Use this worksheet to describe the attainment of the response action objectives in each media.

Response Action Objectives

What was the selected remedy standard for this affected property? ___ A x B

List the environmental media to which this applies: Soil (addressed in this 2016 Soil Response Action Completion Report (2016 Soil RACR)), Groundwater, Surface Water and Stormwater

Repeat this section for each medium that had a different response action objective.

Provide a detailed description of the response action. Describe the removal actions, decontamination actions, treatment system(s), physical or institutional control actions, and any actions for ecological considerations (ecological services analysis and compensatory restoration plans) that were conducted in each media and indicate if there were any differences between the actions taken and the actions proposed in the SIN or RAP.

INTRODUCTION

Due to its complexity, a description of the Site is provided below, prior to the description of the protective concentration level (PCL) exceedance zones (PCLE zones) for soil and the associated response actions.

SITE DESCRIPTION

The Site is located in El Paso, Texas, on the north side of downtown adjacent to the Rio Grande as illustrated on **Figure 1A-1**. The Affected Property Area was shown on Response Action Plan (RAP) Attachment 1A Figure 1 (Arcadis 2016e). The Site has ten Assessment Areas (AAs) that are largely defined by the arroyo drainages that dictate both surface water and groundwater flow across the Site (**Figure 1A-1**). The Site is divided by I-10 with two AAs to the east (East Mountain AA and East Property AA) and eight AAs to the west (Plant Entrance Arroyo AA, South Terrace Arroyo AA, Pond 1 Arroyo AA, Pond 5/6 Arroyo AA, Acid Plant Arroyo AA, a portion of the Parker Brothers Arroyo (PBA) AA, La Calavera (LC) AA, and Floodplain AA. The area referred to as the Plant Site is located between I-10 and Paisano Drive and is composed of six AAs: Plant Entrance Arroyo AA, South Terrace Arroyo AA, Pond 1 Arroyo AA, Pond 5/6 Arroyo AA, Acid Plant Arroyo AA, and a portion of PBA AA. The site includes three other areas: two slivers of land along Paisano Drive, referred to as West Sliver, Paisano and East Sliver, Paisano; and the Texas Custodial Trust (TCT) Pile 1 property adjacent to the Union Pacific Railroad (UPRR) property in the northwestern portion of the lower PBA. **Figure 1A-1** illustrates the site layout and the AAs.

Climate and topography

The climate in the El Paso area is arid, characterized by very low precipitation and relative humidity. Winters are cool; summers are hot and dry. Temperatures range from above 100 degrees Fahrenheit (°F) in the summer months to below freezing temperatures in the winter. Precipitation averages about 8 inches annually, with most of the precipitation occurring between April and September, usually in the form of intense storms. The Site is located within the Rio Grande Valley floodplain between the Franklin Mountains to the northeast and the Cerro De Cristo Rey to the southwest in Mexico. The Site is located at an elevation of approximately 3,700 feet above mean sea level (amsl) near the Rio Grande. Elevations on the Site increase from west to east, with the highest elevation of 4,140 feet amsl in the southeastern portion of the property in the exposed bedrock outcropping of the East Mountain AA.

Soil

The site soils are characterized by nearly level to steep soils that are: 1) shallow or very shallow, overlying caliche; or 2) deep and gravelly throughout (USDA, 1971). The surface soils consist of fill and a mix of sediments generated from erosion of the Campus Andesite and the Franklin Mountains and fluvial sediments from the Rio Grande, with areas of extensive man-placed fill, principally on the Plant Site. Fill material has been found to include slag, native soil, and other anthropogenic materials such as concrete

and asphalt.

Groundwater

Groundwater at the Site occurs within an unconfined alluvial aquifer with a saturated thickness ranging from approximately 8 to 60 feet underlain by a series of regional, less-permeable bedrock units. Groundwater in the alluvial aquifer flows west and southwest, ultimately discharging to the Rio Grande and sections of the American Canal via the Floodplain AA.

Surface Water

The PBA provides most of the drainage for both surface water and groundwater at the Site. Stormwater runoff from the northern portion of the East Mountain AA and from the East Property AA is directed to the PBA via the North and South Arroyos within the Upper PBA. Runoff from the Plant Site is directed to the PBA via the onsite Stormwater Collection and Reuse System (SWCRS), which is operated as a zero discharge facility. Stormwater captured by this network normally evaporates. If discharge is required, testing is performed to ensure that the water quality limits set by the Site Texas Pollutant Discharge Elimination System (TPDES) Multi-Sector General Permit No. TXR050000 (Permit No. TXR05Y986) are met. Treatment is performed to meet these limits if needed, and discharge is through the PBA outfall, SW-5.

East Mountain and East Property AAs

The East Mountain AA is a bedrock outcropping that does not have any groundwater and has steep rocky slopes that are not amendable to future development. The East Property AA is an alluvial basin located north of the East Mountain AA with two arroyo drainages (North Arroyo and South Arroyo) that provide flow to the upper PBA on the west side of I-10. The East Property AA includes localized areas where slag and waste material were placed during historical operations of the ASARCO plant including Area 4, the Category I and II Material Disposal Area (Category I and Category II defined below), and the Category II Material Storage Area as illustrated on **Figure 1A-1**. Aerial deposition of slag crushing activities and stack emissions had limited impact on the remaining portions of the East Property.

Plant Site AAs

The Plant Site is characterized as an extensively disturbed industrial property that has been leveled by filling in the plant-site arroyos with slag, soil, and demolition debris. Some of the materials used to fill the arroyos are sources of chemicals of concern (COCs) to groundwater. All structures associated with the former smelter site have been demolished and removed from the Plant Site. The two stacks were demolished and the remaining concrete was crushed and disposed on site as Category II material. The future land use for the Plant Site will be restricted to Commercial/Industrial (C/I). The presence of subsurface sources of COCs results in the soil-to-groundwater migration pathway influencing risk management decisions for the Plant Site. Groundwater within the Plant Site generally originates on-site.

PBA AA

The PBA is divided by the UPRR track into upper and lower reaches as illustrated on **Figures 1A-1**. The PBA has several potential source areas for COCs including the PBA channel; the Ephemeral Pond; the Fines Pile; the Boneyard; and portions of the Plant Site where the former wastewater treatment plant, former cadmium plant, and former acid storage tanks were located. The Ephemeral Pond is located within the upper channel, while the Fines Pile is located adjacent to the upper channel. The TCT Pile 1 is located in the northwestern portion of the lower reach of the PBA AA, between the UPRR tracks.

LC AA

LC AA comprises an open area adjacent to the PBA as illustrated on **Figure 1A-1**. The LC AA was historically impacted by aerial deposition of dust from the stacks and slag crushing operations, resulting in concentrations of arsenic and lead in surface soil above C/I PCLs; however, COCs have not migrated vertically and do not pose a threat to groundwater. Groundwater within the LC AA is within an arroyo separated from on-site groundwater and sources for potential groundwater impacts.

Floodplain AA and Sliver Parcels Along Paisano Drive

The Floodplain AA is located west of the Plant Site and Paisano Drive, adjacent to the Rio Grande. Similar to the LC AA, the Floodplain AA was impacted by deposition of fugitive dusts from the stacks and slag crushing operations. Lead is present in surface soil of the Floodplain AA at concentrations above its C/I PCL; however, there is no evidence of migration to groundwater. Groundwater flows from the Plant Site and the PBA toward the Floodplain AA. As a result, groundwater in the Floodplain AA is affected by COCs originating from the Plant Site and PBA. The COCs in the groundwater of the Floodplain AA are available for discharge to the Rio Grande.

Two sliver-shaped parcels of land along Paisano Drive are part of the Site as illustrated on Figure 1A-1. The West Sliver, Paisano parcel is located along the west side of Paisano Drive across from the Plant Entrance AA and South Terrace AA. The East Sliver Paisano parcel is located along the east side of Paisano Drive just south of the Plant Entrance AA. Similar to the Floodplain AA, these sliver parcels have been impacted by historical deposition from the stack and smelter operations without evidence of migration to groundwater.

Historical Site Activities

The smelting and refining activities at the Site produced slag and waste materials that contained metals, principally arsenic, cadmium, lead, mercury, and selenium. These metals came into contact with surface soil, subsurface soil, groundwater, and stormwater through use as fill in historic arroyo channels, which are shown on Figure 1A-1, to prepare a level Plant Site and through on-site storage and disposal. The Phase I Remedial Investigation (RI) provided the first documentation of Category I, Category II, and Category III materials to identify final disposal requirements. In accordance with the agreed remedy, these categories are defined below:

- Category I: Soils and solids identified as containing elevated concentrations of COCs and located in an area where they have the potential to affect human health and the environment. Category I soils and solids are identified in the field from the following lines of evidence:
    - Concentrations of COCs three to four times above their respective industrial screening levels (i.e., human health PCLs for surface soil based on direct contact [$^{Tot}Soil_{Comb}$]);
    - Source and location of materials based on current demolition and historical disposal practices (e.g., old waste disposal areas);
    - Debris in the form of fine-grained grey material usually combined with bricks, concrete, wood debris, and slag pieces from demolition of structures that were previously in direct contact with smelter processes;
    - Soil and slag material with staining and, in some cases, odor; and
    - Category I materials can affect groundwater quality.
- Category II: Soils and solids identified as containing elevated concentrations of COCs but at levels that will not affect groundwater if managed properly. Category II soil and solids are identified in the field from the following lines of evidence:
    - Concentrations of COCs above their respective industrial screening levels;
    - Containing large pieces or quantities of slag, stained concrete, bricks and rocks/boulders separated from Category I removals.
- Category III material: Materials that are inert and contain low, if any, concentrations of COCs below their respective screening levels and, therefore, do not pose a threat to human health or the environment.

PCLE ZONES

The *Conceptual Site Model, Pathway Evaluation, and Protective Concentration Level Report* (Arcadis 2016a) identified complete exposure pathways (Section 3.0) and corresponding PCLs (Section 4.0). The exposure pathways for soil include:

- Direct contact ($^{Tot}Soil_{Comb}$) for areas where residential development could occur at the East

Property AA and C/I for the rest of the Site
- Soil-to-groundwater ($^{GW}Soil_{Ing}$) for entire site, except the East Mountain AA due to lack of groundwater
- Soil-to-groundwater-to-surface water ($^{SW\text{-}GW}Soil$) for AAs adjacent to the American Canal and Rio Grande (South Terrace Arroyo AA, Pond 1 Arroyo AA, Pond 5/6 Arroyo AA, Acid Plant Arroyo AA, and PBA AA)
- Ecological based soil ($^{Eco}Soil$) PCL for South Arroyo of the East Property AA
- Soil-to-sediment ($^{Sed}Soil$) for AAs with stormwater runoff discharging to American Canal or Rio Grande

This information on complete exposure pathways was used to to identify PCL exceedance zones (PCLE Zones) for each of the ten AAs.The PCLE zone for COCs in soil at the Site, which is largely driven by the distribution of arsenic, is shown on **Figure 1A-2**.

The response action objectives (RAOs) for Site soil are to eliminate direct exposure to COCs in soil at concentrations above $^{Tot}Soil_{Comb}$ PCLs and to prevent migration of COCs from soil to groundwater and from soil to surface water via stormwater runoff.

RESPONSE ACTIONS

Descriptions of each of the components of the response action are presented below by AA, and supporting information is presented in **Attachments 1C.1 through 1C.8**, also organized by AA. Some response actions pertain to the Plant Site, which includes four entire AAs (South Terrace Arroyo AA, Pond 1 Arroyo AA, Pond 5/6 Arroyo AA, Acid Plant Arroyo AA), and a portion of the PBA AA including the Boneyard. The locations of the AAs are shown on **Figure 1A-1**. Plugging and abandonment of wells is summarized in **Attachment 1C.9**. A schedule of 2017 Soil RACR activities is presented in **Attachment 1C.10**.

SOIL REMOVAL

Soil removal is the principal means of managing Category I materials at the Site as well as Category II material where a cover will not be used. **Figure 1A-3** provides a site-wide summary showing soil removal areas used to prevent direct contact with COCs above PCLs and to prevent stormwater infiltration through these materials, preventing future groundwater impacts.

East Property AA

Response actions for soil of the East Property AA principally involved excavation of affected soil and on-site disposal as either Category I material or Category II material from three areas in the East Property AA (Figure 1 in **Attachment 1C.2.1**) based on the PCLE zones with exceedances for direct contact with residential and commercial/industrial soils (residential and C/I $^{Tot}Soil_{Comb}$). The excavations were conducted in accordance with approved workplans. The workplan for the Cat I Excavation Area-North (also referred to as Area 4) and Cat I Excavation Area-East (also referred to as Category I Removal Area) was included in the RAP as Attachment 2A.5 (Arcadis 2016e). The Texas Commission on Envrionmental Quality (TCEQ) approved that workplan in a letter dated April 18, 2014 (included in **Attachment 1C.2.1**). The workplan for the Former Cat I and II Waste Disposal Area (also referred to as Category II Removal Area), along with acknowledgement of receipt and notice to proceed from TCEQ, was included in the RAP as Attachment 2A.6 (Arcadis 2016e). Category I and Category II excavation and placement activities are summarized below and further described in **Attachments 1C.2.1 and 1C.2.2**.

Category I material was excavated from the East Property AA at the Cat I Excavation Area North/Area 4 and the Former Cat I and II Waste Disposal Area/Cat II Removal Area (Figure 1 in **Attachment 1C.2.1**). TCT extended the excavations vertically and horizontally until residential $^{Tot}Soil_{Comb}$ PCLs were achieved, and through the Category I Excavation-East/Cat I Removal Area until only Category II material remained. TCT collected confirmation samples in these areas. Results of confirmation samples for Cat I Excavation Area-North/Area 4 are presented in Table 1 of **Attachment 1C.2.1** and in **Appendix 4**. The footprint of the Category I Excavation-East/Cat I Removal Area lay entirely within the Former Category I and II Waste

Disposal Area, which was further excavated as described below; therefore, only results for confirmation samples collected after Cat II removal are presented in this 2016 Soil RACR (Table 3 in **Attachment 1C.2.1**). The Category I material was excavated and disposed of in the Cell 4 waste control unit (WCU), which was designed, approved, and constructed for this purpose (Malcom Pirnie, 2013a through 2013f). The design and construction of approved liner and cover systems (TCEQ 2014) is intended to contain the Category I material and prevent future discharge of COCs to groundwater and surface water.

