MEMORANDUM

TO: Emma Rott, Remedial Project Manager, EPA
Erin Agee, Senior Assistant Regional Counsel, EPA
Will Lindsey, Assistant Regional Counsel, EPA

FROM: State of Montana Natural Resource Damage Program (NRDP)

DATE: May 30, 2024

SUBJECT: Comments on BPSOU "*100% Grove Gulch Final Submittal*" Received from Atlantic Richfield Company (BP-AR) on 3/22/2024

The Montana Natural Resource Damage Program (NRDP) acts on behalf of the Governor as natural resource trustee to coordinate restoration with remedy, and also in our role as a State signatory to the Butte Priority Soils Operable Unit Consent Decree (BPSOU CD), to evaluate whether the work to be implemented complies with the BPSOU CD and does not leave remedy work to be performed using restoration funds.

In support of these roles, NRDP provides the following comments on BP-AR's *100% Grove Gulch Final Submittal* ("100% GG Design") resubmittal from March 22, 2024. To understand 100% GG Design document critical information is also included in the following documents:

1. Materials Management Plan (provided on 3/22/24)
2. GG Construction Monitoring Quality Assurance Protection Plan (QAPP, provided on 3/22/24)
3. Waste Management and Backfill Materials Characterization and Reuse (not provided)

EPA Coordination:
NRDP submitted comments on the *Grove Gulch 95% Remedial Design* (September 25, 2023) on October 11, 2023 (Attachment A).

As you know, following the November 21, 2024, Grove Gulch meeting, EPA, NRDP, and DEQ met on December 21, 2023, to discuss NRDP's Grove Gulch comments. Attached are the meeting notes that were taken and shared during the meeting (Attachment B). NRDP believes the primary comments that were unresolved following that meeting remain unresolved.
We recognize that you may have discussed some of these issues at the meeting on Grove Gulch the week of May 6, 2024, with the other CD Parties (EPA, BP-AR, BSB, and DEQ). Since NRDP was not included in this meeting and you did not consider the draft comments we sent to you on May 29, 2024, your written response to our comments is requested.

100% GG Design Comment Incorporation:
It is difficult to tell what comments from CTEC (July 2023), NRDP (October 2023), or EPA (November 2023) have been incorporated in EPA's comments or addressed in this recent 100% GG Design. BP-AR was not asked to provide a redline in the 100% design, so all the documents had to be re-reviewed from scratch, taking an excessive amount of time and resources. NRDP requests that EPA require BP-AR to provide redline changes in the future.

NRDP has identified seven (7) specific issues of critical importance, below, but generally believe our comments have not been addressed.

(1) <u>BPSOU CD requirements for GG</u> – NRDP's October 11, 2023, General Comment 2 was not incorporated or responded to. BP-AR continues to state that they don't need to remove all non-basin, floodplain Waste (CD Table 1) as required in the BPSOU CD. The BPSOU CD Section 4.1.2 of Attachment C requires all Table 1 Waste: (a) outside the basins, (b) within the project area (presently undefined), and (c) within the floodplain must be removed. This Waste removal requirement is not limited by any predictive concentration modeling efforts, groundwater elevation, or vertical depth.

In the December 21, 2023, meeting between NRDP, DEQ, and EPA, NRDP agreed that the disturbed area for the project may be a reasonable horizonal extent for this "project area"/Waste excavation requirement but it could also be interpreted that the horizonal extent was delimited by the 2020 BPSOU Record of Decision Amendment boundary that EPA developed when they added Grove Gulch. However, the BPSOU CD does not contain a vertical limit to excavation for all Waste outside of the basin and within the floodplain.

The CD requires identifying and removing all Waste above the 3-year high groundwater and below the sedimentation bay, vegetated swale, or bypass channel (depicted on Figure GG-1 of the BPSOU CD). BP-AR must remove all waste <u>outside</u> of the sedimentation bay, vegetated swale, or bypass, but within the floodplain project area. The 3-year high groundwater elevation does not apply to Wastes outside the sedimentation bay, vegetated swale, or bypass channel.

BPSOU CD, Section 4.1.2 of Attachment C provides,

> "*Tailings, waste, and contaminated soils encountered outside of the sedimentation bay within the floodplain will be removed and disposed of as described in the paragraph below."*

The "paragraph below" states:

> "*Unless suitable for use as backfill (under Appendix 1, Table 2), removed tailings waste and contaminated soils shall be segregated and disposed of at a repository approved by EPA in consultation with DEQ, which is not located in the SBC-Above the Confluence or Blacktail Creek areas. Inert solid waste and construction debris may remain on-site for use as backfill that meets Table 2 of Appendix 1 criteria. All*

other municipal wastes, if encountered at the Grove Gulch area, shall be segregated and disposed of at an appropriate permitted facility by the SDs."

The documents state that the entirety of Grove Gulch is in the floodplain.

BP-AR is only proposing to remove approximately 18 inches of Waste/materials below ground surface (BGS) in areas outside the basin that they identified with their Earth Volumetric Studio (EVS) model to "*facilitate construction of the remedial elements and promote construction efficiencies,"* and not as an explicitly stated requirement of the BPSOU CD (GG FRESOW Requirements Checklist 100% GG Design Cover Letter, pg. 2). Leaving Table 1 Waste, and "buried Waste," in the GG 100-year floodplain is not in compliance with BPSOU CD.

(2) <u>The design does not adequately sample/analyze all construction materials that have CD numeric standards</u> – NRDP's previous General Comment 5 was not addressed in the revised documents. EPA had a similar comment:

> 2. **<u>Agency Comment: Section 4.1.1, pg. 4-1 et seq.:</u>** A goal is needed to document as-built soil metals concentrations at the bottom of excavation at the site. This will include a Step 2 goal, Step 3 data collection, Step 5 parameters, Step 7 plan for as-built sampling.
>
> *AR Response: As-built metals concentrations at the bottom of excavation at the site will not be sampled by Atlantic Richfield. This is not a requirement of the Consent Decree, has no impact on the performance of the remedy, and will not bring any additional benefit to the stated goals of the Grove Gulch Remedial Action in the FRESOW. Please refer to the Pre-Design Investigation Evaluation Report (PDIER) for data that summarizes sub-excavation metals concentrations.*

NRDP believes the goal for all materials sampling should be to document CD compliance with numeric requirements and not for "as-built" considerations. Sampling and analysis are necessary to demonstrate compliance with Table 1 - Waste identification, Table 2 – Backfill Suitability Criteria, and Table 3 – Engineered Caps/Cover Systems Material Suitability Criteria (Attachment C).

EPA and other CD parties have a right to sample for Wastes (Table 1) and the fill and capping materials (Table 2 and 3) used in the GG construction and other BPSOU CD sites to ensure that the Settling Defendant, BP-AR, is building what the CD Parties agreed to in the CD.

If EPA does not require BP-AR to sample and analyze to determine what wastes need to be removed, NRDP requests that EPA utilize its authority under the BPSOU CD (Par. 50) to conduct oversight sampling/analysis to determine compliance with the CD requirements.

(3) <u>Use of the EVS Model as the sole determination of all site contaminant conditions</u> – The design does not address NRDP's General Comment #5. NRDP remains very concerned with use of this model at Grove Gulch, as well as future projects, as BP-AR states. This model should not be used as the only method to characterize Table 1 Waste for removal because it is inaccurate and

has as low as 26% confidence interval for mercury, one of the six CD contaminants that are required for determining Waste. See previous NRDP comments for specifics.

BP-AR states that the agencies (EPA and DEQ) "*approved*" their EVS model in the PDIER and then imply that will be the sole source of determining what is "Waste" and that it complies with Table 1 and Attachment C. NRDP has found no documented approval of this model as the only tool for determining compliance with CD numeric criteria.

It appears that EPA still has well-founded reservations with the use of the EVS model as the only tool for determining where Waste is actually located.

> "*EPA does not agree with the waste volumes defined by the EVS model described in Attachment F (Grove Gulch Earth Volumetric Studio Model Inputs Technical Memorandum) of Appendix A (Predesign Investigation Report) of the Final Remedial Design Report (dated March 2024). However, EPA agrees that, as stated in Attachment F of Appendix A of the Final Remedial Design Report, "any excavated material within the Grove Gulch stormwater basin that is not defined as waste by the EVS model described in this technical memorandum will also be removed from the project and taken to an approved repository". Therefore, material defined as waste by the EVS model and excavated material not defined as waste by the EVS model will be moved to a repository. That is, all excavated material will be removed to a repository*." (page 5 of EPAs May 29, 2024, GG comments to BP-AR)

Unfortunately, the EVS model is the only tool EPA is approving BP-AR to use to <u>identify</u> Waste excavation depths outside of the basin, within the floodplain. See previous NRDP Comment. BP-AR is only proposing to remove approximately 18 inches of Waste/materials below ground surface (BGS) in areas outside the basin that they identified with their EVS model. If this position remains in the final 100% design documents, NRDP does not believe this position is in compliance with EPA's comment letter or the intent of the BPSOU CD.

