DRAFT REMEDIAL DESIGN REPORT

GROUNDWATER EXTRACTION SYSTEM

SIMPLOT PLANT AREA
EASTERN MICHAUD FLATS SUPERFUND SITE

August 1, 2002

MFG, Inc.
consulting scientists and engineers

USEPA SF
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1.0 INTRODUCTION

This document presents the J.R. Simplot Company's draft Remedial Design Report (RDR) for extraction of gypsum stack affected groundwater at the Simplot Plant Area of the Eastern Michaud Flats Superfund Site (the Site) located near Pocatello, Idaho (see Figure 1). Groundwater extraction and reuse is the primary component of the comprehensive Site remedy as described in the Record of Decision (EPA, 1998), and this report is one of a series of RDRs that collectively provide the remedial design for the Site in accordance with the Consent Decree Statement of Work (SOW; EPA, 2002).

1.1 Site History and Background

The EMF Site is located near the City of Pocatello, Idaho and includes two industrial facilities (Figure 1): the FMC Elemental Phosphorus Facility (which ceased operations in December 2001) and the J.R. Simplot Don Plant. FMC produced elemental phosphorus. The Don Plant produces phosphoric acid and a variety of liquid and solid fertilizers. The EPA has divided the Site into three areas: The FMC Plant Area includes the FMC facility and adjacent land owned by FMC; The Simplot Plant Area includes the Don Plant and adjacent land owned by Simplot; and the Off-plant Area which surrounds the FMC- and Simplot-Plant Areas.

The Simplot Don Plant covers approximately 745 acres and adjoins the eastern property boundary of the FMC facility. The main portion of the plant lies approximately 500 feet southwest of the Portneuf River. Of the 745 acres, approximately 400 acres are committed to the gypsum stack. Another 185 acres are occupied by the plant and its infrastructure. A significant portion of the remaining acreage to the south and southeast of the plant consists of cliffs and rugged steep terrain. A Union Pacific Railroad right-of-way is adjacent to the northern fence line of the Don Plant and passes through the northern portion of the Simplot Subarea, paralleling U.S. Highway 30. Access to the Don Plant is provided by I-86 and U.S. Highway 30.

The Don Plant began production of a single superphosphate fertilizer in 1944. Phosphoric acid production began in 1954. Currently, the plant produces 12 principal products, including five grades of solid fertilizers and four grades of liquid fertilizers. The principal raw materials for the process are phosphate ore, which is transported to the facility via a slurry pipeline from the Smoky Canyon mine,

sulfur, and ammonia. The primary byproduct from the Don Plant process is gypsum (calcium sulfate) which is stacked on site.

An Administrative Order on Consent (AOC) was issued by the U.S. Environmental Protection Agency (EPA) on May 30, 1991 and entered into voluntarily by FMC and Simplot. The AOC specified requirements for implementation of a Remedial Investigation (RI) and Feasibility Study (FS) to evaluate site conditions and remedial alternatives to address any potential threats to human health and the environment. Based on the findings of these studies, EPA issued a Record of Decision (ROD; USEPA, 1998), specifying the selected remedial actions for the Site on June 8, 1998. A Consent Decree (USEPA, 2002) between EPA and Simplot, which specified the conditions for implementing the selected remedial actions in the Simplot Plant Area was entered on May 9, 2002.

1.2 Remedial Action Objectives and Performance Standards for Groundwater Extraction

Remedial Action Objectives and Performance Standards for groundwater extraction are described in Consent Decree Statement of Work as follows:

The Groundwater Extraction system shall consist of a network of shallow and deep extraction wells located near the northern edge of the gypsum stack and also includes any engineering controls to reduce the volume of water on the surface of the gypsum stack. The extracted groundwater will be conveyed to the Don Plant and recycled into the Don Plant process water system.

EPA recognizes that operation of the extraction system may not necessarily result in achievement of the MCLs or RBCs throughout the plant area and has not identified this as performance criteria until closure of the gypsum stack. After closure of the gypsum stack operation and maintenance of this system will continue until COCS in groundwater throughout the Simplot OU are reduced to below MCLs or RBCs, or until EPA determines that continued groundwater extraction would not be expected to result in additional cost effective reduction in contaminant concentrations within the Simplot OU. Institutional controls will remain in place to control groundwater use until MCLs or RBCs are achieved in the Simplot OU.

a. *The objective of the extraction well system is to prevent the migration of arsenic and other COCs at concentrations above MCLS or RBCs into the Off-Plant Area. Where there is an MCL, the MCL shall control. The extraction system, in combination with the Institutional Controls Program and the Groundwater Monitoring Program, will address this remedial action objective and the overarching objective of protecting human health and the environment. The extraction system shall operate at least as long as the gypsum stack is receiving gypsum.*

b. *Performance standards for the groundwater extraction system are as follows:*

- *Demonstrate hydraulic control for groundwater influenced by gypsum stack seepage. Preliminary work indicates the cumulative annual average pumping rate necessary to achieve hydraulic control during operation of the gypsum stack is 750 gpm. The annual average pumping rate will be established through system design, including the schedule for implementation and achievement of the required pumping rate. At a minimum, the implementation schedule will allow for a system startup period of one year.*

- *Once the annual average pumping rate has been achieved, the performance standard will be the MCLs or RBCs for arsenic and other contaminants of concern, as measured at Batiste Spring and other Off-Plant Area locations. Where there is an MCL, the MCL shall control.*

The term "annual average pumping rate" is used in the groundwater extraction system performance standard discussion to allow for the reduction or cessation of groundwater extraction during periodic short term maintenance functions and a three to four week period each year known as "turnaround." Turnaround is the Simplot Don Plant's annual plant-wide maintenance period when the plant processes are idled and routine maintenance functions are completed. As plant water demand is significantly reduced during turnaround, pumping of the plant production and groundwater extraction wells are typically reduced or suspended. Thus, the annual average pumping rate represents the annual extraction yield equalized over the entire year (including short term outages and turnaround). As such, the annual average pumping rate is the pumping rate that will be achieved with the groundwater extraction wells pumping approximately 90 percent of the time.

1.3 Report Organization

This Draft RDR presents the basis and preliminary design of the groundwater extraction system for the Simplot Plant Area. Technical factors which were considered in developing the system design including the plant and gypsum stack water balances, site hydrogeologic setting, nature and extent of the affected groundwater, modeling efforts performed in support of system design, the existing infrastructure and plant operational considerations are discussed in Section 2.0. The preliminary design of the groundwater extraction system is presented in Section 3.0, and factors likely to affect the implementation of the design including schedule, sequence and system start-up requirements are discussed in Section 4.0. Operation and maintenance requirements and responsibilities for the extraction system are presented in Section 5.0, and additional data collection activities and the design reporting requirements are discussed in Section 6.0.

The results of previous investigations and pilot test performed in support of the groundwater extraction system design are described in Appendix A. Groundwater modeling efforts associated with site characterization and modeling analyses completed to support system design are presented in Appendix B.

2.0 SUMMARY OF FACTORS AFFECTING REMEDIAL DESIGN

2.1 Facility Operations and Water Balance

In the Simplot Don Plant process, phosphate ore (calcium phosphate), received in slurry form via pipeline from the Smoky Canyon Mine near Afton, Wyoming, is digested with sulfuric acid to produce phosphoric acid. The phosphoric acid is a product and is also used to generate other fertilizer products. The byproduct from the phosphate ore digestion reaction is gypsum (calcium sulfate), which is slurried onto the gypsum stack. As such, the gypsum stack is an integral part of the overall Don Plant process.

The Don Plant water balance is complex and is critical to successful facility operation. Numerous unit operations require different water flows and have different minimum water quality requirements. For example, boiler feed water must have relatively low dissolved solids content, whereas water used in the phosphoric acid cooling process has essentially no requirements for water quality. Flows are continuously monitored at many key points within the process as part of routine operation.

As an overview, a generalized schematic of the major water inputs and outputs for the Don Plant process are shown on Figure 3. Flows were based on annual measured totals for 2001 and other information sources. As shown, the main sources of water for the facility (approximately 4,300 gallons per minute) are three production wells that pump from the lower aquifer in the northern portion of the Don Plant. Water also comes in with the ore slurry (approximately 220 gallons per minute). Major water outputs are in the slurry sent to the gypsum stack (approximately 1,900 gallons per minute), water stored prior to sale as irrigation water (approximately 800 gallons per minute), emissions to air and in products.

2.2 Gypsum Stack Operations and Water Balance

The gypsum stack receives approximately 2,800 gallons per minute of slurry with a solids content of approximately 31.3 percent (10 day moving average over the last year); resulting in a total water flow in the slurry of approximately 1,900 gallons per minute. The stack has three separate cells: the lower stack and the eastern and western cells on the upper stack. At the time of the RI, Simplot was using the upper stack only. The lower stack (which had been used historically) was returned to service around 1994 and now gypsum slurry is applied to each of the cells in turn on a schedule of approximately six weeks.

The water balance of the gypsum stack is complex. A general schematic is shown on Figure 4. Water sent to the stack is either collected and returned to the Don Plant process, evaporated, or seeps to groundwater. As discussed above, the Don Plant sends approximately 1,900 gallons per minute of water in the slurry to the stack. This flow rate has been relatively constant over the last decade, since phosphate ore has been slurried to the Don Plant from the mine near Afton, Wyoming.

The rate of evaporation from the stack is difficult to predict. Water evaporates directly from the ponds on the top of the stack, but also migrates laterally within the stack and evaporates from the side slopes. The annual mean precipitation for the region is 10.86 inches per year and the mean evaporation is 33.21 inches (Bechtel, 1996). Using these figures and the stack area of 400 acres, it is estimated that the average rate of evaporation would be 500 gallons per minute. This is likely a reasonable overall estimate. Evaporation would be reduced from this estimate because the water surface area is smaller than the total stack footprint, however, it would increase because the water sent to the stack is warm, the stack is dark in color and absorbs radiative heat and because some water evaporates from the face of the stack.

Seepage from the stack is believed to have significantly decreased since the time of the RI for three primary reasons. First, around the time of the RI Simplot instituted a new method of operating the stacks. Originally slurry had been applied to the east and west cells of the upper stack on an annual cycle. Observations in piezometers and wells during this period indicated that while an individual cell was in use seepage was relatively high (water levels increased significantly on the side of the stack that was being used). In the current practice, slurry is applied more evenly over the three cells on the stack (due to a new rim ditching method used to build the stack), over a six-week cycle. After this change was implemented seepage appeared to decrease based on observations of the water levels in the monitoring wells and piezometers.

A second action that is expected to have reduced seepage from the stack to groundwater is that in 2000 Simplot modified the slurry pumping system to eliminate use of clean water in the pump seals. This clean water used to mix with the slurry and end up on the stack. This modification has reduced the flow rate of water to the stack by approximately 350 gallons per minute. Because less water is being sent to the stack, it is expected that seepage to groundwater has reduced.

Finally, process changes that were implemented in 1991 have gradually been found to have a significant effect of the seepage rate from the stack. Prior to 1991, the phosphate ore was brought to the facility by railcar and calcined prior to processing. In 1991 Simplot completed installation of the slurry

pipeline for the ore and discontinued use of the calciners. The gypsum generated from this modified process has been found to have lower permeability than gypsum generated prior to 1991. As the thickness of the gypsum layer from the current process has increased on the stack, the seepage has substantially reduced such that considerably more water stays in the ponds on top of the stack (ponded areas in 1996 were typically 10 to 15 acres; in 2002 these were approximately 200 acres). The gypsum stack has been built on the side of a hill, such that in the northern part of the stack the gypsum is over 300 feet high, but it tapers toward the south, with the gypsum thickness eventually reducing to zero at the southern-most extent of the stack. Tests performed by Simplot to support the operation of the stack have found that the gypsum permeability decreased as the thickness of gypsum increased and the weight of overlying gypsum increased. Based on these findings, it is believed that the majority of the seepage from the stack to groundwater occurs where the gypsum is thin (i.e. at the southern portion of the upper stacks). Accumulation of ponded water on the top of the stack is a significant operational concern for Simplot, because larger quantities of water can make the stack less stable. Therefore, beginning around 1996, Simplot began to pump water directly off the stack back to the Don Plant process. This pump back flow has steadily increased and is currently approximately 1,160 gallons per minute.

Therefore, considering the overall water balance, the current stack is expected to have a lower seepage rate in recent years due to the following effects:

- Water flows sent to the stack in the gypsum slurry have not changed significantly since the time of the RI (total average water flow of approximately 1,900 gallons per minute in the gypsum slurry), and the total flow discharged to the top of the stack has been reduced by about 350 gallons per minute due to the changes in the way the pump seals on the slurry line are operated;
- Water is collected by the under drain system and returned to the Don Plant process; this has remained relatively constant to the current time (about 40 gallons per minute);
- Evaporation would be expected to have increased, because the wetted area on the stacks is larger; and
- Starting in 1996 Simplot began to pump water directly from the ponded areas on the top of the stacks. This flow has steadily increased and is currently approximately 1,160 gallons per minute.

Based on this overall balance, it is estimated that during the time of the RI and up to about 1996, seepage from the stack to groundwater would have been in the range of 1,700 gallons per minute. This approach results in a continually reducing estimate of seepage since 1996. Currently, using the overall balance, it is estimated that seepage to groundwater is in the range of 250 gallons per minute; a significant reduction since 1996.

2.3 Site Hydrogeologic Setting

The Simplot Plant Area is divided into two principal hydrogeologic areas: the Bannock Range, to the south, and the Michaud Flats, to the north (Figure 2). Key features of each area are described in the following subsections. These descriptions are based on the findings of the EMF site RI performed between 1994 and 1996 and incorporate the results of subsequent pre-design investigations conducted between 1996 and 1998 to further define the hydrogeolgic features. Complete details of the pre-design investigations including updated geologic cross section maps, detailed well/boring logs, and investigation procedures are included in Appendix A. A generalized representation of the Simplot Plant Area geology is shown on Figure 5.

2.3.1 Bannock Range

The geology of the southern portion of the Simplot Plant Area, which lies within the Bannock Range, consists primarily of Tertiary volcanics and related clastic interbeds. The interbeds are typically sands and gravels derived from the erosion and deposition of the underlying Tertiary volcanics from upgradient areas. In some areas, these volcanics are believed to have been incised by ancient streams to form bedrock valleys that are filled with relatively coarse alluvial sediments. These fill deposits are typically covered by loess (windblown silt). In other areas, the volcanic deposits are covered solely by loess, or are exposed at the surface.

Distinct aquifer zones were not identified in the Bannock Range. However, groundwater occurs, to varying degrees, in the loess, buried alluvial channels, and in the clastic interbeds. The general direction of groundwater flow within the Bannock Range is to the north. Two major groundwater flow paths have been defined in the aforementioned water bearing strata that are separated by a ridge of volcanic bedrock, which is aligned along an axis approximated by wells 323 and 313 (Figure 6). The volcanic ridge is of lower hydraulic conductivity than the surrounding, coarser grained sediments. The difference in hydraulic conductivities causes the bulk of northward-flowing groundwater in the Bannock Range, beneath the gypsum stack, to be concentrated on either side of the volcanic ridge.

Groundwater flowing to the west of the ridge encounters a buried relict stream channel along the western boundary of the Simplot Plant Area as defined by wells 304, 333, 307, and 308 (Figure 6). well no logs Subsequently, groundwater flows northwest into the relict channel and then to the north-northeast along the relict stream channel and into the Michaud Flats hydrogeologic area (Figure 7). The relict stream channel was initially identified during the RI on the basis of geologic data (boring logs). Field investigations in 1996 (MFG,1997b; Appendix A-1) confirmed the existence of this channel and further clarified that the channel is relatively narrow and steep-sided in the vicinity of wells 336 and 343. Field investigations in the summer of 1998 also confirmed the existence of the channel in the vicinity of 346 (Figure 6).

Groundwater flowing east of the buried volcanic ridge is not confined to a single drainage channel and covers a wider area as it flows into the Michaud Flats (Figure 7). Evidence of this flow pattern is also reflected in the groundwater chemistry data, which show two "lobes" of gypsum stack affected groundwater to the west and east of the axis approximated by wells 323 and 313, as discussed in Section 2.4. The presence of affected water in wells 313 and 323, which are completed in clastic interbeds between volcanic rock layers within the buried volcanic ridge, indicates that the volcanic ridge does convey some groundwater flow northward. However, the groundwater flux from these interbeds is likely much smaller than the northward flux in the unconsolidated sediments to the west and east of the volcanic ridge.

2.3.2 Michaud Flats

The northern portion of the Simplot Plant Area, situated in the Michaud Flats hydrogeolgic zone is characterized by Snake River Plain basalts overlain by gravels derived from volcanic rocks. Above the gravels are varying thicknesses of fine-grained silts, clays, and sands known as the American Falls Lake Beds (AFLB). In the northern Simplot Plant Area, these fine-grained AFLB deposits are discontinuous confining layers which are overlain by coarse-grained Michaud Gravels. Deposition of the Michaud Gravels, consisting of quartzite, chert, and volcanic gravels, cobbles, and boulders, is associated with catastrophic flooding of ancient Lake Bonneville. To the north and east of the Simplot Don Plant, the Michaud gravel occurs in channels and the AFLB deposits are absent (in the area of wells 519, 504, and 321; Figure 2). Above the Michaud Gravel is a finer-grained unit that consists of interlayered silts, clays, and sands. Deposits of loess and a colluvial silt layer of variable thickness cover the site area.

Groundwater flow through the Michaud Flats portion of the Simplot Plant Area is generally to the north-northeast. The regional aquifer is comprised of coarse-grained alluvial sediments (Michaud Gravels) and underlying basalts. Locally, in the Simplot Plant Area, there are distinct upper and lower aquifer zones in the alluvial sediments, as indicated by the presence of confining strata and the often strong upward vertical gradients between the upper and lower aquifer zones. The confining unit is the AFLB, which locally act as an aquitard, separating the upper shallow aquifer zone from the lower deep aquifer zone. In a large area north of the Don Plant, the lake bed sediments separating the upper zone from the lower zone are absent, having been scoured out by Bonneville Floods and replaced with the Michaud Gravel deposits. Groundwater particle tracks from the RI groundwater modeling effort indicate that a significant portion of the flow in the lower aquifer is captured by the production wells within the Don Plant (Bechtel, 1996; Appendix K). In the area where the AFLB deposits are absent (north of the Don Plant), the lower aquifer groundwater flows upward into the upper aquifer (Figure 5) and mixes with the shallow groundwater. This blended groundwater eventually discharges to the Portneuf River and associated springs, primarily Batiste Spring and the Spring at Batiste Road (Figure 7).

2.4 Distribution of Constituents in Groundwater

An exhaustive investigation of the site environmental conditions was performed during the RI phase of the project from 1992 to 1994. This investigation included quarterly sampling of groundwater from 77 wells, and these samples were typically analyzed for 22 heavy metals, 4 radionuclides and other analytes. After the RI period, Simplot continued to perform groundwater monitoring in the Simplot Plant Area and at Batiste Spring on a semi-annual basis. A summary database compilation of key groundwater data collected during the RI and subsequent sampling efforts is included in Appendix C of this report. It is noted that Simplot is currently working with EPA to generate a comprehensive Site-wide database for groundwater.

In the Simplot Plant Area, the gypsum stack and the East Overflow pond were identified as sources of constituents to groundwater. The gypsum stack was found to have affected groundwater quality over a relatively large area while the East Overflow Pond (an unlined pond used for collection of process water during plant upsets) had a more localized effect (primarily in the area of paired wells 317 and 318), but resulted in higher constituent concentrations in groundwater. Use of the East Overflow Pond was discontinued in 1993 and the pond was replaced with a new, lined impoundment. Details of the

closure and replacement are presented in the Former East Overflow Pond Construction Completion Report (MFG, 2002).

As discussed in Section 2.2, the gypsum stack has three separate cells: the lower stack and the eastern and western cells on the upper stack. Historically, the lower stack had been used, but only the upper stack was in use at the time of the RI. Around 1994, Simplot resumed using the lower stack along with the two upper stack cells but changed its operations such that each cell sequentially receives slurry on an approximate six-week rotating schedule. The liquid portion of the gypsum slurry typically has a pH less than 2, and the dominant cations present are calcium and sodium. The dominant anions are orthophosphate and sulfate. Several trace metals/metalloids, including arsenic, are present in the gypsum slurry and have been observed at elevated concentrations in groundwater downgradient of the gypsum stack. Groundwater affected by seepage from the gypsum stack is characterized by increases in concentrations of major ions (notably sulfate), nutrients (notably phosphate and orthophosphate), and some metal/metalloids (notably arsenic).

Downgradient of the past and current sources, the concentrations of some major and minor ions and metals have been present in groundwater at concentrations above their representative background levels. Background concentrations (i.e., not affected by EMF site sources) were established during the RI for the range of constituents evaluated. For the Portneuf River Valley hydrogeologic area, the background concentration for arsenic was identified as 0.018 mg/L. Isoconcentration maps of the key indicator parameters (arsenic, sulfate, orthophosphate, selenium, and chloride) are shown on Figures 9 through 15.

As described in Section 2.3, groundwater from beneath the gypsum stack flows along the east and west sides of a buried volcanic ridge and into the Don Plant Area. Beneath and immediately downgradient of the Don Plant, mixing of upper and lower groundwater with the larger flux of groundwater from the Michaud Gravels controls the concentrations of site-related constituents in groundwater, which subsequently migrates north toward springs along the Portnuef River. Historically, groundwater discharged at Batiste Spring, to the north of the Simplot Plant Area, has met water quality standards (primarily Maximum Contaminant Levels (MCLs)) for arsenic. However, in February 2002, the arsenic MCL was lowered from 0.05 mg/L to 0.01 mg/L which is approximately equal to the background value of 0.018 mg/L. By comparison, arsenic concentrations at Batiste Spring are typically lower than 0.05 mg/L but greater than 0.01 mg/L, as shown on Figure 16.

With a few exceptions, the current configurations of the gypsum stack affected groundwater plumes are generally consistent with those observed during the RI, and overall the constituent plumes for affected groundwater appear to be relatively steady. Groundwater plume stability is most evident for gypsum stack associated constituents: arsenic, sulfate, and orthophosphate, as discussed below.

- Arsenic - Comparison of the arsenic plumes for 1995 and 2001 (Figures 9 and 14) shows that the plume configurations are generally consistent with notable exception of concentration increases at wells 323 and 318 and a notable decrease at well 332. However, temporal plots of the arsenic concentrations at these well (Figure 17) show that the elevated value at well 323 and the low value at well 332 are inconsistent with typical values for these wells and may be anomalous. Variability in the arsenic concentrations at well 318 reflects: (1) closure of the nearby East Overflow Pond in 1993, and (2) reuse of the upgradient lower stack area beginning in 1994.
- Sulfate - Comparison of the sulfate plumes for 1995 and 2001 (Figures 10 and 15) similarly shows overall plume stability with exception of the higher concentrations at wells 316, 318 and 326 in the lower stack area and a notable decrease at well 332. Temporal plots of the sulfate concentrations for these wells (Figure 16) indicate that the low value at well 332 is inconsistent with typical values for the well and is likely anomalous. The higher values in 2001 for wells 316, 318, and 326 reflect an overall increasing trend, which is consistent with the reuse of the lower stack area. The 1993 values for well 318 also indicate the effects of closure of the East Overflow Pond.
- Orthophosphate - The orthophosphate plumes for 1995 and 2001 (Figure 11) also show overall plume stability with the exception of increasing concentrations in the lower stack area near wells 316, 318 and 326 and a notable decrease at well 332. Temporal plots of the orthophosphate concentrations at these wells (Figure 19) confirm that the low value for well 323 is likely anomalous and an increasing concentration trend in the lower stack area wells consistent with reuse of the lower stack area. Historical values for the Frontier well are also included on the temporal plot to confirm that the 1995 value was atypically high and does not indicate an actual groundwater impact.

Thus, as indicated by multiple lines of evidence, groundwater affected by gypsum stack seepage flows from beneath the gypsum stack along the east and west sides of a buried volcanic ridge to the Don Plant Area where it mixes with groundwater inflow from the Michaud Gravels prior to discharging to the Portneuf River via surface and subsurface seeps. Plumes of stack related constituents in groundwater (including arsenic, sulfate and orthophosphate) extend from beneath the stack down into the Don Plant Area. Extensive characterization and monitoring of the plumes for almost ten years has confirmed that, aside from limited effects from stack operational changes, the overall groundwater plumes are relatively consistent and stable.

2.5 Modeling in Support of Extraction System Design

Numerical groundwater modeling was initially performed during the FS to identify candidate groundwater extraction areas and conceptual pumping rates for capture, to the extent practicable, of groundwater affected by gypsum stack seepage. Subsequent to the FS, field studies and pilot tests were performed to further evaluate the candidate extraction areas and assess if the identified pumping scenarios would hold true under active pumping. Results from these studies and pump tests were evaluated and used to develop the detailed groundwater capture and extraction strategy described in this report. Details of this process are discussed in Appendix B and summarized in the subsections below.

2.5.1 Identification of Candidate Extraction Areas

During the FS, candidate groundwater extraction areas were identified and evaluated based on numerical modeling of the Simplot Plant Area groundwater flow system. A Visual MODFLOW model of the flow system was constructed based on data collected during and subsequent to the RI, and the model was used to evaluate the effectiveness of various well configurations for capture ofaffected groundwater. The modeling study evaluated combinations of wells located in the east plant and west plant areas, both with and without the effects of Simplot's three existing productions wells (SWP-4, SWP-5 and SWP-7), which are currently used to continuously pump approximately 4,300 gpm of groundwater from the lower hydraulic zone. The modeling study indicated that nearly all of the affect groundwater that is not currently captured by the existing plant production wells could be intercepted by placing wells in the locations marked A, B and C on Figure 20. Location A was selected to intercept groundwater flowing down the buried alluvial valley on the west side of the buried volcanic bedrock ridge while locations B and C were selected to intercept east side groundwater from the upper and lower zone alluvial sediments.

Extraction wells were not considered to be practical in the area down gradient of the bedrock knob for the following reasons: (1) the groundwater flow rates out of the central area occupied by the bedrock knob and the observed concentrations of arsenic and other gypsum stack related constituents downgradient of the knob are much lower than in the adjacent areas, particularly to the east of the knob, (2) extraction wells in this area are likely to be much less effective than wells located to intercept groundwater along the major flow paths to the east and west of the bedrock knob, and (3) data indicate that the Simplot production wells capture a significant portion of the affected groundwater flowing northward from the bedrock knob.

data to support

2.5.2 Recommended Extraction Well Configuration and Pumping Rates

A series of investigations were conducted between 1996 and 1998 to collect additional data to support extraction system design. These activities included installing pilot extraction wells in each candidate extraction area and performing pumping tests to evaluate key aquifer parameters and identify sustainable pumping rates for the wells. Field reports and other documentation of these investigations are included in Appendix A, and the key findings of the investigations are summarized in Appendix B.

Data from the field investigations were used to develop well spacings and pumping rates for extraction wells as follows:

- West Plant Area – Data from the pilot pump tests were used to empirically determine that extraction pumping of two or more wells located within the buried alluvial channel on the west side of the buried volcanic ridge (see Figure 20) at a combined rate of 150 gpm would be effective for capture of affected groundwater.

- East Plant Area – Simplified models of the upper and lower zones of the aquifer were developed to evaluate well spacings and extraction rates for each zone. For the upper zone, extraction pumping of seven wells located along the toe of the lower gypsum stack (see Figure 20) and spaced approximately 130 feet apart at a combined rate of 280 gpm was indicated as being effective for capture of affected groundwater. For the lower zone, extraction pumping of two wells located near Location C and spaced approximately 400 feet apart (see Figure 20) at a combined rate of 400 gpm was indicated.

The well spacings and pumping rates listed above were developed using conservative estimates of the hydraulic parameters and are intended to provide well spacings which are closer and pumping rates which are higher than the minimum necessary for practicable groundwater capture. A conservative approach was used in establishing the well spacings and pumping rates to allow for natural variations of the aquifer hydraulic parameters and reduce the potential for start-up testing to demonstrate a need for supplemental extraction wells in the future. Further details of the final modeling and capture zone analyses performed to support extraction system design are presented in Appendix B.

2.6 Current Extraction Wells and Infrastructure

Four test groundwater extraction wells (337, 338, 343, and 346) were installed as part of the pre-design pilot-testing program between 1996 and 1998, as discussed in the previous section. The pilot tests included extended pump tests at wells 337, 338 and 343 (see Appendix A-2).

For the pilot tests, dedicated submersible pumps, pump controls and ancillary equipment were installed in wells 337, 338, and 343. Permanent electric service was extended to the three wellheads, and each well was equipped with an individual control panel, down hole pump with riser piping, and above-ground well head assembly. Wellhead assemblies typically included a union, check valve, sample port, pressure gauge, globe valve, and flow meter. Heat trace tape and insulation were installed on the exposed wellhead assemblies and the above ground piping to prevent system freeze up. In addition, the wells were connected to the Simplot plant cooling system with permanent above and underground piping. Groundwater extracted from well 343 in the east plant area was piped through a short segment of above ground HDPE pipe to a nearby manhole and underground piping system which conveyed the water by gravity flow to the process cooling system. Groundwater extracted from wells 337 and 338 was pumped directly to the plant cooling towers via individual HDPE pipelines. Construction and pumping equipment details for each of the four pilot test wells are summarized on Table 1.

For the extended pumping tests, the three extraction wells were pumped from fall 1997 until spring 1998. Following the extended pump tests, well 343 has continuously been pumped while wells 337 and 338 have been idle with all of the pumps, piping systems, and ancillary equipment installed for the pilot tests remaining in-place. Because these existing systems have been operated without inspection or idle for a number of years, the condition of the wells, pumps and piping systems will be inspected to assess their current condition and future utility. Details of the inspections are discussed in Section 6.1.

2.7 Operational Considerations

This section describes factors associated with operation of the Simplot Don Plant that may affect operation and management of the groundwater extraction network. Management of the groundwater extraction system will be closely tied to facility operation because the extracted groundwater will be used in the Don Plant process.

2.7.1 Normal Operating Conditions

Following start-up testing and system optimization, the normal operating condition of the groundwater extraction system will be for each extraction well to be on line and pumping at its design flow rate for optimal groundwater capture. The Don Plant ore throughput and the corresponding water usage are relatively steady. Therefore, it is anticipated that plant water demand will ensure that groundwater extraction is on going and steady.

Extraction pumping of individual wells may be periodically interrupted in order to perform routine maintenance on the well, pump or piping system. It is anticipated that, when necessary, these interruptions will be of relatively short duration (typically on the order of a few days) and will be managed such that the annual average pumping rates for groundwater capture in the individual wells and each hydrogeologic zone are achieved.

2.7.2 Annual Maintenance Shutdown (Turnaround)

Routine maintenance and periodic upgrades to the Don Plant production equipment are performed during short-term outages and during a three to four week continuous period during summer known as "turnaround". During turnaround, the plant processes are either shut down or throttled back and demand for cooling and process water is generally reduced. Correspondingly, it is anticipated that groundwater extraction will be reduced or suspended during this time period.

The effects of the short-term outages and the longer turnaround period were considered in determining extraction pumping rates in the groundwater capture analyses (see Appendix B). As such, the sustained pumping rates for the groundwater extraction wells identified in the analyses exceed the minimum necessary for effective capture and compensate for limited pumping during turnaround such that the annual average pumping rate for each well and hydrogeologic zone will be maintained.

3.0 REMEDIAL DESIGN

This section presents the preliminary design of the groundwater extraction system. The extraction system will consist of eleven pumping wells located to capture gypsum stack affected groundwater. Well locations have been selected based on detailed groundwater modeling and pilot testing, as described in Section 2.5, to identify extraction areas which are effective in capturing affected groundwater downgradient of the gypsum stack while minimizing the total extracted water volume. Groundwater recovered by the extraction wells will be pumped back to the Simplot Don Plant for use in the plant process.

The preliminary design presented herein is based on data collected during the RI and the subsequent pre-design investigations, described in Section 2. As such, it represents the design at approximately 30 percent completion. The design will be advanced through detailed design activities, including inspection of the extraction wells systems and related infrastructure, limited extraction well pump testing, discussions with plant personnel to define operating considerations, and subsequent system refinements, as necessary. Complete design analyses will be presented in the Prefinal and Final design deliverables.

3.1 West Plant Area Extraction Wells

Based on the analysis presented in Section 2.5.2, optimal capture of affected groundwater in the west plant area is predicted to be achieved by extraction pumping of two or more wells within the portion of the west side upper aquifer bounded by the relect drainage channel (Figures 20 and 21) at a combined rate of 150 gpm (135 gpm, average annual). Existing well 343 is located within the recommended area and will be used for groundwater extraction. Existing well 346 is also located within the recommended area but will not be used because it is screened in an underlying saturated zone which is relatively free of affected groundwater (see Figure 14) and would not provide effective capture of arsenic mass.

Extended pumping of well 343 following the pre-design pilot testing indicated the well is capable of sustained pumping at 60 gpm. Therefore, one or two additional wells will be required to provide the combined 150 gpm pumping rate necessary for optimal groundwater capture. In order to determine if one or two wells will be needed, a new extraction well will be installed in the general vicinity of well 308 and pilot tested to assess its sustained yield and capture zone. The well installation and testing will be

performed in conjunction with inspections of wells 343 and 337 planned for Summer 2002 (see Section 6.1), and the test findings will be presented in the Prefinal RDR.

Sustained and annual average design pumping rates for the west plant area extraction wells are summarized on Table 2. As shown, existing well 343 and the new well(s) will be assigned 400 series numbers to identify them as groundwater extractions wells. Well 343 will be re-numbered as well 401.

The new west plant area well (and second well, if necessary) will be equipped with dedicated submersible pump and piping systems similar to those installed in well 401 (formerly 343). The pump system will likely consist of a 7.5 hp submersible pump with an operating range of 45 to 95 gpm at a total dynamic head of 190 to 340 feet. The piping system will likely include a 2-inch down hole riser pipe and above ground well head assembly (2-inch union, 2-inch check valve, sample port pressure gauge, 2-inch globe valve, and 1.5-inch flow meter) with ancillary piping to convey the extracted groundwater to a nearby existing manhole and underground piping system which will convey the water by gravity flow to the Don Plant. Well pumping rates will be controlled either manually by individual control panels located at each wellhead or remotely from a central control system to be integrated with the plant process controls.

(Planning on 2 wells) Pg 8.6 recommendation from model 150gpm 200

3.2 East Plant Area Extraction Wells

As discussed in Section 2.3, the east plant area saturated zone is separated into an upper zone and a lower zone by the lower permeability AFLB sediments. Gypsum stack affected groundwater is present in both the upper and lower zones. Therefore, groundwater will be extracted both zones as discussed below.

Upper Zone

Based on the analysis presented in Section 2.5.2, optimal capture of affected groundwater in the upper portion of the east plant area aquifer is predicted to be achieved by pumping seven extraction wells located near the toe of the lower gypsum stack (Figure 21) at a combined flow rate of 270 gpm (243 gpm, annual average). Based on modeling and pilot testing results, the upper zone wells will be approximately 80 feet deep and spaced approximately 80 feet apart.

The pre-design pilot testing indicated that sustained yields of approximately 40 gpm could be expected for extraction wells in the east plant area upper zone (see Section 2.5.2). Well 338 was initially pumped at 40 gpm, but experienced siltation and fouling that reduced its efficiency. Following redevelopment, well 338 achieved sustained pumping at 30 gpm. However, well 338 will not be included in the upper zone extraction network due to its lower yield following redevelopment and concerns regarding its long-term utility. Seven new extraction wells, each with a sustained design capacity of 40 gpm, will be installed to provide the combined 270 gpm pumping rate needed for optimal groundwater capture. The seven new upper zone extraction wells (wells 403 through 409) will be installed near the toe of the lower gypsum stack as shown on Figure 21. The final extraction well locations will be selected to satisfy both the siting requirements identified in the capture zone analyses and physical constraints, such as roadways and existing equipment, in the proposed well areas. The sustained and annual average design pumping rates for the seven east plant area upper zone extraction wells are summarized on Table 2. As noted in Section 4.2, the individual well pumping rates will be adjusted during start-up to optimize capture of stack-affected groundwater.

Each well will be constructed as a 6-inch ID pumping well to a total depth of approximately 80 feet. The wells will be installed to the base of the upper zone and screened from the top of the saturated zone to the top of the AFLB confining layer (estimated screen length 30 feet). In order to overcome the efficiency problems experienced by pilot test well 338, a minimum 12-inch borehole will be drilled for well construction to ensure a minimum filter pack thickness of two inches. Based on samples of the upper zone formation materials collected during the pre-design investigations (see Appendix A-3), well screens with a slot size of 0.060 inches and an artificial filter pack sized such that the screen retains 90 percent of the filter pack will be used. The wells will be built of Schedule 80 blank casing and Schedule 80 Vee-Wire screen, or equivalent.

The seven new extraction wells will be equipped with dedicated submersible pumps and piping systems similar to those installed in well 338. The pump system will likely consist of a 2 Hp submersible pump with an operating range of 24 to 55 gpm at a total dynamic head of 100 to 180 feet. The piping system will likely include a 2-inch down hole riser pipe and above ground well head assembly (2-inch union, 2-inch check valve, sample port pressure gauge, 2-inch globe valve, and 1.5-inch flow meter) and ancillary piping to convey the captured groundwater to the Don Plant. Well pumping rates will be controlled either manually by individual control panels located at each wellhead or remotely from a central control system to be integrated with the plant process controls.

Lower Zone

Based on the analysis presented in Section 2.5.2, optimal capture of affected groundwater in the lower zone of the east plant area is predicted to be achieved by pumping two extraction wells located slightly northwest of the upper zone groundwater extraction wells (Figures 20 and 21) at a combined flow rate of 400 gpm (360 gpm, annual average). Consistent with the modeling and pilot testing results, the lower zone wells will be installed to a depth of approximately 160 feet and spaced approximately 400 feet apart. Existing well 337 is located in the recommended area and will be used for extraction.

Pilot testing showed that well 337 is capable of sustained pumping at 200 gpm. The second extraction well will also be pumped at 200 gpm to achieve the required 400 gpm pumping rate. These pumping rates for the two east plant area lower zone extraction wells are summarized on Table 2. As indicated, well 337 will be re-numbered as well 410 to designate it as a permanent extraction well.

The second lower zone extraction well will be installed approximately 400 feet east of well 410 (formerly 337), as shown on Figure 21. The new well will be constructed as a 6-inch ID pumping well to a total depth of approximately 170 feet, or the base of the first gravel zone below the AFLB unit, which ever is first encountered. The well will be installed into and screened across the upper portion of the lower aquifer (estimated screen length 40 feet). Lower zone formation material samples will be collected during advancement of an initial pilot boring to support design of the well screen and filter pack. Depending upon the conditions encountered, the well screen and filter pack will consist of either natural development (i.e., no artificial filter pack) and slotted screen sized to retain 50% of the formation material or a gravel filter pack and slotted screen sized to retain 90% of the filter pack. If an artificial filter pack is used, a minimum 14-inch boring will be advanced for well construction to provide a minimum filter pack thickness of three inches. Construction materials for the well will consist of Schedule 80 PVC blank casing and Schedule 80 PVC wire wrap screen.

The new extraction well will be equipped with dedicated submersible pump and piping systems similar to those installed in well 410. The pump system will likely consist of a 15 Hp submersible pump with an operating range of 170 to 300 gpm at a total dynamic head of 150 to 225 feet. The piping system will likely include a 3-inch down hole riser pipe and above ground well head assembly (3-inch union, 3-inch check valve, sample port pressure gauge, 3-inch globe valve, and 2-inch flow meter) and ancillary piping to convey the captured groundwater to the Don Plant. As with the other extraction wells, well

pumping rates will be controlled either manually by individual control panels located at each wellhead or remotely from a central control system to be integrated with the plant process controls.

4.0 IMPLEMENTATION CONSIDERATIONS

This section addresses, in more specific detail, the construction procedures and planning necessary to achieve the performance objectives of the groundwater extraction program. This section also identifies specific sequences and dependencies of activities as well as logistical requirements of various aspects of the work, including use of the extracted water in the Don Plant process.

4.1 General Schedule and Sequence Considerations for Extraction Well Installation

Groundwater extraction is the primary remedial activity that will be conducted at the Simplot Plant Area of the Eastern Michaud Flats Site. Other activities include excavation of phosphate ore residuals from the Dewatering Pit, selection and implementation of measures to control fugitive emissions from the gypsum stack roads, monitoring of groundwater quality to evaluate performance of the groundwater extraction program and other source control measures, and implementation of specified institutional controls in the Simplot Plant Area.

There are no overall sequencing constraints between the various work elements, other than that the groundwater monitoring program will be implemented concurrent with extraction system implementation to allow confirmation that the performance standards have been attained and ensure the long-term effectiveness of the remedy. It is currently anticipated that the field construction activities associated with the remaining remedial action work elements will be completed in 2002 and 2003. Following construction, start-up and optimization of the groundwater extraction wells is expected to last approximately 18 months to two years as discussed in the following sections.

Detailed construction schedules for implementation of the remaining work elements will be provided in the Remedial Action Work Plan for that element. In general, construction of the groundwater extraction wells will be closely coordinated with plant operations personnel. Simplot facility staff will be responsible for extending power and pump controls to the wellheads and installing any required transmission piping from the wellheads to the applicable end use points.

4.2 System Start-Up and Optimization

System start-up and optimization is defined as the period beginning when the first new extraction well is on-line until all planned wells are on-line and operating at the average annual pumping rates identified by post-start-up monitoring.

Based on on-going evaluations of the process, Simplot believes that the extracted groundwater can be directly recycled in the plant without pre-treatment. It is anticipated that this evaluation will be complete and documented in the Prefinal RDR. However, it is certain that process modifications will be necessary to allow the plant to receive the extracted water. As indicated in Section 2.1, the Don Plant water balance is complex, and as such, process modifications will be necessary to accommodate the relatively low-quality water (primarily due to total dissolved solids) that will be returned from the extraction system. It will not be possible to accommodate the full extraction system flow with a single, simple process modification, but rather a series of individual changes will be necessary, each with an evaluation and testing phase before implementing the next. Some process modifications can only be implemented during plant turnaround, typically in June, when the overall process ceases and major upgrades and maintenance activities are performed. Therefore, implementation of the extraction will be a phased approach with a process modification made, some extraction wells brought on line (the number being dependant on the flow rate opened up by the process modification), testing of the system and then making adjustments prior to the next process modification.

EPA acknowledged the difficulty and the associated implementation approach in the Record of Decision and in the Consent Decree, which allows for a minimum system start-up period of one year. Preliminary work initiated by Don Plant operations personnel indicates that 18 months will be needed for system start-up. This work is ongoing and a refined schedule will be provided in the Prefinal RDR.

The performance of the individual pumping wells will be evaluated as the wells are brought on-line. Field data will be collected to assess well performance and to evaluate the radius of influence and well capture. These data may include extraction flow rate, pumping well draw down, draw down in nearby observation wells, and extracted water quality. Limited groundwater modeling may also be used to evaluate pumping well performance. Based on these findings, individual well pumping rates will be adjusted to optimize overall capture of stack-affected groundwater.

For wells installed within a single pumping zone, the performance of the overall zone network will be evaluated once all wells are brought on-line. Periodic assessments will be conducted to evaluate well network performance and identify an appropriate average annual pumping rate. At a minimum, system start-up and optimization are expected to last for a period of eighteen months to fit with plant modifications necessary to receive the extracted groundwater. Further details regarding extraction system optimization will be included as part of the Groundwater Extraction Remedial Action Work Plan.

4.3 Modification of Extraction System Based on Groundwater Monitoring Data

As described in Section 1.2, the performance standard for the extraction system after the system is up and running is to meet MCLs or Risk Based Concentrations (RBCs) for arsenic or other constituents of concern at Batiste Spring and the Spring at Batiste Road. The RI/FS evaluation found that the risk driver for groundwater was arsenic. The MCL for arsenic is 0.01 mg/L, which is less than the naturally occurring background level of 0.018 mg/L estimated during the RI (Bechtel, 1996).

A detailed groundwater monitoring plan has been developed as part of the overall remedial design (MFG, 2002). As described in this plan, two points of compliance (POCs) will be monitored in springs that discharge to the Portneuf River: Batiste Spring and the Spring at Batiste Road (Figure 2). Also, consistent with the Consent Decree Statement of Work, groundwater samples will be collected on a quarterly basis for a period of 5-years as part of the remedial action. This sampling period will cover the start-up and optimization period for the extraction system (18 months to two years, as described above) and the subsequent three and a half to three years (when additional monthly samples will be collected from the POCs and analyzed for arsenic). During this second period (referred to as the system operation and maintenance period), it is expected that groundwater concentrations of arsenic and other constituents will decrease down gradient and at the POCs as the extraction system initiates full operation (MFG, 2002).

At the end of the initial 5-year period, the monitoring data will be evaluated to assess the effectiveness of the extraction system and assess if there are other significant sources of arsenic and other constituents that appear to be contributing to any potential exceedances of the arsenic MCL at the springs discharging to the Portneuf River. Other sources that could be evaluated are: (1) releases from the Don Plant production area; and (2) releases from FMC source areas, particularly in the area of the joint fenceline area. In the event that the performance standard for arsenic is exceeded at the springs (see the

Groundwater Monitoring RDR for a detailed discussion), Simplot will prepare a Corrective Action Plan which will identify: (1) suspected causes of arsenic exceedances; (2) additional investigation required (if necessary); (3) modifications to the extraction system (if stack affected groundwater is identified as the continuing principal source); and (4) mitigation measures if a source is identified in the Don Plant Area. Simplot will implement the identified measures once the Corrective Action Plan is approved by EPA. It is also noted that if an obvious problem is identified during the 5-year period, Simplot will take prompt action to correct it.

5.0 OPERATIONS AND MAINTENANCE

Operation and maintenance (O&M), as defined in the preceding section, is the period of operation following system start-up and optimization (i.e., when all planned wells are on-line and pumping at the average annual pumping rates identified by post-start-up monitoring). The groundwater extraction system O&M will be performed by the Simplot plant staff due to the close link between groundwater extraction well operation, water use considerations, and plant production. In addition, Simplot personnel are already familiar with O&M issues for the groundwater extraction wells through their experience with the plant production wells and extended pumping of the extraction wells during the pilot tests.

To assist plant personnel in conducting the system operation and maintenance tasks, an O&M Plan will be prepared and included with the Prefinal RDR. At a minimum, the O&M plan will describe start-up procedures, operation, troubleshooting, training and evaluation activities associated with system operation, including equipment start-up procedures and operator training, normal operation and maintenance, potential operating problems, routine monitoring and laboratory testing (excluding testing associated with groundwater monitoring), alternate procedures, safety procedures, equipment description and details, and record keeping and reporting requirements.

6.0 FINAL DESIGN AND OTHER WORK REQUIRED

This section includes a summary of pertinent investigations necessary to support final design and a general description of the documents required under the SOW to complete the design process.

6.1 Inspection of Existing Extraction Wells

In preparation for prefinal design, existing wells 401 (formerly 343) and 410 (formerly 337) will be inspected to assess their current condition and confirm their future utility as long-term extraction wells. Wells 401 and 410 were previously subjected to extended pump tests in fall 1997 (see Appendix A-2) and well 401 continues to operate. Both wells are currently equipped with dedicated pumps and piping systems which have not been inspected or modified since the extended pump tests.

The inspections will likely include visual assessment of the wellhead and above ground piping system integrity; testing of the control panel, valves, and gauges; removal and inspection of the pump and down hole piping; down hole video survey of the well screen; and performance of a short term pump test (well 410 only). If evidence of well screen encrustation or biofouling is observed by the video survey, well reconditioning (redevelopment, screen jetting, acid washing and/or disinfection) may be performed to restore well performance, as warranted. The pump test for well 410 will likely consist of four (4) hour or longer, continuous pumping with measurement of the sustained pumping flow rate and measurement of draw down in the pumping well and adjacent observation wells. Pump test results will be compared with prior pumping measurements to identify any changes in well performance. If diminished performance is observed, additional reconditioning may be performed.

Water produced during the pump tests will be directed to the plant cooling towers via existing or new piping systems. Results of the inspections will be summarized and included in the Prefinal RDR.

6.2 West Plant Pilot Well

As described in Section 3.1, a pilot extraction well will be installed in the west plant area and pump tested to provide additional information required for final design of the west plant extraction system. The new well (well 402) will be installed using procedures similar to those used during

construction of well 346 except that the well will be installed in the relect drainage channel in a position amenable to capture of stack affected groundwater near well 308. Soil samples of the aquifer materials will be collected for grain size analysis during drilling of a pilot boring for the well, and these data will be used to select the screen and filter pack materials for well construction. As indicated in Section 3.1, a dedicated submersible pump will be installed in the well, and a discharge pipe will be installed from the wellhead to the pipeline that currently collects water from well 343, such that the water produced during pumping of well 402 is directed to the Don Plant cooling system.

Pump testing of well 402 will be performed using procedures similar to those previously used during testing of wells 337, 338, and 343. Geologic logs from well construction and results of the well pump tests will be summarized and included in the Prefinal RDR.

6.3 Construction Plans and Specifications

Construction plans and specifications will be prepared for the groundwater extraction well network based upon the design analyses to be refined and presented in the Prefinal RDR. The final design drawings will be included in the Final RDR and in a construction contract bid document. A preliminary list of construction drawings is tabulated on Table 3.

Construction technical specifications, with quality assurance and quality control requirements, will be prepared for the groundwater extraction system in standard Construction Specifications Institute (CSI) format. An outline of the currently anticipate specifications is presented on Table 4.

An Idaho-registered Professional Engineer will seal all final (issue for construction) drawings and final technical specifications for the project.

6.4 Additional Plans Required

This section discusses the various plans identified in the SOW or otherwise required to design and implement the groundwater extraction component of the remedial action.

6.4.1 Prefinal Remedial Design Report

A Prefinal Remedial Design Report is required to present the groundwater extraction design when it is approximately 90 percent complete. The Prefinal RDR will be submitted within 90 day of receipt of Agency comments on the Draft RDR and will address the comments on the Draft RDR and incorporate any modifications to the design. The Prefinal RDR will include the complete design analyses, draft final plans and specifications, a draft final construction schedule, and a construction cost estimate. The Prefinal RDR will also include a draft O&M plan for the groundwater extraction system. The O&M plan will identify practices and procedures associated with routine operation of the groundwater extractions system, as discussed in Section 5.0.

6.4.2 Final Remedial Design Report

A Final RDR will be required within thirty days or receipt of Agency comments on the Prefinal RDR and will be accompanied by a memorandum describing how comments on the Prefinal RDR have been incorporated into the Final RDR. A Professional Engineer registered in the State of Idaho will certify the Final RDR. The Final RDR submittal will also include the Remedial Action Work Plan described in the next section.

6.4.3 Remedial Action

In preparation for implementing the design, a Remedial Action Work Plan (RAWP) will be prepared. The RAWP will include the following documents as specified in the SOW: (1) Construction Management Plan, (2) Construction Quality Assurance Plan, and (3) Construction Health and Safety Plan/Contingency Plan. As appropriate, the RAWP may include a System Start-up and Optimization Plan describing the procedures that will be used to evaluate and optimize groundwater capture during the initial start-up period.

Prefinal and final construction inspections will be performed to ensure that the construction activities required to implement the design have been performed in accordance with the Consent Decree and the approved design. Within thirty days of the final construction inspection, a Final Construction

Completion Report (CCR) will be submitted. The CCR will document and certify that the construction work has been appropriately completed.

7.0 REFERENCES

Bechtel Environmental, Inc. (BEI). 1996. *Remedial Investigative Report for the Eastern Michaud Flats Superfund Site*. Prepared for FMC Corporation and the J. R. Simplot Company.

McCulley, Frick & Gilman, Inc. (MFG). 1997a. *Report on Comparative Analysis Simplot Subarea (EMF Superfund Site Feasibility Study Report Sections 7 and 8)*.

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TABLES

TABLES

Table 1
Summary of Existing Pilot Test Extraction Wells

Well No.	Area	Well Construction Details								
		Installation Date	Well Diameter (Inches)	Total Depth (Feet)	Screened Interval (Feet bgs)	Filter Pack Interval (Feet bgs)	Bentonite Seal Interval (Feet bgs)	Grout Seal Interval (Feet bgs)	Casing	Screen
343	West Plant	Sep-96	6	208.0	174.7 - 204.7	168.8 - 208.0	164.0 - 168.8	0 - 164.0	Sch 80 PVC	20 slot wire-wrap Sch 80 PVC
346	West Plant	Aug-98	6	251.5	236.2 - 241.2 (30 slot) 241.2 - 251.2 (40 slot)	228.4 - 239.2 (10-20 Sand) 239.2 - 252 (Pea Gravel)	226.3 - 228.4	0 - 226.3	Sch 40 Steel	30 and 40 slot wire-wrap Stainless
338	East Plant (Upper)	Aug-96	6	81.7	58.7 - 78.7	56.8 - 83.5	52.3 - 56.8	0 - 52.3	Sch 80 PVC	20 slot continuous wrap Sch 80 PVC
337	East Plant (Lower)	Aug-96	6	160.6	117.6 - 157.6	114.0 - 169.0	110.0 - 114.0	0 - 110.0	Sch 80 PVC	20 slot continuous wrap Sch 80 PVC

Table 1
Summary of Existing Pilot Test Extraction Wells

Well No.	Area	Well Pumping Details						
		Sustained Yield (GPM)	Well Equipment			Extracted Water Collection Point	Current Status	Comment
			Pump	Power	Controls			
343	West Plant	50 (11/96) 70 (9/97-5/98) 60 (2002)	Dedicated 7.5 Hp Grundfos Model 75S75-12 Submersible Installed 9/97	Yes	Yes	HDPE pipe to nearby manhole with gravity flow to plant cooling system	In Service	
346	West Plant	Not Determined	No	No	No	N/A	Never Pumped	
338	East Plant (Upper)	30 - 40	Dedicated 2 Hp Grundfos Model 40S20-7 Submersible Installed 10/97	Yes	Yes	HDPE pipe to nearby cooling tower	Inactive since 1998	Well reconditioned by acid wash, surging, jetting, and chlorination in March 1998 to counter reduced yield caused by siltation and limited scaling
337	East Plant (Lower)	200	Dedicated 15 Hp Goulds 5THC01564CTB Submersible Installed 10/97	Yes	Yes	HDPE pipe to nearby cooling tower	Inactive since 1998	

Table 2
Summary of Extraction Wells and Design Pumping Rates

Area	Zone	Well No.	Status	Max Pumping Rate (gpm)	Design Pumping Rate (Sustained, gpm)	Design Pumping Rate (Annual Avg., gpm)
West Plant Area		401 (343)	Existing	60	60	54
		402	New	unknown	90	81
East Plant Area	Upper	403	New	-	40	36
		404	New	-	40	36
		405	New	-	40	36
		406	New	-	40	36
		407	New	-	40	36
		408	New	-	40	36
		409	New	-	40	36
East Plant Area	Lower	410 (337)	Existing	200	200	180
		411	New	-	200	180
				Total	830	747

150 - 200 gpm

Table 3
Preliminary Construction Drawing List

Groundwater Extraction Construction Drawings

Drawing Number	Drawing Title
G1	Site Location Map and Title Sheet
G2	General Notes, Symbols and Abbreviations
G3	General Site Plan
CW1	West Plant Area Extraction Wells - Plan
CW2	East Plant Area Extraction Wells - Plan
CW3	Extraction Wells - Section & Details
ME1	West Plant Area Pumps and Piping Systems - Schematic & Details
ME2	East Plant Area (Upper Zone) Pumps and Wellhead Systems - Schematic & Details
ME3	East Plant Area (Lower Zone) Pumps and Wellhead Systems - Schematic & Details

Table 4
Preliminary Outline of Construction Specifications

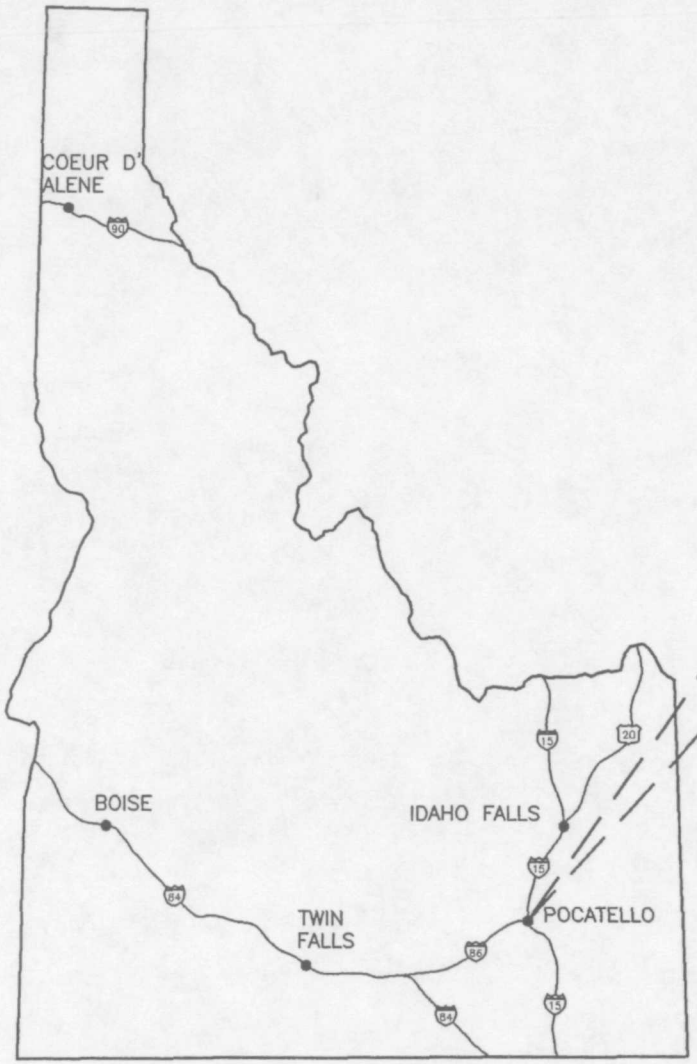
Technical Specifications with
Construction Quality Control/Quality Assurance

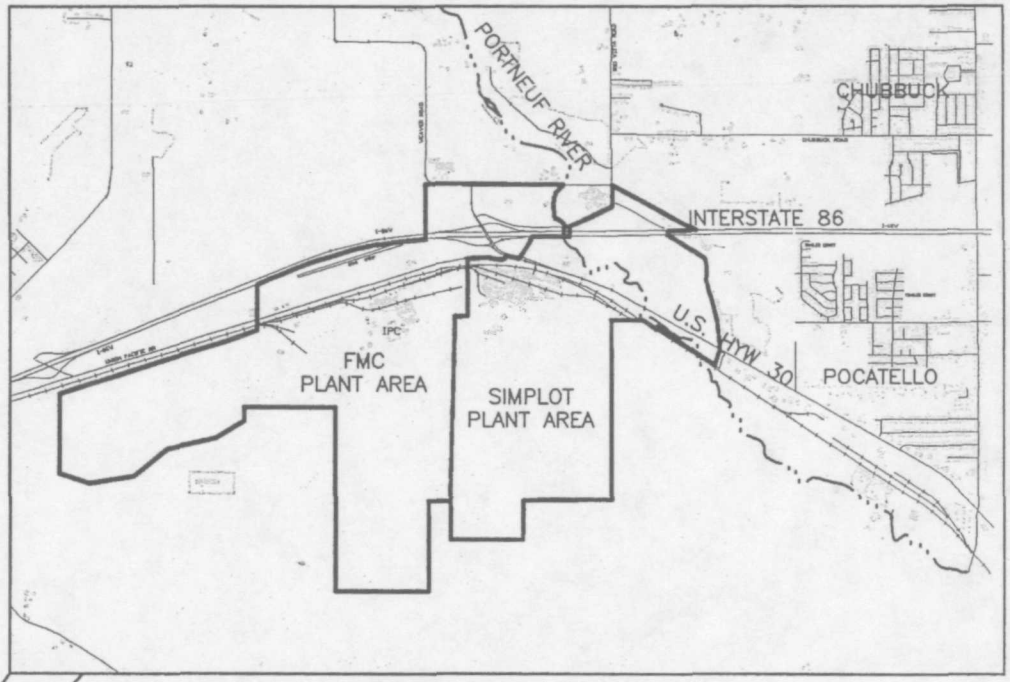
Specification Number	Description
Division 1 General Requirements	
01010	Summary of Work
01040	Project Coordination, Schedules and Meetings
01044	Safety
01060	Regulatory Requirements and Reference Standards
01300	Submittals
01400	Quality Control
01500	Construction Facilities and Temporary Controls
01700	System Start-up and Contract Closeout
Division 2 Site Work	
02000	Mobilization
02100	Site Preparation
02200	Earthwork
02660	Groundwater Extraction Wells
Division 3 Concrete	
03330	Concrete
Division 15 Mechanical	
15010	General Mechanical Requirements
15061	Piping and Fittings
15101	Valves and Appurtenances
15160	Pumps
15980	Instrumentation

FIGURES

FIGURES

4/02 BY: RHF





EASTERN MICHAUD FLATS SUPERFUND SITE VICINITY

SIMPLOT PLANT AREA
EASTERN MICHAUD FLATS
SUPERFUND SITE
POCATELLO, IDAHO

GROUNDWATER EXTRACTION REMEDIAL DESIGN REPORT

FIGURE 1

SITE LOCATION MAP

PROJECT: 010121.1	DATE: JULY 2002	
REV:	BY: RHF	CHECKED: AC

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consulting scientists and engineers

Plot time: 1:41 pm
Plot date: 5/22/02
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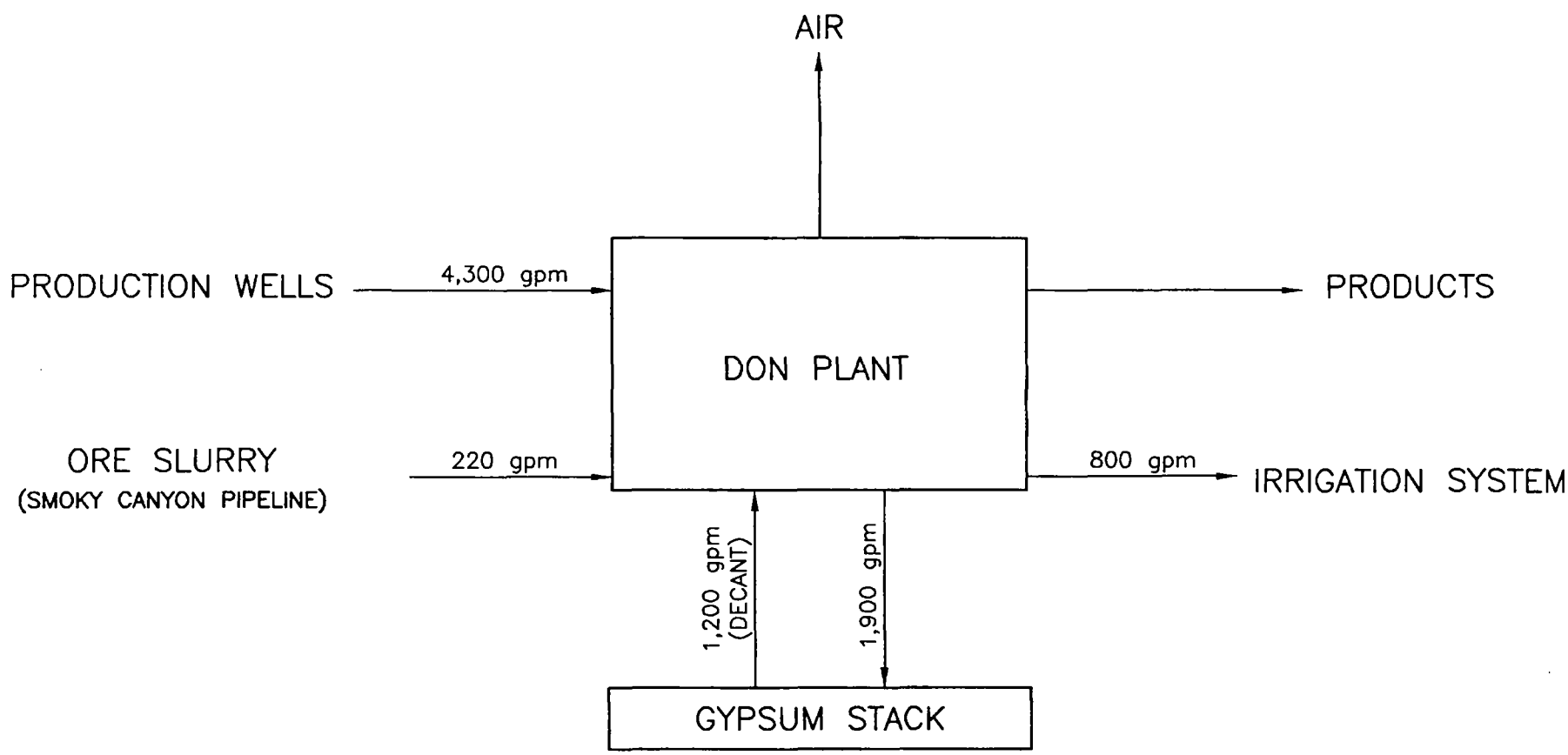


NOTE:

1. FLOWS ARE APPROXIMATE AND MAY CHANGE IN THE FUTURE.

SIMPLOT PLANT AREA
EASTERN MICHAUD FLATS
SUPERFUND SITE
POCATELLO, IDAHO

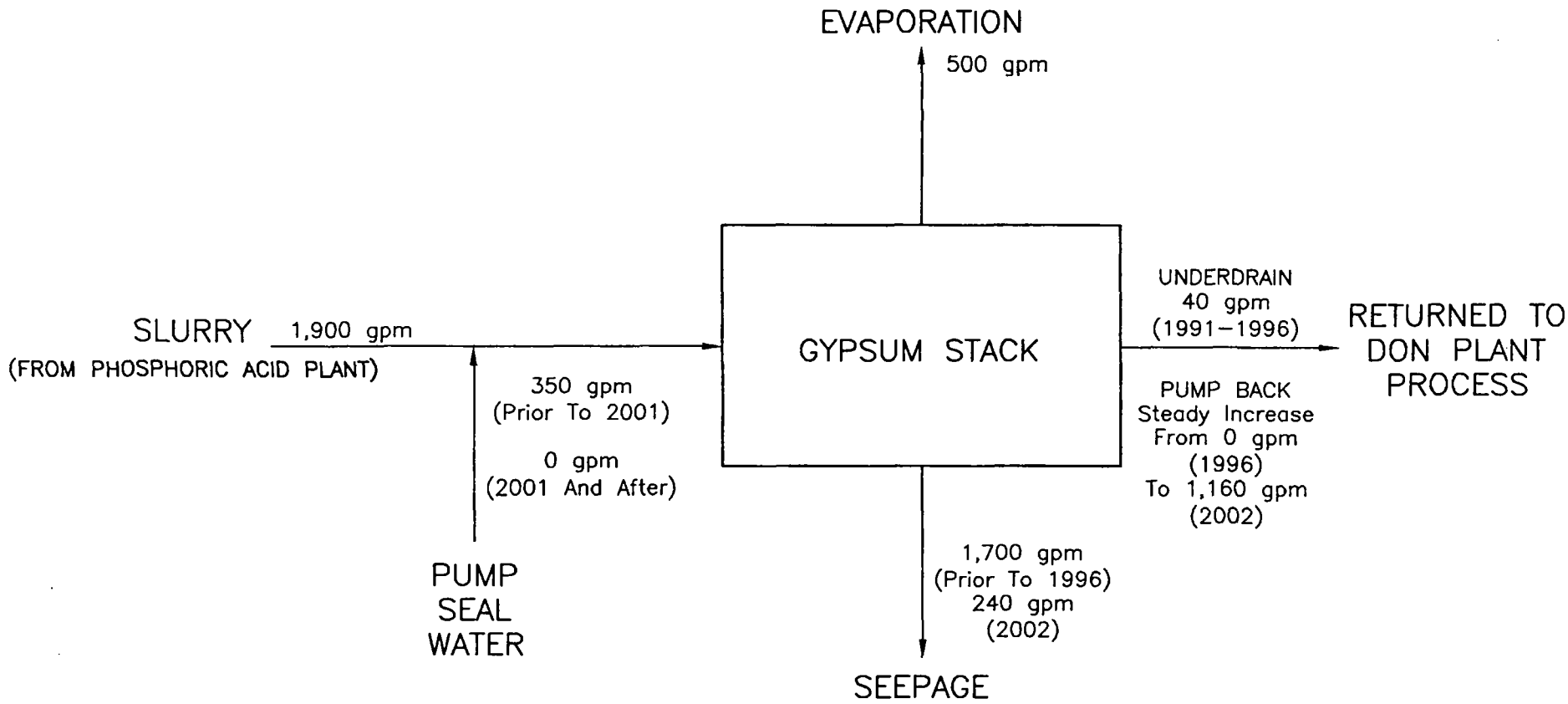
GROUNDWATER EXTRACTION REMEDIAL DESIGN REPORT

FIGURE 3

DON PLANT
WATER BALANCE SCHEMATIC

PROJECT: 010121.2	DATE: JUNE 2002	
REV:	BY: SCG	CHECKED: DEP

MFG, Inc.
consulting scientists and engineers

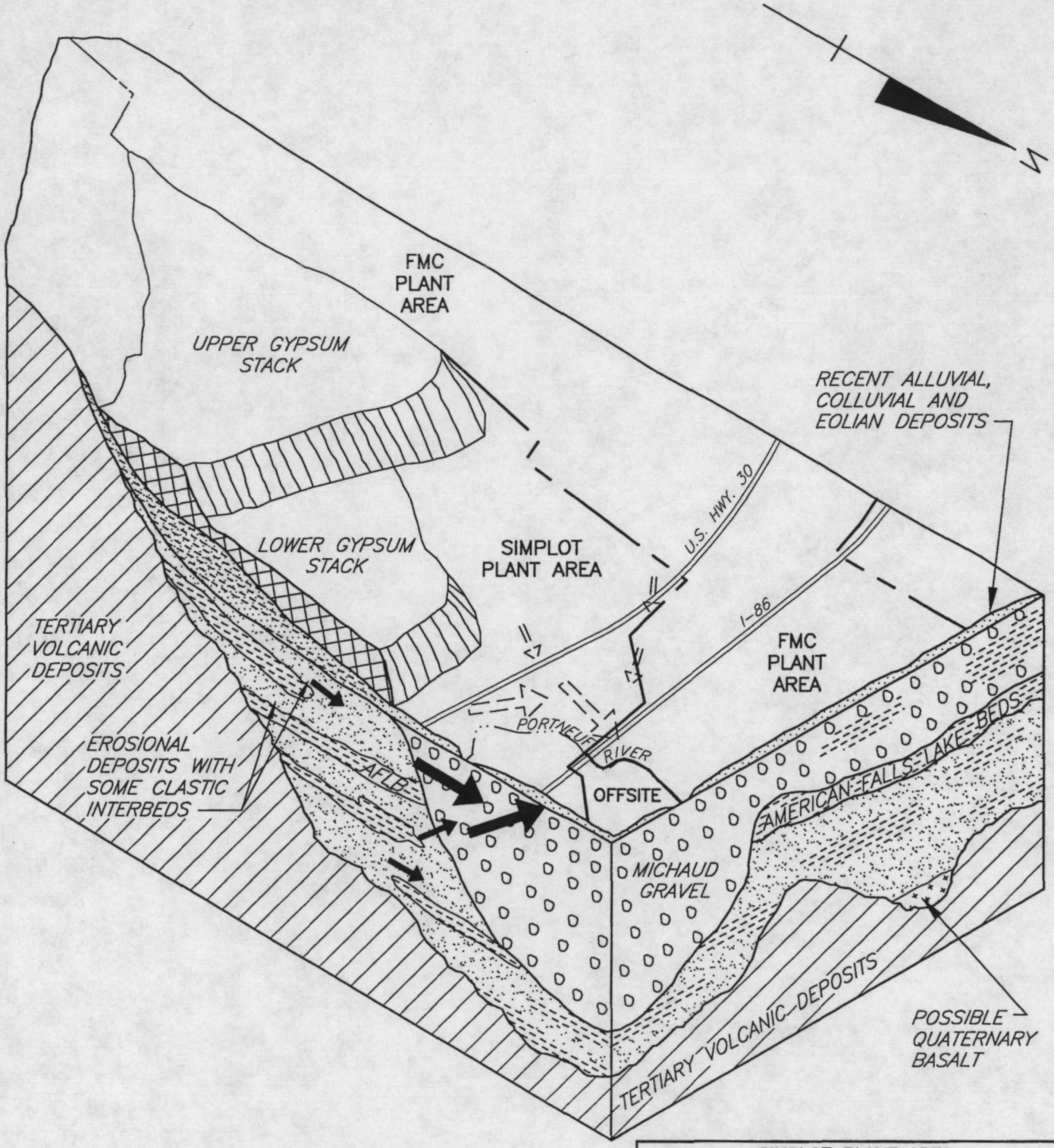


NOTE:

1. THE FLOWS SHOWN FOR SLURRY, PUMP SEAL WATER, AND RETURNED TO DON PLANT PROCESS ARE RELATIVELY ACCURATE (BASED ON MEASUREMENTS, PUMP CAPACITIES, ETC). THE FLOWS FOR EVAPORATION AND SEEPAGE ARE ESTIMATES.

SIMPLOT PLANT AREA EASTERN MICHAUD FLATS SUPERFUND SITE POCATELLO, IDAHO		
GROUNDWATER EXTRACTION REMEDIAL DESIGN REPORT		
FIGURE 4 GYPSUM STACK WATER BALANCE SCHEMATIC		
PROJECT: 010121.2	DATE: JUNE 2002	
REV:	BY: SCG	CHECKED: DEP
MFG, Inc. consulting scientists and engineers		

5/02 BY: RHF



LEGEND:

GENERAL GROUNDWATER FLOW DIRECTIONS

SIMPLOT PLANT AREA
EASTERN MICHAUD FLATS
SUPERFUND SITE
POCATELLO, IDAHO

GROUNDWATER EXTRACTION REMEDIAL DESIGN REPORT

FIGURE 5

GEOLOGIC BLOCK DIAGRAM

PROJECT: 010121.1	DATE: JULY 2002	
REV:	BY: RHF	CHECKED: AC

MFG, Inc.
consulting scientists and engineers

RFIELD D:\0121\0121-1.dwg ???? 5/22/02 2:04 pm
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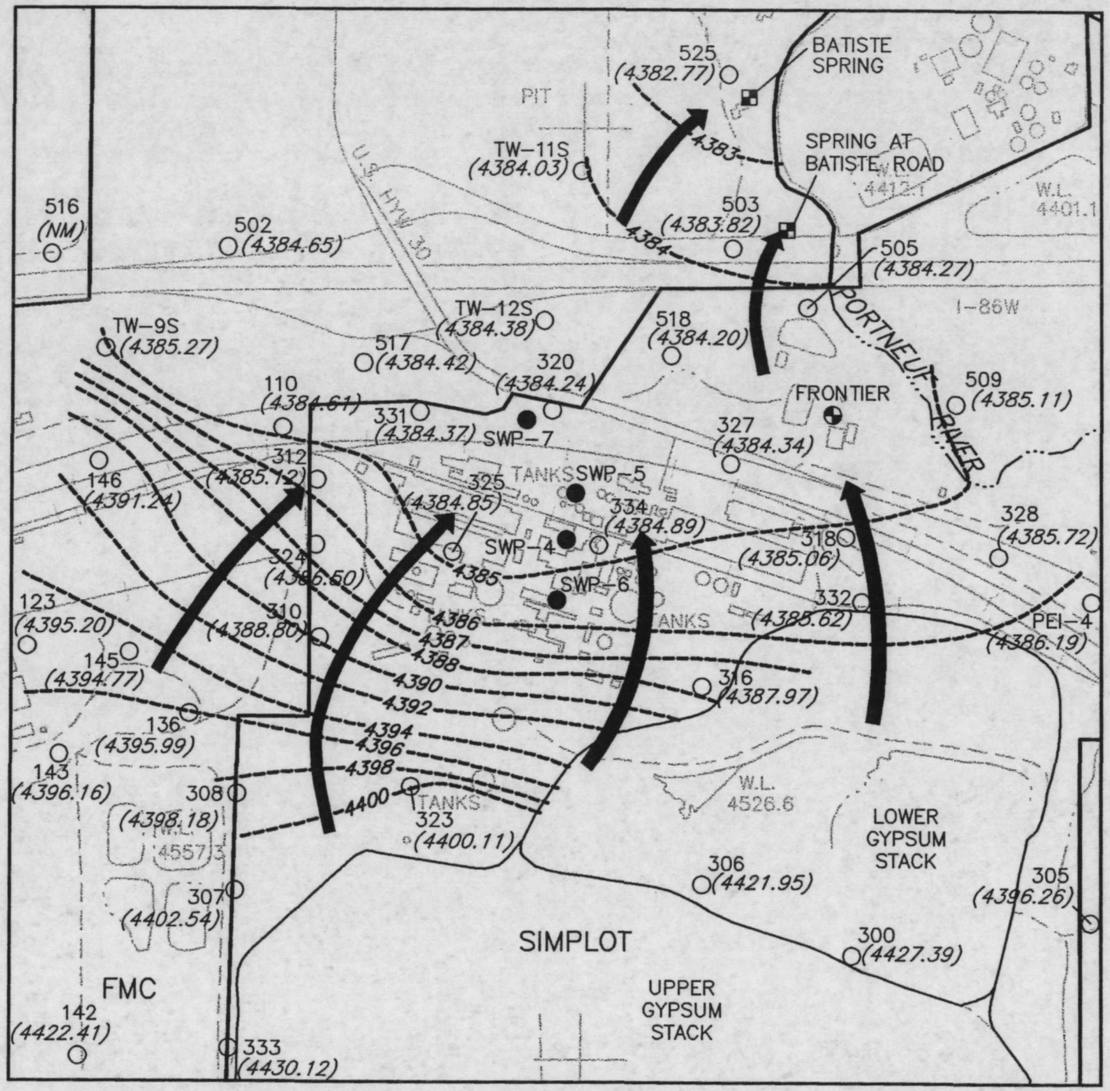
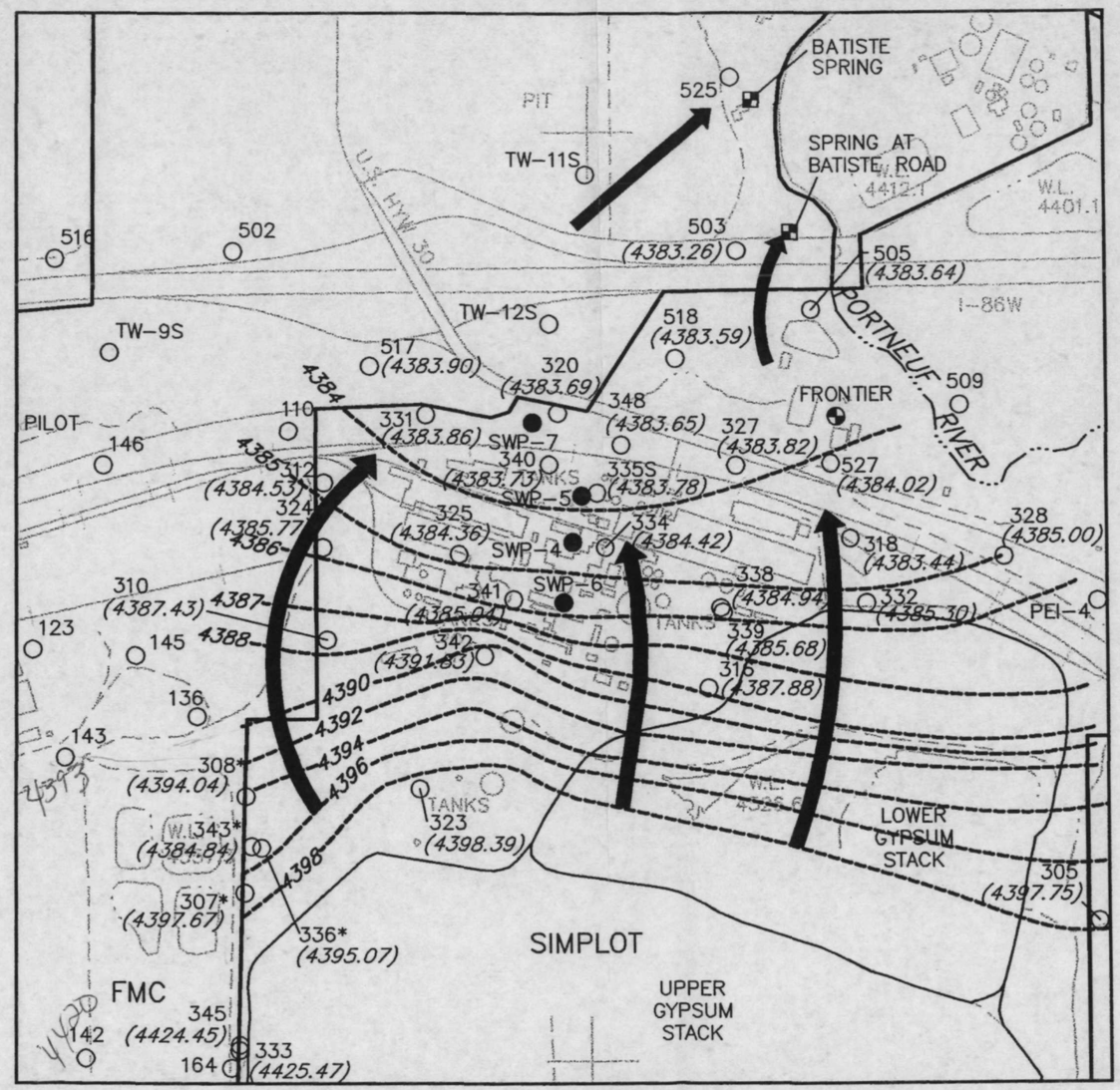


UPPER ZONE POTENTIOMETRIC SURFACE 1995



UPPER ZONE POTENTIOMETRIC SURFACE 2001

LEGEND:

346 ○	GROUNDWATER MONITORING WELL LOCATION AND DESIGNATION
(4397.67)	WATER LEVEL ELEVATION MEASURED NOVEMBER 1995 AND AUGUST 2001 (ft MSL)
→	GENERAL DIRECTION OF GROUNDWATER FLOW
4388	LINE OF EQUAL WATER LEVEL ELEVATION (CONTOUR INTERVAL VARIABLE)
FRONTIER	WATER SUPPLY WELL LOCATION AND DESIGNATION
SWP-5	PRODUCTION WELL LOCATION AND DESIGNATION
BATISTE SPRING	NATURAL SPRING

NOTE:

*—WATER LEVEL AFFECTED BY PUMPING AT WELL 343.

SCALE

800 0 800 FEET

SIMPLOT PLANT AREA
EASTERN MICHAUD FLATS SUPERFUND SITE
POCATELLO, IDAHO

GROUNDWATER EXTRACTION REMEDIAL DESIGN REPORT

FIGURE 7
UPPER ZONE POTENTIOMETRIC SURFACE AND GROUNDWATER FLOW DIRECTION MAPS (1995/2001)

PROJECT: 010121.2	DATE: MAY 2002	
REV:	BY: SCG	CHECKED: DEP

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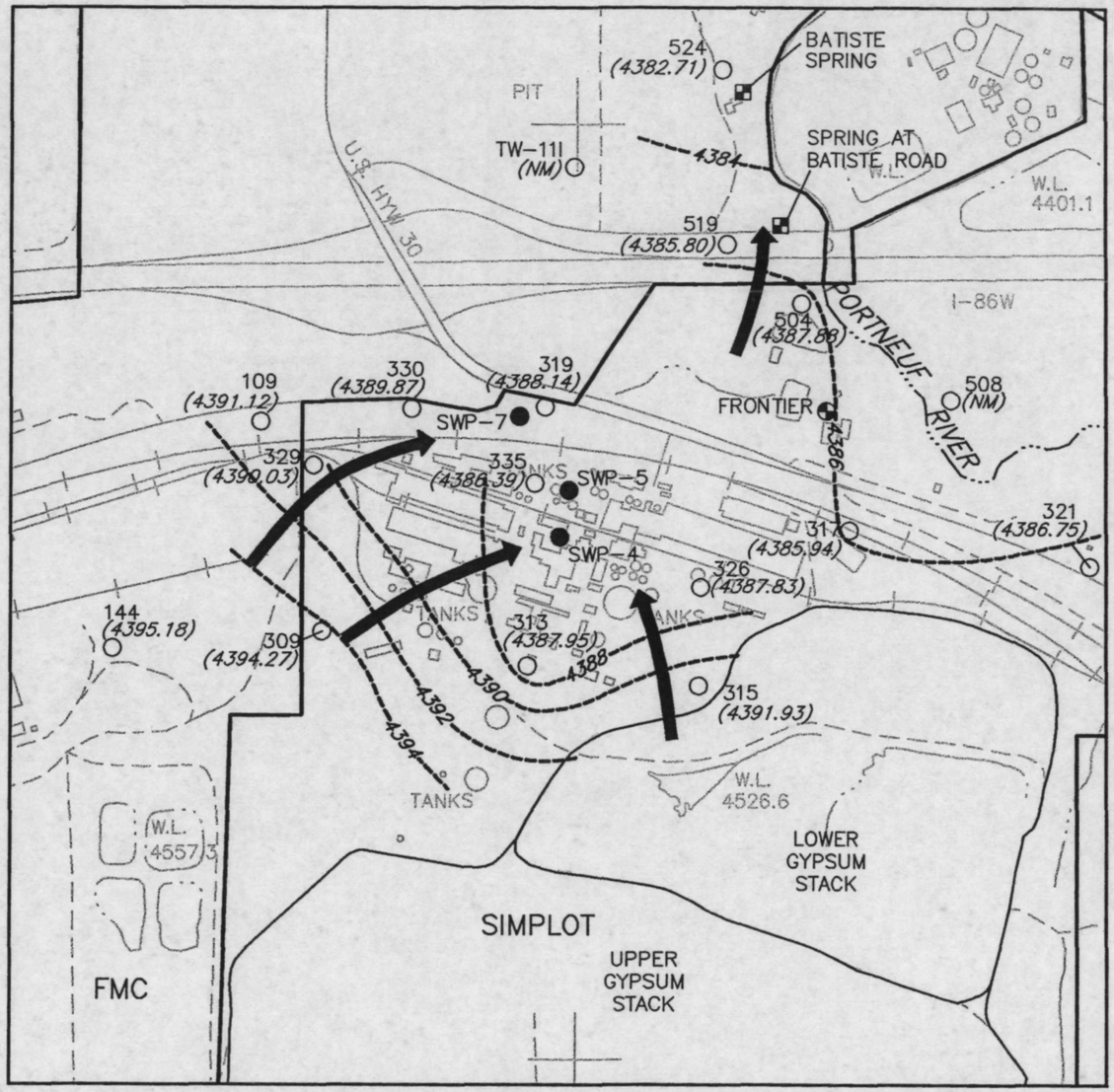
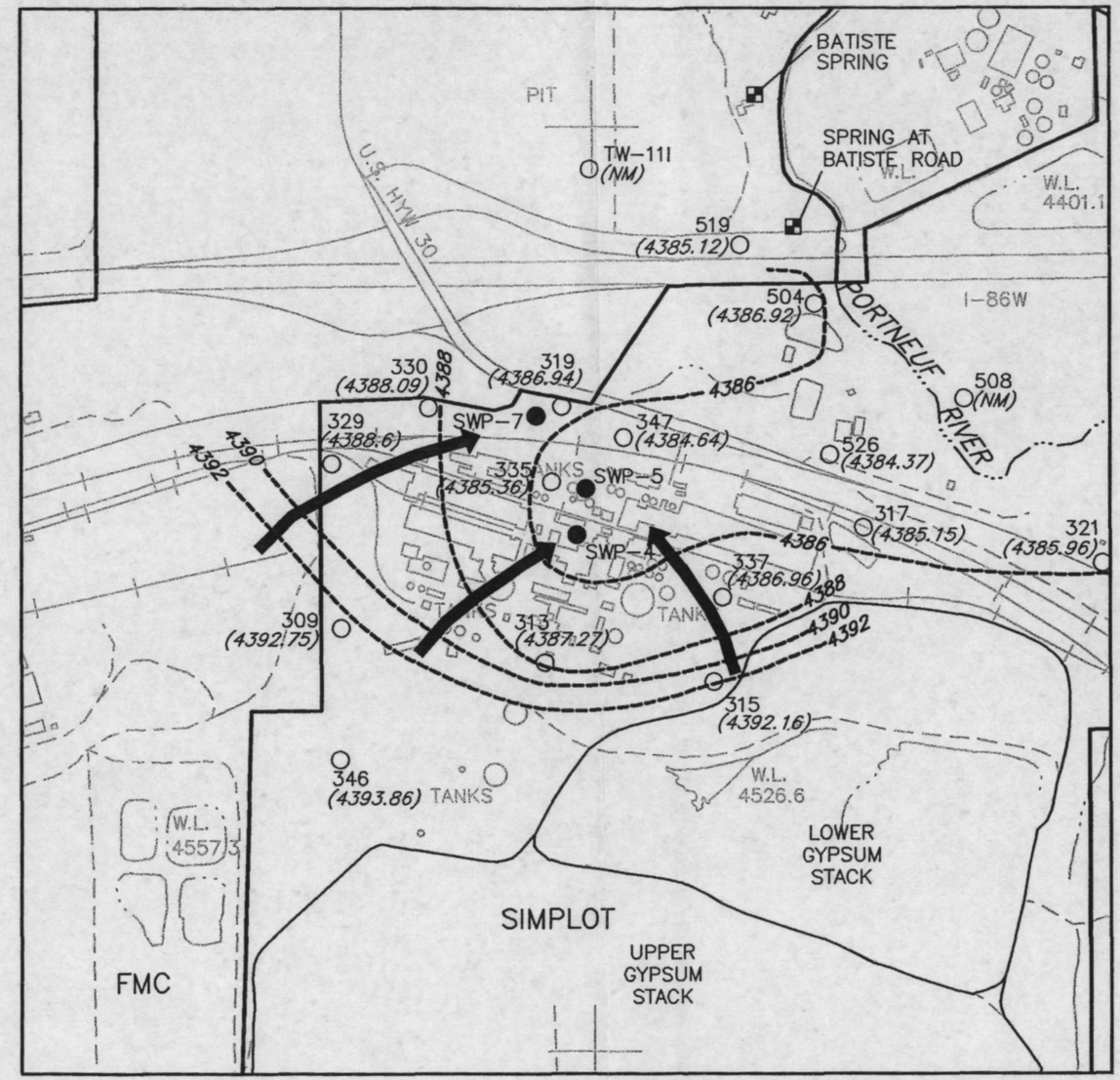


LOWER ZONE POTENTIOMETRIC SURFACE 1995



LOWER ZONE POTENTIOMETRIC SURFACE 2001

LEGEND:

346 ○	GROUNDWATER MONITORING WELL LOCATION AND DESIGNATION
(4397.67)	WATER LEVEL ELEVATION MEASURED NOVEMBER 1995 AND AUGUST 2001 (ft MSL)
→	GENERAL DIRECTION OF GROUNDWATER FLOW
4388	LINE OF EQUAL WATER LEVEL ELEVATION (CONTOUR INTERVAL VARIABLE)
FRONTIER	WATER SUPPLY WELL LOCATION AND DESIGNATION
SWP-5 ●	PRODUCTION WELL LOCATION AND DESIGNATION
BATISTE SPRING	NATURAL SPRING

SCALE

800 0 800 FEET

SIMPLOT PLANT AREA
EASTERN MICHAUD FLATS
SUPERFUND SITE
POCATELLO, IDAHO

GROUNDWATER EXTRACTION REMEDIAL DESIGN REPORT

FIGURE 8
LOWER ZONE POTENTIOMETRIC SURFACE AND GROUNDWATER FLOW DIRECTION MAPS (1993/2001)

PROJECT: 010121.2	DATE: MAY 2002	
REV:	BY: RHF	CHECKED: DEP

MFG, Inc.
consulting scientists and engineers

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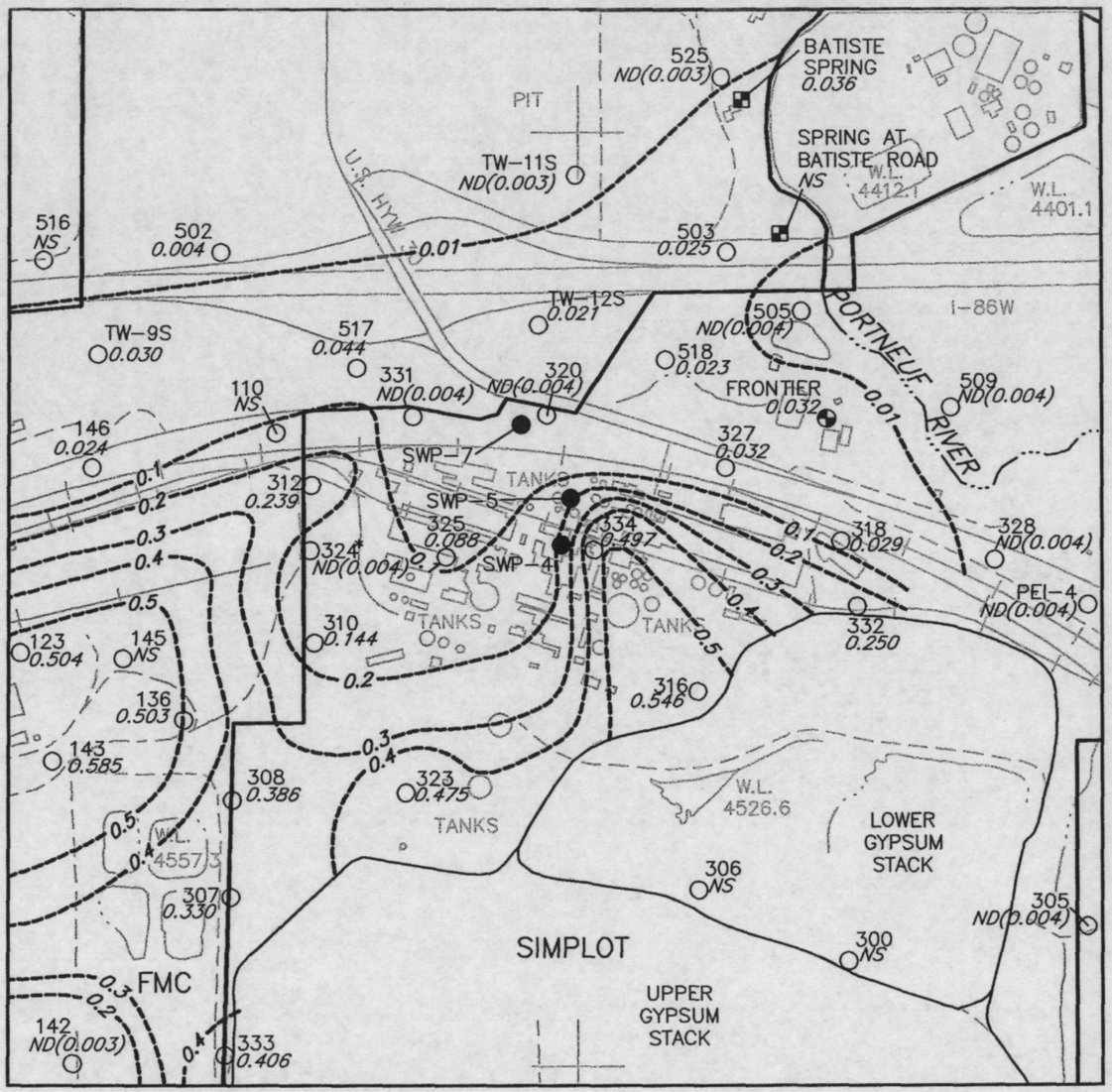
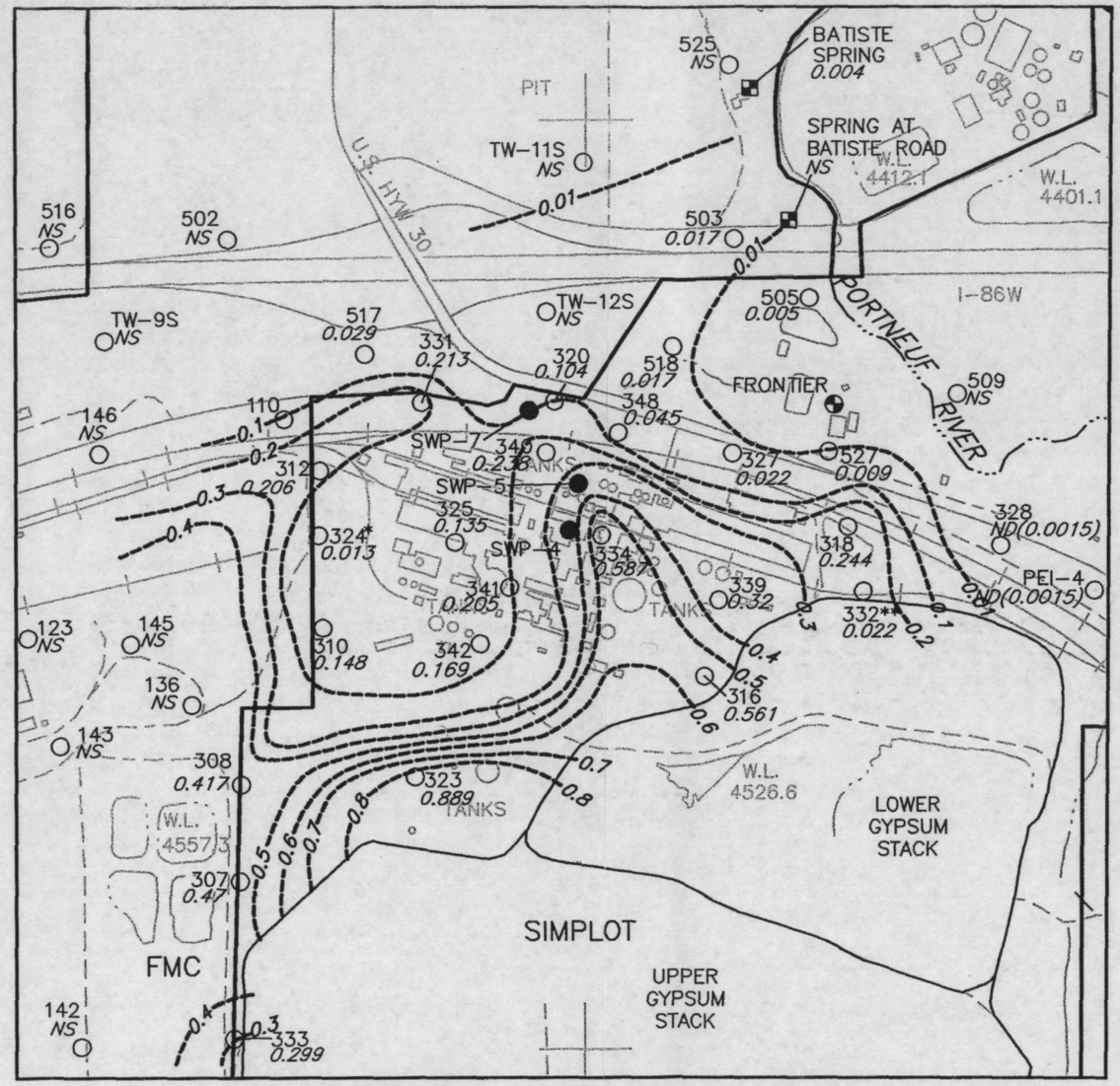


ARSENIC ISOCONCENTRATION LINES 1995



ARSENIC ISOCONCENTRATION LINES 2001

LEGEND:

346 ○	GROUNDWATER MONITORING WELL LOCATION AND DESIGNATION
0.497	CONCENTRATION IN Mg/L
ND(0.040)	ANALYTE NOT DETECTED AT A CONCENTRATION ABOVE THE VALUE INDICATED IN THE PARENTHESIS
0.2	ISOCONCENTRATION LINE (CONTOUR INTERVAL VARIABLE)
FRONTIER	WATER SUPPLY WELL LOCATION AND DESIGNATION
SWP-5	PRODUCTION WELL LOCATION AND DESIGNATION
BATISTE SPRING	NATURAL SPRING

NOTE:

*-WELL 324 NOT CONSIDERED IN DEVELOPING CONTOURS AS THIS WELL'S SCREEN EXTENDS INTO THE LOWER ZONE.

**-UNUSUALLY LOW CONCENTRATIONS WERE REPORTED FOR WELL 332 IN AUGUST 2001. ISOCONCENTRATION CONTOURS REFLECT TYPICAL VALUES.

SCALE

800 0 800 FEET

SIMPLOT PLANT AREA
EASTERN MICHAUD FLATS
SUPERFUND SITE
POCATELLO, IDAHO

GROUNDWATER EXTRACTION REMEDIAL DESIGN REPORT

FIGURE 9

UPPER ZONE ARSENIC ISOCONCENTRATION MAPS (1995/2001)

PROJECT: 010121.2	DATE: MAY 2002	
REV:	BY: RHF	CHECKED: DEP

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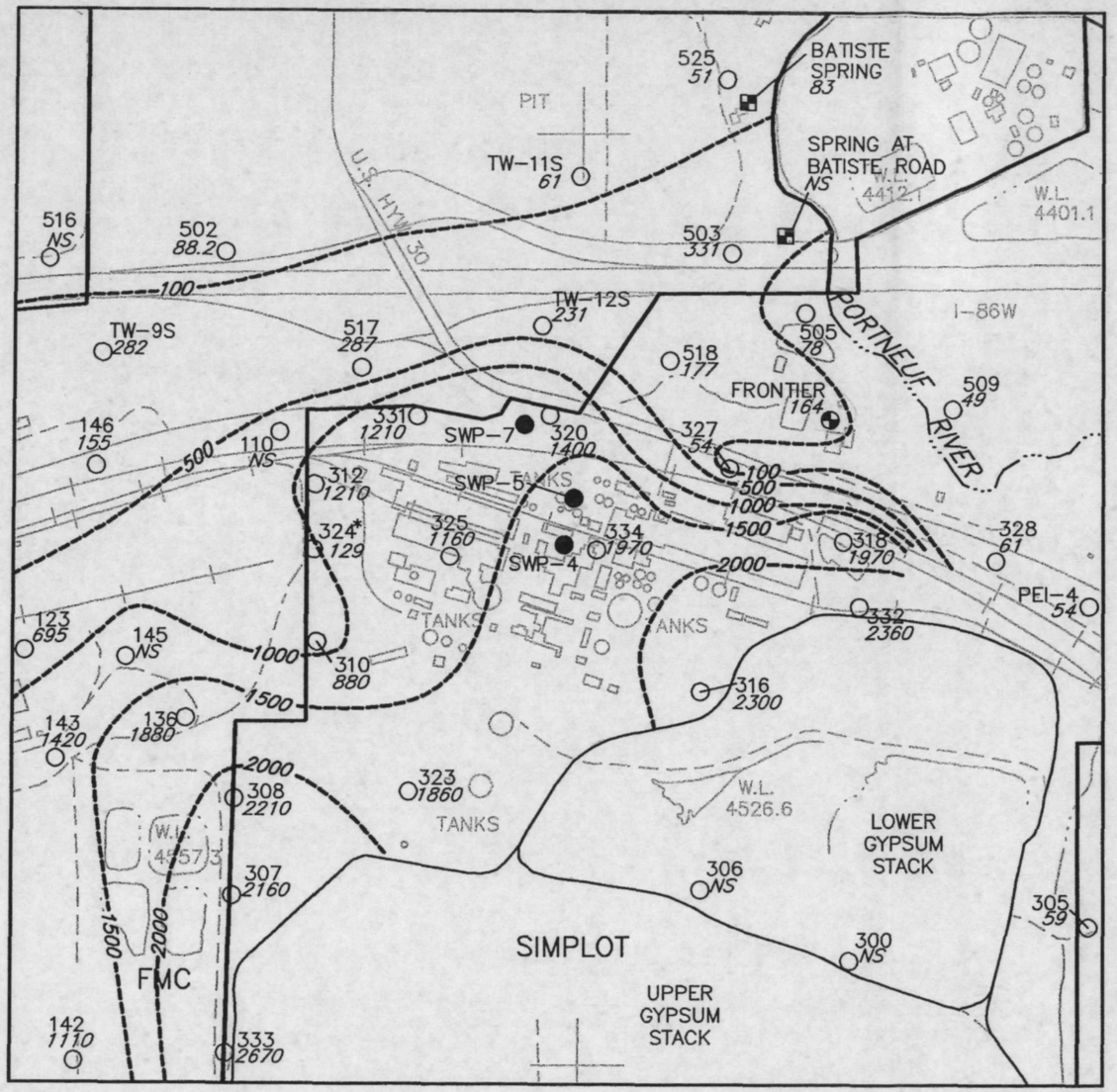
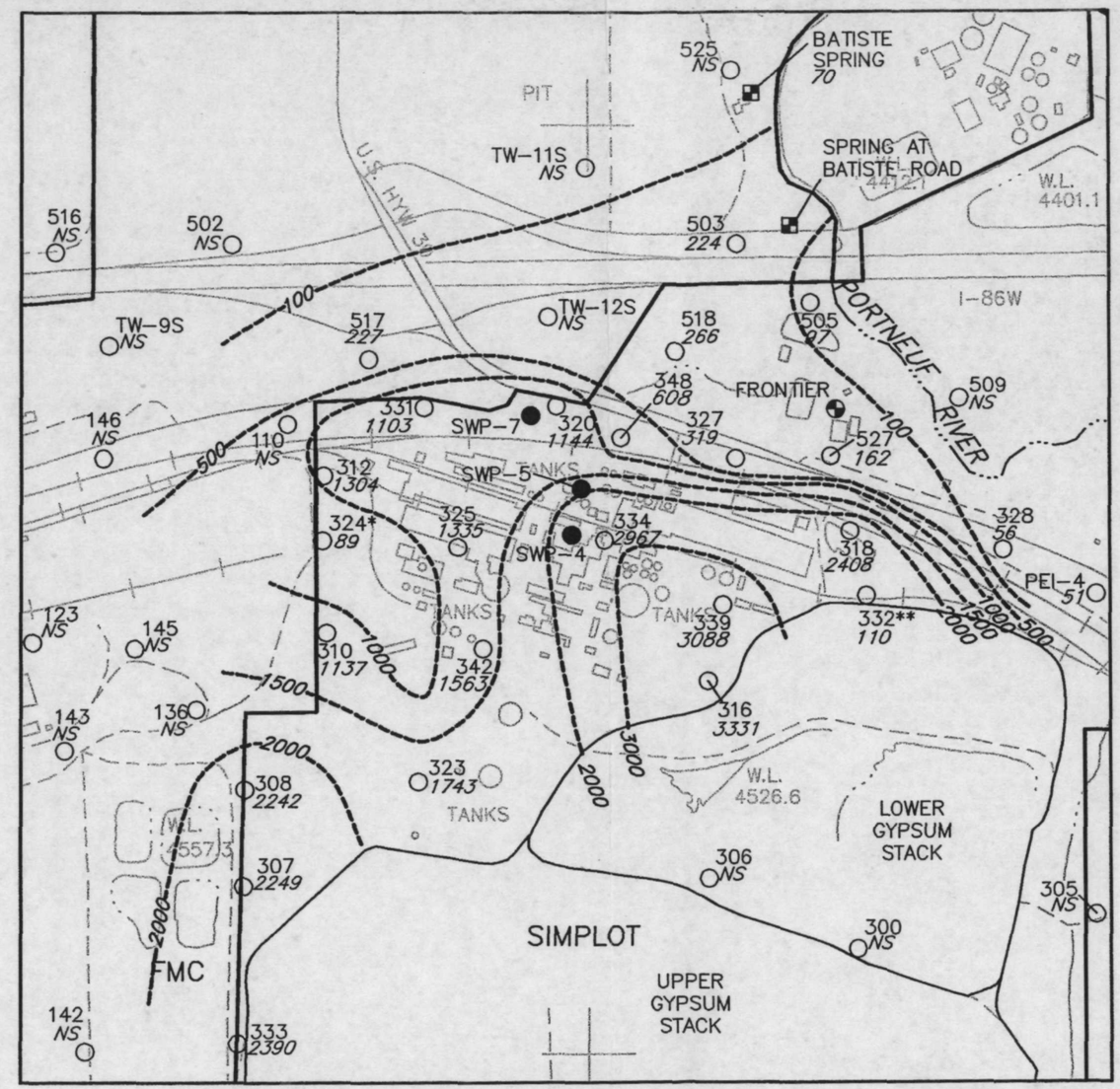


SULFATE ISOCONCENTRATION LINES 1995



SULFATE ISOCONCENTRATION LINES 2001

LEGEND:

346 ○	GROUNDWATER MONITORING WELL LOCATION AND DESIGNATION
2967	CONCENTRATION IN mg/L
500	ISOCONCENTRATION LINE (CONTOUR INTERVAL VARIABLE)
FRONTIER	WATER SUPPLY WELL LOCATION AND DESIGNATION
SWP-5 ●	PRODUCTION WELL LOCATION AND DESIGNATION
BATISTE SPRING	NATURAL SPRING

NOTE:

*–WELL 324 NOT CONSIDERED IN DEVELOPING CONTOURS AS THIS WELL'S SCREEN EXTENDS INTO THE LOWER ZONE.

**–UNUSUALLY LOW CONCENTRATIONS WERE REPORTED FOR WELL 332 IN AUGUST 2001. ISOCONCENTRATION CONTOURS REFLECT TYPICAL VALUES.

SCALE

800 0 800 FEET

SIMPLOT PLANT AREA
EASTERN MICHAUD FLATS
SUPERFUND SITE
POCATELLO, IDAHO

GROUNDWATER EXTRACTION REMEDIAL DESIGN REPORT

FIGURE 10

UPPER ZONE SULFATE ISOCONCENTRATION MAPS (1995/2001)

PROJECT: 010121.2	DATE: MAY 2002
REV:	BY: RHF CHECKED: DEP

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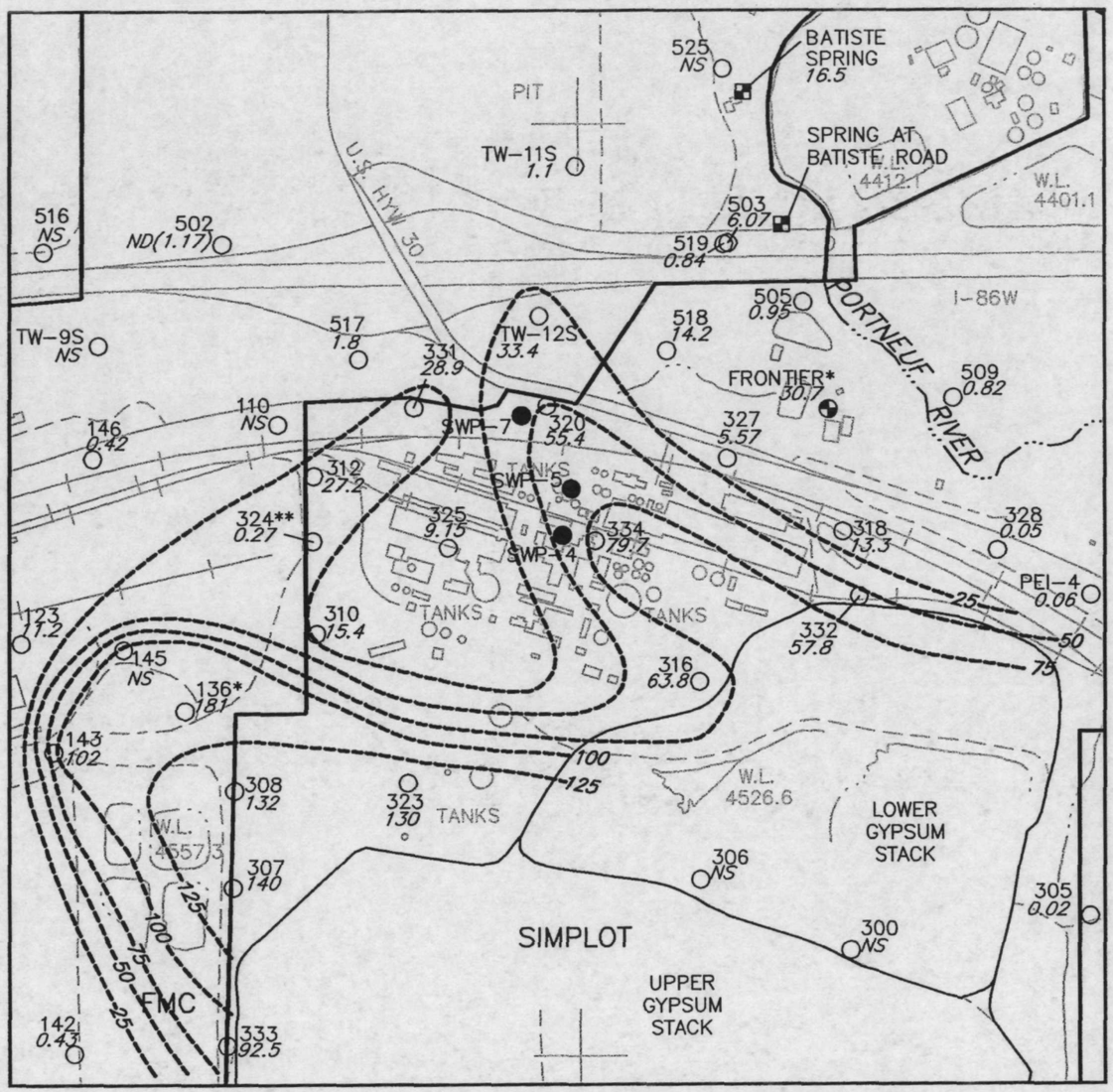
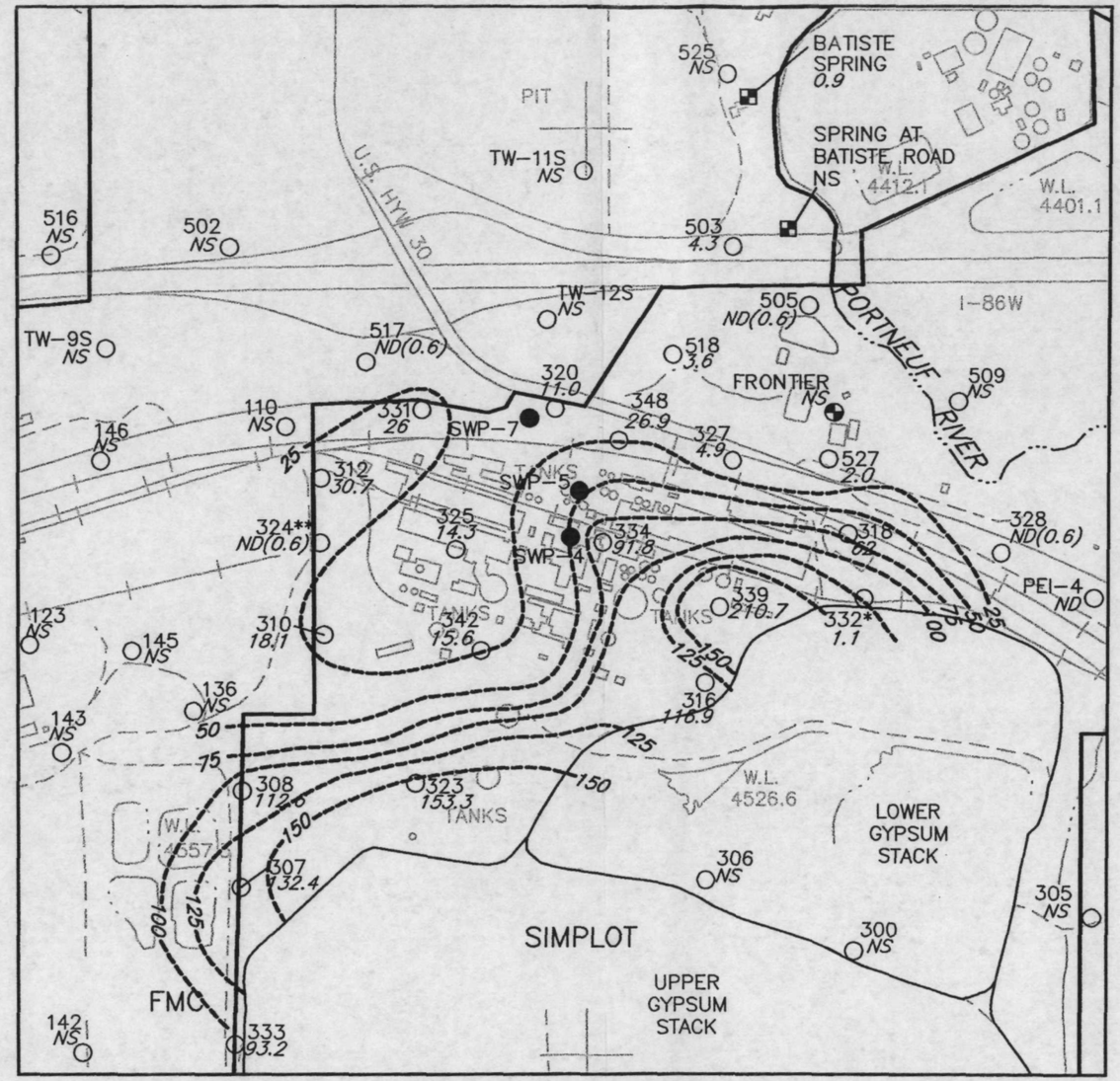


ORTHOPHOSPHATE ISOCONCENTRATION LINES 1995



ORTHOPHOSPHATE ISOCONCENTRATION LINES 2001

LEGEND:

346 ○	GROUNDWATER MONITORING WELL LOCATION AND DESIGNATION
0.43	CONCENTRATION IN mg/L
ND(0.1)	ANALYTE NOT DETECTED AT A CONCENTRATION ABOVE THE VALUE INDICATED IN THE PARENTHESIS
75 ----	ISOCONCENTRATION LINE (CONTOUR INTERVAL VARIABLE)
FRONTIER ⊕	WATER SUPPLY WELL LOCATION AND DESIGNATION
SWP-5 ●	PRODUCTION WELL LOCATION AND DESIGNATION
BATISTE SPRING ⊞	NATURAL SPRING

NOTE:

*UNUSUALLY HIGH ORTHOPHOSPHATE CONCENTRATIONS WERE MEASURED IN WELLS 136 AND FRONTIER IN DECEMBER 1995, AND UNUSUALLY LOW CONCENTRATIONS WERE MEASURED IN WELL 332 IN AUGUST 2001. ISOCONCENTRATION CONTOURS SHOWN REFLECT TYPICAL VALUES.