Category II material can be left on-site as long as it is properly managed. Following the removal of Category I material from the Former Cat I and II Waste Disposal Area/Cat II Removal Area, Cat II material was excavated from the area and placed in the new Category II Material Storage Area on the East Property AA illustrated on Figure 3 in **Attachment 1C.2.1**.

In the new Category II Material Storage Area, TCT scraped the area within the footprint shown on Figure 3 in **Attachment 1C.2.1**, collected confirmation samples for analysis according to the grid (Table 3 in **Attachment 1C.2.1**).

During soil removal activities and characterization sampling within the East Property Former Cat I and II Waste Disposal Area/Cat II Removal Area, reported results for selenium (Se) in soil samples within the 100-year floodplain in the South Arroyo exceeded the Texas Risk Reduction Program PCL for residential soil. This area is referred to as the "Se removal area". TCT excavated selenium-impacted soil from this area and transported the material to the Cat II Stockpile/Storage Area. Confirmation sampling conducted in July 2015 verified attainment of the residential direct contact ($^{Tot}Soil_{Comb}$) PCL for selenium (Table 4 and Figure 5 in **Attachment 1C.2.1**).

A small number of samples from the Former Cat I and II Waste Disposal Area and Area 4 exceeded the USEPA-method holding times for mercury. The delay in analysis was associated with a request for and approval of site-specific arsenic PCLs for the East Property soil removals. The missed hold times resulted in the data being flagged as estimated, biased low. While the reported results were well below the PCLs (sometimes an order of magnitude or more), location A4-C6 will be resampled during 2017 to confirm that the results are definitive.

In addition, TCT conducted a screening level ecological risk assessment (SLERA) (Appendix M of the *Conceptual Site Model, Pathway Evaluation and Protective Concentration Level Report* (Arcadis 2016a). Based on the lowest observable adverse effect level-based, less-conservative Hazard Quotients calculated in the SLERA (Arcadis 2016a), selenium was not considered to be a risk for the South Arroyo in the East Property AA. Furthermore, as noted in RAP Worksheet 1.0 (Arcadis 2016e), representative concentrations of COCs remaining in soil after excavation were calculated using the 95 percent Upper Confidence Limits (UCLs) on confirmation sample results. The representative concentration calculated for each constituent of concern was below both the human health-based and ecological-based PCLs. Therefore, the excavations of the Category II Material Removal Area in the South Arroyo achieve protection of ecological receptors through compliance with ^{Eco}Soil PCLs and no controls are required for this area.

Plant Entrance Arroyo AA

TCT identified a PCLE zone in soil along the roadway in the Plant Entrance Arroyo based on concentrations of arsenic and lead, as noted in RAP Worksheet 2.0 and on RAP Figure 6 (Arcadis 2016e). A pump station and railroad structures are located in this steeply sloped area that also supports numerous trees. A roadway is located at the top of the slope. Although a larger area was anticipated to be excavated in the RAP, TCT excavated a more limited area as shown on Figure 1 in **Attachment 1C.3** to retain stability of the slope, roadways and railroad infrastructure. TCT excavated soils to a depth of 1 to 2 ft below ground surface (bgs) and collected a 5-point composite confirmation sample to verify that remaining soil is below the PCLs for direct contact with commercial/industrial soils (C/I $^{Tot}Soil_{Comb}$) as shown on **Figure 1A-3**. Results are presented in Table 1 of **Attachment 1C.3**. Excavated soil was placed beneath the evapotranspirative (ET) soil cover on the Plant Site. **Attachment 1C.3** provides additional information on these activities.

Plant Site AAs

The Plant Site includes four entire AAs (South Terrace Arroyo AA, Pond 1 Arroyo AA, Pond 5/6 Arroyo AA, Acid Plant Arroyo AA), and a portion of the PBA AA including the Boneyard, as illustrated on **Figure 1A-1**. The response action for the Plant Site included localized excavations to meet chemical-specific PCLs for inhalation (polychlorinated biphenyls [PCBs]), regulatory requirements (Toxic Substance Control Act [TSCA]), and site drainage requirements, as illustrated on **Figure 1A-3**. Limited hot spot excavations were completed on the western Plant Site slopes. Activities are summarized below by AA and further described in **Attachments 1C.4.1 through 1C.4.6**.

Plant Site AAs: South Terrace and Pond 1 Arroyo AAs

TCT identified a PCLE zone at the former Antimony Processing Building and the storage yard to the south.

Notice of Registration Waste Units

Thirty-five active or inactive waste units are present in the NOR with 21 units having hazardous waste codes associated with them as illustrated on Figure 14 of the RAP (Arcadis 2016e). Waste units will be closed as part of the response action for the Site. Seven waste units require characterization: 012, 019, 021, 022, 024, 028, and 032 (Figure 1 of this attachment).

The characterization and closure of unit 012 is described in the NOR Closure Report (Malcolm Pirnie (2015) included as RAP Appendix 3.5 (Arcadis 2016e)). In addition, Unit 12 was located within the Storage Yard where soil was excavated and confirmation sampling performed (see Section 1C.5). A summary of activities regarding the other six waste accumulations areas is presented in **Attachment 1C.4.6**. At NOR Units 019 (Container Storage Area Security Bunker Building) and Unit 024 (Container Storage Area/Satellite Accumulation Area Units, laboratory analytical results for concrete samples include C/I PCL exceedances for antimony, arsenic, and/or cadmium. TCT will conduct additional concrete and/or soil cleaning, removal and confirmation sampling in 2017.

Former Antimony Processing Building

The storage yard and gas utility lines were shown on figures in RAP Attachment 2A.14, and the PCLE zone is shown as a soil removal on **Figure 1A-3** in this 2016 Soil RACR. Soil that sloughed onto the asphalt parking surfaces and building foundations from demolition activities, contained concentrations of COCs above C/I $^{Tot}Soil_{Comb}$ PCLs for antimony, arsenic, cadmium, and lead. TCT removed impacted soils by removing stockpiles from concrete and asphalt areas, wetting the exposed surface and using an industrial sweeper to remove remaining soils. TCT placed excavated and swept material in Cell 4. **Attachment 1C.5** provides additional details.

Storage Yard

At the Storage Yard, reported concentrations of COCs in soil samples were above C/I PCLs and $^{SW\text{-}GW}$Soil PCLs for copper, iron, lead, mercury, and selenium. Characterization data for COCs in surface soil were presented in Tables 2 and 3 of RAP Appendix 2.5 (Arcadis 2016e). The PCLE zone extended over much of the storage yard and the high pressure gas utility easement along the eastern boundary of the storage yard adjacent to UPRR property.

Between July 2015 and January 2016, TCT excavated soil in an area within the Storage Yard ranging in depth from 1 ft to 10 ft thick and transported the Category II material from the Storage Yard to the South Pad to use as subgrade material under the ET cover. After excavation, TCT collected a 5-point composite sample from each 50-ft by 50-ft grid square, shown on Figure 1 of **Attachment 1C.5**. Analytical results for these confirmation samples (Table 1 in **Attachment 1C.5**) show two exceedances of the PCL for copper and one exceedance of the PCL for iron. Additional excavation will be performed in 2017 at the locations of the copper exceedances until confirmation sampling shows the achievement of the $^{SW\text{-}GW}$Soil PCL.

The iron exceedance was considered as a suspected outlier compared to the other measured results for iron. An outlier evaluation was performed using the Dixon's test at 95 percent confidence using the United States Environmental Protection Agency (USEPA) statistical software ProUCL (USEPA 2015), and the results were confirmed to be statistically significant at 95 percent confidence, indicating that this result was an outlier (Table 2 in **Attachment 1C.5**). Given that this result is an outlier, no further response

actions are required at this sample location. Additional details are presented in **Attachment 1C.5**. A 440 V powerline is located on the ground surface in the eastern portion of this area. This powerline is scheduled for removal in 2017. Following powerline removal, TCT will excavate the remaining impacted soil in this area to $^{SW\text{-}GW}$Soil PCLs and place the material on the South Pad prior to placement of the final cover.

The PCLE Zone extends to a utility easement for a high pressure gas line along the eastern boundary of the storage yard. The presence of the gas line prohibits excavation to PCLs in this area. A surface sealant will be applied within the utility easement to prevent infiltration from occurring through soils with concentrations of COCs above their respective $^{SW\text{-}GW}$Soil PCLs.

Plant Site AAs: Pond 5/6 Arroyo and Acid Plant Arroyo AAs

Polychlorinated Biphenyl-Impacted Soils

The PCB Investigation Work Plan (Malcolm Pirnie 2012) and analytical characterization data were presented in RAP Appendix 3.3 (Arcadis 2016e). The TCT's letter to TCEQ regarding excavations and disposal of soil from the Powerhouse (AE11) and other locations (AE5 and PCB03) impacted by PCBs ((Malcolm Pirnie 2014b), included in RAP Appendix 3.3 (Arcadis 2016e)) demonstrated that PCBs were delineated vertically and laterally to the C/I PCL of 7.1 mg/kg at sample location AE11.

Two areas, sample locations AE5/PCB02 and sample location PCB03 had concentrations of PCBs in soil above the C/I $^{Tot}Soil_{Comb}$ PCL, as illustrated on Figure 2 in RAP Appendix 3.3 (Arcadis 2016e). TCT has performed limited excavations in these areas. PCB-containing soil from these two areas was disposed offsite as hazardous waste, consistent with TSCA and Resource Conservation and Recovery Act requirements. As shown on Figure 1 of **Attachment 1C.4.1**, remaining work in 2017 includes investigation sampling at threelocations (ERM11, ERM14, and AE2) and delineation, excavation, and confirmation sampling at AE5. Activities are further described in **Attachment 1C.4.1**.

Historical Category I Material Fill Areas

TCT excavated above-grade Category I material from the Cell 3 WCU in the Pond 5/6 Arroyo AA, moved the material to the Cell 4 WCU and constructed an ET cover for the Cell 3 WCU, as described in the workplan presented in RAP Attachment 2A.2 (Arcadis 2016e) and in **Attachment 1C.4.3**

Parker Brothers Arroyo AA

TCT removed Category I and II soil from six areas in the PBA AA, based on the PCLE zone exceedances of the C/I $^{Tot}Soil_{Comb}$ PCLs. These areas, shown on Figure 1 in **Attachment 1C.6** include:

1. The Cell 4 WCU footprint
2. Lower PBA Channel
3. Area 12 (located within Upper PBA)
4. TCT Pile 1
5. Plant site areas within the PBA containing Category I materials
6. Area adjacent to the Fines Pile

After constructing the Cell 4 WCU and receiving approval from TCEQ, TCT disposed of excavated Category I materials in Cell 4. Category II material was used as subgrade on the Plant Site. Removal activities in each of the six areas is described below.

Cell 4 Landfill

TCT excavated the footprint of the Cell 4 WCU, removing Category II slag material (and achieving the design specifications for the landfill described in Malcolm Pirnie (2011a) (RAP Attachment 2A.1). The removal of Category II material from the WCU footprint is further described in **Attachment 1C.6.1**.

Lower PBA Channel

The Lower PBA channel excavation design was based on soil boring data and test pits detailing the subsurface distribution of arsenic that could continue to provide a source of contamination to groundwater

in the Lower PBA. TCT characterized the lateral and vertical extent of leachable arsenic in subsurface material and estimated that approximately 110,000 cy of material would be removed and managed as Category II material on the Plant Site (Malcolm Pirnie 2011d)(RAP Attachment 2A.3). TCT excavated the Lower PBA Channel, removing all Category II material (primarily slag), to the Plant Site for use as subgrade material beneath the future cover.This work was performed in accordance with the design for excavation of the PBA channel (Malcolm Pirnie 2011c) (RAP Attachment 2A.3).

Following excavation, TCT collected soil samples to document metals concentrations in the remaining ground surface prior to backfill. The removal of Category II material from the Lower PBA channel footprint is further described in **Attachment 1C.6.1**.

Area 12

In 2006 ASARCO excavated the PCLE Zone in the portion of the Upper PBA between the UPRR tracks and the TxDOT property along I-10 shown on a figure included in RAP Attachment 2A.8 ("Figure 3-10 Investigation Area 12 (Ephemeral Pond and Pond Sediment Storage Area)" (Hydrometrics No date)).

Plant Site portion of PBA AA

In the Plant Site portion of the PBA AA, TCT excavated specific areas near the former Acid Plant (in Acid Plant AA and in the PBA AA just north of the Acid Plant AA) where Category I materials were identified. Figure 2 in RAP Attachment 2A.4 provided an illustration of Category I Material identified on the Plant Site within the PBA AA. Category I materials were removed from this area and disposed of in the Cell 4 WCU. Additional removals (illustrated on RAP Figure 17 and **Figure 1A-3** of this 2016 Soil RACR) occurred on the Plant Site within the PBA as part of the effort to level the property prior to construction of the North Pad ET soil cover. These excavations were necessary to provide appropriate drainage and a level surface for future construction. Additional detail regarding these activities is provided in **Attachment 1C.4 Introduction**.

Adjacent to Fines Pile

TCT identified areas with elevated COCs in an area between the Fines Pile and the Asarco Cemetery as shown on RAP Figure 17. TCT excavated surface soil to depths between 0 and 2 feet bgs. TCT used x-ray fluorescence (XRF) to estimate metals concentrations in soil and determine excavation limits. After XRF results indicated that the C/I PCLs had been achieved, TCT collected confirmation samples on a 50-ft sampling grid, as illustrated in RAP Attachment 2A.9, Drawing 1 and **Figure 1A-3** of this 2016 Soil RACR. Excavations brought this area into compliance with requirements under the Texas Risk Reduction Program (TRRP). Additional detail is provided in **Attachment 1C.6.4**.