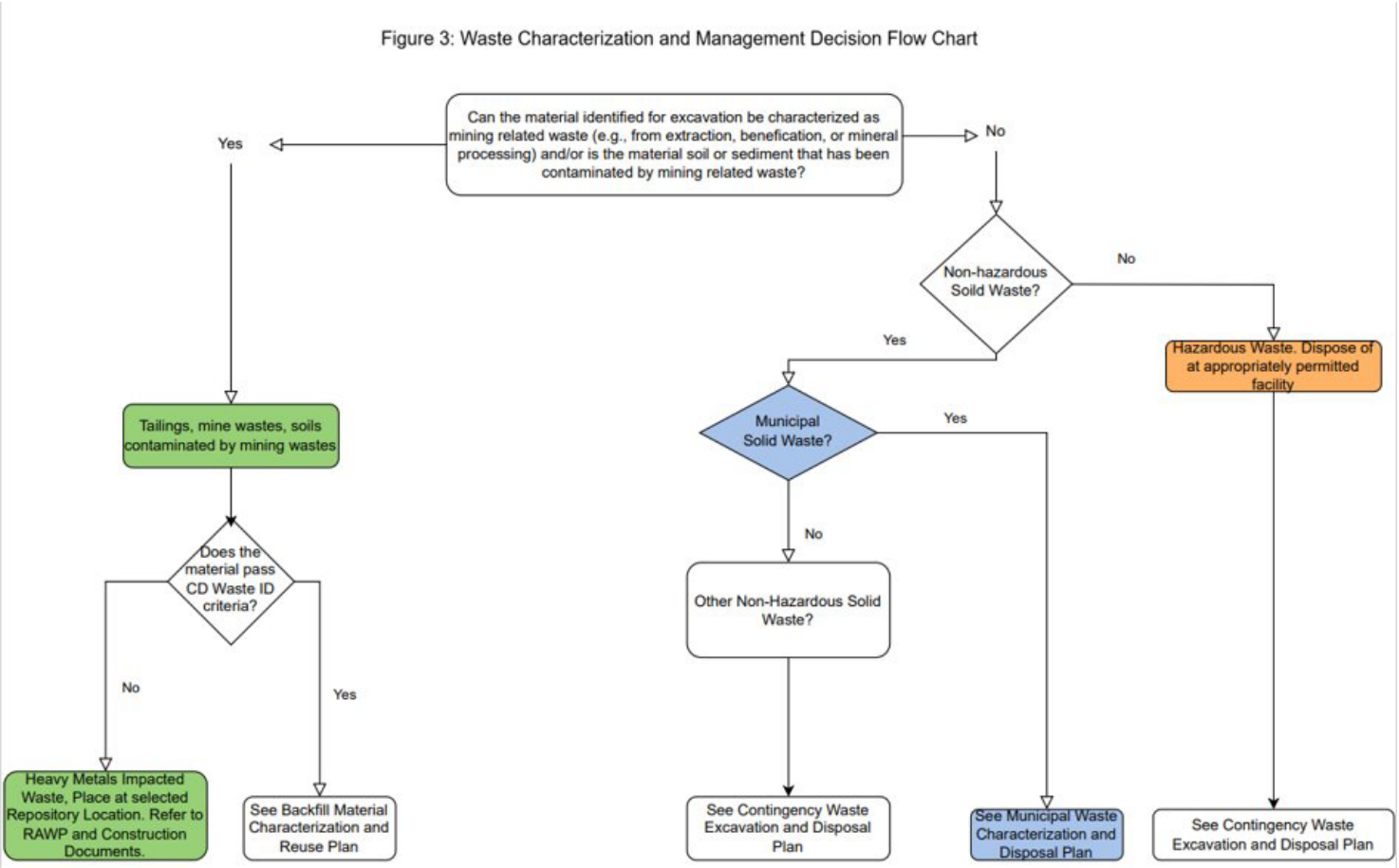
Leaving waste adjacent to surface water and groundwater can lead to upward leaching of contaminants, which can pose a risk. Floodplain waste can also become re-entrained in the surface water system, which can result in waste being transported downstream.

As noted previously, EPA has the authority to ensure CD compliance by performing sampling/analysis of the areas excavated and of all the construction materials detailed in BPSOU CD Tables 1-3 and NRDP is requesting that EPA utilize those authorities to document CD compliance.

An example of inappropriate reliance on the model to identify Waste is in Figure 3: Waste Characterization and Management Decision Flow Chart (below). Its first decision box states:

"Can the material be identified for excavation be characterized as mine related waste (e.g. from extraction, beneficiation, or mineral processing) and/or is the material soil or sediment that has been contaminated by mining related waste?"

The CD requires is that any materials that exceeds the Table 1 contaminant concentrations as described in the Table is Waste.



EPA and NRDP commented on the logic of this diagram and that the first box was determined entirely by BP-AR's EVS model and not sampling (the actual site conditions), which is the CD requirement.

"*This flow chart is inclusive of material that will be potentially encountered and is a template for following SBCCA sites and therefore will not be changed. Indication of tests to this flow chart at each decision point will be included as a footnote that references the appropriate sections of the MMP. Decisions for characterization and lab analysis are included in Sections 2.1, 2.2, and 2.3 of the MMP and Attachment A of the MMP*." (BP-ARs 100% GG Design Cover letter response 26)

See NRDP's previous comments. Waste should be determined by sampling/analysis and not by the model, which has numerous problems.

(4) Final Materials Management Plan (100% Design, March 2024) – The materials management plan (MPP) and its appendices are still confusing and could be consolidated such that they apply only to Grove Gulch.

The MMP lacks detail in important areas, such as compliance and confirmation sampling, segregation of materials, and stockpile locations/management. However, the material that is removed still needs to be properly characterized and sorted to ensure that materials are disposed of properly. Furthermore, all backfill also needs to be adequately characterized prior to use. The source of the backfill is irrelevant to meeting the Table 2 requirements. Backfill that currently does not meet Attachment C Table 2 criteria for contaminants should be sampled at a higher frequency than 1 sample per 500 CY (one 5-point composite sample per ~42 trucks). Please provide additional details.

This could all be simplified. The MMP includes a section on excavation and disposal analysis, but this is a better fit in the Waste Management Plan, which lacks pertinent details. The Waste Management Plan includes a Municipal Waste Characterization and Management Plan and Contingency Waste Characterization and Management Plan. NRDP recommends merging these into one document.

(5) New proposal for the bypass channel – In the 100% GG Design, BP-AR is now proposing to remove 18 inches BGS of Waste/materials in the bypass channel and replace it with Table 3 Criteria C fill material and D capping materials. (GG FRESOW Requirements Checklist 100% GG Cover Letter, pg. 2). The rationale for leaving any Waste in place was a "scour depth" calculation, which is not an Attachment C criterion for compliance with Tables 1-3. Leaving and capping of Waste in floodplains is inherently risky for water quality, vegetation, sediment quality for numerous reasons. NRDP strongly advises against leaving Waste in a channel but recognizes it could be considered allowed in the CD language.

(6) Proposed modification of Table 2 Fill requirements – Table 2 does not allow the use of General Fill (CD Table 2, Criteria B) outside of the basins et al. in floodplains. It appears that BP-AR is proposing to use General Fill outside of the GG basin in the floodplain but use the containment concentrations that are from Criteria A in Table 2, "*Riparian, Wetland and Sub-irrigated Growth Media*". If this is incorrect, please clarify.

(7) Unclear fill (Table 2) and capping (Table 3) materials confirmation sampling – It's very difficult to tell what Backfill Suitability Criteria (CD Table 2) and Engineered Caps/Cover Systems Material Suitability Criteria (CD Table 3) testing there would be. It looks like the requirements are in a number of different documents or it's required of the construction contractors. Please clarify the sampling required for both backfill and engineered caps/cover.

Attachments:

A – NRDPs October 11, 2023, Comment Letter on the 95% Design

B – NRDPs Contemporaneous Notes from the NRDP-DEQ-EPA December 21, 2023, GG Coordination Meeting

C – BPSOU CD Attachment C Tables of Numeric Criteria

Attachment A
NRDP 10-11-23 GG Comments

STATE OF MONTANA, NATURAL RESOURCE DAMAGE PROGRAM

MEMORANDUM

TO: Ms. Erin Agee, Senior Assistant Regional Counsel, EPA
Mr. Nikia Greene, Remedial Project Manager, EPA

FROM: NRDP

DATE: October 11, 2023

SUBJECT: Comments on BPSOU Grove Gulch Submittals Received from British Petroleum – Atlantic Richfield (BP-AR) on 9/25/2023

The Montana Natural Resource Damage Program (NRDP) acts on behalf of the Governor as natural resource trustee to coordinate restoration with remedy, and also in our role as a State signatory to the Butte Priority Soils Operable Unit Consent Decree (BPSOU CD), to evaluate whether the work to be implemented complies with the BPSOU CD. In support of these roles, NRDP provides the following comments on BP-Atlantic Richfield's (BP-AR's) *Grove Gulch 95% Remedial Design* resubmittal from September 25, 2023.

