Multicultural Alliance for a Safe Environment
www.swuraniumimpacts.org
PO Box 4524 Albuquerque NM 87196
505-577-8438

Mark Purcell
Regional Project Manager

Adam Weece
Community Involvement Coordinator

EPA Region VI

Via email: Mark Purcell

Re: Lack of community involvement in Homestake Superfund Site remediation

December 2, 2020

Dear Mr. Purcell and Mr. Weece,

We write to formally object to the lack of meaningful community involvement in the clean-up of the Homestake Superfund Site. As you know, community involvement is required by law. And, just as important, community involvement is necessary to reach a just and satisfactory outcome. Despite Multicultural Alliance for a Safe Environment (MASE) and Bluewater Valley Downstream Alliance (BVDA) longstanding and well-known commitment to cleaning up the uranium contamination left at the Homestake site, EPA has not adequately involved us in the remediation process. Instead, we get superficial information at annual meetings, and have had to retain an attorney to submit FOIA requests and sort through the documents produced in order to piece together what is going on at Homestake. We should not need an attorney; and we should not need to conduct FOIA requests. We hope that you will choose to work with us so that we can meaningfully engage in this remediation process that impacts our health and our environment.

We recently discovered through a response that your office made to a FOIA request from the NM Environmental Law Center, that many key documents have never been made available to MASE or BVDA. This is unacceptable.

EPA held a community meeting in September of 2019 and another one in September of 2020. At both of those meetings, you stated the importance of community involvement and that it is EPA's responsibility to ensure that the community is given the opportunity to be involved.

However, meeting with us once a year is simply not enough, especially given the amount of correspondence and interactions between EPA and Homestake Barrick Gold. At the September 2020 meeting, we requested to be involved in the process and to see drafts, not just final documents. You told us no. This is also unacceptable. The information available on the website about Homestake is scant – and though you recently updated it, it still does not contain critical documents which we need to assess the situation.

We also object to EPA's failure to provide us the opportunity to be involved in the scoping and comment on the RI, the Administrative Settlement Agreement and the work plan. We request that in the future, we are notified that these types of major documents are in the works and that we are included and able to provide input before they are completed.

Moving forward, at a minimum, EPA should (1) provide us with the information and documents as they come in or are produced; (2) answer our questions; (3) create information that is understandable to a lay person; (4) provide us additional documents as we request them; (5) keep us apprised of your interactions with Homestake-Barrick Gold, including the steps being considered and discussed; (6) consider our views and information in any decision making process; and perhaps most importantly (7) give us an opportunity to weigh in before decisions are made, and not only afterwards. What we request is not optional or a luxury. It is both required by law, and necessary to achieve an outcome that complies with the law at Homestake.

At this point, we request:

1. All of the documents listed in the April 20 2019 letter from Holland and Hart to the EPA, concerning "Status of HMC's CERCLA Equivalency Efforts" under the "Tasks Completed" section, which include:
    a. 11/25/2013 Equivalency Package
    b. 12/6/2013 Draft ARARs Table and Memo
    c. 11/20/2014 Draft equivalency RI report
    d. 11/2015 draft Administrative Orders on Consent
    e. 11/2013 Statement of Work
    f. Identification of Candidate Technologies Memo for Treatability Studies – drafts submitted in 2/2015 – drafts and final
    g. EPA comments on Draft Equivalency RI report
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    j. 2019 Work Plan (There is one on the website considering background levels. Is there another one?)

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    f. Drafts of Feasibility Study
    g. Proposed Plan
    h. Drafts of Record of Decision
    i. Drafts of consent decree
3. Both drafts and final documents of all of the documents you mentioned in the slides you presented at the 9/30/2020 meeting, specifically:
    a. Screen Alternatives Memorandum (perhaps this is the same as 2e above)
    b. EPA/NMED Background Reassessment
    c. TI Waiver Evaluation Report
    d. Feasibility Study Report
4. Timely information about any spills, including sludge spills, when they occur, including all remediation actions taken
5. All actions taken by EPA to comply with 40 C.F.R.§300.430(c)(2)(i): "The lead agency shall provide for the conduct of the following community relations activities, to the extent practicable, prior to commencing field work for the remedial investigation: (i) Conducting interviews with local officials, community residents, public interest groups, or other interested or affected parties, as appropriate, to solicit their concerns and information needs, and to learn how and when citizens would like to be involved in the Superfund process
6. A copy of your Community Involvement Plan for the Site, as required by 40 C.F.R.§300.430(c)(2)(ii)(A-C)
7. A virtual meeting with you, to discuss our requests, as well as EPA plans for community involvement moving forward
8. A follow up meeting with you after we have received all of the above information so that we can provide you with feedback and have our questions answered

Please let us know by 12/11/2020 when you can meet with us and whether you are willing to provide us with the information we have requested by no later than 12/20/2020. Thank you very much.

Sincerely,

Susan R Gordon

Susan Gordon on behalf of the Multicultural Alliance for a Safe Environment

and the Bluewater Valley Downstream Alliance

CC: Kurt Vollbrecht, NMED
Senator Martin Heinrich - Alex Eubanks
Senator Tom Udall - Calvert Curley
Rep Ben Ray Lujan - Jennifer Catechis
Rep Deb Haaland - Brenda McKenna
Rep Xochtil Torres Small - Ashley Beyers
Governor Michelle Lujan Grisham
Nadine Padilla - NM Indian Affairs Department

Message

From: Purcell, Mark [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=FE198E260B024EB4BD9D30DC11F900B1-PURCELL, MARK]
Sent: 3/30/2021 1:44:40 PM
To: Poore, Christine [Poore.Christine@epa.gov]
Subject: FW: Homestake NRRB Follow-Up Letter
Attachments: 20210329 Homestake NRRB Follow-Up Letter.pdf

Hi Christine,

Homestake has prepared a follow-up letter to the Board. See attached and email communication below.

Mark

From: Daniel Lattin <dlattin@barrick.com>
Sent: Monday, March 29, 2021 9:32 PM
To: Purcell, Mark <purcell.mark@epa.gov>
Cc: Patrick Malone <pmalone@barrick.com>; Adam Arguello <aarguello@barrick.com>; Brad Bingham <bbingham@barrick.com>; Kevin Murray (krmurray@hollandhart.com) <krmurray@hollandhart.com>; Ellie Rudolf <EARudolf@hollandhart.com>
Subject: Homestake NRRB Follow-Up Letter

Mark,

Homestake appreciated the opportunity to share with the National Remedy Review Board its perspective and vision for Site as informed and shaped by its extensive investigation and remediation of the Site over the last four decades. HMC provides the Board with the attached letter containing references with the intention of clarifying some technical points raised during the meeting.

Please don't hesitate to contact by phone (775) 397-7215 or by email dlattin@barrick.com if you have any questions.

Thank you,

BARRICK

www.barrick.com

Daniel Lattin, P.E.
Sr. Closure Program Manager
Barrick Gold of North America, Inc.

Tel: (775) 748-1022
Mobile: (775) 397-7215

Homestake Mining Company of California
P.O. Box 98
Grants, NM 87020

Tel +1 505 287 4456
Fax +1 505 287 9289

By Email

March 29, 2021

Mr. Mark Purcell
Superfund Division (6SF)
U.S. Environmental Protection Agency - Region 6
1445 Ross Avenue, Suite 1200
Dallas, TX 75202
Email: (purcell.mark@epa.gov)

Re: U.S. EPA Region 6
CERCLA Docket No. 06-03-20
Homestake Mining Company Superfund Site
NRRB Board Presentation Letter

Mark:

Homestake Mining Company of California (HMC) appreciated the opportunity to share with the National Remedy Review Board (Board) its perspective and vision for its Homestake Mining Company Superfund Site (Site) as informed and shaped by its extensive investigation and remediation of the Site over the last four decades.

While not an exhaustive response to the issues raised during the presentations, HMC provides the Board with the following references with the intention of clarifying some technical points:

1. Hydraulic containment

The Board asked HMC if its proposed remedy included continued hydraulic containment. The proposed remedy does not include hydraulic containment; however, per Nuclear Regulatory Commission (NRC) requirements, HMC's Long Term Care Boundary accounts for potential downgradient exposure over a 1,000-year period as part of the requirements for site transfer to the United States Department of Energy.

2. Alternative Concentration Limits (ACL)

Specifically, the Board asked how the ACL standards are determined. While HMC is currently completing this analysis and its ACL application that will be submitted to NRC in Q3 2021, the ACL process will achieve protectiveness. An ACL is a concentration standard for a given constituent at the foot of the tailings pile, which ensures that no excessive human health risk above baseline will be observed beyond the long-term care boundary. The boundary is established through a series of bounding analyses that encompass any worst-case scenarios for contaminant transport within the groundwater model.

3. Mobility of uranium in the aquifer and its attenuation

For contaminant transport analysis, HMC refers the Board to Section 5.5 of HMC Groundwater Flow and Transport Model Report (Appendix B to HMC's Technical Impracticability Waiver Evaluation), and Worthington Miller Environmental' s Geochemical Characterization of Tailings, Alluvial Solids, and Groundwater (Appendix B to HMC's Groundwater Corrective Action Plan). HMC's model shows some natural attenuation due to adsorption.

4. HMC water quality analysis for SAG Well 943

Well 943 was abandoned in coordination with NMED, EPA and NRC in 2018. HMC refers the Board to June 23, 2020 Letter from Ron Linton (NRC) to David Pierce (HMC) regarding Agencies' agreement with HMC's assessment and the proposed groundwater monitoring adjustment to SAG wells.

5. Modeling of Chinle/SAG contamination

HMC refers the Board to its Groundwater Flow and Transport Model Report (Appendix B to HMC's Technical Impracticability Waiver Evaluation) for its extensive modeling of contamination in the Chinle aquifers. This modeling report incorporates Chinle and SAG aquifers into HMC's groundwater model. 200yr modelling did not show contaminant transfer to SAG aquifer. SAG characterization and expanded modelling to 1,000yr is in progress to support a Q3 2021 ACL application to NRC.

6. Uranium absorption onto clays

HMC's analysis supports the concept that adsorption of uranium and molybdenum onto ferrihydrite, and that under site conditions the anionic forms of uranium and molybdenum are essentially excluded from interacting with negatively charged clays. The silts and clays in the aquifer are significant to COC transport as a result of diffusion rather than adsorption. HMC refers the Board to Section 5.3 (for the conceptual geochemical model), Section 5.4 (for discussion of geochemical parameters), and Section 5.5 (for discussion of Dual Domain Porosity) of its Groundwater Flow and Transport Model Report (Appendix B to HMC's Technical Impracticability Waiver Evaluation).

7. Groundwater remediation system capacity

The treatment systems are actually overbuilt for and constrained by overall site limitations. More importantly, as HMC has explained, even if treatment rates could be increased, it would not alter the technical impracticability of remediating groundwater or the proposed remedy to ensure protectiveness because these ex-situ treatment systems do not address the primary limiting factors, the back-diffusion of mass from the fine-grained material to the coarse-grained material and the perpetual sources of the unlined tailings impoundments and associated geologically hosted contamination.

8. Tailings characterization

For a discussion of tailings characterization, HMC refers the Board to Worthington Miller Environmental' s reports detailing the geochemical characterization of the pile (Appendices B and C of HMC's Groundwater Corrective Action Plan).

Upon request, HMC can provide these additional reference materials or any other information the Board needs to conduct its review. HMC remains committed to working cooperatively with all agencies to reach Site closure and ensure protection of human health and the environment while reducing the consumptive impact to water resources and carbon emissions in the region.

Please do not hesitate to contact by phone (775) 397-7215 or by email dlattin@barrick.com if you have any questions.

Sincerely,

Daniel Lattin, P.E.
Sr. Closure Program Manager
Homestake Mining Company of California

Cc:

Michael McCarthy
Kevin Murray
Patrick Malone
Adam Arguello
Brad Bingham
file

Message

From: Purcell, Mark [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=FE198E260B024EB4BD9D30DC11F900B1-PURCELL, MARK]
Sent: 2/17/2021 10:49:06 PM
To: Vollbrecht, Kurt, NMENV [kurt.vollbrecht@state.nm.us]
Subject: RE: NRRB

Kurt,

Please send your package to me on March 10th. I will be forwarding the Region's package and slide presentation, along with all the written comments and presentations from all stakeholders, to the Board on March 11th.

The EPA ID No. is: NMD007860935

Mark D. Purcell
Superfund and Emergency Management Division (6SF)
U.S. Environmental Protection Agency - Region 6
1201 Elm Street, Suite 500
Dallas, TX 75270
Tel: 214-665-6707
Fax: 214-665-6660

From: Vollbrecht, Kurt, NMENV <kurt.vollbrecht@state.nm.us>
Sent: Wednesday, February 17, 2021 2:53 PM
To: Purcell, Mark <purcell.mark@epa.gov>
Subject: RE: NRRB

Our comments should be directed to?

Christine Poore
U.S. EPA National Remedy Review Board Chair
U.S. Environmental Protection Agency
1200 Pennsylvania Ave., NW
MC5204P
Washington, DC 20460

Also, the Questa Site had a "Cerclis #" associated with it. is there something similar for Homestake?

Sorry to bother you with bookkeeping!

Please note new phone number below

Kurt Vollbrecht, Manager
Mining Environmental Compliance Section
Ground Water Quality Bureau
New Mexico Environment Department
1190 St. Francis Dr., Suite N2200
Santa Fe, NM 87502

(505) 660-9420
Kurt.vollbrecht@state.nm.us
https://www.env.nm.gov/

From: Purcell, Mark <purcell.mark@epa.gov>
Sent: Wednesday, February 17, 2021 12:25 PM
To: Vollbrecht, Kurt, NMENV <kurt.vollbrecht@state.nm.us>
Subject: [EXT] RE: NRRB

I think the Board would want to see the PowerPoint presentation as well.

Mark D. Purcell
Superfund and Emergency Management Division (6SF)
U.S. Environmental Protection Agency - Region 6
1201 Elm Street, Suite 500
Dallas, TX 75270
Tel: 214-665-6707
Fax: 214-665-6660

From: Vollbrecht, Kurt, NMENV <kurt.vollbrecht@state.nm.us>
Sent: Wednesday, February 17, 2021 1:19 PM
To: Purcell, Mark <purcell.mark@epa.gov>
Subject: RE: NRRB

I'm basing comments in part on the draft FS because I need to have a reference point. We will be able to give a PowerPoint I imagine? If so, should that be submitted by March 10 as well, or can I just show up with slides to talk through?

Please note new phone number below

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Mining Environmental Compliance Section
Ground Water Quality Bureau
New Mexico Environment Department
1190 St. Francis Dr., Suite N2200
Santa Fe, NM 87502
(505) 660-9420
Kurt.vollbrecht@state.nm.us
https://www.env.nm.gov/

From: Purcell, Mark <purcell.mark@epa.gov>
Sent: Tuesday, February 9, 2021 4:06 PM
To: Vollbrecht, Kurt, NMENV <kurt.vollbrecht@state.nm.us>
Subject: [EXT] RE: NRRB

Not the TI Evaluation Report. I asked, but they said not to. I did send them the draft FS. I think they will be looking mostly at the package I have to prepare and the stakeholder written comments.

I may try to convince the NRRB coordinator, Christine Poore, to let you and Pat participate in the first day because Pat is the expert on the background geochemistry. I may need him to answer questions regarding his report. I will let you know.

Mark

From: Vollbrecht, Kurt, NMENV <kurt.vollbrecht@state.nm.us>
Sent: Tuesday, February 09, 2021 5:02 PM
To: Purcell, Mark <purcell.mark@epa.gov>
Subject: NRRB

Hi Mark,

Will EPA be providing the draft TI waiver evaluation and draft FS to the NRRB prior to the meeting in late March?

Thanks.

Please note new phone number below

Kurt Vollbrecht, Manager
Mining Environmental Compliance Section
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New Mexico Environment Department
1190 St. Francis Dr., Suite N2200
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Sincerely,

Susan R Gordon

Susan Gordon on behalf of the Multicultural Alliance for a Safe Environment

and the Bluewater Valley Downstream Alliance

CC: Kurt Vollbrecht, NMED
Senator Martin Heinrich - Alex Eubanks
Senator Tom Udall - Calvert Curley
Rep Ben Ray Lujan - Jennifer Catechis
Rep Deb Haaland - Brenda McKenna
Rep Xochtil Torres Small - Ashley Beyers
Governor Michelle Lujan Grisham
Nadine Padilla - NM Indian Affairs Department

APPENDIX B

EPA NOMINATION OF THE CONTRACTING OFFICER'S REPRESENTATIVE (COR)

This form is submitted by the COR nominee's supervisor to the cognizant contracting officer (CO) within the Office of Acquisition Management or Regional Contracting Office. The CO will send a signed copy of this form back to the nominating supervisor with approval or deny approval with reason. If approved, the CO will respond to this nomination, in writing, to both the COR nominee and the COR nominee's supervisor with a COR Appointment Memorandum. For additional information on the requirements for being a COR Reference EPAAG 1.6.5 - Contracting Officer's Representatives Three-Tiered Program Policy.

1a. Name of Nominee Mark Purcell	b. Title, Series, and Grade Remedial Project Manager - GS-1301-13
c. Mailing Address: USEPA Region 6 Mail Code: 6SEM Street Address: 1201 Elm Street, Suite 500 City, State & Zip Code: Dallas, TX 75270	d. Organization/Office: EPA Region 6 - Superfund e. Phone Number: 214-665-6707; cell 469-553-7211 f. E-mail Address purcell.mark@epa.gov

2. This COR nomination is for FAC-COR Level (Check appropriate block):

COR Type	FAC-COR Level I	FAC-COR Level II	FAC-COR Level III
Contract Level COR	☐	☐	☐
Delivery Order COR	☐	☐	☐
Work Assignment COR	☐	☐	☐
Task Order COR	☐	☐	☐
IA COR	☐	☐	☐
Simplified Acquisition COR	☐	☐	☐
Foreign Contract COR	☐	☐	☐
Alternate COR	☐	☐	☐
Other (Specify): Task Order COR - Level II	☐	☐	☐

3. Certification and Experience

a. **Certification:** Current FAC-COR certification level II certificate attached (Y/N) Yes

b. **Current CL Achievement Certificate,** (if applicable): Valid to 10/1/2022 attached (Y/N) Yes

4. Contract Number: 68HE0519D0005

5. I find that the nominee is technically proficient and is certified at the appropriate FAC-COR Level for this nomination. I affirm that, if appointed, the COR will be provided sufficient time to execute the duties of a COR and to maintain certification through completion of required CLPs for the appropriate FAC-COR Level. I certify, if the COR nominee is appointed, that the PARs agreement for the COR nominee includes applicable language related to COR duties and responsibilities. I will notify the CO immediately if there is a need to change the appointed COR and nominate a replacement COR for the contract(s).

5a. Name of Nominee's Immediate Supervisor Blake Atkins	5b. Signature of Nominee's Immediate Supervisor BLAKE ATKINS Digitally signed by BLAKE ATKINS DN: c=US, o=U.S. Government, ou=Environmental Protection Agency, cn=BLAKE ATKINS, 0.9.2342.19200300.100.1.1=68001003652741 Date: 2021.08.16 15:00:56 -05'00' 5c. Date 5d. Phone Number 214-665-2297

6. I understand that my appointment as a COR is dependent on adequately performing my COR duties, following ethical standards of conduct for employees of the Executive Branch, and maintaining certification as prescribed in this policy. If any of these conditions are not met, I may be removed as the COR from this contract(s). I cannot redelegate my COR duties. In the event that I am unable to continue performing my COR duties, I will contact my supervisor and the contracting officer immediately. If applicable: I have filed the Office of Government Ethics Form 450, Confidential Financial Report, with the cognizant deputy Ethics official.

6a. Signature of Nominee MARK PURCELL Digitally signed by MARK PURCELL DN: c=US, o=U.S. Government, ou=Environmental Protection Agency, cn=MARK PURCELL, 0.9.2342.19200300.100.1.1=68001003652706 Date: 2021.08.16 11:58:51 -05'00'	6b. Date August 16, 2021

Contracting Officer's Use Only

☐ I approve of the above nominated COR for FAC-COR level ___.

☐ I deny approval of the above nominated COR for FAC-COR level ___. Reason: _____

Contracting Officer Name (Print): Signature: Date:

EPA Form 1900-65b (Rev.12-14) All previous editions of this form are obsolete. Electronic and Paper Copies Acceptable.

From: Tonsil, Pauline
To: Purcell, Mark
Subject: RE: Request verification of current COR status
Date: Monday, August 9, 2021 2:52:10 PM
Attachments: CL- FAI Acquisition Newsletter.docx

Good afternoon Mark,

Continuous Learning Verification for Employees Posted in FAITAS May 14, 2021 Report On OAS Website - https://contracts.epa.gov/certlisting

- There is no way to provide a copy of the current FAC-COR Continuous Learning Achievement certificate. FATIAS is no longer available and the continuous learning achievement certificate is not available in FAI CSOD.
- For Federal Acquisition Certifications and CL achievement that were current with a CL end date of February 1, 2020 or later, these certifications are still current until further notice from OMB, OFPP and FAI.
- The new FAI landing page at https://dau.csod.com open in the go-live launch on June 14th.
- ***There is no CL module developed in FAI CSOD; thus, there is no available module for entering CLPs for credit.*** (Please see the attached FAI Newsletter dated 7/7/2021).
- Automated processing or entering of CL achievements points **is not developed** in FAI CSOD until further notice.
- Employees are highly encouraged to continue completing continuous training/ events/activities to meet the FAC-COR continuous learning requirements and follow guidance as stated in the FAI Newsletter dated 7/7/2021.
- FAI has the CLPs data transferred from FAITAS for those CLPs completed within FAITAS and those entered as completed external trainings/events/activities transferred in the migration per the 7/7/2021 FAI Newsletter and will determine how to apply them sometime in the future.
- FAI will announce when FAI CSOD CL Module features are ready for use and any additional CL information, at a later date
- The SPE will determine CL mandatory training based on audit findings after OMB, OFPP and FAI provide CL guidelines as related to FAI CSOD.
- The **Equivalent/Fulfillment Module** is Not Used for entering continuous learning points.
- The **Equivalent/Fulfillment Module** is only used for New EPA FAC- COR initial Level 2 and Level 3 certifications when requesting CLC 222 as an equivalent for FCR 201 and FCR 400.
- The OMB, OFPP, February 1, 2020, extension for current Federal Acquisition Certifications and CL achievement requirements remains in effect until further notice.
- That is OMB, OFPP administratively extended certification continuous learning requirements effective February 1, 2020, until further notice.
- All FAC-C, FAC-COR, and/or FAC- P/PM certifications that resided in FAITAS with CL ends dates of February 1, 2020 and later dates are still current until future notice.
- This also means that if a FAC-C, FAC-COR, and/or FAC- P/PM certification is shown as **"Expired"** on the May 14, 2021 FAITAS report on the OAS Website at https://contracts.epa.gov/certlisting, with a CL end date of February 1, 2020 or later, the certification is still "**Current"** . This is based on the OMB OFPP, certification CL extension that states all certification that were current with a CL end date of February 1, 2020 or later are still current until further notice.

Last Name	First Name	Middle Name	AAShip Region	SubAAShip	Office Name	Division/ SubOffice Name	Level	Continuous Learning Period Start Date	Continuous Learning Period End Date	CLPs Approved	CLPs Remaining	Certification Status	CL Achievement Request Status *	Employee Email	Supervisor Email
Purcell	Mark		Region 6				2	10/02/2020	10/01/2022	20.00	20.00	Current	N/A	purcell.mark@epa.gov	alberts.blake@epa.gov

- n Career Manager (ACM), I certify that employees listed in the May 14, 2021 FAITAS report on the OAS Website at https://contracts.epa.gov/certlisting, with a CL end date of February 1, 2020 or later, the certification is still "**Current"** until further notice from OMB OFPP and FAI.

Thank you.
Respectfully,
Pauline V. Tonsil
US Environmental Protection Agency (EPA)
EPA Acquisition Career and Human Capital Manager
Office of Acquisition Solutions - (Immediate Office)
Tonsil.Pauline@epa.gov | 202-564-9197
OAS...Advancing EPA's Mission Through Acquisitions!
"For Success, Attitude is Equally as Important as Ability" -Harry F. Banks

From: Purcell, Mark <purcell.mark@epa.gov>
Sent: Monday, August 9, 2021 3:34 PM
To: Tonsil, Pauline <tonsil.pauline@epa.gov>
Subject: Request verification of current COR status

Hi Pauling,

As the Acquisition Career Manager, would you please verify my current status in DAU as COR certified. I received my recertification in May 2021. I am a remedial project manager in the Region 6 Superfund program.

Thank you,

Mark

Mark Purcell
Superfund and Emergency Management Division (6SED)
U.S. Environmental Protection Agency – Region 6
1201 Elm Street, Suite 500
Dallas, TX 75270
Office Tel: 214-665-6707
Work Cell: 469-553-7211
Fax: 214-665-6660

News for the Acquisition Workforce

Acquisition Today

July 7, 2021

Government-wide Acquisition Workforce Key Initiatives

OnDemand FAI CSOD Support

Do you have a question about working in FAI CSOD? Your answer is probably in one of the short (30-second to 3-minute) [HYPERLINK "https://gcc02.safelinks.protection.outlook.com/?url=https%3A%2F%2Flnks.gd%2Fl%2FeyJhbGciOiJIUzI1NiJ9.eyJidWxsZXRpbl9saW5rX2lkIjoxMDAsInVyaSI6ImJwMjpjbGljayIsImJ1bGxldGluX2lkIjoiMjAyMTA3MDcuNDI4OTkwNDEiLCJ1cmwiOiJodHRwczovL3d3dy5rYWx0dXJhLmNvbS9pbmRleC5waHAvZXh0d2lkZ2V0L3ByZXZpZXcvcGFydG5lcl9pZC8yMjAzOTgxL3VpY29uZl9pZC8zOTgwNDkzMS9lbWJlZC9keW5hbWIjP2ZsYXNodmFycyU1QnBsYXlsaXN0QVBJLmtwbDBJZCU1RD0xXzE5aG10anE2JnV0bV9tZWRpdW09ZW1haWwmdXRtX3NvdXJjZT1nb3ZkZWxpdmVyeSJ9.kbsBAI9_KxZX9maNynreKdlZCEDElZCuQfpRRjrI9So%2Fs%2F748924914%2Fbr%2F108962328766-l&data=04%7C01%7Ctonsil.pauline%40epa.gov%7C256c7bde227d44d2bbd408d9417fad08%7C88b378b367484867acf976aacbeca6a7%7C0%7C0%7C637612838950093473%7CUnknown%7CTWFpbGZsb3d8eyJWIjoiMC4wLjAwMDAiLCJQIjoiV2luMzIiLCJBTiI6Ik1haWwiLCJXVCI6Mn0%3D%7C1000&sdata=Hksl4oescJ43PHXStoe9fcjDVjemAdh3Q4PhTbgaolY%3D&reserved=0" \t "_blank"] or task aids located on the help menu within FAI CSOD. Training video topics include: Updating User Records, Registering for Certification, Submitting Education and Experience Requirements, Registering for Instructor-led Training, Requesting Equivalencies and Fulfillments, and more.

Continuous Learning (CL) Extension Still In Effect

All Continuous Learning (CL) Achievement requirements with a current status of February 1, 2020 are still considered valid until further notice. FAI CSOD is not automatically processing CL achievements at this time. FAI is working with the Office of Federal Procurement Policy (OFPP) and federal agencies to examine CL processes going forward. Certification holders should still pursue continuous learning through all available methods. You should be aware:

- FAI CSOD is not recording external CLPs at this time; you should maintain your records of external training; FAI will provide instructions for submitting external CLP requests after processes are established in FAI CSOD.

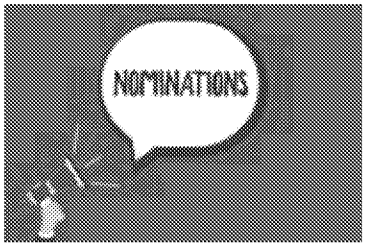
- Data is available for CLPs achieved in both FAITAS and CSOD, and continuous learning approved in FAITAS. These will be applied after the February 1, 2020 extension is lifted and guidelines for tracking of CL within FAI CSOD are established.

OFPP Seeks Your Feedback on EPIC Ideas to Improve Federal Procurement

The Office of Federal Procurement Policy (OFPP) wants your feedback on ideas received in response to their EPIC – Engaging Procurement Ideas to Consider – crowdsourcing campaign. Help identify ideas to incorporate into the President's Management Agenda (PMA) and other government-wide acquisition priorities and initiatives! Visit [HYPERLINK

"https://gcc02.safelinks.protection.outlook.com/?url=https%3A%2F%2Flnks.gd%2Fl%2FeyJhbGciOiJIUzI1NiJ9.eyJidWxsZXRpbl9saW5rX2lkIjoxMDEsInVyaSI6ImJwMjpjbGljayIsImJ1bGxldGluX2lkIjoiMjAyMTA3MDcuNDI4OTkwNDEiLCJ1cmwiOiJodHRwczovL29wZW5vcHBzLnVzYWpvYnMuZ292L3Rhc2tzLzI0NDA_dXRtX21lZGl1bT1lbWFpbCZ1dG1fc291cmNlPWdvdmRlbGl2ZXJ5In0.8dZQsNMzFgRW44V99C69Sq5c9US-p0cAaVUUk9pQB9w%2Fs%2F748924914%2Fbr%2F108962328766-l&data=04%7C01%7Ctonsil.pauline%40epa.gov%7C256c7bde227d44d2bbd408d9417fad08%7C88b378b367484867acf976aacbeca6a7%7C0%7C0%7C637612838950730665%7CUnknown%7CTWFpbGZsb3d8eyJWIjoiMC4wLjAwMDAiLCJQIjoiV2luMzIiLCJBTiI6Ik1haWwiLCJXVCI6Mn0%3D%7C1000&sdata=jjn%2Fs2fmM9%2ByNmOH7w1knXM7%2B4XBDztKnO89fpoJICk%3D&reserved=0" \t "_blank"] to learn more.

Acquisition Professional Excellence Awards' Deadline Extended



The nomination deadline for the Chief Acquisition Officer Council (CAOC) Acquisition, Program Management, and Small Business Excellence Awards is extended to August 2 at 5 p.m. ET. These awards recognize acquisition professionals who have contributed to improvements in acquisition, especially for responses to the COVID-19 pandemic. The awards will be presented at the Imagine Nation Conference, November 7 to 9. For award details and the nomination form, visit [HYPERLINK "https://gcc02.safelinks.protection.outlook.com/?url=https%3A%2F%2Flnks.gd%2Fl%2FeyJhbGciOiJIUzI1NiJ9.eyJidWxsZXRpbl9saW5rX2lkIjoxMDIsInVyaSI6ImJwMjpjbGljayIsImJ1bGxldGluX2lkIjoiMjAyMTA3MDcuNDI4OTkwNDEiLCJ1cmwiOiJodHRwczovL3d3dy5mYWkuZ292L3N1cnZleS9BRTIw

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0&sdata=QuMQr%2FLLWAcyxm7w0t7FLWcHuxRQkvCn35vQ8SumKm4%3D&reserved=0" \t
"_blank"].

Registration is Live for Acquisition Training for the Real World

Acquisition Training for the Real World is a virtual, two-week program that consists of daily training sessions on GSA's tools and digital services, as well as updates on Federal Marketplace initiatives. Federal agency personnel can join daily from 1 to 2 p.m. ET starting July 26 through August 6. Register using [HYPERLINK

"https://gcc02.safelinks.protection.outlook.com/?url=https%3A%2F%2Flnks.gd%2Fl%2FeyJhbGci
OiJIUzI1NiJ9.eyJidWxsZXRpbl9saW5rX2lkIjoxMDMsInVyaSI6ImJwMjpjbGljayIsImJ1bGxldGluX2lkIjo
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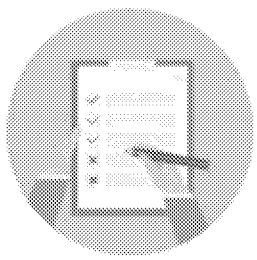
0&sdata=tsZ%2FCnnEfJSBVkzE7xYAvZ2twBHKWQSsRuX7dRPtMZY%3D&reserved=0" \t "_blank"].
Earn up to 11 CLPs for attending all sessions.



FAC-COR Competency Model Validation Survey

FAI has updated the FAC-COR Competency Model, which is the foundation of COR certification and training. Updates were made through a series of workshops with COR subject matter experts from across the civilian agencies. The last step in the process is to validate the competencies through a web-based survey of active CORs. The survey will run from July 7 - July 23 and will take approximately 20 minutes to complete. If you receive an invitation, please complete the survey to make sure

that CORs in your agency are well represented in the updated model. If you have any questions please contact [HYPERLINK "mailto:malinda.joyner-davis@fai.gov" \t "_blank"]

Periodic Table of Acquisition Innovations Video Tutorial Goes Live

The Periodic Table of Acquisition Innovations recently launched a short [HYPERLINK "https://gcc02.safelinks.protection.outlook.com/?url=https%3A%2F%2Flnks.gd%2Fl%2FeyJhbGciOiJIUzI1NiJ9.eyJidWxsZXRpbl9saW5rX2lkIjoxMDQsInVyaSI6ImJwMjpjbGljayIsImJ1bGxldGluX2lkIjoiMjAyMTA3MDcuNDI4OTkwNDEiLCJ1cmwiOiJodHRwczovL3d3dy5mYWkuZ292L21lZGlhLWxpYnJhcnkvaXRlbS9wZXJpb2RpYy10YWJsZS1hY3F1aXNpdGlvbi1pbm5vdmF0aW9ucy1pbnRyb2R1Y3RvcnktdHV0b3JpYWw_dXRtX21lZGl1bT1lbWFpbCZ1dG1fc291cmNlPWdvdmRlbGl2ZXJ5In0.x1YVuiTcniwLLPM6fs8m7rywFCqdMhJRZZzFZ3NNZ_g%2Fs%2F748924914%2Fbr%2F108962328766-l&data=04%7C01%7Ctonsil.pauline%40epa.gov%7C256c7bde227d44d2bbd408d9417fad08%7C88b378b367484867acf976aacbeca6a7%7C0%7C0%7C637612838950760538%7CUnknown%7CTWFpbGZsb3d8eyJWIjoiMC4wLjAwMDAiLCJQIjoiV2luMzIiLCJBTiI6Ik1haWwiLCJXVCI6Mn0%3D%7C1000&sdata=cw22gvP7nE8%2B82V8JRfctx3RI877yzL%2FdIaOxIqq13M%3D&reserved=0" \t "_blank"] highlighting the knowledge management portal's functionality, layout and capabilities. Learn about the techniques on the [HYPERLINK "https://gcc02.safelinks.protection.outlook.com/?url=https%3A%2F%2Flnks.gd%2Fl%2FeyJhbGciOiJIUzI1NiJ9.eyJidWxsZXRpbl9saW5rX2lkIjoxMDUsInVyaSI6ImJwMjpjbGljayIsImJ1bGxldGluX2lkIjoiMjAyMTA3MDcuNDI4OTkwNDEiLCJ1cmwiOiJodHRwczovL3d3dy5mYWkuZ292L3BlcmlvZGljLXRhYmxlP3V0bV9tZWRpdW09ZW1haWwmdXRtX3NvdXJjZT1nb3ZkZWxpdmVyeSJ9.ZisP1SNP3A_S_-qPfx-0FqRXKnE8CtkLbavoEA1mRKk%2Fs%2F748924914%2Fbr%2F108962328766-l&data=04%7C01%7Ctonsil.pauline%40epa.gov%7C256c7bde227d44d2bbd408d9417fad08%7C88b378b367484867acf976aacbeca6a7%7C0%7C0%7C637612838950760538%7CUnknown%7CTWFpbGZsb3d8eyJWIjoiMC4wLjAwMDAiLCJQIjoiV2luMzIiLCJBTiI6Ik1haWwiLCJXVCI6Mn0%3D%7C1000&sdata=tRus4a4jrvJHCcbzU6Lot0m1mfvvcuEBFs0dzJIYZQk%3D&reserved=0" \t "_blank"] that have been proven successful by other acquisition professionals!

Learn How 8(a) STARS III can Benefit Your Agency

8(a) STARS III, a small business set-aside Government-Wide Acquisition Contract, can provide flexible access to customized IT solutions from a large, diverse pool of 8(a) industry partners. This complimentary training will cover the benefits and features of the contract, ordering procedures, and tools that can help

meet your IT-services requirements. The webinar will take place on July 13 from 2 to 3:30 p.m. ET. Register using [HYPERLINK "https://gcc02.safelinks.protection.outlook.com/?url=https%3A%2F%2Flnks.gd%2Fl%2FeyJhbGciOiJIUzI1NiJ9.eyJidWxsZXRpbl9saW5rX2lkIjoxMDYsInVyaSI6ImJwMjpjbGljayIsImJ1bGxldGluX2lkIjoiMjAyMTA3MDcuNDI4OTkwNDEiLCJ1cmwiOiJodHRwczovL2dzYS56b29tZ292LmNvbS93ZWJpbmFyL3JlZ2lzdGVyL1dOX3d3eEotUUdIUkhDVHhaa21WS0RkREE_dXRtX21lZGl1bT1lbWFpbCZ1dG1fc291cmNlPWdvdmRlbGl2ZXJ5In0.-uDR9It5-twvgCJ6Qv5CJnW9tap7zj1BMfpdRKac5Sk%2Fs%2F748924914%2Fbr%2F108962328766-l&data=04%7C01%7Ctonsil.pauline%40epa.gov%7C256c7bde227d44d2bbd408d9417fad08%7C88b378b367484867acf976aacbeca6a7%7C0%7C0%7C637612838950770493%7CUnknown%7CTWFpbGZsb3d8eyJWIjoiMC4wLjAwMDAiLCJQIjoiV2luMzIiLCJBTiI6Ik1haWwiLCJXVCI6Mn0%3D%7C1000&sdata=EKKaMA05nEpkRMvrzyNTyqGdRsK9FWRXth7%2Fh%2Bchs7I%3D&reserved=0" \t "_blank"] and learn more at [HYPERLINK "https://gcc02.safelinks.protection.outlook.com/?url=https%3A%2F%2Flnks.gd%2Fl%2FeyJhbGciOiJIUzI1NiJ9.eyJidWxsZXRpbl9saW5rX2lkIjoxMDcsInVyaSI6ImJwMjpjbGljayIsImJ1bGxldGluX2lkIjoiMjAyMTA3MDcuNDI4OTkwNDEiLCJ1cmwiOiJodHRwczovL3d3dy5nc2EuZ292L3RlY2hub2xvZ3kvdGVjaG5vbG9neS1wdXJjaGFzaW5nLXByb2dyYW1zL2dvdmVybm1lbnR3aWRlLWFjcXVpc2l0aW9uLWNvbnRyYWN0cy84YS1zdGFycy1paWk_dXRtX21lZGl1bT1lbWFpbCZ1dG1fc291cmNlPWdvdmRlbGl2ZXJ5In0.OTJiSXxHpjRzzFlaIXh5EVDwftnWkbRg6CEYH7QY8aM%2Fs%2F748924914%2Fbr%2F108962328766-l&data=04%7C01%7Ctonsil.pauline%40epa.gov%7C256c7bde227d44d2bbd408d9417fad08%7C88b378b367484867acf976aacbeca6a7%7C0%7C0%7C637612838950780459%7CUnknown%7CTWFpbGZsb3d8eyJWIjoiMC4wLjAwMDAiLCJQIjoiV2luMzIiLCJBTiI6Ik1haWwiLCJXVCI6Mn0%3D%7C1000&sdata=6i%2FGmmGofbwOMC3pWf48h8x5FNZ3amJ5bQvpkLpjJ%2Fk%3D&reserved=0" \t "_blank"].

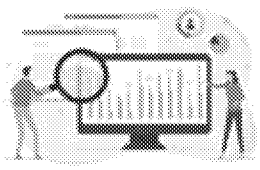
Adapting Category Management Principles

Join the OMB, the Category Management (CM) team, DHS, the Industrial Products and Services Category and others to learn how they incorporate CM principles into contracts and business practices. The webinar will take place on July 22 from 1 to 2:30 p.m. ET. Register using [HYPERLINK "https://gcc02.safelinks.protection.outlook.com/?url=https%3A%2F%2Flnks.gd%2Fl%2FeyJhbGciOiJIUzI1NiJ9.eyJidWxsZXRpbl9saW5rX2lkIjoxMDgsInVyaSI6ImJwMjpjbGljayIsImJ1bGxldGluX2lkIjoiMjAyMTA3MDcuNDI4OTkwNDEiLCJ1cmwiOiJodHRwczovL2dzYS56b29tZ292LmNvbS93ZWJpbmFyL3JlZ2lzdGVyL1dPX0pUdU1udmZhU2lPRF9uaDMwVWdxQUE_dXRtX21lZGl1bT1lbWFpbCZ1dG1fcu291cmNlPWdvdmRlbGl2ZXJ5In0.ZHVJTgA8PUqjdKUdWTf_SueOir70KTivVsdxGhPF42c%2Fs%2F748924914%2Fbr%2F108962328766-l&data=04%7C01%7Ctonsil.pauline%40epa.gov%7C256c7bde227d44d2bbd408d9417fad08%7C88b378b367484867acf976aacbeca6a7%7C0%7C0%7C637612838950780459%7CUnknown%7CTWFpbGZsb3d8eyJWIjoiMC4wLjAwMDAiLCJQIjoiV2luMzIiLCJBTiI6Ik1haWwiLCJXVCI6Mn0%3D%7C1000&sdata=WO2TI3k49WJEb0s%2FOKaUjE8fyQVI4JQffPFeCrte%2FYQ%3D&reserved=0" \t "_blank"

]. Earn 1.5 CLPs for attending and registering in [HYPERLINK "https://gcc02.safelinks.protection.outlook.com/?url=https%3A%2F%2Flnks.gd%2Fl%2FeyJhbGciOiJIUzI1NiJ9.eyJidWxsZXRpbl9saW5rX2lkIjoxMDksInVyaSI6ImJwMjpjbGljayIsImJ1bGxldGluX2lkIjoiMjAyMTA3MDcuNDI4OTkwNDEiLCJ1cmwiOiJodHRwczovL2lkLmRhdS5lZHUvP3V0bV9tZWRpdW09ZW1haWwmdXRtX3NvdXJjZT1nb3ZkZWxpdmVyeSJ9.BCugZy7bGK_vNJHZaMKzOI0byaMzXV40aORRXmfN3_M%2Fs%2F748924914%2Fbr%2F108962328766-l&data=04%7C01%7Ctonsil.pauline%40epa.gov%7C256c7bde227d44d2bbd408d9417fad08%7C88b378b367484867acf976aacbeca6a7%7C0%7C0%7C637612838950790410%7CUnknown%7CTWFpbGZsb3d8eyJWIjoiMC4wLjAwMDAiLCJQIjoiV2luMzIiLCJBTiI6Ik1haWwiLCJXVCI6Mn0%3D%7C1000&sdata=q8Pc6vYRs1DNbio9Z4k6adcoLA1TL5eT57%2F97eeTaLw%3D&reserved=0" \t "_blank"].

GSA Issues Notice to Proceed to HCaTS 8(a) Pool 2 Contractors

GSA has issued its Notice to Proceed (NTP) for the Human Capital and Training Solutions (HCaTS) 8(a) Pool 2 contract. These awards provide the 8(a) community expanded access to the HCaTS Best-in-Class contract program while creating more options for Federal Agencies to meet their 8(a) business development program goals through both competitive 8(a) set-asides and 8(a) direct task order awards. Read this [HYPERLINK "https://gcc02.safelinks.protection.outlook.com/?url=https%3A%2F%2Flnks.gd%2Fl%2FeyJhbGciOiJIUzI1NiJ9.eyJidWxsZXRpbl9saW5rX2lkIjoxMTAsInVyaSI6ImJwMjpjbGljayIsImJ1bGxldGluX2lkIjoiMjAyMTA3MDcuNDI4OTkwNDEiLCJ1cmwiOiJodHRwczovL2hhbGx3YXlzLmNhcC5nc2EuZ292L2FwcC8_dXRtX21lZGl1bT1lbWFpbCZ1dG1fc291cmNlPWdvdmRlbGl2ZXJ5Iy9nYXRld2F5L2NhdGVnb3J5LW1hbmFnZW1lbnQvNjUxMi9kb2NzLzM1ODI0L1N1Y2Nlc3MlMjBTdG9yeV8lMjBHU0ElMjBJc3N1ZXMlMjBOb3RpY2UlMjB0byUyMFByb2NlZWQlMjB0byUyMEhDYVRTJTIwOChhKSUyMFBvb2wlMjAyJTIwQ29udHJhY3RvcnMtMTYyMzA4NzU2MC5wZGYifQ.wmcr6HVLwbMJBDZ5ZoTg15VT-M8NsNrGs4sTQ_d8KvU%2Fs%2F748924914%2Fbr%2F108962328766-l&data=04%7C01%7Ctonsil.pauline%40epa.gov%7C256c7bde227d44d2bbd408d9417fad08%7C88b378b367484867acf976aacbeca6a7%7C0%7C0%7C637612838953747387%7CUnknown%7CTWFpbGZsb3d8eyJWIjoiMC4wLjAwMDAiLCJQIjoiV2luMzIiLCJBTiI6Ik1haWwiLCJXVCI6Mn0%3D%7C1000&sdata=Ct5d%2FgxOFTlalGUnmUs%2BtS0LPzVsz%2Fr3%2BJKhhkumqkY%3D&reserved=0" \t "_blank"] to learn more.



Use Category Management Dashboards and Avoid Unmanaged Spend

Get the most out of Category Management's tools and dashboards! On July 14 from 2 to 3:30 p.m. ET, the Government-wide Category Management PMO will demonstrate how to avoid unmanaged spend also known as Tier 0, a key Category Management metric! Register using [HYPERLINK "https://gcc02.safelinks.protection.outlook.com/?url=https%3A%2F%2Flnks.gd%2Fl%2FeyJhbGci

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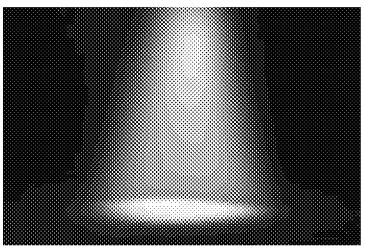
Acquisition Workforce Spotlight with Lisa Bravo



Acquisition workforce members from across the federal government are making amazing contributions to the acquisition community every day, and FAI wants you to know about them! Check out this quarter's spotlight featuring Lisa Bravo, an Acquisition Career Manager and Procurement Analyst from the U.S. Department of Justice. Go to [HYPERLINK
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"_blank"] to learn more about Lisa and her work with the DOJ!

Acquisition Today is published the first and third Wednesday of each month. If you have information that you would like to share with the federal acquisition workforce community via Acquisition Today, you may submit your article for consideration by completing this [HYPERLINK "https://gcc02.safelinks.protection.outlook.com/?url=https%3A%2F%2Flnks.gd%2Fl%2FeyJhbGciOiJIUzI1NiJ9.eyJidWxsZXRpbl9saW5rX2lkIjoxMTQsInVyaSI6ImJwMjpjbGljayIsImJ1bGxldGluX2lkIjoiMjAyMTA3MDcuNDI4OTkwNDEiLCJ1cmwiOiJodHRwczovL2RvY3MuZ29vZ2xlLmNvbS9mb3Jtcy9kL2UvMUZBSXBRTFNkOFJUQ25fUVhSSVhTRnpFVUJaRzlsVnVkMDU1ZTVINEp6Uzk5SDlSa3phQVRvVUEvdmlld2Zvcm0_dXRtX21lZGl1bT1lbWFpbCZ1dG1fc291cmNlPWdvdmRlbGl2ZXJ5In0.StaSFw-Niv_hPpSFdgAvwwaEaMAs4DfenJwAEGSYVwI%2Fs%2F748924914%2Fbr%2F108962328766-l&data=04%7C01%7Ctonsil.pauline%40epa.gov%7C256c7bde227d44d2bbd408d9417fad08%7C88b378b367484867acf976aacbeca6a7%7C0%7C0%7C637612838953777259%7CUnknown%7CTWFpbGZsb3d8eyJWIjoiMC4wLjAwMDAiLCJQIjoiV2luMzIiLCJBTiI6Ik1haWwiLCJXVCI6Mn0%3D%7C1000&sdata=UtX7V%2Fb57VFaCtPqPtkSnjf2BCWx%2BUqzDHLqQHXUMUE%3D&reserved=0" \t "_blank"]. *If you have feedback that you would like to share with FAI, please email us at* [HYPERLINK "mailto:contact@fai.gov" \t "_blank"].

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Thank you.
Respectfully,
Pauline V. Tonsil
US Environmental Protection Agency (EPA)
EPA Acquisition Career and Human Capital Manager
Office of Acquisition Solutions - (Immediate Office)
[HYPERLINK "mailto:Tonsil.Pauline@epa.gov"] | 202-564-9197
OAS…Advancing EPA's Mission Through Acquisitions!
"For Success, Attitude is Equally as Important as Ability" -Harry F. Banks

August 9, 2021

STATEMENT OF WORK

FEASIBILITY STUDY TECHNICAL OVERSIGHT SUPPORT
HOMESTAKE MINING COMPANY SUPERFUND SITE, GRANTS, NEW MEXICO

I. PURPOSE

This Statement of Work (SOW) describes the feasibility study (FS) technical oversight support and deliverables to be provided to the EPA Office of Superfund Remedial Technology and Innovation (OSRTI) in support of EPA Region 6 for the Homestake Mining Company Superfund site (Site), located in Grants, New Mexico. The FS is being performed in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the National Contingency Plan (NCP).

The SOW and deliverables align with the work activities and deliverables outlined in the Administrative Settlement Agreement and Order on Consent (ASAOC) for FS at the Site; dated August 12, 2020. The ASAOC specifies the primary tasks to be completed by Homestake Mining Company, the responsible party (RP) in the performance of the FS. Following are the associated activities to be completed under this SOW.

II. TECHNICAL SUPPORT REQUIREMENTS

Task 1 – Project Planning and Support

This task includes the following work effort related to project initiation and project management:

- Conflict of Interest (COI) Determination – The Contractor shall seek confirmation of the Site's RP with the EPA Task Monitor and the Remedial Project Manager (RPM). The Contractor shall perform an internal evaluation of prior or current involvements at the Site with respect to the PRP and/or activities of technical significance to determine whether there is any internal COI, an appearance of a COI, or a confirmed COI. The Contractor shall report results to the EPA Task Monitor, Contracting Officer, and the Contracting Officer Representative (COR) in writing of its final internal COI evaluation to facilitate EPA's COI assessment.

- Scoping Meeting – the Contractor shall provide logistical support for and participate in a scoping meeting/conference call with the EPA Task Monitor and the Regional RPM.

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- Project Management – the Contractor shall perform project management, including the following:

    - Coordinate staffing and other support activities to perform the project tasks set forth in this SOW, including Team subcontractors and other subcontractors;
    - Establish and maintain necessary project files;
    - Perform contract administration functions associated with this project;
    - Coordinate monthly reporting and invoices;
    - Monitor overall cost and performance;
    - Attend periodic project planning meetings, as necessary, and;
    - Perform final project closeout per requirements of the contract.

Task 2 – Project Kickoff Meeting

The Contractor shall provide logistic support for and participation in a kick-off meeting/conference call with the EPA Task Monitor, the Regional RPM, EPA technical staff, other EPA contractor(s), and other stakeholders as appropriate. The purpose of the meeting/call is for EPA to provide the Contractor with an overview of the Site, discuss site characteristics and history, goals of the project, schedules, roles and responsibilities, and key site documents for review.

Task 3 – Site Document/Data Review

The Contractor shall obtain, copy and review available site documents and data provided by the Region to support the project. The Contractor shall obtain the necessary information from the EPA Task Monitor, Regional RPM and/or the Regional site contractors, as applicable.

The Contractor shall notify EPA immediately should there be critical information missing or incomplete, or any other circumstances, that will delay or prevent the ability to perform the tasks set forth in this SOW. Document/data review is anticipated that may include one or more teleconferences with the Regional RPM and staff to resolve questions and address any review uncertainties.

The Contractor shall assist EPA in seeking opportunities for the Region through the HQ Optimization Program to optimize the RP-lead FS activities and seek cost reducing, innovative, and technically advanced or cutting-edge methodologies for innovation and for advancing the CERCLA potentially responsible party (PRP) overview process.

Task 4 – Technical Review of TI Evaluation Report

The Contractor shall perform multidisciplinary technical reviews and provide review comments on all draft and final versions of the Technical Impracticability (TI) Waiver Evaluation Report, as well as any other technical documents related to TI that are submitted to EPA for review and approval by the PRP. The technical review shall include a detailed review of the models used for

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the TI evaluation, including all model parameters and assumptions. The Contractor shall review the report for consistency with EPA guidance (EPA/540-R-93-080). The Contractor shall also review the report to assess the appropriateness and reasonableness of the modeling parameters and assumptions.

If EPA directs the RP to collect additional site-specific data, including laboratory testing of core samples, to complete the TI evaluation and modeling, the Contractor shall review and comment on any work plans, memorandum, reports and laboratory data submitted by the PRP for this purpose.

Task 5 – Technical Review of FS Reporting Documents

The Contractor shall perform multidisciplinary technical reviews and provide review comments on all draft and final versions of the following Feasibility Study (FS) reporting documents in support of EPA's oversight of the ongoing FS being performed by the RP:

- Technical Impracticability Waiver Evaluation Report (draft 11/2020); and
- Feasibility Study Report (draft 12/2020).

The Contractor shall review the documents for consistency with CERCLA, the NCP, and EPA guidance for conducting a FS. The Contractor shall also review the documents for technical soundness from an engineering feasibility and cost perspective.

Task 6 – Participate in EPA Technical Meetings

The Contractor shall participate in technical meetings or teleconferences between the EPA, other federal and state regulatory agencies, and/or the RP on the TI evaluation process and the FS process. The Contractor shall also participate in technical meetings with EPA to discuss its review comments submitted as part of Task 4 and Task 5.

Task 7 – Geochemical Analytical Support for EPA Background Reassessment

The Contractor shall prepare and analyze Trilinear Diagrams and other graphs or charts of geochemistry data for alluvial and Chinle aquifers, as directed by EPA, to support EPA's ongoing groundwater background reassessment.

The Contractor shall participate in technical meetings or teleconferences with EPA and the New Mexico Environment Department (NMED) to discuss the Trilinear Diagrams, graphs or other charts prepared as part of this task.

Task 8 – Community Involvement Support

The Contractor shall provide community involvement support, if requested by EPA. Such support shall include, but not be limited to, the following:

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- Meeting planning and logistics support;
- Development, formatting and production of hard copy and/or electronic media on technical topics of concern or interest.

Task 9 – Miscellaneous Technical Support

The Contractor shall provide miscellaneous, multidisciplinary technical support to EPA OSRTI and EPA Region 6 in support of Task 1 through 5, or as otherwise directed.

Task 10 – Optimization Review Technical Memorandum

The Contractor will prepare a technical memorandum, if requested by EPA, to document any recommendations for optimizing technologies, process options or remedial alternatives that are to be developed during the performance of the CERCLA FS.

III. PERIOD OF PERFORMANCE

The period of performance shall be the award date through April 1, 2023.

IV. SCHEDULE OF DELIVERABLES

All deliverable due dates will be established based on the following:

- The receipt of RP documents to review under Task 4 – Technical Review of TI Evaluation Report and Task 5 – Technical Review of FS Reporting Documents;
- As determined based on support activities directed by EPA under Task 7 – Geochemical Analytical Support for Background Reassessment;
- As determined based on support activities directed by EPA under Task 8 – Community Involvement Support; and
- As determined based on support activities directed by EPA under Task 9 – Miscellaneous Technical Support.

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Message

From: Purcell, Mark [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=FE198E260B024EB4BD9D30DC11F900B1-PURCELL, MARK]
Sent: 5/28/2021 9:36:59 PM
To: Aaron M. Sims [ams@chestnutlaw.com]; Governor Brian Vallo [Governor@poamail.org]; Franklin Martinez [FMartinez@poamail.org]; dmartinez@poamail.org
CC: Turner, LaDonna [turner.ladonna@epa.gov]; Ryan Burdge [rburdge@skeo.com]; Jill Billus [jbillus@skeo.com]
Subject: Pueblo of Acoma Interview with EPA - Homestake NPL Site Five-Year Review
Attachments: Acoma Pueblo 2021 Interview - EPA 5YR - Homestake NPL Site.docx

Greetings Governor Vallo and other representatives of the Pueblo of Acoma,

I have attached the completed Five-Year Review interview form that documents the conversation between EPA and the Pueblo of Acoma during the April 21, 2021, interview on the Homestake NPL Site. It was prepared based on the notes taken by myself and EPA's contractor, Skeo Solutions, during the call. Please review the interview form and make any revisions you feel necessary to accurately describe those conversations with EPA.

I would appreciate if the edited interview form can be returned to me within the next 2-3 weeks. We are currently preparing the Five-Year Review report that will be signed by the Superfund Director this Summer.

If you have any questions, please do not hesitate to contact me.

Thank you again for providing EPA the opportunity to interview the Pueblo of Acoma.

Mark

Mark Purcell
Superfund and Emergency Management Division (6SED)
U.S. Environmental Protection Agency – Region 6
1201 Elm Street, Suite 500
Dallas, TX 75270
Office Tel: 214-665-6707
Work Cell: 469-553-7211
Fax: 214-665-6660

INTERVIEW RECORD

Site Name: Homestake Mining Company Superfund Site	**EPA ID #:** NMD007860935	
Subject: Fifth Five-Year Review	**Time:** 9 am mountain	**Date:** 4/21/21
Type: Teleconference **Location of Visit:** Not applicable (NA)		

Contact Made By:

Name:	Title:	Organization:
• Mark Purcell • LaDonna Turner	Remedial Project Manager (RPM)	EPA Region 6

Individual Contacted:

Name(s):	Title(s):	Organization:
• Brian Vallo, Governor of the Pueblo of Acoma • Aaron M. Sims, legal counsel • Donna Martinez, Environment Coordinator for the Acoma Department of Natural Resources (ADNR) • Franklin Martinez, ADNR Director	See names for associated titles	Pueblo of Acoma
Telephone No: NA **Fax No:** NA **E-Mail Address:** [HYPERLINK "mailto:fmartinez@poamail.org"]	**Street Address:** NA	

Summary of Conversation

EPA: The RPM began with a brief introduction of the Homestake site (the Site). Under the Superfund law and regulations, EPA is required to conduct a review of an ongoing remedy every five years. The purpose of the review is to make sure that the remedy remains protective. While the cleanup is ongoing, EPA needs to assess the remedy to determine if it remains protective of human health and the environment. After the review is over, EPA will present the findings of the review in a report. The report is not a decision document, but it includes issues and recommendations to ensure protectiveness in the short or long term. An important part of the five-year review is interviews with Site stakeholders. A form with the interview questions was sent previously to the Pueblo of Acoma. EPA will take notes during the interview and fill out the form. EPA will then send the filled out form to the Pueblo of Acoma to review and modify as needed. The form can identify the individuals interviewed by name, or identities can remain anonymous. The Pueblo of Acoma representatives should let EPA know how they would like to be identified.

The Homestake site is a former milling operation and tailings disposal facility. Today the mill has been demolished and reclaimed. There are two tailings impoundments that remain. Tailings are a byproduct material from the milling process. One of two piles is quite large and can be seen from the adjacent

highway.

Homestake has been cleaning up groundwater since 1977. The Site is regulated by the Nuclear Regulatory Commission (NRC) and the New Mexico Environment Department (NMED) in addition to EPA. NRC has been the lead federal agency through a Memorandum of Understanding with EPA. NMED has authority through a groundwater discharge permit.

Governor Vallo: Governor Vallo noted that the Pueblo of Acoma submitted written comments concerning the Site and a multitude of issues during the EPA's National Remedy Review Board (NRRB) meeting on March 25, 2021. The Pueblo of Acoma also had the opportunity to provide oral statements on the concerns. Governor Vallo stated that he appreciates the overview of the Site, and he is interested in learning how these interviews will impact the report and future decision-making with the Agency and its Superfund program. He would also appreciate the opportunity to review the Pueblo of Acoma's responses to the six interview questions, as recorded by EPA, prior to EPA releasing the Five-Year Review report.

EPA: The RPM clarified that the NRRB process, including the meeting held on March 25th, is different from the five-year review; however, the Pueblo's concerns may be the same. The NRRB is a board of 9 to 10 people from EPA, and includes technical experts, policy experts, attorneys, etc. Following the March 25th meeting, the board has six weeks to provide recommendations regarding the Superfund process Region 6 is conducting at the Site. The NRRB process is ongoing.

Ms. Martinez: Ms. Martinez asked how long the Pueblo of Acoma would have to review the interview narrative and noted that at least two weeks would be helpful.

EPA: The RPM responded that a few weeks is fine, and EPA can be flexible with the turnaround. The RPM also described the internal review process for the five-year review report. EPA would likely have a draft of the interview narrative ready for review in a few weeks. The Pueblo of Acoma can review and revise the narrative as necessary.

Question 1: What is your overall impression of the project? (general sentiment)

Mr. Sims: From the Pueblo of Acoma's perspective, the general sentiment is that there is severe and deep concern about the continued impact of the contamination and the effects from mining within the basin. He noted that the length of time the cleanup project has been going on is staggering (it is the fifth five-year review).

He noted that the idea of Homestake seeking a technical impracticability (TI) waiver is troubling as it seems like an attempt to walk away from the project. Doing so could leave contamination and potential contamination for the surrounding community to deal with in perpetuity.

He noted that there are three major concerns of impact. The first concern is the groundwater contamination, migration of the plume and potential impacts to the San Andres-Glorieta (SAG) aquifer. The SAG aquifer, on the western side, is a primary source of water and recharge for many of the water sources used by the Pueblo of Acoma. Mr. Sims noted that the Pueblo of Acoma's presentation to the NRRB showed the hydrology in the area and how those systems are connected.

He noted that mining and dewatering of aquifers in the basins have devastated the natural hydrologic system. With the impacts of contamination as well as the depletion of the SAG aquifer and overlying aquifers, the Pueblo of Acoma is concerned about how it will protect its people in the long-term and how it will provide water for its people in the long-term. The possibility that the federal agencies are

considering Homestake's TI waiver, and prospects for Homestake to walk away from its responsibility for cleanup, is concerning to the Pueblo of Acoma and inappropriate.

The Pueblo of Acoma is also concerned about impacts on Acoma cultural resources, because of mining throughout the San Mateo basin by Homestake and other mining companies. The Acoma have lived in the area for hundreds, maybe thousands of years. There are cultural resources both identified and unidentified that have been impacted and may continue to be impacted by mining activities and the continued presence of contaminants such as the tailing piles. The impacts limit Acoma cultural practitioners from accessing these areas due to safety concerns.

Mr. Sims then summarized the broad concerns of cultural impact, health impact and resource impact. These impacts are all deeply concerning to the Pueblo of Acoma due to the prospect that cleanup may be discontinued following the TI analysis.

Mr. Martinez: Mr. Martinez noted that the water office's biggest concern is water quality. If the contaminated plume continues to migrate, there are concerns for Acoma and neighboring towns such as Milan, Grants, Laguna, etc. The concern is to protect the limited water that is available.

Ms. Martinez: Ms. Martinez noted that overall, impacts to cultural use and impacts to human health have always been a concern with the upstream contamination. The Acoma consume products they grow. A main concern is consumption of products that may be impacted by that contamination. There have been so many incidences of cancer in the community and there are questions about whether they are related to the contamination. Ms. Martinez also noted that the contamination has been there for years, and she wondered when the Acoma will see more impacts to their lands and streams. She noted that remediating the contamination will be beneficial to everyone – communities upstream and downstream.

Question 2: What effects have the site operations had on the surrounding community?

Mr. Sims: Mr. Sims noted that pumping from Homestake and other mines in the area has impacted availability of water sources to the Pueblo of Acoma. He noted impacts to springs that contribute to river flows of the Rio San Jose, which is a primary surface water source that flows through the Pueblo of Acoma. Depletion of water has been so severe that springs that feed the river, one of which is close to Milan – Ojo del Gallo – has completely gone dry and no longer contributes to the Rio San Jose. The Acoma use that water for irrigation, as a means of supporting themselves and as a cultural practice.

Mr. Sims noted that decades of mining have resulted in significant declines in water availability to the Pueblo. This is also a subject of ongoing litigation about water rights (United States vs. Kerr-McGee as an example) with Pueblo of Laguna and others.

With depletion of the water supply, the Pueblo is looking at how they can continue to provide water for agricultural uses, domestic uses and industrial uses. The SAG aquifer west is one of the last remaining water supplies for the Rio San Jose basin and the Homestake plume is contaminating it. Other aquifers in the area have been investigated as possible water sources, but natural contamination (such as total dissolved solids) makes them unreasonable to develop as a water source.

Mr. Martinez: Mr. Martinez also added that dust from the Homestake facility, which is significant on a windy day, is also a concern for the surrounding community.

Governor Vallo: Governor Vallo noted that there are concerns not only for exposure to dangerous chemicals in the dust (with added concern for tailings remaining onsite), but there are concerns to

cultural resources in the area. Mount Taylor is a traditional cultural property. The lands adjacent to the traditional cultural boundaries are full of cultural resources, including pilgrimage trails, archaeological remnants, springs, shrines, etc. Some of these areas are accessed by cultural leaders as well as non-tribal technical experts, and there is concern about the safety of those individuals in those environments, from dust and other contamination.

Ms. Martinez: Ms. Martinez noted the potential long-term financial impacts of the contamination, including the possibility that the Pueblo may need to treat water for agricultural or human consumption in the future. Air quality and potential impacts from wind was also a concern.

Question 3: Are you aware of any community concerns regarding the site or its operation and administration? If so, please give details.

Governor Vallo: Governor Vallo reiterated his previous concerns regarding tribal and community members working on cultural resource management issues and projects. Governor Vallo also noted that the Pueblo of Acoma does not have an ongoing public outreach initiative keeping community apprised of the Superfund site. He stated that it would be helpful if there is a greater effort to maintain a level of communication via written documentation, social media or other virtual outlets to provide information to the community. This outreach should continue beyond the project term because the Site will continue to be an ongoing concern for the Acoma. He was unaware of availability of resources for this outreach, but requested the Agency consider providing those resources to develop a program if one does not already exist.

Ms. Martinez: Ms. Martinez noted that they do get limited funding from EPA but they are limited on what they can spend on Superfund. She reiterated that money should not be an issue when it comes to health. She stated that if there are other resources out there, the Pueblo of Acoma would like to work with them to develop continued education for its communities.

Ms. Martinez noted that another community concern is the incidence of cancer among past uranium workers, not only in the Acoma community but other communities. She also mentioned the impacts on quality of life to others in the uranium industry, and to those not qualified for the uranium impact fund.

Mr. Sims: Mr. Sims noted that a general community concern is also the availability of water, as addressed in previous responses.

Question 4: Are you aware of any complaints, incidents or activities at the Site such as vandalism, trespassing, or emergency response from local authorities? If so, please provide details.

The Pueblo of Acoma representatives were not aware of any complaints, incidents or activities at the Site.

Question 5: Do you feel well informed about the Site's activities and progress?

Governor Vallo: Governor Vallo indicated that although the project has been ongoing for some time, he located very little documentation sent to tribal leadership. While more information might be provided to the environment office, from a government-to-government standpoint, there has not been a lot of communication between tribal government and the Agency. Tribal leadership changes from year

to year, so it is important that the Agency recognize that and try to ensure there is ongoing communication. It is also important for the Agency to ask tribal leadership about preferred level of engagement, as some prefer limited interaction while others prefer more frequent interaction.

Ms. Martinez: Ms. Martinez also indicated that communication has been limited to correspondence with the RPM and Ms. LaDonna Turner. Most communication has been in the past year.

Mr. Sims: Mr. Sims noted that most information seems to be shared when there is a big decision to be made. Regular communication and updates are more infrequent.

Governor Vallo: Governor Vallo noted the Biden administration's memorandum on tribal consultation to strengthen relations with tribes. He asked if EPA would be organizing a consultation because of the memorandum. He suggested EPA organize a consultation to help tribal leaders gain a better understanding of Superfund reporting, communication, and the process in general, and to help EPA understand the needs of tribes during such projects. He recommended interagency collaboration.

EPA: EPA responded that it was not aware of the Region's response to the memorandum but would follow up internally with the Region.

Ms. Martinez: Ms. Martinez noted that the Pueblo of Acoma is working on a Region 6 transition document with the National Tribal Operations (NTO) committee that will be presented to EPA headquarters. She noted that this document might also be a way to address EPA headquarters.

Question 6: Do you have any comments, questions, or recommendations regarding the Site's management or operation?

Governor Vallo: Governor Vallo stated that he would encourage site management plans and operation plans take into consideration concerns of communities, including Acoma. He noted that there should be more solid means of communication among Acoma's environment office, water office and the tribal government directly so that they are aware of issues, such as trespassing, vandalism, etc., as they arise. He encouraged a commitment to establishing a more robust level of communication at the site and local level.

Mr. Sims: Mr. Sims stated that it would be helpful if EPA better explain how analyses prepared by Homestake, such as the TI evaluation, are evaluated by the Agency. He questioned whether technical experts conduct an independent evaluation of the work completed by Homestake.

EPA: The RPM clarified that Homestake prepares an annual report that describes site operations, results from those operations, groundwater quality monitoring and other data. The report includes plume maps, graphs of contaminant concentrations in wells, etc. The reports are prepared for the NRC and the state, and EPA receives a copy. EPA uploads the reports to the Homestake site profile page on EPA's website. EPA recently received the 2020 annual report and will upload to the EPA webpage shortly. These reports provide an overview of all cleanup activities at the Site.

EPA also noted that EPA is currently conducting its review of Homestake's draft TI evaluation report. EPA provides oversight and checks all the details of the report to ensure they are technically sound. An EPA contractor is conducting an analysis of the modeling effort. NMED also has experienced groundwater modelers conducting a detailed analysis of the work as well.

The RPM noted that EPA and NMED have also been reassessing natural background concentrations in groundwater upgradient of the site. Currently, background levels determined by Homestake in 2006 are used as the cleanup standards established by the NRC for constituents such as uranium and selenium. These standards are much higher than federal drinking water standards. Once this reassessment is completed, EPA will select groundwater cleanup levels as part of a Superfund remedy decision. The groundwater cleanup levels to be selected will likely be different than the cleanup standards established by the NRC.

Message

From: Purcell, Mark [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=FE198E260B024EB4BD9D30DC11F900B1-PURCELL, MARK]
Sent: 6/15/2021 8:51:39 PM
To: Khoury, Ghassan [Khoury.Ghassan@epa.gov]; Travis, Pamela [Travis.Pamela@epa.gov]; Applegate, Nathaniel [Applegate.Nathaniel@epa.gov]
Subject: FW: Homestake NRRB Recommendations
Attachments: Homestake NRRB Recommendations Final.pdf

Final NRRB Recommendations

From: Poore, Christine <Poore.Christine@epa.gov>
Sent: Tuesday, June 15, 2021 3:49 PM
To: Stenger, Wren <stenger.wren@epa.gov>; Douchand, Larry <Douchand.Larry@epa.gov>
Cc: Stalcup, Dana <Stalcup.Dana@epa.gov>; Lowery, Brigid <Lowery.Brigid@epa.gov>; Fitz-James, Schatzi <Fitz-James.Schatzi@epa.gov>; Meyer, John <Meyer.John@epa.gov>; Atkins, Blake <Atkins.Blake@epa.gov>; Purcell, Mark <purcell.mark@epa.gov>; Villarreal, Chris <villarreal.chris@epa.gov>; Luzecky, Hollis <Luzecky.Hollis@epa.gov>; McKernan, John <McKernan.John@epa.gov>; Openchowski, Charles <openchowski.charles@epa.gov>; Mahmud, Shahid <Mahmud.Shahid@epa.gov>; Wharton, Steve <Wharton.Steve@epa.gov>; Wilson, Karl <Wilson.Karl@epa.gov>; Walker, Stuart <Walker.Stuart@epa.gov>; Richards, Jon M. <Richards.Jon@epa.gov>; Bartenfelder, David <Bartenfelder.David@epa.gov>; Juett, Lynn <Juett.Lynn@epa.gov>; Gartner, Lois <Gartner.Lois@epa.gov>
Subject: Homestake NRRB Recommendations

Dear Wren and Larry,

On behalf of the National Remedy Review Board (NRRB), attached are Board Review Teams' recommendations from the review of the Homestake Superfund Site Feasibility Scoping Meeting.

The review meeting, held March 25-26, 2021, addressed the site characterization, background, remedial action objectives, preliminary remediation goals, and remedial alternatives for the tailings piles and groundwater. We greatly appreciate the dedication, time, and resources the Region put into developing the site materials, information package, and presentations.

The Board Review Team looks forward to the Region's responses to the recommendations and engaging further when the site reaches the Detailed Alternatives Analysis stage. If you, or anyone on the team, have any questions, please don't hesitate to call or email. Thank you for the opportunity to engage with the Regional Site Team on Homestake Mine.

Thank you,
Christine Poore

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

WASHINGTON, D.C. 20460

June 15, 2021

OFFICE OF
LAND AND EMERGENCY
MANAGEMENT

MEMORANDUM

SUBJECT: National Remedy Review Board Recommendations for the Homestake Mining Site. Feasibility Study Scoping Meeting.

FROM: Christine Poore, Chair, on behalf of the Board Review Team
National Remedy Review Board

TO: Wren Stenger, Director
Superfund and Emergency Management Division (SEMD), Region 6

Larry Douchand, Director
Office of Superfund Remediation and Technology Innovation (OSRTI)

PURPOSE

The National Remedy Review Board (NRRB/Board) Review Team for the Homestake Mining Company (HMC) Site has conducted a review of the site information package, including groundwater background, human health and ecological risk assessments, and a draft alternatives screening memo for the HMC Site in Milan, New Mexico. This memorandum documents the Board Review Team's recommendations and advisory considerations.

CONTEXT FOR BOARD REVIEW

The U.S. Environmental Protection Agency (EPA) Administrator established the Board as one of the October 1995 Superfund Administrative Reforms to help control response costs and promote consistent and cost-effective remedy decisions. The purpose of the Board was to review proposed cleanup decisions to help evaluate whether they are consistent with current law, regulations, and Agency guidance.

In 2020 the Office of Superfund Remediation and Technology Innovation (OSRTI) re-envisioned headquarters/regional engagement throughout the remedial process with a focus on earlier engagement, including the Board's scope and role. The NRRB continues to focus on ensuring national consistency in remedy selection at selected sites. To this end the Board advises and evaluates ongoing, selected sites' Regional technical work during the Feasibility Study Scoping stage for response decisions, with a focus on overall site management/response strategy, evaluation of technologies and data necessary to support nationally consistent remedy selection, and the range of alternatives that should be considered.

The NRRB's intent is to provide support to the Regional Site Team in developing a robust conceptual site model, a comprehensive risk assessment, and a range of remedial alternatives while developing the Administrative Record (AR) to support remedy selection. The Board

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Review Team considers the information provided on the nature of the site; potential site risks; Regional, state, tribal, community advisory group and potentially responsible party (PRP) positions. The review's overall goal is to ensure sound decision-making consistent with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), and applicable Agency guidance.

Generally, the Board Review Team makes a set of recommendations and a set of advisory considerations to the appropriate Regional Division Director. The recommendations will identify technical and programmatic opportunities and limitations with a focus on early issue resolution. While the NRRB's recommendations are expected to carry substantial weight, other important factors may influence the Region's implementation of Board recommendations. The NRRB expects the Regional Division Director to respond to the OSRTI Office Director in writing to address implementation of each Board recommendation and those advisory considerations that the Region is not adopting. The Board Review Team's recommendations, while of considerable import, do not change the Agency's current delegations or alter the public's role in providing EPA with input on remedy selection. Typically, before the Region issues the proposed plan for public comment, the Region includes the recommendations memo and Regional response memo in the site's AR. Once the AR is published, the memos will be posted to the NRRB webpage.

BRIEF DESCRIPTION OF THE SITE

The HMC Site is located in Cibola County, New Mexico, about 5.5 miles north of the village of Milan. The site includes a former uranium mill and the impacted portions of the underlying groundwater aquifers. Uranium milling operations began at the site in 1958 under a license issued by the Atomic Energy Commission. The mill was decommissioned and demolished from 1993 to 1995. Site operations and seepage from two tailings impoundments contaminated soil and groundwater with hazardous chemicals. The site sits on the lower floodplain of the San Mateo Creek drainage basin near multiple geologic faults. There are over 80 legacy uranium mines and four former uranium mill facilities that operated in the San Mateo basin, including HMC Site.

The HMC Site is one of four National Priorities List (NPL) sites subject to both EPA and Nuclear Regulatory Commission (NRC)/Department of Energy (DOE) regulation, under CERCLA and Title II of the Uranium Mill Tailings Radiation Control Act (UMTRCA), respectively. The site occupies approximately 1,085 acres and includes a large unlined tailing pile containing approximately 21 million tons of tailing material, a small unlined tailing pile containing approximately 1.2 million tons of tailing material, three evaporation ponds, two collection ponds, a reverse osmosis (RO) water treatment plant, and a zeolite filtration water treatment system that are part of an ongoing groundwater corrective action.

SITE REVIEW

The Board Review Team reviewed OU1, Tailing seepage contamination of groundwater aquifers, and OU2, Long-term tailing stabilization, surface reclamation, and site closure, of the HMC Site on March 25-26, 2021, via remote webinar meetings. The meeting addressed the site history including a discussion on the nature and extent of contamination, background determination, site risks, remedial action objectives (RAOs), and potential remedial alternatives. Input was provided to the Board Review Team by the Region, the New Mexico Environmental

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Department (NMED), the Pueblo of Acoma, the Pueblo of Laguna, Homestake Mining Co., the Bluewater Valley Downstream Alliance (BVDA), and the Multicultural Alliance for a Safe Environment (MASE).

RECOMMENDATIONS

1. Current Tailings and Treatment Operations

As stated earlier, the HMC Site includes two unlined tailings piles. Based on the information provided to the Board, the flanks of the large tailings pile (LTP) have a permanent radon cover, but the top of the LTP has an interim cover. Despite the partial cover, it is the Board's understanding that radon exfiltration from the large pile at the site may currently exceed UMTRCA standards. Additionally, the zeolite filtration system sits atop the uncovered portion of the LTP. Based on the information provided to the Board, there are two large scale water treatment systems operating at the site: a RO system and a zeolite filtration system. It's the Board's understanding that neither system has operated at full capacity, though the reasons for reduced operations were unclear. The RO system has operated at nearly half capacity and the zeolite filtration system has operated at nearly one third capacity. Despite the limited capacity, it was indicated that approximately 100 pounds of uranium was recovered.

Recommendations

a. The Board recommends that the Region assess the challenges that prevented the treatment systems from operating at full capacity. Based on the information provided to the Board, the current water treatment systems, operating at full capacity, may be inadequate to treat the current seepage from the piles at the site. It was unclear to the Board if this is due to the current limited treatment capacity or if it was due to a high seepage rate. Understanding and resolving the challenges associated with limited system operations may improve treatment capacity, thereby reducing seepage. Additionally, improvements to the treatment systems may improve the recovery of uranium, in effect resulting in secondary recovery of the uranium (i.e., resource recovery/reprocessing).
b. Should the tailings piles remain in place, the site will likely have to comply with UMTRCA cover standards that address radon emissions. Based on the information provided to the Board, it was unclear if the tailings piles are fenced off from the public. If there is not a complete fence line enclosing the Source Materials License boundary, the Board recommends the implementation of engineering and institutional controls (i.e. fencing and signage) to minimize access to the uncovered portion of the LTP until a final remedy is constructed. This should prevent the public from accessing the large pile until a final remedy is constructed.

2. Technical Impracticability Waiver

The Site Information Package included a "Development and Screening of Remedial Alternatives Technical Memorandum" that discussed Technical Impracticability (TI), as a potential remedial component. The selection of a TI waiver is the acknowledgement that the applicable or relevant and appropriate regulation (ARAR) is waived due to "technical impracticability from an

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engineering perspective."[1]. The NCP Preamble states that TI determinations should be based on "...engineering feasibility and reliability, with cost generally not a major factor unless compliance would be inordinately costly."[2] This determination is based on contaminant properties, subsurface conditions and appropriate remedial technologies evaluation. The TI zone should be as minimal as appropriate and can be multiple zones[3]. The TI zone may not necessarily encapsulate the whole groundwater plume and should include source control as part of the Alternate Remedial Strategy. The Alternate Remedial Strategy is essential to controlling the contribution from the source to the groundwater[4].

Recommendations

a. In assessing the appropriateness of a TI waiver, the conclusion that it is not possible from an engineering perspective to restore groundwater to its beneficial use is based upon the factors identified in Section 1.1 of the 1993 Guidance for Evaluating the Technical Impracticability of Ground-Water Restoration (TI Guidance). Additionally, as stated on page 2 of the TI Guidance, "Failure to achieve desired cleanup standards resulting from inadequate system design or operation is not considered by EPA to be a sufficient justification for a determination of technical impracticability of ground-water cleanup." Recommendation 1a supports the assessment of current system design and operation. Should the Region pursue a TI waiver component, the Board recommends that the Regional Site Team work closely with their Regional TI representative, and the Headquarters TI point of contact, currently Dave Bartenfelder, in developing the TI evaluation package.
b. Should a TI waiver be supported and a component of the preferred alternative, the Board recommends the TI zone be appropriately sized based on the site characterization and analysis. Per Section 4.4.2 of the TI Guidance, the potential TI zone should be "limited to as small an area as possible, given the circumstances of the site." Generally, the TI zone is based on current site conditions rather than projected modeling results. The TI zone can be modified (expanded/contracted) if conditions change in the future and can be justified (e.g., discovery of new sources), per Section 6.2 of the 1993 TI Guidance.
c. The information provided to the Board highlighted the complexity of the hydrogeologic setting. The Board recommends additional geochemical and hydrogeologic modeling (e.g., EPA-Office of Research and Development (ORD) or United States Geological Survey (USGS)) to better understand the subsurface conceptual site model behavior. The Board further recommends the Region assess, and if appropriate, augment the current modeling with those models conducted by the NMED. A more refined conceptual site model of the geochemical and hydrogeologic conditions should better support the remedy development and selection process.

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[1] Guidance for Evaluating the Technical Impracticability of Ground-Water Restoration. September 1993. (Page 9) https://semspub.epa.gov/work/HQ/175387.pdf
[2] See NCP Preamble, 55 FR 8748, March 8, 1990.
[3] Guidance for Evaluating the Technical Impracticability of Ground-Water Restoration. September 1993. (Section 4.4.2)
https://semspub.epa.gov/work/HQ/175387.pdf
[4] Guidance for Evaluating the Technical Impracticability of Ground-Water Restoration. September 1993. (Section 5.0)
https://semspub.epa.gov/work/HQ/175387.pdf

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3. Background Groundwater and Soil

The information provided to the Board included a discussion of historical mining activities in the San Mateo Creek Basin. This area of New Mexico has historically been a viable source of uranium with over 80 legacy mines and several milling operations. Some of these mines were "wet" mines, meaning that mine waters had to be pumped from the mine to allow access for mining activities. Based on the information provided to the Board, groundwater impacted by these activities may be flowing downgradient through the basin. If this is the case, uranium levels in groundwater may be elevated due to the presence and practices of upgradient mine sites.

Recommendations

a. The Board recommends the Region refine the background investigation for uranium, radium and thorium with additional monitoring wells to identify background in this complex geologic setting and influenced by up-gradient mine discharges (~125B gallons). The geochemical report developed by New Mexico is a good resource, and additional sampling and analysis might augment the report analysis to benefit the site understanding. To support this effort, the Region should consider the option to identify an unimpacted area in the surrounding environment to identify a naturally occurring soil background concentrations of uranium, radium, and thorium. The Board also recommends reaching out to Matt Jefferson (OSRTI/Technology Innovation and Field Services Division), Dave Kappelman (OSRTI/Environmental Response Team), and Felicia Barnet (ORD; Site Characterization & Monitoring Technical Support Center Director).

4. Principal Threat Waste

The LTP covers about 234 acres and contains approximately 21 million tons of tailing material, and the STP covers about 40 acres and contains approximately 1.2 million tons of mill tailings, with both tailing piles being unlined. Of great concern is the ongoing release of contaminants from the LTP and STP to the groundwater due to these piles being unlined. The Site Information Package identifies the LTP and STP as the primary sources of contamination in the groundwater, soil and air at the site. The contaminants of concern (COCs) in groundwater are uranium, selenium, radium-226, radium 228, thorium-230, molybdenum, sulfate, chloride, nitrate and total dissolved solids. The maximum concentrations of COCs detected in groundwater were detected in the alluvial groundwater directly beneath or near the LTP. In addition to the COCs' mobility as evidenced by the leaching of uranium and other contaminants to groundwater, the toxic tailings pose risks to future receptors. For example, in the revised risk assessment presentation for the Board, the future composite worker's total cancer risk is estimated at 2E-02, which exceeds the acceptable risk range by two orders of magnitude (approximately a factor of 100).

Recommendations

a. The Site Information Package states that no principal threat waste has been identified. However, there are significant amounts of mill tailings present at the site that may be highly toxic and mobile, as evidenced by the site data. The Board recommends the Region give further consideration as to whether the mill tailings present at the site constitute principal threat waste (PTW) as discussed in OSWER Directive No. 9380.3-06FS, November 1991, *A Guide to Principal Threat and Low Level Threat Wastes*

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(Principal Threat Waste Guidance and OSWER Directive 9355.0-69, August 1997, *Rules of Thumb for Superfund Remedy Selection* at page 11).

b. If the Region determines that portions of the mill tailings are PTW, as the Region further develops or considers the range of alternatives for the Site, it should consider the Principal Threat Waste Guidance, the statutory preference for treatment or resource recovery to the maximum extent practicable in CERCLA section 121(b), and the NCP's expectations for treatment of principal threats posed by the site, wherever practicable.

5. Risk Analysis

Recommendations

a. Consideration of Land Use Restrictions in Risk Analysis - Based on the information provided to the Board, there may be portions of the Site that lie outside of the tailings piles boundaries for which Institutional Controls (ICs) have already been established to restrict land use. Consideration should be given as to whether the ICs should be established as a part of the CERCLA remedial action in those areas. The Board recommends the Region update the risk assessment to assess if unacceptable risks under one or more unrestricted exposure scenarios exist, or if uncertainties in predicting reasonably anticipated future land use exist. This information may inform the need for including ICs as part of the CERCLA remedial action despite the current land restrictions. OSWER Directive 9355.0-30 which is titled, "*Role of the Baseline Risk Assessment in Superfund Remedy Selection Decisions*" may serve as a resource for this assessment. For example, the second paragraph on page 3 states, "*This cumulative site baseline risk...should not assume that institutional controls or fences will account for risk reduction.*" Further discussion is provided in the sections titled "*Risks Considered in Risk Management Decision*" and "*Risks Warranting Remedial Action*" on pages 4-6. In order to demonstrate that an IC is necessary to ensure protectiveness of human health and the environment as part of a CERCLA remedial action, (i.e., selected as part of the remedy in the Record of Decision (ROD)), risks should be estimated and documented for exposure scenarios without consideration of current or proposed land use restrictions.

b. LTP and STP - A conclusion presented in the Revised Risk Assessment Presentation noted that although there are excess cancer risks from soil and air for a composite worker, the risks are associated with soil and air concentrations that are below soil and air ARARS. As discussed in OSWER Directive 9200.4-23 which is titled "*Clarification of the Role of Applicable, or Relevant and Appropriate Requirements in Establishing Preliminary Remediation Goals under CERCLA,*" "*EPA's policy of generally establishing PRGs[Preliminary Remediation Goals] based on ARARs in the absence of multiple pathways or contaminants, is based on the assumption that individual ARARs will be protective. For example, the NCP expressly authorizes consideration of the cumulative risk range in setting PRGs where attainment of ARARs would result in a cumulative risk in excess of 10^{-4} due to multiple contaminants or pathways. (40 C.F.R. 300.430(e)(2)(I)(D).*" This may be relevant to the radon exfiltration noted in recommendation 1b. Additionally, because the future composite worker evaluated in the risk assessment is exposed via the inhalation, submersion, ingestion, dermal contact, and gamma radiation pathways to multiple contaminants and is estimated to receive a total cancer risk outside the CERCLA risk range, an evaluation to determine whether ARARs are sufficiently protective should be completed. If not, PRGs should be established in

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accordance with CERCLA and EPA guidance including OSWER Directive 9200.4-23, which includes consultation with Headquarters contacts, currently Robin Anderson for OSRTI and Charles Openchowski for the Office of General Counsel.

6. Remedial Action Objectives

Based on the information provided to the Board, the NRC is the lead agency for byproduct material disposal area reclamation and closure, but tailings closure is part of OU2. The "*Development and Screening of Remedial Alternatives Technical Memorandum, HOMESTAKE MINING COMPANY SUPERFUND SITE*" lists in table 7-1 the various ARARs and TBC criteria for the Site. The listed ARARs include 10 CFR Part 40 Appendix A, 6, as well as, 40 CFR Part 192 Subparts A, C, and D which include various requirements for the design of the controls for residual radioactive material.

Recommendations

a. These required controls pertain to more than just the emanation of radon. For example, 10 CFR Part 40 Appendix A, 6(1) states, "*In disposing of waste byproduct material, licensees shall place an earthen cover (or approved alternative) over tailings or wastes at the end of milling operations and shall close the waste disposal area in accordance with a design which provides reasonable assurance of control of radiological hazards to (i) be effective for 1,000 years, to the extent reasonably achievable, and, in any case, for at least 200 years...*" (underlined for emphasis). Although NRC is the lead for closure of the tailings piles, a CERCLA remedial action (among other things) must ensure protectiveness of human health and the environment, consistent with the NCP and existing EPA CERCLA guidance; at this site, that includes a cover to prevent exposure to COCs and to protect groundwater. Given that the radiological hazards from the tailings are expected to include exposure to external gamma radiation, ingestion, and inhalation of the various radiological contaminants of concern, the Board recommends the Region include an analysis of the risk related to the tailings piles material and, as appropriate, develop additional RAOs to achieve protectiveness of human health and the environment as required by CERCLA. Examples of RAOs that may be appropriate for the OU2 tailings piles include:
   i. Prevent direct contact to contaminated media (including waste material, stormwater, sediments, leachate and groundwater) located on or emanating from the tailings piles.
   ii. Limit inhalation and external radiation exposure from contaminated media (including waste material, fill, leachate, and emissions) located on or emanating from the tailings piles to within the acceptable risk range (10-4 to 10-6 cancer risk or a HI of less than 1 for non-carcinogenic risk).
   iii. Prevent migration of contaminants to groundwater above levels protective for the beneficial use of groundwater and reasonably anticipated use of surface water.

b. The Board also notes that guidance should be considered pertaining to the groundwater protection standards in 40 CFR Part 192. The Board recommends the Region refer to "Use of Uranium Drinking Water Standards Under 40 CFR Part 141 and 40 CFR Part

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192 as Remediation Goals for Groundwater at CERCLA Sites"[5] to support the approach for determining groundwater protection standards.

7. Coordination with NRC and DOE

As stated in the site description above, the overlapping regulatory requirements of UMTRCA Title II and CERCLA present unique challenges to developing a remedial approach for the site that satisfies the legal and technical requirements of both statutes. This issue is particularly relevant in at least two specific instances, identifying ARARs/PRGs/RAOs and site deletion. For example, taking a site off the NPL may have implications for the UMTRCA site closure and transfer process including long-term maintenance and care under the DOE Legacy Management Program. EPA has not established policy and guidance that address future EPA, NRC and DOE overlapping regulatory requirements.

As noted earlier, Homestake is one of four NPL sites subject to NRC regulations regarding closure and EPA oversight of CERCLA cleanup actions. The four sites are located in two EPA regions and are in varying stages of the Superfund cleanup process. Additionally, the Office of Mountains, Deserts, and Plains (OMDP), established in 2020, focuses on hardrock mining NPL sites in the western portion of the United States. It is the Board's understanding that while each Region works directly with NRC and DOE for their respective site(s), there may be an intra-agency workgroup focused on this unique cadre of sites.

Recommendations

a. Coordination that affects remedy selection including ARARs/PRGs/RAOs
   i. Inter-Agency Coordination
      1. The Board recommends that, as part of the feasibility study, the Region clearly enumerate the underlying basis (e.g., UMTCRA ARARs related to closure; Safe Drinking Water Act Maximum Contamination Levels for ground water remediation) for cleanup criteria for each impacted environmental medium. The Board notes that CERCLA's requirement to ensure protectiveness of human health and the environment will need to be met for NPL deletion purposes.
      2. The Board further recommends that the Region clarify with the NRC the criteria for identifying areas for potential transfer into the DOE Legacy Management Program. Clarity from NRC/DOE on what are their criteria for accepting these areas may help inform the selection of appropriate treatment technologies when selecting a CERCLA remedy.
      3. It is EPA's concern that DOE may not accept an NPL site into its Legacy Management Program due to the expenses associated with the potential need for additional work. Since the HMC Site is on the NPL, EPA may be requested to delete the site prior to site transfer. If this is the case, EPA will need to conduct a formal notice and comment rulemaking in order to delete this site. As part of that formal rulemaking process, EPA will need to include data and information in the rulemaking docket to support the deletion process. In particular, the NCP provides that deleting a site from

[5] https://semspub.epa.gov/work/06/619832.pdf

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the NPL can occur when there is no further federal or PRP-lead response needed at that site (e.g., because CERCLA protectiveness of human health and the environment has been achieved). While EPA can acknowledge and take into account the work being done pursuant to the NRC license process, various aspects of that process (e.g., prior calculation of background concentrations in ground water, development of alternative concentration limits) do not appear to be consistent with the CERCLA program guidance. That potential gap may be significant at a point when the Agency undertakes an NPL deletion rulemaking process in the future, especially with regard to the no further federal or PRP-lead response needed requirement. It also may be significant if NRC concludes its license process and DOE refuses to accept the site into its Legacy Management Program due to the potential need for additional response actions (e.g., for groundwater) to ensure protectiveness of human health and the environment. Therefore, the Board recommends that the site's administrative record file, including the RI/FS and other documentation used to support the remedy development and selection process, fully address how the approach to various aspects of the cleanup at this site are being undertaken consistent with CERCLA, the NCP and existing EPA CERCLA guidance. For example, the administrative record file should explain how the approach for calculating the soil and ground water background concentrations, the use of MCLs and UMTRCA groundwater standards for uranium in developing PRGs, RAOs, and cleanup levels, the point of compliance for attaining ground water ARARs, and consideration of a technical impracticability waiver, is consistent with the NCP preamble and various guidance documents, such as the Role of Background guidance, the RI/FS guidance, Use of Soil Cleanup Criteria in 40 CFR Part 192 as Remediation Goals for CERCLA Sites guidance, Remediation Goals for Radioactively Contaminated CERCLA Sites Using the Benchmark Dose Cleanup Criteria in 10 CFR Part 40 Appendix A, I, Criterion 6(6), the 2009 Summary of Key Existing Ground Water guidance, Use of Uranium Drinking Water Standards under 40 CFR 141 and 40 CFR 192 as Remediation Goals for Groundwater at CERCLA sites guidance, and the TI waiver guidance.

ii. EPA Coordination

1. The Board recommends the Region coordinate within Region 6 and with Regions 8 and 9, as well as with OMDP and OSRTI, where appropriate. Additionally, there is a multi-agency team that is actively working to establish operations and maintenance (O&M) expectations and the team may be positioned to provide valuable feedback.

8. Suite of Remedial Alternatives

The HMC Site is unique in that the site is currently subject to interim reclamation/remedial components. As discussed earlier, while the flanks of the large tailing pile have a radon barrier, the top of the pile has only an interim cover that may not protect to UMTRCA standards. Without a permanent cover, there may be current human health exposures and rain may

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penetrate, resulting in ongoing source migration from the tailings pile (seepage) to groundwater. The groundwater at Homestake is currently subject to containment through pumping clean water from the San Andreas/Glorietta (SAG) aquifer and injecting it into the alluvial aquifer to create a groundwater mound. The Region provided a Remedial Alternative Technical Memorandum for the site as part of the site information package. The tailing remedial alternatives considered included on-site remediation and tailing closure; and removal and off-site disposal (outside of the San Mateo Creek Basin and Milan) of the tailings piles. The remedial alternatives considered for groundwater included long-term monitoring and ICs; groundwater containment and removal; groundwater containment, removal, and in-situ treatment; and groundwater restoration via containment and removal; and technical impracticability.

Recommendations

a. In addition to the current remedial technologies, the Board recommends that the Region assess a wider selection of remedial alternatives, including source control actions, before conducting the detailed alternatives analysis. The Region may want to consider the Board's recommendations on RAOs when assessing remedial alternatives for source control and/or protection of drinking water. Below are a few recommended options for consideration that could be used alone or in combination to expand the suite of alternatives:
    i. Given the importance of the SAG aquifer to local communities, the Board recommends the Region consider utilizing pumping and treating the alluvial aquifer to prevent migration rather than creating a hydraulic mound. The remediated water from the treatment systems could be reinjected to the alluvial, Chinle, or SAG aquifers, depending on the level to which it is treated. This would allow for containment while preventing the use of clean water to create a mound in the contaminated alluvial aquifer. Additionally, this approach would minimize the use of the SAG aquifer for remedial purposes, reserving it for domestic use.
    ii. Should the current hydraulic barrier be considered as a remedial alternative, the Region should consider evaluating the hydraulic head, similar the analysis performed upgradient, to better understand the influence of the ceased LTP flushing operation on downgradient migration.
    iii. As noted in recommendation 1a, assessing the challenges facing the RO and zeolite treatment systems may improve current operations, but this information may also be valuable to inform optimization opportunities moving forward.
    iv. It was stated that a permeable reactive barrier (PRB) may be utilized as a contingency alternative. The Board recommends that the Region consider the use of a PRB in the current suite of alternatives rather than only as a contingency. Similar to pump and treat, a PRB may be an option to replacing the current hydraulic mound.
    v. In terms of waste disposal, the HMC Site is one of many mines and mills in the San Mateo Basin, some of which the Homestake Mining Company is responsible for. The Board recommends that the Region consider the use of a regional waste disposal facility or consolidation at another DOE facility, that may result is cost efficiencies over the long-term.
    vi. In addition to the closure of the LTP and STP, the Region may consider alternative on-site source control options such as a lined cell adjacent to the current cell. If the material is moved to a lined cell, the primary source of contamination to

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groundwater (seepage) would be substantially reduced, if not eliminated. This approach has been used at another Superfund site in Region 10.

vii. Should the Region consider alternatives that maintain the LTP and SPT, the Region may also consider solidifying the base of the tailings piles through injections. This may create a less permeable surface at the base of the landfill that would limit source migration/seepage to groundwater much like a liner.

viii. Should the tailings material remain onsite, the Board recommends the Region work with NRC and DOE to design a cap that meets their requirements while preventing infiltration into the tailings.

ix. Based on the information provided to the Board, the UMTRCA radon emission standards are above the CERCLA human health risk range for unlimited use and unrestricted exposure. As a result, the Board recommends that, should the Region select a remedial alternative that includes on-site waste management, the Region consider alternatives that utilize institutional controls and fencing to limit access to the piles to reduce exposures.

9. Climate Change

As noted on EPA's Climate Change website[6], understanding and addressing climate change is critical to EPA's mission to protect human health and the environment. With regards to the Superfund program, it's important to consider the impact of severe weather events, potential flooding, changes in rain patterns and temperature changes into remedy selection and design. It may be necessary to incorporate elements of climate resilience, especially for sites subject to groundwater contamination and/or material being left in place, such as the HMC Site.

Recommendation

a. The Board recommends that the Region, when evaluating remedial alternatives, consider the potential impacts of climate change that may negatively affect the protectiveness of alternatives. The June 2014 OLEM Climate Change Adaptation Implementation Plan[7] (Implementation Plan) discusses potential program vulnerabilities to climate change. Per Table 1 in the Implementation Plan, such vulnerabilities may include: design and placement of storage facilities to accommodate climate change impacts, changing climate conditions may impact continued remedy effectiveness, current assumptions regarding protectiveness of remediation and containment methods may not reflect changing climate impacts, or conducting periodic evaluations of implemented remedies, including changes to frequency and intensity that may impact remedy effectiveness. Examples of vulnerabilities that may be applicable to Homestake include: evapotranspirative covers may be less effective in areas with stronger drought/rain cycles, the depth to groundwater may be affected by climate change, or a site's O&M needs may change based on more extreme weather events.

[6] https://www.epa.gov/climate-change

[7] https://www.epa.gov/sites/production/files/2018-08/documents/oswer-climate-change-adaptation-plan.pdf

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10. Environmental Justice

Based on the information provided to the Board, two downgradient tribes, the Pueblo of Acoma and the Pueblo of Laguna, as well as the cities of Milan and Grants are dependent upon the SAG aquifer for drinking water. These vulnerable communities may be disproportionately impacted by the HMC Site. Impacts to the SAG aquifer may create environmental justice (EJ) concerns for tribal communities, as they cannot move their homelands, and the tribes' relationship to the resource includes cultural as well as public health considerations.

Recommendations

a. Based on the presentations made by the Region and other stakeholders, the Board recommends the Region address the potentially disproportionate impact of site-related contamination and potential EJ concerns related to cleanup approaches. In particular, the policies articulated in section 1 of Executive Order 13990 (e.g., using science to improve public health, protect the environment, ensure access to clean water, consideration of impacts on EJ and low income communities) and public statements made by the Administrator since the issuance of that Order, as well as long-standing Agency EJ guidance, offer a framework that can inform policy considerations in evaluating alternatives for limiting exposure to highly toxic/carcinogenic and mobile constituents of concern (radionuclides). Given the evolving priorities related to environmental justice (EJ), the Board recommends the site team engage with Region 6's designated EJ coordinator and OSRTI's EJ coordinator, currently Lavar Thomas, to address potential EJ concerns.
b. Given the impact to two tribes, the Board recommends that the Region ensure adequate tribal consultation with regard to resources that may be negatively impacted by site-related contamination and potential response action alternatives.

ADVISORY CONSIDERATIONS

Advisory considerations are Board Review Team suggestions that are meant to support the Regional Site Team in moving forward, but do not necessarily rise to the level of recommendations. Please take these comments under consideration as the RI is finalized and the FS is initiated.

1. Utilize Lessons Learned from Other Sites

As noted earlier, there are over 80 legacy uranium mines and four former uranium mill facilities that operated in the San Mateo basin, including the HMC Site. Some of these, such as Bluewater, have already undergone some remedial/reclamation activity. Similarly, other NPL sites also subject to UMTRCA Title II may be further in the remedy selection process. It might be helpful for the Region to learn more about those sites to determine if there are any lessons learned that may inform the HMC Site. Those site lessons may provide useful information and approaches for addressing inter-agency coordination, groundwater management and other related issues as the Region moves forward with remedy selection at this site.

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CONCLUSION

The Board Review Team commends the Region's collaborative efforts in working with the State, tribes and site stakeholders. We would also like to thank the Regional Site Team for the thought and effort that went into preparation of the Board package and presentations.

Per the NRRB Charter, approximately six weeks after receipt of these recommendations, the Board expects the Regional Division Director to respond to the OSRTI Office Director in writing to address implementation of each Board recommendation and those advisory considerations that the Region is not adopting. The OSRTI Office Director will then discuss the response with the Regional Division Director within approximately two weeks of receiving the Region's written response level. Typically, before the Region issues the proposed plan for public comment, the Region includes the recommendations memo and regional response memo in the site's AR. Once the Board recommendations and Regional responses are made a part of the AR, they will be posted to the NRRB website (https://www.epa.gov/superfund/national-remedy-review-board-nrrb).

Thank you for your support and the support of your managers and staff in preparing for this review. The Board looks forward to working with the Regional Site Team during the Detailed Alternatives Analysis meeting. Should you have any questions, please contact me at poore.christine@epa.gov or call me at 703-603-9022. Thank you for the opportunity to engage on the Homestake Superfund Site.

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NRRB Board Review Team Members
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August 9, 2021

DRAFT STATEMENT OF WORK

FEASIBILITY STUDY TECHNICAL OVERSIGHT SUPPORT
HOMESTAKE MINING COMPANY SUPERFUND SITE, GRANTS, NEW MEXICO

I. PURPOSE

This Statement of Work (SOW) describes the feasibility study (FS) technical oversight support and deliverables to be provided to the EPA Office of Superfund Remedial Technology and Innovation (OSRTI) in support of EPA Region 6 for the Homestake Mining Company Superfund site (Site), located in Grants, New Mexico. The FS is being performed in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the National Contingency Plan (NCP).

The SOW and deliverables align with the work activities and deliverables outlined in the Administrative Settlement Agreement and Order on Consent (ASAOC) for FS at the Site; dated August 12, 2020. The ASAOC specifies the primary tasks to be completed by Homestake Mining Company, the responsible party (RP) in the performance of the FS. Following are the associated activities to be completed under this SOW.

II. TECHNICAL SUPPORT REQUIREMENTS

Task 1 – Project Planning and Support

This task includes the following work effort related to project initiation and project management:

- Conflict of Interest (COI) Determination – The Contractor shall seek confirmation of the Site's RP with the EPA Task Monitor and the Remedial Project Manager (RPM). The Contractor shall perform an internal evaluation of prior or current involvements at the Site with respect to the PRP and/or activities of technical significance to determine whether there is any internal COI, an appearance of a COI, or a confirmed COI. The Contractor shall report results to the EPA Task Monitor, Contracting Officer, and the Contracting Officer Representative (COR) in writing of its final internal COI evaluation to facilitate EPA's COI assessment.

- Scoping Meeting – the Contractor shall provide logistical support for and participate in a scoping meeting/conference call with the EPA Task Monitor and the Regional RPM.

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- Project Management – the Contractor shall perform project management, including the following:

    - Coordinate staffing and other support activities to perform the project tasks set forth in this SOW, including Team subcontractors and other subcontractors;
    - Establish and maintain necessary project files;
    - Perform contract administration functions associated with this project;
    - Coordinate monthly reporting and invoices;
    - Monitor overall cost and performance;
    - Attend periodic project planning meetings, as necessary, and;
    - Perform final project closeout per requirements of the contract.

Task 2 – Project Kickoff Meeting

The Contractor shall provide logistic support for and participation in a kick-off meeting/conference call with the EPA Task Monitor, the Regional RPM, EPA technical staff, other EPA contractor(s), and other stakeholders as appropriate. The purpose of the meeting/call is for EPA to provide the Contractor with an overview of the Site, discuss site characteristics and history, goals of the project, schedules, roles and responsibilities, and key site documents for review.

Task 3 – Site Document/Data Review

The Contractor shall obtain, copy and review available site documents and data provided by the Region to support the project. The Contractor shall obtain the necessary information from the EPA Task Monitor, Regional RPM and/or the Regional site contractors, as applicable.

The Contractor shall notify EPA immediately should there be critical information missing or incomplete, or any other circumstances, that will delay or prevent the ability to perform the tasks set forth in this SOW. Document/data review is anticipated that may include one or more teleconferences with the Regional RPM and staff to resolve questions and address any review uncertainties.

The Contractor shall assist EPA in seeking opportunities for the Region through the HQ Optimization Program to optimize the RP-lead FS activities and seek cost reducing, innovative, and technically advanced or cutting-edge methodologies for innovation and for advancing the CERCLA potentially responsible party (PRP) overview process.

Task 4 – Technical Review of TI Evaluation Report

The Contractor shall perform multidisciplinary technical reviews and provide review comments on all draft and final versions of the Technical Impracticability (TI) Waiver Evaluation Report, as well as any other technical documents related to TI that are submitted to EPA for review and approval by the PRP. The technical review shall include a detailed review of the models used for

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the TI evaluation, including all model parameters and assumptions. The Contractor shall review the report for consistency with EPA guidance (EPA/540-R-93-080). The Contractor shall also review the report to assess the appropriateness and reasonableness of the modeling parameters and assumptions.

If EPA directs the RP to collect additional site-specific data, including laboratory testing of core samples, to complete the TI evaluation and modeling, the Contractor shall review and comment on any work plans, memorandum, reports and laboratory data submitted by the PRP for this purpose.

Task 5 – Technical Review of FS Reporting Documents

The Contractor shall perform multidisciplinary technical reviews and provide review comments on all draft and final versions of the following Feasibility Study (FS) reporting documents in support of EPA's oversight of the ongoing FS being performed by the RP:

- Technical Impracticability Waiver Evaluation Report (draft 11/2020); and
- Feasibility Study Report (draft 12/2020).

The Contractor shall review the documents for consistency with CERCLA, the NCP, and EPA guidance for conducting a FS. The Contractor shall also review the documents for technical soundness from an engineering feasibility and cost perspective.

Task 6 – Participate in EPA Technical Meetings

The Contractor shall participate in technical meetings or teleconferences between the EPA, other federal and state regulatory agencies, and/or the RP on the TI evaluation process and the FS process. The Contractor shall also participate in technical meetings with EPA to discuss its review comments submitted as part of Task 4 and Task 5.

Task 7 – Geochemical Analytical Support for EPA Background Reassessment

The Contractor shall prepare and analyze Trilinear Diagrams and other graphs or charts of geochemistry data for alluvial and Chinle aquifers, as directed by EPA, to support EPA's ongoing groundwater background reassessment.

The Contractor shall participate in technical meetings or teleconferences with EPA and the New Mexico Environment Department (NMED) to discuss the Trilinear Diagrams, graphs or other charts prepared as part of this task.

Task 8 – Community Involvement Support

The Contractor shall provide community involvement support, if requested by EPA. Such support shall include, but not be limited to, the following:

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- Meeting planning and logistics support;
- Development, formatting and production of hard copy and/or electronic media on technical topics of concern or interest.

Task 9 – Miscellaneous Technical Support

The Contractor shall provide miscellaneous, multidisciplinary technical support to EPA OSRTI and EPA Region 6 in support of Task 1 through 5, or as otherwise directed.

Task 10 – Optimization Review Technical Memorandum

The Contractor will prepare a technical memorandum, if requested by EPA, to document any recommendations for optimizing technologies, process options or remedial alternatives that are to be developed during the performance of the CERCLA FS.

III. PERIOD OF PERFORMANCE

The period of performance shall be the award date through April 1, 2023.

IV. SCHEDULE OF DELIVERABLES

All deliverable due dates will be established based on the following:

- The receipt of RP documents to review under Task 4 – Technical Review of TI Evaluation Report and Task 5 – Technical Review of FS Reporting Documents;
- As determined based on support activities directed by EPA under Task 7 – Geochemical Analytical Support for Background Reassessment;
- As determined based on support activities directed by EPA under Task 8 – Community Involvement Support; and
- As determined based on support activities directed by EPA under Task 9 – Miscellaneous Technical Support.

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Message

From: Purcell, Mark [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=FE198E260B024EB4BD9D30DC11F900B1-PURCELL, MARK]
Sent: 1/7/2021 4:44:55 PM
To: Ann Berkley Rodgers [abr@chestnutlaw.com]; Aaron M. Sims [ams@chestnutlaw.com]; TSecretary@poamail.org; Governor@poamail.org; 1st_lt@poamail.org; CVandiver@poamail.org; JWilson@poamail.org; FMartinez@poamail.org; dmartinez@poamail.org; tcouncilpoa@gmail.com; administration@poamail.org
CC: Turner, LaDonna [turner.ladonna@epa.gov]; Weece, Adam [weece.adam@epa.gov]
Subject: Preliminary Draft Technical Impracticability Evaluation Report - Homestake NPL Site
Attachments: 20201115 GRP RIFS DRAFT TI Waiver Evaluation Text.pdf

All,

I have attached the draft TI Evaluation Report text.

Please confirm receipt.

Mark

Mark D. Purcell
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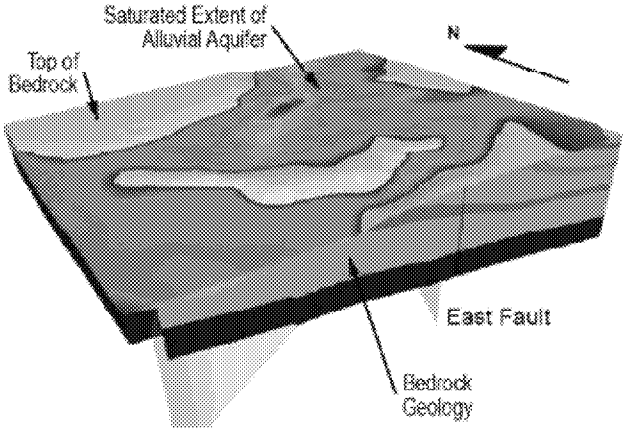

Draft Technical Impracticability Evaluation

Homestake Mining Company Superfund Site

Operable Unit #1 – Groundwater Remediation

Cibola County, New Mexico

November 2020

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Appendices

Appendix A Technical Memorandum on First-Order Decay Attenuation Analysis for Grants

Appendix B Groundwater Fate and Transport Modeling Report

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Executive Summary

This Technical Impracticability Evaluation Report (TIER) presents the justification for the waiver of Applicable or Relevant and Appropriate Requirements (ARARs) for Operable Unit 1 (OU1) at the Homestake Mining Company Superfund Site (Site) located in Cibola County, New Mexico. This TIER has been prepared in accordance with the United States Environmental Protection Agency (USEPA) Office of Solid Waste and Emergency Response (OSWER) Directive 9234.2-25, *Guidance for Evaluating the Technical Impracticability of Groundwater Restoration* (TI Guidance) (EPA 1993).

In accordance with the provisions in Section 4.2 of the TI Guidance, this TIER is being submitted after completion of the Remedial Investigation (RI Report) as the data collected during the RI are sufficient to identify the critical limitations to groundwater restoration. These RI data that characterize the nature and extent of groundwater contamination are the product of over 40 years of Site investigation and performance monitoring (operation, maintenance, and monitoring) data collected during the operation of a groundwater remediation system.

Site Location and Background

The Site is located approximately 5.5 miles north of Milan, in Cibola County, New Mexico. Homestake Mining Company of California (HMC) opened and began operating the mill facility in 1958 under two partnerships. Beginning in 1981, HMC became both the sole owner and operator. In 2001, HMC merged with Barrick Gold Corporation. Currently, HMC is a wholly owned indirect subsidiary of Barrick Gold Corporation and owns the Homestake Facility.

Uranium milling operations were performed at the Homestake Facility from 1958 until 1990. Operations originally consisted of two independently operated mills: a larger mill with a nominal milling capacity of 1,750 tons per day (tpd) and a smaller mill with a nominal milling capacity of 750 tpd. Generally, sandstone ore was processed at the larger mill and limestone ore was processed at the smaller mill. In 1961, the two milling facilities were combined, and milling capacity expanded to a combined 3,400 tpd.

Tailings from the milling operations were deposited in two on-Site tailings piles, while tailings liquid was recovered and reused. The two mills each used separate tailings piles, referred to as the Large Tailings Pile (LTP) and the Small Tailings Pile (STP). The larger sandstone ore processing mill deposited tailings in the LTP and tailings from the smaller limestone ore processing mill were deposited in the STP. Milling operations ceased on February 2, 1990. Mill decommissioning began on May 5, 1992. Demolition of milling facilities was completed by March 1995 (AKG 1996). Mill debris was buried in pits located within the mill area or south of the LTP. Debris was placed into pits in lifts up to 5 feet thick and slurry grout was poured into the pit until it had filled the voids and reached a level approximately equal to the top of the debris lift. This process was repeated until each pit was filled with debris and slurry. Debris pits were capped with up to 4 feet of soil (AKG 1996).

Cover materials were placed on the former mill area, the LTP, and the STP as part of the mill decommissioning efforts completed in the mid-1990s. One foot of cover material was placed over the STP in areas outside of Evaporation Pond 1. Extensive re-grading was completed to fill in the tailings ponds and flatten the side slopes to improve stability at the LTP. Two to 3.8 feet of cover material was placed on the side slopes of the LTP to effectively buffer radon emissions. In addition, 6 to 9 inches of rock cover was placed on the side slopes for erosion protection. One foot of cover

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material was placed on the top of the LTP. Since this initial placement, additional cover has been placed on the LTP to fill depressions caused by settlement, to improve drainage, and to address specific areas with elevated radon flux measurements.

Historical Groundwater Contamination and Remediation

In 1976, a contaminant plume that originated from the LTP was detected in the alluvial aquifer and was moving to the south and west (HMC and Hydro-Engineering 2010). In 1977 a line of groundwater extraction and injection wells were installed and currently operate along the southern facility boundary between the LTP/STP and the downgradient residential subdivisions to hydraulically contain groundwater contamination from the LTP/STP and to create a hydraulic barrier to limit movement of the groundwater contamination towards the downgradient residential subdivisions. Since 1977, HMC has continually improved and expanded the scope and operation of this groundwater remediation system. To date, HMC has installed over 1,200 wells at the Site. The following is a brief summary of the major changes and improvements made to the groundwater remediation system:

- 1975 - HMC providing bottled water to residents of nearby subdivisions upon request.
- 1976 - HMC entered into agreement with NMEID to provide bottled water to residents located hydraulically downgradient of the source areas.
- 1977 - water was added into the alluvial aquifer to create a hydraulic barrier to limit the movement of contaminated groundwater.
- 1977-1983 - Multiple hydraulic extraction wells were installed in the alluvial aquifer.
- 1984 - Hydraulic containment of the Upper Chinle aquifer was initiated.
- 1986 - Extension of the Milan water supply to the Broadview Acres, Felice Acres, Murray Acres, Valle Verde, and Pleasant Valley Estates subdivisions was initiated.
- 1990 - Evaporation Pond EP-1 was constructed within the footprint of the STP to assist in the dewatering of the LTP and to hold water pumped from the collection wells. Additional hydraulic extraction wells were installed in the alluvial aquifer.
- 1992 - Toe drains were installed around the tailings (LTP/STP).
- 1993-2000 - During this period, corrective action and monitoring well networks were revised through addition and abandonment of wells.
- 1996 - Use of Evaporation Pond EP-2 began in March.
- 1999 - The reverse osmosis (RO) treatment unit was added; treated water is used for hydraulic containment of the alluvial aquifer.
- 2000 - Irrigation of 270 acres groundwater was initiated as a means to manage extracted groundwater.
- 2000-2015 - Tailings flushing of the LTP was conducted where water was introduced into the LTP to expedite the mass flux of contaminants from the tailings.
- 2002 - 60 acres of irrigation area were added, and RO plant capacity increased from 300 gallons per minute (gpm) (one unit) to 600 gpm (two units).

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- 2002-2009 - During this period, corrective action, and monitoring well networks were revised through addition and abandonment of wells.
- 2004-2005 - 64 acres of irrigation area were added.
- 2010 - Evaporation Pond EP-3 was constructed and commissioned.
- 2012 - Land Application program ceased operation
- 2012 - 300 gpm Zeolite pilot treatment started operation.
- 2015 - RO Plant was expanded to a maximum throughput of 1200 gpm with the addition of a 600 gpm low pressure skid, a 250 gpm high pressure skid, and two microfiltration skids to replace the existing sand filters amongst other updates.
- 2016 - 1200 gpm Zeolite system started operation for off-Site water treatment.

Furthermore, HMC completed three treatability studies to improve the groundwater remediation system that further demonstrate the technical impracticability of remediating groundwater at the Site.

These treatability studies include:

- Tripolyphosphate treatment (TPP): TPP treatment employs the injection solution containing TPP and other amendments to promote uranyl phosphate precipitation, which immobilizes dissolved uranium. TPP Pilot Studies demonstrated rapid in-situ treatment of dissolved uranium in the S Area; however, the technology was less effective in areas which has lower soil permeability. In addition, TPP injections were not effective in treating selenium and molybdenum.
- Electrocoagulation treatment: introduces an electrical current in the feed water that destabilizes suspended particles, multivalent metals, and organic compounds. The results show electrocoagulation treatment technology was effective in removing uranium; however, the electrocoagulation treatment technology was unable to reduce molybdenum concentrations to below the Site standard.
- In-situ biological treatment: A pilot testing was completed at two locations near the LTP to evaluate the effectiveness of anaerobic in-situ biological treatment. The testing targeted the reduction of dissolved uranium, selenium, molybdenum, sulfate, and nitrate in the alluvial aquifer by injecting nutrients into the aquifer to stimulate robust growth of specific organisms. The results show in-situ biological treatment was successful in low hydraulic conductivity portions of the alluvial aquifer; however, in-situ biological treatment was not successful in high hydraulic conductivity portions of the alluvial aquifer.

Current Groundwater Remediation

Groundwater extracted from the alluvium, Upper Chinle, and Middle Chinle is conveyed to either the RO or Zeolite plants depending on whether the groundwater contains selenium and/or molybdenum above the groundwater standards. Groundwater that contains just uranium is conveyed to the zeolite plant and groundwater with uranium and selenium and/or molybdenum is conveyed to the RO plant for treatment. In 2018, the RO plant treated and annual average flow rate of 443 gpm. RO influent was comprised of 279 gpm from the alluvium, 130 gpm from the Upper Chinle, and 34 gpm from the Middle Chinle. In 2018, the Zeolite plant treated and annual average flow rate of 296 gpm. Zeolite influent was comprised of 240 gpm from the alluvium, and 56 gpm from the Middle Chinle.

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The treated water from the RO and Zeolite plants (and clean water from the San Andres-Glorietta aquifer) is conveyed to the post treatment tank before it is conveyed to the injection wells where it is injected into the alluvial, Upper Chinle, and Middle Chinle aquifers to maintain a hydraulic barrier between the LTP/STP and the neighborhoods. The brine or liquid waste from the RO plant and zeolite plant is conveyed either directly to the evaporation ponds or to the collection ponds before it is conveyed to the evaporation ponds. A small amount of water is conveyed from the collection ponds back to the RO plant to optimize treatment.

Water from the LTP toe drains that contains uranium, selenium or molybdenum above the groundwater protection standards is conveyed to either the RO plant or the evaporation ponds.

Justification for Technical Impracticability

A Technical Impracticability Waiver of specific ARARs at a Superfund site is appropriate for groundwater when it is technically infeasible to restore groundwater to the ARARs within a reasonable timeframe (EPA 1993). The following sections outline the rationale for why groundwater cannot be remediated in a reasonable timeframe.

There are significant Site-specific factors that render remedial technologies to achieve groundwater ARARs at this Site technically infeasible. These include an inability to remediate the primary source (LTP/STP) and secondary sources (vadose and silt/clay in alluvial aquifer beneath the LTP) of Contaminants of Potential Concern (COPCs) and Radionuclides of Potential Concern (ROPCs) and an inability to remediate groundwater in a reasonable time frame and compliance with such ARARs would be inordinately costly.

The primary source of uranium, selenium and molybdenum is the LTP/STP. However, significant uranium, selenium and molybdenum have leached from the LTP/STP to the vadose and silt/clay portion of the alluvial aquifer underlying the LTP/STP. It is estimated that the LTP contains 21,000,000 tons of tailings, making it impracticable to remove. Engineered covers were installed on the LTP/STP in the mid-1990s.

It is impracticable to move the LTP for the following reasons (TetraTech, 2012):

- Cost Prohibitive: The estimated costs range from $1.8 billion (truck transport) to over $2 billion (rail and slurry pipeline transport).
- Additional Risk to Human Health: The potential risk to human health risk is significant. The increased cancer risk to workers involved with tailings excavation and placement is 1 in 10. The increased cancer risk to nearby residents is approx. 1 in 100 based on exposure to radioactive material.
- Potential Ecological Damage: Relocating tailings would require extensive amount of land that will be irretrievable committed for perpetuity as a disposal cell. Removal of habitat will potentially affect native wildlife and vegetation.
- Potential Damage to Cultural Resources: Relocating tailings could negatively affect the large number of cultural resources in the area including federal and state parks and native American lands.
- Potential Impacts from Increased Truck Traffic: Truck traffic to move tailings would be large and noticeable. This would include additional noise impacts, negative air quality, and potential for accidents and accidental releases. The potential impacts

are not as great with rail, but increased activity would impact community and increase potential for traffic accidents and accidental releases.

- Potential Regulatory Challenges: Siting studies, public hearings, and environmental reports and preconstruction monitoring has been estimated to take up to 7 years. The construction of cell has been estimated to take up to 3 years and it has been estimated to take up to 2 years to move the LTP
- Carbon Footprints: Offsite disposal would require greater use of consumable materials and fossil fuel and result in greater greenhouse emissions.
- Potential Impact to Community: Construction at new site would result in negative noise and vibration impacts to residents and wildlife.

It is impracticable to remediate COPCs/ROPCs in the vadose and the alluvium silt/clay beneath the LTP/STP, which would be continued sources even if the LTP/STP were removed, as the COPCs/ROPCs have adsorbed to the unsaturated soil and diffused into the pore-water in the silt/clay. Therefore, it is technically impracticable to remediate the sources of uranium, selenium or molybdenum.

Active groundwater remediation has been implemented for over 40 years. Going forward, groundwater remediation would have to occur for as long as uranium, selenium or molybdenum is transferred from the primary and secondary sources to groundwater causing groundwater to contain uranium, selenium or molybdenum at concentrations greater than the ARARs. Empirical data (1st Order Decay analysis presented in Appendix A) show active groundwater remediation would have to occur for centuries (Uranium = 210 years; and Molybdenum = 360 years) making groundwater restoration impracticable based on required excessively long duration for remediation.

The technical impracticability of groundwater remediation was also assessed herein and during the Feasibility Study (FS). Potentially applicable technology types and process options were reviewed by screening the technologies and process options with respect to technical feasibility. This was accomplished by using Site information regarding geology, and contaminant concentrations and distribution, as well as pilot studies that have been conducted by HMC. The major factors that influence the technical feasibility of remedial technologies are the duration of source(s) remediation, hydrogeologic complexity, and aquifer heterogeneity. Based on this screening, remedial technologies were retained or not retained for further consideration. The retained remedial technologies and process options were evaluated and potentially combined to develop a range of remedial alternatives.

Five remedial alternatives were evaluated:

- Remedial Alternative 1: No Action;
- Remedial Alternative 2: Long-Term Monitoring and Institutional Controls;
- Remedial Alternative 3: Groundwater Containment and Removal;
- Remedial Alternative 4: Groundwater Containment and Removal and In Situ Treatment; and
- Remedial Alternative 5: Groundwater Restoration via Containment and Removal.

These remedial alternatives were simulated using a groundwater flow and solute transport model and evaluated using the nine Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) criteria. The results show that there are no remedial technologies capable of remediating groundwater in the alluvial, Upper Chinle, and Middle Chinle aquifers in a reasonable

timeframe. All remedial technologies will have to treat groundwater for at least the longest length of time uranium, selenium or molybdenum are transferred from the primary and secondary sources to groundwater that has been estimated to be at360 years by first order decay analysis. Therefore, Remedial Alternative 3, which is a pump and treat groundwater remediation system, would have to operate for over 360 years, and PRBs in Remedial Alternative 4 would have to be replaced multiple times to achieve the ARARs in 360 years. This evaluation shows it is impracticable to successfully remediate groundwater within a reasonable timeframe. Therefore, a TI Waiver, contained herein, is warranted as it meets EPA Guidance.

TI Zone

The USEPA TI Guidance (EPA 1993) states that at sites where restoration of groundwater to its most beneficial use is technically impracticable, the area over which the decision applies (referred to as the TI Zone) generally will include all portions of the contaminated groundwater that do not meet ARARs. ARARs are waived inside the TI Zone and other measures, such as pathway elimination and/or administrative controls, are used to prevent exposure to human health and the environment and ensure protectiveness. Outside of the TI Zone, ARARs will still apply. In accordance with the TI Guidance, a TI Zone has been developed that meets these criteria (Figure ES-1).

Groundwater flow and solute transport modeling has been used to define a TI Zone. The model was used to simulate the fate and transport of uranium and molybdenum in groundwater using Site-specific conditions (LTP/STP sources and physical and chemical aquifer conditions) while turning off the existing groundwater remediation. These simulations were used to establish the TI Zone. A TI Zone that is protective beyond all reasonable estimates was established using the extent of uranium simulated with a recharge value increased by 75 percent and a retardation value decreased by 20 percent. These worst-case results were used along with a 200-year simulation to establish the TI Zone.

Protectiveness

Finally, the primary objective of any remedial strategy is overall protectiveness. Exposure control or protectiveness will be achieved with a series of actions, land use controls, and institutional controls, including; property acquisition, alternative water supply, well abandonment, and point of use treatment, if necessary.

HMC completed the following protectiveness and exposure control measures:

- **Land Purchases**

  HMC currently owns approximately 74 percent (4,200 acres of the total 5,700 acres) of the land within the LTC/TI Zone Boundary.

- **Alternative Groundwater Supply**

  In 1975, HMC began providing bottled water to residents of the nearby subdivisions upon request. On August 18, 1976, HMC entered into an agreement with NMEID to provide bottled water to residents located hydraulically downgradient of the source areas.

  In 1983, HMC signed an agreement with EPA that required HMC to provide an extension of the Village of Milan municipal water system to four residential subdivisions south and southwest of the former mill site (Broadview Acres, Felice Acres, Murray Acres, Valle Verde, and Pleasant Valley Estates) which were in the impacted groundwater area.

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- **Groundwater Use Restrictions**

  In 2018 the Office of the State Engineer issued an Order restricting well drilling in the Alluvial and Chinle aquifers within an area where groundwater is impacted by historical uranium milling and mining activities. The purpose of the Order is to protect human health and prevent interference with groundwater flow associated with ongoing remediation. The Order restricts the permitting and drilling of wells for new appropriations, or replacement or supplemental wells, and restricts the permitting of any change to the point of diversion of any existing wells within the boundaries defined. The Order will be in effect in perpetuity or until groundwater concentrations decrease to levels less than WQCC standards.

  NM OSE Alluvial Aquifer and Chinle Aquifer Well Prohibition Boundaries were established by State of NM to prevent future groundwater use.

HMC will complete the following human health protectiveness and exposure control actions:

- HMC will make a good faith effort to acquire all property within TI Zone, not already purchased by HMC, including homes;
- Properties purchased by HMC inside of the TI Zone will have their wells abandoned;
- Properties within the TI Zone, not purchased by HMC, where people live will be contacted to connect the home to a municipal water supply located outside of the TI Zone and their wells will be abandoned;
- Properties not purchased by HMC but refusing to be connected to municipal water supply will be offered point of use water treatment;
- HMC will attempt to place water use restrictions/restrictive covenants on all deeds within the TI Zone; and

Environmental protectiveness and exposure control:

- Due to the hydrogeologic conditions within the TI Zone as presented herein and the RI Report, groundwater does not discharge to surface water within the TI Zone; therefore, there are no potential future exposures to the environment from groundwater.

The TI Waiver approach described herein will satisfy the threshold remedy selection criteria (protect human health and the environment) and use permanent solutions and treatment to the maximum extent practicable.

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1 Introduction

1.1 Purpose of the Report

This TIER presents justification for the waiver of Applicable or Relevant and Appropriate Requirements (ARARs) within a defined Technical Impracticability Zone (TI Zone) at the Site located in Cibola County, New Mexico. Administratively, the Site has been divided into three Operable Units (OUs):

- OU1: Tailings seepage contamination of groundwater aquifers;
- OU2: Long-term tailings stabilization, surface reclamation and Site closure; and
- OU3: Radon concentrations in neighboring subdivisions.

This TI Evaluation report addresses OU1. COPCs and ROPCs were established for OU1 under the NRC's radioactive materials license SUA-1471. The COPCs and ROPCs include uranium, molybdenum, selenium, sulfate, nitrate, vanadium, thorium 230, radium 226/228 and indicator parameters chloride and total dissolved solids (TDS). Preliminary Remediation Goals (PRGs) were established for the COPCs and ROPCs during the Remedial Investigation (RI). A more in-depth discussion of the COPCs and ROPCs is presented in Section 3.2.1 of this report. Data presented in the RI show uranium and molybdenum, have impacted groundwater the greatest, in terms of aerial extent and concentration. The nature and extent of uranium has been shown to be the greatest of the COPCs/ROPCs at the Site. The nature and extent of molybdenum is far less extensive than uranium but is present in greater concentrations than the other COPC/ROPCs. The nature and extent of selenium historically was similar to uranium; however, remedial activities completed to date have reduced the impact of selenium so that uranium and molybdenum have the greatest nature and extent and are therefore the current drivers of remedial action at the Site.

This report was prepared in accordance with the USEPA OSWER Directive 9234.2-25, Guidance for Evaluating the Technical Impracticability of Groundwater Restoration (TI Guidance) (EPA 1993), and on behalf of the HMC. In accordance with the provisions in Section 4.2 of the TI Guidance, this TIER is being submitted after completion of the RI Report and subsequent modeling activities as the data presented in the RI report are sufficient to identify the critical limitations to groundwater restoration. Furthermore, and more importantly, four decades of data collected during the operation of the groundwater remedy demonstrate the effect these critical limitations have on groundwater remediation and demonstrate that groundwater remediation is technically impracticable as described in Section 5 of this TIER. Accordingly, this TIER demonstrates the impact of these critical limitations on contaminant distribution, restoration potential, and the effectiveness of currently available remedial technologies.

1.2 Site Location and Ownership

The Site is a former uranium milling facility located approximately 5.5 miles north of Milan, in Cibola County, New Mexico (Figure 1-1). HMC opened and began operating the mill facility in 1958 under two partnerships. Beginning in 1981, HMC became the sole owner and operator. In 2001, HMC merged with Barrick Gold Corporation. Currently, HMC is a wholly owned, indirect subsidiary of Barrick Gold Corporation and owns the Homestake Facility.

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1.3 Site Description

The Site includes the following areas:

- Former uranium milling operation areas, tailings piles, and facilities used for on-going closure operations, including collection and evaporation ponds, water treatment plants, and support facilities. as shown on Figure 1-2.
- The location of the release (or releases) of hazardous substances and CERCLA eligible pollutants and contaminants associated with the Homestake Facility and wherever those hazardous substances, pollutants and contaminants have come to be located.

1.4 Site Operational History

1.4.1 Overall Operation

Uranium milling operations occurred at the Site from 1958 to 1990. The *primary* source of ore for the Homestake mill was underground mines located within 30 miles of the Site in the Ambrosia Lake district (Skiff and Turner, 1981). The smaller mill, built in 1957, was known as the Homestake-New Mexico Partners mill (Chenoweth, 1989; McLemore and Chenoweth, 2003). It had a nominal milling capacity of 750 tons per day (tpd) and typically processed limestone ore. The Homestake-Sapin Partners, a partnership between Homestake and Sabre Pinon Corporation, built a second, larger mill in 1957 with a nominal milling capacity of 1,750 tpd. It was located north of the first facility and generally processed sandstone ore. The two mills initially operated independently but were subsequently combined and expanded in 1961 under Homestake-Sapin Partners. The nominal milling capacity of the combined mills was 3,400 tpd (McLemore 2007).

In 1962, United Nuclear Corporation merged with Sabre Pinon Corporation, but maintained the United Nuclear Corporation name. United Nuclear Corporation became the limited partner with Homestake forming the United Nuclear-Homestake partnership and continued operating the mill. In March 1981, the United Nuclear-Homestake Partnership was dissolved and Homestake became the sole owner. Uranium production ceased at the Site in 1981 but reopened in 1988 to process ore from the Section 23 mine and Chevron's Mount Taylor mine (McLemore 2007). The mill closed soon after and was decommissioned in 1990. Homestake completed reclamation of the mill in 1994. After four decades of remediation, Homestake continues to manage groundwater restoration and tailings reclamation activities at the former mill Site.

The Homestake Facility was regulated through radioactive materials licenses since milling operations began in 1958. From 1958 through 1974, the Homestake Facility was regulated by the Atomic Energy Commission under License Number SUA-708. In 1974, regulatory authority was granted to the New Mexico Environmental Improvement Board. In 1986, regulatory authority over uranium milling and closure operations at the Homestake Facility was transferred to NRC from the State of New Mexico and the Homestake Facility was granted license SUA-1471, replacing license SUA-708.

In 1983, at the request of the State of New Mexico, the Site was added to EPA's Superfund National Priorities List. As a result, the Site's cleanup activities are also subject to regulation under EPA's Superfund Program, in accordance with the CERCLA. Pursuant to a 1993 memorandum of understanding between EPA and NRC, NRC is designated as the lead regulatory agency for reclamation and closure activities, while EPA has responsibility to monitor reclamation activities to assure attainment of ARARs under CERCLA.

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The State of New Mexico asserts regulatory authority at the Site through a number of state environmental statutes and regulations. Currently, the Site maintains groundwater discharge permit DP-200, which regulates several aspects of the ongoing groundwater cleanup program and related RO water treatment system. A former Discharge Permit (DP-725) that regulated the discharge to the evaporation ponds and two existing collection ponds has been rolled into DP-200. The New Mexico Office of State Engineer also regulates construction and operation of the evaporation ponds, tailings piles, water appropriations, and well permits.

1.4.2 Milling Process

The primary source of ore for the Homestake mill was underground mines located within 30 miles of the Site in the Ambrosia Lake district (Skiff and Turner, 1981). Two basic types of uranium ore are known to have been processed by the mill, sandstone and limestone. Sandstone ore accounted for 80 to 85% of the mill feed, and limestone ore made up the remaining 15 to 20% of the feed (Skiff and Turner, 1981). The ore contained uranium in the form of the minerals coffinite, uraninite, tyuyamunite, and carnotite. The minerals were distributed as impregnations, pore fillings, and cementation between sand grains or along fractures. The ore grade ranged from 0.04 to 0.3% uranium as triuranium octoxide (U_3O_8), the most common form found in nature. Uranium minerals were generally associated with carbonaceous material, which also contained smaller amounts of molybdenum and selenium (McLemore 2007).

Milling of the ore was conducted in five general stages; ore handling and preparation, extraction, liquid-solid separation, precipitation and purification, and product preparation (Skiff and Turner, 1981). The mill used two parallel circuits for grinding, thickening, and leaching of the ore. The North Circuit was used to process the majority of sandstone ore, while the South Circuit used a secondary grind and longer leach time to process the refractory limestone ore. Product from each grinding circuit was then advanced to their respective thickening circuits and removed at approximately 40% solids prior to leaching.

The Homestake mill used an alkaline leach process to recover uranium from the thickened slurry. Chemicals used during the milling process included sodium carbonate, sodium bicarbonate, polyacrylamide flocculent, sodium hydroxide, sulfuric acid, and ammonia (Skiff and Turner, 1981). Alkaline leaching is based on the enhanced dissolution of uranium minerals by the addition of carbonate, resulting in the formation of the stable uranium (VI) tricarbonate solution species (Butler, 1972; Skiff and Turner, 1981).

The thickened slurry was leached in a two-stage circuit, where the first stage consisted of a high pressure and temperature leach (414 kiloPascals (kPa) at 93 degrees Centigrade (°C)) for 4.5 hours. The second stage used a 12-hour atmospheric pressure leach at 77°C for the sandstone ore and 24 hours for the limestone ore. Leached slurries were then processed through three levels of filtration: (1) first stage filtrate contained the pregnant uranium solution which was sent to the clarifier before the precipitation circuit, (2) second stage filtrate was sent to the mill solution circuit, and (3) third stage filtrate was used as a wash and repulper solution on the first stage of filters. Filter cake from the third stage was repulped with recycled tailings pond solution and slurried for tailings disposal (Skiff and Turner, 1981).

Pregnant solution from the clarifier was then pumped to the precipitation circuit after heating to 82°C and precipitation of sodium diuranate was conducted in two stages (Butler, 1972; Skiff and Turner, 1981). The precipitate was further purified to increase the uranium concentration and remove

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impurities and was then reprecipitated as yellowcake. The yellowcake was packaged into 55-gallon drums for shipment.

1.4.3 Tailings Management

Tailings from the milling operations were deposited in two on-Site tailings piles, while tailings liquid was recovered and reused. The two mills each used separate tailings piles, referred to as the Large Tailings Pile (LTP) and the Small Tailings Pile (STP). The larger sandstone ore processing mill deposited tailings in the LTP and tailings from the smaller limestone ore processing mill were deposited in the STP.

Tailings deposited at the LTP were initially placed into only one cell. A cell adjacent to and west of the existing cell was added in 1966. Tailings disposal alternated between the two cells to maintain optimal operating conditions from 1966 until 1990. The initial perimeter dike for the LTP was constructed by compacting 6-inch lifts of natural soils excavated from within the tailings pile area. The starter dike was constructed to a height of approximately 10 feet and a width of approximately 10 to 15 feet at the crest and 25 to 30 feet at the base. During operations, the perimeter dike was raised to add volume for deposition of tailings. The tailings piped to the LTP were separated using hydrocyclone equipment. Hydrocycloning separated the tailings by grain size, into a coarse fraction comprised mostly of sand and a fine fraction that contained mostly silt. The coarse fraction was deposited downstream of the dike crest to raise the dike, and the fine fraction was deposited upstream of the dike crest toward the center of each cell. The tailings liquid was recovered through the use of two decant towers and piped back to the milling operation. When production rates were low during the latter stages of mill operations, hydrocyclone separation was not used. Instead, the tailings slurry was discharged directly into the tailings pond. This method of operation confined disposal to a single cell, while the other cell was used for evaporation.

Tailings deposited at the STP were contained by an embankment dike composed of compacted natural soils. The embankment dike was compacted by heavy equipment and raised to a height of 20 to 25 feet. The crest was a minimum of 10 feet wide and the base approximately 40 feet wide.

1.5 Site Remediation History

1.5.1 Decommissioning and Soil Remediation Activities

Milling operations ceased on February 2, 1990. In January 1991, HMC submitted a proposed tailings reclamation and mill decommissioning plan to NRC (AKG et al. 1991). On October 29, 1993, HMC submitted an Updated Reclamation Plan that superseded the 1991 submittal (AKG and Jenkins 1993). Mill decommissioning and soil remediation activities began prior to the cessation of milling operations in 1987 and proceeded through 1995.

1.5.1.1 Mill Decommissioning and Burial

Demolition activities began on May 5, 1992, with removal of asbestos-containing materials (ACM) from various mill facilities prior to demolition. The ACM was disposed of in a pit at the toe of the original slope of the LTP (Figure 1-3). Demolition of milling facilities was completed by March 1995 (AKG 1996).

Mill debris was buried in pits located within the mill area or south of the LTP (Figure 1-3). Debris was placed into pits in lifts up to 5 feet thick and slurry grout was poured into the pit until it had filled the voids and reached a level approximately equal to the top of the debris lift. This process was repeated

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until each pit was filled with debris and slurry. Debris pits were capped with up to 4 feet of soil (AKG 1996). Mill decommissioning at the Site met applicable standards in 10 CFR Part 40 and applicable license conditions (HMC 2013a).

1.5.1.2 Removal of Windblown Tailings Contamination Areas

In 1987, HMC began a contaminated soil cleanup effort in which soil exceeding 5 picocuries per gram (pCi/g). Radium 226 (Ra-226) above background in the top 15 centimeters (cm) of soil (HMC 1987) would be remediated in accordance with 10 CFR 40 Appendix A Criterion 6 (6). Background for Ra-226 was calculated to be 5.5 pCi/g. Thus, per Criterion 6 (6), the cleanup level was set at 10.5 pCi/g (5.5 pCi/g background + 5 pCi/g). The cleanup of windblown contaminated soils began early in 1988 (Environmental Restoration Group, Inc. [ERG] 1995). In February 16, 1989, pursuant to a plan approved by NRC as License Condition No. 19, HMC agreed to remediate certain areas near the tailings piles that exceeded the 10.5 pCi/g cleanup criterion for Ra-226 (ERG 1995) in the top 15 cm of soil. At depths greater than 15 cm below the surface, the Ra-226 cleanup criterion was 20.5 pCi/g (5.5 pCi/g background + 15 pCi/g) in accordance with 10 CFR 40 Appendix A Criterion 6 (6). There was a period of inaction during soil cleanup due to mill decommissioning activities. After the mill decommissioning was complete, cleanup of the windblown contamination and other off-pile contaminated materials resumed in 1993 under License Condition 29C, which also required the cleanup be completed in accordance with 10 CFR 40 Appendix A Criterion 6 (6).

Surface soils from approximately 1,200 acres of land were removed to an average clean-up value below 3 pCi/g; well below the 10.5 pCi/g target. Most of the excavated soils were placed on the eastern side slope of the LTP, but significant quantities were also placed on the southern end of the STP and the aprons of the LTP. Subsequent to placement, deposited soils were covered with soil and rock as described in the section below.

1.5.1.3 Placement of Cover Materials

Cover materials were placed on the former mill area, the LTP, and the STP as part of the mill decommissioning efforts completed in the mid-1990s:

- At the STP, 1 foot of cover material was placed in areas outside of Evaporation Pond (EP) 1.
- At the LTP, extensive re-grading was completed to fill in the tailings ponds and flatten the side slopes to improve stability. Cover material was placed on the side slopes at a thickness varying from 2 to 3.8 feet, as needed to effectively buffer radon emissions. In addition, 6 to 9 inches of rock cover was placed on the side slopes for erosion protection. On the top of the LTP, HMC placed 1 foot of cover material. Since this initial placement, additional cover has been placed on the LTP to fill depressions caused by settlement, to improve drainage, and to address specific areas with elevated radon flux measurements.
- At the former mill area, located southeast of the LTP (Figure 1-2), an average of 2 feet of contaminated soil (containing radium levels above the cleanup standard) was removed following completion of mill demolition. Excavated soils were transported to the east end of the LTP or the south end of the STP for burial. Areas that had been excavated were backfilled with clean alluvial soils. After backfilling, at least 2 feet of clean soil was placed over the entire mill area. The average thickness of material placed was 4.7 feet. The rock was the same crushed basalt used for erosion protection on the impoundment surfaces. During the period of November 16, 1995 to December 10, 1995, this rock was applied in a single lift of 2 to 6 inches, and then mixed with the underlying soil to a depth of not more than two times the rock lift thickness. After the mill cover material was placed, gamma surveys were conducted to

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verify gamma emission rates were acceptable at the cover surface.

Cover materials were obtained from borrow areas near the LTP, STP, mill area, and evaporation and collection ponds. Drainage was reestablished following soil cleanup activities, with the work being conducted in 1994 and 1995. Drainage areas within the Homestake Facility (including areas adjacent to the LTP, mill and ore storage areas, windblown soil cleanup areas, and borrow areas) were re-graded and surface channels established for drainage.

1.5.2 Groundwater Remediation

In 1975, at the request of the New Mexico Environmental Improvement Division (NMEID), now New Mexico Environment Department (NMED), EPA undertook a study of the groundwater impacts resulting from uranium mining and milling activities in the Grants Mineral Belt. After sampling several Broadview and Murray Acres subdivision wells, EPA determined that groundwater in the alluvial aquifer, which was a source of domestic water supply for the subdivisions, had elevated selenium levels. HMC subsequently conducted a hydrological assessment (Hoffman, 1976) which included installation of more than 40 wells. The hydrogeological assessment in 1976 determined that there was a contaminant plume in the alluvial aquifer that originated from the LTP and that it was moving to the south and west (HMC and Hydro-Engineering 2010). The NMEID and HMC entered into an agreement on August 18, 1976 which specified that HMC would design and construct a system to contain the seepage from the tailings pile.

HMC has investigated and used a variety of groundwater remediation approaches and technologies since 1977 to restore groundwater quality in areas impacted by seepage from the LTP and other facilities at the Site. The program to restore groundwater impacted by seepage from the facilities at the Site has historically included six major operational components: (1) source control, (2) plume control, (3) reverse osmosis (RO) treatment, (4) zeolite treatment, (5) passive and forced evaporation, and (6) land treatment. The first two operational components involve extraction from or injection of water into the tailings or underlying aquifers to remove contaminants or otherwise control the movement of contaminants. The last four operational components are related to the treatment, disposal, and/or utilization of tailings pore water with un-impacted to slightly impacted groundwater to enhance the removal of COPCs/ROPCs by dewatering wells while reducing the COPC concentrations in the LTP.

The original plume control program consisted of freshwater injection in selected locations with simultaneous collection of groundwater within seepage-impacted areas. The collection water was discharged to the mill processing stream until milling at the Site ceased. Thereafter, the collection water was evaporated until water treatment systems were developed to treat and thereby allow reuse of the collected groundwater. Water treatment processes include RO, land application and zeolite treatment. Injection of un-impacted or mildly impacted water to flush contaminants in combination with collection by dewatering wells has been used for source control at the LTP. The following list summarizes the groundwater restoration processes and methods, and the general sequence of their use.

- Original groundwater restoration operations: Homestake operated groundwater collection and injection wells. Injection operations began in 1977 and collection began in 1978. Groundwater injection was started just north of Broadview Acres to stop impacted water from flowing into this area. Groundwater collection was started 4,000 feet upgradient of the injection wells.
- Post-milling groundwater restoration operations: Groundwater collection and injection wells were operated with collection water discharged to evaporation ponds. The milling operations

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originally stopped in 1981 but additional milling was done from 1988 through 1990.

- Initial source control operations: Dewatering wells were installed in the LTP in 1995. tailings pore-water collected from these wells was discharged to evaporation ponds. Dewatering well operations in the LTP ended in 2017 because the system had reduced water levels in the LTP to a point that resulted in diminishing collection volumes. Toe drains were installed around the LTP in 1992. Collected tailings seepage from the toe drains was also discharged to evaporation ponds. The toe drain collection is ongoing and the current rate is 5.6 gpm, based on the 2019 Grants Reclamation Project (GRP) Annual Performance Report, and is expected to reduce continuously.
- Collection for reinjection operations: Collection from alluvial aquifer wells southeast of the STP for reinjection near the LTP began in 1995 and continued through July 2016 when sufficient treatment capacity was available to supply reinjection operations with treated collection water.
- Initial groundwater collection treatment operations: After completion of the RO treatment plant in 1999, on-Site collection water was treated with RO and used for injection. The RO brine was discharged to the evaporation ponds. Also beginning in 1999, mildly impacted off-Site groundwater was collected and used to irrigate land application areas. The land application irrigation program continued through 2012 when HMC elected to forgo using collected groundwater for irrigation of crops.
- Enhanced source control operations: A program of flushing and dewatering was initiated in 2000 to enhance removal of COPC/ROPC mass from the LTP. Flushing and dewatering was accomplished through a system of injection and collection wells completed within the LTP and dewatering collection water was discharged to the evaporation ponds. Flushing (injection) was discontinued in 2015 because of limited benefit from continued operation. Dewatering (collection) was continued for another two years and was discontinued in 2017 when water levels in the LTP had dropped to the point where collection volumes were reduced to the point of diminishing returns. These source control programs dramatically reduced uranium and molybdenum concentrations in the LTP water.
- Expanded groundwater collection treatment operations: A 300 gpm zeolite system was constructed in 2013 and a larger 1,200 gpm zeolite system was constructed in 2015. The zeolite system has been used to treat seepage-impacted groundwater for reuse as injection water since 2016. Modifications and expansion of the RO plant were done in 2014 and 2015. Collected groundwater is treated with RO or zeolite and the treated water is used for injection. The RO brine, zeolite regeneration water, and other waste waters are discharged to the evaporation ponds.

1.5.2.1 Alluvial Aquifer Remediation History

HMC designed a groundwater extraction and injection system for the alluvial aquifer using a numerical groundwater flow model (Hoffman 1977) in 1977/1978. The groundwater extraction and injection system was changed numerous times from 1977/1978 to the present. The following describes significant changes:

- In 1980, three groundwater collection wells were installed adjacent to the LTP. Injection wells were installed in the alluvial aquifer just north of Broadview Acres. Ten groundwater collection and injection wells were also installed adjacent to Murray Acres in 1980. This system, as shown on Figure 1-4, was operated from 1977 through 1981. From 1982 to 1992, the

groundwater collection and injection system was expanded (Figure 1-5). Injection wells were installed in 1982 to the east of the original injection wells, just north of Broadview Acres and along the west side of the LTP. A line of freshwater injection wells was also installed north of Murray Acres in 1983 and additional collection wells were installed east of Murray Acres in 1990.

- From 1993 to 1994, additional groundwater collection and injection wells were installed southwest and southeast of the STP and injection wells were installed near the K area wells southwest of the STP (Figure 1-6). Collection wells were installed north of the LTP in 1993 with this water being discharged to the drainage in the non-saturated portion of the alluvium to the west.
- From 1995 to 1999, collection wells were added to the K area on the southwest side of the STP and to the L area to the southeast of the STP (Figure 1-7). The groundwater collected from these two lines of wells was injected into the alluvial aquifer near the LTP. Additional on-Site collection wells were installed during this period in the S area, the K area, and the B & D area. Additional injection wells were installed in the Murray Acres area and on the south and east sides of the STP and on the northeast side of the LTP.
- From 2000 to 2004 and from 2005 to 2009, additional groundwater collection wells and injection wells were installed (Figures 1-8 and 1-9) to feed groundwater to the RO plant and for land application irrigation. Groundwater collection wells were installed in the K area on top of the STP on the south side of EP1. Groundwater from these wells was fed to the RO plant.

  The South Irrigation System: Groundwater from irrigation wells in Sections 32 and 33 (T12N, R10W) and in Section 3 (T11N, R10W) and Felice Acres was applied to either the Section 33 (T12N, R10W) or Section 34 (T12N, R10W) irrigation fields. Because the section numbers referenced above are unique in the area near the Site, the township and range notations are only included for the first reference to a particular section. Additional extraction wells were added in Felice Acres from 2005 to 2009. Fresh water was injected in the South off-Site area to help maintain the irrigation well production.

  The North Irrigation System: Groundwater irrigation wells were installed in Section 28 (T12N, R10W) and started irrigation in 2002. Fresh water was injected downgradient of these irrigation wells and upgradient of the Section 32/33 irrigation wells. Additional irrigation wells were installed to the east of the North land application irrigation area and the North irrigation center pivot was expanded to 100 acres in 2005. Fresh water injection wells were installed to the north of the irrigation wells in this area during this period to increase the irrigation well pumping rate.

- From 2010 to 2012 (during the last three years of operation of the land application irrigation program), the NMED imposed an additional restriction on the quality of water used for irrigation. Water from San Andres irrigation well 943 was added to the water from the South irrigation wells to produce water with an average uranium concentration less than 0.16 mg/L, while water from San Andres well 951R was added to the water from the North irrigation wells to meet this average uranium concentration limit as shown on Figure 1-10.
- In 2012, irrigation ended.
- In 2013, groundwater extraction upgradient from the Site ended.
- From 2013 through 2015, the off-Site collection was reduced to smaller areas in Sections 28, 34 and 35 to supply water for the tailings flushing and testing of the zeolite treatment (Figure 1-11).
- From 2016 to 2018, collection wells were added in the southwestern portion of the LTP area

and between the LTP and evaporation ponds (Figure 1-12) and conveyed to the RO plant.

- Groundwater from collection wells southeast of the STP that is primarily in the Northeast quarter of Section 35 (T12N, R10W), designated as the L area, was switched to the RO plant.
- Groundwater from collection wells in the South off-Site area, mainly in the Felice Acres area and northeast corner of the South and North off-Site areas, was treated through the zeolite systems.

Groundwater collection for the reinjection program operated for approximately seven months during 2016 but was discontinued after July 2016 due to concerns raised by the NRC. The Confirmatory Order (CO) issued by the NRC in March 2017 (NRC, 2017) required that HMC provide an analysis of the collection for reinjection program and its impacts on restoration progress. This analysis was reported in Hydro-Engineering L.L.C. (2017a). The conclusions of this analysis were that the collection for reinjection was successful in preventing the expansion of the L area contaminant plume without detracting from restoration efforts within the hydraulic control area near the LTP, and, the transfer of relatively small quantities of COPCs/ROPCs into the hydraulic control area by reinjection did not significantly delay restoration progress near the LTP. The collection for reinjection in the L area groundwater collection was treated through the RO plant after July of 2016.

In addition, HMC completed three treatability studies to improve the groundwater remediation system that further demonstrate the technical impracticability of remediating groundwater at the Site.

These treatability studies include:

- Tripolyphosphate treatment (TPP): TPP treatment employs the injection solution containing TPP and other amendments to promote uranyl phosphate precipitation, which immobilizes dissolved uranium. TPP Pilot Studies demonstrated rapid in-situ treatment of dissolved uranium in the S Area; however, the technology was less effective in areas which has lower soil permeability. In addition, TPP injections were not effective in treating selenium and molybdenum.
- Electrocoagulation treatment: introduces an electrical current in the feed water that destabilizes suspended particles, multivalent metals, and organic compounds. The results show electrocoagulation treatment technology was effective in removing uranium; however, the electrocoagulation treatment technology was unable to reduce molybdenum concentrations to below the Site standard.
- In-situ biological treatment: A pilot testing was completed at two locations near the LTP to evaluate the effectiveness of anaerobic in-situ biological treatment. The testing targeted the reduction of dissolved uranium, selenium, molybdenum, sulfate, and nitrate in the alluvial aquifer by injecting nutrients into the aquifer to stimulate robust growth of specific organisms. The results show in-situ biological treatment was successful in low hydraulic conductivity portions of the alluvial aquifer; however, in-situ biological treatment was not successful in high hydraulic conductivity portions of the alluvial aquifer.

1.5.2.2 Chinle Aquifer Remediation History

Groundwater collection and injection wells were installed in the Upper, Middle, and Lower Chinle aquifers from 1984 through 1999. The subcrop for the Upper Chinle aquifer directly underlies the alluvium beneath the western portion of the LTP. This creates a direct pathway for groundwater to migrate from the alluvium near the LTP to Upper Chinle aquifer. The Upper Chinle aquifer extends down dip to the east and northeast.

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Groundwater was initially injected into the Upper Chinle aquifer in 1984 at well CW5 located just north of Broadview Acres (Figure 1-13). Groundwater collection at upper Chinle well CW4R located just west of the STP began in 1995. Groundwater collection from well CE2 started in 1999 and has continued through the present. Groundwater was injected into Upper Chinle well CW13 located east of the East Fault and east of Broadview Acres in 1996 and was followed by groundwater injection into the middle Chinle injection well CW14 north of the northwest corner of Broadview Acres in 1997.

Groundwater was injected in Upper Chinle injection well CW5 from 2000 to 2012. Groundwater injection began at Upper Chinle well CW25, which is located just east of the northeastern portion of Murray Acres, in 2000 while groundwater was injected into Upper Chinle wells 944, east of Highway 605, and CW4R, west of the STP, in 2002 and 2003, respectively (Figure 1-14).

Groundwater collection, from Upper Chinle wells CE5, CE6, CE11 and CE12, which are located southwest of Evaporation Pond 2 (EP2) and the Collection Ponds, was started in 2006 along with Upper Chinle well CE2 located just south of the Collection Ponds. Groundwater collection from Upper Chinle well CE7, which is located just north of the Collection Ponds, was started in 2010. Groundwater collection from Upper Chinle well CW3, located northeast of the LTP, was done as a source of water for the tailings flushing program from 2001 into early 2007. Upper Chinle collection wells 929 and 934 are located east of Highway 605 were also used as a source of tailings flushing water starting in 2002 and 2001, respectively. Felice Acres area Upper Chinle well CW53 was pumped for irrigation supply from 2006 through 2011. Upper Chinle collection well CW18, located east of Highway 605 and Felice Acres, was used as a source of freshwater injection starting in 2002 and continuing through 2004.

Groundwater continues to be injected in Middle Chinle well CW14 is located north of the northwest corner of Broadview Acres. Groundwater was pumped from Middle Chinle wells CW1 and CW2, north of the LTP, from 2001 through 2012 as a source of tailings flushing water. Groundwater pumped from middle Chinle groundwater started in Felice Acres with the start of the land application irrigation program in 2000. Groundwater pumped from Middle Chinle extraction wells CW44 and 498 and well CW45 in southern Felice Acres was used from 2000-2009 and 2004-2009, respectively. Groundwater pumped from Middle Chinle extraction wells 482 and 483 in northern Felice Acres were used from 2005-2012 while collection well 493 was used from 2008-2012. Groundwater pumped from Middle Chinle collection well CW28, east of Highway 605 and east of Felice Acres, was used as a source of fresh water for alluvial injection wells 848 and 868 starting in 2002 and continuing through 2006.

Groundwater pumped from four lower Chinle extraction wells located in Section 3 was used in the land application irrigation program started in 2000. Groundwater pumped from Lower Chinle extraction well 653 was used through 2009. Groundwater pumped from Lower Chinle extraction well 538 was used 2004-2009, while wells CW29 and CW42 were pumped from 2005-2009 and 2007-2009, respectively.

Groundwater was injected into the Upper, Middle and Lower Chinle aquifers from 2013 through 2015 (Figure 1-15). Groundwater was injected into the Upper Chinle injection wells 944, CW4R, CW5, CW13 and CW25 during this three-year period. Groundwater was pumped from the Upper Chinle extraction wells CE2, CE5, CE6, CE7, CE11 and CE12 near the Collection Ponds for the three-year period, while groundwater pumped from the Upper Chinle extraction well 929 was used only in 2013. Felice Acres-area Upper Chinle well CW53 was only pumped as a source of water for flushing injection into the tailings during 2014.

Groundwater was injected in middle Chinle well CW14, located north of the northwest corner of Broadview Acres, during 2013-2015. Groundwater was pumped from the Middle Chinle extraction wells CW1 and CW2 north of the LTP during 2013 for use as a source of tailings flushing water.

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Groundwater was pumped from the middle Chinle in Felice Acres with wells 482 and 483 being used in 2013 and 2015 while extraction wells 498, CW44 and CW45 in southern Felice Acres were used in 2013 and 2014. Felice Acres collection well Y7 was also used during 2014 and 2015. Collection of Middle Chinle groundwater from five R series wells in the northeast corner of Section 3 also occurred during some of this three-year period. Beginning in 2013, lower Chinle collection well CW29 in Section 3 was used as a source of water for the tailings flushing program.

Groundwater collection and injection well from the Upper, Middle and Lower Chinle aquifers continued during the period from 2016 through 2018 (Figure 1-16). Upper Chinle injection wells 944, CW4R, CW5, CW13 and CW25 were continually used during this three-year period. Upper Chinle collection wells CE2, CE5, CE6, CE7, CE11 and CE12 located near the Collection Ponds were also used for the three-year period, while Upper Chinle collection CE19 (located just south of the wells listed above) and collection wells CE15 and CE15A, located north of Broadview Acres, were only used in 2017 and 2018. A series of wells prefaced with a B in the well name are located along the southern toe of the LTP and are collectively referred to as the B wells. Similarly, a series of wells prefaced with a T in the well name are located on top of the LTP and are collectively referred to as the T wells. Five B collection wells near the Upper Chinle subcrop just south of the LTP and five T wells near the subcrop on top of the LTP were also operated to collect Upper Chinle water during 2017 and 2018.

Injection continued into middle Chinle well CW14 located north of the northwest corner of Broadview Acres and well CW30 west of Felice Acres. Injection into Middle Chinle well CW77, which is located just west of well CW30, occurred during 2017 and 2018. As noted in the preceding paragraph, a series of wells prefaced with a letter of the alphabet in the well name is collectively referred to by that letter for many wells in the Site. Examples of this in the South off-Site area are the R wells in Section 3 and the Y wells in southern Felice Acres. Injection of treated water into five wells in southern Felice Acres and three R wells in the northeast corner of Section 3 occurred over the three-year period. Middle Chinle collection from four Y wells in southern Felice Acres was done during this three-year period while well CW45 was pumped during 2018. Collection of Middle Chinle groundwater from six R wells in the northeast corner of Section 3 also occurred during 2016-2018. Middle Chinle collection well CW62 located west of the West Fault and three Middle Chinle injection wells located to the south of well CW62 were also used during 2016-2018. Lower Chinle collection well R68 in Section 3 was used during 2018 as a feed to the zeolite treatment system.

1.5.2.3 Ongoing Current Groundwater Remediation Program

The current system includes multiple components that are frequently adjusted based on evaluation of monitoring data. The following provides a brief description of the components:

- Source Control: Water is pumped from the alluvium, Upper Chinle, and Middle Chinle beneath and down-gradient of the LTP/STP and conveyed to the RO or zeolite plants depending on whether the groundwater contains selenium and/or molybdenum above the groundwater standards. Groundwater that contains just uranium is conveyed to the zeolite plant and groundwater with uranium and selenium and/or molybdenum is conveyed to the RO plant for treatment. In 2018, the RO plant treated and annual average flow rate of 443 gpm. the RO plant treated and annual average flow rate of 443 gpm. RO influent was comprised of 279 gpm from the Alluvium, 130 gpm from the Upper Chinle, and 34 gpm from the Middle. In 2018, The Zeolite plant treated and annual average flow rate of 296gpm. Zeolite influent was comprised of 240 gpm from the alluvium and 56 gpm from the Middle Chinle.

- Plume Control: Water is injected into the alluvial, Upper Chinle, and Middle Chinle aquifers to create hydraulic barriers to limit the movement of contaminated groundwater. The hydraulic barrier in the alluvial aquifer is created and maintained downgradient of the LTP with 82 wells used to introduce the water into the alluvium and more than 6,000 linear feet of infiltration lines (HMC 2012). Water added to the alluvial aquifer to create an inward hydraulic gradient toward LTP/STP is derived from several sources, including the RO plant product water, Zeolite treatment system, and the San Andres-Glorietta (SAG) aquifer. In 2018, an average of 678 gpm was introduced into the alluvial aquifer to maintain the hydraulic barriers. In addition, an average of 21 gpm and 46 gpm was introduced into the Upper Chinle and Middle Chinle aquifers, respectively (HMC 2019a).

- Reverse Osmosis Treatment: The RO treatment has been used since 1999 to remove contaminant mass from on-Site groundwater extracted upgradient of the hydraulic barrier. Plant influent is composed of groundwater from the alluvial aquifer, the Upper and Middle Chinle aquifers, and the collection ponds, which receives water from the RO plant. The RO plant treatment process includes a lime/caustic pre-treatment and clarification unit and microfiltration as pre-treatment to the three RO treatment units. Accounting for scheduled and unscheduled maintenance, the functional capacity of RO treatment based on the last four years of operations is roughly 450 gpm.

- Zeolite Treatment: Zeolite beds have been used since 2016 to remove the uranium from off-Site collection water because uranium is the only Site constituent that exceeds the Site cleanup levels in this collected water. There are two zeolite treatment plants that have a combined functional capacity of approximately 250 gpm based on the last four years of operations (HMC 2019).

- Evaporation: There are three lined evaporation ponds (EP-1, EP-2, and EP-3) in use at the Homestake Facility to concentrate uranium and other contaminants. The evaporation system receives water from the brine from the RO plant and regeneration water from the zeolite treatment systems. Prior to the construction of the evaporation ponds, two small lined collection ponds constructed west of the STP in 1986 were used to store and evaporate collected groundwater. In 2019, average evaporation (passive from pond surface and active through enforced evaporators) was approximately 174 gpm, while receiving an average of 153gpm (27 gpm from the collection ponds, 57 gpm of brine from the RO plant, 31 gpm from the zeolite treatment plant, and 38 gpm from precipitation).

- Land Treatment: Irrigation and land treatment ended in 2012.

Pursuant to the 1983 Agreement between HMC and the EPA, HMC financed the extension of the Village of Milan's municipal water supply to the residences of the subdivisions and made payments to the Village of Milan for the residents' water usage over a period of ten years. The extension of the water supply was completed in 1985 (EPA 2006). The New Mexico Environment Department and HMC entered into a Memorandum of Agreement pursuant to which HMC voluntarily agreed to reimburse cost to connect residents within a designated area (La Siembra Estates Block 1 Lot 21 and Block 2 Lot 1) and Valle Verde Estates (Block 4 Lot 14, Block 3 Lot 2, Block 2 Lot 6, Block 5 Lot 12, Block 3 Lot 3, Block 2 Lot 5, and Block 4 Lot 11) near the Site to the Village of Milan's water system on January 21, 2009 (NMED 2009). This work has been completed.

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1.5.2.4 Remediation Performance

The performance of the Source Control portion of the groundwater remediation system was evaluated by reviewing and analyzing the influent concentration of COPCs/ROPCs to the RO Plant. The RO plant received 279 gpm from the alluvium, 130 gpm from the Upper Chinle, and 34 gpm from the Middle Chinle. Influent concentration of COPCs/ROPCs to the RO Plant were available from 1999 to 2018. Monitoring data for the plant influent sampling port were available from 1999, when the RO treatment plant was brought online, through the present. The analytical results for uranium, molybdenum and selenium and the corresponding sampling dates are presented in Table 1-1.

Graphs of concentration versus time for the COPCs/ROPCs uranium, molybdenum, selenium, vanadium, radium 226/228, thorium 230, sulfate and nitrate are presented on Figures 1-17 through 1-24. These figures show that all of the COPC/ROPC concentrations are either asymptotic or the concentrations are below PRGs. Vanadium, radium 226/228, thorium 230, sulfate, and nitrate are all below the PRGs. Uranium, molybdenum and selenium are above the PRGs; however, there is an overall downward trend. This asymptotic behavior or "tailing" of concentrations most likely results from a combination of a small, constant contribution from the LTP, mass flux from the vadose, and back-diffusion from fine-grained silts and clays within the alluvial aquifer.

The concentration versus time data for uranium and molybdenum data were analyzed using first order decay methods to estimate the time it would take for COPCs/ROPCs to meet PRGs. These methods are discussed in the Groundwater Issue Paper *Calculation and Use of First-Order Rate Constants for Monitored Natural Attenuation* (Newell, et al. 2002) and in the U.S. EPA directive on the use of *Monitored Natural Attenuation (MNA) at Superfund, RCRA, and UST Sites (U.S. EPA, 1999).* The results of the analysis are presented in a technical memorandum entitled First-Order Decay Attenuation analysis for Grants, which is included in this TIER as Appendix A. Graphs showing the data and calculated first order decay rates for uranium and molybdenum are presented on Figures 1-25 and 1-26. The analysis shows active groundwater remediation would need to occur for 210 years from the start of remediation before the uranium remediation goal is met (with a 95% confidence limit range of 170 to 290 years). First-order decay analysis for molybdenum shows that its remediation goal will be met in approximately 360 years, with a 95% confidence limit range of 260 to 580 years.

1.5.3 Uranium Mass Balance Evaluation

Mass balance calculations for uranium over time were performed to evaluate the impact of remediation activities at the Site. This section also presents an assessment of the uranium remaining in the LTP and documents uranium was transferred from the LTP to the vadose beneath the LTP as the LTP, vadose beneath the LTP, and diffusion of uranium into underlying silt/clay will act as continuing sources of uranium. Uranium was chosen because it has the greatest impact of all the COPC/ROPCs on groundwater at the Site. The evaluation included estimates of uranium mass associated with the following system components:

- Maximum soluble mass in the Large Tailings Pile (LTP)
- Mass in the tailings pore water
- Mass removed by the flushing program
- Mass removed by the toe drain system
- Remaining mass at the LTP
- Mass loading to the alluvial aquifer
- Mass removed from the alluvial aquifer, and
- Soluble mass remaining in the alluvial aquifer > 0.16 milligrams per liter (mg/L)

1.5.3.1 Uranium in the LTP

Calculation of the maximum soluble mass present in the LTP was based on 22 million tons of ore processed, 0.3% ore grade as U_3O_8, which represents the high end of the ore grade present in the basin (Skiff and Turner 1981), 95% recovery (as reported by AK Geoconsultant 1992), and 27.1% of the uranium present being in the soluble phase as reported in a slimes sample selective extraction in WME's 2020 geochemical characterization (WME 2020). The mass removed by the flushing program and by the toe drain system was based upon the historical reporting in Table 2.1-1 of the 2019 Annual Performance Report.

The dissolved mass in the LTP pore water was calculated based upon the concentration contours and data points compiled for 2019 and applied across the saturated volume of the LTP using an effective porosity of 0.14 for the sands portion of the LTP and 0.08 for the slimes. These effective porosity values are based on specific yields that were derived from pumping tests performed during the initial testing phase for the tailings dewatering program (Hydro-Engineering 1996). Given the low permeability of the material, the concentrations likely reflect only the most permeable (mobile) portions of the LTP that were rinsed through the flushing program.

The remaining mass was then calculated by subtracting the flushing program collection, the toe drain collection, the 2019 average LTP pore water concentration mass, and the mass loading to the alluvial aquifer as shown in Table 1-2.

1.5.3.2 Uranium in the Vadose Zone

Water was injected into the LTP (averaged 233 gpm) from 2000 to 2015 to flush the COPCs/ROPCs from the tailings. The tailings flushing programs reduced the concentration of uranium in the LTP porewater from pre-flushing levels of approximately 40 mg/L to average concentrations of 5.4 mg/L in 2018.

Solid samples were collected during the drilling of three sand (WME-1 through WME-3) and three slime (WME-4 through WME-6) tailings wells and tested for uranium and molybdenum (Figure 1-27). Samples were collected from the underlying alluvium (upper perched zone and a lower vadose zone) at two additional boring locations (WME-7 below LTP sands and WME-8 below LTP slimes) (Figure 1-27). Alluvial aquifer solids were also collected from areas located north (background), south, and adjacent to the LTP for geochemical testing. The results show a portion of the uranium and molybdenum from the LTP was flushed into the alluvial aquifer, however; the majority of the uranium and molybdenum was transferred to the vadose beneath the LTP (Figures 1-28 and 1-29). These data show the vadose zone contains significant uranium and will be a significant sustainable long-term source of uranium and molybdenum to the alluvial aquifer due to extremely low unsaturated hydraulic conductivity (WME 2020).

1.5.3.3 Uranium in the Alluvial Aquifer

Mass loading to alluvial aquifer from 1958 through 2000 was assessed using a water balance and an average of tailings solution water quality samples presented in the 1981 Discharge Permit Report for the Site. The mass loading from 2000 onward was based upon the mixing model from Hydro-Engineering LLC. The mass removed was based upon the historical reporting in the 2019 Annual Performance Report.

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The dissolved mass remaining was then calculated based on the concentration contours and data points compiled for each of the given years and applied across the saturated volume using an effective porosity of 0.2. The contouring software SURFER from Golden Software was used to facilitate the process. The 0.16 mg/L contour was used as the cutoff point for calculating mass, meaning any mass in the saturated alluvium with concentrations below 0.16 mg/L are not accounted for in the total mass. The off-Site contribution of collection and mass removal was not accounted for in this assessment as its contribution to mass remained is considered minimal. Yearly values are listed in Table 1-3, and comparison of cumulative LTP loading, mass removal and mass remaining with time are shown on Figure 1-30.

As shown in Table 1-2, the calculated mass of uranium remaining (in excess of 0.16 mg/L) in the alluvial aquifer is decreased by 50 percent over the 20-year period from 1999 to 2019. However, the overall footprint of the plume does not significantly change over that period as shown on Figures 1-31 through 1-33. This shows that dissolved mass is being removed from the aquifer, but that there is an ongoing source that maintains low levels of contamination in the alluvial aquifer.

Review of contaminant concentrations plotted against time at both alluvial aquifer collection wells and monitoring wells further support the presence of a continuing source to the alluvial aquifer. Figure 1-34 shows the location of roughly 900 alluvial aquifer wells. Figures 1-35 and 1-36 show uranium concentration plotted against time for collection wells and monitoring wells. The graphs for uranium show that uranium concentrations fluctuate but have been relatively stable for a period of 10 to 15 years. Stable concentrations are consistent with the presence of a continuing source (i.e., mass transfer from the LTP/STP and vadose to alluvial aquifer and back-diffusion from the silt/clay to sand and gravel in alluvial aquifer).

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2 Site Characteristics

This section describes the physical characteristics of the Site. Included in this section are: demographics and land use, climate, topography, geology, hydrogeology, surface water hydrology, and ecology.

2.1 Demographics and Land Use

The Site is situated in Cibola County, which encompasses a land area of 4,539 square miles (City-Data 2019a). Cibola County was created by a division of Valencia County in 1981; therefore, population data for the new county before 1981 are estimated. In 1970, the county's population was 20,125 rising to 30,109 in 1980 and falling to 20,794 in 1990. The population changes were mainly related to uranium mining activity in the area. The population was estimated at 27,351 in 2016 with a population density of six people per square mile (City-Data 2019a).

The average household size in the county in 2016 was 2.0 people compared to 3 people for the State of New Mexico (City-Data 2019a). The estimated median household income in 2016 was $37,010 compared to the state median income of $46,748 (City-Data 2019a). Industries providing employment in Cibola County as of 2016 were: educational, health, and social services (36.7%); professional, scientific, management, administrative, and waste management services (11.9%); agriculture, forestry, fishing and hunting, and mining (11.4%); and public administration (14.1 percent) (City-Data 2019a).

The median resident age is 36.3 years, compared to the state median age of 37.7 years (City-Data

2019a).

A mix of rural and industrial activities has characterized the Cibola County economy. Uranium mining has been the biggest factor in the boom cycles of the 1950s, 1960s, and 1970s and the bust cycle in the 1980s. The location of the federal and state prisons in the county has helped buffer some of the past economic downturn.

The City of Grants is the largest incorporated area near the Site and is the county seat of Cibola County. The City of Grants began as a railroad camp in the 1880s and now encompasses a land area of approximately 14.86 square miles with a population of 9,241 in 2014 (City-Data 2019b). The estimated median household income for the City of Grants in 2016 was $36,606, compared to $30,652 in 2000 (City-Data 2019b). The Village of Milan is a suburb of the City of Grants and had a population of 3,255 as of 2014 (City-Data 2019c).

Current major land uses south and southwest of the Site consist of residential development, agriculture, and livestock raising (EPA 2011). Five residential subdivisions near the Site include Felice Acres, Broadview Acres, Murray Acres, Pleasant Valley Estates, and Valle Verde. There are large areas north, east, and west of the Site that are mostly unused except for livestock grazing (ACOE 2010). According to the United States Department of Agriculture (USDA), cattle are the main livestock produced in Cibola County, followed by sheep (USDA 2007).

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2.2 Climate

The climate of western New Mexico and the Site is generally a mild, arid to semi-arid, continental climate characterized by low precipitation, abundant sunshine, low relative humidity, and a large annual and diurnal (day and night) temperature range. Temperature and precipitation are largely controlled by elevation and slope. Summer precipitation is generally associated with southeasterly circulation from the Gulf of Mexico, whereas winter precipitation is generally associated with fronts moving eastward from the Pacific Ocean (New Mexico State University [NMSU] 2013). Most precipitation falls in the form of rain during the late summer and early autumn. Severe thunderstorms are not common in the area, but short-lived cloudbursts during the summer can produce flash flood conditions in nearby drainages and may be accompanied by significant lightning and hail events.

Climate data was collected from the following sources:

- The National Weather Station (NWS) at Grants Airport, located approximately 5.5 miles south of the Site at an elevation of approximately 6,530 feet above mean sea level (msl).
- An on-Site meteorological station maintained by HMC located south of EP-2 (Figure 1-2) and equipped to measure horizontal wind speed and wind direction at 10 meters, temperature at 9.5 meters, solar radiation at 9.5 meters, relative humidity at 9.5 meters, precipitation at 0.4 meter, and barometric pressure at 8.8 meters.

2.2.1 Temperature

Long-term historical average monthly maximum and minimum temperatures measured at the Grants Airport NWS are presented in Table 2-1.

2.2.2 Precipitation

Long-term historical average monthly precipitation and annual precipitation from 1979 through 2018 are summarized in Table 2-2. Average annual precipitation averages approximately 11 inches at the Site. The majority of annual precipitation typically occurs during July, August, and September. Summer precipitation is typically associated with thunderstorms, which form with the arrival of warm, moist air from the Gulf of Mexico. Snowfall usually occurs when storms move eastward from the Pacific Ocean or northeast from the Gulf of California (NRC 2008). Average annual evaporation was measured at an on-Site evaporation pan to be approximately 74 inches over this same period. Passive evaporation is generally highest in May, June, and early July during the onset of the rainy season. In addition to passive evaporation, active evaporation from treatment process evaporators increases overall evaporation rates at the Site.

2.2.3 Wind

The prevailing wind direction at the Grants Airport, located 5.5 miles south of the Site, is from the northwest (WRCC 2013). Surface wind speeds at the Grants Airport are highest in the spring, with a maximum monthly average of 14 miles per hour (mph) during April (New Mexico Climate Center 2013). Wind speed and wind direction are measured hourly at the on-Site meteorological station. The hourly average wind speed exceeded 8.8 meters per second (m/sec) (19.7 mph) and 11.1 m/sec (24.8 mph) 4.25 percent and 1.34 percent of the time, respectively (HMC 2013a).

Historic data indicate that dominant (strongest) winds are from the west and southwest and are associated with frontal systems moving from the Pacific Ocean. High spring winds in the area are known to create periods of dusty conditions, which may occur for several days during the months of

March, April, and May. Moderate winds from the south-southeast are common and typically associated with summer storms sourced in the Gulf of Mexico. Most of the light northeasterly breezes occur at night. Nighttime is relatively calm compared to daytime hours (HMC 2013a).

2.3 Topography

The Site is located in a semi-circular valley defined by a series of mesas that are approximately 7,000 to 8,000 feet above mean sea level (msl). The Site elevation is approximately 6,600 feet above msl. Local topography in the valley is generally flat with some low, rolling hills and shallow arroyos. The Site is located near the confluence of the ephemeral Lobo Creek and San Mateo Creek drainages, both tributaries of the Rio San Jose.

2.4 Surface Water

The Site area has very little surface water because of the limited rainfall and high evaporation rates in the region. Surface water in the immediate vicinity of the Site is ephemeral and consists of the San Mateo and Lobo Creeks, and Rio San Jose. The streams do not receive base flow from the alluvial aquifer. As a result, surface flows in these creeks are virtually non-existent and may only occur for short periods of time in response to extreme snowmelt and/or summer thunderstorm events (Brown and Caldwell 2018). During these events, the alluvial aquifer at the Site is recharged from surface stream flow infiltration losses and precipitation that collects in low-lying areas. Surface water bodies and drainage features in the vicinity of the Site are presented on Figure 1-1.

The San Mateo Creek watershed drainage covers an area of approximately 76 square miles and is part of the Rio Grande drainage basin (Byrd et al. 2004). The headwaters of San Mateo Creek are on the north flank of Mt. Taylor located approximately 15 miles east of the Site. San Mateo Creek is intermittent over its middle reach, which is normally dry in the summer except for high rainfall events when runoff occurs and is ephemeral in its lower reach near the Site. The natural land surface gradients at the Site are usually less than 1 percent, and average 0.1 percent. Surface drainage is predominately directed to the southwest, although there are generally no established drainage courses or signs of active erosion. Ponding may occur after significant precipitation events, but this water either evaporates or infiltrates the alluvium (HMC 2012).

In the upper parts of San Mateo Creek and Lobo Canyon, on the western side of Mount Taylor, perennial flow occurs at San Mateo Springs, an unnamed tributary of San Mateo Creek, and an unnamed tributary of Lobo Creek. San Mateo and Lobo Creeks both drain onto the Site. Surface water discharges from the Lobo Canyon portion of the San Mateo watershed follow a drainage that cuts across the northeast corner of the former mill Site. Two Lobo Creek drainages enter the east side of the Site (Figure 1-1).

HMC constructed a diversion levee north of the former mill area to divert surface water flows from the northern branch of Lobo Creek (AK Geoconsult and Jenkins 1993). During flood events, the levee diverts Lobo Creek to the North Diversion Channel along the north edge of the LTP, preventing water from flowing across the former mill area. The levee was constructed using uncontaminated soils generally consisting of clayey sands and sandy clays. The slopes of the levee are protected against erosion using the same cover material specified for the LTP (HMC 2013). San Mateo Creek drainage enters the Site from the north and is also diverted by the North Diversion Channel west around the LTP.

2.5 Geology

The Site is located in the southeastern portion of the Colorado Plateau physiographic province, on the south flank of the San Juan Basin. Figure 2-1 presents a portion of the geologic map of the Grants quadrangle (Dillinger 1990). The region experienced structural deformation (regional folding and block uplift) associated with formation of the Zuni Uplift from the Late Cretaceous through the Eocene during the Laramide Orogeny (HDR 2016). This uplift formed the Zuni Mountains, which consist of a northwest-trending monoclinal fold approximately 75 miles long and 30 miles wide to the southwest of Grants composed of Precambrian crystalline basement rocks overlain by Permian to Jurassic sedimentary rocks (Langman et al. 2012).

2.5.1 Bedrock

Bedrock units at the Site consist of the Glorietta Sandstone (Early Permian), San Andres Limestone (Early Permian), and the Chinle Formation (Late Triassic). The Chinle Formation is composed of laterally continuous sandstone units separated by thick sections of low permeability shale. The Site is located on the eastern flank of a fold, where bedrock dips approximately 3 to 10 degrees to the north-northeast into the San Juan Basin (Kelley 1967).

More recent faulting associated with the Rio Grande Rift resulted in the large northeast-striking San Mateo normal fault located northeast of the Site and two small-scale normal faults near the Site referred to as the West Fault and the East Fault (Figure 2-2). The dip of these two faults is nearly vertical and offset in the Chinle Formation results in the juxtaposition of permeable sandstones with impermeable mudstones and siltstones across the two faults near the Site. Displacement along the East Fault is minimal immediately south of the Felice Acres subdivision and sandstone units are not vertically offset (HMC and Hydro-Engineering 2010). The magnitude of structural offset of the underlying SAG regional aquifer is much lower than the vertical thickness of the unit and does not appear to significantly affect groundwater flow.

During the Tertiary (Neogene) volcanic activity associated with the Mount Taylor volcanic field resulted in widely scattered andesite and basalt flows (HDR 2016). An erosional period followed the volcanism and created the valley forms observed in the SMC Basin, eroding the surface up to 150 to 200 feet below the current land surface (Langman et al. 2012). This erosional period exposed Cretaceous and Permian bedrock formations, which outcrop in progressively older (northeast to southwest) trending bands to the west of the Site. Erosion of the dipping formations produced a pronounced angular unconformity between bedrock strata and Quaternary valley fill, resulting in sandstone units within the underlying Chinle Formation abruptly truncating at the base of the alluvium.

2.5.2 Alluvium

Quaternary deposits consist of localized andesite and basalt flows and widespread alluvium composed of locally eroded bedrock materials; some of which were ore-bearing rock. As a result, the alluvium contains significant concentrations of naturally occurring uranium, as well as selenium and molybdenum, which are typically present in uranium deposits (HMC 2012). The lithology types and stratigraphic placement observed in the borehole logs (primarily clays and sands with varying silt and/or gravel) are consistent with a fluvial depositional environment (e.g. meandering stream and flood over bank deposits). Clay and silt beds typically range from two to ten feet in thickness with combined thickness up to 20 feet. Sand beds generally range from five to 20 feet. Clasts range from rounded to sub-angular grains, though the majority are sub-rounded, indicating that sediments were transported a moderate distance from their source (Novak-Szabo et al., 2018). Microscopy and petrographic

microscopy results also provide support of the local origin of the sediment. This type of depositional environment results in the presence of a higher permeability channel and channel lag deposits positioned directly adjacent to fine-grained, low permeability over bank deposits.

High resolution site characterization techniques were used in two supplemental studies at the Site; a study of background concentrations in alluvial aquifer groundwater and a tri poly phosphate pilot study. Two geologic cross sections from these studies have been reproduced in this report to show the degree of heterogeneity in the alluvial aquifer at the Site. One cross section is located to the north, immediately upgradient, of the LTP (Figure 2-3) and the other is located to the west, downgradient, of the LTP (Figure 2-4). Both cross sections illustrate the heterogeneous nature of the alluvium and the scale and degree to which the texture (i.e., grain size) of the sediments horizontally and vertically vary.

2.5.3 Quaternary Volcanics

Widespread Quaternary andesite and basalt flows are interbedded with the alluvial deposits. These localized volcanic flows were encountered during drilling investigations to the west of the LTP and are limited to the area west of the Pleasant Valley Estates neighborhood in both the San Mateo Creek and Rio San Jose alluviums. The basalt encountered during drilling had a maximum thickness of 109 feet and an average thickness of 49 feet. The Site geology and hydrogeology are illustrated in three dimensions on Figure 2-5.

2.6 Hydrogeology

The hydrogeological framework at the Site consists of a hydraulically unconfined, buried valley alluvial aquifer overlying and in hydraulic connection with the Chinle aquifer and the SAG Regional aquifer. The Chinle aquifers are under partially confined conditions where they subcrop beneath the alluvial aquifer and confined conditions further downdip. These bedrock units have tilted and faulted near the Site. As a result, all three Chinle aquifers subcrop with the overlying alluvial aquifer.

Though the Chinle Formation is largely comprised of shale, there are three water-bearing units within the Chinle, referred to as the Upper, Middle and Lower Chinle aquifers. The Upper and Middle Chinle aquifers are both largely composed of sandstone, and the Lower Chinle aquifer, which consists of a zone of enhanced water yield within the shale formation. A regional aquifer, the Permian-age SAG, exists at depth below the Site, and predominantly consists of limestone with subsidiary sandstones and shale.

2.6.1 Alluvial Aquifer System

The unconfined alluvial aquifer at the Site is laterally bound by areas of higher bedrock elevation. The extent of the aquifer is shown on Figure 2-6. As a result of these bedrock highs, the alluvial aquifer has been subdivided into three distinct but connected alluvial systems, referred to as the San Mateo, Rio Lobo, and Rio San Jose alluvial systems. The San Mateo alluvial system covers the majority of the Site area, extending northeast, south and southwest of the Site, eventually joining with the Rio Lobo and more extensive Rio San Jose alluvial systems.

2.6.1.1 San Mateo Aquifer

The San Mateo alluvial aquifer occurs as a north-south trending buried valley aquifer extending through the Site. Groundwater flow in the San Mateo alluvial aquifer is generally north to the south, upgradient of the LTP, and to the southwest in the area of the LTP. Figure 2-7 shows alluvial groundwater flow directions based on 2019 data. An artificial hydraulic barrier that is part of the current

remediation system creates a zone on the southern and western sides of the LTP area where the natural gradient is artificially interrupted by a combination of collection and injection operations.

An area of high bedrock southwest and downgradient of the LTP results in a local branching of the San Mateo alluvial aquifer downgradient of the LTP. A branch extends to the west to a confluence with the Rio San Jose alluvial aquifer, and a branch extends to the south to a confluence with the Lobo alluvium, which eventually leads to a confluence with the Rio San Jose alluvial aquifer.

The San Mateo alluvial aquifer generally behaves as an unconfined aquifer with specific yields ranging from 0.038 to 0.28. A specific yield of 0.1 represents the alluvial aquifer at the Site (HMC 2019d). Hydraulic conductivity values are relatively high, ranging from approximately 10 to more than 200 ft/day. Figure 2-8 shows the distribution of hydraulic conductivities in the alluvial aquifer based on a series of pumping tests (transmissivity/aquifer thickness). The water table ranges between from 40 to 60 feet below the ground surface, with elevations ranging from 6,428 to 6,550 feet above msl during the fall 2019 monitoring event.

2.6.1.2 Rio Lobo Aquifer

The Rio Lobo aquifer is typically a sandy material with minor clay and silt layers. Based on a 1995 investigation, it was determined that saturated portions of the Rio Lobo aquifer were likely confined to narrow sections where the alluvium was deposited within incised channels, or that a subcrop of pervious bedrock drained the alluvial aquifer upgradient of the confluence with the San Mateo system. Water quality differences between well ND and borehole BK3 and other background wells indicated that the confluence of the Lobo Creek and San Mateo Creek alluvial systems may be in the vicinity of well ND (HMC 2019b).

2.6.1.3 Rio San Jose Aquifer

Rio San Jose aquifer is generally composed of sand and gravel with a wide range of transmissivity. Groundwater in the Rio San Jose system flows southeast from the Bluewater site and merges with San Mateo Creek alluvial system. The combined flow continues southeast toward Milan (DOE 2014). Groundwater flow direction is provided on Figure 2-9 (DOE 2014).

2.6.2 Chinle Aquifer System

The Chinle aquifer system is made up of three hydraulically conductive zones within the Chinle Formation, referred to as the Upper, Middle and Lower aquifers. The aquifers subcrop beneath the alluvial aquifer providing hydraulic connection between the units.

2.6.2.1 Upper Chinle Aquifer

The Upper Chinle aquifer is a northeast-dipping, confined aquifer composed of a laterally continuous sandstone unit. Structural elevation contours of the top of the Upper Chinle aquifer indicate minor variations in the steepness of the northeasterly dip, particularly in the area immediately south of the LTP. The aquifer unit is hydraulically bounded from other Chinle Formation aquifer units by competent overlying and underlying shale that has been structurally offset by the West and East Faults at the Site. The average thickness of the sandstone is approximately 35 feet (HMC 2012).

The Upper Chinle aquifer subcrops at the base of the alluvium on both sides of the East Fault, most notably at the base of the western side of the LTP. However, the sandstone subcrop does not occur west of the West Fault, rather, the subcrop was offset farther north as a result of the most recent high-angle normal faulting and northeast-dipping bed surface.

The water quality of the Upper Chinle aquifer is influenced by the water quality of the alluvial aquifer as a result of the alluvial aquifer discharging to the Upper Chinle east of the East Fault and in the vicinity near and north of the LTP (HMC 2012).

Aquifer properties vary significantly within the bedrock units due to the nature of secondary porosity; specifically, fracturing of the sandstone related to faulting. As a result, a narrow band (several hundred feet wide) of elevated transmissivity exists on both sides of the East Fault. Estimated transmissivity values along the western side of the East Fault exceed 10,000 gallons per day per foot (gpd/ft). Estimated transmissivity values on the eastern side of the East Fault exceeds 2,000 gpd/ft, but generally ranges between approximately 100 to 2,000 gpd/ft (HMC and Hydro-Engineering, 2010). In contrast, estimated transmissivity values are much lower in the region between the West and East Faults, where the aquifer is not fractured, and finer grain size was noted. Figure 2-10 provides a plan view showing Upper Chinle aquifer transmissivities. The hydraulic conductivity of the Upper Chinle ranges from less than 0.1 ft/day to more than 100 ft/day (HMC and Hydro-Engineering 2010). The saturated thickness of the aquifer ranges from 15 to 65 feet thick with an average thickness of approximately 35 feet near the Site.

Groundwater flow direction in the Upper Chinle aquifer is greatly influenced by remedial action involving the injection of fresh water into the Upper Chinle and collection from a series of extraction wells (Figure 2-11). Groundwater at the Site generally flows from areas mounding near the injection wells toward collection wells.

2.6.2.2 Middle Chinle Aquifer

The Middle Chinle aquifer is an east to northeast-dipping, confined aquifer composed of laterally continuous sandstone. The aquifer is similar to the Upper Chinle aquifer and is hydraulically bounded from other Chinle Formation aquifer units by competent overlying and underlying shale. The Middle Chinle aquifer is generally the thickest of the sandstone units in the formation with a saturated thickness ranging from 10 to 80 feet and an average thickness of approximately 44 feet near the Site (HMC 2012).

The Middle Chinle aquifer exists as three fault-bound groundwater systems separated by the West and East Faults (HMC and Hydro-Engineering 2010). All three systems for the Middle Chinle aquifer subcrop at the base of the alluvium. The Middle Chinle is hydraulic connected to the overlying alluvial aquifer on the west side of the West Fault and between the West and East Faults at an isolated location in a confined alluvial channel south of the Felice Acres subdivision (HMC 2012).

Transmissivity of the Middle Chinle aquifer varies significantly due to the effects of reduced permeability associated with faulting, groundwater pumping, and containment measures (HMC and Hydro-Engineering 2010). East of the East Fault, transmissivity values range from 500 gpd/ft to less than 100 gpd/ft. Transmissivity values greater than 5,000 gpd/ft have been observed in the western portion of the LTP, eastern Murray Acres and western Broadview and Felice Acres. Figure 2-12 shows the distribution of Middle Chinle aquifer transmissivities.

Groundwater flow in the Middle Chinle aquifer is shown on Figure 2-13. The figure shows that hydraulic head in areas outside of the two faults is significantly different from the head between the two faults, which demonstrates that the groundwater is not readily connected across fault boundaries. The West Fault represents a significant barrier to groundwater flow within the Middle Chinle aquifer, with up to 110 feet of hydraulic head difference across the fault in the area west of the LTP.

Pumping of Middle Chinle South Collection wells near the south end of South Felice Acres developed a depression in the Middle Chinle potentiometric surface that extends nearly 500 feet to the northeast

and southwest of well Y7 and intercepting much of the flow in the area of the Broadview Acres and South Felice Acres developments. A steep gradient was developed to the southeast of this well indicating potential recharge to the Middle Chinle aquifer from the alluvial aquifer.

Ground water flow west of the West Fault is historically to the southwest, and discharges into the alluvial aquifer. This prevented the alluvial aquifer from affecting the water quality of the Middle Chinle aquifer on the west side of the West Fault. The area west of the LTP receives flow from upgradient off-Site areas, where based on water quality monitoring, the aquifer is in hydraulic connection with the alluvial aquifer. Alluvial aquifer injection activities temporarily reversed the vertical hydraulic gradient in the northern portion of Section 27 during 2006 through 2014. This situation was corrected in 2016 by targeting groundwater withdrawal from the Middle Chinle to the north and from the alluvial aquifer through the subcrop to the south.

The remainder of the Middle Chinle aquifer is recharged by the alluvial aquifer south of Felice Acres. The injection of fresh water into wells CW14 (north of Broadview Acres) and CW30 (west of Felice Acres) has created ground water mounds in their respective areas. These mounds cause the ground water to flow both north and south from these two wells.