**WELL 324 NOT CONSIDERED IN DEVELOPING CONTOUR AS THIS WELL'S SCREEN EXTENDS INTO LOWER ZONE.

SCALE

800 0 800 FEET

SIMPLOT PLANT AREA
EASTERN MICHAUD FLATS
SUPERFUND SITE
POCATELLO, IDAHO

GROUNDWATER EXTRACTION REMEDIAL DESIGN REPORT

FIGURE 11

UPPER ZONE ORTHOPHOSPHATE ISOCONCENTRATION MAPS (1995/2001)

PROJECT: 010121.2	DATE: MAY 2002
REV:	BY: RHF CHECKED: DEP

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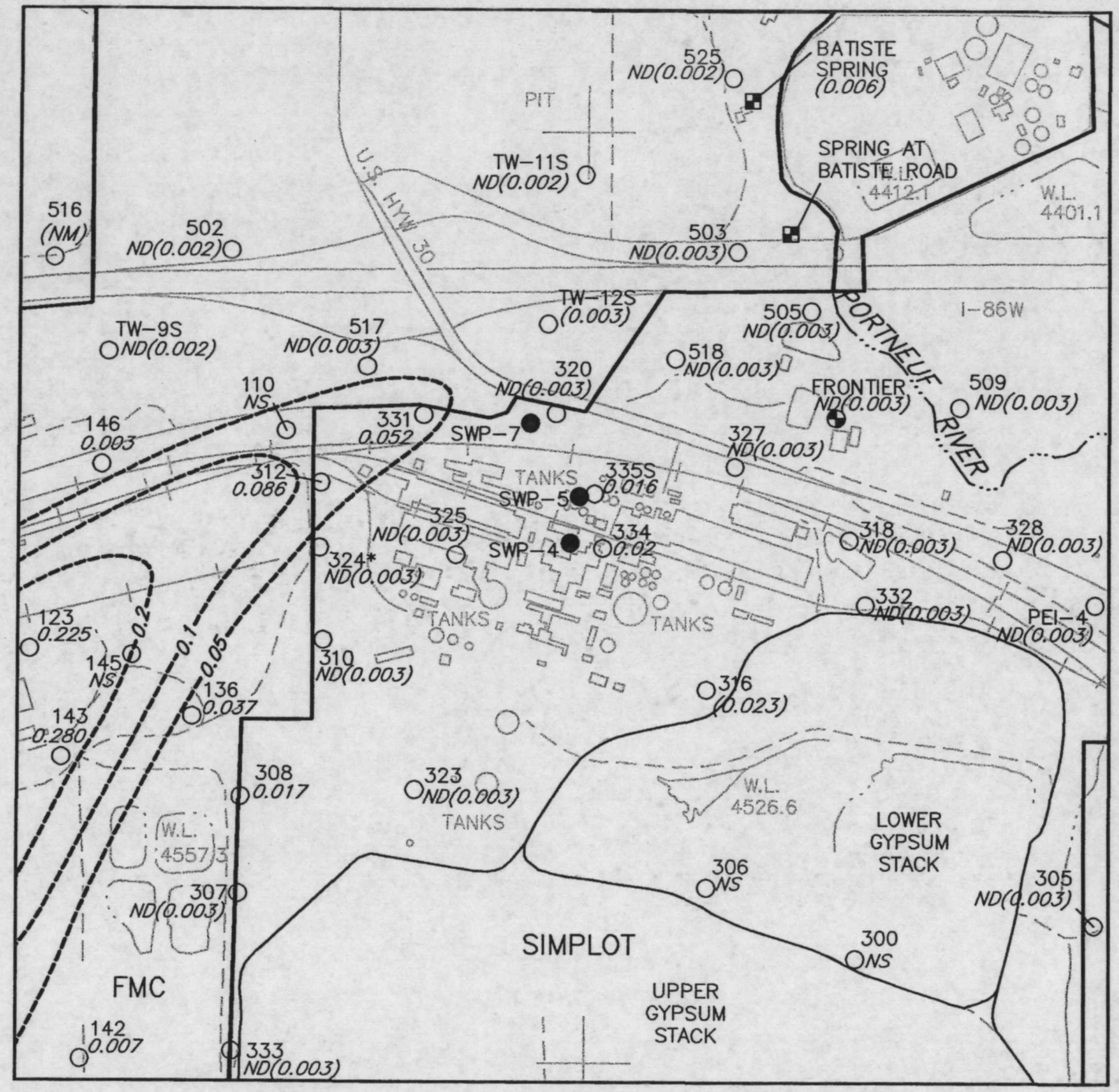
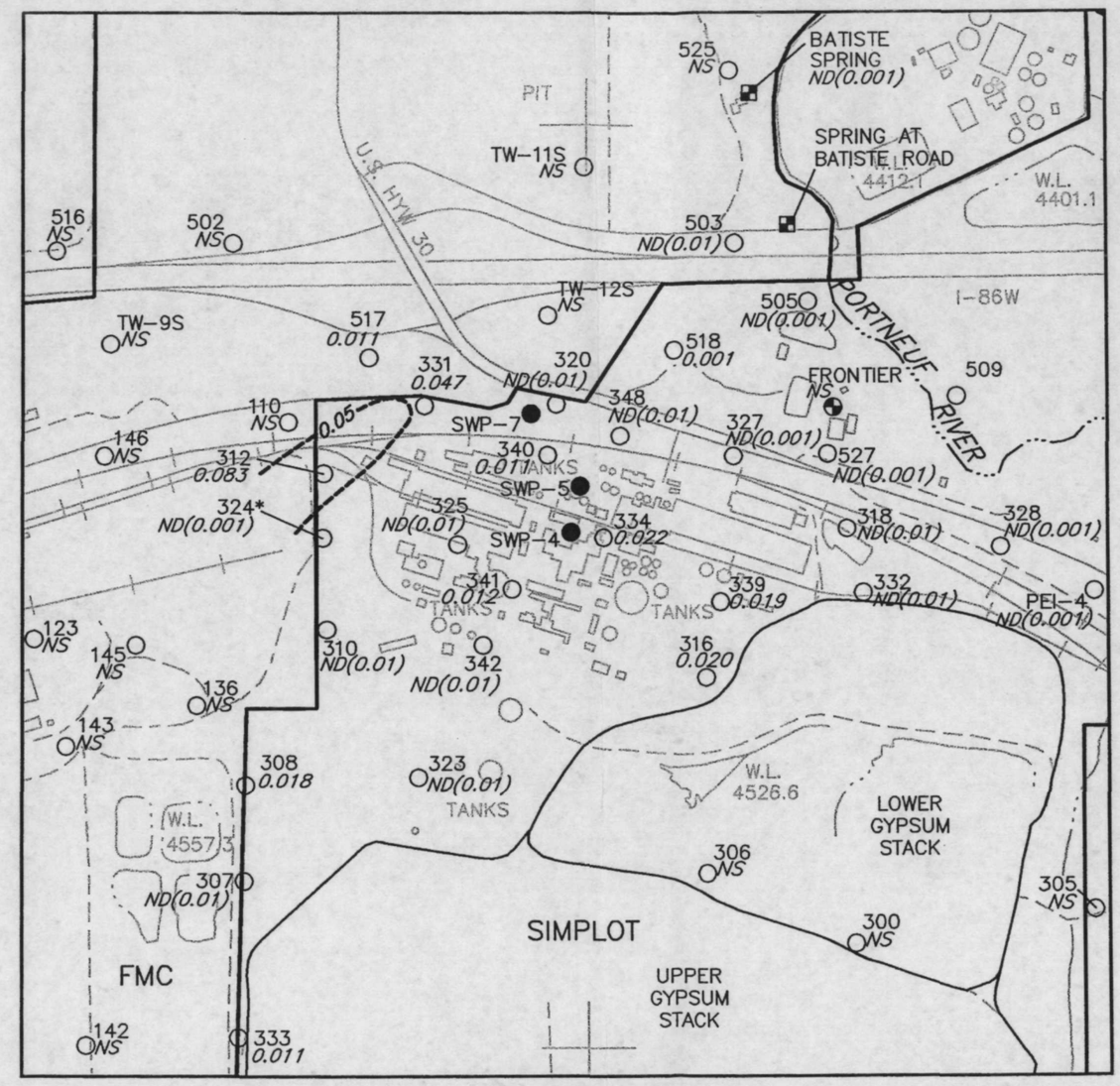


SELENIUM ISOCONCENTRATION LINES 1995



SELENIUM ISOCONCENTRATION LINES 2001

LEGEND:

346 ○	GROUNDWATER MONITORING WELL LOCATION AND DESIGNATION
0.011	CONCENTRATION IN mg/L
ND(0.003)	ANALYTE NOT DETECTED AT A CONCENTRATION ABOVE THE VALUE INDICATED IN THE PARENTHESIS
0.05	ISOCONCENTRATION LINE (CONTOUR INTERVAL VARIABLE)
FRONTIER	WATER SUPPLY WELL LOCATION AND DESIGNATION
SWP-5	PRODUCTION WELL LOCATION AND DESIGNATION
BATISTE SPRING	NATURAL SPRING

NOTE:

*-WELL 324 NOT CONSIDERED IN DEVELOPING CONTOURS AS THIS WELL'S SCREEN EXTENDS INTO THE LOWER ZONE.

SCALE

800 0 800 FEET

SIMPLOT PLANT AREA
EASTERN MICHAUD FLATS
SUPERFUND SITE
POCATELLO, IDAHO

GROUNDWATER EXTRACTION REMEDIAL DESIGN REPORT

FIGURE 12

UPPER ZONE SELENIUM ISOCONCENTRATION MAPS (1995/2001)

PROJECT: 010121.2	DATE: MAY 2002
REV:	BY: SCG CHECKED: DEP

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consulting scientists and engineers

Plot time: 3:22 pm
Plot date: 7/23/02
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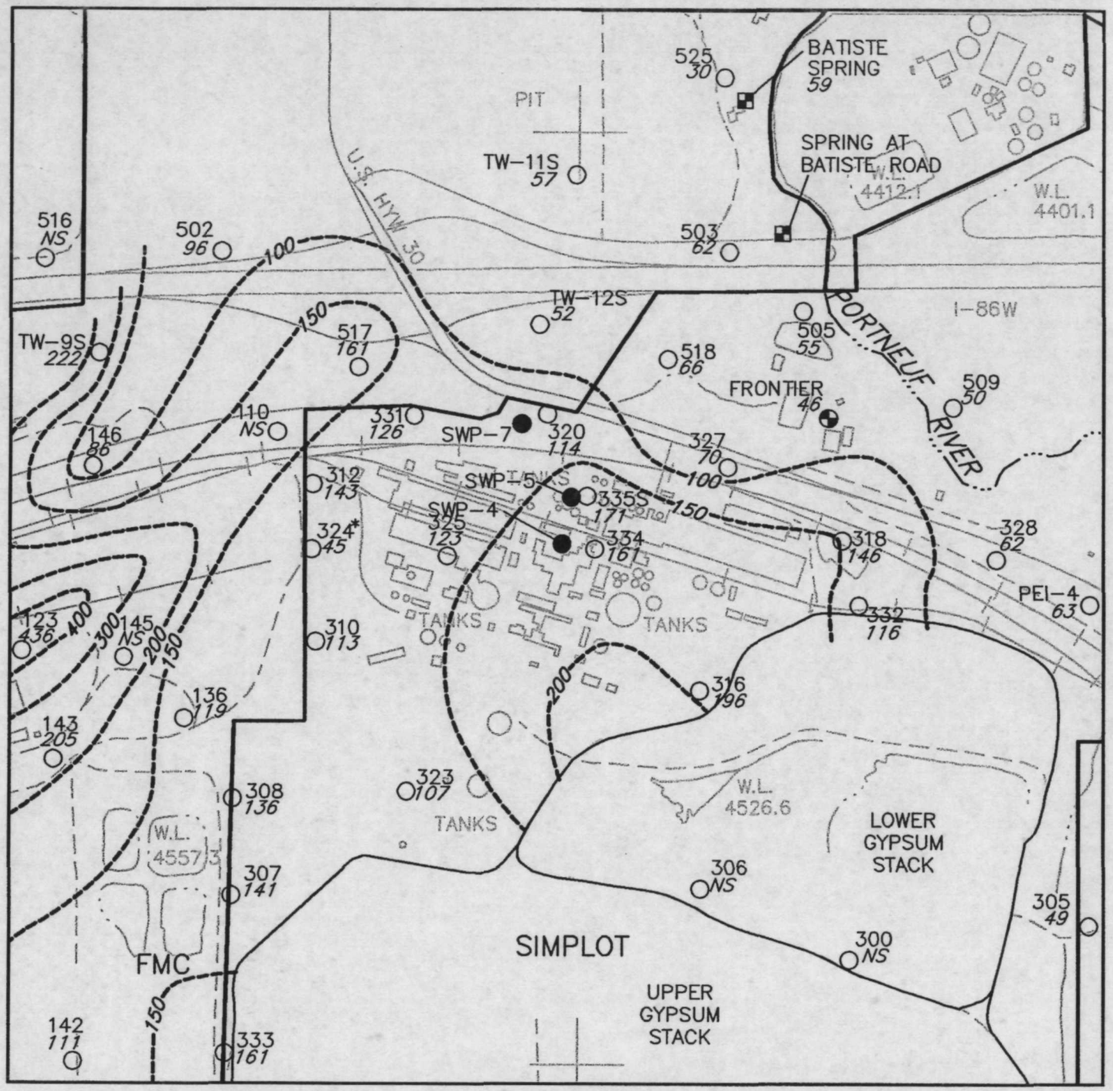
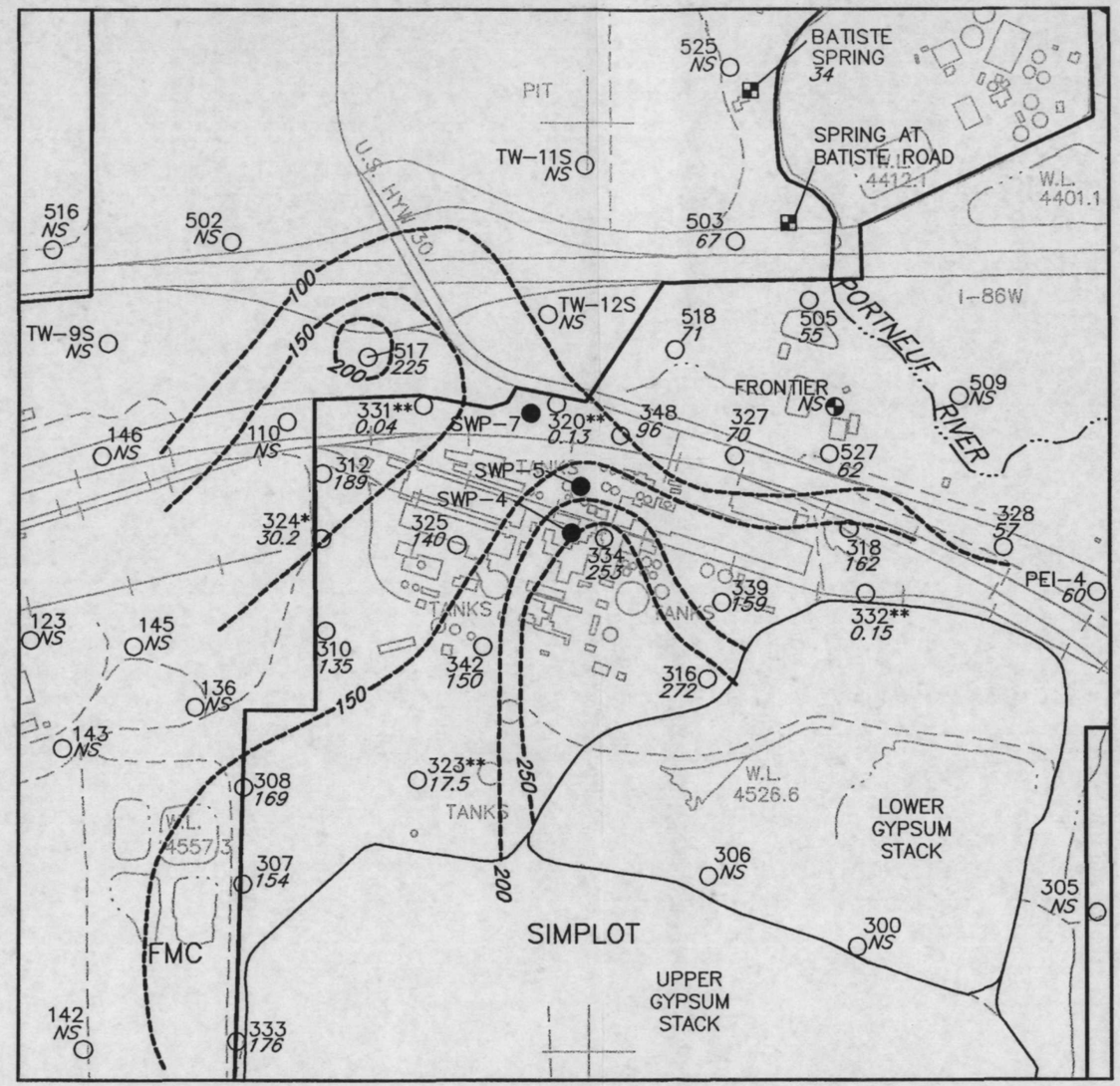


CHLORIDE ISOCONCENTRATION LINES 1995



CHLORIDE ISOCONCENTRATION LINES 2001

LEGEND:

346 ○	GROUNDWATER MONITORING WELL LOCATION AND DESIGNATION
119	CONCENTRATION IN mg/L
150	ISOCONCENTRATION ZONE (CONTOUR INTERVAL VARIABLE)
FRONTIER	WATER SUPPLY WELL LOCATION AND DESIGNATION
SWP-5	PRODUCTION WELL LOCATION AND DESIGNATION
BATISTE SPRING	NATURAL SPRING

NOTE:

* –WELL 324 NOT CONSIDERED IN DEVELOPING CONTOUR AS THIS WELL'S SCREEN EXTENDS INTO LOWER ZONE.

** –UNUSUALLY LOW CHLORIDE CONCENTRATIONS WERE REPORTED FOR WELLS 320, 323, 331, AND 332 IN AUGUST 2001. ISCONCENTRATION CONTOURS REFLECT TYPICAL VALUES.

SCALE

800 0 800 FEET

SIMPLOT PLANT AREA
EASTERN MICHAUD FLATS
SUPERFUND SITE
POCATELLO, IDAHO

GROUNDWATER EXTRACTION REMEDIAL DESIGN REPORT

FIGURE 13
UPPER ZONE CHLORIDE ISOCONCENTRATION MAPS (1995/2001)

PROJECT: 010121.2	DATE: MAY 2002	
REV:	BY: RHF	CHECKED: DEP

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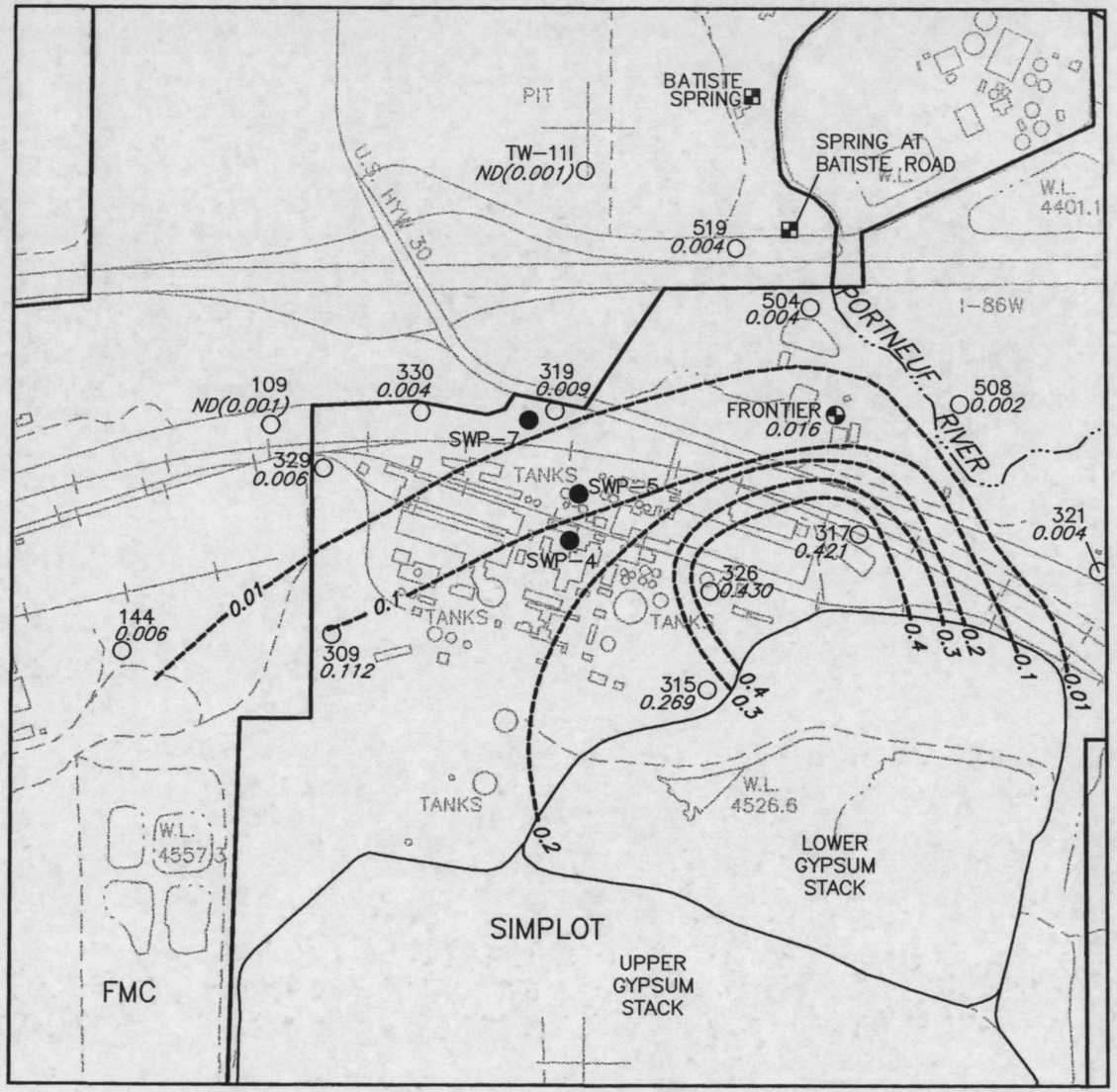
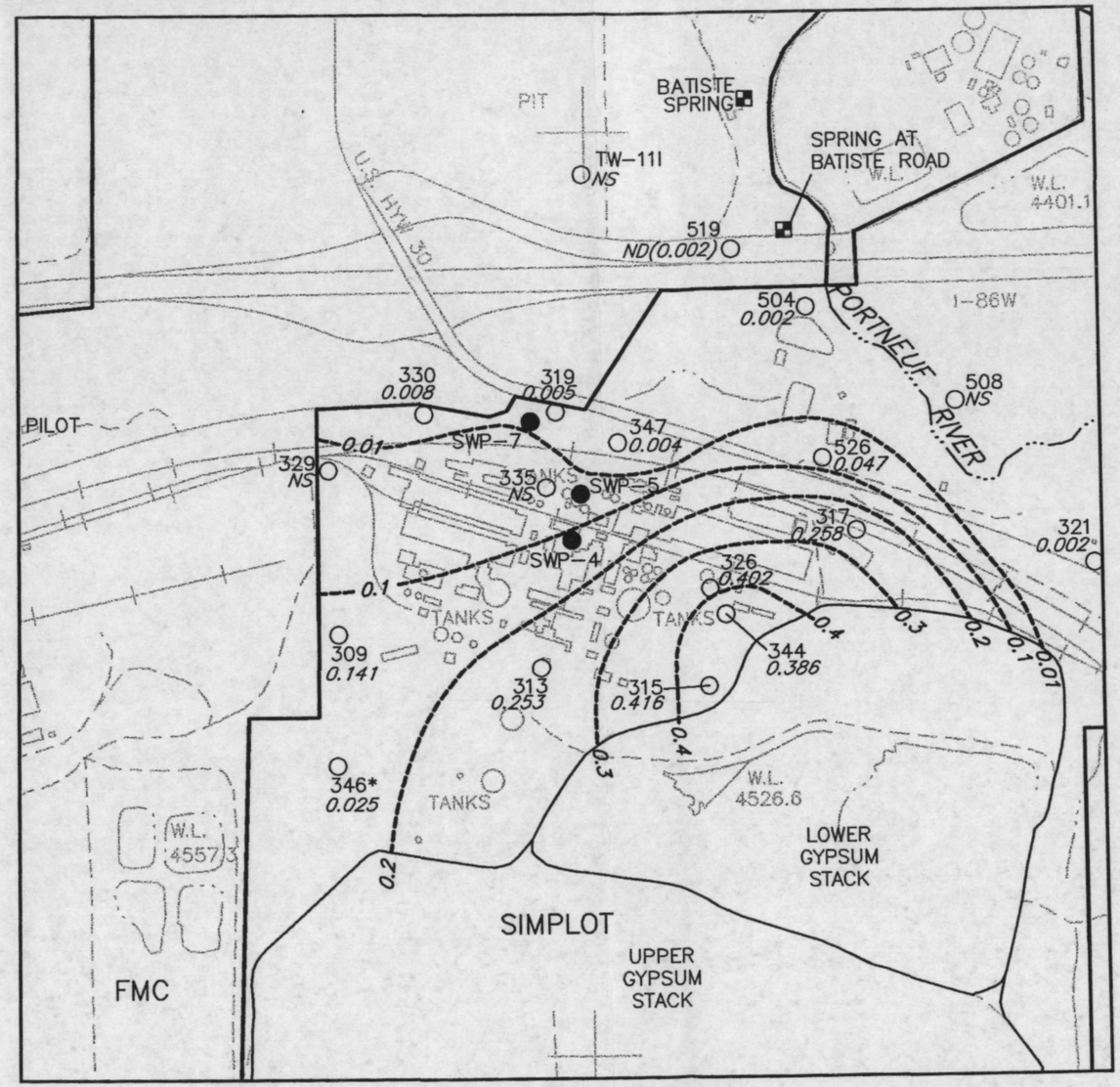
consulting scientists and engineers



LOWER ZONE ARSENIC ISOCONCENTRATION LINES 1993



LOWER ZONE ARSENIC ISOCONCENTRATION LINES 2001

LEGEND:

346 ○	GROUNDWATER MONITORING WELL LOCATION AND DESIGNATION
0.504	CONCENTRATION IN mg/L
NS	NOT SAMPLED
ND(0.004)	ANALYTE NOT DETECTED AT A CONCENTRATION ABOVE THE VALUE INDICATED IN THE PARENTHESIS
0.1	ISOCONCENTRATION LINE (CONTOUR INTERVAL VARIABLE)
FRONTIER	WATER SUPPLY WELL LOCATION AND DESIGNATION
SWP-5 ●	PRODUCTION WELL LOCATION AND DESIGNATION
BATISTE SPRING	NATURAL SPRING

NOTE:

*-WELL 346 NOT CONSIDERED IN DEVELOPING CONTOURS.

SCALE

800 0 800 FEET

SIMPLOT PLANT AREA
EASTERN MICHAUD FLATS
SUPERFUND SITE
POCATELLO, IDAHO

GROUNDWATER EXTRACTION REMEDIAL DESIGN REPORT

FIGURE 14

LOWER ZONE ARSENIC ISOCONCENTRATION MAPS (1993/2001)

PROJECT: 010121.2	DATE: MAY 2002	
REV:	BY: RHF	CHECKED: DEP

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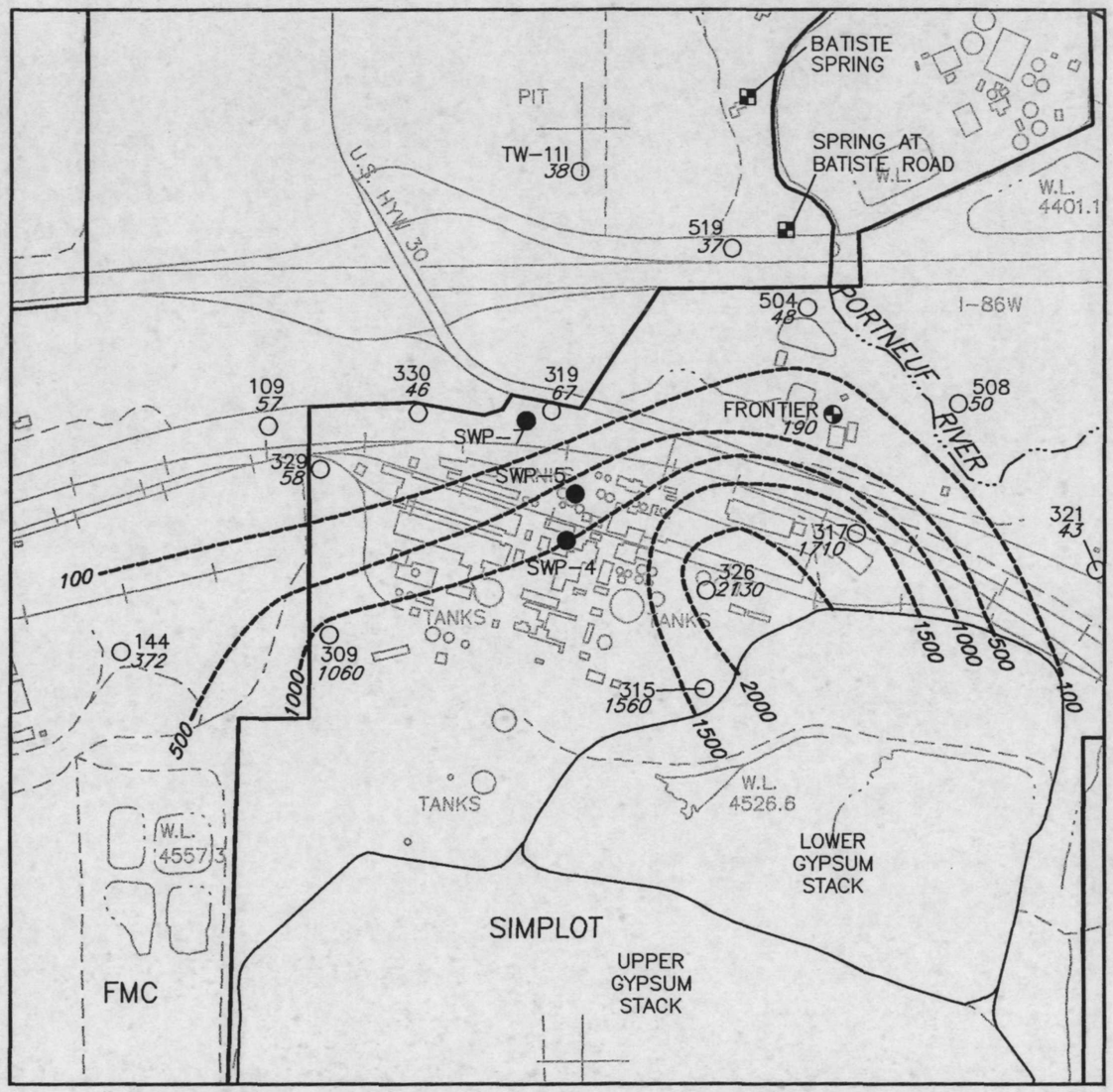
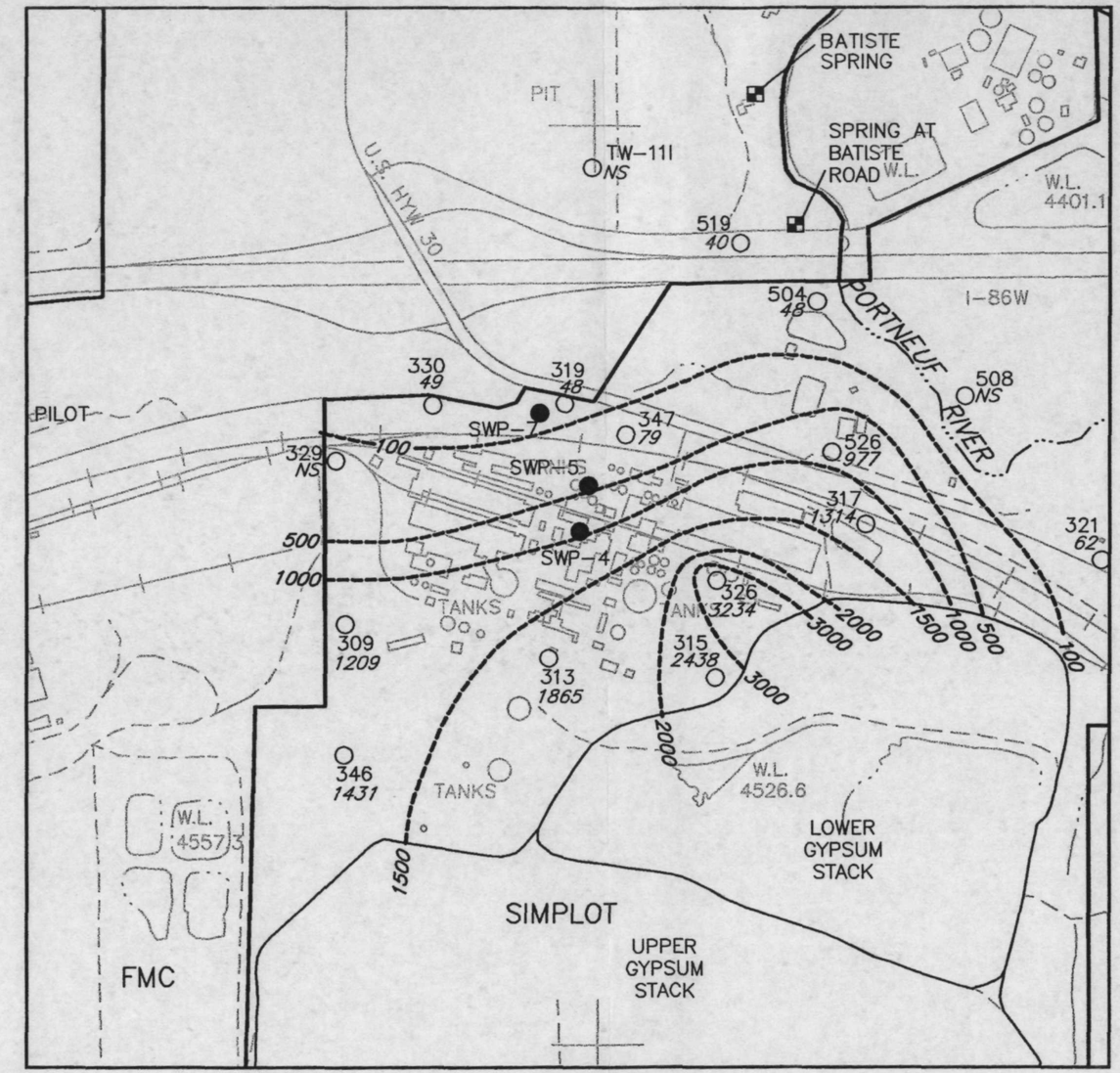
consulting scientists and engineers



LOWER ZONE SULFATE ISOCONCENTRATION LINES 1993



LOWER ZONE SULFATE ISOCONCENTRATION LINES 2001

LEGEND:

346 ○	GROUNDWATER MONITORING WELL LOCATION AND DESIGNATION
1560	CONCENTRATION IN mg/L
NS	NOT SAMPLED
ND(0.002)	ANALYTE NOT DETECTED AT A CONCENTRATION ABOVE THE VALUE INDICATED IN THE PARENTHESIS
2000	LINE OF EQUAL WATER LEVEL ELEVATION (CONTOUR INTERVAL VARIABLE)
FRONTIER ⊕	WATER SUPPLY WELL LOCATION AND DESIGNATION
SWP-5 ●	PRODUCTION WELL LOCATION AND DESIGNATION
BATISTE SPRING ⊞	NATURAL SPRING

SCALE

800 0 800 FEET

SIMPLOT PLANT AREA
EASTERN MICHAUD FLATS
SUPERFUND SITE
POCATELLO, IDAHO

GROUNDWATER EXTRACTION REMEDIAL DESIGN REPORT

FIGURE 15

LOWER ZONE SULFATE ISOCONCENTRATION MAPS (1993/2001)

PROJECT: 010121.2	DATE: MAY 2002	
REV:	BY: RHF	CHECKED: DEP

MFG, Inc.
consulting scientists and engineers

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Figure 16
Arsenic Concentrations at Batiste Spring

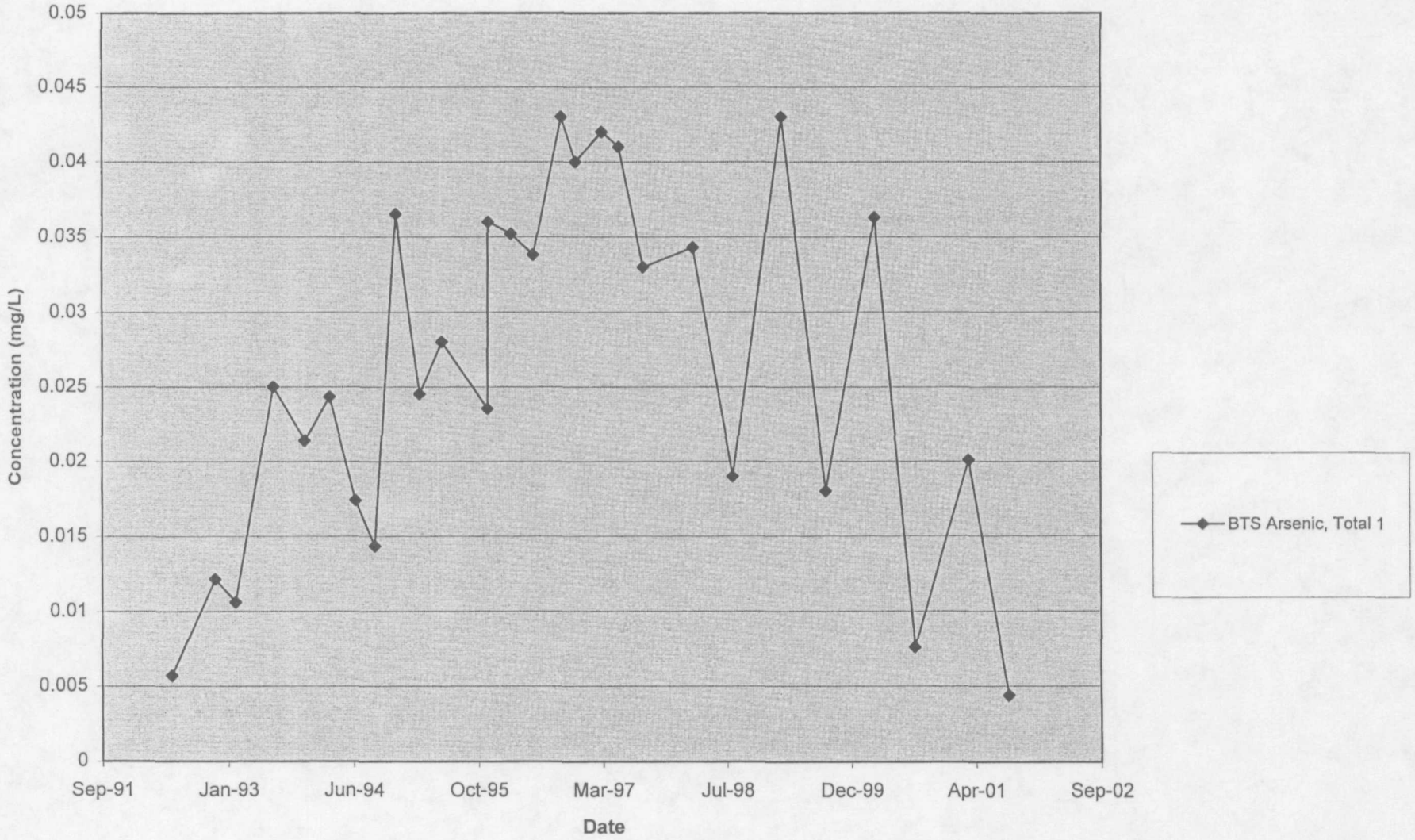


Figure 17
Temporal Plots of Arsenic Concentrations at Select Well Locations

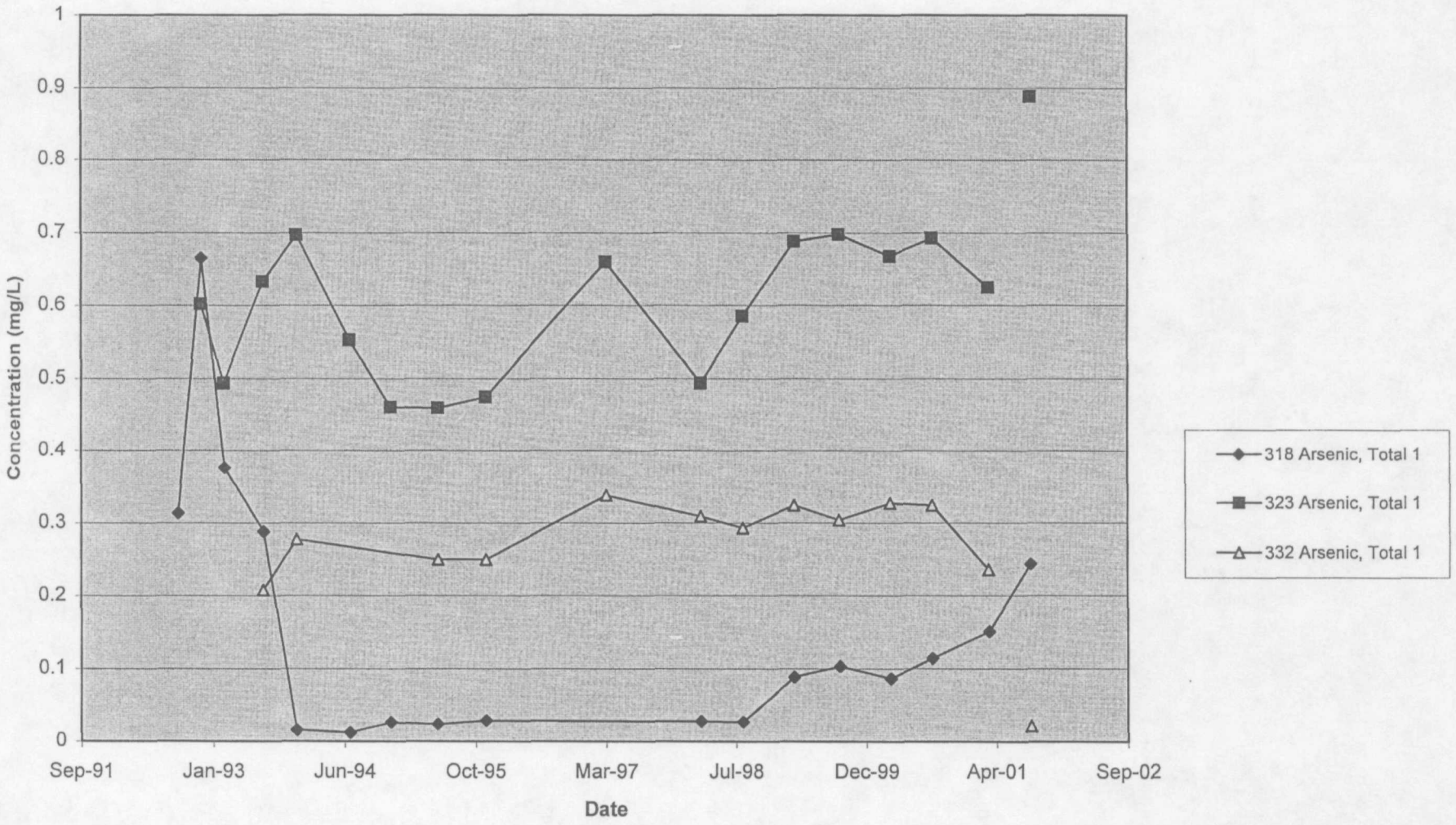


Figure 18
Temporal Plots of Sulfate Concentrations at Select Well Locations

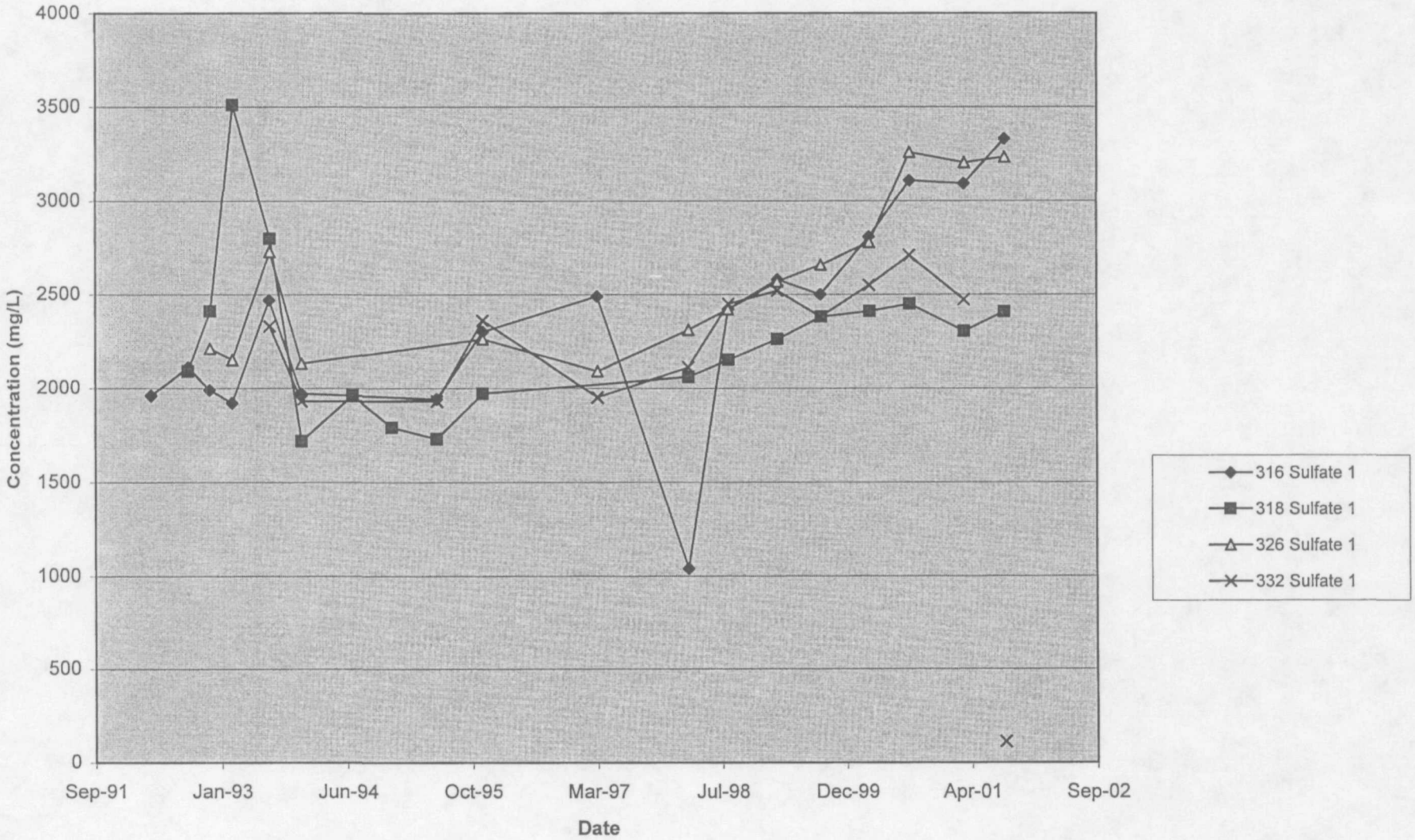
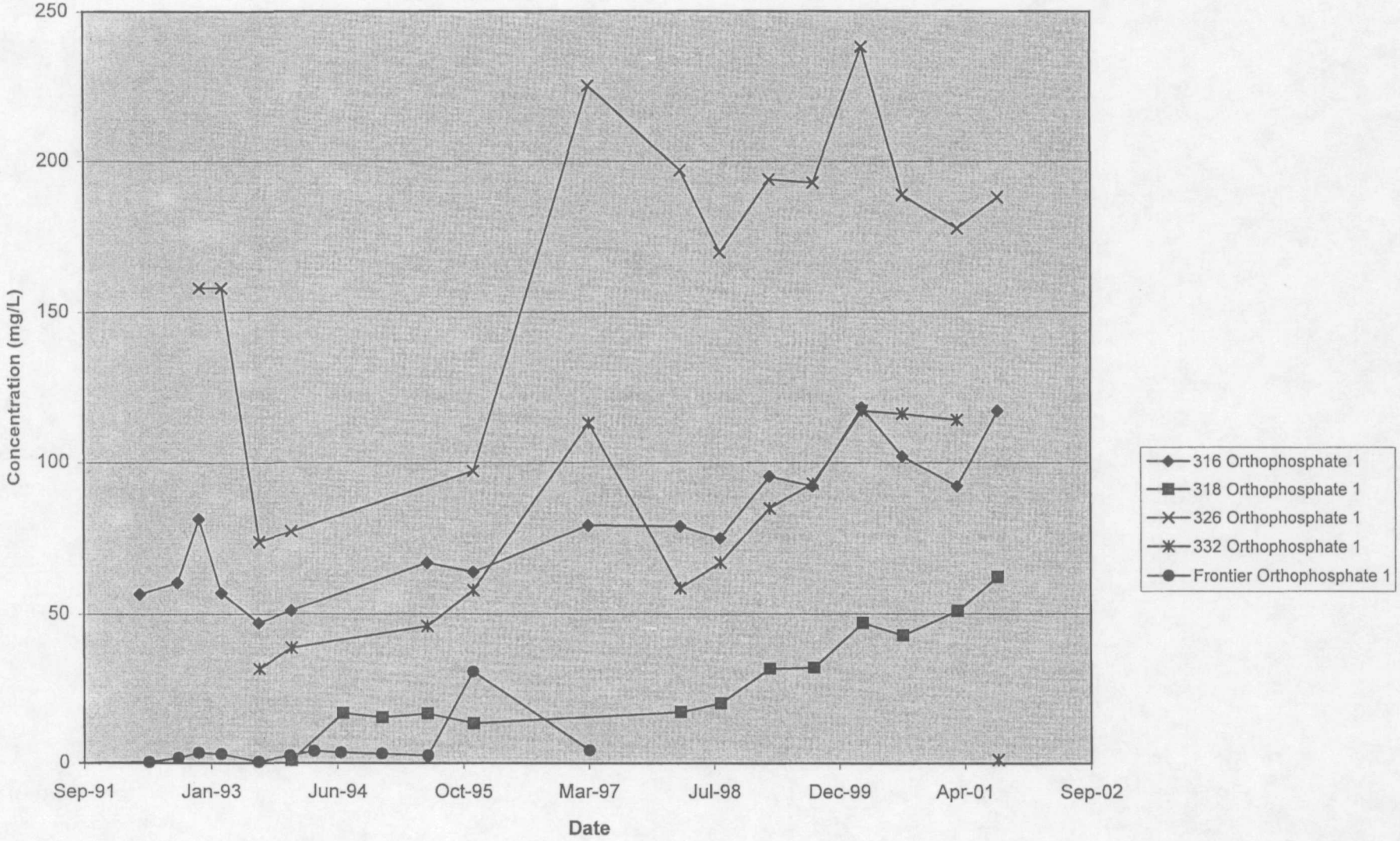
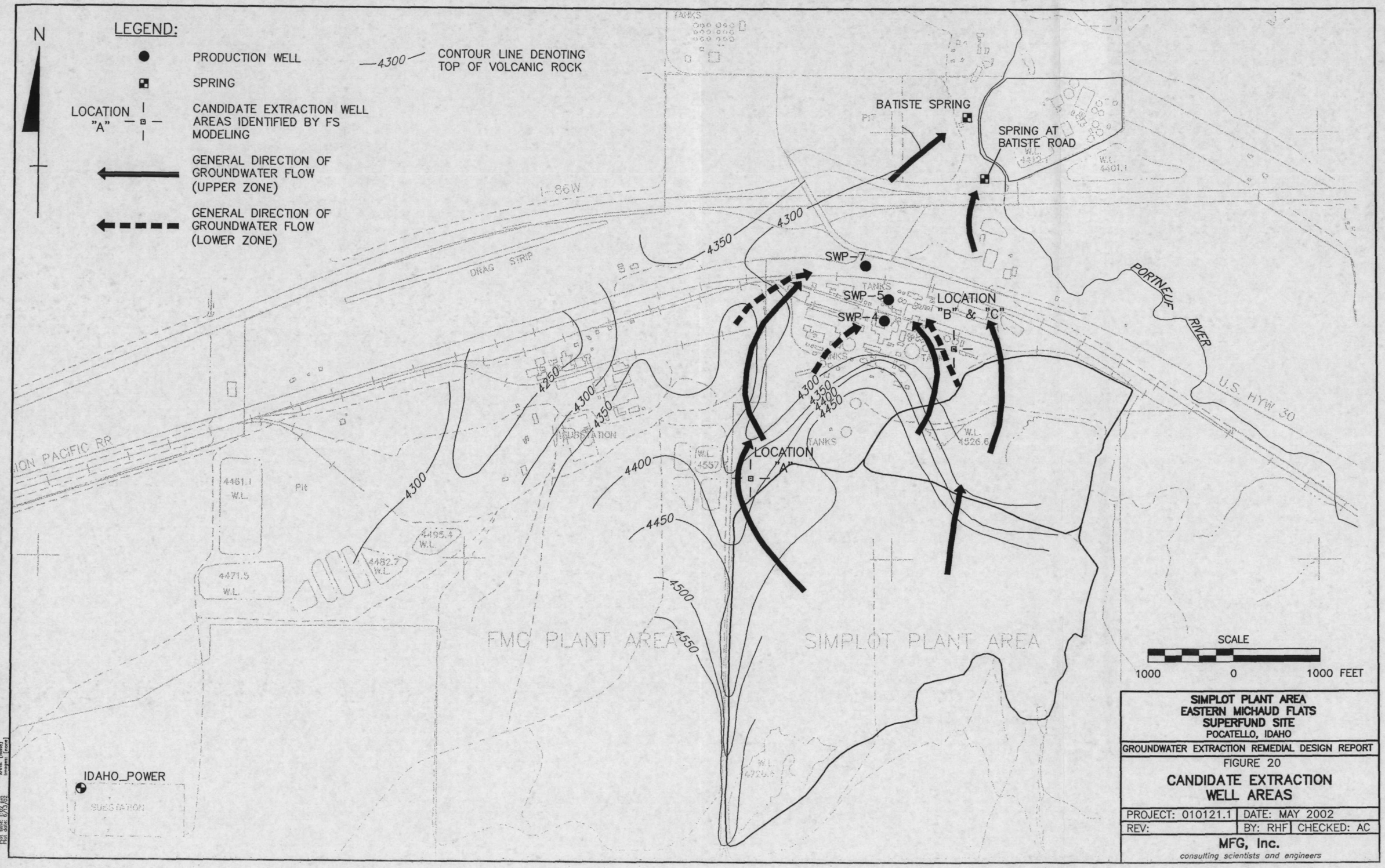


Figure 19
Temporal Plots of Orthophosphate Concentrations at Select Well Locations





SIMPLOT PLANT AREA
EASTERN MICHAUD FLATS
SUPERFUND SITE
POCATELLO, IDAHO

GROUNDWATER EXTRACTION REMEDIAL DESIGN REPORT

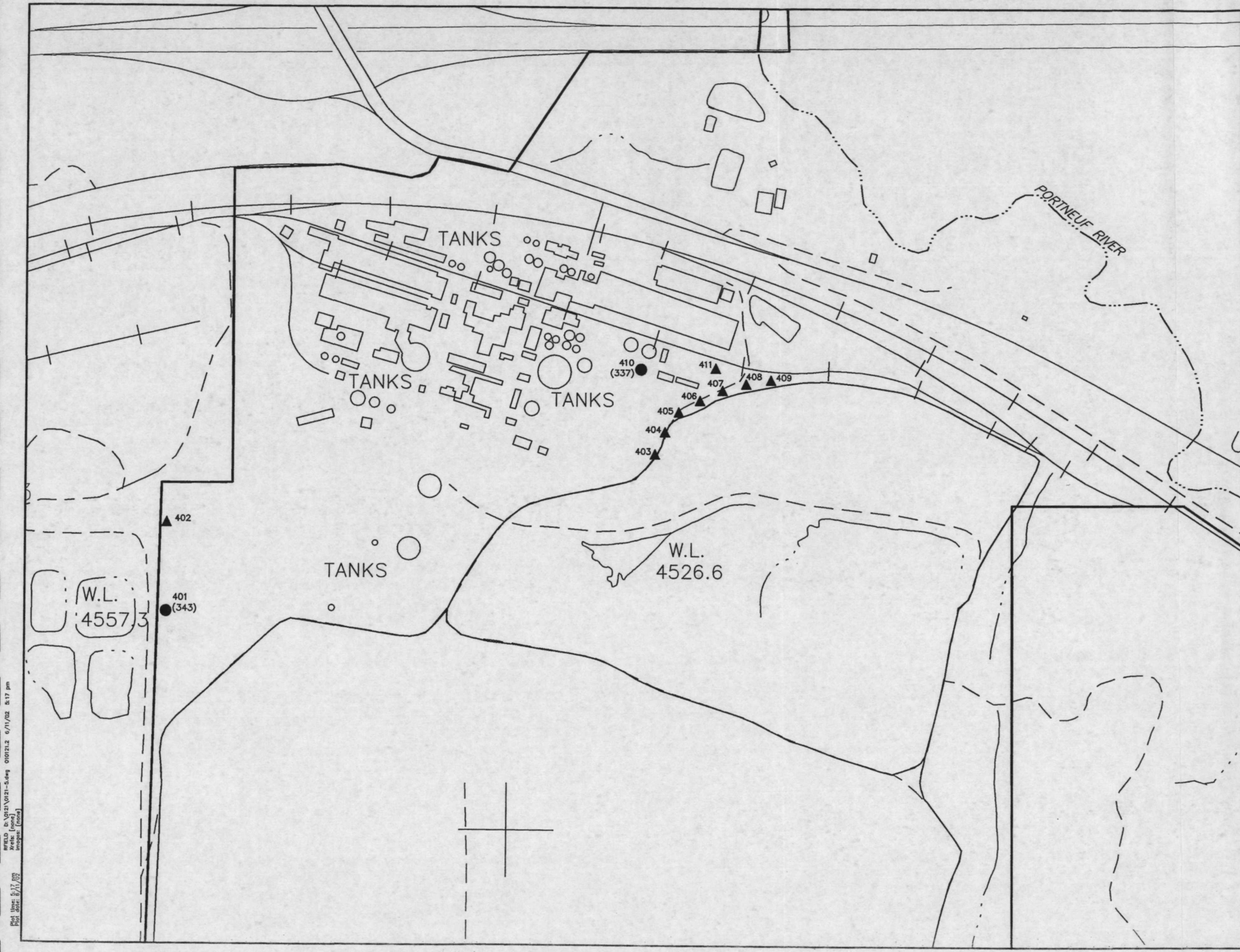
FIGURE 20

CANDIDATE EXTRACTION WELL AREAS

PROJECT: 010121.1	DATE: MAY 2002
REV:	BY: RHF CHECKED: AC

MFG, Inc.
consulting scientists and engineers

Plot time: 1:02 pm
Plot date: 6/13/02



LEGEND:

403 ▲ NEW EXTRACTION WELL

402 ● EXISTING EXTRACTION WELL

(346) PREVIOUS WELL DESIGNATION NUMBER

N

SCALE

500 0 500 FEET

SIMPLOT PLANT AREA
EASTERN MICHAUD FLATS
SUPERFUND SITE
POCATELLO, IDAHO

GROUNDWATER EXTRACTION REMEDIAL DESIGN REPORT

FIGURE 21

EXTRACTION WELL LOCATIONS

PROJECT: 010121.2	DATE: JULY 2002	
REV:	BY: RHF	CHECKED: AC

MFG, Inc.
consulting scientists and engineers

RFIELD D:\010121\010121-5.dwg 010121.2 6/11/02 5:17 pm
Xrefs: [none]
Images: [none]
Plot time: 5:17 pm
Plot date: 6/11/02

APPENDICES

APPENDIX A

APPENDIX A

Findings of the Pre-Design Investigations

APPENDIX A-1
SUBSURFACE INVESTIGATIONS AND SHORT-TERM PUMPING TESTS 1996

This appendix contains a copy of the summary report for field activities conducted in the fall of 1996 to support the groundwater extraction system design. This summary report was previously submitted to U.S. EPA Region 10 in August 1997. It is included here for completeness and convenience of review.

J.R. SIMPLOT COMPANY P.O. BOX 912 POCATELLO, IDAHO 83204
(208) 232-6620 (PLANT) (208) 238-2700 (GROUP OFFICES)

MINERALS & CHEMICAL GROUP

August 25, 1997

Mr. Bill Adams, Project Manager
HW - 113
U.S. Environmental Protection Agency
Region 10
1200 Sixth Avenue
Seattle, WA 98101

Re: Report of Field Activities in Support of Remedial Design of a Groundwater Extraction System - Simplot Plant Area, Eastern Michaud Flats Superfund Site

Dear Bill:

Attached to this transmittal letter are four copies of the above-reference document. The report provides a summary of our recent field activities in support of the design of the proposed groundwater extraction system downgradient of the gypsum stack.

Simplot is currently completing facility infrastructure improvements to allow for extended pump testing of the extraction wells. The primary activities are installation of power and piping to the wellheads. Don Plant personnel are examining the current water consumption to best integrate the water from the tests into the process. Extraction at well 343 will be initiated first, with pumping expected to begin in the next few weeks. In addition, Don Plant engineers are working on a detailed water balance for the facility to determine possible long term uses for extracted groundwater from the final system. This evaluation is expected to be completed in October. The data gathered from extended extraction well test and from the facility water balance evaluation will be incorporated into the extraction system design.

We look forward to working with you on the design and implementation of the extraction system. Please do not hesitate to call if you have any questions or comments.

Sincerely yours,

for P. L. Avery
J.R. SIMPLOT COMPANY

cc: Susan Hanson, Shoshone-Bannock Tribes
Rob Hanson, Idaho Department of Environmental Quality
Gordon Brown, Idaho Department of Environmental Quality

bcc: J.R. Simplot Company
Terry Uhling
Ward Wolleson

J:\5205\PROJECT\TASK-9\ADAMS2.LTR

REPORT OF FIELD ACTIVITIES IN SUPPORT OF REMEDIAL DESIGN OF A GROUNDWATER EXTRACTION SYSTEM

Simplot Plant Area
Eastern Michaud Flats Superfund Site
Pocatello, Idaho

August 1997

Prepared For:

J.R. SIMPLOT COMPANY
4122 Yellowstone Avenue
Pocatello, Idaho

Prepared by:

MCCULLEY, FRICK & GILMAN, INC.
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19203 36th Avenue West, Suite 101
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1.0 INTRODUCTION

This report provides a summary of field activities conducted in the fall of 1996 in support of design for the proposed groundwater extraction system in the Simplot Plant Area at the Eastern Michaud Flats (EMF) Superfund Site in Pocatello, Idaho. The purpose of the proposed extraction system is to capture, to the extent practicable, groundwater affected by seepage from the gypsum stack (also know as the gypstack). Extracted water will be used in the Don Plant process, replacing makeup water currently extracted from the deep aquifer.

A groundwater extraction system, in conjunction with institutional controls such as groundwater monitoring, has been selected by the EPA in the Proposed Plan as the preferred remedial alternative. However, insufficient information was generated in the RI to characterize key areas for the purposes of designing a groundwater extraction system.

Additional field data collection activities and evaluations were accomplished in support of the extraction system design. The Work Plan for field activities was presented in Appendix B of the *Report on Comparative Analysis Simplot Subarea* (EMF Superfund Site Feasibility Study Sections 7 and 8). The objectives of the field program were to:

1. Further characterize the hydrogeology at the locations identified as potentially optimum areas for groundwater extraction;

2. Provide additional information for selection of extraction well locations and estimation of extraction rates and capture efficiencies; and

3. Provide additional information on the total flow rate and quality of extracted groundwater.

The field program consisted of the following key components:

1. Installation and development of four extraction test wells and three observation wells.

2. Hydraulic testing (pumping tests) of the four extraction test wells.

This field report contains the following general elements: background discussion of geologic, hydrogeologic and geochemical conditions, and selection of extraction well test sites (Section 2.0); description of the field program implementation (Section 3.0); discussion of the field investigation results and related evaluations in support of extraction system design (Section 4.0); and principal conclusions and proposed design schedule (Section 5.0).

2.0 BACKGROUND

The EMF Superfund Site is located at the juncture between the Basin and Range physiographic province to the south and the Snake River Plain to the north. The site, which is composed of the FMC Subarea, Simplot Subarea, and Offsite Subarea, is at the base of the northern slope of the Bannock Range and extends onto the southeastern margin of the Michaud Flats. A map of the EMF site area, showing well locations and facility features, is presented in Figure 1. A more detailed discussion of the physical setting of the site can be found in the Remedial Investigative Report (BEI, 1996).

2.1 GEOLOGY

The geology and hydrogeology of the Simplot Plant Area are divided into two principal zones: the Bannock Range and the Michaud Flats (Figure 2). The Bannock Range is part of the Basin and Range physiographic province. The Michaud Flats is a subarea within the Snake River Plain, which is part of the Columbia Plateau physiographic province.

The southern portion of the Simplot Plant Area is situated within the Bannock Range. The Bannock Range is a basement complex of undifferentiated metamorphic, sedimentary and volcanic rocks of Precambrian to Cambrian age overlain by the late Miocene to Pliocene age Starlight Formation, which consists of a series of interbedded volcanic rocks and reworked volcanic (alluvial) deposits. These volcanic rocks are thought to be associated with the Picabo volcanic center, which was active about 10 million years ago (Ma). The crustal extension and associated block faulting that characterizes the Basin and Range Province began about 35 Ma, peaked at about 17 to 14 Ma, and continues episodically through the present.

The geology of the portion of the Simplot Plant Area that falls within the Bannock Range was not characterized in great detail during the RI and is thought to consist primarily of Tertiary volcanics and related sedimentary interbeds (the Starlight Formation). The Tertiary volcanics are comprised of rhyolitic tuff, porphyritic trachyandesite, rhyolitic ash flow tuffs, and basalts. The interbeds

are typically sands and gravels derived from the volcanic deposits during periods of volcanic quiescence. In some areas, these volcanics have been incised by ancient streams to form bedrock valleys that are filled with relatively coarse sediments and mantled by loess. In other areas, the volcanic deposits are mantled by loess, or are exposed at the surface.

The northern portion of the Simplot Plant Area is situated in the Michaud Flats portion of the Snake River Plain. The Snake River Plain was formed by the extrusion of magma from a series of volcanic vents, most of which are aligned along volcanic rift zones, and associated normal faulting. The basalts of the Snake River Plain are younger than the Bannock Range volcanics and range in age from about 2,000 to 500,000 years old. Some of these basalt deposits dammed the Snake River near American Falls, which led to the formation of an ancient lake that extended to the Bannock Range foothills in the site area. The sediments associated with this lake are called the American Falls Lake Beds (AFLB) and are comprised primarily of clay with minor silt, sand and localized gravel. Another formation, called the Sunbeam Formation, was deposited approximately contemporaneously with the American Falls Lake Beds, and includes the stream, floodplain, and delta deposits surrounding the ancient lake. About 15,000 years ago, a catastrophic flood from ancient Lake Bonneville downcut the basalt dam, scoured some of the existing sediments, and deposited the very coarse Michaud Gravels along the Portneuf River Valley and into the Michaud Flats.

The stratigraphy of the Michaud Flats portion of the Simplot Plant Area can be described as discontinuous layers of unconsolidated sediments deposited on an erosional surface that was incised on volcanic bedrock (Figure 3). The sedimentary unit immediately above the bedrock is a gravel derived from volcanic rocks. Overlying the gravel are varying thicknesses of fine-grained silts, clays, and sands that comprise the discontinuous confining unit of the American Falls Lake Beds. In the Simplot plant area these fine-grained AFLB deposits are overlain by the coarse-grained Michaud Gravels, which consists of quartzite, chert, and volcanic gravels, cobbles and boulders. To the north and east of the plant facilities, the Michaud Gravel occurs in channels (scoured by the catastrophic flooding of ancient Lake Bonneville), and the AFLB deposits are absent (in the area of wells 519, 504, and 321). Above the Michaud Gravels is a finer-grained unit

that consists of interlayered silts, clays and sands. Deposits of windblown silt (loess) and a colluvial silt layer of variable thickness mantle the site area.

The transition from the Bannock Range to the Michaud Flats occurs in a relatively thin zone which is characterized by the northward thickening of unconsolidated sediments, initially as small coalescing alluvial fans in a complexly layered sequence of apparently discontinuous coarse and fine alluvial and colluvial deposits.

2.2 HYDROGEOLOGY

Groundwater within the Simplot Plant Area flows generally to the north and northeast (Figure 4[1]). Groundwater elevations in wells range from more than 4600 feet above mean sea level (MSL) in the upgradient southern end of the Simplot Plant Area, to less than 4400 feet MSL in the area of the Don Plant itself. As with the geology of the site, the hydrogeology can be divided into two different zones, the Bannock Range and Michaud Flats.

2.2.1 Bannock Range

Groundwater flow conditions in the Bannock Range portion of the Simplot Plant Area (and adjoining FMC Plant Area) were not well defined in the RI due to the complexity of the hydrogeology and the low density of data in the area. The general direction of groundwater flow within the Bannock Range is to the north. The steep gradient in the Bannock Range lessens dramatically with the northward transition to the relatively level plain and the associated thickening and coarsening of the alluvial aquifer section in the plant area. The depth to groundwater also decreases downgradient (north). Depths to water range from 100 to 170 feet below ground surface in the Bannock Range area and from 55 to 65 feet below ground surface in the transition zone between the Bannock Range and Michaud Flats.

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[1] The potentiometric maps reflect the reclassification of well 326 to a deep aquifer monitoring well, as discussed in Section 4.1.2.

Distinct hydrostratigraphic units are typically not correlative within the Bannock Range portion of the Simplot Plant area. Groundwater occurs, to varying degrees, in the loess mantling the volcanic deposits, in buried alluvial channels, and in the interbeds. There may also be fracture zones within the volcanics that form significant water-bearing areas, although very few have been encountered in the course of site investigations.

Along the joint fenceline with FMC there is some evidence of a relict, buried stream channel originating within the Bannock Range and roughly running along the line defined by wells 304, 333, 307, and 308 (Figure 5). This feature was identified during the remedial investigation (RI) on the basis of geologic data (boring logs) and was thought to be a preferential flow path for groundwater on the west side of the gypstack. This postulated feature was incorporated into the groundwater model constructed for the EMF RI (BEI, 1996).

Another feature of the volcanic bedrock of the Bannock Range that may affect groundwater flow is the buried ridge along an axis approximated by wells 323 and 313. The effect of this buried volcanic ridge, as indicated by groundwater modeling, is that northward-flowing groundwater in the Bannock Range, beneath the gypstack, is diverted to either side of this bedrock ridge. Groundwater on the west side of the ridge initially flows to the north-northwest (along the west side of the ridge) and presumably encounters the relict stream channel, which is the primary pathway for northward groundwater flow along the joint fenceline with FMC. Subsequently, groundwater flows to the north-northeast along the relict stream channel and into the Michaud Flats. Groundwater on the east of the ridge flows to the north-northeast (along the east side of the ridge) across a much wider area (see Figure 4) than the west side. However, the presence of gypstack-affected water in wells 313 and 323, which are completed in clastic interbeds between volcanic rock layers in the buried bedrock ridge, indicates that the bedrock is not an impermeable boundary. Groundwater flow data indicate that these interbed zones are hydraulically connected with the transition zone and Michaud Flats gravels to the north, which means that site-related constituents reaching the interbed zones eventually reach the gravels in the transition zone and could be captured by extraction wells in the plant area. The groundwater flux from these

interbeds, however, is likely much smaller than the northward flux in the unconsolidated sediments to the east and west of the bedrock ridge.

2.2.2 Michaud Flats

In the Michaud Flats portion of the Simplot Plant Area (approximately the Don Plant facilities area), the regional aquifer is comprised of coarse-grained alluvial sediments and the underlying basalts. Distinct shallow and deep aquifer zones are evident in the alluvial sediments in the Simplot Plant Area, as indicated by the presence of confining strata (primarily clay) and the often strong upward vertical gradients between the two zones. This confining unit is the American Falls Lake Beds (AFLB), which locally act as an aquitard separating the upper shallow aquifer zone from the deep aquifer zone. The convention developed during the RI, and continued here, is to refer to these zones as the shallow aquifer and the deep aquifer. In a large area north of the Don Plant, the lake bed sediments separating the shallow aquifer from the deep aquifer are absent (Figure 2), having been scoured out by the Bonneville Floods and replaced with gravel flood deposits (Michaud Gravel).

Groundwater flow in both the shallow and deep aquifers in the Michaud Flats portion of the plant area is generally northward (see Figure 4). A significant part of the flow in the deeper aquifer is thought to be captured by the production wells within the plant facility. However, some of the deep groundwater in the east plant area (roughly between wells 326 and 317) flows to the northeast and does not appear to be captured by the production wells. Groundwater particle tracks from the RI groundwater modeling effort indicate that deep aquifer groundwater flows upward into the shallow aquifer in the area to the north of the Don Plant where the American Falls Lake Beds, the confining unit separating the shallow and deep aquifers, is absent. A portion of the groundwater flow eventually discharges to the Portneuf River and associated springs.

2.3 GROUNDWATER CHEMISTRY

2.3.1 Shallow Aquifer

The distribution of site-related constituents in the shallow aquifer supports the general conceptual model of groundwater flow discussed above. Isoconcentration maps for arsenic and sulfate (Figure 6) show two "lobes" of affected groundwater, to the east and west of the axis approximated by wells 323 and 313[2]. Other constituents showing this general pattern include calcium, magnesium, sodium, pH, lithium, and orthophosphate.

Groundwater chemistry data also reveal the existence of distinct constituent plumes associated with FMC sources west of the joint fenceline. Selenium and chloride isoconcentration maps (Figure 7) show a distinct plume trending northeast and entering Simplot property near well 312. Other constituents elevated in FMC wells in the joint fenceline area and believed to emanate from FMC sources include arsenic, ammonia, manganese, and potassium.

2.3.2 Deep Aquifer

Groundwater samples collected from deep aquifer monitoring wells 315, 317 and 326 in the eastern part of the Don Plant area contain arsenic and sulfate, as well as other constituents, at concentrations comparable to those encountered in impacted shallow aquifer wells downgradient of the gypstack. Concentrations of arsenic and sulfate in groundwater samples from deep aquifer monitoring wells are shown in Figure 8. The elevated levels of constituents in the deep aquifer within the Simplot Plant Area are most likely the result of flow of gypstack-affected water along multiple flowpaths from the Bannock Range to the Michaud Flats in the east plant area.

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[2] The isoconcentration maps for the shallow aquifer (Figures 4 and 5) have been revised to exclude data from well 326, which is completed in the deep aquifer, as discussed in Section 4.1.2.

2.4 USE OF THE RI GROUNDWATER FLOW MODEL FOR INITIAL EVALUATION OF THE GROUNDWATER EXTRACTION SYSTEM

The hydrogeologic and chemical data noted above, coupled with groundwater flow directions indicated by groundwater modeling performed for the RI, indicated two areas as potentially favorable for placement of extraction wells to capture groundwater affected by gypstack seepage: west of the gypstack (in the vicinity of wells 307 and 308) and the east plant area (in the vicinity of well 326). For the FS, this groundwater model was used to evaluate various combinations of extraction wells placed to intercept groundwater affected by the gypstack. Interception of affected groundwater was considered to have occurred when particle pathlines originating in the gypstack were intercepted by extraction wells.

While the model provided an approximation of steady-state flow conditions, it has several limitations that warrant caution in interpreting the results of transient simulations. Most notably, the model was not calibrated against transient conditions, so its accuracy as a predictor under aquifer stress conditions (such as pumping) was unknown. The model did incorporate the pumping of the Simplot production wells, but as a steady state condition (i.e., the pumping rates did not vary over time). A transient calibration is typically necessary to test the applicability of the assumed hydraulic parameters. This is because various combinations of boundary conditions, hydraulic conductivities, recharge, and other parameters can be used to simulate essentially the same potentiometric surface.

Additionally, this model incorporated abrupt changes in hydraulic conductivity values (up to five orders of magnitude in some cases) assigned to adjacent zones in each layer. Most of these abrupt changes were not based on actual changes in the physical system (i.e., they were not based on hydraulic testing or boring log data), and appeared to result in corresponding abrupt changes in simulated groundwater flow directions, both horizontally and vertically, that were not evident in potentiometric maps for the shallow and deep aquifers.

The abrupt and large changes in hydraulic conductivity resulted in "channeling" of the simulated groundwater flow toward the extraction wells in a manner that may not occur in the actual system. Consequently, the model could overestimate the capture zone of a single well in a manner that was favorable to capture of flow originating in the gypstack. This effect was evident at the modeled Locations B and C (Figure 9) in the east plant area. Similar problems are possible for flowpath simulations in the Bannock Range area of the groundwater model. As stated earlier, this southern portion of the site (which included the joint fenceline area) is highly complex and the simulated flow path of groundwater originating in the gypstack is highly influenced by model assumptions for which there are limited data.

The results of the groundwater modeling indicated that interception of nearly all of the water affected by the gypstack could be achieved by pumping at three locations (Figure 9). At Location A near the west fenceline, a pumping rate of 200 gpm was apparently effective in capturing groundwater flowing northward in the buried alluvial channel on the west side of the gypstack. In the east plant area, a combined pumping rate of 200 gpm from the deep aquifer (Location B) and the shallow aquifer (Location C) was effective in capturing flow from the gypstack area that enters the shallow and deep aquifers. Because the groundwater model had known limitations and because any model is only an approximation of the physical system, additional field investigations were performed in support of the remedial design.

details ?

3.0 FIELD PROGRAM

The field program consisted of two key components: (1) installation and development of extraction wells and observation wells; and (2) conducting hydraulic testing (pumping tests) at the proposed extraction well locations. Two sites along the fenceline with FMC in the west plant area and two sites near the cooling towers in the east plant area were selected as test locations, based on their identification as favorable sites for optimum interception of northward flowing groundwater, as predicted by groundwater modeling conducted as part of the FS.

Sampling and analysis of water from each pumping well was proposed in the Work Plan, but this activity was postponed because groundwater chemistry data has been generated during the RI at, or in the immediate vicinity of all proposed pumping wells, with the exception of well 338. Sampling and analysis of groundwater from the extraction wells for major ions and selected key chemical constituents was conducted in the first quarter of 1997. These data will be reported along with other pertinent chemistry data generated since the RI, in the Remedial Design Report.

It was noted in the Work Plan that placement of an extraction test well at proposed Location A (between monitoring wells 307 and 308 on Figure 9) might not meet the needs of the investigation, because the selection of that location was based on limited geologic data. During the course of well installation, bedrock was encountered at a shallower depth than anticipated and it became apparent that well 336 was located near the eastern boundary of the postulated relict channel paralleling the fenceline. Consequently, a decision was made in the field to complete well 336 as an observation well and to move the location of the extraction test well to the west in hopes of penetrating the approximate center of the relict channel.

Confirmation of the existence of the relict channel also led to the installation of extraction test well 345, as a means to investigate the southern extent of the relict channel and the potential effectiveness of an extraction well further to the south. Test well 345 was located adjacent to well 333 to make use of the latter well as an observation well.

3.1 WELL INSTALLATION AND DEVELOPMENT

Four extraction test wells and three observation wells were installed as part of this field effort. The extraction test wells (337, 338, 343, and 345) were completed with 6-inch inside diameter (i.d.) Schedule 80 polyvinyl chloride (PVC) casing and continuous-slot screen. The observation wells (336, 339, and 344) were completed with 4-inch i.d. Schedule 40 PVC casing and factory-cut slotted casing. Well locations are shown on Figure 10. All of the new wells were installed by Layne Christensen, Incorporated using a dual wall, reverse circulation, air hammer rig. Installation and development occurred between August 20 and September 26, 1996. Descriptions of drilling, well completion and well development activities are provided in Appendix A and well logs are provided in Appendix B. A summary of well construction data is provided in Table 1.

3.2 PUMPING TESTS

Pumping tests were conducted at wells 337, 338, 343, and 345 (see Figure 10) between November 10 and November 17, 1996. Each pumping test was conducted for a period of approximately 24 hours, the drawdown portion of the test, followed by a recovery period. Water levels were measured in the pumping and observation wells periodically during the drawdown and recovery portions of each test. Existing monitoring wells 307, 308, 326, and 333 were also used as observation wells. Extraction wells were pumped using various submersible pumps, depending on the required pumping rate. Discharge rates were monitored using in-line totalizing flow meters, and with a calibrated container and stopwatch. Discharges were maintained at a constant rate using an in-line gate valve, except at well 338 where the pumping rate exhibited a gradual decrease throughout the test.

Detailed descriptions of the pumping tests and the analytical results are presented in Appendix C.

4.0 RESULTS

The primary objective of the field program was to further characterize hydrogeologic conditions, including hydraulic properties, at the extraction well test sites, which were previously identified through preliminary modeling as optimum locations for capture of groundwater affected by seepage from the gypsum stack. A discussion of the issues and uncertainties surrounding the hydrogeologic conditions and the model predictions is presented in Section 2.4 of this report.

The relevant findings of the additional investigation conducted in support of the extraction system design are summarized below. The results of aquifer testing to estimate hydraulic properties of the aquifers at the extraction well test sites are discussed in Section 4.1. In Section 4.2, general findings with respect to hydrogeologic conditions are presented. For purposes of discussion, these descriptions of hydraulic properties and hydrogeologic conditions have been divided by geographic area: the east plant area and the west plant area. The east plant area describes the general area around well 326, which is in the Michaud Flats hydrogeologic zone. This area receives groundwater flow from the east side of the bedrock ridge in the Bannock Range described in Section 2.2 of this report. The west plant area describes the area to the west of the west of the upper gypstack within the Bannock Range hydrogeologic zone, along the relict valley described in Section 2.2. More specifically, this term describes the area between wells 333 and 308 along the Simplot west property line.

4.1 HYDRAULIC PROPERTIES

Graphs, data, and information sheets for each pumping test are presented in Appendix C. The results of the pumping tests are summarized in Table 2. Table 3 compares the hydraulic conductivity values obtained from these pumping tests with hydraulic conductivity values used in the groundwater model, and with values obtained by previous hydraulic (slug) testing of monitoring wells at or near the test locations.

Several analytical methods were used to estimate the hydraulic properties of the tested areas based on the pumping test results. The Theis non-equilibrium method (Theis, 1935) employs a curve matching technique using a log-log plot of time-drawdown data to estimate transmissivity and storativity. Cooper and Jacob (1946) is a method of using straight line semi-log plots of time-drawdown data to obtain estimates of hydraulic properties. Hantush (Hantush and Jacob, 1955) is a method of using log-log plots of time-drawdown data to estimate confined aquifer properties when the aquifer has a leaky confining layer. Recovery data were analyzed using the Theis recovery method. The Theis recovery method is typically the only one of these methods that is appropriate for analyzing data from the pumping well. These analytical methods were developed for use in confined aquifers. However, they can generally be used in unconfined situations if the amount of drawdown is small with respect to the total saturated thickness of the aquifer. When delayed yield from an unconfined aquifer is an important factor, the Neuman method (1975) can be used. This method employs curve matching techniques using a log-log plot of time-drawdown data to estimate aquifer properties.

4.1.1 East Plant Area

Pumping Test at Well 337

The pumping test at well 337 was conducted using wells 326 and 344 as observation wells. A summary of the pumping test can be found in Appendix C-1 and graphs and data from the pumping test can be found in Appendix C-2. Extraction well 337 is screened at a depth interval of 117.6 to 157.6 feet within an upper transmissive unit of the deep aquifer. This unit is confined by an overlying, relatively impermeable clay and possibly below by a somewhat leaky silt. The static water level in well 337 prior to pumping was 64.77 feet below the ground surface (bgs). The average discharge for the test was 200 gpm and the pumping rate was constant throughout the test. The maximum drawdown in the pumping well was 39 feet. The maximum drawdown in the observation wells was 1.7 feet in well 344 and 0.64 feet in well 326. Both of the observation wells are approximately 80 feet from the pumping well. The difference in drawdown levels in wells approximately equidistant from the pumping well may indicate some horizontal anisotropy

in the flow system. However, because these wells are also screened across vertically different portions of the deep aquifer, this difference in drawdown is more likely due to vertical differences in hydraulic conductivity.

Drawdown data for the wells were analyzed using the Cooper-Jacob and Hantush methods. Examination of the Cooper-Jacob semi-log time-drawdown plots for both observation wells show that the water level curve flattens, suggesting a recharge source within the zone of influence of the well. In this case, this type of curve indicates a leaky aquifer, probably upward leakage through the lower silt unit, rather than leakage through the overlying clay aquitard. Water level measurements in well 338, which is completed in the shallow aquifer, did not fluctuate during the hydraulic testing of well 337, indicating that the clays are an effective confining unit between the shallow and deep aquifers in this area. The early portions of the Cooper-Jacob plots (before the curve flattens due to leakage through the confining unit) for the observation wells also yielded good matches. The hydraulic conductivity values calculated from data for wells 326 and 344 using this method were 589 ft/day and 190 ft/day, respectively. The storativity values were 2.24×10^{-3} (well 326) and 1.8×10^{-4} (well 344).

Good curve matches for both observation wells were obtained using the Hantush method. The drawdown data from well 326 yielded a hydraulic conductivity value of 320 ft/day and a storativity of 2.65×10^{-3}. The drawdown data for well 344 yielded a hydraulic conductivity value of 180 ft/day and a storativity of 2.12×10^{-4}.

Recovery data were analyzed using the Theis recovery method. Similar results were obtained using the recovery method for well 326 (436 ft/day) and the pumping well (337; 283 ft/day). Because the pump did not have a check valve, only the data after the pump drained were used for this calculation in the pumping well. Storativity values cannot be calculated using this method. No suitable curve matches were obtained for well 344 using the recovery data.

The representative hydraulic parameters were taken as the average of the calculated values. Hydraulic conductivity in this portion of the deep aquifer is estimated to be approximately 330

ft/day. In comparison, the values of hydraulic conductivity assigned to Layer 4 of the groundwater model (representing the deep aquifer) in this area ranged from 60 ft/day to 6000 ft/day. The storativity is estimated to be about 1.3×10^3. The hydraulic tests in the deep aquifer performed closest to this area during the RI were at wells 315 and 317 and resulted in values about an order of magnitude lower than the pumping test (33.7 ft/day and 28.1 ft/day, respectively). A comparison of hydraulic testing results and groundwater model values for hydraulic conductivity is presented in Table 3.

Pumping Test at Well 338

The pumping test at well 338 was conducted using well 339 as the observation well. A summary of the pumping test can be found in Appendix C-1 and graphs and data can be found in Appendix C-2. Extraction well 338 is screened at a depth interval of 58.7 to 78.7 feet bgs within the shallow aquifer. The static water level in well 338 prior to pumping was 68.42 feet bgs. The average discharge for the test was about 39 gpm. The maximum drawdown was 9.28 feet in pumping well 338 and 0.25 feet in observation well 339.

Pumping records indicate small changes in the discharge rate throughout the test, but especially after 40 minutes, which led to a slight decreasing trend in the pumping rate throughout the test. However, this does not appear to have affected test results (it would have the same apparent effect as a leaky aquifer--a flattening of the semi-log curve of the Cooper-Jacob plot). Flattening of the curve does not occur in the Cooper-Jacob plot, but it is possible that the decrease in pumping rate may lead to a slight underestimation of the hydraulic conductivity in this area.

Drawdown data were analyzed using the Neuman and Cooper-Jacob methods. The match for the Neuman method actually matched the upper Theis curve, indicating that delayed yield is not significant in the shallow aquifer. This result is expected in such a coarse-grained unit. The estimated hydraulic conductivity for well 339 was 1138 ft/day using the Neuman method, and was 923 ft/day using the Cooper-Jacob method. The calculated specific yields were 0.276 (Neuman) and 0.411 (Cooper-Jacob).

Recovery data were analyzed using the Theis recovery method. Similar results were obtained using the recovery data for both wells 338 and 339. The estimated hydraulic conductivity value, based on recovery data from well 338, was 1071 ft/day. Because the pump did not have a check valve, only the data after the pump drained were used for this calculation in the pumping well. The calculated hydraulic conductivity value based on data from well 339 was 804 ft/day.

The representative hydraulic parameters were taken as the average of the calculated values. Hydraulic conductivity in this portion of the shallow aquifer is estimated to be 985 ft/day. This value compares to a hydraulic conductivity of 56.8 ft/day used in the RI model for the shallow aquifer in this area. The specific yield is estimated to be 0.34. The hydraulic test performed closest to this area during the RI was a slug test in well 316, which yielded a value of 28.9 ft/day. A comparison of hydraulic testing results and groundwater model values for hydraulic conductivity is presented in Table 3.

4.1.2 West Plant Area

Pumping Test in Well 343

The pumping test at well 343 was conducted using wells 336, 307, and 308 as observation wells. A summary of the pumping test can be found in Appendix C-1 and graphs and data for the pumping test are presented in Appendix C-2. Extraction well 343 is screened at a depth interval of 174.7 to 204.7 feet bgs, within gravel and sand that is thought to be a portion of a buried alluvial channel in the Bannock Range. The static water level in well 343 prior to pumping was 153.16 feet bgs. The average discharge for the test was 50 gpm, which was held constant throughout the test. The maximum drawdown in the pumping well was 16.68 feet. This observed drawdown reflects a low well efficiency, and the actual drawdown at the edge of the well bore was likely much less. The maximum drawdown in the observation wells was 0.51 feet in well 336 and 0.36 feet in wells 307 and 308. Water levels in the pumping well and in well 336 were measured using transducers, and water levels in well 307 and 308 were measured using an electronic water level meter. Estimation of hydraulic conductivity from data collected at wells 307 and 308 is

complicated by the fact that the aquifer thickness at these locations is unknown. These two wells are partially penetrating (they were not drilled to the top of the volcanic rock) and the gravel deposit likely dips northward and is not of uniform shape. For these reasons, hydraulic conductivities for wells 307 and 308 were calculated in two ways: 1) assuming an aquifer thickness equivalent to the saturated screened interval of the individual wells, and 2) assuming an aquifer thickness equivalent to the thickness at pumping well 343. Specific yield calculations are independent of aquifer thickness.

Drawdown data were analyzed using the Neuman and Cooper-Jacob methods. For well 336, a hydraulic conductivity of 229 ft/day and a specific yield of 4.1×10^{3} were calculated from the drawdown data using the Neuman method. Examination of the Cooper-Jacob plot for well 336 shows that the curve starts steeply, flattens, and then becomes steep again. This pattern is probably due to delayed yield from finer-grained strata overlying the coarser sand and gravel. With such a pattern, it is appropriate to use the latter portion of the curve to calculate aquifer characteristics by the Cooper-Jacob method. The data from well 336 yield a hydraulic conductivity of 217 ft/day and a specific yield of 2.06×10^{1}.

Using the Neuman method and the saturated screened interval for aquifer thickness, hydraulic conductivities for 307 and 308 were calculated as 213 ft/day and 69 ft/day, respectively. There were insufficient data for these two wells to calculate specific yield. Using the aquifer thickness observed at well 343, hydraulic conductivities for 307 and 308 were calculated to be 78 ft/day and 49 ft/day, respectively, by the Neuman method. Using the Cooper-Jacob method and the saturated screened interval for aquifer thickness, data from well 307 yield a hydraulic conductivity of 245 ft/day and a storativity of 1.81×10^{-2}. Data from well 308 yielded a hydraulic conductivity of 146 ft/day and a storativity of 1.37×10^{-2}. Using the aquifer thickness at 343 yielded a hydraulic conductivity of 90 ft/day in well 307 and a hydraulic conductivity of 104 ft/day in well 308 by the Cooper-Jacob method.

Recovery data were analyzed using the Theis recovery method, which yielded value of 346 ft/day for well 343. Because the pump did not have a check valve, only the data after the pump drained

were used for this calculation in the pumping well. The calculated hydraulic conductivity using the recovery method for data from well 336 yielded a value of 425 ft/day. Using the saturated screened interval as the aquifer thickness yielded hydraulic conductivities of 433 ft/day for data from well 307 and 332 ft/day for data from well 308 by the recovery method. Using the aquifer thickness observed at well 343 yielded hydraulic conductivity values of 159 ft/day for data from well 307 and 241 ft/day for data from well 308.

Because of uncertainties regarding the aquifer configuration and the variability of results, specific representative values for the hydraulic parameters of the aquifer in this area were not estimated. Calculated hydraulic conductivity values range from 49 ft/day to 433 ft/day. It is most likely that the productive gravel unit has a hydraulic conductivity in the range of 200 to 300 ft/day, based on values calculated for wells 343 and 336. These hydraulic conductivity values compare to values used in the groundwater model of 1700 ft/day in the upper two layers and 150 to 200 ft/day in the lower two layers in the vicinity of well 307, and model values of 56.8 ft/day in the upper two layers and 150 to 200 ft/day in the lower two layers in the vicinity of well 308. Slug tests were also performed in these wells during the RI. Hydraulic conductivity values obtained from slug tests were 281 ft/day in well 307 and 71.2 ft/day in well 308. A comparison of hydraulic testing results and groundwater model values for hydraulic conductivity is presented in Table 3.

Pumping Test in Well 345

The pumping test at well 345 was conducted using well 333 as the observation well. A summary of the pumping test can be found in Appendix C-1 and graphs and data from the pumping test can be found in Appendix C-2. Extraction well 345 is screened at a depth interval of 140.2 to 160.2 feet bgs within a sandy to silty gravel unit that shows some fining-upward in grain size. Gravelly silt beds underlie and overlie the gravel. Bedrock is at about 164 feet bgs. The static water level in well 345 prior to pumping was 144.4 feet bgs. Observation well 333 is located about 27 feet from well 345, is screened slightly deeper, and the screen crosses a gravel layer that is only three feet thick and is bounded above and below by silty gravel. The average discharge for the test was 6.5 gpm and the pumping rate was held constant throughout the test. Fluctuations in the water

levels (rather than a steady decline) after about 600 minutes are indicative of barometric fluctuations during the pumping test.

Drawdown data were analyzed using the Neuman and Cooper-Jacob methods. Using the Neuman (leaky) method, drawdown data from well 333 yielded an estimated hydraulic conductivity value of 263 ft/day and a storativity of 1.42×10^{-3}. Using the Cooper-Jacob method, the hydraulic conductivity was estimated as 233 ft/day and the estimated storativity was 2.47×10^{3} ft/day to 1.53×10^{-2} ft/day.

Recovery data were analyzed using the Theis recovery method. The recovery data from the observation well did not produce a good match with the analytical method, and therefore, no calculated hydraulic conductivity is presented for the observation well using this method. Using this method of analysis produced a much lower value for hydraulic conductivity for data from the pumping well (3.52 ft/day) than calculated for the observation well by other methods.

Representative values for this area are estimated as the average of the values found for well 333 and are most representative of the gravel layer. The calculated representative hydraulic conductivity is 250 ft/day and the representative specific yield is 6.39×10^{3}. This compares to values used in the groundwater model of 56.8 ft/day in the upper two layers and 150 to 200 ft/day in the lower two layers. A slug test performed during the RI in well 333 yielded a hydraulic conductivity of 28.1 ft/day. A comparison of hydraulic testing results and groundwater model values for hydraulic conductivity is presented in Table 3.

4.2 HYDROGEOLOGIC CONDITIONS

A map showing cross-section locations and cross-sections incorporating data from newly installed wells are included in Figures 11 through 14.

4.2.1 West Plant Area

As discussed in Section 2.2, the predominant groundwater flow path on the west side of the upper gypstack is likely associated with a relatively narrow, northward trending relict stream channel deposit. The channel deposit occurs within a trough in the volcanic bedrock surface (see Figure 5). This figure has been updated with information obtained during this field program and corrected for errors in the RI figure. The bedrock trough is subparallel to the fenceline from the southern limit of the upper gypsum stack to the vicinity of well 308, where it trends to the north-northeast and becomes less distinct in the plant facilities area. In the area between wells 333 and 308 this feature contains a layer of coarser (and therefore, more permeable) sediments just above the volcanic deposits (at the base of the relict valley). This layer of coarser sediments also appears to thicken northward (see Figure 12). While the geometry of this feature has not been fully defined, available geologic and water level data appear to confirm that the channel is relatively narrow. The apparently narrow, steep-sided cross-sectional shape of the channel deposit is illustrated in cross section C-C' (Figure 14), which shows proposed extraction well 343, located in the center of the channel, and observation well 336, located a little more than 50 feet from the channel center. Cross section A-A' (Figure 11) depicts the subsurface conditions along the approximate longitudinal profile of the relict channel, and also illustrates the narrow transverse channel geometry in the vicinity of wells 333 and 164.

4.2.2 East Plant Area

At the extraction test site in the east plant area, drilling and geologic logging of boreholes for the deep aquifer test well (337) and observation well (344) provided data to show that monitoring well 326 is completed within the deep aquifer rather than the shallow aquifer, as indicated in the RI report (BEI, 1996). The stratigraphic correlations and completion zones for wells at the test site, including monitoring well 326, are shown on cross sections B-B' and D-D' (Figures 13 and 14). Incorporation of the water level elevation for well 326 in the deep aquifer potentiometric map for September 1994 (Figure 4) provides further confirmation of the north-northeast flow direction in the deep aquifer (or at least the upper part of the deep aquifer) in the east plant area, confirming

that a portion of the deep aquifer flow through the Don Plant area is not captured by the production wells. This finding is generally consistent with the interpretations based on deep aquifer particle track results using the groundwater flow model (Section 3.3 of the RI report, BEI, 1996), which in summary, concluded that deeper aquifer flow not captured by the production wells migrates upward into the Michaud Gravels where the American Falls Lake Beds are absent (north of U.S. Highway 30).

5.0 SUMMARY

5.1 FIELD INVESTIGATION FINDINGS

The principal findings of this study are listed below:

- Groundwater in the vicinity of the gypsum stacks follows two main northward flow paths: (1) along the alluvial channel deposit parallel to the joint fenceline in the west plant area; and (2) through the east plant area.

- West Plant Area:

  1) The existence of a relict stream channel approximately along the west fenceline was confirmed and the relatively narrow, steep-sided geometry of the channel was better defined.

  2) The new data supplement and further refine the aquifer characteristics described in the RI report and used in constructing the RI groundwater model. Pumping test data indicate that hydraulic conductivities in this area are on the same order of magnitude or higher than values obtained from RI slug tests (see Table 3).

  3) Based on the new geologic and hydraulic data, anticipated pumping rates from extraction wells in this area are slightly lower than those estimated by modeling.

- East Plant Area:

  Shallow Aquifer

  1) Pumping test data indicate that hydraulic conductivities in this area are much higher than the values obtained from RI slug testing and the values used in the groundwater model (see Table 3).

  2) The capture zones of wells in the shallow aquifer are smaller than anticipated and more wells are required to capture shallow groundwater flow than originally anticipated.

  3) Anticipated pumping rates from the shallow aquifer are higher than the rates estimated with the RI groundwater model.

Deep Aquifer

1) Well 326 is completed in the deep aquifer, not the shallow aquifer as indicated during the RI. This change alters the interpretation of groundwater quality conditions, particularly in regard to the extent of site-related constituents in the deep aquifer.

2) Pumping test data indicate that hydraulic conductivities are much higher than the values obtained from RI slug testing (see Table 3). Additionally, the hydraulic conductivity values used in the model varied more than three orders of magnitude and the boundaries of these conductivity zones contributed significantly to the channeling effect described in Section 2.4. Results of this investigation indicate that the range of hydraulic conductivities in this area is much less varied than in the model and, by inference, that much less channeling effect occurs in the deep aquifer than predicted by the RI groundwater model.

3) More wells pumping at higher rates are required to capture gypstack-affected water in the deep aquifer than were anticipated based on extraction simulations using the RI model.

5.2 DESIGN SCHEDULE

Contingent on the groundwater extraction/reuse system being selected in the ROD, we propose the following approach to design and implementation of the system:

- Perform long term extraction tests on selected wells (308, 343, 337, and possibly 338) beginning as soon as possible, dependent on water balance evaluations for the Don Plant process.

- Use the results of this field program and the long term extraction tests to further refine the extraction system design. This refinement may include substantial revisions to the RI groundwater flow model to more accurately predict extraction system performance.

- Prepare draft Remedial Design Reports for the extraction/reuse system and for the groundwater monitoring program and submit these reports for agency review.

- Work with the agencies to finalize the Remedial Design Reports, which are intended to be incorporated into the Statement of Work for the Consent Decree, if the timing is appropriate.

6.0 REFERENCES

Bechtel Environmental, Inc. (BEI), 1996. Remedial investigative report for the Eastern Michaud Flats Site, Part II Surface and Subsurface Characterizations.

Cooper, H.H. and C.E. Jacob, 1946. A generalized graphical method for evaluating formation constants and summarizing well field history. American Geophysical Union Transactions, vol. 27, pp. 526-534.

Hantush, M.S., and C.E Jacob, 1955. Non-steady radial flow in an infinite leaky aquifer. American Geophysical Union Transactions, vol. 36, pp. 95-100.

McCulley, Frick & Gilman, Inc. (MFG), 1997. Report on Comparative Analysis Simplot Subarea (EMF Superfund Site Feasibility Study Report Sections 7 and 8).

Neuman, S.P., 1975. Analysis of pumping test data from anisotropic unconfined aquifers considering delayed yield. Water Resources Research, vol. 11, no. 2, pp. 329-342.

Theis, C.V., 1935. The relation between the lowering of the piezometric surface and the rate and duration of discharge of a well using groundwater storage. American Geophysical Union Transactions, vol. 16, pp. 519-524.

TABLE 1

SUMMARY OF PUMPING AND OBSERVATION WELL CONSTRUCTION DATA

J.R. Simplot Don Plant
Pocatello, Idaho

Well No.	Installation Date	Well Diameter (inches)	Total Depth (ft bgs[1])	Screened Interval (ft bgs)	Filter Pack Interval (ft bgs)	Bentonite Seal Interval (ft bgs)	Grout Seal Interval[2] (ft bgs)
336	8/20-23/96	4	179.6	146.1-176.1	141.8-180.0	136.0-141.8	0-136.0
337	8/23-27/96	6	160.6	117.6-157.6	114.0-169.0	110.0-114.0	0-110.0
338	8/27-28/96	6	81.7	58.7-78.7	56.8-83.5	52.3-56.8	0-52.3
339	9/4/96	4	79.0	56.0-76.0	52.5-79.0	48.9-52.5	0-48.9
343	9/9-11/96	6	208.0	174.7-204.7	168.8-208	164.0-168.8	0-164.0
344	9/18-19/96	4	148.8	130.8-145.8	125.0-148.8	117.5-125.0	0-117.5
345	9/24-26/96	6	163.75	140.2-160.2	137.7-163.7	131.7-137.7	0-131.7

[1] ft bgs - feet below ground surface.

[2] Includes concrete surface completion

TABLE 2

SUMMARY OF PUMPING TEST RESULTS
NOVEMBER 1996

J.R. Simplot Don Plant
Pocatello, Idaho

			Representative Values				
				Hydraulic Conductivity			
Well	Aquifer Type	Aquifer Thickness (feet)	Transmissivity (gpd/ft)	(ft/d)	(cm/s)	Storativity	Specific Yield
337	confined	38	94,700	330	1.16×10^{-1}	1.3×10^{-3}	--
338	unconfined	11	81,000	985	3.39×10^{-1}	--	3.43×10^{-1}
343	unconfined	18 to 49	18,000 to 120,300	50 to 425	1.76×10^{-2} to 1.5×10^{-1}	--	4.1×10^{-3} to 2.06×10^{-1}
345	unconfined	14	24,800	250	8.8×10^{-2}	--	6.39×10^{-3}

TABLE 3

COMPARISON OF PUMPING TEST RESULTS WITH SLUG TEST RESULTS AND GROUNDWATER MODEL VALUES FOR HYDRAULIC CONDUCTIVITY

J.R. Simplot Don Plant
Pocatello, Idaho

		Hydraulic Conductivity (ft/day)			
Well Test Number	Aquifer	Pumping Tests	RI Slug Tests	Model (Shallow Aquifer)	Model (Deep Aquifer)
East Plant Area					
337	Deep	330	33.7 (well 315) 28.1 (well 317)	--	60-6000
338	Shallow	985	28.9 (well 316)	56.8	--
West Plant Area					
343	NA*	200-300	281 (well 307) 71.2 (well 308)	1700 56.8	150-200 150-200
345	NA	250	28.1 (well 333)	56.8	150-200

NOTE:

NA* - These wells are located in the Bannock Range portion of the Simplot Subarea, where distinct aquifer units cannot be identified.

TABLE 4

SUMMARY OF EXPECTED QUALITY OF EXTRACTED GROUNDWATER SIMPLOT SUBAREA

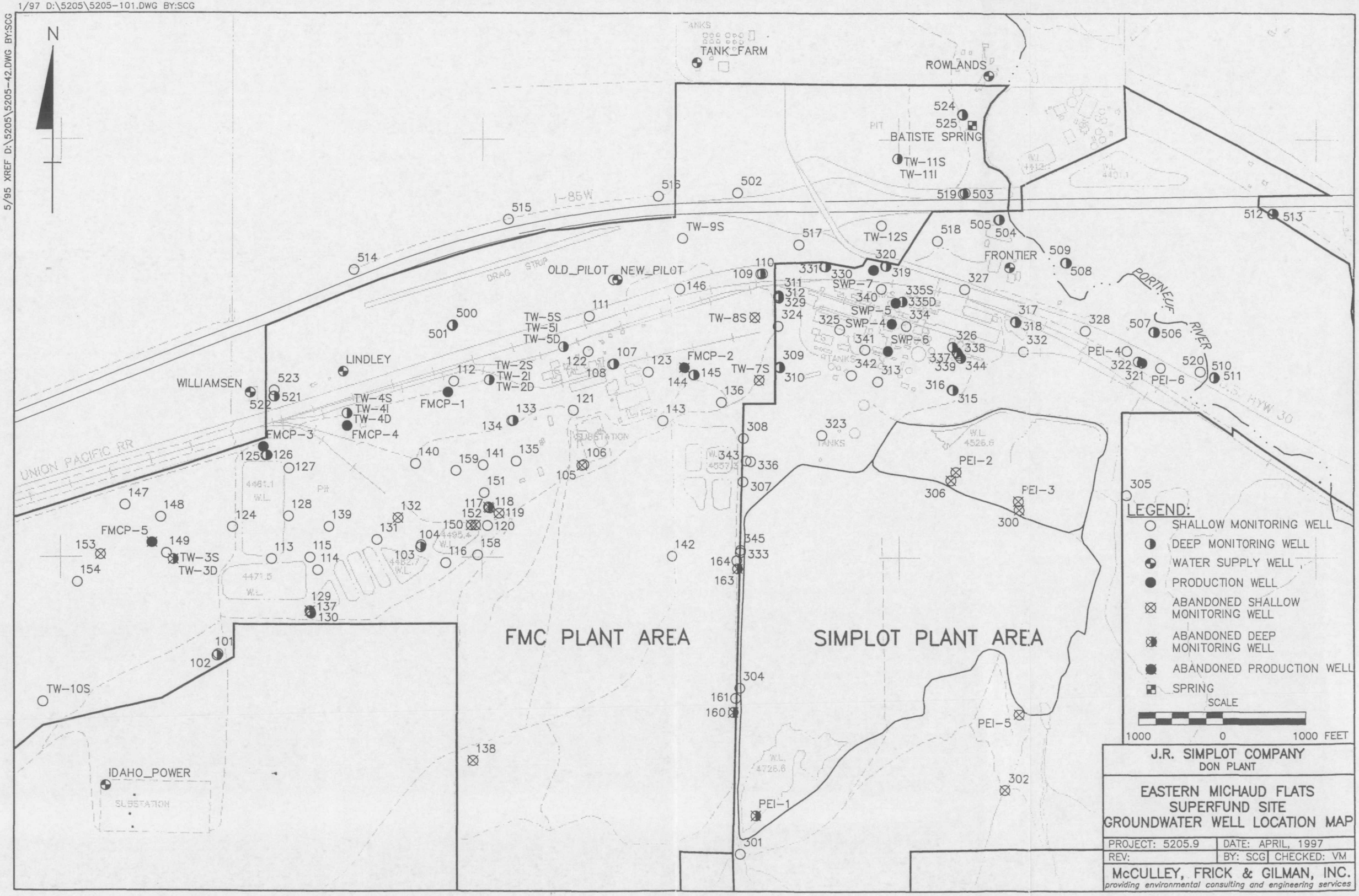
J.R. Simplot Don Plant
Pocatello, Idaho

	Constituents						
Area	pH	Hardness[4] (mg/L $CaCO_3$)	Arsenic (mg/L)	Fluoride (mg/L)	Gross Alpha (pCi/L)	Nitrate (mg/L)	Sulfate (mg/L)
East Plant Area[1] (Shallow)	6.18 to 6.24	2112 to 2264	0.2429 to 0.3427	0.13 to 0.30	Not Detected to 17.6	5.19 to 12.63	2070 to 2130
East Plant Area[2] (Deep)	6.25	2322	0.4620	0.15	Not detected to 8.2	15.6	2305
Joint Fenceline[3]	6.13 to 6.14	1842 to 2176	0.5521 to 0.5970	0.50 to 1.34	Not Detected to 11	2.9 to 24.41	1932 to 1958

[1] Values based on mean values for wells 316 and 332 obtained during the RI.
[2] Values based on mean values for well 326 obtained during the RI.
[3] Values based on mean values for wells 307 and 308 obtained during the RI.
[4] Hardness is calculated mg/L equivalent $CaCO_3$, calculated from mean calcium and magnesium values obtained during the RI.