Our evaluation, detailed in the comments, identified inconsistencies with two places in the BPSOU CD: Section 4.1.2 and footnotes showing the locations for Table 3 Engineered Cap/Cover Systems Material Suitability Criteria (Appendix D, Attachment C, the FRESOW). Additional comments are provided on the sampling and analysis and the use of the EVS model to delineate the Waste at the Grove Gulch site.

It is important to note, NRDP was not invited to the Grove Gulch technical meetings; thus, these comments are likely late in the design development process. However, NRDP believes these comments are important to ensure consistency with the BPSOU CD and to state for the record our concerns with the use of design methods and other details that should not be used at this and the other downstream sites within BPSOU.

As we have previously requested, please include us on all future comments and meetings.

Natural Resource Damage Program
State of Montana
P.O. Box 201425
1720 9th Avenue
Helena, MT 59620-1425
Phone: 406-444-0205
Fax: 406-444-0236
nrdp@mt.gov

Attachment A
NRDP 10-11-23 GG Comments

NRDP Comments Grove Gulch Documents received on 9/25/2023
October 11, 2023

3. The supplied documents do not contain sufficient characterization of site Waste, nor do they include a plan to characterize, identify, and remove all Waste within the floodplain, as required by the BPSOU CD (see General Comment 2).

The site investigation, Grove Gulch PDIER and the resulting Figure 2 (Attachment A), is an incomplete and inaccurate approximation of the nature and extent of GG Wastes per Table 1 of the BPSOU CD. According to the Materials Management Plan, Section 1.3 – Project Description, page 8, "Figure 2 shows the extent of waste identified on site." However, Figure 2 only shows small patches of "waste" within the bigger CD-required area for Grove Gulch. The forms on Figure 2 look like an artifact of sample distribution rather than the nature and extent of fluvially-transported and distributed Waste. General Comment 5 further describes how NRDP believes the EVS model is insufficient as the sole method of waste delineation. Complete delineation of Waste nature and extent requires additional field qualifying methods as well as confirmation sampling. Please identify where in the submittal is the document that describes how Waste will be characterized on the project area.

NRDP believes BP-AR should develop a sampling and analysis program to better identify Waste during construction and to confirm that all Waste is being removed as required by the BPSOU CD and all other numeric and location-specific requirements as defined in the BPSOU CD Attachment C are met.

4. It is unclear how the 3-year high groundwater level was determined. The EVS model memo indicates that one year of data (August 2020 to August 2021) was used as an input to the EVS model, which then interpolated the 3-year high groundwater level across the project site (Section 1.0, page 2). However, the memo later states that the 3-year high groundwater elevation was an input to the EVS model (Section 4.0, pages 8 and 9). It's unclear from these descriptions whether the 3-year high groundwater level was an input to EVS or an output from EVS.

5. The EVS model used to delineate Waste at Grove Gulch is based on limited data and includes a very high degree of uncertainty, making it inappropriate for use as the sole method of delineating Waste. Additional detail is needed in the material characterization plans that will allow for more accurate delineation of Wastes for this and future projects. Concerns with the EVS model being used for this purpose include:

a. Mercury XRF results are unusable and mercury lab results from 2018 were rejected due to data quality concerns. Are the usable mercury results sufficient to characterize this contaminant at the site? Can waste be accurately delineated if one of the six contaminants was not adequately characterized? (Grove Gulch Soils Characterization Data Summary Report, Section 5.1, page 8)

Attachment A
NRDP 10-11-23 GG Comments

NRDP Comments Grove Gulch Documents received on 9/25/2023
October 11, 2023

General Comments:

1. NRDP is concerned these documents do not articulate all of the BPSOU CD, Appendix D, Attachment C requirements (i.e., the requirement to remove all of the Waste in the floodplain outside of the sedimentation bay, see comments below.) We believe our previous request to develop a publicly available tracking system would be best to ensure all BPSOU CD requirements are met, such as a master table for BPSOU outlining the requirements and a notation as to specific sections of CD deliverables that meet each requirement. Specific to Grove Gulch, there are at least five different documents that include some portion of BPSOU CD compliance with these requirements. One document could include all the relevant information that demonstrates compliance with the numeric (Tables 1-3) and location-specific requirements of the BPSOU CD, Attachment C. EPA has previously stated that these requirements would be included in the Materials Management Plan, which we agree would be the appropriate document to capture CD compliance.

2. The design package does not adequately characterize Waste for removal outside the sedimentation bay but within the floodplain, as required by the BPSOU CD. Section 4.1.2 of Attachment C provides,

   "Tailings, waste, and contaminated soils encountered outside of the sedimentation bay within the floodplain will be removed and disposed of as described in the paragraph below."

   The "paragraph below" states:

   "Unless suitable for use as backfill (under Appendix 1, Table 2), removed tailings waste and contaminated soils shall be segregated and disposed of at a repository approved by EPA in consultation with DEQ, which is not located in the SBC-Above the Confluence or Blacktail Creek areas. Inert solid waste and construction debris may remain on-site for use as backfill that meets Table 2 of Appendix 1 criteria. All other municipal wastes, if encountered at the Grove Gulch area, shall be segregated and disposed of at an appropriate permitted facility by the SDs."

   In addition to identifying all Waste that are required to be excavated from below the sedimentation bay, vegetated swale, or bypass Channel on Figure GG-1 of the BPSOU CD, BP-AR must identify the areas outside of the sedimentation bay, vegetated swale, or bypass, but within the floodplain that contain Waste to be removed. The documents state that the entirety of Grove Gulch is in the floodplain, which indicates that all Waste within Grove Gulch needs to be characterized and removed per the BPSOU CD. The BPSOU CD text quoted above is not included in the Design Report Section 4.1, which lists the FRESOW requirements. The text of Section 2.2.1.2 of the RAWP references two areas for excavation outside of the sedimentation bay footprint, but Figure 2 does not clearly identify these areas (see Attachment A). Also, the sampling and characterization is not sufficient to determine that the remainder of the floodplain does not include Waste above the Table 1 criteria. See additional comments.

Attachment A
NRDP 10-11-23 GG Comments

b. The EVS model memo provides figures showing the model confidence for each contaminant throughout the site and states that this represents the percent confidence that the true result falls within one order of magnitude of the interpolated result. Confidence ranges from 82 to 100% for most contaminants, though mercury is much lower (as low as 26% confidence). Even the highest confidence level can only indicate that modeled concentrations are within an order of magnitude of the true concentration. With this level of uncertainty in concentrations, the model is not sufficient to be the sole indicator of waste on site. (Grove Gulch Earth Volumetric Studio Model Inputs, Section 2.5, page 6)

c. Waste characterization depends on concentrations of all six contaminants: arsenic, cadmium, copper, lead, mercury, and zinc. Uncertainty is compounded when waste designation depends on concentrations of multiple contaminants, each of which has an order of magnitude uncertainty even at the highest level of confidence.

d. The PDIER states that the EVS model indicates waste at PZ-GG-02, 18-24" bgs, though no waste was identified within this interval at the borehole. BP-AR uses this as evidence that the model is conservative in defining the waste extents. It seems more to indicate that the model is unreliable – predictions by the model are shown to be inaccurate. It is unclear, then, how well the model predicts the presence or absence of waste in locations where samples were not taken. (PDIER, Section 4.2, page 16)

6. NRDP notes that there are EPA comments responded to in the crosswalk, e.g., dated May 16, 2022, which NRDP does not have record of receiving. Could EPA please check its distribution list for those comments and let us know if we received them (and presumably there was an error with the State email system)?

7. Page 3-1, Section 3.2 and the defined terms of the RDWP uses the term "Metro Storm Drain." Please replace this term with "Silver Bow Creek" in this location and elsewhere in the documents for this site and other FRESOW documents.

Specific Comments on the Materials Management Plan:

1. **Section 1.3.1 – Contaminants of Concern Sources (pg. 8)**

   "The contaminants of concern (COCs) identified in the BPSOU Record of Decision (EPA, 2006) (ROD) include aluminum, arsenic, cadmium, copper, iron, lead, mercury, silver, and zinc for surface water; arsenic, cadmium, copper, lead, mercury, and zinc for groundwater; and arsenic, lead, and mercury for solid media."