TCT's Portion of Pile 1

TCT submitted a letter to TCEQ regarding Notification of Removal and Cover Activities Planned for TCT's portion of Pile 1 (Arcadis 2016f) included in RAP Attachment 2A.18 (Arcadis 2016e). Following TCEQ's acknowledgement of receipt and notice to proceed (TCEQ 2016, **Attachment 1C.6.5**), TCT removed primarily slag material from the shoulders of a ramp extending up to UPRR railroad property. On the lower eastern portion of the area adjacent to the BNSF railroad tracks, TCT removed the slag to native soil and collected confirmation samples to demonstrate that C/I PCLs were achieved as shown on **Figure 1A-3**. TCT placed and compacted this Category II material on the north portion of the South Pad on the Plant Site. On the western portion of the area, TCT placed an ET cover on the ramp. This response action is further described in **Attachment 1C.6.5**.

La Calavera AA

TCT identified PCLE zones in surface soil in the LC AA based on concentrations of arsenic and lead above their respective C/I $^{Tot}Soil_{Comb}$ PCLs. TCT excavated Category 1 material to depths between 0 and 2 feet bgs from a former ASARCO disposal site north of the ASARCO Cemetery. TCT disposed of this material in Cell 4. TCT used XRF to monitor the progress of the removal. When soil, within a 50-ft sampling grid as illustrated in RAP Attachment 2A.9, Drawing 2, contained metals concentrations below the C/I PCLs, TCT collected confirmation samples for laboratory analysis. Analytical results are shown in Table 1 of the Parcel 13 Closure Report (Arcadis 2016d) in **Attachment 1C.6.4**.

In addition, TCT removed scattered slag and debris from a relatively small area west of the ASARCO Cemetery as well as a 50-ft square area in the vicinity of a PCL exceedance shown on RAP Figure 9. This activity is further described in **Attachment 1C.7**. These excavations brought LC AA into compliance with requirements under TRRP.

Floodplain AA and Paisano Drive

As illustrated on RAP Figure 4, site characterization data for the Floodplain AA and the two slivers of TCT property along Paisano Drive (West Sliver, Paisano and East Sliver, Paisano) indicated localized elevated concentrations of lead in the first 1.5 feet of soil.

Floodplain AA

In the Floodplain AA TCT removed soil exceeding the C/I PCL as shown on RAP Figure 9 and **Figure 1A-3** of this 2016 Soil RACR and placed the excavated soil in Category II areas of the Plant Site prior to cover construction. In 2017, TCT will remove soil from one additional 50-ft by 50-ft area in the Floodplain AA (**Figure 1A-3**) to a depth of 1 ft. After XRF results indicate that the C/I PCLs have been achieved, TCT will collect confirmation samples. The response action is further described in **Attachment 1C8.1**.

West Sliver, Paisano Drive

No further action is required in the West Sliver, Paisano because results of soil sampling do not exceed the PCLs for metals in residential soil as described in **Attachment 1C.8.2**.

East Sliver

In 2017, the East Sliver, Paisano parcel will require a minimal removal of the top 0.5 ft of surface soil near two sample locations in the northern portion of the parcel which exceed the C/I PCL for lead (**Figure 1A-3**). The response action is described in **Attachment 1C8.3**.

COVER PLACEMENT

Soil covers are the principal means of managing Category II materials at the Site. **Figures 1A-4** and **1A-5** provide a site-wide summary of covers used to prevent direct contact with COCs above PCLs and to prevent stormwater infiltration through Category II materials, thereby preventing future groundwater impacts. In addition to placing covers in areas with elevated COCs to manage soils, institutional controls are being established to protect the integrity of the physical control and to perform operation, maintenance, and monitoring (OM&M) required for long-term performance. Covers used as part of the site-wide response action for each AA are described below.

East Property AA

Category II Material Storage Area

TCT established a Category II Material Storage Area in the East Property by grading the area, placing demarcation fabric within the footprint, and placing Category II material from both the Former Cat I and Cat II Waste Disposal Area and the Cat II Storage Area in the South Arroyo on the demarcation fabric. Because groundwater resources at the Site are Class 2 under TRRP, COCs in the soil of the Category II Material Storage Area can be managed in-place to meet requirements of TRRP by installing a physical barrier against direct contact and water infiltration [30 TAC §350.33(b)]. The ET soil cover will have a maximum infiltration rate of 0.19 cm/yr (same as other Category II areas), providing sufficient protection against potential leachate that might impact groundwater beneath the Category II Material Storage Area. Design of the cover system includes drainage improvements to prevent ponding of stormwater runoff on the cover. Letters to and from TCEQ regarding this area are included in **Attachments IC.2.1 and 1C.2.2**.

In the RAP, TCT proposed to place the first ft of clay-enhanced silty-sand cover soil on the outer slopes and top deck of the Category II Material Storage Area in 2016, and place the remaining 1.5 feet of silty-sand material and 0.5 ft of desert armor in 2017; however, scheduling constraints dictated that TCT delay placement of cover materials from 2016 to 2017. Consequently, TCT will place the 3-ft cover and

construct drainage improvements in 2017 (**Figure 1A-5**). TCT will document these activities in the 2017 Soil RACR. Activities planned for 2017 are further described below and in **Attachment 1C.10**.

Because the Category II Material Storage Area does not have a liner, groundwater beneath the covered surface must be monitored. Groundwater monitoring well EP-94, which was completed within the footprint of the covered Category II Storage Area, will be monitored to determine the effectiveness of the cover in controlling leachate to groundwater. Details of the groundwater monitoring program for the Category II Storage Area are presented in RAP Worksheet 3.1 (Arcadis 2016e). Finally, an institutional control will be added to the property over the footprint of the Category II Material Storage Area that restricts land use to C/I activities and notifies future developers of the presence of the soil cover and the impacted material beneath it. An institutional control will also be placed that requires any future development to maintain the maximum infiltration rate of 0.19 cm/yr, prevent stormwater ponding on the cover, and obtain approval for proposed development by the TCEQ.

Area Within 100-Year Floodplain of South Arroyo

In the RAP TCT proposed to use Rio Grande floodplain soil from the International Boundary Water Commission to place a soil cover within an area in the 100-year floodplain of the South Arroyo to restore the area's ecological value; however, this soil was not available for natural restoration of the wetland. Instead, TCT graded the area to have positive drainage. Since completion of removal and grading activities, the area has begun to revegetate naturally. If needed to supplement this natural revegetation, TCT will seed this area using a USACE-approved seed mixture. Lastly, an institutional control is being implemented, restricting land use to commercial/industrial use.

Plant Entrance Arroyo AA

TCT identified a PCLE zone in soil along the roadway in the Plant Entrance. A limited quantity of soil was removed as summarized under Soil Removal and described in Attachment 1C.3. In 2017 TCT will apply surface sealant to the steep portion of the PCLE zone in this AA as shown on **Figure 1A-5**.

TCT identified a PCLE zone in soil surrounding the lined stormwater retention pond, also referred to as the Rubber Pond, shown on Figure 2-1 in RAP Appendix 2.5, based on concentrations of arsenic and lead. Most affected soil was delineated down to 1 ft bgs; however, several sample locations had elevated concentrations of arsenic and lead down to 2 feet bgs (Table 1 and Figure 2-1 in RAP Appendix 2.5). The steep slopes and stormwater runoff from the Plant Site make removal less feasible for addressing soils with elevated concentrations of COCs in areas around the pond. Therefore, in 2017 TCT proposes to apply a surface sealant to the PCLE zone around the stormwater pond as shown on **Figure 1A-5**.

COCs in soil at the Plant Entrance Arroyo AA do not pose a potential risk to groundwater quality, so no additional monitoring wells are recommended for this area. Institutional controls will be placed on the property deed as part of the remedy for this area (RAP Appendix 4, Arcadis 2016e). The institutional controls will restrict land use to C/I development, provide notice of the presence of the sealant, and limit development.

Plant Site AAs

As illustrated on **Figure 1A-2**, the Plant Site AAs fall within the soil PCLE zone. To prevent stormwater infiltration through Category II materials, TCT proposed installation of covers at the Plant Site. Final covers in the Plant Site area include existing asphalt pavement, concrete foundations, Category II material asphalt cover, Cell 1 WCU landfill liner and cover, stormwater pond liner, asphalt drive/parking area, low permeability flexible membrane liner (FML) cover, ET soil cover, or other low permeability cover (**Figures 1A-4 and 1A-5**). Cover placement activities are summarized below and further described in **Attachments 1C.4.1 through 1C.4.5.**

Following plant demolition and the disposal of Category I material into Cell 4, TCT used structural fill to backfill basements, pits, and trenches (**Attachment 1C.4.2**) and abandoned utilities and backfilled vaults (**Attachment 1C.4.4**). The Plant Site has been divided into a South Pad (South Terrace Arroyo AA and Pond 1 Arroyo AA) and a North Pad (Pond 5/6 AA and Acid Plant AA). Cover placement activities in these areas are summarized below and further described in **Attachment 1C.4.5**.

Groundwater monitoring wells will be retained within the Plant Site cover footprint to monitor the performance of the cover system. Both groundwater quality and groundwater elevation data will be evaluated to determine the performance of the cover with regard to preventing leachate generation and reducing groundwater gradient to control off-site migration. RAP Worksheet 3.1 (Arcadis 2016e) provides details of the monitoring program.

South Pad

TCT has placed and compacted Category II/III materials as subgrade for the South Pad, installed a demarcation fabric on top of this Category II/Category III material, and begun placing the final cover as shown on **Figure 1A-4** and further described in **Attachment 1C.4.5b**. Activities remaining for 2017 include placement and compaction of 1 ft of clayey soil and 2 ft of sandy soil in the far northern and southern portions of South Pad and one drainage swale as shown on **Figure 1A-5** and further described in **Attachment 1C.4.5b**.

An institutional control will be placed on the property deed that requires any future development to maintain the maximum infiltration rate of 0.19 cm/yr, to prevent stormwater ponding on the cover, and to obtain approval of proposed development by the TCEQ (RAP Appendix 4, Arcadis 2016e).

North Pad

TCT has placed and compacted Category II/III materials as subgrade for the North Pad. TCT installed a demarcation fabric on top of this Category II/Category III material, installed geofabric and placed 1 ft of clayey soil and up to 2 ft of desert armor on slopes, and placed the final cover (1 ft clayey soil and 2 ft. sandy soil) on the top deck. Additionally, TCT constructed the lined North Stormwater Detention Pond and lined drainage swales as shown on **Figure 1A-4** and further described in **Attachment 1C.4.5b**.

An institutional control will be placed on the property deed that requires any future development to maintain the maximum infiltration rate of 0.19 cm/yr, to prevent stormwater ponding on the cover, and to obtain approval of proposed development by the TCEQ (RAP Appendix 4, Arcadis 2016e).

Storage Yard

To minimize infiltration in the Storage Yard located along the eastern boundary of the South Terrace/Pond 1 Arroyo AAs, TCT will compact and re-vegetate the area. Soils with COCs above their respective C/I $^{Tot}Soil_{Comb}$ and $^{SW\text{-}GW}$Soil PCLs were removed. Drainage improvements will be installed to prevent ponding of stormwater in the area. An institutional control will be placed for any development to prevent ponding in the area.

An area along the eastern edge of the Storage Yard cannot be excavated due to the presence of the buried gas line. To prevent infiltration from occurring through soils with concentrations of COCs above their respective $^{SW\text{-}GW}$Soil PCLs, TCT will apply surface sealant to the surface overlying the gas line and extending approximately 15 feet to the west.

Cell 3 WCU

To establish a flat surface on the Plant Site for the final cover, TCT removed the Cell 3 temporary cover and top layer of Category I material to an appropriate elevation and installed a cover compliant with closure requirements to establish the landfill as a WCU (**Attachment 1C.4.3**).

In 2017 TCT will apply surface hardscape improvements adjacent to SWPS-2, east of Cell 3 WCU as shown on Drawing C-7 Sheet 9 of 20 in **Attachment 1C.4.5**.

Existing Category II Asphalt Cover

The Category II asphalt cover design provides an effective barrier against both direct contact and water infiltration. An institutional control will also be placed on the property deed that alerts the developer to the presence of affected materials beneath the asphalt and requires future development to maintain the maximum infiltration rate of 0.1 cm/yr, to prevent stormwater ponding on the cover, and to obtain approval of proposed development by the TCEQ (RAP Appendix 4, Arcadis 2016e).

Existing Asphalt Pavement

The existing pavement provides an effective barrier against both direct contact and water infiltration. TCT will make appropriate repairs to existing asphalt pavement in 2017. An institutional control will also be placed on the property deed that alerts the property owner to the potential presence of impacted materials beneath the asphalt and requires maintaining the pavement to retain the effectiveness of the barrier. The institutional control will also require that any future development of areas with existing asphalt paving be designed to retain the maximum infiltration rate of 0.1 cm/yr, to prevent stormwater ponding on the cover, and to obtain approval by the TCEQ (RAP Appendix 4, Arcadis 2016e).

Other Structures

Existing structures located within the Plant Site include concrete foundations, four lined stormwater ponds (one of which is new), and the Cell 1 and Cell 2 WCUs. These structures provide an effective barrier against both direct contact and water infiltration. An institutional control will be placed on the property deed that alerts the property owner to the potential presence of affected materials beneath these structures and requires approval by the TCEQ for any re-development (RAP Appendix 4, Arcadis 2016e).