1/97 D:\5205\5205-101.DWG BY:SCG

5/95 XREF D:\5205\5205-42.DWG BY:SCG



J.R. SIMPLOT COMPANY
DON PLANT

EASTERN MICHAUD FLATS
SUPERFUND SITE
GROUNDWATER WELL LOCATION MAP

PROJECT: 5205.9	DATE: APRIL, 1997	
REV:	BY: SCG	CHECKED: VM

McCULLEY, FRICK & GILMAN, INC.
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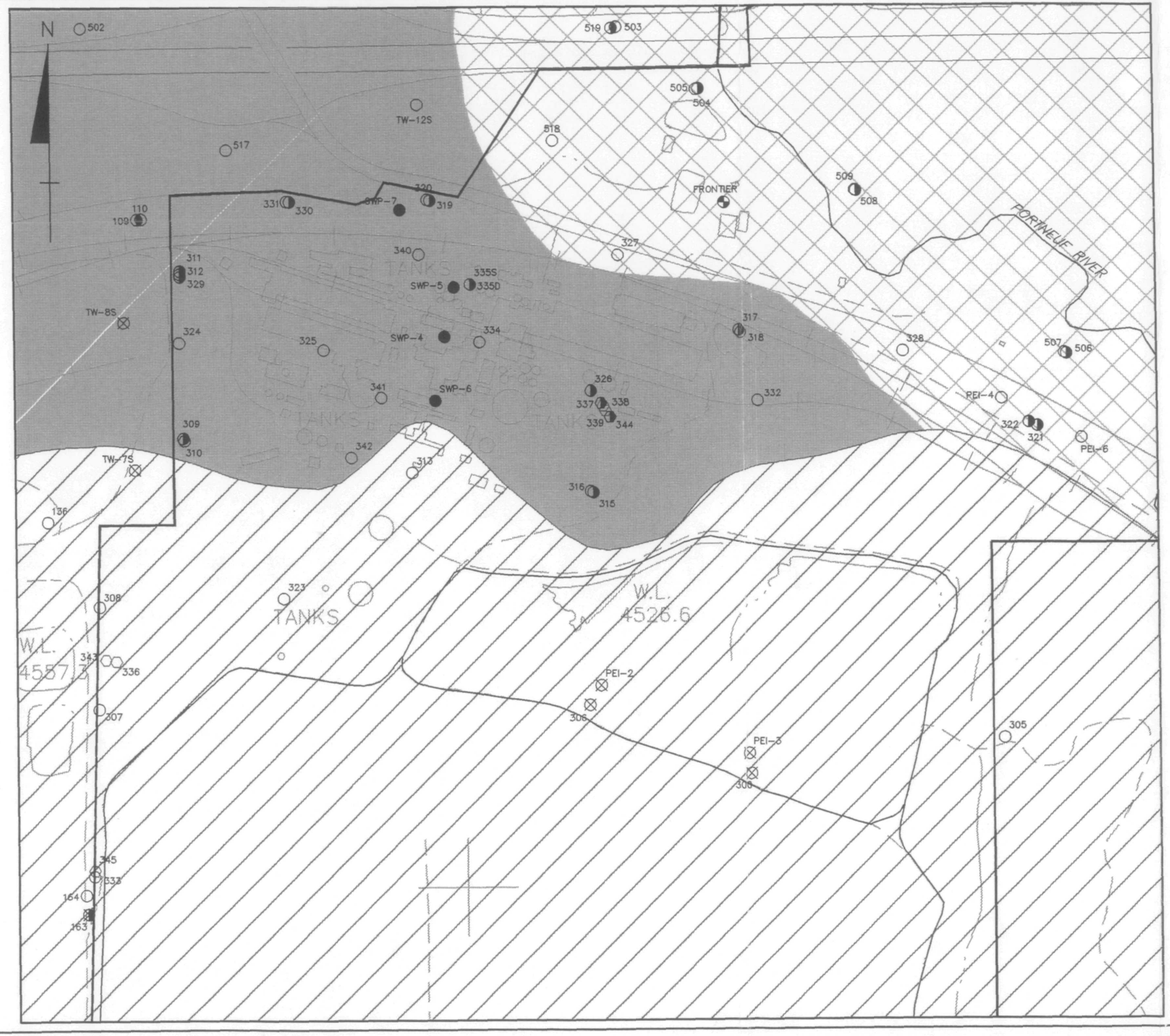
5/97 D:\5205\5205-135.DWG BY:MCP



LEGEND:

- MICHAUD FLATS – AFLB* PRESENT
- MICHAUD FLATS – AFLB ABSENT, SCOURED BY CATASTROPHIC FLOODING AND REPLACED BY MICHAUD GRAVELS
- BANNOCK RANGE – AFLB NEVER DEPOSITED IN THIS AREA
- *AFLB = AMERICAN FALLS LAKE BEDS
- SHALLOW MONITORING WELL
- DEEP MONITORING WELL
- WATER SUPPLY WELL
- PRODUCTION WELL
- ABANDONED SHALLOW MONITORING WELL
- ABANDONED DEEP MONITORING WELL
- ABANDONED PRODUCTION WELL
- SHALLOW WELL INSTALLED FOR THIS INVESTIGATION
- DEEP WELL INSTALLED FOR THIS INVESTIGATION

SCALE

500 0 500 FEET

J.R. SIMPLOT COMPANY
DON PLANT

APPROXIMATE BOUNDARIES OF BANNOCK RANGE AND MICHAUD FLATS HYDROGEOLOGIC AREAS

PROJECT: 5205.9	DATE: MAY, 1997	
REV:	BY: MCP	CHECKED: VM

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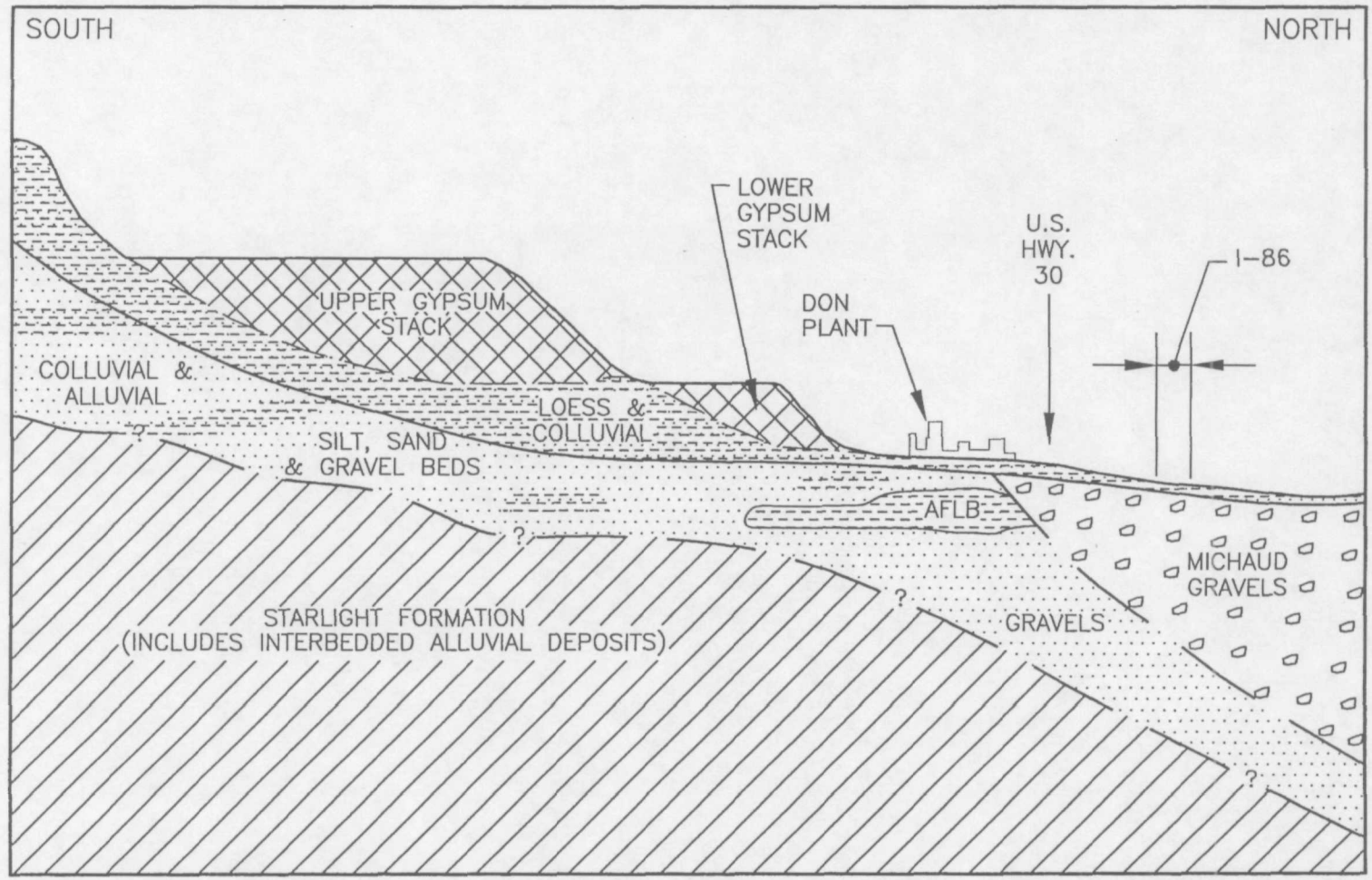
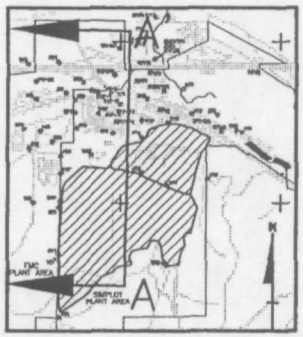
FIGURE 2

2/97 D:\5205\5205-115.DWG BY:SCG





LOCATION OF CROSS SECTION

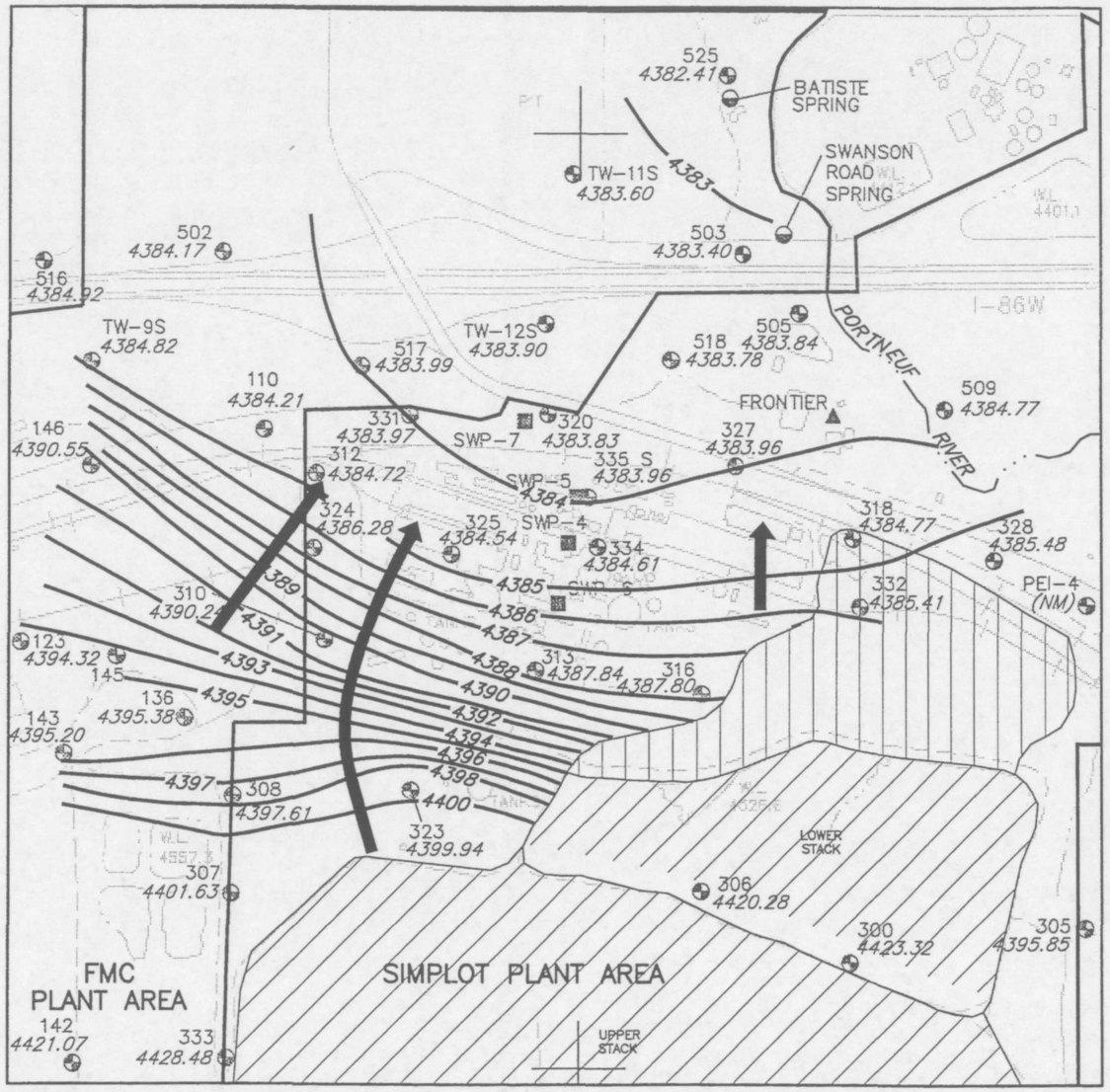
LEGEND:

AFLB = AMERICAN FALLS LAKE BEDS

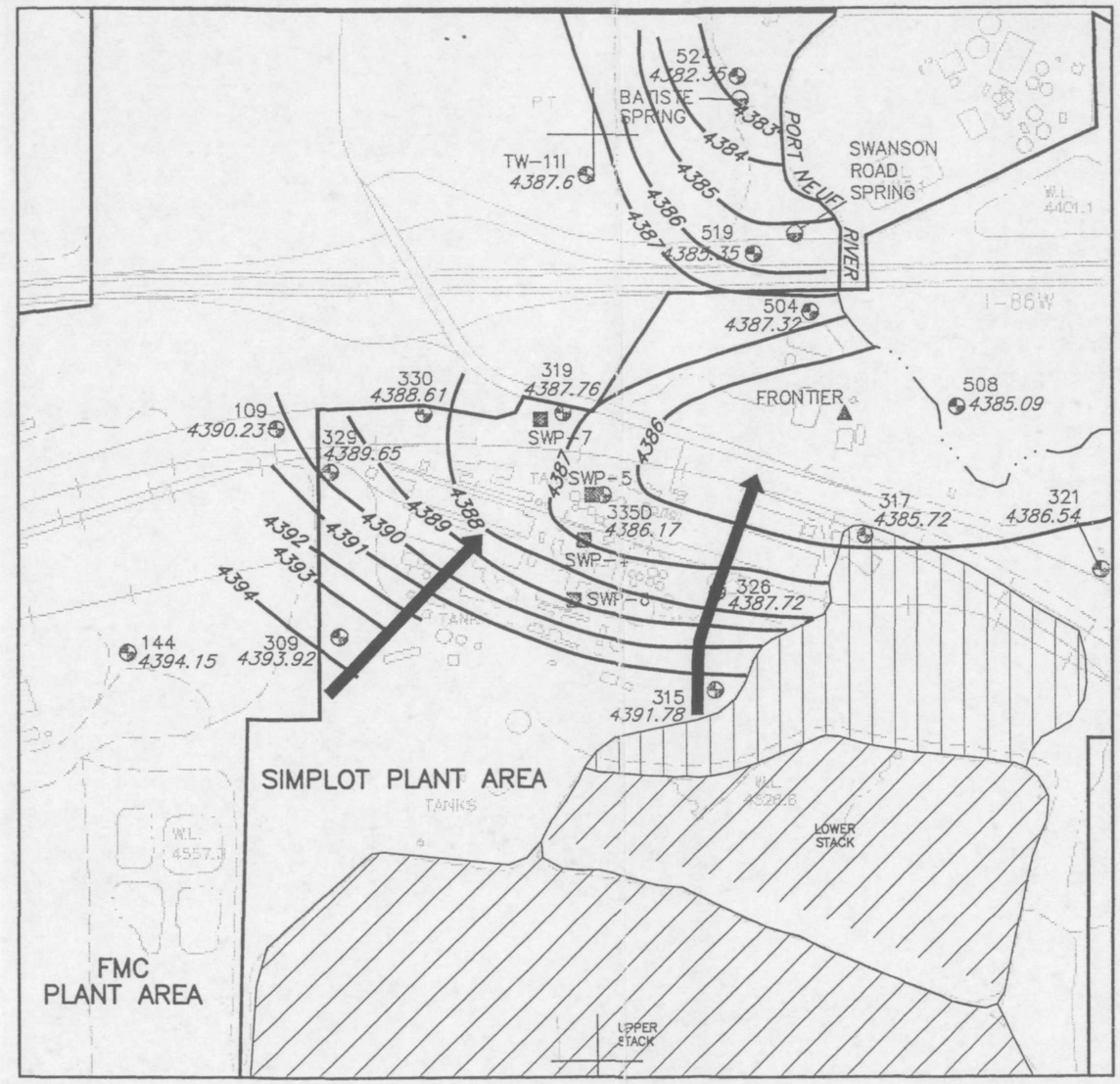
J.R. SIMPLOT COMPANY DON PLANT	
SCHEMATIC CROSS SECTION	
PROJECT: 5205.9	DATE: FEBRUARY, 1997
REV:	BY: SCG CHECKED: VM
McCULLEY, FRICK & GILMAN, INC. *providing environmental consulting and engineering services*	

FIGURE 3

2/97 D:\5205\5205-109.DWG BY:SCG PLOT SCALE 1:1000



SHALLOW AQUIFER POTENTIOMETRIC SURFACE MAP



DEEP AQUIFER POTENTIOMETRIC SURFACE MAP

LEGEND:

310	GROUNDWATER MONITORING WELL LOCATION AND DESIGNATION	4388	LINE OF EQUAL WATER LEVEL ELEVATION (CONTOUR INTERVAL VARIABLE)
4387.32	WATER LEVEL ELEVATION (FT. MSL)	(NM)	DENOTES WELL NOT MONITORED
	GENERAL DIRECTION OF GROUNDWATER FLOW	FRONTIER	WATER SUPPLY WELL LOCATION AND DESIGNATION
	CURRENT GYPSUM STACK	SWP-5	PRODUCTION WELL LOCATION AND DESIGNATION
	APPROXIMATE LOCATION OF GYPSUM STACK FROM PRE-1966 OPERATIONS	BATISTE SPRING	NATURAL SPRING

NOTE:

1. WATER LEVELS WERE MEASURED DURING SEPTEMBER 1994.

SCALE IN FEET

800 0 800 FEET

J.R. SIMPLOT COMPANY
DON PLANT

POTENTIOMETRIC SURFACE MAPS
SHALLOW AND DEEP AQUIFERS
SEPTEMBER 1994

PROJECT: 5205.9	DATE: FEBRUARY, 1997	
REV:	BY: SCG	CHECKED: VM

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FIGURE 4

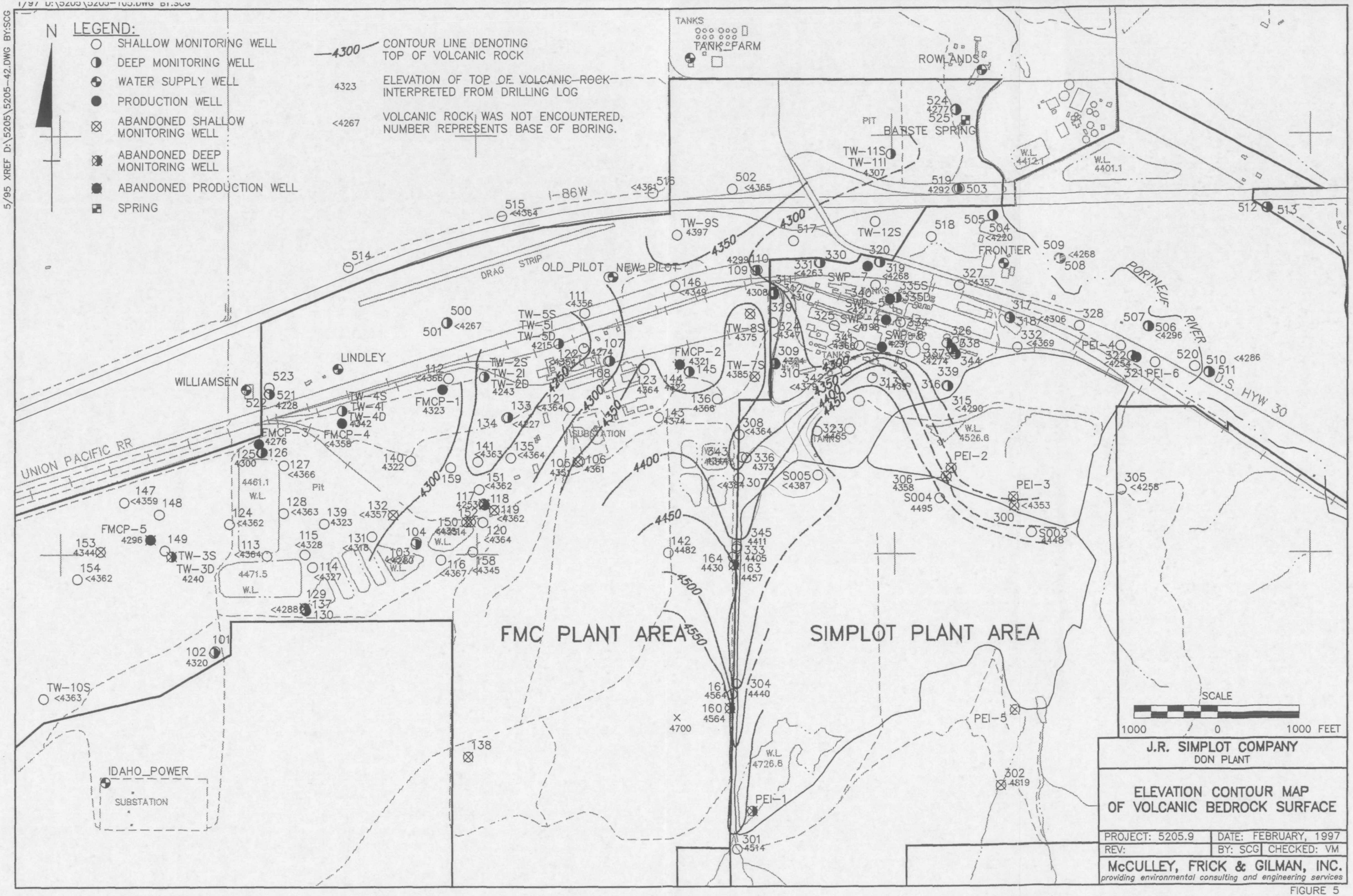
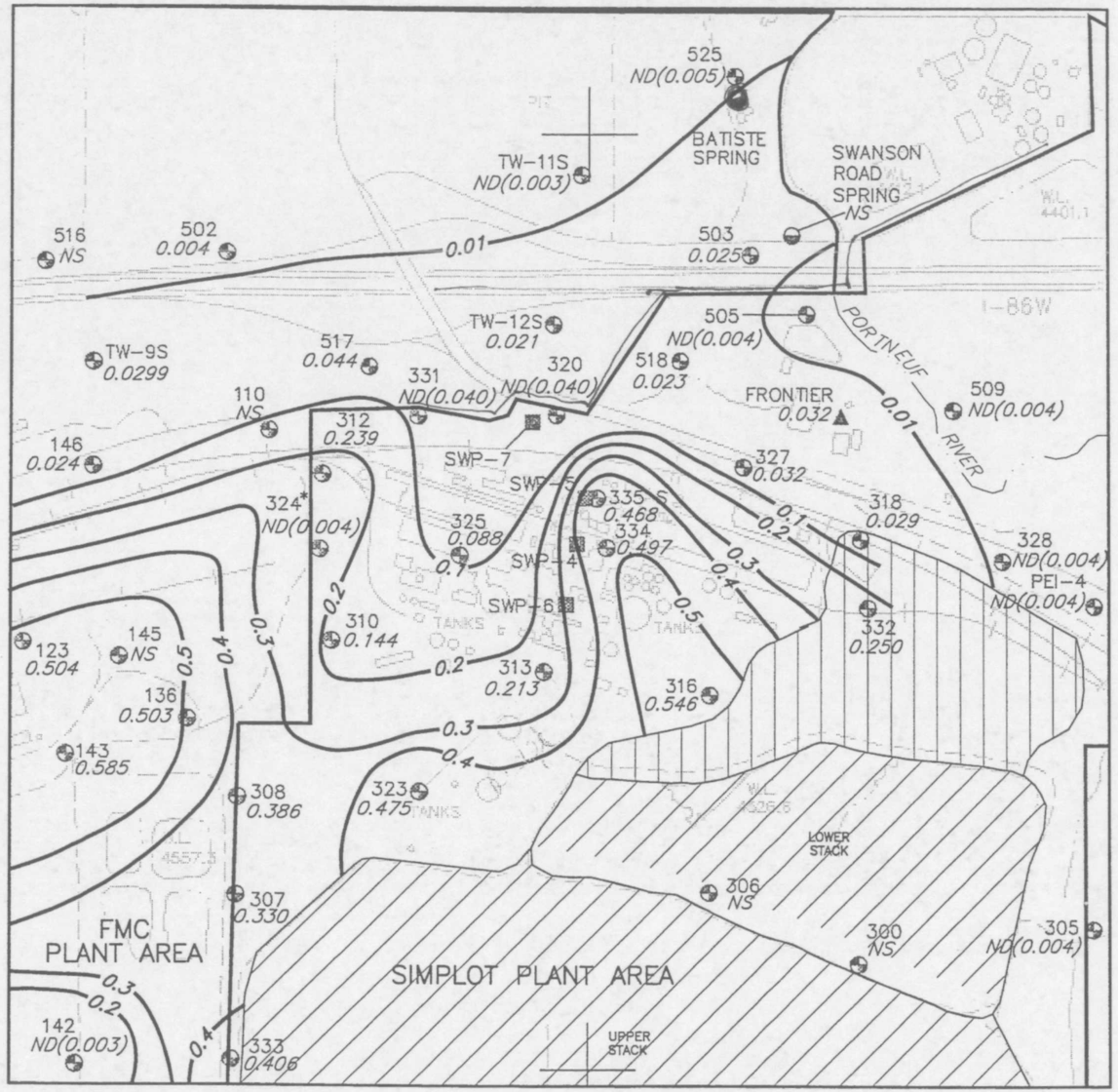
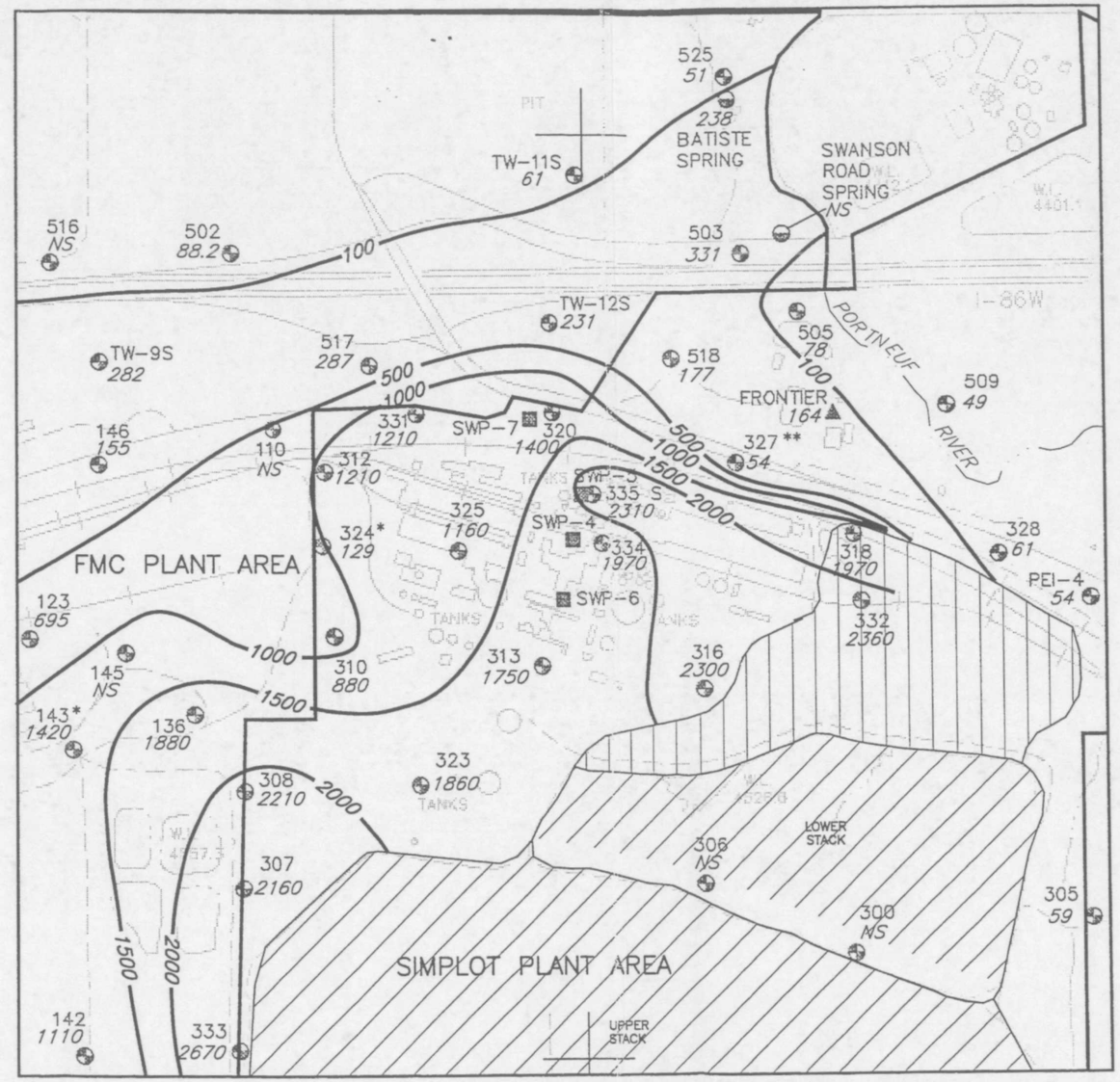

LEGEND:
SHALLOW MONITORING WELL
DEEP MONITORING WELL
WATER SUPPLY WELL
PRODUCTION WELL
ABANDONED SHALLOW MONITORING WELL
ABANDONED DEEP MONITORING WELL
ABANDONED PRODUCTION WELL
SPRING
4300 CONTOUR LINE DENOTING TOP OF VOLCANIC ROCK
4323 ELEVATION OF TOP OF VOLCANIC ROCK INTERPRETED FROM DRILLING LOG
<4267 VOLCANIC ROCK WAS NOT ENCOUNTERED, NUMBER REPRESENTS BASE OF BORING.
FMC PLANT AREA
SIMPLOT PLANT AREA
UNION PACIFIC RR
I-86W
DRAG STRIP
OLD_PILOT
NEW_PILOT
LINDLEY
WILLIAMSEN
TANK FARM
ROWLANDS
BATISTE SPRING
FRONTIER
PORTNEUF RIVER
U.S. HYW 30
IDAHO_POWER SUBSTATION
SCALE
1000 0 1000 FEET
J.R. SIMPLOT COMPANY
DON PLANT
ELEVATION CONTOUR MAP OF VOLCANIC BEDROCK SURFACE
PROJECT: 5205.9
DATE: FEBRUARY, 1997
REV:
BY: SCG
CHECKED: VM
McCULLEY, FRICK & GILMAN, INC.
providing environmental consulting and engineering services

FIGURE 5

2/97 D:\5205\5205-110.DWG BY:SCG PLOT SCALE 1:1000



ARSENIC ISOCONCENTRATION LINES



SULFATE ISOCONCENTRATION LINES

LEGEND:

310	SHALLOW MONITORING WELL LOCATION AND DESIGNATION
0.475	CONCENTRATION IN mg/L
	CURRENT GYPSUM STACK
	APPROXIMATE LOCATION OF GYPSUM STACK FROM PRE-1966 OPERATIONS
NS	DENOTES WELL NOT SAMPLED
ND(0.004)	ANALYTE NOT DETECTED AT A CONCENTRATION ABOVE THE VALVE INDICATED IN THE PARENTHESIS
0.3	ISOCONCENTRATION LINE (VARIABLE CONTOUR INTERVAL)
FRONTIER	WATER SUPPLY WELL LOCATION AND DESIGNATION
SWP-5	PRODUCTION WELL LOCATION AND DESIGNATION
BATISTE SPRING	NATURAL SPRING

NOTES:

1. SIMPLOT AND FMC PLANT AREA GROUNDWATER SAMPLES WERE COLLECTED BETWEEN 11/29/95 AND 12/07/95.

*– DATA FOR WELL 324 ARE NOT CONSIDERED IN PREPARING THE ISOCONTOURS. THE SULFATE CONCENTRATION FOR WELL 143 APPEARS TO BE ERRONEOUS AND IS NOT USED FOR THE SULFATE ISOCONTOURS.

**– SULFATE DATUM FOR WELL 327 IS ANOMALOUSLY LOW. THE 1992 THROUGH 1994 AVERAGE OF VALUE OF 203 mg/L WAS USED FOR CONTOURING.

SCALE IN FEET

800 0 800 FEET

J.R. SIMPLOT COMPANY
DON PLANT

ISOCONCENTRATION MAPS FOR ARSENIC AND SULFATE – SHALLOW AQUIFER DECEMBER 1995

PROJECT: 5205.9	DATE: FEBRUARY, 1997
REV:	BY: SCG CHECKED: VM

McCULLEY, FRICK & GILMAN, INC.
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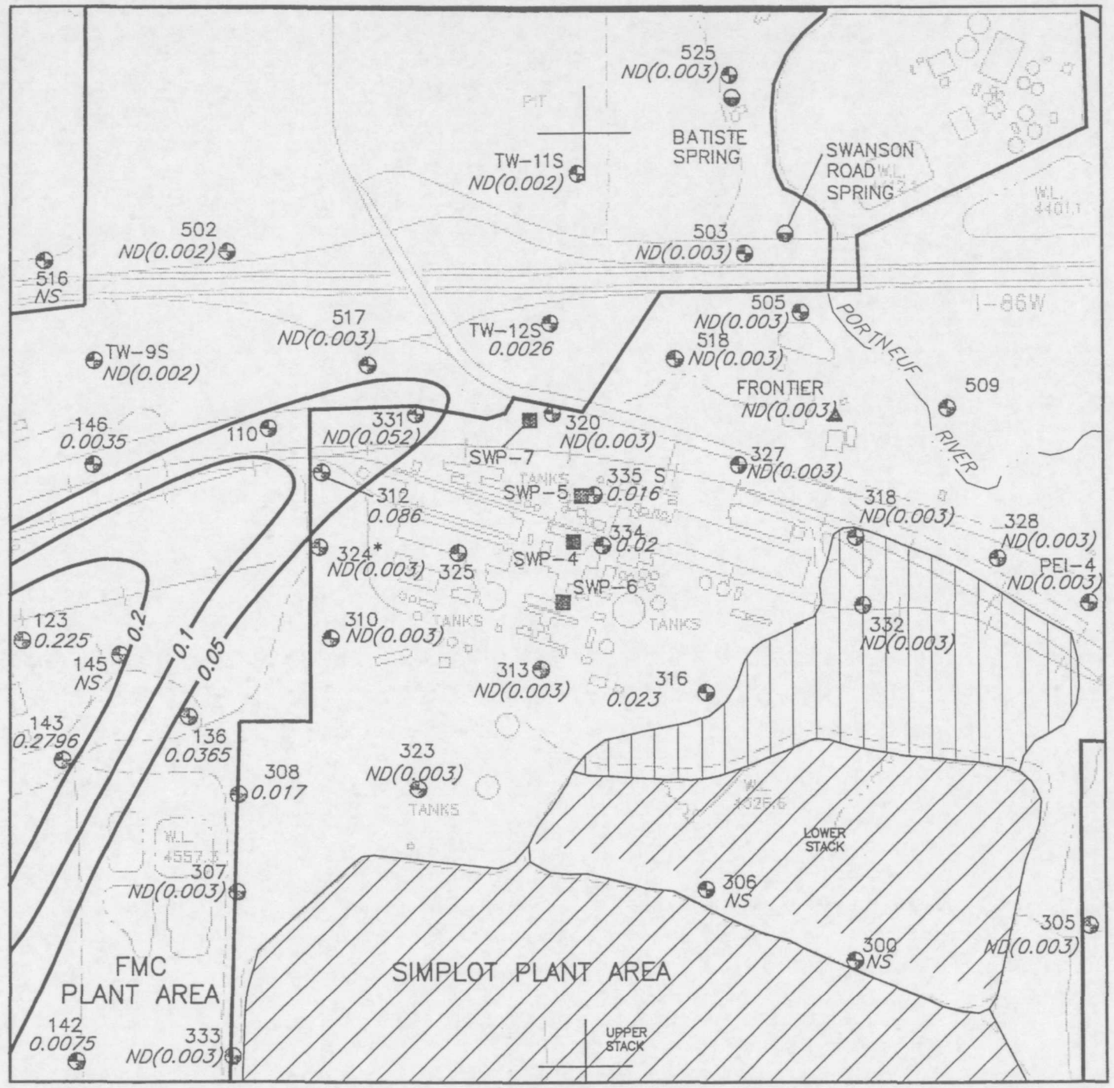
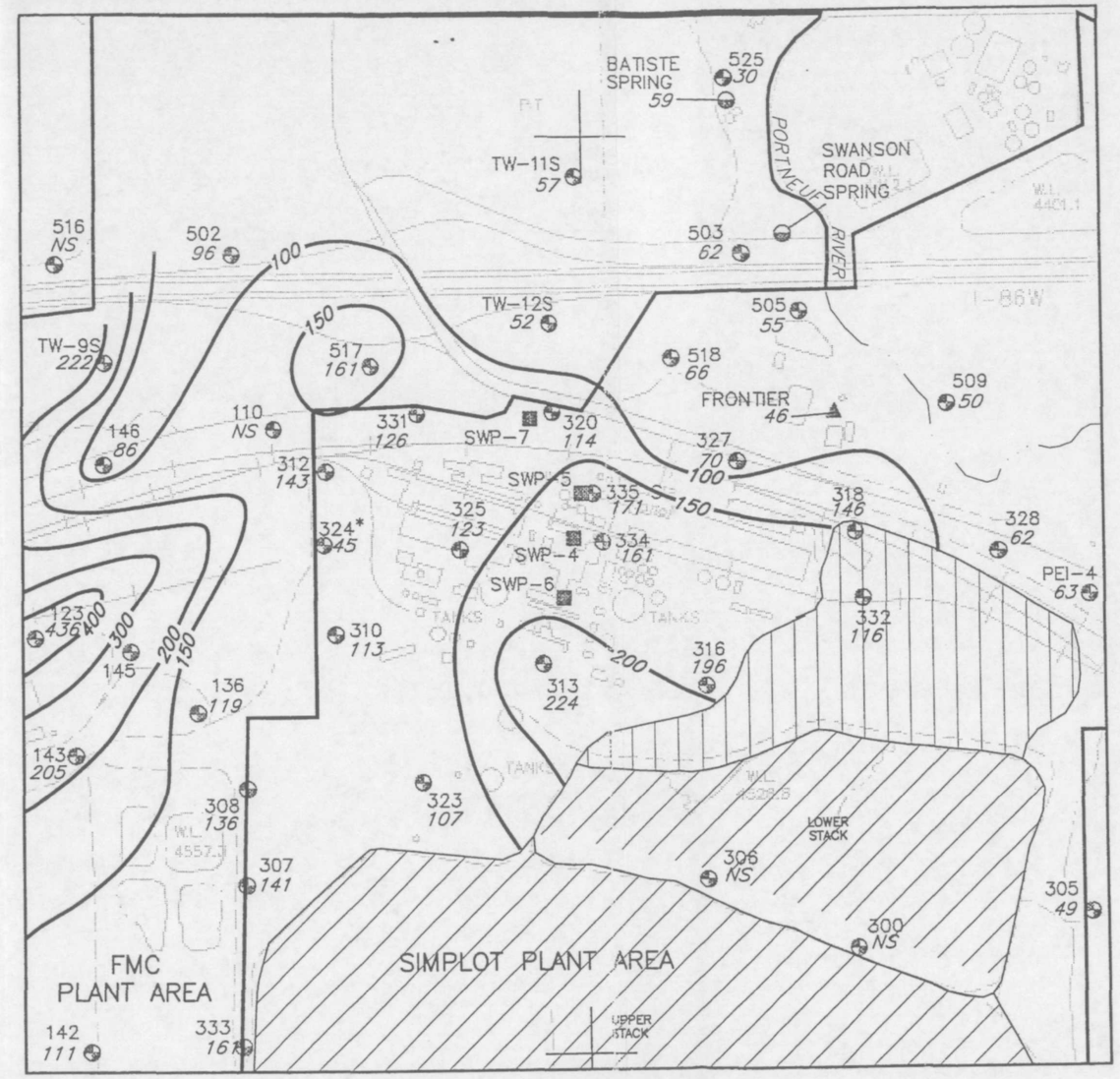
FIGURE 6

2/97 D:\5205\5205-108.DWG BY:SCG PLOT SCALE 1:1000



SELENIUM ISOCONCENTRATION LINES



CHLORIDE ISOCONCENTRATION LINES

LEGEND:

310	SHALLOW MONITORING WELL LOCATION AND DESIGNATION
0.023	CONCENTRATION IN mg/L
	CURRENT GYPSUM STACK
	APPROXIMATE LOCATION OF GYPSUM STACK FROM PRE-1966 OPERATIONS
NS	DENOTES WELL NOT SAMPLED
ND(0.003)	ANALYTE NOT DETECTED AT A CONCENTRATION ABOVE THE VALUE INDICATED IN THE PARENTHESIS
0.1	ISOCONCENTRATION LINE (VARIABLE CONTOUR INTERVAL)
FRONTIER	WATER SUPPLY WELL LOCATION AND DESIGNATION
SWP-5	PRODUCTION WELL LOCATION AND DESIGNATION
BATISTE SPRING	NATURAL SPRING

NOTES:

1. SIMPLOT AND FMC PLANT AREA GROUNDWATER SAMPLES WERE COLLECTED BETWEEN 11/29/95 AND 12/07/95.

*– DATA FOR WELL 324 ARE NOT CONSIDERED IN PREPARING THE ISOCONTOURS.

SCALE IN FEET

800 0 800 FEET

J.R. SIMPLOT COMPANY
DON PLANT

ISOCONCENTRATION MAPS FOR SELENIUM AND CHLORIDE – SHALLOW AQUIFER DECEMBER 1995

PROJECT: 5205.9	DATE: FEBRUARY, 1997	
REV:	BY: SCG	CHECKED: VM

McCULLEY, FRICK & GILMAN, INC.
providing environmental consulting and engineering services

FIGURE 7

2/97 D:\5205\5205-112.DWG BY:SCG

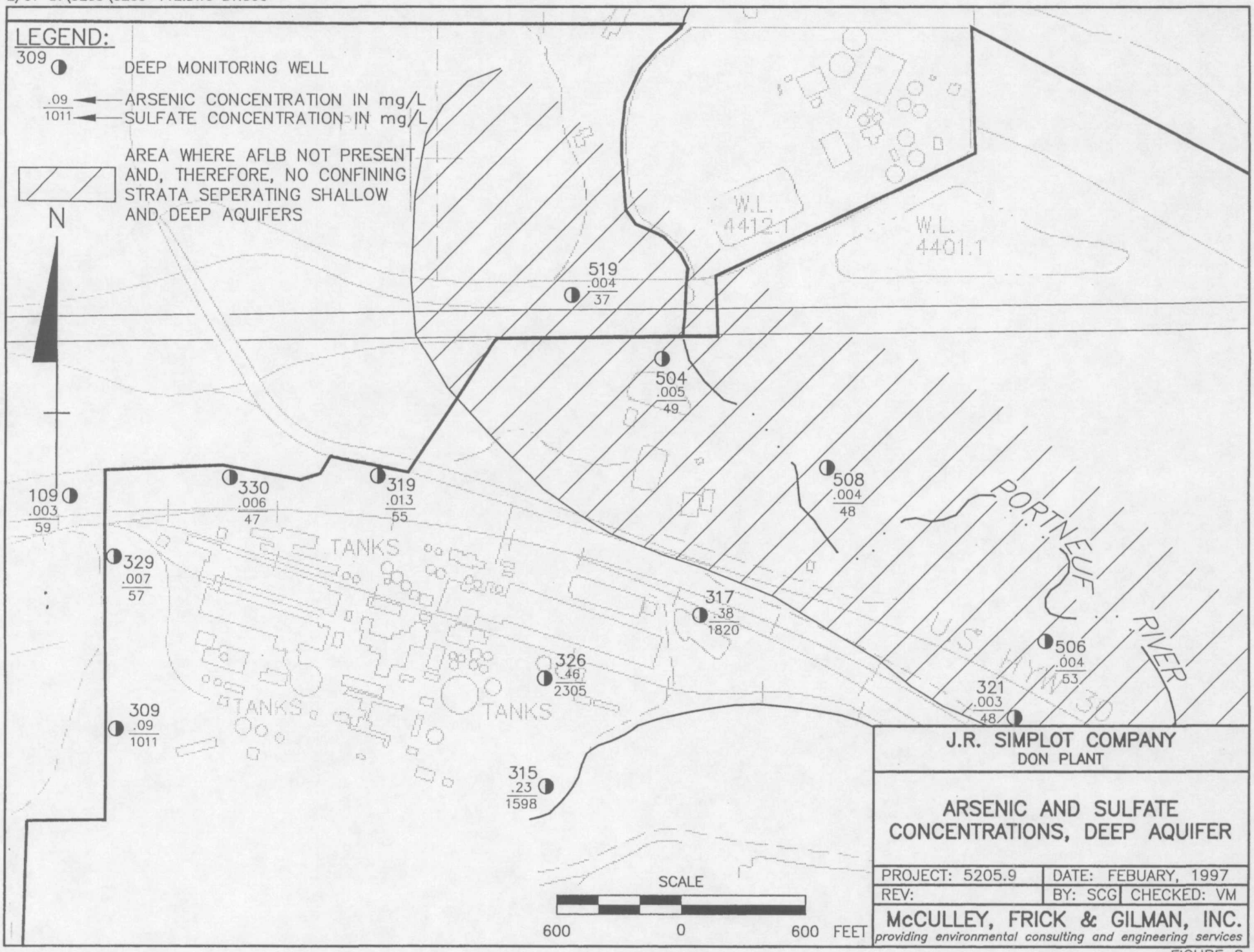


FIGURE 8

2/97 D:\5205\5205-113.DWG BY:SCG

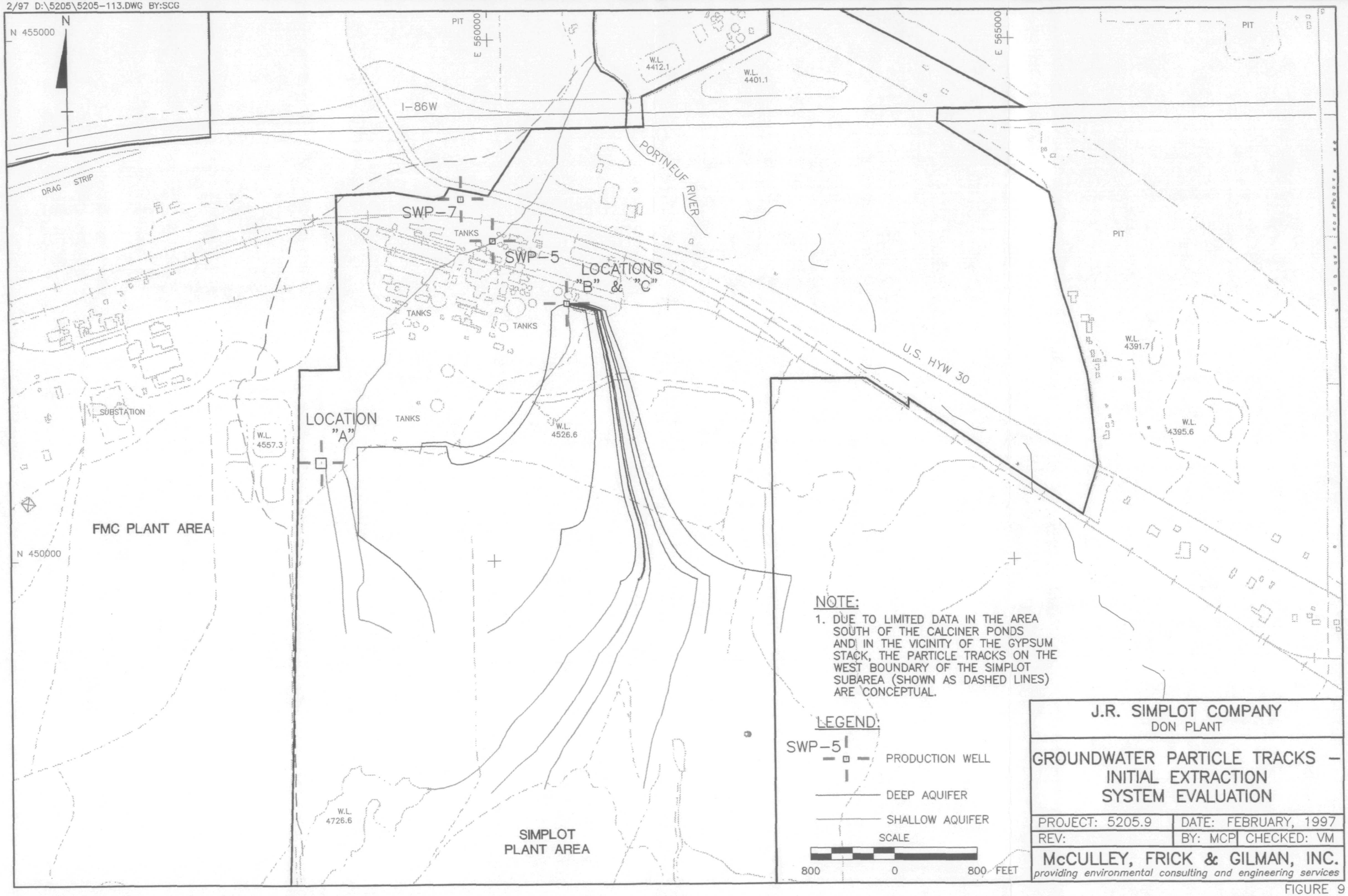
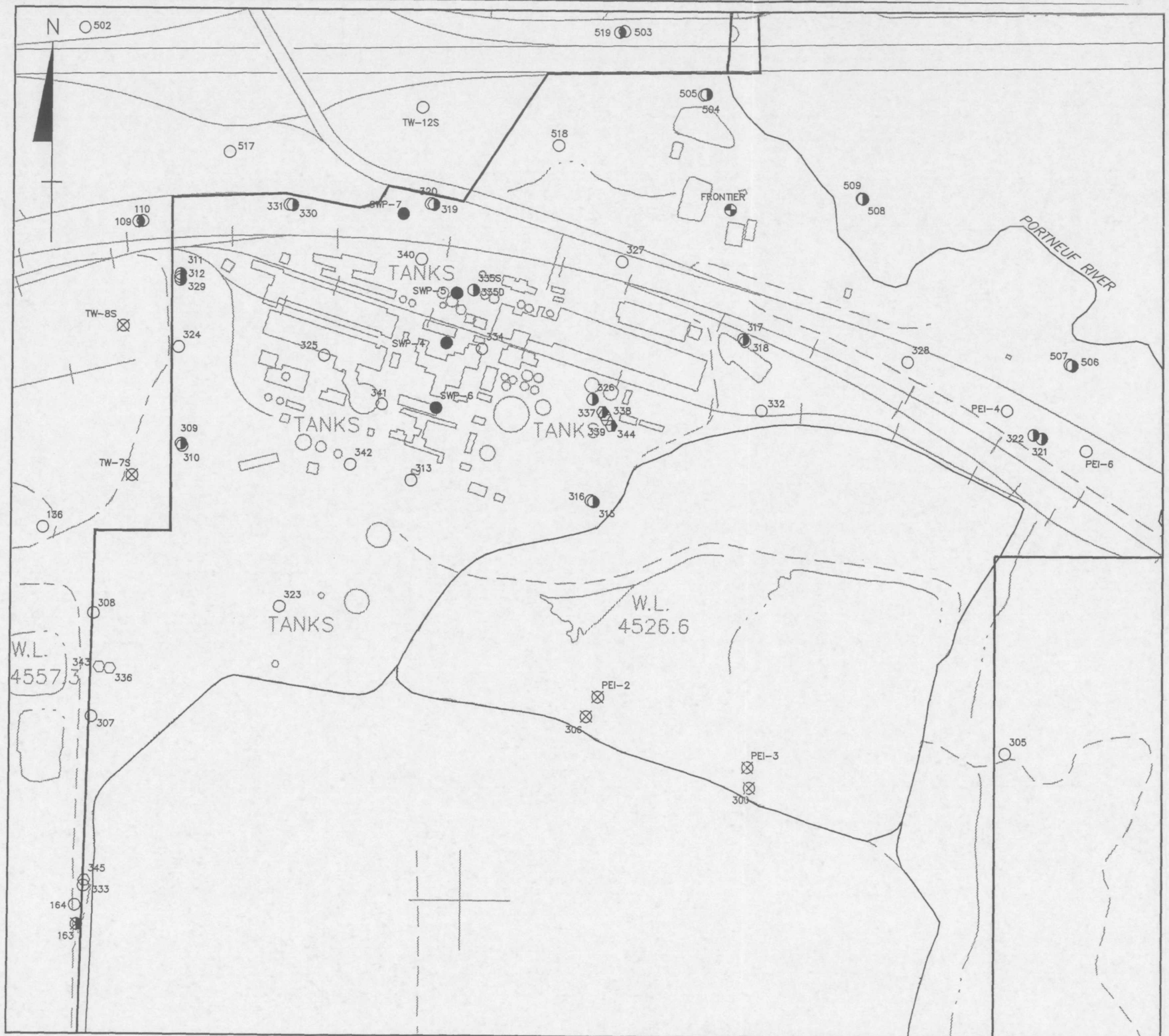


FIGURE 9



LEGEND:

- SHALLOW MONITORING WELL
- DEEP MONITORING WELL
- PRODUCTION WELL
- ABANDONED SHALLOW MONITORING WELL
- ABANDONED DEEP MONITORING WELL
- SHALLOW WELL INSTALLED FOR THIS INVESTIGATION
- DEEP WELL INSTALLED FOR THIS INVESTIGATION

SCALE

500 0 500 FEET

J.R. SIMPLOT COMPANY
DON PLANT

LOCATIONS OF EXISTING AND NEW WELLS, SIMPLOT PLANT AREA FALL 1996

PROJECT: 5205.9	DATE: FEBUARY, 1997
REV:	BY: MCP CHECKED: VM

McCULLEY, FRICK & GILMAN, INC.
providing environmental consulting and engineering services

FIGURE 10

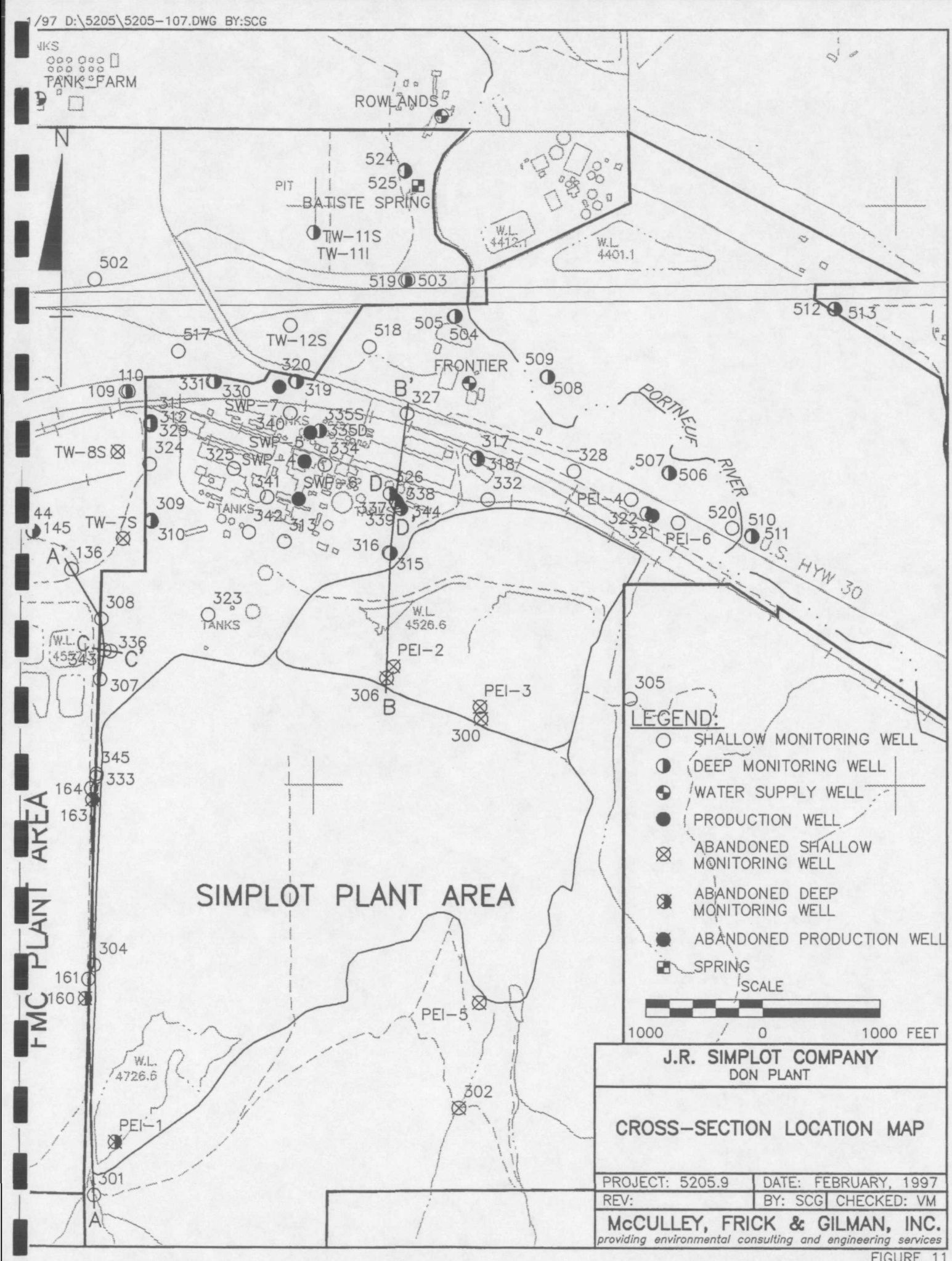

1/97 D:\5205\5205-107.DWG BY:SCG
TANK FARM
ROWLANDS
N
524
525
PIT
BATISTE SPRING
TW-11S
TW-11I
W.L. 4412.1
W.L. 4401.1
502
519
503
512
513
505
504
517
TW-12S
518
FRONTIER
509
508
110
109
331
330
320
319
B'
327
PORTNEUF RIVER
311
312
329
SWP-7
340
335S
335D
TW-8S
324
325
SWP-5
334
SWP-4
317
318
328
507
506
341
SWP-6
D
326
338
332
PEI-4
309
TANKS
342
313
337
339
344
D'
322
321
PEI-6
520
510
511
44
145
TW-7S
310
A'
136
316
315
U.S. HYW 30
308
323
TANKS
W.L. 4526.6
W.L. 4557
C
336
C'
343
307
PEI-2
306
B
PEI-3
300
305
345
333
164
163
FMC PLANT AREA
SIMPLOT PLANT AREA
304
161
160
PEI-5
W.L. 4726.6
302
PEI-1
301
A
LEGEND:
SHALLOW MONITORING WELL
DEEP MONITORING WELL
WATER SUPPLY WELL
PRODUCTION WELL
ABANDONED SHALLOW MONITORING WELL
ABANDONED DEEP MONITORING WELL
ABANDONED PRODUCTION WELL
SPRING
SCALE
1000
0
1000 FEET
J.R. SIMPLOT COMPANY
DON PLANT
CROSS-SECTION LOCATION MAP
PROJECT: 5205.9
DATE: FEBRUARY, 1997
REV:
BY: SCG
CHECKED: VM
McCULLEY, FRICK & GILMAN, INC.
providing environmental consulting and engineering services

FIGURE 11

1/97 D:\5205\5205-116.DWG BY:SCG

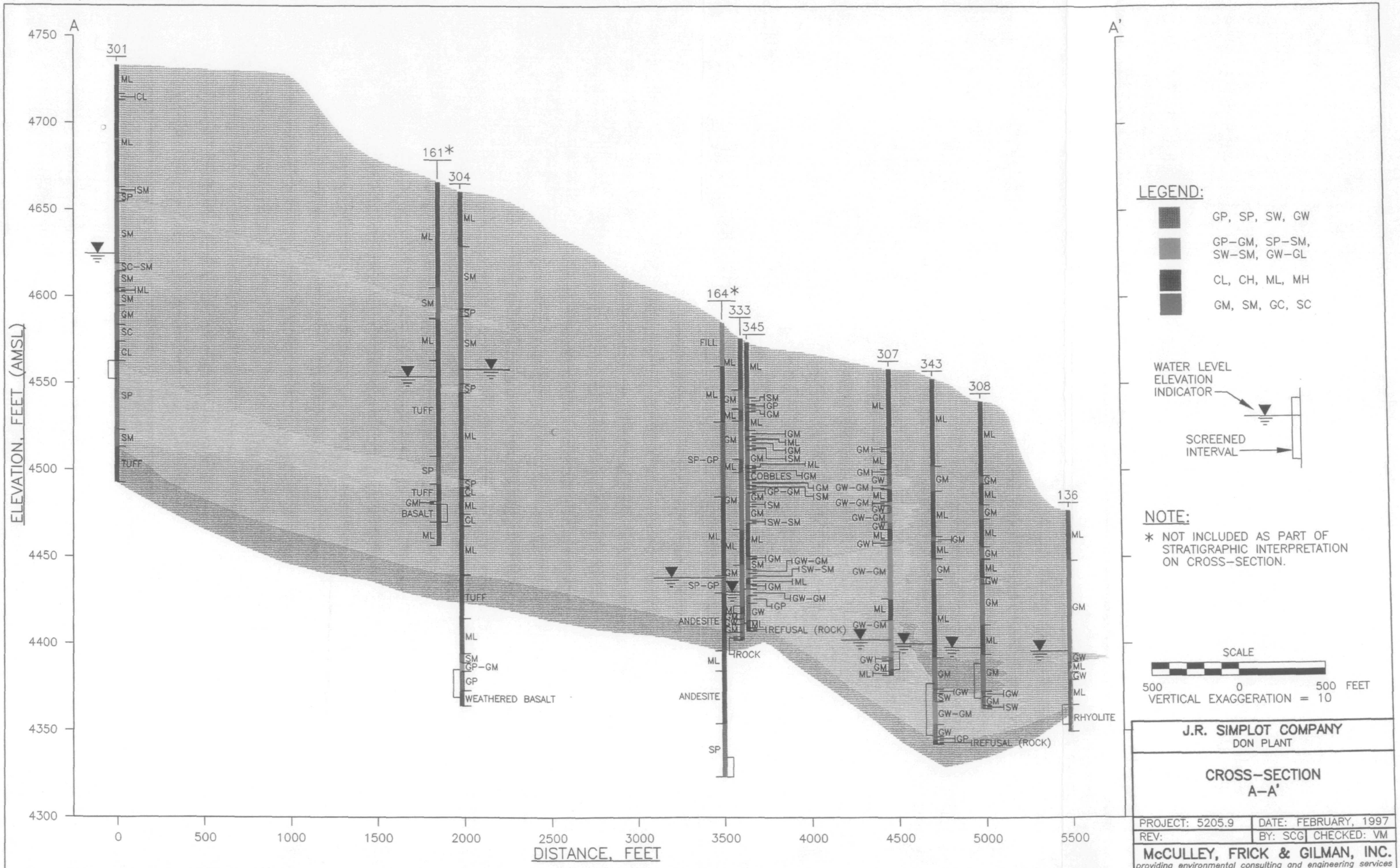
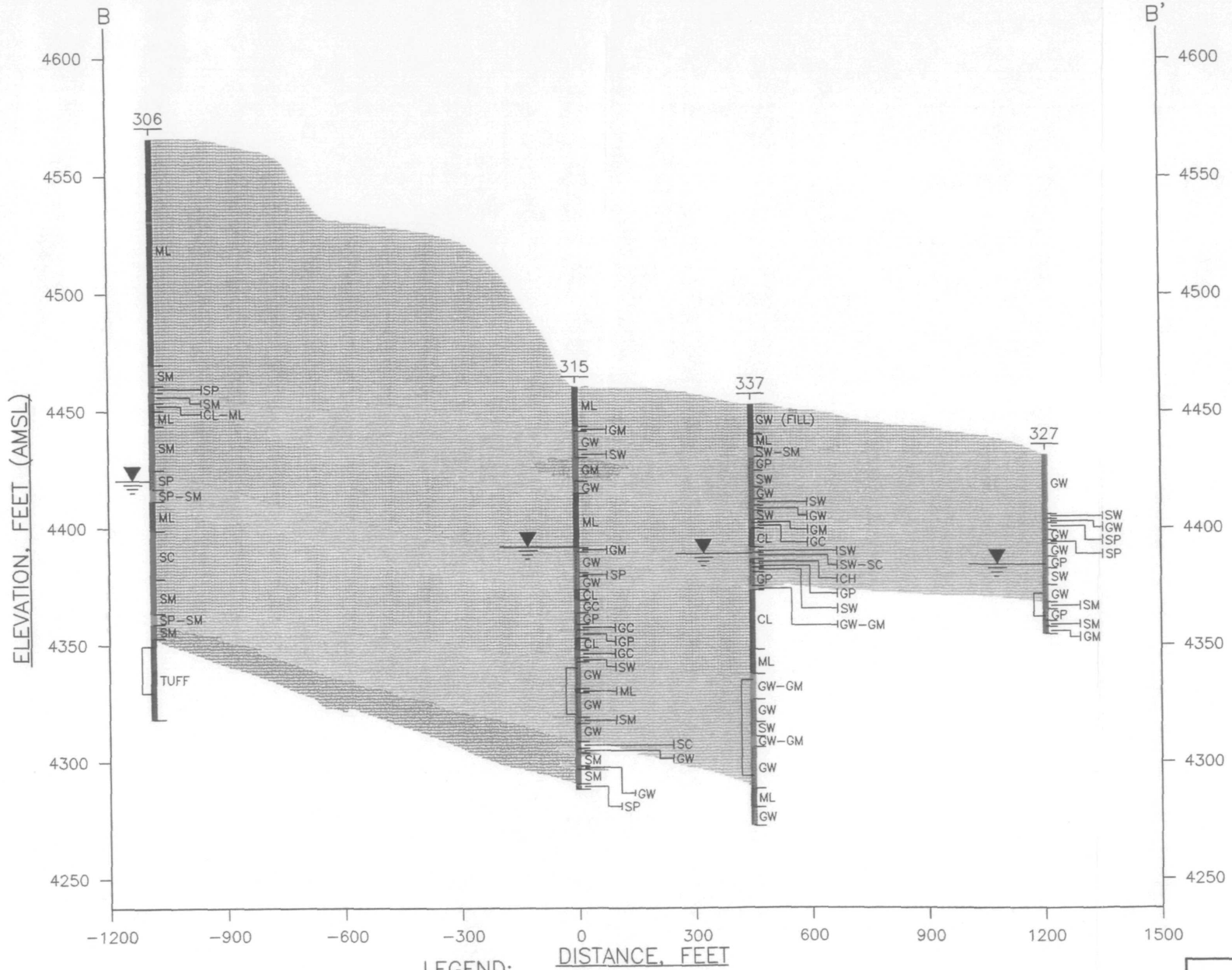


FIGURE 12

2/97 D:\5205\5205-117.DWG BY:SCG



LEGEND:

- GP, SP, SM, GW
- GP-GM, SP-SM, SW-SM, GW-GC
- CL, CH, ML, MH
- GM, SM, GC, SC

WATER LEVEL ELEVATION INDICATOR

SCREENED INTERVAL

SCALE

300 0 300 FEET

VERTICAL EXAGGERATION = 6X

J.R. SIMPLOT COMPANY
DON PLANT

CROSS-SECTION B-B'

PROJECT: 5205.9	DATE: FEBRUARY, 1997
REV:	BY: SCG CHECKED: VM

McCULLEY, FRICK & GILMAN, INC.
providing environmental consulting and engineering services

FIGURE 13

1/97 D:\5205\5205-106.DWG 5205-106.HPC BY:SCG

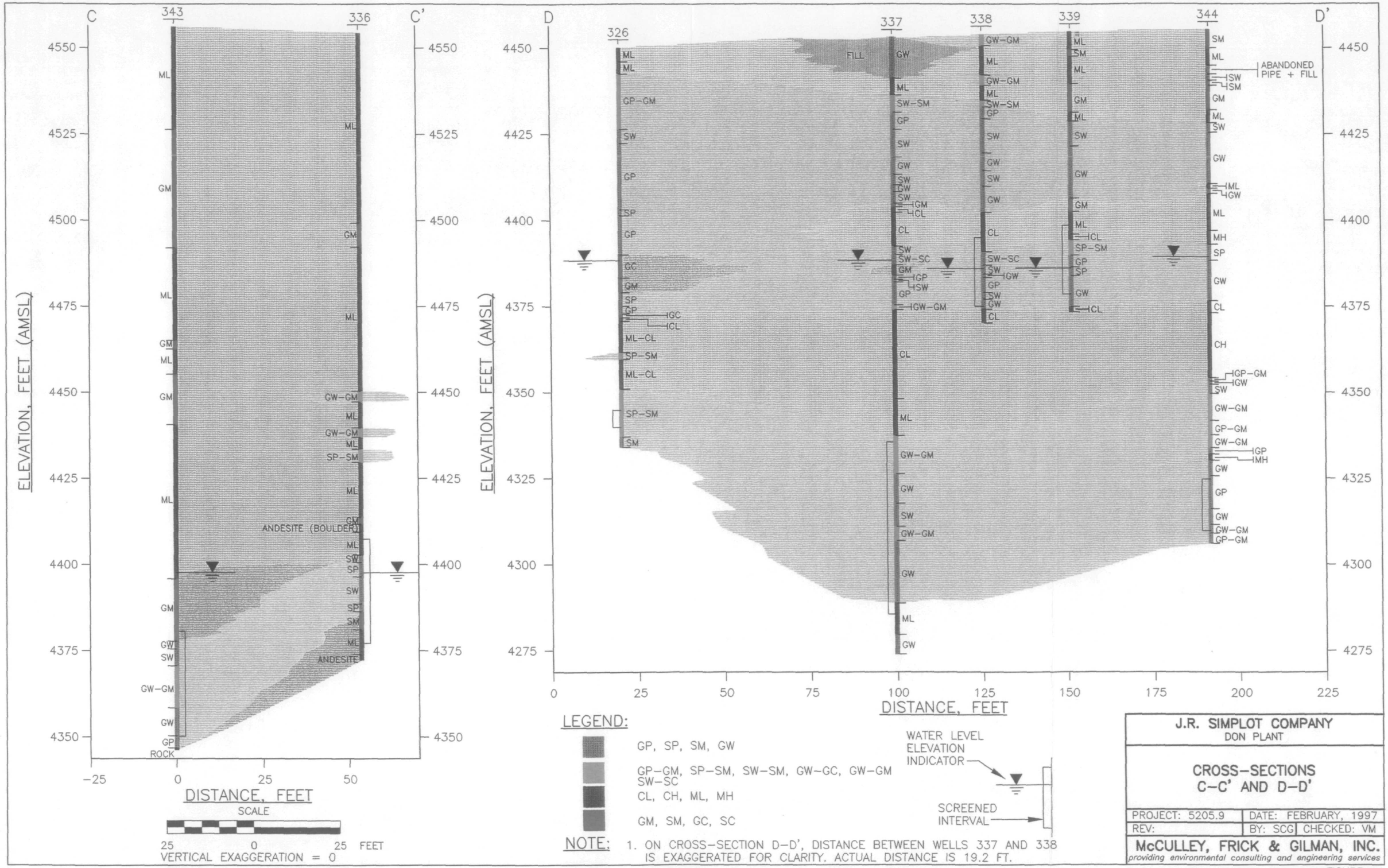


FIGURE 14

APPENDIX A

INSTALLATION PROCEDURES FOR EXTRACTION AND OBSERVATION WELLS

APPENDIX A
INSTALLATION PROCEDURES FOR EXTRACTION AND OBSERVATION WELLS

Well logs for the extraction and observation wells constructed as part of this field effort can be found in Appendix B of this document.

EXTRACTION WELLS

Four extraction wells (337, 338, 343, and 345) were installed as part of this field effort. Drilling was performed using an AP-1000 dual wall, reverse circulation, air hammer drill rig. The drill bit and casing were 10.75-inch outer diameter.

Borings were logged by a registered professional geologist based on drill cuttings, which were "grab" sampled approximately every two feet.

Wells were cased using 6-inch diameter Schedule 80 polyvinyl chloride (PVC) casing. Wells were screened using 6-inch diameter Schedule 80 continuous slot screen. All well screens were 20-slot screen, and all wells had 3-foot sumps. Stainless steel centralizers were placed just below and just above the screened interval. While the casing was held under tension, filter material consisting of clean 10-20 silica sand was placed to at least two feet above the well screen by gravity feed from the surface. Depth of the filter material was checked using a weighted measuring tape. At least two feet of bentonite pellets were placed above the sand and hydrated. A cement bentonite slurry was placed above the pellets to within approximately 5 feet of the ground surface.

The upper five feet of the annulus was filled with cement. A 6-foot long 8-inch nominal inner diameter (i.d.) steel protective casing (minimum 3/16-inch thick) was imbedded in the concrete to at least three feet below grade and fitted with a locking cap. A concreted pad at least 6 inches thick and approximately three feet square was constructed around the protective casing. Four protective bollards were emplaced around the well head. The bollards consist of 4-inch i.d. steel pipe, extending three feet above and below the ground surface, and filled with concrete.

OBSERVATION WELLS

Observation wells (336, 339, and 344) were also drilled using an AP-1000 dual wall, reverse circulation, air hammer drill rig. For well 336, the drill bit and casing were 10.75-inch outer diameter. For wells 339 and 344 the drill bit and casing were 9-inch outer diameter.

Borings were logged by a registered professional geologist based on drill cuttings, which were "grab" sampled approximately every two feet.

Wells were cased with 4-inch diameter Schedule 40 PVC casing and screened with 4-inch diameter Schedule 40, factory slotted 20-slot screen.

Well completion was accomplished in the same manner as the extraction wells, except that centralizers were not used because they would not fit in the annular space between the PVC and the drill casing.

WELL DEVELOPMENT

Wells were developed by surging with a surge block and bailing with a stainless steel and Teflon bailer until fine particulates were significantly decreased. Wells were then pumped at approximately 20 gpm until the temperature and pH were stable, and water was clear or nearly clear. Well 345 could not sustain a 20 gpm pumping rate and was pumped at approximately 5 gpm.

APPENDIX B

WELL LOGS

J.R. Simplot Don Plant	LOG OF MONITORING WELL 336

BORING LOCATION: *N 453218.1 E 559784.1 (near west fenceline)*		ELEVATION AND DATUM: *4556.63 ft NGVD top of PVC*	
DRILLING AGENCY: *Layne Christensen*	DRILLER: *Blaine Wright*	DRILL BIT: *10.75" O.D.*	DATE STARTED: *8/20/96*
DRILLING METHOD: *dual wall reverse circulation air hammer*		BORING DEPTH: *181' bgs*	DATE FINISHED: *8/23/96*
SIZE AND TYPE OF CASING: *4" flush-threaded Sch40 PVC; 0.020" slot*		WELL DEPTH: *179.6' bgs*	CHECKED BY: *D. Frick*
SAMPLING METHOD: *split spoon and cuttings*		LOGGED BY: *V. Martinez*	
SAMPLER TYPE: *3" split spoon, grab*	LENGTH: *2'* / DROP: *3'*		

DEPTH (feet)	DESCRIPTION	USCS CLASS	WELL CONSTRCT.	DEPTH (feet)	SAMPLING RUN NO (Recov)	SAMPLING BLOWS/ 6 in.	REMARKS (drill rate, fluid loss, odor, etc.)
	SILT, light brownish gray (10YR 6/2), dry	ML					PVC casing stickup: 2.33 ft ground elevation: 4554.3 ft
2			Concrete	2			
4				4			
6				6			
8				8			
10	very pale brown, <1% coarse very angular sand (sand is white-7.5YR 8/10)			10			
12				12			
14				14			
16			Grout	16			
18				18			
20	light brownish gray (10YR 6/2), slightly damp			20			
22				22			
24				24			
26				26			
28				28			
30				30			

J.R. Simplot Don Plant	LOG OF MONITORING WELL 336

DEPTH (feet)	DESCRIPTION	USCS CLASS	WELL CONSTRCT.	DEPTH (feet)	SAMPLING RUN NO (Recov)	SAMPLING BLOWS/ 6 in.	REMARKS (drill rate, fluid loss, odor, etc.)
	pale brown (10YR 6/3)	ML					
32				32			
34				34			
36				36			
38				38			
40				40			
42				42			
44				44			
46				46			
48	light gray (10YR 7/2), about 5% angular to subangular fine gravel		Grout	48			
50				50			
	increasing gravel						
52				52			
54				54			
	SILTY FINE GRAVEL, light gray (10YR 7/2), dry, gravel is angular to subangular	GM					
56				56			
58	fine to coarse gravel			58			
60				60	1 (1%)	8/11/17	
62	SILT with gravel, light gray (10YR 7/2), dry	GM		62			
64				64			

J.R. Simplot Don Plant	LOG OF MONITORING WELL 336

DEPTH (feet)	DESCRIPTION	USCS CLASS	WELL CONSTRCT.	DEPTH (feet)	SAMPLING RUN NO (Recov)	SAMPLING BLOWS/ 6 in.	REMARKS (drill rate, fluid loss, odor, etc.)
66		ML		66			
68	sandy silt with gravel, pale brown (10YR 6/3), dry, gravel is fine, angular to subangular, porphyritic dark volcanics			68			
70	gravelly silt with trace fine grained sand, light gray (10YR 7/2), gravel is mixed lithology			70	2 (50%)	15/28/31	
72				72			
74	silt with gravel, very pale brown (10YR 7/3), dry			74			
76	decreased gravel to trace amounts			76			
78				78			
80	pale brown (10YR 6/3), slightly damp		Grout	80	3 (0%)	5/16/17	
82				82			
84	5-10% gravel			84			
86	decreased gravel			86			
88				88			
90	silt with coarse sand			90	4 (10%)	9/15/20	
92				92			
94				94			
96	silt with gravel			96			
98				98			

J.R. Simplot Don Plant	LOG OF MONITORING WELL 336

DEPTH (feet)	DESCRIPTION	USCS CLASS	WELL CONSTRCT.	DEPTH (feet)	SAMPLING RUN NO (Recov)	SAMPLING BLOWS/ 6 in.	REMARKS (drill rate, fluid loss, odor, etc.)
100	silt with coarse sand, light yellowish brown (10YR 6/4), slightly damp	ML		100	5 (0%)	7/15/20	
102				102			
104	FINE to COARSE, WELL GRADED GRAVEL with silt, light yellowish brown (10YR 6/4), slightly damp	GW-GM		104			hard drilling-large piece of boulder blown out
106				106			
108	SILT with well graded fine to coarse grained sand, light brownish gray (10YR 6/2), dry	ML		108			
110	gravelly silt with sand			110			
112	silt with gravel			112			
114			Grout	114			
116	WELL GRADED GRAVEL with silt and sand, light brownish gray (10YR 6/2), dry	GW-GM		116			hard drilling
118	SILT with gravel and trace fine grained sand, light brownish gray (10YR 6/2), dry, gravel is fine to coarse	ML		118			
120				120			
122	COARSE GRAINED SAND with silt and trace fine grained sand, light brownish gray (10YR 6/2), dry	SP-SM		122			
124				124			
126				126			
128	SANDY SILT with gravel, yellowish brown (10YR 5/4), damp, sand is coarse with slight medium and fine grained	ML		128			
130				130			
132				132			

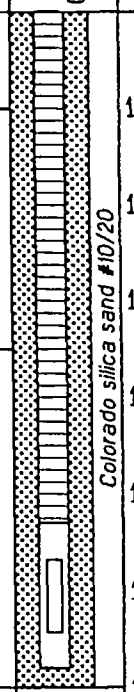
J.R. Simplot Don Plant

LOG OF MONITORING WELL 336

DEPTH (feet)	DESCRIPTION	USCS CLASS	WELL CONSTRCT.	SAMPLING RUN NO (Recov)	SAMPLING BLOWS/ 6 in.	REMARKS (drill rate, fluid loss, odor, etc.)
	silt with medium to coarse grained sand, light brownish gray (10YR 6/2)	ML				
134	silt with coarse grained sand and fine gravel, brown (10YR 5/3), damp		Grout			
136						
138			Bentonite chips			
	silt with coarse grained sand and fine to coarse dark porphyritic volcanic gravel					
140						
	SILTY GRAVEL with coarse grained sand, pale brown (10YR 6/3), damp	GM				
142						
	ROCK - andesitic porphyry, matrix: gray (2.5Y 5/0), phenocrysts: white (lighter than any of the color chips) 1-5 mm in size with iron staining around edges	Andesite				
144						
	SILT with gravel and coarse grained sand, brown (10YR 5/3), damp	ML				
146						
148						
150						
152			Colorado silica sand #10/20			
	WELL GRADED, FINE to COARSE GRAINED SAND, brown (10YR 5/3), damp	SW				
154						water level 9-22-96: 156.86 ft below top of PVC casing
	POORLY GRADED, COARSE GRAINED SAND with minor (<5%) fine sand and silt, brown (10YR 5/3), damp to moist, rounded to subangular	SP				
156						
158						
	WELL GRADED SAND, dark grayish brown (10YR 4/2), with minor silt, moist, rounded to subangular	SW				
160						
162						
	wet - water during drilling					
164						
166						

J.R. Simplot Don Plant	LOG OF MONITORING WELL 336

DEPTH (feet)	DESCRIPTION	USCS CLASS	WELL CONSTRCT.	DEPTH (feet)	SAMPLING RUN NO (Recov)	SAMPLING BLOWS/ 6 in.	REMARKS (drill rate, fluid loss, odor, etc.)
	POORLY GRADED, MEDIUM to COARSE GRAINED SAND with minor silt, dark grayish brown (10YR 4/2), subrounded to subangular	SP					
168	WELL GRADED SILTY SAND, brown (10YR 5/3), angular to subangular, ~5-10% gravel	SM		168			
170				170			
172				172			
174	SANDY SILT with gravel, brown to dark brown (10YR 4/3), ~10% gravel; ~40% sand, sand is predominately fine grained	ML		174			
176				176			
178				178			
180	ROCK - andesitic porphyry and rhyolitic porphyry, matrix: dark gray (2.5Y 4/0) and very pale brown (10YR 7/3), phenocrysts: white 1-2 mm, rhyolite has andesitic phenocrysts in it	Bedrock		180			very hard drilling
182	Bottom of hole at 181 ft bgs			182			
184				184			
186				186			
188				188			
190				190			
192				192			
194				194			
196				196			
198				198			
200				200			



J.R. Simplot Don Plant	LOG OF MONITORING WELL 337

BORING LOCATION: *N 452460.6 E 560698.9 (south of cooling towers)*		ELEVATION AND DATUM: *4455.33 ft NGVD top of PVC*	
DRILLING AGENCY: *Layne Christensen*	DRILLER: *Blaine Wright*	DRILL BIT: *10.75" O.D.*	DATE STARTED: *8/23/96*
DRILLING METHOD: *dual wall reverse circulation air hammer*		BORING DEPTH: *179.0' bgs*	DATE FINISHED: *8/27/96*
SIZE AND TYPE OF CASING: *6" flush-threaded Sch80 PVC; 0.020" cont. slot*		WELL DEPTH: *160.6' bgs*	CHECKED BY: *D. Frick*
SAMPLING METHOD: *cuttings*		LOGGED BY: *V. Martinez*	
SAMPLER TYPE: *grab*	LENGTH: *N/A* / DROP: *N/A*		

DEPTH (feet)	DESCRIPTION	USCS CLASS	WELL CONSTRCT.	DEPTH (feet)	REMARKS (drill rate, fluid loss, odor, etc.)
	(ROAD FILL) GRAVEL and SILT, dark grayish brown (10YR 4/2), subangular to rounded gravel, varying lithology	GW	Concrete		PVC casing stickup: 2.23 ft ground elevation: 4453.1 ft
12	SILT with FINE GRAVEL, brown to dark brown (10YR 4/3), damp, ~10% medium grained sand, gravel subangular to subrounded	ML	Grout		
18	WELL GRADED FINE to COARSE GRAINED SAND with silt and gravel, ~5% cobbles, brown to dark brown (10YR 4/3), damp, gravel is varying lithology and rounded to subrounded	SW-SM			
22	POORLY GRADED GRAVEL with ~5% silt and 5% coarse grained sand, variable lithology (multicolored), rounded to subrounded	GP			
	WELL GRADED FINE to COARSE GRAINED SAND, brown (7.5YR 5/2), damp, sand is subrounded to subangular, varying lithology	SW			

J.R. Simplot Don Plant	LOG OF MONITORING WELL 337

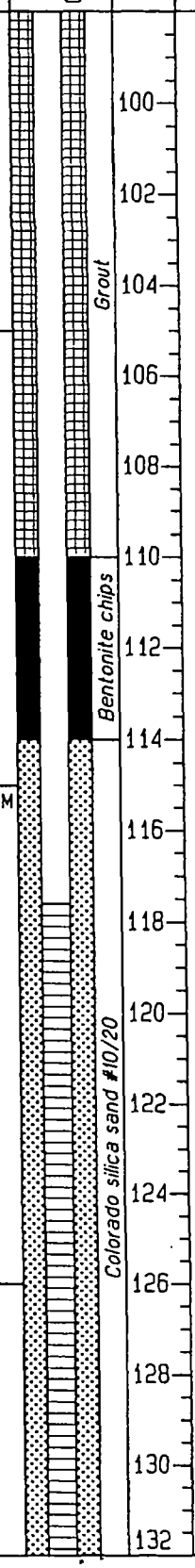
DEPTH (feet)	DESCRIPTION	USCS CLASS	WELL CONSTRCT.	DEPTH (feet)	REMARKS (drill rate, fluid loss, odor, etc.)
	increasing gravel (~10%)	SW			
32	increased gravel to well graded sand with gravel			32	
34				34	
36	WELL GRADED GRAVEL with sand and 5% cobbles, trace fines, pale brown (10YR 6/3), dry, gravel well rounded to subrounded, predominantly quartzite with some volcanics	GW		36	
38				38	
40	WELL GRADED SAND with gravel, brown (10YR 5/3), dry to damp, well rounded to subangular (~15% gravel)	SW		40	
42				42	
44	WELL GRADED GRAVEL with sand and ~10% cobbles, brown (10YR 5/3), gravel: varying lithology, well rounded to subrounded	GW		44	
46	WELL GRADED SAND, brown (10YR 5/3), damp	SW	Grout	46	
48				48	
50	POORLY GRADED SILTY COARSE GRAVEL and COBBLES, brown (10YR 5/3), damp, ~40% silt, ~15% fine gravel, varying lithology	GM		50	
52	CLAYEY POORLY GRADED GRAVEL, brown (10YR 5/3), moist	GC		52	
54	LEAN CLAY, brown (10YR 5/3), moist to wet, trace gravel	CL		54	
	no gravel				
56				56	
58	wet			58	
	increased fine grained sand to sandy lean clay, damp				
60				60	
62	WELL GRADED SAND, minor clay, brown (10YR 5/3), damp	SW		62	
64	WELL GRADED CLAYEY SAND with gravel, brown (10YR 5/3), moist	SW-SC		64	

J.R. Simplot Don Plant	LOG OF MONITORING WELL 337

DEPTH (feet)	DESCRIPTION	USCS CLASS	WELL CONSTRCT.	DEPTH (feet)	REMARKS (drill rate, fluid loss, odor, etc.)
		SW-SC			water level 9-3-96: 84.45 ft bgs
66	FAT CLAY, grayish brown (10YR 5/2), damp, medium stiff with ~10% gravel and cobbles, ~3% white shell fragments	CH		66	
68				68	water level 8-25-96: 68.3 ft bgs with 120 ft of drill stem in
	POORLY GRADED GRAVEL with sand, grayish brown (10YR 5/2), damp, minor clay, ~20% well graded sand	GP			
70	WELL GRADED SAND, grayish brown (10YR 5/2), wet, rounded to subangular	SW		70	
	water during drilling	GP			
72	POORLY GRADED GRAVEL with well graded sand, grayish brown (10YR 5/2), wet, rounded to subangular			72	
74				74	
	slightly increased fines (~5-10%), saturated				producing water
76				76	
78	WELL GRADED GRAVEL with silt and well graded sand, brown (10YR 5/3), saturated, ~5% cobbles, ~40% sand	GW-GM		78	
	LEAN CLAY with gravel and sand, yellowish brown (10YR 5/4), wet, gravel and sand are variable lithology	CL			cobbles stuck in return pipe
80	no gravel, decreased sand to ~10%		Grout	80	
82				82	
84	clay, moist, ~1% or less shells, 5-10% very dark gray mottling ((2-5 mm size) (possibly organic material-2.5Y 3/0) and 5% or less strong brown (7.5YR 5/8) mottling (1-3 mm size)			84	
86				86	
88				88	
90				90	
92				92	
94				94	
96				96	
98				98	

J.R. Simplot Don Plant	LOG OF MONITORING WELL 337

DEPTH (feet)	DESCRIPTION	USCS CLASS	REMARKS (drill rate, fluid loss, odor, etc.)
100–104		CL	
106–114	GRAVELLY SILT, silt is brown (10YR 5/3), gravel is black (10YR 2/1), volcanic, saturated	ML	
116–126	SILTY GRAVEL, silt is brown (10YR 5/3), gravel is black (10YR 2/1), volcanic, with white phenocrysts, well graded gravel with coarse grained sand cobbles decreasing silt	GW-GM	producing good water
126–132	WELL GRADED GRAVEL with abundant well graded sand, varying lithologies (multicolored-quartzite, volcanics), ~5-10% cobbles	GW	



J.R. Simplot Don Plant	LOG OF MONITORING WELL 337

DEPTH (feet)	DESCRIPTION	USCS CLASS	WELL CONSTRCT.	DEPTH (feet)	REMARKS (drill rate, fluid loss, odor, etc.)
	decreasing sand, increasing cobbles	GW			
134				134	
136	WELL GRADED SAND with abundant gravels and cobbles, and trace fines, varying lithology (multicolored)	SW		136	harder drilling, cobbles getting stuck in return pipe
138				138	
140				140	
142	SILTY WELL GRADED GRAVEL, silt is brown to dark brown (10YR 4/3), gravel is dark brown (10YR 3/3), porphyritic, phenocrysts are white	GW-GM		142	
144				144	
146	WELL GRADED GRAVEL with sand and some silt, sand and gravels are dark brown (10YR 3/3), porphyritic with white phenocrysts	GW	Colorado silica sand #10/20	146	
148				148	
150				150	
152				152	
154				154	
156				156	
158				158	
160				160	
162				162	
164	SANDY CLAYEY SILT with ~5% gravel, brown to dark brown (10YR 4/3), sand and gravel are dark volcanics	ML		164	
166				166	

J.R. Simplot Don Plant	LOG OF MONITORING WELL 337

DEPTH (feet)	DESCRIPTION	USCS CLASS	WELL CONSTRCT.	DEPTH (feet)	REMARKS (drill rate, fluid loss, odor, etc.)
168		ML		168	
170				170	
172				172	
174	VOLCANIC GRAVEL, very dark gray to dark brown (10YR 3/1 to 10YR 3/3), ~10% well graded sand and minor fines, gravels are porphyritic with white phenocrysts, subrounded to angular	GW	Bentonite pellets	174	
176				176	
178				178	
180	Bottom of hole at 179 ft bgs			180	
182				182	
184				184	
186				186	
188				188	
190				190	
192				192	
194				194	
196				196	
198				198	
200				200	

J.R. Simplot Don Plant	LOG OF MONITORING WELL 338

BORING LOCATION: *N 452444.8 E 560709.8 (south of cooling towers)*		ELEVATION AND DATUM: *4455.79 ft NGVD top of PVC*	
DRILLING AGENCY: *Layne Christensen*	DRILLER: *Blaine Wright*	DRILL BIT: *10.75" O.D.*	DATE STARTED: *8/27/96*
DRILLING METHOD: *dual wall reverse circulation air hammer*		BORING DEPTH: *83.5' bgs*	DATE FINISHED: *8/28/96*
SIZE AND TYPE OF CASING: *6" flush-threaded Sch80 PVC; 0.020" cont. slot*		WELL DEPTH: *81.7' bgs*	CHECKED BY: *D. Frick*
SAMPLING METHOD: *cuttings*		LOGGED BY: *V. Martinez*	
SAMPLER TYPE: *grab*	LENGTH: *N/A* DROP: *N/A*		

DEPTH (feet)	DESCRIPTION	USCS CLASS	WELL CONSTRCT.	DEPTH (feet)	REMARKS (drill rate, fluid loss, odor, etc.)
	(FILL) WELL GRADED SILTY GRAVEL, dark grayish brown (10YR 4/2), damp	GW-GM	Concrete		PVC casing stickup: 2.19 ft ground elevation: 4453.6 ft
2				2	
	SILT, brown (10YR 5/3), damp	ML			
4				4	
6				6	
	silt with gravel, brown to dark brown (10YR 4/3), damp, gravel is subangular to subrounded, variable lithology				
8				8	
10				10	
12	GRAVEL with silt and sand, brown (10YR 5/3), gravel is well graded, subangular to subrounded, varying lithology	GW-GM		12	
14				14	
16	SILT with gravel, brown (10YR 5/3), damp, gravel is subrounded to subangular, variable lithology	ML	Grout	16	
18				18	
20	WELL GRADED SAND with silt and gravel, brown (10YR 5/3), damp	SW-SM		20	
22	WELL GRADED GRAVEL and COARSE GRAINED SAND, variable lithology (multicolored), ~5% silt	GP		22	
24				24	
26	WELL GRADED SAND with 10-5% coarse gravel and cobbles, pale brown (10YR 6/3), gravel is subrounded to subangular, variable lithology	SW		26	
28				28	
30	increased gravel			30	

J.R. Simplot Don Plant	LOG OF MONITORING WELL 338

DEPTH (feet)	DESCRIPTION	USCS CLASS	WELL CONSTRCT.	DEPTH (feet)	REMARKS (drill rate, fluid loss, odor, etc.)
		SW			
32				32	
34	WELL GRADED GRAVEL with sand, matrix is well graded sand, brown (10YR 5/3), damp	GW		34	
36				36	
38				38	
40	WELL GRADED SAND with gravel, brown (10YR 5/3), dry to damp, well rounded to subangular, variable lithology (multicolored)	SW	Grout	40	
42				42	
44	WELL GRADED GRAVEL with sand, light brownish gray (10YR 6/2), dry to damp, ~10% cobbles, gravel is subangular to subrounded, variable lithology (multicolored)	GW		44	
46				46	
48				48	
50				50	
52	LEAN CLAY, brown (10YR 5/3), moist to wet	CL	Bentonite pellets	52	
54				54	
56				56	
58			Colorado silica sand #10/20	58	
60				60	
62				62	
64	WELL GRADED CLAYEY SAND with 15-20% gravel, brown (10YR 5/3)	SW-SC		64	

Project No. 5205-9	McCulley, Frick & Gilman, Inc.	*Sheet 2 of 3*

J.R. Simplot Don Plant	LOG OF MONITORING WELL 338

DEPTH (feet)	DESCRIPTION	USCS CLASS	WELL CONSTRCT.	DEPTH (feet)	REMARKS (drill rate, fluid loss, odor, etc.)
66		SW-SC		66	
68	WELL GRADED SAND, brown (10YR 5/3), damp to moist, trace fines, ~5% gravel	SW		68	water level 9-3-96: 67.90 ft bgs
70	increased gravel (~10%)			70	
	WELL GRADED GRAVEL with well graded sand, variable lithology (multicolored), moist, subrounded to subangular	GW			
72	POORLY GRADED GRAVEL with well graded sand matrix, grayish brown (10YR 5/2), moist, minor fines	GP	Colorado silica sand #10/20	72	
74				74	
76	WELL GRADED SAND, variable lithology (multicolored), wet	SW		76	
78	WELL GRADED GRAVEL with well graded sand matrix, variable lithology (multicolored), moist	GW		78	
80	LEAN CLAY, yellowish brown (10YR 5/4), moist, ~1% or less shells, 5-10% very dark gray (2.5Y 3/0) mottling and 5% or less strong brown mottling (7.5YR 5/6)	CL		80	
82				82	
84	Bottom of hole at 83.5 ft bgs			84	
86				86	
88				88	
90				90	
92				92	
94				94	
96				96	
98				98	

J.R. Simplot Don Plant	LOG OF MONITORING WELL 339

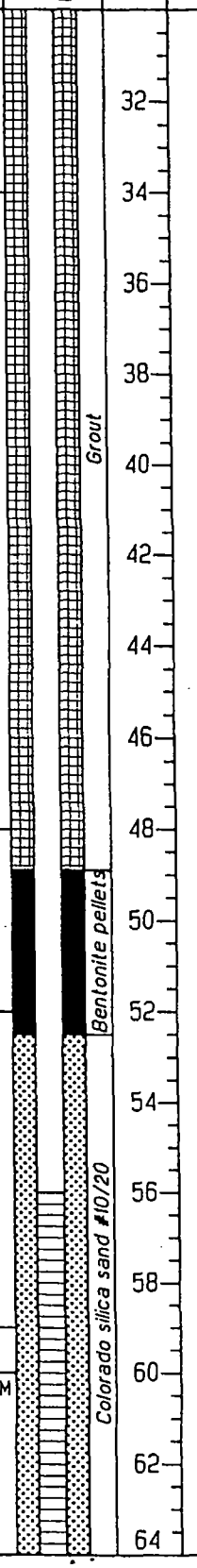
BORING LOCATION: *N 452421.6 E 560721.5 (south of cooling towers)*		ELEVATION AND DATUM: *4456.86 NGVD top of PVC*	
DRILLING AGENCY: *Layne Christensen*	DRILLER: *Blaine Wright*	DRILL BIT: *9" O.D.*	DATE STARTED: *9/4/96*
DRILLING METHOD: *dual wall reverse circulation air hammer*		BORING DEPTH: *81' bgs*	DATE FINISHED: *9/4/96*
SIZE AND TYPE OF CASING: *4" flush-threaded Sch40 PVC; 0.020" slot*		WELL DEPTH: *79' bgs*	CHECKED BY: *D. Frick*
SAMPLING METHOD: *cuttings*		LOGGED BY: *V. Martinez*	
SAMPLER TYPE: *grab*	LENGTH: *N/A* / DROP: *N/A*		

DEPTH (feet)	DESCRIPTION	USCS CLASS	WELL CONSTRCT.	DEPTH (feet)	REMARKS (drill rate, fluid loss, odor, etc.)
	SILT, black (10YR 2/1), dry, <1% gravel	ML	Concrete		PVC casing stickup: 2.28 ft ground elevation: 4454.6 ft
4	sandy silt with gravel, dark brown (7.5YR 3/2), dry, ~3% fine gravel, ~15% fine to medium grained sand				
6	WELL GRADED SILTY SAND, dark grayish brown (10YR 4/2), damp	SM			
8	SILT with minor gravel (~3%), grayish brown (10YR 5/2), moist to wet, gravel up to 3" dia., subangular to subrounded	ML			
10	silt with fine gravel and coarse grained sand (20-30%), damp to moist				
12	silt with well graded sand and fine gravel (30-40%), pale brown (10YR 6/3), barely damp				
14					
16	WELL GRADED SILTY GRAVEL with well graded sand, pale brown (10YR 6/3), damp, gravel is variable lithology, subrounded to subangular	GM	Grout		
18	increased gravel				
20					
22					
24	SILT with coarse grained sand and gravel (~20%), light gray (10YR 7/2), dry	ML			
26	WELL GRADED SAND with ~10% gravel, grayish brown (10YR 5/2), damp	SW			
28					
30					

J.R. Simplot Don Plant

LOG OF MONITORING WELL 339

DEPTH (feet)	DESCRIPTION	USCS CLASS
32		SW
34	WELL GRADED GRAVEL with well graded sand (30-40%), pale brown (10YR 6/3), dry, trace fines	GW
36		
38	very pale brown (10YR 7/3)	
40		
42		
44	increased silt to ~5-10%	
	decreased silt (trace)	
46		
48	SILTY GRAVEL, dark grayish brown (10YR 4/2), damp to moist, gravel up to 3" dia.	GM
50		
52	SILT, yellowish brown (10YR 5/4), damp to moist, ~5% gravel of varied lithology, subangular	ML
54		
	silt, brown (10YR 5/3), ~3% sand, wet	
56		
58		
	LEAN CLAY, light gray to gray (10YR 6/1), with trace fine grained sand, damp	CL
60	POORLY GRADED SILTY FINE GRAINED SAND, yellowish brown (10YR 5/4), damp	SP-SM
62	increased gravel	
64		



REMARKS (drill rate, fluid loss, odor, etc.)

J.R. Simplot Don Plant	LOG OF MONITORING WELL 339

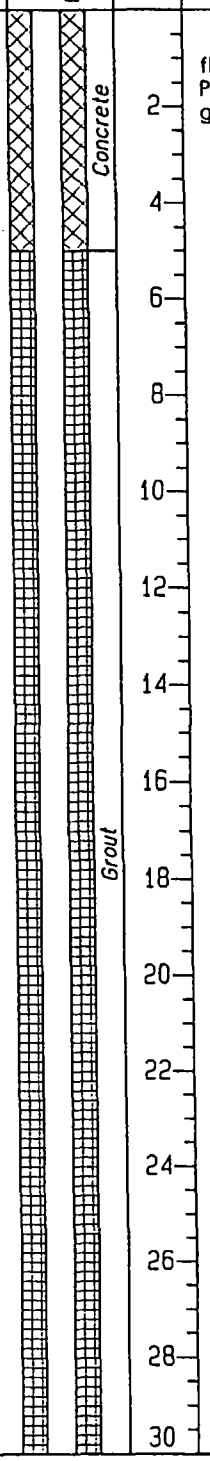
DEPTH (feet)	DESCRIPTION	USCS CLASS	WELL CONSTRCT.	DEPTH (feet)	REMARKS (drill rate, fluid loss, odor, etc.)
	POORLY GRADED GRAVEL with fine grained sand matrix, yellowish brown (10YR 5/4), moist, minor fines	GP			
66				66	
68				68	water level 10-1-98: 68.22 ft bgs
	POORLY GRADED, FINE GRAINED SAND with gravel, pale brown (10YR 8/3), wet, ~3% gravel up to 3" dia.	SP			water during drilling 69.00 ft bgs
70				70	
	WELL GRADED GRAVEL with well graded sand, varied lithology (multicolored), wet, gravel is subangular to subrounded, ~1-5% cobbles	GW			
72				72	
74	slightly increased silt			74	
76				76	
78			Colorado silica sand #10/20	78	
80			Heave	80	
	LEAN CLAY, yellowish brown (10YR 5/4), moist to wet	CL			
	Bottom of hole at 81.0 ft bgs				
82				82	
84				84	
86				86	
88				88	
90				90	
92				92	
94				94	
96				96	
98				98	

Project No. 5205-9	McCulley, Frick & Gilman, Inc.	*Sheet 3 of 3*

J.R. Simplot Don Plant	LOG OF MONITORING WELL 343

BORING LOCATION: *N 451159.1 E 558176.9 (near west fenceline)*		ELEVATION AND DATUM: *4555.84 ft NGVD top of PVC*	
DRILLING AGENCY: *Layne Christensen*	DRILLER: *Blaine Wright*	DRILL BIT: *10.75" O.D.*	DATE STARTED: *9/9/96*
DRILLING METHOD: *dual wall reverse circulation air hammer*		BORING DEPTH: *209' bgs*	DATE FINISHED: *9/11/96*
SIZE AND TYPE OF CASING: *6" flush-threaded Sch80 PVC; 0.020" cont. slot*		WELL DEPTH: *208' bgs*	CHECKED BY: *D. Frick*
SAMPLING METHOD: *cuttings*		LOGGED BY: *V. Martinez*	
SAMPLER TYPE: *grab*	LENGTH: *N/A* / DROP: *N/A*		

DEPTH (feet)	DESCRIPTION	USCS CLASS	WELL CONSTRCT.	DEPTH (feet)	REMARKS (drill rate, fluid loss, odor, etc.)
	SILT, light gray to gray (10YR 6/3)	ML			floury PVC casing stickup: 2.44 ft ground elevation: 4553.4 ft



J.R. Simplot Don Plant	LOG OF MONITORING WELL 343

DEPTH (feet)	DESCRIPTION	USCS CLASS	WELL CONSTRCT.	DEPTH (feet)	REMARKS (drill rate, fluid loss, odor, etc.)
		ML			
32				32	
34	~1% medium grained sand			34	
36				36	
38				38	
40				40	
42				42	
44				44	
46	~5% fine weathered dark porphyritic volcanic gravel, subangular to angular		Grout	46	
48	~15% fine volcanic gravel			48	
50	POORLY GRADED SILTY FINE GRAVEL, light brownish gray (10YR 6/2), dry	GM		50	
52				52	
	well graded gravel, dark porphyritic volcanic				
54				54	
56				56	
58				58	
60				60	
62				62	
64				64	

J.R. Simplot Don Plant	LOG OF MONITORING WELL 343

DEPTH (feet)	DESCRIPTION	USCS CLASS	WELL CONSTRCT.	DEPTH (feet)	REMARKS (drill rate, fluid loss, odor, etc.)
	SILT with well graded gravel, very pale brown (10YR 7/3), dry, gravel is dark porphyritic volcanics	ML			
66				66	
68				68	
70				70	
	~15-20% gravel, pale brown (10YR 6/3)				
72				72	
74				74	
76				76	
78	decreased gravel to ~5%			78	
80			Grout	80	
82				82	
84				84	
	~15% gravel, light gray (10YR 7/1)				
86				86	
	increased fine gravel				
88				88	
90				90	
92	WELL GRADED SILTY GRAVEL, light gray (10YR 7/2), dry, angular to subangular, dark porphyritic volcanics	GM		92	
94	SILT, very pale brown (10YR 7/3), damp, ~3% dark porphyritic volcanic gravel	ML		94	
96				96	
98				98	

J.R. Simplot Don Plant	LOG OF MONITORING WELL 343

DEPTH (feet)	DESCRIPTION	USCS CLASS	WELL CONSTRCT.	DEPTH (feet)	REMARKS (drill rate, fluid loss, odor, etc.)
		ML			
100				100	
	WELL GRADED SILTY GRAVEL with well graded sand, light gray (10YR 7/2), dry, sand and gravel are dark volcanics, angular to subangular	GM			
102				102	
104	decreased silt			104	
106	increased silt			106	
108				108	
110	very pale brown (10YR 7/3)			110	
112				112	
	poorly graded silty fine gravel, light yellowish brown (10YR 6/4), dry				
114			Grout	114	
	SILT with very fine grained sand, pale brown (10YR 6/3), dry, ~10% fine to medium grained sand, ~1% gravel	ML			
116				116	
118				118	
120	increased gravel			120	
122	silt with poorly graded fine gravel and well graded sand, ~1% cobbles,			122	
	grayish brown (10YR 5/2)				
124				124	
126	pale brown (10YR 6/3)			126	
128				128	
130				130	
132				132	

J.R. Simplot Don Plant	LOG OF MONITORING WELL 343

DEPTH (feet)	DESCRIPTION	USCS CLASS	WELL CONSTRCT.	DEPTH (feet)	REMARKS (drill rate, fluid loss, odor, etc.)
	silt with ~5% cobbles and coarse gravel, yellowish brown (10YR 5/4), gravel is subangular dark volcanic porphyry	ML			
134				134	
	damp				
136				136	
138				138	
	~15% well graded gravel				
140				140	
142				142	
	damp to moist				
144				144	
	decreased gravel (~1%)				
146				146	
148			Grout	148	
150				150	
	silt with well graded sand and fine gravel, brown to dark brown (10YR 4/3), moist				
152				152	
154				154	water level 9/23/96: 153.57 ft below TOC
	wet, brown (10YR 5/3), increased well graded sand and gravel (~40%) and one large (8-9") cobble				
156				156	
	saturated				157 ft water during drilling
158				158	added ~10 gal. of water to clean return pipe
160				160	
	WELL GRADED SILTY GRAVEL with sand, brown (10YR 5/3), saturated, sand is ~40% of coarse fraction	GM			
162				162	
164				164	
166				166	

J.R. Simplot Don Plant	LOG OF MONITORING WELL 343

DEPTH (feet)	DESCRIPTION	USCS CLASS	WELL CONSTRCT.	DEPTH (feet)	REMARKS (drill rate, fluid loss, odor, etc.)
168		GM		168	
170				170	
172				172	
174				174	
176	decreased silt, large cobble (~9" dia.)			176	
178	WELL GRADED GRAVEL with ~10% sand, primarily dark volcanics (dark gray (10YR 4/1)) with ~10% lighter (quartzites, quartz, feldspars), saturated, minor silt	GW		178	producing good water
180	WELL GRADED SAND, primarily dark volcanics (dark gray 10YR 4/1) with ~10% lighter (quartzites, quartz, feldspars), saturated, minor fines	SW		180	
182			Colorado silica sand #10/20	182	
184				184	
186	WELL GRADED GRAVEL with abundant well graded sand and silt, silt is brown (10YR 5/3), gravel is porphyritic and ranges from light gray (10YR 7/2) to very dark gray (10YR 3/1) to greenish gray (5G 6/1), subrounded to subangular, saturated	GW-GM		186	
188				188	
190				190	
192				192	
194				194	
196				196	
198	WELL GRADED GRAVEL with sand (~40%), gravel is porphyritic and ranges from light gray (10YR 7/2) to very dark gray (10YR 3/1) and to greenish gray (5G 6/1), subrounded to subangular, saturated	GW		198	water much clean and more abundant
200				200	

Project No. 5205-9	McCulley, Frick & Gilman, Inc.	*Sheet 6 of 7*

J.R. Simplot Don Plant	LOG OF MONITORING WELL 343

DEPTH (feet)	DESCRIPTION	USCS CLASS	WELL CONSTRCT.	DEPTH (feet)	REMARKS (drill rate, fluid loss, odor, etc.)
202		GW	Colorado silica sand #10/20	202	
204	well graded gravel with medium and coarse grained sand (15-20%), primarily dark volcanics (10YR 4/1) with 10-20% variable lithologies (multicolored)			204	producing really well
206	POORLY GRADED FINE GRAVEL with ~5% coarse gravel and cobbles, and ~25% well graded sand, primarily very dark gray (7.5YR 3/0) with 10-15% lighter lithologies (multicolored), subangular to subrounded	GP		206	flowing sand/gravel
208				208	refusal, heave to 208 ft
	Bottom of hole at 209.0 ft bgs				
210				210	
212				212	
214				214	
216				216	
218				218	
220				220	
222				222	
224				224	
226				226	
228				228	
230				230	
232				232	
234				234	

J.R. Simplot Don Plant	LOG OF MONITORING WELL 344

BORING LOCATION: *N 452390.1 E 560745.1 (south of cooling towers)*		ELEVATION AND DATUM: *4457.75 ft NGVD top of PVC*	
DRILLING AGENCY: *Layne Christensen*	DRILLER: *Blaine Wright*	DRILL BIT: *9" O.D.*	DATE STARTED: *9/18/96*
DRILLING METHOD: *dual wall reverse circulation air hammer*		BORING DEPTH: *149.0' bgs*	DATE FINISHED: *9/19/96*
SIZE AND TYPE OF CASING: *4" flush-threaded Sch40 PVC; 0.020" slot*		WELL DEPTH: *148.8' bgs*	CHECKED BY: *D. Frick*
SAMPLING METHOD: *cuttings*		LOGGED BY: *V. Martinez*	
SAMPLER TYPE: *grab*	LENGTH: *N/A* / DROP: *N/A*		

DEPTH (feet)	DESCRIPTION	USCS CLASS	REMARKS (drill rate, fluid loss, odor, etc.)
	POORLY GRADED SILTY SAND, very dark brown (10YR 2/2), damp to moist, ~3% cobbles (fill)	SM	PVC casing stickup 2.25 ft ground elevation: 4455.5 ft
6	SILT with well graded gravel (~15%), dark grayish brown (10YR 4/2), moist	ML	
	old abandoned line (concrete pipe)	pipe	
12	PEA GRAVEL (fill under pipe)	GP	
	WELL GRADED SAND, brown (10YR 5/3), damp, rounded to subangular	SW	
	POORLY GRADED SILTY COARSE GRAINED SAND and FINE GRAVEL, brown (10YR 5/3), damp	SM	
16	WELL GRADED SILTY GRAVEL, silt is brown (10YR 5/3), gravel is variable lithology (multicolored), subangular to subrounded, ~1-5% cobbles, damp	GM	
24	SILT with sand and fine gravel (~30%), pale brown (10YR 6/3), dry	ML	
28	WELL GRADED SAND with gravel (~15%), variable lithology (multicolored), damp	SW	

WELL CONSTRCT.: *Concrete*; *Grout*

Project No. 5205-9	McCulley, Frick & Gilman, Inc.	*Sheet 1 of 5*

J.R. Simplot Don Plant	LOG OF MONITORING WELL 344

DEPTH (feet)	DESCRIPTION	USCS CLASS	WELL CONSTRCT.	DEPTH (feet)	REMARKS (drill rate, fluid loss, odor, etc.)
	WELL GRADED GRAVEL and COBBLES, ~10% well graded sand, trace fines, variable lithology (multicolored), damp, subrounded to subangular	GW			
32				32	
	decreased sand				
34				34	
36				36	
					no return, clogged
38				38	
					unclogged
40				40	
42				42	
44	10-20% cobbles, dry			44	
	SILT with well graded sand (~20%), light gray (10YR 7/2), dry	ML			
46				46	
	WELL GRADED GRAVEL and COBBLES with sand (~30%), ~5% fines, variable lithology (multicolored), dry	GW	Grout		
48				48	
	SILT with sand (~40%), yellowish brown (10YR 5/4), damp	ML			
50				50	
	~10-15% cobbles, brown to dark brown (10YR 4/3), damp				
52				52	
54				54	
56	trace sand, brown (10YR 5/3), moist			56	
58				58	
	ELASTIC SILT, light brownish gray (10YR 6/2), moist	MH			
60				60	
62				62	
	POORLY GRADED COARSE GRAINED SAND with poorly graded coarse gravel (~20%), yellowish brown (10YR 5/6), moist	SP			
					looks iron-stained
64				64	

J.R. Simplot Don Plant	LOG OF MONITORING WELL 344

DEPTH (feet)	DESCRIPTION	USCS CLASS	WELL CONSTRCT.	DEPTH (feet)	REMARKS (drill rate, fluid loss, odor, etc.)
		SP			
	increased gravel (~30%), yellowish brown (10YR 5/6), moist to wet				
66				66	water level 10/1/96: 66.01 ft bgs
	WELL GRADED GRAVEL with abundant well graded sand (~50%), variable lithology (multicolored), wet to saturated	GW			
68				68	
70				70	
72	gravel and cobbles with poorly graded medium grained sand			72	
74	slight fines (<5%)			74	
76				76	
	increased fines				
78				78	
	CLAY with sand and gravel (~15-20%), brown (10YR 5/3), wet	CL			
80			Grout	80	
82	FAT CLAY, brown (10YR 5/3), saturated	CH		82	
84				84	
	5-10% black mottling, ~3% iron stain mottling, ~1% shell fragments (white)				
86				86	
88				88	
90				90	
92	~25% sand and gravel			92	
94				94	
96				96	
98				98	

J.R. Simplot Don Plant

LOG OF MONITORING WELL 344

DEPTH (feet)	DESCRIPTION	USCS CLASS	WELL CONSTRCT.	DEPTH (feet)	REMARKS (drill rate, fluid loss, odor, etc.)
	~45-50% sand and gravel, saturated	CH			
100				100	
	POORLY GRADED GRAVEL with silt, mafic volcanic gravel, subangular	GP-GM			
102				102	
	WELL GRADED GRAVEL and COBBLES with well graded sand, variable dark colors-primarily very dark gray (10YR 3/1)	GW			
104				104	
	WELL GRADED SAND with gravel (25-30%) and cobbles, variable dark colors-primarily very dark gray (10YR 3/1), subangular	SW			
106				106	
	WELL GRADED GRAVEL with well graded sand and silt, variable dark colors, angular to subrounded	GW-GM			
108			Grout	108	
110				110	
	less well graded, ~3% cobbles				
112				112	
	increased silt				
114				114	
	POORLY GRADED COARSE GRAVEL with silt, variable dark colors, saturated	GP-GM			
116				116	
118				118	
	WELL GRADED GRAVEL with silt, silt is yellowish brown (10YR 5/4), gravel is variable dark colors, subangular to subrounded	GW-GM			
120			Bentonite chips	120	
122				122	
	POORLY GRADED FINE GRAVEL, variable dark colors, angular to subrounded	GP			
	ELASTIC SILT with coarse grained sand (~15%), yellowish brown (10YR 5/4)	MH			sticky
124				124	
	WELL GRADED GRAVEL, ~3% cobbles, variable dark colors with ~1% light sandstone	GW			
126				126	
128				128	
130				130	
	POORLY GRADED FINE GRAVEL, ~5% cobbles, ~3% fine grained sand, variable lithology (multicolored), well rounded to subangular	GP			
132				132	

J.R. Simplot Don Plant	LOG OF MONITORING WELL 344

DEPTH (feet)	DESCRIPTION	USCS CLASS	WELL CONSTRCT.	DEPTH (feet)	REMARKS (drill rate, fluid loss, odor, etc.)
134		GP		134	
	increased sand				
136				136	
138			Colorado silica sand #10/20	138	
	gravel and sand primarily mafic (10YR 4/1) with 5-10% lighter minerals				
140	WELL GRADED GRAVEL with ~20% cobbles, variable dark colors (primarily 10YR 4/1), angular to subangular	GW		140	
142				142	
144	WELL GRADED GRAVEL with silt, ~5-10% cobbles, ~15% well graded sand, brown (10YR 5/3), gravel and sand are variable dark colors (primarily 10YR 4/1)	GW-GM		144	
146				146	
148	POORLY GRADED FINE GRAVEL/COARSE GRAINED SAND with silt, brown (10YR 5/3), gravel and sand are variable dark colors, angular to subangular	GP-GM		148	
	Bottom of hole at 149.0 ft bgs				
150				150	
152				152	
154				154	
156				156	
158				158	
160				160	
162				162	
164				164	
166				166	

