Remedial Elements Scope of Work

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1. Diggings East Stormwater Basin Area

A lined stormwater retention/detention basin shall be constructed after the removal of contaminated waste materials within the Diggings East area to improve stormwater quality for the sub-drainage area upstream of Casey Street in upper Silver Bow Creek (uSBC) by the SDs. The required remedial construction activities are:

1. *Stormwater Retention/Detention, Conveyance, and Treatment* – Construction of a lined stormwater retention/detention basin with volume sufficient to retain/detain and treat the 10-year 24-hour Type I storm of the uSBC sub-drainage area upstream of Casey Street in uSBC.

2. *Tailings, Waste, and Contaminated Soils Excavation, Removal, and Disposal* – Removal of all tailings, waste and contaminated soils as defined in Table 1 of Appendix 1, and as shown on Figure DE-1, which are unsaturated by groundwater to the maximum observed groundwater elevation surface as recorded over the most recent 3-year monitoring period.

3. *Regrading, Revegetation and Capping* – Regrading, vegetating, and constructing an cover system, in accordance with Table 3, of Appendix 1 and as shown on Figure DE-1.

Stormwater Retention/Detention, Conveyance, and Treatment

Stormwater from the uSBC sub-drainage shall be directed to a retention/detention basin located at the Diggings East. The cumulative volume of the forebay and basin shall be a minimum of 32 acre-feet in volume, which is equivalent to the runoff volume from a 10-year 24-hour SCS Type I storm event. The basin shall include a maintainable forebay for collection of coarse sediment that will facilitate periodic clean out in the basin. Forebay cleanout frequency shall be determined by the SDs with the schedule set forth in the operation and maintenance (O&M) plan. Additional sediment storage volume beyond the stormwater capacity shall be included in the main stormwater retention/detention basin. This volume is intended to maintain system performance, minimize operation and maintenance (O&M) cleanout frequency, and prevent structural or vegetation disturbances. No structural or vegetation disturbances shall occur in the primary basin during the compliance standard determination monitoring period. The sediment storage volume in the main basin shall be sized to limit the cleanout frequency to no more than once every 20 years; modeling of the 20-year sediment accumulation volume shall be provided with the final design and subject to EPA approval, in consultation with MDEQ. Cleanout of the main basin may be initiated more frequently if conditions require, with attendant provisions included in the O&M plan to maintain the integrity of the liner and re-establishment of the basin vegetation.

The basin shall be engineered and managed according to site ARARs, and the applicable requirements of Butte-Silver Bow's Municipal Stormwater Engineering Standards (BSBC 2011). If there are conflicting requirements, whatever requirement is more protective shall be followed,

unless specifically stated otherwise herein. The basin shall be designed and constructed in a fashion that would allow it to be operated as a detention or retention basin to reach optimal treatment efficiency, and must also be sized to adequately pass the diverted influent flow from the uSBC channel as described above. Any diversion structure constructed within the existing uSBC channel shall be sized according to Butte Silver Bow Municipal stormwater requirements.

The stormwater basin liner shall be designed to meet the following leakage performance specification: $1x10^{-7}$ centimeters per second (cm/s). A plan to monitor leakage through the liner shall also be developed during final design and approved by EPA, in consultation with MDEQ.

The objective of the basin leak detection monitoring system is to assess leakage from the basin to protect the BPSOU sub-drain, groundwater and Blacktail Creek from infiltration of stormwater through adjacent tailings, wastes or contaminated soils and additional contaminant loading to groundwater. Monitoring and leak detection data shall be collected utilizing stormwater water balance, existing wells, and newly installed groundwater monitoring wells that are located downgradient, cross-gradient, and upgradient of the basin. Other leak detection technology/methods as approved by EPA in consultation with MDEQ may be used as an alternative to the storm water balance. SDs may additionally employ piezometers. To the extent feasible, the detection system shall be capable of detecting leakage at a rate of $1x10^{-6}$ cm/s. The exact number, type, and location of monitoring wells, proposed analytes, and monitoring frequency shall be submitted to EPA for approval, in consultation with MDEQ, as a component of the final design plan.

If leakage is detected as described above, the SDs shall generate a report describing the leakage and any effects, and shall submit this report to EPA and MDEQ. The report shall include recommended actions for correcting the leak if it adversely impacts surface water, the groundwater capture system (BPSOU subdrain), groundwater mounding concerns, neighbors and the surrounding area, or the integrity, operation and/or capacity of the stormwater basin. Corrective measures directed by EPA, in consultation with MDEQ, in response to this report shall be implemented by the SDs.

Tailings, Waste, and Contaminated Soils Excavation, Removal, and Disposal

The exact location of the basin shall be determined in design, and approved by EPA, in consultation with MDEQ. The footprint location shall consider the future land use for the Diggings East area.

All materials within the project area, as shown on Figure DE-1, that meet the waste identification criteria in Table 1 of Appendix 1, will be removed and disposed of as described below. The depth of excavation shall extend to the maximum observed groundwater elevation as recorded over the most recent 3-year monitoring period. The horizontal and vertical delineation of tailings, waste and contaminated soils, and other waste, along with an evaluation of critical infrastructure will be performed prior to remedial design. Critical infrastructure will be protected during removal construction actions, and removal of waste around those features will not be required, as

determined by EPA, in consultation with MDEQ. Pre-design investigation sampling shall be used to refine the location of the removal area based on Appendix 1 criteria.

Removed tailings, wastes and contaminated soils shall be segregated and disposed of at a repository approved by EPA in consultation with MDEQ, which is not located in the uSBC 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 Diggings East area, shall be segregated and disposed of at an appropriate permitted facility by the SDs.

Regrading, Revegetation and Capping

Removed tailings, waste, and contaminated soils shall be replaced to existing or appropriate elevations with material suitable for establishing appropriate vegetation. Backfill and Engineered Cap materials shall meet the applicable Backfill and Cover System Material Suitability Criteria in Table 2 and Table 3 of Appendix 1.

Regrading shall be conducted on the areas outside of the basin to produce a landscape suitable for the determined future land use of the Diggings East area, subject to consistency with the BPSOU remedial action objectives. The future land use shall be coordinated with Butte-Silver Bow County, and will be evaluated by EPA, in consultation with MDEQ, by looking at information such as local ordinances and zoning, patterns of development in the area, and information from local planning officials and information provided by the public.

For landscaping purposes, a maximum additional 10 percent of the imported cap material volume over the fill required by the remedial design shall be provided to accommodate the future land use, if needed. The additional soil for landscaping purposes shall meet the General Fill Criteria B requirements in Table 2 of Appendix 1. A cover system, where necessary, shall be constructed in areas as shown on Figure DE-1. The cover system shall be constructed in accordance with the criteria set forth in Appendix 1.

Modification of this design description may be implemented in coordination and support of proposed features (i.e. maintenance access road, parking lot, trail, etc.) consistent with listed design elements, and subject to EPA approval, in consultation with MDEQ. These modifications may require placement of structural sub-base course. Specific requirements and specific design of cap and cover sections shall be developed during the design phase of the project, subject to EPA approval in consultation with MDEQ. Should any additional measures be required to maintain the effectiveness of the BPSOU groundwater capture system as a result of this action, these shall be developed in the design phase of the project, subject to EPA approval in consultation with MDEQ, as described below.

Institutional Control Considerations

Through the planning and design process, certain institutional controls shall be identified and described in the remedial design plan. The implementation of any institutional control for this area shall be a cooperative effort among local government, state government, SDs, and other project stakeholders, and shall be the responsibility of the SDs. Potential institutional controls may include motorized and non-motorized travel restrictions, sensitive area exclosures, and future site development restrictions. Fencing or other access restrictions may also be identified.

Any existing institutional controls (including the CGWA) shall remain in effect, including throughout construction.

Potential Impacts to Existing Remedial Components

Construction of the stormwater basin is not expected to adversely impact performance of the existing BPSOU groundwater remedy within the uSBC corridor. An evaluation of the remedial performance of the subdrain capture and treatment system shall be conducted by the SDs following the 4th cycle BMP implementation and prior to KRECCR approval. The evaluation will determine if any additional upgrades to the existing system(s) are needed, as a result of this action. Any upgrades proposed by the SDs are subject to approval of EPA, in consultation with MDEQ, and shall be implemented upon such approval. Further discussion of the evaluation of the remedial performance of the subdrain capture and treatment system is set forth in Section XX of the BPSOU RD/RA Statement of Work.

Additional Project Requirements and Information to be Addressed in Remedial Design

1. **Engineering Design:** Detailed design of the stormwater basin including the liner system(s), leak monitoring plan, surface grading, and detailed design of cover systems and caps in accordance with this section.
2. **Excavation and Disposal Analysis:** The horizontal and vertical delineation of tailings, waste and contaminated soils, and other waste will be performed prior to remedial design. Pre-design investigation sampling shall be used to refine the location and extent of the removal area as shown on Figure DE-1 and based on Appendix 1 criteria. The expected disposal quantities of tailings, waste, and contaminated soils shall be further investigated to select an appropriate repository location(s). The excavation and disposal plans shall be developed during the project design phase subject to EPA approval, in consultation with MDEQ.
3. **Municipal Waste Characterization and Disposal Plan:** Screening criteria shall be developed to accurately characterize and quantify municipal waste intended for disposal at the Butte-Silver Bow municipal landfill. Contingency excavation and disposal plans shall be developed during the project design phase subject to EPA approval, in consultation with MDEQ.

4. **Backfill Material Characterization and Reuse Plan:** A sampling and analysis plan shall be developed to further delineate existing site soils that may be characterized and reused as suitable backfill material in accordance with Table 2 of Appendix 1.
5. **Other Waste or Impacted Materials:** The presence and type of additional waste impacted materials within the perimeter of the project site is relatively unknown due to the uncontrolled nature of historic dumping activities. Additional waste or impacted material that may be encountered includes hydrocarbons, solvents, detergents, or other organic materials. Contingency excavation and disposal plans shall be developed during the project design phase subject to EPA approval, in consultation with MDEQ.
6. **Geotechnical Conditions:** EPA, in consultation with MDEQ, may require geotechnical investigation to adequately characterize subsurface conditions in areas of the basin, diversion structures, discharge structures or any other structural feature, or to optimize the horizontal extents of excavation and minimize off-site disposal of materials. SDs may also propose such investigations in design documents.
7. **Other:** EPA, in consultation with MDEQ, may identify additional design data gaps during the design phase and require the SDs to address during design. SDs may also identify such data gaps.

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Figure DE-1
Diggings East
Remedial Action Plan

Conceptual
Features, boundaries, and areas indicated are conceptual.

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COORD SYS ZONE: MT SP
DATUM: NAD83
UNITS: FEET

0 150 300 600 Feet

2. Buffalo Gulch Stormwater Basin(s)

A lined stormwater retention/detention basin(s) shall be constructed by the SDs to address stormwater for the Buffalo Gulch sub-drainage. The required remedial construction activities are:

1. *Stormwater Retention/Detention, Conveyance, and Treatment* – Construction of a lined stormwater retention/detention basin with a volume sufficient to retain/detain the 10-year 24-hour Type I storm of the Buffalo Gulch drainage area.
2. *Tailings, Waste, and Contaminated Soils Excavation, Removal, and Disposal* – Removal of all tailings, waste and contaminated soils, as defined in Table 1 of Appendix 1, which are unsaturated by groundwater, beneath the stormwater basin footprint to the maximum observed groundwater elevation surface as recorded over the most recent 3-year monitoring period. An Engineered Cap is required if tailings, waste, and contaminated soils are found outside of the basin footprint (see Figure BG-1).
3. *Regrading, Revegetation and Capping* – Regrading, vegetating, and constructing an Engineered Cap, in accordance with Table 3, of Appendix 1 and as shown on Figure BG-1.

Stormwater Retention/Detention, Conveyance, and Treatment

Stormwater from the Buffalo Gulch sub-drainage (reporting through sampling point BG-01) shall be directed to a retention/detention basin. The exact location of the basin shall be determined in design, and approved by EPA, in consultation with MDEQ. The preferred location is located entirely south of the railroad tracks on the former wetland demonstration area (WL12), however the basin may be split between the north and south of the railroad tracks, or water could be moved to another location, in order to achieve the necessary volume (Figure BG-1). If approved by EPA, in consultation with MDEQ, the area north of the railroad tracks could include the deeded property of AR (commonly referred to as the McDonough property), or the property currently owned by the Lisac's. If the Lisac property is used, the SDs shall not be required to purchase or own the Lisac property unless an agreement is reached which would avoid incurring liability by the SDs for the hydrocarbon contamination at that property.

The cumulative volume of the forebay and basin shall be a minimum of 20 acre-feet in volume, which is equivalent to the runoff volume from a 10-year, 24-hour SCS Type I storm event. The basin shall include a maintainable forebay for collection of coarse sediment that will facilitate periodic clean out in the basin. Forebay cleanout frequency shall be determined by the SDs with the schedule set forth in the operation and maintenance (O&M) plan. Additional sediment storage volume beyond the stormwater capacity shall be included in the main stormwater retention/detention basin. This volume is intended to maintain system performance, minimize operation and maintenance (O&M) cleanout frequency, and prevent structural or vegetation disturbances. No structural or vegetation disturbances shall occur during the compliance standard determination monitoring period. The sediment storage volume in the main basin shall be sized

to limit the cleanout frequency to no more than once every 20 years; modeling of the 20-year sediment accumulation volume shall be provided with the final design and subject to EPA approval, in consultation with MDEQ. Cleanout of the main basin may be initiated more frequently if conditions require, with attendant provisions included in the O&M plan to maintain the integrity of the liner and re-establishment of the basin vegetation.

