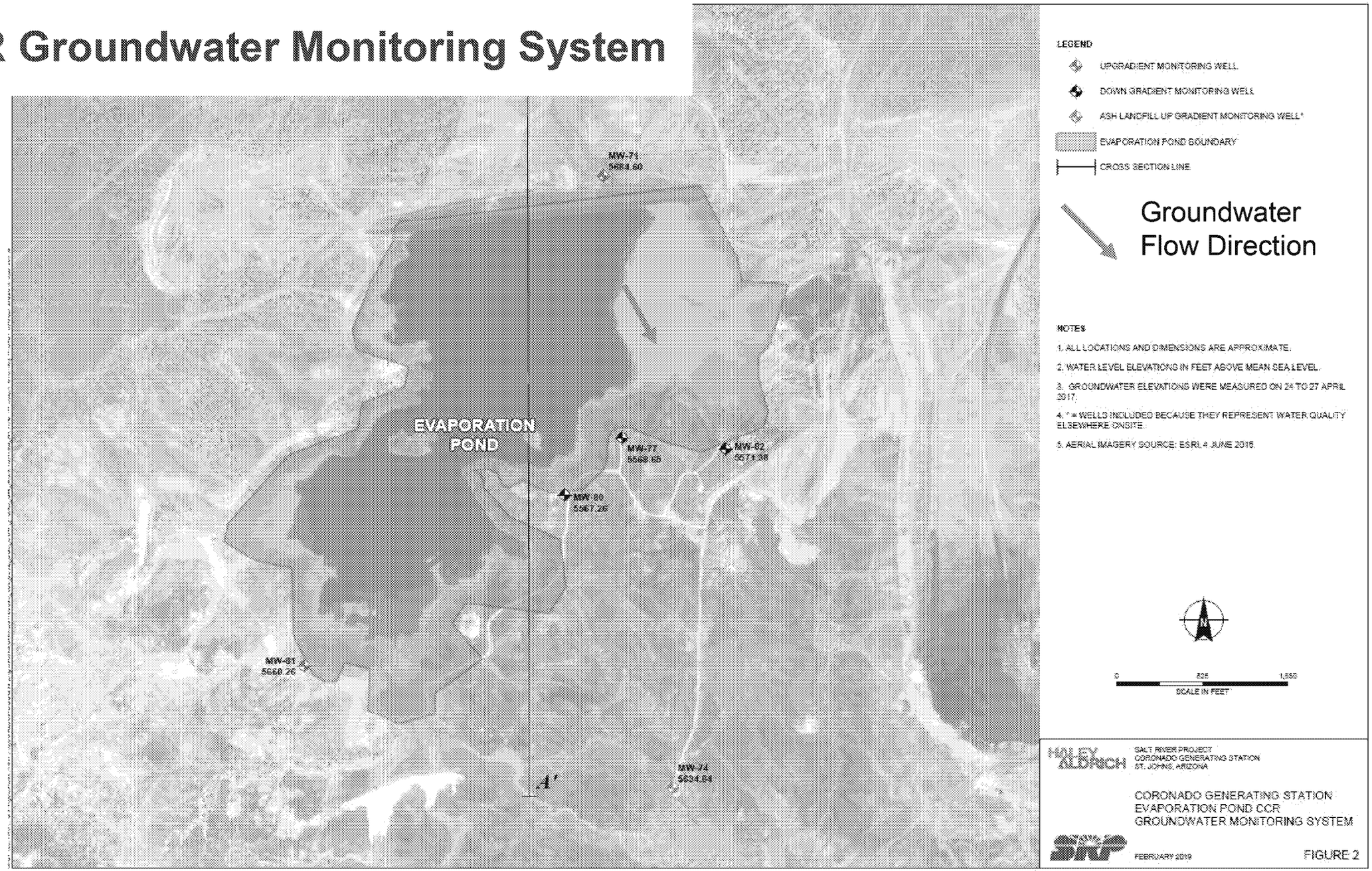
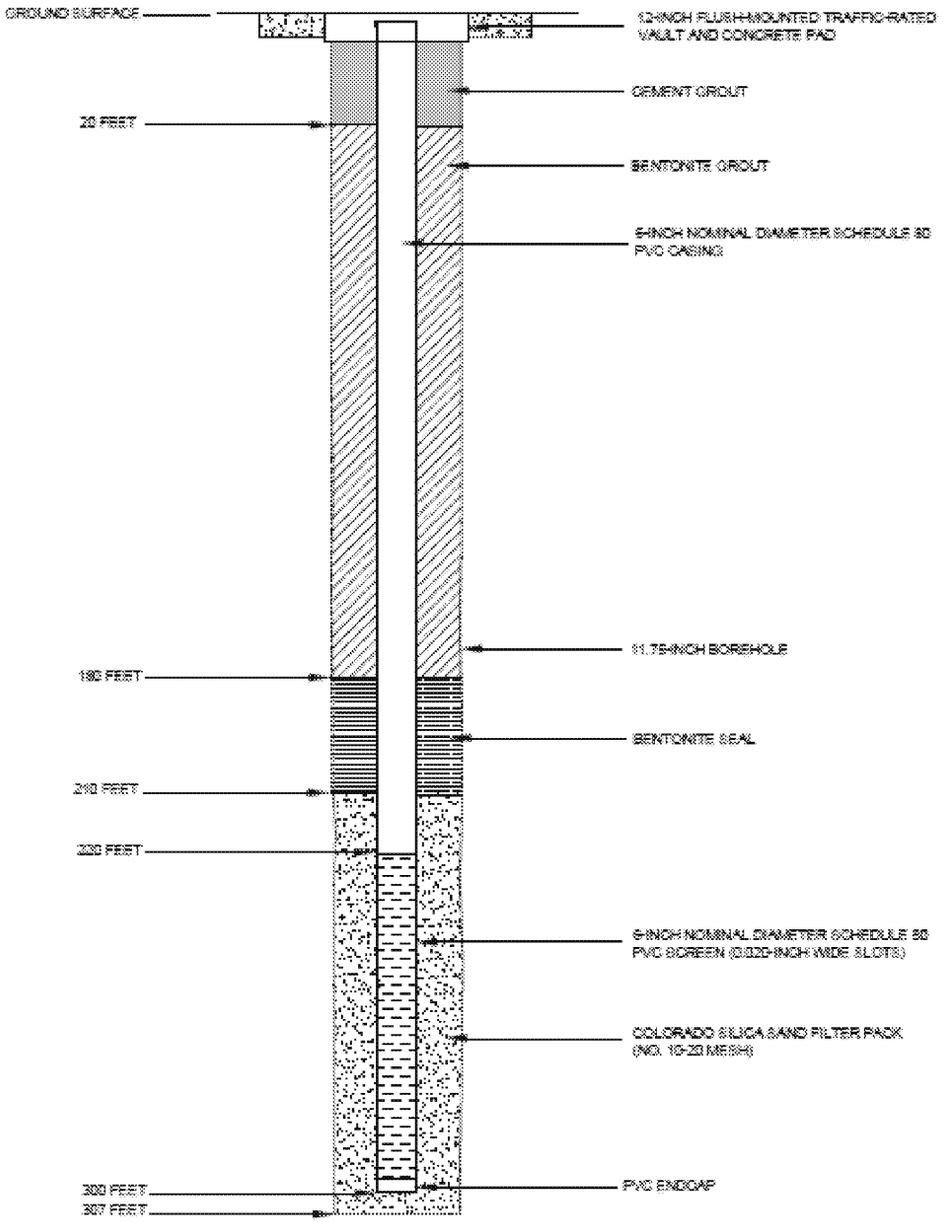
CCR Groundwater Monitoring System

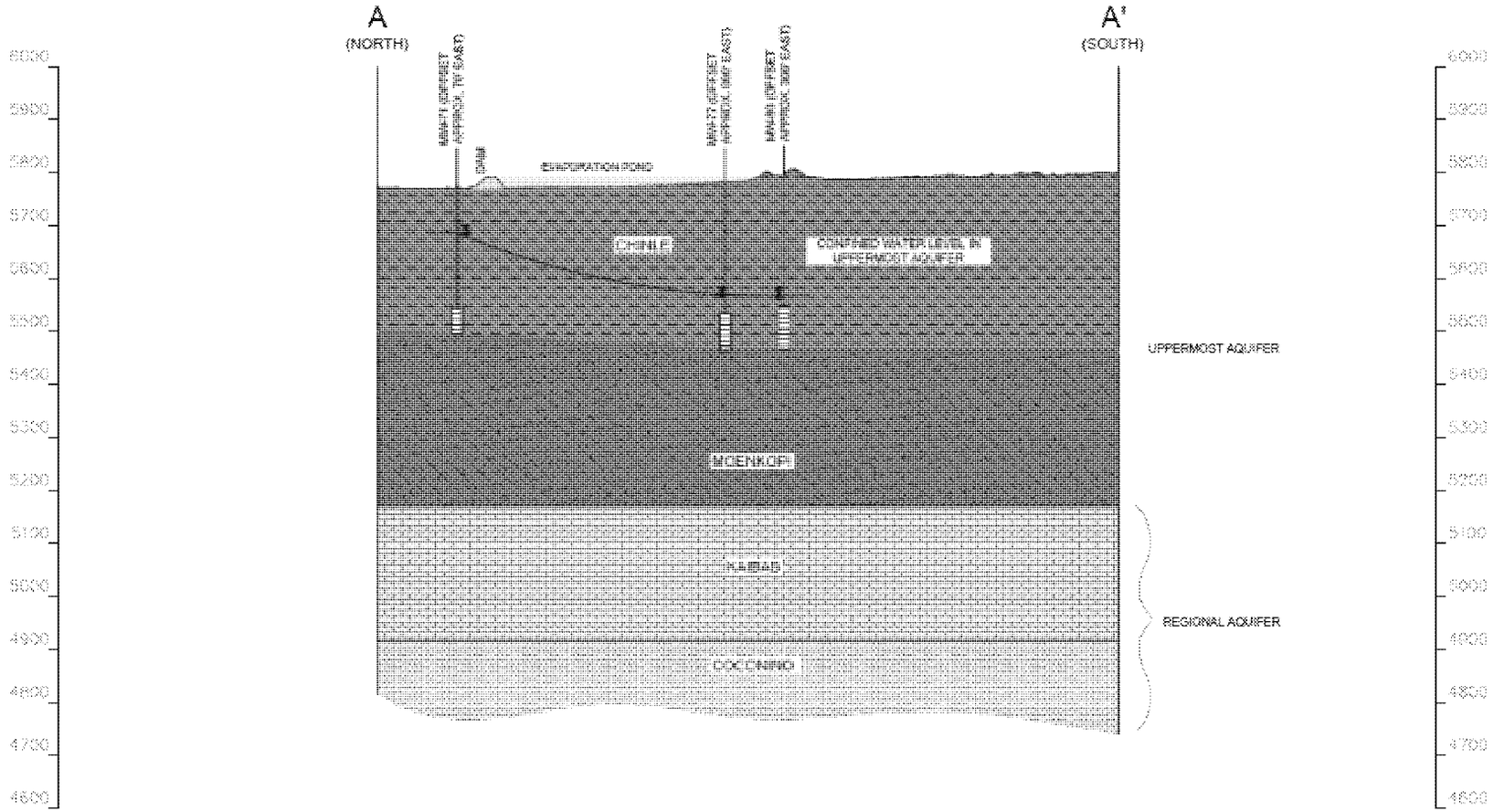


Groundwater Monitoring

- Evaporation Pond
  - Installed 4 new wells
  - Utilized 1 existing well (State Aquifer Permit compliance well)
  - Depth: 270’ to 330’ below ground surface
- Wells monitor the uppermost aquifer at the contact between the Chinle and Moenkopi formations
- Conducted 12 rounds of background sampling and groundwater elevations in 2016-2017



Conceptualized Geologic Cross Section



LEGEND

MW-71 WELL IDENTIFICATION

GROUND SURFACE

GROUNDWATER ELEVATION

WELL SCREEN

APPROXIMATE PIEZOMETRIC SURFACE IN CHINLE/MOENKOPI

UPPERMOST AQUIFER

NOTE:

1. ALL LOCATIONS AND DIMENSIONS ARE APPROXIMATE.

HORIZ. 0 1,000 2,000

VERT. 0 200 400

SCALE IN FEET

HALEY & ALDRICH

SALT RIVER PROJECT
CORONADO GENERATING STATION
ST. JOHNS, ARIZONA

GENERALIZED CROSS SECTION A-A'

SRP

SCALE: AS SHOWN
FEBRUARY 2019

FIGURE 3

Part B Application Discussion

- Coronado Generating Station Evaporation Pond Status
  - The unit is in full compliance with the subparts
  - Monitoring wells network characterizes representative flow paths
  - Unit has not and will not adversely affect groundwater (no statically significant increases of Appendix IV)
    - April 2018 Calcium (Appendix III) SSI
    - Alternate Source Demonstration (naturally occurring) made to Public Website
  - Meets all location restrictions

Part B Application Information

- Supplemental Data and Information Describing Liner Equivalent Characteristics of Natural Clay Materials (highlights)
  - Homogeneity of the clay
  - Proximity to surface water bodies and potential groundwater discharge locations
  - Detection Monitoring groundwater quality data
  - Statistical methods used to evaluate detection monitoring data
  - Map showing groundwater flow direction
  - Local precipitation data
  - Geotechnical data describing hydraulic conductivity, calculated seepage velocity
  - Calculations demonstrating the effective thickness compared with CCR compliant liner system
  - Technical conclusions

Part B Demonstration

- Line of evidence 1

  Characterization of site hydrogeology

- Line of evidence 2

  Potential for infiltration

- Performance-based demonstration

Evaporation Pond Hydrologic Setting

- Uppermost aquifer is a sandstone and conglomerate member at the base of the Chinle Formation.
- Uppermost aquifer is confined. During drilling of CCR monitoring wells, first wet cuttings were observed at depths between 270 and 320 feet bgs.
- Depth to piezometric surface ranges from 98 feet bgs upgradient to 255 feet bgs down gradient (2019). Water levels rose within the well casings between 40 and 170 feet after well completion.
- Regional aquifer is composed of the Coconino sandstone and Kaibab limestone, is also confined and underlies the uppermost aquifer at greater depth.
- Nearest surface water body is the Little Colorado River
  - Three miles away, cross gradient, on the opposite side of topographic divide, and more than 100 feet in elevation lower than the CGS Evaporation Pond.
  - Located topographically down gradient at a distance of 12 miles.

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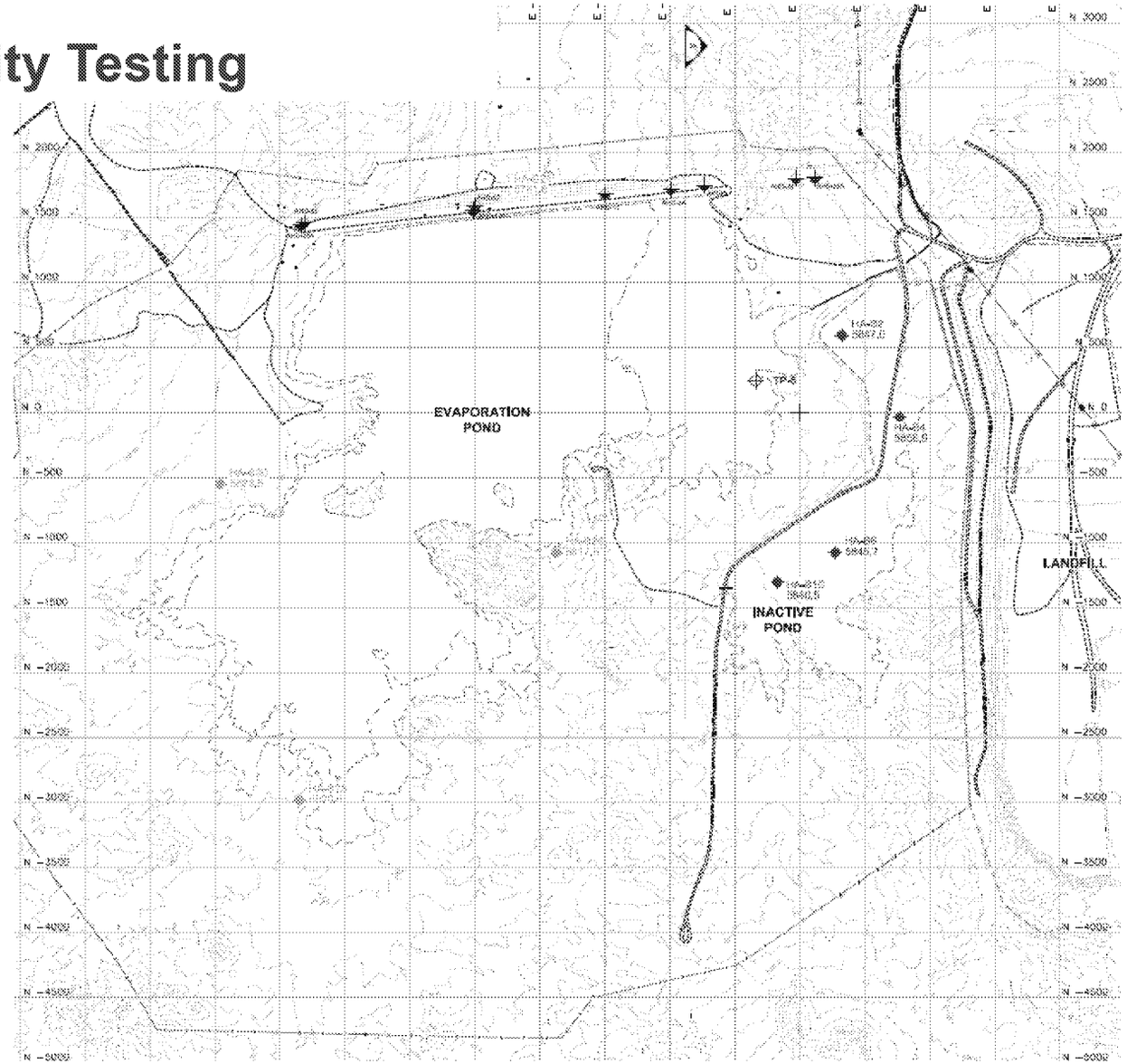
Site Hydrogeology - Hydraulic Conductivity Testing

Includes testing data from 1980 and 2016



LEGEND

- EXISTING MAJOR CONTOUR
- EXISTING MINOR CONTOUR
- APPROXIMATE LIMITS OF POND
- EXISTING FENCE
- HA-B24 5781.8 — DESIGNATION, LOCATION, AND GROUND SURFACE ELEVATION OF TEST BORINGS PERFORMED BY YELLOW JACKET DRILLING SERVICES OF PHOENIX, ARIZONA DURING THE PERIOD 25 JULY 2016 TO 11 AUGUST 2016
- HA-B2 5847.0 — INACTIVE POND TEST BORING (GEOTECHNICAL BORING) [1]
- DESIGNATION AND APPROXIMATE LOCATION OF HISTORIC TEST BORING
- TP-5 — TEST PIT - CLAY SAMPLE
- A — A' — LOCATION OF SLOPE STABILITY CROSS SECTION

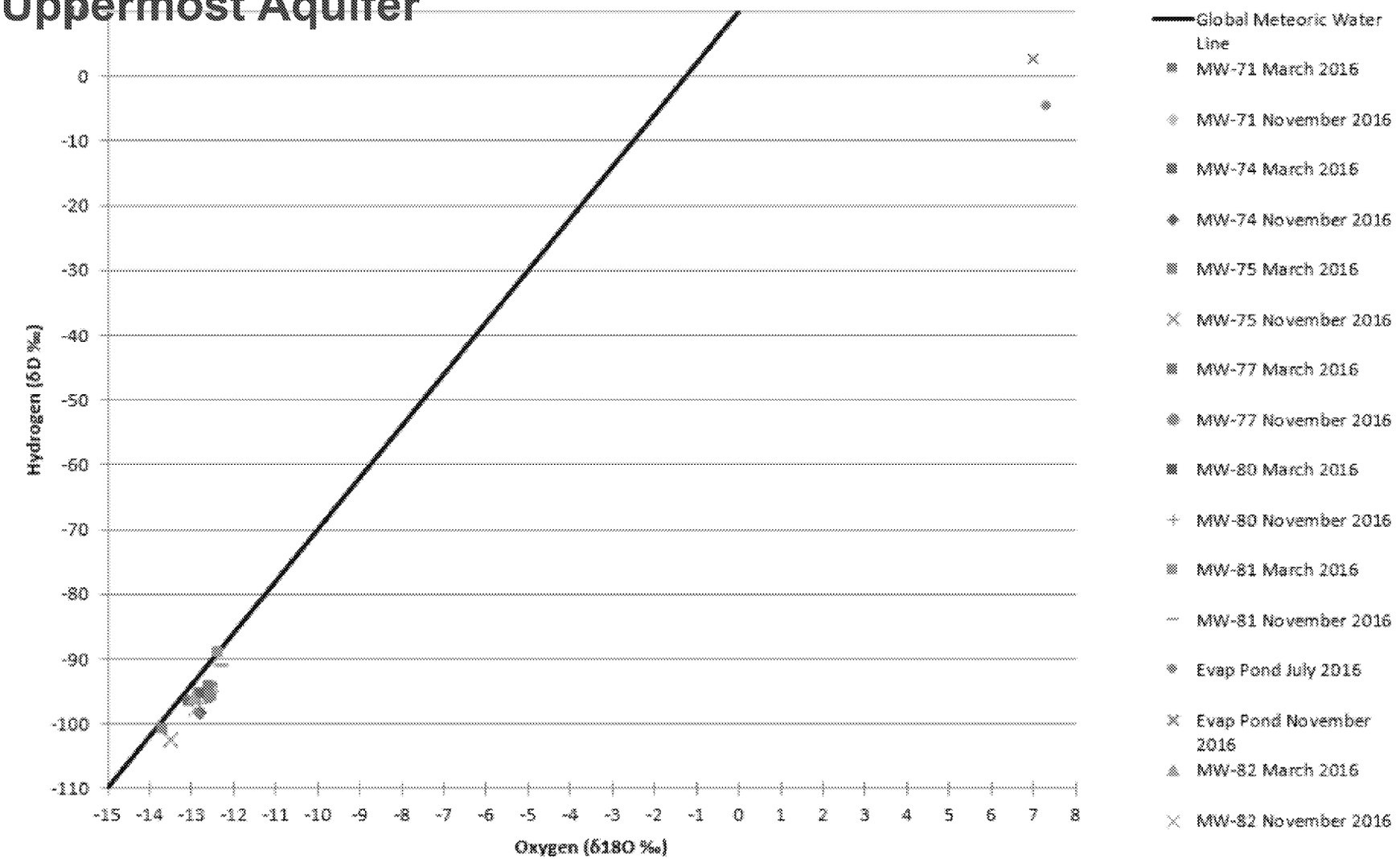
NOTES:

1. TOPOGRAPHY WAS PROVIDED BY SOUTHWEST SURVEYING AND MAPPING PARTNERS, LLC., FLOWN ON 28 SEPTEMBER 2015.
   a. HORIZONTAL CONTROL IS BASED ON PLANT DATUM.
   b. VERTICAL CONTROL IS BASED ON NVGD29.
2. ELEVATIONS OF HALEY & ALDRICH 2016 TEST BORINGS INDICATED ON THIS DRAWING ARE IN FEET AND REFER TO NGVD29 DATUM.
3. TECHNICAL MONITORING OF TEST BORINGS COMPLETED DURING THE PERIOD 25 JULY 2016 TO 11 AUGUST 2016 WAS PERFORMED BY HALEY & ALDRICH.
4. AS-DRILLED LOCATIONS OF TEST BORINGS WERE DETERMINED IN THE FIELD BY SALT RIVER PROJECT BY OPTICAL SURVEY ON 16 AUGUST 2016.
5. HISTORIC BECHTEL BORING LOCATIONS ARE REFERENCED FROM AN ELECTRONIC CAD DRAWING ENTITLED "EVAPORATION RESERVOIR TEST BORINGS, TEST TRENCHES & BORROW AREAS PLAN REVISED 30 APRIL 1980 BY BECHTEL OF LOS ANGELES, CALIFORNIA.

0 1000 2000
APPROXIMATE SCALE IN FEET

Site Conceptual Model- Stable isotope Characteristics of Evaporation Pond Water and Groundwater in the Uppermost Aquifer

Stable isotope analysis shows that no seepage has reached the uppermost aquifer from the CGS Evaporation Pond



Characterization of Site Hydrogeology - Subsurface Sampling

- Drilling every 200 feet around the CGS Evaporation Pond will result in approximately 100 borings.
- Drilling to the uppermost aquifer will require drilling depths between 270 and 320 feet bgs, potentially resulting in more than 27,000 feet of core.
- Drilling to the uppermost aquifer will create conduits for upwelling of confined groundwater and downward seepage of Evaporation Pond water or other surface runoff.
- Upwelling of confined groundwater in the deep borings may saturate otherwise dry sand lenses.
- There is no hydraulic relationship between the Evaporation Pond and the nearest surface water body.
- There is no hydraulic relationship between the Evaporation Pond and groundwater in the uppermost aquifer.

ED_005947A_00018992-00016

Potential For Infiltration

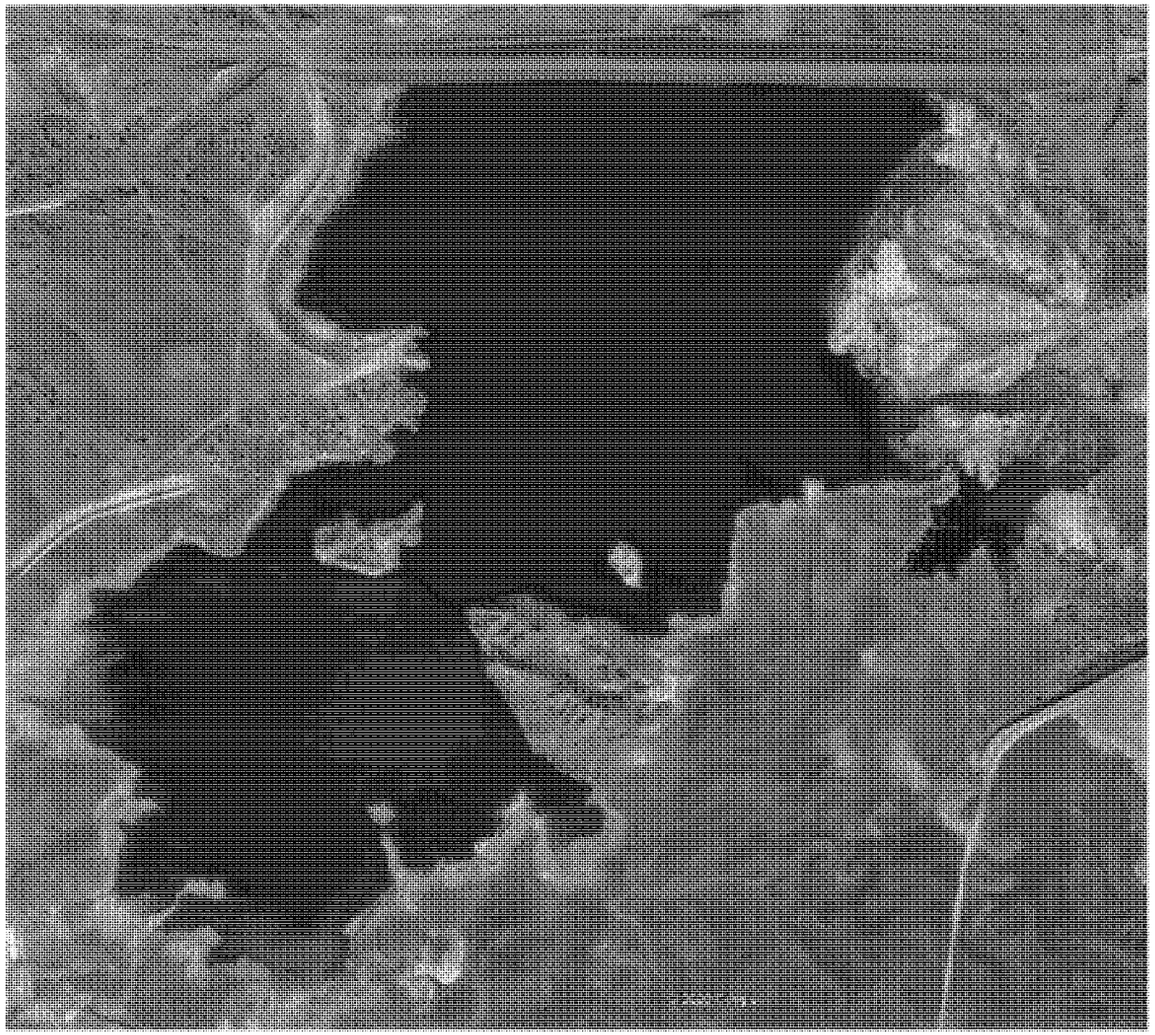
- Drilling within the pond to characterize sediments beneath the pond is problematic
  - Pond area is too shallow for a barge and too deep or mushy for a drill rig.
  - Borings drilled in the bottom of the Evaporation Pond may become conduits for seepage even after being sealed.
  - Downward seepage of Evaporation Pond water in the test borings may saturate otherwise dry sand lenses.
- The proposed Rule text applies the GWPS at the unit boundary as the criterion for a successful Alternate Liner Demonstration
  - Drilling at the perimeter will define the potential for lateral seepage.
  - Borings around the pond are sufficient to characterize materials beneath the pond.

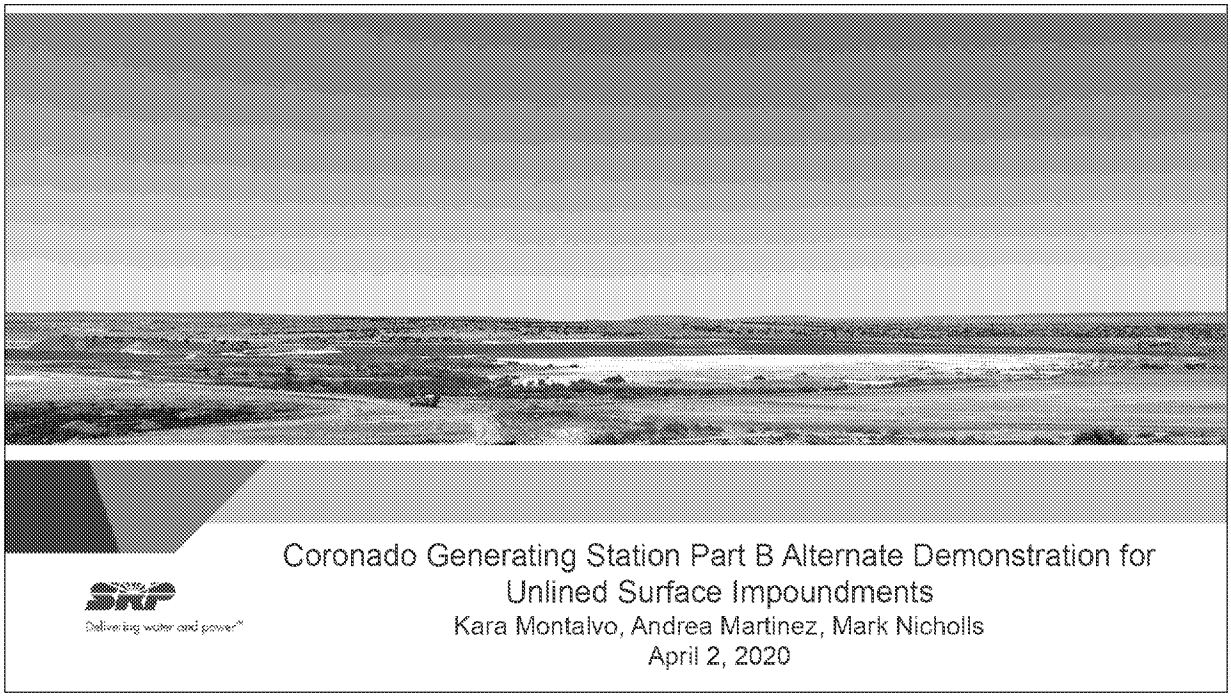
Performance-Based Alternative Liner Demonstration

- Drill test borings at perimeter of Evaporation Pond.
  - Site-specific spacing.
  - Drill the borings to a depth equivalent to 20 feet below the lowest point of the pond floor.
  - Or drill to a depth equal to the thickness of material necessary to achieve the same seepage restriction (based on preliminary analysis) represented by the composite liner defined in the Rule.
- Conduct in-situ hydraulic conductivity testing and laboratory analysis.
- If significant saturated sand lenses are encountered, add additional boring(s) to increase sample density.
- Characterize saturated sand lenses (if encountered) using isotopes and water quality to define the relationship to water in the Evaporation Pond.
  - Unsaturated sand lenses have no connection to the Evaporation Pond or the uppermost aquifer.
- Use deterministic or probabilistic model to evaluate performance of the Alternative Liner relative to human and ecological risk.

ED_005947A_00018992-00018

Discussion




Coronado Generating Station Part B Alternate Demonstration for
Unlined Surface Impoundments
Kara Montalvo, Andrea Martinez, Mark Nicholls
April 2, 2020

K.J. Barr

Agenda

- Site Overview
- Part B Application
- Hydrogeological Setting
- Site Conceptual Model
- Characterization of Site Hydrogeology
- Potential for Infiltration
- Performance-based Alternative Liner Demonstration

Today's Presenters

- Salt River Project
  - Kara Montalvo, Environmental Services Director
  - Andrea Martinez, Water Quality & Waste Management Services Manager
- Haley & Aldrich, Inc.
  - Mark D. Nicholls, Lead Hydrogeologist

Coronado Generating Station Evaporation Pond Overview

- In operation since 1979
- Permitted by Arizona under Aquifer Protection Permit Program
- Pond inflow is approximately 500,000 gallons per day of CCR and non-CCR materials
- Approximately 330 acres
- Design capacity of 3,682 acre-feet
- Located in a broad valley 1.5 miles southwest of the CGS Plant site
- Does not have an engineered liner system

Plant maximum design capacity of 912 megawatts

Coronado Generating Station CCR Disposal Units

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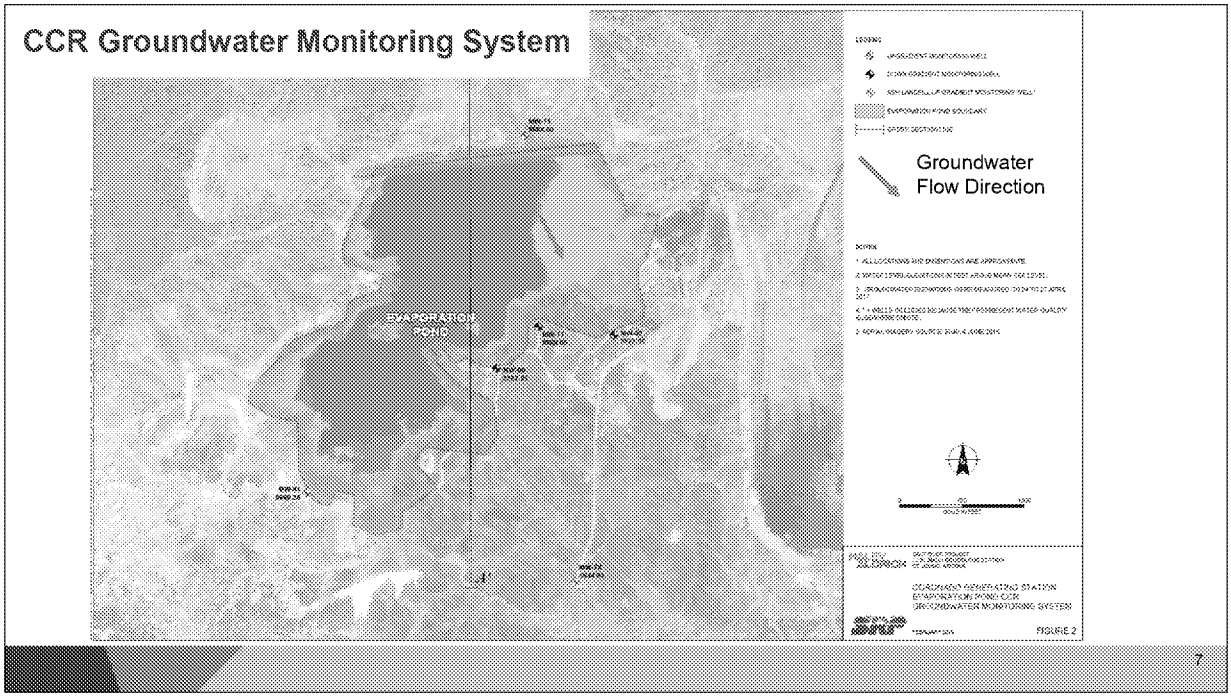
Evaporation Pond Geologic Setting

- Evaporation Pond is sited directly on top of Chinle Formation
- Chinle is composed of claystone, mudstone, siltstone, and with documented sandstone and conglomerate members at the base of the Formation
- Chinle is 220 and 250 feet thick beneath Evaporation Pond
- Hydraulic conductivity ranges from $1x10^{-5}$ to $4x10^{-9}$ cm/s
- Average hydraulic conductivity is $3.4x10^{-7}$ cm/s
- The scattered sand lenses encountered during drilling at the Evaporation Pond were found to be dry



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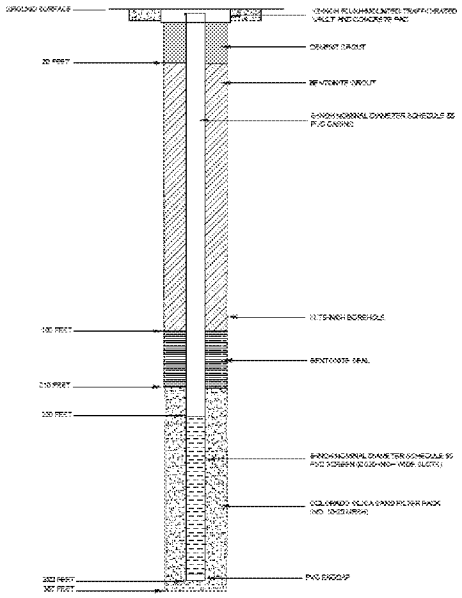
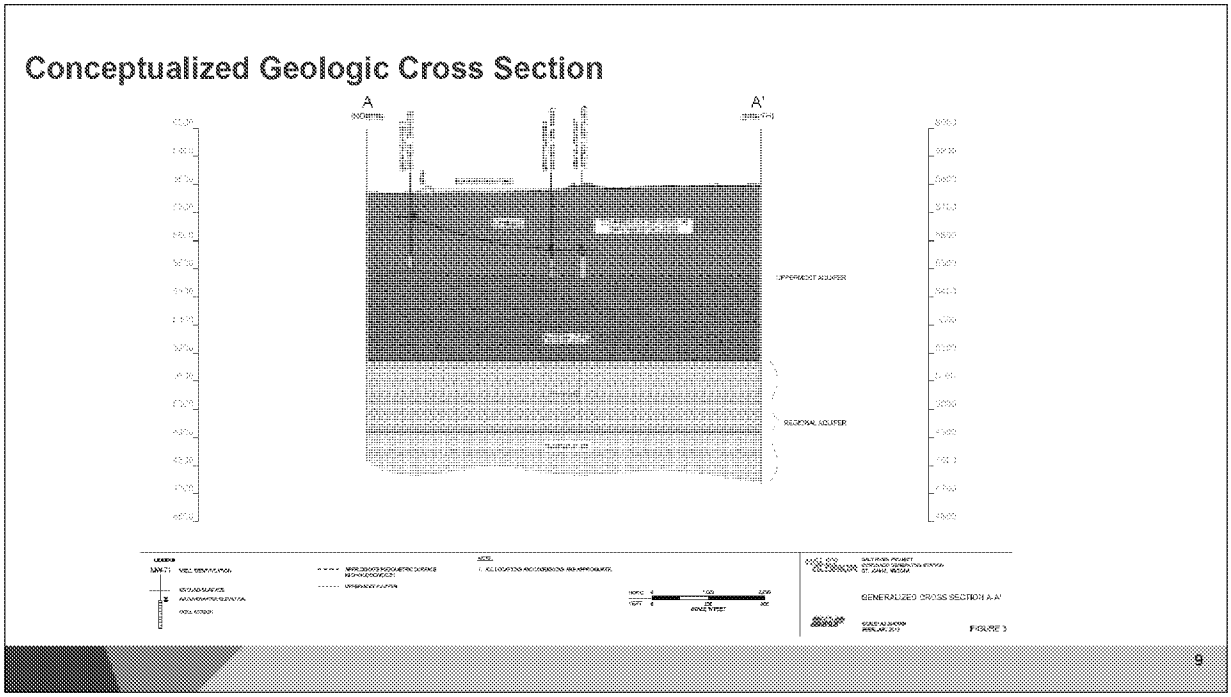
Groundwater Monitoring

- Evaporation Pond
  - Installed 4 new wells
  - Utilized 1 existing well (State Aquifer Permit compliance well)
  - Depth: 270' to 330' below ground surface
- Wells monitor the uppermost aquifer at the contact between the Chinle and Moenkopi formations
- Conducted 12 rounds of background sampling and groundwater elevations in 2016-2017





This is a simplified but representative graphic, showing the Evaporation Pond, Chinle and Moenkopi formulations and CCR monitoring wells. The Regional aquifer is shown in the lower Kaibab and Coconino formations.

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Part B Application Discussion

- Coronado Generating Station Evaporation Pond Status
  - The unit is in full compliance with the subparts
  - Monitoring wells network characterizes representative flow paths
  - Unit has not and will not adversely affect groundwater (no statically significant increases of Appendix IV)
    - April 2018 Calcium (Appendix III) SSI
    - Alternate Source Demonstration (naturally occurring) made to Public Website
  - Meets all location restrictions

Speaking note- In accordance with proposed amended Rule Section § 257.71.d.1.i, SRP plans to submit an application announcing our intent to submit an Alternate Liner Application and Demonstration.

Part B Application Information

- Supplemental Data and Information Describing Liner Equivalent Characteristics of Natural Clay Materials (highlights)
  - Homogeneity of the clay
  - Proximity to surface water bodies and potential groundwater discharge locations
  - Detection Monitoring groundwater quality data
  - Statistical methods used to evaluate detection monitoring data
  - Map showing groundwater flow direction
  - Local precipitation data
  - Geotechnical data describing hydraulic conductivity, calculated seepage velocity
  - Calculations demonstrating the effective thickness compared with CCR compliant liner system
  - Technical conclusions

Speaker notes:
April 2, 2019 SRP submitted a Technical Memorandum to the EPA to Johnson and Huggins

Asking feedback, what else is needed for a Part B Alternate Liner Application?