2.6.2.3 Lower Chinle Aquifer

The confined Lower Chinle aquifer is the deepest permeable zone within the Chinle Formation and is generally located approximately 200 feet above the geologic contact with the SAG. The aquifer is hydraulically isolated from the overlying Middle Chinle aquifer and underlying SAG regional aquifer. In contrast with the overlying Chinle aquifers, the Lower Chinle aquifer is composed of shale with enough developed secondary permeability to behave as a limited aquifer (HMC and Hydro-Engineering 2010). The permeability of the aquifer is not consistently high enough to serve as a viable aquifer, and areas exist where the aquifer permeability is effectively absent.

The Lower Chinle aquifer subcrops at the base of the alluvium on either side of the West Fault. Direct hydraulic connectivity with the overlying alluvial aquifer exists in the area between the West and East Faults southwest of the Felice Acres subdivision and immediately west of the Valley Verde and Pleasant Valley subdivisions on the west side of the West Fault. The Lower Chinle aquifer is presumed to be laterally continuous immediately south of the terminus of the East Fault, where the aquifer functions as a single hydrologic unit (HMC 2012).

The hydraulic properties of the Lower Chinle aquifer are highly variable and largely depend on secondary permeability within the shale. The ability of the Lower Chinle aquifer to produce water is much lower and less consistent than overlying Chinle sandstone aquifers. Hydraulic conductivity ranges from 0.1 to more than 50 ft/day (HMC and Hydro-Engineering 2010). Estimated transmissivity values for the aquifer are generally higher than 100 gpd/ft (750 ft^2/day) near subcrop locations (HMC and Hydro-Engineering 2010). However, selected areas near subcrop locations exceed 1,000 gpd/ft (7,500 ft^2/day). Figure 2-14 provides a plan view showing Lower Chinle aquifer transmissivities.

The direction of groundwater flow in the Lower Chinle is shown on Figure 2-15. Groundwater elevations for the aquifer ranged from 6,420 to 6,488 feet above msl during the fall 2019 annual monitoring event (HMC and Hydro-Engineering 2019). Flow west of the West Fault in the Lower Chinle is mainly to the northeast. Flow between the two faults is to the northeast in the area of the tailings. The flow is to the northwest in the southern portion of the Lower Chinle aquifer between the faults. The northwesterly flow direction in this area indicates that the Lower Chinle water moves across the West Fault in the area west of Broadview Acres. Hydraulic head is higher in the alluvial aquifer than

in the Lower Chinle aquifer with the exception of the subcrop locations, where the hydraulic communication occurs.

In general, the Lower Chinle aquifer is only viable as a water resource near the subcrop locations in connection with the alluvial aquifer, where adequate secondary permeability has likely resulted from weathering and faulting (HMC 2012).

2.6.3 San Andres-Glorietta Regional Aquifer

The SAG aquifer consists of the San Andres Limestone and Glorietta Sandstone with a total thickness that exceeds 200 feet (HMC and Hydro-Engineering, 2010). Similar to the Chinle Formation aquifers, the regional aquifer is mildly folded and dips to the east and northeast as a result of regional tectonic deformation (Figure 2-16). A plan view map of the Site showing well locations, measured ground water elevations and inferred contours from 2019 measurements is provided on Figure 2-17. The aquifer has been used by HMC as the source of unimpacted clean water used for hydraulic containment of the alluvial aquifer and Chinle Formation aquifers.

Groundwater elevations near the Site ranged from 6,417 to 6,420 feet above msl during 2019. Flow direction is to the east-southeast. The water-level elevations measured during 2014 show a very flat (0.00086 ft/ft) piezometric surface. The U.S. Geological Survey (USGS) suggested an average transmissivity of 374,000 gpd/ft (Baldwin and Anderholm 1992; Frenzel 1992).

2.6.4 Summary

Groundwater flows in three distinct hydrogeologic units; alluvium, Chinle (including the Upper, Middle, and Lower subunits), and the SAG. The alluvial aquifer is unconfined composed of 50 to 100-foot thick heterogeneous mixture of layers of gravel, sand and gravel, fine to coarse sand, and silt and clay. The water table ranges between 40 and 60 feet below the ground surface. Groundwater flow in the alluvial aquifer primarily occurs through the high hydraulic conductivity sand and gravel lenses (mobile aquifer fractions). The hydraulic conductivity of the sand and gravel ranges from 10 to more than 200 ft/day. Groundwater generally flows from 0.3 to 6.5 feet per day with a mean velocity of 3.5 feet per day. Water levels collected as part of the active groundwater remediation show groundwater flows from the Site to the west in the San Mateo portion of the alluvial aquifer where it combined with the San Jose portion of the alluvial aquifer. Silt and clay lenses in the alluvium create an anisotropy that restricts vertical groundwater movement (immobile aquifer fractions).

Similarly, the solute transport of COPCs/ROPCs in this anisotropic aquifer mainly occurs in the high hydraulic conductivity coarse grained sand and gravel (mobile aquifer fraction). As the COPCs/ROPCs migrate in the sand and gravel portions of the alluvial aquifer, the COPCs/ROPCs diffuse into the silt and clay lenses. Diffusion is a concentration gradient driven process where high concentrations of COPCs/ROPCs in groundwater migrating through the sand and gravel will diffuse into the porewater in the silt and clay that contains less COPCs/ROPCs. These silt and clay lenses can store significant amounts of mass especially beneath the LTP/STP allowing it to act as a storage zone or a secondary contaminant source within the aquifer. Once the COPCs/ROPCs have diffused into the silt and clay, they are left nearly immobile because of the low hydraulic conductivity of the silt and clay. The COPCs/ROPCs in the silt and clay lenses will eventually diffuse out of the silt and clay back into the sand and gravel when the concentration of COPCs/ROPCs in the sand and gravel becomes lower than the concentration in the silt and clay typically after the implementation of a source remedy like the HMC groundwater remediation system. In this case, the slits and clay lenses can be a long-term low concentration source of COPCs/ROPCs to the sand and gravel often lasting for decades to centuries.

COPCs/ROPCs have also migrated from the alluvial aquifer into the Upper and Middle Chinle bedrock aquifer. Groundwater flow direction in the Upper Chinle aquifer is greatly influenced by injection of fresh-water and collection of groundwater. Groundwater at the Site generally flows from areas mounding near the injection wells toward collection wells.

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3 Nature and Extent of Contamination

3.1 Source Material

The primary sources of contaminants at the Site are the two tailings piles referred to as the LTP and STP. The LTP and STP contain approximately 21 million tons and 1.2 million tons of uranium mill tailings, respectively. Throughout most of the mill operations, tailings were hydraulically deposited after particle size separation by a cyclone operation. The cyclone was moved along the crest of the embankment, creating overlapping fields of deposition with no distinct interface between the coarse and fine tailings (HMC 1982).

The finer fraction, which generally consisted of silt and clay particles, made up approximately 30 percent of the tailings deposited. The coarse fraction, generally consisting of sand, made up the remaining 70 percent of the tailings (HMC 1982).

Debris from the mill operating facilities, which is buried south of the tailings piles is also a source of potential contamination. Comparatively, the buried debris pits are much smaller than the tailings piles.

3.2 Groundwater Impacts

Seepage from the tailings piles has resulted in the contamination of groundwater in the alluvial, Upper, Middle, and Lower Chinle aquifers at the Site. HMC has operated a remediation system to mitigate the impact of seepage from tailings to groundwater since 1977 and has provided water from the City of Milan drinking water system to the subdivisions south of the Homestake Facility since 1986.

3.2.1 Groundwater COPCs/ROPCs and Preliminary Remediation Goals for Remedial Investigation

COPCs/ROPCs were identified in the RI and PRGs for the COPCs/ROPCs were developed based on screening levels established by ARARs or by risk-based information or criteria. Table 3-1 lists potential PRGs for the COPC/ROPCs that are the most stringent of potential chemical-specific ARARs. Note that chloride and TDS, which are regulated in the NRC license, are not considered contaminants by EPA; however, they are regulated by the State of New Mexico pursuant to the Clean Water Act.

PRGs based on background concentrations were scientifically calculated based on data and methodologies that met regulatory guidance and were approved by the applicable regulatory agencies, including NRC, NMED, and EPA. Background concentrations in the alluvial aquifer are further supported by a local study of the natural variability in concentrations resulting from alluvial deposits and their parent material (Arcadis 2018)

3.2.2 Alluvial Aquifer

Figure 3-1 presents uranium data collected in 2019. The light yellow/green pattern on Figure 3-1 shows areas where uranium concentrations are elevated, which includes the LTP, the STP, and the area to the west extending into Section 28. Additional areas where uranium concentrations in the alluvium were greater than the PRG in 2019 exist south of the STP along Highway 605, and in Felice Acres. The area of elevated concentrations in Felice Acres extends southwest approximately 2,600 feet from the southwest corner of Felice Acres.

A more regional look at the uranium concentrations in the Rio San Jose is provided on Figure 3-2, which presents 2017 uranium concentrations measured for the Rio San Jose Alluvial aquifer and the

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San Mateo Alluvial aquifer in an area extending from the confluence of the alluvial aquifers to the south. Higher uranium concentrations exist in the Rio San Jose Alluvial aquifer to the northwest of the San Mateo confluence, from the Bluewater Mill Tailings Site which is under DOE long-term management. Uranium contamination has not been observed in the Rio Lobo Alluvial System.

Selenium concentrations throughout the Site in 2019 are presented on Figure 3-3. Concentrations of selenium in the alluvial aquifer above the PRG are located within the Homestake Facility, with the exception of an area east of Highway 605 located southeast of the LTP. Selenium concentrations in the nearby subdivisions are below the Site Cleanup Levels.

Figure 3-4 presents data and contours of molybdenum concentrations in the alluvial aquifer during 2019. The PRG for molybdenum is 0.10 mg/L. Significant molybdenum concentrations extend approximately ¼ mile west of the LTP and to the southeast of the STP along Highway 605. A 10 mg/L contour extends around the LTP and to the west side of the STP.

Figure 3-5 presents Ra-226 and Ra-228 concentrations for the alluvial groundwater near the Site. Ra-226 and Ra-228 concentrations above the PRG in the alluvial aquifer are limited to areas directly underneath the LTP. Vanadium and Th-230 concentrations are presented on Figures 3-6 and 3-7, respectively. Vanadium concentrations were above or equal to the PRG of 0.02 mg/L in four of the seven alluvial wells located within the footprint of the LTP, one well near the southwest corner of the LTP and three wells located near the perimeter of STP. Thorium-230 was present above the NRC Site Cleanup Level of 0.3 pCi/L in two of the five alluvial wells sampled within the footprint of the LTP.

Sulfate concentration contours for the alluvial aquifer during 2019 are presented on Figure 3-8. Areas where sulfate exceeds the PRG includes below the LTP, approximately 0.25 mile west of the LTP, within the 120-acre flood irrigation field, and south of the Murray Acres subdivision.

Nitrate concentrations measured in the alluvial aquifer in 2019 near the Site are presented in Figure 3-9. Areas where the nitrate concentrations exceeded the PRG of 12 mg/L include within the footprint of the LTP (6 out of 30 wells), between the LTP and STP (three wells). Nitrate concentrations in all of the alluvial subdivision wells were below 12 mg/L.

3.2.3 Upper Chinle Aquifer

Impact to the Upper Chinle aquifer is limited to a mixing zone, adjacent to the subcrop area, where the alluvial aquifer has had a direct impact on water quality in the Chinle aquifer (Figure 3-10). Uranium concentrations in 2019 exceeded the Upper Chinle mixing zone PRG of 0.18 mg/L in the LTP area extending down to the south of the Collection Ponds and in two isolated areas at the developments south of the facility. One location exceeded the mixing zone PRG just north of Broadview Acres and two values exceeded the PRG at Felice Acres as shown on Figure 3-11. The PRG for uranium in the non-mixing zone was not exceeded.

Figure 3-12 presents the molybdenum concentrations in the Upper Chinle aquifer during 2019. Molybdenum concentrations near and underlying the LTP exceeded both the mixing and non-mixing zone PRGs of 0.1 mg/L. Concentrations greater than 1.0 mg/L were observed in a region extending from the Upper Chinle-alluvium subcrop area, below the LTP, toward the east side of the LTP and to the south of Evaporation Pond 2 and the Collection Ponds. The Site Cleanup Levels is exceeded in one well north of Broadview Acres. Molybdenum concentrations from Broadview Acres to the south and east of the East Fault were equal or below Site Cleanup Levels in 2019.

Selenium concentrations in the Upper Chinle aquifer are presented on Figure 3-13. In 2019, the selenium concentrations were less than the mixing-zone PRG of 0.14 mg/L with the exception of wells

in and near the subcrop area near the LTP and extending down to the Collection Ponds. The non-mixing zone PRG of 0.06 mg/L was not exceeded in 2019.

Vanadium concentrations measured in 2019 are presented on Figure 3-14. A vanadium concentration of 0.02 mg/L, which is above the NRC Site Cleanup Level of 0.01 mg/L, was detected in well CW3. Well CW3 is located northwest of the HMC office. Remaining measurements were equal to or less than the Site Cleanup Levels. Figure 3-15 presents the radium-226 (Ra-226) and radium-228 (Ra-228) values measured in 2019. None of the values exceed the EPA Maximum Contaminant Level (MCL). The highest Ra-226 concentration measured in the Upper Chinle wells in 2019 was 0.2 pCi/L in well CW3. The largest Ra-228 value was 1.4 pCi/L in well CE15.

Sulfate concentrations in the Upper Chinle aquifer during 2019 are presented on Figure 3-16. Only wells below and near the LTP area exceeded the NRC Site Cleanup Level for the mixing zone of 1750 mg/L. The non-mixing zone NRC Site Cleanup Level of 914 mg/L in the Upper Chinle in 2019 is also exceeded in the eastern portion of the LTP and at well CW73 in the southern end of Felice Estates (922 mg/L). Nitrate concentrations in the Upper Chinle aquifer measured in 2019 are presented on Figure 3-17. All measured nitrate concentrations in the Upper Chinle aquifer in 2019 are less than the NRC Site Cleanup Level except for well T32 at 18.7 mg/L.

3.2.4 Middle Chinle Aquifer

PRGs were established for mixing zone and non-mixing zone in the Middle Chinle aquifer. The extent of the Middle Chinle Mixing Zone is shown on Figure 3-18. In the area west of the West Fault, geochemical conditions, primarily calcium concentrations, indicate that the Middle Chinle is impacted by a connection to an alluvial aquifer further north of the Site. PRGs for the Middle Chinle mixing zone reflect this northern connection to the alluvial aquifer.

The extent of uranium that exceeds PRGs in the Middle Chinle aquifer, based on 2019 data, is shown on Figure 3-19. Areas in the southern portion of Felice Acres, extending into Section 3, west and northwest of the LTP exhibited concentrations greater than the mixing-zone PRGs as a result of direct migration through the subcrop window. Uranium concentrations in the Middle Chinle aquifer exceeded non-mixing zone PRGs in Broadview Acres and Felice Acres show limited migration from the mixing zone.

The 2019 molybdenum concentrations in the Middle Chinle aquifer are presented on Figure 3-20. Molybdenum concentrations greater than the PRG of 0.10 mg/L were detected west of the West Fault and northwest of the LTP in the same area as elevated uranium and selenium concentrations.

Middle Chinle selenium concentrations, measured in 2019, are presented on Figure 3-21. An area northwest of the LTP exceeded the mixing zone PRG. The higher selenium concentrations in these wells are followed the same path of downward movement of alluvial water into the Middle Chinle aquifer as the uranium. An area located in Felice Acres exceeded the non-mixing zone PRG in two wells is also consistent with uranium migration.

Middle Chinle aquifer sulfate concentration contours for 2019 are presented on Figure 3-22. Concentrations ranged from 285 to a high of 1,860 mg/L in 2019. Mixing-zone sulfate concentrations in the Middle Chinle aquifer were above the PRG of 1,750 mg/L in two wells west of the West Fault. Sulfate concentrations in the non-mixing zone of the Middle Chinle were below the PRG of 867 mg/L.

Figure 3-23 presents the nitrate concentrations in the Middle Chinle aquifer wells from samples collected in 2019. Nitrate concentrations exceed the mixing zone PRG in the same area west of the West Fault where other COPCs and ROPCs exceeded PRGs in the Middle Chinle aquifer.

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3.2.5 Lower Chinle Aquifer

PRGs for the Lower Chinle aquifer have been established for the mixing zone and the non-mixing zone, as shown in Table 3-1. The location of the Lower Chinle Mixing Zone is shown on Figure 3-24.

Uranium concentrations in the Lower Chinle aquifer measured in 2019 are shown on Figure 3-25. Uranium concentrations measured in 2019 in the Lower Chinle aquifer exceeded the mixing-zone PRG southwest of Felice Acres in Section 3. The non-mixing zone adjacent and northeast of the mixing zone also exceeded its PRG.

The 2019 molybdenum concentrations measured from the Lower Chinle wells were at levels near the DL and did not exceed PRGs. These measurements were consistent with historic measurements of molybdenum in the Lower Chinle aquifer.

Selenium concentrations in the Lower Chinle aquifer for 2019 are presented on Figure 3-26. None of the selenium concentrations measured in 2019 from the Lower Chinle wells exceeded the Site Cleanup Levels.

Sulfate concentrations in the Lower Chinle aquifer during 2019 are presented on Figures 3-27. None of the Lower Chinle concentrations of sulfate exceed PRGs in the mixing zone. Areas west of the West Fault and north of the LTP have sulfate concentrations greater than PRGs in the non-mixing zone, which are thought to be naturally occurring levels.

Nitrate concentrations measured in 2019 are all significantly below PRGs.

3.2.6 San Andres-Glorietta Aquifer

The alluvial and SAG aquifers are separated by the Chinle formation, preventing the direct communication between the aquifers. A subcrop of the SAG to the alluvial aquifer occurs about 2 miles southwest of the LTP at a location that has not been impacted by releases from the Site.

Figures 3-28 and 3-29 provide concentrations versus time plots for uranium from SAG wells that are routinely monitored by HMC. The location of these wells is shown on Figure 2-17. Highest uranium concentrations in the SAG wells measured during 2019 were 0.02 and 0.01 mg/L in wells 806R and 998 respectively. The 2017 uranium value of 0.11 mg/L from well 806R appears to be an outlier

Selenium concentrations in the SAG aquifer vary from <0.005 to 0.011 mg/L except for the effected concentration in well 943 of 0.047 mg/L. All measured molybdenum concentrations are less than 0.03 mg/L.

Uranium milling operations at the Bluewater Mill Site, which is located approximately 4 miles west north-west (directly upgradient) of the LTP released uranium to the SAG aquifer. Figure 3-30 presents an isoconcentration contour map for uranium in the SAG aquifer. Based on this information, the increase in uranium concentration experienced in Well 951R is probably the result of uranium releases from the Bluewater Mill Site.

3.3 Contaminant Fate and Transport

Migration and persistence of COPCs and ROPCs in the environment will be discussed in this section. Understanding contaminant fate and transport at a site provides an important basis for assessing human health and ecological risks from exposure. The COPCs and ROPCs for the Site are limited to inorganic chemicals and radionuclides.

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As described in Section 1.4, the LTP and STP were deposited above grade, the majority in the form of slurry. Downward migration of pore water from the tailings piles is a primary source of groundwater contamination at the Site. Once COPCs/ROPCs reach the groundwater, movement is governed by groundwater flow within the alluvial and Chinle Formation aquifers and geochemical conditions.

HMC developed a Groundwater Flow and Transport model for the Site. The framework for the model is a Hydrogeologic Site Conceptual Model. The hydrogeologic CSM is a summary of available knowledge related to groundwater flow and water quality of the principal hydrostratigraphic units at a certain location and scale. Key elements of the hydrogeologic CSM as they relate to the Site include:

- Aquifers of Quaternary, Triassic, and Permian age are present at the Site.
- Principal aquifers with groundwater flow at the Site include the alluvium; Upper, Middle, and Lower aquifers of the Chinle Formation; and SAG regional aquifer.
- Local groundwater flow in the alluvial aquifer generally flows parallel to surface drainage but bifurcates around a bedrock high located south of the LTP.
- Groundwater flow in the Chinle aquifer units is generally to the north-northeast, except where influenced by faulting, subcrop locations, or ongoing restoration operations.
- Groundwater flow in the underlying SAG aquifer is to the east and southeast.
- Site remedial activities have included groundwater extraction and injection in both the alluvium and Chinle aquifers, affecting local groundwater flow conditions.
- The presence of fault zones has restricted and redirected local groundwater flow in the Chinle aquifers under the Site.
- Local groundwater flow conditions have been well characterized through data collected from hundreds of monitoring wells on the Site.

As an initial step toward creating a groundwater flow and transport model, a 3-D geologic model was developed that captures stratigraphy and faulting at both the site scale around the Site and regionally within the SMC Basin. The geologic model was then used to create appropriate hydrostratigraphic layer structure. The geologic model was developed using LeapfrogTM, a geologic modeling software that provides for enhanced interpretation and visualization of regional stratigraphy and geology. Development of the regional Leapfrog 3-D geologic included the incorporation of an existing site-scale geologic model's interpretations of surface outcrops, stratigraphic layer thicknesses, fault structures, dip directions, and dip angles to produce "layer cake" representation of the primary stratigraphic units in the SMC Basin in the vicinity of the Site. Information from 1,437 geologic logs from the Site, along with regional well information (well depths and units penetrated) and 14 geologic maps for the region were added and localized changes were made to stratigraphic thicknesses and depths (HMC 2019d).

To understand COPC/ROPC transport through the LTP, STP, and the alluvial aquifer a conceptual geochemical model has been developed – Figure 3-31 (WME 2019). A fundamental description of the model is summarized in the following statements:

- The source of groundwater contamination is contained within the mound of tailings water within the LTP. After flushing of the LTP ceased in 2015, mounding in the LTP has continued to dissipate.
- As a result of the alkaline leaching process, the source is an alkaline (pH ≈ 10) sodium-sulfate type water, with elevated concentrations of TDS, uranium, selenium,

molybdenum, and indicator constituents, such as chloride and sulfate. Redox conditions are moderately oxidizing and therefore uranium, selenium, and molybdenum exist in solution as oxyanions (e.g., MoO_4^{2-}, SeO_4^{2-}, $UO_2(CO_3)_3^{4-}$).

- As LTP seepage migrates into the alluvial aquifer, it becomes partially diluted as it mixes with moderately-oxidizing water from upgradient in the San Mateo Alluvial aquifer.
- As the impacted groundwater moves downgradient, the concentrations of predominantly indicator constituents (chloride, sulfate) are primarily controlled by advection and diffusion. The oxyanionic forms of uranium ($UO_2(CO_3)_3^{4-}$), molybdenum (MoO_4^{2-}), and selenium (SeO_4^{2-} and/or SeO_3^{2-}) are partially adsorbed to hydrous ferric hydroxide, but the majority remain mobile and are transported downgradient.
- Some areas of the groundwater are slightly reducing, such that selenium exists as selenium (IV) (SeO_3^{2-}), with the potential for precipitation as amorphous elemental selenium.
- Within the LTP, solid forms of uranium, selenium, and molybdenum remain in the tailing, which could be released upon long-term leaching or weathering. Historical information suggests that uranium, selenium, and molybdenum may exist as oxide and/or sulfide minerals, associated with clays, or adsorbed to iron oxides.

Movement of contaminants into and within groundwater has been modeled by HMC using MODFLOW-USG Block-Centered Transport Process. MODFLOW-USG is a publicly available model, created and maintained by U.S. Geological Survey, that supports a wide variety of structured and unstructured grid types (e.g. nested grids, grids based on triangles, rectangles, hexagons and other shapes). MODFLOW-USG includes an optional Newton-Raphson solution formulation that enables improved unconfined groundwater flow simulations, and incorporates code changes that better simulate drying and rewetting, which may occur within the Site and SMC Basin if sufficient water table declines and increases are predicted (Niswonger et al. 2011). MT3D-USGS simulates contaminant transport (Bedekar et al. 2016). A new Sparse Matrix Solver (SMS) was also developed to resolve nonlinearities and multiple symmetric and asymmetric linear solution schemes to solve the matrix arising from flow equations and the Newton-Raphson formulation and a separate seepage model (the reformulated mixing model [RMM]) was previously developed to assess long-term changes in both seepage flow rates and constituent mass loading. Assessments of past LTP seepage rates, along with predictions of future seepage rates, were developed based on vadose modeling using the VADOSE/W code (HMC 2012). The Reformulated Mixing Model (RMM) was developed as a mechanism to estimate or forecast water and COPC mass balance and exchange within the LTP. The RMM was replaced by a Drain Down Model (DDM) that incorporates the Brooks and Corey method to estimate seepage and toe drain rates (Brooks and Corey 1964). The revised seepage estimates developed from the DDM model were incorporated into this SMC Basin model update to simulate seepage from the LTP into the underlying local groundwater system (HMC 2019d).

In the land treatment fields, irrigating with water containing inorganics is a pathway for contaminants to potentially impact groundwater quality. Recharge from rainfall, can also drive contaminants through the vadose zone into groundwater, though recharge rates are low due to the arid climate.

The release of contaminants from the LTP has impacted residential wells in the nearby subdivisions. As described in Section 1, through agreements with EPA in 1983 and NMED in 2009, HMC has

extended the Village of Milan's municipal water supply to the residences of the subdivisions and provided connection.

4 Evaluation of Site Restoration Potential

Remedial technologies and response actions were screened to develop remedial alternatives capable of restoring groundwater to PRGs. Each remedial alternative was evaluated with a solute transport model to assess whether it could achieve the PRGs (and ARARs) within a reasonable timeframe and/or be protective of human health and the environment. Groundwater remediation would have to occur for as long as the primary and secondary source terms transfer COPC/ROPCs to the alluvial aquifer estimated to be over 360 years based on a first-order decay analysis for molybdenum. Modeling simulations of Alternatives 1 through 4 (provided in Section 4.4) show uranium would be transported roughly 2 miles (Alternatives 1 & 2) from the LTP/STP over 200 years. These simulations show Alternatives 3 and 4 are technically infeasible and little value would be realized for operating the current groundwater for 36 additional years (Alt 3) or operating the current remedy for 18 years and then installing a PRB (Alternative 4). The conservative model simulations are used to identifying potential receptors.

4.1 Potential Applicable Technologies

4.1.1 Initial Screen of Remedial Technologies and Response Actions

This section identifies remedial technologies and selects process options that represent these remedial technologies. The technology selection and screening processes were conducted in accordance with the USEPA RI/FS Guidance for CERCLA sites (EPA 1988).

Remedial technologies are general categories of technologies, such as chemical treatment, thermal destruction, immobilization, capping, dewatering, etc. Several broad remedial technologies have been identified. Numerous process options may exist within each remedial technology type. For example, chemical treatment is a remedial technology and process options for this technology include precipitation, ion exchange, and adsorption.

Remedial technologies and process options identified to address groundwater include those technologies that prevent and reduce exposure. During the initial screening step, process options and entire remedial technology types are eliminated from further consideration on the basis of technically implementability. Technologies that are difficult to implement due to site constraints and technologies that have not been proven to effectively control the COPCs/ROPCs are considered non-implementable. This initial screening step is applied based on published information and experience with the technologies and process options, knowledge of the site characteristics, and engineering judgment.

Table 4.1 identifies remedial technologies and process options for groundwater. Screening comments in these tables provided the basis for eliminating options.

4.1.2 Detailed Screen of Remedial Technologies and Response Actions

The potentially applicable remedial technologies and process options carried forward from the initial screening were evaluated in detail as remedial options. Effectiveness, implementability, and relative cost of remedial technologies and process options were considered during this screening evaluation.

Effectiveness for each option was screened independently and focused on the following primary considerations:

- Ability to handle the estimated areas or volumes of contaminated media and to meet remedial action objectives;

- Potential impacts to human health and the environment during construction; and
- Reliability and proven performance with respect to site conditions and contaminants.

Implementability for each option was screened independently and included consideration of the technical and administrative feasibility. Since the technical implementability was a criterion used in the selection of potentially applicable technologies, it was less a factor at this stage than administrative feasibility. The following factors were considered as part of the implementability evaluation:

- The availability and capacity of treatment, storage, and disposal facilities; and
- The availability of equipment and skilled workers needed to implement the process option.

The cost evaluation was limited to a qualitative cost comparison that considers the capital and operation and maintenance (O&M) costs of a particular process option. Costs were characterized as low, moderate, or high based on experience and engineering judgment. Table 4-2 summarize the detailed screening of the retained options.

Alternatives were developed by assembling combinations of representative process options that were retained during the screening. Assembled alternatives range from no action to alternatives that use treatment technologies to reduce the toxicity, mobility, or volume of the contaminants.

4.2 Description of Alternatives

4.2.1 Alternative 1 – No Action

Alternative 1 was developed from the NCP provision that requires consideration of a no action response to serve as a baseline for evaluating other remedial alternatives. The No Action response does not include any containment, removal, disposal, or treatment of contaminated groundwater. In accordance with EPA policy (EPA 2009), it also does not include new or existing institutional controls. The existing treatment system including injection and extraction wells, and certain monitoring wells would be removed. Any improvement of groundwater quality would be through natural mechanisms including adsorption, mineral precipitation, and dilution (WME 2019). Because hazardous contaminants remain at the Site under this alternative, five-year remedy reviews are required under CERCLA Section 121(c).

4.2.2 Alternative 2 – Long-Term Monitoring and Institutional Controls

Alternative 2 includes long-term monitoring of the dissolved plumes. Similar to the No Action alternative, groundwater quality improvement would be through natural mechanisms including adsorption, mineral precipitation, and dilution (WME 2019). Activities included in this alternative include decommissioning of the groundwater remediation system and groundwater monitoring to evaluate the behavior of the plumes and natural processes. Groundwater use restrictions in the form of ICs (land acquisition, environmental restrictive covenants, land use zoning or deed restrictions) and Engineering Controls (ECs) (fencing) to limit Site access. Because hazardous contaminants remain at the Site under this alternative, five-year remedy reviews are required under CERCLA Section 121(c).

4.2.3 Alternative 3 – Groundwater Containment and Removal

Alternative 3 includes continued active remediation of groundwater for 36 years, using the existing components, to reduce the existing off-site plumes and decrease the extent and concentration of

impacted groundwater beneath and in the immediate vicinity of the LTP. Elements of the remediation system will include extraction wells, injection wells, and injection trenches to hydraulically contain and remove the dissolved COPCs/ROPCs plumes. Operation of the wells and trenches is modified over time to contain plume migration and enhance plume removal. In addition to plume removal by groundwater capture at extraction wells, strategic injection of treated water that meets Site cleanup levels increases gradients towards extraction wells (directed groundwater recirculation) to increase groundwater velocity, enhance plume removal, and decrease the amount of sorbed COPCs/ROPCs on aquifer solids that could cause COPCs/ROPCs concentration rebound. Evaporation ponds would be operated, including active systems, to balance the storage of treated groundwater.

After 36 years, groundwater remediation would cease. Long-Term monitoring would be used to manage and monitor the effect of discharge from the LTP/STP to groundwater after operation of the system is stopped.

4.2.4 Alternative 4 – Groundwater Containment and Removal and In Situ Treatment

Alternative 4 includes continued active remediation of groundwater for 18 years, using the existing components, to shrink the existing off-site plumes and decreasing the extent and concentration of impacted groundwater beneath and in the immediate vicinity of the LTP/STP. Elements of the remediation system will include extraction wells, injection wells, and injection trenches to hydraulically contain and remove the dissolved COPCs/ROPCs plumes. Operation of the wells and trenches is modified over time to contain plume migration and enhance plume removal. In addition to plume removal by groundwater capture at extraction wells, strategic injection of treated water that meets Site cleanup levels increases gradients towards extraction wells (directed groundwater recirculation) to increase groundwater velocity, enhance plume removal, and decrease the amount of sorbed COPCs/ROPCs on aquifer solids that could cause COPCs/ROPCs concentration rebound. Evaporation ponds would be operated, including active systems, to balance the storage of treated groundwater. After 18 years, groundwater would be remediated with a PRB to achieve the ARARs.

4.2.1 Alternative 5 – Groundwater Restoration via Containment and Removal

Alternative 5 includes continued active remediation of groundwater for 50 years (14 years past Alternative 2) using extraction wells, injection wells, and injection trenches to hydraulically contain and remove the dissolved COPC/ROPC plumes. Alternative 5 includes operation of extraction wells, injection wells, and injection trenches to hydraulically contain and remove the dissolved plumes between the extraction wells and the LTP. In addition, extracted groundwater during operation of the groundwater containment and removal system for Alternative 5 would be treated above ground with the reverse osmosis and zeolite treatment systems. Evaporation ponds would be used to manage and dispose water that cannot be injected.

During a longer system operation time than Alternative 2, this scenario assumes that all mobile domain groundwater contaminants have been remediated to ARARs with 50 years of groundwater remediation. After removing COPCs/ROPCs and containing the plume and COPCs/ROPCs discharge from the LTP through operation of the groundwater containment and removal system, operation would stop. It is acknowledged that this assumption of full restoration will underestimate the time, costs, and impacts associated with this alternative and overestimate the efficacy of it as well. Long-term monitoring would be used to manage and monitor the effect of discharge from the LTP to groundwater after operation of the system is stopped. In essence, this alternative assesses the effects of long-term sources on groundwater concentrations following full groundwater restoration in the mobile domain.

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4.3 Fate and Transport Model

Contaminant fate and transport modeling was conducted to assess whether each remedial alternative could reach the PRGs (and ARARs) in a reasonable timeframe. The results of the modeling are presented the Groundwater Flow and Transport Model (modeling report) in Appendix B and are summarized below.

4.3.1 Parameter Selection

As introduced in the RI report and discussed in more detail in Section 3 Nature and Extent of Contamination, the nature and extent of uranium has been shown to be the greatest of the COPCs/ROPCs at the Site. The nature and extent of molybdenum is far less extensive than uranium but is present in greater concentrations than the other COPC/ROPCs. Therefore, fate and transport modeling focused on simulating the nature and extent of uranium and molybdenum. The reasons for the limited impact of the other COPC/ROPCs vary but are related to the geochemical conditions in the aquifers and fate and transport characteristics of each parameter as discussed in the following sections.

<u>Selenium</u>

In 1976 Selenium exceeding the Site standard of 0.32 mg/L extended about 2,000 feet southwest of the LTP and approximately 1,400 feet southwest of the STP in the alluvial aquifer similar to the nature and extent of the uranium plume. However, groundwater restoration activities reduced the nature and extent of selenium in both the LTP and underlying alluvium, and the areal extent of the selenium plume is smaller than the uranium plume today. Currently, selenium exceeds Site cleanup levels in the alluvial aquifer primarily beneath the LTP and STP (HMC and HE, 2020).

In oxidizing environments such as the alluvial aquifer, dissolved selenium occurs primarily as Se (VI) in the form of selenate (SeO_4^{2-}), where the primary attenuation mechanism is adsorption to iron oxides (WME 2020). However, selenate adsorption is very weak under neutral to alkaline conditions and is more weakly adsorbed compared to uranium (Kaplan and Serne 1995; Goldberg 2014). In the presence of sulfate, the extent of selenium adsorption is even further reduced due to competition for adsorption sites (Dhillon and Dhillon, 2000). Evidence for the high mobility of selenate are the elevated selenium concentrations (up to 3.4 mg/L) measured in downgradient domestic wells prior to groundwater restoration (Kaufmann et al., 1976). As a result, the relative extent of the oxidized portion of the selenium plume was more effectively reversed by groundwater restoration source control activities; however, geochemical conditions, explained below, within and beneath the LTP have since limited further migration of selenium.

Tailings seepage and alluvial groundwater beneath the LTP is more reducing compared to the outlying oxidizing alluvial groundwater. In the LTP seepage, dissolved selenium occurs as reduced Se (IV) in the form of selenite (SeO_3^{2-}) and reduced solid-phase forms of selenium (elemental selenium and iron selenide) have also been identified in the tailings solids (WME 2020). Selenite is more strongly adsorbed to mineral surfaces relative to selenate (Goldberg 2012), and precipitation of the reduced solid-phase forms also act to reduce selenium solubility. Reducing conditions within the LTP are driven by the decay of organic matter, where the rates of oxygen consumption are greater than the rates of oxygen replenishment, as controlled by infiltration of dissolved oxygen and diffusion into the LTP. The dramatic decreases in dissolved selenium in both the LTP and underlying alluvial groundwater since the 1970s indicate that conditions have become more reducing in the LTP. Increasingly reducing conditions over time may have been further enhanced by changes in

hydraulics of the LTP. For example, during early milling operations with a much smaller thickness in the LTP, seepage was likely occurring from the coarse sands and would have reported more directly to the alluvium. As the thickness of the tailings increased, a larger fraction of the solution passing through the pile was likely exposed to the finer slimes, where the reducing conditions would be more quickly established. Following final cover placement on the LTP, the supply of oxygen was further diminished. Therefore, selenium concentrations within the LTP source continue to decline, consistent with the pattern that has been observed since the 1970s, and therefore demonstrate significantly lower mobility compared to uranium due to the diminishing selenium source.

Radium-226+228

As early as 1976, Kaufman et al. (1976) reported a maximum radium-226 activity of 1.92 pCi/L in Well D located a short distance downgradient of the LTP. The sharp concentration gradient between the LTP and Well D was attributed to attenuation through sorption, and it was noted that radium-226 activities reverted to an average of only 0.36 pCi/L less than 2,000 ft from the LTP. By 1998, it was reported that radium-226+228 activities were below the Site standard in all alluvial wells (with the exception of a single outlier) and none of the point of compliance wells contained radium-226+228 activities above the standard. Consequently, radium-226+228 activities were also below Site cleanup levels in the Upper and Middle Chinle aquifers and it was recommended that radium-226+228 should be eliminated as a Site standard (HE, 1999). Currently, all radium-226+228 activities are below the Site standard in the alluvial aquifer outside of the LTP, and in all Upper, Middle, and Lower Chinle monitoring wells (HMC and HE, 2020).

The potential attenuation mechanisms for radium in groundwater are: (1) ion exchange with clay minerals, (2) specific adsorption to mineral surfaces (iron oxides), (3) coprecipitation with barite (BaSO4) and/or gypsum ($CaSO_4 \cdot 2H_2O$), and (4) direct precipitation (IAEA, 2014). Although radium sulfate ($RaSO_4$) and radium carbonate ($RaCO_3$) can potentially precipitate directly from solution, radium concentrations in waters associated with uranium mining are usually not high enough to reach saturation with these pure radium solids (Langmuir and Riese 1985). Radium mobility in the alluvial groundwater beneath the LTP is therefore likely limited by a combination of ion exchange, adsorption, and coprecipitation. This is supported through bulk mineralogical characterization of alluvial solids which has identified the presence of both clay minerals (kaolinite, smectite) and iron oxides (hematite, ferrihydrite) (Arcadis, 2018; WME, 2020). In addition, the presence of barite in alluvial solids has been confirmed (WME, 2020) and represents a significant potential sink for radium in groundwater (Bosbach et al., 2010). On a mass basis, the concentrations of radium in groundwater beneath the LTP would be miniscule compared to the mass of uranium. For example, a radium-226 activity concentration of 1 pCi/L is equivalent to mass concentration of only 1×10^{-9} mg/L. The low relative mass of dissolved radium and consequent high radium attenuation capacity of the alluvium results in a much lower mobility of radium compared to uranium. Elevated radium activities have historically been primarily confined to the area beneath the LTP. Currently, radium-226+228 activities in all alluvial wells remain below the Site standard, indicating the alluvium essentially contains an infinite capacity to attenuate radium from the LTP seepage.

Thorium-230

Similar to radium-226+228, the historical distribution of thorium-230 has been primarily limited to the LTP. In 1998, it was reported that only five wells in the vicinity of the LTP exceeded the Site standard for thorium-230, with all Upper and Middle Chinle wells being below the Site standard (HE, 1999). Currently, thorium-230 activities are below the Site standard in all alluvial wells except directly below the LTP, while thorium-230 activities are below the Site cleanup levels in all Upper,

Middle, and Lower Chinle wells (HMC and HE, 2020). Overall thorium-230 has consistently demonstrated low mobility and remains only a minor constituent of concern in the alluvial aquifer below the LTP.

The mobility of thorium in groundwater is restricted at pH values greater than 6 due to precipitation of insoluble thorium hydroxide [$Th(OH)_4$], thorium oxide (ThO_2), and potentially thorium sulfate [$Th(SO_4)_2$] in the presence of elevated sulfate concentrations (Ryan and Rai 1987; Langmuir 1997). Thorium is also strongly adsorbed by clays, iron oxides, and organic matter which causes thorium to be naturally concentrated in soils and sediments. Studies have shown that maximum thorium adsorption (95 to 100%) onto various mineral and organic constituents occurs above a pH of approximately 5.5 to 6.5 (Langmuir and Herman 1980; LaFlamme and Murray 1987). As a result, dissolved thorium-230 concentrations in natural waters rarely exceed 0.08 pCi/L (Langmuir and Herman, 1980). This is consistent with the 2019 measured thorium-230 activities in alluvial groundwater beneath the LTP of 0.01 to 0.1 pCi/L just beyond the edge of the plume (HMC and HE, 2020). Similar to radium, the low relative mass of dissolved thorium-230 and consequent high thorium attenuation capacity of the alluvium results in a much lower mobility compared to uranium. Because elevated thorium-230 activities in the alluvial aquifer have historically been confined to the area beneath the LTP, its future mobility will also be limited and is expected to remain significantly less mobile compared to uranium.

Vanadium

Vanadium has also proven to be only a minor COPC due to its demonstrated low mobility at the Site. In 1998, vanadium only exceeded the Site standard in two alluvial wells near the LTP and was below the standard in all Upper and Middle Chinle wells (HE 1999). Currently, vanadium remains below the Site standard in all alluvial wells except for those located beneath the LTP. Vanadium concentrations are also below the Site standard in all Upper, Middle, and Lower Chinle wells, consistent with the low concentrations in overlying alluvial wells (HMC and HE 2020).

The transport characteristics of vanadium in groundwater are highly dependent on redox conditions, where dissolved vanadium can exist as either V(IV) or V(V) (Lee, 1983). In oxidizing environments under near-neutral conditions such as the alluvial aquifer, vanadium exists primarily as V(V) in the form of the vanadate ion (H_2VO^{4-}) (Wehrli and Stumm 1989). Vanadate behaves very similar to phosphate in aqueous and biological systems and is known to adsorbed and incorporated into clay mineral structures and iron oxide coatings (Evans and Landergren 1974). Humic and fulvic acids which constitute many natural organics also have a strong affinity for vanadium, where these materials can reduce dissolved vanadate to vanadyl, which favors vanadium complexation by organic substances (McBride 1980; Wehrli and Stumm 1989). The presence of organic substances has shown to further enhance the adsorption of vanadium to iron oxides (Peng and Korshin 2011). Mineralogical characterization of the alluvial aquifer has identified the presence of clay minerals (kaolinite, smectite), iron oxides (hematite, ferrihydrite), and organic matter which can effectively act to reduce dissolved vanadium concentrations in groundwater (Arcadis 2018; WME 2020). Based on the historically observed lack of notable migration from the LTP and the strong attenuation capacity of the alluvial aquifer, the future mobility of vanadium should continue to be restricted and remain significantly less mobile compared to uranium.

Nitrate-N

In 1998, it was recognized that naturally elevated concentration of nitrate-N above the Site standard existed upgradient of the Site, masking the potential influence of tailings on nitrate-N concentrations

in the alluvial aquifer. However, a limited area between the LTP and STP did contain > 20 mg/L nitrate-N which was attributed to tailings seepage, although no impacts from nitrate-N were observed in the Upper or Middle Chinle aquifers (HE 1999). Currently, elevated nitrate-N concentrations still exceed the Site standard to the north of the LTP, and in two wells near the LTP and STP (HMC and HE 2020). However, nitrate-N concentrations are below the Site standard in the remaining alluvial wells. Nitrate-N concentrations are also below the Site standard in the Upper, Middle, and Lower Chinle aquifer except for a small area of the Middle Chinle west of the West Fault (HMC and HE 2020). In oxidizing environments where nitrate-N is stable and not subject to reduction to ammonia-N (NH_3-N) or denitrification to nitrogen gas (N_2), mixing (dilution and dispersion) with downgradient groundwater would be the only plausible mechanisms to reduce groundwater nitrate-N concentrations. However, because the concentrations of nitrate-N in the LTP source are currently below the Site standard (WME, 2020), no future migration to levels above the Site standard is possible, and therefore nitrate-N will remain effectively immobile compared to uranium.

Chloride, Sulfate, and TDS

Chloride, sulfate, and TDS behave relatively conservatively during groundwater transport and are often referred to as "indicator constituents" (USNRC 2003). Chloride concentrations are important in defining tailings seepage due to its conservative transport nature and low upgradient concentrations, although sulfate has been used as the main indicator constituent at the Site due to the elevated concentrations in the LTP solution (HE 1999). In 1998, a significant portion of the alluvial aquifer around the LTP and STP contained chloride exceeding the Site standard, although chloride did not exceed the standard to the west or south of the Site. Similarly, elevated sulfate concentrations above the Site standard only occurred in the immediate vicinity of the LTP and were found to be within the range of natural background. As a result, TDS concentrations in the alluvial aquifer above the current Site standard only existed in the vicinity of the LTP and STP (HE 1999).

Currently, the only areas where chloride and sulfate exceed Site cleanup levels in the alluvial aquifer are in a small area east of the Valle Verde subdivision (that are naturally occurring) and a larger area that is in close proximity to the LTP and STP. TDS is also slightly elevated in a small area to the west of the LTP and between Valle Verde and Broadview Acres (HMC and HE 2020). In the Upper Chinle aquifer, all chloride, sulfate, and TDS concentrations are below the Site standard, except for within the footprint of the LTP. In the Middle Chinle, all chloride concentrations are below the standard, and all sulfate concentrations are less than the standard except for two wells west of the West Fault. All TDS concentrations in the Middle Chinle aquifer are less than the standard, except for one well in Murray Acres and wells located in Broadview and Felice Acres that are above the non-mixing zone background value; there are also two wells west of the West Fault with TDS concentration greater than the mixing zone standard. In the Lower Chinle, all chloride, sulfate, and TDS concentrations are below their standards except in downgradient areas, where natural concentrations exceed the non-mixing zone Site standard. These exceedances are a result of the limited background data for the far downgradient areas of the Lower Chinle aquifer, and there is a naturally occurring deterioration of Lower Chinle water quality in the downgradient direction (HMC and HE 2020).

It is clear that the major extents of groundwater exceedances of the indicator constituents chloride, sulfate, and TDS are confined to the areas immediately adjacent to the LTP and STP. A few small isolated pockets which exceed Site cleanup levels are still present to the west and south of the tailings piles but will ultimately be attenuated by continued mixing with downgradient groundwater.

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In comparison, uranium will likely continue to demonstrate overall greater mobility in the future as demonstrated by its historical farther migration both to the west and south.

4.3.2 Model Software

The numerical groundwater flow model that serves as a basis for the transport model was developed using MODFLOW-USG, a version of the U.S. Geological Survey family of MODFLOW groundwater flow modeling codes (USGS 2013; Panday 2020). MODFLOW-USG includes the Newton-Raphson solution formulation that enables improved unconfined groundwater flow simulations and incorporates code changes that better simulate drying and rewetting, which may occur within the alluvial aquifer in the study area, if substantial water table declines and increases are predicted. The code is based on an underlying control volume finite difference formulation that supports unstructured grids. The unstructured grid format allows grid refinement that is restricted only to the area of interest and can significantly reduce computational demands.

The groundwater transport model simulations were conducted using the USG-Transport version of MODFLOW-USG (Panday 2020). USG-Transport was selected as the transport simulation code because it is incorporated directly within the MODFLOW-USG code and includes compatibility with the handling of model dry cells in the MODFLOW-USG Newton-Raphson formulation. Transport simulations were performed using the total variation diminishing (TVD) approach for advection. The TVD method was selected because it is mass conservative, virtually free of numerical oscillation, and minimizes numerical dispersion (Panday 2020; Zheng and Bennett 2002).

Transport modeling included simulation of dispersion and geochemical attenuation processes through Freundlich non-linear adsorption isotherms, as discussed in the modeling report (Appendix B). Transport modeling also included diffusion-based dual-porosity transport in a portion of the alluvial aquifer in the vicinity of the Site to simulate the potential for uranium and molybdenum to diffuse between relatively permeable sands and gravels (the “mobile” domain) and less permeable silts and clays (the “immobile” domain).

4.3.3 Model Construction

The groundwater flow and transport model encompass the alluvial, Upper Chinle, Middle Chinle, Lower Chinle and SAG aquifers in the immediate area of the Site. The model domain is shown on Figure 4-1, and model layering is shown on Figure 4-2. The model extent or domain was designed to allow representation of alluvial aquifer inflows from the northern portion of the San Mateo Creek Basin, westerly inflows from the Rio San Jose alluvium, and southerly flow directions in the vicinity of the Village of Milan. A prior regional modelling effort demonstrated that alluvial aquifer saturation is largely constrained to the Rio San Jose and San Mateo Creek alluvial systems within the SMC Basin (HMC, 2019)., The domain structure in the SAG aquifer also allows east to southeast regional groundwater flow paths as indicated in literature and by observed groundwater elevations (Baldwin and Anderholm 1992; HMC 2018a).

Using the unstructured grid approach, the model was constructed with larger cell sizes at the active domain margins that gradually decrease towards the Site and migration path of the plume. This approach allowed for simulation of both constituent transport and fluxes from the numerous wells that make up the Site extraction/injection system. Boundary conditions such as recharge, general head boundaries, pumping and injection, the San Mateo Fault splay, storage and the range and distribution of hydraulic conductivity were developed from onsite records, testing and observations. Details of the flow model boundary conditions, hydraulic properties and calibration are discussed in the modeling report (Appendix B). The flow model was calibrated to observed groundwater elevations datasets from

operational years 2002 through 2017. A comparison of simulated and observed groundwater elevation contours for 2017 is shown on Figure 4-3 showing that the flow model is calibrated to observed conditions.

The transport code simulates advection, dispersion. geochemical attenuation through a non-linear sorption analog, and dual-porosity processes. The dual-porosity transport represents the potential for uranium and molybdenum to diffuse between mobile pore space in relatively permeable sands and gravels and immobile pore space in less permeable silts and clays.

Input parameters for the transport model were developed through site-specific geochemical testing and modeling, which are discussed in detail in the modeling report (Appendix B). The transport model was then calibrated to observed concentrations of uranium in the Upper, Middle and Lower Chinle aquifers and molybdenum in the alluvial aquifer, and the Upper and Middle Chinle aquifers for operational years 2007, 2012, 2015 and 2017. Calibration was not performed for molybdenum concentrations in the Lower Chinle aquifer because observed concentrations were below PRGs for operational years 2002 through 2017. Details of the transport model calibration and calibration statistics are presented in the modeling report (Appendix B). Final calibration results for uranium and molybdenum in each of the aquifers for 2017 are shown on Figures 4-4 through 4-10. The figures demonstrate that the contaminant transport model is calibrated to observed conditions.

4.4 Groundwater Modeling of Remedial Alternatives

The calibrated transport model was used to perform predictive simulations for the five remedial alternatives established in the FS and presented in Section 4.2 of this document. Initial head, mobile concentrations and immobile concentrations were based on the final model calibration run. Recharge and tailings seepage were based on modeling of anticipated future conditions, and groundwater input and withdrawal from injection and extraction wells were kept at present levels. Details of these input parameters are discussed in Appendix B.

The predicted nature and extent of uranium and molybdenum for Alternatives 1 and 2 are represented by a single set of models runs, as only natural attenuation processes impact the fate of two metals under both of these alternatives. The results of predictive runs for the alluvial, Upper Chinle, Middle Chinle and Lower Chinle aquifers at Year 200 are presented on Figures 4-11 through 4-18. The results show that uranium and molybdenum concentrations are predicted to exceed ARARs through Year 200. Figures were not included for the SAG because the simulation showed no impact to the aquifer over the 200-year timeframe. Details of the Alternatives 1 and 2 predictive simulations and figures showing the mitigation of the plumes at 10-year increments are presented in the modeling report (Appendix B). The results also show the nature and extent of uranium is predicted to be greater than molybdenum, consistent with observations to date that indicate uranium has the greatest impact of the COPCs/ROPCs at the Site. Therefore, based on these results and the information provided in Section 4.3, transport modeling simulated the nature and extent of uranium only, for active remediation Alternatives 3, 4, and 5 and for model sensitivity runs.

The predicted nature and extent of uranium for Alternative 3 in the alluvial, Upper Chinle, Middle Chinle and Lower Chinle aquifers at Year 200 is shown on Figures 4-19 through 4-22. The results indicate that uranium concentrations are predicted to exceed ARARs in all four aquifers through Year 200. Alternative 3 figures for the SAG were not included because the simulation showed no impact to the aquifer over the 200-year timeframe. The predicted nature and extent of uranium for Alternative 4 in the alluvial, Upper Chinle, Middle Chinle and Lower Chinle aquifers at Year 200 is shown on Figures 4-23 through 4-26. The predicted nature and extent of uranium for Alternative 5 in the alluvial, Upper

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Chinle, Middle Chinle and Lower Chinle aquifers at Year 200 is shown on Figures 4-27 through 4-30. The results indicate that uranium concentrations are predicted to exceed ARARs in all four aquifers through Year 200. Alternative 4 and 5 figures for the SAG were not included because the simulation showed no impact to the aquifer over the 200-year timeframe. Details of the Alternatives 3, 4, and 5 simulations and figures showing the predicted development of the plumes at 10-year increments are presented in the modeling report (Appendix B).

Sensitivity runs were performed to evaluate the overall impact that changes in dual-domain input parameters, aerial recharge, retardation, and mass transfer from the LTP/STP could have on the simulated nature and extent of uranium. Sensitivity to the dual-domain model was evaluated by increasing and decreasing the mass transfer rate coefficient between mobile and immobile phases, and the immobile porosity. Aerial recharge sensitivity was evaluated by increasing and decreasing recharge by 75 percent. Sensitivity to the retardation and LTP/STP mass transfer rate were evaluated by reducing the Freundlich non-linear isotherm by 20 percent; and increasing the mass transfer rate by a factor of 4 to represent the long-term contingency value established in the drain-down model (Hydro-Engineering. 2020). Sensitivity simulations were made using uranium under the Alternatives 1 and 2 for the alluvial aquifer and were compared to the base case. The following figures show the extent of uranium in the alluvial aquifer as that is where the greatest impacts were observed. Simulations showed that changes to the dual-domain mass transfer coefficient and porosity ratio resulted in minor changes to porosity but little change to the overall plume extent (Figures 4-31 through 4-34). The predicted result of reducing the retardation by 20 percent had the greatest effect in that the leading edge of the plume travelled approximately one mile further than the base case over the 200-year period (Figure 4-35). Recharge sensitivity runs also showed moderate changes the extent of uranium at year 200 (Figures 4-36 and 4-37), while increasing the mass transfer rate from the LTP/STP resulted in concentration contours very similar to the base case (Figure 4-38). As was the case for predictive runs, sensitivity runs did not show impact to the SAG. These sensitivity runs show the model in general provides conservatively large simulations of the extent of uranium and molybdenum for predictive runs of natural attenuation-based Alternatives 1 and 2, and therefore the extent of uranium for predictive runs of active remedial Alternatives 3, 4, and 5.

The modeling results show it is technically infeasible to restore the COPC/ROPCs to ARARS within a reasonable timeframe for all five remedial alternatives. Groundwater remediation would have to occur for as long as the primary and secondary source terms transfer COPC/ROPCs to the alluvial aquifer estimated to be over 360 years based on a first-order decay analysis for molybdenum. Modeling simulations of Alternatives 1 through 5 show uranium would be transported roughly 2 miles (Alternatives 1 & 2) from the LTP/STP over 200 years. These simulations show Alternatives 3, 4, and 5 are technically impracticable as COPCs/ROPCs would still be transported over 1.8 miles over 200 years while operating the current groundwater remedy for 36 additional years (Alt 3), COPCs/ROPCs would still be transported over 2 miles over 200 years while operating the current remedy for 18 years and then installing a PRB (Alternative 4), or COPCs/ROPCs would still be transported over 1.3 miles over 200 years while operating the current remedy for 50 years (Alternative 5). The conservative model simulations are used to identifying potential receptors.

4.5 Potential Receptors

An exposure pathway consists of:

- A source (e.g., LTP) and mechanism of constituent release from source;

- A transport medium (e.g., groundwater) for the constituent;
- A point of contact (e.g., drinking water) between the human receptor and the medium; and
- A route of exposure (e.g., ingestion) for the potential human receptor at the contact point.

An exposure pathway is considered complete only if all four components are present.

Potential receptors have been identified as human populations that are potentially subject to contaminant exposure. Both current and future land and water use conditions are considered when determining exposure scenarios. The current land use surrounding the Site consists of commercial and residential uses and is expected to remain the same in the future. Therefore, the potential groundwater receptors have been identified as current/future on-Site worker and current/future adult and child resident. The exposure pathway between groundwater containing COPCs/ROPCs above ARARS and current/future on-Site worker has been disconnected as bottled water is used for drinking and potable water from a SAG well is used for other domestic and sanitary uses. Groundwater may be used as a potable water source by current/future adult and child resident. A current/future adult and child resident's exposure to groundwater contaminants is via ingestion, dermal contact, and shower inhalation. Direct groundwater exposure pathways to ecological receptors were determined to be incomplete as groundwater does not discharge to surface water at the Site.

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5 Applicable or Relevant and Appropriate Requirements

A discussion of ARARs that would require a waiver and the rationale behind the request for an ARAR waiver is presented below. All of the chemicals listed in these acts and regulations would be waived consistent with the TI waiver approach at other CERCLA sites (EPA, 2012). Waiving all of the ARARs is further supported by the fact that all of the COPCs/ROPCs originate from one primary source, the LTP/STP and waiving some of the ARARs but not all of the ARARs would not reduce the human health risk as the nature, extent, and mobility of uranium is the human health risk driver. Therefore, remediating selective COPCs/ROPCs would not reduce the human health risk.

5.1 Safe Drinking Water Act (40 CFR 141/40 CFR 192)

40 CFR 141: Maximum Contaminant Levels (MCLs) and non-zero Maximum Contaminant Level Goals (MCLGs) established under the Safe Drinking Water Act are chemical-specific requirements for the contaminants present in the groundwater. Since the alluvial, Chinle, and SAG aquifers are used as a potable water supply, MCLs and MCLGs are considered to be relevant and appropriate requirements. These requirements will not be met within the groundwater impacts since restoration of the aquifer such that it meets ARARs, allowing use as a potable water supply without treatment at the wellhead, is not practicable due to:

- The long-term release of COPCs/ROPCs to groundwater from the LTP/STP (primary source term),
- The complex heterogeneous nature of the alluvium;
- The anisotropic nature of groundwater flow in the alluvium; and
- The long-term release of COPCs/ROPCs from the vadose and silt and clay beneath the LTP/STP (secondary source term).

40 CFR 192: This regulation sets standards for the protection of public health, safety and the environment from radiological and non-radiological hazards associated with uranium and thorium ore processing, and disposal of associated wastes. A waiver of these standards will be required for the same reasons listed above.

5.2 New Mexico Water Quality Act (Ground and Surface Water Protection) § 20.6.2.3103 NMAC and § 20.6.2.4103(A)-(D) NMAC — Abatement Standards and Requirements

The New Mexico Water Quality Act (Ground and Surface Water Protection) § 20.6.2.3103 NMAC and § 20.6.2.4103(A)-(D) NMAC — Abatement Standards and Requirements set the requirements for drinking water quality in the State of New Mexico. By rule, these requirements are as stringent, or more stringent, than those promulgated by the federal Safe Drinking Water Act. A waiver of the New Mexico Water Quality Act will also be required for the same reasons listed above.

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6 Justification for Technical Impracticability

A Technical Impracticability Waiver of specific ARARs at a Superfund site is appropriate for groundwater when it is technically infeasible to restore groundwater to the ARARs within a reasonable timeframe. The following sections outline the rationale for why groundwater cannot be remediated in a reasonable timeframe.

There are significant Site-specific factors that render remedial technologies to achieve groundwater ARARs at this Site technically infeasible. These include an inability to remediate the primary source (LTP/STP) and secondary sources (vadose and silt/clay in alluvial aquifer beneath the LTP) of COPCs/ROPCs and an inability to remediate groundwater in a reasonable time frame and compliance with such ARARs would be inordinately costly.

The primary source of COPCs/ROPCs is the LTP/STP. However, significant COPCs/ROPCs have leached from the LTP/STP to the vadose and silt/clay portion of the alluvial aquifer underlying the LTP/STP. Engineered covers were installed on the LTP/STP in the mid-1990s. It is estimated that the LTP contains 21,000,000 tons of tailings, making it impracticable to remove.

It is impracticable to move the LTP for the following reasons (TetraTech, 2012):

- Cost Prohibitive: The estimated costs range from $1.8 billion (truck transport) to over $2 billion (rail and slurry pipeline transport).
- Additional Risk to Human Health: The potential risk to human health risk is significant. The increased cancer risk to workers involved with tailings excavation and placement is 1 in 10. The increased cancer risk to nearby residents is approx. 1 in 100 based on exposure to radioactive material.
- Potential Ecological Damage: Relocating tailings would require extensive amount of land that will be irretrievable committed for perpetuity as a disposal cell. Removal of habitat will potentially affect native wildlife and vegetation.
- Potential Damage to Cultural Resources: Relocating tailings could negatively affect the large number of cultural resources in the area including federal and state parks and native American lands.
- Potential Impacts from Increased Truck Traffic: Truck traffic to move tailings would be large and noticeable. This would include additional noise impacts, negative air quality, and potential for accidents and accidental releases. The potential impacts are not as great with rail, but increased activity would impact community and increase potential for traffic accidents and accidental releases.
- Potential Regulatory Challenges: Siting studies, public hearings, and environmental reports and preconstruction monitoring has been estimated to take up to 7 years. The construction of cell has been estimated to take up to 3 years and it has been estimated to take up to 2 years to move the LTP
- Carbon Footprints: Offsite disposal would require greater use of consumable materials and fossil fuel and result in greater greenhouse emissions.
- Potential Impact to Community: Construction at new site would result in negative noise and vibration impacts to residents and wildlife.

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Engineered covers were installed on the LTP/STP in the mid-1990s. It is impracticable to remediate COPCs/ROPCs in the vadose and the alluvium silt/clay beneath the LTP/STP, which would be continued sources even if the LTP/STP were removed, as the COPCs/ROPCs have adsorbed to the unsaturated soil and diffused into the pore-water in the silt/clay. Therefore, it is technically impracticable to remediate the sources of COPCs/ROPCs.

Active groundwater remediation has been implemented for over 40 years. Going forward, groundwater remediation would have to occur for as long as COPCs/ROPCs are transferred from the primary and secondary sources to groundwater causing groundwater to contain COPCs/ROPCs at concentrations greater than the ARARS. Empirical data (1st Order Decay analysis) show active groundwater remediation would have to occur for centuries (Uranium = 210 years and Molybdenum = 360 years) demonstrating it is technically infeasible to restore groundwater to the ARARs within a reasonable timeframe.

The technical impracticability of groundwater remediation was also assessed during the Remedial/Investigation/Feasibility Study (RI/FS). Potentially applicable technology types and process options were reviewed by screening the technologies and process options with respect to technical feasibility. This was accomplished by using Site-specific information regarding geology, and contaminant concentrations and distribution, as well as pilot studies that have been conducted by HMC. The major factors that influence the technical feasibility of remedial technologies are the duration of the source(s) remediation, hydrogeologic complexity, and aquifer heterogeneity. Based on this screening, remedial technologies were retained or not retained for further consideration. The retained remedial technologies and process options were evaluated and potentially combined to develop a range of remedial alternatives.

Five remedial alternatives were evaluated:

- Remedial Alternative 1: No Action;
- Remedial Alternative 2: Long-Term Monitoring and Institutional Controls;
- Remedial Alternative 3: Groundwater Containment and Removal;
- Remedial Alternative 4 Groundwater Containment and Removal and In Situ Treatment; and
- Remedial Alternative 5: Groundwater Restoration via Containment and Removal

These remedial alternatives were simulated using a groundwater flow and solute transport model and evaluated using the nine CERCLA criteria. The results show that there are no technically feasible remedial technologies capable of remediating groundwater in the alluvial, Upper Chinle, and Middle Chinle aquifers in a reasonable timeframe. All remedial technologies will have to treat groundwater for at least the length of time COPCs/ROPCs are transferred from the primary and secondary sources to groundwater that has been estimated to be over 360 years based on the molybdenum first-order decay analysis. Therefore, Remedial Alternative 3, which is a pump and treat groundwater remediation system, would have to operate for over 200 years, and PRBs in Remedial Alternative 4 would have to be replaced multiple times to achieve the ARARs in 200 years. This evaluation shows it is impracticable to successfully remediate groundwater within a reasonable timeframe. Therefore, since COPCs/ROPCs do not pose a risk to human health and environment with the fulfilment of ICs described in Section 8 of this document, the ARARs should be waived.

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7 TI Zone

The RI established the presence of several metals, radionuclides and inorganic anions in the alluvial aquifer and the upper, middle and lower aquifers of the Chinle Formation in excess of ARARs. The list of these substances includes uranium, molybdenum, selenium, vanadium, radium 226/228, thorium 230, sulfate and nitrate. The RI and other documents prepared for the Site have demonstrated that uranium has had the greatest impact on these aquifers, both in terms of concentration and aerial extent. Predictive contaminant transport modeling has established the aerial extent and depth to which these substances are expected to migrate over the next 200 years. Therefore, while the TI Waiver includes all of the metals, radionuclides and anions that exceed ARARs, the proposed TI zone is based on the substance with the greatest observed and predicted range: uranium.

7.1 Horizontal Extent

The proposed horizontal extent of the TI zone is shown on Figure 7-1. The TI Zone encompasses the extent to which the most mobile contaminant, uranium, is expected to migrate over the next 200 years. A TI Zone that is protective beyond all reasonable estimates was established using the extent of uranium simulated with a recharge value increased by 75 percent and a retardation value decreased by 20 percent. These worst-case results were used along with a 200-year simulation to establish the TI Zone. The TI zone is also within the New Mexico OSE Alluvial Aquifer Well Prohibition Boundary and the portion of the New Mexico OSE Chinle Aquifer Well Prohibition Area that encompasses the predicted extent of the uranium plume in the three Chinle aquifers (Figure 7-1). Therefore, the horizontal extent of the TI zone represents an area that can potentially be impacted by any of the COPCs/ROPCs that exceed ARARs in the alluvial, Upper Chinle, Middle Chinle and Lower Chinle aquifers over the next 200 years.

7.2 Vertical Extent

The proposed vertical extent of the TI zone is shown conceptually on Figures 7-2 through 7-6. The vertical extent is based on the depth to which uranium is predicted to migrate over the next 200 years in the deepest impacted aquifer, the Lower Chinle aquifer.

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8 Protectiveness

Finally, the primary objective of any remedial strategy is overall protectiveness. Exposure control or protectiveness will be achieved with a series of actions, land use controls, and institutional controls, including deed restrictions, property acquisition, alternative water supply, well abandonment, and point of use treatment, if necessary.

Human Heath protectiveness and exposure control will be provided by completing the following:

- HMC will attempt to buy all property within TI Zone, including homes;
- Properties purchased by HMC will have their wells abandoned;
- Properties not purchased by HMC where people live will be contacted to connect the home to a municipal water supply located outside of the TI Zone and their wells will be abandoned;
- Properties not purchased by HMC but refusing to be connected to municipal water supply will be offered point of use water treatment;
- HMC will attempt to place water use restrictions/restrictive covenants on all deeds within the TI Zone; and
- NM OSE Alluvial Aquifer and Chinle Aquifer Well Prohibition Boundaries was established by State of NM to prevent future groundwater use.

Environmental protectiveness and exposure control:

- Due to the hydrogeologic conditions within the TI Zone as presented herein and the RI Report, groundwater does not discharge to surface water within the TI Zone; therefore, there are no potential future exposures to the environment from groundwater.

The TI Waiver approach described herein will satisfy the threshold remedy selection criteria for protection of human health with the use of permanent solutions to the maximum extent practicable.

ED_006200_00000042-00063

9 References

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Message

From: Purcell, Mark [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=FE198E260B024EB4BD9D30DC11F900B1-PURCELL, MARK]
Sent: 6/15/2021 8:50:52 PM
To: Kurt Vollbrecht (kurt.vollbrecht@state.nm.us) [kurt.vollbrecht@state.nm.us]; Winton, Ashlynne, NMENV [Ashlynne.Winton@state.nm.us]; Longmire, Patrick, NMENV [patrick.longmire@state.nm.us]; Maurer, Anne, NMENV [Anne.Maurer@state.nm.us]
Subject: FW: Homestake NRRB Recommendations
Attachments: Homestake NRRB Recommendations Final.pdf

NRRB Final Recommendations for Homestake NPL Site

From: Poore, Christine <Poore.Christine@epa.gov>
Sent: Tuesday, June 15, 2021 3:49 PM
To: Stenger, Wren <stenger.wren@epa.gov>; Douchand, Larry <Douchand.Larry@epa.gov>
Cc: Stalcup, Dana <Stalcup.Dana@epa.gov>; Lowery, Brigid <Lowery.Brigid@epa.gov>; Fitz-James, Schatzi <Fitz-James.Schatzi@epa.gov>; Meyer, John <Meyer.John@epa.gov>; Atkins, Blake <Atkins.Blake@epa.gov>; Purcell, Mark <purcell.mark@epa.gov>; Villarreal, Chris <villarreal.chris@epa.gov>; Luzecky, Hollis <Luzecky.Hollis@epa.gov>; McKernan, John <McKernan.John@epa.gov>; Openchowski, Charles <openchowski.charles@epa.gov>; Mahmud, Shahid <Mahmud.Shahid@epa.gov>; Wharton, Steve <Wharton.Steve@epa.gov>; Wilson, Karl <Wilson.Karl@epa.gov>; Walker, Stuart <Walker.Stuart@epa.gov>; Richards, Jon M. <Richards.Jon@epa.gov>; Bartenfelder, David <Bartenfelder.David@epa.gov>; Juett, Lynn <Juett.Lynn@epa.gov>; Gartner, Lois <Gartner.Lois@epa.gov>
Subject: Homestake NRRB Recommendations

Dear Wren and Larry,

On behalf of the National Remedy Review Board (NRRB), attached are Board Review Teams' recommendations from the review of the Homestake Superfund Site Feasibility Scoping Meeting.

The review meeting, held March 25-26, 2021, addressed the site characterization, background, remedial action objectives, preliminary remediation goals, and remedial alternatives for the tailings piles and groundwater. We greatly appreciate the dedication, time, and resources the Region put into developing the site materials, information package, and presentations.

The Board Review Team looks forward to the Region's responses to the recommendations and engaging further when the site reaches the Detailed Alternatives Analysis stage. If you, or anyone on the team, have any questions, please don't hesitate to call or email. Thank you for the opportunity to engage with the Regional Site Team on Homestake Mine.

Thank you,
Christine Poore

Message

From: Purcell, Mark [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=FE198E260B024EB4BD9D30DC11F900B1-PURCELL, MARK]
Sent: 1/7/2021 3:13:46 PM
To: Linton, Ron [Ron.Linton@nrc.gov]; Alexander, George [george.alexander@nrc.gov]; Von Till, Bill [Bill.VonTill@nrc.gov]; Tsosie, Bernadette [Bernadette.Tsosie@lm.doe.gov]; Lancaster, Thomas [Thomas.Lancaster@nrc.gov]; Kuhlman, Alison (CONTR) [Alison.Kuhlman@lm.doe.gov]; Evans, Robert (Robert.Evans@nrc.gov) [Robert.Evans@nrc.gov]; Morse, Mike (CONTR) [Mike.Morse@lm.doe.gov]; Rheubottom, Amber, NMENV [Amber.Rheubottom@state.nm.us]; Winton, Ashlynne, NMENV [ashlynne.winton@state.nm.us]; Kurt Vollbrecht (kurt.vollbrecht@state.nm.us) [kurt.vollbrecht@state.nm.us]; Maurer, Anne, NMENV [Anne.Maurer@state.nm.us]; Burrus, Christopher, OSE [Christopher.Burrus@state.nm.us]
Subject: Draft TI Evaluation Report (Text)
Attachments: 20201115 GRP RIFS DRAFT TI Waiver Evaluation Text.pdf

All,

I will be sending you the links to the Homestake NPL Site preliminary draft TI Evaluation Report (figures, appendices, etc.) via EPA's One Drive. Please let me know when you receive them. EPA does not consider these preliminary draft documents to be releasable to the public at this time.

The text of report is attached since the file was small enough to email.

Some of the folks at NMED may already have this draft.

Mark

Mark D. Purcell
Superfund and Emergency Management Division (6SF)
U.S. Environmental Protection Agency - Region 6
1201 Elm Street, Suite 500
Dallas, TX 75270
Tel: 214-665-6707
Fax: 214-665-6660

Message

From: Purcell, Mark [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=FE198E260B024EB4BD9D30DC11F900B1-PURCELL, MARK]
Sent: 6/15/2021 9:01:58 PM
To: Weece, Adam [weece.adam@epa.gov]
CC: Atkins, Blake [atkins.blake@epa.gov]
Subject: FW: Homestake NRRB Recommendations
Attachments: Homestake NRRB Recommendations Final.pdf

Hi Adam,

We have received the final National Remedy Review Board recommendations from the Board Chairperson, Christine Poore. Please forward them to Susan Gordon, MASE.

Thanks,

Mark

Mark Purcell
Superfund and Emergency Management Division (6SED)
U.S. Environmental Protection Agency – Region 6
1201 Elm Street, Suite 500
Dallas, TX 75270
Office Tel: 214-665-6707
Work Cell: 469-553-7211
Fax: 214-665-6660

From: Poore, Christine <Poore.Christine@epa.gov>
Sent: Tuesday, June 15, 2021 3:49 PM
To: Stenger, Wren <stenger.wren@epa.gov>; Douchand, Larry <Douchand.Larry@epa.gov>
Cc: Stalcup, Dana <Stalcup.Dana@epa.gov>; Lowery, Brigid <Lowery.Brigid@epa.gov>; Fitz-James, Schatzi <Fitz-James.Schatzi@epa.gov>; Meyer, John <Meyer.John@epa.gov>; Atkins, Blake <Atkins.Blake@epa.gov>; Purcell, Mark <purcell.mark@epa.gov>; Villarreal, Chris <villarreal.chris@epa.gov>; Luzecky, Hollis <Luzecky.Hollis@epa.gov>; McKernan, John <McKernan.John@epa.gov>; Openchowski, Charles <openchowski.charles@epa.gov>; Mahmud, Shahid <Mahmud.Shahid@epa.gov>; Wharton, Steve <Wharton.Steve@epa.gov>; Wilson, Karl <Wilson.Karl@epa.gov>; Walker, Stuart <Walker.Stuart@epa.gov>; Richards, Jon M. <Richards.Jon@epa.gov>; Bartenfelder, David <Bartenfelder.David@epa.gov>; Juett, Lynn <Juett.Lynn@epa.gov>; Gartner, Lois <Gartner.Lois@epa.gov>
Subject: Homestake NRRB Recommendations

Dear Wren and Larry,

On behalf of the National Remedy Review Board (NRRB), attached are Board Review Teams' recommendations from the review of the Homestake Superfund Site Feasibility Scoping Meeting.

The review meeting, held March 25-26, 2021, addressed the site characterization, background, remedial action objectives, preliminary remediation goals, and remedial alternatives for the tailings piles and groundwater. We greatly appreciate the dedication, time, and resources the Region put into developing the site materials, information package, and presentations.

The Board Review Team looks forward to the Region's responses to the recommendations and engaging further when the site reaches the Detailed Alternatives Analysis stage. If you, or anyone on the team, have any questions, please don't hesitate to call or email. Thank you for the opportunity to engage with the Regional Site Team on Homestake Mine.

Thank you,
Christine Poore

Message

From: Purcell, Mark [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=FE198E260B024EB4BD9D30DC11F900B1-PURCELL, MARK]
Sent: 6/15/2021 9:06:03 PM
To: Linton, Ron [Ron.Linton@nrc.gov]; Tsosie, Bernadette [Bernadette.Tsosie@lm.doe.gov]
Subject: FW: Homestake NRRB Recommendations
Attachments: Homestake NRRB Recommendations Final.pdf

Hi Ron, Bernadette,

Attached are the EPA National Remedy Review Board recommendations on the Homestake NPL Site Feasibility Study.

These are considered releasable to the public.

Mark

Mark Purcell
Superfund and Emergency Management Division (6SED)
U.S. Environmental Protection Agency – Region 6
1201 Elm Street, Suite 500
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Office Tel: 214-665-6707
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Message

From: Purcell, Mark [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=FE198E260B024EB4BD9D30DC11F900B1-PURCELL, MARK]
Sent: 6/15/2021 9:11:31 PM
To: Daniel Lattin [dlattin@barrick.com]
Subject: FW: Homestake NRRB Recommendations
Attachments: Homestake NRRB Recommendations Final.pdf

Hi Daniel,

Attached are the EPA National Remedy Review Board recommendations on the Homestake NPL Site Feasibility Study. We are providing these recommendations to all stakeholders that participated in the March 2021 NRRB meeting, as well as the NRC and DOE. We will also make them available to the public for review via EPA's site webpage.

Once Region 6 has an opportunity to review and assess the significance of these recommendations, we would like to schedule a meeting to discuss.

Mark

Mark Purcell
Superfund and Emergency Management Division (6SED)
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1201 Elm Street, Suite 500
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Office Tel: 214-665-6707
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Message

From: Purcell, Mark [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=FE198E260B024EB4BD9D30DC11F900B1-PURCELL, MARK]
Sent: 3/8/2021 12:12:28 AM
To: Khoury, Ghassan [Khoury.Ghassan@epa.gov]; Turner, Philip [Turner.Philip@epa.gov]
Subject: FW: Slides for todays FS Presentation - Homestake NPL Site
Attachments: 20210302 Homestake Superfund Site - Draft Feasibility Study Presentation.pdf

As discussed.

From: Daniel Lattin <dlattin@barrick.com>
Sent: Tuesday, March 2, 2021 6:15 PM
To: Purcell, Mark <purcell.mark@epa.gov>
Cc: Vollbrecht, Kurt, NMENV <kurt.vollbrecht@state.nm.us>; Linton, Ron <ron.linton@nrc.gov>; Tsosie, Bernadette <Bernadette.Tsosie@lm.doe.gov>; Longmire, Patrick, NMENV <patrick.longmire@state.nm.us>; Adam Arguello <aarguello@barrick.com>; Daniel St Germain (Daniel.StGermain@hdrinc.com) <Daniel.StGermain@hdrinc.com>; Brad Bingham <bbingham@barrick.com>; Kevin Murray (krmurray@hollandhart.com) <krmurray@hollandhart.com>
Subject: RE: Slides for todays FS Presentation - Homestake NPL Site

Good Evening Mark,

Please see attached presentation as requested. Kindly acknowledge receipt to confirm successful email submission.

Thank you,

BARRICK

www.barrick.com

Daniel Lattin, P.E.
Sr. Closure Program Manager
Barrick Gold of North America, Inc.

Tel: (775) 748-1022
Mobile: (775) 397-7215

From: Purcell, Mark <purcell.mark@epa.gov>
Sent: Tuesday, March 2, 2021 2:02 PM
To: Daniel Lattin <dlattin@barrick.com>
Cc: Vollbrecht, Kurt, NMENV <kurt.vollbrecht@state.nm.us>; Linton, Ron <ron.linton@nrc.gov>; Tsosie, Bernadette <Bernadette.Tsosie@lm.doe.gov>; Longmire, Patrick, NMENV <patrick.longmire@state.nm.us>
Subject: EXT: Slides for todays FS Presentation - Homestake NPL Site

Hi Daniel,

Any chance we can get a copy of the slides used in the presentation today? That would be really helpful.

Thanks.

And thanks again for the presentation. Your team did a great job. I think Pat Longmire appreciated Dan Levy on the call as well.

Mark

Mark D. Purcell

Superfund and Emergency Management Division
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Message

From: Purcell, Mark [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=FE198E260B024EB4BD9D30DC11F900B1-PURCELL, MARK]
Sent: 6/4/2021 8:35:15 PM
To: Linton, Ron [Ron.Linton@nrc.gov]; Tsosie, Bernadette [Bernadette.Tsosie@lm.doe.gov]
Subject: Stakeholder Written Statements - EPA National Remedy Review Board Meeting - Homestake NPL Site
Attachments: 2021-03-09_Acoma Homestake Comment.pdf; 21.03.10 MASE memo to EPA NRRB.pdf; Maest_NRRB.written.submittal.for.BVDA_10Mar2020.pdf; 20210310 Homestake Written Statement to NRRB.pdf; Homestake Superfund Site Letter.pdf

Hi Ron, Bernadette,

I have attached the written statements from Acoma Pueblo, Laguna Pueblo, BVDA/MASE, and Homestake that went to the National Remedy Review Board. I have not included NMED's statements as they have already been provided to you.

I will provide slide presentations in a separate email.

These are releasable to the public.

Mark

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Written Comment of the Pueblo of Acoma
Before the
National Remedy Review Board

Meeting on
Homestake Mining Company Superfund Site – Technical Impracticability Waiver Request

March 25, 2021

The Pueblo of Acoma ("Pueblo" or "Acoma") is pleased to provide these written comments for the record of the National Remedy Review Board for its meeting on the Homestake Mining Company Superfund Site – Technical Impracticability Waiver on March 25, 2021.

Acoma remains deeply concerned about the continued impact of contamination from the Homestake Mining Company on the Pueblo of Acoma, our people, and our water. A complete Technical Impracticability ("TI") Waiver is inappropriate. Remediation of the primary source contaminants and the groundwater must be required. Removal of contamination close to the tailings will reduce the long-term impact to the basin, even if the farthest reaches of the contaminants plume cannot be removed for centuries. At a minimum, any TI Waiver must provide for maintenance of the hydraulic barrier. If not, what will prevent contamination of the SAGA?

Acoma supports the selection of alternatives that will continue to remediate available groundwater. The agency's Guidance for Evaluating the Technical Impracticability of Ground-Water Restoration, United States Environmental Protection Agency at page 19 (Sep. 1993) makes it clear that cost should not automatically determine technical impracticability ("relatively high restoration costs may be appropriate in certain cases, depending on the nature of the contamination problem and considerations such as the current and likely future use of ground water."). Meeting the United States' trust responsibility to replace a water supply for tribal nations is a paramount future use that must be given appropriately great weight.

Acoma urges the National Remedy Review Board to consider these comments in its determination.

I. Acoma Background & History in the Rio San Jose Basin

The Pueblo of Acoma is one of, if not, the longest continually inhabited community in the United States. Prior to the arrival of the Spaniards in the first half of the 16th Century, the Pueblo of

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Acoma had long been in existence. The Acoma Culture Province encompasses most, if not all, of the Rio San Jose Basin.[1] The people of Acoma cultivated lands, raised crops, developed irrigation systems, maintained livestock and generally used the waters of the Rio San Jose and its tributaries long before the arrival of European settlers. Thus, from "time immemorial," the Acoma people cared for the land and used its water, and continue to do so, for their livelihood.

Acoma lies within the Rio San Jose Basin. Today the Rio San Jose Basin includes the surface flows and groundwater of the Rio San Jose, and the Bluewater Groundwater Basin.[2] In a natural state, the Rio San Jose gains flows from groundwater at certain places and loses flow to the underlying aquifers in different places. Acoma has historically relied on surface and alluvial ground water in the Basin. Wells tapping alluvial groundwater were mentioned in reports of Coronado's first visit to Acoma in the 1540s. Two of the most important sources of water for the Pueblo of Acoma as of 1848 were (1) the Ojo Del Gallo spring[3] and (2) Bluewater Creek, a major tributary of the Rio San Jose that collects water from the Zuni Mountains. About two-thirds or more of the original, pre-European contact supply for the Pueblos was derived from these two sources.[4] Springs, summer rain and melting Mount Taylor snowpack provide the remaining water supply to Acoma.

II. San Andres-Glorieta Aquifer

The San Andres-Glorieta aquifer is an important aquifer in the Rio San Jose Basin. It reaches the surface at the Ojo Del Gallo spring located near the community of San Rafael and in certain reaches of Bluewater Creek. [5] It also contributes to the alluvial aquifer of the Rio San Jose just north of the Ojo Del Gallo and west of Horace Springs on the western boundary of Acoma's federally recognized land grant.

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[1] Ruppé, Reynold J. (Jr.) "The Acoma Culture Province: An Archaeological Concept (1990), Page8, Figure 2. Dr. Ruppé

[2] In 1956, the State Engineer of New Mexico declared the Bluewater Underground Basin which underlies the western Rio San Jose Basin. Thus, references to groundwater in the Bluewater Basin refer to groundwater within the larger Rio San Jose Basin.

[3] *See* William D. White, Hydrological and Environmental Indicators of a Dewatered Wetland: Ojo Del Gallo, San Rafael, New Mexico, 1989, 337-338. ("A fault-controlled spring, the Ojo Del Gallo, issues from the Permian San Andres Limestone on the eastern toe of the Zuni Mountains, immediately north of the village of San Rafael, New Mexico. The spring is a surface expression of the groundwater flow system that now provides the water supply for the upstream communities of Bluewater, Milan and Grants, and supported the uranium industry during its heyday.")

[4] *Id.* The United States Geological Survey has estimated the unimpeded natural flow in the Rio San Jose to be 12,000 to 14,000 ACRE-FEET PER YEAR at the western boundary of the Pueblo of Acoma. These annual natural flows were made up of about 5,000 ACRE-FEET PER YEAR of overland stream flow, primarily from Bluewater Creek; 3,000 to 5,000 ACRE-FEET PER YEAR of steady spring flow from Ojo Del Gallo; 3,600 ACRE-FEET PER YEAR from Horace Spring, etc. The State of New Mexico has estimated it to be up to 17,000 ACRE-FEET PER YEAR. Additional springs on Acoma lands east of the western boundary increase the unimpeded natural flow through Acoma towards Laguna Pueblo. Thereafter additional springs on Laguna Pueblo and on non-Pueblo lands contribute to surface flows across Laguna (citing Risser, Dennis W., Natural Streamflow in the Rio San Jose Upstream from the Pueblos of Acoma and Laguna, New Mexico, USGS, Water Resources Investigation, No. 82-4096, 1982 and Petronis, Laura, Estimated Natural Streamflow at the Western Boundary of the Acoma Pueblo and Western Boundary and Northern Areas of the Laguna Pueblo in the Rio San Jose Basin, New Mexico (2008)).

[5] Affidavit of William P. Balleau, Hydrologist, Branch of Rights Protections, Albuquerque Area Office of the BIA, March 13, 1985.

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Studies demonstrate that the groundwater and surface water systems in this basin are interrelated and that the effects of changes in groundwater pumping or surface diversions can be seen throughout the basin. Due to the high transmissivity of the San Andres-Glorieta aquifer, the flow of water at Ojo Del Gallo and Bluewater Creek is very sensitive to groundwater pumping in the Basin.[6]

The conclusion that groundwater pumping in the 20th century caused Ojo Del Gallo to go dry is widely accepted by regional hydrologists.[7] As a result of agricultural development in the 1930's and 1940's, and the uranium industry in the 1950's - 1970's, the spring's discharge declined from a virgin flow condition of approximately 7 cubic feet per second to zero discharge in 1953. "Ground water development, originally for agricultural purposes followed by the uranium industry, reduced the pressure head on the San Andres Limestone to a point below the ground surface elevation of Ojo Del Gallo by the year 1953."[8] After the collapse of the uranium mining industry, the spring returned briefly in the early 1980's only to go dry again once industrial uses increased, including attempts to remediate contamination of land and water by the uranium mining and milling companies.

A subcrop of the alluvium overlies the San Andres-Glorieta aquifer limestone near the Homestake Site.[9] Despite the Chinle Shale underlying the alluvium at the Homestake site, to the west of the Homestake Site shallower portions of the San Andres-Glorieta aquifer with a much thinner section of the Chinle Formation establish that a "... good connection between the alluvial and San Andres aquifers may exist even when a few tens of feet of Chinle Formation exist."[10]

III. Uranium Mining & Homestake-Barrick Mine

The uranium mining and milling industry in areas upstream from the Pueblo of Acoma, further diminished Acoma's water supply for the following reasons. (1) Uranium mining required substantial groundwater use, depleting groundwater that would have supplied springs on and around Mount Taylor and tributary runoff that supplemented the Rio San Jose surface flows and which fed tributaries to the Rio San Jose; (2) the cleanup of contamination from uranium mines

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[6] Affidavit of William P. Balleau, hydrologist at the Branch of Rights Protections, Albuquerque Area Office of the BIA, March 13, 1985. ("The San Andres-Glorieta aquifer in its natural equilibrium state was recharged by surface streams by approximately 5,000 ACRE-FEET PER YEAR near the mouth of Bluewater Creek and approximately 5,000 ACRE-FEET PER YEAR were correspondingly discharged at Ojo Del Gallo. High rates of groundwater pumping in the 1940's through 1970's cause the groundwater levels in the aquifer to decrease and cause Ojo Del Gallo to cease flowing. That intensive pumping also decreased natural discharge from the aquifer into Bluewater creek and induced additional recharge to the aquifer from Bluewater Creek, thus causing reduced surface flow in the Rio San Jose and largely preventing Bluewater Creek surface water from reaching the western boundary of the Pueblo of Acoma.")

[7] William P. Balleau, Bluewater Basin Withdrawals and Sources of Water, Bureau of Indian Affairs, Albuquerque Area Office, Branch of Rights Protection, March 1984, 1-4.

[8] *See* William D. White, Hydrological and Environmental Indicators of a Dewatered Wetland: Ojo Del Gallo, San Rafael, New Mexico, 1989, 337-338.

[9] *See* Draft Technical Impracticability Evaluation, Homestake Mining Company Superfund Site Operable Unit #1 – Groundwater Remediation, Cibola County, New Mexico (Nov. 2020) (Figures 2-16 and 2-17); *See also*, *Id.* at Figure 7-6 (Vertical extent of TI Zone_Cross Section D-D).

[10] Homestake Mining Company of California, Ground-Water Hydrology, Restoration and Monitoring at the Grants Reclamation Project for NMED Offsite DP (Feb. 2010), 6-1.

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and mills to this day requires substantial groundwater use; and (3) population growth, settlement and the agricultural and real estate development associated with the growth of the uranium industry in the Grants/Acoma region led to substantial groundwater use. Thus, for a number of decades, withdrawals from the Basin for these uses have far exceeded the recharge to the groundwater aquifers, effectively creating the situation where the aquifers are being mined for water.[11]

Uranium mining and milling in New Mexico impacted all constituents of the environment, including soils stream sediments, surface water and groundwater.[12] There were at least four mills for creating yellowcake near Grants in the Rio San Jose Basin: Bluewater Disposal, now known as the ARCO site northwest of Grants, Rio Algom (formerly Kerr-McGee and Quivera) and Phillips-United Nuclear Corporation in the Ambrosia Lake area and Homestake- Barrick, the subject of these comments, a short distance north of Grants and located on a major tributary of the Rio San Jose, San Mateo Creek. Decades of collective uranium milling activity in the Grants/Acoma area caused region-wide groundwater contamination in alluvial and other shallow aquifers.[13] Cleanup of contamination has used, and continues to use, extensive water resources, with significant depletion of water resources.

Homestake-Barrick Mining Company ("HMC"), licensed by the Atomic Energy Commission, operated two uranium mills from approximately 1958-1990. During operations, approximately 22 million tons of ore were milled at the site, using a conventional alkaline leach process.[14] This milling activity caused widespread groundwater use and contamination contained in alluvial and nearby aquifers. The mill site was declared a Superfund Site by the U.S. Environmental Protection Agency ("EPA") and has been in reclamation since 1990, following the demolition of the mill.

Cleanup of the Homestake site continues to use extensive water resources and has not been wholly successful.[15] "The contaminant plume has receded back almost three-quarters of a mile into the site boundaries of HMC by injecting fresh water down gradient of the site. Nearly 4.5 billion gallons of contaminated water have been removed and 540 million gallons of treated

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[11] While "mining" of groundwater in aquifers that are not associated with alluvial and surface flows, and therefore have minimal recharge, may be acceptable, where there is an on-going hydrologic relationship between surface flows and groundwater is not acceptable as it ultimately destroys the surface flows that others rely on. See, Mathers *v. Texaco, Inc.*, 421 P.2d 771 (N.M. 1966).

[12] *See*, Dixon, Earle Campbell, "The Legacy Uranium Mining and Milling Cleanup Plan: Evaluation of the EPA Five Year Plan, Grants Mining District, New Mexico" (July 2015).

[13] The discovery of large subsurface uranium deposits within the Jurassic Wastewater Canyon Member of the Morrison Formation at Ambrosia Lake resulted in the establishment of two-thirds of the active uranium mines in New Mexico within the Ambrosia Lake Mining Sub-District by 1980. *See* U.S. Environmental Protection Agency, Administrative Settlement Agreement and Order on Consent for the San Mateo Creek Basin Legacy Mines Sites, Dec. 3, 2019. Ambrosia Lake is in the northwestern portion of the Rio San Jose Basin and the adjoining San Juan Basin.

[14] EPA Third Five-Year Review Report, Homestake Mining Company Superfund Site, (EPA ID: NMD007860935) Cibola County, New Mexico

[15] *See generally*, Pueblo of Acoma Protest to Applications by Homestake Mining Company to Change Well Location No. B-28-S-323 and to Drill Supplemental Wells in the Bluewater Underground Water Basin No. B-28-S-386 through B-28-S-429.

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water have injected into the aquifer."[16] Acoma has submitted multiple protests to HMC's applications to drill supplemental wells in the Bluewater Underground Water Basin, on the grounds that there is insufficient unappropriated water available to satisfy Homestake's request, yet the applications were approved.[17] The United States did nothing.

In 2012, the Office of the State Engineer approved HMC's application to temporarily divert 4,500 acre-feet per year and drill 839 supplemental wells.[18] This temporary permitted use is in addition to applying the 1,200-acre feet per year water right claimed by Homestake for reclamation activities. Despite Acoma's protests, the Office of the New Mexico State Engineer approved the installation of nearly 600 wells as of 2016 for the reclamation project, further draining the region's water supply.[19] According to EPA reports, 5,855,488,029 gallons of water, or 48,658.72 acre feet of water were pumped from the alluvial aquifer from 1978-2014.[20] The amount pumped from the San Andres Glorieta aquifer in the same period is likely to be more as the remediation effort pumped water from the San Andres Aquifer and then injected it into the alluvial aquifer. According to reports, water levels in three wells in the San Andres Glorieta aquifer under Acoma, where the aquifer is 2,000 feet below the surface have decreased by 46 feet since 1998.[21] The decline in the San Andres Glorieta aquifer west of the San Rafael fault where it is near or in contact with the alluvial aquifer is likely much greater.

Declines in the west San Andres Glorieta aquifer are of great concern to Acoma as 80% of the surface flows in the Rio San Jose as it traverses Acoma emanate from Horace Springs now come from the west SAGA. The flow at Horace Springs has diminished to a low of 1.8 cubic feet per second in dry periods.

Compounding this decline in water is the contamination in the Bluewater Basin. Small communities located near the Homestake Mill Site have had to discontinue use of their wells due to high levels of contamination. Contamination plumes from both the Homestake Mill Site and Bluewater Disposal, now known as the ARCO site, are moving towards Grants. Absent significant water pumping to keep those plumes from moving, they will contaminate surface and groundwater just upstream from Acoma in the not-too-distant future.

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[16] May 9, 2019, Homestake Mining Co., Superfund Site Profile, Superfund Site Information

[17] Pueblo of Acoma Protest to Applications by Homestake Mining Company to Change Well Location No. B-28-S-323 and to Drill Supplemental Wells in the Bluewater Underground Water Basin No. B-28-S-386 through B-28-S-429. ("Groundwater cannot be treated exactly like surface water because once appropriations exceed the natural recharge in an aquifer, it is being mined. It cannot be treated as a reoccurring resource. Based on the drop in flow from Ojo Del Gallo at San Rafael, which is historically related to depletion of the San Andres-Glorieta aquifer, this aquifer is already being mined to meet present uses, threatening senior water users. Supplementing Homestake's use will result in a greater possibility that water will be insufficient to meet the needs of the holders of senior water rights.")

[18] *See* Feb. 6, 2012 letter from NM Office of the State Engineer. A temporary diversion request of 4,500 was approved in Feb. 2008.

[19] U.S. Environmental Protection Agency, Fourth Five-Year Review Report for Homestake Mining Company Superfund Site, September 2016.

[20] *Id.* Appendix G-2.

[21] Kathy Helms, "Official: Dilution Helps Reduce Uranium Mill Contamination", *Gallup Independent*, May 5-6, 2018.

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IV. Acoma Concern: Spread of Contamination

Acoma has grave concerns regarding the potential for the spread of contamination from polluted aquifers to the San Andres-Glorieta aquifer, a primary domestic water source for the region; a complete TI Waiver is inappropriate. Remediation of the primary source contaminants and the groundwater must be required.

The restoration of contaminated ground waters is a primary objective of the Superfund and Resource Conservation and Recovery Act ("RCRA") Corrective Action programs.[22] Remedial alternatives must: 1) be protective of human health and the environment; and 2) "the remedy must meet (or provide the basis for waiving) [applicable or relevant and appropriate requirements] for the action."[23]

The primary focus must be on the "engineering perspective" of the technical feasibility to achieve cleanup. The cost should not be a major factor, unless inordinately costly.[24] Guidance further states that cost, "is subordinate to that of ensuring protectiveness [,]" and the determination of inordinate cost, "must be determined based on the particular circumstances of the site." Further, "relatively high restoration costs may be appropriate in certain cases, depending on the nature of the contamination problem and considerations such as the **current and likely future use of ground water**."[25]

In addition, the restorative timeframe is a subordinate factor in a requested TI waiver. There is no single timeframe in which restoration must be achieved to be considered technically practicable. While very long timeframes may be indicative of remedial constraints, the EPA must establish "TI decisions on an overall demonstration of the extent of such physical constraints at a site, not on restoration timeframe analyses alone."[26]

First, Homestake's requested TI Waiver Evaluation makes conclusions about the impracticability of remediation of the primary source of contaminations (the tailings piles and secondary sources) and the remediation of contaminated groundwater. The TI Waiver Evaluation lists several reasons to justify the impracticability of remediation of the primary and secondary source contaminants.[27] The reasons include: 1) Cost Prohibitive; 2) Additional Risk to Human Health; 3) Potential Ecological Damage; 4) Potential Damage to Cultural Resources; 5) Potential Impacts from Increased Traffic; 6) Potential Regulatory Challenges; 7) Carbon Footprints; and 9) Potential Impacts to Community.[28]

Acoma takes the position that Homestake has not sufficiently demonstrated that remediation of the primary source and secondary sources are technically infeasible from an engineering perspective. Instead, the primary reasons described are primarily policy considerations. As an

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[22] Guidance for Evaluating the Technical Impracticability of Ground-Water Restoration, United States Environmental Protection Agency (Sep. 1993).
[23] *Id.* at 9
[24] *Id.* at 10 (citing the National Contingency Plan preamble).
[25] *Id.* at 19 (emphasis added)
[26] *Id.* at 16.
[27] Draft Technical Impracticability Evaluation, at 45.
[28] *Id.* at ES-4

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example, it is inconceivable that "potential regulatory challenges" described as "siting studies, public hearings, and environmental reports [...]" should be an impediment towards the engineering feasibility to remove the primary and secondary sources. Further, federal processes to consider the potential impacts and alternatives towards any federal undertaking exist to address purported impracticability reasons to the environment, human health, and cultural resources. This is the primary reason for federal statutes and reviews under the National Environmental Policy Act and the National Historic Preservation Act and should not be considered as a factor of infeasibility.

While costly, Homestake has not demonstrated that the estimated costs ranges from $1.8 billion to $2 billion are inordinately costly or have such an unusual magnitude to be excessive for this type of removal. This should **not** be a primary factor in considering the engineering feasibility of its removal. So long as the primary and secondary sources remain present, there is a continued threat for further contamination and its removal should be required. Because of the continued impact, which the primary and secondary sources may have to ground water, "high restoration costs may be appropriate in certain cases, depending on the nature of the contamination problem and considerations such as the current and likely future use of the ground water."[29] The sheer magnitude of millions of tons of contaminants justifies the cost here, and should not be considered inordinate. Further, **all** water in the Bluewater basin must be considered as likely to be used in the future due to the continued water shortages faced by communities within the Basin.

The Homestake TI Waiver Evaluation makes conclusions about the technical impracticability of remediation of the groundwater. A primary reason for all five remedial alternatives is because of data demonstrating water remediation "would have to occur for centuries (Uranium = 210 years; and Molybdenum = 360 years) making groundwater restoration impracticable based on required excessively long duration for remediation."[30] This is primarily the case for the down gradient contamination plume. However, Alternatives GW3 through GW5 "are considered effective technologies for providing long-term effectiveness and permanence at addressing groundwater contaminated with [Contaminants of Primary Concern/and Radionuclides of Potential Concern,]"[31] and can be achieved in comparably shorter amounts of time, ranging between a few decades among the alternatives.

Remediation of ground water should be achieved wherever possible. According to the Guidance for Evaluating the Technical Impracticability of Ground-Water Restoration, a primary goal of protectiveness should consider that:

> Potentially drinkable water would be cleaned up to levels safe for drinking throughout the contaminated plume, regardless of whether the water was in fact being consumed...[.] Alternative levels protective of the environment and safe for

[29] Guidance for Evaluating the Technical Impracticability of Ground-Water Restoration, at 19.
[30] *Id.* at ES-5
[31] *Id.* at 66.

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other uses could be established for ground water that is not an actual or reasonably expected source of drinking water.[32]

Remediation should not be considered an all or nothing approach. The restoration of water is a primary remediation goal regardless of whether the water is reasonably expected to be used or not. The challenge of total remediation should not be used to discount alternatives that result in achievable remediation for only parts of the contaminated groundwater. A requested TI waiver can be narrow in scope and not preclude restoration of some of the contaminants present in the groundwater.[33] Therefore Acoma supports the selection of alternatives that will continue to remediate available groundwater.

V. Acoma Concern: Depletion of the San Andres-Glorieta aquifer

Acoma remains concerned about the continued depletion of the San Andres-Glorieta aquifer, which has historically and is presently being mined to meet present uses. As a senior water user in the Basin, the continued depletion of the San Andres-Glorieta aquifer is a grave threat to Acoma, as depletions have caused and will continue to cause damage to the water supply that the Pueblo has relied on for a millennia, and must rely on into the future for future generations.

As discussed earlier, in 2009 Acoma protested Homestake's *Applications to Change Well Location and Drill Supplemental Wells in the Bluewater Underground Water Basin,* due to the Pueblo's concern about the insufficient availability of San Andres-Glorieta aquifer water and the potential for contamination of the primary freshwater source in the region. While Acoma can appreciate the need for the increased pumping for remediation purposes, Acoma cannot idly stand by without raising concerns about the continued depletion of an increasingly limited water supply. The reality is the alluvial and Chinle formation groundwater will face several decades, if not centuries, of potential contamination, but will sacrifice the limited availability of San Andres-Glorieta aquifer water to improve the condition of the alluvial aquifer. The depletion of the San Andres-Glorieta aquifer is inextricably tied to the uranium industry's decades of pumping, and Homestake remains to be a major water pumper in the aquifer.

If the United States does agree to grant even a limited waiver of Homestake's clean up responsibilities prior to the expected transfer of site to the Department of Energy Legacy Management, as was done for ARCO/Bluewater mill site, and is in process for the Ambrosia Lake/Rio Algom site, then United States should acquire not only the perpetual liability, but also the water rights assets of Homestake so they might fulfill the nation's trust responsibility to protect the Pueblos' senior right to water flowing to Horace Springs. Therefore, an agreement should be entered into, or a condition should be placed upon the transfer of title of the Homestake site to the Department of Energy that would transfer Homestake's water rights to the United States.

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[32] Guidance for Evaluating the Technical Impracticability of Ground-Water Restoration, at 1 (citing the Preamble to the Proposed Subpart S to 40 CFR 254.)

[33] *See generally*, Guidance for Evaluating the Technical Impracticability of Ground-Water Restoration, at 12 (Section 4.4.1 Specific ARARs or Media Cleanup Standards and Section 4.4.2 Spatial Extent of TI Decisions).

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VI. Conclusion

At the end of this century, archaeologists will have estimated the Acoma people will have lived atop Acoma and in this region for over a thousand years. While the end of this century may seem far off, that will be within the lifetimes of current Acoma children and grandchildren. Based upon the estimated times for remediation to occur, the impacts of contaminants from the Homestake mine will still be felt, and of continued concern for them. Acoma strongly urges the board to consider this in making its determination. And to require the remediation of the primary source contaminants and the groundwater and continued maintenance of the hydraulic barrier.

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Memo: EPA National Remedy Review Board

From: Multicultural Alliance for a Safe Environment

Date: 3/10/21

Re: Homestake Mill Superfund Site

The community near the Homestake Mill has been destroyed over 45 years of failed clean-up efforts. The mill first started operations in 1958 and the community was notified in 1975 that their drinking wells were contaminated with selenium. EPA's 2014 Human Health Risk Assessment found that residents of the subdivisions next to the Homestake site face excess cancer risks 18 times higher than EPA's generally acceptable risk. This serious risk has been exacerbated by years of remediation failure. If domestic water sources beneath the subdivisions are used, that risk rises to 22 times the highest acceptable risk for radionuclides in water. EPA should have initiated comprehensive health and epidemiological studies to assist the exposed residents in pinpointing the cause of their cancers and to establish the liability of the responsible parties. Instead, Homestake is working to buy out the surrounding homeowners, whose lifestyle and culture have been devastated by the many years of failed cleanup efforts and who will now be left to relocate and solve future health issues on their own. https://www.abqjournal.com/223831/nm-homeowners-say-decadeslong-cleanup-too-slow.html

The Multicultural Alliance for a Safe Environment (MASE) and the Bluewater Valley Downstream Alliance (BVDA) hired two independent technical experts to examine background groundwater quality and groundwater protection standards provided by Homestake Barrick Gold (HBG) as the basis for its cleanup plans. The new proposed background groundwater values presented to EPA, the Nuclear Regulatory Commission and the New Mexico Environment Department proved that the HBG groundwater protection standards in place were incorrect. Currently, the agencies are revising their expectations, thanks to the independent scientific work that was paid for by our communities.

HBG is now asking to walk away from their legal obligation to clean up their site. HBG has made clear its intentions to seek a Technical Impracticability Waiver with the EPA and Alternative Concentration Limits with the Nuclear Regulatory Commission (NRC). Simultaneously, they have continued their efforts to purchase private property surrounding the site -- all showing their lack of commitment to do what is right.

Yet, even while there are fewer and fewer people living in the vicinity of the site, the legacy of contamination threatens future generations. This is environmental injustice and a grave threat to New Mexico's water resources.

For all these reasons, as set forth in more detail below, it is premature to grant a Technical Impracticability waiver.

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I. Human health and the environment must be protected from a legacy of Homestake Mill uranium contamination.

Protecting human health and the environment is the ultimate goal of groundwater remediation efforts at the Homestake Mining Company Superfund Site. *See EPA Guidance for Evaluating the Technical Impracticability of Groundwater Restoration (EPA TI Waiver Guidance), Section 1.1.*

- Alternative Groundwater Protection Standards (GWPS) were approved for the Superfund Site in 2006. The alternative site standards relieved Homestake Barrick Gold, the owner of the Site, from cleaning up groundwater at the site to drinking water quality.
- Importantly, as recently as December of 2019, Homestake Barrick Gold proposed in its Groundwater Corrective Action Program (GCAP) that 10 more years of remediation efforts at full capacity was the best way forward. *See 12/19 HBG GCAP*.

The site will not be properly addressed until background water quality is established, sufficient modeling is developed, and remediation efforts are fully and effectively implemented.

- NMED and EPA are currently working to assess background water quality, prompted by the scientific studies that MASE and BVDA provided.
- EPA agrees that HBG needs to revise its conceptual model to incorporate the potential for tailings "rebound" (increasing concentrations) and NMED/EPA's reassessment of background groundwater quality. *EPA Fourth Five-Year Review, 2016.*
- EPA has yet to issue a Record of Decision (ROD) for Operating Unit 1 (OU1) on groundwater and Operating Unit 2 (OU2) on long-term stabilization, even though the site has been on the National Priorities List for almost 40 years.

NRC approved Homestake's 1989 Corrective Action Plan (CAP) for groundwater (updated in 2006, 2012, 2019 and 2020), which originally set out to dewater its large tailings pile (LTP) in order to remove this area as a continuing source of groundwater contamination.

- After dewatering the tailings in 1999, Homestake initiated flushing of the LTP with fresh water from the San Andres-Glorieta (SAG) aquifer from 2000-2015.
- The integrity of HBG's SAG wells had not been assessed when MASE first raised the issue during a public hearing on the renewal of Homestake's discharge permit DP-200 in 2014.
- A well integrity assessment was finally conducted, resulting in the replacement and abandonment of several SAG wells. Since then, elevated Constituents of Concern (COCs) in several SAG wells have come to light.

Then, in an about face, in the summer of 2020, Homestake Barrick Gold made public its goal of seeking a Technical Impracticability (TI) waiver from the EPA and Alternate Concentration Limits from the NRC. Allowing HBG to walk away before clean-up is complete would leave a legacy of air, soil and water contamination in New Mexico that will burden future generations. This is unacceptable to the impacted communities.

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- The techniques tried have not been completed in the manner promised or approved. A clean-up of the Homestake Mill contamination based on the best available science and technology has never been attempted. The community has long called for the removal of the large tailings pile. *See* https://cvnmef.org/in-the-news/homestake-site-haunts-residents/ Their voice rings more and more true as the groundwater contamination caused by the tailings has increased over the decades.

- If the tailings piles are not removed, HBG should optimize its cleanup strategy by implementing its Reverse Osmosis (RO) improvements and zeolite upgrades to treat more water, especially off-site plumes; use treated water in lieu of fresh water; and remedy SAG aquifer well contamination. EPA agrees that these improvements will improve the protectiveness of Homestake's remedy. *EPA Fourth Five-Year Review, 2016*

II. Contamination at the site has grown, not decreased, during HBG's "clean-up"

Groundwater contamination was first detected in the shallow alluvial aquifer beneath the Homestake site. Since then, contamination has spread to the Upper Chinle, the Middle Chinle, the Lower Chinle, and we believe, the SAG aquifer.

- The original hydraulic barrier placed south of the LTP in the early 1980s pushed a contamination plume further south of the original contamination footprint.

- Since 2000 Homestake has enlarged its original footprint with many hundreds of wells on the site, and a flushing program that also pushed contamination past site boundaries.

- HBG did significant collateral damage by flushing the LTP with clean water from the SAG aquifer and implementing a collection/injection program, which mobilized the uranium and other contaminants rather than drying and containing the source of contamination within the large tailings pile through dewatering.

- HBG's groundwater model should now be revised to reflect the following changes in operating conditions: discontinuation of land application; active flushing of the tailings with SAG water; increased operating capacity of the water treatment systems; plume movement beyond Homestake's licensed boundary and down gradient into the SAG aquifer.

- The timeframe for groundwater restoration can then be updated to include the additional time needed for groundwater restoration outside the facility's licensed boundary and down gradient of the source areas.

As a property owner and MASE member told EPA:

"When I bought my property at 3021 Hwy 605 in January 2001 I talked to local people about the area but mainly relied on the EPA web site which gave a description of the super fund site. There were maps and graphs and calculations and descriptions of the site. It stated that the alluvial aquifer was contaminated but that the other Chinle's weren't and that the cleanup-remediation would be complete in 2003. We are all aware of the many attempts to restore our

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water quality and the failure of those attempts. They waited about 10 year to start addressing the problem after discovering contamination. They sprayed water in the air for 10 more years, they created a hydraulic dam to contain the spread, they set up an RO plant to treat the water along with the evaporation ponds, they sprayed water for irrigation, and now have tried newer methods only to watch them fail. All the while the problems get worse and more complicated. We have gone through "evaluations," "examinations," and "calculations", so many times that our heads are dizzy and tired. The approach has been cosmetic and never getting at the true source of the problem. That is, the tailings piles are leaking. You have a hole in the bucket and until that is addressed it will continue to spread and all other cosmetic methods and numerous calculations will fail. We can't just continue to "look" at the problem. The pile must be moved to a state of the arts facility that would be double lined, monitored and have the ability to retrieve the leakage and process or extract harmful elements before releasing any water back into the aquifers. It is an enormous project-concept to correct an enormously, grossly negligent problem. It only gets worse the longer you put off the inevitable. To continue stalling or to abandon this mess would clearly be criminal negligence. I hope and pray you will do the right thing."

III. Inadequate system design and operation is not a reason to grant a Technical Impracticability Waiver

"Failure to achieve desired cleanup standards resulting from inadequate system design or operation is not considered by EPA to be a sufficient justification for a determination of technical impracticability of groundwater cleanup." *EPA TI Waiver Guidance, Section 1.1*

Our communities can cite a litany of actions by HBG over the years since reclamation began in 1977 that have contributed to the spread of groundwater contamination from HBG's uranium mill tailings into the alluvium and deeper bedrock aquifers of the Chinle Formation, and possibly into the SAG Aquifer. HBG used a variety of tested and untested experimental groundwater treatments that HBG repeatedly assured our community would clean up our water supplies within 10 years, then 25 years, then 35 years or more.

HBG's so-called "upgrades" and "improvements" have done nothing to stop contaminant plumes in the alluvial and Chinle aquifers from moving offsite. Even as HBG buys out property owners adjacent to the site, the plumes will continue moving further down gradient to the SAG aquifer, or downstream to the Rio San Jose and all the communities who depend on these fresh water sources to meet their needs now and into the future. Homestake activities did not comply with its permits and license.

1. <u>Massive Collection/ Injection well network has increased the problem:</u>

- The 2010 supplemental remedial system evaluation by the Army Corps of Engineers cited the need for improved management of injection volumes and rates into impacted aquifers. Community stakeholders and their technical experts have repeatedly raised concerns about well integrity.

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- The source of the contamination in HBG's SAG wells remains undetermined. Total Dissolved Solids (TDS) numbers are rising in SAG wells - this is still unexplained. The SAG aquifer supplies the only alternative water source for the five subdivisions and is the sole municipal water supply source for the downstream communities of Milan and Grants.
- HBG's injection wells and infiltration lines have diluted contaminant concentrations in nearby monitoring wells, making it difficult to effectively or accurately assess contaminant trends.
- A comprehensive well integrity survey of ALL Homestake wells should be undertaken to eliminate the potential for any well to become a conduit for contamination.
- SAG water usage should be minimized and replaced with treated water.
- Long-term monitoring of HBG's SAG wells for COCs must continue.
- Rising Total Dissolved Solids levels must be explained.

2. <u>Flushing added to groundwater contamination</u>:

- Over 22 million tons of unlined tailings disposal atop the ancestral San Mateo Creek bed channel has created a pathway for contaminant transport off-site.
- In 2000, HBG began using freshwater from the SAG aquifer to flush the large tailings pile until it terminated the flushing program in 2015. Actual rebound conditions from the re-saturated LTP must now be monitored and incorporated into its groundwater model.
- Over the course of fifteen years, HBG has pumped SAG wells of questionable integrity for its flushing program that may have provided direct pathways for contamination of the SAG aquifer.
- At a 9/29/20 public meeting with EPA Region 6, EPA stated that saturation of the LTP remains a concern – they are still seeing rebound. EPA reported we should know more once we see a November 2020 report. MASE has yet to see that report.

3. <u>Reverse Osmosis has not operated properly or at capacity:</u>

- The expanded and upgraded Reverse Osmosis (RO) facility is still only operating at 25% capacity.
- HBG has used freshwater from the SAG Aquifer for 21 years to dilute its RO treated water in order to meet its NRC approved Groundwater Protection Standards for re-injection.
- HBG says it has doubled its RO treatment capacity and plans to significantly expand RO treatment after relining Evaporation Pond 1, which has been postponed until 2022.
- HBG expects its expanded RO system to treat up to 900 gpm of contaminated groundwater on an average annual basis. The system has three runs, but only two operate at a time at 600 gpm. It has never approached full capacity. *HBG 12/19 Groundwater Corrective Action Program.*

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- Significantly more RO treatment is required to treat the high volumes of water necessary to truly remediate this site.

4. Zeolite system has not operated at full capacity as promised:

- HBG's zeolite treatment systems constructed on top of the LTP are used to treat off-site groundwaters where uranium is the only constituent that exceeds the GWPS. Zeolite treatment was first tested at bench scale in 2007 followed by additional pilot tests.
- A full-scale zeolite treatment system with a maximum treatment capacity of 300 gpm was constructed in 2012 followed by a system with a maximum capacity of 1,200 gpm in 2015. *HBG 12/19 Groundwater Corrective Action Program*
- The zeolite treatment systems are expected to treat up to 1,200 gpm of contaminated groundwater on an annual average basis under this CAP. Again, this system has never operated at capacity.
- HBG intends to use zeolite treated water to maintain its hydraulic barrier in lieu of SAG water. *EPA Fourth Five-Year Review, 2016*
- After approximately 216,000 gallons of zeolite extraction water was accidentally released onto the ground surface on August 26, 2020, HBG identified corrective actions to prevent this type of incident in the future. These additional corrective actions include updating standard operating procedures specific to the zeolite water treatment operation and additional personnel training.

5. Land Application Program was illegal:

- HBG operated a Land Application project that used contaminated groundwater on irrigation plots from 2000 until 2012, in violation of their NRC license.
- Conducting land application of groundwater that exceeded groundwater protection standards for the site has resulted in increased contamination over the years.

IV. The tailings piles must be moved and isolated with liners and barrier caps.

The re-saturated Homestake Tailings Piles will continue to seep in perpetuity. This is critical as it means contaminant concentrations will continue to percolate into the impacted aquifers and push plumes downstream and downgradient, threatening community and regional water supplies. Because the western portion of the Large Tailings Pile covers the ancestral San Mateo Creek, seepage from the tailings can be transported via the Creek into the Rio San Jose, or "waters of the United States." The unlined tailings currently sit on 80-90 feet of alluvium.

The tailings piles must be moved and encapsulated into lined impoundments with leak detection and redundancy/fail-safe systems before they are finally covered with a radon barrier that also prevents the infiltration of precipitation and storm water.

Until the tailings piles are moved, the source of contamination will continue to spread.

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During the EPA's Remedial System Evaluation, the option to move the Large Tailings Pile to an off-site regional waste repository was briefly considered. The option was viewed as too expensive and unsafe to removal workers. However, two options that were not considered at that time include: 1) creating a waste repository in the Ambrosia Lake area—making the truck and shovel removal less expensive; and 2) removal via slurry to a nearby site owned by Homestake, or, again, to a nearby repository.

V. EPA has not meaningfully engaged the impacted community in this process.

While EPA completed a ROD on OU 3 – concerning radon – within a few years of the site being placed on the NPL, EPA neglected to complete a ROD on OU1 and OU 2. EPA has now begun steps towards a ROD on OU1 and OU2, almost 40 years later, but has failed to engage stakeholders in a meaningful way.

EPA has provided us with limited information about its Remedial Investigation (RI) and Feasibility Study (FS) determinations. Our communities were not given any opportunity to participate or comment on the RI or the settlement agreement and planning for the FS. We expressed our concerns in a December 3, 2020 letter to EPA.

EPA recognizes that because "TI decisions may affect the potential future uses of groundwater, interest in TI ARAR waivers may be high. Therefore, it is EPA' s intent to coordinate and consult with States and the public regarding TI ARAR waiver issues as early as possible in the remedy decision process." EPA TI Waiver Guidance, Section 6.1.1. We therefore expect that the EPA will ensure a much more vigorous and meaningful community involvement going forward.

At a 9/30/20 public meeting, EPA told us that they would meet with us before the end of the year once they received numbers on background. That didn't happen. EPA also told us that they would share the TI Evaluation report with us. That hasn't happened.

We need more opportunities for community involvement in selecting a remedy that protects our health and environment.

VI. Cost plays a subordinate role to protectiveness.

We understand that the EPA can grant a Technical Impracticability waiver if ... "compliance with the [ARAR] is technically impracticable from an engineering perspective." 40 CFR 300.320(f)(ii)(C)(3) and 42 U.S.C. 9621(d)(4)(C). According to the EPA, the use of the term "engineering perspective" implies that a TI determination should primarily focus on the technical capability of achieving the cleanup level, with cost playing a subordinate role. The NCP Preamble states that TI determinations should be based on: "...engineering feasibility and reliability, with cost generally not a major factor unless compliance would be inordinately costly." EPA TI Waiver Guidance Sec. 4.1.1

The role of cost, however, is subordinate to that of ensuring protectiveness. The point at which the cost of ARAR compliance becomes inordinate must be determined based on the particular circumstances of the site. As with long restoration timeframes, relatively high restoration costs may be appropriate in certain cases, depending on the nature of the contamination problem

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and considerations such as the current and likely future use of the groundwater. "Compliance with ARARs is not subject to a cost-benefit analysis," and cost is subordinate to protectiveness. *EPA TI Waiver Guidance, Section 4.4.5*

HBG should be required to maximize and optimize the remedies it has chosen to implement at the site. EPA thinks that recent improvements and upgrades to HBG's remedial systems will increase the protectiveness of the remedy. *EPA Fourth Five-Year Review, 2016.*

VII. Any remedy selected must be protective of human health and the environment.

Regardless of whether ARARs are waived at the site, the alternative remedy still must satisfy the two threshold remedy selection criteria: 1) protect human health and the environment; and 2) comply with all ARARs that have not been waived. *EPA TI Waiver Guidance, Section 5.2.1*

EPA's general expectations are to prevent further migration of the contaminated groundwater plume, prevent exposure to the contaminated groundwater, and evaluate further risk reduction measures as appropriate. *NCP §300.430(a)(l)(iii)(F).* These expectations should be evaluated along with the nine remedy selection criteria to determine the most appropriate remedial strategy for the site.

EPA Region 6 has noted that the remedy for the Homestake Superfund site was protective for the short-term in 2016, but that long-term protectiveness of the remedy required completion of EPA's CERCLA equivalency review, re-assessment of background groundwater quality for the alluvial and Chinle aquifers, and the issuance of RODs for OU1 and OU2. The timeframe for groundwater restoration for areas outside the facility's licensed boundary needs updating, and the source of elevated uranium in Homestake's SAG wells should be investigated to determine if pumping from the SAG wells is drawing site contamination into the deeper regional aquifer.

It is instructive to note that New Mexico Water Quality Control Commission regulations (20.6.24103 NMAC) must be met outside Homestake's site boundary and that EPA's Guidance for Evaluating Completion of Groundwater Restoration Remedial Actions (OSWER9355.0-129, November 2013) counsels that groundwater remediation levels should be met throughout the contaminant plume (not just at compliance locations).

Because HBG has been acting under a 1989 GCAP for over 30 years in the absence of a ROD for groundwater cleanup, it is premature to consider the approval of alternative remedies or waivers until the CERCLA process for this Superfund site has been carried out. HBG must first demonstrate substantial compliance with its approved or revised GCAP, in conformity with EPA RODs on Operating Units 1 and 2.

Any remedial measures that fall short of attaining approved background levels at the site will not be protective of our regional groundwater supplies, including the SAG aquifer, the last remaining freshwater supply source available to meet our and the region's domestic and municipal needs now and into the future.

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The remedies selected must have long-term effectiveness in reducing the toxicity, mobility, and volume of contaminants from the large and small tailings piles into our surface water and groundwater supplies.

Community, State and Tribal acceptance of the remedies selected must also be considered.

NMED/EPA must follow through with a defensible reassessment of background groundwater quality that does not attempt to grandfather in water quality impacts from Homestake's milling or reclamation operations.

An ecological risk assessment should be performed due to Homestake's expanded footprint and off-site impacts over the last five years.

The remedy selected must curtail releases from and permanently isolate the sources of contamination in the tailings piles in order to protect the health and sustainability of our communities.

VIII. It is premature to grant a Technical Impracticability Waiver.

As recently as December of 2019, HBG proposed to do corrective action for another 10 years that would significantly reduce groundwater contamination. *See December 2019 GCAP.* Indeed, HBG's 12/19 GCAP proposed continued groundwater collection, treatment, and injection within the alluvial and Chinle Aquifers for approximately 10 years to contain the constituent plumes in the alluvial and Chinle Aquifers to within its licensed boundary. HBG proposed remedial actions so that COC concentrations on-site and off-site would be reduced to less than the site GWPS. *See Id., Section 9 CORRECTIVE ACTION PROGRAM.* In that corrective action program, HBG stated:

- Approximately 300 gpm of fresh groundwater would be extracted from the SAG Aquifer wells Deep #1R and Deep #2R and used to mix with treated waters and injected for hydraulic control.
- Groundwater monitoring results would be used to evaluate the performance and effectiveness of the groundwater collection and injection system.
- The proposed groundwater collection and injections system would be operated dynamically so that pumping and injection rates will vary as groundwater plume extents and COC concentrations are reduced.
- Some COCs may not be reduced to meet the GWPS in some areas. HMC also acknowledged that LTP seepage to groundwater will continue following corrective action and that groundwater at and beyond the point of compliance (POC) would exceed the GWPS in the future.

If, as HBG states, it is unable to control contaminant plumes from the site, especially into the SAG aquifer, or to meet GWPS within a reasonable timeframe, then the tailings must be removed and isolated. The source of contamination in HBG's SAG wells must be determined and continued treatment of the alluvial and Chinle plumes should continue.

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IX. EPA must abide by the Superfund CERCLA process to protect our communities and our land and water.

Historical waste and contamination from uranium mills in the United States, and more specifically within the San Mateo Creek Basin, have resulted in a persistent and unwanted legacy for future generations of residents. Our future generations need clean water to drink, clean air to breathe, and clean soil to till. We all need to be surrounded by healthy ecosystems to survive and prosper. Clean air, water and soil form the core of our national security, which in turn preserves the health of regional ecosystems throughout the country for future generations. Without healthy ecosystems, all life forms will wither and die.

We are now at a crossroads. One road will allow Homestake Barrick Gold to leave behind spreading plumes of contaminants that are seeping from Homestake's tailings piles. The plumes will move downstream into the Rio San Jose through the alluvial aquifer and downgradient into the last remaining source of clean water in the San Mateo Creek Basin - the SAG aquifer. This cannot be allowed to happen, as it will be difficult to maintain enforceable Institutional Controls beyond HBG's site boundaries.

EPA must abide by the Superfund CERCLA process. EPA must reassess background groundwater quality and establish long overdue ARARs for the Homestake Superfund site with community involvement. The Remedial Investigation and Feasibility Study equivalency review that will form the foundation for its ROD on OU1 (long-term groundwater contamination from the tailings) and OU2 (long-term tailings stabilization, surface reclamation, and site closure) must be completed. Removal of the tailings should be reconsidered as the only remedy that can eliminate the sources of contamination after 44 years of attempted cleanup. Treatment of the existing alluvial and Chinle plumes should continue.

Affected community members and local residents cannot be left out of this process. We must have a voice in how to protect the places where we live, work and pray. After 45 years of struggle, it is past time for HBG to be held accountable for its toxic legacy. After decades of profit, Homestake Barrick Gold must ensure a livable landscape and clean water for future generations.

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Memorandum

To: U.S. Environmental Protection Agency; National Remedy Review Board (NRRB)
From: Ann Maest, PhD; Buka Environmental on behalf of Bluewater Valley Downstream Alliance (BVDA)
Date: 10 March 2021
Re: NRRB Written Submittal for BVDA on the Homestake Mill Superfund Site

1.0 Introduction

The comments contained herein are submitted on the behalf of the Bluewater Valley Downstream Alliance (BVDA) and present information relevant to the selection of remedies for cleanup of groundwater at the Homestake Mining Company Superfund Site in Grants, New Mexico. The comments further address technical issues related to Homestake Mining Company's (HMC) request to the Nuclear Regulatory Commission for Alternative Concentration Limits (ACLs) and to the Environmental Protection Agency for a Technical Impracticability (TI) Waiver for groundwater cleanup standards. The comments are divided into two sections: proposed remedies and assumptions, and independent evaluation of groundwater protection standards. Based on an examination of HMC's proposals, associated documents, and our own independent evaluations, we find that granting HMC a TI Waiver and ACLs for groundwater is premature and not based on the best available science.

2.0 Remedies and Assumptions

2.1 Overview

In the letter from HMC to the Nuclear Regulatory Commission (NRC)[1], HMC states: "The revised assessment in the GCAP shows that none of the range of proposed reasonable alternatives provide assurance of long-term compliance with the current groundwater protection standards. The revised assessment and the results of over 40 years of groundwater corrective action support the need for Alternative Concentration Limits to comply with the requirements of 10 CFR 40 Appendix A Criterion 5B(5)." The finding of "not reasonably achievable" was based on modeling indicating long-term mobilization of contaminants from the alluvial aquifer and long-term large tailings pile (LTP) seepage. The basis for this statement is questioned in Sections 2.2 and 2.3.

2.2 Ongoing Failed Remedies and Remedies Considered but Not Retained

Failed Remedies. HMC's 2020 Groundwater Corrective Action Program (GCAP)[2] proposes "continued groundwater collection, treatment and injection within the alluvial and Chinle aquifers using the existing infrastructure while an ACL application is prepared, reviewed, and approved."[1] Four alternatives are being considered by HMC, and three involve continued use of this same approach (GCAP, p. 8-5 – 8-7). The capture of contaminated LTP seepage has been incomplete, the treatment has not adequately removed the contaminants, and the approach has relied on extensive dilution with groundwater from the San Andres/Glorieta (SAG) aquifer.

Water management and treatment schematics for 2012 and 2018 show the volume of seepage draining from the LTP and entering the alluvial aquifer without treatment (GCAP, Figures 6-28, 6-29). A hydraulic barrier is supposed to exist downgradient of the tailings impoundments due to *injection* of treated and

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[1] Homestake Mining Company of California, 2020. Letter to Ron Linton, NRC, Re: Homestake Mining Company of California – Responses to NRC's "Request for Supplement Information, Groundwater Corrective Action Program," Docket No. 040-08903, License No. SUA-14-71. November 31. 9pp.

[2] Homestake Mining Company (HMC), 2020. Grants Reclamation Project, Groundwater Corrective Action Program (and appendices). US NRC License SUA-1471, State of New Mexico DP-200, November 13. 385pp.

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SAG water (GCAP, p. 4-5). Normally, hydraulic barriers to groundwater flow are created by pumping rather than injection, or by installing a slurry wall or other physical barrier to limit groundwater flow. The alluvial aquifer groundwater contours indicate that contaminated seepage from the LTP can still be transported to downgradient locations on the west and east sides of the LTP (2018 Annual Monitoring Report; Figure 4.2-1).[3] A paleochannel in the alluvium on the west and southwest sides of the LTP has the highest measured hydraulic conductivity and is likely still transporting contaminants from the LTP to downgradient parts of the alluvial aquifer.[4] The shape of the uranium plume indicates that the paleochannel is an important preferential pathway for transporting contaminants from the LTP to downgradient areas in the San Mateo Creek basin (Figure 1).

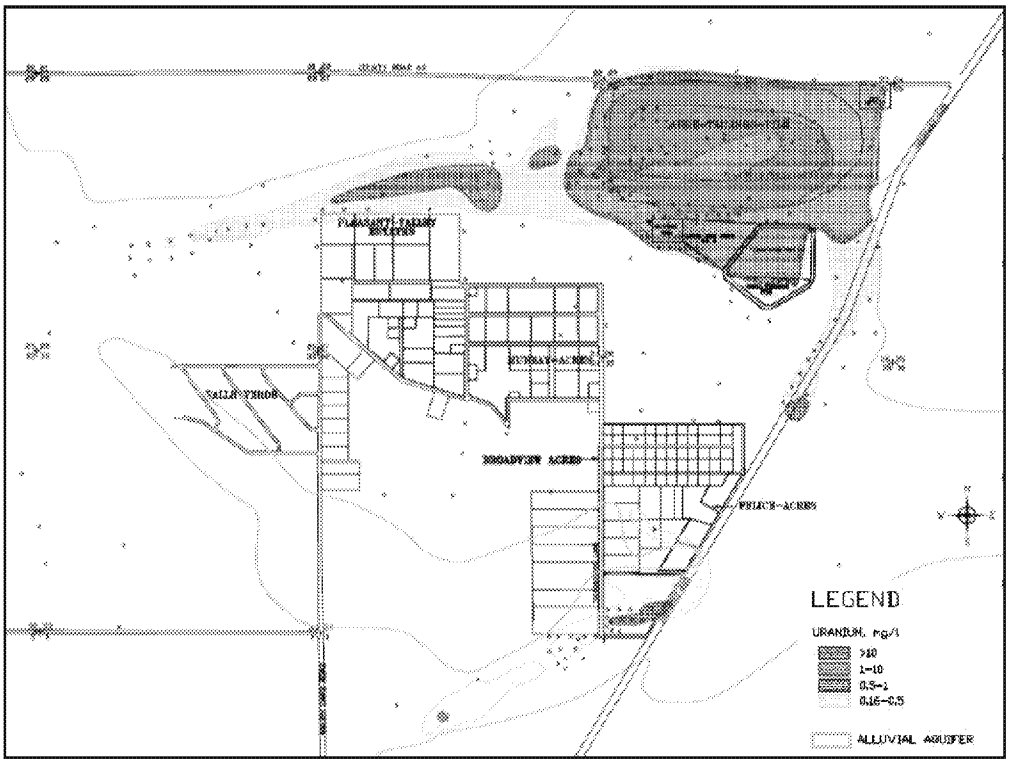

Figure 1. Uranium plumes in the alluvial aquifer in 2018.
Source: HMC and Hydro-Engineering, 2019. 2018 Annual Monitoring Report, Figure 1.1-14.

The treatment scheme uses reverse osmosis (RO) and at times zeolite treatment. The zeolite treatment system was started in 2012, and since 2016 has been used to remove uranium from the off-site collection water (GCAP, p. 6-11 – 6-12). The zeolite-treated water is mixed with the RO-treated water and the SAG water in the post-treatment tank (PTT) and sent directly to the aquifers (GCAP, Figure 6-29). The water balance for 2018 shows an average of 267 gallons per minute (gpm) of zeolite-treated water, 350 gpm of RO-treated water, and 128 gpm of SAG water reporting to the PTT in 2018 (GCAP, Figure 6-29). The water quality of the PTT, the RO product, and the zeolite product waters for 2018 is shown in the 2018 Monitoring Report (Tables 2.1-3, 2.1-5, and 2.1-6, respectively). In terms of uranium concentrations in 2018, the PTT water had only one exceedance of the uranium site standard (0.16 mg/L) but six exceedances of the State/EPA drinking water standard. The RO product water (after

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[3] HMC, 2019. 2018 Annual Monitoring Report/ Performance Review for Homestake's Grants Project Pursuant to NRC License SUA-1571 and DP-200. 877 pp.

[4] Brown and Caldwell, 2018. Summary of San Mateo Creek Basin Hydrogeologic Site Conceptual Models, 101pp; p. 66 and Figure 44.

treatment) had only one exceedance of the site standard but four exceedances of the State/EPA standard. The zeolite-treated water had no exceedances of the site standard but 27 exceedances of the State/EPA water quality standard. Although only the site standards are relevant, the results show that if the applicable groundwater standards were lowered to the State/EPA standard, additional treatment upgrades would be needed, especially to the zeolite system. Importantly, the zeolite-treated water was proposed to be used in lieu of fresh water (SAG aquifer water) for reinjection,[5] possibly because of the reduction in allowable pumping volumes from the SAG aquifer by the New Mexico Environment Department (NMED). If this is the case, water with elevated uranium concentrations will continue to be spread throughout the site. An independent evaluation of the treatment system is needed.

SAG water is proposed to be used in three of the four Alternatives in the GCAP. The SAG aquifer is a major regional aquifer used for industry, irrigation, municipal water supplies, and private water wells (GCAP, p. 3-12), and pumping the aquifer so extensively and using the water for questionable remediation measures should not be allowed. Well 943 was used as the pumping well from the SAG aquifer until 2017. Uranium concentrations first increased in the well in 2015 and continued to increase from 2016 to 2018 (RI Report, Figure 3-58). HMC has attributed the increases to poor well casing and leakage of higher-concentration groundwater from overlying aquifers and to the Bluewater Mill, but the NRC has rejected these theories and required more information.[6]

Another failed remedy used by HMC was land application and irrigation using groundwater that exceeded site water quality standards. This approach also contributed to expansion of plumes in the alluvial aquifer. Land application "was an integral part of the groundwater restoration program" (GCAP, p. 2-5). According to HMC's 2020 Remedial Investigation Report (RI Report),[7] from 2000 to 2012, nearly 10,000 ac-ft of mine-influenced waters derived largely from alluvial wells but also from some Chinle wells were used for irrigation (p. 3-2). Water from the SAG aquifer was also used for the land application process (GCAP, Fig. 6-28). Although the concentrations of uranium are described as "low," waters used for irrigation had *average* uranium concentrations that ranged from 0.12 to 0.38 mg/L (RI Report, Tables 3-3 and 3-5) – up to 2.4 times higher than the NRC groundwater cleanup value (0.16 mg/L) and over 12 times higher than the State's and EPA's primary maximum contaminant level (0.03 mg/L). Rather than remediating the groundwater contamination caused by land application, "Restrictive Covenants will be put in place for HMC's former land treatment areas (Section 2.7) that will prohibit residential and agricultural use of the land treatment areas and use of groundwater for drinking beneath the land treatment areas." (GCAP, p. 2-6).

Remedies Considered but not Retained. The GCAP (Table 8-1) includes information on remedial technologies considered but not retained. Source removal (removal of all tailings in the LTP) was not retained even though its effectiveness was rated as high because the "increase in truck and heavy equipment traffic could adversely affect community." Another reason cited was "...increase in human health risks from transporting waste..." HMC has essentially removed the community by purchasing homes, so these reasons are not valid. Another reason was costs. TI waivers should be based on "...engineering feasibility and reliability, with cost generally not a major factor unless compliance would

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[5] EPA, 2016. Fourth five-year review for HMC Superfund Site, p. 15. September, 115 pp.

[6] NRC, 2020. Letter to HMC and attachment: Results of U.S. Nuclear Regulatory Commission Staff Review of the May 10, 2019, "Response to the Homestake Mining Company of California letter, dated July 26, 2018: Proposed adjustment in groundwater monitoring of the San Andres-Glorieta aquifer near the Grants Reclamation Project. January 23, 13pp.

[7] HDR, 2020. Final Remedial Investigation Report. HMC Superfund Site. Operable Unites 1 and 2. June 22. 245 pp.

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be inordinately costly."[8] The only reasonable remedy for long-term protection of the aquifers, especially the Chinle and SAG aquifers, is removal of the source (the LTP) and placement nearby on liners with a leachate-collection system and monitoring. Remediation of the vadose zone under and downgradient of the LTP will also likely be needed to remove that long-term source.

The cleanup of nuclear weapons and nuclear power plant sites (e.g., Hanford, Three Mile Island) appears to have been prioritized over cleanup of uranium mines and production facilities. And more removals are used as remedial measures at the nuclear sites. However, the two types of sites are inextricably linked when viewed through the lens of whole life-cycle analysis. Uranium mines and the associated processing facilities (e.g., mills) have supplied the raw materials for nuclear energy and nuclear weapons, yet these upstream facilities are often in less populated areas – many of which are on Native American reservations or lands (e.g., Church Rock on Navajo Nation lands) – that are undervalued. This perspective contravenes the Biden administration's emphasis on environmental justice and communities. The relative success stories from the cleanup of nuclear energy and nuclear weapons facilities demonstrates that similar successes could be achieved at uranium mines and production facilities, if these sites were given higher priority and funding. A summary of some of the cleanups touted as successes at the nation's nuclear sites includes:

- Rocky Flats, Colorado. Made plutonium triggers for nuclear weapons. The Rocky Flats Cleanup Agreement authorized DOE to perform most of the cleanup through removal actions. The Savannah River Site in South Carolina, the Waste Isolation Pilot Plant (WIPP) in New Mexico, the Nevada Test Site, and the Hanford Site in Washington State received materials or wastes from Rocky Flats.[9] The cleanup was completed for approximately $7 billion. Although not a perfect remediation and concerns still exist, the site today is a wildlife refuge.
- Oak Ridge, Tennessee. Erected for the Manhattan Project to develop an atomic weapon to end World War II. The remediation project generated more than 1.7 million cubic yards of waste. Approximately 10 percent of the waste was sent out of state for disposal. The remaining 90 percent was disposed safely at onsite disposal facilities. This decades-long environmental cleanup effort marks the first uranium enrichment complex in the world that was successfully removed.[10] At least $2.9 billion will be spent on the cleanup, and costs are expected to be well over that amount by completion in 2046.[11]
- Hanford, Washington State. A nuclear production complex established in 1943 as part of the Manhattan Project.[12] The groundwater pump-and-treat system has operated since 2008 will be continued and expanded. Their numerous improvements have resulted in "significant reduction of

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[8] EPA, 1993. Guidance for Evaluating the Technical Impracticability of Ground-Water Restoration. Directive 9234.2-25 (p. 10). September. 30pp.

[9] GAO, 2006. Nuclear Cleanup of Rocky Flats. DOE can use lessons learned to improve oversight of other sites' cleanup activities. July. 122 pp.

[10] DOE Office of Environmental Management. 2020. DOE's cleanup of nuclear waste sites a continuing success. August 20. https://www.energy.gov/orem/articles/does-cleanup-nuclear-waste-sites-continuing-success

[11] DOE Office of Environmental Management. 2018. https://www.energy.gov/em/articles/oak-ridge-cleanup-contractor-hits-2-billion-contract-mark

[12] DOE Office of Environmental Management. 2019. Hanford Builds on Groundwater Cleanup Success, Plans for Treatment Expansion. https://www.energy.gov/em/articles/hanford-builds-groundwater-cleanup-success-plans-treatment-expansion

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areas of groundwater contamination." The low-range cost estimate for the cleanup was estimated at $323.2 billion.[13]

In stark contrast to the cleanups of U.S. nuclear facilities, much less money has been spent on remediation of uranium mill sites, and those near communities of color (e.g., Church Rock and the Homestake Mill) have received even less attention and funding. A comparison of waste volumes, cleanup costs, and remedial approaches for uranium tailings sites with groundwater contamination will be included in the presentation by BVDA to the NRRB on March 25, 2021.

2.3 Issues with Granting a TI Waiver for the HMC Superfund Site

The granting of a TI waiver for cleanup of the HMC Superfund Site is premature for the following reasons:

- The conceptual models are incomplete or incorrect. The conceptual models presented by HMC and their consultants (e.g., HDR, 2020. Final Remedial Investigation Report, Fig. 4-1; GCAP, Figs. 3-17, 4-18) do not provide a "...three-dimensional representation that conveys what is known or suspected about contamination sources, release mechanisms, and the transport and fate of those contaminants"[14] or an adequate or complete description of the "site geology, hydrology, ground-water contamination sources, transport, and fate" that is required to secure a TI waiver.[8] Missing elements include:
    - Understanding the fluxes and sources of contamination in the SAG aquifer (well 943). NRC has not accepted HMC's arguments that the increasing uranium concentrations result from input of concentrations from overlying aquifers or the Bluewater Mill. Because of the uncertainty and the importance of the SAG aquifer as a regional resource, NRC requires further investigation.[6]
    - Including the influence of the upgradient plume derived from mine water discharges sourced from the Ambrosia Lake mine area, for which HMC is a responsible party, in the conceptual model and the cleanup proposal. An evaluation of the restoration potential of the site must include "A demonstration that contamination sources have been identified and have been, or will be, removed and contained to the extent practicable."[8] The proposal for ACLs to "automatically adjust upward" based on upgradient monitoring results, influenced by infiltration of mine water discharges, allows HMC to skirt responsibility for upgradient sources and on-site contamination. Increasing concentrations of uranium and selenium in wells north of the LTP have been attributed "a perennial supply of recharge effluent" from upstream mines.[15] The "slow, multi-decadal rise in alluvial groundwater levels" is attributed to infiltration of mine water discharges, mixing with native alluvial groundwater, and movement of alluvial groundwater from upgradient historical mines and remediation discharges (GCAP, p. 3-12).
- Site background/GWPS values need to be re-evaluated. NMED and EPA need to complete their reassessment of background groundwater quality before issuing a ROD or a TI waiver. Our

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[13] DOE, 2019. Lifecycle report. https://www.hanford.gov/files.cfm/2019_Hanford_Lifecycle_Report_w-Transmittal_Letter.pdf

[14] EPA, 2015. Use of monitored natural attenuation for inorganic contaminants in groundwater at Superfund sites. August. 83pp. (p. 6)

[15] Weston Solutions, Inc. 2018. Phase 2 groundwater investigation report for the San Mateo Creek Basin legacy uranium mines sites. October. 244 pp. (p. ES-4 – ES-5).

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independent evaluation of background values in the alluvial and Chinle aquifers is presented in Section 3.0 of this memorandum.

- The modeling to evaluate the fate and transport of hazardous constituents at the site only includes uranium and molybdenum. Predicted concentrations for all other hazardous constituents are based on the results for uranium (U) and molybdenum (Mo). (GCAP, Section 7.0). Our work has shown that selenium behaves differently than U, yet its fate and transport will not be specifically considered.
- The basis for concluding that long-term groundwater restoration is not reasonably achievable (GCAP, p. 9-4) relies on modeling that is not supported by site-specific characterization or laboratory experiments. The GCAP evaluation of Alternative 4 assumes that "immobile U" (U in clays) will diffuse into "mobile U" pathways (sandy sections) forever (GCAP, Section 7.0), even if groundwater in the mobile pathways is completely restored. This conclusion relies on an unproven assumption that U will adsorb onto clays or ferrihydrite ($Fe(OH)_3$, also referred to as HFO; GCAP, Appendix F). The extensive U plumes in the alluvium, as shown in Figure 1 in this memorandum, demonstrate that U is highly mobile in this bicarbonate-rich, oxidized, and somewhat basic groundwater environment. Under these pH and redox conditions, the dominant U species are calcium uranyl carbonate complexes, as noted in the GCAP (Appendix F, p. 18). These species are either uncharged or negatively charged and will not substantially adsorb onto HFO under site groundwater conditions. However, the modeling conducted for evaluating the alternatives assumes U will be present as a positively charged ion, UO_2^{2+}, which is much more likely to adsorb to HFO. This poorly adsorbing species constitutes less than 0.0001 percent of other more strongly adsorbates, such as calcium, copper, zinc, and bicarbonate bound to HFO based on modeling simulations conducted by NMED. The related GCAP discussion refers to two tables that do not exist in the document (see GCAP, p. 7-2), and they select the "improved constants published by Mahoney et al. (2009)," yet these constants are for the free uranyl complex (UO_2^{2+}) rather than the calcium uranyl carbonate complexes that exist in groundwater under site conditions. This approach will overestimate "immobile U" and create an unsupported source for diffusion back into the alluvium after modeled remediation. An independent examination of the modeling performed for the alternatives evaluation needs to be conducted that honors site conditions.
- Modeling efforts to evaluate the effectiveness of proposed remedial measures and whether certain measures should be retained did not include a scenario with removal of the LTP. A site in New Jersey that received a TI waiver for arsenic, beryllium, and lead in groundwater based the evaluation on modeling that included no source removal and the implementation of source removal.[16] A similar exercise should be done for the HMC Superfund site to determine its restoration potential. The GCAP contains completely contradictory statements about long-term seepage from the LTP: Seepage from the LTP will continue after the final cover is installed and impact groundwater quality (GCAP, p. 9-4); and the tailings do not represent a significant residual source term upon prolonged weathering (GCAP, Appendix F, p. 16). The tailings leachate itself is the best measure of long-term leaching potential from the tailings, not results from the short-term tests upon which the latter statement is based. The finding in the GCAP that corrective action in impracticable is not based on removal of the source materials, which will continue to leach in perpetuity. For this site, removal of the LTP is the most effective remedial approach; it sits at the top of the mitigation hierarchy, which favors control or elimination of the sources over treatment.

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[16] EPA, 2012. Summary of Technical Impracticability Waivers at National Priorities List Sites (p. A-23).

3.0 Independent Evaluation of Groundwater Protection Standards

3.1 Overview

A complete reevaluation of background groundwater quality and the current GWPS has been recommended and is currently being conducted by EPA.[5] BVDA and the Multicultural Alliance for a Safe Environment (MASE) conducted its own evaluation of background groundwater quality by hiring Ann Maest, PhD and Tom Myers, PhD to complete an independent review of existing ("current") Groundwater Protection Standards (GWPS) for selenium and uranium, which are the primary groundwater contaminants around the Homestake site. The GWPS for the Homestake Mining Company's Grants Reclamation Project were proposed by Homestake and accepted by the NMED, the U.S. Environmental Protection Agency (EPA), and the Nuclear Regulatory Commission (NRC) in 2006 (NRC 2006; Arcadis 2018 and 2019). These values are referred to as "current" GWPS. The GWPS are intended to represent non-mining-influenced groundwater quality. Homestake (2015, p. 1-2) states that uranium concentrations used in the background analysis completed in 2004 have not been affected by upgradient mining and are representative of local natural conditions.

However, current GWPS values do not accurately reflect pre-mining/milling-influenced, background conditions because the standards are based on many sample results that reflect mining influence. A re-evaluation of background water quality data for the alluvial and Chinle aquifers found that representative non-mining-influenced concentrations were well below the current GWPS values. The re-evaluated GWPS values are referred to as "proposed" GWPS. The studies conducted by Maest (2020) and Myers (2020) examined the underlying data for the current GWPS values and excluded values indicating increasing selenium and uranium concentrations over time, as they were representative of mining influence. Due to page limitations, the procedure used for determining proposed selenium GWPS values for the alluvial aquifer is described, and the approach for the Chinle aquifer was similar. A similar approach was used to determine proposed uranium GWPS values for the alluvial and Chinle aquifers. The full reports by Myers and Maest are available online.[17] Our work has prompted the NMED, with support from EPA, to conduct its own, ongoing re-evaluation of GWPS values for the alluvial and Chinle aquifers for uranium, selenium, and other mining-related constituents.

3.2 Selenium GWPS Re-evaluation and Proposed Values

The current GWPS for the alluvial aquifer are based on values from 1995 to 2004 for the "near-upgradient" wells and include wells DD, ND, P, P1, P2, P3, P4, Q, and R (NRC, 2016; Arcadis, 2019). However, very few wells in the center of the alluvial aquifer were unaffected by mine-influenced water in the period from 1995 to 2004 (the period selected for the current GWPS), as shown in Figure 2. All alluvial wells except DD, P1, and P2 used in the current GWPS evaluation had increasing concentrations of selenium during this time period, indicating mine-related influence, likely from upgradient mines in the San Mateo Creek basin.

The following assumptions and approaches were used to calculate proposed GWPS values:

- Water quality data showing a consistent increase or decrease in concentration over time and across seasons or years for the identified contaminants of concern is an indication of mine-influenced water and should not be used for the background evaluation. Unexplained spikes that do not correlate with seasonal water-level variability should also not be used.

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[17] Maest report: https://swuraniumimpacts.org/wp-content/uploads/2021/03/20.03-Maest-Background-Study.pdf; Myers report: https://swuraniumimpacts.org/wp-content/uploads/2021/03/20.03-Myers-Background-Report.pdf

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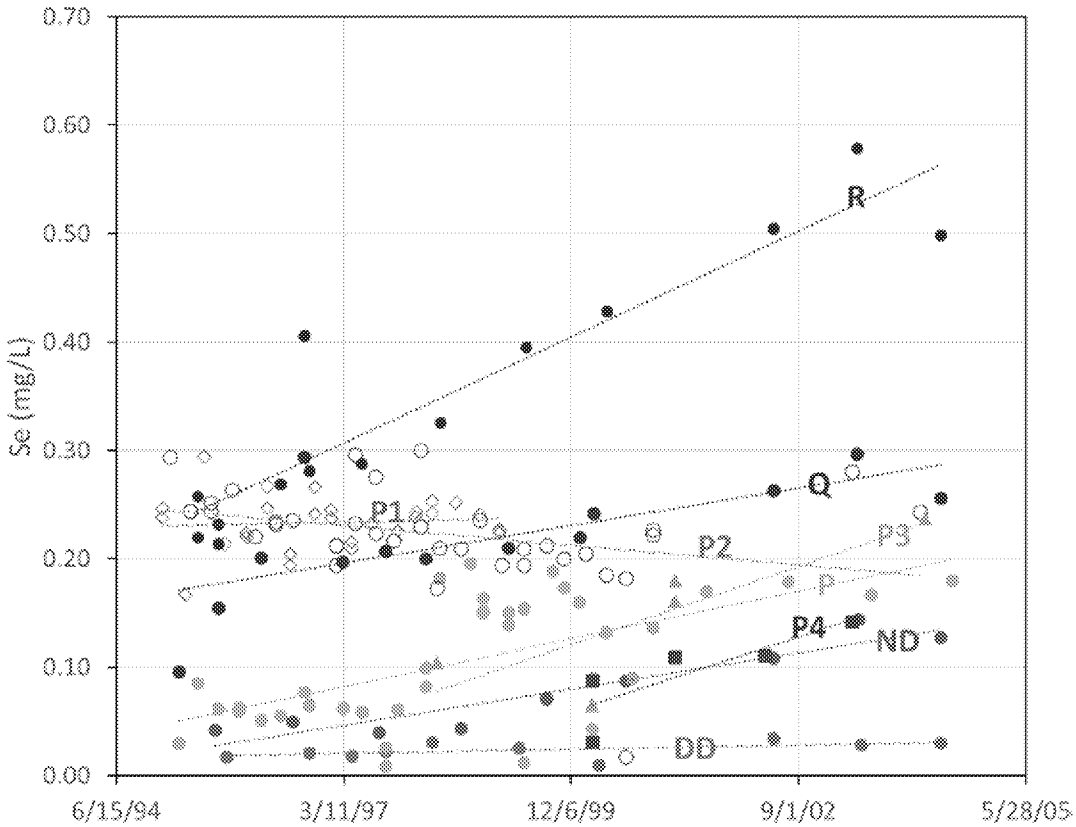
- Water quality samples from wells in identified contaminant plumes in the alluvial aquifer for a given time period have been affected by mine discharge and should not be used for the background evaluation.
- Results from wells before selenium concentrations began to increase can be used for background water quality.
- Using these assumptions, the total number of values used for alluvial groundwater was 131. Because only 9.2% of the values were below detection, they were replaced by ½ the detection limit.
- The 95th percentile was used to calculate the GWPS; therefore, differences in the low concentration range do not affect the high percentile values.



Data source: Homestake Access groundwater chemistry database.

Figure 2. Selenium concentrations from 1995 through 2004 in the near-upgradient wells selected for determining current GWPS values. The increasing concentration trends for all wells except P1, P2, and DD indicate that these groundwater data should not have been used for background because they are influenced by mining activity.

The proposed GWPS excludes wells Q and R and uses wells P (1995-1997), DD (1981-2014), ND (1983-1998), and 916 (1994-2005). Selenium concentrations in wells P1 and P2 have consistent concentrations over the narrow period of sampling (see Figure 2), but concentrations are similar to those in R and Q, which are known to be affected by mining-related sources. While wells R and Q had lower concentrations before the early 1990s, wells P1 and P2 were not sampled during this timeframe. P3 concentrations increased from the first sampling, so this well was excluded from consideration as background. Well P concentrations jumped in 1998, and concentrations from 1998 forward are not used.

The selenium concentrations in the "far-upgradient" wells (921, 920, 950, 916, 922, 914) were not used for calculating current GWPS values. Well 916 is the only far upgradient well with information on total depth and the screened interval.[18] Far upgradient well 916 was therefore also used for the proposed GWPS evaluation.

Table 1 compares current and proposed GWPS values for the alluvial aquifer; the Chinle Mixing Zone; and the Upper, Middle, and Lower Chinle Non-Mixing Zones. All proposed GWPS values are lower than the current GWPS values because the samples that reflect mining influence have been excluded. The proposed GWPS value for the Upper Chinle Mixing Zone is about half that of the Upper Chinle Non-Mixing Zone and about six times lower than the alluvial value, suggesting that the stratigraphically lower Chinle non-mixing zone was not contaminated by selenium moving from the Alluvial aquifer through the Upper Chinle Mixing Zone. The largest differences between current and proposed GWPS values are for the Alluvial and Lower Chinle Non-Mixing Zones.

Table 1. Current and Proposed Groundwater Protection Standards for Selenium

Aquifer	Current GWPS	Proposed GWPS	Basis for Recommendations
Alluvial	0.32	0.063	Excluded wells Q, R, P1, P2 – mining influence
Chinle Mixing Zone: Combined	0.14	0.079	See below
Chinle Mixing: Upper	Not determined	0.011	Excluded well CW9 (outlier)
Chinle Mixing: Middle		0.078	Excluded wells CW17, WR25 (mining influence)
Chinle Mixing: Lower		0.082	Included all well, all time periods
Upper Chinle Non-Mixing Zone	0.06	0.024	Excluded wells CW3 (2002 onward-mining influence), CW13 (east of East Fault and used for remediation), CW18 (east of East Fault)
Middle Chinle Non-Mixing Zone	0.07	0.02	Excluded DW1, DW2, ACW (spikes and increases), CW14 (high concentrations and used for freshwater injection), CW28 (mining influence)
Lower Chinle Non-Mixing Zone	0.32	0.022	Excluded CW16, CW29 (off-site collection well used for remediation), CW32 (extreme outlier), CW41 (2010 onward-mining influence)

The independent evaluation of selenium GWPS values has the following recommendations:

- Re-evaluate background water quality for all COCs and all aquifers, excluding data that reflect mining influence.
- Remediate Upper Chinle Mixing Zone to a lower (more protective) selenium concentration than the middle and lower Chinle mixing zones.

[18] Homestake Mining Company and Hydro-Engineering LLC. 2018. 2017 Annual Monitoring Report/Performance Review for Homestake's Grants Project Pursuant to NRC License SUA-1471 and Discharge Plan DP-200. Prepared for: U.S. Nuclear Regulatory Commissions and New Mexico Environment Department. March. 714 pp.

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- Study the relative transport rates of COCs to help predict future extent of contaminant plumes – will help focus remediation on preventing spread of existing and future contamination.

3.3 Uranium GWPS Re-evaluation and Proposed Values

A similar independent study was conducted on the current and proposed GWPS values for U in the alluvial and Chinle aquifers. See footnote 17 for details. A comparison of the current and proposed GWPS values and the basis for the recommendation can be found in Table 2.

Table 2. Current and Proposed Groundwater Protection Standards for Uranium

Aquifer	Current GWPS (mg/L)	Proposed GWPS (mg/L)	Basis for Recommendations
Alluvial	0.16	0.04	Statistics from the near upgradient wells, not including well DD, from 1995 through 2004, manually adjusted by the understanding that many wells in the far upgradient well field and in wells southwest of the LTP have much lower U concentrations.
Upper Chinle	0.09	0.03	A reasonable background for the Upper Chinle non-mixing zone is 0.03 mg/l based on data from before 7/22/87 at CW3 and 931. All other wells have been affected by LTP seepage during the period for which concentrations are available.
Middle Chinle	0.07	0.04	Background based on frequency analysis of HMC's Middle Chinle well data from 1982 through 2002 excepting wells and observations described in the text. Recommended background accounts for the many Middle Chinle wells throughout the area with very low concentrations early in the period by using a lower estimate even though the data is not amenable to being added to the frequency analysis. U concentrations varied, but most were initially very low.
Lower Chinle	0.03	0.03	Almost all concentrations prior to 6/26/2002 are <0.03 mg/l
Chinle Mixing Zone	0.18	0.05	Based on the 95% exceedance for the Upper and Lower Chinle and well CW15 from the Middle Chinle, with data from 1987 through 2018. LTP seepage has affected much of the data used by HMC in the Middle Chinle.

4.0 Summary and Conclusions

- Granting HMC a TI Waiver and ACLs for groundwater is premature and not based on the best available science. Major uncertainties exist regarding the site conceptual model, incorrect background groundwater quality, and the modeling used to conclude that a TI waiver and ACLs are needed.
- The finding that groundwater restoration is "not reasonably achievable" is based on faulty modeling assumptions that are not representative of site conditions. Removal of the LTP should also be considered in the modeling effort to examine the effects on long-term groundwater quality.
- For this site, removal of the tailings is the most effective solution for long-term groundwater protection. The argument that costs are too high is typical for legacy uranium mines, whereas legacy nuclear facility cleanups costing billions have been approved by the DOE. The argument that tailings removal would adversely affect the community is irrelevant because HMC has effectively eliminated the community. Long-term protection of the SAG aquifer is essential so it can continue its role as the primary regional water supply source.

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Written Statement to the National Remedy Review Board

Homestake Mining Company of California

March 10, 2021

Site Overview

Homestake Mining Company Superfund Site, also known as Grants Reclamation Project, (the "Site") is located in Cibola County, New Mexico, approximately 5.5 miles north of the Village of Milan. Homestake Mining Company of California (HMC), and others (through partnerships), operated the uranium processing mill at the Site from approximately 1958 to 1990. The mill historically supplied uranium primarily to the United States for weapon-making during the Cold War era. The Site consists of three operable units: groundwater aquifers (OU1); long-term tailings stabilization, surface reclamation and site closure (OU2); and radon concentrations in neighboring subdivisions (OU3). EPA issued a ROD for OU3 in September of 1989 requiring no further action. The focus of HMC's current work is OU1 and OU2, and as such, this memorandum is limited in scope to these operable units. The Site presently consists of the large tailings pile (LTP), small tailings pile (STP), reverse osmosis groundwater treatment system, zeolite groundwater treatment system, and multiple evaporation ponds.

Regulatory Oversight & Status

The Site is under the often-conflicting federal jurisdiction of the Nuclear Regulatory Commission (NRC), formally the Atomic Energy Commission (AEC), through the Uranium Mill Tailings Radiation Control Act (UMTRCA) and the Environmental Protection Agency (EPA) through the Environmental Response, Compensation, and Liability Act (CERCLA). In addition to the dual-federal regulation, the Site is subject to New Mexico State regulation under its Discharge Permit-200 (DP-200) by New Mexico Environment Department (NMED), as well as the State's participation as provided under CERCLA.

UMTRCA authorizes NRC to regulate byproduct material at uranium processing sites through production, reclamation, and disposal phases. AEC initially issued Source Materials License SUA-708 in 1958 to address uranium milling operations at the Site. From 1974 to 1986, the State, with delegated authority from NRC, regulated uranium milling operations at the Site (operating as what is known as an "Agreement State").

In 1983, EPA listed the Site on the National Priorities List (NPL) because of New Mexico's Agreement State status. EPA generally defers listing on the NPL sites subject to NRC licensing authority; however, this deferral policy does not apply to sites in "Agreement States" where NRC has delegated oversight authority to a state. New Mexico was an "Agreement State" until June 1, 1986 (after EPA listed the Site on the NPL). The Site remained on the NPL thereafter, putting it in the unusual position of being under NRC's direct oversight while also subject to EPA oversight as an NPL site even after the State relinquished its licensing authority.

In 1993, NRC and EPA entered into a memorandum of understanding (MOU) delineating each agency's responsibility in remediation activities. According to the MOU, NRC would take the "lead regulatory agency" role. EPA would monitor remedial and reclamation activities required by NRC and provide reviews and

comments directly to NRC. EPA would also have authority to "take whatever action it deems appropriate" "[i]n the event that EPA determines that the implementation of the site reclamation plan, closure activities, and/or groundwater corrective action has not resulted in, or may not result in, cleanup conditions that meet applicable or relevant and appropriate requirements."

The Site is presently undergoing reclamation, groundwater corrective action (with a Corrective Action Plan submitted November 13, 2020 and Alternate Concentration Limit (ACL) application forthcoming), and closure pursuant to NRC Source Materials License SUA-1471, as amended. The Site is further regulated by EPA as it meets its requirements under the National Contingency Plan (NCP), CERCLA's implementing regulations, to allow delisting from the NPL.

The Site's extensive regulatory oversight, particularly that of two different federal agencies and statutory schemes governing remediation, is a regulatory anomaly, and the reason for its occurrence is long gone. As explained, EPA listed the Site on the NPL because of New Mexico's status as an Agreement State with delegated authority from NRC. Like other Title II UMTRCA sites, had NRC never delegated its authority, the Site would not be listed on the NPL and would not be under EPA's CERCLA jurisdiction. Even though NRC resumed authority and New Mexico is no longer an Agreement State for the purposes of uranium mill tailings, the Site remains on the NPL. There is only one other site in the entire country caught by this particular regulatory limbo (Church Rock, New Mexico).[1] There is no substantive, legal justification for this dual regulation where all other similar Title II UMTRCA site are under the sole federal oversight of NRC. No unusual or extraordinary risks exist at this particular Site justifying additional oversight and dissimilar treatment from all other Title II UMTRCA sites. Despite this, HMC acknowledges its need to meet its CERCLA obligations in order to reach NPL delisting.

These jurisdictional conflicts between EPA and NRC reached an apparent impasse in 2012. At this time, EPA and NRC contemplated consecutive, as opposed to concurrent processes (including a potential license abeyance), which would have resulted in decades delay and uncoordinated oversight. As a result, HMC proposed to both agencies pursuing "CERCLA equivalency," a legal mechanism to harmonize the two federal processes. Under 40 CFR § 300.700(c)(3), "[a] private party response action will be considered 'consistent with the NCP' if the action, when evaluated as a whole, is in substantial compliance with the applicable requirements [of the NCP], and results in a CERCLA-quality cleanup." With equivalency, HMC seeks to simultaneously meet EPA's obligations under CERCLA while achieving its NRC obligations under UMTRCA. In practicality this means that HMC utilizes investigation, data gathered, and work performed for NRC (with EPA concurrence) under UMTRCA, supplementing as necessary to fill data gaps, to produce a CERCLA administrative record. Through this equivalency approach, the NRC process remains the lead, via the agencies MOU, but allows EPA to also achieve its goals parallel to the NRC actions without unnecessary redundancies. As both legal authorities oversee HMC's surface and groundwater remediation, the concurrent progression of these two regulatory processes is critical in order to ensure a consistent remedy and nonconflicting site standards.

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[1] Two sites are listed on the NPL as well as regulated by Agreement State Colorado (Umetco in Uravan, and Cotter Uranium Mill in Canon City). Their NPL listing (and consequently their EPA oversight) are consistent with EPA policy to list sites in Agreement States and are not subject to dual-federal agency oversight.

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To that end, HMC has prepared, in cooperation with EPA Region 6, the following CERCLA- and NCP-compliant documents:

- Remedial Investigation (RI) (including Human Health Risk Assessment; Conceptual Site Model; Baseline Ecological Risk Assessment) – approved by EPA June 15, 2020;
- Candidate Technologies Memorandum – submitted to EPA and acknowledged in Statement of Work (SOW) ¶ 19; and
- Entered into Administrative Settlement and Order on Consent (AOC) and corresponding SOW for preparation of a Feasibility Study (FS), including Technical Impracticability Waiver Evaluation Report (TI Waiver Report) – effective August 12, 2020. Under the AOC, HMC has submitted the following deliverables:
    - Draft Screening of Remedial Alternative Memorandum – revised version addressing EPA comments submitted to EPA, and EPA acknowledged satisfaction of SOW requirement on September 2, 2020;
    - Draft TI Waiver Report – submitted on Nov. 16, 2020 and awaiting EPA comment; and
    - Draft FS – submitted on Dec. 15, 2020 and awaiting EPA comment.

HMC seeks to continue its cooperative path with all agencies and appreciates its collaborative relationship with EPA. Recognizing the technological limitations, persistent contaminant sources, and hydrogeologic complexity all affect remediation efficacy of the Site contaminants, HMC is pursuing an ACL from NRC. Similarly, to move this Site to closure under CERCLA, a technical impracticability (TI) waiver of groundwater Applicable or Relevant and Appropriate Requirements (ARARs) is appropriate both from a technical standpoint and a CERCLA equivalency perspective to align these competing regulatory processes and arrive at a consistent remedial strategy that is protective of human health and the environment.[2] HMC continues to urge EPA, and particularly the NRRB, to approach Site decisions recognizing that HMC is diligently pursuing a parallel, equivalent, and protective process under NRC's implementation of UMTRCA.

History of Remediation

Surface

Under NRC oversight with review and consent from the EPA and NMED, between 1988 and 1993, HMC excavated windblown materials with elevated radium-226 concentrations in areas adjacent to the tailings piles and placed the soil on the piles. HMC removed surface soil from approximately 1,200 acres of land. This resulted in the cleanup of surface soils to an average radium-226 concentration of 1.11 pCi/g (standard deviation 1.05 pCi/g) for the inner zone of the cleanup area and 2.95 pCi/g (standard deviation 1.89 pCi/g) for the outer zone of the cleanup area, based on verification soil sampling that was biased high (ERG 1995).

Between 1993 and 1995, HMC, with each agencies' review and consent, decommissioned and demolished the mill facilities. HMC excavated an average of two feet of contaminated soil (containing elevated radium-226 concentrations) from mill area following the completion of demolition. Excavated soils were transported to the LTP and STP for burial. HMC stabilized the tailings piles by regrading and placing soil covers and rock on

[2] Of note, NMED has an analogous regulatory process known as an Alternative Abatement Standard (AAS). HMC has begun discussions with NMED as to its path to meet NMED's process as well, which may include reliance on HMC's TI waiver and/or ACL processes to avoid duplicative efforts.

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the side slopes for erosion protection. One foot of soil cover was initially placed on top of the LTP. Additional cover material was placed on top of the pile to fill in depressions caused by settlement, improve drainage, and address specific area with elevated radon flux measurements. Excavated areas were backfilled with alluvial soils, as well as rock for erosion protection.

HMC refers the Board to its draft FS for future discussion of planned surface remediation for OU2 as the remainder of this document focuses on HMC's groundwater remediation efforts.

Groundwater

Remediation and monitoring activities began around 1976 under applicable state and federal licenses and authorities. For over four decades, HMC has conducted extensive groundwater remediation, expanding and improving its remediation as follows:

- **1975 – HMC began providing bottled water to residents of nearby subdivisions upon request.**
- **1976 – HMC entered into agreement with NMEID to provide bottled water to residents located hydraulically downgradient of the source areas.**
- 1977 - Water is added into the alluvial aquifer to create a hydraulic barrier to limit the movement of contaminated groundwater.
- **1977-1983 - Multiple hydraulic extraction wells were installed in the alluvial aquifer.**
- 1984 - Hydraulic containment of the Upper Chinle aquifer was initiated.
- **1986 - Extension of the Milan water supply to the Broadview Acres, Felice Acres, Murray Acres, Valle Verde, and Pleasant Valley Estates subdivisions was initiated.**
- 1990 – Evaporation Pond EP-1 was constructed within the footprint of the STP to assist in the dewatering of the LTP and to hold water pumped from the collection wells.
- 1992 - Toe drains were installed around the tailings (LTP/STP).
- 1993-2000 - During this period, corrective action and monitoring well networks were revised through addition and abandonment of wells.
- 1994 - HMC completed bench-scale treatability testing for ion exchange and activated alumina.
- 1996 - Use of Evaporation Pond EP-2 began in March.
- 1999 - The reverse osmosis (RO) treatment unit was added; treated water is used for hydraulic containment of the alluvial aquifer.
- 2000 - Irrigation of 270 acres groundwater was initiated as a means to manage extracted groundwater. HMC began flushing program.
- 2000-2015 – Tailings flushing of the LTP was conducted where water was introduced into the LTP to expedite the mass flux of contaminants from the tailings.
- 2002 - 60 acres of irrigation area were added and added an additional RO skid to plant for increased treatment rate.
- 2002-2009 - During this period, corrective action, and monitoring well networks were revised through addition and abandonment of wells.
- 2004-2005 - 64 acres of irrigation area were added.
- **2006 - EPA, NMED, and NRC approved site groundwater standards.**
- 2010 - Evaporation Pond EP-3 was constructed and commissioned.
- 2012 - Land Application program ceased operation.
- 2012 - 300 gpm Zeolite pilot treatment started operation.

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- 2015 - RO Plant was expanded to a theoretical maximum throughput of 1200 gpm with the addition of a 600 gpm low pressure skid, a 250 gpm high pressure skid, and two microfiltration skids to replace the existing sand filters amongst other updates.
- 2016 - Zeolite system with a theoretical maximum throughput of 1200 gpm started operation for off-Site water treatment.
- 2016 - EPA initiated background reassessment study (USGS split sampling event).
- **2018 - HMC (Arcadis) borehole development and geophysics programs near wells DD and DD2 (Controls on Groundwater Background Constituent Concentrations due to Mineralogy Local to Monitoring Wells).**
- **2019 - In collaboration with EPA, HMC conducted additional field investigations to expand the characterization of the soils east of wells DD and DD2, across the alluvial channel (Supplemental Background Soil and Groundwater investigation Report Grants Reclamation Project).**

Path Forward: Technical Impracticability Waiver

After 40+ years of progressive remediation and investigation at the Site, it has become apparent that there are technical barriers to achieving groundwater ARARs. As required by its AOC with EPA, HMC submitted a Draft TI Waiver Report on November 16, 2020 for EPA's review, comment, and approval. HMC seeks to waive the following ARARs:

- **Safe Drinking Water Act**
  - **40 CFR § 141, Subpart B** – sets Maximum Contaminant Levels and non-zero Maximum Contaminant Level Goals.
  - **40 CFR § 192** – sets standards for the protection of public health, safety and the environment from radiological and non-radiological hazards associated with uranium and thorium ore processing, and disposal of associated wastes, including setting the standard for molybdenum.
- **New Mexico Water Quality Act, § 20.6.2.3103 NMAC** – sets state water quality standards.
- **10 CFR Part 40, Appendix A, Criterion 5B(5) (establishes concentration limits to be used for groundwater protection at uranium mill tailings sites)** – provides that "At the point of compliance, the concentration of that constituent in the groundwater must not exceed—(a) *The Commission approved background concentration of that constituent in the groundwater*; (b) The respective value given in the table in paragraph 5C if the constituent is listed in the table and if the background level of the constituent is below the value listed; or (c) An alternate concentration limit established by the Commission," which sets the standard for uranium as background.

Unlike almost any NPL site that has come before it, this Site benefits from 40+ years of extensive investigation, monitoring, and on-the-ground application of its remedial strategy. While other sites select remedies and make TI waiver determinations based on projection, HMC's draft TI Waiver Report and alternatives evaluation is based on the more than 40 years of groundwater remediation and investigation (applying an exhaustive list of remediation technologies: RO treatment, Zeolite treatment, ion exchange, in situ phosphate treatment, in situ bioremediation, amongst others), and conducting three treatability studies (Tripolyphosphate, Electrocoagulation, and In-situ biological treatment). EPA guidance distinguishes between "front-end" (those that are granted at the Record of Decision (ROD) stage and "back-end" (those that are granted subsequently after remedy implementation) TI waivers, suggesting a preference for "back-end" TI waivers once the remedy's efficacy is best understood. While the Site does not have a formal ROD, for all

intents and purposes this is a back-end TI waiver. As mentioned and detailed above, HMC has remediated already for over four decades. Neither more time nor investigation will yield greater certainty.

HMC encourages the Board to review its draft TI Waiver Report for a detailed explanation of HMC's technical basis for a TI waiver. Distilled to its simplest form, modeling demonstrates that ARARs cannot be achieved in a reasonable timeframe. The 1st Order of Decay Analysis predicts 210 years for uranium and 360 years for molybdenum to achieve *present* cleanup standards. EPA, NMED, and NRC approved site standards for each constituent of concern (COC) in 2006 based on an evaluation of background water quality (HMC and HE 2003; HE 2001; ERG 2003; ERG 2002; ERG 1999). The standards were incorporated into the radioactive materials license via license amendment number 39 as groundwater protection standards and New Mexico DP-200. EPA expressed concern with background levels in 2013. Homestake has endeavored to resolve EPA concerns since, with renewed focus and extensive investigation beginning in 2018. HMC maintains that the current background levels, previously accepted by all agencies, are scientifically defensible and represent the natural heterogeneity of the alluvial aquifer. Regardless, HMC evaluated the technical impracticability of achieving the background levels established in 2006—if HMC cannot meet these cleanup levels, it surely cannot meet more stringent standards contemplated by EPA, making continued investigation into this issue moot. A decision to change background levels for the purpose of HMC's CERCLA cleanup unnecessarily runs contrary to the objective of achieving a parallel regulatory process with lead-agency NRC and could result in an inconsistent remedy and/or site standards—all without apparent benefit to protecting human health and the environment.

Ultimately, even if cleanup standards could be achieved, the result would be temporary and contamination to groundwater would continue after the groundwater treatment systems were shut off. HMC cannot remediate the primary sources (LTP and STP) or the secondary source (vadose and silt/clay in the alluvial aquifer beneath the LTP). The viability of moving the LTP has been sufficiently analyzed and determined to be impracticable. Most recently, Tetra Tech on behalf of HMC (Tetra Tech 2012), dismissed moving the LTP for the following reasons:

- **Additional risk to human health**: The potential risk to human health risk is significant. The increased cancer risk to workers involved with tailings excavation and placement is 1 in 10. The increased cancer risk to nearby residents is approximately 1 in 100 based on exposure to radioactive material.
- **Potential ecological damage**: Relocating tailings would require extensive amount of land that will be irretrievable committed for perpetuity as a disposal cell. Removal of habitat will potentially affect native wildlife and vegetation.
- **Potential damage to cultural resources**: Relocating tailings could negatively affect the large number of cultural resources in the area including federal and state parks and tribal lands.
- **Potential impacts from increased truck traffic**: Truck traffic to move tailings would be large and noticeable. This would include additional noise impacts, negative air quality, and potential for accidents and accidental releases. The potential impacts are not as great with rail, but increased activity would impact community and increase potential for traffic accidents and accidental releases.
- **Potential Regulatory Challenges**: Siting studies, public hearings, and environmental reports and preconstruction monitoring has been estimated to take up to seven years. The construction of cell has been estimated to take up to three years, and it has been estimated to take up to two years to move the LTP.
- **Carbon Footprints**: Offsite disposal would require greater use of consumable materials and fossil fuel and result in greater greenhouse emissions.

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- **Potential Impact to Community**: Construction at new site would result in negative noise and vibration impacts to residents and wildlife.
- **Cost prohibitive**: The estimated costs range from $1.8 billion (truck transport) to over $2 billion (rail and slurry pipeline transport).

Similarly, in 2009, U.S. Army Corps of Engineers (ACOE), on behalf of EPA, reviewed the remediation efforts at the Site, issuing a final report in 2010 (ACOE 2010). ACOE presented alternate strategies to the current groundwater restoration program, including relocation of tailings to an engineered landfill within 30 miles of the Site. ACOE concluded, "Relocation of the tailings should not be considered further by any means given the risks to the community and workers and the greenhouse gas emissions that would be generated during such work." EPA (EPA 2011) and NRC (NRC 2011) agreed with this recommendation. NMED supported EPA's recommendations by letter to NRC dated April 20, 2011 (NMED 2011).

Additionally, NRC considered moving the LTP in 1993, concluding based on the costs and benefits associated with the proposed reclamation options (reclamation in place, slurry relocation to the alternative offsite location, or conventional earthwork relocation to the alternative offsite location) that the additional costs of relocation outweighed any minor benefits that would result from relocation.

Not only is this primary source impracticable to remediate, HMC cannot remediate the secondary source (the vadose and silt/clay in the alluvial aquifer beneath the LTP) even if HMC could remove the LTP. COPCs/ROPCs have adsorbed to the unsaturated soil and diffused into the pore-water in the silt/clay, making groundwater restoration an unachievable goal.

Further, increased remediation system capacity will not overcome impracticability. The treatment rates used in the updated modeling efforts are approximately 50% higher than the peak annual average actually achieved onsite since the expansion of the treatment systems. Alternative 5 from the draft FS shows that even with the overly-optimistic assumption that 50 years of pumping removes all contamination in the mobile domain (coarse grained material)—a timeframe unsupported by the 1st order decay analysis or the groundwater model—the back-diffusion from the immobile domain (fine-grained material) and the continued seepage from the LTP would generate a new plume following cessation of remediation. As a result, ARARs would still be unattainable, a TI waiver would be needed, and groundwater access would need to be limited to ensure protectiveness resulting in the same remedy implementation regardless of remediation system capacity. The various alternatives analyzed in HMC's draft FS show that while concentrations within the footprint of the plume may vary, the footprint of the plume above background and/or a protective standard remains largely unchanged even if system capacity is increased.

Increased system capacity may even have negative consequences to water resources in the area. Historic groundwater remediation at the Site has evaporated approximately three billion gallons of water, the equivalent of three years of combined consumption from the nearby municipalities of Grants and Milan. Each additional year of remediation at the Site commits approximately 105 million gallons to evaporative loss in an arid desert region where total precipitation is typically less than 12 inches a year. While the groundwater within the TI zone may not be usable at its present concentrations, downstream beyond the TI zone will be a useable resource. Continued pumping and evaporation would remove billions of gallons, including useable groundwater, from the region's water supply entirely.

Ultimately, future remediation will not result in attainment of ARARs, and the measures needed to ensure protectiveness of human health and the environment remain the same regardless of continued remediation. HMC has already completed the following steps in order to protect potential receptors:

- **Land purchase**: HMC currently owns approximately 74% (4,200 acres of the total 5,700 acres) of the land within the LTC/TI Zone Boundary.
- **Alternative groundwater supply**: HMC has connected all residents in the neighboring subdivisions to municipal water.

Additionally, in 2009, NMED issued a Health Advisory, notifying private well owners of potential contaminant concentrations above federal drinking water standards, and in 2018, the Office of the State Engineer issued an Order restricting well drilling in the Alluvial and Chinle aquifers within an area where groundwater is impacted by historical uranium milling and mining activities.

As next steps, HMC proposes the following protectiveness and exposure control actions:

- Continued property acquisition;
- Water well abandonment;
- Point of use treatment if necessary; and
- Water use restrictions including restrictive covenants.

Together, these measures will protect human health and the environment.

Proposed Remedy

HMC refers the Board to its Draft FS, submitted December 15, 2020, for a detailed analysis of proposed remedial alternatives. Notably, each alternative does not achieve compliance with ARARs, and thus requires a TI waiver. In summary, based on the results of HMC's robust groundwater modeling and analysis in its draft TI Waiver Report, HMC proposes long-term monitoring coupled with application of the institutional controls detailed above. This remedial alternative will satisfy the threshold criteria:

- **Protectiveness of human health and the environment** – achieved through the institutional controls and confirmed through monitoring; and
- **Compliance with ARARs** – achieved through TI waiver.

Importantly, this alternative will be consistent with the NRC remedial strategy, including the proposed ACLs and established cleanup levels, and will finally make meaningful steps toward regulatory closure after decades of remediation and oversight.

Conclusion

Despite the apparent challenges from coordinating multi-federal agency oversight, neither designed to accommodate the other, HMC has developed a scientifically-supported remedial strategy that offers both an opportunity to protect human health and the environment and close the chapter on more than four decades of investigation, remediation, and use of regulatory resources. HMC appreciates Region 6's, and this Board's, support in achieving this common goal.

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Environmental Restoration Group Inc. (ERG). 1999. Statistical Evaluation of Alluvial Groundwater Quality Upgradient of the Homestake Site Near Grants, NM Molybdenum, Selenium, Uranium

Environmental Restoration Group Inc. (ERG). 2002. Statistical Evaluation of Alluvial Groundwater Quality Upgradient of the Homestake Site Near Grants, NM Chloride, Nitrate, Sulfate, Total Dissolved Solids

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Hydro-Engineering LLC (HE). 2001. Ground-water Hydrology for Support of Background Concentration at the Grants Reclamation Site. December.

New Mexico Environment Department (NMED). 2011. Letter from William C. Olson, Chief, Ground Water Quality Bureau, NMED, Santa Fe, New Mexico to Keith I. McConnell, Deputy Director, Decommissioning and Uranium Recovery Licensing Directorate, U.S. NRC, Rockville Maryland regarding NMED's review of the EPA Region 6 recommendations to the NRC on the Focused Review of Specific Recommendations in the Addendum to the Remediation System Evaluation for the Homestake Mining Company Site. April 20.

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Tetra Tech. 2012. Screening Level Evaluation of an Off-site Relocation of the Large Tailings Pile, Homestake Mining Company – Grants Site. June.

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PUEBLO OF LAGUNA

Date: March 10, 2021

To: Mark Purcell, Superfund and Emergency Management Division

From: John E. Antonio, Sr., Governor

Re: National Remedy Review Board Hearing – Homestake Superfund Site – Pueblo of Laguna Comments

Dear Mr. Purcell,

Water is sacred to all Pueblo people, and it is the desire of the K'waika'me (the people of Laguna, in the Keresan language), that all people have enough clean water for their needs. The Laguna People have a long history of residing near and farming along the Rio San José in west-central New Mexico. It is neither an accident nor a mystery why the Laguna people have traditionally lived near flowing water; for many centuries, since before Europeans arrived in the Southwest in the sixteenth century, they have relied on ditch irrigation to grow much of the food that has sustained them. The sources of water for Pueblo irrigation have been many and varied, but for the Laguna people, that source has been primarily the Rio San Jose and its tributaries. It is because of this history, and these traditions, that the Pueblo of Laguna is concerned with the potential impacts to the Rio San Jose, and its underlying aquifers, from the Homestake site.

The water that flows in the Rio San Jose comes from a combination of surface and groundwater sources, including water flowing down the Rio San Mateo, and from the San Andres Glorieta Aquifer (SAGA). In times past, other springs contributed more dramatically to this flow, however, extensive groundwater pumping upstream as well as the impacts of climate change has caused them to go dry.

The Pueblo of Laguna, along with the Pueblo of Acoma, is involved in a decades long water rights adjudication to quantify their water rights, (part of State of New Mexico, ex. rel. State Engineer, v. Kerr-McGee Corp., et al., and CB-83-220-CV (Consolidated)), after years of trespass on those rights by upstream users, that have contributed to a regional water shortage. One of our greatest challenges is to find water sources in the basin that do not require significant treatment. Beyond the water available in the Rio San Jose itself, the best quality water remaining is the SAGA, which is also used by the Village of Milan, and City of Grants, and others. The risk of losing another water supply due to contamination from Homestake's inability to clean up its mess is unacceptable.

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After the discovery of uranium in the Grants Mining District in the 1950's through the 1980's, a significant quantity of both uranium and groundwater were removed, from the San Mateo Creek area, as well as across the region. These mining activities provided economic development for the area, but had a high cost in lingering environmental damage to the Pueblo of Laguna and its people. Homestake's current mitigation activities are reducing the likelihood of contaminated waters reaching either the Rio San Jose or the SAGA. The Pueblo of Laguna does not support any cessation of cleanup operations without permanent protection for Rio San Jose and the SAGA as well as any other clean water sources at risk from the Homestake site.

The Pueblo of Laguna encourages the Environmental Protection Agency, as well as the National Remedy Review Board to continue to support the requirement that the Homestake Mine be cleaned up entirely, so that the people of Laguna, and the others in the vicinity do not have to suffer the consequences of a failed environmental cleanup. The weight of environmental damage from decades of profit by the extractive industry for the benefit of the Federal Government should not continue to fall on Native American communities, or our neighbors.

Message

From: Purcell, Mark [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=FE198E260B024EB4BD9D30DC11F900B1-PURCELL, MARK]
Sent: 6/15/2021 9:31:30 PM
To: Adam Ringia [ringiaa@pol-nsn.gov]
CC: Setter@pol-nsn.gov; gjojola@pol-nsn.gov; Turner, LaDonna [turner.ladonna@epa.gov]; Gee, Randy [Gee.Randy@epa.gov]
Subject: FW: Homestake NRRB Recommendations
Attachments: Homestake NRRB Recommendations Final.pdf

Hi Adam,

Please find attached the EPA National Remedy Review Board (NRRB) recommendations on the Homestake NPL Site Feasibility Study.

We are providing these recommendations to all stakeholders that participated in the March 2021 NRRB meeting, as well as the U.S. Nuclear Regulatory Commission and the U.S. Department of Energy. We will also make them available to the public for review via EPA's site webpage.

EPA Region 6 will begin to review/assess these recommendations and prepare written responses to the NRRB over the next couple of months.

If you have any questions, please let me know.

Best regards,

Mark

Message

From: Purcell, Mark [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=FE198E260B024EB4BD9D30DC11F900B1-PURCELL, MARK]
Sent: 3/24/2021 6:42:09 PM
To: Gail Evans [gevans@nmelc.org]
CC: Susan Gordon - MASE [sgordon@swuraniumimpacts.org]; Poore, Christine [Poore.Christine@epa.gov]; yahoo mail [boomerart62@yahoo.com]; sharon mackendrick [smackend@nmsu.edu]; Laura Watchempino [5000wave@gmail.com]
Subject: RE: NRRB meeting on Thursday 3/25
Attachments: 20210311 Homestake Presentation Slides to NRRB.pdf

I will replace the slides.

I have also attached Homestake's presentation slides in advance of the meeting tomorrow. I will also be providing BVDA/MASE slides to Homestake today as well.

Mark D. Purcell
Superfund and Emergency Management Division
U.S. Environmental Protection Agency – Region 6
1201 Elm Street, Suite 500
Dallas, TX 75270 - 2162
Tel: 214-665-6707
Fax: 214-665-6660
Purcell.mark@epa.gov

From: Gail Evans <gevans@nmelc.org>
Sent: Wednesday, March 24, 2021 1:10 PM
To: Purcell, Mark <purcell.mark@epa.gov>
Cc: Susan Gordon - MASE <sgordon@swuraniumimpacts.org>; Poore, Christine <Poore.Christine@epa.gov>
Subject: RE: NRRB meeting on Thursday 3/25

Thanks for this Mark. I just got off the phone with Laura and Susan and we changed around the order of Laura's slides a bit. We moved slide 3 to slide 6, and we moved slide 13 to slide 14. I have attached the corrected presentation here. If it is possible to share this one with the NRRB that would be great. If it is too late, we understand.

Thank you. gail

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From: Purcell, Mark <purcell.mark@epa.gov>
Sent: Wednesday, March 24, 2021 9:38 AM
To: Gail Evans <gevans@nmelc.org>
Cc: Susan Gordon - MASE <sgordon@swuraniumimpacts.org>; Poore, Christine <Poore.Christine@epa.gov>
Subject: RE: NRRB meeting on Thursday 3/25

Thank you for submitting the slides on behalf of BVDA and MASE.

You should be able to share your screen in Teams for the presentation. There will be a button at the top of the Teams screen that shows a rectangle outline with an upward-pointing arrow inside. That will allow you to share your screen. There will be some views that pop up for sharing once you hit that button, depending on what is open on your computer. Pick the view that shows your desktop and then open or go to the slides. That should do it.

If you have difficulty doing this, then I can open up your slides and share my screen for you. I will then change the slides as you direct.

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From: Gail Evans <gevans@nmelc.org>
Sent: Tuesday, March 23, 2021 6:31 PM
To: Purcell, Mark <purcell.mark@epa.gov>
Cc: Susan Gordon - MASE <sgordon@swuraniumimpacts.org>; Poore, Christine <Poore.Christine@epa.gov>
Subject: RE: NRRB meeting on Thursday 3/25

Hi again Mark.

We are disappointed with EPA's response about stakeholder participation.

We have attached the presentations that MASE and BVDA will be giving on March 25th. Please forward these to the Board members and make them part of the record.

Will there be a way for our presenters to share their screens and go through the power points during the presentation?

Thank you.

Gail

Gail Evans

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From: Purcell, Mark <purcell.mark@epa.gov>
Sent: Tuesday, March 23, 2021 3:01 PM
To: Gail Evans <gevans@nmelc.org>
Cc: Susan Gordon - MASE <sgordon@swuraniumimpacts.org>; Poore, Christine <Poore.Christine@epa.gov>
Subject: RE: NRRB meeting on Thursday 3/25

Ms. Evans,

Such participation by the stakeholders is not allowed by the National Remedy Review Board. It is a very deliberative and structured process.

Also, I want to emphasize again that each stakeholder is only allowed a specific amount of time in which to present to the Board. BVDA and MASE have been given a combined 60 minutes to make their presentations. They cannot take more time than that. After 60 minutes, their session will be cut off. As I have also told BVDA and MASE, they are encouraged to allow some time after their presentations for the Board to ask questions.

Just so you know, Region 6 is also only allowed a specific amount of time. The Board will not allow us to go over.

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From: Gail Evans <gevans@nmelc.org>
Sent: Tuesday, March 23, 2021 11:57 AM
To: Purcell, Mark <purcell.mark@epa.gov>
Cc: Susan Gordon - MASE <sgordon@swuraniumimpacts.org>
Subject: NRRB meeting on Thursday 3/25

Dear Mark,

I write on behalf of MASE and BVDA. Thank you for sending us the link for the MASE, BVDA and Homestake presentations. We understand that NMED and the Pueblos have been invited to attend those sessions as well.

As we have expressed previously, we would like to listen to the entire day of NRRB hearings on March 25. At the very least, we would like the link for the NMED and Pueblo presentations. We hope that you will provide that to us so that we can have a fuller understanding of this NRRB process which impacts MASE and BVDA members.

As always, if it would be helpful to have a phone call about this, please call me on my cell – 505 463 5293.