The basin shall be engineered and managed according to site ARARs, and the applicable requirements of Butte-Silver Bow's Municipal Stormwater Engineering Standards (BSBC 2011). If there are conflicting requirements, whatever requirement is more protective shall be followed, unless specifically stated otherwise herein. The basin shall be designed and constructed in a fashion that would allow it to be operated as a detention or retention basin to reach optimal treatment efficiency, and shall also be sized to adequately pass the diverted influent from the Buffalo Gulch sub-drainage area as described above. Any diversion structure shall be sized according to Butte Silver Bow Municipal stormwater requirements.

SDs shall perform a technical evaluation of the basin liner and infiltration that accounts for protection of the groundwater capture system (BPSOU subdrain), groundwater mounding concerns, impacts to neighbors and the surrounding area, and impacts on the integrity and/or capacity of the stormwater basin. The stormwater basin shall be lined if it is determined that infiltration could adversely affect surface water quality, groundwater capture, or neighboring properties. The evaluation will be approved by EPA in consultation with MDEQ. A plan to monitor effects of leakage or infiltration shall also be developed during final design and approved by EPA, in consultation with MDEQ.

The objective of the basin leak detection monitoring system is to assess leakage from the basin to Silver Bow Creek from infiltration of stormwater through adjacent tailings, wastes or contaminated soils and additional contaminant loading to groundwater. Monitoring and leak detection data shall be collected utilizing stormwater water balance, existing wells, and newly installed groundwater monitoring wells. Other leak detection technology/methods as approved by EPA, in consultation with MDEQ may be used as an alternative to the stormwater balance. As necessary, groundwater monitoring wells shall be located downgradient, cross-gradient, and upgradient of the basin. SDs may additionally employ piezometers. The detection system shall be capable of detecting leakage at an appropriate rate to fully evaluate impacts of leakage or infiltration. The exact number, type, and location of monitoring wells, proposed analytes, and monitoring frequency shall be submitted to EPA for approval, in consultation with MDEQ, as a component of the final design plan.

If infiltration following basin construction is determined to have adverse effects as described above, the SDs shall generate a report describing the effects, and shall submit this report to EPA and MDEQ. The report shall include recommended actions for corrections. Corrective measures

directed by EPA, in consultation with MDEQ, in response to this report shall be implemented by the SDs.

Tailings, Waste, and Contaminated Soils Excavation, Removal, and Disposal

The exact location of the basin shall be determined in design, and approved by EPA, in consultation with MDEQ. All materials below the basin(s) that meet the waste identification criteria in Table 1 of Appendix 1, will be removed and disposed of as described below. The depth of excavation below the basin shall extend to the maximum observed groundwater elevation as recorded over the most recent 3-year monitoring period. The horizontal extent of the excavation for the basin is limited to the crest of the basin (at the liner anchor trench) with additional accommodation of excavation layback as dictated by the angle of repose of the tailings, wastes and contaminated soils being removed. Critical infrastructure will be protected during removal construction actions, and removal of waste around those features will not be required, as determined by EPA, in consultation with MDEQ.

Removed tailings, wastes and contaminated soils shall be segregated and disposed of at a repository approved by EPA in consultation with MDEQ, which is not located in the uSBC 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 Buffalo Gulch area, shall be segregated and disposed of at an appropriate permitted facility by the SDs.

Regrading, Revegetation and Capping

Removed tailings, waste, and contaminated soils outside of the basin(s) footprint, as described above, shall be replaced to existing or appropriate elevations with material suitable for establishing appropriate vegetation. Tailings, waste, and contaminated soils outside the footprint of the stormwater basin (regraded to facilitate installation of the engineered cap system) may be left in place if appropriately capped as approved in design and as set forth below. Backfill and Engineered Cap materials shall meet the applicable Backfill and Engineered Caps Material Suitability Criteria in Table 2 and Table 3 of Appendix 1.

Regrading shall be conducted on the areas outside of the basin to produce a landscape suitable for the determined future land use of the Buffalo Gulch Area, subject to consistency with the BPSOU remedial action objectives. The future land use shall be coordinated with Butte-Silver Bow County, and will be evaluated by EPA in consultation with MDEQ, by looking at information such as local ordinances and zoning, patterns of development in the area, and information from local planning officials and information provided by the public.

For landscaping purposes, a maximum additional 10 percent of the imported cap material volume over the fill required by the remedial design shall be provided to accommodate the future land use, if needed. The additional soil for landscaping purposes shall meet the General Fill Criteria B requirements in Table 2 of Appendix 1.

Modification of this design description may be implemented in coordination and support of proposed features (i.e. maintenance access road, parking lot, trail, etc.) consistent with listed design elements, and subject to EPA approval, in consultation with MDEQ. These modifications may require placement of structural sub-base course. Specific requirements and specific design of cap sections shall be developed during the design phase of the project, subject to EPA approval in consultation with MDEQ. Should any additional measures be required to maintain the effectiveness of the BPSOU groundwater capture system, as a result of this action, these shall be developed in the design phase of the project, subject to EPA approval, in consultation with MDEQ, as described below.

Institutional Control Considerations

Through the planning and design process, certain institutional controls shall be identified and described in the remedial design plan. The implementation of any institutional control for this area shall be a cooperative effort among local government, state government, SDs, and other project stakeholders, and shall be the responsibility of the SDs. Potential institutional controls may include motorized and non-motorized travel restrictions, sensitive area exclosures, and future site development restrictions. Fencing or other access restrictions may also be identified.

Any existing institutional controls (including the CGWA) shall remain in effect, including throughout construction.

Potential Impacts to Existing Remedial Components

Construction of the stormwater basin is not expected to adversely impact performance of the existing of the BPSOU groundwater remedy within the uSBC corridor. As conceptualized, construction of the Buffalo Gulch stormwater features and adjacent capping is expected to maintain or reduce site infiltration rates through tailings, waste, and contaminated soils, and is not expected to adversely affect compliance with BPSOU Record of Decision RAOs. Leakage from the stormwater basin through tailings, waste, and contaminated soils beneath the basin shall be addressed through repair or maintenance of the basin and liner system. Regardless, an evaluation of the remedial performance of the subdrain capture and treatment system shall be conducted by the SDs following the 4th cycle BMP implementation and completed prior to KRECCR approval. The evaluation will determine if any additional upgrades to the existing system(s) are needed. Any upgrades proposed by the SDs are subject to approval of EPA, in consultation with MDEQ, and shall be implemented upon such approval. Further discussion of the evaluation of the remedial performance of the subdrain capture and treatment system is set forth in Section XX of the BPSOU RD/RA Statement of Work.

Additional Project Requirements and Information to be Addressed in Remedial Design

1. **Railroad Easement:** Construction of a basin south of the railroad will require Group 1 SDs to coordinate with Group 2 SDs.

2. **Engineering Design:** Detailed design of the stormwater basin(s) and associated infrastructure, including the liner system(s), leak monitoring plan, surface grading, and detailed design of caps in accordance with this section.
3. **Excavation and Disposal Analysis:** The horizontal and vertical delineation of tailings, waste and contaminated soils, and other waste will be performed prior to remedial design. Pre-design investigation sampling shall be used to refine the location and extent of the removal area based on Appendix 1 criteria. The expected disposal quantities of tailings, waste, and contaminated soils shall be further investigated to select an appropriate repository location(s). The excavation and disposal plans shall be developed during the project design phase subject to EPA approval, in consultation with MDEQ.
4. **Municipal Waste Characterization and Disposal Plan:** If municipal wastes are encountered at Buffalo Gulch, screening criteria shall be developed to accurately characterize and quantify municipal waste intended for disposal at the Butte-Silver Bow municipal landfill. Contingency excavation and disposal plans shall be developed during the project design phase subject to EPA approval, in consultation with MDEQ.
5. **Backfill Material Characterization and Reuse Plan:** A sampling and analysis plan shall be developed to further delineate existing site soils that may be characterized and reused as suitable backfill material in accordance with Table 2 of Appendix 1.
6. **Other Waste or Impacted Materials:** The presence and type of additional waste impacted materials within the perimeter of the project site is relatively unknown. Additional waste or impacted material that may be encountered includes hydrocarbons. Contingency excavation and disposal plans shall be developed during the project design phase subject to EPA approval, in consultation with MDEQ.
7. **Geotechnical Conditions:** EPA, in consultation with MDEQ, may require geotechnical investigation to adequately characterize subsurface conditions in areas of the basin(s), diversion structures, discharge structures or any other structural feature, or to optimize the horizontal extents of excavation and minimize off-site disposal of excavated materials.
8. **Other:** EPA, in consultation with MDEQ, may identify additional design data gaps that may be identified during the design phase and require the SDs to address during design.

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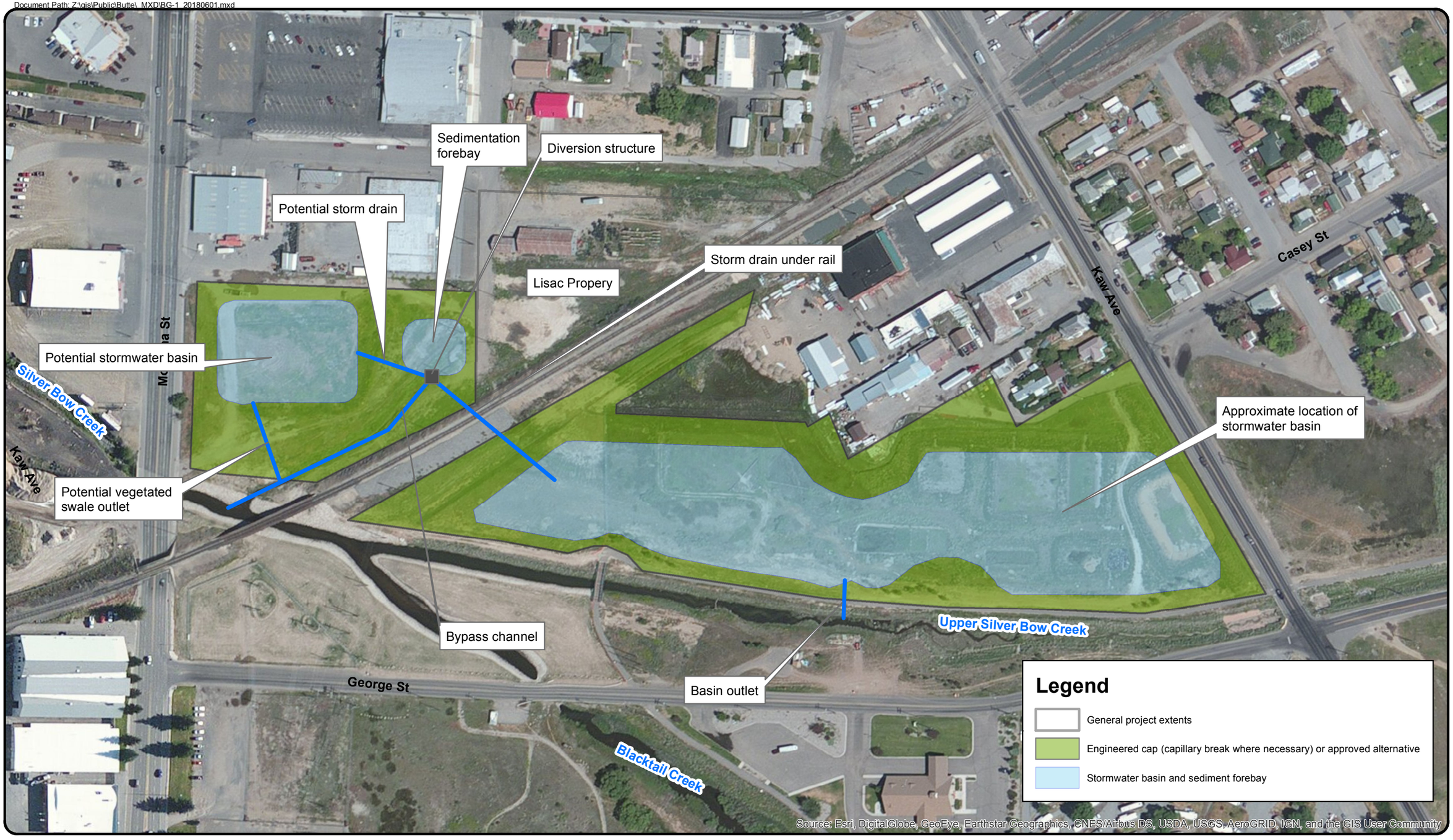

Figure BG-1
Buffalo Gulch
Remedial Action Plan

Conceptual
Features, boundaries, and areas indicated are conceptual.

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COORD SYS ZONE: MT SP
DATUM: NAD83
UNITS: FEET

0 125 250 500 Feet

3. Northside Tailings / East Buffalo Gulch Area

A stormwater basin or sedimentation bay and vegetated swale shall be constructed after the removal of contaminated waste materials in the area of the Northside Tailings by the SDs to improve stormwater quality from the East Buffalo Gulch (EBG) sub-drainage area. A cover system shall also be constructed to support vegetative cover (see Figure NST-1). The required remedial activities are:

1. *Stormwater Basin or Sedimentation Bay, and Vegetated Swale* – Construction of a stormwater basin or sedimentation bay and vegetated swale designed to capture and treat sediment and contaminants in stormwater from the EBG sub-drainage area.

2. *Tailings, Waste, and Contaminated Soils Excavation, Removal, and Disposal* - Removal of all tailings, waste and contaminated soils, as defined in Table 1 of Appendix 1 and as shown on Figure NST-1, which are unsaturated by groundwater to the maximum observed groundwater elevation surface as recorded over the most recent 3-year monitoring period.