   Contaminants of concern and their applicability to the project areas are defined in the BPSOU CD Attachment C. Arsenic, cadmium, copper, lead, mercury and zinc are the

Attachment A
NRDP 10-11-23 GG Comments

NRDP Comments Grove Gulch Documents received on 9/25/2023
October 11, 2023

As stated above, NRDP does not agree that onsite soils removal obviates the need for confirmation sampling. To meet CD requirements, sampling must be performed to identify Table 1-Waste and ensure that all Waste has all been excavated or capped (depending on the location of the Waste; see comments above.) Limited pre-design investigation modeling and visual identification are inaccurate methods.

Specific Comments on the Construction Monitoring Quality Assurance Project Plan (QAPP):

1. **Section 4.3.1 – Sampling of Imported or Borrow Soil Materials**
   This section references "imported or borrow soil materials." What is the distinction between "borrow" and "imported" materials? For BPSOU CD Table 2-Fill and Table 3-Capping, the BPSOU CD does not use "borrow" and it is unclear what is meant. These terms may suggest that the sampling process applies to imported or onsite reused material. Other documents for this project indicate that no onsite material will be reused at Grove Gulch. "Borrow material" should be defined, or references to it should be removed if it refers to backfill generated onsite and will not be used in project construction.

2. **Section 4.3.1 – Sampling of Imported or Borrow Soil Materials**
   This section states that "*soils … from sources that have been sampled and certified as acceptable materials during the BPSOU FRESOW construction may be used without any additional testing or certification, however the Construction Contractor shall verify and provide as a submittal prior to importing the material.*" It goes on to state that "*Ongoing sampling of import and borrow soil will be completed by the Construction Contractor at a frequency of one sample for every 500 CY of material used on site.*" These statements seem contradictory. Perhaps the first statement is meant to say that "initial testing or certification" is not needed if the material has been previously certified? Ongoing sampling and analysis of imported material should be required to make sure that all soil meets the BPSOU CD Table 2-Fill requirements.

3. **Section 4.3.1 – Sampling of Imported or Borrow Soil Materials**
   NRDP does not believe the sampling proposed in this section is sufficient to ensure that the backfill material is uncontaminated. It is unclear who would "certify[y] as acceptable" the "borrow" materials from other FRESOW locations and how it would be demonstrated that these other materials meet all Table 2 backfill requirements. Further, the one sample per 500 cubic yards is not sufficient to characterize the backfill and is less protective than DEQ's approach to adequately characterizing backfill. *See* 2023 06 05_Clean Fill FAQ.pdf (mt.gov)

4. **Table 3 Engineered Cap/Cover Systems Material Suitability Criteria (from FRESOW Table 3) (pg. 79)**

   This Table has been modified from the BPSOU CD, Attachment C and as such is not representative of the location-specific requirements of the BPSOU CD. Specifically, the

Attachment A
NRDP 10-11-23 GG Comments

table changed the footnotes (Footnotes 5 and 6 in the BPSOU CD, Footnotes 1 and 2 in the QAPP) that reference the BPSOU CD figures that show where these caps are to be placed. Please correct or remove.

cc:

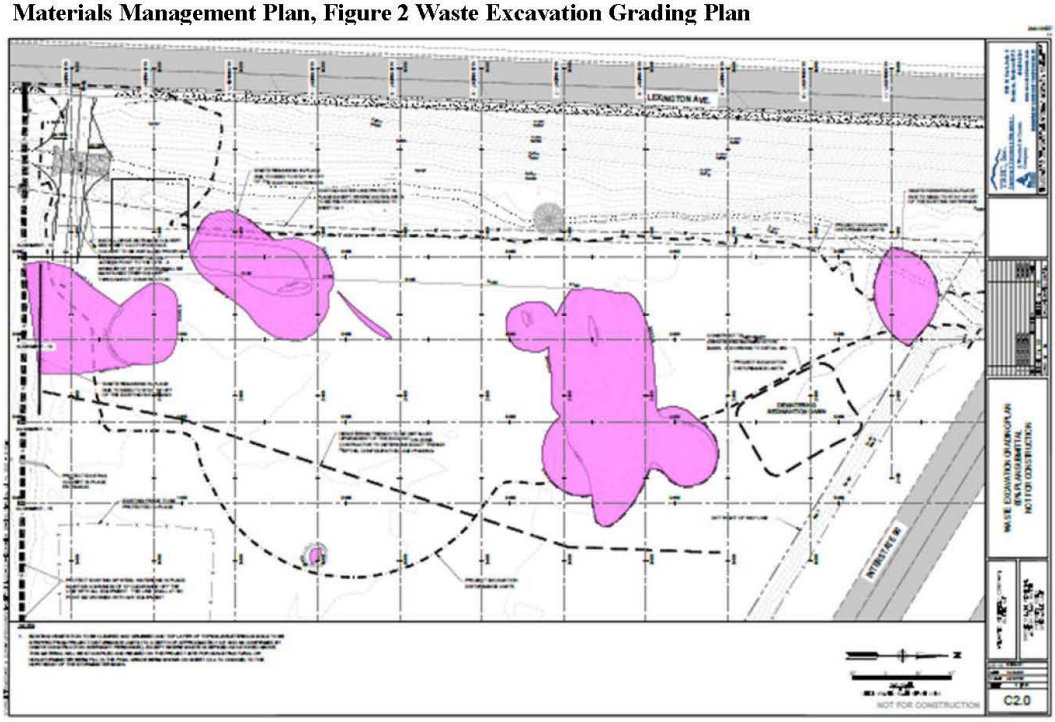
Pat Cunneen; NRDP
Sydney Stewart, NRDP
Jim Ford; NRDP
Katherine Hausrath; NRDP counsel
Ben Bielenberg, EPA
Aaron Urdiales, EPA
Dana Barnicoat; EPA
Jon Morgan; DEQ counsel
Katie Garcin-Forba, DEQ
Daryl Reed; DEQ
JP Gallagher, BSB
Jim Kambich, BSB
Eric Hassler; BSB
Josh Bryson; BP-AR
Jean Martin; BP-AR counsel
Mave Gasaway; BP-AR counsel
Elizabeth Erickson, BNRC

Attachment A
NRDP 10-11-23 GG Comments

NRDP Comments Grove Gulch Documents received on 9/25/2023
October 11, 2023

Attachment A

Materials Management Plan, Figure 2 Waste Excavation Grading Plan

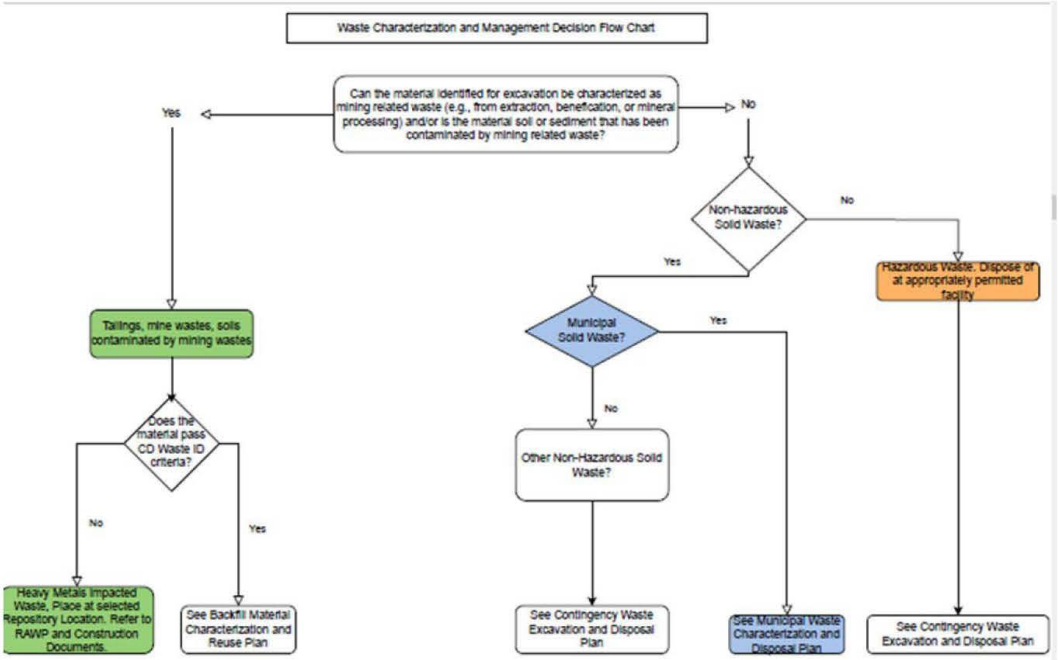


Attachment A
NRDP 10-11-23 GG Comments

NRDP Comments Grove Gulch Documents received on 9/25/2023
October 11, 2023

Attachment B

Figure 3: Waste Characterization and Management Decision Flow Chart



Attachment B
NRDP 10-11-23 GG Comments with notes from NRDP-EPA-DEQ 12-21-23 coordination meeting