J.R. Simplot Don Plant	LOG OF MONITORING WELL 345

BORING LOCATION: *N 450088.9 E 558110.2 (W of gypstack near W fence)*		ELEVATION AND DATUM: *4577.2 ft NGVD top of PVC*	
DRILLING AGENCY: *Layne Christensen*	DRILLER: *Blaine Wright*	DRILL BIT: *10.75" O.D.*	DATE STARTED: *9/24/96*
DRILLING METHOD: *dual wall reverse circulation air hammer*		BORING DEPTH: *163.75' bgs*	DATE FINISHED: *9/26/96*
SIZE AND TYPE OF CASING: *6" flush-threaded Sch80 PVC; 0.020" cont. slot*		WELL DEPTH: *163.75' bgs*	CHECKED BY: *D. Frick*
SAMPLING METHOD: *cuttings*		LOGGED BY: *V. Martinez*	
SAMPLER TYPE: *grab*	LENGTH: *N/A* / DROP: *N/A*		

DEPTH (feet)	DESCRIPTION	USCS CLASS	WELL CONSTRCT.	DEPTH (feet)	REMARKS (drill rate, fluid loss, odor, etc.)
	SILT, brown (10YR 5/3), dry	ML			PVC casing stickup: 2.3 ft ground elevation: 4574.9 ft
2			Concrete	2	
4				4	
6				6	
	pale brown (10YR 6/3), dry to damp, 1% medium grained sand				
8				8	
10				10	
12				12	
14	damp, no sand			14	
16				16	
18			Grout	18	
20				20	
22				22	
24				24	
	1% fine gravel, gravel is dark volcanic, angular to subangular				
26				26	
28				28	
30				30	

J.R. Simplot Don Plant	LOG OF MONITORING WELL 345

DEPTH (feet)	DESCRIPTION	USCS CLASS	WELL CONSTRCT.	DEPTH (feet)	REMARKS (drill rate, fluid loss, odor, etc.)
	~15% well graded sand to fine gravel	ML			
	SILTY, WELL GRADED SAND, brown (10YR 5/3), damp	SM			
32				32	
34				34	
	COBBLES and BOULDERS of VESICULAR PORPHYRITIC BASALT with silty well graded sand, basalt is black (2.5YR 2.5/0), crystals are white (7.5YR 8/0), not very weathered, dry	GP			
36				36	
	WELL GRADED, SILTY GRAVEL with well graded sand, gravel and sand predominately black (2.5YR 2.5/0), silt is brown (10YR 5/3), damp	GM			
38				38	
	SILT, brown (10YR 5/3), damp, ~3% fine gravel and coarse grained sand	ML			
40	yellowish brown (10YR 5/4), ~5-10% well graded gravel			40	
42				42	
44				44	
	1-3% fine gravel				
46			Grout	46	
48	~25% well graded gravel			48	
	decreased gravel to ~10%				
50	WELL GRADED SILTY GRAVEL with sand, dark grayish brown (10YR 4/2), damp	GM		50	
52	brown (10YR 5/3)			52	
54	SILT, yellowish brown (10YR 5/4), damp, ~1-3% gravel	ML		54	
	increased gravel to ~15%				switch to larger compressor
56	WELL GRADED SILTY GRAVEL with well graded sand (~30%), brown (10YR 5/3), damp, gravel is dark volcanic with 3-5% quartz and quartzite	GM		56	
58				58	
60	POORLY GRADED SILTY, MEDIUM GRAINED SAND, brown (10YR 5/3), damp	SM		60	
62	WELL GRADED SILTY GRAVEL with well graded sand (~30%), grayish brown (10YR 5/2), damp, gravel is dark porphyritic volcanic (primarily 10YR 4/1) with occasional (1-3%) quartz and quartzite	GM		62	
64				64	

J.R. Simplot Don Plant	LOG OF MONITORING WELL 345

DEPTH (feet)	DESCRIPTION	USCS CLASS	WELL CONSTRCT.	DEPTH (feet)	REMARKS (drill rate, fluid loss, odor, etc.)
	yellowish brown (10YR 5/4)	GM			
66				66	
68	increased silt, ~3% cobbles, gravel subrounded to subangular			68	
70	SILT with poorly graded, fine to medium grained sand (15-20%), ~5% gravel, brown (10YR 5/3), damp	ML		70	
72	SILTY WELL GRADED GRAVEL with poorly graded, fine to medium grained sand (~15%), 3-5% cobbles, yellowish brown (10YR 5/4), damp	GM		72	
		Cobbles			rock
74	COBBLES, BOULDERS and GRAVEL with silt and sand matrix, weathered variable dark porphyritic volcanics (primarily 10YR 4/1)			74	hard drilling
76				76	
78	WELL GRADED SILTY GRAVEL with well graded sand, pale brown (10YR 6/3), dry to damp, gravel is dark porphyritic volcanics (primarily 10YR 4/1), subangular to subrounded	GM		78	extremely hard drilling
80			Grout	80	
82	WELL GRADED SILTY SAND with gravel (~15%), ~5% cobbles, brown (10YR 5/3), damp, sand and gravel ~90% dark porphyritic volcanics (primarily 10YR 4/1), ~10% lighter minerals	SM		82	
84	POORLY GRADED FINE GRAVEL with silt and coarse grained sand, gravel is dark porphyritic volcanics (primarily 10YR 4/1), damp, subangular to subrounded	GP-GM		84	
86	SILTY GRAVEL and COBBLES, with ~10% fine grained sand, yellowish brown (10YR 5/4), damp	GM		86	
88				88	
90				90	
92	WELL GRADED SILTY SAND with gravel (~15%), brown (10YR 5/3), damp	SM		92	
94	WELL GRADED SILTY GRAVEL with well graded sand (~30), silt is brown (10YR 5/3), sand and gravel are dark porphyritic volcanics (primarily 10YR 4/1), angular to subrounded	GM		94	
96				96	
98				98	

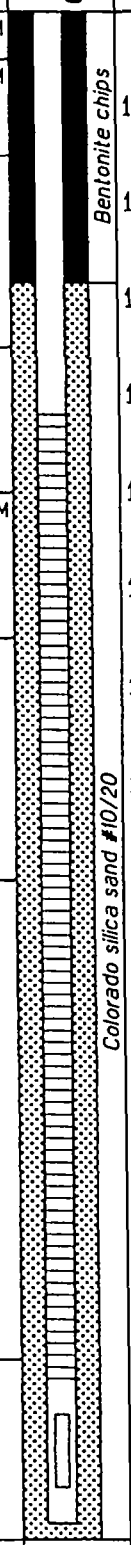
J.R. Simplot Don Plant	LOG OF MONITORING WELL 345

DEPTH (feet)	DESCRIPTION	USCS CLASS	WELL CONSTRCT.	DEPTH (feet)	REMARKS (drill rate, fluid loss, odor, etc.)
100		GM		100	
102	WELL GRADED SILTY SAND with fine gravel, brown (10YR 5/3), damp, sand and gravel are dark porphyritic volcanics (primarily 10YR 4/1), angular to subrounded	SW-SM		102	
104	SILT with ~10% fine to medium grained sand, ~10% cobbles, yellowish brown (10YR 5/4), damp to moist	ML		104	
106				106	
108	increased sand, ~3% gravel			108	
110	decreased sand (~10%)			110	
112				112	
114	~15% well graded gravel, gravel is dark porphyritic volcanics (primarily 10YR 4/1) and rhyolite		Grout	114	
116				116	
118	decreased gravel			118	
120	brown (10YR 5/3)			120	
	40-45% sand and gravel, damp				
122	POORLY GRADED SILTY FINE GRAVEL, ~5% cobbles, brown (10YR 5/3), damp, gravel is dark porphyritic volcanics (primarily 10YR 4/1), subangular to subrounded	GM		122	
124	SILTY SAND with ~10% fine gravel, light brownish gray (10YR 6/2), damp, gravel is dark porphyritic volcanics (primarily 10YR 4/1), subangular to subrounded	SM		124	hard drilling
126				126	
128	increased silt (~40-45%), ~5% gravel, brown (10YR 5/3)			128	
130				130	
132	WELL GRADED GRAVEL with silt and sand, grayish brown (10YR 5/2), damp	GW-GM		132	

Project No. 5205-9	McCulley, Frick & Gilman, Inc.	*Sheet 4 of 5*

J.R. Simplot Don Plant	LOG OF MONITORING WELL 345

DEPTH (feet)	DESCRIPTION	USCS CLASS	REMARKS (drill rate, fluid loss, odor, etc.)
		GW-GM	
134	WELL GRADED SAND with silt and fine gravel (~15%), dark volcanics (primarily 10YR 4/1) with ~10% quartz, quartzite and other lighter rocks, damp, angular to subrounded	SW-SM	
136	SILT with well graded sand and fine gravel (~40%), pale brown (10YR 6/3), damp to moist	ML	
138			
140	SILTY GRAVEL with ~10% sand, yellowish brown (10YR 5/4), damp to moist, gravel is medium to very dark gray (10YR 6/1 to 10YR 3/1) with occasional pink quartzite	GM	
142	WELL GRADED GRAVEL with silt and well graded sand, brown (10YR 5/3), moist, gravel and sand are dark volcanics with ~10% lighter rocks, subangular to subrounded	GW-GM	
144			
146	POORLY GRADED FINE GRAVEL and COARSE GRAINED SAND, minor fines, brown (10YR 5/3), moist, sand and gravel area medium to dark brown and gray porphyritic volcanics with ~10% lighter rocks (quartzite, rhyolite and other)	GP	
148	wet		
150	WELL GRADED GRAVEL with well graded sand, minor fines, gravel is variable medium grays and porphyritic (white), wet, subangular to subrounded	GW	producing water fairly well
152			
154			
156			
158			
160	SILT with gravel, yellowish brown (10YR 5/4), wet, gravel is porphyritic rhyolite (10YR 7/3) and andesite (10YR 4/1), angular to subangular	ML	
162			
164	Bottom of hole at 163.75 ft bgs		refusal
166			



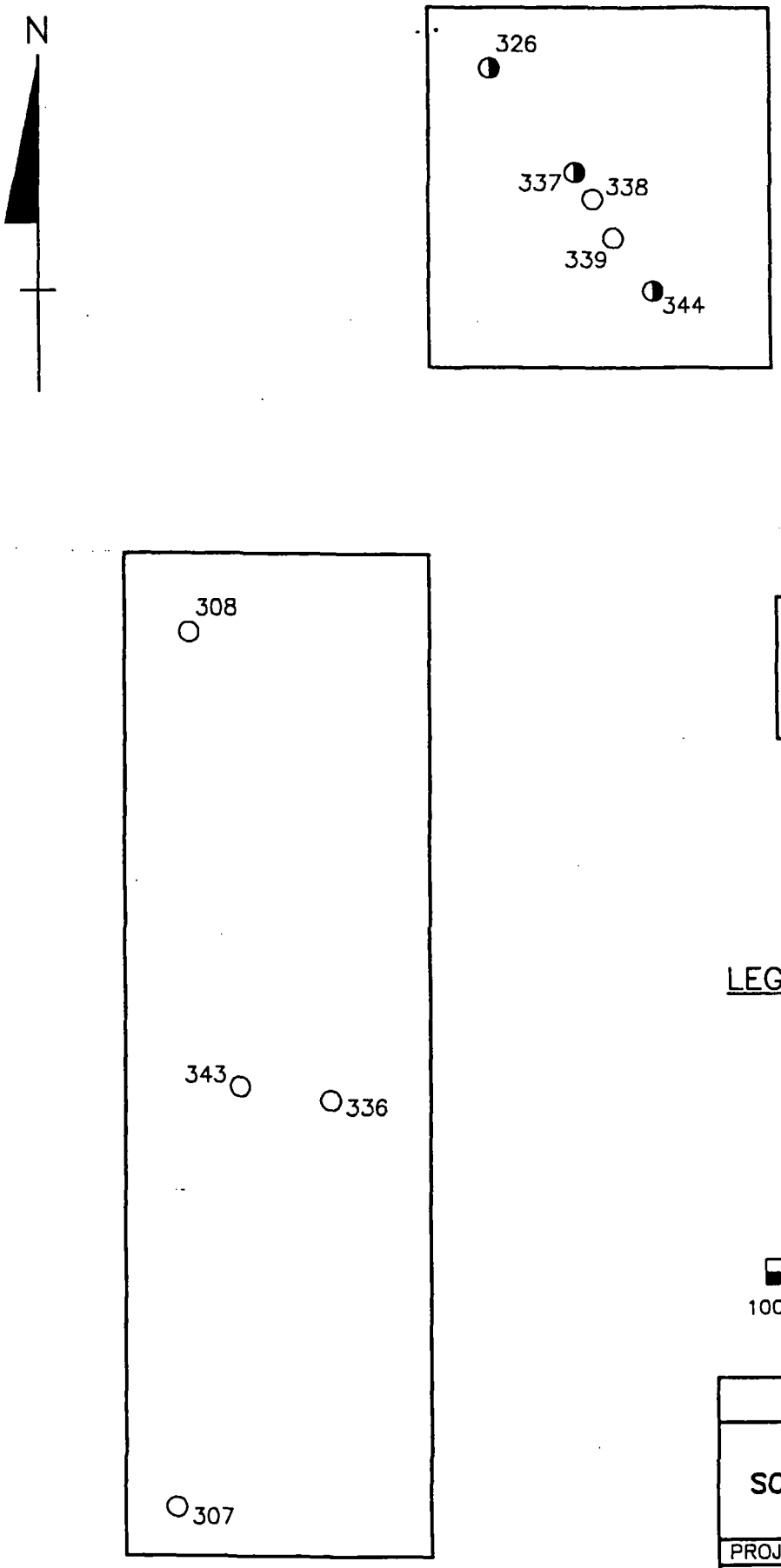
APPENDIX C

PUMPING TEST DESCRIPTIONS, DATA AND GRAPHS

APPENDIX C-1

AQUIFER TEST SUMMARIES

1/97 D:\5205\5205-102.DWG BY:SCG



LEGEND:

○ SHALLOW MONITORING WELL

◑ DEEP MONITORING WELL

SCALE

100 0 100 FEET

J.R. SIMPLOT COMPANY
DON PLANT

SCHEMATIC OF WELL CLUSTERS

PROJECT: 5205.9	DATE: JANUARY, 1997	
REV:	BY: SCG	CHECKED: VM

McCULLEY, FRICK & GILMAN, INC.
providing environmental consulting and engineering services

AQUIFER TEST SUMMARY

PUMPING WELL: 337 **LOCATION:** J.R. Simplot Don Plant
Purpose of test: Evaluate hydraulic characteristics of deep aquifer north of gypstack
Stratigraphy: Sand, gravel, and cobbles with silty gravel beds; underlain by silt, overlain by clay
Aquifer type: Confined
Type of test: Constant discharge drawdown and recovery **Method of lift:** Submersible pump
Depth of pump (ft bgs): 117 **How discharge measured:** Flowmeter; container and stopwatch

Static Water Level (ft bgs): 64.77
PUMP ON: **Date:** 11/12/96 **Time:** 15:42 **Average discharge:** 200 gpm
PUMP OFF: **Date:** 11/13/96 **Time:** 16:48
Duration of aquifer test (min): **Drawdown:** 1506 **Recovery:** 23

Pumping Well: 337
Screened Interval (ft bgs): 117.6 - 157.6 **Filter Pack Interval (ft bgs):** 114.0 - 169.0
Diameter of casing (in.): 6 **How water levels measured:** transducer and well probe

Observation Well: 326
Screened Interval (ft bgs): 105.0 - 110.0 **Filter Pack Interval (ft bgs):** 99.5 - 116.0
Distance from pumping well (ft): 80.0 **How water levels measured:** transducer and well probe

Observation Well: 344
Screened Interval (ft bgs): 130.8 - 145.8 **Filter Pack Interval (ft bgs):** 125.0 - 148.8
Distance from pumping well (ft): 84.3 **How water levels measured:** transducer and well probe

TEST RESULTS

Well Number	Method of Test Analysis	Transmissivity (gpd/ft)	Aquifer Thickness (ft)	Hydraulic Conductivity (ft/day)	Hydraulic Conductivity (cm/sec)	Storativity
337	Recovery	80,574	38	283	1.0×10^{-1}	--
326	Hantush	91,238	38	321	1.1×10^{-1}	2.65×10^{-3}
	Cooper/Jacob	166,965	38	589	2.1×10^{-1}	2.24×10^{-3}
	Recovery	123,877	38	436	1.5×10^{-1}	--
344	Hantush	51,274	38	180	6.3×10^{-2}	2.12×10^{-4}
	Cooper/Jacob	54,291	38	190	6.7×10^{-2}	1.8×10^{-4}
Rep. Value		94,706	38	333	1.2×10^{-1}	1.3×10^{-3}

AQUIFER TEST SUMMARY

PUMPING WELL: 338 **LOCATION:** J.R. Simplot Don Plant
Purpose of test: Evaluate hydraulic characteristics of shallow aquifer north of gypstack
Stratigraphy: Sand, gravel, and cobbles; underlain by clay
Aquifer type: unconfined
Type of test: Constant discharge drawdown and recovery **Method of lift:** Submersible pump
Depth of pump (ft bgs): 78 **How discharge measured:** Flowmeter; container and stopwatch

Static Water Level (ft bgs): 68.42
PUMP ON: **Date:** 11/14/96 **Time:** 18:02 **Average discharge:** 39 gpm
PUMP OFF: **Date:** 11/15/96 **Time:** 18:05
Duration of aquifer test (min): **Drawdown:** 1443 **Recovery:** 779.5

Pumping Well: 338
Screened Interval (ft bgs): 58.7 - 78.7 **Filter Pack Interval (ft bgs):** 56.8 - 83.5
Diameter of casing (in.): 6 **How water levels measured:** transducer and well probe

Observation Well: 339
Screened Interval (ft bgs): 56.0 - 76.0 **Filter Pack Interval (ft bgs):** 52.5 - 79.0
Distance from pumping well (ft): 25.88 **How water levels measured:** transducer and well probe

TEST RESULTS

Well Number	Method of Test Analysis	Transmissivity (gpd/ft)	Aquifer Thickness (ft)	Hydraulic Conductivity (ft/day)	Hydraulic Conductivity (cm/sec)	Specific Yield
338	Recovery	88,869	11.08	1071	3.8×10^{-1}	--
339	Neuman	89,299	11.5	1138	3.7×10^{-1}	2.76×10^{-1}
	Cooper/Jacob	79,389	11.5	923	3.3×10^{-1}	4.11×10^{-1}
	Recovery	69,156	11.5	804	2.8×10^{-1}	--
Rep. Value		81,064	11.3	984	3.4×10^{-1}	3.43×10^{-1}

COMMENTS:

AQUIFER TEST SUMMARY

PUMPING WELL: 343 **LOCATION:** J.R. Simplot Don Plant
Purpose of test: Evaluate hydraulic characteristics northwest of gypstack
Stratigraphy: Gravel and sand; overlain by silty gravel and silt, underlain by volcanic rock
Aquifer type: Semi-Unconfined
Type of test: Constant discharge drawdown and recovery **Method of lift:** Submersible pump
Depth of pump (ft bgs): 174 **How discharge measured:** Flowmeter; container and stopwatch

Static Water Level (ft bgs): 153.16
PUMP ON: **Date:** 11/10/96 **Time:** 10:58 **Average discharge:** 50 gpm
PUMP OFF: **Date:** 11/11/96 **Time:** 11:03
Duration of aquifer test (min): **Drawdown:** 1445 **Recovery:** 180.5

Pumping Well: 343
Screened Interval (ft bgs): 174.7 - 204.7 **Filter Pack Interval (ft bgs):** 168.8 - 208.0
Diameter of casing (in.): 6 **How water levels measured:** transducer and well probe

Observation Well: 307
Screened Interval (ft bgs): 162.0 - 172.0 **Filter Pack Interval (ft bgs):** 158.0 - 176.0
Distance from pumping well (ft): 253.2 **How water levels measured:** well probe

Observation Well: 308
Screened Interval (ft bgs): 150.8 - 170.8 **Filter Pack Interval (ft bgs):** 147.0 - 176.0
Distance from pumping well (ft): 271.9 **How water levels measured:** well probe

Observation Well: 336
Screened Interval (ft bgs): 146.1 - 176.1 **Filter Pack Interval (ft bgs):** 141.8 - 180.0
Distance from pumping well (ft): 54.0 **How water levels measured:** transducer and well probe

TEST RESULTS

Well Number	Method of Test Analysis	Transmissivity (gpd/ft)	Aquifer Thickness (ft)	Hydraulic Conductivity (ft/day)	Hydraulic Conductivity (cm/sec)	Specific Yield
343	Recovery	120,323	49	346	1.2×10^{-1}	--
307	Neuman	28,653	18	213	7.5×10^{-2}	--
	Neuman	28,653	49	78	2.8×10^{-2}	--
	Cooper/Jacob	32,962	18	245	8.7×10^{-2}	1.81×10^{-2}
	Cooper/Jacob	32,989	49	90	3.2×10^{-2}	1.81×10^{-2}
	Recovery	58,384	18	433	1.5×10^{-1}	--
	Recovery	58,384	49	159	5.6×10^{-2}	--
308	Neuman	18,097	35	69	2.4×10^{-2}	--
	Neuman	18,097	49	49	1.7×10^{-2}	--
	Cooper/Jacob	38,133	35	146	5.1×10^{-2}	1.37×10^{-2}
	Cooper/Jacob	38,133	49	104	3.6×10^{-2}	1.37×10^{-2}
	Recovery	88,438	35	337	1.2×10^{-2}	--

TEST RESULTS (continued)

Well Number	Method of Test Analysis	Transmissivity (gpd/ft)	Aquifer Thickness (ft)	Hydraulic Conductivity (ft/day)	Hydraulic Conductivity (cm/sec)	Specific Yield
	Recovery	88,438	49	241	8.5×10^{-2}	--
336	Neuman	32,208	18.7	229	8.1×10^{-2}	4.10×10^{-3}
	Cooper/Jacob	30,485	18.7	217	7.7×10^{-2}	2.06×10^{-1}
	Recovery	59,461	18.7	425	1.5×10^{-1}	--
Rep. Value		*		*	*	*

COMMENTS:

- Aquifer thickness at 307 and 308 is unknown. Hydraulic conductivities have been calculated in two ways. The first is based on saturated screened intervals in each well (thicknesses of 18 and 35 feet). The second assumes that the aquifer thickness along the line between 307 and 308 is relatively uniform and that the thickness at these wells is equivalent to the aquifer thickness in well 343 (49 feet).
- The productive unit is a channel deposit of variable thickness and lithology, and unknown width.
- Well 343 is completed in gravels and sands that grade upward to silty gravel, then silt; the well is bounded below by volcanic rock.
- Well 336 is completed in sand and appears to be near the edge of the channel.

* Because of uncertainties regarding the aquifer configuration and variability of results, representative values have not been included in this table.

AQUIFER TEST SUMMARY

PUMPING WELL: 345 **LOCATION:** J.R. Simplot Don Plant
Purpose of test: Evaluate hydraulic characteristics west of gypstack
Stratigraphy: Gravel grading upward to silty gravel and silt; underlain by silt and volcanic rock
Aquifer type: Semi-Unconfined
Type of test: Constant discharge drawdown and recovery **Method of lift:** Submersible pump
Depth of pump (ft bgs): 160 **How discharge measured:** Flowmeter; container and stopwatch

Static Water Level (ft bgs):
PUMP ON: **Date:** 11/16/96 **Time:** 16:02 **Average discharge:** 6 gpm
PUMP OFF: **Date:** 11/17/96 **Time:** 16:05
Duration of aquifer test (min): **Drawdown:** 1443 **Recovery:** 720

Pumping Well: 345
Screened Interval (ft bgs): 140.2 - 160.2 **Filter Pack Interval (ft bgs):** 137.7 - 163.7
Diameter of casing (in.): 6 **How water levels measured:** transducer and well probe

Observation Well: 333
Screened Interval (ft bgs): 159.0 - 169.0 **Filter Pack Interval (ft bgs):** 155.0 - 172.5
Distance from pumping well (ft): 27.8 **How water levels measured:** transducer and well probe

TEST RESULTS

Well Number	Method of Test Analysis	Transmissivity (gpd/ft)	Aquifer Thickness (ft)	Hydraulic Conductivity (ft/day)	Hydraulic Conductivity (cm/sec)	Storativity
345	Recovery	396	15	3.52	1.2×10^{-3}	--
333	Neuman	26,391	13.4	263	9.3×10^{-2}	1.42×10^{-3}
	Cooper/Jacob	23,375	13.4	233	8.2×10^{-2}	2.47×10^{-3} to 1.53×10^{-2}
	Recovery	24,725	13.4	247	8.7×10^{-2}	--
Rep. Value		24,830*		248*	8.7×10^{-2}*	6.39×10^{-3}*

COMMENTS:

- The productive unit is a channel deposit of variable thickness and lithology, and unknown width.

* These representative values are likely indicative of the gravel subunit.

APPENDIX C-2

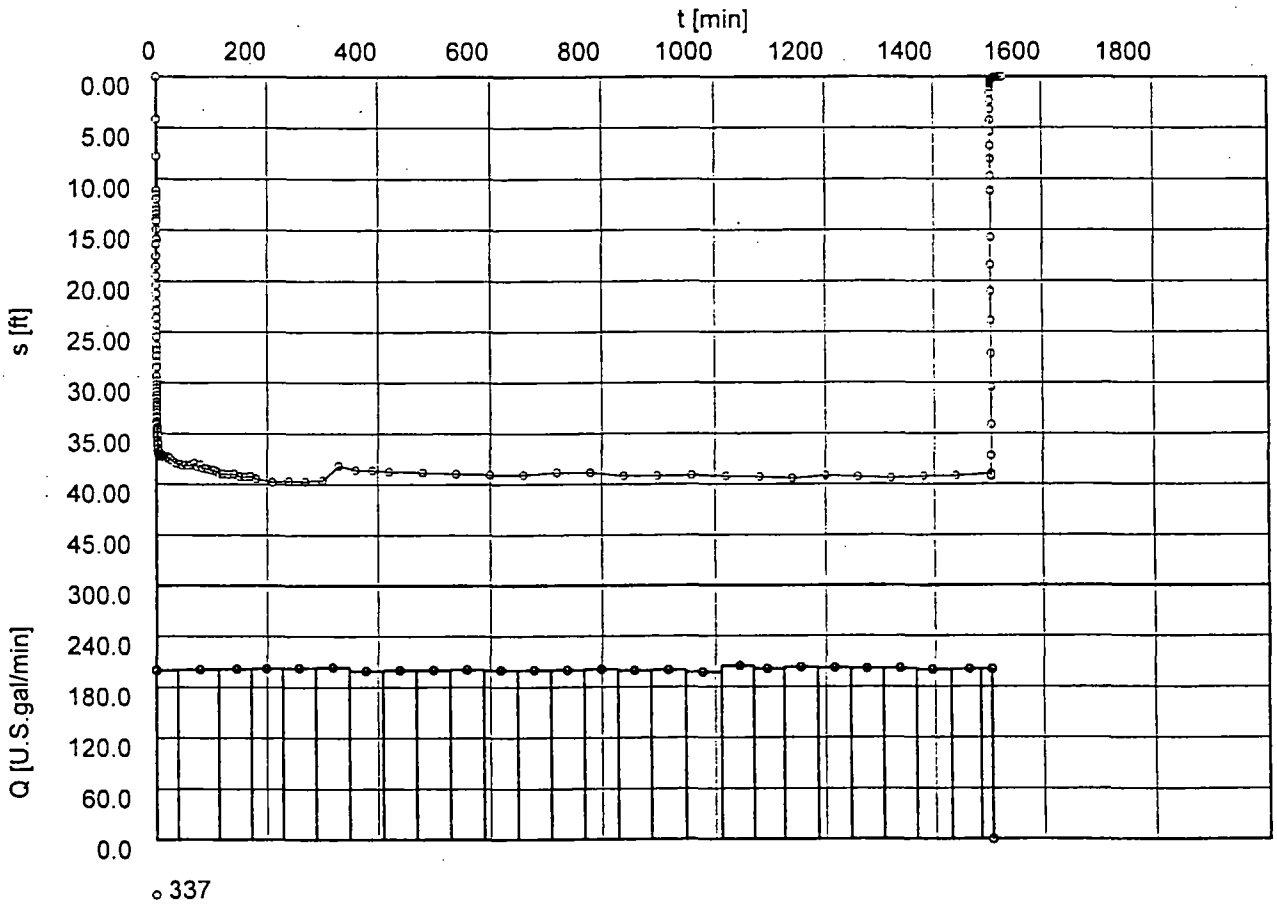
AQUIFER TEST GRAPHS AND DATA

C-2

PUMPING WELL 337

McCulley, Frick &Gilman, Inc. 19203 36th Avenue W. Suite 101 Lynnwood, WA 98036 ph.(206) 778-8252	Pumping test analysis Time-Drawdown plot with discharge	Page 1 Project: Simplot Subarea Evaluated by: VBM Date: 26.11.1996

Pumping Test No. 2	Test conducted on: November 12, 1996
337	
Discharge 200.89 U.S.gal/min	



McCulley, Frick &Gilman, Inc.
19203 36th Avenue W. Suite 101
Lynnwood, WA 98036
ph.(206) 778-8252

Pumping test analysis
Time-Drawdown plot
with discharge

Project: Simplot Subarea

Evaluated by: VBM | Date: 26.11.1996

Pumping Test No. 2 | Test conducted on: November 12, 1996

337 | 337

Discharge 200.89 U.S.gal/min

Static water level: 0.00 ft below datum

	Pumping test duration [min]	Water level [ft]	Drawdown [ft]
1	0.00	0.00	0.00
2	0.02	4.16	4.16
3	0.03	7.78	7.78
4	0.05	11.11	11.11
5	0.07	11.52	11.52
6	0.08	11.95	11.95
7	0.10	12.71	12.71
8	0.12	13.04	13.04
9	0.13	13.43	13.43
10	0.15	13.82	13.82
11	0.16	14.12	14.12
12	0.18	14.92	14.92
13	0.20	15.87	15.87
14	0.22	16.39	16.39
15	0.23	17.54	17.54
16	0.25	18.56	18.56
17	0.27	19.51	19.51
18	0.28	20.42	20.42
19	0.30	21.27	21.27
20	0.31	22.20	22.20
21	0.33	22.87	22.87
22	0.35	23.65	23.65
23	0.37	24.34	24.34
24	0.38	25.06	25.06
25	0.40	25.51	25.51
26	0.42	26.33	26.33
27	0.43	26.83	26.83
28	0.45	27.37	27.37
29	0.47	27.96	27.96
30	0.48	28.48	28.48
31	0.51	29.37	29.37
32	0.53	29.80	29.80
33	0.54	30.17	30.17
34	0.56	30.49	30.49
35	0.57	30.88	30.88
36	0.59	31.21	31.21
37	0.60	31.49	31.49
38	0.61	31.88	31.88
39	0.63	32.16	32.16
40	0.65	32.40	32.40
41	0.67	32.68	32.68
42	0.68	32.96	32.96
43	0.70	33.29	33.29
44	0.71	33.46	33.46
45	0.73	33.76	33.76
46	0.75	33.89	33.89
47	0.76	34.09	34.09
48	0.78	34.41	34.41
49	0.80	34.56	34.56
50	0.82	34.76	34.76

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Lynnwood, WA 98036
ph.(206) 778-8252

Pumping test analysis
Time-Drawdown plot
with discharge

Project: Simplot Subarea

Evaluated by: VBM | Date: 26.11.1996

Pumping Test No. 2 | Test conducted on: November 12, 1996

337 | 337

Discharge 200.89 U.S.gal/min

Static water level: 0.00 ft below datum

	Pumping test duration [min]	Water level [ft]	Drawdown [ft]
51	0.83	35.06	35.06
52	0.85	35.19	35.19
53	0.86	35.30	35.30
54	0.88	35.49	35.49
55	0.97	36.12	36.12
56	1.05	36.49	36.49
57	1.13	36.17	36.17
58	1.22	35.71	35.71
59	1.30	35.30	35.30
60	1.38	35.10	35.10
61	1.47	34.87	34.87
62	1.55	34.65	34.65
63	1.63	34.50	34.50
64	1.72	34.63	34.63
65	1.80	34.48	34.48
66	1.88	34.35	34.35
67	1.97	34.37	34.37
68	2.05	34.43	34.43
69	2.13	34.54	34.54
70	2.22	34.50	34.50
71	2.30	34.65	34.65
72	2.38	34.87	34.87
73	2.47	35.17	35.17
74	2.55	35.67	35.67
75	2.63	35.91	35.91
76	2.72	36.06	36.06
77	2.80	36.43	36.43
78	2.88	36.51	36.51
79	3.05	36.79	36.79
80	3.22	36.75	36.75
81	3.38	36.95	36.95
82	3.55	36.86	36.86
83	3.72	36.95	36.95
84	3.88	36.99	36.99
85	4.05	37.14	37.14
86	4.22	36.99	36.99
87	4.38	37.08	37.08
88	4.55	36.90	36.90
89	4.72	37.08	37.08
90	4.88	36.73	36.73
91	5.05	37.01	37.01
92	5.22	36.88	36.88
93	5.38	37.01	37.01
94	5.55	37.01	37.01
95	5.72	37.05	37.05
96	5.88	36.79	36.79
97	6.05	36.99	36.99
98	6.22	37.10	37.10
99	6.38	37.14	37.14
100	6.55	37.12	37.12

McCulley, Frick &Gilman, Inc. 19203 36th Avenue W. Suite 101 Lynnwood, WA 98036 ph.(206) 778-8252	Pumping test analysis Time-Drawdown plot with discharge	Page 4 Project: Simplot Subarea Evaluated by: VBM Date: 26.11.1996

Pumping Test No. 2	Test conducted on: November 12, 1996
337	337
Discharge 200.89 U.S.gal/min	
Static water level: 0.00 ft below datum	

	Pumping test duration [min]	Water level [ft]	Drawdown [ft]
101	6.72	37.29	37.29
102	6.88	37.08	37.08
103	7.05	37.16	37.16
104	7.22	37.16	37.16
105	7.38	37.03	37.03
106	7.55	37.25	37.25
107	7.72	37.27	37.27
108	7.88	37.29	37.29
109	8.05	37.05	37.05
110	8.22	37.21	37.21
111	8.38	37.18	37.18
112	8.55	37.21	37.21
113	8.72	37.14	37.14
114	8.88	37.23	37.23
115	9.05	37.25	37.25
116	9.22	37.18	37.18
117	9.38	36.99	36.99
118	9.55	37.10	37.10
119	9.72	37.21	37.21
120	9.88	37.18	37.18
121	10.38	37.14	37.14
122	10.88	37.21	37.21
123	11.38	37.12	37.12
124	11.88	37.12	37.12
125	12.38	37.21	37.21
126	12.88	37.25	37.25
127	13.38	37.27	37.27
128	13.88	37.38	37.38
129	14.38	37.25	37.25
130	14.89	37.18	37.18
131	15.88	37.31	37.31
132	16.88	37.31	37.31
133	17.88	37.25	37.25
134	18.88	37.47	37.47
135	19.88	37.29	37.29
136	20.88	37.34	37.34
137	21.88	37.27	37.27
138	22.88	37.34	37.34
139	23.88	37.57	37.57
140	24.88	37.40	37.40
141	29.88	37.66	37.66
142	34.88	37.88	37.88
143	39.88	38.01	38.01
144	44.88	38.01	38.01
145	49.88	38.16	38.16
146	54.88	38.09	38.09
147	59.88	38.16	38.16
148	64.88	38.07	38.07
149	69.88	37.92	37.92
150	74.88	38.29	38.29

McCulley, Frick &Gilman, Inc.
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Lynnwood, WA 98036
ph.(206) 778-8252

Pumping test analysis
Time-Drawdown plot
with discharge

Project: Simplot Subarea

Evaluated by: VBM | Date: 26.11.1996

Pumping Test No. 2 | Test conducted on: November 12, 1996

337 | 337

Discharge 200.89 U.S.gal/min

Static water level: 0.00 ft below datum

	Pumping test duration [min]	Water level [ft]	Drawdown [ft]
151	79.88	38.07	38.07
152	84.88	38.44	38.44
153	89.88	38.46	38.46
154	94.88	38.51	38.51
155	99.88	38.59	38.59
156	104.88	38.64	38.64
157	109.88	38.79	38.79
158	114.88	38.98	38.98
159	119.88	38.96	38.96
160	129.88	39.00	39.00
161	139.88	38.98	38.98
162	149.88	39.24	39.24
163	159.88	39.26	39.26
164	169.88	39.20	39.20
165	179.88	39.46	39.46
166	209.88	39.76	39.76
167	239.88	39.65	39.65
168	269.88	39.70	39.70
169	299.88	39.63	39.63
170	329.88	38.16	38.16
171	359.88	38.57	38.57
172	389.88	38.61	38.61
173	419.89	38.72	38.72
174	479.89	38.83	38.83
175	539.88	38.94	38.94
176	599.88	39.05	39.05
177	659.88	39.09	39.09
178	719.88	38.81	38.81
179	779.88	38.87	38.87
180	839.88	39.18	39.18
181	899.88	39.18	39.18
182	959.88	39.11	39.11
183	1019.88	39.22	39.22
184	1079.88	39.28	39.28
185	1139.88	39.44	39.44
186	1199.88	39.18	39.18
187	1259.88	39.28	39.28
188	1319.88	39.39	39.39
189	1379.88	39.22	39.22
190	1439.88	39.18	39.18
191	1506.34	38.96	38.96
192	1506.38	39.00	39.00
193	1506.40	39.05	39.05
194	1506.41	38.98	38.98
195	1506.43	39.03	39.03
196	1506.44	39.00	39.00
197	1506.47	39.05	39.05
198	1506.48	39.07	39.07
199	1506.50	39.03	39.03
200	1506.51	39.00	39.00

McCulley, Frick &Gilman, Inc. 19203 36th Avenue W. Suite 101 Lynnwood, WA 98036 ph.(206) 778-8252	Pumping test analysis Time-Drawdown plot with discharge	Page 6 Project: Simplot Subarea Evaluated by: VBM Date: 26.11.1996

Pumping Test No. 2	Test conducted on: November 12, 1996
337	337
Discharge 200.89 U.S.gal/min	
Static water level: 0.00 ft below datum	

	Pumping test duration [min]	Water level [ft]	Drawdown [ft]
201	1506.53	39.18	39.18
202	1506.54	39.13	39.13
203	1506.55	38.94	38.94
204	1506.57	39.09	39.09
205	1506.58	39.07	39.07
206	1506.60	39.11	39.11
207	1506.61	38.98	38.98
208	1506.63	39.16	39.16
209	1506.65	39.26	39.26
210	1506.66	39.16	39.16
211	1506.68	39.16	39.16
212	1506.70	38.96	38.96
213	1506.71	39.05	39.05
214	1506.73	39.16	39.16
215	1506.75	39.13	39.13
216	1506.76	39.05	39.05
217	1506.78	39.07	39.07
218	1506.80	39.18	39.18
219	1506.81	39.16	39.16
220	1506.83	39.16	39.16
221	1506.85	39.09	39.09
222	1506.87	39.07	39.07
223	1506.88	39.22	39.22
224	1506.90	39.13	39.13
225	1506.91	39.07	39.07
226	1506.93	37.18	37.18
227	1506.95	34.13	34.13
228	1506.96	30.43	30.43
229	1506.98	27.14	27.14
230	1507.00	23.89	23.89
231	1507.02	21.01	21.01
232	1507.03	18.43	18.43
233	1507.05	15.72	15.72
234	1507.08	11.18	11.18
235	1507.09	9.72	9.72
236	1507.11	8.06	8.06
237	1507.12	6.74	6.74
238	1507.14	5.39	5.39
239	1507.15	4.27	4.27
240	1507.17	3.18	3.18
241	1507.18	2.34	2.34
242	1507.20	1.58	1.58
243	1507.21	1.00	1.00
244	1507.23	0.61	0.61
245	1507.25	0.41	0.41
246	1507.27	0.24	0.24
247	1507.28	0.24	0.24
248	1507.30	0.26	0.26
249	1507.31	0.37	0.37
250	1507.33	0.48	0.48

McCulley, Frick &Gilman, Inc.
19203 36th Avenue W. Suite 101
Lynnwood, WA 98036
ph.(206) 778-8252

Pumping test analysis
Time-Drawdown plot
with discharge

Project: Simplot Subarea

Evaluated by: VBM | Date: 26.11.1996

Pumping Test No. 2 | Test conducted on: November 12, 1996

337 | 337

Discharge 200.89 U.S.gal/min

Static water level: 0.00 ft below datum

	Pumping test duration [min]	Water level [ft]	Drawdown [ft]
251	1507.35	0.63	0.63
252	1507.43	0.76	0.76
253	1507.52	0.72	0.72
254	1507.60	0.67	0.67
255	1507.68	0.61	0.61
256	1507.77	0.56	0.56
257	1507.85	0.54	0.54
258	1507.93	0.52	0.52
259	1508.02	0.48	0.48
260	1508.10	0.48	0.48
261	1508.18	0.43	0.43
262	1508.27	0.41	0.41
263	1508.35	0.41	0.41
264	1508.43	0.37	0.37
265	1508.52	0.37	0.37
266	1508.60	0.39	0.39
267	1508.68	0.35	0.35
268	1508.77	0.35	0.35
269	1508.85	0.32	0.32
270	1508.93	0.30	0.30
271	1509.02	0.30	0.30
272	1509.10	0.30	0.30
273	1509.18	0.26	0.26
274	1509.27	0.26	0.26
275	1509.35	0.26	0.26
276	1509.52	0.28	0.28
277	1509.68	0.24	0.24
278	1509.85	0.22	0.22
279	1510.02	0.22	0.22
280	1510.18	0.22	0.22
281	1510.35	0.19	0.19
282	1510.52	0.19	0.19
283	1510.68	0.19	0.19
284	1510.85	0.17	0.17
285	1511.02	0.22	0.22
286	1511.18	0.11	0.11
287	1511.35	0.15	0.15
288	1511.52	0.15	0.15
289	1511.68	0.15	0.15
290	1511.85	0.11	0.11
291	1512.02	0.13	0.13
292	1512.18	0.17	0.17
293	1512.35	0.11	0.11
294	1512.52	0.13	0.13
295	1512.68	0.13	0.13
296	1512.85	0.13	0.13
297	1513.02	0.11	0.11
298	1513.18	0.09	0.09
299	1513.35	0.11	0.11
300	1513.52	0.11	0.11

McCulley, Frick &Gilman, Inc.
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ph.(206) 778-8252

Pumping test analysis
Time-Drawdown plot
with discharge

Project: Simplot Subarea

Evaluated by: VBM | Date: 26.11.1996

Pumping Test No. 2 | Test conducted on: November 12, 1996

337 | 337

Discharge 200.89 U.S.gal/min

Static water level: 0.00 ft below datum

	Pumping test duration [min]	Water level [ft]	Drawdown [ft]	
301	1513.68	0.07	0.07	
302	1513.85	0.07	0.07	
303	1514.02	0.11	0.11	
304	1514.18	0.09	0.09	
305	1514.35	0.09	0.09	
306	1514.52	0.13	0.13	
307	1514.68	0.07	0.07	
308	1514.85	0.04	0.04	
309	1515.02	0.07	0.07	
310	1515.18	0.09	0.09	
311	1515.35	0.09	0.09	
312	1515.52	0.09	0.09	
313	1515.68	0.09	0.09	
314	1515.85	0.07	0.07	
315	1516.02	0.07	0.07	
316	1516.18	0.07	0.07	
317	1516.35	0.04	0.04	
318	1516.85	0.04	0.04	
319	1517.35	0.09	0.09	
320	1517.85	0.04	0.04	
321	1518.35	0.04	0.04	
322	1518.85	0.04	0.04	
323	1519.35	0.02	0.02	
324	1519.85	0.04	0.04	
325	1520.35	0.00	0.00	
326	1520.85	0.07	0.07	
327	1521.35	0.02	0.02	
328	1522.35	0.07	0.07	
329	1523.35	0.02	0.02	
330	1524.35	0.02	0.02	
331	1525.35	0.02	0.02	
332	1526.35	0.02	0.02	
333	1527.35	0.02	0.02	
334	1528.35	0.02	0.02	
335	1529.35	0.00	0.00	

McCulley, Frick &Gilman, Inc.
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Lynnwood, WA 98036
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Pumping test analysis
Time-Drawdown plot
with discharge

Project: Simplot Subarea

Evaluated by: VBM | Date: 26.11.1996

Pumping Test No. 2

Test conducted on: November 12, 1996

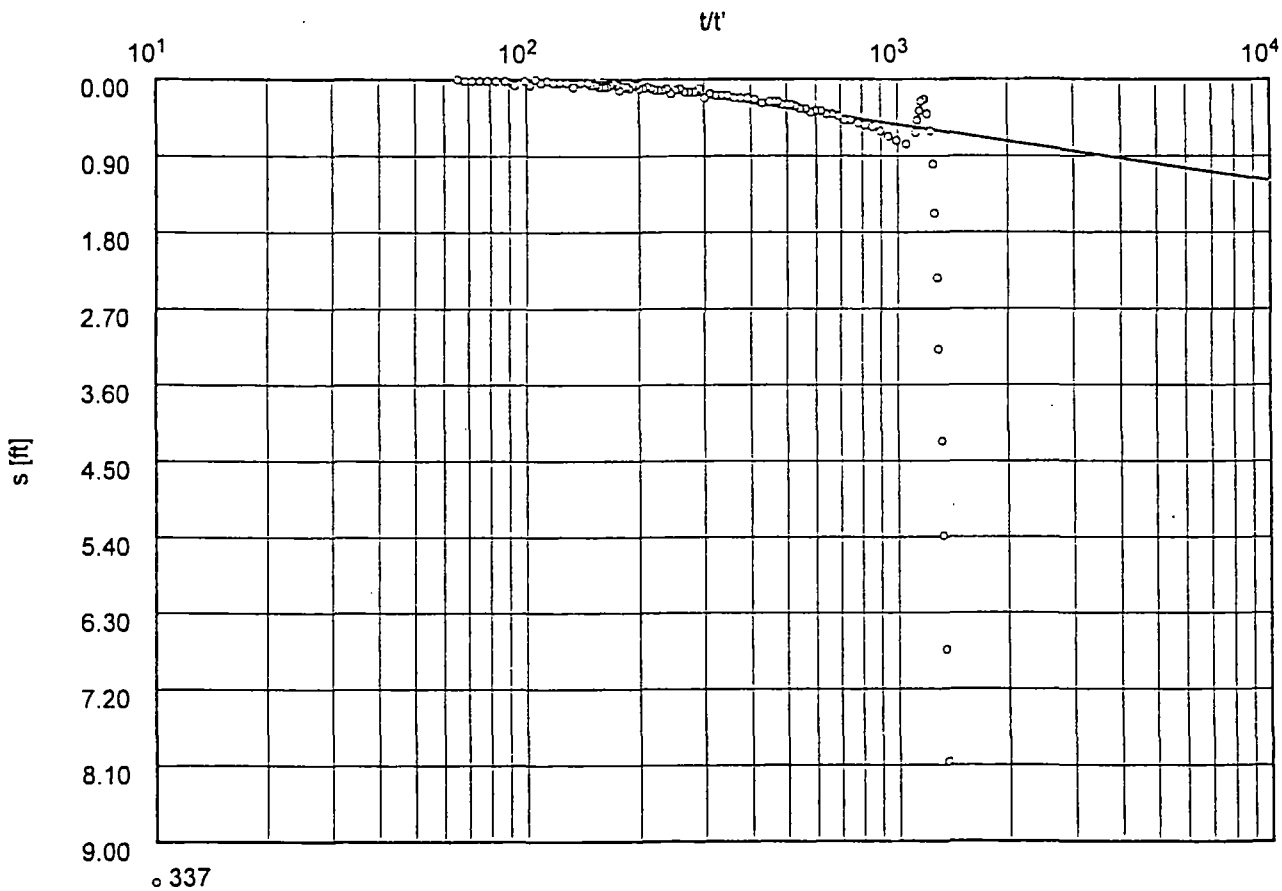
337

Discharge 200.89 U.S.gal/min

	Pumping test duration [min]	Discharge [U.S.gal/min]		
1	0.00	200.00		
2	79.00	200.81		
3	144.00	201.53		
4	198.00	201.85		
5	258.00	202.50		
6	318.00	203.33		
7	378.00	199.16		
8	438.00	200.00		
9	498.00	200.00		
10	558.00	200.83		
11	618.00	200.00		
12	678.00	200.00		
13	738.00	200.00		
14	798.00	200.83		
15	858.00	199.10		
16	918.00	200.00		
17	978.00	197.50		
18	1043.00	204.61		
19	1093.00	201.00		
20	1154.00	203.00		
21	1216.00	202.40		
22	1274.00	201.70		
23	1335.00	201.60		
24	1394.00	200.00		
25	1464.00	200.70		
26	1505.90	200.70		
27	1506.00	0.00		

McCulley, Frick &Gilman, Inc. 19203 36th Avenue W. Suite 101 Lynnwood, WA 98036 ph.(206) 778-8252	Pumping test analysis Recovery method after THEIS & JACOB Confined aquifer	Page 1 Project: Simplot Subarea Evaluated by: VBM Date: 26.11.1996

Pumping Test No. 2	Test conducted on: November 12, 1996
337	
Discharge 200.89 U.S.gal/min	
	Pumping test duration: 1506.00 min



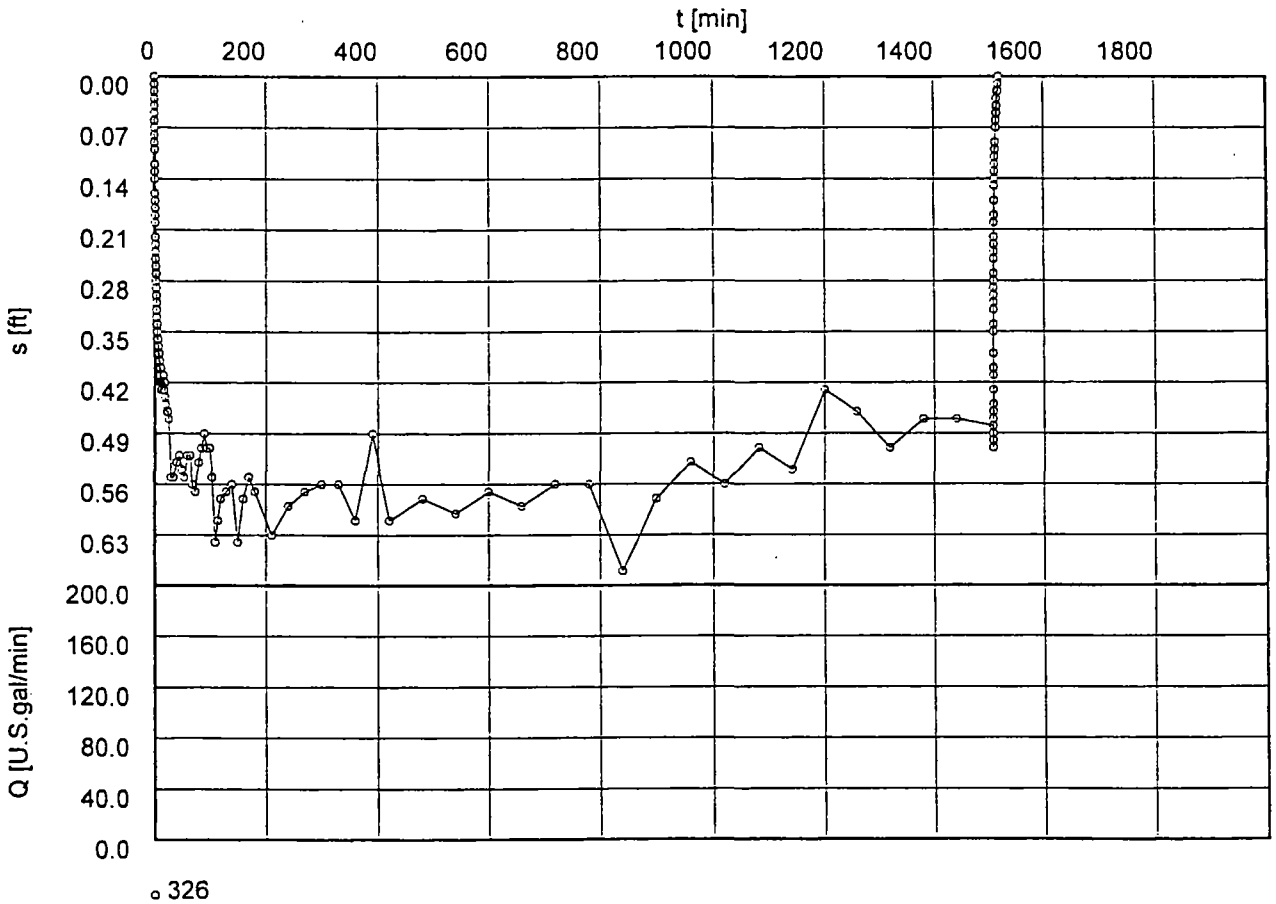
Transmissivity [ft²/min]: 7.48×10^0

Hydraulic conductivity [ft/min]: 1.96×10^{-1}

Aquifer thickness [ft]: 38.00

McCulley, Frick &Gilman, Inc. 19203 36th Avenue W. Suite 101 Lynnwood, WA 98036 ph.(206) 778-8252	Pumping test analysis Time-Drawdown plot with discharge	Page 1 Project: Simplot Subarea Evaluated by: VBM Date: 26.11.1996

Pumping Test No. 2	Test conducted on: November 12, 1996
326	
Discharge 200.00 U.S.gal/min	



McCulley, Frick &Gilman, Inc. 19203 36th Avenue W. Suite 101 Lynnwood, WA 98036 ph.(206) 778-8252	Pumping test analysis Time-Drawdown plot with discharge	Page 2 Project: Simplot Subarea Evaluated by: VBM Date: 26.11.1996

Pumping Test No. 2	Test conducted on: November 12, 1996
326	326
Discharge 200.00 U.S.gal/min	Distance from the pumping well 80.00 ft
Static water level: 0.00 ft below datum	

	Pumping test duration [min]	Water level [ft]	Drawdown [ft]
1	0.00	0.00	0.00
2	0.02	0.00	0.00
3	0.16	0.00	0.00
4	0.22	0.01	0.01
5	0.23	0.01	0.01
6	0.25	0.00	0.00
7	0.27	0.01	0.01
8	0.28	0.00	0.00
9	0.30	0.01	0.01
10	0.31	0.00	0.00
11	0.33	0.02	0.02
12	0.35	0.02	0.02
13	0.37	0.02	0.02
14	0.38	0.02	0.02
15	0.40	0.02	0.02
16	0.42	0.03	0.03
17	0.43	0.04	0.04
18	0.45	0.03	0.03
19	0.47	0.04	0.04
20	0.48	0.04	0.04
21	0.51	0.04	0.04
22	0.53	0.05	0.05
23	0.54	0.04	0.04
24	0.56	0.06	0.06
25	0.57	0.04	0.04
26	0.59	0.05	0.05
27	0.60	0.07	0.07
28	0.61	0.07	0.07
29	0.63	0.06	0.06
30	0.65	0.06	0.06
31	0.67	0.06	0.06
32	0.68	0.07	0.07
33	0.70	0.08	0.08
34	0.71	0.07	0.07
35	0.73	0.07	0.07
36	0.75	0.08	0.08
37	0.76	0.07	0.07
38	0.78	0.09	0.09
39	0.80	0.09	0.09
40	0.82	0.09	0.09
41	0.83	0.09	0.09
42	0.85	0.09	0.09
43	0.86	0.09	0.09
44	0.88	0.10	0.10
45	0.97	0.12	0.12
46	1.05	0.12	0.12
47	1.13	0.13	0.13
48	1.22	0.14	0.14
49	1.30	0.16	0.16
50	1.38	0.16	0.16

McCulley, Frick &Gilman, Inc. 19203 36th Avenue W. Suite 101 Lynnwood, WA 98036 ph.(206) 778-8252	Pumping test analysis Time-Drawdown plot with discharge	Page 3 Project: Simplot Subarea Evaluated by: VBM Date: 26.11.1996

Pumping Test No. 2	Test conducted on: November 12, 1996
326	326
Discharge 200.00 U.S.gal/min	Distance from the pumping well 80.00 ft
Static water level: 0.00 ft below datum	

	Pumping test duration [min]	Water level [ft]	Drawdown [ft]
51	1.47	0.17	0.17
52	1.55	0.18	0.18
53	1.63	0.19	0.19
54	1.72	0.19	0.19
55	1.80	0.19	0.19
56	1.88	0.20	0.20
57	1.97	0.22	0.22
58	2.05	0.22	0.22
59	2.13	0.22	0.22
60	2.22	0.23	0.23
61	2.30	0.24	0.24
62	2.38	0.24	0.24
63	2.47	0.24	0.24
64	2.55	0.24	0.24
65	2.63	0.25	0.25
66	2.72	0.26	0.26
67	2.80	0.27	0.27
68	2.88	0.28	0.28
69	3.05	0.27	0.27
70	3.22	0.27	0.27
71	3.38	0.29	0.29
72	3.55	0.30	0.30
73	3.72	0.30	0.30
74	3.88	0.30	0.30
75	4.05	0.31	0.31
76	4.22	0.32	0.32
77	4.38	0.33	0.33
78	4.55	0.34	0.34
79	4.72	0.34	0.34
80	4.88	0.36	0.36
81	5.05	0.34	0.34
82	5.22	0.35	0.35
83	5.38	0.35	0.35
84	5.55	0.35	0.35
85	5.72	0.36	0.36
86	5.88	0.36	0.36
87	6.05	0.38	0.38
88	6.22	0.37	0.37
89	6.38	0.38	0.38
90	6.55	0.36	0.36
91	6.72	0.38	0.38
92	6.88	0.38	0.38
93	7.05	0.38	0.38
94	7.22	0.37	0.37
95	7.38	0.39	0.39
96	7.55	0.39	0.39
97	7.72	0.38	0.38
98	7.88	0.38	0.38
99	8.05	0.40	0.40
100	8.22	0.39	0.39

McCulley, Frick &Gilman, Inc. 19203 36th Avenue W. Suite 101 Lynnwood, WA 98036 ph.(206) 778-8252	Pumping test analysis Time-Drawdown plot with discharge	Page 4 Project: Simplot Subarea Evaluated by: VBM Date: 26.11.1996

Pumping Test No. 2	Test conducted on: November 12, 1996
326	326
Discharge 200.00 U.S.gal/min	Distance from the pumping well 80.00 ft
Static water level: 0.00 ft below datum	

	Pumping test duration [min]	Water level [ft]	Drawdown [ft]
101	8.38	0.38	0.38
102	8.55	0.40	0.40
103	8.72	0.41	0.41
104	8.88	0.41	0.41
105	9.05	0.40	0.40
106	9.22	0.41	0.41
107	9.38	0.39	0.39
108	9.55	0.42	0.42
109	9.72	0.41	0.41
110	9.88	0.41	0.41
111	10.38	0.41	0.41
112	10.88	0.40	0.40
113	11.38	0.42	0.42
114	11.88	0.43	0.43
115	12.38	0.42	0.42
116	12.88	0.42	0.42
117	13.38	0.43	0.43
118	13.88	0.42	0.42
119	14.38	0.42	0.42
120	14.89	0.42	0.42
121	15.88	0.41	0.41
122	16.88	0.43	0.43
123	17.88	0.42	0.42
124	18.88	0.44	0.44
125	19.88	0.45	0.45
126	20.88	0.46	0.46
127	21.88	0.46	0.46
128	22.88	0.46	0.46
129	23.88	0.46	0.46
130	24.88	0.47	0.47
131	29.88	0.55	0.55
132	34.88	0.55	0.55
133	39.88	0.53	0.53
134	44.88	0.52	0.52
135	49.88	0.54	0.54
136	54.88	0.55	0.55
137	59.88	0.52	0.52
138	64.88	0.52	0.52
139	69.88	0.56	0.56
140	74.88	0.57	0.57
141	79.88	0.53	0.53
142	84.88	0.51	0.51
143	89.88	0.49	0.49
144	94.88	0.51	0.51
145	99.88	0.51	0.51
146	104.88	0.55	0.55
147	109.88	0.64	0.64
148	114.88	0.61	0.61
149	119.88	0.58	0.58
150	129.88	0.57	0.57

McCulley, Frick &Gilman, Inc. 19203 36th Avenue W. Suite 101 Lynnwood, WA 98036 ph.(206) 778-8252	Pumping test analysis Time-Drawdown plot with discharge	Page 5 Project: Simplot Subarea Evaluated by: VBM Date: 26.11.1996

Pumping Test No. 2	Test conducted on: November 12, 1996
326	326
Discharge 200.00 U.S.gal/min	Distance from the pumping well 80.00 ft
Static water level: 0.00 ft below datum	

	Pumping test duration [min]	Water level [ft]	Drawdown [ft]
151	139.88	0.56	0.56
152	149.88	0.64	0.64
153	159.88	0.58	0.58
154	169.88	0.55	0.55
155	179.88	0.57	0.57
156	209.88	0.63	0.63
157	239.88	0.59	0.59
158	269.88	0.57	0.57
159	299.88	0.56	0.56
160	329.88	0.56	0.56
161	359.88	0.61	0.61
162	389.88	0.49	0.49
163	419.89	0.61	0.61
164	479.89	0.58	0.58
165	539.88	0.60	0.60
166	599.88	0.57	0.57
167	659.88	0.59	0.59
168	719.88	0.56	0.56
169	779.88	0.56	0.56
170	839.88	0.68	0.68
171	899.88	0.58	0.58
172	959.88	0.53	0.53
173	1019.88	0.56	0.56
174	1079.88	0.51	0.51
175	1139.88	0.54	0.54
176	1199.88	0.43	0.43
177	1259.88	0.46	0.46
178	1319.88	0.51	0.51
179	1379.88	0.47	0.47
180	1439.88	0.47	0.47
181	1506.34	0.48	0.48
182	1506.38	0.49	0.49
183	1506.40	0.49	0.49
184	1506.41	0.50	0.50
185	1506.43	0.49	0.49
186	1506.44	0.51	0.51
187	1506.47	0.50	0.50
188	1506.48	0.50	0.50
189	1506.50	0.50	0.50
190	1506.51	0.51	0.51
191	1506.53	0.50	0.50
192	1506.54	0.51	0.51
193	1506.55	0.51	0.51
194	1506.57	0.50	0.50
195	1506.58	0.50	0.50
196	1506.60	0.51	0.51
197	1506.61	0.50	0.50
198	1506.63	0.50	0.50
199	1506.65	0.50	0.50
200	1506.66	0.50	0.50

McCulley, Frick &Gilman, Inc. 19203 36th Avenue W. Suite 101 Lynnwood, WA 98036 ph.(206) 778-8252	Pumping test analysis Time-Drawdown plot with discharge	Page 6 Project: Simplot Subarea Evaluated by: VBM Date: 26.11.1996

Pumping Test No. 2	Test conducted on: November 12, 1996
326	326
Discharge 200.00 U.S.gal/min	Distance from the pumping well 80.00 ft
Static water level: 0.00 ft below datum	

	Pumping test duration [min]	Water level [ft]	Drawdown [ft]
201	1506.68	0.51	0.51
202	1506.70	0.50	0.50
203	1506.71	0.51	0.51
204	1506.73	0.50	0.50
205	1506.75	0.49	0.49
206	1506.76	0.49	0.49
207	1506.78	0.49	0.49
208	1506.80	0.50	0.50
209	1506.81	0.50	0.50
210	1506.83	0.50	0.50
211	1506.85	0.51	0.51
212	1506.87	0.51	0.51
213	1506.88	0.50	0.50
214	1506.90	0.50	0.50
215	1506.91	0.50	0.50
216	1506.93	0.49	0.49
217	1506.95	0.49	0.49
218	1506.96	0.50	0.50
219	1506.98	0.50	0.50
220	1507.00	0.50	0.50
221	1507.02	0.50	0.50
222	1507.03	0.49	0.49
223	1507.05	0.50	0.50
224	1507.08	0.51	0.51
225	1507.09	0.51	0.51
226	1507.11	0.49	0.49
227	1507.12	0.50	0.50
228	1507.14	0.48	0.48
229	1507.15	0.50	0.50
230	1507.17	0.48	0.48
231	1507.18	0.49	0.49
232	1507.20	0.48	0.48
233	1507.21	0.48	0.48
234	1507.23	0.48	0.48
235	1507.25	0.46	0.46
236	1507.27	0.47	0.47
237	1507.28	0.47	0.47
238	1507.30	0.47	0.47
239	1507.31	0.46	0.46
240	1507.33	0.46	0.46
241	1507.35	0.45	0.45
242	1507.43	0.43	0.43
243	1507.52	0.41	0.41
244	1507.60	0.40	0.40
245	1507.68	0.38	0.38
246	1507.77	0.38	0.38
247	1507.85	0.35	0.35
248	1507.93	0.34	0.34
249	1508.02	0.34	0.34
250	1508.10	0.32	0.32

McCulley, Frick &Gilman, Inc.
19203 36th Avenue W. Suite 101
Lynnwood, WA 98036
ph.(206) 778-8252

Pumping test analysis
Time-Drawdown plot
with discharge

Project: Simplot Subarea

Evaluated by: VBM | Date: 26.11.1996

Pumping Test No. 2 | Test conducted on: November 12, 1996

326 | 326

Discharge 200.00 U.S.gal/min | Distance from the pumping well 80.00 ft

Static water level: 0.00 ft below datum

	Pumping test duration [min]	Water level [ft]	Drawdown [ft]
251	1508.18	0.31	0.31
252	1508.27	0.30	0.30
253	1508.35	0.29	0.29
254	1508.43	0.28	0.28
255	1508.52	0.28	0.28
256	1508.60	0.27	0.27
257	1508.68	0.27	0.27
258	1508.77	0.27	0.27
259	1508.85	0.25	0.25
260	1508.93	0.23	0.23
261	1509.02	0.23	0.23
262	1509.10	0.24	0.24
263	1509.18	0.23	0.23
264	1509.27	0.22	0.22
265	1509.35	0.22	0.22
266	1509.52	0.20	0.20
267	1509.68	0.19	0.19
268	1509.85	0.19	0.19
269	1510.02	0.17	0.17
270	1510.18	0.17	0.17
271	1510.35	0.17	0.17
272	1510.52	0.15	0.15
273	1510.68	0.14	0.14
274	1510.85	0.13	0.13
275	1511.02	0.13	0.13
276	1511.18	0.12	0.12
277	1511.35	0.13	0.13
278	1511.52	0.11	0.11
279	1511.68	0.10	0.10
280	1511.85	0.10	0.10
281	1512.02	0.09	0.09
282	1512.18	0.10	0.10
283	1512.35	0.09	0.09
284	1512.52	0.09	0.09
285	1512.68	0.09	0.09
286	1512.85	0.10	0.10
287	1513.02	0.09	0.09
288	1513.18	0.07	0.07
289	1513.35	0.07	0.07
290	1513.52	0.07	0.07
291	1513.68	0.06	0.06
292	1513.85	0.07	0.07
293	1514.02	0.06	0.06
294	1514.18	0.05	0.05
295	1514.35	0.07	0.07
296	1514.52	0.04	0.04
297	1514.68	0.05	0.05
298	1514.85	0.06	0.06
299	1515.02	0.05	0.05
300	1515.18	0.05	0.05

McCulley, Frick &Gilman, Inc.
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Lynnwood, WA 98036
ph.(206) 778-8252

Pumping test analysis
Time-Drawdown plot
with discharge

Project: Simplot Subarea

Evaluated by: VBM | Date: 26.11.1996

Pumping Test No. 2 | Test conducted on: November 12, 1996

326 | 326

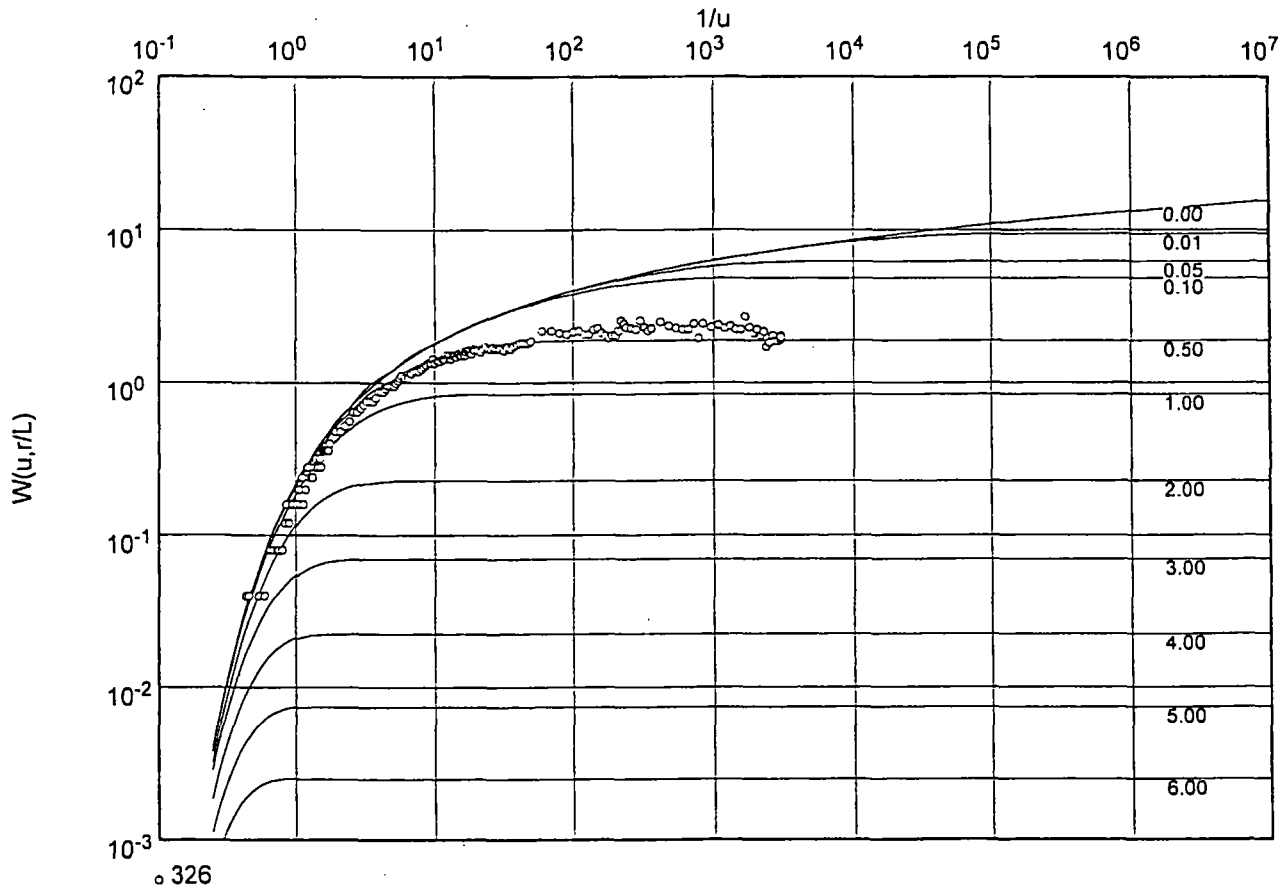
Discharge 200.00 U.S.gal/min | Distance from the pumping well 80.00 ft

Static water level: 0.00 ft below datum

	Pumping test duration [min]	Water level [ft]	Drawdown [ft]	
301	1515.35	0.03	0.03	
302	1515.52	0.05	0.05	
303	1515.68	0.04	0.04	
304	1515.85	0.03	0.03	
305	1516.02	0.02	0.02	
306	1516.18	0.04	0.04	
307	1516.35	0.04	0.04	
308	1516.85	0.02	0.02	
309	1517.35	0.02	0.02	
310	1517.85	0.02	0.02	
311	1518.35	0.01	0.01	
312	1518.85	0.02	0.02	
313	1519.35	0.00	0.00	

McCulley, Frick &Gilman, Inc. 19203 36th Avenue W. Suite 101 Lynnwood, WA 98036 ph.(206) 778-8252	Pumping test analysis HANTUSH's method Leaky aquifer, no aquitard storage	Page 1 Project: Simplot Subarea Evaluated by: VBM Date: 26.11.1996

Pumping Test No. 2	Test conducted on: November 12, 1996
326	
Discharge 200.00 U.S.gal/min	



Transmissivity [ft²/min]: 8.47×10^{0}

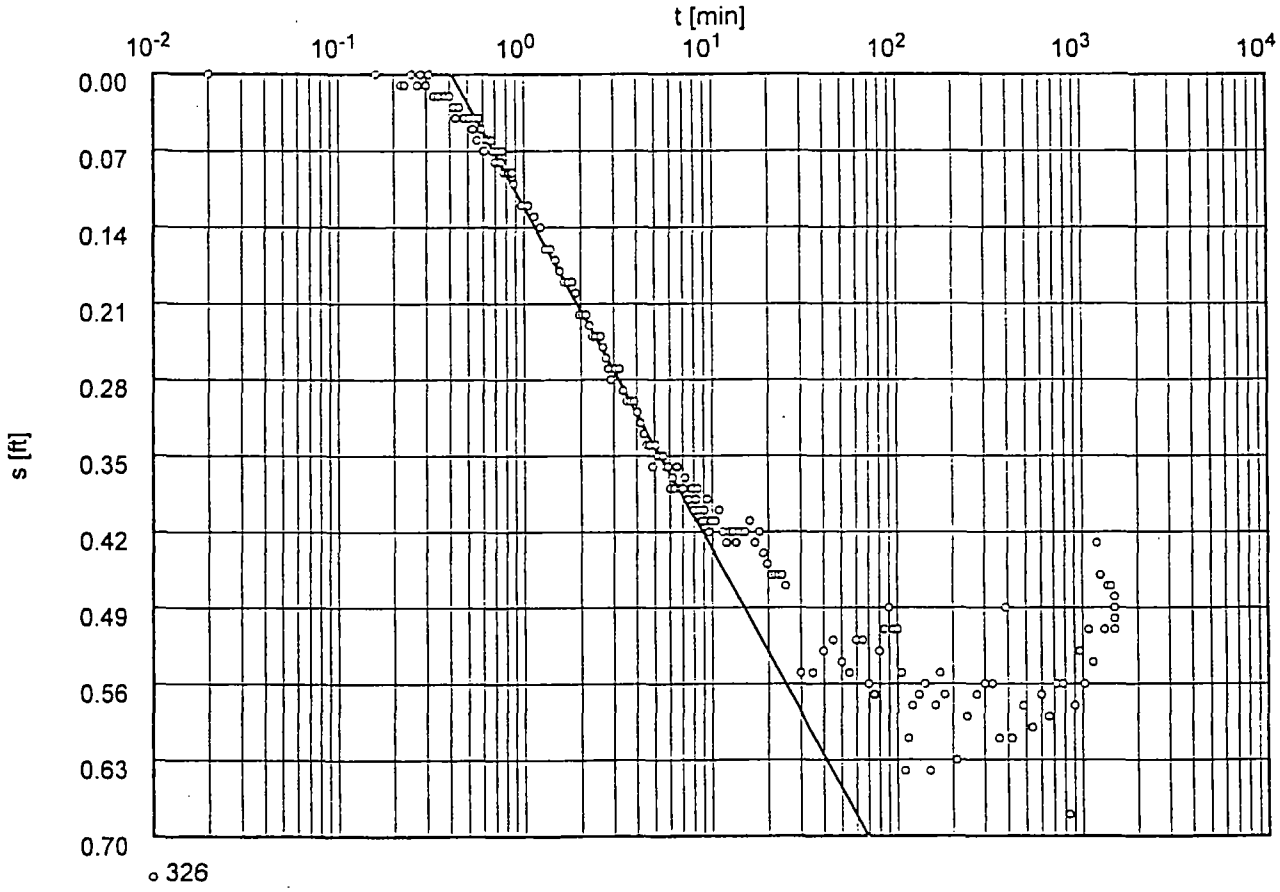
Hydraulic conductivity [ft/min]: 2.22×10^{-1}

Aquifer thickness [ft]: 38.00

Storativity: 2.65×10^{-3}

McCulley, Frick &Gilman, Inc. 19203 36th Avenue W. Suite 101 Lynnwood, WA 98036 ph.(206) 778-8252	Pumping test analysis Time-Drawdown-method after COOPER & JACOB Confined aquifer	Page 1 Project: Simplot Subarea Evaluated by: VBM Date: 26.11.1996

Pumping Test No. 2	Test conducted on: November 12, 1996
326	
Discharge 200.00 U.S.gal/min	



Transmissivity [ft²/min]: 1.55×10^{1}

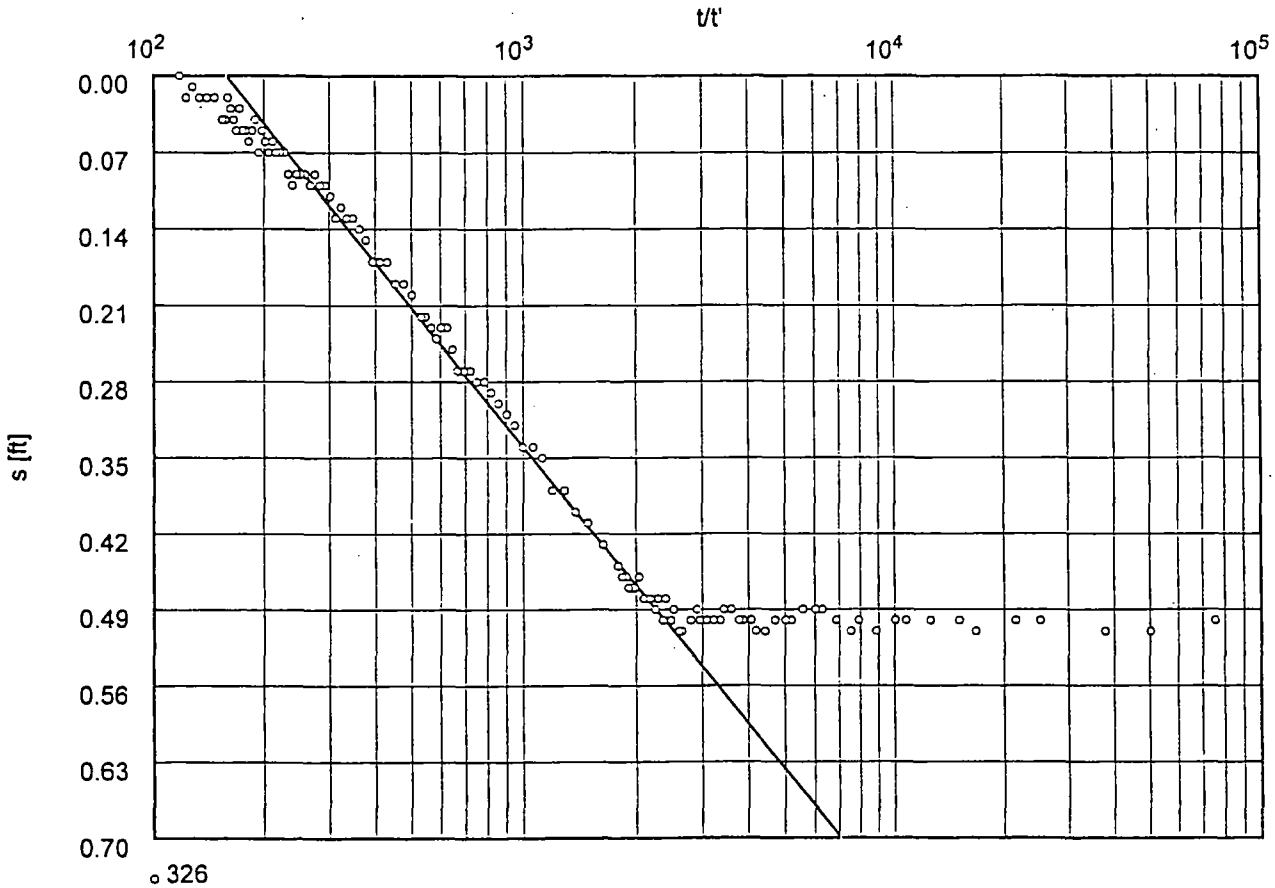
Hydraulic conductivity [ft/min]: 4.09×10^{-1}

Aquifer thickness [ft]: 38.00

Storativity: 2.24×10^{-3}

McCulley, Frick &Gilman, Inc. 19203 36th Avenue W. Suite 101 Lynnwood, WA 98036 ph.(206) 778-8252	Pumping test analysis Recovery method after THEIS & JACOB Confined aquifer	Page 1 Project: Simplot Subarea Evaluated by: VBM | Date: 26.11.1996

Pumping Test No. 2	Test conducted on: November 12, 1996
326	
Discharge 200.00 U.S.gal/min	
	Pumping test duration: 1506.51 min



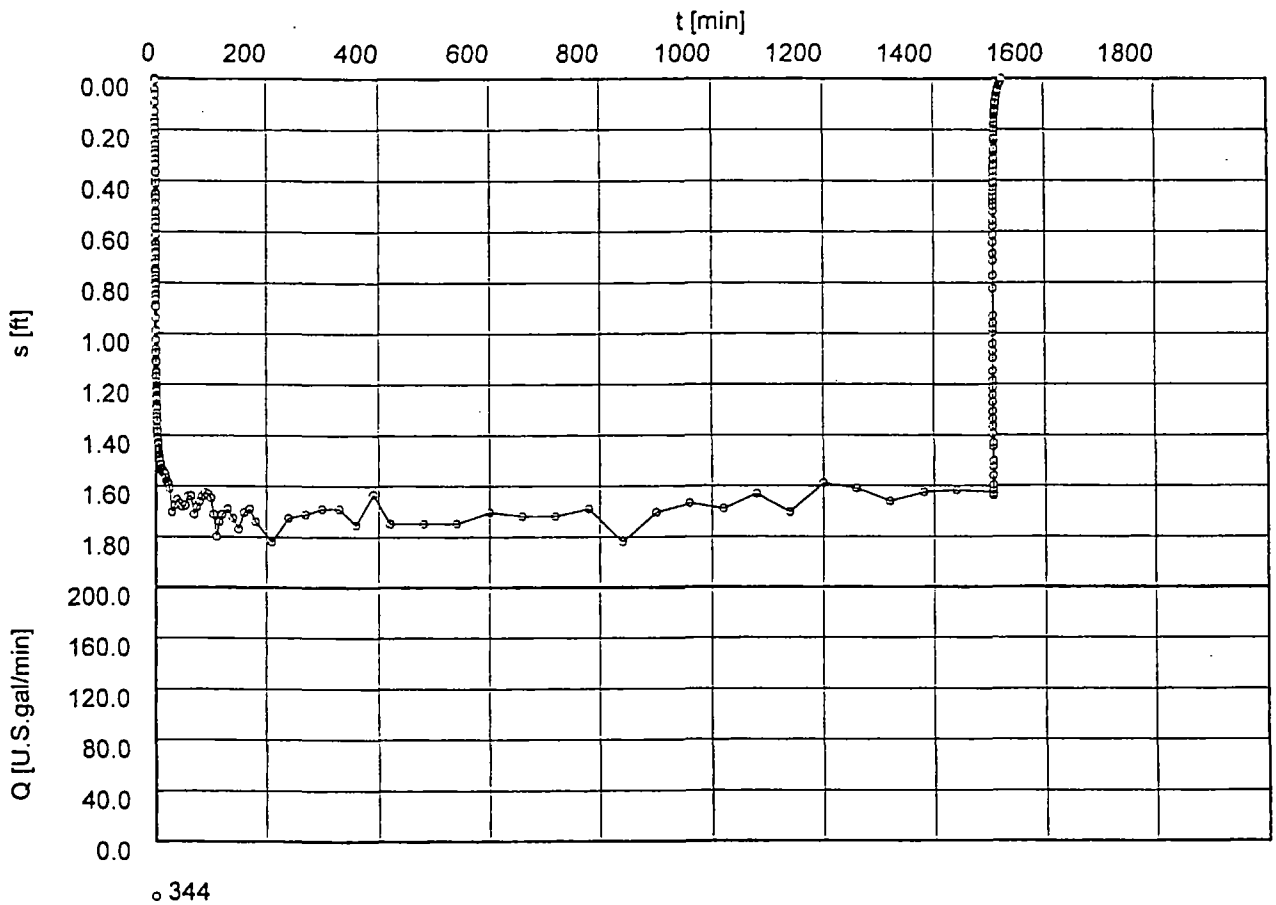
Transmissivity [ft²/min]: 1.15×10^{1}

Hydraulic conductivity [ft/min]: 3.03×10^{-1}

Aquifer thickness [ft]: 38.00

McCulley, Frick &Gilman, Inc. 19203 36th Avenue W. Suite 101 Lynnwood, WA 98036 ph.(206) 778-8252	Pumping test analysis Time-Drawdown plot with discharge	Page 1 Project: Simplot Subarea Evaluated by: VBM Date: 26.11.1996

Pumping Test No. 2	Test conducted on: November 12, 1996
344	
Discharge 200.00 U.S.gal/min	



McCulley, Frick &Gilman, Inc.
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Pumping test analysis
Time-Drawdown plot
with discharge

Project: Simplot Subarea

Evaluated by: VBM | Date: 26.11.1996

Pumping Test No. 2 | Test conducted on: November 12, 1996

344 | 344

Discharge 200.00 U.S.gal/min | Distance from the pumping well 84.30 ft

Static water level: 0.00 ft below datum

	Pumping test duration [min]	Water level [ft]	Drawdown [ft]
1	0.00	0.00	0.00
2	0.02	0.00	0.00
3	0.03	0.01	0.01
4	0.05	0.04	0.04
5	0.07	0.07	0.07
6	0.08	0.09	0.09
7	0.10	0.13	0.13
8	0.12	0.16	0.16
9	0.13	0.17	0.17
10	0.15	0.19	0.19
11	0.16	0.22	0.22
12	0.18	0.25	0.25
13	0.20	0.26	0.26
14	0.22	0.28	0.28
15	0.23	0.30	0.30
16	0.25	0.32	0.32
17	0.27	0.34	0.34
18	0.28	0.37	0.37
19	0.30	0.37	0.37
20	0.31	0.40	0.40
21	0.33	0.41	0.41
22	0.35	0.45	0.45
23	0.37	0.45	0.45
24	0.38	0.47	0.47
25	0.40	0.49	0.49
26	0.42	0.52	0.52
27	0.43	0.53	0.53
28	0.45	0.55	0.55
29	0.47	0.56	0.56
30	0.48	0.59	0.59
31	0.51	0.61	0.61
32	0.53	0.64	0.64
33	0.54	0.65	0.65
34	0.56	0.65	0.65
35	0.57	0.66	0.66
36	0.59	0.68	0.68
37	0.60	0.69	0.69
38	0.61	0.71	0.71
39	0.63	0.72	0.72
40	0.65	0.74	0.74
41	0.67	0.75	0.75
42	0.68	0.76	0.76
43	0.70	0.77	0.77
44	0.71	0.79	0.79
45	0.73	0.80	0.80
46	0.75	0.81	0.81
47	0.76	0.83	0.83
48	0.78	0.85	0.85
49	0.80	0.85	0.85
50	0.82	0.87	0.87

McCulley, Frick &Gilman, Inc.
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Lynnwood, WA 98036
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Pumping test analysis
Time-Drawdown plot
with discharge

Project: Simplot Subarea

Evaluated by: VBM | Date: 26.11.1996

Pumping Test No. 2 | Test conducted on: November 12, 1996

344 | 344

Discharge 200.00 U.S.gal/min | Distance from the pumping well 84.30 ft

Static water level: 0.00 ft below datum

	Pumping test duration [min]	Water level [ft]	Drawdown [ft]
51	0.83	0.87	0.87
52	0.85	0.89	0.89
53	0.86	0.90	0.90
54	0.88	0.90	0.90
55	0.97	0.94	0.94
56	1.05	0.99	0.99
57	1.13	1.02	1.02
58	1.22	1.06	1.06
59	1.30	1.08	1.08
60	1.38	1.10	1.10
61	1.47	1.11	1.11
62	1.55	1.15	1.15
63	1.63	1.15	1.15
64	1.72	1.16	1.16
65	1.80	1.17	1.17
66	1.88	1.19	1.19
67	1.97	1.21	1.21
68	2.05	1.21	1.21
69	2.13	1.22	1.22
70	2.22	1.23	1.23
71	2.30	1.24	1.24
72	2.38	1.25	1.25
73	2.47	1.26	1.26
74	2.55	1.28	1.28
75	2.63	1.29	1.29
76	2.72	1.29	1.29
77	2.80	1.31	1.31
78	2.88	1.31	1.31
79	3.05	1.33	1.33
80	3.22	1.34	1.34
81	3.38	1.37	1.37
82	3.55	1.37	1.37
83	3.72	1.39	1.39
84	3.88	1.39	1.39
85	4.05	1.41	1.41
86	4.22	1.42	1.42
87	4.38	1.43	1.43
88	4.55	1.43	1.43
89	4.72	1.44	1.44
90	4.88	1.44	1.44
91	5.05	1.45	1.45
92	5.22	1.46	1.46
93	5.38	1.46	1.46
94	5.55	1.47	1.47
95	5.72	1.47	1.47
96	5.88	1.47	1.47
97	6.05	1.48	1.48
98	6.22	1.48	1.48
99	6.38	1.49	1.49
100	6.55	1.49	1.49

McCulley, Frick &Gilman, Inc.
19203 36th Avenue W. Suite 101
Lynnwood, WA 98036
ph.(206) 778-8252

Pumping test analysis
Time-Drawdown plot
with discharge

Project: Simplot Subarea

Evaluated by: VBM | Date: 26.11.1996

Pumping Test No. 2 | Test conducted on: November 12, 1996

344 | 344

Discharge 200.00 U.S.gal/min | Distance from the pumping well 84.30 ft

Static water level: 0.00 ft below datum

	Pumping test duration [min]	Water level [ft]	Drawdown [ft]	
101	6.72	1.49	1.49	
102	6.88	1.50	1.50	
103	7.05	1.49	1.49	
104	7.22	1.49	1.49	
105	7.38	1.51	1.51	
106	7.55	1.51	1.51	
107	7.72	1.50	1.50	
108	7.88	1.52	1.52	
109	8.05	1.52	1.52	
110	8.22	1.52	1.52	
111	8.38	1.52	1.52	
112	8.55	1.52	1.52	
113	8.72	1.52	1.52	
114	8.88	1.52	1.52	
115	9.05	1.53	1.53	
116	9.22	1.53	1.53	
117	9.38	1.53	1.53	
118	9.55	1.52	1.52	
119	9.72	1.53	1.53	
120	9.88	1.53	1.53	
121	10.38	1.54	1.54	
122	10.88	1.55	1.55	
123	11.38	1.55	1.55	
124	11.88	1.54	1.54	
125	12.38	1.55	1.55	
126	12.88	1.54	1.54	
127	13.38	1.55	1.55	
128	13.88	1.55	1.55	
129	14.38	1.55	1.55	
130	14.89	1.55	1.55	
131	15.88	1.55	1.55	
132	16.88	1.55	1.55	
133	17.88	1.57	1.57	
134	18.88	1.58	1.58	
135	19.88	1.58	1.58	
136	20.88	1.58	1.58	
137	21.88	1.59	1.59	
138	22.88	1.59	1.59	
139	23.88	1.60	1.60	
140	24.88	1.61	1.61	
141	29.88	1.70	1.70	
142	34.88	1.67	1.67	
143	39.88	1.65	1.65	
144	44.88	1.67	1.67	
145	49.88	1.68	1.68	
146	54.88	1.67	1.67	
147	59.88	1.64	1.64	
148	64.88	1.64	1.64	
149	69.88	1.71	1.71	
150	74.88	1.68	1.68	

McCulley, Frick &Gilman, Inc. 19203 36th Avenue W. Suite 101 Lynnwood, WA 98036 ph.(206) 778-8252	Pumping test analysis Time-Drawdown plot with discharge	Page 5 Project: Simplot Subarea Evaluated by: VBM Date: 26.11.1996

Pumping Test No. 2	Test conducted on: November 12, 1996
344	344
Discharge 200.00 U.S.gal/min	Distance from the pumping well 84.30 ft
Static water level: 0.00 ft below datum	

	Pumping test duration [min]	Water level [ft]	Drawdown [ft]
151	79.88	1.66	1.66
152	84.88	1.64	1.64
153	89.88	1.62	1.62
154	94.88	1.63	1.63
155	99.88	1.65	1.65
156	104.88	1.71	1.71
157	109.88	1.80	1.80
158	114.88	1.74	1.74
159	119.88	1.71	1.71
160	129.88	1.69	1.69
161	139.88	1.73	1.73
162	149.88	1.77	1.77
163	159.88	1.70	1.70
164	169.88	1.69	1.69
165	179.88	1.74	1.74
166	209.88	1.82	1.82
167	239.88	1.73	1.73
168	269.88	1.71	1.71
169	299.88	1.69	1.69
170	329.88	1.69	1.69
171	359.88	1.75	1.75
172	389.88	1.63	1.63
173	419.89	1.75	1.75
174	479.89	1.75	1.75
175	539.88	1.75	1.75
176	599.88	1.70	1.70
177	659.88	1.72	1.72
178	719.88	1.72	1.72
179	779.88	1.69	1.69
180	839.88	1.82	1.82
181	899.88	1.70	1.70
182	959.88	1.67	1.67
183	1019.88	1.69	1.69
184	1079.88	1.63	1.63
185	1139.88	1.70	1.70
186	1199.88	1.59	1.59
187	1259.88	1.61	1.61
188	1319.88	1.66	1.66
189	1379.88	1.62	1.62
190	1439.88	1.62	1.62
191	1506.34	1.62	1.62
192	1506.38	1.62	1.62
193	1506.40	1.62	1.62
194	1506.41	1.62	1.62
195	1506.43	1.63	1.63
196	1506.44	1.63	1.63
197	1506.47	1.62	1.62
198	1506.48	1.63	1.63
199	1506.50	1.63	1.63
200	1506.51	1.63	1.63

McCulley, Frick &Gilman, Inc.
19203 36th Avenue W. Suite 101
Lynnwood, WA 98036
ph.(206) 778-8252

Pumping test analysis
Time-Drawdown plot
with discharge

Project: Simplot Subarea

Evaluated by: VBM | Date: 26.11.1996

Pumping Test No. 2 | Test conducted on: November 12, 1996

344 | 344

Discharge 200.00 U.S.gal/min | Distance from the pumping well 84.30 ft

Static water level: 0.00 ft below datum

	Pumping test duration [min]	Water level [ft]	Drawdown [ft]
201	1506.53	1.62	1.62
202	1506.54	1.62	1.62
203	1506.55	1.62	1.62
204	1506.57	1.62	1.62
205	1506.58	1.62	1.62
206	1506.60	1.63	1.63
207	1506.61	1.62	1.62
208	1506.63	1.62	1.62
209	1506.65	1.62	1.62
210	1506.66	1.64	1.64
211	1506.68	1.62	1.62
212	1506.70	1.63	1.63
213	1506.71	1.64	1.64
214	1506.73	1.62	1.62
215	1506.75	1.62	1.62
216	1506.76	1.62	1.62
217	1506.78	1.63	1.63
218	1506.80	1.62	1.62
219	1506.81	1.63	1.63
220	1506.83	1.64	1.64
221	1506.85	1.62	1.62
222	1506.87	1.62	1.62
223	1506.88	1.62	1.62
224	1506.90	1.62	1.62
225	1506.91	1.63	1.63
226	1506.93	1.63	1.63
227	1506.95	1.63	1.63
228	1506.96	1.62	1.62
229	1506.98	1.61	1.61
230	1507.00	1.60	1.60
231	1507.02	1.56	1.56
232	1507.03	1.52	1.52
233	1507.05	1.50	1.50
234	1507.08	1.44	1.44
235	1507.09	1.43	1.43
236	1507.11	1.39	1.39
237	1507.12	1.36	1.36
238	1507.14	1.34	1.34
239	1507.15	1.31	1.31
240	1507.17	1.27	1.27
241	1507.18	1.24	1.24
242	1507.20	1.21	1.21
243	1507.21	1.18	1.18
244	1507.23	1.15	1.15
245	1507.25	1.10	1.10
246	1507.27	1.07	1.07
247	1507.28	1.04	1.04
248	1507.30	1.00	1.00
249	1507.31	0.98	0.98
250	1507.33	0.96	0.96

McCulley, Frick &Gilman, Inc.
19203 36th Avenue W. Suite 101
Lynnwood, WA 98036
ph.(206) 778-8252

Pumping test analysis
Time-Drawdown plot
with discharge

Project: Simplot Subarea

Evaluated by: VBM | Date: 26.11.1996

Pumping Test No. 2 | Test conducted on: November 12, 1996

344 | 344

Discharge 200.00 U.S.gal/min | Distance from the pumping well 84.30 ft

Static water level: 0.00 ft below datum

	Pumping test duration [min]	Water level [ft]	Drawdown [ft]	
251	1507.35	0.93	0.93	
252	1507.43	0.82	0.82	
253	1507.52	0.77	0.77	
254	1507.60	0.72	0.72	
255	1507.68	0.69	0.69	
256	1507.77	0.64	0.64	
257	1507.85	0.61	0.61	
258	1507.93	0.58	0.58	
259	1508.02	0.56	0.56	
260	1508.10	0.52	0.52	
261	1508.18	0.50	0.50	
262	1508.27	0.48	0.48	
263	1508.35	0.46	0.46	
264	1508.43	0.44	0.44	
265	1508.52	0.43	0.43	
266	1508.60	0.41	0.41	
267	1508.68	0.40	0.40	
268	1508.77	0.38	0.38	
269	1508.85	0.35	0.35	
270	1508.93	0.36	0.36	
271	1509.02	0.34	0.34	
272	1509.10	0.34	0.34	
273	1509.18	0.34	0.34	
274	1509.27	0.32	0.32	
275	1509.35	0.31	0.31	
276	1509.52	0.29	0.29	
277	1509.68	0.28	0.28	
278	1509.85	0.28	0.28	
279	1510.02	0.25	0.25	
280	1510.18	0.24	0.24	
281	1510.35	0.23	0.23	
282	1510.52	0.21	0.21	
283	1510.68	0.21	0.21	
284	1510.85	0.19	0.19	
285	1511.02	0.18	0.18	
286	1511.18	0.18	0.18	
287	1511.35	0.17	0.17	
288	1511.52	0.17	0.17	
289	1511.68	0.16	0.16	
290	1511.85	0.16	0.16	
291	1512.02	0.14	0.14	
292	1512.18	0.14	0.14	
293	1512.35	0.14	0.14	
294	1512.52	0.12	0.12	
295	1512.68	0.12	0.12	
296	1512.85	0.13	0.13	
297	1513.02	0.12	0.12	
298	1513.18	0.12	0.12	
299	1513.35	0.11	0.11	
300	1513.52	0.09	0.09	

McCulley, Frick &Gilman, Inc.
19203 36th Avenue W. Suite 101
Lynnwood, WA 98036
ph.(206) 778-8252

Pumping test analysis
Time-Drawdown plot
with discharge

Project: Simplot Subarea

Evaluated by: VBM | Date: 26.11.1996

Pumping Test No. 2 | Test conducted on: November 12, 1996

344 | 344

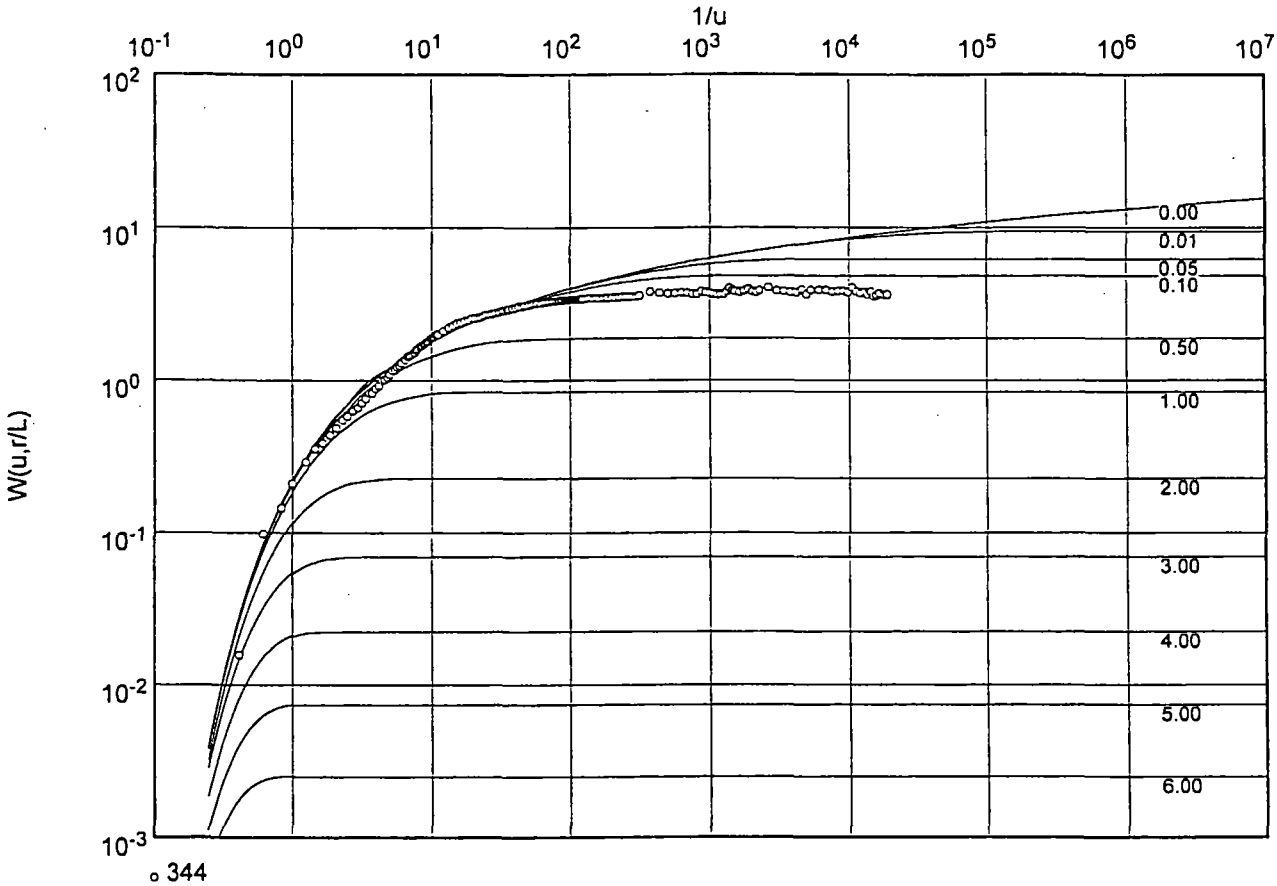
Discharge 200.00 U.S.gal/min | Distance from the pumping well 84.30 ft

Static water level: 0.00 ft below datum

	Pumping test duration [min]	Water level [ft]	Drawdown [ft]
301	1513.68	0.10	0.10
302	1513.85	0.09	0.09
303	1514.02	0.10	0.10
304	1514.18	0.09	0.09
305	1514.35	0.09	0.09
306	1514.52	0.09	0.09
307	1514.68	0.08	0.08
308	1514.85	0.09	0.09
309	1515.02	0.07	0.07
310	1515.18	0.07	0.07
311	1515.35	0.06	0.06
312	1515.52	0.07	0.07
313	1515.68	0.07	0.07
314	1515.85	0.07	0.07
315	1516.02	0.06	0.06
316	1516.18	0.06	0.06
317	1516.35	0.07	0.07
318	1516.85	0.06	0.06
319	1517.35	0.05	0.05
320	1517.85	0.05	0.05
321	1518.35	0.04	0.04
322	1518.85	0.04	0.04
323	1519.35	0.02	0.02
324	1519.85	0.03	0.03
325	1520.35	0.02	0.02
326	1520.85	0.02	0.02
327	1521.35	0.02	0.02
328	1522.35	0.02	0.02
329	1523.35	0.02	0.02
330	1524.35	0.01	0.01
331	1525.35	0.00	0.00

McCulley, Frick &Gilman, Inc. 19203 36th Avenue W. Suite 101 Lynnwood, WA 98036 ph.(206) 778-8252	Pumping test analysis HANTUSH's method Leaky aquifer, no aquitard storage	Page 1 Project: Simplot Subarea Evaluated by: VBM Date: 26.11.1996

Pumping Test No. 2	Test conducted on: November 12, 1996
344	
Discharge 200.00 U.S.gal/min	



Transmissivity [ft²/min]: 4.76×10^{0}

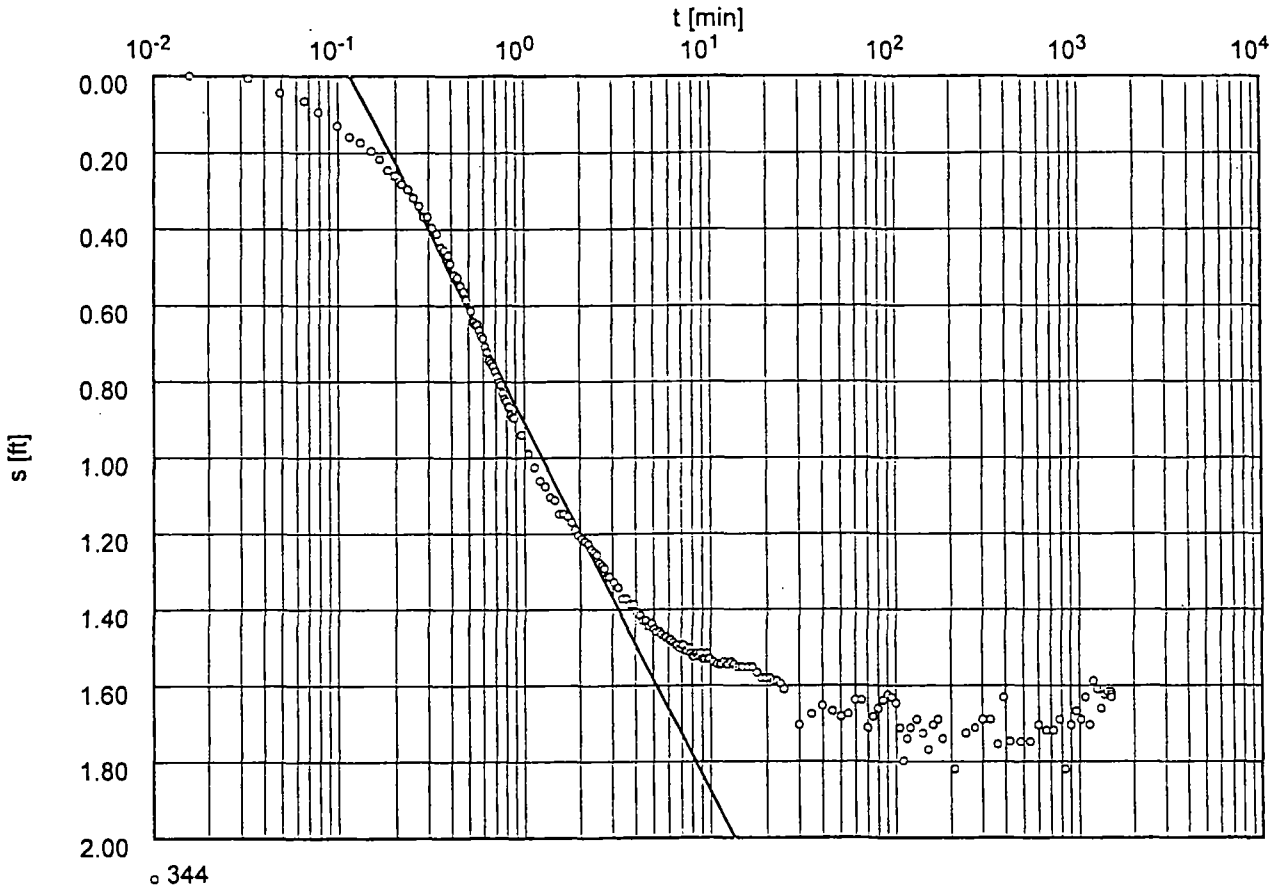
Hydraulic conductivity [ft/min]: 1.25×10^{-1}

Aquifer thickness [ft]: 38.00

Storativity: 2.12×10^{-4}

McCulley, Frick &Gilman, Inc. 19203 36th Avenue W. Suite 101 Lynnwood, WA 98036 ph.(206) 778-8252	Pumping test analysis Time-Drawdown-method after COOPER & JACOB Confined aquifer	Page 1 Project: Simplot Subarea Evaluated by: VBM Date: 26.11.1996

Pumping Test No. 2	Test conducted on: November 12, 1996
344	
Discharge 200.00 U.S.gal/min	



Transmissivity [ft²/min]: 5.04×10^{0}

Hydraulic conductivity [ft/min]: 1.32×10^{-1}

Aquifer thickness [ft]: 38.00

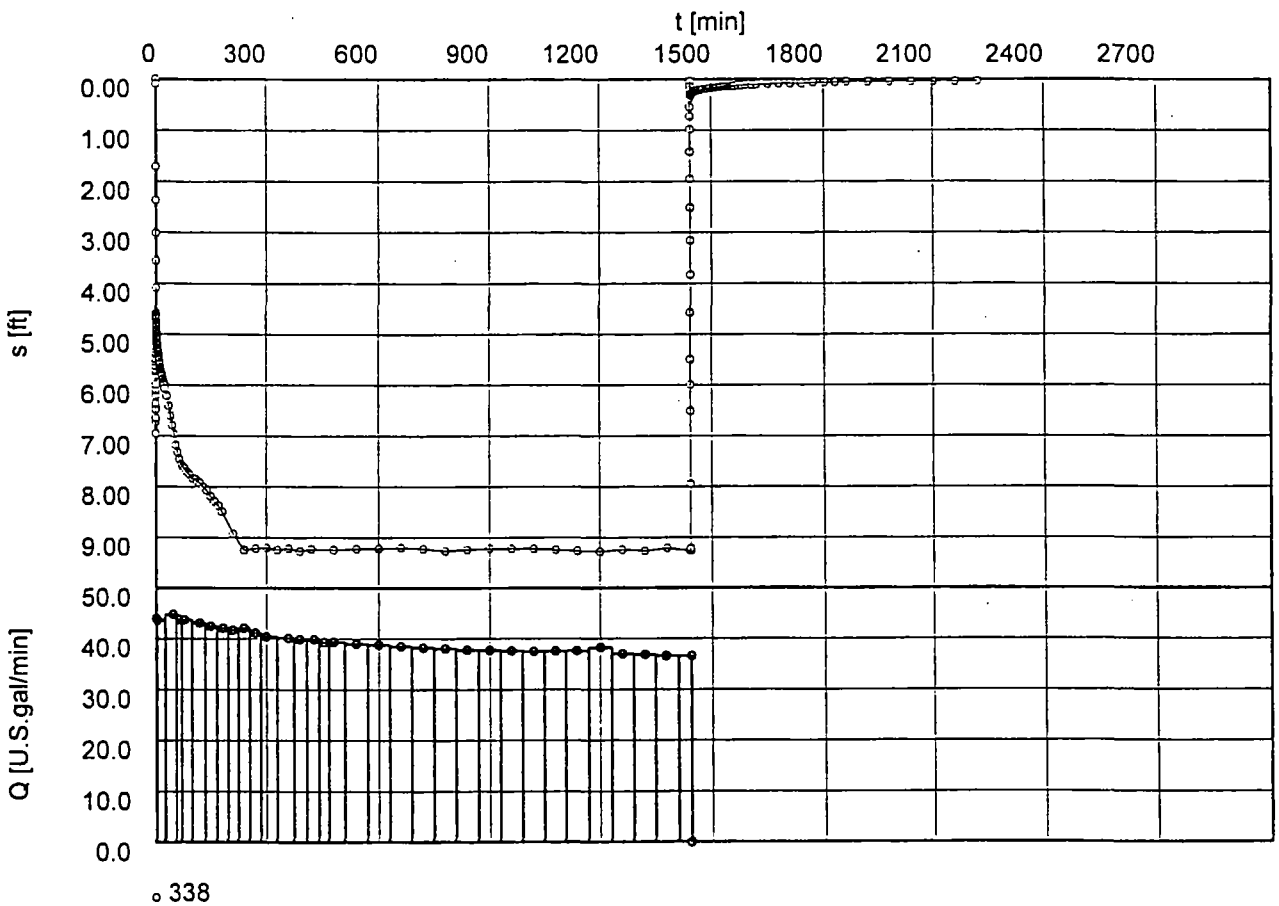
Storativity: 1.84×10^{-4}

C-2

PUMPING WELL 338

McCulley, Frick &Gilman, Inc. 19203 36th Avenue W. Suite 101 Lynnwood, WA 98036 ph.(206) 778-8252	Pumping test analysis Time-Drawdown plot with discharge	Page 1 Project: Simplot Subarea Evaluated by: VBM Date: 26.11.1996

Pumping Test No. 3	Test conducted on: November 14, 1996
338	
Discharge 39.09 U.S.gal/min	



McCulley, Frick &Gilman, Inc. 19203 36th Avenue W. Suite 101 Lynnwood, WA 98036 ph.(206) 778-8252	Pumping test analysis Time-Drawdown plot with discharge	Page 2 Project: Simplot Subarea Evaluated by: VBM Date: 26.11.1996

Pumping Test No. 3	Test conducted on: November 14, 1996
338	338
Discharge 39.09 U.S.gal/min	
Static water level: 0.00 ft below datum	

	Pumping test duration [min]	Water level [ft]	Drawdown [ft]
1	0.00	0.00	0.00
2	0.02	0.09	0.09
3	0.03	1.71	1.71
4	0.05	2.37	2.37
5	0.07	3.01	3.01
6	0.08	3.55	3.55
7	0.10	4.09	4.09
8	0.12	4.57	4.57
9	0.13	5.02	5.02
10	0.15	5.42	5.42
11	0.17	5.77	5.77
12	0.18	6.11	6.11
13	0.20	6.45	6.45
14	0.22	6.72	6.72
15	0.23	6.95	6.95
16	0.25	6.65	6.65
17	0.27	6.48	6.48
18	0.28	6.36	6.36
19	0.30	6.21	6.21
20	0.32	6.09	6.09
21	0.33	5.98	5.98
22	0.36	5.81	5.81
23	0.37	5.73	5.73
24	0.38	5.71	5.71
25	0.40	5.62	5.62
26	0.42	5.54	5.54
27	0.43	5.49	5.49
28	0.45	5.40	5.40
29	0.47	5.36	5.36
30	0.48	5.31	5.31
31	0.50	5.25	5.25
32	0.52	5.20	5.20
33	0.53	5.15	5.15
34	0.55	5.13	5.13
35	0.57	5.08	5.08
36	0.58	5.03	5.03
37	0.60	5.00	5.00
38	0.62	4.96	4.96
39	0.63	4.93	4.93
40	0.65	4.89	4.89
41	0.67	4.84	4.84
42	0.68	4.83	4.83
43	0.70	4.79	4.79
44	0.72	4.78	4.78
45	0.73	4.75	4.75
46	0.75	4.73	4.73
47	0.77	4.69	4.69
48	0.78	4.67	4.67
49	0.80	4.65	4.65
50	0.82	4.64	4.64

McCulley, Frick &Gilman, Inc. 19203 36th Avenue W. Suite 101 Lynnwood, WA 98036 ph.(206) 778-8252	Pumping test analysis Time-Drawdown plot with discharge	Page 3 Project: Simplot Subarea Evaluated by: VBM Date: 26.11.1996

Pumping Test No. 3	Test conducted on: November 14, 1996
338	338
Discharge 39.09 U.S.gal/min	
Static water level: 0.00 ft below datum	