Thank you. gail

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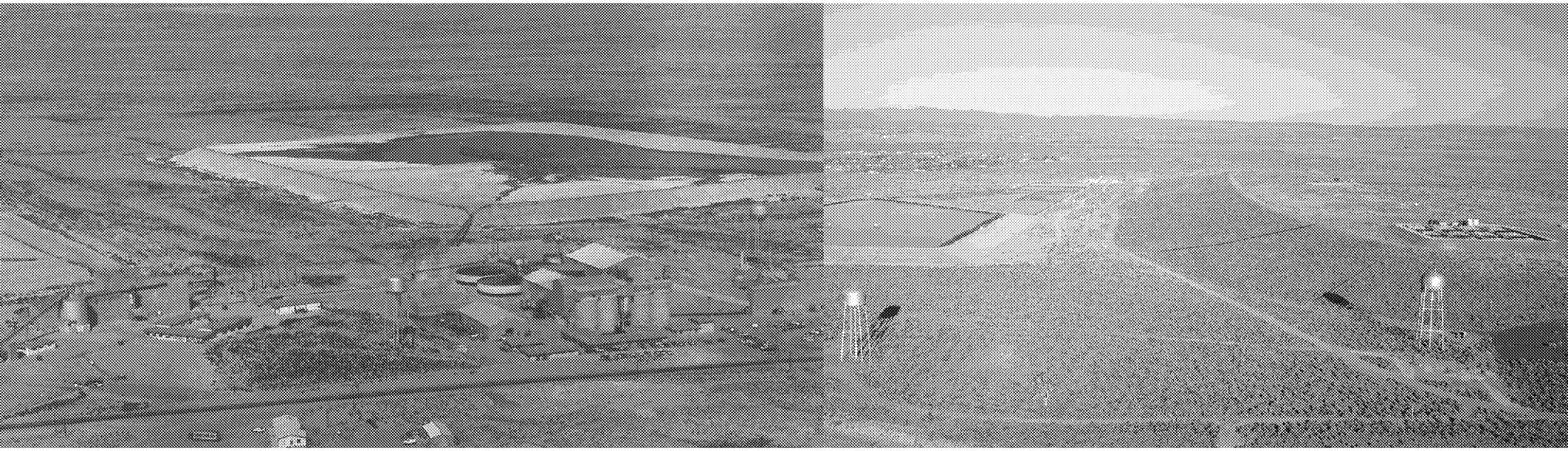
Homestake Mining Company Superfund Site

March 25, 2021

National Remedy Review Board

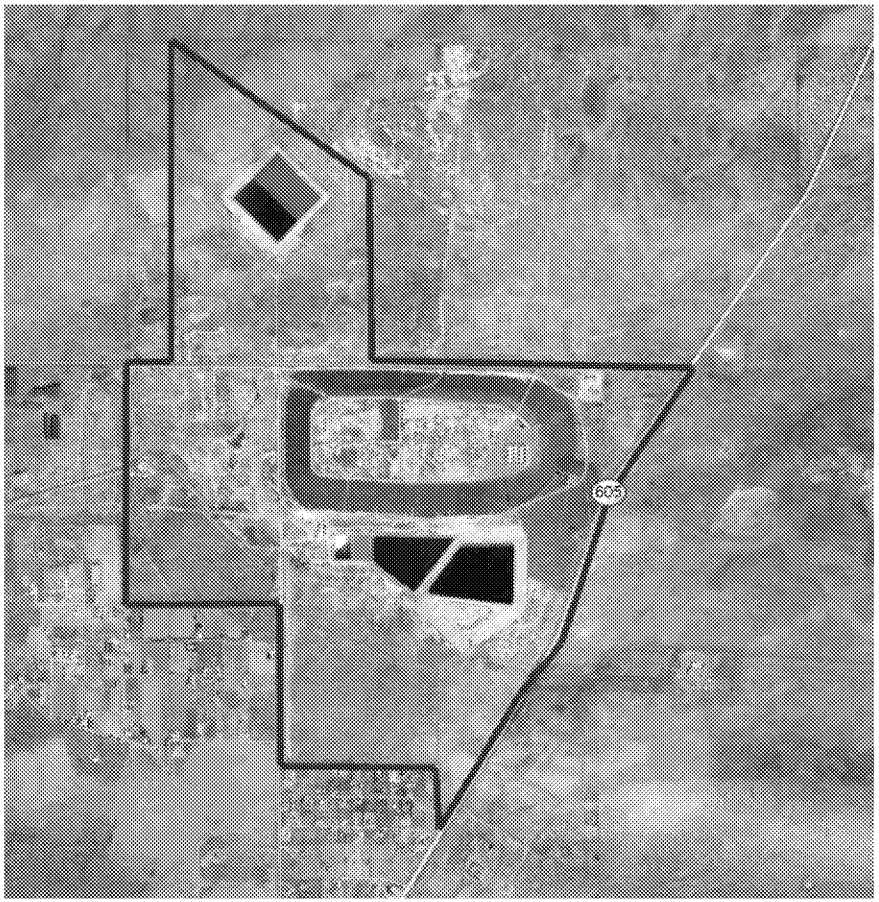


Agenda

- Site Overview
- Regulatory Oversight
  - NRC, EPA, & NMED
- History of Remediation
  - Surface & Groundwater
- Path Forward
  - Technical Impracticability

Site Overview

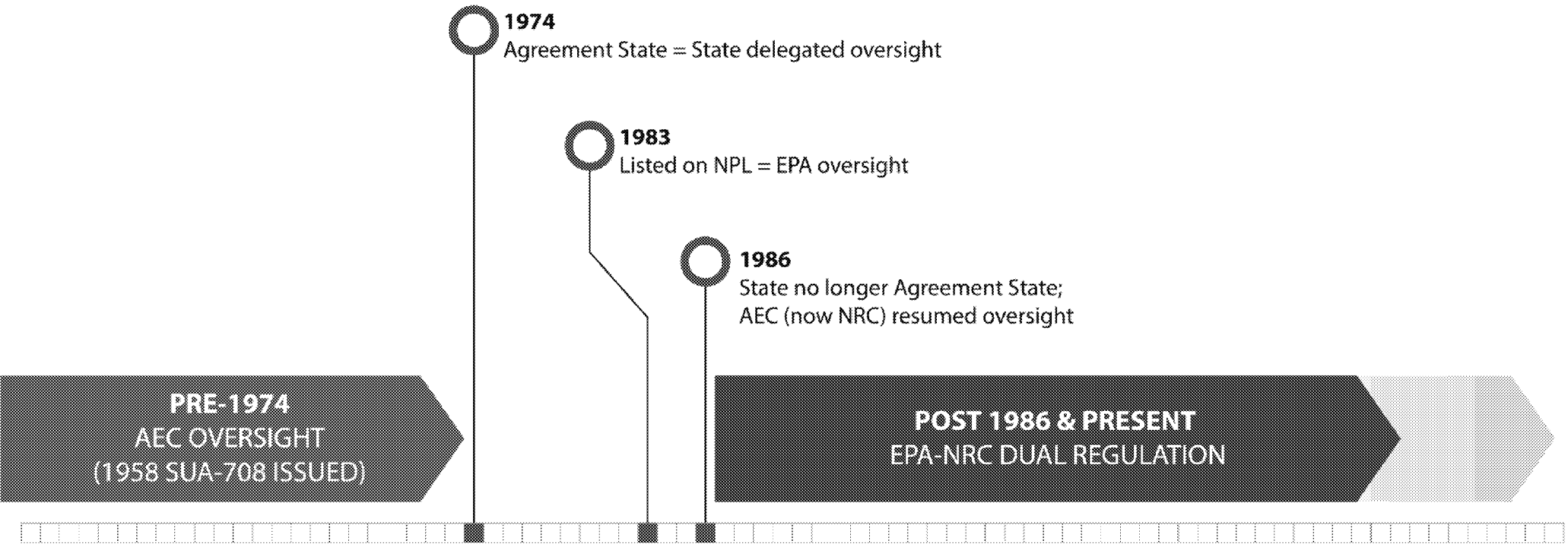
- Located in Cibola County, New Mexico, ~5.5 miles north of the Village of Milan
- Uranium processing mill operated from approx. 1958 to 1990.
- Historically supplied uranium to the United States.
- 3 operable units: tailing seepage contamination of groundwater aquifers (OU1), long-term tailings stabilization, surface reclamation and site closure (OU2), and radon concentrations in neighboring subdivisions (OU3).
  - **Current focus is OU1 and OU2**
  - EPA issued a ROD for OU3 in Sept. 1989 requiring no further action.



Regulatory Oversight

1. Nuclear Regulatory Commission (NRC) (Lead Agency)
2. United States Environmental Protection Agency (EPA)
3. New Mexico Environment Department (NMED)

How Did EPA-NRC Dual Regulation Happen?



CERCLA Equivalency

- "Equivalency" approach approved by agencies 2012.

- **Equivalency Goal**: simultaneously meet Homestake's CERCLA obligations while achieving its NRC obligations. NRC process remains the lead, via the MOU, but allows EPA to also achieve its goals parallel to the NRC actions.

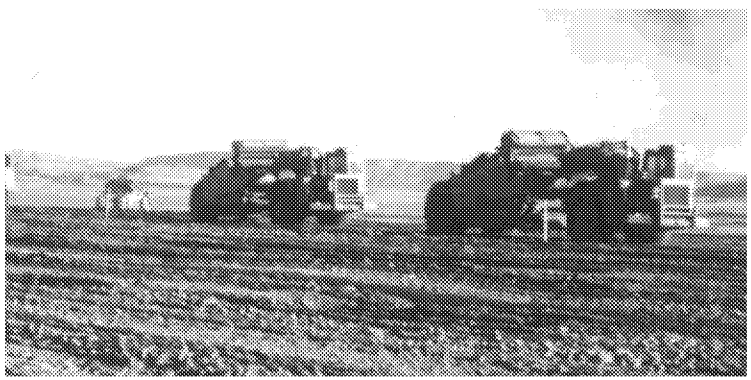
  - Equivalency = satisfy CERCLA obligations by substantial compliance with NCP requirements resulting in a CERCLA-quality cleanup. See 40 CFR § 300.700(c)(3).

Current CERCLA Status

- Prepared documents in cooperation with Region 6 using work performed for NRC & supplementing where necessary
  - RI (including HHRA, BERA, CSM) –approved by EPA
  - Candidate Technologies Memorandum
  - Screening of Remedial Alternative Memorandum
  - Entered into AOC for preparation of FS, including TI Waiver Evaluation
    - Submitted TI on Nov. 16, 2020
    - Submitted FS on Dec. 15, 2020

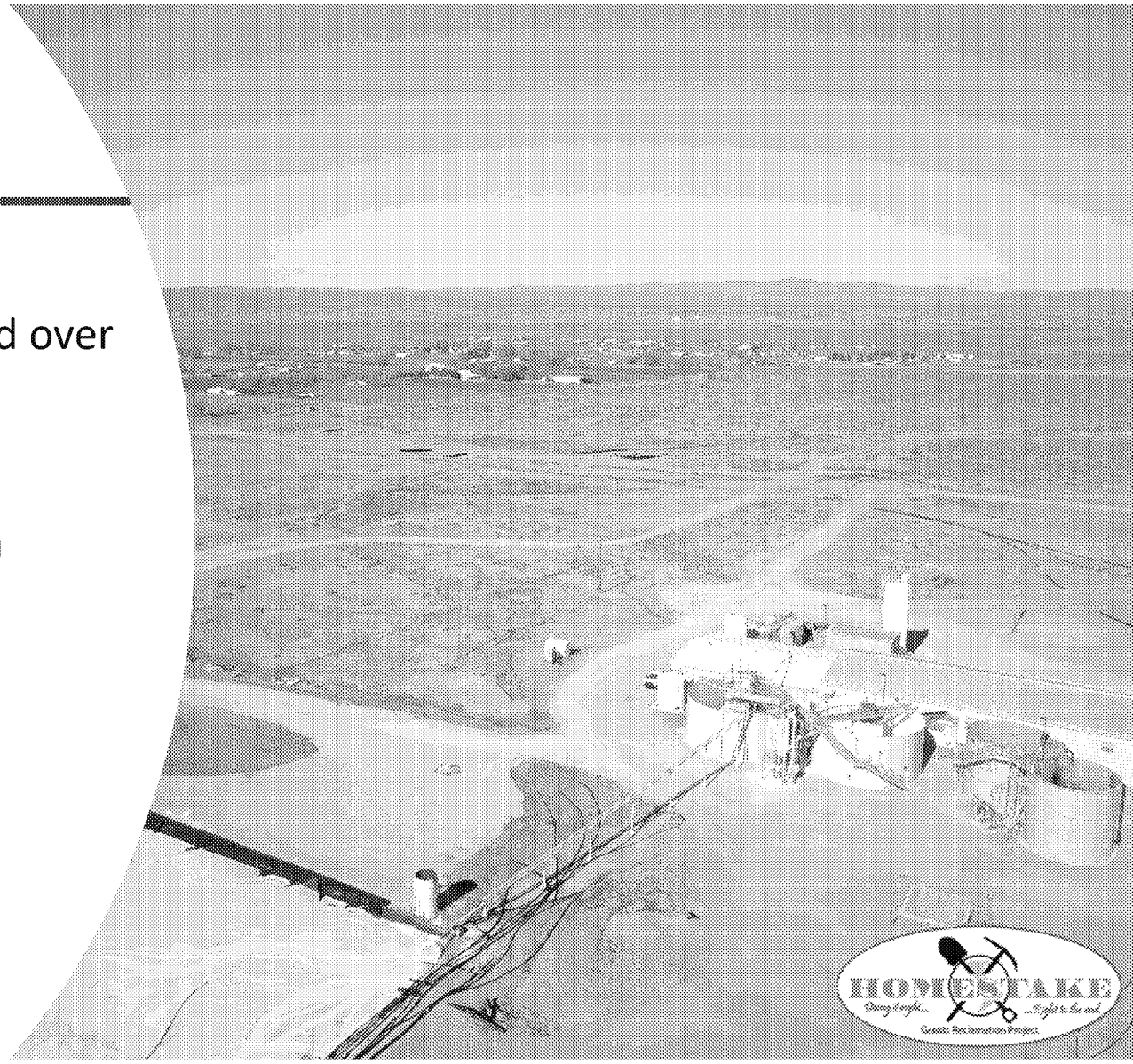
History of Remediation: Surface

- **1988 – 1993:**
  - HMC excavated windblown materials with elevated radium-226 concentrations in areas adjacent to the tailings piles and placed the soil on the piles.
  - Approx. 1,200 acres of surface soils removed.
- **1993 – 1995:**
  - Mill decommissioned and demolished.
  - Average of two feet of contaminated soil (containing elevated radium-226 concentrations) excavated from the mill area following the completion of demolition and transported to the LTP and STP. Excavated areas were backfilled with alluvial soils, as well as rock for erosion protection.
  - Tailings piles were stabilized by regrading, soil covers and rock on the side slopes for erosion protection.



History of Remediation: Groundwater

- Approx. 10 billion gallons collected over 4 decades of remediation
- Over 1 million pounds of Uranium removed
- Over $230,000,000 spent



Detailed Groundwater Remediation Efforts

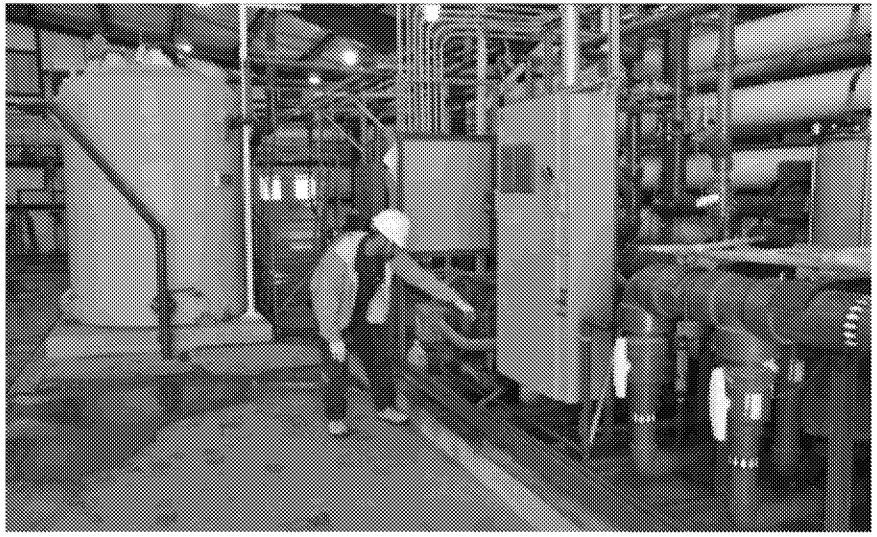
Remediation and monitoring activities began circa 1976 under applicable state and federal licenses and authorities. The following is a brief summary of the groundwater remediation efforts conducted at the Site:

- **1975 – HMC began providing bottled water to residents of nearby subdivisions upon request.**
- **1976 – HMC entered into agreement with NMEID to provide bottled water to residents located hydraulically downgradient of the source areas.**
- 1977 - Water is added into the alluvial aquifer to create a hydraulic barrier to limit the movement of contaminated groundwater
- **1977-1983 - Multiple hydraulic extraction wells were installed in the alluvial aquifer.**
- 1984 - Hydraulic containment of the Upper Chinle aquifer was initiated.
- **1986 - Extension of the Milan water supply to the Broadview Acres, Felice Acres, Murray Acres, Valle Verde, and Pleasant Valley Estates subdivisions was initiated.**
- 1990 – Evaporation Pond EP-1 was constructed within the footprint of the STP to assist in the dewatering of the LTP and to hold water pumped from the collection wells.
- 1992 - Toe drains were installed around the tailings (LTP/STP).
- 1993-2000 - During this period, corrective action and monitoring well networks were revised through addition and abandonment of wells.
- 1994 - HMC completed bench-scale treatability testing for ion exchange and activated alumina.
- 1996 - Use of Evaporation Pond EP-2 began in March.
- 1999 - The reverse osmosis (RO) treatment unit was added; treated water is used for hydraulic containment of the alluvial aquifer.
- 2000 - Irrigation of 270 acres groundwater was initiated as a means to manage extracted groundwater. HMC began flushing program.
- 2000-2015 – Tailings flushing of the LTP was conducted where water was introduced into the LTP to expedite the mass flux of contaminants from the tailings.
- 2002 - 60 acres of irrigation area were added and added an additional RO skid to plant for increased treatment rate.
- 2002-2009 - During this period, corrective action, and monitoring well networks were revised through addition and abandonment of wells.
- 2004-2005 - 64 acres of irrigation area were added.
- **2006 - EPA, NMED, and NRC approved groundwater site standards**
- 2010 - Evaporation Pond EP-3 was constructed and commissioned.
- 2012 - Land Application program ceased operation
- 2012 - 300 gpm Zeolite pilot treatment started operation.
- 2015 - RO Plant was expanded to a theoretical maximum throughput of 1200 gpm with the addition of a 600 gpm low pressure skid, a 250 gpm high pressure skid, and two microfiltration skids to replace the existing sand filters amongst other updates.
- 2016 - Zeolite system with a theoretical maximum throughput of 1200 gpm started operation for off-Site water treatment..
- 2016 - EPA initiated background reassessment study (USGS split sampling event)
- **2018 - HMC (Arcadis) borehole development and geophysics programs near wells DD and DD2 (Controls on Groundwater Background Constituent Concentrations due to Mineralogy Local to Monitoring Wells)**
- **2019 - In collaboration with EPA, HMC conducted additional field investigations to expand the characterization of the soils east of wells DD and DD2, across the alluvial channel (Supplemental Background Soil and Groundwater investigation Report Grants Reclamation Project)**

Path Forward: Technical Impracticability Waiver

- Draft TI waiver evaluation submitted Nov. 16, 2020.
- Draft FS submitted Dec. 15, 2020 **proposing long-term monitoring, institutional controls, and TI waiver**.
- Homestake has already conducted 40+ years of groundwater remediation and even with 360+ years of continued remediation will not reach ***present*** groundwater standards.
- Continued Sources:
  - Primary: LTP/STP
  - Secondary: vadose beneath LTP/STP and silt/clay in heterogeneous aquifer

Groundwater Remediation Is Technically Impracticable



- Unable to remediate the primary source (LTP/STP) and secondary source (vadose and silt/clay in alluvial aquifer beneath the LTP)
- HMC has remediated for 40+ years
  - **Applied all available technologies** (RO treatment, Zeolite treatment, ion exchange, in situ phosphate treatment, in situ bioremediation, amongst others)
  - **Treatability studies** (Tripolyphosphate, Electrocoagulation, In-situ biological treatment) – each supported impracticability
- ARARs cannot be achieved in a reasonable timeframe. 1st Order of Decay Analysis:
  - Uranium – over 200 yrs
  - Molybdenum – over 300 yrs

Protective Measures

Already implemented:

- Land Purchase - HMC currently owns approx. 74% (4,200 acres of the total 5,700 acres) of the land within the LTC/TI Zone Boundary
- Alternative Groundwater Supply – HMC connected all residents in subdivisions to municipal water system
- Groundwater Use Restrictions - Office of the State Engineer Order restricting well drilling

Future measures:

- Continued property acquisition
- Water well abandonment
- Point of use treatment if necessary
- Water use restrictions including restrictive covenants.

Summary

- **HMC has done everything that is practicable**
  - HMC has applied all available remedial strategies and tested all technologies
- **All alternatives require a TI waiver**
  - Even remediating for 200 years with overly optimistic system capacity requires a TI waiver
- **HMC is presently and will continue to implement a protective strategy**
- **A TI waiver aligns with the other regulatory programs**
  - NRC ACLs
  - NMED AAS (if necessary)

Message

From: Purcell, Mark [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=FE198E260B024EB4BD9D30DC11F900B1-PURCELL, MARK]
Sent: 6/4/2021 8:42:23 PM
To: Linton, Ron [Ron.Linton@nrc.gov]; Tsosie, Bernadette [Bernadette.Tsosie@lm.doe.gov]
Subject: Stakeholder Presentation Slides - NRRB March 25, 2021, Meeting - Homestake NPL Site
Attachments: 20210311 Homestake Presentation Slides to NRRB.pdf

Ron, Bernadette,

Here is the last of the slide presentations from Homestake. If you did not receive NMED's presentation, please let me know.

Mark

Mark Purcell
Superfund and Emergency Management Division (6SED)
U.S. Environmental Protection Agency – Region 6
1201 Elm Street, Suite 500
Dallas, TX 75270
Office Tel: 214-665-6707
Work Cell: 469-553-7211
Fax: 214-665-6660

Message

From: Purcell, Mark [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=FE198E260B024EB4BD9D30DC11F900B1-PURCELL, MARK]
Sent: 3/25/2021 10:02:10 PM
To: Daniel Lattin [dlattin@barrick.com]
Subject: RE: NRRB Presentation
Attachments: NRRB.Presentation.Maest_25Mar2021_Final.pdf

Hi Daniel,

I thought I sent it to you yesterday, but may have only sent Laura Watchempino's. I have attached the presentation.

Mark

Mark D. Purcell
Superfund and Emergency Management Division
U.S. Environmental Protection Agency – Region 6
1201 Elm Street, Suite 500
Dallas, TX 75270 - 2162
Tel: 214-665-6707
Fax: 214-665-6660
Purcell.mark@epa.gov

From: Daniel Lattin <dlattin@barrick.com>
Sent: Thursday, March 25, 2021 4:26 PM
To: Purcell, Mark <purcell.mark@epa.gov>
Subject: NRRB Presentation

Good afternoon Mark,

I hope your presentations to the board are going well. I wanted to thank you once again for allowing us to present to the board. I also appreciated the opportunity to hear from our stakeholders at BVDA/MACE. Would it be possible to get a copy of the BVDA (Anne's) technical presentation?

BARRICK

www.barrick.com

Daniel Lattin, P.E.
Sr. Closure Program Manager
Barrick Gold of North America, Inc.

Tel: (775) 748-1022
Mobile: (775) 397-7215

Presentation to the U.S. EPA National Remedy Review Board for the Homestake NPL Site

Ann Maest, PhD
Bluewater Valley Downstream Alliance
25 March 2021

Introduction

- Comments and presentation on behalf of Bluewater Valley Downstream Association (BVDA)
- Written comments submitted to NRRB on 10 March 2021
- Technical issues related to HMC's requests for Alternative Concentration Limits (ACLs) and a Technical Impracticability (TI) waiver for groundwater cleanup standards

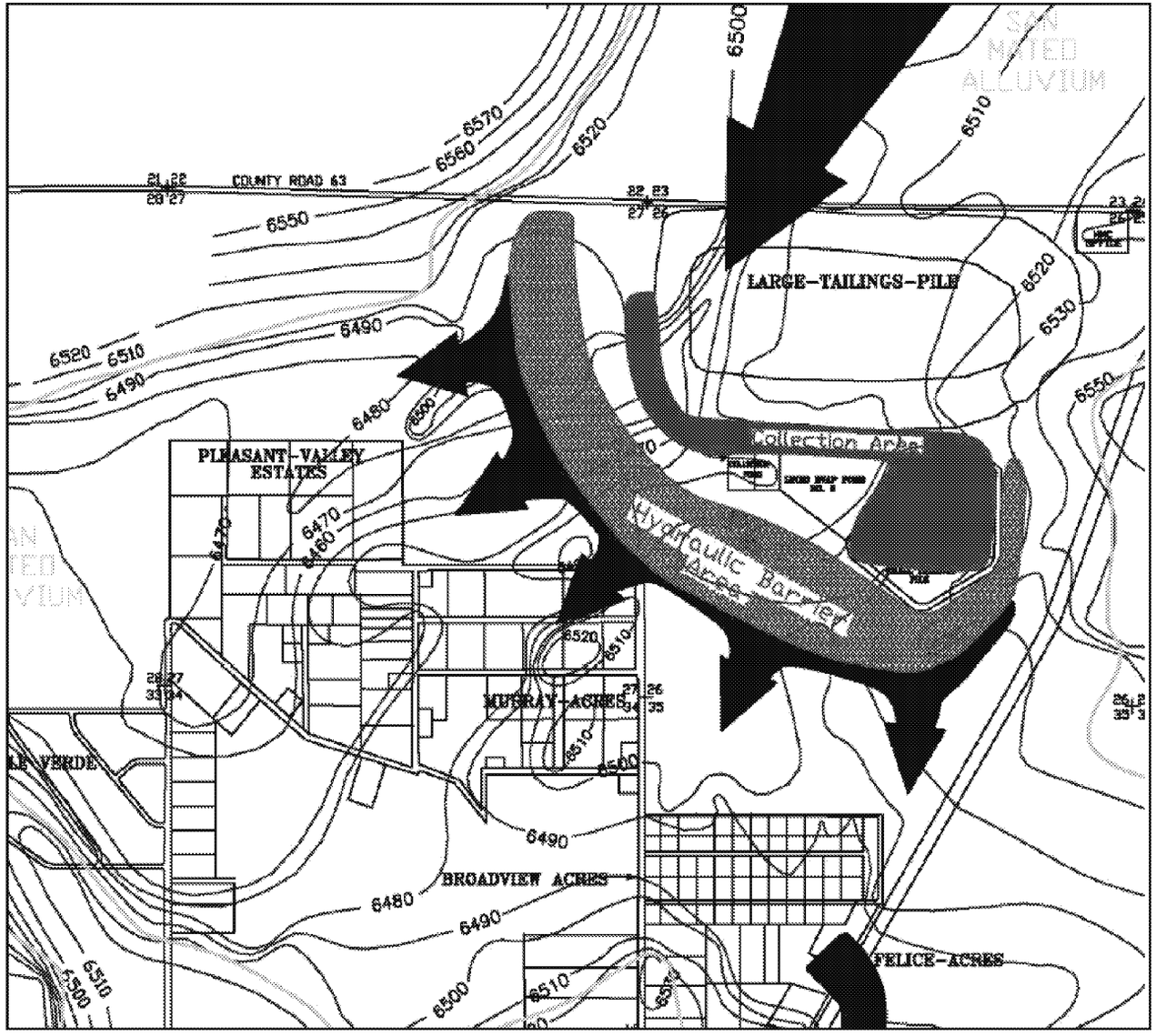
TI Waiver and ACLs are Premature

- Finding of “not reasonably achievable” based on modeling **that is not technically defensible/faulty** indicating long-term contaminant mobilization from the alluvial aquifer and large tailings pile (LTP) seepage
- HMC’s remedies have failed due to improper conceptualization, selection, and execution
- Remedies considered but not retained should be reconsidered

Failed Remedies

- Four remedies considered – three involve continuing same failed approach
  - Incomplete capture of LTP seepage
  - Water treatment not effective
  - Extensive use of San Andres/Glorieta (SAG) aquifer water for dilution
- Hydraulic barrier
  - Doesn’t address escape of LTP seepage via preferential pathways on west and east sides of LTP
  - Uses SAG groundwater for reinjection – 9 billion gallons

Alluvial Flow and Hydraulic Barrier

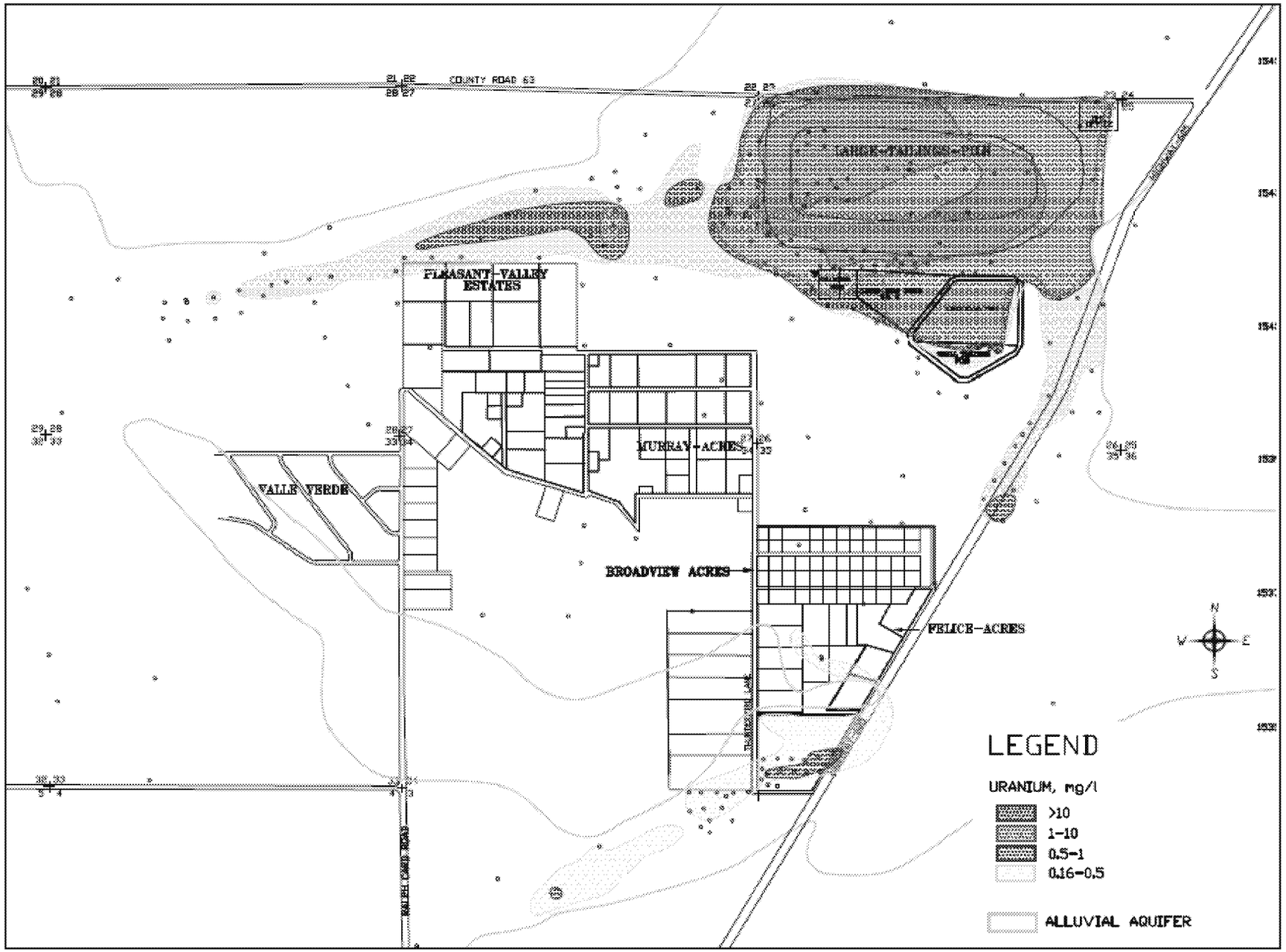


- HMC prediction – didn't work out
- Hydraulic barrier not successful in remediating plumes in preferential flow paths or from land application
- Use of SAG water throwing good water after bad – dilution is not the solution.

Source: Homestake, 2015; Figure 2-20.

Uranium Concentrations, Alluvial Aquifer, 2018

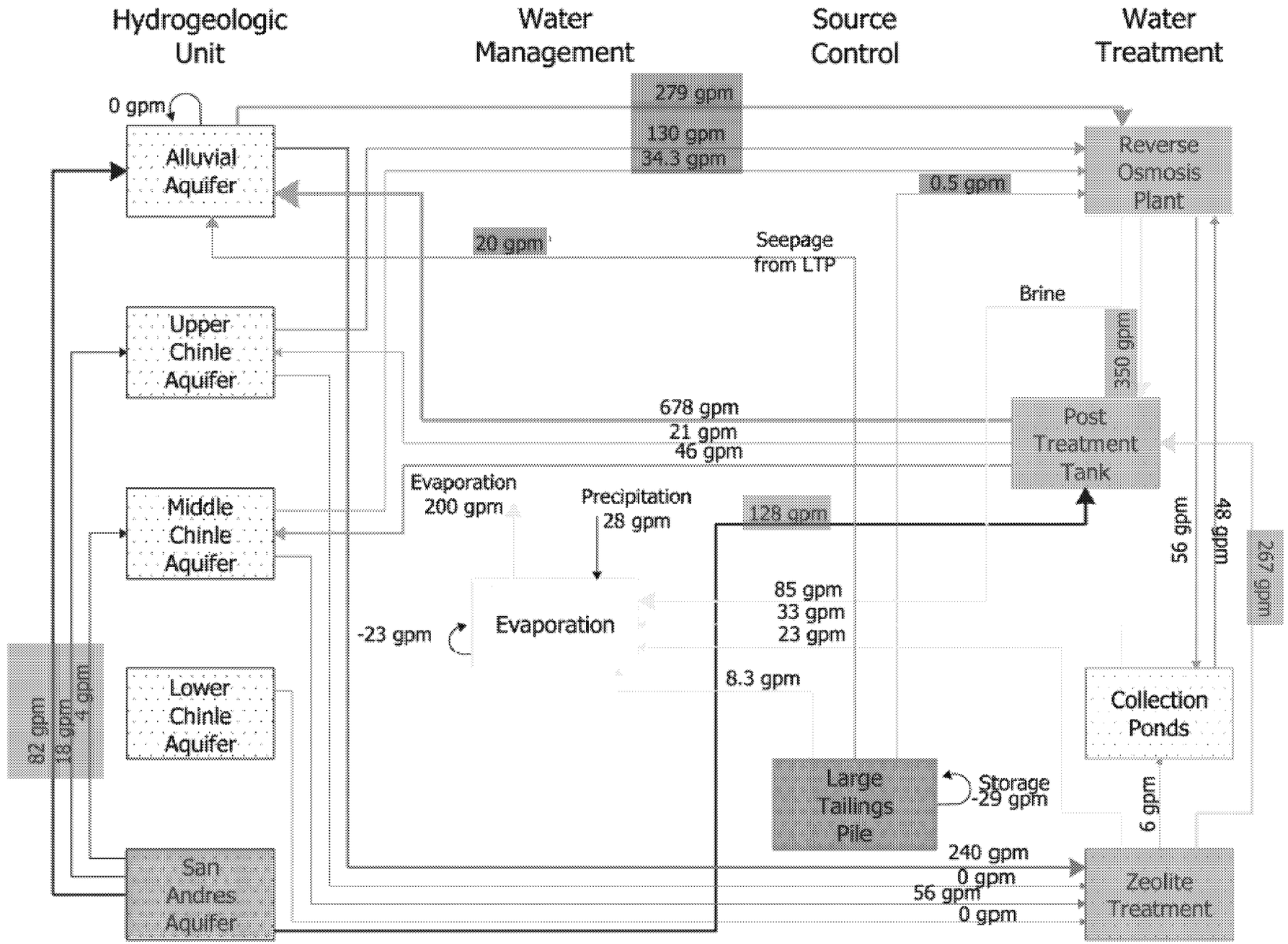
- Preferential pathways for escape of LTP seepage
- U highly mobile; all colored areas exceed site standard



Source: HMC and Hydro-Engineering, 2019. 2018 Annual Monitoring Report, Fig. 1.1-14.

2018 Water Balance: Average Flows

- LTP: 40 times more untreated seepage than treatment

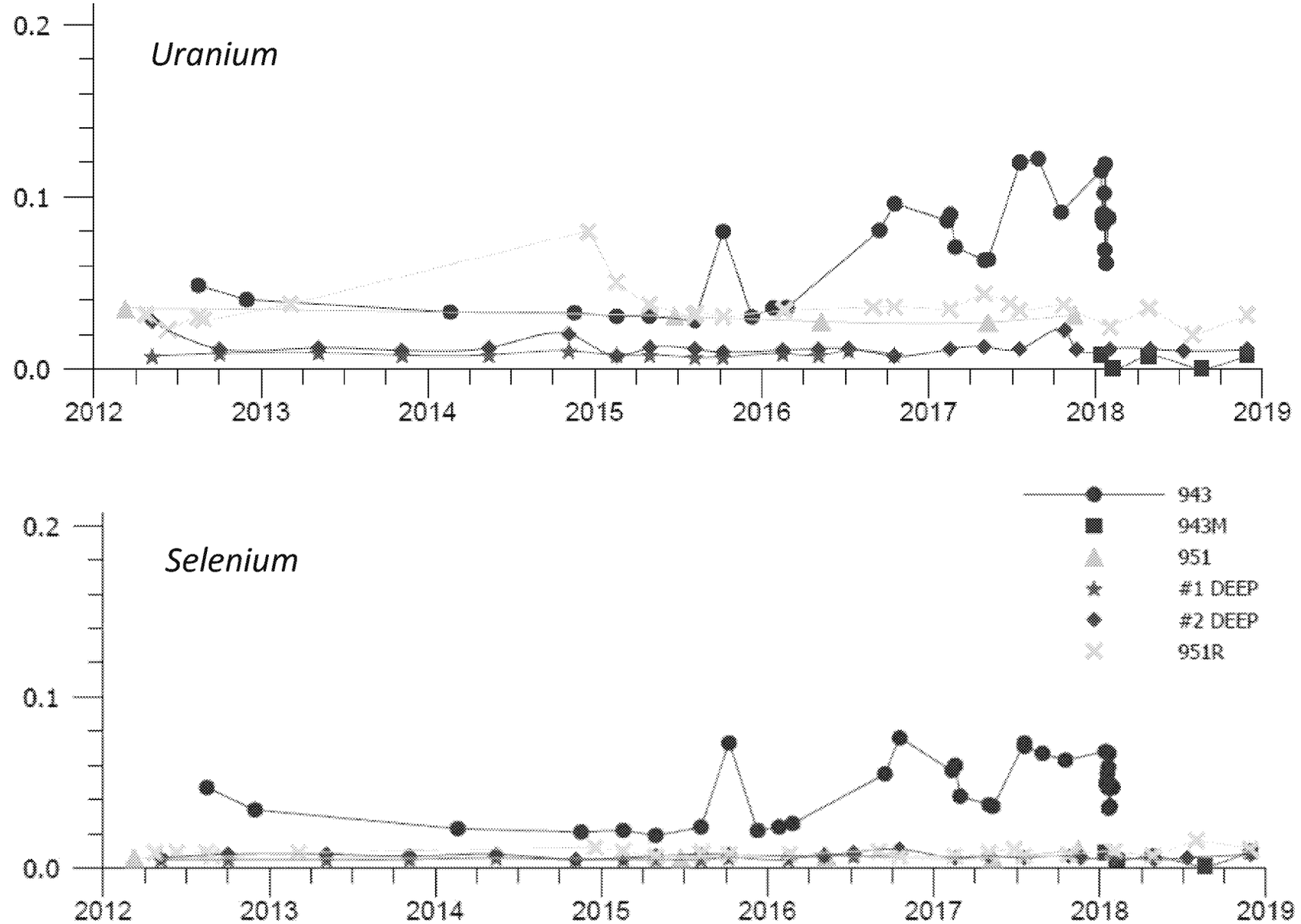


Source: HMC 2020, GCAP, Fig. 6-29.

Failed Remedies: Treatment and Water Balance

- Treatment: reverse osmosis (RO) and, at times, zeolite treatment
  - RO product – 1 exceedance of U site standard, 4 of State/EPA standard.
  - Zeolite product – no exceedances of U site standard, 27 of State/EPA standard.
- Post-treatment tank (PTT): mixed RO + zeolite + SAG water to aquifers
  - PTT – one exceedance of site U standard (0.16 mg/L), 6 exceedances of the State/EPA U drinking water standard
  - Using zeolite-treated water to replace SAG water for reinjection (reduced allowable pumping volumes) will result in more exceedances
- SAG water: only regional water supply aquifer
  - Used SAG water to dilute for quality/quantity reasons
  - Unexplained water quality problems – HMC explanations not accepted by NRC

Concentrations in SAG well 943 increasing

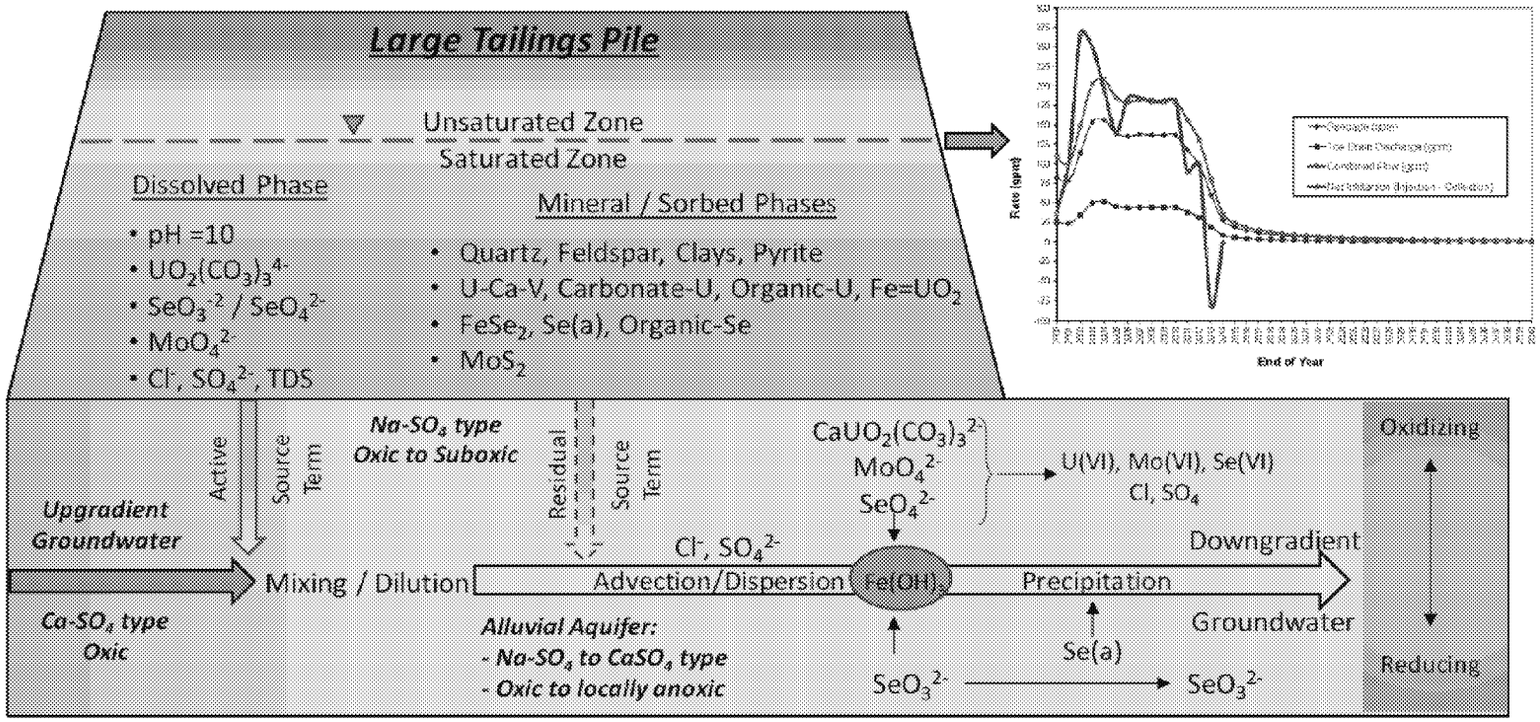


Source: HMC and Hydro-Engineering, 2019. 2018 Annual Monitoring Report, Figs. 8.2-8 & 8.2-10.

Issues with Granting a TI Waiver for the HMC Superfund Site

- Conceptual hydrologic and geochemical models incomplete/incorrect
- “Not achievable” relies on modeling not supported by site-specific characterization or laboratory experiments
- Fate and transport modeling only uses U and Mo
- Site background/GWPS values must be re-evaluated
- Modeling to evaluate effectiveness did not include LTP removal scenario
- More tailings characterization needed.

Flawed LTP and Alluvial Aquifer Conceptual Models



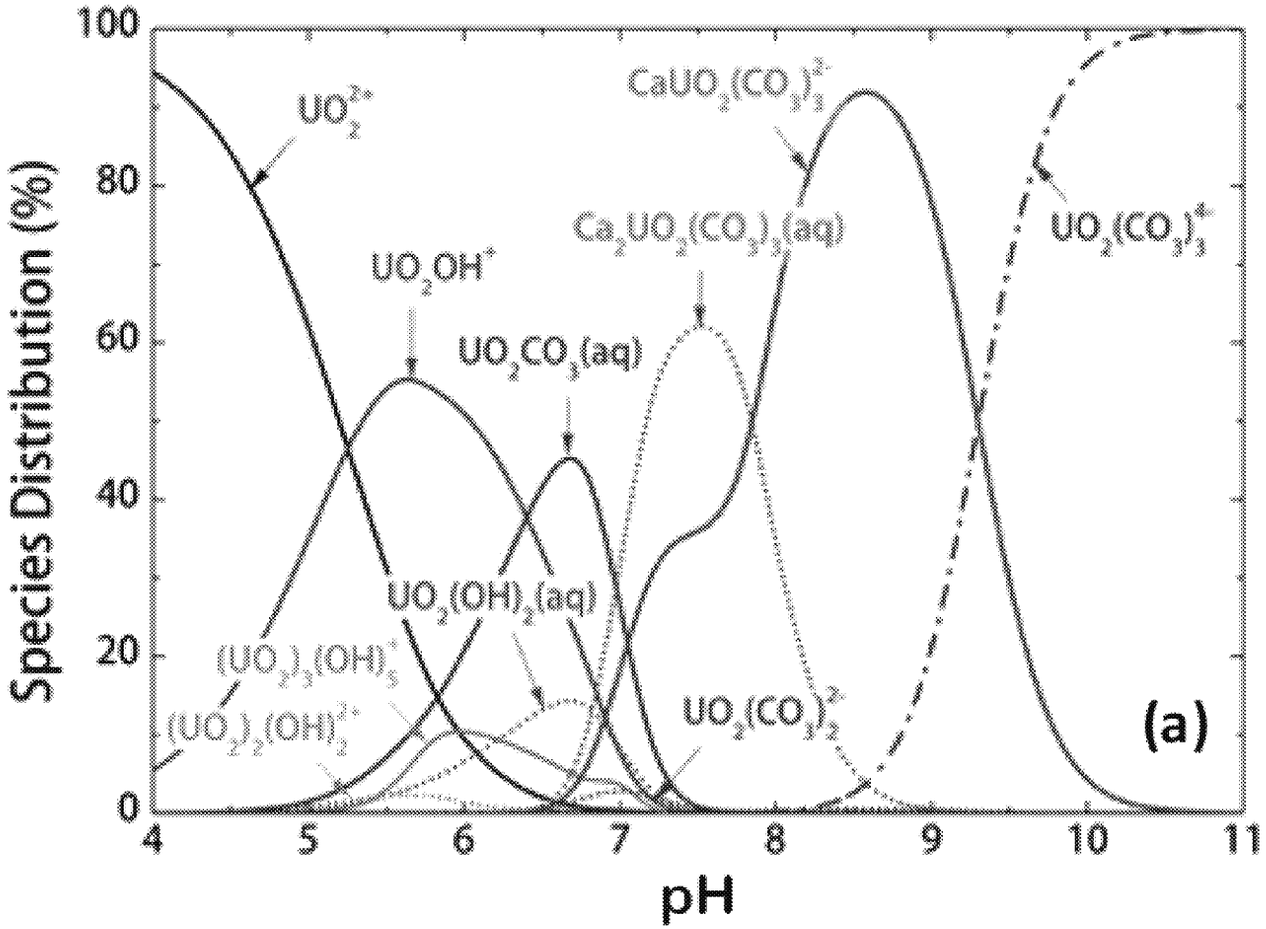
- Conceptual models do not account for
  - Upgradient plumes
  - Contamination of Chinle and SAG aquifers
  - High mobility of U, Se in alluvial aquifer: "natural attenuation" not supported.

HMC's conceptual models do not provide a *"…three-dimensional representation that conveys what is known or suspected about contamination sources, release mechanisms, and the transport and fate of those contaminants"* or an adequate or complete description of the *"site geology, hydrology, ground-water contamination sources, transport, and fate"* required to secure a TI waiver.*

Sources: Diagram: HMC, 2020. GCAP, Figure 4-18;

** EPA, 1993. Guidance for Evaluating the Technical Impracticability of Ground-Water Restoration. Directive 9234.2-25 (p. 10). September. 30pp.*

U Sorption to/from Solids Not Supportable



- HMC invokes adsorption, then desorption from clays/$Fe(OH)_3$ to show futility of cleaning up alluvial aquifer to site standards (GCAP, App. F, Table 5-3)
- U and Se species: little adsorption
- $Ca_2UO_2(CO_3)_3^0$ dominant and highly mobile in alluvial aquifer: low "natural attenuation"

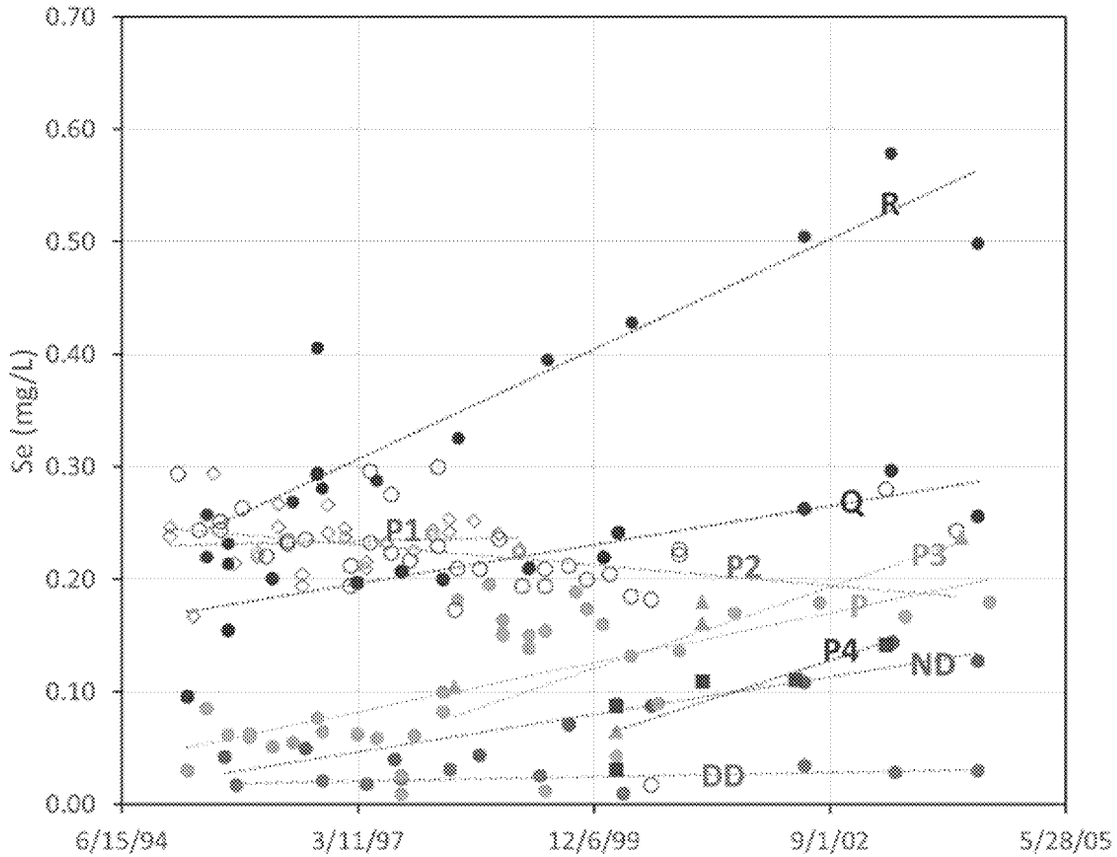
Source: HDR, 2020. RI report, Figure 4-1

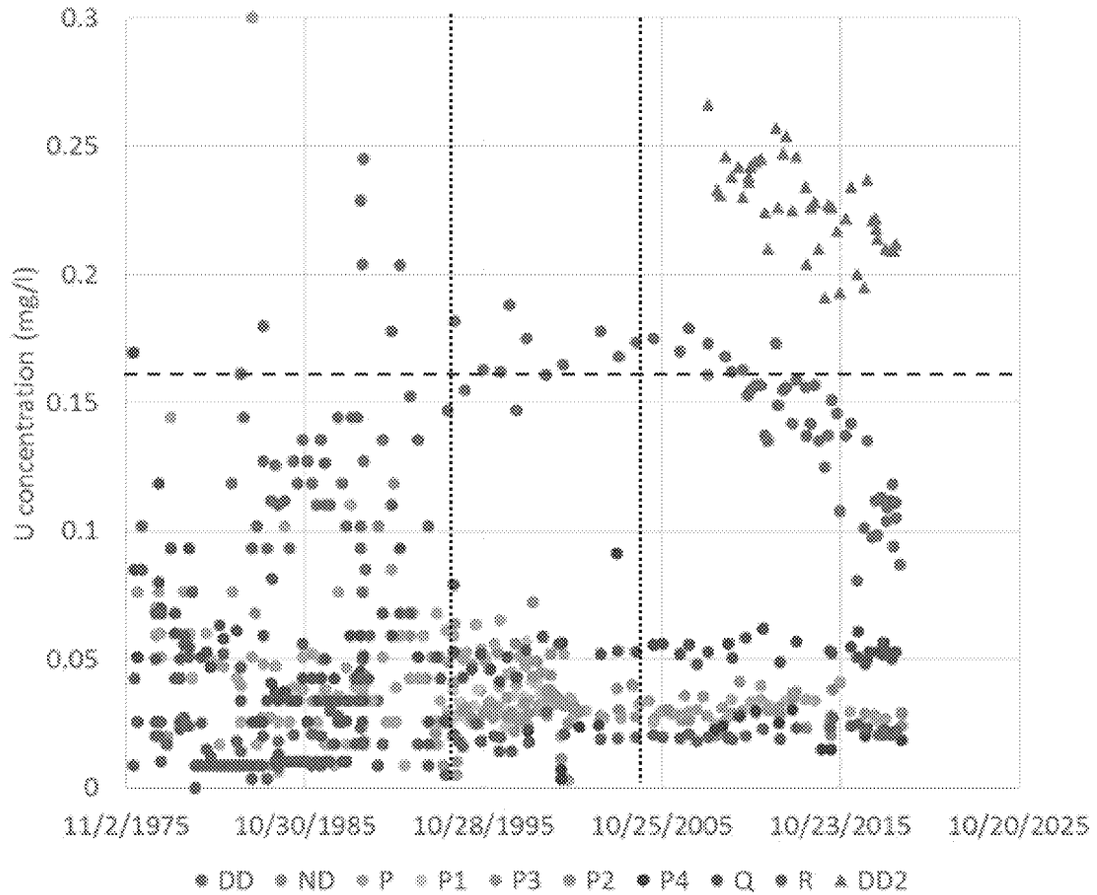
Independent Evaluation of GWPS Values

- BVDA/MASE conducted independent review of current GWPS for selenium and uranium - primary groundwater contaminants
- GWPS should represent non-mining-influenced groundwater quality, but current values include mining-influenced samples
- We excluded values indicating increasing concentrations over time, as they were representative of mining influence; used 95th percentile
- Our studies prompted NMED/EPA to conduct their own re-evaluation of site background groundwater quality

Maest report (Se): https://swuraniumimpacts.org/wp-content/uploads/2021/03/20.03-Maest-Background-Study.pdf;
Myers report (U): https://swuraniumimpacts.org/wp-content/uploads/2021/03/20.03-Myers-Background-Report.pdf

Sample results selected for Current GWPS Show Mining Influence





- Current GWPS used alluvial wells DD, ND, P, P1, P2, P3, P4, Q, and R
- 1995-2004; approx. date range and current GWPS shown
- Well DD should be excluded for U GWPS

Sources: Maest, 2020; Myers, 2020.

Proposed GWPS Values for Se and U (mg/L)

Selenium

Aquifer	Current GWPS	Proposed GWPS
Alluvial	0.32	0.063
Chinle Mixing Zone: Combined	0.14	0.079
Chinle Mixing: Upper	ND	0.011
Chinle Mixing: Middle		0.078
Chinle Mixing: Lower		0.082
Upper Chinle Non-Mixing Zone	0.06	0.024
Middle Chinle Non-Mixing Zone	0.07	0.02
Lower Chinle Non-Mixing Zone	0.32	0.022

Uranium

Aquifer	Current GWPS	Proposed GWPS
Alluvial	0.16	0.04
Chinle Mixing Zone	0.18	0.05
Upper Chinle Non-Mixing Zone	0.09	0.03
Middle Chinle Non-Mixing Zone	0.07	0.04
Lower Chinle Non-Mixing Zone	0.03	0.03

Sources: Maest, 2020; Myers, 2020.

Remedies Preferred, Considered and Rejected

- Alternative 2 preferred (Draft FS, 2021) – institutional controls and long-term monitoring
- Source removal (tailings) not retained, yet "high" effectiveness
  - "Increase in truck and heavy equipment traffic could adversely affect community." "…increase in human health risks from transporting waste…"
    - Community slowly destroyed over time so not valid
  - Costs - TI waivers based on "...engineering feasibility and reliability, with cost generally not a major factor unless compliance would be inordinately costly."
- Impermeable cap rejected, so tailings will continue to leak in perpetuity
- Potential for recovery of valuable metals from tailings not considered at all; more characterization needed
  - Rare earths found in feldspars[1]
  - Inclusions of gold found in calcite[1]
- Source removal only reasonable remedy for long-term protection - placement nearby on liners with a leachate-collection system and monitoring; vadose zone remediation under LTP also likely needed.

1 Worthington Miller Environmental, LLC, 2020. Geochemical Characterization of Tailings, Alluvial Solids and Groundwater Grants Reclamation Project, p. 8-9.

Disparity in Cleanup Priority

- Uranium life cycle starts with mining and ends with nuclear power or nuclear weapons waste disposal
- Much less cleanup effort and funding on “upstream” end; more source removals on “downstream” end
- U mining often in less populated areas with undervalued communities of color – goes against Biden administration’s emphasis on environmental justice and communities
- Nuclear facility “success” stories
  - Rocky Flats, Colorado. Pu triggers. DOE removal actions to Savannah River Site, WIPP, NV Test Site, Hanford. **~$7 billion**. Although not a perfect remediation and concerns still exist, the site today is a wildlife refuge.
  - Oak Ridge, Tennessee. Manhattan Project, WWII weapons. ~10% of waste removed off-site, 90% disposed in safe onsite facilities. At least **$2.9 billion**, completion in 2046.
  - Hanford, Washington State. Manhattan Project, 1943. Groundwater pump-and-treat system will be expanded, “significant reduction of areas of groundwater contamination.” At least **$323.2 billion**.

Disparity in Regional Mill Tailings Site Cleanup Efforts

	Durango Mill, Colorado	Atlas Mill, Moab, Utah	United Nuclear Corp. Mill, Church Rock, NM	Homestake Mill, Milan, NM
Tailings volume (yd^3)	2.5 million	9.1 million tailings	2.0 million + 1.0 million mine waste	12.6 million
Contaminated area (acres)	127	130	125	274
Distance from nearest community (miles)	0.25	3	0.5	<0.25
Offsite disposal/Source removal?	Yes	Yes	No[1]	No
Cost	$120 million (1995)	$844 million to $1.1 billion (2008)	$40-45 million (2012 mine wastes to mill)[1]	$34.9 million NPV (2021 Draft FS, preferred alternative)
Demographics	80.9% White non-Hispanic	90.3% White non-Hispanic	95.0% Native American	65.3% Hispanic Close to Acoma/Laguna Pueblos

Sources: (using 1.76 tons/yd3 for conversions)
Durango: DOE, 2020. Durango Fact Sheet; GAO, 1995. Uranium Mill Tailings Cleanup Continues, but Future Costs Are Uncertain. https://www.gao.gov/assets/rced-96-37.pdf.
Moab: DOE, 2020 https://www.energy.gov/sites/prod/files/2020/06/f75/EM-By-the-Numbers-MOAB-5.19.20-v4-FINAL.pdf; Costs https://www.wise-uranium.org/udmoa.html.
Church Rock: UNC-Church Rock Mill U Recovery Facility, NRC 2020 https://www.nrc.gov/info-finder/decommissioning/uranium/united-nuclear-corporation-unc.html; 1 Wastes from mine to be moved to tailings impoundment. NRC, 2020. Draft EIS Disposal Mine Wastes UNC Mill Site. https://www.nrc.gov/docs/ML2028/ML20289A621.pdf
Homestake Mill: HMC, 2020 GCAP, p. 2-2, HMC, 2021 Draft Feasibility Study presentation.
Demographics: https://datausa.io/profile/geo/durango-co/; https://datausa.io/profile/geo/moab-ut/; https://datausa.io/profile/geo/church-rock-nm#demographics; https://datausa.io/profile/geo/milan-nm.

Summary and Conclusions

- Granting HMC a TI Waiver and ACLs for groundwater is premature and not based on the best available science
- Major uncertainties and errors exist in conceptual site model, background groundwater quality
- Modeling used to conclude that a TI waiver and ACLs are needed based on faulty modeling assumptions not representative of site conditions and does not consider source removal option
- Source removal is most effective solution for long-term groundwater protection.
  - Community impact and cost arguments not supportable; source removals elsewhere
- Long-term protection of regional water supply SAG aquifer is essential.

Message

From: Purcell, Mark [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=FE198E260B024EB4BD9D30DC11F900B1-PURCELL, MARK]
Sent: 6/21/2021 9:02:31 PM
To: Susan Gordon - MASE [sgordon@swuraniumimpacts.org]
CC: Laura Watchempino [5000wave@gmail.com]; Atkins, Blake [atkins.blake@epa.gov]; Weece, Adam [weece.adam@epa.gov]; Mekeel, Edward [mekeel.edward@epa.gov]
Subject: RE: NRRB report and Adam Weese
Attachments: Homestake NRRB Recommendations Final.pdf

Please direct all of your communication to Adam Weece, Community Involvement Coordinator.

From: Susan Gordon - MASE <sgordon@swuraniumimpacts.org>
Sent: Monday, June 21, 2021 3:47 PM
To: Purcell, Mark <purcell.mark@epa.gov>
Subject: NRRB report and Adam Weese
Importance: High

Hi Mark, I have been waiting for a copy of the NRRB report which I just found out was release last week or even earlier. I have been emailing Adam Weece and left two phone messages. I though we had a call set for tomorrow, but nothing.

Can you please send me a copy of the NRRB report?

Thanks, Susan

Susan Gordon
Multicultural Alliance
for a Safe Environment
sgordon@swuraniumimpacts.org
505-577-8438
www.swuraniumimpacts.org

Keep Uranium In The Ground!

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

WASHINGTON, D.C. 20460

June 15, 2021

OFFICE OF
LAND AND EMERGENCY
MANAGEMENT

MEMORANDUM

SUBJECT: National Remedy Review Board Recommendations for the Homestake Mining Site. Feasibility Study Scoping Meeting.

FROM: Christine Poore, Chair, on behalf of the Board Review Team
National Remedy Review Board

TO: Wren Stenger, Director
Superfund and Emergency Management Division (SEMD), Region 6

Larry Douchand, Director
Office of Superfund Remediation and Technology Innovation (OSRTI)

PURPOSE

The National Remedy Review Board (NRRB/Board) Review Team for the Homestake Mining Company (HMC) Site has conducted a review of the site information package, including groundwater background, human health and ecological risk assessments, and a draft alternatives screening memo for the HMC Site in Milan, New Mexico. This memorandum documents the Board Review Team's recommendations and advisory considerations.

CONTEXT FOR BOARD REVIEW

The U.S. Environmental Protection Agency (EPA) Administrator established the Board as one of the October 1995 Superfund Administrative Reforms to help control response costs and promote consistent and cost-effective remedy decisions. The purpose of the Board was to review proposed cleanup decisions to help evaluate whether they are consistent with current law, regulations, and Agency guidance.

In 2020 the Office of Superfund Remediation and Technology Innovation (OSRTI) re-envisioned headquarters/regional engagement throughout the remedial process with a focus on earlier engagement, including the Board's scope and role. The NRRB continues to focus on ensuring national consistency in remedy selection at selected sites. To this end the Board advises and evaluates ongoing, selected sites' Regional technical work during the Feasibility Study Scoping stage for response decisions, with a focus on overall site management/response strategy, evaluation of technologies and data necessary to support nationally consistent remedy selection, and the range of alternatives that should be considered.

The NRRB's intent is to provide support to the Regional Site Team in developing a robust conceptual site model, a comprehensive risk assessment, and a range of remedial alternatives while developing the Administrative Record (AR) to support remedy selection. The Board

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Review Team considers the information provided on the nature of the site; potential site risks; Regional, state, tribal, community advisory group and potentially responsible party (PRP) positions. The review's overall goal is to ensure sound decision-making consistent with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), and applicable Agency guidance.

Generally, the Board Review Team makes a set of recommendations and a set of advisory considerations to the appropriate Regional Division Director. The recommendations will identify technical and programmatic opportunities and limitations with a focus on early issue resolution. While the NRRB's recommendations are expected to carry substantial weight, other important factors may influence the Region's implementation of Board recommendations. The NRRB expects the Regional Division Director to respond to the OSRTI Office Director in writing to address implementation of each Board recommendation and those advisory considerations that the Region is not adopting. The Board Review Team's recommendations, while of considerable import, do not change the Agency's current delegations or alter the public's role in providing EPA with input on remedy selection. Typically, before the Region issues the proposed plan for public comment, the Region includes the recommendations memo and Regional response memo in the site's AR. Once the AR is published, the memos will be posted to the NRRB webpage.

BRIEF DESCRIPTION OF THE SITE

The HMC Site is located in Cibola County, New Mexico, about 5.5 miles north of the village of Milan. The site includes a former uranium mill and the impacted portions of the underlying groundwater aquifers. Uranium milling operations began at the site in 1958 under a license issued by the Atomic Energy Commission. The mill was decommissioned and demolished from 1993 to 1995. Site operations and seepage from two tailings impoundments contaminated soil and groundwater with hazardous chemicals. The site sits on the lower floodplain of the San Mateo Creek drainage basin near multiple geologic faults. There are over 80 legacy uranium mines and four former uranium mill facilities that operated in the San Mateo basin, including HMC Site.

The HMC Site is one of four National Priorities List (NPL) sites subject to both EPA and Nuclear Regulatory Commission (NRC)/Department of Energy (DOE) regulation, under CERCLA and Title II of the Uranium Mill Tailings Radiation Control Act (UMTRCA), respectively. The site occupies approximately 1,085 acres and includes a large unlined tailing pile containing approximately 21 million tons of tailing material, a small unlined tailing pile containing approximately 1.2 million tons of tailing material, three evaporation ponds, two collection ponds, a reverse osmosis (RO) water treatment plant, and a zeolite filtration water treatment system that are part of an ongoing groundwater corrective action.

SITE REVIEW

The Board Review Team reviewed OU1, Tailing seepage contamination of groundwater aquifers, and OU2, Long-term tailing stabilization, surface reclamation, and site closure, of the HMC Site on March 25-26, 2021, via remote webinar meetings. The meeting addressed the site history including a discussion on the nature and extent of contamination, background determination, site risks, remedial action objectives (RAOs), and potential remedial alternatives. Input was provided to the Board Review Team by the Region, the New Mexico Environmental

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Department (NMED), the Pueblo of Acoma, the Pueblo of Laguna, Homestake Mining Co., the Bluewater Valley Downstream Alliance (BVDA), and the Multicultural Alliance for a Safe Environment (MASE).

RECOMMENDATIONS

1. Current Tailings and Treatment Operations

As stated earlier, the HMC Site includes two unlined tailings piles. Based on the information provided to the Board, the flanks of the large tailings pile (LTP) have a permanent radon cover, but the top of the LTP has an interim cover. Despite the partial cover, it is the Board's understanding that radon exfiltration from the large pile at the site may currently exceed UMTRCA standards. Additionally, the zeolite filtration system sits atop the uncovered portion of the LTP. Based on the information provided to the Board, there are two large scale water treatment systems operating at the site: a RO system and a zeolite filtration system. It's the Board's understanding that neither system has operated at full capacity, though the reasons for reduced operations were unclear. The RO system has operated at nearly half capacity and the zeolite filtration system has operated at nearly one third capacity. Despite the limited capacity, it was indicated that approximately 100 pounds of uranium was recovered.

Recommendations

a. The Board recommends that the Region assess the challenges that prevented the treatment systems from operating at full capacity. Based on the information provided to the Board, the current water treatment systems, operating at full capacity, may be inadequate to treat the current seepage from the piles at the site. It was unclear to the Board if this is due to the current limited treatment capacity or if it was due to a high seepage rate. Understanding and resolving the challenges associated with limited system operations may improve treatment capacity, thereby reducing seepage. Additionally, improvements to the treatment systems may improve the recovery of uranium, in effect resulting in secondary recovery of the uranium (i.e., resource recovery/reprocessing).
b. Should the tailings piles remain in place, the site will likely have to comply with UMTRCA cover standards that address radon emissions. Based on the information provided to the Board, it was unclear if the tailings piles are fenced off from the public. If there is not a complete fence line enclosing the Source Materials License boundary, the Board recommends the implementation of engineering and institutional controls (i.e. fencing and signage) to minimize access to the uncovered portion of the LTP until a final remedy is constructed. This should prevent the public from accessing the large pile until a final remedy is constructed.

2. Technical Impracticability Waiver

The Site Information Package included a "Development and Screening of Remedial Alternatives Technical Memorandum" that discussed Technical Impracticability (TI), as a potential remedial component. The selection of a TI waiver is the acknowledgement that the applicable or relevant and appropriate regulation (ARAR) is waived due to "technical impracticability from an

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engineering perspective."[1]. The NCP Preamble states that TI determinations should be based on "…engineering feasibility and reliability, with cost generally not a major factor unless compliance would be inordinately costly."[2] This determination is based on contaminant properties, subsurface conditions and appropriate remedial technologies evaluation. The TI zone should be as minimal as appropriate and can be multiple zones[3]. The TI zone may not necessarily encapsulate the whole groundwater plume and should include source control as part of the Alternate Remedial Strategy. The Alternate Remedial Strategy is essential to controlling the contribution from the source to the groundwater[4].

Recommendations

a. In assessing the appropriateness of a TI waiver, the conclusion that it is not possible from an engineering perspective to restore groundwater to its beneficial use is based upon the factors identified in Section 1.1 of the 1993 Guidance for Evaluating the Technical Impracticability of Ground-Water Restoration (TI Guidance). Additionally, as stated on page 2 of the TI Guidance, "Failure to achieve desired cleanup standards resulting from inadequate system design or operation is not considered by EPA to be a sufficient justification for a determination of technical impracticability of ground-water cleanup." Recommendation 1a supports the assessment of current system design and operation. Should the Region pursue a TI waiver component, the Board recommends that the Regional Site Team work closely with their Regional TI representative, and the Headquarters TI point of contact, currently Dave Bartenfelder, in developing the TI evaluation package.
b. Should a TI waiver be supported and a component of the preferred alternative, the Board recommends the TI zone be appropriately sized based on the site characterization and analysis. Per Section 4.4.2 of the TI Guidance, the potential TI zone should be "limited to as small an area as possible, given the circumstances of the site." Generally, the TI zone is based on current site conditions rather than projected modeling results. The TI zone can be modified (expanded/contracted) if conditions change in the future and can be justified (e.g., discovery of new sources), per Section 6.2 of the 1993 TI Guidance.
c. The information provided to the Board highlighted the complexity of the hydrogeologic setting. The Board recommends additional geochemical and hydrogeologic modeling (e.g., EPA-Office of Research and Development (ORD) or United States Geological Survey (USGS)) to better understand the subsurface conceptual site model behavior. The Board further recommends the Region assess, and if appropriate, augment the current modeling with those models conducted by the NMED. A more refined conceptual site model of the geochemical and hydrogeologic conditions should better support the remedy development and selection process.

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[1] Guidance for Evaluating the Technical Impracticability of Ground-Water Restoration. September 1993. (Page 9) https://semspub.epa.gov/work/HQ/175387.pdf
[2] See NCP Preamble, 55 FR 8748, March 8, 1990.
[3] Guidance for Evaluating the Technical Impracticability of Ground-Water Restoration. September 1993. (Section 4.4.2)
https://semspub.epa.gov/work/HQ/175387.pdf
[4] Guidance for Evaluating the Technical Impracticability of Ground-Water Restoration. September 1993. (Section 5.0)
https://semspub.epa.gov/work/HQ/175387.pdf

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3. Background Groundwater and Soil

The information provided to the Board included a discussion of historical mining activities in the San Mateo Creek Basin. This area of New Mexico has historically been a viable source of uranium with over 80 legacy mines and several milling operations. Some of these mines were "wet" mines, meaning that mine waters had to be pumped from the mine to allow access for mining activities. Based on the information provided to the Board, groundwater impacted by these activities may be flowing downgradient through the basin. If this is the case, uranium levels in groundwater may be elevated due to the presence and practices of upgradient mine sites.

Recommendations

a. The Board recommends the Region refine the background investigation for uranium, radium and thorium with additional monitoring wells to identify background in this complex geologic setting and influenced by up-gradient mine discharges (~125B gallons). The geochemical report developed by New Mexico is a good resource, and additional sampling and analysis might augment the report analysis to benefit the site understanding. To support this effort, the Region should consider the option to identify an unimpacted area in the surrounding environment to identify a naturally occurring soil background concentrations of uranium, radium, and thorium. The Board also recommends reaching out to Matt Jefferson (OSRTI/Technology Innovation and Field Services Division), Dave Kappelman (OSRTI/Environmental Response Team), and Felicia Barnet (ORD; Site Characterization & Monitoring Technical Support Center Director).

4. Principal Threat Waste

The LTP covers about 234 acres and contains approximately 21 million tons of tailing material, and the STP covers about 40 acres and contains approximately 1.2 million tons of mill tailings, with both tailing piles being unlined. Of great concern is the ongoing release of contaminants from the LTP and STP to the groundwater due to these piles being unlined. The Site Information Package identifies the LTP and STP as the primary sources of contamination in the groundwater, soil and air at the site. The contaminants of concern (COCs) in groundwater are uranium, selenium, radium-226, radium 228, thorium-230, molybdenum, sulfate, chloride, nitrate and total dissolved solids. The maximum concentrations of COCs detected in groundwater were detected in the alluvial groundwater directly beneath or near the LTP. In addition to the COCs' mobility as evidenced by the leaching of uranium and other contaminants to groundwater, the toxic tailings pose risks to future receptors. For example, in the revised risk assessment presentation for the Board, the future composite worker's total cancer risk is estimated at 2E-02, which exceeds the acceptable risk range by two orders of magnitude (approximately a factor of 100).

Recommendations

a. The Site Information Package states that no principal threat waste has been identified. However, there are significant amounts of mill tailings present at the site that may be highly toxic and mobile, as evidenced by the site data. The Board recommends the Region give further consideration as to whether the mill tailings present at the site constitute principal threat waste (PTW) as discussed in OSWER Directive No. 9380.3-06FS, November 1991, *A Guide to Principal Threat and Low Level Threat Wastes*

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(Principal Threat Waste Guidance and OSWER Directive 9355.0-69, August 1997, *Rules of Thumb for Superfund Remedy Selection* at page 11).

b. If the Region determines that portions of the mill tailings are PTW, as the Region further develops or considers the range of alternatives for the Site, it should consider the Principal Threat Waste Guidance, the statutory preference for treatment or resource recovery to the maximum extent practicable in CERCLA section 121(b), and the NCP's expectations for treatment of principal threats posed by the site, wherever practicable.

5. Risk Analysis

Recommendations

a. Consideration of Land Use Restrictions in Risk Analysis - Based on the information provided to the Board, there may be portions of the Site that lie outside of the tailings piles boundaries for which Institutional Controls (ICs) have already been established to restrict land use. Consideration should be given as to whether the ICs should be established as a part of the CERCLA remedial action in those areas. The Board recommends the Region update the risk assessment to assess if unacceptable risks under one or more unrestricted exposure scenarios exist, or if uncertainties in predicting reasonably anticipated future land use exist. This information may inform the need for including ICs as part of the CERCLA remedial action despite the current land restrictions. OSWER Directive 9355.0-30 which is titled, "*Role of the Baseline Risk Assessment in Superfund Remedy Selection Decisions*" may serve as a resource for this assessment. For example, the second paragraph on page 3 states, "*This cumulative site baseline risk...should not assume that institutional controls or fences will account for risk reduction.*" Further discussion is provided in the sections titled "*Risks Considered in Risk Management Decision*" and "*Risks Warranting Remedial Action*" on pages 4-6. In order to demonstrate that an IC is necessary to ensure protectiveness of human health and the environment as part of a CERCLA remedial action, (i.e., selected as part of the remedy in the Record of Decision (ROD)), risks should be estimated and documented for exposure scenarios without consideration of current or proposed land use restrictions.

b. LTP and STP - A conclusion presented in the Revised Risk Assessment Presentation noted that although there are excess cancer risks from soil and air for a composite worker, the risks are associated with soil and air concentrations that are below soil and air ARARS. As discussed in OSWER Directive 9200.4-23 which is titled "*Clarification of the Role of Applicable, or Relevant and Appropriate Requirements in Establishing Preliminary Remediation Goals under CERCLA,*" "*EPA's policy of generally establishing PRGs[Preliminary Remediation Goals] based on ARARs in the absence of multiple pathways or contaminants, is based on the assumption that individual ARARs will be protective. For example, the NCP expressly authorizes consideration of the cumulative risk range in setting PRGs where attainment of ARARs would result in a cumulative risk in excess of 10^{-4} due to multiple contaminants or pathways. (40 C.F.R. 300.430(e)(2)(I)(D).*" This may be relevant to the radon exfiltration noted in recommendation 1b. Additionally, because the future composite worker evaluated in the risk assessment is exposed via the inhalation, submersion, ingestion, dermal contact, and gamma radiation pathways to multiple contaminants and is estimated to receive a total cancer risk outside the CERCLA risk range, an evaluation to determine whether ARARs are sufficiently protective should be completed. If not, PRGs should be established in

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accordance with CERCLA and EPA guidance including OSWER Directive 9200.4-23, which includes consultation with Headquarters contacts, currently Robin Anderson for OSRTI and Charles Openchowski for the Office of General Counsel.

6. Remedial Action Objectives

Based on the information provided to the Board, the NRC is the lead agency for byproduct material disposal area reclamation and closure, but tailings closure is part of OU2. The "*Development and Screening of Remedial Alternatives Technical Memorandum, HOMESTAKE MINING COMPANY SUPERFUND SITE*" lists in table 7-1 the various ARARs and TBC criteria for the Site. The listed ARARs include 10 CFR Part 40 Appendix A, 6, as well as, 40 CFR Part 192 Subparts A, C, and D which include various requirements for the design of the controls for residual radioactive material.

Recommendations

a. These required controls pertain to more than just the emanation of radon. For example, 10 CFR Part 40 Appendix A, 6(1) states, "*In disposing of waste byproduct material, licensees shall place an earthen cover (or approved alternative) over tailings or wastes at the end of milling operations and shall close the waste disposal area in accordance with a design which provides reasonable assurance of control of radiological hazards to (i) be effective for 1,000 years, to the extent reasonably achievable, and, in any case, for at least 200 years...*" (underlined for emphasis). Although NRC is the lead for closure of the tailings piles, a CERCLA remedial action (among other things) must ensure protectiveness of human health and the environment, consistent with the NCP and existing EPA CERCLA guidance; at this site, that includes a cover to prevent exposure to COCs and to protect groundwater. Given that the radiological hazards from the tailings are expected to include exposure to external gamma radiation, ingestion, and inhalation of the various radiological contaminants of concern, the Board recommends the Region include an analysis of the risk related to the tailings piles material and, as appropriate, develop additional RAOs to achieve protectiveness of human health and the environment as required by CERCLA. Examples of RAOs that may be appropriate for the OU2 tailings piles include:
   i. Prevent direct contact to contaminated media (including waste material, stormwater, sediments, leachate and groundwater) located on or emanating from the tailings piles.
   ii. Limit inhalation and external radiation exposure from contaminated media (including waste material, fill, leachate, and emissions) located on or emanating from the tailings piles to within the acceptable risk range (10-4 to 10-6 cancer risk or a HI of less than 1 for non-carcinogenic risk).
   iii. Prevent migration of contaminants to groundwater above levels protective for the beneficial use of groundwater and reasonably anticipated use of surface water.

b. The Board also notes that guidance should be considered pertaining to the groundwater protection standards in 40 CFR Part 192. The Board recommends the Region refer to "Use of Uranium Drinking Water Standards Under 40 CFR Part 141 and 40 CFR Part

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192 as Remediation Goals for Groundwater at CERCLA Sites"[5] to support the approach for determining groundwater protection standards.

7. Coordination with NRC and DOE

As stated in the site description above, the overlapping regulatory requirements of UMTRCA Title II and CERCLA present unique challenges to developing a remedial approach for the site that satisfies the legal and technical requirements of both statutes. This issue is particularly relevant in at least two specific instances, identifying ARARs/PRGs/RAOs and site deletion. For example, taking a site off the NPL may have implications for the UMTRCA site closure and transfer process including long-term maintenance and care under the DOE Legacy Management Program. EPA has not established policy and guidance that address future EPA, NRC and DOE overlapping regulatory requirements.

As noted earlier, Homestake is one of four NPL sites subject to NRC regulations regarding closure and EPA oversight of CERCLA cleanup actions. The four sites are located in two EPA regions and are in varying stages of the Superfund cleanup process. Additionally, the Office of Mountains, Deserts, and Plains (OMDP), established in 2020, focuses on hardrock mining NPL sites in the western portion of the United States. It is the Board's understanding that while each Region works directly with NRC and DOE for their respective site(s), there may be an intra-agency workgroup focused on this unique cadre of sites.

Recommendations

a. Coordination that affects remedy selection including ARARs/PRGs/RAOs
   i. Inter-Agency Coordination
      1. The Board recommends that, as part of the feasibility study, the Region clearly enumerate the underlying basis (e.g., UMTCRA ARARs related to closure; Safe Drinking Water Act Maximum Contamination Levels for ground water remediation) for cleanup criteria for each impacted environmental medium. The Board notes that CERCLA's requirement to ensure protectiveness of human health and the environment will need to be met for NPL deletion purposes.
      2. The Board further recommends that the Region clarify with the NRC the criteria for identifying areas for potential transfer into the DOE Legacy Management Program. Clarity from NRC/DOE on what are their criteria for accepting these areas may help inform the selection of appropriate treatment technologies when selecting a CERCLA remedy.
      3. It is EPA's concern that DOE may not accept an NPL site into its Legacy Management Program due to the expenses associated with the potential need for additional work. Since the HMC Site is on the NPL, EPA may be requested to delete the site prior to site transfer. If this is the case, EPA will need to conduct a formal notice and comment rulemaking in order to delete this site. As part of that formal rulemaking process, EPA will need to include data and information in the rulemaking docket to support the deletion process. In particular, the NCP provides that deleting a site from

[5] https://semspub.epa.gov/work/06/619832.pdf

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the NPL can occur when there is no further federal or PRP-lead response needed at that site (e.g., because CERCLA protectiveness of human health and the environment has been achieved). While EPA can acknowledge and take into account the work being done pursuant to the NRC license process, various aspects of that process (e.g., prior calculation of background concentrations in ground water, development of alternative concentration limits) do not appear to be consistent with the CERCLA program guidance. That potential gap may be significant at a point when the Agency undertakes an NPL deletion rulemaking process in the future, especially with regard to the no further federal or PRP-lead response needed requirement. It also may be significant if NRC concludes its license process and DOE refuses to accept the site into its Legacy Management Program due to the potential need for additional response actions (e.g., for groundwater) to ensure protectiveness of human health and the environment. Therefore, the Board recommends that the site's administrative record file, including the RI/FS and other documentation used to support the remedy development and selection process, fully address how the approach to various aspects of the cleanup at this site are being undertaken consistent with CERCLA, the NCP and existing EPA CERCLA guidance. For example, the administrative record file should explain how the approach for calculating the soil and ground water background concentrations, the use of MCLs and UMTRCA groundwater standards for uranium in developing PRGs, RAOs, and cleanup levels, the point of compliance for attaining ground water ARARs, and consideration of a technical impracticability waiver, is consistent with the NCP preamble and various guidance documents, such as the Role of Background guidance, the RI/FS guidance, Use of Soil Cleanup Criteria in 40 CFR Part 192 as Remediation Goals for CERCLA Sites guidance, Remediation Goals for Radioactively Contaminated CERCLA Sites Using the Benchmark Dose Cleanup Criteria in 10 CFR Part 40 Appendix A, I, Criterion 6(6), the 2009 Summary of Key Existing Ground Water guidance, Use of Uranium Drinking Water Standards under 40 CFR 141 and 40 CFR 192 as Remediation Goals for Groundwater at CERCLA sites guidance, and the TI waiver guidance.

ii. EPA Coordination

1. The Board recommends the Region coordinate within Region 6 and with Regions 8 and 9, as well as with OMDP and OSRTI, where appropriate. Additionally, there is a multi-agency team that is actively working to establish operations and maintenance (O&M) expectations and the team may be positioned to provide valuable feedback.

8. Suite of Remedial Alternatives

The HMC Site is unique in that the site is currently subject to interim reclamation/remedial components. As discussed earlier, while the flanks of the large tailing pile have a radon barrier, the top of the pile has only an interim cover that may not protect to UMTRCA standards. Without a permanent cover, there may be current human health exposures and rain may

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penetrate, resulting in ongoing source migration from the tailings pile (seepage) to groundwater. The groundwater at Homestake is currently subject to containment through pumping clean water from the San Andreas/Glorietta (SAG) aquifer and injecting it into the alluvial aquifer to create a groundwater mound. The Region provided a Remedial Alternative Technical Memorandum for the site as part of the site information package. The tailing remedial alternatives considered included on-site remediation and tailing closure; and removal and off-site disposal (outside of the San Mateo Creek Basin and Milan) of the tailings piles. The remedial alternatives considered for groundwater included long-term monitoring and ICs; groundwater containment and removal; groundwater containment, removal, and in-situ treatment; and groundwater restoration via containment and removal; and technical impracticability.

Recommendations

a. In addition to the current remedial technologies, the Board recommends that the Region assess a wider selection of remedial alternatives, including source control actions, before conducting the detailed alternatives analysis. The Region may want to consider the Board's recommendations on RAOs when assessing remedial alternatives for source control and/or protection of drinking water. Below are a few recommended options for consideration that could be used alone or in combination to expand the suite of alternatives:
    i. Given the importance of the SAG aquifer to local communities, the Board recommends the Region consider utilizing pumping and treating the alluvial aquifer to prevent migration rather than creating a hydraulic mound. The remediated water from the treatment systems could be reinjected to the alluvial, Chinle, or SAG aquifers, depending on the level to which it is treated. This would allow for containment while preventing the use of clean water to create a mound in the contaminated alluvial aquifer. Additionally, this approach would minimize the use of the SAG aquifer for remedial purposes, reserving it for domestic use.
    ii. Should the current hydraulic barrier be considered as a remedial alternative, the Region should consider evaluating the hydraulic head, similar the analysis performed upgradient, to better understand the influence of the ceased LTP flushing operation on downgradient migration.
    iii. As noted in recommendation 1a, assessing the challenges facing the RO and zeolite treatment systems may improve current operations, but this information may also be valuable to inform optimization opportunities moving forward.
    iv. It was stated that a permeable reactive barrier (PRB) may be utilized as a contingency alternative. The Board recommends that the Region consider the use of a PRB in the current suite of alternatives rather than only as a contingency. Similar to pump and treat, a PRB may be an option to replacing the current hydraulic mound.
    v. In terms of waste disposal, the HMC Site is one of many mines and mills in the San Mateo Basin, some of which the Homestake Mining Company is responsible for. The Board recommends that the Region consider the use of a regional waste disposal facility or consolidation at another DOE facility, that may result is cost efficiencies over the long-term.
    vi. In addition to the closure of the LTP and STP, the Region may consider alternative on-site source control options such as a lined cell adjacent to the current cell. If the material is moved to a lined cell, the primary source of contamination to

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groundwater (seepage) would be substantially reduced, if not eliminated. This approach has been used at another Superfund site in Region 10.

vii. Should the Region consider alternatives that maintain the LTP and SPT, the Region may also consider solidifying the base of the tailings piles through injections. This may create a less permeable surface at the base of the landfill that would limit source migration/seepage to groundwater much like a liner.

viii. Should the tailings material remain onsite, the Board recommends the Region work with NRC and DOE to design a cap that meets their requirements while preventing infiltration into the tailings.

ix. Based on the information provided to the Board, the UMTRCA radon emission standards are above the CERCLA human health risk range for unlimited use and unrestricted exposure. As a result, the Board recommends that, should the Region select a remedial alternative that includes on-site waste management, the Region consider alternatives that utilize institutional controls and fencing to limit access to the piles to reduce exposures.

9. Climate Change

As noted on EPA's Climate Change website[6], understanding and addressing climate change is critical to EPA's mission to protect human health and the environment. With regards to the Superfund program, it's important to consider the impact of severe weather events, potential flooding, changes in rain patterns and temperature changes into remedy selection and design. It may be necessary to incorporate elements of climate resilience, especially for sites subject to groundwater contamination and/or material being left in place, such as the HMC Site.

Recommendation

a. The Board recommends that the Region, when evaluating remedial alternatives, consider the potential impacts of climate change that may negatively affect the protectiveness of alternatives. The June 2014 OLEM Climate Change Adaptation Implementation Plan[7] (Implementation Plan) discusses potential program vulnerabilities to climate change. Per Table 1 in the Implementation Plan, such vulnerabilities may include: design and placement of storage facilities to accommodate climate change impacts, changing climate conditions may impact continued remedy effectiveness, current assumptions regarding protectiveness of remediation and containment methods may not reflect changing climate impacts, or conducting periodic evaluations of implemented remedies, including changes to frequency and intensity that may impact remedy effectiveness. Examples of vulnerabilities that may be applicable to Homestake include: evapotranspirative covers may be less effective in areas with stronger drought/rain cycles, the depth to groundwater may be affected by climate change, or a site's O&M needs may change based on more extreme weather events.

[6] https://www.epa.gov/climate-change

[7] https://www.epa.gov/sites/production/files/2018-08/documents/oswer-climate-change-adaptation-plan.pdf

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10. Environmental Justice

Based on the information provided to the Board, two downgradient tribes, the Pueblo of Acoma and the Pueblo of Laguna, as well as the cities of Milan and Grants are dependent upon the SAG aquifer for drinking water. These vulnerable communities may be disproportionately impacted by the HMC Site. Impacts to the SAG aquifer may create environmental justice (EJ) concerns for tribal communities, as they cannot move their homelands, and the tribes' relationship to the resource includes cultural as well as public health considerations.

Recommendations

a. Based on the presentations made by the Region and other stakeholders, the Board recommends the Region address the potentially disproportionate impact of site-related contamination and potential EJ concerns related to cleanup approaches. In particular, the policies articulated in section 1 of Executive Order 13990 (e.g., using science to improve public health, protect the environment, ensure access to clean water, consideration of impacts on EJ and low income communities) and public statements made by the Administrator since the issuance of that Order, as well as long-standing Agency EJ guidance, offer a framework that can inform policy considerations in evaluating alternatives for limiting exposure to highly toxic/carcinogenic and mobile constituents of concern (radionuclides). Given the evolving priorities related to environmental justice (EJ), the Board recommends the site team engage with Region 6's designated EJ coordinator and OSRTI's EJ coordinator, currently Lavar Thomas, to address potential EJ concerns.
b. Given the impact to two tribes, the Board recommends that the Region ensure adequate tribal consultation with regard to resources that may be negatively impacted by site-related contamination and potential response action alternatives.

ADVISORY CONSIDERATIONS

Advisory considerations are Board Review Team suggestions that are meant to support the Regional Site Team in moving forward, but do not necessarily rise to the level of recommendations. Please take these comments under consideration as the RI is finalized and the FS is initiated.

1. Utilize Lessons Learned from Other Sites

As noted earlier, there are over 80 legacy uranium mines and four former uranium mill facilities that operated in the San Mateo basin, including the HMC Site. Some of these, such as Bluewater, have already undergone some remedial/reclamation activity. Similarly, other NPL sites also subject to UMTRCA Title II may be further in the remedy selection process. It might be helpful for the Region to learn more about those sites to determine if there are any lessons learned that may inform the HMC Site. Those site lessons may provide useful information and approaches for addressing inter-agency coordination, groundwater management and other related issues as the Region moves forward with remedy selection at this site.

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CONCLUSION

The Board Review Team commends the Region's collaborative efforts in working with the State, tribes and site stakeholders. We would also like to thank the Regional Site Team for the thought and effort that went into preparation of the Board package and presentations.

Per the NRRB Charter, approximately six weeks after receipt of these recommendations, the Board expects the Regional Division Director to respond to the OSRTI Office Director in writing to address implementation of each Board recommendation and those advisory considerations that the Region is not adopting. The OSRTI Office Director will then discuss the response with the Regional Division Director within approximately two weeks of receiving the Region's written response level. Typically, before the Region issues the proposed plan for public comment, the Region includes the recommendations memo and regional response memo in the site's AR. Once the Board recommendations and Regional responses are made a part of the AR, they will be posted to the NRRB website (https://www.epa.gov/superfund/national-remedy-review-board-nrrb).

Thank you for your support and the support of your managers and staff in preparing for this review. The Board looks forward to working with the Regional Site Team during the Detailed Alternatives Analysis meeting. Should you have any questions, please contact me at poore.christine@epa.gov or call me at 703-603-9022. Thank you for the opportunity to engage on the Homestake Superfund Site.

cc: Dana Stalcup, OSRTI
Brigid Lowery, OSRTI
Schatzi Fitz-James, OSRTI
John Meyer, R6
Blake Atkins, R6
Mark Purcell, R6
NRRB Board Review Team Members
Chris Villarreal, R6
Hollis Luzecky, OSRE

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Message

From: Purcell, Mark [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=FE198E260B024EB4BD9D30DC11F900B1-PURCELL, MARK]
Sent: 6/15/2021 9:32:16 PM
To: Gee, Randy [Gee.Randy@epa.gov]
Subject: FW: Homestake NRRB Recommendations
Attachments: Homestake NRRB Recommendations Final.pdf

Randy,

I sent this communication to the Acoma Pueblo today.

From: Purcell, Mark
Sent: Tuesday, June 15, 2021 4:29 PM
To: Governor Brian Vallo <Governor@poamail.org>; 1st Lt. Governor Raymond J. Concho, Jr. <1st_lt@puebloofacoma.org>; 2nd_lt@poamail.org; Interpreter@poamail.org; CVandiver@poamail.org; Ann Berkley Rodgers <abr@chestnutlaw.com>; Aaron M. Sims <ams@chestnutlaw.com>; Jacob Wilson <JWilson@poamail.org>; Franklin Martinez <FMartinez@poamail.org>; dmartinez@poamail.org; tcouncilpoa@gmail.com; Francine Torivio <administration@poamail.org>
Cc: Turner, LaDonna <turner.ladonna@epa.gov>
Subject: FW: Homestake NRRB Recommendations

Dear Governor Vallo and other representatives of the Pueblo of Acoma,

Please find attached the EPA National Remedy Review Board (NRRB) recommendations on the Homestake NPL Site CERCLA Feasibility Study.

We are providing these recommendations to all stakeholders that participated in the March 2021 NRRB meeting, as well as the U.S. Nuclear Regulatory Commission and the U.S. Department of Energy. We will also make them available to the public for review via EPA's site webpage.

EPA Region 6 will begin to review/assess these recommendations and prepare written responses to the NRRB over the next couple of months.

If you have any questions, please let me know.

Best regards,

Mark

Mark Purcell
Superfund and Emergency Management Division (6SED)
U.S. Environmental Protection Agency – Region 6
1201 Elm Street, Suite 500
Dallas, TX 75270
Office Tel: 214-665-6707
Work Cell: 469-553-7211
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Message

From: Purcell, Mark [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=FE198E260B024EB4BD9D30DC11F900B1-PURCELL, MARK]
Sent: 1/7/2021 4:32:12 PM
To: Ann Berkley Rodgers [abr@chestnutlaw.com]; Aaron M. Sims [ams@chestnutlaw.com]; TSecretary@poamail.org; Governor@poamail.org; 1st_lt@poamail.org; CVandiver@poamail.org; JWilson@poamail.org; FMartinez@poamail.org; dmartinez@poamail.org; tcouncilpoa@gmail.com; administration@poamail.org
CC: Turner, LaDonna [turner.ladonna@epa.gov]; Weece, Adam [weece.adam@epa.gov]
Subject: Revised Draft Alternatives Development and Screening Memorandum - Homestake NPL Site Feasibility Study
Attachments: 20200422 GRP RIFS Homestake Alternative Screening Memo.pdf

All,

I have attached the revised draft Alternatives Development and Screening Memorandum for the Homestake NPL Site. This document represents the initial phase of the ongoing Feasibility Study (FS) equivalency process. A draft FS Report has also been prepared by Homestake. EPA is in the process of downloading the link to the document and sending it to you.

I have also sent you three links to the Final RI Report for the Homestake NPL Site (Text, Figures, Appendices). Please confirm when you receive the documents.

I will also be sending links to the draft Technical Impracticability (TI) Evaluation Report submitted by Homestake in November 2020. Again, please confirm when you receive the documents.

Finally, EPA is in the process of rescheduling the National Remedy Review Board (NRRB) meeting for the Homestake NPL site to late March 2021. Once the dates have been finalized, you will be notified.

Thank you.

Mark

Mark D. Purcell
Superfund and Emergency Management Division (6SF)
U.S. Environmental Protection Agency - Region 6
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Dallas, TX 75270
Tel: 214-665-6707
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Message

From: Purcell, Mark [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=FE198E260B024EB4BD9D30DC11F900B1-PURCELL, MARK]
Sent: 3/24/2021 9:05:29 PM
To: Ann Berkley Rodgers [abr@chestnutlaw.com]; Aaron M. Sims [ams@chestnutlaw.com]; Governor@poamail.org; TSecretary@poamail.org; 1st_lt@poamail.org; Interpreter@poamail.org; CVandiver@poamail.org; Jacob Wilson [JWilson@poamail.org]; FMartinez@poamail.org; dmartinez@poamail.org; tcouncilpoa@gmail.com; administration@poamail.org
Subject: Homestake and BVDA/MASE Presentation Slides for National Remedy Review Board March 25, 2021, Meeting - Homestake Superfund Site
Attachments: 20210311 Homestake Presentation Slides to NRRB.pdf; Revised Presentation-21.03.25 MASE-BVDA Laura_NRRB FINAL.pdf; NRRB.Presentation.Maest_25Mar2021_Final.pdf

All,

I have attached the presentation slides for Homestake Mining Company and the Bluewater Valley Downstream Alliance and the Multicultural Alliance for a Safe Environment (MASE).

As a reminder, the State and Tribal Session begins tomorrow at Noon (Mountain Time). The Stakeholder Session for Homestake and the BVDA/MASE begins at 1:30 pm (Mountain Time). I sent you the final agenda. And I also sent you two Microsoft Teams meeting invites for these two sessions.

These meetings are for the specific stakeholder to present to the Board and the Board to ask questions. We will ask other parties that are attending the meeting to not interrupt the discussions.

Mark

Mark D. Purcell
Superfund and Emergency Management Division
U.S. Environmental Protection Agency – Region 6
1201 Elm Street, Suite 500
Dallas, TX 75270 - 2162
Tel: 214-665-6707
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Purcell.mark@epa.gov

MULTICULTURAL ALLIANCE FOR A SAFE ENVIRONMENT

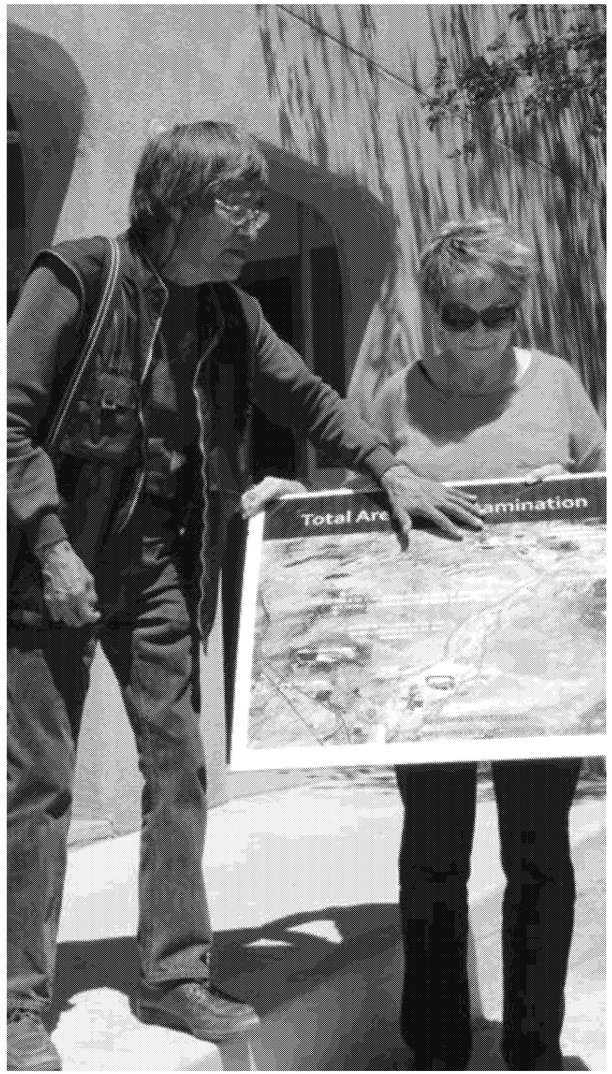
SWURANIUMIMPACTS.ORG

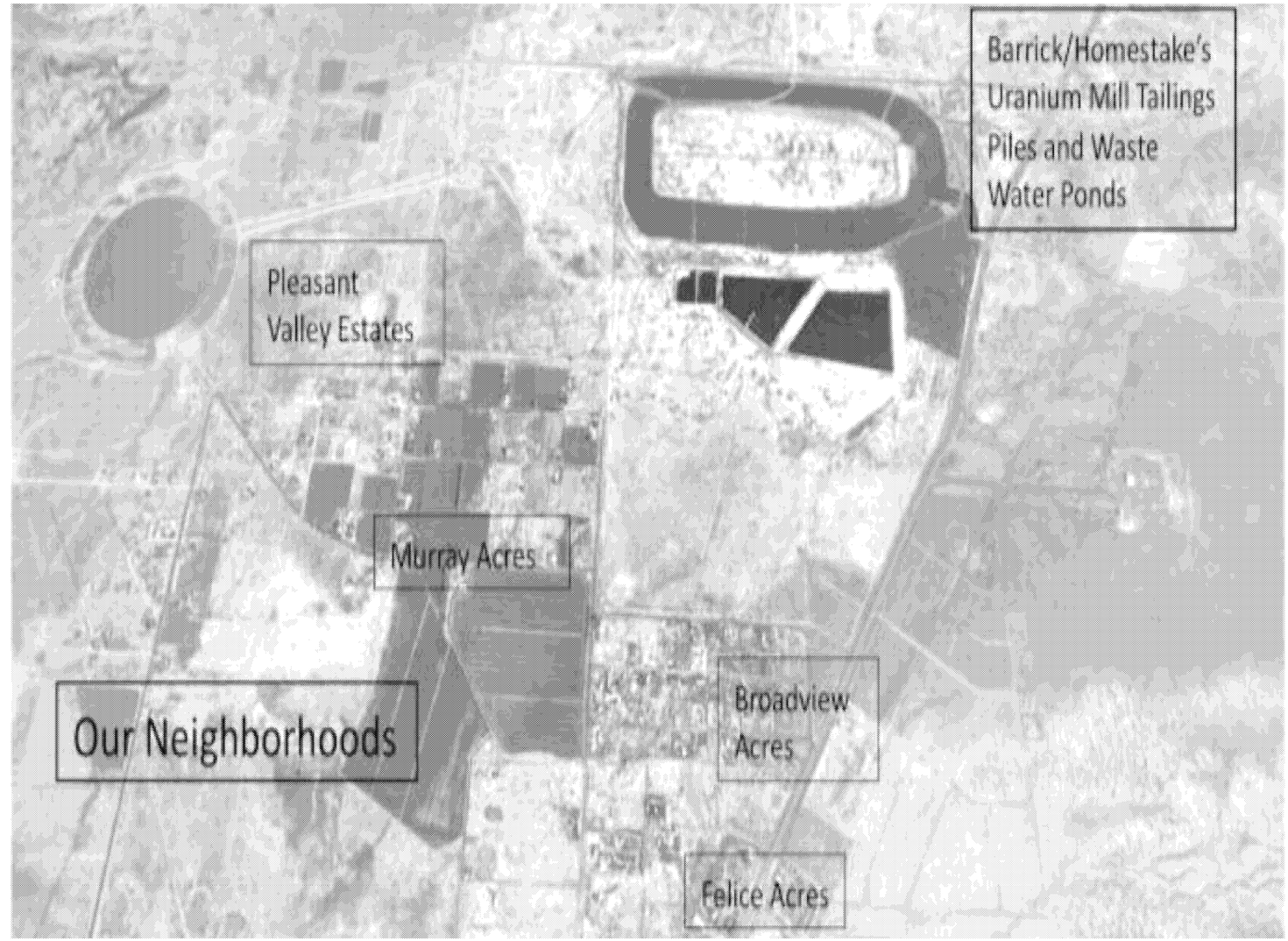
March 25, 2021
Presentation to the
U.S. EPA National Remedy Review Board
by Laura Watchempino
Multicultural Alliance for a Safe Environment

MASE Core Groups:

Blue Water Valley Downstream Alliance
Eastern Navajo Dine Again Uranium Mining
Laguna-Acoma Coalition for a Safe Environment
Post-71 Uranium Workers Committee
Red Water Pond Road Community Association

Blue Water Valley Downstream Alliance



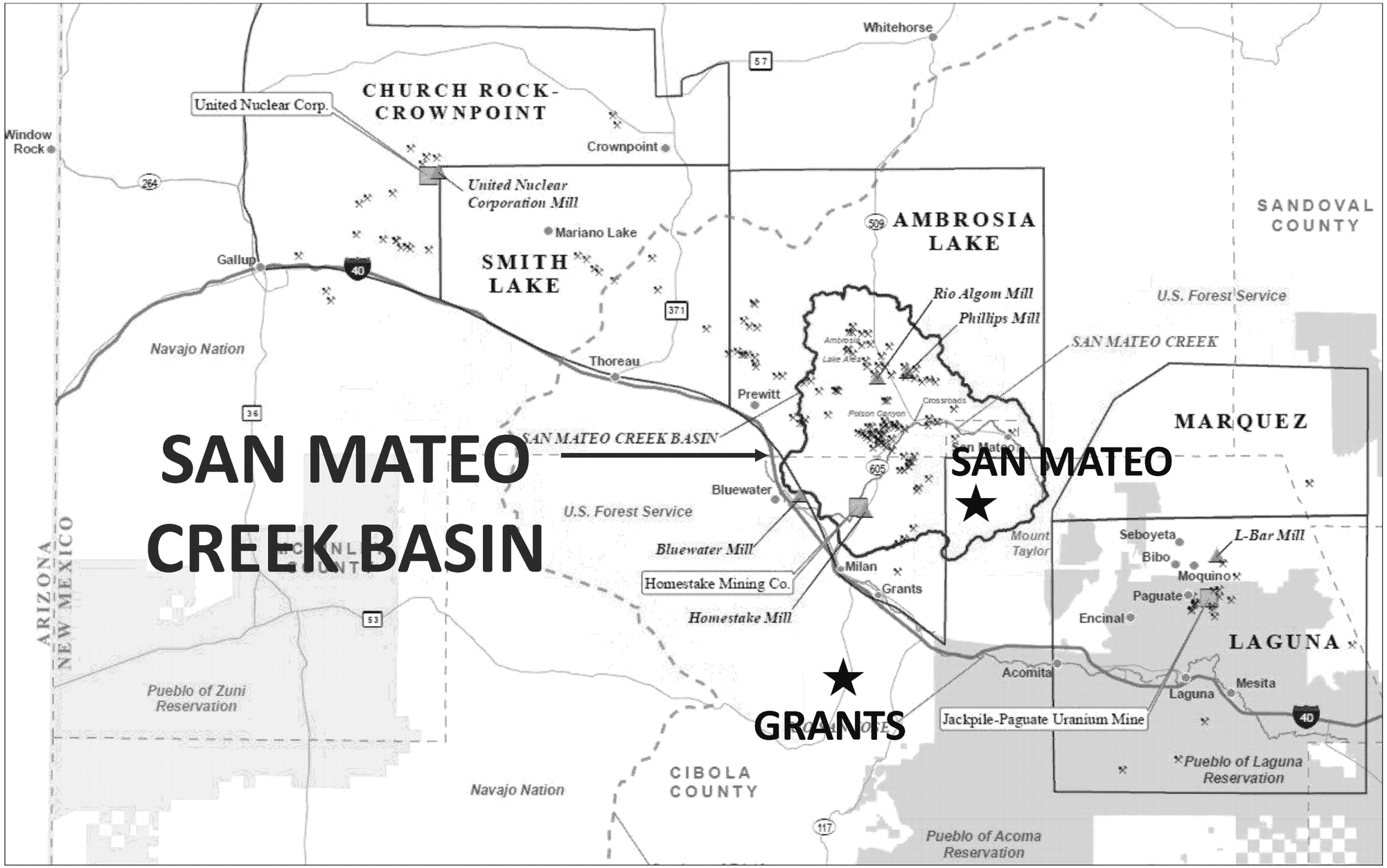


1972 Flood

Looking East, Wagon Wheel Rd., Broadview Acres
Mt. Taylor in background

Looking North, Thunderbird Road between Broadview and Murray Acres; Tailings Pile to Right of Road in Upper Right

Looking East, from Chapmans (former Home of Milton and Jonnie Head) on Ridgerunner Road



MINE

LAND OWNERSHIP

- NAVAJO
- LAGUNA PUEBLO
- ACOMA PUEBLO
- ZUNI PUEBLO
- USFS

GRANTS MINING DISTRICT

Homestake Barrick Gold Mill

Contaminating New Mexico for Decades

1957 - Mill licensed by NRC
1961 - Water contamination first identified
1977 – Site Reclamation Begins
1983 - Listed on National Priorities List – Super Fund Site
1989 - HBG CAP approved by NRC
2000 - New remedial program begins

Failed Remedy:
Massive Collection / Injection Well Network Has Increased Problem

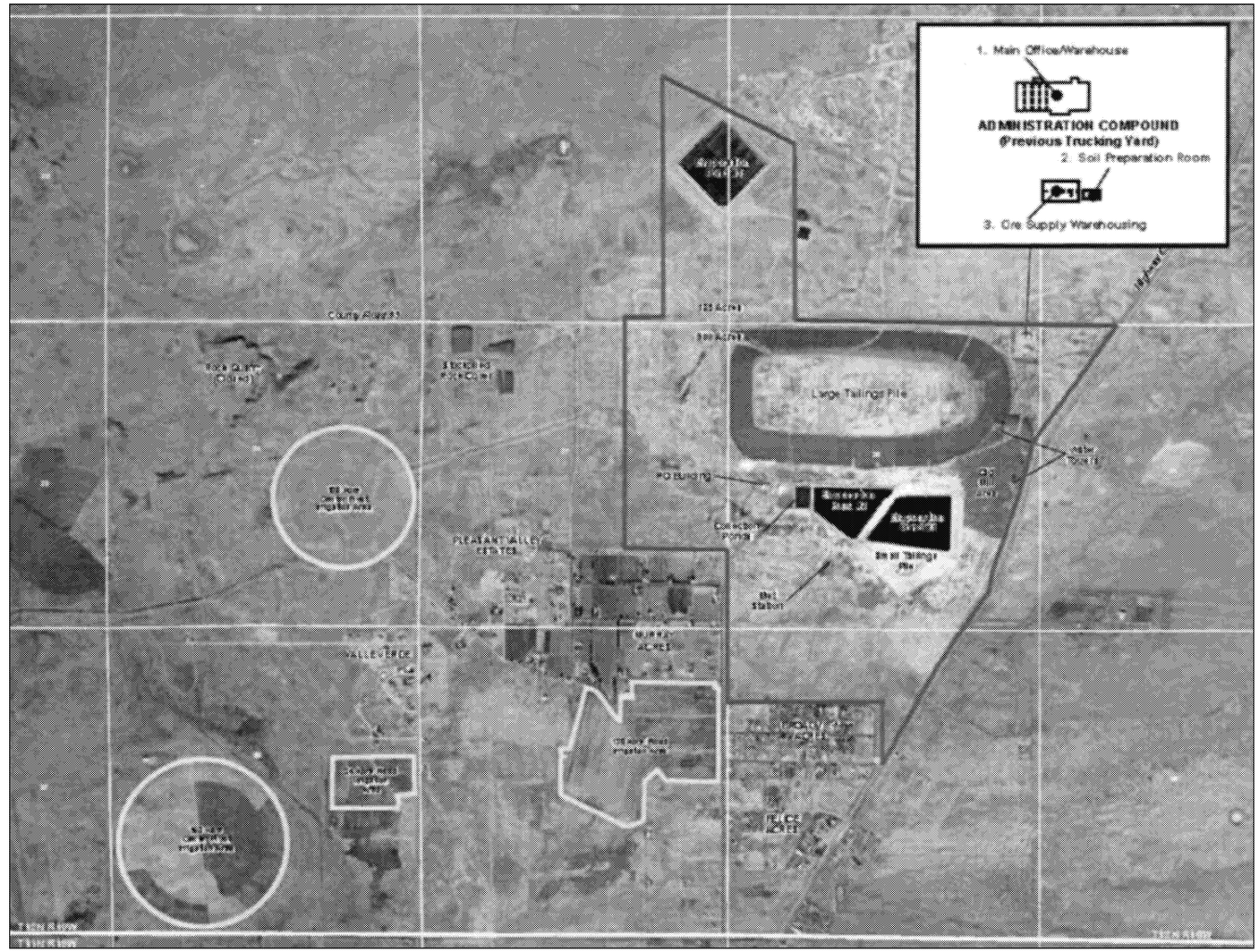
Failed Remedy:
Flushing the Tailings Piles

Failed Remedy:
Reverse Osmosis

Failed Remedy:
Zeolite System

Failed Remedy:
Illegal Land Application Off-Site

- 2000-2012: ~10,000 ac-ft of mine-influenced waters from alluvial and some Chinle wells were used for irrigation + SAG water
- Mean U values: 0.12 to 0.38 mg/L – up to 2.4 times > current GWPS and >12 times State/EPA MCL
- No remediation, Restrictive Covenants prohibit residential/ ag use of land and groundwater for drinking.



Sources: RI Report, Tables 3-3 and 3-5; GCAP, p. 2-6. Map: Brown and Caldwell, 2018. SMC and HMC Mill hydrogeo concept model, Figure 41.

Remedy: Move the Tailings Piles

In order to protect the Rio San Jose, the lifeblood of Acoma Pueblo and Laguna Pueblo, we must protect the San Andres-Glorieta Aquifer for future generations.

MULTICULTURAL ALLIANCE FOR A SAFE ENVIRONMENT

SWURANIUMIMPACTS.ORG

Message

From: Purcell, Mark [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=FE198E260B024EB4BD9D30DC11F900B1-PURCELL, MARK]
Sent: 8/3/2021 6:51:07 PM
To: Biggs, Kirby [Biggs.Kirby@epa.gov]
Subject: Draft SOW - Opt Team Technical Support - Homestake FS
Attachments: SOW for Homestake FS OS - Aug 2 2021 Draft.docx

Hi Kirby,

Here is the draft SOW.

Mark Purcell
Superfund and Emergency Management Division (6SED)
U.S. Environmental Protection Agency – Region 6
1201 Elm Street, Suite 500
Dallas, TX 75270
Office Tel: 214-665-6707
Work Cell: 469-553-7211
Fax: 214-665-6660

August 3, 2021

DRAFT STATEMENT OF WORK

FEASIBILITY STUDY TECHNICAL OVERSIGHT SUPPORT
HOMESTAKE MINING COMPANY SUPERFUND SITE, GRANTS, NEW MEXICO

I. PURPOSE

This Statement of Work (SOW) describes the feasibility study (FS) technical oversight support and deliverables to be provided to the EPA Office of Superfund Remedial Technology and Innovation (OSRTI) in support of EPA Region 6 for the Homestake Mining Company Superfund site (Site), located in Grants, New Mexico. The FS is being performed in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the National Contingency Plan (NCP).

The SOW and deliverables align with the work activities and deliverables outlined in the Administrative Settlement Agreement and Order on Consent (ASAOC) for FS at the Site; dated August 12, 2020. The ASAOC specifies the primary tasks to be completed by Homestake Mining Company, the responsible party (RP) in the performance of the FS. Following are the associated activities to be completed under this SOW.

II. TECHNICAL SUPPORT REQUIREMENTS

Task 1 – Project Planning and Support

This task includes the following work effort related to project initiation and project management:

- Conflict of Interest (COI) Determination – The Contractor shall seek confirmation of the Site's RP with the EPA Task Monitor and the Remedial Project Manager (RPM). The Contractor shall perform an internal evaluation of prior or current involvements at the Site with respect to the PRP and/or activities of technical significance to determine whether there is any internal COI, an appearance of a COI, or a confirmed COI. The Contractor shall report results to the EPA Task Monitor, Contracting Officer, and the Contracting Officer Representative (COR) in writing of its final internal COI evaluation to facilitate EPA's COI assessment.

- Scoping Meeting – the Contractor shall provide logistical support for and participate in a scoping meeting/conference call with the EPA Task Monitor and the Regional RPM.

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- Project Management – the Contractor shall perform project management, including the following:

    - Coordinate staffing and other support activities to perform the project tasks set forth in this SOW, including Team subcontractors and other subcontractors;
    - Establish and maintain necessary project files;
    - Perform contract administration functions associated with this project;
    - Coordinate monthly reporting and invoices;
    - Monitor overall cost and performance;
    - Attend periodic project planning meetings, as necessary, and;
    - Perform final project closeout per requirements of the contract.

Task 2 – Project Kickoff Meeting

The Contractor shall provide logistic support for and participation in a kick-off meeting/conference call with the EPA Task Monitor, the Regional RPM, EPA technical staff, other EPA contractor(s), and other stakeholders as appropriate. The purpose of the meeting/call is for EPA to provide the Contractor with an overview of the Site, discuss site characteristics and history, goals of the project, schedules, roles and responsibilities, and key site documents for review.

Task 3 – Site Document/Data Review

The Contractor shall obtain, copy and review available site documents and data provided by the Region to support the project. The Contractor shall obtain the necessary information from the EPA Task Monitor, Regional RPM and/or the Regional site contractors, as applicable.

The Contractor shall notify EPA immediately should there be critical information missing or incomplete, or any other circumstances, that will delay or prevent the ability to perform the tasks set forth in this SOW. Document/data review is anticipated that may include one or more teleconferences with the Regional RPM and staff to resolve questions and address any review uncertainties.

The Contractor shall assist EPA in seeking opportunities for the Region through the HQ Optimization Program to optimize the RP-lead FS activities and seek cost reducing, innovative, and technically advanced or cutting-edge methodologies for innovation and for advancing the CERCLA potentially responsible party (PRP) overview process.

Task 4 – Technical Review of TI Evaluation Report

The Contractor shall perform multidisciplinary technical reviews and provide review comments on all draft and final versions of the Technical Impracticability (TI) Waiver Evaluation Report, as well as any other technical documents related to TI that are submitted to EPA for review and approval by the PRP. The technical review shall include a detailed review of the models used for

ED_006200_00000086-00002

the TI evaluation, including all model parameters and assumptions. The Contractor shall review the report for consistency with EPA guidance (EPA/540-R-93-080). The Contractor shall also review the report to assess the appropriateness and reasonableness of the modeling parameters and assumptions.

If EPA directs the RP to collect additional site-specific data, including laboratory testing of core samples, to complete the TI evaluation and modeling, the Contractor shall review and comment on any work plans, memorandum, reports and laboratory data submitted by the PRP for this purpose.

Task 5 – Technical Review of FS Reporting Documents

The Contractor shall perform multidisciplinary technical reviews and provide review comments on all draft and final versions of the following Feasibility Study (FS) reporting documents in support of EPA's oversight of the ongoing FS being performed by the RP:

- Technical Impracticability Waiver Evaluation Report (draft 11/2020); and
- Feasibility Study Report (draft 12/2020).

The Contractor shall review the documents for consistency with CERCLA, the NCP, and EPA guidance for conducting a FS. The Contractor shall also review the documents for technical soundness from an engineering feasibility and cost perspective.

Task 6 – Participate in EPA Technical Meetings

The Contractor shall participate in technical meetings or teleconferences between the EPA, other federal and state regulatory agencies, and/or the RP on the TI evaluation process and the FS process. The Contractor shall also participate in technical meetings with EPA to discuss its review comments submitted as part of Task 4 and Task 5.

Task 7 – Community Involvement Support

The Contractor shall provide community involvement support, if requested by EPA. Such support shall include, but not be limited to, the following:

- Meeting planning and logistics support;
- Development, formatting and production of hard copy and/or electronic media on technical topics of concern or interest.

Task 8 – Miscellaneous Technical Support

The Contractor shall provide miscellaneous, multidisciplinary technical support to EPA OSRTI and EPA Region 6 in support of Task 1 through 5, or as otherwise directed.

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III. PERIOD OF PERFORMANCE

The period of performance shall be the award date through April 1, 2023.

IV. SCHEDULE OF DELIVERABLES

All deliverable due dates will be established based on the following:

- The receipt of RP documents to review under Task 4 – Technical Review of TI Evaluation Report and Task 5 – Technical Review of FS Reporting Documents;
- As determined based on support activities directed by EPA under Task 7 – Community Involvement Support; and
- As determined based on support activities directed by EPA under Task 8 – Miscellaneous Technical Support.

ED_006200_00000086-00004

Message

From: Purcell, Mark [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=FE198E260B024EB4BD9D30DC11F900B1-PURCELL, MARK]
Sent: 8/4/2021 8:58:31 PM
To: Biggs, Kirby [Biggs.Kirby@epa.gov]
Subject: Updated SOW - Technical Support on Homestake Superfund Site
Attachments: SOW for Homestake FS OS - Aug 2 2021 Draft.docx

Hi Kirby,

I updated the SOW with a new Task 9 to match the IGCE.

Mark

Mark Purcell
Superfund and Emergency Management Division (6SED)
U.S. Environmental Protection Agency – Region 6
1201 Elm Street, Suite 500
Dallas, TX 75270
Office Tel: 214-665-6707
Work Cell: 469-553-7211
Fax: 214-665-6660

August 3, 2021

DRAFT STATEMENT OF WORK

FEASIBILITY STUDY TECHNICAL OVERSIGHT SUPPORT
HOMESTAKE MINING COMPANY SUPERFUND SITE, GRANTS, NEW MEXICO

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The Contractor shall assist EPA in seeking opportunities for the Region through the HQ Optimization Program to optimize the RP-lead FS activities and seek cost reducing, innovative, and technically advanced or cutting-edge methodologies for innovation and for advancing the CERCLA potentially responsible party (PRP) overview process.

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- Feasibility Study Report (draft 12/2020).

The Contractor shall review the documents for consistency with CERCLA, the NCP, and EPA guidance for conducting a FS. The Contractor shall also review the documents for technical soundness from an engineering feasibility and cost perspective.

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- Development, formatting and production of hard copy and/or electronic media on technical topics of concern or interest.

Task 8 – Miscellaneous Technical Support

The Contractor shall provide miscellaneous, multidisciplinary technical support to EPA OSRTI and EPA Region 6 in support of Task 1 through 5, or as otherwise directed.

ED_006200_00000091-00003

Task 9 – Optimization Review Technical Memorandum

The Contractor will prepare a technical memorandum, if requested by EPA, to document any recommendations for optimizing technologies, process options or remedial alternatives that are to be developed during the performance of the CERCLA FS.

III. PERIOD OF PERFORMANCE

The period of performance shall be the award date through April 1, 2023.

IV. SCHEDULE OF DELIVERABLES

All deliverable due dates will be established based on the following:

- The receipt of RP documents to review under Task 4 – Technical Review of TI Evaluation Report and Task 5 – Technical Review of FS Reporting Documents;
- As determined based on support activities directed by EPA under Task 7 – Community Involvement Support; and
- As determined based on support activities directed by EPA under Task 8 – Miscellaneous Technical Support.

ED_006200_00000091-00004

Message

From: Purcell, Mark [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=FE198E260B024EB4BD9D30DC11F900B1-PURCELL, MARK]
Sent: 3/24/2021 8:57:34 PM
To: Adam Ringia [ringiaa@pol-nsn.gov]; gjojola@pol-nsn.gov; ewoodward@pol-nsn.gov; Setter@pol-nsn.gov
Subject: Presentation Slides from Homestake and BVDA/Mase for March 25 2021 National Remedy Review Board Meeting
Attachments: 20210311 Homestake Presentation Slides to NRRB.pdf; NRRB.Presentation.Maest_25Mar2021_Final.pdf; Revised Presentation-21.03.25 MASE-BVDA Laura_NRRB FINAL.pdf

All,

I have attached the slide presentations for Homestake Mining Company and the Bluewater Valley Downstream Alliance (BVDA) and Multicultural Alliance for a Safe Environment (MASE) to be used at the NRRB March 25, 2021, meeting on the Homestake NPL Site.

Mark

Mark D. Purcell
Superfund and Emergency Management Division
U.S. Environmental Protection Agency – Region 6
1201 Elm Street, Suite 500
Dallas, TX 75270 - 2162
Tel: 214-665-6707
Fax: 214-665-6660
Purcell.mark@epa.gov

Message

From: Purcell, Mark [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=FE198E260B024EB4BD9D30DC11F900B1-PURCELL, MARK]
Sent: 1/20/2021 11:49:50 PM
To: Daniel Lattin [dlattin@barrick.com]
Subject: RE: Proposed dates and times for follow-up meeting on TI Evaluation and other matters - Homestake NPL Site

Sorry for the confusion Daniel. This is for HMC and EPA to discuss TI Waiver and Background.

I am still inquiring with DOE and NRC about the TI Waiver Presentation dates. Is Homestake still able to do this next week?

Mark

From: Daniel Lattin <dlattin@barrick.com>
Sent: Wednesday, January 20, 2021 4:42 PM
To: Purcell, Mark <purcell.mark@epa.gov>
Subject: RE: Proposed dates and times for follow-up meeting on TI Evaluation and other matters - Homestake NPL Site

Good Afternoon Mark,

Can you kindly clarify if this meeting is for the HMC TI Waiver Presentation to DOE & NRC or if this is for HMC & EPA to discuss TI Waiver timing and Background re-evaluation. I have different attendees to coordinate availability with for the separate meetings.

Thank you,

BARRICK

www.barrick.com

Daniel Lattin, P.E.
Sr. Closure Program Manager
Barrick Gold of North America, Inc.

Tel: (775) 748-1022
Mobile: (775) 397-7215

From: Purcell, Mark <purcell.mark@epa.gov>
Sent: Wednesday, January 20, 2021 2:20 PM
To: Daniel Lattin <dlattin@barrick.com>
Cc: Vollbrecht, Kurt, NMENV <kurt.vollbrecht@state.nm.us>; Winton, Ashlynne, NMENV <ashlynne.winton@state.nm.us>; Longmire, Patrick, NMENV <patrick.longmire@state.nm.us>; Travis, Pamela <Travis.Pamela@epa.gov>; Applegate, Nathaniel <Applegate.Nathaniel@epa.gov>; Malott, Vincent <malott.vincent@epa.gov>; Bartenfelder, David <Bartenfelder.David@epa.gov>; Alexander, George <george.alexander@nrc.gov>; Linton, Ron <ron.linton@nrc.gov>; Von Till, Bill <Bill.VonTill@nrc.gov>; Tsosie, Bernadette <Bernadette.Tsosie@lm.doe.gov>; Kathryn Becker <kathryn.becker@state.nm.us>
Subject: EXT: Proposed dates and times for follow-up meeting on TI Evaluation and other matters - Homestake NPL Site

Hi Daniel,

EPA and NMED are available for a follow-up meeting on TI and other items on the following dates and times:

Monday (January 25): 12:00 – 2:30 pm (Mountain)
Tuesday (January 26): 1:00 – 2:00 pm (Mountain)

Please let us know if these will work for your team. I think that Monday may be best as I suggest that we plan for a 2-hour call. There is only a 1-hour time period for Tuesday. Also, please be aware that I invited representatives of the NRC and DOE for the call.

Mark

Mark D. Purcell
Superfund and Emergency Management Division (6SF)
U.S. Environmental Protection Agency - Region 6
1201 Elm Street, Suite 500
Dallas, TX 75270
Tel: 214-665-6707
Fax: 214-665-6660

Message

From: Purcell, Mark [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=FE198E260B024EB4BD9D30DC11F900B1-PURCELL, MARK]
Sent: 3/3/2021 5:57:08 PM
To: Adam Ringia [ringiaa@pol-nsn.gov]; ewoodward@pol-nsn.gov
CC: gjojola@pol-nsn.gov; Setter@pol-nsn.gov; Turner, LaDonna [turner.ladonna@epa.gov]
Subject: Draft Alternative Screening and Development Technical Memorandum and Equivalency Document - Homestake NPL Site
Attachments: 20190531 GRP Memorandum to EPA re Equivalency.pdf; 20200422 GRP RIFS Homestake Alternative Screening Memo.pdf

See attached Homestake Site related documents to ongoing Remedial Investigation and Feasibility Study (RI/FS) equivalency process.

Mark D. Purcell
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Purcell.mark@epa.gov

HOLLAND&HART

MEMORANDUM

May 31, 2019

TO: U.S. Environmental Protection Agency, Region VI

FROM: Holland & Hart, on behalf of Homestake Mining Company

RE: Homestake Mining Superfund Site: Coordination Between NRC and EPA CERCLA Equivalency Processes

---

I. Introduction

The Homestake Mining Company Superfund Site (the Site), also known as the Grants Reclamation Project, is currently under jurisdiction of both the Nuclear Regulatory Commission (NRC) and the Environmental Protection Agency (EPA).

EPA has had a general "deferral policy," typically not listing on the National Priorities List (NPL) sites subject to NRC's licensing authority "on the grounds that NRC has full authority to require a cleanup of releases from such facilities."[1] This deferral policy, however, has not applied to sites located in states to which NRC has delegated oversight authority, so-called "Agreement States."[2] New Mexico was an Agreement State until June 1, 1986, during which time EPA listed the Site on the NPL.

Given the dual-agency oversight of the Site, Homestake Mining Company (HMC), NRC, and EPA have agreed to streamline the two regulatory processes by satisfying EPA's requirements under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), and its implementing regulations set forth in the National Contingency Plan (NCP), through an equivalency process. The purpose of this document, along with its attached flow chart and proposed schedule, is to present the steps HMC intends to take to achieve CERCLA equivalency and explain HMC's view of the relationship between the EPA and NRC processes.

II. Overview of Equivalency Process[3]

HMC's path forward to closure under NRC orders and regulatory requirements provides that HMC prepare and submit by the end of 2019, an updated Corrective Action Plan (CAP) to

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[1] 48 Fed. Reg. 40,658; *see also U.S. v. United Nuclear*, 814 F. Supp. 1552, 1558 (D.N.M. 1992) ("EPA generally follows a hands-off policy with regard to facilities directly regulated by the NRC. In contrast, however, EPA policy dictates the monitoring of facilities which are regulated by states pursuant to NRC authority."); 48 Fed. Reg. at 40,661.

[2] *Id.*

[3] HMC refers EPA to HMC's CERCLA Equivalency of Investigation and Remediation Efforts at the Homestake Mining Company of California Uranium Milling Facility—Grants, New Mexico (Nov. 11, 2013). This

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address groundwater restoration. After submittal of the CAP, HMC plans to also submit an updated Decommissioning and Reclamation Plan (DRP) to address surface reclamation. The CAP deadline is incorporated in a Confirmatory Order with NRC; there is no deadline for the DRP, but HMC anticipates that the DRP will be revised and submitted to NRC shortly after its CAP submittal. Upon NRC approval of the CAP and DRP, HMC intends to implement both plans to remediate the Site.

HMC understands that to reach closure for EPA, HMC will enter into an Administrative Order on Consent (AOC) for Remedial Investigation (RI) and Feasibility Study (FS). EPA will then prepare a Proposed Plan explaining the selected remedy. After an opportunity for public comment, EPA will approve and formally select the remedy in the Record of Decision (ROD). After the ROD is published, HMC and EPA will negotiate a Consent Decree (CD) for implementation of the remedy selected in the ROD and determine if, under the equivalency process, an equivalency Remedial Design and Remedial Action (RD/RA) plan should be developed based on the CAP, DRP, and related documents.

Both the NRC and EPA processes are designed to protect human health and the environment through Site remediation. The purpose and objective of undertaking a CERCLA equivalency process is to align the NRC and EPA cleanups such that they run congruently and achieve the substantive requirements of both regulatory processes.

As HMC has discussed with EPA before, under an equivalency process, a private party response action "will be considered consistent with the NCP if the action, when evaluated as a whole, is in substantial compliance with" NCP requirements, "and results in a CERCLA-quality cleanup."[4] Whether a private party cleanup action is consistent with the NCP is evaluated on a case-by-case basis, evaluating "the cleanup effort as a whole."[5]

Substantial compliance does not require adherence to all NCP's technical requirements, so long as any omission or inconsistency does not affect the quality of the cleanup.[6] Cleanup actions "reflecting in substance NCP procedures and criteria" qualify as consistent with the NCP."[7] "A 'CERCLA-quality cleanup' results if the response action protects human health and the environmental through the utilizations of permanent solutions and alternative treatment or resource recovery technologies to the maximum extent possible."[8]

HMC noted in material previously presented to EPA that courts generally have concluded a response action is NCP compliant where the party demonstrates its efforts included investigation, remedy selection, and other measures that meet the goals of each or most components of the NCP-outlined process. However, in some instances, the cleanup has still been

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memorandum is an abbreviated explanation of the more elaborate process described in HMC's 2013 submittal to EPA.

[4] 40 CFR § 300.700(c)(3)(i).

[5] *See* Bedford Affiliates v. Sills, 156 F.3d 416, 428 (2d Cir. 1998) (abrogated on other grounds).

[6] *See* Franklin Cty. Convention Facilities Authority v. Am. Premier Underwriters, Inc., 240 F.3d 534, 546 (6th Cir. 2001) (holding that a cleanup action was consistent with the NCP despite multiple "shortcomings [that] were immaterial and insubstantial deviations from the technical NCP requirements").

[7] *See* Public Serv. Co. v. Gates Rubber Co., 175 F.3d 117, 1182 (10th Cir. 1999).

[8] Young v. U.S., 394 F.3d 858, 864 (10th Cir. 2005) (citing Franklin Cty., 240 F.3d at 543); see also National Oil and Hazardous Substances Pollution Contingency Plan, 55 Fed. Reg. 8666-01, 8793 (March 9, 1990).

found to substantially comply with the NCP where a cleanup action has not included all (or even multiple) of the specific components listed. This appears to be particularly true where a governmental agency, such as NRC, has been actively involved in the cleanup.[9]

III. The Process for Grants Equivalency and Ultimate De-Listing

The following sections detail the status of each component of the CERCLA equivalency process, noting the necessary coordination with the NRC process where applicable.

A. Administrative Order on Consent (AOC)

HMC seeks to sign an Administrative Order on Consent (AOC) for its Equivalency Remedial Investigation (RI) and Feasibility Study (FS). In approximately November of 2015, EPA and HMC exchanged drafts and negotiated the terms of an AOC for an Equivalency RI and reached tentative agreement on many of the terms. The AOC would include the Equivalency RI as an exhibit to the AOC. The Equivalency RI is largely drafted, and EPA has provided some comments. HMC is currently addressing EPA's comments, as well as updating the Equivalency RI with data collected since the last draft was prepared in 2016. HMC anticipates additional comments from EPA and intends to address those comments as necessary.

As previously discussed with EPA at the May 1, 2019 meeting in Dallas, to better align the NRC process with the EPA process, HMC now proposes to prepare the Equivalency FS concurrently with the Equivalency RI and AOC and also attach that Equivalency FS as an exhibit to the AOC. HMC's target date for execution of the AOC, including the exhibits, is February 15, 2020.

The following tasks have been identified as necessary to complete AOC:

1. Revise Equivalency RI to address EPA comments and include new data;
2. Update Identification of Candidate Technologies Memorandum for Treatability Studies;
3. Create Alternative Development and Screening Memorandum;
4. Draft FS.

B. Remedial Investigation (RI)

As EPA is aware, the RI is designed to "collect data necessary to adequately characterize the site for the purpose of developing and evaluating effective remedial alternatives."[10] As stated in the NCP, an RI should provide "information to assess the risks to human health and the environment and to support the development, evaluation and selection of appropriate response alternatives."[11] Specifically, an RI includes information regarding physical site characteristics, contaminant characteristics and sources (also referred to in EPA guidance as "source characteristics" and "the nature and extent of contamination"), exposure pathways and routes

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[9] *See, e.g.*, Bedford Affiliates, 156 F.3d at 428 (holding that a cleanup conducted pursuant to a consent order with a state agency met public participation requirements where the agency periodically observed implementation of the preliminary site assessment and interim remedial measure and oversaw the progress of the cleanup and soil vapor evacuation system).

[10] 40 CFR § 300.430(d)(1).

[11] *Id.*

(commonly referred to as contaminant fate and transport), identification of ARARs, and a baseline risk assessment.[12]

To demonstrate equivalency for the ground water at the Site (OU1), HMC intends to rely primarily on the CAP, an analogous RI document for the NRC process for ground water remediation. HMC may identify and cite to other related documents. Consistent with NCP requirements for an RI, HMC anticipates that the CAP will describe site characteristics, extent of groundwater contamination and include a Site Hydrogeologic Conceptual Model and Groundwater Flow and Contaminant Transport Model. HMC is in the process of updating the CAP and will seek NRC's feedback on the developing CAP on or about September 16, 2019. On November 18, 2019, HMC will submit the final CAP to NRC. NRC has agreed to set a goal date for official approval of the CAP of October 21, 2020. To ensure EPA agrees with the provisions of the CAP that are essential to the equivalency process, HMC proposes to engage in ongoing discussions with EPA and address EPA concerns throughout the development of the CAP and prior to its submittal to NRC.

To demonstrate equivalency for the surface reclamation at the Site (OU2), HMC will rely primarily on the DRP, the analogous RI document for the NRC process relating to surface reclamation. HMC may identify and cite to other related documents.[13] Consistent with the NCP requirements for an RI, the DRP and related documents will describe the site characteristics, nature and extent of contamination, and exposure pathways. HMC currently has a 2013 DRP submitted to NRC that is awaiting approval. HMC intends to present an updated DRP incorporating data gathered since 2013 to NRC shortly after submitting the CAP. HMC's proposed revisions to the 2013 DRP are minor, and HMC anticipates that the information contained in the 2013 DRP will continue to serve as the basis for demonstrating equivalency for OU2. As with the CAP, HMC proposes engaging in discussion with EPA prior to the updated DRP's submittal to NRC to address any concerns.

1. Risk Assessment

The NCP requires a site-specific baseline risk assessment to be conducted as part of the remedial investigation.[14] Specifically, the NCP states that the baseline risk assessment should "characterize the current and potential threats to human health and the environment that may be posed by contaminants migrating to ground water or surface water, releasing to air, leaching through soil, remaining in the soil, and bioaccumulating in the food chain."[15]

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[12] *Id.* § 300.430(d)(2)–(4); EPA RI/FS Guidance, § 3.4.1.2–4.

[13] These documents may include, among others, Five-Year Reviews; Annual Reports; Tailings Stabilization and Site Reclamation Plan (1986); Groundwater Contamination Study: Monitoring and Analytical Testing (1976); Completion Report for Reclamation of Off-Pile Areas at the Homestake Mining Company of California Uranium Mill – Grants Operation (1995); State of New Mexico Environmental Improvement Division Uranium Mill License Renewal Application Environmental Report (1982); Environmental Report for the Construction of Evaporation Pond #3 (EP3) and Associated Operations Boundary Expansion (2007). *See* HMC's CERCLA Equivalency of Investigation and Remediation Efforts at the Homestake Mining Company of California Uranium Milling Facility—Grants, New Mexico (Nov. 11, 2013) for other documents supporting an Equivalency RI for surface reclamation.

[14] 40 CFR § 300.430(d)(1).

[15] *Id.* § 300.430(d)(4).

The NRC process does not have a specific counterpart to the CERCLA risk assessment process upon which to rely for demonstrating CERCLA equivalency. To satisfy this requirement, EPA performed a Human Health Risk Assessment for offsite exposure (Off-Site HHRA), which has been included as part of the RI. To address a potential gap in the RI risk analysis, HMC conducted an HHRA for onsite-worker exposure (On-Site HHRA) that, combined with EPA's Off-Site HHRA, addressed the requirement for a human health risk assessment. To address ecological risk, HMC completed a Screening Level Ecological Risk Assessment (SLERA). While HMC believes it addressed EPA's last comments and had reached agreement with EPA on the On-Site HHRA and SLERA, it will need to incorporate new data into the On-Site HHRA and SLERA. Upon completion, the risk assessments will be incorporated in the Equivalency RI.

2. Applicable or Relevant and Appropriate Requirements (ARARs)

Pursuant to CERCLA § 121, the remedial action selected "shall require, at the completion of the remedial action, a level or standard of control . . . which at least attains such legally applicable or relevant and appropriate standard requirement, criteria or limitation" (ARARs).[16] Pursuant to the 1993 Memorandum of Understanding between NRC and EPA, EPA is the agency responsible for "ensur[ing] cleanup conditions . . . meet [ARARs]." The setting of ARARs is one of the points where the NRC and EPA processes are somewhat incongruent.

HMC prepared and submitted for EPA's consideration a draft ARARs table to EPA in November of 2013. In preliminary discussions, EPA indicated that the draft ARARs table was generally acceptable but that it may have some comments. EPA has not provided any comments on the ARAR table to date. EPA has indicated that ARARs will not be finalized until issuance of the ROD; however, NRC has suggested it will not approve the CAP until final ARARs are established. As discussed at the recent meeting on May 1, 2019, one option may be to develop a draft ARARs table and present it to NRC. If the ARARS are subsequently modified during ROD publication, the parties could address the change with NRC at that time.

C. Feasibility Study (FS)

According to the NCP, the primary objective of an FS is to ensure that appropriate remedial alternatives are developed and evaluated so the information can be presented to a decisionmaker for the selection of a remedy.[17] An NCP-compliant FS addresses the development and evaluation of remedial alternatives as well as the preparation of treatability studies, as appropriate, and performs an analysis of those alternatives.[18]

The revised CAP, DRP, and their related documents[19] include an alternatives analysis. Additionally, in response to an EPA request, HMC will draft an Identification of Candidate

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[16] 42 U.S.C. § 9621(2)(A)(ii).
[17] 40 CFR § 300.430(e).
[18] 40 CFR § 300.430(e).
[19] *See* HMC's CERCLA Equivalency of Investigation and Remediation Efforts at the Homestake Mining Company of California Uranium Milling Facility—Grants, New Mexico (Nov. 11, 2013) for other documents supporting an Equivalency FS.

Technologies Memorandum for Treatability Studies and an Alternatives Development and Screening Memorandum for review and comment by EPA.

D. Proposed Plan

To select a remedial action, EPA "identifies a preferred alternative and presents it to the public in a proposed plan, for review and comment."[20] The NCP requires EPA to "review the public comments and consult with the state (or support agency) in order to determine if the alternative remains the most appropriate remedial action for the site or site problem."[21]

There is no equivalent to the Proposed Plan and comment procedure in the NRC process. CERCLA requires EPA to draft the Proposed Plan. To ensure equivalency, HMC anticipates that the Proposed Plan be drafted to incorporate the critical elements of the CAP and DRP. At EPA's option, HMC is willing to assist with the development of the Proposed Plan to the extent appropriate.

E. Record of Decision (ROD) and Consent Decree (CD)

After receiving comments on the Proposed Plan, EPA makes the final remedy selection and documents its selection in the Record of Decision (ROD).[22] The NRC-equivalent process for the ROD is NRC's approval of the CAP and DRP, which collectively select and approve the remedy. If equivalency between the NRC and EPA processes is successfully achieved, the ROD should select the remedy set forth in the CAP and DRP. HMC seeks to have the ROD issued concurrently, or shortly after, NRC's approval of the CAP and DRP. Approval is anticipated for the DRP and CAP during the Fourth Quarter of 2020.

After issuance of the ROD, HMC would like to negotiate a Consent Decree with EPA for the remedy selected in the ROD. At this time, under the traditional CERCLA process, HMC and EPA would develop a Remedial Design/Remedial Action (RD/RA). An RD/RA, however, may not be required in the equivalency process given that the remedy is already designed and implemented through the NRC CAP and DRP. HMC welcomes discussion with EPA on this element to arrive at an acceptable equivalent option.

IV. Conclusion

This summary is intended to supplement the comprehensive report submitted to EPA regarding the equivalency process in November 2013.[23] As has become evident, CERCLA equivalency is an iterative process. HMC will continue to work with EPA to identify the appropriate equivalent elements, as well as to identify and address data gaps as necessary to successfully demonstrate CERCLA equivalency.

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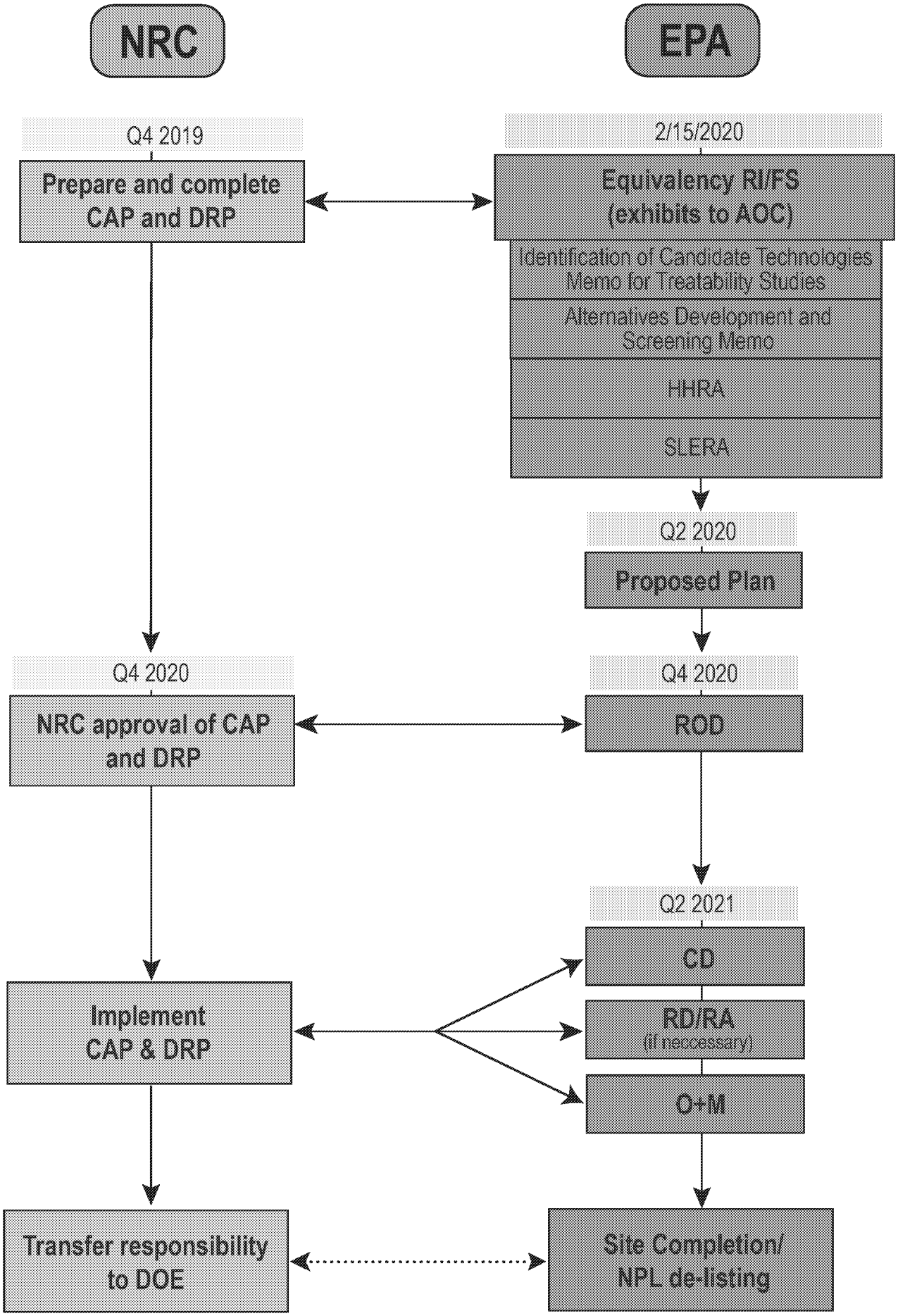
[20] 40 CFR § 300.430(f)(ii).
[21] *Id.*
[22] 40 CFR § 300.430(f)(ii).
[23] *See* HMC's CERCLA Equivalency of Investigation and Remediation Efforts at the Homestake Mining Company of California Uranium Milling Facility—Grants, New Mexico (Nov. 11, 2013).

NRC/EPA CLOSURE PROCESS



Grants Reclamation Project
Agency Schedule (NRC and EPA)

EPA Deliverables	Date	NRC/NMED Deliverables
	05/20/2019	Renewal Application for DP-200 (NMED)
	06/01/2019	Receive results of Root Cause Analysis and Self-Assessment reviews; prepare responses as required and submit to NRC (Confirmatory Order)
	06/03/2019	Complete new groundwater model (CAP)
	07/31/2019	Receive results of re-injection impacts and RO plant exceedances; prepare responses as required and submit to NRC (Confirmatory Order)
	11/18/2019	Submit final CAP to NRC; prepare responses and revise as required
	Similar timeframe as CAP	Complete DRP update
RI Report	02/15/2020	
Conceptual Site Model	02/15/2020	
List of Preliminary Remedial Action Objectives	02/15/2020	
List of Preliminary Remedial Action Alternatives	02/15/2020	
Refined List of Preliminary ARARs and TBCs	02/15/2020	
Identification of Candidate Technologies for Treatability Studies Memorandum	02/15/2020	
SLERA	02/15/2020	
Draft Human Health Risk Assessment	02/15/2020	
Treatability Study Evaluation	02/15/2020	
Memorandum on Alternatives Development and Screening	02/15/2020	
Draft FS report	02/15/2020	
Execute AOC	02/15/2020	
Proposed Plan	05/21/2020	
RD/RA, if required	--	
	10/21/2020 (goal date)	NRC approval of CAP
ROD	10/21/2020	
CD, if required	+3-6 months from ROD	
Five-Year Reviews	TBD	Transfer to DOE (negotiation of monitoring plan and trust fund)
	TBD	Cancel DP-200 (NMED)

Message

From: Purcell, Mark [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=FE198E260B024EB4BD9D30DC11F900B1-PURCELL, MARK]
Sent: 1/20/2021 10:23:02 PM
To: Law, Preston [law.preston@epa.gov]; Mahmud, Shahid [Mahmud.Shahid@epa.gov]; Wright, Felicia [Wright.Felicia@epa.gov]; Powell, Dan [Powell.Dan@epa.gov]
CC: Atkins, Blake [atkins.blake@epa.gov]
Subject: Slide Presentation for OMDP Discussion on Homestake NPL Site
Attachments: January 21 2021 Briefing for OMDP.pptx

All,

Please see attached slides.

Mark

Mark D. Purcell
Superfund and Emergency Management Division (6SF)
U.S. Environmental Protection Agency - Region 6
1201 Elm Street, Suite 500
Dallas, TX 75270
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HOMESTAKE MINING CO. SUPERFUND SITE

EPA REGION 6 BRIEFING TO OFFICE OF MOUNTAINS, DESSERTS AND PLAINS

Mark Purcell, RPM Region 6
January 21, 2021

REGULATORY STAKEHOLDERS

U.S. EPA
- Superfund law and regulations (National Contingency Plan)

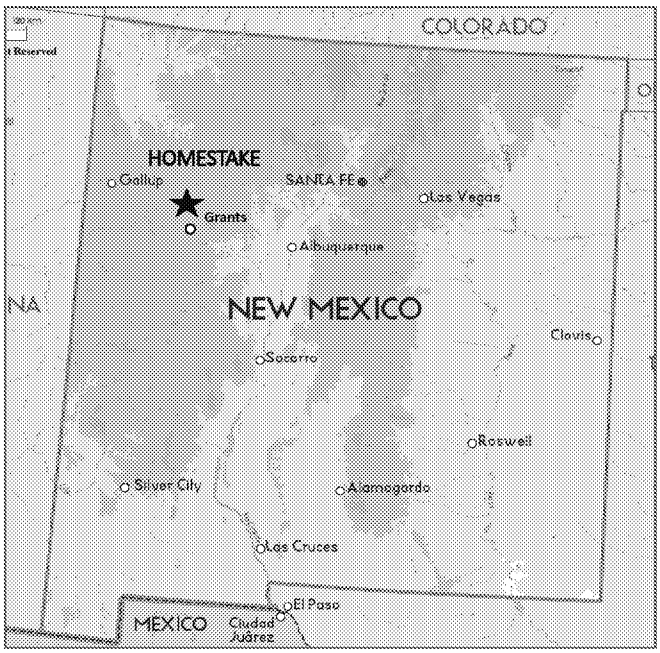
New Mexico Environment Department (NMED)
- NM Water Quality Act and permitting regulations
- Groundwater Discharge Permit

U.S. Nuclear Regulatory Commission (NRC)
- Uranium Mill Tailings Radiation and Control Act (UMTRCA)
- Source Materials Licensing Program

U.S. Department of Energy (DOE)
- Legacy Management Program – long-term surveillance and maintenance

OTHER KEY STAKEHOLDERS

- LAGUNA PUEBLO
- ACOMA PUEBLO
- COMMUNITY
  - BLUEWATER VALLEY DOWNSTREAM ALLIANCE (BVDA)
  - MULTI-CULTURAL ALLIANCE FOR A SAFE ENVIRONMENT (MASE)
    - NEW MEXICO ENVIRONMENTAL LAW CENTER

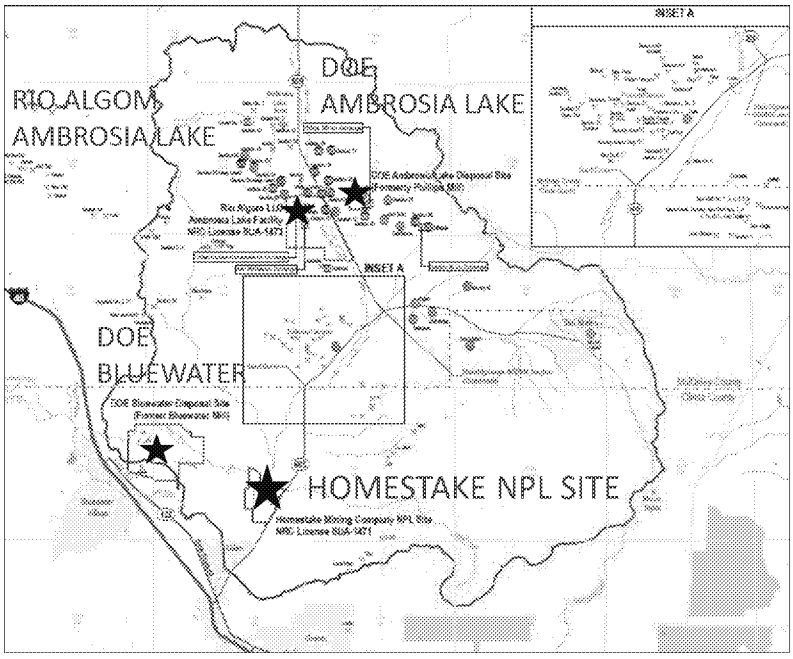


LOCATION MAP

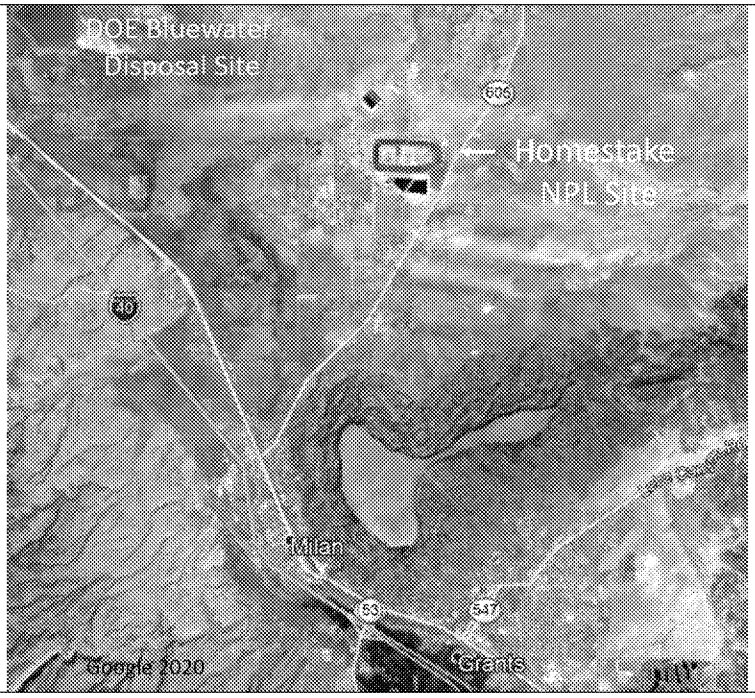
SAN MATEO CREEK BASIN MAP

OVER 80 LEGACY URANIUM MINES

FOUR FORMER URANIUM MILL SITES



SITE
LOCATION
MAP



OPERABLE UNITS

- OFF-SITE RADON
- TAILING IMPOUNDMENTS AND SOIL
- GROUNDWATER

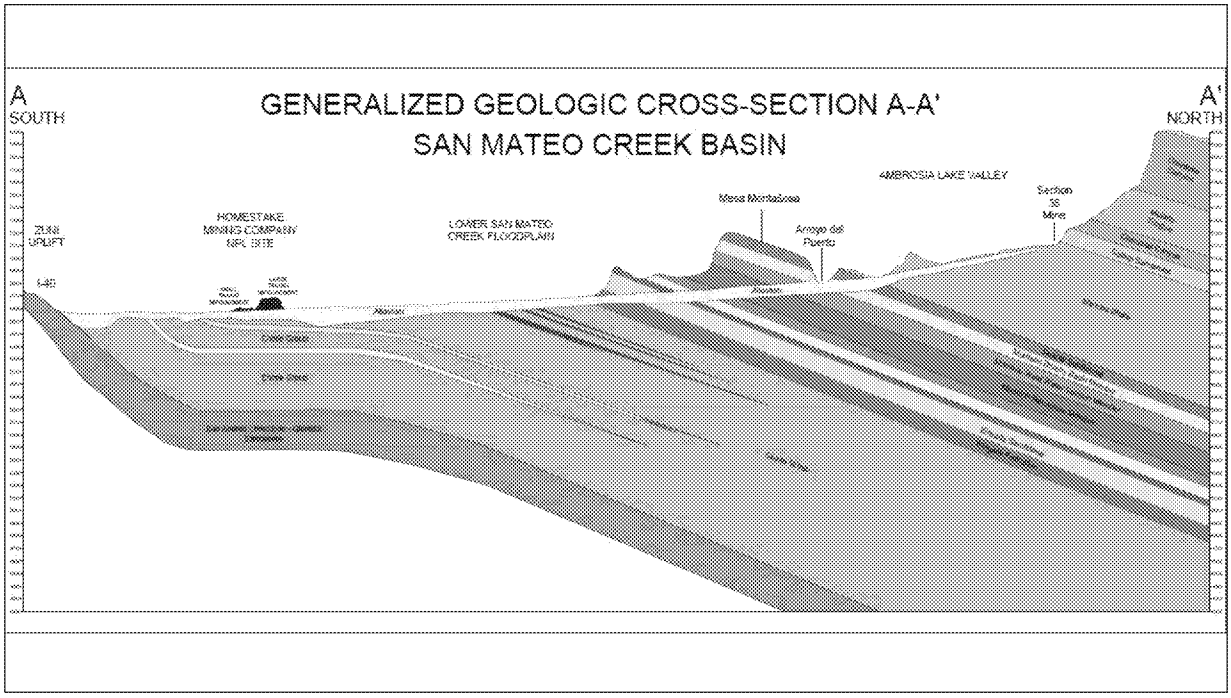
EARLY REGULATORY HISTORY

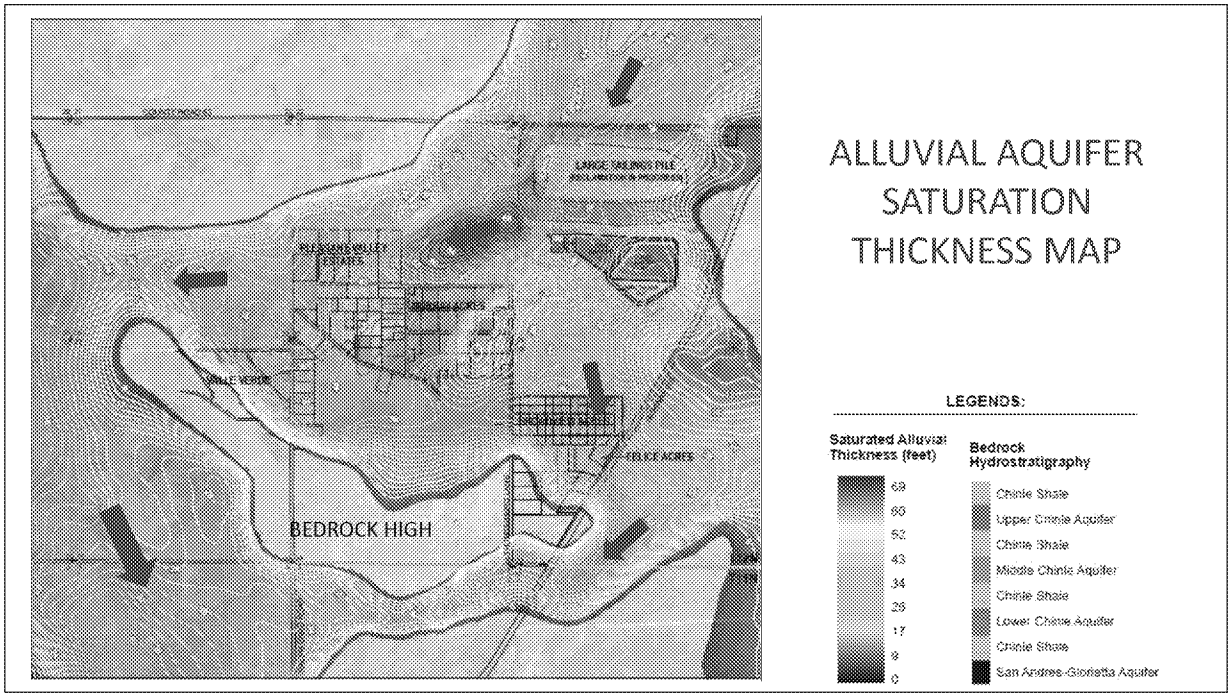
ACTIVITY	DATE
Facility operation	1958-1990
Regulated by Atomic Energy Commission	1958 - 1974
Groundwater contamination first discovered	1960
NM became an "Agreement State"	1974
★ **Groundwater cleanup initiated**	**1977**
Placed on EPA's National Priorities List (NPL) of Superfund sites	1983
Homes connected to municipal water supply	1985
NM gave up Agreement State status – NRC resumed jurisdiction over uranium milling and issued license to Homestake	1986
EPA issues "No Action" Record of Decision for off-site radon	1989
EPA and NRC sign Memorandum of Understanding	1993

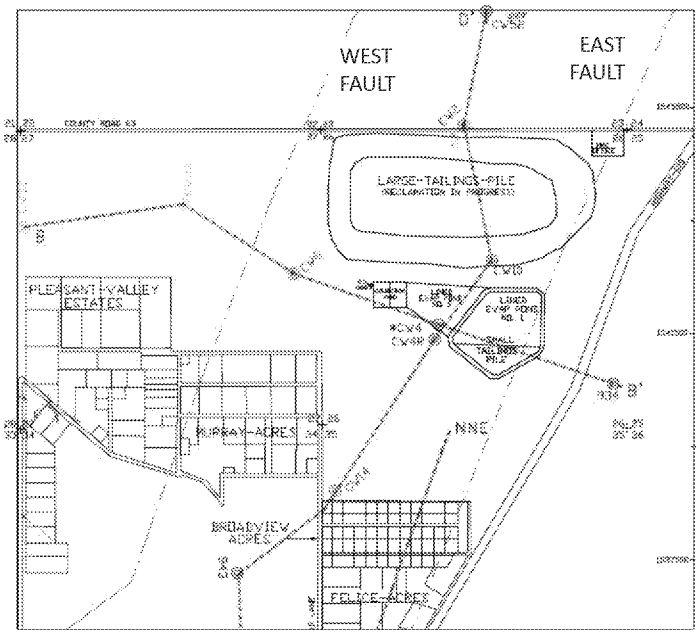
Agreement State – NM given jurisdiction for licensing and regulating uranium milling.

Listed to NPL after selenium contamination discovered in private water wells in subdivisions near site. At this time, EPA did not investigate or select a groundwater remedy at the site under Superfund. Groundwater corrective action was already being performed by Homestake to comply with regulations and standards under the NM Water Quality Act. EPA has never selected a Superfund groundwater remedy at this site.

NM relinquished its Agreement State status at request of the Governor.

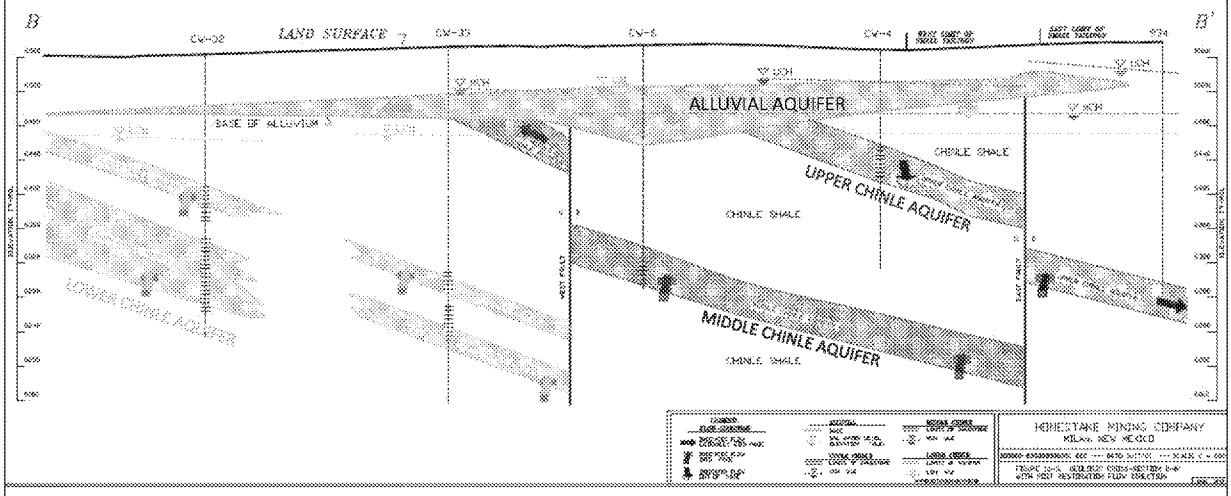

A
SOUTH
GENERALIZED GEOLOGIC CROSS-SECTION A-A'
SAN MATEO CREEK BASIN
A'
NORTH
AMBROSIA LAKE VALLEY
Mesa Montadosa
Arroyo del Puerto
Section 35 Mine
ZUNI UPLIFT
HOMESTAKE MINING COMPANY NPL SITE
LOWER SAN MATEO CREEK FLOODPLAIN
I-40


ALLUVIAL AQUIFER
SATURATION
THICKNESS MAP
BEDROCK HIGH
LEGENDS:
Saturated Alluvial
Thickness (feet)
69
60
52
43
34
26
17
9
0
Bedrock
Hydrostratigraphy
Chinle Shale
Upper Chinle Aquifer
Chinle Shale
Middle Chinle Aquifer
Chinle Shale
Lower Chinle Aquifer
Chinle Shale
San Andres-Glorietta Aquifer

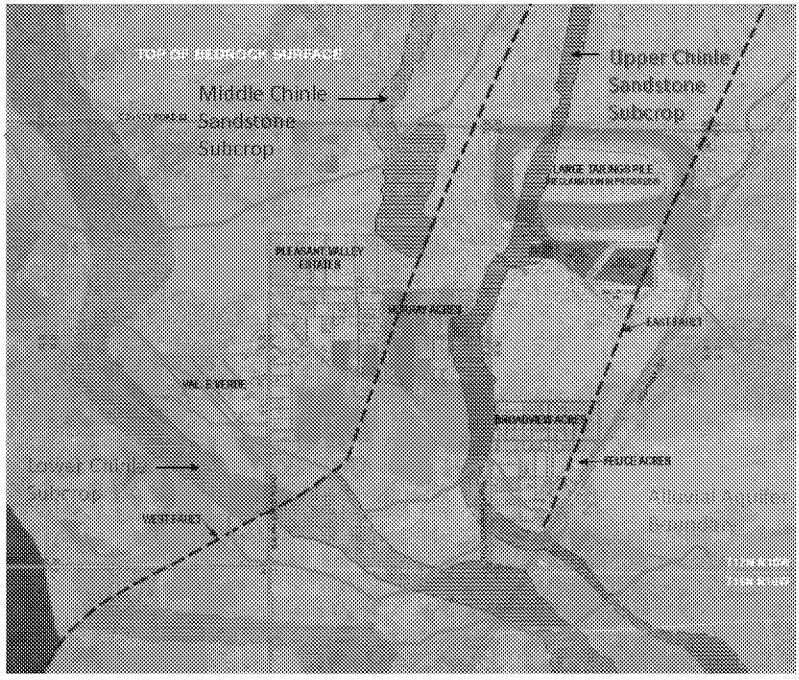


HOMESTAKE HYDROGEOLOGIC CROSS SECTIONS

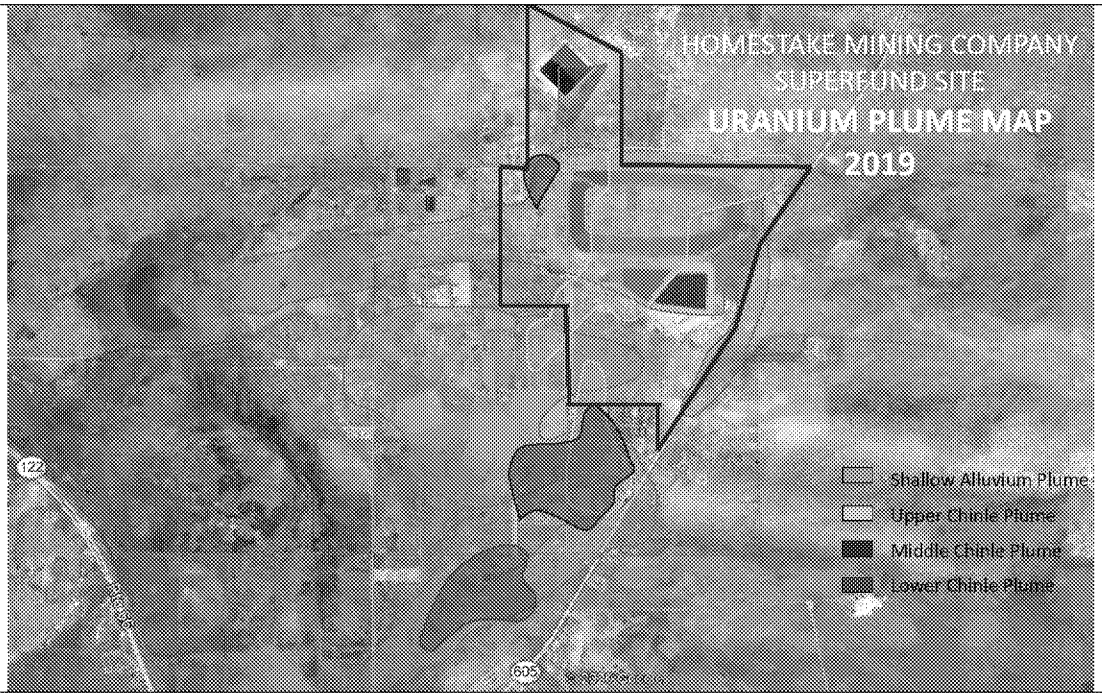
HYDROGEOLOGIC CROSS SECTION B-B'



From 2017 Homestake Annual Report



TOP OF BEDROCK SURFACE MAP

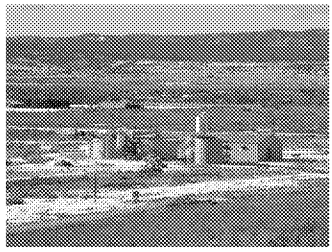

HOMESTAKE MINING COMPANY
SUPERFUND SITE
URANIUM PLUME MAP
2019
12
605
Shallow Alluvium Plume
Upper Chinle Plume
Middle Chinle Plume
Lower Chinle Plume

GROUNDWATER REMEDY

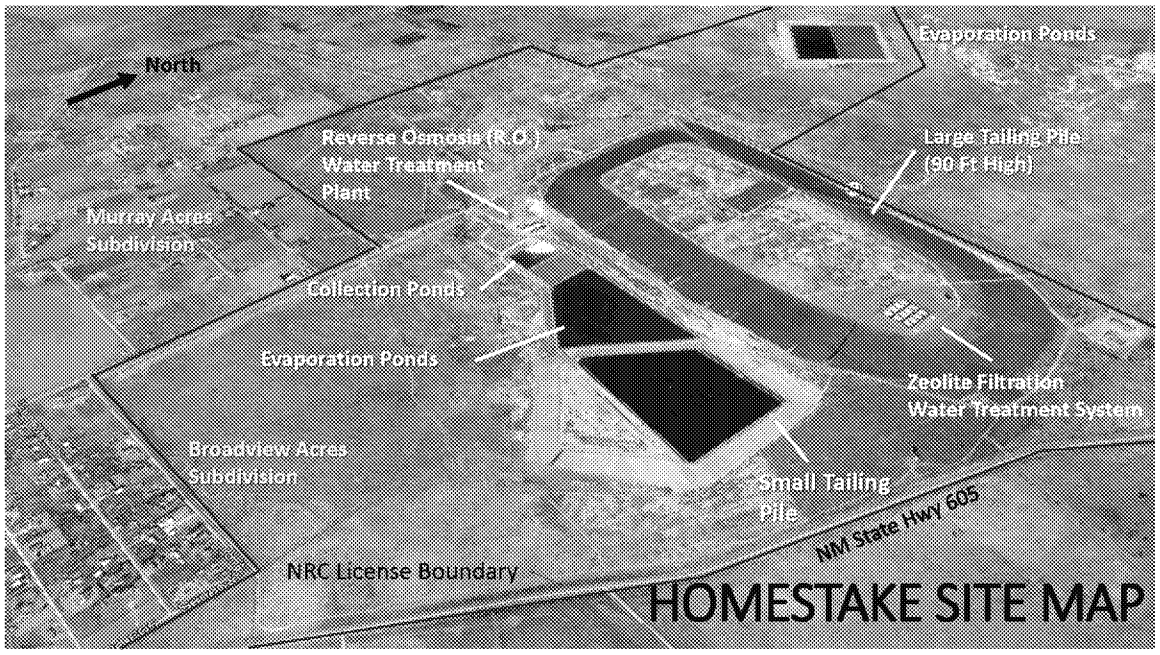
- TAILING FLUSHING
- EXTRACTION AND INJECTION OF WATER
  - Hydraulic Containment
  - Restore aquifers to cleanup levels
- WATER TREATMENT
  - Reverse Osmosis (RO) Plant (1999)
  - Zeolite Filtration System (2012)
- Collection and Evaporation of of Contaminated Water

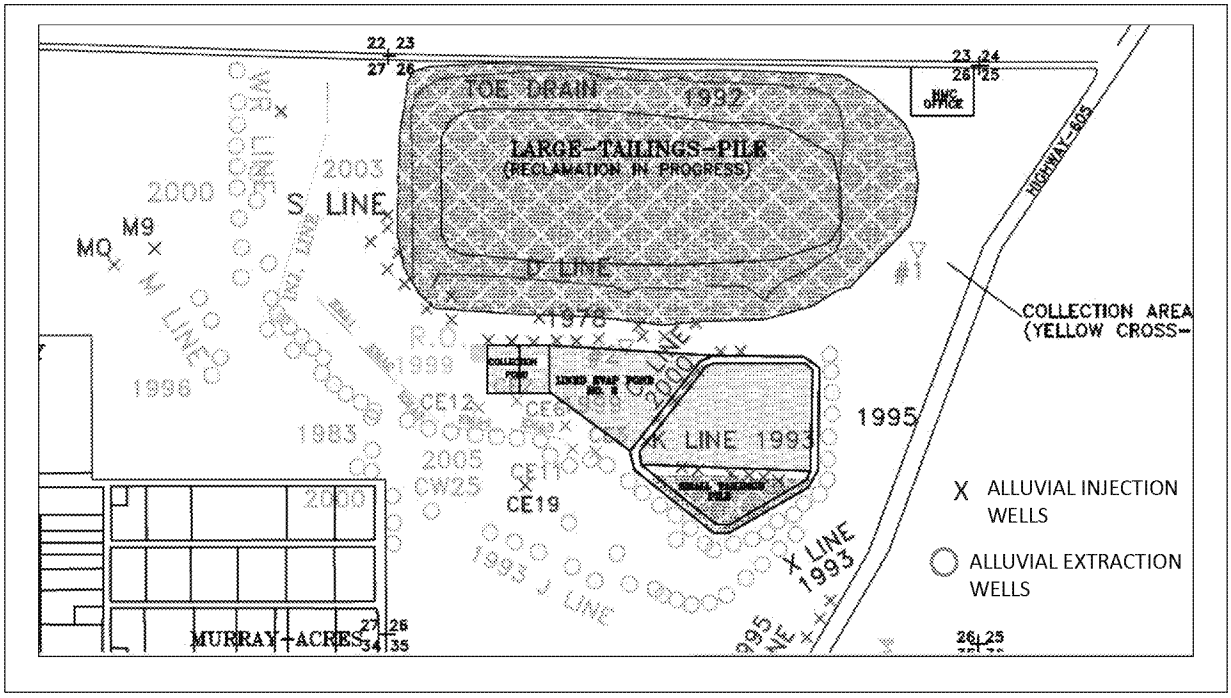
Zeolite Filtration System

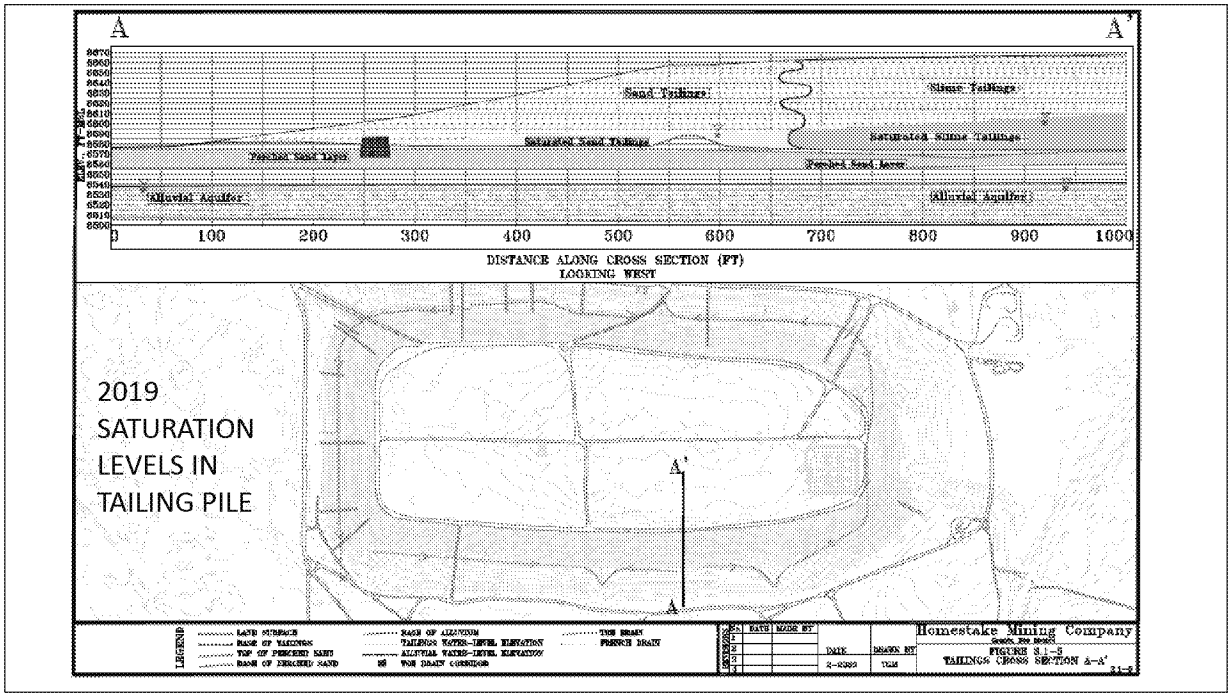
Evaporation Pond



RO Water Treatment Plant


North
Evaporation Ponds
Reverse Osmosis (R.O.)
Water Treatment
Plant
Large Tailing Pile
(90 Ft High)
Murray Acres
Subdivision
Collection Ponds
Evaporation Ponds
Zeolite Filtration
Water Treatment System
Broadview Acres
Subdivision
Small Tailing
Pile
NM State Hwy 605
NRC License Boundary
HOMESTAKE SITE MAP


TOE DRAIN
1992
LARGE-TAILINGS-PILE
(RECLAMATION IN PROGRESS)
D LINE
S LINE
2000
2003
M9
MQ
M LINE
1996
1999
CE12
1983
2005
CW25
CE19
2030
MURRAY+ACRES
K LINE 1993
1995
X LINE
1993
J LINE
1993
HIGHWAY-395
COLLECTION AREA
(YELLOW CROSS-
X ALLUVIAL INJECTION WELLS
ALLUVIAL EXTRACTION WELLS


A
A'
Sand Tailings
Slimes Tailings
Saturated Sand Tailings
Saturated Slimes Tailings
Fractured Sand Layer
Fractured Sand Layer
Alluvial Aquifer
Alluvial Aquifer
0
100
200
300
400
500
600
700
800
900
1000
DISTANCE ALONG CROSS SECTION (FT)
LOOKING WEST
2019
SATURATION
LEVELS IN
TAILING PILE
A'
A
LEGEND
LAND SURFACE
BASE OF TAILINGS
TOP OF FRACTURED SAND
BASE OF FRACTURED SAND
BASE OF ALLUVIUM
TAILINGS WATER-LEVEL ELEVATION
ALLUVIAL WATER-LEVEL ELEVATION
WS WOR DRAIN CONNECTION
TOE DRAIN
FRENCH DRAIN
NO. DATE MODE BY
DATE
DRAWN BY
2-2999
TLM
Homestake Mining Company
Grants, New Mexico
FIGURE S.1-5
TAILINGS CROSS SECTION A-A'
S1-5

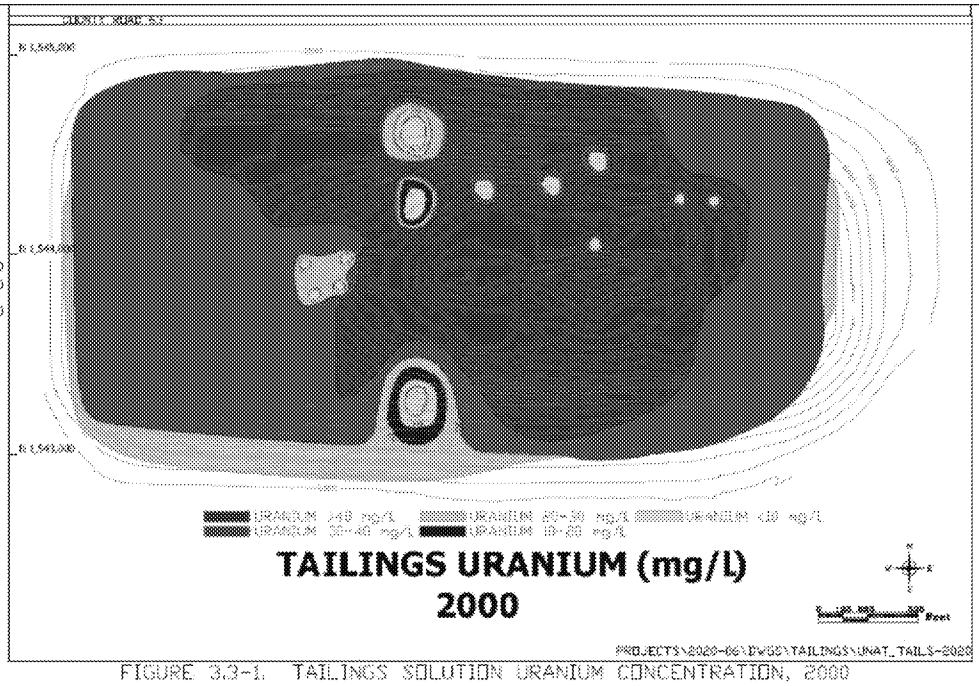


FIGURE 3.3-1. TAILINGS SOLUTION URANIUM CONCENTRATION, 2000

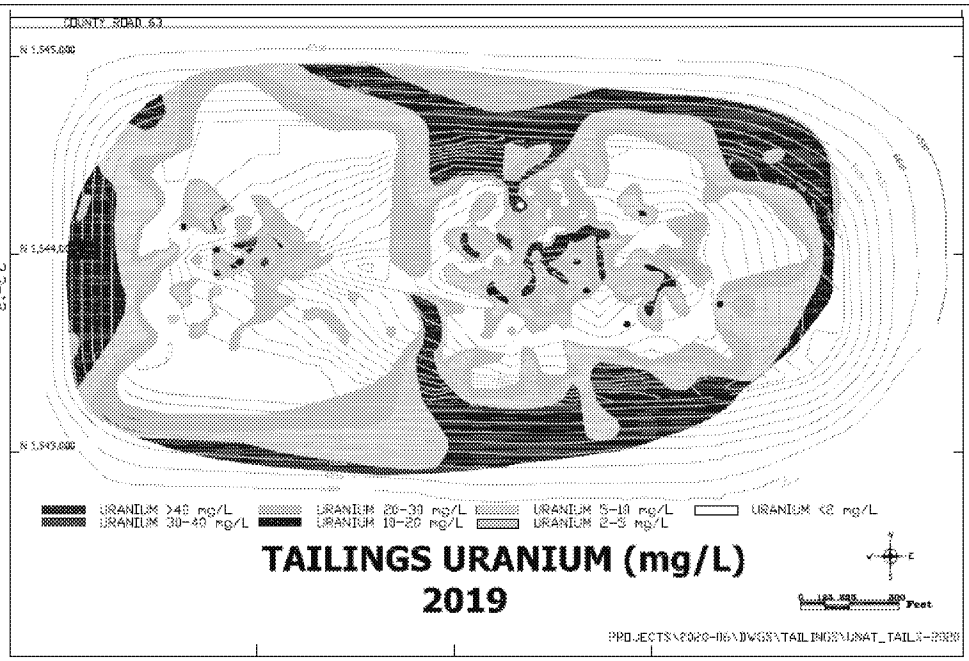


FIGURE 3.3-5. TAILINGS SOLUTION URANIUM CONCENTRATION, 2019

URANIUM AND SELENIUM BACKGROUND LEVELS ESTABLISHED IN 2004

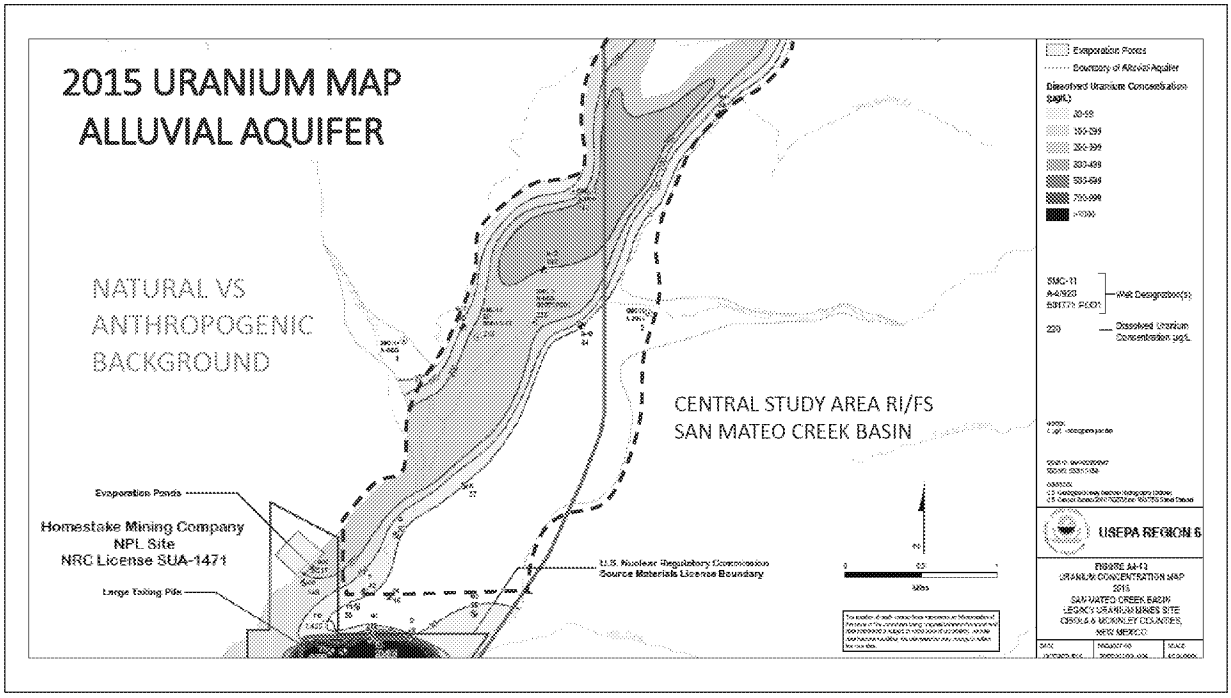
Selected as Groundwater Cleanup Levels by NRC

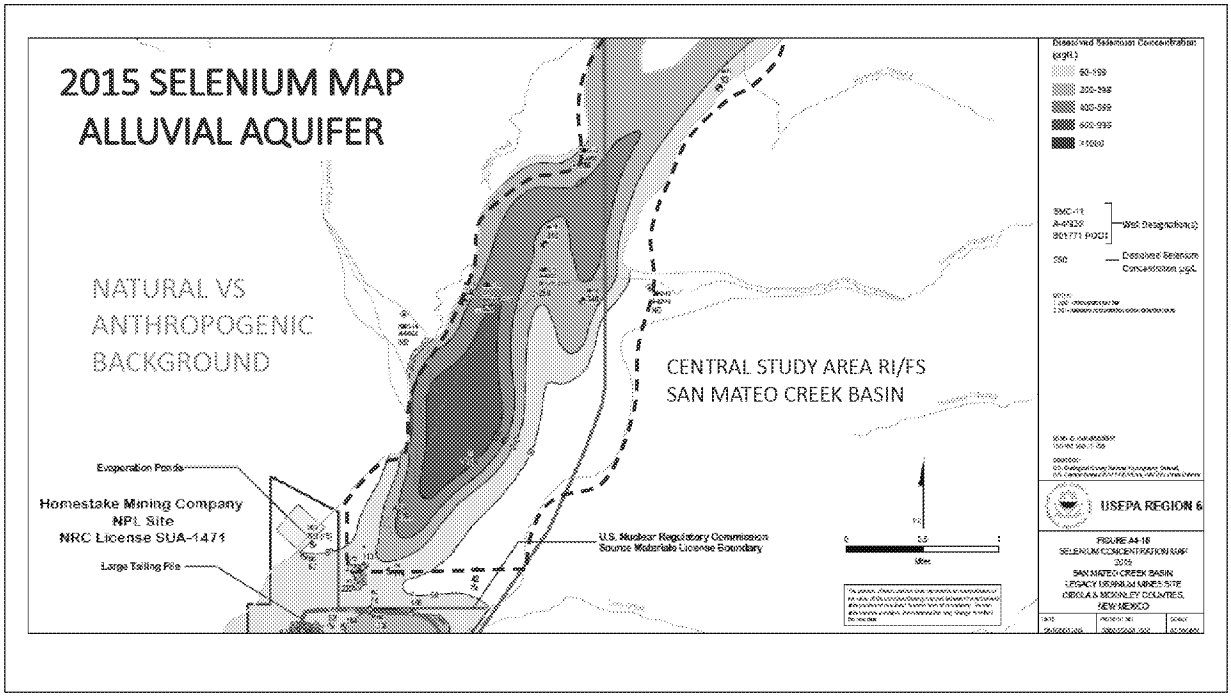
Constituent	Federal MCL	Alluvium	Chinle Mixing Zone	Upper Chinle Non-mixing Zone	Middle Chinle Non-Mixing Zone	Lower Chinle Non-mixing Zone
Uranium (µg/L)	30	160	180	90	70	30
Selenium (µg/L)	50	320	140	60	70	320

EPA BACKGROUND REASSESSMENT ONGOING

- REQUESTED BY COMMUNITY GROUPS (BVDA/MASE)
- INITIATED BY EPA AND USGS – 2012
- HOMESTAKE SUPPLEMENTAL BACKGROUND STUDY – 2018
- NMED INITIATED GEOCHEMICAL MODELING STUDY – 2020

★ *EPA/NMED Reassessing* ***Natural Background*** *Water Quality*


2015 URANIUM MAP
ALLUVIAL AQUIFER
NATURAL VS
ANTHROPOGENIC
BACKGROUND
CENTRAL STUDY AREA RI/FS
SAN MATEO CREEK BASIN
Evaporation Ponds
Homestake Mining Company
NPL Site
NRC License SUA-1471
Large Tailing Pile
U.S. Nuclear Regulatory Commission
Source Materials License Boundary
Evaporation Ponds
Boundary of Alluvial Aquifer
Dissolved Uranium Concentration (ug/L)
20-99
100-199
200-299
300-499
500-699
700-999
>1000
SMC-11
A-4/1923
Well Designation(s)
220
Dissolved Uranium Concentration (ug/L)
USEPA REGION 6
FIGURE A4-13
URANIUM CONCENTRATION MAP
2015
SAN MATEO CREEK BASIN
LEGACY URANIUM MINES SITE
CIBOLA & MCKINLEY COUNTIES,
NEW MEXICO


2015 SELENIUM MAP
ALLUVIAL AQUIFER
NATURAL VS
ANTHROPOGENIC
BACKGROUND
CENTRAL STUDY AREA RI/FS
SAN MATEO CREEK BASIN
Evaporation Ponds
Homestake Mining Company
NPL Site
NRC License SUA-1471
Large Tailing Pile
U.S. Nuclear Regulatory Commission
Source Materials License Boundary
Dissolved Selenium Concentration (µg/L)
50-199
200-399
400-599
600-999
>1000
Well Designation(s)
Dissolved Selenium Concentration µg/L
USEPA REGION 6
FIGURE A4-18
SELENIUM CONCENTRATION MAP
2015
SAN MATEO CREEK BASIN
LEGACY URANIUM MINES SITE
CIBOLA & MCKINLEY COUNTIES,
NEW MEXICO

REMEDIAL INVESTIGATION/FEASIBILITY STUDY EQUIVALENCY PROCESS

- HOMESTAKE CONDUCTING RI/FS
  - Determine If Response Actions Substantially Achieve Requirements For CERCLA Remedy
- FINAL RI REPORT – JUNE 2020
- EPA AND HOMESTAKE NEGOTIATE FS ORDER – JULY 2020
- DRAFT FS REPORT – SUBMITTED DECEMBER 2020

*EPA HQ Selected Site For **National Remedy Review Board** Process In October 2020*

CURRENT ONGOING SITE ACTIVITIES

- UMTRCA GROUNDWATER CORRECTIVE ACTION
- CERCLA FS EQUIVALENCY
- NRRB PROCESS FOR FS
- EPA/STATE GROUNDWATER BACKGROUND REASSESSMENT
- HOMESTAKE EVALUATING TECHNICAL IMPRACTICABILITY FOR GW
- CERCLA FIVE-YEAR REVIEW FOR 2021

NEXT STEPS

- NRRB MEETING – MARCH 2021
- COMPLETE BACKGROUND STUDY – MARCH 2021
- COMPLETE FIVE-YEAR REVIEW – SEPTEMBER 2021
- COMPLETE FS – 2021/22
- ISSUE RECORD OF DECISION ON SELECTED REMEDY – 2022
  - SELECT CERCLA CLEANUP LEVELS
  - EVALUATE MERITS OF INVOKING TI WAIVER

POSSIBLE OMDP ASSISTANCE

- BACKGROUND ISSUE
  - EPA DECISION-MAKING ON CLEANUP LEVELS - ROD
  - NATURAL BACKGROUND VS ANTHROPOGENIC BACKGROUND

Message

From: Purcell, Mark [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=FE198E260B024EB4BD9D30DC11F900B1-PURCELL, MARK]
Sent: 3/24/2021 8:53:07 PM
To: Kurt Vollbrecht (kurt.vollbrecht@state.nm.us) [kurt.vollbrecht@state.nm.us]; Longmire, Patrick, NMENV [patrick.longmire@state.nm.us]; Winton, Ashlynne, NMENV [Ashlynne.Winton@state.nm.us]; Maurer, Anne, NMENV [Anne.Maurer@state.nm.us]
CC: Applegate, Nathaniel [Applegate.Nathaniel@epa.gov]; Travis, Pamela [Travis.Pamela@epa.gov]; Atkins, Blake [atkins.blake@epa.gov]; Villarreal, Chris [villarreal.chris@epa.gov]; Khoury, Ghassan [Khoury.Ghassan@epa.gov]; Turner, Philip [Turner.Philip@epa.gov]; Vaughn, Gloria [Vaughn.Gloria@epa.gov]; Tellez, Debra [Tellez.Debra@epa.gov]
Subject: Presentation slides from Homestake and BVDA/MASE - NRRB March 25 2021 Meeting - Homestake NPL Site
Attachments: Revised Presentation-21.03.25 MASE-BVDA Laura_NRRB FINAL.pdf; NRRB.Presentation.Maest_25Mar2021_Final.pdf; 20210311 Homestake Presentation Slides to NRRB.pdf

All,

See attached presentation slides.

Mark

Mark D. Purcell
Superfund and Emergency Management Division
U.S. Environmental Protection Agency – Region 6
1201 Elm Street, Suite 500
Dallas, TX 75270 - 2162
Tel: 214-665-6707
Fax: 214-665-6660
Purcell.mark@epa.gov

R6 Five-Year Review Checklist:

RPM: Mark Purcell

FYR Lead Agency/Entity: U.S. Environmental Protection Agency

FYR Start Date in SEMS: 07/15/2020

FYR public notice date: 09/30/2020

FYR inspection & community interviews: Site Inspection not performed due to Covid-19 Pandemic; Community Interviews performed from 04/01/2021 through 06/04/2021

Draft FYR received date: 02/19/2021

- Please review, ensure compliance to template and send to site team members for their review.
  - Draft FYR send date to site team members: 08/16/2021
- Send to the state environmental agency for its review (if it was not the lead agency):
  - Draft FYR send date to state environmental agency: 08/16/2021
  - Comments received date: _____
- Send to EPA HQ (Jennifer Edwards/OSRTI for private sites; Monica McEaddy/FFRRO for federal facilities) for HQ review.
  - Draft FYR send date to EPA HQ: 08/16/2021
  - Comments received date: _____
- Please allow for 30 days for all reviews and feedback.