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Part B Demonstration

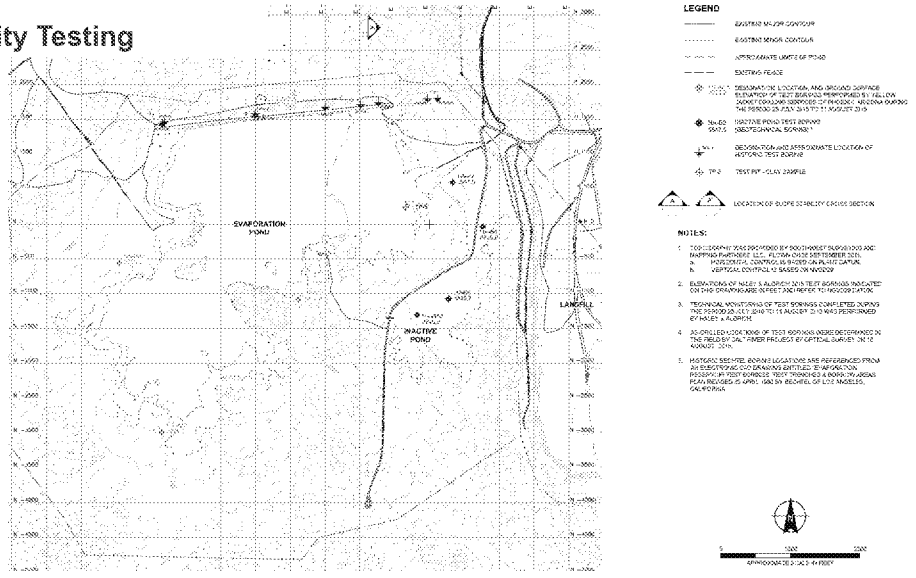
- Line of evidence 1
  - Characterization of site hydrogeology
- Line of evidence 2
  - Potential for infiltration
- Performance-based demonstration

Evaporation Pond Hydrologic Setting

- Uppermost aquifer is a sandstone and conglomerate member at the base of the Chinle Formation.
- Uppermost aquifer is confined. During drilling of CCR monitoring wells, first wet cuttings were observed at depths between 270 and 320 feet bgs.
- Depth to piezometric surface ranges from 98 feet bgs upgradient to 255 feet bgs down gradient (2019). Water levels rose within the well casings between 40 and 170 feet after well completion.
- Regional aquifer is composed of the Coconino sandstone and Kaibab limestone, is also confined and underlies the uppermost aquifer at greater depth.
- Nearest surface water body is the Little Colorado River
  - Three miles away, cross gradient, on the opposite side of topographic divide, and more than 100 feet in elevation lower than the CGS Evaporation Pond.
  - Located topographically down gradient at a distance of 12 miles.

Site Hydrogeology - Hydraulic Conductivity Testing

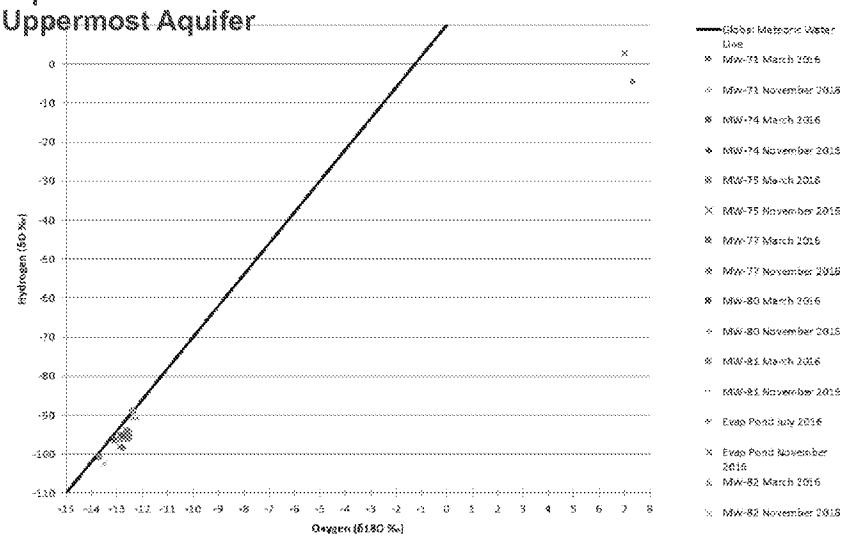
Includes testing data from 1980 and 2016



01/xx/2018 Name of Meeting, K.J. Barr

Site Conceptual Model- Stable isotope Characteristics of Evaporation Pond Water and Groundwater in the Uppermost Aquifer

Stable isotope analysis shows that no seepage has reached the uppermost aquifer from the CGS Evaporation Pond



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  - Drilling at the perimeter will define the potential for lateral seepage.
  - Borings around the pond are sufficient to characterize materials beneath the pond.

Drilling notes- Under no circumstances should borings be drilled to the uppermost aquifer through the bottom of the pond. Prescriptive sampling criteria applied on top of standard laboratory and field procedures will result in a significant number of samples deemed to be unusable resulting in wasted effort.

Performance-Based Alternative Liner Demonstration

- Drill test borings at perimeter of Evaporation Pond.
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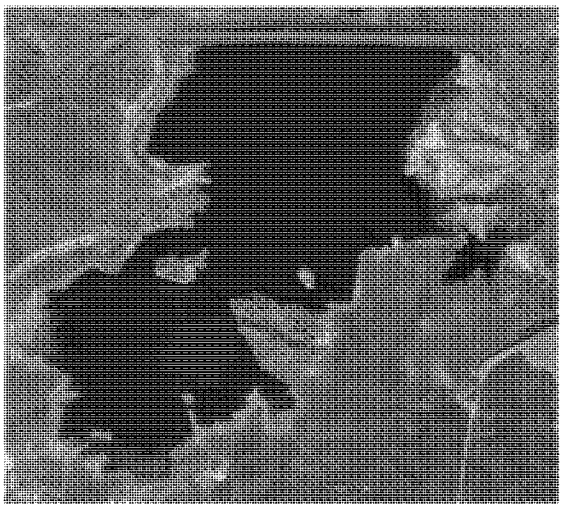

Message

From: Smith, Brooks M. [Brooks.Smith@troutman.com]
Sent: 12/8/2020 12:44:30 PM
To: Cook, Steven [cook.steven@epa.gov]
Subject: Part B Application/Demonstration for a Clay Liner for a CCR Surface Impoundment

It was great to catch up with you last week and I look forward to our virtual CEEC gathering later today. I checked the webpage but it does not look like there is anything posted about accepting these applications/demonstrations through 12/14. Would you mind confirming by reply email that EPA will indeed accept them through that date, given the unanticipated glitch in timing on FR publication? Thanks so much. Best, Brooks

Brooks M. Smith
Partner
Direct: 804.697.1414 | Mobile: Ex. 6 Personal Privacy (PP) | Internal: 15-1414
brooks.smith@troutman.com

troutman **pepper**
1001 Haxall Point, Suite 1500
Richmond, VA 23219
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Message

From: Smith, Brooks M. [Brooks.Smith@troutman.com]
Sent: 12/8/2020 12:59:28 PM
To: Cook, Steven [cook.steven@epa.gov]
Subject: RE: Part B Application/Demonstration for a Clay Liner for a CCR Surface Impoundment

Great – thank you!

Brooks M. Smith
Partner
troutman pepper
Direct: 804.697.1414 | Mobile: Ex. 6 Personal Privacy (PP) | Internal: 15-1414
brooks.smith@troutman.com

From: Cook, Steven <cook.steven@epa.gov>
Sent: Tuesday, December 8, 2020 7:59 AM
To: Smith, Brooks M. <Brooks.Smith@troutman.com>
Subject: Re: Part B Application/Demonstration for a Clay Liner for a CCR Surface Impoundment

EXTERNAL SENDER

Brooks -

We are in the process of updating the webpage to reflect the 12/14 date. We will accept Part B applications received by then.

Steven

Sent from my iPhone

On Dec 8, 2020, at 7:44 AM, Smith, Brooks M. <Brooks.Smith@troutman.com> wrote:

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Message

From: Cook, Steven [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=394F5DEDE6184BC083CF9390E49A192C-COOK, STEVE]
Sent: 3/19/2020 9:10:57 PM
To: Segal, Scott [scott.segal@bracewell.com]; Brooks, Becky [Brooks.Becky@epa.gov]
Subject: RE: Part B - Alternative Liner Rule MEETING

Scott –

We will have this converted to a call. If there are maps or data to share, we should think through how to handle that as well.

Thanks for the interest.

Steven

From: Segal, Scott <scott.segal@bracewell.com>
Sent: Thursday, March 19, 2020 12:10 PM
To: Brooks, Becky <Brooks.Becky@epa.gov>
Cc: Cook, Steven <cook.steven@epa.gov>
Subject: RE: Part B - Alternative Liner Rule MEETING

Howdy Becky and Steven – hope you both are doing well in these trying times. The team at SRP is still interested in touching base on April 2, but under current circumstances, it seems like we should convert to a conference call. Does that still work for the OLEM team? Thanks, and please let me know when you can. Meanwhile, stay safe! Ss/

SCOTT SEGAL
Partner
scott.segal@policyres.com
T: +1.202.828.5845 | F: +1.800.404.3970

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From: Brooks, Becky [mailto:Brooks.Becky@epa.gov]
Sent: Friday, March 13, 2020 9:17 AM
To: Segal, Scott <scott.segal@bracewell.com>
Cc: Cook, Steven <cook.steven@epa.gov>
Subject: Re: Part B - Alternative Liner Rule MEETING

Ok. Will get a calendar notice out momentarily.

Sent from my iPhone

On Mar 12, 2020, at 9:06 PM, Segal, Scott <scott.segal@bracewell.com> wrote:

Just to confirm - the date and time you propose works just fine. Thanks! ss/

Sent from my iPhone

SCOTT SEGAL
Partner
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T: +1.202.828.5845 | F: +1.800.404.3970

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On Mar 12, 2020, at 6:30 PM, Segal, Scott <scott.segal@bracewell.com> wrote:

I believe it would let me check. Assuming there is still air travel at that point - if not, might make a good time for phone or video.

Sent from my iPhone

SCOTT SEGAL
Partner
scott.segal@policyres.com
T: +1.202.828.5845 | F: +1.800.404.3970

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On Mar 12, 2020, at 6:27 PM, Brooks, Becky <Brooks.Becky@epa.gov> wrote:

Hi Scott – Does April 2 at 11:30 work for you and the others?

Becky Brooks
Special Assistant
Office of Land and Emergency Management
U.S. Environmental Protection Agency
ph. 202-566-2762

From: Segal, Scott <scott.segal@bracewell.com>
Sent: Thursday, March 12, 2020 4:18 PM
To: Brooks, Becky <Brooks.Becky@epa.gov>; Cook, Steven <cook.steven@epa.gov>
Subject: RE: Part B - Alternative Liner Rule MEETING

Howdy Becky – just checking in on the possible scheduling for April.

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From: Segal, Scott
Sent: Monday, March 9, 2020 3:29 PM
To: 'Brooks, Becky' <Brooks.Becky@epa.gov>; Cook, Steven <cook.steven@epa.gov>
Subject: RE: Part B - Alternative Liner Rule MEETING

Let's do – thanks!

From: Brooks, Becky [mailto:Brooks.Becky@epa.gov]
Sent: Monday, March 9, 2020 2:10 PM
To: Segal, Scott <scott.segal@bracewell.com>; Cook, Steven <cook.steven@epa.gov>
Subject: RE: Part B - Alternative Liner Rule MEETING

Scott – At this time, Steven will be on travel the week of March 23. Do you want us to check times for April 1-3?

Becky Brooks
Special Assistant
Office of Land and Emergency Management
U.S. Environmental Protection Agency
ph. 202-566-2762

From: Segal, Scott <scott.segal@bracewell.com>
Sent: Monday, March 09, 2020 1:46 PM
To: Cook, Steven <cook.steven@epa.gov>; Brooks, Becky <Brooks.Becky@epa.gov>
Subject: RE: Part B - Alternative Liner Rule MEETING

Great and thanks.

Becky – here is our request:

Topic: Disposal Regulation Revisions & Permitting Program; procedures to allow facilities to request approval to use an alternate liner for CCR surface impoundments; specifics related to Salt River Project (SRP) location (Arizona).
Hoping to meet with Steven Cook and his designees.
Proposed dates: March 23, 24, or 25. One hour would be preferable.
Attendees: Renee Eastman, Senior Director, Federal Affairs, SRP
Kara Montalvo, Director, Environmental Services, SRP
Marybeth Klein, Senior Attorney, SRP
Andrea Martinez, Manager, Water Quality & Waste Management Services, SRP
Mark Nicholls, Lead Hydrogeologist, Haley & Aldritch (Phoenix office)
Scott Segal, Partner, Bracewell LLP, Washington, DC
Thanks, ss/

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Partner
scott.segal@policyres.com
T: +1.202.828.5845 | F: +1.800.404.3970

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From: Cook, Steven [mailto:cook.steven@epa.gov]
Sent: Monday, March 9, 2020 1:31 PM
To: Segal, Scott <scott.segal@bracewell.com>
Cc: Brooks, Becky <Brooks.Becky@epa.gov>
Subject: Re: Part B - Alternative Liner Rule MEETING

Scott -

We are taking meetings. Schedules are a bit in flux. Please work with Becky to find some time.

Steven

Sent from my iPhone

> On Mar 9, 2020, at 7:16 AM, Segal, Scott <scott.segal@bracewell.com> wrote:
>
> Steven – are you folks taking live meetings, particularly on this topic? Folks from Arizona could be present to meet with you March 23-25. Any time at that time? L:ess preferred would be April 1-3. Thanks, ss/
>
> **SCOTT SEGAL**
> Partner
> scott.segal@policyres.com
> T: +1.202.828.5845 | F: +1.800.404.3970

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Message

From: Cook, Steven [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=394F5DEDE6184BC083CF9390E49A192C-COOK, STEVE]
Sent: 12/8/2020 3:13:54 PM
To: Smith, Brooks M. [Brooks.Smith@troutman.com]
Subject: RE: Part B Application/Demonstration for a Clay Liner for a CCR Surface Impoundment

Website has now been updated.

From: Smith, Brooks M. <Brooks.Smith@troutman.com>
Sent: Tuesday, December 8, 2020 7:59 AM
To: Cook, Steven <cook.steven@epa.gov>
Subject: RE: Part B Application/Demonstration for a Clay Liner for a CCR Surface Impoundment

Great – thank you!

Brooks M. Smith
Partner
troutman pepper
Direct: 804.697.1414 | Mobile: Ex. 6 Personal Privacy (PP) | Internal: 15-1414
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> **Brooks M. Smith**
> **Partner**

Direct: 804.697.1414 | Mobile Ex. 6 Personal Privacy (PP) | Internal: 15-1414
brooks.smith@troutman.com

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Richmond, VA 23219
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A HIGHER COMMITMENT TO CLIENT CARE

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Message

From: Thomsen, Martha [martha.thomsen@bakerbotts.com]
Sent: 6/7/2021 2:36:40 PM
To: Huggins, Richard [Huggins.Richard@epa.gov]
CC: Berge, Megan [megan.berge@bakerbotts.com]
Subject: RE: Quick call sometime next week?

Hi Richard – thank you again for agreeing to speak with CCIG on Thursday! Below are (1) some of the initial topics I was hoping to ask you about during the Q&A session and (2) as requested, our current member list.

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Q and A seems fine to me.

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To: Huggins, Richard [Huggins.Richard@epa.gov]
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Click here to join the meeting
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To: Huggins, Richard [Huggins.Richard@epa.gov]
CC: Berge, Megan [megan.berge@bakerbotts.com]
Subject: RE: Quick call sometime next week?

No problem at all – thanks for the heads up!

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Sent: Thursday, June 10, 2021 8:58 AM
To: Thomsen, Martha <martha.thomsen@bakerbotts.com>
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martha.thomsen@bakerbotts.com
T +1.202.639.7863
F +1.202.508.9329
M Ex. 6 Personal Privacy (PP)

700 K Street, NW
Washington, DC 20001
USA

(Please note the recent change in address)

From: Huggins, Richard <Huggins.Richard@epa.gov>
Sent: Sunday, April 25, 2021 2:28 PM
To: Thomsen, Martha <martha.thomsen@bakerbotts.com>
Cc: Berge, Megan <megan.berge@bakerbotts.com>
Subject: RE: Quick call sometime next week?

[EXTERNAL EMAIL]

How about sometime Wed AM? My calendar is open so just send me an invite. Thanks

Richard Huggins Jr., Chief
Energy Recovery and Waste Disposal Branch
Office of Resource Conservation and Recovery
U.S. Environmental Protection Agency
Desk: 703-308-0017 iPhone: 571-345-6855

From: Thomsen, Martha <martha.thomsen@bakerbotts.com>
Sent: Friday, April 23, 2021 2:32 PM
To: Huggins, Richard <Huggins.Richard@epa.gov>
Cc: Berge, Megan <megan.berge@bakerbotts.com>
Subject: Quick call sometime next week?

Hi Richard – we hope you're doing well. I just wanted to follow up on my voicemail yesterday and see if you might have time for a quick call next week to discuss whether you would be willing to participate in an upcoming Cross-Cutting Issues Group meeting on CCR issues? Just let me know if there is a particularly good time for you for a quick call – thank you!

Martha S. Thomsen
Senior Associate

Baker Botts L.L.P
martha.thomsen@bakerbotts.com
T +1.202.639.7863
F +1.202.508.9329
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700 K Street, NW
Washington, DC 20001
USA

(Please note the recent change in address)

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Message

From: Montalvo Kara M [Kara.Montalvo@srpnet.com]
Sent: 10/22/2020 3:31:26 PM
To: Huggins, Richard [Huggins.Richard@epa.gov]; Behan, Frank [Behan.Frank@epa.gov]; Hillyer, Kirsten [hillyer.kirsten@epa.gov]; Anderson, Lydia [Anderson.Lydia@epa.gov]
CC: Klein Maribeth M [Maribeth.Klein@srpnet.com]; Martinez Andrea L [Andrea.Martinez@srpnet.com]
Subject: Request for "Part B" Pre-Submission Meeting: Salt River Project Coronado Generating Station

Good Morning –

I am contacting you on behalf of Salt River Project to request a pre-submission meeting with EPA to discuss SRP's planned application to make an alternate line demonstration under the recently finalized "Part B" amendments to the 2015 CCR rule. Understanding that the "first step" application submission must occur no later than November 30, 2020, SRP would like to request a virtual 1-hour meeting with EPA the week of November 9. Our preference is a meeting on either November 12 or November 13, but we understand the constraints on EPA's schedule and are willing to meet on an alternate day that week as necessary.

SRP's application is for an existing surface impoundment, more commonly called the "Evaporation Pond" by SRP, at SRP's Coronado Generating Station (CGS) located in St. Johns, Arizona. Planned attendees from SRP for this meeting are as follows:

- Kara Montalvo, Director, Environmental Services
- Maribeth Klein, Senior Attorney
- Andrea Martinez, Manager, Water Quality & Waste Management Services
- Kent Liesemeyer, Senior Environmental Compliance Engineer
- Prabhat Bhargava, Operations & Maintenance Supervisor, CGS
- Mark Prein, Senior Environmental Scientist, CGS
- Mark Nicholls, Haley & Aldrich
- Jason Pokorny, Haley & Aldrich

Please let me know if you need any additional information from SRP to support scheduling of the pre-submission meeting. We are prepared to send EPA meeting materials (e.g., agenda, etc.) at least 2 days in advance of the scheduled meeting date.

Regards,
Kara

Kara M. Montalvo, QEP
Director, Environmental Services
SRP | Environmental Services | PAB359
P.O. Box 52025, Phoenix, AZ 85072-2025
P: (602) 236-5256 | **M**: Ex. 6 Personal Privacy (PP)

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Message

From: Jared Morrison [Jared.Morrison@evergy.com]
Sent: 11/6/2020 3:09:04 PM
To: Huggins, Richard [Huggins.Richard@epa.gov]
Subject: RE: CCR Part A Question

Internal Use Only

I'm reaching out to hopefully get a few minutes on the phone with you regarding the CCR Part B regulation. I appreciated your insight on the Part A regulation in previous conversation, and as Evergy evaluates the potential application of Part B at one of our sites, I had a question regarding the intent of the regulation.

If you have a few minutes you can reach me at the number below. Thanks,

Jared Morrison
Director, Water and Waste Programs
Evergy

jared.morrison@evergy.com

M: Ex. 6 Personal Privacy (PP)

evergy.com

From: Jared Morrison
Sent: Monday, September 28, 2020 11:48 AM
To: Huggins.Richard@epa.gov
Subject: CCR Part A Question

Internal Use Only

I have a question regarding the "cessation of boiler operation" option in the recent Part A CCR regulation. Evergy is in a situation attempting to evaluate options at a facility with units near closure that utilize an unlined CCR surface impoundment. I am trying to understand the applicability of this boiler shutdown option and the requirements surrounding alternative capacity. With the tight timelines around the November submission date and the subsequent April 2021 closure date, I was hoping you'd have a few minutes to discuss this regulation.

I can be reached at the number below or will make myself available whenever you are able to speak. Thanks,

Jared Morrison
Director, Water and Waste Programs
Evergy

jared.morrison@evergy.com

M: Ex. 6 Personal Privacy (PP)

evergy.com

Message

From: Long, Michelle [Long.Michelle@epa.gov]
Sent: 11/23/2020 5:19:21 PM
To: Shimshock, John [jshimshock@keyconops.com]
CC: Kushner, Joseph [jkushner@keyconops.com]; Adam Scheller [a.scheller@gaiconsultants.com]; Huggins, Richard [Huggins.Richard@epa.gov]; Jackson, Mary [Jackson.Mary@epa.gov]; Mills, Jason [Mills.Jason@epa.gov]
Subject: RE: CCR Rule Part B application per § 257.71(d)(1)(ii) for four existing CCR clay-lined surface impoundments at Conemaugh Station

Hi John,

That makes sense, and either option would work for us. EPA email can receive attachments up to 150 MB, but if needed, you may send the people copied on this email a few separate emails. Posting it to the website would also be good, but please also email it to us. Does that work for you?

Thanks,
Michelle

Michelle Long
Biologist
U.S. Environmental Protection Agency
Office of Resource Conservation and Recovery
Materials Recovery and Waste Management Division
(703) 347-8953

From: Shimshock, John <jshimshock@keyconops.com>
Sent: Monday, November 23, 2020 12:13 PM
To: Long, Michelle <Long.Michelle@epa.gov>
Cc: Kushner, Joseph <jkushner@keyconops.com>; Adam Scheller <a.scheller@gaiconsultants.com>
Subject: RE: CCR Rule Part B application per § 257.71(d)(1)(ii) for four existing CCR clay-lined surface impoundments at Conemaugh Station

Hi Michelle,
Yes - there are many attachments with the subject application. We can generate and forward either (1) a single composite document (we'll post that document to the KEY-CON CCR website) or (2) several files, largely based on the attachment ID. We may be forced to go with option #2 (in 2 or more transmittals) because of the file size of the single composite document (may be 25MB or larger). Please advise what works best for you / EPA.

Wishing you and yours a Happy Thanksgiving holiday – John.

From: Long, Michelle <Long.Michelle@epa.gov>
Sent: Monday, November 23, 2020 11:37 AM
To: Shimshock, John <jshimshock@keyconops.com>
Cc: Kushner, Joseph <jkushner@keyconops.com>; Adam Scheller <a.scheller@gaiconsultants.com>
Subject: RE: CCR Rule Part B application per § 257.71(d)(1)(ii) for four existing CCR clay-lined surface impoundments at Conemaugh Station

Hi John,

Thank you for your question. It looks like my manager, Richard Huggins, replied to you last week. Do you have any further questions?

I hope you have a safe and happy Thanksgiving as well.

Michelle Long
Biologist
U.S. Environmental Protection Agency
Office of Resource Conservation and Recovery
Materials Recovery and Waste Management Division
(703) 347-8953

From: Shimshock, John <jshimshock@keyconops.com>
Sent: Thursday, November 19, 2020 12:11 PM
To: Long, Michelle <Long.Michelle@epa.gov>
Cc: Kushner, Joseph <jkushner@keyconops.com>; Adam Scheller <a.scheller@gaiconsultants.com>
Subject: CCR Rule Part B application per § 257.71(d)(1)(ii) for four existing CCR clay-lined surface impoundments at Conemaugh Station

Hi again Ms. Long,
I'm writing to inquire of the submittal procedures for the subject application. You are listed as the EPA contact for this rule, so I thought it would be best to start my inquiry with you. Conemaugh Station and our engineering firm, GAI Consultants, are aware that EPA set-up a Part A implementation webpage (link: https://www.epa.gov/coalash/ccr-part-implementation) that provides submittal instructions, but to our knowledge a similar Part B webpage has not yet been (or will be) set-up. As such, I'd be grateful for your guidance on this matter. For the Part A submittals, the demonstration transmittal letter was addressed to Administrator Wheler, and the cc list included the designated EPA reviewers, who received the entire package via email transmittal. We can do the same for a Part B submittal, please advise. Because of the number of attachments required for the Part B application, the resulting file size may be large, and I'm uncertain if EPA restricts email transmittals with large file size attachments.

Thanks in advance for your help with this matter, and I'm looking forward to receipt of your reply. Wishing you and yours an (early) enjoyable Thanksgiving holiday – John.

John P. Shimshock
Environmental Specialist
Conemaugh Generating Station
1442 Power Plant Road
New Florence, PA 15944
Office Phone: (724) 235-4596
Cellular Phone: Ex. 6 Personal Privacy (PP)
jshimshock@keyconops.com

From: Long, Michelle <Long.Michelle@epa.gov>
Sent: Tuesday, February 4, 2020 11:18 AM
To: Shimshock, John <jshimshock@keyconops.com>
Cc: 'P. E. Stephen M. Frank (Stephen.Frank@genon.com)' <Stephen.Frank@genon.com>
Subject: RE: GenOn Website Postings - updates for Keystone and Conemaugh Generating Stations

Hello Mr. Shimshock,

Thank you for this update and I will share with my colleagues to update EPA's CCR website for the Keystone and Conemaugh Generating Stations. If there are any other changes to the facility websites in the future, please let me know so we can update our records accordingly.

Thanks,
Michelle

Michelle Long
Biologist
U.S. Environmental Protection Agency
Office of Resource Conservation and Recovery
(703) 347-8953

From: Shimshock, John <jshimshock@keyconops.com>
Sent: Wednesday, January 29, 2020 4:27 PM
To: Long, Michelle <Long.Michelle@epa.gov>
Cc: 'P. E. Stephen M. Frank (Stephen.Frank@genon.com)' <Stephen.Frank@genon.com>
Subject: RE: GenOn Website Postings - updates for Keystone and Conemaugh Generating Stations

Greetings Ms. Long,
A follow-up to the email below from my colleague Steve Frank at GenOn (copied herein).

In accordance with various fillings submitted to U.S. EPA and Pennsylvania Department of Environmental Protection (PA DEP) in CY 2019, the association between GenOn and the Keystone and Conemaugh Generating Stations was terminated in CY 2019. CCR reports for the Keystone and Conemaugh Stations previously posted to GenOn's CCR webpage were transferred as part of the above-mentioned development to a new CCR webpage for these stations, link: http://ccr.keyconops.com/. The PA DEP was informed of recent postings to this site, example email inform attached herein.

I was just informed that EPA maintains a website that presents the links for all of CCR webpages for the applicable stations, link:
https://www.epa.gov/coalash/list-publicly-accessible-internet-sites-hosting-compliance-data-and-information-required#pa

I'm writing simply to inform you of the update for the Keystone and Conemaugh Stations. I hope you find this message helpful, happy to discuss – John.

John P. Shimshock
Environmental Specialist
Conemaugh Generating Station
1442 Power Plant Road
New Florence, PA 15944
Office Phone: (724) 235-4596
Cellular Phone: Ex. 6 Personal Privacy (PP) Ex. 6 Personal Privacy (PP)
jshimshock@keyconops.com
Please note my new email address

From: Frank, Stephen <Stephen.Frank@genon.com>
Sent: Friday, May 17, 2019 9:28 AM
To: long.michelle@epa.gov
Cc: Shimshock, John <John.Shimshock@genon.com>; Jacklin, Mark J <Mark.Jacklin@genon.com>; McGraw, William P. <William.McGraw@genon.com>; Schenker, Jeremy S. <Jeremy.Schenker@genon.com>; Johnson, Walter <walter.johnson@genon.com>; Nitz, Mark <Mark.Nitz@genon.com>; Heimlicher, Peter <Bruce.Heimlicher@genon.com>; Anderson, Pilantana <Pilantana.Anderson@genon.com>
Subject: GenOn Website Postings

Michelle,

Conemaugh Generating Station received correspondence from EPA, dated May 7, 2019 regarding the posting of CCR Data and Information under the rule. GenOn and NRG initiated activities to separate the two businesses in 2017. As a result, GenOn's CCR records were moved to a new website in August 2018 and are now maintained at https://www.genon.com/ccr-rule-compliance. GenOn Holdings, Inc. separated from NRG Energy, Inc. in December 2018.

As you will find, the GenOn CCR units include:

1. The Brandywine Ash Landfill in Brandywine, MD
2. The Cheswick Generating Station Bottom Ash Emergency Pond (#0272216), Bottom Ash Recycle Pond (#0272216) and Cheswick Ash Disposal Site (#300720) in Springdale, PA
3. The Conemaugh Generating Station Bottom Ash Filter Recycle Pond - A (#3283201), Bottom Ash Filter Ponds – B, C & D (#3283201), and the Conemaugh Station Ash/Refuse Disposal Site Stage II & III (#300876) in New Florence, PA
4. The Keystone Generating Station Bottom Ash Ponds A, B, & C (#0386201) and the Keystone Generating Station Ash/Refuse Disposal Site East and West Valley (#300837) in Shelocta, PA
5. The New Castle Generating Station North Bottom Ash Pond and the New Castle Plant Ash Landfill (#300818) in West Pittsburg, PA
6. Westland Ash Landfill Unit B in Dickerson, MD

Please do not hesitate to contact me with any questions regarding the CCR postings for the GenOn fleet.

Thank you,

GenOn

Stephen M. Frank, PE (Pa)
Senior Manager, Environmental
Stephen.Frank@GenOn.com
724-249-3610

Message

From: Martinez Andrea L [Andrea.Martinez@srpnet.com]
Sent: 11/25/2020 3:23:27 PM
To: Long, Michelle [Long.Michelle@epa.gov]
CC: Huggins, Richard [Huggins.Richard@epa.gov]; Jackson, Mary [Jackson.Mary@epa.gov]; Mills, Jason [Mills.Jason@epa.gov]
Subject: RE: Salt River Project, Coronado Generating Station, Part B Application Receipt Assistance

Thank you so much Ms. Long,

The below link is very helpful, thank you to the EPA for getting this set up. We intend to submit our Part B application via e-mail with an imbedded link to the Haley & Aldrich secure file transfer, as we did for the pre-application meeting. Our e-mail only transmits a maximum size of 35 MB. Thank you again.

Andrea Martinez
Water Quality & Waste Management Services Manager
SRP | Environmental Services
P: (602) 236-2618 | **M:** Ex. 6 Personal Privacy (PP)

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From: Long, Michelle <Long.Michelle@epa.gov>
Sent: Wednesday, November 25, 2020 8:13 AM
To: Martinez Andrea L <Andrea.Martinez@srpnet.com>
Cc: Huggins, Richard <Huggins.Richard@epa.gov>; Jackson, Mary <Jackson.Mary@epa.gov>; Mills, Jason <Mills.Jason@epa.gov>
Subject: RE: Salt River Project, Coronado Generating Station, Part B Application Receipt Assistance

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For mobile forward to phish@srpnet.com

Ms. Martinez,

For your awareness, EPA just set up a CCR Part B Implementation website. Please follow the "How to Submit a Demonstration Package" instructions to submit the your application.
https://www.epa.gov/coalash/ccr-part-b-implementation

This information is the same as we have already shared with you, below, but I wanted to tell you we set up the website. Thanks.

Michelle Long
Biologist
U.S. Environmental Protection Agency
Office of Resource Conservation and Recovery
Materials Recovery and Waste Management Division
(703) 347-8953

From: Martinez Andrea L <Andrea.Martinez@srpnet.com>
Sent: Tuesday, November 24, 2020 3:56 PM
To: Long, Michelle <Long.Michelle@epa.gov>
Cc: Huggins, Richard <Huggins.Richard@epa.gov>; Jackson, Mary <Jackson.Mary@epa.gov>; Mills, Jason <Mills.Jason@epa.gov>
Subject: RE: Salt River Project, Coronado Generating Station, Part B Application Receipt Assistance

Thank you so much Ms. Long,

We will submit to all four EPA team members below via secure link as we did for the November 9 meeting, as quickly as possible once we are satisfied with the final draft from our consulting team. Thank you for your reply!

Andrea Martinez
Water Quality & Waste Management Services Manager
SRP | Environmental Services
P: (602) 236-2618 | **M:** Ex. 6 Personal Privacy (PP)

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From: Long, Michelle <Long.Michelle@epa.gov>
Sent: Tuesday, November 24, 2020 1:12 PM
To: Martinez Andrea L <Andrea.Martinez@srpnet.com>
Cc: Huggins, Richard <Huggins.Richard@epa.gov>; Jackson, Mary <Jackson.Mary@epa.gov>; Mills, Jason <Mills.Jason@epa.gov>
Subject: RE: Salt River Project, Coronado Generating Station, Part B Application Receipt Assistance

CAUTION - EXTERNAL EMAIL
Phishing? **Click the fish** in Outlook
For mobile forward to phish@srpnet.com

Good afternoon Ms. Martinez,

I received your message from my colleague Kirsten Hillyer. I'm the point of contact for the Part B demonstrations.

I think I was the person who was able to access the sharefile link to open all the files for the November 12 call. None of the pages are blank from the 3 files I downloaded from the sharefile site. That should work for us to send that way too, and if you're able to send it early just to make sure we can open everything, that would be great. Also, EPA email can receive up to 150MB of files, but the sharefile site would also work.

Similar to the November 12 meeting, please send to Richard Huggins, Mary Jackson, Jason Mills, and me. Let us know if you have further questions. Thanks.

Michelle Long
Biologist
U.S. Environmental Protection Agency
Office of Resource Conservation and Recovery
Materials Recovery and Waste Management Division
(703) 347-8953

From: Martinez Andrea L <Andrea.Martinez@srpnet.com>
Sent: Tuesday, November 24, 2020 12:54 PM
To: Hillyer, Kirsten <hillyer.kirsten@epa.gov>
Subject: Salt River Project, Coronado Generating Station, Part B Application Receipt Assistance

Good afternoon Ms. Hillyer,

It is Salt River Project's intent to submit a Part B application for our Coronado Generating Station, on or before the November 30 deadline. We were concerned that our Part B Rule Discussion materials only fully conveyed to one EPA participant for our meeting November 12. Some staff conveyed they were unable to download and some were only able to see a partial download (some blank pages were noted). Could you please be of assistance in confirming the full receipt of the download to the EPA? I want to ensure receipt of all narrative, appendices (no blank pages) are properly received. Please advise if you can be of assistance, if so I will let you know when the materials have been conveyed.

As with other submittals, this file size will be very large or broken into two (still larger) parts. We are awaiting final revisions from our consultant, so plan to submit as early as tomorrow or as late as November 30 (pending this final draft review) via Haley & Aldrich secure link. Thank you so much for your consideration.

Andrea Martinez
Water Quality & Waste Management Services Manager
SRP | Environmental Services
P: (602) 236-2618 | **M:** Ex. 6 Personal Privacy (PP)

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Message

From: Michelle Freeark [mfreeark@azgt.coop]
Sent: 12/1/2020 5:08:10 AM
To: Huggins, Richard [Huggins.Richard@epa.gov]; Jackson, Mary [Jackson.Mary@epa.gov]; Long, Michelle [Long.Michelle@epa.gov]; Mills, Jason [Mills.Jason@epa.gov]
CC: 'Weber, Wayne A' [waweber@burnsmcd.com]; Eichenberger, Jason [jeichenberger@burnsmcd.com]; 'Williamson, Liz' [ewilliamson@williamsmullen.com]; Justine McCune [jmccune@azgt.coop]
Subject: AEPCO-Apache Station ALD Application
Attachments: AEPCO ALD Application Cover Letter_11302020.pdf

Attached please find a cover letter with details on AEPCO's ALD Applications and Appendices.

The complete document is very large, so please see this link:

https://1drv.ms/b/s!Ajm5uvC86F2-iDHOZPKeTgrnlv-L?e=3pA4f9

If you have difficulty with this link, you can also find the document on our CCR website https://ccr.azgt.coop/.

Please confirm receipt of this correspondence.

Sincerely,
Michelle R. Freeark

Michelle Freeark, Executive Director of Regulatory Affairs and Corporate Services

Arizona G&T Cooperatives

1000 S. Hwy 80 | Benson, AZ 85602
o: 520-586-5122 | m: Ex. 6 Personal Privacy (PP) mfreeark@azgt.coop

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Arizona G&T Cooperatives

Touchstone Energy® Cooperatives

November 30, 2020

Mr. Andrew Wheeler, Administrator
U.S. Environmental Protection Agency
1200 Pennsylvania Avenue, NW
Washington, D.C. 20460

Via Email

RE: ALTERNATIVE LINER DEMONSTRATION APPLICATIONS
ASH PONDS 1-4 AND SCRUBBER POND NO. 2
APACHE GENERATING STATION, COCHISE, ARIZONA

Dear Administrator Wheeler:

Arizona Electric Power Cooperative, Inc. (AEPCO) owns and operates the Apache Generating Station (Apache Station), an electric generation station located in southeastern Arizona. Apache Station disposes of coal combustion residuals (CCR) materials in Ash Ponds 1-4 and Scrubber Pond No. 2, which are composite-lined surface impoundments subject to the CCR Rule.

AEPCO seeks approval from the U.S. Environmental Protection Agency (EPA) to develop a site-specific record that will demonstrate that the CCR surface impoundments at Apache Station are protective of human health and the environment. Specifically, AEPCO provides Alternate Liner Demonstration (ALD) applications (Applications) for Ash Ponds 1-4 and Scrubber Pond No. 2 pursuant to 40 CFR § 257.71(d)(1)(i).

Enclosed please find the ALD Applications. Additionally, the Applications can also be found on AEPCO's public-facing website at https://ccr.azgt.coop.

AEPCO's Applications demonstrate that the above-referenced CCR surface impoundments meet and exceed EPA's Application requirements and should be allowed to progress to the more detailed demonstration step. The surface impoundments meet and exceed EPA's protectiveness expectations during the year-long process to complete the demonstration.

Thank you for your review and consideration of the enclosed Applications. AEPCO would appreciate an acknowledgement of receipt of the Applications. If you should have any questions concerning this submittal, please contact me directly at (520) 586-5122 or mfreeark@azgt.coop.

Sincerely,

Michelle R. Freeark
Executive Director of Regulatory Affairs & Corporate Services

Enclosure
Cc: Mr. Richard Huggins, EPA
Ms. Mary Jackson, EPA
Ms. Michelle Long, EPA
Mr. Jason Mills, EPA

Message

From: Long, Michelle [Long.Michelle@epa.gov]
Sent: 12/1/2020 12:43:34 PM
To: Michelle Freeark [mfreeark@azgt.coop]; Huggins, Richard [Huggins.Richard@epa.gov]; Jackson, Mary [Jackson.Mary@epa.gov]; Mills, Jason [Mills.Jason@epa.gov]
CC: 'Weber, Wayne A' [waweber@burnsmcd.com]; Eichenberger, Jason [jeichenberger@burnsmcd.com]; 'Williamson, Liz' [ewilliamson@williamsmullen.com]; Justine McCune [jmccune@azgt.coop]
Subject: RE: AEPCO-Apache Station ALD Application

Good morning,

This email is to acknowledge receipt of the Part B application from the AEPCO-Apache Station. EPA was able to download the file from the link provided. Thank you.

Michelle Long
Biologist
U.S. Environmental Protection Agency
Office of Resource Conservation and Recovery
Materials Recovery and Waste Management Division
(703) 347-8953

From: Michelle Freeark <mfreeark@azgt.coop>
Sent: Tuesday, December 1, 2020 12:08 AM
To: Huggins, Richard <Huggins.Richard@epa.gov>; Jackson, Mary <Jackson.Mary@epa.gov>; Long, Michelle <Long.Michelle@epa.gov>; Mills, Jason <Mills.Jason@epa.gov>
Cc: 'Weber, Wayne A' <waweber@burnsmcd.com>; Eichenberger, Jason <jeichenberger@burnsmcd.com>; 'Williamson, Liz' <ewilliamson@williamsmullen.com>; Justine McCune <jmccune@azgt.coop>
Subject: AEPCO-Apache Station ALD Application

Attached please find a cover letter with details on AEPCO's ALD Applications and Appendices.

The complete document is very large, so please see this link:

https://1drv.ms/b/s!Ajm5uvC86F2-iDHOZPKeTgrnlv-L?e=3pA4f9

If you have difficulty with this link, you can also find the document on our CCR website https://ccr.azgt.coop/.

Please confirm receipt of this correspondence.

Sincerely,
Michelle R. Freeark

Michelle Freeark, Executive Director of Regulatory Affairs and Corporate Services

Arizona G&T Cooperatives

1000 S. Hwy 80 | Benson, AZ 85602
o: 520-586-5122 | m: Ex. 6 Personal Privacy (PP) mfreeark@azgt.coop

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Message

From: Pesek, Adam [apesek@pa.gov]
Sent: 12/17/2020 8:16:44 PM
To: Huggins, Richard [Huggins.Richard@epa.gov]
CC: Jackson, Mary [Jackson.Mary@epa.gov]; Long, Michelle [Long.Michelle@epa.gov]; Mills, Jason [Mills.Jason@epa.gov]
Subject: Conemaugh Power Plant (Pennsylvania) § 257.71(d): Alternate Liner Demonstration

Richard,

I am a permit engineer with the Pennsylvania Dept. of Environmental Protection that is preparing a state-issued Clean Streams Law Permit for the modification and operation of the Ash Filter Ponds at the Conemaugh Power Plant. I understand certain elements of the proposed liner replacement are under review by EPA for demonstration for an alternate liner design in meeting the CCR Part B Final Rule.

Could you provide me with a contact that is reviewing the demonstration for § 257.71(d): Alternate Liner Demonstration for this facility located in Pennsylvania. I have a few questions regarding your review of their demonstration and how it could influence the Department's permitting decision.

Thank you.