Portions of the Plant Site Within the PBA

Several facilities at the Plant Site are located in the PBA AA, including the Boneyard (Drawing C-7 Sheet 9 of 20 in **Attachment 1C.4.5b**), Boneyard Channel (south of, and adjacent to Boneyard), and Little Mesa (south of, and adjacent to Boneyard Channel). In 2017, TCT will construct ET soil covers compliant with the TCEQ-approved design at the Boneyard, Boneyard Channel, and Little Mesa as further described in **Attachment 1C.4.5**.

For the Boneyard, access to the material within the Boneyard will be maintained for potential future recovery of metals should technology make this feasible. Institutional controls will be established to protect the integrity of the cover system until the material is removed in the future for potential recovery of metal assets.

Similar to other areas with soil covers and no liners, groundwater quality data will be collected from monitoring wells within the Boneyard to evaluate the effectiveness of the ET cover system.

Western Plant Site Slopes

TCT will apply slope stabilization and drainage improvements on the western Plant Site slopes to control direct contact risk and potential migration of impacted soil in stormwater runoff.

An institutional control will be required to maintain drainage features, to restrict land use to C/I, to prohibit groundwater usage, and to provide notice of the Plume Management Zone (PMZ).

PBA AA

Figure 17 of the RAP provided an illustration of the Upper and Lower PBA with five areas requiring covers over PCLE zones based on C/I $^{Tot}Soil_{Comb}$ PCLs and $^{SW\text{-}GW}$Soil PCLs: the Cell 4 WCU, the Fines Pile, the Boneyard (described above in the subsection on the Plant Site), and TCT's portion of Pile 1 . TCT has installed or will install covers at each of these areas as summarized below, as further described in **Attachments 1C.6.1 through 1C.6.5,** and as shown on **Figures 1A-3 and 1A-4**.

Cell 4 WCU

Prior to landfill construction, ASARCO used the northwestern portion of the Plant Site for the storage of slag and debris including concrete, wood, and scrap equipment. As part of the response action for the area, TCT removed Category II material from the area (**Attachment 1C6.1**). TCT then prepared the area as a subgrade for Cell 4, installed a liner and constructed the WCU as a repository for plant demolition debris (excluding recycleable materials such as scrap steel) and ASARCO-generated waste (Category I material) (**Attachment 1C.6.2**). TCT will install the approved cover system for the Cell 4 WCU in 2017 (**Figure 1A-5**). Letters to and from TCEQ regarding the final design are included in **Attachment 1C.6.2**.

Institutional controls will be placed on the property deed requiring inspection and maintenance activities to ensure the cover's integrity (RAP Appendix 4, Arcadis 2016e).

Fines Pile

TCT has performed extensive grading of the Fines Pile area to prevent ponding of stormwater runoff on its surface and thereby eliminate the potential for infiltration through the material of the Fines Pile and down to groundwater. TCT will complete placement of an ET soil cover system (initiated in 2016), including desert armor, in 2017. The cover will comply with the approved design described in letters to and from TCEQ in **Attachment 1C.2.2** and **Attachment 4.5b**. These activities are further described in **Attachment 1.6.4**.

The closure of the Fines Pile will include placement of an institutional control on the property deed to restrict future development over the area (RAP Appendix 4, Arcadis 2016e). The Fines Pile does not have a liner system; therefore, groundwater monitoring will be required from wells located within the footprint of the area. Groundwater monitoring for the Fines Pile is discussed further in RAP Worksheet 3.1 (Arcadis 2016e).

TCT's Portion of Pile 1

Within the PBA, the Pile 1 area included piles of slag adjacent to a ramp that ascended from a northern truck access road adjacent to Paisano Drive and the BNSF railroad tracks to the UPRR property between UPRR railroad tracks and the trestles that extend across the Rio Grande River. UPRR owns the property adjacent to their tracks on the north and south side of the TCT portion of the property. TCT removed Category II material (slag) from both UPRR's portion and TCT's portion of Pile 1. In the ramped eastern portion of TCT's portion of Pile 1, TCT removed slag, graded the area, placed a demarcation fabric to identify the top of slag, and constructed an ET soil coverconsisting of 1 ft of clay, 1.5 ft of silty sand, and 0.5 ft of desert armor.

In the lower western portion of TCT's portion of Pile 1 near the BNSF railway tracks, TCT removed slag to native soil. Confirmation sample results demonstrated that the remaining soil surface meets C/I PCLs. These activities are further described in **Attachment 1C.6.5**.

LINER PLACEMENT AND CHANNEL/SLOPE STABILIZATION

Stormwater Control and Slope Stabilization

The construction and operation of the SWCRS has successfully maintained control of stormwater discharges from the Plant Site since 2001. The cover design for the Pond 5/6 and Acid Plant Arroyo AAs (North Pad) includes grading and drainage plans that direct on-site stormwater runoff to a new, lined stormwater retention pond in the northern ET soil cover footprint, as illustrated on **Figure 1A-4**. No stormwater runoff will be directed to the slope on the west side of the Pond 5/6 Arroyo or Acid Plant Arroyo AAs. On-site slope stabilization in the form of sealants will be used to reduce the potential for erosion of the slopes adjacent to the Pond 5/6 Arroyo and Acid Plant Arroyo AAs. The stabilization of these slopes will protect the site from off-site migration based on entrainment of soil particles with elevated concentrations of COCs.

Liners and Channel/Slope Stabilization

To address multiple exposure pathways for COCs from the Site including direct contact, migration to groundwater, entrainment in stormwater runoff, and deposition of sediment, TCT has installed liners and implemented channel/slope stabilization measures at locations shown on **Figure 1A-4** and **Figure 1A-5**. Liners and channel stabilization have been, or will be, applied in four areas: 1) Upper PBA Ephemeral Pond and Triangle Area west of I-10, 2) Lower PBA channel and northern Plant Site slopes, 3) Plant Entrance, and 5) western Plant Site slope and drainage. These areas are described below.

Upper PBA/Ephemeral Pond and South Arroyo

As illustrated on Figure 1 of **Attachment 1C.6**, the Upper PBA channel extending along the Fines Pile includes the Ephemeral Pond. The Catagory II sediment in the occasionally inundated Ephemeral Pond has been identified as a source of groundwater contamination in the PBA; however, excavation as a means of source control is not an option due to the presence of a large-diameter, high-pressure gas pipeline in the area of concern. The response action, therefore, was to cap the sediment in-place. TCT placed and compacted a layer of clean fill followed by a liner and a nonwoven geofabric to prevent

infiltration of surface water into the channel. TCT then placed riprap over the liner to slow stormwater flow and promote settling of sediment. The response action is further described in **Attachment 1C.6.4**. TCT will complete installation of these measures in 2017.

In addition to this more northern branch of the upper PBA which is downstream from the North Arroyo, a similar response action was performed downstream of the South Arroyo and west of I-10 in an area called the Triangle Area, as described in **Attachment 1C.6.4**.

Lower PBA Channel

To prevent future erosion and migration of COCs in stormwater runoff, and to provide a barrier against surface water infiltration and further reducing the groundwater gradient in the PBA, TCT stabilized the lower PBA channel. To remove source material and establish a suitable surface, TCT excavated Catagory II material from the lower PBA channel . Subsequently, TCT constructed a lined, stabilized channel as part of the final response action. On the slopes, TCT placed geotextile and articulated concrete block (ACB) over the liner. In the channel bottom, TCT placed geotextile and riprap for channel stabilization. TCT made additional improvements to the outlet of the lower PBA, where stormwater flows to a stormwater catch basin to the east of the BNSF railroad tracks and Paisano Drive. These activities are further described in **Attachment 1C.6.3** and **Attachment 1C.6.4**.

The northern Plant Site slopes are adjacent to the southern bank of the Lower PBA. These slopes were graded for drainage and will be stabilized in 2017 using a spray-on surface sealant.

Plant Entrance

As noted above in the sections on Soil Removal and Cover Placement, TCT identified a PCLE zone in soil along the roadway in the Plant Entrance. A limited quantity of soil was removed as described under Soil Removal and **Attachment 1C.3**. In 2017 TCT will apply a surface sealant to the steep portion of the PCLE zone in this AA as shown on **Figure 1A-5**.

As noted above in the section on Cover Placement, TCT identified a PCLE zone in soil surrounding the lined stormwater retention pond, also referred to as the Rubber Pond, shown on Figure 1 in RAP Appendix 2.5, based on concentrations of arsenic and lead. The steep slopes and stormwater runoff from the Plant Site make removal infeasible for addressing soils with elevated concentrations of COCs in areas around the pond. Therefore, in 2017 TCT proposes to apply a surface sealant to the PCLE zone around the stormwater pond as noted in **Attachment 1C.3** and shown on **Figure 1A-5**.

Western Plant Slopes and Drainage

On steep slopes such as the western slopes of the Plant Site, infiltration and groundwater impacts are not considered a complete exposure pathway for these areas. The slopes also represent areas where direct contact with impacted soils is a low probability due to the presence of the off-site active rail line at the toe of the slope and slope steepness. The slopes do pose a risk to stormwater from entrainment of soil particles in runoff. Management of COCs in soil from the slope areas, therefore, is being pursued through the application of stabilization materials.

During completion of site covers in 2017 (**Figure 1A-5**), TCT will install curbs and establish drainage that directs stormwater runoff away from the western slopes of the Plant Site, effectively controlling potential erosion from the top of the slope. In 2017, TCT will conduct limited excavations where access is practical and apply slope stabilization to the western Plant Site slopes to control potential migration of impacted soil in stormwater runoff. TCT will apply a surficial sealant (see Attachment 2A.17 of the RAP for product information) to stabilize the on-site slopes with the goal of reducing the potential for erosion and entrainment of soil particles with elevated concentrations of COCs that could result in off-site migration. The sealant will be re-applied annually. TCT will monitor the effectiveness of this slope stabilization measure by conducting and documenting inspections on an annual basis to identify rills and other indicators of significant erosion. TCT will make repairs and re-apply surface sealant as appropriate. See **Attachment 1C.10** for a schedule showing 2017 Soil RACR activities. These on-site response actions will prevent impacts to stormwater runoff from impacted soil.

At the toe of the western Plant Site slopes, the railroad tracks minimize the risk of direct contact with

COCs in surface soil. TCT will coordinate with the landowner to determine any further action in this off-site area.

INSTITUTIONAL CONTROLS

Institutional Controls are an integral component of the response action for the Site. There are three general types of controls that are being implemented: 1) land use controls, 2) TRRP regulatory controls, and 3) land development restrictions to protect the response action. Each of the institutional controls is summarized below, organized by type. RAP Appendix 4 (Arcadis 2016e) includes draft institutional controls for affected parcels including those that are off-site.

Land Use Controls

Land use controls include groundwater PMZ and C/I land use restrictions. RAP Figure 8 (Arcadis 2016e) provided an illustration of the extent of the land use institutional controls. The entire PCLE Zone for groundwater on the Site will be subject to the PMZ, prohibiting the use of groundwater (RAP Appendix 4, Arcadis 2016e). The PMZ will include a meets and bounds description of the groundwater PCLE Zone on the property and a list of COCs including antimony, arsenic, cadmium, chloride, chromium, copper, fluoride, lead, mercury, molybdenum, nickel, nitrate, selenium, sulfate, thallium, and zinc at concentrations above TRRP PCLs. The establishment of the PMZ removes the compete pathway for ingestion of groundwater.

The second land use control is a deed restriction limiting the land use to C/I (RAP Appendix 4, Arcadis 2016e). The C/I land use restriction will apply to the Site property located west of I-10. The property east of I-10 within the PMZ and south of the South Arroyo will also have the C/I land use restriction, as illustrated on RAP Figure 8. The C/I land use restriction will also be implemented as a deed restriction on the applicable portions of the property.

The East Property north of the PMZ and C/I use restricted area have been remediated to meet residential $^{Tot}Soil_{Comb}$ PCLs. Groundwater in the East Property AA upgradient of the Category II Material storage area, as represented by groundwater data from monitoring wells EP-86, EP-95, EP-96, and EP-129, have concentrations of COCs below their respective $^{GW}GW_{Ing}$ PCLs. Similar to other AAs, the soil-to-groundwater pathway is incomplete in the northern portion of the East Property AA, as COCs are present as the result of aerial deposition rather than slag and waste storage. Therefore, no land use restrictions are required in the northern portion of the East Property.

TRRP Regulatory Controls

Two regulatory institutional controls under TRRP are being proposed, including a PMZ and four WCUs. RAP Figure 8 (Arcadis 2016e) provided an illustration of the extent of the PMZ and WCUs at the Site.

The PMZ will extend from monitoring well EP-84 on the East Property AA to the eastern bank of the Rio Grande. The purpose of the PMZ is to move the point of exposure (POE) from within the PCLE zone to the down-gradient edge of the PMZ, which will allow management of the groundwater in source areas (East Property, PBA, and south arroyos of the Plant Site) without the need to achieve Tier 1 PCLs in these on-site areas. The goal of the response action at the Site is to contain COCs in soil and localized pockets of groundwater and prevent off-site migration. The PMZ will provide a point for evaluation and compliance for that goal.

The four lined and covered landfills at the Site are being designated as WCUs under TRRP. The purpose of this designation is to exclude that portion of the groundwater PCLE zone which lies directly beneath the WCU from the requirement to meet the general groundwater response objectives. Other covered portions of the Site that fall within the PMZ will still require that groundwater monitoring be conducted to evaluate the performance of the covers and to establish that PCLs will be met at the new alternate POE wells at the downgradient edge of the PMZ. Since Cells 1 through 4 are lined and covered landfills, they meet the requirements of the WCU under TRRP.

Implementing the PMZ and WCU modified groundwater response action approaches requires that institutional controls be placed on the property deed and deeds for off-site properties to provide notice of the existence and location of the groundwater PCLE zone beneath the PMZ/WCU and to prevent usage

of and exposure to this groundwater (RAP Appendix 4, Arcadis 2016e).