	Pumping test duration [min]	Water level [ft]	Drawdown [ft]
51	0.90	4.58	4.58
52	0.98	4.57	4.57
53	1.07	4.58	4.58
54	1.15	4.57	4.57
55	1.23	4.56	4.56
56	1.32	4.60	4.60
57	1.40	4.62	4.62
58	1.48	4.64	4.64
59	1.57	4.66	4.66
60	1.65	4.67	4.67
61	1.73	4.71	4.71
62	1.82	4.70	4.70
63	1.90	4.75	4.75
64	1.98	4.76	4.76
65	2.07	4.80	4.80
66	2.15	4.81	4.81
67	2.23	4.81	4.81
68	2.32	4.84	4.84
69	2.40	4.84	4.84
70	2.48	4.86	4.86
71	2.57	4.86	4.86
72	2.65	4.90	4.90
73	2.73	4.91	4.91
74	2.82	4.92	4.92
75	2.98	4.94	4.94
76	3.15	4.98	4.98
77	3.32	4.99	4.99
78	3.48	5.02	5.02
79	3.65	5.05	5.05
80	3.82	5.07	5.07
81	3.98	5.08	5.08
82	4.15	5.11	5.11
83	4.32	5.10	5.10
84	4.48	5.14	5.14
85	4.65	5.18	5.18
86	4.82	5.19	5.19
87	4.98	5.20	5.20
88	5.15	5.22	5.22
89	5.32	5.23	5.23
90	5.48	5.28	5.28
91	5.65	5.26	5.26
92	5.82	5.30	5.30
93	5.98	5.29	5.29
94	6.15	5.29	5.29
95	6.32	5.31	5.31
96	6.48	5.32	5.32
97	6.65	5.33	5.33
98	6.82	5.35	5.35
99	6.98	5.36	5.36
100	7.15	5.39	5.39

McCulley, Frick &Gilman, Inc. 19203 36th Avenue W. Suite 101 Lynnwood, WA 98036 ph.(206) 778-8252	Pumping test analysis Time-Drawdown plot with discharge	Page 4 Project: Simplot Subarea Evaluated by: VBM Date: 26.11.1996

Pumping Test No. 3	Test conducted on: November 14, 1996
338	338
Discharge 39.09 U.S.gal/min	
Static water level: 0.00 ft below datum	

	Pumping test duration [min]	Water level [ft]	Drawdown [ft]
101	7.32	5.39	5.39
102	7.48	5.39	5.39
103	7.65	5.41	5.41
104	7.82	5.41	5.41
105	7.98	5.43	5.43
106	8.15	5.42	5.42
107	8.32	5.44	5.44
108	8.48	5.45	5.45
109	8.65	5.46	5.46
110	8.82	5.45	5.45
111	8.98	5.46	5.46
112	9.15	5.48	5.48
113	9.32	5.49	5.49
114	9.48	5.51	5.51
115	9.65	5.50	5.50
116	9.82	5.51	5.51
117	10.32	5.55	5.55
118	10.82	5.55	5.55
119	11.32	5.59	5.59
120	11.82	5.64	5.64
121	12.32	5.67	5.67
122	12.82	5.70	5.70
123	13.32	5.70	5.70
124	13.82	5.72	5.72
125	14.32	5.75	5.75
126	14.82	5.77	5.77
127	15.82	5.76	5.76
128	16.82	5.78	5.78
129	17.82	5.82	5.82
130	18.82	5.87	5.87
131	19.82	5.89	5.89
132	20.82	5.93	5.93
133	21.82	5.95	5.95
134	22.82	5.98	5.98
135	23.82	6.01	6.01
136	24.82	6.06	6.06
137	29.82	6.22	6.22
138	34.82	6.41	6.41
139	39.82	6.60	6.60
140	44.82	6.79	6.79
141	49.82	6.96	6.96
142	54.82	7.18	7.18
143	59.82	7.32	7.32
144	64.82	7.46	7.46
145	69.82	7.56	7.56
146	74.82	7.60	7.60
147	79.82	7.64	7.64
148	84.82	7.70	7.70
149	89.82	7.73	7.73
150	94.82	7.77	7.77

McCulley, Frick &Gilman, Inc. 19203 36th Avenue W. Suite 101 Lynnwood, WA 98036 ph.(206) 778-8252	Pumping test analysis Time-Drawdown plot with discharge	Page 5 Project: Simplot Subarea Evaluated by: VBM Date: 26.11.1996

Pumping Test No. 3	Test conducted on: November 14, 1996
338	338
Discharge 39.09 U.S.gal/min	
Static water level: 0.00 ft below datum	

	Pumping test duration [min]	Water level [ft]	Drawdown [ft]
151	99.82	7.83	7.83
152	104.82	7.85	7.85
153	109.82	7.85	7.85
154	114.82	7.90	7.90
155	119.82	7.93	7.93
156	129.82	8.01	8.01
157	139.82	8.07	8.07
158	149.82	8.19	8.19
159	159.82	8.29	8.29
160	169.82	8.37	8.37
161	179.82	8.49	8.49
162	209.82	8.93	8.93
163	239.82	9.25	9.25
164	269.82	9.22	9.22
165	299.82	9.20	9.20
166	329.82	9.24	9.24
167	359.82	9.22	9.22
168	389.82	9.27	9.27
169	419.82	9.23	9.23
170	479.82	9.24	9.24
171	539.82	9.23	9.23
172	599.82	9.22	9.22
173	659.82	9.20	9.20
174	719.82	9.23	9.23
175	779.82	9.27	9.27
176	839.82	9.24	9.24
177	899.82	9.22	9.22
178	959.82	9.23	9.23
179	1019.82	9.23	9.23
180	1079.82	9.24	9.24
181	1139.82	9.27	9.27
182	1199.82	9.28	9.28
183	1259.82	9.24	9.24
184	1319.82	9.27	9.27
185	1379.82	9.21	9.21
186	1439.81	9.27	9.27
187	1442.51	9.25	9.25
188	1442.52	9.23	9.23
189	1442.53	9.24	9.24
190	1442.55	9.23	9.23
191	1442.57	9.26	9.26
192	1442.58	9.25	9.25
193	1442.60	9.23	9.23
194	1442.62	9.25	9.25
195	1442.63	9.23	9.23
196	1442.65	9.25	9.25
197	1442.66	9.25	9.25
198	1442.68	9.26	9.26
199	1442.70	9.27	9.27
200	1442.72	9.25	9.25

McCulley, Frick &Gilman, Inc. 19203 36th Avenue W. Suite 101 Lynnwood, WA 98036 ph.(206) 778-8252	Pumping test analysis Time-Drawdown plot with discharge	Page 6 Project: Simplot Subarea Evaluated by: VBM Date: 26.11.1996

Pumping Test No. 3	Test conducted on: November 14, 1996
338	338
Discharge 39.09 U.S.gal/min	
Static water level: 0.00 ft below datum	

	Pumping test duration [min]	Water level [ft]	Drawdown [ft]
201	1442.73	9.27	9.27
202	1442.75	9.24	9.24
203	1442.77	9.23	9.23
204	1442.78	9.25	9.25
205	1442.80	9.25	9.25
206	1442.82	9.22	9.22
207	1442.83	9.23	9.23
208	1442.85	7.95	7.95
209	1442.88	6.51	6.51
210	1442.89	5.99	5.99
211	1442.90	5.49	5.49
212	1442.92	4.57	4.57
213	1442.93	3.83	3.83
214	1442.95	3.15	3.15
215	1442.97	2.51	2.51
216	1442.98	1.95	1.95
217	1443.00	1.42	1.42
218	1443.02	0.98	0.98
219	1443.03	0.73	0.73
220	1443.05	0.54	0.54
221	1443.07	0.38	0.38
222	1443.08	0.25	0.25
223	1443.10	0.16	0.16
224	1443.12	0.10	0.10
225	1443.13	0.04	0.04
226	1443.75	0.04	0.04
227	1443.83	0.14	0.14
228	1443.91	0.22	0.22
229	1444.00	0.28	0.28
230	1444.08	0.30	0.30
231	1444.17	0.30	0.30
232	1444.25	0.31	0.31
233	1444.33	0.32	0.32
234	1444.42	0.30	0.30
235	1444.50	0.32	0.32
236	1444.58	0.32	0.32
237	1444.67	0.31	0.31
238	1444.75	0.31	0.31
239	1444.83	0.31	0.31
240	1444.92	0.31	0.31
241	1445.00	0.30	0.30
242	1445.08	0.32	0.32
243	1445.16	0.30	0.30
244	1445.25	0.30	0.30
245	1445.33	0.31	0.31
246	1445.42	0.30	0.30
247	1445.50	0.32	0.32
248	1445.67	0.30	0.30
249	1445.83	0.30	0.30
250	1446.00	0.30	0.30

McCulley, Frick &Gilman, Inc.
19203 36th Avenue W. Suite 101
Lynnwood, WA 98036
ph.(206) 778-8252

Pumping test analysis
Time-Drawdown plot
with discharge

Project: Simplot Subarea

Evaluated by: VBM | Date: 26.11.1996

Pumping Test No. 3 | Test conducted on: November 14, 1996

338 | 338

Discharge 39.09 U.S.gal/min

Static water level: 0.00 ft below datum

	Pumping test duration [min]	Water level [ft]	Drawdown [ft]
251	1446.17	0.29	0.29
252	1446.33	0.29	0.29
253	1446.50	0.29	0.29
254	1446.67	0.28	0.28
255	1446.83	0.29	0.29
256	1447.00	0.29	0.29
257	1447.16	0.28	0.28
258	1447.33	0.29	0.29
259	1447.50	0.29	0.29
260	1447.67	0.28	0.28
261	1447.83	0.28	0.28
262	1448.00	0.27	0.27
263	1448.17	0.27	0.27
264	1448.33	0.28	0.28
265	1448.50	0.27	0.27
266	1448.67	0.27	0.27
267	1448.83	0.27	0.27
268	1449.00	0.27	0.27
269	1449.17	0.25	0.25
270	1449.33	0.25	0.25
271	1449.50	0.27	0.27
272	1449.66	0.26	0.26
273	1449.83	0.25	0.25
274	1450.00	0.26	0.26
275	1450.17	0.25	0.25
276	1450.33	0.26	0.26
277	1450.50	0.26	0.26
278	1450.67	0.26	0.26
279	1450.83	0.26	0.26
280	1451.00	0.25	0.25
281	1451.17	0.25	0.25
282	1451.33	0.25	0.25
283	1451.50	0.25	0.25
284	1451.66	0.25	0.25
285	1451.83	0.26	0.26
286	1452.00	0.25	0.25
287	1452.17	0.25	0.25
288	1452.33	0.26	0.26
289	1452.50	0.25	0.25
290	1453.00	0.25	0.25
291	1453.50	0.25	0.25
292	1454.00	0.25	0.25
293	1454.50	0.23	0.23
294	1455.00	0.24	0.24
295	1455.50	0.25	0.25
296	1456.00	0.24	0.24
297	1456.50	0.24	0.24
298	1457.00	0.25	0.25
299	1457.50	0.24	0.24
300	1458.50	0.24	0.24

McCulley, Frick &Gilman, Inc.
19203 36th Avenue W. Suite 101
Lynnwood, WA 98036
ph.(206) 778-8252

Pumping test analysis
Time-Drawdown plot
with discharge

Project: Simplot Subarea

Evaluated by: VBM | Date: 26.11.1996

Pumping Test No. 3 | Test conducted on: November 14, 1996

338 | 338

Discharge 39.09 U.S.gal/min

Static water level: 0.00 ft below datum

	Pumping test duration [min]	Water level [ft]	Drawdown [ft]
301	1459.50	0.22	0.22
302	1460.50	0.23	0.23
303	1461.50	0.23	0.23
304	1462.50	0.21	0.21
305	1463.50	0.22	0.22
306	1464.50	0.22	0.22
307	1465.50	0.22	0.22
308	1466.50	0.21	0.21
309	1467.50	0.22	0.22
310	1472.50	0.21	0.21
311	1477.50	0.19	0.19
312	1482.50	0.19	0.19
313	1487.50	0.19	0.19
314	1492.50	0.18	0.18
315	1497.50	0.17	0.17
316	1502.50	0.17	0.17
317	1507.50	0.17	0.17
318	1512.50	0.17	0.17
319	1517.50	0.16	0.16
320	1522.50	0.15	0.15
321	1527.50	0.14	0.14
322	1532.50	0.14	0.14
323	1537.50	0.13	0.13
324	1542.50	0.14	0.14
325	1547.50	0.14	0.14
326	1552.50	0.13	0.13
327	1557.50	0.13	0.13
328	1562.50	0.13	0.13
329	1572.50	0.12	0.12
330	1582.50	0.12	0.12
331	1592.50	0.11	0.11
332	1602.50	0.10	0.10
333	1612.50	0.12	0.12
334	1622.50	0.10	0.10
335	1652.50	0.09	0.09
336	1682.50	0.08	0.08
337	1712.50	0.08	0.08
338	1742.50	0.08	0.08
339	1772.50	0.06	0.06
340	1802.50	0.06	0.06
341	1832.50	0.06	0.06
342	1862.50	0.05	0.05
343	1922.50	0.05	0.05
344	1982.50	0.04	0.04
345	2042.50	0.04	0.04
346	2102.50	0.04	0.04
347	2162.50	0.04	0.04
348	2222.50	0.04	0.04

McCulley, Frick &Gilman, Inc.
19203 36th Avenue W. Suite 101
Lynnwood, WA 98036
ph.(206) 778-8252

Pumping test analysis
Time-Drawdown plot
with discharge

Project: Simplot Subarea

Evaluated by: VBM | Date: 26.11.1996

Pumping Test No. 3 | Test conducted on: November 14, 1996

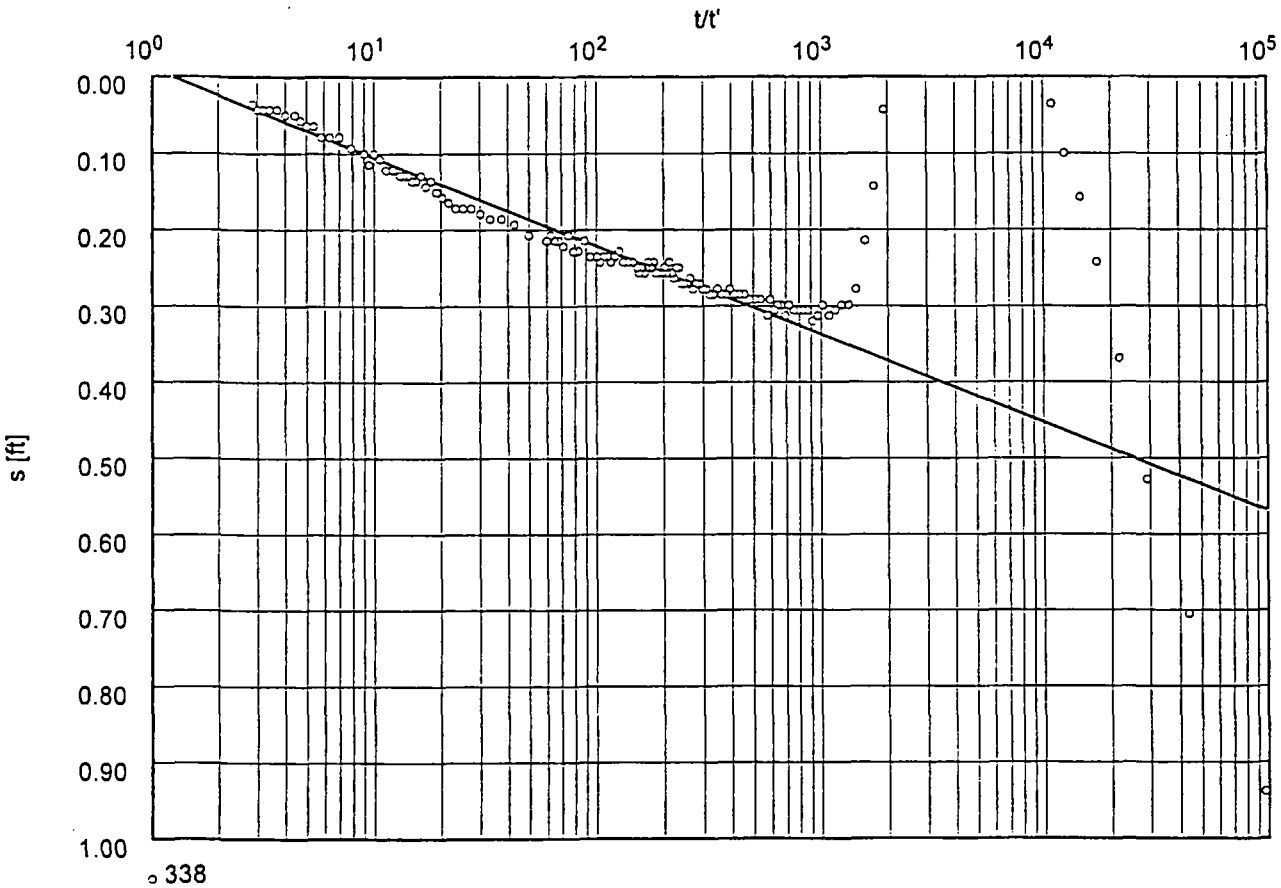
338 | Measured at outflow

Discharge 39.09 U.S.gal/min

	Pumping test duration [min]	Discharge [U.S.gal/min]		
1	0.00	44.00		
2	3.00	43.70		
3	46.00	44.80		
4	63.00	43.81		
5	78.00	43.75		
6	118.00	43.10		
7	148.00	42.50		
8	181.00	42.09		
9	208.00	41.71		
10	238.00	42.12		
11	268.00	41.18		
12	298.00	40.40		
13	358.00	40.17		
14	388.00	39.90		
15	426.00	39.90		
16	453.00	39.34		
17	478.00	39.42		
18	538.00	39.00		
19	598.00	38.80		
20	658.00	38.53		
21	718.00	38.25		
22	778.00	38.05		
23	838.00	37.83		
24	898.00	37.75		
25	958.00	37.60		
26	1018.00	37.48		
27	1077.00	37.57		
28	1136.00	37.60		
29	1200.00	38.25		
30	1259.00	37.00		
31	1318.00	36.90		
32	1375.00	36.62		
33	1442.90	36.62		
34	1443.00	0.00		

McCulley, Frick &Gilman, Inc. 19203 36th Avenue W. Suite 101 Lynnwood, WA 98036 ph.(206) 778-8252	Pumping test analysis Recovery method after THEIS & JACOB Unconfined aquifer	Page 1 Project: Simplot Subarea Evaluated by: VBM Date: 26.11.1996

Pumping Test No. 3	Test conducted on: November 14, 1996
338	
Discharge 39.09 U.S.gal/min	
	Pumping test duration: 1443.00 min



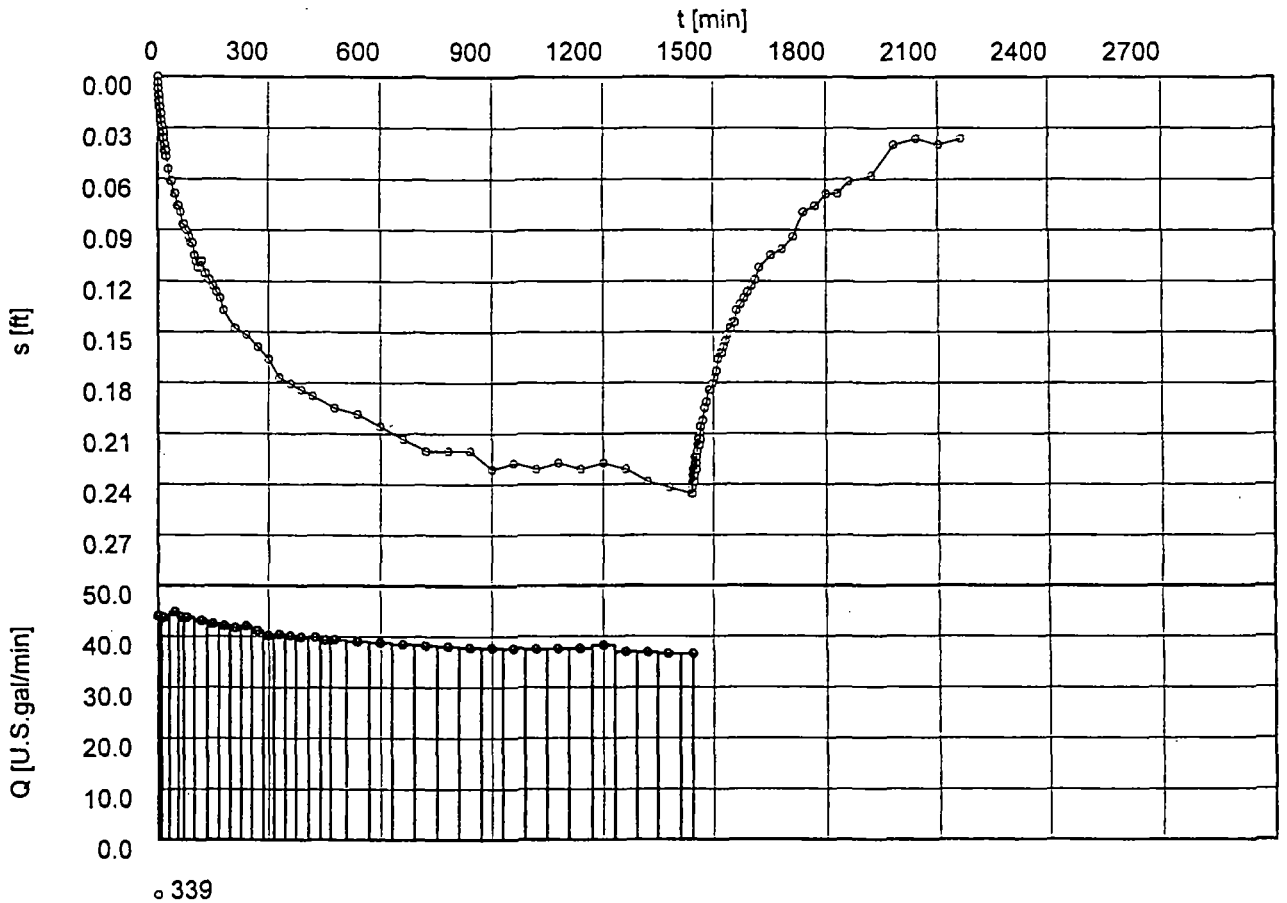
Transmissivity [ft²/min]: 8.25×10^0

Hydraulic conductivity [ft/min]: 7.44×10^{-1}

Aquifer thickness [ft]: 11.08

McCulley, Frick &Gilman, Inc. 19203 36th Avenue W. Suite 101 Lynnwood, WA 98036 ph.(206) 778-8252	Pumping test analysis Time-Drawdown plot with discharge	Page 1 Project: Simplot Subarea Evaluated by: VBM Date: 26.11.1996

Pumping Test No. 3	Test conducted on: November 14, 1996
339	
Discharge 39.09 U.S.gal/min	



McCulley, Frick &Gilman, Inc. 19203 36th Avenue W. Suite 101 Lynnwood, WA 98036 ph.(206) 778-8252	Pumping test analysis Time-Drawdown plot with discharge	Page 2 Project: Simplot Subarea Evaluated by: VBM Date: 26.11.1996

Pumping Test No. 3	Test conducted on: November 14, 1996
339	339
Discharge 39.09 U.S.gal/min	Distance from the pumping well 26.00 ft
Static water level: 0.00 ft below datum	

	Pumping test duration [min]	Water level [ft]	Drawdown [ft]
1	0.00	0.00	0.00
2	0.02	0.00	0.00
3	0.03	0.00	0.00
4	0.05	0.00	0.00
5	0.07	0.01	0.01
6	0.08	0.00	0.00
7	0.10	0.00	0.00
8	0.13	0.00	0.00
9	0.15	0.00	0.00
10	0.17	0.00	0.00
11	0.20	0.00	0.00
12	0.22	0.01	0.01
13	0.25	0.00	0.00
14	0.27	0.00	0.00
15	0.28	0.01	0.01
16	0.30	0.01	0.01
17	0.32	0.00	0.00
18	0.33	0.00	0.00
19	0.36	0.00	0.00
20	0.37	0.00	0.00
21	0.38	0.01	0.01
22	0.40	0.00	0.00
23	0.42	0.01	0.01
24	0.43	0.00	0.00
25	0.45	0.01	0.01
26	0.47	0.01	0.01
27	0.48	0.00	0.00
28	0.50	0.00	0.00
29	0.52	0.00	0.00
30	0.53	0.00	0.00
31	0.55	0.01	0.01
32	0.57	0.00	0.00
33	0.58	0.00	0.00
34	0.60	0.01	0.01
35	0.62	0.00	0.00
36	0.63	0.01	0.01
37	0.65	0.01	0.01
38	0.67	0.01	0.01
39	0.68	0.01	0.01
40	0.70	0.01	0.01
41	0.72	0.01	0.01
42	0.73	0.01	0.01
43	0.75	0.01	0.01
44	0.77	0.00	0.00
45	0.78	0.00	0.00
46	0.80	0.01	0.01
47	0.82	0.01	0.01
48	0.90	0.01	0.01
49	0.98	0.01	0.01
50	1.07	0.01	0.01

McCulley, Frick &Gilman, Inc. 19203 36th Avenue W. Suite 101 Lynnwood, WA 98036 ph.(206) 778-8252	Pumping test analysis Time-Drawdown plot with discharge	Page 3 Project: Simplot Subarea Evaluated by: VBM Date: 26.11.1996

Pumping Test No. 3	Test conducted on: November 14, 1996
339	339
Discharge 39.09 U.S.gal/min	Distance from the pumping well 26.00 ft
Static water level: 0.00 ft below datum	

	Pumping test duration [min]	Water level [ft]	Drawdown [ft]
51	1.15	0.01	0.01
52	1.23	0.01	0.01
53	1.32	0.01	0.01
54	1.40	0.01	0.01
55	1.48	0.00	0.00
56	1.57	0.01	0.01
57	1.65	0.01	0.01
58	1.73	0.01	0.01
59	1.82	0.01	0.01
60	1.90	0.01	0.01
61	1.98	0.01	0.01
62	2.07	0.00	0.00
63	2.15	0.01	0.01
64	2.23	0.02	0.02
65	2.32	0.01	0.01
66	2.40	0.01	0.01
67	2.48	0.01	0.01
68	2.57	0.01	0.01
69	2.65	0.01	0.01
70	2.73	0.01	0.01
71	2.82	0.01	0.01
72	2.98	0.01	0.01
73	3.15	0.01	0.01
74	3.32	0.01	0.01
75	3.48	0.01	0.01
76	3.65	0.01	0.01
77	3.82	0.01	0.01
78	3.98	0.01	0.01
79	4.15	0.01	0.01
80	4.32	0.02	0.02
81	4.48	0.01	0.01
82	4.65	0.01	0.01
83	4.82	0.01	0.01
84	4.98	0.01	0.01
85	5.15	0.02	0.02
86	5.32	0.03	0.03
87	5.48	0.02	0.02
88	5.65	0.02	0.02
89	5.82	0.02	0.02
90	5.98	0.01	0.01
91	6.15	0.01	0.01
92	6.32	0.02	0.02
93	6.48	0.02	0.02
94	6.65	0.02	0.02
95	6.82	0.03	0.03
96	6.98	0.02	0.02
97	7.15	0.03	0.03
98	7.32	0.03	0.03
99	7.48	0.02	0.02
100	7.65	0.02	0.02

McCulley, Frick &Gilman, Inc. 19203 36th Avenue W. Suite 101 Lynnwood, WA 98036 ph.(206) 778-8252	Pumping test analysis Time-Drawdown plot with discharge	Page 4 Project: Simplot Subarea Evaluated by: VBM Date: 26.11.1996

Pumping Test No. 3	Test conducted on: November 14, 1996
339	339
Discharge 39.09 U.S.gal/min	Distance from the pumping well 26.00 ft
Static water level: 0.00 ft below datum	

	Pumping test duration [min]	Water level [ft]	Drawdown [ft]
101	7.82	0.02	0.02
102	7.98	0.03	0.03
103	8.15	0.03	0.03
104	8.32	0.02	0.02
105	8.48	0.03	0.03
106	8.65	0.03	0.03
107	8.82	0.03	0.03
108	8.98	0.03	0.03
109	9.15	0.03	0.03
110	9.32	0.03	0.03
111	9.48	0.03	0.03
112	9.65	0.03	0.03
113	9.82	0.03	0.03
114	10.32	0.03	0.03
115	10.82	0.02	0.02
116	11.32	0.03	0.03
117	11.82	0.03	0.03
118	12.32	0.03	0.03
119	12.82	0.03	0.03
120	13.32	0.03	0.03
121	13.82	0.04	0.04
122	14.32	0.04	0.04
123	14.82	0.03	0.03
124	15.82	0.03	0.03
125	16.82	0.04	0.04
126	17.82	0.04	0.04
127	18.82	0.04	0.04
128	19.82	0.04	0.04
129	20.82	0.04	0.04
130	21.82	0.05	0.05
131	22.82	0.05	0.05
132	23.82	0.04	0.04
133	24.82	0.05	0.05
134	29.82	0.05	0.05
135	34.82	0.06	0.06
136	39.82	0.06	0.06
137	44.82	0.07	0.07
138	49.82	0.07	0.07
139	54.82	0.08	0.08
140	59.82	0.08	0.08
141	64.82	0.08	0.08
142	69.82	0.09	0.09
143	74.82	0.09	0.09
144	79.82	0.09	0.09
145	84.82	0.09	0.09
146	89.82	0.10	0.10
147	94.82	0.10	0.10
148	99.82	0.10	0.10
149	104.82	0.11	0.11
150	109.82	0.11	0.11

McCulley, Frick &Gilman, Inc. 19203 36th Avenue W. Suite 101 Lynnwood, WA 98036 ph.(206) 778-8252	Pumping test analysis Time-Drawdown plot with discharge	Page 5 Project: Simplot Subarea Evaluated by: VBM Date: 26.11.1996

Pumping Test No. 3	Test conducted on: November 14, 1996
339	339
Discharge 39.09 U.S.gal/min	Distance from the pumping well 26.00 ft
Static water level: 0.00 ft below datum	

	Pumping test duration [min]	Water level [ft]	Drawdown [ft]
151	114.82	0.11	0.11
152	119.82	0.11	0.11
153	129.82	0.12	0.12
154	139.82	0.12	0.12
155	149.82	0.12	0.12
156	159.82	0.13	0.13
157	169.82	0.13	0.13
158	179.82	0.14	0.14
159	209.82	0.15	0.15
160	239.82	0.15	0.15
161	269.82	0.16	0.16
162	299.82	0.17	0.17
163	329.82	0.18	0.18
164	359.82	0.18	0.18
165	389.82	0.18	0.18
166	419.82	0.19	0.19
167	479.82	0.19	0.19
168	539.82	0.20	0.20
169	599.82	0.21	0.21
170	659.82	0.21	0.21
171	719.82	0.22	0.22
172	779.82	0.22	0.22
173	839.82	0.22	0.22
174	899.82	0.23	0.23
175	959.82	0.23	0.23
176	1019.82	0.23	0.23
177	1079.82	0.23	0.23
178	1139.82	0.23	0.23
179	1199.82	0.23	0.23
180	1259.82	0.23	0.23
181	1319.82	0.24	0.24
182	1379.82	0.24	0.24
183	1439.81	0.25	0.25
184	1442.51	0.23	0.23
185	1442.52	0.25	0.25
186	1442.53	0.24	0.24
187	1442.55	0.23	0.23
188	1442.57	0.24	0.24
189	1442.58	0.25	0.25
190	1442.60	0.24	0.24
191	1442.62	0.24	0.24
192	1442.63	0.25	0.25
193	1442.65	0.23	0.23
194	1442.67	0.24	0.24
195	1442.68	0.24	0.24
196	1442.70	0.25	0.25
197	1442.72	0.24	0.24
198	1442.73	0.24	0.24
199	1442.75	0.23	0.23
200	1442.77	0.24	0.24

McCulley, Frick &Gilman, Inc. 19203 36th Avenue W. Suite 101 Lynnwood, WA 98036 ph.(206) 778-8252	Pumping test analysis Time-Drawdown plot with discharge	Page 6 Project: Simplot Subarea Evaluated by: VBM Date: 26.11.1996

Pumping Test No. 3	Test conducted on: November 14, 1996
339	339
Discharge 39.09 U.S.gal/min	Distance from the pumping well 26.00 ft
Static water level: 0.00 ft below datum	

	Pumping test duration [min]	Water level [ft]	Drawdown [ft]
201	1442.78	0.24	0.24
202	1442.80	0.24	0.24
203	1442.82	0.24	0.24
204	1442.83	0.24	0.24
205	1442.85	0.23	0.23
206	1442.88	0.24	0.24
207	1442.89	0.24	0.24
208	1442.90	0.24	0.24
209	1442.92	0.24	0.24
210	1442.93	0.25	0.25
211	1442.95	0.24	0.24
212	1442.97	0.23	0.23
213	1442.98	0.24	0.24
214	1443.00	0.24	0.24
215	1443.02	0.24	0.24
216	1443.03	0.24	0.24
217	1443.05	0.24	0.24
218	1443.07	0.25	0.25
219	1443.08	0.23	0.23
220	1443.10	0.24	0.24
221	1443.12	0.24	0.24
222	1443.13	0.23	0.23
223	1443.15	0.24	0.24
224	1443.17	0.24	0.24
225	1443.18	0.24	0.24
226	1443.20	0.24	0.24
227	1443.22	0.24	0.24
228	1443.23	0.23	0.23
229	1443.25	0.24	0.24
230	1443.27	0.25	0.25
231	1443.28	0.23	0.23
232	1443.30	0.24	0.24
233	1443.32	0.24	0.24
234	1443.33	0.24	0.24
235	1443.35	0.23	0.23
236	1443.37	0.24	0.24
237	1443.38	0.23	0.23
238	1443.40	0.24	0.24
239	1443.42	0.23	0.23
240	1443.43	0.25	0.25
241	1443.45	0.23	0.23
242	1443.47	0.23	0.23
243	1443.48	0.24	0.24
244	1443.50	0.24	0.24
245	1443.58	0.23	0.23
246	1443.67	0.23	0.23
247	1443.75	0.24	0.24
248	1443.83	0.24	0.24
249	1443.92	0.24	0.24
250	1444.00	0.24	0.24

McCulley, Frick &Gilman, Inc.
19203 36th Avenue W. Suite 101
Lynnwood, WA 98036
ph.(206) 778-8252

Pumping test analysis
Time-Drawdown plot
with discharge

Project: Simplot Subarea

Evaluated by: VBM | Date: 26.11.1996

Pumping Test No. 3 | Test conducted on: November 14, 1996

339 | 339

Discharge 39.09 U.S.gal/min | Distance from the pumping well 26.00 ft

Static water level: 0.00 ft below datum

	Pumping test duration [min]	Water level [ft]	Drawdown [ft]	
251	1444.08	0.23	0.23	
252	1444.17	0.23	0.23	
253	1444.25	0.23	0.23	
254	1444.33	0.24	0.24	
255	1444.42	0.23	0.23	
256	1444.50	0.23	0.23	
257	1444.58	0.23	0.23	
258	1444.67	0.23	0.23	
259	1444.75	0.23	0.23	
260	1444.83	0.23	0.23	
261	1444.92	0.24	0.24	
262	1445.00	0.23	0.23	
263	1445.08	0.23	0.23	
264	1445.17	0.23	0.23	
265	1445.25	0.23	0.23	
266	1445.33	0.23	0.23	
267	1445.42	0.23	0.23	
268	1445.50	0.23	0.23	
269	1445.67	0.23	0.23	
270	1445.83	0.23	0.23	
271	1446.00	0.23	0.23	
272	1446.17	0.24	0.24	
273	1446.33	0.23	0.23	
274	1446.50	0.23	0.23	
275	1446.67	0.23	0.23	
276	1446.83	0.23	0.23	
277	1447.00	0.23	0.23	
278	1447.17	0.23	0.23	
279	1447.33	0.23	0.23	
280	1447.50	0.23	0.23	
281	1447.67	0.23	0.23	
282	1447.83	0.23	0.23	
283	1448.00	0.23	0.23	
284	1448.17	0.23	0.23	
285	1448.33	0.23	0.23	
286	1448.50	0.22	0.22	
287	1448.67	0.23	0.23	
288	1448.83	0.24	0.24	
289	1449.00	0.22	0.22	
290	1449.17	0.22	0.22	
291	1449.33	0.23	0.23	
292	1449.50	0.23	0.23	
293	1449.67	0.23	0.23	
294	1449.83	0.23	0.23	
295	1450.00	0.23	0.23	
296	1450.17	0.23	0.23	
297	1450.33	0.23	0.23	
298	1450.50	0.23	0.23	
299	1450.67	0.22	0.22	
300	1450.83	0.23	0.23	

McCulley, Frick &Gilman, Inc. 19203 36th Avenue W. Suite 101 Lynnwood, WA 98036 ph.(206) 778-8252	Pumping test analysis Time-Drawdown plot with discharge	Page 8 Project: Simplot Subarea Evaluated by: VBM Date: 26.11.1996

Pumping Test No. 3	Test conducted on: November 14, 1996
339	339
Discharge 39.09 U.S.gal/min	Distance from the pumping well 26.00 ft
Static water level: 0.00 ft below datum	

	Pumping test duration [min]	Water level [ft]	Drawdown [ft]
301	1451.00	0.23	0.23
302	1451.17	0.22	0.22
303	1451.33	0.23	0.23
304	1451.50	0.23	0.23
305	1451.67	0.22	0.22
306	1451.83	0.22	0.22
307	1452.00	0.22	0.22
308	1452.17	0.23	0.23
309	1452.33	0.22	0.22
310	1452.50	0.23	0.23
311	1453.00	0.22	0.22
312	1453.50	0.22	0.22
313	1454.00	0.23	0.23
314	1454.50	0.22	0.22
315	1455.00	0.23	0.23
316	1455.50	0.22	0.22
317	1456.00	0.22	0.22
318	1456.50	0.22	0.22
319	1457.00	0.22	0.22
320	1457.50	0.22	0.22
321	1458.50	0.21	0.21
322	1459.50	0.22	0.22
323	1460.50	0.22	0.22
324	1461.50	0.21	0.21
325	1462.50	0.21	0.21
326	1463.50	0.22	0.22
327	1464.50	0.21	0.21
328	1465.50	0.21	0.21
329	1466.50	0.21	0.21
330	1467.50	0.21	0.21
331	1472.50	0.20	0.20
332	1477.50	0.19	0.19
333	1482.50	0.19	0.19
334	1487.50	0.18	0.18
335	1492.50	0.18	0.18
336	1497.50	0.18	0.18
337	1502.50	0.18	0.18
338	1507.50	0.17	0.17
339	1512.50	0.17	0.17
340	1517.50	0.16	0.16
341	1522.50	0.16	0.16
342	1527.50	0.16	0.16
343	1532.50	0.16	0.16
344	1537.50	0.15	0.15
345	1542.50	0.15	0.15
346	1547.50	0.15	0.15
347	1552.50	0.14	0.14
348	1557.50	0.14	0.14
349	1562.50	0.14	0.14
350	1572.50	0.13	0.13

McCulley, Frick &Gilman, Inc.
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Pumping test analysis
Time-Drawdown plot
with discharge

Project: Simplot Subarea

Evaluated by: VBM | Date: 26.11.1996

Pumping Test No. 3 | Test conducted on: November 14, 1996

339 | 339

Discharge 39.09 U.S.gal/min | Distance from the pumping well 26.00 ft

Static water level: 0.00 ft below datum

	Pumping test duration [min]	Water level [ft]	Drawdown [ft]
351	1582.50	0.13	0.13
352	1592.50	0.13	0.13
353	1602.50	0.12	0.12
354	1612.50	0.12	0.12
355	1622.50	0.11	0.11
356	1652.50	0.10	0.10
357	1682.50	0.10	0.10
358	1712.50	0.09	0.09
359	1742.50	0.08	0.08
360	1772.50	0.08	0.08
361	1802.50	0.07	0.07
362	1832.50	0.07	0.07
363	1862.50	0.06	0.06
364	1922.50	0.06	0.06
365	1982.50	0.04	0.04
366	2042.50	0.04	0.04
367	2102.50	0.04	0.04
368	2162.50	0.04	0.04

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Pumping test analysis
Time-Drawdown plot
with discharge

Project: Simplot Subarea

Evaluated by: VBM | Date: 26.11.1996

Pumping Test No. 3 | Test conducted on: November 14, 1996

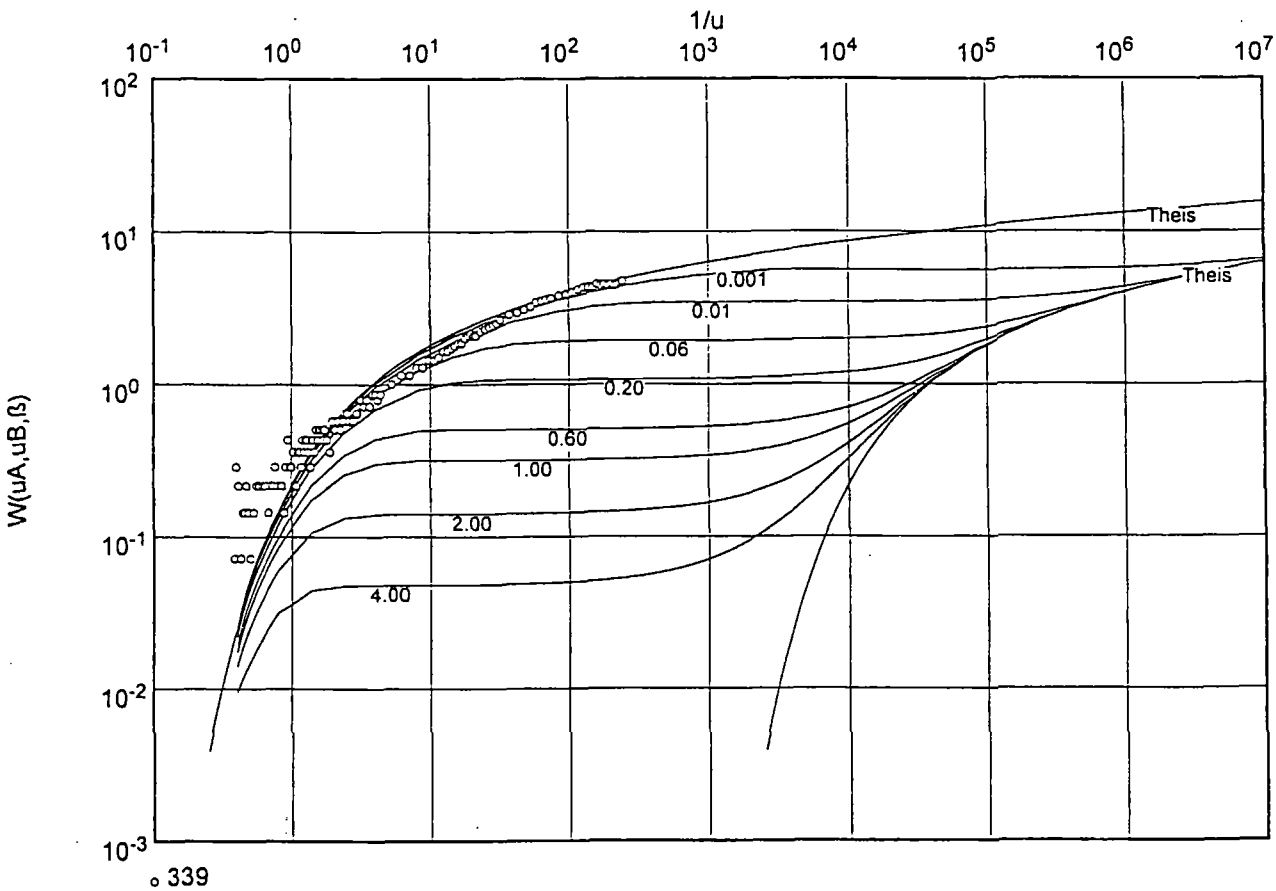
339 | measured at outflow

Discharge 39.09 U.S.gal/min

	Pumping test duration [min]	Discharge [U.S.gal/min]		
1	0.00	44.00		
2	3.00	44.00		
3	15.00	43.70		
4	46.00	44.80		
5	63.00	43.81		
6	78.00	43.75		
7	118.00	43.10		
8	148.00	42.50		
9	181.00	42.09		
10	208.00	41.71		
11	238.00	42.12		
12	268.00	41.18		
13	298.00	40.20		
14	328.00	40.40		
15	358.00	40.17		
16	388.00	39.90		
17	426.00	39.90		
18	453.00	39.34		
19	478.00	39.42		
20	538.00	39.00		
21	598.00	38.80		
22	658.00	38.53		
23	718.00	38.25		
24	778.00	38.05		
25	838.00	37.83		
26	898.00	37.75		
27	958.00	37.60		
28	1018.00	37.48		
29	1077.00	37.57		
30	1136.00	37.60		
31	1200.00	38.25		
32	1259.00	37.00		
33	1318.00	36.90		
34	1375.00	36.62		
35	1442.90	36.62		

McCulley, Frick &Gilman, Inc. 19203 36th Avenue W. Suite 101 Lynnwood, WA 98036 ph.(206) 778-8252	Pumping test analysis NEUMAN's method Unconfined aquifer with delayed watertable response	Page 1 Project: Simplot Subarea Evaluated by: VBM Date: 26.11.1996

Pumping Test No. 3	Test conducted on: November 14, 1996
339	
Discharge 39.09 U.S.gal/min	



Transmissivity [ft²/min]: 8.29×10^{0}

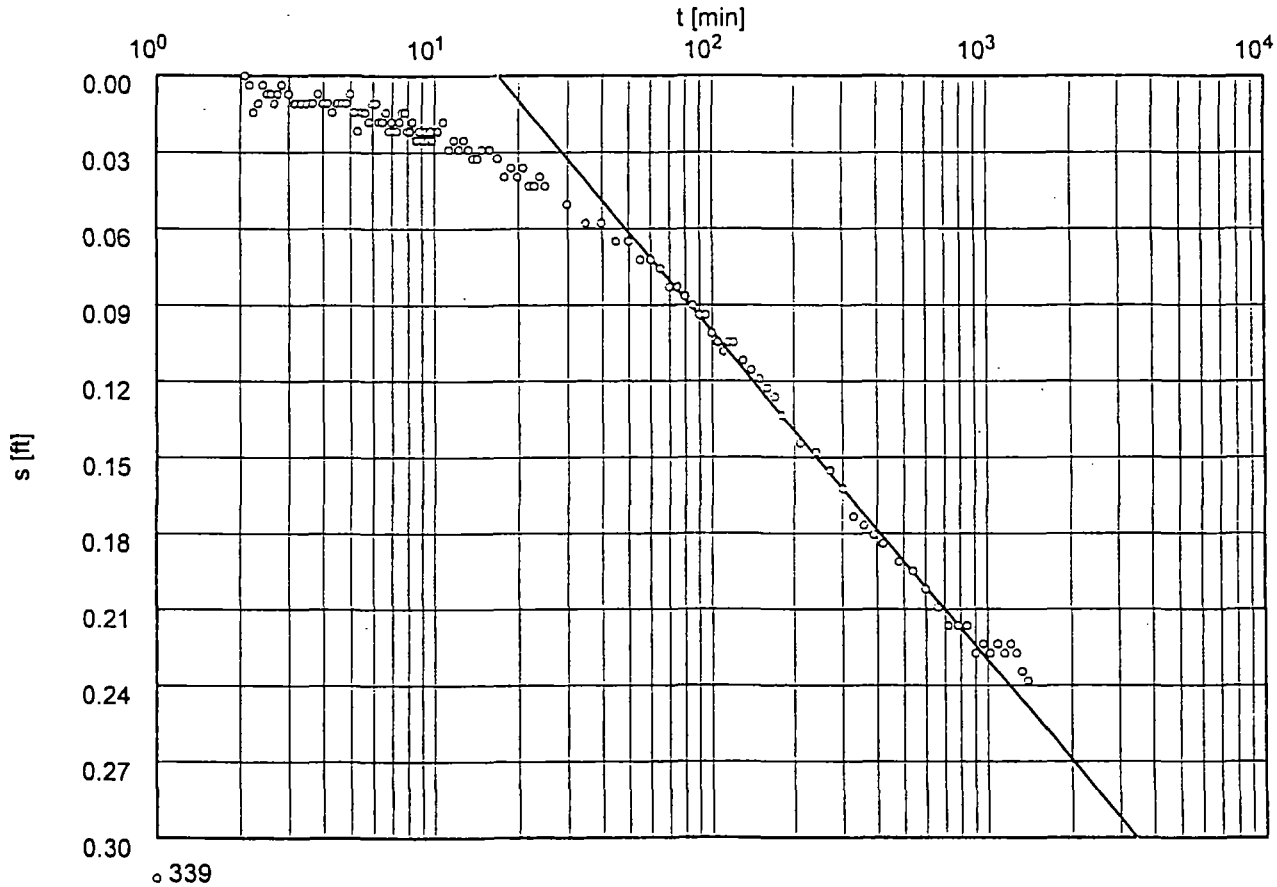
Hydraulic conductivity [ft/min]: 7.21×10^{-1}

Aquifer thickness [ft]: 11.50

Storativity: 2.76×10^{-1}

McCulley, Frick &Gilman, Inc. 19203 36th Avenue W. Suite 101 Lynnwood, WA 98036 ph.(206) 778-8252	Pumping test analysis Time-Drawdown-method after COOPER & JACOB Confined aquifer	Page 1 Project: Simplot Subarea Evaluated by: VBM Date: 26.11.1996

Pumping Test No. 3	Test conducted on: November 14, 1996
339	
Discharge 39.09 U.S.gal/min	



Transmissivity [ft²/min]: 7.37×10^0

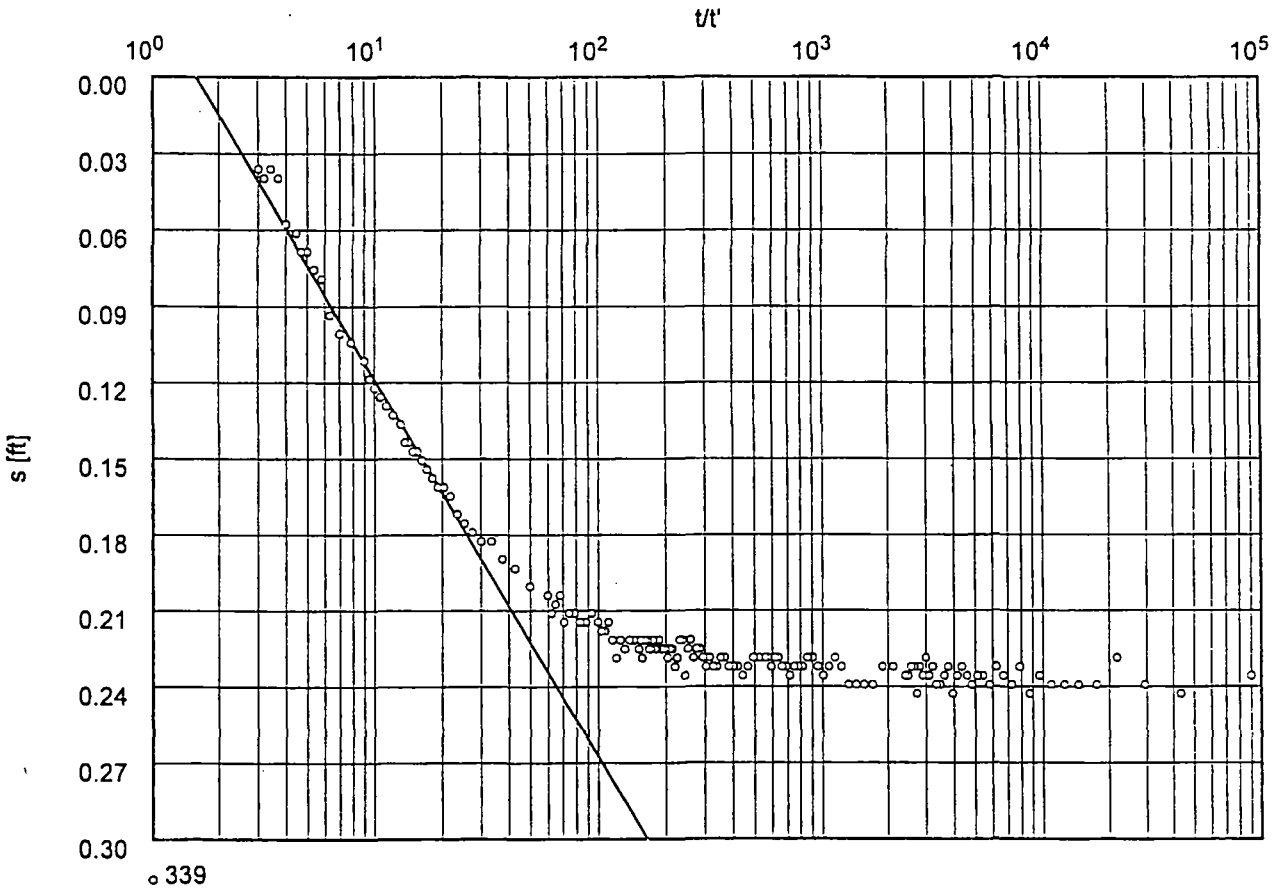
Hydraulic conductivity [ft/min]: 6.41×10^{-1}

Aquifer thickness [ft]: 11.50

Storativity: 4.11×10^{-1}

McCulley, Frick &Gilman, Inc. 19203 36th Avenue W. Suite 101 Lynnwood, WA 98036 ph.(206) 778-8252	Pumping test analysis Recovery method after THEIS & JACOB Unconfined aquifer	Page 1 Project: Simplot Subarea Evaluated by: VBM Date: 09.12.1996

Pumping Test No. 3	Test conducted on: November 14, 1996
339	
Discharge 39.09 U.S.gal/min	
	Pumping test duration: 1442.90 min



Transmissivity [ft²/min]: 6.42×10^0

Hydraulic conductivity [ft/min]: 5.58×10^{-1}

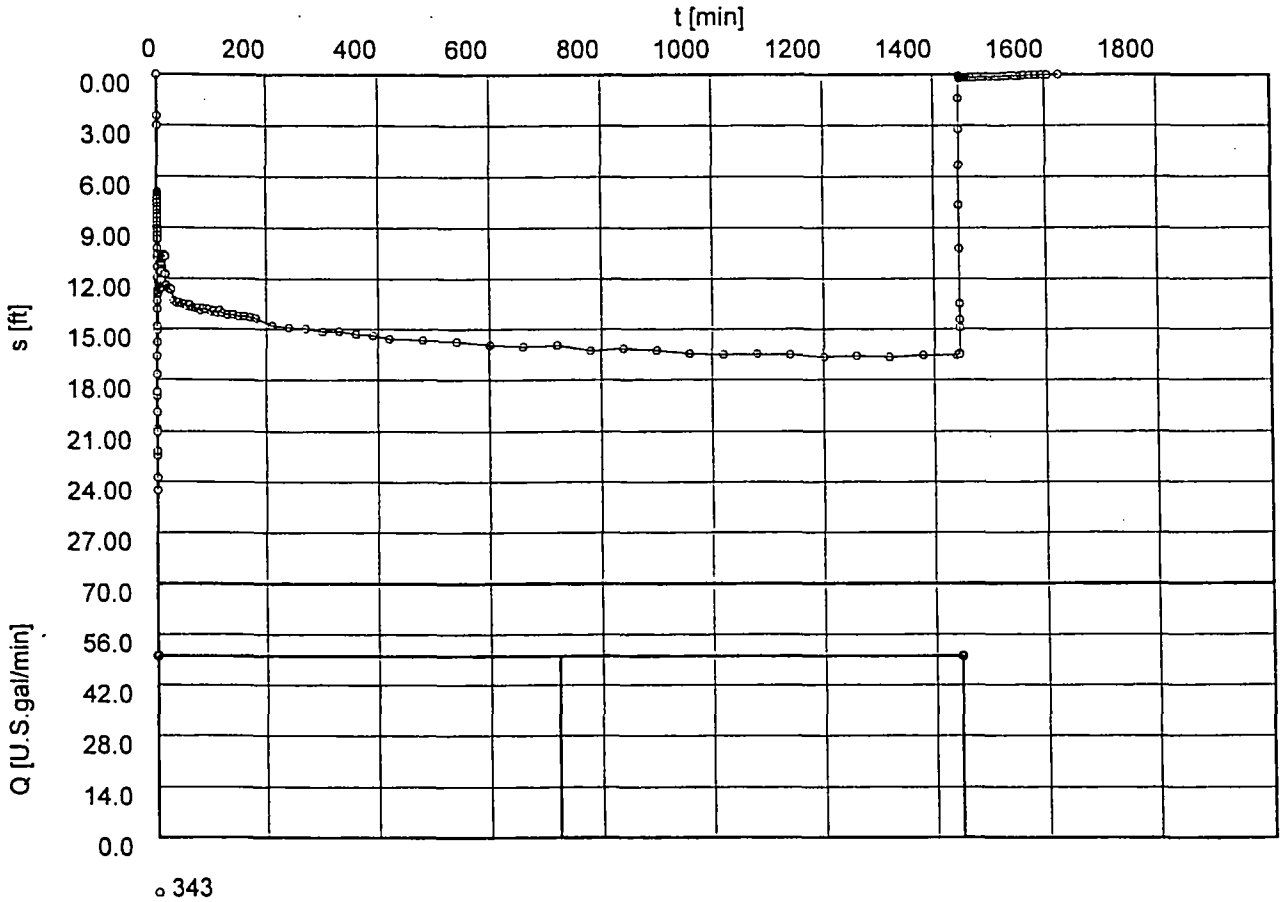
Aquifer thickness [ft]: 11.50

C-2

PUMPING WELL 343

McCulley, Frick &Gilman, Inc. 19203 36th Avenue W. Suite 101 Lynnwood, WA 98036 ph.(206) 778-8252	Pumping test analysis Time-Drawdown plot with discharge	Page 1 Project: Simplot Subarea Evaluated by: VBM Date: 27.11.1996

Pumping Test No. 1	Test conducted on: November 10, 1996
343	
Discharge 50.00 U.S.gal/min	



Note: Discharge rates were measured hourly, at a minimum.

McCulley, Frick &Gilman, Inc. 19203 36th Avenue W. Suite 101 Lynnwood, WA 98036 ph.(206) 778-8252	Pumping test analysis Time-Drawdown plot with discharge	Page 2 Project: Simplot Subarea Evaluated by: VBM Date: 27.11.1996

Pumping Test No. 1	Test conducted on: November 10, 1996
343	343
Discharge 50.00 U.S.gal/min	
Static water level: 0.00 ft below datum	

	Pumping test duration [min]	Water level [ft]	Drawdown [ft]
1	0.00	0.00	0.00
2	0.50	2.99	2.99
3	0.51	2.43	2.43
4	0.53	8.97	8.97
5	0.55	12.97	12.97
6	0.58	18.95	18.95
7	0.59	20.88	20.88
8	0.60	22.44	22.44
9	0.62	24.52	24.52
10	0.63	23.76	23.76
11	0.65	22.18	22.18
12	0.67	21.05	21.05
13	0.68	19.88	19.88
14	0.70	18.71	18.71
15	0.72	17.69	17.69
16	0.73	16.63	16.63
17	0.75	15.79	15.79
18	0.77	15.09	15.09
19	0.78	14.86	14.86
20	0.80	13.82	13.82
21	0.82	13.34	13.34
22	0.83	12.67	12.67
23	0.85	12.04	12.04
24	0.87	11.33	11.33
25	0.88	10.76	10.76
26	0.90	10.20	10.20
27	0.92	9.70	9.70
28	0.93	9.36	9.36
29	0.95	8.90	8.90
30	0.97	8.60	8.60
31	0.98	8.19	8.19
32	1.00	7.99	7.99
33	1.02	7.62	7.62
34	1.03	7.45	7.45
35	1.05	7.23	7.23
36	1.07	7.04	7.04
37	1.08	6.95	6.95
38	1.10	6.93	6.93
39	1.12	6.87	6.87
40	1.13	6.95	6.95
41	1.15	6.91	6.91
42	1.17	6.93	6.93
43	1.18	6.93	6.93
44	1.20	7.02	7.02
45	1.22	7.00	7.00
46	1.23	7.04	7.04
47	1.26	7.15	7.15
48	1.27	7.17	7.17
49	1.28	7.28	7.28
50	1.30	7.34	7.34

McCulley, Frick &Gilman, Inc. 19203 36th Avenue W. Suite 101 Lynnwood, WA 98036 ph.(206) 778-8252	Pumping test analysis Time-Drawdown plot with discharge	Page 3 Project: Simplot Subarea Evaluated by: VBM Date: 27.11.1996

Pumping Test No. 1	Test conducted on: November 10, 1996
343	343
Discharge 50.00 U.S.gal/min	
Static water level: 0.00 ft below datum	

	Pumping test duration [min]	Water level [ft]	Drawdown [ft]
51	1.32	7.49	7.49
52	1.33	7.54	7.54
53	1.35	7.78	7.78
54	1.37	7.95	7.95
55	1.38	8.16	8.16
56	1.40	8.36	8.36
57	1.42	8.62	8.62
58	1.43	8.86	8.86
59	1.45	9.05	9.05
60	1.47	9.20	9.20
61	1.48	9.44	9.44
62	1.50	9.68	9.68
63	1.58	10.57	10.57
64	1.67	11.30	11.30
65	1.75	11.91	11.91
66	1.83	12.32	12.32
67	1.92	12.67	12.67
68	2.00	12.93	12.93
69	2.08	12.84	12.84
70	2.17	12.84	12.84
71	2.25	12.89	12.89
72	2.33	12.86	12.86
73	2.42	12.73	12.73
74	2.50	12.54	12.54
75	2.58	12.58	12.58
76	2.67	12.50	12.50
77	2.75	12.39	12.39
78	2.83	12.41	12.41
79	2.92	12.43	12.43
80	3.00	12.39	12.39
81	3.08	12.39	12.39
82	3.17	12.41	12.41
83	3.25	12.39	12.39
84	3.33	12.39	12.39
85	3.42	12.37	12.37
86	3.50	12.26	12.26
87	3.67	12.37	12.37
88	3.83	12.39	12.39
89	4.00	12.43	12.43
90	4.17	12.45	12.45
91	4.33	12.39	12.39
92	4.50	12.45	12.45
93	4.67	12.52	12.52
94	4.83	12.50	12.50
95	5.00	12.58	12.58
96	5.17	12.60	12.60
97	5.33	12.69	12.69
98	5.50	12.65	12.65
99	5.67	12.67	12.67
100	5.83	12.67	12.67

McCulley, Frick &Gilman, Inc.
19203 36th Avenue W. Suite 101
Lynnwood, WA 98036
ph.(206) 778-8252

Pumping test analysis
Time-Drawdown plot
with discharge

Project: Simplot Subarea

Evaluated by: VBM | Date: 27.11.1996

Pumping Test No. 1 | Test conducted on: November 10, 1996

343 | 343

Discharge 50.00 U.S.gal/min

Static water level: 0.00 ft below datum

	Pumping test duration [min]	Water level [ft]	Drawdown [ft]
101	6.00	12.65	12.65
102	6.17	12.58	12.58
103	6.33	12.54	12.54
104	6.50	12.32	12.32
105	6.67	12.26	12.26
106	6.83	12.19	12.19
107	7.00	12.24	12.24
108	7.17	12.21	12.21
109	7.33	12.21	12.21
110	7.50	12.21	12.21
111	7.67	12.11	12.11
112	7.83	11.59	11.59
113	8.00	11.18	11.18
114	8.17	11.04	11.04
115	8.33	10.85	10.85
116	8.50	10.76	10.76
117	8.67	10.81	10.81
118	8.83	10.76	10.76
119	9.00	10.74	10.74
120	9.17	10.70	10.70
121	9.33	10.76	10.76
122	9.50	10.74	10.74
123	9.67	10.68	10.68
124	9.83	10.72	10.72
125	10.00	10.68	10.68
126	10.17	10.76	10.76
127	10.33	10.81	10.81
128	10.50	10.76	10.76
129	11.00	10.63	10.63
130	11.50	10.57	10.57
131	12.00	10.61	10.61
132	12.50	10.68	10.68
133	13.00	10.61	10.61
134	13.50	10.63	10.63
135	14.00	10.65	10.65
136	14.50	10.68	10.68
137	15.00	11.74	11.74
138	15.50	12.39	12.39
139	16.50	12.39	12.39
140	17.50	12.43	12.43
141	18.50	12.58	12.58
142	19.50	12.58	12.58
143	20.50	12.60	12.60
144	21.50	12.56	12.56
145	22.50	12.58	12.58
146	23.50	12.67	12.67
147	24.50	12.71	12.71
148	25.50	12.65	12.65
149	30.50	13.32	13.32
150	35.50	13.47	13.47

McCulley, Frick &Gilman, Inc. 19203 36th Avenue W. Suite 101 Lynnwood, WA 98036 ph.(206) 778-8252	Pumping test analysis Time-Drawdown plot with discharge	Page 5 Project: Simplot Subarea Evaluated by: VBM Date: 27.11.1996

Pumping Test No. 1	Test conducted on: November 10, 1996
343	343
Discharge 50.00 U.S.gal/min	

Static water level: 0.00 ft below datum

	Pumping test duration [min]	Water level [ft]	Drawdown [ft]
151	40.50	13.43	13.43
152	45.50	13.51	13.51
153	50.50	13.54	13.54
154	55.50	13.67	13.67
155	60.50	13.58	13.58
156	65.50	13.75	13.75
157	70.50	13.77	13.77
158	75.50	13.75	13.75
159	80.50	13.90	13.90
160	85.50	13.80	13.80
161	90.50	13.82	13.82
162	95.50	13.84	13.84
163	100.50	13.99	13.99
164	105.50	13.93	13.93
165	110.50	14.03	14.03
166	115.50	13.88	13.88
167	120.50	14.05	14.05
168	130.50	14.14	14.14
169	140.50	14.12	14.12
170	150.50	14.25	14.25
171	160.50	14.25	14.25
172	170.50	14.32	14.32
173	180.50	14.36	14.36
174	210.50	14.79	14.79
175	240.50	14.90	14.90
176	270.50	14.96	14.96
177	300.50	15.16	15.16
178	330.50	15.14	15.14
179	360.50	15.31	15.31
180	390.50	15.38	15.38
181	420.50	15.57	15.57
182	480.50	15.64	15.64
183	540.50	15.74	15.74
184	600.50	15.94	15.94
185	660.50	16.05	16.05
186	720.50	15.96	15.96
187	780.50	16.29	16.29
188	840.50	16.16	16.16
189	900.50	16.26	16.26
190	960.50	16.46	16.46
191	1020.50	16.52	16.52
192	1080.50	16.48	16.48
193	1140.50	16.52	16.52
194	1200.50	16.68	16.68
195	1260.50	16.59	16.59
196	1320.50	16.68	16.68
197	1380.50	16.55	16.55
198	1440.50	16.55	16.55
199	1445.46	16.44	16.44
200	1445.50	16.50	16.50

McCulley, Frick &Gilman, Inc.
19203 36th Avenue W. Suite 101
Lynnwood, WA 98036
ph.(206) 778-8252

Pumping test analysis
Time-Drawdown plot
with discharge

Project: Simplot Subarea

Evaluated by: VBM | Date: 27.11.1996

Pumping Test No. 1 | Test conducted on: November 10, 1996

343 | 343

Discharge 50.00 U.S.gal/min

Static water level: 0.00 ft below datum

	Pumping test duration [min]	Water level [ft]	Drawdown [ft]
201	1445.51	14.42	14.42
202	1445.52	14.90	14.90
203	1445.53	13.49	13.49
204	1445.55	10.20	10.20
205	1445.57	7.64	7.64
206	1445.58	5.33	5.33
207	1445.60	3.23	3.23
208	1445.62	1.41	1.41
209	1446.55	0.07	0.07
210	1446.63	0.09	0.09
211	1446.72	0.13	0.13
212	1446.80	0.17	0.17
213	1446.88	0.17	0.17
214	1446.97	0.17	0.17
215	1447.05	0.19	0.19
216	1447.13	0.19	0.19
217	1447.22	0.19	0.19
218	1447.30	0.22	0.22
219	1447.38	0.19	0.19
220	1447.47	0.19	0.19
221	1447.55	0.22	0.22
222	1447.63	0.24	0.24
223	1447.72	0.22	0.22
224	1447.80	0.19	0.19
225	1447.88	0.22	0.22
226	1447.97	0.19	0.19
227	1448.05	0.22	0.22
228	1448.13	0.22	0.22
229	1448.22	0.22	0.22
230	1448.30	0.19	0.19
231	1448.38	0.22	0.22
232	1448.47	0.19	0.19
233	1448.63	0.19	0.19
234	1448.80	0.19	0.19
235	1448.97	0.24	0.24
236	1449.13	0.19	0.19
237	1449.30	0.24	0.24
238	1449.47	0.22	0.22
239	1449.63	0.22	0.22
240	1449.80	0.19	0.19
241	1449.97	0.22	0.22
242	1450.13	0.19	0.19
243	1450.30	0.19	0.19
244	1450.47	0.19	0.19
245	1450.63	0.19	0.19
246	1450.80	0.19	0.19
247	1450.97	0.19	0.19
248	1451.13	0.19	0.19
249	1451.30	0.19	0.19
250	1451.47	0.19	0.19

McCulley, Frick &Gilman, Inc. 19203 36th Avenue W. Suite 101 Lynnwood, WA 98036 ph.(206) 778-8252	Pumping test analysis *Time-Drawdown plot* with discharge	Page 7 Project: Simplot Subarea Evaluated by: VBM Date: 27.11.1996

Pumping Test No. 1	Test conducted on: November 10, 1996
343	343
Discharge 50.00 U.S.gal/min	
Static water level: 0.00 ft below datum	

	Pumping test duration [min]	Water level [ft]	Drawdown [ft]
251	1451.63	0.19	0.19
252	1451.80	0.19	0.19
253	1451.97	0.19	0.19
254	1452.13	0.19	0.19
255	1452.30	0.19	0.19
256	1452.47	0.19	0.19
257	1452.63	0.22	0.22
258	1452.80	0.22	0.22
259	1452.97	0.19	0.19
260	1453.13	0.19	0.19
261	1453.30	0.17	0.17
262	1453.47	0.19	0.19
263	1453.63	0.19	0.19
264	1453.80	0.19	0.19
265	1453.97	0.22	0.22
266	1454.13	0.22	0.22
267	1454.30	0.19	0.19
268	1454.47	0.19	0.19
269	1454.63	0.22	0.22
270	1454.80	0.22	0.22
271	1454.97	0.19	0.19
272	1455.13	0.19	0.19
273	1455.30	0.19	0.19
274	1455.47	0.19	0.19
275	1455.97	0.19	0.19
276	1456.47	0.17	0.17
277	1456.97	0.17	0.17
278	1457.47	0.17	0.17
279	1457.97	0.19	0.19
280	1458.47	0.17	0.17
281	1458.97	0.19	0.19
282	1459.47	0.17	0.17
283	1459.97	0.19	0.19
284	1460.47	0.19	0.19
285	1461.47	0.17	0.17
286	1462.47	0.17	0.17
287	1463.47	0.17	0.17
288	1464.47	0.17	0.17
289	1465.47	0.19	0.19
290	1466.47	0.17	0.17
291	1467.47	0.15	0.15
292	1468.47	0.17	0.17
293	1469.47	0.19	0.19
294	1470.47	0.19	0.19
295	1475.47	0.19	0.19
296	1480.47	0.15	0.15
297	1485.47	0.15	0.15
298	1490.47	0.15	0.15
299	1495.47	0.15	0.15
300	1500.47	0.13	0.13

McCulley, Frick &Gilman, Inc.
19203 36th Avenue W. Suite 101
Lynnwood, WA 98036
ph.(206) 778-8252

Pumping test analysis
Time-Drawdown plot
with discharge

Project: Simplot Subarea

Evaluated by: VBM | Date: 27.11.1996

Pumping Test No. 1 | Test conducted on: November 10, 1996

343 | 343

Discharge 50.00 U.S.gal/min

Static water level: 0.00 ft below datum

	Pumping test duration [min]	Water level [ft]	Drawdown [ft]	
301	1505.47	0.13	0.13	
302	1510.47	0.11	0.11	
303	1515.47	0.11	0.11	
304	1520.47	0.11	0.11	
305	1525.47	0.09	0.09	
306	1530.47	0.09	0.09	
307	1535.47	0.09	0.09	
308	1540.47	0.07	0.07	
309	1545.47	0.07	0.07	
310	1550.47	0.09	0.09	
311	1555.47	0.09	0.09	
312	1560.47	0.07	0.07	
313	1565.47	0.04	0.04	
314	1575.47	0.04	0.04	
315	1585.47	0.02	0.02	
316	1595.47	0.02	0.02	
317	1605.47	0.02	0.02	
318	1625.47	0.00	0.00	

McCulley, Frick &Gilman, Inc.
19203 36th Avenue W. Suite 101
Lynnwood, WA 98036
ph.(206) 778-8252

Pumping test analysis
Time-Drawdown plot
with discharge

Project: Simplot Subarea

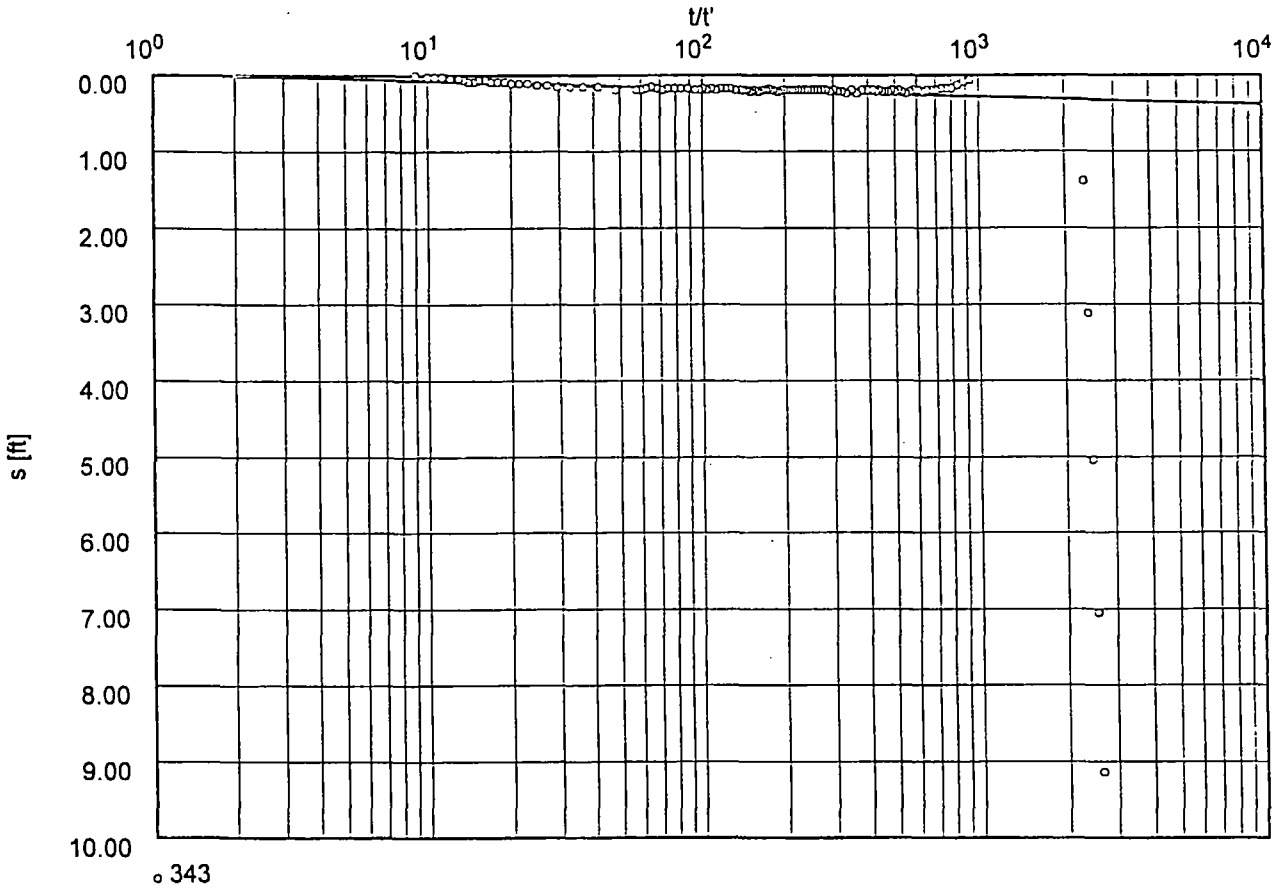
Evaluated by: VBM | Date: 27.11.1996

Pumping Test No. 1	Test conducted on: November 10, 1996
343	Measured at outflow
Discharge 50.00 U.S.gal/min	

	Pumping test duration [min]	Discharge [U.S.gal/min]		
1	0.00	50.00		
2	1445.00	50.00		

McCulley, Frick &Gilman, Inc. 19203 36th Avenue W. Suite 101 Lynnwood, WA 98036 ph.(206) 778-8252	Pumping test analysis Recovery method after THEIS & JACOB Unconfined aquifer	Page 1 Project: Simplot Subarea Evaluated by: VBM Date: 27.11.1996

Pumping Test No. 1	Test conducted on: November 10, 1996
343	
Discharge 50.00 U.S.gal/min	
	Pumping test duration: 1445.00 min



Transmissivity [ft²/min]: 1.17×10^1

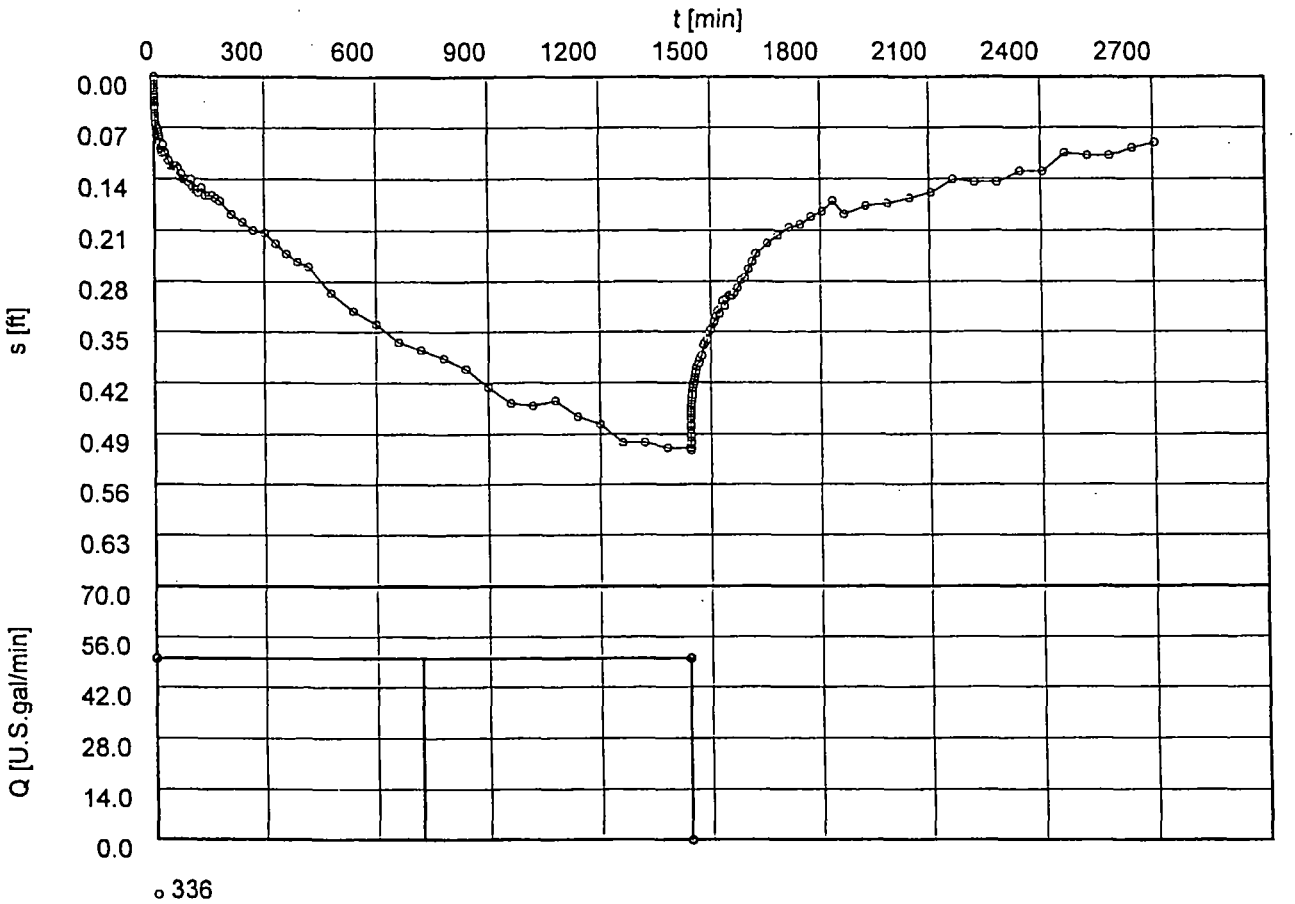
Hydraulic conductivity [ft/min]: 2.40×10^{-1}

Aquifer thickness [ft]: 49.00

No check valve in pump.

McCulley, Frick &Gilman, Inc. 19203 36th Avenue W. Suite 101 Lynnwood, WA 98036 ph.(206) 778-8252	Pumping test analysis Time-Drawdown plot with discharge	Page 1 Project: Simplot Subarea Evaluated by: VBM Date: 27.11.1996

Pumping Test No. 1	Test conducted on: November 10, 1996
336	
Discharge 50.00 U.S.gal/min	



Note: Discharge rates measured hourly, at a minimum.

McCulley, Frick &Gilman, Inc. 19203 36th Avenue W. Suite 101 Lynnwood, WA 98036 ph.(206) 778-8252	Pumping test analysis Time-Drawdown plot with discharge	Page 2 Project: Simplot Subarea Evaluated by: VBM Date: 27.11.1996

Pumping Test No. 1	Test conducted on: November 10, 1996
336	336
Discharge 50.00 U.S.gal/min	Distance from the pumping well 54.00 ft
Static water level: 0.00 ft below datum	

	Pumping test duration [min]	Water level [ft]	Drawdown [ft]
1	0.00	0.00	0.00
2	0.50	0.00	0.00
3	0.55	0.00	0.00
4	0.58	0.00	0.00
5	0.59	0.00	0.00
6	0.60	0.00	0.00
7	0.62	0.01	0.01
8	0.63	0.01	0.01
9	0.65	0.03	0.03
10	0.67	0.01	0.01
11	0.68	0.02	0.02
12	0.70	0.02	0.02
13	0.72	0.03	0.03
14	0.73	0.03	0.03
15	0.75	0.03	0.03
16	0.77	0.03	0.03
17	0.78	0.04	0.04
18	0.80	0.04	0.04
19	0.82	0.04	0.04
20	0.83	0.04	0.04
21	0.85	0.04	0.04
22	0.87	0.04	0.04
23	0.88	0.04	0.04
24	0.90	0.04	0.04
25	0.92	0.04	0.04
26	0.93	0.04	0.04
27	0.95	0.04	0.04
28	0.97	0.04	0.04
29	0.98	0.04	0.04
30	1.00	0.04	0.04
31	1.02	0.04	0.04
32	1.03	0.04	0.04
33	1.05	0.04	0.04
34	1.07	0.04	0.04
35	1.08	0.04	0.04
36	1.10	0.04	0.04
37	1.12	0.04	0.04
38	1.13	0.04	0.04
39	1.15	0.04	0.04
40	1.17	0.04	0.04
41	1.18	0.04	0.04
42	1.20	0.04	0.04
43	1.22	0.04	0.04
44	1.23	0.04	0.04
45	1.26	0.04	0.04
46	1.27	0.04	0.04
47	1.28	0.04	0.04
48	1.30	0.04	0.04
49	1.32	0.04	0.04
50	1.33	0.04	0.04

McCulley, Frick &Gilman, Inc. 19203 36th Avenue W. Suite 101 Lynnwood, WA 98036 ph.(206) 778-8252	Pumping test analysis Time-Drawdown plot with discharge	Page 3 Project: Simplot Subarea Evaluated by: VBM Date: 27.11.1996

Pumping Test No. 1	Test conducted on: November 10, 1996
336	336
Discharge 50.00 U.S.gal/min	Distance from the pumping well 54.00 ft
Static water level: 0.00 ft below datum	

	Pumping test duration [min]	Water level [ft]	Drawdown [ft]	
51	1.35	0.04	0.04	
52	1.37	0.04	0.04	
53	1.38	0.04	0.04	
54	1.40	0.04	0.04	
55	1.42	0.04	0.04	
56	1.43	0.04	0.04	
57	1.45	0.04	0.04	
58	1.47	0.04	0.04	
59	1.48	0.04	0.04	
60	1.50	0.04	0.04	
61	1.58	0.04	0.04	
62	1.67	0.04	0.04	
63	1.75	0.04	0.04	
64	1.83	0.04	0.04	
65	1.92	0.04	0.04	
66	2.00	0.05	0.05	
67	2.08	0.04	0.04	
68	2.17	0.06	0.06	
69	2.25	0.05	0.05	
70	2.33	0.05	0.05	
71	2.42	0.05	0.05	
72	2.50	0.06	0.06	
73	2.58	0.05	0.05	
74	2.67	0.07	0.07	
75	2.75	0.05	0.05	
76	2.83	0.06	0.06	
77	2.92	0.07	0.07	
78	3.00	0.06	0.06	
79	3.08	0.07	0.07	
80	3.17	0.07	0.07	
81	3.25	0.06	0.06	
82	3.33	0.06	0.06	
83	3.42	0.07	0.07	
84	3.50	0.06	0.06	
85	3.67	0.07	0.07	
86	3.83	0.06	0.06	
87	4.00	0.07	0.07	
88	4.17	0.07	0.07	
89	4.33	0.07	0.07	
90	4.50	0.07	0.07	
91	4.67	0.07	0.07	
92	4.83	0.08	0.08	
93	5.00	0.08	0.08	
94	5.17	0.07	0.07	
95	5.33	0.07	0.07	
96	5.50	0.07	0.07	
97	5.67	0.08	0.08	
98	5.83	0.07	0.07	
99	6.00	0.07	0.07	
100	6.17	0.07	0.07	

McCulley, Frick &Gilman, Inc. 19203 36th Avenue W. Suite 101 Lynnwood, WA 98036 ph.(206) 778-8252	Pumping test analysis Time-Drawdown plot with discharge	Page 4 Project: Simplot Subarea Evaluated by: VBM Date: 27.11.1996

Pumping Test No. 1	Test conducted on: November 10, 1996
336	336
Discharge 50.00 U.S.gal/min	Distance from the pumping well 54.00 ft
Static water level: 0.00 ft below datum	

	Pumping test duration [min]	Water level [ft]	Drawdown [ft]	
101	6.33	0.08	0.08	
102	6.50	0.08	0.08	
103	6.67	0.07	0.07	
104	6.83	0.08	0.08	
105	7.00	0.08	0.08	
106	7.17	0.08	0.08	
107	7.33	0.08	0.08	
108	7.50	0.08	0.08	
109	7.67	0.08	0.08	
110	7.83	0.08	0.08	
111	8.00	0.08	0.08	
112	8.17	0.08	0.08	
113	8.33	0.08	0.08	
114	8.50	0.08	0.08	
115	8.67	0.08	0.08	
116	8.83	0.07	0.07	
117	9.00	0.08	0.08	
118	9.17	0.08	0.08	
119	9.33	0.07	0.07	
120	9.50	0.08	0.08	
121	9.67	0.08	0.08	
122	9.83	0.08	0.08	
123	10.00	0.08	0.08	
124	10.17	0.08	0.08	
125	10.33	0.08	0.08	
126	10.50	0.08	0.08	
127	11.00	0.08	0.08	
128	11.50	0.08	0.08	
129	12.00	0.08	0.08	
130	12.50	0.08	0.08	
131	13.00	0.09	0.09	
132	13.50	0.08	0.08	
133	14.00	0.09	0.09	
134	14.50	0.09	0.09	
135	15.00	0.09	0.09	
136	15.50	0.08	0.08	
137	16.50	0.09	0.09	
138	17.50	0.09	0.09	
139	18.50	0.10	0.10	
140	19.50	0.10	0.10	
141	20.50	0.10	0.10	
142	21.50	0.10	0.10	
143	22.50	0.10	0.10	
144	23.50	0.10	0.10	
145	24.50	0.10	0.10	
146	25.50	0.09	0.09	
147	30.50	0.10	0.10	
148	35.50	0.11	0.11	
149	40.50	0.12	0.12	
150	45.50	0.12	0.12	

McCulley, Frick &Gilman, Inc. 19203 36th Avenue W. Suite 101 Lynnwood, WA 98036 ph.(206) 778-8252	Pumping test analysis Time-Drawdown plot with discharge	Page 5 Project: Simplot Subarea Evaluated by: VBM Date: 27.11.1996

Pumping Test No. 1	Test conducted on: November 10, 1996
336	336
Discharge 50.00 U.S.gal/min	Distance from the pumping well 54.00 ft
Static water level: 0.00 ft below datum	

	Pumping test duration [min]	Water level [ft]	Drawdown [ft]
151	50.50	0.12	0.12
152	55.50	0.12	0.12
153	60.50	0.12	0.12
154	65.50	0.13	0.13
155	70.50	0.14	0.14
156	75.50	0.13	0.13
157	80.50	0.14	0.14
158	85.50	0.14	0.14
159	90.50	0.14	0.14
160	95.50	0.14	0.14
161	100.50	0.14	0.14
162	105.50	0.15	0.15
163	110.50	0.16	0.16
164	115.50	0.16	0.16
165	120.50	0.16	0.16
166	130.50	0.15	0.15
167	140.50	0.16	0.16
168	150.50	0.16	0.16
169	160.50	0.16	0.16
170	170.50	0.17	0.17
171	180.50	0.17	0.17
172	210.50	0.19	0.19
173	240.50	0.20	0.20
174	270.50	0.21	0.21
175	300.50	0.21	0.21
176	330.50	0.23	0.23
177	360.50	0.24	0.24
178	390.50	0.25	0.25
179	420.50	0.26	0.26
180	480.50	0.30	0.30
181	540.50	0.32	0.32
182	600.50	0.34	0.34
183	660.50	0.36	0.36
184	720.50	0.38	0.38
185	780.50	0.39	0.39
186	840.50	0.40	0.40
187	900.50	0.43	0.43
188	960.50	0.45	0.45
189	1020.50	0.45	0.45
190	1080.50	0.44	0.44
191	1140.50	0.47	0.47
192	1200.50	0.48	0.48
193	1260.50	0.50	0.50
194	1320.50	0.50	0.50
195	1380.50	0.51	0.51
196	1440.50	0.51	0.51
197	1445.46	0.50	0.50
198	1445.50	0.51	0.51
199	1445.51	0.51	0.51
200	1445.52	0.51	0.51

McCulley, Frick &Gilman, Inc. 19203 36th Avenue W. Suite 101 Lynnwood, WA 98036 ph.(206) 778-8252	Pumping test analysis Time-Drawdown plot with discharge	Page 6 Project: Simplot Subarea Evaluated by: VBM Date: 27.11.1996

Pumping Test No. 1	Test conducted on: November 10, 1996
336	336
Discharge 50.00 U.S.gal/min	Distance from the pumping well 54.00 ft
Static water level: 0.00 ft below datum	

	Pumping test duration [min]	Water level [ft]	Drawdown [ft]
201	1445.53	0.51	0.51
202	1445.55	0.51	0.51
203	1445.57	0.51	0.51
204	1445.58	0.51	0.51
205	1445.60	0.51	0.51
206	1445.62	0.51	0.51
207	1445.63	0.51	0.51
208	1445.65	0.51	0.51
209	1445.67	0.51	0.51
210	1445.68	0.50	0.50
211	1445.70	0.50	0.50
212	1445.72	0.50	0.50
213	1445.73	0.50	0.50
214	1445.75	0.49	0.49
215	1445.77	0.49	0.49
216	1445.78	0.48	0.48
217	1445.80	0.48	0.48
218	1445.82	0.48	0.48
219	1445.83	0.48	0.48
220	1445.85	0.48	0.48
221	1445.87	0.47	0.47
222	1445.88	0.47	0.47
223	1445.90	0.47	0.47
224	1445.92	0.47	0.47
225	1445.93	0.47	0.47
226	1445.95	0.47	0.47
227	1445.98	0.47	0.47
228	1445.99	0.46	0.46
229	1446.00	0.46	0.46
230	1446.02	0.46	0.46
231	1446.03	0.45	0.45
232	1446.05	0.46	0.46
233	1446.07	0.45	0.45
234	1446.08	0.45	0.45
235	1446.10	0.45	0.45
236	1446.12	0.45	0.45
237	1446.13	0.45	0.45
238	1446.15	0.45	0.45
239	1446.17	0.45	0.45
240	1446.18	0.45	0.45
241	1446.20	0.45	0.45
242	1446.22	0.45	0.45
243	1446.23	0.45	0.45
244	1446.25	0.45	0.45
245	1446.27	0.45	0.45
246	1446.28	0.45	0.45
247	1446.30	0.45	0.45
248	1446.32	0.45	0.45
249	1446.33	0.45	0.45
250	1446.35	0.45	0.45

McCulley, Frick &Gilman, Inc. 19203 36th Avenue W. Suite 101 Lynnwood, WA 98036 ph.(206) 778-8252	Pumping test analysis Time-Drawdown plot with discharge	Page 7 Project: Simplot Subarea Evaluated by: VBM Date: 27.11.1996

Pumping Test No. 1	Test conducted on: November 10, 1996
336	336
Discharge 50.00 U.S.gal/min	Distance from the pumping well 54.00 ft
Static water level: 0.00 ft below datum	

	Pumping test duration [min]	Water level [ft]	Drawdown [ft]
251	1446.37	0.45	0.45
252	1446.38	0.45	0.45
253	1446.40	0.44	0.44
254	1446.42	0.45	0.45
255	1446.43	0.45	0.45
256	1446.45	0.45	0.45
257	1446.47	0.44	0.44
258	1446.55	0.44	0.44
259	1446.63	0.45	0.45
260	1446.72	0.44	0.44
261	1446.80	0.44	0.44
262	1446.88	0.44	0.44
263	1446.97	0.44	0.44
264	1447.05	0.44	0.44
265	1447.13	0.44	0.44
266	1447.22	0.45	0.45
267	1447.30	0.44	0.44
268	1447.38	0.44	0.44
269	1447.47	0.45	0.45
270	1447.55	0.44	0.44
271	1447.63	0.44	0.44
272	1447.72	0.44	0.44
273	1447.80	0.44	0.44
274	1447.88	0.44	0.44
275	1447.97	0.44	0.44
276	1448.05	0.44	0.44
277	1448.13	0.44	0.44
278	1448.22	0.44	0.44
279	1448.30	0.44	0.44
280	1448.38	0.44	0.44
281	1448.47	0.43	0.43
282	1448.63	0.43	0.43
283	1448.80	0.43	0.43
284	1448.97	0.44	0.44
285	1449.13	0.43	0.43
286	1449.30	0.43	0.43
287	1449.47	0.43	0.43
288	1449.63	0.43	0.43
289	1449.80	0.43	0.43
290	1449.97	0.43	0.43
291	1450.13	0.43	0.43
292	1450.30	0.43	0.43
293	1450.47	0.44	0.44
294	1450.63	0.43	0.43
295	1450.80	0.43	0.43
296	1450.97	0.42	0.42
297	1451.13	0.43	0.43
298	1451.30	0.42	0.42
299	1451.47	0.43	0.43
300	1451.63	0.43	0.43

McCulley, Frick &Gilman, Inc. 19203 36th Avenue W. Suite 101 Lynnwood, WA 98036 ph.(206) 778-8252	Pumping test analysis Time-Drawdown plot with discharge	Page 8 Project: Simplot Subarea Evaluated by: VBM Date: 27.11.1996

Pumping Test No. 1	Test conducted on: November 10, 1996
336	336
Discharge 50.00 U.S.gal/min	Distance from the pumping well 54.00 ft
Static water level: 0.00 ft below datum	

	Pumping test duration [min]	Water level [ft]	Drawdown [ft]
301	1451.80	0.43	0.43
302	1451.97	0.43	0.43
303	1452.13	0.42	0.42
304	1452.30	0.43	0.43
305	1452.47	0.42	0.42
306	1452.63	0.42	0.42
307	1452.80	0.42	0.42
308	1452.97	0.42	0.42
309	1453.13	0.42	0.42
310	1453.30	0.42	0.42
311	1453.47	0.42	0.42
312	1453.63	0.42	0.42
313	1453.80	0.42	0.42
314	1453.97	0.42	0.42
315	1454.13	0.42	0.42
316	1454.30	0.42	0.42
317	1454.47	0.42	0.42
318	1454.63	0.42	0.42
319	1454.80	0.42	0.42
320	1454.97	0.42	0.42
321	1455.13	0.42	0.42
322	1455.30	0.42	0.42
323	1455.47	0.42	0.42
324	1455.97	0.42	0.42
325	1456.47	0.42	0.42
326	1456.97	0.41	0.41
327	1457.47	0.41	0.41
328	1457.97	0.41	0.41
329	1458.47	0.41	0.41
330	1458.97	0.41	0.41
331	1459.47	0.41	0.41
332	1459.97	0.41	0.41
333	1460.47	0.40	0.40
334	1461.47	0.40	0.40
335	1462.47	0.40	0.40
336	1463.47	0.40	0.40
337	1464.47	0.40	0.40
338	1465.47	0.39	0.39
339	1466.47	0.39	0.39
340	1467.47	0.39	0.39
341	1468.47	0.39	0.39
342	1469.47	0.39	0.39
343	1470.47	0.39	0.39
344	1475.47	0.38	0.38
345	1480.47	0.37	0.37
346	1485.47	0.36	0.36
347	1490.47	0.36	0.36
348	1495.47	0.35	0.35
349	1500.47	0.35	0.35
350	1505.47	0.34	0.34

McCulley, Frick &Gilman, Inc. 19203 36th Avenue W. Suite 101 Lynnwood, WA 98036 ph.(206) 778-8252	Pumping test analysis Time-Drawdown plot with discharge	Page 9 Project: Simplot Subarea Evaluated by: VBM Date: 27.11.1996

Pumping Test No. 1	Test conducted on: November 10, 1996
336	336
Discharge 50.00 U.S.gal/min	Distance from the pumping well 54.00 ft
Static water level: 0.00 ft below datum	

	Pumping test duration [min]	Water level [ft]	Drawdown [ft]	
351	1510.47	0.34	0.34	
352	1515.47	0.33	0.33	
353	1520.47	0.32	0.32	
354	1525.47	0.32	0.32	
355	1530.47	0.31	0.31	
356	1535.47	0.31	0.31	
357	1540.47	0.31	0.31	
358	1545.47	0.30	0.30	
359	1550.47	0.30	0.30	
360	1555.47	0.30	0.30	
361	1560.47	0.30	0.30	
362	1565.47	0.30	0.30	
363	1575.47	0.29	0.29	
364	1585.47	0.28	0.28	
365	1595.47	0.27	0.27	
366	1605.47	0.26	0.26	
367	1615.47	0.25	0.25	
368	1625.47	0.24	0.24	
369	1655.47	0.23	0.23	
370	1685.47	0.22	0.22	
371	1715.47	0.21	0.21	
372	1745.47	0.20	0.20	
373	1775.47	0.19	0.19	
374	1805.47	0.18	0.18	
375	1835.47	0.17	0.17	
376	1865.47	0.19	0.19	
377	1925.47	0.18	0.18	
378	1985.47	0.17	0.17	
379	2045.47	0.17	0.17	
380	2105.47	0.16	0.16	
381	2165.47	0.14	0.14	
382	2225.47	0.14	0.14	
383	2285.47	0.14	0.14	
384	2345.47	0.13	0.13	
385	2405.47	0.13	0.13	
386	2465.47	0.10	0.10	
387	2525.47	0.11	0.11	
388	2585.47	0.11	0.11	
389	2645.47	0.10	0.10	
390	2705.47	0.09	0.09	

McCulley, Frick &Gilman, Inc.
19203 36th Avenue W. Suite 101
Lynnwood, WA 98036
ph.(206) 778-8252

Pumping test analysis
Time-Drawdown plot
with discharge

Project: Simplot Subarea

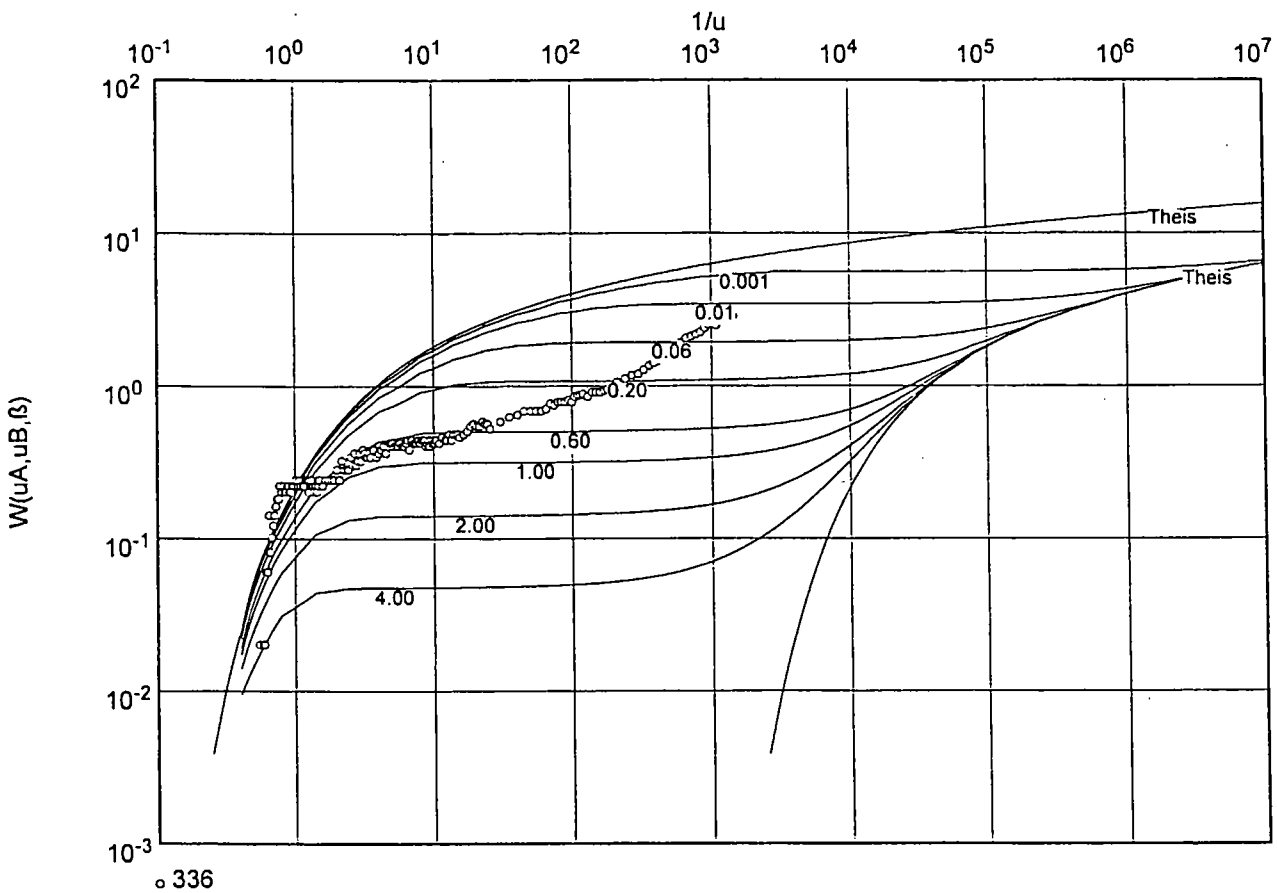
Evaluated by: VBM | Date: 27.11.1996

Pumping Test No. 1	Test conducted on: November 10, 1996
336	Measured at outflow
Discharge 50.00 U.S.gal/min	

	Pumping test duration [min]	Discharge [U.S.gal/min]		
1	0.00	50.00		
2	1440.00	50.00		
3	1441.00	0.00		

McCulley, Frick &Gilman, Inc. 19203 36th Avenue W. Suite 101 Lynnwood, WA 98036 ph.(206) 778-8252	Pumping test analysis NEUMAN's method Unconfined aquifer with delayed watertable response	Page 1 Project: Simplot Subarea Evaluated by: VBM | Date: 27.11.1996

Pumping Test No. 1	Test conducted on: November 10, 1996
336	
Discharge 50.00 U.S.gal/min	



Transmissivity [ft²/min]: 2.99×10^{0}

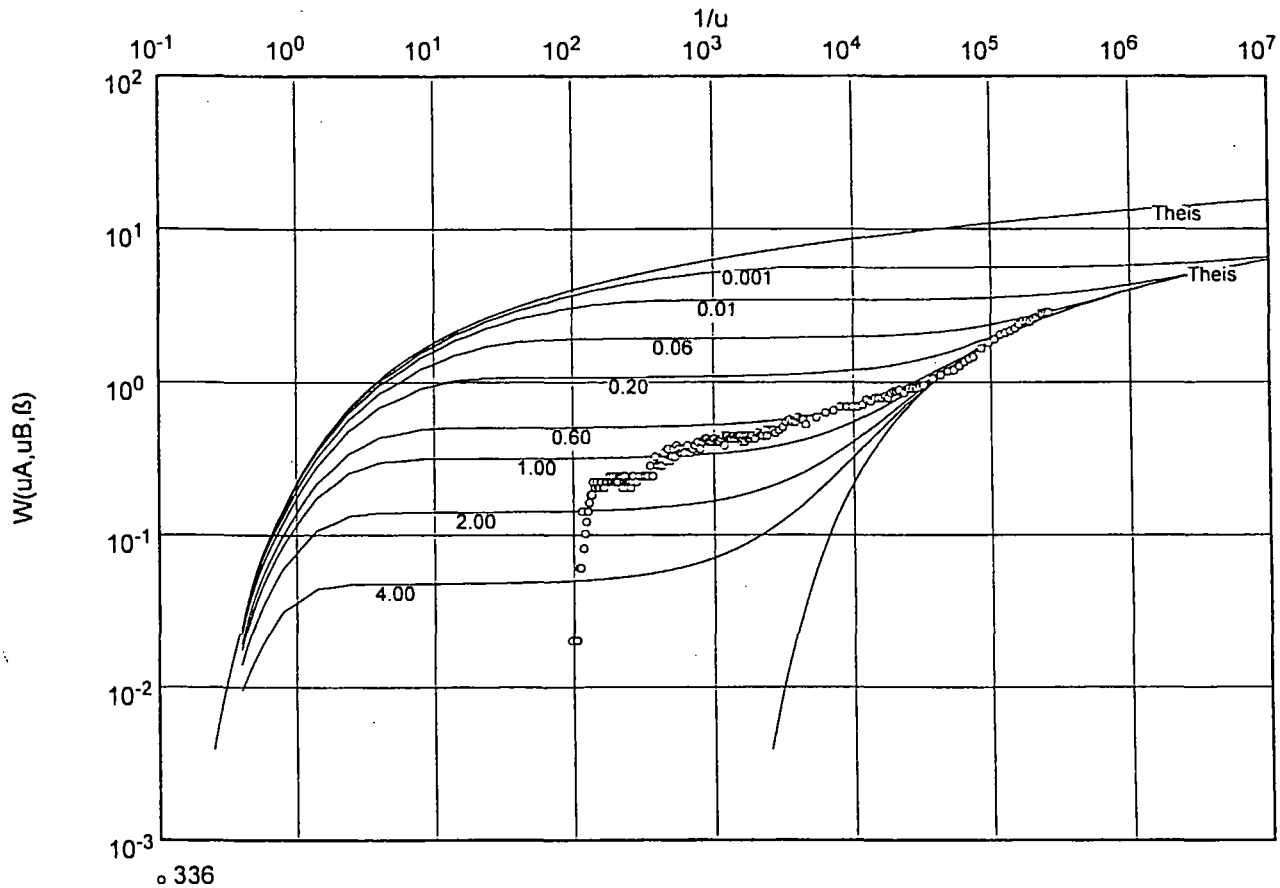
Hydraulic conductivity [ft/min]: 1.59×10^{-1}

Aquifer thickness [ft]: 18.73

Storativity: 4.10×10^{-3}

McCulley, Frick &Gilman, Inc. 19203 36th Avenue W. Suite 101 Lynnwood, WA 98036 ph.(206) 778-8252	Pumping test analysis NEUMAN's method Unconfined aquifer with delayed watertable response	Page 1 Project: Simplot Subarea Evaluated by: VBM Date: 27.11.1996

Pumping Test No. 1	Test conducted on: November 10, 1996
336	
Discharge 50.00 U.S.gal/min	



Transmissivity [ft²/min]: 2.99×10^{0}

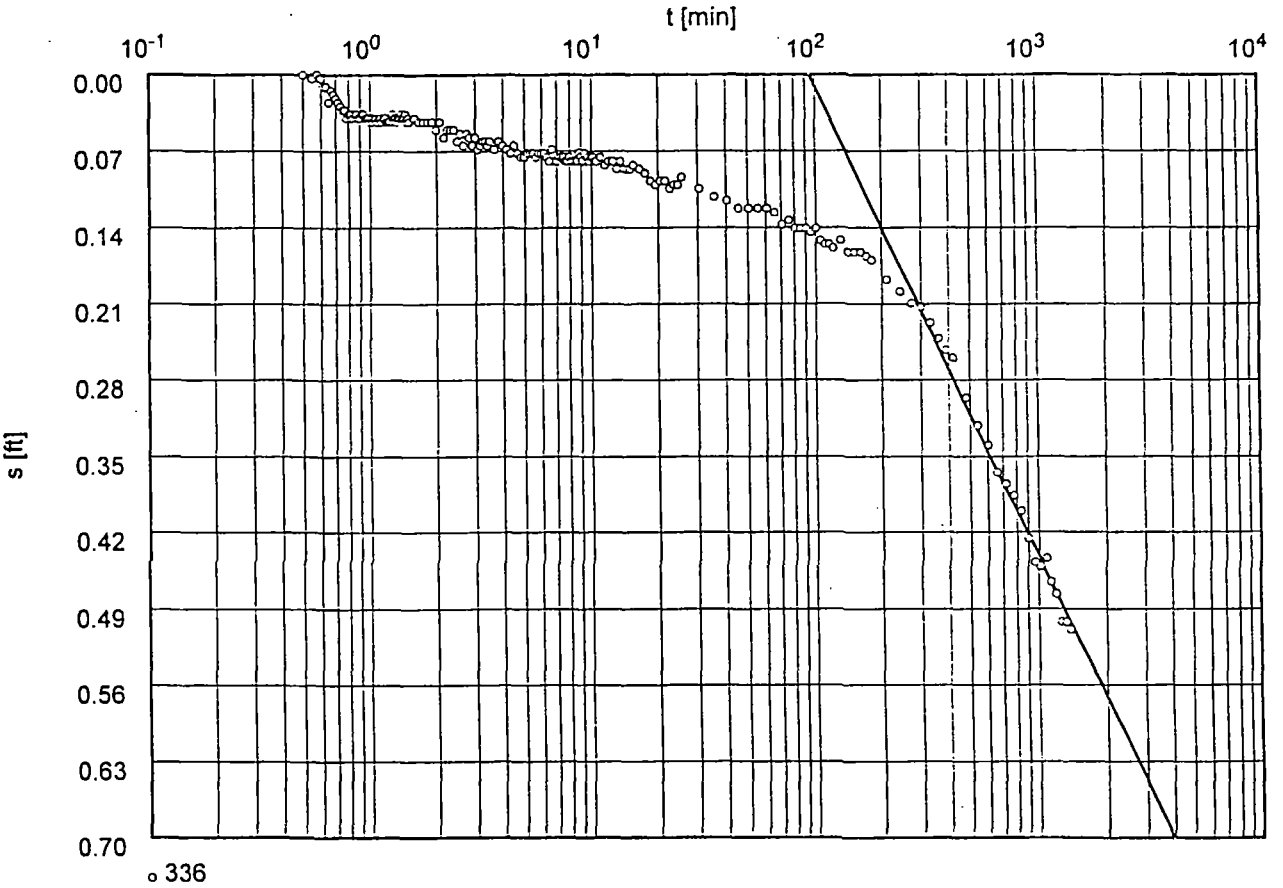
Hydraulic conductivity [ft/min]: 1.59×10^{-1}

Aquifer thickness [ft]: 18.73

Storativity: 2.30×10^{-5}

McCulley, Frick &Gilman, Inc. 19203 36th Avenue W. Suite 101 Lynnwood, WA 98036 ph.(206) 778-8252	Pumping test analysis Time-Drawdown-method after COOPER & JACOB Confined aquifer	Page 1 Project: Simplot Subarea Evaluated by: VBM Date: 27.11.1996

Pumping Test No. 1	Test conducted on: November 10, 1996
336	
Discharge 50.00 U.S.gal/min	



Transmissivity [ft²/min]: 2.83×10^{0}

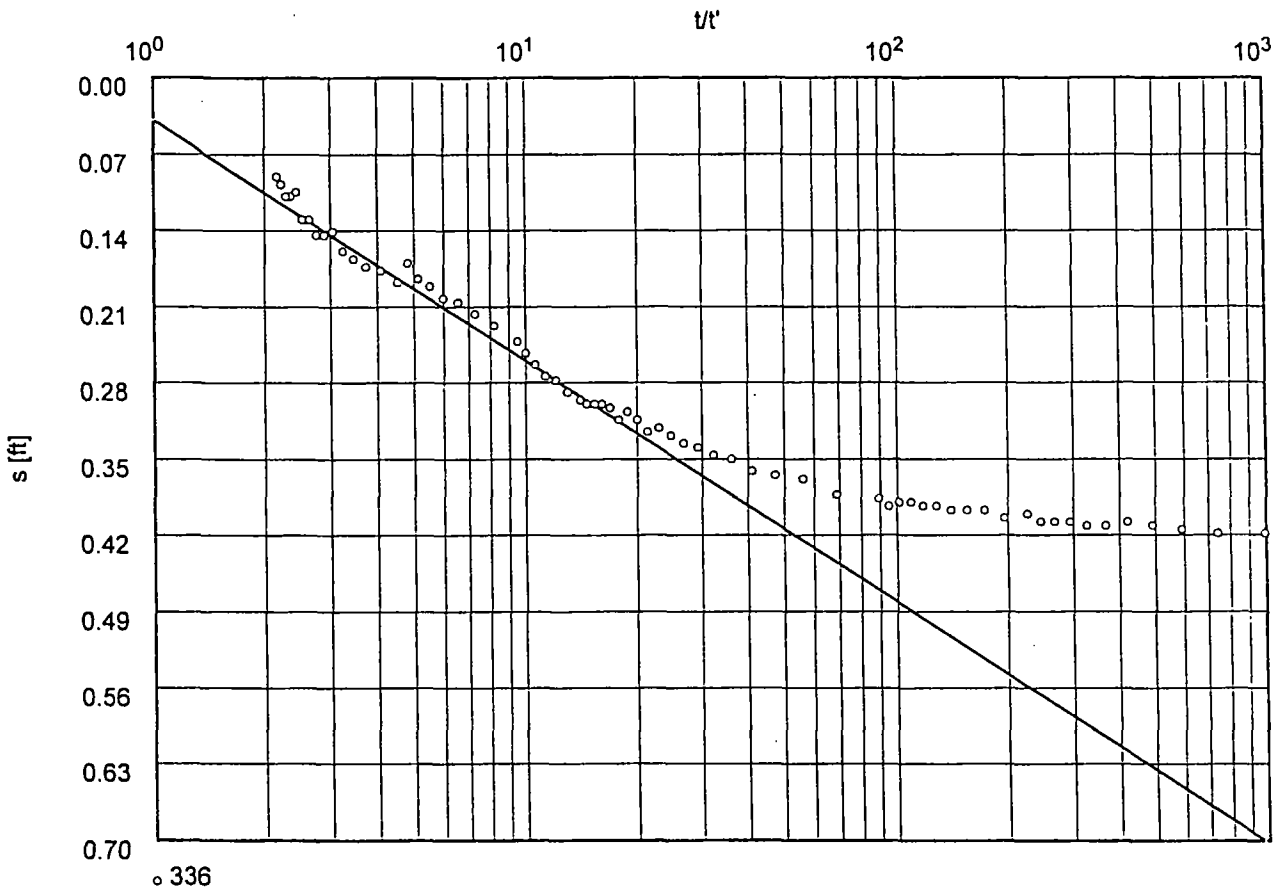
Hydraulic conductivity [ft/min]: 1.51×10^{-1}