Adam J. Pesek, E.I.T. / Environmental Engineer
Department of Environmental Protection / Clean Water Program
230 Chestnut Street, Meadville, PA 16335
Phone: 814.332.6331 / Fax: 814.332.6121

Message

From: Pesek, Adam [apesek@pa.gov]
Sent: 12/30/2020 7:25:35 PM
To: Huggins, Richard [Huggins.Richard@epa.gov]
Subject: RE: [External] RE: Conemaugh Power Plant (Pennsylvania) § 257.71(d): Alternate Liner Demonstration

Yes. Any time before 4:15 today, or tomorrow morning will work.

Adam J. Pesek, E.I.T. / Environmental Engineer
Department of Environmental Protection / Clean Water Program
230 Chestnut Street, Meadville, PA 16335
Phone: 814.332.6331 / Fax: 814.332.6121

From: Huggins, Richard <Huggins.Richard@epa.gov>
Sent: Wednesday, December 30, 2020 2:24 PM
To: Pesek, Adam <apesek@pa.gov>
Subject: [External] RE: Conemaugh Power Plant (Pennsylvania) § 257.71(d): Alternate Liner Demonstration

__ATTENTION:__ This email message is from an external sender. Do not open links or attachments from unknown sources. To report suspicious email, forward the message as an attachment to CWOPA_SPAM@pa.gov.

Adam- I think you are calling me right now on my cell. I am on a call. Can I call you back in say 20 or so minutes?

Richard Huggins Jr., Chief
Energy Recovery and Waste Disposal Branch
Office of Resource Conservation and Recovery
U.S. Environmental Protection Agency
Desk: 703-308-0017 iPhone: 571-345-6855

From: Huggins, Richard
Sent: Wednesday, December 30, 2020 1:42 PM
To: Pesek, Adam <apesek@pa.gov>
Cc: Jackson, Mary <Jackson.Mary@epa.gov>; Long, Michelle <Long.Michelle@epa.gov>; Mills, Jason <Mills.Jason@epa.gov>
Subject: RE: Conemaugh Power Plant (Pennsylvania) § 257.71(d): Alternate Liner Demonstration

Hi Adam- sorry for the delay in responding. I would be happy to speak with you about the Part B rule. Feel free to call me on my cell umber listed in my signature. Thanks

Richard Huggins Jr., Chief
Energy Recovery and Waste Disposal Branch
Office of Resource Conservation and Recovery
U.S. Environmental Protection Agency
Desk: 703-308-0017 iPhone: 571-345-6855

From: Pesek, Adam <apesek@pa.gov>
Sent: Thursday, December 17, 2020 3:17 PM
To: Huggins, Richard <Huggins.Richard@epa.gov>
Cc: Jackson, Mary <Jackson.Mary@epa.gov>; Long, Michelle <Long.Michelle@epa.gov>; Mills, Jason

<Mills.Jason@epa.gov>
Subject: Conemaugh Power Plant (Pennsylvania) § 257.71(d): Alternate Liner Demonstration

Richard,

I am a permit engineer with the Pennsylvania Dept. of Environmental Protection that is preparing a state-issued Clean Streams Law Permit for the modification and operation of the Ash Filter Ponds at the Conemaugh Power Plant. I understand certain elements of the proposed liner replacement are under review by EPA for demonstration for an alternate liner design in meeting the CCR Part B Final Rule.

Could you provide me with a contact that is reviewing the demonstration for § 257.71(d): Alternate Liner Demonstration for this facility located in Pennsylvania. I have a few questions regarding your review of their demonstration and how it could influence the Department's permitting decision.

Thank you.

Adam J. Pesek, E.I.T. / Environmental Engineer
Department of Environmental Protection / Clean Water Program
230 Chestnut Street, Meadville, PA 16335
Phone: 814.332.6331 / Fax: 814.332.6121

Message

From: McCarter, Jennifer [jennifer.mccarter@xcelenergy.com]
Sent: 5/20/2020 7:08:40 PM
To: Huggins, Richard [Huggins.Richard@epa.gov]
CC: Clarke, Roger A [roger.a.clarke@xcelenergy.com]; Kilty, Quinn V [quinn.v.kilty@xcelenergy.com]
Subject: RE: Xcel Energy request for CCR call

Hi Richard, thank you for your response. We appreciate that your time is valuable and understand your perspective on the benefit of having more clarity when the final rules are published, prior to talking.

One reason we were seeking the opportunity to discuss this sooner is that as you know, Part B, as currently proposed, requires submittal within 30 days of publication of the final rule, an application for eligibility to make a liner equivalency demonstration, which we intend to pursue for our Comanche Station. The application must include information documenting that the facility is in compliance with all applicable requirements of the rule. While we believe that we are in compliance with the rule, as our comments to the Part B proposal note, certain provisions are not a good fit with the very unique hydrogeologic conditions at Comanche. Prior to our submittal of the application, we think it would be helpful not only for us, but also for EPA if we could discuss how we are implementing these requirements at this site. Late last year, we received a request from Linda Jacobson in Region 8 for documentation related to the site-specific conditions at Comanche and have had multiple email exchanges following up to that original request. While we await the final rules we will follow up with Ms. Jacobson to address any questions the Region may have and preview our planned equivalency demonstration. At the appropriate time, we are hoping we can involve you in that conversation as well.

In the meantime, if we can address any questions you may have regarding our Part A and Part B rule comments, please do not hesitate to contact us.

Jennifer McCarter, R.E.M.
Xcel Energy | Responsible By Nature
Environmental Analyst
Environmental Services Department
1800 Larimer St., Suite 1300, Denver, CO 80202-1414
P: 303-294-2228 C: Ex. 6 Personal Privacy (PP) F: 303-294-2328
E: jennifer.mccarter@xcelenergy.com

XCELENERGY.COM
Please consider the environment before printing this email

From: Huggins, Richard <Huggins.Richard@epa.gov>
Sent: Monday, May 18, 2020 3:05 PM
To: McCarter, Jennifer <jennifer.mccarter@xcelenergy.com>
Cc: Clarke, Roger A <roger.a.clarke@xcelenergy.com>; Kilty, Quinn V <quinn.v.kilty@xcelenergy.com>
Subject: RE: Xcel Energy request for CCR call

EXTERNAL - STOP & THINK before opening links and attachments.

Good afternoon Jennifer,

My apologies for the delayed response. At this time it would be best if EPA could delay meeting until the CCR Part A and B Final Rules are in place. Once the final rules are in place, EPA will be able to provide meaningful comments on the Part A and B requirements and feedback on any possible demonstrations you may have in the works.

I appreciate your understanding and look forward to speaking with you in the near future.
If you have any questions or concerns please do not hesitate to give me a call.

Take Care
Richard

Richard Huggins Jr., Chief
Energy Recovery and Waste Disposal Branch
Office of Resource Conservation and Recovery
U.S. Environmental Protection Agency
Desk: 703-308-0017 iPhone: 571-345-6855

From: McCarter, Jennifer <jennifer.mccarter@xcelenergy.com>
Sent: Wednesday, May 13, 2020 7:09 PM
To: Huggins, Richard <Huggins.Richard@epa.gov>
Cc: Clarke, Roger A <roger.a.clarke@xcelenergy.com>; Kilty, Quinn V <quinn.v.kilty@xcelenergy.com>
Subject: RE: Xcel Energy request for CCR call

Hello Richard, I'm following up on my email from last week. It seems like there's so many more emails now that everyone is working remotely and it's easy for things to get buried. As I mentioned, we'd like to have a brief call with you to discuss our Comanche Station and how we are implementing the CCR Rule requirements at this site with very unique hydrogeologic conditions.

Would you have 30 minutes during any of the following times next week for a call? Thank you for your consideration.

Eastern Time

- Mon 5/18 430-530
- Tue 5/19 830-10, noon-1, 2-3, 5-530
- Wed 5/20 830-130, 5-6
- Thu 5/21 830-11, 430-530
- Fri 5/22 830-5

Jennifer McCarter, R.E.M.
Xcel Energy | Responsible By Nature
Environmental Analyst
Environmental Services Department
1800 Larimer St., Suite 1300, Denver, CO 80202-1414
P: 303-294-2228 C: Ex. 6 Personal Privacy (PP) F: 303-294-2328
E: jennifer.mccarter@xcelenergy.com

XCELENERGY.COM
Please consider the environment before printing this email

From: McCarter, Jennifer
Sent: Monday, May 4, 2020 11:19 AM
To: Huggins.richard@EPA.gov
Cc: Clarke, Roger A <roger.a.clarke@xcelenergy.com>; Kilty, Quinn V <quinn.v.kilty@xcelenergy.com>
Subject: Xcel Energy request for CCR call

Hello Richard,

I'm with Xcel Energy in our Colorado operating region; we met last fall at the USWAG Ash Committee meeting. I hope you and your family are staying well. I'm writing to ask if you would have time for a brief call to share our thoughts on how the recent proposed Part A and Part B rulemakings will affect our Colorado power

plants. In particular, we'd like to discuss Comanche Station which has very unique hydrogeologic conditions that don't fit well within the 2015 rule. While we appreciate the opportunities provided in Parts A and B to make site specific demonstrations to address the unique conditions, we still find certain provisions extremely difficult, if not impossible to apply to the site. After our call, we think it would be helpful to begin a dialogue with Region 8 sooner than later and wonder if you could let us know who the appropriate regional staff would be.

Sincerely,

Jennifer McCarter, R.E.M.
Xcel Energy | Responsible By Nature
Environmental Analyst
Environmental Services Department
1800 Larimer St., Suite 1300, Denver, CO 80202-1414
P: 303-294-2228 C: 720-810-1220 F: 303-294-2328
E: jennifer.mccarter@xcelenergy.com

XCELENERGY.COM
Please consider the environment before printing this email

Message

From: Michelle Freeark [mfreeark@azgt.coop]
Sent: 11/12/2020 2:52:27 PM
To: Huggins, Richard [Huggins.Richard@epa.gov]; Behan, Frank [Behan.Frank@epa.gov]; Hillyer, Kirsten [hillyer.kirsten@epa.gov]; Anderson, Lydia [Anderson.Lydia@epa.gov]
Subject: Arizona Electric Power Cooperative, Inc (AEPCO) meeting request on CCR Part B ALD Demonstration

Good morning,

Arizona Electric Power Cooperative, Inc. (AEPCO) is hereby requesting a virtual meeting with EPA staff to discuss AEPCO's Alternative Liner Demonstration (ALD) application submittal in accordance with 40 C.F.R. § 257.71(d)(1)(i).

AEPCO owns and operates the Apache Generating Station (Apache Station), an electric generation station located in Cochise, Arizona about 80 miles east of Tucson, Arizona and about 25 miles northeast of Benson, Arizona. AEPCO is a rural, consumer-owned generation and transmission electric cooperative that provides electric generation service to local rural, consumer-owned electric distribution cooperatives in Arizona and California. As a not-for-profit cooperative, AEPCO is fully owned by its members. AEPCO has six "Class A" members. Together, AEPCO's Class A members serve more than 160,000 meters, representing approximately 400,000 individual residential, commercial, agricultural and industrial consumers. The electric service base is heavily skewed toward rural residential use, with relatively little commercial or industrial load. A substantial proportion of AEPCO's end-users are low income residents.

As the owner and operator of Apache Station, which includes one coal-fired steam electric generating unit (EGU), AEPCO is subject to the CCR Rule. Apache Station is AEPCO's only generating plant.

AEPCO respectfully requests the meeting to be held on Tuesday, November 24th. AEPCO intends to have staff, outside legal counsel and its consultant, Burns & McDonnell participate in the meeting. AEPCO will provide EPA with a draft ALD application prior to the meeting.

AEPCO certainly understands the high demand for meetings with EPA and greatly appreciate your time to consider a meeting with AEPCO, particularly in light of the upcoming deadline for the ALD application.

Thanks,
Michelle

Michelle Freeark, Executive Director of Regulatory Affairs and Corporate Services

Arizona G&T Cooperatives

1000 S. Hwy 80 | Benson, AZ 85602
o: 520-586-5122 | m: Ex. 6 Personal Privacy (PP) | mfreeark@azgt.coop

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Message

From: Jared Morrison [Jared.Morrison@evergy.com]
Sent: 11/12/2020 8:22:02 PM
To: Huggins, Richard [Huggins.Richard@epa.gov]
Subject: Re: CCR Part A Question

Yes. I can be available at 11. Would you like to just call my cell or I can set up a Teams meeting with call in number?

Jared Morrison
Ex. 6 Personal Privacy (PP)

From: Huggins, Richard <Huggins.Richard@epa.gov>
Sent: Thursday, November 12, 2020 2:21:04 PM
To: Jared Morrison <Jared.Morrison@evergy.com>
Subject: RE: CCR Part A Question

****CAUTION: This email originated from outside of the Evergy network. Do not click links or open attachments unless you recognize the sender and know the content is safe****

Jared are you working tomorrow? If so, can we have a quick call at 11? I would like to have my technical person join us. Thanks

Richard Huggins Jr., Chief
Energy Recovery and Waste Disposal Branch
Office of Resource Conservation and Recovery
U.S. Environmental Protection Agency
Desk: 703-308-0017 iPhone: [redacted]

From: Jared Morrison <Jared.Morrison@evergy.com>
Sent: Thursday, November 12, 2020 10:46 AM
To: Huggins, Richard <Huggins.Richard@epa.gov>
Subject: FW: CCR Part A Question

Internal Use Only

Richard,

I wanted to follow up to our discussion last week. We discussed one of my facilities CCR units and how it's situation might apply to the Part B regulation. Specifically, the lack of design information on the unit and how that might impact the potential success of a Part B application under the final rule language. You mentioned having additional discussions with your technical staff. If you have additional thoughts after those discussions you can reach me via email or cell phone.

Thanks,

Jared Morrison
Director, Water and Waste Programs
Evergy

jared.morrison@evergy.com

M: Ex. 6 Personal Privacy (PP)

evergy.com

From: Jared Morrison
Sent: Friday, November 6, 2020 9:09 AM
To: 'Huggins.Richard@epa.gov' <Huggins.Richard@epa.gov>
Subject: RE: CCR Part A Question

Internal Use Only

I'm reaching out to hopefully get a few minutes on the phone with you regarding the CCR Part B regulation. I appreciated your insight on the Part A regulation in previous conversation, and as Evergy evaluates the potential application of Part B at one of our sites, I had a question regarding the intent of the regulation.

If you have a few minutes you can reach me at the number below. Thanks,

Jared Morrison
Director, Water and Waste Programs
Evergy

jared.morrison@evergy.com

M: Ex. 6 Personal Privacy (PP)

evergy.com

From: Jared Morrison
Sent: Monday, September 28, 2020 11:48 AM
To: Huggins.Richard@epa.gov
Subject: CCR Part A Question

Internal Use Only

I have a question regarding the "cessation of boiler operation" option in the recent Part A CCR regulation. Evergy is in a situation attempting to evaluate options at a facility with units near closure that utilize an unlined CCR surface impoundment. I am trying to understand the applicability of this boiler shutdown option and the requirements surrounding alternative capacity. With the tight timelines around the November submission date and the subsequent April 2021 closure date, I was hoping you'd have a few minutes to discuss this regulation.

I can be reached at the number below or will make myself available whenever you are able to speak. Thanks,

Jared Morrison
Director, Water and Waste Programs
Evergy

jared.morrison@evergy.com

M: Ex. 6 Personal Privacy (PP)

evergy.com

Message

From: Jared Morrison [Jared.Morrison@evergy.com]
Sent: 11/12/2020 8:48:07 PM
To: Huggins, Richard [Huggins.Richard@epa.gov]
Subject: Re: CCR Part A Question

Thank you. The facility is the Jeffrey Energy Center and the unit is the Bottom Ash Settling Area.

Jared Morrison
Ex. 6 Personal Privacy (PP)

From: Huggins, Richard <Huggins.Richard@epa.gov>
Sent: Thursday, November 12, 2020 2:30:59 PM
To: Jared Morrison <Jared.Morrison@evergy.com>
Subject: RE: CCR Part A Question

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Just sent an invite for 11:15, just in case my 10 AM runs long. Talk to you then and thanks for your patience. Btw, do you mind telling me which facility this is?

Richard Huggins Jr., Chief
Energy Recovery and Waste Disposal Branch
Office of Resource Conservation and Recovery
U.S. Environmental Protection Agency
Desk: 703-308-0017 iPhone: 571-345-6855

From: Jared Morrison <Jared.Morrison@evergy.com>
Sent: Thursday, November 12, 2020 3:22 PM
To: Huggins, Richard <Huggins.Richard@epa.gov>
Subject: Re: CCR Part A Question

Yes. I can be available at 11. Would you like to just call my cell or I can set up a Teams meeting with call in number?

Jared Morrison
Ex. 6 Personal Privacy (PP)

From: Huggins, Richard <Huggins.Richard@epa.gov>
Sent: Thursday, November 12, 2020 2:21:04 PM
To: Jared Morrison <Jared.Morrison@evergy.com>
Subject: RE: CCR Part A Question

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Richard Huggins Jr., Chief
Energy Recovery and Waste Disposal Branch
Office of Resource Conservation and Recovery
U.S. Environmental Protection Agency
Desk: 703-308-0017 iPhone: 571-345-6855

From: Jared Morrison <Jared.Morrison@evergy.com>
Sent: Thursday, November 12, 2020 10:46 AM
To: Huggins, Richard <Huggins.Richard@epa.gov>
Subject: FW: CCR Part A Question

Internal Use Only

Richard,

I wanted to follow up to our discussion last week. We discussed one of my facilities CCR units and how it's situation might apply to the Part B regulation. Specifically, the lack of design information on the unit and how that might impact the potential success of a Part B application under the final rule language. You mentioned having additional discussions with your technical staff. If you have additional thoughts after those discussions you can reach me via email or cell phone.

Thanks,

Jared Morrison
Director, Water and Waste Programs
Evergy

jared.morrison@evergy.com

M: Ex. 6 Personal Privacy (PP)
evergy.com

From: Jared Morrison
Sent: Friday, November 6, 2020 9:09 AM
To: 'Huggins.Richard@epa.gov' <Huggins.Richard@epa.gov>
Subject: RE: CCR Part A Question

Internal Use Only

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If you have a few minutes you can reach me at the number below. Thanks,

Jared Morrison
Director, Water and Waste Programs
Evergy

jared.morrison@evergy.com

M: Ex. 6 Personal Privacy (PP)

evergy.com

From: Jared Morrison
Sent: Monday, September 28, 2020 11:48 AM
To: Huggins.Richard@epa.gov
Subject: CCR Part A Question

Internal Use Only

I have a question regarding the "cessation of boiler operation" option in the recent Part A CCR regulation. Evergy is in a situation attempting to evaluate options at a facility with units near closure that utilize an unlined CCR surface impoundment. I am trying to understand the applicability of this boiler shutdown option and the requirements surrounding alternative capacity. With the tight timelines around the November submission date and the subsequent April 2021 closure date, I was hoping you'd have a few minutes to discuss this regulation.

I can be reached at the number below or will make myself available whenever you are able to speak. Thanks,

Jared Morrison
Director, Water and Waste Programs
Evergy

jared.morrison@evergy.com

M: Ex. 6 Personal Privacy (PP)

evergy.com

Message

From: Michelle Freeark [mfreeark@azgt.coop]
Sent: 11/17/2020 1:24:36 PM
To: Huggins, Richard [Huggins.Richard@epa.gov]
CC: Long, Michelle [Long.Michelle@epa.gov]; Behan, Frank [Behan.Frank@epa.gov]; Hillyer, Kirsten [hillyer.kirsten@epa.gov]; Anderson, Lydia [Anderson.Lydia@epa.gov]
Subject: RE: Arizona Electric Power Cooperative, Inc (AEPCO) meeting request on CCR Part B ALD Demonstration
Attachments: ATT00001.txt

Thank you Richard!

Michelle Freeark, Executive Director of Regulatory Affairs and Corporate Services

Arizona G&T Cooperatives

1000 S. Hwy 80 | Benson, AZ 85602
o: 520-586-5122 | m: Ex. 6 Personal Privacy (PP) **mfreeark@azgt.coop**

-------- Original message --------
From: "Huggins, Richard" <Huggins.Richard@epa.gov>
Date: 11/16/20 4:07 PM (GMT-05:00)
To: Michelle Freeark <mfreeark@azgt.coop>
Cc: "Long, Michelle" <Long.Michelle@epa.gov>, "Behan, Frank" <Behan.Frank@epa.gov>, "Hillyer, Kirsten" <hillyer.kirsten@epa.gov>, "Anderson, Lydia" <Anderson.Lydia@epa.gov>
Subject: RE: Arizona Electric Power Cooperative, Inc (AEPCO) meeting request on CCR Part B ALD Demonstration

Good afternoon,
Sorry for the delay Michelle. I have asked Michelle Long (Part B rule coordinator), to work with you to get this meeting on our calendar. She will be reaching out tomorrow.

Look forward to the meeting,
Richard

Richard Huggins Jr., Chief
Energy Recovery and Waste Disposal Branch
Office of Resource Conservation and Recovery
U.S. Environmental Protection Agency
Desk: 703-308-0017 iPhone: 571-345-6855

From: Michelle Freeark <mfreeark@azgt.coop>
Sent: Monday, November 16, 2020 3:54 PM
To: Huggins, Richard <Huggins.Richard@epa.gov>; Behan, Frank <Behan.Frank@epa.gov>; Hillyer, Kirsten <hillyer.kirsten@epa.gov>; Anderson, Lydia <Anderson.Lydia@epa.gov>
Subject: RE: Arizona Electric Power Cooperative, Inc (AEPCO) meeting request on CCR Part B ALD Demonstration

Good afternoon,

I am following up on our meeting request that was sent via email last Thursday. Knowing how extremely busy you have been, I thought I would reach out to ensure our email request was received and is being considered.

Respectfully,
Michelle Freeark

Michelle Freeark, Executive Director of Regulatory Affairs and Corporate Services

1000 S. Hwy 80 | Benson, AZ 85602
o: 520-586-5122 | m: Ex. 6 Personal Privacy (PP) nfreeark@azgt.coop

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From: Michelle Freeark
Sent: Thursday, November 12, 2020 7:52 AM
To: 'Huggins.Richard@epa.gov' <Huggins.Richard@epa.gov>; 'Behan.Frank@epa.gov' <Behan.Frank@epa.gov>; 'Hillyer.Kirsten@epa.gov' <Hillyer.Kirsten@epa.gov>; 'anderson.lydia@epa.gov' <anderson.lydia@epa.gov>
Subject: Arizona Electric Power Cooperative, Inc (AEPCO) meeting request on CCR Part B ALD Demonstration

Good morning,

Arizona Electric Power Cooperative, Inc. (AEPCO) is hereby requesting a virtual meeting with EPA staff to discuss AEPCO's Alternative Liner Demonstration (ALD) application submittal in accordance with 40 C.F.R. § 257.71(d)(1)(i).

AEPCO owns and operates the Apache Generating Station (Apache Station), an electric generation station located in Cochise, Arizona about 80 miles east of Tucson, Arizona and about 25 miles northeast of Benson, Arizona. AEPCO is a rural, consumer-owned generation and transmission electric cooperative that provides electric generation service to local rural, consumer-owned electric distribution cooperatives in Arizona and California. As a not-for-profit cooperative, AEPCO is fully owned by its members. AEPCO has six "Class A" members. Together, AEPCO's Class A members serve more than 160,000 meters, representing approximately 400,000 individual residential, commercial, agricultural and industrial consumers. The electric service base is heavily skewed toward rural residential use, with relatively little commercial or industrial load. A substantial proportion of AEPCO's end-users are low income residents.

As the owner and operator of Apache Station, which includes one coal-fired steam electric generating unit (EGU), AEPCO is subject to the CCR Rule. Apache Station is AEPCO's only generating plant.

AEPCO respectfully requests the meeting to be held on Tuesday, November 24th. AEPCO intends to have staff, outside legal counsel and its consultant, Burns & McDonnell participate in the meeting. AEPCO will provide EPA with a draft ALD application prior to the meeting.

AEPCO certainly understands the high demand for meetings with EPA and greatly appreciate your time to consider a meeting with AEPCO, particularly in light of the upcoming deadline for the ALD application.

Thanks,
Michelle

EXTERNAL EMAIL: **Do not open attachments/click links if source is unknown. Please report all phishing attempts to phishing@azgt.coop**

Message

From: Long, Michelle [Long.Michelle@epa.gov]
Sent: 11/17/2020 1:39:13 PM
To: Michelle Freeark [mfreeark@azgt.coop]; Huggins, Richard [Huggins.Richard@epa.gov]
CC: Mills, Jason [Mills.Jason@epa.gov]; Jackson, Mary [Jackson.Mary@epa.gov]
Subject: RE: Arizona Electric Power Cooperative, Inc (AEPCO) meeting request on CCR Part B ALD Demonstration

Hi Michelle,

Let's go for 10-11am ET. That looks like it works best for all of us. Would you like me to set up a MS Teams meeting or do you want to set up the meeting? Thanks.

Michelle Long
Biologist
U.S. Environmental Protection Agency
Office of Resource Conservation and Recovery
Materials Recovery and Waste Management Division
(703) 347-8953

From: Michelle Freeark <mfreeark@azgt.coop>
Sent: Tuesday, November 17, 2020 8:33 AM
To: Long, Michelle <Long.Michelle@epa.gov>; Huggins, Richard <Huggins.Richard@epa.gov>
Cc: Mills, Jason <Mills.Jason@epa.gov>; Jackson, Mary <Jackson.Mary@epa.gov>
Subject: RE: Arizona Electric Power Cooperative, Inc (AEPCO) meeting request on CCR Part B ALD Demonstration

Good morning Michelle,

In our email request we asked for a meeting on Tuesday, November 24th. Our only request is that it is after 8:30 am EDT, other than that we have no preference.

Thanks,
Michelle

Michelle Freeark, Executive Director of Regulatory Affairs and Corporate Services

Arizona G&T Cooperatives

1000 S. Hwy 80 | Benson, AZ 85602
o: 520-586-5122 | m: Ex. 6 Personal Privacy (PP) | **mfreeark@azgt.coop**

-------- Original message --------
From: "Long, Michelle" <Long.Michelle@epa.gov>
Date: 11/17/20 8:28 AM (GMT-05:00)
To: Michelle Freeark <mfreeark@azgt.coop>, "Huggins, Richard" <Huggins.Richard@epa.gov>
Cc: "Mills, Jason" <Mills.Jason@epa.gov>, "Jackson, Mary" <Jackson.Mary@epa.gov>
Subject: RE: Arizona Electric Power Cooperative, Inc (AEPCO) meeting request on CCR Part B ALD Demonstration

Hi Michelle,

Do you have any preferred meeting dates and times? If you can offer a few times, I'll check our calendars and find a time that would work for us. Thanks.

Michelle Long
Biologist
U.S. Environmental Protection Agency
Office of Resource Conservation and Recovery
Materials Recovery and Waste Management Division
(703) 347-8953

From: Michelle Freeark <mfreeark@azgt.coop>
Sent: Tuesday, November 17, 2020 8:25 AM
To: Huggins, Richard <Huggins.Richard@epa.gov>
Cc: Long, Michelle <Long.Michelle@epa.gov>; Behan, Frank <Behan.Frank@epa.gov>; Hillyer, Kirsten <hillyer.kirsten@epa.gov>; Anderson, Lydia <Anderson.Lydia@epa.gov>
Subject: RE: Arizona Electric Power Cooperative, Inc (AEPCO) meeting request on CCR Part B ALD Demonstration

Thank you Richard!

Michelle Freeark, Executive Director of Regulatory Affairs and Corporate Services

1000 S. Hwy 80 | Benson, AZ 85602
o: 520-586-5122 | m: Ex. 6 Personal Privacy (PP) | **mfreeark@azgt.coop**

-------- Original message --------
From: "Huggins, Richard" <Huggins.Richard@epa.gov>
Date: 11/16/20 4:07 PM (GMT-05:00)
To: Michelle Freeark <mfreeark@azgt.coop>
Cc: "Long, Michelle" <Long.Michelle@epa.gov>, "Behan, Frank" <Behan.Frank@epa.gov>, "Hillyer, Kirsten" <hillyer.kirsten@epa.gov>, "Anderson, Lydia" <Anderson.Lydia@epa.gov>
Subject: RE: Arizona Electric Power Cooperative, Inc (AEPCO) meeting request on CCR Part B ALD Demonstration

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Richard

Richard Huggins Jr., Chief
Energy Recovery and Waste Disposal Branch
Office of Resource Conservation and Recovery
U.S. Environmental Protection Agency
Desk: 703-308-0017 iPhone: 571-345-6855

From: Michelle Freeark <mfreeark@azgt.coop>
Sent: Monday, November 16, 2020 3:54 PM
To: Huggins, Richard <Huggins.Richard@epa.gov>; Behan, Frank <Behan.Frank@epa.gov>; Hillyer, Kirsten <hillyer.kirsten@epa.gov>; Anderson, Lydia <Anderson.Lydia@epa.gov>
Subject: RE: Arizona Electric Power Cooperative, Inc (AEPCO) meeting request on CCR Part B ALD Demonstration

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Respectfully,
Michelle Freeark

Michelle Freeark, Executive Director of Regulatory Affairs and Corporate Services

1000 S. Hwy 80 | Benson, AZ 85602
o: 520-586-5122 | m: [redacted] Ex. 6 Personal Privacy (PP) | **mfreeark@azgt.coop**

Notice: This message and any attachments are for the sole and confidential use of the intended recipients and may contain proprietary and/or confidential information which may be privileged or otherwise protected from disclosure.

From: Michelle Freeark
Sent: Thursday, November 12, 2020 7:52 AM
To: 'Huggins.Richard@epa.gov' <Huggins.Richard@epa.gov>; 'Behan.Frank@epa.gov' <Behan.Frank@epa.gov>; 'Hillyer.Kirsten@epa.gov' <Hillyer.Kirsten@epa.gov>; 'anderson.lydia@epa.gov' <anderson.lydia@epa.gov>
Subject: Arizona Electric Power Cooperative, Inc (AEPCO) meeting request on CCR Part B ALD Demonstration

Good morning,

Arizona Electric Power Cooperative, Inc. (AEPCO) is hereby requesting a virtual meeting with EPA staff to discuss AEPCO's Alternative Liner Demonstration (ALD) application submittal in accordance with 40 C.F.R. § 257.71(d)(1)(i).

AEPCO owns and operates the Apache Generating Station (Apache Station), an electric generation station located in Cochise, Arizona about 80 miles east of Tucson, Arizona and about 25 miles northeast of Benson, Arizona. AEPCO is a rural, consumer-owned generation and transmission electric cooperative that provides electric generation service to local rural, consumer-owned electric distribution cooperatives in Arizona and California. As a not-for-profit cooperative, AEPCO is fully owned by its members. AEPCO has six "Class A" members. Together, AEPCO's Class A members serve more than 160,000 meters, representing approximately 400,000 individual residential, commercial, agricultural and industrial consumers. The electric service base is heavily skewed toward rural residential use, with relatively little commercial or industrial load. A substantial proportion of AEPCO's end-users are low income residents.

As the owner and operator of Apache Station, which includes one coal-fired steam electric generating unit (EGU), AEPCO is subject to the CCR Rule. Apache Station is AEPCO's only generating plant.

AEPCO respectfully requests the meeting to be held on Tuesday, November 24th. AEPCO intends to have staff, outside legal counsel and its consultant, Burns & McDonnell participate in the meeting. AEPCO will provide EPA with a draft ALD application prior to the meeting.

AEPCO certainly understands the high demand for meetings with EPA and greatly appreciate your time to consider a meeting with AEPCO, particularly in light of the upcoming deadline for the ALD application.

Thanks,
Michelle

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Message

From: Michelle Freeark [mfreeark@azgt.coop]
Sent: 11/17/2020 6:09:46 PM
To: Long, Michelle [Long.Michelle@epa.gov]; Huggins, Richard [Huggins.Richard@epa.gov]
CC: Mills, Jason [Mills.Jason@epa.gov]; Jackson, Mary [Jackson.Mary@epa.gov]
Subject: RE: Arizona Electric Power Cooperative, Inc (AEPCO) meeting request on CCR Part B ALD Demonstration

Michelle,

Our preference is to use our virtual meeting platform, Ring Central, which has worked extremely well since March.

I can send the invite and you can forward to EPA attendees if that is ok?

Thanks,
Michelle

Michelle Freeark, Executive Director of Regulatory Affairs and Corporate Services

Arizona G&T Cooperatives

1000 S. Hwy 80 | Benson, AZ 85602
o: 520-586-5122 | m: Ex. 6 Personal Privacy (PP) | **mfreeark@azgt.coop**

From: Long, Michelle <Long.Michelle@epa.gov>
Sent: Tuesday, November 17, 2020 6:39 AM
To: Michelle Freeark <mfreeark@azgt.coop>; Huggins, Richard <Huggins.Richard@epa.gov>
Cc: Mills, Jason <Mills.Jason@epa.gov>; Jackson, Mary <Jackson.Mary@epa.gov>
Subject: RE: Arizona Electric Power Cooperative, Inc (AEPCO) meeting request on CCR Part B ALD Demonstration

Hi Michelle,

Let's go for 10-11am ET. That looks like it works best for all of us. Would you like me to set up a MS Teams meeting or do you want to set up the meeting? Thanks.

Michelle Long
Biologist
U.S. Environmental Protection Agency
Office of Resource Conservation and Recovery
Materials Recovery and Waste Management Division
(703) 347-8953

From: Michelle Freeark <mfreeark@azgt.coop>
Sent: Tuesday, November 17, 2020 8:33 AM
To: Long, Michelle <Long.Michelle@epa.gov>; Huggins, Richard <Huggins.Richard@epa.gov>
Cc: Mills, Jason <Mills.Jason@epa.gov>; Jackson, Mary <Jackson.Mary@epa.gov>
Subject: RE: Arizona Electric Power Cooperative, Inc (AEPCO) meeting request on CCR Part B ALD Demonstration

Good morning Michelle,

In our email request we asked for a meeting on Tuesday, November 24th. Our only request is that it is after 8:30 am EDT, other than that we have no preference.

Thanks,
Michelle

Michelle Freeark, Executive Director of Regulatory Affairs and Corporate Services

Arizona G&T Cooperatives

1000 S. Hwy 80 | Benson, AZ 85602
o: 520-586-5122 | m: Ex. 6 Personal Privacy (PP) | **mfreeark@azgt.coop**

-------- Original message --------
From: "Long, Michelle" <Long.Michelle@epa.gov>
Date: 11/17/20 8:28 AM (GMT-05:00)
To: Michelle Freeark <mfreeark@azgt.coop>, "Huggins, Richard" <Huggins.Richard@epa.gov>
Cc: "Mills, Jason" <Mills.Jason@epa.gov>, "Jackson, Mary" <Jackson.Mary@epa.gov>
Subject: RE: Arizona Electric Power Cooperative, Inc (AEPCO) meeting request on CCR Part B ALD Demonstration

Hi Michelle,

Do you have any preferred meeting dates and times? If you can offer a few times, I'll check our calendars and find a time that would work for us. Thanks.

Michelle Long
Biologist
U.S. Environmental Protection Agency
Office of Resource Conservation and Recovery
Materials Recovery and Waste Management Division
(703) 347-8953

From: Michelle Freeark <mfreeark@azgt.coop>
Sent: Tuesday, November 17, 2020 8:25 AM
To: Huggins, Richard <Huggins.Richard@epa.gov>
Cc: Long, Michelle <Long.Michelle@epa.gov>; Behan, Frank <Behan.Frank@epa.gov>; Hillyer, Kirsten <hillyer.kirsten@epa.gov>; Anderson, Lydia <Anderson.Lydia@epa.gov>
Subject: RE: Arizona Electric Power Cooperative, Inc (AEPCO) meeting request on CCR Part B ALD Demonstration

Thank you Richard!

Michelle Freeark, Executive Director of Regulatory Affairs and Corporate Services

1000 S. Hwy 80 | Benson, AZ 85602
o: 520-586-5122 | m: Ex. 6 Personal Privacy (PP) | mfreeark@azgt.coop

-------- Original message --------
From: "Huggins, Richard" <Huggins.Richard@epa.gov>
Date: 11/16/20 4:07 PM (GMT-05:00)
To: Michelle Freeark <mfreeark@azgt.coop>
Cc: "Long, Michelle" <Long.Michelle@epa.gov>, "Behan, Frank" <Behan.Frank@epa.gov>, "Hillyer, Kirsten" <hillyer.kirsten@epa.gov>, "Anderson, Lydia" <Anderson.Lydia@epa.gov>
Subject: RE: Arizona Electric Power Cooperative, Inc (AEPCO) meeting request on CCR Part B ALD Demonstration

Good afternoon,
Sorry for the delay Michelle. I have asked Michelle Long (Part B rule coordinator), to work with you to get this meeting on our calendar. She will be reaching out tomorrow.

Look forward to the meeting,
Richard

Richard Huggins Jr., Chief
Energy Recovery and Waste Disposal Branch
Office of Resource Conservation and Recovery
U.S. Environmental Protection Agency
Desk: 703-308-0017 iPhone: 571-345-6855

From: Michelle Freeark <mfreeark@azgt.coop>
Sent: Monday, November 16, 2020 3:54 PM
To: Huggins, Richard <Huggins.Richard@epa.gov>; Behan, Frank <Behan.Frank@epa.gov>; Hillyer, Kirsten <hillyer.kirsten@epa.gov>; Anderson, Lydia <Anderson.Lydia@epa.gov>
Subject: RE: Arizona Electric Power Cooperative, Inc (AEPCO) meeting request on CCR Part B ALD Demonstration

Good afternoon,

I am following up on our meeting request that was sent via email last Thursday. Knowing how extremely busy you have been, I thought I would reach out to ensure our email request was received and is being considered.

Respectfully,
Michelle Freeark

Michelle Freeark, Executive Director of Regulatory Affairs and Corporate Services

1000 S. Hwy 80 | Benson, AZ 85602
o: 520-586-5122 | m: Ex. 6 Personal Privacy (PP) | mfreeark@azgt.coop

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Subject: Arizona Electric Power Cooperative, Inc (AEPCO) meeting request on CCR Part B ALD Demonstration

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AEPCO certainly understands the high demand for meetings with EPA and greatly appreciate your time to consider a meeting with AEPCO, particularly in light of the upcoming deadline for the ALD application.

Thanks,
Michelle

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EXTERNAL EMAIL: Do not open attachments/click links if source is unknown. Please report all phishing attempts to phishing@azgt.coop

Message

From: Shimshock, John [jshimshock@keyconops.com]
Sent: 11/19/2020 5:13:36 PM
To: Huggins, Richard [Huggins.Richard@epa.gov]
CC: Kushner, Joseph [jkushner@keyconops.com]; Adam Scheller [a.scheller@gaiconsultants.com]
Subject: FW: CCR Rule Part B application per § 257.71(d)(1)(ii) for four existing CCR clay-lined surface impoundments at Conemaugh Station
Attachments: ATT00001.txt

Greetings Mr. Huggins,
I'm forwarding this email to you per the instructions included in the auto out-of-office reply from Michelle Long. Thanks in advance for your help with this matter – John.

From: Shimshock, John
Sent: Thursday, November 19, 2020 12:11 PM
To: Long, Michelle <Long.Michelle@epa.gov>
Cc: Kushner, Joseph <jkushner@keyconops.com>; Adam Scheller <a.scheller@gaiconsultants.com>
Subject: CCR Rule Part B application per § 257.71(d)(1)(ii) for four existing CCR clay-lined surface impoundments at Conemaugh Station

Hi again Ms. Long,
I'm writing to inquire of the submittal procedures for the subject application. You are listed as the EPA contact for this rule, so I thought it would be best to start my inquiry with you. Conemaugh Station and our engineering firm, GAI Consultants, are aware that EPA set-up a Part A implementation webpage (link: https://www.epa.gov/coalash/ccr-part-implementation) that provides submittal instructions, but to our knowledge a similar Part B webpage has not yet been (or will be) set-up. As such, I'd be grateful for your guidance on this matter. For the Part A submittals, the demonstration transmittal letter was addressed to Administrator Wheler, and the cc list included the designated EPA reviewers, who received the entire package via email transmittal. We can do the same for a Part B submittal, please advise. Because of the number of attachments required for the Part B application, the resulting file size may be large, and I'm uncertain if EPA restricts email transmittals with large file size attachments.

Thanks in advance for your help with this matter, and I'm looking forward to receipt of your reply. Wishing you and yours an (early) enjoyable Thanksgiving holiday – John.

John P. Shimshock
Environmental Specialist
Conemaugh Generating Station
1442 Power Plant Road
New Florence, PA 15944
Office Phone: (724) 235-4596
Cellular Phone: Ex. 6 Personal Privacy (PP)
jshimshock@keyconops.com

From: Long, Michelle <Long.Michelle@epa.gov>
Sent: Tuesday, February 4, 2020 11:18 AM
To: Shimshock, John <jshimshock@keyconops.com>
Cc: 'P. E. Stephen M. Frank (Stephen.Frank@genon.com)' <Stephen.Frank@genon.com>
Subject: RE: GenOn Website Postings - updates for Keystone and Conemaugh Generating Stations

Hello Mr. Shimshock,

Thank you for this update and I will share with my colleagues to update EPA's CCR website for the Keystone and Conemaugh Generating Stations. If there are any other changes to the facility websites in the future, please let me know so we can update our records accordingly.

Thanks,
Michelle

Michelle Long
Biologist
U.S. Environmental Protection Agency
Office of Resource Conservation and Recovery
(703) 347-8953

From: Shimshock, John <jshimshock@keyconops.com>
Sent: Wednesday, January 29, 2020 4:27 PM
To: Long, Michelle <Long.Michelle@epa.gov>
Cc: 'P. E. Stephen M. Frank (Stephen.Frank@genon.com)' <Stephen.Frank@genon.com>
Subject: RE: GenOn Website Postings - updates for Keystone and Conemaugh Generating Stations

Greetings Ms. Long,
A follow-up to the email below from my colleague Steve Frank at GenOn (copied herein).

In accordance with various fillings submitted to U.S. EPA and Pennsylvania Department of Environmental Protection (PA DEP) in CY 2019, the association between GenOn and the Keystone and Conemaugh Generating Stations was terminated in CY 2019. CCR reports for the Keystone and Conemaugh Stations previously posted to GenOn's CCR webpage were transferred as part of the above-mentioned development to a new CCR webpage for these stations, link: http://ccr.keyconops.com/. The PA DEP was informed of recent postings to this site, example email inform attached herein.

I was just informed that EPA maintains a website that presents the links for all of CCR webpages for the applicable stations, link:
https://www.epa.gov/coalash/list-publicly-accessible-internet-sites-hosting-compliance-data-and-information-required#pa

I'm writing simply to inform you of the update for the Keystone and Conemaugh Stations. I hope you find this message helpful, happy to discuss – John.