After review and feedback, please consolidate comments and send to Lead Agency/Entity:
Draft FYR consolidated comments send date to Lead Agency/Entity: _____

Draft Final/Final FYR received date: _____

- Please review, ensure compliance to template, and ensure all comments have been resolved.

Begin R6 concurrence routing for final signature:

- R6 concurrence routing start date: _____
- Logged in date for legal concurrence (date logged in with Shellita Garrett/R6): _____
- R6 SED division director briefing date (if one is scheduled): _____
- R6 Final FYR signature date: _____

After Final FYR signature, please file signed document in SEMS: _____

Update SEMS with Final FYR signature date and FYR Issues/Recommendations info: _____

Send Final FYR, along with the SEMS Document ID, to EPA HQ (to: David Reynolds/OSRTI, with cc: Jennifer Edwards/OSRTI, Charles Sands/OSRTI. For federal facilities, add cc: Monica McEaddy/FFRRO):

- Final FYR and SEMS Document ID send date to EPA HQ: _____

Send Final FYR to state environmental agency _____, PRP _____, Tribal org: _____

Ensure that the Final FYR is publicly available at the site local repository: _____

Ensure that the Final FYR is publicly available on the R6 site profile page (via Diana Ortiz/R6): _____

Ensure that the Final FYR availability public notice is published: _____

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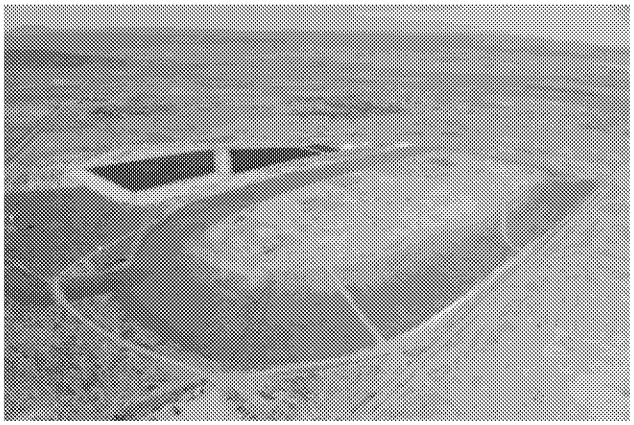
FIFTH FIVE-YEAR REVIEW REPORT FOR HOMESTAKE MINING COMPANY SUPERFUND SITE CIBOLA COUNTY, NEW MEXICO

SEPTEMBER 2021



2012

2019

Prepared by

U.S. Environmental Protection Agency
Region 6
Dallas, Texas

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FIFTH FIVE-YEAR REVIEW REPORT
HOMESTAKE MINING COMPANY SUPERFUND SITE
EPA ID#: NMD007860935
CIBOLA COUNTY, TEXAS

This memorandum documents the U.S. Environmental Protection Agency's (EPA's) performance, determinations and approval of the Homestake Mining Company Superfund site (Site) fifth five-year review under Section 121 (c) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), 42 U.S. Code Section 9621 (c), as provided in the attached fifth Five-Year Review Report.

Summary of the Fifth Five-Year Review Report

The Site is a former uranium mill and tailing disposal facility located in Cibola County, New Mexico. It occupies approximately 1,085 acres of land and includes a large tailing pile, containing approximately 21 million tons of tailing material, and a small tailing pile, containing about 1.2 million tons of tailing material. Both tailing piles are unlined. The Site also includes groundwater contamination that resulted from tailing seepage at the piles. The Site was operated from 1958 until 1990. Groundwater contamination was first discovered in 1960 by the New Mexico Department of Health.

The Site was placed on EPA's National Priorities List (NPL) of CERCLA sites in 1983 because of groundwater contamination. It is also a Title II Uranium Mill Tailing Radiation Control Act (UMTRCA) site that is regulated by the U.S. Nuclear Regulatory Commission (NRC) through Source Materials License SUA-1471 (NRC License SUA-1471). The Site is also regulated by the New Mexico Environment Department (NMED), through Groundwater Discharge Permit DP-200. Homestake Mining Company of California (HMC), the responsible party and licensee, conducts decommissioning, reclamation, and closure activities and long-term groundwater corrective action at the Site. The former mill area and the tailing disposal site comprise the HMC Facility. The facility is within a fenced area that defines the NRC license boundary. There are water treatment facilities, evaporation and collection ponds, and a network of injection and collection wells that are operated at the Site as part of the ongoing groundwater corrective action. There is also an extensive network of monitoring wells used to assess groundwater quality and flow within a shallow alluvial aquifer and multiple bedrock aquifers. There are 394 acres of land located outside of the NRC license boundary that were historically used for irrigation as a means to dispose of groundwater with low levels of contamination; they are referred to as land treatment areas. The only current operations at the Site, in addition to groundwater corrective action, are related to security, maintenance, and environmental monitoring.

EPA has divided the Site into three project areas called operable units (OUs). OU1 addresses tailings seepage contamination of the groundwater aquifers. OU2 addresses long-term tailings stabilization, surface reclamation and site closure. OU3 addresses radon contamination in neighboring residential subdivisions. EPA has yet to select a remedy under its CERCLA authority for either OU1 or OU2; the remedies are implemented by HMC under the direction of NRC and NMED. EPA negotiated a settlement agreement with HMC, in 1983, for HMC to provide an alternate water supply to residences with private wells impacted by tailing seepage. Under that agreement, HMC connected the residences to the village of Milan municipal water supply distribution system and paid for ten years of the residents' water usage. EPA selected a "no further action" in a record of decision for OU3 in 1989. At that time, EPA determined the radon contamination in indoor and ambient (outdoor) air at the subdivisions was from naturally occurring background levels of radon. EPA concluded that the large tailing pile, though a potential source of radon emissions, did not contribute significantly to the radon contamination in the subdivisions.

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From 2010 to 2014, EPA conducted additional investigations and performed a supplemental human health risk assessment for the neighboring subdivisions due to concerns raised by the community. The results of the investigations led EPA to conduct removal actions to mitigate indoor air radon levels, in 2012, and soil contamination at residential yards, in 2014. The indoor air radon contamination and soil contamination were not attributed to the Site.

OU1 groundwater corrective action has been conducted at the Site since 1977. The objective of the corrective action is to achieve Groundwater Protection Standards (cleanup levels) established by NRC in accordance with UMTRCA and NRC License SUA-1471. The NRC cleanup levels were revised in 2006 to reflect background groundwater quality, which was determined to be significantly above federal drinking water standards and State of New Mexico (State) groundwater standards. The NRC-directed groundwater corrective action has helped contain the most highly contaminated groundwater within the NRC licensed boundary and prevented the further migration of the contaminant plumes by hydraulic containment. Hydraulic containment is created by the injection of water that is compliant with State groundwater standards at designated wells, and the extraction (pumping) of contaminated groundwater at other wells. The extracted contamination groundwater is piped to on-site water treatment facilities and reinjected back into the aquifer. The residual brine from the treatment process is evaporated at the ponds constructed on site. Institutional controls in the form of a state health advisory for private water well owners and users and a state order prohibiting well drilling are in place to limit exposure to contaminated groundwater. All residences in the subdivisions with contaminated private water wells are currently connected to the village of Milan's municipal water supply distribution system. This was performed by HMC under the agreement with EPA in 1983 and a subsequent agreement with NMED for providing an alternate water supply.

OU2 decommissioning and surface reclamation activities have been conducted at the Site since the late 1980s. Contaminated soil at the former mill was excavated and disposed of at the large tailing pile. The mill was decontaminated and demolished, and parts were buried in place or at the large tailings pile. Windblown contamination in surface soil within and outside of the NRC license boundary was excavated to meet UMTRCA standards and placed on the side slopes of the large tailing pile as part of decommissioning activities in the early 1990s. A final radon barrier and erosion protection cover were constructed on the side slopes of the large tailings pile. Interim soil covers were placed on the top of the large tailings pile and on the small tailings pile to reduce radon emissions while groundwater treatment facilities, ponds, and injection/collection wells were in operation on top of the tailing piles. Placement of the final radon barriers on the tailing piles will be performed once groundwater corrective actions are completed. Exposure to contamination at the HMC Facility and the other areas within the NRC license boundary is currently controlled by restricting access through perimeter fencing. HMC monitors radon flux at the large tailing pile and air particulates, gamma radiation, and radon at the perimeter of the NRC license boundary as part of an air monitoring program required under NRC License SUA-1471. Monitoring data at the license boundary currently meet UMTRCA requirements for protection of the public from radiation.

In 2013, HMC and EPA initiated a process to assess whether response actions conducted at the Site in accordance with the requirements of UMTRCA and NRC License SUA-1471 were equivalent to CERCLA requirements for protectiveness, and to satisfy NPL deletion requirements of the NCP (*i.e.,* CERCLA equivalency). This assessment showed that the UMTRCA response actions would be considered consistent with the NCP if such actions, when evaluated as a whole, are in substantial compliance with the NCP and result in a CERCLA-quality cleanup. As the NCP requires the performance of a remedial investigation and feasibility study for supporting CERCLA remedy selection, many of the prior actions substantially satisfied those requirements. However,

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missing elements included a baseline risk assessment and performance of the feasibility study. HMC completed a human health risk assessment for its facility and the land treatment areas, and compiled the results of the risk assessment and previous investigations into a final remedial investigation report that was approved by EPA in June 2020. HMC also began the feasibility study pursuant to a settlement agreement negotiated with EPA, dated August 2020. A draft feasibility study report was submitted to EPA for review in December 2020.

During the settlement negotiations for performance of the feasibility study, HMC notified EPA that it believed it was technically impracticable, from an engineering perspective, to restore groundwater to the current NRC cleanup levels. HMC requested that EPA consider invoking a waiver of the groundwater standards due to technical impracticability and selecting an alternate remedial strategy for protecting human health and the environment in a future CERCLA record of decision. HMC agreed to perform a technical impracticability evaluation as part of the settlement agreement that would support a waiver of groundwater standards in the record of decision, if deemed reasonable and technically sound by EPA. A draft technical impracticability evaluation report was submitted to EPA for review in November 2020.

EPA and NMED are currently performing a reassessment of background groundwater quality to determine if the original background study completed by HMC, and used by NRC to establish groundwater cleanup level above federal drinking water standards, reflects natural background conditions. Once the background reassessment is completed, EPA will develop preliminary cleanup levels that will inform the ongoing CERCLA feasibility study and remedy selection process.

After completion of the feasibility study, EPA plans to issue a record of decision documenting the selection of CERCLA remedies for OU1 and OU2. EPA will conduct public, tribal, and state participation processes in accordance with the NCP prior to selecting the remedies.

Following completion of the UMTRCA remedies at OU1 and OU2, the tailing disposal area and potentially other areas within the NRC license boundary will be transferred to the U.S. Department of Energy's Office of Legacy Management for long-term surveillance and maintenance in accordance with UMTRCA.

This fifth five-year review is performed as a matter of policy. It is not required to meet the statutory mandate of CERCLA Section 121(c) because no CERCLA remedies have yet to be selected by EPA for this Site: there are no record of decisions for OU1 and OU2, and EPA selected a "no further action" in a record of decision for OU3. Therefore, this fifth five-year review is not intended to make CERCLA protectiveness determinations on UMTRCA remedies at OU1 and OU2, or recommend actions to ensure a CERCLA-level of protectiveness for those remedies. UMTRCA remedies are subject to UMTRCA and NRC License SUA-1471 standards to protect the public. The recommended actions made in this review are only intended to ensure protectiveness of the prior CERCLA response actions and decisions made by EPA that address site-related contamination; specifically, the OU3 radon contamination in neighboring subdivisions and the OU1 provision of an alternate water supply for residences with private water wells contaminated by tailing seepage. The ongoing CERCLA equivalency process, including the remedial investigation and feasibility study, will lead to future EPA decision-making for OU1 and OU2 CERCLA remedies that provides for a CERCLA-level of protectiveness.

Environmental Indicators

Human Exposure Status: Exposure to groundwater contamination is under control through EPA and State response actions for providing an alternate water supply and putting in place institutional controls to restrict groundwater usage. Exposure to soil contamination is under control through UMTRCA response actions that

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achieve UMTRCA soil cleanup standards. Exposure to radon contamination in air is under control by UMTRCA response actions that achieve UMTRCA radiation standards for protecting the public.

Contaminated Groundwater Status: The migration of contaminated groundwater is under control by UMTRCA groundwater corrective action.

Sitewide Ready for Reuse: The Site has not yet achieved the Sitewide Ready for Anticipated Use performance measure.

Actions Needed

The following action must be taken to confirm that EPA's 1989 decision for "no further action" on off-site radon contamination is still appropriate:

- Perform an update of the 2014 human health risk assessment for the subdivisions using new toxicity data and the updated EPA electronic calculator for performing radiation risk assessments at CERCLA sites. In performing this update, include individual risk calculations for the various lighter radionuclides in the decay chain and use a sum-of-the fractions approach for calculating total risk from radionuclides in ambient air.

Determination

I have determined that a protectiveness determination of the CERCLA response actions and "no further action" decision at the Homestake Mining Company Superfund site cannot be made at this time until further information is obtained. The attached fifth Five-Year Review Report specifies the action that needs to be taken to obtain the information required to complete the protectiveness determination and for the CERCLA response actions to be protective in the long term.

_____ _____

Wren Stenger Date

Director, Superfund and Emergency Management Division

U.S. Environmental Protection Agency, Region 6

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CONCURRENCES

FIFTH FIVE-YEAR REVIEW REPORT
HOMESTAKE MINING COMPANY SUPERFUND SITE
EPA ID#: NMD007860935
CIBOLA COUNTY, NEW MEXICO

Mark Purcell Remedial Project Manager	Date
Blake Atkins Chief, Louisiana, New Mexico and Oklahoma Section	Date
John C. Meyer Associate Director, Superfund Remedial Branch	Date
Pamela Travis Attorney, Office of Regional Counsel	Date
I-Jung Chiang Chief, Superfund Branch, Office of Regional Counsel	Date

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ISSUES/RECOMMENDATIONS

FIFTH FIVE-YEAR REVIEW REPORT
HOMESTAKE MINING COMPANY SUPERFUND SITE
EPA ID#: NMD007860935
CIBOLA COUNTY, NEW MEXICO

Issues/Recommendations				
Issues and Recommendations Identified in the FYR:				
OU(s): OU3	**Issue Category: Other**			
	Issue: EPA selected "no further action" in a 1989 a record of decision for radon contamination in neighboring subdivisions. At that time, EPA determined the indoor and outdoor radon levels were mostly naturally occurring and that the large tailing pile, although a potential source of off-site radon contamination, was not contributing significantly to the radon levels in the subdivisions. From 2010 to 2014, EPA conducted additional investigations and performed a supplemental human health risk assessment for the subdivisions. The results of the risk assessment again showed risk from radon in air above EPA's excess lifetime cancer risk range, mostly from background radon levels. However, a significant component of the ambient air risk was attributed to the Site. A review of the toxicity data used in the 2014 risk assessment shows that not all of the data are still valid and that there is new toxicity information relevant to the risk assessment. Additionally, the computerized mathematic model (electronic calculator) used by EPA for conducting radiation risk assessments for radionuclides at CERCLA sites has been updated in October 2020. Furthermore, EPA has determined that the calculation of risk from exposure to radionuclides in ambient air should include separate calculations of risk for the lighter radionuclides in the decay chain and the use of a "sum of the fractions" approach for determining total risk.			
	Recommendation: Update the baseline human health risk assessment for the neighboring subdivisions using the current toxicity data and the updated EPA Rad PRG Calculator. For the update on risk from radon in ambient air, include separate calculations for the various radionuclides and use a "sum of the fractions" approach for determining total risk. This updated risk assessment will inform the ongoing CERCLA feasibility study and remedy selection process for OU1 and OU2, including response actions for controlling site-related sources of radon contamination.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
Yes	Yes	EPA		3/31/2022

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Table of Contents

[TOC \o "1-1" \h \z \t "Heading 3,2"]

Tables

[TOC \h \z \t "Heading 2,1"]

Figures

[TOC \h \z \t "Figures,1"]

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LIST OF ABBREVIATIONS AND ACRONYMS

ARAR	Applicable or Relevant and Appropriate Requirement
ASAOC	Administrative Settlement Agreement and Order on Consent
CAP	Corrective Action Program
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
cm	Centimeter
COC	Contaminant of Concern
COPC	Chemical of Potential Concern
DOE	Department of Energy
EPA	United States Environmental Protection Agency
FS	Feasibility Study
FYR	Five-Year Review
GCAP	Groundwater Corrective Action Program
gpm	Gallons per Minute
HHRA	Human Health Risk Assessment
HMC	Homestake Mining Company
HQ	Hazard Quotient
IC	Institutional Control
LTA	Land Treatment Area
LTP	Large Tailings Pile
MCL	Maximum Contaminant Level
mg/L	Milligrams per Liter
mrem/yr	Millirems per Year
NCP	National Contingency Plan
NMED	New Mexico Environment Department
NM-OSE	New Mexico Office of State Engineer
NPL	National Priorities List
NRC	Nuclear Regulatory Commission
O&M	Operation and Maintenance
OU	Operable Unit
pCi/g	Picocuries per Gram
pCi/L	Picocuries per Liter
pCi/m^2s	Picocuries per Square Meter per Second
PRP	Potentially Responsible Party
RI	Remedial Investigation
RO	Reverse Osmosis
ROD	Record of Decision
ROPC	Radionuclide of Potential Concern
STP	Small Tailings Pile
TEDE	Total Effective Dose Equivalent
UU/UE	Unlimited Use and Unrestricted Exposure

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I. INTRODUCTION

The purpose of a five-year review (FYR) is to evaluate the implementation and performance of a remedy in order to determine if the remedy is and will continue to be protective of human health and the environment. The methods, findings, and conclusions of reviews are documented in FYR reports, such as this one. In addition, FYR reports identify issues found during the review, if any, and document recommendations to address them.

The U.S. Environmental Protection Agency (EPA) is preparing this FYR pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Section 121, consistent with the National Contingency Plan (NCP) (40 CFR Section 300.430(f)(4)(ii)), and considering EPA policy.

This is the fifth FYR for the Homestake Mining Company Superfund site (the Site). This review is being conducted as a matter of policy.[1] The triggering action for this policy review is the previous FYR completed in September 2016. This FYR has been prepared because hazardous substances, pollutants or contaminants remain at the Site above levels that allow for unlimited use and unrestricted exposure (UU/UE).

The Site is regulated by EPA, the U.S. Nuclear Regulatory Commission (NRC), and the state of New Mexico (State). NRC regulates the Site through Source Material License SUA-1471 (License SUA-1471),[2] issued pursuant to Title II of the 1978 Uranium Mill Tailings Radiation Control Act (UMTRCA). The New Mexico Environment Department (NMED) regulates the Site through Groundwater Discharge Permit DP-200, issued pursuant to the 1978 New Mexico Water Quality Act. EPA regulates the Site through its CERCLA authority. CERCLA is also known as the Superfund law. EPA placed the Site on the National Priorities List (NPL) of Superfund sites in 1983, primarily due to groundwater contamination.

The Site consists of three operable units (OUs).[3] OU1 addresses groundwater contamination from the seepage of liquids from byproduct material,[4] referred to as tailing,[5] that was produced from the uranium milling operation and disposed of in unlined impoundments at the Site. OU2 addresses long-term tailing stabilization, surface reclamation and site closure. OU3 addresses radon concentrations in neighboring residential subdivisions. This FYR Report addresses all site OUs.

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[1] Five-year reviews are conducted to meet the statutory mandate under CERCLA Section 121(c) or as a matter of policy. In accordance with CERCLA and the NCP, a five-year review is required for all remedial actions selected under CERCLA Section 121 that result in any hazardous substances, pollutants, or contaminants remaining at the site above levels that allow for unlimited use and unrestricted exposure. As there have been no remedial actions selected at this Site under CERCLA Section 121, a five-year review is not mandated.

[2] Source Material is defined in 10 CFR Part 40 (Domestic Licensing of Source Material) as (1) uranium or thorium, or any combination thereof, in any physical or chemical form, or (2) ores which contain by weight one-twentieth of one percent (0.05%) or more of uranium, thorium, or any combination thereof.

[3] During cleanup, EPA can divide a site into a number of distinct areas depending on the complexity of the problems associated with the site. These areas are called operable units and may address geographic areas of a site, specific site problems, or areas where a specific action is required.

[4] The Atomic Energy Act, as revised in 1978 and in 2005 by the Energy Policy Act (EPAct), defines byproduct material in Section 11e.(2) as the tailing or waste produced by the extraction or concentration of uranium or thorium from any ore processed primarily for its source material content.

[5] Uranium mill tailing is primarily the sandy or fine grained (slime) process waste material from a conventional uranium mill that crushes the ore then extracts (leaches) and concentrates the uranium. The leaching process also extracts other "heavy metal" constituents such as molybdenum, selenium and vanadium. Uranium mill tailing is defined in 10 CFR Part 40 as byproduct material.

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Homestake Mining Company of California (HMC), the Site's potentially responsibly party (PRP), is implementing groundwater corrective actions, as well as decommissioning, reclamation, and closure activities, at the Site in accordance with NRC License SUA-1471.

The EPA remedial project manager Mark Purcell led this FYR. Participants included the EPA community involvement coordinator Adam Weece, the NMED project manager Ashlynne Winton, and Ryan Burdge and Jill Billus from the EPA FYR contractor Skeo. HMC, as the Site's PRP, was notified of the initiation of the FYR. The review began on July 15, 2020.

Appendix A lists resources used in the development of this FYR Report. Appendix B includes a chronology of major site events.

Site Background

The Site is located in a rural area of Cibola County, New Mexico, about 5.5 miles north of the village of Milan (Figure 1). The Site includes HMC's former uranium processing mill complex and groundwater contaminated by site-related wastes. The Site also includes 394 acres of land owned by HMC used historically for irrigation and referred to as land treatment areas (LTAs). The uranium mill operated between 1958 and 1990. The mill was decommissioned and demolished between 1993 and 1995 as part of the mill site reclamation work required under NRC License SUA-1471. The only current operations at the former mill complex are related to security, groundwater remediation and environmental monitoring.

The former uranium processing mill complex, known as the HMC Facility, consists of two tailing impoundments (the large tailings pile [LTP] and small tailings pile [STP]), a groundwater injection and collection system, reverse osmosis (R.O.) and zeolite[6] water treatment systems, collection and evaporation ponds, and support facilities that are part of an ongoing groundwater corrective action to mitigate tailing seepage impacts to underlying groundwater (Figure 2). The LTP covers an area of about 200 acres and is approximately 85 to 100 feet in height. It contains an estimated 21 million tons of mill tailing. The STP covers an area of about 40 acres and is approximately 20 to 25 feet in height. It contains about 1.2 million tons of mill tailing. These features are located within a fenced area of approximately 1,085 acres that is licensed by NRC for uranium milling and closure activities. Additional site features include a groundwater collection system for areas outside the NRC licensed boundary, as well as four LTAs (*see* Figure 2). Historically, groundwater extracted as part of ongoing remediation activities at the Site irrigated the LTAs.

Site operations and seepage from the tailing piles have contaminated soil and the underlying groundwater aquifers with radiological and non-radiological contaminants. The aquifers are known locally as the San Mateo alluvial aquifer and the Upper, Middle, and Lower Chinle bedrock aquifers of the Triassic Chinle Group. The Permian San Andres-Glorieta (SAG) aquifer is a deeper regional aquifer that underlies the Site, but it is not currently known to be impacted by site-related contamination. There are two geologic faults at the Site that are part of a large fault zone, known as the San Mateo Fault Zone, that extends northward to the Ambrosia Lake valley, located approximately 5 miles to the north of the Site. The two faults extend in a northeast-southwest direction across the entire Site and are referred to as the West Fault and the East Fault. Fault displacements can exceed 100 feet in some places, resulting in the separation of the bedrock aquifers into discrete and separate aquifers within each fault block. Figure C-1 in Appendix C depicts a generalized geological cross section of the aquifers beneath

[6] Zeolites are a group of naturally-occurring and synthetically produced minerals with unique adsorption capabilities. Zeolites are used in industrial applications for water and waste water treatment, nuclear waste, agriculture, animal feed additives and in biochemical applications.

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the Site. Detailed geological cross sections that include the faults, and a map showing the locations of the detailed sections, are depicted on Figures C-2 through C-4 in Appendix C. General groundwater flow directions for each aquifer are also depicted on the cross sections. Groundwater flow directions are greatly influenced by the ongoing operation of a network of injection and collection wells that are part of the groundwater corrective action. The Data Review section of this FYR Report addresses groundwater flow direction in more detail.

Surface water nearest to the Site is ephemeral and flows along San Mateo Creek, Lobo Creek, and the Rio San Jose (*see* Figure 1). The San Mateo Creek and Lobo Creek basins both drain onto the HMC Facility. Two Lobo Creek drainage paths enter the east side of the HMC Facility. A diversion levee was constructed to the north of the mill area to divert surface water discharges from the northern branch of Lobo Creek. During flood events, the levee diverts Lobo Creek water to a north diversion channel located north of the LTP, preventing discharges from flowing across the former mill area.

HMC owns land in and around its facility and leases much of it to other parties for livestock grazing. The major land use south and west of the HMC Facility is residential development in the Pleasant Valley Estates, Murray Acres, Broadview Acres, Valle Verde and Felice Acres subdivisions (*see* Figure 2). Future land use is expected to be consistent with current use for residential, agriculture, livestock grazing, and commercial/industrial purposes.

The HMC Facility uses bottled water for drinking. The Facility also uses water from a production well, screened in the SAG aquifer, for other domestic and sanitary uses. Because private water wells at residences located downgradient of the HMC Facility have been impacted by site-related contamination, the residences have been connected to the Milan municipal water supply distribution system at HMC's expense. HMC has historically and currently pays the residents' water bills for this usage.

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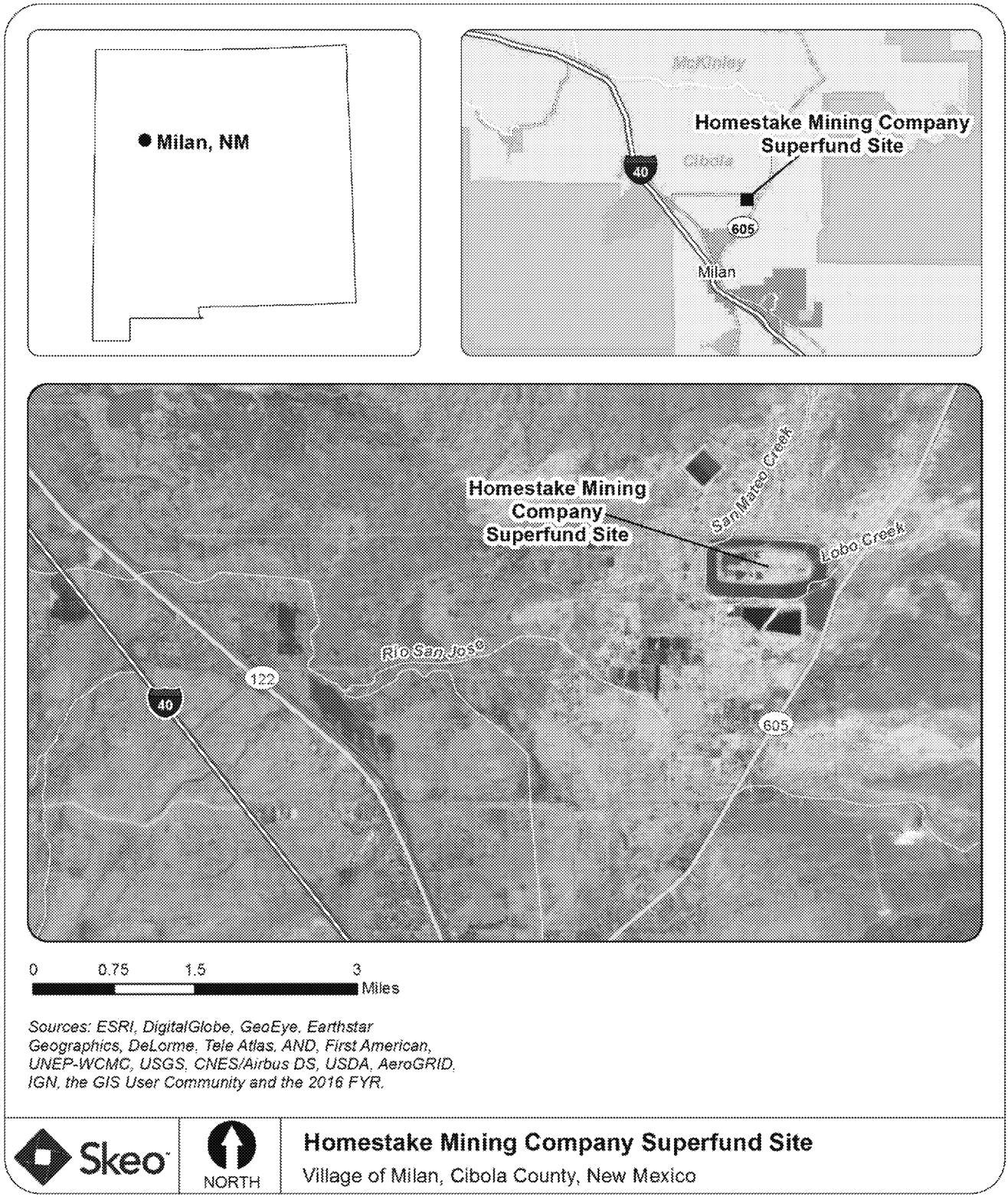
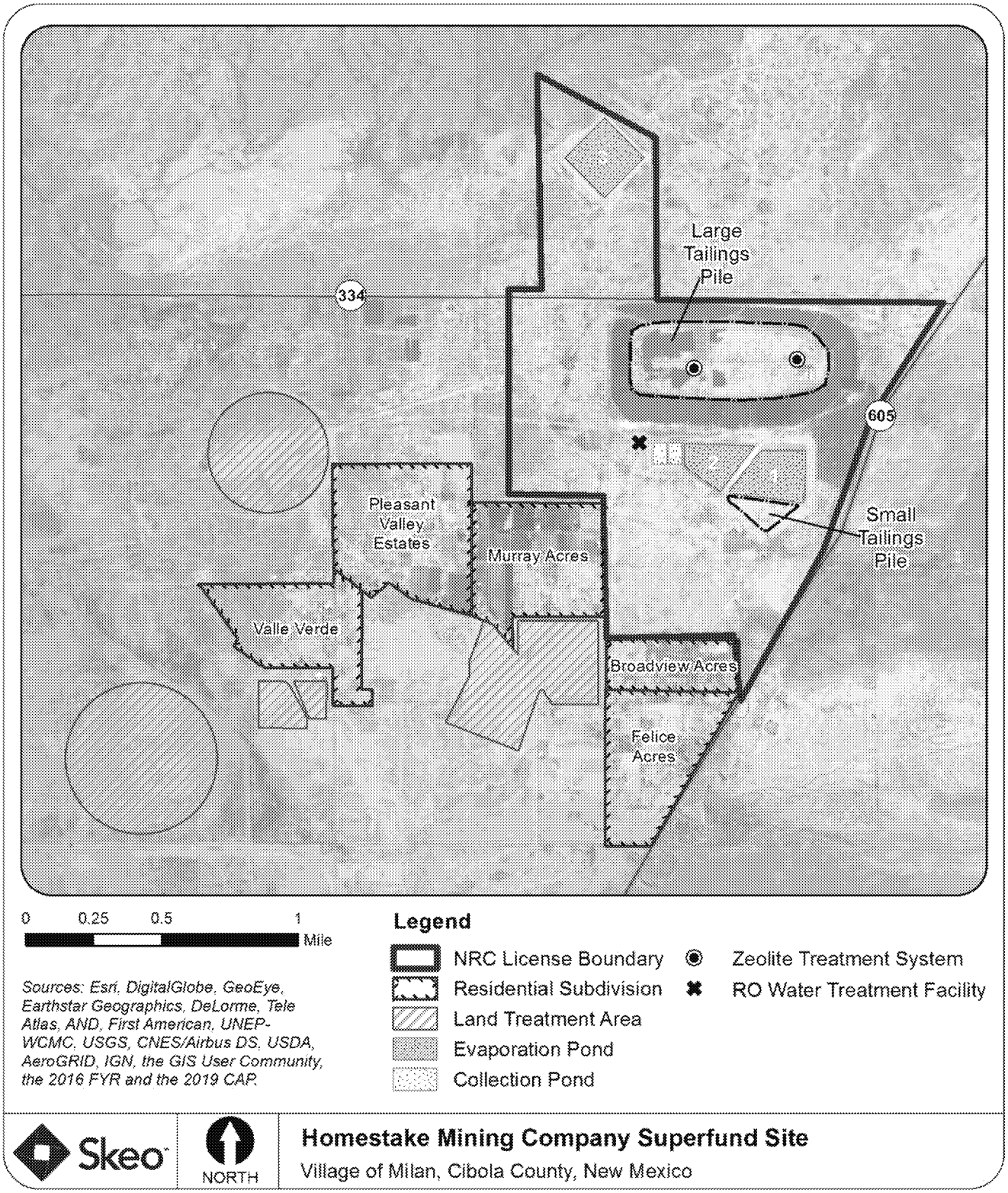
Figure 1: Site Vicinity Map



Disclaimer: This map and any boundary lines within the map are approximate and subject to change. The map is not a survey. The map is for informational purposes only regarding EPA's response actions at the Site.

Figure 2: Site Map



Disclaimer: This map and any boundary lines within the map are approximate and subject to change. The map is not a survey. The map is for informational purposes only regarding EPA's response actions at the Site.

FIVE-YEAR REVIEW SUMMARY FORM

SITE IDENTIFICATION		
Site Name: Homestake Mining Company		
EPA ID: NMD007860935		
Region: 6	**State:** New Mexico	**City/County:** Milan/Cibola
SITE STATUS		
NPL Status: Final		
Multiple OUs? Yes	**Has the Site achieved construction completion?** Yes	
REVIEW STATUS		
Lead agency: EPA		
Author name: Mark Purcell, with additional support provided by Skeo		
Author affiliation: EPA Region 6		
Review period: 7/15/2020 – 9/13/2021		
Date of site inspection: No inspection due to Covid Pandemic		
Type of review: Policy		
Review number: 5		
Triggering action date: 9/13/2016		
Due date *(five years after triggering action date)*: 9/13/2021		

II. RESPONSE ACTION SUMMARY

Basis for Taking Action

In 1975, EPA sampled several wells in the Broadview and Murray Acres subdivisions as part of a larger study of the Grants Mineral Belt, an area in northwestern New Mexico, where significant uranium mining and milling occurred, starting in the 1950s. EPA determined that groundwater, which was being used for drinking water, had high selenium levels. In 1976, the New Mexico Environmental Improvement Division (predecessor to NMED) and HMC signed a Groundwater Protection Plan. That same year, HMC identified a contaminant plume in the alluvial aquifer that originated from the LTP. The plume was moving in a downgradient direction to the south and west. Under the 1977 New Mexico Water Quality Act and NMED's groundwater discharging permitting program, NMED required HMC to implement a groundwater restoration program.

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EPA placed the Site on the NPL in 1983 at the request of the State due to groundwater contamination. Site investigations since that time identified several chemicals and radionuclides[7] in site media above levels of concern. Table 1 lists the site chemicals and radionuclides of concern.

Table 1: Chemicals and Radionuclides of Concern, by Media

Chemical/Radionuclide	Media
Uranium, selenium, molybdenum, vanadium, radium-226 + radium-228, thorium-230, sulfate, chloride, nitrate, total dissolved solids	Groundwater
Radium-226 and uranium	Soil
Radon	Indoor and outdoor air
Source: Section V, Item 27 of the August 2020 Administrative Settlement Agreement and Order on Consent for Feasibility Study.	

Response Actions

Uranium milling and closure operations at the HMC Facility have been regulated through the following radioactive materials licenses since operations began in 1958:

- From 1958 to 1974, the Atomic Energy Commission regulated the facility under License SUA-708.
- From 1974 to 1986, the State regulated uranium milling operations at the Site as an Agreement State.[8]
- In 1986, the State relinquished its licensing authority to the NRC. At that time, the NRC issued License SUA-1471, replacing License SUA-708.

EPA does not license uranium mills but establishes environmental standards under UMTRCA that must be adopted by NRC and Agreement States. EPA regulations at 40 CFR Part 192 apply to remediation of both inactive uranium mill tailing and uranium milling facilities and address emissions of radon, as well as radionuclides and other contaminants into surface and groundwater.

In 2013, HMC initiated an evaluation of the response actions performed at the Site under UMTRCA and NRC License SUA-1471 to determine if they were consistent with CERCLA and the NCP (CERCLA equivalency). Additionally, it was determined that the response actions performed at the Site by HMC, when evaluated as a whole, could be considered consistent with the NCP if they substantially complied with the requirements of the NCP and resulted in a CERCLA-quality cleanup (40 C.F.R. § 300.700 (c)(3)(i)). The requirements set forth in the NCP, to achieve a CERCLA-quality cleanup, include the performance of a remedial investigation and feasibility study (RI/FS) and selection of a remedy to be documented in a record of decision (ROD).[9]

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[7] A radionuclide is a radioactive form of a chemical element. Some occur naturally in the environment, such as uranium, radium, radon, and thorium, while others are man-made, either deliberately or as products of nuclear reactions. Every radionuclide emits radiation at its own specific rate when it decays or transforms into another radionuclide.

[8] An "Agreement State" is a state that has entered into an agreement with NRC under section 274 of the Atomic Energy Act of 1954 (42 U.S.C. 2021)

[9] The NCP RI/FS and remedy selection process specified at 40 C.F.R. § 300.430 includes the following:

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HMC submitted a CERCLA Equivalency Package to EPA in 2013 that describes Site activities in the context of how or to what degree they should be considered equivalent to CERCLA and NCP requirements. The documents in the package included a collection of existing data from previous investigations, analysis of alternatives, treatability studies, and other work performed at the Site. After reviewing the documents, EPA determined there were components of the NCP RI/FS process that needed to be completed to demonstrate substantial compliance with the NCP requirements. These activities included preparing an RI report documenting the previous investigations at OU1 and OU2, performing a baseline risk assessment as part of the RI, conducting a FS to develop and analyze remedial alternatives that support EPA's selection of a remedy, and documenting EPA's remedy in a ROD for OU1 and OU2.

- Remedial Investigation (RI) – The RI is a process to assess site conditions and assess potential risk to human health and the environment. The RI emphasizes data collection and site characterization to determine the nature and extent of contamination, and includes sampling of environmental media (air, soil, surface water, groundwater). Site characterization includes an evaluation of background levels for each medium. Background refers to constituent concentrations or locations that are not influenced by releases of contamination from the Site and is usually described as naturally occurring or anthropogenic (a result of human activities). The RI also includes the performance of a site-specific baseline risk assessment to characterize the current and potential threats to human health and the environment that may be posed by Site contamination. The results of the baseline risk assessment will help establish acceptable (health-based) exposure levels for use in developing preliminary remediation goals, remedial action objectives, and remedial alternatives in the FS.

- Feasibility Study (FS) – The FS is a process to develop, screen, and evaluate a range of remedial alternatives (cleanup options) to the extent necessary to select a remedy. The FS emphasizes data analysis and is performed using data gathered during the RI to define the objectives of the cleanup and identify preliminary applicable or relevant and appropriate requirements. The FS consists of an initial phase to develop and screen a broad set of alternatives against three of nine NCP criteria for evaluating and selecting a CERCLA remedy: effectiveness, implementability, and cost. This is followed by a detailed analysis on a limited number of viable alternatives carried over from the screening phase of the FS. The detailed analysis is performed using the following seven of the nine NCP criteria:
    - Overall protection of human health and the environment
    - Compliance with applicable or relevant and appropriate requirements
    - Long-term effectiveness and permanence;
    - Reduction of toxicity, mobility, or volume through treatment;
    - Short-term effectiveness;
    - Implementability; and
    - Cost.

  The first two of the above-listed criteria are "threshold" requirements that each alternative must meet in order to be eligible for selection. The five other criteria listed above are "balancing" criteria that identify key tradeoffs (advantages and disadvantages) among the alternatives that provides sufficient information for EPA to balance the tradeoffs. The final two NCP criteria are state/tribal acceptance and community acceptance. These are evaluated during the final step in the process, which is the selection of the remedy.

- Selection of the Remedy – Remedy selection is a two-step process that involves: (1) the identification of a preferred alternative by EPA in conjunction with the state, and the participation of the public, tribes, and state in the decision-making process; and (2) a reassessment by EPA that the preferred alternative provides the best balance of tradeoffs factoring in any new information or points of view expressed by the state/tribes, or the community, followed by a final selection of the remedy by EPA that is documented in a ROD. If EPA decides to modify aspects of the preferred alternative, or selects another alternative that provides a more appropriate balance of the NCP criteria, after considering comments, EPA shall include a discussion of the significant changes to the remedy in the ROD along with a written summary of the significant comments and EPA's responses to each issue. For the public participation process, EPA shall prepare a Proposed Plan that describes the alternatives evaluated during the FS and identifies the best alternative in meeting the NCP criteria. The Proposed Plan and supporting analysis and information shall be made available to the public for review. EPA shall also hold a 30- to 60-day public comment period and present the preferred alternative at a public meeting to be held during the public comment period.

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A final RI Report for OU1 and OU2 was completed by HMC in March 2020 and approved by EPA in June 2020. HMC completed a baseline human health risk assessment (HHRA) for the HMC Facility and the LTAs and a baseline ecological risk assessment (BERA) for the Site. The risk assessment results were documented in the RI Report. The FS for OU1 and OU2 is ongoing. The RI/FS work is discussed in this FYR Report.

EPA and HMC entered into an Administrative Settlement Agreement and Order on Consent (ASAOC) for performance of the FS in August 2020. Under the ASAOC, HMC agreed to conduct the FS to evaluate remedial alternatives to the extent necessary to analyze if the current response actions at the Site substantially comply with the requirements of CERCLA and the NCP for achieving a CERCLA-quality remedy, or to identify additional response actions to supplement the previous work or new alternatives that would achieve such compliance with CERCLA and the NCP and support future EPA decision-making.

EPA issued a "no further action" ROD for OU3 (radon contamination in neighboring residential subdivisions) in 1989. However, at the request of two community environmental groups, the Bluewater Valley Downstream Alliance (BVDA) and the Multicultural Alliance for a Safe Environment (MASE), in 2010, EPA performed a supplemental HHRA for the five subdivisions (hereinafter HHRA-Subdivisions), located south and southwest of the HMC Facility. The findings of the HHRA-Subdivisions were included in the 2016 FYR report. They were also summarized in the 2020 RI Report. This FYR Report summarizes those findings.

The following sections describe the OU-specific remedial objectives and components for those cleanup activities currently underway.

OU1 – Tailings Seepage Contamination of Groundwater Aquifers

HMC is implementing groundwater corrective action under NRC License SUA-1471, an NRC-required Groundwater Corrective Action Program (GCAP) for groundwater restoration, and NMED Discharge Permit DP-200, renewed in September 2014. The GCAP was approved by NRC in 1989. Updates to the GCAP were prepared by HMC in 2006 and 2012; however, they were never approved by NRC. The most recent update (December 2019) is currently under NRC review. The objective or goal of the groundwater corrective action, as set forth in UMTRCA requirements at 10 CFR Part 40, Appendix A, Criterion 5D, is to return hazardous constituent concentration levels in groundwater to the concentration levels set by NRC as Groundwater Protection Standards (GWPS) (i.e., cleanup levels). NRC License SUA-1471 and the GCAP define additional general objectives for groundwater restoration as follows:

- Remediate groundwater to levels set as standards; and
- Prevent the consumption of contaminated groundwater by residents in the nearby subdivisions.

The GCAP defines the groundwater restoration program for the Site, including the individual components of the CAP, performance criteria, associated monitoring, pumping and injection rates, treatment systems and point of compliance assessment. The major components of the groundwater restoration program currently include the following:

- Dewatering the LTP to remove contaminated groundwater and control the source area of the groundwater contamination.

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- Provisions for an alternate and permanent water supply for nearby subdivision residents whose properties are located in the area of site-related groundwater contamination. HMC financed the cost of residents' water use for 10 years after reaching a settlement agreement with EPA in 1983 for providing an alternate water supply and has recently resumed such financing.
- Operation of a groundwater injection and collection system to reverse groundwater flow within the alluvial and Chinle aquifers back toward collection wells located next to the tailing piles and across the Site. The contaminated groundwater flows to the collection wells where it is removed by pumping and then piped to the treatment facilities. The collected groundwater is treated by R.O. and zeolite filtration for reinjection into the aquifers, and the residual brine water created from the treatment process is evaporated. The reinjected water is compliant with State groundwater standards. Fresh water is also pumped from the deeper SAG aquifer, as needed, to supplement the treated water used for the injection program.

The current NRC cleanup levels for groundwater are depicted in Table 2 for Site chemicals of concern (COCs) and radionuclides of concern (ROCs). They are based partly on background levels determined by HMC for each of the contaminated aquifers. The cleanup levels based on background are significantly above federal MCLs and State groundwater standards. Separate cleanup levels are established for the alluvial aquifer and the Upper, Middle, and Lower Chinle bedrock aquifers. Because groundwater in each of the three Chinle aquifers consists of a mixing zone comprised of Chinle and alluvial groundwater and a non-mixing zone of only Chinle groundwater, cleanup levels have been established for the mixing zone and all three Chinle non-mixing zones. Figures C-5 through C-7 in Appendix C depict the locations of the mixing zone and non-mixing zone for each of the three Chinle aquifers and the wells used by HMC to calculate background.

Table 2: NRC 2006 Site Cleanup Levels – Groundwater

Constituent[a] (units)	Alluvial Aquifer	Chinle Mixing Zone[b]	Upper Chinle Non-Mixing Zone	Middle Chinle Non-Mixing Zone	Lower Chinle Non-Mixing Zone
Uranium (mg/L)	0.16[c]	0.18[c]	0.09[c]	0.07[c]	0.03
Selenium (mg/L)	0.32[c]	0.14[c]	0.06[c]	0.07[c]	0.32[c]
Molybdenum (mg/L)	0.1	0.1	0.1	0.1	0.1
Radium-226 + Radium-228 (pCi/L)	5.0	NR	NR	NR	NR
Thorium-230 (pCi/L)	0.3	NR	NR	NR	NR
Sulfate (mg/L)	1,500[c]	1,750[c]	914[c]	857[c]	2,000[c]
Chloride (mg/L)	250	250	412[c]	250	634[c]
Total dissolved solids (mg/L)	2,734[c]	3,140[c]	2,010[c]	1,560[c]	4,140[c]
Nitrate (mg/L)	12[c]	15[c]	NR	NR	NR
Vanadium (mg/L)	0.02	0.01	0.01	NR	NR

Notes:

a) Radium-226 + radium-228 and thorium-230 are ROPCs; all other constituents are COPCs

b) Mixing zones occur in Chinle aquifers from the intrusion of alluvial groundwater into the Chinle aquifer at subcrop locations (*i.e.,* where the Chinle aquifer is in contact with the overlying alluvial aquifer). Alluvial groundwater typically has a much higher calcium concentration than the Chinle aquifers' groundwater. Therefore, mixing zone groundwater within the Chinle aquifers is

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Constituent[a] (units)	Alluvial Aquifer	Chinle Mixing Zone[b]	Upper Chinle Non-Mixing Zone	Middle Chinle Non-Mixing Zone	Lower Chinle Non-Mixing Zone

characterized by an elevated calcium concentration. Areas of the Chinle aquifers where the water quality has not been affected by the intrusion of alluvial groundwater are referred to as the "non-mixing" zones.

c) Values based on site-specific groundwater background concentrations.

NR = groundwater protection standards not required for constituents in this zone.

mg/L = milligrams per liter

pCi/L = picocuries per liter

Source: Table 1-1 of the 2018 GCAP.

Although there currently is no EPA ROD that establishes remedial action objectives and remediation goals for OU1, preliminary remediation goals (PRGs) are being developed as part of the ongoing CERCLA RI/FS for OU1 and OU2. Preliminary remediation goals are concentration or exposure goals for individual chemicals or radionuclides for a specific medium. These goals are based on preliminary chemical-specific ARARs (*e.g.,* federal MCLs and/or state groundwater standards) or site-specific health-based factors as to-be-considered (TBC) criteria. After completion of the RI/FS, EPA will select final cleanup levels and remedial action objectives as part of the CERCLA remedy selection process to be documented in a future ROD for OU1.

OU2 – Long-Term Tailings Stabilization, Surface Reclamation and Site Closure

Documents that detail the response action decisions for OU2 include NRC License SUA-1471 and a 1993 NRC-approved Decommissioning and Reclamation Plan.[10]

License SUA-1471 defines the following remedial objectives for OU2:

- Limit radon emissions from the tailing impoundments; and
- Remediate soil contamination that resulted from windblown tailing.

License SUA-1471 and an updated 2013 draft Decommissioning and Reclamation Plan define the following major components of the OU2 cleanup:

- Decontamination of the mill facilities and equipment;
- Demolition of the mill facilities and equipment;
- Burial of contaminated debris and asbestos-containing materials in the out slope of the LTP;
- Burial of uncontaminated debris and equipment in pits on the mill site;
- Excavation of surface soil contaminated with windblown tailing and burial in the out slope of the LTP; and
- Construction of a final radon barrier on the two tailing piles to minimize radon emissions and reduce erosion.

[10] A draft updated Decommissioning and Reclamation Plan was submitted to the NRC in 2013, but has not been approved.

Soil cleanup criteria for OU2 were based on NRC requirements in 10 CFR 40, Appendix A, Criterion 6, which conform to EPA environmental standards specified in 40 CFR 192. These regulations include a cleanup standard for radium-226 of 5 picocuries/gram (pCi/g) above background, averaged over the first 15 centimeters (cm) of soil below the surface, and 15 pCi/g above background, averaged over 15-cm depth increments below the top 15 cm of soil. The NRC-approved background level for radium-226 at the mill site was established as 5.5 pCi/g. Therefore, the radium-226 cleanup standards established by NRC are 10.5 pCi/g for the top 15 cm of soil and 20.5 pCi/g for the subsequent 15-cm depth increments of soil.

OU3 – Radon in Neighboring Subdivisions

Under a 1987 EPA administrative order on consent, HMC conducted an RI/FS specifically for radon[11] and radon progeny[12] at the five residential subdivisions located south and southwest of the HMC Facility (Broadview Acres, Murray Acres, Felice Acres, Valle Verde, and Pleasant Valley Estates). Average annual radon levels in indoor air were found to exceed EPA's indoor air guidance action level of 4 picocuries per liter (pCi/L) for radon at eight residences, but there was no definitive correlation between the radon concentrations and the proximity of the homes to the HMC Facility. EPA selected a "no further action" alternative and documented the decision in the OU3 ROD, dated September 1989.

EPA performed additional investigations at and in the vicinity of the subdivisions to support a supplemental HHRA between 2010 and 2014. The investigations consisted of the following:

- Gamma Radiation Scanning: a walking gamma scan was performed at 90 properties in the five subdivisions and at 250 acres of HMC property between the evaporation ponds and the fence line (NRC license boundary) separating the HMC property and the subdivisions;
- Soil Sampling and Analysis: 640 surface soil samples were collected from residential properties, various locations on HMC property, and an area south of the residential properties to evaluate background soil conditions;
- Ambient and Indoor Air Sampling and Radon Analysis: 1500 air samples were collected during four sampling events over a period of one year at homes (indoors and outdoors) within the subdivisions, on HMC property, north of the LTP, and in Bluewater Village, the location EPA selected to represent background;
- Produce Sampling and Analysis: vegetables were collected from existing home gardens and sent to a laboratory for analysis; and
- Private Well Sampling: water samples were collect from existing private water wells in the subdivisions.

The purpose of the gamma scan was to investigate: 1) whether the spraying of contaminated water high into the air resulted in contaminants being deposited in the adjacent residential neighborhoods; and 2) whether heavy rains could have resulted in contaminants being carried from the tailing piles and evaporation ponds into the adjacent neighborhoods. In performing the risk assessment, EPA evaluated two land use scenarios: residential and subsistence farming.

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[11] Radon is an odorless, colorless, radioactive gas. It is created from the decay of uranium and radium found naturally in rock and soil.

[12] Radon progeny are the radioactive elements produced from the decay of radon. The rate of radon decay is 3.8 days.

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EPA finalized the HHRA-Subdivisions in December 2014, the results of which are summarized in Question B of this FYR Report. EPA determined that mitigation of soil contamination and radon levels in indoor air was needed at several residential properties. EPA also determined that, except for radon in ambient air, contamination was unrelated to the Site.

EPA performed a removal action[13] to install radon mitigation systems at 12 residential properties where radon in indoor air exceeded the 4 pCi/L action level based on average annual sampling. EPA installed mitigation systems in 11 homes in 2012.[14] One homeowner declined the mitigation effort. The source of high radon levels in these homes has not been identified. The HHRA-Subdivisions found no significant difference between annual indoor radon levels in the five subdivisions and background indoor radon levels at Bluewater Village.

EPA conducted a soil and debris removal action at residential properties in 2014. The soil action level established by EPA for residential properties was 3.5 pCi/g of radium-226, inclusive of background, in outdoor soils. EPA's site-specific removal action level met CERCLA and NCP requirements for protectiveness by equating to an excess lifetime cancer risk of $3x10^{-4}$ (the chance of three additional cancer incidents out of 10,000 individuals), which is approximately at the upper bound of EPA's acceptable excess lifetime cancer risk range of 10^{-4} to 10^{-6} (one chance in 10,000 to one chance in a million).

An NRC license condition requires HMC to monitor outdoor radon, air particulate levels, and direct gamma radiation at the NRC license boundary to ensure that conditions in the subdivisions do not significantly change before final site closure.

Status of Implementation

OU1 – Tailings Seepage Contamination of Groundwater Aquifers

Supplemental Drinking Water Supply to Residents

A 1983 Agreement and Stipulation between HMC and EPA required HMC to provide an alternate water supply to residences with contaminated private water wells in four of the neighboring subdivisions (Broadview Acres, Felice Acres, Murray Acres, and Pleasant Valley Estates). The residences were connected to the Milan municipal water supply distribution system. The agreement also required HMC to pay for residents' water usage for a period of 10 years. HMC completed the water supply connections in 1985 and paid for water use until the end of 1994. In late 2018, HMC restarted the water supply payment program for the subdivisions downgradient of the Site. Regulatory agencies did not require this action.

In January 2009, NMED and HMC entered into a Memorandum of Agreement in which HMC agreed to connect residences within a designated area near the Site to Milan's municipal water supply distribution system. The 2020 RI Report noted that this work has been completed.

HMC conducts an annual land use survey to meet annual license condition reporting requirements under NRC License SUA-1471. This review includes an assessment of the five residential subdivisions south and west of the HMC Facility. The assessment determines whether occupied dwellings are using water service from the Milan

[13] A removal action under the EPA's Superfund program is a short-term response intended to stabilize or clean up an incident or site that poses a threat to public health or welfare.

[14] Radon mitigation systems consisted of single suction point active soil depressurization system with a radon-specific fan (RadonAway).

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municipal water supply distribution system, rather than private wells, for potable water consumption. As of 2020, all residences in the subdivisions are connected to the public water supply. A Valle Verde resident, who had previously declined the offer for connection in previous years, agreed to connect in 2019. HMC connected the residence to the public water supply in 2020.

Groundwater Restoration Activities

HMC began groundwater restoration activities at the Site in 1977. At that time, groundwater contaminant plumes, defined primarily by selenium and uranium concentrations, extended from the LTP south and west into the residential areas. The initial program included a line of groundwater injection wells along the southern NRC license boundary, which is located between the LTP and the downgradient residences. The purpose of this line of wells was to create a hydraulic barrier that reversed the natural flow direction of the contaminated groundwater away from residences and back toward the tailing piles. Since that time, HMC has continually improved and expanded the scope and operation of this remediation system. Table C-1 in Appendix C summarizes the changes and improvements made to the groundwater restoration system over time. Groundwater cleanup at the Site is ongoing.

The current restoration program includes multiple components that are frequently adjusted based on evaluation of monitoring data. The current program includes a groundwater injection and collection system for the alluvial aquifer and the Upper and Middle Chinle aquifers, a tailings toe drain system, a zeolite water treatment system on top of the LTP, an R.O. water treatment plant, two collection ponds, and three evaporation ponds (*see* Figure 2). Previously, the restoration program included dewatering and flushing of the LTP to enhance source control. HMC discontinued the tailing flushing program in 2015 and LTP dewatering in 2017.

Treated water compliant with State groundwater standards and fresh water pumped from the SAG aquifer are currently injected into the alluvial aquifer and the Upper and Middle Chinle aquifers to reverse the natural gradients and to flush contaminated groundwater toward collection wells. The collection wells are used to pump the contaminated groundwater from the aquifers. Groundwater pumped from wells located within the NRC license boundary is piped to the R.O. treatment plant; groundwater pumped from wells located outside of the NRC license boundary is piped to the zeolite treatment system or discharged into lined collection ponds or one of three lined evaporation ponds. Modifications to the injection and collection systems have been made as restoration has progressed, including discontinuing injection in some downgradient alluvial wells and adding injection wells closer to the collection wells. Figure C-8 in Appendix C shows the current injection and collection systems.

Historically, groundwater collected from areas outside of the NRC license boundary was used for irrigation (a practice initially started in 2000 as a means for water disposal). Center pivot irrigation and flood irrigation systems were used. The irrigated areas are shown as four LTAs in Figure 2. NMED prohibited use of the irrigation systems with a renewal/modification of DP-200 and required groundwater treatment instead. Irrigation at the LTAs ended in 2012.

Water Treatment Systems

HMC operates the R.O. treatment plant and zeolite treatment systems at the Site. The R.O. treatment process includes lime clarification and microfiltration as pre-treatment to the R.O. treatment units. Sludge from the R.O. treatment process is discharged to the west collection pond. Brine water generated in the treatment process is discharged to the evaporation ponds. HMC completed significant upgrades to the R.O. treatment plant from 2015 through 2020 to expand the treatment capacity of the R.O. system. In 2015, equalization basins, an additional clarifier, and a microfiltration unit upgrade were added to the system. In addition, a Low-Pressure R.O. Unit was

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added. In 2016, a High-Pressure R.O. Unit was added to reduce total brine stream from the R.O. plant to the evaporation ponds. In 2019, the existing microfiltration modules were replaced and additional modules were added.

The expanded and upgraded R.O. system has a theoretical design capacity to treat 1,200 gallons per minute (gpm) of water. However, while these system improvements increased the theoretical design capacity flowrates up to 1,200 gpm, these "nameplate" rates were never expected to be sustainable as long-term treatment rates. The theoretical design capacity is the maximum output of a system operated continuously during a given period under optimal conditions. Theoretical design capacity does not account for down time from planned or unplanned maintenance, component underperformance/failure and other site-specific factors (*e.g.,* weather-related downtime). The average treated water rate (input rate) at the R.O. plant from 2016 through 2020 was 436 gpm. The average R.O. product water recovery rate and brine generation rate (output rates) for the same period were approximately 329 gpm and 92 gpm, respectively. The brine water generated over the last five years represents about 28 percent of the total output from the R.O. treatment plant.

In addition to operating the R.O. treatment plant, HMC utilizes zeolite bed filtration technology to treat uranium-contaminated groundwater collected from wells located off the NRC license boundary. Such utilization has undergone significant change from 2015 through 2020. HMC evaluated the zeolites as an additional innovative, but unproven, alternative to address treatment of off-site, less impacted groundwater within a fairly small treatment system footprint. In 2016, HMC built a 1200 gpm full-scale zeolite water treatment plant on top of the LTP after pilot testing of 50 and 300 gpm systems indicated promise. Unfortunately, system operations from 2016 through 2018 demonstrated that overall efficiency was less than original system design expectations due to unforeseen physical limitations of the regeneration process. These limitations resulted in a much lower actual efficiency. In 2017, the regeneration process was redesigned. The redesign required a change to the effluent piping to allow for independent operation of each of the trains for either treatment or regeneration. Unanticipated algae growth has become an increasingly significant problem in the zeolite treatment system, severely limiting efficient operation and requiring algae cleanout at a greater frequency than is required for regeneration. From 2016 to 2020, the zeolite treatment systems have been operated at a rate anywhere from zero to 200 gpm due to the ongoing algae issues. With a recent, July 2021 amendment to NRC License SUA-1471, HMC is now evaluating a copper sulfate additive to the zeolite treatment system to control algae growth. Additional operational issues include exposure of system components to the elements, weather delays (lightning, etc.), and overall difficulties in operating an innovative treatment system.

Despite the challenges noted above, HMC has successfully operated the R.O. plant and zeolite treatment systems over the 2016 to 2020 timeframe at a combined average rate of 678 gpm. This has resulted in the removal of approximately 72,000 pounds of uranium from the aquifers during this time period. The treatment rate of 678 gpm includes a reduction in treatment from 2018, and continuing through the spring of 2021, to reduce the total volume of brine water requiring evaporation. The reduction in brine water was necessary to dewater Evaporation Pond No. 1 to facilitate replacement of a damaged liner. However, the planned relining of the pond has been put on hold due to the COVID-19 pandemic. Currently, HMC is not draining down the brine water in the pond for liner replacement, but operating the pond at a lower water level due to the tears at the top of the liner. At this operating level, NRC estimates that the available evaporative capacity of Evaporation Pond No. 1 is only limiting the total evaporative capacity of system by about five percent. NRC has also estimated that, given the limitation of the total pond evaporative capacity, the combined operational water treatment capacity of the R.O. plant and zeolite treatment systems should be approximately 900 gpm.

OU2 – Long-Term Tailings Stabilization, Surface Reclamation and Site Closure

HMC began demolition activities at the mill facility in 1992. Mill debris was deposited in the LTP or buried in pits in the mill area or south of the LTP. Prior to and following demolition of the mill facility, HMC removed soil contaminated by windblown tailings, ore storage and processing. HMC removed surface soil from about 1,200 acres of land and disposed of most of the soil on the eastern side slope of the LTP. Significant quantities were also placed on the southern end of the STP and the apron of the LTP.

HMC placed cover materials on the former mill area, the LTP and the STP as part of mill decommissioning efforts. At the former mill area, located southeast of the LTP, HMC backfilled excavated areas with clean alluvial soils. HMC also placed at least two feet of clean soil over the entire mill area.

HMC regraded and recontoured the surface of the LTP to improve long-term stability and drainage, and to prepare for final covering and closure. In 1994, HMC constructed a final radon barrier and erosion protection cover (rock cover) on the sides of the LTP, as well as an interim soil cover on its top. Since this initial placement, HMC has placed more soil cover on the LTP to fill depressions caused by settlement, improve drainage and address specific areas with elevated radon flux[15] measurements. In 1995, HMC constructed an interim one-foot soil cover on the part of the STP not covered by Evaporation Pond No. 1. The placement of final radon barriers on the STP and LTP is not planned to occur until groundwater restoration activities are completed and the facilities and equipment on top of the tailing piles are removed and the wells on top of the piles are properly plugged and abandoned.

Following soil cleanup activities, HMC regraded drainage areas at the HMC Facility and established surface channels for drainage. These activities were completed by 1995. Mill decommissioning at the Site met applicable standards in 10 CFR Part 40, Appendix A, and applicable conditions of NRC License SUA-1471.

HMC conducted a pilot study at a portion of the LTP between December 2010 and May 2012 to evaluate the possibility of a rebound in contaminant concentrations once the flushing program ended. Data from the study found that significant rebound was not expected. HMC ended the LTP flushing program in July 2015.

HMC began plugging and abandonment of injection, collection, and monitoring wells on top of the LTP in 2018. The injection and collection wells were used for the tailing flushing program, which was discontinued in 2015. The plugging and abandonment work was completed on July 23, 2021; a total of 641 wells were plugged and abandoned. Several monitoring wells selected by HMC, and concurred on by the regulatory agencies, will remain in place for continued monitoring of the tailing water within the pile and the underlying aquifers as part of the ongoing groundwater monitoring program.

OU3 – Radon in Neighboring Subdivisions

EPA conducted a removal action to install radon mitigation systems at 11 residences in the neighboring subdivisions in 2012. EPA also conducted a soil removal action at 16 residential properties to clean up radium-226 contamination and debris from two additional residential properties in 2014. The indoor air radon levels and the radium-226 contamination in soil and debris was not attributed to the Site.

EPA's 2014 HHRA-Subdivisions showed a risk exceeding EPA"s excess lifetime cancer risk range of 10-4 to 10-6 for elevated levels of radon in ambient (outdoor) air in the residential neighborhoods. Most of the risk is

[15] Flux is defined as the rate of flow of fluids, particles, or energy across a given surface area.

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attributable to background concentrations of radon; however, some risk was determined to be site-related. Placement of the final radon barrier on top of the LTP and STP as part of reclamation and closure for OU2 are expected to reduce site-related radon concentrations in ambient air.

OU1 and OU2 Activities Completed Since the 2016 FYR

In addition to groundwater monitoring and operation and maintenance (O&M) activities completed for OU1 and reclamation and closure activities completed for OU2, the following other OU1 and OU2 activities have occurred since 2016:

Remedial Investigation Report as Part of CERCLA Equivalency Process for OU1 and OU2
HMC prepared the RI Report for OU1 and OU2 as part of the ongoing CERCLA RI/FS equivalency process. The RI Report is a compilation and summary of data and other information collected from previous investigations, decommissioning activities, reclamation, and groundwater corrective action performed over the years pursuant to NRC license conditions, NMED's groundwater discharge permitting program, and as directed by other regulatory authorities. This work is summarized in HMC's 2013 CERCLA Equivalency Package, which included a compilation of the historical documents. HMC, in consultation with EPA, also performed additional work for site characterization and baseline risk assessments to fill gaps identified for completing the RI equivalency process. HMC documented this additional work in the RI Report that was approved by EPA in June 2020. The RI Report included the following:

- Site history, including mill operation history, decommissioning activities, groundwater restoration activities completed to date, and HMC supply of drinking water to residences in neighboring subdivisions;
- Site characterization, including: 1) hydrogeology of the alluvial, Chinle, and SAG aquifers; 2) historical mining impacts to the alluvial aquifer north of the Site, as reported in EPA's 2018 Phase 2 groundwater study for the San Mateo Creek Basin; and 3) HMC's assessment and supplemental investigation of background concentrations in the alluvial aquifer;
- Nature and extent of contamination, including an assessment of the remediation performed as part of decommissioning under UMTRCA and NRC License SUA-1471 requirements and whether it satisfies CERLA and NCP requirements for protectiveness;
- Contaminant fate and transport;
- Risk analysis consisting of a baseline HHRA for the HMC Facility and the LTAs and a site-wide BERA; and
- Summary and conclusions on the nature and extent of contamination at the HMC Facility and LTAs, the baseline risk assessments, and EPA's supplemental HHRA-Subdivisions.

The RI Report also includes a discussion of the windblown contamination cleanup that was conducted in the late 1980s and early 1990s as part of decommissioning activities. Remediation of windblown contamination in surface soil, primarily radium-226, within and outside of the NRC license boundary, was performed. UMTRCA standards for radium-226, specified in 10 CFR Part 40, Appendix A, Criterion 6, which conforms to EPA's environmental standards at 40 CFR 192, were used for the soil cleanup. The radium-226 standards were 5 pCi/g above background in surface soil (upper 15 cm) and 15 pCi/g above background in subsurface soil (below a depth of 15 cm). Based on the radium-226 background level of 5 pC/g in soil, determined by HMC, the site-specific cleanup levels were set at 10.5 pCi/g and 20.5 pCi/g for surface and subsurface soil, respectively.

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Confirmatory sampling was performed following the windblown soil remediation that consisted of both field gamma readings and soil sampling and analysis. The soil sample results showed the mean radium-226 concentration was 2.95 pCi/g, and the 95 percent upper confidence level (UCL) using statistical testing was 3.5 pCi/g. Although the residual concentrations of radium-226 in soil were below the UMTRCA standards, an evaluation was made to determine if such concentrations were consistent with CERCLA and NCP requirements for protectiveness. A comparison of the residual radium-226 concentrations in the windblown remediation area was made to the cleanup levels used by EPA for the 2014 soil removal action at residential properties in the neighboring subdivisions. EPA selected a radium-226 cleanup level of 3.5 pCi/g, inclusive of background, for the removal action. At that time, the removal cleanup level equated to an excess lifetime cancer risk of $3x10^{-4}$, which was considered by EPA to be protective of human health. The residual average radium-226 concentrations did not exceed the EPA's cleanup level established for the removal. Confirmatory gamma radiation scans, performed to verify the adequacy of the cleanup, showed the average gamma reading of 16,629 counts per minute (cpm) was slightly higher than the average gamma scan reading of 14,337 cpm recorded by HMC in 2019 at an area north of the HMC facility; however, the confirmatory scanning methodology was considered to be biased high. HMC calculated the potential health risks within the windblown remediation area outside of the NRC license boundary for a future trespasser scenario to be within EPA's acceptable excess lifetime cancer risk range of 10^{-4} to 10^{-6}.

The RI Report also discusses HMC's evaluation of the LTAs as potential secondary source areas. Based on site data, HMC showed no apparent data trends that point to groundwater impacts from historical irrigation activities using low-level contaminated groundwater.

Question B of this FYR Report describes the results of the risk assessments completed as part of the RI.

HMC Evaluation of Background Water Quality

In 2016, HMC elected to conduct an independent background study for groundwater at the Site after EPA had obtained the support of the U.S. Geological Survey (USGS) to perform an investigation of the anomalous high concentrations of dissolved uranium at alluvial background monitoring well DD (discussed below). Well DD is a key location used in the calculation of the current Site background levels. HMC split groundwater samples collected by the USGS at well DD and other alluvial wells for independent analyses. HMC also drilled and cored soil boreholes for mineralogical analysis of core samples and performance of downhole borehole geophysics. HMC submitted a white paper to EPA and NMED documenting the results of the evaluation in 2018 and putting forth a conceptual site model (CSM) that describes local naturally occuring mineralogical sources of uranium as the source of the high uranium concentrations in groundwater.

HMC, in consultation with EPA and NMED, performed a supplemental background soil and groundwater investigation in 2018 and 2019 to expand on the work it completed in 2018 and to address EPA and NMED concerns with the study. The purpose of the supplemental investigation was to refine the CSM for natural uranium distribution and transport by identifying the mineralogical heterogeneity and hydraulic conductivity, as well as local variability of uranium concentrations, across the alluvial paleochannel upgradient of the LTP. Additional boreholes were drilled and cored as part of the study and laboratory batch leach tests were performed on select core samples. HMC submitted a supplemental background report to EPA in August 2019. In the report, HMC concluded that the alluvial sediments contained leachable uranium. HMC also concluded that the groundwater samples from the monitoring wells used in the 2006 background study captured the natural variability and heterogeneity of the mineralogy of the alluvial sediments and represent the natural uranium

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concentration variations in alluvial groundwater upgradient of the Site. The results of the supplemental investigation are presented in the 2020 RI Report.

HMC also performed a review of the 2006 statistical background study for groundwater. The review included an evaluation of the statistical methods used to calculate the existing background levels and recalculation of background using an independent software program consistent with up-to-date EPA guidance for comparison to the original calculations. HMC concluded that the previous statistical background assessment used to establish the current NRC-approved cleanup levels appears robust and the use of updated statistical methods to calculate background would result in only minor adjustments. HMC provided the results of this review to EPA and the other regulatory agencies in September 2019.

EPA and NMED Reassessment of Background Groundwater Quality

EPA and NMED began a reassessment of background in about 2014 at the request of BVDA and MASE, the two local community groups. USGS supported EPA in this effort and performed a study in 2016 focused on alluvial groundwater at several monitoring wells, include background monitoring wells DD and DD2. The purpose of the study was to differentiate between anthropogenic and natural sources of uranium in groundwater by geochemical fingerprinting. USGS published two papers in the Environmental Earth Sciences journal in 2019 that documented its findings. The results of the USGS study were inconclusive regarding the source of uranium in alluvial groundwater upgradient of the Site and USGS recommended additional studies be performed for the background reassessment.

BVDA and MASE hired two consultants to review the background technical reports and other information prepared by the regulatory agencies, the USGS, and HMC, and to perform an independent reassessment on background. In December 2019, EPA received technical papers by the BVDA and MASE consultants proposing new background levels for uranium and selenium in the alluvial aquifer. EPA and NMED met with BVDA, MASE, and their consultants in March 2020 to discuss the consultants' findings. At the meeting, NMED agreed to perform additional geochemical modeling and analysis of alluvial groundwater at the request of the two community groups.

NMED performed a background geochemical modeling study and released a report in September 2020. The purpose of the study was to determine the source of the groundwater and uranium at well DD. NMED and EPA received comments from HMC on the modeling report in October 2020, and an updated report was released in May 2021 that addressed several of HMC's technical concerns. NMED performed the modeling using the computer software program PHREEQC. NMED's report describes hydraulic and geochemical impacts to the alluvial aquifer upgradient (north) of the LTP that were likely caused by historical mine water discharges. NMED describes a CSM where approximately 125 billion gallons of mine water were discharged from legacy underground uranium mines that operated from the mid-1950s to early-1980s in the Ambrosia Lake valley to impact the basin. The CSM includes the transport of mine-water discharges, as surface water flow, into the lower San Mateo Creek floodplain to infiltrate and recharge the alluvial aquifer. Graphs of constituent concentrations over time for alluvial monitoring wells located upgradient of the LTP, including well DD, are presented in the report. The graphs show transient (changing) conditions in concentrations of uranium, selenium, and other constituents. The transience or non-steady state conditions support NMED's model for the infiltration of mine-water discharges and the subsequent mixing with native alluvial groundwater. The report states that changing concentrations of the constituents in groundwater over time indicate that the aquifer system has not yet returned to steady state after the recharge event and are not representative of natural background water quality. The report also states that the results of the batch-leach tests conducted by HMC in 2018 and 2019 on core samples collected near wells DD and DD2 are inconclusive and do not demonstrate predominance of naturally occurring uranium

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leached from alluvial sediments. NMED concluded that the anomalously high concentrations of uranium and other constituents at wells DD and DD2 are likely the result of 1) mixing of native alluvial groundwater and mine-water discharges, and 2) vadose zone[16] leaching of constituents occuring with rising water table conditions caused by mine water recharge and the hydraulic damming at and near the LTP from tailing seepage and the groundwater restoration program operated by HMC at the Site for the past several decades.

EPA and NMED continue to reassess background for the alluvial and three Chinle aquifers at the Site and plan to perform updated statistical calculations of naturally-occurring background. The new background concentrations will inform the process for developing PRGs as part of the ongoing CERCLA FS for OU1 and OU2.

Feasibility Study as part of CERCLA Equivalency Process for OU1 and OU2, including a Technical Impracticability Evaluation for Groundwater

HMC is performing a CERCLA FS in accordance with the 2020 ASAOC signed by EPA and HMC and a statement of work attached thereto. The work includes the initial development and screening of a range of remedial alternatives, followed by a detailed analysis on a limited number of alternatives that pass the screening step. HMC is also performing an evaluation of the technical impracticability (TI) of groundwater restoration. HMC has informed EPA and the other regulatory agencies that it believes it is technically impracticable to achieve groundwater ARARs, such as the current NRC cleanup levels, State groundwater standards, or federal MCLs, and has requested EPA consider invoking a waiver of such standards in future EPA decision-making pursuant to CERCLA § 121(d)(4).[17] HMC submitted a revised draft technical memorandum on the development

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[16] Vadose Zone is defined as the zone of unsaturated soils or sediments below ground surface and above the water table.

[17] Technical impracticability (TI) is one of several reasons specified in CERCLA and the NCP for EPA to waive an ARAR such as a federal drinking water standard or state groundwater standard. The NCP states that "EPA expects to return usable groundwaters to their beneficial uses wherever practicable, within a timeframe that is reasonable given the particular circumstances of the site" (40 CFR § 300.430(a)(1)(iii)(F)). However, EPA recognizes that restoration to drinking water quality may not always be achievable due to the limitations of available remediation technologies. Therefore, EPA needs to evaluate whether groundwater restoration is feasible from an engineering perspective. Determination of TI will be made by EPA based on an evaluation of site-specific characteristics and remedy performance data. The TI evaluation generally includes the following components:

- Specific ARARs to which TI determinations are sought;
- Spatial area over which the TI decision will apply;
- Conceptual site model that describes the hydrogeology and the groundwater contaminants, sources, fate, and transport;
- An evaluation of the restoration potential of the site, including data and analyses that support any assertion that attainment of ARARs is technically impracticable from an engineering perspective;
- Estimates of costs of existing or proposed remedies;
- Any additional information or analyses that EPA deems necessary for a TI evaluation.

In accordance with EPA guidance for evaluating TI for groundwater restoration (EPA Directive 9234.2-25), a TI evaluation should include a demonstration that no other remedial technologies or strategies would be capable of achieving groundwater restoration at a site. Furthermore, any demonstration that groundwater restoration is technically impracticable should be accompanied by a demonstration that contaminant sources have been, or will be, removed or treated where feasible. If EPA determines that a TI waiver of an ARAR is supported, based on a thorough review and analysis of the TI evaluation, EPA will invoke the waiver and select an alternative remedial strategy that is technical practicable, protective, and satisfies CERCLA and NCP requirements in a ROD. If a groundwater ARAR is waived at a Superfund site due to TI, EPA's general expectations include preventing further migration of the groundwater contaminant plume and preventing exposure to the contaminated groundwater. Where a Superfund ROD invokes a TI waiver, EPA must provide notice of its intent to waive the ARAR in the Proposed Plan and respond to any state, tribal, or federal agency or public comments concerning the waiver. The Proposed Plan is released to the public for comment before issuance of a ROD.

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and screening of remedial alternatives in April 2020, a draft TI Evaluation Report in November 2020, and a draft FS Report in December 2020. These draft documents are currently under review by EPA.

In October 2020, EPA's National Remedy Review Board (NRRB)[18] selected the ongoing CERCLA FS for review at the recommendation of EPA Region 6. The Site was selected due to complexities of site characteristics, environmental impacts, and ongoing groundwater restoration. The Board review team held a series of virtual meetings with Region 6 on March 25 and 26, 2021, to discuss the RI and various aspects of the ongoing FS. State and tribal stakeholders, as well as HMC and the two community groups (BVDA and MASE), were provided the opportunity to make verbal statements to the Board and to submit written statements on their expectations for the CERCLA remedy. NMED and the Pueblo of Acoma gave presentations to the Board review team in a separate state/tribal stakeholder meeting. HMC and BVDA/MASE also gave presentations to the Board review team in another separate meeting in which NMED and the Pueblo of Acoma were allowed to attend. The Pueblo of Laguna did not attend the stakeholder meeting but provided a written statement to the Board. EPA Region 6 attended all stakeholder meetings. The NRRB submitted recommendations to Region 6 on June 15, 2021. They are currently under review. Region 6 will provide written responses to the Board review team's recommendations in October 2021.

Update of Groundwater Corrective Action Plan for NRC

HMC submitted an updated draft GCAP to the NRC in 2019. The purpose of the updated GCAP is to satisfy NRC license requirements for groundwater CAPs, provide an update regarding current site groundwater conditions, describe recent modifications to the groundwater restoration program, discuss the proposed future implementation of the CAP, and present predictions as to when completion of groundwater restoration is expected based on updated groundwater flow and transport modeling.

The draft GCAP provides a screening and evaluation of remedial technology options to identify a preferred groundwater restoration program that is generally consistent with CERCLA FS requirements and recommends a CAP based on this evaluation. Although the GCAP focuses on the current groundwater corrective action as the means for achieving the requirements of 10 CFR Part 40, Appendix A, Criterion 5 (Domestic Licensing of Source Material criteria),[19] HMC states in the GCAP that it believes the long-term groundwater corrective action will require approval of alternate concentration limits (ACLs) by the NRC that would be the subject of a subsequent license amendment application. The draft GCAP is currently under review by NRC. HMC has proposed submitting a draft ACL application to NRC in December 2021.

HMC Land Treatment Area Soil Sampling and Analysis

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[18] The NRRB is a technical and policy review group made up of experienced members with both regional and headquarters perspectives in the CERCLA remedy selection process. The NRRB's primary mission is to ensure national consistency in remedy selection at selected sites and will assists the regions in operating in a nationally consistent manner in compliance with CERCLA, the NCP, and applicable agency guidance. A Board Review Team is comprised of key members of the NRRB that brings the appropriate experience for the type of site under review. The Board Review Team is positioned to provide support to the regions in developing a comprehensive suite of remedial alternatives that should be evaluated in the FS.

[19] Criterion 5 of 10 CFR Part 40, Appendix A, incorporate basic groundwater protection standards imposed by EPA in 40 CFR 192, Subparts D and E, which are health and environmental standards for uranium and thorium mill tailing.

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In 2017 and 2018, HMC completed comprehensive soil sampling and analysis at the LTAs as the Final Status Survey.[20] The objective was to evaluate whether contaminants of potential concern met the proposed criteria for unrestricted release from NRC License SUA-1471. Over 100 soil samples were collected and analyzed for selenium, uranium, and radium-226. Based on the results, HMC concluded that the criteria for unrestricted release from the NRC License had been met. In 2018, to confirm these results, HMC funded a study by the Oak Ridge Institute for Science and Education to independently sample soil at the four LTAs. Results of the study were consistent with the Final Status Survey. They are summarized in the 2020 RI Report.

HMC San Andres/Glorieta Aquifer Investigation
In 2020 and 2021, HMC conducted an investigation of the SAG aquifer at the location where it is known to subcrop to the base of the Rio San Jose alluvial aquifer southwest of the HMC Facility. The purpose of the investigation was to characterize the physical and geochemical properties of the SAG aquifer and to evaluate the hydraulic connection[21] between the SAG aquifer and the overlying alluvial aquifer. The information was used to update the HMC CSM and groundwater flow and solute transport model at the Site. HMC drilled and cored two boreholes into the SAG formation and installed monitoring wells. Lithologic cores were analyzed to measure physical properties, including porosity. Boring geophysical logging was also performed. HMC also installed three alluvial piezometers to measure water levels in the alluvial aquifer at the SAG subcrop area. A draft report was submitted to EPA and NMED in May 2021 and is currently under review.

Well Integrity Testing of San Andres-Glorieta Aquifer Monitoring and Water Supply Wells
HMC conducted well integrity tests at several SAG water supply wells and monitoring wells in 2015 and 2016. The results showed compromised casing integrity at well 928, corrosion of the casing in well 943 and other integrity concerns with the wells. Due to these concerns, HMC installed replacement monitoring well 943M in December 2017 and abandoned well 943 in July 2018. HMC also drilled water supply replacement wells #1R Deep and #2R Deep in 2018 and abandoned monitoring well 928 in 2018 and water supply well #1 Deep in 2019. The water supply replacement wells #1R Deep and #2R Deep were drilled deeper into the SAG aquifer in 2021 to improve water production. SAG well integrity testing is a requirement of NMED Discharge Permit DP-200.

Institutional Control Review

Table 3 summarizes institutional controls (ICs) in place or planned for the Site, with additional OU-specific information below.

OU1 – Tailings Seepage Contamination of Groundwater Aquifers

In 2009, NMED issued a health advisory for private wells within the San Mateo Creek basin. The advisory cautions current and future owners and users of private wells that their well water could contain contaminant concentrations above federal drinking water standards. The NMED Health Advisory is considered to be an informational institutional control.

[20] The Final Status Survey is the measurements and sampling to describe the radiological conditions of a site following completion of decontamination activities in preparation for release. The objective of the survey is to show that residual radioactivity levels within the survey areas are less than the limits for unrestricted release.

[21] Hydraulic connectivity of two aquifers is a condition where permeable material in one aquifer is in contact with such material in another aquifer that allows for the free movement of groundwater from the one aquifer to the other under an hydraulic gradient.

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In May 2018, the New Mexico Office of the State Engineer (NM-OSE) issued a State Engineer Order (Order) restricting well drilling in the alluvial and Chinle aquifers within an area where groundwater is contaminated with uranium, selenium, combined radium-226 plus radium-228, molybdenum, chloride, nitrate, sulfide, and total dissolved solids (TDS) from historical uranium milling and mining activities. The Order protects human health and prevents interference with groundwater flow associated with ongoing remediation. The Order restricts the permitting and drilling of new wells, replacement wells, and supplemental wells, and restricts the permitting of any change to the point of diversion of any existing wells within the boundaries defined. This moratorium excludes permit applications that are submitted on behalf of NMED, or that may be required for remedial action and monitoring, and excludes areas within the NRC-licensed boundaries for this Site and the U.S. Department of Energy (DOE) - Office of Legacy Management's (DOE-LM's) Bluewater Disposal Site.[22]

EPA will evaluate the need for more ICs as part of the ongoing OU1/OU2 FS.

OU2 – Long-Term Tailings Stabilization, Surface Reclamation and Site Closure

HMC currently restricts access within the NRC license boundary with a security fence and warning signs. The HMC Facility maintains security support services, security alarm systems and site entry controls. Once site reclamation, closure, and groundwater corrective action are complete, HMC will maintain the site controls until transfer of title to DOE-LM. Upon title transfer, DOE-LM will assume custody of and responsibility for the tailing disposal site and potentially other land within an established general NRC license boundary in perpetuity. Restrictions will need to be put in place to prevent disturbance of soil, waste, and any remedy components to prevent unacceptable future use and to prevent use of groundwater for potable purposes.

The 2020 RI Report noted that HMC was developing a Declaration of Restrictive Covenants, as a proprietary IC, that upon recording, will prohibit residential and agricultural use of the LTAs and use of groundwater beneath the LTAs for drinking water purposes. EPA will evaluate the need for this and any other ICs that may be components of remedial alternatives being developed as part of the CERCLA FS for OU1 and OU2.

OU3 – Radon in Neighboring Subdivisions

Decision documents did not require ICs for OU3. However, annual radon flux measurements and radon monitoring at the fence line of the NRC license boundary is required under NRC License SUA-1471.

[22] The DOE Bluewater Disposal Site is a former uranium mill site located about 4 miles west-northwest of the HMC Facility. The site is under long-term surveillance and maintenance by the DOE Office of Legacy Management.

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Table 3: Summary of Planned or Implemented Institutional Controls

Media, Engineered Controls and Areas that do not Support UU/UE Based on Current Conditions	ICs Needed?	ICs Called for in the Decision Documents[a]	Impacted Parcels	IC Objective	Title of IC Instrument Implemented or Planned (Date)
Groundwater, soil and waste within the NRC license boundary	Yes	No	Parcels within the NRC license boundary (see Figure 3)	To prevent disturbance of 11e.(2) byproduct material in soil and waste and any remedy components; to prevent unacceptable future use; and to prevent use of groundwater for potable purposes.	CERCLA OU1/OU2 FS to evaluate need for ICs UMTRCA requires HMC to transfer a part of the Site that includes the LTP and STP to DOE-LM for long-term surveillance and maintenance, which will limit public access in perpetuity.
LTAs outside the NRC license boundary	Unknown	No	Parcels within LTAs (see Figure 3)	To prohibit residential and agricultural use and to prohibit use of groundwater beneath the LTAs for drinking water.	Restrictive covenants (proposed by HMC)[b] CERCLA OU1/OU2 FS to evaluate need for ICs

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Media, Engineered Controls and Areas that do not Support UU/UE Based on Current Conditions	ICs Needed?	ICs Called for in the Decision Documents[a]	Impacted Parcels	IC Objective	Title of IC Instrument Implemented or Planned (Date)
Groundwater outside the NRC license boundary	Yes	No	Parcels overlying the contaminant plumes (see Figure 3)	To caution current and future owners and users of private wells in the San Mateo Creek basin that their well water could contain contaminant concentrations above federal drinking water standards. To restrict well drilling in the alluvial and Chinle aquifers in an area where groundwater is impacted by historical uranium milling and mining activities.	NMED Health Advisory (2009) NM-OSE Order for drilling moratorium (2018) HMC recording restrictive covenants on HMC property which restricts the use of domestic wells[c] CERCLA OU1/OU2 FS to evaluate need for ICs

Notes:

a) EPA decision document(s) have not yet been issued for OU1 and OU2.

b) HMC has proposed IC for the LTAs, but the HHRA did not assess the potential risk for a residential or agricultural use for the LTAs, so the need for such an IC at the LTAs is unknown.

c) HMC is currently purchasing property outside of the NRC license boundary and recording restrictive covenants which restricts the use of domestic wells.

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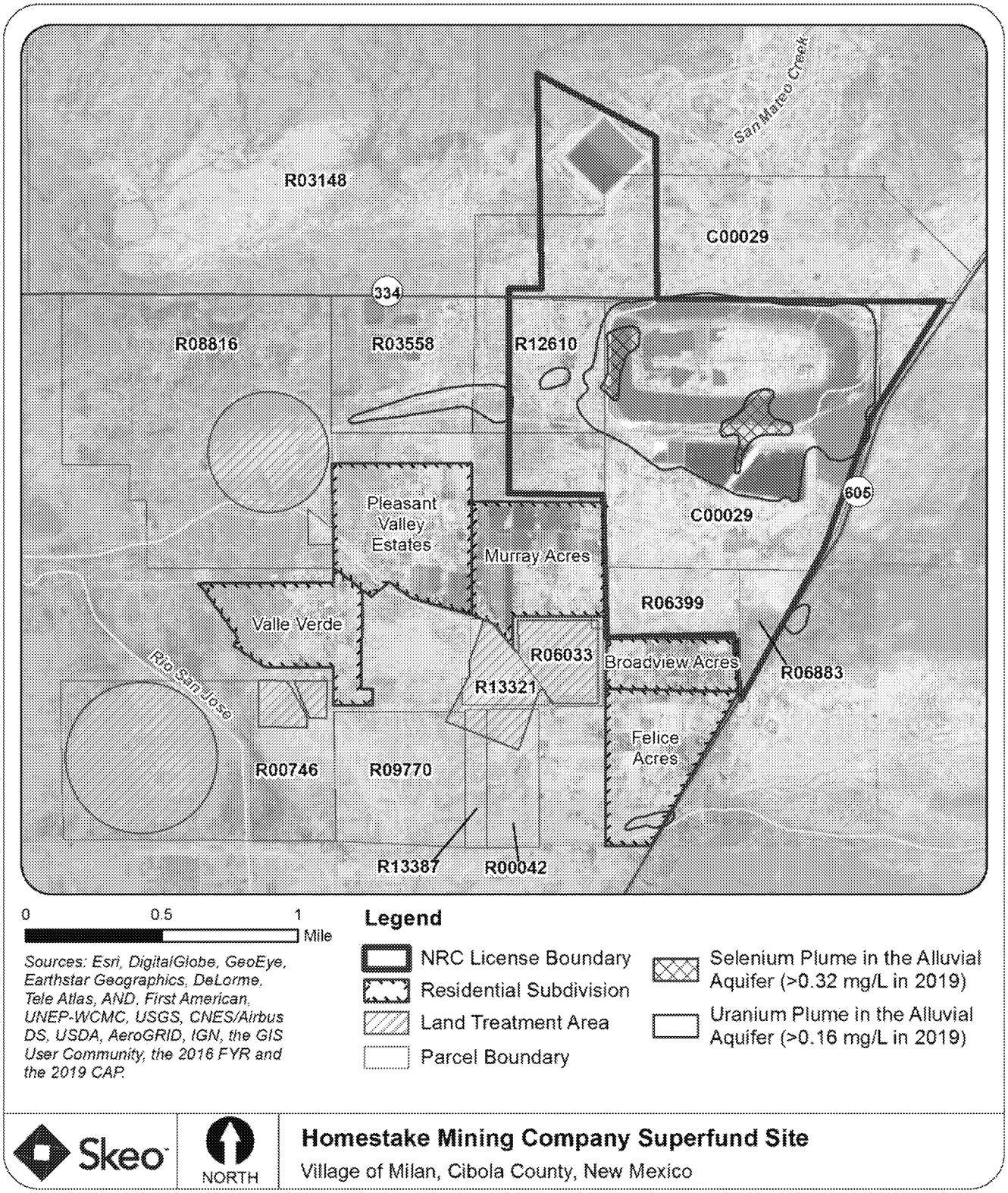
Figure 3: Institutional Control Map



Disclaimer: This map and any boundary lines within the map are approximate and subject to change. The map is not a survey. The map is for informational purposes only regarding EPA's response actions at the Site.

Systems Operations/Operation and Maintenance

OU1 – Tailings Seepage Contamination of Groundwater Aquifers

NRC License SUA-1471 and NMED Discharge Permit DP-200 stipulate O&M requirements for OU1. Several documents kept at the HMC Facility also outline O&M activities. The O&M activities include:

- O&M and monitoring of the groundwater injection and collection wells and associated water conveyance piping;
- O&M of the R.O. treatment plant, zeolite treatment systems, collection ponds and evaporation ponds;
- Groundwater sampling and monitoring;
- Air monitoring; and
- Maintenance of air monitoring stations and groundwater monitoring wells.

HMC personnel are at the Site daily during the week doing O&M activities. Daily and weekly inspections verify the condition of the R.O. treatment plant and zeolite treatment systems components. HMC monitors the volume of groundwater collected and amount of contaminants removed as a part of O&M activities. Over 7 billion gallons of groundwater were extracted from the on-site collection system between 1978 and 2020. Over 1 billion gallons were extracted during the last five years (2016-2020). Additionally, more than 1.2 million pounds of uranium and 73,000 pounds of selenium have been removed from groundwater, with subsequent treatment by the R.O. treatment plant since 1978. Over the last five year, approximately 72,000 pounds of uranium and 4,000 pounds of selenium have been removed. Table C-2 in Appendix C lists the total volume of groundwater collected and quantities of constituents removed by the Site's groundwater collection and tailings dewatering systems from 1978 to 2020.

O&M activities also include periodic monitoring of several hundred groundwater monitoring wells and continual O&M of dozens of collection and injection wells. The Data Review section of this FYR Report summarizes recent groundwater sampling results.

During ongoing O&M activities at the Site during this FYR period, HMC identified and reported the following two spills to the NRC, EPA and NMED:

- A release of non-impacted water from the "Y" injection wellfield occurred on December 20, 2019, as a result of a broken flowmeter caused by freezing temperatures. The spill, estimated to be between 50,000 and 72,000 gallons of injection water, affected an area of about 20,000 square feet. The entire wellfield, both collection and injection systems, and the zeolite system were shut down to complete the inspection. The systems are currently back up and running. The injection water does not include contaminated groundwater, but is compliant with State groundwater standards as required by NMED Discharge Permit DP-200.

- A release of impacted groundwater from the off-site collection pipeline at collection well 490 occurred south of the NRC license boundary in a vacant lot owned by HMC. HMC discovered and stopped the accidental release on September 1, 2020. The release is believed to have begun about six days earlier due to a check valve failure, combined with the fact that two manual valves had inadvertently been left in the open position prior to resumption of pumping off-site groundwater to the zeolite treatment facility.

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An estimated 216,000 gallons of impacted groundwater were released to the ground. None of the spilled groundwater migrated outside of the boundaries of the vacant lot (beyond HMC property). HMC performed a gamma radiation survey and soil sampling to determine potential environmental or health impacts of the release. These response actions demonstrated that: 1) radiological impacts were not significant relative to the public radiation limits (dose limits) given in federal regulations at 10 CFR 20.1301; 2) incremental uranium concentrations in surface soils were insignificant and likely not measurable relative to background; and 3) the release impacted only property owned by HMC. Therefore, soil remediation was not deemed necessary by the regulatory agencies.

Alluvial groundwater beneath the HMC property where the spill occurred is already contaminated. If the spilled groundwater percolates downward to the water table, it would not further degrade the quality of the groundwater currently present in this area of the aquifer.

At the request of NMED, HMC also performed an incident investigation to identify additional corrective actions to prevent this type of incident occurring in the future, including updating standard operating procedures (SOPs) specific to the groundwater extraction and conveyance system for the zeolite filtration treatment operation. HMC submitted a Corrective Action Report to NMED in November 2020 that identified these and other preventative actions it would undertake. NMED approved the report in December 2020.

OU2 – Long-Term Tailings Stabilization, Surface Reclamation and Site Closure

NRC License SUA-1471 conditions require that HMC conduct annual inspections of the tailing piles and pond dikes, and annual radon flux surveys for the tailing piles. The annual inspections include visual observations of the tops and out slopes of both tailing piles and dikes and the slopes and liners of the evaporation ponds. The inspections also include review of piezometer (depth of water) readings, tailing collection well and tailing drainage sump collection rates, leak detection monitoring records for two of the evaporation ponds (Evaporation Pond Nos. 2 and 3), settlement monitoring survey data, pond-level measurements, and other data. Annual reports submitted to NRC, EPA and NMED document the results of the inspections and the radon flux surveys. Recent results from the annual reports are summarized in the Data Review section of this FYR Report.

OU3 – Radon in Neighboring Subdivisions

There are no current long-term O&M activities for OU3. The radon mitigation systems installed in residential homes are robust and do not require regular O&M. Homeowners with mitigation systems are responsible for maintaining the systems and have been instructed to contact the installer for servicing any repairs beyond the warranty period.

III. PROGRESS SINCE THE PREVIOUS REVIEW

Table 4 includes the protectiveness determinations and statements from the 2016 FYR Report. Table 5 includes the recommendations from the 2016 FYR Report and the status of those recommendations.

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Table 4: Protectiveness Determinations/Statements from the 2016 FYR Report

OU #	Protectiveness Determination	Protectiveness Statement
OU1	Short-term Protective	The OU1 remedy is currently protective of human health and the environment because the groundwater collection/injection system is containing the highest contaminant concentrations within a defined collection area, primarily within the facility's licensed boundary; the system is also reducing contaminant concentrations in groundwater beyond the facility's licensed boundary; residents near the Site utilize the public water supply or have been given the option to connect to public water. An institutional control in the form of a health advisory is in place to caution current and future owners and users of private wells about potential contamination. In order for the remedy to be protective in the long term, the following actions need to be taken: Complete EPA's reassessment of background groundwater and complete the CERCLA equivalency analysis, including issuance of a ROD for OU1 and OU2. Update the timeframe estimate for groundwater restoration based on current operating conditions and data. Include an estimate of the time needed for groundwater restoration of those areas outside the facility's licensed boundary in addition to the areas downgradient of the source areas. Investigate the source of the elevated uranium in HMC supply wells in the San Andres aquifer to determine if pumping from the San Andres wells is drawing site contamination into the deeper aquifer.
OU2	Short-term Protective	The OU2 remedy is currently protective of human health and the environment because soil contaminated by windblown tailings was excavated and disposed, the mill facility was decontaminated, demolished, and disposed of in the LTP. A final radon barrier and erosion protection cover were constructed on the sides of the LTP, and an interim soil cover was constructed on its top and on the small tailings pile, resulting in exposures to contamination being currently controlled. In order for the remedy to be protective in the long-term, complete the CERCLA equivalency analysis, including issuance of a ROD for OU1 and OU2.
OU3	Protective	The ROD issued for OU3 was a no action ROD. However, EPA conducted removal actions to address concerns identified during supplemental investigations conducted between 2010 and 2014. These removal actions are protective of human health and the environment. Radon mitigation systems and soil/debris removal efforts mitigated exposures to unacceptable levels of contaminants.
Sitewide	Short-term Protective	The remedy at the Site is currently protective of human health and the environment. The removal actions conducted at OU3 are protective of human health and the environment. However, in order for the remedy to be protective in the long-term, the actions identified in the OU1 and OU2 protectiveness statements need to be taken.

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Table 5: Status of Recommendations from the 2016 FYR Report

OU #	Issue	Recommendations	Current Status	Current Implementation Status Description	Completion Date (if applicable)
OU1, OU2	Although remediation is underway under NRC authority, there is no EPA ROD in place for OU1 and OU2.	Complete EPA reassessment of background groundwater and complete the CERCLA equivalency analysis, including issuance of a ROD for OU1 and OU2.	Ongoing	As part of a demonstration of CERCLA equivalency, EPA approved the OU1/OU2 RI Report in June 2020. An FS, TI evaluation, and background reassessment are underway. Following their completion, EPA, in consultation with the State and NRC, and after performing the public, tribal, and state participation process in remedy selection, will select and document a remedy for OU1 and OU2 in a ROD.	10/31/2023
OU1	The 2012 Updated CAP estimated active groundwater restoration to be complete by 2020. However, the estimate was based on groundwater modeling, observed results from present operating conditions and predicted future operating conditions. Several operating conditions have changed since the groundwater modeling, including discontinuation of land treatment and active flushing of the LTP as well as an increase in the operating capacity of the water treatment systems. In addition, groundwater modeling estimated the time for point-of-compliance wells to achieve contaminant of concern (COC) groundwater protection standards. Modeling did not predict COC concentrations for any other areas, including those areas outside the facility's licensed boundary.	Update the timeframe estimate for groundwater restoration based on current operating conditions and data. Include an estimate of the time needed for groundwater restoration of those areas outside the facility's licensed boundary, in addition to the areas downgradient of the source areas.	Completed	HMC submitted an updated GCAP to the NRC for approval in 2019. The GCAP includes the results of more modeling efforts conducted in support of corrective action selection. The GCAP updates the timeframe for active remediation using the groundwater collection/injection systems. However, HMC notified EPA, NRC and NMED in 2019 that it does not believe that groundwater restoration to the current NRC cleanup levels, or federal MCLs and State groundwater standards, which are more stringent, can be achieved within a reasonable timeframe from an engineering perspective. HMC believes it is technically impracticable to do so. HMC has requested that EPA consider invoking a TI waiver of these standards, as potential ARARs, in future EPA decision-making. HMC has also indicated to the NRC that it will apply for alternate abatement standards (ACLs) through a license amendment application. HMC has notified NMED that it will also	12/18/2019

				request alternate abatement standards (AAS) through the New Mexico Water Quality Control Commission (WQCC) regulations.	
OU1	The source of the uranium exceedance in the SAG supply wells at the Site is unclear.	Investigate the source of the elevated uranium in the HMC supply wells to determine if pumping from the SAG wells is drawing site contamination into the deeper aquifer.	Completed	HMC conducted well integrity testing at SAG wells in 2015. The results found compromised integrity at well 928, corrosion in well 943 and other concerns with SAG wells. Due to integrity concerns, HMC installed replacement well 943M in December 2017 and abandoned well 943 in July 2018. HMC also drilled replacement wells #1R Deep and #2R Deep in 2018 and abandoned deep well 928 in 2018 and #1 Deep in 2019. The water supply replacement wells #1 Deep and #2 Deep were drilled deeper into the SAG aquifer in 2021 to improve water production.	3/1/2016

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IV. FIVE-YEAR REVIEW PROCESS

Community Notification, Community Involvement and Site Interviews

EPA published a public notice in the *Cibola Citizen* newspaper on 9/30/2020 (Appendix D). It stated that the FYR was underway and invited the public to submit any comments to EPA. The results of the review and the report will be made available at the Site's information repository, Grants Campus Library at New Mexico State University, located at 1500 Third Street, Grants, New Mexico 87020.

During the FYR process, interviews were conducted to document any perceived problems or successes with the remedy implemented to date. Interviews were conducted with the HMC Site Closure Manager, Governor of the Pueblo of Acoma and his staff, Water Rights Office Manager for the Pueblo of Laguna, Mayor of the Village of Milan, a community resident that is a member of BVDA, a former community resident that is a former member of BVDA, and a downstream community resident that is a member of MASE. The Cibola County manager was given the opportunity to be interviewed, but declined. All interviewees have granted their permission to use their names in the interview records. Appendix E includes the completed interview forms. The interviews are summarized below.

The HMC Site Closure Manager noted that substantial progress has been made over more than 40 years of groundwater corrective action and that all known available groundwater treatment technologies have been implemented or considered for use at the Site. The manager also noted that HMC has proposed a strategy for regulatory closure of the Site and protection of human health that includes ICs to prevent exposure to contamination, but not restoring the groundwater aquifers to drinking water quality. HMC is proposing TI as a reason for EPA to consider waiving groundwater standards in future EPA decision-making. The manager indicated that his company's cleanup efforts have had a positive effect on the community in that residences with contaminated water wells were connected to the Milan municipal water supply and their water bills were paid. He further indicated that properties were bought by HMC for value to allow residents to relocate if they chose to do so, and risks to human health were mitigated. The manager noted that HMC was not aware of any community concerns other than those raised by the community to EPA.

Pueblo of Acoma conveyed a severe and deep concern about the continued impact of contamination and that the length of time the cleanup has been ongoing is staggering. The Pueblo also noted that the idea of HMC seeking a TI waiver is troubling and seems like an attempt to walk away from the project. Pueblo of Acoma indicated that they had three major concerns: 1) groundwater contamination and the migration of the contaminant plume to impact the SAG aquifer; 2) the impact of contamination and the depletion of the SAG aquifer from pumping has the Pueblo worried about protecting its people's health and providing clean water to its people in the long-term; and (3) impacts on the Pueblo of Acoma cultural resources. It was noted that the SAG aquifer is one of the last remaining water supplies within the Rio San Jose drainage basin. Air quality and potential dust-related impacts from wind were also a health concern. The Governor indicated that there has generally been a lack of communication between the Pueblo and EPA from a government-to-government perspective. Tribal leadership changes from year to year and it is important that EPA recognize that and try to ensure ongoing communication. It is also important that EPA asks new tribal leadership about its preferred level of engagement as it will vary between different tribal leaders. The Governor also noted the Biden Administration's memorandum on tribal consultation and suggested that EPA organize a consultation to help tribal leaders gain a better understanding of the Superfund process in general. He recommended interagency collaboration.

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Pueblo of Laguna noted that the project seems fairly ineffective as a cleanup, but moderately effective as a barrier to downstream contamination. They also noted that the tailing material should never have been allowed to remain without an impermeable barrier between it and the groundwater. Pueblo of Laguna recognize that they are further downstream to the Site than other stakeholders, but they are still concerned with groundwater contamination and a reduction of available water in the SAG aquifer (from Site pumping) that would contribute to the flow of the Rio San Jose. Another concern of the Pueblo was not requiring HMC to operate the water treatment plants at 100 percent of capacity, so it is not known how effective the remedy could be.

The Mayor of Milan is aware of the contamination to groundwater and the windblown contamination. He indicated that people living close to the Site and some ranchers with cattle do not get satisfactory answers to their questions. He noted that the public relations person at the HMC Facility does a good job in communicating with the public, but as far as Site operations goes, he does not believe the public or the Village are well informed. The Mayor recommended that HMC keep the Board of Trustees and his office informed on changes and construction at the Site so that the Village can keep the public informed.

The general sentiments of the two community residents and one former resident interviewed ranged from strong disappointment to anger over the progress made to clean up the Site. One resident noted that he spent half his lifetime waiting for the groundwater to be cleaned up. At the beginning, in 1978, the company indicated that the groundwater cleanup would not take long, but not much work was done until about 2000, and after that very little progress was made on the groundwater. The resident has the impression that HMC is looking to get out of the cleanup.

A former resident was very upset and claimed that the cleanup had been an abject failure. She stated that the community has lost its water and a way of life that cannot be regained. In addition, those living closest to the LTP were exposed to unsafe levels of airborne radon contamination for more than 30 years. She also conveyed a strong disappointment with the regulatory agencies and stated that no one listened to the community until they wrote letters and engaged politicians. When community members joined, raised money, and hired their own technical experts, they were no longer ignored. She stated that the Site destroyed the community and her dream of always living there and to have it for her grandchildren. She described it as a tragedy. She noted that nobody in the community cares anymore and all they want is to get out. She also suggested that what needs to happen is for local elected officials to understand where their water comes from and how the Site could affect future water resources. She indicated that education and outreach for the communities and local officials is necessary if EPA wants informed community engagement.

The downstream community member discussed her overall concern with the ongoing remedy in significant detail. She stated that the "jumble" of remedies used at the Site have not been well managed or operated. She argued that HMC should never have conducted the tailing flushing program and that the tailing piles should have been dewatered and relocated away from the ancestral San Mateo Creek bed to a new site with a double liner and leak-detection system. She noted that BVDA previously recommended that the tailing material be relocated to a permanent regional repository to facilitate cleanup of the Site. BVDA proposed that the regional repository could also be used for tailing material near the Red Water Pond Road community and the Mariano and Smith Lake communities, among others. She also noted that BVDA and MASE consistently asked EPA to reassess background water quality and challenged HMC's extensive use of the SAG aquifer in the groundwater cleanup effort. She indicated that there is a need for a long-overdue comprehensive health survey of community residents living around the Site, along with an epidemiological study, which should be included as an outcome in the EPA's next Five-Year Plan for the Grants Mining District. She made a general statement that the failure of the federal

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government to plan for and develop permanent waste disposal sites to contain and isolate uranium mine and mill waste is truly abysmal.

Overall, the community residents indicated that they were somewhat informed of Site activities by HMC and the regulatory agencies, but it could be better. One interviewee suggested that EPA or NRC should break down the substance of HMC's annual reports and explain it to the public, especially for local residents and downstream community members. She felt the reports are too complicated and long, and she doesn't have the time to try reading them.

None of the interviewees were aware of any complaints or incidents at the Site such as vandalism, trespassing, or emergency response by local authorities. However, one interviewee noted the spill of an estimated 216,000 gallons of contaminated groundwater at the zeolite groundwater collection and conveyance system in 2020 and an apparent violation to NRC License SUA-1471 that was cited in 2018 by NRC for use of water in the injection program that did not meet NRC's cleanup levels.

Data Review

OU1 – Tailings Seepage Contamination of Groundwater Aquifers

The data reviewed for OU1 primarily consist of water chemistry analytical data and water-level data from monitoring, injection, and collection wells originally presented in HMC's 2016 and 2020 Annual Monitoring Reports/Performance Reviews (annual reports). The current monitoring program consists of several hundred wells, most of which monitor the San Mateo Creek alluvial aquifer. The other wells in the program are in the Upper, Middle, and Lower Chinle aquifers, and the SAG aquifer. Sampling is conducted at least annually. Some wells are sampled more frequently.

Groundwater monitoring is used to characterize the hydraulic flow regimes of the aquifers and contaminant plumes, evaluate performance of the restoration activities, and demonstrate progress made in restoring groundwater to meet NRC cleanup levels. Uranium and selenium are the most widespread contaminants above NRC cleanup levels at the Site. Therefore, the groundwater monitoring data review focuses on uranium and selenium concentrations and distributions within each aquifer. Other key constituents currently detected above NRC cleanup levels beyond the footprints of the LTP and STP are sulfate, total dissolved solids, chloride and molybdenum. Contaminants and radionuclides such as nitrate, radium-226, radium-228, vanadium and thorium-230 are generally only detected above NRC cleanup levels under or near the LTP. HMC's annual reports provide a complete discussion of all groundwater constituents.

Groundwater Flow

Figures F-1 through F-5 in Appendix F are groundwater elevation maps for 2020 showing groundwater flow direction in the alluvial, Chinle and SAG aquifers. Review of the maps shows that groundwater flow directions in the alluvial and Chinle aquifers have been altered by operations of the injection/collection systems. The groundwater gradients in the alluvial and Upper Chinle aquifers in targeted areas south of the LTP have been reversed, with groundwater flowing from injection wells toward the collection wells. The groundwater gradients in the two Middle Chinle aquifers (in two separate fault blocks) have also been altered to flow toward the collection wells. These operations are consistent with the designed performance objectives of the injection/collection systems.

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Alluvial Aquifer – Plume Characterization

Figures F-6 through F-18 in Appendix F present plume maps showing the distribution of uranium and selenium in the alluvial aquifer in 2016 and 2020 and the injection/collection systems that are operated at various localities at the Site for groundwater restoration. Two maps from 2015 and 2017 are also presented because they show additional data points compared to the corresponding 2016 maps. These maps are provided for comparative purposes so that progress in the cleanup effort over the last five years can be observed. Plume maps from additional years, dating back to 1976, are included in HMC's annual reports.

The uranium plume maps presented herein for the alluvial aquifer depict the overall plume extent over the entire Site, as well as three areas of detail focused on the LTP and the downgradient edge of the plume along the western and eastern channels of the alluvial aquifer.[23] The uranium plume depicted on the maps (shown by green color) represent uranium concentrations above the 0.16 mg/L NRC cleanup level.

Figures F-6 and F-7 depict the site-wide uranium plume. These maps show a slight reduction in the overall extent of the uranium plume from 2016 to 2020, specifically along the downgradient edge of the plumes in the western and eastern channel, and near the east flank of the LTP. A comparison of the uranium plume maps for the western channel (Figure F-8) show uranium concentrations have decreased at many of the monitoring wells within the western channel from 2016 to 2020, but concentrations have also increased in a few wells. North of Valle Verde and Pleasant Valley Estates subdivisions, the uranium concentrations ranged up to approximately 0.43 mg/L for 2016 and 2020. The injection/collection systems in operation for the western channel in 2016 and 2020 are presented on Figures F-9 and F-10 to show where actual injection and extraction of water is occurring. A comparison of the 2016 and 2020 uranium plume maps for the eastern channel (Figure F-11), located south of Felice Acres subdivision, show uranium concentrations ranged up to 0.49 mg/L in 2016 and 0.58 mg/L in 2020. Figures F-12 and F-13 depict the injection/collection systems in operation for the eastern channel in 2016 and 2020.

Maps of uranium concentrations in the alluvial aquifer beneath the LTP for 2015 and 2020 are shown on Figure F-14. A comparison of these maps indicate that the uranium concentrations have remained very high over the last five years, but overall there appears to be a decrease in the concentrations. The maximum uranium concentration detected in 2015 was approximately 75 mg/L on the eastern side of the LTP. In 2020, the maximum uranium concentration was 56 mg/L for the same area. The concentrations beneath the LTP are approximately two orders of magnitude higher than the uranium concentrations in the western and eastern channels of the alluvial aquifer. Such high concentrations are due to tailing seepage from the LTP, which continues to be a source for alluvial groundwater contamination. The tailing flushing program was discontinued at the LTP in 2015. Since then, saturation has been draining out of the pile over the last five years, with some of the tailing seepage moving downward into the alluvial aquifer beneath the pile. This is discussed in further detail in the Data Review section for OU2, below. Figure F-15 depicts the currently operating injection/collection system in the area of the LTP and STP.

Figures F-16 and F-17 depict the 2016 and 2020 selenium plume maps for the alluvial aquifer. The selenium plume is shown in green and represents concentrations exceeding the 0.32 mg/L NRC cleanup level. The maps show the main selenium plume under the LTP has not changed significantly over the last five years. An isolated pocket of higher selenium concentrations is shown south of the STP along State Highway 605. Figure F-18 shows a detailed selenium plume map of the State Highway 605 area for 2017, along with a map of the

[23] South of the HMC Facility is a bedrock high that divides the alluvial sediments and groundwater flow into a western and eastern channel.

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injection/collection system for the area. Any contamination migrating south in this area of the alluvial aquifer would likely be intercepted by the line of collection wells along State Highway 605. This isolated selenium plume has decreased in areal extent from 2016 to 2020. Selenium concentrations in and near the residential neighborhoods southwest of the HMC Facility are below the NRC cleanup level of 0.32 mg/L for the alluvial aquifer. An isolated selenium detection between 0.32 mg/L and 1.0 mg/L was detected in a groundwater sample from a well located east of the Felice Acres neighborhood in 2019; this well is beyond the influence of any collection well and will continue to be monitored.

A comparison of the selenium plume maps also shows that selenium concentrations have increased in the upgradient monitoring wells north of the LTP since 2016, with concentrations ranging up to 0.44 mg/L. These higher selenium concentrations to the north are part of a large selenium plume unrelated to the Site that is moving toward the Site. This plume is being investigated as part of an ongoing CERCLA groundwater RI/FS for a portion of the San Mateo Creek Basin, referred to as the Central Study Area. The work is being performed by HMC and two other mining companies in accordance with a November 2019 EPA administrative order (CERCLA Docket No. 06-01-20).

Alluvial aquifer restoration continues to be needed at the Site as contaminants and radionuclides exceed the NRC cleanup levels. Uranium concentrations in alluvial groundwater beyond the area of the LTP and STP continue to exceed the NRC cleanup level of 0.16 mg/L, as well as the federal MCL of 0.03 mg/L. Selenium concentrations in alluvial groundwater beyond the tailing piles also exceed the NRC cleanup level of 0.32 mg/L, as well as the federal MCL of 0.05 mg/L. The injection/collection systems currently operating for the alluvial aquifer are shown on Figure C-5 in Appendix C.

Upper, Middle and Lower Chinle Aquifers – Plume Characterization

Figures F-19 through F-24 in Appendix F show the distribution of uranium in the Upper, Middle and Lower Chinle aquifers in 2016 and 2020. The plume definitions shown on these maps are based on the NRC cleanup level for uranium (0.18 mg/L) in the mixing zone of all three Chinle aquifers, and the different NRC cleanup levels for the non-mixing zone in each aquifer (Upper Chinle – 0.09 mg/L; Middle Chinle – 0.07 mg/L; and Lower Chinle – 0.03 mg/L). The mixing zone for each of the three Chinle aquifers is depicted on Figures C-5 through C-7 in Appendix C.

The Upper Chinle uranium plume maps show the areal extent of the 2020 plume is similar to the extent of the 2016 plume under the LTP, but slightly smaller in the area of the Felice Acres and Broadview Acres subdivisions (Figure F-19). The maps also show the area of highest uranium concentrations (greater than 10 mg/L) beneath the LTP in 2020 is reduced compared to the highest concentrations in the 2016 plume. .

The Middle Chinle uranium plume maps depicted on Figure F-20 for 2016 and 2020 show two separate plumes: the first is located west of the LTP and West Fault; the second is located in the area of the Felice Acres and Broadview Acres subdivisions and Thunderbird Lane. These plumes are in separate Middle Chinle aquifers that have been separated by the faults; the aquifers are not known to be in hydraulic communication with each other. Overall, the areal extents of the plumes appear to be slightly diminished in 2020 compared to 2016, with the greatest reduction in the area of Felice Acres subdivision and Thunderbird Lane. Figures F-21 and F-22 show an enlargement of the uranium plume map in the Felice Acres subdivision and Thunderbird Lane area for 2016, and a water-level elevation map for the same area for 2016. The injection and collection wells in operation are

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depicted on both maps. The water-level elevation map shows a cone of depression[24] of the water levels, which is caused by pumping at the collection wells. The cone of depression indicates that groundwater and the uranium plume are flowing toward the collection wells from every direction, hence effectuating hydraulic control and plume capture for that specific area of the aquifer. Figure F-23 depicts the same area of enlargement of the uranium plume for 2020, where a reduction in the size of the plume is apparent compared to the 2016 plume map. The reduction is a direct result of the injection/collection well operation.

Lower Chinle uranium plume maps for 2016 and 2020 are depicted on Figure F-24. A comparison of the two maps show a general decrease in the uranium plume magnitude over the last five years of operations.

Plume maps for selenium in the Chinle aquifers are not included due to the limited number of wells that had reported selenium concentrations above the cleanup level in 2020. Selenium concentrations, in 2020, were less than the cleanup level in all Upper Chinle wells, except for wells near the southern part of the LTP. None of the sampled subdivision wells contained selenium concentrations above the NRC cleanup level.

San Andres-Glorieta Aquifer Monitoring

The SAG aquifer and the alluvial aquifer are known to be hydraulically connected where they are in direct contact with each other in an area southwest of the HMC Facility. The area of hydraulic connectivity is downgradient to the area where the alluvial aquifer is impacted by Site contamination, based on the current cleanup levels established by the NRC. The SAG aquifer is not known to be in direct contact with the Chinle aquifers at the Site and, therefore, it is not known to be in hydraulic communication with the Chinle aquifers.

The SAG aquifer has been used as a source for freshwater injection into the alluvial and Chinle aquifers at the Site. As a result, HMC established a monitoring program for the aquifer. During this FYR period, multiple SAG wells were abandoned because of well casing integrity issues and replacement wells were installed (Table 5). HMC samples the SAG wells quarterly, semi-annually or annually, depending on the well. Figure F-25 in Appendix F presents selenium, uranium, and other constituent concentrations in SAG wells from 2020. Figure F-25 also includes historical data from other wells that have since been abandoned or were not sampled in 2020 (*e.g.,* well 951).

Uranium concentrations were generally low in all SAG wells monitored in 2020, with the highest concentration of 0.032 mg/L detected in well 951. This concentration is slightly above the federal MCL of 0.03 mg/L for uranium. Selenium concentrations in the SAG aquifer vary from 0.004 mg/L in well 938 to 0.031 mg/L in well 907. These detected concentrations are below the federal MCL of 0.05 mg/L for selenium.

The 2020 RI Report noted that historical uranium milling operations at the DOE Bluewater Disposal Site released uranium to the SAG aquifer. The uranium concentrations in well 951, which was pumped for a number of years by HMC to supply SAG water for the injection program, may be the result of these releases.

OU2 – Long-Term Tailings Stabilization, Surface Reclamation and Site Closure

This FYR considered data from annual inspections of the STP, LTP, pond dikes, slopes and evaporation ponds, as well as the radon flux surveys originally presented in the 2018, 2019 and 2020 annual reports. The 2016 FYR

[24] A cone of depression is the drawdown or depression of the water levels (in unconfined aquifers) or pressure head (in confining aquifers) surrounding a pumping well, with the degree of drawdown diminishing as the distance from the pumping well increases.

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previously evaluated data from the tailings flushing program. Although this practice ended in July 2015, this FYR included a review of the tailing water quality and water-level changes in the LTP since cessation of the flushing program, as the LTP remains a source of tailing seepage to groundwater.

Condition of Tailing Piles and Evaporation Ponds

The 2018, 2019, and 2020 annual Engineer of Record (EOR) inspections of the tailings piles and evaporation ponds[25] found that they were in generally stable condition. Evidence of animal burrows, rilling[26] and a sinkhole were observed on the LTP. Rilling, significant slumps, and benching under the liner at Evaporation Pond No. 1 were observed at the STP. The annual EOR inspection reports, which are appended to the HMC annual reports, include recommendations for addressing these issues. The recommendations are primarily related to erosion control and drainage management. HMC submitted a design report to NRC for relining the aging evaporation pond in December 2018. HMC anticipated replacement of the liner in 2020, but this work was postponed due to the Covid-19 pandemic.

Radon Flux Measurements at Tailing Piles

Radon flux at the LTP and STP is measured by HMC as part of the annual review of the radiation protection program (As Low As Reasonably Achievable [ALARA] Audit).[27] The ALARA Audit includes radiological survey and sample data.

Average radon flux measurements for the LTP from 2017 through 2020, measured in picocuries per square meter per second (pCi/m^2/s), are as follows:

2017 – 46.6 pCi/m^2/s;
2018 – 51.3 pCi/m^2/s;
2019 – 35.4 pCi/m^2/s;
2020 – 22.5 pCi/m^2/s.

All of these measurements are above the 20 pCi/m^2/s limit specified at 10 CFR Part 40, Appendix A, Criterion 6. The 2018 annual EOR inspection noted that HMC requested a variance to the radon flux standard from NRC in 2017 since the existing groundwater treatment system and monitoring wells on top of the LTP prevent placement of a final radon barrier, and a dose assessment by modeling indicated that a variance would not result in exceedances of public dose limits. HMC performs such dose assessment by measuring radiation levels at the NRC license boundary and at monitoring locations representative of the nearest resident and comparing those data to background monitoring stations to determine radiological levels sourcing from facilities and operations. NRC is currently conducting a review of this matter, and has indicated to HMC in June 2020 that corrective actions are not required until the NRC review is complete.

The average radon flux measurements at the STP from 2017 through 2020 are as follows:

2017 – 3.5 pCi/m^2/s;

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[25] Annual Engineer of Record inspections are performed by HMC and it's contractor to inspect the stability and functionality of the tailing impoundments and evaporation ponds. The inspections are required by NRC Source Materials License SUA-1471, Condition 12, and NMED Discharge Permit DP-200, Condition 52i.

[26] Rilling is the forming of narrow, straight or sinuous channels or gullies by soil erosion.

[27] Annual ALARA Audits are required by NRC Source Materials License SUA-1471, Condition 42 and NRC Regulatory Guide 8.31.

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2018 – 12.7 pCi/m^2/s;
2019 – 10.5 pCi/m^2/s;
2020 – 4.6 pCi/m^2/s.

All of the average flux levels measured at the STP are below the radon flux limit of 20 pCi/m^2/s. Although the STP met the required standard, HMC placed about 6 inches of additional fill along the crest of the Evaporation Pond No. 1 east embankment in response to elevated radon flux measurements in this area.

The 2020 RI Report presents additional history of radon flux measurements at the LTP and STP.

Tailing Water Monitoring

The tailing water monitoring program includes LTP wells, toe drains, and sumps to monitor tailing water quality and water-levels conditions. Figure F-26 in Appendix F is a water-level elevation map for 2020 showing the locations of these features and the area of saturation within the tailing material. The water-level contours define two mounds of tailing water. Figure F-27 in Appendix F includes a cross section through a portion of the LTP showing the location of the fine-grained tailing (slimes) within the interior of the pile and the coarse-grained tailing (sands) along the perimeter of the pile.[28] The zone of saturated tailing is depicted on the cross section at the base of the pile. A map of the cross-section location relative to the position of the LTP is included on Figure F-27.

Figure F-28 in Appendix F is a graph of the yearly quantity of tailing water and uranium removed from the LTP from 2000 to 2020. The graph shows a significant decrease in the quantities of water and uranium removed since the cessation of the tailing flushing program in 2015 and tailing dewatering (pumping) operations in 2018.

An overall decline in tailing water levels has been observed in the LTP since 2015, when the tailing flushing program was discontinued. Figure F-29 in Appendix F shows a graph of water-level changes for several tailing wells from 2009 to 2020. The graph depicts a dramatic decline in the water levels beginning in 2015. This decline represents the expected drain down of tailing water from the pile with the cessation of tailing flushing. The observed rate of the water-level decline is greatest in the first year or two after cessation of flushing and gradually slows to approximately 1-2 feet for the year 2020.

The largest water-level declines occur mostly along the central sand dike and the perimeter sand dike where the permeability of the tailing material is highest. In contrast, the two water-level mounds, depicted on Figure F-26, are present in the lower permeability slime areas east and west of the central sand dike. Each mound has a saturated thickness of approximately 50 feet. Because there has been no recent dewatering and tailing flushing injection over the last few years, the change in tailing water levels are almost entirely the result of water exchange between the slimes and sands and drainage from the pile. An analysis by HMC of the water volume change in the saturated tailing of the LTP indicates a reduction of approximately 7,356,000 gallons over 2020, which equates to a reduction of approximately 14 gpm. The total discharge from the toe drains during 2020 was approximately 5 gpm. Subtracting the toe drain discharge from the water volume change leaves about 9 gpm of the water volume change that was discharged from the LTP as seepage to groundwater. Taking into account infiltration of precipitation (estimated at 2 gpm), the effective seepage rate is approximately 11 gpm. This equates to

[28] HMC's method of tailing deposition using a cyclone resulted in the segregation of the fine-grained slimes with much lower permeability within the interior of the LTP and the coarse-grained sands with higher permeability along a central dike and on the perimeter of the LTP.

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approximately 5,765,760 gallons of tailing seepage to groundwater per year. A detailed discussion of the water balance at the LTP is presented in HMC's 2020 annual report.

Uranium is a key water quality indicator for tailing water. A series of uranium concentration maps are presented in the HMC 2020 annual report to show changes in uranium concentrations in tailing water over time, beginning in 2000 when the tailing flushing program was initiated. The uranium concentration maps for 2000, 2015 ad 2020 are included in this FYR report for comparative purposes (*see* Figures F-30 and F-31 in Appendix F). These figures show a decline in uranium concentrations during the tailing flushing program.

In the HMC 2020 annual report, a series of graphs are presented of uranium, molybdenum and selenium concentrations over time for select tailing wells in the LTP. The graphs show that the concentrations of these constituents in tailing water have stabilized after flushing ended. Several of these graphs are included in Appendix F of this FYR report. Figures F-32 and F-33 show two graphs for the sand tailing wells from 2004 to 2020 and 2016 to 2020. Figures F-34 and F-35 show two graphs for the slime tailing wells from 2006 to 2020 and 2016 to 2020. Figure F-36 depicts a map of the tailing well locations. The graphs show the concentrations of uranium, selenium, and molybdenum decreased significantly during active flushing of the LTP, but they have been relatively stable for many of the wells since discontinuation of the flushing program in 2015 and the tailing dewatering program in 2018, while some concentrations actually increased slightly. Although it was assumed that a rebound in contaminant concentrations could occur after the flushing program, HMC does not consider the recent increases to be significant, based on the water quality data collected.

OU3 – Radon in Neighboring Subdivisions

No new data have been collected from the neighboring subdivisions during this FYR period.

Site Inspection

Due to the COVID-19 pandemic, EPA did not conduct a site inspection for this FYR. However, EPA visited the Site in 2019 to review borehole geologic data obtain during the HMC supplemental background study and to tour the R.O. treatment plant, full-scale zeolite filtration system, and other areas of the HMC Facility. No issues related to protectiveness of the remedy were observed during the site visit. Appendix G includes photographs taken during the visit.

V. TECHNICAL ASSESSMENT

QUESTION A: Is the remedy functioning as intended by the decision documents?

Question A Summary:

OU1 – Tailings Seepage Contamination of Groundwater Aquifers

Yes. The review of site-related documents indicates that the groundwater restoration program is being implemented as intended by NRC License SUA-1471 and NMED Discharge Permit DP-200. Although an EPA ROD for groundwater restoration has not been issued for OU1, EPA plans to select a remedy in a future ROD

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after completion of the ongoing CERCLA RI/FS equivalency process and performance of the public, tribal, and state participation processes as part of the CERCLA remedy selection process.

The current groundwater corrective action program includes an extensive groundwater injection/collection well system, R.O. and zeolite-based water treatment, two collection ponds and three evaporation ponds. Due to the complexity of the OU1 remedial system, HMC maintains full-time staff to perform daily O&M. This level of O&M appears to be adequate to maintain the program.

Evaporation Pond No. 1, located on top of the STP, is currently in operational condition. However, it is operated at reduced capacity due to the damaged pond liner. There are several holes (less than 2 inches in diameter) that developed in the liner and there are significant rills, slumps and benching that developed under the liner as a result of wave action over time. Weathering cracks are also present along most of the top portion of the liner. Recommendations made in the 2020 annual Engineer of Record inspection report by an HMC contractor included the continued operation of Evaporation Pond No. 1 at a reduced capacity until the damaged liner can be replaced. Liner replacement, which was originally planned for 2020, has been delayed due to the Covid-19 pandemic.

HMC continually evaluates the performance of the groundwater injection/collection well systems and adjusts the scope and operation of the systems as the cleanup progresses. The injection/collection well systems have helped contain the most highly contaminated groundwater in the collection areas, which includes groundwater under the tailings piles, collection ponds and evaporation ponds 1 and 2. Although contaminant levels have generally decreased over time, they still exceed the NRC cleanup levels in some portions of the alluvial and Chinle aquifers. Additionally, the water treatment and injection rates for 2019 and 2020 were smaller due to the reduced evaporation capacity for disposal of R.O. brine and zeolite regeneration water (due to the anticipated relining of Evaporation Pond No. 1). It appears that hydraulic capture of the groundwater contaminant plumes is being maintained with the reduced injection and collection rates. However, ongoing groundwater monitoring will determine if such rates result in any changes to the plumes configurations over time.

Contaminant concentrations also remain above NRC cleanup levels in the alluvial and Chinle aquifers outside the HMC Facility and in the residential neighborhoods. Injection/collection operations continue in areas where contaminant concentrations exceed cleanup standards. All residences in the neighboring subdivisions south and southwest of the HMC Facility are connected to the Milan municipal water supply distribution system. Institutional controls for OU1 consist of a 2009 NMED Health Advisory for users of private water wells in the San Mateo Creek Basin and a 2018 NM-OSE Order restricting well drilling for the alluvial and Chinle aquifers. The ICs limit exposure to contaminated groundwater.

In 2019, HMC informed the regulatory agencies that it now believes restoration of groundwater to current NRC cleanup levels, or to more stringent federal MCLs and State groundwater standards, is not technically practicable given the site characteristics and a phenomenon called "back diffusion." Back diffusion is a condition where contaminants adsorb onto fine-grained sediments such as clays and silts in an aquifer and become difficult to remove by groundwater pumping. HMC has indicated that site contaminants in tailing seepage sourced from the LTP have likely adsorbed onto the clays/silts in the alluvial aquifer, as well as the vadose zone soil beneath the LTP. These impacted clays and silts act as a secondary, long-term source of groundwater contamination by slowly diffusing back into the porous and more permeable portions of the aquifer where groundwater is mobile and the plume can migrate. HMC indicated that back diffusion limits the ability of available remedial technologies to meet groundwater standards at the Site in a reasonable timeframe.

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HMC has requested EPA consider TI as a reason for waiving ARARs, such as groundwater standards, in any future decision-making for a CERCLA remedy. In accordance with EPA's 2020 ASAOC for performance of the FS, HMC agreed to conducted a TI evaluation to support any waiver of ARARs in a ROD based on TI. HMC also notified NRC that it believes long-term groundwater corrective action pursuant to UMTRCA and NRC License SUA-1471 requirements will require approval of Alternate Concentration Limits (ACLs) that will be the subject of a subsequent license amendment application. HMC has discussed with NMED the Alternate Abatement Standard (AAS) process under New Mexico Water Quality Control Commission (WQCC) regulations.

Groundwater flow and transport modeling was performed by HMC to support the ongoing CERCLA FS and TI evaluation, the updated GCAP, and the NRC license amendment application for ACLs. Predictive modeling simulations were performed to assess potential future groundwater transport under different future remedial alternative scenarios using the existing site injection and collection well system and infrastructure. EPA and NMED are currently performing a detailed review of HMC's groundwater flow and transport modeling work presented in the November 2020 draft TI Evaluation Report, including all modeling parameters and assumptions.

OU2 – Long-Term Tailings Stabilization, Surface Reclamation and Site Closure

Yes. Several OU2 surface reclamation and closure activities have been implemented as intended, and in accordance with NRC License SUA-1741, including amendments, license changes, and the approved 1993 Decommissioning and Reclamation Plan. The remaining components for final site reclamation and closure are anticipated to be put in place after completion of OU1 groundwater restoration. At this time EPA has not issued a ROD for the OU2 cleanup. However, as discussed above for OU1, EPA will select a CERCLA remedy for OU2 in a ROD following completion of the CERCLA RI/FS equivalency process and the formal public, tribal, and state participation processes for CERCLA remedy selection.

To date, HMC has decommissioned and dismantled the mill, and placed some waste materials and impacted soil from the mill area on the out slopes of the LTP. HMC has also recontoured the LTP, constructed a final radon barrier and erosion protection cover on its sides, and placed an interim radon soil cover on its top. An interim radon cover has been constructed on a portion of the STP. HMC conducts regular O&M to maintain effectiveness of the implemented actions and takes corrective action as needed.

From 2017 through 2020, the average radon flux measurements for the LTP were above the 20 $pCi/m^2/s$ limit specified at 10 CFR Part 40, Appendix A, Criterion 6. In 2017 HMC requested a variance to the flux standard from NRC since existing groundwater treatment facilities and wells located on top of the LTP prevent placement of a final radon barrier, and a dose assessment indicates that a variance would not result in exceedances of public dose limits. NRC is currently conducting a review of this matter and has indicated to HMC that corrective actions are not required until the NRC review is complete.

Following approved closure of the LTP, NRC will implement ICs for the tailing disposal site and other areas within the NRC licensed boundary. Following HMC's specific license termination, a custodial agency, DOE-LM, will ensure continued long-term surveillance and maintenance activities to protect public health and safety, as required by 10 CFR Part 40.28. EPA will evaluate the need for additional ICs for OU2 as part of the ongoing CERCLA FS for OU1 and OU2.

OU3 – Radon in Neighboring Subdivisions

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EPA did not require a remedy for OU3 in the September 1989 ROD, as a "no further action" alternative was selected. However, EPA conducted additional investigations in and near the neighboring subdivisions between 2010 and 2014 in response to community concerns. Data from the investigations were used to perform the supplemental HHRA-Subdivisions and to identify residences where removal actions to mitigate soil contamination and radon levels in indoor air were necessary to protect human health.

Although EPA's investigations found no significant difference between the annual indoor air radon levels at the five neighboring subdivisions and the background annual indoor air radon levels at Bluewater Village, EPA elected to install radon mitigation systems in 11 homes with radon levels above EPA's recommended action guideline of 4 pCi/L in 2012; one additional homeowner declined to have a mitigation system installed. The mitigation systems are operating as intended and have reduced indoor air radon concentrations in these homes to levels below 4 pCi/L. Homeowners with radon mitigation systems have been instructed to contact the installer for servicing any repairs beyond the warranty period. Radon mitigation systems are known to operate without any maintenance problems for many years before the motor in the unit wears out.

EPA also conducted a removal action in 2014 to address radioactive contaminated soil at 16 residential properties and radioactive discrete material at two more residential properties. The removal action was successful in achieving the soil cleanup level of 3.5 pCi/g established by EPA for radium-226. EPA determined that the radiological contamination in the soil and debris was unrelated to the Site, but elected to conduct the removal action to protect human health.

EPA's HHRA-Subdivisions identified site-related risks, as well as background-related risks, for residential exposure to radionuclides (radon gas) in ambient air that exceeded EPA's acceptable excess lifetime cancer risk range of 10^{-4} to 10^{-6} and NMED's lifetime cancer threshold value of 10^{-5} (addressed further in Question B, below).
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QUESTION B: Are the exposure assumptions, toxicity data, cleanup levels and remedial action objectives used at the time of the remedy selection still valid?

Question B Summary:

As a CERCLA remedy has yet to be selected and documented in a ROD for OU1 and OU2, cleanup levels and remedial action objectives have yet to be defined by EPA under its CERCLA authority. Therefore, no response is provided to Question B for OU1 and OU2.

OU3 – Radon in Neighboring Subdivisions

There is no CERCLA remedy for OU3 as EPA issued a "no further action" ROD for radon in 1989. However, after community members raised concerns about potential exposure to site contamination in 2009, EPA elected to conduct a field investigation and perform a supplemental risk assessment for the subdivision. The HHRA-Subdivisions was completed in 2014. The risk assessment evaluated land-use exposure scenarios for the resident and subsistence farmer at the neighboring subdivisions, Valley Verde, Pleasant Valley Estates, Broadview Acres, Murray Acres, and Felice Acres. The risk assessment identified chemicals and radionuclides of concern and the pathways and routes of exposure. It also quantitatively estimated the potential excess lifetime cancer and non-cancer risks. The HHRA-Subdivisions had the following findings:

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- Indoor radon gas levels exceeded EPA's recommended 4 pCi/L action guideline at several homes within the five subdivisions. They were similar to levels measured at the indoor radon background location.
- Cancer risk to the current and future resident and subsistence farmer from exposure to radionuclides in ambient (outdoor) air is above EPA's acceptable excess lifetime cancer risk range of 10^{-4} to 10^{-6} and NMED's lifetime cancer risk threshold level of 10^{-5}. Most of the risk is attributable to background concentrations of radon. However, after factoring out background risks, the site-related risk is still above EPA's cancer risk range and NMED's cancer threshold level.
- Cancer risk to the current and future resident and subsistence farmer from exposure to radionuclides in soil is above EPA's acceptable cancer risk range of 10^{-4} and 10^{-6} and NMED's cancer threshold value of 10^{-5}. However, when risk attributable to background is factored out, cancer risks are within the EPA acceptable cancer risk range and slightly above NMED's cancer threshold value. Based on sample data, EPA determined that the soil contamination in the subdivisions was not attributable to the Site.
- Cancer risk to the current and future resident and subsistence farmer from exposure to radionuclides in untreated groundwater used for domestic purposes is above EPA's acceptable cancer risk range and NMED's cancer threshold value.

EPA conducted two separate removal actions to mitigate radon in indoor air and radium-226 in residential yard soils to protect human health. Neither of these impacts are associated with the Site and they will not be discussed further in response to Question B.

Risk Assessment Exposure Assumptions

The exposure assumptions used in the HHRA-Subdivisions are still valid. There are residents currently living in the five subdivisions. Some of these residents continue to consume homegrown produce from gardens, including squash, tomatoes, corn, and lettuce. Some residents continue to raise a few cattle on their properties for meat consumption. The cattle graze in pastures for most of the year and are fed hay that is bought during the winter months. The pastures are irrigated from a community supply well screened in the SAG aquifer.

All residences within the subdivisions are connected to the Milan municipal water supply (as part of a response action for OU1). This response action was taken to abate risks from exposure to contaminants in groundwater. Although there is currently no known groundwater exposure pathway, EPA elected to assess the potential future risk to groundwater exposure for the resident and subsistence farmer because an assumption was made that a new resident might decide to install a water well and use it for drinking or other domestic purposes. There is a NM-OSE drilling prohibition to prevent the construction of new water wells. However, it is still possible that a future resident may install a water well in violation of the drilling prohibition.

Over the last few years, HMC has been purchasing residential properties and other properties at and in the vicinity of the neighboring subdivisions. HMC has informed EPA that it is in the process of recording restrictive covenants for the properties that will prohibit the use of private water wells for drinking water and other domestic purposes in the area of groundwater contamination.

Toxicity Data

A review of the toxicity data used for the 2014 HHRA-Subdivisions shows some values have changed since 2014, and there are new data for some chemicals and radionuclides when none were available in 2014. These data changes are described below. The complete results of the toxicity data review are presented in Tables H-1 through H-6 in Appendix H.

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- Oral reference dose used for ingestion toxicity of uranium (total) changed from 3.0E-3 to 2.0E-4 milligrams per kilogram per day (mg/kg-day), a more stringent value for risk calculations.
- External Exposure Cancer Slope Factor for radium-228 + decay products changed from 1.2E-3 to 4.53E-6 (in units of risk/year per pCi/g), a less stringent value for risk calculations.
- Available new inhalation reference concentrations are:
    - Molybdenum – 2.0E-3 mg/m^3;
    - Vanadium – 1.0E-4 mg/m^3;
    - Uranium (total) – 4.0E-5 mg/m^3.

Updated EPA Rad PRG Calculator

A reassessment of the estimated cancer risks to the resident and subsistence farmer from exposure to radon in ambient air is needed to verify the results of the 2014 risk assessment. EPA uses a computerized mathematical model (electronic calculator) for conducting radiation risk assessments and developing PRGs for radionuclides at CERCLA sites (EPA OSRTI Directive 9200.4-40). The EPA's electronic calculator, known as the Rad PRG Calculator, was updated in October 2020. A new PRG output option, called peak PRG, was added to the Rad PRG Calculator and is now the default PRG option for use at CERCLA sites.[29] However, the Rad PRG Calculator approach for assuming that all potential radioactive progeny (decay products or daughters) are present at the same concentrations as the parent radionuclide (*i.e.,* secular equilibrium) may not be appropriate for the air medium at the Site. The reason is that several of the progeny are heavier radionuclides that will likely drop out of the air and not be transported far from their sources. These heavier progeny, specifically lead-210 and heavier radionuclides, should be removed from the calculation of total risk. Therefore, the risk calculations for various radionuclides in decay chains should be made separately and a "sum of the fractions" approach used for determining total risk for radon in ambient air.

To summarize the response to Question B for OU3, the changes to the toxicity data used in the 2014 risk assessment and the new toxicity data that are available for risk assessment calculations could potentially change the results of the risk assessment for OU3. Additionally, the use of the updated EPA Rad PRG Calculator and the sum-of-fractions approach for estimating risk from radon in ambient air at the subdivisions could also change the results. An updated risk assessment for OU3 would inform the ongoing CERCLA FS and remedy selection process for OU2, which includes the reclamation and closure of the LTP. The LTP currently remains a source of radon flux without the final radon barrier placed on its top. Response actions to be taken under the NRC authority, such as placement of the final radon barrier on the top of the LTP, should reduce radon emissions coming off the LTP.

QUESTION C: Has any other information come to light that could call into question the protectiveness of the remedy?

No other information has come to light that could call into question the protectiveness of the remedy.

[29] The peak PRG option calculates the activity of the parent radionuclide to be protective of the peak excess lifetime cancer risk for the entire chain of decay products (progeny or daughters) over time. For waste profiles that contain a refined radionuclide product with a relative long half-life, the progeny may present more excess lifetime cancer risk in the distant future than the parent in the present. By modeling the decay of the parent, with the ingrowth of all progeny, a protective peak PRG can be calculated and used to compare against current monitoring or sample data for the protection of future receptors. The benefits of using the peak PRG option are that future dates of peak excess lifetime cancer risk are known.

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VI. ISSUES/RECOMMENDATIONS

Issues/Recommendations				
Issues and Recommendations Identified in the FYR:				
OU(s): OU3	**Issue Category: Other**			
	Issue: EPA selected "no further action" in a 1989 a record of decision for radon contamination in neighboring subdivisions. At that time, EPA determined the indoor and outdoor radon levels were mostly naturally occurring and that the large tailing pile, although a potential source of off-site radon contamination, was not contributing significantly to the radon levels in the subdivisions. From 2010 to 2014, EPA conducted additional investigations and performed a supplemental human health risk assessment for the subdivisions. The results of the risk assessment again showed risk from radon in air above EPA's excess lifetime cancer risk range, mostly from background radon levels. However, a significant component of the ambient air risk was attributed to the Site. A review of the toxicity data used in the 2014 risk assessment shows that not all of the data are still valid and that there is new toxicity information relevant to the risk assessment. Additionally, the computerized mathematic model (electronic calculator) used by EPA for conducting radiation risk assessments for radionuclides at CERCLA sites has been updated in October 2020. Furthermore, EPA has determined that the calculation of risk from exposure to radionuclides in ambient air should include separate calculations of risk for the lighter radionuclides in the decay chain and the use of a "sum of the fractions" approach for determining total risk.			
	Recommendation: Update the baseline human health risk assessment for the neighboring subdivisions using the current toxicity data and the updated EPA Rad PRG Calculator. For the update on risk from radon in ambient air, include separate calculations for the various radionuclides and use a "sum of the fractions" approach for determining total risk. This updated risk assessment will inform the ongoing CERCLA feasibility study and remedy selection process for OU1 and OU2, including response actions for controlling site-related sources of radon contamination.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
Yes	Yes	EPA		3/31/2022

OTHER FINDINGS

None

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VII. PROTECTIVENESS STATEMENTS

Protectiveness Statement	
Operable Unit: OU3	*Protectiveness Determination:* Protectiveness Deferred
Protectiveness Statement: A protectiveness determination for OU3 at the Homestake Mining Company Superfund site cannot be made at this time until further information is obtained. Further information will be obtained by updating the 2014 human health risk assessment for the neighboring subdivisions using new toxicity data and EPA's updated electronic calculator for assessing risk from radionuclides. The update will include separate calculations of risk for various radionuclides and a sum-of-the-fractions approach for calculating total risk for radon in ambient (outdoor) air. The heavier radionuclides shall be removed from the calculation of total risk for radon. It will take approximately four to six months to complete the updated risk assessment, at which time a protectiveness statement will be made. In 1989, EPA selected "no further action" in a record of decision for radon contamination in the neighboring subdivisions. At that time, EPA determined the indoor and outdoor radon levels were mostly naturally occurring and that the large tailing pile, although a potential source of off-site radon contamination, was not contributing significantly to the radon levels in the subdivisions. Because the final radon barrier has not been placed on the top of the large tailing pile while groundwater remediation is ongoing, the pile continues to be a potential source of radon in the subdivisions. Placement of the final radon barrier should reduce radon emissions at the large tailing pile. From 2010 to 2014, EPA conducted additional investigations of air, soil and groundwater at and in the vicinity of the subdivisions. Based on the data collected, EPA performed removal actions at the subdivisions to mitigate radon in indoor air and soil contamination in residential yards. The contamination addressed by the removal actions was not related to the Site.	

Sitewide Protectiveness Statement
Protectiveness Determination: Protectiveness Deferred
Protectiveness Statement: A site-wide protectiveness determination of the remedy at the Homestake Mining Company Superfund site cannot be made at this time until further information is obtained. Further information will be obtained by updating the 2014 human health risk assessment for the neighboring subdivisions, primarily for radon in ambient air, using new toxicity data and EPA's updated electronic calculator for assessing risk from radionuclides. For the groundwater exposure pathway, there is currently no known human exposure. Residences with wells contaminated by tailing seepage are connected to the village of Milan's municipal water supply distribution system. Institutional controls are in place by the State of New Mexico that prohibit the permitting of new water wells and provide a health advisory to owners and users of private water wells that their well water could be contaminated. The institutional controls limit exposure to contaminated ground water.

VIII. NEXT REVIEW

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The next FYR Report for the Homestake Mining Company Superfund site shall be completed five years from the completion date of this review.

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APPENDIX A – REFERENCE LIST

2015 Annual Monitoring Report / Performance Review for Homestake's Grants Project Pursuant to NRC License SUA-1471 and Discharge Plan DP-200. Prepared by Homestake Mining Company of California and Hydro-Engineering, LLC. March 2016.

2016 Annual Monitoring Report / Performance Review for Homestake's Grants Project Pursuant to NRC License SUA-1471 and Discharge Plan DP-200. Prepared by Homestake Mining Company of California and Hydro-Engineering, LLC. March 2017.

2017 Annual Monitoring Report / Performance Review for Homestake's Grants Project Pursuant to NRC License SUA-1471 and Discharge Plan DP-200. Prepared by Homestake Mining Company of California and Hydro-Engineering, LLC. March 2018.

2018 Annual Monitoring Report / Performance Review for Homestake's Grants Project Pursuant to NRC License SUA-1471 and Discharge Plan DP-200. Prepared by Homestake Mining Company of California and Hydro-Engineering, LLC. March 2019.

2019 Annual Monitoring Report / Performance Review for Homestake's Grants Project Pursuant to NRC License SUA-1471 and Discharge Plan DP-200. Prepared by Homestake Mining Company of California and Hydro-Engineering, LLC. March 2020.

2020 Annual Monitoring Report / Performance Review for Homestake's Grants Project Pursuant to NRC License SUA-1471 and Discharge Plan DP-200. Prepared by Homestake Mining Company of California and Hydro-Engineering, LLC. March 2021.

Administrative Settlement Agreement and Order on Consent for Feasibility Study. Homestake Mining Company Site, Cibola County, New Mexico. CERCLA Docket No. 06-03-20. August 12, 2020.

Decommissioning and Reclamation Plan Update 2013, SUA-1471, Homestake Grants Reclamation Project, Cibola County, New Mexico. Prepared by ARCADIS U.S., Inc. for Homestake Mining Company of California. April 2013.

Differentiating Anthropogenic and Natural Sources of Uranium by Geochemical Fingerprinting of Groundwater at the Homestake Uranium Mill, Milan, New Mexico, USA. By Johanna M. Blake, Philip Harte and Kent Becher, USGS. Published online in Environmental Earth Sciences; 78:234. June 29, 2019.

Discharge Permit DP-200, Homestake Mining Company of California Uranium Mill Site. Prepared by New Mexico Environment Department, Groundwater Quality Bureau.

Evaluation of Water Quality in Regard to Site Background Standards at the Grants Reclamation Project. Prepared by Arcadis U.S., Inc. September 2018.

Final Remedial Investigation Report, Homestake Mining Company Superfund Site, Operable Unit 1: Tailings Seepage Contamination of Groundwater Aquifers, Operable Unit 2: Long-term Tailings Stabilization, Surface Reclamation and Site Closure. Prepared by HDR. March 30, 2020.

First Five-Year Review Report for Homestake Mining Company Superfund Site, Cibola County, New Mexico. Prepared by CH2M Hill for USEPA Region 6. September 2001.

Fourth Five-Year Review Report for Homestake Mining Company Superfund Site, Cibola County, New Mexico. Prepared by USEPA Region 6. September 2016.

Grants Reclamation Project, 2015 San Andres Well Integrity Testing. Prepared by Hydro-Engineering, L.L.C. for Homestake Mining Company. December 2015.

Grants Reclamation Project, 1st Quarter 2016 San Andres Well Integrity Testing. Prepared by Hydro-Engineering, LLC. March 2016.

Groundwater Corrective Action Program, Homestake Mining Company of California, Grants Reclamation Projection. Prepared by HMC. December 2019.

Homestake Mining Company, Grants Reclamation Project, License Source Materials License SUA-1471, Docket Number 40-8903; NMED Discharge Permit DP-200: 7-Day Notification of Unauthorized Discharge from Injection Wellfield. Prepared by Homestake Mining Company of California. December 2019.

Homestake Mining Company, Grants Reclamation Project, License Source Materials License SUA-1471, Docket Number 40-8903; NMED Discharge Permit DP-200: NMED 15-Day/NRC 30-Day Corrective Action Report for Unauthorized Discharge from Off-site Well. Prepared by Homestake Mining Company of California. September 2020.

Human Health Risk Assessment, Homestake Mining Co. Superfund Site, Cibola County, New Mexico. Prepared by U.S. EPA. December 2014.

Record of Decision, Homestake Mining Company, Radon Operable Unit, Cibola County, New Mexico. Prepared by U.S. EPA Region 6. September 1989.

Review of 2006 Background Evaluation Completed by Homestake Mining Company of California (HMC), Environmental Resources Group, and Hydro-Engineering for the HMC Grants Reclamation Project, Grants, New Mexico. Prepared by Arcadis, U.S., Inc. September 2019.

San Andres Well 943M Completion Report. Prepared by Homestake Mining Company of California. January 2018.

Second Five-Year Review Report for Homestake Mining Company Superfund Site, Cibola County, New Mexico. Prepared by U.S. EPA Region 6. September 2006.

Supplemental Background Soil and Groundwater Investigation Report, Grants Reclamation Project, Cibola County, New Mexico. Prepared by Arcadis. April 2019.

Third Five-Year Review Report for Homestake Mining Company Superfund Site, Cibola County, New Mexico. Prepared by U.S. EPA Region 6. September 2011.

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APPENDIX B – SITE CHRONOLOGY

Table B-1: Site Chronology

Event	Date
Uranium mill operations began at the Homestake Mining Company of California (HMC) Facility Atomic Energy Commission began regulatory authority of operations at the HMC Facility under License SUA-708	1958
Regulatory authority of uranium mill operations was granted to the New Mexico Environmental Improvement Board	1974
A state of New Mexico (State) and EPA study identified selenium contamination in groundwater near the HMC Facility	1975
The State and HMC reached an agreement on a groundwater protection plan, establishing a groundwater injection and collection system and an associated monitoring program, and providing bottled water for affected residents	1976
HMC began groundwater restoration activities at the Site	1977
EPA listed the Site on the NPL EPA and HMC signed a settlement agreement, requiring HMC to pay for an extension of the Milan municipal water supply distribution system to four residential subdivisions, and to pay for the water service for 10 years	1983
The State approved a groundwater discharge plan (Operable Unit 01 or OU1)	1984
HMC constructed the west and east collection ponds in support of water treatment operations	1985
HMC installed the extension of the Milan municipal water supply distribution system to Broadview Acres, Felice Areas, Murray Acres and Pleasant Valley Estates subdivisions (OU1)	1986
The State returned regulatory authority of the HMC Facility to the U.S. Nuclear Regulatory Commission (NRC) The NRC granted the facility License SUA-1471	1986
EPA issued an Administrative Order on Consent to HMC to conduct an RI/FS for the radon OU (OU3) HMC began the Remedial Investigation/Feasibility Study (RI/FS)	1987
HMC finished the OU3 RI/FS EPA issued a "no further action" ROD for OU3 HMC submitted an updated Corrective Action Plan (CAP) for groundwater remediation to the NRC (OU1)	1989
Uranium milling operations at the HMC Facility ended HMC constructed evaporation pond 1 to assist in dewatering the Large Tailing Pile (LTP)	1990
HMC began reclamation activities to clean up soils and decommission the mill HMC submitted a reclamation plan to the NRC	1992-1993
EPA and the NRC signed a Memorandum of Understanding detailing each agency's responsibility and authority at the Site	1993
HMC completed demolition of the mill and surface reclamation activities (OU2) HMC constructed evaporation pond 2 and completed installation of an interim soil cover on the Small Tailing Pile (STP)	1995
HMC began freshwater injections in Upper Chinle well CW13 (OU1)	1996
The NRC approved the soil cleanup and mill reclamation (OU2) HMC added Reverse Osmosis (RO) water treatment to the groundwater restoration program (OU1)	1999
HMC began the flushing program for the LTP (OU2) and use of land treatment areas (LTAs)	2000
EPA issued Site's first Five-Year Review (FYR) Report	2001
HMC added a second RO unit to the treatment plant to increase RO treatment capacity from 300 gallons per minute (gpm) to 600 gpm (OU1)	2002
New Mexico Environment Department (NMED) sampled residential wells in nearby subdivisions based on recommendations from the Bluewater Valley Downstream Alliance (BVDA) (OU1)	2005

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Event	Date
EPA issued Site's second FYR Report HMC submitted an updated CAP to the NRC The NRC, EPA and NMED agreed on contaminants of potential concern (COPCs) and radionuclides of potential concern (ROPCs) and cleanup levels in groundwater	2006
EPA completed the Remedy System Evaluation, a broad evaluation that considered remedy goals, the conceptual site model, aboveground and subsurface performance, and site closure strategy	2008
NMED issued a health advisory to limit groundwater exposure NMED and HMC reached a Memorandum of Agreement for HMC to provide additional water service to residents The Agency for Toxic Substances and Disease Registry issued a Health Consultation Report NMED approved discharge plan DP-725 and evaporation pond 3	2009
EPA began a multimedia sampling effort in support of the human health risk assessment HMC constructed evaporation pond 3 north of the LTP	2010
EPA issued Site's third FYR Report	2011
EPA issued an Administrative Order on Consent to HMC HMC submitted an updated CAP to the NRC, EPA and NMED for review and approval (OU1) EPA installed radon mitigation systems at 10 residential properties, with one property owner whose residence was eligible for a system refusing mitigation efforts (OU3)	2012
HMC submitted a revised Decommissioning and Reclamation Plan to the NRC for review and approval (OU2) HMC submitted to EPA the report CERCLA Equivalency of Investigation and Remediation Efforts at the Homestake Mining Company of California Uranium Facility	2013
EPA conducted a soil/debris removal action at 18 residential properties (OU3) EPA completed a human health risk assessment (HHRA) for subdivisions (OU3) EPA initiated background reassessment for groundwater at the request of BVDA and Multicultural Alliance for a Safe Environmet (MASE) EPA and NMED agreed to sample 40 private wells at the request of BVDA and MASE NMED performed private well sampling	2014
HMC completed updates to the RO treatment plant EPA engaged the U.S. Geological Survey (USGS) to conduct a groundwater background study	2015
EPA issued Site's fourth FYR Report Full-scale zeolite water treatment began USGS initiated groundwater background study HMC split groundwater samples with USGS and performed an independent background study	2016
HMC submitted white paper to EPA entitled "Evaluation of Water Quality in Regard to Site Background Standards at the Grants Reclamation Project HMC submitted a revised groundwater CAP (GCAP) to the NRC for approval	2018
HMC completed a Supplemental Background Assessment Report USGS published two papers on groundwater background study BVDA/MASE requested historical groundwater data be provided to two consultants, Dr. Tom Myers (Hydrologist) and Dr. Ann Maest (Geochemist) EPA received technical papers from Dr. Myers and Dr. Maest proposing new selenium and uranium background concentrations for groundwater	2019
Dr. Myers and Dr. Maest presented their papers to EPA and NMED and requested the agencies initiate a new background geochemistry study NMED conducted a PHREEQC geochemical modeling study on alluvial groundwater quality at well DD based on the BVDA/MASE request and released a modeling report EPA approved the OU1 and OU2 RI Report, prepared by HMC EPA and HMC entered into an Administrative Settlement Agreement and Order on Consent (ASAOC) for Feasibility Study (FS) HMC submitted revised draft Alternatives Development and Screening Technical Memorandum as initial phase of FS	2020

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Event	Date
HMC submitted a draft Technical Impracticability Evaluation Report in accordance with ASAOC HMC submitted a draft FS Report in accordance with ASAOC EPA selected Site for the EPA's National Remedy Review Board (NRRB) to evaluate the CERCLA feasibility study HMC submitted written comments on NMED modeling report	
NRRB conducted a meeting with EPA Region 6; State, Acoma Pueblo, HMC, and BVDA/MASE make oral presentations to the Board and submit written statements Laguna Pueblo also submit written statements to the NRRB NMED released an updated geochemical modeling report NRRB submitted recommendations to EPA Region 6 on FS process and remedial alternatives being considered in the FS	2021

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APPENDIX C – GROUNDWATER RESTORATION PROGRAM SUPPORTING DOCUMENTATION

Table C-1: Summary of Changes to the Groundwater Restoration System

Year(s)	Activity
1977 to 1983	Installation of multiple hydraulic containment and collection wells in the alluvial aquifer
1984	Initiation of hydraulic containment of the Upper Chinle aquifer
1990	Construction of evaporation pond 1 within the footprint of the STP to assist in the dewatering of the LTP and to hold water pumped from collection wells Installation of additional hydraulic containment and collection wells in the alluvial aquifer
1992	Installation of toe drains around the tailings
1993 to 2000	Revisions to the corrective action and monitoring well networks, including well installations and well abandonments
1996	Use of evaporation pond 2 began
1999	Addition of the RO treatment unit for extracted groundwater Use of treated water from the RO unit for hydraulic containment of the alluvial aquifer began
2000	Initiation of irrigation of 270 acres as LTAs to manage extracted groundwater
2002	Addition of 60 acres to the LTAs RO treatment plant capacity increased from 300 gpm (one unit) to 600 gpm (two units)
2002 to 2009	Revisions to the corrective action and monitoring well networks
2004 to 2005	Addition of 64 acres to the LTAs
2010	Construction and use of evaporation pond 3 began
2012	Use of LTAs ended The 300-gpm zeolite pilot treatment began
2015	Expansion of the RO treatment plant to 1,200-gpm capacity, with updates including addition of a 600-gpm low pressure skid, a 250-gpm high-pressure skid and two microfiltration skids to replace the existing sand filters
2016	Addition and startup of a 1,200-gpm zeolite treatment system for off-site groundwater
2017	LTP dewatering ceased

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Table C-2: Quantities of Constituents Collected On Site

TABLE 2.1-1. QUANTITIES OF CONSTITUENTS COLLECTED ON-SITE.

YEAR	SOURCE	TOTAL VOLUME PUMPED (GAL)	SULFATE (SO4) CONC. AMT. (MG/L)	(LB)	URANIUM (U) CONC. AMT. (MG/L)	(LB)	MOLYBDENUM (MO) CONC. AMT. (MG/L)	(LB)	SELENIUM (SE) CONC. AMT. (MG/L)	(LB)
1978	G.W.	27670033	5200	1200620	35	8081	40	9236	2	462
1979	G.W.	46371629	5200	2012095	35	13543	40	15478	3	774
1980	G.W.	39385860	5200	1708978	35	11503	40	13146	2	657
1981	G.W.	91613183	5200	3975155	35	26756	40	30578	3	1529
1982	G.W.	159848025	5200	6935910	35	46684	40	53353	2	2668
1983	G.W.	167018540	5200	7247043	35	48778	40	55746	3	2787
1984	G.W.	203258522	5200	8819519	35	59362	40	67842	2	3392
1985	G.W.	194074421	5200	8421015	35	56680	40	64777	2	3239
1986	G.W.	199326030	5200	8648886	35	58214	40	66530	2	3326
1987	G.W.	180881740	5200	7848576	35	52827	40	60374	2	3019
1988	G.W.	166460826	5200	7222843	35	48615	40	55560	2	2778
1989	G.W.	175780600	5200	7627243	35	51337	40	58671	2	2934
1990	G.W.	164378919	5200	7132598	35	48007	40	54865	2	2743
1991	G.W.	171497720	5200	7441397	35	50086	40	57242	2	2862
1992	G.W.	128398849	4925	5276234	27.2	291.34	35.9	38419	1.60	1718
1992	TOE	8544670	12117	864006	53.2	3793	106.5	7595	1.73	123
1993	G.W.	115795020	5011	4841203	28.1	27130	45.4	43885	1.47	1425
1993	TOE	18357680	12117	1856262	53.2	8150	106.5	16315	1.73	265
1994	G.W.	98294087	4423	3624762	26.0	21146	27.3	22349	1.42	1162
1994	TOE	18337680	12117	1854240	53.2	8141	106.5	16299	1.73	264
1995	G.W.	108306398	3256	2942827	16.1	14553	19.2	17355	1.65	1491
1995	TOE	17711370	11370	1680500	54.6	8069	94.4	13952	2.25	332
1995	TAILS	5905740	8191	403680	36.1	1778	89.7	4420	0.15	7
1996	G.W.	122064160	3899	3967919	30.9	21225	26.8	27259	1.92	1950
1996	TOE	15431810	11537	1484295	46.4	5970	105.0	13509	1.29	166
1996	TAILS	9181390	9434	722129	40.2	3077	108.0	8236	0.18	14
1997	G.W.	94465562	4955	3836678	26.9	20892	33.4	25887	3.17	2456
1997	TOE	12029390	11034	1113808	41.8	419	100.0	10040	0.81	81
1997	TAILS	21292909	10284	1827575	45.8	8139	92.4	16420	0.14	25
1998	G.W.	74459130	5088	3161866	29.6	18385	34.8	21625	1.85	1151
1998	TOE	10321780	9870	850257	42.5	3665	95.2	8203	0.73	63
1999	G.W.	117752408	3363	3305027	16.6	16314	14.8	14545	2.06	2024
1999	TOE	8809890	11560	849976	54.3	3993	106.0	7794	0.48	34
1999	TAILS	120550	9420	9478	40.9	41	111.5	112	0.19	0
2000	G.W.	146609842	3358	4108868	18.8	23004	20.6	25206	1.94	2374
2000	TOE	8032870	9734	652590	58.6	3929	118.0	7911	0.34	23
2000	TAILS	12446810	9710	1008685	37.8	3927	127.0	13193	0.30	31
2001	G.W.	144925056	2770	3350438	19.6	23707	21.4	25884	1.65	1996
2001	TOE	9606280	9935	796529	43.1	3455	95.7	7673	0.78	63
2001	TAILS	31465370	8688	2281555	34.6	9086	89.2	23425	0.19	50
2002	G.W.	201357360	2748	4618092	14.9	25040	16.7	28065	1.23	2067
2002	TOE	17975520	9210	1381718	33.4	5011	88.7	13307	0.76	114
2002	TAILS	17817840	7670	1140588	23.5	3495	40.8	6067	0.12	18
2003	G.W.	177727419	2417	3585168	13.8	20470	15.5	22991	0.73	1083
2003	TOE	28418871	9457	2243048	35.6	8444	78.9	18714	4.35	1032
2003	TAILS	8890076	9800	727126	28.0	2078	92.0	6826	0.30	22
2004	G.W.	154422720	2272	2931913	11.3	14633	16.6	21386	0.79	1017
2004	TOE	26720928	8007	1787722	31.9	7115	87.8	15102	2.78	622
2004	TAILS	44745696	6360	2377848	23.1	8637	60.9	22769	0.20	75
2005	G.W.	139810679	2478	2705346	11.8	12883	15.5	16922	0.59	644
2005	TOE	20704320	8228	1421784	43.5	7517	87.5	15120	2.63	454
2005	TAILS	45685786	4389	1673497	18.7	7130	56.3	21467	0.18	69
2006	G.W.	132406109	1990	2199072	9.6	10609	14.3	15802	0.73	807
2006	TOE	20374782	7432	1263796	38.0	6462	76.2	12958	1.09	185
2006	TAILS	43707760	4278	1560650	17.6	6420	51.9	18932	0.14	51
2007	G.W.	137707200	2420	2781316	10.3	11838	16.7	19193	0.52	598
2007	TOE	25037779	6829	1427024	31.9	6666	67.3	14063	1.20	251
2007	TAILS	24561680	4130	846616	19.9	4079	61.1	12525	0.15	31
2008	G.W.	137145174	2672	3058408	11.5	13163	16.5	18886	0.61	698
2008	TOE	26140850	7847	1711992	31.6	6894	68.5	14945	1.58	345
2008	TAILS	5950324	4871	231968	16.0	795	42.8	2126	0.24	12
2009	G.W.	131564160	3145	3453318	15.5	17020	19.1	20660	0.85	933
2009	TOE	27238830	7792	1771396	35.0	7957	69.9	15891	0.81	184
2009	TAILS	29403070	3850	944782	13.7	3362	38.6	9472	0.24	59
2010	G.W.	135785118	2793	2932099	12.9	13542	16.6	17437	0.64	672
2010	TOE	18444330	6848	1054156	32.9	5065	52.1	8020	0.51	79
2010	TAILS	12953960	3018	326287	9.4	1016	33.5	3622	0.19	21
2011	G.W.	132573855	2908	3217590	14.4	15933	22.5	24895	1.23	1361
2011	TOE	14777020	6747	832101	29.9	3688	53.2	6561	0.44	54
2011	TAILS	54713150	2887	1318308	10.5	4795	33.5	15297	0.18	82

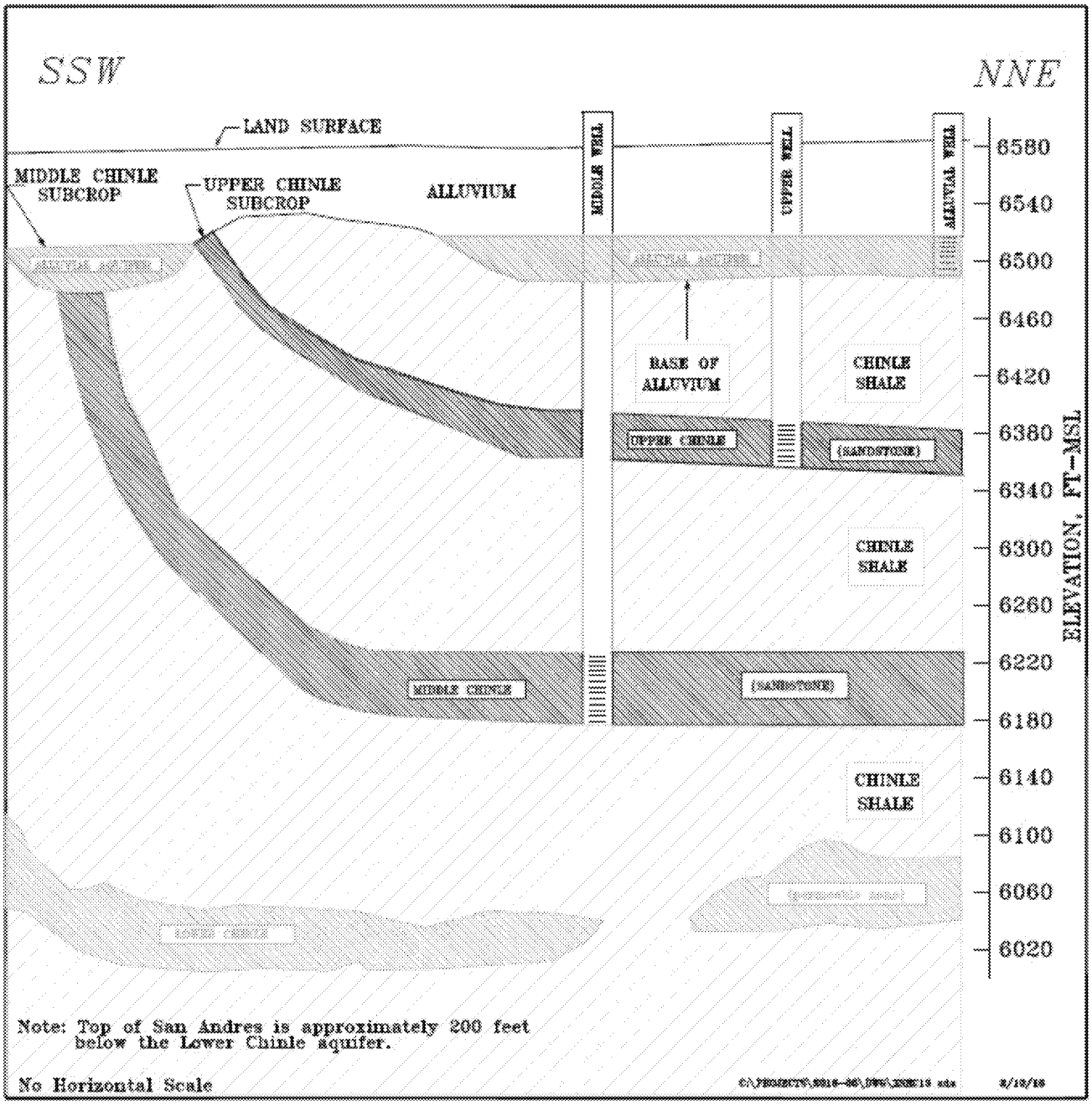
TABLE 2.1-1. QUANTITIES OF CONSTITUENTS COLLECTED ON-SITE.

YEAR	SOURCE	TOTAL VOLUME PUMPED (GAL)	SULFATE (SO4) CONC. AMT. (MG/L)	(LB)	URANIUM (U) CONC. AMT. (MG/L)	(LB)	MOLYBDENUM (MO) CONC. AMT. (MG/L)	(LB)	SELENIUM (SE) CONC. AMT. (MG/L)	(LB)
2012	G.W.	143304728	3070	3671785	13.4	16027	16.8	20093	0.62	742
2012	TOE	12201316	6478	659465	26.8	2729	48.9	4980	0.43	44
2012	TAILS	56486600	2632	1240823	8.9	4196	26.2	12352	0.17	80
2013	G.W.	122813790	2793	2862836	12.5	12813	16.2	16605	0.73	748
2013	TOE	9211575	6453	496105	26.7	2053	53.3	4098	0.35	27
2013	TAILS	31489800	2448	643368	7.5	1958	23.6	6202	0.12	32
2014	G.W.	124070324	2570	2661212	11.4	11805	15.8	16361	0.63	652
2014	TOE	9427490	5683	447149	21.2	1668	46.0	3619	0.15	12
2014	TAILS	24487100	2788	569782	7.8	1594	27.1	5538	0.16	33
2015	G.W.	109360371	3100	2829437	10.8	9857	14.1	12869	0.83	758
2015	TOE	10222310	5252	448076	20.7	1766	41.2	3515	0.30	26
2015	TAILS	8644000	2891	208565	8.2	592	28.0	2020	0.11	8
2016	G.W.	312653024	2590	6758352	8.2	21397	14.5	37836	0.45	1174
2016	TOE	7553090	4756	299809	17.2	1085	36.7	2310	0.15	9
2016	TAILS	2678400	2891	64625	8.2	183	28.0	626	0.11	2
2017	G.W.	261047358	2104	4583987	10.5	22876	17.1	37256	0.66	1438
2017	TOE	5455170	3305	150473	13.9	633	26.9	1225	0.21	10
2017	TAILS	674300	4918	27677	14.7	83	32.5	183	0.70	4
2018	G.W.	229336854	1460	2794506	3.8	7235	5.5	10566	0.28	542
2018	TOE	4530130	4708	178002	17.5	662	36.6	1384	0.27	10
2019	G.W.	170189842	2185	3103584	7.3	10369	13.4	19033	0.49	696
2019	TOE	3024380	4959	125172	15.4	389	42.4	1070	0.20	5
2020	G.W.	156370198	2600	3262604	8.3	10858	14.3	18662	0.45	587
2020	TOE	2152800	4952	88974	16.1	289	39.7	713	0.52	9
SUM G.W.		6,229,283,043		188,668,296		1,074,329		1,321,322		68,134
SUM TOE		416,794,911		29,790,427		125,674		266,885		4,885
SUM TAILS		493,302,302		20,155,515		76,460		211,831		725
COMBINED SUM		7,139,380,256		238,614,238		1,276,463		1,800,037		73,743

NOTE: Average concentrations for 1978 to 1991 were used in calculating the quantities of constituents removed. Concentrations from the collection wells have gradually decreased from 1978 through 1991.
G.W. = Ground water; TOE = Toe drains on edge of tailings; TAILS = Large tailings collection wells

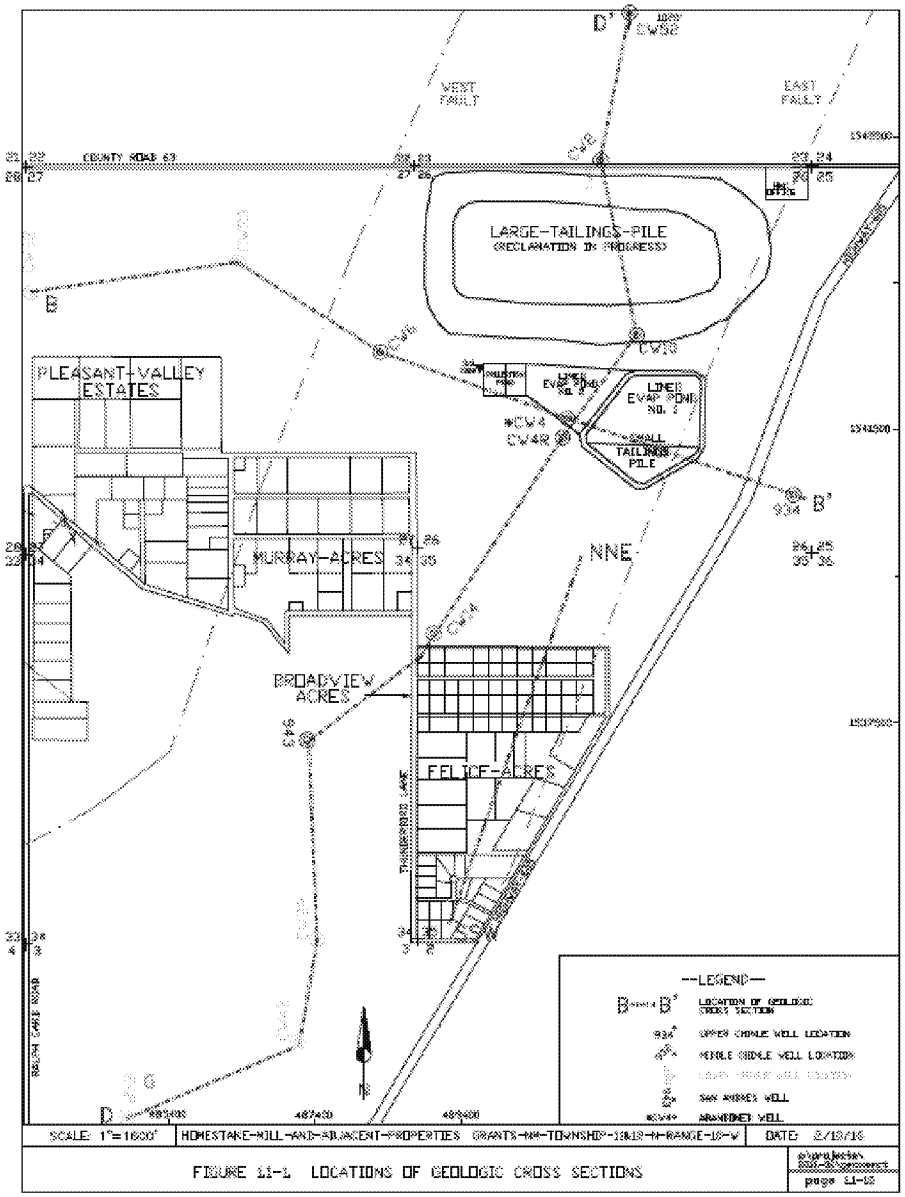
Source: 2020 HMC Annual Monitoring Report/Performance Review.

Figure C-1: Generalized Geological Cross Section



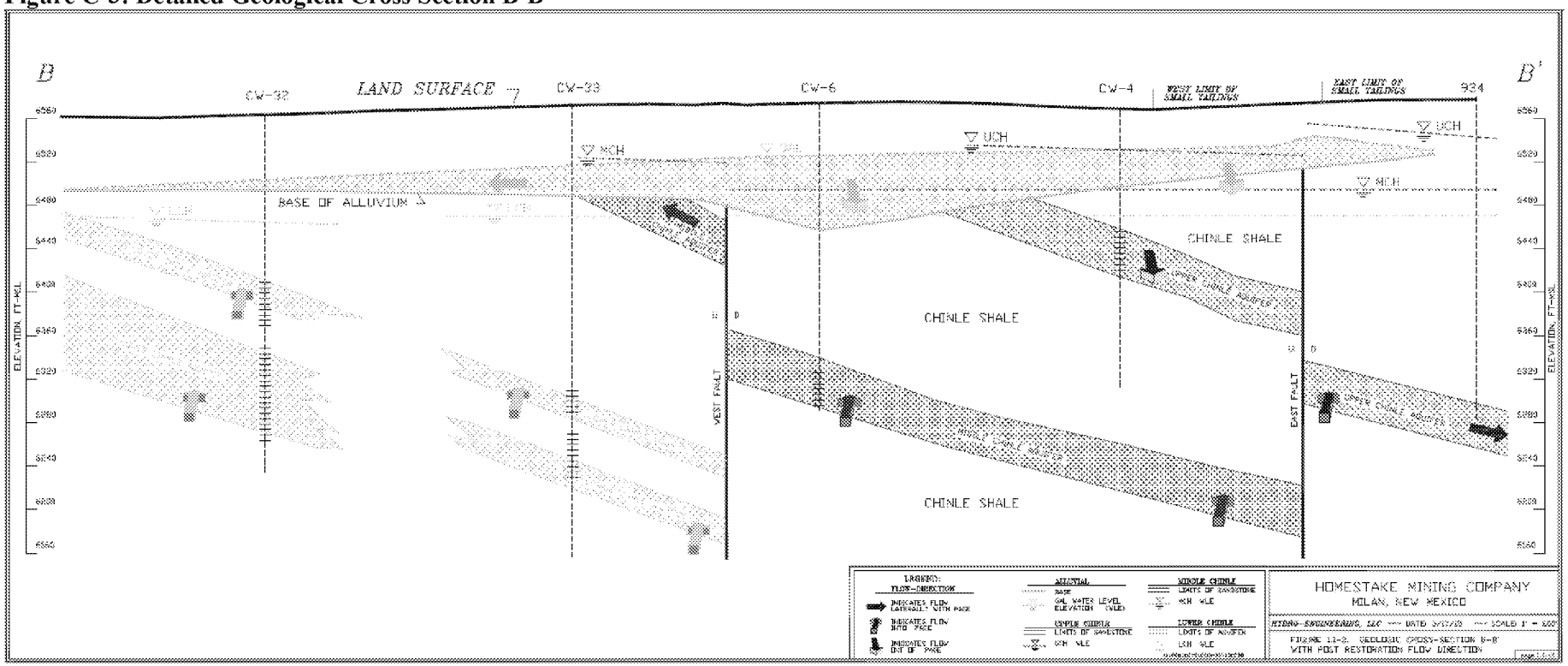
Source: 2020 HMC Annual Monitoring Report/Performance Review.

Figure C-2: Location of Detailed Geologic Cross Sections



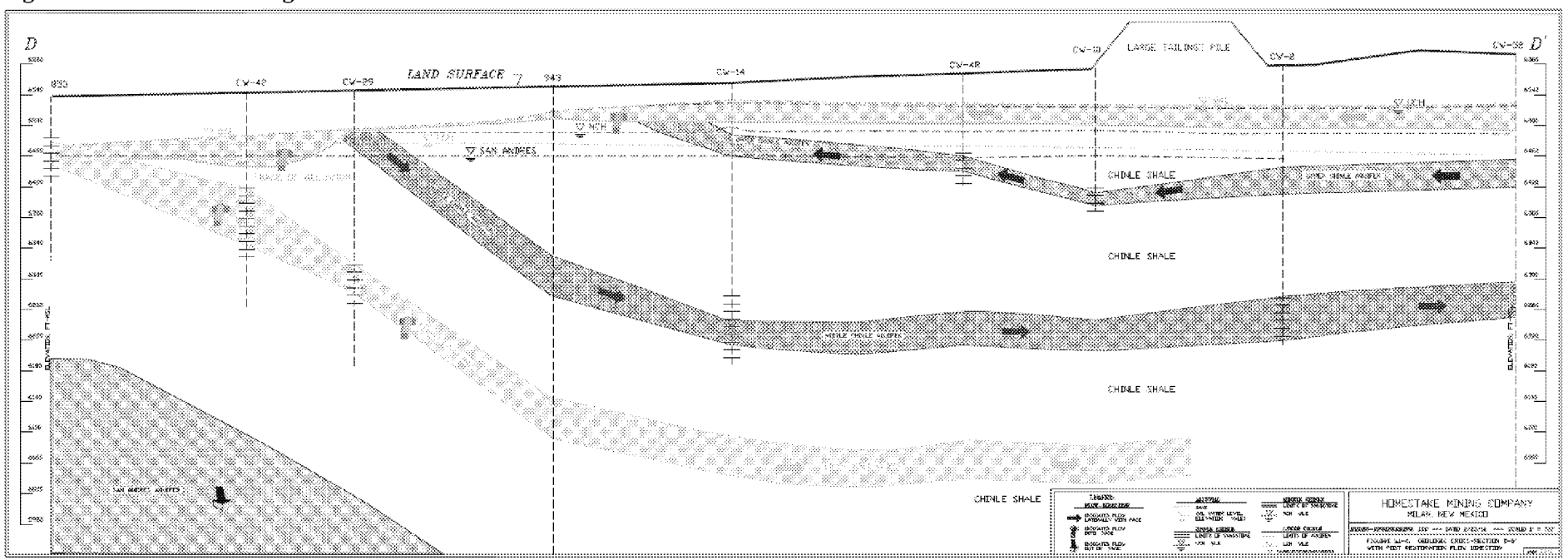
Source: 2020 HMC Annual Monitoring Report/Performance Review.

Figure C-3: Detailed Geological Cross Section B-B'



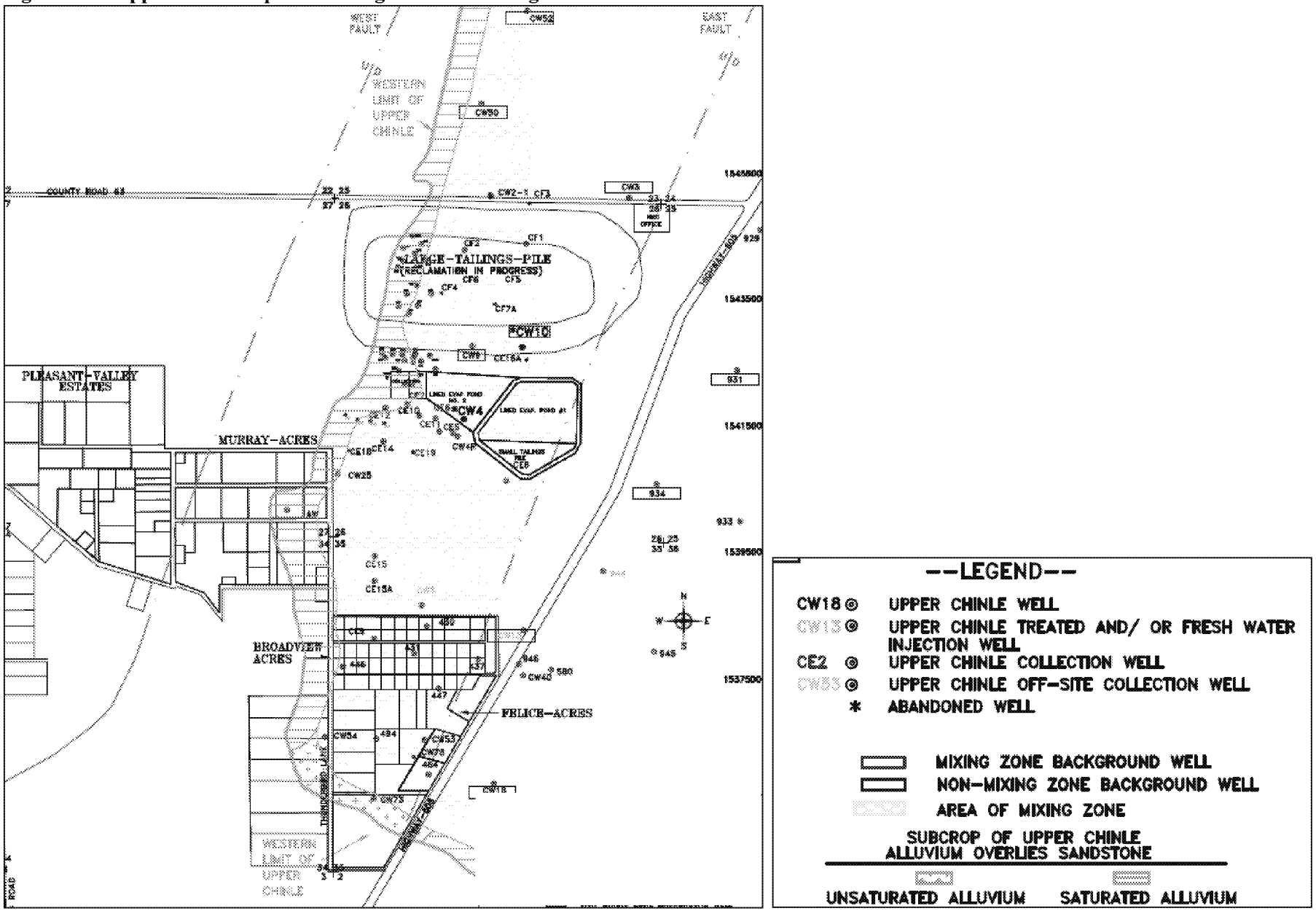
Source: 2020 HMC Annual Monitoring Report/Performance Review.

Figure C-4: Detailed Geological Cross Section D-D'



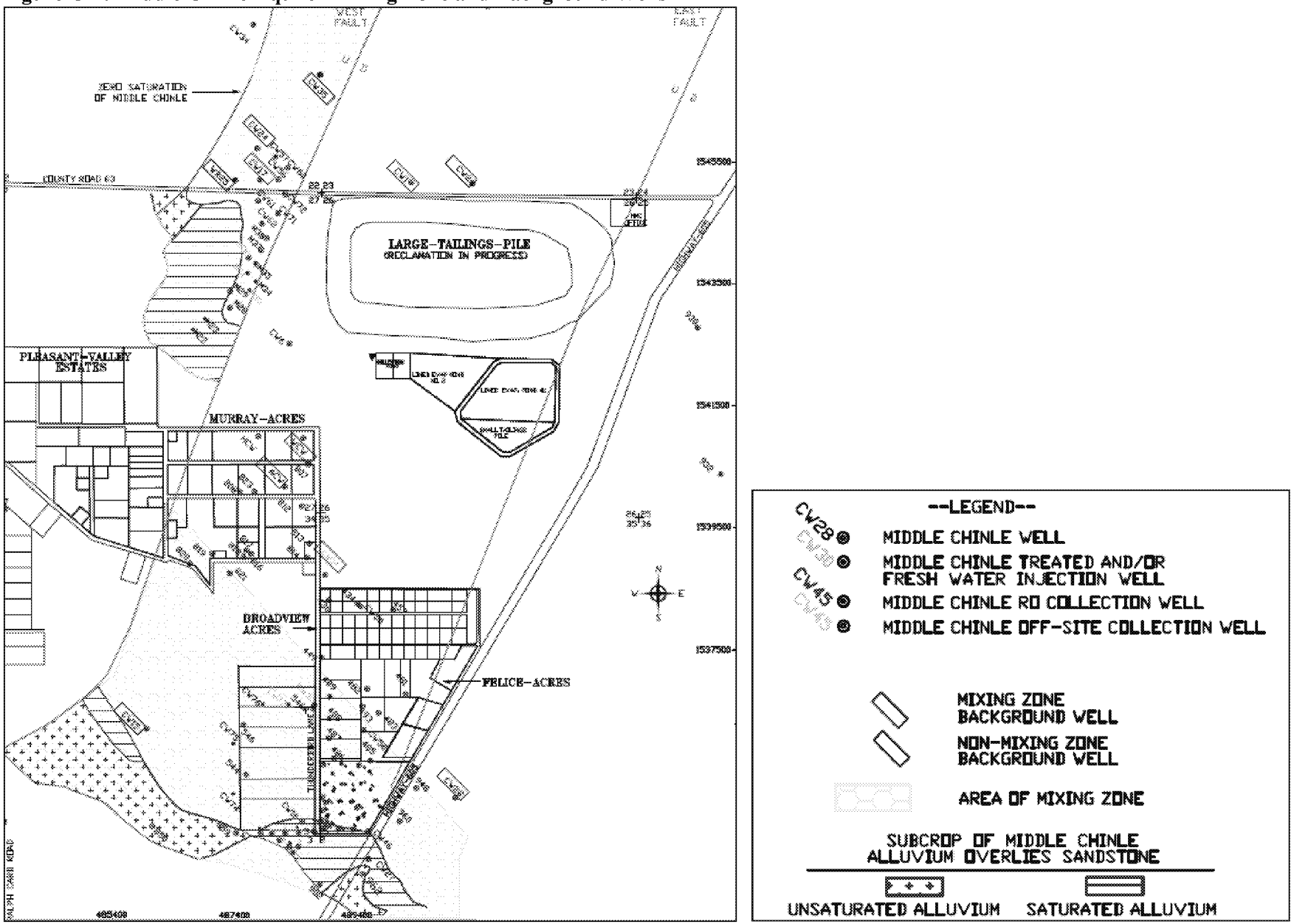
Source: 2020 HMC Annual Monitoring Report/Performance Review.

Figure C-5: Upper Chinle Aquifer Mixing Zone and Background Wells



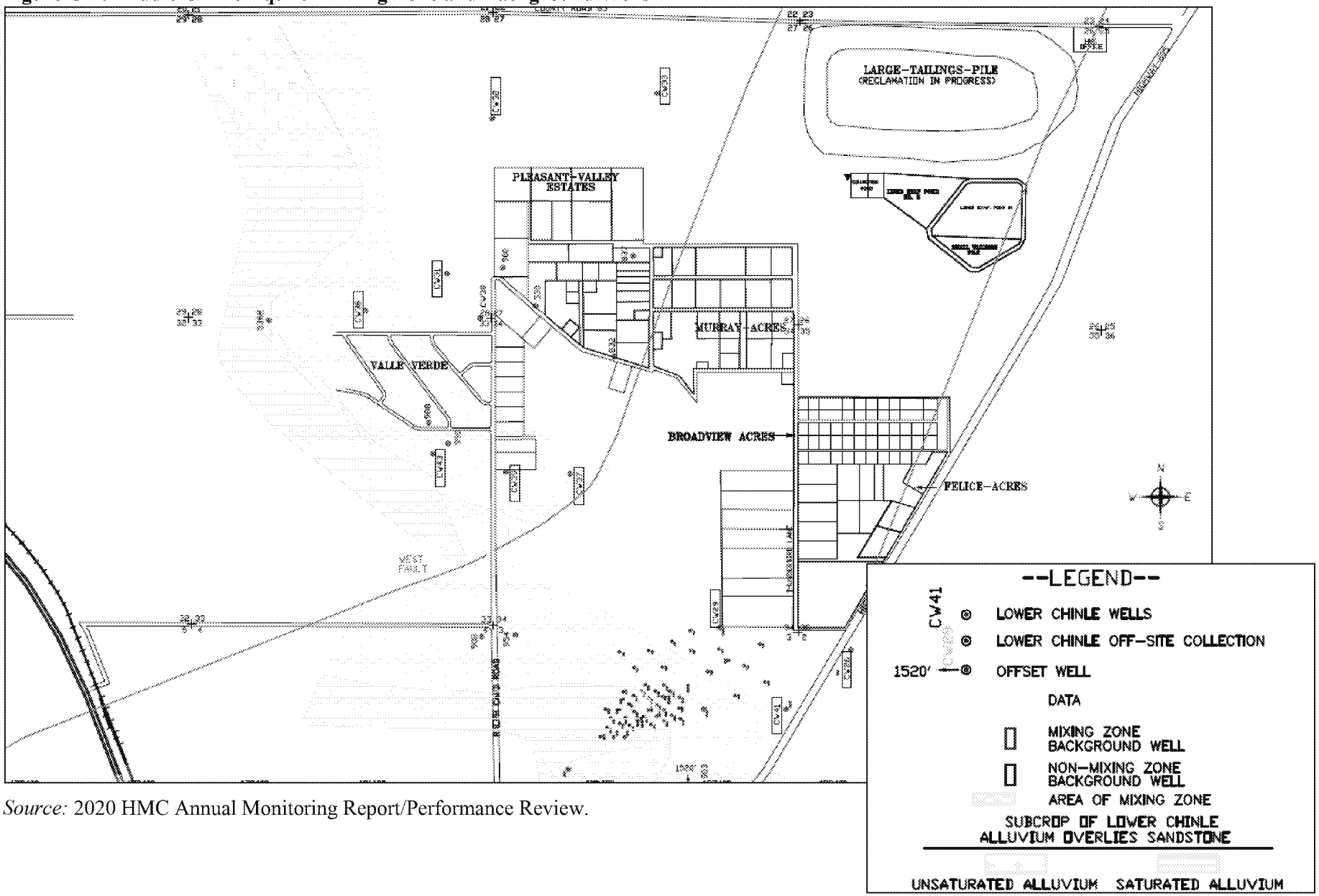
Source: 2020 HMC Annual Monitoring Report/Performance Review.