3. *Regrading, Revegetation and Capping* – Regrading, vegetating, and constructing a cover system, in accordance with Table 3, of Appendix 1 and as shown on Figure NST-1.

Stormwater Basin or Sedimentation Bay, Vegetated Swale

Stormwater from the EBG sub-drainage shall be diverted to a maintainable (concrete, or concrete-like) basin or sedimentation bay located at the Northside Tailings which shall be sized for a volume that minimizes exceedances for acute water quality standards to the extent practicable, with a minimum of the 6-month, 24-hour Type I storm volume. Connection of the Northside Tailings sedimentation bay with the stormwater basin(s) in Diggings East or Buffalo Gulch shall be evaluated during remedial design. The final design shall be approved by EPA, in consultation with MDEQ. Additional sediment storage volume beyond the stormwater capacity shall be included to maintain system performance and coincide with the operation and maintenance (O&M) cleanout frequency, which shall occur a minimum of twice per year, or as necessary.

The basin or sedimentation bay shall be engineered and managed according to site ARARs, and the applicable requirements of Butte-Silver Bow's Municipal Stormwater Engineering Standards (BSBC 2011). If there are conflicting requirements, whatever requirement is the most protective shall be followed, unless specifically stated otherwise herein. Discharge from the basin or bay shall be directed through a vegetated swale prior to entering upper Silver Bow Creek (see Figure NST-1). The diversion structure and vegetated swale from the outlet of the basin or bay shall also be sized to meet the requirements of the selected design storm.

SDs shall perform a technical evaluation of the basin liner and infiltration that accounts for protection of the groundwater capture system (BPSOU subdrain), groundwater mounding concerns, impacts to neighbors and the surrounding area, and impacts on the integrity and/or

capacity of the stormwater basin. The stormwater basin shall be lined if it is determined that infiltration could adversely affect surface water quality, groundwater capture, or neighboring properties. The evaluation will be approved by EPA in consultation with MDEQ. A plan to monitor effects of leakage or infiltration shall also be developed during final design and approved by EPA, in consultation with MDEQ.

The objective of the basin leak detection monitoring system is to assess leakage from the basin to Silver Bow Creek from infiltration of stormwater through adjacent tailings, wastes or contaminated soils and additional contaminant loading to groundwater. Monitoring and leak detection data shall be collected utilizing stormwater water balance, existing wells, and newly installed groundwater monitoring wells or alternate. Other leak detection technology/methods as approved by EPA, in consultation with MDEQ may be used as an alternative to the stormwater balance. As necessary, groundwater monitoring wells shall be located downgradient, cross-gradient, and upgradient of the basin. SDs may additionally employ piezometers. The detection system shall be capable of detecting leakage at an appropriate rate to fully evaluate impacts of leakage or infiltration. The exact number, type, and location of monitoring wells, proposed analytes, and monitoring frequency shall be submitted to EPA for approval, in consultation with MDEQ, as a component of the final design plan.

If infiltration following basin construction is determined to have adverse effects as described above, the SDs shall generate a report describing the effects, and shall submit this report to EPA and MDEQ. The report shall include recommended actions for corrections. Corrective measures directed by EPA, in consultation with MDEQ, in response to this report shall be implemented by the SDs.

The vegetated bypass channel circumventing the basin or sedimentation bay shall be sized to adequately pass peak hydraulic flows in accordance with applicable Butte-Silver Bow Municipal Stormwater Engineering Standards (BSBC 2011), with the necessary measures to protect the cover system, and tailings, waste, and contaminated soils left in place from erosion. Lining, to prevent leakage to groundwater, of the diversion, discharge, and bypass channels is required.

Tailings, Waste, and Contaminated Soils Excavation, Removal, and Disposal

The exact location of the stormwater basin or sedimentation bay, and channels shall be determined in design, and approved by EPA, in consultation with MDEQ. The footprint of the proposed basin or sedimentation bay shall be positioned to maximize effectiveness of the basin or sedimentation bay and vegetated swale, efficiency of operation and maintenance activities, and shall consider the future land use for the Northside Tailings/East Buffalo Gulch area.

All materials within the project area, as shown on Figure NST-1, that exceed the waste identification criteria set forth in Table 1 of Appendix 1, will be removed and disposed of as described below. Vertical excavation of all tailings, waste, contaminated soils and other materials beneath these features shall occur to the maximum observed groundwater elevation as recorded over the most recent 3-year monitoring period. The horizontal and vertical delineation

of tailings, waste and contaminated soils, other waste, and critical infrastructure will be performed prior to remedial design. Critical infrastructure will be protected during removal construction actions, and removal of waste around those features will not be required, as determined by EPA, in consultation with MDEQ. Pre-design investigation sampling shall be used to refine the location of the removal area based on Appendix 1 criteria.

Removed tailings, waste, and contaminated soils shall be segregated and disposed of at a repository approved by EPA, in consultation with MDEQ, which is not located at the uSBC 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 Northside Tailings/East Buffalo Gulch area, shall be segregated and disposed of at an appropriate permitted facility by the SDs.

Regrading, Revegetation and Capping

Removed tailings, waste, and contaminated soils shall be replaced to existing or appropriate elevations with material suitable for establishing appropriate vegetation. Backfill and Engineered Cap materials shall meet Backfill and Cover System Material Suitability Criteria in Table 2 and Table 3 of Appendix 1.

Regrading shall be conducted on the areas outside of the basin or sedimentation bay to produce a landscape suitable for the determined future land use of the Northside Tailings area, subject to consistency with the BPSOU remedial action objectives (RAOs). The future land use shall be coordinated with Butte-Silver Bow County and will be evaluated by EPA in consultation with MDEQ, by looking at information such as local ordinances and zoning, patterns of development in the area, and information from local planning officials and information provided by the public.

For landscaping purposes, a maximum additional 10 percent of the imported cap material volume over the fill required by the remedial design shall be provided to accommodate the future land use, if needed. The additional soil for landscaping purposes shall meet the General Fill Criteria B requirements in Table 2 of Appendix 1. A cover system with an appropriate capillary break, where necessary, shall be constructed on all property delineated on Figure NST-1. The cover system shall be constructed in accordance with the criteria set forth in Table 3 of Appendix 1. For the areas internal to the basin or sedimentation bay, vegetated swale, and bypass channel, soil meeting the Material Suitability Criteria, Riparian Growth Media (Appendix 1) shall be used.

Modification of this design description may be implemented in coordination and support of future land use proposed features (i.e. maintenance access road, parking lot, trail, etc.), and subject to EPA approval, in consultation with MDEQ. These modifications may require placement of structural sub-base course. Specific requirements and specific design of the cover system and cover sections shall be developed during the design phase of the project, subject to EPA approval in consultation with MDEQ. Should any additional measures be required to maintain the effectiveness of the BPSOU groundwater capture system, as a result of this action,

these shall be developed in the design phase of the project, subject to EPA approval in consultation with MDEQ, as described below.

Institutional Control Considerations

Through the planning and design process, certain institutional controls may be identified and described in the remedial design plan. The implementation of any institutional control shall involve a cooperative effort among local government, state government, SDs, and other stakeholders, and shall be the responsibility of the SDs. Potential institutional controls may include motorized and non-motorized travel restrictions, sensitive area exclosures, and future site development restrictions. Fencing or other access restrictions may also be identified.

Any existing institutional controls (including the CGWA) will remain in effect, including throughout construction.

Potential Impacts to Existing Remedial Components

Construction of the basin or sedimentation bay is not expected to adversely impact performance of the existing of the BPSOU groundwater remedy within the uSBC corridor. Evaluation of the existing remedial performance of the subdrain capture and treatment system(s) in BPSOU shall be conducted following the 4th cycle BMP implementation and prior to KRECCR approval. The evaluation will determine if any upgrades to the existing system(s) are needed. Any upgrades proposed by the SDs are subject to the approval of EPA, in consultation with MDEQ, and shall be implemented upon such approval. Further discussion of the evaluation of the remedial performance of the subdrain capture and treatment system is set forth in Section XX of the BPSOU RD/RA Statement of Work.

Additional Project Requirements and Information to be Addressed in Remedial Design

1. **Engineering Design:** Detailed design of the basin or sedimentation bay and associated, vegetated and lined, bypass and discharge swales.
2. **Excavation and Disposal Analysis:** The horizontal and vertical delineation of tailings, waste and contaminated soils, and other waste will be performed prior to remedial design. Pre-design investigation sampling shall be used to refine the location and extent of the removal area as shown on Figure NST-1 and based on Appendix 1 criteria. The expected disposal quantities of site tailings, waste, and contaminated soils shall be used to select an appropriate repository location. The excavation and disposal planning shall be evaluated during the project design phase subject to EPA approval, in consultation with MDEQ.
3. **Municipal Waste Characterization and Disposal Plan:** Screening criteria shall be developed to accurately characterize and quantify municipal waste intended for disposal at the Butte-Silver Bow municipal landfill. Contingency excavation and disposal planning shall be evaluated during the project design phase.
4. **Backfill Material Characterization and Reuse Plan:** A sampling and analysis plan shall be developed to further delineate existing site soils that may be characterized and reused as suitable backfill material in accordance with Table 2 of Appendix 1.

5. **Other Waste or Impacted Materials:** The presence and type of additional tailings, waste, and contaminated soils within the perimeter of the project site is relatively unknown. Additional tailings, waste, and contaminated soils may be encountered during performance of the work. Contingency excavation and disposal planning shall be evaluated during the project design phase.
6. **Geotechnical Conditions:** EPA, in consultation with MDEQ, may require geotechnical investigation to adequately characterize subsurface conditions in areas of the basin or sedimentation bay, diversion structures, discharge structures, vegetated swale, or other structural features to optimize the horizontal extents of excavation and minimize off-site disposal of materials. SDs may also propose such investigations in design documents.
7. **Other:** EPA, in consultation with MDEQ, may identify additional data gaps that may be identified during the design phase and require the SDs to address during design. SDs may also propose such data gaps.

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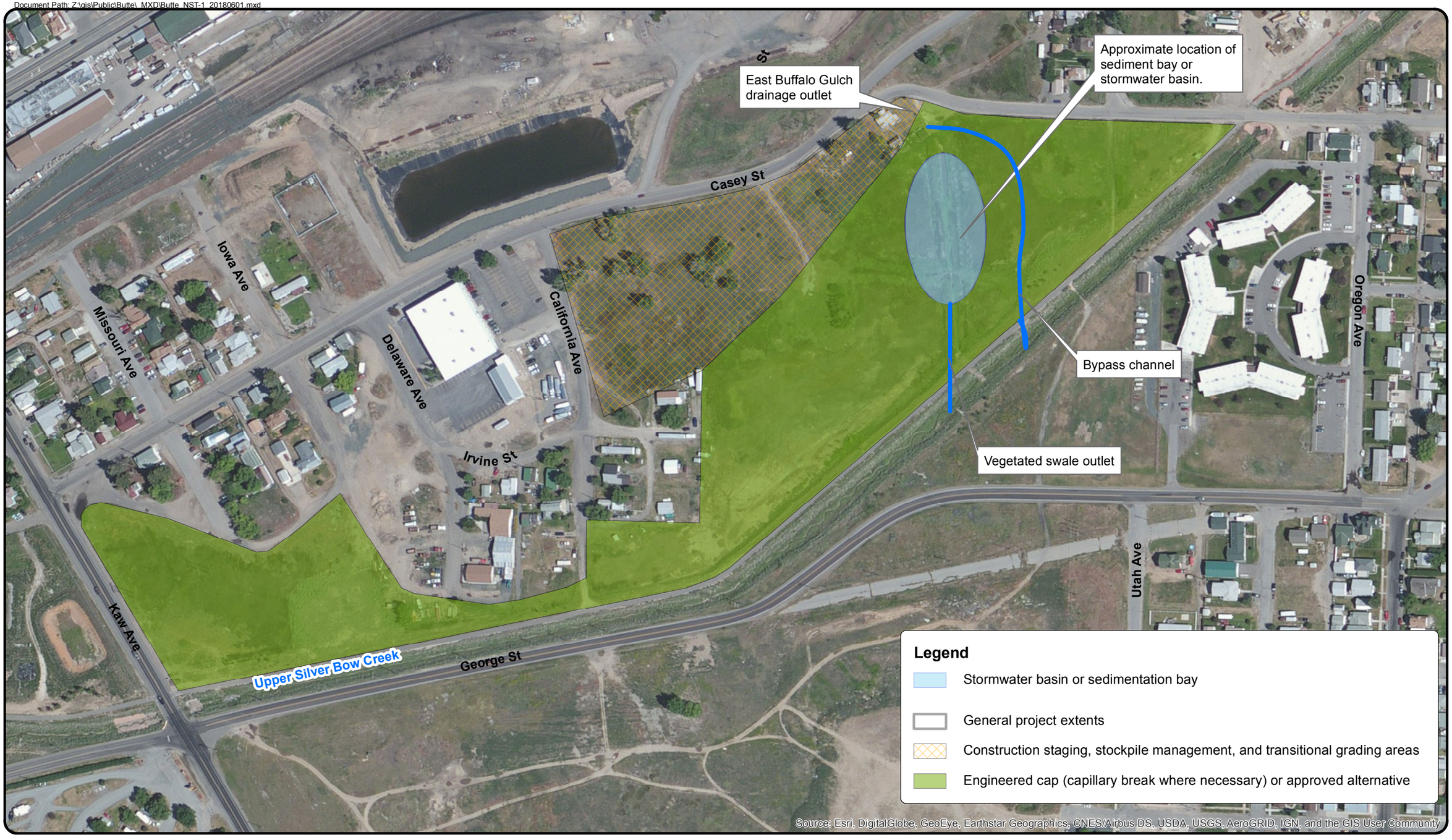

Figure NST-1
Northside Tailings
Remedial Action Plan

Conceptual
Features, boundaries, and areas indicated are conceptual.