Restrictions on Future Development

Restrictions on future development are principally related to maintaining the integrity of soil covers, maintaining drainage to eliminate ponding of stormwater or irrigation water runoff in unlined facilities, and maintaining stormwater discharge controls to prevent potential off-site migration of affected soil. **Figure 1A-4** and **Figure 1A-5** provide a summary of response actions for soil, including soil covers and lined stormwater detention/retention ponds and channels. RAP Figure 8 (Arcadis 2016e) showed the corresponding development restrictions. The types of development restrictions are related to the individual type of cover. All restrictions will be implemented in the form of restrictive covenants, and all restrictive covenants will include a requirement that all future development plans be reviewed and approved by the TCEQ.

Two locations will have complete bans on any type of development. These locations include the Fines Pile and the channel areas of the Upper and Lower PBA. The Fines Pile has been covered with an ET soil cover system with an outer layer of desert armor. The integrity of the surface drainage and the low permeability liners of the Upper and Lower PBA channels are critical components of the overall containment of COCs in soil and groundwater on site. The PBA channel is largely within the 100-year floodplain and does not lend itself to re-development.

ET soil covers identified on **Figure 1A-4** and **Figure 1A-5** include the north and south ET covers on the Plant Site. Areas designated for ET covers will require a deed notification that soils with COCs at levels above PCLs are contained beneath the cover (RAP Appendix 4, Arcadis 2016e). Any future development on the ET soil covers must demonstrate that the proposed development will not adversely affect the designed infiltration rate of 0.19 cm/yr established for the original cover. In addition, all development will require grading and drainage plans that eliminate potential ponding or detention of stormwater runoff. Finally, no standing water features will be allowed as part of development on areas with ET covers.

As illustrated on **Figure 1A-4** and **Figure 1A-5**, the low permeability cover areas typically adjoin areas capped with ET soil covers and/or areas capped with asphalt. Asphalt covers include both the Category II asphalt covers and the existing asphalt pavement on the Plant Site portion of the Site, as illustrated on **Figure 1A-4** and **Figure 1A-5**. Areas with asphalt covers will have institutional controls notifying the property owner of the presence of concentrations of COCs in soil above their respective PCLs. Penetrations through the asphalt covers are prohibited without agency approval. Any development requiring the disturbance or removal of asphalt must demonstrate that the 0.1 cm/yr infiltration rate is not exceeded.

SUMMARY OF 2017 RACR ACTIVITIES

SOIL REMOVAL

South Terrace AA

<u>Notice of Registration Waste Units</u>

In 2017 TCT will conduct additional cleaning and/or concrete removal at NOR units 019 and 024, along with confirmation sampling to verify waste removal has been performed to the C/I standards to meet the performance objective requirement. Confirmation sampling results will be presented in an Addendum to the NOR Closure Report.

<u>Former Antimony Processing Building</u>

In 2017 TCT will conduct additional cleaning and/or concrete removal at waste units 019 and 024, along with confirmation sampling to verify waste removal has been performed to the C/I standards to meet the performance objective requirement. Activities related to the NOR waste units are summarized in **Attachment 1C.4.6**.

<u>Storage Yard</u>

In 2017 a power line that remains on the ground along the eastern side of the Storage Yard will be removed. After removal of the power line, TCT will excavate an area which extends approximately 1,000 ft by approximately 75 feet north-to-south along an asphalt road near the east side property line (Figure 1 in **Attachment 1C.5**). Following excavation, soil samples will be collected for XRF analysis. When XRF results are below the $^{SW\text{-}GW}$Soil PCL for metals, 5-point composite confirmation samples will be collected to verify that remaining concentrations of metals in surface soil are below the PCL. After confirmation, the excavated area will be backfilled to properly drain with native soil borrowed from the East Borrow Source (EBS) and compacted.

Plant 5/6 and Acid Plant AAs

In 2017 TCT will conduct additional vertical and lateral delineation of PCBs at sample location AE5. In addition, borings will be advanced at the following locations to collect soil and/or concrete samples: sample locations AE2 and ERM11 at the former Acid Plant, and ERM14 near the the Cottrell's electrostatic precipitators. Delineation sampling and soil removal will occur if analytical results exceed 47 mg/kg total PCBs. These activities are further described in **Attachment 1C.4.1**.

Floodplain AA

Floodplain

In 2017 TCT will remove approximately 1 ft of soil from a 50-ft square area where the reported concentration for lead exceeded its C/I $^{Tot}Soil_{Comb}$ PCL. TCT will place excavated soil as levelling material/subgrade under the ET soil cover on the Plant Site. Following excavation, XRF analysis will be used to confirm achievement of the PCLs for metals, followed by chemical analysis of a 5-point composite sample for final confirmation. The excavated soil will be placed on the South Pad of the Plant Site as subgrade material. This activity is further described in **Attachment 1C.8.1**.

East Sliver, Paisano

In 2017 TCT will excavate a 350-ft by 20-ft by 0.5-ft area from the northern portion of the East Sliver, Paisano parcel. Samples will be collected for XRF analysis. When XRF results are below the respective C/I $^{Tot}Soil_{Comb}$ PCLs for metals, two 5-point composite confirmation samples will be collected to verify that remaining concentrations of metals in surface soil are below the respective C/I PCLs, completing the response action. This activity is further described in **Attachment 1C.8.3**. See **Attachment 1C.10** for the schedule.

COVER PLACEMENT AND SLOPE STABILIZATION

East Property AA

Cat II Material Storage Area

In 2017 TCT will construct an ET soil cover on the Cat II Material Storage Area. The approved cap will consist of a 3-ft thick cover (12 inches of compacted EBS clayey soil followed by 18-inches of compacted EBS sandy soil, followed by 6 inches of EBS desert armor material). This activity is further described in **Attachment 1C.2.2**. See **Attachment 1C.10** for the schedule.

Plant Entrance Arroyo AA

Plant Entrance

As noted above in the sections on Soil Removal and Cover Placement, TCT identified a PCLE zone in soil along the roadway in the Plant Entrance. A limited quantity of soil was removed as described under Soil Removal and **Attachment 1C.3**. In 2017 TCT will apply a surface sealant to the steep portion of the PCLE zone in this AA as shown on **Figure 1A-5**.

Rubber Pond

The steep slopes and stormwater runoff from the Plant Site make removal infeasible for addressing soils

with elevated concentrations of COCs in areas around the pond. Therefore, in 2017 TCT proposes to apply a surface sealant to the PCLE zone around the stormwater pond as noted in **Attachment 1C.3** and shown on **Figure 1A-5**.

Plant Site AAs

Storage Yard

In the eastern part of the Storage Yard, a buried utility gas line extends in a trench parallel to and beneath the western shoulder of the asphalt road. This area cannot be excavated due to the presence of the buried gas line; therefore, TCT will spray the soil sealant on the surface overlying the gas line and extending approximately 15 feet to the west.

South Pad

As shown on **Figure 1A-5** and described in **Attachment 1C.4.5b**, aspects of this Response Action that remain to be completed in 2017 include:

- Construction of the remaining ET cover at South Pad (Drawing C-8 Sheet 10 of 20 in **Attachment 1C.4.5b**), Boneyard (Drawing C-7 Sheet 9 of 20 in **Attachment 1C.4.5b**), Boneyard Channel (south of, and adjacent to Boneyard), and Little Mesa (south of, and adjacent to Boneyard Channel)
- Construction of one drainage swale at South Pad (northern portion of South Pad) that connects with, and drains to, Pond 1.
- Construction of low permeability cover and paved areas as shown on **Figure 1A-5**.
- Application of surface hardscape improvements adjacent to SWPS-2 (east of Cell 3 on Drawing C-7 Sheet 9 of 20 in **Attachment 1C.4.5b**)
- Completion of power hook-up to SWPS-10 (southwest corner of site shown on Drawing C-7 Sheet 9 of 20 in **Attachment 1C.4.5b**)

North Pad

In 2017 TCT will complete the final cover on the North Pad as shown on **Figure 1A-5** and further described in **Attachment 1C.4.5b**.

Plant Site-wide

TCT will make appropriate repairs to existing asphalt pavement in 2017.

Western Plant Site Slopes

Improvements along the Burlington Northern Santa Fe (BNSF) railway tracks will be coordinated with BNSF. In addition, a surface sealant will be applied to the western Plant Site slopes following limited spot removal of surface soil, where practical.

INSTITUTIONAL CONTROLS

TCT is coordinating with other parties to establish land use and future development restrictions at the Site (RAP Figure 8 and RAP Appendix 4 (Arcadis 2016e), **Worksheet 4.0** and **Appendix 3**).

TCT will also establish regulatory controls under TRRP, including a PMZ over the aquifer within the Site boundaries to remove requirement to meet the soil-to-groundwater ($^{GW}Soil_{Ing}$) PCLs within the PMZ (**Worksheet 2** and **Attachment 2A**) and designation of the four lined and covered landfills as WCUs.

Describe how the response action achieved the property-specific response objectives for the PCLE zone in each media in the context of the response objectives set forth in §350.32 or §350.33, as applicable. Explain how the response action was appropriate based on the hydrogeologic and COC characteristics. Describe any unprotective conditions that continued or resulted from the remedial actions and the actions taken to mitigate unprotective conditions.

Remedial Objectives

The overall response objectives are to achieve a Remedy Standard B closure for each of the affected media at the Site. Site soil and groundwater have been affected by metals, principally arsenic, cadmium, chromium, copper, lead, mercury, selenium, and zinc, from either disposal of site-related process material and slag or aerial deposition of metals to surface soil from stack emissions and/or fugitive dusts from slag crushing operations associated with operations of the Site for over 100 years.

The RAOs for soil remediation at the Site were met by:

1. Preventing contact with soils containing concentrations of COCs greater than C/I $^{Tot}Soil_{Comb}$ by establishing institutional controls for C/I land use at the Site with the exception of the northeastern portion of the East Property AA, which will remain unrestricted for residential land use (Figure 8 of the RAP, **Worksheet 4** and **Appendix 3**). These controls bring 9 of the 10 AAs into compliance with C/I $^{Tot}Soil_{Comb}$ PCLs.

2. Preventing contact with soils containing concentrations of COCs greater than residential $^{Tot}Soil_{Comb}$ PCLs in the East Property AA by soil removals (illustrated on **Figure 1A-3** and summarized in **Attachment 1C.2.1**) and placement of low permeability covers (illustrated on **Figure 1A-4** and described in TCT's letters to TCEQ dated April 8, 2015 and July 23, 2015 (**Attachment 1C.2.2**)).

3. Removing soil with COCs above their respective C/I $^{Tot}Soil_{Comb}$ PCLs at the Plant Entrance Arroyo AA (**Attachment 1C.3**), LC AA (**Attachment 1C.7**), and Floodplain AA (**Attachment 1C.8**) as illustrated on **Figure 1A-3**.

4. Removing soils sloughed onto asphalt and open areas around the former Antimony Building impacted by arsenic at concentrations above its C/I $^{Tot}Soil_{Comb}$ PCL for C/I land use as illustrated on **Figure 1A-3** and summarized in **Attachment 1C.5**.

5. Removing soils impacted by polychlorinated biphenyls (PCBs) above C/I $^{Tot}Soil_{Comb}$ and Soil exposure by inhalation of dust particulate ($^{Air}Soil_{Inh\text{-}vp}$) PCLs at the Pond 5/6 Arroyo AA and Acid Plant Arroyo AA and disposing of the removed soil in accordance with State and Federal requirements. These activities are summarized in **Attachment 1C.4.1**, and locations of soil excavations are illustrated on **Figure 1A-3**.

6. Constructing a lined, stabilized channel in the upper and lower PBA to control potential entrainment of soil in stormwater to sediment of the Rio Grande ($^{Sed}Soil$) (**Attachments 1C.6.1, 1C.6.2, 1C.6.3, and 1C.6.4**). Constructing an impermeable liner, overlaying that liner with riprap, and establishing appropriate grading and drainage for the Ephemeral Pond to prevent infiltration of surface water ($^{SW\text{-}GW}Soil$) (**Attachment 1C.6.4**). TCT is coordinating with off-site parties as appropriate to coordinate drainage interfaces on their property.

7. Constructing an agency-approved WCU (Cell 4) for the placement of Category I materials and removal/placement of identified Category I material from the Site into the Cell 4 WCU (**Attachments 1C.6.1 and 1C.6.2**). Completing cover installation and closure requirements for the Cell 3 and Cell 4 WCUs (**Attachments 1C.4.3 and 1C.6.2**, respectively).

8. Constructing an ET soil cover system for Category II materials located in the Category II Material Storage Area on the East Property AA (to be completed during 2017 Soil RACR activities); the Plant Site AA (**Attachment 1C.4.5b**); and the Fines Pile and Boneyard (**Attachment 1C.6.4**) and Pile 1 in the PBA AA (**Attachment 1C.6.5**) (see **Figure 1A-4** and **Figure 1A-5**). The ET cover system at the Plant Site has been installed to prevent exposure to COCs in soil above the C/I $^{Tot}Soil_{Comb}$ PCL, to control potential migration of COCs in soil above their respective soil-to-groundwater-to-surface water PCLs ($^{SW\text{-}GW}Soil$) and C/I $^{Tot}Soil_{Comb}$ PCLs, and to prevent COCs in surface soil from becoming entrained in stormwater runoff and conveyed to surface water sediments ($^{Sed}Soil$ pathway). In more common terms, the goal of the

cover system is to prevent direct contact of people and stormwater runoff with COCs in surface soil. The ET cover also provides control of stormwater infiltration, reducing groundwater hydraulic gradients that drive COCs into groundwater of the floodplain and out into the surface water of the Rio Grande and American Canal.

9. Controlling the discharge of COCs in Site soil to the sediment of the American Canal (^{Sed}Soil pathway) through installation, maintenance, and monitoring of gabion structures in the East Mountain AA and stormwater best management practices (BMPs) in the upper portion of the PBA AA, as illustrated on **Figure 1A-3.** Controlling stormwater runoff from the Floodplain AA through a settling pond and installing BMP features, as illustrated on **Figure 1A-3**.