Figure C-6: Middle Chinle Aquifer Mixing Zone and Background Wells



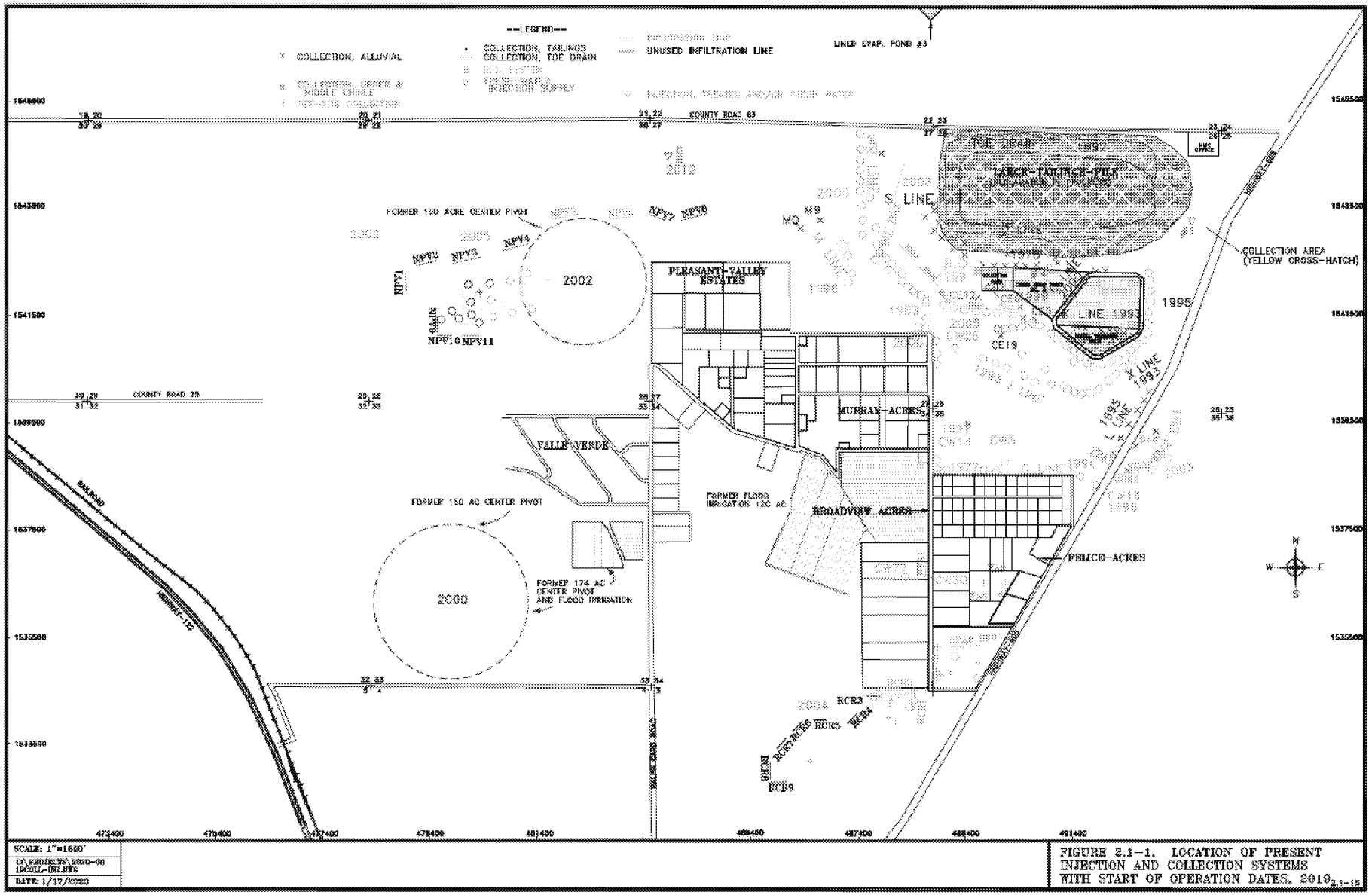
Source: 2020 HMC Annual Monitoring Report/Performance Review.

Figure C-7: Middle Chinle Aquifer Mixing Zone and Background Wells



Source: 2020 HMC Annual Monitoring Report/Performance Review.

Figure C-8: Location of Present Injection and Collection Systems



Source: 2019 Annual Monitoring Report/Performance Review.

APPENDIX D – PUBLIC NOTICE

PUBLIC NOTICE
HOMESTAKE MINING COMPANY SUPERFUND SITE

U. S. EPA, Region 6 Initiates
Fifth Five-Year Review of Site Remedy
September 2020

The U.S. Environmental Protection Agency Region 6 (EPA), in coordination with the New Mexico Environment Department, will be conducting the fifth five-year review of remedy implementation and performance at the Homestake Mining Company Superfund site (Site) in Milan, Cibola County, New Mexico. The Site is a former uranium mill and tailing disposal facility that includes a large and small tailings impoundment and contaminated portions of the underlying groundwater aquifers that extend into neighboring subdivisions. Current groundwater remedial actions include source control, plume control, evaporation, and water treatment.

The five-year review will determine if the ongoing remedy remains protective of human health and the environment. The five-year review is scheduled for completion in September 2021.

A report of the results of the review will be made available to the public at the following EPA Internet address and the local information repository:

http://www.epa.gov/superfund/homestake-mining

New Mexico State University,
Grants Campus Library
1500 Third Street
Grants, New Mexico 87020
(505) 287-6839

Site status updates are also available on the Internet. All media inquiries should be directed to the EPA Press Office at (214) 665-2200.

For more information about the Site, contact:

Mark Purcell
Remedial Project Manager
U.S. Environmental Protection Agency, Region 6
(214) 665-6707
or 1-800-533-3508 (toll-free)
or by email at purcell.mark@epa.gov

Adam Wiesch
Community Involvement Coordinator
U.S. Environmental Protection Agency, Region 6
(214) 665-2264
or 1-800-533-3508 (toll-free)
or by email at wiesch.adam@epa.gov

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AVISO PÚBLICO
SITIO SUPERFUND HOMESTAKE MINING COMPANY

La Región 6 de la Agencia de Protección Ambiental de los Estados Unidos Inicia La Quinta Revisión de Cinco Años del Remedio
Septiembre de 2020

La Región 6 de la Agencia de Protección Ambiental de los Estados Unidos (EPA, por sus siglas en inglés), en coordinación con el Departamento de Medio Ambiente de Nuevo México, llevará a cabo la quinta revisión de cinco años de la implementación y el desempeño del plan de limpieza del sitio Superfund Homestake Mining Company (Sitio) en Milan, Condado de Cibola, Nuevo México. El Sitio es un antiguo molino de uranio y una instalación de almacenamiento de relaves que incluye un depósito de relaves grandes y pequeños tanto como porciones contaminadas de los acuíferos subterráneos subyacentes que se extienden a las subdivisiones vecinas. Las acciones correctivas actuales para las aguas subterráneas incluyen el control de la fuente de contaminación, el control del penacho de aguas subterráneas contaminadas, la evaporación y el tratamiento de las aguas subterráneas.

La revisión de cinco años determinará si el remedio en curso sigue protegiendo la salud humana y el medio ambiente. La revisión de cinco años está prevista para septiembre de 2021.

El informe se pondrá a disposición del público en la siguiente dirección de Internet de la EPA y en el repositorio local de información:

https://www.epa.gov/superfund/homestake-mining

New Mexico State University,
Grants Campus Library
1500 Third Street
Grants, New Mexico 87020
(505) 287-6839

Actualizaciones del estado del sitio Superfund están disponibles en la dirección de Internet de la EPA. Todas las preguntas de los medios deben dirigirse a la Oficina de la Prensa de la EPA al (214) 665-2200.

Para obtener más información sobre el sitio, contacte a:

Mark Purcell
Gerente de Proyecto de Limpieza
Región 6 de la EPA de los EE. UU.
(214) 665-6707
o 1-800-533-3508 (número gratuito)
o por correo electrónico a purcell.mark@epa.gov

Adam Wasco
Coordinador de Participación Comunitaria
Región 6 de la EPA de los EE. UU.
(214) 665-2294
o 1-800-533-3508 (número gratuito)
o por correo electrónico a wasco.adam@epa.gov

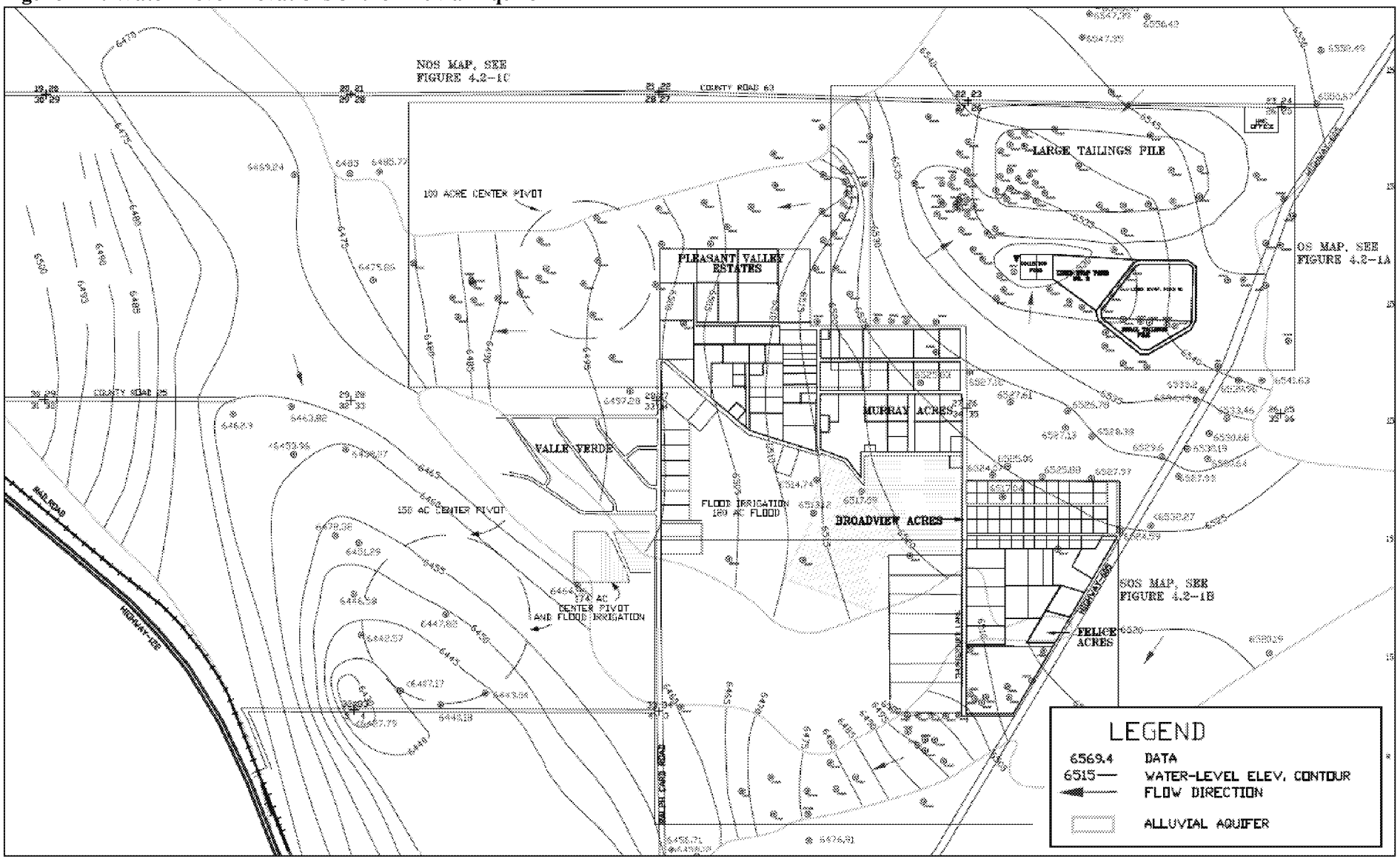
Ashlynne Winton
Líder de Permisos
Departamento de Medio Ambiente de Nuevo México
(505) 827-8602
o por correo electrónico a Ashlynne.winton@state.nm.us

APPENDIX E – INTERVIEW FORMS

ED_006200_00000116-00077

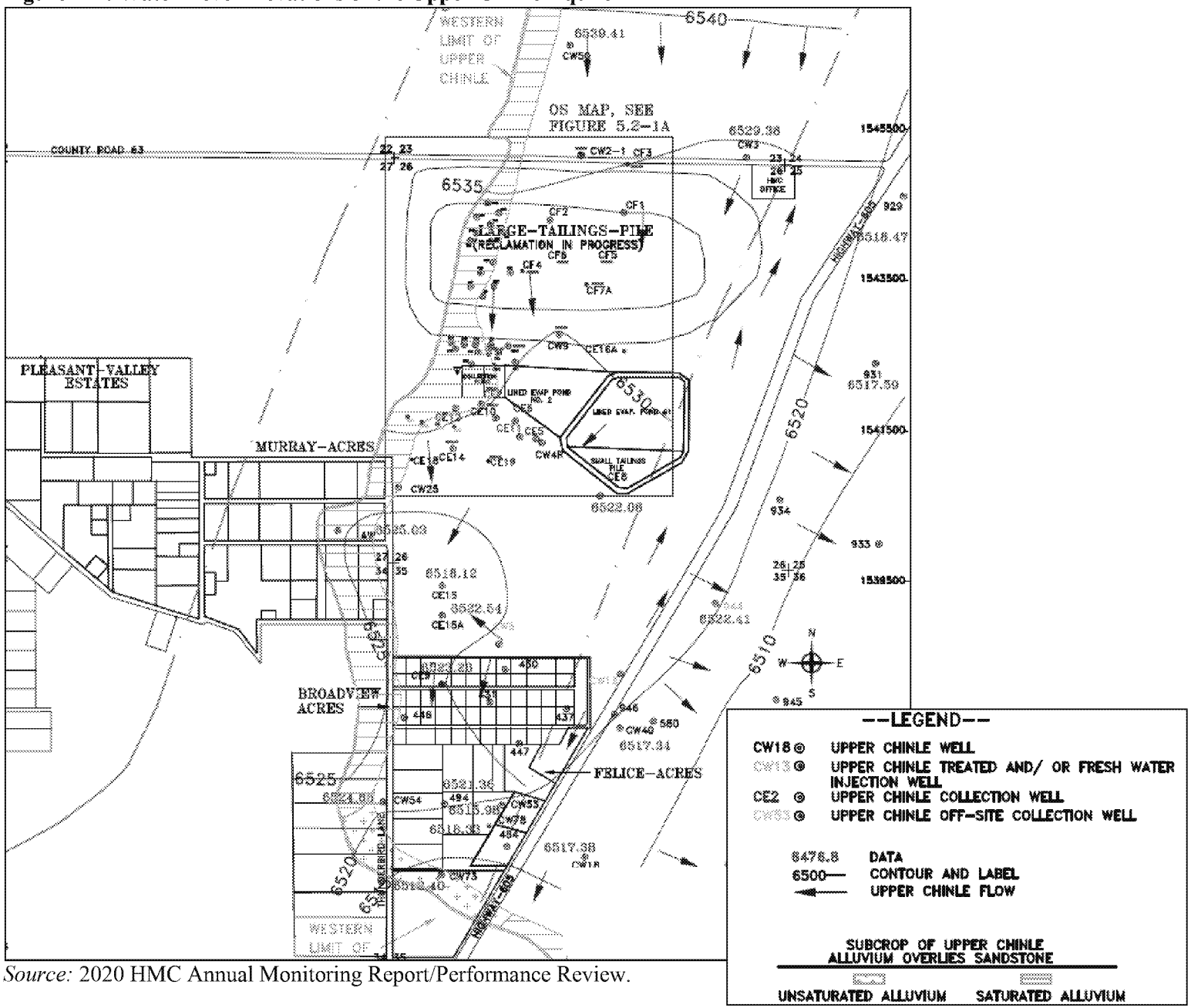
APPENDIX F – DATA REVIEW SUPPORTING DOCUMENTATION

Figure F-1: Water-Level Elevations of the Alluvial Aquifer – 2020



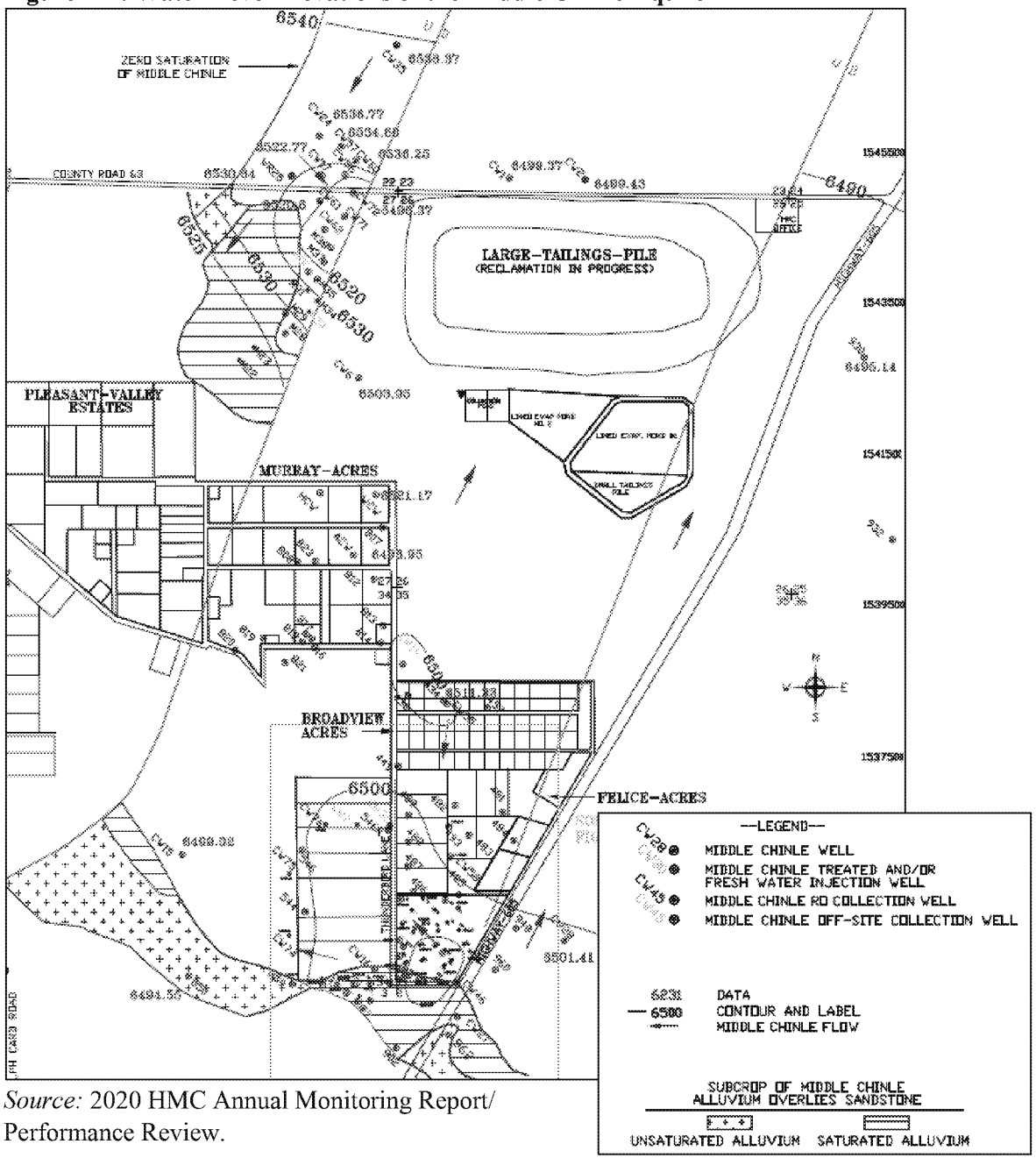
Source: 2020 HMC Annual Monitoring Report/Performance Review.

Figure F-2: Water Level Elevations of the Upper Chinle Aquifer – 2020



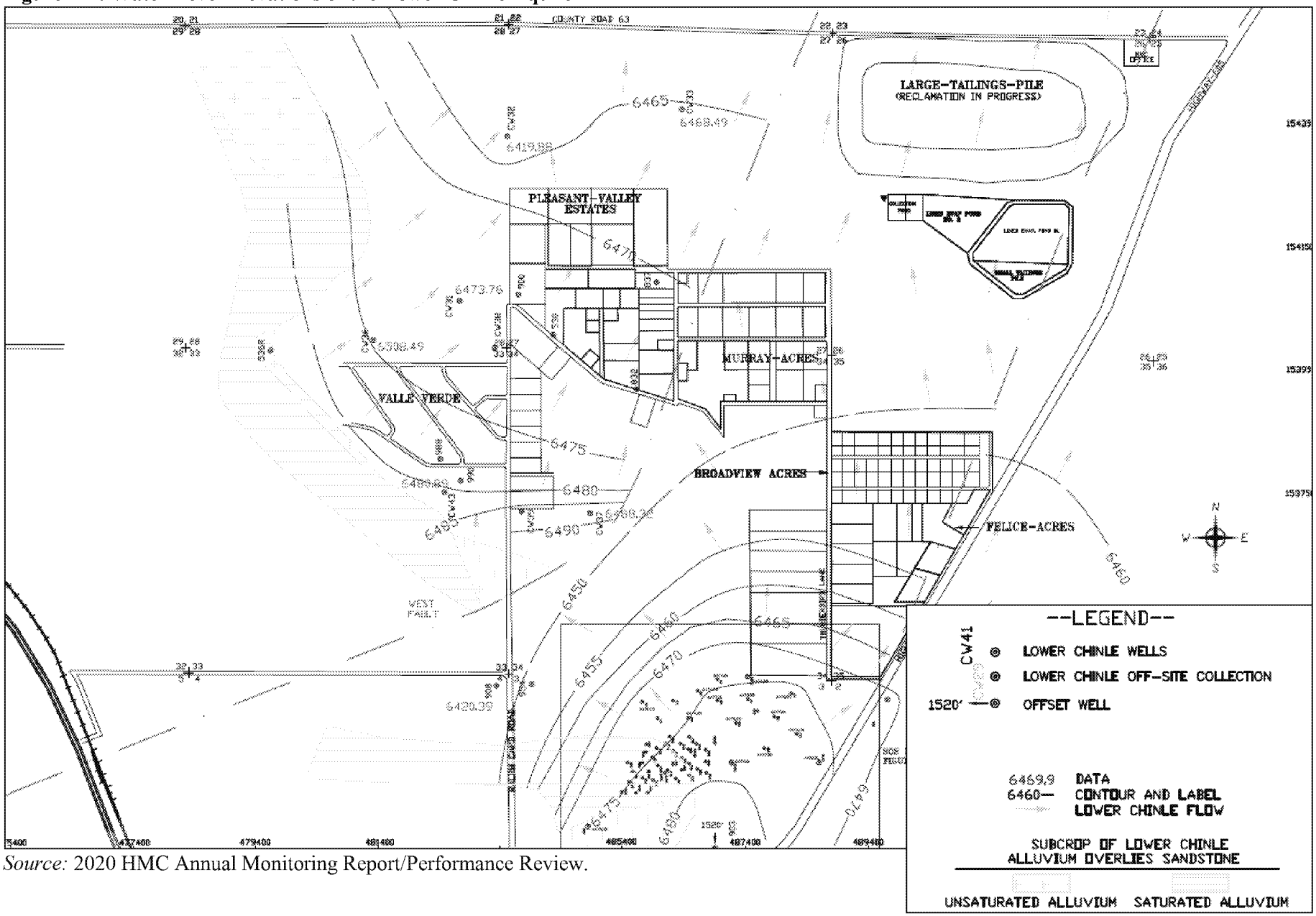
Source: 2020 HMC Annual Monitoring Report/Performance Review.

Figure F-3: Water Level Elevations of the Middle Chinle Aquifer – 2020



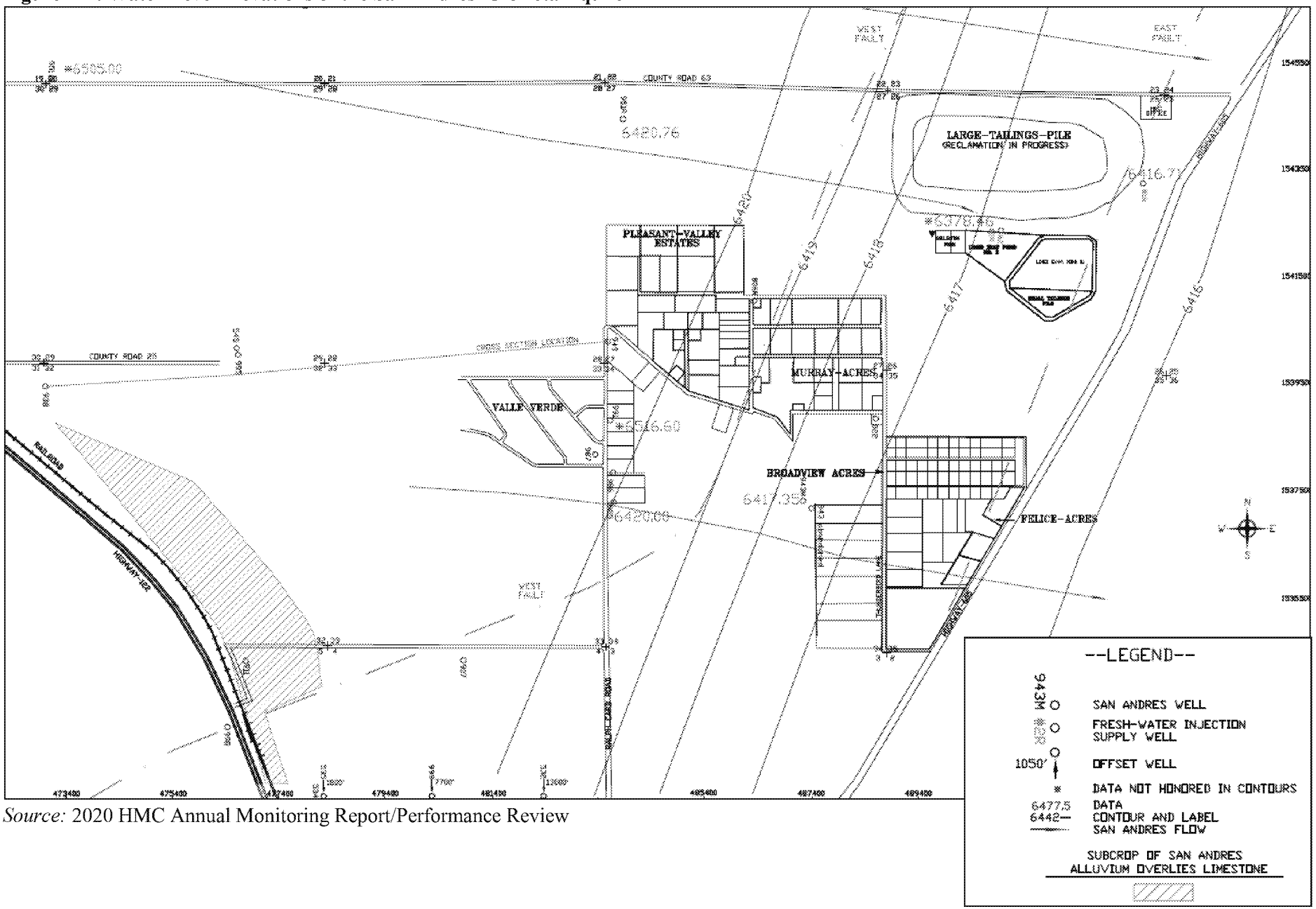
Source: 2020 HMC Annual Monitoring Report/ Performance Review.

Figure F-4: Water Level Elevations of the Lower Chinle Aquifer – 2020



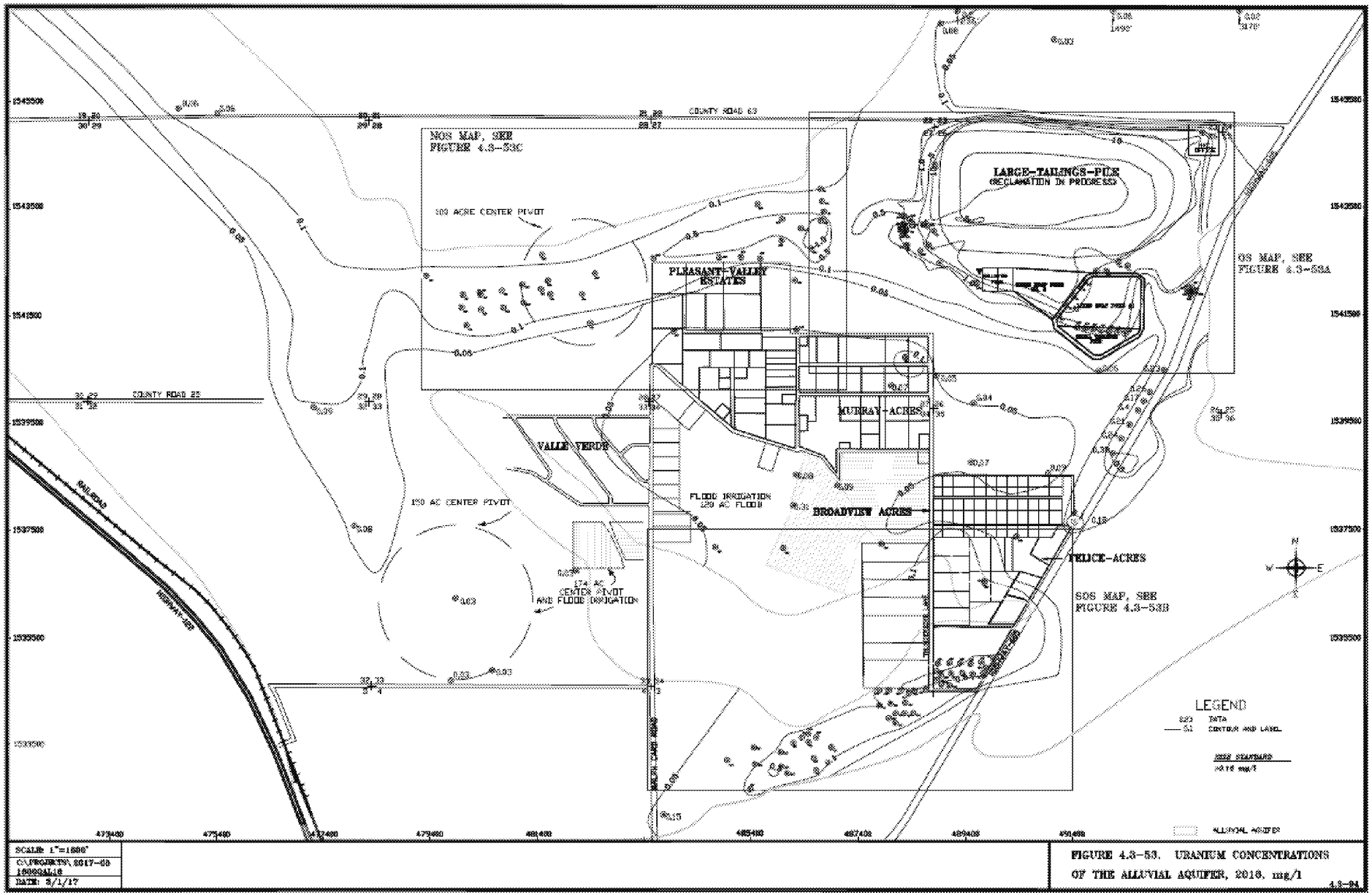
Source: 2020 HMC Annual Monitoring Report/Performance Review.

Figure F-5: Water Level Elevations of the San Andres–Glorieta Aquifer – 2020



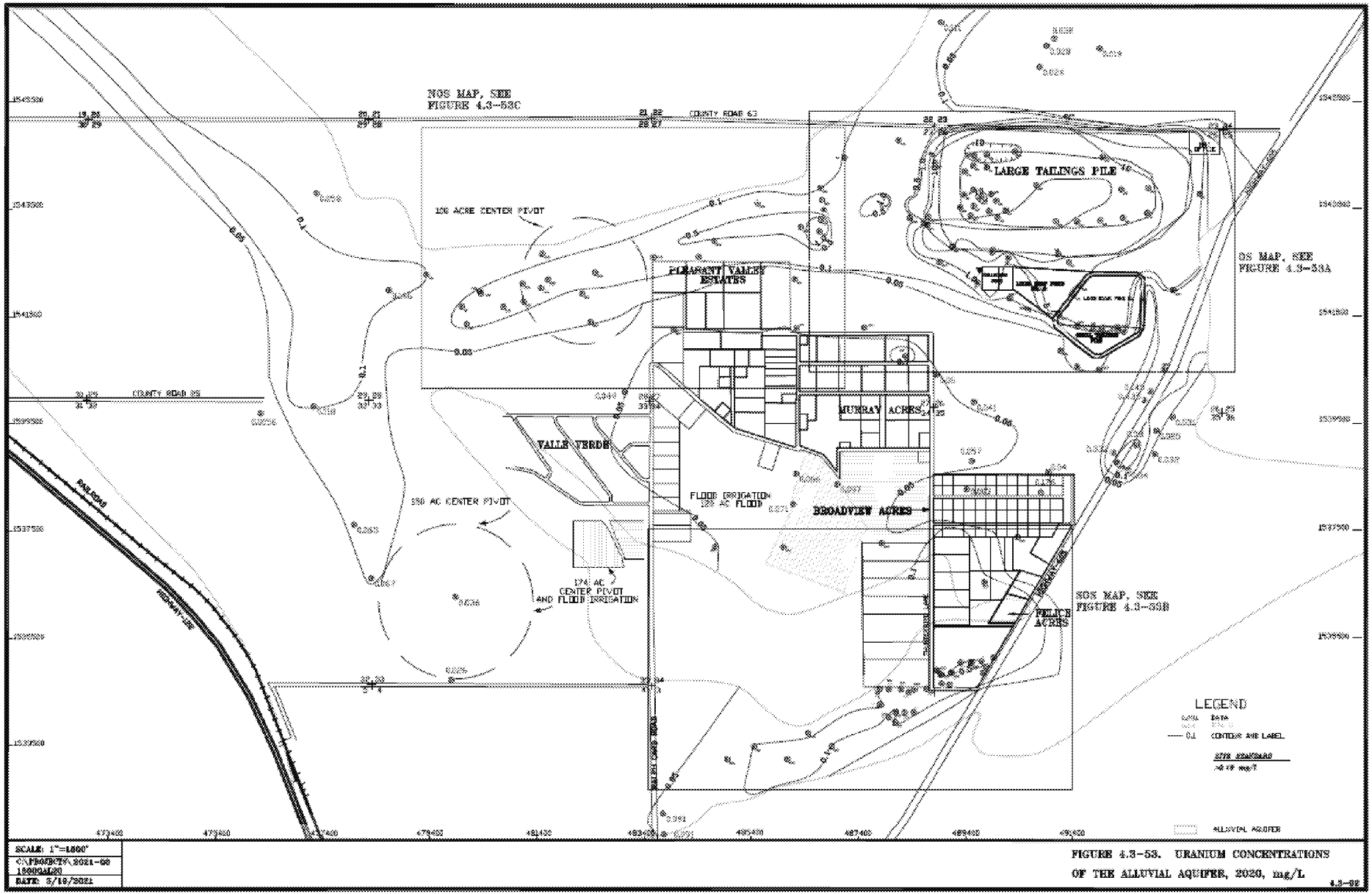
Source: 2020 HMC Annual Monitoring Report/Performance Review

Figure F-6: 2016 Alluvial Aquifer Uranium Plume Map



Source: 2016 HMC Annual Monitoring Report/Performance Review

Figure F-7: 2020 Alluvial Aquifer Uranium Plume Map



Source: 2020 HMC Annual Monitoring Report/Performance Review

Figure F-8: 2016 and 2020 Alluvial Aquifer Uranium Plume Maps – Downgradient Plume Area in West Channel

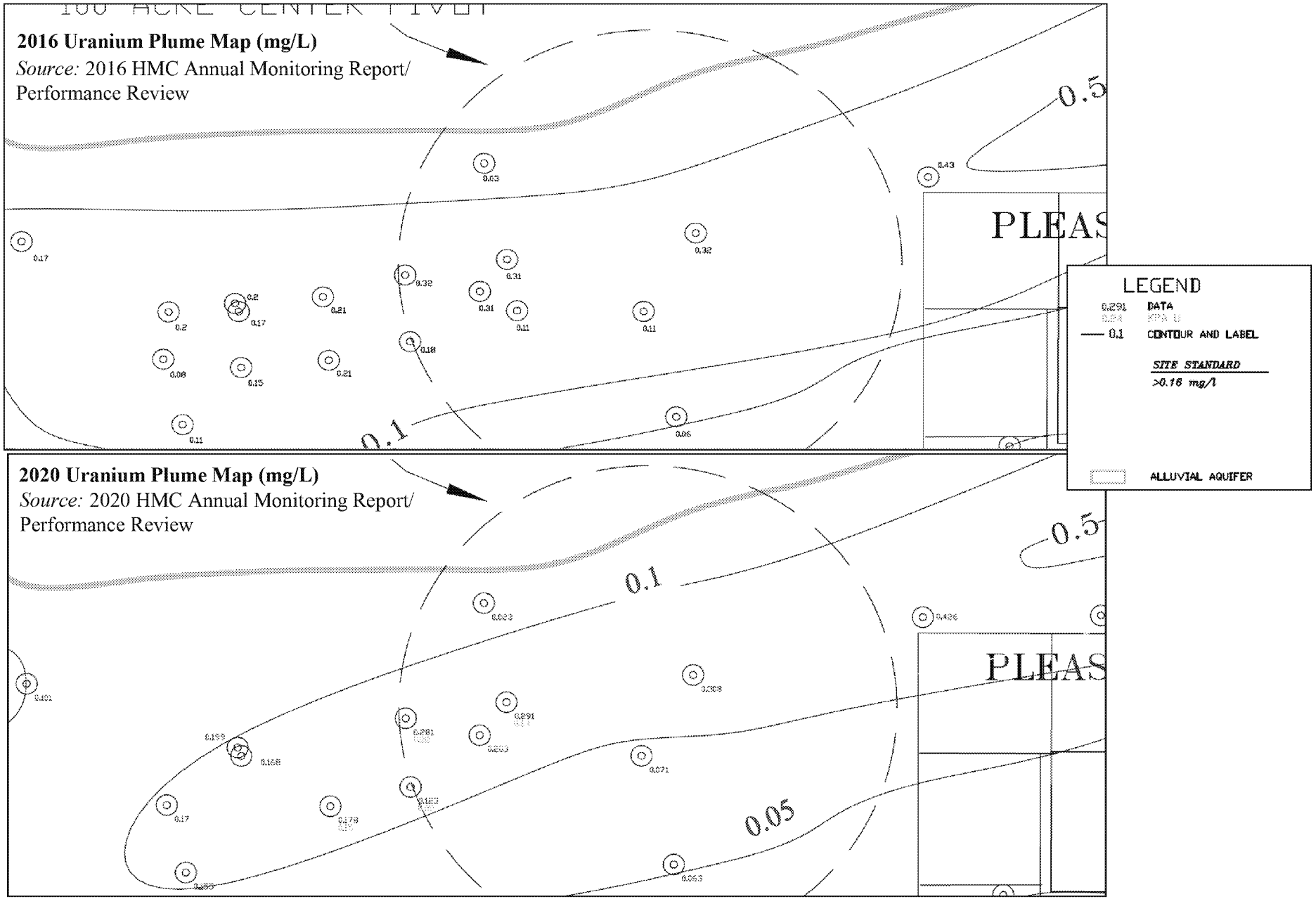
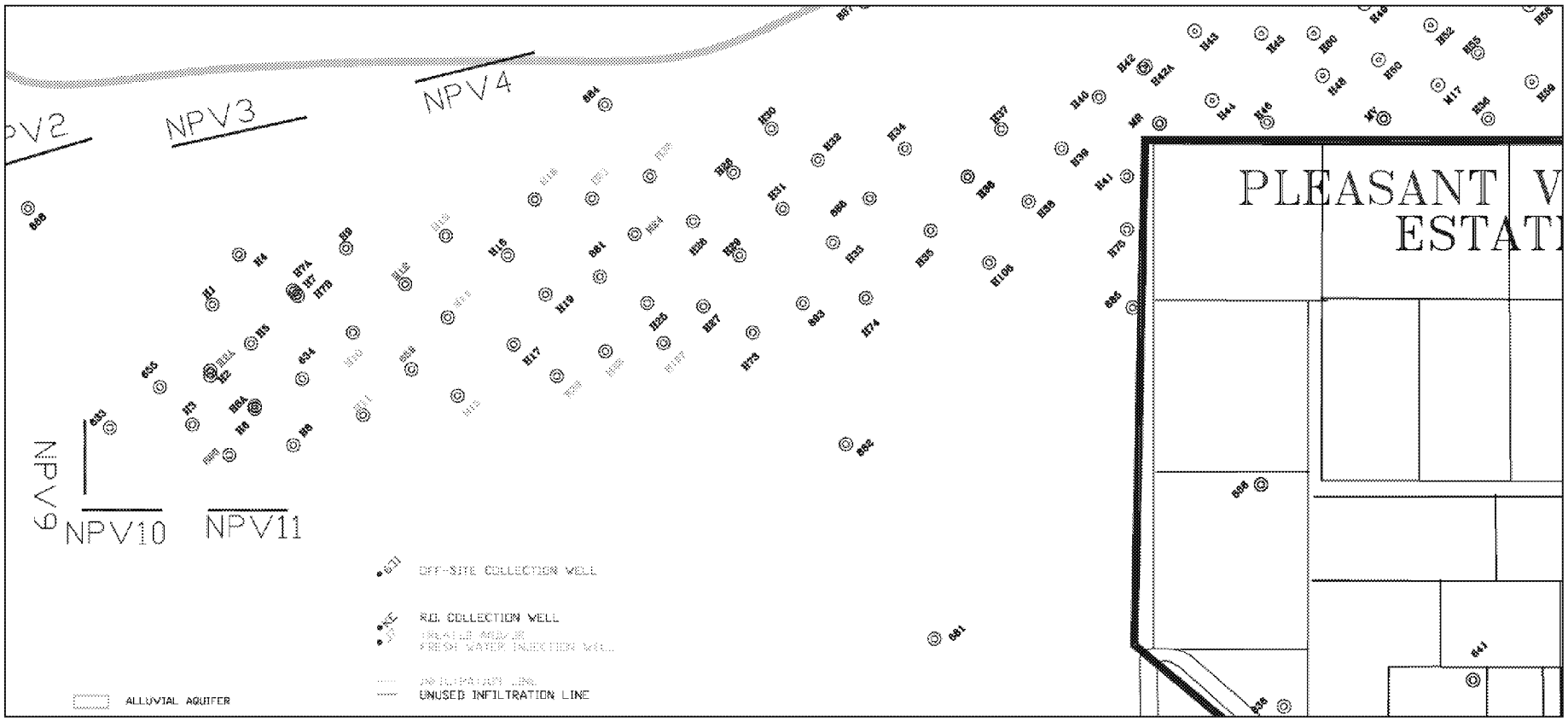
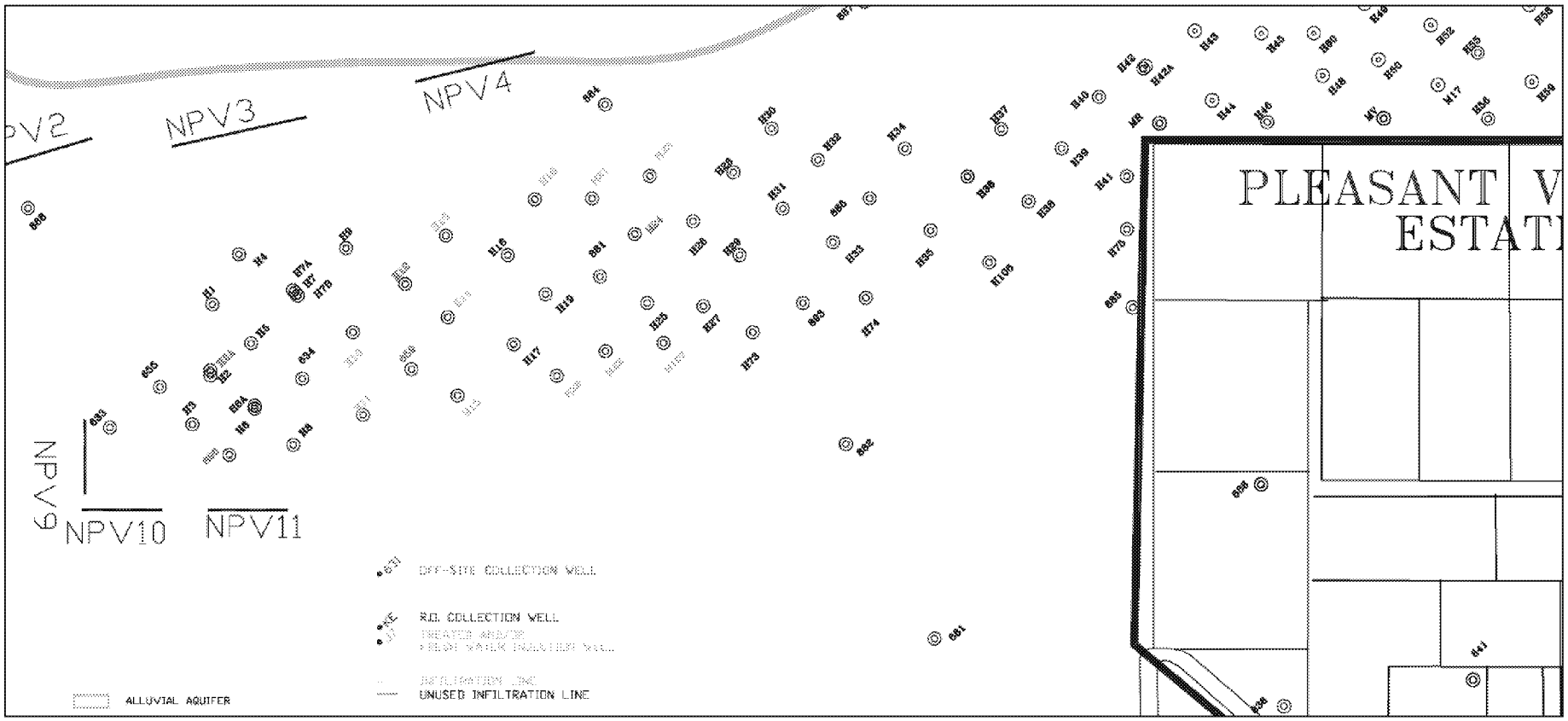


Figure F-9: 2016 Alluvial Aquifer Injection and Collection System – West Channel



Source: 2016 HMC Annual Monitoring Report/Performance Review

Figure F-10: 2020 Alluvial Aquifer Injection and Collection System – West Channel



Source: 2020 HMC Annual Monitoring Report/Performance Review

Figure F-11: 2016 and 2020 Alluvial Aquifer Uranium Plume Maps – Downgradient Plume Area in East Channel

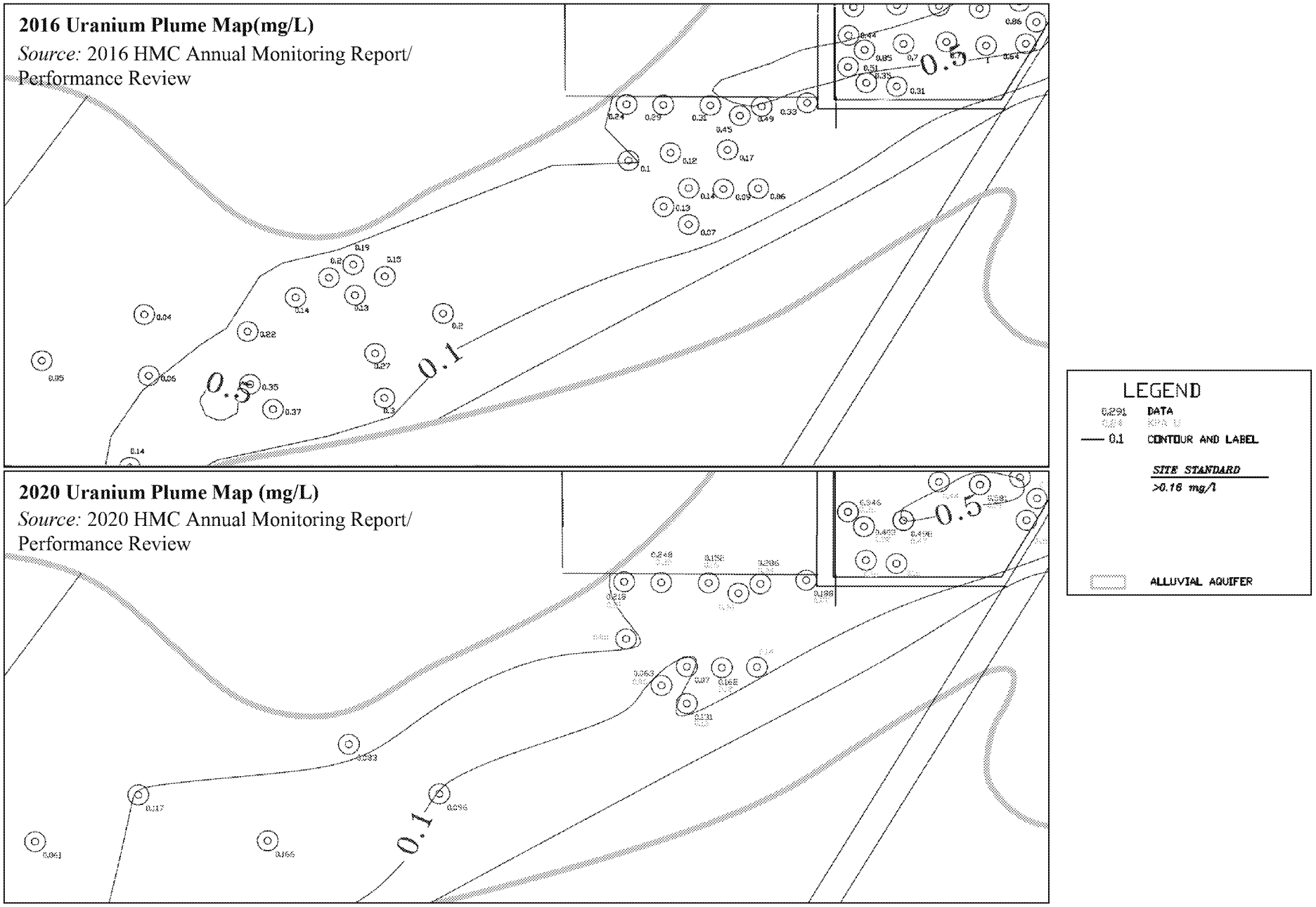
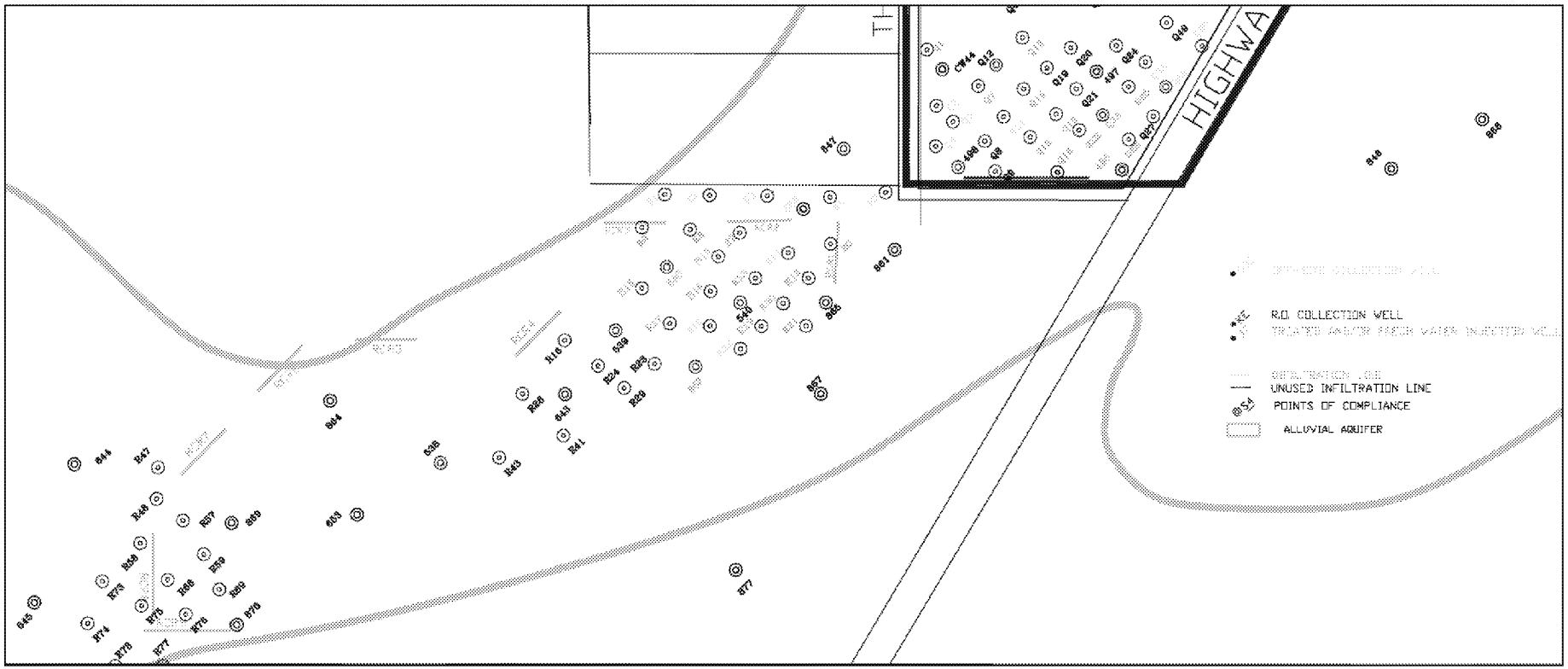
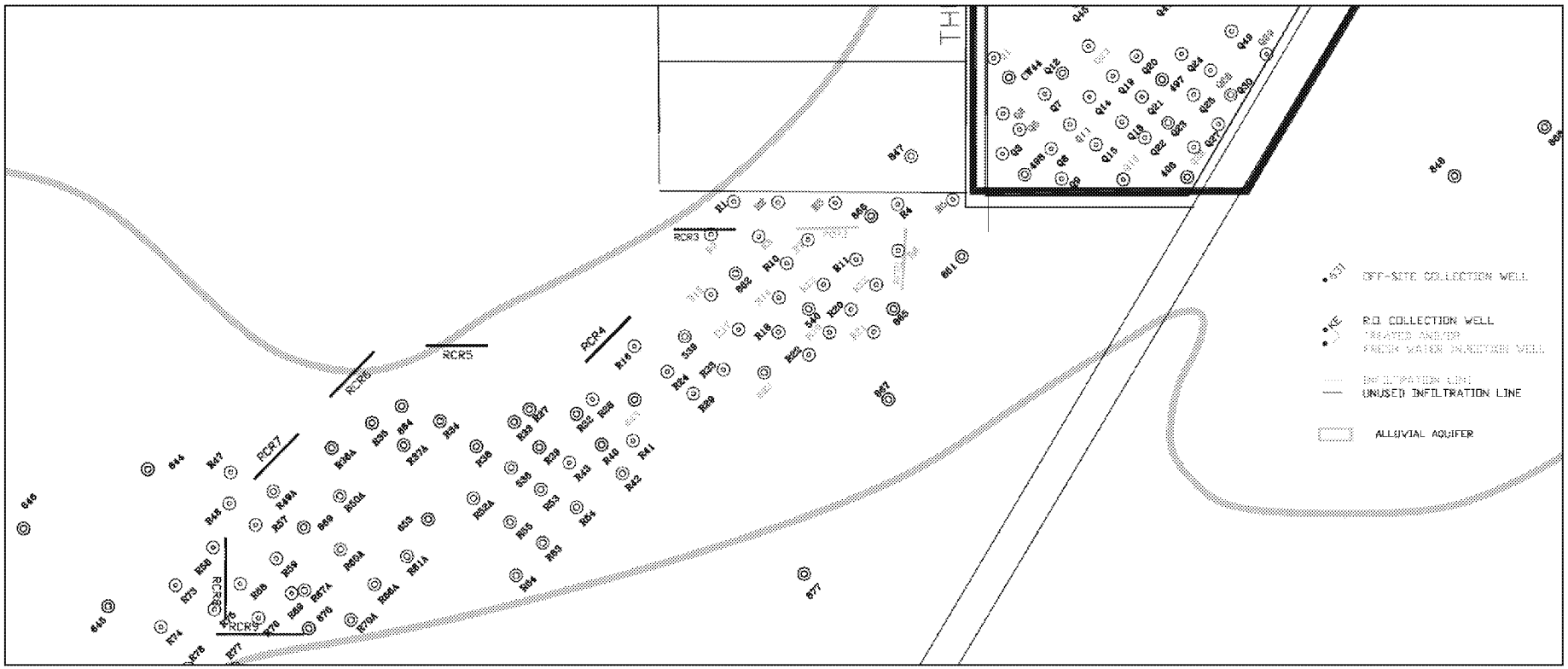


Figure F-12: 2016 Alluvial Aquifer Injection and Collection System – East Channel



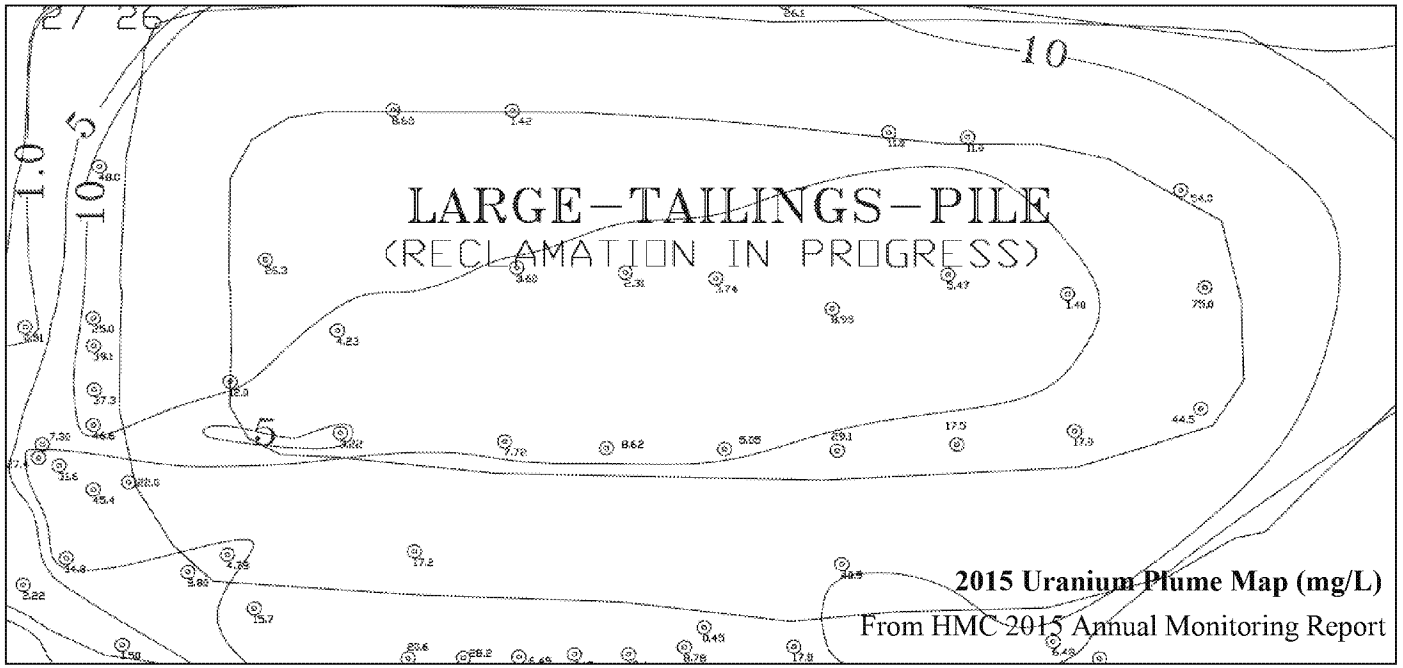
Source: 2016 HMC Annual Monitoring Report/Performance Review

Figure F-13: 2020 Alluvial Aquifer Injection and Collection System – East Channel

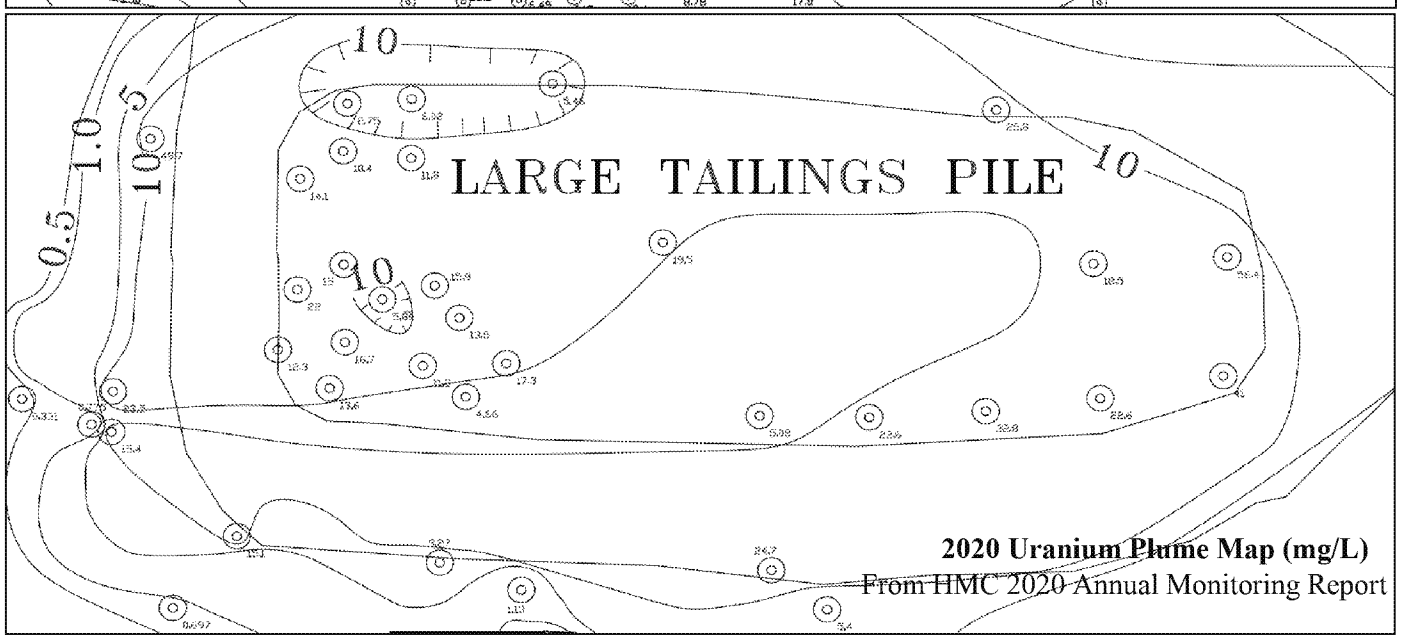


Source: 2020 HMC Annual Monitoring Report/Performance Review

Figure F-14: 2015 and 2020 Alluvial Aquifer Uranium Plume Maps – Large Tailing Pile



2015 Uranium Plume Map (mg/L)
From HMC 2015 Annual Monitoring Report



2020 Uranium Plume Map (mg/L)
From HMC 2020 Annual Monitoring Report

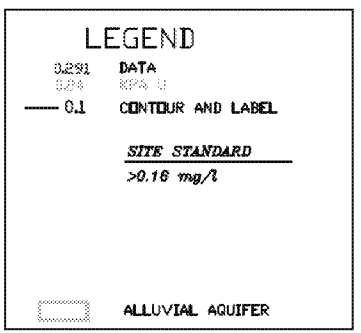
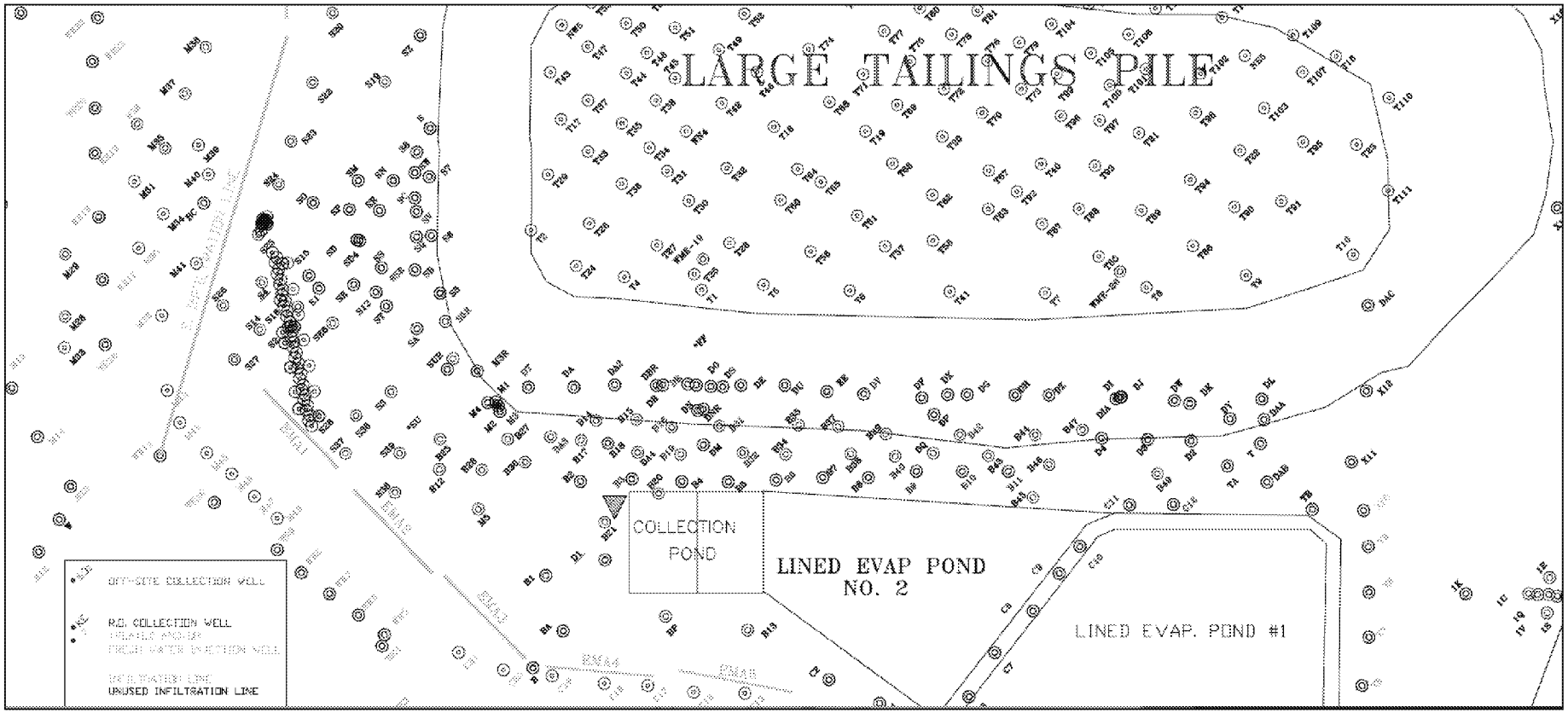
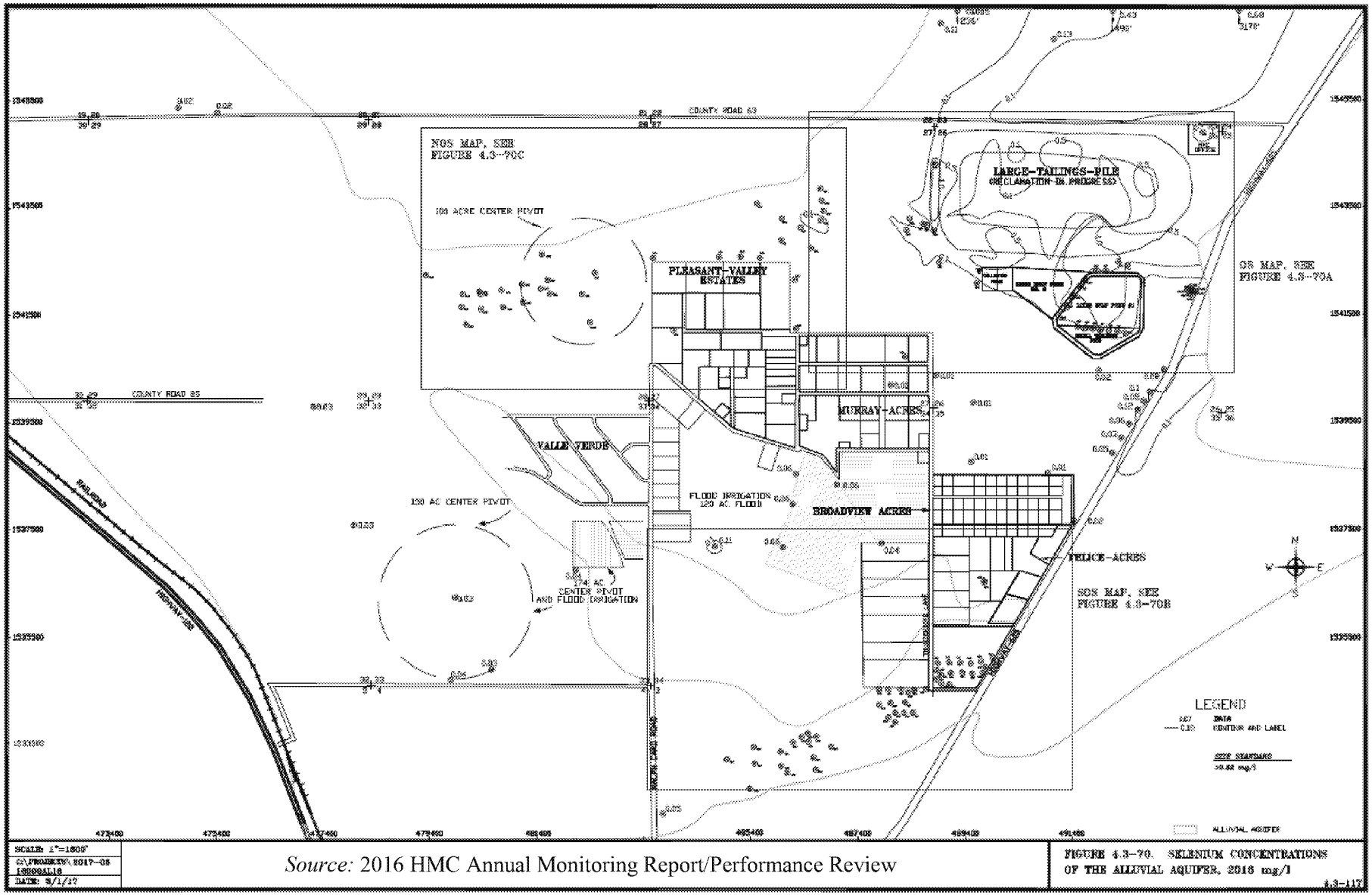


Figure F-15: 2020 Alluvial Aquifer Injection and Collection System – Large Tailing Pile



Source: 2020 HMC Annual Monitoring Report/Performance Review

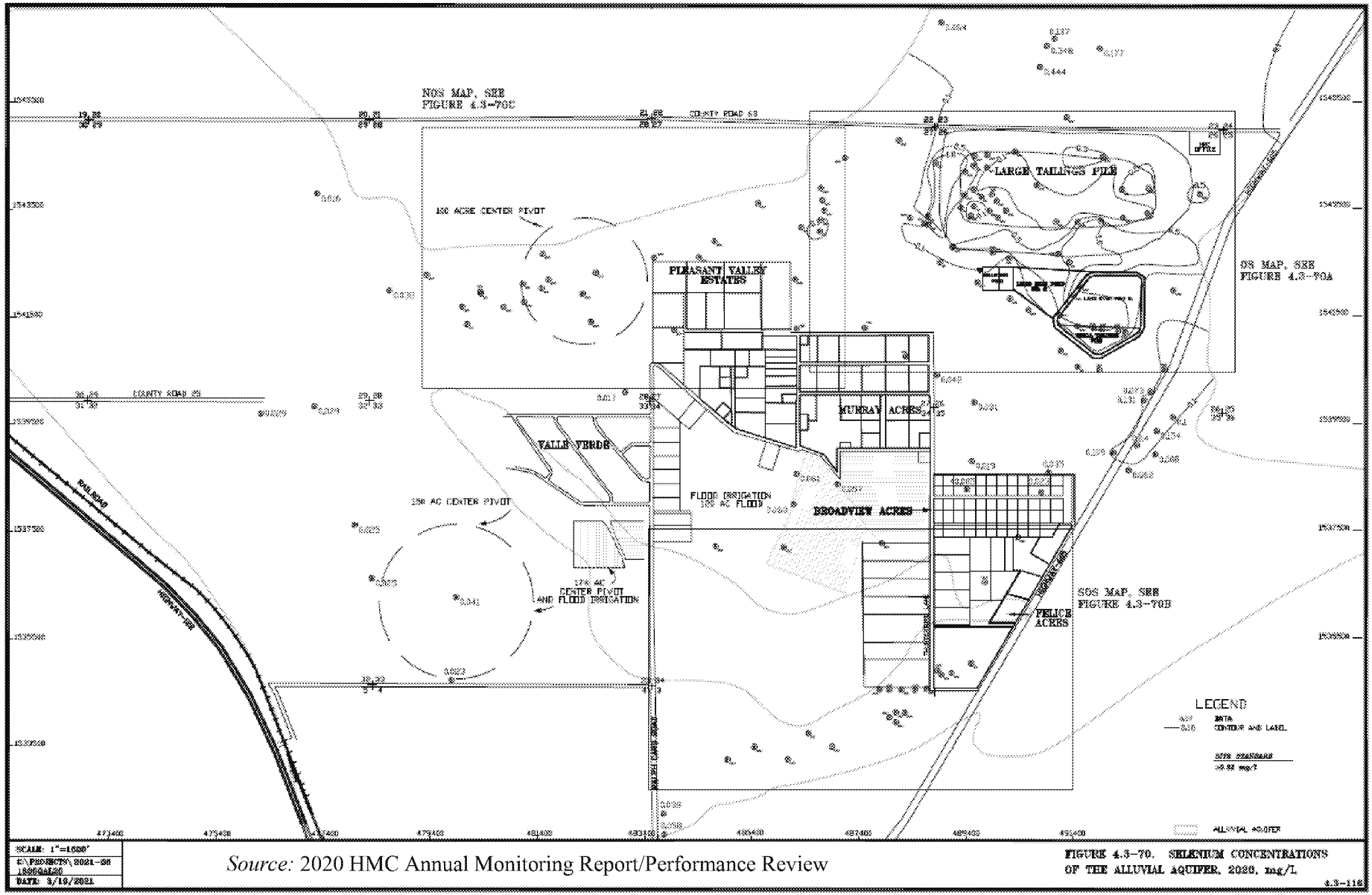
Figure F-16: 2016 Alluvial Aquifer Selenium Plume Map



Source: 2016 HMC Annual Monitoring Report/Performance Review

FIGURE 4.3-70. SELENIUM CONCENTRATIONS OF THE ALLUVIAL AQUIFER, 2016 mg/l

Figure F-17: 2020 Alluvial Aquifer Selenium Plume Map

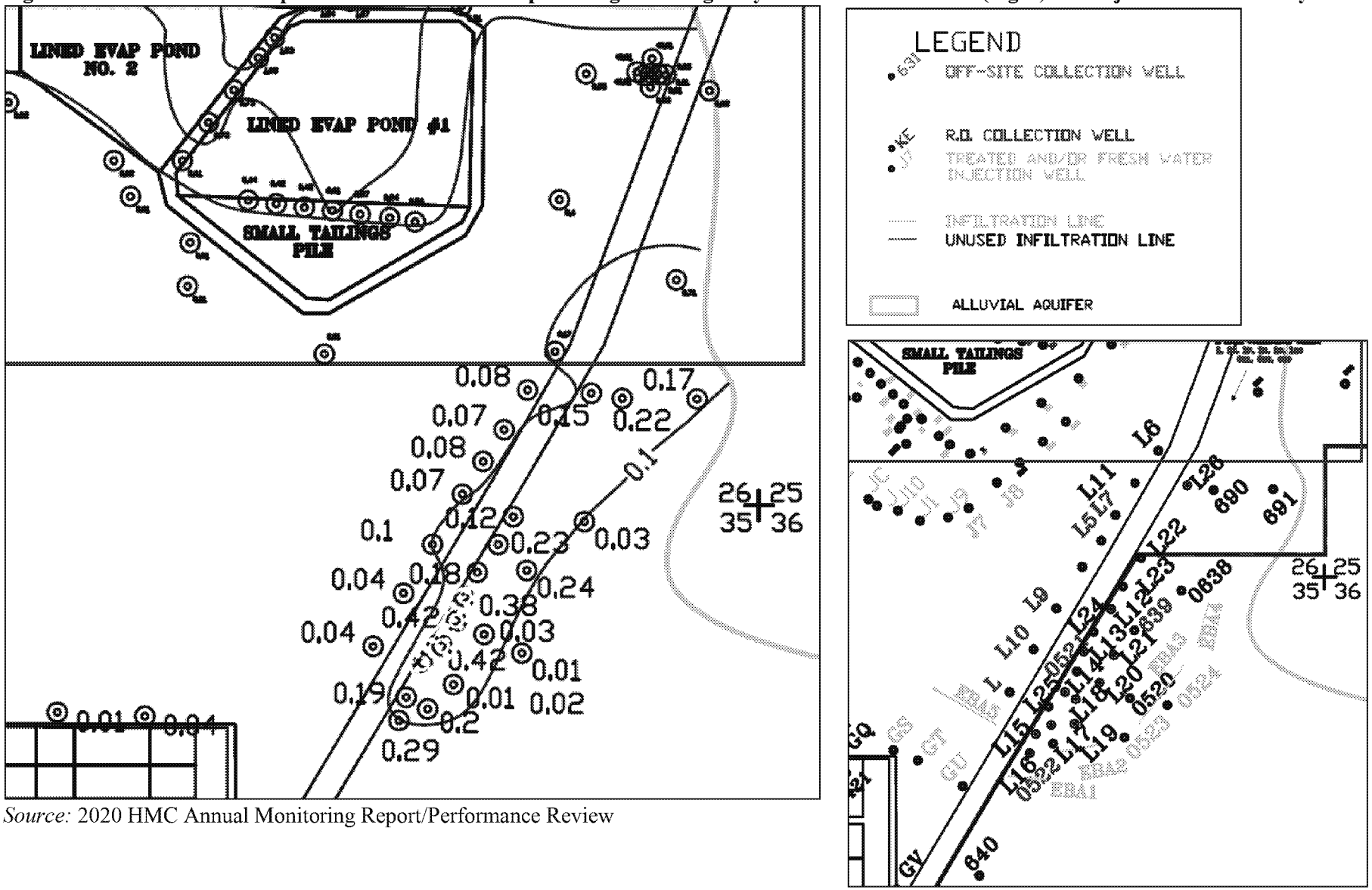


Source: 2020 HMC Annual Monitoring Report/Performance Review

FIGURE 4.3-70. SELENIUM CONCENTRATIONS OF THE ALLUVIAL AQUIFER, 2020, mg/L

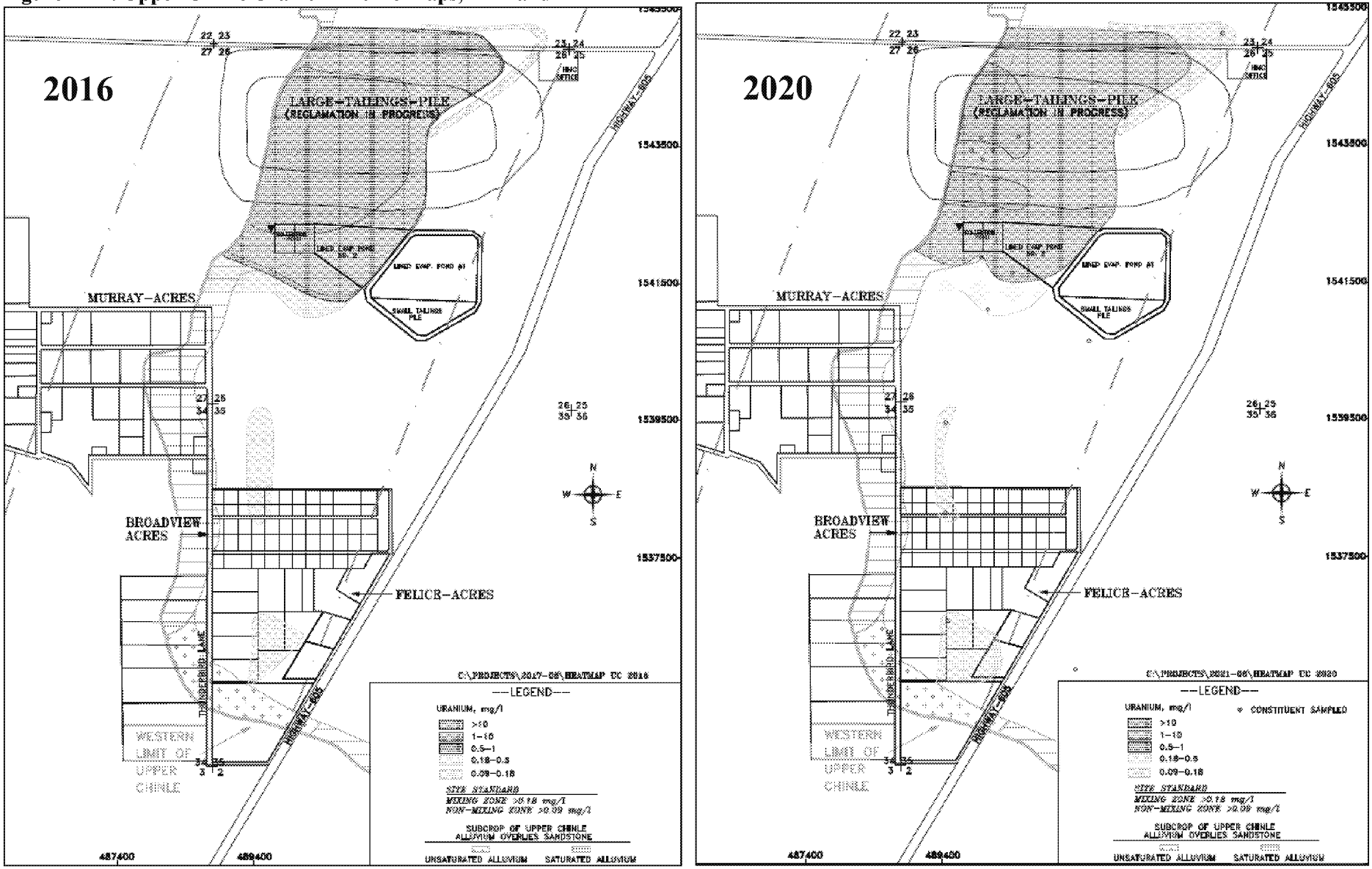
4.3-116

Figure F-18: 2017 Alluvial Aquifer Selenium Plume Map – Along State Highway 605 and South of STP (mg/L) and Injection/Collection System



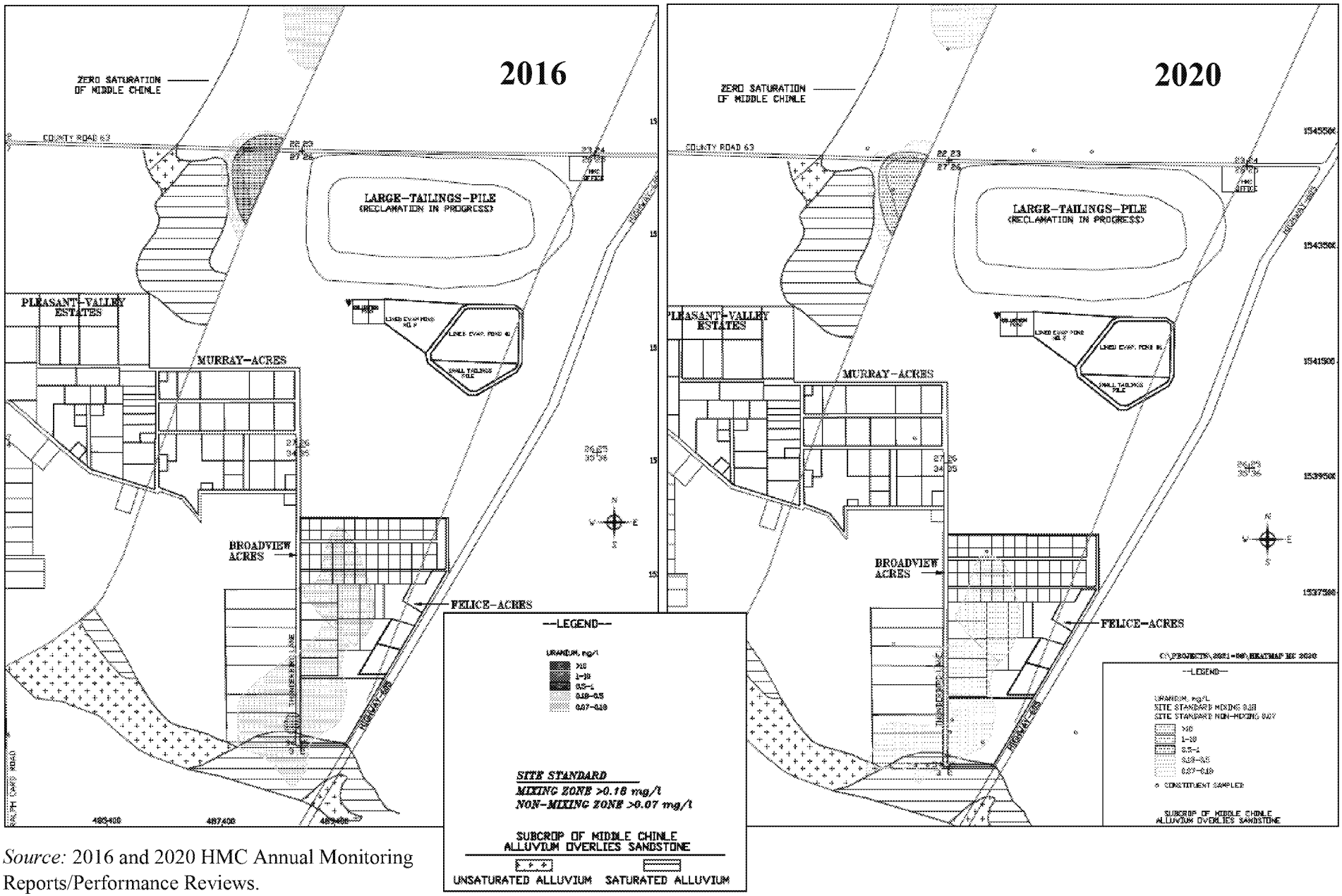
Source: 2020 HMC Annual Monitoring Report/Performance Review

Figure F-19: Upper Chinle Uranium Plume Maps, 2016 and 2020



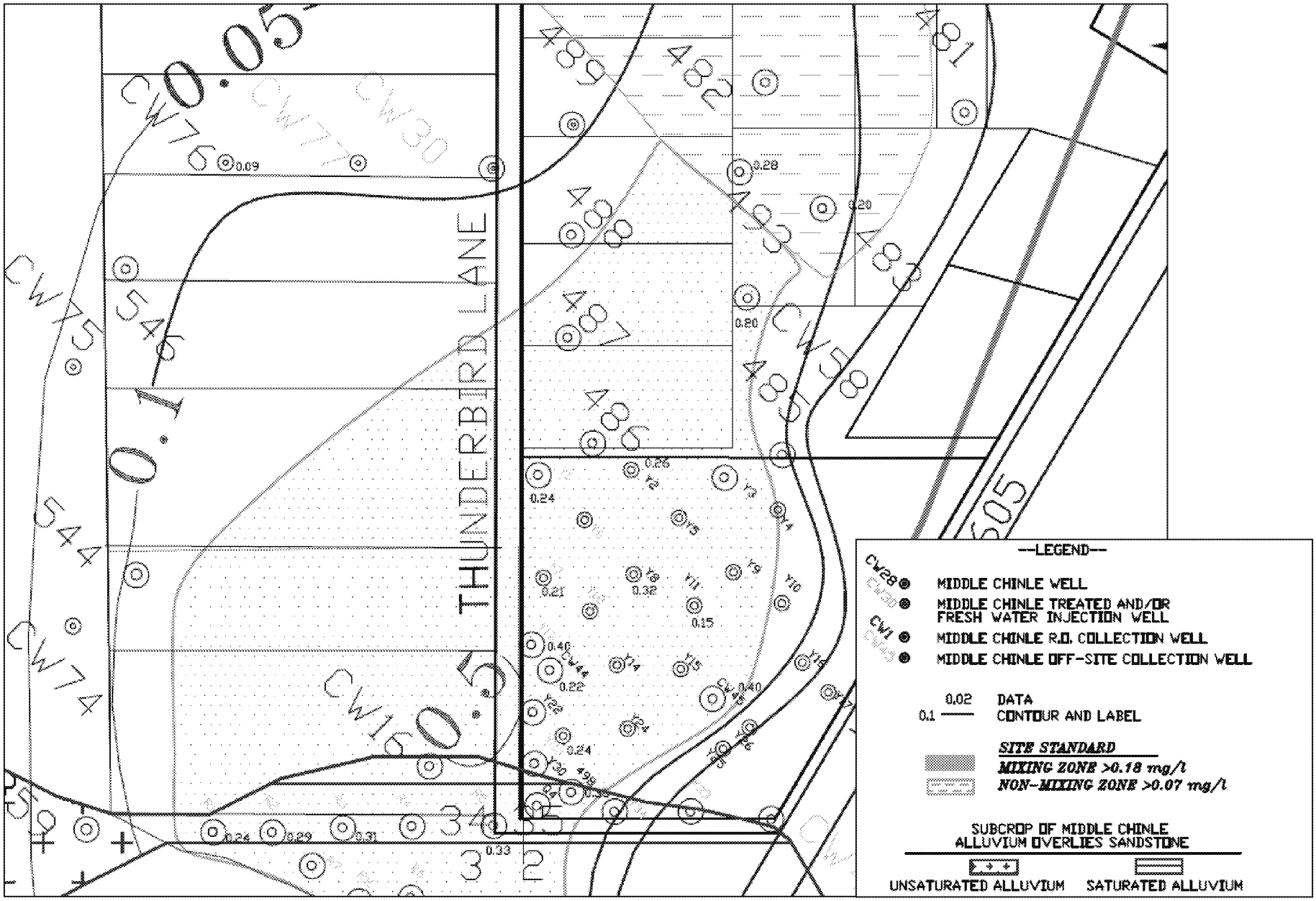
Source: 2016 and 2020 HMC Annual Monitoring Reports/Performance Reviews.

Figure F-20: Middle Chinle Uranium Plume Maps, 2016 and 2020



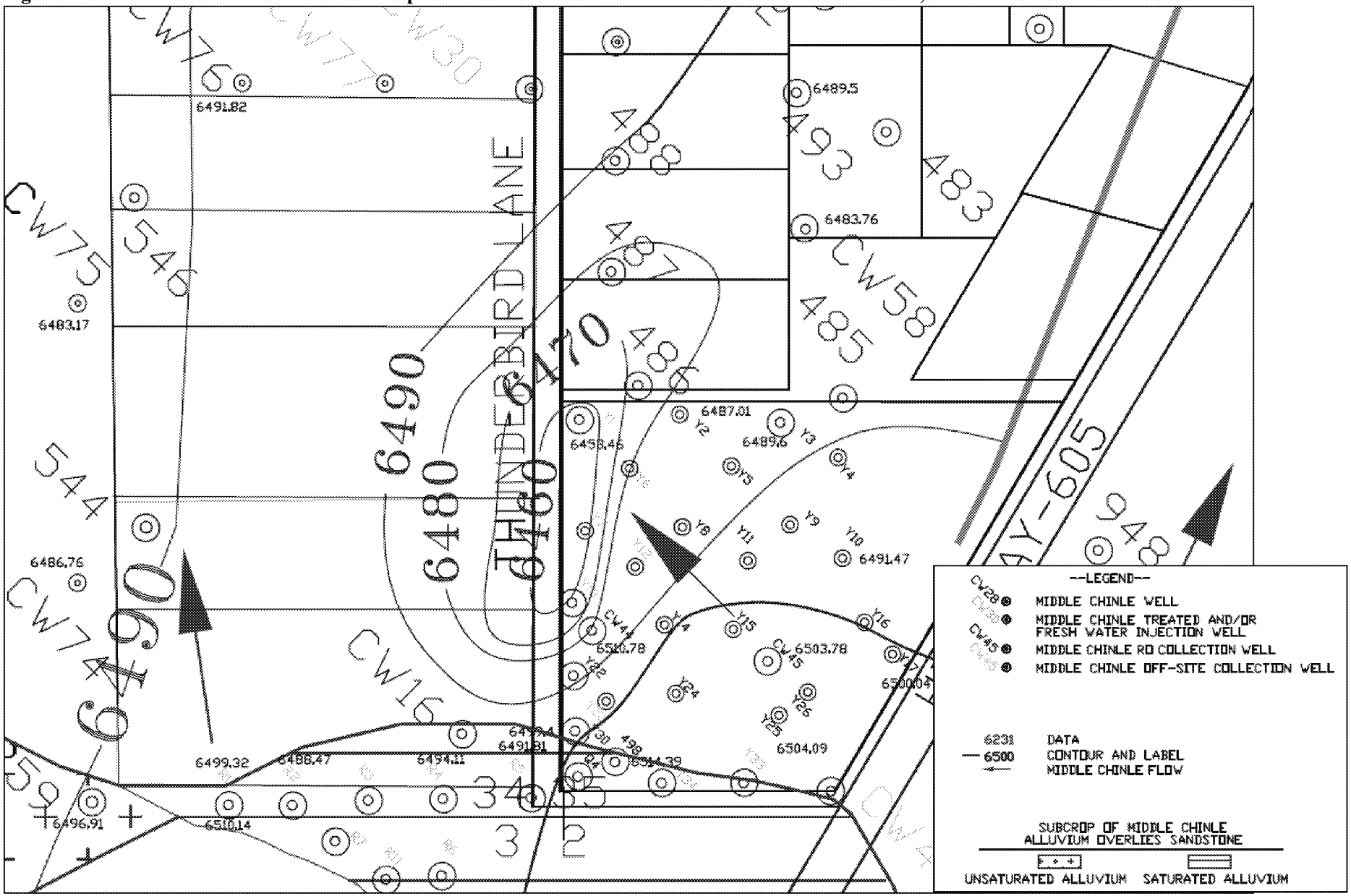
Source: 2016 and 2020 HMC Annual Monitoring Reports/Performance Reviews.

Figure F-21: Middle Chinle Uranium Plume Map for Felice Acres Subdivision – Thunderbird Lane Area, 2016



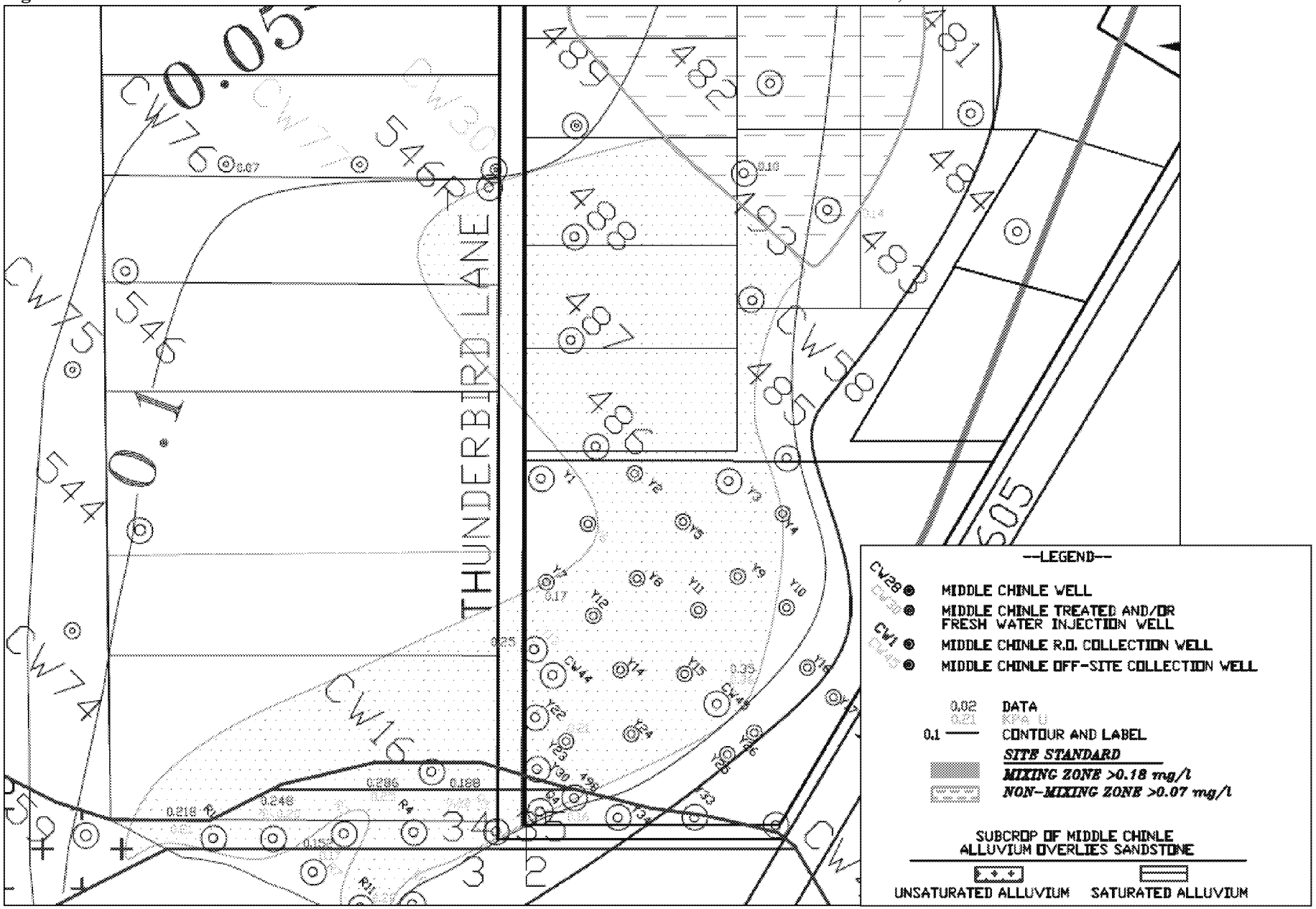
Source: 2016 HMC Annual Monitoring Report/Performance Review

Figure F-22: Middle Chinle Water-Level Map for Felice Acres Subdivision – Thunderbird Lane Area, 2016



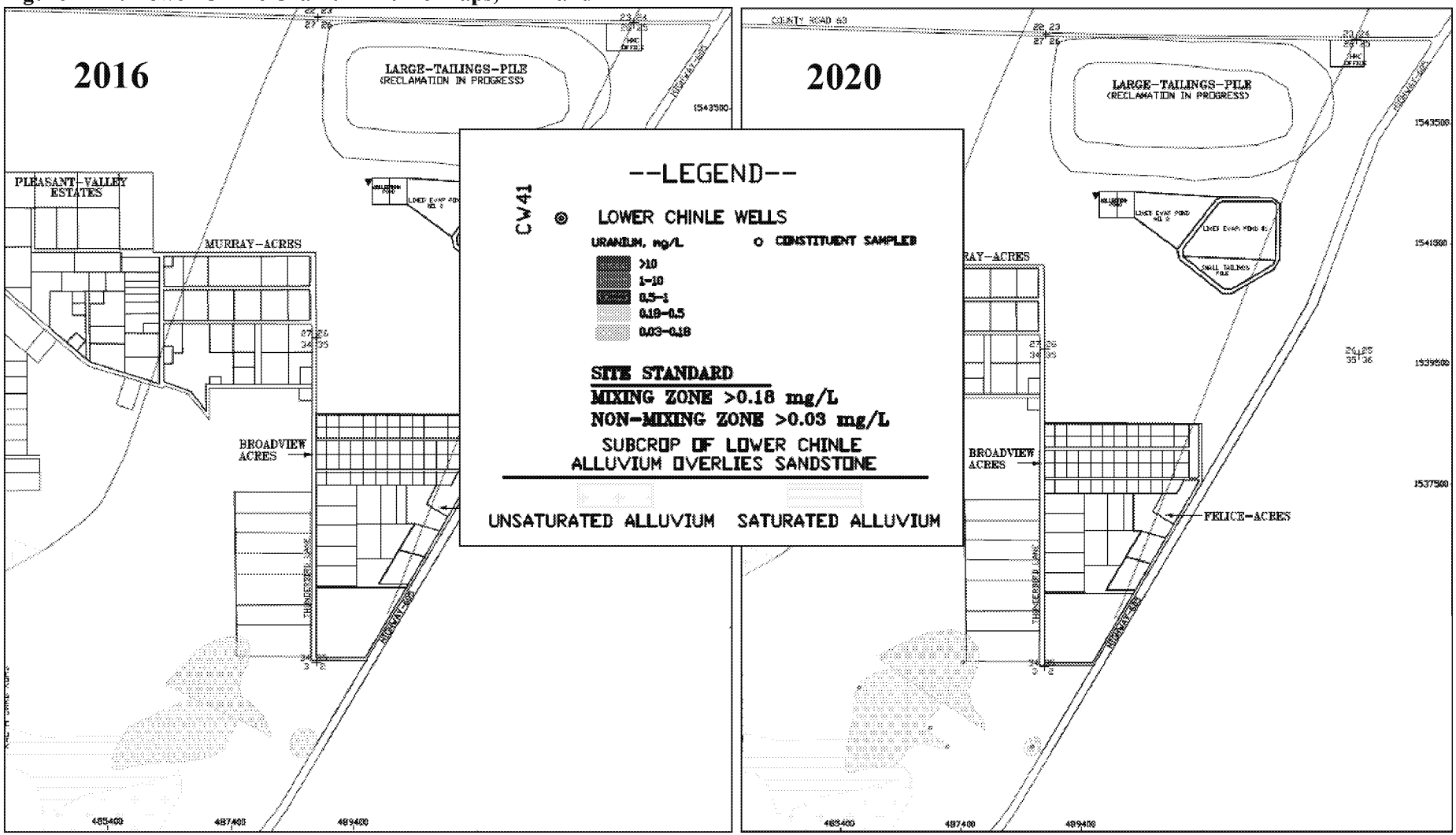
Source: 2016 HMC Annual Monitoring Report/Performance Review

Figure F-23: Middle Chinle Uranium Plume for Felice Acres Subdivision – Thunderbird Lane Area, 2020



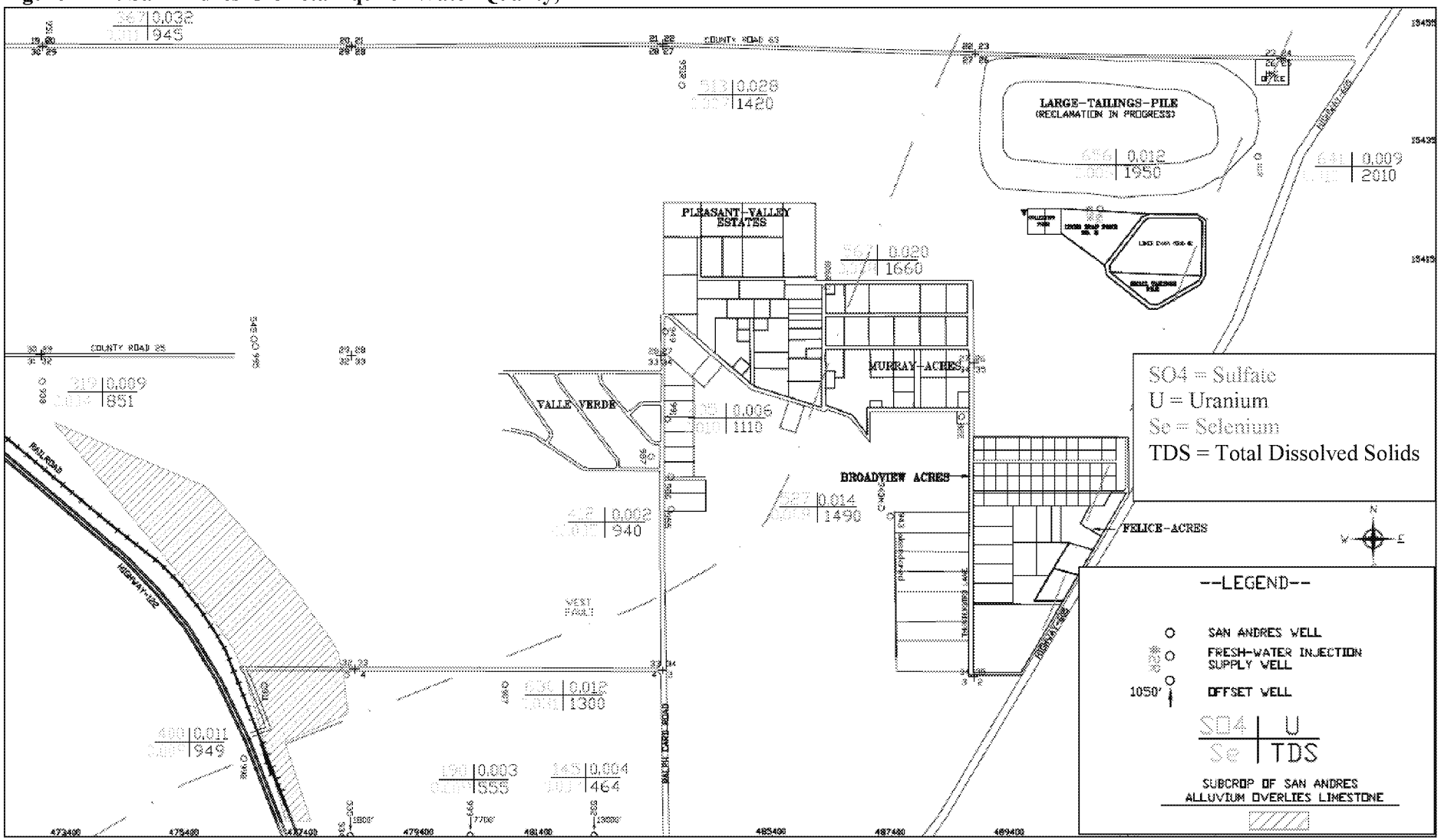
Source: 2020 HMC Annual Monitoring Report/Performance Review

Figure F-24: Lower Chinle Uranium Plume Maps, 2016 and 2020



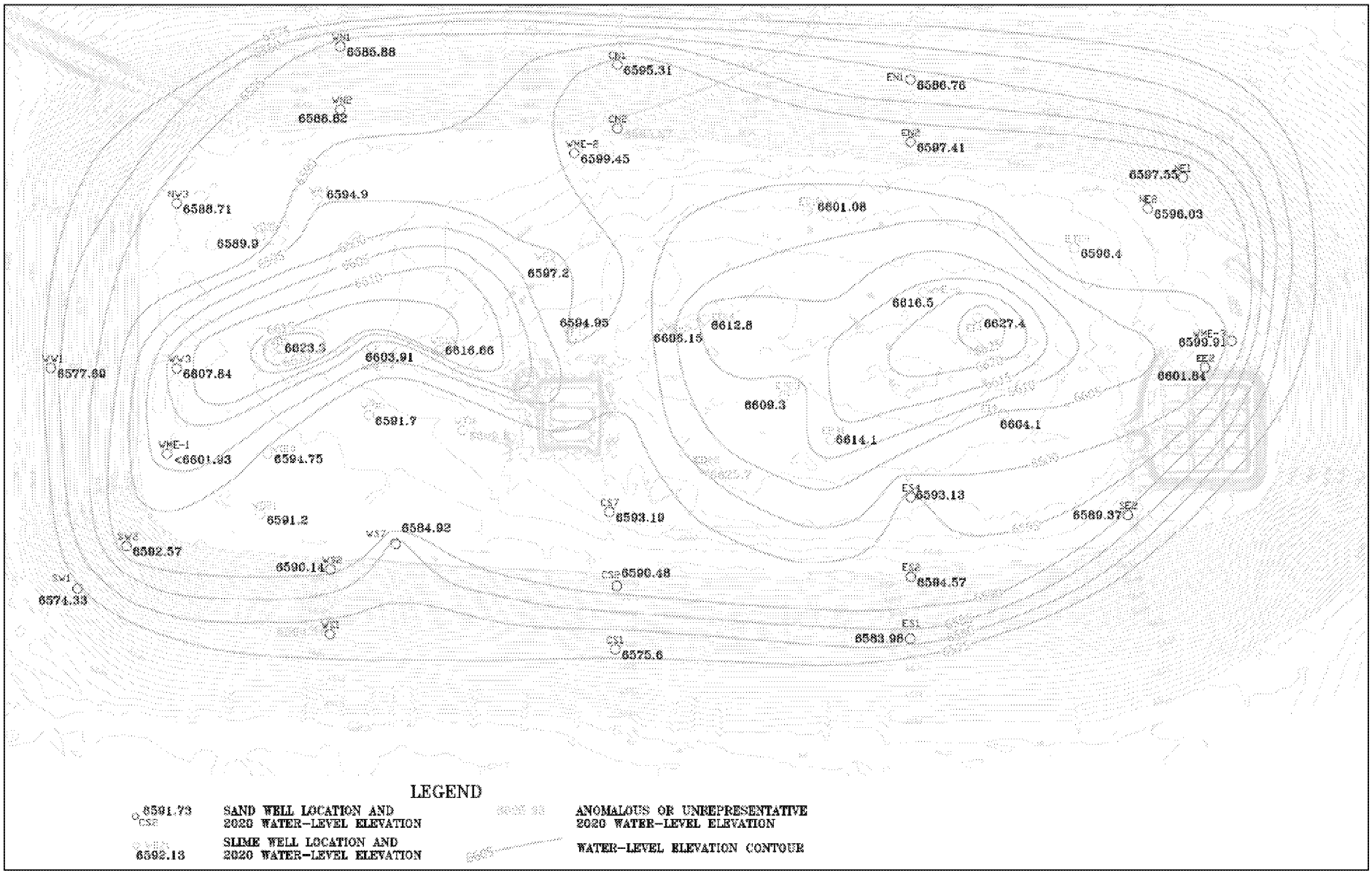
Source: 2016 and 2020 HMC Annual Monitoring Reports/Performance Reviews.

Figure F-25: San Andres-Glorieta Aquifer Water Quality, 2020



Source: 2020 HMC Annual Monitoring Report/Performance Review.

Figure F-26: Large Tailing Pile Well Locations and Water-Level Elevations 2020



Source: 2020 HMC Annual Monitoring Report/Performance Review.

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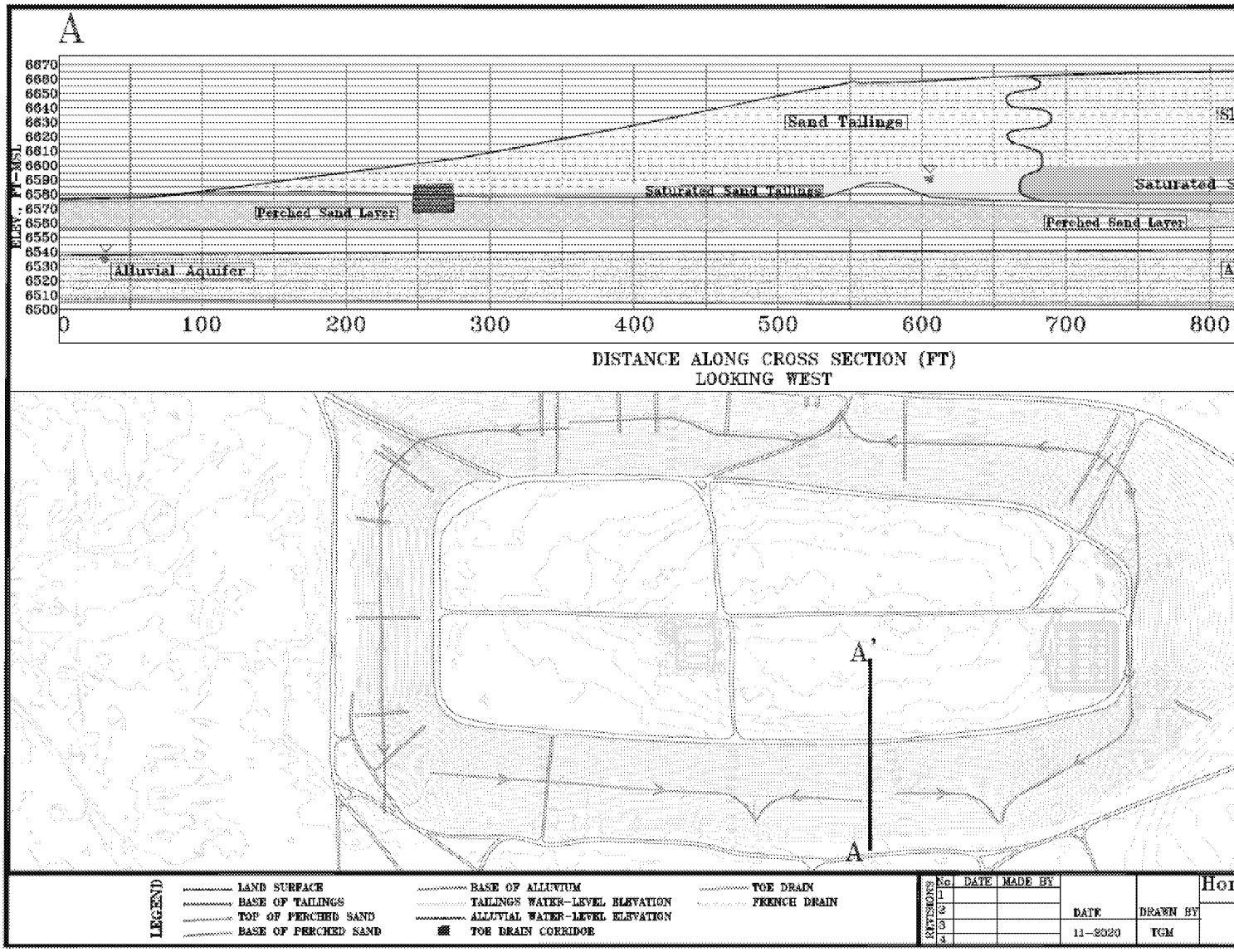
Figure F-27: Large Tailing Pile Cross Section Depicting Tailing Saturation 2020



Source: 2020 HMC Annual Monitoring Report/Performance Review.

Figure F-28: Yearly Quantity of Tailing Water and Uranium Removed from the LTP – 2000 to 2020

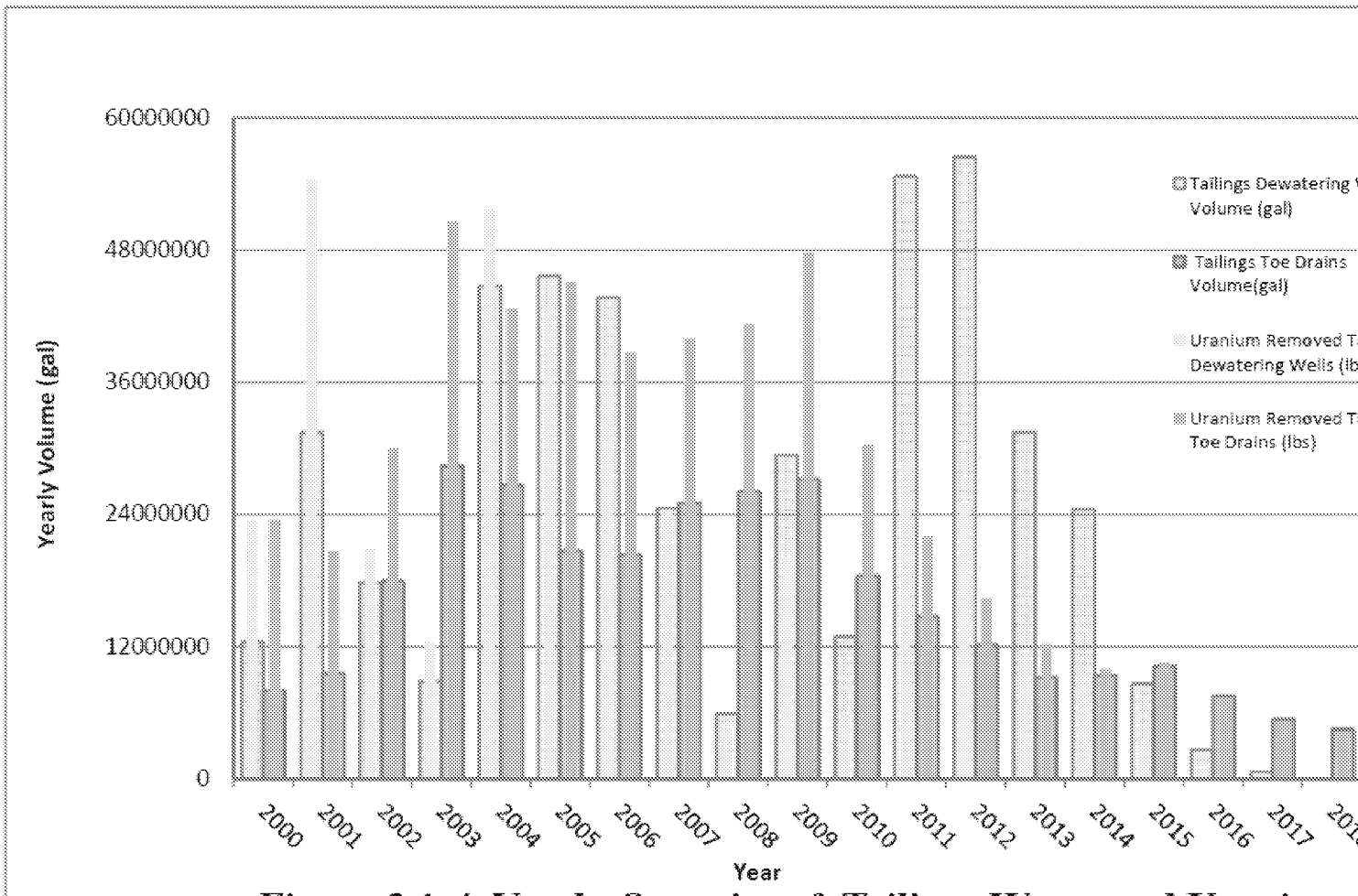


Figure 3.1-4. Yearly Quantity of Tailings Water and Uranium

Source: 2020 HMC Annual Monitoring Report/Performance Review.

Figure F-29: Large Tailing Pile – Water-Level Elevation Changes for Tailing Wells 2009-2020

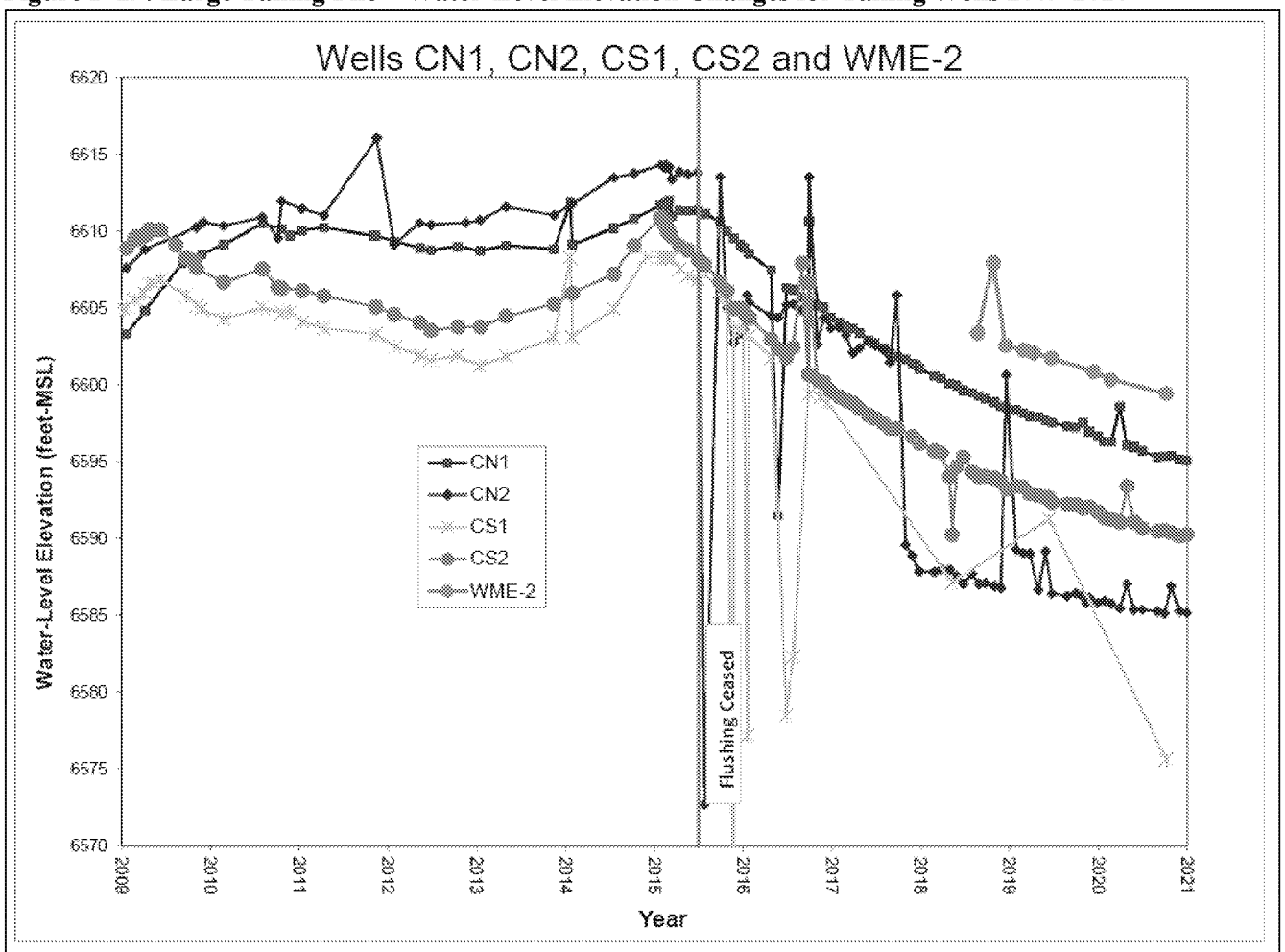


Figure 3.2-2. Water-Level Elevation ForTailings Wells CN1, CN2, CS1, CS2 and WME-2

Source: 2020 HMC Annual Monitoring Report/Performance Review.

Figure F-30: Large Tailing Pile – Tailing Uranium Concentrations in 2000

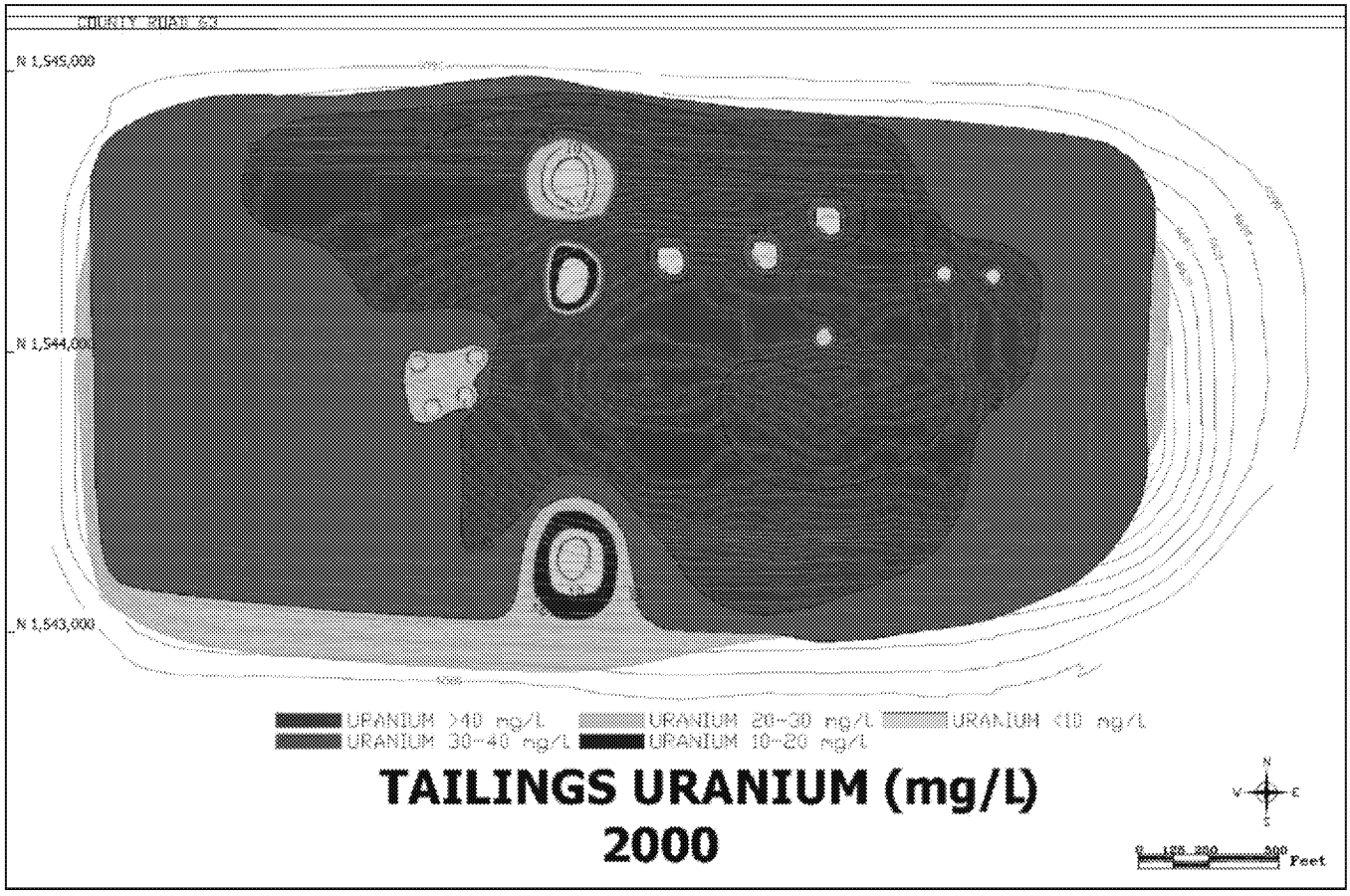
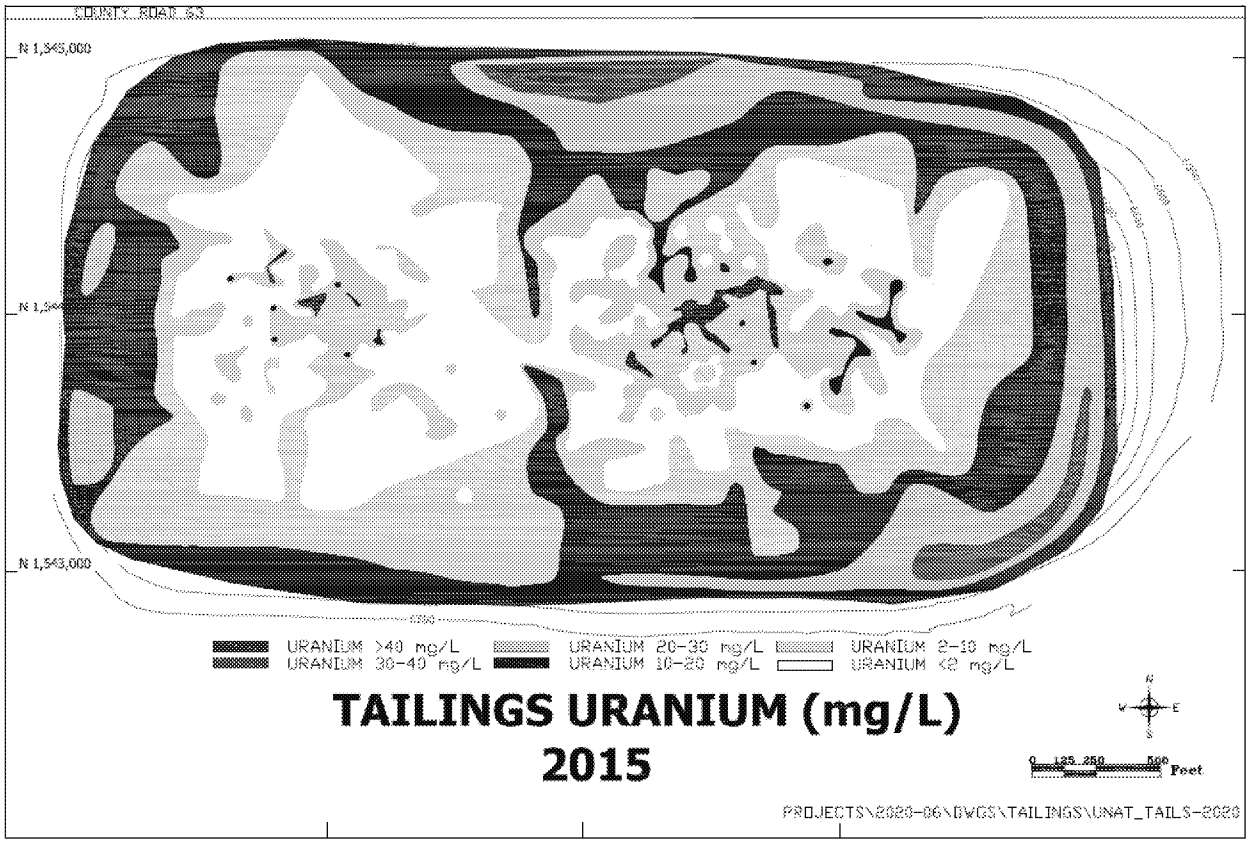
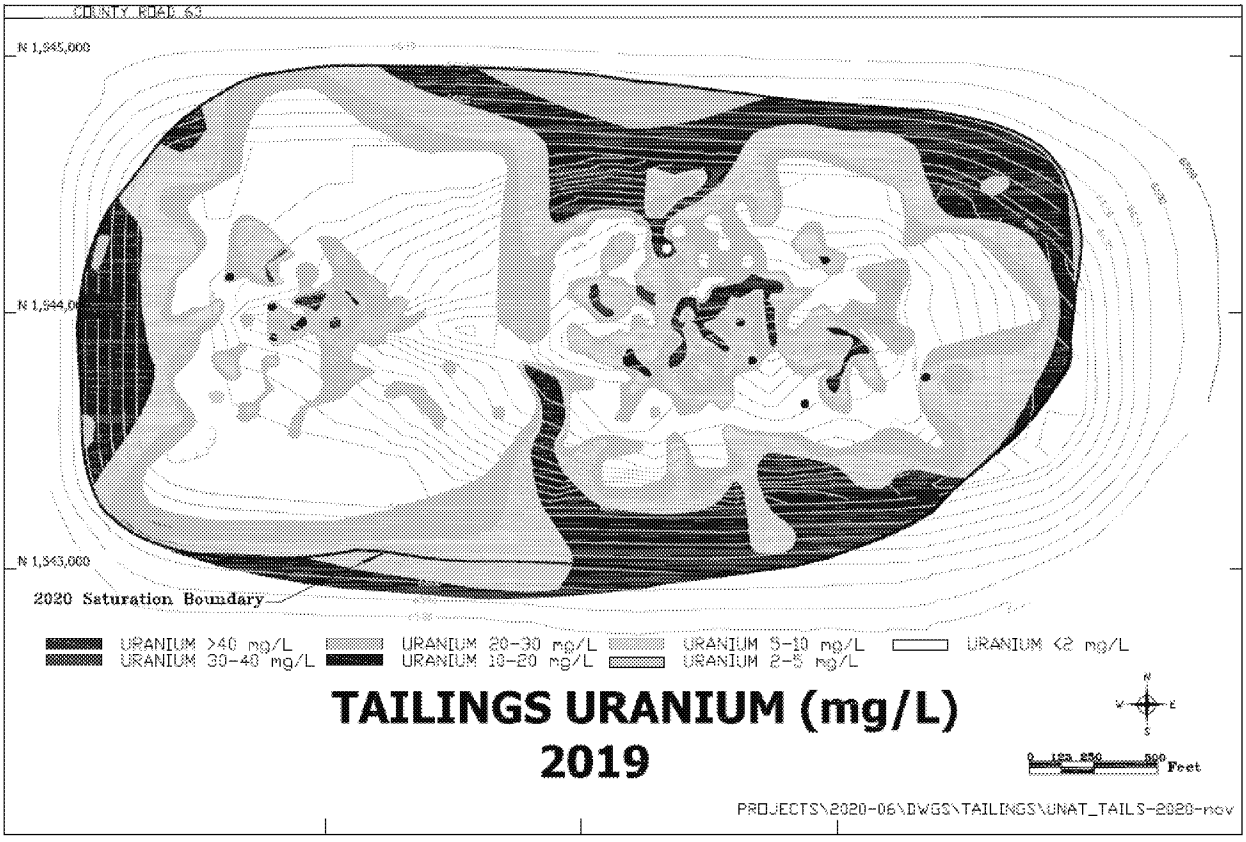


Figure F-31: Large Tailing Pile – Tailing Uranium Concentrations in 2015 and 2019





Source: 2020 HMC Annual Monitoring Report/Performance Review.

Figure F-32: Graph of Uranium, Molybdenum, and Selenium Concentration Changes Over Time in Sand Tailing Wells at Large Tailing Pile 2004-2020

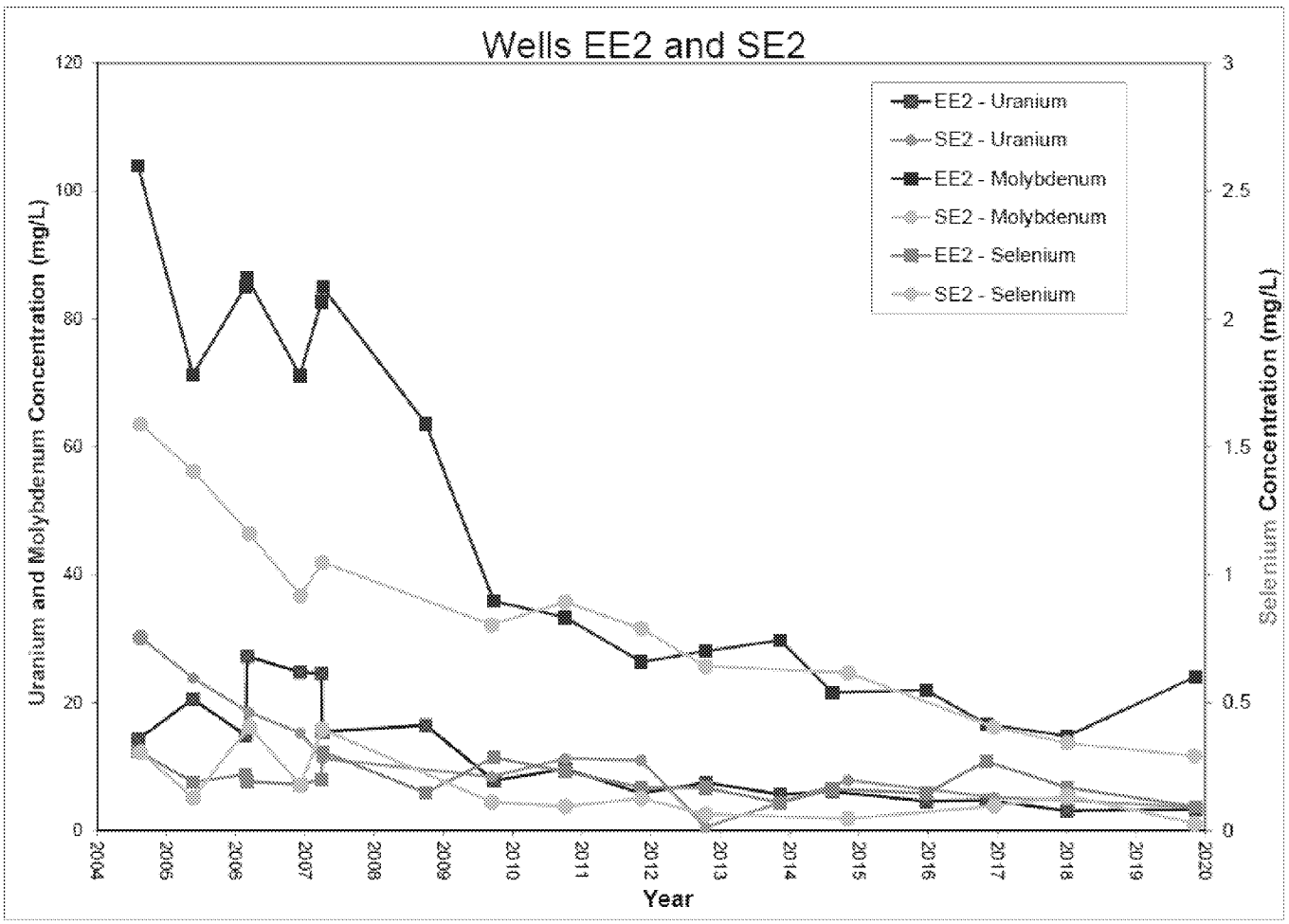


Figure 3.3-8. Uranium, Molybdenum and Selenium Concentrations for Sand Tailings Wells EE2 and SE2

Source: 2020 HMC Annual Monitoring Report/Performance Review.

Figure F-33: Graph of Uranium, Molybdenum, and Selenium Concentration Changes Over Time in Sand Tailing Wells at Large Tailing Pile 2016-2020

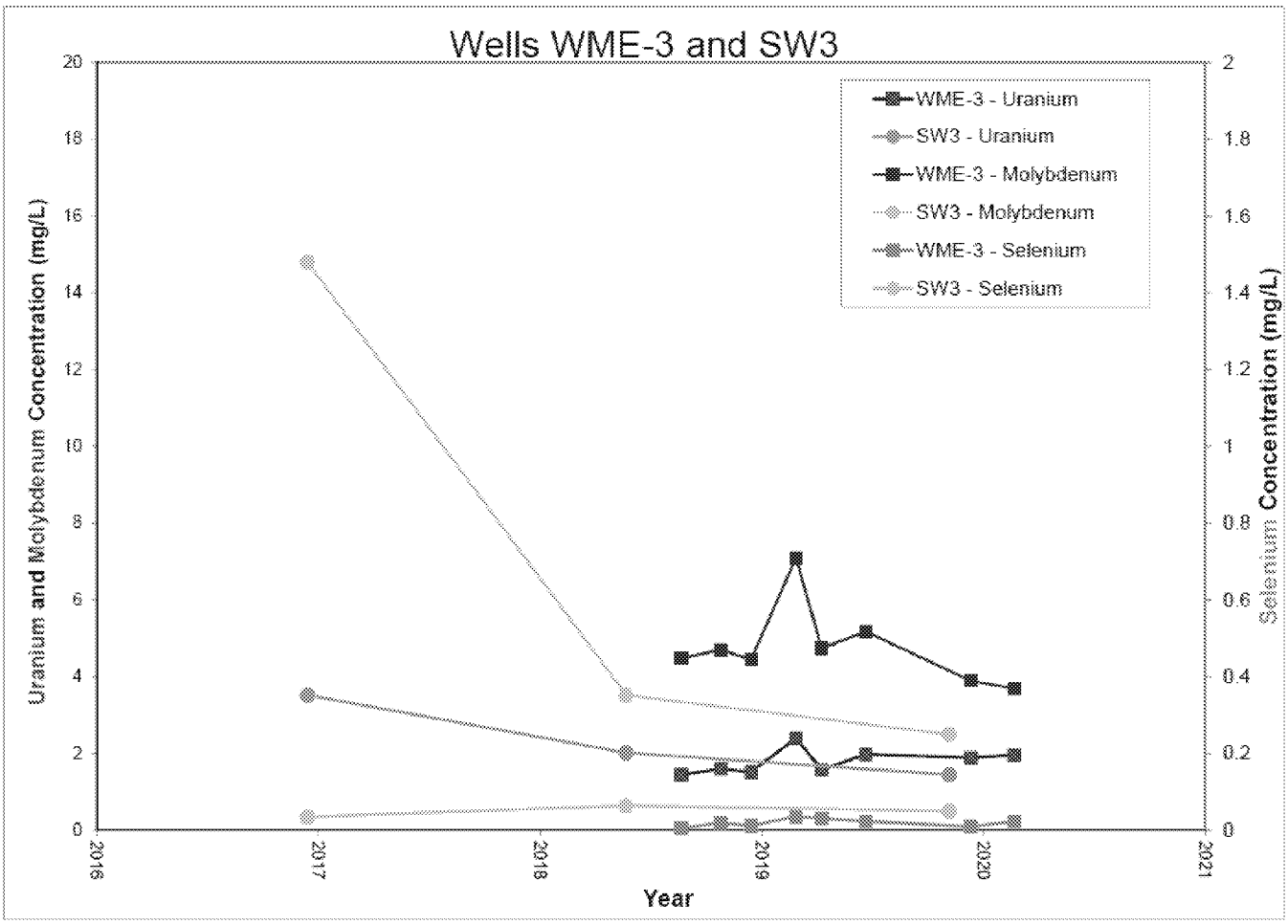


Figure 3.3-10. Uranium, Molybdenum and Selenium Concentrations for Sand Tailings Wells WME-3 and SW3

Source: 2020 HMC Annual Monitoring Report/Performance Review.

Figure F-34: Graph of Uranium, Molybdenum, and Selenium Concentration Changes Over Time in Slime Tailing Wells at Large Tailing Pile 2006-2020

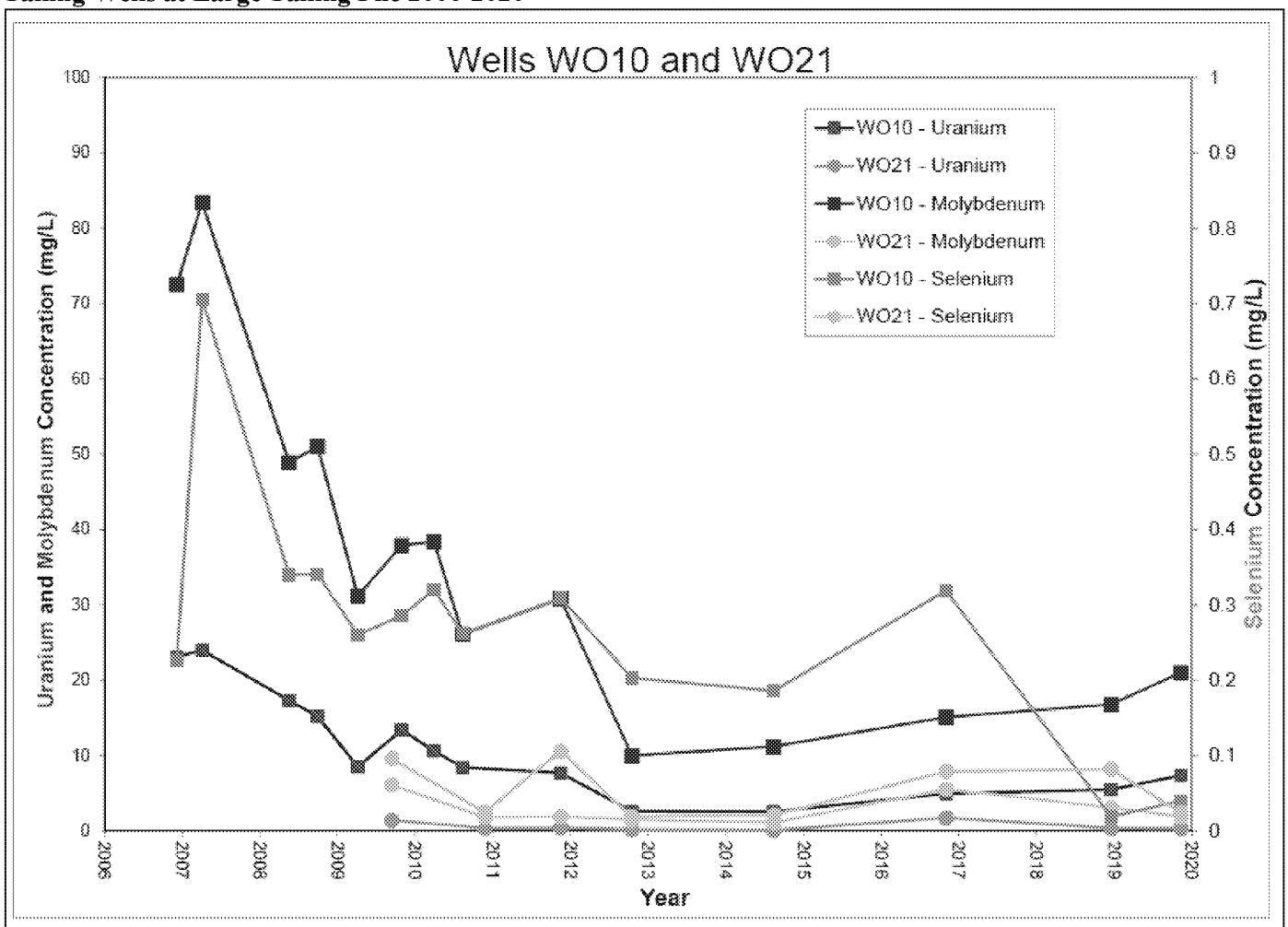


Figure 3.3-13. Uranium, Molybdenum and Selenium Concentrations for Slime Tailings Wells WO10 and WO21

Source: 2020 HMC Annual Monitoring Report/Performance Review.

Figure F-35: Graph of Uranium, Molybdenum, and Selenium Concentration Changes Over Time in Slime Tailing Wells at Large Tailing Pile 2016-2020

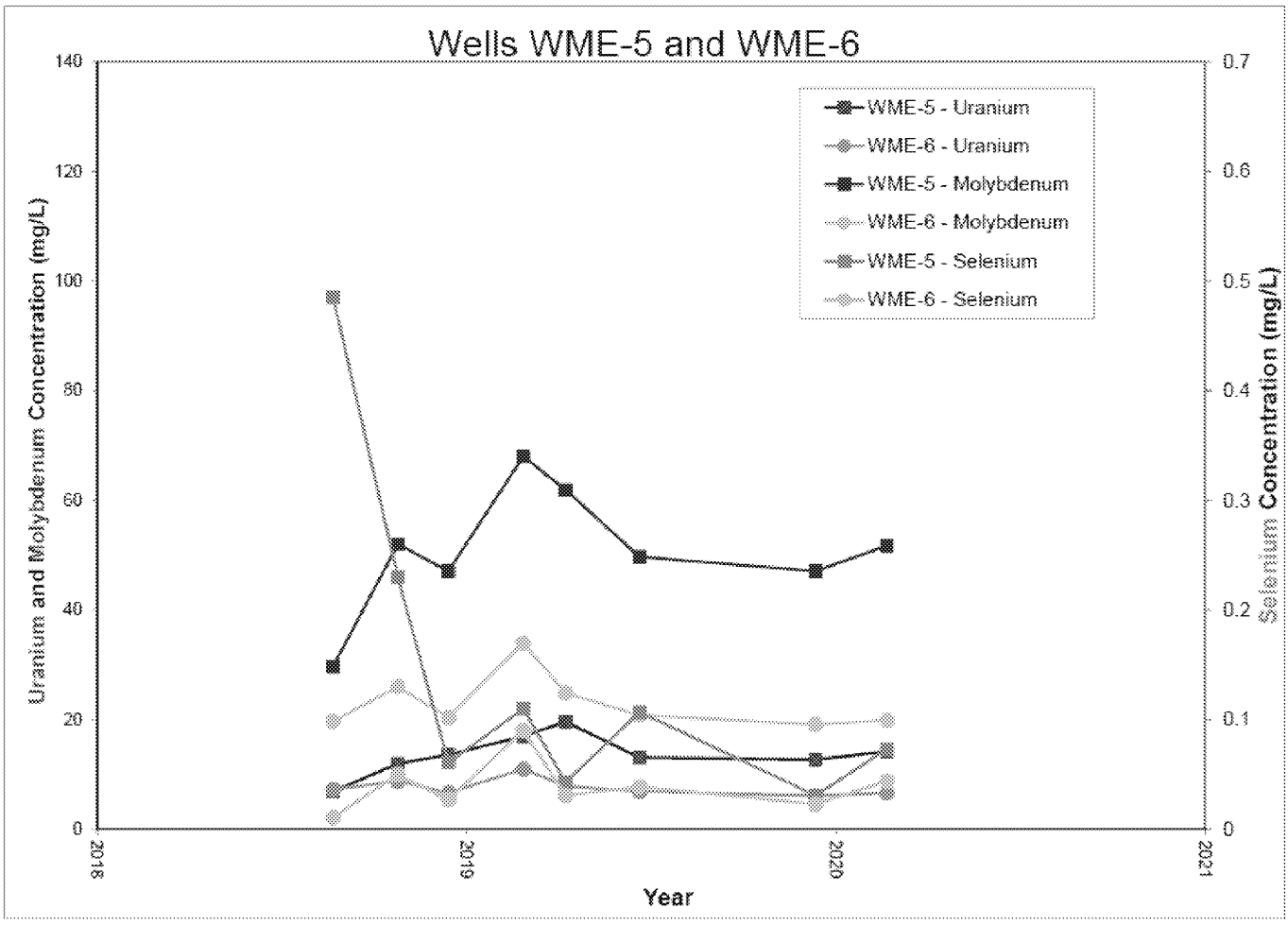
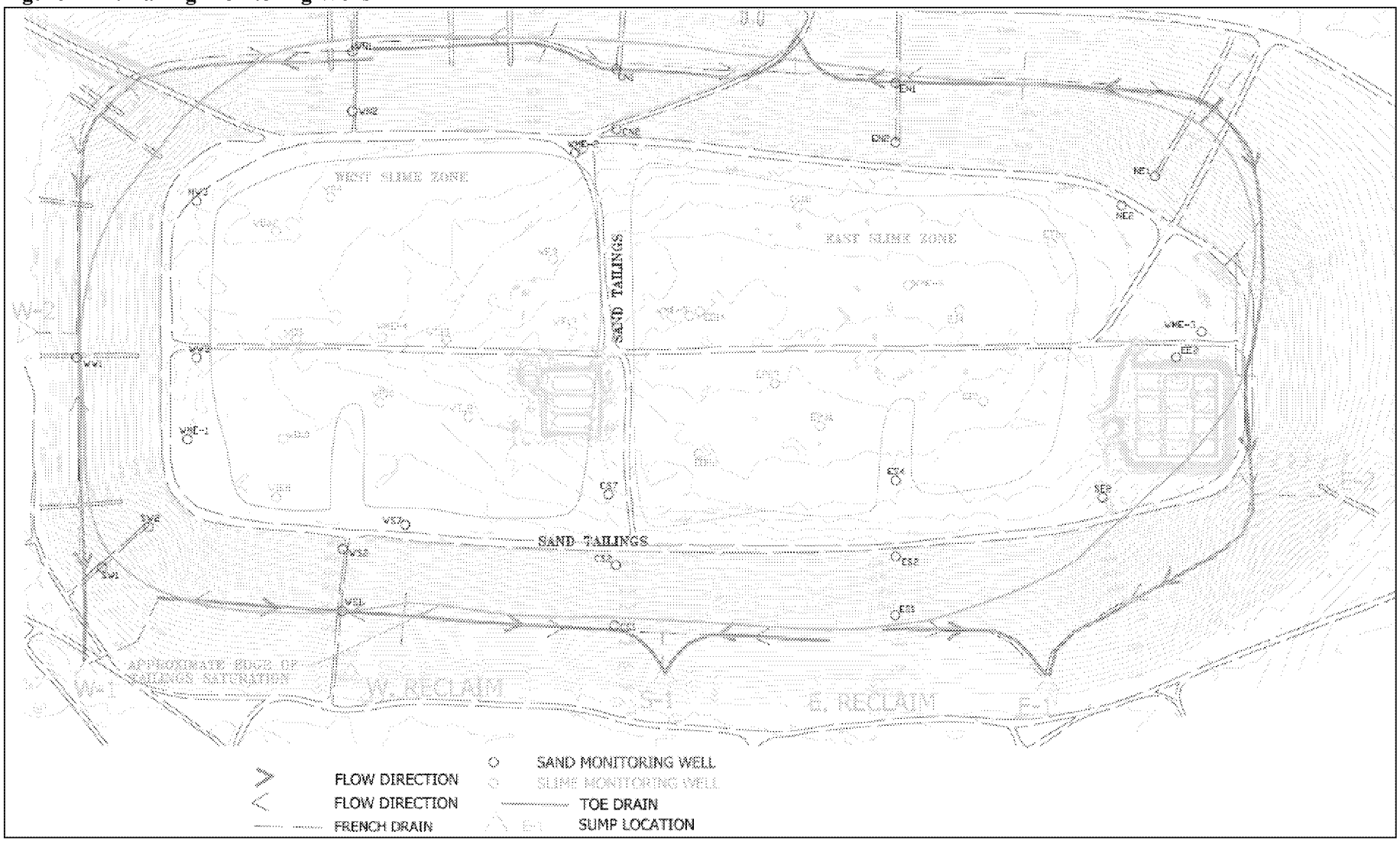


Figure 3.3-15. Uranium, Molybdenum and Selenium Concentrations for Slime Tailings Wells WME-5 and WME-6

Source: 2020 HMC Annual Monitoring Report/Performance Review.

Figure F-36: Tailing Monitoring Wells in 2020

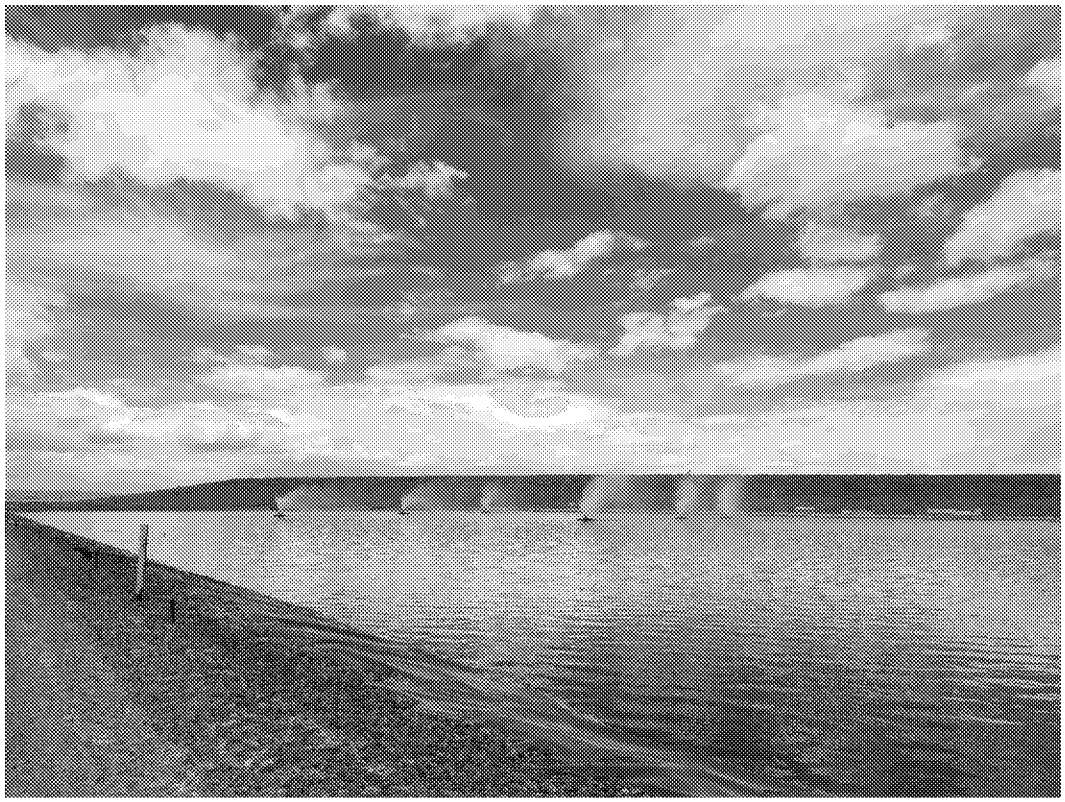


Source: 2020 HMC Annual Monitoring Report/Performance Review.

APPENDIX G – 2019 SITE VISIT PHOTOGRAPHS

Collection ponds with RO treatment plant and LTP in the background, looking northwest

Evaporation pond 1



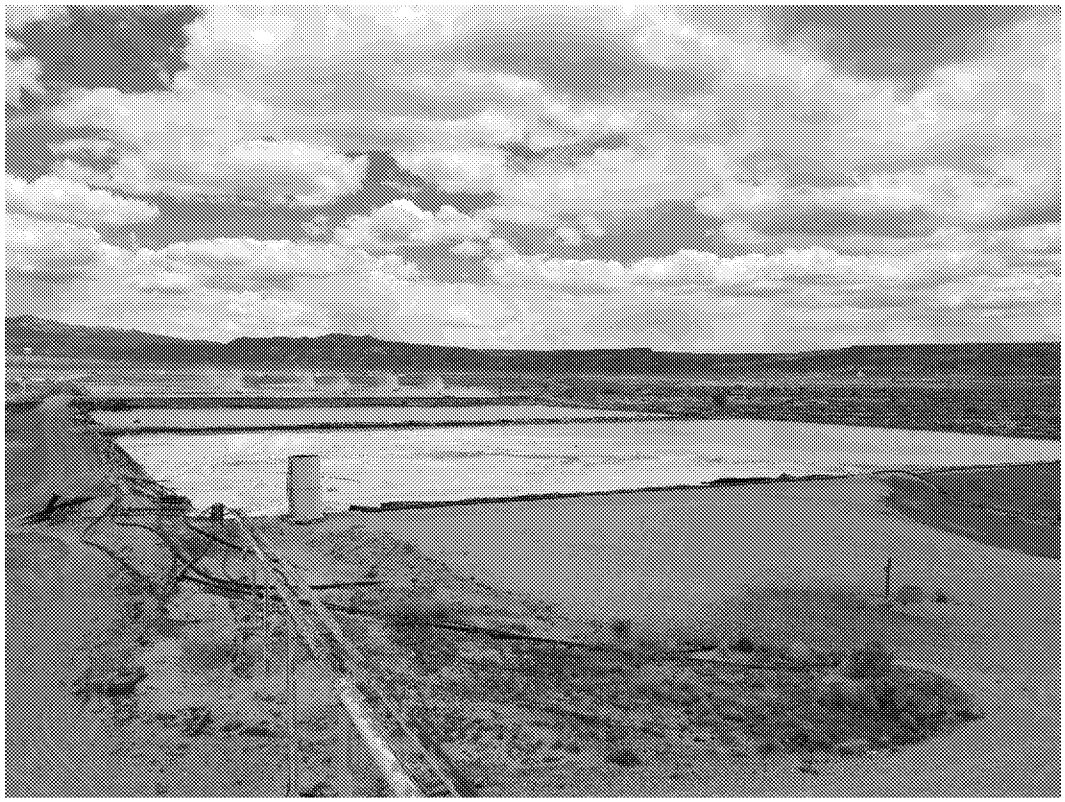
Evaporation pond 2 with sprayers

RO treatment plant storage tanks

Top of RO storage tanks with LTP in the background

RO treatment plant interior

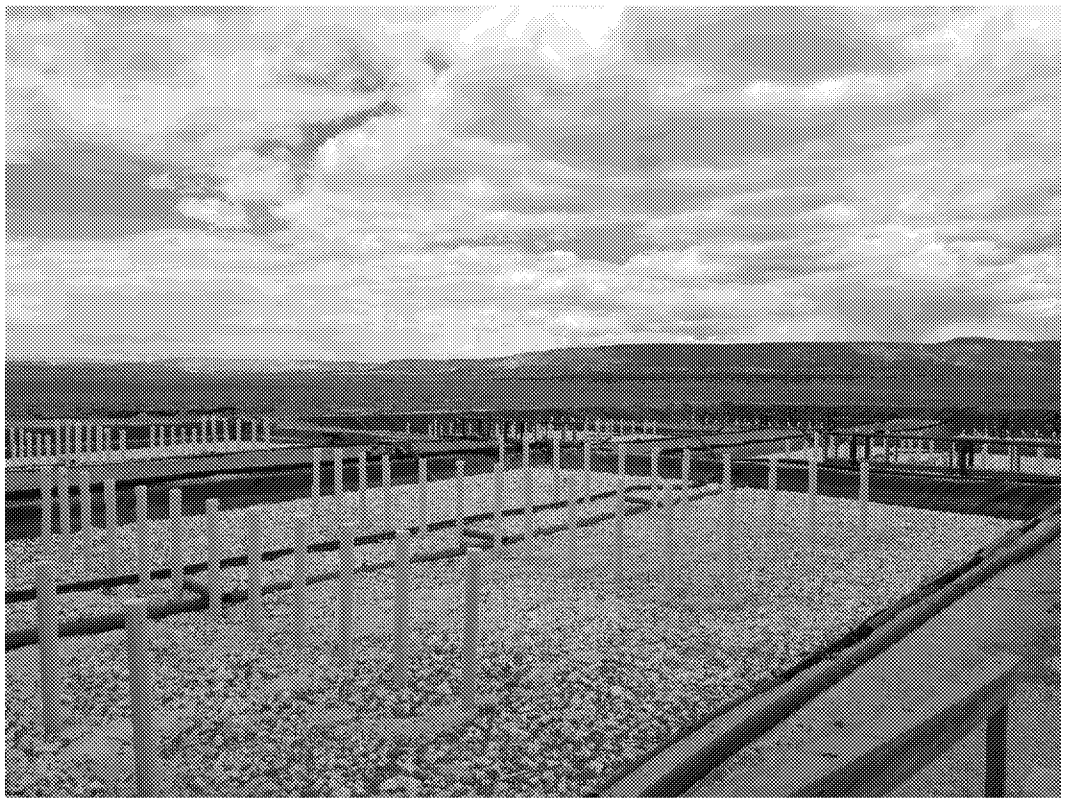
RO treatment plant interior



Collection ponds looking east from the RO treatment plant

Zeolite filtration system on top of the LTP

Zeolite treatment system tanks on top of the LTP



Zeolite treatment system

APPENDIX H – TOXICITY DATA EVALUATION FOR 2014 HHRA

Table H-1: Oral Cancer Toxicity Value Review (Soil Ingestion)

Radionuclide/Chemical of Potential Concern[a]	Oral Cancer Slope Factor (Soil Ingestion)					
	Value Used in 2014 Risk Assessment[b]		2021 Value		Units	Change
	Value	Source	Value	Source		
Arsenic	1.50E+00	IRIS	1.5E+00	IRIS[c]	$(mg/kg\text{-}day)^{-1}$	no change
Radium-226 +D	7.30E-10	HEAST	7.30E-10	HEAST[d]	risk/pCi	no change
Radium-228 +D	2.29E-09	HEAST	2.29E-09	HEAST[d]	risk/pCi	no change
Thorium-230	2.02E-10	HEAST	2.02E-10	HEAST[d]	risk/pCi	no change
Uranium-234	1.58E-10	HEAST	1.58E-10	HEAST[d]	risk/pCi	no change
Uranium-238 +D	2.10E-10	HEAST	2.10E-10	HEAST[d]	risk/pCi	no change

Notes:

a) Risk from decay products (+D) included as appropriate.
b) Source: December 2014 Human Health Risk Assessment, Appendix A, Table 6.1
c) Source: May 2021 EPA Regional Screening Levels tables, accessed 7/28/2021 at [HYPERLINK "https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables"]
d) Source: EPA Radionuclide Table (formerly HEAST Table 4), accessed 7/28/2021 at [HYPERLINK "https://www.epa.gov/radiation/radionuclide-table-radionuclide-carcinogenicity-slope-factors"]

$(mg/kg\text{-}day)^{-1}$ = per milligram per kilogram per day
risk/pCi = risk per picocurie
-- = toxicity data not available
IRIS = Integrated Risk Information System
HEAST = Health Effects Assessment Summary Tables

Table H-2: Oral Cancer Toxicity Value Review (Food Ingestion)

Radionuclide of Potential Concern[a]	Oral Cancer Slope Factor (Food Ingestion)					
	Value Used in 2014 Risk Assessment[b]		2021 Value[c]		Units	Change
	Value	Source	Value	Source		
Radium-226 +D	5.15E-10	HEAST	5.15E-10	HEAST	risk/pCi	no change
Radium-228 +D	1.43E-09	HEAST	1.43E-09	HEAST	risk/pCi	no change
Thorium-230	1.19E-10	HEAST	1.19E-10	HEAST	risk/pCi	no change
Uranium-234	9.55E-11	HEAST	9.55E-11	HEAST	risk/pCi	no change
Uranium-238 +D	1.21E-10	HEAST	1.21E-10	HEAST	risk/pCi	no change

Notes:

a) Risk from decay products (+D) included as appropriate.
b) Source: December 2014 Human Health Risk Assessment, Appendix A, Table 6.3
c) Source: EPA Radionuclide Table (formerly HEAST Table 4), accessed 7/28/2021 at [HYPERLINK "https://www.epa.gov/radiation/radionuclide-table-radionuclide-carcinogenicity-slope-factors"]

risk/pCi = risk per picocurie
HEAST = Health Effects Assessment Summary Tables

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Table H-3: Inhalation Cancer Toxicity Value Review

Radionuclide/Chemical of Potential Concern[a]	Inhalation Cancer Slope Factor					
	Value Used in 2014 Risk Assessment[b]		2021 Value		Units	Change
	Value	Source	Value	Source		
Lead-210	2.77E-09	HEAST	2.77E-09	HEAST[c]	risk/pCi	no change
Radium-226 +D	1.16E-08	HEAST	1.16E-08	HEAST[c]	risk/pCi	no change
Radium-228 +D	5.23E-09	HEAST	5.23E-09	HEAST[c]	risk/pCi	no change
Thorium-230	2.85E-08	HEAST	2.85E-08	HEAST[c]	risk/pCi	no change
Uranium-234	1.14E-08	HEAST	1.14E-08	HEAST[c]	risk/pCi	no change
Uranium-238 +D	9.35E-09	HEAST	9.35E-09	HEAST[c]	risk/pCi	no change
Arsenic	4.30E-03	IRIS	4.3E-03	IRIS[d]	per µg/m³	no change
Radon gas	1.80E-11	HEAST	--		risk/pCi	no value
Radon-222 (Rn-222 +D)	1.80E-11	HEAST	1.80E-11	HEAST[c]	risk/pCi	no change
Thoron (Rn-220)[e]	--	HEAST	--	HEAST[c]	risk/pCi	no change

Notes:

a) Risk from decay products (+D) included as appropriate.
b) Source: December 2014 Human Health Risk Assessment, Appendix A, Table 6.2
c) Source: EPA Radionuclide Table (formerly HEAST Table 4), accessed 7/28/2021 at [HYPERLINK "https://www.epa.gov/radiation/radionuclide-table-radionuclide-carcinogenicity-slope-factors"]
d) Source: May 2021 EPA Regional Screening Levels tables, accessed 7/28/2021 at [HYPERLINK "https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables"]
e) Thoron gas an isotope of Radon gas (Rn-220)

-- = toxicity data not available
risk/pCi = risk per picocurie
µg/m³ = microgram per cubic meter
HEAST = Health Effects Assessment Summary Tables
IRIS = Integrated Risk Information System

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Table H-4: External Exposure (Radiation) Cancer Toxicity Value Review

Radionuclide of Potential Concern[a]	Cancer Slope Factor (External Exposure)					
	Value Used in 2014 Risk Assessment[b]		2021 Value[c]		Units	Change
	Value	Source	Value	Source		
Lead-210	1.4E-09	HEAST	1.41E-09	HEAST	risk/yr per pCi/g	no change
Radium-226 +D	7.87E-09	HEAST	--		risk/yr per pCi/m³	--[d]
	8.49E-06	HEAST	8.49E-06	HEAST	risk/yr per pCi/g	no change
Radium-228 +D	1.2E-05	HEAST	4.53E-06	HEAST	risk/yr per pCi/g	less stringent
Thorium-230	1.31E-12	HEAST	--		risk/yr per pCi/m³	--[d]
	8.19E-10	HEAST	8.19E-10	HEAST	risk/yr per pCi/g	no change
Uranium-234	2.5E-10	HEAST	2.52E-10	HEAST	risk/yr per pCi/g	no change
Uranium-238 +D	1.22E-10	HEAST	--		risk/yr per pCi/m³	--[d]
	1.14E-07	HEAST	1.14E-07	HEAST	risk/yr per pCi/g	no change
Radon gas	7.85E-09	HEAST	--		risk/yr per pCi/m³	--[d]
	8.48E-06	HEAST	--		risk/yr per pCi/g	no value
Radon-222 (Rn-222 +D)	7.85E-09	HEAST	--		risk/yr per pCi/m³	--[d]
	8.48E-06	HEAST	--		risk/yr per pCi/g	no value
Thoron (Rn-220)[e]	1.61E-12	HEAST	--		risk/yr per pCi/m³	--[d]
	1.71E-09	HEAST	1.70E-09	HEAST	risk/yr per pCi/g	no change

Notes:

a) Risk from decay products (+D) included as appropriate.
b) Source: December 2014 Human Health Risk Assessment, Appendix A, Tables 6.4 and 6.5
c) Source: EPA Radionuclide Table (formerly HEAST Table 4), accessed 7/28/2021 at [HYPERLINK "https://www.epa.gov/radiation/radionuclide-table-radionuclide-carcinogenicity-slope-factors"]
d) EPA Radionuclide Table presents external exposure cancer slope factors using units of "risk per year per picocurie per gram" (not using units of "risk per year per picocurie per cubic meter")
e) Thoron gas an isotope of Radon gas (Rn-220)

-- = toxicity data not available
risk/yr per pCi/g = risk per year per picocurie per gram
risk/yr per pCi/m³ = risk per year per picocurie per cubic meter
HEAST = Health Effects Assessment Summary Tables
IRIS = Integrated Risk Information System

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Table H-5: Non-Cancer Ingestion Toxicity Value Review

Chemical of Potential Concern	Reference Dose				
	Value Used in 2014 Risk Assessment[a]	2021 Value[b]		Units	Change
		Value	Source		
Arsenic	3.00E-04	3.0E-04	IRIS	mg/kg-day	no change
Lead	--	--		mg/kg-day	no change
Molybdenum	5.00E-03	5.0E-03	IRIS	mg/kg-day	no change
Selenium	5.00E-03	5.0E-03	IRIS	mg/kg-day	no change
Vanadium	5.04E-03	5.0E-03	IRIS[c]	mg/kg-day	no change
Uranium. Total	3.0E-03	2.0E-04	ATSDR	mg/kg-day	more stringent

Notes:

a) Source: December 2014 Human Health Risk Assessment, Appendix A, Table 7.1.7

b) Source: May 2021 EPA Regional Screening Levels tables, accessed 7/28/2021 at [HYPERLINK "https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables"] +

c) The RSLs User's Guide states that "The oral RfD toxicity value for Vanadium, used in this website, is derived from the IRIS oral RfD for Vanadium Pentoxide by factoring out the molecular weight (MW) of the oxide ion. Vanadium Pentoxide (V_2O_5) has a molecular weight of 181.88. The two atoms of Vanadium contribute 56% of the MW. Vanadium Pentoxide's oral RfD of 9E-03 mg/kg-day multiplied by 56% gives a Vanadium oral RfD of 5.04E-03 mg/kg-day."

-- = toxicity data not available

(mg/kg-day) = milligram per kilogram per day

IRIS = Integrated Risk Information System

ATSDR = Agency for Toxic Substances and Disease Registry

Table H-6: Non-Cancer Inhalation Toxicity Value Review

Chemical of Potential Concern	Reference Concentration				
	Value Used in 2014 Risk Assessment[a]	2021 Value[b]		Units	Change
		Value	Source		
Arsenic	1.50E-05	1.5E-05	CalEPA	mg/m³	no change
Lead	--	--		mg/m³	no change
Molybdenum	--	2.0E-03	ATSDR	mg/m³	new value
Selenium	2.00E-02	2.0E-02	CalEPA	mg/m³	no change
Vanadium	--	1.0E-04	ATSDR	mg/m³	new value
Uranium. Total	--	4.0E-05	ATSDR	mg/m³	new value

Notes:

a) Source: December 2014 Human Health Risk Assessment, Appendix A, Table 7.1.7

b) Source: May 2021 EPA Regional Screening Levels tables, accessed 7/28/2021 at [HYPERLINK "https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables"]

-- = toxicity data not available

mg/m³ = milligrams per cubic meter

CalEPA = California Environmental Protection Agency

ATSDR = Agency for Toxic Substances and Disease Registry

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INTERVIEW RECORD

Site Name: Homestake Mining Company Superfund Site	**EPA ID #:** NMD007860935	
Subject: Fifth Five-Year Review	**Time:** 1:00 PM MST	**Date:** 04/01/2021
Type: Teleconference **Location of Visit:** Not applicable (NA)		

Contact Made By:

Name: Mr. Mark Purcell	**Title:** Remedial Project Manager	**Organization:** EPA Region 6

Individual Contacted:

Name: Candace Head-Dylla. Ph.D.	**Title:** Former Resident	**Organization:** Former Blue Water Valley Downstream Alliance (BVDA) Member

Telephone No: 505-401-4349 **Fax No:** **E-Mail Address:** cheaddylla@gmail.com	**Street Address:** NA

Summary Of Conversation

Question 1: What is your overall impression of the project? (general sentiment)

The Homestake Barrick Gold site has been an abject failure, which EPA, NMED, and NRC would have walked away from long ago had community members not kept writing letters and engaging politicians to force at least a modicum of attention to be paid to the injustice of this environmental disaster. In the early years, community efforts to bring obvious deficits in remediation to the attention of regulators were relegated to the dustbin because we could not afford competent technical expertise. When community members joined with other affected communities, raised money, and hired skilled technical experts, we were no longer ignored, but by then the incompetence of regulators had resulted in the community's loss of wells, water, and a way of life that could not be regained. In addition, those living closest to the large tailings pile were exposed to unsafe levels of airborne radon contamination for more than 30 years.

An autopsy of the failures at this site would be most informative if the EPA actually cared about the environment, safety of citizens, or the site. Unfortunately, EPA and other environmental regulators probably begin their careers with admirable aims, but the political cycles and compromises necessary to maintain a job, let alone rise in this organization, precludes those responsible for the site from acting responsibly and in ways that would actually solve environmental problems.

It is unfortunate to see today's EPA leadership speak about environmental justice and juxtapose that

with the actual experiences of our community, which had legitimate ideas and solutions and were fully engaged, but no one listened to them and now it is too late. Unless the community has money to hire experts, and probably even then, Superfund sites across the nation languish from inattention and lack of political will to solve the problems. The only thing that moved our site forward—for a brief period of time--was a combination of political pressure (from Senator Heinrich's office and Katy Richardson) and expert comments that could not be easily ignored, as well as the change of leadership in EPA Region 6 (Regional Administrator Ron Curry). Unfortunately, by this time too much damage had been done and the process was too far gone.

This site would be a great case study to look back and consider why and how regulators failed the community. In another community with more resources, things might have gone better. But here, with Barrick Gold (the parent company to Homestake) involved, they were "a god who could not be touched" politically. For example, I cannot understand why there is no remedy for groundwater—no ROD for groundwater after more than 30 years of failed remediation.

Throughout the process, community members never knew what was going on behind closed doors. That is a huge problem. We know Barrick Gold has meetings with Senator Heinrich every few months and this has been true since Domenici's days. Maybe they just shoot the breeze or maybe they make deals. The community is left out. Regulators meet with lawmakers and RPs and there is no record of those meetings—no way for community members to know what is happening outside the community meetings and no way for them to be part of these informal processes. If you step back, I think you, Mark, would agree this site is a huge failure—yet you seem sincere about your commitment to health and the environment, so what went wrong?

My husband and I built our home on our own. We saved our money to buy the land. My dad, husband, and I shoveled out the crawlspace and laid the blocks, built every wall, hammered every nail together. We thought we would always live in that home and have it for our grandkids. It was a thriving community at that time and folks irrigated beautiful green pastures. It was such a peaceful, soft and wonderful place to live. It was truly a joy. But, because a greedy company named Homestake/Barrick Gold believed its mission gave it permission to destroy that community in pursuit of its "fiduciary responsibility" to stockholders and because politicians such as Domenici, Bingaman, and others needed that company's money, and because regulators failed—that is all gone. The dream is gone. The community is gone, and it a direct result of what Homestake/Barrick Gold did and what regulators and politicians allowed them to do.

I understand that Mark, Sai, and many others begin their jobs with best intentions. But some are just there for the job. Even those with good intentions know they are limited and some boats cannot be rocked. The community is then caught in the middle and the work on the ground does not get done. This Superfund site destroyed our community. Now if I get a twinge of pain or any illness, I just immediately think of cancer because of the site. I am a freak about not having any extra x-rays and checking the basement regularly for radon because I know my family and I have been so exposed because of the site. And I do this with every family member—all of us who lived on that site. That could have been avoided if the company and regulators had addressed the ambient radon and effectively remediated the site. The future health of people who lived so many years near this site is a real question and one that has never been considered by regulators or politicians—another aspect just ignored.

Now that the community is destroyed, there is no one there to keep fighting. MASE (Multicultural Alliance for a Safe Environment) is doing what it can. It is finally well-funded, but cannot fight every front and has other groups with the same level of need. And MASE is not the same as having local community stakeholders. Homestake/Barrick Gold has done such a good job of co-opting and exploiting the local political scene and the community is so desperate for mining jobs with no

imagination, no clue how to create a different economic base, it has bowed to Homestake/Barrick Gold. Local politicians do not even question where their water comes from and where water will come from in the future. They are not educated about water resources and, worse, are deliberately kept ignorant. In this way, local people who welcomed the mining would be at meetings to show support for Homestake/Barrick Gold and even provide a platform for Homestake/Barrick Gold to espouse lies. That is a tragedy. Particularly because regulators know what is actually happening, but use these uninformed people as cover for their inaction or ineffective action.

Question 2: What effects have the site operations had on the surrounding community?

See above. Basically, we lost everything we held dear, including our health. In the informal community survey we did, there were a number of deaths adjacent to the site and a greater than normal rate of thyroid problems and cancer throughout the community, with the greater number and most severe cases closest to the large tailings pile. No one cared. We were not epidemiologists. Our information was ignored except for one front page Albuquerque Journal article that featured our "death map." It was all quickly brushed aside because we were not experts—even though the illnesses and deaths were simply facts.

Question 3: Are you aware of any community concerns regarding the site or its operation and administration? If so, please give details.

I am aware of 40 years-worth of community concerns. I have a room full of boxes documenting our concerns and efforts to engage regulators for effective oversight.

At this point there is nobody in the community who cares anymore. They all just want to get out. They want to sell and get out because they understand at this point that there may be an opportunity to recoup at least some of what was lost in property values due to the site and they are equally certain that there is no political will to solve the problem.

Question 4: Are you aware of any complaints, incidents or activities at the Site such as vandalism, trespassing, or emergency response from local authorities? If so, please provide details.

Oh no, there were no problems from our community. We followed all laws and rules. We very politely allowed Homestake/Barrick Gold to take our community and our health, aided and abetted by the EPA, NMED, and NRC. We are very law abiding and thought that regulators would protect us. We were wrong.

Question 5: Do you feel well informed about the Site's activities and progress?

Staying informed at this point would just be salt in a wound. I try not to think about this site anymore because to keep thinking about it would make me crazy. My family and I thankfully all had full time jobs, so my mom and I then did the BVDA/MASE work after long hours at our regular jobs. Trying to keep up for almost 30 years was exhausting. At one point we also had to fight a medical waste incinerator in the community, which took two years. I put so much into it over the years, but now I ignore it because it would otherwise just be too ridiculously painful. EPA will do whatever the powers that be decide is politically convenient—communities and the environment really do not matter as every action can and will be rationalized and justified so the regulators and politicians can sleep at night.

In the past, around the time Mark came back on, it did improve some. It has to do with who is in the leadership positions. We used to tell the NRC to please not come to the community because they were so rude and demeaning to us and people felt great animosity towards them. I felt that changed when Mathew Meyer came on board. Then, suddenly we were well informed, and NRC then was much better than EPA. We had monthly calls with the NRC, which were very useful in letting the community know what was happening and for the community to share its concerns. This had never happened with the EPA. The regulators can make a difference if they find the political will to do so.

Doing all of this outside of our paid work was difficult. I'm not sure how helpful the TAG (Technical Assistance Grant) was. We appreciated the TAG and TASC (Technical Assistance Services for Communities) assistance, and maybe if we had received better technical advice and help, it would have been more successful. We never received adequate technical assistance until we started paying for it ourselves. Working class people struggle to get and use grants. Sure, it is good thing, but I thought the monthly meetings with NRC were more helpful than the TAG or TASC support.

Question 6: Do you have any comments, questions, or recommendations regarding the Site's management or operation?

We have no idea how EPA works or the current political landscape within EPA, but if community involvement is helpful in pushing cleanups, then the thing that needs to happen at this site is for local elected officials to understand where their water comes from and how this Superfund site could impinge on future water resources. Right now, you could go to any elected official in the area and none (except Christine Lowry – Cibola County Commissioner; also a MASE member) would have a clue where their water comes from or where the community hopes water will come from in the future. They have no clue how this site could impact those resources. I do not know how this is allowed to happen. The Village of Milan does not understand their water resources. They are ignorant regarding how this site could affect the entire area in the future. But officials have been purposefully kept in the dark because their ignorance has kept them supporting the big mining company, which, if threatened, becomes a threat to state and federal politicians. So, the game has been to just pretend that the community is a bunch of troublemakers and the regulators and politicians have it all under control. Future generations will come to understand that the whole thing was a farce at their expense.

I do not know what government agency might be interested in doing the education and outreach, but it is necessary if EPA wants informed community engagement. The few community people who could do this type of education are old, and also just want out. Making the larger community aware where their water comes from and what the risks are would be useful. But currently, no one cares because they do not see how it is important.

I have survived my engagement in this process by becoming bitter, cynical, and sarcastic. That is not really who I am, so I have to be finished with this now. No more comments, no more contact, please.

INTERVIEW RECORD

Site Name: Homestake Mining Company Superfund Site	**EPA ID #: NMD007860935**	
Subject: Fifth Five-Year Review	**Time:**	**Date: 06/18/21**
Type: Teleconference **Location of Visit: NA**		

Contact Made By:

Name: Mr. Mark Purcell	**Title:** **Remedial Project Manager**	**Organization:** **EPA Region 6**

Individual Contacted:

Name: Mr. Brad R. Bingham	**Title: Closure Manager**	**Organization: HMC**

Telephone No: 505-290-8019 **Fax No:** **E-Mail Address: bbingham@barrick.com**	**Street Address: 560 Anaconda Road, Route 605 Milan, NM 87021**

Summary Of Conversation

Question 1: What is your overall impression of the project? (general sentiment)

Homestake, in cooperation with EPA, NRC, and NMED, has made substantial progress at the site.

- Over more than 40 years of groundwater remediation, Homestake has removed 1 million pounds of uranium and spent more than $230,000,000.
- Homestake has progressively used essentially all available groundwater treatment strategies, including containment measures, evaporation, and pump and treat. From RO, zeolite, and ion exchange to phosphate, bioremediation, not to mention its treatability studies on options not actually implemented, Homestake has either used or evaluated all applicable technologies.

After multiple investigations and years of remediation, we now have clear understanding of the site and the path forward.

- The site is in a position to move toward closure, and Homestake has proposed a strategy that will allow for regulatory closure and protection of human health and the environment, which includes granting a technical impracticability waiver to waive groundwater ARARs and a belt and suspenders approach to institutional controls.

Question 2: What effects have the site operations had on the surrounding community?

Homestake's continued commitment to the site and progress made have had positive effects on the surrounding community:

- Connected residents to municipal water and paid for their water

- Purchased property for value that would allow residents to relocate if they would like to
- Mitigated risk to human health and the environment
- Reduced the footprint of the groundwater plume

Question 3: Are you aware of any community concerns regarding the site or its operation and administration? If so, please give details.

We are not aware of any concerns other than those that have already been raised by the community to EPA.

- As previously discussed, we are aware of the concern regarding GW treatment rate/capacity: Reasons for the misconception include nameplate capacities, aquifer geochemical properties, and the lack of understanding of the overall remediation treatment system(s) limitations. Regardless of our treatment capacity, back diffusion from fine-grained materials within the aquifer will continue to impact the mobile domain resulting in loss of a natural resource through extraction and evaporation without discernable improvement in groundwater quality. HMC is committed to continue treatment at a maximum sustainable rate for the site as we progress through the ACL application and TI Waiver processes.

- More importantly, even if system capacity could be increased, that will not overcome the fact that it is technical impracticability to remediate GW. ICs and a TI waiver would still be needed, resulting in the application of the same remedy.
    - Even assuming that the mobile domain could be completely remediated, back diffusion from the nearby geologic features and continued seepage from the LTP would generate a new plume with the same characteristics.
    - Increased treatment capacity, as referenced above, will not result in improved groundwater quality. The solution is placing institutional measures that protect human, health and the environment.

Question 4: Are you aware of any complaints, incidents or activities at the Site such as vandalism, trespassing, or emergency response from local authorities? If so, please provide details.

No.

Question 5: Do you feel well informed about the Site's activities and progress?

- Yes.
- Homestake welcomes the cooperative relationship with EPA, NRC, and NMED that allows for open communication to achieve the agencies' and Homestake's collective goal to protect human health and the environment.

Question 6: Do you have any comments, questions, or recommendations regarding the Site's management or operation?

- Just want to reiterate that HMC is committed to maintaining active communication and continued transparency with all stakeholders, including regulatory agencies, local communities, local officials, NGOs, and other interested parties.

INTERVIEW RECORD

Site Name: Homestake Mining Company Superfund Site	**EPA ID #:** NMD007860935	
Subject: Fifth Five-Year Review	**Time:** 2:20 PM MST	**Date:** 04/06/21
Type: Teleconference **Location of Visit:** Not applicable (NA)		

Contact Made By:		
Name: Mr. Mark Purcell	**Title:** Remedial Project Manager	**Organization:** EPA Region 6

Individual Contacted:		
Name: Mr. Larry Carver	**Title:** NA	**Organization:** Resident

Telephone No: **Fax No:** **E-Mail Address:** carveroil@qwestoffice.net	**Street Address:** NA

Summary of Conversation

Question 1: What is your overall impression of the project? (general sentiment)

The whole project since it started back in 1975/76 has been rather slow. We started out in 1975/76 and everyone was jumping in. Homestake brought out Dr. Love to test locals for selenium poisoning (taking fingernail and hair samples). In 1976, Paul Price, Homestake general manager, held a meeting with residents from Murray Acres to discuss putting in a temporary municipal irrigation system; however, that was the last positive meeting we had with Homestake. Paul Price was transferred to Arizona and Homestake brought in a new general manager, John Parker. Edward Kennedy was an environmental expert on Homestake's staff who argued that no contamination left the Homestake property. Further, the Homestake attorneys – Mr. Kraut and Mr. Nixon – just seemed to toe the line.

We had hundreds of meetings from 1978 to 2000. The general consensus was that groundwater would be cleaned up to drinking water standards. At the time the uranium standard was 5 parts per million (ppm), but it was subsequently dropped to 1 to 2 ppm, and now it is at 0.03 ppm. Homestake's groundwater model showed that it will take 200 years to cleanup to those standards. Now Homestake is saying that it will never reach the cleanup levels. What was supposed to be a short remedy did not turn out that way. We had hoped in the past that the system would work, but my recollection is from 1978 to 2000 it was show and tell, but nothing happened. Homestake collapsed the mill and covered it. They put all of it on the eastside of the site because the prevailing wind is from the west. Homestake also cleaned up the soil, about to a 1-foot depth.

When they brought in Al Cox as the site manager in 2000, that was the first time we had seen real action with the groundwater collection and injection systems that would clean things up. From 2000 to present, they have done a lot of work. But overall, I've spent half my lifetime waiting for this problem to be cleaned up. Over the years, a lot of solutions have been offered, but not a lot of progress has been made. A few of us are still living here, but of the 130 acres of the Murray Acres subdivision, only about 50 acres of land were not sold to Homestake. Most people have sold their property to Homestake. I get the impression that Homestake has made a deal with the NRC and it is looking to get

out of cleaning the groundwater to the current uranium cleanup standard of 0.16 ppm by applying for an Alternate Concentration Limit with the NRC. I have heard rumors that they want a great deal of the property west, through the railroad and part of Milan. I read the first EPA five-year review report and talked to Nate Patel (local environmental consultant who used to work for ARCO and worked on the Anaconda site) who helped write the second five-year review report. The review reports have a lot of technical stuff. It says they need to put institutional controls on the drinking water wells to prevent their use, which is fine if we can be provided with drinking water that meets standards.

Question 2: What effects have the site operations had on the surrounding community?

Back in the 1970s and 1980s, uranium was still a big business. We had people in the nearby communities and subdivisions that worked for Homestake at the time. Every time there was a problem or big push from the locals to deal with the contamination, it caused a lot of friction with Homestake employees. Homestake employees did not want to place the blame on Homestake because they were interested in keeping their jobs. Around 1984, we [as a group of Murray Acres residents as well as some folks from surrounding subdivisions] hired Jim Tellus, an attorney, to help us file a suit against Homestake for property damages (at the time, we did not know that he was a good friend of one of the Homestake attorneys). Our attorney filed the suit and Homestake settled out. While we received a settlement for the damages, the community members who were not a part of the lawsuit were also compensated for damages. However, they received more money than those involved in the lawsuit. Essentially, Homestake paid their employees for property damages at a higher rate than what was agreed upon in our [group of Murray Acres residents and some others] legal settlement. This created a lot of friction between neighbors and was seen as an effort to punish the others in the lawsuit.

In 1985 Santa Fe Resources constructed a coal plant because a lot of coal was found when digging for uranium. A coal mine was established at the Lee Ranch. Toby Michaels was a developer and bought a farm, then sold the water rights to the coal-fired power plant (now Tri-State Power Plant).

The uranium companies – Homestake, Kerr McGee, etc. – were very good at giving local students jobs. I ended up working for all of them at different points. In spring 1961, rather than go to Kerr McGee, I got a job working at Homestake while I was a student at New Mexico State. At the time, I worked about 48 hours a week in the office writing up local purchase orders and things like that. On the weekends, I would work on the tailings pile. At that time, the milling solution was pumped out to a little pond. A ten-inch pipeline surrounded the brim. The pipeline had lots of two-inch diameter holes with wooden pegs and every hour you pulled out 40 plugs. I worked six months during the summer on the labor team and worked on the pile itself. That is how I know that the 21 million tons of tailings that are currently within the pile contain about 15% uranium. United Nuclear sold its interest in the facility when the tailing spill occurred at its Church Rock uranium mill.

I was surprised throughout 1975 to 2000 that Homestake did very little for the cleanup. I guess I had more faith in them. Paul Price, the site manager, transferred out and John Parker came in. The groundwater collection/injection system sounded good at first, but then we learned that all it did was shift the groundwater location and made a big plume to the west side of the pile.

There have also been changes to the water levels in the groundwater aquifers. Saturation has been built up in the alluvium. The static water level in my private alluvial well used to be at a depth of 50 to 60 feet below the ground surface, but in 1999 the static water level was at a depth of 39 feet. The San Andres-Glorieta (SAG) aquifer provides water for the irrigation well and the static water level was around a depth of 110 feet, but the power plant's constant pumping has lowered the static water level about 30 feet so that it is at a depth of 140 feet today. We discovered a leak in the irrigation well casing in 1995. We hired a well logging company from Wilcox, Arizona to come out and log our well.

Wilcox specialized in putting swage patches in irrigation wells. We also invited Mr. Cox and Homestake's engineer. The well pump was at a depth of 175 feet. When they logged our irrigation well, they found a hole in the casing at 172 feet that was bringing in sand and gravel. It was also pulling in contaminated water from the alluvium and two Chinle aquifers above. They put in a 20-foot swage patch (of wavy galvanized tin) in the well which stopped the sand and gravel from entering, but it did not stop the influence from the overlying contaminated alluvial and Chinle aquifers. We were able to use it to irrigate, but there was an uptick in radionuclides.

In 2004 or 2005, there was a proposition to line the well or drill a replacement, but Homestake never volunteered. After Homestake had purchased a few properties in Murray Acres, they volunteered to drill a replacement well (at around $200,000). Homestake drilled the B5R replacement well in 2006 to a depth of 600 feet. Replacement well B5R was about 100 feet from the original irrigation well. We have been using B5R ever since. The static water level in the new well is at a depth of 140 feet and the well pump is at a depth of 200 feet.

Question 3: Are you aware of any community concerns regarding the site or its operation and administration? If so, please give details.

It was unusual for Homestake to purchase properties in Murray Acres. Jesse Toepfer was former military and worked as Homestake's site closure manager for about two years (2014-2015), then a new site closure manager, Tom Wolford, was hired. Tom Wolford leased the Murray Acres property to Larry Grider for growing alfalfa and hay. Homestake had started farming alfalfa and hay in the area using center pivot irrigation and flood irrigation practices. This land irrigation was done to dispose of contaminated groundwater Homestake collected at the site because they did not have enough treatment capacity for the water. The reason Tom Wolford leased the property to Larry Grider was also to dispose of this extra collection water. I heard a rumor that when they would have to test the hay, Larry Grider would go out and get hay from somewhere else to test. Whether there is truth to that, I don't know. Larry Grider used some of the alfalfa and sold some of it for feed. There is a question of what happens with the animals that eat the alfalfa and hay that has been irrigated with collection water, especially since they are being sold in interstate commerce, which is probably why the hay had to be tested, but eventually they shut off the water and the farming stopped. I believe the Natural Resources Conservation Service (NRCS) or Nuclear Regulatory Commission shut down the disposal of the collection water in that manner. After they shut off the collection water supply, Larry Grider grazed the land, but it became a dust bowl with no vegetation. Then there was an issue with the sand blowing all over. I think Larry would have preferred to continue growing alfalfa to prevent the sand from blowing in the wind.

Tom Wolford hired someone to talk to the NRCS to determine what kind of seed to plant, but the field had an infestation of prairie dogs. Before they could reseed, they had to exterminate the prairie dogs, which they did. However, once they planted the seed, they did not irrigate or fertilize so the seeds all blew away. Tom apparently remarked, "We can tell them we tried."

In New Mexico it isn't against the law to have blowing sand unless you are deliberately doing so. I think it would probably be better to use the collection water to establish a wind break than have nothing.

Question 4: Are you aware of any complaints, incidents or activities at the Site such as vandalism, trespassing, or emergency response from local authorities? If so, please provide details.

Nothing that I know of. They have people who run security at the site all the time; never heard of

anyone having any troubles with trespassing. The site is fenced with metal t-posts and five-strand barbed wire; the mill is fenced on the north, west and south sides. State Highway 605 intersects a portion of the site.

Question 5: Do you feel well informed about the Site's activities and progress?

Pretty well, I have tried to keep up with the last 40 years. There has been a lot of turnover in Homestake site managers since John Parker left. When Tom Wolford left, we were told the next manager would sign a three-year contract. David Pierce came in and signed a three-year contract. He had some remediation experience, but was let go after a year and a half. Daniel Lattin is Homestake's new site closure program manager, but he is in located in Nevada; Brad Bingham, who is Homestake's environmental manager, now seems to be the on-site manager.

Follow-up question: Do you feel well informed by EPA, NRC and the regulatory agencies?

Yes and no. In the 1970s and 1980s, we had periodic meetings and were brought up to date, although we never had any input. Biggest concern is that they would not try Milton Head's idea for moving the tailings through pipelines back to Ambrosia Lake, which would have eliminated future problems. There is good shale in the Ambrosia Lake area for which to dispose the tailings on. I remember one meeting, the NRC representative said they would kill more people moving the tailings than leaving them in place. I disagree, because it is less than 20 miles and you can use a slurry to move the tailings through the pipe. In Caliente, NM, coal is slurried 200 miles to a power plant, so we should be able to do the same thing with the tailings and it would be safer than moving it by truck. There was no real discussion around moving it though, just expectation that it would stay there. Milton Head also recommended digging a trench, putting in a liner/barrier, and burying the tailings. We know that in other locations, tailings were moved because of their proximity to surface water. Homestake covered the sides of the tailing piles. When they tore the mill building down, rather than giving the yellow cake to Kerr McGee to deal with, they just buried it.

Looking at the ARCO project (DOE Bluewater Disposal Site), Mrs. Bernadette Tsosie said DOE is monitoring the site but they have no funds for the cleanup. What are the local people supposed to do when the groundwater contamination starts to migrate 20 years from now? What about the next generations? We can hope the hydrologist is correct and it won't migrate to the SAG aquifer.