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COORD SYS ZONE: MT SP
DATUM: NAD83
UNITS: FEET

0 150 300 600 Feet

4. Grove Gulch Sedimentation Bay

A sedimentation bay and vegetated swale shall be constructed by the SDs along the eastern edge of Lexington Avenue to address stormwater from the Grove Gulch sub-drainage area. The remedial activity is:

1. *Stormwater Sedimentation Bay and Vegetated Swale* – Construction of a stormwater sedimentation bay and vegetated swale designed to treat stormwater from the 6-month, 24-hour Type I storm from the Grove Gulch sub-drainage area.

2. *Tailings, Waste, and Contaminated Soils Excavation, Removal, and Disposal* – Removal of all tailings, waste and contaminated soils, as defined in Table 1 of Appendix 1, which are unsaturated by groundwater, encountered beneath the sedimentation bay and vegetated swale to the maximum observed groundwater elevation surface as recorded over the most recent 3-year monitoring period in the area shown on Figure GG-1.

3. *Regrading, Revegetation and Capping* – Regrading, vegetating, and constructing a cover system in any areas disturbed during construction, in accordance with Table 3, of Appendix 1 and as shown on Figure GG-1.

Stormwater Sedimentation Bay and Vegetated Swale

Stormwater from the Grove Gulch sub-drainage (which reports to Blacktail Creek at point GG-01) shall be directed to a maintainable (concrete, or similar) sedimentation bay located on the eastern edge of Lexington Avenue. The bay shall be sized to capture the runoff volume from a 6-month, 24-hour SCS Type I storm event. Additional sediment storage volume beyond the stormwater capacity shall be included to maintain system performance and coincide with the operation and maintenance (O&M) cleanout frequency, which shall be defined during the design.

The sedimentation bay shall be engineered and managed according to site ARARs, and the applicable requirements of Butte-Silver Bow's Municipal Stormwater Engineering Standards (BSBC 2011). If there are conflicting requirements, whatever requirement is the more protective shall be followed, unless specifically stated otherwise herein. Discharge from the bay shall be directed through a vegetated swale prior to entering Blacktail Creek (see Figure GG-1). The vegetated swale shall be designed to the 6-month 24-hour storm for treatment purposes. A vegetated bypass channel circumventing the sedimentation bay shall be sized, at a minimum, to adequately pass peak hydraulic flows in accordance to Butte-Silver Bow's Municipal Stormwater Engineering Standards (BSBC 2011) to protect the design from high flow events.

Tailings, Waste and Contaminated Soils Excavation, Removal, and Disposal

If tailings, wastes and contaminated soils, as defined by Table 1 of Appendix 1, are encountered within the footprint of the sedimentation bay, swale, and/or bypass channel to Blacktail Creek,

then these wastes shall be removed down to the maximum observed groundwater elevation as recorded over the most recent 3-year monitoring period.

All materials below the sedimentation bay, vegetated swale, or bypass channel that exceed the waste identification criteria set forth in Table 1 of Appendix 1, will be removed and disposed of as described in the paragraph below. If tailings, waste, and contaminated soils are encountered outside of the sedimentation bay outside the floodplain then they will be capped using cover system requirements of Table 3 of Appendix 1. The horizontal extent of sedimentation bay excavation is limited to the exterior wall of the sedimentation bay with additional accommodation of excavation layback as dictated by the angle of repose of the material being removed. 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 horizontal extent of vegetated swale and bypass channel excavation is limited to the design flow channel widths with additional accommodation of excavation layback as dictated by the angle of repose of the material being removed that allows placement of clean fill material in and around the channel. Critical infrastructure will be protected during removal construction actions, and removal of waste around those features will not be required, as determined by EPA, in consultation with MDEQ. Pre-design investigation sampling shall be used to refine the location of the removal area based on Appendix 1 criteria.

Removed tailings waste and contaminated soils shall be segregated and disposed of at a repository approved by EPA in consultation with MDEQ, which is not located in the uSBC 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.

Regrading, Revegetation and Capping

Regrading shall be conducted on the areas outside of the sedimentation bay, and swale, and channel as needed to provide operation and maintenance access, and to support appropriate vegetation. If wastes are encountered outside of the sedimentation bay in the Grove Gulch area outside the floodplain then they will be capped using the cover system requirements of Table 3, Criteria D of Appendix 1.

Modification of this design description may be implemented in coordination and support of proposed features (i.e. maintenance access road, parking lot, trail, etc.) consistent with listed design elements, and subject to EPA approval, in consultation with MDEQ. These modifications may require placement of structural sub-base course. Specific requirements for regrading and revegetation shall be developed during the design phase of the project, subject to EPA approval in consultation with MDEQ.

Institutional Control Considerations

Through the planning and design process, certain institutional controls shall be identified and described in the remedial design plan. The implementation of any institutional control for this area will involve a cooperative effort among local government, state government, Group 1 SDs, and other stakeholders, and shall be the responsibility of the Group 1 SDs. Potential institutional controls may include motorized and non-motorized travel restrictions, sensitive area exclosures, and future site development restrictions. Fencing or other access restrictions may also be identified.

Any existing institutional controls will remain in effect and adhered to throughout construction and following construction completion.

Additional Project Requirements and Information to be Addressed in Remedial Design

1. **Other Waste or Impacted Materials:** The presence and type of additional wastes or contaminated materials within the perimeter of the project site is unknown. Additional wastes or contaminated materials may be encountered during performance of the work. Contingency excavation and disposal planning shall be evaluated during the project design phase.
2. **Engineering Design:** Detailed design of the stormwater sedimentation bay and associated vegetated bypass and treatment swales and associated regrading and vegetative soil cover plans.
3. **Excavation and Disposal Feasibility:** The expected quantities of site materials for disposal shall be further investigated to select an appropriate repository location.
4. **Backfill Material Characterization and Reuse Plan:** A sampling and analysis plan shall be developed to further delineate existing site soils that may be characterized and reused as suitable backfill material in accordance with Table 2 of Appendix 1.
5. **Geotechnical Conditions:** EPA, in consultation with MDEQ, may require geotechnical investigation to adequately characterize subsurface conditions in areas of the sedimentation bay, vegetated swale, diversion structures, discharge structures or other structural features. SDs may also propose such investigation in design documents.
6. **Other:** EPA, in consultation with MDEQ, may identify additional data gaps during the design phase and require SDs to address during design. SDs may also propose such data gaps.

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Figure GG-1
Grove Gulch
Remedial Action Plan

Conceptual
Features, boundaries, and areas indicated are conceptual.

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COORD SYS ZONE: MT SP
DATUM: NAD83
UNITS: FEET

0 105 210 420 Feet

5. Blacktail Creek Remediation and Contaminated Groundwater Hydraulic Control

The objective of the remedial activities described below for the Blacktail Creek area is to remove tailings, wastes, contaminated soils and sediments from Blacktail Creek and Silver Bow Creek, including the Blacktail Creek wetlands, and control discharge of contaminated ground water to surface water in the area, as depicted in Figure BTC-1. Remedial activities at the Blacktail Creek and confluence area shall include:

1. **Remove All Tailings, Waste, and Contaminated Soils** – The State, through the Montana Department of Environmental Quality (MDEQ) shall remove all groundwater saturated and groundwater unsaturated tailings, wastes, contaminated soils, and in-stream sediments, in and along Blacktail Creek and Silver Bow Creek and their 100-year floodplains, as delineated in Figure BTC-1.

2. **Control Contaminated Ground Water** – The SDs shall prevent discharge of contaminated ground water to surface water along Blacktail Creek as shown in Figure BTC-1. Removal of source material contributing to groundwater contamination is anticipated through remedial actions identified in item 1; however, some areas north of Blacktail Creek, outside of the floodplain, are known to contain tailings, waste, and/or contaminated soils. Prevention of contaminated ground water discharge to surface water may be accomplished through hydraulic capture and treatment using the Butte Treatment Lagoons (BTL) facility, and/or an alternative groundwater treatment facility or approach, as approved by EPA, in consultation with MDEQ.

3. **Reconstruct Blacktail Creek and Silver Bow Creek** – MDEQ shall replace removed tailings, wastes, contaminated soils, and in-stream sediments with suitable clean soils. MDEQ shall also reconstruct Blacktail and Silver Bow Creek's beds, banks, and 100-year floodplains MDEQ shall also revegetate areas addressed by these restoration and remedial actions in accordance with the Material Suitability Criteria in Appendix 1.

Remove All Tailings, Waste, Contaminated Sediments and Soils (MDEQ Responsibilities)

All groundwater saturated and groundwater unsaturated tailings, waste, and contaminated soils shall be removed from the 100-year flood plain extending from the Lexington Avenue culverts to the George Street Culverts, as depicted in Figure BTC-1. Contaminated in-stream sediments shall be removed from just upstream of the Blacktail Creek and Grove Gulch confluence to the Montana Street Bridge as depicted in Figure BTC-1. Removal in the area from the east side of Lexington Avenue to 250-feet north just past Grove Gulch as depicted on Figure BTC-1, shall also include contaminated bank materials, if any.

Tailings, wastes, contaminated soils, and contaminated in-stream sediments shall be defined by the Waste Identification Screening Criteria shown in Table 1 of Appendix 1. The vertical and lateral extent of removals will be determined following a pre-design investigation to delineate tailings, wastes, and contaminated soils and sediments within the areas on Figure BTC-1. Current data do not indicate the need for vertical excavation depths beyond approximately 5 feet below local groundwater elevations, especially moving further to the east towards Lexington Avenue, although data gaps exist regarding the extent. The removal extent shall take into consideration actions described in items 2 and 3 of this RDRA Blacktail Creek Remediation work plan. Critical infrastructure will be protected during removal construction actions, and removal of waste around those features will not be required, as determined by EPA, in consultation with MDEQ.

The State, through MDEQ, will similarly remove tailings, waste, and contaminated soils and reconstruct Blacktail Creek and Silver Bow Creek and its 100-year floodplain in the "Confluence Area" north of George Street and east of Montana Street as shown in Figure BTC-1. The work extending into the Confluence Area is a restoration project integrated with the BPSOU remedy, and will be exempt from permitting requirements under CERCLA Section 121(e), and will be conducted under EPA oversight only to the extent needed to oversee and coordinate remedial actions within BPSOU.

All removed tailings, wastes, and contaminated soils, including in-stream sediments, shall be disposed by MDEQ in an acceptable repository or repositories, provided by the SDs for up to 200,000 cubic yards, approved by EPA, in consultation with MDEQ, and not located in the uSBC, Blacktail Creek, or BRW areas. All encountered municipal wastes (including household trash, demolition debris, timbers, brick, concrete and other non-soil materials) shall be segregated and disposed of at an appropriate permitted facility. Municipal waste may not be used as backfill material. Only those excavated soils meeting the criteria in Table 2 of Appendix 1, may be reused on-site, in the locations defined by the criteria in the table. MDEQ shall manage construction de-watering water from the Confluence Area and BTC projects on site where feasible, and AR will work with MDEQ and EPA to identify the volume and chemistry of construction de-watering water that can be treated at BTL to the extent treatment is needed.

Control Contaminated Ground Water (SDs Responsibilities)

Contaminated ground water is known to exist in wells located to the south of the Visitor's Center and exposed tailings are present along the walking path potentially above and outside of the floodplain of Blacktail Creek. Recent pore water and other sampling data indicate ground water in this area is adversely affecting surface water quality in this reach of Blacktail Creek. This ground water inflow, along with additional inflows, contributes to exceedances of surface water quality standards.

All contaminated groundwater north of Blacktail Creek to the BPSOU subdrain capture area shall be prevented from discharging to surface water. The extent of ground water control will be determined following a pre-design investigation and may be greater or less than as depicted on Figure BTC-1.

The exact means of ground water control cannot be determined based on existing available data. However, control of contaminated ground water is required in areas where all tailings, wastes, and contaminated soils have not been removed to prevent contaminated groundwater from discharging to the creeks. Depending on the findings of further investigation, control of ground water may be accomplished by hydraulic capture and treatment, and/or other methods to be approved by EPA in consultation with MDEQ.

Design of the expanded hydraulic capture system shall consider and account for interference with or enhancement of the BPSOU subdrain. Any ground water collected shall be conveyed to a treatment system, whether the existing BTL system or an alternative system as approved by EPA, in consultation with MDEQ. Monitoring shall be implemented to ensure an inward gradient towards the hydraulic capture system is maintained. Other contaminated ground water control alternatives such as permeable reactive barriers or drains to intercept or otherwise treat contaminated groundwater in-situ may be considered.

Reconstruct Blacktail Creek and Silver Bow Creek (MDEQ Responsibilities)

Removed tailings, wastes, contaminated soils, and in-stream sediments shall be replaced with replacement soils which meet criteria defined in Table 2 of Appendix 1, according to the location of the media to be replaced (i.e. Riparian or In-Stream Sediment). The reconstructed channel and floodplain, including the bankfull channel depth, shall be constructed according to appropriate design considerations, and shall be designed to accommodate the 100-year base flood event with a minimum flow design.