10. Preventing groundwater use in part of the East Property AA, the Plant Site AAs, the Floodplain AA and the West Sliver, Paisano parcel by establishing a Plume Management Zone (PMZ) over the aquifer within the Site boundaries to remove the requirement to meet the soil-to-groundwater ($^{GW}Soil_{Ing}$) PCLs within the PMZ (**Worksheet 2** and **Attachment 2A**). Treating groundwater with PRBs installed within the PBA to achieve the ^{SW}GW PCL at downgradient locations from permeable reactive barriers (PRBs) (**Attachment 1C.6.6**). Extracting groundwater and reducing the amount of groundwater upgradient of the the PRBs. A summary of these activities is presented in **Attachment 1C.2.4**, and the groundwater hydraulic barrier (GHB) will be described in the Groundwater RACR.

11. Establishing WCUs at the Cell 1, Cell 2, Cell 3, and Cell 4 landfills, removing the requirement for monitoring groundwater beneath these structures.

12. Closing active waste codes and waste management units listed on the ASARCO Notice of Registration (NOR) (**Attachment 1C.4.6**).

If different from the information provided in the RAP, explain how the COCs were handled, treated, disposed, or transferred to another media and document that the response action did not result in any additional exposure conditions due to response action activities.

Response action objectives stated in the RAP included removing soils impacted by PCBs above C/I $^{Tot}Soil_{Comb}$ PCLs and soil exposure by direct contact at the Pond 5/6 Arroyo AA and Acid Plant Arroyo AA by placement of soil covers and disposing of the removed soil in accordance with State and Federal requirements. This objective was met in an area adjacent to the Powerhouse as reported in a letter to TCEQ dated September 26, 2012 which primarily discusses the remediation of PCBs at AE11 where PCBs were delineated, soil was excavated and disposed off site, and sampling was performed to confirm remaining soil was below the C/I PCL.

As shown on **Figure 1A-5**, in 2017 TCT will collect samples at the following locations:

- at AE2 and ERM11 in the vicinity of the former Acid Plant
- at AE5 and approximately 30 feet north to delineate PCBs vertically and horizontally
- At ERM14 near the Cottrell's electrostatic precipitators to delineate PCBs laterally and vertically

Based on analytical results, PCBs in soil or concrete exceeding 47 mg/kg will be removed and properly disposed. Confirmation sampling will be performed to document the removal. Following removal, the soil cover will be replaced.

Explain how the response action achieved the objectives within the reasonable time frame.

The remediation of the Site is being conducted in stages. The first stage of activities involved demolition of the former smelter structures, subgrade utilities and vaults, and removal of waste management units listed on the NOR for the facility. The second stage included the response action to control sources of COCs in soil and groundwater for direct contact and off-site migration. Direct contact with COCs in soil is controlled by soil removals, construction of a combination of covers for soil with residual concentrations above critical PCLs, and institutional controls restricting residential development. Off-site migration of COCs from soil is controlled by covers over soils with COC concentrations greater than the soil-to-groundwater-surface water ($^{SW\text{-}GW}$Soil) PCLs; lining and stabilization of the upper and lower PBA channel; stabilization of slopes; and stormwater controls in the East Mountain AA, upper portion of the PBA AA, and Floodplain AA. Direct contact with groundwater on-site and in the Floodplain AA is eliminated by an

institutional control prohibiting groundwater use. Off-site migration of COCs in groundwater at concentrations above the PCLs will be controlled with groundwater hydraulic gradient control (GHB extraction well EP-163 and covers on Plant Site) and in-situ treatment groundwater facilities (PRBs). The third stage of the response action at the Site is hydraulic gradient source control followed by monitored natural attenuation of groundwater in the Floodplain AA. RAP Figure 13 provides a timeline of the remediation and compliance for the Site.

Plant Site Decommissioning and Demolition

Asset recovery and structure demolition occurred at the Site from summer 2010 through fall 2012. Demolition of the two stacks was completed in April 2013. Sub-surface utilities including water and electric vaults along with manholes and sewers were abandoned in-place in 2015 (Attachment 1C.4.4). Finally, the NOR for the former ASARCO Smelter in El Paso has never been closed. Thirty-five active or inactive waste units are present in the NOR with 21 units having hazardous waste codes associated with them as illustrated on RAP Figure 14. Waste units will be closed as part of the response action for the Site. RAP Appendix 3.5 provides a closure report for the NOR units. All but eight of the waste units are within the footprint of the soil cover system for the Plant Site. Completion of closure of waste units will coincide with completion of the response action. Waste units outside the soil cover system footprint will be characterized with respect of potential COC impacts to soil at each of the following units: 012, 019, 021, 022, 024, 028, and 032. The current status of the NOR units is described in **Attachment 1C.4.6**. The final closure documentation for the NOR units will be submitted with the 2017 Soil RACR in fourth quarter of 2017. Once the approval letter for closure of the NOR units is received from the TCEQ, the NOR will be updated to show all the units as closed and the waste streams as inactive.

Response Actions at Source Areas

Source area remediation work began in the lower PBA AA with the excavation of the Cell 4 WCU, removal of slag from the PBA channel, and installation of the PRBs. These activities occurred in 2012 and 2013. Only Category II materials were identified for removal from the PBA. Category II materials were transported and stockpiled at the Plant Site. Lining of the Cell 4 WCU, covering of the Cell 3 WCU, excavation of PCB-containing soil, and excavations of the Category I and Category II materials from the East Property AA occurred in 2013 and 2014. Excavations of impacted soil at the LC AA also occurred in 2014. Partial construction of the ET cover for the Cell 4 WCU and the lining and stabilization of the Lower PBA channel occurred in early 2015. Installation of the East Property extraction well (EP-163, GHB extraction well) was performed in 2014 and startup of groundwater gradient control began in 2015 with operational startup of the extraction well.

Additional excavations will occur in Floodplain AA and East Sliver, Paisano in 2017. Remaining covers for the East Category II Material Storage Area, Plant Site, and Boneyard will be constructed in 2017. Any actions along the Burlington Northern Santa Fe (BNSF) railway tracks will be coordinated with BNSF.

Institutional controls for the Site are summarized on Figure 8 of the RAP (Arcadis 2016e) and are being implemented. Institutional controls will include:

1. Groundwater use restrictions.

2. C/I land use restriction for the entire Site, except a portion of the East Property AA north of the South Arroyo that will be residential.

3. Documentation of the PMZ over the East Property AA, PBA, and Plant Site to the eastern bank of the Rio Grande.

4. Establishment of 4 WCUs at Cell 1, Cell 2, Cell 3, and Cell 4 landfills.

5. Construction restrictions for areas with soil covers.

6. Construction restrictions for drainage plans that include on-site retention/detention or unintentional ponding of stormwater runoff.

7. Requirements to allow operations and maintenance (O&M) of the response action.

The goals for response action in soil at the Site are to eliminate direct exposure to COCs in soil at

concentrations above $^{Tot}Soil_{Comb}$ PCLs and to prevent migration of COCs from soil to groundwater and from soil to surface water via stormwater runoff. A Final Soil RACR for response actions in source areas will be submitted for partial site closure following completion of the response actions in soil at the end of 2017.

Were physical controls used as part of the response action? x Yes ____ No
If yes, describe the type and purpose of the physical control and discuss how the physical control has proved effective.

COVERS

Soil covers prevent exposure to COCs in soil above the C/I $^{Tot}Soil_{Comb}$ PCL, control potential migration of COCs in soil above their respective soil-to-groundwater-to-surface water PCLs ($^{SW\text{-}GW}$Soil) and C/I $^{Tot}Soil_{Comb}$ PCLs, and prevent COCs in surface soil from becoming entrained in stormwater runoff and conveyed to surface water sediments (^{Sed}Soil pathway). The goal of the cover systems is to prevent direct contact for people and stormwater runoff with COCs in surface soil and provide control of stormwater infiltration, reducing groundwater hydraulic gradients that drive COCs into groundwater of the floodplain and out into the surface water of the Rio Grande and American Canal.

The ET soil cover will cover approximately 53 percent of the Plant Site and will be composed of 3 feet of soil from the EBS area previously characterized for the cover of the Cell 4 WCU. In addition, the ET cover design calculations use the same model as approved for the Cell 4 WCU. The ET soil cover is designed to have a maximum infiltration rate of 0.19 cm/yr, providing sufficient protection against potential leachate that might impact groundwater beneath the Plant Site. Design of the cover system includes drainage improvements to prevent ponding of stormwater runoff on the cover. RAP Appendix 3.7 presented the Site Cover Modeling Report (Geosyntec, 2015).

Approximately 40 percent of the site will be covered by the existing low permeability covers. These include lined ponds, covered landfills, and asphalt surfaces. Included in the 40 percent is the North Stormwater Detention Basin, which is lined with a 60 mil LLDPE geomembrane (Drawing C-7, Sheet 9 of 20 in **Attachment 1C.4.5b**).

The remaining balance of the site, approximately 7 percent, will be covered using a variety of low permeability cover materials including asphalt, geosynthetic membranes or a surficial sealant.

Figures 1A-4 presents a summary of covers used throughout the site as of December 2016 and **Figure 1A-5** shows additional cover placement activities to be completed in 2017. Each of the cover materials are further described below.

ET Soil Cover

The 3-ft thick ET soil cover consists of clay, silt, sand and gravelly desert armor. The ET section from the top to the bottom is:

- 2.0-ft thick silty sand with gravel.
  Note: portions of sloped areas will include desert armor in the upper 0.5 ft as necessary to control erosion and soil loss.
- 1.0-ft thick silty sand with gravel, mixed with at least 15 percent clay.
- A lightweight fabric (this layer provides future constructors with a marker to show where impacted materials lie beneath).

Areas where concentrated surface water flows are anticipated over the ET cover are/will be lined with a flexible membrane liner (FML).

Category II Asphalt Cover

Asphalt exists at the site in two forms: (1) former plant roads and parking lots; and (2) areas where Category II materials were previously capped. The roads along perimeters and the interior of the Plant Site were tied into existing asphalt to create continuous and uniform paved areas that direct storm water away from the Plant Site slopes and toward existing sumps and detention ponds. Existing asphalt will be

repaired as needed in 2017.

A cross-section detail for the Category II asphalt cover was presented in RAP Attachment 2A.15. The projected infiltration rate for the Category II asphalt cover is 0.1 cm/yr. The Category II asphalt cover design provides an effective barrier against both direct contact and water infiltration. New asphalt will be placed on portions of the site as shown on **Figure 1A-5**.

Existing Asphalt Pavement

Existing asphalt pavement will be repaired as necessary in 2017.

Channel Liners

Two types of liners were used to meet the specific objectives:

1. In select areas, TCT placed an impermeable synthetic geomembrane System, Hydro-Turf™, that is resistant to erosion and limits surface flow velocities.
2. In areas of concentrated surface water flow, TCT placed a 60 mil LLPDE liner with ballast rock.

Surficial Sealant

Surficial sealants will be applied in 2017 in areas with access challenges, configuration limitations, or adjacent property restrictions. Examples of these types of areas are slopes that are shared with an adjacent property or areas that would cause interruption to adjacent property activities.

Performance of the cover system will be monitored by tracking both groundwater quality and groundwater elevation data for monitoring wells within the footprint of the covers. RAP Worksheet 3.1 provided more detail about the groundwater monitoring program to evaluate the performance of the Plant Site cover system.

Soil Response Action Objectives

When using removal and/or decontamination with controls or controls only, demonstrate that the physical control or combination of measures reliably contained COCs within and/or derived from the surface soil and subsurface soil PCLE zone materials over time.

The RAOs for Site soil are to eliminate direct exposure to COCs in soil at concentrations above $^{Tot}Soil_{Comb}$ PCLs and to prevent migration of COCs from soil to groundwater and from soil to surface water via stormwater runoff. The response action objectives for soil remediation at the Site were achieved by removing source materials where feasible and placing physical barriers to preclude direct contact and retain soil on-site.

EAST MOUNTAIN AA

Soils in the steep, inaccessible ravines of the East Mountain AA have been affected by historical aerial deposition from stack emissions and/or dust from site operations or slag processing. The two pathways that could lead to COC exposure in soils at the East Mountain AA are direct contact with COCs in soil ($^{Tot}Soil_{Comb}$) and migration of COCs adsorbed to soil entrained in stormwater runoff ($^{Sed}Soil$) (Arcadis 2016a, Arcadis 2016e).

Direct contact with COCs in residential or C/I soil

The maximum concentrations of antimony, arsenic, cadmium, copper, and lead in soil exceeded their respective residential $^{Tot}Soil_{Comb}$ PCLs; however, the maximum concentrations or the representative concentrations based on the 95 percent upper confidence limit (95% UCL) are less than the C/I $^{Tot}Soil_{Comb}$ PCLs, indicating that arsenic and lead in soil of the East Mountain AA do not pose an unacceptable risk to human health from direct contact (Arcadis 2016e). The East Mountain AA is a bedrock outcropping that has steep rocky slopes that are not amendable to future development. An institutional control restricting land use to C/I in the East Mountain AA will be placed on the property's deed (**Worksheet 4.0** and **Appendix 3**). With the institutional control, COCs in soil at the East Mountain AA will not pose an

unacceptable to risk to human health.

Migration of COCs Adsorbed to Soil Entrained in Stormwater Runoff

To promote ponding of stormwater runoff and allow for entrained soil particles to settle out as sediment, TCT installed gabions made from rock baskets covered by filter fabric, as described in RAP Worksheet 2.0 (page 13) and RAP Attachment 2A.17 (Arcadis 2016e) and shown on **Figure 1A-3**. Maintenance of gabions includes inspection and replacement of fabric as needed and removal of sediment. Sediments accumulated on fabrics at the gabions contain elevated levels of COCs; therefore, these sediments are being removed and disposed in the Cell 4 WCU until its closure, after which time the sediments will be disposed in an authorized, regulated landfill. Relatively small volumes of sediment (10 to 15 cubic yards) are generated per removal event, with limited availability for exposure to off-site receptors between removal events. This response action minimizes transport of sediments and receptor exposure to those sediments.