Aquifer thickness [ft]: 18.73

Storativity: 2.06×10^{-1}

McCulley, Frick &Gilman, Inc. 19203 36th Avenue W. Suite 101 Lynnwood, WA 98036 ph.(206) 778-8252	Pumping test analysis Recovery method after THEIS & JACOB Confined aquifer	Page 1 Project: Simplot Subarea Evaluated by: VBM Date: 27.11.1996

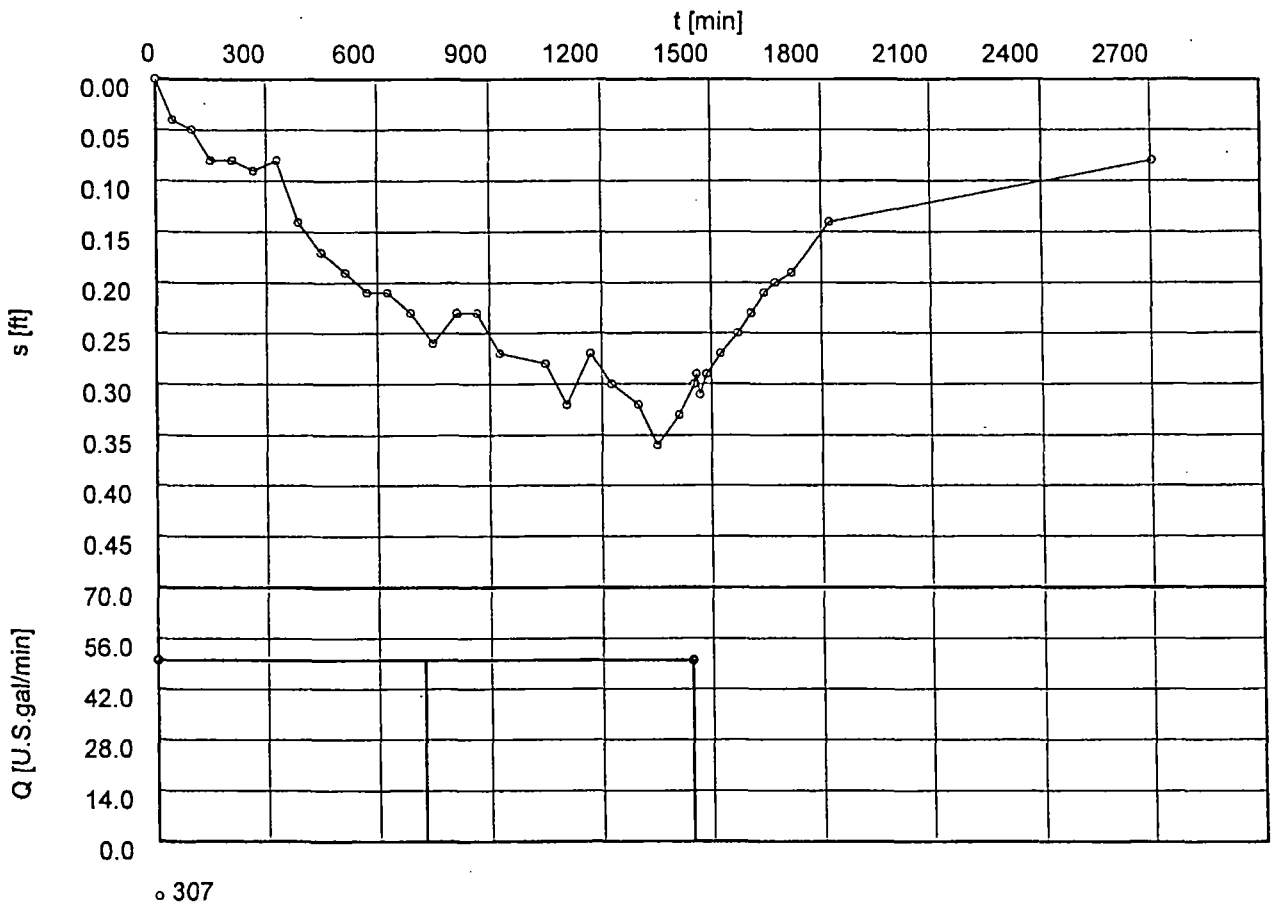
Pumping Test No. 1	Test conducted on: November 10, 1996
336	
Discharge 50.00 U.S.gal/min	
	Pumping test duration: 1454.00 min



Transmissivity [ft²/min]: 5.52×10^0

McCulley, Frick &Gilman, Inc. 19203 36th Avenue W. Suite 101 Lynnwood, WA 98036 ph.(206) 778-8252	Pumping test analysis Time-Drawdown plot with discharge	Page 1 Project: Simplot Subarea Evaluated by: VBM Date: 27.11.1996

Pumping Test No. 1	Test conducted on: November 10, 1996
307	
Discharge 50.00 U.S.gal/min	



McCulley, Frick &Gilman, Inc.
19203 36th Avenue W. Suite 101
Lynnwood, WA 98036
ph.(206) 778-8252

Pumping test analysis
Time-Drawdown plot
with discharge

Project: Simplot Subarea

Evaluated by: VBM | Date: 27.11.1996

Pumping Test No. 1 | Test conducted on: November 10, 1996

307 | 307

Discharge 50.00 U.S.gal/min | Distance from the pumping well 253.20 ft

Static water level: 0.00 ft below datum

	Pumping test duration [min]	Water level [ft]	Drawdown [ft]
1	0.00	0.00	0.00
2	46.65	0.04	0.04
3	98.68	0.05	0.05
4	151.13	0.08	0.08
5	208.55	0.08	0.08
6	266.55	0.09	0.09
7	329.13	0.08	0.08
8	387.55	0.14	0.14
9	450.55	0.17	0.17
10	514.55	0.19	0.19
11	571.55	0.21	0.21
12	626.55	0.21	0.21
13	690.55	0.23	0.23
14	749.55	0.26	0.26
15	814.55	0.23	0.23
16	867.55	0.23	0.23
17	927.55	0.27	0.27
18	1049.55	0.28	0.28
19	1105.55	0.32	0.32
20	1170.55	0.27	0.27
21	1227.55	0.30	0.30
22	1299.55	0.32	0.32
23	1349.55	0.36	0.36
24	1411.55	0.33	0.33
25	1452.55	0.30	0.30
26	1459.55	0.29	0.29
27	1469.55	0.31	0.31
28	1487.55	0.29	0.29
29	1525.55	0.27	0.27
30	1572.55	0.25	0.25
31	1609.55	0.23	0.23
32	1642.55	0.21	0.21
33	1673.55	0.20	0.20
34	1718.55	0.19	0.19
35	1821.55	0.14	0.14
36	2704.55	0.08	0.08

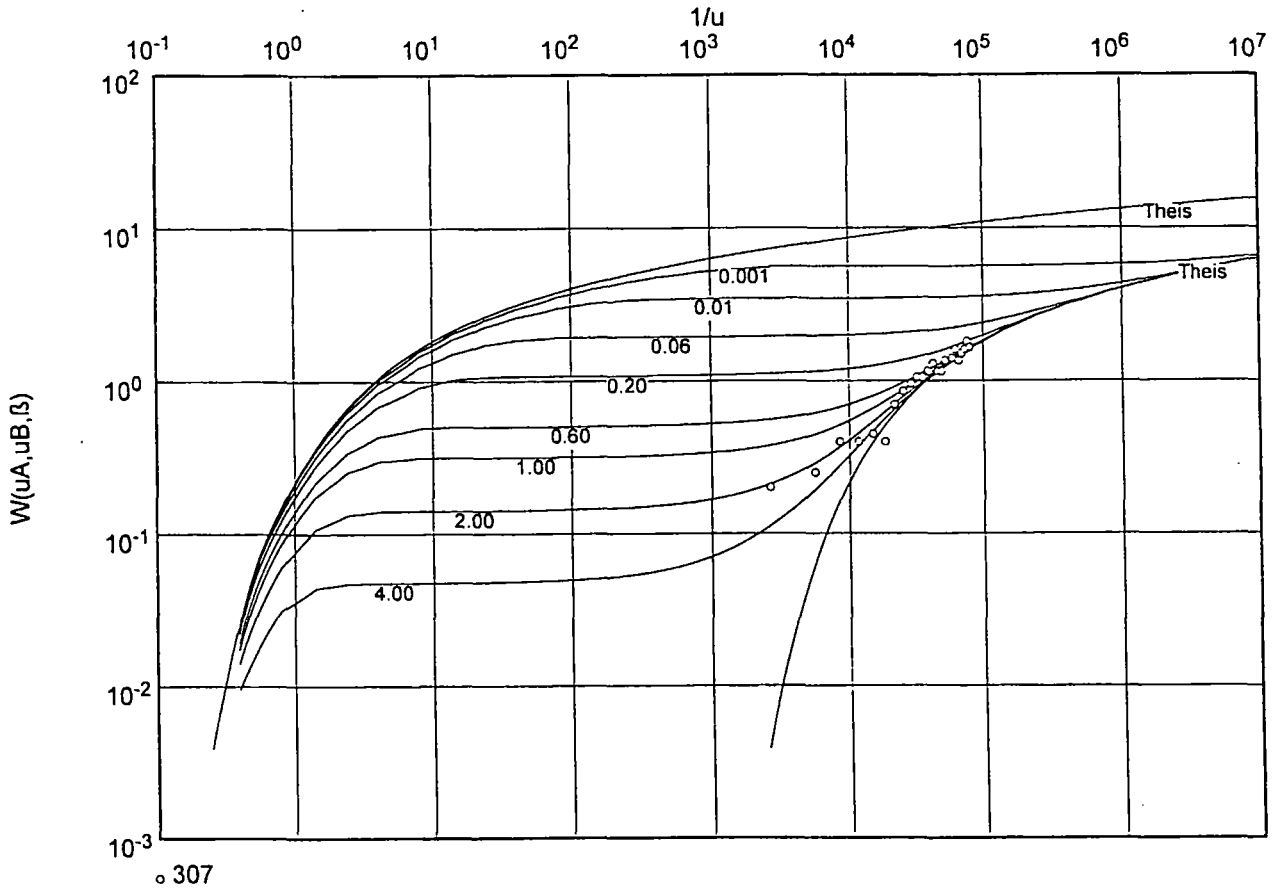
McCulley, Frick &Gilman, Inc. 19203 36th Avenue W. Suite 101 Lynnwood, WA 98036 ph.(206) 778-8252	Pumping test analysis Time-Drawdown plot with discharge	Page 3 Project: Simplot Subarea Evaluated by: VBM Date: 27.11.1996

Pumping Test No. 1	Test conducted on: November 10, 1996
307	*Measured at outflow*
Discharge 50.00 U.S.gal/min	

	Pumping test duration [min]	Discharge [U.S.gal/min]		
1	0.00	50.00		
2	1445.00	50.00		

McCulley, Frick &Gilman, Inc. 19203 36th Avenue W. Suite 101 Lynnwood, WA 98036 ph.(206) 778-8252	Pumping test analysis NEUMAN's method Unconfined aquifer with delayed watertable response	Page 1 Project: Simplot Subarea Evaluated by: VBM Date: 27.11.1996

Pumping Test No. 1	Test conducted on: November 10, 1996
307	
Discharge 50.00 U.S.gal/min	

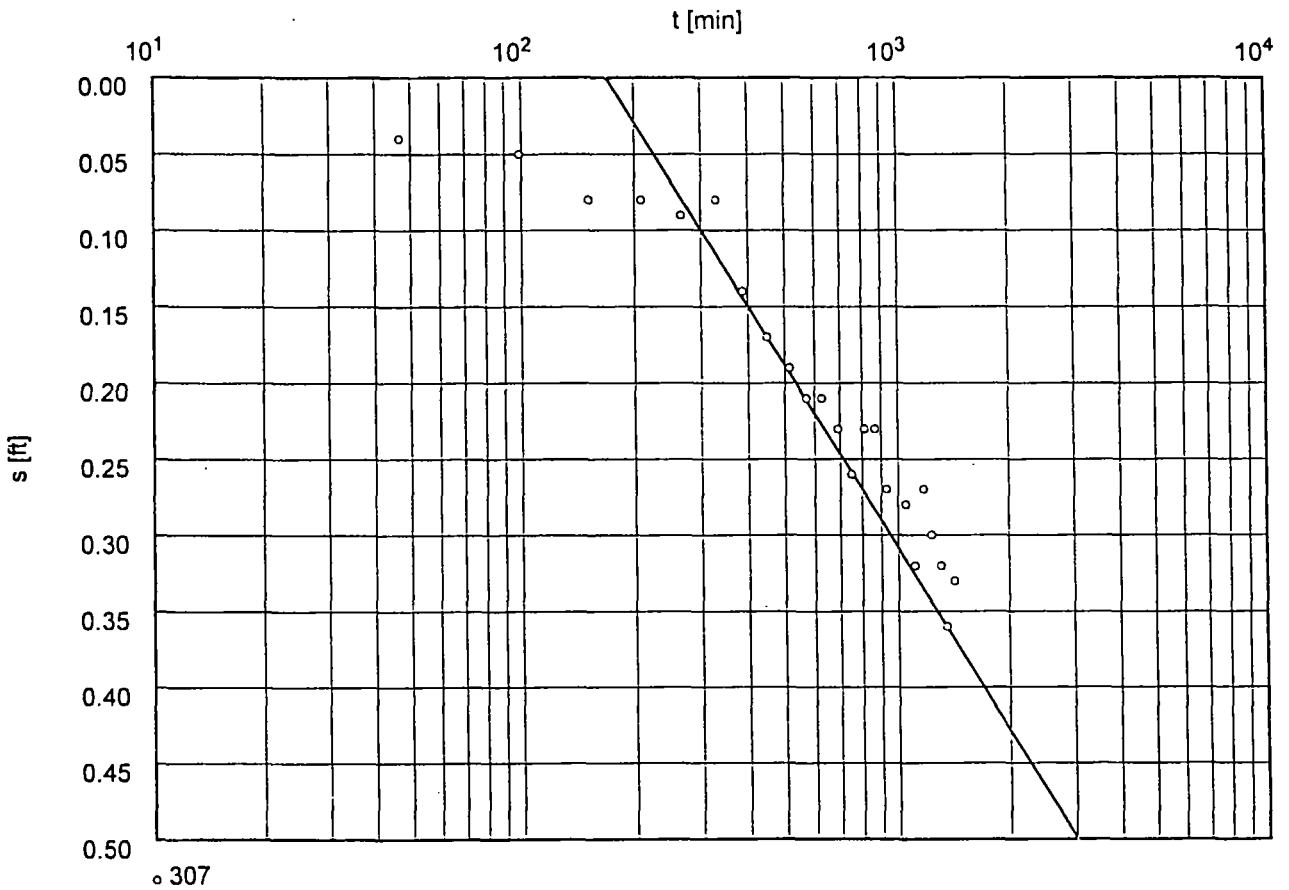


Transmissivity [ft²/min]: 2.66×10^{0}

Storativity: 2.95×10^{-6}

McCulley, Frick &Gilman, Inc. 19203 36th Avenue W. Suite 101 Lynnwood, WA 98036 ph.(206) 778-8252	Pumping test analysis Time-Drawdown-method after COOPER & JACOB Confined aquifer	Page 1 Project: Simplot Subarea Evaluated by: VBM Date: 27.11.1996

Pumping Test No. 1	Test conducted on: November 10, 1996
307	
Discharge 50.00 U.S.gal/min	

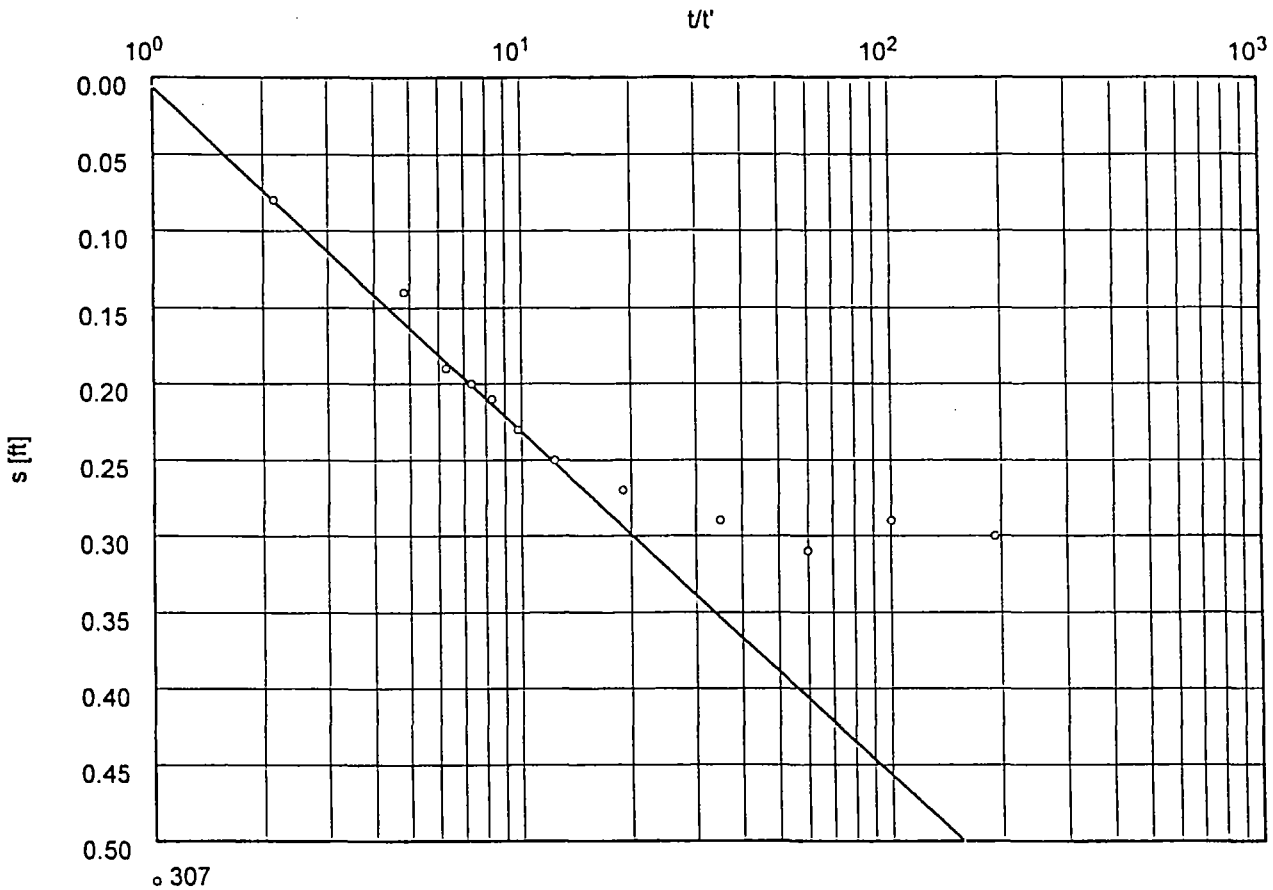


Transmissivity [ft²/min]: 3.06×10^0

Storativity: 1.81×10^{-2}

McCulley, Frick &Gilman, Inc. 19203 36th Avenue W. Suite 101 Lynnwood, WA 98036 ph.(206) 778-8252	Pumping test analysis Recovery method after THEIS & JACOB Confined aquifer	Page 1 Project: Simplot Subarea Evaluated by: VBM Date: 27.11.1996

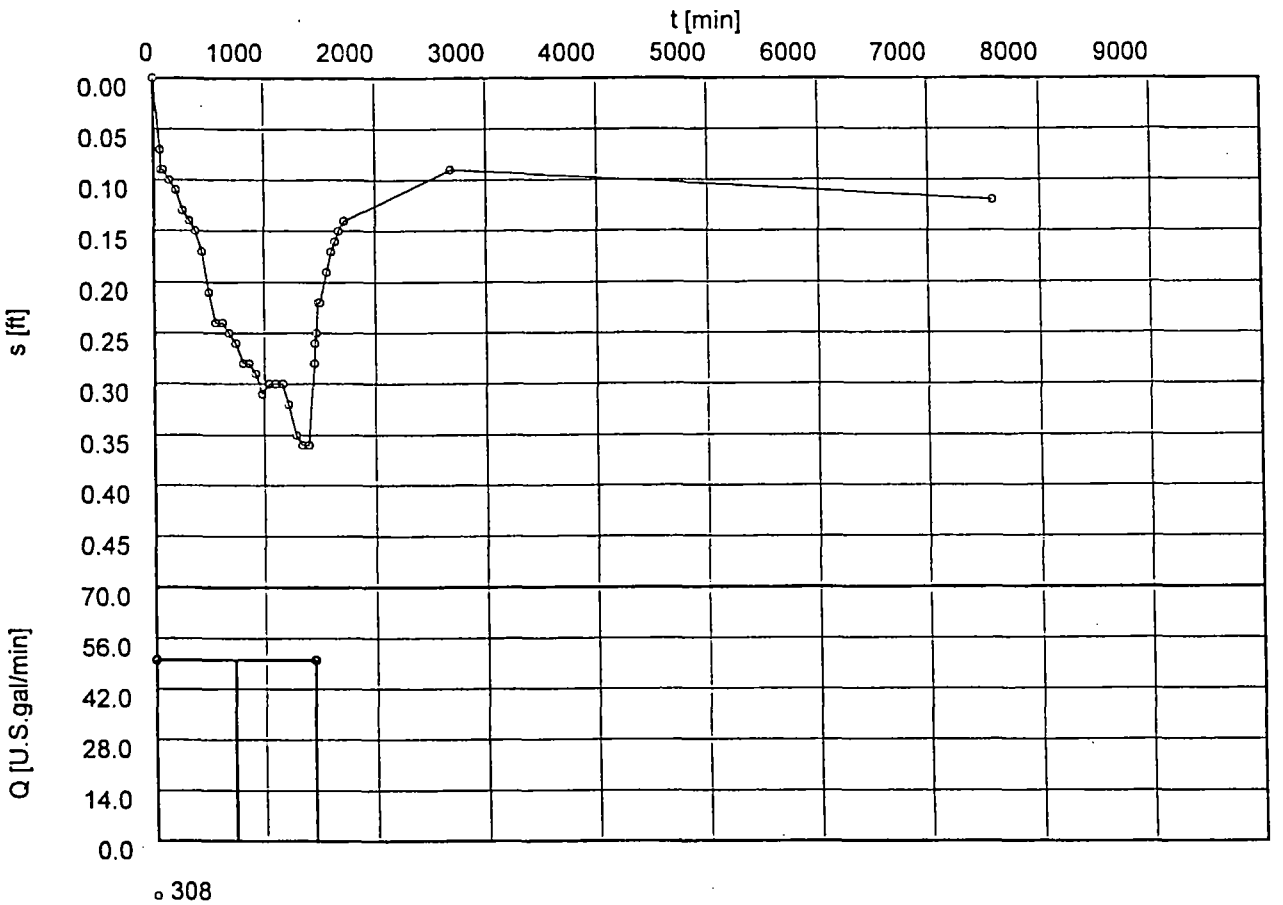
Pumping Test No. 1	Test conducted on: November 10, 1996
307	
Discharge 50.00 U.S.gal/min	
	Pumping test duration: 1445.00 min



Transmissivity [ft²/min]: 5.42×10^0

McCulley, Frick &Gilman, Inc. 19203 36th Avenue W. Suite 101 Lynnwood, WA 98036 ph.(206) 778-8252	Pumping test analysis Time-Drawdown plot with discharge	Page 1 Project: Simplot Subarea Evaluated by: VBM Date: 27.11.1996

Pumping Test No. 1	Test conducted on: November 10, 1996
308	
Discharge 50.00 U.S.gal/min	



McCulley, Frick &Gilman, Inc. 19203 36th Avenue W. Suite 101 Lynnwood, WA 98036 ph.(206) 778-8252	Pumping test analysis Time-Drawdown plot with discharge	Page 2 Project: Simplot Subarea Evaluated by: VBM Date: 27.11.1996

Pumping Test No. 1	Test conducted on: November 10, 1996
308	308
Discharge 50.00 U.S.gal/min	Distance from the pumping well 271.90 ft
Static water level: 0.00 ft below datum	

	Pumping test duration [min]	Water level [ft]	Drawdown [ft]
1	0.00	0.00	0.00
2	61.80	0.07	0.07
3	67.55	0.09	0.09
4	90.55	0.09	0.09
5	146.43	0.10	0.10
6	204.55	0.11	0.11
7	263.55	0.13	0.13
8	325.47	0.14	0.14
9	384.72	0.15	0.15
10	445.55	0.17	0.17
11	504.55	0.21	0.21
12	565.55	0.24	0.24
13	625.55	0.24	0.24
14	684.55	0.25	0.25
15	743.55	0.26	0.26
16	806.55	0.28	0.28
17	861.55	0.28	0.28
18	921.55	0.29	0.29
19	982.55	0.31	0.31
20	1043.55	0.30	0.30
21	1101.55	0.30	0.30
22	1165.55	0.30	0.30
23	1222.55	0.32	0.32
24	1289.55	0.35	0.35
25	1345.55	0.36	0.36
26	1404.55	0.36	0.36
27	1452.55	0.28	0.28
28	1459.55	0.26	0.26
29	1469.55	0.25	0.25
30	1488.55	0.22	0.22
31	1505.55	0.22	0.22
32	1568.55	0.19	0.19
33	1608.55	0.17	0.17
34	1642.55	0.16	0.16
35	1674.55	0.15	0.15
36	1718.55	0.14	0.14
37	2683.55	0.09	0.09
38	7585.55	0.12	0.12

McCulley, Frick &Gilman, Inc.
19203 36th Avenue W. Suite 101
Lynnwood, WA 98036
ph.(206) 778-8252

Pumping test analysis
Time-Drawdown plot
with discharge

Project: Simplot Subarea

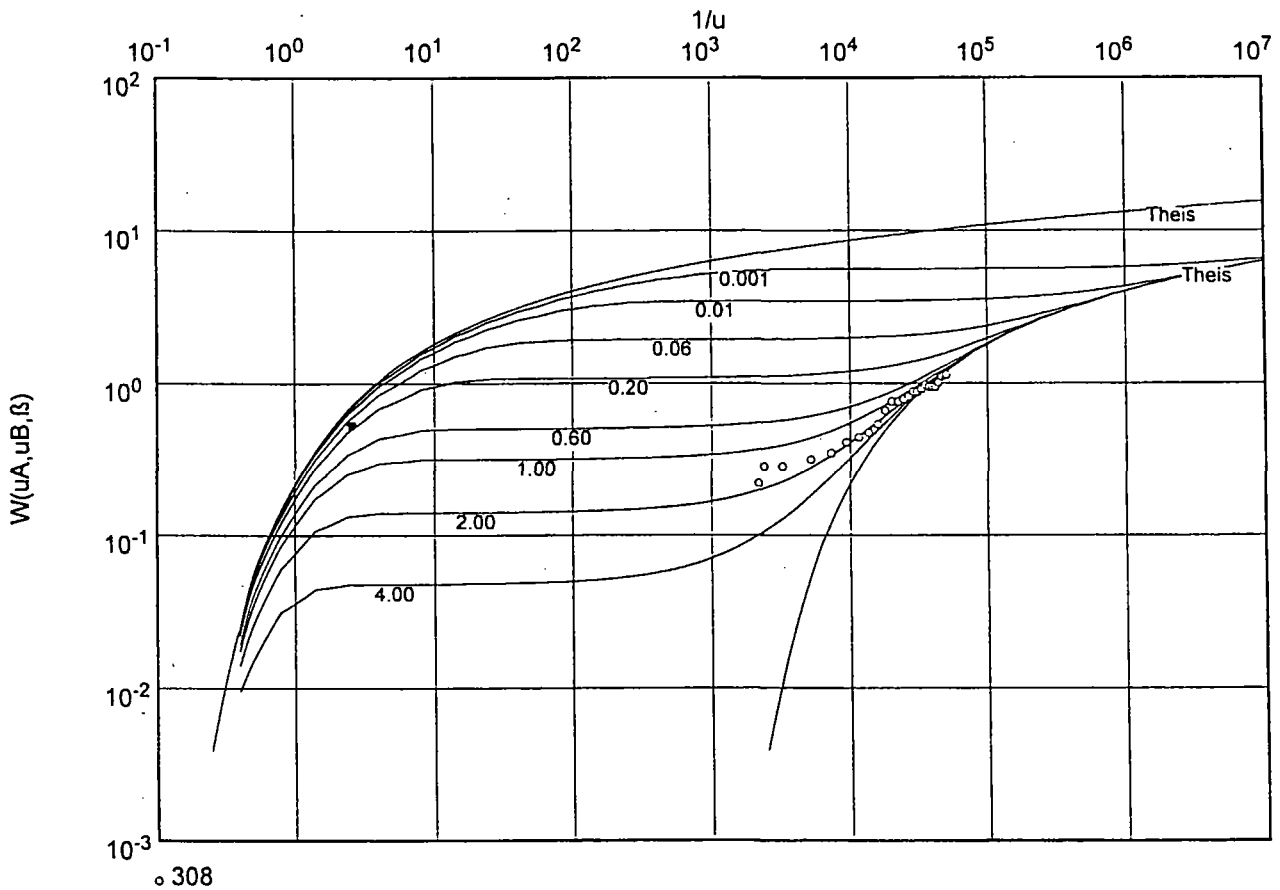
Evaluated by: VBM | Date: 27.11.1996

Pumping Test No. 1	Test conducted on: November 10, 1996
308	Measured at outflow
Discharge 50.00 U.S.gal/min	

	Pumping test duration [min]	Discharge [U.S.gal/min]		
1	0.00	50.00		
2	1445.00	50.00		

McCulley, Frick &Gilman, Inc. 19203 36th Avenue W. Suite 101 Lynnwood, WA 98036 ph.(206) 778-8252	Pumping test analysis NEUMAN's method Unconfined aquifer with delayed watertable response	Page 1 Project: Simplot Subarea Evaluated by: VBM Date: 27.11.1996

Pumping Test No. 1	Test conducted on: November 10, 1996
308	
Discharge 50.00 U.S.gal/min	

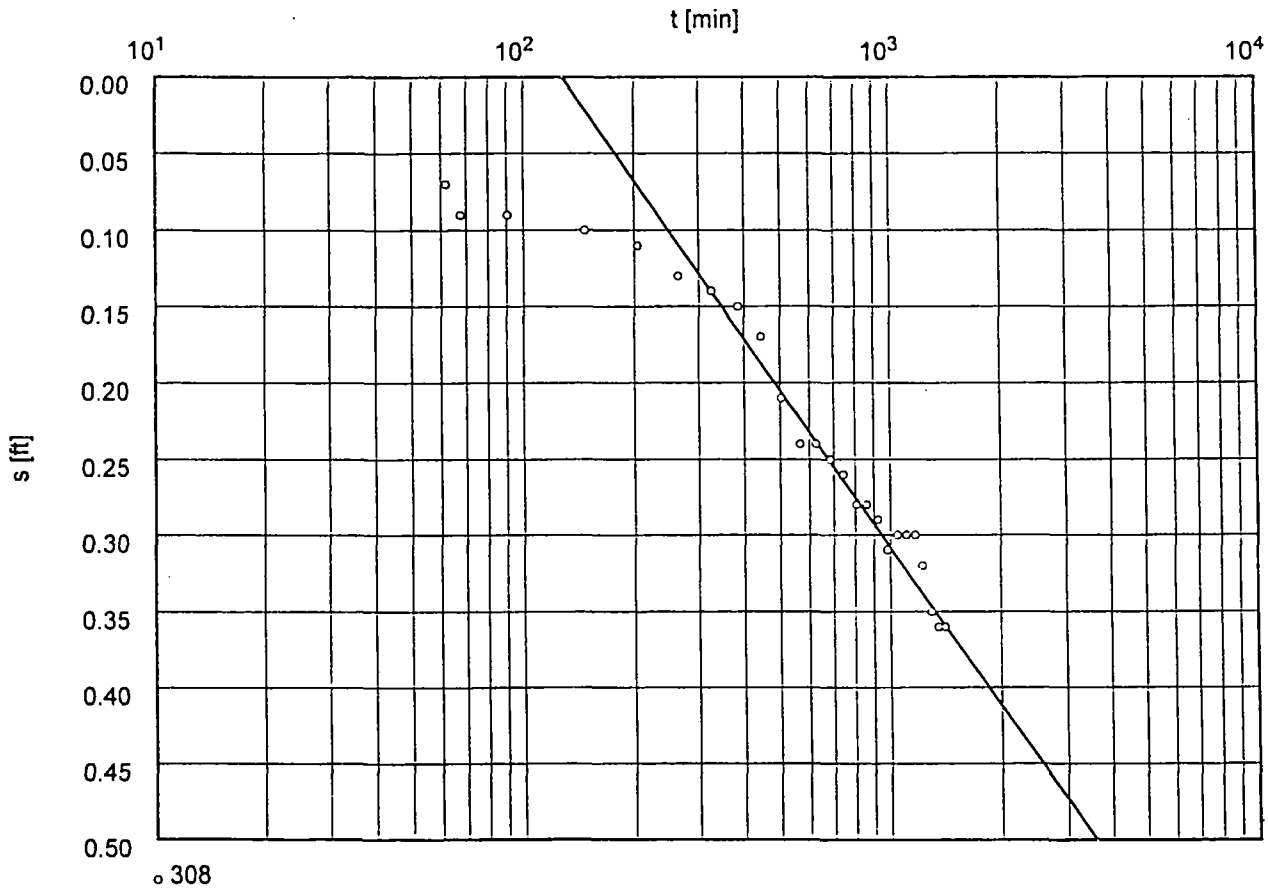


Transmissivity [ft²/min]: 1.68×10^{0}

Storativity: 2.56×10^{-6}

McCulley, Frick &Gilman, Inc. 19203 36th Avenue W. Suite 101 Lynnwood, WA 98036 ph.(206) 778-8252	Pumping test analysis Time-Drawdown-method after COOPER & JACOB Confined aquifer	Page 1 Project: Simplot Subarea Evaluated by: VBM Date: 27.11.1996

Pumping Test No. 1	Test conducted on: November 10, 1996
308	
Discharge 50.00 U.S.gal/min	

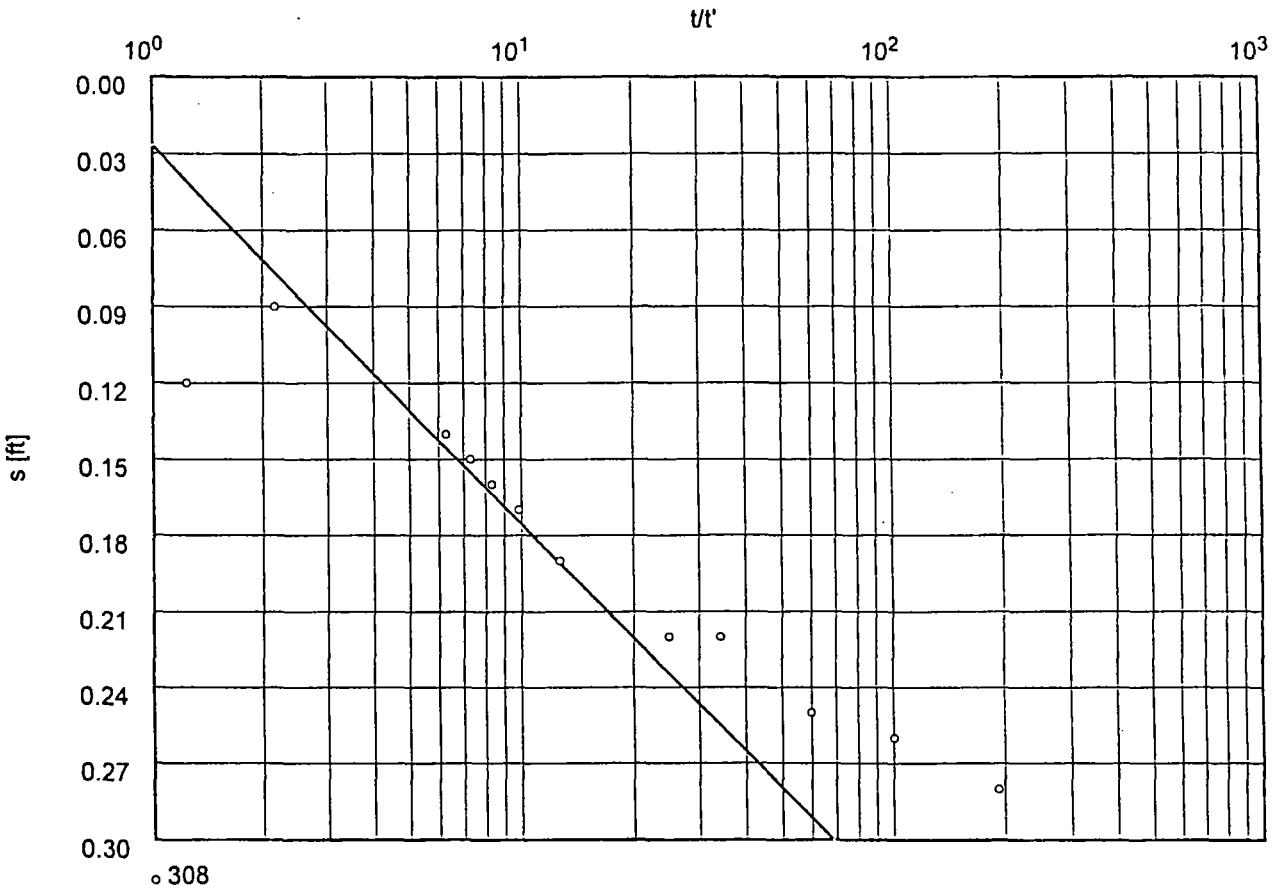


Transmissivity [ft²/min]: 3.54×10^0

Storativity: 1.37×10^{-2}

McCulley, Frick &Gilman, Inc. 19203 36th Avenue W. Suite 101 Lynnwood, WA 98036 ph.(206) 778-8252	Pumping test analysis Recovery method after THEIS & JACOB Confined aquifer	Page 1 Project: Simplot Subarea Evaluated by: VBM Date: 27.11.1996

Pumping Test No. 1	Test conducted on: November 10, 1996
308	
Discharge 50.00 U.S.gal/min	
	Pumping test duration: 1445.00 min



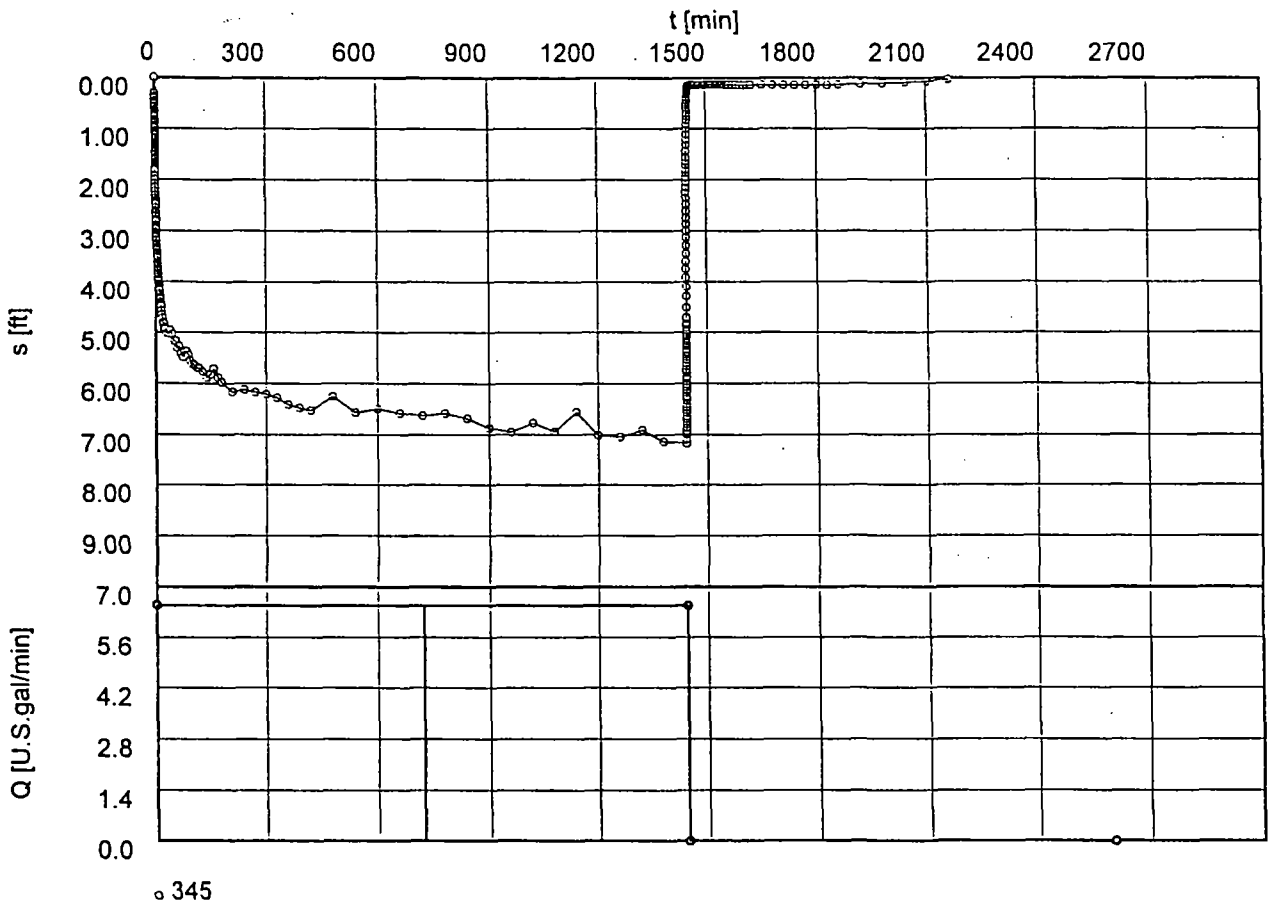
Transmissivity [ft²/min]: 8.21×10^0

C-2

PUMPING WELL 345

McCulley, Frick &Gilman, Inc. 19203 36th Avenue W. Suite 101 Lynnwood, WA 98036 ph.(206) 778-8252	Pumping test analysis Time-Drawdown plot with discharge	Page 1 Project: Simplot Subarea FS Evaluated by: VBM Date: 26.11.1996

Pumping Test No. 4	Test conducted on: November 16, 1996
345	
Discharge 6.50 U.S.gal/min	



McCulley, Frick &Gilman, Inc.
19203 36th Avenue W. Suite 101
Lynnwood, WA 98036
ph.(206) 778-8252

Pumping test analysis
Time-Drawdown plot
with discharge

Project: Simplot Subarea FS

Evaluated by: VBM | Date: 26.11.1996

Pumping Test No. 4 | Test conducted on: November 16, 1996

345 | 345

Discharge 6.50 U.S.gal/min

Static water level: 0.00 ft below datum

	Pumping test duration [min]	Water level [ft]	Drawdown [ft]
1	0.00	0.00	0.00
2	0.05	0.28	0.28
3	0.07	0.32	0.32
4	0.08	0.33	0.33
5	0.10	0.38	0.38
6	0.12	0.41	0.41
7	0.13	0.47	0.47
8	0.15	0.49	0.49
9	0.17	0.53	0.53
10	0.18	0.57	0.57
11	0.20	0.60	0.60
12	0.22	0.64	0.64
13	0.23	0.67	0.67
14	0.25	0.70	0.70
15	0.26	0.73	0.73
16	0.28	0.75	0.75
17	0.30	0.78	0.78
18	0.32	0.83	0.83
19	0.33	0.85	0.85
20	0.35	0.88	0.88
21	0.37	0.91	0.91
22	0.38	0.95	0.95
23	0.40	0.97	0.97
24	0.41	1.01	1.01
25	0.43	1.06	1.06
26	0.45	1.06	1.06
27	0.47	1.10	1.10
28	0.48	1.11	1.11
29	0.50	1.14	1.14
30	0.52	1.15	1.15
31	0.53	1.19	1.19
32	0.55	1.21	1.21
33	0.57	1.24	1.24
34	0.58	1.25	1.25
35	0.60	1.29	1.29
36	0.61	1.30	1.30
37	0.63	1.33	1.33
38	0.65	1.36	1.36
39	0.67	1.39	1.39
40	0.69	1.40	1.40
41	0.70	1.42	1.42
42	0.72	1.45	1.45
43	0.73	1.48	1.48
44	0.75	1.48	1.48
45	0.76	1.53	1.53
46	0.78	1.52	1.52
47	0.80	1.54	1.54
48	0.82	1.58	1.58
49	0.83	1.59	1.59
50	0.85	1.60	1.60

McCulley, Frick &Gilman, Inc. 19203 36th Avenue W. Suite 101 Lynnwood, WA 98036 ph.(206) 778-8252	Pumping test analysis Time-Drawdown plot with discharge	Page 3 Project: Simplot Subarea FS Evaluated by: VBM Date: 26.11.1996

Pumping Test No. 4	Test conducted on: November 16, 1996
345	345
Discharge 6.50 U.S.gal/min	
Static water level: 0.00 ft below datum	

	Pumping test duration [min]	Water level [ft]	Drawdown [ft]
51	0.87	1.63	1.63
52	0.88	1.67	1.67
53	0.90	1.68	1.68
54	0.92	1.69	1.69
55	0.93	1.71	1.71
56	0.95	1.73	1.73
57	0.96	1.76	1.76
58	0.98	1.78	1.78
59	1.00	1.79	1.79
60	1.02	1.80	1.80
61	1.03	1.82	1.82
62	1.05	1.83	1.83
63	1.13	1.94	1.94
64	1.22	2.01	2.01
65	1.30	2.09	2.09
66	1.38	2.16	2.16
67	1.47	2.24	2.24
68	1.55	2.32	2.32
69	1.63	2.38	2.38
70	1.72	2.43	2.43
71	1.80	2.48	2.48
72	1.88	2.56	2.56
73	1.97	2.62	2.62
74	2.05	2.67	2.67
75	2.13	2.72	2.72
76	2.21	2.79	2.79
77	2.30	2.82	2.82
78	2.38	2.90	2.90
79	2.47	2.92	2.92
80	2.55	2.96	2.96
81	2.63	2.98	2.98
82	2.72	3.04	3.04
83	2.80	3.08	3.08
84	2.88	3.11	3.11
85	2.96	3.12	3.12
86	3.05	3.14	3.14
87	3.22	3.19	3.19
88	3.38	3.26	3.26
89	3.55	3.27	3.27
90	3.72	3.30	3.30
91	3.88	3.29	3.29
92	4.05	3.33	3.33
93	4.21	3.34	3.34
94	4.38	3.35	3.35
95	4.55	3.38	3.38
96	4.72	3.38	3.38
97	4.88	3.39	3.39
98	5.05	3.43	3.43
99	5.22	3.44	3.44
100	5.38	3.43	3.43

McCulley, Frick &Gilman, Inc. 19203 36th Avenue W. Suite 101 Lynnwood, WA 98036 ph.(206) 778-8252	Pumping test analysis Time-Drawdown plot with discharge	Page 4 Project: Simplot Subarea FS Evaluated by: VBM Date: 26.11.1996

Pumping Test No. 4	Test conducted on: November 16, 1996
345	345
Discharge 6.50 U.S.gal/min	
Static water level: 0.00 ft below datum	

	Pumping test duration [min]	Water level [ft]	Drawdown [ft]
101	5.55	3.45	3.45
102	5.72	3.46	3.46
103	5.88	3.50	3.50
104	6.05	3.54	3.54
105	6.22	3.53	3.53
106	6.38	3.60	3.60
107	6.55	3.63	3.63
108	6.71	3.65	3.65
109	6.88	3.68	3.68
110	7.05	3.71	3.71
111	7.22	3.75	3.75
112	7.38	3.78	3.78
113	7.55	3.80	3.80
114	7.72	3.84	3.84
115	7.88	3.87	3.87
116	8.05	3.88	3.88
117	8.22	3.92	3.92
118	8.38	3.95	3.95
119	8.55	3.99	3.99
120	8.71	3.99	3.99
121	8.88	4.04	4.04
122	9.05	4.04	4.04
123	9.22	4.07	4.07
124	9.38	4.10	4.10
125	9.55	4.11	4.11
126	9.72	4.14	4.14
127	9.88	4.14	4.14
128	10.05	4.15	4.15
129	10.55	4.18	4.18
130	11.05	4.23	4.23
131	11.55	4.28	4.28
132	12.05	4.32	4.32
133	12.55	4.34	4.34
134	13.05	4.41	4.41
135	13.55	4.42	4.42
136	14.05	4.45	4.45
137	14.55	4.48	4.48
138	15.05	4.49	4.49
139	16.05	4.58	4.58
140	17.05	4.65	4.65
141	18.05	4.72	4.72
142	19.05	4.80	4.80
143	20.05	4.80	4.80
144	21.05	4.83	4.83
145	22.05	4.85	4.85
146	23.05	4.83	4.83
147	24.05	4.91	4.91
148	25.05	4.94	4.94
149	30.05	5.03	5.03

McCulley, Frick &Gilman, Inc. 19203 36th Avenue W. Suite 101 Lynnwood, WA 98036 ph.(206) 778-8252	Pumping test analysis Time-Drawdown plot with discharge	Page 5 Project: Simplot Subarea FS Evaluated by: VBM Date: 26.11.1996

Pumping Test No. 4	Test conducted on: November 16, 1996
345	345
Discharge 6.50 U.S.gal/min	
Static water level: 0.00 ft below datum	

	Pumping test duration [min]	Water level [ft]	Drawdown [ft]
151	40.05	4.96	4.96
152	45.05	5.03	5.03
153	50.05	5.17	5.17
154	55.05	5.17	5.17
155	60.05	5.31	5.31
156	65.05	5.27	5.27
157	70.05	5.42	5.42
158	75.05	5.49	5.49
159	80.05	5.37	5.37
160	85.05	5.38	5.38
161	90.05	5.45	5.45
162	95.05	5.55	5.55
163	100.05	5.63	5.63
164	105.05	5.63	5.63
165	110.05	5.66	5.66
166	115.05	5.70	5.70
167	120.05	5.70	5.70
168	130.05	5.77	5.77
169	140.05	5.89	5.89
170	150.05	5.82	5.82
171	160.05	5.71	5.71
172	170.05	5.89	5.89
173	180.05	5.97	5.97
174	210.05	6.16	6.16
175	240.05	6.12	6.12
176	270.05	6.17	6.17
177	300.05	6.20	6.20
178	330.05	6.28	6.28
179	360.05	6.41	6.41
180	390.05	6.47	6.47
181	420.05	6.52	6.52
182	480.05	6.25	6.25
183	540.05	6.56	6.56
184	600.05	6.49	6.49
185	660.05	6.58	6.58
186	720.05	6.62	6.62
187	780.05	6.58	6.58
188	840.05	6.68	6.68
189	900.05	6.87	6.87
190	960.05	6.95	6.95
191	1020.05	6.77	6.77
192	1080.05	6.94	6.94
193	1140.05	6.55	6.55
194	1200.05	7.01	7.01
195	1260.05	7.05	7.05
196	1320.05	6.90	6.90
197	1380.05	7.14	7.14
198	1440.04	7.16	7.16
199	1442.76	7.17	7.17

McCulley, Frick &Gilman, Inc. 19203 36th Avenue W. Suite 101 Lynnwood, WA 98036 ph.(206) 778-8252	Pumping test analysis Time-Drawdown plot with discharge	Page 6 Project: Simplot Subarea FS Evaluated by: VBM Date: 26.11.1996

Pumping Test No. 4	Test conducted on: November 16, 1996
345	345
Discharge 6.50 U.S.gal/min	
Static water level: 0.00 ft below datum	

	Pumping test duration [min]	Water level [ft]	Drawdown [ft]
201	1442.81	7.17	7.17
202	1442.82	7.18	7.18
203	1442.83	7.17	7.17
204	1442.85	7.18	7.18
205	1442.87	7.18	7.18
206	1442.88	7.17	7.17
207	1442.90	7.17	7.17
208	1442.92	7.18	7.18
209	1442.93	7.18	7.18
210	1442.95	7.18	7.18
211	1442.96	7.16	7.16
212	1442.98	7.18	7.18
213	1443.00	7.17	7.17
214	1443.02	7.09	7.09
215	1443.04	7.00	7.00
216	1443.05	6.97	6.97
217	1443.06	6.93	6.93
218	1443.08	6.85	6.85
219	1443.10	6.80	6.80
220	1443.11	6.75	6.75
221	1443.13	6.69	6.69
222	1443.15	6.64	6.64
223	1443.17	6.56	6.56
224	1443.18	6.51	6.51
225	1443.20	6.46	6.46
226	1443.22	6.40	6.40
227	1443.23	6.33	6.33
228	1443.25	6.28	6.28
229	1443.27	6.25	6.25
230	1443.28	6.17	6.17
231	1443.30	6.12	6.12
232	1443.31	6.07	6.07
233	1443.33	6.02	6.02
234	1443.35	5.95	5.95
235	1443.37	5.90	5.90
236	1443.38	5.86	5.86
237	1443.40	5.79	5.79
238	1443.42	5.76	5.76
239	1443.43	5.73	5.73
240	1443.45	5.65	5.65
241	1443.46	5.60	5.60
242	1443.48	5.54	5.54
243	1443.50	5.48	5.48
244	1443.52	5.43	5.43
245	1443.53	5.39	5.39
246	1443.55	5.34	5.34
247	1443.57	5.27	5.27
248	1443.58	5.22	5.22
249	1443.60	5.17	5.17

McCulley, Frick &Gilman, Inc. 19203 36th Avenue W. Suite 101 Lynnwood, WA 98036 ph.(206) 778-8252	Pumping test analysis Time-Drawdown plot with discharge	Page 7 Project: Simplot Subarea FS Evaluated by: VBM Date: 26.11.1996

Pumping Test No. 4	Test conducted on: November 16, 1996
345	345
Discharge 6.50 U.S.gal/min	

Static water level: 0.00 ft below datum

	Pumping test duration [min]	Water level [ft]	Drawdown [ft]
251	1443.63	5.08	5.08
252	1443.65	5.04	5.04
253	1443.66	5.00	5.00
254	1443.68	4.96	4.96
255	1443.70	4.90	4.90
256	1443.72	4.85	4.85
257	1443.73	4.81	4.81
258	1443.76	4.74	4.74
259	1443.77	4.70	4.70
260	1443.85	4.51	4.51
261	1443.93	4.28	4.28
262	1444.01	4.10	4.10
263	1444.10	3.92	3.92
264	1444.18	3.74	3.74
265	1444.27	3.59	3.59
266	1444.35	3.44	3.44
267	1444.43	3.28	3.28
268	1444.52	3.13	3.13
269	1444.60	2.99	2.99
270	1444.68	2.86	2.86
271	1444.76	2.74	2.74
272	1444.85	2.61	2.61
273	1444.93	2.47	2.47
274	1445.02	2.35	2.35
275	1445.10	2.23	2.23
276	1445.18	2.14	2.14
277	1445.26	2.04	2.04
278	1445.35	1.95	1.95
279	1445.43	1.86	1.86
280	1445.52	1.80	1.80
281	1445.60	1.71	1.71
282	1445.68	1.63	1.63
283	1445.77	1.56	1.56
284	1445.93	1.44	1.44
285	1446.10	1.31	1.31
286	1446.27	1.21	1.21
287	1446.43	1.11	1.11
288	1446.60	1.00	1.00
289	1446.77	0.91	0.91
290	1446.93	0.83	0.83
291	1447.10	0.75	0.75
292	1447.26	0.69	0.69
293	1447.43	0.63	0.63
294	1447.60	0.59	0.59
295	1447.77	0.53	0.53
296	1447.93	0.49	0.49
297	1448.10	0.44	0.44
298	1448.27	0.42	0.42
299	1448.43	0.39	0.39

McCulley, Frick &Gilman, Inc. 19203 36th Avenue W. Suite 101 Lynnwood, WA 98036 ph.(206) 778-8252	Pumping test analysis Time-Drawdown plot with discharge	Page 8 Project: Simplot Subarea FS Evaluated by: VBM Date: 26.11.1996

Pumping Test No. 4	Test conducted on: November 16, 1996
345	345
Discharge 6.50 U.S.gal/min	
Static water level: 0.00 ft below datum	

	Pumping test duration [min]	Water level [ft]	Drawdown [ft]
301	1448.77	0.32	0.32
302	1448.93	0.30	0.30
303	1449.10	0.29	0.29
304	1449.26	0.26	0.26
305	1449.43	0.25	0.25
306	1449.60	0.23	0.23
307	1449.76	0.20	0.20
308	1449.93	0.21	0.21
309	1450.10	0.18	0.18
310	1450.27	0.18	0.18
311	1450.43	0.18	0.18
312	1450.60	0.18	0.18
313	1450.77	0.17	0.17
314	1450.93	0.16	0.16
315	1451.10	0.17	0.17
316	1451.27	0.15	0.15
317	1451.43	0.15	0.15
318	1451.60	0.15	0.15
319	1451.76	0.15	0.15
320	1451.93	0.15	0.15
321	1452.10	0.16	0.16
322	1452.27	0.15	0.15
323	1452.43	0.15	0.15
324	1452.60	0.14	0.14
325	1452.77	0.15	0.15
326	1453.27	0.14	0.14
327	1453.76	0.14	0.14
328	1454.26	0.14	0.14
329	1454.77	0.14	0.14
330	1455.27	0.15	0.15
331	1455.77	0.14	0.14
332	1456.26	0.14	0.14
333	1456.77	0.15	0.15
334	1457.27	0.13	0.13
335	1457.77	0.13	0.13
336	1458.76	0.13	0.13
337	1459.77	0.14	0.14
338	1460.76	0.14	0.14
339	1461.77	0.13	0.13
340	1462.76	0.14	0.14
341	1463.77	0.15	0.15
342	1464.77	0.14	0.14
343	1465.77	0.14	0.14
344	1466.77	0.14	0.14
345	1467.77	0.14	0.14
346	1472.77	0.14	0.14
347	1477.77	0.15	0.15
348	1482.77	0.14	0.14
349	1487.76	0.13	0.13
350	[illegible]	[illegible]	[illegible]

McCulley, Frick &Gilman, Inc.
19203 36th Avenue W. Suite 101
Lynnwood, WA 98036
ph.(206) 778-8252

Pumping test analysis
Time-Drawdown plot
with discharge

Project: Simplot Subarea FS

Evaluated by: VBM | Date: 26.11.1996

Pumping Test No. 4 | Test conducted on: November 16, 1996

345 | 345

Discharge 6.50 U.S.gal/min

Static water level: 0.00 ft below datum

	Pumping test duration [min]	Water level [ft]	Drawdown [ft]
351	1497.77	0.14	0.14
352	1502.77	0.13	0.13
353	1507.76	0.13	0.13
354	1512.76	0.13	0.13
355	1517.77	0.13	0.13
356	1522.77	0.13	0.13
357	1527.77	0.13	0.13
358	1532.76	0.13	0.13
359	1537.77	0.13	0.13
360	1542.77	0.13	0.13
361	1547.77	0.13	0.13
362	1552.76	0.14	0.14
363	1557.76	0.13	0.13
364	1562.77	0.13	0.13
365	1572.77	0.13	0.13
366	1582.77	0.13	0.13
367	1592.77	0.14	0.14
368	1602.76	0.14	0.14
369	1612.77	0.14	0.14
370	1622.77	0.13	0.13
371	1652.77	0.13	0.13
372	1682.77	0.14	0.14
373	1712.76	0.14	0.14
374	1742.77	0.14	0.14
375	1772.77	0.14	0.14
376	1802.76	0.13	0.13
377	1832.77	0.14	0.14
378	1862.77	0.13	0.13
379	1922.77	0.12	0.12
380	1982.76	0.10	0.10
381	2042.77	0.08	0.08
382	2102.77	0.07	0.07
383	2162.76	0.03	0.03

McCulley, Frick &Gilman, Inc.
19203 36th Avenue W. Suite 101
Lynnwood, WA 98036
ph.(206) 778-8252

Pumping test analysis
Time-Drawdown plot
with discharge

Project: Simplot Subarea FS

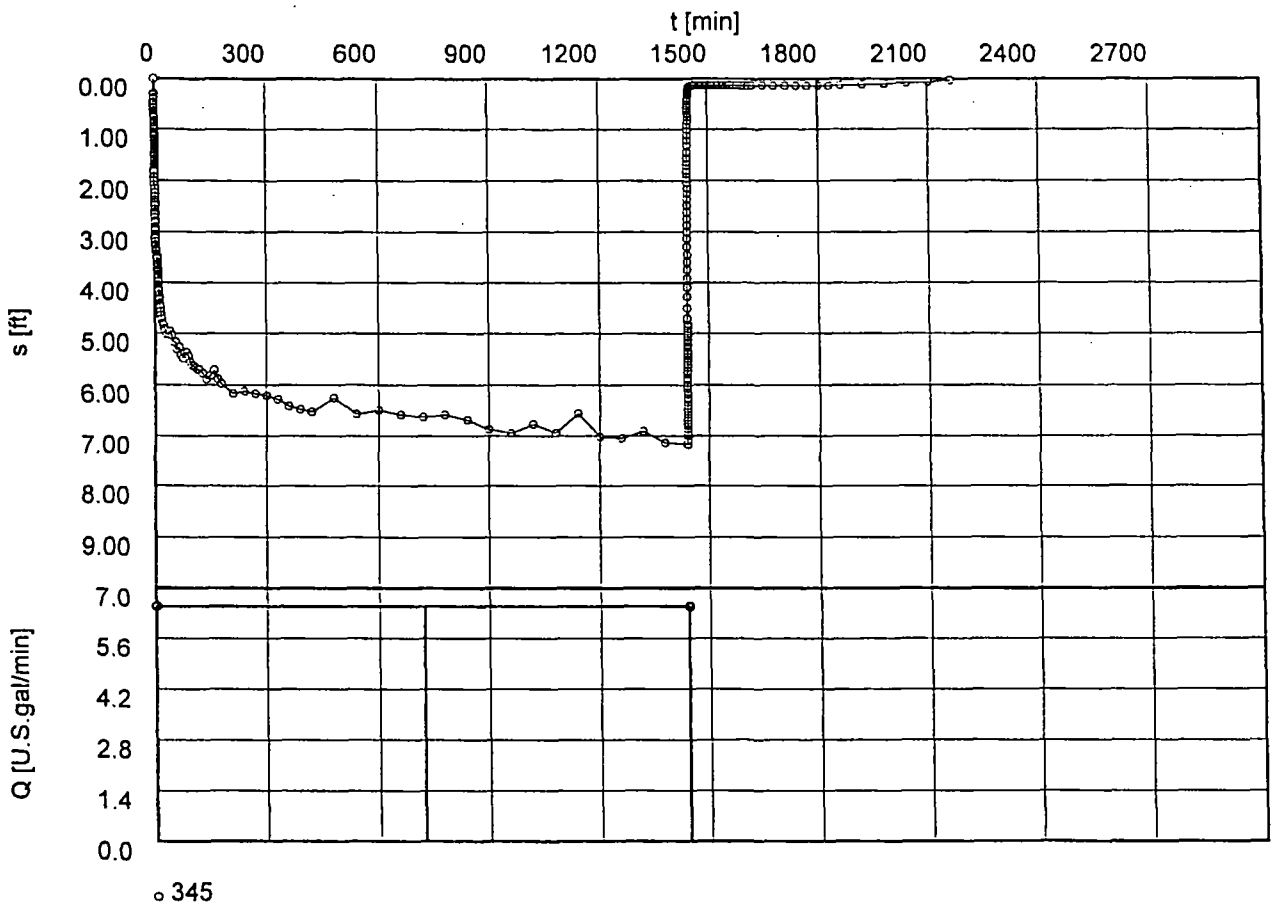
Evaluated by: VBM | Date: 26.11.1996

Pumping Test No. 4	Test conducted on: November 16, 1996
345	Measured at discharge
Discharge 6.50 U.S.gal/min	

	Pumping test duration [min]	Discharge [U.S.gal/min]		
1	0.00	6.50		
2	1443.03	6.50		
3	1443.04	0.00		
4	2600.00	0.00		

McCulley, Frick &Gilman, Inc. 19203 36th Avenue W. Suite 101 Lynnwood, WA 98036 ph.(206) 778-8252	Pumping test analysis Time-Drawdown plot with discharge	Page 1 Project: Simplot Subarea Evaluated by: VBM Date: 26.11.1996

Pumping Test No. 4	Test conducted on: November 16, 1996
345	
Discharge 6.50 U.S.gal/min	



Note: Discharge rate measured hourly, at a minimum.

McCulley, Frick &Gilman, Inc. 19203 36th Avenue W. Suite 101 Lynnwood, WA 98036 ph.(206) 778-8252	Pumping test analysis Time-Drawdown plot with discharge	Page 2 Project: Simplot Subarea Evaluated by: VBM Date: 26.11.1996

Pumping Test No. 4	Test conducted on: November 16, 1996
345	345
Discharge 6.50 U.S.gal/min	
Static water level: 0.00 ft below datum	

	Pumping test duration [min]	Water level [ft]	Drawdown [ft]
1	0.00	0.00	0.00
2	0.05	0.28	0.28
3	0.07	0.32	0.32
4	0.08	0.33	0.33
5	0.10	0.38	0.38
6	0.12	0.41	0.41
7	0.13	0.47	0.47
8	0.15	0.49	0.49
9	0.17	0.53	0.53
10	0.18	0.57	0.57
11	0.20	0.60	0.60
12	0.22	0.64	0.64
13	0.23	0.67	0.67
14	0.25	0.70	0.70
15	0.26	0.73	0.73
16	0.28	0.75	0.75
17	0.30	0.78	0.78
18	0.32	0.83	0.83
19	0.33	0.85	0.85
20	0.35	0.88	0.88
21	0.37	0.91	0.91
22	0.38	0.95	0.95
23	0.40	0.97	0.97
24	0.41	1.01	1.01
25	0.43	1.06	1.06
26	0.45	1.06	1.06
27	0.47	1.10	1.10
28	0.48	1.11	1.11
29	0.50	1.14	1.14
30	0.52	1.15	1.15
31	0.53	1.19	1.19
32	0.55	1.21	1.21
33	0.57	1.24	1.24
34	0.58	1.25	1.25
35	0.60	1.29	1.29
36	0.61	1.30	1.30
37	0.63	1.33	1.33
38	0.65	1.36	1.36
39	0.67	1.39	1.39
40	0.69	1.40	1.40
41	0.70	1.42	1.42
42	0.72	1.45	1.45
43	0.73	1.48	1.48
44	0.75	1.48	1.48
45	0.76	1.53	1.53
46	0.78	1.52	1.52
47	0.80	1.54	1.54
48	0.82	1.58	1.58
49	0.83	1.59	1.59
50	[illegible]	[illegible]	[illegible]

McCulley, Frick &Gilman, Inc. 19203 36th Avenue W. Suite 101 Lynnwood, WA 98036 ph.(206) 778-8252	Pumping test analysis Time-Drawdown plot with discharge	Page 3 Project: Simplot Subarea Evaluated by: VBM Date: 26.11.1996

Pumping Test No. 4	Test conducted on: November 16, 1996
345	345
Discharge 6.50 U.S.gal/min	
Static water level: 0.00 ft below datum	

	Pumping test duration [min]	Water level [ft]	Drawdown [ft]
51	0.87	1.63	1.63
52	0.88	1.67	1.67
53	0.90	1.68	1.68
54	0.92	1.69	1.69
55	0.93	1.71	1.71
56	0.95	1.73	1.73
57	0.96	1.76	1.76
58	0.98	1.78	1.78
59	1.00	1.79	1.79
60	1.02	1.80	1.80
61	1.03	1.82	1.82
62	1.05	1.83	1.83
63	1.13	1.94	1.94
64	1.22	2.01	2.01
65	1.30	2.09	2.09
66	1.38	2.16	2.16
67	1.47	2.24	2.24
68	1.55	2.32	2.32
69	1.63	2.38	2.38
70	1.72	2.43	2.43
71	1.80	2.48	2.48
72	1.88	2.56	2.56
73	1.97	2.62	2.62
74	2.05	2.67	2.67
75	2.13	2.72	2.72
76	2.21	2.79	2.79
77	2.30	2.82	2.82
78	2.38	2.90	2.90
79	2.47	2.92	2.92
80	2.55	2.96	2.96
81	2.63	2.98	2.98
82	2.72	3.04	3.04
83	2.80	3.08	3.08
84	2.88	3.11	3.11
85	2.96	3.12	3.12
86	3.05	3.14	3.14
87	3.22	3.19	3.19
88	3.38	3.26	3.26
89	3.55	3.27	3.27
90	3.72	3.30	3.30
91	3.88	3.29	3.29
92	4.05	3.33	3.33
93	4.21	3.34	3.34
94	4.38	3.35	3.35
95	4.55	3.38	3.38
96	4.72	3.38	3.38
97	4.88	3.39	3.39
98	5.05	3.43	3.43
99	5.22	3.44	3.44

McCulley, Frick &Gilman, Inc. 19203 36th Avenue W. Suite 101 Lynnwood, WA 98036 ph.(206) 778-8252	Pumping test analysis Time-Drawdown plot with discharge	Page 4 Project: Simplot Subarea Evaluated by: VBM Date: 26.11.1996

Pumping Test No. 4	Test conducted on: November 16, 1996
345	345
Discharge 6.50 U.S.gal/min	
Static water level: 0.00 ft below datum	

	Pumping test duration [min]	Water level [ft]	Drawdown [ft]
101	5.55	3.45	3.45
102	5.72	3.46	3.46
103	5.88	3.50	3.50
104	6.05	3.54	3.54
105	6.22	3.53	3.53
106	6.38	3.60	3.60
107	6.55	3.63	3.63
108	6.71	3.65	3.65
109	6.88	3.68	3.68
110	7.05	3.71	3.71
111	7.22	3.75	3.75
112	7.38	3.78	3.78
113	7.55	3.80	3.80
114	7.72	3.84	3.84
115	7.88	3.87	3.87
116	8.05	3.88	3.88
117	8.22	3.92	3.92
118	8.38	3.95	3.95
119	8.55	3.99	3.99
120	8.71	3.99	3.99
121	8.88	4.04	4.04
122	9.05	4.04	4.04
123	9.22	4.07	4.07
124	9.38	4.10	4.10
125	9.55	4.11	4.11
126	9.72	4.14	4.14
127	9.88	4.14	4.14
128	10.05	4.15	4.15
129	10.55	4.18	4.18
130	11.05	4.23	4.23
131	11.55	4.28	4.28
132	12.05	4.32	4.32
133	12.55	4.34	4.34
134	13.05	4.41	4.41
135	13.55	4.42	4.42
136	14.05	4.45	4.45
137	14.55	4.48	4.48
138	15.05	4.49	4.49
139	16.05	4.58	4.58
140	17.05	4.65	4.65
141	18.05	4.72	4.72
142	19.05	4.80	4.80
143	20.05	4.80	4.80
144	21.05	4.83	4.83
145	22.05	4.85	4.85
146	23.05	4.83	4.83
147	24.05	4.91	4.91
148	25.05	4.94	4.94
149	30.05	5.03	5.03
150	35.05	5.03	5.03

McCulley, Frick &Gilmàn, Inc. 19203 36th Avenue W. Suite 101 Lynnwood, WA 98036 ph.(206) 778-8252	Pumping test analysis Time-Drawdown plot with discharge	Page 5 Project: Simplot Subarea Evaluated by: VBM Date: 26.11.1996

Pumping Test No. 4	Test conducted on: November 16, 1996
345	345
Discharge 6.50 U.S.gal/min	
Static water level: 0.00 ft below datum	

	Pumping test duration [min]	Water level [ft]	Drawdown [ft]
151	40.05	4.96	4.96
152	45.05	5.03	5.03
153	50.05	5.17	5.17
154	55.05	5.17	5.17
155	60.05	5.31	5.31
156	65.05	5.27	5.27
157	70.05	5.42	5.42
158	75.05	5.49	5.49
159	80.05	5.37	5.37
160	85.05	5.38	5.38
161	90.05	5.45	5.45
162	95.05	5.55	5.55
163	100.05	5.63	5.63
164	105.05	5.63	5.63
165	110.05	5.66	5.66
166	115.05	5.70	5.70
167	120.05	5.70	5.70
168	130.05	5.77	5.77
169	140.05	5.89	5.89
170	150.05	5.82	5.82
171	160.05	5.71	5.71
172	170.05	5.89	5.89
173	180.05	5.97	5.97
174	210.05	6.16	6.16
175	240.05	6.12	6.12
176	270.05	6.17	6.17
177	300.05	6.20	6.20
178	330.05	6.28	6.28
179	360.05	6.41	6.41
180	390.05	6.47	6.47
181	420.05	6.52	6.52
182	480.05	6.25	6.25
183	540.05	6.56	6.56
184	600.05	6.49	6.49
185	660.05	6.58	6.58
186	720.05	6.62	6.62
187	780.05	6.58	6.58
188	840.05	6.68	6.68
189	900.05	6.87	6.87
190	960.05	6.95	6.95
191	1020.05	6.77	6.77
192	1080.05	6.94	6.94
193	1140.05	6.55	6.55
194	1200.05	7.01	7.01
195	1260.05	7.05	7.05
196	1320.05	6.90	6.90
197	1380.05	7.14	7.14
198	1440.04	7.16	7.16
199	1442.76	7.17	7.17

McCulley, Frick &Gilman, Inc. 19203 36th Avenue W. Suite 101 Lynnwood, WA 98036 ph.(206) 778-8252	Pumping test analysis Time-Drawdown plot with discharge	Page 6 Project: Simplot Subarea Evaluated by: VBM Date: 26.11.1996

Pumping Test No. 4	Test conducted on: November 16, 1996
345	345
Discharge 6.50 U.S.gal/min	
Static water level: 0.00 ft below datum	

	Pumping test duration [min]	Water level [ft]	Drawdown [ft]
201	1442.81	7.17	7.17
202	1442.82	7.18	7.18
203	1442.83	7.17	7.17
204	1442.85	7.18	7.18
205	1442.87	7.18	7.18
206	1442.88	7.17	7.17
207	1442.90	7.17	7.17
208	1442.92	7.18	7.18
209	1442.93	7.18	7.18
210	1442.95	7.18	7.18
211	1442.96	7.16	7.16
212	1442.98	7.18	7.18
213	1443.00	7.17	7.17
214	1443.02	7.09	7.09
215	1443.04	7.00	7.00
216	1443.05	6.97	6.97
217	1443.06	6.93	6.93
218	1443.08	6.85	6.85
219	1443.10	6.80	6.80
220	1443.11	6.75	6.75
221	1443.13	6.69	6.69
222	1443.15	6.64	6.64
223	1443.17	6.56	6.56
224	1443.18	6.51	6.51
225	1443.20	6.46	6.46
226	1443.22	6.40	6.40
227	1443.23	6.33	6.33
228	1443.25	6.28	6.28
229	1443.27	6.25	6.25
230	1443.28	6.17	6.17
231	1443.30	6.12	6.12
232	1443.31	6.07	6.07
233	1443.33	6.02	6.02
234	1443.35	5.95	5.95
235	1443.37	5.90	5.90
236	1443.38	5.86	5.86
237	1443.40	5.79	5.79
238	1443.42	5.76	5.76
239	1443.43	5.73	5.73
240	1443.45	5.65	5.65
241	1443.46	5.60	5.60
242	1443.48	5.54	5.54
243	1443.50	5.48	5.48
244	1443.52	5.43	5.43
245	1443.53	5.39	5.39
246	1443.55	5.34	5.34
247	1443.57	5.27	5.27
248	1443.58	5.22	5.22
249	1443.60	5.17	5.17

McCulley, Frick &Gilman, Inc. 19203 36th Avenue W. Suite 101 Lynnwood, WA 98036 ph.(206) 778-8252	Pumping test analysis Time-Drawdown plot with discharge	Page 7 Project: Simplot Subarea Evaluated by: VBM Date: 26.11.1996

Pumping Test No. 4	Test conducted on: November 16, 1996
345	345
Discharge 6.50 U.S.gal/min	
Static water level: 0.00 ft below datum	

	Pumping test duration [min]	Water level [ft]	Drawdown [ft]
251	1443.63	5.08	5.08
252	1443.65	5.04	5.04
253	1443.66	5.00	5.00
254	1443.68	4.96	4.96
255	1443.70	4.90	4.90
256	1443.72	4.85	4.85
257	1443.73	4.81	4.81
258	1443.76	4.74	4.74
259	1443.77	4.70	4.70
260	1443.85	4.51	4.51
261	1443.93	4.28	4.28
262	1444.01	4.10	4.10
263	1444.10	3.92	3.92
264	1444.18	3.74	3.74
265	1444.27	3.59	3.59
266	1444.35	3.44	3.44
267	1444.43	3.28	3.28
268	1444.52	3.13	3.13
269	1444.60	2.99	2.99
270	1444.68	2.86	2.86
271	1444.76	2.74	2.74
272	1444.85	2.61	2.61
273	1444.93	2.47	2.47
274	1445.02	2.35	2.35
275	1445.10	2.23	2.23
276	1445.18	2.14	2.14
277	1445.26	2.04	2.04
278	1445.35	1.95	1.95
279	1445.43	1.86	1.86
280	1445.52	1.80	1.80
281	1445.60	1.71	1.71
282	1445.68	1.63	1.63
283	1445.77	1.56	1.56
284	1445.93	1.44	1.44
285	1446.10	1.31	1.31
286	1446.27	1.21	1.21
287	1446.43	1.11	1.11
288	1446.60	1.00	1.00
289	1446.77	0.91	0.91
290	1446.93	0.83	0.83
291	1447.10	0.75	0.75
292	1447.26	0.69	0.69
293	1447.43	0.63	0.63
294	1447.60	0.59	0.59
295	1447.77	0.53	0.53
296	1447.93	0.49	0.49
297	1448.10	0.44	0.44
298	1448.27	0.42	0.42
299	1448.43	0.39	0.39

McCulley, Frick &Gilman, Inc. 19203 36th Avenue W. Suite 101 Lynnwood, WA 98036 ph.(206) 778-8252	Pumping test analysis Time-Drawdown plot with discharge	Page 8 Project: Simplot Subarea Evaluated by: VBM Date: 26.11.1996

Pumping Test No. 4	Test conducted on: November 16, 1996
345	345
Discharge 6.50 U.S.gal/min	
Static water level: 0.00 ft below datum	

	Pumping test duration [min]	Water level [ft]	Drawdown [ft]
301	1448.77	0.32	0.32
302	1448.93	0.30	0.30
303	1449.10	0.29	0.29
304	1449.26	0.26	0.26
305	1449.43	0.25	0.25
306	1449.60	0.23	0.23
307	1449.76	0.20	0.20
308	1449.93	0.21	0.21
309	1450.10	0.18	0.18
310	1450.27	0.18	0.18
311	1450.43	0.18	0.18
312	1450.60	0.18	0.18
313	1450.77	0.17	0.17
314	1450.93	0.16	0.16
315	1451.10	0.17	0.17
316	1451.27	0.15	0.15
317	1451.43	0.15	0.15
318	1451.60	0.15	0.15
319	1451.76	0.15	0.15
320	1451.93	0.15	0.15
321	1452.10	0.16	0.16
322	1452.27	0.15	0.15
323	1452.43	0.15	0.15
324	1452.60	0.14	0.14
325	1452.77	0.15	0.15
326	1453.27	0.14	0.14
327	1453.76	0.14	0.14
328	1454.26	0.14	0.14
329	1454.77	0.14	0.14
330	1455.27	0.15	0.15
331	1455.77	0.14	0.14
332	1456.26	0.14	0.14
333	1456.77	0.15	0.15
334	1457.27	0.13	0.13
335	1457.77	0.13	0.13
336	1458.76	0.13	0.13
337	1459.77	0.14	0.14
338	1460.76	0.14	0.14
339	1461.77	0.13	0.13
340	1462.76	0.14	0.14
341	1463.77	0.15	0.15
342	1464.77	0.14	0.14
343	1465.77	0.14	0.14
344	1466.77	0.14	0.14
345	1467.77	0.14	0.14
346	1472.77	0.14	0.14
347	1477.77	0.15	0.15
348	1482.77	0.14	0.14
349	1487.76	0.13	0.13

McCulley, Frick &Gilman, Inc. 19203 36th Avenue W. Suite 101 Lynnwood, WA 98036 ph.(206) 778-8252	Pumping test analysis Time-Drawdown plot with discharge	Page 9 Project: Simplot Subarea Evaluated by: VBM Date: 26.11.1996

Pumping Test No. 4	Test conducted on: November 16, 1996
345	345
Discharge 6.50 U.S.gal/min	
Static water level: 0.00 ft below datum	

	Pumping test duration [min]	Water level [ft]	Drawdown [ft]
351	1497.77	0.14	0.14
352	1502.77	0.13	0.13
353	1507.76	0.13	0.13
354	1512.76	0.13	0.13
355	1517.77	0.13	0.13
356	1522.77	0.13	0.13
357	1527.77	0.13	0.13
358	1532.76	0.13	0.13
359	1537.77	0.13	0.13
360	1542.77	0.13	0.13
361	1547.77	0.13	0.13
362	1552.76	0.14	0.14
363	1557.76	0.13	0.13
364	1562.77	0.13	0.13
365	1572.77	0.13	0.13
366	1582.77	0.13	0.13
367	1592.77	0.14	0.14
368	1602.76	0.14	0.14
369	1612.77	0.14	0.14
370	1622.77	0.13	0.13
371	1652.77	0.13	0.13
372	1682.77	0.14	0.14
373	1712.76	0.14	0.14
374	1742.77	0.14	0.14
375	1772.77	0.14	0.14
376	1802.76	0.13	0.13
377	1832.77	0.14	0.14
378	1862.77	0.13	0.13
379	1922.77	0.12	0.12
380	1982.76	0.10	0.10
381	2042.77	0.08	0.08
382	2102.77	0.07	0.07
383	2162.76	0.03	0.03

McCulley, Frick &Gilman, Inc.
19203 36th Avenue W. Suite 101
Lynnwood, WA 98036
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Pumping test analysis
Time-Drawdown plot
with discharge

Project: Simplot Subarea

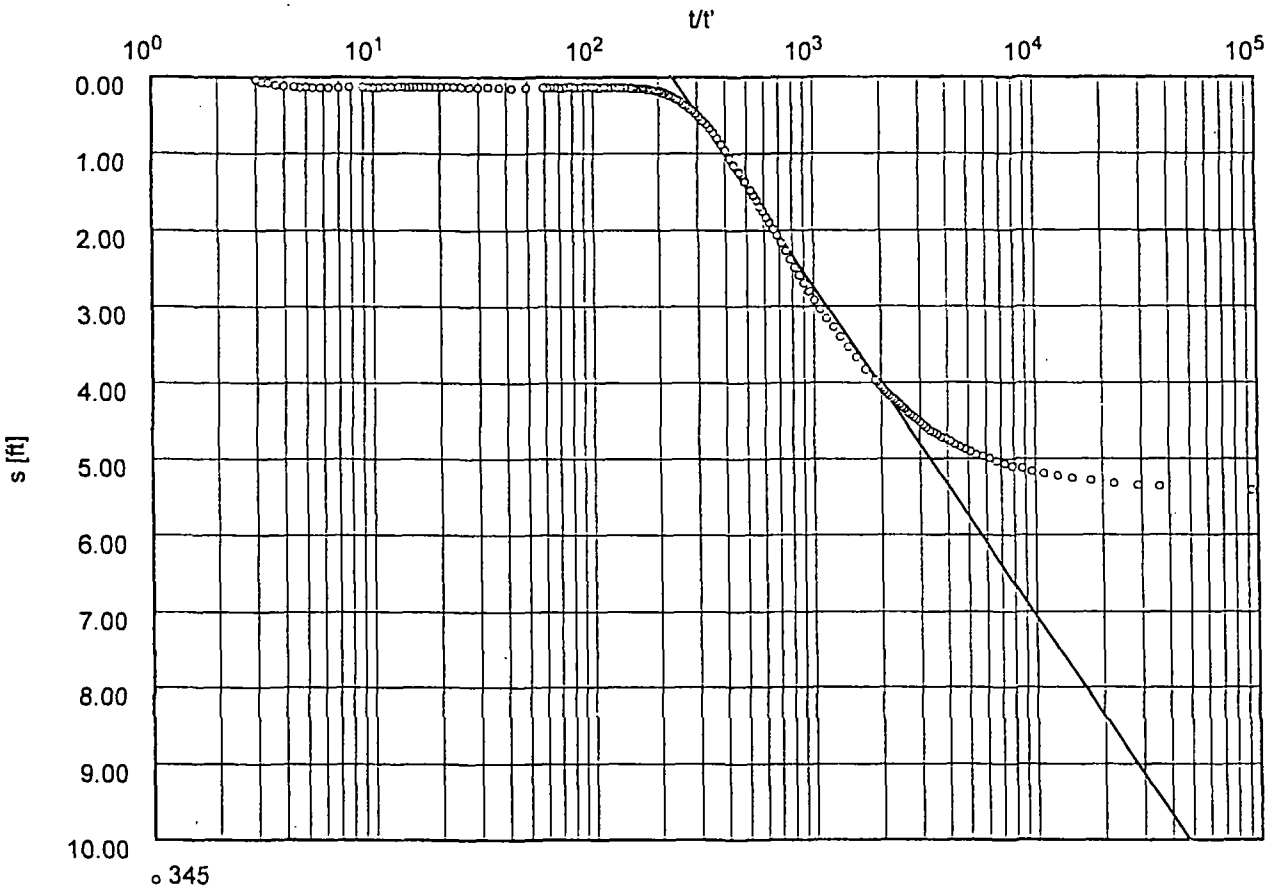
Evaluated by: VBM | Date: 26.11.1996

Pumping Test No. 4	Test conducted on: November 16, 1996
345	Measured at discharge
Discharge 6.50 U.S.gal/min	

	Pumping test duration [min]	Discharge [U.S.gal/min]		
1	0.00	6.50		
2	1443.03	6.50		

McCulley, Frick &Gilman, Inc. 19203 36th Avenue W. Suite 101 Lynnwood, WA 98036 ph.(206) 778-8252	Pumping test analysis Recovery method after THEIS & JACOB Unconfined aquifer	Page 1 Project: Simplot Subarea Evaluated by: VBM Date: 26.11.1996

Pumping Test No. 4	Test conducted on: November 16, 1996
345	
Discharge 6.50 U.S.gal/min	
	Pumping test duration: 1443.00 min



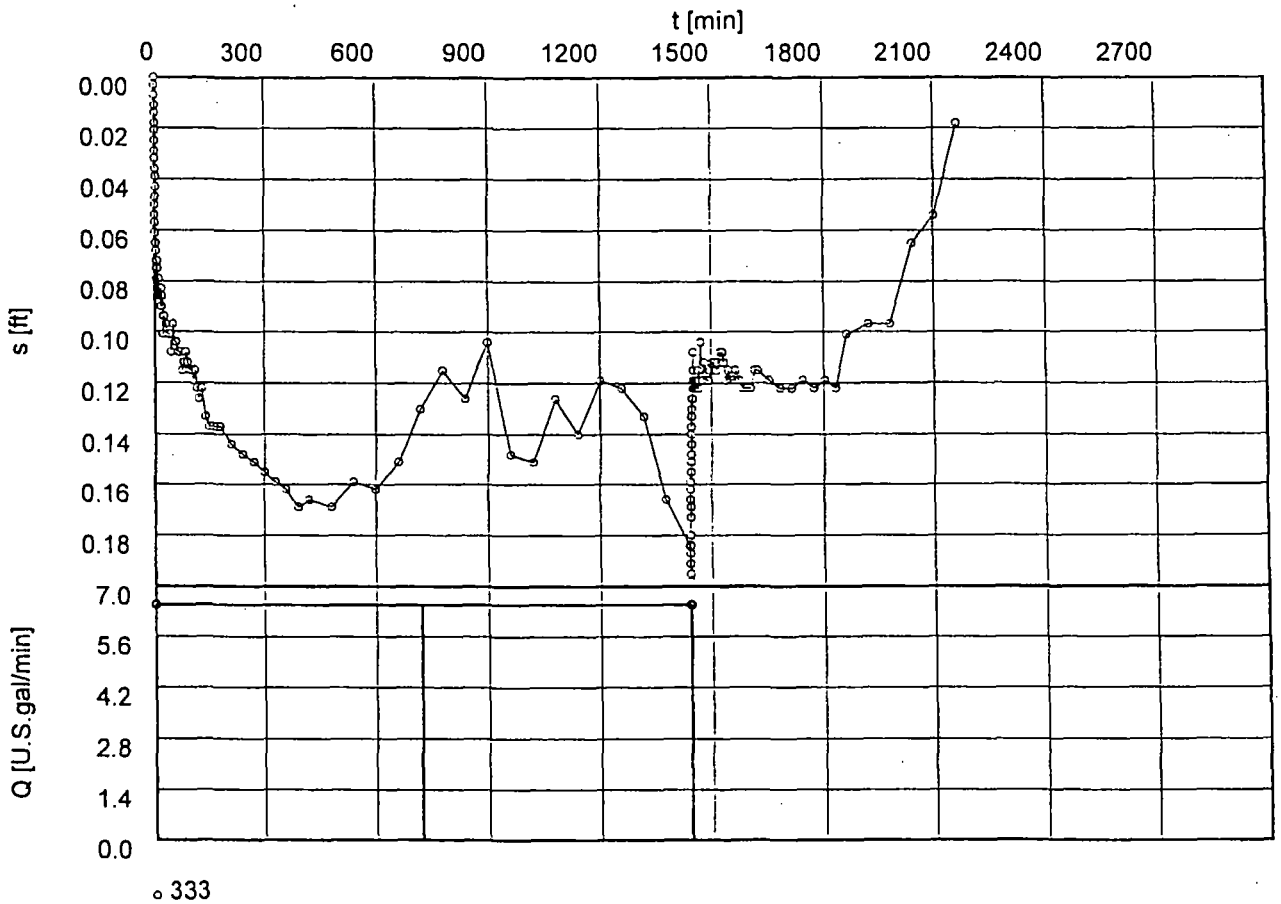
Transmissivity [ft²/min]: 3.68×10^{-2}

Hydraulic conductivity [ft/min]: 2.45×10^{-3}

Aquifer thickness [ft]: 15.00

McCulley, Frick &Gilman, Inc. 19203 36th Avenue W. Suite 101 Lynnwood, WA 98036 ph.(206) 778-8252	Pumping test analysis Time-Drawdown plot with discharge	Page 1 Project: Simplot Subarea Evaluated by: VBM Date: 02.12.1996

Pumping Test No. 4	Test conducted on: November 16, 1996
333	
Discharge 6.50 U.S.gal/min	



McCulley, Frick &Gilman, Inc. 19203 36th Avenue W. Suite 101 Lynnwood, WA 98036 ph.(206) 778-8252	Pumping test analysis Time-Drawdown plot with discharge	Page 2 Project: Simplot Subarea Evaluated by: VBM Date: 02.12.1996

Pumping Test No. 4	Test conducted on: November 16, 1996
333	333
Discharge 6.50 U.S.gal/min	Distance from the pumping well 27.80 ft
Static water level: 0.00 ft below datum	

	Pumping test duration [min]	Water level [ft]	Drawdown [ft]
1	0.00	0.00	0.00
2	0.05	0.00	0.00
3	0.07	0.00	0.00
4	0.08	0.00	0.00
5	0.10	0.01	0.01
6	0.12	0.01	0.01
7	0.13	0.01	0.01
8	0.15	0.01	0.01
9	0.17	0.01	0.01
10	0.18	0.01	0.01
11	0.20	0.01	0.01
12	0.22	0.01	0.01
13	0.23	0.01	0.01
14	0.25	0.02	0.02
15	0.26	0.01	0.01
16	0.28	0.01	0.01
17	0.30	0.02	0.02
18	0.32	0.01	0.01
19	0.33	0.02	0.02
20	0.35	0.02	0.02
21	0.37	0.02	0.02
22	0.38	0.02	0.02
23	0.40	0.02	0.02
24	0.41	0.02	0.02
25	0.43	0.02	0.02
26	0.45	0.03	0.03
27	0.47	0.02	0.02
28	0.48	0.03	0.03
29	0.50	0.02	0.02
30	0.52	0.02	0.02
31	0.53	0.03	0.03
32	0.55	0.03	0.03
33	0.57	0.03	0.03
34	0.58	0.03	0.03
35	0.60	0.02	0.02
36	0.61	0.03	0.03
37	0.63	0.03	0.03
38	0.65	0.03	0.03
39	0.67	0.03	0.03
40	0.69	0.03	0.03
41	0.70	0.03	0.03
42	0.72	0.03	0.03
43	0.73	0.03	0.03
44	0.75	0.03	0.03
45	0.76	0.03	0.03
46	0.78	0.04	0.04
47	0.80	0.03	0.03
48	0.82	0.03	0.03
49	0.83	0.04	0.04

McCulley, Frick &Gilman, Inc. 19203 36th Avenue W. Suite 101 Lynnwood, WA 98036 ph.(206) 778-8252	Pumping test analysis Time-Drawdown plot with discharge	Page 3 Project: Simplot Subarea Evaluated by: VBM Date: 02.12.1996

Pumping Test No. 4	Test conducted on: November 16, 1996
333	333
Discharge 6.50 U.S.gal/min	Distance from the pumping well 27.80 ft
Static water level: 0.00 ft below datum	

	Pumping test duration [min]	Water level [ft]	Drawdown [ft]
51	0.87	0.03	0.03
52	0.88	0.04	0.04
53	0.90	0.03	0.03
54	0.92	0.04	0.04
55	0.93	0.04	0.04
56	0.95	0.03	0.03
57	0.96	0.04	0.04
58	0.98	0.03	0.03
59	1.00	0.04	0.04
60	1.02	0.04	0.04
61	1.03	0.04	0.04
62	1.05	0.04	0.04
63	1.13	0.04	0.04
64	1.22	0.03	0.03
65	1.30	0.04	0.04
66	1.38	0.04	0.04
67	1.47	0.04	0.04
68	1.55	0.04	0.04
69	1.63	0.04	0.04
70	1.72	0.04	0.04
71	1.80	0.05	0.05
72	1.88	0.05	0.05
73	1.97	0.05	0.05
74	2.05	0.05	0.05
75	2.13	0.05	0.05
76	2.21	0.06	0.06
77	2.30	0.06	0.06
78	2.38	0.07	0.07
79	2.47	0.06	0.06
80	2.55	0.06	0.06
81	2.63	0.06	0.06
82	2.72	0.06	0.06
83	2.80	0.06	0.06
84	2.88	0.06	0.06
85	2.96	0.07	0.07
86	3.05	0.07	0.07
87	3.22	0.07	0.07
88	3.38	0.07	0.07
89	3.55	0.07	0.07
90	3.72	0.07	0.07
91	3.88	0.07	0.07
92	4.05	0.07	0.07
93	4.21	0.08	0.08
94	4.38	0.07	0.07
95	4.55	0.08	0.08
96	4.72	0.08	0.08
97	4.88	0.08	0.08
98	5.05	0.08	0.08
99	5.22	0.08	0.08
100	5.38	0.08	0.08

McCulley, Frick &Gilman, Inc. 19203 36th Avenue W. Suite 101 Lynnwood, WA 98036 ph.(206) 778-8252	Pumping test analysis Time-Drawdown plot with discharge	Page 4 Project: Simplot Subarea Evaluated by: VBM Date: 02.12.1996

Pumping Test No. 4	Test conducted on: November 16, 1996
333	333
Discharge 6.50 U.S.gal/min	Distance from the pumping well 27.80 ft
Static water level: 0.00 ft below datum	

	Pumping test duration [min]	Water level [ft]	Drawdown [ft]
101	5.55	0.08	0.08
102	5.72	0.08	0.08
103	5.88	0.07	0.07
104	6.05	0.08	0.08
105	6.22	0.08	0.08
106	6.38	0.08	0.08
107	6.55	0.07	0.07
108	6.71	0.08	0.08
109	6.88	0.08	0.08
110	7.05	0.08	0.08
111	7.22	0.09	0.09
112	7.38	0.08	0.08
113	7.55	0.08	0.08
114	7.72	0.08	0.08
115	7.88	0.08	0.08
116	8.05	0.07	0.07
117	8.22	0.08	0.08
118	8.38	0.08	0.08
119	8.55	0.08	0.08
120	8.71	0.08	0.08
121	8.88	0.08	0.08
122	9.05	0.08	0.08
123	9.22	0.08	0.08
124	9.38	0.08	0.08
125	9.55	0.08	0.08
126	9.72	0.08	0.08
127	9.88	0.09	0.09
128	10.05	0.08	0.08
129	10.55	0.08	0.08
130	11.05	0.08	0.08
131	11.55	0.08	0.08
132	12.05	0.08	0.08
133	12.55	0.09	0.09
134	13.05	0.08	0.08
135	13.55	0.08	0.08
136	14.05	0.08	0.08
137	14.55	0.08	0.08
138	15.05	0.09	0.09
139	16.05	0.09	0.09
140	17.05	0.09	0.09
141	18.05	0.09	0.09
142	19.05	0.08	0.08
143	20.05	0.09	0.09
144	21.05	0.09	0.09
145	22.05	0.09	0.09
146	23.05	0.10	0.10
147	24.05	0.10	0.10
148	25.05	0.09	0.09
149	30.05	0.10	0.10
150	35.05	0.10	0.10

McCulley, Frick &Gilman, Inc. 19203 36th Avenue W. Suite 101 Lynnwood, WA 98036 ph.(206) 778-8252	Pumping test analysis Time-Drawdown plot with discharge	Page 5 Project: Simplot Subarea Evaluated by: VBM Date: 02.12.1996

Pumping Test No. 4	Test conducted on: November 16, 1996
333	333
Discharge 6.50 U.S.gal/min	Distance from the pumping well 27.80 ft
Static water level: 0.00 ft below datum	

	Pumping test duration [min]	Water level [ft]	Drawdown [ft]
151	40.05	0.10	0.10
152	45.05	0.11	0.11
153	50.05	0.10	0.10
154	55.05	0.10	0.10
155	60.05	0.10	0.10
156	65.05	0.11	0.11
157	70.05	0.11	0.11
158	75.05	0.12	0.12
159	80.05	0.11	0.11
160	85.05	0.11	0.11
161	90.05	0.11	0.11
162	95.05	0.12	0.12
163	100.05	0.12	0.12
164	105.05	0.12	0.12
165	110.05	0.12	0.12
166	115.05	0.12	0.12
167	120.05	0.13	0.13
168	130.05	0.12	0.12
169	140.05	0.13	0.13
170	150.05	0.14	0.14
171	160.05	0.14	0.14
172	170.05	0.14	0.14
173	180.05	0.14	0.14
174	210.05	0.14	0.14
175	240.05	0.15	0.15
176	270.05	0.15	0.15
177	300.05	0.15	0.15
178	330.05	0.16	0.16
179	360.05	0.16	0.16
180	390.05	0.17	0.17
181	420.05	0.17	0.17
182	480.05	0.17	0.17
183	540.05	0.16	0.16
184	600.05	0.16	0.16
185	660.05	0.15	0.15
186	720.05	0.13	0.13
187	780.05	0.12	0.12
188	840.05	0.13	0.13
189	900.05	0.10	0.10
190	960.05	0.15	0.15
191	1020.05	0.15	0.15
192	1080.05	0.13	0.13
193	1140.05	0.14	0.14
194	1200.05	0.12	0.12
195	1260.05	0.12	0.12
196	1320.05	0.13	0.13
197	1380.05	0.17	0.17
198	1440.04	0.18	0.18
199	1442.76	0.19	0.19
200	1442.80	0.19	0.19

McCulley, Frick &Gilman, Inc. 19203 36th Avenue W. Suite 101 Lynnwood, WA 98036 ph.(206) 778-8252	Pumping test analysis Time-Drawdown plot with discharge	Page 6 Project: Simplot Subarea Evaluated by: VBM Date: 02.12.1996

Pumping Test No. 4	Test conducted on: November 16, 1996
333	333
Discharge 6.50 U.S.gal/min	Distance from the pumping well 27.80 ft
Static water level: 0.00 ft below datum	

	Pumping test duration [min]	Water level [ft]	Drawdown [ft]
201	1442.81	0.19	0.19
202	1442.82	0.19	0.19
203	1442.83	0.19	0.19
204	1442.85	0.19	0.19
205	1442.87	0.19	0.19
206	1442.88	0.19	0.19
207	1442.90	0.19	0.19
208	1442.92	0.19	0.19
209	1442.93	0.19	0.19
210	1442.95	0.19	0.19
211	1442.96	0.19	0.19
212	1442.98	0.19	0.19
213	1443.00	0.19	0.19
214	1443.02	0.19	0.19
215	1443.04	0.19	0.19
216	1443.05	0.19	0.19
217	1443.06	0.19	0.19
218	1443.08	0.20	0.20
219	1443.10	0.19	0.19
220	1443.12	0.19	0.19
221	1443.13	0.19	0.19
222	1443.15	0.19	0.19
223	1443.16	0.19	0.19
224	1443.18	0.19	0.19
225	1443.20	0.19	0.19
226	1443.22	0.19	0.19
227	1443.23	0.19	0.19
228	1443.25	0.19	0.19
229	1443.27	0.19	0.19
230	1443.28	0.19	0.19
231	1443.30	0.19	0.19
232	1443.31	0.19	0.19
233	1443.33	0.19	0.19
234	1443.35	0.19	0.19
235	1443.37	0.19	0.19
236	1443.38	0.19	0.19
237	1443.40	0.19	0.19
238	1443.42	0.19	0.19
239	1443.43	0.18	0.18
240	1443.45	0.19	0.19
241	1443.46	0.18	0.18
242	1443.48	0.19	0.19
243	1443.50	0.18	0.18
244	1443.52	0.19	0.19
245	1443.53	0.18	0.18
246	1443.55	0.18	0.18
247	1443.56	0.18	0.18
248	1443.58	0.18	0.18
249	1443.60	0.18	0.18
250	1443.62	0.18	0.18

McCulley, Frick &Gilman, Inc. 19203 36th Avenue W. Suite 101 Lynnwood, WA 98036 ph.(206) 778-8252	Pumping test analysis Time-Drawdown plot with discharge	Page 7 Project: Simplot Subarea Evaluated by: VBM Date: 02.12.1996

Pumping Test No. 4	Test conducted on: November 16, 1996
333	333
Discharge 6.50 U.S.gal/min	Distance from the pumping well 27.80 ft
Static water level: 0.00 ft below datum	

	Pumping test duration [min]	Water level [ft]	Drawdown [ft]
251	1443.63	0.19	0.19
252	1443.65	0.18	0.18
253	1443.66	0.17	0.17
254	1443.68	0.18	0.18
255	1443.70	0.18	0.18
256	1443.71	0.18	0.18
257	1443.73	0.18	0.18
258	1443.76	0.17	0.17
259	1443.77	0.18	0.18
260	1443.85	0.17	0.17
261	1443.93	0.17	0.17
262	1444.02	0.17	0.17
263	1444.10	0.17	0.17
264	1444.18	0.17	0.17
265	1444.27	0.17	0.17
266	1444.35	0.17	0.17
267	1444.43	0.17	0.17
268	1444.52	0.17	0.17
269	1444.60	0.16	0.16
270	1444.68	0.16	0.16
271	1444.77	0.16	0.16
272	1444.85	0.16	0.16
273	1444.93	0.16	0.16
274	1445.02	0.15	0.15
275	1445.10	0.16	0.16
276	1445.18	0.15	0.15
277	1445.27	0.15	0.15
278	1445.35	0.15	0.15
279	1445.43	0.15	0.15
280	1445.52	0.15	0.15
281	1445.60	0.15	0.15
282	1445.68	0.15	0.15
283	1445.77	0.14	0.14
284	1445.93	0.14	0.14
285	1446.10	0.14	0.14
286	1446.27	0.14	0.14
287	1446.43	0.14	0.14
288	1446.60	0.13	0.13
289	1446.77	0.13	0.13
290	1446.93	0.14	0.14
291	1447.10	0.13	0.13
292	1447.27	0.13	0.13
293	1447.43	0.13	0.13
294	1447.60	0.13	0.13
295	1447.77	0.13	0.13
296	1447.93	0.13	0.13
297	1448.10	0.13	0.13
298	1448.27	0.13	0.13
299	1448.43	0.13	0.13
300	1448.60	0.13	0.13

McCulley, Frick &Gilman, Inc. 19203 36th Avenue W. Suite 101 Lynnwood, WA 98036 ph.(206) 778-8252	Pumping test analysis Time-Drawdown plot with discharge	Page 8 Project: Simplot Subarea Evaluated by: VBM Date: 02.12.1996

Pumping Test No. 4	Test conducted on: November 16, 1996
333	333
Discharge 6.50 U.S.gal/min	Distance from the pumping well 27.80 ft
Static water level: 0.00 ft below datum	

	Pumping test duration [min]	Water level [ft]	Drawdown [ft]
301	1448.77	0.13	0.13
302	1448.93	0.13	0.13
303	1449.10	0.13	0.13
304	1449.27	0.12	0.12
305	1449.43	0.12	0.12
306	1449.60	0.12	0.12
307	1449.77	0.12	0.12
308	1449.93	0.12	0.12
309	1450.10	0.12	0.12
310	1450.27	0.12	0.12
311	1450.43	0.12	0.12
312	1450.60	0.13	0.13
313	1450.77	0.12	0.12
314	1450.93	0.13	0.13
315	1451.10	0.12	0.12
316	1451.27	0.12	0.12
317	1451.43	0.12	0.12
318	1451.60	0.12	0.12
319	1451.77	0.12	0.12
320	1451.93	0.12	0.12
321	1452.10	0.12	0.12
322	1452.27	0.12	0.12
323	1452.43	0.12	0.12
324	1452.60	0.12	0.12
325	1452.77	0.11	0.11
326	1453.27	0.12	0.12
327	1453.77	0.12	0.12
328	1454.27	0.12	0.12
329	1454.77	0.12	0.12
330	1455.27	0.12	0.12
331	1455.77	0.12	0.12
332	1456.27	0.12	0.12
333	1456.77	0.12	0.12
334	1457.27	0.12	0.12
335	1457.77	0.12	0.12
336	1458.77	0.12	0.12
337	1459.77	0.12	0.12
338	1460.77	0.12	0.12
339	1461.77	0.12	0.12
340	1462.77	0.12	0.12
341	1463.77	0.12	0.12
342	1464.77	0.12	0.12
343	1465.77	0.12	0.12
344	1466.77	0.12	0.12
345	1467.77	0.12	0.12
346	1472.77	0.10	0.10
347	1477.77	0.12	0.12
348	1482.77	0.11	0.11
349	1487.77	0.12	0.12
350	1492.77	0.12	0.12

McCulley, Frick &Gilman, Inc.
19203 36th Avenue W. Suite 101
Lynnwood, WA 98036
ph.(206) 778-8252

Pumping test analysis
Time-Drawdown plot
with discharge

Project: Simplot Subarea

Evaluated by: VBM | Date: 02.12.1996

Pumping Test No. 4 | Test conducted on: November 16, 1996

333 | 333

Discharge 6.50 U.S.gal/min | Distance from the pumping well 27.80 ft

Static water level: 0.00 ft below datum

	Pumping test duration [min]	Water level [ft]	Drawdown [ft]	
351	1497.77	0.12	0.12	
352	1502.77	0.11	0.11	
353	1507.77	0.11	0.11	
354	1512.77	0.12	0.12	
355	1517.77	0.11	0.11	
356	1522.77	0.11	0.11	
357	1527.77	0.11	0.11	
358	1532.77	0.11	0.11	
359	1537.77	0.12	0.12	
360	1542.77	0.12	0.12	
361	1547.77	0.12	0.12	
362	1552.77	0.12	0.12	
363	1557.77	0.12	0.12	
364	1562.77	0.12	0.12	
365	1572.77	0.12	0.12	
366	1582.77	0.12	0.12	
367	1592.77	0.12	0.12	
368	1602.77	0.12	0.12	
369	1612.77	0.12	0.12	
370	1622.77	0.12	0.12	
371	1652.77	0.12	0.12	
372	1682.77	0.12	0.12	
373	1712.77	0.12	0.12	
374	1742.77	0.12	0.12	
375	1772.77	0.12	0.12	
376	1802.77	0.12	0.12	
377	1832.77	0.12	0.12	
378	1862.77	0.10	0.10	
379	1922.77	0.10	0.10	
380	1982.77	0.10	0.10	
381	2042.77	0.07	0.07	
382	2102.77	0.05	0.05	
383	2162.77	0.02	0.02	

McCulley, Frick &Gilman, Inc.
19203 36th Avenue W. Suite 101
Lynnwood, WA 98036
ph.(206) 778-8252

Pumping test analysis
Time-Drawdown plot
with discharge

Project: Simplot Subarea

Evaluated by: VBM | Date: 02.12.1996

Pumping Test No. 4

Test conducted on: November 16, 1996

333

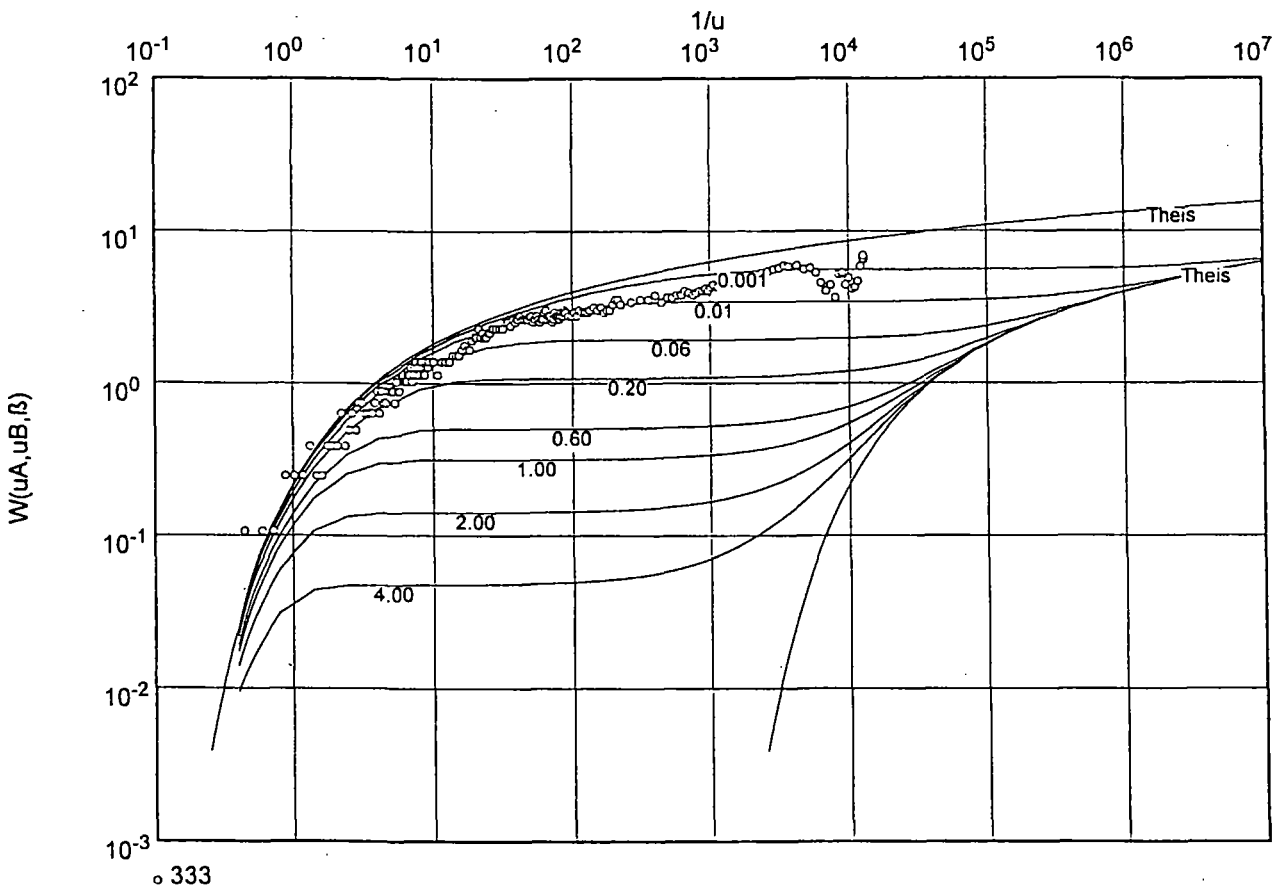
Measured at outflow

Discharge 6.50 U.S.gal/min

	Pumping test duration [min]	Discharge [U.S.gal/min]		
1	0.00	6.50		
2	1443.00	6.50		

McCulley, Frick &Gilman, Inc. 19203 36th Avenue W. Suite 101 Lynnwood, WA 98036 ph.(206) 778-8252	Pumping test analysis NEUMAN's method Unconfined aquifer with delayed watertable response	Page 1 Project: Simplot Subarea Evaluated by: VBM Date: 26.11.1996

Pumping Test No. 4	Test conducted on: November 16, 1996
333	
Discharge 6.50 U.S.gal/min	



Transmissivity [ft²/min]: 2.45×10^{0}

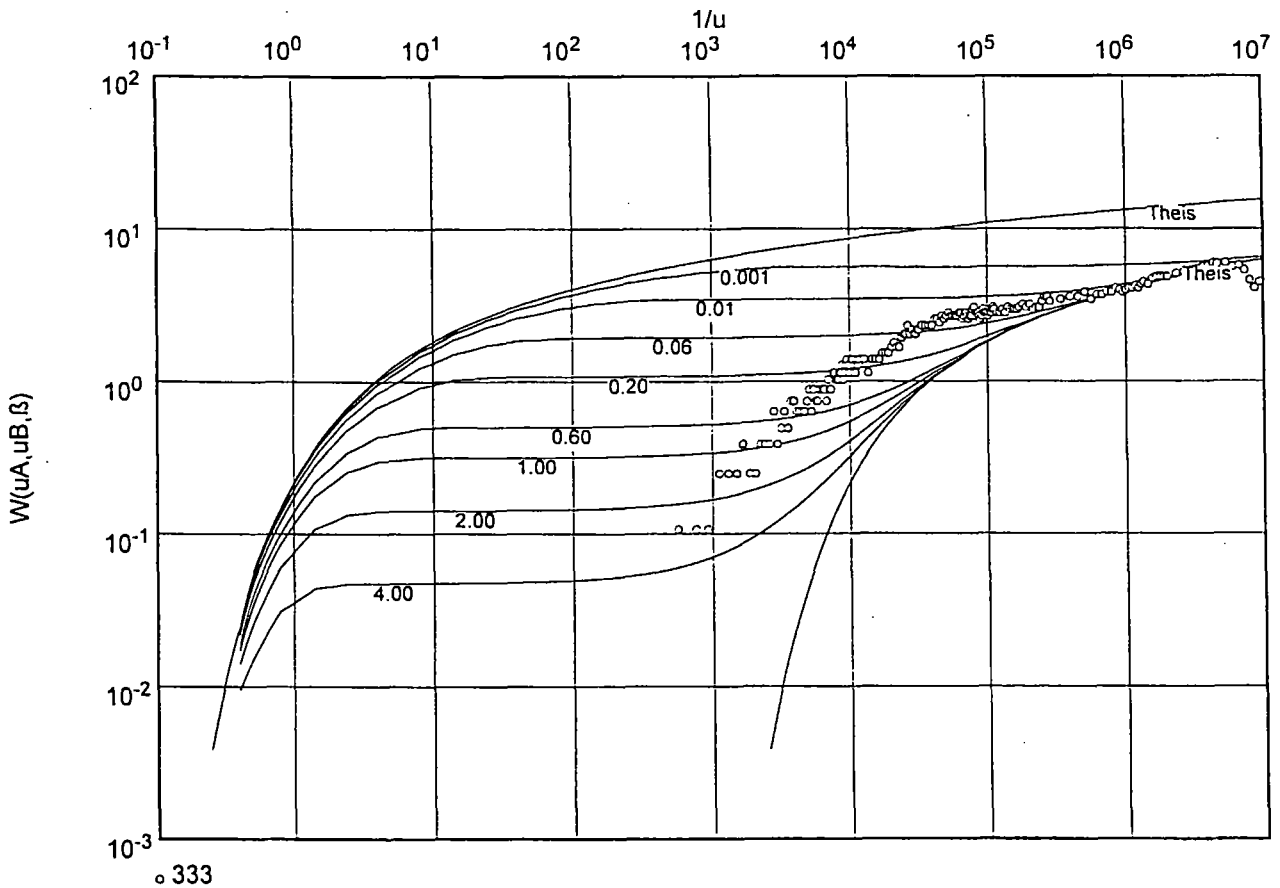
Hydraulic conductivity [ft/min]: 1.83×10^{-1}

Aquifer thickness [ft]: 13.40

Storativity: 1.42×10^{-3}

McCulley, Frick &Gilman, Inc. 19203 36th Avenue W. Suite 101 Lynnwood, WA 98036 ph.(206) 778-8252	Pumping test analysis NEUMAN's method Unconfined aquifer with delayed watertable response	Page 1 Project: Simplot Subarea Evaluated by: VBM | Date: 26.11.1996

Pumping Test No. 4	Test conducted on: November 16, 1996
333	
Discharge 6.50 U.S.gal/min	



Transmissivity [ft²/min]: 2.45×10^{0}

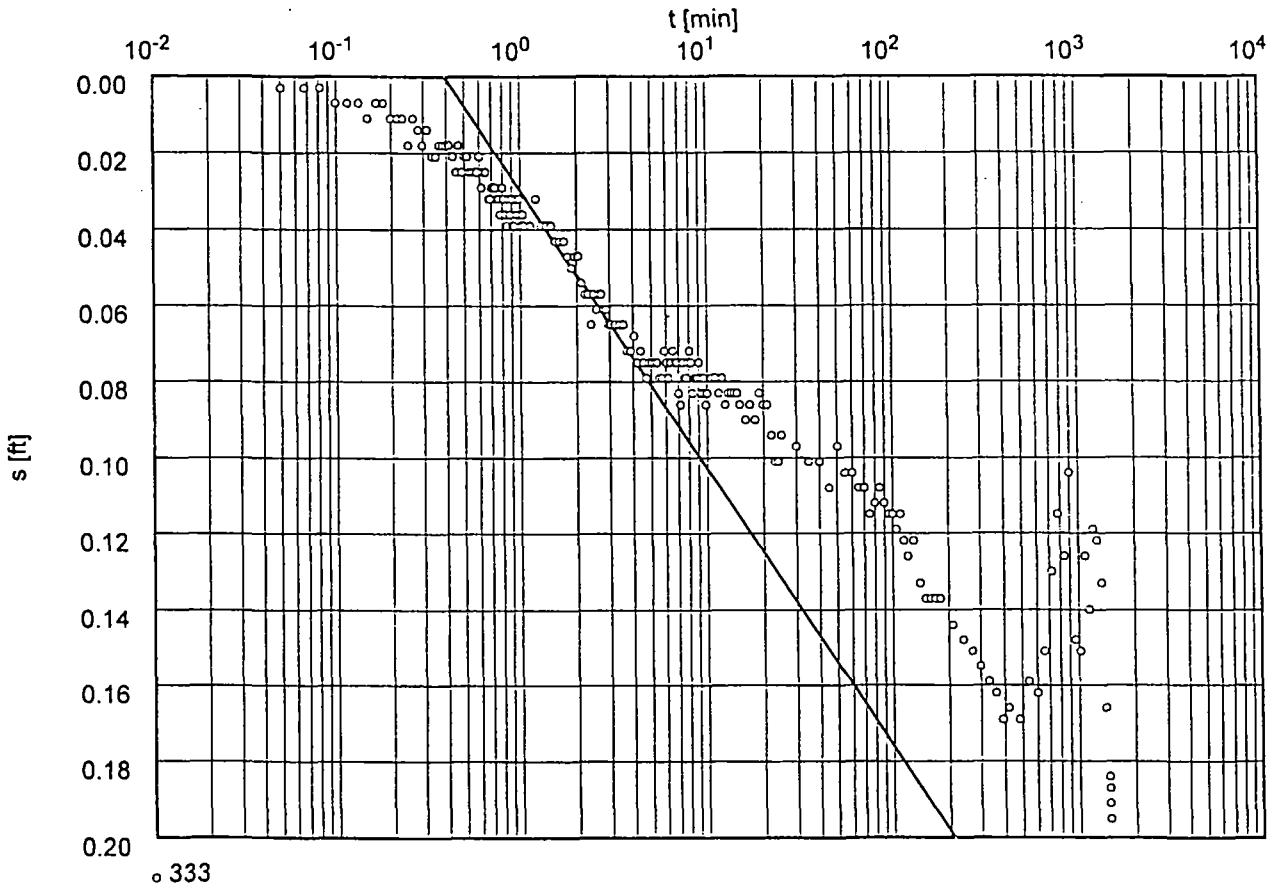
Hydraulic conductivity [ft/min]: 1.83×10^{-1}

Aquifer thickness [ft]: 13.40

Storativity: 1.13×10^{-6}

McCulley, Frick &Gilman, Inc. 19203 36th Avenue W. Suite 101 Lynnwood, WA 98036 ph.(206) 778-8252	Pumping test analysis Time-Drawdown-method after COOPER & JACOB Confined aquifer	Page 1 Project: Simplot Subarea Evaluated by: VBM Date: 26.11.1996

Pumping Test No. 4	Test conducted on: November 16, 1996
333	
Discharge 6.50 U.S.gal/min	



Transmissivity [ft²/min]: 2.17×10^{0}

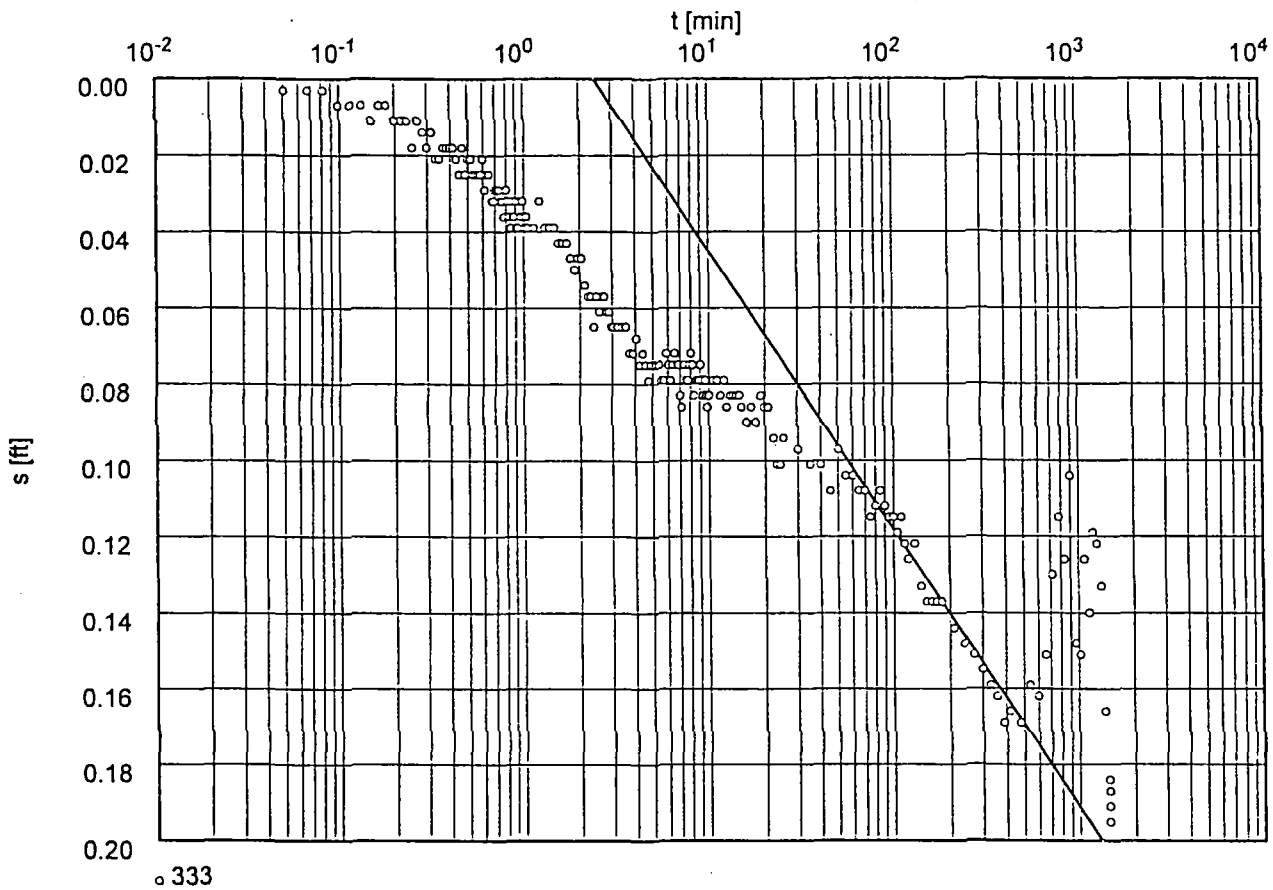
Hydraulic conductivity [ft/min]: 1.62×10^{-1}

Aquifer thickness [ft]: 13.40

Storativity: 2.47×10^{-3}

McCulley, Frick &Gilman, Inc. 19203 36th Avenue W. Suite 101 Lynnwood, WA 98036 ph.(206) 778-8252	Pumping test analysis Time-Drawdown-method after COOPER & JACOB Confined aquifer	Page 1 Project: Simplot Subarea Evaluated by: VBM Date: 26.11.1996

Pumping Test No. 4	Test conducted on: November 16, 1996
333	
Discharge 6.50 U.S.gal/min	



Transmissivity [ft²/min]: 2.17×10^{0}

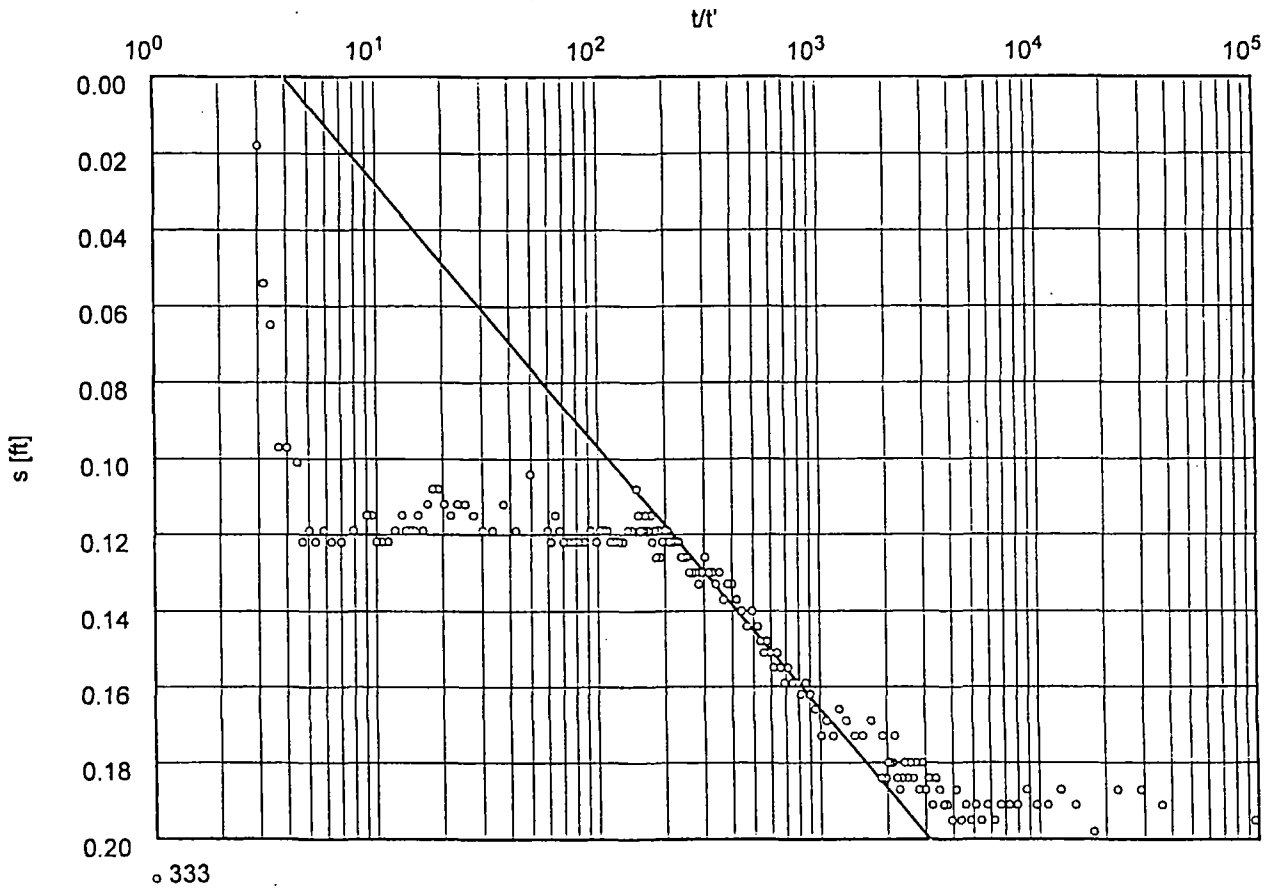
Hydraulic conductivity [ft/min]: 1.62×10^{-1}

Aquifer thickness [ft]: 13.40

Storativity: 1.53×10^{-2}

McCulley, Frick &Gilman, Inc. 19203 36th Avenue W. Suite 101 Lynnwood, WA 98036 ph.(206) 778-8252	Pumping test analysis Recovery method after THEIS & JACOB Confined aquifer	Page 1 Project: Simplot Subarea Evaluated by: VBM Date: 02.12.1996

Pumping Test No. 4	Test conducted on: November 16, 1996
333	
Discharge 6.50 U.S.gal/min	
	Pumping test duration: 1443.00 min



Transmissivity [ft²/min]: 2.30×10^0

Hydraulic conductivity [ft/min]: 1.72×10^{-1}

Aquifer thickness [ft]: 13.40

APPENDIX A-2
EXTENDED PUMPING TESTS OF EXTRACTION TEST WELLS
Fall 1997 to Spring 1998

This appendix presents the results of extended pumping tests which were performed at wells 343, 337, and 338 beginning in the fall of 1997. Permanent pumps were installed in the three pumping wells for the tests. The objectives of the pilot tests were to: 1) evaluate the performance and efficiency characteristics of the pump and well, and 2) evaluate boundary conditions and the radius of influence. The data collected also provided supplemental data on the hydraulic properties of the aquifer.