John P. Shimshock
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Conemaugh Generating Station
1442 Power Plant Road
New Florence, PA 15944
Office Phone: (724) 235-4596
Cellular Phone: Ex. 6 Personal Privacy (PP)
jshimshock@keyconops.com
Please note my new email address

From: Frank, Stephen <Stephen.Frank@genon.com>
Sent: Friday, May 17, 2019 9:28 AM
To: long.michelle@epa.gov
Cc: Shimshock, John <John.Shimshock@genon.com>; Jacklin, Mark J <Mark.Jacklin@genon.com>; McGraw, William P. <William.McGraw@genon.com>; Schenker, Jeremy S. <Jeremy.Schenker@genon.com>; Johnson, Walter <walter.johnson@genon.com>; Nitz, Mark <Mark.Nitz@genon.com>; Heimlicher, Peter <Bruce.Heimlicher@genon.com>; Anderson, Pilantana <Pilantana.Anderson@genon.com>
Subject: GenOn Website Postings

Michelle,

Conemaugh Generating Station received correspondence from EPA, dated May 7, 2019 regarding the posting of CCR Data and Information under the rule. GenOn and NRG initiated activities to separate the two businesses in 2017. As a result, GenOn's CCR records were moved to a new website in August 2018 and are now maintained at https://www.genon.com/ccr-rule-compliance. GenOn Holdings, Inc. separated from NRG Energy, Inc. in December 2018.

As you will find, the GenOn CCR units include:

1. The Brandywine Ash Landfill in Brandywine, MD
2. The Cheswick Generating Station Bottom Ash Emergency Pond (#0272216), Bottom Ash Recycle Pond (#0272216) and Cheswick Ash Disposal Site (#300720) in Springdale, PA
3. The Conemaugh Generating Station Bottom Ash Filter Recycle Pond - A (#3283201), Bottom Ash Filter Ponds – B, C & D (#3283201), and the Conemaugh Station Ash/Refuse Disposal Site Stage II & III (#300876) in New Florence, PA
4. The Keystone Generating Station Bottom Ash Ponds A, B, & C (#0386201) and the Keystone Generating Station Ash/Refuse Disposal Site East and West Valley (#300837) in Shelocta, PA
5. The New Castle Generating Station North Bottom Ash Pond and the New Castle Plant Ash Landfill (#300818) in West Pittsburg, PA
6. Westland Ash Landfill Unit B in Dickerson, MD

Please do not hesitate to contact me with any questions regarding the CCR postings for the GenOn fleet.

Thank you,

Stephen M. Frank, PE (Pa)
Senior Manager, Environmental
Stephen.Frank@GenOn.com
724-249-3610

Message

From: Shimshock, John [jshimshock@keyconops.com]
Sent: 11/23/2020 5:26:43 PM
To: Long, Michelle [Long.Michelle@epa.gov]
CC: Kushner, Joseph [jkushner@keyconops.com]; Adam Scheller [a.scheller@gaiconsultants.com]; Huggins, Richard [Huggins.Richard@epa.gov]; Jackson, Mary [Jackson.Mary@epa.gov]; Mills, Jason [Mills.Jason@epa.gov]
Subject: RE: CCR Rule Part B application per § 257.71(d)(1)(ii) for four existing CCR clay-lined surface impoundments at Conemaugh Station

Yes it does, thanks for the quick response. We expect to forward the application to you / EPA via email either today or tomorrow, and certainly no later than the Nov. 30 deadline – John.

From: Long, Michelle <Long.Michelle@epa.gov>
Sent: Monday, November 23, 2020 12:19 PM
To: Shimshock, John <jshimshock@keyconops.com>
Cc: Kushner, Joseph <jkushner@keyconops.com>; Adam Scheller <a.scheller@gaiconsultants.com>; Huggins, Richard <Huggins.Richard@epa.gov>; Jackson, Mary <Jackson.Mary@epa.gov>; Mills, Jason <Mills.Jason@epa.gov>
Subject: RE: CCR Rule Part B application per § 257.71(d)(1)(ii) for four existing CCR clay-lined surface impoundments at Conemaugh Station

Hi John,

That makes sense, and either option would work for us. EPA email can receive attachments up to 150 MB, but if needed, you may send the people copied on this email a few separate emails. Posting it to the website would also be good, but please also email it to us. Does that work for you?

Thanks,
Michelle

Michelle Long
Biologist
U.S. Environmental Protection Agency
Office of Resource Conservation and Recovery
Materials Recovery and Waste Management Division
(703) 347-8953

From: Shimshock, John <jshimshock@keyconops.com>
Sent: Monday, November 23, 2020 12:13 PM
To: Long, Michelle <Long.Michelle@epa.gov>
Cc: Kushner, Joseph <jkushner@keyconops.com>; Adam Scheller <a.scheller@gaiconsultants.com>
Subject: RE: CCR Rule Part B application per § 257.71(d)(1)(ii) for four existing CCR clay-lined surface impoundments at Conemaugh Station

Hi Michelle,
Yes - there are many attachments with the subject application. We can generate and forward either (1) a single composite document (we'll post that document to the KEY-CON CCR website) or (2) several files, largely based on the attachment ID. We may be forced to go with option #2 (in 2 or more transmittals) because of the file size of the single composite document (may be 25MB or larger). Please advise what works best for you / EPA.

Wishing you and yours a Happy Thanksgiving holiday – John.

From: Long, Michelle <Long.Michelle@epa.gov>
Sent: Monday, November 23, 2020 11:37 AM

To: Shimshock, John <jshimshock@keyconops.com>
Cc: Kushner, Joseph <jkushner@keyconops.com>; Adam Scheller <a.scheller@gaiconsultants.com>
Subject: RE: CCR Rule Part B application per § 257.71(d)(1)(ii) for four existing CCR clay-lined surface impoundments at Conemaugh Station

Hi John,

Thank you for your question. It looks like my manager, Richard Huggins, replied to you last week. Do you have any further questions?

I hope you have a safe and happy Thanksgiving as well.

Michelle Long
Biologist
U.S. Environmental Protection Agency
Office of Resource Conservation and Recovery
Materials Recovery and Waste Management Division
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Subject: RE: GenOn Website Postings - updates for Keystone and Conemaugh Generating Stations

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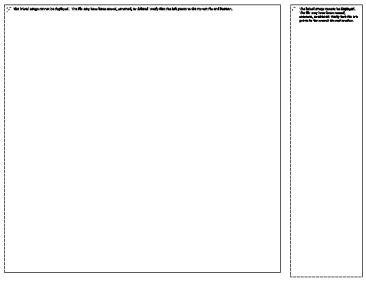

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Cc: Shimshock, John <John.Shimshock@genon.com>; Jacklin, Mark J <Mark.Jacklin@genon.com>; McGraw, William P. <William.McGraw@genon.com>; Schenker, Jeremy S. <Jeremy.Schenker@genon.com>; Johnson, Walter <walter.johnson@genon.com>; Nitz, Mark <Mark.Nitz@genon.com>; Heimlicher, Peter <Bruce.Heimlicher@genon.com>; Anderson, Pilantana <Pilantana.Anderson@genon.com>
Subject: GenOn Website Postings

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Thank you,

GenOn

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Senior Manager, Environmental
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724-249-3610

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Sent: 11/24/2020 7:35:20 PM
To: Long, Michelle [Long.Michelle@epa.gov]; Jackson, Mary [Jackson.Mary@epa.gov]; Huggins, Richard [Huggins.Richard@epa.gov]; Mills, Jason [Mills.Jason@epa.gov]
CC: Kushner, Joseph [jkushner@keyconops.com]; Illig, Lauren [lillig@keyconops.com]; Adam Scheller [a.scheller@gaiconsultants.com]; 'Kent Cockley' [k.cockley@gaiconsultants.com]; Leigh Rounce [L.Rounce@gaiconsultants.com]; Derek Furstenwerth [derek@camsesparc.com]; Patrick Brosnan [pbrosnan@camsesparc.com]
Subject: Conemaugh Generating Station - Submittal per 40 CFR §257.71(d)(1)(i) Requirements

Greetings Ms. Long, Ms. Jackson and Messrs. Huggins and Mills,

Please see below a link to a Sharepoint site for the subject submittal (a single document, 27 MB file size). I was successful in downloading and opening the document (pdf).
Conemaugh Station and our engineering firm, GAI Consultants, are grateful to EPA for your consideration and hopeful approval to this application.
If you have any questions or concerns regarding this submittal, then please contact either Joe Kushner or me, contact info below.
Wishing all an enjoyable Thanksgiving holiday – John.

Joseph Kushner, PE

Strategy and Compliance Manager
Keystone/Conemaugh Generating Stations
1142 Power Plant Rd.
New Florence, PA 15944
Office: 724-235-4529
Cell: Ex. 6 Personal Privacy (PP)
jkushner@keyconops.com

John P. Shimshock
Environmental Specialist
Conemaugh Generating Station
1442 Power Plant Road
New Florence, PA 15944
Office Phone: (724) 235-4596
Cellular Phone: Ex. 6 Personal Privacy (PP)
jshimshock@keyconops.com

From: Leigh Rounce <L.Rounce@gaiconsultants.com>
Sent: Tuesday, November 24, 2020 11:29 AM
To: Shimshock, John <jshimshock@keyconops.com>
Cc: Adam Scheller <a.scheller@gaiconsultants.com>
Subject: Conemaugh AFPs - CCR Rule Part B - Final Alternate Liner Demonstration Application

John,

The final, compiled Part B Demonstration Application can be downloaded using the following link: https://gaiconsultants-my.sharepoint.com/:f:/p/l_rounce/EtlPeUrvTK9Os4g7_vbLKmsBOc9MY5JI7JIY3L8iuYj1OQ?e=xYnaMd

File access has been granted to the following individuals:
- Richard Huggins (Huggins.Richard@epa.gov)

- Michelle Long (Long.Michelle@epa.gov)
- Mary Jackson (Jackson.Mary@epa.gov)
- Jason Mills (Mills.Jason@epa.gov)
- Joseph Kushner (jkushner@keyconops.com)
- Patrick Brosnan (pbrosnan@camsesparc.com)
- Adam Scheller (a.scheller@gaiconsultants.com)

Please let us know if you have any difficulty accessing this document, and we can work with our IT department to resolve the issue.

Thank you,
Leigh

Leigh L. Rounce, EIT
Project EIT

GAI Consultants, 4200 Triangle Lane, Export, PA 15632-1358
T 724.387.2170 Ex. 6 Personal Privacy (PP)

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Message

From: Buening, Vincent [VBuening@trccompanies.com]
Sent: 11/25/2020 12:11:48 AM
To: Huggins, Richard [Huggins.Richard@epa.gov]
Subject: Part B Alternative Liner Demonstration Application Submittals - EPA Personnel to Email Them To

Mr. Huggins,

I looked for and could not find a CCR Part B Implementation web site yet like EPA has for Part A.

Should Part B Alternative Liner Demonstration Applications be submitted via email to the same three people as listed for Part A (Kirsten Hillyer
Frank Behan and Richard Huggins)?

Hoping to submit some Part B Alternative Liner Demonstration Applications tomorrow and we want to be sure we submit them to the proper EPA personnel.

Thank you. Regards. Vince

Vincent E. Buening, C.P.G.
Senior Project Manager/Senior Client Service Manager

TRC
1540 Eisenhower Place, Ann Arbor, MI 48108
T 734.585.7812 | F 734.971.9022 | C Ex. 6 Personal Privacy (PP)
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Message

From: Long, Michelle [Long.Michelle@epa.gov]
Sent: 11/25/2020 12:16:03 PM
To: Shimshock, John [jshimshock@keyconops.com]; Jackson, Mary [Jackson.Mary@epa.gov]; Huggins, Richard [Huggins.Richard@epa.gov]; Mills, Jason [Mills.Jason@epa.gov]
CC: Kushner, Joseph [jkushner@keyconops.com]; Illig, Lauren [lillig@keyconops.com]; Adam Scheller [a.scheller@gaiconsultants.com]; 'Kent Cockley' [k.cockley@gaiconsultants.com]; Leigh Rounce [L.Rounce@gaiconsultants.com]; Derek Furstenwerth [derek@camsesparc.com]; Patrick Brosnan [pbrosnan@camsesparc.com]
Subject: RE: Conemaugh Generating Station - Submittal per 40 CFR §257.71(d)(1)(i) Requirements

Hello John,

I am confirming receipt of Conemaugh Generating Station's application and EPA is able to open the document from the file shared below. Thanks.

Michelle Long
Biologist
U.S. Environmental Protection Agency
Office of Resource Conservation and Recovery
Materials Recovery and Waste Management Division
(703) 347-8953

From: Shimshock, John <jshimshock@keyconops.com>
Sent: Tuesday, November 24, 2020 2:35 PM
To: Long, Michelle <Long.Michelle@epa.gov>; Jackson, Mary <Jackson.Mary@epa.gov>; Huggins, Richard <Huggins.Richard@epa.gov>; Mills, Jason <Mills.Jason@epa.gov>
Cc: Kushner, Joseph <jkushner@keyconops.com>; Illig, Lauren <lillig@keyconops.com>; Adam Scheller <a.scheller@gaiconsultants.com>; 'Kent Cockley' <k.cockley@gaiconsultants.com>; Leigh Rounce <L.Rounce@gaiconsultants.com>; Derek Furstenwerth <derek@camsesparc.com>; Patrick Brosnan <pbrosnan@camsesparc.com>
Subject: Conemaugh Generating Station - Submittal per 40 CFR §257.71(d)(1)(i) Requirements

Greetings Ms. Long, Ms. Jackson and Messrs. Huggins and Mills,

Please see below a link to a Sharepoint site for the subject submittal (a single document, 27 MB file size). I was successful in downloading and opening the document (pdf).
Conemaugh Station and our engineering firm, GAI Consultants, are grateful to EPA for your consideration and hopeful approval to this application.
If you have any questions or concerns regarding this submittal, then please contact either Joe Kushner or me, contact info below.
Wishing all an enjoyable Thanksgiving holiday – John.

Joseph Kushner, PE

Strategy and Compliance Manager
Keystone/Conemaugh Generating Stations
1142 Power Plant Rd.
New Florence, PA 15944
Office: 724-235-4529
Cell: Ex. 6 Personal Privacy (PP)
jkushner@keyconops.com

John P. Shimshock
Environmental Specialist
Conemaugh Generating Station
1442 Power Plant Road
New Florence, PA 15944
Office Phone: (724) 235-4596
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jshimshock@keyconops.com

From: Leigh Rounce <L.Rounce@gaiconsultants.com>
Sent: Tuesday, November 24, 2020 11:29 AM
To: Shimshock, John <jshimshock@keyconops.com>
Cc: Adam Scheller <a.scheller@gaiconsultants.com>
Subject: Conemaugh AFPs - CCR Rule Part B - Final Alternate Liner Demonstration Application

John,

The final, compiled Part B Demonstration Application can be downloaded using the following link: https://gaiconsultants-my.sharepoint.com/:f:/p/l_rounce/EtlPeUrvTK9Os4g7_vbLKmsBOc9MY5Jl7JlY3L8iuYj1OQ?e=xYnaMd

File access has been granted to the following individuals:

- Richard Huggins (Huggins.Richard@epa.gov)
- Michelle Long (Long.Michelle@epa.gov)
- Mary Jackson (Jackson.Mary@epa.gov)
- Jason Mills (Mills.Jason@epa.gov)
- Joseph Kushner (jkushner@keyconops.com)
- Patrick Brosnan (pbrosnan@camsesparc.com)
- Adam Scheller (a.scheller@gaiconsultants.com)

Please let us know if you have any difficulty accessing this document, and we can work with our IT department to resolve the issue.

Thank you,
Leigh

Leigh L. Rounce, EIT
Project EIT

GAI Consultants, 4200 Triangle Lane, Export, PA 15632-1358
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Message

From: Long, Michelle [Long.Michelle@epa.gov]
Sent: 11/25/2020 2:58:01 PM
To: Huggins, Richard [Huggins.Richard@epa.gov]; Buening, Vincent [VBuening@trccompanies.com]
CC: Mills, Jason [Mills.Jason@epa.gov]; Jackson, Mary [Jackson.Mary@epa.gov]
Subject: RE: Part B Alternative Liner Demonstration Application Submittals - EPA Personnel to Email Them To

Mr. Buening,

We just set up a CCR Part B implementation website in case you need it, but the information that Richard provided is accurate. Thanks.
https://www.epa.gov/coalash/ccr-part-b-implementation

Michelle Long
Biologist
U.S. Environmental Protection Agency
Office of Resource Conservation and Recovery
Materials Recovery and Waste Management Division
(703) 347-8953

From: Huggins, Richard <Huggins.Richard@epa.gov>
Sent: Tuesday, November 24, 2020 7:34 PM
To: Buening, Vincent <VBuening@trccompanies.com>
Cc: Long, Michelle <Long.Michelle@epa.gov>; Mills, Jason <Mills.Jason@epa.gov>; Jackson, Mary <Jackson.Mary@epa.gov>
Subject: RE: Part B Alternative Liner Demonstration Application Submittals - EPA Personnel to Email Them To

My apologies, we should have updated the web for Part B but have been swamped.

Submittals should go to the folks also included on this email. Thank you

Richard Huggins Jr., Chief
Energy Recovery and Waste Disposal Branch
Office of Resource Conservation and Recovery
U.S. Environmental Protection Agency
Desk: 703-308-0017 iPhone: 571-345-6855

From: Buening, Vincent <VBuening@trccompanies.com>
Sent: Tuesday, November 24, 2020 7:12 PM
To: Huggins, Richard <Huggins.Richard@epa.gov>
Subject: Part B Alternative Liner Demonstration Application Submittals - EPA Personnel to Email Them To

Mr. Huggins,

I looked for and could not find a CCR Part B Implementation web site yet like EPA has for Part A.

Should Part B Alternative Liner Demonstration Applications be submitted via email to the same three people as listed for Part A (Kirsten Hillyer
Frank Behan and Richard Huggins)?

Hoping to submit some Part B Alternative Liner Demonstration Applications tomorrow and we want to be sure we submit them to the proper EPA personnel.

Thank you. Regards. Vince

Vincent E. Buening, C.P.G.
Senior Project Manager/Senior Client Service Manager

TRC

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Message

From: Long, Michelle [Long.Michelle@epa.gov]
Sent: 11/25/2020 3:12:35 PM
To: Martinez Andrea L [Andrea.Martinez@srpnet.com]
CC: Huggins, Richard [Huggins.Richard@epa.gov]; Jackson, Mary [Jackson.Mary@epa.gov]; Mills, Jason [Mills.Jason@epa.gov]
Subject: RE: Salt River Project, Coronado Generating Station, Part B Application Receipt Assistance

Ms. Martinez,

For your awareness, EPA just set up a CCR Part B Implementation website. Please follow the "How to Submit a Demonstration Package" instructions to submit the your application.
https://www.epa.gov/coalash/ccr-part-b-implementation

This information is the same as we have already shared with you, below, but I wanted to tell you we set up the website. Thanks.

Michelle Long
Biologist
U.S. Environmental Protection Agency
Office of Resource Conservation and Recovery
Materials Recovery and Waste Management Division
(703) 347-8953

From: Martinez Andrea L <Andrea.Martinez@srpnet.com>
Sent: Tuesday, November 24, 2020 3:56 PM
To: Long, Michelle <Long.Michelle@epa.gov>
Cc: Huggins, Richard <Huggins.Richard@epa.gov>; Jackson, Mary <Jackson.Mary@epa.gov>; Mills, Jason <Mills.Jason@epa.gov>
Subject: RE: Salt River Project, Coronado Generating Station, Part B Application Receipt Assistance

Thank you so much Ms. Long,

We will submit to all four EPA team members below via secure link as we did for the November 9 meeting, as quickly as possible once we are satisfied with the final draft from our consulting team. Thank you for your reply!

Andrea Martinez
Water Quality & Waste Management Services Manager
SRP | Environmental Services
P: (602) 236-2618 | **M:** Ex. 6 Personal Privacy (PP)

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From: Long, Michelle <Long.Michelle@epa.gov>
Sent: Tuesday, November 24, 2020 1:12 PM
To: Martinez Andrea L <Andrea.Martinez@srpnet.com>
Cc: Huggins, Richard <Huggins.Richard@epa.gov>; Jackson, Mary <Jackson.Mary@epa.gov>; Mills, Jason <Mills.Jason@epa.gov>
Subject: RE: Salt River Project, Coronado Generating Station, Part B Application Receipt Assistance

CAUTION - EXTERNAL EMAIL
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For mobile forward to phish@srpnet.com

Good afternoon Ms. Martinez,

I received your message from my colleague Kirsten Hillyer. I'm the point of contact for the Part B demonstrations.

I think I was the person who was able to access the sharefile link to open all the files for the November 12 call. None of the pages are blank from the 3 files I downloaded from the sharefile site. That should work for us to send that way too, and if you're able to send it early just to make sure we can open everything, that would be great. Also, EPA email can receive up to 150MB of files, but the sharefile site would also work.

Similar to the November 12 meeting, please send to Richard Huggins, Mary Jackson, Jason Mills, and me. Let us know if you have further questions. Thanks.

Michelle Long
Biologist
U.S. Environmental Protection Agency
Office of Resource Conservation and Recovery
Materials Recovery and Waste Management Division
(703) 347-8953

From: Martinez Andrea L <Andrea.Martinez@srpnet.com>
Sent: Tuesday, November 24, 2020 12:54 PM
To: Hillyer, Kirsten <hillyer.kirsten@epa.gov>
Subject: Salt River Project, Coronado Generating Station, Part B Application Receipt Assistance

Good afternoon Ms. Hillyer,

It is Salt River Project's intent to submit a Part B application for our Coronado Generating Station, on or before the November 30 deadline. We were concerned that our Part B Rule Discussion materials only fully conveyed to one EPA participant for our meeting November 12. Some staff conveyed they were unable to download and some were only able to see a partial download (some blank pages were noted). Could you please be of assistance in confirming the full receipt of the download to the EPA? I want to ensure receipt of all narrative, appendices (no blank pages) are properly received. Please advise if you can be of assistance, if so I will let you know when the materials have been conveyed.

As with other submittals, this file size will be very large or broken into two (still larger) parts. We are awaiting final revisions from our consultant, so plan to submit as early as tomorrow or as late as November 30 (pending this final draft review) via Haley & Aldrich secure link. Thank you so much for your consideration.

Andrea Martinez
Water Quality & Waste Management Services Manager
SRP | Environmental Services
P: (602) 236-2618 | **M:** Ex. 6 Personal Privacy (PP)

Confidentiality Notice
This message and any accompanying attachments may contain confidential and/or privileged information. The message and attachments should be read and retained by intended recipients only. If you received this message in error, please notify the sender immediately and delete the message and any attachments.

Message

From: Long, Michelle [Long.Michelle@epa.gov]
Sent: 11/25/2020 3:17:01 PM
To: Michelle Freeark [mfreeark@azgt.coop]; Huggins, Richard [Huggins.Richard@epa.gov]; Mills, Jason [Mills.Jason@epa.gov]; Jackson, Mary [Jackson.Mary@epa.gov]
CC: 'Williamson, Liz' [ewilliamson@williamsmullen.com]; Eichenberger, Jason [jeichenberger@burnsmcd.com]; 'Weber, Wayne A' [waweber@burnsmcd.com]; Justine McCune [jmccune@azgt.coop]; Nathen Hatch [nhatch@azgt.coop]; Charles S Reece IV [creece@azgt.coop]
Subject: RE: Arizona Electric Power Cooperative, Inc (AEPCO)/EPA meeting on CCR Part B ALD Application on November 24, 2020

Good Morning,

For your awareness, EPA just set up a CCR Part B Implementation website: https://www.epa.gov/coalash/ccr-part-b-implementation. Please follow the "How to Submit a Demonstration Package" instructions to submit the your application by November 30, 2020. Thank you.

Michelle Long
Biologist
U.S. Environmental Protection Agency
Office of Resource Conservation and Recovery
Materials Recovery and Waste Management Division
(703) 347-8953

From: Michelle Freeark <mfreeark@azgt.coop>
Sent: Saturday, November 21, 2020 10:27 PM
To: Long, Michelle <Long.Michelle@epa.gov>; Huggins, Richard <Huggins.Richard@epa.gov>; Mills, Jason <Mills.Jason@epa.gov>; Jackson, Mary <Jackson.Mary@epa.gov>; Capiro, Mirtha <capiro.mirtha@epa.gov>; Celeste, Laurel <celeste.laurel@epa.gov>; Hillyer, Kirsten <hillyer.kirsten@epa.gov>; Behan, Frank <Behan.Frank@epa.gov>
Cc: 'Williamson, Liz' <ewilliamson@williamsmullen.com>; Eichenberger, Jason <jeichenberger@burnsmcd.com>; 'Weber, Wayne A' <waweber@burnsmcd.com>; Justine McCune <jmccune@azgt.coop>; Nathen Hatch <nhatch@azgt.coop>; Charles S Reece IV <creece@azgt.coop>
Subject: Arizona Electric Power Cooperative, Inc (AEPCO)/EPA meeting on CCR Part B ALD Application on November 24, 2020

Good evening,

In advance of the scheduled meeting between EPA and Arizona Electric Power Cooperative, Inc. (AEPCO) on Tuesday, November 24, 2020 at 10 am EDT, AEPCO is providing the attached documents.

First, an agenda that provides an outline for Tuesday's discussion.

Second, AEPCO's ***Draft*** ALD Application for discussion proposes.

We know EPA staff time is incredibly pressed at this time and we greatly appreciate the time you have given to meet with us.

AEPCO looks forward to our meeting on Tuesday,

Very respectfully,

Michelle Freeark

Michelle Freeark, Executive Director of Regulatory Affairs and Corporate Services

Arizona G&T Cooperatives

1000 S. Hwy 80 | Benson, AZ 85602
o: 520-586-5122 | m: Ex. 6 Personal Privacy (PP) mfreeark@azgt.coop

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Message

From: Long, Michelle [Long.Michelle@epa.gov]
Sent: 11/25/2020 3:17:52 PM
To: Christopher P Scieszka [christopher.scieszka@dteenergy.com]; Robert J Lee [robert.j.lee@dteenergy.com]; Christy D Clark [christy.clark@dteenergy.com]; Kelly M Martorano [kelly.martorano@dteenergy.com]; John Seymour [JSeymour@Geosyntec.com]; Omer Bozok [OBozok@Geosyntec.com]
CC: Jackson, Mary [Jackson.Mary@epa.gov]; Mills, Jason [Mills.Jason@epa.gov]; Huggins, Richard [Huggins.Richard@epa.gov]
Subject: RE: Part B Discussion with DTE

Good Morning,

For your awareness, EPA just set up a CCR Part B Implementation website: https://www.epa.gov/coalash/ccr-part-b-implementation. Please follow the "How to Submit a Demonstration Package" instructions to submit the your application by November 30, 2020. Thank you.

Michelle Long
Biologist
U.S. Environmental Protection Agency
Office of Resource Conservation and Recovery
Materials Recovery and Waste Management Division
(703) 347-8953

From: Christopher P Scieszka <christopher.scieszka@dteenergy.com>
Sent: Thursday, November 19, 2020 2:41 PM
To: Long, Michelle <Long.Michelle@epa.gov>; Huggins, Richard <Huggins.Richard@epa.gov>; Mills, Jason <Mills.Jason@epa.gov>; Birchfield, Norman <Birchfield.Norman@epa.gov>; Jackson, Mary <Jackson.Mary@epa.gov>; Celeste, Laurel <celeste.laurel@epa.gov>; Robert J Lee <robert.j.lee@dteenergy.com>; Christy D Clark <christy.clark@dteenergy.com>; Kelly M Martorano <kelly.martorano@dteenergy.com>; John Seymour <JSeymour@Geosyntec.com>; Omer Bozok <OBozok@Geosyntec.com>; Mooney, Susan <mooney.susan@epa.gov>; Schumacher, Jessica <Schumacher.Jessica@epa.gov>
Subject: RE: Part B Discussion with DTE

Hi Michelle,

I understand you are all very busy right now. Thank you for taking the time to set up this discussion.

Proposed timeframes (EST):
12/1: 11-12 AM
12/2: 3-4 PM

Please let us know what works best for you.

Thank you,

Chris Scieszka
Environmental Management & Safety
One Energy Plaza | 410 G.O. | Detroit, MI 48226
(O) 313-235-0153 | (C) Ex. 6 Personal Privacy (PP)
christopher.scieszka@dteenergy.com

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From: Long, Michelle <Long.Michelle@epa.gov>
Sent: Wednesday, November 18, 2020 8:40 AM
To: Christopher P Scieszka <christopher.scieszka@dteenergy.com>; Huggins, Richard <Huggins.Richard@epa.gov>; Mills, Jason <Mills.Jason@epa.gov>; Birchfield, Norman <Birchfield.Norman@epa.gov>; Jackson, Mary <Jackson.Mary@epa.gov>; Celeste, Laurel <celeste.laurel@epa.gov>; Robert J Lee <robert.j.lee@dteenergy.com>; Christy D Clark <christy.clark@dteenergy.com>; Kelly M Martorano <kelly.martorano@dteenergy.com>; John Seymour <JSeymour@Geosyntec.com>; Omer Bozok <OBozok@Geosyntec.com>; Mooney, Susan <mooney.susan@epa.gov>; Schumacher, Jessica <Schumacher.Jessica@epa.gov>
Subject: [EXTERNAL] RE: Part B Discussion with DTE

Chris,

Due to many other meetings for the Part A demonstrations and other work we are doing, plus the holiday, we won't be able to meet until December 1 or 2. Would a time one of those days work for DTE?

Michelle Long
Biologist
U.S. Environmental Protection Agency
Office of Resource Conservation and Recovery
Materials Recovery and Waste Management Division
(703) 347-8953

From: Christopher P Scieszka <christopher.scieszka@dteenergy.com>
Sent: Monday, November 16, 2020 3:17 PM
To: Huggins, Richard <Huggins.Richard@epa.gov>; Mills, Jason <Mills.Jason@epa.gov>; Birchfield, Norman <Birchfield.Norman@epa.gov>; Long, Michelle <Long.Michelle@epa.gov>; Jackson, Mary <Jackson.Mary@epa.gov>; Celeste, Laurel <celeste.laurel@epa.gov>; Robert J Lee <robert.j.lee@dteenergy.com>; Christy D Clark <christy.clark@dteenergy.com>; Kelly M Martorano <kelly.martorano@dteenergy.com>; John Seymour <JSeymour@Geosyntec.com>; Omer Bozok <OBozok@Geosyntec.com>; Mooney, Susan <mooney.susan@epa.gov>; Schumacher, Jessica <Schumacher.Jessica@epa.gov>
Subject: RE: Part B Discussion with DTE

Hi Richard and EPA team,

Continuing our conversation from last Monday, we are hoping to schedule a meeting to discuss our approach for the alternate liner demonstration field investigations we intend to conduct in the near future (December).

We have the following times (EST) available in the next couple of days:

- Wednesday 11/18: 8-11 AM or 2-3:30
- Thursday 11/19: 10-12:30

We'd like to discuss the following agenda:

- Monroe Fly Ash Basin

    - Boring locations
    - Drilling methods
- Belle River Bottom Ash Basins and Diversion Basin
    - Boring locations
    - Drilling methods
    - Permeant collection/analysis

Please let me know if we can book an hour with your team.

Thank you!

Chris Scieszka
Environmental Management & Safety
One Energy Plaza | 410 G.O. | Detroit, MI 48226
(O) 313-235-0153 | (C) Ex. 6 Personal Privacy (PP)
christopher.scieszka@dteenergy.com

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-----Original Appointment-----
From: Huggins, Richard <Huggins.Richard@epa.gov>
Sent: Friday, October 30, 2020 1:08 PM
To: Huggins, Richard; Mills, Jason; Birchfield, Norman; Long, Michelle; Jackson, Mary; Celeste, Laurel; Christopher P Scieszka; Robert J Lee; Christy D Clark; Kelly M Martorano; Buening, Vincent; Crockford, Graham; Cratsenburg, Kelly; John Seymour; Omer Bozok; Mooney, Susan; Schumacher, Jessica
Subject: Part B Discussion with DTE
When: Monday, November 09, 2020 11:00 AM-12:00 PM (UTC-05:00) Eastern Time (US & Canada).
Where: Microsoft Teams Meeting

one for Monroe Power Plant Fly Ash Basin, one for the Belle River Power Plant Bottom Ash Basins, and one for the Belle River Power Plant Diversion Basin

---

Microsoft Teams meeting

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Message

From: Michelle Freeark [mfreeark@azgt.coop]
Sent: 11/25/2020 4:24:20 PM
To: Long, Michelle [Long.Michelle@epa.gov]; Huggins, Richard [Huggins.Richard@epa.gov]; Mills, Jason [Mills.Jason@epa.gov]; Jackson, Mary [Jackson.Mary@epa.gov]
CC: 'Williamson, Liz' [ewilliamson@williamsmullen.com]; Eichenberger, Jason [jeichenberger@burnsmcd.com]; 'Weber, Wayne A' [waweber@burnsmcd.com]; Justine McCune [jmccune@azgt.coop]; Nathen Hatch [nhatch@azgt.coop]; Charles S Reece IV [creece@azgt.coop]
Subject: RE: Arizona Electric Power Cooperative, Inc (AEPCO)/EPA meeting on CCR Part B ALD Application on November 24, 2020

Good morning Michelle,

Thank you for reaching out with this new information.

Thanks,
Michelle

Michelle Freeark, Executive Director of Regulatory Affairs and Corporate Services

Arizona G&T Cooperatives

1000 S. Hwy 80 | Benson, AZ 85602
o: 520-586-5122 | m: Ex. 6 Personal Privacy (PP) mfreeark@azgt.coop

From: Long, Michelle <Long.Michelle@epa.gov>
Sent: Wednesday, November 25, 2020 8:17 AM
To: Michelle Freeark <mfreeark@azgt.coop>; Huggins, Richard <Huggins.Richard@epa.gov>; Mills, Jason <Mills.Jason@epa.gov>; Jackson, Mary <Jackson.Mary@epa.gov>
Cc: 'Williamson, Liz' <ewilliamson@williamsmullen.com>; Eichenberger, Jason <jeichenberger@burnsmcd.com>; 'Weber, Wayne A' <waweber@burnsmcd.com>; Justine McCune <jmccune@azgt.coop>; Nathen Hatch <nhatch@azgt.coop>; Charles S Reece IV <creece@azgt.coop>
Subject: RE: Arizona Electric Power Cooperative, Inc (AEPCO)/EPA meeting on CCR Part B ALD Application on November 24, 2020

Good Morning,

For your awareness, EPA just set up a CCR Part B Implementation website: https://www.epa.gov/coalash/ccr-part-b-implementation. Please follow the "How to Submit a Demonstration Package" instructions to submit the your application by November 30, 2020. Thank you.

Michelle Long
Biologist
U.S. Environmental Protection Agency
Office of Resource Conservation and Recovery
Materials Recovery and Waste Management Division
(703) 347-8953

From: Michelle Freeark <mfreeark@azgt.coop>
Sent: Saturday, November 21, 2020 10:27 PM
To: Long, Michelle <Long.Michelle@epa.gov>; Huggins, Richard <Huggins.Richard@epa.gov>; Mills, Jason <Mills.Jason@epa.gov>; Jackson, Mary <Jackson.Mary@epa.gov>; Capiro, Mirtha <capiro.mirtha@epa.gov>; Celeste, Laurel <celeste.laurel@epa.gov>; Hillyer, Kirsten <hillyer.kirsten@epa.gov>; Behan, Frank <Behan.Frank@epa.gov>
Cc: 'Williamson, Liz' <ewilliamson@williamsmullen.com>; Eichenberger, Jason <jeichenberger@burnsmcd.com>; 'Weber, Wayne A' <waweber@burnsmcd.com>; Justine McCune <jmccune@azgt.coop>; Nathen Hatch <nhatch@azgt.coop>; Charles S Reece IV <creece@azgt.coop>
Subject: Arizona Electric Power Cooperative, Inc (AEPCO)/EPA meeting on CCR Part B ALD Application on November 24, 2020

Good evening,

In advance of the scheduled meeting between EPA and Arizona Electric Power Cooperative, Inc. (AEPCO) on Tuesday, November 24, 2020 at 10 am EDT, AEPCO is providing the attached documents.

First, an agenda that provides an outline for Tuesday's discussion.

Second, AEPCO's ***Draft*** ALD Application for discussion proposes.

We know EPA staff time is incredibly pressed at this time and we greatly appreciate the time you have given to meet with us.

AEPCO looks forward to our meeting on Tuesday,

Very respectfully,

Michelle Freeark

Michelle Freeark, Executive Director of Regulatory Affairs and Corporate Services

Arizona G&T Cooperatives

1000 S. Hwy 80 | Benson, AZ 85602
o: 520-586-5122 | m: Ex. 6 Personal Privacy (PP) **mfreeark@azgt.coop**

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EXTERNAL EMAIL: Do not open attachments/click links if source is unknown. Please report all phishing attempts to phishing@azgt.coop

Message

From: garcher@GREnergy.com [garcher@GREnergy.com]
Sent: 11/30/2020 1:47:03 PM
To: Huggins, Richard [Huggins.Richard@epa.gov]
Subject: CCR Alternative Liner Application - Great River Energy

Message Information

To	long.michelle@epa.gov, huggins.richard@epa.gov, mills.jason@epa.gove, jackson.mary@epa.gov, wheeler.andrew@epa.gov
Cc	sstockdill@grenergy.com, eheinen@grenergy.com, eolsen@grenergy.com, jbauer@grenergy.com, jcharles@grenergy.com, garche
Attachments	201129 Final GRE Alternative Liner Application Full Report.pdf (312.27 MB) Download All Files

Dear Mr. Wheeler,

Great River Energy is submitting its Alternative Liner Application for Upstream Raise 91 CCR surface impoundment at Coal Creek Station. This application was prepared in response to the requirements in 40 CFR 257.71 (d)(1). Should you have any questions regarding the FTP linked report, please contact Shane Stockdill (701) 442-7010 or Erik Heinen (612) 801-1269.

Sincerely,

Greg Archer
Manager, Environmental Services

Message

From: Stockdill, Shane GRE-CC [SStockdill@GREnergy.com]
Sent: 11/30/2020 5:31:38 PM
To: Huggins, Richard [Huggins.Richard@epa.gov]
Subject: FW: CCR Alternative Liner Application - Great River Energy

Hi Richard,

I just wanted to follow up with you and make sure that you were able to access the Alternative Liner submittal that Great River Energy submitted this morning to the EPA in the link below. If you need this submittal broken out in smaller files, please let us know and we can provide each appendix independently. We are in the process of uploading this to our CCR website for access at the moment. Hopefully everything arrived and is working as intended. Again, thank you for working with us on this submittal, we truly appreciate it, have a great week!

Shane

From: Archer, Gregory GRE-MG <garcher@GREnergy.com>
Sent: Monday, November 30, 2020 7:47 AM
To: Stockdill, Shane GRE-CC <SStockdill@GREnergy.com>
Subject: CCR Alternative Liner Application - Great River Energy

Message Information

To	long.michelle@epa.gov, huggins.richard@epa.gov, mills.jason@epa.gove, jackson.mary@epa.gov, wheeler.andrew@epa.gov
Cc	sstockdill@grenergy.com, eheinen@grenergy.com, eolsen@grenergy.com, jbauer@grenergy.com, jcharles@grenergy.com, garche
Attachments	201129 Final GRE Alternative Liner Application Full Report.pdf (312.27 MB) Download All Files

Dear Mr. Wheeler,

Great River Energy is submitting its Alternative Liner Application for Upstream Raise 91 CCR surface impoundment at Coal Creek Station. This application was prepared in response to the requirements in 40 CFR 257.71 (d)(1). Should you have any questions regarding the FTP linked report, please contact Shane Stockdill (701) 442-7010 or Erik Heinen (612) 801-1269.

Sincerely,

Greg Archer
Manager, Environmental Services

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Message

From: Stockdill, Shane GRE-CC [SStockdill@GREnergy.com]
Sent: 11/30/2020 6:27:18 PM
To: Huggins, Richard [Huggins.Richard@epa.gov]
Subject: RE: CCR Alternative Liner Application - Great River Energy

Richard,

Thanks for the reply. Yeah, I sent her this email prior to you and her out of office reply said to get in contact with you. Since today is the submittal day, I figured I'd at least get some confirmation. Thanks again, have a great week and let us know if you have any questions at all.

Shane

From: Huggins, Richard <Huggins.Richard@epa.gov>
Sent: Monday, November 30, 2020 12:25 PM
To: Stockdill, Shane GRE-CC <SStockdill@GREnergy.com>
Subject: RE: CCR Alternative Liner Application - Great River Energy

This email was sent by an external sender. Opening attachments or clicking links from untrusted sources may cause damage to you and Great River Energy.
Shane- I was able to download the 1 attachment that is your Part B demonstration. Sorry for the delay, Michelle Long is my point person on this and officially responds to submittals but she is out today. Expect a more formal receipt confirmation from her tomorrow. If you have any questions, please let me know. Thanks

Richard Huggins Jr., Chief
Energy Recovery and Waste Disposal Branch
Office of Resource Conservation and Recovery
U.S. Environmental Protection Agency
Desk: 703-308-0017 iPhone: 571-345-6855

From: Stockdill, Shane GRE-CC <SStockdill@GREnergy.com>
Sent: Monday, November 30, 2020 12:32 PM
To: Huggins, Richard <Huggins.Richard@epa.gov>
Subject: FW: CCR Alternative Liner Application - Great River Energy

Hi Richard,

I just wanted to follow up with you and make sure that you were able to access the Alternative Liner submittal that Great River Energy submitted this morning to the EPA in the link below. If you need this submittal broken out in smaller files, please let us know and we can provide each appendix independently. We are in the process of uploading this to our CCR website for access at the moment. Hopefully everything arrived and is working as intended. Again, thank you for working with us on this submittal, we truly appreciate it, have a great week!

Shane

From: Archer, Gregory GRE-MG <garcher@GREnergy.com>
Sent: Monday, November 30, 2020 7:47 AM
To: Stockdill, Shane GRE-CC <SStockdill@GREnergy.com>
Subject: CCR Alternative Liner Application - Great River Energy

Message Information

To	long.michelle@epa.gov, huggins.richard@epa.gov, mills.jason@epa.gove, jackson.mary@epa.gov, wheeler.andrew@epa.gov
Cc	sstockdill@grenergy.com, eheinen@grenergy.com, eolsen@grenergy.com, jbauer@grenergy.com, jcharles@grenergy.com, garche
Attachments	201129 Final GRE Alternative Liner Application Full Report.pdf (312.27 MB) Download All Files

Dear Mr. Wheeler,

Great River Energy is submitting its Alternative Liner Application for Upstream Raise 91 CCR surface impoundment at Coal Creek Station. This application was prepared in response to the requirements in 40 CFR 257.71 (d)(1). Should you have any questions regarding the FTP linked report, please contact Shane Stockdill (701) 442-7010 or Erik Heinen (612) 801-1269.