Follow-up question: Do you think over the past 8 to 10 years the agencies have been better about keeping you informed?

Yes, we have been kept informed, but we haven't seen much progress. Seems like NRC has made a deal with Homestake to walk away from this project without having to meet the cleanup standards. The agencies talk to us and explain, but I haven't heard a scenario where the problem is actually taken care of.

Question 6: Do you have any comments, questions, or recommendations regarding the Site's management or operation?

Follow-up question: Is there anything EPA can do going forward with community outreach (in other words, how EPA informs the community)?

The only major question I have is: what if a person does not sell to Homestake/DOE, what do we do for clean drinking water? Does DOE have the wherewithal to claim imminent domain? The village of

Milan signed an agreement to furnish water, but people are concerned that DOE can come in and condemn the property.

INTERVIEW RECORD

Site Name: Homestake Mining Company Superfund Site	**EPA ID #: NMD007860935**	
Subject: Fifth Five-Year Review	**Time:**	**Date:**
Type: Teleconference **Location of Visit: NA**		

Contact Made By:

Name: Mr. Mark Purcell	**Title:** **Remedial Project Manager**	**Organization:** **EPA Region 6**

Individual Contacted:

Name: Mr. Adam Ringia	**Title: Water Rights Office Manager**	**Organization: Pueblo of Laguna**

Telephone No: -505-235-5023 **Fax No: -** **E-Mail Address: ringiaa@pol-nsn.gov**	**Street Address:** 22 Bay Tree Road, Building A, Room 208 Kawaik'a Center Paraje, NM 87007

Summary Of Conversation

Question 1: What is your overall impression of the project? (general sentiment)

In general, the project seems fairly ineffective as a clean-up, but moderately effective as a barrier to downstream contamination. The Homestake mill tailings should never have been allowed to remain in situ without an impermeable barrier between it and the groundwater. The current "remediation" effort, has apparently never been implemented to the extent envisioned by the EPA or as described by Homestake. Possibly as a result, the efforts have not had a more permanent effect, however, the water withdrawals have at least (apparently) helped to prevent the infiltration of toxic chemicals and radionuclides into the aquifers providing the domestic water supply to the local communities.

Question 2: What effects have the site operations had on the surrounding community?

Laguna is a way downstream, so is less effected by the operations, however, we are certainly concerned about the contamination of those same aquifers, as well as the reduction in available water from that aquifer (that is used in the remediation efforts) that would contribute to the flow of the Rio San Jose. The actual site is an eyesore, and almost certainly detracts from the desire of the local community to be in that area, impairs any ability to use the land, and reminds people of the costs of uranium mining.

Question 3: Are you aware of any community concerns regarding the site or its operation and administration? If so, please give details.

Yes, this site has been active for some time and has sparked the creation of a number of activist groups, who have been vocal opponents of both uranium impacts, as well as the effectiveness of the cleanup. They have indicated that the company has appeared to attempt to circumvent remediation strategies, irrigate with contaminated water, not fixed wells, failed to continue to provide free water when remediation continued beyond the expected timeframe, failed to fully operate equipment, not invested appropriately in cleanup efforts, and ruined their community in general.

Question 4: Are you aware of any complaints, incidents or activities at the Site such as vandalism, trespassing, or emergency response from local authorities? If so, please provide details.

I am not aware of any – the local residents would be a better source here.

Question 5: Do you feel well informed about the Site's activities and progress?

We could be, the information is there, and in general the EPA has been quite proactive about providing updates and opportunities to ask questions. Depending on time, prioritization and staffing availability Laguna has participated when it could.

Question 6: Do you have any comments, questions, or recommendations regarding the Site's management or operation?

The primary question is why the site managers have been permitted to run their equipment at far less than the proposed levels, giving us an inability to know how effective those agreed upon strategies could be. Running a 20% operation does not necessarily give a good representation of what a 100% operation could do.

INTERVIEW RECORD

Site Name: Homestake Mining Company Superfund Site	**EPA ID #: NMD007860935**
Subject: Fifth Five-Year Review	**Time:** 1200 **Date:** 4/12/2022
Type: Teleconference **Location of Visit: NA**	

Contact Made By:

Name: Mr. Mark Purcell	**Title:** **Remedial Project Manager**	**Organization:** **EPA Region 6**

Individual Contacted:

Name: Mr. /Ms. Felix O Gonzales	**Title:** Mayor	**Organization:** V.O.M.
Telephone No: 285-6694 **Fax No:** **E-Mail Address:**	**Street Address:** 623 Uranium St Milan, NM 87021	

Summary Of Conversation

Question 1: What is your overall impression of the project? (general sentiment)

On water Contamination— ground Contamination wells that are Capped. Flying Dirt. wind Blown Contamination.

Question 2: What effects have the site operations had on the surrounding community?

People who live close to Homestake don't get answers to their satisfaction. Some Ranchers That have cattle.

Question 3: Are you aware of any community concerns regarding the site or its operation and administration? If so, please give details.

Same as Question 1-2

Question 4: Are you aware of any complaints, incidents or activities at the Site such as vandalism, trespassing, or emergency response from local authorities? If so, please provide details.

not aware

Question 5: Do you feel well informed about the Site's activities and progress?

Joann Martong is good on public Relations – as far as operations go we are not well informed

Question 6: Do you have any comments, questions, or recommendations regarding the Site's management or operation?

Homestake – can keep the Board of Trustees – and myself – (mayor) Sarah (manager.) informed on changes and on Construction at the site – so we can inform the Community.

INTERVIEW RECORD

Site Name: Homestake Mining Company Superfund Site	**EPA ID #: NMD007860935**
Subject: Fifth Five-Year Review	**Time:** 12:03 / **Date:** 4-12-21
Type: Teleconference **Location of Visit: NA**	

Contact Made By:

Name: Mr. Mark Purcell	**Title:** **Remedial Project Manager**	**Organization:** **EPA Region 6**

Individual Contacted:

Name: Mr. /Ms. Vicki Brumbelow	**Title:** Mayor-Pro Tem	**Organization:** Village of Milan

Telephone No: **Fax No:** **E-Mail Address:**	**Street Address:**

Summary Of Conversation

Question 1: What is your overall impression of the project? (general sentiment)

I feel Homestake is doing a good job on clean up.
We haven't got a lot of concerns from residents that the Village has to address.

Question 2: What effects have the site operations had on the surrounding community?

Have more community meetings because we would be able to inform public.
This is located in the County, this involves more citizens than just the Village.

Question 3: Are you aware of any community concerns regarding the site or its operation and administration? If so, please give details.

Dust concerns - Wind blowing soil - is it contaminated

Question 4: Are you aware of any complaints, incidents or activities at the Site such as vandalism, trespassing, or emergency response from local authorities? If so, please provide details.

Not any we are aware.

Question 5: Do you feel well informed about the Site's activities and progress?

I am making trips to answer any questions the Village has, but there are some things she cannot answer.

Question 6: Do you have any comments, questions, or recommendations regarding the Site's management or operation?

Keep Mayor, Manager and Trustees informed more often.

INTERVIEW RECORD

Site Name: Homestake Mining Company Superfund Site	**EPA ID #: NMD007860935**	
Subject: Fifth Five-Year Review	**Time:**	**Date:**
Type: Teleconference **Location of Visit: NA**		

Contact Made By:

Name: Mr. Mark Purcell	**Title:** **Remedial Project Manager**	**Organization:** **EPA Region 6**

Individual Contacted:

Name: L. Watchempino, downstream community resident	**Title: NA**	**Organization:** Multicultural Alliance for a Safe Environment (MASE)

Telephone No: **Fax No:** **E-Mail Address:** 5000wave@gmail.com	**Street Address:**

Summary Of Conversation

Question 1: What is your overall impression of the project? (general sentiment)

Which project? Flushing to extract contaminants and maintain hydraulic barrier; unauthorized land application of excess contaminated water; injection/extraction of groundwater in several aquifers without accounting for movement between aquifers; Reverse Osmosis (RO); zeolite treatment (both treatments operating below capacity); use of the San Andres-Glorieta, or SAG, aquifer to flush the large tailings pile (LTP), create a hydraulic barrier, and to dilute water before land application and before/after RO treatment. None of these projects has successfully contained the sources of groundwater contamination. Instead, they have spread contaminants throughout the San Mateo Creek Basin, prolonging the need for remediation.

The jumble of remedies used at the site has not been well managed or operated in accordance with a comprehensive remedial plan. The 2008 ACOE evaluation of remedies (RSE) and 2010 Supplement cited Homestake's management of injection/extraction rates, along with recommendations to end Homestake's flushing and land application projects that were likely to spread contamination and prolong the need for remediation.

Homestake's LTP should have been dewatered and lined to limit the release of contaminants. Flushing the tailings created saturated conditions and re-mobilized the uranium in pore spaces as they were flushed out of the pile. Now that flushing has been terminated, we can expect a long-term rebound of seepage from the LTP that must be captured and treated to assure that the seepage does not push existing contaminant plumes further off-site into community water supplies.

The only Institutional Control that can protect us from this threat is to remove the tailings, or contaminant sources, out of the San Mateo Creek Basin. We are agricultural communities that need good clean water to survive into the future, and to maintain our cultural traditions. We understand that we can do neither without clean water to nourish our bodies and sustain our homelands.

Not much has changed in the way of managing uranium mill waste since UNC's massive tailings impoundment breached near Churchrock, NM in 1979, sending 1,100 tons of radioactive uranium mill tailings and 94,000,000 gallons of radioactive wastewater downstream into the Rio Puerco for at least 80 miles. After the spill, unmonitored contaminants eventually reached the community of Sanders, AZ, which is now experiencing water quality impacts in its community drinking water wells.

Question 2: What effects have the site operations had on the surrounding community?

The surrounding community has been subjected to ongoing radon emissions from Homestake's uranium mill tailings into air, soil and groundwater since 1958 when mill operations began. Radon emissions from the site must continue to be managed in perpetuity for the health and safety of all surrounding communities. Radon monitor stations are needed around the site at different locations and elevations, as prevailing winds often shift. Who will take responsibility for future emissions and releases to nearby residents or to downstream communities in the event of a tailings breach?

An EPA, NM Health Advisory for community wells was issued in 2009, but what about residents that used the water from these wells for domestic and agriculture purposes prior to the health advisory?

EPA's 2014 Human Health Risk Assessment underscores the need for a long-overdue comprehensive health survey of community residents around the Homestake Superfund site, along with an epidemiological study, which should be included as an outcome in EPA's next Five-Year Plan for the Grants Mining District. A large number of community residents have experienced a greater number of health maladies than those living in other areas (cancer, asthma, severe migraines, gall bladder diseases, and thyroid diseases). Many residents have died. Families have experienced intense stress knowing that their children's health will be compromised by living in a hazardous environment, but they are unable to sell their homes due to depressed property values.

Overuse and contamination of the SAG aquifer by Homestake's high-production pumping wells of questionable integrity has undermined community confidence in SAG aquifer water quality. Milan Well #4 directly downstream of the Homestake Superfund site should be monitored for radionuclides, sulfates, and TDS on an annual basis to assure the downstream municipalities that their drinking water sources in the SAG aquifer have not been impaired by Homestake's remedial operations.

EPA's attempt to characterize the SAG aquifer subcrop at this late date is likely to grandfather in over half a century of uranium development impacts within the San Mateo Creek Basin.

Question 3: Are you aware of any community concerns regarding the site or its operation and administration? If so, please give details

In 2012, MASE advocated for a better approach to plume control by utilizing source controls to collect all discharges at the source, thereby minimizing infiltration to groundwater.
MASE Comments to US NRC on Homestake's Revised Updated Corrective Action Plan (October 31, 2012); EPA 2005 Draft Hardrock Mine Cleanup Guide; Global Acid Rock Drainage Guide (GARD 2012)

The Bluewater Valley Downstream Alliance (BVDA) initially recommended that Homestake's mill tailings be relocated to a permanent regional repository to facilitate cleanup of the site. Removal of the sources of contamination would also protect residents from radon levels which elevated the acceptable cancer risk 2-3 times at the site boundary, according to **EPA's 2014 Human Health Risk Assessment**. A regional repository that is double-lined with leak detection protections could also help to isolate similar radioactive byproduct source material near the Red Water Pond Road Community and the Mariano and Smith Lake Communities, among others.

In addition, MASE and BVDA have consistently asked EPA to reassess background water quality at the site. EPA never investigated background water quality prior to 2006, or issued a Record of Decision for groundwater at this site, even after agreeing to alternate Ground Water Protection Standards for Homestake's groundwater remediation. Nor has the NRC approved a groundwater Corrective Action Plan for the Homestake site since 1989.

The SAG aquifer has been heavily used by Homestake to push tailings seepage back on-site for treatment, then again before RO treatment. and again before treated RO water is re-injected into the alluvial aquifer and Chinle (Upper and Middle) aquifers. Homestake's use of the SAG aquifer before and after RO treatment amounts to dilution, prohibited by NRC license SUA-1471 and NMED's discharge permit DP-200.

Because the SAG aquifer is the only clean water source available for domestic use in the San Mateo Creek Basin and provides an alternative water supply for community residents around the Homestake site, MASE and BVDA have challenged Homestake's extensive use of this freshwater source in its remedial operations.

MASE repeatedly questioned Homestake's assertions that the SAG aquifer was not impacted by its remedial operations during a 2014 public hearing on the renewal of Homestake's discharge permit DP-200. Homestake's rationale for upholding the integrity of its active SAG wells during the 2014 DP-200 renewal hearing was consistent water quality results that comply with the site standards for injection. Nevertheless, Condition 21of DP-200 required Homestake to perform a well integrity evaluation of its seven SAG wells. Several of those wells were finally plugged and abandoned, but Deep Well 2, which is compromised, is still being used by Homestake, despite the availability of replacement wells Deep 2R and Deep 1R.

It should also be noted that the SAG aquifer is an unimpacted source of water that remains subject to the Clean Water Act and must comply with the Safe Drinking Water Act when used as a public water supply.

Homestake made a similar argument for SAG well 943 in 2018, that its faulty well 943 would not have been able to affect water quality in the SAG when it was being pumped continuously until 2017. But the NRC is not certain that pumping during operations was sufficient to capture all of the seepage from the overlying aquifers, or that uranium concentrations in the overlying aquifers was high enough to result in the uranium exceedances observed in well 943 during a recent pump test. NRC has suggested a pump test on Well 943M to verify that contamination is not occurring around Well 943M. NRC also recommends additional well integrity evaluations for other SAG wells that have not been previously tested.
US NRC January 23, 2020 Review of *Homestake's Proposed Adjustment in Groundwater Monitoring of the SAG Aquifer near Well 943*

Additionally, when uranium concentrations in Homestake Well 951 became elevated, it was converted to a monitoring well. But Homestake's use of both 951 and 951R should be discontinued, as both are located within the Bluewater site SAG aquifer uranium plume. The SAG plume is approximately 2

miles north of Milan Well #4, which could be influenced by pumping from Homestake Wells 951 and 951R.
DOE's 2020 Legacy Management Report: *Evaluating the Influence of High-Production Pumping Wells on Impacted Groundwater at the Bluewater, New Mexico Disposal Site*

MASE therefore recommends that ALL of Homestake's wells be subjected to integrity testing so that they can be properly abandoned and plugged. Faulty wells should not be used for remediation or monitoring. A well abandonment schedule be developed and followed. Many hundreds of Homestake's wells are currently inactive. A plan for the retirement of Homestake's injection lines should also be developed.

Furthermore, while MASE has consistently raised the threat to the SAG aquifer from Homestake high-production wells, EPA is just now characterizing the SAG subcrop southeast of the Homestake site, after decades of SAG aquifer use by Homestake. Baseline water quality data for the SAG subcrop should have been collected before Homestake's intensive use of the SAG aquifer in its remedial activities.

Our communities are very concerned that Homestake will prematurely shut down its expanded RO and zeolite treatment systems and extensive injection/extraction well network just when they are needed most to treat contaminant plumes that have migrated beyond the site. Now it appears that a fifth aquifer, the SAG aquifer, has been impacted by Homestake's faulty well maintenance and remedial operations, which would take the last remaining clean aquifer from our communities and future generations.

Our communities will suffer immeasurably if Homestake is allowed to end treatment after causing such profound damages near the headwaters of the Rio San Jose basin, damages that have permeated every viable aquifer within the San Mateo Creek sub-basin.

EPA, DOE, NRC, and the state regulators should have acted together to forestall the migration of contaminant plumes that are moving from upgradient sites in the Ambrosia Lake mining district and from the Bluewater Disposal Site with more stringent cleanup standards at each site, rather than agreeing to alternate concentration limits (ACLs) for constituents of concern. MASE and BVDA adamantly oppose the conversion of the Homestake Superfund site into another permanent disposal site for radioactive materials that will continue to pollute our watershed and river basin for hundreds of years.

BVDA has long advocated for a site-wide EIS by EPA to enlarge the scope of Homestake's uranium milling impacts to include: 1) remedial system operation impacts to the SAG aquifer; 2) cumulative human health impacts from contaminated air, soil and water impacts over 44 years of remediation attempts that spread, rather than contained, contaminant sources; 3) basin-wide ecological impacts; 4) off-site contamination plumes from all sources in the San Mateo Creek Basin; and 5) the expanded use of the former mill site as a permanent tailings disposal site.

Question 4: Are you aware of any complaints, incidents or activities at the Site such as vandalism, trespassing, or emergency response from local authorities? If so, please provide details.

An unauthorized release of impacted water was discharged from off-site Well 490 around September 2020, as Homestake's zeolite treatment system was being reactivated. The zeolite system had been out of operation since November 2019. Since then, the system has undergone additional operational down time due to membranes clogged with algae. The RO system has been operating at 300 gpm, or close to 30% capacity for the past 2 years.

In 2018, Homestake was cited for several "apparent violations" of its NRC license relating to its use of water that did not meet the site's NRC approved groundwater protection standards (GWPS). Homestake sprayed water that exceeded those standards on irrigated plots as part of a land application project. Homestake also failed to comply with its license reporting requirements for monthly sample collection at the RO plant and injected RO treated water that exceeded the site GWPS on numerous occasions. Homestake admitted that it failed to promote a culture of safety at the project site and needed to implement procedures to ensure public safety and compliance with its NRC license conditions. Homestake needs to implement staff training programs that prioritize compliance and safety over production goals and cost reduction.

2018 Homestake Self-Assessment Report

Homestake failed to keep adequate records to demonstrate license compliance and discouraged the reporting of safety lapses and procedural violations. Inadequate oversight and staff accountability resulted in a failure to identify corrective actions and the need for additional resources to elevate safety over competing expediency and cost reduction goals. For example, in 2014 Homestake proposed to inject "high-concentration" injectate above NRC GWPS in Table 3 of discharge permit DP-200.

More recently, Homestake piped "compliant" water to 2 landowners for off-site irrigation that did not meet state water quality standards.

Emergency responders must be warned of the dangers before responding to any unplanned releases from the site in the future. Only trained hazmat responders should be allowed to enter the site. What precautionary measures will be taken to assure the safety of first responders in the event of climate-induced releases of hazardous materials? Who will pay for such contingencies after the site is decommissioned?

Who will maintain institutional controls at the site for as long as the site remains hazardous?

Question 5: Do you feel well informed about the Site's activities and progress?

I am somewhat informed because I participate in monthly community calls with the NRC and community updates with EPA Region 6, but I don't have the time or ability to read Homestake's massive annual reports. It's too bad that EPA or NRC doesn't attempt to break down the substance of Homestake's annual reports for the public, especially for local residents and downstream community members like myself.

EPA produced some updates for the community in 2014 and 2015 to document the timeline for its RI/FS functional equivalency process, and the issuance of a ROD for OU1.

However, EPA's 1989 issuance of an ROD for OU3 required further evaluation by EPA to assure that current air and soil quality data supports the protectiveness of the OU3 remedy, following EPA's 2014 Human Health Risk Assessment.

EPA's determination of protectiveness has not been reported to the communities, depriving community members of the information they need to assure their own health and safety.

Question 6: Do you have any comments, questions, or recommendations regarding the Site's management or operation?

.

EPA's inordinate delay in conducting the CERCLA mandated RI/FS (remedial investigation and feasibility study) for the Homestake Superfund site means that current remedial activities were undertaken prior to characterization of the tailings piles and surrounding hydrologic conditions, foreclosing an informed evaluation of remedies based on the best available science.

Characterization of background water and air quality generally takes place during a Remedial Investigation. EPA's delay in completing a hydrological characterization of all impacted aquifers, including a nearby SAG aquifer subcrop directly connected to the alluvial aquifer beneath the Homestake site, has increased the risk that contamination of the SAG aquifer has gone undetected for some time. In this case, a provisional ROD for radon emissions was issued in 1989 and Ground Water Protection Standards were approved by all site regulators in 2006.

Another reason that functional equivalency for a Remedial Investigation cannot be attained by Homestake is that EPA has not yet adopted guiding ARARs for the Homestake Superfund site under CERCLA.

ARARs (applicable or relevant and appropriate requirements) are required to attain a proper measure of cleanup and to control further releases during remediation. Public involvement in the development of ARARs is necessary to assure that cleanup standards and the remedy(ies) selected are protective of our health and our environment. EPA must also complete its reassessment of background groundwater quality and investigate the source of elevated uranium in Homestake SAG aquifer supply wells in order for the remedy to be protective in the long term.

EPA Fourth Five-Year Review for HMC Superfund Site (2016)

Following the adoption of ARARs and reassessment of background groundwater, EPA must fully evaluate all remedial options, including removal of the source material, to achieve long-term protectiveness of human health and the environment.

Further investigation to determine how Homestake's use of faulty SAG aquifer wells like Deep Well #2, Well 951 and Well 943 have impacted contaminant transport in the SAG aquifer is needed. Surface water impacts to San Mateo Creek and the Rio San Jose should also be investigated, and Homestake's modeling of groundwater flow and contaminant transport should be verified against historical data.

Homestake should attempt to verify its seepage rate model as well. Until the models are verified, we cannot have confidence in their predictions of future flow and transport conditions, or predicted seepage rates from the large tailings pile.

MASE Comments on the Grants Reclamation Project, Updated 2012 HMC CAP by George Rice, October 30, 2012

It's a shame that EPA, NRC, and state regulators (OSE, NMED) haven't looked into these issues, but have tended to defer to HMC's assumed knowledge of what they were doing, allowing damages to the regional hydrology to be compounded.

Additional comments:

An unstated assumption that leaving toxic mountains of untreated mill waste to leach into regional groundwater supplies can be protective of our health or environment is not warranted and is contrary to CERCLA law. Conversion of the former mill site into a permanent disposal site for untreated mill tailings must be evaluated as an inadequate remedy.

The permanent disposal of Homestake's unlined uranium mill tailings next to the headwaters of San Mateo Creek, a critical watershed and groundwater basin, where other plumes are converging cannot achieve long-term protectiveness of regional groundwater supplies. In addition, the large tailings pile (LTP) is situated on the ancestral San Mateo Creek, which acts as a preferential flow path for contaminated seepage from the unlined tailings to be transported downstream into the shallow aquifers feeding the SAG aquifer and larger Rio San Jose Basin.

The failure of the United States to plan for and develop permanent waste disposal sites to contain and isolate uranium mine and mill waste is truly abysmal and could lead to climate-induced disasters from

severe weather events, such as the damage to the Homestake's tailings piles caused by storms in July 2010. More recent events like the winter storms that wreaked havoc in Texas earlier this year and the heat waves that led to wildfires in California, with subsequent flooding and mudslides in burned out forested areas have created disaster after disaster.

While it may be tempting for the regulators to pretend that capping the unlined tailings piles is a remedy that can achieve long-term protectiveness for our communities, it will result in a severe breach of EPA's duty to protect our health and our ecosystems. Long-term protectiveness at the Homestake site will not be achieved until the massive tailings waste piles are completely contained and isolated from our regional groundwater sources and off-site plumes are captured and treated.

Homestake-Barrick Gold should be required to seek another license for the permanent disposal of radioactive materials onsite, and the enlargement of its licensed boundary to include all the property it has annexed. What is Homestake's plan for all the homes and facilities they have acquired? How will they be managed and how will Institutional Controls be maintained? For as long as the waste emits radiation and seeps into underlying aquifers, our communities remain at risk of continued exposure. Even now, the liner on Evaporation Pond 1 has been stretched beyond its useful life because synthetic liners have an average life span of 25 years.

My recommendation is for Homestake to dewater the tailings piles, so that the tailings can be moved away from the ancestral San Mateo Creek bed onto double-lined ponds with leak-detection systems that are then encapsulated to prevent the infiltration of water into the tailings and radon releases from the tailings. This option would still require Homestake to capture contaminants in off-site plumes using treated water and its massive injection/extraction well network, followed by treatment in RO and zeolite systems that have been optimized to operate at full capacity . The mill facility and equipment that were buried in the tailings should be transported to a licensed disposal site.

Message

From: Purcell, Mark [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=FE198E260B024EB4BD9D30DC11F900B1-PURCELL, MARK]
Sent: 6/4/2021 8:39:58 PM
To: Linton, Ron [Ron.Linton@nrc.gov]; Tsosie, Bernadette [Bernadette.Tsosie@lm.doe.gov]
Subject: Stakeholder Presentation Slides for NRRB March 25, 2021, Meeting - Homestake NPL Site
Attachments: 2021-03-25_Acoma Slides_NRRB_Homestake_TIWaiver.pdf; Revised Presentation-21.03.25 MASE-BVDA Laura_NRRB FINAL.pdf; NRRB.Presentation.Maest_25Mar2021_Final.pdf

Ron, Bernadette,

The stakeholder presentation slides are attached.

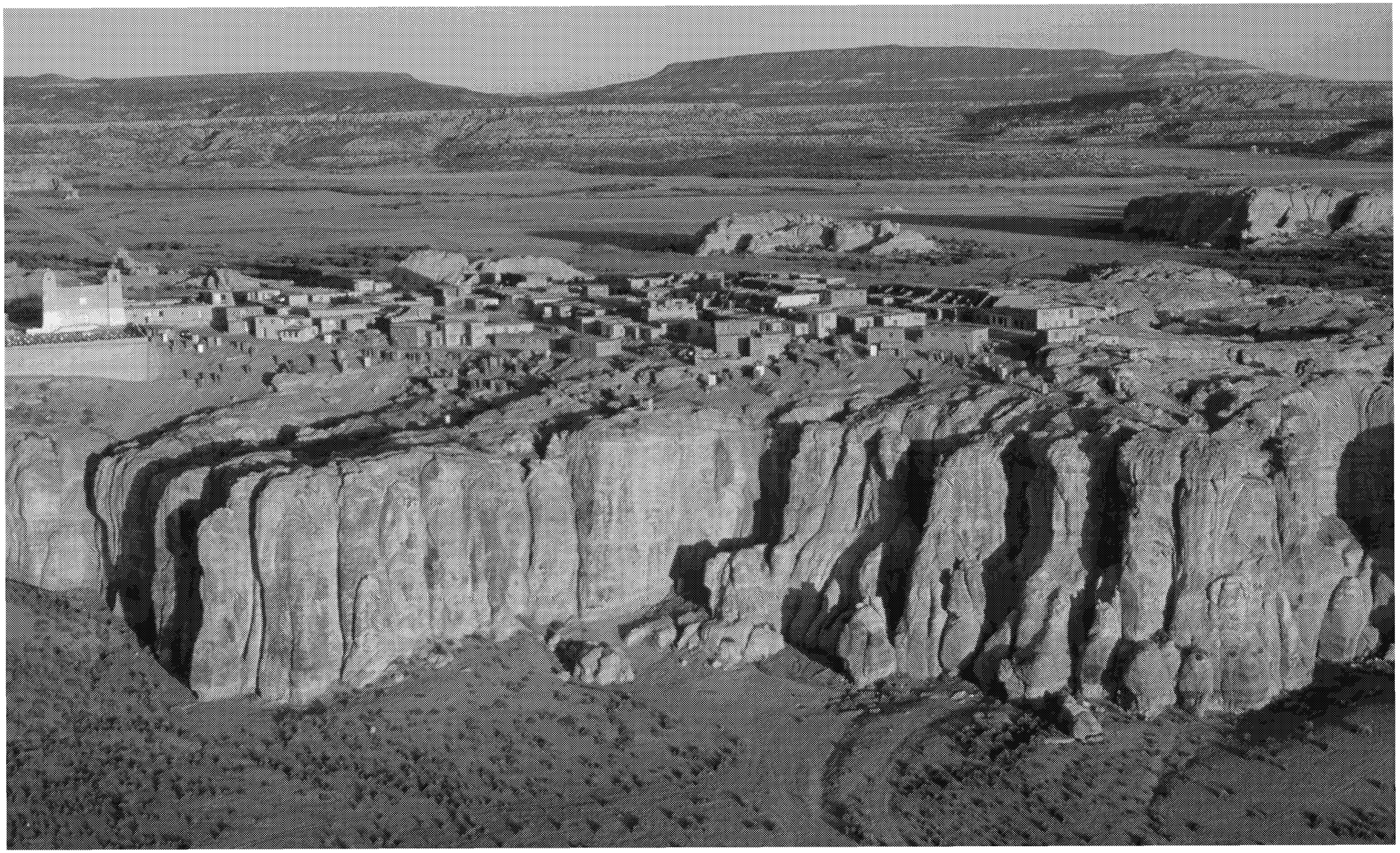
Mark

Mark Purcell
Superfund and Emergency Management Division (6SED)
U.S. Environmental Protection Agency – Region 6
1201 Elm Street, Suite 500
Dallas, TX 75270
Office Tel: 214-665-6707
Work Cell: 469-553-7211
Fax: 214-665-6660

Pueblo of Acoma Presentation

National Remedy Review Board meeting on the
Homestake Mining Company Superfund Site
– Technical Impracticability Waiver Request

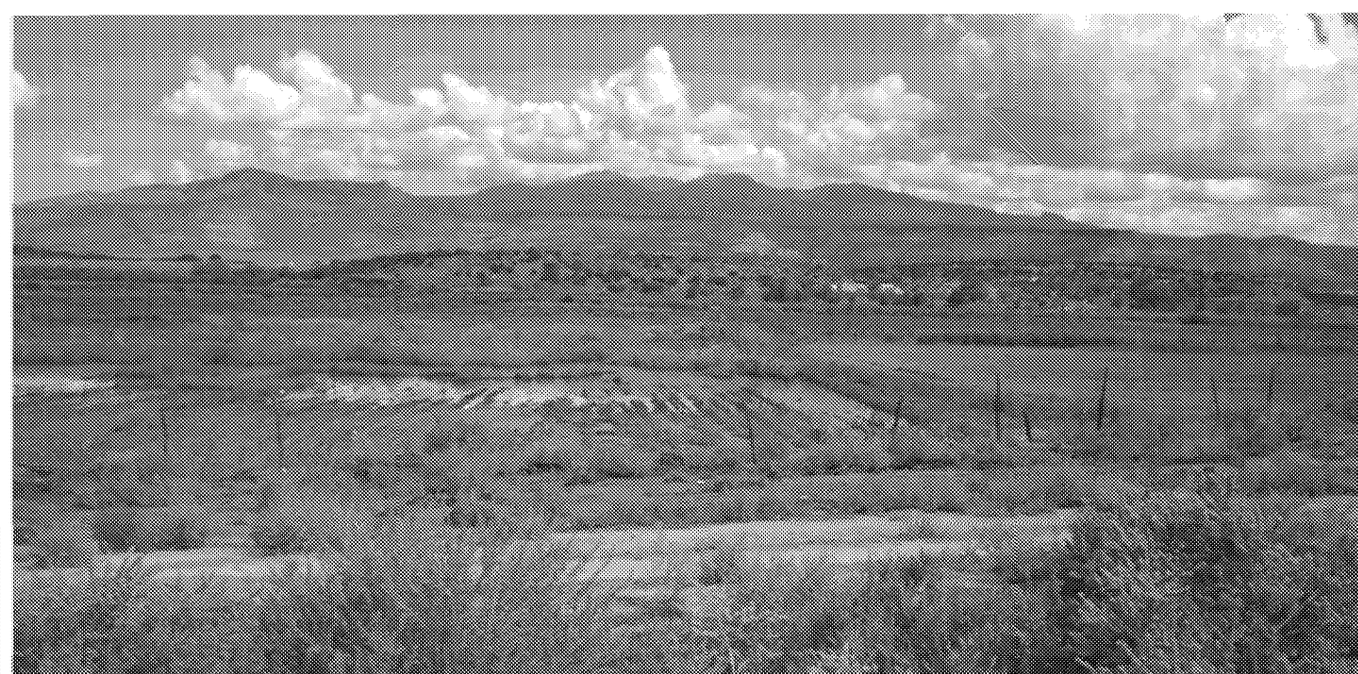
March 25, 2021



Acoma Pueblo

ED_006200_00000158-00002

WATER - A NATURAL AND CULTURAL RESOURCE



View of Mt. Taylor as seen from Acomita, Pueblo of Acoma, showing outcrops of volcanic rocks and Mesa Verde Sandstones (background) and Dakota Sandstone (foreground) with flooded cornfield in the Rio San Jose Valley.

ED_006200_00000158-00003

Rio San Jose Adjudication Boundary

NAVAJO RESERVATION

THOREAU

SANDOVAL

LAGUNA PUEBLO

Bernalillo

RAMAH

ACOMA PUEBLO

LAGUNA PUEBLO

Grants

SAN RAFAEL

SAN FIDEL

CUBERO

CAÑONCITO RESERVATION

Albuquerque

BERNALILLO

LAGUNA PUEBLO

CEBOLLA

ACOMA PUEBLO

NAVAJO RESERVATION

Los Lunas

LAGUNA PUEBLO

VALENCIA

TORRANCE

CATRON

QUEMADO

LEGEND

Indian Pueblos, Reservations and Trustlands

- Acoma Pueblo & Trustlands
- Cañoncito Reservation
- Laguna Pueblo & Trustlands
- Navajo Reservation & Trustlands

Other Features

- County Seat
- County Boundary
- Adjudication Boundary
- BIA Hydrographic Survey

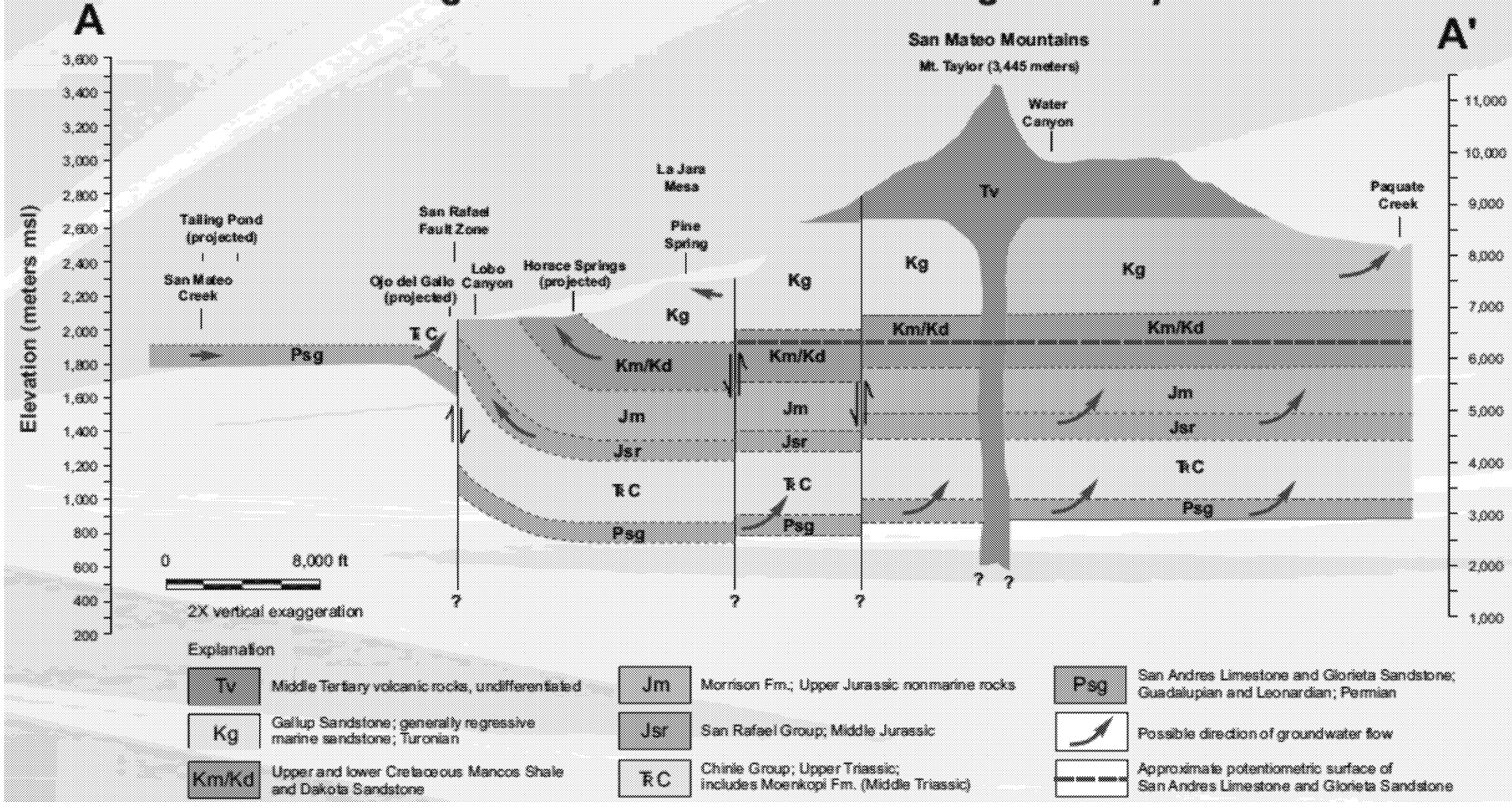
Roads

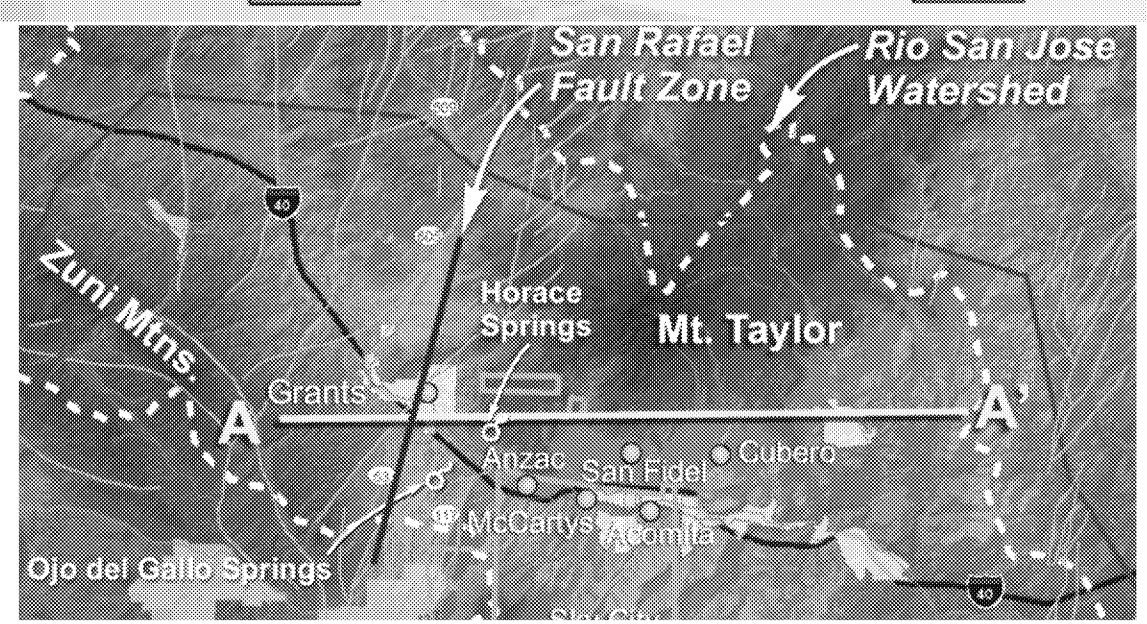
- Interstate Road
- State Road

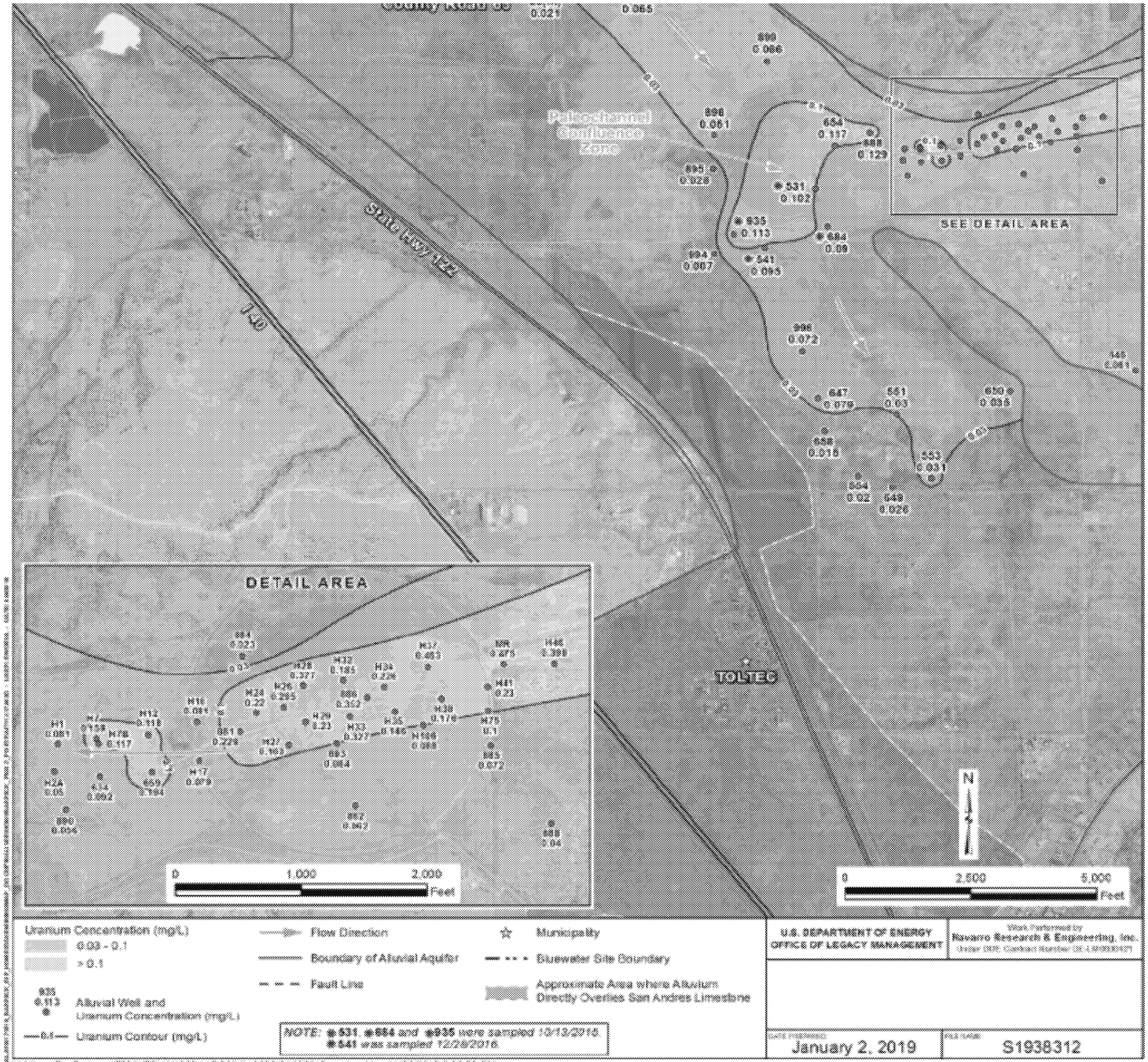
Hydrography

- Main Flow
- Water Body

Geologic Cross Section A-A' Through Mt. Taylor







HOMESTAKE

RECENT URANIUM CONCENTRATIONS
IN THE RIO SAN JOSE ALLUVIAL AQUIFER

FIGURE 3-7

Questions?

ED_006200_00000158-00008

Message

From: Daniel Lattin [dlattin@barrick.com]
Sent: 2/16/2021 5:26:28 PM
To: Purcell, Mark [purcell.mark@epa.gov]
CC: Patrick Malone [pmalone@barrick.com]; Michael McCarthy [mmccarthy@barrick.com]; Adam Arguello [aarguello@barrick.com]; Brad Bingham [bbingham@barrick.com]; Kevin Murray (krmurray@hollandhart.com) [krmurray@hollandhart.com]
Subject: GRP FS - EPA Docket No. 06-03-20 January 2021 Monthly Report
Attachments: 20210216 GRP FS - EPA Docket No. 06-03-20 January Monthly Report.pdf

Good Morning Mark,

Please find attached monthly report as required by the Homestake Mining Company Administrative Settlement Agreement and Order on Consent Section IX, Paragraph 48, and Appendix A Statement of Work Section IV.A.4 Paragraph 16. Kindly acknowledge receipt to confirm successful email submission.

Thank you,

BARRICK

www.barrick.com

Daniel Lattin, P.E.
Sr. Closure Program Manager
Barrick Gold of North America, Inc.

Tel: (775) 748-1022
Mobile: (775) 397-7215

Homestake Mining Company of California
P.O. Box 98
Grants, NM 87020

Tel +1 505 287 4456
Fax +1 505 287 9289

By Email

February 16, 2021

Mr. Mark Purcell
Superfund Division (6SF)
U.S. Environmental Protection Agency - Region 6
1445 Ross Avenue, Suite 1200
Dallas, TX 75202
Email: (purcell.mark@epa.gov)

Re: U.S. EPA Region 6
CERCLA Docket No. 06-03-20
Homestake Mining Company Superfund Site
Administrative Settlement Agreement and Order on Consent for Feasibility Study

Mark:

As required by the Administrative Settlement Agreement and Order on Consent (AOC) Section IX, Paragraph 48, and Appendix A "Statement of Work" (SOW) Section IV.A.4 Paragraph 16, Homestake hereby submits the January 2021 monthly report.

Please don't hesitate to contact by phone (775) 397-7215 or by email dlattin@barrick.com if you have any questions.

Sincerely,

Daniel Lattin, P.E.
Sr. Closure Program Manager
Homestake Mining Company of California

Cc:

Michael McCarthy
Kevin Murray
Patrick Malone
Adam Arguello
Brad Bingham
file

Homestake Mining Company Superfund Site
Feasibility Study

U.S. EPA Region 6
CERCLA Docket No. 06-03-20

ELECTRONIC SUBMITTAL

Report Number:	6
Reporting Period:	January 1, 2021 to January 31, 2021
Date:	February 16, 2021
Project:	Homestake Mining Company Superfund Site – Feasibility Study
EPA Contact:	Mark Purcell, RPM, USEPA Region 6

A. Introduction

This monthly report is being submitted to the US Environmental Protection Agency (EPA) by Homestake Mining Company of California (HMC) to meet the monthly reporting requirements pursuant to Section IX, Paragraph 48 of the "Administrative Settlement Agreement and Order on Consent for Feasibility Study" (AOC) for the Homestake Mining Company Superfund Site (Site) and Section IV.A.4 Paragraph 16 of Appendix A "Statement of Work" (SOW).

B. Actions undertaken pursuant to the AOC/SOW during the reporting period

January 25 – HMC provided a presentation of the Draft TI Waiver Evaluation report to EPA, NRC, NMED and DOE.

January - HMC completed the two surface geophysical surveys and the drilling of OB1, OB2, OB3, SAG1, and SAG2, the downhole geophysics and the hydraulic conductivity profiling of SAG1 and SAG2 as part of the SAG Characterization work.

C. Developments

None.

D. Results of analytical data received during the reporting period.

None.

E. Problems Encountered and Resolutions

Problems Encountered - SAG2 was drilled (cored) to 500 feet below ground surface (bgs) as described in the EPA approved work plan. The borehole core log shows that the bedrock is also very highly fractured (roughly one fracture every one half-foot) and there are a few depths where the bedrock fracturing is even more pronounced with many fractures over a half-foot interval. A few days after finishing SAG2, the team mobilized the borehole geophysical logging contractor (JetWest) to log SAG2. An obstruction was encountered in SAG2 at roughly 440 feet bgs as JetWest lowered the probe into the borehole. JetWest lowered a weighted cable into the hole to clear the obstruction but

was unsuccessful. JetWest logged the hole to 440 ft bgs. A few days later, FLUTe was mobilized to the site to complete the hydraulic conductivity profile in SAG2. FLUTe encountered an obstruction at 377 feet bgs. The FLUTe liner remains in the borehole to 377 feet bgs to stabilize the borehole wall with hydrostatic pressure. SAG1 was drilled to 500 feet below ground surface (bgs) as described in the EPA approved work plan. The borehole core log shows that the bedrock is also very highly fractured (roughly one fracture every one half-foot) and there are a few depths where the bedrock fracturing is even more pronounced with many fractures over a half-foot interval. JetWest began logging SAG1 on January 13th and encountered an obstruction at 204 ft bgs.

Resolution - HMC has quickly planned and began executing a path forward to resolve the Problems Encountered as described above. HMC contacted Cascade Drilling to re-mobilize the drilling rig to the Site. They arrived onsite on January 19th and removed the obstruction in SAG2. The hydraulic conductivity profile test on SAG2 was performed on January 20th and again encountered an obstruction at 377 feet. After discussion with the field geologist, the FLUTe team, and drillers, the decision was made to not attempt further cleanout of the well and complete the FLUTe liner above the collapse. The drillers started the cleaned out SAG1 on January 20th but could not resolve the hole collapse issues at 204 feet. A 5.75" steel sleeve was inserted to a depth of 260 feet to keep the borehole from collapsing. The hydraulic profile test and borehole geophysics were completed from the bottom of the sleeve to 500 feet.

F. Developments Anticipated and Schedule of Actions for the Next Reporting Period

HMC anticipates completing installation of the FLUTe sampling liners and the first round of groundwater sampling to be associated with SAG Characterization Work Plan to be completed in the next reporting period. HMC will continue submitting monthly reports by the 15th day of the following month.

Message

From: Balent, Jean [Balent.Jean@epa.gov]
Sent: 5/3/2021 4:03:53 PM
To: Purcell, Mark [purcell.mark@epa.gov]
Subject: You submitted an optimization engagement form for Homestake Mining Company NPL Site/OU1-Groundwater/5.5 miles north of Milan along NM State Hwy 605, Cibola County, New Mexico in R6

Importance: Low

Hello,
Thank you for submitting an optimization engagement form. This copy is being sent for your records. The new optimization engagement form submission is included below, but can also be found at https://usepa.sharepoint.com/sites/OLEM_Community/superfund_optimization_and_optimization_related_technical_support/_layouts/15/listform.aspx?PageType=4&ListId=95649a0b%2Dc4d4%2D4545%2Dae42%2D09cea701b2e0&ID=910&ContentTypeID=0x0100FEDE34A57C92224A8EA189D19E37DEAF

Section 1 – General Site Information
Site: Homestake Mining Company NPL Site/OU1-Groundwater/5.5 miles north of Milan along NM State Hwy 605, Cibola County, New Mexico
Site Specific Charge Code: 0618BD0006LTDD2
EPA Region: R6
Site Type (e.g., sediment, mining, dry cleaning):Former uranium milling facility
Remedy Type(s) (e.g., P&T, bioremediation): Groundwater Injection and Extraction with Reverse Osmosis and Zeolite Filtration Treatment and Forced Spray Evaporation
Completed by (enter a valid email address): purcell.mark@epa.gov
CERCLA Cleanup Stage (RI, FS, RD, RA, etc.): FS
Other Relevant Cleanup Programs (RCRA, UST, etc.):UMTRCA Title 2/NRC Source Materials License groundwater corrective action. State groundwater discharge permitting program.
Site Lead: PRP
Special Account (check if yes): False
Date of Most Recent Five-Year Review: 2016-09-13
Does this site have a Federal Facilities flag in SEMS?: No

Section 2 – Superfund Cleanup Progress
Groundwater Environmental Indicator Status: GMUC – Contaminated Groundwater Migration Under Control
Human Exposer Environmental Indicator Status: HEUC - Human Exposer Under Control
Site Lacking Progress or Having performance Issues: True
Site Has Projected Cleanup Date Within 5-15 Years: False
Site is on EPA Administrators Priorities List: False
Large, Complex Site: False
Site Has Stakeholder Conflicts or Concerns: False
Site is on Reuse/Redevelopment List: False

Section 3 – Optimization Request
Date of Optimization Request: 2021-05-03T16:03:18Z
Reason for Request:

To perform technical support to the Region by reviewing and commenting on PRP draft Technical Impracticabililty Evaluation Report (dated Nov 2020) and draft Feasibility Study Report (dated Dec 2020). Request detailed review of Modflow- USG and PHREEQC modeling in the TI Evaluation Report.

Accelerated Review Schedule Requested: True
Rational for Accelerated Review:

To avoid further delay to ongoing FS schedule as the draft reports were submitted late in 2020 and the Region did not consider seeking such support until Dan Powell (OMDP) suggested it in early April 2021. Also, the Region is not requesting a report, but for technical review and evaluation of the PRP modeling effort for TI and an evaluation of the merits of Back Diffusion characteristics for EPA to consider TI Waiver in future decision-making.

Desired Approximate Completion Date: 2021-07-15
Is 3-D Visualization and Analysis of Interest at this Site? False
Other Significant Factors (e.g., enforcement orders, current/pending litigation, funding limitations, etc.):

Possible funding limitations for FY2021 as this work was not considered when the Region planned its FY2021 budget for HQ approval

Section 4 – Optimization Review– Site Stakeholders
RPM: Mark Purcell, Region 6 - SEMD, purcell.mark@epa.gov, 214-507-8897
Regional Optimization Liaison: Vince Malott, Region 6 - SEMD, malott.vincent@epa.gov,
ARD Regional Coordinator: , , ,
Regional Technical Support: , , ,
ORD Superfund Technical Liaison: Terry Burton, Region 6 - SEMD, burton.terry@epa.gov, ,
State Regulator: Ashlynne Winton, NMED, ashlynne.winton@state.nm.us,
Other Federal Agency: U.S. Nuclear Regulatory Commission, , ron.linton@nrc.gov, ,
PRP: Homestake Mining Co, , dlattin@barrick.com,
Regional Branch Chief: John Meyer, Region 6 - SEMD, meyer.john@epa.gov, 214-665-6742
Regional Section Chief: Blake Atkins, Region 6 - SEMD, atkins.blake@epa.gov, 214-665-2297,
Other: , , ,

Section 5 – Optimization Project Information
Brief General Site/Problem Description and Scope as it Pertains to the Optimization Effort:

PRP has proposed TI as an appropriate mechanism for EPA to consider a ARAR Waiver for groundwater in decision-making because of Back Diffusion. Currently, the NRC-approved cleanup levels for groundwater for uranium, selenium, and other parameters are based on background and are approximately 5 times higher than federal MCLs. EPA and NMED are reassessing background and will likely select MCLs or slightly higher concentrations for cleanup levels in future ROD. PRP is performing an FS, including the TI Evaluation, and based on modeling, estimates that it would take 200-360 years to cleanup groundwater. Groundwater remediation has been ongoing for 44 years under NRC Source Material License. A key component of the PRP's modeling is the retardation factor for dissolved uranium in an oxic aqueous environment. Region 6 requests site technical support to review and evaluate the merits of the PRP's technical work.

Types of Evaluations or Areas of Focus (e.g., CSM review, exit strategy, capture zone analysis):

Evaluation of the Modflow-USG and PHREEQC modeling in the draft TI Evaluation Report and supporting assumptions/data is needed. An evaluation of the groundwater remedial alternatives in the draft FS is needed as well. These alternatives are based partly on the modeling performed for the TI Evaluation Report. Specifically,

determine if the PRP's assumptions on retardation of uranium and selenium are valid and the PRPs predicted amount of time for achieving cleanup levels. Assess if the PRP's empirical data support the modeling and if additional empirical data are needed to assess the merits of back diffusion. This work will support the Regions decision on whether to approve the TI Evaluation Report, request modification to the Report, or reject the Report in its entirety, as well as whether a TI Waiver can be supported in a future ROD.

List of Documents to Be Reviewed:

Draft TI Waiver Evaluation Report (11/2020)

Draft FS Report (12/2020)

NMED Geochemical Modeling Report for Background Reassessment (5/2021)

2020 Annual Report

2016 Five-Year Review/2021 Draft Five Year Review

Message

From: Daniel Lattin [dlattin@barrick.com]
Sent: 7/30/2021 11:26:59 PM
To: Purcell, Mark [purcell.mark@epa.gov]
Subject: GRP HMC NRRB Recommendations Review
Attachments: 20210730 GRP HMC NRRB Recommendations Review.pdf

Good Afternoon Mark,

Homestake has completed our review of NRRB recommendations and believe you may find some of our thoughts helpful in support of the EPA effort. Notably we evaluated the many references to guidance and or topics related to previous or ongoing work done by HMC, NRC, NMED and EPA or a combination thereof, and the original record assembled to support the CERCLA equivalency process. For ease of access Homestake would be happy to provide any of the extensive references cited upon request.

I hope this is helpful to you and your team. Please don't hesitate to reach out of you have any questions.

Thank you,

BARRICK

www.barrick.com

Daniel Lattin, P.E.
Sr. Closure Program Manager
Barrick Gold of North America, Inc.

Tel: (775) 748-1022
Mobile: (775) 397-7215

National Remedy Review Board Recommendations

Homestake Mining Company points for consideration in response to Board recommendations

July 30, 2021

Homestake Mining Company of California ("HMC") provides the following information to support Region 6's response to the National Remedy Review Board ("NRRB" or the "Board") recommendations for the Homestake Mining Company Superfund Site (also known as Grants Reclamation Project and generally referred to as the "site").

Recommendation 1.a:

Current Tailings and Treatment Operations - The Board recommends that the Region assess the challenges that prevented the treatment systems from operating at full capacity. Based on the information provided to the Board, the current water treatment systems, operating at full capacity, may be inadequate to treat the current seepage from the piles at the site. It was unclear to the Board if this is due to the current limited treatment capacity or if it was due to a high seepage rate. Understanding and resolving the challenges associated with limited system operations may improve treatment capacity, thereby reducing seepage. Additionally, improvements to the treatment systems may improve the recovery of uranium, in effect resulting in secondary recovery of the uranium (i.e., resource recovery/reprocessing).

Response:

The current and future rates of seepage from the tailings pile is significantly less than that of the treatment systems influent rate. Based upon the draindown model presented in the groundwater modeling report in support of HMC's Technical Impracticability Evaluation Report (TIER), submitted November 16, 2020, the estimated seepage from the LTP has been less than 100 gpm average since 2016. Anticipated seepage is expected to asymptotically approach the long-term infiltration rate of 0.6 gpm. In comparison, the RO system has treated an average of 471 gpm since 2016. In terms of uranium mass balance, the large tailings pile has seeped approximately 11,000 pounds of uranium since 2016, while the RO plant has removed 72,000 pounds over the same period.

In addition to these comparisons, Figure 1-30 of the TIER shows that in spite of the approximately 15,000 pounds a year of mass removal and diminishing mass loading from the LTP as the pile drains down, the dissolved mass remaining the aquifer has remained relatively unchanged over the last decade indicating that the groundwater remediation is yielding limited benefit in reducing overall concentrations in the aquifer.

All of this information indicates that system treatment rate is not the overall controlling factor in groundwater remediation. The groundwater modeling done in support of the TIER, assumed combined treatment rates between the RO and zeolite plants of 1200 gpm, a value higher than has been averaged onsite. In spite of this increased rate, the modeling indicated that over the next 50 years, the footprint of the plume would be relatively unchanged and the need for institutional controls would remain the same.

Based on the findings in HMC's TIER, increased system capacity will not make groundwater remediation practicable at the site. The TIER supports the conclusion that even if system operated at maximum theoretical capacity, groundwater cleanup would remain technically impracticable. Even if HMC presumes that the mobile domain can be cleaned to current groundwater cleanup standards, the result would be temporary and contamination to groundwater would continue after the groundwater treatment systems were shut off. HMC cannot remediate the primary sources (LTP and STP) or the secondary source (vadose and silt/clay in the alluvial aquifer beneath the LTP). See response to Recommendation 2.a.

Recommendation 1.b:

Current Tailings and Treatment Operations - Should the tailings piles remain in place, the site will likely have to comply with UMTRCA cover standards that address radon emissions. Based on the information provided to the Board, it was unclear if the tailings piles are fenced off from the public. If there is not a complete fence line enclosing the Source Materials License boundary, the Board recommends the implementation of engineering and institutional controls (i.e. fencing and signage) to minimize access to the uncovered portion of the LTP until a final remedy is constructed. This should prevent the public from accessing the large pile until a final remedy is constructed.

Response:

Reg Guide 8.30 Section 6 provides guidance for controlling access to the controlled area, including signage and notice requirements as noted below:

From RG 8.30 Health Physics Surveys in Uranium Mills:

Section 6. POSTING OF CAUTION SIGNS, LABELS, AND NOTICES TO EMPLOYEES

The radiation protection staff should periodically survey to ensure that signs, labels, required notices to employees, copies of licenses, and other items are properly posted as required by 10 CFR §19.11 and §20.203.

The mill and tailings area should be fenced to restrict access, and the fence should be posted with "Caution, Radioactive Material" signs as required in §20.203(e)(2). If the fence and all entrances are posted and in addition contain the words "Any area within this mill may contain radioactive material," the entire area is posted adequately to meet the requirement in §20.203(e)(2). Additional posting of each room with "Radioactive Material" signs is not necessary.

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"Radiation Areas" and "Airborne Radioactivity Areas" must be posted in accordance with §§20.203(b) and (d). The licensee should avoid posting radiation area signs and airborne radioactivity area signs in areas that do not require them. The purpose of the signs is to warn workers where additional precautions to avoid radiation exposure are appropriate. Posting all areas in the mill with such signs defeats this purpose.

Some of this language is not applicable since the mill is no longer present. The site or "controlled area" does have existing engineering and institutional controls in the form of fencing with proper signage, "Caution, Radioactive Material", to control access to the site. In addition to the tailings piles, access is controlled to ponds and groundwater treatment systems, all of which represent the highest risk associated with radioactive materials. In addition, the perimeter of the site is regularly patrolled by site personnel and maintenance of the perimeter fence and/or replacement of signage is performed as necessary. Upon completion of an NRC onsite inspections, fencing and signage compliance is referenced in its inspection report.

Recommendation 2a:

Technical Impracticability Waiver - In assessing the appropriateness of a TI waiver, the conclusion that it is not possible from an engineering perspective to restore groundwater to its beneficial use is based upon the factors identified in Section 1.1 of the 1993 Guidance for Evaluating the Technical Impracticability of Ground-Water Restoration (TI Guidance). Additionally, as stated on page 2 of the TI Guidance, "Failure to achieve desired cleanup standards resulting from inadequate system design or operation is not considered by EPA to be a sufficient justification for a determination of technical impracticability of groundwater cleanup." Recommendation 1a supports the assessment of current system design and operation. Should the Region pursue a TI waiver component, the Board recommends that the Regional Site Team work closely with their Regional TI representative, and the Headquarters TI point of contact, currently Dave Bartenfelder, in developing the TI evaluation package.

Response:

The system's treatment capacity is not the limiting factor on site ground-water restoration, and increased system capacity will not overcome impracticability. As discussed in the TIER, the limiting capacity is not the ability for the ex-situ systems, (RO & zeolite plants) but the inability to reduce concentrations below ground-water protective standards through the pumping of impacted groundwater and the injection of treated water (at any rate) or any other evaluated technology. As supported by the groundwater model used in support of the TIER, the treatment rates used in the updated modeling efforts are approximately 50% higher than the peak annual average actually achieved onsite since the expansion of the treatment systems. Alternative 5 from the draft FS shows that even with the overly-optimistic assumption that 50 years of pumping removes all contamination in the mobile domain (coarse grained material)—a timeframe unsupported by the 1st order decay analysis or the groundwater model—the back-diffusion from the immobile domain (fine-grained material) and the continued seepage from the LTP would generate a new plume following cessation of remediation. As a result, ARARs would still be unattainable, a TI waiver would be needed, and groundwater access would need to be limited to

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ensure protectiveness resulting in the same remedy implementation regardless of remediation system capacity. The various alternatives analyzed in HMC's draft FS show that while concentrations within the footprint of the plume may vary, the footprint of the plume above current background levels and/or a protective standard remains largely unchanged even if system capacity is increased. In addition to the modeling, a 1st order decay analysis was presented on the uranium and molybdenum concentrations of the RO influent water from the last 20 years of operation. The analysis showed that 201 years for uranium and 360 years for molybdenum would be needed to reduce concentrations to the current groundwater protective standards.

Increased system capacity may even have negative consequences to water resources in the area. Historic groundwater remediation at the site has evaporated approximately three billion gallons of water, the equivalent of three years of combined consumption from the nearby municipalities of Grants and Milan. Each additional year of remediation at the site commits approximately 105 million gallons to evaporative loss in an arid desert region where total precipitation is typically less than 12 inches a year. While the groundwater within the TI zone may not be usable at its present concentrations, downstream beyond the TI zone will be a useable resource. Continued pumping and evaporation would remove billions of gallons, including useable groundwater, from the region's water supply entirely.

Recommendation 2.b:

Technical Impracticability Waiver - Should a TI waiver be supported and a component of the preferred alternative, the Board recommends the TI zone be appropriately sized based on the site characterization and analysis. Per Section 4.4.2 of the TI Guidance, the potential TI zone should be "limited to as small an area as possible, given the circumstances of the site." Generally, the TI zone is based on current site conditions rather than projected modeling results. The TI zone can be modified (expanded/contracted) if conditions change in the future and can be justified (e.g., discovery of new sources), per Section 6.2 of the 1993 TI Guidance.

Response:

HMC acknowledges the Board's reference to the TI Guidance and reiterates the flexibility of the standard to be applied "*given the circumstances of the site.*" Section 4.4.2 does state that "[d]elineation of the TI zone based on the location of a particular mapped contaminant concentration contour . . . generally should be avoided," but "[t]his is because the location of such mapped contours often is highly interpretive, and their position may change with time." Guidance continues that "[w]hile concentration data may be appropriate to consider when determining the size of a containment area of the extent of a TI zone, the limits of that TI zone should be fixed in space, both horizontally and vertically."

HMC provides the following explanation to further clarify how it established its proposed TI zone. As permitted by guidance, HMC does consider concentration data to determine the limits of its TI zone, and HMC has proposed a TI zone that is fixed in space both horizontally and vertically. The proposed boundaries are delineated by observed contaminant concentration and hydrogeologic data as well as the modeling presented in the TIER. The extensive investigation and monitoring associated with the site have defined the water-yielding formations and the

hydrologic connections, or lack thereof, between those formations. The aquitards, geologic layers that inhibit the flow of groundwater between water yielding formations, are the primary control upon vertical water flow. All of this data is used to define the limits of the TI zone, including by using this data as inputs to the groundwater flow and transport model. The TI zone is delineated by structural geology, such as the aquitards, current observed concentrations, observed flow paths, and conservative future predications on where the contaminants may end up over the next 200 years.

Most importantly, HMC delineated the TI zone to meet the most important objective of CERCLA and TI waiver guidance – protectiveness of human health and the environment – and this boundary can be reduced if found to retain protectiveness. The TI Zone ensures protectiveness because the plume exceeding groundwater protection standards will never cross the boundary. Further, given HMC's strategic land purchase program, HMC owns 74% of the property within the proposed TI Zone as of today and continues to acquire additional properties. As such, the TI Zone will impact as few people as possible.

HMC acknowledges that all modeling contains inherent uncertainties; however, after 40+ years of investigation and remediation, this site is well studied and understood. To further explain HMC's TI Zone, HMC refers the Board to Figure ES-1 from its TI Waiver Evaluation. Specifically, HMC refers the Board to the Green-Blue Boundary,[1] which represents the TI Zone. This boundary was developed to encompass additional uncertainty beyond the sensitivity analyses in modeling multiple centuries into the future. This boundary is designed to account for the uncertainty TI Waiver guidance seeks to avoid and ensure protection of human health and the environment.

Ultimately, the TI Zone must be sized to be protective and practicable. Because HMC cannot remediate the primary sources (tailings piles) or the secondary sources (vadose and silt/clay in the alluvial aquifer beneath the large tailings pile), HMC believes restoration is technically impracticable. As such, HMC has delineated a TI Zone that it can defensibly and reliably protect human health and the environment based on the extensive characterization of this site. If EPA agrees with HMC's assessment that remediation of groundwater is technically impracticable, HMC welcomes discussion with EPA in order to finalize the TI zone boundary.

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[1] Of note, this figure includes two additional boundaries drawn in blue and red for comparison:

- Blue Boundary: Simulated extent of the plume above 0.16 mg/L. This boundary is the prediction of what HMC believes to happen in the future based upon calibrating the model to historic observed flow and transport behavior.
- Red Boundary: Simulated extent of the plume encompassing all sensitivity runs. These sensitivity runs are adjustments to specific model inputs to encompass worst case scenarios for contaminant transport.

These boundaries are included for comparative value to visually represent the protectiveness of the delineated TI zone.

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Recommendation 2.c:

Technical Impracticability Waiver - The information provided to the Board highlighted the complexity of the hydrogeologic setting. The Board recommends additional geochemical and hydrogeologic modeling (e.g., EPA-Office of Research and Development (ORD) or United States Geological Survey (USGS)) to better understand the subsurface conceptual site model behavior. The Board further recommends the Region assess, and if appropriate, augment the current modeling with those models conducted by the NMED. A more refined conceptual site model of the geochemical and hydrogeologic conditions should better support the remedy development and selection process.

Response:

Extensive geochemical and groundwater modeling work has been developed for the site. Worthington Miller Environmental (WME) conducted two geochemical characterization studies on the site in 2018 and 2019, leading to a robust understanding of the geochemical environment of both the tailings piles and the alluvial ground-water systems. A geochemical site conceptual model was developed by WME based upon this data as well as historical data collected over the previous 4 decades of investigation and remediation. The work done by Dr. Longmire with NMED is based, in part, upon the geochemical characterization done by WME.

The groundwater model developed in support of the TIER and the Feasibility Study was developed using data collected from the last 40 years of characterization and remediation on the site. The flow and contaminant transport was calibrated to a historic period of 15 years of extremely transient conditions and achieved industry standard calibration statistics. In addition, this model has built up on the iterative modeling efforts that started over 4 decades ago. This has led to an enhanced understanding of both the hydrogeologic behavior and contaminant transport of the site as well as provided refinement of the input parameters for the model.

Recommendation 3:

Background Groundwater and Soil - The Board recommends the Region refine the background investigation for uranium, radium and thorium with additional monitoring wells to identify background in this complex geologic setting and influenced by up-gradient mine discharges (~125B gallons). The geochemical report developed by New Mexico is a good resource, and additional sampling and analysis might augment the report analysis to benefit the site understanding. To support this effort, the Region should consider the option to identify an unimpacted area in the surrounding environment to identify a naturally occurring soil background concentrations of uranium, radium, and thorium. The Board also recommends reaching out to Matt Jefferson (OSRTI/Technology Innovation and Field Services Division), Dave Kappelman (OSRTI/Environmental Response Team), and Felicia Barnet (ORD; Site Characterization & Monitoring Technical Support Center Director).

Response:

HMC has previously expressed its position to the Board and Region 6 that the present background levels are defensible and representative of the heterogeneous nature of the region

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and further discussion relating to background would be unnecessary if EPA grants HMC's technical impracticability waiver for groundwater cleanup levels. Upon request, HMC can provide the Board or Region 6 additional information regarding its position.

Recommendation 4.a:

Principal Threat Waste - The Site Information Package states that no principal threat waste has been identified. However, there are significant amounts of mill tailings present at the site that may be highly toxic and mobile, as evidenced by the site data. The Board recommends the Region give further consideration as to whether the mill tailings present at the site constitute principal threat waste (PTW) as discussed in OSWER Directive No. 9380.3-06FS, November 1991, A Guide to Principal Threat and Low Level Threat Wastes Principal Threat Waste Guidance and OSWER Directive 9355.0-69, August 1997, Rules of Thumb for Superfund Remedy Selection at page 11).

Response:

Based on HMC's understanding of the guidance and the nature of the tailings piles, the tailings piles are not PTW. Determinations can be based on inherent toxicity or the physical state of the materials. Considering the factors provided in EPA guidance, the tailings piles are not PTW because they can be reliably contained, are not liquid, and are not highly mobile (e.g., not solvents).

HMC would like to highlight the purpose of the classification of PTW. Guidance explains, "[t]he principal threat/low level threat waste concept and the NCP expectations were established to help streamline and focus remedy selection process, not as a mandatory waste classification requirement." *A Guide to Principal Threat and Low Level Threat Wastes*, 9380.3-06FS (Nov. 1991) at p. 2. The GRP is a unique site subject to tri-regulatory oversight (NRC, EPA, and NMED) that has already undergone more than forty years of investigation and remediation. To retroactively require HMC to return to a waste classification stage at this advanced point in the regulatory and remedy selection process will not result in a streamlined approach and is unnecessary after the extensive investigation and work already complete at the site.

Ultimately, and most importantly, HMC believes this classification has no bearing on the outcome of the site, as HMC's evaluation of the remedial alternatives for the tailings piles is consistent with CERCLA, the NCP, and guidance, including all PTW guidance. *See* response to Comment 4(b).

Recommendation 4.b:

Principal Threat Waste - If the Region determines that portions of the mill tailings are PTW, as the Region further develops or considers the range of alternatives for the Site, it should consider the Principal Threat Waste Guidance, the statutory preference for treatment or resource recovery to the maximum extent practicable in CERCLA section 121(b), and the NCP's expectations for treatment of principal threats posed by the site, wherever practicable.

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Response:

As a general policy, "EPA expects to use treatment to address the principal threats posed by a site, wherever practicable" (40 CFR 300.430(a)(1)(iii)(A)).

HMC recommends that the NRRB review its Screening of Remedial Alternatives Memorandum ("Screening Memo"), submitted to EPA August 27, 2020. Consistent with CERCLA authority favoring the consideration treatment options, in its Screening Memo, HMC considers multiple remedial alternatives that involve treatment of the mill tailings, summarized in the below table:

Treatment Alternatives OU2				
General Response Action	**Remedial Technology**	**Process Option**	**Description**	**Applicability**
In-situ treatments	Physical	Cement Solidification / Stabilization	Addition of cement or a cement-based mixture that limits the solubility or mobility of the waste constituents. In-situ techniques use auger/caisson systems and injector head systems to apply agents to in-situ soils	Potentially Applicable
	Chemical	Chemical Solidification / Stabilization	Similar to cement except chemical agents such as thermoplastic polymers, thermosetting polymers or other proprietary additives into contaminated materials	Potentially Applicable
	Biological	Phytoextraction	Uptake of contaminants by plant roots and the translocation / accumulation of contaminants into plant shoots and leaves. Plants are subsequently harvested from the	Not Applicable – the thickness of the tailings pile and the side slopes make this impracticable

			growing area, dried, and disposed	
	Thermal	Vitrification	Heating contaminated media to extremely high temperatures, then cooling them to form a solid mass.	Not Applicable – the thickness of the tailings pile and the side slopes makes this impracticable
Ex-Situ Treatment	Physical	Cement Solidification / Stabilization	Addition of cement or a cement-based mixture that limits the solubility or mobility of the waste constituents	Not Applicable – ex-situ solutions are not practical alternative due to the vast quantity of tailings (estimated to be mover 22 million tons)
		Vitrification	Involves heating contaminated media to extremely high temperatures, then cooling them to form a solid mass.	Not Applicable – ex-situ solutions are not practical alternative due to the vast quantity of tailings (estimated to be mover 22 million tons)
		Separation	Radionuclides are associated with particular fractions of the media, which can be separated based on particle size. Wet and dry methods have been used.	Not Applicable – ex-situ solutions are not practical alternative due to the vast quantity of tailings (estimated to be mover 22 million tons)
	Chemical	Chemical Solidification / Stabilization	Similar to cement solidification / stabilization processes except chemical agents rather than cement are mixed with contaminated materials	Not Applicable – ex-situ solutions are not practical alternative due to the vast quantity of tailings (estimated to be mover 22 million tons)

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		Chemical Extraction / Flotation	Use chemicals to separate radionuclides from soils, sludges, and sediments to reduce the volume of contaminated tailings	Not Applicable – ex-situ solutions are not practical alternative due to the vast quantity of tailings (estimated to be mover 22 million tons)

Not only has each of the above described treatment methods been evaluated, HMC considered various options for removal and disposal, summarized in the below table:

Removal and Disposal Alternatives OU2				
General Response Action	**Remedial Technology**	**Process Option**	**Description**	**Applicability**
Removal and Disposal		Reclamation and Soil Remediation	Reclamation and closure of site facilities, excavation and on-site disposal of contaminated Soils	Potentially Applicable
Removal and Disposal			Building a cell for permanent disposal of the tailings and other radioactive waste. The cell would be lined and capped. This option could include use of a commercial facility; however, due to the volume of material, commercial disposal is unlikely	Potentially Applicable

According to guidance, the sole fact that a given remedial alternative treats PTW does not result in selection of that alternative during remedy selection. Guidance explains "[w]hile [the] expectations [to use treatment where practicable] may guide the development of appropriate alternatives, the fact that a remedy is consistent with the expectations does not constitute sufficient grounds for the selection of that remedial alternative. The selection of an appropriate waste management strategy is determined *solely through the remedy selection process outlined in the NCP* (i.e., all remedy selection decisions are site-specific and must be based on a

comparative analysis of the alternatives using the nine criteria in accordance with the NCP)." *A Guide to Principal Threat and Low Level Threat Wastes*, 9380.3-06FS (Nov. 1991) at p. 3. (emphasis added). EPA describes the application of the expectation to treat PTW as "general guidelines [that] do not dictate the selection of a particular remedial alternative. *Id.* Thus, EPA policy does not require selection of a remedy that involves treatment of PTW. Instead, treatment alternatives should be evaluated, and the remedy should be selected using the threshold, balancing, and modifying criteria used for all CERCLA remedy selection. As documented in HMC's Screening Memo and Feasibility Study, HMC properly evaluates the alternatives consistent with the nine criteria required by the NCP.

Further, guidance and the NCP clearly contemplate a limitation on the use of treatment. Specifically, guidance identifies the following situations where "it may be appropriate to contain rather than treat principal threat wastes due to difficulties in treating the wastes" and "should result in a determination that treatment is not practicable under the nine remedy selection criteria;"

- Treatment technologies are not technically feasible or are not available within a reasonable time frame;
- The extraordinary volume of materials or complexity of the site may make implementation of the treatment technologies impracticable;
- Implementation of a treatment-based remedy would result in greater overall risk to human health and the environment due to risks posed to workers, the surrounding community, or impacted ecosystems during implementation (to the degree that these risks cannot be otherwise addressed through implementation measures); and
- Implementation of the treatment technology would have severe effects.

Id.

HMC's Screening Memo retains in-situ cement and chemical solidification and stabilization for further evaluation; however, consistent with the first and second factors that could render treatment not practicable, no ex-situ treatment technology could feasibly treat the tailings given the thickness, side slopes, and quantity (approx.. 22 million tons) of the tailings. Any disposal not in place (either on-site or off-site) will cause unnecessary and excessive risk to workers, and off-site disposal specifically presents extensive risk to the surrounding community and ecosystem. HMC discussed the risk of relocation of the large tailings pile in its Written Statement to the Board, and upon request, would of course provide the studies and evaluations conducted that lead to the conclusion that relocation was an impractical, unsafe remedial alternative.

In sum, regardless of whether the tailings piles are PTW or not, HMC has evaluated the appropriate remedial alternatives involving treatment and determined that pursuing treatment is not practicable. Due to the extraordinary volume of the material and potential risk, limitations in technology, and risk to workers, community, and environment, the tailings piles must be contained as opposed to treated or alternatively disposed. For further information, HMC suggests

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that the Board consider its Screening Memorandum and Feasibility Study (submitted to EPA December 15, 2020).

Recommendation 5.a:

Risk Analysis - Consideration of Land Use Restrictions in Risk Analysis - Based on the information provided to the Board, there may be portions of the Site that lie outside of the tailings piles boundaries for which Institutional Controls (ICs) have already been established to restrict land use. Consideration should be given as to whether the ICs should be established as a part of the CERCLA remedial action in those areas. The Board recommends the Region update the risk assessment to assess if unacceptable risks under one or more unrestricted exposure scenarios exist, or if uncertainties in predicting reasonably anticipated future land use exist. This information may inform the need for including ICs as part of the CERCLA remedial action despite the current land restrictions. OSWER Directive 9355.0-30 which is titled, "Role of the Baseline Risk Assessment in Superfund Remedy Selection Decisions" may serve as a resource for this assessment. For example, the second paragraph on page 3 states, "This cumulative site baseline risk...should not assume that institutional controls or fences will account for risk reduction." Further discussion is provided in the sections titled "Risks Considered in Risk Management Decision" and "Risks Warranting Remedial Action" on pages 4-6. In order to demonstrate that an IC is necessary to ensure protectiveness of human health and the environment as part of a CERCLA remedial action, (i.e., selected as part of the remedy in the Record of Decision (ROD)), risks should be estimated and documented for exposure scenarios without consideration of current or proposed land use restrictions.

Response:

Risk assessment has been revised to remove institutional controls on assessment of the Land Treatment Areas.[2] Few radionuclides or inorganic contaminants exceed current site background. Of the four that exceed background, only three also have unacceptably high residential risks based on the Peak Risk estimate in the 2021 Rad Calculator. The U-total noncancer hazard quotient is less than 1. The cancer risk for the radionuclides above background exceeds $1x10^{-4}$, the upper bound of the acceptable cancer risk range, indicating soils present an unacceptable cancer risk.

The risk due to background was evaluated and the site risks corrected to reflect the contribution from the site minus the contribution from background. This identifies how much the site is contributing above background levels. Th-232, U-234, and U-238 contributed excess risk from the LTAs soil. Cumulative cancer risk is **1E-03** for residents, above the upper bound of the acceptable cancer risk range of 1E-06 to 1E-04.

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[2] Land Treatment Areas are the only offsite areas HMC evaluated for risk. Remaining offsite areas are evaluated as part of EPA's residential risk assessment.

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Recommendation 5.b:

Risk Analysis - LTP and STP - A conclusion presented in the Revised Risk Assessment Presentation noted that although there are excess cancer risks from soil and air for a composite worker, the risks are associated with soil and air concentrations that are below soil and air ARARS. As discussed in OSWER Directive 9200.4-23 which is titled "Clarification of the Role of Applicable, or Relevant and Appropriate Requirements in Establishing Preliminary Remediation Goals under CERCLA," "EPA's policy of generally establishing PRGs[Preliminary Remediation Goals] based on ARARs in the absence of multiple pathways or contaminants, is based on the assumption that individual ARARs will be protective. For example, the NCP expressly authorizes consideration of the cumulative risk range in setting PRGs where attainment of ARARs would result in a cumulative risk in excess of 10-4 due to multiple contaminants or pathways. (40 C.F.R. 300.430(e)(2)(I)(D)." This may be relevant to the radon exfiltration noted in recommendation 1b. Additionally, because the future composite worker evaluated in the risk assessment is exposed via the inhalation, submersion, ingestion, dermal contact, and gamma radiation pathways to multiple contaminants and is estimated to receive a total cancer risk outside the CERCLA risk range, an evaluation to determine whether ARARs are sufficiently protective should be completed. If not, PRGs should be established in accordance with CERCLA and EPA guidance including OSWER Directive 9200.4-23, which includes consultation with Headquarters contacts, currently Robin Anderson for OSRTI and Charles Openchowski for the Office of General Counsel.

Response:

The risks associated with the composite worker are predicated upon an unrealistic expectation of future risk for a composite worker. Following reclamation of the site as specified in the DRP, all evaporation ponds, salts, and impacted soils will be contained within the tailings impoundments which will have barrier to mitigate radon emissions and rock armor for erosional protection. As such, the submersion, ingestion, and dermal contact exposure pathways will no longer be complete pathways. Prior to the full reclamation of the site, any contractor or consultant that would be doing work on the site would receive a similar level of training as the current employees of the site and would require the following, as needed, to mitigate the risks associated potential exposure to hazardous materials: monitoring, use of personal protective equipment, and engineering controls. Following turnover of the site to DOE, no individual would be working onsite year-round and would only be onsite for periodic inspections of the facilities and groundwater sampling and monitoring. Any work done onsite would require similar controls to ensure worker safety from hazardous constituents.

Recommendation 6.a:

Remedial Action Objectives - These required controls pertain to more than just the emanation of radon. For example, 10 CFR Part 40 Appendix A, 6(1) states, "In disposing of waste byproduct material, licensees shall place an earthen cover (or approved alternative) over tailings or wastes at the end of milling operations and shall close the waste disposal area in accordance with a design which provides reasonable assurance of control of radiological hazards to

(i) be effective for 1,000 years, to the extent reasonably achievable, and, in any case, for at least 200 years..." (underlined for emphasis). Although NRC is the lead for closure of the tailings piles, a CERCLA remedial action (among other things) must ensure protectiveness of human health and the environment, consistent with the NCP and existing EPA CERCLA guidance; at this site, that includes a cover to prevent exposure to COCs and to protect groundwater. Given that the radiological hazards from the tailings are expected to include exposure to external gamma radiation, ingestion, and inhalation of the various radiological contaminants of concern, the Board recommends the Region include an analysis of the risk related to the tailings piles material and, as appropriate, develop additional RAOs to achieve protectiveness of human health and the environment as required by CERCLA. Examples of RAOs that may be appropriate for the OU2 tailings piles include:

i. Prevent direct contact to contaminated media (including waste material, stormwater, sediments, leachate and groundwater) located on or emanating from the tailings piles.

ii. Limit inhalation and external radiation exposure from contaminated media

(including waste material, fill, leachate, and emissions) located on or emanating from the tailings piles to within the acceptable risk range (10-4 to 10-6 cancer risk or a HI of less than 1 for non-carcinogenic risk).

iii. Prevent migration of contaminants to groundwater above levels protective for the beneficial use of groundwater and reasonably anticipated use of surface water."

Response:

To address the Board's concern regarding a risk analysis of the tailings piles, HMC recommends that the Board review Section 5 of its Remedial Investigation. The risks of the tailings piles have been thoroughly evaluated, and RAOs have been developed to meet the risks identified and in accordance with EPA's *Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA*, OSWER Directive 9355.3-01 (Oct. 1988) ("RI/FS Guidance").

RI/FS Guidance explains that RAOs "consist of medium-specific or operable unit-specific goals for protecting human health and the environment. The objectives should be as specific as possible but not so specific that the range of alternatives [to meet the RAOs] that can be developed is unduly limited." Section 4.2.1. Specifically, RAOs should specify

- "The contaminant(s) of concern
- Exposure route(s) and receptor(s)
- An acceptable contaminant level or range of levels for each exposure route (i.e., a preliminary remediation goal)."

Id.

HMC, in cooperation with Region 6, developed operable-unit-specific RAOs (as provided for in guidance). Regarding OU2 specifically, HMC and Region 6 developed the following RAO: "Protect human receptors from inhalation of Rn-222 emissions from the Homestake Facility by

limiting average radon flux from the LTP and STP to 20/Ci/m^{2}s." This RAO meets the requirements of EPA guidance by identifying the COC (i.e., Rn-222), exposure route (i.e., inhalation through emissions), receptor (i.e., human), and the acceptable contaminant level (i.e., 20/Ci/m^{2}s).

Any concerns relating to groundwater are addressed in OU1, not OU2.

Recommendation 6.b:

Remedial Action Objectives - The Board also notes that guidance should be considered pertaining to the groundwater protection standards in 40 CFR Part 192. The Board recommends the Region refer to "Use of Uranium Drinking Water Standards Under 40 CFR Part 141 and 40 CFR Part 192 as Remediation Goals for Groundwater at CERCLA Sites"5 to support the approach for determining groundwater protection standards.

Response:

HMC acknowledges the guidance the Board cites and has considered both 40 CFR Parts 141 and 192 in developing the ARARs for the site. HMC has worked in collaboration with Region 6 to develop a draft ARARs table which has been incorporated into HMC's Screening Memo. For convenience of reference, HMC can provide this ARARs table upon request.

- 40 CFR Part 141: Part 141 is listed as "Potentially relevant and appropriate where ground or surface water is considered a potential or current source of drinking water unless waived as technically impracticable, an alternative abatement standard is adopted, or the standard is otherwise determined to not be relevant and appropriate."
- 40 CFR Part 192: Part 192 requirements are identified in the draft ARARs table to address both "residual radioactive material" and "uranium byproduct material." In addition, NRC's regulations in 10 CFR pt. 40, Appendix A (included in HMC's ARARs table as "Applicable for any area impacted by 11e.(2) byproduct material") require cleanup consistent with Part 192. Appendix A addresses the Part 192 standards specifically in setting remediation standards: "Criterion 5A-D and new Criterion 13 incorporate the basic ground-water protection standards imposed by the Environmental Protection Agency in 40 CFR part 192, subparts D and E (48 FR 45926; October 7, 1983) which apply during operations and prior to the end of closure. Ground-water monitoring to comply with these standards is required by Criterion 7A." 10 CFR pt. 40, Appendix A, Criterion 5. *See also* US NRC, "Standard Review Plan for the Review of a Reclamation Plan for Mill Tailings Sites under Title II of the Uranium Mill Tailings Radiation Control Act of 1978, Final Report" Revision 1 (2003) ("NUREG 1620"). Even NRC's application of alternative cleanup standards calls for those standards to provide protection equivalent to the requirements in Part 192, subparts D and E: "The Commission may find that the proposed alternatives meet the Commission's requirements if the alternatives will achieve a level of stabilization and containment of the site concerned, and a level of protection for public health, safety and the environment from radiological and nonradiological hazards associated with the sites, which is equivalent to, to the extent

practicable, or more stringent than the level which would be achieved by the requirements of this appendix ***and the standards promulgated by the Environmental Protection Agency in 40 CFR part 192, subparts D and E***." 10 CFR pt. 40, Appendix A, Introduction.

As such, HMC has considered both Parts 141 and 192.

Of note, HMC believes these groundwater ARARs must be waived as technically impracticable. *See* HMC's TIER (Nov. 16, 2020).

Recommendation 7:

Coordination with NRC and DOE - Coordination that affects remedy selection including ARARs/PRGs/RAOs

i. Inter-Agency Coordination

1. The Board recommends that, as part of the feasibility study, the Region clearly enumerate the underlying basis (e.g., UMTCRA ARARs related to closure; Safe Drinking Water Act Maximum Contamination Levels for ground water remediation) for cleanup criteria for each impacted environmental medium. The Board notes that CERCLA's requirement to ensure protectiveness of human health and the environment will need to be met for NPL deletion purposes.

2. The Board further recommends that the Region clarify with the NRC the criteria for identifying areas for potential transfer into the DOE Legacy Management Program. Clarity from NRC/DOE on what are their criteria for accepting these areas may help inform the selection of appropriate treatment technologies when selecting a CERCLA remedy.

3. It is EPA's concern that DOE may not accept an NPL site into its Legacy Management Program due to the expenses associated with the potential need for additional work. Since the HMC Site is on the NPL, EPA may be requested to delete the site prior to site transfer. If this is the case, EPA will need to conduct a formal notice and comment rulemaking in order to delete this site. As part of that formal rulemaking process, EPA will need to include data and information in the rulemaking docket to support the deletion process. In particular, the NCP provides that deleting a site from he NPL can occur when there is no further federal or PRP-lead response needed at that site (e.g., because CERCLA protectiveness of human health and the environment has been achieved). While EPA can acknowledge and take into account the work being done pursuant to the NRC license process, various aspects of that process (e.g., prior calculation of background concentrations in ground water, development of alternative concentration limits) do not appear to be consistent with the CERCLA program guidance. That potential gap may be significant at a point when the Agency undertakes an NPL deletion rulemaking process in the future, especially with regard to the no further federal or PRP-lead response needed requirement. It also may be significant if NRC concludes its license process and DOE refuses to accept the site into its Legacy Management Program due to the potential need for additional response actions (e.g., for groundwater) to ensure protectiveness of human health and the environment. Therefore, the Board recommends that the site's administrative

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record file, including the RI/FS and other documentation used to support the remedy development and selection process, fully address how the approach to various aspects of the cleanup at this site are being undertaken consistent with CERCLA, the NCP and existing EPA CERCLA guidance. For example, the administrative record file should explain how the approach for calculating the soil and ground water background concentrations, the use of MCLs and UMTRCA groundwater standards for uranium in developing PRGs, RAOs, and cleanup levels, the point of compliance for attaining ground water ARARs, and consideration of a technical impracticability waiver, is consistent with the NCP preamble and various guidance documents, such as the Role of Background guidance, the RI/FS guidance, Use of Soil Cleanup Criteria in 40 CFR Part 192 as Remediation Goals for CERCLA Sites guidance, Remediation Goals for Radioactively Contaminated CERCLA Sites Using the Benchmark Dose Cleanup Criteria in 10 CFR Part 40 Appendix A, I, Criterion 6(6), the 2009 Summary of Key Existing Ground Water guidance, Use of Uranium Drinking Water Standards under 40 CFR 141 and 40 CFR 192 as Remediation Goals for Groundwater at CERCLA sites guidance, and the TI waiver guidance.

ii. EPA Coordination

1. The Board recommends the Region coordinate within Region 6 and with Regions 8 and 9, as well as with OMDP and OSRTI, where appropriate. Additionally, there is a multi-agency team that is actively working to establish operations and maintenance (O&M) expectations and the team may be positioned to provide valuable feedback.

Response 7.i:

HMC addresses each Comment 7(i) subpart in turn:

1. HMC acknowledges CERCLA's requirement to ensure protectiveness of human health and the environment for NPL deletion purposes. HMC's proposed remedy will protect human health and the environment. Specifically, to achieve protectiveness, HMC has or will implement the following measures:

- Land Purchase - HMC currently owns approx. 74% (4,200 acres of the total 5,700 acres) of the land within the LTC/TI Zone Boundary and will continue its property acquisition.
- Alternative Groundwater Supply – HMC has connected all residents in subdivisions to municipal water system
- Groundwater Use Restrictions
    - Office of the State Engineer Order restricting well drilling
    - Water well abandonment
    - Point of use treatment (if necessary)
    - Restrictive covenants

2. HMC and NRC have presented information to the Region on their efforts to delineate the scope of the long-term site boundary, including groundwater monitoring and modeling efforts

and results relevant to determining the extent of the contaminant plume. HMC anticipates ongoing coordination and communications to ensure that the Region is kept apprised of these analyses.

By way of background on NRC's process, NRC will determine the areal extent of the site based on potential exposure to groundwater contamination from the site. *See, e.g.*, NUREG 1620 §4.3.3.2 at 4-32. *See also* DOE, "Process for Transition of UMTRCA Title II Disposal Sites to DOE for Long-Term Surveillance and Management," (April 2016) (DOE, "Process of Transition") §6.3 at 23 ("NRC and the site licensee establish the site boundary on the basis of final site conditions and the projected extent of contaminated groundwater as determined through modeling.") In setting the long-term site boundary, NRC must ensure that contamination will not "result in an unacceptable hazard to human health and the environment," at the "Point of Exposure," (POE) (effectively, any point beyond the site boundary). The long-term site may encompass full fee title real property, less than full-fee title property (surface or mineral rights), or properties subject to institutional controls. *See, e.g.*, DOE, "Process for Transition of UMTRCA Title II Disposal Sites to DOE for Long-Term Surveillance and Management," (April 2016) (DOE, "Process of Transition") § 3.2.1 at 4 ("Once the extent of groundwater contamination has been determined and accepted by the regulator, site boundaries can be established for long-term custody and care. Boundaries may include both ownership and IC boundaries." (emphasis added).

When NRC determines that the licensee has satisfied all site-related reclamation, decommissioning, and groundwater-related requirements pursuant to Atomic Energy Act 83C, and approves a long-term surveillance plan for the site, NRC will terminate the specific license. *See, e.g.*, U.S. NRC, "Status of Decommissioning, 2004 Report, Final Report") (NUREG-1814) §10.2 at 36 ("In accordance with Section 83c of the Atomic Energy Act of 1954, as amended (AEA), NRC determines whether the licensee has met all applicable standards and requirements or whether a licensee-proposed alternative meets the standards. This determination will involve NRC review of licensee submittals relative to the completion of decommissioning, reclamation, and, if necessary, groundwater cleanup. In addition, the staff will review the site Long Term Surveillance Plan (LTSP) submitted by the custodial agency (DOE in this case), for both NRC and Agreement State sites. On NRC acceptance of the LTSP, NRC terminates the specific license and places the long-term care and surveillance of the site by the custodial agency under the general license provided at 10 CFR 40.28.") At that time, the site will be transferred to the custodianship of the DOE and will become subject to a general license under 10 CFR § 40.28. *See, e.g.* Atomic Energy Act § 83c ("If transfer to the United States of title to such byproduct material and such land is required under this section, the Secretary of Energy or any Federal agency designated by the President ***shall, following the Commission's determination of compliance under subsection c., assume title and custody of such byproduct material and land*** transferred as provided in this subsection.") *See also* "Guidance to the U.S. Nuclear Regulatory Commission Staff on the License Termination Process for Licensees of Conventional Uranium Mills," (Appendix E to NUREG 1620), at E3.6 (emphasis added); 10 C.F.R. § 40.42(k); 10 CFR pt. 40, App. A., Criterion 11.

Any CERCLA claims, processes, or issues outstanding at that time are distinct from that process and will not control, or be controlled by, NRC or DOE's actions. As DOE explains:

> Under CERCLA, EPA may have requirements that are in addition to those in the specific or general licenses under 10 CFR 40. ***However, once the licensee has met all NRC or agreement state requirements, NRC or the agreement state will have no basis for denying a request to terminate any specific license (NUREG-1620, Appendix E), and transition will occur***. At the time of transition, NRC and EPA will determine the regulatory roles of each agency.
>
> In accordance with the Protocol, because the disposal site is licensed by NRC under the general license, NRC has primary regulatory authority for the radioactive materials and the associated remedies at the site. As the long-term custodian, DOE is responsible only for the materials, terms, and conditions that are required under UMTRCA and for meeting the requirements included in the general license and that are provided in the NRC-approved LTSP. For dual regulated sites, ***any unresolved CERCLA issues that fall outside the scope of DOE's general license will be resolved between the EPA and potentially responsible parties. These concerns are beyond the limits of DOE's custodial authority and NRC's regulatory authority for the site***.

DOE, "Process for Transition of UMTRCA Title II Disposal Sites to DOE for Long-Term Surveillance and Management," (April 2016) at 3.2.1 (pp.7-8) (emphasis added).

3. Please see response to sub-comment (i)(2) immediately above. HMC recognizes that the regulatory history of this site is extensive, and for convenience, HMC provides a summary of the circumstances under which HMC, Region 6, and NRC decided to proceed with a "CERCLA Equivalency" process to align the two regulatory schemes, which may be helpful to address the Board's concern regarding potential data gaps that could interfere with CERCLA compliance and an NPL de-listing.

On August 7, 2012, EPA sent a letter to NRC indicating that a Record of Decision would be necessary for OU1 (groundwater) and OU2 (tailings piles) to document findings required for deletion from the NPL. During a meeting between EPA, NRC, and HMC in August 2013, EPA and NRC reached an apparent impasse. The parties struggled to find a path forward whereby HMC could meet both agency's regulatory objectives. The agencies considered proceeding with consecutive, as opposed to concurrent, paths forward, which would have resulted in likely decades-long delays to reach regulatory closure. As such, HMC suggested implementing a "CERCLA-equivalency" approach.

Under an equivalency approach, HMC can use its work conducted for NRC to meet its obligations to EPA under CERCLA. A private-party cleanup action "will be considered 'consistent with the NCP' if the action, when evaluated as a whole, is in *substantial compliance* with" NCP requirements "and results in a CERCLA-quality cleanup." 40 C.F.R. § 300.700(c)(3)(i) (emphasis added). Strict adherence to the NCP is not necessary, and NCP compliance is evaluated on a case-by-case basis, evaluating "the cleanup effort as a whole." *See*

Bedford Affiliates v. Sills, 156 F.3d 416, 428 (2d Cir. 1998), *abrogated on other grounds*, *W.R. Grace & Co.-Conn. v. Zotos Intern, Inc.*, 559 F.3d 85, 90 (2d Cir. 2009). In applying EPA's "substantial compliance" standard, courts have generally emphasized substance over form. An "'immaterial or insubstantial' deviation from the [NCP] will [not] cause the cleanup to be deemed inconsistent." *Bedford Affiliates*, 156 F.3d at 427 (citing 40 C.F.R. § 300.700(c)(4)). Substantial compliance does not require adherence to all of the NCP's technical requirements, so long as any omission or inconsistency does not affect the quality of the cleanup. *See Franklin Cty. Convention Facilities Auth. v. Am. Premier Underwriters, Inc.*, 240 F.3d 534, 546 (6th Cir. 2001) (holding that a cleanup action was consistent with the NCP despite multiple "shortcomings [that] were immaterial and insubstantial deviations from the technical NCP requirements"). The "NCP requirements are not intended to be a checklist of required actions for private remediations." *Id. See also City of Wichita, Kansas v. APCO Oil Corp.*, 306 F. Supp. 2d 1040, 1077 (D. Kan. 2003) (noting that "strict, to-the-letter compliance" with the NCP "is not necessary"); *American Color & Chem. Corp. v. Tenneco Polymers, Inc.*, 918 F. Supp. 945, 956 (D.S.C. 1995) (stating that the "NCP is not intended to provide complex and detailed site-specific decision-making criteria," but, rather, the regulations "suggest the creation of certain documents" that fulfill the NCP's goals). Cleanup actions "reflecting in substance NCP procedures and criteria" qualify as consistent with the NCP. *See Public Service Co.*, 175 F.3d at 1182.

"A 'CERCLA-quality cleanup' results if the response action protects human health and the environment through the utilization of permanent solutions and alternative treatment or resource recovery technologies to the maximum extent possible." *Young v. U.S.*, 394 F.3d 858, 864 (10th Cir. 2005) (citing *Franklin Cty.*, 240 F.3d at 543); *see also* National Oil and Hazardous Substances Pollution Contingency Plan, 55 Fed. Reg. 8666-01, 8793 (March 9, 1990).

To demonstrate equivalency, HMC's counsel (Holland & Hart) and consultant (HDR) prepared a lengthy document titled "CERCLA Equivalency of Investigation and Remediation Efforts at the Homestake Mining Company of California Uranium Milling Facility—Grants, New Mexico" (the "Equivalency Package"). This document was submitted to EPA in November 2013. On November 25, 2013, HMC representatives presented the Equivalency Package to EPA. The Equivalency Package discussed in length how HMC's work under NRC oversight meets CERCLA objectives and could be used to build a defensible administrative record. Of note, HMC has not sought to replace otherwise-required CERCLA documentation. Instead, HMC's objective has been to provide CERCLA-consistent documentation for the administrative record, including conducting additional field work and investigations where gaps were identified, to demonstrate substantial compliance with the NCP:

- Remedial Investigation Report, including risk assessments
- Candidate Technologies Memorandum
- Administrative Settlement Agreement and Order on Consent for a Feasibility Study
- Screening of Remedial Alternatives Memorandum

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- Supplemental background investigations
- Feasibility Study
- Technical Impracticability Evaluation Report

HMC has consistently worked in cooperation with Region 6 to develop adequate documentation to support a remedy selection that results in a CERCLA-quality cleanup, and HMC intends to continue building an administrative record until NPL deletion. Specifically, the Board expressed concern with the NRC's development of alternative concentration limits as not "consistent with the CERCLA program guidance." HMC has submitted its TIER consistent with CERCLA and EPA guidance independent of its application to NRC for an alternate concentration limit and will modify its TIER to address any Region 6 comments received. While the technical challenges preventing groundwater restoration are the same supporting both the TIER and the application for alternate concentration limits, HMC intends to meet each programs requirements, eliminating the Board's concern.

Response 7.ii:

As explained in 7.i.2 above , DOE will prepare a Long Term Surveillance Plan (LTSP) for the site to ensure adequate O&M. As discussed in the response to 7.i.2, HMC will continue to work with EPA to develop adequate documentation to support its CERCLA administrative record, including documenting any O&M requirements.

Recommendation 8:

The HMC Site is unique in that the site is currently subject to interim reclamation/remedial components. As discussed earlier, while the flanks of the large tailing pile have a radon barrier, the top of the pile has only an interim cover that may not protect to UMTRCA standards. Without a permanent cover, there may be current human health exposures and rain may penetrate, resulting in ongoing source migration from the tailings pile (seepage) to groundwater. The groundwater at Homestake is currently subject to containment through pumping clean water from the San Andreas/Glorietta (SAG) aquifer and injecting it into the alluvial aquifer to create a groundwater mound. The Region provided a Remedial Alternative Technical Memorandum for the site as part of the site information package. The tailing remedial alternatives considered included on-site remediation and tailing closure; and removal and off-site disposal (outside of the San Mateo Creek Basin and Milan) of the tailings piles. The remedial alternatives considered for groundwater included long-term monitoring and ICs; groundwater containment and removal; groundwater containment, removal, and in-situ treatment; and groundwater restoration via containment and removal; and technical impracticability.

Response:

HMC installed a permanent cover on the side slopes of the LTP in the mid-1990's. On the LTP, extensive regrading was completed to fill in the tailings ponds and flatten the side slopes to

improve stability. Cover material was placed on the side slopes at a thickness varying from 2 to 3.8 feet, as needed to effectively buffer radon emissions. In addition, a minimum of 9 inches of rock armor cover was placed on the side slopes for erosion protection. On the top of the LTP, HMC placed 1 foot of cover material because the top surface was still being actively used for remediation activities, principally as the site of a large well field for collecting contaminated water. Since this initial placement, additional cover has been placed on the LTP to fill depressions caused by settlement, to improve drainage, and to address specific areas with elevated radon flux measurements.

As discussed in Response 1.a, the estimated seepage rate from the LTP is expected to asymptotically approach the long-term infiltration rate of 0.6 gpm across the entire footprint of the pile with the currently approved tailings pile cover design. HMC is currently in the process of revising the existing cover design to an evapotranspirative cover. The cover design of the tailings facilities also incorporates a 3-4.5 foot thick radon barrier underneath the ET cover, made up of primarily compacted clay material, to attenuate radon emissions, that will further reduce total infiltration into the pile. HMC anticipates the installation of a permanent cover on the top of the LTP in 2023 following EPA and NRC review and approval of design plans in 2022. The installation of a permanent cover on the top of the LTP will mitigate potential human health exposures and will mitigate the infiltration of rain that could result in ongoing source migration from the tailings pile (seepage) to groundwater.

Furthermore, the main component of the groundwater remedy is hydraulic containment through groundwater extraction from the alluvium and Chinle aquifer, not groundwater mounding through injecting water from the SAG. Groundwater mounding is only a minor component of the overall groundwater remedy. Groundwater is extracted from the alluvium, Upper Chinle, and Middle Chinle and conveyed to either the RO or Zeolite plants depending on whether the groundwater contains selenium and/or molybdenum above the groundwater standards. Groundwater that contains just uranium is conveyed to the zeolite plant and groundwater with uranium and selenium and/or molybdenum is conveyed to the RO plant for treatment.

The restoration program, as described above, is made up of injection and collection well systems. The restoration systems were operated at reduced rates during 2020 to reduce the volume of water requiring evaporation. A mixture of R.O. product water, zeolite treated and/or fresh water pumped from deep wells is injected in a series of wells or infiltration trenches arranged to form a continuous injection line across the site. The injection line creates a hydraulic barrier that results in containment of the contaminants within the collection area. The contaminated groundwater is pumped and collected from a series of wells within the collection area. The collected aquifer water from on-site is pumped to the RO plant.

In 2018, the RO plant treated and annual average flow rate of 443 gpm and removed 7235 pounds of uranium. RO influent was comprised of 279 gpm from the alluvium, 130 gpm from

the Upper Chinle, and 34 gpm from the Middle Chinle. In 2018, the Zeolite plant treated and annual average flow rate of 296 gpm and removed 260 pounds of uranium. Zeolite influent was comprised of 240 gpm from the alluvium, and 56 gpm from the Middle Chinle. Since remediation started in 1977, over 7.1 billion gallons of water and over 1.2 million pounds of uranium has been collected. The treated water from the RO and Zeolite plants (and approximately 300 gpm of clean water from the SAG aquifer) is conveyed to the post treatment tank before it is conveyed to the injection wells where it is injected into the alluvial, Upper Chinle, and Middle Chinle aquifers to maintain a hydraulic barrier between the LTP/STP and the neighborhoods. The brine or liquid waste from the RO plant and zeolite plant is conveyed either directly to the evaporation ponds or to the collection ponds before it is conveyed to the evaporation ponds.

A draft Feasibility Study (FS) for Operable Unit 1 (OU1) and Operable Unit 2 (OU2) has been prepared for the site, pursuant to an Administrative Settlement and Order on Consent for Feasibility Study, CERCLA Docket No. 06-03-20, filed August 12, 2020. Outlined in the draft Feasibility Study are five remedial alternatives evaluated in a detailed analysis and comparison. These five Remedial alternatives include:

Alternative GW1 – No Action;
Alternative GW2 – LTM and ICs (i.e., Natural Attenuation);
Alternative GW3 – Groundwater Containment and Removal;
Alternative GW4 – Groundwater Containment and Removal and In-Situ Treatment; and
Alternative GW5 – Groundwater Restoration via Containment and Removal.

These remedial alternatives and a detailed analysis are presented in the Draft Feasibility Study submitted to Region 6 December 15, 2020.

To ensure protectiveness, each alternative (summarized below) would require a TI waiver, as ARARs would not be attainable over a 200-year period, and groundwater access would require limitations in the form of institutional controls.

Alternative GW1 – No Action

Although the site has been in active remediation for 40 years, the No Action alternative is required by the NCP to be carried through the screening process. Under this alternative, no action will be taken to remediate the contaminated groundwater. This alternative will also not involve ICs. Contaminants present in the groundwater will remain in place.

Alternative GW2 –LTM and ICs (i.e., Natural Attenuation)

Alternative 2 includes ICs, that will be placed to restrict future groundwater use activities that would expose users to contaminants at levels that may pose human health risk. These ICs include connecting the residences to a municipal water supply located outside of the TI Zone, point of

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use treatment, and NMOSE Alluvial Aquifer and Chinle Aquifer Well Prohibition Boundaries. The residences in the five nearby residential subdivisions have been connected to a municipal water supply. A small number of residents on the eastern and southern TI boundary may not be connected to a municipal water supply. Properties not connected to a municipal water supply will be contacted to coordinate connection and their wells will be abandoned. HMC will attempt to place water use restrictions/restrictive covenants on all deeds within the TI Zone. Alternative 2 also includes long-term MNA of the dissolved plumes to monitor the movement and natural chemical attenuation processes in the aquifer. This alternative would be combined with a TI Waiver to meet the RAOs for groundwater. Five- year reviews would be conducted. For cost estimating purposes, it is assumed that monitoring to evaluate contaminant levels will be conducted for a period of 50 years.

Alternative GW3 – Groundwater Containment and Removal

Alternative 3 includes the use of extraction wells, injection wells, and injection trenches to hydraulically contain and remove the dissolved COPCs/ROPCs plumes for a period of 36 years. Based on modeling results 36 years was selected as the time it would take for the extent of the dissolved plume to be retracted back to the LTP/STP. In addition to plume removal by groundwater capture at extraction wells, strategic injection of treated water that meets site standards increases gradients towards extraction wells (directed groundwater recirculation) to increase groundwater velocity, enhance plume removal, and decrease the amount of COPCs/ROPCs mass stored (dissolved and sorbed) in the immobile domains that could cause COPCs/ROPCs concentration rebound.

After removing COPCs/ROPCs mass and containing the plume and COPCs/ROPCs discharge from the LTP through operation of the groundwater containment and removal system, operation would stop since continued operation is not expected to achieve groundwater standards throughout the site within a reasonable time. LTM (e.g., natural attenuation) would be used to monitor the effect of discharge from the LTP to groundwater after operation of the system is stopped. For cost estimating purposes, it is assumed that monitoring to evaluate contaminant levels will be conducted for a period of 50 years. A description of the conceptual design for system operation and the operation timeframe are provided in the alternatives analysis in Section 8.3.

Extracted groundwater and pore water recovered from the LTP toe drains would be treated with ex-situ treatment processes including the RO treatment system and the zeolite treatment system. Untreated and treated water that does not meet site-specific standards and cannot be injected would also be managed and disposed in EPs.

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Alternative GW4 - Groundwater Containment and Removal and In-Situ Treatment

Similar to Alternative 3, Alternative 4 includes operation of extraction wells, injection wells, and injection trenches to hydraulically contain and remove the dissolved plumes. During a shorter system operation time of 18 years than Alternative 3, operation of the groundwater containment and removal system would remove COPCs/ROPCs mass and contain the plume and COPCs/ROPCs discharge from the LTP. Based on modeling results 18 years was selected as the time it would take for the extent of the dissolved plume to be retracted to the location of the permeable reactive barrier (PRB). Unlike Alternative 3 after system operation is stopped; a portion of the remaining dissolved plume in the Alluvial Aquifer resulting from long-term discharge from the LTP and rebound from the immobile domain would be treated with an in-situ hydroxyapatite PRB. The PRB would be located downgradient of the LTP to provide long-term treatment of the dissolved plumes.

Similar to Alternative 3, extracted groundwater during operation of the groundwater containment and removal system would be treated above ground with the RO and zeolite treatment systems. EPs would be used to manage and dispose water that cannot be injected. LTM (e.g., natural attenuation) would be used to monitor the effect of discharge from the LTP to groundwater after operation of the system is stopped. For cost estimating purposes, it is assumed that monitoring to evaluate contaminant levels will be conducted for a period of 50 years.

Alternative GW5 – Groundwater Restoration via Containment and Removal

Alternative 5 is an extension of Alternative 3 by an additional 14 years of remedial action through the use of extraction wells, injection wells, and injection trenches to hydraulically contain and remove the dissolved COPCs/ROPCs plumes. Based on modeling results 50 years was selected as the time it would take for the dissolved phase plume to be retracted to and beneath the LTP. Alternative 5 includes operation of extraction wells, injection wells, and injection trenches to hydraulically contain and remove the dissolved plumes. In addition, extracted groundwater during operation of the groundwater containment and removal system for Alternative 5 would be treated above ground with the RO and zeolite treatment systems. EPs would be used to manage and dispose water that cannot be injected. This alternative assesses the effects of long-term sources on groundwater concentrations following full groundwater restoration in the mobile domain.

This scenario assumes that all mobile domain groundwater contaminants have been remediated to License standards (and uranium to 0.02 milligrams per liter (mg/L)) via the 50 years of remedial action. After removing COPCs/ROPCs mass and containing the plume and COPCs/ROPCs discharge from the LTP through operation of the groundwater containment al system, operation would stop. It is acknowledged that this assumption of full restoration will

underestimate the time, costs, and impacts associated with this alternative and overestimate the efficacy of it as well. MNA would be used to manage and monitor the effect of discharge from the LTP to groundwater after operation of the system is stopped.

Recommendation 8.a:

a. *In addition to the current remedial technologies, the Board recommends that the Region assess a wider selection of remedial alternatives, including source control actions, before conducting the detailed alternatives analysis. The Region may want to consider the Board's recommendations on RAOs when assessing remedial alternatives for source control and/or protection of drinking water. Below are a few recommended options for consideration that could be used alone or in combination to expand the suite of alternatives:*

Response:

Please see the response to Comment 8 above. The installation of a permanent cover on the top of the LTP will mitigate potential human health exposures and will mitigate the infiltration of rain that could result in ongoing source migration from the tailings pile (seepage) to groundwater providing source control.

Recommendation 8.a.i:

i. Given the importance of the SAG aquifer to local communities, the Board recommends the Region consider utilizing pumping and treating the alluvial aquifer to prevent migration rather than creating a hydraulic mound. The remediated water from the treatment systems could be reinjected to the alluvial, Chinle, or SAG aquifers, depending on the level to which it is treated. This would allow for containment while preventing the use of clean water to create a mound in the contaminated alluvial aquifer. Additionally, this approach would minimize the use of the SAG aquifer for remedial purposes, reserving it for domestic use.

Response:

As described in HMC response to Recommendation No. 8 above, HMC operates a pump and treat groundwater remedy that extracts groundwater from the alluvium and Chinle aquifers, treats the water, and then injects the water into the alluvium and Chinle aquifers with approximately 500 ac-ft (300 gpm) of groundwater from the SAG to create a hydraulic barrier that locally reverses the gradient back towards the collection wells. The main component of the groundwater remedy is mass removal and hydraulic containment through groundwater extraction from the alluvium and Chinle aquifer, not groundwater mounding through injecting water from the SAG. Groundwater mounding is only a minor component of the overall groundwater remedy.

Recommendation 8.a.ii:

ii. Should the current hydraulic barrier be considered as a remedial alternative, the Region should consider evaluating the hydraulic head, similar the analysis performed

upgradient, to better understand the influence of the ceased LTP flushing operation on downgradient migration.

Response:

The hydraulic barrier is incorporated into Remedial Alternatives 3, 4, and 5 as part of the pump and treat operations delineated in those alternatives. Further evaluation of the efficacy and effectiveness of the hydraulic barrier's proximity to the collection wells may be incorporated into the alternatives utilizing guidance from A Systematic Approach for Evaluating Capture Zones at Pump and Treat systems (EPA, 2008).

Recommendation 8.a.iii:

iii. As noted in recommendation 1a, assessing the challenges facing the RO and zeolite treatment systems may improve current operations, but this information may also be valuable to inform optimization opportunities moving forward.

Response:

Linkan Engineering was contracted to provide technical support for operation of the RO Plant. They have maximized the recovery of the system given the influent water quality with adjustments to the clarifier operation, microfiltration operation, and RO skids themselves.

Recommendation 8.a.iv:

iv. It was stated that a permeable reactive barrier (PRB) may be utilized as a contingency alternative. The Board recommends that the Region consider the use of a PRB in the current suite of alternatives rather than only as a contingency. Similar to pump and treat, a PRB may be an option to replacing the current hydraulic mound.

Response:

As noted in HMC's response to Comment No. 8, a PRB was evaluated as part of Remedial Alternative 4.

Recommendation 8.a.v:

v. In terms of waste disposal, the HMC Site is one of many mines and mills in the San Mateo Basin, some of which the Homestake Mining Company is responsible for. The Board recommends that the Region consider the use of a regional waste disposal facility or consolidation at another DOE facility, that may result is cost efficiencies over the long-term.

Response:

Relocation of the pile has been extensively evaluated. First by NRC in 1993, second by the Army Corps of Engineers for the EPA in 2010 (with NRC and NMED concurrence), and lastly by Tetra Tech for HMC in 2012. All three evaluations came to the same conclusion that the additional risks and costs outweighed any benefits that would result from relocation. In addition, all waste generated as part of the soil clean-up and groundwater remediation is considered

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11(e)2 by-product material under UMTRCA regulations, thus is required to be disposed of in a manner consistent with that of the tailings piles themselves

Recommendation 8.a.vi:

vi. In addition to the closure of the LTP and STP, the Region may consider alternative on-site source control options such as a lined cell adjacent to the current cell. If the material is moved to a lined cell, the primary source of contamination to groundwater (seepage) would be substantially reduced, if not eliminated. This approach has been used at another Superfund site in Region 10.

Response:

As stated in HMC's response to Comment 8, HMC is currently designing a permanent cover for the top of the LTP. This permanent cover will mitigate the potential migration of seepage water to the underlying groundwater. The option of removal and disposal of the tailings facility was evaluated and screened out in the detailed screening of technologies and process options for OU2.

Recommendation 8.a.vii:

vii. Should the Region consider alternatives that maintain the LTP and SPT, the Region may also consider solidifying the base of the tailings piles through injections. This may create a less permeable surface at the base of the landfill that would limit source migration/seepage to groundwater much like a liner.

Response:

As stated in HMC's response to Comment 8, HMC is currently designing a permanent cover for the top of the LTP. This permanent cover will mitigate the potential migration of seepage water to the underlying groundwater. The option of chemical or physical solidification/stabilization of the tailings facility was evaluated and screened out in the detailed screening of technologies and process options for OU2.

Recommendation 8.a.viii:

viii. Should the tailings material remain onsite, the Board recommends the Region work with NRC and DOE to design a cap that meets their requirements while preventing infiltration into the tailings.

Response:

As stated in HMC's response to Comment 8, HMC is currently designing a permanent cover for the top of the LTP under NRC oversight. This permanent cover will mitigate the potential migration of seepage water to the underlying groundwater.

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Recommendation 8.a.ix:

ix. Based on the information provided to the Board, the UMTRCA radon emission standards are above the CERCLA human health risk range for unlimited use and unrestricted exposure. As a result, the Board recommends that, should the Region select a remedial alternative that includes on-site waste management, the Region consider alternatives that utilize institutional controls and fencing to limit access to the piles to reduce exposures.

Response:

As discussed in response to recommendations 1.b and 2, access to the LTP and STP is currently limited with existing fences and signage warning of potential radiological hazards.

Recommendation 9:

Climate Change - The Board recommends that the Region, when evaluating remedial alternatives, consider the potential impacts of climate change that may negatively affect the protectiveness of alternatives. The June 2014 OLEM Climate Change Adaptation Implementation Plan7 (Implementation Plan) discusses potential program vulnerabilities to climate change. Per Table 1 in the Implementation Plan, such vulnerabilities may include: design and placement of storage facilities to accommodate climate change impacts, changing climate conditions may impact continued remedy effectiveness, current assumptions regarding protectiveness of remediation and containment methods may not reflect changing climate impacts, or conducting periodic evaluations of implemented remedies, including changes to frequency and intensity that may impact remedy effectiveness. Examples of vulnerabilities that may be applicable to Homestake include: evapotranspirative covers may be less effective in areas with stronger drought/rain cycles, the depth to groundwater may be affected by climate change, or a site's O&M needs may change based on more extreme weather events.

Response:

UMTRCA requirements for site closure and license termination require that all design elements of the tailings pile cover systems and protective measures for groundwater be effective and durable for 200-1000 years. HMC is currently in the process of revising the existing cover design to an evaportranspirative cover. The cover design of the tailings facilities also incorporates a 3-4.5 foot thick radon barrier underneath the ET cover, made up of primarily compacted clay material, to attenuate radon emissions, that will further reduce total infiltration into the pile. In addition to the design criteria, the licensee is obligated to fund the long-term care and maintenance program in perpetuity upon transfer to the Department of Energy's Legacy Management, who will be the site's custodian following completion of all remedial activities.

Recommendation 10

a. Based on the presentations made by the Region and other stakeholders, the Board recommends the Region address the potentially disproportionate impact of site-related contamination and potential EJ concerns related to cleanup approaches. In particular, the policies articulated in section 1 of Executive Order 13990 (e.g., using science to improve public

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health, protect the environment, ensure access to clean water, consideration of impacts on EJ and low income communities) and public statements made by the Administrator since the issuance of that Order, as well as long-standing Agency EJ guidance, offer a framework that can inform policy considerations in evaluating alternatives for limiting exposure to highly toxic/carcinogenic and mobile constituents of concern (radionuclides). Given the evolving priorities related to environmental justice (J), the Board recommends the site team engage with Region 6's designated EJ coordinator and OSRTI's EJ coordinator, currently Lavar Thomas, to address potential EJ concerns.

b. Given the impact to two tribes, the Board recommends that the Region ensure adequate tribal consultation with regard to resources that may be negatively impacted by site-related contamination and potential response action alternatives.

Response:

HMC would welcome an opportunity to discuss these issues with Region 6 and EPA's EJ coordinators.

ADVISORY CONSIDERATIONS - Utilize Lessons Learned from Other Sites - As noted earlier, there are over 80 legacy uranium mines and four former uranium mill facilities hat operated in the San Mateo basin, including the HMC Site. Some of these, such as Bluewater, have already undergone some remedial/reclamation activity. Similarly, other NPL sites also subject to UMTRCA Title II may be further in the remedy selection process. It might be helpful for the Region to learn more about those sites to determine if there are any lessons learned that may inform the HMC Site. Those site lessons may provide useful information and approaches for addressing inter-agency coordination, groundwater management and other related issues as the Region moves forward with remedy selection at this site.

Response:

As noted, there are similar UMTRCA Title II sites are further along in the remedial/reclamation process. Amongst the 22 sites in Title II, 3 have no impacts to the uppermost aquifer, 1 has a high background, and 18 have or will be applying for ACLs as the selected groundwater alternative. Another 6 Title II sites have already been transferred to DOE, 3 of which had no impact to groundwater, and the other 3 have had ACLs approved for groundwater.

In regard to reclamation, no Title II site has been relocated to a separate facility. In the Title I portfolio, the Old Rifle Site has been relocated and groundwater issues still persist in spite of the pile's removal.

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Message

From: Brad Bingham [bbingham@barrick.com]
Sent: 6/18/2021 9:41:04 PM
To: Purcell, Mark [purcell.mark@epa.gov]
CC: Daniel Lattin [dlattin@barrick.com]; Jennifer Ortega [Jennifer.Ortega@barrick.com]
Subject: GRP 5 year review interview response
Attachments: 20210618 GRP 5Y Review Interview Response.pdf

Hi Mark,

I wanted to forward my responses to you regarding the 5 year review interview. Please let me know if you have any questions.

Respectfully,

BARRICK

www.barrick.com

Brad R. Bingham
Closure Manager – Grants Reclamation Project
Barrick Gold of North America, Inc.

Tel: (505) 287-4456
Mobile: (505) 290-8019

INTERVIEW RECORD

Site Name: Homestake Mining Company Superfund Site	**EPA ID #: NMD007860935**	
Subject: Fifth Five-Year Review	**Time:**	**Date: 06/18/21**
Type: Teleconference **Location of Visit: NA**		

Contact Made By:

Name: Mr. Mark Purcell	**Title:** **Remedial Project Manager**	**Organization:** **EPA Region 6**

Individual Contacted:

Name: Mr. Brad R. Bingham	**Title: Closure Manager**	**Organization: HMC**

Telephone No: 505-290-8019 **Fax No:** **E-Mail Address: bbingham@barrick.com**	**Street Address: 560 Anaconda Road, Route 605 Milan, NM 87021**

Summary Of Conversation

Question 1: What is your overall impression of the project? (general sentiment)

Homestake, in cooperation with EPA, NRC, and NMED, has made substantial progress at the site.

- Over more than 40 years of groundwater remediation, Homestake has removed 1 million pounds of uranium and spent more than $230,000,000.
- Homestake has progressively used essentially all available groundwater treatment strategies, including containment measures, evaporation, and pump and treat. From RO, zeolite, and ion exchange to phosphate, bioremediation, not to mention its treatability studies on options not actually implemented, Homestake has either used or evaluated all applicable technologies.

After multiple investigations and years of remediation, we now have clear understanding of the site and the path forward.

- The site is in a position to move toward closure, and Homestake has proposed a strategy that will allow for regulatory closure and protection of human health and the environment, which includes granting a technical impracticability waiver to waive groundwater ARARs and a belt and suspenders approach to institutional controls.

Question 2: What effects have the site operations had on the surrounding community?

Homestake's continued commitment to the site and progress made have had positive effects on the surrounding community:

- Connected residents to municipal water and paid for their water

- Purchased property for value that would allow residents to relocate if they would like to
- Mitigated risk to human health and the environment
- Reduced the footprint of the groundwater plume

Question 3: Are you aware of any community concerns regarding the site or its operation and administration? If so, please give details.

We are not aware of any concerns other than those that have already been raised by the community to EPA.

- As previously discussed, we are aware of the concern regarding GW treatment rate/capacity: Reasons for the misconception include nameplate capacities, aquifer geochemical properties, and the lack of understanding of the overall remediation treatment system(s) limitations. Regardless of our treatment capacity, back diffusion from fine-grained materials within the aquifer will continue to impact the mobile domain resulting in loss of a natural resource through extraction and evaporation without discernable improvement in groundwater quality. HMC is committed to continue treatment at a maximum sustainable rate for the site as we progress through the ACL application and TI Waiver processes.

- More importantly, even if system capacity could be increased, that will not overcome the fact that it is technical impracticability to remediate GW. ICs and a TI waiver would still be needed, resulting in the application of the same remedy.
    - Even assuming that the mobile domain could be completely remediated, back diffusion from the nearby geologic features and continued seepage from the LTP would generate a new plume with the same characteristics.
    - Increased treatment capacity, as referenced above, will not result in improved groundwater quality. The solution is placing institutional measures that protect human, health and the environment.

Question 4: Are you aware of any complaints, incidents or activities at the Site such as vandalism, trespassing, or emergency response from local authorities? If so, please provide details.

No.

Question 5: Do you feel well informed about the Site's activities and progress?

- Yes.
- Homestake welcomes the cooperative relationship with EPA, NRC, and NMED that allows for open communication to achieve the agencies' and Homestake's collective goal to protect human health and the environment.

Question 6: Do you have any comments, questions, or recommendations regarding the Site's management or operation?

- Just want to reiterate that HMC is committed to maintaining active communication and continued transparency with all stakeholders, including regulatory agencies, local communities, local officials, NGOs, and other interested parties.

Message

From: Ryan Burdge [rburdge@skeo.com]
Sent: 4/27/2021 1:16:55 PM
To: Purcell, Mark [purcell.mark@epa.gov]
CC: Jill Billus [jbillus@skeo.com]
Subject: Homestake Mine FYR - Pueblo Acoma interview
Attachments: Interview form_Homestake NPL Site_Acoma Pueblo.docx

Mark,

Attached are the notes from the Pueblo Acoma interview last week. Let us know if you need anything else.

Thanks,
Ryan

Ryan Burdge
Senior Associate
(434) 233-4642 | www.skeo.com
Skeo is a contractor and subcontractor for the United States Environmental Protection Agency.

INTERVIEW RECORD

Site Name: Homestake Mining Company Superfund Site	**EPA ID #:** NMD007860935	
Subject: Fifth Five-Year Review	**Time:** 9 am mountain	**Date:** 4/21/21
Type: Teleconference **Location of Visit:** Not applicable (NA)		

Contact Made By:

Name:	Title:	Organization:
• Mark Purcell • LaDonna Turner	Remedial Project Manager (RPM)	EPA Region 6

Individual Contacted:

Name(s):	Title(s):	Organization:
• Brian Vallo, Governor of the Pueblo of Acoma • Aaron M. Sims, legal counsel • Donna Martinez, Environment Coordinator for the Acoma Department of Natural Resources (ADNR) • Franklin Martinez, ADNR Director	See names for associated titles	Pueblo of Acoma
Telephone No: NA **Fax No:** NA **E-Mail Address:** [HYPERLINK "mailto:fmartinez@poamail.org"]	**Street Address:** NA	

Summary of Conversation

EPA: The RPM began with a brief introduction of the Homestake site (the Site). Under the Superfund law and regulations, EPA is required to conduct a review of an ongoing remedy every five years. The purpose of the review is to make sure that the remedy remains protective. While the cleanup is ongoing, EPA needs to assess the remedy to determine if it remains protective of human health and the environment. After the review is over, EPA will present the findings of the review in a report. The report is not a decision document, but it includes issues and recommendations to ensure protectiveness in the short or long term. An important part of the five-year review is interviews with Site stakeholders. A form with the interview questions was sent previously to the Pueblo of Acoma. EPA can take notes and fill out the form during the interview. EPA can then send the form to the Pueblo of Acoma to review and modify as needed. The forms can identify the individuals interviewed by name, or identities can remain anonymous. There are many options. The Pueblo of Acoma representatives should let EPA know how they would like to be identified.

The Homestake site is a former milling operation and tailings disposal facility. Today the mill has been demolished and reclaimed. There are two tailings impoundments that remain. Tailings are a byproduct material from the milling process. One of two piles is quite large and can be seen from the adjacent

highway.

Homestake has been trying to cleanup groundwater since 1977. The Site is regulated by the Nuclear Regulatory Commission (NRC) and the New Mexico Environment Department (NMED) in addition to EPA. NRC has been the lead federal agency. NMED has authority through a groundwater discharge permit.

Governor Vallo: Governor Vallo noted that the Pueblo of Acoma submitted written comments concerning the Site and a multitude of issues during the EPA's National Remedy Review Board (NRRB) meeting on March 25, 2021. The Pueblo of Acoma also had the opportunity to provide oral statements on the concerns. Governor Vallo stated that he appreciates the overview of the Site, and he is interested in learning how these interviews will impact the report and future decision-making with the Agency and its Superfund program. He would also appreciate the opportunity to review the responses to the six questions prior to the report.

EPA: The RPM indicated that EPA wants to give the Pueblo of Acoma the opportunity to say exactly what they would like to say. The RPM also clarified that the NRRB process, including the meeting held on March 25th, is different from the five-year review; however, the Pueblo's concerns may be the same. The NRRB is a board of 9 to 10 people from EPA, and includes technical experts, policy experts, attorneys, etc. Following the March 25th meeting, the board has six weeks to provide recommendations regarding the Superfund process Region 6 is conducting at the Site. The NRRB process is ongoing.

Ms. Martinez: Ms. Martinez asked how long the Pueblo of Acoma would have to review the interview narrative and noted that at least two weeks would be helpful.

EPA: The RPM responded that a few weeks is fine, and EPA can be flexible with the turnaround. The RPM also described the internal review process for the five-year review report. EPA would likely have a draft of the interview narrative ready for review early next week. The Pueblo of Acoma can review and revise the narrative as necessary.

Question 1: What is your overall impression of the project? (general sentiment)

Mr. Sims: From the Pueblo of Acoma's perspective, the general sentiment is that there is severe and deep concern about the continued impact of the contamination and the effects from mining within the basin. He noted that the length of time the cleanup project has been going on is staggering (it is the fifth five-year review).

He noted that the idea of Homestake seeking a technical impracticability (TI) waiver is troubling as it seems like an attempt to walk away from the project. Doing so could leave contamination and potential contamination for the surrounding community to deal with in perpetuity.

He noted that there are three major concerns of impact. The first concern is the groundwater contamination, migration of the plume and potential impacts to the San Andres-Glorietta (SAG) aquifer. The SAG aquifer, on the western side, is a primary source of water and recharge for many of the water sources used by the Pueblo of Acoma. Mr. Sims noted that the Pueblo of Acoma's presentation to the NRRB showed the hydrology in the area and how those systems are connected.

He noted that mining and dewatering of aquifers in the basins have devastated the natural hydrologic system. With the impacts of contamination as well as the depletion of the SAG aquifer and overlying aquifers, the Pueblo of Acoma is concerned about how it will protect its people in the long-term and how it will provide water for its people in the long-term. The possibility that the federal agencies are

considering Homestake's TI waiver, and prospects for Homestake to walk away from its responsibility for cleanup, is concerning to the Pueblo of Acoma and inappropriate.

The Pueblo of Acoma is also concerned about impacts on Acoma cultural resources, because of mining throughout the San Mateo basin by Homestake and other mines. The Acoma have lived in the area for hundreds, maybe thousands of years. There are cultural resources both identified and unidentified that have been impacted and may continue to be impacted by mining activities and the continued presence of contaminants such as the tailings pilings. The impacts limit Acoma cultural practitioners from accessing these areas due to safety concerns.

Mr. Sims then summarized the broad concerns of cultural impact, health impact and resource impact. These impacts are all deeply concerning to the Pueblo of Acoma due to the prospect that cleanup may be discontinued following the TI analysis.

Mr. Martinez: Mr. Martinez noted that the water office's biggest concern is water quality. If the contaminated plume continues to migrate, there are concerns for Acoma and neighboring towns such as Milan, Grants, Laguna, etc. The concern is to protect the limited water that is available.

Ms. Martinez: Ms. Martinez noted that overall, impacts to cultural use and impacts to human health have always been a concern with the upstream contamination. The Acoma consume products they grow. A main concern is consumption of products that may be impacted by that contamination. There have been so many incidences of cancer in the community and there are questions about whether they are related to the contamination. Ms. Martinez also noted that the contamination has been there for years, and she wondered when the Acoma will see more impacts to their lands and streams. She noted that remediating the contamination will be beneficial to everyone – communities upstream and downstream.

Question 2: What effects have the site operations had on the surrounding community?

Mr. Sims: Mr. Sims noted that pumping from Homestake and other mines in the area has impacted availability of water sources to the Pueblo of Acoma. He noted impacts to springs that contribute to river flows of the Rio San Jose, which is a primary surface water source that flows through the Pueblo of Acoma. Depletion of water has been so severe that streams that feed the river, one of which is close to Milan – Ojo del Gallo – has completely gone dry and no longer contributes to the Rio San Jose. The Acoma use that water for irrigation, as a means of supporting themselves and as a cultural practice.

Mr. Sims noted that decades of mining have resulted in significant declines in water availability to the Pueblo. This is also a subject of ongoing litigation about water rights (United States vs. Kerr-McGee as an example) with Pueblo of Laguna and others.

With depletion of the water supply, the Pueblo is looking at how they can continue to provide water for agricultural uses, domestic uses and industrial uses. The SAG aquifer west is one of the last remaining water supplies for the San Rio basin and the Homestake plume is contaminating it. Other aquifers in the area have been investigated as possible water sources, but natural contamination (such as total dissolved solids) makes them unreasonable to develop as a water source.

Mr. Martinez: Mr. Martinez also added that dust from the Homestake facility, which is significant on a windy day, is also a concern for the surrounding community.

Governor Vallo: Governor Vallo noted that there are concerns not only for exposure to dangerous chemicals in the dust (with added concern for tailings remaining onsite), but there are concerns to

cultural resources in the area. Mount Taylor is a traditional cultural property. The lands adjacent to the traditional cultural boundaries are full of cultural resources, including pilgrimage trails, archaeological remnants, springs, shrines, etc. Some of these areas are accessed by cultural leaders as well as non-tribal technical experts, and there is concern about the safety of those individuals in those environments, from dust and other contamination.

Ms. Martinez: Ms. Martinez noted the potential long-term financial impacts of the contamination, including the possibility that the Pueblo may need to treat water for agricultural or human consumption in the future. Air quality and potential impacts from wind was also a concern.

Question 3: Are you aware of any community concerns regarding the site or its operation and administration? If so, please give details.

Governor Vallo: Governor Vallo reiterated his previous concerns regarding tribal and community members working on cultural resource management issues and projects. Governor Vallo also noted that the Pueblo of Acoma does not have an ongoing public outreach initiative keeping community apprised of the Superfund site. He stated that it would be helpful if there is a greater effort to maintain a level of communication via written documentation, social media or other virtual outlets to provide information to the community. This outreach should continue beyond the project term because the Site will continue to be an ongoing concern for the Acoma. He was unaware of availability of resources for this outreach, but requested the Agency consider providing those resources to develop a program if one does not already exist.

Ms. Martinez: Ms. Martinez noted that they do get limited funding from EPA but they are limited on what they can spend on Superfund. She reiterated that money should not be an issue when it comes to health. She stated that if there are other resources out there, the Pueblo of Acoma would like to work with them to develop continued education for its communities.

Ms. Martinez noted that another community concern is the incidence of cancer among past uranium workers, not only in the Acoma community but other communities. She also mentioned the impacts on quality of life to others in the uranium industry, and to those not qualified for the uranium impact fund.

Mr. Sims: Mr. Sims noted that a general community concern is also the availability of water, as addressed in previous responses.

Question 4: Are you aware of any complaints, incidents or activities at the Site such as vandalism, trespassing, or emergency response from local authorities? If so, please provide details.

The Pueblo of Acoma representatives were not aware of any complaints, incidents or activities at the Site.

Question 5: Do you feel well informed about the Site's activities and progress?

Governor Vallo: Governor Vallo indicated that although the project has been ongoing for some time, he located very little documentation sent to tribal leadership. While more information might be provided to the environment office, from a government-to-government standpoint, there has not been a lot of communication between tribal government and the Agency. Tribal leadership changes from year

to year, so it is important that the Agency recognize that and try to ensure there is ongoing communication. It is also important for the Agency to ask tribal leadership about preferred level of engagement, as some prefer limited interaction while others prefer more frequent interaction.

Ms. Martinez: Ms. Martinez also indicated that communication has been limited to correspondence with the RPM and Ms. LaDonna Turner. Most communication has been in the past year.

Mr. Sims: Mr. Sims noted that most information seems to be shared when there is a big decision to be made. Regular communication and updates are more infrequent.

Governor Vallo: Governor Vallo noted the Biden administration's memorandum on tribal consultation to strengthen relations with tribes. He asked if EPA would be organizing a consultation because of the memorandum. He suggested EPA organize a consultation to help tribal leaders gain a better understanding of Superfund reporting, communication, and the process in general, and to help EPA understand the needs of tribes during such projects. He recommended interagency collaboration.

EPA: EPA responded that it was not aware of the Region's response to the memorandum but would follow up internally with the Region.

Ms. Martinez: Ms. Martinez noted that the Pueblo of Acoma is working on a Region 6 transition document with the National Tribal Operations (NTO) committee that will be presented to EPA headquarters. She noted that this document might also be a way to address EPA headquarters.

Question 6: Do you have any comments, questions, or recommendations regarding the Site's management or operation?

Governor Vallo: Governor Vallo stated that he would encourage site management plans and operation plans take into consideration concerns of communities including Acoma. He noted that there should be more solid means of communication among Acoma's environment office, water office and the tribal government directly so that they are aware of issues, such as trespassing, vandalism, etc., as they arise. He encouraged a commitment to establishing a more robust level of communication at the site and local level.

Mr. Sims: Mr. Sims stated that it would be helpful if EPA better explain how analyses prepared by Homestake, such as the TI waiver evaluation, are evaluated by the Agency. He questioned whether technical experts conduct an independent evaluation of the work completed by Homestake.

EPA: The RPM clarified that Homestake prepares an annual report that describes site operations, results from those operations, groundwater quality monitoring and other data. The report includes plume maps, graphs of contaminant concentrations in wells, etc. The reports are prepared for the NRC and the state, and EPA receives a copy. EPA uploads to the report to the Homestake site profile page on EPA's website. EPA recently received the 2020 annual report and will upload to the EPA webpage shortly. These reports provide an overview of all cleanup activities at the Site.

EPA also noted that EPA is currently conducting its review of Homestake's TI waiver evaluation. Because Homestake could be biased in their evaluation, EPA provides oversight and checks everything. EPA has experienced groundwater modelers conducting a detailed analysis of the work. EPA is also bringing in another consultant to conduct an independent analysis of the modeling effort, which may take another three months. The analysis will be very thorough.

The RPM noted that the TI waiver evaluation is a critical document. He noted that EPA and the state have also been reassessing background concentrations in groundwater. The background reassessment document is currently being updated. When EPA selects a final groundwater remedy, the groundwater cleanup numbers will likely be different than the cleanup numbers NRC developed.

Message

From: Aaron M. Sims [ams@chestnutlaw.com]
Sent: 3/10/2021 11:01:55 PM
To: Purcell, Mark [purcell.mark@epa.gov]
CC: Governor@poamail.org; Interpreter@poamail.org; administration@poamail.org; FMartinez@poamail.org; dmartinez@poamail.org; Jacob Wilson [JWilson@poamail.org]; Ann Berkley Rodgers [abr@chestnutlaw.com]; CVandiver@poamail.org; TSecretary@poamail.org; 1st_lt@poamail.org
Subject: Acoma - Homestake Written Comment
Attachments: 2021-03-09_Acoma Homestake Comment.pdf

Good afternoon Mark,

On behalf of the Pueblo of Acoma I am sending to you the Pueblo's written comment for the upcoming meeting of the Dept of Energy's National Remedy Review Board for the Homestake Superfund Site - TI Waiver. We look forward to speaking with the Board on March 25th as part of the Pueblo's presentation.

When the agenda and call information is available, please provide the information to the persons addressed on this email.

Thank you,

Aaron M. Sims, Esq.
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Brian D. Vallo, Governor
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Davy D. Malie, Tribal Secretary
Patrick Ortiz, Tribal Interpreter

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Written Comment of the Pueblo of Acoma
Before the
National Remedy Review Board

Meeting on
Homestake Mining Company Superfund Site – Technical Impracticability Waiver Request

March 25, 2021

The Pueblo of Acoma ("Pueblo" or "Acoma") is pleased to provide these written comments for the record of the National Remedy Review Board for its meeting on the Homestake Mining Company Superfund Site – Technical Impracticability Waiver on March 25, 2021.

Acoma remains deeply concerned about the continued impact of contamination from the Homestake Mining Company on the Pueblo of Acoma, our people, and our water. A complete Technical Impracticability ("TI") Waiver is inappropriate. Remediation of the primary source contaminants and the groundwater must be required. Removal of contamination close to the tailings will reduce the long-term impact to the basin, even if the farthest reaches of the contaminants plume cannot be removed for centuries. At a minimum, any TI Waiver must provide for maintenance of the hydraulic barrier. If not, what will prevent contamination of the SAGA?

Acoma supports the selection of alternatives that will continue to remediate available groundwater. The agency's Guidance for Evaluating the Technical Impracticability of Ground-Water Restoration, United States Environmental Protection Agency at page 19 (Sep. 1993) makes it clear that cost should not automatically determine technical impracticability ("relatively high restoration costs may be appropriate in certain cases, depending on the nature of the contamination problem and considerations such as the current and likely future use of ground water."). Meeting the United States' trust responsibility to replace a water supply for tribal nations is a paramount future use that must be given appropriately great weight.

Acoma urges the National Remedy Review Board to consider these comments in its determination.

I. Acoma Background & History in the Rio San Jose Basin

The Pueblo of Acoma is one of, if not, the longest continually inhabited community in the United States. Prior to the arrival of the Spaniards in the first half of the 16th Century, the Pueblo of

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Acoma had long been in existence. The Acoma Culture Province encompasses most, if not all, of the Rio San Jose Basin.[1] The people of Acoma cultivated lands, raised crops, developed irrigation systems, maintained livestock and generally used the waters of the Rio San Jose and its tributaries long before the arrival of European settlers. Thus, from "time immemorial," the Acoma people cared for the land and used its water, and continue to do so, for their livelihood.

Acoma lies within the Rio San Jose Basin. Today the Rio San Jose Basin includes the surface flows and groundwater of the Rio San Jose, and the Bluewater Groundwater Basin.[2] In a natural state, the Rio San Jose gains flows from groundwater at certain places and loses flow to the underlying aquifers in different places. Acoma has historically relied on surface and alluvial ground water in the Basin. Wells tapping alluvial groundwater were mentioned in reports of Coronado's first visit to Acoma in the 1540s. Two of the most important sources of water for the Pueblo of Acoma as of 1848 were (1) the Ojo Del Gallo spring[3] and (2) Bluewater Creek, a major tributary of the Rio San Jose that collects water from the Zuni Mountains. About two-thirds or more of the original, pre-European contact supply for the Pueblos was derived from these two sources.[4] Springs, summer rain and melting Mount Taylor snowpack provide the remaining water supply to Acoma.

II. San Andres-Glorieta Aquifer

The San Andres-Glorieta aquifer is an important aquifer in the Rio San Jose Basin. It reaches the surface at the Ojo Del Gallo spring located near the community of San Rafael and in certain reaches of Bluewater Creek. [5] It also contributes to the alluvial aquifer of the Rio San Jose just north of the Ojo Del Gallo and west of Horace Springs on the western boundary of Acoma's federally recognized land grant.

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[1] Ruppé, Reynold J. (Jr.) "The Acoma Culture Province: An Archaeological Concept (1990), Page8, Figure 2. Dr. Ruppé

[2] In 1956, the State Engineer of New Mexico declared the Bluewater Underground Basin which underlies the western Rio San Jose Basin. Thus, references to groundwater in the Bluewater Basin refer to groundwater within the larger Rio San Jose Basin.

[3] *See* William D. White, Hydrological and Environmental Indicators of a Dewatered Wetland: Ojo Del Gallo, San Rafael, New Mexico, 1989, 337-338. ("A fault-controlled spring, the Ojo Del Gallo, issues from the Permian San Andres Limestone on the eastern toe of the Zuni Mountains, immediately north of the village of San Rafael, New Mexico. The spring is a surface expression of the groundwater flow system that now provides the water supply for the upstream communities of Bluewater, Milan and Grants, and supported the uranium industry during its heyday.")

[4] *Id.* The United States Geological Survey has estimated the unimpeded natural flow in the Rio San Jose to be 12,000 to 14,000 ACRE-FEET PER YEAR at the western boundary of the Pueblo of Acoma. These annual natural flows were made up of about 5,000 ACRE-FEET PER YEAR of overland stream flow, primarily from Bluewater Creek; 3,000 to 5,000 ACRE-FEET PER YEAR of steady spring flow from Ojo Del Gallo; 3,600 ACRE-FEET PER YEAR from Horace Spring, etc. The State of New Mexico has estimated it to be up to 17,000 ACRE-FEET PER YEAR. Additional springs on Acoma lands east of the western boundary increase the unimpeded natural flow through Acoma towards Laguna Pueblo. Thereafter additional springs on Laguna Pueblo and on non-Pueblo lands contribute to surface flows across Laguna (citing Risser, Dennis W., Natural Streamflow in the Rio San Jose Upstream from the Pueblos of Acoma and Laguna, New Mexico, USGS, Water Resources Investigation, No. 82-4096, 1982 and Petronis, Laura, Estimated Natural Streamflow at the Western Boundary of the Acoma Pueblo and Western Boundary and Northern Areas of the Laguna Pueblo in the Rio San Jose Basin, New Mexico (2008)).

[5] Affidavit of William P. Balleau, Hydrologist, Branch of Rights Protections, Albuquerque Area Office of the BIA, March 13, 1985.

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Studies demonstrate that the groundwater and surface water systems in this basin are interrelated and that the effects of changes in groundwater pumping or surface diversions can be seen throughout the basin. Due to the high transmissivity of the San Andres-Glorieta aquifer, the flow of water at Ojo Del Gallo and Bluewater Creek is very sensitive to groundwater pumping in the Basin.[6]

The conclusion that groundwater pumping in the 20th century caused Ojo Del Gallo to go dry is widely accepted by regional hydrologists.[7] As a result of agricultural development in the 1930's and 1940's, and the uranium industry in the 1950's - 1970's, the spring's discharge declined from a virgin flow condition of approximately 7 cubic feet per second to zero discharge in 1953. "Ground water development, originally for agricultural purposes followed by the uranium industry, reduced the pressure head on the San Andres Limestone to a point below the ground surface elevation of Ojo Del Gallo by the year 1953."[8] After the collapse of the uranium mining industry, the spring returned briefly in the early 1980's only to go dry again once industrial uses increased, including attempts to remediate contamination of land and water by the uranium mining and milling companies.

A subcrop of the alluvium overlies the San Andres-Glorieta aquifer limestone near the Homestake Site.[9] Despite the Chinle Shale underlying the alluvium at the Homestake site, to the west of the Homestake Site shallower portions of the San Andres-Glorieta aquifer with a much thinner section of the Chinle Formation establish that a "... good connection between the alluvial and San Andres aquifers may exist even when a few tens of feet of Chinle Formation exist."[10]

III. Uranium Mining & Homestake-Barrick Mine

The uranium mining and milling industry in areas upstream from the Pueblo of Acoma, further diminished Acoma's water supply for the following reasons. (1) Uranium mining required substantial groundwater use, depleting groundwater that would have supplied springs on and around Mount Taylor and tributary runoff that supplemented the Rio San Jose surface flows and which fed tributaries to the Rio San Jose; (2) the cleanup of contamination from uranium mines

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[6] Affidavit of William P. Balleau, hydrologist at the Branch of Rights Protections, Albuquerque Area Office of the BIA, March 13, 1985. ("The San Andres-Glorieta aquifer in its natural equilibrium state was recharged by surface streams by approximately 5,000 ACRE-FEET PER YEAR near the mouth of Bluewater Creek and approximately 5,000 ACRE-FEET PER YEAR were correspondingly discharged at Ojo Del Gallo. High rates of groundwater pumping in the 1940's through 1970's cause the groundwater levels in the aquifer to decrease and cause Ojo Del Gallo to cease flowing. That intensive pumping also decreased natural discharge from the aquifer into Bluewater creek and induced additional recharge to the aquifer from Bluewater Creek, thus causing reduced surface flow in the Rio San Jose and largely preventing Bluewater Creek surface water from reaching the western boundary of the Pueblo of Acoma.")

[7] William P. Balleau, Bluewater Basin Withdrawals and Sources of Water, Bureau of Indian Affairs, Albuquerque Area Office, Branch of Rights Protection, March 1984, 1-4.

[8] *See* William D. White, Hydrological and Environmental Indicators of a Dewatered Wetland: Ojo Del Gallo, San Rafael, New Mexico, 1989, 337-338.

[9] *See* Draft Technical Impracticability Evaluation, Homestake Mining Company Superfund Site Operable Unit #1 – Groundwater Remediation, Cibola County, New Mexico (Nov. 2020) (Figures 2-16 and 2-17); *See also*, *Id.* at Figure 7-6 (Vertical extent of TI Zone_Cross Section D-D).

[10] Homestake Mining Company of California, Ground-Water Hydrology, Restoration and Monitoring at the Grants Reclamation Project for NMED Offsite DP (Feb. 2010), 6-1.

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and mills to this day requires substantial groundwater use; and (3) population growth, settlement and the agricultural and real estate development associated with the growth of the uranium industry in the Grants/Acoma region led to substantial groundwater use. Thus, for a number of decades, withdrawals from the Basin for these uses have far exceeded the recharge to the groundwater aquifers, effectively creating the situation where the aquifers are being mined for water.[11]

Uranium mining and milling in New Mexico impacted all constituents of the environment, including soils stream sediments, surface water and groundwater.[12] There were at least four mills for creating yellowcake near Grants in the Rio San Jose Basin: Bluewater Disposal, now known as the ARCO site northwest of Grants, Rio Algom (formerly Kerr-McGee and Quivera) and Phillips-United Nuclear Corporation in the Ambrosia Lake area and Homestake- Barrick, the subject of these comments, a short distance north of Grants and located on a major tributary of the Rio San Jose, San Mateo Creek. Decades of collective uranium milling activity in the Grants/Acoma area caused region-wide groundwater contamination in alluvial and other shallow aquifers.[13] Cleanup of contamination has used, and continues to use, extensive water resources, with significant depletion of water resources.

Homestake-Barrick Mining Company ("HMC"), licensed by the Atomic Energy Commission, operated two uranium mills from approximately 1958-1990. During operations, approximately 22 million tons of ore were milled at the site, using a conventional alkaline leach process.[14] This milling activity caused widespread groundwater use and contamination contained in alluvial and nearby aquifers. The mill site was declared a Superfund Site by the U.S. Environmental Protection Agency ("EPA") and has been in reclamation since 1990, following the demolition of the mill.

Cleanup of the Homestake site continues to use extensive water resources and has not been wholly successful.[15] "The contaminant plume has receded back almost three-quarters of a mile into the site boundaries of HMC by injecting fresh water down gradient of the site. Nearly 4.5 billion gallons of contaminated water have been removed and 540 million gallons of treated

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[11] While "mining" of groundwater in aquifers that are not associated with alluvial and surface flows, and therefore have minimal recharge, may be acceptable, where there is an on-going hydrologic relationship between surface flows and groundwater is not acceptable as it ultimately destroys the surface flows that others rely on. See, Mathers *v. Texaco, Inc.*, 421 P.2d 771 (N.M. 1966).

[12] *See*, Dixon, Earle Campbell, "The Legacy Uranium Mining and Milling Cleanup Plan: Evaluation of the EPA Five Year Plan, Grants Mining District, New Mexico" (July 2015).

[13] The discovery of large subsurface uranium deposits within the Jurassic Wastewater Canyon Member of the Morrison Formation at Ambrosia Lake resulted in the establishment of two-thirds of the active uranium mines in New Mexico within the Ambrosia Lake Mining Sub-District by 1980. *See* U.S. Environmental Protection Agency, Administrative Settlement Agreement and Order on Consent for the San Mateo Creek Basin Legacy Mines Sites, Dec. 3, 2019. Ambrosia Lake is in the northwestern portion of the Rio San Jose Basin and the adjoining San Juan Basin.

[14] EPA Third Five-Year Review Report, Homestake Mining Company Superfund Site, (EPA ID: NMD007860935) Cibola County, New Mexico

[15] *See generally*, Pueblo of Acoma Protest to Applications by Homestake Mining Company to Change Well Location No. B-28-S-323 and to Drill Supplemental Wells in the Bluewater Underground Water Basin No. B-28-S-386 through B-28-S-429.

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water have injected into the aquifer."[16] Acoma has submitted multiple protests to HMC's applications to drill supplemental wells in the Bluewater Underground Water Basin, on the grounds that there is insufficient unappropriated water available to satisfy Homestake's request, yet the applications were approved.[17] The United States did nothing.

In 2012, the Office of the State Engineer approved HMC's application to temporarily divert 4,500 acre-feet per year and drill 839 supplemental wells.[18] This temporary permitted use is in addition to applying the 1,200-acre feet per year water right claimed by Homestake for reclamation activities. Despite Acoma's protests, the Office of the New Mexico State Engineer approved the installation of nearly 600 wells as of 2016 for the reclamation project, further draining the region's water supply.[19] According to EPA reports, 5,855,488,029 gallons of water, or 48,658.72 acre feet of water were pumped from the alluvial aquifer from 1978-2014.[20] The amount pumped from the San Andres Glorieta aquifer in the same period is likely to be more as the remediation effort pumped water from the San Andres Aquifer and then injected it into the alluvial aquifer. According to reports, water levels in three wells in the San Andres Glorieta aquifer under Acoma, where the aquifer is 2,000 feet below the surface have decreased by 46 feet since 1998.[21] The decline in the San Andres Glorieta aquifer west of the San Rafael fault where it is near or in contact with the alluvial aquifer is likely much greater.

Declines in the west San Andres Glorieta aquifer are of great concern to Acoma as 80% of the surface flows in the Rio San Jose as it traverses Acoma emanate from Horace Springs now come from the west SAGA. The flow at Horace Springs has diminished to a low of 1.8 cubic feet per second in dry periods.

Compounding this decline in water is the contamination in the Bluewater Basin. Small communities located near the Homestake Mill Site have had to discontinue use of their wells due to high levels of contamination. Contamination plumes from both the Homestake Mill Site and Bluewater Disposal, now known as the ARCO site, are moving towards Grants. Absent significant water pumping to keep those plumes from moving, they will contaminate surface and groundwater just upstream from Acoma in the not-too-distant future.

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[16] May 9, 2019, Homestake Mining Co., Superfund Site Profile, Superfund Site Information

[17] Pueblo of Acoma Protest to Applications by Homestake Mining Company to Change Well Location No. B-28-S-323 and to Drill Supplemental Wells in the Bluewater Underground Water Basin No. B-28-S-386 through B-28-S-429. ("Groundwater cannot be treated exactly like surface water because once appropriations exceed the natural recharge in an aquifer, it is being mined. It cannot be treated as a reoccurring resource. Based on the drop in flow from Ojo Del Gallo at San Rafael, which is historically related to depletion of the San Andres-Glorieta aquifer, this aquifer is already being mined to meet present uses, threatening senior water users. Supplementing Homestake's use will result in a greater possibility that water will be insufficient to meet the needs of the holders of senior water rights.")

[18] *See* Feb. 6, 2012 letter from NM Office of the State Engineer. A temporary diversion request of 4,500 was approved in Feb. 2008.

[19] U.S. Environmental Protection Agency, Fourth Five-Year Review Report for Homestake Mining Company Superfund Site, September 2016.

[20] *Id.* Appendix G-2.

[21] Kathy Helms, "Official: Dilution Helps Reduce Uranium Mill Contamination", *Gallup Independent*, May 5-6, 2018.

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IV. Acoma Concern: Spread of Contamination

Acoma has grave concerns regarding the potential for the spread of contamination from polluted aquifers to the San Andres-Glorieta aquifer, a primary domestic water source for the region; a complete TI Waiver is inappropriate. Remediation of the primary source contaminants and the groundwater must be required.

The restoration of contaminated ground waters is a primary objective of the Superfund and Resource Conservation and Recovery Act ("RCRA") Corrective Action programs.[22] Remedial alternatives must: 1) be protective of human health and the environment; and 2) "the remedy must meet (or provide the basis for waiving) [applicable or relevant and appropriate requirements] for the action."[23]

The primary focus must be on the "engineering perspective" of the technical feasibility to achieve cleanup. The cost should not be a major factor, unless inordinately costly.[24] Guidance further states that cost, "is subordinate to that of ensuring protectiveness [,]" and the determination of inordinate cost, "must be determined based on the particular circumstances of the site." Further, "relatively high restoration costs may be appropriate in certain cases, depending on the nature of the contamination problem and considerations such as the **current and likely future use of ground water**."[25]

In addition, the restorative timeframe is a subordinate factor in a requested TI waiver. There is no single timeframe in which restoration must be achieved to be considered technically practicable. While very long timeframes may be indicative of remedial constraints, the EPA must establish "TI decisions on an overall demonstration of the extent of such physical constraints at a site, not on restoration timeframe analyses alone."[26]

First, Homestake's requested TI Waiver Evaluation makes conclusions about the impracticability of remediation of the primary source of contaminations (the tailings piles and secondary sources) and the remediation of contaminated groundwater. The TI Waiver Evaluation lists several reasons to justify the impracticability of remediation of the primary and secondary source contaminants.[27] The reasons include: 1) Cost Prohibitive; 2) Additional Risk to Human Health; 3) Potential Ecological Damage; 4) Potential Damage to Cultural Resources; 5) Potential Impacts from Increased Traffic; 6) Potential Regulatory Challenges; 7) Carbon Footprints; and 9) Potential Impacts to Community.[28]

Acoma takes the position that Homestake has not sufficiently demonstrated that remediation of the primary source and secondary sources are technically infeasible from an engineering perspective. Instead, the primary reasons described are primarily policy considerations. As an

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[22] Guidance for Evaluating the Technical Impracticability of Ground-Water Restoration, United States Environmental Protection Agency (Sep. 1993).
[23] *Id.* at 9
[24] *Id.* at 10 (citing the National Contingency Plan preamble).
[25] *Id.* at 19 (emphasis added)
[26] *Id.* at 16.
[27] Draft Technical Impracticability Evaluation, at 45.
[28] *Id.* at ES-4

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example, it is inconceivable that "potential regulatory challenges" described as "siting studies, public hearings, and environmental reports [...]" should be an impediment towards the engineering feasibility to remove the primary and secondary sources. Further, federal processes to consider the potential impacts and alternatives towards any federal undertaking exist to address purported impracticability reasons to the environment, human health, and cultural resources. This is the primary reason for federal statutes and reviews under the National Environmental Policy Act and the National Historic Preservation Act and should not be considered as a factor of infeasibility.

While costly, Homestake has not demonstrated that the estimated costs ranges from $1.8 billion to $2 billion are inordinately costly or have such an unusual magnitude to be excessive for this type of removal. This should **not** be a primary factor in considering the engineering feasibility of its removal. So long as the primary and secondary sources remain present, there is a continued threat for further contamination and its removal should be required. Because of the continued impact, which the primary and secondary sources may have to ground water, "high restoration costs may be appropriate in certain cases, depending on the nature of the contamination problem and considerations such as the current and likely future use of the ground water."[29] The sheer magnitude of millions of tons of contaminants justifies the cost here, and should not be considered inordinate. Further, **all** water in the Bluewater basin must be considered as likely to be used in the future due to the continued water shortages faced by communities within the Basin.

The Homestake TI Waiver Evaluation makes conclusions about the technical impracticability of remediation of the groundwater. A primary reason for all five remedial alternatives is because of data demonstrating water remediation "would have to occur for centuries (Uranium = 210 years; and Molybdenum = 360 years) making groundwater restoration impracticable based on required excessively long duration for remediation."[30] This is primarily the case for the down gradient contamination plume. However, Alternatives GW3 through GW5 "are considered effective technologies for providing long-term effectiveness and permanence at addressing groundwater contaminated with [Contaminants of Primary Concern/and Radionuclides of Potential Concern,]"[31] and can be achieved in comparably shorter amounts of time, ranging between a few decades among the alternatives.

Remediation of ground water should be achieved wherever possible. According to the Guidance for Evaluating the Technical Impracticability of Ground-Water Restoration, a primary goal of protectiveness should consider that:

> Potentially drinkable water would be cleaned up to levels safe for drinking throughout the contaminated plume, regardless of whether the water was in fact being consumed...[.] Alternative levels protective of the environment and safe for

[29] Guidance for Evaluating the Technical Impracticability of Ground-Water Restoration, at 19.
[30] *Id.* at ES-5
[31] *Id.* at 66.

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other uses could be established for ground water that is not an actual or reasonably expected source of drinking water.[32]

Remediation should not be considered an all or nothing approach. The restoration of water is a primary remediation goal regardless of whether the water is reasonably expected to be used or not. The challenge of total remediation should not be used to discount alternatives that result in achievable remediation for only parts of the contaminated groundwater. A requested TI waiver can be narrow in scope and not preclude restoration of some of the contaminants present in the groundwater.[33] Therefore Acoma supports the selection of alternatives that will continue to remediate available groundwater.

V. Acoma Concern: Depletion of the San Andres-Glorieta aquifer

Acoma remains concerned about the continued depletion of the San Andres-Glorieta aquifer, which has historically and is presently being mined to meet present uses. As a senior water user in the Basin, the continued depletion of the San Andres-Glorieta aquifer is a grave threat to Acoma, as depletions have caused and will continue to cause damage to the water supply that the Pueblo has relied on for a millennia, and must rely on into the future for future generations.

As discussed earlier, in 2009 Acoma protested Homestake's *Applications to Change Well Location and Drill Supplemental Wells in the Bluewater Underground Water Basin,* due to the Pueblo's concern about the insufficient availability of San Andres-Glorieta aquifer water and the potential for contamination of the primary freshwater source in the region. While Acoma can appreciate the need for the increased pumping for remediation purposes, Acoma cannot idly stand by without raising concerns about the continued depletion of an increasingly limited water supply. The reality is the alluvial and Chinle formation groundwater will face several decades, if not centuries, of potential contamination, but will sacrifice the limited availability of San Andres-Glorieta aquifer water to improve the condition of the alluvial aquifer. The depletion of the San Andres-Glorieta aquifer is inextricably tied to the uranium industry's decades of pumping, and Homestake remains to be a major water pumper in the aquifer.

If the United States does agree to grant even a limited waiver of Homestake's clean up responsibilities prior to the expected transfer of site to the Department of Energy Legacy Management, as was done for ARCO/Bluewater mill site, and is in process for the Ambrosia Lake/Rio Algom site, then United States should acquire not only the perpetual liability, but also the water rights assets of Homestake so they might fulfill the nation's trust responsibility to protect the Pueblos' senior right to water flowing to Horace Springs. Therefore, an agreement should be entered into, or a condition should be placed upon the transfer of title of the Homestake site to the Department of Energy that would transfer Homestake's water rights to the United States.

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[32] Guidance for Evaluating the Technical Impracticability of Ground-Water Restoration, at 1 (citing the Preamble to the Proposed Subpart S to 40 CFR 254.)

[33] *See generally*, Guidance for Evaluating the Technical Impracticability of Ground-Water Restoration, at 12 (Section 4.4.1 Specific ARARs or Media Cleanup Standards and Section 4.4.2 Spatial Extent of TI Decisions).

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VI. Conclusion

At the end of this century, archaeologists will have estimated the Acoma people will have lived atop Acoma and in this region for over a thousand years. While the end of this century may seem far off, that will be within the lifetimes of current Acoma children and grandchildren. Based upon the estimated times for remediation to occur, the impacts of contaminants from the Homestake mine will still be felt, and of continued concern for them. Acoma strongly urges the board to consider this in making its determination. And to require the remediation of the primary source contaminants and the groundwater and continued maintenance of the hydraulic barrier.

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Message

From: Meyer, John [Meyer.John@epa.gov]
Sent: 6/16/2021 3:10:06 PM
To: Atkins, Blake [Atkins.Blake@epa.gov]; Purcell, Mark [purcell.mark@epa.gov]
Subject: FW: Homestake NRRB Recommendations
Attachments: Homestake NRRB Recommendations Final.pdf

This sets in motion an expectation for a written response in approximately 6 weeks. Please keep me in the loop during this timeframe and if Wren needs to request additional time I would like to make that request in advance of the expected due date. Thanks.

John C Meyer
Chief, Superfund Remedial Branch
Region 6

Office (214) 665-6742
Cell (214) 460-5897

From: Poore, Christine <Poore.Christine@epa.gov>
Sent: Tuesday, June 15, 2021 3:49 PM
To: Stenger, Wren <stenger.wren@epa.gov>; Douchand, Larry <Douchand.Larry@epa.gov>
Cc: Stalcup, Dana <Stalcup.Dana@epa.gov>; Lowery, Brigid <Lowery.Brigid@epa.gov>; Fitz-James, Schatzi <Fitz-James.Schatzi@epa.gov>; Meyer, John <Meyer.John@epa.gov>; Atkins, Blake <Atkins.Blake@epa.gov>; Purcell, Mark <purcell.mark@epa.gov>; Villarreal, Chris <villarreal.chris@epa.gov>; Luzecky, Hollis <Luzecky.Hollis@epa.gov>; McKernan, John <McKernan.John@epa.gov>; Openchowski, Charles <openchowski.charles@epa.gov>; Mahmud, Shahid <Mahmud.Shahid@epa.gov>; Wharton, Steve <Wharton.Steve@epa.gov>; Wilson, Karl <Wilson.Karl@epa.gov>; Walker, Stuart <Walker.Stuart@epa.gov>; Richards, Jon M. <Richards.Jon@epa.gov>; Bartenfelder, David <Bartenfelder.David@epa.gov>; Juett, Lynn <Juett.Lynn@epa.gov>; Gartner, Lois <Gartner.Lois@epa.gov>
Subject: Homestake NRRB Recommendations

Dear Wren and Larry,

On behalf of the National Remedy Review Board (NRRB), attached are Board Review Teams' recommendations from the review of the Homestake Superfund Site Feasibility Scoping Meeting.

The review meeting, held March 25-26, 2021, addressed the site characterization, background, remedial action objectives, preliminary remediation goals, and remedial alternatives for the tailings piles and groundwater. We greatly appreciate the dedication, time, and resources the Region put into developing the site materials, information package, and presentations.

The Board Review Team looks forward to the Region's responses to the recommendations and engaging further when the site reaches the Detailed Alternatives Analysis stage. If you, or anyone on the team, have any questions, please don't hesitate to call or email. Thank you for the opportunity to engage with the Regional Site Team on Homestake Mine.

Thank you,
Christine Poore

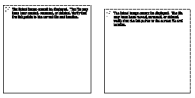
Message

From: Meyer, John [Meyer.John@epa.gov]
Sent: 3/11/2021 6:29:18 PM
To: Atkins, Blake [Atkins.Blake@epa.gov]; Purcell, Mark [purcell.mark@epa.gov]
Subject: Fwd: NMED National Remedy Review Board submittal - Homestake Mining Company
Attachments: 2021-03-10 - WPD Homestake NRRB comments (Final).pdf

FYI

John C Meyer
Chief, Superfund Remedial Branch
Region 6

Office (214) 665-6742
Cell (214) 460-5897



Begin forwarded message:

From: "Stenger, Wren" <stenger.wren@epa.gov>
Date: March 11, 2021 at 12:27:50 PM CST
To: "Meyer, John" <Meyer.John@epa.gov>
Subject: FW: NMED National Remedy Review Board submittal - Homestake Mining Company

FYI email from Rebecca

WREN STENGER
DIRECTOR, SUPERFUND AND EMERGENCY MANAGEMENT
EPA REGION 6 DALLAS, TEXAS
214.665.6583

From: Roose, Rebecca, NMENV <Rebecca.Roose@state.nm.us>
Sent: Thursday, March 11, 2021 11:25 AM
To: Hartstebbins, Maggie, NMENV <maggie.hartstebbins@state.nm.us>; Kerster, Courtney, GOV <Courtney.Kerster@state.nm.us>; Gray, David <gray.david@epa.gov>; Stenger, Wren <stenger.wren@epa.gov>
Cc: Vollbrecht, Kurt, NMENV <kurt.vollbrecht@state.nm.us>; Kathryn Becker <kathryn.becker@state.nm.us>
Subject: FW: NMED National Remedy Review Board submittal - Homestake Mining Company

Courtney, Maggie, David and Wren,

I hope this finds you well. NMED's comments to the National Remedy Review Board on the Homestake Superfund Site are attached. We submitted them through Region 6 staff yesterday. You are all copied on the cover letter.

Please feel free to reach out to me if you have any questions.

Best regards,

Rebecca

Rebecca Roose
Director, Water Protection Division
New Mexico Environment Department
Mobile: (505) 670-6852
rebecca.roose@state.nm.us
https://www.env.nm.gov/water/
Innovation, Science, Collaboration, Compliance

From: Vollbrecht, Kurt, NMENV
Sent: Wednesday, March 10, 2021 6:56 PM
To: 'Purcell, Mark' <purcell.mark@epa.gov>
Cc: Becker, Kathryn, NMENV <kathryn.becker@state.nm.us>
Subject: NMED National Remedy Review Board submittal

Hi Mark,

Please find attached comments from NMED regarding the upcoming National Remedy Review Board (NRRB) meeting on March 25, 2021. Also attached is a PowerPoint presentation for discussion purposes during the time allotted to present and discuss NMED comments with the NRRB.

NMED appreciates EPA's attention to this important matter.

Let me know if you have any comments.

Thanks.

Please note new phone number below

Kurt Vollbrecht, Manager
Mining Environmental Compliance Section
Ground Water Quality Bureau
New Mexico Environment Department
1190 St. Francis Dr., Suite N2200
Santa Fe, NM 87502
(505) 660-9420
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Michelle Lujan Grisham
Governor

Howie C. Morales
Lt. Governor

James C. Kenney
Cabinet Secretary

Jennifer J. Pruett
Deputy Secretary

March 10, 2021

Christine Poore
National Remedy Review Board Chair
U.S. Environmental Protection Agency
1200 Pennsylvania Ave., NW, MC5204P
Washington, DC 20460

Re: NMED comments to the National Remedy Review Board on EPA's Proposed Plan for Homestake Mining Company Superfund Site, CERCLA # NMD007860935

Dear Ms. Poore:

The New Mexico Environment Department (NMED) appreciates Environmental Protection Agency (EPA) National Remedy Review Board (NRRB) attention on the Homestake Mining Company Superfund Site (Site). The NRRB review of the Site continues EPA's excellent efforts over the past few years to conduct a strong, science-based evaluation of the Site to inform critical decisions about future remediation efforts.

NMED's comments address the scope of the forthcoming Feasibility Study and the remedial alternatives. In addition, this letter summarizes NMED's position on the effectiveness of remedial efforts to date, the importance of background groundwater quality determinations, and how the Site is befitting of a regional approach. NMED provides recommendations for alternatives for EPA to consider as part of the Feasibility Study to ensure that the requirements of State law are met and that the sole source of drinking water for multiple communities and private well owners is protected for future generations. We also convey NMED's regulatory position on Institutional Controls, Alternative Abatement Standards, and Monitored Natural Attenuation.

Sincerely,

Jennifer Pruett Digitally signed by Jennifer Pruett
Date: 2021.03.10 14:59:00 -07'00'

James C. Kenney
Cabinet Secretary

Attachment (1)

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Mark Purcell, Superfund Remedial Project Manager, EPA Region 6
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Maggie Hart Stebbins, New Mexico Natural Resources Trustee
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New Mexico Environment Department Comments to
the National Remedy Review Board on the Homestake Mining Company Superfund Site
March 10, 2021

Outline

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A. Regulatory Overview

The Homestake Mining Company Superfund Site (Site) has a long and complex regulatory history. The State of New Mexico provided regulatory oversight of uranium milling operations at the Site following transfer of oversight of the radioactive materials license to the NM Environmental Improvement Division (the precursor to NMED) from the Atomic Energy Commission in 1974. NMED maintained oversight of that license until 1986 when New Mexico transferred oversight and agreement state status for uranium mill licensing to the Nuclear Regulatory Commission (NRC). Pursuant to the Water Quality Control Commission (WQCC) Regulations,[1] NMED issued a groundwater discharge permit (DP-200) for the Homestake Mill Site in 1984. DP-200 remains in effect today and was most recently renewed in 2014.

HMC submitted a Groundwater Corrective Action Program (GCAP) to NRC to address groundwater remediation at the Site following transfer of uranium mill licensing from New Mexico to NRC. The GCAP was approved by NRC in 1989 under Radioactive Materials License SUA-1471 with review and comment by EPA and NMED. Since that time the remedial action continues pursuant to the 1989 GCAP and subsequent license amendments under NRC oversight. HMC submitted two subsequent GCAPs to the NRC, in 2006 and 2012, which EPA and NMED have reviewed but NRC has not approved. HMC developed a GCAP in December 2019 as a response to a Confirmatory Order issued by NRC on March 28, 2017 (Radioactive Materials License SUA-1471, Condition 44). HMC submitted an updated GCAP to NRC in November 2020 in response to NRC comments on the 2019 GCAP. While NRC action on the November 2020 GCAP is pending, the 1989 GCAP remains in effect.[2]

In 1983, EPA listed the Site on the Superfund National Priorities List at the request of the State of New Mexico. Under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), the site is divided into three Operable Units: OU1 -Tailing seepage and contamination of groundwater aquifers; OU2 - Mill decommissioning, surface soils, and tailing reclamation; and OU3 - Radon concentrations in neighboring subdivision. EPA signed the Record of Decision (ROD) for OU3 in 1989 with the final selected remedial action being No Further Action.

[1] WQCC Regulations for Ground and Surface Water Protection, 20.6.2 New Mexico Administration Code.
[2] Eventually, after all closure and remediation efforts are completed in accordance with the NRC license, NRC will transfer the Site to Department of Energy Legacy Management (DOE-LM) for long-term care.

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NRC and EPA have primacy over remediation efforts at the site, with NRC taking a lead role pursuant to a 1993 Memorandum of Understanding between the two federal agencies. In 2012 EPA announced that it would proceed with compiling the information necessary to issue RODs for OU1 and OU2. EPA has continued with the CERCLA process for OU1 and OU2, notwithstanding that the remedial investigation and remediation efforts have been underway for many years pursuant to the GCAP and NRC license. HMC has received EPA approval of the Remedial Investigation and has provided a draft Feasibility Study (FS) to EPA and NMED for review and comment.

B. History of Remediation Efforts

Efforts by HMC to contain and remediate contaminated groundwater at the Site have been ongoing since the mid-1970s, beginning with extraction and injection to maintain plume containment and slowly evolving to include extraction, injection, evaporation, and active treatment beginning in 1999. HMC began injecting water from the San Andres-Glorieta Aquifer (SAG) into the San Mateo Creek Alluvial Aquifer in 1977 to attempt to maintain hydraulic containment of the contaminated alluvial groundwater near and downgradient of the tailing impoundments. From 1977 until 1990 the primary strategy for remediation was hydraulic containment with dilution resulting from injection of potable water from the SAG. Although contaminated groundwater that was extracted during the active milling operations was processed in the mill for uranium removal, the waste stream from the mill discharged to the unlined tailing impoundments and subsequently back into groundwater. Significant expansion of HMC's injection line locations away from the tailing impoundments from 1977 through 2005 suggests the containment strategy was an ineffective patchwork of attempts to limit the spread of groundwater contamination. In 1990, coincident with cessation of milling operations, HMC constructed the first evaporation pond to dispose of contaminated groundwater. HMC added a second evaporation pond in 1996 to provide more disposal capacity to manage the volume of contaminated groundwater that the company was extracting. HMC then added a third evaporation pond in 2010 to dispose of highly contaminated groundwater that was being extracted and brine reject from a reverse osmosis (RO) treatment system.

From 2000 to 2012, in order to further manage an increased volume of extracted, contaminated groundwater, HMC land-applied contaminated groundwater blended with water from the SAG to meet site standards. HMC considered land application necessary to prevent further expansion of the groundwater plumes and stated this in the 2012 Corrective Action Plan submitted by HMC to NRC for approval. The need for land application of contaminated groundwater was the direct result of a lack of active treatment capacity and evaporative capacity to manage contaminated groundwater that was being extracted. The temporary permission granted by NMED to HMC for land application in 2012 required HMC to conduct an evaluation of treatment alternatives to replace land application of contaminated groundwater. Land application ceased in 2012 after NMED indicated it would not provide further approval of this activity. NRC did not take an active role in regulatory oversight of land application of contaminated groundwater over the 12-year period.

Although HMC states in the December 2020 draft FS that groundwater remediation efforts have been ongoing for over 40 years, it was not until 1999 that active treatment of contaminated groundwater was initiated when a 300 gallon per minute (gpm) RO treatment system began operation. In 2002, the RO treatment system capacity was increased to 600 gpm, but only operated at approximately 65% design capacity the first year. By 2004 the RO treatment system efficiency was reduced to approximately 50% of design capacity, and from 2005 through 2015 the system never operated above 50% design capacity.

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In 2012, NMED engaged in negotiations with HMC to renew groundwater discharge permit 200 (DP-200). Although NRC, not NMED, was the lead agency for groundwater remediation, permit conditions in the 2014 DP-200 renewal provide a framework for HMC to accelerate groundwater remediation efforts. This included permit conditions for testing and implementing new treatment technologies, to implement upgrades to the existing 600 gpm RO treatment system to achieve maximum steady state design throughput, and to provide a schedule for expansion of RO treatment system capacity. DP-200 also includes a permit condition that authorizes construction of additional ponds to increase evaporative capacity.

By 2016, HMC had doubled RO treatment system capacity to 1200 gpm, tested and constructed a 300 gpm zeolite treatment system, and subsequently constructed an additional 1200 gpm zeolite system to treat contaminated groundwater at the site to remove uranium. Despite these increases in treatment capacity, continued technical and engineering design setbacks at the Site have limited the volume of contaminated water HMC is treating. Limitations on treatment system throughput include undersized and inefficient RO pre-treatment systems, limitations in evaporative capacity to manage RO brine reject, and operational failures including piping malfunctions, algal blooms in the zeolite system, and liner failure in the collection and evaporation ponds. Treatment rates from the RO and zeolite treatment systems, which never reached capacity, steadily decreased from a combined maximum of approximately 900 gpm in 2016 to approximately 450 gpm in 2019. While NMED acknowledges that it is unrealistic to expect the RO and zeolite treatment systems to operate at 100% of design capacity, the data reflects ongoing failure by HMC to operate the system anywhere near maximum treatment capabilities.

Potable water from the SAG has been used extensively throughout the history of the containment and remediation efforts at the site. Beginning in 1977, water from the SAG was used for hydraulic containment by injection into the alluvial aquifer to reverse the gradient of groundwater flow back towards the tailing impoundment. Significant volumes of water from the SAG have also been used to dilute contaminated groundwater to meet site cleanup standards for land application and for injection to reverse groundwater gradients to drive contaminated water towards extraction wells. NMED included language in the 2014 DP-200 permit renewal intended to limit the use of SAG water solely for dilution of contaminated groundwater. Annual SAG water usage ranged from 400 million gallons to over 700 million gallons between 2000 and 2015 and dropped significantly following construction of additional RO and zeolite treatment capacity in 2016. Total SAG water usage for this twenty-year period, approximately half the time period of HMC groundwater withdrawals associated with the Site, is nearly nine billion gallons. Although the SAG is a highly productive aquifer, water levels have dropped significantly through the years and HMC has played a significant role in mining groundwater from the SAG. HMC maintains groundwater withdrawal in accordance with their water rights allocations.

In summary, while HMC has claimed to have made significant efforts to remediate contaminated groundwater aquifers at the site over the past 40 years, and further claims that achievement of state groundwater standards is not possible based on projection of past treatment efforts into the future, NMED maintains that HMC's efforts to date have never been optimized. For many years the remediation efforts operated with minimal to no treatment capacity and the strategy was more focused on dilution and containment rather than contaminant mass removal. Active treatment systems at the Site were non-existent prior to 1999 and have rarely operated at more than 50% capacity since construction and operation.

As explained in further detail below, NMED strongly believes that groundwater remediation would acheive greater success if all active treatment systems were operated at full capacity for extended periods of time, or if active treatment systems were expanded.

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C. San Mateo Creek Basin Overview and Regional Context

The Site is located at the nexus of widespread impacts from legacy uranium mining and milling in the San Mateo Creek Basin (SMCB). Historic uranium mine dewatering and uranium mill discharges into Arroyo del Puerto from the Ambrosia Lake area to the north of the Site and mine water discharges into San Mateo Creek from the northeast have contaminated groundwater upgradient of the Site. This contaminated groundwater has traveled south in the San Mateo Creek Alluvium from the confluence with the Arroyo del Puerto and is likely responsible for elevated contaminant concentrations in wells such as DD, ND, P, and Q that were among those used to establish Site cleanup standards under the NRC license. Discharges from the HMC tailing impoundments have resulted in significant groundwater contamination beneath and downgradient of the Site. This groundwater contamination has comingled further downgradient with contamination from the Bluewater Mill site within the Rio San Jose Alluvial Aquifer. The SAG subcrops beneath the Rio San Jose Alluvial Aquifer, which means groundwater contamination in the Rio San Jose Alluvial Aquifer threatens the SAG and other downgradient users and aquifers.

<u>It is imperative that the NRRB understand that the SAG is the sole remaining potable groundwater source in the lower part of the SMCB and is currently being used as a public water supply by the Village of Milan, the City of Grants, the Pueblo of Acoma, and by numerous private well owners.</u> HMC has injected billions of gallons of water from the SAG and treated water over the past 40+ years to maintain a groundwater mound across the San Mateo Creek Alluvial Aquifer to reverse the groundwater gradient back towards the tailing impoundments. This hydraulic containment zone has effectively created a plug in the bottom of a funnel that holds impacted groundwater from decades of mining and milling discharges in the SMCB. Cessation of Site groundwater remediation efforts and elimination of this containment could have dire consequences for the remaining potable water sources in the region.

D. Background Groundwater Quality

The current site cleanup standards established in the NRC license in 2006 were based on an analysis by HMC of upgradient groundwater conditions in the San Mateo Creek Alluvial Aquifer. Both NMED and EPA participated in review of the HMC background groundwater analysis prior to formalization of the site cleanup standards in the NRC license, which selected 0.16 mg/L uranium as the background level. The high uranium background concentrations established in the NRC license as site cleanup standards for the various aquifers were strongly influenced by one alluvial well (well DD) with high concentrations of uranium located on the extreme west side of the San Mateo Creek Alluvial Aquifer. Up to 90% of the cross-sectional area of the San Mateo Creek Alluvial Aquifer directly upgradient of the Site has uranium concentrations less than the drinking water Maximum Contaminant Level and WQCC groundwater standard of 0.03 mg/L. Despite this a background uranium concentration of 0.16 mg/L has been selected for the entire extent of the San Mateo Creek Alluvial Aquifer and the portions of the Rio San Jose Alluvial Aquifer contaminated by Site discharges.

Over the past several years, HMC, NMED, EPA, and consultants hired by Bluewater Valley Downstream Alliance/Multicultural Alliance for a Safe Environment carried out extensive investigations to further evaluate groundwater background chemistry at the Site. NMED worked closely with EPA during 2019 and 2020 to conduct a thorough evaluation of available data and conducted detailed geochemical modeling to accurately identify background groundwater chemistry upgradient of the Site. The preliminary results of these investigations demonstrate that the high levels of uranium in groundwater on the extreme west side of the San Mateo Creek Alluvial Aquifer upgradient of the Site is most likely a

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result of both historic mine water discharges and HMC's injection and extraction activities. More recent NMED analysis of background groundwater chemistry for the Chinle aquifers reveals further evidence that the background levels set in the 2006 NRC license are not based on the best available science. The 2006 background analysis included data from wells that did not exhibit stable trends or were in locations that suggest they had already been impacted by Site groundwater contamination resulting from mixing with contaminated San Mateo Creek Alluvial groundwater through subcrops.

Geochemical modeling, evaluation of groundwater water chemistry trends, and water level trends strongly suggest that mine water discharge from wet mines, operating from 1956 to 1982 in the upper portions of the SMCB, likely flowed over the ground surface to areas in proximity to well DD. This is a contributing factor to the high uranium concentrations in alluvial groundwater along the far western portion of the alluvial groundwater system.

In addition, manipulation of the San Mateo Creek Alluvial Aquifer by HMC over several decades, as a component of the remedial efforts at the Site, has resulted in a rising water table that has also played a role in the high uranium concentrations at well DD. Additional leaching of nitrate, selenium, sulfate, and other contaminants from the vadose zone is occurring as mine water discharges have infiltrated and mixed with native alluvial groundwater north of the Site. The NRRB should also note that investigation of the San Mateo Creek Alluvial Aquifer in the area of the Site in 1960 after just a few years of operation of the Homestake Mill showed significantly less saturation. At that time, the Large Tailing Impoundment was not yet constructed in its current configuration, and a groundwater mound had potentially been created from releases of water to the subsurface from the Small Tailing Impoundment. In large part, the alluvial aquifer that HMC is attempting to remediate has been greatly expanded in saturated thickness and areal extent due to a combination of discharges from HMC milling operations and remediation efforts. Modeling done by HMC as a component of the draft Technical Infeasibility (TI) Evaluation Report suggest that the natural flow path of groundwater in the San Mateo Creek Alluvial Aquifer is to the west, with little to no southward flow.

Uranium and selenium will remain mobile as alluvial groundwater recharges the Chinle Formation aquifers. With successful remediation of the San Mateo Creek Alluvial Aquifer, dilution and groundwater mixing should decrease dissolved concentrations of uranium, selenium, nitrate, and other contaminants in the Chinle aquifers. Molybdenum concentrations are below the WQCC standard of 1.0 mg/L in the alluvium and it is precipitating as the mineral powellite (calcium molybdate), which is an example of monitored natural attenuation.

Efforts to characterize the nature and extent of contamination from mine water discharges to the groundwater systems upgradient of HMC are underway pursuant to CERCLA, including investigation of the San Mateo Creek Alluvial Aquifer in the Central Study Area. This characterization work is being conducted by three potentially responsible parties (PRPs) including HMC, Rio Algom Mining LLC, and United Nuclear Corporation. These PRPs signed an Administrative Order on Consent with EPA in November 2019 to conduct a remedial investigation of groundwater impacts in the lower SMCB immediately upgradient of the Homestake Superfund Site. These PRPs operated wet mines in the SMCB that discharged mine dewatering water to Arroyo del Puerto and San Mateo Creek.

In summary, while joint efforts to identify new proposed background concentrations are ongoing, the NMED and EPA evaluation of the San Mateo Creek Alluvial Aquifer suggests the natural background of dissolved uranium was likely less than 0.05 mg/L prior to mine water discharges and HMC operations at the Site. The uranium concentration of 0.16 mg/L currently set as the site cleanup standard for the San Mateo Creek Alluvial Aquifer under the NRC license is reflective of impacts from the mine related

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discharges and Homestake activities mentioned above, and only applies to groundwater entering the Site on the far western margin. In general, other contaminants of concern for the Site follow this same pattern and uranium contamination is the driver for cleanup efforts. Natural background groundwater chemistry is important due to both a consideration of the Site relative to the CERCLA action being undertaken for the Central Study Area, and a consideration of groundwater flow paths and the extent of saturation at the time milling operations at the Site began. Revisiting background concentrations is also a critical factor for future EPA decision-making about the Site remedy in order to protect the SAG for present and future generations. NMED requests that site cleanup levels be reestablished by EPA to more accurately reflect recent analysis of background water quality and groundwater flow paths.

E. Scope of Feasibility Study

HMC provides a review and comparison of several remedial action alternatives in a December 2020 draft FS that has been submitted to EPA and NMED for review and comment. NMED has performed a preliminary review of the draft FS for preparation of this document for the NRRB process. Following more substantive review of the draft FS, NMED will provide detailed written comments to EPA.

OU2 (mill decommissioning, surface soils, and tailing reclamation): NMED is confident that remediation of the existing surface facilities will be adequately addressed through attainment of NRC license requirements that include capping the tailing impoundments to ensure no surface exposure to radioactive material and other contaminants in the tailing impoundments. The cover system required will also reduce percolation of precipitation into the underlying tailing materials to limit future release of contaminants from the tailing into the subsurface. The engineering controls being proposed are well-tested and likely to provide for long-term protection of human health and the environment from surface exposure. NMED agrees that placement of an engineered cover over the existing tailing along with restricting access is an appropriate remedial strategy for the Mill decommissioning, surface soils, and tailing reclamation operable unit.

OU1 (tailing seepage and contamination of groundwater aquifers): The issue of primary concern for NMED is identification of the proper long-term approach to remediate groundwater contamination that has migrated beyond the NRC license boundary and impacted multiple aquifers at the Site. Groundwater remediation strategies must ensure long-term protection of the SAG. The SAG is the primary water source in the region, and the sole remaining aquifer in the lower SMCB that contains potable water. Modeling alone is not protective, and predictive modeling over a period of hundreds of years is not a reliable means to ensure long-term protection.

In addition to the No Action and the Monitored Natural Attenuation alternatives, the draft FS includes three alternatives for OU1 based on operation of the existing remedial system for varying lengths of time. HMC argues that there are several technical considerations that are crucial to these remedial alternatives. Primary among those considerations put forth by HMC is that the Large Tailing Pile (LTP), the contaminated vadose zone, and alluvial system beneath the tailing impoundments will continue to discharge contaminants for hundreds of years, and that there is currently no available technology that can address the ongoing sources of contamination in the vadose zone and alluvial system beneath the LTP within a reasonable time frame. Following placement of a final cover system on the tailing impoundments, drain down of tailing pore water will become negligible over time. The remedial alternatives evaluated by HMC in the draft FS all propose to cease active pumping of contaminated groundwater within 18 to 50 years. HMC argues that because of the contaminant source that exists beneath the LTP, none of these alternatives will provide long-term protection of human health and the environment once the pumping systems are shut off.

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For each of the proposed alternatives in the draft FS for OU1, protection of human health and the environment following shutdown of the remediation system extraction and injection wells is reliant on two factors: institutional controls and groundwater monitoring. Institutional controls would be maintained in perpetuity over a suggested Technical Infeasibility (TI) waiver area of approximately 5700 acres (9 square miles). The limits of the expansion of groundwater contamination following cessation of pumping activities is determined through groundwater modeling. Protection of human health and the environment outside the suggested TI waiver area is dependent on the accuracy of the groundwater modeling and long-term groundwater monitoring.

NMED questions whether the predictive model results for OU1 can be used to ensure long-term protection of groundwater resources. The modelling effort that provides a prediction 200 years into the future is calibrated using less than 20 years of data. In order to have confidence in the results of this type of groundwater model, predictions should be limited to a time period not to exceed two to three times the length of the calibration period. NMED acknowledges that the HMC model is well-calibrated; however, the validity of the predictive model is questionable for multiple reasons. In particular, the calibration period has different stresses (i.e., changes in pumping and extraction rates and locations) and the current system used for calibration has potentially different boundary conditions and hydrologic properties than those likely to exist during the predictive period. In such a case, NMED asserts that EPA, NRC and others must exercise caution when making long-term decisions based on the data provided.[3] Long-term monitoring and monitored natural attenuation provide a "hope for the best" approach that is simply unacceptable to NMED.

As mentioned in Footnote 2, DOE-LM assumes responsibility for long-term monitoring and maintenance of uranium mill sites. DOE-LM's mandate does not include requirements or funding to remediate groundwater contamination outside of the long-term care boundary. The Bluewater Mill Site is one such site where groundwater contamination exists outside of the long-term care boundary and DOE-LM has limited means to address this contamination. In addition, there is no apparent consideration for future land use for the area being proposed for a TI waiver by HMC. Much of the land within this area was historically productive farmland. HMC states in the draft TI waiver report that they own 74% of the land within the proposed TI waiver area, but the bulk of the land not owned by HMC lies within residential subdivisions with individual homeowners. The negative impact on the quality of life of those individuals who wish to remain in their homes while being surrounded by a TI waiver area subject to federal control is likely to be substantial.

Given the potential for contamination to migrate downgradient to the Rio San Jose Alluvial Aquifer and to areas where the SAG and other aquifer systems exist, coupled with the uncertainties associated with modeling and monitored natural attenuation, NMED urges EPA to expand the FS scoping to include all of the following.

1) Evaluate alternatives that include pump and treat to reduce existing groundwater contamination in the San Mateo Creek Alluvial Aquifer that is present outside of the NRC license boundary to contaminant levels below those determined to be naturally occurring by NMED and EPA pursuant to ongoing geochemistry analysis by both agencies. Treatment to lower contaminant levels reduces the reliance on modeling to demonstrate long-term protection of downgradient aquifers including the SAG.

[3] Ahmed Hassan, "A Validation Process for the Groundwater Flow and Transport Model of the Faultless Nuclear Test at Central Nevada Test Area." Submitted to Nevada Site Office National Nuclear Security Administration, U.S. Department of Energy, Las Vegas, Nevada (January 2003).

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2) Evaluate alternatives that create a hydraulic capture zone through groundwater extraction within the license boundary, coupled with achievement of groundwater standards in the San Mateo Creek Alluvial Aquifer outside of the license boundary. This alternative contemplates active capture to maintain long-term hydraulic containment of ongoing sources beneath the tailing impoundment instead of injection of potable water to create a groundwater mound. Maintaining long-term hydraulic capture through extraction will significantly reduce the strain on remaining potable water sources in the region and eliminates the reliance on modeling to demonstrate long-term protection of downgradient aquifers including the SAG.