For Blacktail Creek, the minimum flow design shall be 372 cubic feet per second (cfs; TREC, Oct. 18, 2016). For Silver Bow Creek, the minimum flow design shall be 493 cfs. Soft armoring may be utilized to control lateral migration at the margins of the constructed floodplain. The extent of soft armoring will be determined during remedial design.

The position or meander of the reconstructed Blacktail Creek channel, including floodplain alteration from approximate existing conditions, may be an integral part of the overall ground water control item described above. Although changes to the existing culverts are not anticipated, relocation of the channel away from contaminated ground water may be integrated with other measures to prevent discharge of contaminated ground water to Blacktail Creek. Geomorphic principles shall be used in design of the creek floodplain, to the extent practicable based on these boundary conditions and to provide bank and floodplain stabilization.

Replacement of the Blacktail Creek wetland is not required; however, the "no net loss" of wetlands ARAR shall be adhered to through use of a Clark Fork Basin wide accounting approach. In addition, the area shall be incorporated into the overall reconstructed floodplain design, and shall accommodate groundwater or other flows that emanate into the area.

All areas addressed by this action shall be reconstructed and revegetated in accordance with ARARs. The revegetation plan shall be described in the design documents and is subject to approval by EPA, in consultation with MDEQ.

As described above, all work that extends into the Confluence Area is a restoration project integrated with the BPSOU remedy, and will be exempt from permitting requirements under CERCLA Section 121(e), and will be conducted under EPA oversight only to the extent needed to oversee and coordinate remedial actions within BPSOU.

Institutional Control Considerations

Through the planning and design process, certain institutional controls shall be identified and described in the remedial design plan. The implementation of any institutional control for this area shall be a cooperative effort among local government, state government, SDs, and other project stakeholders, and shall be the responsibility of the SDs. Potential institutional controls may include motorized and non-motorized travel restrictions, sensitive area enclosures, and future site development restrictions. Fencing or other access restrictions may also be identified. Any existing institutional controls (including the CGWA) shall remain in effect, including throughout construction.

Additional Project Requirements and Information to be Addressed in Remedial Design

Site-specific data shall be required to refine the following:

1. **Engineering Design:** Detailed analysis and design of the contaminated materials removal and replacement with clean materials, including existing and post-remediation hydraulic design through the reach. This includes further delineation of the nature and extent of tailings, waste, and contaminated soils that exceed the waste identification criteria in Table 1. Specific areas that have been identified as having data gaps include the wetland area south of the Blacktail Berm and the area north of Blacktail Creek to the BPSOU subdrain capture area in the vicinity of the Visitor's Center.
2. **Excavation and Disposal Analysis:** The total expected disposal quantities of tailings, waste, and contaminated soils shall be further investigated to select an appropriate repository location(s). Contingency excavation and disposal plans shall be developed during the project design phase subject to EPA approval, in consultation with MDEQ.
3. **100-year Flow:** The 100-year flow rate through the remedial reach of Blacktail Creek and Silver Bow Creek shall be calculated through appropriate Bulletin 17B statistical analysis of data available from the USGS stream gage site 12323240 (SS-04).

4. **100-year Base Flood Elevation[1]:** The 100-year flood elevation of the new shall be determined based on the calculated 100-year flow via appropriate hydraulic modeling method. All connected areas below this elevation shall be considered in the "100-year floodplain." Additional survey information may be required to complete this modeling.
5. **Soil Replacement Materials:** All replacement floodplain and in-stream materials shall meet the appropriate specifications in the Material Suitability Criteria in Appendix 1.
6. **Repository Location and Transport Route:** All removed materials shall be safely transported to an acceptable repository or repositories approved by EPA, in consultation with MDEQ. The remedial design shall identify the location of the repository and the appropriate and safe transport route for removed wastes, contaminated soils and tailings.
7. **Soft Armoring:** Design of a soft armor bank shall be completed based on hydraulic modelling results.
8. **Vegetative Materials:** Appropriate native vegetative materials, to the extent practicable, shall be determined to suit the area being planted, including considerations of upland, riparian, wetland, and sub-irrigated locations.
9. **Construction Planning and Evaluation:** More detailed evaluation of the quantity, requirements, dewaterability, and geotechnical properties of the material to be removed shall be necessary prior to detailed design and implementation.
10. **Geotechnical Conditions:** EPA, in consultation with MDEQ, may require geotechnical investigation to adequately characterize subsurface conditions in areas near bridges and culverts, and/or other structural features. SDs may also propose such investigations in design documents.
11. **Achievement of RAOs:** Construction of the prescribed remedy is expected to contribute to achievement of RAOs. The total contribution and effectiveness of the Blacktail Creek remediation may not be fully quantifiable until all remedial activities associated with surface water have been constructed and optimized.
12. **Site Programming and Master Plan:** To facilitate coordination between remedial and restoration activities as well as land use development, it is necessary for project stakeholders to engage in discussions regarding final site conditions and intended end land use objectives. Project benefits may be obtained by all stakeholders and within all phases of the work through comprehensive site planning.
13. **Municipal Waste Characterization and Disposal Plan:** Screening criteria must be developed to accurately characterize and quantify municipal waste intended for disposal at a permitted facility.

[1] Note that the calculated 100-year flow and the resulting modeled 100-year base flood elevation may differ from the FEMA defined 100-year flow and associated floodplain. For the purposes of the remedial design, the calculated 100-year flow and modeled 100-year water level and flood width will be used, not the FEMA defined flows and floodplain.

14. **Other Waste Materials:** In addition, the presence of other types of contamination (e.g., landfill, RCRA, organic, etc.) in soils at Blacktail Creek area may impact the disposal of the material. This issue shall be addressed in during remedial design.
15. **Other:** Data gaps that may be identified during the design phase.

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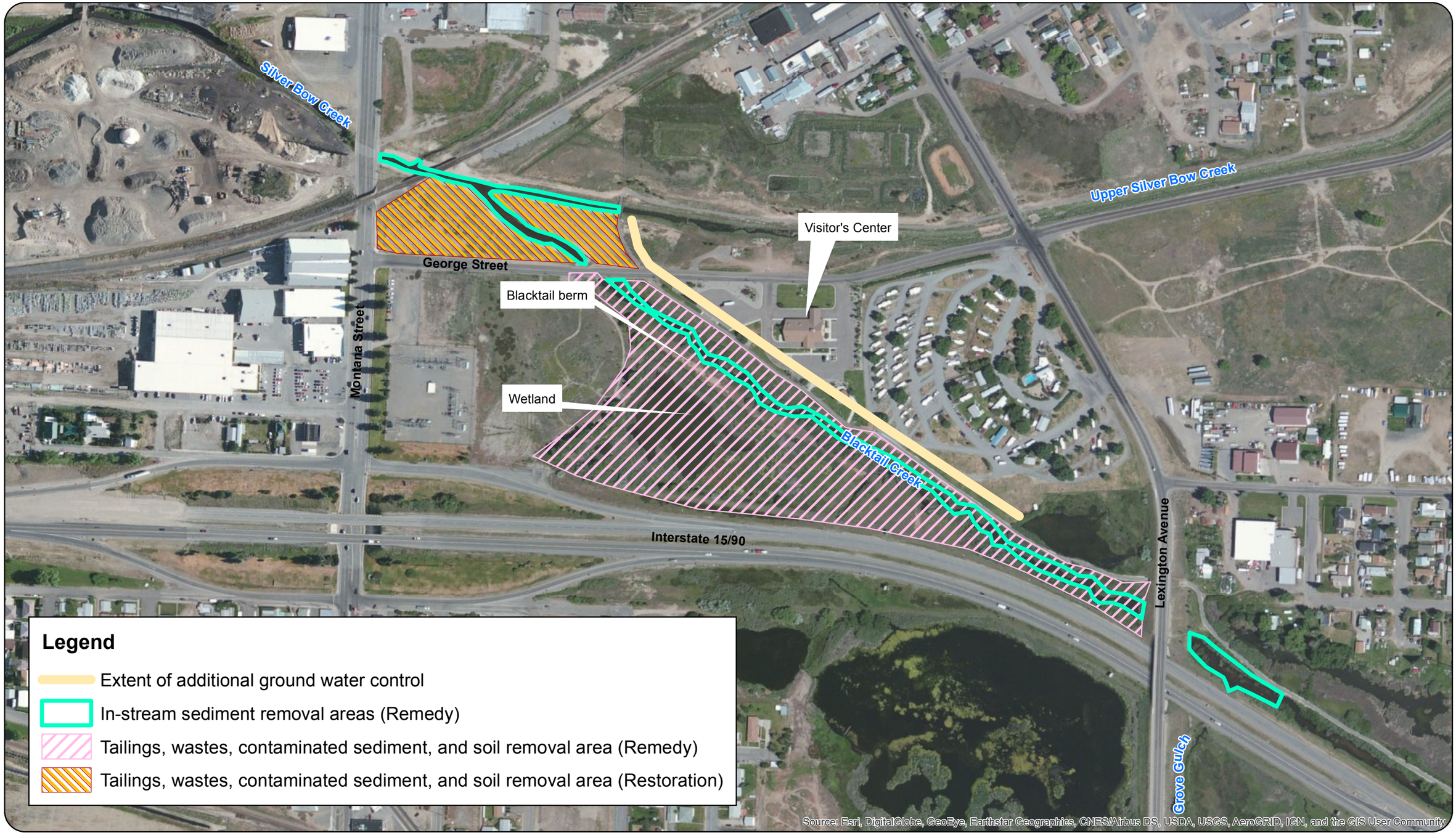

Figure BTC-1
Blacktail Creek
Remedial Action Plan

Conceptual
Features, boundaries, and areas indicated are conceptual.

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COORD SYS ZONE: MT SP
DATUM: NAD83
UNITS: FEET

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6. Butte Reduction Works Smelter Area Mine Waste Remediation and Contaminated Groundwater Hydraulic Control

The objective of the remedial activities described below for the portion of the Butte Reduction Works (BRW) Smelter Area not addressed as part of the Lower Area One (LAO) Expedited Response Action (See Figure BRW-1) is to protect Silver Bow Creek (SBC) by removing tailings, waste, contaminated soils, and slag from the BRW Smelter Area in a corridor that will contain a new channel for Silver Bow Creek, hydraulically controlling and treating contaminated groundwater at the site, and realigning SBC, as generally depicted in Figure BRW-1 and as described further below. These remedial activities shall be conducted by the SDs.

Tailings, waste, contaminated soils, and slag from the BRW Smelter Area shall be removed from the area identified on Figure BRW-1. Where tailings, waste, contaminated soils, and slag are left in place, the contaminated groundwater which results from these wastes shall be hydraulically controlled, including a groundwater collection and conveyance system, so that contaminated groundwater shall not discharge to SBC. Physical barriers (such as a native clay material) may be added to further protect the groundwater remedy from infiltration as allowed by State ARARs. The required remedial activities are:

1. **Tailings, Waste, Contaminated Soils, Slag Excavation, Removal, and Disposal** Removal of all tailings, waste, contaminated soils and slag within the reconstructed SBC 100-year floodplain area extending south to the railroad grade as designated on Figure BRW-1 by the SDs. The removal depth shall include all tailings, waste, contaminated soils, and slag as defined by the Waste Identification Screening Criteria in Appendix 1 Table 1, up to a depth determined in remedial design. The depth of removal will consider the feasibility of excavation and shall include the organic silt layer beneath the BRW Smelter Area unless determined to be infeasible in design. As the tailings, waste, contaminated soils, slag, and organic silt layer are removed, the underlying alluvium may become exposed at the base of the excavation. If the alluvium is below the groundwater table (at the time of construction), it will be left in place. If the alluvium is above the groundwater table, oversight personnel will screen the materials using the Waste Identification Criteria (Table 1). If the sample fails the Waste Identification Criteria, the area associated with that sample will be over-excavated as directed by the engineer and the area will be re-sampled. The width of the removal area shall be an average of 275 feet beginning at the toe of the railroad extending north into the BRW Smelter Area.

2. **Hydraulically Control and Treat Contaminated Groundwater within the BRW Smelter Area –**As part of the remedial design, the SDs shall submit for review, comment, and approval by EPA, in consultation with MDEQ, an analysis of the adequacy of the Butte Treatment Lagoons (BTL) to perpetually treat the volume and chemistry of

collected contaminated groundwater from the BRW Smelter Area. If necessary, the SDs shall expand the treatment capacity of the Butte Treatment Lagoons to treat groundwater that is captured in the hydraulic control system in the BRW Smelter Area.

The SDs shall hydraulically control groundwater from Montana Street to the reconstructed LAO area. If EPA, in consultation with MDEQ, determines that there is not sufficient capacity within the existing BTL system to treat captured groundwater, a BTL expansion to accommodate the additional groundwater shall be implemented.

3. **Realign Silver Bow Creek and Construct 100-Year Floodplain** – The SDs shall relocate SBC and construct the associated 100-year floodplain in a new alignment through the BRW Smelter Area from Montana Street to the reconstructed LAO area as shown on Figure BRW-1. The creek shall be located away from existing slag walls and associated contaminated sediments. This SBC realignment shall be designed so that contaminated groundwater is hydraulically controlled as described below. Lining of the reconstructed stream may be considered for this purpose.

4. **Regrade and Construct Cap(s)** – The SDs shall regrade and construct an appropriate cap over tailings, waste, contaminated soils, and slag left in place to ensure protectiveness of human health and surface water, and acceptability for future land uses consistent with this remedial action for the BRW Site. Capped areas shall be outside of the 100-year floodplain and shall meet the Engineered Cap requirements of Table 3 of Appendix1.