STATE OF MONTANA, NATURAL RESOURCE DAMAGE PROGRAM

MEMORANDUM

TO: Ms. Erin Agee, Senior Assistant Regional Counsel, EPA Mr. Nikia Greene, Remedial Project Manager, EPA

FROM: NRDP

DATE: October 11, 2023 (Notes from the 12-21-23 NRDP – EPA coordination meeting)

SUBJECT: Comments on BPSOU Grove Gulch Submittals Received from British Petroleum – Atlantic Richfield (BP-AR) on 9/25/2023

The Montana Natural Resource Damage Program (NRDP) acts on behalf of the Governor as natural resource trustee to coordinate restoration with remedy, and also in our role as a State signatory to the Butte Priority Soils Operable Unit Consent Decree (BPSOU CD), to evaluate whether the work to be implemented complies with the BPSOU CD. In support of these roles, NRDP provides the following comments on BP-Atlantic Richfield's (BP-AR's) *Grove Gulch 95% Remedial Design* resubmittal from September 25, 2023.

Our evaluation, detailed in the comments, identified inconsistencies with two places in the BPSOU CD: Section 4.1.2 and footnotes showing the locations for Table 3 Engineered Cap/Cover Systems Material Suitability Criteria (Appendix D, Attachment C, the FRESOW). Additional comments are provided on the sampling and analysis and the use of the EVS model to delineate the Waste at the Grove Gulch site.

It is important to note, NRDP was not invited to the Grove Gulch technical meetings; thus, these comments are likely late in the design development process. However, NRDP believes these comments are important to ensure consistency with the BPSOU CD and to state for the record our concerns with the use of design methods and other details that should not be used at this and the other downstream sites within BPSOU.

Attachment B
NRDP 10-11-23 GG Comments with notes from NRDP-EPA-DEQ 12-21-23 coordination meeting

As we have previously requested, please include us on all future comments and meetings.

Natural Resource Damage Program
State of Montana
P.O. Box 201425
1720 9th Avenue
Helena, MT 59620-1425
Phone: 406-444-0205
Fax: 406-444-0236
nrdp@mt.gov

Attachment B
NRDP 10-11-23 GG Comments with notes from NRDP-EPA-DEQ 12-21-23 coordination meeting

General Comments:

1. NRDP is concerned these documents do not articulate all of the BPSOU CD, Appendix D, Attachment C requirements (i.e., the requirement to remove all of the Waste in the floodplain outside of the sedimentation bay, see comments below.) We believe our previous request develop a publicly available tracking system would be best to ensure all BPSOU requirements are met, such as a master table for BPSOU outlining the requirements notation as to specific sections of CD deliverables that meet each requirement. Specific to Grove Gulch, there are at least five different documents that include some portion of BPSOU CD compliance with these requirements. One document could include all the relevant information that demonstrates compliance with the numeric (Tables 1-3) and location- specific requirements of the BPSOU CD, Attachment C. EPA has previously stated that these requirements would be included in the Materials Management Plan, which we agree would be the appropriate document to capture CD compliance.

EPA sees the CD itself as the place for what is required. The design packages gets confusing – EPA did provide 3 comments about providing details. Comments 21 and 23. Several design documents include the CD requirements.

NRDP's request is what specific documents address particular CD requirments. E.g., the 3-year high groundwater is documented in X document and the waste characterization is addressed in Y document, floodplain removal is addressed in Z document. NRDP offered to provide EPA the spreadsheet that identifies the major components of Attachment C and then identifying and will attempt the document where it is being addressed.

2. The design package does not adequately characterize Waste for removal outside the sedimentation bay but within the floodplain, as required by the BPSOU CD. Section 4.1.2 of Attachment C provides,

"Tailings, waste, and contaminated soils encountered outside of the sedimentation bay within the floodplain will be removed and disposed of as described in the paragraph below."

The "paragraph below" states:
"Unless suitable for use as backfill (under Appendix 1, Table 2), removed tailings waste and contaminated soils shall be segregated and disposed of at a repository approved by EPA in consultation with DEQ, which is not located in the SBC-Above the Confluence or Blacktail Creek areas. Inert solid waste and construction debris may remain on-site for use as backfill that meets Table 2 of Appendix 1 criteria. All other municipal wastes, if encountered at the Grove Gulch area, shall be segregated and disposed of at an appropriate permitted facility by the SDs."

Attachment B
NRDP 10-11-23 GG Comments with notes from NRDP-EPA-DEQ 12-21-23 coordination meeting

In addition to identifying all Waste that are required to be excavated from below the sedimentation bay, vegetated swale, or bypass Channel on Figure GG-1 of the BPSOU CD, BP-AR must identify the areas outside of the sedimentation bay, vegetated swale, or bypass, but within the floodplain that contain Waste to be removed. The documents state that the entirety of Grove Gulch is in the floodplain, which indicates that all Waste within Grove Gulch needs to be characterized and removed per the BPSOU CD. The BPSOU CD text quoted above is not included in the Design Report Section 4.1, which lists the FRESOW requirements. The text of Section 2.2.1.2 of the RAWP references two areas for excavation outside of the sedimentation bay footprint, but Figure 2 does not clearly identify these areas (see Attachment A). Also, the sampling and characterization is not sufficient to determine that the remainder of the floodplain does not include Waste above the Table 1 criteria. See additional comments.

EPA: floodplain and project area. Issues with SWM model and how delineating drainages and volumes coming in and out. Several meetings with FEMA, BSB, etc. to identify the floodplain. Took about 2 years. BP-AR brought up the 3-year high groundwater. Material is saturated at Grove Gulch. Other sites had conceptual boundaries. GG only had the oval in Attachment C.

More of an "implementability issue", given the lack of clarity on the horizontal project area. Not a chasing waste remedy. What does that mean?

Note that the ROD A figure follows property boundaries.

EPA required AR to remove the language re capping in the floodplain, because it also affects the floodplain FEMA "no rise" calculations.

BP-AR elected to remove 18 inches in the project area (wherever that is horizontally). Asked if the State's intent in negotiations was to include full vertical removal of GG. [NOTE: this goes into CD negotiations so is not documented here.] 18 inches was based on not changing the landscape and affecting the floodplain, not based on sampling of contaminants (NRDP question?).

CDM/EPA showed a figure and a spreadsheet of sample data. CDM ran the EVS model and came up with something different (actually smaller). Then took data identified as waste and then ran it through LeapFrog, which was also different.

CDM most waste is in the shallow waste layer, consistent with fluvially deposited waste.

Attachment B
NRDP 10-11-23 GG Comments with notes from NRDP-EPA-DEQ 12-21-23 coordination meeting

The clay layer also contains it. Around 0-24 inches for most part.

NRDP: referenced the ROD amendment figure as a way to interpret the GG boundary (horizontal). Vertical Waste extent is very similar to Blacktail Creek or Butte Reduction Works etc re defining the vertical through the PDI ER Work Plans and confirmation sampling. Pointed out the language in Design Report FRESOW report re capping in floodplain. NRDP noted that the18 inches everywhere is a different requirement than what Attachment C requires that all waste in the project area in the floodplain be removed.

NRDP noted that BTC is no deeper than 5-8 feet based on the data that was available when they investigated the site. There was agreement that there was non BPSOU CD/Attachment C language that limited Waste removal only to the high 3-year GW level outside the basin but that is what EPA was proposing.

Who decided on the new project boundary? EPA: EPA came up with whatever is disturbed.

How was 18 inches chosen? EPA: not based on contamination, based on FEMA flood no rise determination.

EPA: only 2 samples were found to have Waste below 18 inches, but will be removed based on incidental need of excavation.

Don't need extra data to bid; need data at the end of the project (confirmation sampling to show the waste is removed and the backfill meets CD requirements).

Summary: NRDP would expect that the clay lens would be the floor of the waste but data should determine it. EPA/CDM seemed to agree on the clay lens based on the limited data. NRDP tentatively agrees with the disturbed area as the horizontal extent. NRDP wants to make sure all Waste in the project area, outside the basin, be removed as required in Attachment C. To do this with the current limited data and order-of-magnitude uncertainty with the model there will need to be confirmation sampling to document that all Waste is removed in that area (the area in the floodplain outside of the bay) which is required in Attachment C.

EPA needs to discuss a requirement to have confirmation sampling to ensure Waste removal. Issue put in parking lot until EPA gets back to NRDP.