Sincerely,

Greg Archer
Manager, Environmental Services

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Message

From: Long, Michelle [Long.Michelle@epa.gov]
Sent: 11/30/2020 6:35:09 PM
To: Stockdill, Shane GRE-CC [SStockdill@GREnergy.com]
CC: Huggins, Richard [Huggins.Richard@epa.gov]; Mills, Jason [Mills.Jason@epa.gov]; Jackson, Mary [Jackson.Mary@epa.gov]
Subject: RE: CCR Alternative Liner Application - Great River Energy

Hi Shane,

I was able to download open the file that was sent this morning- it was 5182 pages in the one PDF. I have copied the others from EPA for awareness and this is official confirmation of receipt of Great River Energy's application.

If anyone from EPA was unable to open the file or would like it broken into smaller pieces, please reply all to this email. Thanks.

Michelle Long
Biologist
U.S. Environmental Protection Agency
Office of Resource Conservation and Recovery
Materials Recovery and Waste Management Division
(703) 347-8953

From: Stockdill, Shane GRE-CC <SStockdill@GREnergy.com>
Sent: Monday, November 30, 2020 11:31 AM
To: Long, Michelle <Long.Michelle@epa.gov>
Subject: CCR Alternative Liner Application - Great River Energy

Hi Michelle,

I just wanted to follow up with you and make sure that you were able to access the Alternative Liner submittal that Great River Energy submitted this morning to the EPA. If you need this submittal broken out in smaller files, please let us know and we can provide each appendix independently. We are in the process of uploading this to our CCR website for access at the moment. Hopefully everything arrived and is working as intended. Again, thank you for working with us on this submittal, we truly appreciate it, have a great week!

Shane

From: Archer, Gregory GRE-MG <garcher@GREnergy.com>
Sent: Monday, November 30, 2020 7:47 AM
To: Stockdill, Shane GRE-CC <SStockdill@GREnergy.com>
Subject: CCR Alternative Liner Application - Great River Energy

Message Information	
To	long.michelle@epa.gov, huggins.richard@epa.gov, mills.jason@epa.gove, jackson.mary@epa.gov, wheeler.andrew@epa.gov
Cc	sstockdill@grenergy.com, eheinen@grenergy.com, eolsen@grenergy.com, jbauer@grenergy.com, jcharles@grenergy.com, garche
Attachments	201129 Final GRE Alternative Liner Application Full Report.pdf (312.27 MB) Download All Files

Dear Mr. Wheeler,

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Sincerely,

Greg Archer
Manager, Environmental Services

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Message

From: Martinez Andrea L [Andrea.Martinez@srpnet.com]
Sent: 11/30/2020 6:37:58 PM
To: Huggins, Richard [Huggins.Richard@epa.gov]; Jackson, Mary [Jackson.Mary@epa.gov]; Long, Michelle [Long.Michelle@epa.gov]; Mills, Jason [Mills.Jason@epa.gov]
CC: Larson Craig R [Craig.Larson@srpnet.com]; Montalvo Kara M [Kara.Montalvo@srpnet.com]
Subject: RE: Salt River Project, Coronado Generating Station, Part B Application Transmittal

Good afternoon,

In addition to the Haley & Aldrich secure link below, the Salt River Project Part B Application package is also available on our website at the following link:

Document direct link:
https://environmental.srpnet.com/CCR/Part%20B%20Application.pdf

Salt River Project CCR Website:
https://environmental.srpnet.com/CCR

If you have any issues accessing these materials, please let me know, I am happy to assist.

Andrea Martinez
Water Quality & Waste Management Services Manager
SRP | Environmental Services
P: (602) 236-2618 | **M:** Ex. 6 Personal Privacy (PP)

Confidentiality Notice
This message and any accompanying attachments may contain confidential and/or privileged information. The message and attachments should be read and retained by intended recipients only. If you received this message in error, please notify the sender immediately and delete the message and any attachments.

From: Martinez Andrea L
Sent: Wednesday, November 25, 2020 1:31 PM
To: Huggins, Richard <Huggins.Richard@epa.gov>; Jackson, Mary <Jackson.Mary@epa.gov>; 'Long, Michelle' <Long.Michelle@epa.gov>; Mills, Jason <Mills.Jason@epa.gov>
Cc: Martinez Andrea L <Andrea.Martinez@srpnet.com>; Larson Craig R <Craig.Larson@srpnet.com>; Montalvo Kara M <Kara.Montalvo@srpnet.com>
Subject: Salt River Project, Coronado Generating Station, Part B Application Transmittal

Good Afternoon,

Please find the below link to the Salt River Project (SRP) Application and Notice of Intent to Submit an Alternate Liner Demonstration in Accordance with 40 CFR § 257.71(d)(1)(ii). SRP appreciates the U.S. Environmental Protection Agency's consideration of this Application to make an Alternate Liner Demonstration for the Coronado Generating Station Evaporation Pond. Any questions regarding the contents of the Application may be directed to myself, Andrea Martinez at 602-236-2618 or Andrea.Martinez@srpnet.com.

https://haleyaldrich.sharefile.com/d-sbb8a0844fc3a4a30915bec637fc4e232

If you have any issues accessing these materials, please let me know. If it is not to much trouble, could I receive a reply that the full Adobe .pdf package and all pages were transmitted? A successful transmittal notification would be greatly appreciated. Thank you so much for your time and consideration.

Andrea Martinez
Water Quality & Waste Management Services Manager
SRP | Environmental Services
P: (602) 236-2618 | **M:** Ex. 6 Personal Privacy (PP)

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Message

From: Long, Michelle [Long.Michelle@epa.gov]
Sent: 11/30/2020 8:48:58 PM
To: Martinez Andrea L [Andrea.Martinez@srpnet.com]; Huggins, Richard [Huggins.Richard@epa.gov]; Jackson, Mary [Jackson.Mary@epa.gov]; Mills, Jason [Mills.Jason@epa.gov]
CC: Larson Craig R [Craig.Larson@srpnet.com]; Montalvo Kara M [Kara.Montalvo@srpnet.com]
Subject: RE: Salt River Project, Coronado Generating Station, Part B Application Transmittal

Good afternoon Ms. Martinez,

This email is to acknowledge receipt of the Part B application from the Salt River Project, Coronado Generating Station. EPA was able to download the file from the link provided. Thank you.

Michelle Long
Biologist
U.S. Environmental Protection Agency
Office of Resource Conservation and Recovery
Materials Recovery and Waste Management Division
(703) 347-8953

From: Martinez Andrea L <Andrea.Martinez@srpnet.com>
Sent: Monday, November 30, 2020 1:38 PM
To: Huggins, Richard <Huggins.Richard@epa.gov>; Jackson, Mary <Jackson.Mary@epa.gov>; Long, Michelle <Long.Michelle@epa.gov>; Mills, Jason <Mills.Jason@epa.gov>
Cc: Larson Craig R <Craig.Larson@srpnet.com>; Montalvo Kara M <Kara.Montalvo@srpnet.com>
Subject: RE: Salt River Project, Coronado Generating Station, Part B Application Transmittal

Good afternoon,

In addition to the Haley & Aldrich secure link below, the Salt River Project Part B Application package is also available on our website at the following link:

Document direct link:
https://environmental.srpnet.com/CCR/Part%20B%20Application.pdf

Salt River Project CCR Website:
https://environmental.srpnet.com/CCR

If you have any issues accessing these materials, please let me know, I am happy to assist.

Andrea Martinez
Water Quality & Waste Management Services Manager
SRP | Environmental Services
P: (602) 236-2618 | **M:** Ex. 6 Personal Privacy (PP)

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From: Martinez Andrea L
Sent: Wednesday, November 25, 2020 1:31 PM

To: Huggins, Richard <Huggins.Richard@epa.gov>; Jackson, Mary <Jackson.Mary@epa.gov>; 'Long, Michelle' <Long.Michelle@epa.gov>; Mills, Jason <Mills.Jason@epa.gov>
Cc: Martinez Andrea L <Andrea.Martinez@srpnet.com>; Larson Craig R <Craig.Larson@srpnet.com>; Montalvo Kara M <Kara.Montalvo@srpnet.com>
Subject: Salt River Project, Coronado Generating Station, Part B Application Transmittal

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https://haleyaldrich.sharefile.com/d-sbb8a0844fc3a4a30915bec637fc4e232

If you have any issues accessing these materials, please let me know. If it is not to much trouble, could I receive a reply that the full Adobe .pdf package and all pages were transmitted? A successful transmittal notification would be greatly appreciated. Thank you so much for your time and consideration.

Andrea Martinez
Water Quality & Waste Management Services Manager
SRP | Environmental Services
P: (602) 236-2618 | **M:** Ex. 6 Personal Privacy (PP)

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This message and any accompanying attachments may contain confidential and/or privileged information. The message and attachments should be read and retained by intended recipients only. If you received this message in error, please notify the sender immediately and delete the message and any attachments.

Message

From: Long, Michelle [Long.Michelle@epa.gov]
Sent: 11/30/2020 8:51:06 PM
To: Vodopivec, Cynthia [Cynthia.Vodopivec@vistracorp.com]; Huggins, Richard [Huggins.Richard@epa.gov]; Jackson, Mary [Jackson.Mary@epa.gov]; Mills, Jason [Mills.Jason@epa.gov]
CC: Mitchell, David [David.Mitchell@vistracorp.com]; Collins, Renee [Renee.Collins@luminant.com]
Subject: RE: Martin Lake Alternate Liner Demonstration Application

Good afternoon,

This email is to acknowledge receipt of the Part B application from the Luminant Generation Company, Martin Lake Steam Electric Station. EPA was able to download the file from the link provided. Thank you.

Michelle Long
Biologist
U.S. Environmental Protection Agency
Office of Resource Conservation and Recovery
Materials Recovery and Waste Management Division
(703) 347-8953

From: Vodopivec, Cynthia <Cynthia.Vodopivec@vistracorp.com>
Sent: Wednesday, November 25, 2020 4:44 PM
To: Huggins, Richard <Huggins.Richard@epa.gov>; Jackson, Mary <Jackson.Mary@epa.gov>; Long, Michelle <Long.Michelle@epa.gov>; Mills, Jason <Mills.Jason@epa.gov>
Cc: Mitchell, David <David.Mitchell@vistracorp.com>; Collins, Renee <Renee.Collins@luminant.com>
Subject: Martin Lake Alternate Liner Demonstration Application

Luminant Generation Company LLC (Luminant) hereby submits this Alternate Liner Demonstration (ALD) application to the U.S. Environmental Protection Agency (EPA) pursuant to 40 C.F.R. § 257.71(d)(i) for the Permanent Disposal Pond 5 located at the Martin Lake Steam Electric Station near Tatum, Texas. Due to the file size, I cannot transmit this application through email, however you may download it from our website at the following location:
https://www.luminant.com/ccr/?wpdf_download_file=L25hcy9jb250ZW50L2xpdmUvbHVtaW5hbnQzL2RvY3VtZW50cy9jY3IvVGV4YXMvTWFydGluLUxha2UvMjAyMC8yMDIwLU1hcnRpbiBMYWtlLVNXUiAzMTI3Ny1BbHRlcm5hdGl2ZSBMaW5lciBEZW1vbnN0cmF0aW9uIEFwcGxpY2F0aW9uLVBEUCA1LnBkZg%3D%3D

Please let me know if you have any questions.

Best Regards,

Cynthia Vodopivec

Cynthia E. Vodopivec, P.E.
VP – Environmental, Health & Safety
o 214-812-2050
m Ex. 6 Personal Privacy (PP)
cynthia.vodopivec@vistracorp.com

Message

From: Vodopivec, Cynthia [Cynthia.Vodopivec@vistracorp.com]
Sent: 11/30/2020 9:10:38 PM
To: Long, Michelle [Long.Michelle@epa.gov]; Huggins, Richard [Huggins.Richard@epa.gov]; Jackson, Mary [Jackson.Mary@epa.gov]; Mills, Jason [Mills.Jason@epa.gov]
CC: Mitchell, David [David.Mitchell@vistracorp.com]; Collins, Renee [Renee.Collins@luminant.com]
Subject: RE: Martin Lake Alternate Liner Demonstration Application

Thank you for confirming.

Best Regards,

Cynthia

From: Long, Michelle <Long.Michelle@epa.gov>
Sent: Monday, November 30, 2020 3:51 PM
To: Vodopivec, Cynthia <Cynthia.Vodopivec@vistracorp.com>; Huggins, Richard <Huggins.Richard@epa.gov>; Jackson, Mary <Jackson.Mary@epa.gov>; Mills, Jason <Mills.Jason@epa.gov>
Cc: Mitchell, David <David.Mitchell@vistracorp.com>; Collins, Renee <Renee.Collins@luminant.com>
Subject: RE: Martin Lake Alternate Liner Demonstration Application

EXTERNAL EMAIL

Good afternoon,

This email is to acknowledge receipt of the Part B application from the Luminant Generation Company, Martin Lake Steam Electric Station. EPA was able to download the file from the link provided. Thank you.

Michelle Long
Biologist
U.S. Environmental Protection Agency
Office of Resource Conservation and Recovery
Materials Recovery and Waste Management Division
(703) 347-8953

From: Vodopivec, Cynthia <Cynthia.Vodopivec@vistracorp.com>
Sent: Wednesday, November 25, 2020 4:44 PM
To: Huggins, Richard <Huggins.Richard@epa.gov>; Jackson, Mary <Jackson.Mary@epa.gov>; Long, Michelle <Long.Michelle@epa.gov>; Mills, Jason <Mills.Jason@epa.gov>
Cc: Mitchell, David <David.Mitchell@vistracorp.com>; Collins, Renee <Renee.Collins@luminant.com>
Subject: Martin Lake Alternate Liner Demonstration Application

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https://www.luminant.com/ccr/?wpdf_download_file=L25hcy9jb250ZW50L2xpdmUvbHVtaW5hbnQzL2RvY3VtZW50cy9jY3IvVGV4YXMvTWFydGluLUxha2UvMjAyMC8yMDIwLU1hcnRpbiBMYWtlLVNXUiAzMTI3Ny1BbHRlcm5hdGl2ZSBMaW5lciBEZW1vbnN0cmF0aW9uIEFwcGxpY2F0aW9uLVBEUCA1LnBkZg%3D%3D

Please let me know if you have any questions.

Best Regards,

Cynthia Vodopivec

Cynthia E. Vodopivec, P.E.
VP – Environmental, Health & Safety
o 214-812-2050
m Ex. 6 Personal Privacy (PP)
cynthia.vodopivec@vistracorp.com

Message

From: Christopher P Scieszka [christopher.scieszka@dteenergy.com]
Sent: 11/30/2020 9:12:55 PM
To: Huggins, Richard [Huggins.Richard@epa.gov]; Jackson, Mary [Jackson.Mary@epa.gov]; Long, Michelle [Long.Michelle@epa.gov]; Mills, Jason [Mills.Jason@epa.gov]
CC: Robert J Lee [robert.j.lee@dteenergy.com]
Subject: DTE Monroe Power Plant Fly Ash Basin Part B ALD Application

Richard, Mary, Michelle, and Jason,

Please follow the link below to download the DTE Electric Company's initial application for an alternate liner demonstration 40 CFR §257.71(a)(1)(i) - for the Monroe Power Plant Fly Ash Basin.

https://nam02.safelinks.protection.outlook.com/?url=https%3A%2F%2Fadhocftp.trccompanies.com%2FAHT%2FAHT_UI%2Fpublic%2F%23%2Fpassword%3Fpackage%3DwI4lZpTx9HexGAsxjfsjanZsAuUNIsE1GhTxOeHO7UUC7qQO8uZmN0EjPyaOJOjyBqypvExf18UCwz%252fw8A9fuhR%252fqaX%252fAAvrvV4ZduG%252fEjk%253d&data=04%7C01%7Cchristopher.scieszka%40dteenergy.com%7C6765365a25a64045a8b208d8956b1021%7C8e61d5fe77494e7688ee6d8799ae8143%7C0%7C0%7C637423634362724359%7CUnknown%7CTWFpbGZsb3d8eyJWIjoiMC4wLjAwMDAiLCJQIjoiV2luMzIiLCJBTiI6Ik1haWwiLCJXVCI6Mn0%3D%7C1000&sdata=oVZkuD%2Br42kgYSjECK47%2BXrXXvOwbwYeiZnRnMX76Yc%3D&reserved=0

The application is currently in process of being posted to DTE's CCR compliance website.

Please let me know if you have any issues downloading the document.

All the best,

Chris Scieszka
Environmental Management & Safety
One Energy Plaza | 410 G.O. | Detroit, MI 48226
(O) 313-235-0153 | (C) Ex. 6 Personal Privacy (PP)
christopher.scieszka@dteenergy.com

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Message

From: Christopher P Scieszka [christopher.scieszka@dteenergy.com]
Sent: 11/30/2020 9:13:02 PM
To: Huggins, Richard [Huggins.Richard@epa.gov]; Jackson, Mary [Jackson.Mary@epa.gov]; Long, Michelle [Long.Michelle@epa.gov]; Mills, Jason [Mills.Jason@epa.gov]
CC: Robert J Lee [robert.j.lee@dteenergy.com]
Subject: DTE Belle River Bottom Ash Basins Part B ALD Application

Richard, Mary, Michelle, and Jason,

Please follow the link below to download the DTE Electric Company's initial application for an alternate liner demonstration 40 CFR §257.71(a)(1)(i) - for the Belle River Power Plant Bottom Ash Basins.

https://nam02.safelinks.protection.outlook.com/?url=https%3A%2F%2Fadhocftp.trccompanies.com%2FAHT%2FAHT_UI%2Fpublic%2F%23%2Fpassword%3Fpackage%3Devnhv%252bEYbChCB4dgTMmK%252beiGYR8xqDCmUzL02V3PxnyLA1wTV81pE2NqoL0DMZGT5NJcbcctqe%252f3ejC3KDQMAASOjEiTlSmP0g6l%252bDgwyQ4%253d&data=04%7C01%7Cchristopher.scieszka%40dteenergy.com%7Cef7ea65b4bf04bfef29308d895697027%7C8e61d5fe77494e7688ee6d8799ae8143%7C0%7C0%7C637423627367584993%7CUnknown%7CTWFpbGZsb3d8eyJWIjoiMC4wLjAwMDAiLCJQIjoiV2luMzIiLCJBTiI6Ik1haWwiLCJXVCI6Mn0%3D%7C1000&sdata=2gkmHAOBfolf88Ji%2BIPvE2QTCXlVC9oDCnDvNc6wLZ0%3D&reserved=0

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All the best,

Chris Scieszka
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Message

From: Christopher P Scieszka [christopher.scieszka@dteenergy.com]
Sent: 11/30/2020 9:13:07 PM
To: Huggins, Richard [Huggins.Richard@epa.gov]; Jackson, Mary [Jackson.Mary@epa.gov]; Long, Michelle [Long.Michelle@epa.gov]; Mills, Jason [Mills.Jason@epa.gov]
CC: Robert J Lee [robert.j.lee@dteenergy.com]
Subject: DTE Belle River Diversion Basin Part B ALD Application

Richard, Mary, Michelle, and Jason,

Please follow the link below to download the DTE Electric Company's initial application for an alternate liner demonstration 40 CFR §257.71(a)(1)(i) - for the Belle River Power Plant Diversion Basin.

https://nam02.safelinks.protection.outlook.com/?url=https%3A%2F%2Fadhocftp.trccompanies.com%2FAHT%2FAHT_Uf%2Fpublic%2F%23%2Fpassword%3Fpackage%3DU6fSKQxmJehkETSrMjLQKLZetVQDpg8awwwjM8GqBg6vL4VlUW7sPLd4%252bsogG3Y7rCtaxrRg3nqNWW30fPCYcDLKmf4%252f8qeCVKkS96mp740%253d&data=04%7C01%7Cchristopher.scieszka%40dteenergy.com%7Cd1719c59a53d47d796c808d895624b0d%7C8e61d5fe77494e7688ee6d8799ae8143%7C0%7C0%7C637423596699615719%7CUnknown%7CTWFpbGZsb3d8eyJWIjoiMC4wLjAwMDAiLCJQIjoiV2luMzIiLCJBTiI6Ik1haWwiLCJXVCI6Mn0%3D%7C1000&sdata=w2jVEVuJP7Z2eJMa7EpxHKNgmk7Dyin22Y0fzMs1N08%3D&reserved=0

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All the best,

Chris Scieszka
Environmental Management & Safety
One Energy Plaza | 410 G.O. | Detroit, MI 48226
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christopher.scieszka@dteenergy.com

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Message

From: Long, Michelle [Long.Michelle@epa.gov]
Sent: 11/30/2020 9:29:07 PM
To: Christopher P Scieszka [christopher.scieszka@dteenergy.com]; Huggins, Richard [Huggins.Richard@epa.gov]; Jackson, Mary [Jackson.Mary@epa.gov]; Mills, Jason [Mills.Jason@epa.gov]
CC: Robert J Lee [robert.j.lee@dteenergy.com]
Subject: RE: DTE Belle River Diversion Basin Part B ALD Application

Good afternoon,

This email is to acknowledge receipt of the Part B application from the DTE Electric Company for the Belle River Power Plant Diversion Basin. EPA was able to download the file from the link provided. Thank you.

Michelle Long
Biologist
U.S. Environmental Protection Agency
Office of Resource Conservation and Recovery
Materials Recovery and Waste Management Division
(703) 347-8953

From: Christopher P Scieszka <christopher.scieszka@dteenergy.com>
Sent: Monday, November 30, 2020 4:13 PM
To: Huggins, Richard <Huggins.Richard@epa.gov>; Jackson, Mary <Jackson.Mary@epa.gov>; Long, Michelle <Long.Michelle@epa.gov>; Mills, Jason <Mills.Jason@epa.gov>
Cc: Robert J Lee <robert.j.lee@dteenergy.com>
Subject: DTE Belle River Diversion Basin Part B ALD Application

Richard, Mary, Michelle, and Jason,

Please follow the link below to download the DTE Electric Company's initial application for an alternate liner demonstration 40 CFR §257.71(a)(1)(i) - for the Belle River Power Plant Diversion Basin.

https://nam02.safelinks.protection.outlook.com/?url=https%3A%2F%2Fadhocftp.trccompanies.com%2FAHT%2FAHT_Uj%2Fpublic%2F%23%2Fpassword%3Fpackage%3DU6fSKQxmJehkETSrMjLQKLZetVQDpg8awwwjM8GqBg6yL4VlUW7sPLd4%252bsogG3Y7rCtaxrRg3nqNWW30fPCYcDLKmf4%252f8qeCVKkS96mp740%253d&data=04%7C01%7Cchristopher.scieszka%40dteenergy.com%7Cd1719c59a53d47d796c808d895624b0d%7C8e61d5fe77494e7688ee6d8799ae8143%7C0%7C0%7C637423596699615719%7CUnknown%7CTWFpbGZsb3d8eyJWIjoiMC4wLjAwMDAiLCJQIjoiV2luMzIiLCJBTiI6Ik1haWwiLCJXVCI6Mn0%3D%7C1000&sdata=w2jVEVuJP7Z2eJMa7EpxHKNgmk7Dyin22Y0fzMs1N08%3D&reserved=0

The application is currently in process of being posted to DTE's CCR compliance website.

Please let me know if you have any issues downloading the document.

All the best,

Chris Scieszka
Environmental Management & Safety
One Energy Plaza | 410 G.O. | Detroit, MI 48226
(O) 313-235-0153 | (C) Ex. 6 Personal Privacy (PP)
christopher.scieszka@dteenergy.com

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Message

From: Long, Michelle [Long.Michelle@epa.gov]
Sent: 11/30/2020 9:29:08 PM
To: Christopher P Scieszka [christopher.scieszka@dteenergy.com]; Huggins, Richard [Huggins.Richard@epa.gov]; Jackson, Mary [Jackson.Mary@epa.gov]; Mills, Jason [Mills.Jason@epa.gov]
CC: Robert J Lee [robert.j.lee@dteenergy.com]
Subject: RE: DTE Belle River Bottom Ash Basins Part B ALD Application

Good afternoon,

This email is to acknowledge receipt of the Part B application from the DTE Electric Company for the Belle River Power Plant Bottom Ash Basins. EPA was able to download the file from the link provided. Thank you.

Michelle Long
Biologist
U.S. Environmental Protection Agency
Office of Resource Conservation and Recovery
Materials Recovery and Waste Management Division
(703) 347-8953

From: Christopher P Scieszka <christopher.scieszka@dteenergy.com>
Sent: Monday, November 30, 2020 4:13 PM
To: Huggins, Richard <Huggins.Richard@epa.gov>; Jackson, Mary <Jackson.Mary@epa.gov>; Long, Michelle <Long.Michelle@epa.gov>; Mills, Jason <Mills.Jason@epa.gov>
Cc: Robert J Lee <robert.j.lee@dteenergy.com>
Subject: DTE Belle River Bottom Ash Basins Part B ALD Application

Richard, Mary, Michelle, and Jason,

Please follow the link below to download the DTE Electric Company's initial application for an alternate liner demonstration 40 CFR §257.71(a)(1)(i) - for the Belle River Power Plant Bottom Ash Basins.

https://nam02.safelinks.protection.outlook.com/?url=https%3A%2F%2Fadhocftp.trccompanies.com%2FAHT%2FAHT_UI%2Fpublic%2F%23%2Fpassword%3Fpackage%3Deynhv%252bEYbChCB4dgTMmK%252beiGYR8xqDCmUzL02V3PxnyLA1wTV81pE2NqoL0DMZGT5NJcbcctqe%252f3ejC3KDQMAASOjEiTlSmP0g6I%252bDgwyQ4%253d&data=04%7C01%7Cchristopher.scieszka%40dteenergy.com%7Cef7ea65b4bf04bfef29308d895697027%7C8e61d5fe77494e7688ee6d8799ae8143%7C0%7C0%7C637423627367584993%7CUnknown%7CTWFpbGZsb3d8eyJWIjoiMC4wLjAwMDAiLCJQIjoiV2luMzIiLCJBTiI6Ik1haWwiLCJXVCI6Mn0%3D%7C1000&sdata=2qkmHAOBfolf88Ji%2BIPvE2QTCXIVC9oDCnDvNc6wLZ0%3D&reserved=0

The application is currently in process of being posted to DTE's CCR compliance website.

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All the best,

_ _ _ _

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Message

From: Long, Michelle [Long.Michelle@epa.gov]
Sent: 11/30/2020 9:29:11 PM
To: Christopher P Scieszka [christopher.scieszka@dteenergy.com]; Huggins, Richard [Huggins.Richard@epa.gov]; Jackson, Mary [Jackson.Mary@epa.gov]; Mills, Jason [Mills.Jason@epa.gov]
CC: Robert J Lee [robert.j.lee@dteenergy.com]
Subject: RE: DTE Monroe Power Plant Fly Ash Basin Part B ALD Application

Good afternoon,

This email is to acknowledge receipt of the Part B application from the DTE Electric Company for the Monroe Power Plant Fly Ash Basin. EPA was able to download the file from the link provided. Thank you.

Michelle Long
Biologist
U.S. Environmental Protection Agency
Office of Resource Conservation and Recovery
Materials Recovery and Waste Management Division
(703) 347-8953

From: Christopher P Scieszka <christopher.scieszka@dteenergy.com>
Sent: Monday, November 30, 2020 4:13 PM
To: Huggins, Richard <Huggins.Richard@epa.gov>; Jackson, Mary <Jackson.Mary@epa.gov>; Long, Michelle <Long.Michelle@epa.gov>; Mills, Jason <Mills.Jason@epa.gov>
Cc: Robert J Lee <robert.j.lee@dteenergy.com>
Subject: DTE Monroe Power Plant Fly Ash Basin Part B ALD Application

Richard, Mary, Michelle, and Jason,

Please follow the link below to download the DTE Electric Company's initial application for an alternate liner demonstration 40 CFR §257.71(a)(1)(i) - for the Monroe Power Plant Fly Ash Basin.

https://nam02.safelinks.protection.outlook.com/?url=https%3A%2F%2Fadhocftp.trccompanies.com%2FAHT%2FAHT_UI%2Fpublic%2F%23%2Fpassword%3Fpackage%3Dwl4lZpTx9HexGAsxjfsjanZsAuUNlsE1GhTxOeHO7UUC7qQO8uZmN0EjPyaOJOjyBqypvExf18UCwz%252fw8A9fuhR%252fqaX%252fAAvrvV4ZduG%252fEjk%253d&data=04%7C01%7Cchristopher.scieszka%40dteenergy.com%7C6765365a25a64045a8b208d8956b1021%7C8e61d5fe77494e7688ee6d8799ae8143%7C0%7C0%7C637423634362724359%7CUnknown%7CTWFpbGZsb3d8eyJWIjoiMC4wLjAwMDAiLCJQIjoiV2luMzIiLCJBTiI6Ik1haWwiLCJXVCI6Mn0%3D%7C1000&sdata=oVZkuD%2Br42kgYSjECK47%2BXrXXvOwbwYeiZnRnMX76Yc%3D&reserved=0

The application is currently in process of being posted to DTE's CCR compliance website.

Please let me know if you have any issues downloading the document.

All the best,

Chris Scieszka
Environmental Management & Safety
One Energy Plaza | 410 G.O. | Detroit, MI 48226
(O) 313-235-0153 | (C) Ex. 6 Personal Privacy (PP)
christopher.scieszka@dteenergy.com

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Message

From: Martinez Andrea L [Andrea.Martinez@srpnet.com]
Sent: 11/30/2020 10:01:04 PM
To: Long, Michelle [Long.Michelle@epa.gov]; Huggins, Richard [Huggins.Richard@epa.gov]; Jackson, Mary [Jackson.Mary@epa.gov]; Mills, Jason [Mills.Jason@epa.gov]
CC: Larson Craig R [Craig.Larson@srpnet.com]; Montalvo Kara M [Kara.Montalvo@srpnet.com]
Subject: RE: Salt River Project, Coronado Generating Station, Part B Application Transmittal

Thank you so much Ms. Long for the confirmation. Have a wonderful week.

Andrea Martinez

Sent from VMWare Boxer

On November 30, 2020 at 1:49:02 PM MST, Long, Michelle <Long.Michelle@epa.gov> wrote:

CAUTION - EXTERNAL EMAIL
Phishing? **Click the fish** in Outlook
For mobile forward to phish@srpnet.com

Good afternoon Ms. Martinez,

This email is to acknowledge receipt of the Part B application from the Salt River Project, Coronado Generating Station. EPA was able to download the file from the link provided. Thank you.

Michelle Long
Biologist
U.S. Environmental Protection Agency
Office of Resource Conservation and Recovery
Materials Recovery and Waste Management Division
(703) 347-8953

From: Martinez Andrea L <Andrea.Martinez@srpnet.com>
Sent: Monday, November 30, 2020 1:38 PM
To: Huggins, Richard <Huggins.Richard@epa.gov>; Jackson, Mary <Jackson.Mary@epa.gov>; Long, Michelle <Long.Michelle@epa.gov>; Mills, Jason <Mills.Jason@epa.gov>
Cc: Larson Craig R <Craig.Larson@srpnet.com>; Montalvo Kara M <Kara.Montalvo@srpnet.com>
Subject: RE: Salt River Project, Coronado Generating Station, Part B Application Transmittal

Good afternoon,

In addition to the Haley & Aldrich secure link below, the Salt River Project Part B Application package is also available on our website at the following link:

Document direct link:
https://environmental.srpnet.com/CCR/Part%20B%20Application.pdf

Salt River Project CCR Website:
https://environmental.srpnet.com/CCR

If you have any issues accessing these materials, please let me know, I am happy to assist.

Andrea Martinez
Water Quality & Waste Management Services Manager
SRP | Environmental Services
P: (602) 236-2618 | **M:** Ex. 6 Personal Privacy (PP)

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From: Martinez Andrea L
Sent: Wednesday, November 25, 2020 1:31 PM
To: Huggins, Richard <Huggins.Richard@epa.gov>; Jackson, Mary <Jackson.Mary@epa.gov>; 'Long, Michelle' <Long.Michelle@epa.gov>; Mills, Jason <Mills.Jason@epa.gov>
Cc: Martinez Andrea L <Andrea.Martinez@srpnet.com>; Larson Craig R <Craig.Larson@srpnet.com>; Montalvo Kara M <Kara.Montalvo@srpnet.com>
Subject: Salt River Project, Coronado Generating Station, Part B Application Transmittal

Good Afternoon,

Please find the below link to the Salt River Project (SRP) Application and Notice of Intent to Submit an Alternate Liner Demonstration in Accordance with 40 CFR § 257.71(d)(1)(ii). SRP appreciates the U.S. Environmental Protection Agency's consideration of this Application to make an Alternate Liner Demonstration for the Coronado Generating Station Evaporation Pond. Any questions regarding the contents of the Application may be directed to myself, Andrea Martinez at 602-236-2618 or Andrea.Martinez@srpnet.com.

https://haleyaldrich.sharefile.com/d-sbb8a0844fc3a4a30915bec637fc4e232

If you have any issues accessing these materials, please let me know. If it is not to much trouble, could I receive a reply that the full Adobe .pdf package and all pages were transmitted? A successful transmittal notification would be greatly appreciated. Thank you so much for your time and consideration.

Andrea Martinez
Water Quality & Waste Management Services Manager
SRP | Environmental Services
P: (602) 236-2618 | **M:** Ex. 6 Personal Privacy (PP)

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Message

From: Michelle Freeark [mfreeark@azgt.coop]
Sent: 12/1/2020 3:21:57 PM
To: Long, Michelle [Long.Michelle@epa.gov]; Huggins, Richard [Huggins.Richard@epa.gov]; Jackson, Mary [Jackson.Mary@epa.gov]; Mills, Jason [Mills.Jason@epa.gov]
CC: 'Weber, Wayne A' [waweber@burnsmcd.com]; Eichenberger, Jason [jeichenberger@burnsmcd.com]; 'Williamson, Liz' [ewilliamson@williamsmullen.com]; Justine McCune [jmccune@azgt.coop]
Subject: RE: AEPCO-Apache Station ALD Application

Thank you Michelle for the acknowledgment of receipt and download.

Very respectfully,
Michelle Freeark

Michelle Freeark, Executive Director of Regulatory Affairs and Corporate Services

Arizona G&T Cooperatives

1000 S. Hwy 80 | Benson, AZ 85602
o: 520-586-5122 | m: Ex. 6 Personal Privacy (PP) mfreeark@azgt.coop

From: Long, Michelle <Long.Michelle@epa.gov>
Sent: Tuesday, December 1, 2020 5:44 AM
To: Michelle Freeark <mfreeark@azgt.coop>; Huggins, Richard <Huggins.Richard@epa.gov>; Jackson, Mary <Jackson.Mary@epa.gov>; Mills, Jason <Mills.Jason@epa.gov>
Cc: 'Weber, Wayne A' <waweber@burnsmcd.com>; Eichenberger, Jason <jeichenberger@burnsmcd.com>; 'Williamson, Liz' <ewilliamson@williamsmullen.com>; Justine McCune <jmccune@azgt.coop>
Subject: RE: AEPCO-Apache Station ALD Application

Good morning,

This email is to acknowledge receipt of the Part B application from the AEPCO-Apache Station. EPA was able to download the file from the link provided. Thank you.

Michelle Long
Biologist
U.S. Environmental Protection Agency
Office of Resource Conservation and Recovery
Materials Recovery and Waste Management Division
(703) 347-8953

From: Michelle Freeark <mfreeark@azgt.coop>
Sent: Tuesday, December 1, 2020 12:08 AM
To: Huggins, Richard <Huggins.Richard@epa.gov>; Jackson, Mary <Jackson.Mary@epa.gov>; Long, Michelle <Long.Michelle@epa.gov>; Mills, Jason <Mills.Jason@epa.gov>
Cc: 'Weber, Wayne A' <waweber@burnsmcd.com>; Eichenberger, Jason <jeichenberger@burnsmcd.com>; 'Williamson,

Liz' <ewilliamson@williamsmullen.com>; Justine McCune <jmccune@azgt.coop>
Subject: AEPCO-Apache Station ALD Application

Attached please find a cover letter with details on AEPCO's ALD Applications and Appendices.

The complete document is very large, so please see this link:

https://1drv.ms/b/s!Ajm5uvC86F2-iDHOZPKeTgrnIv-L?e=3pA4f9

If you have difficulty with this link, you can also find the document on our CCR website https://ccr.azgt.coop/.

Please confirm receipt of this correspondence.

Sincerely,
Michelle R. Freeark

Michelle Freeark, Executive Director of Regulatory Affairs and Corporate Services

Arizona G&T Cooperatives

1000 S. Hwy 80 | Benson, AZ 85602
o: 520-586-5122 | m: Ex. 6 Personal Privacy (PP) mfreeark@azgt.coop

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EXTERNAL EMAIL: **Do not open attachments/click links if source is unknown. Please report all phishing attempts to** phishing@azgt.coop

Message

From: Shimshock, John [jshimshock@keyconops.com]
Sent: 12/7/2020 7:41:45 PM
To: Long, Michelle [Long.Michelle@epa.gov]; Jackson, Mary [Jackson.Mary@epa.gov]; Huggins, Richard [Huggins.Richard@epa.gov]; Mills, Jason [Mills.Jason@epa.gov]
CC: Kushner, Joseph [jkushner@keyconops.com]; Illig, Lauren [lillig@keyconops.com]; Adam Scheller [a.scheller@gaiconsultants.com]; 'Kent Cockley' [k.cockley@gaiconsultants.com]; Leigh Rounce [L.Rounce@gaiconsultants.com]; Derek Furstenwerth [derek@camsesparc.com]; Patrick Brosnan [pbrosnan@camsesparc.com]
Subject: Conemaugh Generating Station - Submittal per 40 CFR §257.71(d)(1)(i) Requirements (Rev. 1)

Greetings Ms. Long, Ms. Jackson and Messrs. Huggins and Mills,

Please see below a link to a SharePoint site for the subject submittal (a single document, 32 MB file size). I was successful in downloading and opening the document (pdf).
Conemaugh Station and our engineering firm, GAI Consultants, are grateful to EPA for your consideration and hopeful approval to this application.
If you have any questions or concerns regarding this submittal, then please contact either Joe Kushner or me, contact info below – John.

Joseph Kushner, PE

Strategy and Compliance Manager
Keystone/Conemaugh Generating Stations
1142 Power Plant Rd.
New Florence, PA 15944
Office: 724-235-4529
Cell: Ex. 6 Personal Privacy (PP)
jkushner@keyconops.com

John P. Shimshock
Environmental Specialist
Conemaugh Generating Station
1442 Power Plant Road
New Florence, PA 15944
Office Phone: (724) 235-4596
Cellular Phone: Ex. 6 Personal Privacy (PP)
jshimshock@keyconops.com

From: Leigh Rounce <L.Rounce@gaiconsultants.com>
Sent: Monday, December 7, 2020 1:22 PM
To: Shimshock, John <jshimshock@keyconops.com>
Cc: Adam Scheller <a.scheller@gaiconsultants.com>
Subject: Conemaugh AFPs - CCR Rule Part B - Revised Alternate Liner Demonstration Application

John,

The revised, compiled Part B Demonstration Application can be downloaded using the following link: https://gaiconsultants-my.sharepoint.com/:f:/p/l_rounce/EpagQRM_MTJHjd4Rx8viOyMBmQfEA07I-fC1whIyqnBWqA?e=QjijPc

File access has been granted to the following individuals:
- Richard Huggins (Huggins.Richard@epa.gov)

- Michelle Long (Long.Michelle@epa.gov)
- Mary Jackson (Jackson.Mary@epa.gov)
- Jason Mills (Mills.Jason@epa.gov)
- Joseph Kushner (jkushner@keyconops.com)
- Patrick Brosnan (pbrosnan@camsesparc.com)
- Adam Scheller (a.scheller@gaiconsultants.com)

Per your request, we have also granted file access to the Station's CCR Website Manager, Neil Baksh (nbaksh@fixinium.com).

Please let us know if you have any difficulty accessing this document, and we can work with our IT department to resolve the issue.

Thank you,
Leigh

Leigh L. Rounce, EIT
Project EIT

GAI Consultants, 4200 Triangle Lane, Export, PA 15632-1358
T 724.387.2170 Ex. 6 Personal Privacy (PP)

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GAI Consultants
ENGINEERING, PLANNING, AND ENVIRONMENTAL CONSULTING SINCE 1958

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Message

From: Long, Michelle [Long.Michelle@epa.gov]
Sent: 12/7/2020 8:33:43 PM
To: Shimshock, John [jshimshock@keyconops.com]; Jackson, Mary [Jackson.Mary@epa.gov]; Huggins, Richard [Huggins.Richard@epa.gov]; Mills, Jason [Mills.Jason@epa.gov]
CC: Kushner, Joseph [jkushner@keyconops.com]; Illig, Lauren [lillig@keyconops.com]; Adam Scheller [a.scheller@gaiconsultants.com]; 'Kent Cockley' [k.cockley@gaiconsultants.com]; Leigh Rounce [L.Rounce@gaiconsultants.com]; Derek Furstenwerth [derek@camsesparc.com]; Patrick Brosnan [pbrosnan@camsesparc.com]
Subject: RE: Conemaugh Generating Station - Submittal per 40 CFR §257.71(d)(1)(i) Requirements (Rev. 1)

Good afternoon,

EPA received the revised application from the Conemaugh Generating Station and was able to download and open the document provided. Thank you.

Michelle Long
Biologist
U.S. Environmental Protection Agency
Office of Resource Conservation and Recovery
Materials Recovery and Waste Management Division
(703) 347-8953

From: Shimshock, John <jshimshock@keyconops.com>
Sent: Monday, December 7, 2020 2:42 PM
To: Long, Michelle <Long.Michelle@epa.gov>; Jackson, Mary <Jackson.Mary@epa.gov>; Huggins, Richard <Huggins.Richard@epa.gov>; Mills, Jason <Mills.Jason@epa.gov>
Cc: Kushner, Joseph <jkushner@keyconops.com>; Illig, Lauren <lillig@keyconops.com>; Adam Scheller <a.scheller@gaiconsultants.com>; 'Kent Cockley' <k.cockley@gaiconsultants.com>; Leigh Rounce <L.Rounce@gaiconsultants.com>; Derek Furstenwerth <derek@camsesparc.com>; Patrick Brosnan <pbrosnan@camsesparc.com>
Subject: Conemaugh Generating Station - Submittal per 40 CFR §257.71(d)(1)(i) Requirements (Rev. 1)

Greetings Ms. Long, Ms. Jackson and Messrs. Huggins and Mills,

Please see below a link to a SharePoint site for the subject submittal (a single document, 32 MB file size). I was successful in downloading and opening the document (pdf).
Conemaugh Station and our engineering firm, GAI Consultants, are grateful to EPA for your consideration and hopeful approval to this application.
If you have any questions or concerns regarding this submittal, then please contact either Joe Kushner or me, contact info below – John.