By implementing the combination of institutional controls restricting land use to C/I and stormwater controls, TCT has met the RAOs for COCs in surface soil at the East Mountain AA.

EAST PROPERTY AA

East Property AA includes localized areas where slag and waste material were placed during historical operations of the ASARCO plant, including Area 4, the former Category I and II Waste Disposal Area, and the Category II Material Storage Area (**Figure 1A-1**). Aerial deposition of slag crushing activities and stack emissions had limited impact on the remaining portions of the East Property. The exposure pathways at the East Property AA that require controls to prevent exposure to COCs are direct contact with COCs in soil ($^{Tot}Soil_{Comb}$), migration from soil to groundwater ($^{GW}Soil_{Ing}$) and exposure of ecological receptors to COCs in soil ($^{Eco}Soil$) in an area of the 100-year floodplain of the South Arroyo (Arcadis 2016a, Arcadis 2016e).

Direct contact with COCs in residential soil

An institutional control restricting land use to C/I in the western and southern portions of the East Property AA will be placed on the property's deed (**Worksheet 4.0** and **Appendix 3**). A PMZ will be documented to prohibit the use of groundwater within the PMZ, which will include the East Property AA, thereby removing the pathway for ingestion of groundwater. With the institutional controls, COCs in soil at the East Property AA will not pose an unacceptable to risk to human health.

To prevent contact with soils containing concentrations of COCs greater than residential and commercial/industrial $^{Tot}Soil_{Comb}$ PCLs, and to control potential migration of COCs in soil above their respective C/I $^{Tot}Soil_{Comb}$ PCLs,TCT excavated Category I material. Excavations were extended until residential $^{Tot}Soil_{Comb}$ PCLs were achieved in confirmation samples (**Figure 1A-3** and **Attachment 1C.2.1**). A sample will be collected in this area in 2017 to verify previously flagged sample results for mercury that exceeded recommended holding times.

TCT disposed of the excavated Category I material in the Cell 4 WCU, which has been designed, approved, and constructed for this purpose (Malcom Pirnie, 2013). The containment of the Category I material in the lined WCU will prevent future discharge of COCs to groundwater and surface water through design and construction of approved liner and cover systems (TCEQ 2014).

TCT excavated Category II material until residential $^{Tot}Soil_{Comb}$ PCLs were achieved in confirmation samples (**Figure 1A-3** and **Attachment 1C.2.1**).

Groundwater Protection for COCs in Surface and Subsurface Soil

TCT placed the excavated Category II materials in the Category II Material Storage Area on the East Property AA, illustrated on **Figure 1A-1** These placed materials are managed in-place by placement of an appropriately designed soil cover to prevent direct contact with COCs and migration to groundwater (**Attachment 1C.2.2**). Because the Category II Material Storage Area does not have a liner, groundwater beneath the covered surface must be monitored. Groundwater monitoring well EP-94, which was completed within the footprint of the covered Category II Storage Area, will be monitored to determine the effectiveness of the cover in controlling leachate to groundwater. Details of the groundwater monitoring

program for the Category II Storage Area were presented in RAP Worksheet 3.1.

Protection of Ecological Receptors in Open Space of South Arroyo

The ecological (^{Eco}Soil) PCLs for surface soil in the South Arroyo were calculated for arsenic, cadmium, copper, lead, and zinc. Excavations were performed based on the aerial extent of arsenic in surface soil above the residential $^{Tot}Soil_{Comb}$ PCL. Following excavations, a total of 277 confirmation samples were collected on 50-ft grids in this area. Representative concentrations of COCs remaining in soil after excavation were calculated using the 95% UCL on confirmation sample results. The representative concentration calculated for each COC was below both the human health-based and ecological-based PCLs. Therefore, the excavations of the Category II Material Removal Area in the South Arroyo achieve protection of ecological receptors through compliance with ^{Eco}Soil PCLs and no controls are required for this area (Arcadis 2016a, Arcadis 2016e).

By implementing the combination of institutional controls restricting land use to C/I in portions of the East Property AA and removal and placement of low permeability covers, TCT has met the RAOs for COCs in surface soil at the East Property AA.

PLANT ENTRANCE AA

The exposure pathway at the Plant Entrance Arroyo AA requiring controls to prevent exposure is direct contact with COCs in soil ($^{Tot}Soil_{Comb}$) (Arcadis 2016a, Arcadis 2016e).

Direct contact with COCs in soil

The maximum concentrations of arsenic, cadmium, copper, lead, and mercury exceeded their respective residential $^{Tot}Soil_{Comb}$ PCLs; and the maximum concentrations of arsenic and lead also exceeded their respective C/I $^{Tot}Soil_{Comb}$ PCLs. During 2017 Soil RACR activities, TCT will spray a surface sealant on the entire PCLE zone at the Plant Entrance Arroyo.

A PCLE Zone has been delineated at the paved south entrance to the Plant Site based on concentrations of arsenic and lead above C/I $^{Tot}Soil_{Comb}$ PCLs in the upper two ft of soil. To maintain stability of steep slopes and structures along the roadway, TCT scraped soil from a limited area, removing elevated hot spot concentrations, principally of arsenic and lead. TCT disposed of the removed soil material beneath the Plant Site ET cover (Figure 1 in **Attachment 1C.3**). The plant entrance area is covered with existing asphalt, and soils will be sprayed with a surface sealant during 2017 Soil RACR activities.

The existing rubber pond provides a barrier to direct contact with COCs. Additional soil samples were collected around the rubber pond, as illustrated in Appendix 2 of the RAP and on Figure 4 of the RAP. Concentrations of arsenic and lead in surface soil around the rubber pond exceeded their respective C/I $^{Tot}Soil_{Comb}$ PCLs. TCT will install slope stabilization and drainage improvements at this area of the Plant Site to control infiltration of precipitation.

Additionally, an institutional control restricting land use in the Plant Entrance Arroyo AA to C/I land use, providing notice of the presence of the sealant, and limiting development will be placed on the property's deed (**Worksheet 4.0** and **Appendix 3**). On small portions of the Plant Entrance AA, a PMZ will be documented to prohibit the use of groundwater within the PMZ, thereby removing the pathway for ingestion of groundwater in the Plant Entrance AA.

With the soil removals, application of surface sealant, and implementation of institutional controls, COCs in soil at the Plant Entrance Arroyo AA will not pose an unacceptable to risk to human health.

PLANT SITE AAs

The Plant Site is characterized as an extensively disturbed industrial property that has been leveled by filling in the plant-site arroyos with slag, soil, and demolition debris. The exposure pathways at the Plant Site that require controls to prevent exposure are direct contact with COCs in soil ($^{Tot}Soil_{Comb}$), migration from soil to groundwater ($^{GW}Soil_{Ing}$), and migration from soil to groundwater to surface water/sediment ($^{SW\text{-}GW}$Soil).

The response actions for the Plant Site included localized excavations to meet chemical-specific PCLs for regulatory requirements for PCBs (TSCA) (**Attachment 1C.4.1**) and site drainage requirements, as

illustrated on **Figure 1A-3.** The Plant Site has been covered (or is being covered in 2017) with either Category II material asphalt cover, asphalt drive/parking area, FML cover, ET soil cover, or low permeability cover as illustrated on **Figure 1A-4** and **Figure 1A-5**.

The ET cover system at the Plant Site prevents exposure to COCs in soil above the C/I $^{Tot}Soil_{Comb}$ PCL, controls potential migration of COCs in soil above their respective soil-to-groundwater-to-surface water PCLs ($^{SW\text{-}GW}Soil$) and C/I $^{Tot}Soil_{Comb}$ PCLs, and to prevent COCs in surface soil from becoming entrained in stormwater runoff and conveyed to surface water sediments ($^{Sed}Soil$ pathway). The goal of the cover system is to prevent direct contact for people and stormwater runoff with COCs in surface soil. The ET cover also provides control of stormwater infiltration, reducing groundwater hydraulic gradients that drive COCs into groundwater of the floodplain and out into the surface water of the Rio Grande and American Canal.

Limited hot spot excavations and slope stabilization of the western Plant Site slopes will be completed in 2017 to control direct contact risk and potential migration of impacted soil in stormwater runoff.

An institutional control restricting land use in the Plant Site AAs to C/I land use will be placed on the property's deed. An institutional control will be placed on the property deed that requires any future development to maintain the maximum infiltration rate of 0.19 cm/yr for ET soil covers and 0.1 cm/yr for asphalt covers, to prevent stormwater ponding on the covers, and to obtain approval of proposed development by the TCEQ (**Worksheet 4.0** and **Appendix 3**). A PMZ will be documented to prohibit the use of groundwater within the PMZ, which will include the Plant Site AAs, thereby removing the pathway for ingestion of groundwater ($^{GW}Soil_{Ing}$).

Combination cover systems on the Plant Site consist of existing asphalt pavement, Category II asphalt covers, the Cell 1 cover (and liner), Cell 2 cover (and liner), Cell 3 cover (and liner), lined stormwater ponds, low permeability (FML) covers between major cover components and on slopes, and the north and south ET covers. Because these combination cover systems (excepting the WCUs) are not being constructed with liner systems, groundwater monitoring beneath the covers must continue. TRRP requires groundwater monitoring in relation to WCUs. Performance of the cover systems will be monitored by tracking both groundwater quality and groundwater elevation data for monitoring wells within the footprint of the covers. RAP Worksheet 3.1 (Arcadis 2016e) provided more detail about the groundwater monitoring program to evaluate the performance of the Plant Site cover system.

By implementing the combination of institutional controls restricting land use to C/I in the Plant Site AAs, soil removals and placement of low permeability covers, TCT will meet the RAOs for COCs in surface soil at the Plant Site AAs.

Specific elements are addressed individually below.

<u>South Pad</u>

The 3-ft thick soil cover provides an effective barrier against direct contact and provides sufficient protection against infiltration of water through the cover. Design of the cover system includes drainage improvements to prevent ponding of stormwater runoff on the cover. The footprint of the ET cover also provides a barrier against contact with and infiltration through soil potentially affected by former waste units listed on the NOR (**Attachment 1C.4.6**). An institutional control will be placed on the property deed that requires any future development to maintain the maximum infiltration rate of 0.19 cm/yr, to prevent stormwater ponding on the covers, and to obtain approval of proposed development by the TCEQ (**Appendix 3**). The South Pad will be completed in 2017.

<u>North Pad</u>

The 3-ft thick soil cover provides an effective barrier against direct contact and provides sufficient protection against infiltration of water through the cover. Design of the cover system includes drainage improvements to prevent ponding of stormwater runoff on the cover. A lined stormwater retention pond was constructed on the northeastern portion of the North Pad ET soil cover. The footprint of the ET soil cover also provides a barrier against contact with and infiltration through soil potentially affected by former waste units listed on the NOR (**Attachment 1C.4.6**). An institutional control will also be placed on the property deed that requires any future development to maintain the maximum infiltration rate of 0.19

cm/yr, to prevent stormwater ponding on the cover, and to obtain approval of proposed development by the TCEQ (**Appendix 3**). The North Pad will be completed in 2017.

Category II Asphalt Cover

The projected infiltration rate for the Category II asphalt cover is 0.1 cm/yr (RAP Appendix 3.7, Arcadis 2016e). The Category II cover design provides an effective barrier against both direct contact and water infiltration. An institutional control will also be placed on the property deed that alerts the developer to the presence of affected materials beneath the asphalt and requires future development to maintain the maximum infiltration rate of 0.1 cm/yr, to prevent stormwater ponding on the cover, and to obtain approval of proposed development by the TCEQ (**Appendix 3**).

Existing Asphalt Pavement

The projected infiltration rate for the asphalt pavement is 0.1 cm/yr (RAP Appendix 3.7, Arcadis 2016e). The existing pavement provides an effective barrier against both direct contact and water infiltration. An institutional control will also be placed on the property deed that alerts the property owner to the potential presence of impacted materials beneath the asphalt and requires maintaining the pavement to retain the effectiveness of the barrier. The institutional control will also require that any future development of areas with existing asphalt paving be designed to retain the maximum infiltration rate of 0.1 cm/yr, to prevent stormwater ponding on the cover, and to obtain approval by the TCEQ (**Appendix 3**).

Surface Sealant

Storage Yard

Following excavation to $^{SW\text{-}GW}$Soil PCLs, as previously described in this worksheet under Soil Removal, TCT will compact native soil to reduce infiltration rates and to aid in groundwater gradient control in the South Terrace/Pond 1 Arroyo AAs. Soils with COCs above their respective C/I $^{Tot}Soil_{Comb}$ and $^{SW\text{-}GW}$Soil PCLs were removed; therefore, no notification or institutional control is required for this cover area. Design of the cover system includes drainage improvements to prevent ponding of stormwater runoff on the cover. An institutional control will be placed for any development that may include ponding on the cover.

Surface sealant will be sprayed over the utility easement along the eastern edge of the Storage Yard to prevent infiltration from occurring through soils with concentrations of COCs above their respective $^{SW\text{-}GW}$Soil PCLs.

Other Structures

Existing structures, including concrete foundations, a lined stormwater pond, and the Cell 1 WCU, are within the southern Plant Site. The projected infiltration rate for these features is assumed to be 0.1 cm/yr (RAP Appendix 3.7, Arcadis 2016e). These structures provide an effective barrier against both direct contact and water infiltration. An institutional control will be placed on the property deed that alerts the property owner to the potential presence of affected materials beneath these structures and requires approval by the TCEQ for any proposed re-development (**Appendix 3**).