Remove Tailings, Waste, Contaminated Soils, and Slag at the BRW Smelter Removal Areas
Remove all tailings, waste, contaminated soils and slag within the reconstructed SBC 100-year floodplain area to the toe of the slope of the south railroad grade, including materials saturated by groundwater to a depth determined following a pre-design investigation. The depth of removal will consider the feasibility of excavation and shall include the organic silt layer underlying the site, where present, unless determined to be infeasible in design. As the tailings, waste, contaminated soils, slag, and organic silt layer are removed, the underlying alluvium may become exposed at the base of the excavation. If the alluvium is below the groundwater table, it will be left in place. If the alluvium is above the groundwater table, oversight personnel will screen the materials using the Waste Identification Criteria (Table 1). If the sample fails the Waste Identification Criteria, the area associated with that sample will be over-excavated as directed by the engineer and the area will be re-sampled. The width of this removal corridor shall be an average of 275 feet from the toe of the south railroad grade, as shown on Figure BRW-1, and shall be sufficient to accommodate the relocation of SBC with a base flow channel and 100-year floodplain, similar to the reconstructed channel and floodplain in the LAO area downstream. Tailings, wastes, and contaminated soils shall be defined by the Waste Identification Screening Criteria in Table 1, Appendix 1. All soils contaminated with organic

wastes encountered within the excavation extent shall also be removed and disposed of as described below. Critical infrastructure will be protected during removal construction actions, and removal of waste around those features will not be required, as determined by EPA, in consultation with MDEQ.

Removed tailings, waste, contaminated soils, and slag shall be segregated and disposed of at a repository approved by EPA, in consultation with MDEQ, which shall not be located in the upper SBC, Blacktail Creek, or BRW Smelter Area. Tailings, waste, contaminated soils, and slag mixed with organic wastes (including organic contamination) at the BRW Smelter Removal Area, shall be segregated and disposed of at an appropriate permitted facility. Organic wastes in soils at the BRW Smelter Removal Areas, shall be segregated and disposed of appropriately by the SDs. Any dissolved phase or free product organic contamination found in groundwater shall also be properly addressed by the SDs. SD's shall complete the remediation of organic waste at the BRW in a manner that is complimentary and not inconsistent with the CERCLA remedy.

Removed tailings, waste, contaminated soils, and slag shall be replaced to existing or appropriate elevations in and outside of the floodplain with material suitable for protection of SBC and for establishing appropriate native vegetation. These materials shall meet the requirements as defined by Appendix 1, Table 2, as applicable for the location of the material being replaced.

Hydraulically Control and Treat Contaminated Groundwater within the BRW Smelter Area
Hydraulic control of contaminated groundwater is required in areas where all tailings, wastes, and contaminated soils have not been removed to protect the newly constructed stream, prevent contaminated groundwater from discharging to SBC and to keep contaminated groundwater from leaving the BRW Smelter Area. Groundwater control shall be in accordance with a hydraulic gradient performance standard. The hydraulic gradient performance standard shall be a minimum of 0.006 foot per foot (0.6%) of gradient between the performance monitoring points and the hydraulic capture system.

All contaminated groundwater collected shall be conveyed to, and treated in, the BTL facility, as modified, if necessary. The extent and means (extraction wells, gravity collection system, or combination) of groundwater capture, treatment, and monitoring, shall be determined during design.

This performance standard shall be evaluated through a monitoring program approved by EPA, in consultation with MDEQ. There shall be a minimum of five sets of three (3) monitoring wells (or piezometer) transects across SBC to ensure the minimum hydraulic gradient is maintained. There shall be a minimum of six (6) monitoring wells on the western, hydraulically down-gradient, edge of the BRW Smelter Area that shall be required to show that contaminated groundwater is not leaving the BRW Smelter Area and discharging into another portion of SBC

downstream of the site. Monitoring points shall be no closer than 100 feet apart and no further than 200 feet apart.

Realign Silver Bow Creek and Construct 100-Year Floodplain

SBC from Montana Street to the reconstructed LAO area shall be re-constructed in the excavated area described above, and designed with a floodplain adequate to contain the peak flow resulting from a 100-year flood event with a minimum capacity to convey 493 cfs (TREC, October 18, 2016). This shall be done to relocate the channel away from contaminated in-stream sediments, provide a new alignment in a location where tailings, waste, contaminated soils, and slag have been removed, and aid the hydraulic control of contaminated groundwater (described previously). Soft armoring may be utilized to limit lateral migration within and at the margins of the reconstructed floodplain. The reconstruction of SBC shall isolate remaining waste left in place from a 100-year flood event to comply with solid waste requirements and other location and action-specific ARARs. Lining of the reconstructed stream may be considered to reduce capture and treatment of surface water.

The bankfull channel shall be constructed according to appropriate design considerations. Exact removal depth and width, reconstruction width, design specifics, and channel materials shall be determined during the design phase, subject to EPA approval, in consultation with MDEQ. Flood elevations for the design flood shall be determined using an EPA, in consultation with MDEQ, approved approach. The stream corridor shall be constructed from suitable clean materials and using native riparian vegetation. All replacement floodplain and in-stream materials shall meet the requirements as defined by Appendix 1, Table 2, as applicable for the location of the material being replaced. The realignment of SBC shall include establishing the channel with a geomorphically acceptable gradient.

The exact location and design details of the relocated channel and other details not identified in this work plan shall be determined during the design phase, subject to approval by EPA, in consultation with MDEQ.

Regrade and Construct Cap(s)

Re-grading shall be conducted on the BRW Northern Cap or Removal Area shown in Figure BRW-1 outside of the removed wastes to produce a land surface acceptable for future land uses. A cap shall be constructed over this area where waste is left in place, in accordance with Appendix 1, Table 3 that will ensure protectiveness of human health and surface water. No tailings, waste, contaminated soils, or slag shall be left in the newly constructed 100-year floodplain, except as set forth in this Remedial Element Scope of Work. Efforts shall be made to construct the cap(s) in a manner that will be acceptable to facilitate future land uses. The exact nature of the cap(s) shall be defined in the final design documents and could vary according to location and is subject to approval by EPA, in consultation with MDEQ.

Institutional Control Considerations

Through the planning and design process, certain institutional controls shall be identified and described in the remedial design plan. The implementation of any institutional control for this area shall be a cooperative effort among local government, state government, SDs, and other project stakeholders, and shall be the responsibility of the SDs. Potential institutional controls may include motorized and non-motorized travel restrictions, sensitive area exclosures, and future site development restrictions. Fencing or other access restrictions may also be identified.

Any existing institutional controls (including the CGWA) shall remain in effect, including throughout construction.

Further Information Needed

As part of the remedial design, the SDs shall demonstrate that there is sufficient treatment capacity at the Butte Treatment Lagoons to incorporate expected groundwater flowrates and chemistry. To that end the SDs shall perform an analysis showing that there is adequate capacity and treatment capability to treat all expected BRW Smelter Area contaminated groundwater. If necessary, the SDs shall expand the treatment capacity of the Butte Treatment Lagoons to treat groundwater that is captured in the hydraulic control system in the BRW Smelter Area.

Data Gaps that Need to be Addressed Prior to Completion of the 30% design plan

a. Lateral limits, thickness, and base of tailings, waste, contaminated soils, and slag in or adjacent to the removal areas.
b. Estimates of total tailings, waste, contaminated soils, and slag volumes
c. The nature and extent of the organic contamination within the BRW
d. Groundwater elevations and potentiometric surface.
e. Groundwater conductivity and transmissivity.
f. Aquifer geometry.
g. Seasonal groundwater change.
h. Geotechnical considerations for constructability (i.e. excavation or other removal methods for poured slag and other debris).
i. SBC bottom invert at the upstream and downstream tie in locations of the reconstructed stream.
j. Evaluation of potential lining of relocated SBC channel: design considerations and examples of other sites with successful implementation.
k. A plan to deal with organic contamination in soils and groundwater.
l. Analysis of the adequacy of the BTL to perpetually treat the volume and chemistry of collected contaminated groundwater from the BRW Smelter Area.
m. Pre-Design Investigation: A pre-design investigation and report is required to fill the data gaps described above related to tailings, waste, and contaminated soils extents, slag extents, slag integrity, groundwater levels and movement, other

contamination, and all other data gaps that may be identified during pre-design activities. Upon approval of the pre-design report, by EPA in consultation with MDEQ, the SDs shall produce a 30% BRW Smelter Area Remedial Design Report in draft form for review and comment by EPA and MDEQ. The final 30% BRW Smelter Area Remedial Design Report shall be submitted by the SDs, after receipt and incorporation of agency comments, for approval by EPA in consultation with MDEQ.

The 30% remedial design report shall present the following information:

1. **Engineering Design:** Detailed analysis and design of the contaminated materials removal and replacement with clean materials, including existing and post-remediation hydraulic modelling through the reach.
2. **100-year Base Flood Elevation[2]:** The 100-year flood elevation shall be determined based on the calculated 100-year flow via appropriate hydraulic modelling methods. All connected areas below this elevation shall be considered in the "100-year floodplain". Additional survey information may be required to complete this modelling.
3. **Soil Replacement Materials:** All replacement floodplain and in-stream materials shall meet Criteria A and Criteria C in Appendix 1, Table 2.
4. **Repository Location and Transport Route:** All removed materials shall be safely transported to a repository approved by EPA in consultation with MDEQ.
5. **Soft Armoring:** Design of a soft armor bank shall be completed based on hydraulic modelling results.
6. **Vegetative Materials:** Appropriate native vegetative materials shall be determined to suit the area being planted, including considerations of upland, riparian, wetland, and sub-irrigated locations.
7. **Construction Planning and Evaluation:** More detailed evaluation of the quantity, requirements, dewaterability, and geotechnical properties of the material to be removed shall be necessary prior to a completed design and implementation.
8. **Geotechnical Conditions:** Geotechnical investigation may be required to adequately characterize subsurface conditions in areas near bridges and culverts, and/or other structural features.
9. **Other Waste Materials:** In addition, the potential for presence of other types of contamination (e.g., landfill, RCRA, organic, etc.) in soils at BRW area may impact the disposal of the material. This issue shall be addressed in the 30% BRW Smelter Area Remedial Design Report.

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[2] Note that the calculated 100-year flow and the resulting modelled 100-year base flood elevation may differ from the FEMA defined 100-year flow and associated floodplain. For the purposes of the remedial design, the calculated 100-year flow and modelled 100-year water level and flood width will be used, not the FEMA defined flows and floodplain.

10. **Other:** Data gaps that may be identified during the design phase shall also be addressed in the 30% BRW Smelter Area Remedial Design Report.

Following approval of the 30% BRW Smelter Area Remedial Design Report, the SDs shall submit a draft final BRW Smelter Area Remedial Design Report for review and comment by EPA, in consultation with MDEQ. Following receipt of these comments, the SDs shall produce a final BRW Smelter Area Remedial Design Report for review and possible approval by EPA in consultation with MDEQ.

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Hydraulically control groundwater from Montana Street to the reconstructed LAO area

Monitoring wells for monitoring hydraulic gradient and groundwater capture

275 feet

Reconstructed Silver Bow Creek and 100 year floodplain

Kaw Ave

Montana St

Legend

- Conceptual reconstructed steam alignment
- Extent of additional ground water control
- General project extents
- Engineered cap (capillary break where necessary) or approved alternative
- Tailings, wastes, and soil removal area

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Figure BRW-1
Butte Reduction Works Smelter Area
Remedial Action Plan

Conceptual
Features, boundaries, and areas indicated are conceptual.

N

COORD SYS ZONE: MT SP
DATUM: NAD83
UNITS: FEET

0 105 210 420 Feet

7. Insufficiently Reclaimed Source Areas

The sites presented in Exhibit 1 and on Figure IR-1 are located within the Butte Priority Soils Operable Unit (BPSOU) and have been previously reclaimed. These sites were reclaimed prior to establishment of the Butte Hill Revegetation Specifications (BHRS) (EPA 1997). Additional reclamation work is may be required to bring them into compliance with the BHRS. The SDs shall carry out the activities required to implement this element of the RD/RA Scope of Work. The requirements of this remedial activity are:

1. *Site Evaluations* – Evaluate the sites presented in Exhibit 1 to determine the appropriate reclamation plan for meeting the criteria of the BHRS.

2. *Remedial Action Work Plans* – For all sites listed in Exhibit 1, prepare remedial action work plans (RAWP) describing the reclamation work which shall be performed.

3. *Site Reclamation* – For all sites listed in Exhibit 1, perform additional reclamation to meet the criteria in the BHRS.

Site Evaluations

Sites presented in Exhibit 1 shall be evaluated individually by the SDs to assess past actions and to identify any site-specific conditions that fail to comply with the BHRS. The initial evaluation may include review of previous BRES field evaluations, onsite evaluations, and construction completion reports. The evaluation may require additional sampling to determine if the presence of COCs, insufficient growth media, or additional sources (i.e. storm water controls) contribute to site deficiencies. Evaluations shall be reviewed by personnel with appropriate vegetation expertise (for example, personnel within the Montana Tech Restoration Program or SD experts) prior to submittal.

If additional data collection is necessary, a site-specific Quality Assurance Project Plan (QAPP) shall be developed. The QAPP shall require sampling at depth for COCs. All QAPPs shall be submitted to EPA and MDEQ for review and approval by EPA in consultation with MDEQ. After the evaluations and data collection activities have been completed, a summary report shall be submitted to EPA and MDEQ for review and approval by EPA in consultation with MDEQ. The summary report shall include the following:

- All site data (historic and new data)
- A declaration as to what BHRS standards and criteria are not met.