Joseph Kushner, PE

Strategy and Compliance Manager
Keystone/Conemaugh Generating Stations
1142 Power Plant Rd.
New Florence, PA 15944
Office: 724-235-4529
Cell Ex. 6 Personal Privacy (PP)
jkushner@keyconops.com

John P. Shimshock
Environmental Specialist
Conemaugh Generating Station
1442 Power Plant Road
New Florence, PA 15944
Office Phone: (724) 235-4596
Cellular Phone: Ex. 6 Personal Privacy (PP)
jshimshock@keyconops.com

From: Leigh Rounce <L.Rounce@gaiconsultants.com>
Sent: Monday, December 7, 2020 1:22 PM
To: Shimshock, John <jshimshock@keyconops.com>
Cc: Adam Scheller <a.scheller@gaiconsultants.com>
Subject: Conemaugh AFPs - CCR Rule Part B - Revised Alternate Liner Demonstration Application

John,

The revised, compiled Part B Demonstration Application can be downloaded using the following link: https://gaiconsultants-my.sharepoint.com/:f:/p/l_rounce/EpagQRM_MTJHjd4Rx8viOyMBmQfEA07I-fC1whlyqnBWqA?e=QjijPc

File access has been granted to the following individuals:

- Richard Huggins (Huggins.Richard@epa.gov)
- Michelle Long (Long.Michelle@epa.gov)
- Mary Jackson (Jackson.Mary@epa.gov)
- Jason Mills (Mills.Jason@epa.gov)
- Joseph Kushner (jkushner@keyconops.com)
- Patrick Brosnan (pbrosnan@camsesparc.com)
- Adam Scheller (a.scheller@gaiconsultants.com)

Per your request, we have also granted file access to the Station's CCR Website Manager, Neil Baksh (nbaksh@fixinium.com).

Please let us know if you have any difficulty accessing this document, and we can work with our IT department to resolve the issue.

Thank you,
Leigh

Leigh L. Rounce, EIT
Project EIT

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Message

From: Long, Michelle [Long.Michelle@epa.gov]
Sent: 11/17/2020 1:28:26 PM
To: Michelle Freeark [mfreeark@azgt.coop]; Huggins, Richard [Huggins.Richard@epa.gov]
CC: Mills, Jason [Mills.Jason@epa.gov]; Jackson, Mary [Jackson.Mary@epa.gov]
Subject: RE: Arizona Electric Power Cooperative, Inc (AEPCO) meeting request on CCR Part B ALD Demonstration

Hi Michelle,

Do you have any preferred meeting dates and times? If you can offer a few times, I'll check our calendars and find a time that would work for us. Thanks.

Michelle Long
Biologist
U.S. Environmental Protection Agency
Office of Resource Conservation and Recovery
Materials Recovery and Waste Management Division
(703) 347-8953

From: Michelle Freeark <mfreeark@azgt.coop>
Sent: Tuesday, November 17, 2020 8:25 AM
To: Huggins, Richard <Huggins.Richard@epa.gov>
Cc: Long, Michelle <Long.Michelle@epa.gov>; Behan, Frank <Behan.Frank@epa.gov>; Hillyer, Kirsten <hillyer.kirsten@epa.gov>; Anderson, Lydia <Anderson.Lydia@epa.gov>
Subject: RE: Arizona Electric Power Cooperative, Inc (AEPCO) meeting request on CCR Part B ALD Demonstration

Thank you Richard!

Michelle Freeark, Executive Director of Regulatory Affairs and Corporate Services

Arizona G&T Cooperatives

1000 S. Hwy 80 | Benson, AZ 85602
o: 520-586-5122 | m: Ex. 6 Personal Privacy (PP) **mfreeark@azgt.coop**

-------- Original message --------
From: "Huggins, Richard" <Huggins.Richard@epa.gov>
Date: 11/16/20 4:07 PM (GMT-05:00)
To: Michelle Freeark <mfreeark@azgt.coop>
Cc: "Long, Michelle" <Long.Michelle@epa.gov>, "Behan, Frank" <Behan.Frank@epa.gov>, "Hillyer, Kirsten" <hillyer.kirsten@epa.gov>, "Anderson, Lydia" <Anderson.Lydia@epa.gov>
Subject: RE: Arizona Electric Power Cooperative, Inc (AEPCO) meeting request on CCR Part B ALD Demonstration

Good afternoon,
Sorry for the delay Michelle. I have asked Michelle Long (Part B rule coordinator), to work with you to get this meeting on our calendar. She will be reaching out tomorrow.

Look forward to the meeting,
Richard

Richard Huggins Jr., Chief
Energy Recovery and Waste Disposal Branch
Office of Resource Conservation and Recovery
U.S. Environmental Protection Agency
Desk: 703-308-0017 iPhone: 571-345-6855

From: Michelle Freeark <mfreeark@azgt.coop>
Sent: Monday, November 16, 2020 3:54 PM
To: Huggins, Richard <Huggins.Richard@epa.gov>; Behan, Frank <Behan.Frank@epa.gov>; Hillyer, Kirsten <hillyer.kirsten@epa.gov>; Anderson, Lydia <Anderson.Lydia@epa.gov>
Subject: RE: Arizona Electric Power Cooperative, Inc (AEPCO) meeting request on CCR Part B ALD Demonstration

Good afternoon,

I am following up on our meeting request that was sent via email last Thursday. Knowing how extremely busy you have been, I thought I would reach out to ensure our email request was received and is being considered.

Respectfully,
Michelle Freeark

Michelle Freeark, Executive Director of Regulatory Affairs and Corporate Services

1000 S. Hwy 80 | Benson, AZ 85602
o: 520-586-5122 | m: Ex. 6 Personal Privacy (PP) **mfreeark@azgt.coop**

Notice: This message and any attachments are for the sole and confidential use of the intended recipients and may contain proprietary and/or confidential information which may be privileged or otherwise protected from disclosure.

From: Michelle Freeark
Sent: Thursday, November 12, 2020 7:52 AM
To: 'Huggins.Richard@epa.gov' <Huggins.Richard@epa.gov>; 'Behan.Frank@epa.gov' <Behan.Frank@epa.gov>; 'Hillyer.Kirsten@epa.gov' <Hillyer.Kirsten@epa.gov>; 'anderson.lydia@epa.gov' <anderson.lydia@epa.gov>
Subject: Arizona Electric Power Cooperative, Inc (AEPCO) meeting request on CCR Part B ALD Demonstration

Good morning,

Arizona Electric Power Cooperative, Inc. (AEPCO) is hereby requesting a virtual meeting with EPA staff to discuss AEPCO's Alternative Liner Demonstration (ALD) application submittal in accordance with 40 C.F.R. § 257.71(d)(1)(i).

AEPCO owns and operates the Apache Generating Station (Apache Station), an electric generation station located in Cochise, Arizona about 80 miles east of Tucson, Arizona and about 25 miles northeast of Benson, Arizona. AEPCO is a rural, consumer-owned generation and transmission electric cooperative that provides electric generation service to

local rural, consumer-owned electric distribution cooperatives in Arizona and California. As a not-for-profit cooperative, AEPCO is fully owned by its members. AEPCO has six "Class A" members. Together, AEPCO's Class A members serve more than 160,000 meters, representing approximately 400,000 individual residential, commercial, agricultural and industrial consumers. The electric service base is heavily skewed toward rural residential use, with relatively little commercial or industrial load. A substantial proportion of AEPCO's end-users are low income residents.

As the owner and operator of Apache Station, which includes one coal-fired steam electric generating unit (EGU), AEPCO is subject to the CCR Rule. Apache Station is AEPCO's only generating plant.

AEPCO respectfully requests the meeting to be held on Tuesday, November 24th. AEPCO intends to have staff, outside legal counsel and its consultant, Burns & McDonnell participate in the meeting. AEPCO will provide EPA with a draft ALD application prior to the meeting.

AEPCO certainly understands the high demand for meetings with EPA and greatly appreciate your time to consider a meeting with AEPCO, particularly in light of the upcoming deadline for the ALD application.

Thanks,
Michelle

EXTERNAL EMAIL: Do not open attachments/click links if source is unknown. Please report all phishing attempts to phishing@azgt.coop

Message

From: Michelle Freeark [mfreeark@azgt.coop]
Sent: 11/17/2020 1:32:45 PM
To: Long, Michelle [Long.Michelle@epa.gov]; Huggins, Richard [Huggins.Richard@epa.gov]
CC: Mills, Jason [Mills.Jason@epa.gov]; Jackson, Mary [Jackson.Mary@epa.gov]
Subject: RE: Arizona Electric Power Cooperative, Inc (AEPCO) meeting request on CCR Part B ALD Demonstration
Attachments: ATT00001.txt

Good morning Michelle,

In our email request we asked for a meeting on Tuesday, November 24th. Our only request is that it is after 8:30 am EDT, other than that we have no preference.

Thanks,
Michelle

Michelle Freeark, Executive Director of Regulatory Affairs and Corporate Services

Arizona G&T Cooperatives

1000 S. Hwy 80 | Benson, AZ 85602
o: 520-586-5122 | m: Ex. 6 Personal Privacy (PP) | **mfreeark@azgt.coop**

-------- Original message --------
From: "Long, Michelle" <Long.Michelle@epa.gov>
Date: 11/17/20 8:28 AM (GMT-05:00)
To: Michelle Freeark <mfreeark@azgt.coop>, "Huggins, Richard" <Huggins.Richard@epa.gov>
Cc: "Mills, Jason" <Mills.Jason@epa.gov>, "Jackson, Mary" <Jackson.Mary@epa.gov>
Subject: RE: Arizona Electric Power Cooperative, Inc (AEPCO) meeting request on CCR Part B ALD Demonstration

Hi Michelle,

Do you have any preferred meeting dates and times? If you can offer a few times, I'll check our calendars and find a time that would work for us. Thanks.

Michelle Long
Biologist
U.S. Environmental Protection Agency
Office of Resource Conservation and Recovery
Materials Recovery and Waste Management Division
(703) 347-8953

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Sent: Tuesday, November 17, 2020 8:25 AM
To: Huggins, Richard <Huggins.Richard@epa.gov>
Cc: Long, Michelle <Long.Michelle@epa.gov>; Behan, Frank <Behan.Frank@epa.gov>; Hillyer, Kirsten

<hillyer.kirsten@epa.gov>; Anderson, Lydia <Anderson.Lydia@epa.gov>
Subject: RE: Arizona Electric Power Cooperative, Inc (AEPCO) meeting request on CCR Part B ALD Demonstration

Thank you Richard!

Michelle Freeark, Executive Director of Regulatory Affairs and Corporate Services

1000 S. Hwy 80 | Benson, AZ 85602
o: 520-586-5122 | m: Ex. 6 Personal Privacy (PP) **mfreeark@azgt.coop**

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Date: 11/16/20 4:07 PM (GMT-05:00)
To: Michelle Freeark <mfreeark@azgt.coop>
Cc: "Long, Michelle" <Long.Michelle@epa.gov>, "Behan, Frank" <Behan.Frank@epa.gov>, "Hillyer, Kirsten" <hillyer.kirsten@epa.gov>, "Anderson, Lydia" <Anderson.Lydia@epa.gov>
Subject: RE: Arizona Electric Power Cooperative, Inc (AEPCO) meeting request on CCR Part B ALD Demonstration

Good afternoon,
Sorry for the delay Michelle. I have asked Michelle Long (Part B rule coordinator), to work with you to get this meeting on our calendar. She will be reaching out tomorrow.

Look forward to the meeting,
Richard

Richard Huggins Jr., Chief
Energy Recovery and Waste Disposal Branch
Office of Resource Conservation and Recovery
U.S. Environmental Protection Agency
Desk: 703-308-0017 iPhone: 571-345-6855

From: Michelle Freeark <mfreeark@azgt.coop>
Sent: Monday, November 16, 2020 3:54 PM
To: Huggins, Richard <Huggins.Richard@epa.gov>; Behan, Frank <Behan.Frank@epa.gov>; Hillyer, Kirsten <hillyer.kirsten@epa.gov>; Anderson, Lydia <Anderson.Lydia@epa.gov>
Subject: RE: Arizona Electric Power Cooperative, Inc (AEPCO) meeting request on CCR Part B ALD Demonstration

Good afternoon,

I am following up on our meeting request that was sent via email last Thursday. Knowing how extremely busy you have been, I thought I would reach out to ensure our email request was received and is being considered.

Respectfully,
Michelle Freeark

Michelle Freeark, Executive Director of Regulatory Affairs and Corporate Services

1000 S. Hwy 80 | Benson, AZ 85602
o: 520-586-5122 | m: Ex. 6 Personal Privacy (PP) | **mfreeark@azgt.coop**

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From: Michelle Freeark
Sent: Thursday, November 12, 2020 7:52 AM
To: 'Huggins.Richard@epa.gov' <Huggins.Richard@epa.gov>; 'Behan.Frank@epa.gov' <Behan.Frank@epa.gov>; 'Hillyer.Kirsten@epa.gov' <Hillyer.Kirsten@epa.gov>; 'anderson.lydia@epa.gov' <anderson.lydia@epa.gov>
Subject: Arizona Electric Power Cooperative, Inc (AEPCO) meeting request on CCR Part B ALD Demonstration

Good morning,

Arizona Electric Power Cooperative, Inc. (AEPCO) is hereby requesting a virtual meeting with EPA staff to discuss AEPCO's Alternative Liner Demonstration (ALD) application submittal in accordance with 40 C.F.R. § 257.71(d)(1)(i).

AEPCO owns and operates the Apache Generating Station (Apache Station), an electric generation station located in Cochise, Arizona about 80 miles east of Tucson, Arizona and about 25 miles northeast of Benson, Arizona. AEPCO is a rural, consumer-owned generation and transmission electric cooperative that provides electric generation service to local rural, consumer-owned electric distribution cooperatives in Arizona and California. As a not-for-profit cooperative, AEPCO is fully owned by its members. AEPCO has six "Class A" members. Together, AEPCO's Class A members serve more than 160,000 meters, representing approximately 400,000 individual residential, commercial, agricultural and industrial consumers. The electric service base is heavily skewed toward rural residential use, with relatively little commercial or industrial load. A substantial proportion of AEPCO's end-users are low income residents.

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AEPCO respectfully requests the meeting to be held on Tuesday, November 24th. AEPCO intends to have staff, outside legal counsel and its consultant, Burns & McDonnell participate in the meeting. AEPCO will provide EPA with a draft ALD application prior to the meeting.

AEPCO certainly understands the high demand for meetings with EPA and greatly appreciate your time to consider a meeting with AEPCO, particularly in light of the upcoming deadline for the ALD application.

Thanks,
Michelle

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EXTERNAL EMAIL: Do not open attachments/click links if source is unknown. Please report all phishing attempts to phishing@azgt.coop

Message

From: Vodopivec, Cynthia [Cynthia.Vodopivec@vistracorp.com]
Sent: 11/25/2020 9:44:10 PM
To: Huggins, Richard [Huggins.Richard@epa.gov]; Jackson, Mary [Jackson.Mary@epa.gov]; Long, Michelle [Long.Michelle@epa.gov]; Mills, Jason [Mills.Jason@epa.gov]
CC: Mitchell, David [David.Mitchell@vistracorp.com]; Collins, Renee [Renee.Collins@luminant.com]
Subject: Martin Lake Alternate Liner Demonstration Application

Luminant Generation Company LLC (Luminant) hereby submits this Alternate Liner Demonstration (ALD) application to the U.S. Environmental Protection Agency (EPA) pursuant to 40 C.F.R. § 257.71(d)(i) for the Permanent Disposal Pond 5 located at the Martin Lake Steam Electric Station near Tatum, Texas. Due to the file size, I cannot transmit this application through email, however you may download it from our website at the following location:
https://www.luminant.com/ccr/?wpdf_download_file=L25hcy9jb250ZW50L2xpdmUvbHVtaW5hbnQzL2RvY3VtZW50cy9jY3IvVGV4YXMvTWFydGluLUxha2UvMjAyMC8yMDIwLU1hcnRpbiBMYWtlLVNXUiAzMTI3Ny1BbHRlcm5hdGl2ZSBMaW5lciBEZW1vbnN0cmF0aW9uIEFwcGxpY2F0aW9uLVBEUCA1LnBkZg%3D%3D

Please let me know if you have any questions.

Best Regards,

Cynthia Vodopivec

Cynthia E. Vodopivec, P.E.
VP – Environmental, Health & Safety
o 214-812-2050
m Ex. 6 Personal Privacy (PP)
cynthia.vodopivec@vistracorp.com

Message

From: Shimshock, John [jshimshock@keyconops.com]
Sent: 11/17/2020 2:38:40 PM
To: Hillyer, Kirsten [hillyer.kirsten@epa.gov]; Behan, Frank [Behan.Frank@epa.gov]; Huggins, Richard [Huggins.Richard@epa.gov]
CC: Kushner, Joseph [jkushner@keyconops.com]; Illig, Lauren [lillig@keyconops.com]; Adam Scheller [a.scheller@gaiconsultants.com]; Kent Cockley [k.cockley@gaiconsultants.com]; Leigh Rounce [L.Rounce@gaiconsultants.com]; Derek Furstenwerth [derek@camsesparc.com]; Patrick Brosnan [pbrosnan@camsesparc.com]
Subject: Conemaugh Generating Station - Submittal per 40 CFR §257.103(f)(1) Requirements
Attachments: Conemaugh AFPs_CCR Rule Part A Demonstration_11-17-2020.pdf

Greetings Ms. Hillyer and Messrs. Behan and Huggins,
Please find attached the subject submittal for your consideration and hopeful approval.
Conemaugh Station and our engineering firm, GAI Consultants, are grateful to EPA for their attention to this submittal. If you have any questions or concerns regarding this demonstration, then please contact either Joe Kushner or me, contact info below – John.

Joseph Kushner, PE

Strategy and Compliance Manager
Keystone/Conemaugh Generating Stations
1142 Power Plant Rd.
New Florence, PA 15944
Office: 724-235-4529
Cell: Ex. 6 Personal Privacy (PP)
jkushner@keyconops.com

John P. Shimshock
Environmental Specialist
Conemaugh Generating Station
1442 Power Plant Road
New Florence, PA 15944
Office Phone: (724) 235-4596
Cellular Phone: Ex. 6 Personal Privacy (PP)
jshimshock@keyconops.com

Message

From: Kushner, Joseph [jkushner@keyconops.com]
Sent: 11/27/2020 4:37:04 PM
To: Huggins, Richard [Huggins.Richard@epa.gov]
CC: Shott, David [David.Shott@aptim.com]; Lillys, Ted [tlillys@rti.org]; dsw@rti.org; Shimshock, John [jshimshock@keyconops.com]; Shimshock, John [jshimshock@keyconops.com]; Hillyer, Kirsten [hillyer.kirsten@epa.gov]; Mills, Jason [Mills.Jason@epa.gov]; Long, Michelle [Long.Michelle@epa.gov]; Kushner, Joseph [jkushner@keyconops.com]; Illig, Lauren [lillig@keyconops.com]; Adam Scheller [a.scheller@gaiconsultants.com]; Kent Cockley [k.cockley@gaiconsultants.com]; Leigh Rounce [L.Rounce@gaiconsultants.com]; Patrick Brosnan [pbrosnan@camsesparc.com]; Derek Furstenwerth [derek@camsesparc.com]
Subject: RE: Conemaugh Station - CCR Rule Part A and B submittals - TEAMS meeting to discuss EPA's initial concerns

Mr. Huggins,

Thank you for taking the time to discuss the CCR Part A Demonstration and Part B Application packages for Conemaugh's Ash Filter Ponds, both in during our conference call at 1:00 PM on Wednesday November 25, and in your follow-up call with Mr. Shimshock the same day shortly after.

I wanted to take this opportunity to document some pertinent conclusions from our discussions to make sure there are no misunderstandings and ensure Conemaugh takes the appropriate steps to remain compliant with the CCR regulations. Please review the bullet points below and let us know if you concur or if anything has been misinterpreted:

1. EPA stated that the final deadline to amend the Part B Application corresponds to the Effective Date of the Part B Rule, which is December 14th, 2020.
    a. The EPA requested that pertinent information about establishing the groundwater monitoring network for the Ash Filter Ponds be extracted from the appendices of the application and incorporated into the narrative discussion of the application.
    b. Any information concerning establishment of the groundwater monitoring network not included in the appendices will be added to the narrative as well.
    c. The Station also plans to include a summary of the preliminary result of the on-going cobalt investigation.
    d. The Station's understanding is that it would be EPA's preference that Conemaugh resubmit an ammended Part B Application (originally submitted 11/24/20) rather than submitting an addendum. We plan to do this ahead of the Part B effective date of 12/14/20.
2. EPA stated that Conemaugh is able to withdraw its currently submitted Part A Demonstration (submitted 11/17/20) by emailing a request to EPA's Part A department.
    a. Per EPA's guidance, the Station plans to withdraw its Part A Demonstration on Monday, November 30, 2020 and proceed solely with the Part B Demonstration Application. EPA stated that the Part B Rule provides a pathway for facilities to submit the Part A Demonstration after a decision has been made regarding the Part B Application.

Thank you again for your help in this matter. If you have any questions or concerns, please do not hesitate to contact me or Mr. Shimshock. Since I am typically working remotely, please call my cell phone or email me.

Sincerely,

Joseph Kushner, PE

Strategy and Compliance Manager
Keystone/Conemaugh Generating Stations
1142 Power Plant Rd.
New Florence, PA 15944
Office: 724-235-4529
Cell: Ex. 6 Personal Privacy (PP)
jkushner@keyconops.com

Message

From: Shimshock, John [jshimshock@keyconops.com]
Sent: 11/30/2020 1:29:19 PM
To: Hillyer, Kirsten [hillyer.kirsten@epa.gov]; Behan, Frank [Behan.Frank@epa.gov]; Huggins, Richard [Huggins.Richard@epa.gov]
CC: Kushner, Joseph [jkushner@keyconops.com]; Illig, Lauren [lillig@keyconops.com]; Adam Scheller [a.scheller@gaiconsultants.com]; Kent Cockley [k.cockley@gaiconsultants.com]; Leigh Rounce [L.Rounce@gaiconsultants.com]; Derek Furstenwerth [derek@camsesparc.com]; Patrick Brosnan [pbrosnan@camsesparc.com]
Subject: Conemaugh Generating Station - Withdrawal of Submittal per 40 CFR §257.103(f)(1) Requirements
Attachments: ATT00001.txt

Greetings again Ms. Hillyer and Messrs. Behan and Huggins,

Per our recent communications, Conemaugh Station wishes to withdraw the subject submittal. Instead, Conemaugh Station and our engineering firm, GAI Consultants, would be grateful to EPA for your attention and hopeful approval to the submittal per 40 CFR §257.71(d)(1)(i) requirements. A CCR Rule "Part B" application was forwarded to EPA on 11-24-2020. Conemaugh Station and GAI Consultants expect to forward a revised "Part B" application to EPA either this week or early next week, per our recent communications. Thanks again for your efforts in support of these submittals. Please accept my apologies for any inconveniences related to the Station's submittals, happy to discuss – John

John P. Shimshock
Environmental Specialist
Conemaugh Generating Station
1442 Power Plant Road
New Florence, PA 15944
Office Phone: (724) 235-4596
Cellular Phone: Ex. 6 Personal Privacy (PP)
jshimshock@keyconops.com

From: Hillyer, Kirsten <hillyer.kirsten@epa.gov>
Sent: Wednesday, November 18, 2020 10:11 AM
To: Shimshock, John <jshimshock@keyconops.com>
Cc: Kushner, Joseph <jkushner@keyconops.com>; Illig, Lauren <lillig@keyconops.com>; Adam Scheller <a.scheller@gaiconsultants.com>; Kent Cockley <k.cockley@gaiconsultants.com>; Leigh Rounce <L.Rounce@gaiconsultants.com>; Behan, Frank <Behan.Frank@epa.gov>; Derek Furstenwerth <derek@camsesparc.com>; Patrick Brosnan <pbrosnan@camsesparc.com>; Huggins, Richard <Huggins.Richard@epa.gov>
Subject: RE: Conemaugh Generating Station - Submittal per 40 CFR §257.103(f)(1) Requirements

Good Morning,

EPA has received the demonstration submitted pursuant to the alternative closure provision § 257.103(f)(1) for the Conemaugh Generating Station. We will begin our completeness review of the demonstration as quickly as possible. EPA is maintaining a table of all submitted demonstrations and their review status on our website, https://www.epa.gov/coalash/ccr-part-implementation.
When EPA concludes the completeness review, we will notify you.

Thank you for your patience.

If you have any questions, please contact myself, Frank Behan, or Richard Huggins

Kirsten Hillyer
U.S. EPA
OLEM/ORCR/MRWMD
Cube:S-6834 Phone: (703) 347-0369

From: Shimshock, John <jshimshock@keyconops.com>
Sent: Tuesday, November 17, 2020 9:39 AM
To: Hillyer, Kirsten <hillyer.kirsten@epa.gov>; Behan, Frank <Behan.Frank@epa.gov>; Huggins, Richard <Huggins.Richard@epa.gov>
Cc: Kushner, Joseph <jkushner@keyconops.com>; Illig, Lauren <lillig@keyconops.com>; Adam Scheller <a.scheller@gaiconsultants.com>; Kent Cockley <k.cockley@gaiconsultants.com>; Leigh Rounce <L.Rounce@gaiconsultants.com>; Derek Furstenwerth <derek@camsesparc.com>; Patrick Brosnan <pbrosnan@camsesparc.com>
Subject: Conemaugh Generating Station - Submittal per 40 CFR §257.103(f)(1) Requirements

Greetings Ms. Hillyer and Messrs. Behan and Huggins,
Please find attached the subject submittal for your consideration and hopeful approval.
Conemaugh Station and our engineering firm, GAI Consultants, are grateful to EPA for their attention to this submittal. If you have any questions or concerns regarding this demonstration, then please contact either Joe Kushner or me, contact info below – John.

Joseph Kushner, PE

Strategy and Compliance Manager
Keystone/Conemaugh Generating Stations
1142 Power Plant Rd.
New Florence, PA 15944
Office: 724-235-4529
Cell: 724-747-1945
jkushner@keyconops.com

John P. Shimshock
Environmental Specialist
Conemaugh Generating Station
1442 Power Plant Road
New Florence, PA 15944
Office Phone: (724) 235-4596
Cellular Phone: Ex. 6 Personal Privacy (PP)
jshimshock@keyconops.com

Message

From: Hillyer, Kirsten [hillyer.kirsten@epa.gov]
Sent: 11/30/2020 3:09:31 PM
To: Shimshock, John [jshimshock@keyconops.com]
CC: Kushner, Joseph [jkushner@keyconops.com]; Illig, Lauren [lillig@keyconops.com]; Adam Scheller [a.scheller@gaiconsultants.com]; Kent Cockley [k.cockley@gaiconsultants.com]; Leigh Rounce [L.Rounce@gaiconsultants.com]; Derek Furstenwerth [derek@camsesparc.com]; Patrick Brosnan [pbrosnan@camsesparc.com]; Long, Michelle [Long.Michelle@epa.gov]; Huggins, Richard [Huggins.Richard@epa.gov]; Behan, Frank [Behan.Frank@epa.gov]
Subject: RE: Conemaugh Generating Station - Withdrawal of Submittal per 40 CFR §257.103(f)(1) Requirements

Good Morning,

Thank you for notifying EPA that you wish to withdraw the submittal per 40 CFR § 257.103(f)(1). We will update our website to show that the demonstration is withdrawn and EPA will stop the review of the demonstration for § 257.103(f)(1).
If you have any further questions concerning the demonstration for § 257.103(f)(1) please contact myself, Frank Behan and Richard Huggins.
If you have any further questions concerning the demonstration for the CCR Part B rule please contact Michelle Long and Richard Huggins.
Thank you,

Kirsten Hillyer
U.S. EPA
OLEM/ORCR/MRWMD
Cube:S-6834 Phone: (703) 347-0369

From: Shimshock, John <jshimshock@keyconops.com>
Sent: Monday, November 30, 2020 8:29 AM
To: Hillyer, Kirsten <hillyer.kirsten@epa.gov>; Behan, Frank <Behan.Frank@epa.gov>; Huggins, Richard <Huggins.Richard@epa.gov>
Cc: Kushner, Joseph <jkushner@keyconops.com>; Illig, Lauren <lillig@keyconops.com>; Adam Scheller <a.scheller@gaiconsultants.com>; Kent Cockley <k.cockley@gaiconsultants.com>; Leigh Rounce <L.Rounce@gaiconsultants.com>; Derek Furstenwerth <derek@camsesparc.com>; Patrick Brosnan <pbrosnan@camsesparc.com>
Subject: Conemaugh Generating Station - Withdrawal of Submittal per 40 CFR §257.103(f)(1) Requirements

Greetings again Ms. Hillyer and Messrs. Behan and Huggins,

Per our recent communications, Conemaugh Station wishes to withdraw the subject submittal. Instead, Conemaugh Station and our engineering firm, GAI Consultants, would be grateful to EPA for your attention and hopeful approval to the submittal per 40 CFR §257.71(d)(1)(i) requirements. A CCR Rule "Part B" application was forwarded to EPA on 11-24-2020. Conemaugh Station and GAI Consultants expect to forward a revised "Part B" application to EPA either this week or early next week, per our recent communications. Thanks again for your efforts in support of these submittals. Please accept my apologies for any inconveniences related to the Station's submittals, happy to discuss – John

John P. Shimshock
Environmental Specialist
Conemaugh Generating Station
1442 Power Plant Road
New Florence, PA 15944
Office Phone: (724) 235-4596
Cellular Phone: Ex. 6 Personal Privacy (PP)
jshimshock@keyconops.com

From: Hillyer, Kirsten <hillyer.kirsten@epa.gov>
Sent: Wednesday, November 18, 2020 10:11 AM
To: Shimshock, John <jshimshock@keyconops.com>
Cc: Kushner, Joseph <jkushner@keyconops.com>; Illig, Lauren <lillig@keyconops.com>; Adam Scheller <a.scheller@gaiconsultants.com>; Kent Cockley <k.cockley@gaiconsultants.com>; Leigh Rounce <L.Rounce@gaiconsultants.com>; Behan, Frank <Behan.Frank@epa.gov>; Derek Furstenwerth <derek@camsesparc.com>; Patrick Brosnan <pbrosnan@camsesparc.com>; Huggins, Richard <Huggins.Richard@epa.gov>
Subject: RE: Conemaugh Generating Station - Submittal per 40 CFR §257.103(f)(1) Requirements

Good Morning,

EPA has received the demonstration submitted pursuant to the alternative closure provision § 257.103(f)(1) for the Conemaugh Generating Station. We will begin our completeness review of the demonstration as quickly as possible. EPA is maintaining a table of all submitted demonstrations and their review status on our website, https://www.epa.gov/coalash/ccr-part-implementation.
When EPA concludes the completeness review, we will notify you.

Thank you for your patience.

If you have any questions, please contact myself, Frank Behan, or Richard Huggins

Kirsten Hillyer
U.S. EPA
OLEM/ORCR/MRWMD
Cube:S-6834 Phone: (703) 347-0369

From: Shimshock, John <jshimshock@keyconops.com>
Sent: Tuesday, November 17, 2020 9:39 AM
To: Hillyer, Kirsten <hillyer.kirsten@epa.gov>; Behan, Frank <Behan.Frank@epa.gov>; Huggins, Richard <Huggins.Richard@epa.gov>
Cc: Kushner, Joseph <jkushner@keyconops.com>; Illig, Lauren <lillig@keyconops.com>; Adam Scheller <a.scheller@gaiconsultants.com>; Kent Cockley <k.cockley@gaiconsultants.com>; Leigh Rounce <L.Rounce@gaiconsultants.com>; Derek Furstenwerth <derek@camsesparc.com>; Patrick Brosnan <pbrosnan@camsesparc.com>
Subject: Conemaugh Generating Station - Submittal per 40 CFR §257.103(f)(1) Requirements

Greetings Ms. Hillyer and Messrs. Behan and Huggins,
Please find attached the subject submittal for your consideration and hopeful approval.
Conemaugh Station and our engineering firm, GAI Consultants, are grateful to EPA for their attention to this submittal. If you have any questions or concerns regarding this demonstration, then please contact either Joe Kushner or me, contact info below – John.

Joseph Kushner, PE

Strategy and Compliance Manager
Keystone/Conemaugh Generating Stations
1142 Power Plant Rd.
New Florence, PA 15944
Office: 724-235-4529
Cell: Ex. 6 Personal Privacy (PP)
jkushner@keyconops.com

John P. Shimshock
Environmental Specialist
Conemaugh Generating Station
1442 Power Plant Road
New Florence, PA 15944
Office Phone: (724) 235-4596
Ex. 6 Personal Privacy (PP)
jshimshock@keyconops.com

Appointment

From: Huggins, Richard [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=0314E81A1F4843FCBBE0910CFDDD53F4-HUGGINS, RICHARD]
Sent: 3/16/2020 6:56:35 PM
To: Huggins, Richard [Huggins.Richard@epa.gov]; Ross Elliott [Elliott.Ross@epa.gov]; Mills, Jason [mills.jason@epa.gov]; Frank Behan [Behan.Frank@epa.gov]; Celeste, Laurel [celeste.laurel@epa.gov]; Roewer, James [JRoewer@eei.org]; 'Doug Green' [dhgreen@venable.com]; Chow, Rita [chow.rita@epa.gov]; Janjic, Ksenija [Janjic.Ksenija@epa.gov]
CC: MarkJ Huff [Huff.MarkJ@epa.gov]; Birchfield, Norman [Birchfield.Norman@epa.gov]; Fawal, Margaret K. [MKFawal@Venable.com]; HAROLD D. REGISTER JR [HAROLD.REGISTERJR@cmsenergy.com]

Subject: CCR Part B Discussion

Start: 3/19/2020 7:00:00 PM
End: 3/19/2020 8:00:00 PM
Show Time As: Busy

Required Attendees: Huggins, Richard; Ross Elliott; Mills, Jason; Frank Behan; Celeste, Laurel; Roewer, James; 'Doug Green'; Chow, Rita; Janjic, Ksenija
Optional Attendees: MarkJ Huff; Birchfield, Norman; Fawal, Margaret K.; HAROLD D. REGISTER JR

Call in number: (202) 991-0477
Ex. 6 Personal Privacy (PP)

Appointment

From: Huggins, Richard [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=0314E81A1F4843FCBBE0910CFDDD53F4-HUGGINS, RICHARD]
Sent: 10/27/2020 7:28:43 PM
To: Huggins, Richard [Huggins.Richard@epa.gov]; Celeste, Laurel [celeste.laurel@epa.gov]; Jackson, Mary [Jackson.Mary@epa.gov]; Mills, Jason [mills.jason@epa.gov]; Long, Michelle [Long.Michelle@epa.gov]; Capiro, Mirtha [capiro.mirtha@epa.gov]; Anderson, Lydia [Anderson.Lydia@epa.gov]; Newton, Mimi [Newton.Mimi@epa.gov]; Gross, Barbara [Gross.Barbara@epa.gov]; Klein Maribeth M [Maribeth.Klein@srpnet.com]; Martinez Andrea L [Andrea.Martinez@srpnet.com]; Montalvo Kara M [Kara.Montalvo@srpnet.com]; Pokorny, Jason [JPokorny@haleyaldrich.com]
CC: Prein Mark G [Mark.Prein@srpnet.com]; Wall, Steve [Wall.Steve@epa.gov]; Cruz, Amanda [cruz.amanda@epa.gov]; Bhargava Prabhat [Prabhat.Bhargava@srpnet.com]

Subject: CCR Part B Rule Discussion with Salt River Project
Location: Microsoft Teams Meeting

Start: 11/12/2020 7:00:00 PM
End: 11/12/2020 8:00:00 PM
Show Time As: Busy

Required Attendees: Huggins, Richard; Celeste, Laurel; Jackson, Mary; Mills, Jason; Long, Michelle; Capiro, Mirtha; Anderson, Lydia; Newton, Mimi; Gross, Barbara; Klein Maribeth M; Martinez Andrea L; Montalvo Kara M; Pokorny, Jason
Optional Attendees: Prein Mark G; Wall, Steve; Cruz, Amanda; Bhargava Prabhat

Please forward as necessary. Thanks

Microsoft Teams meeting

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Message

From: Huggins, Richard [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=0314E81A1F4843FCBBE0910CFDDD53F4-HUGGINS, RICHARD]
Sent: 6/10/2021 12:58:04 PM
To: Thomsen, Martha [martha.thomsen@bakerbotts.com]
CC: Berge, Megan [megan.berge@bakerbotts.com]
Subject: RE: Quick call sometime next week?

Yes I have it. I may be a minute or two late as I have back to back meetings, but hopefully ill be on time.

Richard Huggins Jr., Chief
Energy Recovery and Waste Disposal Branch
Office of Resource Conservation and Recovery
U.S. Environmental Protection Agency
Desk: 703-308-0017 iPhone: 571-345-6855

From: Thomsen, Martha <martha.thomsen@bakerbotts.com>
Sent: Thursday, June 10, 2021 8:57 AM
To: Huggins, Richard <Huggins.Richard@epa.gov>
Cc: Berge, Megan <megan.berge@bakerbotts.com>
Subject: RE: Quick call sometime next week?

Hi Richard – I just wanted to make sure you had the Teams/call in info for 3 pm today (also copied below). Let me know if you have any questions and thank you again!

Microsoft Teams meeting

Join on your computer or mobile app
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Or call in (audio only)
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Martha S. Thomsen
Senior Associate

Baker Botts L.L.P
martha.thomsen@bakerbotts.com
T +1.202.639.7863
F +1.202.508.9329
M Ex. 6 Personal Privacy (PP)

700 K Street, NW
Washington, DC 20001
USA

From: Thomsen, Martha
Sent: Monday, June 7, 2021 10:37 AM
To: Huggins, Richard <Huggins.Richard@epa.gov>
Cc: Berge, Megan <megan.berge@bakerbotts.com>
Subject: RE: Quick call sometime next week?

Hi Richard – thank you again for agreeing to speak with CCIG on Thursday! Below are (1) some of the initial topics I was hoping to ask you about during the Q&A session and (2) as requested, our current member list.

Topics for discussion –

- EPA's recent announcement that "EPA completed review of the three coal combustion residuals rules in response to Executive Order 13990. EPA determined that the most environmentally protective course is to implement the rules. EPA will be addressing the remaining issues remanded back to the Agency regarding the July 2018 rule through the rulemaking process."
    - Outlook for Part A/Part B Rule
    - "Remaining issues" that EPA is reviewing/expects to address
- Part A and Part B applications – status and key issues
- Any further guidance or other statements from EPA on closure and/or cleanup criteria
- Other rulemakings/approvals
    - State permitting program
    - Federal permitting program
    - Legacy impoundment rulemaking
- FY 2022 enforcement budget request and key potential enforcement issues for EPA

CCIG Member list –

- AES Corporation
- Arizona Public Service
- Alliant Energy Corporation
- Basin Electric Power Cooperative
- Dominion Energy
- Duke Energy
- Entergy Services, LLC
- Evergy, Inc.
- Florida Power & Light Company
- Louisville Gas & Electric/Kentucky Utilities
- Minnesota Power
- NextEra Energy, Inc.
- OGE Energy Corp.
- Public Service Company of New Mexico
- PowerSouth Energy Cooperative
- Puget Sound Energy
- Talen Energy
- Tucson Electric Power Company
- Salt River Project
- Southern Company
- Vectren
- Vistra Energy

Feel free to call with any questions – thanks!

Martha S. Thomsen
Senior Associate

Baker Botts L.L.P
martha.thomsen@bakerbotts.com
T +1.202.639.7863
F +1.202.508.9329
M Ex. 6 Personal Privacy (PP)

700 K Street, NW
Washington, DC 20001
USA

From: Huggins, Richard <Huggins.Richard@epa.gov>
Sent: Tuesday, June 1, 2021 4:10 PM
To: Thomsen, Martha <martha.thomsen@bakerbotts.com>
Cc: Berge, Megan <megan.berge@bakerbotts.com>
Subject: RE: Quick call sometime next week?

[EXTERNAL EMAIL]

Yes I have time to chat. Can chat tomorrow anytime before 10, 11-12, 1-3.

Q and A seems fine to me.

Richard Huggins Jr., Chief
Energy Recovery and Waste Disposal Branch
Office of Resource Conservation and Recovery
U.S. Environmental Protection Agency
Desk: 703-308-0017 iPhone: 571-345-6855

From: Thomsen, Martha <martha.thomsen@bakerbotts.com>
Sent: Friday, May 28, 2021 10:28 AM
To: Huggins, Richard <Huggins.Richard@epa.gov>
Cc: Berge, Megan <megan.berge@bakerbotts.com>
Subject: RE: Quick call sometime next week?

Hi Richard – thank you again for agreeing to speak on June 10 to our CCIG members – we're really looking forward to it. Do you have time next week to talk about logistics? Our meeting is scheduled for 2-5 pm ET and you would be welcome to speak during whatever part of that window is most convenient for you. We were thinking about a Q&A format but wanted to hear your thoughts on what format would make the most sense.

Thank you – and have a great holiday weekend!

Martha S. Thomsen
Senior Associate

Baker Botts L.L.P

martha.thomsen@bakerbotts.com
T +1.202.639.7863
F +1.202.508.9329
M Ex. 6 Personal Privacy (PP)

700 K Street, NW
Washington, DC 20001
USA

From: Huggins, Richard <Huggins.Richard@epa.gov>
Sent: Monday, May 10, 2021 6:30 AM
To: Thomsen, Martha <martha.thomsen@bakerbotts.com>
Cc: Berge, Megan <megan.berge@bakerbotts.com>
Subject: RE: Quick call sometime next week?

[EXTERNAL EMAIL]

Yes I can participate on June 10, thanks

Richard Huggins Jr., Chief
Energy Recovery and Waste Disposal Branch
Office of Resource Conservation and Recovery
U.S. Environmental Protection Agency
Desk: 703-308-0017 iPhone: 571-345-6855

From: Thomsen, Martha <martha.thomsen@bakerbotts.com>
Sent: Friday, May 7, 2021 9:48 AM
To: Huggins, Richard <Huggins.Richard@epa.gov>
Cc: Berge, Megan <megan.berge@bakerbotts.com>
Subject: RE: Quick call sometime next week?