3) Consider long-term pump and treat options beyond 50 years to maintain containment of groundwater contamination within the current NRC license boundary. Evaluation of long-term pump and treat systems should include consideration for providing treated water for industrial or other uses to offset previous, current, and future use of the SAG. Long-term containment of contaminated groundwater across the San Mateo Creek Alluvial Aquifer at the Site will also significantly reduce the risk posed by upgradient contamination from legacy mine and mill discharges in the SMCB.

   It is not an unusual requirement for groundwater treatment to extend for a period of 100 years or more to address contaminated groundwater contamination from mine operations. The Chino Mine and Tyrone Mine, both copper mines in southwest New Mexico, are required to construct and operate treatment systems for a minimum of 100 years to contain contamination associated with mine operations and the open pit capture zone. The Questa Mine Superfund Site in northern New Mexico is subject to similar requirements for long-term groundwater containment and treatment. Financial assurance is in place to cover costs associated with these long-term containment strategies, and the net present value of the long-term costs to reclaim and remediate these sites are similar to or greater than those predicted for the Site by HMC in the draft FS. Numerous other examples exist of mine sites in the western United States with requirements for long-term water treatment beyond 50 years.

4) This is the appropriate time to evaluate a regional approach to the disposition of the Site relative to other legacy uranium mining and milling impacts. The Site sits at the nexus of basin wide impacts as discussed above and the future remediation strategy should be evaluated in a basin wide context. A treatment system is in place and the Site activities are currently preventing downgradient migration of groundwater contaminated by legacy mining and milling activities towards potable water supplies. HMC is one of the PRPs associated with the upgradient contamination that has likely also impacted the Site. Future remedial strategies for the Site will directly impact remedial strategies for both upgradient and downgradient contamination, and ultimately any solution needs to consider the comingled impacts.

F. NMED'S Regulatory Position

In conjunction with all the technical comments above, NMED points to several relevant provisions that support the State's regulatory position for future remedial action at the Site.

i. Institutional Controls

NMED disagrees with alternatives that contemplate institutional controls (ICs) to determine future use of groundwater in New Mexico. NMED opposes the use of ICs for such purposes for several reasons.

ICs should be a supplement to, not a substitute for, active remediation. ICs can serve a useful purpose in certain circumstances, but that purpose is a narrow one. ICs are appropriate as a temporary measure where groundwater has become contaminated and despite active abatement measures it will take a significant period of time to abate that groundwater contamination until it meets standards. However, once remediation cleanup goals are achieved, the ICs would be removed. Likewise, ICs might be used where groundwater has become contaminated and the WQCC has approved alternate abatement standards after determining that achieving standards is technically infeasible. In these narrow circumstances, it makes sense to try to restrict access to that water through ICs imposed by the New Mexico Office of the State Engineer (OSE) or other government agency having such authority.

Furthermore, the use of ICs is problematic due to the following: 1) ICs often do not work[4]; 2) ICs often are not enforceable[5]; and 3) ICs are contrary to the purposes of the WQA, which dictates active response measures for cleaning up groundwater and institutional controls are not a substitute for active remediation.

Despite the shortcomings with ICs, they can be helpful in limiting access to contaminated groundwater while abatement is ongoing. NMED has consistently used ICs only for implementing cleanup requirements under the WQA and other New Mexico laws. In New Mexico, groundwater is a public natural resource and not private property.

ii. Alternate Abatement Standards

The WQA and the WQCC Regulations require that all groundwater in the State with a concentration of less than 10,000 mg/L of total dissolved solids is protected, except in the rare instance where the discharger can demonstrate that certain locations are not places of withdrawal of water for present or reasonably foreseeable future use. The WQCC Regulations expressly provide for alternate abatement standards under certain circumstances. 20.6.2.4103.F NMAC. Should HMC decide to pursue alternate abatement standards, HMC would file a petition with the WQCC.

iii. Monitored Natural Attenuation

Inorganic contaminants persist in the subsurface and are not degraded or destroyed by natural attenuation processes (a major component for considering MNA) and continue to migrate. Therefore, the State of New Mexico does not consider monitored natural attenuation to be an active remedial approach for metal contaminants in groundwater. As previously stated, HMC is considering an exceptionally large area for a TI waiver to accommodate monitored natural attention. The approach relies on a long-term modeling effort to demonstrate long-term protection of human health and the environment. This is not an acceptable approach to ensure protection of New Mexico's precious groundwater resources. Moreover, when relying on natural attenuation processes for site remediation, EPA prefers processes that degrade or destroy contaminants. Also, EPA generally expects that monitored natural attenuation will only be appropriate for sites that have a low potential for contaminant migration and the plume is shrinking or stable. Decreasing concentrations in the groundwater plumes should not be solely the result of plume migration and dilution. The NRRB should note that monitored natural attenuation is not a "presumptive" or "default" remediation alternative, but rather should be fully evaluated and compared to other viable remediation methods (including other innovative technologies) during the FS phase leading to the selection of a remedy (see OSWER Directive 9200.4-17P).

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[4] *See, e.g.,* Government Accountability Office, *Hazardous Waste Sites: Improved Effectiveness of Controls at Sites Could Better Protect the Public* (GAO 05-163 Jan. 2005).
[5] Id. at page 33.

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G. Conclusion

In closing, NMED appreciates EPA Region 6's close coordination with the State over the past few years to develop a greater shared understanding of the physical characteristics of the Site, including background uranium concentrations, and evaluating alternative remedial options for the Site. NMED thanks the National Remedy Review Board and EPA Region 6 for taking these comments into consideration for Feasibility Study scoping, the Proposed Plan, and ROD development for OU1 and OU2.

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Message

From: Purcell, Mark [purcell.mark@epa.gov]
Sent: 6/15/2021 9:28:57 PM
To: Governor Brian Vallo [Governor@poamail.org]; 1st Lt. Governor Raymond J. Concho, Jr. [1st_lt@puebloofacoma.org]; 2nd_lt@poamail.org; Interpreter@poamail.org; CVandiver@poamail.org; Ann Berkley Rodgers [abr@chestnutlaw.com]; Aaron M. Sims [ams@chestnutlaw.com]; Jacob Wilson [JWilson@poamail.org]; Franklin Martinez [FMartinez@poamail.org]; dmartinez@poamail.org; tcouncilpoa@gmail.com; Francine Torivio [administration@poamail.org]
CC: Turner, LaDonna [turner.ladonna@epa.gov]
Subject: FW: Homestake NRRB Recommendations
Attachments: Homestake NRRB Recommendations Final.pdf

Dear Governor Vallo and other representatives of the Pueblo of Acoma,

Please find attached the EPA National Remedy Review Board (NRRB) recommendations on the Homestake NPL Site CERCLA Feasibility Study.

We are providing these recommendations to all stakeholders that participated in the March 2021 NRRB meeting, as well as the U.S. Nuclear Regulatory Commission and the U.S. Department of Energy. We will also make them available to the public for review via EPA's site webpage.

EPA Region 6 will begin to review/assess these recommendations and prepare written responses to the NRRB over the next couple of months.

If you have any questions, please let me know.

Best regards,

Mark

Mark Purcell
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Message

From: Daniel Lattin [dlattin@barrick.com]
Sent: 3/10/2021 11:08:49 PM
To: Purcell, Mark [purcell.mark@epa.gov]
CC: Ellie Rudolf [EARudolf@hollandhart.com]; Kevin Murray (krmurray@hollandhart.com) [krmurray@hollandhart.com]; Michael McCarthy [mmccarthy@barrick.com]; Patrick Malone [pmalone@barrick.com]; Brad Bingham [bbingham@barrick.com]; Adam Arguello [aarguello@barrick.com]
Subject: GRP - Homestake Written Statement to NRRB
Attachments: 20210310 Homestake Written Statement to NRRB.pdf

Good Afternoon Mark,

Homestake hereby provides the attached written statement to the National Remedy Review Board. Please let me know if you have any questions.

Thank you,

BARRICK

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Written Statement to the National Remedy Review Board

Homestake Mining Company of California

March 10, 2021

Site Overview

Homestake Mining Company Superfund Site, also known as Grants Reclamation Project, (the "Site") is located in Cibola County, New Mexico, approximately 5.5 miles north of the Village of Milan. Homestake Mining Company of California (HMC), and others (through partnerships), operated the uranium processing mill at the Site from approximately 1958 to 1990. The mill historically supplied uranium primarily to the United States for weapon-making during the Cold War era. The Site consists of three operable units: groundwater aquifers (OU1); long-term tailings stabilization, surface reclamation and site closure (OU2); and radon concentrations in neighboring subdivisions (OU3). EPA issued a ROD for OU3 in September of 1989 requiring no further action. The focus of HMC's current work is OU1 and OU2, and as such, this memorandum is limited in scope to these operable units. The Site presently consists of the large tailings pile (LTP), small tailings pile (STP), reverse osmosis groundwater treatment system, zeolite groundwater treatment system, and multiple evaporation ponds.

Regulatory Oversight & Status

The Site is under the often-conflicting federal jurisdiction of the Nuclear Regulatory Commission (NRC), formally the Atomic Energy Commission (AEC), through the Uranium Mill Tailings Radiation Control Act (UMTRCA) and the Environmental Protection Agency (EPA) through the Environmental Response, Compensation, and Liability Act (CERCLA). In addition to the dual-federal regulation, the Site is subject to New Mexico State regulation under its Discharge Permit-200 (DP-200) by New Mexico Environment Department (NMED), as well as the State's participation as provided under CERCLA.

UMTRCA authorizes NRC to regulate byproduct material at uranium processing sites through production, reclamation, and disposal phases. AEC initially issued Source Materials License SUA-708 in 1958 to address uranium milling operations at the Site. From 1974 to 1986, the State, with delegated authority from NRC, regulated uranium milling operations at the Site (operating as what is known as an "Agreement State").

In 1983, EPA listed the Site on the National Priorities List (NPL) because of New Mexico's Agreement State status. EPA generally defers listing on the NPL sites subject to NRC licensing authority; however, this deferral policy does not apply to sites in "Agreement States" where NRC has delegated oversight authority to a state. New Mexico was an "Agreement State" until June 1, 1986 (after EPA listed the Site on the NPL). The Site remained on the NPL thereafter, putting it in the unusual position of being under NRC's direct oversight while also subject to EPA oversight as an NPL site even after the State relinquished its licensing authority.

In 1993, NRC and EPA entered into a memorandum of understanding (MOU) delineating each agency's responsibility in remediation activities. According to the MOU, NRC would take the "lead regulatory agency" role. EPA would monitor remedial and reclamation activities required by NRC and provide reviews and

comments directly to NRC. EPA would also have authority to "take whatever action it deems appropriate" "[i]n the event that EPA determines that the implementation of the site reclamation plan, closure activities, and/or groundwater corrective action has not resulted in, or may not result in, cleanup conditions that meet applicable or relevant and appropriate requirements."

The Site is presently undergoing reclamation, groundwater corrective action (with a Corrective Action Plan submitted November 13, 2020 and Alternate Concentration Limit (ACL) application forthcoming), and closure pursuant to NRC Source Materials License SUA-1471, as amended. The Site is further regulated by EPA as it meets its requirements under the National Contingency Plan (NCP), CERCLA's implementing regulations, to allow delisting from the NPL.

The Site's extensive regulatory oversight, particularly that of two different federal agencies and statutory schemes governing remediation, is a regulatory anomaly, and the reason for its occurrence is long gone. As explained, EPA listed the Site on the NPL because of New Mexico's status as an Agreement State with delegated authority from NRC. Like other Title II UMTRCA sites, had NRC never delegated its authority, the Site would not be listed on the NPL and would not be under EPA's CERCLA jurisdiction. Even though NRC resumed authority and New Mexico is no longer an Agreement State for the purposes of uranium mill tailings, the Site remains on the NPL. There is only one other site in the entire country caught by this particular regulatory limbo (Church Rock, New Mexico).[1] There is no substantive, legal justification for this dual regulation where all other similar Title II UMTRCA site are under the sole federal oversight of NRC. No unusual or extraordinary risks exist at this particular Site justifying additional oversight and dissimilar treatment from all other Title II UMTRCA sites. Despite this, HMC acknowledges its need to meet its CERCLA obligations in order to reach NPL delisting.

These jurisdictional conflicts between EPA and NRC reached an apparent impasse in 2012. At this time, EPA and NRC contemplated consecutive, as opposed to concurrent processes (including a potential license abeyance), which would have resulted in decades delay and uncoordinated oversight. As a result, HMC proposed to both agencies pursuing "CERCLA equivalency," a legal mechanism to harmonize the two federal processes. Under 40 CFR § 300.700(c)(3), "[a] private party response action will be considered 'consistent with the NCP' if the action, when evaluated as a whole, is in substantial compliance with the applicable requirements [of the NCP], and results in a CERCLA-quality cleanup." With equivalency, HMC seeks to simultaneously meet EPA's obligations under CERCLA while achieving its NRC obligations under UMTRCA. In practicality this means that HMC utilizes investigation, data gathered, and work performed for NRC (with EPA concurrence) under UMTRCA, supplementing as necessary to fill data gaps, to produce a CERCLA administrative record. Through this equivalency approach, the NRC process remains the lead, via the agencies MOU, but allows EPA to also achieve its goals parallel to the NRC actions without unnecessary redundancies. As both legal authorities oversee HMC's surface and groundwater remediation, the concurrent progression of these two regulatory processes is critical in order to ensure a consistent remedy and nonconflicting site standards.

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[1] Two sites are listed on the NPL as well as regulated by Agreement State Colorado (Umetco in Uravan, and Cotter Uranium Mill in Canon City). Their NPL listing (and consequently their EPA oversight) are consistent with EPA policy to list sites in Agreement States and are not subject to dual-federal agency oversight.

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To that end, HMC has prepared, in cooperation with EPA Region 6, the following CERCLA- and NCP-compliant documents:

- Remedial Investigation (RI) (including Human Health Risk Assessment; Conceptual Site Model; Baseline Ecological Risk Assessment) – approved by EPA June 15, 2020;
- Candidate Technologies Memorandum – submitted to EPA and acknowledged in Statement of Work (SOW) ¶ 19; and
- Entered into Administrative Settlement and Order on Consent (AOC) and corresponding SOW for preparation of a Feasibility Study (FS), including Technical Impracticability Waiver Evaluation Report (TI Waiver Report) – effective August 12, 2020. Under the AOC, HMC has submitted the following deliverables:
    - Draft Screening of Remedial Alternative Memorandum – revised version addressing EPA comments submitted to EPA, and EPA acknowledged satisfaction of SOW requirement on September 2, 2020;
    - Draft TI Waiver Report – submitted on Nov. 16, 2020 and awaiting EPA comment; and
    - Draft FS – submitted on Dec. 15, 2020 and awaiting EPA comment.

HMC seeks to continue its cooperative path with all agencies and appreciates its collaborative relationship with EPA. Recognizing the technological limitations, persistent contaminant sources, and hydrogeologic complexity all affect remediation efficacy of the Site contaminants, HMC is pursuing an ACL from NRC. Similarly, to move this Site to closure under CERCLA, a technical impracticability (TI) waiver of groundwater Applicable or Relevant and Appropriate Requirements (ARARs) is appropriate both from a technical standpoint and a CERCLA equivalency perspective to align these competing regulatory processes and arrive at a consistent remedial strategy that is protective of human health and the environment.[2] HMC continues to urge EPA, and particularly the NRRB, to approach Site decisions recognizing that HMC is diligently pursuing a parallel, equivalent, and protective process under NRC's implementation of UMTRCA.

History of Remediation

Surface

Under NRC oversight with review and consent from the EPA and NMED, between 1988 and 1993, HMC excavated windblown materials with elevated radium-226 concentrations in areas adjacent to the tailings piles and placed the soil on the piles. HMC removed surface soil from approximately 1,200 acres of land. This resulted in the cleanup of surface soils to an average radium-226 concentration of 1.11 pCi/g (standard deviation 1.05 pCi/g) for the inner zone of the cleanup area and 2.95 pCi/g (standard deviation 1.89 pCi/g) for the outer zone of the cleanup area, based on verification soil sampling that was biased high (ERG 1995).

Between 1993 and 1995, HMC, with each agencies' review and consent, decommissioned and demolished the mill facilities. HMC excavated an average of two feet of contaminated soil (containing elevated radium-226 concentrations) from mill area following the completion of demolition. Excavated soils were transported to the LTP and STP for burial. HMC stabilized the tailings piles by regrading and placing soil covers and rock on

[2] Of note, NMED has an analogous regulatory process known as an Alternative Abatement Standard (AAS). HMC has begun discussions with NMED as to its path to meet NMED's process as well, which may include reliance on HMC's TI waiver and/or ACL processes to avoid duplicative efforts.

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the side slopes for erosion protection. One foot of soil cover was initially placed on top of the LTP. Additional cover material was placed on top of the pile to fill in depressions caused by settlement, improve drainage, and address specific area with elevated radon flux measurements. Excavated areas were backfilled with alluvial soils, as well as rock for erosion protection.

HMC refers the Board to its draft FS for future discussion of planned surface remediation for OU2 as the remainder of this document focuses on HMC's groundwater remediation efforts.

Groundwater

Remediation and monitoring activities began around 1976 under applicable state and federal licenses and authorities. For over four decades, HMC has conducted extensive groundwater remediation, expanding and improving its remediation as follows:

- **1975 – HMC began providing bottled water to residents of nearby subdivisions upon request.**
- **1976 – HMC entered into agreement with NMEID to provide bottled water to residents located hydraulically downgradient of the source areas.**
- 1977 - Water is added into the alluvial aquifer to create a hydraulic barrier to limit the movement of contaminated groundwater.
- **1977-1983 - Multiple hydraulic extraction wells were installed in the alluvial aquifer.**
- 1984 - Hydraulic containment of the Upper Chinle aquifer was initiated.
- **1986 - Extension of the Milan water supply to the Broadview Acres, Felice Acres, Murray Acres, Valle Verde, and Pleasant Valley Estates subdivisions was initiated.**
- 1990 – Evaporation Pond EP-1 was constructed within the footprint of the STP to assist in the dewatering of the LTP and to hold water pumped from the collection wells.
- 1992 - Toe drains were installed around the tailings (LTP/STP).
- 1993-2000 - During this period, corrective action and monitoring well networks were revised through addition and abandonment of wells.
- 1994 - HMC completed bench-scale treatability testing for ion exchange and activated alumina.
- 1996 - Use of Evaporation Pond EP-2 began in March.
- 1999 - The reverse osmosis (RO) treatment unit was added; treated water is used for hydraulic containment of the alluvial aquifer.
- 2000 - Irrigation of 270 acres groundwater was initiated as a means to manage extracted groundwater. HMC began flushing program.
- 2000-2015 – Tailings flushing of the LTP was conducted where water was introduced into the LTP to expedite the mass flux of contaminants from the tailings.
- 2002 - 60 acres of irrigation area were added and added an additional RO skid to plant for increased treatment rate.
- 2002-2009 - During this period, corrective action, and monitoring well networks were revised through addition and abandonment of wells.
- 2004-2005 - 64 acres of irrigation area were added.
- **2006 - EPA, NMED, and NRC approved site groundwater standards.**
- 2010 - Evaporation Pond EP-3 was constructed and commissioned.
- 2012 - Land Application program ceased operation.
- 2012 - 300 gpm Zeolite pilot treatment started operation.

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- 2015 - RO Plant was expanded to a theoretical maximum throughput of 1200 gpm with the addition of a 600 gpm low pressure skid, a 250 gpm high pressure skid, and two microfiltration skids to replace the existing sand filters amongst other updates.
- 2016 - Zeolite system with a theoretical maximum throughput of 1200 gpm started operation for off-Site water treatment.
- 2016 - EPA initiated background reassessment study (USGS split sampling event).
- **2018 - HMC (Arcadis) borehole development and geophysics programs near wells DD and DD2 (Controls on Groundwater Background Constituent Concentrations due to Mineralogy Local to Monitoring Wells).**
- **2019 - In collaboration with EPA, HMC conducted additional field investigations to expand the characterization of the soils east of wells DD and DD2, across the alluvial channel (Supplemental Background Soil and Groundwater investigation Report Grants Reclamation Project).**

Path Forward: Technical Impracticability Waiver

After 40+ years of progressive remediation and investigation at the Site, it has become apparent that there are technical barriers to achieving groundwater ARARs. As required by its AOC with EPA, HMC submitted a Draft TI Waiver Report on November 16, 2020 for EPA's review, comment, and approval. HMC seeks to waive the following ARARs:

- **Safe Drinking Water Act**
  - **40 CFR § 141, Subpart B** – sets Maximum Contaminant Levels and non-zero Maximum Contaminant Level Goals.
  - **40 CFR § 192** – sets standards for the protection of public health, safety and the environment from radiological and non-radiological hazards associated with uranium and thorium ore processing, and disposal of associated wastes, including setting the standard for molybdenum.
- **New Mexico Water Quality Act, § 20.6.2.3103 NMAC** – sets state water quality standards.
- **10 CFR Part 40, Appendix A, Criterion 5B(5) (establishes concentration limits to be used for groundwater protection at uranium mill tailings sites)** – provides that "At the point of compliance, the concentration of that constituent in the groundwater must not exceed—(a) *The Commission approved background concentration of that constituent in the groundwater*; (b) The respective value given in the table in paragraph 5C if the constituent is listed in the table and if the background level of the constituent is below the value listed; or (c) An alternate concentration limit established by the Commission," which sets the standard for uranium as background.

Unlike almost any NPL site that has come before it, this Site benefits from 40+ years of extensive investigation, monitoring, and on-the-ground application of its remedial strategy. While other sites select remedies and make TI waiver determinations based on projection, HMC's draft TI Waiver Report and alternatives evaluation is based on the more than 40 years of groundwater remediation and investigation (applying an exhaustive list of remediation technologies: RO treatment, Zeolite treatment, ion exchange, in situ phosphate treatment, in situ bioremediation, amongst others), and conducting three treatability studies (Tripolyphosphate, Electrocoagulation, and In-situ biological treatment). EPA guidance distinguishes between "front-end" (those that are granted at the Record of Decision (ROD) stage and "back-end" (those that are granted subsequently after remedy implementation) TI waivers, suggesting a preference for "back-end" TI waivers once the remedy's efficacy is best understood. While the Site does not have a formal ROD, for all

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intents and purposes this is a back-end TI waiver. As mentioned and detailed above, HMC has remediated already for over four decades. Neither more time nor investigation will yield greater certainty.

HMC encourages the Board to review its draft TI Waiver Report for a detailed explanation of HMC's technical basis for a TI waiver. Distilled to its simplest form, modeling demonstrates that ARARs cannot be achieved in a reasonable timeframe. The 1st Order of Decay Analysis predicts 210 years for uranium and 360 years for molybdenum to achieve *present* cleanup standards. EPA, NMED, and NRC approved site standards for each constituent of concern (COC) in 2006 based on an evaluation of background water quality (HMC and HE 2003; HE 2001; ERG 2003; ERG 2002; ERG 1999). The standards were incorporated into the radioactive materials license via license amendment number 39 as groundwater protection standards and New Mexico DP-200. EPA expressed concern with background levels in 2013. Homestake has endeavored to resolve EPA concerns since, with renewed focus and extensive investigation beginning in 2018. HMC maintains that the current background levels, previously accepted by all agencies, are scientifically defensible and represent the natural heterogeneity of the alluvial aquifer. Regardless, HMC evaluated the technical impracticability of achieving the background levels established in 2006—if HMC cannot meet these cleanup levels, it surely cannot meet more stringent standards contemplated by EPA, making continued investigation into this issue moot. A decision to change background levels for the purpose of HMC's CERCLA cleanup unnecessarily runs contrary to the objective of achieving a parallel regulatory process with lead-agency NRC and could result in an inconsistent remedy and/or site standards—all without apparent benefit to protecting human health and the environment.

Ultimately, even if cleanup standards could be achieved, the result would be temporary and contamination to groundwater would continue after the groundwater treatment systems were shut off. HMC cannot remediate the primary sources (LTP and STP) or the secondary source (vadose and silt/clay in the alluvial aquifer beneath the LTP). The viability of moving the LTP has been sufficiently analyzed and determined to be impracticable. Most recently, Tetra Tech on behalf of HMC (Tetra Tech 2012), dismissed moving the LTP for the following reasons:

- **Additional risk to human health**: The potential risk to human health risk is significant. The increased cancer risk to workers involved with tailings excavation and placement is 1 in 10. The increased cancer risk to nearby residents is approximately 1 in 100 based on exposure to radioactive material.
- **Potential ecological damage**: Relocating tailings would require extensive amount of land that will be irretrievable committed for perpetuity as a disposal cell. Removal of habitat will potentially affect native wildlife and vegetation.
- **Potential damage to cultural resources**: Relocating tailings could negatively affect the large number of cultural resources in the area including federal and state parks and tribal lands.
- **Potential impacts from increased truck traffic**: Truck traffic to move tailings would be large and noticeable. This would include additional noise impacts, negative air quality, and potential for accidents and accidental releases. The potential impacts are not as great with rail, but increased activity would impact community and increase potential for traffic accidents and accidental releases.
- **Potential Regulatory Challenges**: Siting studies, public hearings, and environmental reports and preconstruction monitoring has been estimated to take up to seven years. The construction of cell has been estimated to take up to three years, and it has been estimated to take up to two years to move the LTP.
- **Carbon Footprints**: Offsite disposal would require greater use of consumable materials and fossil fuel and result in greater greenhouse emissions.

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- **Potential Impact to Community**: Construction at new site would result in negative noise and vibration impacts to residents and wildlife.
- **Cost prohibitive**: The estimated costs range from $1.8 billion (truck transport) to over $2 billion (rail and slurry pipeline transport).

Similarly, in 2009, U.S. Army Corps of Engineers (ACOE), on behalf of EPA, reviewed the remediation efforts at the Site, issuing a final report in 2010 (ACOE 2010). ACOE presented alternate strategies to the current groundwater restoration program, including relocation of tailings to an engineered landfill within 30 miles of the Site. ACOE concluded, "Relocation of the tailings should not be considered further by any means given the risks to the community and workers and the greenhouse gas emissions that would be generated during such work." EPA (EPA 2011) and NRC (NRC 2011) agreed with this recommendation. NMED supported EPA's recommendations by letter to NRC dated April 20, 2011 (NMED 2011).

Additionally, NRC considered moving the LTP in 1993, concluding based on the costs and benefits associated with the proposed reclamation options (reclamation in place, slurry relocation to the alternative offsite location, or conventional earthwork relocation to the alternative offsite location) that the additional costs of relocation outweighed any minor benefits that would result from relocation.

Not only is this primary source impracticable to remediate, HMC cannot remediate the secondary source (the vadose and silt/clay in the alluvial aquifer beneath the LTP) even if HMC could remove the LTP. COPCs/ROPCs have adsorbed to the unsaturated soil and diffused into the pore-water in the silt/clay, making groundwater restoration an unachievable goal.

Further, increased remediation system capacity will not overcome impracticability. The treatment rates used in the updated modeling efforts are approximately 50% higher than the peak annual average actually achieved onsite since the expansion of the treatment systems. Alternative 5 from the draft FS shows that even with the overly-optimistic assumption that 50 years of pumping removes all contamination in the mobile domain (coarse grained material)—a timeframe unsupported by the 1st order decay analysis or the groundwater model—the back-diffusion from the immobile domain (fine-grained material) and the continued seepage from the LTP would generate a new plume following cessation of remediation. As a result, ARARs would still be unattainable, a TI waiver would be needed, and groundwater access would need to be limited to ensure protectiveness resulting in the same remedy implementation regardless of remediation system capacity. The various alternatives analyzed in HMC's draft FS show that while concentrations within the footprint of the plume may vary, the footprint of the plume above background and/or a protective standard remains largely unchanged even if system capacity is increased.

Increased system capacity may even have negative consequences to water resources in the area. Historic groundwater remediation at the Site has evaporated approximately three billion gallons of water, the equivalent of three years of combined consumption from the nearby municipalities of Grants and Milan. Each additional year of remediation at the Site commits approximately 105 million gallons to evaporative loss in an arid desert region where total precipitation is typically less than 12 inches a year. While the groundwater within the TI zone may not be usable at its present concentrations, downstream beyond the TI zone will be a useable resource. Continued pumping and evaporation would remove billions of gallons, including useable groundwater, from the region's water supply entirely.

Ultimately, future remediation will not result in attainment of ARARs, and the measures needed to ensure protectiveness of human health and the environment remain the same regardless of continued remediation. HMC has already completed the following steps in order to protect potential receptors:

- **Land purchase**: HMC currently owns approximately 74% (4,200 acres of the total 5,700 acres) of the land within the LTC/TI Zone Boundary.
- **Alternative groundwater supply**: HMC has connected all residents in the neighboring subdivisions to municipal water.

Additionally, in 2009, NMED issued a Health Advisory, notifying private well owners of potential contaminant concentrations above federal drinking water standards, and in 2018, the Office of the State Engineer issued an Order restricting well drilling in the Alluvial and Chinle aquifers within an area where groundwater is impacted by historical uranium milling and mining activities.

As next steps, HMC proposes the following protectiveness and exposure control actions:

- Continued property acquisition;
- Water well abandonment;
- Point of use treatment if necessary; and
- Water use restrictions including restrictive covenants.

Together, these measures will protect human health and the environment.

Proposed Remedy

HMC refers the Board to its Draft FS, submitted December 15, 2020, for a detailed analysis of proposed remedial alternatives. Notably, each alternative does not achieve compliance with ARARs, and thus requires a TI waiver. In summary, based on the results of HMC's robust groundwater modeling and analysis in its draft TI Waiver Report, HMC proposes long-term monitoring coupled with application of the institutional controls detailed above. This remedial alternative will satisfy the threshold criteria:

- **Protectiveness of human health and the environment** – achieved through the institutional controls and confirmed through monitoring; and
- **Compliance with ARARs** – achieved through TI waiver.

Importantly, this alternative will be consistent with the NRC remedial strategy, including the proposed ACLs and established cleanup levels, and will finally make meaningful steps toward regulatory closure after decades of remediation and oversight.

Conclusion

Despite the apparent challenges from coordinating multi-federal agency oversight, neither designed to accommodate the other, HMC has developed a scientifically-supported remedial strategy that offers both an opportunity to protect human health and the environment and close the chapter on more than four decades of investigation, remediation, and use of regulatory resources. HMC appreciates Region 6's, and this Board's, support in achieving this common goal.

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Monthly Homestake Regulators Meeting/Call Agenda
Wednesday, June 2, 2021, 3:00 PM (EDT) (1:00 MDT), via MS Teams

- **HMC performance & general updates – All**
  - RO system & Zeolite system efficiency.
  - HMC Well Abandonment Plan, submission to OSE. Most wells abandoned. HMC figure showing LTP monitoring wells (attached). Agencies discussed on 3/3/21 the wells HMC proposes to keep. NRC sent 3/3/2021 e-mail to HMC on remaining LTP monitoring well locations.
  - HMC access for non-HMC SAG wells in vicinity of the GRP, NMED attempt to contact Tri-State. HMC has restricted DOE access to well 951 due to purge water issue.
  - HMC offers to landowners to purchase property.
  - NRC virtual inspection – [HYPERLINK "https://adamswebsearch2.nrc.gov/webSearch2/main.jsp?AccessionNumber=ML21096A200"] NOV conflicting SOPs.
- Combined RO and Zeolite (feed) rates:

2016: 859 gpm	2019: 474 gpm
2017: 803 gpm	2020: 383 gpm
2018: 742 gpm	

A 5% decrease in evaporative capacity due to reduced capacity of EP1 does not explain the recent decreases in groundwater treatment rates. 2019 could have been low due to drawdown. The treatment rates would have been significantly impacted while they were trying to lower EP1. However, they should still be able to operate around ~900 gpm (total) even with EP1 at reduced capacity. (see graphs below)

HMC License Amendment Requests (LAR) - NRC

- [HYPERLINK "https://adamswebsearch2.nrc.gov/webSearch2/main.jsp?AccessionNumber=ML20358A192"]
- [HYPERLINK "https://adamswebsearch2.nrc.gov/webSearch2/main.jsp?AccessionNumber=ML21112A051"]
- [HYPERLINK "https://adamswebsearch2.nrc.gov/webSearch2/main.jsp?AccessionNumber=ML20356A288"]
- [HYPERLINK "https://adamswebsearch2.nrc.gov/webSearch2/main.jsp?AccessionNumber=ML20225A280"]
- [HYPERLINK "https://adamswebsearch2.nrc.gov/webSearch2/main.jsp?AccessionNumber=ML21112A266"]
  - Upper Chinle well CF4, compromised, elevated water level and high contaminant concentrations
- [HYPERLINK "https://adamswebsearch2.nrc.gov/webSearch2/main.jsp?AccessionNumber=ML21032A306"]

- **ACL pre-submission audit July 15, 2021, as per HMC request**
  - ACL application expected Sept 30, 2021.

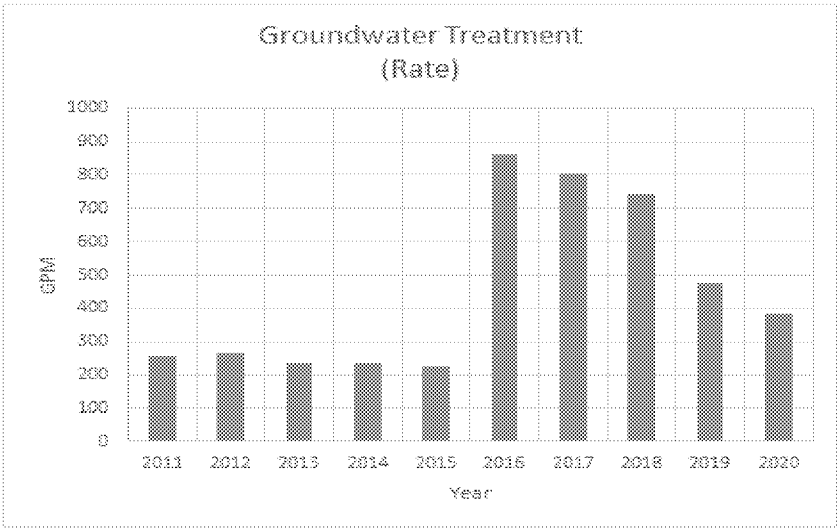
- **Well Sampling - NMED**
  - DOE/NMED Coop Activities, extension of agreement through 2022, sampling should occur in fall 2021. Well Construction Report for the BSAG wells? Status of DOE sampling of Chinle wells in the future.

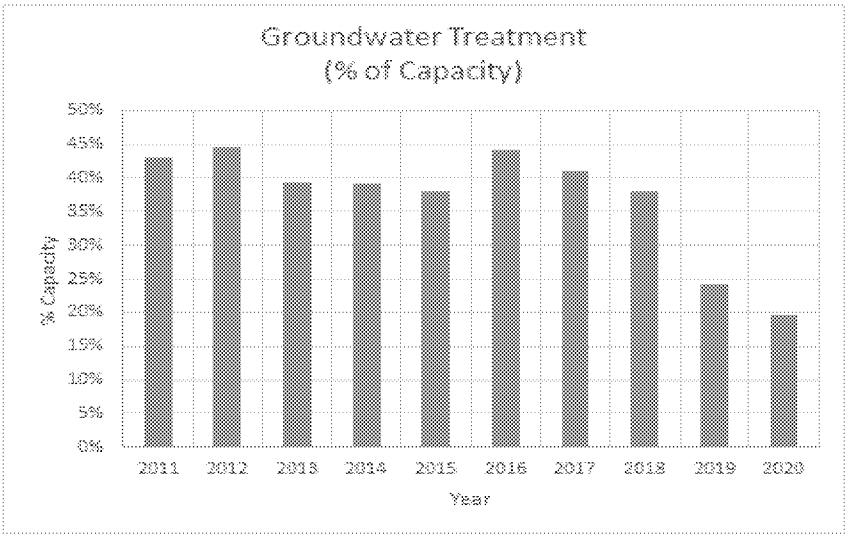
- **EPA/NMED**
  - NMED comments to the National Remedy Review Board on the Homestake site. NMED comments from secretary can be made public (ML21127A277).
  - Background study: [HYPERLINK "https://adamswebsearch2.nrc.gov/webSearch2/main.jsp?AccessionNumber=ML20269A458"]
    Mark: Floodplain, mine water from flooding impacting background & surface water impacting background.
  - HMC investigation of SAG subcrop SW of site. HMC indicated 3 alluvial wells & 2 SAG well complete, SAG w highly fractured bedrock @ SAG well locations. HMC investigation to be published soon.
  - TI Waiver – EPA provided NRC with Draft TI report & FS report. National remedy review process, meeting 3/25 & 3/26 might slow down the process. Want to look @ FS process from scoping phase, stakeholders & expectations, written comments, HMC & BVDA/MASE, tribes, comments that EPA RVI will need to address. Review of documents is continuing. NRRB comments mid-May likely.
  - EPA 5-year review, this is the 5th review for HMC. Stakeholder interviews by EPA.

- **Bluewater Activities - DOE**
  - [HYPERLINK "https://adamswebsearch2.nrc.gov/webSearch2/main.jsp?AccessionNumber=ML19081A121"]
  - [HYPERLINK "https://adamswebsearch2.nrc.gov/webSearch2/main.jsp?AccessionNumber=ML20066F283"]
  - [HYPERLINK "https://adamswebsearch2.nrc.gov/webSearch2/main.jsp?AccessionNumber=ML20259A314"]

- DOE & USACE future plans to repair tailing cell depressions, possible ET cover on repair area. DOE continues to work with ACE on project plans. [HYPERLINK "https://adamswebsearch2.nrc.gov/webSearch2/main.jsp?AccessionNumber=ML21106A244"]
- DOE public meeting May 5, 2021. [HYPERLINK "https://adamswebsearch2.nrc.gov/webSearch2/main.jsp?AccessionNumber=ML21132A317"]
- Discussion on 951 HMC well near BW site. Future next steps.
- Discussion on 951R SAG well sampling. HMC Annual Rpt shows continual sampling.

- **San Mateo Basin update**
- **HMC Annual Report**
  - [HYPERLINK "https://adamswebsearch2.nrc.gov/webSearch2/main.jsp?AccessionNumber=ML21090A190"]
- **Other items**
  - RIV 2017 NOV on Radon Flux – RIV responded, NOV withdrawn, unclear license condition
- **Next Call –Wednesday, July 7, 2021, @ 1:00 MT, 3:00 ET**



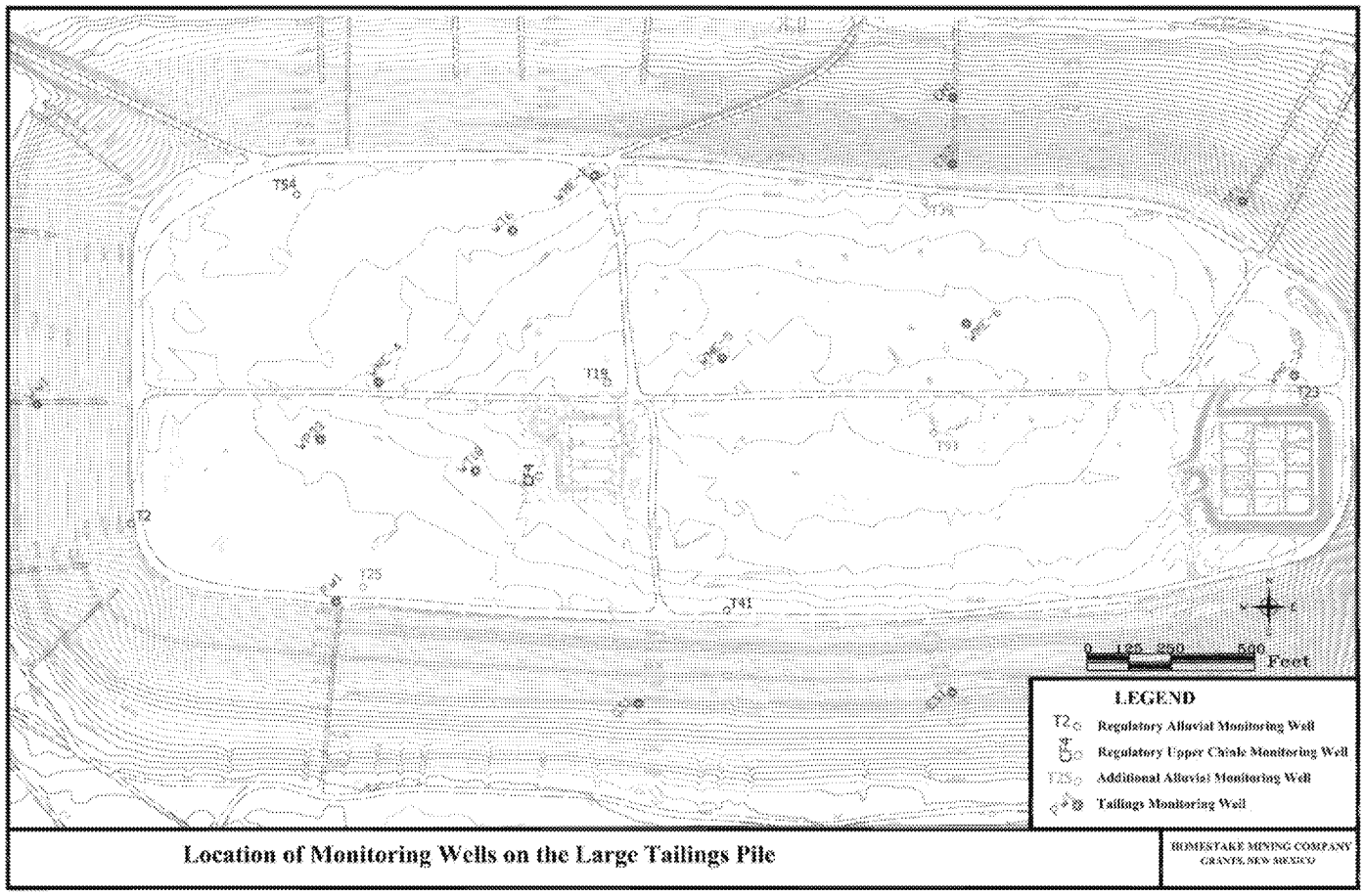


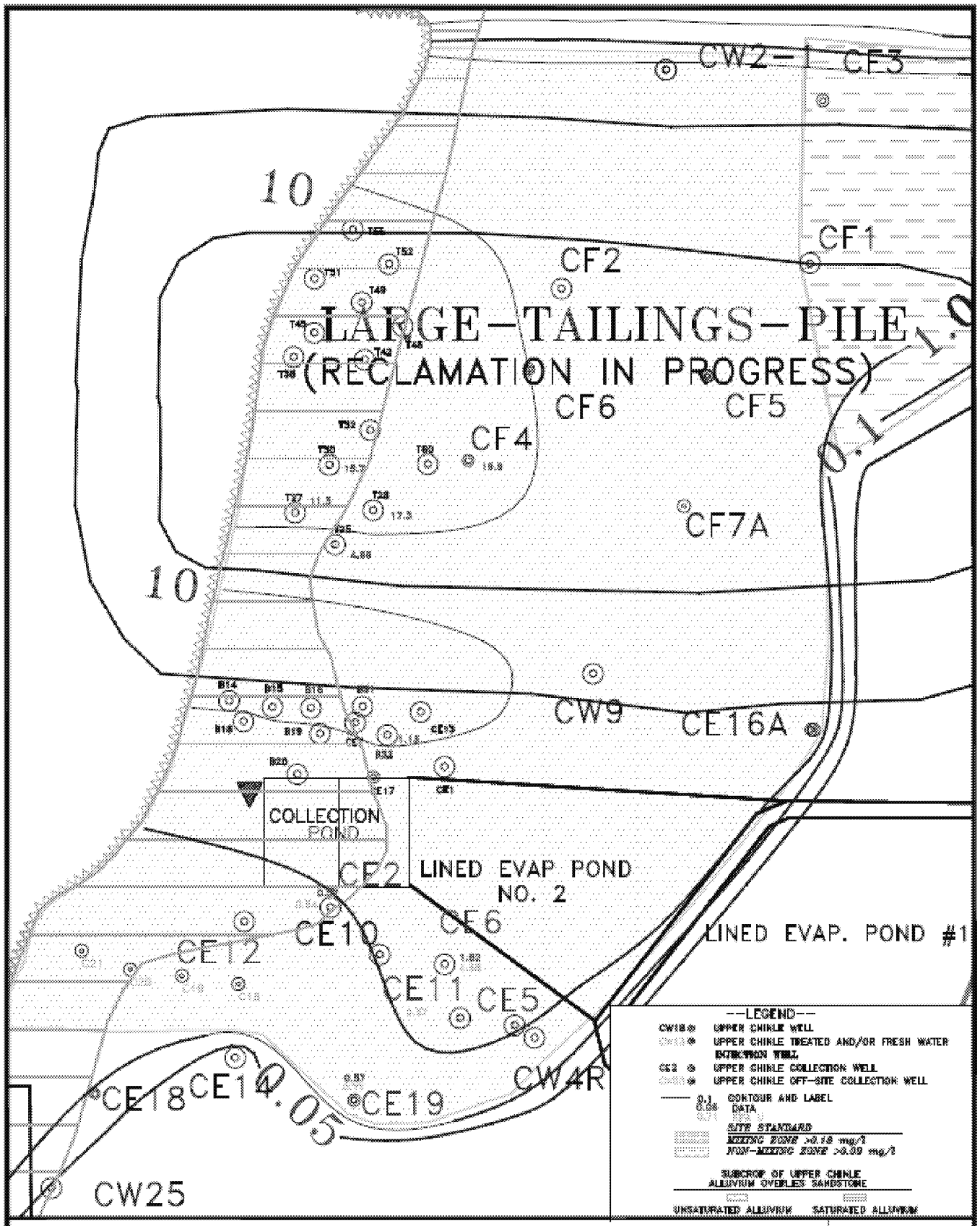
All,
During our recent discussion HMC was to provide a figure showing the tailings and alluvial wells that will remain for future monitoring (in addition to the regulatory monitoring wells). Please see attached figure indicating the tailings and alluvial wells that will not be included in the GRP LTP well plugging and abandonment project. Thanks.

Reginald Shirley | Project Engineer
Homestake Mining Company- Grants, NM
Mailing Address: PO Box 98, Hwy 605, Grants, NM 87020
Physical Address: 560 Anaconda Road, Route 605, Milan, NM 87021
[HYPERLINK "mailto:regishirley@barrick.com"]
Office: 1-505-287-4456 ext. 36 Fax: 1-505-287-9974
Mobile: +1-505-290-3195

Brad:
The regulatory agencies discussed the Alluvial, Chinle, and tailings wells on the LTP and the map Reggie provided (attached). We agree with the wells HMC has provided in the map to maintain on the site are acceptable for monitoring purposes. Based on the information from Adam Arguello today that Chinle well CF-4 is likely compromised, we suggest replacing CF-4 with both CF-5 and CF-6. Only one of these wells would be needed to add/replace in the NRC licensed monitoring program, but we would suggest maintaining both since they may be the same vintage as CF-4. If either CF-5 or CF-6 is compromised, there would be one Chinle well remaining beneath the LTP, hopefully.
Let me know if you have additional questions.

Ron C. Linton, Project Manager
U.S. NRC
phone 301-415-7777
[HYPERLINK "mailto:ron.linton@nrc.gov"]





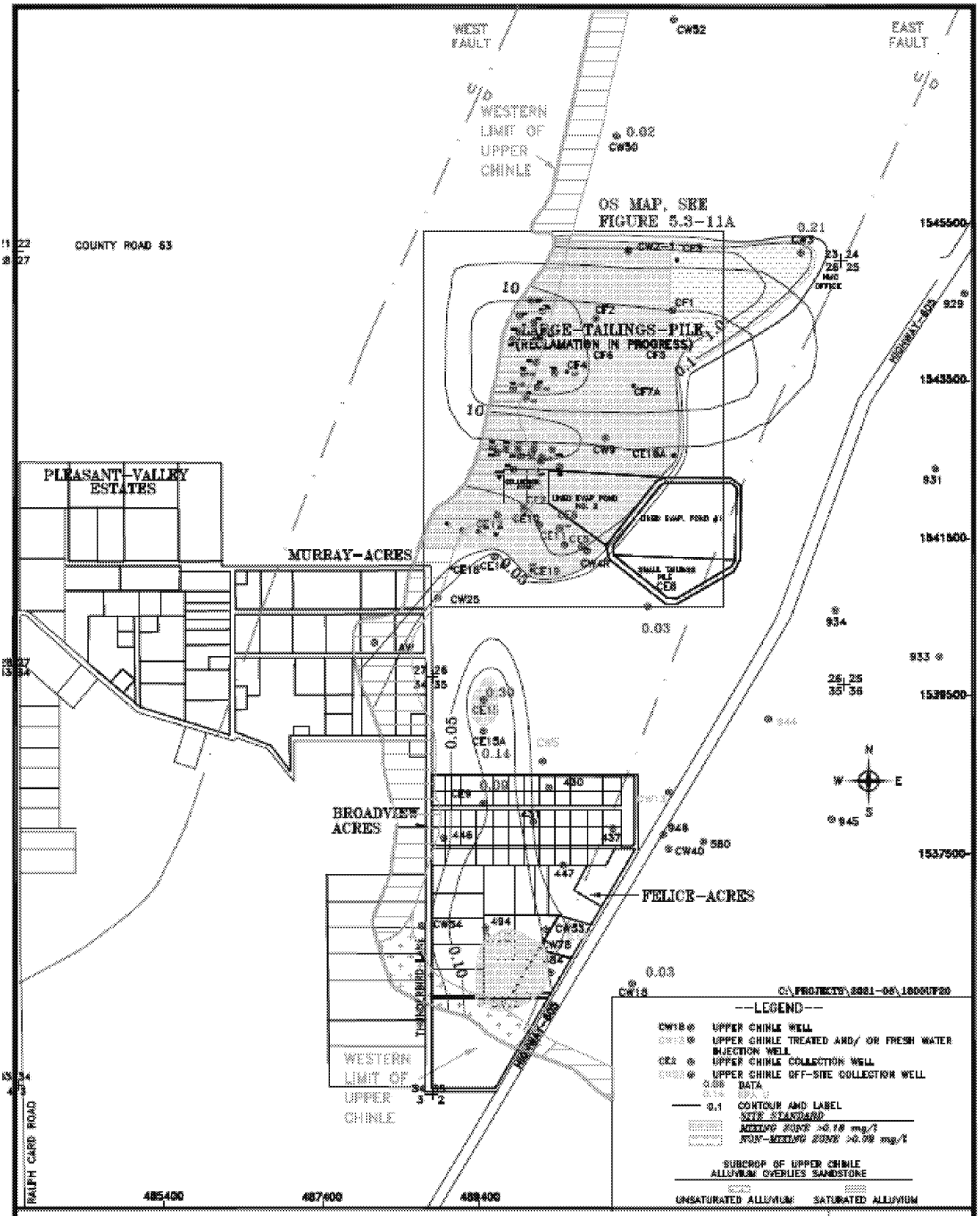
HOMESTAKE MILL AND ADJACENT PROPERTIES ~ GRANTS, NM ~ TOWNSHIP-11&12N, RANGE-10W

DATE: 3/11/2021

FIGURE 5.3-11A. URANIUM CONCENTRATIONS OF THE UPPER CHINLE AQUIFER, OS, 2020, mg/L

SCALE: 1"= 500'

PAGE: 5.3-25



HOMESTAKE MILL AND ADJACENT PROPERTIES ~ GRANTS, NM ~ TOWNSHIP-11&12N, RANGE-10W

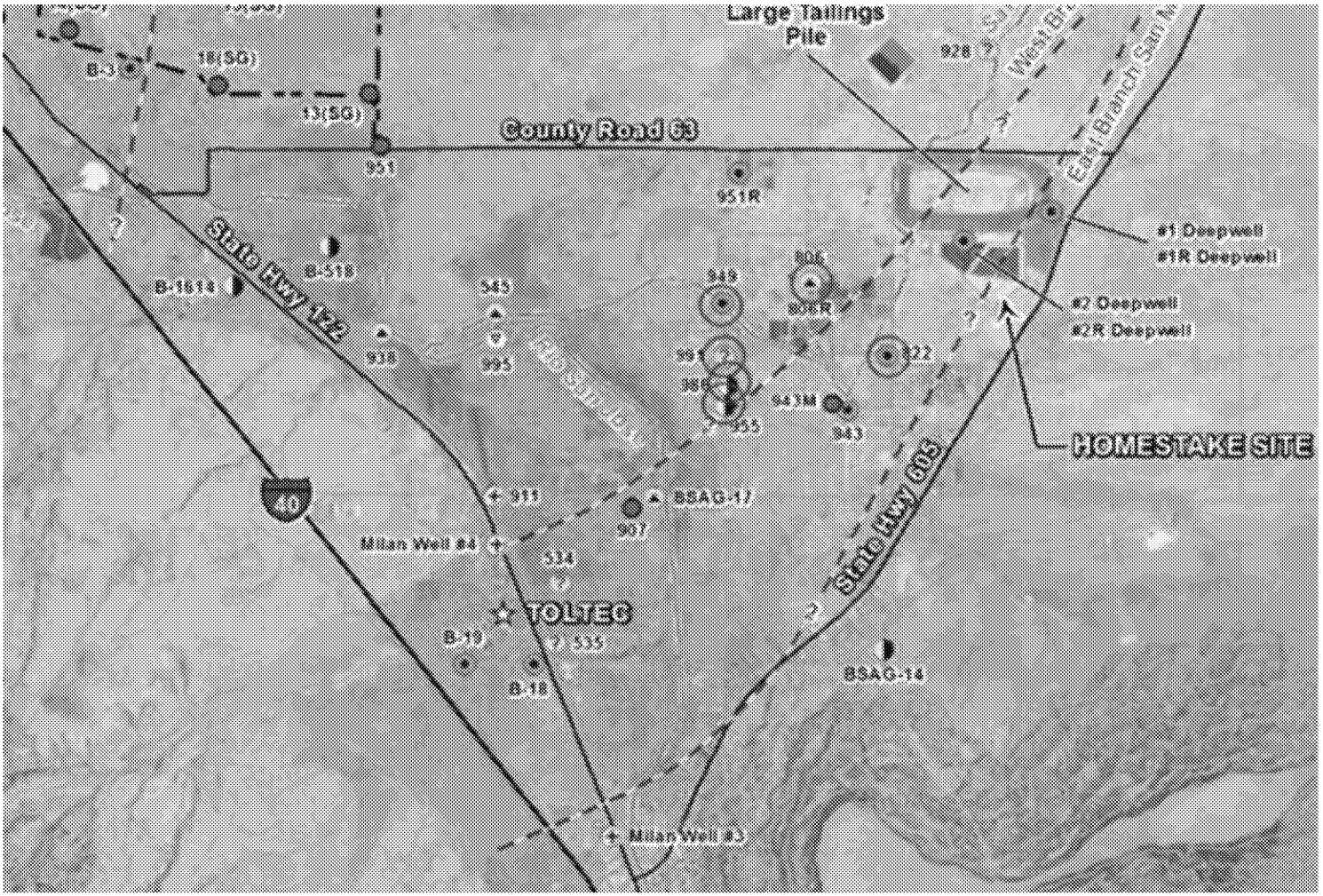
DATE: 3/2/2021

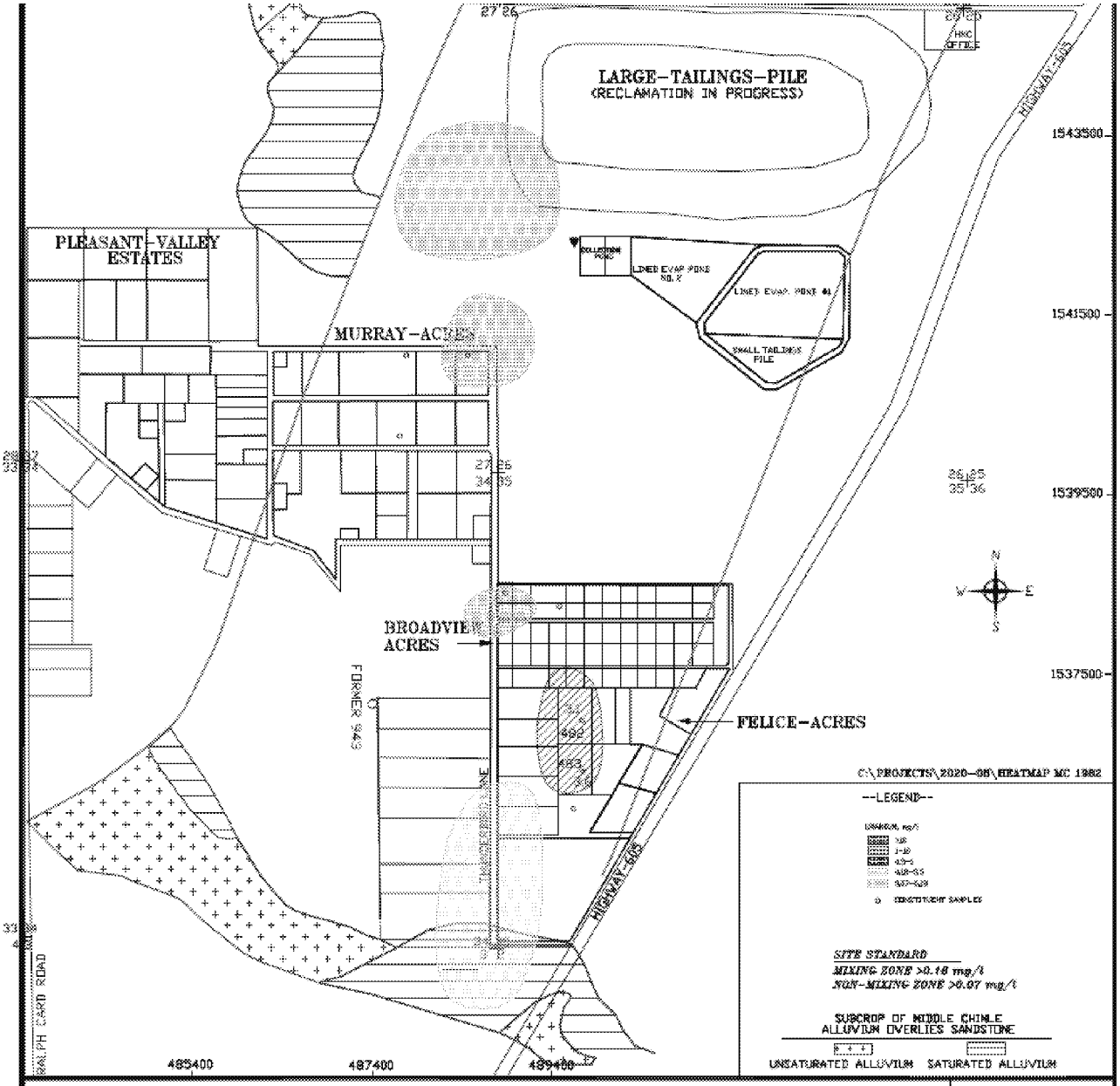
FIGURE 5.3-11. URANIUM CONCENTRATIONS OF THE UPPER CHINLE AQUIFER, 2020, mg/L

SCALE: 1"= 1000'

PAGE: 5.3-22

Adapted from draft figure from DOE of SAG wells in the vicinity of the HMC GRP. Red circles highlight the non-HMC wells that HMC is proposing to attempt to monitor.





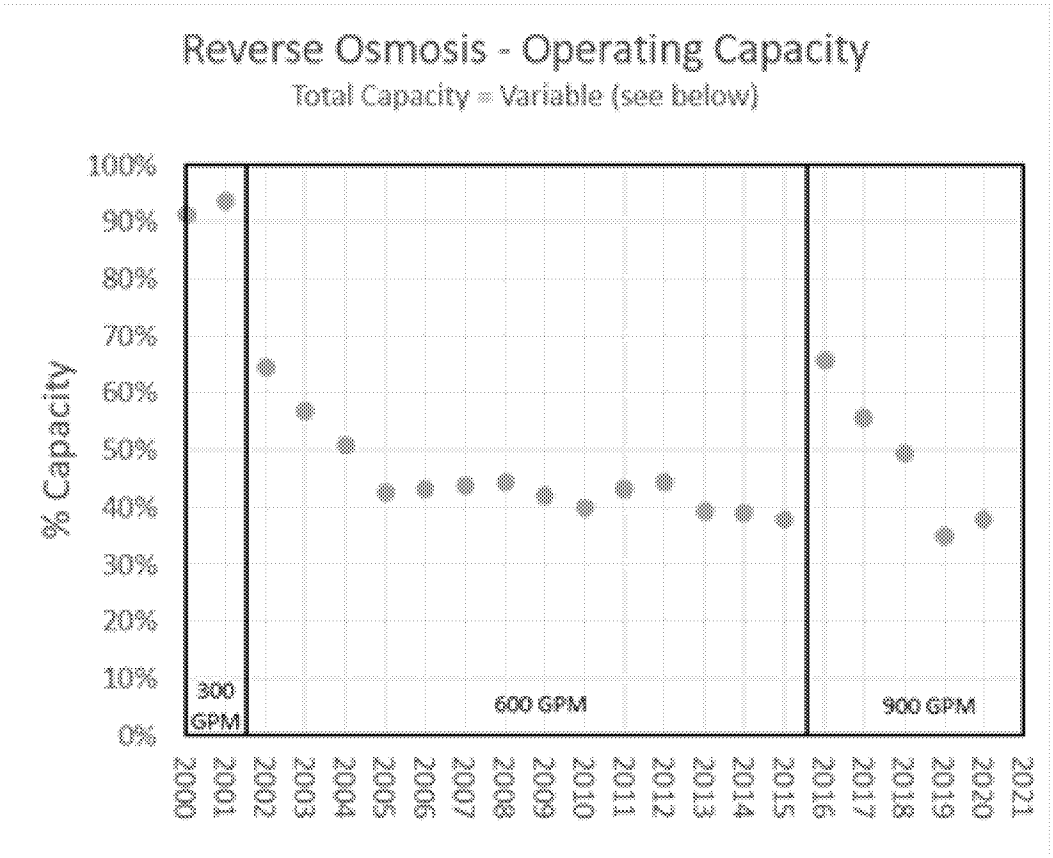
HOMESTAKE MILL AND ADJACENT PROPERTIES ~ GRANTS, NM ~ TOWNSHIP-11&12N, RANGE-10W

DATE: 2/17/2020

SCALE: 1"= 1600'

PAGE: 1.1-29

FIGURE 1. MIDDLE CHINLE URANIUM CONCENTRATIONS 1982


Reverse Osmosis - Operating Capacity
Total Capacity = Variable (see below)
% Capacity
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
300 GPM
600 GPM
900 GPM
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
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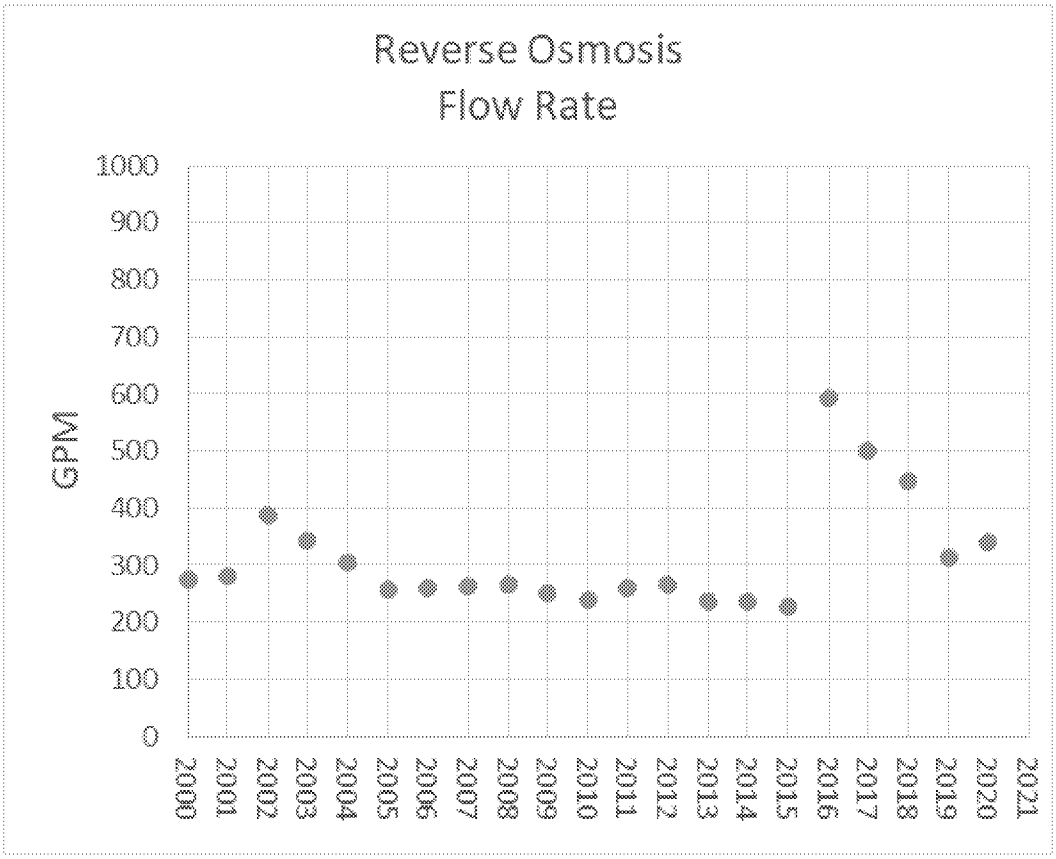
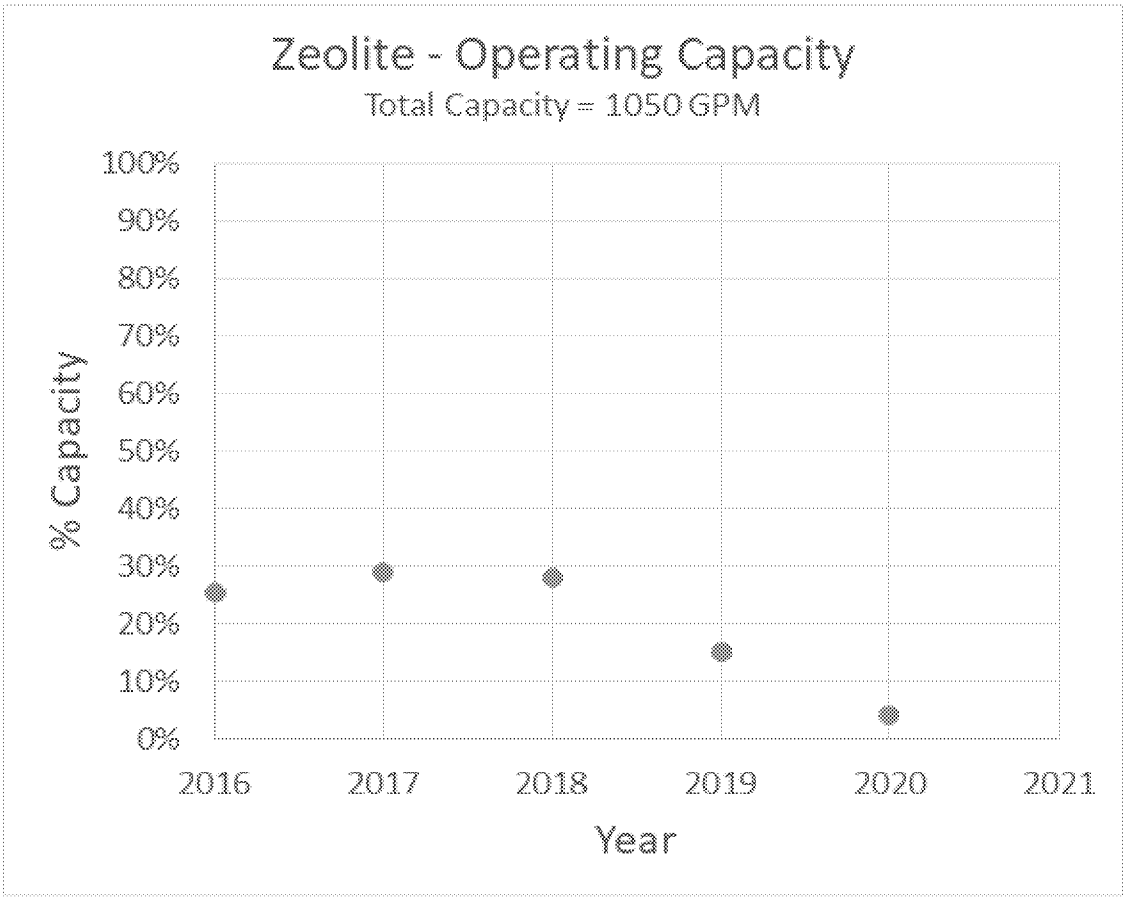
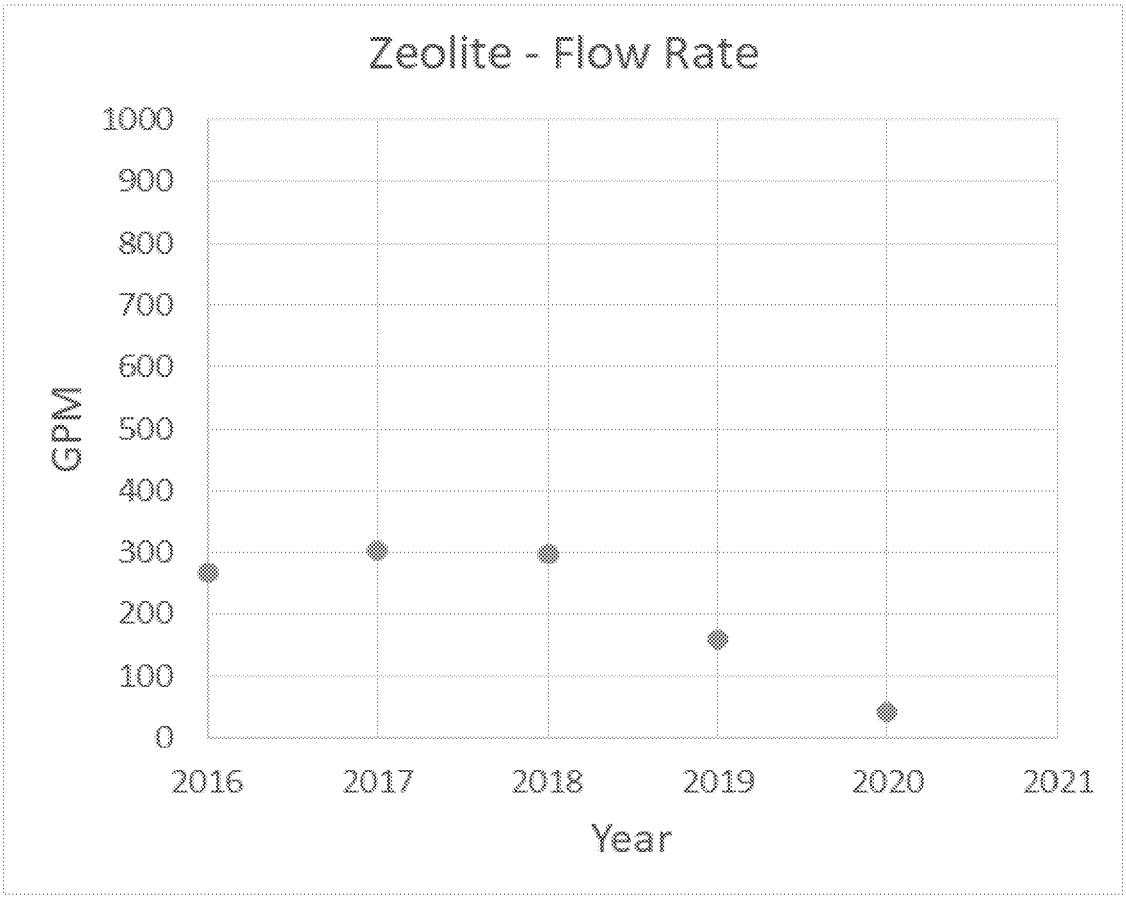
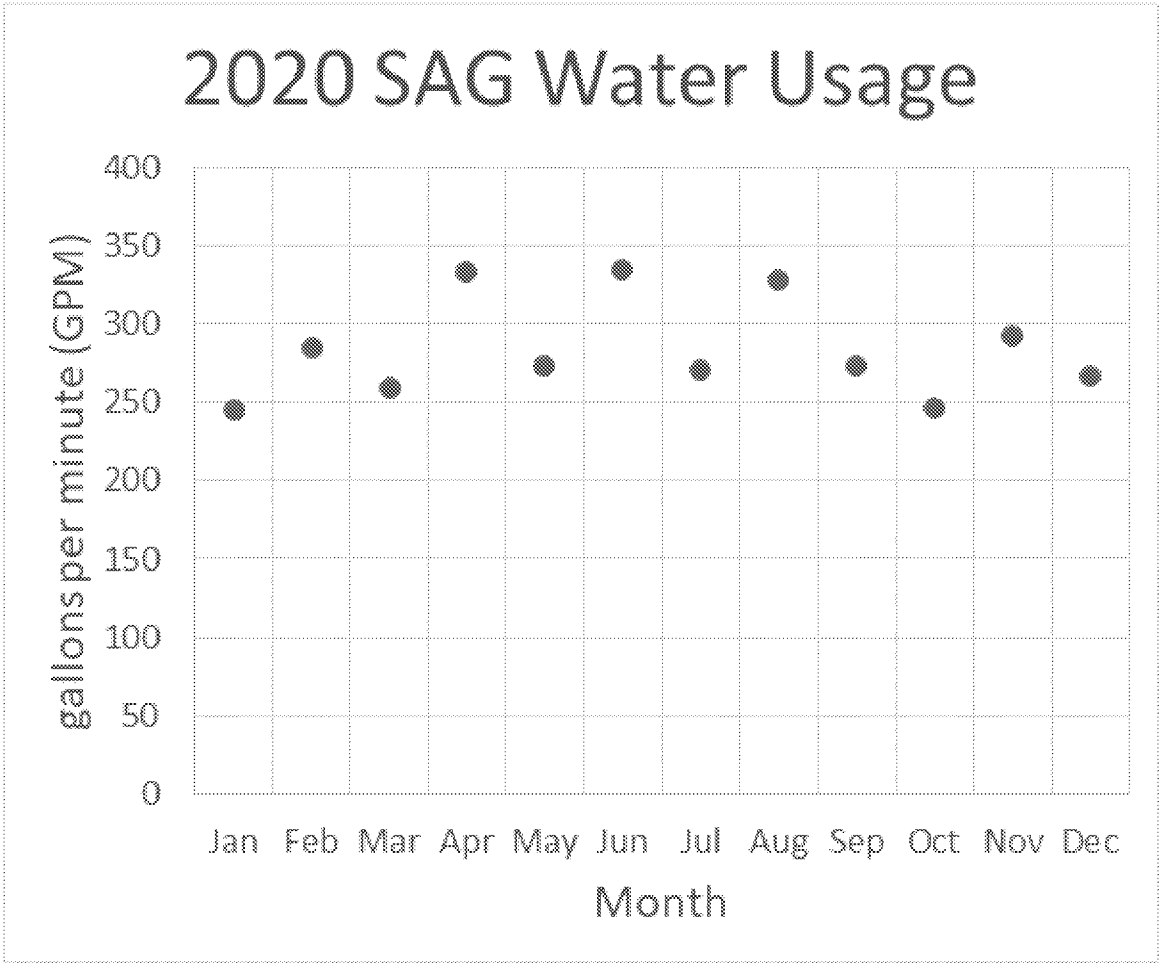
2016
2017
2018
2019
2020
2021

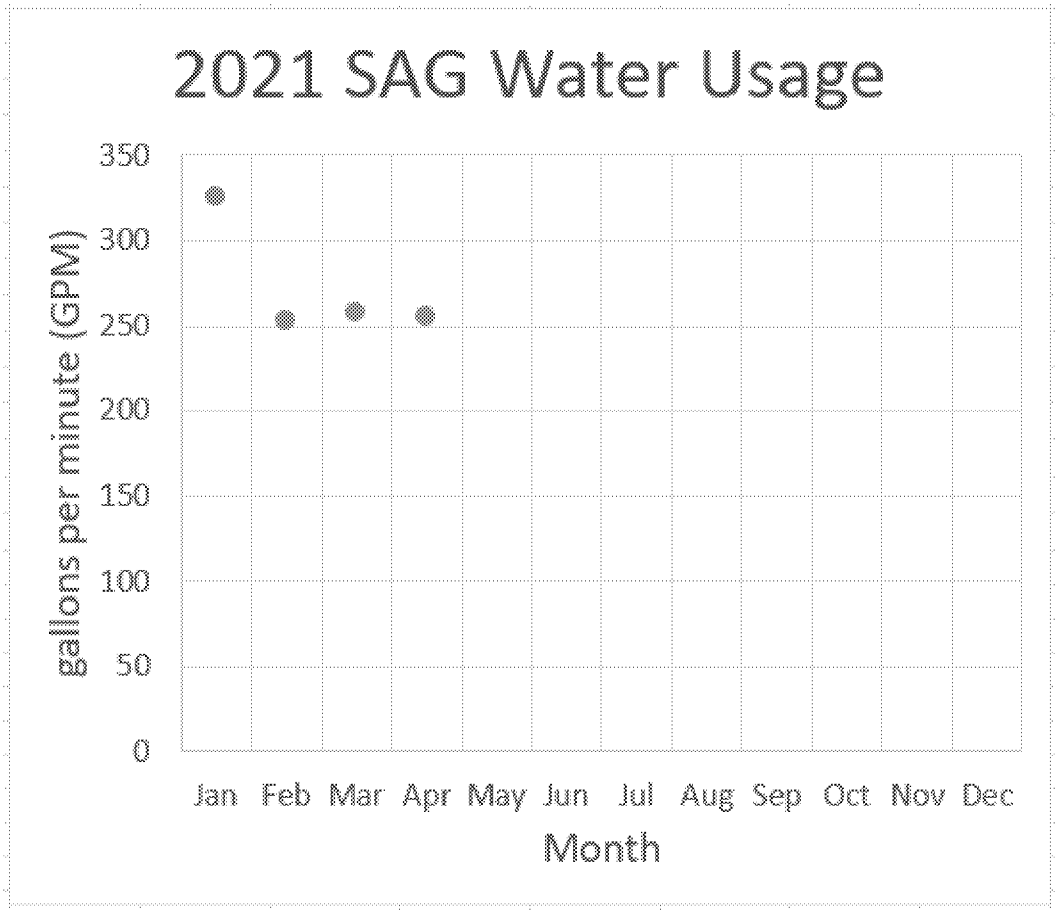

Reverse Osmosis
Flow Rate
GPM
1000
900
800
700
600
500
400
300
200
100
0
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021


Zeolite - Operating Capacity
Total Capacity = 1050 GPM
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
% Capacity
2016
2017
2018
2019
2020
2021
Year


Zeolite - Flow Rate
1000
900
800
700
600
500
400
300
200
100
0
GPM
2016
2017
2018
2019
2020
2021
Year



2020	Deep #1	Deep #2	951R	Total	Total
	gal	gal	gal	gal	gpm
Jan	0	10,933,000	0	10,933,000	245
Feb	0	11,458,000	0	11,458,000	284
Mar	0	11,572,089	0	11,572,089	259
Apr	0	14,396,911	0	14,396,911	333
May	0	12,022,000	174000	12,196,000	273
Jun	0	14,331,000	95000	14,426,000	334
Jul	0	12,086,000	6000	12,092,000	271
Aug	0	14,537,000	111000	14,648,000	328
Sep	0	11,808,000	18000	11,826,000	274
Oct	0	10,970,000	13000	10,983,000	246
Nov	0	12,608,000	0	12,608,000	292
Dec	0	11,844,000	38000	11,882,000	266
Avg					**288**
Total		148,566,000	455,000	149,021,000	



2021		Deep #1	Deep #2	951R	Total	Total
	days	gal	gal	gal	gal	gpm
Jan	31	0	14,500,000	30,000	14,530,000	325
Feb	28	0	10,165,000	42,000	10,207,000	253
Mar	31	0	11,470,000	54,000	11,524,000	258
Apr	30	0	11,015,000	0	11,015,000	255
May	31	0			0	
Jun	30	0			0	
Jul	31	0			0	
Aug	31	0			0	
Sep	30	0			0	
Oct	31	0			0	
Nov	30	0			0	
Dec	31	0			0	
Avg						**273**
Total			**47,150,000**	**126,000**	**47,276,000**	

Message

From: Gail Evans [gevans@nmelc.org]
Sent: 3/10/2021 10:41:30 PM
To: Purcell, Mark [purcell.mark@epa.gov]
CC: Susan Gordon - MASE [sgordon@swuraniumimpacts.org]; Susan Gordon [susangordon@earthlink.net]
Subject: Written documents for NRRB re: Homestake
Attachments: ATT00001.txt; 21.03.10 MASE memo to EPA NRRB.pdf; Maest_NRRB.written.submittal.for.BVDA_10Mar2020.pdf

Dear Mark, I hope you are well. I've attached the written submittals from MASE and BVDA concerning for the NRRB. Please let us know that you received them. And, of course, please let us know if you have any questions. Thank you very much. Gail Evans

Gail Evans
Attorney
(she/her or they/them)
Office: (505) 629 4748
Cell: (505) 463-5293
www.nmelc.org

Memo: EPA National Remedy Review Board

From: Multicultural Alliance for a Safe Environment

Date: 3/10/21

Re: Homestake Mill Superfund Site

The community near the Homestake Mill has been destroyed over 45 years of failed clean-up efforts. The mill first started operations in 1958 and the community was notified in 1975 that their drinking wells were contaminated with selenium. EPA's 2014 Human Health Risk Assessment found that residents of the subdivisions next to the Homestake site face excess cancer risks 18 times higher than EPA's generally acceptable risk. This serious risk has been exacerbated by years of remediation failure. If domestic water sources beneath the subdivisions are used, that risk rises to 22 times the highest acceptable risk for radionuclides in water. EPA should have initiated comprehensive health and epidemiological studies to assist the exposed residents in pinpointing the cause of their cancers and to establish the liability of the responsible parties. Instead, Homestake is working to buy out the surrounding homeowners, whose lifestyle and culture have been devastated by the many years of failed cleanup efforts and who will now be left to relocate and solve future health issues on their own. https://www.abqjournal.com/223831/nm-homeowners-say-decadeslong-cleanup-too-slow.html

The Multicultural Alliance for a Safe Environment (MASE) and the Bluewater Valley Downstream Alliance (BVDA) hired two independent technical experts to examine background groundwater quality and groundwater protection standards provided by Homestake Barrick Gold (HBG) as the basis for its cleanup plans. The new proposed background groundwater values presented to EPA, the Nuclear Regulatory Commission and the New Mexico Environment Department proved that the HBG groundwater protection standards in place were incorrect. Currently, the agencies are revising their expectations, thanks to the independent scientific work that was paid for by our communities.

HBG is now asking to walk away from their legal obligation to clean up their site. HBG has made clear its intentions to seek a Technical Impracticability Waiver with the EPA and Alternative Concentration Limits with the Nuclear Regulatory Commission (NRC). Simultaneously, they have continued their efforts to purchase private property surrounding the site -- all showing their lack of commitment to do what is right.

Yet, even while there are fewer and fewer people living in the vicinity of the site, the legacy of contamination threatens future generations. This is environmental injustice and a grave threat to New Mexico's water resources.

For all these reasons, as set forth in more detail below, it is premature to grant a Technical Impracticability waiver.

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I. Human health and the environment must be protected from a legacy of Homestake Mill uranium contamination.

Protecting human health and the environment is the ultimate goal of groundwater remediation efforts at the Homestake Mining Company Superfund Site. *See EPA Guidance for Evaluating the Technical Impracticability of Groundwater Restoration (EPA TI Waiver Guidance), Section 1.1.*

- Alternative Groundwater Protection Standards (GWPS) were approved for the Superfund Site in 2006. The alternative site standards relieved Homestake Barrick Gold, the owner of the Site, from cleaning up groundwater at the site to drinking water quality.
- Importantly, as recently as December of 2019, Homestake Barrick Gold proposed in its Groundwater Corrective Action Program (GCAP) that 10 more years of remediation efforts at full capacity was the best way forward. *See 12/19 HBG GCAP*.

The site will not be properly addressed until background water quality is established, sufficient modeling is developed, and remediation efforts are fully and effectively implemented.

- NMED and EPA are currently working to assess background water quality, prompted by the scientific studies that MASE and BVDA provided.
- EPA agrees that HBG needs to revise its conceptual model to incorporate the potential for tailings "rebound" (increasing concentrations) and NMED/EPA's reassessment of background groundwater quality. *EPA Fourth Five-Year Review, 2016.*
- EPA has yet to issue a Record of Decision (ROD) for Operating Unit 1 (OU1) on groundwater and Operating Unit 2 (OU2) on long-term stabilization, even though the site has been on the National Priorities List for almost 40 years.

NRC approved Homestake's 1989 Corrective Action Plan (CAP) for groundwater (updated in 2006, 2012, 2019 and 2020), which originally set out to dewater its large tailings pile (LTP) in order to remove this area as a continuing source of groundwater contamination.

- After dewatering the tailings in 1999, Homestake initiated flushing of the LTP with fresh water from the San Andres-Glorieta (SAG) aquifer from 2000-2015.
- The integrity of HBG's SAG wells had not been assessed when MASE first raised the issue during a public hearing on the renewal of Homestake's discharge permit DP-200 in 2014.
- A well integrity assessment was finally conducted, resulting in the replacement and abandonment of several SAG wells. Since then, elevated Constituents of Concern (COCs) in several SAG wells have come to light.

Then, in an about face, in the summer of 2020, Homestake Barrick Gold made public its goal of seeking a Technical Impracticability (TI) waiver from the EPA and Alternate Concentration Limits from the NRC. Allowing HBG to walk away before clean-up is complete would leave a legacy of air, soil and water contamination in New Mexico that will burden future generations. This is unacceptable to the impacted communities.

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- The techniques tried have not been completed in the manner promised or approved. A clean-up of the Homestake Mill contamination based on the best available science and technology has never been attempted. The community has long called for the removal of the large tailings pile. *See* https://cvnmef.org/in-the-news/homestake-site-haunts-residents/ Their voice rings more and more true as the groundwater contamination caused by the tailings has increased over the decades.

- If the tailings piles are not removed, HBG should optimize its cleanup strategy by implementing its Reverse Osmosis (RO) improvements and zeolite upgrades to treat more water, especially off-site plumes; use treated water in lieu of fresh water; and remedy SAG aquifer well contamination. EPA agrees that these improvements will improve the protectiveness of Homestake's remedy. *EPA Fourth Five-Year Review, 2016*

II. Contamination at the site has grown, not decreased, during HBG's "clean-up"

Groundwater contamination was first detected in the shallow alluvial aquifer beneath the Homestake site. Since then, contamination has spread to the Upper Chinle, the Middle Chinle, the Lower Chinle, and we believe, the SAG aquifer.

- The original hydraulic barrier placed south of the LTP in the early 1980s pushed a contamination plume further south of the original contamination footprint.

- Since 2000 Homestake has enlarged its original footprint with many hundreds of wells on the site, and a flushing program that also pushed contamination past site boundaries.

- HBG did significant collateral damage by flushing the LTP with clean water from the SAG aquifer and implementing a collection/injection program, which mobilized the uranium and other contaminants rather than drying and containing the source of contamination within the large tailings pile through dewatering.

- HBG's groundwater model should now be revised to reflect the following changes in operating conditions: discontinuation of land application; active flushing of the tailings with SAG water; increased operating capacity of the water treatment systems; plume movement beyond Homestake's licensed boundary and down gradient into the SAG aquifer.

- The timeframe for groundwater restoration can then be updated to include the additional time needed for groundwater restoration outside the facility's licensed boundary and down gradient of the source areas.

As a property owner and MASE member told EPA:

"When I bought my property at 3021 Hwy 605 in January 2001 I talked to local people about the area but mainly relied on the EPA web site which gave a description of the super fund site. There were maps and graphs and calculations and descriptions of the site. It stated that the alluvial aquifer was contaminated but that the other Chinle's weren't and that the cleanup-remediation would be complete in 2003. We are all aware of the many attempts to restore our

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water quality and the failure of those attempts. They waited about 10 year to start addressing the problem after discovering contamination. They sprayed water in the air for 10 more years, they created a hydraulic dam to contain the spread, they set up an RO plant to treat the water along with the evaporation ponds, they sprayed water for irrigation, and now have tried newer methods only to watch them fail. All the while the problems get worse and more complicated. We have gone through "evaluations," "examinations," and "calculations", so many times that our heads are dizzy and tired. The approach has been cosmetic and never getting at the true source of the problem. That is, the tailings piles are leaking. You have a hole in the bucket and until that is addressed it will continue to spread and all other cosmetic methods and numerous calculations will fail. We can't just continue to "look" at the problem. The pile must be moved to a state of the arts facility that would be double lined, monitored and have the ability to retrieve the leakage and process or extract harmful elements before releasing any water back into the aquifers. It is an enormous project-concept to correct an enormously, grossly negligent problem. It only gets worse the longer you put off the inevitable. To continue stalling or to abandon this mess would clearly be criminal negligence. I hope and pray you will do the right thing."

III. Inadequate system design and operation is not a reason to grant a Technical Impracticability Waiver

"Failure to achieve desired cleanup standards resulting from inadequate system design or operation is not considered by EPA to be a sufficient justification for a determination of technical impracticability of groundwater cleanup." *EPA TI Waiver Guidance, Section 1.1*

Our communities can cite a litany of actions by HBG over the years since reclamation began in 1977 that have contributed to the spread of groundwater contamination from HBG's uranium mill tailings into the alluvium and deeper bedrock aquifers of the Chinle Formation, and possibly into the SAG Aquifer. HBG used a variety of tested and untested experimental groundwater treatments that HBG repeatedly assured our community would clean up our water supplies within 10 years, then 25 years, then 35 years or more.

HBG's so-called "upgrades" and "improvements" have done nothing to stop contaminant plumes in the alluvial and Chinle aquifers from moving offsite. Even as HBG buys out property owners adjacent to the site, the plumes will continue moving further down gradient to the SAG aquifer, or downstream to the Rio San Jose and all the communities who depend on these fresh water sources to meet their needs now and into the future. Homestake activities did not comply with its permits and license.

1. <u>Massive Collection/ Injection well network has increased the problem:</u>

- The 2010 supplemental remedial system evaluation by the Army Corps of Engineers cited the need for improved management of injection volumes and rates into impacted aquifers. Community stakeholders and their technical experts have repeatedly raised concerns about well integrity.

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- The source of the contamination in HBG's SAG wells remains undetermined. Total Dissolved Solids (TDS) numbers are rising in SAG wells - this is still unexplained. The SAG aquifer supplies the only alternative water source for the five subdivisions and is the sole municipal water supply source for the downstream communities of Milan and Grants.
- HBG's injection wells and infiltration lines have diluted contaminant concentrations in nearby monitoring wells, making it difficult to effectively or accurately assess contaminant trends.
- A comprehensive well integrity survey of ALL Homestake wells should be undertaken to eliminate the potential for any well to become a conduit for contamination.
- SAG water usage should be minimized and replaced with treated water.
- Long-term monitoring of HBG's SAG wells for COCs must continue.
- Rising Total Dissolved Solids levels must be explained.

2. <u>Flushing added to groundwater contamination</u>:

- Over 22 million tons of unlined tailings disposal atop the ancestral San Mateo Creek bed channel has created a pathway for contaminant transport off-site.
- In 2000, HBG began using freshwater from the SAG aquifer to flush the large tailings pile until it terminated the flushing program in 2015. Actual rebound conditions from the re-saturated LTP must now be monitored and incorporated into its groundwater model.
- Over the course of fifteen years, HBG has pumped SAG wells of questionable integrity for its flushing program that may have provided direct pathways for contamination of the SAG aquifer.
- At a 9/29/20 public meeting with EPA Region 6, EPA stated that saturation of the LTP remains a concern – they are still seeing rebound. EPA reported we should know more once we see a November 2020 report. MASE has yet to see that report.

3. <u>Reverse Osmosis has not operated properly or at capacity:</u>

- The expanded and upgraded Reverse Osmosis (RO) facility is still only operating at 25% capacity.
- HBG has used freshwater from the SAG Aquifer for 21 years to dilute its RO treated water in order to meet its NRC approved Groundwater Protection Standards for re-injection.
- HBG says it has doubled its RO treatment capacity and plans to significantly expand RO treatment after relining Evaporation Pond 1, which has been postponed until 2022.
- HBG expects its expanded RO system to treat up to 900 gpm of contaminated groundwater on an average annual basis. The system has three runs, but only two operate at a time at 600 gpm. It has never approached full capacity. *HBG 12/19 Groundwater Corrective Action Program.*

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- Significantly more RO treatment is required to treat the high volumes of water necessary to truly remediate this site.

4. Zeolite system has not operated at full capacity as promised:

- HBG's zeolite treatment systems constructed on top of the LTP are used to treat off-site groundwaters where uranium is the only constituent that exceeds the GWPS. Zeolite treatment was first tested at bench scale in 2007 followed by additional pilot tests.
- A full-scale zeolite treatment system with a maximum treatment capacity of 300 gpm was constructed in 2012 followed by a system with a maximum capacity of 1,200 gpm in 2015. *HBG 12/19 Groundwater Corrective Action Program*
- The zeolite treatment systems are expected to treat up to 1,200 gpm of contaminated groundwater on an annual average basis under this CAP. Again, this system has never operated at capacity.
- HBG intends to use zeolite treated water to maintain its hydraulic barrier in lieu of SAG water. *EPA Fourth Five-Year Review, 2016*
- After approximately 216,000 gallons of zeolite extraction water was accidentally released onto the ground surface on August 26, 2020, HBG identified corrective actions to prevent this type of incident in the future. These additional corrective actions include updating standard operating procedures specific to the zeolite water treatment operation and additional personnel training.

5. Land Application Program was illegal:

- HBG operated a Land Application project that used contaminated groundwater on irrigation plots from 2000 until 2012, in violation of their NRC license.
- Conducting land application of groundwater that exceeded groundwater protection standards for the site has resulted in increased contamination over the years.

IV. The tailings piles must be moved and isolated with liners and barrier caps.

The re-saturated Homestake Tailings Piles will continue to seep in perpetuity. This is critical as it means contaminant concentrations will continue to percolate into the impacted aquifers and push plumes downstream and downgradient, threatening community and regional water supplies. Because the western portion of the Large Tailings Pile covers the ancestral San Mateo Creek, seepage from the tailings can be transported via the Creek into the Rio San Jose, or "waters of the United States." The unlined tailings currently sit on 80-90 feet of alluvium.

The tailings piles must be moved and encapsulated into lined impoundments with leak detection and redundancy/fail-safe systems before they are finally covered with a radon barrier that also prevents the infiltration of precipitation and storm water.

Until the tailings piles are moved, the source of contamination will continue to spread.

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During the EPA's Remedial System Evaluation, the option to move the Large Tailings Pile to an off-site regional waste repository was briefly considered. The option was viewed as too expensive and unsafe to removal workers. However, two options that were not considered at that time include: 1) creating a waste repository in the Ambrosia Lake area—making the truck and shovel removal less expensive; and 2) removal via slurry to a nearby site owned by Homestake, or, again, to a nearby repository.

V. EPA has not meaningfully engaged the impacted community in this process.

While EPA completed a ROD on OU 3 – concerning radon – within a few years of the site being placed on the NPL, EPA neglected to complete a ROD on OU1 and OU 2. EPA has now begun steps towards a ROD on OU1 and OU2, almost 40 years later, but has failed to engage stakeholders in a meaningful way.

EPA has provided us with limited information about its Remedial Investigation (RI) and Feasibility Study (FS) determinations. Our communities were not given any opportunity to participate or comment on the RI or the settlement agreement and planning for the FS. We expressed our concerns in a December 3, 2020 letter to EPA.

EPA recognizes that because "TI decisions may affect the potential future uses of groundwater, interest in TI ARAR waivers may be high. Therefore, it is EPA' s intent to coordinate and consult with States and the public regarding TI ARAR waiver issues as early as possible in the remedy decision process." EPA TI Waiver Guidance, Section 6.1.1. We therefore expect that the EPA will ensure a much more vigorous and meaningful community involvement going forward.

At a 9/30/20 public meeting, EPA told us that they would meet with us before the end of the year once they received numbers on background. That didn't happen. EPA also told us that they would share the TI Evaluation report with us. That hasn't happened.

We need more opportunities for community involvement in selecting a remedy that protects our health and environment.

VI. Cost plays a subordinate role to protectiveness.

We understand that the EPA can grant a Technical Impracticability waiver if ... "compliance with the [ARAR] is technically impracticable from an engineering perspective." 40 CFR 300.320(f)(ii)(C)(3) and 42 U.S.C. 9621(d)(4)(C). According to the EPA, the use of the term "engineering perspective" implies that a TI determination should primarily focus on the technical capability of achieving the cleanup level, with cost playing a subordinate role. The NCP Preamble states that TI determinations should be based on: "...engineering feasibility and reliability, with cost generally not a major factor unless compliance would be inordinately costly." EPA TI Waiver Guidance Sec. 4.1.1

The role of cost, however, is subordinate to that of ensuring protectiveness. The point at which the cost of ARAR compliance becomes inordinate must be determined based on the particular circumstances of the site. As with long restoration timeframes, relatively high restoration costs may be appropriate in certain cases, depending on the nature of the contamination problem

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and considerations such as the current and likely future use of the groundwater. "Compliance with ARARs is not subject to a cost-benefit analysis," and cost is subordinate to protectiveness. *EPA TI Waiver Guidance, Section 4.4.5*

HBG should be required to maximize and optimize the remedies it has chosen to implement at the site. EPA thinks that recent improvements and upgrades to HBG's remedial systems will increase the protectiveness of the remedy. *EPA Fourth Five-Year Review, 2016.*

VII. Any remedy selected must be protective of human health and the environment.

Regardless of whether ARARs are waived at the site, the alternative remedy still must satisfy the two threshold remedy selection criteria: 1) protect human health and the environment; and 2) comply with all ARARs that have not been waived. *EPA TI Waiver Guidance, Section 5.2.1*

EPA's general expectations are to prevent further migration of the contaminated groundwater plume, prevent exposure to the contaminated groundwater, and evaluate further risk reduction measures as appropriate. *NCP §300.430(a)(l)(iii)(F).* These expectations should be evaluated along with the nine remedy selection criteria to determine the most appropriate remedial strategy for the site.

EPA Region 6 has noted that the remedy for the Homestake Superfund site was protective for the short-term in 2016, but that long-term protectiveness of the remedy required completion of EPA's CERCLA equivalency review, re-assessment of background groundwater quality for the alluvial and Chinle aquifers, and the issuance of RODs for OU1 and OU2. The timeframe for groundwater restoration for areas outside the facility's licensed boundary needs updating, and the source of elevated uranium in Homestake's SAG wells should be investigated to determine if pumping from the SAG wells is drawing site contamination into the deeper regional aquifer.

It is instructive to note that New Mexico Water Quality Control Commission regulations (20.6.24103 NMAC) must be met outside Homestake's site boundary and that EPA's Guidance for Evaluating Completion of Groundwater Restoration Remedial Actions (OSWER9355.0-129, November 2013) counsels that groundwater remediation levels should be met throughout the contaminant plume (not just at compliance locations).

Because HBG has been acting under a 1989 GCAP for over 30 years in the absence of a ROD for groundwater cleanup, it is premature to consider the approval of alternative remedies or waivers until the CERCLA process for this Superfund site has been carried out. HBG must first demonstrate substantial compliance with its approved or revised GCAP, in conformity with EPA RODs on Operating Units 1 and 2.

Any remedial measures that fall short of attaining approved background levels at the site will not be protective of our regional groundwater supplies, including the SAG aquifer, the last remaining freshwater supply source available to meet our and the region's domestic and municipal needs now and into the future.

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The remedies selected must have long-term effectiveness in reducing the toxicity, mobility, and volume of contaminants from the large and small tailings piles into our surface water and groundwater supplies.

Community, State and Tribal acceptance of the remedies selected must also be considered.

NMED/EPA must follow through with a defensible reassessment of background groundwater quality that does not attempt to grandfather in water quality impacts from Homestake's milling or reclamation operations.

An ecological risk assessment should be performed due to Homestake's expanded footprint and off-site impacts over the last five years.

The remedy selected must curtail releases from and permanently isolate the sources of contamination in the tailings piles in order to protect the health and sustainability of our communities.

VIII. It is premature to grant a Technical Impracticability Waiver.

As recently as December of 2019, HBG proposed to do corrective action for another 10 years that would significantly reduce groundwater contamination. *See December 2019 GCAP.* Indeed, HBG's 12/19 GCAP proposed continued groundwater collection, treatment, and injection within the alluvial and Chinle Aquifers for approximately 10 years to contain the constituent plumes in the alluvial and Chinle Aquifers to within its licensed boundary. HBG proposed remedial actions so that COC concentrations on-site and off-site would be reduced to less than the site GWPS. *See Id., Section 9 CORRECTIVE ACTION PROGRAM.* In that corrective action program, HBG stated:

- Approximately 300 gpm of fresh groundwater would be extracted from the SAG Aquifer wells Deep #1R and Deep #2R and used to mix with treated waters and injected for hydraulic control.
- Groundwater monitoring results would be used to evaluate the performance and effectiveness of the groundwater collection and injection system.
- The proposed groundwater collection and injections system would be operated dynamically so that pumping and injection rates will vary as groundwater plume extents and COC concentrations are reduced.
- Some COCs may not be reduced to meet the GWPS in some areas. HMC also acknowledged that LTP seepage to groundwater will continue following corrective action and that groundwater at and beyond the point of compliance (POC) would exceed the GWPS in the future.

If, as HBG states, it is unable to control contaminant plumes from the site, especially into the SAG aquifer, or to meet GWPS within a reasonable timeframe, then the tailings must be removed and isolated. The source of contamination in HBG's SAG wells must be determined and continued treatment of the alluvial and Chinle plumes should continue.

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IX. EPA must abide by the Superfund CERCLA process to protect our communities and our land and water.

Historical waste and contamination from uranium mills in the United States, and more specifically within the San Mateo Creek Basin, have resulted in a persistent and unwanted legacy for future generations of residents. Our future generations need clean water to drink, clean air to breathe, and clean soil to till. We all need to be surrounded by healthy ecosystems to survive and prosper. Clean air, water and soil form the core of our national security, which in turn preserves the health of regional ecosystems throughout the country for future generations. Without healthy ecosystems, all life forms will wither and die.

We are now at a crossroads. One road will allow Homestake Barrick Gold to leave behind spreading plumes of contaminants that are seeping from Homestake's tailings piles. The plumes will move downstream into the Rio San Jose through the alluvial aquifer and downgradient into the last remaining source of clean water in the San Mateo Creek Basin - the SAG aquifer. This cannot be allowed to happen, as it will be difficult to maintain enforceable Institutional Controls beyond HBG's site boundaries.

EPA must abide by the Superfund CERCLA process. EPA must reassess background groundwater quality and establish long overdue ARARs for the Homestake Superfund site with community involvement. The Remedial Investigation and Feasibility Study equivalency review that will form the foundation for its ROD on OU1 (long-term groundwater contamination from the tailings) and OU2 (long-term tailings stabilization, surface reclamation, and site closure) must be completed. Removal of the tailings should be reconsidered as the only remedy that can eliminate the sources of contamination after 44 years of attempted cleanup. Treatment of the existing alluvial and Chinle plumes should continue.

Affected community members and local residents cannot be left out of this process. We must have a voice in how to protect the places where we live, work and pray. After 45 years of struggle, it is past time for HBG to be held accountable for its toxic legacy. After decades of profit, Homestake Barrick Gold must ensure a livable landscape and clean water for future generations.

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Memorandum

To: U.S. Environmental Protection Agency; National Remedy Review Board (NRRB)
From: Ann Maest, PhD; Buka Environmental on behalf of Bluewater Valley Downstream Alliance (BVDA)
Date: 10 March 2021
Re: NRRB Written Submittal for BVDA on the Homestake Mill Superfund Site

1.0 Introduction

The comments contained herein are submitted on the behalf of the Bluewater Valley Downstream Alliance (BVDA) and present information relevant to the selection of remedies for cleanup of groundwater at the Homestake Mining Company Superfund Site in Grants, New Mexico. The comments further address technical issues related to Homestake Mining Company's (HMC) request to the Nuclear Regulatory Commission for Alternative Concentration Limits (ACLs) and to the Environmental Protection Agency for a Technical Impracticability (TI) Waiver for groundwater cleanup standards. The comments are divided into two sections: proposed remedies and assumptions, and independent evaluation of groundwater protection standards. Based on an examination of HMC's proposals, associated documents, and our own independent evaluations, we find that granting HMC a TI Waiver and ACLs for groundwater is premature and not based on the best available science.

2.0 Remedies and Assumptions

2.1 Overview

In the letter from HMC to the Nuclear Regulatory Commission (NRC)[1], HMC states: "The revised assessment in the GCAP shows that none of the range of proposed reasonable alternatives provide assurance of long-term compliance with the current groundwater protection standards. The revised assessment and the results of over 40 years of groundwater corrective action support the need for Alternative Concentration Limits to comply with the requirements of 10 CFR 40 Appendix A Criterion 5B(5)." The finding of "not reasonably achievable" was based on modeling indicating long-term mobilization of contaminants from the alluvial aquifer and long-term large tailings pile (LTP) seepage. The basis for this statement is questioned in Sections 2.2 and 2.3.

2.2 Ongoing Failed Remedies and Remedies Considered but Not Retained

Failed Remedies. HMC's 2020 Groundwater Corrective Action Program (GCAP)[2] proposes "continued groundwater collection, treatment and injection within the alluvial and Chinle aquifers using the existing infrastructure while an ACL application is prepared, reviewed, and approved."[1] Four alternatives are being considered by HMC, and three involve continued use of this same approach (GCAP, p. 8-5 – 8-7). The capture of contaminated LTP seepage has been incomplete, the treatment has not adequately removed the contaminants, and the approach has relied on extensive dilution with groundwater from the San Andres/Glorieta (SAG) aquifer.

Water management and treatment schematics for 2012 and 2018 show the volume of seepage draining from the LTP and entering the alluvial aquifer without treatment (GCAP, Figures 6-28, 6-29). A hydraulic barrier is supposed to exist downgradient of the tailings impoundments due to *injection* of treated and

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[1] Homestake Mining Company of California, 2020. Letter to Ron Linton, NRC, Re: Homestake Mining Company of California – Responses to NRC's "Request for Supplement Information, Groundwater Corrective Action Program," Docket No. 040-08903, License No. SUA-14-71. November 31. 9pp.

[2] Homestake Mining Company (HMC), 2020. Grants Reclamation Project, Groundwater Corrective Action Program (and appendices). US NRC License SUA-1471, State of New Mexico DP-200, November 13. 385pp.

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SAG water (GCAP, p. 4-5). Normally, hydraulic barriers to groundwater flow are created by pumping rather than injection, or by installing a slurry wall or other physical barrier to limit groundwater flow. The alluvial aquifer groundwater contours indicate that contaminated seepage from the LTP can still be transported to downgradient locations on the west and east sides of the LTP (2018 Annual Monitoring Report; Figure 4.2-1).[3] A paleochannel in the alluvium on the west and southwest sides of the LTP has the highest measured hydraulic conductivity and is likely still transporting contaminants from the LTP to downgradient parts of the alluvial aquifer.[4] The shape of the uranium plume indicates that the paleochannel is an important preferential pathway for transporting contaminants from the LTP to downgradient areas in the San Mateo Creek basin (Figure 1).

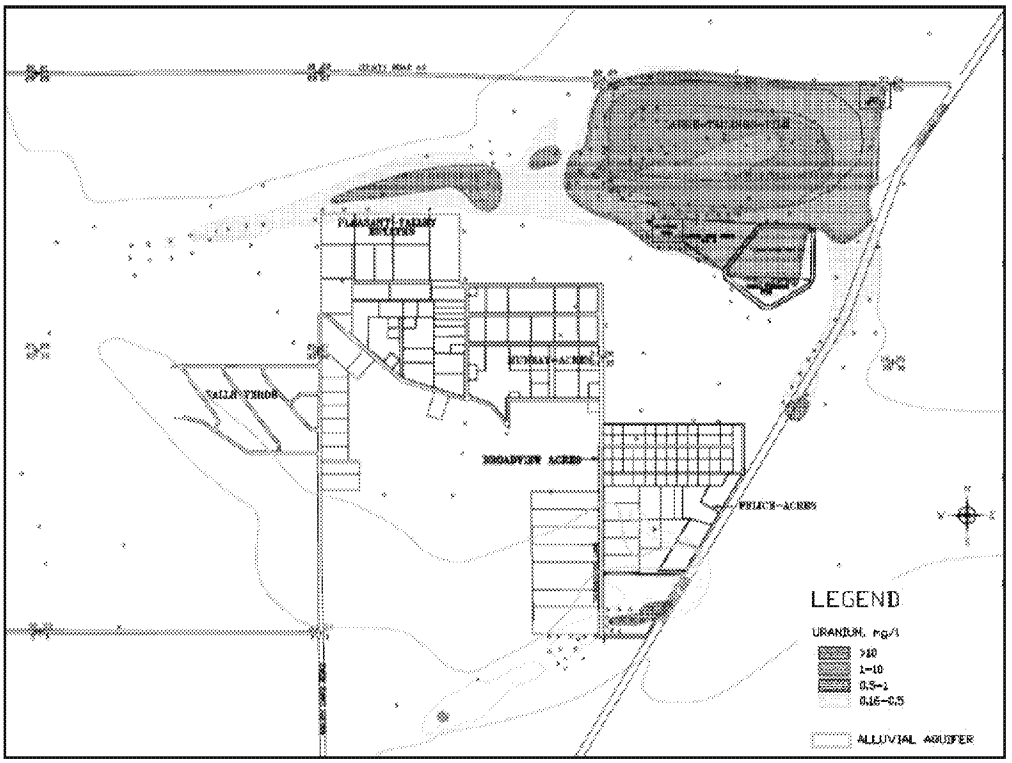

Figure 1. Uranium plumes in the alluvial aquifer in 2018.
Source: HMC and Hydro-Engineering, 2019. 2018 Annual Monitoring Report, Figure 1.1-14.

The treatment scheme uses reverse osmosis (RO) and at times zeolite treatment. The zeolite treatment system was started in 2012, and since 2016 has been used to remove uranium from the off-site collection water (GCAP, p. 6-11 – 6-12). The zeolite-treated water is mixed with the RO-treated water and the SAG water in the post-treatment tank (PTT) and sent directly to the aquifers (GCAP, Figure 6-29). The water balance for 2018 shows an average of 267 gallons per minute (gpm) of zeolite-treated water, 350 gpm of RO-treated water, and 128 gpm of SAG water reporting to the PTT in 2018 (GCAP, Figure 6-29). The water quality of the PTT, the RO product, and the zeolite product waters for 2018 is shown in the 2018 Monitoring Report (Tables 2.1-3, 2.1-5, and 2.1-6, respectively). In terms of uranium concentrations in 2018, the PTT water had only one exceedance of the uranium site standard (0.16 mg/L) but six exceedances of the State/EPA drinking water standard. The RO product water (after

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[3] HMC, 2019. 2018 Annual Monitoring Report/ Performance Review for Homestake's Grants Project Pursuant to NRC License SUA-1571 and DP-200. 877 pp.

[4] Brown and Caldwell, 2018. Summary of San Mateo Creek Basin Hydrogeologic Site Conceptual Models, 101pp; p. 66 and Figure 44.

treatment) had only one exceedance of the site standard but four exceedances of the State/EPA standard. The zeolite-treated water had no exceedances of the site standard but 27 exceedances of the State/EPA water quality standard. Although only the site standards are relevant, the results show that if the applicable groundwater standards were lowered to the State/EPA standard, additional treatment upgrades would be needed, especially to the zeolite system. Importantly, the zeolite-treated water was proposed to be used in lieu of fresh water (SAG aquifer water) for reinjection,[5] possibly because of the reduction in allowable pumping volumes from the SAG aquifer by the New Mexico Environment Department (NMED). If this is the case, water with elevated uranium concentrations will continue to be spread throughout the site. An independent evaluation of the treatment system is needed.

SAG water is proposed to be used in three of the four Alternatives in the GCAP. The SAG aquifer is a major regional aquifer used for industry, irrigation, municipal water supplies, and private water wells (GCAP, p. 3-12), and pumping the aquifer so extensively and using the water for questionable remediation measures should not be allowed. Well 943 was used as the pumping well from the SAG aquifer until 2017. Uranium concentrations first increased in the well in 2015 and continued to increase from 2016 to 2018 (RI Report, Figure 3-58). HMC has attributed the increases to poor well casing and leakage of higher-concentration groundwater from overlying aquifers and to the Bluewater Mill, but the NRC has rejected these theories and required more information.[6]

Another failed remedy used by HMC was land application and irrigation using groundwater that exceeded site water quality standards. This approach also contributed to expansion of plumes in the alluvial aquifer. Land application "was an integral part of the groundwater restoration program" (GCAP, p. 2-5). According to HMC's 2020 Remedial Investigation Report (RI Report),[7] from 2000 to 2012, nearly 10,000 ac-ft of mine-influenced waters derived largely from alluvial wells but also from some Chinle wells were used for irrigation (p. 3-2). Water from the SAG aquifer was also used for the land application process (GCAP, Fig. 6-28). Although the concentrations of uranium are described as "low," waters used for irrigation had *average* uranium concentrations that ranged from 0.12 to 0.38 mg/L (RI Report, Tables 3-3 and 3-5) – up to 2.4 times higher than the NRC groundwater cleanup value (0.16 mg/L) and over 12 times higher than the State's and EPA's primary maximum contaminant level (0.03 mg/L). Rather than remediating the groundwater contamination caused by land application, "Restrictive Covenants will be put in place for HMC's former land treatment areas (Section 2.7) that will prohibit residential and agricultural use of the land treatment areas and use of groundwater for drinking beneath the land treatment areas." (GCAP, p. 2-6).

Remedies Considered but not Retained. The GCAP (Table 8-1) includes information on remedial technologies considered but not retained. Source removal (removal of all tailings in the LTP) was not retained even though its effectiveness was rated as high because the "increase in truck and heavy equipment traffic could adversely affect community." Another reason cited was "...increase in human health risks from transporting waste..." HMC has essentially removed the community by purchasing homes, so these reasons are not valid. Another reason was costs. TI waivers should be based on "...engineering feasibility and reliability, with cost generally not a major factor unless compliance would

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[5] EPA, 2016. Fourth five-year review for HMC Superfund Site, p. 15. September, 115 pp.

[6] NRC, 2020. Letter to HMC and attachment: Results of U.S. Nuclear Regulatory Commission Staff Review of the May 10, 2019, "Response to the Homestake Mining Company of California letter, dated July 26, 2018: Proposed adjustment in groundwater monitoring of the San Andres-Glorieta aquifer near the Grants Reclamation Project. January 23, 13pp.

[7] HDR, 2020. Final Remedial Investigation Report. HMC Superfund Site. Operable Unites 1 and 2. June 22. 245 pp.

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be inordinately costly."[8] The only reasonable remedy for long-term protection of the aquifers, especially the Chinle and SAG aquifers, is removal of the source (the LTP) and placement nearby on liners with a leachate-collection system and monitoring. Remediation of the vadose zone under and downgradient of the LTP will also likely be needed to remove that long-term source.

The cleanup of nuclear weapons and nuclear power plant sites (e.g., Hanford, Three Mile Island) appears to have been prioritized over cleanup of uranium mines and production facilities. And more removals are used as remedial measures at the nuclear sites. However, the two types of sites are inextricably linked when viewed through the lens of whole life-cycle analysis. Uranium mines and the associated processing facilities (e.g., mills) have supplied the raw materials for nuclear energy and nuclear weapons, yet these upstream facilities are often in less populated areas – many of which are on Native American reservations or lands (e.g., Church Rock on Navajo Nation lands) – that are undervalued. This perspective contravenes the Biden administration's emphasis on environmental justice and communities. The relative success stories from the cleanup of nuclear energy and nuclear weapons facilities demonstrates that similar successes could be achieved at uranium mines and production facilities, if these sites were given higher priority and funding. A summary of some of the cleanups touted as successes at the nation's nuclear sites includes:

- Rocky Flats, Colorado. Made plutonium triggers for nuclear weapons. The Rocky Flats Cleanup Agreement authorized DOE to perform most of the cleanup through removal actions. The Savannah River Site in South Carolina, the Waste Isolation Pilot Plant (WIPP) in New Mexico, the Nevada Test Site, and the Hanford Site in Washington State received materials or wastes from Rocky Flats.[9] The cleanup was completed for approximately $7 billion. Although not a perfect remediation and concerns still exist, the site today is a wildlife refuge.
- Oak Ridge, Tennessee. Erected for the Manhattan Project to develop an atomic weapon to end World War II. The remediation project generated more than 1.7 million cubic yards of waste. Approximately 10 percent of the waste was sent out of state for disposal. The remaining 90 percent was disposed safely at onsite disposal facilities. This decades-long environmental cleanup effort marks the first uranium enrichment complex in the world that was successfully removed.[10] At least $2.9 billion will be spent on the cleanup, and costs are expected to be well over that amount by completion in 2046.[11]
- Hanford, Washington State. A nuclear production complex established in 1943 as part of the Manhattan Project.[12] The groundwater pump-and-treat system has operated since 2008 will be continued and expanded. Their numerous improvements have resulted in "significant reduction of

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[8] EPA, 1993. Guidance for Evaluating the Technical Impracticability of Ground-Water Restoration. Directive 9234.2-25 (p. 10). September. 30pp.

[9] GAO, 2006. Nuclear Cleanup of Rocky Flats. DOE can use lessons learned to improve oversight of other sites' cleanup activities. July. 122 pp.

[10] DOE Office of Environmental Management. 2020. DOE's cleanup of nuclear waste sites a continuing success. August 20. https://www.energy.gov/orem/articles/does-cleanup-nuclear-waste-sites-continuing-success

[11] DOE Office of Environmental Management. 2018. https://www.energy.gov/em/articles/oak-ridge-cleanup-contractor-hits-2-billion-contract-mark

[12] DOE Office of Environmental Management. 2019. Hanford Builds on Groundwater Cleanup Success, Plans for Treatment Expansion. https://www.energy.gov/em/articles/hanford-builds-groundwater-cleanup-success-plans-treatment-expansion

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areas of groundwater contamination." The low-range cost estimate for the cleanup was estimated at $323.2 billion.[13]

In stark contrast to the cleanups of U.S. nuclear facilities, much less money has been spent on remediation of uranium mill sites, and those near communities of color (e.g., Church Rock and the Homestake Mill) have received even less attention and funding. A comparison of waste volumes, cleanup costs, and remedial approaches for uranium tailings sites with groundwater contamination will be included in the presentation by BVDA to the NRRB on March 25, 2021.

2.3 Issues with Granting a TI Waiver for the HMC Superfund Site

The granting of a TI waiver for cleanup of the HMC Superfund Site is premature for the following reasons:

- The conceptual models are incomplete or incorrect. The conceptual models presented by HMC and their consultants (e.g., HDR, 2020. Final Remedial Investigation Report, Fig. 4-1; GCAP, Figs. 3-17, 4-18) do not provide a "...three-dimensional representation that conveys what is known or suspected about contamination sources, release mechanisms, and the transport and fate of those contaminants"[14] or an adequate or complete description of the "site geology, hydrology, ground-water contamination sources, transport, and fate" that is required to secure a TI waiver.[8] Missing elements include:
    - Understanding the fluxes and sources of contamination in the SAG aquifer (well 943). NRC has not accepted HMC's arguments that the increasing uranium concentrations result from input of concentrations from overlying aquifers or the Bluewater Mill. Because of the uncertainty and the importance of the SAG aquifer as a regional resource, NRC requires further investigation.[6]
    - Including the influence of the upgradient plume derived from mine water discharges sourced from the Ambrosia Lake mine area, for which HMC is a responsible party, in the conceptual model and the cleanup proposal. An evaluation of the restoration potential of the site must include "A demonstration that contamination sources have been identified and have been, or will be, removed and contained to the extent practicable."[8] The proposal for ACLs to "automatically adjust upward" based on upgradient monitoring results, influenced by infiltration of mine water discharges, allows HMC to skirt responsibility for upgradient sources and on-site contamination. Increasing concentrations of uranium and selenium in wells north of the LTP have been attributed "a perennial supply of recharge effluent" from upstream mines.[15] The "slow, multi-decadal rise in alluvial groundwater levels" is attributed to infiltration of mine water discharges, mixing with native alluvial groundwater, and movement of alluvial groundwater from upgradient historical mines and remediation discharges (GCAP, p. 3-12).
- Site background/GWPS values need to be re-evaluated. NMED and EPA need to complete their reassessment of background groundwater quality before issuing a ROD or a TI waiver. Our

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[13] DOE, 2019. Lifecycle report. https://www.hanford.gov/files.cfm/2019_Hanford_Lifecycle_Report_w-Transmittal_Letter.pdf

[14] EPA, 2015. Use of monitored natural attenuation for inorganic contaminants in groundwater at Superfund sites. August. 83pp. (p. 6)

[15] Weston Solutions, Inc. 2018. Phase 2 groundwater investigation report for the San Mateo Creek Basin legacy uranium mines sites. October. 244 pp. (p. ES-4 – ES-5).

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independent evaluation of background values in the alluvial and Chinle aquifers is presented in Section 3.0 of this memorandum.

- The modeling to evaluate the fate and transport of hazardous constituents at the site only includes uranium and molybdenum. Predicted concentrations for all other hazardous constituents are based on the results for uranium (U) and molybdenum (Mo). (GCAP, Section 7.0). Our work has shown that selenium behaves differently than U, yet its fate and transport will not be specifically considered.
- The basis for concluding that long-term groundwater restoration is not reasonably achievable (GCAP, p. 9-4) relies on modeling that is not supported by site-specific characterization or laboratory experiments. The GCAP evaluation of Alternative 4 assumes that "immobile U" (U in clays) will diffuse into "mobile U" pathways (sandy sections) forever (GCAP, Section 7.0), even if groundwater in the mobile pathways is completely restored. This conclusion relies on an unproven assumption that U will adsorb onto clays or ferrihydrite ($Fe(OH)_3$, also referred to as HFO; GCAP, Appendix F). The extensive U plumes in the alluvium, as shown in Figure 1 in this memorandum, demonstrate that U is highly mobile in this bicarbonate-rich, oxidized, and somewhat basic groundwater environment. Under these pH and redox conditions, the dominant U species are calcium uranyl carbonate complexes, as noted in the GCAP (Appendix F, p. 18). These species are either uncharged or negatively charged and will not substantially adsorb onto HFO under site groundwater conditions. However, the modeling conducted for evaluating the alternatives assumes U will be present as a positively charged ion, UO_2^{2+}, which is much more likely to adsorb to HFO. This poorly adsorbing species constitutes less than 0.0001 percent of other more strongly adsorbates, such as calcium, copper, zinc, and bicarbonate bound to HFO based on modeling simulations conducted by NMED. The related GCAP discussion refers to two tables that do not exist in the document (see GCAP, p. 7-2), and they select the "improved constants published by Mahoney et al. (2009)," yet these constants are for the free uranyl complex (UO_2^{2+}) rather than the calcium uranyl carbonate complexes that exist in groundwater under site conditions. This approach will overestimate "immobile U" and create an unsupported source for diffusion back into the alluvium after modeled remediation. An independent examination of the modeling performed for the alternatives evaluation needs to be conducted that honors site conditions.
- Modeling efforts to evaluate the effectiveness of proposed remedial measures and whether certain measures should be retained did not include a scenario with removal of the LTP. A site in New Jersey that received a TI waiver for arsenic, beryllium, and lead in groundwater based the evaluation on modeling that included no source removal and the implementation of source removal.[16] A similar exercise should be done for the HMC Superfund site to determine its restoration potential. The GCAP contains completely contradictory statements about long-term seepage from the LTP: Seepage from the LTP will continue after the final cover is installed and impact groundwater quality (GCAP, p. 9-4); and the tailings do not represent a significant residual source term upon prolonged weathering (GCAP, Appendix F, p. 16). The tailings leachate itself is the best measure of long-term leaching potential from the tailings, not results from the short-term tests upon which the latter statement is based. The finding in the GCAP that corrective action in impracticable is not based on removal of the source materials, which will continue to leach in perpetuity. For this site, removal of the LTP is the most effective remedial approach; it sits at the top of the mitigation hierarchy, which favors control or elimination of the sources over treatment.

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[16] EPA, 2012. Summary of Technical Impracticability Waivers at National Priorities List Sites (p. A-23).

3.0 Independent Evaluation of Groundwater Protection Standards

3.1 Overview

A complete reevaluation of background groundwater quality and the current GWPS has been recommended and is currently being conducted by EPA.[5] BVDA and the Multicultural Alliance for a Safe Environment (MASE) conducted its own evaluation of background groundwater quality by hiring Ann Maest, PhD and Tom Myers, PhD to complete an independent review of existing ("current") Groundwater Protection Standards (GWPS) for selenium and uranium, which are the primary groundwater contaminants around the Homestake site. The GWPS for the Homestake Mining Company's Grants Reclamation Project were proposed by Homestake and accepted by the NMED, the U.S. Environmental Protection Agency (EPA), and the Nuclear Regulatory Commission (NRC) in 2006 (NRC 2006; Arcadis 2018 and 2019). These values are referred to as "current" GWPS. The GWPS are intended to represent non-mining-influenced groundwater quality. Homestake (2015, p. 1-2) states that uranium concentrations used in the background analysis completed in 2004 have not been affected by upgradient mining and are representative of local natural conditions.

However, current GWPS values do not accurately reflect pre-mining/milling-influenced, background conditions because the standards are based on many sample results that reflect mining influence. A re-evaluation of background water quality data for the alluvial and Chinle aquifers found that representative non-mining-influenced concentrations were well below the current GWPS values. The re-evaluated GWPS values are referred to as "proposed" GWPS. The studies conducted by Maest (2020) and Myers (2020) examined the underlying data for the current GWPS values and excluded values indicating increasing selenium and uranium concentrations over time, as they were representative of mining influence. Due to page limitations, the procedure used for determining proposed selenium GWPS values for the alluvial aquifer is described, and the approach for the Chinle aquifer was similar. A similar approach was used to determine proposed uranium GWPS values for the alluvial and Chinle aquifers. The full reports by Myers and Maest are available online.[17] Our work has prompted the NMED, with support from EPA, to conduct its own, ongoing re-evaluation of GWPS values for the alluvial and Chinle aquifers for uranium, selenium, and other mining-related constituents.

3.2 Selenium GWPS Re-evaluation and Proposed Values

The current GWPS for the alluvial aquifer are based on values from 1995 to 2004 for the "near-upgradient" wells and include wells DD, ND, P, P1, P2, P3, P4, Q, and R (NRC, 2016; Arcadis, 2019). However, very few wells in the center of the alluvial aquifer were unaffected by mine-influenced water in the period from 1995 to 2004 (the period selected for the current GWPS), as shown in Figure 2. All alluvial wells except DD, P1, and P2 used in the current GWPS evaluation had increasing concentrations of selenium during this time period, indicating mine-related influence, likely from upgradient mines in the San Mateo Creek basin.

The following assumptions and approaches were used to calculate proposed GWPS values:

- Water quality data showing a consistent increase or decrease in concentration over time and across seasons or years for the identified contaminants of concern is an indication of mine-influenced water and should not be used for the background evaluation. Unexplained spikes that do not correlate with seasonal water-level variability should also not be used.

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[17] Maest report: https://swuraniumimpacts.org/wp-content/uploads/2021/03/20.03-Maest-Background-Study.pdf; Myers report: https://swuraniumimpacts.org/wp-content/uploads/2021/03/20.03-Myers-Background-Report.pdf

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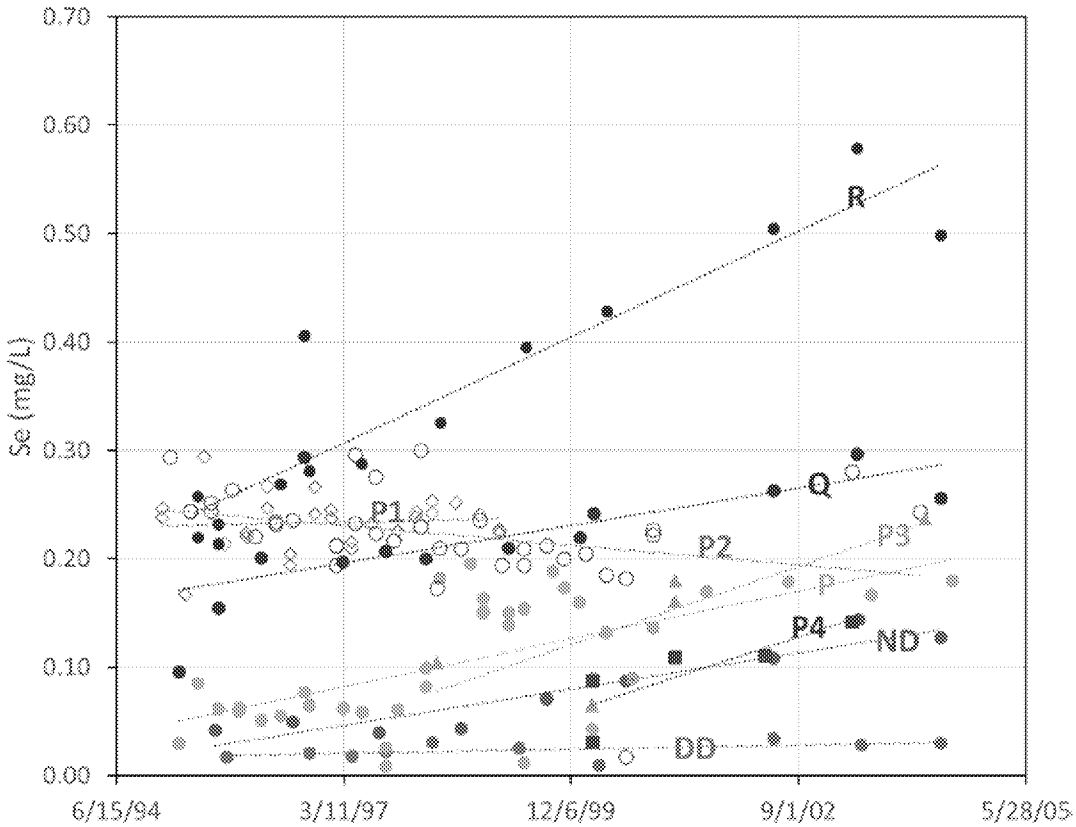
- Water quality samples from wells in identified contaminant plumes in the alluvial aquifer for a given time period have been affected by mine discharge and should not be used for the background evaluation.
- Results from wells before selenium concentrations began to increase can be used for background water quality.
- Using these assumptions, the total number of values used for alluvial groundwater was 131. Because only 9.2% of the values were below detection, they were replaced by ½ the detection limit.
- The 95th percentile was used to calculate the GWPS; therefore, differences in the low concentration range do not affect the high percentile values.



Data source: Homestake Access groundwater chemistry database.

Figure 2. Selenium concentrations from 1995 through 2004 in the near-upgradient wells selected for determining current GWPS values. The increasing concentration trends for all wells except P1, P2, and DD indicate that these groundwater data should not have been used for background because they are influenced by mining activity.

The proposed GWPS excludes wells Q and R and uses wells P (1995-1997), DD (1981-2014), ND (1983-1998), and 916 (1994-2005). Selenium concentrations in wells P1 and P2 have consistent concentrations over the narrow period of sampling (see Figure 2), but concentrations are similar to those in R and Q, which are known to be affected by mining-related sources. While wells R and Q had lower concentrations before the early 1990s, wells P1 and P2 were not sampled during this timeframe. P3 concentrations increased from the first sampling, so this well was excluded from consideration as background. Well P concentrations jumped in 1998, and concentrations from 1998 forward are not used.

The selenium concentrations in the "far-upgradient" wells (921, 920, 950, 916, 922, 914) were not used for calculating current GWPS values. Well 916 is the only far upgradient well with information on total depth and the screened interval.[18] Far upgradient well 916 was therefore also used for the proposed GWPS evaluation.

Table 1 compares current and proposed GWPS values for the alluvial aquifer; the Chinle Mixing Zone; and the Upper, Middle, and Lower Chinle Non-Mixing Zones. All proposed GWPS values are lower than the current GWPS values because the samples that reflect mining influence have been excluded. The proposed GWPS value for the Upper Chinle Mixing Zone is about half that of the Upper Chinle Non-Mixing Zone and about six times lower than the alluvial value, suggesting that the stratigraphically lower Chinle non-mixing zone was not contaminated by selenium moving from the Alluvial aquifer through the Upper Chinle Mixing Zone. The largest differences between current and proposed GWPS values are for the Alluvial and Lower Chinle Non-Mixing Zones.

Table 1. Current and Proposed Groundwater Protection Standards for Selenium

Aquifer	Current GWPS	Proposed GWPS	Basis for Recommendations
Alluvial	0.32	0.063	Excluded wells Q, R, P1, P2 – mining influence
Chinle Mixing Zone: Combined	0.14	0.079	See below
Chinle Mixing: Upper	Not determined	0.011	Excluded well CW9 (outlier)
Chinle Mixing: Middle		0.078	Excluded wells CW17, WR25 (mining influence)
Chinle Mixing: Lower		0.082	Included all well, all time periods
Upper Chinle Non-Mixing Zone	0.06	0.024	Excluded wells CW3 (2002 onward-mining influence), CW13 (east of East Fault and used for remediation), CW18 (east of East Fault)
Middle Chinle Non-Mixing Zone	0.07	0.02	Excluded DW1, DW2, ACW (spikes and increases), CW14 (high concentrations and used for freshwater injection), CW28 (mining influence)
Lower Chinle Non-Mixing Zone	0.32	0.022	Excluded CW16, CW29 (off-site collection well used for remediation), CW32 (extreme outlier), CW41 (2010 onward-mining influence)

The independent evaluation of selenium GWPS values has the following recommendations:

- Re-evaluate background water quality for all COCs and all aquifers, excluding data that reflect mining influence.
- Remediate Upper Chinle Mixing Zone to a lower (more protective) selenium concentration than the middle and lower Chinle mixing zones.

[18] Homestake Mining Company and Hydro-Engineering LLC. 2018. 2017 Annual Monitoring Report/Performance Review for Homestake's Grants Project Pursuant to NRC License SUA-1471 and Discharge Plan DP-200. Prepared for: U.S. Nuclear Regulatory Commissions and New Mexico Environment Department. March. 714 pp.

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- Study the relative transport rates of COCs to help predict future extent of contaminant plumes – will help focus remediation on preventing spread of existing and future contamination.

3.3 Uranium GWPS Re-evaluation and Proposed Values

A similar independent study was conducted on the current and proposed GWPS values for U in the alluvial and Chinle aquifers. See footnote 17 for details. A comparison of the current and proposed GWPS values and the basis for the recommendation can be found in Table 2.

Table 2. Current and Proposed Groundwater Protection Standards for Uranium

Aquifer	Current GWPS (mg/L)	Proposed GWPS (mg/L)	Basis for Recommendations
Alluvial	0.16	0.04	Statistics from the near upgradient wells, not including well DD, from 1995 through 2004, manually adjusted by the understanding that many wells in the far upgradient well field and in wells southwest of the LTP have much lower U concentrations.
Upper Chinle	0.09	0.03	A reasonable background for the Upper Chinle non-mixing zone is 0.03 mg/l based on data from before 7/22/87 at CW3 and 931. All other wells have been affected by LTP seepage during the period for which concentrations are available.
Middle Chinle	0.07	0.04	Background based on frequency analysis of HMC's Middle Chinle well data from 1982 through 2002 excepting wells and observations described in the text. Recommended background accounts for the many Middle Chinle wells throughout the area with very low concentrations early in the period by using a lower estimate even though the data is not amenable to being added to the frequency analysis. U concentrations varied, but most were initially very low.
Lower Chinle	0.03	0.03	Almost all concentrations prior to 6/26/2002 are <0.03 mg/l
Chinle Mixing Zone	0.18	0.05	Based on the 95% exceedance for the Upper and Lower Chinle and well CW15 from the Middle Chinle, with data from 1987 through 2018. LTP seepage has affected much of the data used by HMC in the Middle Chinle.

4.0 Summary and Conclusions

- Granting HMC a TI Waiver and ACLs for groundwater is premature and not based on the best available science. Major uncertainties exist regarding the site conceptual model, incorrect background groundwater quality, and the modeling used to conclude that a TI waiver and ACLs are needed.
- The finding that groundwater restoration is "not reasonably achievable" is based on faulty modeling assumptions that are not representative of site conditions. Removal of the LTP should also be considered in the modeling effort to examine the effects on long-term groundwater quality.
- For this site, removal of the tailings is the most effective solution for long-term groundwater protection. The argument that costs are too high is typical for legacy uranium mines, whereas legacy nuclear facility cleanups costing billions have been approved by the DOE. The argument that tailings removal would adversely affect the community is irrelevant because HMC has effectively eliminated the community. Long-term protection of the SAG aquifer is essential so it can continue its role as the primary regional water supply source.

ED_006200_00000274-00010

Message

From: Daniel Lattin [dlattin@barrick.com]
Sent: 3/11/2021 8:00:58 PM
To: Purcell, Mark [purcell.mark@epa.gov]
CC: Ellie Rudolf [EARudolf@hollandhart.com]; Kevin Murray (krmurray@hollandhart.com) [krmurray@hollandhart.com]; Michael McCarthy [mmccarthy@barrick.com]; Patrick Malone [pmalone@barrick.com]; Brad Bingham [bbingham@barrick.com]; Adam Arguello [aarguello@barrick.com]
Subject: RE: GRP - Homestake Written Statement to NRRB
Attachments: 20210311 Homestake Presentation Slides to NRRB.pdf

Good afternoon Mark,

As requested, please see attached Homestake slides to be presented to NRRB. Kindly acknowledge receipt to confirm successful email submission.

Thank you,

BARRICK

www.barrick.com

Daniel Lattin, P.E.
Sr. Closure Program Manager
Barrick Gold of North America, Inc.

Tel: (775) 748-1022
Mobile: (775) 397-7215

From: Purcell, Mark <purcell.mark@epa.gov>
Sent: Thursday, March 11, 2021 9:54 AM
To: Daniel Lattin <dlattin@barrick.com>
Cc: Ellie Rudolf <EARudolf@hollandhart.com>; Kevin Murray (krmurray@hollandhart.com) <krmurray@hollandhart.com>; Michael McCarthy <mmccarthy@barrick.com>; Patrick Malone <pmalone@barrick.com>; Brad Bingham <bbingham@barrick.com>; Adam Arguello <aarguello@barrick.com>
Subject: EXT: RE: GRP - Homestake Written Statement to NRRB

Good morning Daniel,

Is Homestake planning to use slides for its presentation to the NRRB?

If you are, we would like to get a pdf copy of the presentation as well. Of course, I would need that today.

Mark

Mark D. Purcell
Superfund and Emergency Management Division
U.S. Environmental Protection Agency – Region 6
1201 Elm Street, Suite 500
Dallas, TX 75270 - 2162
Tel: 214-665-6707
Fax: 214-665-6660
Purcell.mark@epa.gov

From: Daniel Lattin <dlattin@barrick.com>
Sent: Wednesday, March 10, 2021 5:09 PM
To: Purcell, Mark <purcell.mark@epa.gov>
Cc: Ellie Rudolf <EARudolf@hollandhart.com>; Kevin Murray (krmurray@hollandhart.com) <krmurray@hollandhart.com>; Michael McCarthy <mmccarthy@barrick.com>; Patrick Malone <pmalone@barrick.com>; Brad Bingham <bbingham@barrick.com>; Adam Arguello <aarguello@barrick.com>
Subject: GRP - Homestake Written Statement to NRRB

Good Afternoon Mark,

Homestake hereby provides the attached written statement to the National Remedy Review Board. Please let me know if you have any questions.

Thank you,

BARRICK

www.barrick.com

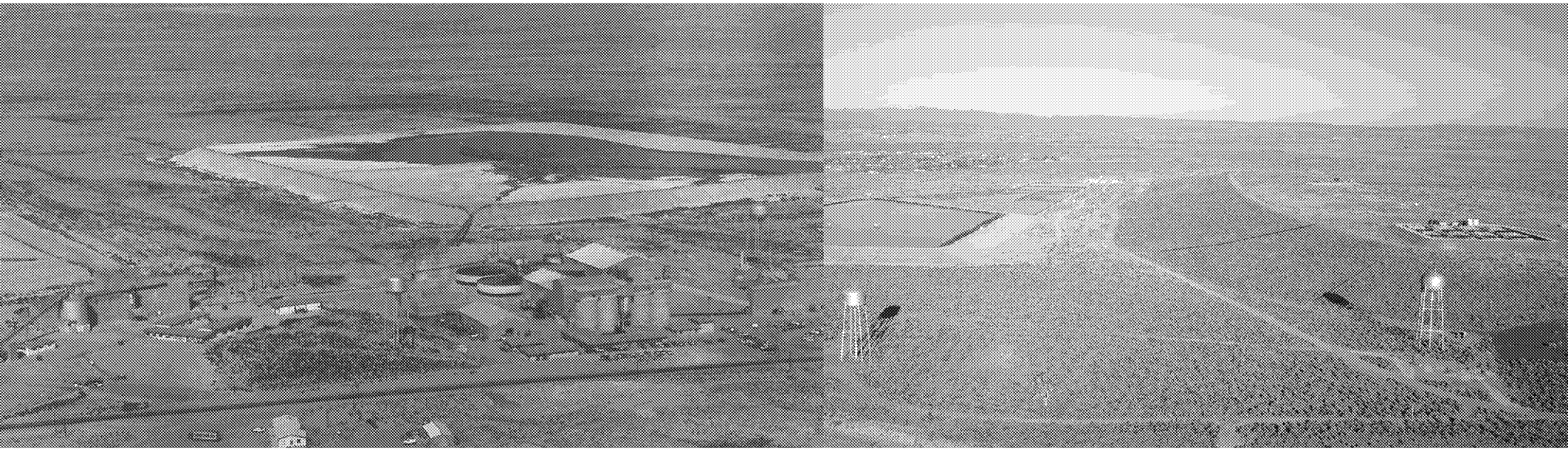
Daniel Lattin, P.E.
Sr. Closure Program Manager
Barrick Gold of North America, Inc.

Tel: (775) 748-1022
Mobile: (775) 397-7215

Homestake Mining Company Superfund Site

March 25, 2021

National Remedy Review Board

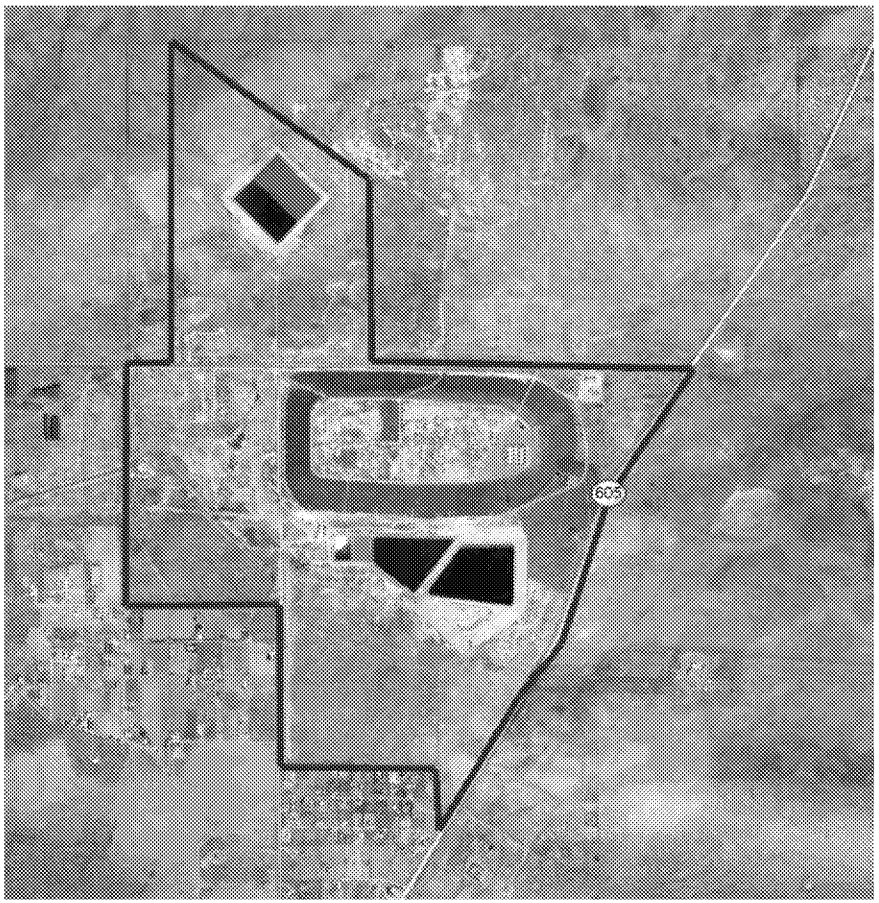


Agenda

- Site Overview
- Regulatory Oversight
  - NRC, EPA, & NMED
- History of Remediation
  - Surface & Groundwater
- Path Forward
  - Technical Impracticability

Site Overview

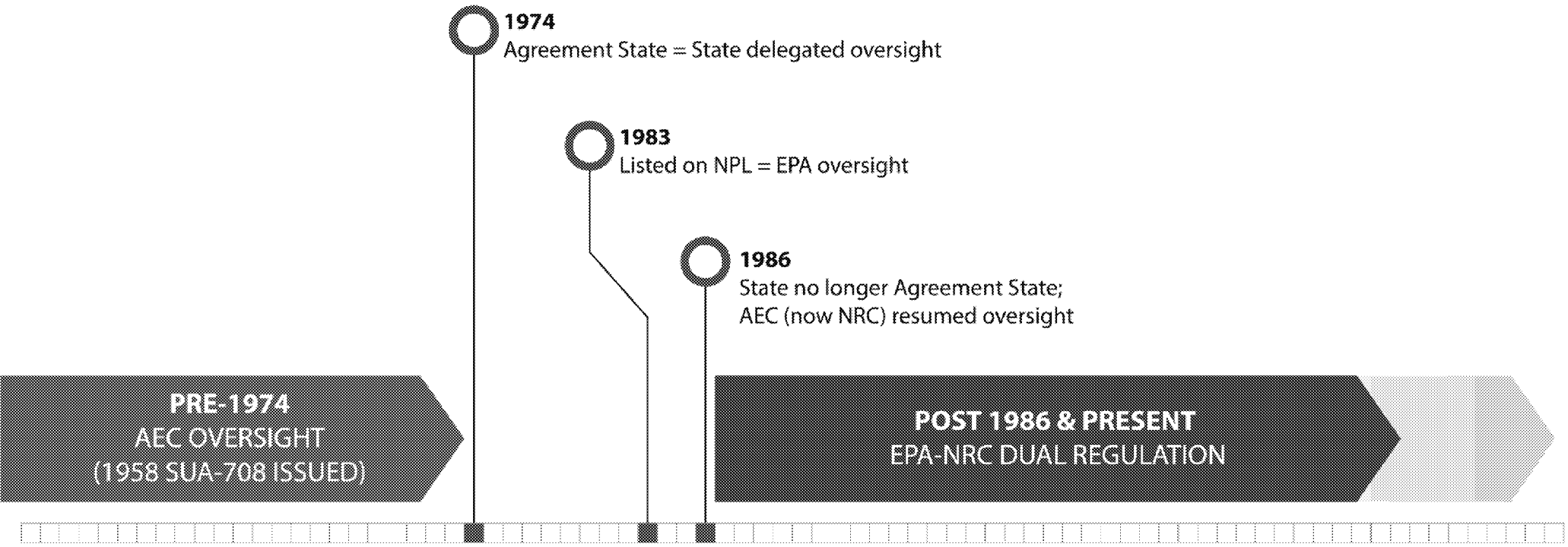
- Located in Cibola County, New Mexico, ~5.5 miles north of the Village of Milan
- Uranium processing mill operated from approx. 1958 to 1990.
- Historically supplied uranium to the United States.
- 3 operable units: tailing seepage contamination of groundwater aquifers (OU1), long-term tailings stabilization, surface reclamation and site closure (OU2), and radon concentrations in neighboring subdivisions (OU3).
  - **Current focus is OU1 and OU2**
  - EPA issued a ROD for OU3 in Sept. 1989 requiring no further action.



Regulatory Oversight

1. Nuclear Regulatory Commission (NRC) (Lead Agency)
2. United States Environmental Protection Agency (EPA)
3. New Mexico Environment Department (NMED)

How Did EPA-NRC Dual Regulation Happen?



CERCLA Equivalency

- "Equivalency" approach approved by agencies 2012.

- **Equivalency Goal**: simultaneously meet Homestake's CERCLA obligations while achieving its NRC obligations. NRC process remains the lead, via the MOU, but allows EPA to also achieve its goals parallel to the NRC actions.

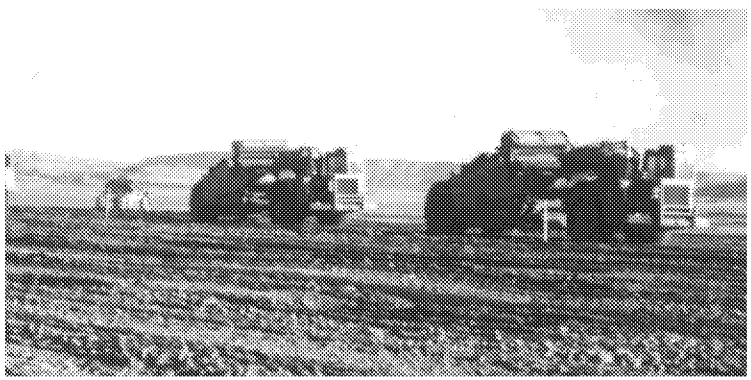
  - Equivalency = satisfy CERCLA obligations by substantial compliance with NCP requirements resulting in a CERCLA-quality cleanup. See 40 CFR § 300.700(c)(3).

Current CERCLA Status

- Prepared documents in cooperation with Region 6 using work performed for NRC & supplementing where necessary
  - RI (including HHRA, BERA, CSM) –approved by EPA
  - Candidate Technologies Memorandum
  - Screening of Remedial Alternative Memorandum
  - Entered into AOC for preparation of FS, including TI Waiver Evaluation
    - Submitted TI on Nov. 16, 2020
    - Submitted FS on Dec. 15, 2020

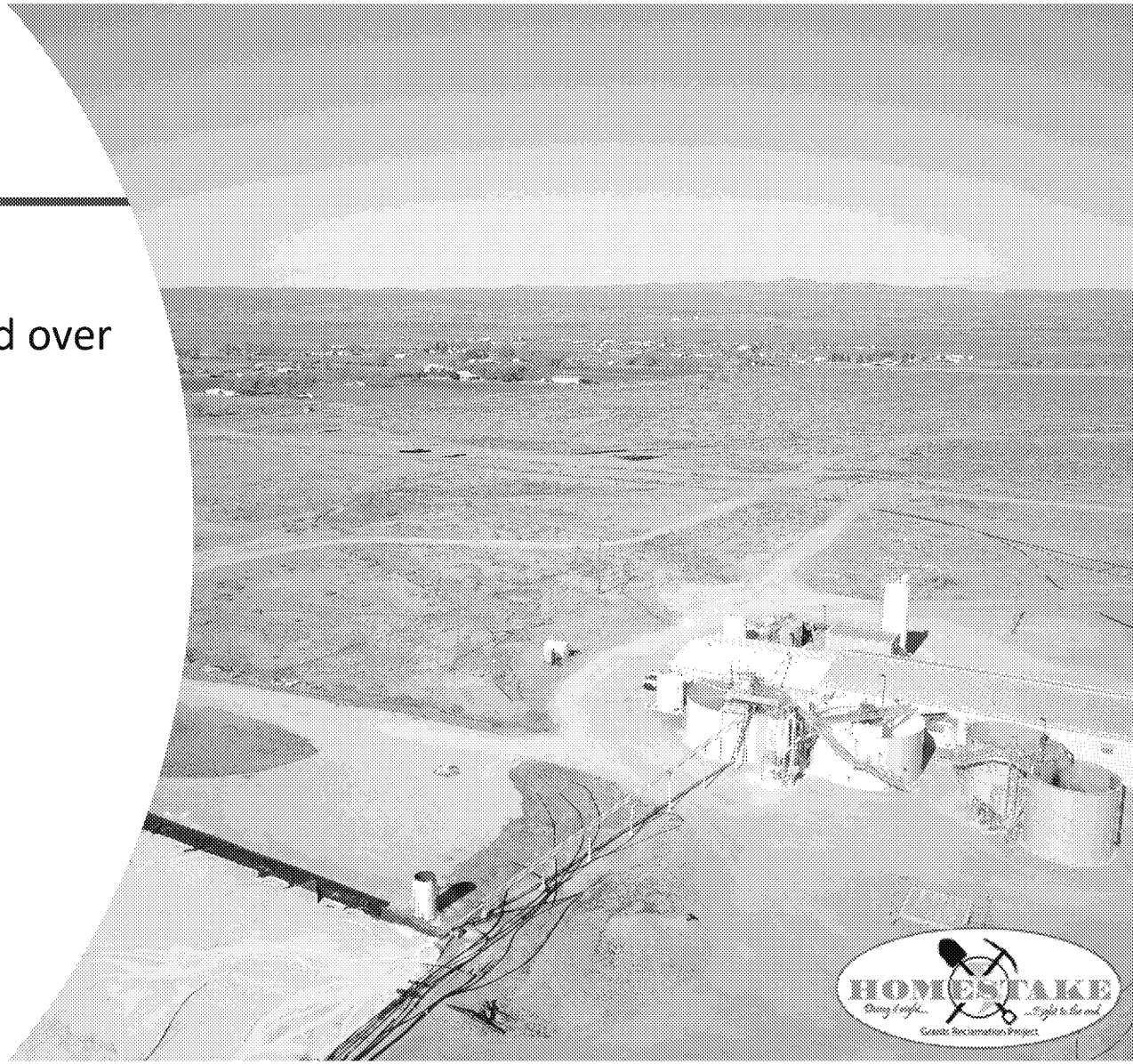
History of Remediation: Surface

- **1988 – 1993:**
  - HMC excavated windblown materials with elevated radium-226 concentrations in areas adjacent to the tailings piles and placed the soil on the piles.
  - Approx. 1,200 acres of surface soils removed.
- **1993 – 1995:**
  - Mill decommissioned and demolished.
  - Average of two feet of contaminated soil (containing elevated radium-226 concentrations) excavated from the mill area following the completion of demolition and transported to the LTP and STP. Excavated areas were backfilled with alluvial soils, as well as rock for erosion protection.
  - Tailings piles were stabilized by regrading, soil covers and rock on the side slopes for erosion protection.



History of Remediation: Groundwater

- Approx. 10 billion gallons collected over 4 decades of remediation
- Over 1 million pounds of Uranium removed
- Over $230,000,000 spent



Detailed Groundwater Remediation Efforts

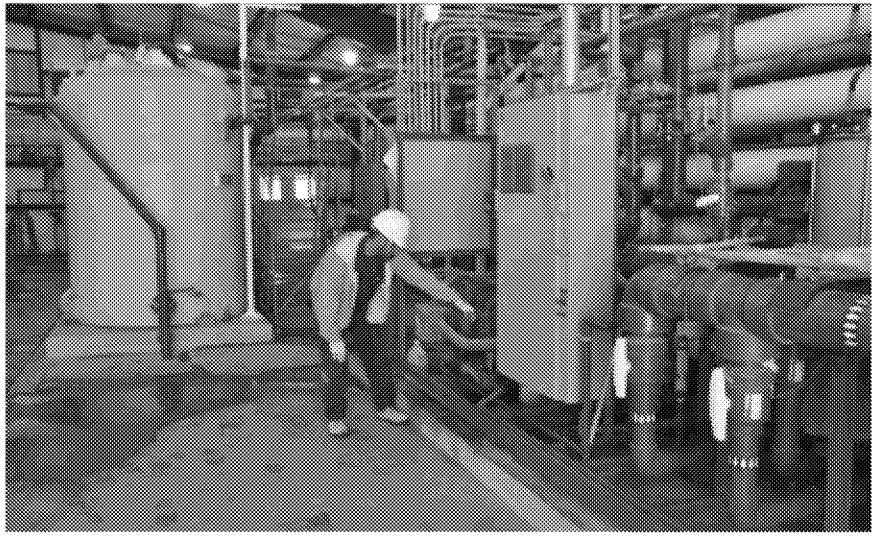
Remediation and monitoring activities began circa 1976 under applicable state and federal licenses and authorities. The following is a brief summary of the groundwater remediation efforts conducted at the Site:

- **1975 – HMC began providing bottled water to residents of nearby subdivisions upon request.**
- **1976 – HMC entered into agreement with NMEID to provide bottled water to residents located hydraulically downgradient of the source areas.**
- 1977 - Water is added into the alluvial aquifer to create a hydraulic barrier to limit the movement of contaminated groundwater
- **1977-1983 - Multiple hydraulic extraction wells were installed in the alluvial aquifer.**
- 1984 - Hydraulic containment of the Upper Chinle aquifer was initiated.
- **1986 - Extension of the Milan water supply to the Broadview Acres, Felice Acres, Murray Acres, Valle Verde, and Pleasant Valley Estates subdivisions was initiated.**
- 1990 – Evaporation Pond EP-1 was constructed within the footprint of the STP to assist in the dewatering of the LTP and to hold water pumped from the collection wells.
- 1992 - Toe drains were installed around the tailings (LTP/STP).
- 1993-2000 - During this period, corrective action and monitoring well networks were revised through addition and abandonment of wells.
- 1994 - HMC completed bench-scale treatability testing for ion exchange and activated alumina.
- 1996 - Use of Evaporation Pond EP-2 began in March.
- 1999 - The reverse osmosis (RO) treatment unit was added; treated water is used for hydraulic containment of the alluvial aquifer.
- 2000 - Irrigation of 270 acres groundwater was initiated as a means to manage extracted groundwater. HMC began flushing program.
- 2000-2015 – Tailings flushing of the LTP was conducted where water was introduced into the LTP to expedite the mass flux of contaminants from the tailings.
- 2002 - 60 acres of irrigation area were added and added an additional RO skid to plant for increased treatment rate.
- 2002-2009 - During this period, corrective action, and monitoring well networks were revised through addition and abandonment of wells.
- 2004-2005 - 64 acres of irrigation area were added.
- **2006 - EPA, NMED, and NRC approved groundwater site standards**
- 2010 - Evaporation Pond EP-3 was constructed and commissioned.
- 2012 - Land Application program ceased operation
- 2012 - 300 gpm Zeolite pilot treatment started operation.
- 2015 - RO Plant was expanded to a theoretical maximum throughput of 1200 gpm with the addition of a 600 gpm low pressure skid, a 250 gpm high pressure skid, and two microfiltration skids to replace the existing sand filters amongst other updates.
- 2016 - Zeolite system with a theoretical maximum throughput of 1200 gpm started operation for off-Site water treatment..
- 2016 - EPA initiated background reassessment study (USGS split sampling event)
- **2018 - HMC (Arcadis) borehole development and geophysics programs near wells DD and DD2 (Controls on Groundwater Background Constituent Concentrations due to Mineralogy Local to Monitoring Wells)**
- **2019 - In collaboration with EPA, HMC conducted additional field investigations to expand the characterization of the soils east of wells DD and DD2, across the alluvial channel (Supplemental Background Soil and Groundwater investigation Report Grants Reclamation Project)**

Path Forward: Technical Impracticability Waiver

- Draft TI waiver evaluation submitted Nov. 16, 2020.
- Draft FS submitted Dec. 15, 2020 **proposing long-term monitoring, institutional controls, and TI waiver**.
- Homestake has already conducted 40+ years of groundwater remediation and even with 360+ years of continued remediation will not reach ***present*** groundwater standards.
- Continued Sources:
  - Primary: LTP/STP
  - Secondary: vadose beneath LTP/STP and silt/clay in heterogeneous aquifer

Groundwater Remediation Is Technically Impracticable



- Unable to remediate the primary source (LTP/STP) and secondary source (vadose and silt/clay in alluvial aquifer beneath the LTP)
- HMC has remediated for 40+ years
  - **Applied all available technologies** (RO treatment, Zeolite treatment, ion exchange, in situ phosphate treatment, in situ bioremediation, amongst others)
  - **Treatability studies** (Tripolyphosphate, Electrocoagulation, In-situ biological treatment) – each supported impracticability
- ARARs cannot be achieved in a reasonable timeframe. 1st Order of Decay Analysis:
  - Uranium – over 200 yrs
  - Molybdenum – over 300 yrs

Protective Measures

Already implemented:

- Land Purchase - HMC currently owns approx. 74% (4,200 acres of the total 5,700 acres) of the land within the LTC/TI Zone Boundary
- Alternative Groundwater Supply – HMC connected all residents in subdivisions to municipal water system
- Groundwater Use Restrictions - Office of the State Engineer Order restricting well drilling

Future measures:

- Continued property acquisition
- Water well abandonment
- Point of use treatment if necessary
- Water use restrictions including restrictive covenants.

Summary

- **HMC has done everything that is practicable**
  - HMC has applied all available remedial strategies and tested all technologies
- **All alternatives require a TI waiver**
  - Even remediating for 200 years with overly optimistic system capacity requires a TI waiver
- **HMC is presently and will continue to implement a protective strategy**
- **A TI waiver aligns with the other regulatory programs**
  - NRC ACLs
  - NMED AAS (if necessary)

Message

From: Gail Evans [gevans@nmelc.org]
Sent: 3/23/2021 11:31:20 PM
To: Purcell, Mark [purcell.mark@epa.gov]
CC: Susan Gordon - MASE [sgordon@swuraniumimpacts.org]; Poore, Christine [Poore.Christine@epa.gov]
Subject: RE: NRRB meeting on Thursday 3/25
Attachments: ATT00001.txt; Presentation-21.03.25 Laura_NRRB FINAL.pdf; NRRB.Presentation.Maest_25Mar2021_Final.pdf

Hi again Mark.

We are disappointed with EPA's response about stakeholder participation.

We have attached the presentations that MASE and BVDA will be giving on March 25th. Please forward these to the Board members and make them part of the record.

Will there be a way for our presenters to share their screens and go through the power points during the presentation?

Thank you.

Gail

Gail Evans
Attorney
(she/her or they/them)
Office: (505) 629 4748
Cell: (505) 463-5293
www.nmelc.org

From: Purcell, Mark <purcell.mark@epa.gov>
Sent: Tuesday, March 23, 2021 3:01 PM
To: Gail Evans <gevans@nmelc.org>
Cc: Susan Gordon - MASE <sgordon@swuraniumimpacts.org>; Poore, Christine <Poore.Christine@epa.gov>
Subject: RE: NRRB meeting on Thursday 3/25

Ms. Evans,

Such participation by the stakeholders is not allowed by the National Remedy Review Board. It is a very deliberative and structured process.

Also, I want to emphasize again that each stakeholder is only allowed a specific amount of time in which to present to the Board. BVDA and MASE have been given a combined 60 minutes to make their presentations. They cannot take more time than that. After 60 minutes, their session will be cut off. As I have also told BVDA and MASE, they are encouraged to allow some time after their presentations for the Board to ask questions.

Just so you know, Region 6 is also only allowed a specific amount of time. The Board will not allow us to go over.

Mark D. Purcell

Superfund and Emergency Management Division
U.S. Environmental Protection Agency – Region 6
1201 Elm Street, Suite 500
Dallas, TX 75270 - 2162
Tel: 214-665-6707
Fax: 214-665-6660
Purcell.mark@epa.gov

From: Gail Evans <gevans@nmelc.org>
Sent: Tuesday, March 23, 2021 11:57 AM
To: Purcell, Mark <purcell.mark@epa.gov>
Cc: Susan Gordon - MASE <sgordon@swuraniumimpacts.org>
Subject: NRRB meeting on Thursday 3/25

Dear Mark,

I write on behalf of MASE and BVDA. Thank you for sending us the link for the MASE, BVDA and Homestake presentations. We understand that NMED and the Pueblos have been invited to attend those sessions as well.

As we have expressed previously, we would like to listen to the entire day of NRRB hearings on March 25. At the very least, we would like the link for the NMED and Pueblo presentations. We hope that you will provide that to us so that we can have a fuller understanding of this NRRB process which impacts MASE and BVDA members.

As always, if it would be helpful to have a phone call about this, please call me on my cell – 505 463 5293.

Thank you. gail

Gail Evans
Attorney
(she/her or they/them)
Office: (505) 629 4748
Cell: (505) 463-5293
www.nmelc.org

MULTICULTURAL ALLIANCE FOR A SAFE ENVIRONMENT

SWURANIUMIMPACTS.ORG

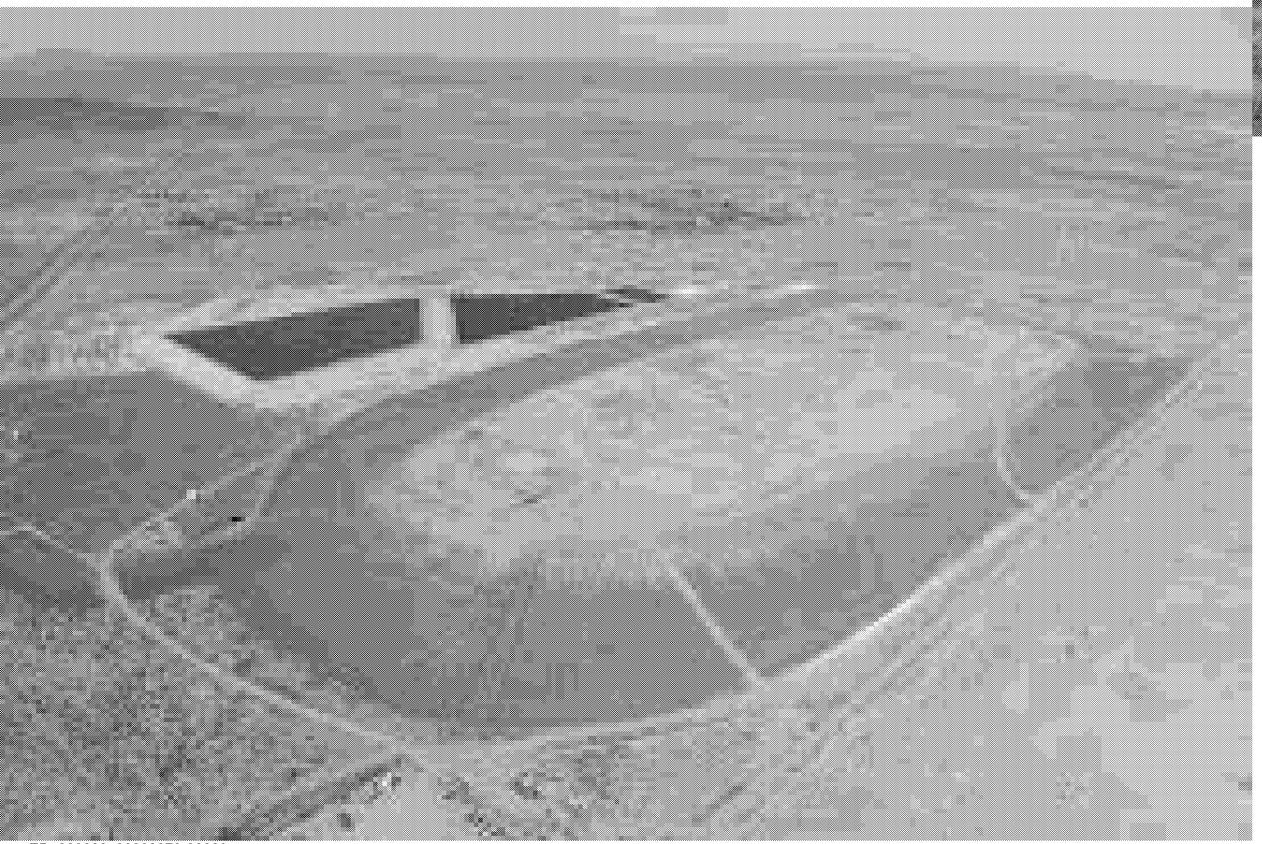
March 25, 2021
Presentation to the
U.S. EPA National Remedy Review Board
by Laura Watchempino
Multicultural Alliance for a Safe Environment

MASE Core Groups:

Blue Water Valley Downstream Alliance
Eastern Navajo Dine Again Uranium Mining
Laguna-Acoma Coalition for a Safe Environment
Post-71 Uranium Workers Committee
Red Water Pond Road Community Association

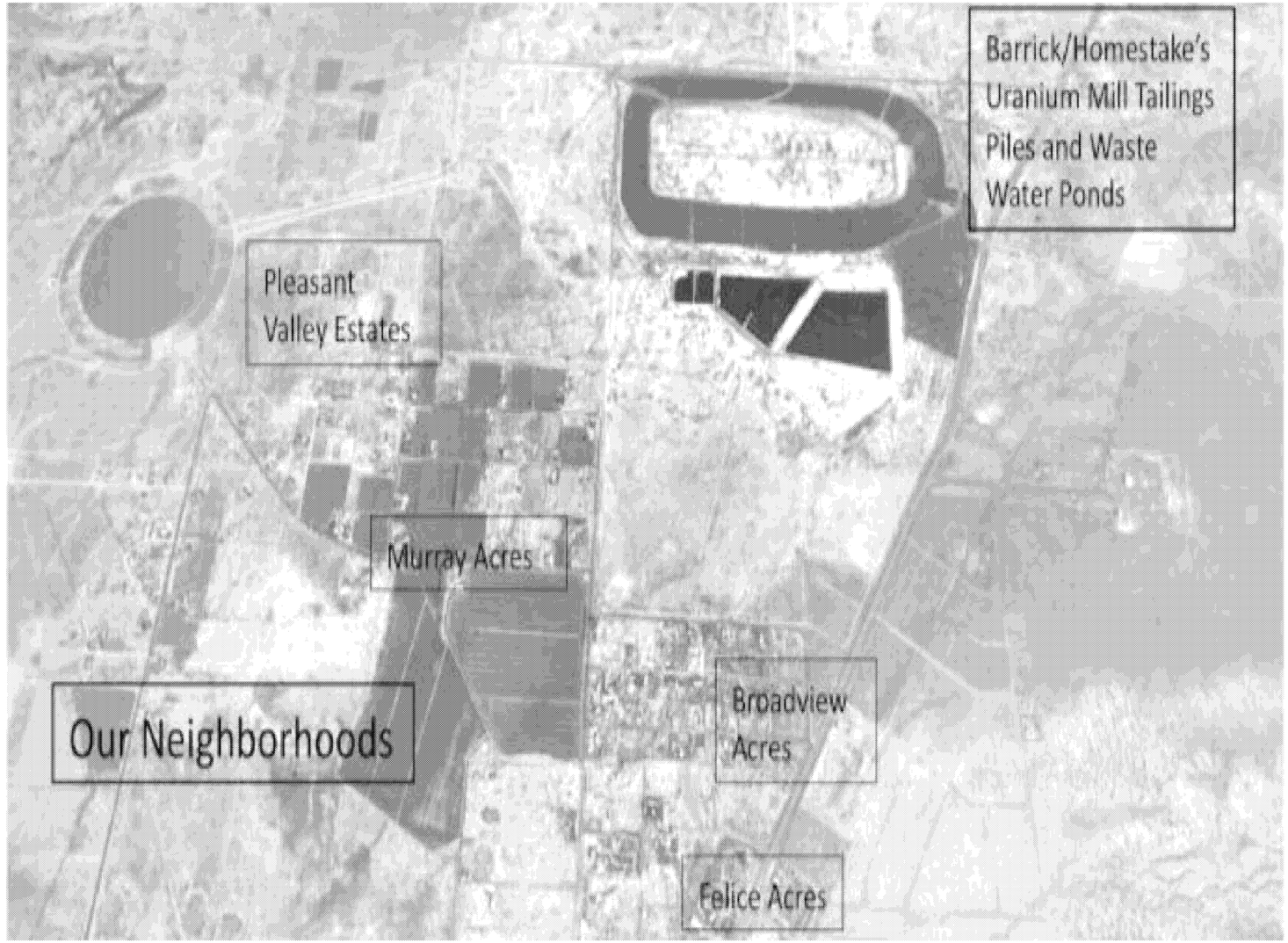
Homestake Barrick Gold Mill

Contaminating New Mexico for Decades



1957 - Mill licensed by NRC
1961 - Water contamination first identified
1977 – Site Reclamation Begins
1983 - Listed on National Priorities List – Super Fund Site
1989 - HBG CAP approved by NRC
2000 - New remedial program begins

Blue Water Valley Downstream Alliance

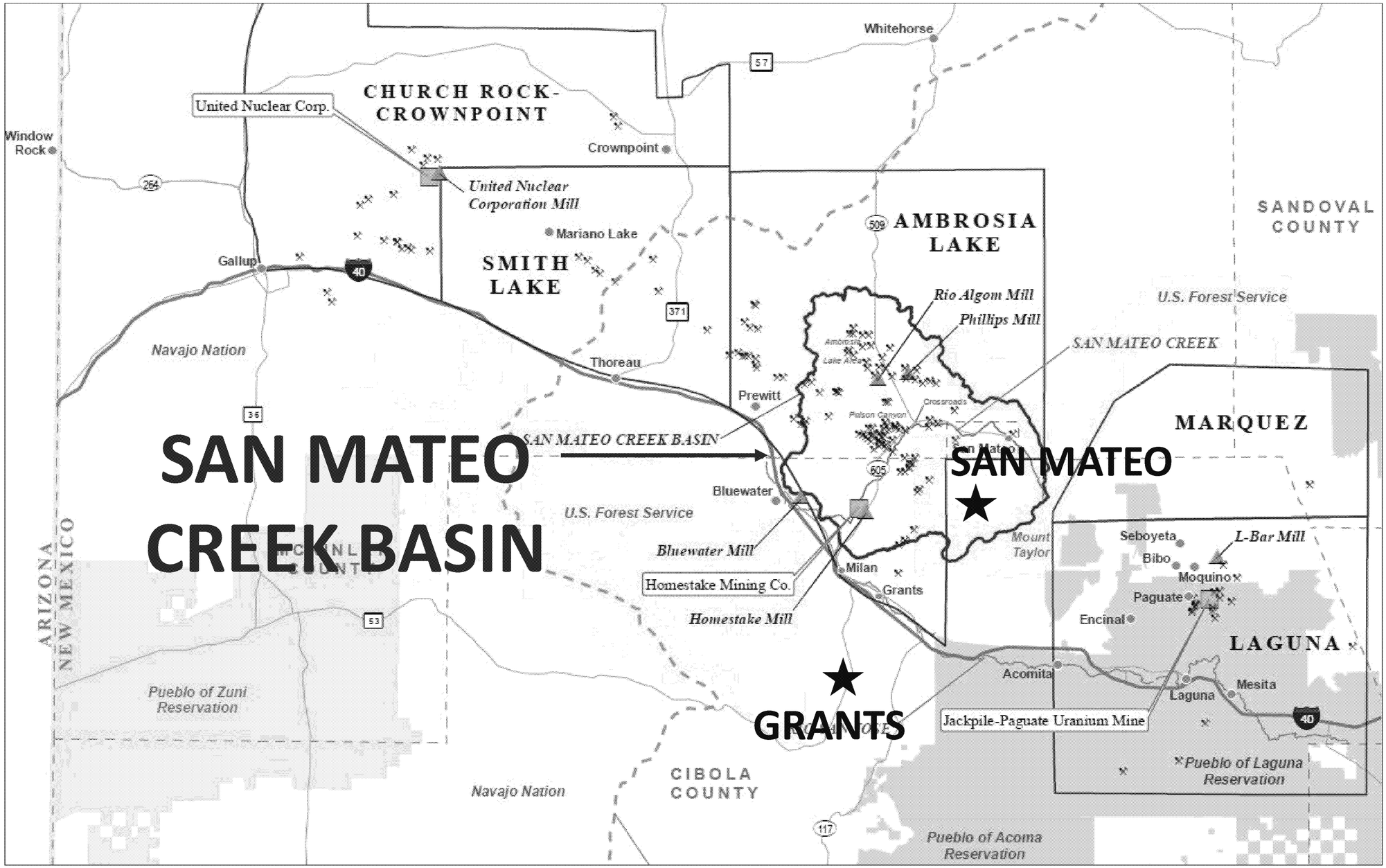


1972 Flood

Looking East, Wagon Wheel Rd., Broadview Acres
Mt. Taylor in background

Looking North, Thunderbird Road between Broadview and Murray Acres; Tailings Pile to Right of Road in Upper Right

Looking East, from Chapmans (former Home of Milton and Jonnie Head) on Ridgerunner Road



MINE

LAND OWNERSHIP

- NAVAJO
- LAGUNA PUEBLO
- ACOMA PUEBLO
- ZUNI PUEBLO
- USFS

GRANTS MINING DISTRICT

Failed Remedy:
Massive Collection / Injection Well Network Has Increased Problem

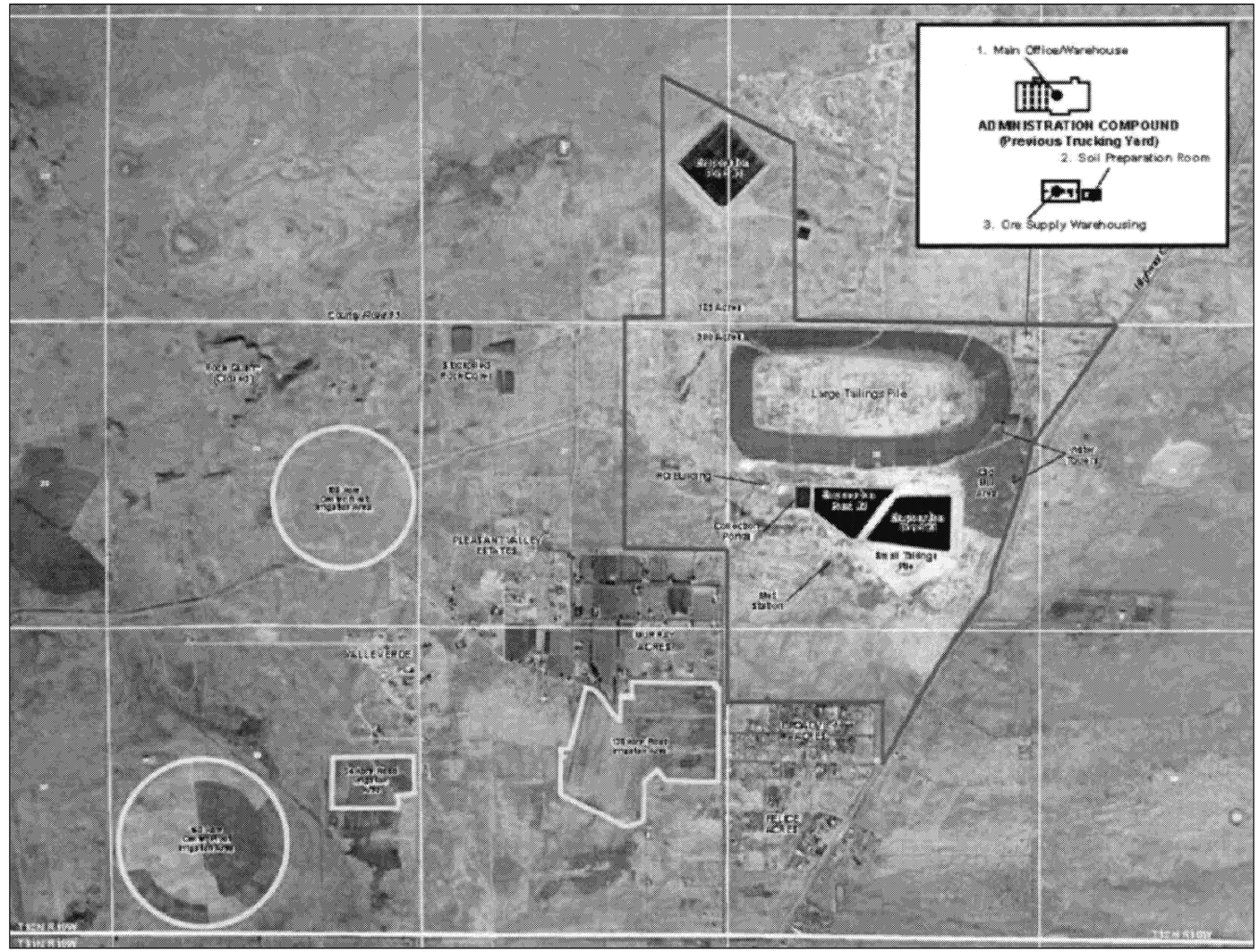
Failed Remedy:
Flushing the Tailings Piles

Failed Remedy:
Reverse Osmosis

Failed Remedy:
Zeolite System

Failed Remedy:
Illegal Land Application Off-Site

- 2000-2012: ~10,000 ac-ft of mine-influenced waters from alluvial and some Chinle wells were used for irrigation + SAG water
- Mean U values: 0.12 to 0.38 mg/L – up to 2.4 times > current GWPS and >12 times State/EPA MCL
- No remediation, Restrictive Covenants prohibit residential/ ag use of land and groundwater for drinking.



Sources: RI Report, Tables 3-3 and 3-5; GCAP, p. 2-6. Map: Brown and Caldwell, 2018. SMC and HMC Mill hydrogeo concept model, Figure 41.

Remedy: Move the Tailings Piles

MULTICULTURAL ALLIANCE FOR A SAFE ENVIRONMENT

SWURANIUMIMPACTS.ORG

In order to protect the Rio San Jose, the lifeblood of Acoma Pueblo and Laguna Pueblo, we must protect the San Andres-Glorieta Aquifer for future generations.

Presentation to the U.S. EPA National Remedy Review Board for the Homestake NPL Site

Ann Maest, PhD
Bluewater Valley Downstream Alliance
25 March 2021

Introduction

- Comments and presentation on behalf of Bluewater Valley Downstream Association (BVDA)
- Written comments submitted to NRRB on 10 March 2021
- Technical issues related to HMC's requests for Alternative Concentration Limits (ACLs) and a Technical Impracticability (TI) waiver for groundwater cleanup standards

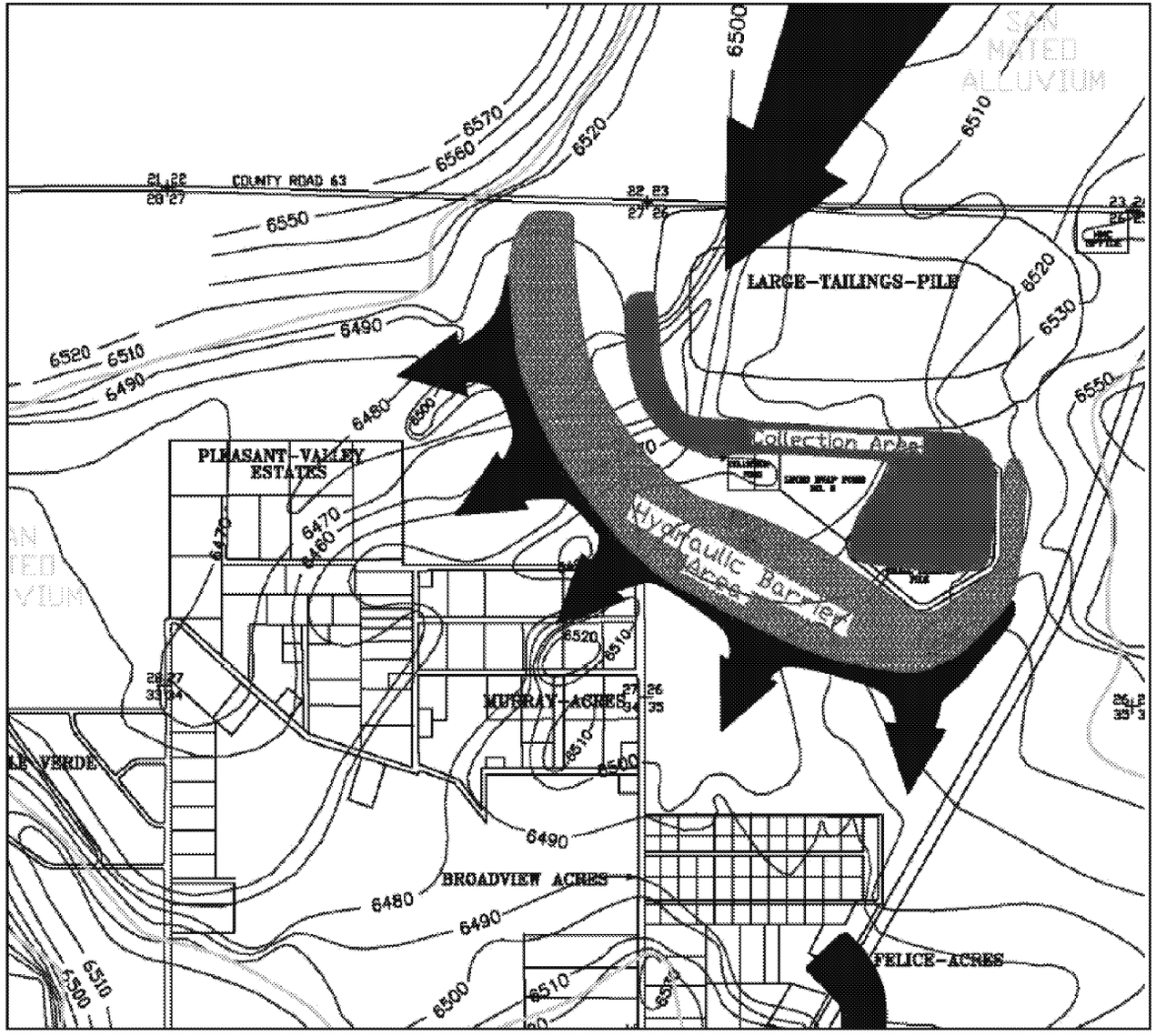
TI Waiver and ACLs are Premature

- Finding of “not reasonably achievable” based on modeling **that is not technically defensible/faulty** indicating long-term contaminant mobilization from the alluvial aquifer and large tailings pile (LTP) seepage
- HMC’s remedies have failed due to improper conceptualization, selection, and execution
- Remedies considered but not retained should be reconsidered

Failed Remedies

- Four remedies considered – three involve continuing same failed approach
  - Incomplete capture of LTP seepage
  - Water treatment not effective
  - Extensive use of San Andres/Glorieta (SAG) aquifer water for dilution
- Hydraulic barrier
  - Doesn’t address escape of LTP seepage via preferential pathways on west and east sides of LTP
  - Uses SAG groundwater for reinjection – 9 billion gallons

Alluvial Flow and Hydraulic Barrier

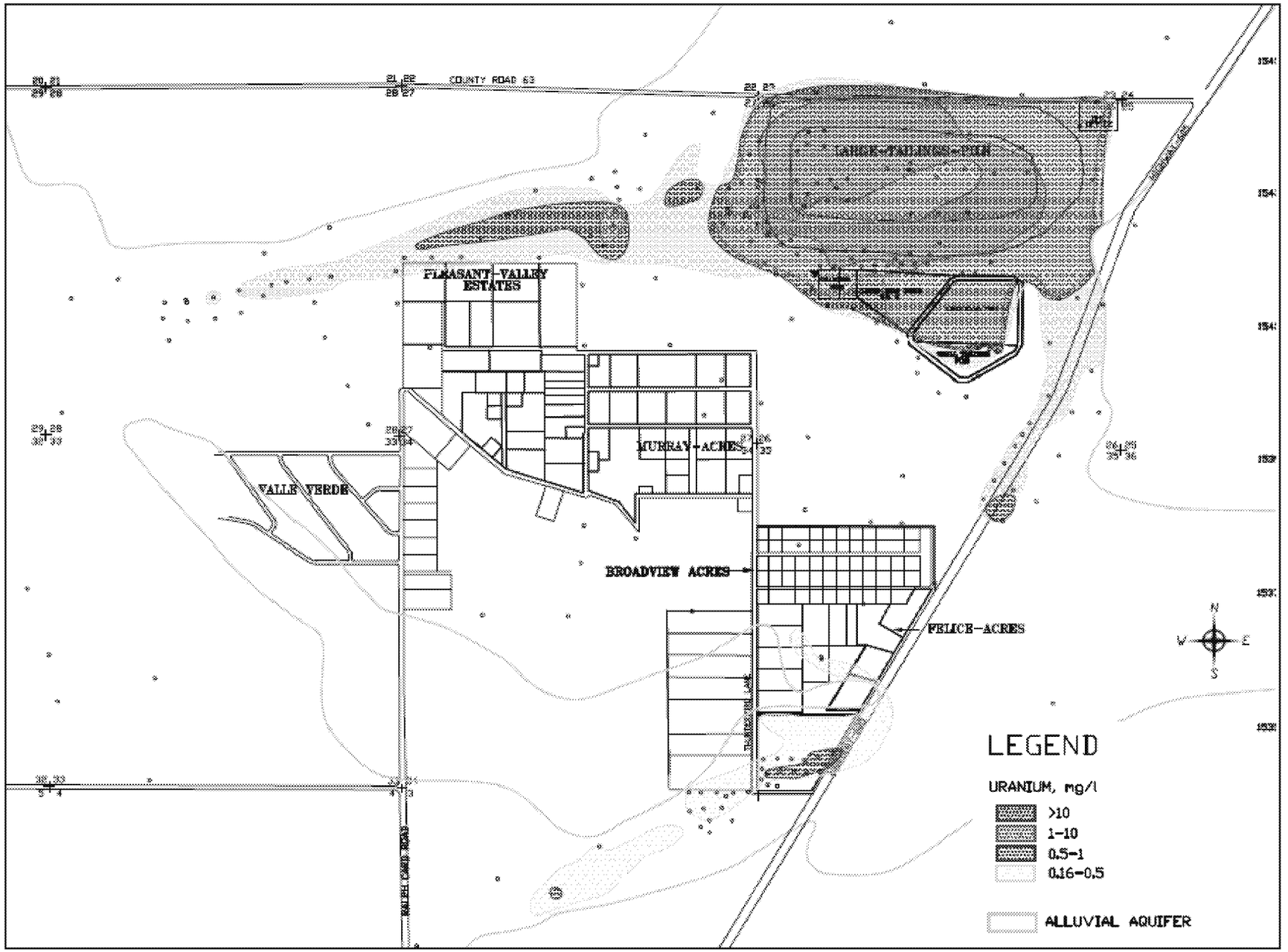


- HMC prediction – didn't work out
- Hydraulic barrier not successful in remediating plumes in preferential flow paths or from land application
- Use of SAG water throwing good water after bad – dilution is not the solution.

Source: Homestake, 2015; Figure 2-20.

Uranium Concentrations, Alluvial Aquifer, 2018

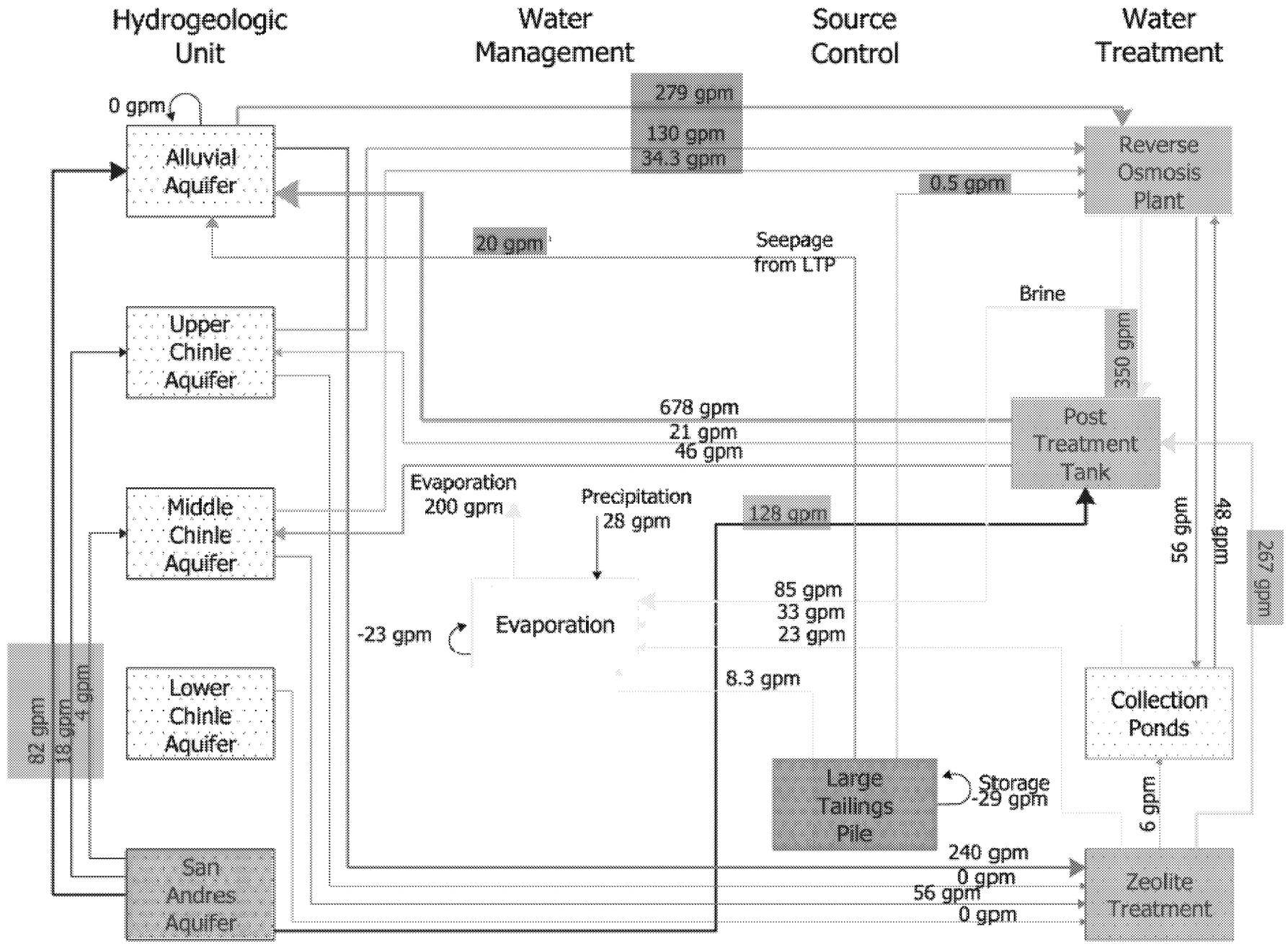
- Preferential pathways for escape of LTP seepage
- U highly mobile; all colored areas exceed site standard



Source: HMC and Hydro-Engineering, 2019. 2018 Annual Monitoring Report, Fig. 1.1-14.

2018 Water Balance: Average Flows

- LTP: 40 times more untreated seepage than treatment

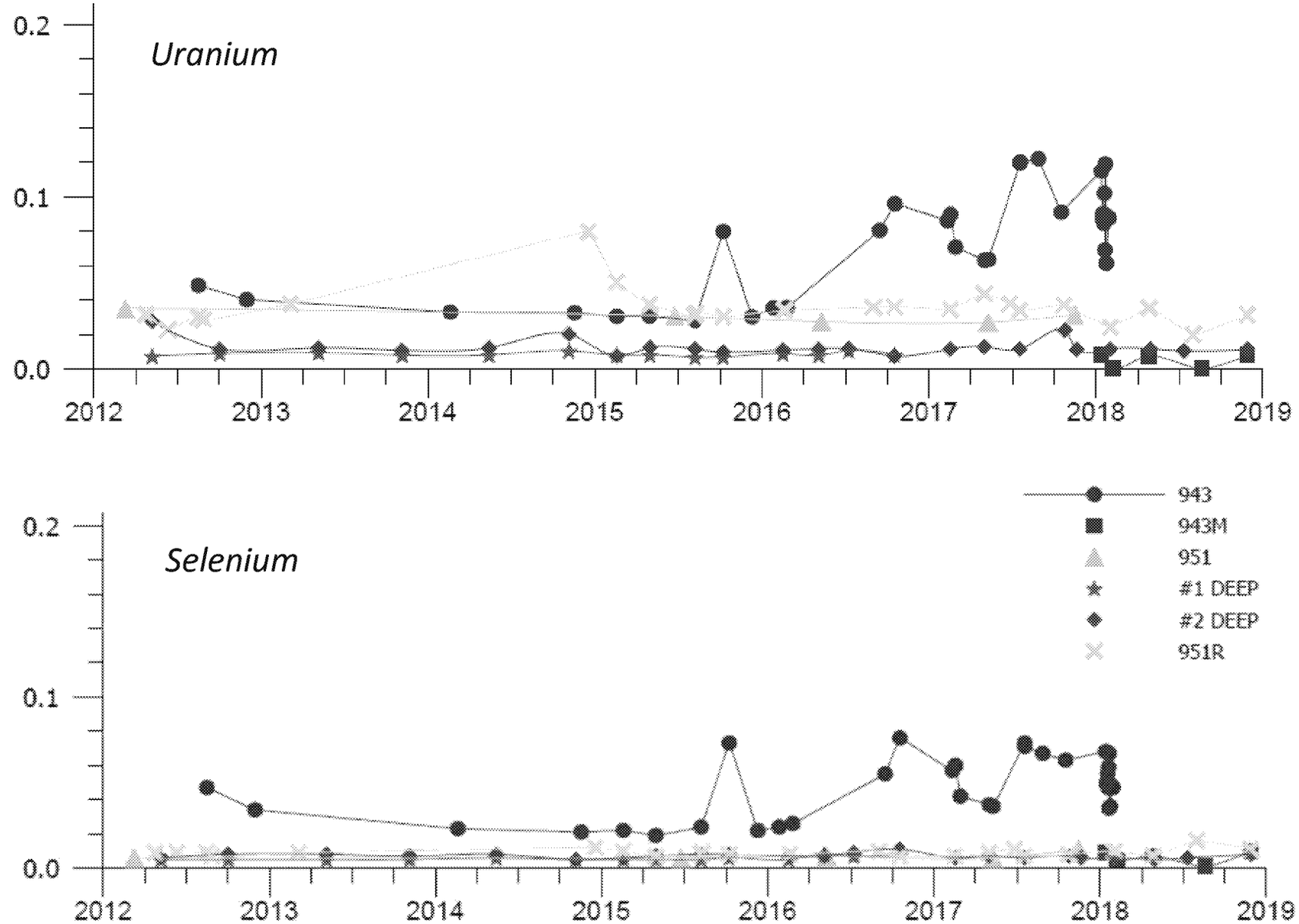


Source: HMC 2020, GCAP, Fig. 6-29.