Boneyard and Plant Site

The North Pad ET soil cover provides coverage of the northern half of the Plant Site, including the Boneyard. TCT will place an ET soil cover on the Boneyard in 2017. This ET soil cover provides an effective barrier against direct contact and provides sufficient protection against infiltration of water through the cover. Design of the cover system includes drainage improvements to prevent ponding of stormwater runoff on the cover. Similar to other areas with soil covers and no liners, groundwater quality data will be collected from monitoring wells within the Boneyard to evaluate the effectiveness of the ET soil cover system. Institutional controls will be established to protect the integrity of the cover system until the material is removed in the future for potential recovery of metal assets.

SWCRS

The construction and operation of the SWCRS has successfully maintained control of stormwater discharges from the Plant Site since 2001. The cover design for the Pond 5/6 and Acid Plant Arroyo AAs

includes grading and drainage plans that direct on-site stormwater runoff to the new, lined stormwater retention pond in the northern ET cover footprint as illustrated on **Figure 1A-4**.

West Plant Site Slopes

TCT will apply slope stabilization surface sealant on the western Plant Site slopes to control direct contact risk and potential migration of impacted soil in stormwater runoff.

The on-site response action will prevent impacts to stormwater runoff from residual COCs in soil. An institutional control will be required to maintain drainage features, to restrict land use to C/I, to prohibit groundwater usage, and to provide notice of the PMZ (**Appendix 3**).

Off-site Portion of Western Plant Site Slopes

TCT is coordinating with BNSF to identify future actions in this area. Any future actions will be documented in the Groundwater RACR.

PBA AA

The PBA has several potential source areas for COCs including the PBA channel; the Ephemeral Pond; the Fines Pile; the Boneyard; and portions of the Plant Site where the former wastewater treatment plant, former cadmium plant, and former acid storage tanks were located. The exposure pathways at the PBA that require controls to prevent exposure to COCs are direct contact with COCs in soil ($^{Tot}Soil_{Comb}$), migration from soil to groundwater ($^{GW}Soil_{Ing}$), migration from soil to groundwater to surface water/sediment ($^{SW\text{-}GW}Soil$), and soil to sediment from stormwater runoff ($^{Sed}Soil$) (Arcadis 2016a, Arcadis 2016e). **Figure 1A-2** provides an illustration of the PCLE Zone in soil at the Upper PBA (Fines Pile, Ephemeral Pond, and Area 12) and Lower PBA (Cell 4 landfill, Boneyard, and main channel). **Figure 1A-3** also shows the outlines and composition of soil excavations. **Figure 1A-4** and **Figure 1A-5** show cover/liner footprints.

Direct contact with COCs in soil

Excavations were performed in four areas of the PBA including the Cell 4 WCU, the main channel of the Lower PBA, Area 12 of the Upper PBA, and at the Plant Site, as illustrated on **Figure 1A-3**. Slag and native soil removed from the Cell 4 footprint were stockpiled on the Plant Site and characterized as either Category I or Category II material. Category I material was eventually placed in the completed Cell 4 WCU. Additional slag removal was performed in the main channel of the Lower PBA, where slag from the TCT Pile 1 area also was removed. Finally, removals of Category I and Category II materials have occurred on the Plant Site within the PBA. Plant Site excavation locations include the former wastewater treatment plant, the Boneyard, and the former Cadmium Plant site. Materials from the Lower PBA channel and the Plant Site locations have all been placed beneath an ET soil cap, which provides an effective barrier against direct contact and provides sufficient protection against infiltration of water through the cover. Design of the cover system includes drainage improvements to prevent ponding of stormwater on the cover.

Portions of the ET soil covers have been placed on the Cell 4 Landfill WCU, Fines Pile and Boneyard. These soil covers wil be completed in 2017 (**Figure 1A-4** and **Figure 1A-5**). These ET soil covers provide an effective barrier against direct contact and provides sufficient protection against infiltration of water through the cover. Design of the cover system includes drainage improvements to prevent ponding of stormwater runoff on the cover. Similar to other areas with soil covers and no liners, groundwater quality data will be collected from monitoring wells within the Fines Pile and Boneyard to evaluate the effectiveness of the ET soil cover system.

The entire length of the PBA channel in the Upper and Lower PBA is being lined with a 60-mil polyethylene liner (**Figure 1A-4** and **Figure 1A-5**). The lined channel includes the entire Ephemeral Pond area in the Upper PBA. The lined channel provides an effective barrier against direct contact and provides sufficient protection against infiltration of water through the liner. The stabilization of the Upper and Lower channels includes riprap in portions of the channel bottom, minimizing the potential for the

entrainment of surface soil particles into stormwater runoff.

The combination of excavation and cover installation achieves the RAO of protecting human health from direct contact with COCs above their respective $^{Tot}Soil_{Comb}$ PCLs, controls potential migration of COCs in soil above their respective soil to groundwater PCLs ($^{GW}Soil_{Ing}$), soil-to-groundwater-to-surface water PCLs ($^{SW\text{-}GW}Soil$), and C/I $^{Tot}Soil_{Comb}$ PCLs, and to prevent COCs in surface soil from becoming entrained in stormwater runoff and conveyed to surface water sediments ($^{Sed}Soil$ pathway).

Groundwater Protection for COCs in Surface and Subsurface Soil

An institutional control protecting the integrity of the cover system at the PBA will be placed on the property's deed to provide long-term assurance against future exposure. Additionally, an institutional control restricting the land use at this AA to C/I will be placed on the property's deed. The PBA will have institutional controls restricting the use of groundwater (see RAP Figure 8) in conjunction with the PMZ established as part of the response action, thereby removing the exposure pathway to COCs in groundwater.

Stormwater Control and Slope Stabilization

The construction and operation of SWCRS has been documented in the *Conceptual Site Model, Pathway Evaluation, and Protective Concentration Level Report* (Arcadis 2016a). The cover designs for TCT Pile 1, Cell 4 WCU, Fines Pile, and Boneyard include grading and drainage plans that minimize impacts from stormwater runoff. The drainage plan for the Boneyard directs runoff to the on-site, lined stormwater retention ponds of the SWCRS. The stabilization of the Upper and Lower channels include riprap minimizing the potential for the entrainment of surface soil particles into stormwater runoff. The stabilization of the Plant Site slopes with crystalline and coarse slag is achieved through re-grading the slopes to a gradual unified angle, and then applying a surficial sealant (see RAP Attachment 2A.17 (Arcadis 2016e). The sealants are being used to protect the remediated Lower PBA channel and the potential for off-site migration based on entrainment of soil particles with elevated concentrations of COCs.

With the soil removals, and the covers/liners, institutional controls, groundwater use restriction, the PMZ, COCs in soil at the PBA will not pose an unacceptable to risk to human health and the RAOs will have been met.

Specific elements are addressed individually below.

Cell 4 Landfill

The cover design and material for the Cell 4 WCU, as approved by TCEQ (**Attachment 1C.6.2**) provides a barrier against direct contact with Category I material and as an appropriate control against water infiltration. Institutional controls will be placed on the property deed requiring inspection and maintenance activities to ensure the cover's integrity (**Appendix 3**).

Fines Pile

TCT has performed extensive grading of the Fines Pile area to prevent ponding of stormwater runoff on its surface and thereby eliminate the potential for infiltration through the material of the Fines Pile and down to groundwater. In 2017 TCT will complete an ET soil cover system (initiated in 2016), including desert armor. The cover will comply with the approved design described in letters to and from TCEQ in **Attachment 1C.2.2** and **Attachment 4.5b**. The closure of the Fines Pile will include placement of an institutional control on the property deed to restrict future development of the area (Appendix 4). The Fines Pile does not have a liner system; therefore, groundwater monitoring will be required from wells located within the footprint of the area. Groundwater monitoring for the Fines Pile is described further in RAP Worksheet 3 (Arcadis 2016e).

Upper PBA/Ephemeral Pond and South Arroyo

As illustrated on **Figure 1A-1**, the Upper PBA channel running along the Fines Pile includes the Ephemeral Pond. The Catagory II sediment in the occasionally inundated Ephemeral Pond has been identified as a source of groundwater contamination in the PBA; however, excavation as a means of

source control is not an option due to the presence of a large-diameter, high-pressure gas pipeline in the area of concern. The response action, therefore, was to cap the sediment in-place to provide a barrier against direct contact and prevent infiltration of surface water in the channel. TCT placed and compacted a layer of clean fill followed by a liner and a nonwoven geofabric to prevent infiltration of surface water in the channel. TCT then placed riprap over the liner to slow stormwater flow and promote settlement of sediment.

Area 12

RAP Attachment 2A.8 (Arcadis 2016e) provides the previous excavations performed by ASARCO in 2006 for excavation of the PCLE Zone in the portion of the Upper PBA between the UPRR tracks and the TxDOT property along I-10. All Category I material was removed from this area and disposed in the Cells 3 and 4 WCUs.

TCT Pile 1

On the western portion of TCT's Pile 1, TCT removed slag down to native soil and conducted confirmation sampling to document that concentrations of COCs in remaining soils were below C/I $^{Tot}Soil_{Comb}$ PCLs. On the eastern portion of TCT's Pile 1, TCT graded the area and placed an ET soil cover that serves as a barrier to direct contact with COCs in soil, precludes stormwater runoff with COCs in surface soil and migration of COCs from affected soil to groundwater.

LA CALAVERA AA

The exposure pathway at the La Calavera AA that requires controls to prevent exposure to COCs includes direct contact with COCs in soil ($^{Tot}Soil_{Comb}$) (Arcadis 2016a). **Figure 1A-2** provides an illustration of the PCLE Zone in soil at the La Calavera AA. **Figure 1A-3** shows the outlines of the excavation footprints at the La Calavera AA.

Direct contact with COCs in soil

TCT excavated the area and achieved the C/I $^{Tot}Soil_{Comb}$ PCL, achieving the RAO for this AA. An institutional control restricting land use at the La Calavera AA to C/I will be placed on the property's deed. With the excavation and institutional control, COCs in soil at the La Calavera AA will not pose an unacceptable to risk to human health (Arcadis 2016e).

FLOODPLAIN AA AND SLIVER PARCELS ALONG PAISANO DRIVE

Floodplain

The exposure pathway at the Floodplain AA requiring controls to prevent exposure to COCs is direct contact with COCs in soil ($^{Tot}Soil_{Comb}$) (Arcadis 2016a). **Figure 1A-2** provides an illustration of the PCLE Zones in soil at the Floodplain AA. **Figure 1A-3** shows the outlines of the excavation footprints.

Direct contact with COCs in soil

The PCLE zone is based on localized sample results. In 2017, one remaining location will be excavated to between 1 to 2 feet bgs, and confirmation samples will be collected to document achievement of the C/I $^{Tot}Soil_{Comb}$ PCLs, satisfying the RAO for this AA. An institutional control restricting land use at the Floodplain AA will be placed on the property's deed. With the excavations and the institutional control, COCs in soil at the Floodplain AA will not pose an unacceptable to risk to human health (Arcadis 2016e). to prohibit the use of groundwater within the PMZ, which will include the Floodplain AA, thereby removing the pathway for ingestion of groundwater.

Stormwater Control

Stormwater from the two northern-most parcels in the Floodplain AA discharges into the stormwater channel between Outfall SW-5 and the Rio Grande. Stormwater from the main parcel discharges to the American Canal through a single culvert in the berm on the IBWC property. The Floodplain AA was graded to drain to a new, filter-fabric lined stormwater detention pond on the western boundary of the property as illustrated on **Figure 1A-3**. The detention pond was designed to allow sediment to settle prior to discharge to the existing culvert. The stormwater discharge points to the stormwater channel between

Outfall SW-5 and the Rio Grande were constructed with BMPs to control sediment discharges in stormwater runoff, minimizing stormwater runoff with COCs in surface soil.

Sliver Parcels Along Paisano Drive

At the West and East Sliver, Paisano parcels, the direct contact exposure pathway represents the critical PCLs ($^{Tot}Soil_{Comb}$) for exposure to COCs in soil. The maximum concentrations of all COCs in soil samples from West Sliver, Paisano are below their respective residential $^{Tot}Soil_{Comb}$ PCLs, so no response action is required for soil in West Sliver, Paisano. A PMZ will be established to prohibit the use of groundwater within the PMZ, which will include the West Sliver, Paisano parcel, thereby removing the pathway for ingestion of groundwater.

The maximum concentrations of arsenic, copper, and lead exceed their respective residential $^{Tot}Soil_{Comb}$ PCLs for East Sliver, Paisano, and the maximum lead concentration exceeds its C/I $^{Tot}Soil_{Comb}$ PCL. In 2017 TCT will excavate soils from the East Sliver, Paisano parcel and collect confirmation samples to document achievement of PCLs (see **Figure 1A-3**).

WASTE ACCUMULATION AREAS

The existing NOR for the former ASARCO El Paso Smelter operation (SWR #31235) includes 35 active and inactive waste units, of which 21 have hazardous waste codes associated with them. The waste management units were located in the Plant Site, and all were removed from the Site as part of the demolition activities. The former locations of these units with respect to the Plant Site are illustrated on RAP Figure 14. RAP Appendix 3.5 presents the Notice of Registration Unit Closure Report (Malcolm Pirnie 2015), which demonstrates that the units will meet the closure performance standards once the applicable response actions outlined in the RAP (Arcadis 2016e) are implemented.

At Units 019 (Container Storage Area Security Bunker Building) and Unit 024 (Container Storage Area/Satellite Accumulation Area Units, laboratory analytical results for concrete samples include C/I PCL exceedances for antimony, arsenic, and/or cadmium. In 2017 TCT will conduct additional cleaning and/or concrete removal at these units, along with confirmation sampling to verify waste removal has been performed to the C/I standards to meet the performance objective requirement. Confirmation sampling results will be presented in an Addendum to the NOR Closure Report.

A summary of activities regarding the waste accumulations areas is presented in **Attachment 1C.4.6**.

Explain how the removal or decontamination action reduced the concentration of COCs to the critical surface soil and subsurface soil PCL throughout the soil PCLE zone and prevented COC concentrations above the critical soil PCLs from migrating beyond the original boundary of the soil PCLE zone.

Not Applicable.