Hi Richard,

Hope you're having a good week. It looks like we're going ahead with our next CCIG meeting Thursday, June 10, from 2:00 to 5:00 p.m. Are you still available to speak sometime in that window? Happy to discuss if you have any questions – and we really appreciate this!

Martha S. Thomsen
Senior Associate

Baker Botts L.L.P
martha.thomsen@bakerbotts.com
T +1.202.639.7863
F +1.202.508.9329
M Ex. 6 Personal Privacy (PP)

700 K Street, NW
Washington, DC 20001
USA

[redacted]

(Please note the recent change in address)

From: Huggins, Richard <Huggins.Richard@epa.gov>
Sent: Wednesday, April 28, 2021 2:35 PM
To: Thomsen, Martha <martha.thomsen@bakerbotts.com>
Cc: Berge, Megan <megan.berge@bakerbotts.com>
Subject: RE: Quick call sometime next week?

[EXTERNAL EMAIL]

That week is fine and no special times needed. Thanks

Richard Huggins Jr., Chief
Energy Recovery and Waste Disposal Branch
Office of Resource Conservation and Recovery
U.S. Environmental Protection Agency
Desk: 703-308-0017 iPhone: 571-345-6855

From: Thomsen, Martha <martha.thomsen@bakerbotts.com>
Sent: Wednesday, April 28, 2021 2:22 PM
To: Huggins, Richard <Huggins.Richard@epa.gov>
Cc: Berge, Megan <megan.berge@bakerbotts.com>
Subject: RE: Quick call sometime next week?

Hi Richard – it was great talking to you today. We discussed internally and we're looking at the week of June 7 for our CCIG meeting that we're hoping you can speak at virtually. We'll be soliciting feedback from our members on the precise date/time, but wanted to give you a heads up and also see if there are particularly good or bad afternoons for you that week? Our meetings are typically in the afternoon to accommodate all time zones.

Thank you! And please let me know if you have any questions or would like to discuss.

Martha S. Thomsen
Senior Associate

Baker Botts L.L.P
martha.thomsen@bakerbotts.com
T +1.202.639.7863
F +1.202.508.9329
M Ex. 6 Personal Privacy (PP)

700 K Street, NW
Washington, DC 20001
USA
[redacted]

(Please note the recent change in address)

From: Huggins, Richard <Huggins.Richard@epa.gov>
Sent: Sunday, April 25, 2021 2:28 PM
To: Thomsen, Martha <martha.thomsen@bakerbotts.com>
Cc: Berge, Megan <megan.berge@bakerbotts.com>
Subject: RE: Quick call sometime next week?

[EXTERNAL EMAIL]

How about sometime Wed AM? My calendar is open so just send me an invite. Thanks

Richard Huggins Jr., Chief
Energy Recovery and Waste Disposal Branch
Office of Resource Conservation and Recovery
U.S. Environmental Protection Agency
Desk: 703-308-0017 iPhone: 571-345-6855

From: Thomsen, Martha <martha.thomsen@bakerbotts.com>
Sent: Friday, April 23, 2021 2:32 PM
To: Huggins, Richard <Huggins.Richard@epa.gov>
Cc: Berge, Megan <megan.berge@bakerbotts.com>
Subject: Quick call sometime next week?

Hi Richard – we hope you're doing well. I just wanted to follow up on my voicemail yesterday and see if you might have time for a quick call next week to discuss whether you would be willing to participate in an upcoming Cross-Cutting Issues Group meeting on CCR issues? Just let me know if there is a particularly good time for you for a quick call – thank you!

Martha S. Thomsen
Senior Associate

Baker Botts L.L.P
martha.thomsen@bakerbotts.com
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F +1.202.508.9329
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Washington, DC 20001
USA

(Please note the recent change in address)

Confidentiality Notice:

The information contained in this email and any attachments is intended only for the recipient[s] listed above and may be privileged and confidential. Any dissemination, copying, or use of or reliance upon such information by or to anyone other than the recipient[s] listed above is prohibited. If you have received this message in error, please notify the sender immediately at the email address above and destroy any and all copies of this message.

Message

From: Huggins, Richard [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=0314E81A1F4843FCBBE0910CFDDD53F4-HUGGINS, RICHARD]
Sent: 10/27/2020 7:30:19 PM
To: Montalvo Kara M [Kara.Montalvo@srpnet.com]
CC: Klein Maribeth M [Maribeth.Klein@srpnet.com]; Martinez Andrea L [Andrea.Martinez@srpnet.com]; Celeste, Laurel [celeste.laurel@epa.gov]; Mills, Jason [mills.jason@epa.gov]; Mary Jackson [Jackson.Mary@epa.gov]; Michelle Long (Long.Michelle@epa.gov) [Long.Michelle@epa.gov]; Newton, Mimi [Newton.Mimi@epa.gov]
Subject: RE: Request for "Part B" Pre-Submission Meeting: Salt River Project Coronado Generating Station

Good morning Kara,
Thank you for reaching out. I just sent a calendar invite out for November 12th at 2 PM eastern. Talk to you then. Thanks

Richard Huggins Jr., Chief
Energy Recovery and Waste Disposal Branch
Office of Resource Conservation and Recovery
U.S. Environmental Protection Agency
Desk: 703-308-0017 iPhone: 571-345-6855

From: Montalvo Kara M <Kara.Montalvo@srpnet.com>
Sent: Thursday, October 22, 2020 11:31 AM
To: Huggins, Richard <Huggins.Richard@epa.gov>; Behan, Frank <Behan.Frank@epa.gov>; Hillyer, Kirsten <hillyer.kirsten@epa.gov>; Anderson, Lydia <Anderson.Lydia@epa.gov>
Cc: Klein Maribeth M <Maribeth.Klein@srpnet.com>; Martinez Andrea L <Andrea.Martinez@srpnet.com>
Subject: Request for "Part B" Pre-Submission Meeting: Salt River Project Coronado Generating Station

Good Morning –

I am contacting you on behalf of Salt River Project to request a pre-submission meeting with EPA to discuss SRP's planned application to make an alternate line demonstration under the recently finalized "Part B" amendments to the 2015 CCR rule. Understanding that the "first step" application submission must occur no later than November 30, 2020, SRP would like to request a virtual 1-hour meeting with EPA the week of November 9. Our preference is a meeting on either November 12 or November 13, but we understand the constraints on EPA's schedule and are willing to meet on an alternate day that week as necessary.

SRP's application is for an existing surface impoundment, more commonly called the "Evaporation Pond" by SRP, at SRP's Coronado Generating Station (CGS) located in St. Johns, Arizona. Planned attendees from SRP for this meeting are as follows:

- Kara Montalvo, Director, Environmental Services
- Maribeth Klein, Senior Attorney
- Andrea Martinez, Manager, Water Quality & Waste Management Services
- Kent Liesemeyer, Senior Environmental Compliance Engineer
- Prabhat Bhargava, Operations & Maintenance Supervisor, CGS
- Mark Prein, Senior Environmental Scientist, CGS
- Mark Nicholls, Haley & Aldrich
- Jason Pokorny, Haley & Aldrich

Please let me know if you need any additional information from SRP to support scheduling of the pre-submission meeting. We are prepared to send EPA meeting materials (e.g., agenda, etc.) at least 2 days in advance of the scheduled meeting date.

Regards,
Kara

Kara M. Montalvo, QEP
Director, Environmental Services
SRP | Environmental Services | PAB359
P.O. Box 52025, Phoenix, AZ 85072-2025
P: (602) 236-5256 | **M**: Ex. 6 Personal Privacy (PP)

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This message and any accompanying attachments may contain confidential and/or privileged information. The message and attachments should be read and retained by intended recipients only. If you received this message in error, please notify the sender immediately and delete the message and any attachments.

Message

From: Huggins, Richard [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=0314E81A1F4843FCBBE0910CFDDD53F4-HUGGINS, RICHARD]
Sent: 11/19/2020 7:38:11 PM
To: Shimshock, John [jshimshock@keyconops.com]
CC: Kushner, Joseph [jkushner@keyconops.com]; Adam Scheller [a.scheller@gaiconsultants.com]; Michelle Long (Long.Michelle@epa.gov) [Long.Michelle@epa.gov]; Mary Jackson [Jackson.Mary@epa.gov]; Mills, Jason [mills.jason@epa.gov]
Subject: RE: CCR Rule Part B application per § 257.71(d)(1)(ii) for four existing CCR clay-lined surface impoundments at Conemaugh Station

Thanks for the email. The submittal process is the same for Part B as it was for Part A except the ccs should be Richard Huggins, Michelle Long, Mary Jackson and Jason Mills.

We will be creating a webpage shortly for Part B. if you have any other questions please let me know. Thanks

Richard Huggins Jr., Chief
Energy Recovery and Waste Disposal Branch
Office of Resource Conservation and Recovery
U.S. Environmental Protection Agency
Desk: 703-308-0017 iPhone: 571-345-6855

From: Shimshock, John <jshimshock@keyconops.com>
Sent: Thursday, November 19, 2020 12:14 PM
To: Huggins, Richard <Huggins.Richard@epa.gov>
Cc: Kushner, Joseph <jkushner@keyconops.com>; Adam Scheller <a.scheller@gaiconsultants.com>
Subject: FW: CCR Rule Part B application per § 257.71(d)(1)(ii) for four existing CCR clay-lined surface impoundments at Conemaugh Station

Greetings Mr. Huggins,
I'm forwarding this email to you per the instructions included in the auto out-of-office reply from Michelle Long. Thanks in advance for your help with this matter – John.

From: Shimshock, John
Sent: Thursday, November 19, 2020 12:11 PM
To: Long, Michelle <Long.Michelle@epa.gov>
Cc: Kushner, Joseph <jkushner@keyconops.com>; Adam Scheller <a.scheller@gaiconsultants.com>
Subject: CCR Rule Part B application per § 257.71(d)(1)(ii) for four existing CCR clay-lined surface impoundments at Conemaugh Station

Hi again Ms. Long,
I'm writing to inquire of the submittal procedures for the subject application. You are listed as the EPA contact for this rule, so I thought it would be best to start my inquiry with you. Conemaugh Station and our engineering firm, GAI Consultants, are aware that EPA set-up a Part A implementation webpage (link: https://www.epa.gov/coalash/ccr-part-implementation) that provides submittal instructions, but to our knowledge a similar Part B webpage has not yet been (or will be) set-up. As such, I'd be grateful for your guidance on this matter. For the Part A submittals, the demonstration transmittal letter was addressed to Administrator Wheler, and the cc list included the designated EPA reviewers, who received the entire package via email transmittal. We can do the same for a Part B submittal, please advise. Because of the number of attachments required for the Part B application, the resulting file size may be large, and I'm uncertain if EPA restricts email transmittals with large file size attachments.

Thanks in advance for your help with this matter, and I'm looking forward to receipt of your reply. Wishing you and yours an (early) enjoyable Thanksgiving holiday – John.

John P. Shimshock
Environmental Specialist
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Office Phone: (724) 235-4596
Cellular Phone: Ex. 6 Personal Privacy (PP)
jshimshock@keyconops.com

From: Long, Michelle <Long.Michelle@epa.gov>
Sent: Tuesday, February 4, 2020 11:18 AM
To: Shimshock, John <jshimshock@keyconops.com>
Cc: 'P. E. Stephen M. Frank (Stephen.Frank@genon.com)' <Stephen.Frank@genon.com>
Subject: RE: GenOn Website Postings - updates for Keystone and Conemaugh Generating Stations

Hello Mr. Shimshock,

Thank you for this update and I will share with my colleagues to update EPA's CCR website for the Keystone and Conemaugh Generating Stations. If there are any other changes to the facility websites in the future, please let me know so we can update our records accordingly.

Thanks,
Michelle

Michelle Long
Biologist
U.S. Environmental Protection Agency
Office of Resource Conservation and Recovery
(703) 347-8953

From: Shimshock, John <jshimshock@keyconops.com>
Sent: Wednesday, January 29, 2020 4:27 PM
To: Long, Michelle <Long.Michelle@epa.gov>
Cc: 'P. E. Stephen M. Frank (Stephen.Frank@genon.com)' <Stephen.Frank@genon.com>
Subject: RE: GenOn Website Postings - updates for Keystone and Conemaugh Generating Stations

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Please note my new email address

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Sent: Friday, May 17, 2019 9:28 AM
To: long.michelle@epa.gov
Cc: Shimshock, John <John.Shimshock@genon.com>; Jacklin, Mark J <Mark.Jacklin@genon.com>; McGraw, William P. <William.McGraw@genon.com>; Schenker, Jeremy S. <Jeremy.Schenker@genon.com>; Johnson, Walter <walter.johnson@genon.com>; Nitz, Mark <Mark.Nitz@genon.com>; Heimlicher, Peter <Bruce.Heimlicher@genon.com>; Anderson, Pilantana <Pilantana.Anderson@genon.com>
Subject: GenOn Website Postings

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6. Westland Ash Landfill Unit B in Dickerson, MD

Please do not hesitate to contact me with any questions regarding the CCR postings for the GenOn fleet.

Thank you,

GenOn

Stephen M. Frank, PE (Pa)
Senior Manager, Environmental
Stephen.Frank@GenOn.com
724-249-3610

Message

From: Huggins, Richard [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=0314E81A1F4843FCBBE0910CFDDD53F4-HUGGINS, RICHARD]
Sent: 11/25/2020 12:33:38 AM
To: Buening, Vincent [VBuening@trccompanies.com]
CC: Michelle Long (Long.Michelle@epa.gov) [Long.Michelle@epa.gov]; Mills, Jason [mills.jason@epa.gov]; Mary Jackson [Jackson.Mary@epa.gov]
Subject: RE: Part B Alternative Liner Demonstration Application Submittals - EPA Personnel to Email Them To

My apologies, we should have updated the web for Part B but have been swamped.

Submittals should go to the folks also included on this email. Thank you

Richard Huggins Jr., Chief
Energy Recovery and Waste Disposal Branch
Office of Resource Conservation and Recovery
U.S. Environmental Protection Agency
Desk: 703-308-0017 iPhone: 571-345-6855

From: Buening, Vincent <VBuening@trccompanies.com>
Sent: Tuesday, November 24, 2020 7:12 PM
To: Huggins, Richard <Huggins.Richard@epa.gov>
Subject: Part B Alternative Liner Demonstration Application Submittals - EPA Personnel to Email Them To

Mr. Huggins,

I looked for and could not find a CCR Part B Implementation web site yet like EPA has for Part A.

Should Part B Alternative Liner Demonstration Applications be submitted via email to the same three people as listed for Part A (Kirsten Hillyer
Frank Behan and Richard Huggins)?

Hoping to submit some Part B Alternative Liner Demonstration Applications tomorrow and we want to be sure we submit them to the proper EPA personnel.

Thank you. Regards. Vince

Vincent E. Buening, C.P.G.
Senior Project Manager/Senior Client Service Manager

TRC
1540 Eisenhower Place, Ann Arbor, MI 48108
T 734.585.7812 | F 734.971.9022 | C Ex. 6 Personal Privacy (PP)
LinkedIn | Twitter | Blog | TRCcompanies.com

This email and its attachments are privileged and confidential and may be subject to attorney-client privilege. The information contained in, or files attached to this email are intended only for the use of the individual or entity to whom it is addressed and others who have been specifically authorized to receive it.

Message

From: Huggins, Richard [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=0314E81A1F4843FCBBE0910CFDDD53F4-HUGGINS, RICHARD]
Sent: 11/30/2020 6:24:45 PM
To: Stockdill, Shane GRE-CC [SStockdill@GREnergy.com]
Subject: RE: CCR Alternative Liner Application - Great River Energy

Shane- I was able to download the 1 attachment that is your Part B demonstration. Sorry for the delay, Michelle Long is my point person on this and officially responds to submittals but she is out today. Expect a more formal receipt confirmation from her tomorrow. If you have any questions, please let me know. Thanks

Richard Huggins Jr., Chief
Energy Recovery and Waste Disposal Branch
Office of Resource Conservation and Recovery
U.S. Environmental Protection Agency
Desk: 703-308-0017 iPhone: 571-345-6855

From: Stockdill, Shane GRE-CC <SStockdill@GREnergy.com>
Sent: Monday, November 30, 2020 12:32 PM
To: Huggins, Richard <Huggins.Richard@epa.gov>
Subject: FW: CCR Alternative Liner Application - Great River Energy

Hi Richard,

I just wanted to follow up with you and make sure that you were able to access the Alternative Liner submittal that Great River Energy submitted this morning to the EPA in the link below. If you need this submittal broken out in smaller files, please let us know and we can provide each appendix independently. We are in the process of uploading this to our CCR website for access at the moment. Hopefully everything arrived and is working as intended. Again, thank you for working with us on this submittal, we truly appreciate it, have a great week!

Shane

From: Archer, Gregory GRE-MG <garcher@GREnergy.com>
Sent: Monday, November 30, 2020 7:47 AM
To: Stockdill, Shane GRE-CC <SStockdill@GREnergy.com>
Subject: CCR Alternative Liner Application - Great River Energy

Message Information

To	long.michelle@epa.gov, huggins.richard@epa.gov, mills.jason@epa.gove, jackson.mary@epa.gov, wheeler.andrew@epa.gov
Cc	sstockdill@grenergy.com, eheinen@grenergy.com, eolsen@grenergy.com, jbauer@grenergy.com, jcharles@grenergy.com, garche
Attachments	201129 Final GRE Alternative Liner Application Full Report.pdf (312.27 MB) Download All Files

Dear Mr. Wheeler,

Great River Energy is submitting its Alternative Liner Application for Upstream Raise 91 CCR surface impoundment at Coal Creek Station. This application was prepared in response to the requirements in 40 CFR 257.71 (d)(1). Should you have any questions regarding the FTP linked report, please contact Shane Stockdill (701) 442-7010 or Erik Heinen (612) 801-1269.

Sincerely,

Greg Archer
Manager, Environmental Services

NOTICE TO RECIPIENT: The information contained in this message from Great River Energy and any attachments are confidential and intended only for the named recipient(s). If you have received this message in error, you are prohibited from copying, distributing or using the information. Please contact the sender immediately by return email and delete the original message.

Message

From: garcher@GREnergy.com [garcher@GREnergy.com]
Sent: 11/30/2020 1:47:04 PM
To: Jackson, Mary [Jackson.Mary@epa.gov]
Subject: CCR Alternative Liner Application - Great River Energy

Message Information

To	long.michelle@epa.gov, huggins.richard@epa.gov, mills.jason@epa.gove, jackson.mary@epa.gov, wheeler.andrew@epa.gov
Cc	sstockdill@grenergy.com, eheinen@grenergy.com, eolsen@grenergy.com, jbauer@grenergy.com, jcharles@grenergy.com, garche
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Greg Archer
Manager, Environmental Services

Message

From: Shimshock, John [jshimshock@keyconops.com]
Sent: 11/19/2020 5:10:31 PM
To: Long, Michelle [Long.Michelle@epa.gov]
CC: Kushner, Joseph [jkushner@keyconops.com]; Adam Scheller [a.scheller@gaiconsultants.com]
Subject: CCR Rule Part B application per § 257.71(d)(1)(ii) for four existing CCR clay-lined surface impoundments at Conemaugh Station
Attachments: ATT00001.txt

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From: Long, Michelle <Long.Michelle@epa.gov>
Sent: Tuesday, February 4, 2020 11:18 AM
To: Shimshock, John <jshimshock@keyconops.com>
Cc: 'P. E. Stephen M. Frank (Stephen.Frank@genon.com)' <Stephen.Frank@genon.com>
Subject: RE: GenOn Website Postings - updates for Keystone and Conemaugh Generating Stations

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Thanks,
Michelle

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Biologist
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To: Long, Michelle <Long.Michelle@epa.gov>
Cc: 'P. E. Stephen M. Frank (Stephen.Frank@genon.com)' <Stephen.Frank@genon.com>
Subject: RE: GenOn Website Postings - updates for Keystone and Conemaugh Generating Stations

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To: long.michelle@epa.gov
Cc: Shimshock, John <John.Shimshock@genon.com>; Jacklin, Mark J <Mark.Jacklin@genon.com>; McGraw, William P. <William.McGraw@genon.com>; Schenker, Jeremy S. <Jeremy.Schenker@genon.com>; Johnson, Walter <walter.johnson@genon.com>; Nitz, Mark <Mark.Nitz@genon.com>; Heimlicher, Peter <Bruce.Heimlicher@genon.com>; Anderson, Pilantana <Pilantana.Anderson@genon.com>
Subject: GenOn Website Postings

Michelle,

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Subject: RE: CCR Rule Part B application per § 257.71(d)(1)(ii) for four existing CCR clay-lined surface impoundments at Conemaugh Station
Attachments: ATT00001.txt

Hi Michelle,
Yes - there are many attachments with the subject application. We can generate and forward either (1) a single composite document (we'll post that document to the KEY-CON CCR website) or (2) several files, largely based on the attachment ID. We may be forced to go with option #2 (in 2 or more transmittals) because of the file size of the single composite document (may be 25MB or larger). Please advise what works best for you / EPA.

Wishing you and yours a Happy Thanksgiving holiday – John.

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To: Shimshock, John <jshimshock@keyconops.com>
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Subject: RE: CCR Rule Part B application per § 257.71(d)(1)(ii) for four existing CCR clay-lined surface impoundments at Conemaugh Station

Hi John,

Thank you for your question. It looks like my manager, Richard Huggins, replied to you last week. Do you have any further questions?

I hope you have a safe and happy Thanksgiving as well.

Michelle Long
Biologist
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Thank you,

GenOn

Stephen M. Frank, PE (Pa)
Senior Manager, Environmental
Stephen.Frank@GenOn.com
724-249-3610

Message

From: Stockdill, Shane GRE-CC [SStockdill@GREnergy.com]
Sent: 11/25/2020 3:17:26 PM
To: Long, Michelle [Long.Michelle@epa.gov]
Subject: RE: Great River Energy Part B Alternative Liner Demonstration Application Call

Thank you Michelle, and again thank you for meeting with us, we really appreciate the feedback! Hope you have a wonderful Thanksgiving!

Shane

From: Long, Michelle <Long.Michelle@epa.gov>
Sent: Wednesday, November 25, 2020 9:15 AM
To: Stockdill, Shane GRE-CC <SStockdill@GREnergy.com>
Subject: RE: Great River Energy Part B Alternative Liner Demonstration Application Call

This email was sent by an external sender. Opening attachments or clicking links from untrusted sources may cause damage to you and Great River Energy.
Good Morning,

For your awareness, EPA just set up a CCR Part B Implementation website: https://www.epa.gov/coalash/ccr-part-b-implementation. Please follow the "How to Submit a Demonstration Package" instructions to submit the your application by November 30, 2020. Thank you.

Michelle Long
Biologist
U.S. Environmental Protection Agency
Office of Resource Conservation and Recovery
Materials Recovery and Waste Management Division
(703) 347-8953

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Sent: Friday, November 6, 2020 5:04 PM
To: Long, Michelle <Long.Michelle@epa.gov>
Subject: RE: Great River Energy Part B Alternative Liner Demonstration Application Call

Hi Michelle,

I just want to confirm that you received the Great River Energy Alternative Liner Demonstration Application documentation we just sent to the EPA. It wasn't too terribly large (approximately 15 MB), so I'm hoping there weren't any issues. I know that I got an out of office reply from Laurel Celeste so it's likely it went through, just want to confirm. Thanks and have a great weekend!

Shane

From: Long, Michelle <Long.Michelle@epa.gov>
Sent: Thursday, November 5, 2020 7:47 AM
To: Stockdill, Shane GRE-CC <SStockdill@GREnergy.com>; Huggins, Richard <Huggins.Richard@epa.gov>; Jackson, Mary <Jackson.Mary@epa.gov>; Mills, Jason <Mills.Jason@epa.gov>; Celeste, Laurel <celeste.laurel@epa.gov>; Capiro, Mirtha <capiro.mirtha@epa.gov>
Cc: Heinen, Erik GRE-MG <EHeinen@GREnergy.com>; Charles, Jennifer GRE-CC <jcharles@GREnergy.com>; Archer,

Gregory GRE-MG <garcher@GREnergy.com>
Subject: RE: Great River Energy Part B Alternative Liner Demonstration Application Call

This email was sent by an external sender. Opening attachments or clicking links from untrusted sources may cause damage to you and Great River Energy.
Shane,

Thank you for setting up the meeting. Please share the materials with this whole group and we will work to review them before our meeting next Tuesday. Talk to you then, and if you have any questions in the meantime let us know. Thanks!

Michelle Long
Biologist
U.S. Environmental Protection Agency
Office of Resource Conservation and Recovery
Materials Recovery and Waste Management Division
(703) 347-8953

From: Stockdill, Shane GRE-CC <SStockdill@GREnergy.com>
Sent: Wednesday, November 4, 2020 1:02 PM
To: Long, Michelle <Long.Michelle@epa.gov>; Huggins, Richard <Huggins.Richard@epa.gov>; Jackson, Mary <Jackson.Mary@epa.gov>; Mills, Jason <Mills.Jason@epa.gov>; Celeste, Laurel <celeste.laurel@epa.gov>; Capiro, Mirtha <capiro.mirtha@epa.gov>
Cc: Heinen, Erik GRE-MG <EHeinen@GREnergy.com>; Charles, Jennifer GRE-CC <jcharles@GREnergy.com>; Archer, Gregory GRE-MG <garcher@GREnergy.com>
Subject: RE: Great River Energy Part B Alternative Liner Demonstration Application Call

Michelle,

Thank you for replying back to us. Based on your availability, I will send an invite for 3:00-4:00 PM ET on Tuesday, November 10. We anticipate sending you all the materials on Friday, November 6 for your review ahead of that discussion. Thanks again and have a great rest of your week!

Shane

From: Long, Michelle <Long.Michelle@epa.gov>
Sent: Wednesday, November 4, 2020 7:44 AM
To: Stockdill, Shane GRE-CC <SStockdill@GREnergy.com>; Huggins, Richard <Huggins.Richard@epa.gov>; Jackson, Mary <Jackson.Mary@epa.gov>; Mills, Jason <Mills.Jason@epa.gov>; Celeste, Laurel <celeste.laurel@epa.gov>; Capiro, Mirtha <capiro.mirtha@epa.gov>
Cc: Heinen, Erik GRE-MG <EHeinen@GREnergy.com>; Charles, Jennifer GRE-CC <jcharles@GREnergy.com>; Archer, Gregory GRE-MG <garcher@GREnergy.com>
Subject: FW: Great River Energy Part B Alternative Liner Demonstration Application Call
Importance: High

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Good morning Shane,

Thank you for your inquiry. November 11 is a Federal Holiday for Veteran's Day, so we will be out of the office that day. Would a different day that week work for you? The days and times (all in Eastern time) that are open for an hour-long meeting with our team next week are:

- Tuesday, November 10 between 1:30-4pm ET

- Thursday, November 12 from 1-2pm ET

I have copied all the EPA staff on this email that should be included in the meeting invite. We also request that you send an agenda and meeting materials at least 2 days before the meeting. I look forward to hearing back from you. Thanks.

Michelle Long
Biologist
U.S. Environmental Protection Agency
Office of Resource Conservation and Recovery
Materials Recovery and Waste Management Division
(703) 347-8953

From: Stockdill, Shane GRE-CC <SStockdill@GREnergy.com>
Sent: Tuesday, November 3, 2020 2:25 PM
To: Huggins, Richard <Huggins.Richard@epa.gov>; Behan, Frank <Behan.Frank@epa.gov>; Hillyer, Kirsten <hillyer.kirsten@epa.gov>; Anderson, Lydia <Anderson.Lydia@epa.gov>
Cc: Heinen, Erik GRE-MG <EHeinen@GREnergy.com>; Charles, Jennifer GRE-CC <jcharles@GREnergy.com>; Archer, Gregory GRE-MG <garcher@GREnergy.com>
Subject: Great River Energy Part B Alternative Liner Demonstration Application Call
Importance: High

Good afternoon Richard, Frank, Kirsten, and Lydia,

We are reaching out to schedule a meeting with the EPA to discuss the completeness of Great River Energy's Part B submittal for our Alternative Liner Demonstration Application due November 30, 2020. We would like to get on your calendar for Wednesday, November 11th preferably in the afternoon, should your calendars allow. We will be submitting a draft version of our submittal to you on Friday, November 6th for your review prior to any discussion we have to allow you time to review that document and identify any deficiencies in the completeness of that submittal.

At this time we don't plan on including any Appendices with that submittal, but they will be available to you upon request. Can you please respond with a time that works best for your team on the 11th (or an alternative day, should that not work) and we will get an invitation sent out to you. Thanks in advance and have a great afternoon.

Shane Stockdill

Shane Stockdill | Environmental Compliance Specialist
GREAT RIVER ENERGY
2875 3rd Street Southwest
Underwood, North Dakota 58576
Direct: (701) 442.7010 /Cell: Ex. 6 Personal Privacy (PP) Fax: (701) 442.7147
sstockdill@GREnergy.com
greatriverenergy.com
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Message

From: Christopher P Scieszka [christopher.scieszka@dteenergy.com]
Sent: 11/25/2020 3:37:11 PM
To: Long, Michelle [Long.Michelle@epa.gov]
Subject: RE: Part B Discussion with DTE

Thank you, Michelle.

Quick question on the submittal… We are submitting 3 Part B applications, and all of them exceed my email size limit. I intend to use our consultant's FTP site in order to send you all a link to download the applications. Is that acceptable?

From: Long, Michelle <Long.Michelle@epa.gov>
Sent: Wednesday, November 25, 2020 10:18 AM
To: Christopher P Scieszka <christopher.scieszka@dteenergy.com>; Robert J Lee <robert.j.lee@dteenergy.com>; Christy D Clark <christy.clark@dteenergy.com>; Kelly M Martorano <kelly.martorano@dteenergy.com>; John Seymour <JSeymour@Geosyntec.com>; Omer Bozok <OBozok@Geosyntec.com>
Cc: Jackson, Mary <Jackson.Mary@epa.gov>; Mills, Jason <Mills.Jason@epa.gov>; Huggins, Richard <Huggins.Richard@epa.gov>
Subject: [EXTERNAL] RE: Part B Discussion with DTE

Good Morning,

For your awareness, EPA just set up a CCR Part B Implementation website: https://www.epa.gov/coalash/ccr-part-b-implementation. Please follow the "How to Submit a Demonstration Package" instructions to submit the your application by November 30, 2020. Thank you.

Michelle Long
Biologist
U.S. Environmental Protection Agency
Office of Resource Conservation and Recovery
Materials Recovery and Waste Management Division
(703) 347-8953

From: Christopher P Scieszka <christopher.scieszka@dteenergy.com>
Sent: Thursday, November 19, 2020 2:41 PM
To: Long, Michelle <Long.Michelle@epa.gov>; Huggins, Richard <Huggins.Richard@epa.gov>; Mills, Jason <Mills.Jason@epa.gov>; Birchfield, Norman <Birchfield.Norman@epa.gov>; Jackson, Mary <Jackson.Mary@epa.gov>; Celeste, Laurel <celeste.laurel@epa.gov>; Robert J Lee <robert.j.lee@dteenergy.com>; Christy D Clark <christy.clark@dteenergy.com>; Kelly M Martorano <kelly.martorano@dteenergy.com>; John Seymour <JSeymour@Geosyntec.com>; Omer Bozok <OBozok@Geosyntec.com>; Mooney, Susan <mooney.susan@epa.gov>; Schumacher, Jessica <Schumacher.Jessica@epa.gov>
Subject: RE: Part B Discussion with DTE

Hi Michelle,

I understand you are all very busy right now. Thank you for taking the time to set up this discussion.

Proposed timeframes (EST):
12/1: 11-12 AM

12/2: 3-4 PM

Please let us know what works best for you.

Thank you,

_____

Chris Scieszka
Environmental Management & Safety
One Energy Plaza | 410 G.O. | Detroit, MI 48226
(O) 313-235-0153 | (C) Ex. 6 Personal Privacy (PP)
christopher.scieszka@dteenergy.com

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From: Long, Michelle <Long.Michelle@epa.gov>
Sent: Wednesday, November 18, 2020 8:40 AM
To: Christopher P Scieszka <christopher.scieszka@dteenergy.com>; Huggins, Richard <Huggins.Richard@epa.gov>; Mills, Jason <Mills.Jason@epa.gov>; Birchfield, Norman <Birchfield.Norman@epa.gov>; Jackson, Mary <Jackson.Mary@epa.gov>; Celeste, Laurel <celeste.laurel@epa.gov>; Robert J Lee <robert.j.lee@dteenergy.com>; Christy D Clark <christy.clark@dteenergy.com>; Kelly M Martorano <kelly.martorano@dteenergy.com>; John Seymour <JSeymour@Geosyntec.com>; Omer Bozok <OBozok@Geosyntec.com>; Mooney, Susan <mooney.susan@epa.gov>; Schumacher, Jessica <Schumacher.Jessica@epa.gov>
Subject: [EXTERNAL] RE: Part B Discussion with DTE

Chris,

Due to many other meetings for the Part A demonstrations and other work we are doing, plus the holiday, we won't be able to meet until December 1 or 2. Would a time one of those days work for DTE?

Michelle Long
Biologist
U.S. Environmental Protection Agency
Office of Resource Conservation and Recovery
Materials Recovery and Waste Management Division
(703) 347-8953

From: Christopher P Scieszka <christopher.scieszka@dteenergy.com>
Sent: Monday, November 16, 2020 3:17 PM
To: Huggins, Richard <Huggins.Richard@epa.gov>; Mills, Jason <Mills.Jason@epa.gov>; Birchfield, Norman <Birchfield.Norman@epa.gov>; Long, Michelle <Long.Michelle@epa.gov>; Jackson, Mary <Jackson.Mary@epa.gov>; Celeste, Laurel <celeste.laurel@epa.gov>; Robert J Lee <robert.j.lee@dteenergy.com>; Christy D Clark <christy.clark@dteenergy.com>; Kelly M Martorano <kelly.martorano@dteenergy.com>; John Seymour <JSeymour@Geosyntec.com>; Omer Bozok <OBozok@Geosyntec.com>; Mooney, Susan <mooney.susan@epa.gov>; Schumacher, Jessica <Schumacher.Jessica@epa.gov>
Subject: RE: Part B Discussion with DTE

Hi Richard and EPA team,

Continuing our conversation from last Monday, we are hoping to schedule a meeting to discuss our approach for the alternate liner demonstration field investigations we intend to conduct in the near future (December).

We have the following times (EST) available in the next couple of days:

- Wednesday 11/18: 8-11 AM or 2-3:30
- Thursday 11/19: 10-12:30

We'd like to discuss the following agenda:

- Monroe Fly Ash Basin
  - Boring locations
  - Drilling methods
- Belle River Bottom Ash Basins and Diversion Basin
  - Boring locations
  - Drilling methods
  - Permeant collection/analysis

Please let me know if we can book an hour with your team.

Thank you!

_____

Chris Scieszka
Environmental Management & Safety
One Energy Plaza | 410 G.O. | Detroit, MI 48226
(O) 313-235-0153 | (C) Ex. 6 Personal Privacy (PP)
christopher.scieszka@dteenergy.com

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-----Original Appointment-----
From: Huggins, Richard <Huggins.Richard@epa.gov>
Sent: Friday, October 30, 2020 1:08 PM
To: Huggins, Richard; Mills, Jason; Birchfield, Norman; Long, Michelle; Jackson, Mary; Celeste, Laurel; Christopher P Scieszka; Robert J Lee; Christy D Clark; Kelly M Martorano; Buening, Vincent; Crockford, Graham; Cratsenburg, Kelly; John Seymour; Omer Bozok; Mooney, Susan; Schumacher, Jessica
Subject: Part B Discussion with DTE
When: Monday, November 09, 2020 11:00 AM-12:00 PM (UTC-05:00) Eastern Time (US & Canada).
Where: Microsoft Teams Meeting

one for Monroe Power Plant Fly Ash Basin, one for the Belle River Power Plant Bottom Ash Basins, and one for the Belle River Power Plant Diversion Basin

---

Microsoft Teams meeting

Join on your computer or mobile app
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Or call in (audio only)

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Message

From: Christopher P Scieszka [christopher.scieszka@dteenergy.com]
Sent: 11/25/2020 8:14:11 PM
To: Long, Michelle [Long.Michelle@epa.gov]
Subject: RE: Part B Discussion with DTE

Perfect, thanks!

Hope you have a great Thanksgiving too.

From: Long, Michelle <Long.Michelle@epa.gov>
Sent: Wednesday, November 25, 2020 3:11 PM
To: Christopher P Scieszka <christopher.scieszka@dteenergy.com>
Subject: [EXTERNAL] RE: Part B Discussion with DTE

Hi Chris,

Yes, I was able to download the file and see a MS Word document with TEST TEST TEST written. Looks like it worked fine and downloaded quickly. Thanks so much and hope you have a happy Thanksgiving.

Michelle Long
Biologist
U.S. Environmental Protection Agency
Office of Resource Conservation and Recovery
Materials Recovery and Waste Management Division
(703) 347-8953

From: Christopher P Scieszka <christopher.scieszka@dteenergy.com>
Sent: Wednesday, November 25, 2020 2:45 PM
To: Long, Michelle <Long.Michelle@epa.gov>
Subject: RE: Part B Discussion with DTE

Thanks, Michelle.

Here is a link for a test. Please confirm that this works when you get a chance.

test for EPA
Please click the following link to download your files:
https://nam02.safelinks.protection.outlook.com/?url=https%3A%2F%2Fadhocftp.trccompanies.com%2FAHT%2FAHT_UI%2Fpublic%2F%23%2Fpassword%3Fpackage%3DMcK%252bzuE7nflgijeORuVqhM6gUfW2Acrdb8CLpnPmslJn8jSyuPmXcy2kpmTzwh0z4osyxvpVjiGrMDMMBffly5l7%252f2vtwdkrSCXFKH%252fFGu8%253d&data=04%7C01%7Cchristopher.scieszka%40dteenergy.com%7Cddcfcc10c0ed44ad3bcd08d8917926b9%7C8e61d5fe77494e7688ee6d8799ae8143%7C0%7C0%7C637419296807464892%7CUnknown%7CTWFpbGZsb3d8eyJWIjoiMC4wLjAwMDAiLCJQIjoiV2luMzIiLCJBTiI6Ik1haWwiLCJXVCI6Mn0%3D%7C1000&sdata=xacdZREyclYlum%2B2WXC%2BmHVsK5zyzt07FrtUGT%2F3ssE%3D&reserved=0

Thanks!

From: Long, Michelle <Long.Michelle@epa.gov>
Sent: Wednesday, November 25, 2020 10:41 AM
To: Christopher P Scieszka <christopher.scieszka@dteenergy.com>
Subject: [EXTERNAL] RE: Part B Discussion with DTE

Yes, a link to a FTP site works fine to submit the applications. We know the appendices often are a large file size so that makes sense and is what other companies are doing when submitting Part A or B demonstrations/applications. If you want to send me a test link with a document in it, I can make sure everything opens properly before you submit the official applications. Thanks.

Michelle Long
Biologist
U.S. Environmental Protection Agency
Office of Resource Conservation and Recovery
Materials Recovery and Waste Management Division
(703) 347-8953

From: Christopher P Scieszka <christopher.scieszka@dteenergy.com>
Sent: Wednesday, November 25, 2020 10:37 AM
To: Long, Michelle <Long.Michelle@epa.gov>
Subject: RE: Part B Discussion with DTE

Thank you, Michelle.

Quick question on the submittal… We are submitting 3 Part B applications, and all of them exceed my email size limit. I intend to use our consultant's FTP site in order to send you all a link to download the applications. Is that acceptable?

From: Long, Michelle <Long.Michelle@epa.gov>
Sent: Wednesday, November 25, 2020 10:18 AM
To: Christopher P Scieszka <christopher.scieszka@dteenergy.com>; Robert J Lee <robert.j.lee@dteenergy.com>; Christy D Clark <christy.clark@dteenergy.com>; Kelly M Martorano <kelly.martorano@dteenergy.com>; John Seymour <JSeymour@Geosyntec.com>; Omer Bozok <OBozok@Geosyntec.com>
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Subject: [EXTERNAL] RE: Part B Discussion with DTE

Good Morning,

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Michelle Long
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12/2: 3-4 PM

Please let us know what works best for you.

Thank you,

Chris Scieszka
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(O) 313-235-0153 | (C) Ex. 6 Personal Privacy (PP)
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Subject: [EXTERNAL] RE: Part B Discussion with DTE

Chris,

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Michelle Long
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  - Permeant collection/analysis

Please let me know if we can book an hour with your team.

Thank you!

Chris Scieszka
Environmental Management & Safety
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Sent: Friday, October 30, 2020 1:08 PM
To: Huggins, Richard; Mills, Jason; Birchfield, Norman; Long, Michelle; Jackson, Mary; Celeste, Laurel; Christopher P Scieszka; Robert J Lee; Christy D Clark; Kelly M Martorano; Buening, Vincent; Crockford, Graham; Cratsenburg, Kelly; John Seymour; Omer Bozok; Mooney, Susan; Schumacher, Jessica
Subject: Part B Discussion with DTE
When: Monday, November 09, 2020 11:00 AM-12:00 PM (UTC-05:00) Eastern Time (US & Canada).
Where: Microsoft Teams Meeting

one for Monroe Power Plant Fly Ash Basin, one for the Belle River Power Plant Bottom Ash Basins, and one for the Belle River Power Plant Diversion Basin

---

Microsoft Teams meeting

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Message

From: garcher@GREnergy.com [garcher@GREnergy.com]
Sent: 11/30/2020 1:47:04 PM
To: Long, Michelle [Long.Michelle@epa.gov]
Subject: CCR Alternative Liner Application - Great River Energy

Message Information

To	long.michelle@epa.gov, huggins.richard@epa.gov, mills.jason@epa.gove, jackson.mary@epa.gov, wheeler.andrew@epa.gov
Cc	sstockdill@grenergy.com, eheinen@grenergy.com, eolsen@grenergy.com, jbauer@grenergy.com, jcharles@grenergy.com, garche
Attachments	201129 Final GRE Alternative Liner Application Full Report.pdf (312.27 MB) Download All Files

Dear Mr. Wheeler,

Great River Energy is submitting its Alternative Liner Application for Upstream Raise 91 CCR surface impoundment at Coal Creek Station. This application was prepared in response to the requirements in 40 CFR 257.71 (d)(1). Should you have any questions regarding the FTP linked report, please contact Shane Stockdill (701) 442-7010 or Erik Heinen (612) 801-1269.