Figure 2 of the Draft RDR shows the locations of each pumping well and the observation wells and Table A-2.1 provides well completion information for each well used in the pilot tests. Details of each pilot test are presented separately in the following pages. Supporting figures and data are also presented.

A-2.1 WELL 343 PILOT TEST

The first pilot test was performed at well 343. Observations wells for the pilot test included well 307, well 308, and well 336 (see Figure 2). Well 307 is located 253.20 feet south of well 343, well 308 is located 271.9 feet north of well 343, and well 336 is located 54.0 feet east of well 343. The wells are screened within the gravel and sand unit that is thought to be a portion of a buried alluvial channel in the Bannock Range (see Table A-2.1).

Pilot testing at well 343 began on September 11, 1997; water level monitoring ended on March 4, 1998. Pumping of well 343 has continued through June 2002. Currently, the extracted water is being transmitted via a concrete pipeline to the plant for use in processing activities. During the first three days of the pilot test, drawdown was monitored in observation wells 307, 308, and 336 using pressure transducers and in well 343 using an electronic water level meter. After this phase of the test, manual measurements were made in all wells using an electronic water level meter. Water was extracted from the pumping well at a constant rate of 70 gallons per minute (gpm). Starting static water levels were 156.6 feet bgs in well 343, 159.29 feet bgs in well 307, 143.23 feet in well 308, and 157.03 feet in well 336.

The greatest drawdown in the pumping well of 34.05 feet was observed at approximately 93,000 minutes into the test. The 34-foot drawdown in 343 reflects a low well efficiency. On November 21, 1997, approximately 103,000 minutes into the test, the pump in well 343 was shut off. Pumping resumed on November 25, 1997, approximately 109,000 minutes into the test. The greatest drawdowns in the observation wells were recorded at approximately 250,000 minutes into the test. The maximum drawdowns recorded were approximately 2.5 feet in well 307, 1.8 feet in well 308, and 2.3 feet in well 336.

Figures A-2.2 through A-2.5 show the time versus drawdown plots for the pilot test. Table A-2.2 presents the data collected during the pilot test. During the initial portion of the test, between September 11 and 14, 1997, boundary condition effects were most evident in the observations wells between approximately 80 minutes through 4,000 minutes into the test. Boundary condition effects were also observed during the extended portion of the pilot test. As the plots indicate, boundary conditions affected drawdown during the pilot test. The observed boundary condition effects are probably a result of variations in the hydraulic conductivity within the formation and boundary conditions associated with the relict alluvial channel. The full lateral and vertical extent of the relict channel have not been established but available data suggest that the channel is relatively narrow (several hundred feet), trending north and parallel to the joint fenceline and then bending northeast near well 308. In addition, the results of the test indicate the radius of influence may be in excess of 1,000 feet. However, the actual radius of influence may be less,

depending on the configuration of the relict channel and hydraulic conductivity of the surrounding formation(s).

Hydraulic properties were evaluated for the data obtained during the first 3 days of the test. Consistent with evaluation of the 1996 aquifer tests, data were analyzed using AquiferTest by Waterloo Hydrogeologic, Inc. and using the same evaluation methods. Consistent with the 1996 evaluation, analysis of the pilot test data included using the Cooper & Jacob method and Neuman's method. In general, the hydraulic property results for the 1997-1998 pilot test results were similar to those obtained during the 1996 aquifer test. Transmissivity values using these methods ranged from 0.101 ft^2/min to 7.44 ft^2/min (1,000 to 80,000 gpd/ft); storativity had a wide range of values but were generally between $5x10^{-3}$ and $5x10^{-2}$; hydraulic conductivity ranged from 0.0398 ft/min to 1.51 ft/min (57 to 2,174 ft/day).

A-2.2 Well 337 PILOT TEST

The second pilot test was performed at well 337. Observation wells for the pilot test included well 326 and 344 (see Figure 2). Well 326 is located 80 feet northwest of well 337 and well 344 is located 84.3 feet southeast of well 337. The wells are completed within an upper transmissive unit of the deep aquifer. The unit is confined by an overlying relatively impermeable clay unit and possibly below by a leaky silt layer. Well completion information is provided in Table A-2.1.

The pilot test began on November 3, 1997 and continued until March 4, 1998. During the first three days of the test, drawdown was monitored in observation wells 326 and 344 using pressure transducers and in well 337 using an electronic water level meter. After this phase of the test, manual measurements were made in all wells using an electronic water level meter. Water was extracted from the pumping well at a constant rate of 199 to 200 gallons per minute (gpm). Starting static water levels were 66.22 feet bgs in well 337; 63.48 feet bgs in well 326; and 67.58 feet bgs in well 344.

The maximum drawdowns in the observation wells of 1.3 feet in well 326 and 2.6 feet in well 344 were recorded on January 6, 1998, approximately 96,100 minutes into the test. The maximum drawdown of 36.7 feet in well 337 feet was recorded on March 4, 1998 after approximately 180,000 minutes into the test. The 36.7 feet of drawdown in well 337 reflects low well efficiency. Well 337 was shut down temporarily on two occasions. The first shut down was on January 13, 1998 (approximately 106,000 minutes into the test) and was restarted on February 5, 1998; the second shut down was on February 25, 1998 (approximately 168,000 minutes into the test) and restarted on February 26, 1998.

Figure A-2.6 and A-2.7 shows the time versus drawdown plots for the pilot test. Table A-2.3 presents the data collected during the pilot test. As the plots indicate, boundary conditions affected drawdown during the pilot test. The observed boundary condition effects are probably a result of variations in the hydraulic conductivity within the formation and confined aquifer effects. A recharge effect may be represented by the slight leveling of the drawdown data observed in well 326 between approximately 10,500 minutes and 40,500 minutes. Recharge in this instance may be from drainage of the surrounding formation and/or the leaky lower silt layer. Two observation wells were used in this test; however, because the observation wells are located a similar distance from the pumping well, distance-drawdown plots using just these two wells are not particularly useful for predicting the radius of influence. Projections of drawdown with distance using the predicted drawdown at well 337 (100% efficiency) and the drawdown at the two observation wells indicate a radius of influence of 550 to over 1000 feet.

Hydraulic properties were evaluated for the data obtained during the first 2 days of the test. Consistent with evaluation of the 1996 aquifer tests, data were analyzed using AquiferTest by Waterloo Hydrogeologic, Inc. and using the same evaluation methods. Consistent with the 1996 evaluation,

analysis of the pilot test data included using the Cooper & Jacob method and Neuman's method, and Hantush's method. In general, the hydraulic property results for the 1997-1998 pilot test results were similar to those obtained during the 1996 aquifer test. Transmissivity values ranged from 1.65 ft^2/min to 11.2 ft^2/min (17,700 to 120,400 gpd/ft); storativity ranged from 1.31×10^{-2} to 1.90×10^{-3}; and hydraulic conductivity ranged from 7.04×10^{-2} ft/min to 2.80×10^{-1} ft/min (107 to 403 ft/day).

A-2.3 WELL 338 PILOT TEST

The third pilot test was performed at well 338. The observation well for the pilot test was 339 (see Figure 2). Well 339 is located 25.88 southeast of well 338. The wells are completed within the shallow gravel and sand aquifer. Well completion information is presented in Table A-2.1.

The pilot test began on November 3, 1997 and continued until March 4, 1998. During the first three days of the test, drawdown was monitored in observation well 339 a pressure transducer and in well 338 using an electronic water level meter. After this phase of the test, manual measurements were made in all wells using an electronic water level meter. Water was extracted from the pumping well at a constant rate of 40 gallons per minute (gpm). Starting static water levels were 70.01 feet bgs in well 339 and 69.65 feet bgs in well 338.

The maximum drawdown of 1.02 feet was observed in observation well 339 on December 30, 1997, approximately 86,000 minutes into the test. A maximum drawdown of 8.6 feet bgs in well 338 was recorded on February 5, 1998, approximately 139,000 minutes into the pilot test. The drawdown of 8.6 feet in well 338 reflects low well efficiency. The two drawdowns of 4.79 and 2.87 feet bgs recorded on November 6, 1997 may have been a result of pump variance and were disregarded as anomalous values. Well 338 was shut down temporarily on three occasions. The first shut down was on January 13, 1998 (approximately 106,000 minutes into the test) and was restarted on February 5, 1998; the second shut down was on February 11, 1998 (approximately 148,000 minutes into the test) and restarted on February 13, 1998; the third shut down was on February 25, 1998 (approximately 168,000 minutes into the test) and restarted on February 26, 1998.

Figures A-2.8 and A-2.9 show the time versus drawdown plots for pumping well 338 and observation well 339, respectively. Table A-2.4 presents the data collected during the pilot test. In general, the drawdown in observation well 339 is relatively stable with a few minor fluctuations. A slight increase in drawdown was observed between 60,000 and 80,000 minutes, with the exception of one anomalous result at approximately 76,000 minutes. The radius of influence for extraction well 338 was estimated to be greater than 60 feet based on the response in observation well 339.

Hydraulic properties were evaluated for the data obtained during the first 2 days of the test. Consistent with evaluation of the 1996 aquifer tests, data were analyzed using AquiferTest by Waterloo Hydrogeologic, Inc. and using the same evaluation methods. Consistent with the 1996 evaluation, analysis of the pilot test data included using the Cooper & Jacob method and Neuman's method, and Hantush's method. In general, the hydraulic property results for the 1997-1998 pilot test results were similar to those obtained during the 1996 aquifer test. Transmissivity values ranged from 0.262 to 6.83 ft^2/min (2,800 to 73,400 gpd/ft); storativity ranged from 3.16×10^{-4} to 4.11×10^{-1}; and hydraulic conductivity ranged from 2.27×10^{-1} ft/min to 5.94×10^{-1} ft/min (327 to 855 ft/day).

TABLE A-2.1
PILOT TEST
WELL COMPLETION INFORMATION

Well Number	Installation Date	Well Diameter (inches)	Total Depth (ft bgs)	Top of PVC (ft ags)	Screened Interval (ft bgs)	Filter Pack Interval (ft bgs)	Bentonite Seal Interval (ft bgs)	Grout Seal Interval (ft bgs)
Pilot Test #1								
343	9/9/96 - 9/11/96	6	208.0	2.44	174.7 – 204.7	168.8 - 208	164.0 – 168.8	0 – 164.0
307	5/8/92 – 5/9/92	4	176.0	2.2	162.0 – 172.0	158.0 – 176.0	155.0 – 158.0	0 – 155.0
308	5/6/92 – 5/7/92	4	176.0	1.8	150.8 – 170.8	147.0 – 176.0	144.0 – 147.0	0 – 144.0
336	8/20/96 – 8/23/96	4	179.6	2.33	146.1 – 176.1	141.8 – 180.0	136.0 – 141.8	0 – 136.0
Pilot Test #2								
337	8/23/96 – 8/27/96	6	160.6	2.23	117.6 – 157.6	114.0 – 169.0	110.0 – 114.0	0 – 110.0
326	11/11/92 - 11/12/92	4	116.0	3.1	105.0 – 110.0	99.5 – 116.0	97.0 – 99.5	0 - 97.0
344	9/18/96 – 9/19/96	4	148.8	2.25	130.8 – 145.8	125.0 – 148.8	117.5 – 125.0	0 – 117.5
Pilot Test #3								
338	8/27/96 – 8/28/96	6	81.7	2.19	58.7 – 78.7	56.8 – 83.5	52.3 – 56.8	0 – 52.3
339	9/4/96	4	79.0	2.26	56.0 – 76.0	52.5 – 79.0	48.9 – 52.5	0 – 48.9

bgs = below ground surface
ags = above ground surface

TABLE A-2.2
WELL 343
PILOT TEST DATA

Well Number		307		308		336		343	
Designation		Observation Well		Observation Well		Observation Well		Pumping Well	
Starting Static Head		159.29 ft bgs		143.23 ft bgs		157.03 ft bgs		156.6 ft bgs	
Distance From Pumping Well		253.20 ft		271.90 ft		54.0 ft		—	
Date	Time (min)	Depth to Water (ft)	Drawdown (ft)	Depth to Water (ft)	Drawdown (ft)	Depth to Water (ft)	Drawdown (ft)	Depth to Water (ft)	Drawdown (ft)
9/11/1997	1.0		0.01		0.05		0.04		8.73
9/11/1997	1.9		0.01		0.06		0.05		9.41
9/11/1997	2.7		0.01		0.07		0.06		9.77
9/11/1997	2.6		0.01		0.07		0.05		10.05
9/11/1997	6.8		0.02		0.10		0.07		10.5
9/11/1997	8.2		0.02		0.11		0.07		10.89
9/11/1997	9.0		0.03		0.12		0.08		10.8
9/11/1997	11.5		0.03		0.12		0.09		11
9/11/1997	20		0.02		0.12		0.10		11.42
9/11/1997	29		0.04		0.14		0.13		11.88
9/11/1997	84		0.09		0.19		0.18		12.44
9/11/1997	129		0.23		0.29		0.37		13.78
9/11/1997	159		0.29		0.38		0.44		14.14
9/11/1997	209		0.34		0.38		0.49		14.44
9/11/1997	479		0.39		0.43		0.57		15.78
9/12/1997	1139		0.53		0.53		0.74		17.34
9/12/1997	1199		0.54		0.53		0.75		17.4
9/12/1997	1259		0.53		0.53		0.75		17.42
9/12/1997	1319		0.55		0.53		0.75		17.57
9/12/1997	1439		0.53		0.52		0.75		17.67
9/12/1997	1499		0.52		0.51		0.74		17.78
9/12/1997	1559		0.52		0.51		0.73		17.88
9/12/1997	1619		0.51		0.51		0.74		17.94
9/12/1997	1679		0.52		0.51		0.73		17.99
9/13/1997	2579		0.67		0.61		0.88		18.89
9/13/1997	2639		0.67		0.61		0.89		19.09
9/13/1997	2699		0.67		0.63		0.90		19.17
9/13/1997	2879		0.65		0.61		0.87		19.2
9/13/1997	3081		0.64		0.57		0.86		19.31
9/14/1997	4239		0.90		0.68		1.01		20.12
9/17/1997	9108	160.25	0.96	140.09		158.16	1.13	178.25	21.65
9/18/1997	10548	160.45	1.16	144.23	1	158.32	1.29	179.04	22.44
9/19/1997	11988	160.47	1.18	144.25	1.02	158.33	1.30	179.41	22.81
9/20/1997	13428	160.49	1.2	144.28	1.05	158.38	1.35	179.74	23.14
9/22/1997	16308	160.57	1.28	144.3	1.07	158.43	1.40	179.84	23.24
9/23/1997	17748	160.6	1.31	144.33	1.1	158.45	1.42	180.49	23.89
9/24/1997	19188	160.58	1.27	144.28	1.05	158.43	1.40	180.29	23.69
9/25/1997	20628	160.51	1.22	144.28	1.05	158.38	1.35	179.98	23.38
9/26/1997	22068	160.56	1.27	144.29	1.06	158.42	1.39	180.99	24.39
9/29/1997	26332	160.6	1.31	144.29	1.06	158.45	1.42	182.28	25.68
9/30/1997	27766	160.65	1.36	144.34	1.11	158.48	1.45	183.37	26.77
10/1/1997	29203	160.61	1.32	144.31	1.08	158.49	1.46	182.05	25.45

TABLE A-2.2
WELL 343
PILOT TEST DATA

Well Number		307		308		336		343	
Designation		Observation Well		Observation Well		Observation Well		Pumping Well	
Starting Static Head		159.29 ft bgs		143.23 ft bgs		157.03 ft bgs		156.6 ft bgs	
Distance From Pumping Well		253.20 ft		271.90 ft		54.0 ft		—	
Date	Time (min)	Depth to Water (ft)	Drawdown (ft)	Depth to Water (ft)	Drawdown (ft)	Depth to Water (ft)	Drawdown (ft)	Depth to Water (ft)	Drawdown (ft)
10/2/1997	30652	160.57	1.28	144.3	1.07	158.47	1.44	183.33	26.73
10/3/1997	32114	160.71	1.42	144.37	1.14	158.55	1.52	184.05	27.45
10/7/1997	38242	160.61	1.32	144.3	1.07	158.48	1.45	185.36	28.76
10/8/1997	39372	160.75	1.46	144.36	1.13	158.55	1.52	185.95	29.35
10/9/1997	40942	160.67	1.38	144.29	1.06	158.46	1.43	186.17	29.57
11/3/1997	76942	160.59	1.3	144.2	0.97	158.37	1.34	189.9	33.3
11/4/1997	78382	160.82	1.53					190.27	33.67
11/6/1997	81367	160.6	1.31	144.25	1.02	158.42	1.39	190.62	34.02
11/11/1997	88567	160.64	1.35	144.3	1.07	158.51	1.48	190.62	34.02
11/12/1997	90052	160.72	1.43	144.29	1.06	158.44	1.41	190.62	34.02
11/13/1997	91260	160.78	1.49	144.33	1.1	158.51	1.48	190.62	34.02
11/14/1997	92887	160.79	1.5	144.35	1.12	158.55	1.52	190.65	34.05
11/17/1997	96992	160.78	1.49	144.38	1.15	158.56	1.53	190.64	34.04
11/18/1997	98622	160.74	1.45	144.33	1.1	158.53	1.50	190.63	34.03
11/19/1997	99917	160.72	1.43	144.41	1.18	158.61	1.58	190.63	34.03
11/21/1997	102952	160.87	1.58	144.41	1.18	158.6	1.57	190.21	33.61
11/25/1997	108822	160.39	1.1	144.06	0.83	158.09	1.06	174.71	18.11
11/26/1997	110242	160.28	0.99	143.98	0.75	158.13	1.10	176.85	20.25
12/1/1997	117462	160.86	1.57	144.43	1.2	158.62	1.59	181.43	24.83
12/2/1997	118652	160.92	1.63	144.43	1.2	158.71	1.68	181.96	25.36
12/4/1997	121672	160.84	1.55	144.43	1.2	158.62	1.59	181.69	25.09
12/5/1997	123144	161.91	2.62	144.45	1.22	158.66	1.63	181.9	25.3
12/8/1997	127477	161.02	1.73	144.54	1.31	158.75	1.72	182.35	25.75
12/16/1997	138952	161.16	1.87	144.71	1.48	158.9	1.87	183.48	26.88
12/23/1997	148807	161.19	1.9	144.72	1.49	158.97	1.94	183.28	26.68
12/30/1997	158870	161.42	2.13	144.9	1.67	159.13	2.10	184.48	27.88
1/6/1998	168967	161.53	2.24	144.93	1.7	159.21	2.18	185.23	28.63
1/13/1998	179055	161.62	2.33	145	1.77	159.28	2.25	186.15	29.55
2/5/1998	212074	161.78	2.49	145.06	1.83	159.3	2.27	183.64	27.04
2/10/1998	219367	161.72	2.43	145.02	1.79	159.3	2.27	184.19	27.59
2/17/1997	226656	161.69	2.4	145.01	1.78	159.16	2.13	185.99	29.39
2/25/1998	238186	161.83	2.54	145.08	1.85	159.34	2.31	185.75	
3/4/1998	249696	161.8	2.51	145.05	1.82	159.3	2.27	185.2	28.6

TABLE A-2.3
WELL 337
PILOT TEST DATA

Well Number		344		326		337	
Designation		Observation Well		Observation Well		Pumping Well	
Starting Static Water Level		67.58 ft bgs		63.48 ft bgs		66.22 ft bgs	
Distance From Pumping Well		84.3 ft		60 ft		---	
Date	Time (min)	Depth to Water (ft)	Drawdown (ft)	Depth to Water (ft)	Drawdown (ft)	Depth to Water (ft)	Drawdown (ft)
11/3/1997	4500			64.03	0.55	95.14	28.92
11/6/1997	8475			64.36	0.88	95.21	28.99
11/11/1997	15675			64.16	0.68	94.9	28.68
11/12/1997	17160			64.25	0.77	95.52	29.3
11/13/1997	18368			64.27	0.79	95.42	29.2
11/14/1997	19995			64.2	0.72	95.75	29.53
11/17/1997	24100			64.25	0.77	96.79	30.57
11/18/1997	25930			64.6	1.12	97.28	31.06
11/19/1997	27025			64.26	0.78	96.86	30.64
11/21/1997	30060			64.27	0.79	96.79	30.57
11/25/1997	35930			64.46	0.98	94.74	28.52
11/26/1997	37350	69.63	2.05	64.28	0.8	97.12	30.9
12/1/1997	44570	69.71	2.13	64.32	0.84	97.3	31.08
12/2/1997	45760	69.1	1.52	64.32	0.84	97.21	30.99
12/4/1997	48760	69.81	2.23	64.41	0.93	97.51	31.29
12/5/1997	50252	69.95	2.37	64.47	0.99	97.44	31.22
12/8/1997	54585	69.82	2.24	64.4	0.92	97.6	31.38
12/16/1997	66060	69.9	2.32	64.48	1	98.88	32.66
12/23/1997	75915	69.96	2.38	64.6	1.12	100.87	34.65
12/30/1997	85978	70.09	2.51	64.66	1.18	102.73	36.51
1/6/1998	96075	70.21	2.63	64.75	1.27	102.7	36.48
1/13/1998	106163	69.84	2.26	64.34	0.86	101.68	35.46
2/5/1998	139182	69.93	2.35	64.5	1.02	100.53	34.31
2/10/1998	146475	69.63	2.05	64.17	0.69	100.8	34.58
2/17/1997	156540	69.73	2.15	64.29	0.81	100.64	34.42
2/25/1998	168070	69.69	2.11	64.24	0.76	101.02	34.8
3/4/1998	179580	69.94	2.36	64.44	0.96	102.95	36.73

TABLE A-2.4
WELL 338
PILOT TEST DATA

Well Number		339		338	
Designation		Observation Well		Pumping Well	
Starting Static Water Level		70.01 ft bgs		69.65 ft bgs	
Distance from Pumping Well		25.88 ft		—	
Date	Time (min)	Depth to Water (ft)	Drawdown (ft)	Depth to Water (ft)	Drawdown (ft)
11/3/1997	4500	70.5	0.49	72.34	2.69
11/6/1997	8475	74.8	4.79	72.52	2.87
11/11/1997	15675	70.64	0.63	70.3	0.65
11/12/1997	17160	70.6	0.59	70.3	0.65
11/13/1997	18368	70.65	0.64	72.91	3.26
11/14/1997	19995	70.64	0.63	72.96	3.31
11/17/1997	24100	70.73	0.72	73.16	3.51
11/18/1997	25930	70.71	0.7	73.24	3.59
11/19/1997	27025	70.72	0.71	73.28	3.63
11/21/1997	30060	70.63	0.62	73.26	3.61
11/25/1997	35930	70.71	0.7	73.55	3.9
11/26/1997	37350	70.68	0.67	73.55	3.9
12/1/1997	44570	70.72	0.71	73.91	4.26
12/2/1997	45760	70.75	0.74	73.92	4.27
12/4/1997	48780	70.75	0.74	74.24	4.59
12/5/1997	50252	70.79	0.78	74.44	4.79
12/8/1997	54585	70.76	0.75	74.54	4.89
12/16/1997	66060	70.9	0.89	75.67	6.02
12/23/1997	75915	69.93	-0.08	75.96	6.31
12/30/1997	85978	71.03	1.02	76.83	7.18
1/6/1998	96075	71	0.99	77.5	7.85
1/13/1998	106163	70.88	0.87	77.65	8
2/5/1998	139182	70.7	0.69	78.25	8.6
2/10/1998	148475	70.69	0.68	not available	
2/11/1998	147937	70.59	0.58	70.23	0.58
2/12/1998	149325	70.44	0.43	70.08	0.43
2/13/1998	150682	70.35	0.34	70.07	0.42
2/15/1997	154021	70.59	0.58	75.41	5.76
2/17/1997	156540	70.48	0.47	75.49	5.84
2/25/1998	168070	70.52	0.51	76.06	6.41
2/26/1998	169500	70.43	0.42	69.95	0.3
3/4/1998	179580	70.66	0.65	Non Detect	

FIGURE A-2.2

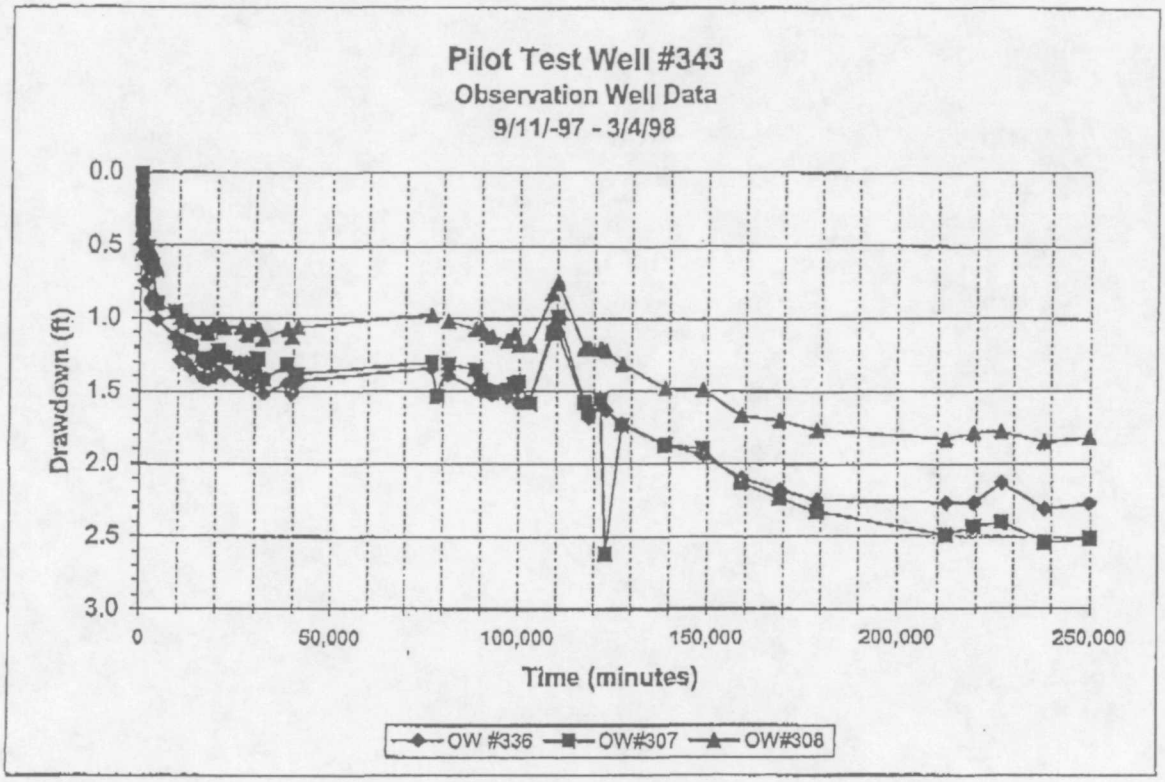


FIGURE A-2.3

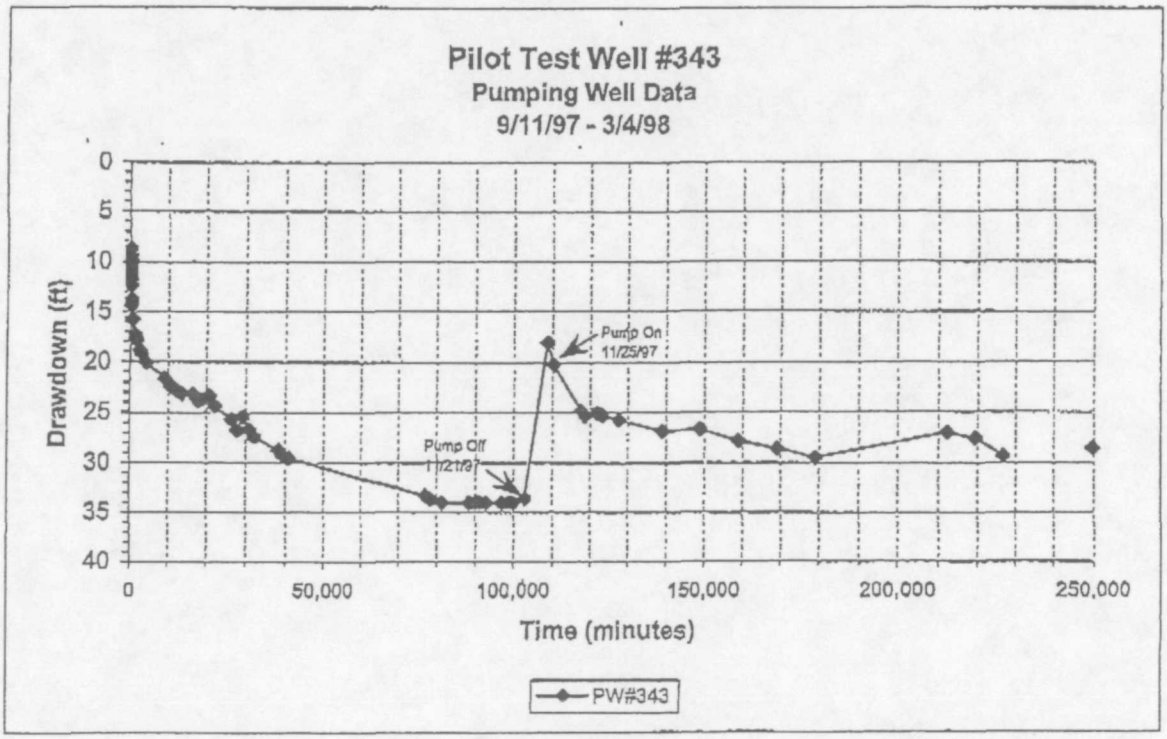


FIGURE A-2.4

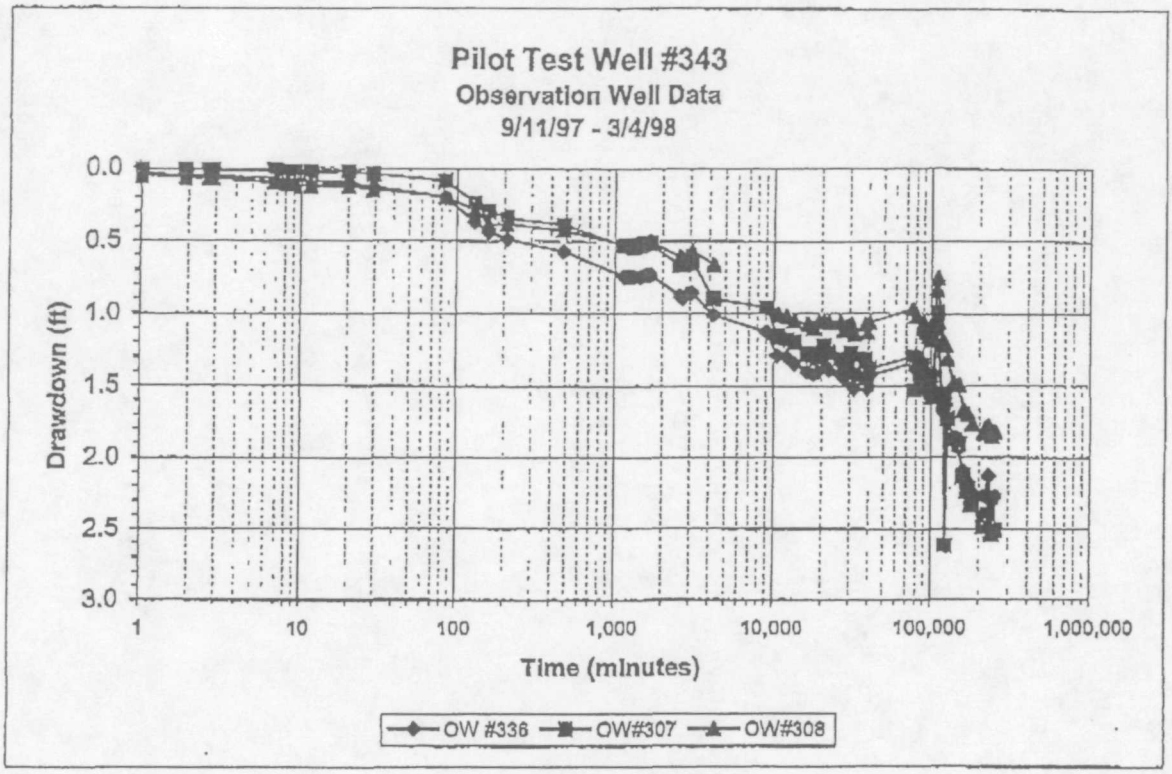


FIGURE A-2.5

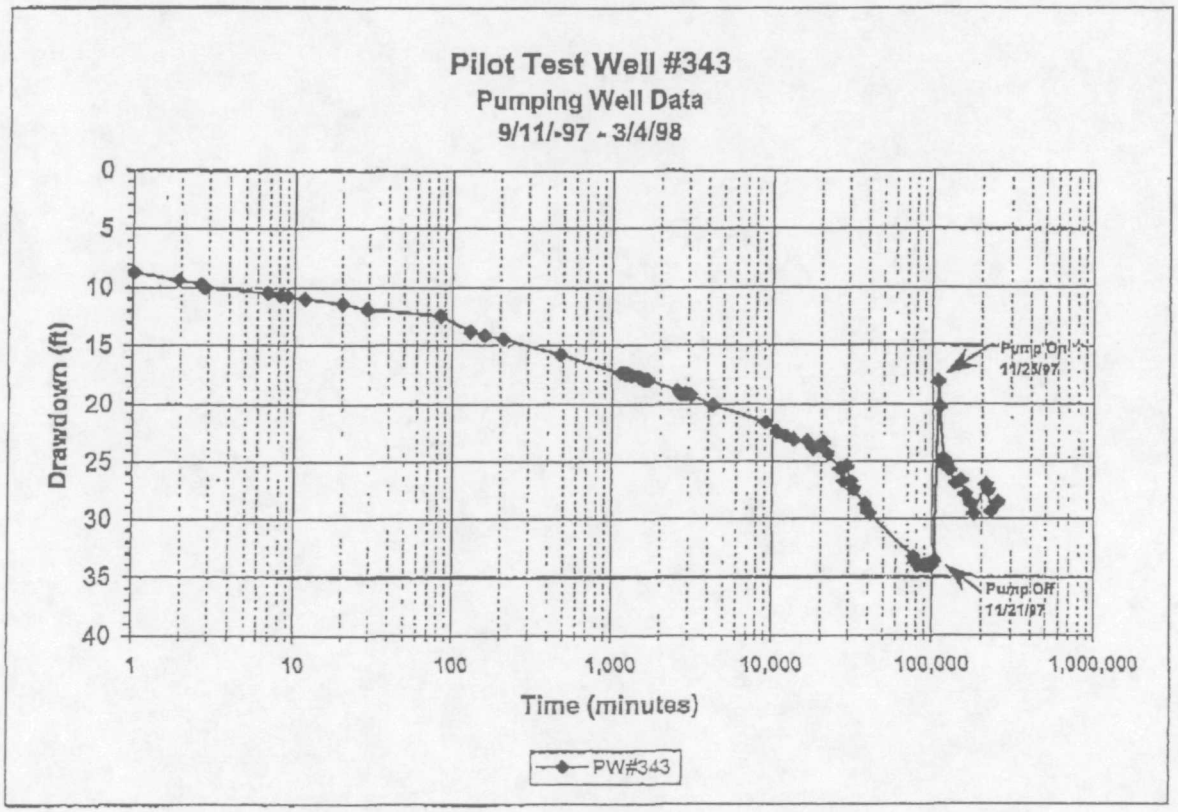


FIGURE A-2.6

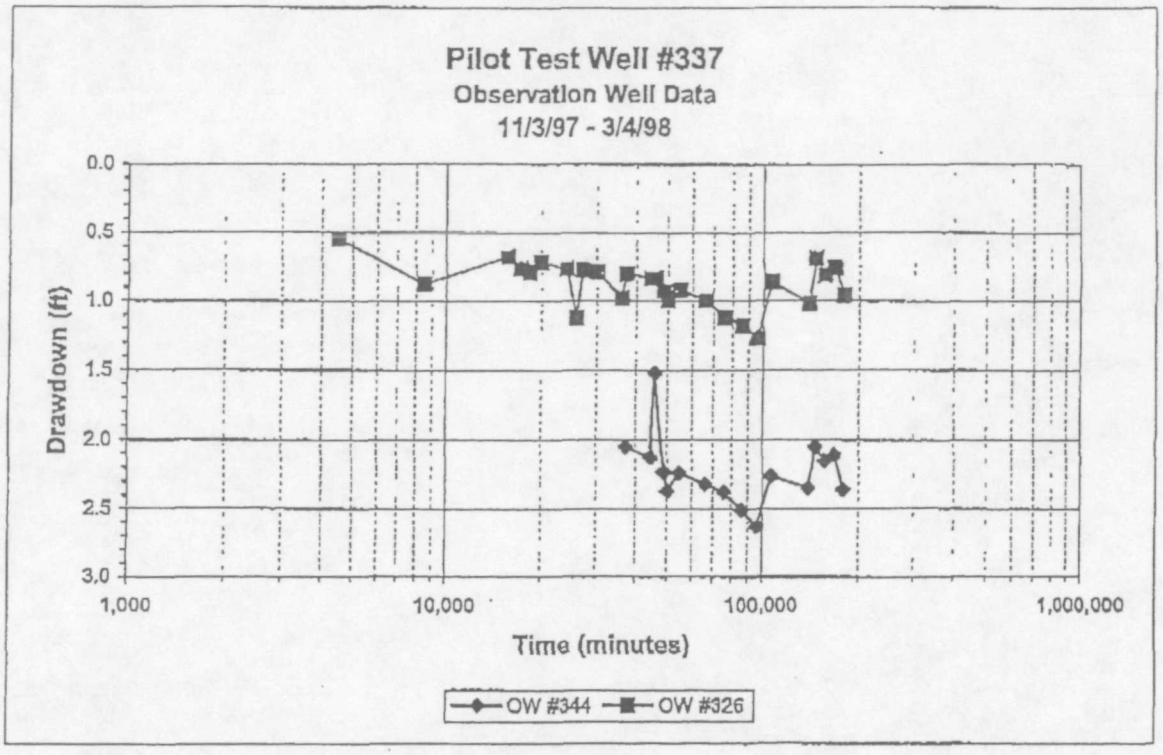


FIGURE A-2.7

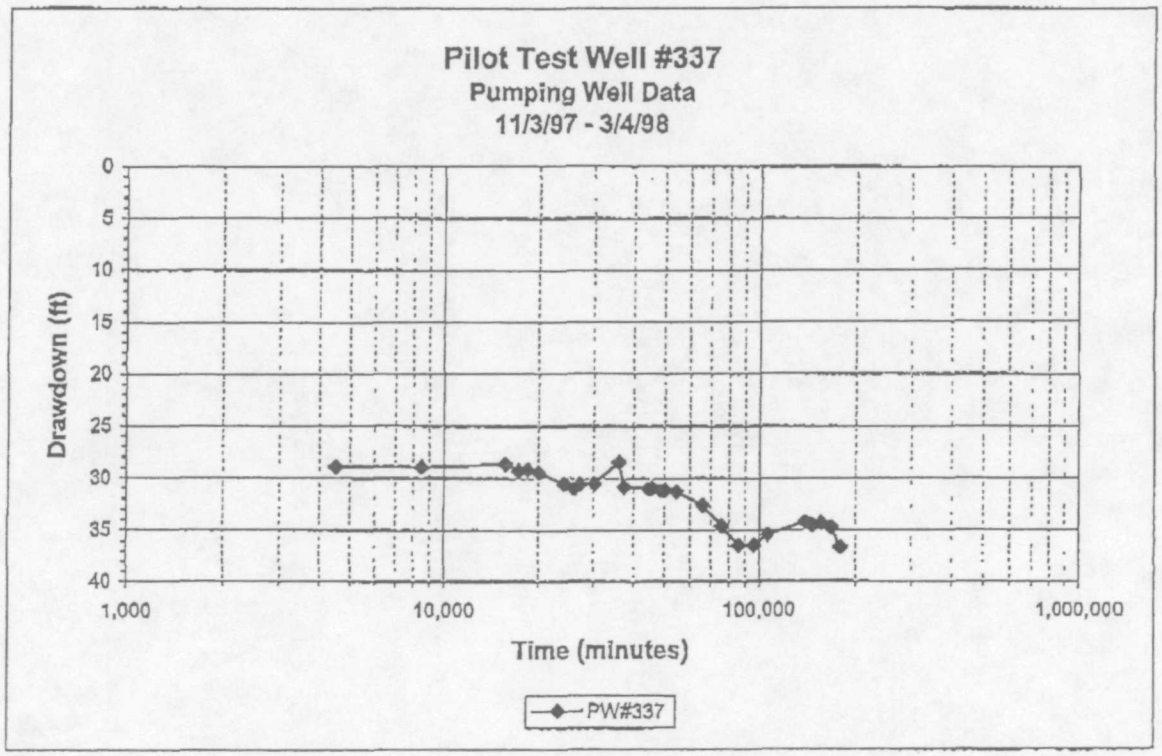


FIGURE A-2.8

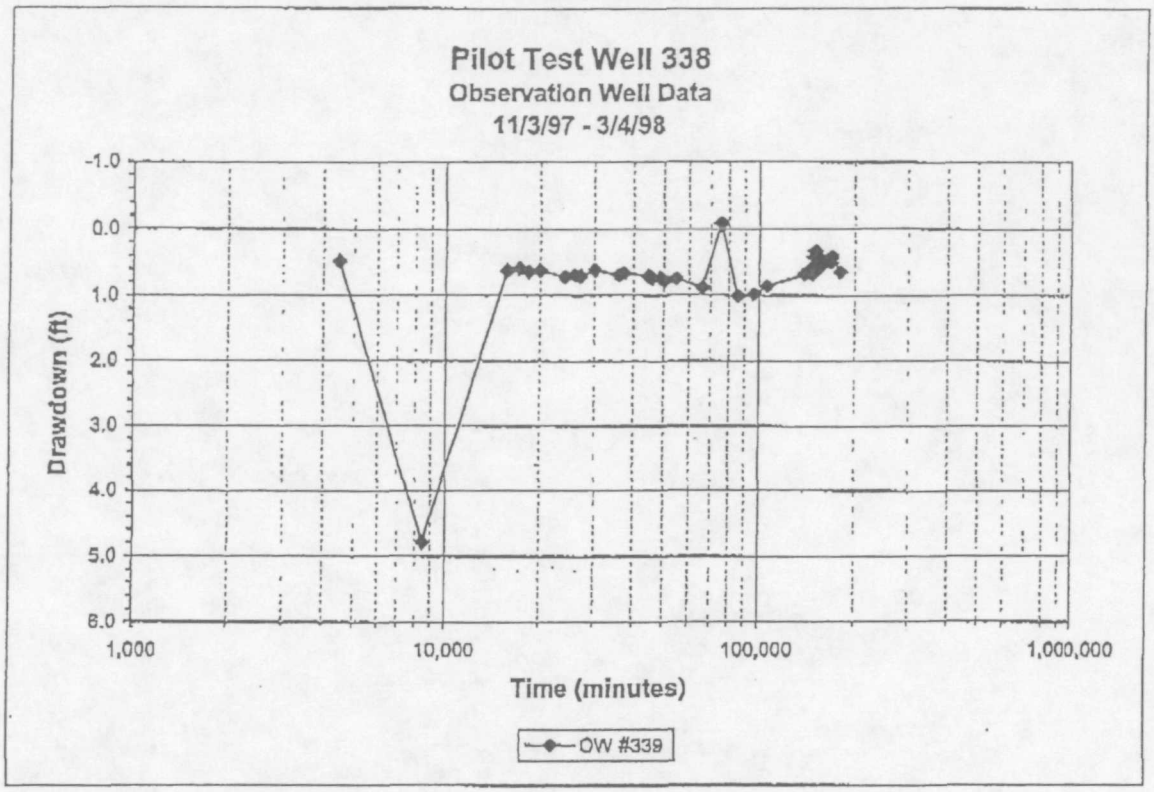
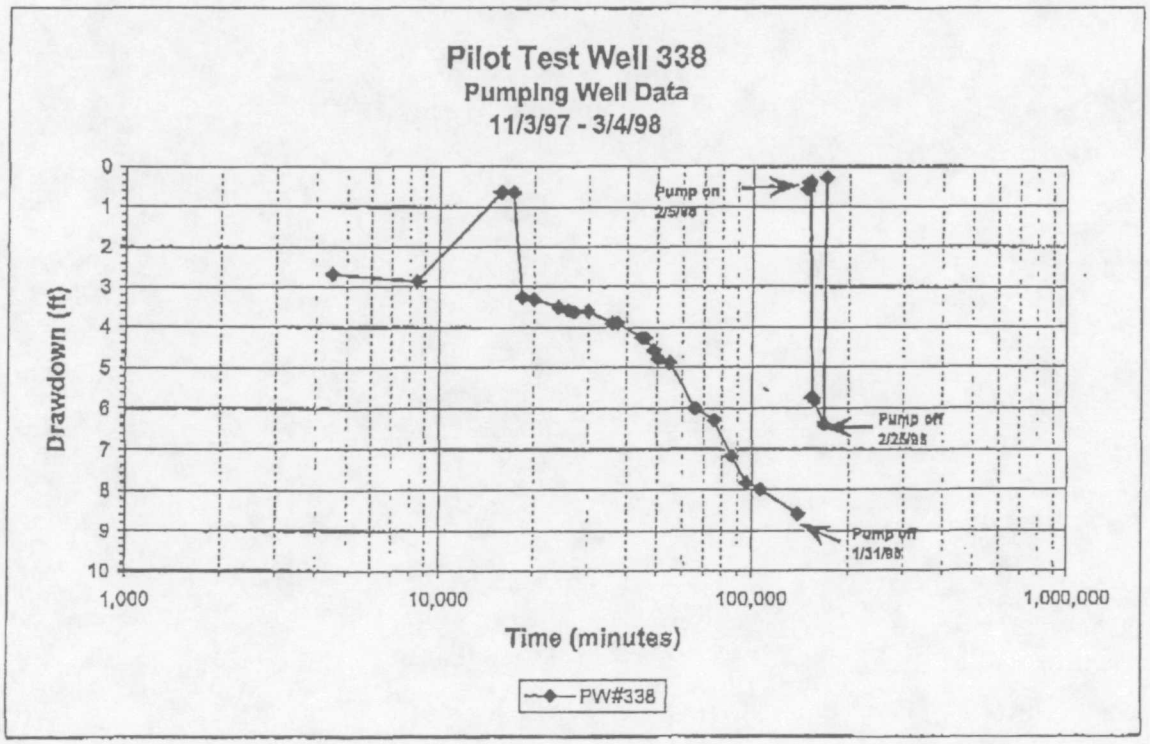


FIGURE A-2.9



APPENDIX A-3
SUPPLEMENTAL DRILLING AND WELL INSTALLATION ACTIVITIES

This appendix summarizes the findings of supplemental drilling and well installation activities performed in the Simplot Plant Area of the EMF Superfund Site between 1996 and 1998. As discussed herein, these supplemental activities were performed for site characterization purposes, and the results of these activities are included in this appendix such that the Draft Remedial Design Report (RDR) presents a complete picture of the investigation and characterization activities performed to date.

A-3.1 Monitoring Wells 340, 341, and 342

Three monitoring wells (340, 341, and 342) were installed during September 1996. The locations of the wells are shown on Figure 2 of the RDR. The purpose of installing these wells was to characterize groundwater in the vicinity of the Nitrogen Solutions Plant. Total depths of the boreholes ranged from 79 feet to 85 feet bgs. The boring/well logs are attached. Each borehole was completed as a groundwater monitoring well for use during aquifer testing.

The general well construction for each well consisted of flush threaded 4-inch diameter schedule 40 PVC riser with flush threaded 4-inch diameter schedule 40 PVC 0.020 slot screens. The length of each well screen was 15 feet. Details of the well completion are included on each boring/well logs.

Well 340

Well 340 was installed on September 5, 1996. The borehole was completed to a total depth of 79 feet bgs. In general, the vadose zone at this location is composed of layers of well to poorly graded sand and gravel. The shallow aquifer at well 340 is composed of well-graded gravel. The total depth of the well is approximately 79 feet bgs and the well screen is completed between approximately 61 feet and 76 feet bgs.

Well 341

Well 341 was installed on September 6, 1996. The borehole was completed to a depth of 85 feet bgs. In general, the vadose zone at well 341 is composed of layers of silt, sand, and gravel and the saturated zone is composed of layers of sand and gravel. The total depth of the well is approximately 83 feet bgs and the well screen is completed between approximately 65 feet bgs and 80 feet bgs.

Well 342

Well 342 was installed on September 7, 1996. The borehole was completed to a depth of 79.5 feet bgs. In general, the vadose zone at well 342 is composed of layers of silt, sand, and gravel and the saturated zone is composed mostly of layers of silt and sand. The total depth of the well is approximately 79.5 feet bgs and the well screen is completed between approximately 76.5 feet bgs and 61.5 feet bgs.

A-3.2 Extraction Test Well 346

Extraction test well 346 was installed between July 8 and August 1, 1998. This well is located approximately 500 feet northeast of test extraction well 343 in the west plant area (see RDR Figure 2).

The boring and well log for 346 is attached. The borehole was completed to a total depth of 257 feet bgs. The well was completed at a total depth of approximately 251.5 feet bgs. In general, the vadose zone at well 346 is composed mostly of silt and two layers of gravel. The saturated zone consists of a layer of silt and a layer of sand. Weathered bedrock was encountered at approximately 253 feet bgs during drilling. The well screen is completed between 236.2 feet bgs and 251.2 feet bgs. Due to differences in lithology, the well screen was constructed using two screen sizes. A 6-inch diameter and 5-foot long 0.030 continuous slot stainless steel screen was installed for the silt portion of the saturated zone and a 6-inch diameter and 10-foot long 0.040 continuous slot stainless steel screen was installed for the sand portion of the saturated zone. Two different filter packs were also used. The filter pack for the 0.030 continuous slot screen is composed of 10-20 Colorado silica sand and the filter pack for the 0.040 continuous slot screen is composed of pea gravel. The well riser is composed of a 6-inch diameter schedule 40 low carbon steel casing.

Grain size sieve analyses were performed on samples collected from the 245 feet and 250 feet bgs depth intervals within the shallow aquifer. The grain size analysis results are attached. The results indicate the shallow aquifer at well 346 primarily consists of sand. Percent gravel in the samples ranged from 6.8 percent to 9.0 percent; sand ranged from 77.7 percent to 90.5 percent; and silt and clay ranged from 15.5 to 0.5 percent. Median grain size in the samples ranged from medium sand to very coarse sand.

A-3.3 Monitoring Wells 347, 348, 526, and 527

Two sets of monitoring well pairs were installed in July 1998. The purpose of installing the shallow and deep well pairs was to add performance monitoring locations downgradient for the proposed extraction system. The well pairs include wells 347 and 348 and wells 526 and 527. The well locations are shown on Figure 2 of the RDR. Each well was constructed using 4-inch diameter schedule 40 PVC casing and 4-inch diameter and 20-foot long schedule 40 0.020 slot PVC screen. The boring/well logs are attached.

Well 347

Well 347 is the deep well in the 347/348 well pair. The lithology between the surface and the screened interval includes layers of silt, sand, and gravel. The water table was encountered at approximately 60 feet bgs during drilling. The well screen was completed in the lower groundwater zone which consists of gravel at this location. Total depth of the boring and well extends to 126.9 feet bgs. The well screen was installed from approximately 104.4 feet and 124.4 feet bgs.

Well 348

Well 348 is the shallow well in the 347/348 well pair. The lithology between the surface and the screened interval includes layers of silt, sand, and gravel. The water table was encountered at approximately 56.8 feet bgs during drilling. The well screen was completed in the shallow groundwater zone which consist of gravel at this location. Total depth of the boring extended to 78 feet bgs and the well extends to 76.5 feet bgs. The well screen was installed from approximately 54 feet to 74 feet bgs.

Well 526

Well 526 is the deep well in the 526/527 well pair. The lithology between the surface and the screened interval consists of gravel with one clay layer. The water table was encountered at approximately 49 feet bgs during drilling. The well screen was completed in the lower groundwater zone and consists of layers of sand and gravel. Total depth of the boring extended to 127.1 feet bgs and the well extends to 124.6 feet bgs. The well screen was installed from approximately 104.6 feet to 124.6 feet bgs.

Well 527

Well 527 is the shallow well in the 526/527 well pair. The lithology throughout the borehole consists of gravel. The water table was encountered at approximately 44.7 feet bgs during drilling. The total depth of the borehole 66.8 feet bgs and the total depth of the well is 62.6 feet bgs. The well screen was installed from approximately 40.1 feet to 60.1 feet bgs.

A-3.4 Exploratory Borings B-1 through B-4

Four boreholes (B-1 through B-4) were completed between July 12, 2998 and July 14, 1998. The borehole locations are shown on Figure 2 of the RDR. The soil borings were completed in the east plant area near the base of the gypsum stack. The purpose of the drilling program was to obtain subsurface soil samples for sieve analysis for characterization of the shallow aquifer materials in support of extraction well design. Total depths of the boreholes ranged from 75 feet bgs to 89 feet bgs. After completion, each borehole was abandoned and backfilled with bentonite pellets and/or bentonite grout to approximately 3 feet bgs. The remaining 3 feet was filled with cement to the surface.

Subsurface sediment/soil samples were collected from each borehole for grain size sieve analysis. A total of 15 samples samples were collected for grain size analysis. Samples were collected starting at or just below the water table within the shallow aquifer. The results of the sieve analyses will be used to assist with the construction design of the extraction wells in the east plant area, near the base of the gypsum stack.

B-1

Boring B-1 was installed on July 13, 1998 and is the western most boring completed during this investigation. It is located approximately 20 feet east-northeast of well 316. The boring log for B-1 is attached. The borehole was completed to a total depth of 89 feet bgs. In general, the vadose zone at B-1 is composed of layers of clay, silt, silty sand, sand, and gravel. The shallow aquifer at B-1 is composed of well graded gravel with sand to well graded gravel with silt and sand. Groundwater was encountered at approximately 76.6 feet bgs during drilling.

Grain size sieve analyses were performed on samples collected from the following depths within the shallow aquifer: 77 feet bgs, 80 feet bgs, 83 feet bgs, and 86 feet bgs. The grain size analysis results are attached. The results indicate the shallow aquifer is fairly coarse grained. Percent gravel in the samples ranged from 57.8 percent to 77.6 percent; sand ranged from 19.1 percent to 39.0 percent; and percent silt ranged from 3.2 to 7.0 percent. Median grain size ranged from fine to medium gravel.

B-2

Boring B-2, located between B-1 and B-3, was completed on July 12, 1998. It lies near the base of the gypsum stack and approximately 200 feet southeast of well 344. The boring log for B-2 is attached. The borehole was completed to a total depth of 87 feet bgs. In general, the vadose zone at B-2 is composed of layers of clay, silt, sand, and gravel. The shallow aquifer at B-2 is composed of well graded gravel to well graded gravel with silt and sand. Groundwater was encountered at approximately 75 feet bgs during drilling.

Grain size sieve analyses were performed on samples collected from the following depths within the shallow aquifer: 73 feet bgs, 75 feet bgs, 78 feet bgs, 81 feet bgs, and 83 feet. The grain size analysis

results for B-2 are attached. The results indicate the shallow aquifer at B-2 is fairly coarse grained. Based on the samples from the saturated zone, the percent gravel in the samples ranged from 72.5 percent to 79.9 percent. Sand ranged from 16.4 percent to 22.3 percent and silt and clay ranged from 3.7 percent to 6.2 percent. Median grain size in the samples ranged from very coarse sand to coarse gravel.

B-3

Boring B-3, completed on July 13, 1998, is located near the base of the gypsum stack and approximately 100 feet southwest of well 332. The boring log for B-3 is attached. Total depth of the borehole was 75 feet bgs. In general, the vadose zone at B-3 is composed of layers of silt and gravel. The shallow aquifer at B-3 is composed of well graded gravel to well graded gravel with silt. Groundwater was encountered approximately 66 feet bgs during drilling.

Grain size sieve analyses were performed on samples collected from the following depths within the shallow aquifer: 69 feet bgs and 71 feet bgs. The grain size analysis results are attached. The results indicate the shallow aquifer is coarse grained. Percent gravel in the samples ranged from 70.8 percent to 80.1 percent. Sand ranged from 16.4 percent to 19.3 percent and silt and clay ranged from 3.5 percent to 9.9 percent. Median grain size in the samples ranged from medium gravel to coarse gravel.

B-4

Boring B-4 was completed on July 14, 1998. It is located adjacent to boring B-2 near the base of the gypsum stack. The boring log for B-4 is attached. Total depth of the borehole was 87 feet bgs. In general, the vadose zone at B-4 is composed of clay, silt, sand, and gravel layers. The shallow aquifer at B-4 is composed of well graded gravel with sand. Groundwater was encountered at approximately 73.3 feet bgs during drilling.

Grain size sieve analyses were performed on samples collected from the following depths within the shallow aquifer: 74 feet bgs, 76 feet bgs, 78 feet bgs, 84 feet bgs. The grain size results are attached. The results indicate the shallow aquifer is coarse grained. Percent gravel in the samples ranged from 71.3 percent to 83.0 percent. Sand ranged from 14.7 percent to 23.2 percent and silt and clay ranged from 2.1 percent to 5.5 percent. Median grain size in the samples ranged from medium gravel to coarse gravel.

MFG, Inc.
Consulting Scientists and Engineers

LOG OF BORING 346

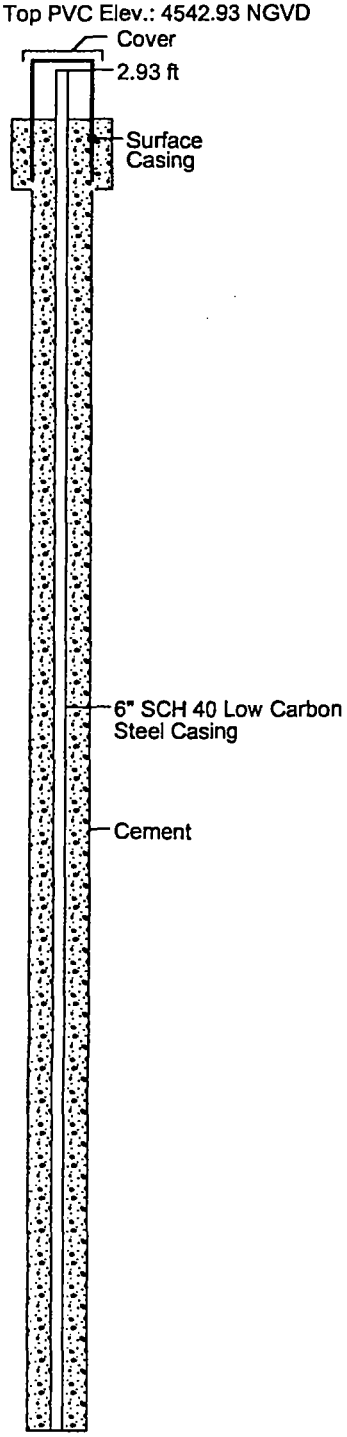
J.R Simplot Don Plant
Pocatello, Idaho

MFG Project# 015205

Drilling Agency	: Layne Christensen	Date Start/Completed	: 7/8/98 - 8/1/98
Drilling Method	: Dual Wall Rev.Circ. Air Hammer	TD of Borehole	: 257 ft bgs
Drill Bit	: 11" O.D.	Northing/Easting Coord:	451581.9/558629.5
Sampling Method	: 140 lb Hammer, 3' drop	Ground Surface Elev.	: 4540.0 NGVD
Sampler Type	: 1.5' Split Spoon	Logged By	: V. Martinez

Depth in	DESCRIPTION	USCS	GRAPHIC	Samples	Blow Count	Recovery (%)	REMARKS
0	SILT, pale brown (10YR 6/3), dry, soft, floury.						
2							
4							
6							
8							
10							
12							
14	As above. Brown (10YR 5/3).						
16							
18							
20							
22		ML					
24	As above.						
26							
28							
30							
32							
34	As above.						
36							
38							
40							
42							

Well: 346
Top PVC Elev.: 4542.93 NGVD



05-03-2002 d:\Natalie\5205-EMF\Logs\Well 346.BOR

MFG, Inc.
Consulting Scientists and Engineers

LOG OF BORING 346

J.R Simplot Don Plant
Pocatello, Idaho

MFG Project# 015205

Drilling Agency	: Layne Christensen	Date Start/Completed	: 7/8/98 - 8/1/98
Drilling Method	: Dual Wall Rev.Circ. Air Hammer	TD of Borehole	: 257 ft bgs
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Sampling Method	: 140 lb Hammer, 3' drop	Ground Surface Elev.	: 4540.0 NGVD
Sampler Type	: 1.5' Split Spoon	Logged By	: V. Martinez

Well: 346
Top PVC Elev.: 4542.93 NGVD

Depth in	DESCRIPTION	USCS	GRAPHIC	Samples	Blow Count	Recovery (%)	REMARKS
43							
45	As above. 1-3% fine to coarse gravel, rounded to subangular.						
47							
49							
51							
53							
55	As above. Pale brown (10YR 6/3), no gravel.						
57							
59							
61							
63							
65		ML					
67	As above. Light yellowish brown (10YR 6/4), 1-3% fine to coarse gravel.						
69							
71							
73	As above. No gravel.						
75							
77							
79							
81							
83							
85	As above. Brown (10YR 5/3).						

MFG, Inc.
Consulting Scientists and Engineers

LOG OF BORING 346

J.R Simplot Don Plant
Pocatello, Idaho

MFG Project# 015205

Drilling Agency	: Layne Christensen	Date Start/Completed	: 7/8/98 - 8/1/98
Drilling Method	: Dual Wall Rev.Circ. Air Hammer	TD of Borehole	: 257 ft bgs
Drill Bit	: 11" O.D.	Northing/Easting Coord:	451581.9/558629.5
Sampling Method	: 140 lb Hammer, 3' drop	Ground Surface Elev.	: 4540.0 NGVD
Sampler Type	: 1.5' Split Spoon	Logged By	: V. Martinez

Well: 346
Top PVC Elev.: 4542.93 NGVD

Depth in	DESCRIPTION	USCS	GRAPHIC	Samples	Blow Count	Recovery (%)	REMARKS
86							
88							
90							
92							
94	As above. Light yellowish brown (10YR 6/4), increase in gravel to 5%, fine to coarse, subangular vesicular basalt, 3% medium sand.						
96							
98							
100							
102							
104	As above. Yellowish brown (10yr 5/4), 1% to 3% fine to coarse gravel.						
106							
108	GRAVELLY SILT, very pale brown (10YR 7/3), 40% fine to coarse basalt and rhyolite gravel, less than 1% small cobbles, dry.	ML					
110							
112							
114							
116							
118							
120	SILT, yellowish brown (10YR 5/4), with 10% fine to medium sand, very slightly damp.						
122							
124							
126	GRAVELLY SILT WITH SAND, yellowish brown (10YR 5/4), 40% medium sand to medium gravel, coarse fraction is well graded, dry.						
128							

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LOG OF BORING 346

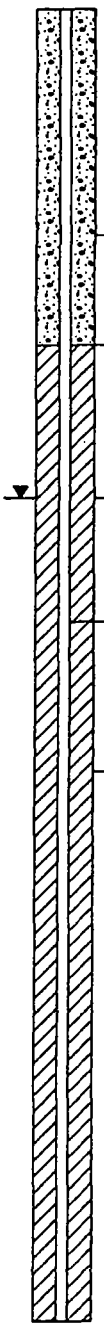
J.R Simplot Don Plant
Pocatello, Idaho

MFG Project# 015205

Drilling Agency	: Layne Christensen	Date Start/Completed	: 7/8/98 - 8/1/98
Drilling Method	: Dual Wall Rev.Circ. Air Hammer	TD of Borehole	: 257 ft bgs
Drill Bit	: 11" O.D.	Northing/Easting Coord:	451581.9/558629.5
Sampling Method	: 140 lb Hammer, 3' drop	Ground Surface Elev.	: 4540.0 NGVD
Sampler Type	: 1.5' Split Spoon	Logged By	: V. Martinez

Depth in	DESCRIPTION	USCS	GRAPHIC	Samples	Blow Count	Recovery (%)	REMARKS
129							
131							
133							
135							
137							
139	SILT, dark yellowish brown (10YR 4/4), 5% fine to medium gravel, composed of rhyolite and dark volcanics.						
141							Moist
143	As above. Brown to dark brown (10YR 4/3).						Wet
145	As above. Dark yellowish brown (10YR 4/6), 1% gravel, wet to saturated.			1	5 6 7	60	
147							Added water to aid with returns.
149							
151	SILT, dark yellowish brown (10YR 4/4), 10% fine to medium sand, trace fine to medium sand, trace fine to coarse rhyolite and basalt gravel.	ML		2	9 10 10	20	
153							
155							
157							
159	As above.						
161							
163							
165							
167							
169							
171	SILT WITH SAND, dark yellow brown (10YR 4/4), 15% fine to medium sand, 5% rhyolite gravel, saturated			3	27 45 R		

Well: 346
Top PVC Elev.: 4542.93 NGVD



MFG, Inc.
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LOG OF BORING 346

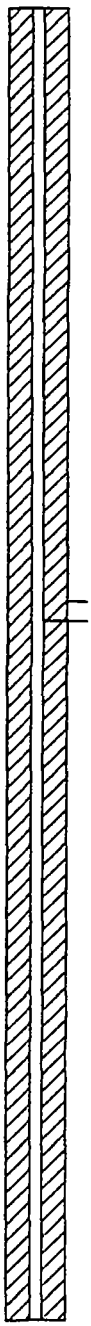
J.R Simplot Don Plant
Pocatello, Idaho

MFG Project# 015205

Drilling Agency	: Layne Christensen	Date Start/Completed	: 7/8/98 - 8/1/98
Drilling Method	: Dual Wall Rev.Circ. Air Hammer	TD of Borehole	: 257 ft bgs
Drill Bit	: 11" O.D.	Northing/Easting Coord:	451581.9/558629.5
Sampling Method	: 140 lb Hammer, 3' drop	Ground Surface Elev.	: 4540.0 NGVD
Sampler Type	: 1.5' Split Spoon	Logged By	: V. Martinez

Well: 346
Top PVC Elev.: 4542.93 NGVD

Depth in	DESCRIPTION	USCS	GRAPHIC	Samples	Blow Count	Recovery (%)	REMARKS
172							
174							
176							
178							
180	SILT, dark yellow brown (10YR 4/4), trace rhyolite cobbles (very pale brown 10YR 7/3) with trace basalt, saturated.						
182							
184							
186		ML					Very hard drilling, possilbly rhyolite boulder.
188	SILT WITH SAND, dark yellow brown (10YR 4/4), 10-15% sand, 10% rhyolite gravel.						
190							
192							
194							
196							
198							
200	SILTY GRAVEL, reddish brown (5YR 4/4) to yellowish brown (10YR 5/6), well graded, small to very coarse, angular to subangular, saturated.	GM					Could not get SPT sample.
202							
204	SILT WITH GRAVEL, yellow brown (10YR 5/4) sand, reddish brown (5YR 4/4) to yellow brown (10YR 5/6) gravel, fine to coarse angular to subangular gravel.						
206							
208							
210		ML					
212							
214							



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LOG OF BORING 346

J.R Simplot Don Plant
Pocatello, Idaho

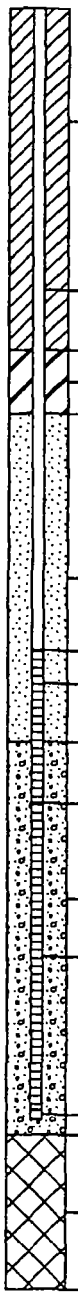
MFG Project# 015205

Drilling Agency	: Layne Christensen	Date Start/Completed	: 7/8/98 - 8/1/98
Drilling Method	: Dual Wall Rev.Circ. Air Hammer	TD of Borehole	: 257 ft bgs
Drill Bit	: 11" O.D.	Northing/Easting Coord:	451581.9/558629.5
Sampling Method	: 140 lb Hammer, 3' drop	Ground Surface Elev.	: 4540.0 NGVD
Sampler Type	: 1.5' Split Spoon	Logged By	: V. Martinez

Depth in	DESCRIPTION	USCS	Samples	Blow Count	Recovery (%)	REMARKS
215–219		ML				
221–229	SILTY GRAVEL WITH SAND, light brown gray (10YR 6/2) with dark reddish brown (5YR 3/3) gravel, well graded rhyolite gravel, 15% fine to medium sand.	GM				
231–239	SILT WITH SAND, light brown gray (10YR 6/2), trace gravel and cobbles.	ML				
241–249	SAND, pale brown (10YR 6/3), well graded, very fine to coarse sand, 13% fines, 10% gravel and cobbles, cobbles are subrounded and flat.	SW				End of drilling for 7/8/98 Lots of water.
251	SAND, light brown (7.5YR 6/4), fine to medium, trace fines, 40% quartz composition, less than 1% olivine.	SW	4	6 7 9	20	
253–257	Weathered RHYOLITE bedrock, red brown (5YR 5/4), 15% gray phenocrysts.	VL	5		0	Harder drilling.

Total depth of borehole = 257 feet bgs.

Well: 346
Top PVC Elev.: 4542.93 NGVD



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Consulting Scientists and Engineers

LOG OF BORING 347

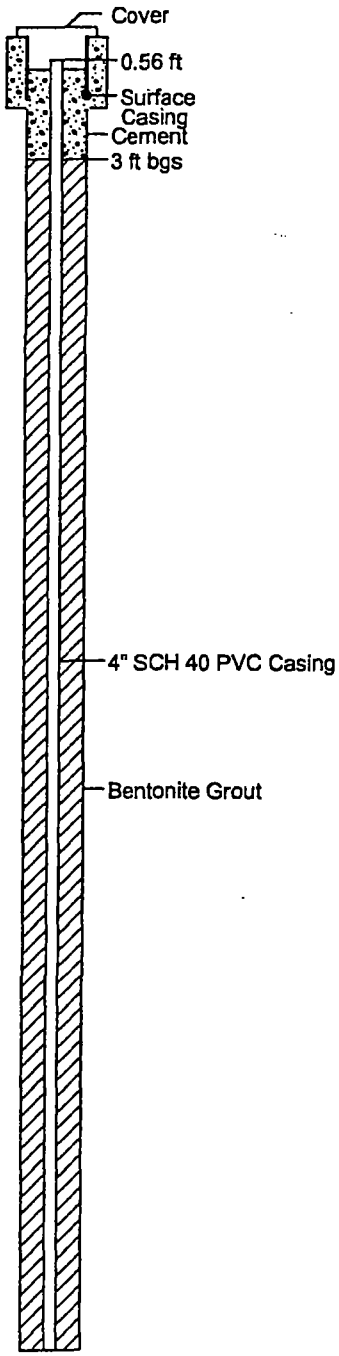
J.R Simplot Don Plant
Pocatello, Idaho

MFG Project# 015205

Drilling Agency	: Layne Christensen	TD of Borehole	: 126.92 ft bgs
Drilling Method	: Dual Wall Rev.Circ. Air Hammer	Northing/Easting Coord:	453326.4/560165.6
Drill Bit	: 9" O.D.	Ground Surface Elev.	: 4440.5 NGVD
Sampler Type	: Grab	Logged By	: V. Martinez
Date Start/Completed	: 7/10/98 - 7/11/98		

Depth in	DESCRIPTION	USCS	GRAPHIC	REMARKS
0	Fill. Gravel and silt.	AR		
2	SILT, grayish brown (10YR 5/2), less than 5% medium sand, less than 1% gravel, moist.	ML		
8	SILTY SAND WITH GRAVEL, grayish brown (10YR 5/2), well graded coarse sand to coarse gravel, less than 40% silt.	SM		
12	SAND WITH SILT AND GRAVEL, brown (10YR 5/3), well graded sand, 5-12% silt, 1% coarse gravel, sand is primarily multicolored quartzite with some dark volcanics, angular to subanguar, dry.	SW-SM		
16	GRAVEL, well graded, primarily multicolored quartzite, 10% sand, dry.	GW		
18	As above. Well graded coarse sand to cobbles.			

Well: 347
Top PVC Elev.: 4439.94 NGVD



MFG, Inc.
Consulting Scientists and Engineers

LOG OF BORING 347

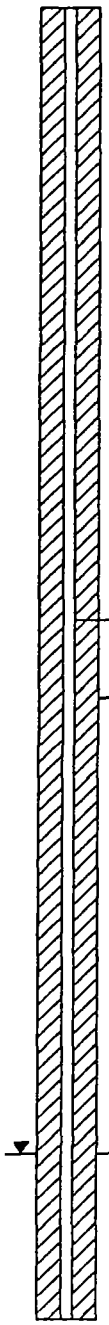
J.R Simplot Don Plant
Pocatello, Idaho

MFG Project# 015205

Drilling Agency	: Layne Christensen	TD of Borehole	: 126.92 ft bgs
Drilling Method	: Dual Wall Rev.Circ. Air Hammer	Northing/Easting Coord:	453326.4/560165.6
Drill Bit	: 9" O.D.	Ground Surface Elev.	: 4440.5 NGVD
Sampler Type	: Grab	Logged By	: V. Martinez
Date Start/Completed	: 7/10/98 - 7/11/98		

Well: 347
Top PVC Elev.: 4439.94 NGVD

Depth in	DESCRIPTION	USCS	GRAPHIC	REMARKS
32				
34	As above. Well graded gravel and cobbles, 5% volcanics, well rounded to subangular.			
36				
38				
40				
42				
44	GRAVEL WITH SAND, brown (10YR 5/3), well graded sand and gravel, 1% of sand and gravel is multicolored quartzite, rounded, 40% sand, less than 5% fines.			
46				
48		GW		
50				
52				
54	As above. Increase in sand, rounded to subangular, damp to moist.			
56				
58				
60	As above. Decrease in sand, saturated.			
62				
64				



MFG, Inc.
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LOG OF BORING 347

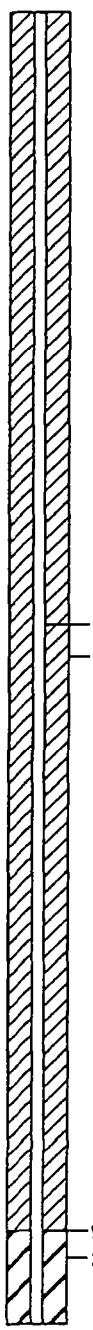
J.R Simplot Don Plant
Pocatello, Idaho

MFG Project# 015205

Drilling Agency	: Layne Christensen	TD of Borehole	: 126.92 ft bgs
Drilling Method	: Dual Wall Rev.Circ. Air Hammer	Northing/Easting Coord:	453326.4/560165.6
Drill Bit	: 9" O.D.	Ground Surface Elev.	: 4440.5 NGVD
Sampler Type	: Grab	Logged By	: V. Martinez
Date Start/Completed	: 7/10/98 - 7/11/98		

Depth in	DESCRIPTION	USCS	GRAPHIC	REMARKS
64	GRAVEL, multicolored quartzite, rounded to subangular, 10% well graded sand, saturated.	GW		
66				
68				
70	As above. 1-5% cobbles.			
72	As above. 1-5% cobbles and boulders.			
74				
76				
78				
80				
82				
84				
86				
88	CLAY, brown (10YR 5/3), 1-5% gray areas with iron stains, fat, very sticky.	CH		
90				
92				
94		GC		
96				

Well: 347
Top PVC Elev.: 4439.94 NGVD



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LOG OF BORING 347

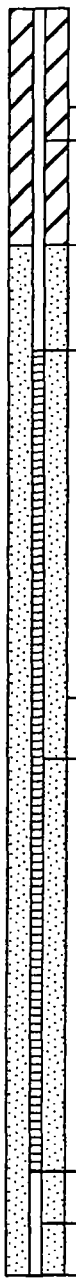
J.R Simplot Don Plant
Pocatello, Idaho

MFG Project# 015205

Drilling Agency	: Layne Christensen	TD of Borehole	: 126.92 ft bgs
Drilling Method	: Dual Wall Rev.Circ. Air Hammer	Northing/Easting Coord:	453326.4/560165.6
Drill Bit	: 9" O.D.	Ground Surface Elev.	: 4440.5 NGVD
Sampler Type	: Grab	Logged By	: V. Martinez
Date Start/Completed	: 7/10/98 - 7/11/98		

Depth in	DESCRIPTION	USCS	GRAPHIC	REMARKS
96	CLAYEY GRAVEL, brown (10YR 5/3), gravel is primarily dark volcanics, 1% quartzite.	GC		
98				
100	As above. Decrease in clay.			
102				Producing good water.
104	GRAVEL WITH SAND, dark yellowish brown (10YR 3/6), gravel is well graded multicolored quartzite, rounded to subangular, 20% fine sand, 1-5% cobbles.	GW		
106				
108				
110				
112				
114	As above. Decrease in fine sand.			
116				
118				
120				
122	As above. Increase in sand.			
124	SAND WITH GRAVEL, dark yellowish brown (10YR 3/6), gravel is rounded to subangular multicolored quartzite, 1% cobbles.	SW		
126				
128	Total depth of borehole = 126.92 ft bgs			

Well: 347
Top PVC Elev.: 4439.94 NGVD



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LOG OF BORING 348

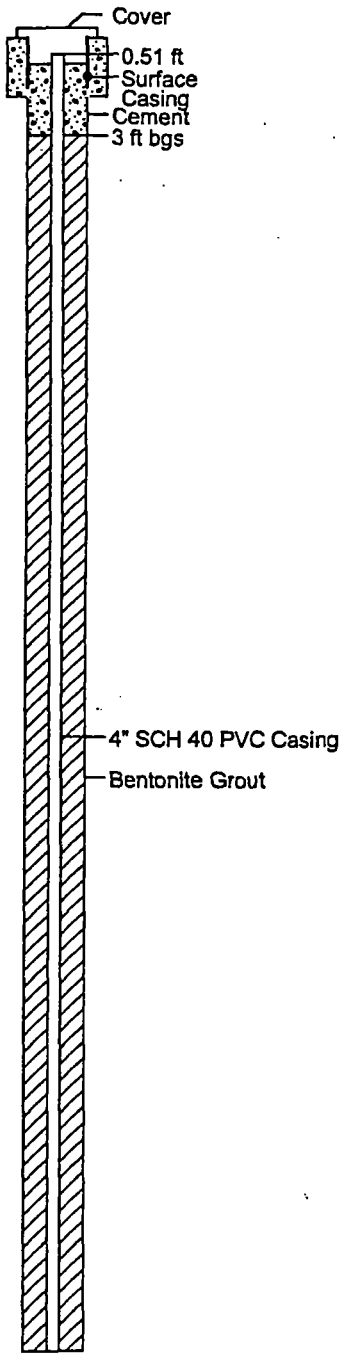
J.R Simplot Don Plant
Pocatello, Idaho

MFG Project# 015205

Drilling Agency	: Layne Christensen	TD of Borehole	: 78 ft bgs
Drilling Method	: Dual Wall Rev.Circ. Air Hammer	Northing/Easting Coord:	453323.7/560177.2
Drill Bit	: 9" O.D.	Ground Surface Elev.	: 4440.5 NGVD
Sampler Type	: Grab	Logged By	: V. Martinez
Date Start/Completed	: 7/11/98-7/11/98		

Depth in	DESCRIPTION	USCS	GRAPHIC	REMARKS
0	Fill. Sand and gravel.	AR		
2	SILT, grayish brown (10YR 5/2), 3% fine to medium sand, 1% gravel, damp.	ML		
8	SILTY SAND WITH GRAVEL, grayish brown (10YR 5/2), well graded sand to coarse gravel, 40% silt, moist.	SM		
12	GRAVEL WITH SILT AND SAND, brown (10YR 5/3), well graded sand and gravel, damp.	GW-GM		
20	GRAVEL WITH SAND, brown (10YR 5/3), coarse sand to cobbles, 5% cobbles, gravel and cobbles are rounded to subgangular and primarily quartzite.	GW		
28	As above. Decrease in sand and cobbles.	GW		
38	As above. Well graded gravel to cobbles, increase in sand to 20%, primarily quartzite.	GW		

Well: 348
Top PVC Elev.: 4439.97 NGVD



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LOG OF BORING 348

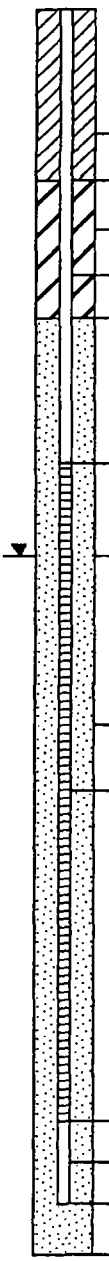
J.R Simplot Don Plant
Pocatello, Idaho

MFG Project# 015205

Drilling Agency	: Layne Christensen	TD of Borehole	: 78 ft bgs
Drilling Method	: Dual Wall Rev.Circ. Air Hammer	Northing/Easting Coord:	453323.7/560177.2
Drill Bit	: 9" O.D.	Ground Surface Elev.	: 4440.5 NGVD
Sampler Type	: Grab	Logged By	: V. Martinez
Date Start/Completed	: 7/11/98-7/11/98		

Depth in	DESCRIPTION	USCS	GRAPHIC	REMARKS
40	GRAVEL WITH SAND, brown (10YR 5/3), coarse sand to cobbles, 5% cobbles, gravel and cobbles are rounded to subgangular and primarily quartzite.	GW		
42				
44				
46				
48				
50				
52				
54				
56				
58				
60				
62	As above. Increase in fine gravel.			
64				
66				
68				
70	As above. Well graded gravel and coarse sand, 10% fine to medium sand, sand and gravel.			
72				
74				
76	GRAVEL, multicolored quartzite, poorly graded, fine gravel and coarse sand, 10% fine to medium sand, rounded to subangular.	GP		Low returns, may be pushing down on large rock.
78	Total depth of borehole = 78 ft bgs			
80				

Well: 348
Top PVC Elev.: 4439.97 NGVD



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LOG OF BORING 526

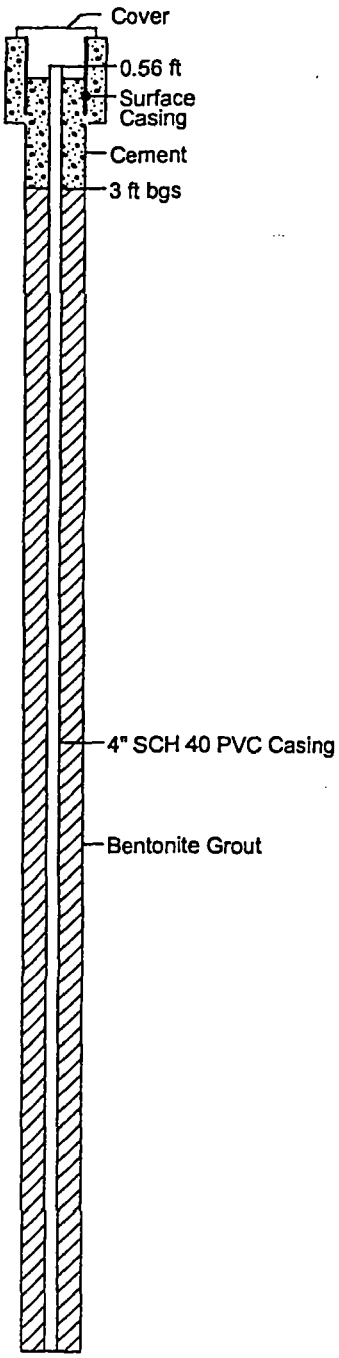
J.R Simplot Don Plant
Pocatello, Idaho

MFG Project# 015205

Drilling Agency	: Layne Christensen	TD of Borehole	: 127.1ft bgs
Drilling Method	: Dual Wall Rev.Circ. Air Hammer	Northing/Easting Coord:	453229.8/561280.3
Drill Bit	: 9" O.D.	Ground Surface Elev.	: 4429.75 NGVD
Sampler Type	: Grab	Logged By	: V. Martinez
Date Start/Completed	: 7/14/98-7/15/98		

Depth in	DESCRIPTION	USCS	GRAPHIC	REMARKS
0	Asphalt and fill.	AR		
2	GRAVEL WITH SAND, grayish brown (10YR 5/2), well graded, 30% well graded sand, gravel and sand are multicolored quartzite, subrounded to subangular, dry.	GW		
4				
6				
8				
10				
12	As above. 1% to 5% cobbles.			
14	As above. Decrease in sand to 15%, light brownish gravy (10YR 6/2).			
16				
18				
20				
22				
24	As above. 25% sand, well graded.			
26				

Well: 526
Top PVC Elev.: 4429.19 NGVD



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LOG OF BORING 526

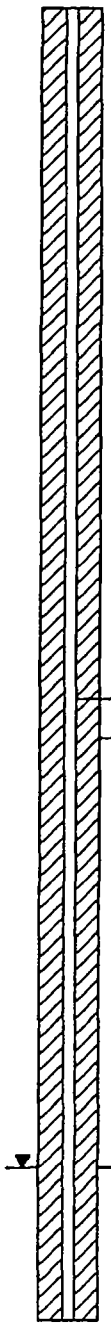
J.R Simplot Don Plant
Pocatello, Idaho

MFG Project# 015205

Drilling Agency	: Layne Christensen	TD of Borehole	: 127.1ft bgs
Drilling Method	: Dual Wall Rev.Circ. Air Hammer	Northing/Easting Coord:	453229.8/561280.3
Drill Bit	: 9" O.D.	Ground Surface Elev.	: 4429.75 NGVD
Sampler Type	: Grab	Logged By	: V. Martinez
Date Start/Completed	: 7/14/98-7/15/98		

Well: 526
Top PVC Elev.: 4429.19 NGVD

Depth in	DESCRIPTION	USCS	GRAPHIC	REMARKS
26				
28		GW		
30	As above. Yellowish brown (10YR 5/4).			
32	GRAVEL WITH SILT AND SAND, brown (10YR 5/3), well graded, 20% well graded sand, sand and gravel are subangular to rounded multicolored quartzite, damp.			
34				
36				
38				
40	As above. 5% cobbles.	GW-GM		
42				
44				
46				
48				
50	GRAVEL WITH SAND, brown (10YR 5/3), sand and gravel are subangular to subrounded multicolored quartzite, wet.	GW		Abundant water
52				



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LOG OF BORING 526

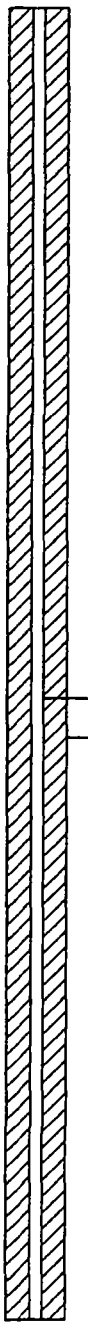
J.R Simplot Don Plant
Pocatello, Idaho

MFG Project# 015205

Drilling Agency	: Layne Christensen	TD of Borehole	: 127.1ft bgs
Drilling Method	: Dual Wall Rev.Circ. Air Hammer	Northing/Easting Coord:	453229.8/561280.3
Drill Bit	: 9" O.D.	Ground Surface Elev.	: 4429.75 NGVD
Sampler Type	: Grab	Logged By	: V. Martinez
Date Start/Completed	: 7/14/98-7/15/98		

Well: 526
Top PVC Elev.: 4429.19 NGVD

Depth in	DESCRIPTION	USCS	GRAPHIC	REMARKS
52				
54	As above. Increase in silt to 5%.			
56				
58				
60				
62	As above. Decrease in sand. As above. Increase cobbles, decrease silt.			
64				
66		GW		
68				
70				
72				
74				
76	Well graded gravel and cobbles with coarse sand.			
78				



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LOG OF BORING 526

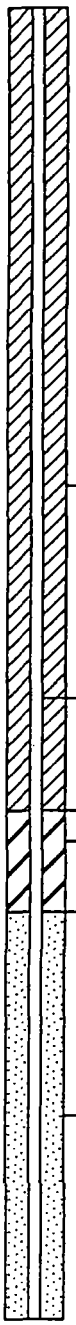
J.R Simplot Don Plant
Pocatello, Idaho

MFG Project# 015205

Drilling Agency	: Layne Christensen	TD of Borehole	: 127.1ft bgs
Drilling Method	: Dual Wall Rev.Circ. Air Hammer	Northing/Easting Coord:	453229.8/561280.3
Drill Bit	: 9" O.D.	Ground Surface Elev.	: 4429.75 NGVD
Sampler Type	: Grab	Logged By	: V. Martinez
Date Start/Completed	: 7/14/98-7/15/98		

Depth in	DESCRIPTION	USCS	GRAPHIC	REMARKS
78				
80				
82				
84	Large boulder (1.5 ft in size). Cobbly layer.	GW		
86				
88				
90				
92	CLAY WITH GRAVEL, brown (10YR 5/5), lean, gravel is subangular to subrounded quartzite, wet.	CL		
94	GRAVEL WITH SAND, brown (10YR 5/3), well graded, abundant cobbles, saturated.	GW		
96				
98				
100				
102				
104				

Well: 526
Top PVC Elev.: 4429.19 NGVD



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LOG OF BORING 526

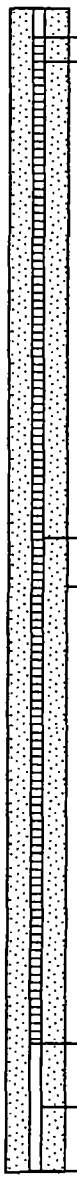
J.R Simplot Don Plant
Pocatello, Idaho

MFG Project# 015205

Drilling Agency	: Layne Christensen	TD of Borehole	: 127.1ft bgs
Drilling Method	: Dual Wall Rev.Circ. Air Hammer	Northing/Easting Coord:	453229.8/561280.3
Drill Bit	: 9" O.D.	Ground Surface Elev.	: 4429.75 NGVD
Sampler Type	: Grab	Logged By	: V. Martinez
Date Start/Completed	: 7/14/98-7/15/98		

Depth in	DESCRIPTION	USCS	GRAPHIC	REMARKS
104				
	As above. Yellowish brown (10YR 5/4).			
106				
108				
110	As above. Decrease in silt.	GW		
112				
114				
116	SAND WITH GRAVEL, yellowish brown (10YR 5/4), well graded sand, 40% gravel, sand and gravel are subrounded to subangular multicolored quartzite, saturated.			
118				
120		SW		
122	Increase in gravel.			
124	GRAVEL WITH SAND, multicolored, well graded, sand and gravel are subrounded to subangular multicolored quartzite, saturated.	GW		
126				
128	Total depth of borehole = 127.1 ft bgs			
130				

Well: 526
Top PVC Elev.: 4429.19 NGVD



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LOG OF BORING 527

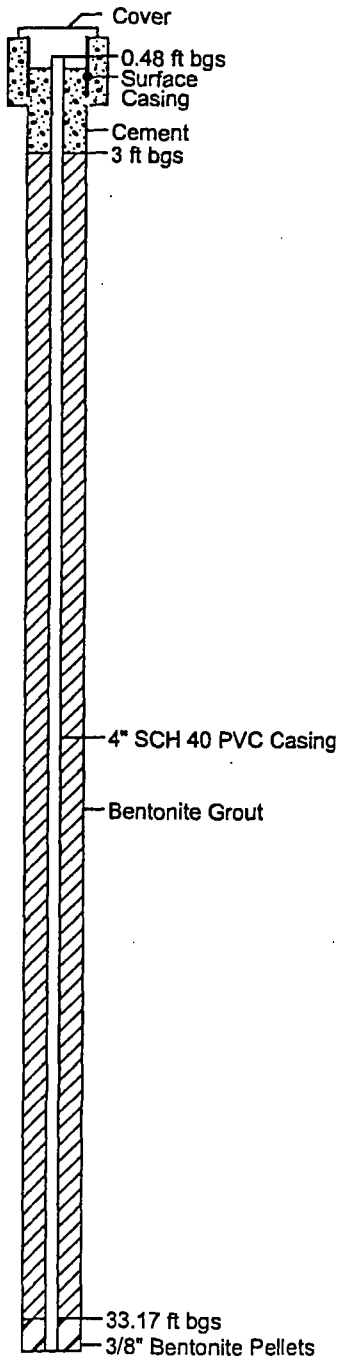
J.R Simplot Don Plant
Pocatello, Idaho

MFG Project# 015205

Drilling Agency	: Layne Christensen	TD of Borehole	: 66.75 ft bgs
Drilling Method	: Dual Wall Rev.Circ. Air Hammer	Northing/Easting Coord:	453222.5/561305.9
Drill Bit	: 9" O.D.	Ground Surface Elev.	: 4429.33 NGVD
Sampler Type	: Grab	Logged By	: V. Martinez
Date Start/Completed	: 7/16/98-7/16/98		

Depth in	DESCRIPTION	USCS	GRAPHIC	REMARKS
0	Asphalt and fill.	AR		
2	GRAVEL WITH SAND, grayish brown (10YR 5/2), well graded, 30% well graded sand, gravel and sand are multicolored quartzite, subrounded to subangular, dry.	GW		2-11ft: No returns, pushing rock down, log based on well #526 log and cuttings returned later.
4				
6				
8				
10				
12				
14				
16	As above. Brown (10YR 5/3), 40% well graded sand, damp.			
18				
20	As above. 30% well graded sand, 1 % cobbles, 5% silt.			
22				
24				
26				
28	10% well graded sand, decreased silt.			
30				
32	As above. Increase in cobbles to 10%.			
34		GW-GM		

Well: 527
Top PVC Elev.: 4428.85 NGVD



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LOG OF BORING 527

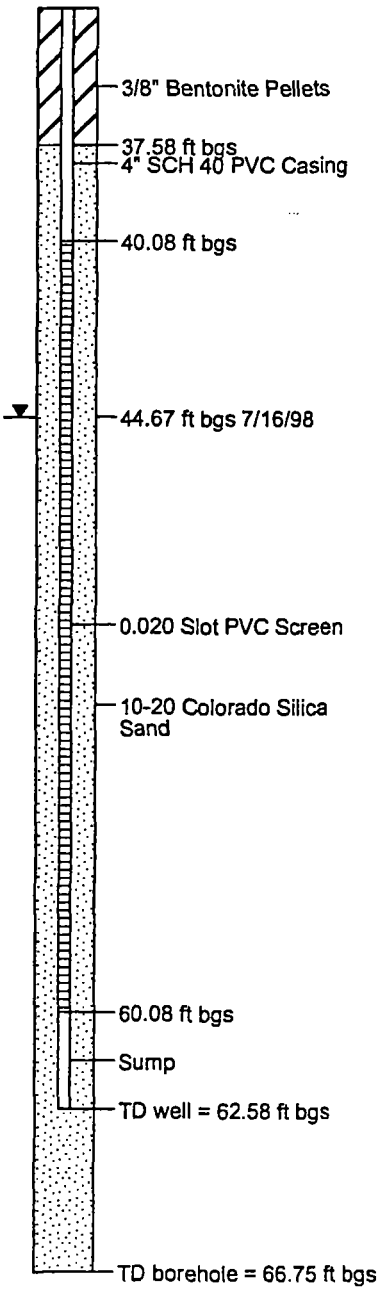
J.R Simplot Don Plant
Pocatello, Idaho

MFG Project# 015205

Drilling Agency	: Layne Christensen	TD of Borehole	: 66.75 ft bgs
Drilling Method	: Dual Wall Rev.Circ. Air Hammer	Northing/Easting Coord:	453222.5/561305.9
Drill Bit	: 9" O.D.	Ground Surface Elev.	: 4429.33 NGVD
Sampler Type	: Grab	Logged By	: V. Martinez
Date Start/Completed	: 7/16/98-7/16/98		

Depth in	DESCRIPTION	USCS	GRAPHIC	REMARKS
34	GRAVEL WITH SILT AND SAND, brown (10YR 5/3), sand and gravel are primarily multicolored quartzite with 5% dark volcanics, subrounded to subangular.	GW-GM		
36				
38	As above. Decrease in silt.			
40				
42	GRAVEL WITH SAND, brown (10YR 5/3), well graded, 15% well graded sand, sand and gravel are primarily quartzite with minor volcanics, subrounded to subangular, damp.	GW		
44				
46				
48				
50				
52				
54				
56				
58				
60				
62				
64				
66				
68	Total depth of borehole = 66.75 ft bgs.			

Well: 527
Top PVC Elev.: 4428.85 NGVD



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LOG OF BORING B-1

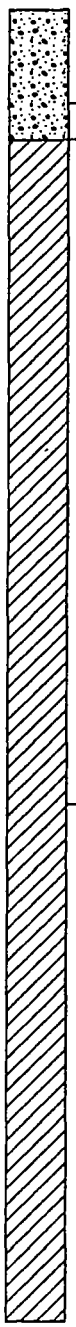
J.R Simplot Don Plant
Pocatello, Idaho

MFG Project# 015205

Drilling Agency	: Layne Christensen	TD of Borehole	: 89 ft bgs
Drilling Method	: Dual Wall Rev.Circ. Air Hammer	Northing/Easting Coord:	451987.0/560672.2
Drill Bit	: 9" O.D.	Logged By	: V. Martinez
Sampler Type	: Grab		
Date Start/Completed	: 7/12/98-7/12/98		

Depth in	DESCRIPTION	USCS	GRAPHIC	REMARKS
0	Gravel fill.	AR		
4	SILT, dark brown to brown (10YR 4/3), floury, damp.	ML		
14	As above.			
20	GRAVELLY SILT, brown (10YR 5/3), 40% well graded gravel, gravel is angular to rounded multicolored quartzite with 1-5% dark volcanics, moist.			
28	SILTY GRAVEL WITH SAND, yellowish brown (10YR 5/4), gravel is angular to rounded multicolored quartzite with trace dark volcanics, damp.	GM		
30				

Well:
Top PVC Elev.:



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LOG OF BORING B-1

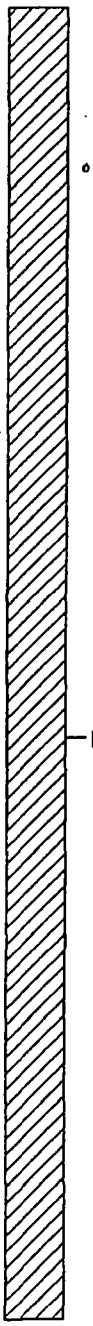
J.R Simplot Don Plant
Pocatello, Idaho

MFG Project# 015205

Drilling Agency	: Layne Christensen	TD of Borehole	: 89 ft bgs
Drilling Method	: Dual Wall Rev.Circ. Air Hammer	Northing/Easting Coord:	451987.0/560672.2
Drill Bit	: 9" O.D.	Logged By	: V. Martinez
Sampler Type	: Grab		
Date Start/Completed	: 7/12/98-7/12/98		

Depth in	DESCRIPTION	USCS	GRAPHIC	REMARKS
30				
32	Increased silt.	GM		
34				
36	SAND WITH GRAVEL AND SILT, brown (10YR 5/3), well graded sand, sand and gravel are primarily multicolored quartzite, rounded to subangular, damp.	SW-SM		
38				
40				
42	SAND AND GRAVEL, yellowish brown (10YR 5/4), well graded sand, damp.	SW		
44				
46	GRAVEL WITH SAND AND SILT, yellowish brown (10YR 5/4), gravel is rounded to subangular with 10% cobbles, damp.	GW-GM		
48				
50				
52	SILT, brown (10YR 5/3), floury, damp.	ML		
54				
56	As above. 1% gravel.			
58	As above. Decrease in gravel.			
60				

Well:
Top PVC Elev.:



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Consulting Scientists and Engineers

LOG OF BORING B-1

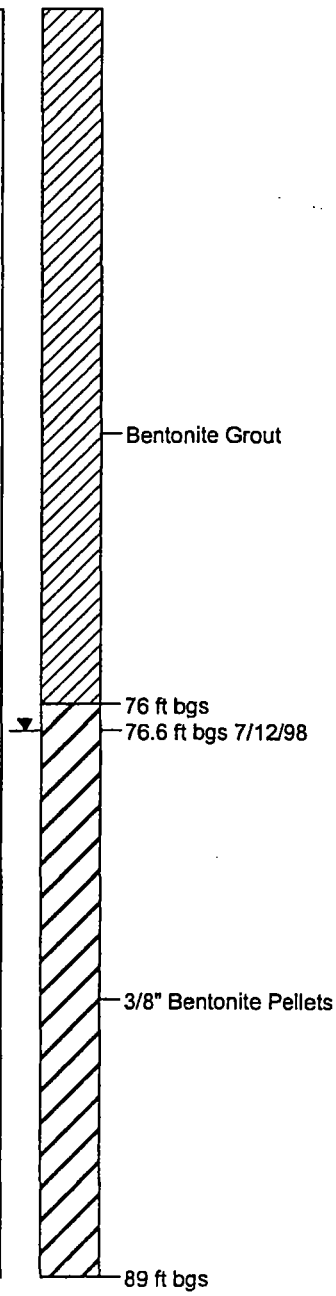
J.R Simplot Don Plant
Pocatello, Idaho

MFG Project# 015205

Drilling Agency	: Layne Christensen	TD of Borehole	: 89 ft bgs
Drilling Method	: Dual Wall Rev.Circ. Air Hammer	Northing/Easting Coord:	451987.0/560672.2
Drill Bit	: 9" O.D.	Logged By	: V. Martinez
Sampler Type	: Grab		
Date Start/Completed	: 7/12/98-7/12/98		

Depth in	DESCRIPTION	USCS	REMARKS
60–68	As above. Brown (7.5YR 5/4).	ML	
70	CLAY, dark brown to brown (7.5YR 4/4), lean, damp to moist.	CL	
72	SILTY SAND WITH GRAVEL, yellowish brown (10YR 5/4), gravel is subrounded to subangular primarily quartzite with 1-5% gravel, damp.	SM	
74	GRAVEL WITH SAND AND SILT, yellowish brown (10YR 5/4), well graded, gravel and sand, subrounded to subangular, primarily multicolored quartzite with 1-5% dark volcanics.	GW-GM	
76	GRAVEL WITH SAND, yellowish brown (10YR 5/4), well graded gravel and sand, 8% cobbles, 3% fines, gravel as above at 80 ft bgs, moist to wet.	GW	Sieve Analysis: 76 ft bgs
80	GRAVEL WITH SILT AND SAND, yellowish brown (10YR 5/4), gravel as above at 80 ft bgs.	GW-GM	Sieve analysis: 80 ft bgs
82–84	GRAVEL WITH SAND, yellowish brown (10YR 5/4), 15% cobbles, gravel as above at 80 ft bgs, saturated.	GW	Sieve analysis: 83 ft bgs
86	As above. Decrease in cobbles to 6%.		Sieve analysis: 86 ft bgs
88	CLAY, yellowish brown (10YR 5/4), lean, 1% fine dark volcanic gravel, wet to moist.	CL	
90	Total depth of borehole = 89 ft bgs.		