Failed Remedies: Treatment and Water Balance

- Treatment: reverse osmosis (RO) and, at times, zeolite treatment
  - RO product – 1 exceedance of U site standard, 4 of State/EPA standard.
  - Zeolite product – no exceedances of U site standard, 27 of State/EPA standard.
- Post-treatment tank (PTT): mixed RO + zeolite + SAG water to aquifers
  - PTT – one exceedance of site U standard (0.16 mg/L), 6 exceedances of the State/EPA U drinking water standard
  - Using zeolite-treated water to replace SAG water for reinjection (reduced allowable pumping volumes) will result in more exceedances
- SAG water: only regional water supply aquifer
  - Used SAG water to dilute for quality/quantity reasons
  - Unexplained water quality problems – HMC explanations not accepted by NRC

Concentrations in SAG well 943 increasing

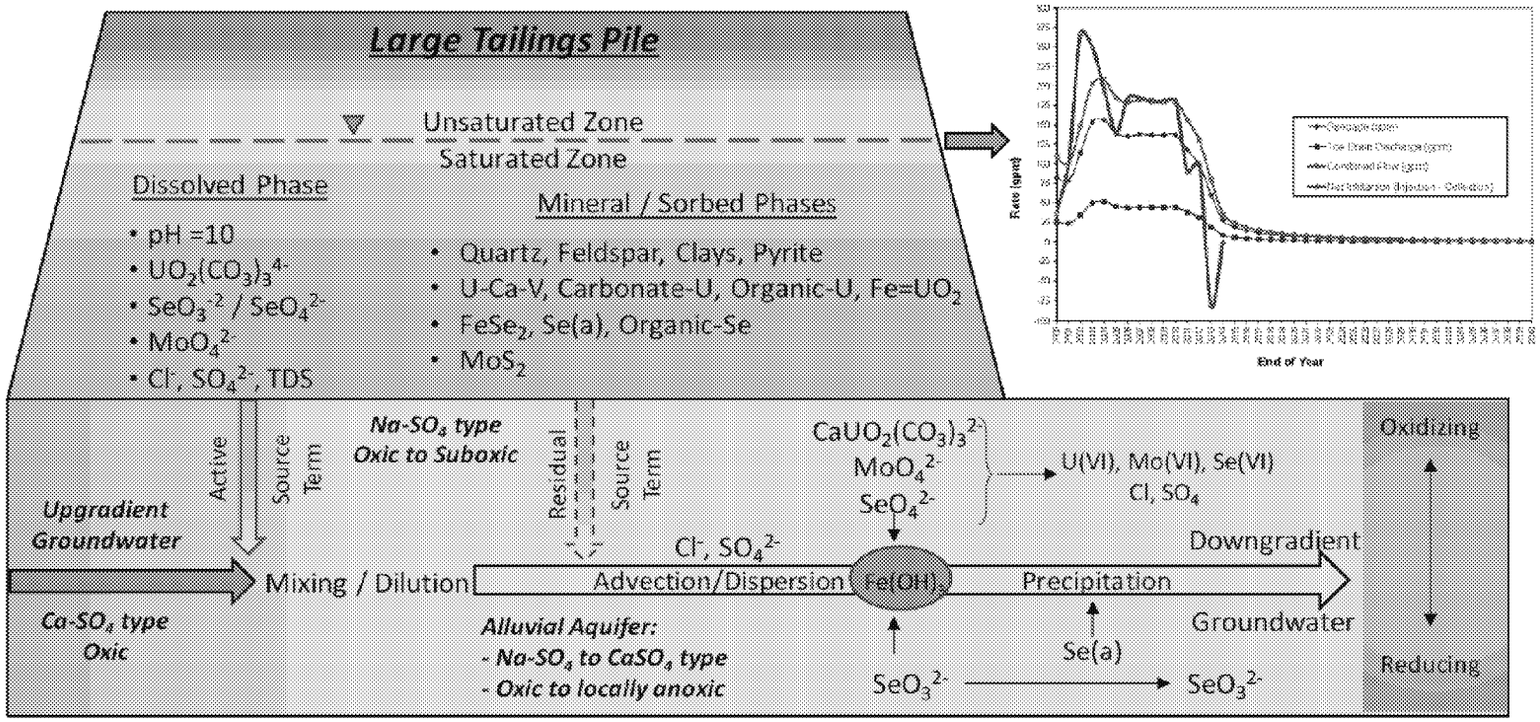


Source: HMC and Hydro-Engineering, 2019. 2018 Annual Monitoring Report, Figs. 8.2-8 & 8.2-10.

Issues with Granting a TI Waiver for the HMC Superfund Site

- Conceptual hydrologic and geochemical models incomplete/incorrect
- “Not achievable” relies on modeling not supported by site-specific characterization or laboratory experiments
- Fate and transport modeling only uses U and Mo
- Site background/GWPS values must be re-evaluated
- Modeling to evaluate effectiveness did not include LTP removal scenario
- More tailings characterization needed.

Flawed LTP and Alluvial Aquifer Conceptual Models



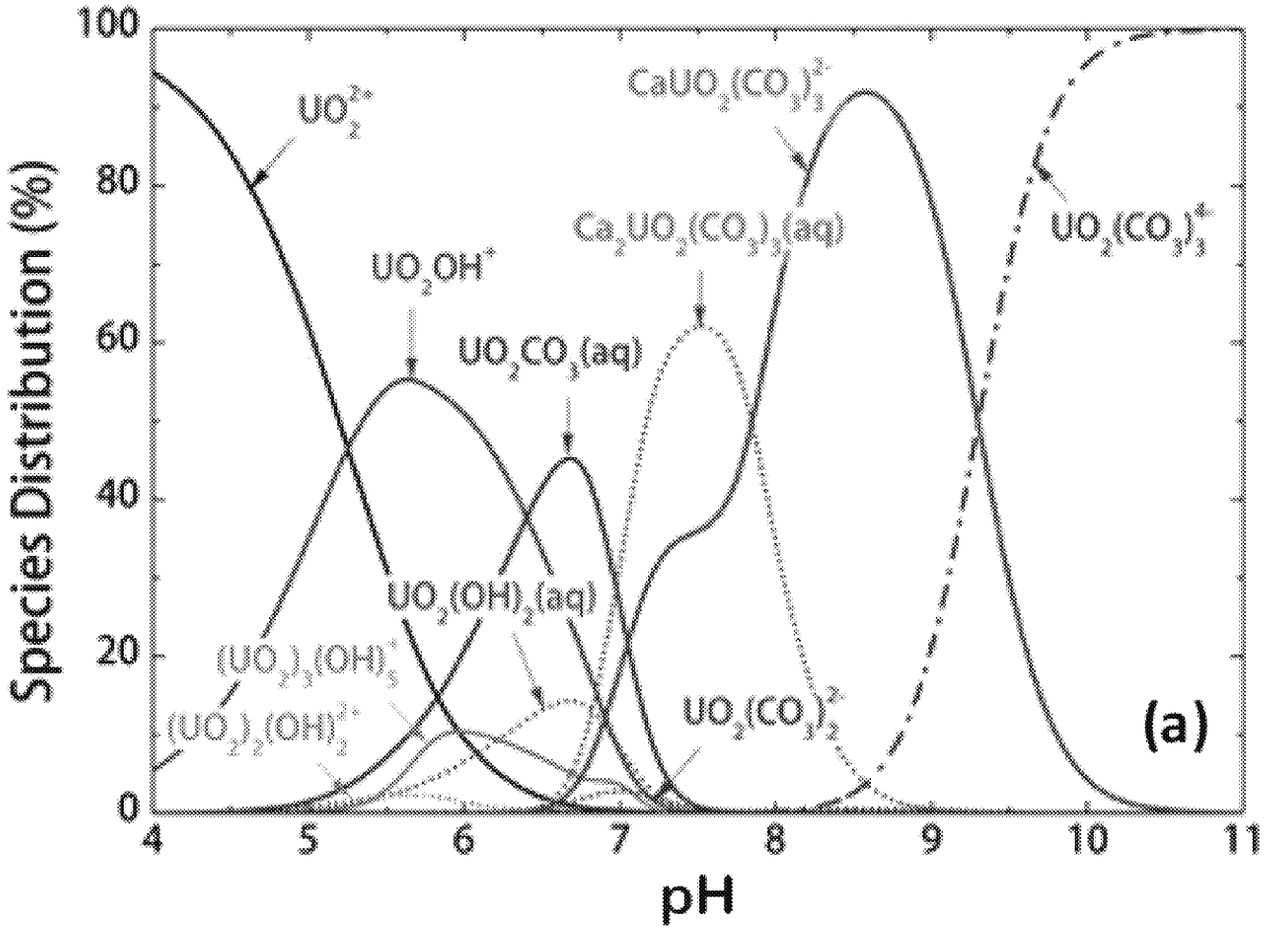
- Conceptual models do not account for
  - Upgradient plumes
  - Contamination of Chinle and SAG aquifers
  - High mobility of U, Se in alluvial aquifer: "natural attenuation" not supported.

HMC's conceptual models do not provide a *"…three-dimensional representation that conveys what is known or suspected about contamination sources, release mechanisms, and the transport and fate of those contaminants"* or an adequate or complete description of the *"site geology, hydrology, ground-water contamination sources, transport, and fate"* required to secure a TI waiver.*

Sources: Diagram: HMC, 2020. GCAP, Figure 4-18;

** EPA, 1993. Guidance for Evaluating the Technical Impracticability of Ground-Water Restoration. Directive 9234.2-25 (p. 10). September. 30pp.*

U Sorption to/from Solids Not Supportable



- HMC invokes adsorption, then desorption from clays/$Fe(OH)_3$ to show futility of cleaning up alluvial aquifer to site standards (GCAP, App. F, Table 5-3)
- U and Se species: little adsorption
- $Ca_2UO_2(CO_3)_3^0$ dominant and highly mobile in alluvial aquifer: low "natural attenuation"

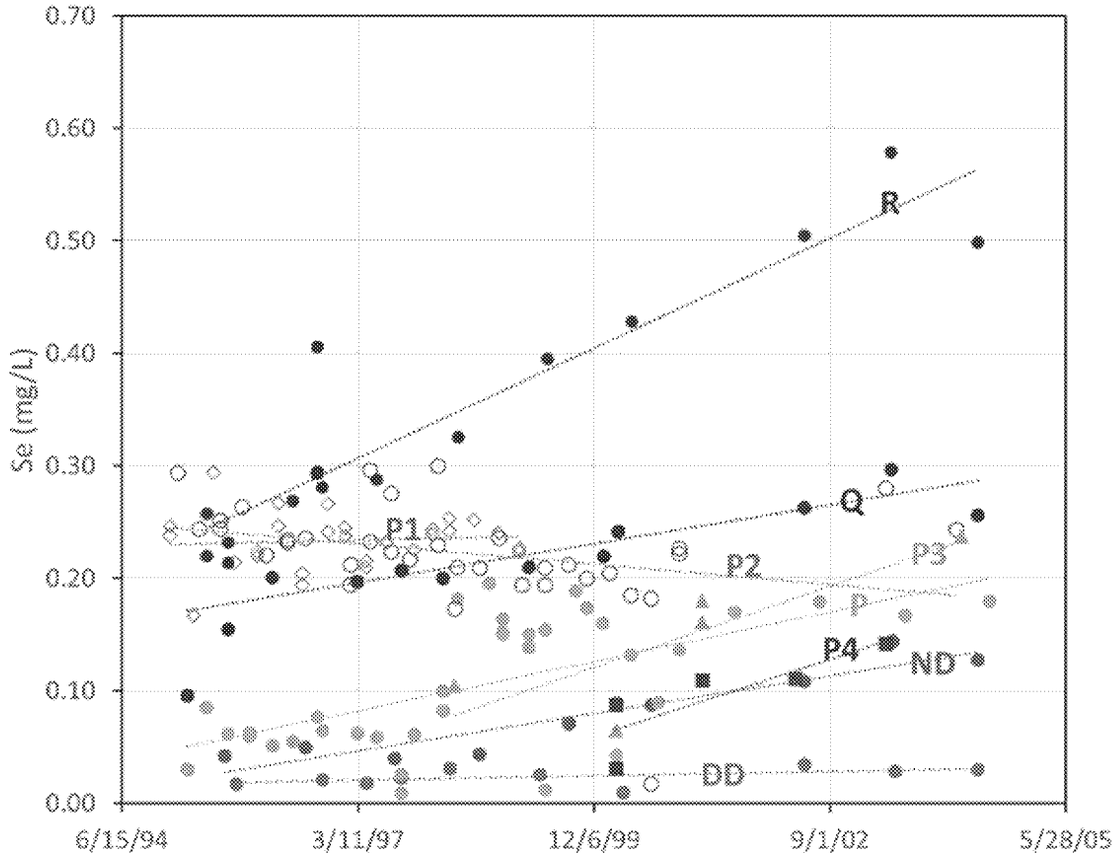
Source: HDR, 2020. RI report, Figure 4-1

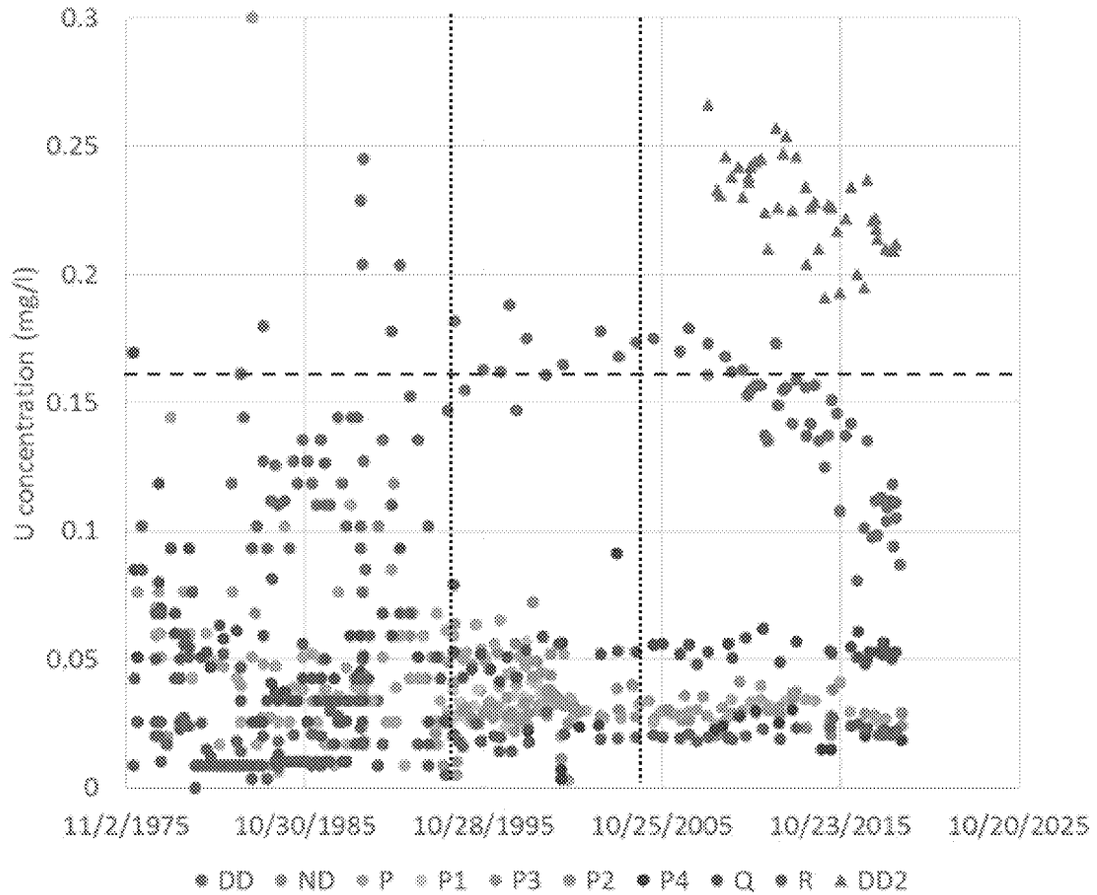
Independent Evaluation of GWPS Values

- BVDA/MASE conducted independent review of current GWPS for selenium and uranium - primary groundwater contaminants
- GWPS should represent non-mining-influenced groundwater quality, but current values include mining-influenced samples
- We excluded values indicating increasing concentrations over time, as they were representative of mining influence; used 95th percentile
- Our studies prompted NMED/EPA to conduct their own re-evaluation of site background groundwater quality

Maest report (Se): https://swuraniumimpacts.org/wp-content/uploads/2021/03/20.03-Maest-Background-Study.pdf;
Myers report (U): https://swuraniumimpacts.org/wp-content/uploads/2021/03/20.03-Myers-Background-Report.pdf

Sample results selected for Current GWPS Show Mining Influence





- Current GWPS used alluvial wells DD, ND, P, P1, P2, P3, P4, Q, and R
- 1995-2004; approx. date range and current GWPS shown
- Well DD should be excluded for U GWPS

Sources: Maest, 2020; Myers, 2020.

Proposed GWPS Values for Se and U (mg/L)

Selenium

Aquifer	Current GWPS	Proposed GWPS
Alluvial	0.32	0.063
Chinle Mixing Zone: Combined	0.14	0.079
Chinle Mixing: Upper	ND	0.011
Chinle Mixing: Middle		0.078
Chinle Mixing: Lower		0.082
Upper Chinle Non-Mixing Zone	0.06	0.024
Middle Chinle Non-Mixing Zone	0.07	0.02
Lower Chinle Non-Mixing Zone	0.32	0.022

Uranium

Aquifer	Current GWPS	Proposed GWPS
Alluvial	0.16	0.04
Chinle Mixing Zone	0.18	0.05
Upper Chinle Non-Mixing Zone	0.09	0.03
Middle Chinle Non-Mixing Zone	0.07	0.04
Lower Chinle Non-Mixing Zone	0.03	0.03

Sources: Maest, 2020; Myers, 2020.

Remedies Preferred, Considered and Rejected

- Alternative 2 preferred (Draft FS, 2021) – institutional controls and long-term monitoring
- Source removal (tailings) not retained, yet "high" effectiveness
  - "Increase in truck and heavy equipment traffic could adversely affect community." "…increase in human health risks from transporting waste…"
    - Community slowly destroyed over time so not valid
  - Costs - TI waivers based on "...engineering feasibility and reliability, with cost generally not a major factor unless compliance would be inordinately costly."
- Impermeable cap rejected, so tailings will continue to leak in perpetuity
- Potential for recovery of valuable metals from tailings not considered at all; more characterization needed
  - Rare earths found in feldspars[1]
  - Inclusions of gold found in calcite[1]
- Source removal only reasonable remedy for long-term protection - placement nearby on liners with a leachate-collection system and monitoring; vadose zone remediation under LTP also likely needed.

1 Worthington Miller Environmental, LLC, 2020. Geochemical Characterization of Tailings, Alluvial Solids and Groundwater Grants Reclamation Project, p. 8-9.

Disparity in Cleanup Priority

- Uranium life cycle starts with mining and ends with nuclear power or nuclear weapons waste disposal
- Much less cleanup effort and funding on “upstream” end; more source removals on “downstream” end
- U mining often in less populated areas with undervalued communities of color – goes against Biden administration’s emphasis on environmental justice and communities
- Nuclear facility “success” stories
  - Rocky Flats, Colorado. Pu triggers. DOE removal actions to Savannah River Site, WIPP, NV Test Site, Hanford. **~$7 billion**. Although not a perfect remediation and concerns still exist, the site today is a wildlife refuge.
  - Oak Ridge, Tennessee. Manhattan Project, WWII weapons. ~10% of waste removed off-site, 90% disposed in safe onsite facilities. At least **$2.9 billion**, completion in 2046.
  - Hanford, Washington State. Manhattan Project, 1943. Groundwater pump-and-treat system will be expanded, “significant reduction of areas of groundwater contamination.” At least **$323.2 billion**.

Disparity in Regional Mill Tailings Site Cleanup Efforts

	Durango Mill, Colorado	Atlas Mill, Moab, Utah	United Nuclear Corp. Mill, Church Rock, NM	Homestake Mill, Milan, NM
Tailings volume (yd^3)	2.5 million	9.1 million tailings	2.0 million + 1.0 million mine waste	12.6 million
Contaminated area (acres)	127	130	125	274
Distance from nearest community (miles)	0.25	3	0.5	<0.25
Offsite disposal/Source removal?	Yes	Yes	No[1]	No
Cost	$120 million (1995)	$844 million to $1.1 billion (2008)	$40-45 million (2012 mine wastes to mill)[1]	$34.9 million NPV (2021 Draft FS, preferred alternative)
Demographics	80.9% White non-Hispanic	90.3% White non-Hispanic	95.0% Native American	65.3% Hispanic Close to Acoma/Laguna Pueblos

Sources: (using 1.76 tons/yd3 for conversions)
Durango: DOE, 2020. Durango Fact Sheet; GAO, 1995. Uranium Mill Tailings Cleanup Continues, but Future Costs Are Uncertain. https://www.gao.gov/assets/rced-96-37.pdf.
Moab: DOE, 2020 https://www.energy.gov/sites/prod/files/2020/06/f75/EM-By-the-Numbers-MOAB-5.19.20-v4-FINAL.pdf; Costs https://www.wise-uranium.org/udmoa.html.
Church Rock: UNC-Church Rock Mill U Recovery Facility, NRC 2020 https://www.nrc.gov/info-finder/decommissioning/uranium/united-nuclear-corporation-unc.html; 1 Wastes from mine to be moved to tailings impoundment. NRC, 2020. Draft EIS Disposal Mine Wastes UNC Mill Site. https://www.nrc.gov/docs/ML2028/ML20289A621.pdf
Homestake Mill: HMC, 2020 GCAP, p. 2-2, HMC, 2021 Draft Feasibility Study presentation.
Demographics: https://datausa.io/profile/geo/durango-co/; https://datausa.io/profile/geo/moab-ut/; https://datausa.io/profile/geo/church-rock-nm#demographics; https://datausa.io/profile/geo/milan-nm.

Summary and Conclusions

- Granting HMC a TI Waiver and ACLs for groundwater is premature and not based on the best available science
- Major uncertainties and errors exist in conceptual site model, background groundwater quality
- Modeling used to conclude that a TI waiver and ACLs are needed based on faulty modeling assumptions not representative of site conditions and does not consider source removal option
- Source removal is most effective solution for long-term groundwater protection.
  - Community impact and cost arguments not supportable; source removals elsewhere
- Long-term protection of regional water supply SAG aquifer is essential.

Message

From: Vollbrecht, Kurt, NMENV [kurt.vollbrecht@state.nm.us]
Sent: 3/11/2021 1:55:59 AM
To: Purcell, Mark [purcell.mark@epa.gov]
CC: Kathryn Becker [kathryn.becker@state.nm.us]
Subject: NMED National Remedy Review Board submittal
Attachments: 2021-03-10 - WPD Homestake NRRB comments (Final).pdf; 2021-03-10 NRRB Slides.pptx

Hi Mark,

Please find attached comments from NMED regarding the upcoming National Remedy Review Board (NRRB) meeting on March 25, 2021. Also attached is a PowerPoint presentation for discussion purposes during the time allotted to present and discuss NMED comments with the NRRB.

NMED appreciates EPA's attention to this important matter.

Let me know if you have any comments.

Thanks.

Please note new phone number below

Kurt Vollbrecht, Manager
Mining Environmental Compliance Section
Ground Water Quality Bureau
New Mexico Environment Department
1190 St. Francis Dr., Suite N2200
Santa Fe, NM 87502
(505) 660-9420
Kurt.vollbrecht@state.nm.us
https://www.env.nm.gov/

New Mexico Environment Department

Homestake Mining Company Superfund Site Proposed Plan

Kurt Vollbrecht, Program Manager

March 25, 2021

2

Regulatory Overview

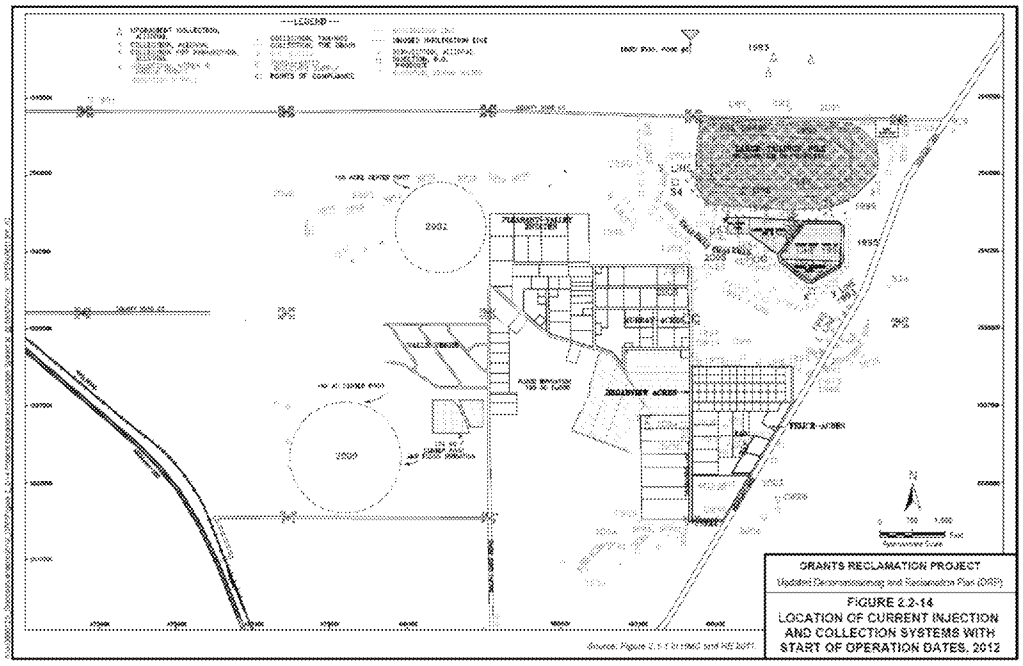
- Complex Regulatory History
  - Radioactive Materials License
    - Atomic Energy Commission (before 1974)
    - State of New Mexico (1974 – 1986)
    - Nuclear Regulatory Commission (1986 to present)
  - Superfund Site (1983)
  - State Groundwater Discharge Permit (1984)

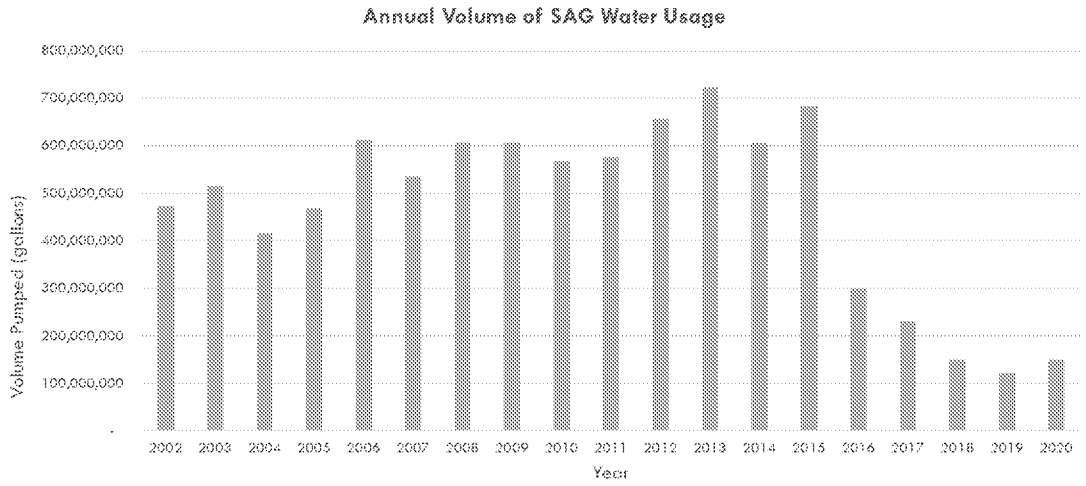
3

Remediation History

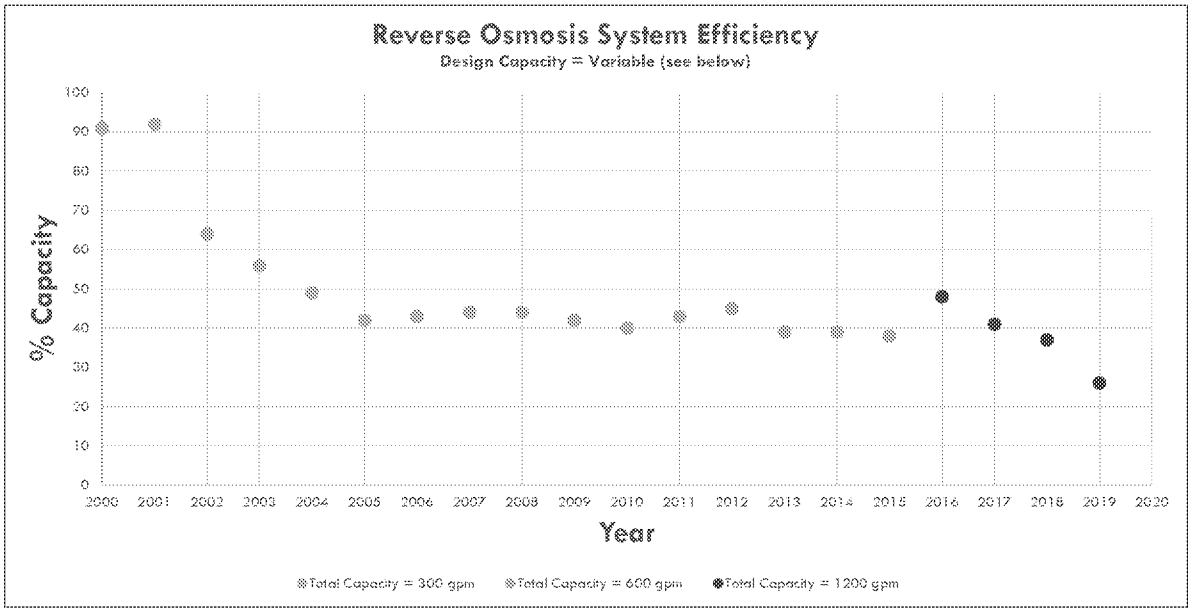
- Phased Approach to Remediation
  - Injection for Hydraulic Containment
  - Disposition of Extracted Contaminated Groundwater
    - Mill Circuit (until 1990)
    - Evaporation (1990 to present)
    - Reverse Osmosis Treatment (1999 to present)
    - Land Application (2000 – 2012)
    - Zeolite Treatment (2016 to present)

Injection and Collection Systems, 2012





*All data is from the 2002 – 2020 "*Annual Monitoring Report/Performance Review for Homestake's Grants Project Pursuant to NRC License SUA-1471 and Discharge Plan DP-200*"


Reverse Osmosis System Efficiency
Design Capacity = Variable (see below)
% Capacity
100
90
80
70
60
50
40
30
20
10
0
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
Year
Total Capacity = 300 gpm
Total Capacity = 600 gpm
Total Capacity = 1200 gpm

Zeolite Treatment Performance				
Average Annual Flow Rates from 2016-2019				
Year	1200 gpm Zeolite Input[1]	300 gpm Zeolite Input[1]	Total Zeolite Input[1][3]	% Capacity[2]
	(gpm)	(gpm)	(gpm)	Total Capacity = 1500 GPM
2016	152	115	267	18
2017	247	56	303	20
2018	259	37	296	20
2019	160	0	160	11
Annual Average	205	52	257	17

Footnote:

1) All data from Section 2.1.1.2 Zeolite Treatment Performance, HMC GRP 2019 Annual Monitoring Report

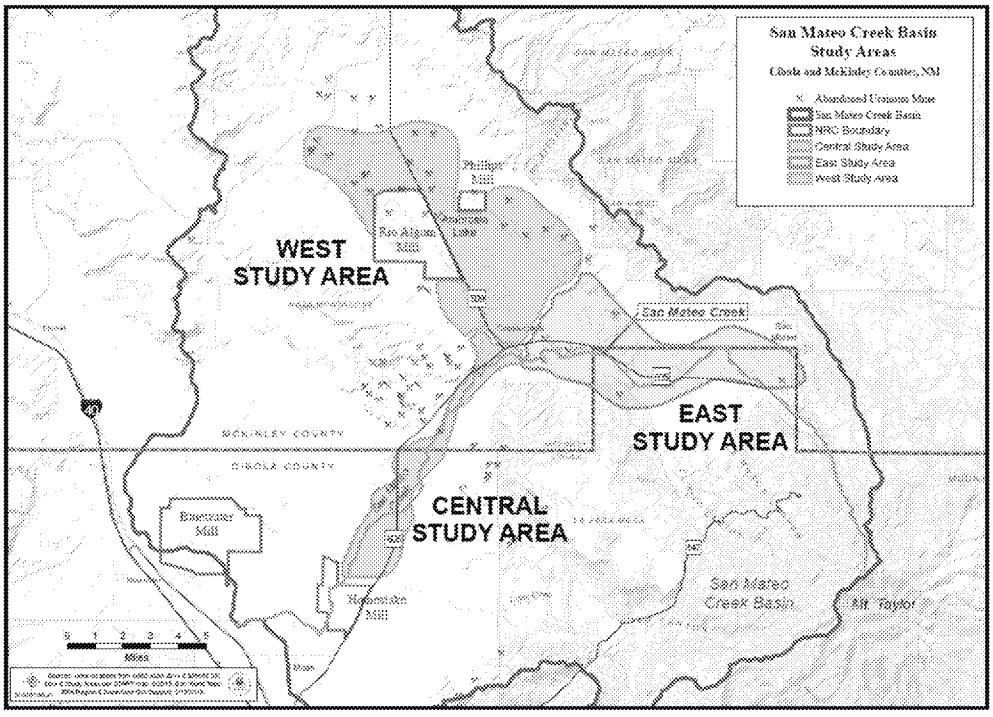
2) Calculated percentage equals the average annual input/1500 gpm total capacity

3) This represents the sum of inputs to the 1200 gpm and 300 gpm zeolite systems.

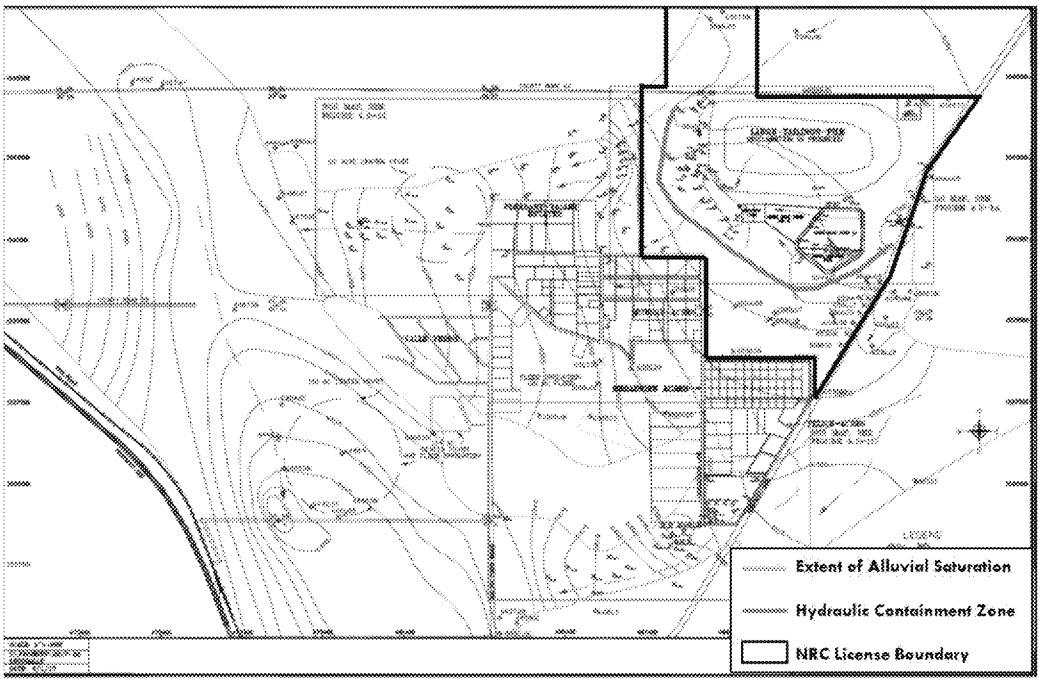
Regional Context

- San Mateo Creek Basin and the Grants Uranium Mining District
  - Transition from Dry Mines to Wet Mines
  - Mine and Mill Water Discharge
  - Homestake Hydraulic Containment
  - Critical Importance of the San Andres-Glorieta Aquifer (SAG)

San Mateo Creek Basin



San Mateo Creek Alluvial Aquifer



Background Groundwater Quality

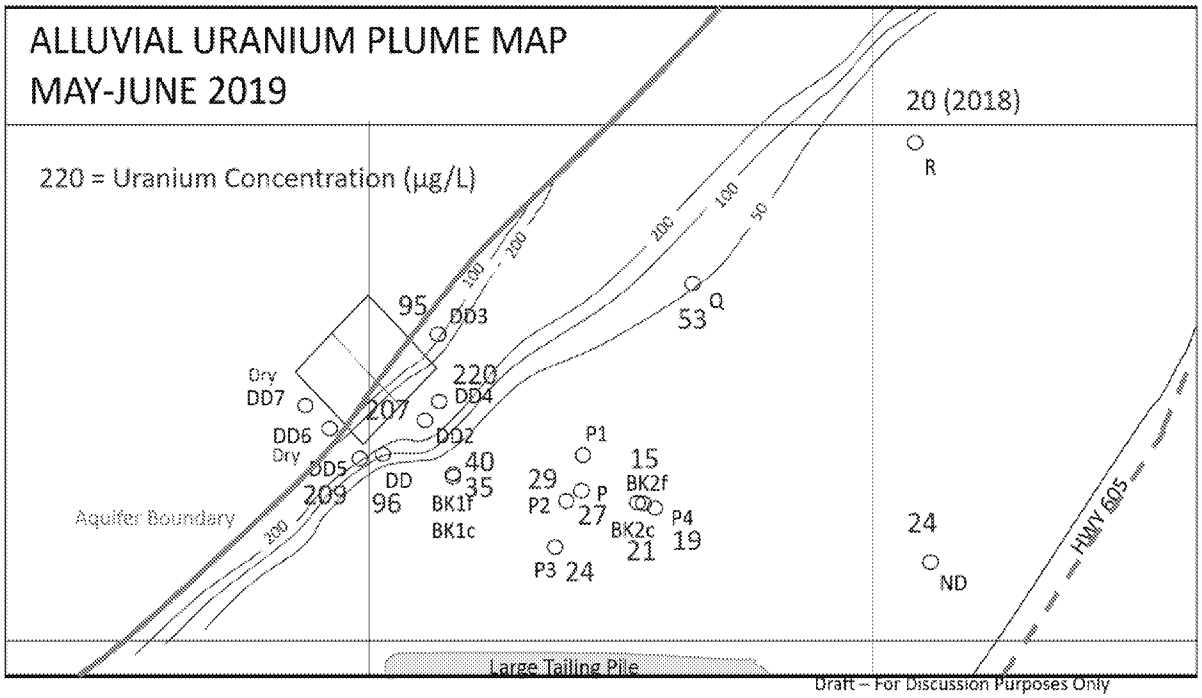
- 2006 Background Analysis
  - NRC License Amendment
  - Distribution of Contaminants in Groundwater
  - Groundwater Flow Path
  - Anthropogenic Increase in San Mateo Creek Alluvial Saturation

Site Ground Water Protection Standards

Groundwater COCs	WQCC Standards	Alluvial Aquifer	Chinle Mixing Zone	Upper Chinle Non-Mixing Zone	Middle Chinle Non-Mixing Zone	Lower Chinle Non-Mixing Zone
Selenium (mg/L)	0.05	0.32	0.14	0.06	0.07	0.32
Uranium (mg/L)	0.03	0.16	0.18	0.09	0.07	0.03
Molybdenum (mg/L)	1	0.1	0.1	0.1	0.1	0.1
Sulfate (mg/L)	600	1,500	1,750	914	857	2,000
Chloride (mg/L)	250	250	250	412	250	634
Total Dissolved Solids (mg/L)	1,000	2,734	3,140	2,010	1,560	4,140
Nitrate (mg/L)	10	12	15	*	*	*
Vanadium (mg/L)	N/A	0.02	0.01	0.01	*	*
Thorium-230 (pCi/L)	N/A	0.3	*	*	*	*
Radium-226 + Radium-228 (pCi/L)	5	5	*	*	*	*

Footnote:
1) The site groundwater protection standards are from Amendment 39 of Source Materials License SUA-1471, Water Quality Control Commission standards apply to dissolved constituents, 20.6.2.3103 NMAC
mg/L = milligrams per liter
pCi/L = picocuries per liter

ALLUVIAL URANIUM PLUME MAP
MAY-JUNE 2019

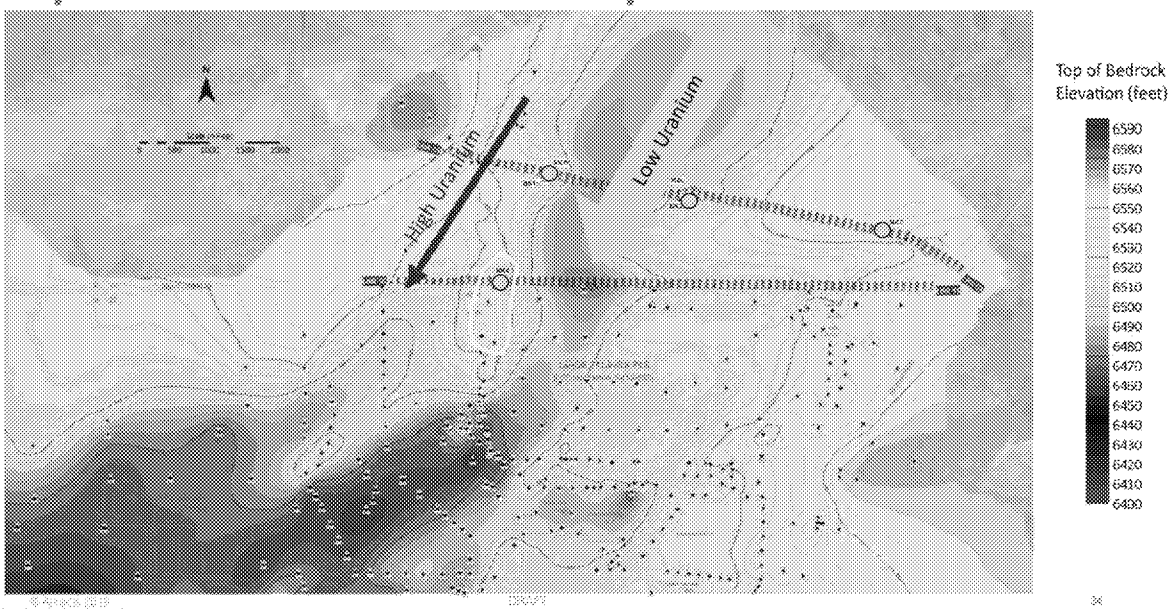


Draft – For Discussion Purposes Only

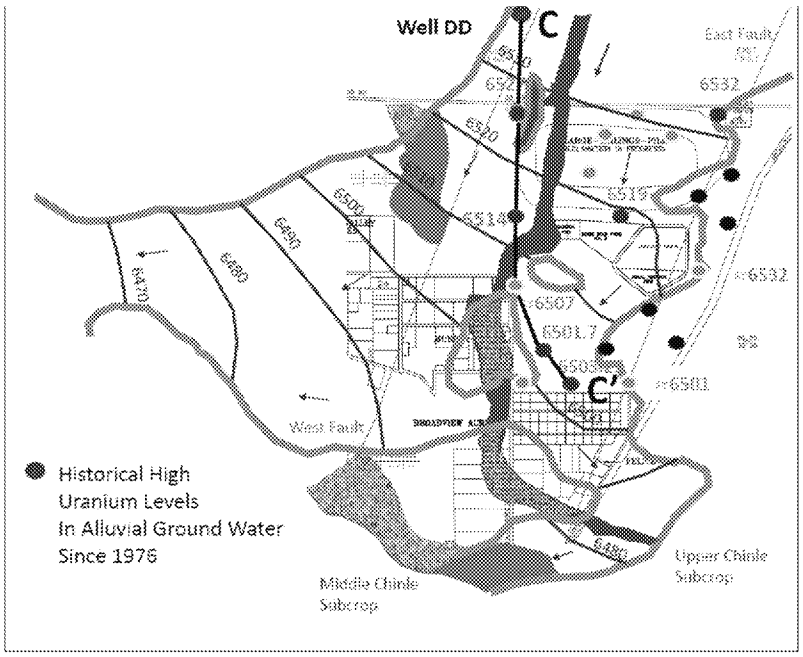
Alluvial Groundwater Flow Path

Top of bedrock elevation map

ARCADIS



Alluvial Saturation, 1960



1960 CHAVEZ BORINGS

- Dry Boring
- Potential Water
- Water
- Aquifer Boundary
- Water Level Contour

BASE FLOW ALLUVIAL AQUIFER

Based on 1960 Chavez Report

Modified From HMC Background Report

Draft -- For Discussion Purposes Only

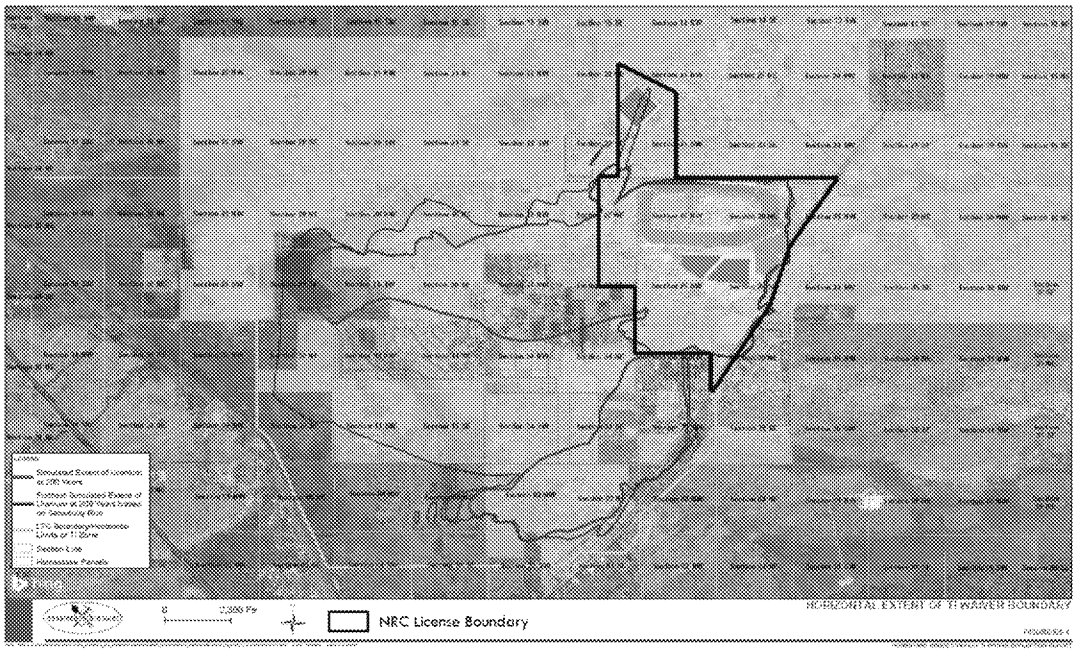
Background Groundwater Quality

- NMED-EPA Geochemical Analysis
  - Geochemical Evaluation, Well DD
  - Future Work - Establish Groundwater Background Concentrations

Homestake Draft Feasibility Study

- Homestake Proposed Remedial Action Alternatives
  - OU2 (mill decommissioning, surface soils, and tailing reclamation)
    - Engineering Controls
  - OU1 (tailing seepage and contamination of groundwater aquifers)
    - Evaluate Existing Treatment and Containment Strategies
      - Forward projection based on past performance
    - Conclusion: Alternatives Evaluated are not Protective of Human Health and the Environment
      - Cease Injection, Extraction, and Treatment Activities
  - Technical Infeasibility Waiver
    - Groundwater Modeling
    - Institutional Controls
    - Long-term Monitoring

Homestake Draft Feasibility Study Modeling Output and Technical Infeasibility Waiver Zone



NMED Request-Expand FS Scoping

1) Evaluate Restoration of Groundwater outside NRC License Boundary to Naturally Occurring Quality
2) Maintain Long-term Hydraulic Barrier through Groundwater Extraction within NRC License Boundary
3) Evaluate Treatment of Contaminated Groundwater beyond 50 Years
4) Evaluate Homestake Site within a Regional Context of Comingled Contamination

Questions?

Message

From: Aaron M. Sims [ams@chestnutlaw.com]
Sent: 3/24/2021 9:19:49 PM
To: Purcell, Mark [purcell.mark@epa.gov]
CC: Ann Berkley Rodgers [abr@chestnutlaw.com]; Governor@poamail.org; TSecretary@poamail.org; 1st_lt@poamail.org; Interpreter@poamail.org; CVandiver@poamail.org; Jacob Wilson [JWilson@poamail.org]; FMartinez@poamail.org; dmartinez@poamail.org; tcouncilpoa@gmail.com; administration@poamail.org
Subject: Re: Homestake and BVDA/MASE Presentation Slides for National Remedy Review Board March 25, 2021, Meeting - Homestake Superfund Site
Attachments: 2021-03-25_Acoma Slides_NRRB_Homestake_TIWaiver.pdf

Good afternoon Mark,

Thank you for providing the slides. Attached are Acoma's slides for our presentation tomorrow. We look forward to tomorrow's meeting.

Thank you,
Aaron M. Sims, Esq.
Chestnut Law Offices, P.A.
317 Commercial St. NE, Suite 102
Albuquerque, N.M. 87102
P: 505 842-5864
C: 505-681-4015
F: 505 843-9249
E: ams@chestnutlaw.com

www.chestnutlaw.com

On Mar 24, 2021, at 3:05 PM, Purcell, Mark <purcell.mark@epa.gov> wrote:

All,

I have attached the presentation slides for Homestake Mining Company and the Bluewater Valley Downstream Alliance and the Multicultural Alliance for a Safe Environment (MASE).

As a reminder, the State and Tribal Session begins tomorrow at Noon (Mountain Time). The Stakeholder Session for Homestake and the BVDA/MASE begins at 1:30 pm (Mountain Time). I sent you the final agenda. And I also sent you two Microsoft Teams meeting invites for these two sessions.

These meetings are for the specific stakeholder to present to the Board and the Board to ask questions. We will ask other parties that are attending the meeting to not interrupt the discussions.

Mark

Mark D. Purcell
Superfund and Emergency Management Division
U.S. Environmental Protection Agency – Region 6
1201 Elm Street, Suite 500
Dallas, TX 75270 - 2162
Tel: 214-665-6707
Fax: 214-665-6660

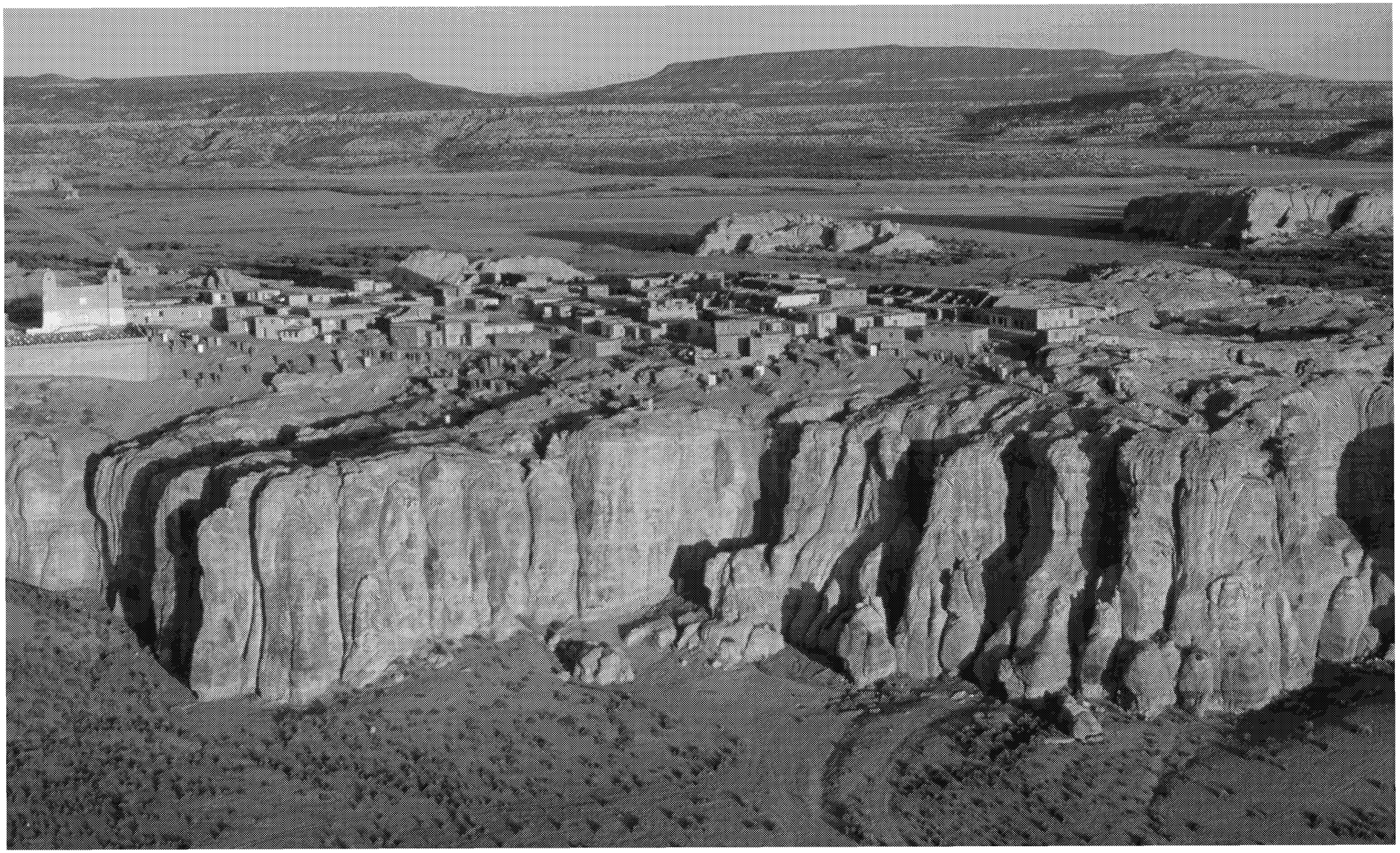
Purcell.mark@epa.gov

<20210311 Homestake Presentation Slides to NRRB.pdf><Revised Presentation-21.03.25 MASE-BVDA Laura_NRRB FINAL.pdf><NRRB.Presentation.Maest_25Mar2021_Final.pdf>

Pueblo of Acoma Presentation

National Remedy Review Board meeting on the
Homestake Mining Company Superfund Site
– Technical Impracticability Waiver Request

March 25, 2021



Acoma Pueblo

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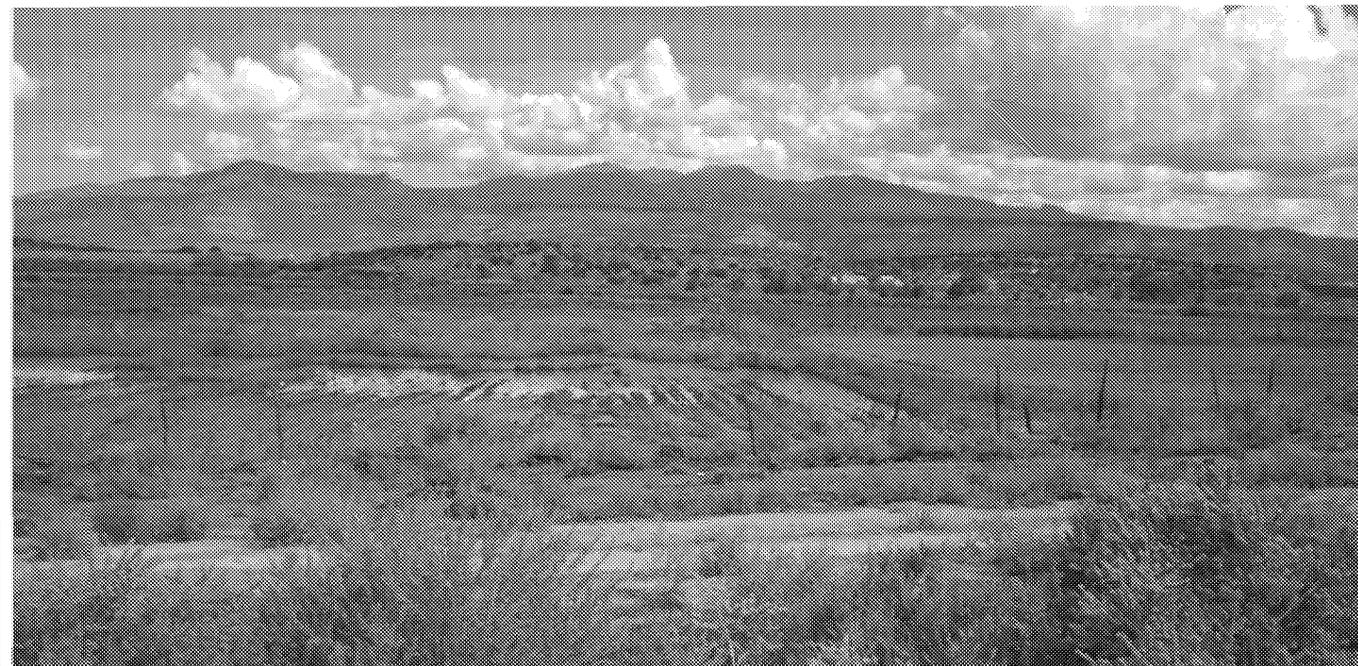
WATER - A NATURAL AND CULTURAL RESOURCE



View of Mt. Taylor as seen from Acomita, Pueblo of Acoma, showing outcrops of volcanic rocks and Mesa Verde Sandstones (background) and Dakota Sandstone (foreground) with flooded cornfield in the Rio San Jose Valley.

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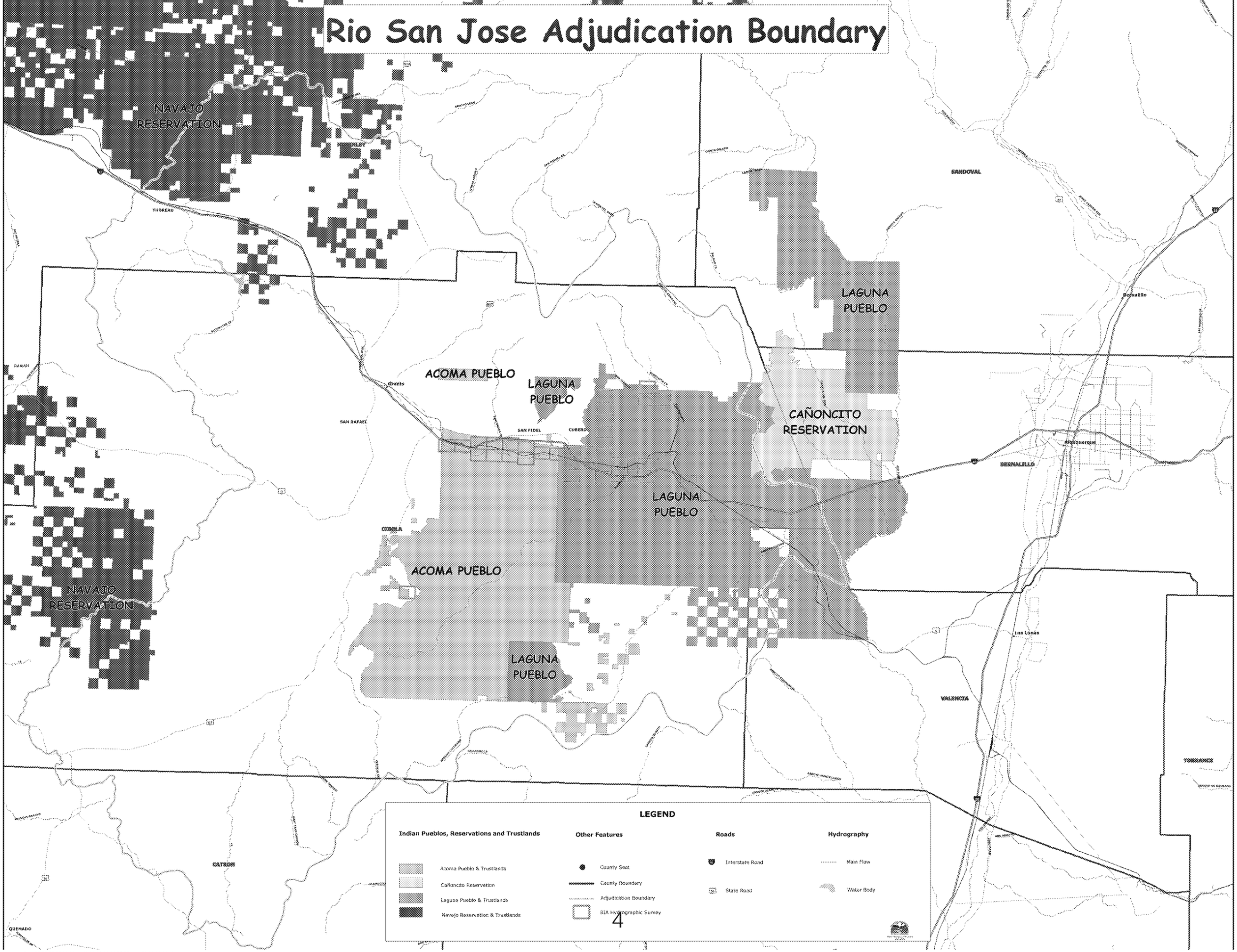
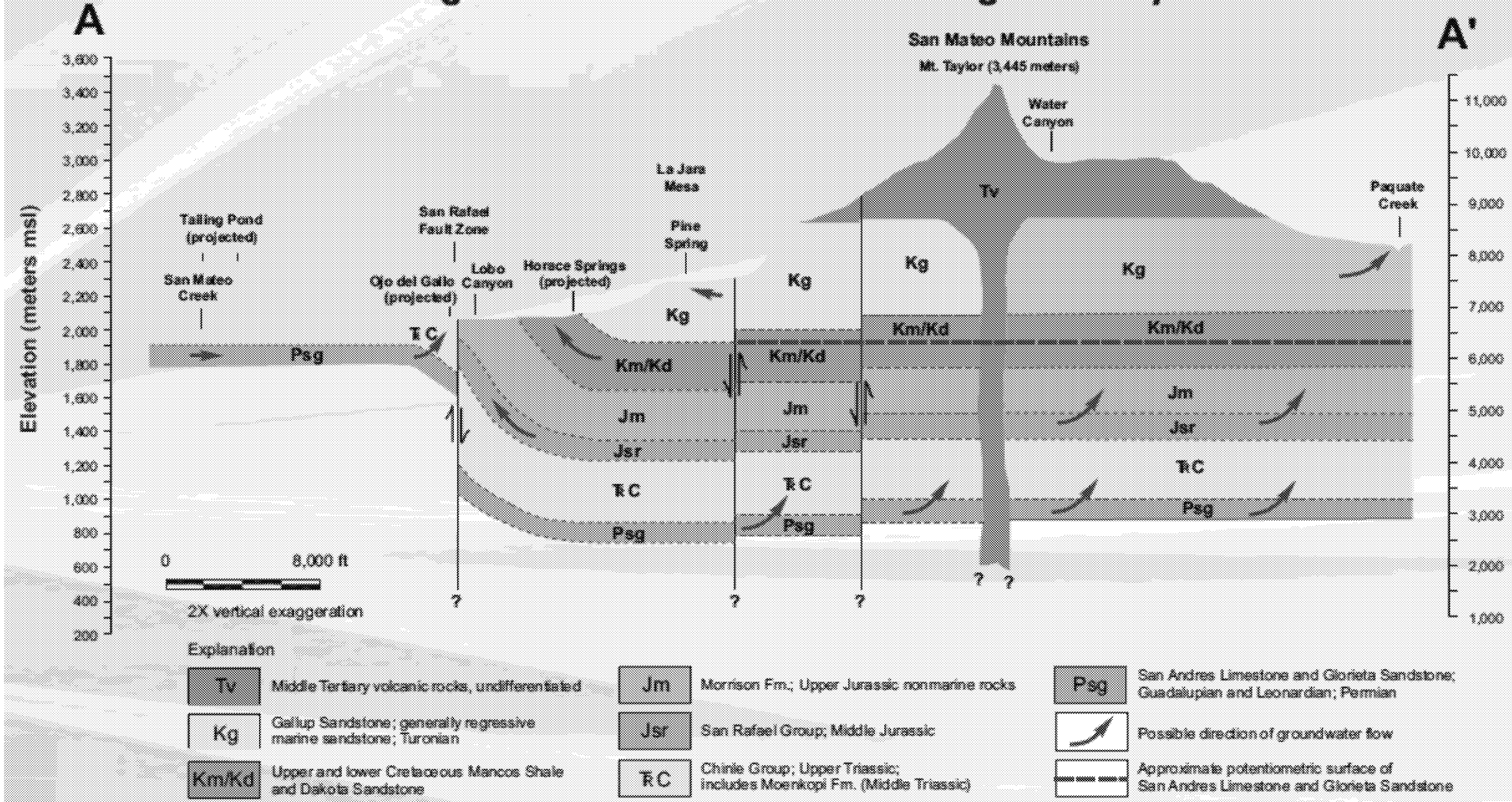
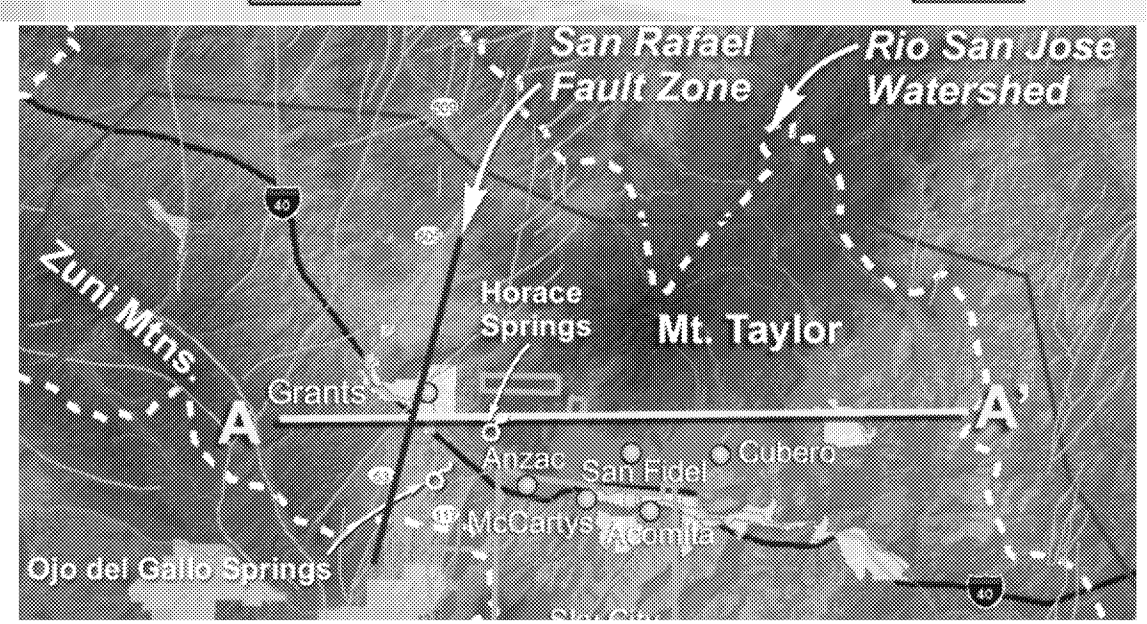
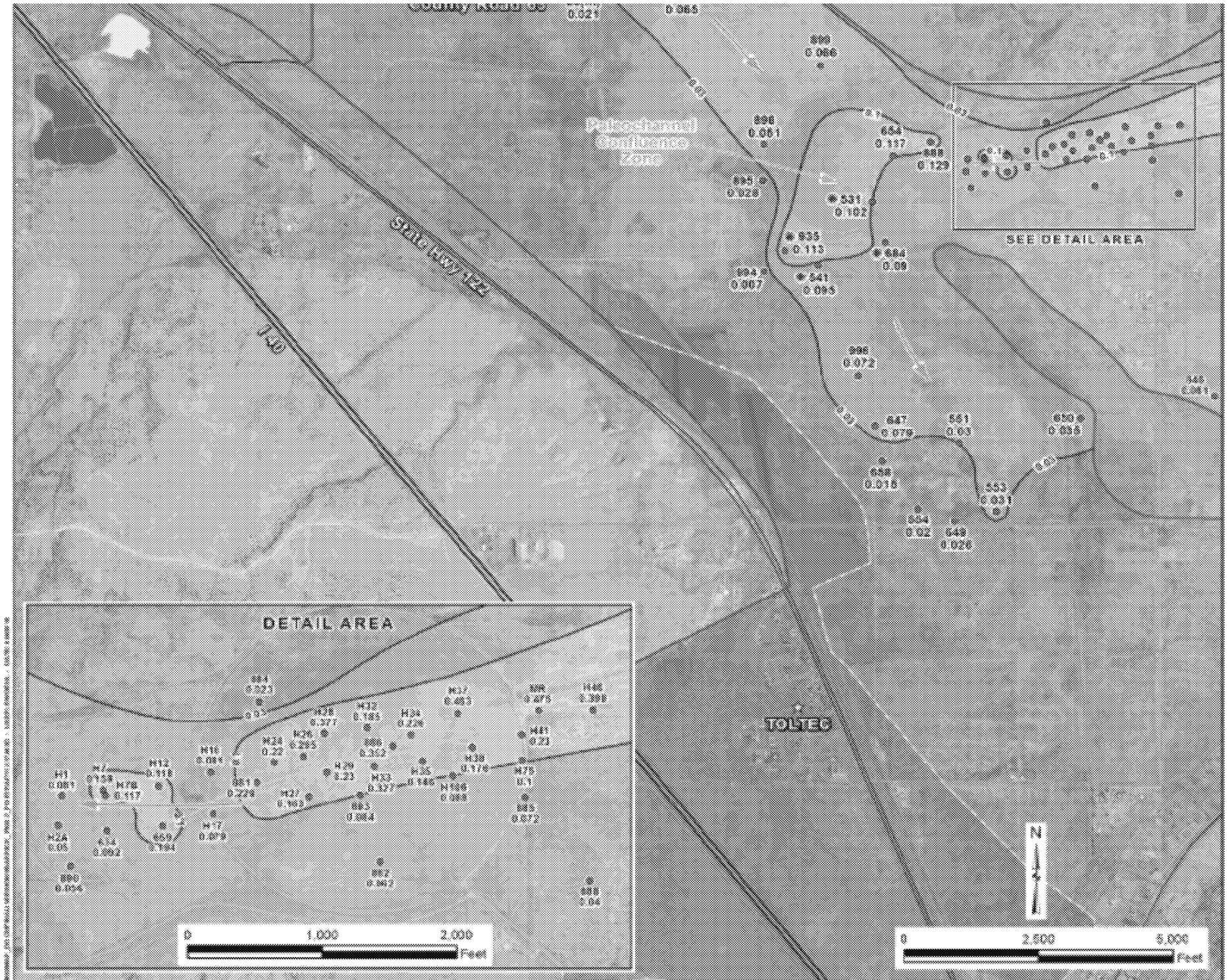
Rio San Jose Adjudication Boundary



Geologic Cross Section A-A' Through Mt. Taylor







Uranium Concentration (mg/L)
0.03 - 0.1
> 0.1

Alluvial Well and Uranium Concentration (mg/L)

Uranium Contour (mg/L)

Flow Direction

Boundary of Alluvial Aquifer

Fault Line

Municipality

Bluewater Site Boundary

Approximate Area where Alluvium Directly Overlies San Andres Limestone

NOTE: ●531, ●684 and ●935 were sampled 10/13/2016
●641 was sampled 12/28/2016.

U.S. DEPARTMENT OF ENERGY
OFFICE OF LEGACY MANAGEMENT

Work Performed by
Navarro Research & Engineering, Inc.
Under DOE Contract Number DE-LM0000007

Date Prepared: January 2, 2019

File Name: S1938312

HOMESTAKE

RECENT URANIUM CONCENTRATIONS
IN THE RIO SAN JOSE ALLUVIAL AQUIFER

FIGURE 3-7

Questions?

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Message

From: Kevin Murray [KRMurray@hollandhart.com]
Sent: 3/10/2021 11:24:16 PM
To: Travis, Pamela [Travis.Pamela@epa.gov]
Subject: FW: GRP - Homestake Written Statement to NRRB
Attachments: 20210310 Homestake Written Statement to NRRB.pdf

Pam

FYI.

regards,

Kevin

Kevin R. Murray
Partner
Holland & Hart
Direct 801-799-5919
Mobile 801-209-9255

From: Daniel Lattin <dlattin@barrick.com>
Sent: Wednesday, March 10, 2021 4:09 PM
To: Mark Purcell (purcell.mark@epa.gov) <purcell.mark@epa.gov>
Cc: Ellie Rudolf <EARudolf@hollandhart.com>; Kevin Murray <KRMurray@hollandhart.com>; Michael McCarthy <mmccarthy@barrick.com>; Patrick Malone <pmalone@barrick.com>; Brad Bingham <bbingham@barrick.com>; Adam Arguello <aarguello@barrick.com>
Subject: GRP - Homestake Written Statement to NRRB

External Email

Good Afternoon Mark,

Homestake hereby provides the attached written statement to the National Remedy Review Board. Please let me know if you have any questions.

Thank you,

BARRICK

www.barrick.com

Daniel Lattin, P.E.
Sr. Closure Program Manager
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Written Statement to the National Remedy Review Board

Homestake Mining Company of California

March 10, 2021

Site Overview

Homestake Mining Company Superfund Site, also known as Grants Reclamation Project, (the "Site") is located in Cibola County, New Mexico, approximately 5.5 miles north of the Village of Milan. Homestake Mining Company of California (HMC), and others (through partnerships), operated the uranium processing mill at the Site from approximately 1958 to 1990. The mill historically supplied uranium primarily to the United States for weapon-making during the Cold War era. The Site consists of three operable units: groundwater aquifers (OU1); long-term tailings stabilization, surface reclamation and site closure (OU2); and radon concentrations in neighboring subdivisions (OU3). EPA issued a ROD for OU3 in September of 1989 requiring no further action. The focus of HMC's current work is OU1 and OU2, and as such, this memorandum is limited in scope to these operable units. The Site presently consists of the large tailings pile (LTP), small tailings pile (STP), reverse osmosis groundwater treatment system, zeolite groundwater treatment system, and multiple evaporation ponds.

Regulatory Oversight & Status

The Site is under the often-conflicting federal jurisdiction of the Nuclear Regulatory Commission (NRC), formally the Atomic Energy Commission (AEC), through the Uranium Mill Tailings Radiation Control Act (UMTRCA) and the Environmental Protection Agency (EPA) through the Environmental Response, Compensation, and Liability Act (CERCLA). In addition to the dual-federal regulation, the Site is subject to New Mexico State regulation under its Discharge Permit-200 (DP-200) by New Mexico Environment Department (NMED), as well as the State's participation as provided under CERCLA.

UMTRCA authorizes NRC to regulate byproduct material at uranium processing sites through production, reclamation, and disposal phases. AEC initially issued Source Materials License SUA-708 in 1958 to address uranium milling operations at the Site. From 1974 to 1986, the State, with delegated authority from NRC, regulated uranium milling operations at the Site (operating as what is known as an "Agreement State").

In 1983, EPA listed the Site on the National Priorities List (NPL) because of New Mexico's Agreement State status. EPA generally defers listing on the NPL sites subject to NRC licensing authority; however, this deferral policy does not apply to sites in "Agreement States" where NRC has delegated oversight authority to a state. New Mexico was an "Agreement State" until June 1, 1986 (after EPA listed the Site on the NPL). The Site remained on the NPL thereafter, putting it in the unusual position of being under NRC's direct oversight while also subject to EPA oversight as an NPL site even after the State relinquished its licensing authority.

In 1993, NRC and EPA entered into a memorandum of understanding (MOU) delineating each agency's responsibility in remediation activities. According to the MOU, NRC would take the "lead regulatory agency" role. EPA would monitor remedial and reclamation activities required by NRC and provide reviews and

comments directly to NRC. EPA would also have authority to "take whatever action it deems appropriate" "[i]n the event that EPA determines that the implementation of the site reclamation plan, closure activities, and/or groundwater corrective action has not resulted in, or may not result in, cleanup conditions that meet applicable or relevant and appropriate requirements."

The Site is presently undergoing reclamation, groundwater corrective action (with a Corrective Action Plan submitted November 13, 2020 and Alternate Concentration Limit (ACL) application forthcoming), and closure pursuant to NRC Source Materials License SUA-1471, as amended. The Site is further regulated by EPA as it meets its requirements under the National Contingency Plan (NCP), CERCLA's implementing regulations, to allow delisting from the NPL.

The Site's extensive regulatory oversight, particularly that of two different federal agencies and statutory schemes governing remediation, is a regulatory anomaly, and the reason for its occurrence is long gone. As explained, EPA listed the Site on the NPL because of New Mexico's status as an Agreement State with delegated authority from NRC. Like other Title II UMTRCA sites, had NRC never delegated its authority, the Site would not be listed on the NPL and would not be under EPA's CERCLA jurisdiction. Even though NRC resumed authority and New Mexico is no longer an Agreement State for the purposes of uranium mill tailings, the Site remains on the NPL. There is only one other site in the entire country caught by this particular regulatory limbo (Church Rock, New Mexico).[1] There is no substantive, legal justification for this dual regulation where all other similar Title II UMTRCA site are under the sole federal oversight of NRC. No unusual or extraordinary risks exist at this particular Site justifying additional oversight and dissimilar treatment from all other Title II UMTRCA sites. Despite this, HMC acknowledges its need to meet its CERCLA obligations in order to reach NPL delisting.

These jurisdictional conflicts between EPA and NRC reached an apparent impasse in 2012. At this time, EPA and NRC contemplated consecutive, as opposed to concurrent processes (including a potential license abeyance), which would have resulted in decades delay and uncoordinated oversight. As a result, HMC proposed to both agencies pursuing "CERCLA equivalency," a legal mechanism to harmonize the two federal processes. Under 40 CFR § 300.700(c)(3), "[a] private party response action will be considered 'consistent with the NCP' if the action, when evaluated as a whole, is in substantial compliance with the applicable requirements [of the NCP], and results in a CERCLA-quality cleanup." With equivalency, HMC seeks to simultaneously meet EPA's obligations under CERCLA while achieving its NRC obligations under UMTRCA. In practicality this means that HMC utilizes investigation, data gathered, and work performed for NRC (with EPA concurrence) under UMTRCA, supplementing as necessary to fill data gaps, to produce a CERCLA administrative record. Through this equivalency approach, the NRC process remains the lead, via the agencies MOU, but allows EPA to also achieve its goals parallel to the NRC actions without unnecessary redundancies. As both legal authorities oversee HMC's surface and groundwater remediation, the concurrent progression of these two regulatory processes is critical in order to ensure a consistent remedy and nonconflicting site standards.

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[1] Two sites are listed on the NPL as well as regulated by Agreement State Colorado (Umetco in Uravan, and Cotter Uranium Mill in Canon City). Their NPL listing (and consequently their EPA oversight) are consistent with EPA policy to list sites in Agreement States and are not subject to dual-federal agency oversight.

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To that end, HMC has prepared, in cooperation with EPA Region 6, the following CERCLA- and NCP-compliant documents:

- Remedial Investigation (RI) (including Human Health Risk Assessment; Conceptual Site Model; Baseline Ecological Risk Assessment) – approved by EPA June 15, 2020;
- Candidate Technologies Memorandum – submitted to EPA and acknowledged in Statement of Work (SOW) ¶ 19; and
- Entered into Administrative Settlement and Order on Consent (AOC) and corresponding SOW for preparation of a Feasibility Study (FS), including Technical Impracticability Waiver Evaluation Report (TI Waiver Report) – effective August 12, 2020. Under the AOC, HMC has submitted the following deliverables:
    - Draft Screening of Remedial Alternative Memorandum – revised version addressing EPA comments submitted to EPA, and EPA acknowledged satisfaction of SOW requirement on September 2, 2020;
    - Draft TI Waiver Report – submitted on Nov. 16, 2020 and awaiting EPA comment; and
    - Draft FS – submitted on Dec. 15, 2020 and awaiting EPA comment.

HMC seeks to continue its cooperative path with all agencies and appreciates its collaborative relationship with EPA. Recognizing the technological limitations, persistent contaminant sources, and hydrogeologic complexity all affect remediation efficacy of the Site contaminants, HMC is pursuing an ACL from NRC. Similarly, to move this Site to closure under CERCLA, a technical impracticability (TI) waiver of groundwater Applicable or Relevant and Appropriate Requirements (ARARs) is appropriate both from a technical standpoint and a CERCLA equivalency perspective to align these competing regulatory processes and arrive at a consistent remedial strategy that is protective of human health and the environment.[2] HMC continues to urge EPA, and particularly the NRRB, to approach Site decisions recognizing that HMC is diligently pursuing a parallel, equivalent, and protective process under NRC's implementation of UMTRCA.

History of Remediation

Surface

Under NRC oversight with review and consent from the EPA and NMED, between 1988 and 1993, HMC excavated windblown materials with elevated radium-226 concentrations in areas adjacent to the tailings piles and placed the soil on the piles. HMC removed surface soil from approximately 1,200 acres of land. This resulted in the cleanup of surface soils to an average radium-226 concentration of 1.11 pCi/g (standard deviation 1.05 pCi/g) for the inner zone of the cleanup area and 2.95 pCi/g (standard deviation 1.89 pCi/g) for the outer zone of the cleanup area, based on verification soil sampling that was biased high (ERG 1995).

Between 1993 and 1995, HMC, with each agencies' review and consent, decommissioned and demolished the mill facilities. HMC excavated an average of two feet of contaminated soil (containing elevated radium-226 concentrations) from mill area following the completion of demolition. Excavated soils were transported to the LTP and STP for burial. HMC stabilized the tailings piles by regrading and placing soil covers and rock on

[2] Of note, NMED has an analogous regulatory process known as an Alternative Abatement Standard (AAS). HMC has begun discussions with NMED as to its path to meet NMED's process as well, which may include reliance on HMC's TI waiver and/or ACL processes to avoid duplicative efforts.

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the side slopes for erosion protection. One foot of soil cover was initially placed on top of the LTP. Additional cover material was placed on top of the pile to fill in depressions caused by settlement, improve drainage, and address specific area with elevated radon flux measurements. Excavated areas were backfilled with alluvial soils, as well as rock for erosion protection.

HMC refers the Board to its draft FS for future discussion of planned surface remediation for OU2 as the remainder of this document focuses on HMC's groundwater remediation efforts.

Groundwater

Remediation and monitoring activities began around 1976 under applicable state and federal licenses and authorities. For over four decades, HMC has conducted extensive groundwater remediation, expanding and improving its remediation as follows:

- **1975 – HMC began providing bottled water to residents of nearby subdivisions upon request.**
- **1976 – HMC entered into agreement with NMEID to provide bottled water to residents located hydraulically downgradient of the source areas.**
- 1977 - Water is added into the alluvial aquifer to create a hydraulic barrier to limit the movement of contaminated groundwater.
- **1977-1983 - Multiple hydraulic extraction wells were installed in the alluvial aquifer.**
- 1984 - Hydraulic containment of the Upper Chinle aquifer was initiated.
- **1986 - Extension of the Milan water supply to the Broadview Acres, Felice Acres, Murray Acres, Valle Verde, and Pleasant Valley Estates subdivisions was initiated.**
- 1990 – Evaporation Pond EP-1 was constructed within the footprint of the STP to assist in the dewatering of the LTP and to hold water pumped from the collection wells.
- 1992 - Toe drains were installed around the tailings (LTP/STP).
- 1993-2000 - During this period, corrective action and monitoring well networks were revised through addition and abandonment of wells.
- 1994 - HMC completed bench-scale treatability testing for ion exchange and activated alumina.
- 1996 - Use of Evaporation Pond EP-2 began in March.
- 1999 - The reverse osmosis (RO) treatment unit was added; treated water is used for hydraulic containment of the alluvial aquifer.
- 2000 - Irrigation of 270 acres groundwater was initiated as a means to manage extracted groundwater. HMC began flushing program.
- 2000-2015 – Tailings flushing of the LTP was conducted where water was introduced into the LTP to expedite the mass flux of contaminants from the tailings.
- 2002 - 60 acres of irrigation area were added and added an additional RO skid to plant for increased treatment rate.
- 2002-2009 - During this period, corrective action, and monitoring well networks were revised through addition and abandonment of wells.
- 2004-2005 - 64 acres of irrigation area were added.
- **2006 - EPA, NMED, and NRC approved site groundwater standards.**
- 2010 - Evaporation Pond EP-3 was constructed and commissioned.
- 2012 - Land Application program ceased operation.
- 2012 - 300 gpm Zeolite pilot treatment started operation.

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- 2015 - RO Plant was expanded to a theoretical maximum throughput of 1200 gpm with the addition of a 600 gpm low pressure skid, a 250 gpm high pressure skid, and two microfiltration skids to replace the existing sand filters amongst other updates.
- 2016 - Zeolite system with a theoretical maximum throughput of 1200 gpm started operation for off-Site water treatment.
- 2016 - EPA initiated background reassessment study (USGS split sampling event).
- **2018 - HMC (Arcadis) borehole development and geophysics programs near wells DD and DD2 (Controls on Groundwater Background Constituent Concentrations due to Mineralogy Local to Monitoring Wells).**
- **2019 - In collaboration with EPA, HMC conducted additional field investigations to expand the characterization of the soils east of wells DD and DD2, across the alluvial channel (Supplemental Background Soil and Groundwater investigation Report Grants Reclamation Project).**

Path Forward: Technical Impracticability Waiver

After 40+ years of progressive remediation and investigation at the Site, it has become apparent that there are technical barriers to achieving groundwater ARARs. As required by its AOC with EPA, HMC submitted a Draft TI Waiver Report on November 16, 2020 for EPA's review, comment, and approval. HMC seeks to waive the following ARARs:

- **Safe Drinking Water Act**
  - **40 CFR § 141, Subpart B** – sets Maximum Contaminant Levels and non-zero Maximum Contaminant Level Goals.
  - **40 CFR § 192** – sets standards for the protection of public health, safety and the environment from radiological and non-radiological hazards associated with uranium and thorium ore processing, and disposal of associated wastes, including setting the standard for molybdenum.
- **New Mexico Water Quality Act, § 20.6.2.3103 NMAC** – sets state water quality standards.
- **10 CFR Part 40, Appendix A, Criterion 5B(5) (establishes concentration limits to be used for groundwater protection at uranium mill tailings sites)** – provides that "At the point of compliance, the concentration of that constituent in the groundwater must not exceed—(a) *The Commission approved background concentration of that constituent in the groundwater*; (b) The respective value given in the table in paragraph 5C if the constituent is listed in the table and if the background level of the constituent is below the value listed; or (c) An alternate concentration limit established by the Commission," which sets the standard for uranium as background.

Unlike almost any NPL site that has come before it, this Site benefits from 40+ years of extensive investigation, monitoring, and on-the-ground application of its remedial strategy. While other sites select remedies and make TI waiver determinations based on projection, HMC's draft TI Waiver Report and alternatives evaluation is based on the more than 40 years of groundwater remediation and investigation (applying an exhaustive list of remediation technologies: RO treatment, Zeolite treatment, ion exchange, in situ phosphate treatment, in situ bioremediation, amongst others), and conducting three treatability studies (Tripolyphosphate, Electrocoagulation, and In-situ biological treatment). EPA guidance distinguishes between "front-end" (those that are granted at the Record of Decision (ROD) stage and "back-end" (those that are granted subsequently after remedy implementation) TI waivers, suggesting a preference for "back-end" TI waivers once the remedy's efficacy is best understood. While the Site does not have a formal ROD, for all

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intents and purposes this is a back-end TI waiver. As mentioned and detailed above, HMC has remediated already for over four decades. Neither more time nor investigation will yield greater certainty.

HMC encourages the Board to review its draft TI Waiver Report for a detailed explanation of HMC's technical basis for a TI waiver. Distilled to its simplest form, modeling demonstrates that ARARs cannot be achieved in a reasonable timeframe. The 1st Order of Decay Analysis predicts 210 years for uranium and 360 years for molybdenum to achieve *present* cleanup standards. EPA, NMED, and NRC approved site standards for each constituent of concern (COC) in 2006 based on an evaluation of background water quality (HMC and HE 2003; HE 2001; ERG 2003; ERG 2002; ERG 1999). The standards were incorporated into the radioactive materials license via license amendment number 39 as groundwater protection standards and New Mexico DP-200. EPA expressed concern with background levels in 2013. Homestake has endeavored to resolve EPA concerns since, with renewed focus and extensive investigation beginning in 2018. HMC maintains that the current background levels, previously accepted by all agencies, are scientifically defensible and represent the natural heterogeneity of the alluvial aquifer. Regardless, HMC evaluated the technical impracticability of achieving the background levels established in 2006—if HMC cannot meet these cleanup levels, it surely cannot meet more stringent standards contemplated by EPA, making continued investigation into this issue moot. A decision to change background levels for the purpose of HMC's CERCLA cleanup unnecessarily runs contrary to the objective of achieving a parallel regulatory process with lead-agency NRC and could result in an inconsistent remedy and/or site standards—all without apparent benefit to protecting human health and the environment.

Ultimately, even if cleanup standards could be achieved, the result would be temporary and contamination to groundwater would continue after the groundwater treatment systems were shut off. HMC cannot remediate the primary sources (LTP and STP) or the secondary source (vadose and silt/clay in the alluvial aquifer beneath the LTP). The viability of moving the LTP has been sufficiently analyzed and determined to be impracticable. Most recently, Tetra Tech on behalf of HMC (Tetra Tech 2012), dismissed moving the LTP for the following reasons:

- **Additional risk to human health**: The potential risk to human health risk is significant. The increased cancer risk to workers involved with tailings excavation and placement is 1 in 10. The increased cancer risk to nearby residents is approximately 1 in 100 based on exposure to radioactive material.
- **Potential ecological damage**: Relocating tailings would require extensive amount of land that will be irretrievable committed for perpetuity as a disposal cell. Removal of habitat will potentially affect native wildlife and vegetation.
- **Potential damage to cultural resources**: Relocating tailings could negatively affect the large number of cultural resources in the area including federal and state parks and tribal lands.
- **Potential impacts from increased truck traffic**: Truck traffic to move tailings would be large and noticeable. This would include additional noise impacts, negative air quality, and potential for accidents and accidental releases. The potential impacts are not as great with rail, but increased activity would impact community and increase potential for traffic accidents and accidental releases.
- **Potential Regulatory Challenges**: Siting studies, public hearings, and environmental reports and preconstruction monitoring has been estimated to take up to seven years. The construction of cell has been estimated to take up to three years, and it has been estimated to take up to two years to move the LTP.
- **Carbon Footprints**: Offsite disposal would require greater use of consumable materials and fossil fuel and result in greater greenhouse emissions.

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- **Potential Impact to Community**: Construction at new site would result in negative noise and vibration impacts to residents and wildlife.
- **Cost prohibitive**: The estimated costs range from $1.8 billion (truck transport) to over $2 billion (rail and slurry pipeline transport).

Similarly, in 2009, U.S. Army Corps of Engineers (ACOE), on behalf of EPA, reviewed the remediation efforts at the Site, issuing a final report in 2010 (ACOE 2010). ACOE presented alternate strategies to the current groundwater restoration program, including relocation of tailings to an engineered landfill within 30 miles of the Site. ACOE concluded, "Relocation of the tailings should not be considered further by any means given the risks to the community and workers and the greenhouse gas emissions that would be generated during such work." EPA (EPA 2011) and NRC (NRC 2011) agreed with this recommendation. NMED supported EPA's recommendations by letter to NRC dated April 20, 2011 (NMED 2011).

Additionally, NRC considered moving the LTP in 1993, concluding based on the costs and benefits associated with the proposed reclamation options (reclamation in place, slurry relocation to the alternative offsite location, or conventional earthwork relocation to the alternative offsite location) that the additional costs of relocation outweighed any minor benefits that would result from relocation.

Not only is this primary source impracticable to remediate, HMC cannot remediate the secondary source (the vadose and silt/clay in the alluvial aquifer beneath the LTP) even if HMC could remove the LTP. COPCs/ROPCs have adsorbed to the unsaturated soil and diffused into the pore-water in the silt/clay, making groundwater restoration an unachievable goal.

Further, increased remediation system capacity will not overcome impracticability. The treatment rates used in the updated modeling efforts are approximately 50% higher than the peak annual average actually achieved onsite since the expansion of the treatment systems. Alternative 5 from the draft FS shows that even with the overly-optimistic assumption that 50 years of pumping removes all contamination in the mobile domain (coarse grained material)—a timeframe unsupported by the 1st order decay analysis or the groundwater model—the back-diffusion from the immobile domain (fine-grained material) and the continued seepage from the LTP would generate a new plume following cessation of remediation. As a result, ARARs would still be unattainable, a TI waiver would be needed, and groundwater access would need to be limited to ensure protectiveness resulting in the same remedy implementation regardless of remediation system capacity. The various alternatives analyzed in HMC's draft FS show that while concentrations within the footprint of the plume may vary, the footprint of the plume above background and/or a protective standard remains largely unchanged even if system capacity is increased.

Increased system capacity may even have negative consequences to water resources in the area. Historic groundwater remediation at the Site has evaporated approximately three billion gallons of water, the equivalent of three years of combined consumption from the nearby municipalities of Grants and Milan. Each additional year of remediation at the Site commits approximately 105 million gallons to evaporative loss in an arid desert region where total precipitation is typically less than 12 inches a year. While the groundwater within the TI zone may not be usable at its present concentrations, downstream beyond the TI zone will be a useable resource. Continued pumping and evaporation would remove billions of gallons, including useable groundwater, from the region's water supply entirely.

Ultimately, future remediation will not result in attainment of ARARs, and the measures needed to ensure protectiveness of human health and the environment remain the same regardless of continued remediation. HMC has already completed the following steps in order to protect potential receptors:

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- **Land purchase**: HMC currently owns approximately 74% (4,200 acres of the total 5,700 acres) of the land within the LTC/TI Zone Boundary.
- **Alternative groundwater supply**: HMC has connected all residents in the neighboring subdivisions to municipal water.

Additionally, in 2009, NMED issued a Health Advisory, notifying private well owners of potential contaminant concentrations above federal drinking water standards, and in 2018, the Office of the State Engineer issued an Order restricting well drilling in the Alluvial and Chinle aquifers within an area where groundwater is impacted by historical uranium milling and mining activities.

As next steps, HMC proposes the following protectiveness and exposure control actions:

- Continued property acquisition;
- Water well abandonment;
- Point of use treatment if necessary; and
- Water use restrictions including restrictive covenants.

Together, these measures will protect human health and the environment.

Proposed Remedy

HMC refers the Board to its Draft FS, submitted December 15, 2020, for a detailed analysis of proposed remedial alternatives. Notably, each alternative does not achieve compliance with ARARs, and thus requires a TI waiver. In summary, based on the results of HMC's robust groundwater modeling and analysis in its draft TI Waiver Report, HMC proposes long-term monitoring coupled with application of the institutional controls detailed above. This remedial alternative will satisfy the threshold criteria:

- **Protectiveness of human health and the environment** – achieved through the institutional controls and confirmed through monitoring; and
- **Compliance with ARARs** – achieved through TI waiver.

Importantly, this alternative will be consistent with the NRC remedial strategy, including the proposed ACLs and established cleanup levels, and will finally make meaningful steps toward regulatory closure after decades of remediation and oversight.

Conclusion

Despite the apparent challenges from coordinating multi-federal agency oversight, neither designed to accommodate the other, HMC has developed a scientifically-supported remedial strategy that offers both an opportunity to protect human health and the environment and close the chapter on more than four decades of investigation, remediation, and use of regulatory resources. HMC appreciates Region 6's, and this Board's, support in achieving this common goal.

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UNITED STATES
ENVIRONMENTAL PROTECTION AGENCY
REGION 6

IN THE MATTER OF: Homestake Mining Company Site Cibola County, New Mexico Homestake Mining Company of California, Respondent Proceeding Under Sections 104, 107 and 122 of the Comprehensive Environmental Response, Compensation, and Liability Act, 42 U.S.C. §§ 9604, 9607 and 9622.	)	CERCLA Docket No. 06-03-20 **ADMINISTRATIVE SETTLEMENT AGREEMENT AND ORDER ON CONSENT FOR FEASIBILITY STUDY**

ADMINISTRATIVE SETTLEMENT AGREEMENT AND ORDER ON CONSENT FOR FEASIBILITY STUDY

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I. JURISDICTION AND GENERAL PROVISIONS

1. This Administrative Settlement Agreement and Order on Consent ("Settlement") is entered into voluntarily by the United States Environmental Protection Agency ("EPA") and Homestake Mining Company of California ("Respondent"). This Settlement provides for the performance of a Feasibility Study ("FS") by Respondent and the payment of certain response costs incurred by the United States at or in connection with the Homestake Mining Company Superfund Site (the "Site") generally located near Milan, Cibola County, New Mexico.

2. This Settlement is issued under the authority vested in the President of the United States by Sections 104, 107, and 122 of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended ("CERCLA"), 42 U.S.C. §§ 9604, 9607 and 9622. This authority was delegated to the Administrator of EPA on January 23, 1987, by Executive Order 12580, 52 Fed. Reg. 2923 (Jan. 29, 1987), and further delegated to Regional Administrators by EPA Delegation Nos. 14-14C (Administrative Actions Through Consent Orders, Jan. 18, 2017) and 14-14D (Cost Recovery Non-Judicial Agreements and Administrative Consent Orders, Jan. 18, 2017). These authorities were further redelegated by the Regional Administrator of EPA Region 6 to the Director of the Superfund and Emergency Management Division, EPA Region 6 by EPA Delegation Nos. R6-14-14-C and R6-14-14-D on June 8, 2001.

3. EPA and Respondent recognize that this Settlement has been negotiated in good faith and that the actions undertaken by Respondent in accordance with this Settlement do not constitute an admission of any liability. Respondent does not admit, and retains the right to controvert in any subsequent proceedings other than proceedings to implement or enforce this Settlement, the validity of the findings of facts, conclusions of law, and determinations in Section V (Findings of Fact) and VI (Conclusions of Law and Determinations) of this Settlement. Respondent agrees to comply with and be bound by the terms of this Settlement and further agrees that it will not contest the basis or validity of this Settlement or its terms.

II. PARTIES BOUND

4. This Settlement is binding upon EPA and upon Respondent and its successors and assigns. Any change in ownership or corporate status of Respondent including, but not limited to, any transfer of assets or real or personal property shall not alter Respondent's responsibilities under this Settlement.

5. The undersigned representative of Respondent certifies that he or she is fully authorized to enter into the terms and conditions of this Settlement and to execute and legally bind Respondent to this Settlement.

6. Respondent shall provide a copy of this Settlement to each contractor hired to perform the Work required by this Settlement and to each person representing Respondent with respect to the Site or the Work, and shall condition all contracts entered into under this Settlement upon performance of the Work in conformity with the terms of this Settlement. Respondent or its contractors shall provide written notice of the Settlement to all subcontractors hired to perform any portion of the Work required by this Settlement. Respondent shall

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nonetheless be responsible for ensuring that its contractors and subcontractors perform the Work in accordance with the terms of this Settlement.

III. STATEMENT OF PURPOSE

7. In entering into this Settlement, the objectives of EPA and Respondent are to: (a) identify and evaluate remedial alternatives to prevent, mitigate, or otherwise respond to or remedy any release or threatened release of hazardous substances, pollutants, or contaminants at or from the Site, to complete an FS as more specifically set forth in the Statement of Work ("SOW") in Appendix A to this Settlement; and (b) recover Future Response Costs incurred by EPA with respect to this Settlement.

8. Respondent has conducted activities since the late 1970s to determine the nature and extent of contamination, identify and evaluate remedial alternatives, and implement remedies at the Site under the U.S. Nuclear Regulatory Commission ("NRC") Source Materials Licenses, New Mexico Environment Department ("NMED") groundwater discharge permits, and other regulatory authorities. Respondent has provided documentation of earlier activities substantially equivalent to those required to conduct a Remedial Investigation and Feasibility Study ("RI/FS") under CERCLA and the National Oil and Hazardous Substances Pollution Contingency Plan ("NCP"). Respondent submitted this documentation to EPA in a November 2013 report entitled "CERCLA Equivalency of Investigation and Remediation Efforts at the Homestake Mining Company of California Uranium Mill Facility – Grants, New Mexico," and included a collection of supporting documents (collectively referred to as the "CERCLA Equivalency Package"). The CERCLA Equivalency Package has been supplemented with additional data collection and technical reports generated since submission. Respondent is performing the Work to further demonstrate equivalency with CERCLA and NCP requirements.

9. This Site is undergoing reclamation, groundwater corrective action, and closure activities under NRC Source Materials License SUA-1471 to ensure that such activities meet all relevant NRC requirements, including 10 CFR part 40, Appendix A, as amended. The Site is subject to the requirements of CERCLA and NMED Discharge Permit DP-200 pursuant to the New Mexico Water Quality Act (NMSA 1978 §§74-6-1 to 74-6-17). Respondent has conducted Site investigations and analyses pursuant to NRC, EPA, and State of New Mexico ("State") authorities that are recorded in reports dating from the 1970s. EPA, with overlapping regulatory authority under CERCLA, agreed to provide formal review, consultation, and comment on the NRC-licensed reclamation, groundwater corrective action and monitoring, and closure activities under the 1993 Memorandum of Understanding between NRC and EPA. EPA monitors all such activities to assure that they will achieve attainment of applicable or relevant and appropriate requirements ("ARARs") under CERCLA outside of the byproduct material disposal site. EPA and Respondent intend to rely upon information gathered to date under the authorities of the NRC, the State, and EPA, as well as any new information necessary to prepare an FS.

10. Respondent believes that satisfying all ARARs for groundwater cleanup is technically impracticable pursuant to CERCLA § 121(d)(4)(C). As such, Respondent intends to prepare a technical impracticability waiver evaluation for specific ARARs as part of the FS for EPA's review.

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11. Respondent has prepared a Final Remedial Investigation Report ("RI Report"), including a baseline human health risk assessment and baseline ecological assessment, attached as Appendix C. EPA approved the RI Report on June 15, 2020.

12. The Work conducted under this Settlement is subject to approval by EPA as described herein and shall provide all appropriate and necessary information to evaluate remedial alternatives to the extent necessary to select a remedy that will be consistent with CERCLA and the NCP. The Work conducted under this Settlement shall be in compliance with all applicable EPA guidance documents, policies, and procedures.

13. The Future Response Costs to be recovered under this Settlement as defined in Section IV consist of costs to oversee and enforce CERCLA Work conducted pursuant to this Settlement. Costs of ongoing state and federal regulatory actions pursuant to non-CERCLA statutory authorities will be addressed in accordance with the relevant statutes, outside the definition of Future Response Costs in this Settlement.

IV. DEFINITIONS

14. Unless otherwise expressly provided in this Settlement, terms used in this Settlement that are defined in CERCLA or in regulations promulgated under CERCLA shall have the meaning assigned to them in CERCLA or in such regulations. Whenever terms listed below are used in this Settlement or its attached appendices, the following definitions shall apply:

"CERCLA" shall mean the Comprehensive Environmental Response, Compensation, and Liability Act, 42 U.S.C. §§ 9601-9675.

"Day" or "day" shall mean a calendar day. In computing any period of time under this Settlement, where the last day would fall on a Saturday, Sunday, or federal or State holiday, the period shall run until the close of business of the next working day.

"Effective Date" shall mean the effective date of this Settlement as provided in Section XXXIV.

"Engineering Controls" shall mean constructed containment barriers or systems that control one or more of the following: downward migration, infiltration, or seepage of surface runoff or rain; or natural leaching migration of contaminants through the subsurface over time. Examples include caps, engineered bottom barriers, immobilization processes, and vertical barriers.

"EPA" shall mean the United States Environmental Protection Agency and its successor departments, agencies, or instrumentalities.

"EPA Hazardous Substance Superfund" shall mean the Hazardous Substance Superfund established by the Internal Revenue Code, 26 U.S.C. § 9507.

"Future Response Costs" shall mean all costs, including, but not limited to, direct and indirect costs, that the United States incurs in reviewing or developing deliverables

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submitted pursuant to this Settlement, in overseeing implementation of the Work, or otherwise implementing, overseeing, or enforcing this Settlement, including but not limited to, payroll costs, contractor costs, travel costs, laboratory costs, the costs incurred pursuant to Section XII (Property Requirements) (including, but not limited to, cost of attorney time and any monies paid to secure or enforce access or land, water, or other resource use restrictions, including, but not limited to, the amount of just compensation), Section XVI (Emergency Response and Notification of Releases), Paragraph 103 (Work Takeover), Paragraph 127 (Access to Financial Assurance), community involvement (including, but not limited to, the costs of any technical assistance grant under Section 117(e) of CERCLA, 42 U.S.C. § 9617(e), Section XIX (Dispute Resolution), and all litigation costs. Future Response Costs shall also include Agency for Toxic Substances and Disease Registry (ATSDR) costs regarding the Site. Future Response Costs shall not include costs the United States incurs under Section XIX (Dispute Resolution) or in litigation if Respondent prevails.

"Homestake Mining Company Site Special Account" shall mean the special account within the EPA Hazardous Substance Superfund, established for the Site (SSID # 0618) by EPA pursuant to Section 122(b)(3) of CERCLA, 42 U.S.C. § 9622(b)(3).

"Institutional Controls" or "ICs" shall mean Proprietary Controls and state or local laws, regulations, ordinances, zoning restrictions, or other governmental controls or notices that: (a) limit land, water, or other resource use to minimize the potential for human exposure to Waste Material at or in connection with the Site; (b) limit land, water, or other resource use to implement, ensure non-interference with, or ensure the protectiveness of the response action pursuant to this Settlement; and/or (c) provide information intended to modify or guide human behavior at or in connection with the Site.

"Interest" shall mean interest at the rate specified for interest on investments of the EPA Hazardous Substance Superfund established by 26 U.S.C. § 9507, compounded annually on October 1 of each year, in accordance with 42 U.S.C. § 9607(a). The applicable rate of interest shall be the rate in effect at the time the interest accrues. The rate of interest is subject to change on October 1 of each year. Rates are available online at https://www.epa.gov/superfund/superfund-interest-rates.

"National Contingency Plan" or "NCP" shall mean the National Oil and Hazardous Substances Pollution Contingency Plan promulgated pursuant to Section 105 of CERCLA, 42 U.S.C. § 9605, codified at 40 C.F.R. Part 300, and any amendments thereto.

"NMED" shall mean the New Mexico Environment Department and any successor departments or agencies of the State.

"Operable Unit 1" or "OU1" shall mean tailings seepage contamination of groundwater aquifers.

"Operable Unit 2" or "OU2" shall mean long-term tailings stabilization, surface reclamation, and site closure.

"Operable Unit 3" or "OU3" shall mean radon concentrations in neighboring subdivisions.

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"Paragraph" shall mean a portion of this Settlement identified by an Arabic numeral or an upper- or lower-case letter.

"Parties" shall mean EPA and Respondent.

"Proprietary Controls" shall mean easements or covenants running with the land that (a) limit land, water, or other resource use and/or provide access rights and (b) are created pursuant to common law or statutory law by an instrument that is recorded in the appropriate land records office.

"RCRA" shall mean the Solid Waste Disposal Act, 42 U.S.C. §§ 6901-6992 (also known as the Resource Conservation and Recovery Act).

"Respondent" shall mean Homestake Mining Company of California.

"Section" shall mean a portion of this Settlement identified by a Roman numeral.

"Settlement" shall mean this Administrative Settlement Agreement and Order on Consent and all appendices attached hereto (listed in Section XXXII (Integration/Appendices)). In the event of conflict between this Settlement and any appendix, this Settlement shall control.

"Site" shall mean the Homestake Mining Company Superfund Site, located near Milan, Cibola County, New Mexico, and depicted generally on the map attached as Appendix B.

"State" shall mean the State of New Mexico.

"Statement of Work" or "SOW" shall mean the document describing the activities Respondent must perform to develop the FS for the Site, as set forth in Appendix A to this Settlement. The SOW is incorporated into this Settlement and is an enforceable part of this Settlement as are any modifications made thereto in accordance with this Settlement.

"United States" shall mean the United States of America and each department, agency, and instrumentality of the United States, including EPA.

"Waste Material" shall mean (a) any "hazardous substance" under Section 101(14) of CERCLA, 42 U.S.C. § 9601(14); (b) any pollutant or contaminant under Section 101(33) of CERCLA, 42 U.S.C. § 9601(33); and (c) any "solid waste" under Section 1004(27) of RCRA, 42 U.S.C. § 6903(27).

"Work" shall mean all activities and obligations Respondent is required to perform under this Settlement, except those required by Section XIV (Record Retention).

V. FINDINGS OF FACT

The Findings of Fact herein are solely those of EPA. Respondent neither admits nor denies these findings.

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15. The Site is located in Cibola County, New Mexico, approximately 5.5 miles north of Milan, at the intersection of Highway 605 and County Road 631. The Site consists of three operable units: tailing seepage contamination of groundwater aquifers (OU1), long-term tailings stabilization, surface reclamation and site closure (OU2), and radon concentrations in neighboring subdivisions (OU3). The Site also consists of 394 acres of land owned by Respondent that were used for land treatment/crop irrigation as part of groundwater corrective action.

16. The Site was a uranium processing mill operated by Respondent and others through partnerships and joint ventures from approximately 1958 to 1990. The mill historically supplied uranium to the United States under contracts with the Atomic Energy Commission, as well as to private commercial entities. The mill was and is regulated under Title II of the Uranium Mill Tailings Radiation Control Act, authorizing the NRC to regulate byproduct material at uranium processing sites to ensure sound management of tailings throughout the production, reclamation, and disposal phases. NRC initially issued NRC Source Materials License SUA-708 in 1958 to address uranium milling operations at the Site. From 1974 to 1986, the State regulated uranium milling operations at the Site. After the State relinquished its licensing authority in 1986, the mill operated, and is presently undergoing reclamation, groundwater corrective action, and closure, pursuant to NRC Source Materials License SUA-1471, as amended.

17. The mill was built in 1958 on remote ranch land. In the 1960s and 1970s several residential subdivisions were developed in the vicinity of the mill, within two miles south and southwest of the facility.

18. The mill used alkaline leach-caustic precipitation processes for concentrating uranium oxide from ores. Tailings from the mill operations, entrained in solutions from the milling process, were placed into lagoons on the top of two disposal impoundments at the Site.

19. The Large Tailings Pile ("LTP") covers an area of approximately 200 acres and is approximately 85 to 100 feet high, containing an estimated 21 million tons of mill tailings. The Small Tailings Pile ("STP") covers an area of about 40 acres and is 20 to 25 feet high. It contains approximately 1.2 million tons of tailings. Seepage from these two tailings impoundments has resulted in contamination of the underlying groundwater aquifers.

20. Remediation and monitoring activities began circa 1976 under applicable state and federal licenses and authorities. The following is a brief summary of the groundwater remediation efforts conducted at the Site:

a. 1976: twenty monitoring wells were installed in the alluvial aquifer.

b. 1977–1983: multiple hydraulic containment and collection wells were installed in the alluvial aquifer.

c. 1984: hydraulic containment of the Upper Chinle aquifer was initiated.

d. 1986: installation of extension of the Milan water supply for Broadview Acres, Felice Acres, Murray Acres, and Pleasant Valley Estates subdivisions.

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e. 1990: first evaporation pond was constructed within the footprint of the STP to assist in the dewatering of the LTP and to hold water pumped from the collection wells. Additional hydraulic containment and collection wells were installed in the alluvial aquifer.

f. 1992: toe drains were installed around the tailings piles.

g. 1993–2000: corrective action and monitoring well networks were revised through addition of wells.

h. 1996: second evaporation pond was constructed and commissioned.

i. 1999: the reverse osmosis ("RO") treatment facility was constructed and operated, and treated water is used for hydraulic containment of the alluvial aquifer.

j. 2000: land treatment/crop irrigation of 270 acres of land owned by Respondent to manage extracted contaminated groundwater was initiated as part of groundwater corrective action (referred to as the land application program); flood irrigation was performed on 120 acres of land, center pivot spray irrigation was performed on 150 acres of land.

k. 2002: 60 acres of irrigation area owned by Respondent were added to the land application program and used for center pivot spray irrigation; RO treatment facility capacity increased from 300 gallons per minute ("gpm") (one unit) to 600 gpm (two units).

l. 2002–2009: corrective action and monitoring well networks were revised through addition of wells.

m. 2004–2005: 64 acres of irrigation area owned by Respondent were added to the land application program; 40 acres were used for center pivot spray irrigation and 24 acres were used for flood irrigation.

n. 2007: memorandum of understanding signed by Respondent and NMED to install municipal water supply connections to residences whose owners had either moved into the area since the 1980s or had opted not to have the water supply connections when originally offered.

o. 2010: third evaporation pond was constructed and commissioned.

p. 2012: land application program ceased operation, and 300 gpm Zeolite pilot treatment started operation.

q. 2015: RO treatment facility was expanded to a maximum throughput of 1200 gpm with the addition of a 600 gpm low pressure skid, a 250 gpm high pressure skid, and two microfiltration skids to replace the existing sand filters amongst other updates. Tailings flushing was discontinued as it was considered no longer effective due to heterogeneity of the tailing pile particle size.

r. 2016: 1200 gpm Zeolite system began operation for water treatment.

21. Windblown materials from the tailings piles contaminated soils with radium-226. The contaminated soils were excavated from surrounding areas and placed on the piles beginning in 1988 and ending in 1993. There was a period of inaction during the soil cleanup due to decommissioning activities. The radium-226 cleanup criterion was established by the NRC as License Condition No. 19 in accordance with 10 CFR Part 40, Appendix A – Criterion 6. The cleanup criterion for radium-226 was 10.5 picocuries per gram (pCi/g) (5.0 pCi/g above background) in the top 15 centimeters of soil and 20.5 pCi/g (15 pCi/g above background) at depths greater than 15 cm. Surface soils from approximately 1,200 acres of land were removed during the removal of off-pile windblown tailing contamination. The remediation resulted in the cleanup of surface soils to an average radium-226 concentration of 1.11 pCi/g (standard deviation 1.05 pCi/g) for the inner zone of the cleanup area and 2.95 pCi/g (standard deviation 1.89 pCi/g) for the outer zone of the cleanup area, based on verification soil sampling that was biased high (ERG 1995).

22. The mill was decommissioned and demolished in 1993–1995. The tailing piles were closed and covered by interim soil covers upon closure of the mill. One foot of soil cover was initially placed on top of the LTP. Additional cover material was placed on top of the pile to fill in depressions caused by settlement, to improve drainage, and to address specific areas with elevated radon flux measurements. Six to nine inches of rock cover was placed on the side slopes for erosion protection.

23. At the former mill area, an average of two feet of contaminated soil (containing elevated radium-226 concentrations) were excavated following the completion of mill demolition. Excavated soils were transported to the LTP and STP for burial. Excavated areas were backfilled with alluvial soils.

24. Remediation continues with the operation of the groundwater extraction and injection system, RO treatment facility, two zeolite treatment systems, two lined collection ponds, three lined evaporation ponds for disposal of contaminated groundwater, and associated equipment and structures. Accounting for scheduled and unscheduled maintenance, the functional capacity of RO treatment based on the last four years of operations is currently about 500 gpm.

25. EPA conducted a CERCLA removal action in 2012 to install radon-222 abatement systems in ten residences in the subdivisions south of the LTP with annual average radon-222 concentrations above EPA's action level of 4 pCi/liter.

26. Pursuant to a 2012 CERCLA Section 122(h)(1) Settlement Agreement for Recovery of Response Costs, Respondent agreed to pay $244,652 to the Homestake Mining Company Site Special Account to support EPA's response to mitigate indoor radon gas. Respondent and EPA executed an amendment to the 2012 CERCLA Section 122(h)(1) Settlement Agreement for Recovery of Response Costs, allowing EPA to retain and use the remaining unused funds in the Homestake Mining Company Site Special Account to reimburse EPA costs incurred in connection with the Site RI/FS activities.

27. The primary contaminants of concern in groundwater at the Site are uranium, selenium, radium-226, radium-228, thorium-230, molybdenum, vanadium, sulfate, chloride,

nitrate, and total dissolved solids. The primary contaminants of concern in soil are radium-226 and uranium. The primary contaminant of concern in indoor and outdoor air is radon.

28. Radon is a radioactive gas produced from the decay of radium-226. Radon decays into short-lived alpha-emitting radon progeny. Exposure to alpha radiation is a known cause of cancer. Inhalation of radon and radon progeny has been shown to cause an increased incidence of cancer of the lung, bronchial epithelium, and other parts of the body of humans.

29. Radium-226 is principally a source of alpha and gamma radiation, although some beta radiation is also produced during the decay process. According to the ATSDR ToxFAQs for Radium (July 1999), exposure to radium-226 can cause adverse effects to the eyes (cataracts) and blood (anemia). Radium-226 has been identified as a known human carcinogen, being specifically linked to cancers of the bone and breast, and also leukemia.

30. Uranium is a widespread mineral forming heavy metal that in nature is composed of three isotopes, uranium-238, uranium-235, and uranium 234, with the uranium-238 isotope generally composing over 98% of the mixture. All of these isotopes are the same chemically, but have different energy and decay properties. According to the ATSDR ToxFAQs for Uranium (October 1999), uranium is an alpha ionizing radiation emitter and in general, weakly radioactive. Exposure to excess levels of uranium can cause human tissue damage, primarily in the kidneys. Cancer risk from exposure to excess uranium levels appears to be low to none. The primary risk from uranium is cancer caused by exposure to the progeny generated by uranium decay.

31. The former uranium mill and associated tailings disposal areas are currently owned by Homestake Mining Company of California, a wholly owned indirect subsidiary of Barrick Gold Corporation.

32. The Site was placed on the National Priorities List pursuant to Section 105 of CERCLA, 42 U.S.C. § 9605 on September 8, 1983.

33. From at least 1977 to the present, Respondent has completed a number of environmental studies and response measures required by NRC Source Materials Licenses, NMED and its predecessor agencies under state discharge permits and Memoranda of Understanding, as well as by EPA.

VI. CONCLUSIONS OF LAW AND DETERMINATIONS

34. Based on the Findings of Fact set forth above, and the administrative record, EPA has determined that:

a. The Site is an appropriate site to meet its CERCLA obligations through CERCLA equivalency pursuant to 40 CFR § 300.700(c)(3).

b. The Site is a "facility" as defined by Section 101(9) of CERCLA, 42 U.S.C. § 9601(9).

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c. The contamination found at the Site, as identified in the Findings of Fact above, includes "hazardous substances" as defined by Section 101(14) of CERCLA, 42 U.S.C. § 9601(14).

d. Respondent is a "person" as defined by Section 101(21) of CERCLA, 42 U.S.C. § 9601(21).

e. Respondent is a responsible party under Section 107(a) of CERCLA, 42 U.S.C. § 9607(a). Respondent is the owner and/or operator of the facility, as well as an arranger for disposal as defined by Section 101(20) of CERCLA, 42 U.S.C. § 9601(20), and within the meaning of Section 107(a)(1)-(3) of CERCLA, 42 U.S.C. § 9607(a)(1)-(3).

f. The conditions described in the Findings of Fact above constitute an actual and/or threatened "release" of a hazardous substance from the facility as defined by Section 101(22) of CERCLA, 42 U.S.C. § 9601(22).

g. The actions required by this Settlement are necessary to protect the public health, welfare, or the environment, are in the public interest, 42 U.S.C. § 9622(a), are consistent with CERCLA and the NCP, 42 U.S.C. §§ 9604(a)(1), 9622(a), and will expedite effective remedial action and minimize litigation, 42 U.S.C. § 9622(a).

h. EPA has determined that Respondent is qualified to conduct the FS within the meaning of Section 104(a) of CERCLA, 42 U.S.C. § 9604(a), and will carry out the Work properly and promptly, in accordance with Sections 104(a) and 122(a) of CERCLA, 42 U.S.C. §§ 9604(a) and 9622(a), if Respondent complies with the terms of this Settlement.

VII. SETTLEMENT AGREEMENT AND ORDER

35. Based upon the Findings of Fact, Conclusions of Law and Determinations set forth above, and the administrative record, it is hereby Ordered and Agreed that Respondent shall comply with all provisions of this Settlement, including, but not limited to, all appendices to this Settlement and all documents incorporated by reference into this Settlement.

VIII. DESIGNATION OF CONTRACTORS AND PROJECT COORDINATORS

36. **Selection of Contractors, Personnel**. All Work performed under this Settlement shall be under the direction and supervision of qualified personnel. Respondent has notified EPA that it intends to use the following personnel in carrying out the Work: HDR Engineering, Inc. under the direction of Joseph R. Shields. EPA hereby approves Respondent's selection of the foregoing contractor and personnel. If, after the commencement of Work, Respondent retains additional contractors or subcontractors, Respondent shall notify EPA of the names, titles, contact information, and qualifications of such contractors or subcontractors retained to perform the Work at least 14 days prior to commencement of Work by such additional contractors or subcontractors. EPA retains the right, at any time, to disapprove of any or all of the contractors and/or subcontractors retained by Respondent. If EPA disapproves of a selected contractor or subcontractor, Respondent shall retain a different contractor or subcontractor and shall notify EPA of that contractor's or subcontractor's name, title, contact information, and qualifications within 30 days after EPA's disapproval. With respect to any proposed contractor, Respondent

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shall demonstrate that the proposed contractor demonstrates compliance with ASQ/ANSI E4:2014 "Quality management systems for environmental information and technology programs – Requirements with guidance for use" (American Society for Quality, February 2014), by submitting a copy of the proposed contractor's Quality Management Plan (QMP). The QMP should be prepared in accordance with "EPA Requirements for Quality Management Plans (QA/R-2)," EPA/240/B-01/002 (Reissued May 2006) or equivalent documentation as determined by EPA. The qualifications of the persons undertaking the Work for Respondent shall be subject to EPA's review for verification based on objective assessment criteria (e.g., experience, capacity, technical expertise) and that they do not have a conflict of interest with respect to the project.

37. Respondent has designated, and EPA has not disapproved, the following individual as Project Coordinator, who shall be responsible for administration of all actions by Respondent required by this Settlement: Daniel Lattin of Barrick Gold of North America, Inc. Respondent has also designated, and EPA has not disapproved, Adam Arguello of Homestake Mining Company of California as its alternate Project Coordinator. To the greatest extent possible, the Project Coordinator shall be present on Site or readily available during the Work. If EPA disapproves of the designated Project Coordinator, Respondent shall retain a different Project Coordinator and shall notify EPA of that person's name, title, contact information, and qualifications within 30 days following EPA's disapproval. Notice or communication relating to this Settlement from EPA to Respondent's Project Coordinator shall constitute notice or communication to Respondent.

38. EPA has designated Mark Purcell, Remedial Project Manager, of the EPA Region 6 Superfund and Emergency Management Division as its Project Coordinator. EPA has also designated Nathaniel Applegate, Remedial Project Manager, of the Superfund and Emergency Management Division as its alternate Project Coordinator. EPA will notify Respondent of a change of its designated Project Coordinator or alternate Project Coordinator. Communications between Respondent and EPA, and all documents concerning the activities performed pursuant to this Settlement, shall be directed to the EPA Project Coordinator in accordance with Paragraph 49.a (General Requirements for Deliverables).

39. EPA's Project Coordinator shall have the authority lawfully vested in a Remedial Project Manager (RPM) and On-Scene Coordinator (OSC) by the NCP. In addition, EPA's Project Coordinator shall have the authority, consistent with the NCP, to halt, conduct, or direct any Work required by this Settlement, or to direct any other response action when he/she determines that conditions at the Site constitute an emergency situation or may present a threat to public health or welfare or the environment. Absence of the EPA Project Coordinator from the area under study pursuant to this Settlement shall not be cause for stoppage or delay of Work.

IX. WORK TO BE PERFORMED

40. For any regulation or guidance referenced in the Settlement, the reference will be read to include any subsequent modification, amendment, or replacement of such regulation or guidance. Such modifications, amendments, or replacements apply to the Work only after Respondent receives notification from EPA of the modification, amendment, or replacement.

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41. Respondent shall conduct the FS in accordance with the provisions of this Settlement, the attached SOW, CERCLA, the NCP, and EPA guidance, including, but not limited to the "Interim Final Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA" ("RI/FS Guidance"), OSWER Directive # 9355.3-01 (October 1988), available at https://semspub.epa.gov/src/document/11/128301 and guidance referenced in the SOW. EPA and Respondent understand that the Site is proceeding under a CERCLA equivalency process pursuant to 40 CFR § 300.700(c)(3). As such, the FS will be sufficient if it substantially complies with NCP requirements, and the Work carried out in accordance with this Settlement will be considered consistent with the NCP. The FS shall determine and evaluate (based on treatability testing, where appropriate) alternatives for remedial action to prevent, mitigate, or otherwise respond to or remedy the release or threatened release of hazardous substances, pollutants, or contaminants at or from the Site. The alternatives evaluated must include, but shall not be limited to, the range of alternatives described in the NCP, 40 C.F.R. § 300.430(e), and shall include remedial actions that utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. In evaluating the alternatives, Respondent shall address the factors required to be taken into account by Section 121 of CERCLA, 42 U.S.C. § 9621, and 40 C.F.R. § 300.430(e).

42. All written documents prepared by Respondent pursuant to this Settlement shall be submitted by Respondent in accordance with Section X (Submission and Approval of Deliverables). With the exception of progress reports and the updated Health and Safety Plan (HASP), all such submittals will be reviewed and approved by EPA in accordance with Section X (Submission and Approval of Deliverables). Respondent shall implement all EPA approved, conditionally-approved, or modified deliverables.

43. Within 30 days after the Effective Date, Respondent shall submit for EPA review and comment an updated HASP that ensures the protection of on-site workers, federal and state officials, and the public during performance of on-site Work under this Settlement or other on-site activities. The updated HASP shall account for the Center for Disease Control's (and/or other state or local health department) restrictions, advisories, or guidelines to address the COVID-19 pandemic disease and the safety practices that will be employed at the Site to minimize the impact of COVID-19, including maintaining social distancing. The updated HASP shall ensure that on-site workers and other response personnel have or can readily access the necessary personal protective equipment to minimize the impact of COVID-19 and to respond to an environmental emergency in an area that is employing active mitigation for COVID-19. In addition, the updated HASP shall comply with all currently applicable Occupational Safety and Health Administration (OSHA) regulations found at 29 C.F.R. Part 1910. Respondent shall incorporate all changes to the HASP provided by EPA.

44. If EPA determines that a Reuse Assessment is necessary for those areas of the Site outside of the byproduct material disposal site and outside any other areas of the Site that will be transferred to DOE's long-term surveillance and maintenance program under an NRC general license, Respondent will perform the Reuse Assessment in accordance with applicable guidance. The Reuse Assessment should provide sufficient information to develop realistic assumptions of the reasonably anticipated future uses for the Site. Respondent shall prepare the Reuse Assessment in accordance with EPA guidance, including, but not limited to: "Reuse

Assessments: A Tool to Implement the Superfund Land Use Directive." OSWER Directive 9355.7-06P (June 2001).

45. **Modification of the SOW**

a. If at any time during the FS process, Respondent identifies a need for additional data, Respondent shall submit a memorandum documenting the need for additional data to EPA's Project Coordinator within 30 days after identification. EPA in its discretion will determine whether the additional data will be collected by Respondent and whether it will be incorporated into deliverables.

b. In the event of unanticipated or changed circumstances at the Site, Respondent shall notify EPA's Project Coordinator by telephone within 24 hours of discovery of the unanticipated or changed circumstances. In the event that EPA determines that the unanticipated or changed circumstances warrant changes in the SOW, EPA shall modify the SOW in writing accordingly or direct Respondent to modify and submit the modified SOW to EPA for approval. Respondent shall perform the SOW as modified.

c. In the event that EPA determines that additional Work consistent with Section III (Statement of Purpose) and Paragraph 41 are necessary to accomplish the purpose of the FS, EPA shall consult with Respondent and consider any concerns or objections expressed by Respondent before making a determination as to the necessary additional tasks. After such consultation, if EPA still considers the additional Work or a modification of such Work necessary to accomplish the purpose of the FS consistent with Section III (Statement of Purpose), and Paragraph 41, EPA will notify Respondent to submit for approval a modified SOW describing the additional Work and modified schedule.

d. Respondent shall confirm its willingness to perform the additional Work in writing to EPA within 7 days after receipt of the EPA notification of the necessary additional tasks. If EPA and Respondent cannot agree on the additional Work required by EPA pursuant to this Paragraph, Respondent may seek dispute resolution pursuant to Section XIX (Dispute Resolution). The SOW shall be modified in accordance with the final resolution of the dispute.

e. Respondent shall complete the additional Work according to the standards, specifications, and schedule set forth or approved by EPA in a written modification to the SOW. EPA reserves the right to conduct the work itself, to seek reimbursement from Respondent for the costs incurred in performing the work, and/or to seek any other appropriate relief.

f. Nothing in this Paragraph shall be construed to limit EPA's authority to enter into additional settlements or orders to require performance of further response actions at the Site.

46. **Off-Site Shipments**

a. Respondent may ship hazardous substances, pollutants, and contaminants from the Site to an off-Site facility only if it complies with Section 121(d)(3) of CERCLA, 42 U.S.C. § 9621(d)(3), and 40 C.F.R. § 300.440. Respondent will be deemed to be in compliance with CERCLA § 121(d)(3) and 40 C.F.R. § 300.440 regarding a shipment if

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Respondent obtains a prior determination from EPA that the proposed receiving facility for such shipment is acceptable under the criteria of 40 C.F.R. § 300.440(b).

b. Respondent may ship Waste Material from the Site to an out-of-state waste management facility in performance of the Work only if, prior to any shipment, they provide written notice to the appropriate state environmental official in the receiving facility's state and to EPA's Project Coordinator. This notice requirement shall not apply to any off-Site shipments when the total quantity of all such shipments will not exceed ten cubic yards. The written notice must include the following information, if available: (1) the name and location of the receiving facility; (2) the type and quantity of Waste Material to be shipped; (3) the schedule for the shipment; and (4) the method of transportation. Respondent shall also notify the state environmental official referenced above and EPA's Project Coordinator of any major changes in the shipment plan, such as a decision to ship the Waste Material to a different out-of-state facility. Respondent shall provide the written notice after the award of the contract for the FS and before the Waste Material is shipped.

c. Respondent may ship Investigation Derived Waste (IDW) from the Site to an off-Site facility only if they comply with Section 121(d)(3) of CERCLA, 42 U.S.C. § 9621(d)(3), 40 C.F.R. § 300.440, EPA's "Guide to Management of Investigation Derived Waste," OSWER 9345.3-03FS (Jan. 1992), and any IDW-specific requirements contained in the SOW. Wastes shipped off-Site to a laboratory for characterization, and RCRA hazardous wastes that meet the requirements for an exemption from RCRA under 40 C.F.R. § 261.4(e) shipped off-Site for treatability studies, are not subject to 40 C.F.R. § 300.440.

47. **Meetings**. Respondent shall make presentations at, and participate in, meetings at the request of EPA during the preparation of the FS. In addition to discussion of the technical aspects of the FS, topics will include anticipated problems or new issues. Meetings will be scheduled at EPA's discretion.

48. **Progress Reports**. In addition to the deliverables set forth in this Settlement, Respondent shall submit written monthly progress reports to EPA by the 15th day of the following month starting on the Effective Date until completion of the FS. At a minimum, with respect to the preceding month, these progress reports shall:

a. describe the actions that have been taken to comply with this Settlement;

b. include all results of sampling and tests and all other data received by Respondent;

c. describe Work planned for the next month with schedules relating such Work to the overall project schedule for FS completion; and

d. describe all problems encountered in complying with the requirements of this Settlement and any anticipated problems, any actual or anticipated delays, and solutions developed and implemented to address any actual or anticipated problems or delays.

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X. SUBMISSION AND APPROVAL OF DELIVERABLES

49. **Submission of Deliverables**

a. **General Requirements for Deliverables**

(1) Except as otherwise provided in this Settlement, Respondent shall direct all submissions required by this Settlement to EPA's Project Coordinator:

Mark Purcell, Remedial Project Manager
U.S. EPA Region 6, SEDRL
1201 Elm St., Ste. 500
Dallas, TX 75270
Purcell.Mark@epa.gov.

Respondent shall submit all deliverables required by this Settlement, the attached SOW, or any approved work plan in accordance with the schedules set forth in this Settlement, the SOW, and such plan.

(2) Respondent shall submit all deliverables in electronic form. Technical specifications for sampling and monitoring data and spatial data are addressed in Paragraph 49.b. All other deliverables shall be submitted in the electronic form specified by EPA's Project Coordinator. If any deliverable includes maps, drawings, or other exhibits that are larger than 8.5 x 11 inches, Respondent shall also provide paper copies of such exhibits.

b. **Technical Specifications for Deliverables**

(1) Technical deliverables shall be provided in accordance with Section IV.A.2 (Document Distribution) of the SOW. Other delivery methods may be allowed if electronic direct submission presents a significant burden or as technology changes.

(2) Spatial data, including spatially-referenced data and geospatial data, should be submitted: (i) in the ESRI File Geodatabase format; and (ii) as unprojected geographic coordinates in decimal degree format using North American Datum 1983 (NAD83) or World Geodetic System 1984 (WGS84) as the datum. If applicable, submissions should include the collection method(s). Projected coordinates may optionally be included but must be documented. Spatial data should be accompanied by metadata, and such metadata should be compliant with the Federal Geographic Data Committee (FGDC) Content Standard for Digital Geospatial Metadata and its EPA profile, the EPA Geospatial Metadata Technical Specification. An add-on metadata editor for ESRI software, the EPA Metadata Editor (EME), complies with these FGDC and EPA metadata requirements and is available at https://edg.epa.gov/EME/.

(3) Each file must include an attribute name for each site unit or sub-unit submitted. Consult https://www.epa.gov/geospatial/geospatial-policies-and-

standards for any further available guidance on attribute identification and naming.

(4) Spatial data submitted by Respondent does not, and is not intended to, define the boundaries of the Site.

50. **Approval of Deliverables**

a. **Initial Submissions**

(1) After review of any deliverable that is required to be submitted for EPA approval under this Settlement or the attached SOW, EPA shall: (i) approve, in whole or in part, the submission; (ii) approve the submission upon specified conditions; (iii) disapprove, in whole or in part, the submission; or (iv) any combination of the foregoing. Any disapproval or modification shall be consistent with the purposes of this Settlement Agreement set forth in Section III (Statement of Purpose) and Paragraph 41.

(2) EPA also may modify the initial submission to cure deficiencies in the submission if: (i) EPA determines that disapproving the submission and awaiting a resubmission would cause substantial disruption to the Work; or (ii) previous submission(s) have been disapproved due to material defects and the deficiencies in the initial submission under consideration indicate a bad faith lack of effort to submit an acceptable deliverable.

b. **Resubmissions**. Upon receipt of a notice of disapproval under Paragraph 50.a(1) (Initial Submissions), or if required by a notice of approval upon specified conditions under Paragraph 50.a(1), Respondent shall, within 30 days or such longer time as specified by EPA in such notice, correct the deficiencies and resubmit the deliverable for approval. After review of the resubmitted deliverable, EPA may: (a) approve, in whole or in part, the resubmission; (b) approve the resubmission upon specified conditions; (c) modify the resubmission; (d) disapprove, in whole or in part, the resubmission, requiring Respondent to correct the deficiencies; or (e) any combination of the foregoing.

c. **Implementation**. Upon approval, approval upon conditions, or modification by EPA under Paragraph 50.a (Initial Submissions) or Paragraph 50.b (Resubmissions), of any deliverable, or any portion thereof: (i) such deliverable, or portion thereof, will be incorporated into and enforceable under the Settlement; and (ii) Respondent shall take any action required by such deliverable, or portion thereof. Implementation of any non-deficient portion of a submission shall not relieve Respondent of any liability for penalties under Section XXI (Stipulated Penalties) for violations of this Settlement.

51. Notwithstanding the receipt of a notice of disapproval, Respondent shall proceed to take any action required by any non-deficient portion of the submission, unless otherwise directed by EPA.

52. In the event that EPA takes over some of the tasks, but not the preparation of the FS, Respondent shall incorporate and integrate information supplied by EPA into the FS.

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53. Respondent shall not proceed with any activities or tasks dependent on the following deliverable until receiving EPA approval, approval on condition, or modification of such deliverable: Development and Screening of Remedial Alternatives Technical Memorandum. While awaiting EPA approval, approval on condition, or modification of this deliverable, Respondent shall proceed with all other tasks and activities that may be conducted independently of this deliverable, in accordance with the schedule set forth under this Settlement.

54. For all remaining deliverables not dependent on the deliverable listed in Paragraph 53, Respondent shall proceed with all subsequent tasks, activities, and deliverables without awaiting EPA approval of the submitted deliverable. EPA reserves the right to stop Respondent from proceeding further, either temporarily or permanently, on any task, activity or deliverable at any point during the Work.

55. **Material Defects**. If an initially submitted or resubmitted plan, report, or other deliverable contains a material defect, and the plan, report, or other deliverable is disapproved or modified by EPA under Paragraph 50.a (Initial Submissions) or 50.b (Resubmissions) due to such material defect, Respondent shall be deemed in violation of this Settlement for failure to submit such plan, report, or other deliverable timely and adequately. Respondent may be subject to penalties for such violation as provided in Section XXI (Stipulated Penalties).

56. Neither failure of EPA to expressly approve or disapprove of Respondent's submissions within a specified time period, nor the absence of comments, shall be construed as approval by EPA.

XI. QUALITY ASSURANCE, SAMPLING, AND DATA ANALYSIS

57. No field work or sampling is anticipated to be necessary to complete the Work; however, in the event additional field work or sampling consistent with Section III (Statement of Purpose) and Paragraph 41 are required by EPA, Respondent shall develop a Quality Assurance Project Plan (QAPP) to which the collection and analysis of samples will conform.

58. Respondent shall use quality assurance, quality control, and other technical activities and chain of custody procedures for all samples consistent with "EPA Requirements for Quality Assurance Project Plans (QA/R5)," EPA/240/B-01/003 (March 2001, reissued May 2006), "Guidance for Quality Assurance Project Plans (QA/G-5)," EPA/240/R-02/009 (December 2002), and "Uniform Federal Policy for Quality Assurance Project Plans, Parts 1-3, EPA/505/B-04/900A-900C (March 2005).

59. **Laboratories**

a. Respondent shall ensure that EPA personnel and its authorized representatives are allowed access at reasonable times to all laboratories utilized by Respondent pursuant to this Settlement. In addition, Respondent shall ensure that such laboratories shall analyze all samples submitted by EPA pursuant to the QAPP for quality assurance, quality control, and technical activities that will satisfy the stated performance criteria as specified in the QAPP and that sampling and field activities are conducted in accordance with the Agency's "EPA QA Field Activities Procedure" CIO 2105-P-02.1 (9/23/2014), available at https://www.epa.gov/irmpoli8/epa-qa-field-activities-procedures. Respondent shall ensure that

the laboratories they utilize for the analysis of samples taken pursuant to this Settlement meet the competency requirements set forth in EPA's "Policy to Assure Competency of Laboratories, Field Sampling, and Other Organizations Generating Environmental Measurement Data under Agency-Funded Acquisitions," available at https://www.epa.gov/measurements/documents-about-measurement-competency-under-acquisition-agreements, and that the laboratories perform all analyses using EPA-accepted methods. Accepted EPA methods consist of, but are not limited to, methods that are documented in the EPA's Contract Laboratory Program (https://www.epa.gov/superfund/programs/clp/), SW 846 "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods" (https://www.epa.gov/hw-sw846), "Standard Methods for the Examination of Water and Wastewater" (http://www.standardmethods.org/), and 40 C.F.R. Part 136, "Air Toxics - Monitoring Methods" (https://www.epa.gov/ttnamti1/airtox.html).

b. Upon approval by EPA, Respondent may use other appropriate analytical methods, as long as (i) quality assurance/quality control (QA/QC) criteria are contained in the methods and the methods are included in the QAPP, (ii) the analytical methods are at least as stringent as the methods listed above, and (iii) the methods have been approved for use by a nationally recognized organization responsible for verification and publication of analytical methods, e.g., EPA, ASTM, NIOSH, OSHA, etc.

c. Respondent shall ensure that all laboratories they use for analysis of samples taken pursuant to this Settlement have a documented Quality System that complies with ASQ/ANSI E4:2014 "Quality Management Systems for Environmental Information and Technology Programs – Requirements With Guidance for Use" (American Society for Quality, February 2014), and "EPA Requirements for Quality Management Plans (QA/R-2)" EPA/240/B-01/002 (March 2001, reissued May 2006), or equivalent documentation as determined by EPA. EPA may consider Environmental Response Laboratory Network (ERLN) laboratories, laboratories accredited under the National Environmental Laboratory Accreditation Program (NELAP), or laboratories that meet International Standardization Organization (ISO 17025) standards or other nationally recognized programs as meeting the Quality System requirements.

d. Respondent shall ensure that all field methodologies utilized in collecting samples for subsequent analysis pursuant to this Settlement are conducted in accordance with the procedures set forth in the approved QAPP.

60. **Sampling**

a. Upon request, Respondent shall provide split or duplicate samples to EPA or its authorized representatives. Respondent shall notify EPA not less than 7 days in advance of any sample collection activity unless shorter notice is agreed to by EPA. In addition, EPA shall have the right to take any additional samples that EPA deems necessary. Upon request, EPA shall provide to Respondent split or duplicate samples of any samples it takes as part of EPA's oversight of Respondent's implementation of the Work, and any such samples shall be analyzed in accordance with the approved QAPP.

b. Respondent shall submit to EPA, in the next monthly progress report as described in Paragraph 48 (Progress Reports) the results of all sampling and/or tests or other data

obtained or generated by or on behalf of Respondent with respect to the Site and/or the implementation of this Settlement.

61. If Respondent objects to any data gathered, generated, or evaluated by EPA, the State, or Respondent relating to the Work to be performed under this Settlement, Respondent shall identify and explain, or submit to EPA a report that specifically identifies and explains its objections, describes the acceptable use of the data, if any, and identifies any limitations to the use of the data. The report shall be submitted to EPA prior to submitting the draft FS report.

XII. PROPERTY REQUIREMENTS

62. **Agreements Regarding Access and Non-Interference**. Respondent shall, with respect to the Site: (i) provide EPA, the State, and their representatives, contractors, and subcontractors with access at all reasonable times to the Site to conduct any activity regarding the Settlement; and (ii) refrain from using the Site in any manner that EPA determines will pose an unacceptable risk to human health or to the environment due to exposure to Waste Material, or interfere with or adversely affect the implementation or integrity of the Work. Respondent shall provide a copy of such access agreement(s) to EPA and the State. Neither EPA nor Respondent anticipates that any Work under this Settlement shall require access to areas owned or in possession of someone other than Respondent; however, in the event Work under this Settlement is to be performed in areas owned by or in possession of someone other than Respondent, Respondent shall use its best efforts to obtain all necessary access agreements within 30 days after Respondent becomes aware that such access is needed, or as otherwise specified in writing by the EPA Project Coordinator. In securing such agreements from property owners, Respondent shall use its best efforts to obtain access agreements that are enforceable by Respondent and EPA, and that require the property owner to: (i) provide EPA and the State, and their representatives, contractors and subcontractors, with access at all reasonable times to such property, (ii) refrain from using the property in any manner that EPA determines will interfere with or adversely affect the implementation or integrity of the Work. Respondent shall provide a copy of such access agreement(s) to EPA and the State. The parties understand and acknowledge that any delays in obtaining access, if required, may affect the schedule and deliverables under this Settlement and SOW.

63. **Best Efforts**. As used in this Section, "best efforts" means the efforts that a reasonable person in the position of Respondent would use so as to achieve the goal in a timely manner, including the cost of employing professional assistance and the payment of reasonable sums of money to secure access and/or use restriction agreements, as required by this Section. If Respondent is unable to accomplish what is required through "best efforts" in a timely manner, it shall notify EPA and include a description of the steps taken to comply with the requirements. If EPA deems it appropriate, it may assist Respondent, or take independent action, in obtaining such access and/or use restrictions. All costs incurred by the United States in providing such assistance or taking such action, including the cost of attorney time and the amount of monetary consideration or just compensation paid, constitute Future Response Costs to be reimbursed under Section XVII (Payment of Response Costs).

64. If EPA determines in a decision document prepared in accordance with the NCP that Institutional Controls in the form of state or local laws, regulations, ordinances, zoning

restrictions, or other governmental controls or notices are needed, Respondent shall cooperate with EPA's and the State's efforts to secure and ensure compliance with such Institutional Controls.

XIII. ACCESS TO INFORMATION

65. Respondent shall provide to EPA, upon request, copies of all records, reports, documents, and other information (including records, reports, documents, and other information in electronic form) (hereinafter referred to as "Records") within Respondent's possession or control or that of their contractors or agents relating to activities at the Site or to the implementation of this Settlement, including, but not limited to, sampling, analysis, chain of custody records, manifests, trucking logs, receipts, reports, sample traffic routing, correspondence, or other documents or information regarding the Work. Respondent shall also make available to EPA, for purposes of investigation, information gathering, or testimony, their employees, agents, or representatives with knowledge of relevant facts concerning the performance of the Work.

66. **Privileged and Protected Claims**

a. Respondent may assert that all or part of a Record requested by EPA is privileged or protected as provided under federal law, in lieu of providing the Record, provided Respondent complies with Paragraph 66.b, and except as provided in Paragraph 66.c.

b. If Respondent asserts a claim of privilege or protection, it shall provide EPA with the following information regarding such Record: its title; its date; the name, title, affiliation (e.g., company or firm), and address of the author, of each addressee, and of each recipient; a reasonable description of the Record's contents sufficient to assess Respondent's claim of privilege or protection without revealing privileged or protected information; and the privilege or protection asserted. If a claim of privilege or protection applies only to a portion of a Record, Respondent shall provide the Record to EPA in redacted form to mask the privileged or protected portion only. Respondent shall retain all Records that it claims to be privileged or protected until EPA has had a reasonable opportunity to dispute the privilege or protection claim and any such dispute has been resolved in Respondent's favor.

c. Respondent may make no claim of privilege or protection regarding: (1) any data regarding the Site, including, but not limited to, all sampling, analytical, monitoring, hydrogeologic, scientific, chemical, radiological, or engineering data, or the portion of any other Record that evidences conditions at or around the Site; or (2) the portion of any Record that Respondent is required to create or generate pursuant to this Settlement.

67. **Business Confidential Claims**. Respondent may assert that all or part of a Record provided to EPA under this Section or Section XIV (Record Retention) is business confidential to the extent permitted by and in accordance with Section 104(e)(7) of CERCLA, 42 U.S.C. § 9604(e)(7), and 40 C.F.R. § 2.203(b). Respondent shall segregate and clearly identify all Records or parts thereof submitted under this Settlement for which Respondent asserts business confidentiality claims. Records claimed as confidential business information will be afforded the protection specified in 40 C.F.R. Part 2, Subpart B. If no claim of confidentiality

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accompanies Records when they are submitted to EPA, or if EPA has notified Respondent that the Records are not confidential under the standards of Section 104(e)(7) of CERCLA or 40 C.F.R. Part 2, Subpart B and Respondent has not disputed that determination, the public may be given access to such Records without further notice to Respondent.

68. Notwithstanding any provision of this Settlement, EPA retains all of its information gathering and inspection authorities and rights, including enforcement actions related thereto, under CERCLA, RCRA, and any other applicable statutes or regulations.

XIV. RECORD RETENTION

69. Until 7 years after EPA provides Respondent with notice, pursuant to Section XXXI (Notice of Completion of Work), that all Work has been fully performed in accordance with this Settlement, Respondent shall preserve and retain all non-identical copies of Records (including Records in electronic form) now in its possession or control, or that come into its possession or control, that relate in any manner to its liability under CERCLA with regard to the Site. Respondent, as potentially liable as an owner or operator of the Site, must retain, in addition, all Records that relate to the liability of any other person under CERCLA with respect to the Site. Respondent must also retain, and instruct its contractors and agents to preserve, for the same period of time specified above all non-identical copies of the last draft or final version of any Records (including Records in electronic form) now in its possession or control or that come into its possession or control that relate in any manner to the performance of the Work, provided, however, that Respondent (and its contractors and agents) must retain, in addition, copies of all data generated during the performance of the Work and not contained in the aforementioned Records required to be retained. Each of the above record retention requirements shall apply regardless of any corporate retention policy to the contrary.

70. At the conclusion of the document retention period, Respondent shall notify EPA at least 60 days prior to the destruction of any such Records, and, upon request by EPA, and except as provided in Paragraph 66 (Privileged and Protected Claims), Respondent shall deliver any such Records to EPA.

71. Respondent certifies individually that, to the best of its knowledge and belief, after thorough inquiry, it has not altered, mutilated, discarded, destroyed, or otherwise disposed of any Records (other than identical copies) relating to its potential liability regarding the Site since notification of potential liability by EPA or the State and that it has fully complied with any and all EPA and State requests for information regarding the Site pursuant to Sections 104(e) and 122(e) of CERCLA, 42 U.S.C. §§ 9604(e) and 9622(e), and Section 3007 of RCRA, 42 U.S.C. § 6927, and state law.

XV. COMPLIANCE WITH OTHER LAWS

72. Nothing in this Settlement limits Respondent's obligations to comply with the requirements of all applicable state and federal laws and regulations when performing the FS. No local, state, or federal permit shall be required for any portion of the Work conducted entirely on-site (i.e., within the areal extent of contamination or in very close proximity to the contamination and necessary for implementation of the Work), including studies, if the action is selected and

carried out in compliance with Section 121 of CERCLA, 42 U.S.C. § 9621. Where any portion of the Work that is not on-site requires a federal or state permit or approval, Respondent shall submit timely and complete applications and take all other actions necessary to obtain and to comply with all such permits or approvals. Respondent may seek relief under the provisions of Section XX (Force Majeure) for any delay in the performance of the Work resulting from a failure to obtain, or a delay in obtaining, any permit or approval required for the Work, provided that it has submitted timely and complete applications and taken all other actions necessary to obtain all such permits or approvals. This Settlement is not, and shall not be construed to be, a permit issued pursuant to any federal or state statute or regulation.

XVI. EMERGENCY RESPONSE AND NOTIFICATION OF RELEASES

73. **Emergency Response**. If any event occurs during performance of the Work that causes or threatens to cause a release of Waste Material on, at, or from the Site that either constitutes an emergency situation or that may present an immediate threat to public health or welfare or the environment, Respondent shall immediately take all appropriate action to prevent, abate, or minimize such release or threat of release. Respondent shall take these actions in accordance with all applicable provisions of this Settlement. Respondent shall also immediately notify EPA's Project Coordinator or, in the event of his/her unavailability, the Regional Duty Officer at (214) 665-6444 of the incident or Site conditions. In the event that Respondent fails to take appropriate response action as required by this Paragraph, and EPA takes such action instead, Respondent shall reimburse EPA for all costs of such response action not inconsistent with the NCP pursuant to Section XVII (Payment of Response Costs).

74. **Release Reporting**. Upon the occurrence of any event during performance of the Work that Respondent is required to report pursuant to Section 103 of CERCLA, 42 U.S.C. § 9603, or Section 304 of the Emergency Planning and Community Right-to-know Act (EPCRA), 42 U.S.C. § 11004, Respondent shall immediately orally notify EPA's Project Coordinator or, in the event of his/her unavailability, the Regional Duty Officer at (214) 665-6444, and the National Response Center at (800) 424-8802. This reporting requirement is in addition to, and not in lieu of, reporting under Section 103 of CERCLA, 42 U.S.C. § 9603, and Section 304 of the Emergency Planning and Community Right-To-Know Act of 1986, 42 U.S.C. § 11004.

75. For any event covered under this Section, Respondent shall submit a written report to EPA within 7 days after the onset of such event, setting forth the action or event that occurred and the measures taken, and to be taken, to mitigate any release or threat of release or endangerment caused or threatened by the release and to prevent the reoccurrence of such a release or threat of release.

XVII. PAYMENT OF RESPONSE COSTS

76. **Payments for Future Response Costs**. Respondent shall pay to EPA all Future Response Costs not inconsistent with the NCP.

a. **Periodic Bill**. On a periodic basis, EPA will send Respondent a bill requiring payment that includes a SCORPIOS Report, which includes direct and indirect costs

incurred by EPA, its contractors, subcontractors, and the United States Department of Justice. Respondent shall make all payments within 30 days after Respondent's receipt of each bill requiring payment, except as otherwise provided in Paragraph 79 (Contesting Future Response Costs), and in accordance with Paragraph 77 (Payment Instructions).

b. **Deposit of Future Response Costs Payments**. The total amount to be paid by Respondent pursuant to Paragraph 76.a. (Periodic Bill) shall be deposited by EPA in the Homestake Mining Company Site Special Account to be retained and used to conduct or finance response actions at or in connection with the Site, or to be transferred by EPA to the EPA Hazardous Substance Superfund, provided, however, that EPA may deposit a Future Response Costs payment directly into the EPA Hazardous Substance Superfund if, at the time the payment is received, EPA estimates that the Homestake Mining Company Site Special Account balance is sufficient to address currently anticipated future response actions to be conducted or financed by EPA at or in connection with the Site.

77. **Payment Instructions**

a. Respondent shall make payment on-line to www.Pay.gov which accepts debit and credit cards and bank account ACH. On the www.Pay.gov main page, enter SFO 1.1 in the search field to obtain EPA's Miscellaneous Payment Form – Cincinnati Finance Center. Complete the form with the Site Name/Spill ID Number 0618 and the EPA docket number for this action.

b. At the time of payment, Respondent shall send notice that payment has been made:

(1) By email to: CINWD_AcctsReceivable@epa.gov, or

(2) By mail to: U.S. Environmental Protection Agency
Superfund Payments
Cincinnati Finance Center
P.O. Box 979076
St. Louis, Missouri 63197-9000

Such notice shall reference Site Name/Spill ID Number 0618 and the EPA docket number for this action.

78. **Interest**. In the event that any payment for Future Response Costs is not made by the date required, Respondent shall pay Interest on the unpaid balance. Future Response Costs shall begin to accrue on the date of the bill. The Interest shall accrue through the date of Respondent's payment. Payments of Interest made under this Paragraph shall be in addition to such other remedies or sanctions available to the United States by virtue of Respondent's failure to make timely payments under this Section, including but not limited to, payment of stipulated penalties pursuant to Section XXI (Stipulated Penalties).

79. **Contesting Future Response Costs**. Respondent may initiate the procedures of Section XIX (Dispute Resolution) regarding payment of any Future Response Costs billed under

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Paragraph 76 (Payments for Future Response Costs) if it determines that EPA has made a mathematical error or included a cost item that is not within the definition of Future Response Costs, or if it believes EPA incurred excess costs as a direct result of an EPA action that was inconsistent with a specific provision or provisions of the NCP. To initiate such a dispute, Respondent shall submit a Notice of Dispute in writing to EPA's Project Coordinator within 30 days after receipt of the bill. Any such Notice of Dispute shall specifically identify the contested Future Response Costs and the basis for objection. If Respondent submits a Notice of Dispute, Respondent shall within the 30-day period, also as a requirement for initiating the dispute, (a) pay all uncontested Future Response Costs to EPA in the manner described in Paragraph 76, and (b) establish, in a duly chartered bank or trust company, an interest-bearing escrow account that is insured by the Federal Deposit Insurance Corporation (FDIC) and remit to that escrow account funds equivalent to the amount of the contested Future Response Costs. Respondent shall send to EPA's Project Coordinator a copy of the transmittal letter and check paying the uncontested Future Response Costs, and a copy of the correspondence that establishes and funds the escrow account, including, but not limited to, information containing the identity of the bank and bank account under which the escrow account is established as well as a bank statement showing the initial balance of the escrow account. If EPA prevails in the dispute, within 5 days after the resolution of the dispute, Respondent shall pay the sums due (with accrued interest) to EPA in the manner described in Paragraph 76. If Respondent prevails concerning any aspect of the contested costs, Respondent shall pay that portion of the costs (plus associated accrued interest) for which it did not prevail to EPA in the manner described in Paragraph 76. Respondent shall be disbursed any balance of the escrow account. The dispute resolution procedures set forth in this Paragraph in conjunction with the procedures set forth in Section XIX (Dispute Resolution) shall be the exclusive mechanisms for resolving disputes regarding Respondent's obligation to reimburse EPA for its Future Response Costs.

XVIII. NATURAL RESOURCE DAMAGES

80. For the purposes of Section 113(g)(1) of CERCLA, the Parties agree that, upon the Effective Date of this Settlement for performance of an FS at the Site, remedial action under CERCLA shall be deemed to be scheduled and an action for damages (as defined in 42 U.S.C. § 9601(6)) must be commenced within 3 years after the completion of the remedial action for the last operable unit at the Site.

XIX. DISPUTE RESOLUTION

81. Unless otherwise expressly provided for in this Settlement, the dispute resolution procedures of this Section shall be the exclusive mechanism for resolving disputes arising under this Settlement. The Parties shall attempt to resolve any disagreements concerning this Settlement expeditiously and informally.

82. **Informal Dispute Resolution**.

a. If Respondent objects to any EPA action taken pursuant to this Settlement, including billings for Future Response Costs, they shall send EPA a written Notice of Dispute describing the objection(s) within 30 days after such action. EPA and Respondent shall have 30 days from EPA's receipt of Respondent's Notice of Dispute to resolve the dispute through

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informal negotiations (the "Negotiation Period"). The Negotiation Period may be extended at the sole discretion of EPA. Any agreement reached by the Parties pursuant to this Section shall be in writing and shall, upon signature by the Parties, be incorporated into and become an enforceable part of this Settlement.

b. Initiation of Alternative Dispute Resolution. At any time during the informal dispute resolution period, either Respondent or EPA may propose the use of a mediator to assist in resolving the dispute. In addition, upon the request of Respondent or EPA, a meeting shall take place between the parties to the dispute with the assistance of a mediator for the purpose of resolving the dispute and/or determining whether to undertake further mediated discussions. This initial meeting shall take place within 10 business days of the party's request, unless Respondent and EPA agree to extend that period. Upon the written agreement of Respondent and EPA, the period for informal dispute resolution may be extended for the purpose of mediating the dispute. Formal dispute resolution, as governed by the procedures set for in Paragraph 83, shall commence immediately upon the termination of the informal dispute resolution period.

c. Decision to Continue Alternative Dispute Resolution. After the initial mediated meeting, the decision to continue the mediation shall be in the sole discretion of each party.

d. Costs of Alternative Dispute Resolution. The Parties agree that they will share equitably the costs of mediation, subject to the availability of EPA funds for this purpose. EPA's ability to share the costs of mediation will be determined by EPA in its sole discretion and shall not be subject to dispute resolution or judicial review. If EPA determines that no mediation funding is available, Respondent shall have the option to cover all of the mediation costs or to request the services of a trained mediator from EPA's in-house Alternate Dispute Resolution (ADR) program or any other dispute resolution professional who services may be available to the Parties at no cost.

e. Confidentiality. The Parties agree that participants in mediated discussions pursuant to this Section shall execute a confidentiality agreement in the form attached as Appendix D to this Settlement Agreement.

f. In the event that the Parties cannot resolve a dispute by informal negotiations under this Paragraph, then the dispute shall proceed under Paragraph 83 (Formal Dispute Resolution).

83. **Formal Dispute Resolution**. If the Parties are unable to reach an agreement within the Negotiation Period, Respondent shall, within 30 days after the end of the Negotiation Period, submit a statement of position to EPA's Project Coordinator. EPA may, within 30 days thereafter, submit a statement of position. Thereafter, an EPA management official at the Branch Chief level or higher will issue a written decision on the dispute to Respondent. EPA's decision shall be incorporated into and become an enforceable part of this Settlement. If Respondent disagrees with the written decision of the EPA management official, it may seek appeal of the decision in the United States District Court for the District of New Mexico. If Respondent seeks appeal to the United States District Court for the District of New Mexico, EPA will contest

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jurisdiction of the United States District Court to hear such appeal. Respondent shall fulfill the requirement that was the subject of the dispute in accordance with the agreement reached or with EPA's or the United States District Court for the District of New Mexico's decision, whichever occurs.

84. Except as provided in Paragraph 79 (Contesting Future Response Costs) or as agreed by EPA, the invocation of formal dispute resolution procedures under this Section does not extend, postpone, or affect in any way any obligation of Respondent under this Settlement. Except as provided in Paragraph 93, stipulated penalties with respect to the disputed matter shall continue to accrue but payment shall be stayed pending resolution of the dispute. Notwithstanding the stay of payment, stipulated penalties shall accrue from the first day of noncompliance with any applicable provision of this Settlement. In the event that Respondent does not prevail on the disputed issue, stipulated penalties shall be assessed and paid as provided in Section XXI (Stipulated Penalties).

XX. FORCE MAJEURE

85. "Force Majeure" for purposes of this Settlement, is defined as any event arising from causes beyond the control of Respondent, of any entity controlled by Respondent, or of Respondent's contractors that delays or prevents the performance of any obligation under this Settlement despite Respondent's best efforts to fulfill the obligation. The requirement that Respondent exercises "best efforts to fulfill the obligation" includes using best efforts to anticipate any potential force majeure and best efforts to address the effects of any potential force majeure (a) as it is occurring and (b) following the potential force majeure such that the delay and any adverse effects of the delay are minimized to the greatest extent possible. "Force majeure" does not include financial inability to complete the Work or increased cost of performance.

86. If any event occurs or has occurred that may delay the performance of any obligation under this Settlement, Respondent shall notify EPA's Project Coordinator orally or, in his or her absence, the alternate EPA Project Coordinator, or, in the event both of EPA's designated representatives are unavailable, the Director of the Land, Chemicals and Redevelopment Division, EPA Region 6, within 14 days of when Respondent first knew that the event might cause a delay. Within 7 days thereafter, Respondent shall provide in writing to EPA an explanation and description of the reasons for the delay; the anticipated duration of the delay; all actions taken or to be taken to prevent or minimize the delay; a schedule for implementation of any measures to be taken to prevent or mitigate the delay or the effect of the delay; Respondent's rationale for attributing such delay to a force majeure; and a statement as to whether, in the opinion of Respondent, such event may cause or contribute to an endangerment to public health or welfare, or the environment. Respondent shall include with any notice all available documentation supporting their claim that the delay was attributable to a force majeure. Respondent shall be deemed to know of any circumstance of which Respondent, any entity controlled by Respondent, or Respondent's contractors knew or should have known. Failure to comply with the above requirements regarding an event shall preclude Respondent from asserting any claim of force majeure regarding that event, provided, however, that if EPA, despite the late or incomplete notice, is able to assess to its satisfaction whether the event is a force majeure under Paragraph 85 and whether Respondent has exercised its best efforts under

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Paragraph 85, EPA may, in its unreviewable discretion, excuse in writing Respondent's failure to submit timely or complete notices under this Paragraph.

87. If EPA agrees that the delay or anticipated delay is attributable to a force majeure, the time for performance of the obligations under this Settlement that are affected by the force majeure will be extended by EPA for such time as is necessary to complete those obligations. An extension of the time for performance of the obligations affected by the force majeure shall not, of itself, extend the time for performance of any other obligation. If EPA does not agree that the delay or anticipated delay has been or will be caused by a force majeure, EPA will notify Respondent in writing of its decision. If EPA agrees that the delay is attributable to a force majeure, EPA will notify Respondent in writing of the length of the extension, if any, for performance of the obligations affected by the force majeure.

88. If Respondent elects to invoke the dispute resolution procedures set forth in Section XIX (Dispute Resolution), it shall do so no later than 15 days after receipt of EPA's notice. In any such proceeding, Respondent shall have the burden of demonstrating by a preponderance of the evidence that the delay or anticipated delay has been or will be caused by a force majeure, that the duration of the delay or the extension sought was or will be warranted under the circumstances, that best efforts were exercised to avoid and mitigate the effects of the delay, and that Respondent complied with the requirements of Paragraphs 85 and 86. If Respondent carries this burden, the delay at issue shall be deemed not to be a violation by Respondent of the affected obligation of this Settlement identified to EPA.

89. The failure by EPA to timely complete any obligation under the Settlement is not a violation of the Settlement, provided, however, that if such failure prevents Respondent from meeting one or more deadlines under the Settlement, Respondent may seek relief under this Section.

XXI. STIPULATED PENALTIES

90. Respondent shall be liable to EPA for stipulated penalties in the amounts set forth in Paragraph 91 for failure to comply with the obligations specified in Paragraph 91 unless excused under Section XX (Force Majeure). "Comply" as used in the previous sentence includes compliance by Respondent with all applicable requirements of this Settlement, within the deadlines established under this Settlement.

91. **Stipulated Penalty Amounts.** The following stipulated penalties shall accrue per violation per day for failure to submit timely or adequate deliverables required pursuant to this Settlement where an extension for the deliverable has not been granted in writing prior to the due date:

Penalty Per Violation Per Day	Period of Noncompliance
$ 500	1st through 14th day
$ 1,000	15th through 30th day
$ 1,500	31st day and beyond

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92. In the event that EPA assumes performance of a portion or all of the Work pursuant to Paragraph 103 (Work Takeover), Respondent shall be liable for a stipulated penalty in the amount of $100,000.

93. All penalties shall begin to accrue on the day after the complete performance is due or the day a violation occurs and shall continue to accrue through the final day of the correction of the noncompliance or completion of the activity. However, stipulated penalties shall not accrue: (a) with respect to a deficient submission under Section X (Submission and Approval of Deliverables), during the period, if any, beginning on the 31st day after EPA's receipt of such submission until the date that EPA notifies Respondent of any deficiency; and (b) with respect to a decision by the EPA Management Official at the Branch Chief level or higher, under Paragraph 83 (Formal Dispute Resolution), during the period, if any, beginning on the 21st day after the Negotiation Period begins until the date that the EPA Management Official issues a final decision regarding such dispute. Nothing in this Settlement shall prevent the simultaneous accrual of separate penalties for separate violations of this Settlement.

94. Following EPA's determination that Respondent has failed to comply with a requirement of this Settlement, EPA may give Respondent written notification of the failure and describe the noncompliance. EPA may send Respondent a written demand for the payment of the penalties. However, penalties shall accrue as provided in the preceding Paragraph regardless of whether EPA has notified Respondent of a violation.

95. All penalties accruing under this Section shall be due and payable to EPA within 30 days after Respondent's receipt from EPA of a demand for payment of the penalties, unless Respondent invokes the Dispute Resolution procedures under Section XIX (Dispute Resolution) within the 30-day period. All payments to EPA under this Section shall indicate that the payment is for stipulated penalties and shall be made in accordance with Paragraph 77 (Payment Instructions).

96. If Respondent fails to pay stipulated penalties when due, Respondent shall pay Interest on the unpaid stipulated penalties as follows: (a) if Respondent has timely invoked dispute resolution such that the obligation to pay stipulated penalties has been stayed pending the outcome of dispute resolution, Interest shall accrue from the date stipulated penalties are due pursuant to Paragraph 93 until the date of payment; and (b) if Respondent fails to timely invoke dispute resolution, Interest shall accrue from the date of demand under Paragraph 95 until the date of payment. If Respondent fails to pay stipulated penalties and Interest when due, the United States may institute proceedings to collect the penalties and Interest.

97. The payment of penalties and Interest, if any, shall not alter in any way Respondent's obligation to complete performance of the Work required under this Settlement.

98. Nothing in this Settlement shall be construed as prohibiting, altering, or in any way limiting the ability of EPA to seek any other remedies or sanctions available by virtue of Respondent's violation of this Settlement or of the statutes and regulations upon which it is based, including, but not limited to, penalties pursuant to Section 122(*l*) of CERCLA, 42 U.S.C. § 9622(*l*), and punitive damages pursuant to Section 107(c)(3) of CERCLA, 42 U.S.C. § 9607(c)(3), provided, however, that EPA shall not seek civil penalties pursuant Section 122(*l*)

of CERCLA or punitive damages pursuant to Section 107(c)(3) of CERCLA for any violation for which a stipulated penalty is provided in this Settlement, except in the case of willful violation of this Settlement or in the event that EPA assumes performance of a portion or all of the Work pursuant to Paragraph 103 (Work Takeover).

99. Notwithstanding any other provision of this Section, EPA may, in its unreviewable discretion, waive any portion of stipulated penalties that have accrued pursuant to this Settlement.

XXII. COVENANTS BY EPA

100. Except as provided in Section XXIII (Reservations of Rights by EPA), EPA covenants not to sue or to take administrative action against Respondent pursuant to Sections 106 and 107(a) of CERCLA, 42 U.S.C. §§ 9606 and 9607(a), for the Work and Future Response Costs. These covenants shall take effect upon the Effective Date. These covenants are conditioned upon the complete and satisfactory performance by Respondent of its obligations under this Settlement. These covenants (and all reservations thereto in this Settlement) shall also apply to Respondent's officers, directors, employees, predecessors-in-interest, affiliates, parents, successors, and assigns (the "Covered Parties"), but only to the extent that the alleged liability of the Covered Parties arises out of those matters relating to the Work, and Future Response Costs. These covenants do not extend to any other person.

XXIII. RESERVATIONS OF RIGHTS BY EPA

101. Except as specifically provided in this Settlement, nothing in this Settlement shall limit the power and authority of EPA or the United States to take, direct, or order all actions necessary to protect public health, welfare, or the environment or to prevent, abate, or minimize an actual or threatened release of hazardous substances, pollutants, or contaminants, or hazardous or solid waste on, at, or from the Site. Further, nothing in this Settlement shall prevent EPA from seeking legal or equitable relief to enforce the terms of this Settlement, from taking other legal or equitable action as it deems appropriate and necessary, or from requiring Respondent in the future to perform additional activities pursuant to CERCLA or any other applicable law.

102. The covenant not to sue set forth in Section XXII (Covenants by EPA) above does not pertain to any matters other than those expressly identified therein. EPA reserves, and this Settlement is without prejudice to, all rights against Respondent with respect to all other matters, including, but not limited to:

a. liability for failure by Respondent to meet a requirement of this Settlement;

b. liability for costs not included within the definition of Future Response Costs;

c. liability for performance of response action other than the Work;

d. criminal liability;

e. liability for violations of federal or state law that occur during or after implementation of the Work;

f. liability for damages for injury to, destruction of, or loss of natural resources, and for the costs of any natural resource damage assessments;

g. liability arising from the past, present, or future disposal, release or threat of release of Waste Materials outside of the Site; and

h. liability for costs incurred or to be incurred by the Agency for Toxic Substances and Disease Registry related to the Site not paid as Future Response Costs under this Settlement.

103. **Work Takeover**

a. In the event EPA determines that Respondent: (1) has ceased implementation of any portion of the Work; (2) is seriously or repeatedly deficient or late in their performance of the Work; or (3) is implementing the Work in a manner that may cause an endangerment to human health or the environment, EPA may issue a written notice ("Work Takeover Notice") to Respondent. Any Work Takeover Notice issued by EPA (which writing may be electronic) will specify the grounds upon which such notice was issued and will provide Respondent a period of 10 days within which to remedy the circumstances giving rise to EPA's issuance of such notice.

b. If, after expiration of the 10-day notice period specified in Paragraph 103.a, Respondent has not remedied to EPA's satisfaction the circumstances giving rise to EPA's issuance of the relevant Work Takeover Notice, EPA may at any time thereafter assume the performance of all or any portion(s) of the Work as EPA deems necessary ("Work Takeover"). EPA will notify Respondent in writing (which writing may be electronic) if EPA determines that implementation of a Work Takeover is warranted under this Paragraph 103.b. Funding of Work Takeover costs is addressed under Paragraph 127 (Access to Financial Assurance).

c. Respondent may invoke the procedures set forth in Section XIX (Dispute Resolution) to dispute EPA's implementation of a Work Takeover under Paragraph 103.b. However, notwithstanding Respondent's invocation of such dispute resolution procedures, and during the pendency of any such dispute, EPA may in its sole discretion commence and continue a Work Takeover under Paragraph 103.b. until the earlier of (1) the date that Respondent remedies, to EPA's satisfaction, the circumstances giving rise to EPA's issuance of the relevant Work Takeover Notice, or (2) the date that a written decision terminating such Work Takeover is rendered in accordance with Paragraph 83 (Formal Dispute Resolution).

d. Notwithstanding any other provision of this Settlement, EPA retains all authority and reserves all rights to take any and all response actions authorized by law.

XXIV. COVENANTS BY RESPONDENT

104. Respondent covenants not to sue and agrees not to assert any claims or causes of action against the United States, or its contractors or employees, with respect to the Work, Future Response Costs, or this Settlement, including, but not limited to:

a. any direct or indirect claim for reimbursement from the EPA Hazardous Substance Superfund through Sections 106(b)(2), 107, 111, 112, or 113 of CERCLA, 42 U.S.C. §§ 9606(b)(2), 9607, 9611, 9612, or 9613, or any other provision of law;

b. any claims under Sections 107 of CERCLA, Section 7002(a) of RCRA, 42 U.S.C. § 6972(a), or state law regarding the Work, Future Response Costs, and this Settlement; or

c. any claim arising out of response actions at or in connection with the Site, including any claim under the United States Constitution, the State Constitution, the Tucker Act, 28 U.S.C. § 1491, the Equal Access to Justice Act, 28 U.S.C. § 2412, or at common law.

105. Respondent reserves, and this Settlement is without prejudice to, claims that Respondent has or may have against the United States brought pursuant to Section 113(f) of CERCLA, 42 U.S.C. § 9613(f), relating to the Work or Future Response Costs.

106. Nothing in this Settlement Agreement shall be deemed to compromise in any way or degree any claim by Respondent against the United States for any claims authorized by Title X of the Energy Policy Act of 1992, the Atomic Energy Act of 1954, or the Uranium Mill Tailings Radiation Control Act of 1978.

107. These covenants not to sue shall not apply in the event the United States brings a cause of action or issues an order pursuant to the reservations set forth in Section XXIII (Reservations of Rights by EPA), other than in Paragraph 102.a (liability for failure to meet a requirement of the Settlement), 102.d (criminal liability), or 102.e (liability for violations of federal or state law), but only to the extent that Respondent's claims arise from the same response action, response costs, or damages that the United States is seeking pursuant to the applicable reservation.

108. Nothing in this Agreement shall be deemed to constitute approval or preauthorization of a claim within the meaning of Section 111 of CERCLA, 42 U.S.C. § 9611, or 40 C.F.R. § 300.700(d).

109. Respondent reserves, and this Settlement is without prejudice to, claims against the United States, subject to the provisions of Chapter 171 of Title 28 of the United States Code, and brought pursuant to any statute other than CERCLA or RCRA and for which the waiver of sovereign immunity is found in a statute other than CERCLA or RCRA, for money damages for injury or loss of property or personal injury or death caused by the negligent or wrongful act or omission of any employee of the United States, as that term is defined in 28 U.S.C. § 2671, while acting within the scope of his or her office or employment under circumstances where the United States, if a private person, would be liable to the claimant in accordance with the law of the place where the act or omission occurred. However, the foregoing shall not include any claim based on

EPA's selection of response actions, or the oversight or approval of Respondent's deliverables or activities.

XXV. OTHER CLAIMS

110. By issuance of this Settlement, the United States and EPA assume no liability for injuries or damages to persons or property resulting from any acts or omissions of Respondent. The United States or EPA shall not be deemed a party to any contract entered into by Respondent or its directors, officers, employees, agents, successors, representatives, assigns, contractors, or consultants in carrying out actions pursuant to this Settlement.

111. Except as expressly provided in Section XXII (Covenants by EPA), nothing in this Settlement constitutes a satisfaction of or release from any claim or cause of action against Respondent or any person not a party to this Settlement, for any liability such person may have under CERCLA, other statutes, or common law, including but not limited to any claims of the United States for costs, damages, and interest under Sections 106 and 107 of CERCLA, 42 U.S.C. §§ 9606 and 9607.

112. No action or decision by EPA pursuant to this Settlement shall give rise to any right to judicial review, except as set forth in Section 113(h) of CERCLA, 42 U.S.C. § 9613(h).

XXVI. EFFECT OF SETTLEMENT/CONTRIBUTION

113. Nothing in this Settlement shall be construed to create any rights in, or grant any cause of action to, any person not a Party to this Settlement. Except as provided in Section XXIV (Covenants by Respondent), each of the Parties expressly reserves any and all rights (including, but not limited to, pursuant to Section 113 of CERCLA, 42 U.S.C. § 9613), defenses, claims, demands, and causes of action which each Party may have with respect to any matter, transaction, or occurrence relating in any way to the Site against any person not a Party hereto. Nothing in this Settlement diminishes the right of the United States, pursuant to Section 113(f)(2) and (3) of CERCLA, 42 U.S.C. § 9613(f)(2)-(3), to pursue any such persons to obtain additional response costs or response action and to enter into settlements that give rise to contribution protection pursuant to Section 113(f)(2).

114. The Parties agree that this Settlement constitutes an administrative settlement pursuant to which each Respondent has, as of the Effective Date, resolved liability to the United States within the meaning of Sections 113(f)(2) and 122(h)(4) of CERCLA, 42 U.S.C. §§ 9613(f)(2) and 9622(h)(4), and is entitled, as of the Effective Date, to protection from contribution actions or claims as provided by Sections 113(f)(2) and 122(h)(4) of CERCLA, or as may be otherwise provided by law, for the "matters addressed" in this Settlement. The "matters addressed" in this Settlement are the Work and Future Response Costs.

115. The Parties further agree that this Settlement constitutes an administrative settlement pursuant to which Respondent has, as of the Effective Date, resolved liability to the United States within the meaning of Section 113(f)(3)(B) of CERCLA, 42 U.S.C. § 9613(f)(3)(B).

116. Respondent shall, with respect to any suit or claim brought by it for matters related to this Settlement, notify EPA in writing no later than 60 days prior to the initiation of such suit or claim. Respondent also shall, with respect to any suit or claim brought against it for matters related to this Settlement, notify EPA in writing within 10 days after service of the complaint or claim upon it. In addition, Respondent shall notify EPA within 10 days after service or receipt of any Motion for Summary Judgment and within 10 days after receipt of any order from a court setting a case for trial, for matters related to this Settlement.

117. In any subsequent administrative or judicial proceeding initiated by EPA, or by the United States on behalf of EPA, for injunctive relief, recovery of response costs, or other relief relating to the Site, Respondent shall not assert, and may not maintain, any defense or claim based upon the principles of waiver, res judicata, collateral estoppel, issue preclusion, claim-splitting, or other defenses based upon any contention that the claims raised in the subsequent proceeding were or should have been brought in the instant case; provided, however, that nothing in this Paragraph affects the enforceability of the covenant by EPA set forth in Section XXII (Covenants By EPA).

XXVII. INDEMNIFICATION

118. The United States does not assume any liability by entering into this Settlement or by virtue of any designation of Respondent as EPA's authorized representative under Section 104(e) of CERCLA, 42 U.S.C. § 9604(e), and 40 C.F.R. § 300.400(d)(3). Respondent shall indemnify, save, and hold harmless EPA, its officials, agents, employees, contractors, subcontractors, and representatives for or from any and all claims or causes of action arising from, or on account of, negligent or other wrongful acts or omissions of Respondent, its officers, directors, employees, agents, contractors, or subcontractors, and any persons acting on Respondent's behalf or under their control, in carrying out activities pursuant to this Settlement. Further, Respondent agrees to pay EPA all costs it incurs, including but not limited to attorneys' fees and other expenses of litigation and settlement arising from, or on account of, claims made against EPA based on negligent or other wrongful acts or omissions of Respondent, its officers, directors, employees, agents, contractors, subcontractors, and any persons acting on its behalf or under its control, in carrying out activities pursuant to this Settlement. The United States shall not be held out as a party to any contract entered into by or on behalf of Respondent in carrying out activities pursuant to this Settlement. Neither Respondent nor any such contractor shall be considered an agent of the United States.

119. EPA shall give Respondent notice of any claim for which EPA plans to seek indemnification pursuant to this Section and shall consult with Respondent prior to settling such claim.

120. Respondent covenants not to sue and agrees not to assert any claims or causes of action against EPA for damages or reimbursement or for set-off of any payments made or to be made to EPA, arising from or on account of any contract, agreement, or arrangement between Respondent and any person for performance of Work on or relating to the Site, including, but not limited to, claims on account of construction delays. In addition, Respondent shall indemnify and hold harmless EPA with respect to any and all claims for damages or reimbursement arising from or on account of any contract, agreement, or arrangement between Respondent and any

person for performance of Work on or relating to the Site, including, but not limited to, claims on account of construction delays.

XXVIII. INSURANCE

121. No later than 30 days before commencing any on-site Work, Respondent shall secure, and shall maintain until the first anniversary after issuance of Notice of Completion of Work pursuant to Section XXXI (Notice of Completion of Work), commercial general liability insurance with limits of liability of $1 million per occurrence, automobile liability insurance with limits of liability of $1 million per accident, and umbrella liability insurance with limits of liability of $5 million in excess of the required commercial general liability and automobile liability limits, naming EPA as an additional insured with respect to all liability arising out of the activities performed by or on behalf of Respondent pursuant to this Settlement. In addition, for the duration of the Settlement, Respondent shall provide EPA with certificates of such insurance and a copy of each insurance policy. Respondent shall resubmit such certificates and copies of policies each year on the anniversary of the Effective Date. In addition, for the duration of the Settlement, Respondent shall satisfy, or shall ensure that its contractors or subcontractors satisfy, all applicable laws and regulations regarding the provision of worker's compensation insurance for all persons performing Work on behalf of Respondent in furtherance of this Settlement. If Respondent demonstrates by evidence satisfactory to EPA that any contractor or subcontractor maintains insurance equivalent to that described above, or insurance covering some or all of the same risks but in a lesser amount, then, with respect to the contractor or subcontractor, Respondent need provide only that portion of the insurance described above that is not maintained by the contractor or subcontractor. Respondent shall ensure that all submittals to EPA under this Paragraph identify the Homestake Mining Company Superfund Site and the EPA docket number for this action.

XXIX. FINANCIAL ASSURANCE

122. In order to ensure completion of the Work, Respondent shall secure financial assurance, initially in the amount of $500,000 ("Estimated Cost of the Work"), for the benefit of EPA. The financial assurance must be one or more of the mechanisms listed below, in a form substantially identical to the relevant sample documents available from EPA or under the "Financial Assurance - Settlements" category on the Cleanup Enforcement Model Language and Sample Documents Database at https://cfpub.epa.gov/compliance/models/, and satisfactory to EPA. Respondent may use multiple mechanisms if they are limited to surety bonds guaranteeing payment, letters of credit, trust funds, and/or insurance policies.

a. A surety bond guaranteeing payment and/or performance of the Work that is issued by a surety company among those listed as acceptable sureties on federal bonds as set forth in Circular 570 of the U.S. Department of the Treasury;

b. An irrevocable letter of credit, payable to or at the direction of EPA, that is issued by an entity that has the authority to issue letters of credit and whose letter-of-credit operations are regulated and examined by a federal or state agency;

c. A trust fund established for the benefit of EPA that is administered by a trustee that has the authority to act as a trustee and whose trust operations are regulated and examined by a federal or state agency;

d. A policy of insurance that provides EPA with acceptable rights as a beneficiary thereof and that is issued by an insurance carrier that has the authority to issue insurance policies in the applicable jurisdiction(s) and whose insurance operations are regulated and examined by a federal or state agency;

e. A demonstration by Respondent that it meets the financial test criteria of Paragraph 124, accompanied by a standby funding commitment, which obligates the Respondent to pay funds to or at the direction of EPA, up to the amount financially assured through the use of this demonstration in the event of a Work Takeover; or

f. A guarantee to fund or perform the Work executed in favor of EPA by a company: (1) that is a direct or indirect parent company of Respondent or has a "substantial business relationship" (as defined in 40 C.F.R. § 264.141(h)) with Respondent; and (2) can demonstrate to EPA's satisfaction that it meets the financial test criteria of Paragraph 124.

123. Respondent shall secure all executed and/or otherwise finalized mechanisms or other documents consistent with the EPA-approved form of financial assurance and shall submit such mechanisms and documents to:

Lydia Johnson, Chief
Enforcement & Cost Recovery Section (SEDAE)
1201 Elm Street, Suite 500
Dallas, TX 75270

124. If Respondent seeks to provide financial assurance by means of a demonstration or guarantee under Paragraph 122.e or 122.f, it must, within 30 days of the Effective Date:

a. Demonstrate that:

(1) Respondent or guarantor has:

i. Two of the following three ratios: a ratio of total liabilities to net worth less than 2.0; a ratio of the sum of net income plus depreciation, depletion, and amortization to total liabilities greater than 0.1; and a ratio of current assets to current liabilities greater than 1.5; and

ii. Net working capital and tangible net worth each at least six times the sum of the Estimated Cost of the Work and the amounts, if any, of other federal, state, or tribal environmental obligations financially assured through the use of a financial test or guarantee; and

iii. Tangible net worth of at least $10 million; and

iv. Assets located in the United States amounting to at least 90 percent of total assets or at least six times the sum of the Estimated Cost of the Work and the amounts, if any, of other federal, state, or tribal environmental obligations financially assured through the use of a financial test or guarantee; or

(2) Respondent or guarantor has:

i. A current rating for its senior unsecured debt of AAA, AA, A, or BBB as issued by Standard and Poor's or Aaa, Aa, A or Baa as issued by Moody's; and

ii. Tangible net worth at least six times the sum of the Estimated Cost of the Work and the amounts, if any, of other federal, state, or tribal environmental obligations financially assured through the use of a financial test or guarantee; and

iii. Tangible net worth of at least $10 million; and

iv. Assets located in the United States amounting to at least 90 percent of total assets or at least six times the sum of the Estimated Cost of the Work and the amounts, if any, of other federal, state, or tribal environmental obligations financially assured through the use of a financial test or guarantee; and

b. Submit to EPA for Respondent or guarantor: (1) a copy of an independent certified public accountant's report of the entity's financial statements for the latest completed fiscal year, which must not express an adverse opinion or disclaimer of opinion; and (2) a letter from its chief financial officer and a report from an independent certified public accountant substantially identical to the sample letter and reports available from EPA or under the "Financial Assurance-Settlements" subject list category on the Cleanup Enforcement Model Language and Sample Documents Database at https://cfpub.epa.gov/compliance/models/.

125. If Respondent provides financial assurance by means of a demonstration or guarantee under Paragraph 122.e or 122.f, it must also:

a. Annually resubmit the documents described in Paragraph 124.b within 90 days after the close of Respondent's or guarantor's fiscal year;

b. Notify EPA within 30 days after Respondent or guarantor determines that it no longer satisfies the relevant financial test criteria and requirements set forth in this Section; and

c. Provide to EPA, within 30 days of EPA's request, reports of the financial condition of Respondent or guarantor in addition to those specified in Paragraph 124.b; EPA may make such a request at any time based on a belief that Respondent or guarantor may no longer meet the financial test requirements of this Section.

126. Respondent shall diligently monitor the adequacy of the financial assurance. If Respondent becomes aware of any information indicating that the financial assurance provided under this Section is inadequate or otherwise no longer satisfies the requirements of this Section, Respondent shall notify EPA of such information within 7 days. If EPA determines that the financial assurance provided under this Section is inadequate or otherwise no longer satisfies the requirements of this Section, EPA will notify Respondent of such determination. Respondent shall, within 30 days after notifying EPA or receiving notice from EPA under this Paragraph, secure and submit to EPA for approval a proposal for a revised or alternative financial assurance mechanism that satisfies the requirements of this Section. EPA may extend this deadline for such time as is reasonably necessary for Respondent, in the exercise of due diligence, to secure and submit to EPA a proposal for a revised or alternative financial assurance mechanism, not to exceed 60 days. Respondent shall follow the procedures of Paragraph 128 (Modification of Amount, Form, or Terms of Financial Assurance) in seeking approval of, and submitting documentation for, the revised or alternative financial assurance mechanism. Respondent's inability to secure financial assurance in accordance with this Section does not excuse performance of any other obligation under this Settlement.

127. **Access to Financial Assurance**

a. If EPA issues a notice of implementation of a Work Takeover under Paragraph 103.b., then, in accordance with any applicable financial assurance mechanism, and/or related standby funding commitment, EPA is entitled to: (1) the performance of the Work; and/or (2) require that any funds guaranteed be paid in accordance with Paragraph 127.d.

b. If EPA is notified by the issuer of a financial assurance mechanism that it intends to cancel the mechanism, and Respondent fails to provide an alternative financial assurance mechanism in accordance with this Section at least 30 days prior to the cancellation date, the funds guaranteed under such mechanism must be paid prior to cancellation in accordance with Paragraph 127.d.

c. If, upon issuance of a notice of implementation of a Work Takeover under Paragraph 103.b, either: (1) EPA is unable for any reason to promptly secure the resources guaranteed under any applicable financial assurance mechanism and/or related standby funding commitment, whether in cash or in kind, to continue and complete the Work; or (2) the financial assurance is a demonstration or guarantee under Paragraphs 122.e or 122.f, then EPA is entitled to demand an amount, as determined by EPA, sufficient to cover the cost of the remaining Work to be performed. Respondent shall, within 30 days of such demand, pay the amount demanded as directed by EPA.

d. Any amounts required to be paid under this Paragraph 127 shall be, as directed by EPA: (i) paid to EPA in order to facilitate the completion of the Work by EPA or by another person; or (ii) deposited into an interest-bearing account, established at a duly chartered

bank or trust company that is insured by the FDIC, in order to facilitate the completion of the Work by another person. If payment is made to EPA, EPA may deposit the payment into the EPA Hazardous Substance Superfund or into the Homestake Mining Company Site Special Account within the EPA Hazardous Substance Superfund to be retained and used to conduct or finance response actions at or in connection with the Site, or to be transferred by EPA to the EPA Hazardous Substance Superfund.

e. All EPA Work Takeover costs not paid under this Paragraph 127 must be reimbursed as Future Response Costs under Section XVII (Payment of Response Costs).

128. **Modification of Amount, Form, or Terms of Financial Assurance**. Respondent may submit, on any anniversary of the Effective Date or at any other time agreed to by the Parties, a request to reduce the amount, or change the form or terms, of the financial assurance mechanism. Any such request must be submitted to EPA in accordance with Paragraph 123, and must include an estimate of the cost of the remaining Work, an explanation of the bases for the cost calculation, and a description of the proposed changes, if any, to the form or terms of the financial assurance. EPA will notify Respondent of its decision to approve or disapprove a requested reduction or change pursuant to this Paragraph. Respondent may reduce the amount of the financial assurance mechanism only in accordance with: (a) EPA's approval; or (b) if there is a dispute, the agreement or written decision resolving such dispute under Section XIX (Dispute Resolution). Respondent may change the form or terms of the financial assurance mechanism only in accordance with EPA's approval. Any decision made by EPA on a request submitted under this Paragraph to change the form or terms of a financial assurance mechanism shall not be subject to challenge by Respondent pursuant to the dispute resolution provisions of this Settlement or in any other forum. Within 30 days after receipt of EPA's approval of, or the agreement or decision resolving a dispute relating to, the requested modifications pursuant to this Paragraph, Respondent shall submit to EPA documentation of the reduced, revised, or alternative financial assurance mechanism in accordance with Paragraph 123.

129. **Release, Cancellation, or Discontinuation of Financial Assurance**. Respondent may release, cancel, or discontinue any financial assurance provided under this Section only: (a) if EPA issues a Notice of Completion of Work under Section XXXI (Notice of Completion of Work); (b) in accordance with EPA's approval of such release, cancellation, or discontinuation; or (c) if there is a dispute regarding the release, cancellation or discontinuance of any financial assurance, in accordance with the agreement or final decision resolving such dispute under Section XIX (Dispute Resolution).

XXX. MODIFICATION

130. EPA's Project Coordinator may modify any plan or schedule or the SOW, but only consistent with Section III (Statement of Purpose) and Paragraph 41 of this Settlement, in writing or by oral direction. Any oral modification will be memorialized in writing by EPA promptly, but shall have as its effective date the date of EPA's Project Coordinator's oral direction. Any other requirements of this Settlement may be modified in writing by mutual agreement of the parties.

131. If Respondent seeks permission to deviate from any approved work plan or schedule or the SOW, Respondent's Project Coordinator shall submit a written request to EPA for approval outlining the proposed modification and its basis. Respondent may not proceed with the requested deviation until receiving oral or written approval from EPA's Project Coordinator pursuant to Paragraph 130.

132. No informal advice, guidance, suggestion, or comment by EPA's Project Coordinator or other EPA representatives regarding any deliverable submitted by Respondent shall relieve Respondent of its obligation to obtain any formal approval required by this Settlement, or to comply with all requirements of this Settlement, unless it is formally modified.

XXXI. NOTICE OF COMPLETION OF WORK

133. When EPA determines that all Work has been fully performed in accordance with this Settlement, with the exception of any continuing obligations required by this Settlement, including Record Retention, EPA will provide written notice to Respondent. If EPA determines that any Work has not been completed in accordance with this Settlement, EPA will notify Respondent, provide a list of the deficiencies, and require that Respondent modify the SOW, if appropriate, in order to correct such deficiencies. Respondent shall implement the modified and approved SOW and shall submit a modified draft FS Report in accordance with the EPA notice. Failure by Respondent to implement the approved modified SOW shall be a violation of this Settlement.

XXXII. INTEGRATION/APPENDICES

134. This Settlement and its appendices constitute the final, complete, and exclusive agreement and understanding among the Parties with respect to the settlement embodied in this Settlement. The parties acknowledge that there are no representations, agreements, or understandings relating to the settlement other than those expressly contained in this Settlement. The following appendices are attached to and incorporated into this Settlement:

a. "Appendix A" is the SOW

b. "Appendix B" is the map of the Site.

c. "Appendix C" is the RI Report.

d. "Appendix D" is the Confidentiality Agreement.

XXXIII. ADMINISTRATIVE RECORD

135. EPA will determine the contents of the administrative record file for selection of the remedial action. Respondent shall submit to EPA documents developed during the course of the FS upon which selection of the remedial action may be based. Upon request of EPA, Respondent shall provide copies of plans, task memoranda for further action, quality assurance memoranda and audits, raw data, field notes, laboratory analytical reports, and other reports. Upon request of EPA, Respondent shall additionally submit any previous studies conducted under state, local, or other federal authorities that may relate to selection of the remedial action,

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and all communications between Respondent and state, local, or other federal authorities concerning selection of the remedial action.

XXXIV. EFFECTIVE DATE

136. This Settlement shall be effective 5 days after the Settlement is signed by the Director, Superfund and Emergency Management Division, EPA Region 6.

IT IS SO AGREED AND ORDERED:

U.S. ENVIRONMENTAL PROTECTION AGENCY:

WREN STENGER Digitally signed by WREN STENGER
DN: c=US, o=U.S. Government, ou=Environmental Protection Agency, cn=WREN STENGER, 0.9.2342.19200300.100.1.1=68001003651787
Date: 2020.08.12 08:57:16 -05'00'

_____
Dated

_____
Wren Stenger, Director
Superfund and Emergency Management Division
U.S. Environmental Protection Agency, Region 6

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Signature Page for Settlement Regarding Homestake Mining Company Superfund Site

FOR HOMESTAKE MINING COMPANY OF CALIFORNIA:

Aug 4, 2020
Dated

Patrick Malone
President
Homestake Mining Company of California
2270 Corporate Circle, Suite 100
Henderson, NV 89074