Sincerely,

Greg Archer
Manager, Environmental Services

Message

From: Stockdill, Shane GRE-CC [SStockdill@GREnergy.com]
Sent: 11/30/2020 4:31:27 PM
To: Long, Michelle [Long.Michelle@epa.gov]
Subject: CCR Alternative Liner Application - Great River Energy

Hi Michelle,

I just wanted to follow up with you and make sure that you were able to access the Alternative Liner submittal that Great River Energy submitted this morning to the EPA. If you need this submittal broken out in smaller files, please let us know and we can provide each appendix independently. We are in the process of uploading this to our CCR website for access at the moment. Hopefully everything arrived and is working as intended. Again, thank you for working with us on this submittal, we truly appreciate it, have a great week!

Shane

From: Archer, Gregory GRE-MG <garcher@GREnergy.com>
Sent: Monday, November 30, 2020 7:47 AM
To: Stockdill, Shane GRE-CC <SStockdill@GREnergy.com>
Subject: CCR Alternative Liner Application - Great River Energy

Message Information

To	long.michelle@epa.gov, huggins.richard@epa.gov, mills.jason@epa.gove, jackson.mary@epa.gov, wheeler.andrew@epa.gov
Cc	sstockdill@grenergy.com, eheinen@grenergy.com, eolsen@grenergy.com, jbauer@grenergy.com, jcharles@grenergy.com, garche
Attachments	201129 Final GRE Alternative Liner Application Full Report.pdf (312.27 MB) Download All Files

Dear Mr. Wheeler,

Great River Energy is submitting its Alternative Liner Application for Upstream Raise 91 CCR surface impoundment at Coal Creek Station. This application was prepared in response to the requirements in 40 CFR 257.71 (d)(1). Should you have any questions regarding the FTP linked report, please contact Shane Stockdill (701) 442-7010 or Erik Heinen (612) 801-1269.

Sincerely,

Greg Archer
Manager, Environmental Services

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Message

From: Christopher P Scieszka [christopher.scieszka@dteenergy.com]
Sent: 11/25/2020 7:45:04 PM
To: Long, Michelle [Long.Michelle@epa.gov]
Subject: RE: Part B Discussion with DTE

Thanks, Michelle.

Here is a link for a test. Please confirm that this works when you get a chance.

test for EPA
Please click the following link to download your files:
https://nam02.safelinks.protection.outlook.com/?url=https%3A%2F%2Fadhocftp.trccompanies.com%2FAHT%2FAHT_UI%2Fpublic%2F%23%2Fpassword%3Fpackage%3DMcK%252bzuE7nflgijeORuVqhM6gUfW2Acrdb8CLpnPmsIJn8jSyuPmXcy2kpmTzwh0z4osyxvpVjiGrMDMMBfFly5l7%252f2vtwdkrSCXFKH%252fFGu8%253d&data=04%7C01%7Cchristopher.scieszka%40dteenergy.com%7Cddcfcc10c0ed44ad3bcd08d8917926b9%7C8e61d5fe77494e7688ee6d8799ae8143%7C0%7C0%7C637419296807464892%7CUnknown%7CTWFpbGZsb3d8eyJWIjoiMC4wLjAwMDAiLCJQIjoiV2luMzIiLCJBTiI6Ik1haWwiLCJXVCI6Mn0%3D%7C1000&sdata=xacdZREyclYlum%2B2WXC%2BmHVsK5zyzt07FrtUGT%2F3ssE%3D&reserved=0

Thanks!

From: Long, Michelle <Long.Michelle@epa.gov>
Sent: Wednesday, November 25, 2020 10:41 AM
To: Christopher P Scieszka <christopher.scieszka@dteenergy.com>
Subject: [EXTERNAL] RE: Part B Discussion with DTE

Yes, a link to a FTP site works fine to submit the applications. We know the appendices often are a large file size so that makes sense and is what other companies are doing when submitting Part A or B demonstrations/applications. If you want to send me a test link with a document in it, I can make sure everything opens properly before you submit the official applications. Thanks.

Michelle Long
Biologist
U.S. Environmental Protection Agency
Office of Resource Conservation and Recovery
Materials Recovery and Waste Management Division
(703) 347-8953

From: Christopher P Scieszka <christopher.scieszka@dteenergy.com>
Sent: Wednesday, November 25, 2020 10:37 AM
To: Long, Michelle <Long.Michelle@epa.gov>
Subject: RE: Part B Discussion with DTE

Thank you, Michelle.

Quick question on the submittal… We are submitting 3 Part B applications, and all of them exceed my email size limit. I intend to use our consultant's FTP site in order to send you all a link to download the applications. Is that acceptable?

From: Long, Michelle <Long.Michelle@epa.gov>
Sent: Wednesday, November 25, 2020 10:18 AM
To: Christopher P Scieszka <christopher.scieszka@dteenergy.com>; Robert J Lee <robert.j.lee@dteenergy.com>; Christy D Clark <christy.clark@dteenergy.com>; Kelly M Martorano <kelly.martorano@dteenergy.com>; John Seymour <JSeymour@Geosyntec.com>; Omer Bozok <OBozok@Geosyntec.com>
Cc: Jackson, Mary <Jackson.Mary@epa.gov>; Mills, Jason <Mills.Jason@epa.gov>; Huggins, Richard <Huggins.Richard@epa.gov>
Subject: [EXTERNAL] RE: Part B Discussion with DTE

Good Morning,

For your awareness, EPA just set up a CCR Part B Implementation website: https://www.epa.gov/coalash/ccr-part-b-implementation. Please follow the "How to Submit a Demonstration Package" instructions to submit the your application by November 30, 2020. Thank you.

Michelle Long
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Office of Resource Conservation and Recovery
Materials Recovery and Waste Management Division
(703) 347-8953

From: Christopher P Scieszka <christopher.scieszka@dteenergy.com>
Sent: Thursday, November 19, 2020 2:41 PM
To: Long, Michelle <Long.Michelle@epa.gov>; Huggins, Richard <Huggins.Richard@epa.gov>; Mills, Jason <Mills.Jason@epa.gov>; Birchfield, Norman <Birchfield.Norman@epa.gov>; Jackson, Mary <Jackson.Mary@epa.gov>; Celeste, Laurel <celeste.laurel@epa.gov>; Robert J Lee <robert.j.lee@dteenergy.com>; Christy D Clark <christy.clark@dteenergy.com>; Kelly M Martorano <kelly.martorano@dteenergy.com>; John Seymour <JSeymour@Geosyntec.com>; Omer Bozok <OBozok@Geosyntec.com>; Mooney, Susan <mooney.susan@epa.gov>; Schumacher, Jessica <Schumacher.Jessica@epa.gov>
Subject: RE: Part B Discussion with DTE

Hi Michelle,

I understand you are all very busy right now. Thank you for taking the time to set up this discussion.

Proposed timeframes (EST):
12/1: 11-12 AM
12/2: 3-4 PM

Please let us know what works best for you.

Thank you,

Chris Scieszka
Environmental Management & Safety
One Energy Plaza | 410 G.O. | Detroit, MI 48226
(O) 313-235-0153 | (C) Ex. 6 Personal Privacy (PP)
christopher.scieszka@dteenergy.com

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From: Long, Michelle <Long.Michelle@epa.gov>
Sent: Wednesday, November 18, 2020 8:40 AM
To: Christopher P Scieszka <christopher.scieszka@dteenergy.com>; Huggins, Richard <Huggins.Richard@epa.gov>; Mills, Jason <Mills.Jason@epa.gov>; Birchfield, Norman <Birchfield.Norman@epa.gov>; Jackson, Mary <Jackson.Mary@epa.gov>; Celeste, Laurel <celeste.laurel@epa.gov>; Robert J Lee <robert.j.lee@dteenergy.com>; Christy D Clark <christy.clark@dteenergy.com>; Kelly M Martorano <kelly.martorano@dteenergy.com>; John Seymour <JSeymour@Geosyntec.com>; Omer Bozok <OBozok@Geosyntec.com>; Mooney, Susan <mooney.susan@epa.gov>; Schumacher, Jessica <Schumacher.Jessica@epa.gov>
Subject: [EXTERNAL] RE: Part B Discussion with DTE

Chris,

Due to many other meetings for the Part A demonstrations and other work we are doing, plus the holiday, we won't be able to meet until December 1 or 2. Would a time one of those days work for DTE?

Michelle Long
Biologist
U.S. Environmental Protection Agency
Office of Resource Conservation and Recovery
Materials Recovery and Waste Management Division
(703) 347-8953

From: Christopher P Scieszka <christopher.scieszka@dteenergy.com>
Sent: Monday, November 16, 2020 3:17 PM
To: Huggins, Richard <Huggins.Richard@epa.gov>; Mills, Jason <Mills.Jason@epa.gov>; Birchfield, Norman <Birchfield.Norman@epa.gov>; Long, Michelle <Long.Michelle@epa.gov>; Jackson, Mary <Jackson.Mary@epa.gov>; Celeste, Laurel <celeste.laurel@epa.gov>; Robert J Lee <robert.j.lee@dteenergy.com>; Christy D Clark <christy.clark@dteenergy.com>; Kelly M Martorano <kelly.martorano@dteenergy.com>; John Seymour <JSeymour@Geosyntec.com>; Omer Bozok <OBozok@Geosyntec.com>; Mooney, Susan <mooney.susan@epa.gov>; Schumacher, Jessica <Schumacher.Jessica@epa.gov>
Subject: RE: Part B Discussion with DTE

Hi Richard and EPA team,

Continuing our conversation from last Monday, we are hoping to schedule a meeting to discuss our approach for the alternate liner demonstration field investigations we intend to conduct in the near future (December).

We have the following times (EST) available in the next couple of days:

- Wednesday 11/18: 8-11 AM or 2-3:30
- Thursday 11/19: 10-12:30

We'd like to discuss the following agenda:

- Monroe Fly Ash Basin
  - Boring locations
  - Drilling methods

- Belle River Bottom Ash Basins and Diversion Basin
    - Boring locations
    - Drilling methods
    - Permeant collection/analysis

Please let me know if we can book an hour with your team.

Thank you!

_ _ _ _

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Learn More | Meeting options

Message

From: Long, Michelle [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=77BC3BD1EB0C4865A074EE8093682D3D-LONG, MICHE]
Sent: 11/23/2020 4:37:23 PM
To: Shimshock, John [jshimshock@keyconops.com]
CC: Kushner, Joseph [jkushner@keyconops.com]; Adam Scheller [a.scheller@gaiconsultants.com]
Subject: RE: CCR Rule Part B application per § 257.71(d)(1)(ii) for four existing CCR clay-lined surface impoundments at Conemaugh Station

Hi John,

Thank you for your question. It looks like my manager, Richard Huggins, replied to you last week. Do you have any further questions?

I hope you have a safe and happy Thanksgiving as well.

Michelle Long
Biologist
U.S. Environmental Protection Agency
Office of Resource Conservation and Recovery
Materials Recovery and Waste Management Division
(703) 347-8953

From: Shimshock, John <jshimshock@keyconops.com>
Sent: Thursday, November 19, 2020 12:11 PM
To: Long, Michelle <Long.Michelle@epa.gov>
Cc: Kushner, Joseph <jkushner@keyconops.com>; Adam Scheller <a.scheller@gaiconsultants.com>
Subject: CCR Rule Part B application per § 257.71(d)(1)(ii) for four existing CCR clay-lined surface impoundments at Conemaugh Station

Hi again Ms. Long,
I'm writing to inquire of the submittal procedures for the subject application. You are listed as the EPA contact for this rule, so I thought it would be best to start my inquiry with you. Conemaugh Station and our engineering firm, GAI Consultants, are aware that EPA set-up a Part A implementation webpage (link: https://www.epa.gov/coalash/ccr-part-implementation) that provides submittal instructions, but to our knowledge a similar Part B webpage has not yet been (or will be) set-up. As such, I'd be grateful for your guidance on this matter. For the Part A submittals, the demonstration transmittal letter was addressed to Administrator Wheler, and the cc list included the designated EPA reviewers, who received the entire package via email transmittal. We can do the same for a Part B submittal, please advise. Because of the number of attachments required for the Part B application, the resulting file size may be large, and I'm uncertain if EPA restricts email transmittals with large file size attachments.

Thanks in advance for your help with this matter, and I'm looking forward to receipt of your reply. Wishing you and yours an (early) enjoyable Thanksgiving holiday – John.

John P. Shimshock
Environmental Specialist
Conemaugh Generating Station
1442 Power Plant Road
New Florence, PA 15944
Office Phone: (724) 235-4596
Cellular Phone: Ex. 6 Personal Privacy (PP)
jshimshock@keyconops.com

From: Long, Michelle <Long.Michelle@epa.gov>
Sent: Tuesday, February 4, 2020 11:18 AM
To: Shimshock, John <jshimshock@keyconops.com>
Cc: 'P. E. Stephen M. Frank (Stephen.Frank@genon.com)' <Stephen.Frank@genon.com>
Subject: RE: GenOn Website Postings - updates for Keystone and Conemaugh Generating Stations

Hello Mr. Shimshock,

Thank you for this update and I will share with my colleagues to update EPA's CCR website for the Keystone and Conemaugh Generating Stations. If there are any other changes to the facility websites in the future, please let me know so we can update our records accordingly.

Thanks,
Michelle

Michelle Long
Biologist
U.S. Environmental Protection Agency
Office of Resource Conservation and Recovery
(703) 347-8953

From: Shimshock, John <jshimshock@keyconops.com>
Sent: Wednesday, January 29, 2020 4:27 PM
To: Long, Michelle <Long.Michelle@epa.gov>
Cc: 'P. E. Stephen M. Frank (Stephen.Frank@genon.com)' <Stephen.Frank@genon.com>
Subject: RE: GenOn Website Postings - updates for Keystone and Conemaugh Generating Stations

Greetings Ms. Long,
A follow-up to the email below from my colleague Steve Frank at GenOn (copied herein).

In accordance with various fillings submitted to U.S. EPA and Pennsylvania Department of Environmental Protection (PA DEP) in CY 2019, the association between GenOn and the Keystone and Conemaugh Generating Stations was terminated in CY 2019. CCR reports for the Keystone and Conemaugh Stations previously posted to GenOn's CCR webpage were transferred as part of the above-mentioned development to a new CCR webpage for these stations, link: http://ccr.keyconops.com/. The PA DEP was informed of recent postings to this site, example email inform attached herein.

I was just informed that EPA maintains a website that presents the links for all of CCR webpages for the applicable stations, link:
https://www.epa.gov/coalash/list-publicly-accessible-internet-sites-hosting-compliance-data-and-information-required#pa

I'm writing simply to inform you of the update for the Keystone and Conemaugh Stations. I hope you find this message helpful, happy to discuss – John.

John P. Shimshock
Environmental Specialist
Conemaugh Generating Station
1442 Power Plant Road
New Florence, PA 15944
Office Phone: (724) 235-4596
Cellular Phone: Ex. 6 Personal Privacy (PP)
jshimshock@keyconops.com
Please note my new email address

From: Frank, Stephen <Stephen.Frank@genon.com>
Sent: Friday, May 17, 2019 9:28 AM
To: long.michelle@epa.gov
Cc: Shimshock, John <John.Shimshock@genon.com>; Jacklin, Mark J <Mark.Jacklin@genon.com>; McGraw, William P. <William.McGraw@genon.com>; Schenker, Jeremy S. <Jeremy.Schenker@genon.com>; Johnson, Walter <walter.johnson@genon.com>; Nitz, Mark <Mark.Nitz@genon.com>; Heimlicher, Peter <Bruce.Heimlicher@genon.com>; Anderson, Pilantana <Pilantana.Anderson@genon.com>
Subject: GenOn Website Postings

Michelle,

Conemaugh Generating Station received correspondence from EPA, dated May 7, 2019 regarding the posting of CCR Data and Information under the rule. GenOn and NRG initiated activities to separate the two businesses in 2017. As a result, GenOn's CCR records were moved to a new website in August 2018 and are now maintained at https://www.genon.com/ccr-rule-compliance. GenOn Holdings, Inc. separated from NRG Energy, Inc. in December 2018.

As you will find, the GenOn CCR units include:

1. The Brandywine Ash Landfill in Brandywine, MD
2. The Cheswick Generating Station Bottom Ash Emergency Pond (#0272216), Bottom Ash Recycle Pond (#0272216) and Cheswick Ash Disposal Site (#300720) in Springdale, PA
3. The Conemaugh Generating Station Bottom Ash Filter Recycle Pond - A (#3283201), Bottom Ash Filter Ponds – B, C & D (#3283201), and the Conemaugh Station Ash/Refuse Disposal Site Stage II & III (#300876) in New Florence, PA
4. The Keystone Generating Station Bottom Ash Ponds A, B, & C (#0386201) and the Keystone Generating Station Ash/Refuse Disposal Site East and West Valley (#300837) in Shelocta, PA
5. The New Castle Generating Station North Bottom Ash Pond and the New Castle Plant Ash Landfill (#300818) in West Pittsburg, PA
6. Westland Ash Landfill Unit B in Dickerson, MD

Please do not hesitate to contact me with any questions regarding the CCR postings for the GenOn fleet.

Thank you,

GenOn

Stephen M. Frank, PE (Pa)
Senior Manager, Environmental
Stephen.Frank@GenOn.com
724-249-3610

Message

From: Long, Michelle [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=77BC3BD1EB0C4865A074EE8093682D3D-LONG, MICHE]
Sent: 11/25/2020 3:15:27 PM
To: Stockdill, Shane GRE-CC [SStockdill@GREnergy.com]
Subject: RE: Great River Energy Part B Alternative Liner Demonstration Application Call

Good Morning,

For your awareness, EPA just set up a CCR Part B Implementation website: https://www.epa.gov/coalash/ccr-part-b-implementation. Please follow the "How to Submit a Demonstration Package" instructions to submit the your application by November 30, 2020. Thank you.

Michelle Long
Biologist
U.S. Environmental Protection Agency
Office of Resource Conservation and Recovery
Materials Recovery and Waste Management Division
(703) 347-8953

From: Stockdill, Shane GRE-CC <SStockdill@GREnergy.com>
Sent: Friday, November 6, 2020 5:04 PM
To: Long, Michelle <Long.Michelle@epa.gov>
Subject: RE: Great River Energy Part B Alternative Liner Demonstration Application Call

Hi Michelle,

I just want to confirm that you received the Great River Energy Alternative Liner Demonstration Application documentation we just sent to the EPA. It wasn't too terribly large (approximately 15 MB), so I'm hoping there weren't any issues. I know that I got an out of office reply from Laurel Celeste so it's likely it went through, just want to confirm. Thanks and have a great weekend!

Shane

From: Long, Michelle <Long.Michelle@epa.gov>
Sent: Thursday, November 5, 2020 7:47 AM
To: Stockdill, Shane GRE-CC <SStockdill@GREnergy.com>; Huggins, Richard <Huggins.Richard@epa.gov>; Jackson, Mary <Jackson.Mary@epa.gov>; Mills, Jason <Mills.Jason@epa.gov>; Celeste, Laurel <celeste.laurel@epa.gov>; Capiro, Mirtha <capiro.mirtha@epa.gov>
Cc: Heinen, Erik GRE-MG <EHeinen@GREnergy.com>; Charles, Jennifer GRE-CC <jcharles@GREnergy.com>; Archer, Gregory GRE-MG <garcher@GREnergy.com>
Subject: RE: Great River Energy Part B Alternative Liner Demonstration Application Call

This email was sent by an external sender. Opening attachments or clicking links from untrusted sources may cause damage to you and Great River Energy.
Shane,

Thank you for setting up the meeting. Please share the materials with this whole group and we will work to review them before our meeting next Tuesday. Talk to you then, and if you have any questions in the meantime let us know. Thanks!

Michelle Long

Biologist
U.S. Environmental Protection Agency
Office of Resource Conservation and Recovery
Materials Recovery and Waste Management Division
(703) 347-8953

From: Stockdill, Shane GRE-CC <SStockdill@GREnergy.com>
Sent: Wednesday, November 4, 2020 1:02 PM
To: Long, Michelle <Long.Michelle@epa.gov>; Huggins, Richard <Huggins.Richard@epa.gov>; Jackson, Mary <Jackson.Mary@epa.gov>; Mills, Jason <Mills.Jason@epa.gov>; Celeste, Laurel <celeste.laurel@epa.gov>; Capiro, Mirtha <capiro.mirtha@epa.gov>
Cc: Heinen, Erik GRE-MG <EHeinen@GREnergy.com>; Charles, Jennifer GRE-CC <jcharles@GREnergy.com>; Archer, Gregory GRE-MG <garcher@GREnergy.com>
Subject: RE: Great River Energy Part B Alternative Liner Demonstration Application Call

Michelle,

Thank you for replying back to us. Based on your availability, I will send an invite for 3:00-4:00 PM ET on Tuesday, November 10. We anticipate sending you all the materials on Friday, November 6 for your review ahead of that discussion. Thanks again and have a great rest of your week!

Shane

From: Long, Michelle <Long.Michelle@epa.gov>
Sent: Wednesday, November 4, 2020 7:44 AM
To: Stockdill, Shane GRE-CC <SStockdill@GREnergy.com>; Huggins, Richard <Huggins.Richard@epa.gov>; Jackson, Mary <Jackson.Mary@epa.gov>; Mills, Jason <Mills.Jason@epa.gov>; Celeste, Laurel <celeste.laurel@epa.gov>; Capiro, Mirtha <capiro.mirtha@epa.gov>
Cc: Heinen, Erik GRE-MG <EHeinen@GREnergy.com>; Charles, Jennifer GRE-CC <jcharles@GREnergy.com>; Archer, Gregory GRE-MG <garcher@GREnergy.com>
Subject: FW: Great River Energy Part B Alternative Liner Demonstration Application Call
Importance: High

This email was sent by an external sender. Opening attachments or clicking links from untrusted sources may cause damage to you and Great River Energy.
Good morning Shane,

Thank you for your inquiry. November 11 is a Federal Holiday for Veteran's Day, so we will be out of the office that day. Would a different day that week work for you? The days and times (all in Eastern time) that are open for an hour-long meeting with our team next week are:

- Tuesday, November 10 between 1:30-4pm ET
- Thursday, November 12 from 1-2pm ET

I have copied all the EPA staff on this email that should be included in the meeting invite. We also request that you send an agenda and meeting materials at least 2 days before the meeting. I look forward to hearing back from you. Thanks.

Michelle Long
Biologist
U.S. Environmental Protection Agency
Office of Resource Conservation and Recovery
Materials Recovery and Waste Management Division
(703) 347-8953

From: Stockdill, Shane GRE-CC <SStockdill@GREnergy.com>
Sent: Tuesday, November 3, 2020 2:25 PM
To: Huggins, Richard <Huggins.Richard@epa.gov>; Behan, Frank <Behan.Frank@epa.gov>; Hillyer, Kirsten <hillyer.kirsten@epa.gov>; Anderson, Lydia <Anderson.Lydia@epa.gov>
Cc: Heinen, Erik GRE-MG <EHeinen@GREnergy.com>; Charles, Jennifer GRE-CC <jcharles@GREnergy.com>; Archer, Gregory GRE-MG <garcher@GREnergy.com>
Subject: Great River Energy Part B Alternative Liner Demonstration Application Call
Importance: High

Good afternoon Richard, Frank, Kirsten, and Lydia,

We are reaching out to schedule a meeting with the EPA to discuss the completeness of Great River Energy's Part B submittal for our Alternative Liner Demonstration Application due November 30, 2020. We would like to get on your calendar for Wednesday, November 11th preferably in the afternoon, should your calendars allow. We will be submitting a draft version of our submittal to you on Friday, November 6th for your review prior to any discussion we have to allow you time to review that document and identify any deficiencies in the completeness of that submittal.

At this time we don't plan on including any Appendices with that submittal, but they will be available to you upon request. Can you please respond with a time that works best for your team on the 11th (or an alternative day, should that not work) and we will get an invitation sent out to you. Thanks in advance and have a great afternoon.

Shane Stockdill

Shane Stockdill | Environmental Compliance Specialist
GREAT RIVER ENERGY
2875 3rd Street Southwest
Underwood, North Dakota 58576
Direct: (701) 442.7010 /Cell: Ex. 6 Personal Privacy (PP) Fax: (701) 442.7147
sstockdill@GREnergy.com
greatriverenergy.com
** Please consider the environment before you print this e-mail.*

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Message

From: Long, Michelle [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=77BC3BD1EB0C4865A074EE8093682D3D-LONG, MICHE]
Sent: 11/25/2020 3:41:29 PM
To: Christopher P Scieszka [christopher.scieszka@dteenergy.com]
Subject: RE: Part B Discussion with DTE

Yes, a link to a FTP site works fine to submit the applications. We know the appendices often are a large file size so that makes sense and is what other companies are doing when submitting Part A or B demonstrations/applications. If you want to send me a test link with a document in it, I can make sure everything opens properly before you submit the official applications. Thanks.

Michelle Long
Biologist
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Office of Resource Conservation and Recovery
Materials Recovery and Waste Management Division
(703) 347-8953

From: Christopher P Scieszka <christopher.scieszka@dteenergy.com>
Sent: Wednesday, November 25, 2020 10:37 AM
To: Long, Michelle <Long.Michelle@epa.gov>
Subject: RE: Part B Discussion with DTE

Thank you, Michelle.

Quick question on the submittal… We are submitting 3 Part B applications, and all of them exceed my email size limit. I intend to use our consultant's FTP site in order to send you all a link to download the applications. Is that acceptable?

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Sent: Wednesday, November 25, 2020 10:18 AM
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Cc: Jackson, Mary <Jackson.Mary@epa.gov>; Mills, Jason <Mills.Jason@epa.gov>; Huggins, Richard <Huggins.Richard@epa.gov>
Subject: [EXTERNAL] RE: Part B Discussion with DTE

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Michelle Long
Biologist
U.S. Environmental Protection Agency
Office of Resource Conservation and Recovery
Materials Recovery and Waste Management Division

(703) 347-8953

From: Christopher P Scieszka <christopher.scieszka@dteenergy.com>
Sent: Thursday, November 19, 2020 2:41 PM
To: Long, Michelle <Long.Michelle@epa.gov>; Huggins, Richard <Huggins.Richard@epa.gov>; Mills, Jason <Mills.Jason@epa.gov>; Birchfield, Norman <Birchfield.Norman@epa.gov>; Jackson, Mary <Jackson.Mary@epa.gov>; Celeste, Laurel <celeste.laurel@epa.gov>; Robert J Lee <robert.j.lee@dteenergy.com>; Christy D Clark <christy.clark@dteenergy.com>; Kelly M Martorano <kelly.martorano@dteenergy.com>; John Seymour <JSeymour@Geosyntec.com>; Omer Bozok <OBozok@Geosyntec.com>; Mooney, Susan <mooney.susan@epa.gov>; Schumacher, Jessica <Schumacher.Jessica@epa.gov>
Subject: RE: Part B Discussion with DTE

Hi Michelle,

I understand you are all very busy right now. Thank you for taking the time to set up this discussion.

Proposed timeframes (EST):
12/1: 11-12 AM
12/2: 3-4 PM

Please let us know what works best for you.

Thank you,

Chris Scieszka
Environmental Management & Safety
One Energy Plaza | 410 G.O. | Detroit, MI 48226
(O) 313-235-0153 | (C) Ex. 6 Personal Privacy (PP)
christopher.scieszka@dteenergy.com

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From: Long, Michelle <Long.Michelle@epa.gov>
Sent: Wednesday, November 18, 2020 8:40 AM
To: Christopher P Scieszka <christopher.scieszka@dteenergy.com>; Huggins, Richard <Huggins.Richard@epa.gov>; Mills, Jason <Mills.Jason@epa.gov>; Birchfield, Norman <Birchfield.Norman@epa.gov>; Jackson, Mary <Jackson.Mary@epa.gov>; Celeste, Laurel <celeste.laurel@epa.gov>; Robert J Lee <robert.j.lee@dteenergy.com>; Christy D Clark <christy.clark@dteenergy.com>; Kelly M Martorano <kelly.martorano@dteenergy.com>; John Seymour <JSeymour@Geosyntec.com>; Omer Bozok <OBozok@Geosyntec.com>; Mooney, Susan <mooney.susan@epa.gov>; Schumacher, Jessica <Schumacher.Jessica@epa.gov>
Subject: [EXTERNAL] RE: Part B Discussion with DTE

Chris,

Due to many other meetings for the Part A demonstrations and other work we are doing, plus the holiday, we won't be able to meet until December 1 or 2. Would a time one of those days work for DTE?

Michelle Long
Biologist
U.S. Environmental Protection Agency
Office of Resource Conservation and Recovery
Materials Recovery and Waste Management Division
(703) 347-8953

From: Christopher P Scieszka <christopher.scieszka@dteenergy.com>
Sent: Monday, November 16, 2020 3:17 PM
To: Huggins, Richard <Huggins.Richard@epa.gov>; Mills, Jason <Mills.Jason@epa.gov>; Birchfield, Norman <Birchfield.Norman@epa.gov>; Long, Michelle <Long.Michelle@epa.gov>; Jackson, Mary <Jackson.Mary@epa.gov>; Celeste, Laurel <celeste.laurel@epa.gov>; Robert J Lee <robert.j.lee@dteenergy.com>; Christy D Clark <christy.clark@dteenergy.com>; Kelly M Martorano <kelly.martorano@dteenergy.com>; John Seymour <JSeymour@Geosyntec.com>; Omer Bozok <OBozok@Geosyntec.com>; Mooney, Susan <mooney.susan@epa.gov>; Schumacher, Jessica <Schumacher.Jessica@epa.gov>
Subject: RE: Part B Discussion with DTE

Hi Richard and EPA team,

Continuing our conversation from last Monday, we are hoping to schedule a meeting to discuss our approach for the alternate liner demonstration field investigations we intend to conduct in the near future (December).

We have the following times (EST) available in the next couple of days:

- Wednesday 11/18: 8-11 AM or 2-3:30
- Thursday 11/19: 10-12:30

We'd like to discuss the following agenda:

- Monroe Fly Ash Basin
  - Boring locations
  - Drilling methods
- Belle River Bottom Ash Basins and Diversion Basin
  - Boring locations
  - Drilling methods
  - Permeant collection/analysis

Please let me know if we can book an hour with your team.

Thank you!

_ _ _ _

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-----Original Appointment-----
From: Huggins, Richard <Huggins.Richard@epa.gov>
Sent: Friday, October 30, 2020 1:08 PM
To: Huggins, Richard; Mills, Jason; Birchfield, Norman; Long, Michelle; Jackson, Mary; Celeste, Laurel; Christopher P Scieszka; Robert J Lee; Christy D Clark; Kelly M Martorano; Buening, Vincent; Crockford, Graham; Cratsenburg, Kelly; John Seymour; Omer Bozok; Mooney, Susan; Schumacher, Jessica
Subject: Part B Discussion with DTE
When: Monday, November 09, 2020 11:00 AM-12:00 PM (UTC-05:00) Eastern Time (US & Canada).
Where: Microsoft Teams Meeting

one for Monroe Power Plant Fly Ash Basin, one for the Belle River Power Plant Bottom Ash Basins, and one for the Belle River Power Plant Diversion Basin

---

Microsoft Teams meeting

Join on your computer or mobile app
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Or call in (audio only)

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Message

From: Long, Michelle [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=77BC3BD1EB0C4865A074EE8093682D3D-LONG, MICHE]
Sent: 11/25/2020 8:11:14 PM
To: Christopher P Scieszka [christopher.scieszka@dteenergy.com]
Subject: RE: Part B Discussion with DTE

Hi Chris,

Yes, I was able to download the file and see a MS Word document with TEST TEST TEST written. Looks like it worked fine and downloaded quickly. Thanks so much and hope you have a happy Thanksgiving.

Michelle Long
Biologist
U.S. Environmental Protection Agency
Office of Resource Conservation and Recovery
Materials Recovery and Waste Management Division
(703) 347-8953

From: Christopher P Scieszka <christopher.scieszka@dteenergy.com>
Sent: Wednesday, November 25, 2020 2:45 PM
To: Long, Michelle <Long.Michelle@epa.gov>
Subject: RE: Part B Discussion with DTE

Thanks, Michelle.

Here is a link for a test. Please confirm that this works when you get a chance.

test for EPA
Please click the following link to download your files:
https://nam02.safelinks.protection.outlook.com/?url=https%3A%2F%2Fadhocftp.trccompanies.com%2FAHT%2FAHT_UI%2Fpublic%2F%23%2Fpassword%3Fpackage%3DMcK%252bzuE7nflgijeORuVqhM6gUfW2Acrdb8CLpnPmslJn8jSyuPmXcy2kpmTzwh0z4osyxvpVjiGrMDMMBffly5l7%252f2vtwdkrSCXFKH%252fFGu8%253d&data=04%7C01%7Cchristopher.scieszka%40dteenergy.com%7Cddcfcc10c0ed44ad3bcd08d8917926b9%7C8e61d5fe77494e7688ee6d8799ae8143%7C0%7C0%7C637419296807464892%7CUnknown%7CTWFpbGZsb3d8eyJWIjoiMC4wLjAwMDAiLCJQIjoiV2luMzIiLCJBTiI6Ik1haWwiLCJXVCI6Mn0%3D%7C1000&sdata=xacdZREyclYlum%2B2WXC%2BmHVsK5zyzt07FrtUGT%2F3ssE%3D&reserved=0

Thanks!

From: Long, Michelle <Long.Michelle@epa.gov>
Sent: Wednesday, November 25, 2020 10:41 AM
To: Christopher P Scieszka <christopher.scieszka@dteenergy.com>
Subject: [EXTERNAL] RE: Part B Discussion with DTE

Yes, a link to a FTP site works fine to submit the applications. We know the appendices often are a large file size so that makes sense and is what other companies are doing when submitting Part A or B demonstrations/applications. If you want to send me a test link with a document in it, I can make sure everything opens properly before you submit the official applications. Thanks.

Michelle Long
Biologist
U.S. Environmental Protection Agency
Office of Resource Conservation and Recovery
Materials Recovery and Waste Management Division
(703) 347-8953

From: Christopher P Scieszka <christopher.scieszka@dteenergy.com>
Sent: Wednesday, November 25, 2020 10:37 AM
To: Long, Michelle <Long.Michelle@epa.gov>
Subject: RE: Part B Discussion with DTE

Thank you, Michelle.

Quick question on the submittal… We are submitting 3 Part B applications, and all of them exceed my email size limit. I intend to use our consultant's FTP site in order to send you all a link to download the applications. Is that acceptable?

From: Long, Michelle <Long.Michelle@epa.gov>
Sent: Wednesday, November 25, 2020 10:18 AM
To: Christopher P Scieszka <christopher.scieszka@dteenergy.com>; Robert J Lee <robert.j.lee@dteenergy.com>; Christy D Clark <christy.clark@dteenergy.com>; Kelly M Martorano <kelly.martorano@dteenergy.com>; John Seymour <JSeymour@Geosyntec.com>; Omer Bozok <OBozok@Geosyntec.com>
Cc: Jackson, Mary <Jackson.Mary@epa.gov>; Mills, Jason <Mills.Jason@epa.gov>; Huggins, Richard <Huggins.Richard@epa.gov>
Subject: [EXTERNAL] RE: Part B Discussion with DTE

Good Morning,

For your awareness, EPA just set up a CCR Part B Implementation website: https://www.epa.gov/coalash/ccr-part-b-implementation. Please follow the "How to Submit a Demonstration Package" instructions to submit the your application by November 30, 2020. Thank you.

Michelle Long
Biologist
U.S. Environmental Protection Agency
Office of Resource Conservation and Recovery
Materials Recovery and Waste Management Division
(703) 347-8953

From: Christopher P Scieszka <christopher.scieszka@dteenergy.com>
Sent: Thursday, November 19, 2020 2:41 PM
To: Long, Michelle <Long.Michelle@epa.gov>; Huggins, Richard <Huggins.Richard@epa.gov>; Mills, Jason <Mills.Jason@epa.gov>; Birchfield, Norman <Birchfield.Norman@epa.gov>; Jackson, Mary <Jackson.Mary@epa.gov>; Celeste, Laurel <celeste.laurel@epa.gov>; Robert J Lee <robert.j.lee@dteenergy.com>; Christy D Clark <christy.clark@dteenergy.com>; Kelly M Martorano <kelly.martorano@dteenergy.com>; John Seymour <JSeymour@Geosyntec.com>; Omer Bozok <OBozok@Geosyntec.com>; Mooney, Susan <mooney.susan@epa.gov>; Schumacher, Jessica <Schumacher.Jessica@epa.gov>
Subject: RE: Part B Discussion with DTE

Hi Michelle,

I understand you are all very busy right now. Thank you for taking the time to set up this discussion.

Proposed timeframes (EST):
12/1: 11-12 AM
12/2: 3-4 PM

Please let us know what works best for you.

Thank you,

Chris Scieszka
Environmental Management & Safety
One Energy Plaza | 410 G.O. | Detroit, MI 48226
(O) 313-235-0153 | (C) Ex. 6 Personal Privacy (PP)
christopher.scieszka@dteenergy.com

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Subject: [EXTERNAL] RE: Part B Discussion with DTE

Chris,

Due to many other meetings for the Part A demonstrations and other work we are doing, plus the holiday, we won't be able to meet until December 1 or 2. Would a time one of those days work for DTE?

Michelle Long
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Subject: RE: Part B Discussion with DTE

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  - Boring locations
  - Drilling methods
- Belle River Bottom Ash Basins and Diversion Basin
  - Boring locations
  - Drilling methods
  - Permeant collection/analysis

Please let me know if we can book an hour with your team.

Thank you!

_____
Chris Scieszka
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christopher.scieszka@dteenergy.com

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Sent: Friday, October 30, 2020 1:08 PM
To: Huggins, Richard; Mills, Jason; Birchfield, Norman; Long, Michelle; Jackson, Mary; Celeste, Laurel; Christopher P Scieszka; Robert J Lee; Christy D Clark; Kelly M Martorano; Buening, Vincent; Crockford, Graham; Cratsenburg, Kelly; John Seymour; Omer Bozok; Mooney, Susan; Schumacher, Jessica
Subject: Part B Discussion with DTE

When: Monday, November 09, 2020 11:00 AM-12:00 PM (UTC-05:00) Eastern Time (US & Canada).
Where: Microsoft Teams Meeting

one for Monroe Power Plant Fly Ash Basin, one for the Belle River Power Plant Bottom Ash Basins, and one for the Belle River Power Plant Diversion Basin

---

Microsoft Teams meeting

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Or call in (audio only)

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Message

From: Long, Michelle [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=77BC3BD1EB0C4865A074EE8093682D3D-LONG, MICHE]
Sent: 11/30/2020 6:35:09 PM
To: Stockdill, Shane GRE-CC [SStockdill@GREnergy.com]
CC: Huggins, Richard [Huggins.Richard@epa.gov]; Mills, Jason [Mills.Jason@epa.gov]; Jackson, Mary [Jackson.Mary@epa.gov]
Subject: RE: CCR Alternative Liner Application - Great River Energy

Hi Shane,

I was able to download open the file that was sent this morning- it was 5182 pages in the one PDF. I have copied the others from EPA for awareness and this is official confirmation of receipt of Great River Energy's application.

If anyone from EPA was unable to open the file or would like it broken into smaller pieces, please reply all to this email. Thanks.

Michelle Long
Biologist
U.S. Environmental Protection Agency
Office of Resource Conservation and Recovery
Materials Recovery and Waste Management Division
(703) 347-8953

From: Stockdill, Shane GRE-CC <SStockdill@GREnergy.com>
Sent: Monday, November 30, 2020 11:31 AM
To: Long, Michelle <Long.Michelle@epa.gov>
Subject: CCR Alternative Liner Application - Great River Energy

Hi Michelle,

I just wanted to follow up with you and make sure that you were able to access the Alternative Liner submittal that Great River Energy submitted this morning to the EPA. If you need this submittal broken out in smaller files, please let us know and we can provide each appendix independently. We are in the process of uploading this to our CCR website for access at the moment. Hopefully everything arrived and is working as intended. Again, thank you for working with us on this submittal, we truly appreciate it, have a great week!

Shane

From: Archer, Gregory GRE-MG <garcher@GREnergy.com>
Sent: Monday, November 30, 2020 7:47 AM
To: Stockdill, Shane GRE-CC <SStockdill@GREnergy.com>
Subject: CCR Alternative Liner Application - Great River Energy

Message Information

To	long.michelle@epa.gov, huggins.richard@epa.gov, mills.jason@epa.gove, jackson.mary@epa.gov, wheeler.andrew@epa.gov
Cc	sstockdill@grenergy.com, eheinen@grenergy.com, eolsen@grenergy.com, jbauer@grenergy.com, jcharles@grenergy.com, garche
Attachments	201129 Final GRE Alternative Liner Application Full Report.pdf (312.27 MB) Download All Files

Dear Mr. Wheeler,

Great River Energy is submitting its Alternative Liner Application for Upstream Raise 91 CCR surface impoundment at Coal Creek Station. This application was prepared in response to the requirements in 40 CFR 257.71 (d)(1). Should you have any questions regarding the FTP linked report, please contact Shane Stockdill (701) 442-7010 or Erik Heinen (612) 801-1269.

Sincerely,

Greg Archer
Manager, Environmental Services

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Message

From: Archer, Gregory GRE-MG [garcher@GREnergy.com]
Sent: 11/30/2020 1:50:33 PM
To: Mills, Jason [Mills.Jason@epa.gov]
Subject: FW: CCR Alternative Liner Application - Great River Energy
Attachments: ATT00001.txt

Jason,

There was a typo in the email address. The linked report below should still be available to you. Please let me know if you have any difficulties downloading it.

Thanks in advance!

Greg Archer | Manager, Environmental Services
12300 Elm Creek Blvd | Maple Grove, MN 55369-4718
P: 763.445.5206 | F: 763.445.5237 | C: Ex. 6 Personal Privacy (PP)
E: garcher@grenergy.com | www.greatriverenergy.com

From: Archer, Gregory GRE-MG <garcher@GREnergy.com>
Sent: Monday, November 30, 2020 7:47 AM
To: Archer, Gregory GRE-MG <garcher@GREnergy.com>
Subject: CCR Alternative Liner Application - Great River Energy

Message Information

To	long.michelle@epa.gov, huggins.richard@epa.gov, mills.jason@epa.gove, jackson.mary@epa.gov, wheeler.andrew@epa.gov
Cc	sstockdill@grenergy.com, eheinen@grenergy.com, eolsen@grenergy.com, jbauer@grenergy.com, jcharles@grenergy.com, garche
Attachments	201129 Final GRE Alternative Liner Application Full Report.pdf (312.27 MB) Download All Files

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Greg Archer
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