Remedial Action Work Plans

After the evaluation and sampling (if needed) is completed, and a summary report is issued and approved, a site-specific RAWP shall be generated by the SD. The RAWPs may include various strategies for improving reclamation performance and achieving BHRS standards, and may also include use of curb and gutter or other stormwater controls where appropriate to manage stormwater and protect reclaimed surfaces. The RAWPs shall define the appropriate corrective

actions required to bring the site into compliance with the BHRS. The corrective measures included in the RAWPs may be applied across the entire site or locally. The RAWPs shall be submitted for review and approval by EPA, in consultation with MDEQ. Upon approval of a RAWPs by EPA, in consultation with MDEQ, the RAWPs shall be implemented by the SDs. All RAWPs shall contain a schedule for implementation.

Site Reclamation

Reclamation of a site(s) shall be performed in accordance with the approved RAWP, and may include, but not limited to, soil import, revegetation, capping and/or implementation of storm water controls, including the addition of curb and gutter construction, at or near the site. After implementation of the RAWPs, a construction completion report for each site shall be submitted for review and approval by EPA, in consultation with MDEQ. Following reclamation, each site shall be integrated within and be evaluated according to the BRES program.

Exhibit 1. Sites for Evaluation

Ref No.	Site Name	BRES No	Year Reclaimed	Acreage	Description of Previous Actions
1	Belle of Butte	8	1987	0.35	Recontoured above the shaft, capped and revegetated.
2	Clark St. Dump	9	1985	0.34	Constructed storm water control ditches, recontoured, capped and revegetated.
3	Magna Carta Lessee Dump	11	1998	10.69	Waste removed, constructed storm water control ditches, recontoured, capped and revegetated.
4	Curry	16	1991	0.17	Waste removal, regraded, capped, and revegetated.
5	Lexington Dump	29	1988	5.67	Regraded, applied lime rock, capped and revegetated.
6	Atlantic 1	30	1991	6.5	Recontoured, recapped, revegetated.
7	Corra 2 Dump	32	1991	2	Regraded, applied lime rock, capped and revegetated.
8	Eveline	34	1991	1.6	Waste removal, regraded, capped, and revegetated.
9	Laplatta Gulch	36	1988	12.24	Waste removal, regraded, capped, and revegetated.
10	Missoula Mine	46	1994	7.85	Regraded and seeded.
11	Zella	50	1991	0.05	Waste removal, regraded, capped, and revegetated.
12	Poulin	53	1985	3.39	Graded, capped and revegetated.
13	Soudan Dump	93	1995	0.24	Parking lot development. Recontoured, installed a retaining wall, covered, and revegetated.
14	Washoe Dump	96	1985; 1998	0.6	Waste removal, regraded, capped, and revegetated. 1998 a 4-foot walking trail was installed. More revegetation.
15	Colorado Dump	104	1986	3.1	Waste removed, recontoured, and revegetated.
16	Lizzie Shaft	105	1980-82	4.18	NA
17	Travona Dump	121	1991	8.31	Waste removal, regraded, capped, and revegetated.
18	Tension Dump	127	1990/91	2.87	Waste removed, recontoured, storm water control ditch installed, capped and revegetated.
19	Heaney Dump	129	1990/91	0.39	Waste removal, regraded, capped, and paved with asphalt.
20	Dexter Mill	133	1990/91	5.07	Waste removal, regraded, capped, and revegetated.
21	Star West Dump	134	1991	3.99	Recontoured, capped and revegetated.
22	Washoe Sampling Works	135	1991	2.11	Waste and debris removal, recontoured, closed shaft, capped and seeded.
23	Timber Butte Mill	156	1989	12.07	Waste removed, recontoured, storm water control ditch installed, capped and revegetated.
24	Waste Rock Dump	158	Unknown		No site summary
25	North Alice Culvert	177	Unknown	0.5	Recontoured, storm water control ditch installed, capped and revegetated.
26	Black Bird	1625	1998	1.36	Regraded, capped and revegetated.

Ref No.	Site Name	BRES No.
1	Belle of Butte	8
2	Clark St. Dump	9
3	Magna Carta Lessee Dump	11
4	Curry	16
5	Lexington Dump	29
6	Atlantic 1	30
7	Corra 2 Dump	32
8	Eveline	34
9	Laplatta Gulch	36
10	Missoula Mine	46
11	Zella	50
12	Poulin	53
13	Soudan Dump	93
14	Washoe Dump	96
15	Colorado Dump	104
16	Lizzie Shaft	105
17	Travona Dump	121
18	Tension Dump	127
19	Heaney Dump	129
20	Dexter Mill	133
21	Star West Dump	134
22	Washoe Sampling Works	135
23	Timber Butte Mill	156
24	Waste Rock Dump	158
25	North Alice Culvert	177
26	Black Bird	1625

LEGEND:

INSUFFICIENTLY RECLAIMED

DISPLAYED AS:
COORD SYS/ZONE: MSP83
DATUM: NAVD88
UNITS: IF
SOURCE: PIONEER

SCALE IN FEET
0 750 1500

FIGURE IR-1

ALL INSUFFICIENTLY RECLAIMED SITES

8. Unreclaimed Solid Media Sites

The sites presented in Exhibit 2 and on Figure UR-1 are located within the Butte Priority Soils Operable Unit (BPSOU) and have potentially been impacted by historic mining and therefore may require capping and reclamation. These sites may pose a threat to human health, contribute sediments to existing or planned wet weather control features, or contribute to the degradation of surface water quality.

These sites shall be evaluated to determine whether capping and reclamation is required at each site by the SDs. The SDs, shall carry out the activities required to implement this element of the RD/RA Scope of Work. The requirements of this remedial activity are:

1. *Site Evaluations* – Evaluate unreclaimed sites to determine if reclamation is necessary.

2. *Remedial Action Work Plans* – As necessary, prepare remedial action work plans describing the reclamation work to be performed.

3. *Site Reclamation* – Reclaim sites that exceed human health action levels, contribute sediments to existing or planned wet weather control features, or contribute to the degradation of surface water quality.

Site Evaluations

Sites presented in Exhibit 2 shall be evaluated individually by the SDs. If additional data collection is necessary, a site-specific Quality Assurance Project Plan (QAPP) shall be developed. The QAPP shall specify sampling at depth requirements for COCs. All QAPPs shall be submitted for review and approval by EPA, in consultation with MDEQ, prior to sampling. After the evaluations and data collection activities have been completed, a summary report shall be submitted for review and approval by EPA, in consultation with MDEQ. The summary report shall include the following:

- A summary of all site data (historic and new data).
- A declaration as to whether the site is at or above human health action levels or the Waste Identification Criteria in Table 1 in Appendix 1, whichever is more stringent.
- A declaration as to whether the site is contributing sediment to existing or planned wet weather control features.
- A declaration as to whether the site is contributing to the degradation of surface water quality.

Unreclaimed sites within BPSOU which are not listed in Exhibit 2, but that are identified in the future as needing further evaluation and/or reclamation, shall be evaluated and addressed as part of the Solid Media Management Program Plan. Sites listed in Exhibit 2, which are determined by EPA, in consultation with MDEQ, to not require site reclamation at this time, pursuant to this section, will be reviewed every 5 years as part of the five-year review report.

Remedial Action Work Plans

After the evaluation and sampling (if needed) is completed, and a summary report is issued and approved, a determination will be made by EPA, in consultation with MDEQ, whether that the evaluated site requires reclamation as determined by the criteria described above. If reclamation is required, a Remedial Action Work Plan (RAWP) shall be generated and submitted for review and approval by EPA, in consultation with MDEQ. The RAWP shall define the appropriate actions required to remediate the site, and shall meet the requirements of the Butte Hill Revegetation Specifications. All RAWPs shall contain a schedule for implementation.

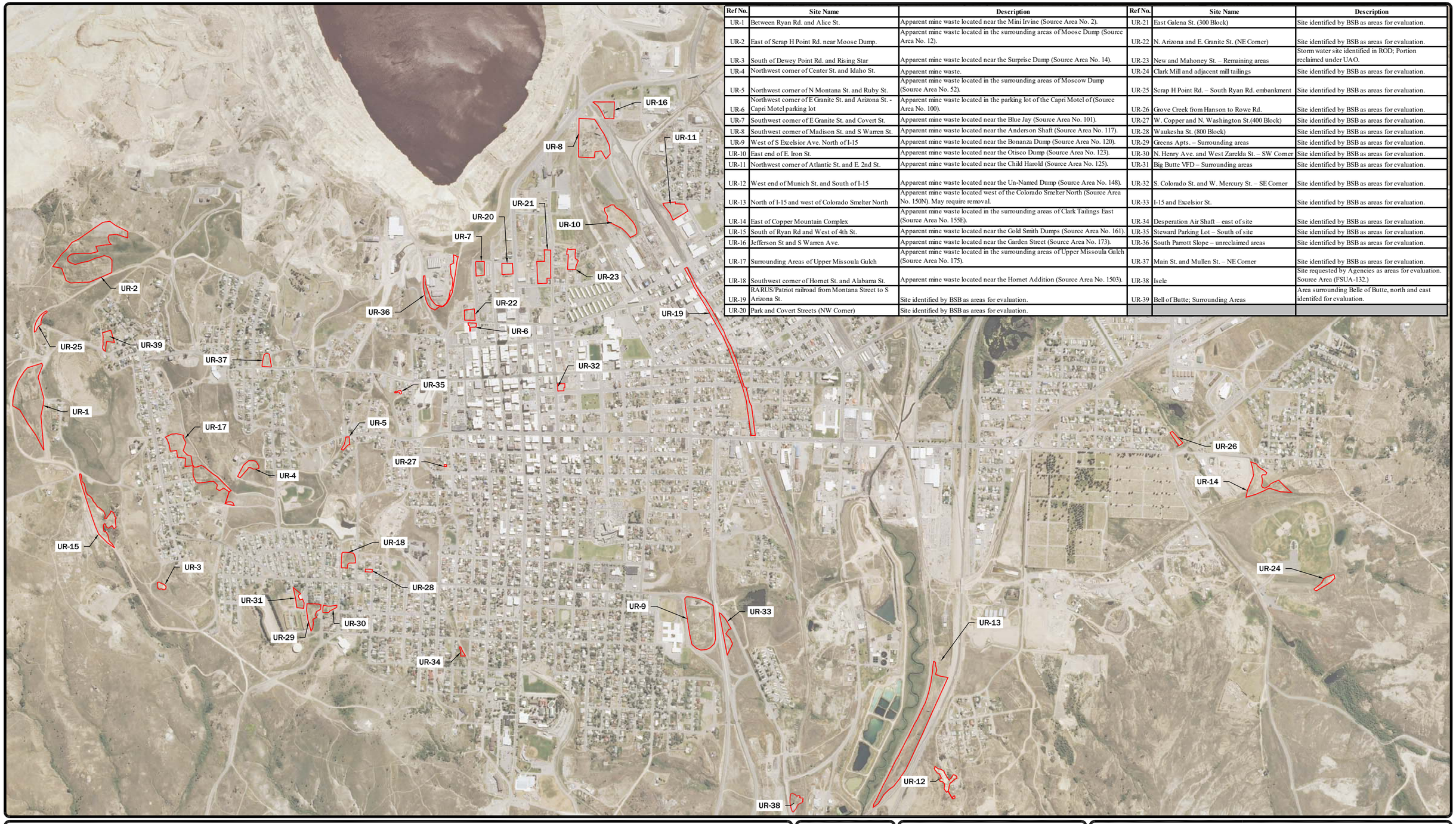
Site Reclamation

Reclamation and other construction activities at a site shall be performed in accordance with the approved RAWP, and may include, but are not limited to, soil import, revegetation, capping and/or implementation of storm water controls, including the addition of curb and gutter construction, at or near the unreclaimed site. Following reclamation, each site shall be integrated within and be evaluated according to the BRES program. Following reclamation and other construction activities, a construction completion report for each site shall be submitted to EPA and MDEQ for review and approval by EPA in consultation with MDEQ.

Exhibit 2. Sites for Evaluation.

Ref No.	Site Name	Description
UR-1	Between Ryan Rd. and Alice St.	Apparent mine waste located near the Mini Irvine (Source Area No. 2).
UR-2	East of Scrap H Point Rd. near Moose Dump.	Apparent mine waste located in the surrounding areas of Moose Dump (Source Area No. 12).
UR-3	South of Dewey Point Rd. and Rising Star	Apparent mine waste located near the Surprise Dump (Source Area No. 14).
UR-4	Northwest corner of Center St. and Idaho St.	Apparent mine waste.
UR-5	Northwest corner of N Montana St. and Ruby St.	Apparent mine waste located in the surrounding areas of Moscow Dump (Source Area No. 52).
UR-6	Northwest corner of E Granite St. and Arizona St. - Capri Motel parking lot	Apparent mine waste located in the parking lot of the Capri Motel of (Source Area No. 100).
UR-7	Southwest corner of E Granite St. and Covert St.	Apparent mine waste located near the Blue Jay (Source Area No. 101).
UR-8	Southwest corner of Madison St. and S Warren St.	Apparent mine waste located near the Anderson Shaft (Source Area No. 117).
UR-9	West of S Excelsior Ave. North of I-15	Apparent mine waste located near the Bonanza Dump (Source Area No. 120).
UR-10	East end of E. Iron St.	Apparent mine waste located near the Otisco Dump (Source Area No. 123).
UR-11	Northwest corner of Atlantic St. and E. 2nd St.	Apparent mine waste located near the Child Harold (Source Area No. 125).
UR-12	West end of Munich St. and South of I-15	Apparent mine waste located near the Un-Named Dump (Source Area No. 148).
UR-13	North of I-15 and west of Colorado Smelter North	Apparent mine waste located west of the Colorado Smelter North (Source Area No. 150N). May require removal.
UR-14	East of Copper Mountain Complex	Apparent mine waste located in the surrounding areas of Clark Tailings East (Source Area No. 155E).
UR-15	South of Ryan Rd and West of 4th St.	Apparent mine waste located near the Gold Smith Dumps (Source Area No. 161).
UR-16	Jefferson St and S Warren Ave.	Apparent mine waste located near the Garden Street (Source Area No. 173).
UR-17	Surrounding Areas of Upper Missoula Gulch	Apparent mine waste located in the surrounding areas of Upper Missoula Gulch (Source Area No. 175).