Attachment B
NRDP 10-11-23 GG Comments with notes from NRDP-EPA-DEQ 12-21-23 coordination meeting

3. The supplied documents do not contain sufficient characterization of site Waste, nor and remove all Waste within the floodplain, as required by the BPSOU CD (see General Comment 2).

The site investigation, Grove Gulch PDIER and the resulting Figure 2 (Attachment A), is an incomplete and inaccurate approximation of the nature and extent of GG Wastes per Table 1 of the BPSOU CD. According to the Materials Management Plan, Section 1.3 – Project Description, page 8, "Figure 2 shows the extent of waste identified on site." However, Figure 2 only shows small patches of "waste" within the bigger CD-required area for Grove Gulch. The forms on Figure 2 look like an artifact of sample distribution rather than the nature and extent of fluvially-transported and distributed Waste. General Comment 5 further describes how NRDP believes the EVS model is insufficient as the sole method of waste delineation.
Complete delineation of Waste nature and extent requires additional field qualifying methods as well as confirmation sampling. Please identify where in the submittal is the document that describes how Waste will be characterized on the project area.

NRDP believes BP-AR should develop a sampling and analysis program to better identify Waste during construction and to confirm that all Waste is being removed as required by the BPSOU CD and all other numeric and location-specific requirements as defined in the BPSOU CD Attachment C are met.

4. It is unclear how the 3-year high groundwater level was determined. The EVS model memo indicates that one year of data (August 2020 to August 2021) was used as an input to the EVS model, which then interpolated the 3-year high groundwater level across the project site (Section 1.0, page 2). However, the memo later states that the 3-year high groundwater elevation was an input to the EVS model (Section 4.0, pages 8 and 9). It's unclear from these descriptions whether the 3-year high groundwater level was an input to EVS or an output from EVS.

EPA: only one year worth of data. BP-AR wanted to fast track the project to have a site go to construction so did not have 3-years. NRDP pointed out that Attachment C was released to the public and started work in January 2018. EPA did not push them on it because the 3-yr high groundwater was basically at ground surface. Satisfies that the area is seasonably saturated within the footprint (bay) area. Data from piezometers was input, the EVS spit out the 3-dimensional surface. Already have more than 3 years of data at the other sites.

NRDP is concerned about this being precedent at other BPSOU Sites.

5. The EVS model used to delineate Waste at Grove Gulch is based on limited data and includes

Attachment B
NRDP 10-11-23 GG Comments with notes from NRDP-EPA-DEQ 12-21-23 coordination meeting

a very high degree of uncertainty, making it inappropriate for use as the sole method of delineating Waste. Additional detail is needed in the material characterization plans that will allow for more accurate delineation of Wastes for this and future projects. Concerns with the EVS model being used for this purpose include:

a. Mercury XRF results are unusable and mercury lab results from 2018 were rejected due to data quality concerns. Are the usable mercury results sufficient to characterize this contaminant at the site? Can waste be accurately delineated if one of the six contaminants was not adequately characterized? (Grove Gulch Soils Characterization Data Summary Report, Section 5.1, page 8)

None of the ICP Hg exceeded the waste criteria. NRDP: more of a looking forward question to other sites that might have Hg related Wastes. Want to make sure that the data are sufficient to characterize the waste for all of the 6 CD-required contaminants.

b. The EVS model memo provides figures showing the model confidence for each contaminant throughout the site and states that this represents the percent confidence that the true result falls within one order of magnitude of the interpolated result. Confidence ranges from 82 to 100% for most contaminants, though mercury is lower (as low as 25%. Even the highest confidence values only indicate that modeled concentrations are within an order of magnitude of the true concentration. With this level of uncertainty in concentrations, the model is not sufficient to be the sole indicator of waste on site. (Grove Gulch Earth Volumetric Studio Model Inputs, Section 2.5, page 6)

EPA agrees with this, may be relevant for other BPSOU projects. EPA in consultation with

DEQ will provide these comments for every phase of the design for other projects in the FRESOW. Different contractor at other locations. EPA believes they are using Leapfrog at BRW, Diggings east, and NST. Grove Gulch and Buffalo Gulch is EVS. Let's fix all of the issues going forward.

NRDP pointed out that only two other BPSOU CD projects, BTC and BRW, use the Waste criteria to define the vertical extent of removals which were unknown when Attachment C was finalized. These two projects are also in floodplains.

c. Waste characterization depends on concentrations of all six contaminants: arsenic, cadmium, copper, lead, mercury, and zinc. Uncertainty is compounded when waste designation depends on concentrations of multiple contaminants, each of which has an order of magnitude uncertainty even at the highest level of confidence.

Attachment B
NRDP 10-11-23 GG Comments with notes from NRDP-EPA-DEQ 12-21-23 coordination meeting

d. The PDIER states that the EVS model indicates waste at PZ-GG-02, 18-24" bgs, though no waste was identified within this interval at the borehole. BP-AR uses this as evidence that the model is conservative in defining the waste extents. It seems more to indicate that the model is unreliable – predictions by the model are shown to be inaccurate. It is unclear, then, how well the model predicts the presence or absence of waste in locations where samples were not taken. (PDIER, Section 4.2, page 16)

Fix it now.

6. NRDP notes that there are EPA comments responded to in the crosswalk, e.g., dated May 16, 2022, which NRDP does not have record of receiving. Could EPA please check its distribution list for those comments and let us know if we received them (and presumably there was an error with the State email system)?

Check on it. NRDP received May 19, 2022.

7. Page 3-1, Section 3.2 and the defined terms of the RDWP uses the term "Metro Storm Drain." Please replace this term with "Silver Bow Creek" in this location and elsewhere in the documents for this site and other FRESOW documents.

Agreed.

Specific Comments on the Materials Management Plan:

1. **Section 1.3.1 – Contaminants of Concern Sources (pg. 8)**

"The contaminants of concern (COCs) identified in the BPSOU Record of Decision (EPA, 2006) (ROD) include aluminum, arsenic, cadmium, copper, iron, lead, mercury, silver, and zinc for surface water; arsenic, cadmium, copper, lead, mercury, and zinc for groundwater; and arsenic, lead, and mercury for solid media."

Contaminants of concern and their applicability to the project areas are defined in the BPSOU CD Attachment C. Arsenic, cadmium, copper, lead, mercury and zinc are the contaminants applicable to Grove Gulch soils and Table 1-Waste, Table 2-Fill. And Table 3- Capping (i.e., all solid media). Please correct.

2. **Figure 3: Waste Characterization and Management Decision Flow Chart (Attachment B)**

This decision tree does not explain how "material" will be "identified for excavation." Is it implied that they will be visually identified? Will they be identified by utilizing Figure 2? Contaminants cannot be identified by visual or accurately predicted by modeling without statistically determined confidence intervals.

EPA added this comment.

Specific Comments on the Waste Management Plan (Attachment A to the Materials Management

Attachment B
NRDP 10-11-23 GG Comments with notes from NRDP-EPA-DEQ 12-21-23 coordination meeting

<u>Plan):</u>

1. **Section 2.1 Characterization (pg. 7)**

"The waste subject to the Grove Gulch RA was characterized based on all samples collected at the Site under the Grove Gulch Pre Design Investigation Evaluation Report (AR 2023a) and a review of past land uses of the Site, including review of historical maps, aerial photos, and Site visits. The waste identification criteria of heavy metals impacted waste is defined in the FRESOW Table 1."

There is no description of the Waste characterization to be performed in the field to document that materials meeting or exceeding the numeric criteria in Table 1-Wastein the floodplain have been excavated. Please provide the details of field screening for numeric confirmation.

Goes to the above discussion.

2. **Section 2.1 Characterization (pg. 7)**

This document refers to "heavy metals impacted waste," in several locations, which is not a defined term BPSOU CD and may create confusion. Please use the terminology of the BPSOU CD; "Waste" is defined in Table 1 and elsewhere.

Agreed will incorporate.

3. **Section 2.2 Disposal (pg. 7)**

This document refers in numerous locations to the "selected repository," which has not yet been selected. Will this document be updated once a repository is selected or will there be a separate document that specifies the "selected" repository and the haul methods and routes to move the wastes?

Butte Mine Waste Repository is the selected repository.

<u>Specific Comments on the Backfill Material Characterization and Reuse Plan (Attachment B to the Materials Management Plan):</u>

1. **Section 2.4 Sampling and Analysis (pg. 8)**

"Confirmation sampling of potential onsite reuse material will not be completed since no existing onsite material will be reused at the Grove Gulch Site as part of this RA. All excavated material will be taken off-site and disposed of in accordance with the requirements and protocols of the Waste Management Plan, which is attached as Appendix A to the Materials Management Plan."