Well:
Top PVC Elev.:



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LOG OF BORING B-2

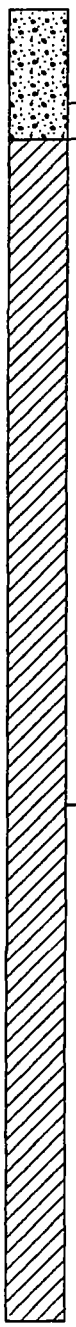
J.R Simplot Don Plant
Pocatello, Idaho

MFG Project# 015205

Drilling Agency	: Layne Christensen	TD of Borehole	: 87 ft bgs
Drilling Method	: Dual Wall Rev.Circ. Air Hammer	Northing/Easting Coord:	452260.1/560882.0
Drill Bit	: 9" O.D.	Ground Surface Elev.	: 4461.0 NGVD
Sampler Type	: Grab	Logged By	: V. Martinez
Date Start/Completed	: 7/12/98-7/12/98		

Depth in	DESCRIPTION	USCS	GRAPHIC	REMARKS
0–4	Fill. dark gray, gravel with silt and gypsum.	AR		
4–10	SILTY GRAVEL, very dark grayish brown (10YR 3/2), possibly fill.	GM-AR		
10–18	SILT, dark brown to brown (10YR 4/3), damp.	ML		
18–20	SILTY GRAVEL WITH SAND, dark grayish brown (10YR 4/2), 1-5% cobbles, gravel is well graded, primarily multicolored quartzite.	GM		
20–30	GRAVEL WITH SILT AND SAND, brown (10YR 5/3), well graded gravel and sand, 1-5% cobbles, gravel is multicolored quartzite, damp.	GW-GM / GP-GM		

Well:
Top PVC Elev.:



MFG, Inc.
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LOG OF BORING B-2

J.R Simplot Don Plant
Pocatello, Idaho

MFG Project# 015205

Drilling Agency	: Layne Christensen	TD of Borehole	: 87 ft bgs
Drilling Method	: Dual Wall Rev.Circ. Air Hammer	Northing/Easting Coord:	452260.1/560882.0
Drill Bit	: 9" O.D.	Ground Surface Elev.	: 4461.0 NGVD
Sampler Type	: Grab	Logged By	: V. Martinez
Date Start/Completed	: 7/12/98-7/12/98		

Depth in	DESCRIPTION	USCS	GRAPHIC	REMARKS
30	GRAVEL WITH SILT AND SAND, brown (10YR 5/3), poorly graded gravel and sand, gravel is multicolored quartzite, damp.	GP-GM		
32				
34				
36				
38				
40				
42	GRAVEL WITH SAND, brown (10YR 5/3), well graded gravel and sand, gravel is subrounded to subangular, primarily multicolored quartzite, dry to damp.	GW		
44				
46	As above. 5% cobbles.			
48				
50				
52				
54	SILT, brown (10YR 5/3), 10% sand and gravel, damp.	ML		
56				
58	CLAY, brown (10YR 5/3), lean, 1% angular to subangular dark volcanic gravel, moist.	CL		
60				

Well:
Top PVC Elev.:

Bentonite Grout

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MFG, Inc.
Consulting Scientists and Engineers

LOG OF BORING B-2

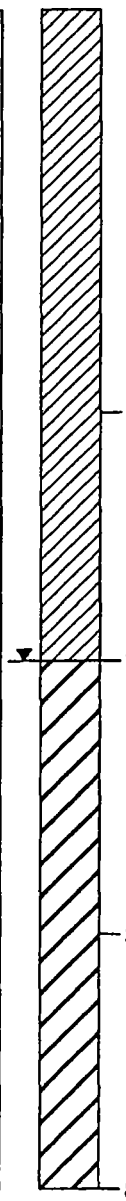
J.R Simplot Don Plant
Pocatello, Idaho

MFG Project# 015205

Drilling Agency	: Layne Christensen	TD of Borehole	: 87 ft bgs
Drilling Method	: Dual Wall Rev.Circ. Air Hammer	Northing/Easting Coord:	452260.1/560882.0
Drill Bit	: 9" O.D.	Ground Surface Elev.	: 4461.0 NGVD
Sampler Type	: Grab	Logged By	: V. Martinez
Date Start/Completed	: 7/12/98-7/12/98		

Depth in	DESCRIPTION	USCS	REMARKS
60–62	CLAY, brown (10YR 5/3), lean, 1% angular to subangular dark volcanic gravel, moist.	CL	
62–64			
64–66	SILT WITH SAND, brown (7.5YR 5/4), very fine sand, damp.	ML	
66–68	SILTY GRAVEL, brown (7.5YR 5/4), subangular to subrounded gravel, multicolored quartzite.	GM	
68–70			
70–72	SAND WITH GRAVEL, brown (7.5YR 5/4), poorly graded sand, medium sand, 40% fine to coarse gravel, subangular to subrounded, multicolored quartzite, 8% cobbles, moist to wet.	SP	Sieve Analysis: 73-74 ft bgs
72–74			
74–76	GRAVEL WITH SAND, brown (10YR 5/3), well graded gravel and sand, 5% cobbles, gravel is primarily multicolored quartzite, moist to wet.	GW	Sieve analysis: 75 ft bgs
76–78			
78–80			Sieve analysis: 78-80 ft bgs
80–82	As above. Increase in silt to 5%		Sieve analysis: 81-82 ft bgs
82–84	GRAVEL WITH SILT AND SAND, brown (10YR 5/3), well graded gravel, 20% well graded sand, 6% silt, gravel is primarily multicolored quartzite.	GW-GM	Sieve analysis: 83-84 ft bgs
84–86			
86–88	CLAY, yellowish brown (10YR 5/4), lean, wet.	CL	
88–90	Total depth of borehole = 87 ft bgs.		

Well:
Top PVC Elev.:



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LOG OF BORING B-3

J.R Simplot Don Plant
Pocatello, Idaho

MFG Project# 015205

Drilling Agency	: Layne Christensen	TD of Borehole	: 75 ft bgs
Drilling Method	: Dual Wall Rev.Circ. Air Hammer	Northing/Easting Coord:	452472.0/561398.1
Drill Bit	: 9" O.D.	Ground surface Elev.	: 4448.7 NGVD
Sampler Type	: Grab	Logged By	: V. Martinez
Date Start/Completed	: 7/13/98-7/13/98		

Depth in	DESCRIPTION	USCS	GRAPHIC	REMARKS
0	SILT, brown to dark brown (10YR 4/3), floury, damp.	ML		
2				
4				
6				
8				
10	As above. 5% gravel.			
12				
14	GRAVEL WITH SILT, brown to dark brown (10YR 4/3), well graded, subrounded to subangular, primarily multicolored quartzite, damp.	GW-GM		
16				
18	As above. Damp to moist.			
20				
22				
24	As above. 5% cobbles.			
26				
28				
30				
32	GRAVEL WITH SAND, brown (10YR 5/3), 15-20% well graded sand, gravel is well graded and rounded to subangular, primarily multicolored quartzite, dry to damp.	GW		
34				
36				
38				
40				

Well:
Top PVC Elev.:

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LOG OF BORING B-3

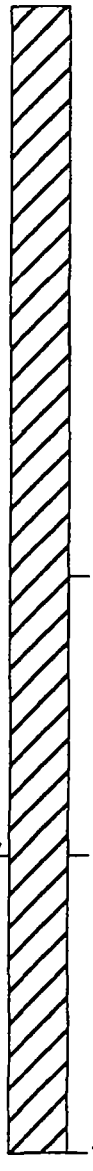
J.R Simplot Don Plant
Pocatello, Idaho

MFG Project# 015205

Drilling Agency	: Layne Christensen	TD of Borehole	: 75 ft bgs
Drilling Method	: Dual Wall Rev.Circ. Air Hammer	Northing/Easting Coord:	452472.0/561398.1
Drill Bit	: 9" O.D.	Ground surface Elev.	: 4448.7 NGVD
Sampler Type	: Grab	Logged By	: V. Martinez
Date Start/Completed	: 7/13/98-7/13/98		

Depth in	DESCRIPTION	USCS	GRAPHIC	REMARKS
40	GRAVEL WITH SAND, brown (10YR 5/3), 15-20% well graded sand, gravel is well graded and rounded to subangular, primarily multicolored quartzite, dry to damp.	GW		
42				
44				
46				
48	As above. Light brownish gray (10YR 6/2), dry.			
50	As above. 1-5% cobbles, 20-30% well graded sand.			
52	As above. Less than 10% sand.			
54	As above. Pale brown (10YR 6/3), dry.			
56				
58	As above. Very large cobbles (at least 8 inches in size).			
60				
62	As above. 5% coarse sand.			
64				
66	SILT, brown (10YR 5/3), 3% gravel, angular to subrounded, primarily multicolored quartzite, moist to wet.	ML		
68	GRAVEL WTH SILT, brown (10YR 5/3), well graded, 10% cobbles, gravel and cobbles are rounded to subangular, primarily quartzite, 10% silt, saturated.	GW-GM		Good water production Sieve analysis: 69-70 ft bgs
70				
72	GRAVEL, brown (10yr 5/3), well graded, 10% cobbles, gravel and cobbles are rounded to subangular, primarily multicolored quartzite, 3% silt, saturated.	GW		Sieve analysis: 71-72 ft bgs
74	CLAY, yellowish brown (10YR 5/4), lean, wet.	CL		
76	Total depth of borehole = 75 ft bgs.			
78				
80				

Well:
Top PVC Elev.:



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LOG OF BORING B-4

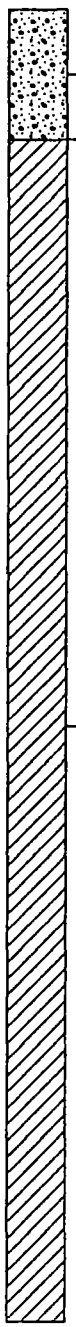
J.R Simplot Don Plant
Pocatello, Idaho

MFG Project# 015205

Drilling Agency	: Layne Christensen	TD of Borehole	: 87 ft bgs
Drilling Method	: Dual Wall Rev.Circ. Air Hammer	Northing/Easting Coord:	452267.6/560898.7
Drill Bit	: 9" O.D.	Ground Surface Elev.	: 4461.2 NGVD
Sampler Type	: Grab	Logged By	: V. Martinez
Date Start/Completed	: 7/14/98-7/14/98		

Depth in	DESCRIPTION	USCS	REMARKS
0	Fill. SILT, brown to dark brown (10YR 4/3), 5% gravel, damp.	AR	
2			
4			
6	As above. 10% medium sand 1% fine gravel.		
8			
10	As above. Decrease in sand, moist.		
12	As above. Increase to 20% gravel.		
14			
16	SILTY GRAVEL, brown (10YR 5/3), gravel is well graded, rounded to subrounded, primarlity multicolored quartzite, damp to moist.	GM	
18	SILTY GRAVEL, brown (10YR 5/3), well graded, subangular to subrounded quartzite, 1% cobbles, damp.	GW-GM	19 inch cobble stuck in return.
20			
22	GRAVEL WITH SAND, brown (10YR 5/3), 40% well graded sand, gravel is well graded subangular to rounded, primarily multicolored quartzite with trace dark volcanics, damp.	GW	
24			
26			
28	As above. Decrease in sand.		
30			

Well:
Top PVC Elev.:



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LOG OF BORING B-4

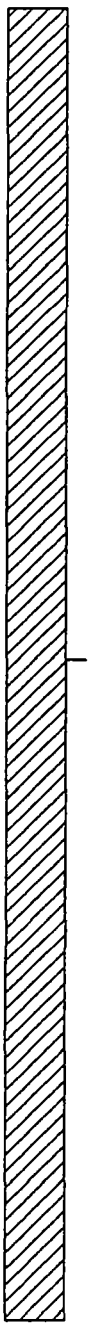
J.R Simplot Don Plant
Pocatello, Idaho

MFG Project# 015205

Drilling Agency	: Layne Christensen	TD of Borehole	: 87 ft bgs
Drilling Method	: Dual Wall Rev.Circ. Air Hammer	Northing/Easting Coord:	452267.6/560898.7
Drill Bit	: 9" O.D.	Ground Surface Elev.	: 4461.2 NGVD
Sampler Type	: Grab	Logged By	: V. Martinez
Date Start/Completed	: 7/14/98-7/14/98		

Depth in	DESCRIPTION	USCS	GRAPHIC	REMARKS
30				
32		GW		
34	SAND WITH GRAVEL, brown (10YR 5/3), sand is medium to coarse, 15% gravel, fine to coarse, sand and gravel are subangular to round, primarily multicolored quartzite, damp to moist.			
36		SW		
38	As above. Increase in gravel.			
40	GRAVEL WITH SAND, pale brown (10YR 6/3), 30% well graded sand, sand and gravel are subangular to rounded, primarily multicolored quartzite, dry.			
42				
44				
46	As above. Decrease in sand.			
48		GW		
50				
52	As above. Light brownish gray (10YR 6/2), 5% cobbles.			
54				
56	SILT, brown (10YR 5/3), floury, 1% gravel, damp.			
58		ML		
60		CL		

Well:
Top PVC Elev.:



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MFG, Inc.
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LOG OF BORING B-4

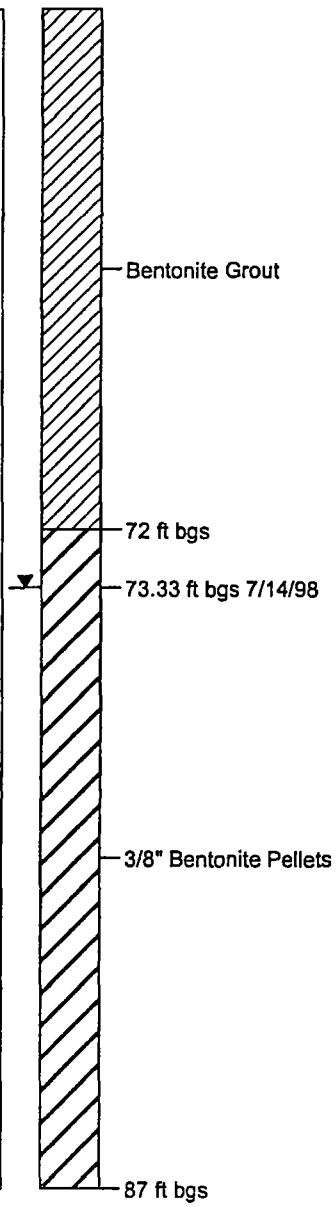
J.R Simplot Don Plant
Pocatello, Idaho

MFG Project# 015205

Drilling Agency	: Layne Christensen	TD of Borehole	: 87 ft bgs
Drilling Method	: Dual Wall Rev.Circ. Air Hammer	Northing/Easting Coord:	452267.6/560898.7
Drill Bit	: 9" O.D.	Ground Surface Elev.	: 4461.2 NGVD
Sampler Type	: Grab	Logged By	: V. Martinez
Date Start/Completed	: 7/14/98-7/14/98		

Depth in	DESCRIPTION	USCS	GRAPHIC	REMARKS
60	CLAY, grayish brown (10YR 5/2), lean, 1% rhyolite gravel, moist.	CL		
62				
64				
66	SAND, brown (7.5YR 5/4), poorly graded, clean fine sand, damp to moist.	SP		
68	As above. 10% cobbles.			
70	GRAVEL WITH SAND, yellowish brown (10YR 5/4), poorly graded fine gravel, poorly graded fine sand, moist.	GP		
72	GRAVEL WITH SAND, brown (10YR 5/3), well graded gravel and sand, 5% cobbles, sand and gravel are subangular to subrounded, primarily multicolored quartzite, wet.	GW		
74				
76				Sieve analysis: 76-77 ft bgs
78	As above. Increased in dark volcanic gravel.			Sieve analysis: 78-79 ft bgs
80				Good water production Sieve analysis: 81-82
82				
84	As above. Increase in silt to 5%, sand and gravel is 50% multicolored quartzite and 50% dark volcanics, 5% cobbles.			
86	CLAY WITH SAND, pale brown (10YR 6/3), 40% gravel and sand, subangular dark volcanic gravel and sand, wet.	CL		
88	Total depth of borehole = 87 ft bgs.			
90				

Well:
Top PVC Elev.:



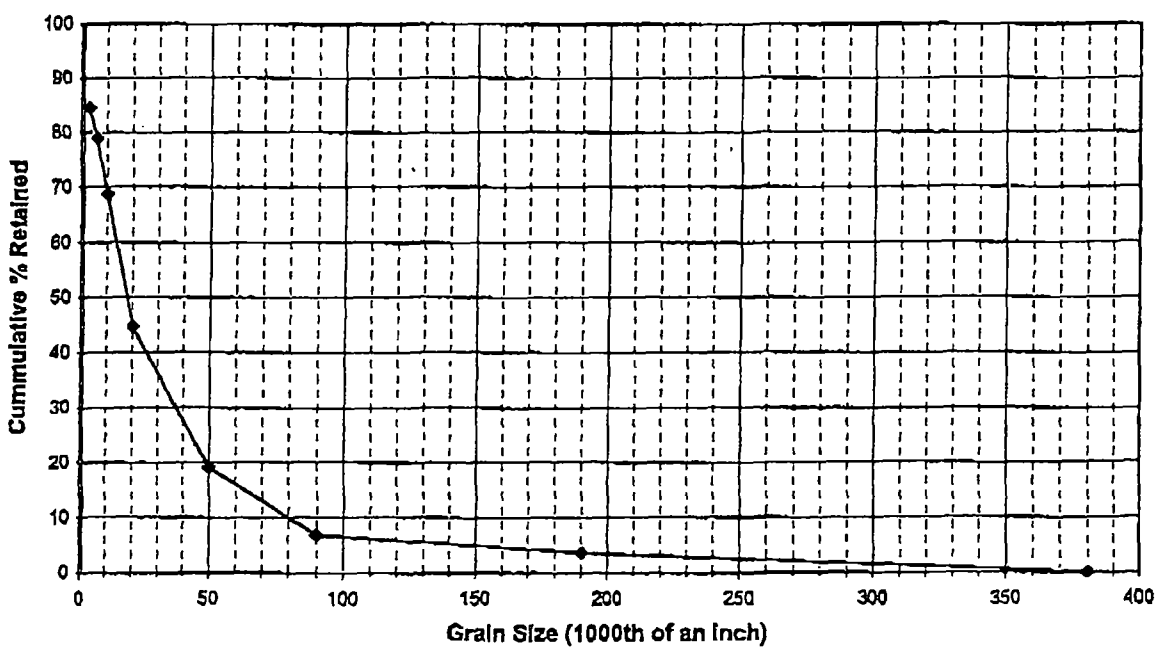
Boring Number: Well 346
Depth Interval: 245 ft bgs
Date Collected: 7/13/1998

Sieve / Mesh Size	Sieve Aperture / Grain Size: Millimeters (mm)	Microns (um)	Inches	1000ths of an Inch	Size Classifications: General Classification	Wentworth / USGS	Cummulative Percent Retained	Cummulative Percent Passing
3	76.2	76,200	3.0	3000	Gravel	Cobble		
2	50.8	50,800	2.0	2000		Pebble / Very Coarse Gravel		
1	25.0	25,000	1.0	1000		Pebble / Very Coarse Gravel		
3/4	19.0	19,000	0.75	750		Pebble / Coarse Gravel		
1/2	12.7	12,700	0.50	500		Pebble / Medium Gravel		
3/8	9.5	9,500	0.38	380		Pebble / Medium Gravel	0.0	100.0
#4	4.75	4,750	0.19	190		Pebble/Fine Gravel	3.6	96.4
#8	2.36	2,360	0.09	90		Granule	6.8	93.2
#16	1.19	1,190	0.05	50	Sand	Very Coarse Sand	19.1	80.9
#30	0.58	580	0.02	20		Coarse Sand	44.7	55.3
#50	0.3	300	0.01	10		Medium Sand	68.7	31.3
#100	0.15	150	0.006	6		Fine Sand	78.9	21.1
#200	0.075	75	0.003	3		Very Fine Sand	84.5	15.5
-#200	0.075	75	0.003	3	Silt & Clay	Silt & Clay		

Approximate d values (in 1000ths of an inch):

d_{40}=	25	% Gravel	6.8
d_{50}=	17	% Sand	77.7
d_{90}=	2	% Silt & Clay	15.5

346 (245 ft bgs)
Grain Size Analysis Results



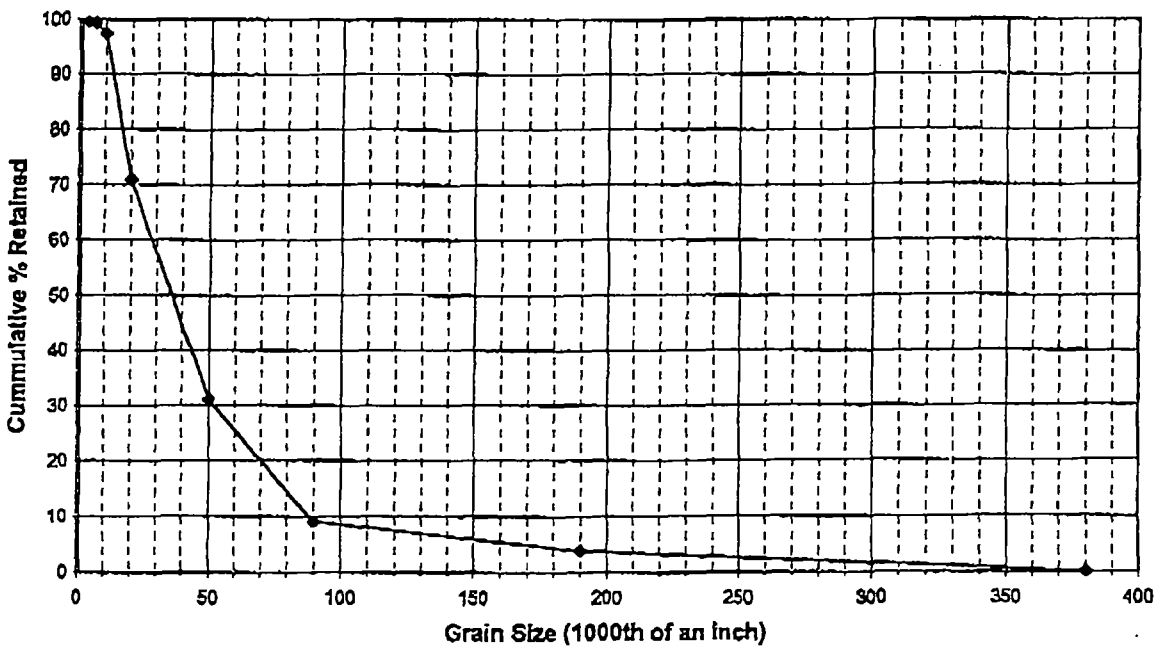
Boring Number: Well 346
Depth Interval: 250 ft bgs
Date Collected: 7/13/1998

Sieve / Mesh Size	Sieve Aperture / Grain Size: Millimeters (mm)	Microns (um)	Inches	1000ths of an Inch	Size Classifications: General Classification	Wentworth / USGS	Cummulative Percent Retained	Cummulative Percent Passing
3	76.2	76,200	3.0	3000	Gravel	Cobble		
2	50.8	50,800	2.0	2000		Pebble / Very Coarse Gravel		
1	25.0	25,000	1.0	1000		Pebble / Very Coarse Gravel		
3/4	19.0	19,000	0.75	750		Pebble / Coarse Gravel		
1/2	12.7	12,700	0.50	500		Pebble / Medium Gravel		
3/8	9.5	9,500	0.38	380		Pebble / Medium Gravel	0.0	100.0
#4	4.75	4,750	0.19	190		Pebble/Fine Gravel	3.8	96.2
#8	2.36	2,360	0.09	90		Granule	9.0	91.0
#16	1.19	1,190	0.05	50	Sand	Very Coarse Sand	31.1	68.9
#30	0.58	580	0.02	20		Coarse Sand	70.9	29.1
#50	0.3	300	0.01	10		Medium Sand	97.4	2.6
#100	0.15	150	0.006	6		Fine Sand	99.3	0.7
#200	0.075	75	0.003	3		Very Fine Sand	99.5	0.5
-#200	0.075	75	0.003	3	Silt & Clay	Silt & Clay		

Approximate d values (in 1000ths of an inch):

d_{40}=	43	% Gravel	9.0
d_{50}=	36	% Sand	90.5
d_{90}=	12	% Silt & Clay	0.5

346 (250 ft bgs)
Grain Size Analysis Results



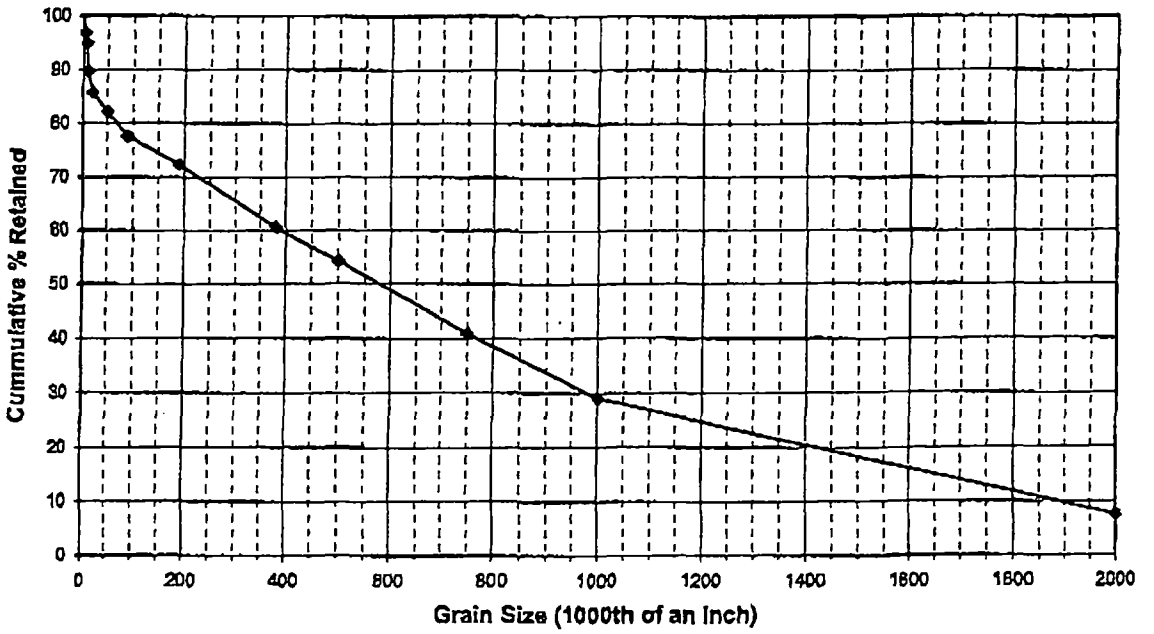
Boring Number: B-1
Depth Interval: 77 ft bgs
Date Collected: 7/12/1998

Sieve / Mesh Size	Sieve Aperture / Grain Size: Millimeters (mm)	Microns (um)	Inches	1000ths of an Inch	Size Classifications: General Classification	Wentworth / USGS Classification	Cummulative Percent Retained	Cummulative Percent Passing
3	76.2	76,200	3.0	3000	Gravel	Cobble		
2	50.8	50,800	2.0	2000		Pebble / Very Coarse Gravel	7.5	92.5
1	25.0	25,000	1.0	1000		Pebble / Very Coarse Gravel	29	71
3/4	19.0	19,000	0.75	750		Pebble / Coarse Gravel	40.9	59.1
1/2	12.7	12,700	0.50	500		Pebble / Medium Gravel	54.2	45.8
3/8	9.5	9,500	0.38	380		Pebble / Medium Gravel	60.5	39.5
#4	4.75	4,750	0.19	190		Pebble/Fine Gravel	72.3	27.7
#8	2.36	2,360	0.09	90		Granule	77.6	22.4
#16	1.19	1,190	0.05	50	Sand	Very Coarse Sand	82.2	17.8
#30	0.58	580	0.02	20		Coarse Sand	85.8	14.2
#50	0.3	300	0.01	10		Medium Sand	89.7	10.3
#100	0.15	150	0.006	6		Fine Sand	95.0	5.0
#200	0.075	75	0.003	3		Very Fine Sand	96.8	3.2
-#200	0.075	75	0.003	3	Silt & Clay	Silt & Clay		

Approximate d values (in 1000ths of an inch):

d_{40}=	760	% Gravel	77.6
d_{50}=	580	% Sand	19.1
d_{90}=	90	% Silt & Clay	3.2

B-1 (77 ft bgs)
Grain Size Analysis Results



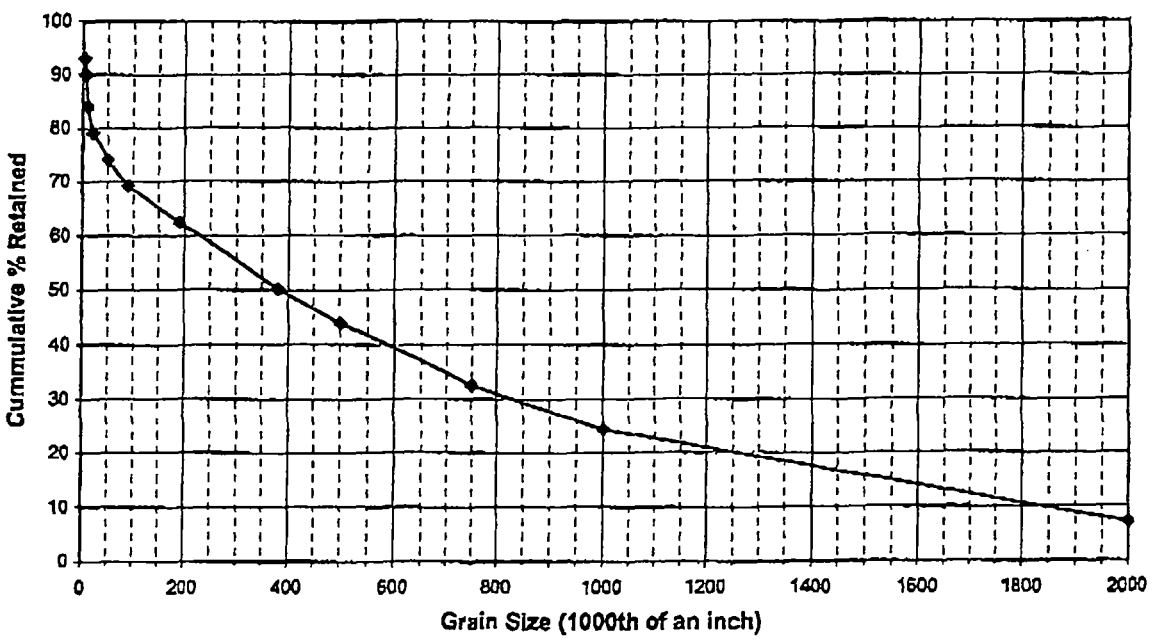
Boring Number: B-1
Depth Interval: 80 ft bgs
Date Collected: 7/12/1998

Sieve / Mesh Size	Sieve Aperture / Grain Size: Millimeters (mm)	Microns (um)	Inches	1000ths of an Inch	Size Classifications: General Classification	Wentworth / USGS Classification	Cummulative Percent Retained	Cummulative Percent Passing
3	76.2	76,200	3.0	3000	Gravel	Cobble		
2	50.8	50,800	2.0	2000		Pebble / Very Coarse Gravel	7.1	92.5
1	25.0	25,000	1.0	1000		Pebble / Very Coarse Gravel	24.5	75.5
3/4	19.0	19,000	0.75	750		Pebble / Coarse Gravel	32.5	67.5
1/2	12.7	12,700	0.50	500		Pebble / Medium Gravel	44.0	56.0
3/8	9.5	9,500	0.38	380		Pebble / Medium Gravel	50.2	49.8
#4	4.75	4,750	0.19	190		Pebble/Fine Gravel	62.5	37.5
#8	2.36	2,360	0.09	90		Granule	69.2	30.8
#16	1.19	1,190	0.05	50	Sand	Very Coarse Sand	74.1	26.0
#30	0.58	580	0.02	20		Coarse Sand	79.0	21.0
#50	0.3	300	0.01	10		Medium Sand	83.9	16.1
#100	0.15	150	0.006	6		Fine Sand	90.0	10.0
#200	0.075	75	0.003	3		Very Fine Sand	93.0	7.0
-#200	0.075	75	0.003	3	Silt & Clay	Silt & Clay		

Approximate d values (in 1000ths of an inch):

d_{40}=	580	**% Gravel**	69.2
d_{50}=	380	**% Sand**	23.8
d_{90}=	6	**% Silt & Clay**	7.0

B-1 (80 ft bgs)
Grain Size Analysis Results

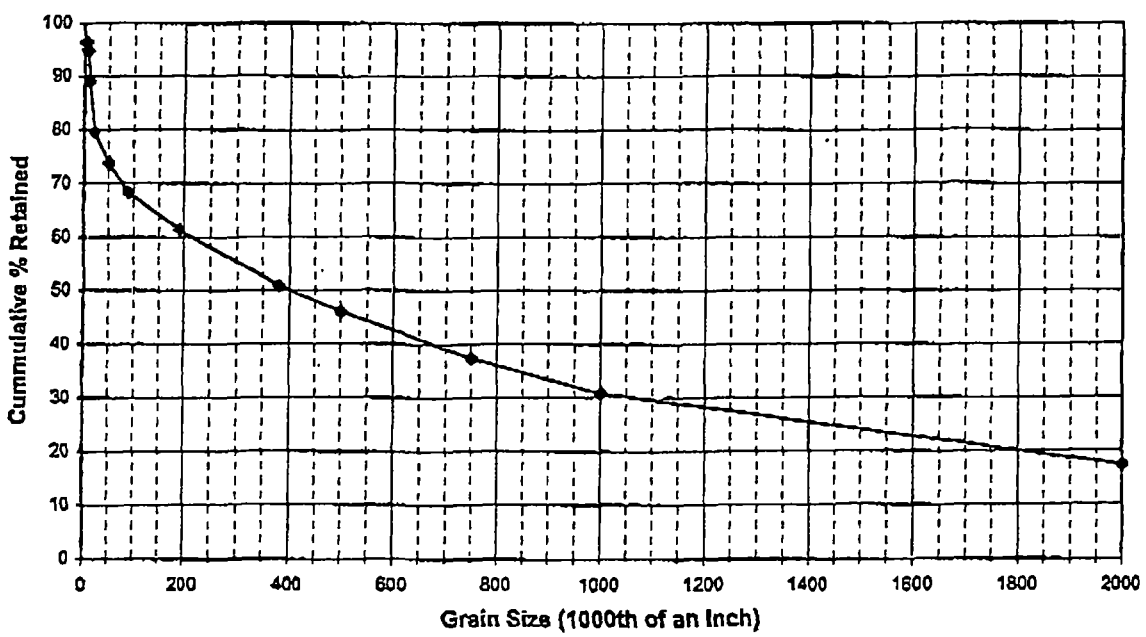


Boring Number: B-1
Depth Interval: 83 ft bgs
Date Collected: 7/12/1998

Sieve / Mesh Size	Sieve Aperture / Grain Size: Millimeters (mm)	Microns (um)	Inches	1000ths of an Inch	Size Classifications: General Classification	Wentworth / USGS Classification	Cummulative Percent Retained	Cummulative Percent Passing
3	76.2	76,200	3.0	3000	Gravel	Cobble		
2	50.8	50,800	2.0	2000		Pebble / Very Coarse Gravel	17.3	82.7
1	25.0	25,000	1.0	1000		Pebble / Very Coarse Gravel	30.8	69.2
3/4	19.0	19,000	0.75	750		Pebble / Coarse Gravel	37.3	62.7
1/2	12.7	12,700	0.50	500		Pebble / Medium Gravel	46.1	53.9
3/8	9.5	9,500	0.38	380		Pebble / Medium Gravel	50.9	49.1
#4	4.75	4,750	0.19	190		Pebble/Fine Gravel	61.4	38.6
#8	2.36	2,360	0.09	90		Granule	68.3	31.7
#16	1.19	1,190	0.05	50	Sand	Very Coarse Sand	73.8	26.2
#30	0.58	580	0.02	20		Coarse Sand	79.7	20.3
#50	0.3	300	0.01	10		Medium Sand	89.0	11.0
#100	0.15	150	0.006	6		Fine Sand	94.8	5.2
#200	0.075	75	0.003	3		Very Fine Sand	96.3	3.7
-#200	0.075	75	0.003	3	Silt & Clay	Silt & Clay		

Approximate d values (in 1000ths of an Inch):				
	d_{40}=	675	% Gravel	68.3
	d_{50}=	400	% Sand	28.0
	d_{90}=	10	% Silt & Clay	3.7

B-1 (83 ft bgs)
Grain Size Analysis Results



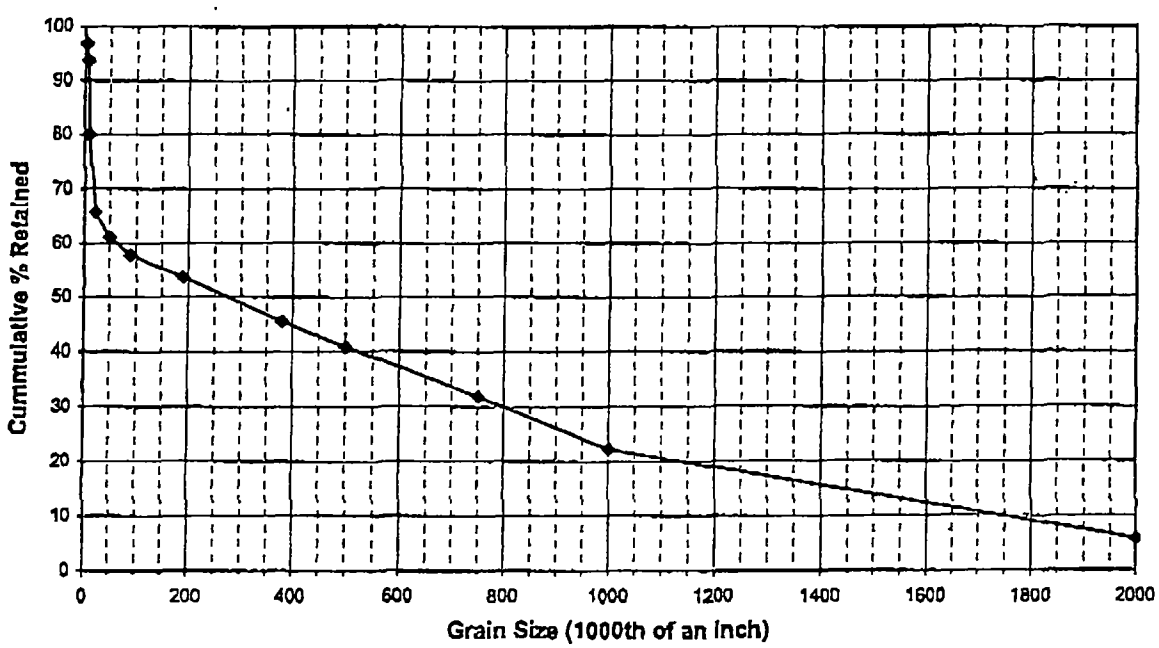
Boring Number: B-1
Depth Interval: 86 ft bgs
Date Collected: 7/12/1998

Sieve / Mesh Size	Sieve Aperture / Grain Size: Millimeters (mm)	Microns (um)	Inches	1000ths of an Inch	Size Classifications: General Classification	Wentworth / USGS Classification	Cummulative Percent Retained	Cummulative Percent Passing
3	76.2	76,200	3.0	3000	Gravel	Cobble		
2	50.8	50,800	2.0	2000		Pebble / Very Coarse Gravel	5.8	94.2
1	25.0	25,000	1.0	1000		Pebble / Very Coarse Gravel	22.2	77.8
3/4	19.0	19,000	0.75	750		Pebble / Coarse Gravel	31.8	68.2
1/2	12.7	12,700	0.50	500		Pebble / Medium Gravel	40.9	59.1
3/8	9.5	9,500	0.38	380		Pebble / Medium Gravel	45.5	54.5
#4	4.75	4,750	0.19	190		Pebble/Fine Gravel	53.7	46.3
#8	2.36	2,360	0.09	90		Granule	57.8	42.2
#16	1.19	1,190	0.05	50	Sand	Very Coarse Sand	61.1	38.9
#30	0.58	580	0.02	20		Coarse Sand	65.7	34.3
#50	0.3	300	0.01	10		Medium Sand	80.0	20.0
#100	0.15	150	0.006	6		Fine Sand	93.7	6.3
#200	0.075	75	0.003	3		Very Fine Sand	96.8	3.2
-#200	0.075	75	0.003	3	Silt & Clay	Silt & Clay		

Approximate d values (in 1000ths of an inch):

d_{40}=	525	**% Gravel**	57.8
d_{50}=	275	**% Sand**	39.0
d_{90}=	6	**% Silt & Clay**	3.2

B-1 (86 ft bgs)
Grain Size Analysis Results



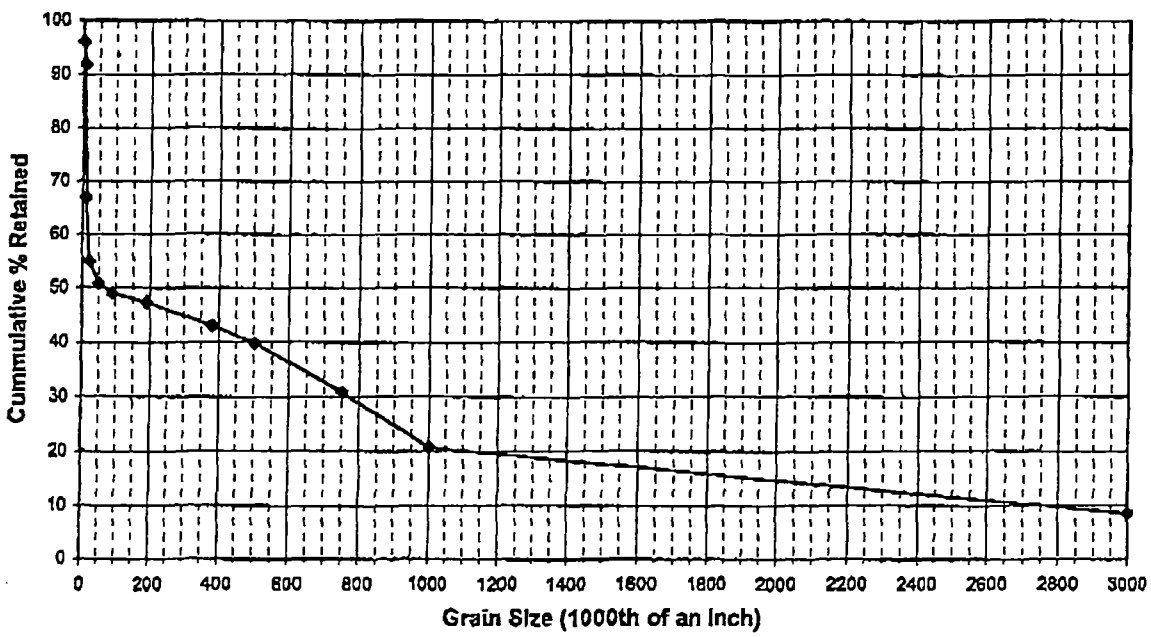
Boring Number: B-2
Depth Interval: 73 ft bgs
Date Collected: 7/12/1998

Sieve / Mesh Size	Sieve Aperture / Grain Size: Millimeters (mm)	Microns (um)	Inches	1000ths of an Inch	Size Classifications: General Classification	Wentworth / USGS Classification	Cummulative Percent Retained	Cummulative Percent Passing
3	76.2	76,200	3.0	3000	Gravel	Cobble	8.5	91.5
1	25.0	25,000	1.0	1000		Pebble / Very Coarse Gravel	20.7	79.3
3/4	19.0	19,000	0.75	750		Pebble / Coarse Gravel	30.8	69.2
1/2	12.7	12,700	0.50	500		Pebble / Medium Gravel	39.8	60.2
3/8	9.5	9,500	0.38	380		Pebble / Medium Gravel	43.0	57.0
#4	4.75	4,750	0.19	190		Pebble/Fine Gravel	47.4	52.6
#8	2.36	2,360	0.09	90		Granule	49.1	50.9
#16	1.19	1,190	0.05	50	Sand	Very Coarse Sand	50.8	49.2
#30	0.58	580	0.02	20		Coarse Sand	55.0	45.0
#50	0.3	300	0.01	10		Medium Sand	66.9	33.1
#100	0.15	150	0.006	6		Fine Sand	91.8	8.2
#200	0.075	75	0.003	3		Very Fine Sand	96.1	3.9
-#200	0.075	75	0.003	3	Silt & Clay	Silt & Clay		

Approximate d values (in 1000ths of an inch):
d_{40}= 500
d_{50}= 50
d_{90}= 6

% Gravel	49.1
% Sand	47.0
% Silt & Clay	3.9

B-2 (73 ft bgs)
Grain Size Analysis Results



Boring Number: B-2
Depth Interval: 75 ft bgs
Date Collected: 7/12/1998

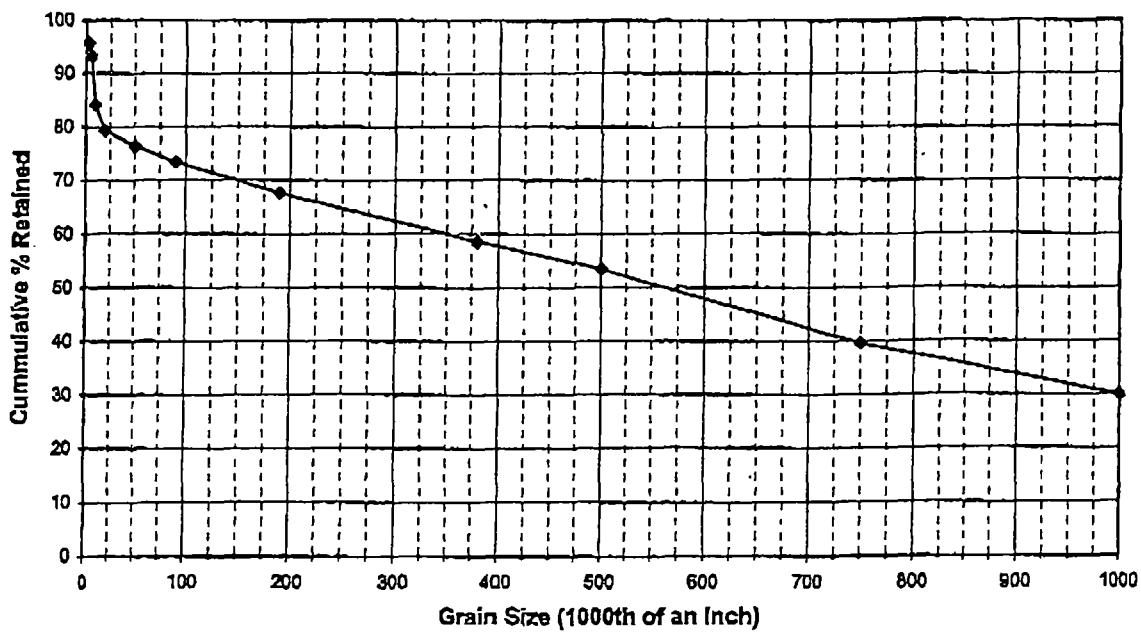
Sieve / Mesh Size	Sieve Aperture / Grain Size: Millimeters (mm)	Microns (um)	Inches	1000ths of an Inch	Size Classifications: General Classification	Wentworth / USGS Classification	Cummulative Percent Retained	Cummulative Percent Passing
3	76.2	76,200	3.0	3000	Gravel	Cobble		
2	50.8	50,800	2.0	2000		Pebble / Very Coarse Gravel		100.0
1	25.0	25,000	1.0	1000		Pebble / Very Coarse Gravel	29.9	70.1
3/4	19.0	19,000	0.75	750		Pebble / Coarse Gravel	39.5	60.5
1/2	12.7	12,700	0.50	500		Pebble / Medium Gravel	53.5	46.5
3/8	9.5	9,500	0.38	380		Pebble / Medium Gravel	58.6	41.4
#4	4.75	4,750	0.19	190		Pebble/Fine Gravel	67.6	32.4
#8	2.36	2,360	0.09	90		Granule	73.4	26.6
#16	1.19	1,190	0.05	50	Sand	Very Coarse Sand	76.3	23.7
#30	0.58	580	0.02	20		Coarse Sand	79.3	20.7
#50	0.3	300	0.01	10		Medium Sand	84.2	15.8
#100	0.15	150	0.006	6		Fine Sand	93.2	6.8
#200	0.075	75	0.003	3		Very Fine Sand	95.7	4.3
-#200	0.075	75	0.003	3	Silt & Clay	Silt & Clay		

Approximate d values (in 1000ths of an inch):

d_{40}=	735	
d_{50}=	565	
d_{90}=	6	

% Gravel	73.4
% Sand	22.3
% Silt & Clay	4.3

B-2 (75 ft bgs)
Grain Size Analysis Results



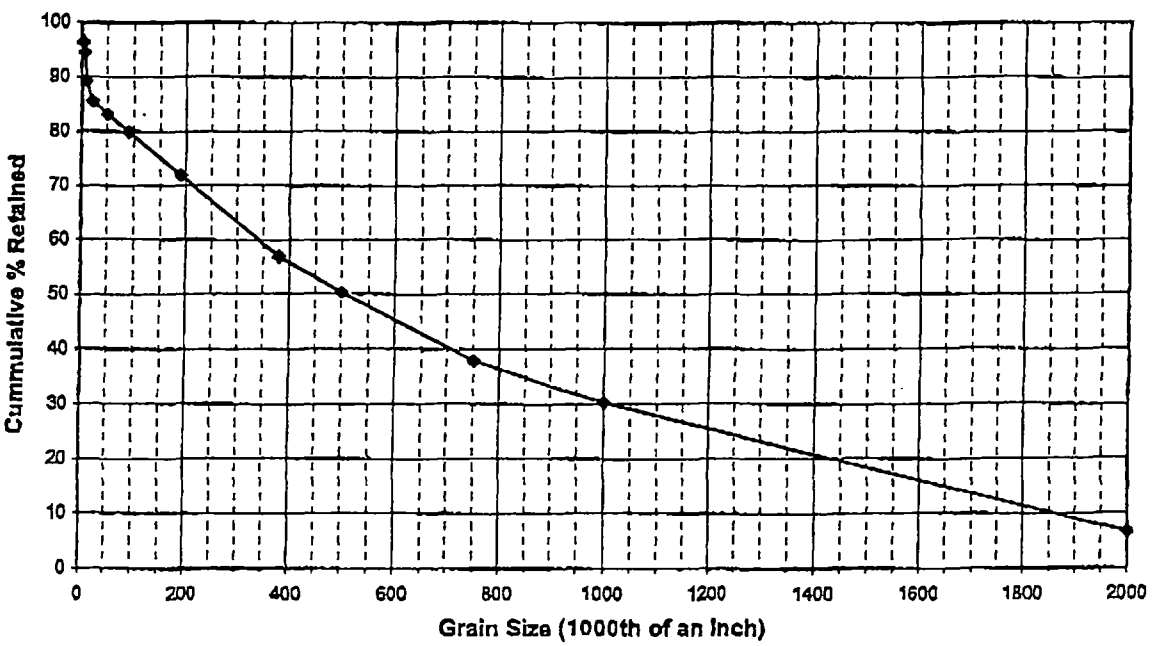
Boring Number: B-2
Depth Interval: 78 ft bgs
Date Collected: 7/12/1998

Sieve / Mesh Size	Sieve Aperture / Grain Size: Millimeters (mm)	Microns (um)	Inches	1000ths of an Inch	Size Classifications: General Classification	Wentworth / USGS Classification	Cummulative Percent Retained	Cummulative Percent Passing
3	76.2	76,200	3.0	3000	Gravel	Cobble		
2	50.8	50,800	2.0	2000		Pebble / Very Coarse Gravel	6.7	93.3
1	25.0	25,000	1.0	1000		Pebble / Very Coarse Gravel	30.2	69.8
3/4	19.0	19,000	0.75	750		Pebble / Coarse Gravel	37.8	62.2
1/2	12.7	12,700	0.50	500		Pebble / Medium Gravel	50.3	49.7
3/8	9.5	9,500	0.38	380		Pebble / Medium Gravel	56.9	43.1
#4	4.75	4,750	0.19	190		Pebble/Fine Gravel	71.9	28.1
#8	2.36	2,360	0.09	90		Granule	79.9	20.1
#16	1.19	1,190	0.05	50	Sand	Very Coarse Sand	83.1	16.9
#30	0.58	580	0.02	20		Coarse Sand	85.5	14.5
#50	0.3	300	0.01	10		Medium Sand	89.2	10.8
#100	0.15	150	0.006	6		Fine Sand	94.5	5.5
#200	0.075	75	0.003	3		Very Fine Sand	96.3	3.7
-#200	0.075	75	0.003	3	Silt & Clay	Silt & Clay		

Approximate d values (in 1000ths of an inch): d_{40}= 700, d_{50}= 500, d_{90}= 8

% Gravel	79.9
% Sand	16.5
% Silt & Clay	3.7

B-2 (78 ft bgs)
Grain Size Analysis Results



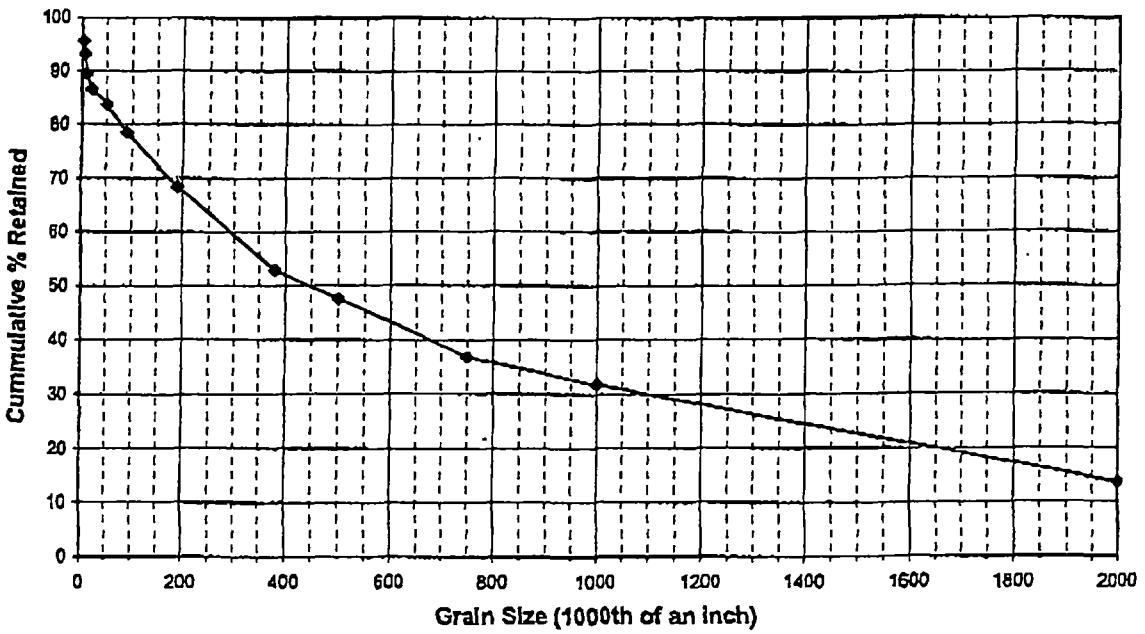
Boring Number: B-2
Depth Interval: 81 ft bgs
Date Collected: 7/12/1998

Sieve / Mesh Size	Sieve Aperture / Grain Size: Millimeters (mm)	Microns (um)	Inches	1000ths of an Inch	Size Classifications: General Classification	Wentworth / USGS Classification	Cummulative Percent Retained	Cummulative Percent Passing
3	76.2	76,200	3.0	3000	Gravel	Cobble		
2	50.8	50,800	2.0	2000		Pebble / Very Coarse Gravel	13.6	86.4
1	25.0	25,000	1.0	1000		Pebble / Very Coarse Gravel	31.8	68.2
3/4	19.0	19,000	0.75	750		Pebble / Coarse Gravel	36.9	63.1
1/2	12.7	12,700	0.50	500		Pebble / Medium Gravel	47.6	52.4
3/8	9.5	9,500	0.38	380		Pebble / Medium Gravel	52.8	47.2
#4	4.75	4,750	0.19	190		Pebble/Fine Gravel	68.4	31.6
#8	2.36	2,360	0.09	90		Granule	78.5	21.5
#16	1.19	1,190	0.05	50	Sand	Very Coarse Sand	83.8	16.2
#30	0.58	580	0.02	20		Coarse Sand	86.7	13.3
#50	0.3	300	0.01	10		Medium Sand	89.5	10.5
#100	0.15	150	0.006	6		Fine Sand	93.2	6.8
#200	0.075	75	0.003	3		Very Fine Sand	95.6	4.4
-#200	0.075	75	0.003	3	Silt & Clay	Silt & Clay		

Approximate d values (in 1000ths of an inch):

d_{40}=	675	**% Gravel**	78.5
d_{50}=	450	**% Sand**	17.1
d_{90}=	8	**% Silt & Clay**	4.4

B-2 (81 ft bgs)
Grain Size Analysis Results

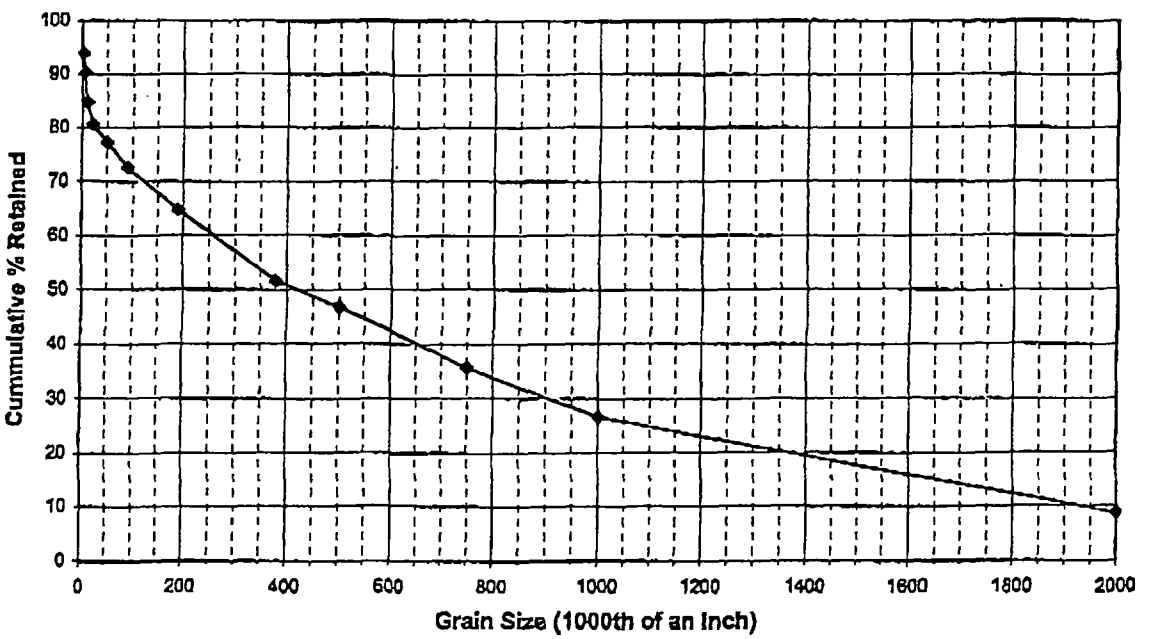


Boring Number: B-2
Depth Interval: 83 ft bgs
Date Collected: 7/12/1998

Sieve / Mesh Size	Sieve Aperture / Grain Size: Millimeters (mm)	Microns (um)	Inches	1000ths of an Inch	Size Classifications: General Classification	Wentworth / USGS Classification	Cummulative Percent Retained	Cummulative Percent Passing
3	76.2	76,200	3.0	3000	Gravel	Cobble		
2	50.8	50,800	2.0	2000		Pebble / Very Coarse Gravel	8.7	91.3
1	25.0	25,000	1.0	1000		Pebble / Very Coarse Gravel	26.6	73.4
3/4	19.0	19,000	0.75	750		Pebble / Coarse Gravel	35.7	64.3
1/2	12.7	12,700	0.50	500		Pebble / Medium Gravel	46.8	53.2
3/8	9.5	9,500	0.38	380		Pebble / Medium Gravel	51.6	48.4
#4	4.75	4,750	0.19	190		Pebble/Fine Gravel	64.7	35.3
#8	2.36	2,360	0.09	90		Granule	72.5	27.5
#16	1.19	1,190	0.05	50	Sand	Very Coarse Sand	77.2	22.8
#30	0.58	580	0.02	20		Coarse Sand	80.6	19.4
#50	0.3	300	0.01	10		Medium Sand	84.8	15.2
#100	0.15	150	0.006	6		Fine Sand	90.3	9.7
#200	0.075	75	0.003	3		Very Fine Sand	93.8	6.2
-#200	0.075	75	0.003	3	Silt & Clay	Silt & Clay		

Approximate d values (in 1000ths of an inch):				
	d_{40}=	625	**% Gravel**	72.5
	d_{50}=	425	**% Sand**	21.3
	d_{90}=	6	**% Silt & Clay**	6.2

B-2 (83 ft bgs)
Grain Size Analysis Results



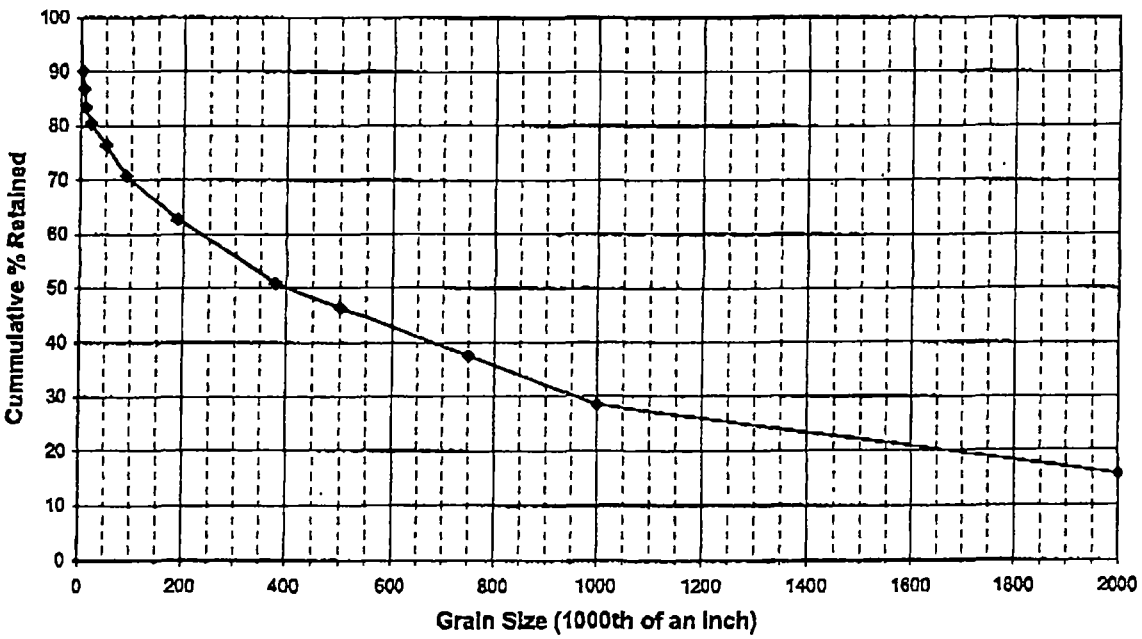
Boring Number: B-3
Depth Interval: 69 ft bgs
Date Collected: 7/13/1998

Sieve / Mesh Size	Sieve Aperture / Grain Size: Millimeters (mm)	Microns (um)	Inches	1000ths of an Inch	Size Classifications: General Classification	Wentworth / USGS Classification	Cummulative Percent Retained	Cummulative Percent Passing
3	76.2	76,200	3.0	3000	Gravel	Cobble		
2	50.8	50,800	2.0	2000		Pebble / Very Coarse Gravel	15.7	84.3
1	25.0	25,000	1.0	1000		Pebble / Very Coarse Gravel	28.5	71.5
3/4	19.0	19,000	0.75	750		Pebble / Coarse Gravel	37.5	62.5
1/2	12.7	12,700	0.50	500		Pebble / Medium Gravel	46.4	53.6
3/8	9.5	9,500	0.38	380		Pebble / Medium Gravel	50.9	49.1
#4	4.75	4,750	0.19	190		Pebble/Fine Gravel	62.7	37.3
#8	2.36	2,360	0.09	90		Granule	70.8	29.2
#16	1.19	1,190	0.05	50	Sand	Very Coarse Sand	76.5	23.5
#30	0.58	580	0.02	20		Coarse Sand	80.5	19.5
#50	0.3	300	0.01	10		Medium Sand	83.4	16.6
#100	0.15	150	0.006	6		Fine Sand	86.8	13.2
#200	0.075	75	0.003	3		Very Fine Sand	90.1	9.9
-#200	0.075	75	0.003	3	Silt & Clay	Silt & Clay		

Approximate d values (in 1000ths of an inch):

d_{40}=	680	**% Gravel**	70.8
d_{50}=	400	**% Sand**	19.3
d_{90}=	3	**% Silt & Clay**	9.9

B-3 (69 ft bgs)
Grain Size Analysis Results



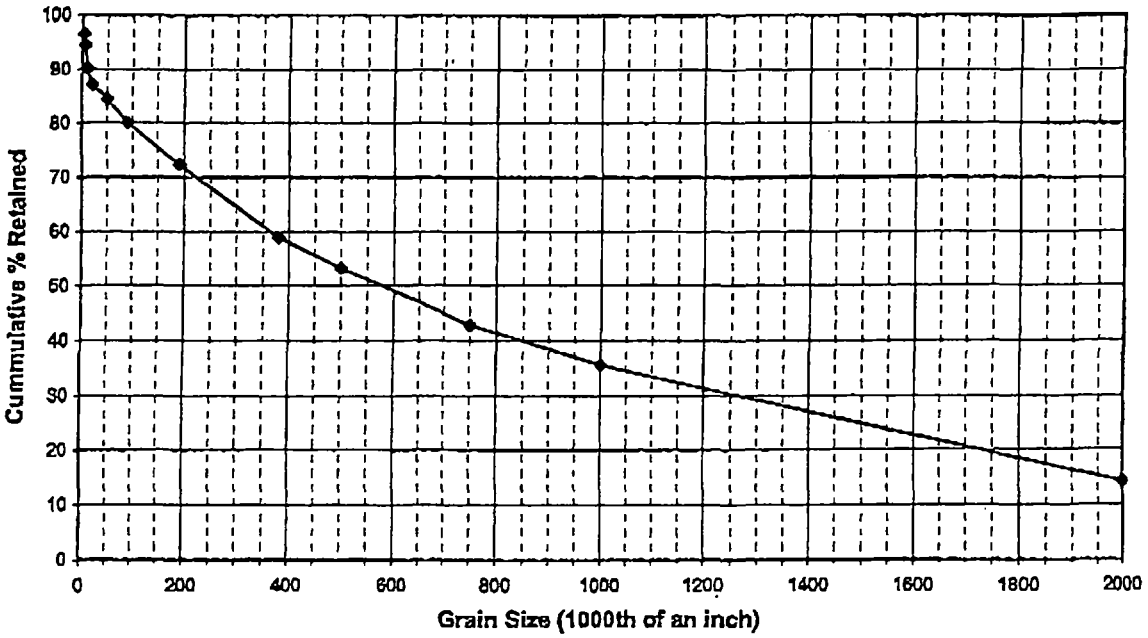
Boring Number: B-3
Depth Interval: 71 ft bgs
Date Collected: 7/13/1998

Sieve / Mesh Size	Sieve Aperture / Grain Size: Millimeters (mm)	Microns (um)	Inches	1000ths of an Inch	Size Classifications: General Classification	Wentworth / USGS Classification	Cummulative Percent Retained	Cummulative Percent Passing
3	76.2	76,200	3.0	3000	Gravel	Cobble		
2	50.8	50,800	2.0	2000		Pebble / Very Coarse Gravel	14.2	85.8
1	25.0	25,000	1.0	1000		Pebble / Very Coarse Gravel	35.6	64.4
3/4	19.0	19,000	0.75	750		Pebble / Coarse Gravel	42.8	57.2
1/2	12.7	12,700	0.50	500		Pebble / Medium Gravel	53.3	46.7
3/8	9.5	9,500	0.38	380		Pebble / Medium Gravel	58.9	41.1
#4	4.75	4,750	0.19	190		Pebble/Fine Gravel	72.3	27.7
#8	2.36	2,360	0.09	90		Granule	80.1	19.9
#16	1.19	1,190	0.05	50	Sand	Very Coarse Sand	84.4	15.6
#30	0.58	580	0.02	20		Coarse Sand	87.1	12.9
#50	0.3	300	0.01	10		Medium Sand	90.1	9.9
#100	0.15	150	0.006	6		Fine Sand	94.5	5.5
#200	0.075	75	0.003	3		Very Fine Sand	96.5	3.5
-#200	0.075	75	0.003	3	Silt & Clay	Silt & Clay		

Approximate d values (in 1000ths of an inch):

d_{40}=	850	**% Gravel**	80.1
d_{50}=	580	**% Sand**	16.5
d_{90}=	10	**% Silt & Clay**	3.5

B-3 (71 ft bgs)
Grain Size Analysis Results



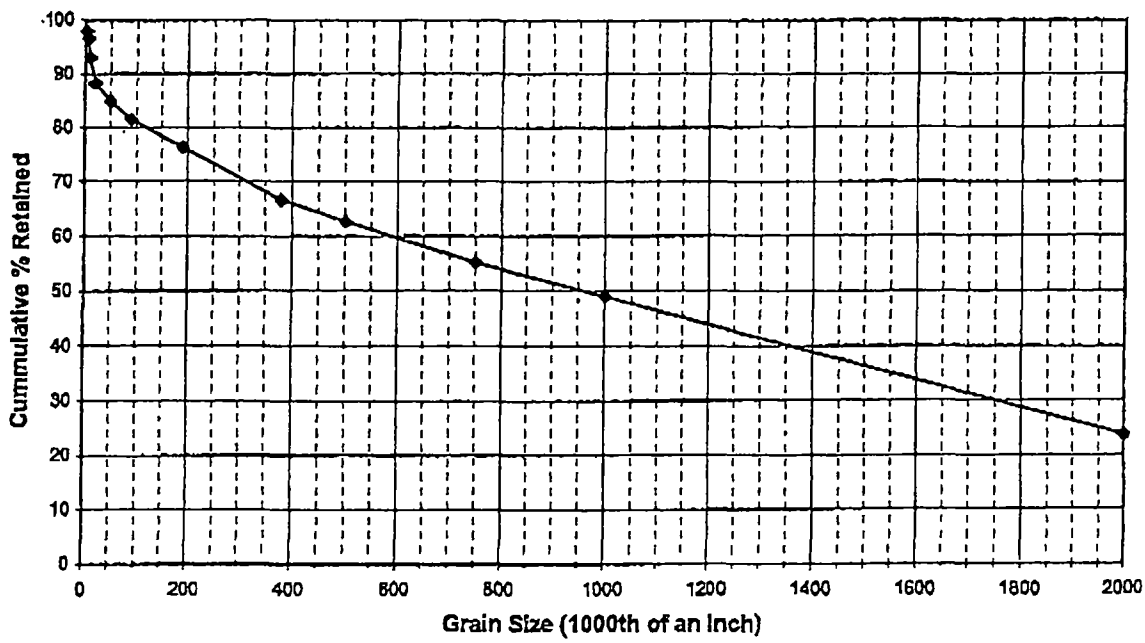
Boring Number: B-4
Depth Interval: 74 ft bgs
Date Collected: 7/14/1998

Sieve / Mesh Size	Sieve Aperture / Grain Size: Millimeters (mm)	Microns (um)	Inches	1000ths of an Inch	Size Classifications: General Classification	Wentworth / USGS Classification	Cummulative Percent Retained	Cummulative Percent Passing
3	76.2	76,200	3.0	3000	Gravel	Cobble		
2	50.8	50,800	2.0	2000		Pebble / Very Coarse Gravel	23.8	76.2
1	25.0	25,000	1.0	1000		Pebble / Very Coarse Gravel	49.0	51.0
3/4	19.0	19,000	0.75	750		Pebble / Coarse Gravel	55.2	44.8
1/2	12.7	12,700	0.50	500		Pebble / Medium Gravel	62.6	37.4
3/8	9.5	9,500	0.38	380		Pebble / Medium Gravel	66.6	33.4
#4	4.75	4,750	0.19	190		Pebble/Fine Gravel	76.3	23.7
#8	2.36	2,360	0.09	90		Granule	81.5	18.5
#16	1.19	1,190	0.05	50	Sand	Very Coarse Sand	85.0	15.0
#30	0.58	580	0.02	20		Coarse Sand	88.2	11.8
#50	0.3	300	0.01	10		Medium Sand	93.0	7.0
#100	0.15	150	0.006	6		Fine Sand	96.6	3.4
#200	0.075	75	0.003	3		Very Fine Sand	97.9	2.1
-#200	0.075	75	0.003	3	Silt & Clay	Silt & Clay		

Approximate d values (in 1000ths of an inch):
d_{40}= 1365
d_{50}= 965
d_{90}= 15

% Gravel 81.5
% Sand 16.4
% Silt & Clay 2.1

B-4 (74 ft bgs)
Grain Size Analysis Results



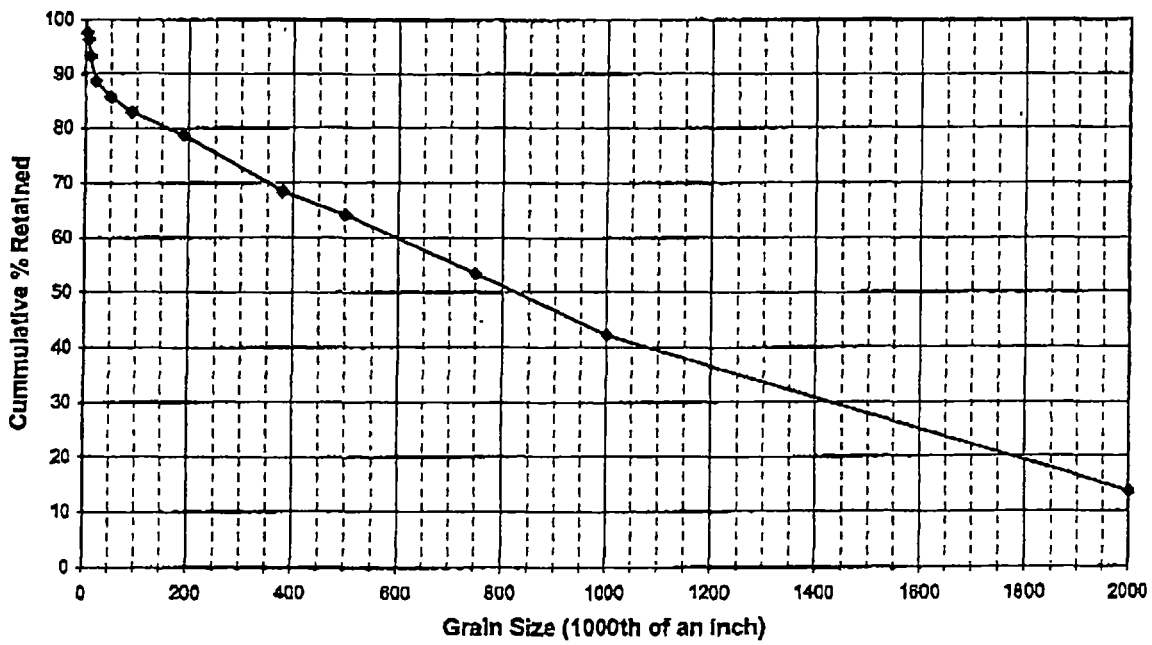
Boring Number: B-4
Depth Interval: 76 ft bgs
Date Collected: 7/14/1998

Sieve / Mesh Size	Sieve Aperture / Grain Size: Millimeters (mm)	Microns (um)	Inches	1000ths of an Inch	Size Classifications: General Classification	Wentworth / USGS Classification	Cummulative Percent Retained	Cummulative Percent Passing
3	76.2	76,200	3.0	3000	Gravel	Cobble		
2	50.8	50,800	2.0	2000		Pebble / Very Coarse Gravel	13.5	86.5
1	25.0	25,000	1.0	1000		Pebble / Very Coarse Gravel	42.3	57.7
3/4	19.0	19,000	0.75	750		Pebble / Coarse Gravel	53.4	46.6
1/2	12.7	12,700	0.50	500		Pebble / Medium Gravel	64.1	35.9
3/8	9.5	9,500	0.38	380		Pebble / Medium Gravel	68.5	31.5
#4	4.75	4,750	0.19	190		Pebble/Fine Gravel	78.7	21.3
#8	2.36	2,360	0.09	90		Granule	83.0	17.0
#16	1.19	1,190	0.05	50	Sand	Very Coarse Sand	85.6	14.4
#30	0.58	580	0.02	20		Coarse Sand	88.7	11.3
#50	0.3	300	0.01	10		Medium Sand	93.3	6.7
#100	0.15	150	0.006	6		Fine Sand	96.3	3.7
#200	0.075	75	0.003	3		Very Fine Sand	97.6	2.4
-#200	0.075	75	0.003	3	Silt & Clay	Silt & Clay		

Approximate d values (in 1000ths of an inch):

d_{40}=	1075	**% Gravel**	83.0
d_{50}=	825	**% Sand**	14.7
d_{90}=	15	**% Silt & Clay**	2.4

B-4 (76 ft bgs)
Grain Size Analysis Results



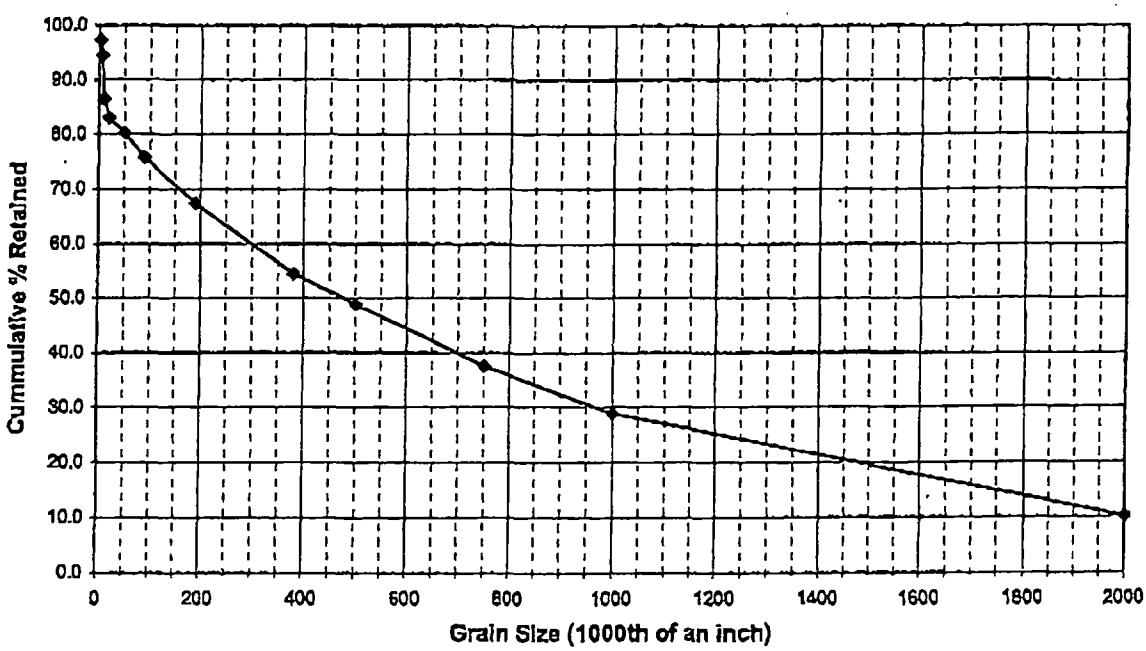
Boring Number: B-4
Depth Interval: 78 ft bgs
Date Collected: 7/14/1998

Sieve / Mesh Size	Sieve Aperture / Grain Size: Millimeters (mm)	Microns (um)	Inches	1000ths of an Inch	Size Classifications: General Classification	Wentworth / USGS Classification	Cummulative Percent Retained	Cummulative Percent Passing
3	76.2	76,200	3.0	3000	Gravel	Cobble	5.2	94.8
2	50.8	50,800	2.0	2000		Pebble / Very Coarse Gravel	10.1	89.9
1	25.0	25,000	1.0	1000		Pebble / Very Coarse Gravel	28.9	71.1
3/4	19.0	19,000	0.75	750		Pebble / Coarse Gravel	37.6	62.4
1/2	12.7	12,700	0.50	500		Pebble / Medium Gravel	48.9	51.1
3/8	9.5	9,500	0.38	380		Pebble / Medium Gravel	54.5	45.5
#4	4.75	4,750	0.19	190		Pebble/Fine Gravel	67.4	32.6
#8	2.36	2,360	0.09	90		Granule	75.7	24.3
#16	1.19	1,190	0.05	50	Sand	Very Coarse Sand	80.3	19.7
#30	0.58	580	0.02	20		Coarse Sand	83.1	16.9
#50	0.3	300	0.01	10		Medium Sand	86.5	13.5
#100	0.15	150	0.006	6		Fine Sand	94.5	5.5
#200	0.075	75	0.003	3		Very Fine Sand	97.2	2.8
-#200	0.075	75	0.003	3	Silt & Clay	Silt & Clay		

Approximate d values (in 1000ths of an inch):

d_{40}=	690	% Gravel	75.7
d_{50}=	480	% Sand	21.5
d_{90}=	8	% Silt & Clay	2.8

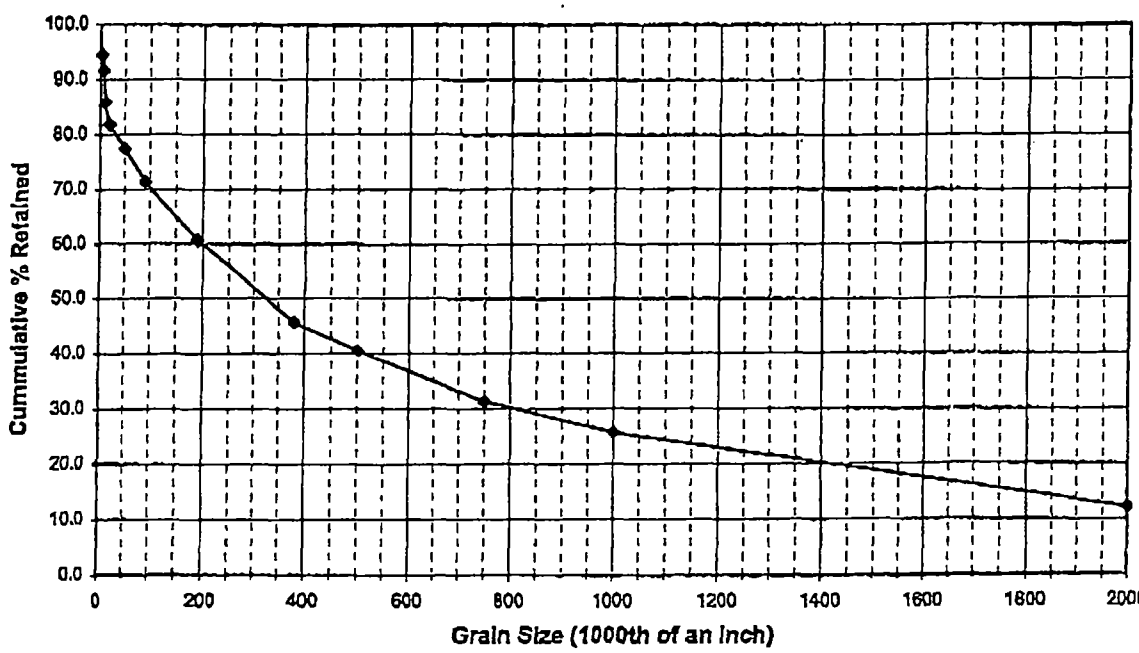
B-4 (78 ft bgs)
Grain Size Analysis Results



Boring Number: B-4
Depth Interval: 84 ft bgs
Date Collected: 7/14/1998

Sieve / Mesh Size	Sieve Aperture / Grain Size: Millimeters (mm)	Microns (um)	Inches	1000ths of an Inch	Size Classifications: General Classification	Wentworth / USGS Classification	Cummulative Percent Retained	Cummulative Percent Passing
3	76.2	76,200	3.0	3000	Gravel	Cobble		
2	50.8	50,800	2.0	2000		Pebble / Very Coarse Gravel	12.1	87.9
1	25.0	25,000	1.0	1000		Pebble / Very Coarse Gravel	25.8	74.2
3/4	19.0	19,000	0.75	750		Pebble / Coarse Gravel	31.4	68.6
1/2	12.7	12,700	0.50	500		Pebble / Medium Gravel	40.5	59.5
3/8	9.5	9,500	0.38	380		Pebble / Medium Gravel	45.6	54.4
#4	4.75	4,750	0.19	190		Pebble/Fine Gravel	60.7	39.3
#8	2.36	2,360	0.09	90		Granule	71.3	28.7
#16	1.19	1,190	0.05	50	Sand	Very Coarse Sand	77.4	22.6
#30	0.58	580	0.02	20		Coarse Sand	81.8	18.2
#50	0.3	300	0.01	10		Medium Sand	85.9	14.1
#100	0.15	150	0.006	6		Fine Sand	91.7	8.3
#200	0.075	75	0.003	3		Very Fine Sand	94.5	5.5
-#200	0.075	75	0.003	3	Silt & Clay	Silt & Clay		
Approximate d values (in 1000ths of an inch):		d_{40}=	515			% Gravel	71.3	
		d_{50}=	325			% Sand	23.2	
		d_{90}=	6			% Silt & Clay	5.5	

B-4 (84 ft bgs)
Grain Size Analysis Results



APPENDIX B

APPENDIX B

Groundwater Modeling in Support of Extraction System Design

APPENDIX B

GROUNDWATER MODELING IN SUPPORT OF EXTRACTION SYSTEM DESIGN

This appendix presents a summary of the development and evolution of numerical groundwater modeling efforts performed in support of evaluation and design of the groundwater extraction system at the Simplot Plant Area of the Eastern Michaud Flat (EMF) Superfund Site. The objective of the modeling effort was initially to evaluate the feasibility of groundwater extraction and then to identify suitable extraction well locations and estimate optimal pumping rates for capture, to the extent practicable, of groundwater affected by gypsum stack seepage.

B-1 INTRODUCTION

Numerical groundwater modeling of the Simplot Plant Area has been performed during the Remedial Investigation (RI), the Feasibility Study (FS), and subsequently in support of remedial system design. Numerical modeling was first conducted during the RI to test a conceptual (non-numeric) model of the groundwater flow system developed from the Site hydrogeologic data and to better describe the Site groundwater flow regime. For the FS, the RI numerical model was used to evaluate the potential effectiveness of groundwater extraction as a remedial alternative for the Simplot Operable Unit and to identify general extraction areas and potential pumping rates. The FS effort also identified areas of uncertainty in the site conceptual model and the numerical model data set. These uncertainties were subsequently resolved through additional site investigation and pilot test pumping of select wells during a series of pre-design investigations (Appendix A). The investigation findings were then used either directly or in conjunction with simplified flow models to identify improved groundwater extraction rate estimates and well spacings for extraction system design.

Details of the various numerical modeling efforts are discussed below. Summaries of the modeling efforts conducted during the RI and FS are presented in subsections B-2 and B-3 and are included to provide a complete picture of groundwater modeling process and to describe how both the numerical and conceptual Site models have been developed and refined. Subsection B-4 presents the findings of the pre-design investigations and specific details of the modeling efforts relating to extraction system design.

B-2 GROUNDWATER MODELING FOR THE REMEDIAL INVESTIGATION

A conceptual model of the Simplot Plant Area groundwater flow regime was developed from the geologic and hydrogeologic characterizations conducted as part of the RI. The conceptual model indicated groundwater affected by gypsum stack seepage generally moves northward from the undifferentiated Bannock Range volcanic rocks and interbedded clastic sediments located beneath the gypsum stack into alluvial sediments underlying the Simplot Plant Area proper. Distinct aquifer zones were not identified in the Bannock Range strata, which underlie nearly the entire gypsum stack. Fine-grained interbeds, notably the American Falls Lake Beds (AFLB), within the predominantly sand and gravel deposits in the Simplot Plant Area provide hydraulic separation between an upper, water table zone and lower confined zones, such that shallow and deep monitoring zones were identified in the RI. To the north of the Don Plant, the historic Bonneville flood events scoured out the AFLB confining unit and deposited the Michaud Gravels.

In order to test the site conceptual model, Bechtel Environmental, Inc. (BEI) constructed a numerical groundwater flow model of the EMF site. Groundwater flow was simulated using

MODFLOW, which is a three dimensional finite difference groundwater flow modeling code developed by the U.S. Geological Survey (USGS). Flow path lines were calculated using MODPATH, which is a post-processor developed by the USGS that uses MODFLOW input and output files to plot particle tracks. A detailed description of the model can be found in Appendix K of the RI report.

The numerical modeling was used to quantitatively test the conceptual model of the flow system and to describe groundwater flow paths. This description of flow paths included a consideration of the potential for migration of affected groundwater along deeper flow paths and for changes in the flow paths that might occur as a result of changing pumping rates in the Simplot production wells, which continuously pump approximately 4,000 to 4,500 gallons per minute (gpm) from the lower zone beneath the Simplot Plant Area.

Particle track outputs from the numerical model were used to indicate the general groundwater flow paths from the area of the gypsum stack. Particle tracks from the upper gypsum stack indicated predominantly northward flow along the joint fenceline area and then northeast across the plant. Particle tracks emanating from the lower gypsum stack indicated flow generally converging on the plant area before trending north-northeast toward the Portneuf river. The modeling results further indicate that the Don Plant production wells provide some capture of groundwater affected by seepage from the gypsum stack.

The model provided a simulation of the groundwater flow system and the associated particle tracking indicated the predicted flow paths of water affected by the gypsum stack seepage. However, as with any model, there are some limitations that must be considered. One limitation of this model is that abrupt changes in hydraulic conductivity values (up to five orders of magnitude in some cases) were assigned to adjacent zones in each layer and likely had a significant effect on the calculated groundwater flow directions. Most of these abrupt changes do not appear to be based on actual changes in the physical system (i.e., they are not based on hydraulic testing or boring log data), and can lead to abrupt changes in the calculated groundwater flow direction, both horizontally and vertically. Data constraints also lead to uncertainties in the conceptual site model and the subsequent numerical model construction near the southern and western portions of the model boundary.

B-3 FEASIBILITY STUDY GROUNDWATER MODELING

Two major pathways for contaminant transport in groundwater from the gypsum stacks were identified from review of the RI results and subsequent groundwater monitoring: 1) a buried alluvial channel along the western boundary of the Simplot Plant Area; and 2) a broader flow path in the eastern part of the Plant Area. These two major pathways are separated by a large bedrock knob, of much lower hydraulic conductivity, that extends northward into the southern portion of the Don Plant proper. The concentrations of arsenic and other gypsum stack-related constituents were much lower in the area downgradient of the bedrock knob than in areas adjacent to the knob, particularly to the east. These conditions reflect the lower flow rates out of the less permeable bedrock units into the alluvial sediments. In addition, groundwater flow out of the bedrock knob primarily enters deeper zones within the thick sequence of alluvial sediments and is captured by the plant production wells.

or other sources.

based on what? physical data.

Groundwater modeling was conducted as part of the feasibility study to evaluate the potential effectiveness of groundwater extraction on capture of northward-flowing groundwater from the gypsum stack area along the two pathways described above. Specifically, the RI model was converted to Visual MODFLOW and used to evaluate various combinations of extraction wells in an effort to intercept groundwater affected by the gypsum stack. The results of this evaluation were presented in Appendix B to the Feasibility Study Comparative Analysis of Alternatives (MFG, 1997) and are summarized below.

Visual MODFLOW uses the USGS model code for its calculation process, but provides a graphically-based shell for model input, editing, and output processing (i.e., it is a pre-and post-processor for MODFLOW and MODPATH and the actual MODFLOW and MODPATH codes are essentially the same as those used in the RI model). The data input files for the converted model were the same as used in the RI model. All model runs were performed for steady-state conditions. For evaluation purposes, interception of affected groundwater was considered to have occurred when particle path lines originating from within the gypsum stack footprint were intercepted by the extraction wells. Particles for the path line calculations originated in each of the four model layers in the gypsum stack area.

Simulations were conducted with extraction wells located to intercept the flow paths identified in the West Plant area (along the joint fenceline) and in the East Plant area. The results of extraction modeling indicated that interception of nearly all of the water affected by the gypsum stack that is not captured by the plant production wells could be achieved by placing wells in the locations marked A, B, and C on Figure 20 in the main body of the Draft RDR. Location A was selected to intercept water flowing down the buried alluvial valley on the western side of the gypsum stack. Location B was selected to intercept flow from the gypsum stack that enters the confined lower zone north of the gypsum stack. Location C was positioned to intercept flow from the gypsum stack that remains in the upper zone north of the gypsum stack. Numerical model runs indicated that most of the particles originating in the gypsum stack would be captured with extraction wells pumping at the following rates:

Location A	: 200 gpm
Locations B and C	: Combined rate of 200 gpm.

The FS modeling effort provided a preliminary estimate of how the flow system could respond to the stress of a groundwater extraction system. The characterization of hydraulic conductivities within the model caused some of the flow to be "channeled" toward extraction wells in a manner that may not occur in the actual system. This channeling was likely the case on the east side of the gypsum stack (east plant area) and suggests that the model may overestimate individual well capture zones. Additionally, some of the hydraulic conductivities used in this model (such as those near Location A in the west plant area) were believed to be higher than the actual field values, which could result in the model underestimating the capture zone of the well while overestimating the required pumping rates. Because of these limitations in the data set used in the model, additional field investigations were conducted in support of the remedial design, as described in Appendix A and summarized briefly below.

B-4 GROUNDWATER MODELING FOR EXTRACTION SYSTEM DESIGN

This section presents key findings of field investigations (pilot tests) and focused modeling efforts, which collectively form the basis for the groundwater extraction system design.

B-4.1 Initial Field Investigations to Support Extraction System Evaluation and Modeling

A series of field investigations (also termed pre-design investigations or pilot tests) were performed between 1996 and 1998 to collect supplemental information to address the data limitations identified by the FS modeling effort.

Field studies were conducted in the fall of 1996 to further characterize the hydrogeology of locations identified as potentially optimum for groundwater extraction in the FS and to conduct pump testing of these candidate areas. Results of the field studies were compiled in a field report, which was issued to EPA on August 25, 1997. A copy of the field report is appended to the Draft RDR (Appendix A-1), and the principal findings of the study are listed below:

West Plant Area

- The existence of a relict stream channel (i.e., buried alluvial valley) located approximately along the west fence line was confirmed and the relatively narrow, steep-sided geometry of the channel was better defined.

- The new data supplemented and further refined the aquifer characteristics described in the RI report and used in constructing the RI groundwater model. Pumping test data indicated that the hydraulic conductivities in the west plant area were the same order of magnitude or higher than values obtained from RI slug tests, but significantly lower than the values used in the RI model.

- Based on the new geologic and hydraulic data, anticipated pumping rates from extraction wells to achieve capture in the west plant area were identified as likely lower than those estimated from the RI model.

East Plant Area

- Pumping test data indicated that hydraulic conductivities in this area are higher than the values obtained from RI slug testing and the values used in the groundwater model.

- Based on the new geologic and hydraulic data, anticipated pumping rates to achieve containment in the east plant area were estimated to be higher than the rates derived with the RI groundwater model.

An extended pilot test of candidate area extraction wells and associated monitoring was initiated in the Fall of 1997 to assess sustainable yields in wells 343, 337, and 338; evaluate extraction water quality; and confirm that the design would hold true under an extended pumping scenario. Results of the extended pilot test are appended to the Draft RDR (Appendix A-2), and the primary findings are summarized below:

- The effectiveness of capture as a result of pumping well 343 at 70 gpm was demonstrated in the West Plant Area by water level measurements in surrounding monitoring wells and one observation well (see discussion in section B-4.2). The radius of influence for well 343 was in excess of 1000 feet:

- Pilot testing of wells 343, 337 and 338 indicated that the well yields identified by FS modeling could be sustained in the long term. Well 338 experienced a loss in well efficiency related to siltation and encrustation, most likely associated with cycling of the pump. Well rehabilitation efforts were partially successful, but the primary result was to dictate a change in well design for the shallow aquifer extraction wells in the East Plant Area. Well 337 also had relatively low well efficiency.

- The radius of influence of pumping well 338 at 40 gpm was estimated to be nearly 100 feet. The radius of influence of pumping well 337 at 200 gpm was estimated to range from about 550 feet to over 1000 feet.

In addition and as described in Appendix A-3, one additional extraction test well (346) was installed in the west plant area in July 1998 to further evaluate the extent of the buried alluvial channel to the northeast of well 343. The well was completed in a sand unit (at a depth of 236 to 251 feet below ground surface) overlying weathered rhyolite bedrock. Saturated conditions were noted in finer-grained strata at shallower depths (180 to 200 feet bgs) and the static water level in the well was approximately 145 feet bgs. Analyses of water samples collected from this well since 1998 indicate an arsenic concentration ranging from about 0.02 to 0.04 mg/L, approximately one order of magnitude lower than at upgradient wells in the fenceline area (307, 308, and 343). The lower arsenic concentration at 346 likely reflects greater mixing of gypsum stack-affected waters with clean underflow coming off the Bannock Range in zones with limited hydraulic connection to the overlying gypsum stack.

B-4.2 Preliminary Extraction System Design

The information gathered since preparation of the FS has confirmed that extraction well pumping in the west plant area (Location A, Figure 20) and east plant areas (Locations B & C) will be effective in capturing groundwater affected by gypsum stack seepage. Extraction in these two areas will supplement the capture provided by the plant production wells in the central portion of the Don Plant. Groundwater extraction in the area downgradient of the gypsum stack between the west plant area and the east plant area would not provide significant additional benefit in terms of arsenic removal for the following reasons:

- The area is occupied by a large bedrock high characterized by interlayered volcanic and clastic beds.
- The bedrock units typically have substantially lower hydraulic conductivity than the adjacent alluvial sediments.
- Groundwater flow conditions in the bedrock strata are complex and highly variable.
- Groundwater flow discharging northward from the bedrock high likely enters deeper zones within the alluvial sequence, which are within the capture zone of the plant production wells.
- The total flow of affected groundwater out of the bedrock strata in this area is likely much smaller than from adjacent areas.
- Groundwater quality data indicate that arsenic concentrations in water from shallow zone wells downgradient of the bedrock knob are much lower than concentrations in groundwater within the preferential flow paths west and east of the bedrock knob

The empirical data derived from pilot testing in the west plant area were sufficient to estimate extraction rates for this area without additional modeling. For the east plant area, simplified flow models for the shallow and deep zones were constructed using FLOWPATH to facilitate estimation of extraction well yields and spacings.

West Plant Area

The short and long term extraction tests performed at well 343 provided data which indicate a total pumping rate of about 150 gpm would be sufficient for containment of groundwater affected by gypsum stack seepage in the relict alluvial channel in the west plant Area (fence line). In effect, the

calculated hydraulic conductivities were substantially lower than the value used in the RI model for this area, indicating that a pumping rate lower than 200 gpm would likely be effective.

The long term extraction test of well 343 indicated that a sustained yield from this well of 70 gpm was feasible. The estimated radius of influence for well 343 is in excess of 1000 feet, a distance larger than the width of the buried channel and extending both upgradient and downgradient along the channel feature. The drawdowns measured at monitoring wells located 253 feet upgradient (south) (well 307) and 272 feet downgradient (north) (well 308) were 2.5 feet and 1.9 feet, respectively, after seven months of pumping (see Appendix A-2).

It is possible that the additional 80 gpm could be extracted from extraction test well 346, located approximately 500 feet northeast of well 343. However, the low arsenic concentration in water from well 346 indicates that it would not provide effective capture of arsenic mass. Therefore, one or more additional extractions wells will be needed. The most likely location for an additional extraction well is in the vicinity of monitoring well 308.

East Plant Area

Simplified models of the upper and lower zones in the East Plant area were constructed using FLOWPATH and the hydraulic conductivity results obtained from the 1996 field studies. These steady-state models were used to evaluate extraction well yields and spacings in the East Plant area.

The key model parameters for the upper zone flow model were as follows:

- 47 rows by 63 columns,
- Dimensions were 2200 feet wide (perpendicular to flow direction) by 1720 feet long,
- Two-dimensional flow system,
- Hydraulic conductivity of 804 feet/day based on the Theis recovery analysis for observation well 339,
- Porosity of 0.25, and
- Constant head boundaries upgradient and downgradient corresponding to observed gradient.

The key model parameters for the lower zone flow model were as follows:

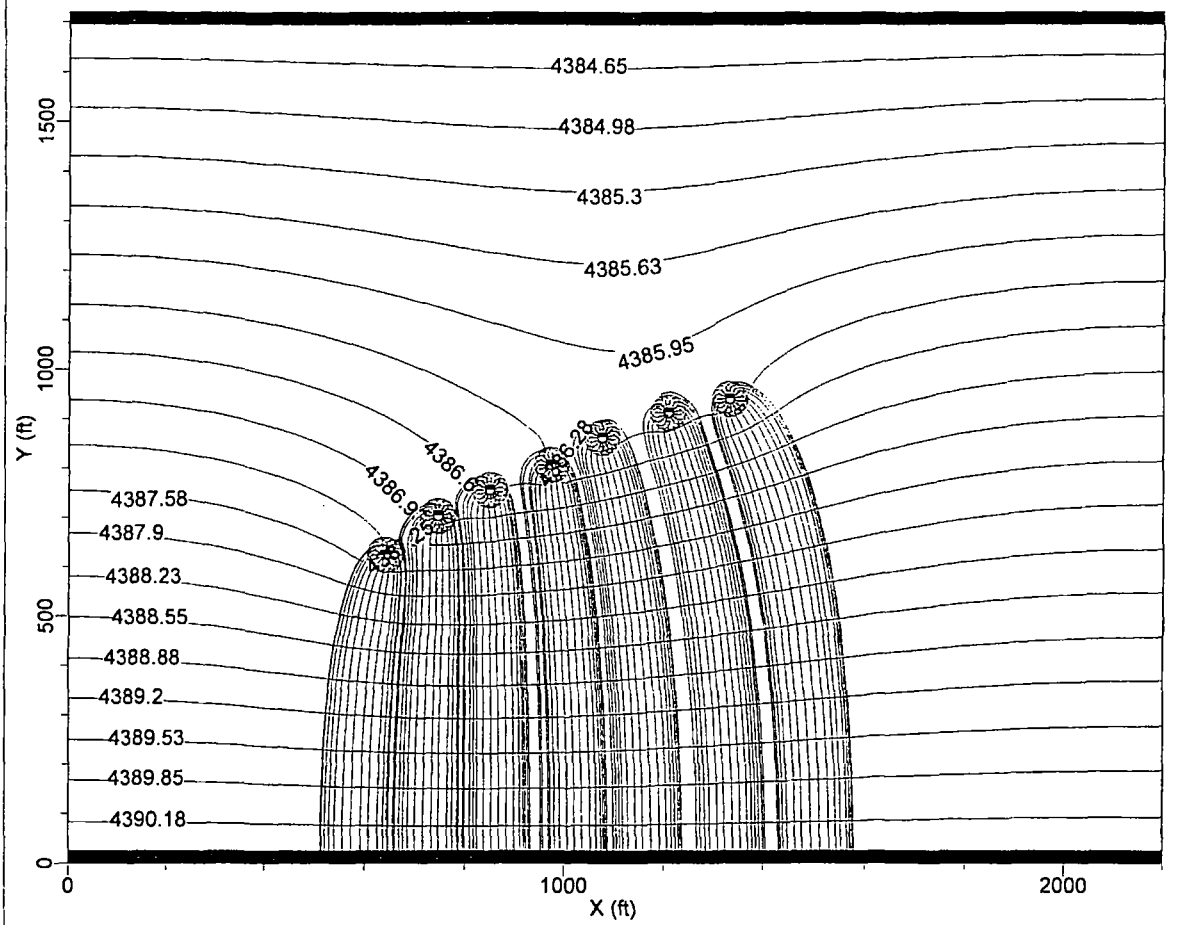
- 52 rows by 68 columns,
- Dimensions were 2200 feet wide (perpendicular to flow direction) by 1720 feet long,
- Two-dimensional flow system,
- Hydraulic conductivity of 260 feet/day,
- Porosity of 0.25, and
- Constant head boundaries upgradient and downgradient corresponding to observed gradient.

FLOWPATH modeling indicated that a total pumping rate of 280 gpm from shallow extraction wells in the east plant area would provide containment of northward-flowing groundwater affected by gypsum stack seepage in the upper zone. These results were obtained with seven wells pumping at 40 gpm each and spaced approximately 130 feet apart at the northern edge of the lower gypsum stack (see Figure B-1).

For the lower zone, FLOWPATH modeling indicated that a total pumping rate of 400 gpm from deep extraction wells would provide containment of northward-flowing groundwater affected by gypsum stack seepage in the lower portion of the aquifer. These results were obtained with two wells pumping at 200 gpm each, well 337 and one additional well to be installed approximately 400 feet east of well 337 (see Figure B-2).

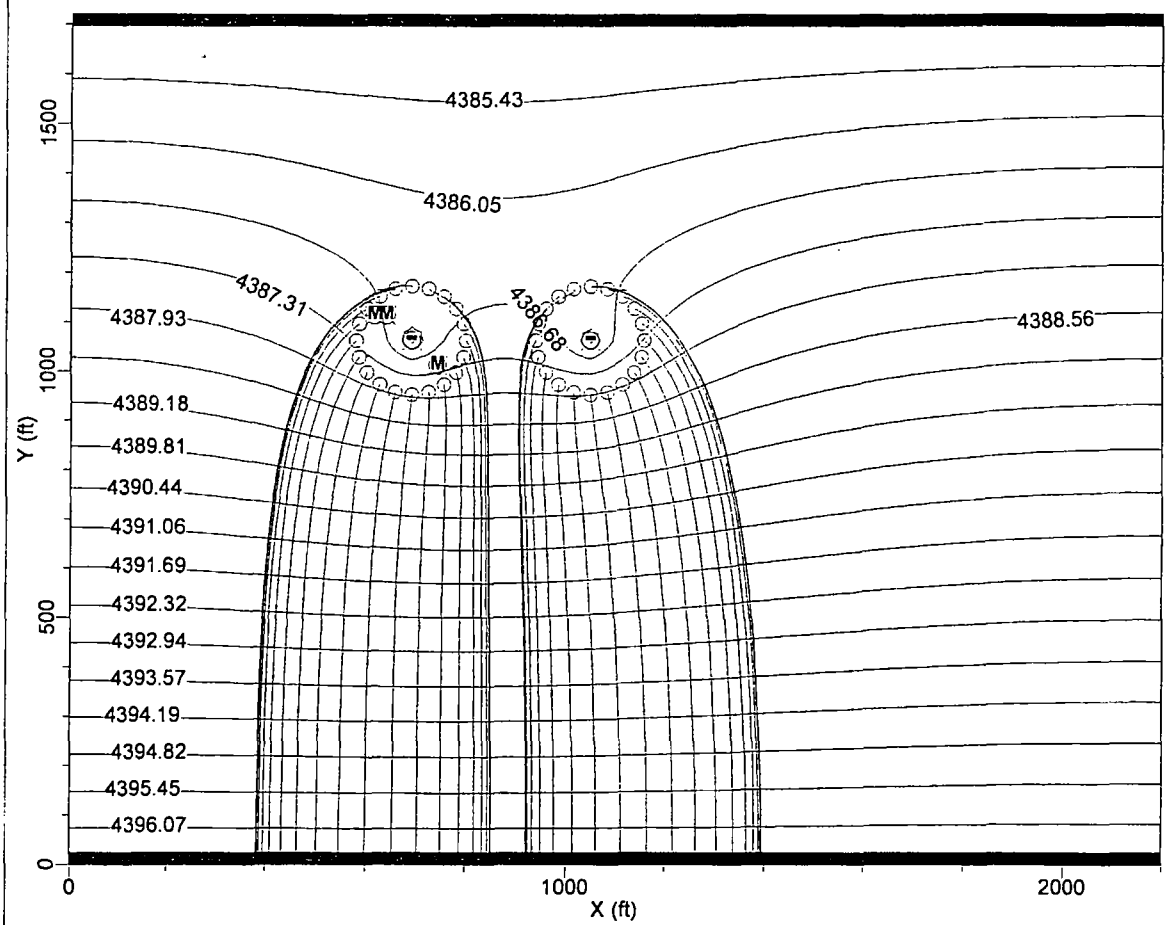
The total groundwater extraction rate indicated by the field testing and FLOWPATH modeling was 830 gpm. This total extraction rate was based (as described above) on pumping 150 gpm from two or more wells located within the buried alluvial channel in the west plant area, 400 gpm from two deep extraction wells pumping 200 gpm each in the East Plant Area, and 280 gpm from seven shallow extraction wells in the east plant area pumping at a rate of 40 gpm each.

In consideration of the Simplot plant's annual turnaround, an approximately three to four week period during which the plant processes are either shut down or throttled back to allow equipment maintenance and replacement and water demand is reduced, the previous extraction well pumping analyses were revisited. The effect of turnaround was evaluated by considering how the system would perform with an average annual pumping rate equal to 90% of the 830 gpm, or about 750 gpm, which is at the upper end of the range of 400 to 830 gpm estimated from MODFLOW and subsequent analyses, respectively. The FLOWPATH analyses of extraction well pumping rates and well spacings in the east plant area were conservative in that the actual rates and spacings determined to be effective were less and greater, respectively, than the rates and spacings selected for the preliminary design. This conclusion is based on the observed effects on water levels and radius of influence from the extended pumping tests, as discussed in Appendix A-2. In addition, evaluation of the observed drawdown and radius of influence for pumping of well 343 in the west plant area indicates that capture of gypstack-affected water in the relict alluvial channel can be achieved with an extraction rate of less than 150 gpm. In summary, a total average annual rate of 750 gpm should, in conjunction with the production wells, provide capture of groundwater affected by gypsum stack seepage to the extent practicable.



Extraction Well Locations and Model Grid, Shallow Aquifer, East Plant Area

FlowPath II Ver. 1.1 © 1989-1998 WHI	MFG, Inc.	Figure B-1



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FlowPath II Ver. 1.1 © 1989-1998 WHI	MFG, Inc.

APPENDIX C

APPENDIX C

Groundwater Quality Data Summary

APPENDIX C
GROUNDWATER QUALITY DATA SUMMARY

[Note: The database is intended to provide summary information of the key constituents. Simplot is currently working with EPA to provide data to support their development of a Site-wide database]

LEGEND

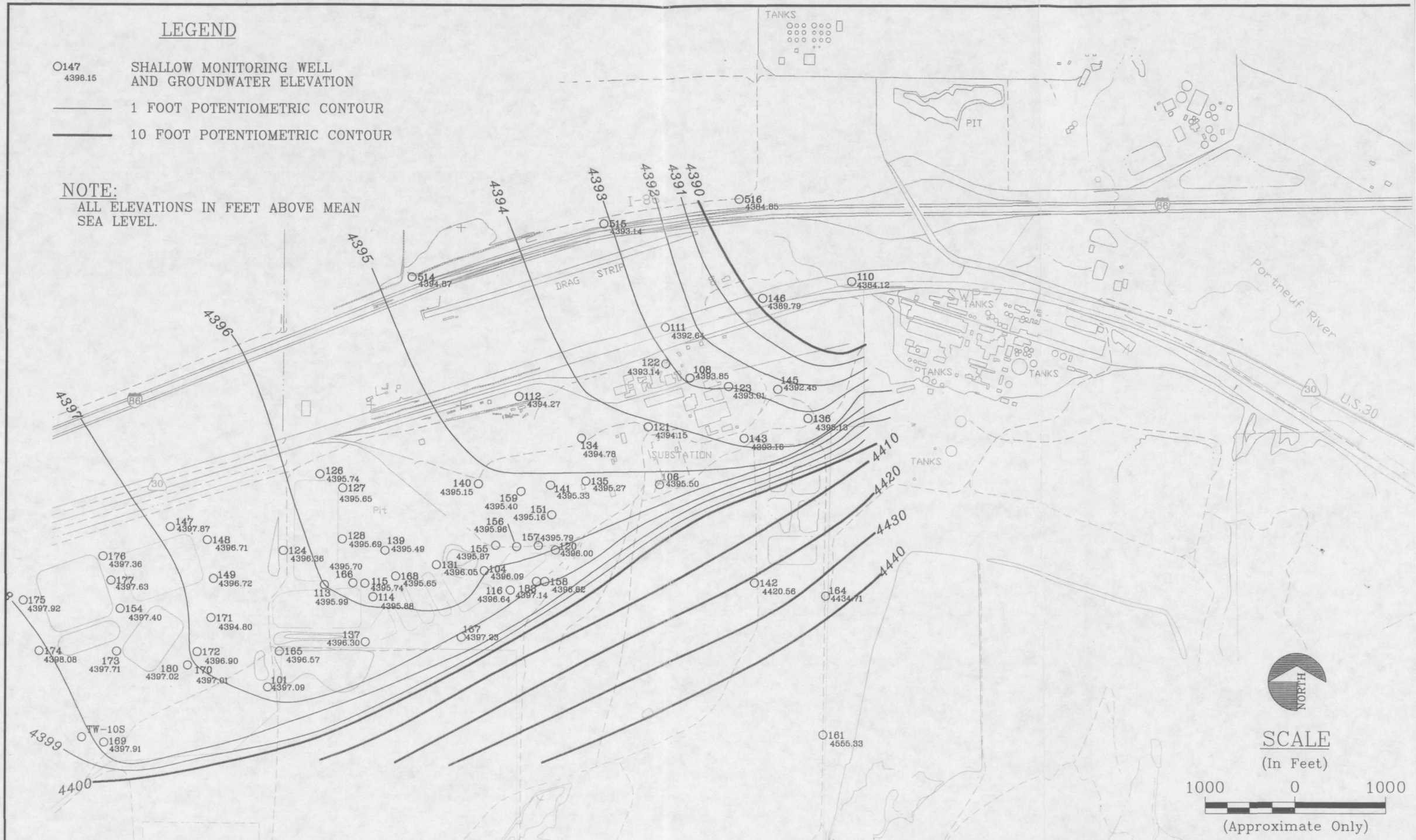
○147 4398.15 — SHALLOW MONITORING WELL AND GROUNDWATER ELEVATION

——— 1 FOOT POTENTIOMETRIC CONTOUR

═══ 10 FOOT POTENTIOMETRIC CONTOUR

NOTE:

ALL ELEVATIONS IN FEET ABOVE MEAN SEA LEVEL.



ASTARIS IDAHO LLC–POCATELLO, IDAHO 2001 GROUNDWATER MONITORING ASSESSMENT	GROUNDWATER CONTOUR MAP - AUGUST 2001	FIGURE 5

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Hydrometrics, Inc.

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