Ref No.	Site Name	Description
UR-18	Southwest corner of Hornet St. and Alabama St.	Apparent mine waste located near the Hornet Addition (Source Area No. 1503).
UR-19	RARUS/Patriot railroad from Montana Street to S Arizona St.	Site identified by BSB as areas for evaluation.
UR-20	Park and Covert Streets (NW Corner)	Site identified by BSB as areas for evaluation.
UR-21	East Galena St. (300 Block)	Site identified by BSB as areas for evaluation.
UR-22	N. Arizona and E. Granite St. (NE Corner)	Site identified by BSB as areas for evaluation.
UR-23	New and Mahoney St. – Remaining areas	Storm water site identified in ROD; Portion reclaimed under UAO.
UR-24	Clark Mill and adjacent mill tailings	Site identified by BSB as areas for evaluation.
UR-25	Scrap H Point Rd. – South Ryan Rd. embankment	Site identified by BSB as areas for evaluation.
UR-26	Grove Creek from Hanson to Rowe Rd.	Site identified by BSB as areas for evaluation.
UR-27	W. Copper and N. Washington St. (400 Block)	Site identified by BSB as areas for evaluation.
UR-28	Waukesha St. (800 Block)	Site identified by BSB as areas for evaluation.
UR-29	Greens Apts. – Surrounding areas	Site identified by BSB as areas for evaluation.
UR-30	N. Henry Ave. and West Zarelda St. – SW Corner	Site identified by BSB as areas for evaluation.
UR-31	Big Butte VFD – Surrounding areas	Site identified by BSB as areas for evaluation.
UR-32	S. Colorado St. and W. Mercury St. – SE Corner	Site identified by BSB as areas for evaluation.
UR-33	I-15 and Excelsior St.	Site identified by BSB as areas for evaluation.
UR-34	Desperation Air Shaft – east of site	Site identified by BSB as areas for evaluation.
UR-35	Steward Parking Lot – South of site	Site identified by BSB as areas for evaluation.
UR-36	South Parrott Slope – unreclaimed areas	Site identified by BSB as areas for evaluation.
UR-37	Main St. and Mullen St. – NE Corner	Site identified by BSB as areas for evaluation.
UR-38	Isele	Site requested to be added by NRD.
UR-39	Belle of Butte – Surrounding areas	Site requested to be added by BSB.



Ref No.	Site Name	Description	Ref No.	Site Name	Description
UR-1	Between Ryan Rd. and Alice St.	Apparent mine waste located near the Mini Irvine (Source Area No. 2).	UR-21	East Galena St. (300 Block)	Site identified by BSB as areas for evaluation.
UR-2	East of Scrap H Point Rd. near Moose Dump.	Apparent mine waste located in the surrounding areas of Moose Dump (Source Area No. 12).	UR-22	N. Arizona and E. Granite St. (NE Corner)	Site identified by BSB as areas for evaluation.
UR-3	South of Dewey Point Rd. and Rising Star	Apparent mine waste located near the Surprise Dump (Source Area No. 14).	UR-23	New and Mahoney St. – Remaining areas	Storm water site identified in ROD; Portion reclaimed under UAO.
UR-4	Northwest corner of Center St. and Idaho St.	Apparent mine waste.	UR-24	Clark Mill and adjacent mill tailings	Site identified by BSB as areas for evaluation.
UR-5	Northwest corner of N Montana St. and Ruby St.	Apparent mine waste located in the surrounding areas of Moscow Dump (Source Area No. 52).	UR-25	Scrap H Point Rd. – South Ryan Rd. embankment	Site identified by BSB as areas for evaluation.
UR-6	Northwest corner of E Granite St. and Arizona St. - Capri Motel parking lot	Apparent mine waste located in the parking lot of the Capri Motel of (Source Area No. 100).	UR-26	Grove Creek from Hanson to Rowe Rd.	Site identified by BSB as areas for evaluation.
UR-7	Southwest corner of E Granite St. and Covert St.	Apparent mine waste located near the Blue Jay (Source Area No. 101).	UR-27	W. Copper and N. Washington St.(400 Block)	Site identified by BSB as areas for evaluation.
UR-8	Southwest corner of Madison St. and S Warren St.	Apparent mine waste located near the Anderson Shaft (Source Area No. 117).	UR-28	Waukesha St. (800 Block)	Site identified by BSB as areas for evaluation.
UR-9	West of S Excelsior Ave. North of I-15	Apparent mine waste located near the Bonanza Dump (Source Area No. 120).	UR-29	Greens Apts. – Surrounding areas	Site identified by BSB as areas for evaluation.
UR-10	East end of E. Iron St.	Apparent mine waste located near the Otisco Dump (Source Area No. 123).	UR-30	N. Henry Ave. and West Zarelda St. – SW Corner	Site identified by BSB as areas for evaluation.
UR-11	Northwest corner of Atlantic St. and E. 2nd St.	Apparent mine waste located near the Child Harold (Source Area No. 125).	UR-31	Big Butte VFD – Surrounding areas	Site identified by BSB as areas for evaluation.
UR-12	West end of Munich St. and South of I-15	Apparent mine waste located near the Un-Named Dump (Source Area No. 148).	UR-32	S. Colorado St. and W. Mercury St. – SE Corner	Site identified by BSB as areas for evaluation.
UR-13	North of I-15 and west of Colorado Smelter North	Apparent mine waste located west of the Colorado Smelter North (Source Area No. 150N). May require removal.	UR-33	I-15 and Excelsior St.	Site identified by BSB as areas for evaluation.
UR-14	East of Copper Mountain Complex	Apparent mine waste located in the surrounding areas of Clark Tailings East (Source Area No. 155E).	UR-34	Desperation Air Shaft – east of site	Site identified by BSB as areas for evaluation.
UR-15	South of Ryan Rd and West of 4th St.	Apparent mine waste located near the Gold Smith Dumps (Source Area No. 161).	UR-35	Steward Parking Lot – South of site	Site identified by BSB as areas for evaluation.
UR-16	Jefferson St and S Warren Ave.	Apparent mine waste located near the Garden Street (Source Area No. 173).	UR-36	South Parrott Slope – unreclaimed areas	Site identified by BSB as areas for evaluation.
UR-17	Surrounding Areas of Upper Missoula Gulch	Apparent mine waste located in the surrounding areas of Upper Missoula Gulch (Source Area No. 175).	UR-37	Main St. and Mullen St. – NE Corner	Site identified by BSB as areas for evaluation.
UR-18	Southwest corner of Hornet St. and Alabama St.	Apparent mine waste located near the Hornet Addition (Source Area No. 1503).	UR-38	Isele	Site requested by Agencies as areas for evaluation. Source Area (FSUA-132.)
UR-19	RARUS/Patriot railroad from Montana Street to S Arizona St.	Site identified by BSB as areas for evaluation.	UR-39	Bell of Butte; Surrounding Areas	Area surrounding Belle of Butte, north and east identified for evaluation.
UR-20	Park and Covert Streets (NW Corner)	Site identified by BSB as areas for evaluation.			

DISPLAYED AS:
COORD SYS/ZONE: MSP83
DATUM: NAVD88
UNITS: IF
SOURCE:

SCALE IN FEET
0 750 1500

FIGURE UR-1

ALL UNRECLAIMED SOLID MEDIA SITES

9. Uncontrolled Surface Flow Areas BMPs

The areas shown on Figure USFA-1 as "Uncaptured Surface Flow" are located within, or drain to, the Butte Priority Soils Operable Unit (BPSOU) and have potentially been impacted by historic mining and may contribute to the degradation of surface water quality. Therefore, these areas may require installation of best management practices (BMPs) to reduce loading of contaminated sediments to Blacktail and Silver Bow Creeks.

The SDs, shall carry out the activities required to implement this element of the RD/RA Scope of Work. The requirements of this remedial activity are:

1. *Site Evaluations* – The uncaptured surface flow areas, as shown in Figure USFA-1, shall be evaluated to determine the areas contributing to degradation of surface water quality and determine whether BMPs are required to be installed by the SDs.

2. *Remedial Action Work Plans* – Prepare remedial action work plans describing the BMPs to be constructed.

3. *Remedial Action* – Construct and install BMPs appropriate for reducing contaminant loading to the creeks.

Site Evaluations

Uncaptured surface areas draining to Blacktail and Silver Bow Creeks (Figure USFA-1) shall be evaluated by the SDs to determine if individual sub-watershed areas contribute to the degradation of surface water quality. If additional data collection is necessary, a site-specific Quality Assurance Project Plan (QAPP) shall be developed for review and approval by EPA, in consultation with MDEQ, prior to sampling. After the evaluations and data collection activities have been completed, a summary report shall be submitted for review and approval by EPA, in consultation with MDEQ. The summary report shall include the following:

- A summary of all site data (historic and new data).
- A declaration of whether the individual sub-watershed areas are contributing contaminants of concern and impacting Blacktail Creek or Silver Bow Creek water quality.

Remedial Action Work Plans

After the necessary evaluation and sampling are completed, and a summary report is issued and approved, EPA, in consultation with MDEQ, will determine which sites require BMPs. If BMPs are required, a Remedial Action Work Plan (RAWP) shall be generated by the SDs and submitted for review and approval by EPA, in consultation with MDEQ. The RAWP shall define the appropriate BMPs to reduce, or prevent, contaminant loading to the creeks. BMPs sizing will not exceed the 6-month, 24-hour Type I storm volume.

Remedial Action

Remedial action activities shall be performed in accordance with the approved RAWP. An operations and maintenance plan shall be developed as part of the RAWP. Following remedial action, each BMP shall be integrated into a stormwater O&M program, with maintenance requirements and schedules dictated by the type of BMP installed. A construction completion report for the BMPs shall be submitted for review and approval by EPA, in consultation with MDEQ.

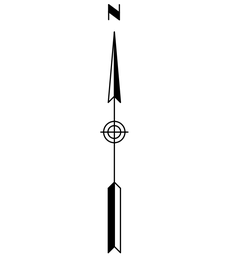
Conceptual

Features, boundaries, and areas indicated are conceptual.

DRAINAGE A
DRAINAGE B
DRAINAGE C
DRAINAGE D
DRAINAGE E
DRAINAGE F
DRAINAGE G
DRAINAGE H
DRAINAGE I
DRAINAGE J
DRAINAGE K
DRAINAGE L

Centennial Avenue
Montana Street
W. Front Street
Kaw Avenue
George Street
Interstate 90
MDT R.O.W.
Greenwood Avenue
Lexington Avenue
Rowe Road
S. Montana Street

FIGURE USFA-1



LEGEND

- UNCAPTURED SURFACE FLOW AREA
- DRAINAGE BASIN
- BPSOU BOUNDARY
- MDT R.O.W.
- MT POLE POND & LTU AREA
- INDUSTRIAL DISCHARGE PERMIT AREA
- RAILROAD PROPERTY

NOTE:
DRAINAGE BASIN DELINEATIONS SHOWN ON THIS FIGURE ARE APPROXIMATE AND SUBJECT TO CHANGE BASED ON FURTHER INVESTIGATION OF EACH INDIVIDUAL BASIN

Figure USFA-1

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Engineering & Environmental Management
1800 W. Koch, Suite 6
Bozeman, Montana 59715
406.586.8384 | www.woodardcurran.com
A Woodard & Curran Company

COMMITMENT & INTEGRITY DRIVE RESULTS

REV	DESCRIPTION	DATE

DESIGNED BY:
DRAWN BY:
CHECKED BY:
BPSOU-UNCAPTURED BASINS*.dwg

BPSOU UNCAPTURED SURFACE FLOW AREAS
REMEDIAL ACTION PLAN

ATLANTIC RICHFIELD
BUTTE, MT

BPSOU UNCAPTURED SURFACE FLOW AREAS

JOB NO.:0231351
DATE: 4/5/2018
SCALE: 400
SHEET: 1 OF 1

24x36 SHEET
1:1

References

BSBC, 2011. Municipal Storm Water Engineering Standards. 2011. Prepared by MMI and WET Technologies, PC. March.

Appendix 1

Table 1: Waste Identification Criteria:

(Source SSTOU)

If three of the six contaminant criteria listed are exceeded or any one contaminant is above 5,000 mg/kg then, the material is considered tailings, waste, or contaminated soil.

Arsenic	200 mg/kg
Cadmium	20 mg/kg
Copper	1,000 mg/kg
Lead	1,000 mg/kg
Mercury	10 mg/kg
Zinc	1,000 mg/kg
Any single analyte above 5,000 mg/kg	

From Field Screen Criteria and Procedures Phase 7 and 8 Remedial Action, SSTOU Subareas 4, Reach R and S (Pioneer 2011). 4 of 6 contaminants need to be below the criteria for area to pass (see MDEQ's "Field Screening Criteria and Procedures Remedial Action SSTOU Subarea 3, Reaches M, N, & O" (January 2013)

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 = 6 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, BRW
   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 and Confluence Area channel and riparian areas including the Blacktail Creek wetland.

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.