As stated above, NRDP does not agree that onsite soils removal obviates the confirmation sampling. To meet CD requirements, sampling must be to identify Table 1-Waste and ensure that all Waste has been excavated or capped (depending on the location of the Waste; see comments above.) Limited pre-design investigation modeling and visual identification are inaccurate methods.

Above discussion.

Attachment B
NRDP 10-11-23 GG Comments with notes from NRDP-EPA-DEQ 12-21-23 coordination meeting

Specific Comments on the Construction Monitoring Quality Assurance Project Plan (QAPP):

1. **Section 4.3.1 – Sampling of Imported or Borrow Soil Materials**

This section references "imported or borrow soil materials." What is the distinction between "borrow" and "imported" materials? For BPSOU CD Table 2-Fill and Table 3-Capping, the BPSOU CD does not use "borrow" and it is unclear what is meant. These terms may suggest that the sampling process applies to imported or onsite reused material. Other documents for this project indicate that no onsite material will be reused at Grove Gulch. "Borrow material" should be defined, or references to it should be removed if it refers to backfill generated onsite and will not be used in project construction.

EPA agrees and included this comment.

2. **Section 4.3.1 – Sampling of Imported or Borrow Soil Materials**

This section states that "*soils … from sources that have been sampled and certified as acceptable materials during the BPSOU FRESOW construction may be used without any additional testing or certification, however the Construction Contractor shall verify and provide as a submittal prior to importing the material."* It goes on to state that "*Ongoing sampling of import and borrow soil will be completed by the Construction Contractor at a frequency of one sample for every 500 CY of material used on site*." These statements seem contradictory. Perhaps the first statement is meant to say that "initial testing or certification" is not needed if the material has been previously certified? Ongoing sampling and analysis of imported material should be required to make sure that all soil meets the BPSOU CD Table
2-Fill requirements.

Agreed with it. Have requested additional sampling. EPA did not agree with entire comment. Need to figure out frequency of sampling for all CD materials.

3. **Section 4.3.1 – Sampling of Imported or Borrow Soil Materials**

NRDP does not believe the sampling proposed in this section is sufficient to ensure that the backfill material is uncontaminated. It is unclear who would "certify[y] as acceptable" the "borrow" materials from other FRESOW locations and how it would be demonstrated that these other materials meet all Table 2 backfill requirements. Further, the one sample per 500 cubic yards is not sufficient to characterize the backfill and is less protective than DEQ's approach to adequately characterizing backfill. *See* 2023 06 05_Clean Fill FAQ.pdf (mt.gov)

EPA in consultation with DEQ, have borrow forms, review the criteria and make sure it is met. Prior to that validation and QA/QC on the samples. Need to figure out sampling frequency?

4. **Table 3 Engineered Cap/Cover Systems Material Suitability Criteria (from FRESOW Table 3) (pg. 79)**

This Table has been modified from the BPSOU CD, Attachment C and as such is not representative of

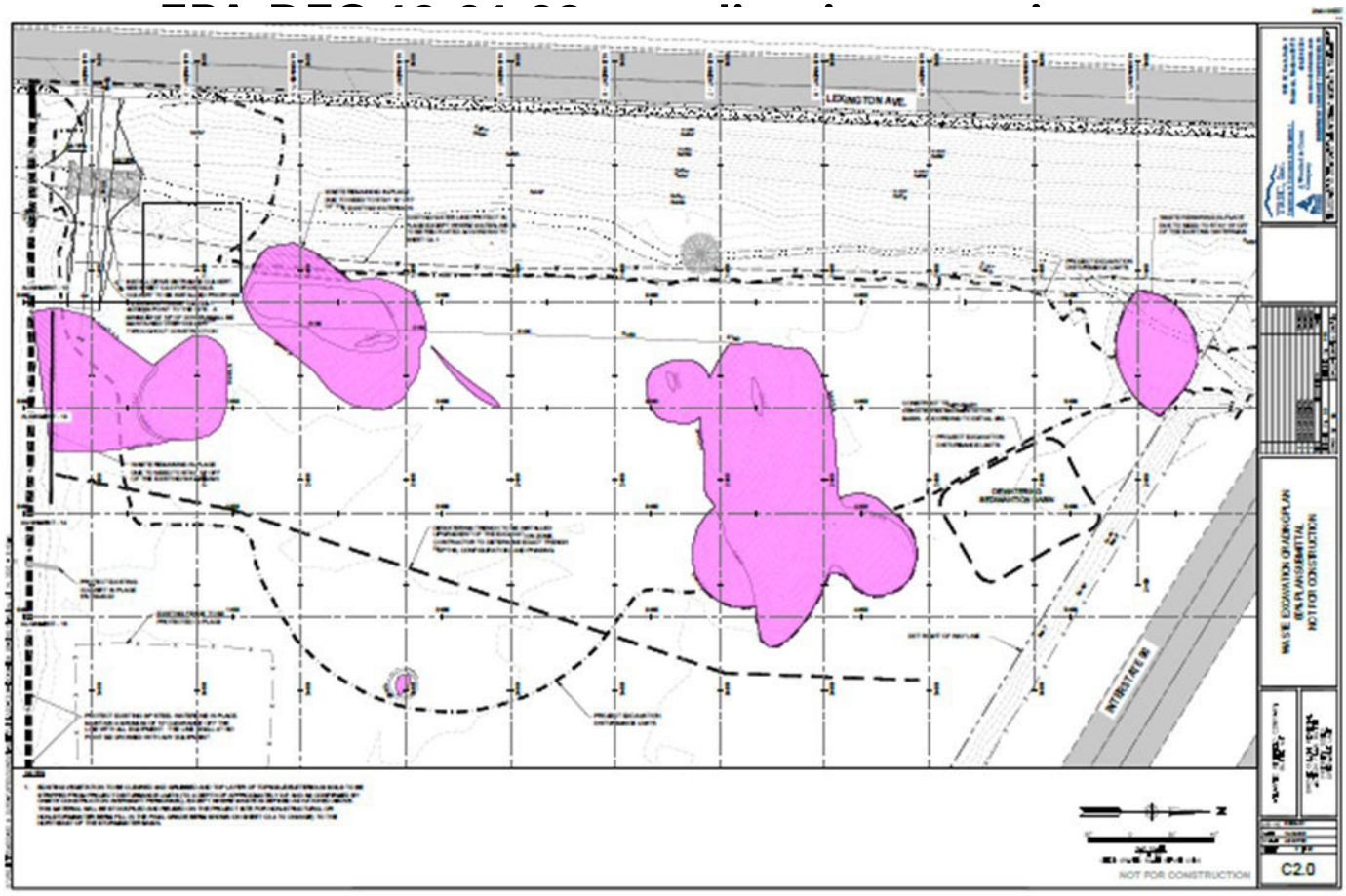
Attachment B
NRDP 10-11-23 GG Comments with notes from NRDP-EPA-DEQ 12-21-23 coordination meeting

the location-specific requirements of the BPSOU CD. Specifically, the table changed the footnotes (Footnotes 5 and 6 in the BPSOU CD, Footnotes 1 and 2 in the QAPP) that reference the BPSOU CD figures that show where these caps are to be placed. Please correct or remove.
EPA added comment.

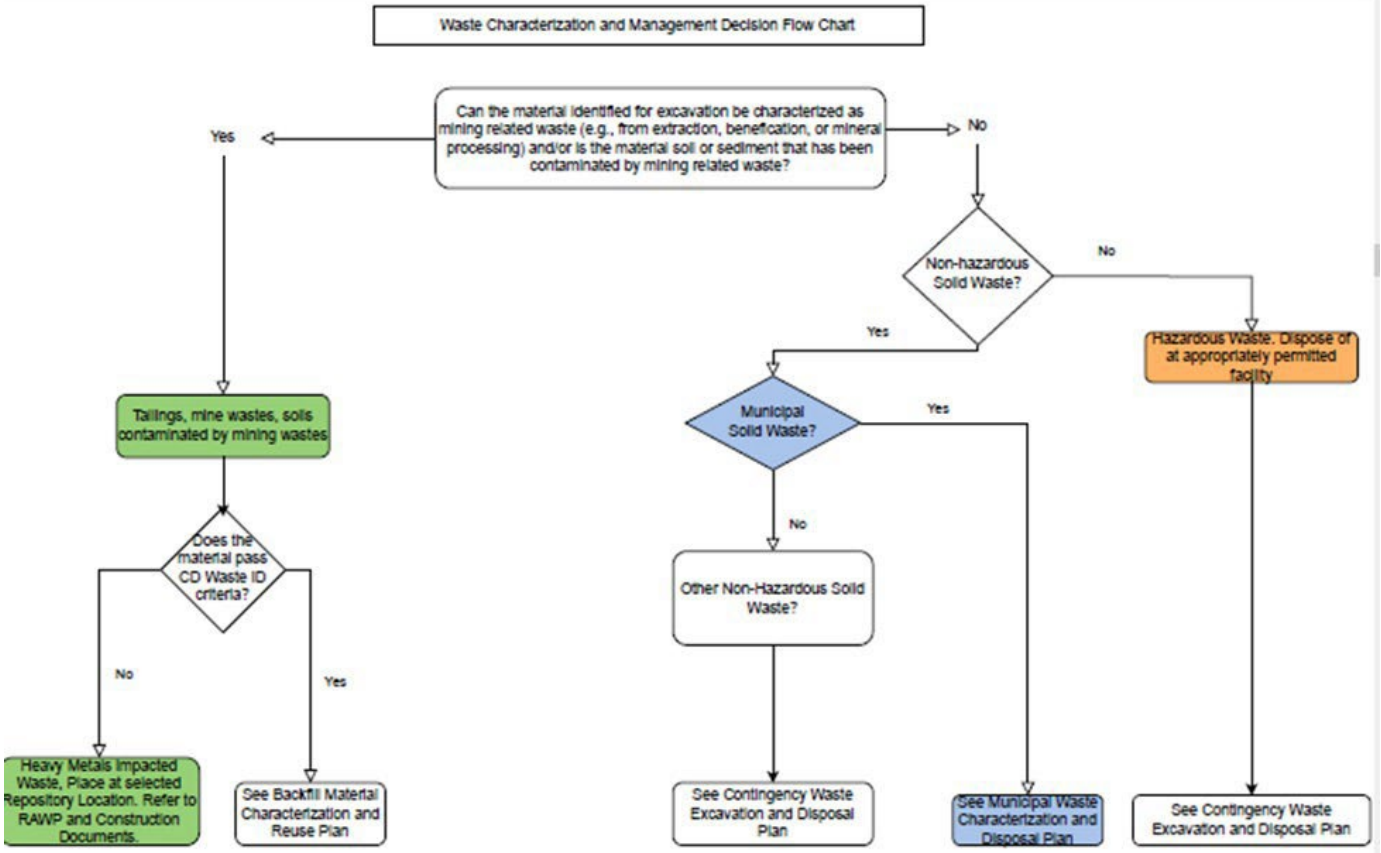
Next steps, EPA understands NRDP's interpretation of the BPSOU CD requirements for GG. NRDP believes the CD requires Waste in the GG floodplain to be removed and that there should be confirmation sampling to document that has been performed. EPA needs to discuss this internally and get back to NRDP after the new year.

Attachment B

NRDP 10-11-23 GG Comments with notes from NRDP-



Attachment B
NRDP 10-11-23 GG Comments with notes from NRDP-EPA-DEQ 12-21-23 coordination meeting



Attachment C

Consent Decree for the Butte Priority Soils Operable Unit
Partial Remedial Design/Remedial Action and Operation and Maintenance

Table 2: Backfill Material Suitability Criteria

PARAMETER	CRITERIA A[1] RIPARIAN, WETLAND AND SUB-IRRIGATED GROWTH MEDIA	CRITERIA B[2],[3] GENERAL FILL	CRITERIA C[4] IN-STREAM SEDIMENT REPLACEMENT MEDIA
Soil Texture			
USDA Texture	Not Sa, LoSa or Cl	Not clay soils	TBD during design phase
Sand	20-70%		
Silt	10-60%		
Clay	5-30%		
Coarse Fraction (%>2mm)	<35%, Maximum fragment size = 3 inches	<60%, Maximum fragment size = 18 inches	
pH	5.5 to 8.5 S.U.		
EC/Salinity	<4.0 mmho/cm	<6.0 mmho/cm	TBD during design phase
SAR	<12		
Soil Saturation Percentage	Between 25% and 85%		
Metals			
Arsenic	<30 mg/kg	<200 mg/kg	<30 mg/kg
Cadmium	<4 mg/kg	<20 mg/kg	<4 mg/kg
Copper	<100 mg/kg	<1,000 mg/kg	<100 mg/kg
Lead	<100 mg/kg	<1,000 mg/kg	<100 mg/kg
Mercury	<5 mg/kg	<10 mg/kg	<5 mg/kg
Zinc	<250 mg/kg	<1,000 mg/kg	<250 mg/kg
Nutrients			
Phosphorous (P)	P, K, and NO_3, will be used to verify fertilizer rates	Not Applicable (NA)	NA
Potassium (K)			
Nitrate + Nitrite (NO_3)			
Organic Matter	3% minimum organic matter on a dry weight basis in the upper 6 inches of cover soil		
Vegetation	Vegetation shall consist of native species appropriate to the riparian, wetland, or sub-irrigated setting to the extent practicable. Final revegetation shall be determined as part of remedial design activities.	Not for use in Engineered Caps. This material can only be placed >18 inches below ground surface for structural needs.	NA

1 - Criteria A, from the SSTOU soil suitability requirements, applies to all replacement soils in:
  a. All areas of BTC and BRW; and
  b. BG, GG, NST and DE materials for the stormwater basin inlet and outlet channels, vegetated swales and bypass areas, and above the stormwater liner systems.

2 - Criteria B applies to structural fill below DE and BG stormwater basins (including associated inlet and outlet structures), GG and NST sedimentation basins (including inlet and outlet structures as appropriate). Not for use in-stream or in floodplains.

3 - Inert solid wastes and construction debris includes only unpainted masonry brick, dirt, rock, and concrete, and shall meet metals criteria in Table 2. Concrete size shall not exceed 3 feet by 3 feet.

4 - Criteria C applies to all materials placed in Blacktail, Silver Bow Creek below the confluence with Blacktail Creek and Confluence Area channel and riparian areas including the Blacktail Creek wetlands.

Attachment C

Consent Decree for the Butte Priority Soils Operable Unit
Partial Remedial Design/Remedial Action and Operation and Maintenance

Table 3: Engineered Caps/Cover Systems Material Suitability Criteria

PARAMETER	CRITERIA D[5] RIPARIAN OR SUB-IRRIGATED ENGINEERED CAP/COVER SYSTEMS		CRITERIA E[6] UPLAND ENGINEERED CAP/COVER SYSTEMS	
	(0 to 6-inches)	(6 to 18 inches)	(0 to 6-inches)	(6 to 18 inches)
Soil Texture				
USDA Texture	Not Sa, LoSa or Cl	Cover soil shall be a friable material and the <2.0 mm fraction characterized as loam, sandy loam, sandy clay loam, sandy clay, clay loam, silty clay, silty clay loam, silt loam, or silt in accordance with the USDA Soil Conservation Service textural classification.		
Sand	20-70%			
Silt	10-60%			
Clay	5-30%			
Coarse Fraction (%>2mm)	<35%, Maximum fragment size = 3 inches	<45%, Maximum fragment size = 6 inches	<45%, Maximum fragment size = 3 inches	<45%, Maximum fragment size = 6 inches
pH	5.5 to 8.5 S.U.			
EC/Salinity	<4.0 mmho/cm			
SAR	<12			
Soil Saturation Percentage	Between 25% and 85%			
Metals				
Arsenic	<30 mg/kg		<97 mg/kg	
Cadmium	<4 mg/kg		<4 mg/kg	
Copper	<100 mg/kg		<250 mg/kg	
Lead	<100 mg/kg		<100 mg/kg	
Mercury	<5 mg/kg		<5 mg/kg	
Zinc	<250 mg/kg		<250 mg/kg	
Nutrients				
Phosphorous (P)	P, K, and NO_3, will be used to verify fertilizer rates	Not applicable	P, K, and NO_3, will be used to verify fertilizer rates	Not applicable
Potassium (K)				
Nitrate + Nitrite (NO_3)				
Organic Matter	3% minimum organic matter on a dry weight basis in the upper 6 inches of cover soil		3% minimum organic matter on a dry weight basis in the upper 6 inches of cover soil	
Cap and Cover Thickness and Vegetation	Engineered Cap minimum depth is 18 inches. Vegetation shall consist of native species appropriate to the riparian setting to the extent practicable. Final revegetation and capillary break design (if necessary) shall be determined as part of remedial design activities.		Engineered Cap minimum depth is 18 inches. Vegetation shall consist of native species appropriate to the upland setting to the extent practicable. Final revegetation and capillary break design (if necessary) shall be determined as part of remedial design activities.	

[5] - Criteria D applies to Engineered Caps at NST, GG and BG set forth in the following figures: Figures NST-1, GG-1, and BG-1.

[6] - Criteria E applies to Engineered Caps in upland areas of DE and NST set forth in the following figures: Figures DE-1 and NST-1. Criteria E does not apply to any sub-irrigated, wetland or riparian areas of NST and DE set forth in the following figures: Figures NST-1 and DE-1.