VISUAL SIMULATIONS
RAY MINE TAILINGS STORAGE FACILITY
______________________________
ASARCO LLC

Prepared for:
U.S. Army Corps of Engineers

Prepared by:
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On behalf of:
ASARCO LLC- Ray Operations

Date July 23, 2014
Project No. 203.25
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1. INTRODUCTION

ASARCO LLC (Asarco) has identified the need for an additional tailings storage facility (TSF) to support ongoing mining operations at the Ray Mine in Pinal County, Arizona. It is anticipated that the construction of an additional tailings impoundment (the Project) would require the discharge of fill to surface drainage features that would be identified as waters of the United States by the U.S. Army Corps of Engineers (Corps).

An analysis of alternatives is required to demonstrate compliance with guidelines established under the Clean Water Act (CWA) Section 404(b)(1) (40 CFR §230) for avoidance and minimization of impacts to jurisdictional waters. Nine alternatives at six potential Project locations are currently being analyzed as part of the Clean Water Act Section 404 (b)(1) Alternatives Analysis prepared for the Project in accordance with the 404(b)(1) guidelines.

Of the six sites considered in the Alternatives Analysis, E Dam, Devils Canyon, West Dam, and Granite Mountain have been deemed impracticable and are not considered further in this investigation. The remaining two sites represent five alternatives, Ripsey Wash (Ripsey Wash Alternatives 1 to 3) and Hackberry Gulch (Hackberry Gulch Alternatives 1 and 2). Ripsey Wash Alternatives 1 and 2 and Hackberry Gulch Alternative 1 were dropped from further consideration because alternatives at these sites were developed that have fewer impacts to waters. Ripsey Wash Alternative 3 and Hackberry Gulch Alternative 2 are currently still being evaluated by Asarco. Asarco has identified Ripsey Wash Alternative 3 as its proposed action in its CWA Section 404 permit application to the Corps.

The Corps has identified visual resources as a topic that will need to be addressed in the Environmental Impact Statement (EIS) to be prepared for the Project in accordance with the requirements of the National Environmental Policy Act. The purpose of this report is to describe the methods used to prepare and present visual simulations of Ripsey Wash Alternative 3 and Hackberry Gulch Alternative 2. The information presented in this report will aid in the evaluation of visual impacts that would result from the construction of either of these alternatives.

2. METHODOLOGY

On December 2, 2013, Susan Corser of ECA Community Planning (ECA), as well as representatives from the Bureau of Land Management, the U.S. Forest Service and WestLand Resources, Inc. (WestLand), met in the field near the town of Kearny, Arizona, to review and discuss possible locations for visual simulations of the Ripsey Wash and Hackberry Gulch alternatives. Based on the findings of that field work and subsequent research performed by ECA, six Key Observation Points (KOP’s) were identified (see Figure E-1).

On February 5 and March 4, 2014, a representative from WestLand took photos from each of the KOP’s and documented the location of each photograph using a Garmin Montana 650t handheld global positioning system (GPS) unit. The camera utilized for taking photographs was a Canon Rebel XT EOS digital camera with a Canon EFS 18–55 mm zoom lens. The lens was set at 33 mm. to compensate for a
crop factor of 1.6, thereby creating an equivalent focal length of 53 mm. (33 mm. lens setting x 1.6 crop factor = 52.8 mm. output view), which creates a frame that mimics the field of view of the human eye. From each KOP, a series of overlapping photographs was taken of the existing landscape that would be affected by the Project.

After downloading the digital images, WestLand “stitched” together the photographs from each photo point using Adobe Photoshop. This “stitching” was done by eye. The width of each panorama was dictated by the size of the visual impact that would result from the construction of the Project. Minor corrections for colors were made in order to correct for small variations between the three photos.

Using ArcGIS 10.1 and 3D Analyst, WestLand merged the publically available USGS Digital Elevation Model (DEM) (10 meter) with three dimensional CAD data of the proposed projects provided by Asarco. The resulting DEM was then imported into AutoDesk InfoWorks (Version 2014) along with the locations of the photo points recorded by the GPS unit. WestLand rotated the DEM to correspond with each photo point location and captured that digital perspective as a DEM image. The horizontal angles of these images varied between 45 to 105 degrees. Depending on the location of the KOP in relation to the Project alternatives, images that incorporated wider angles allowed for more comprehensive simulations of that Project alternative.

For each photo point, the captured DEM perspective was imported into Photoshop along with the corresponding stitched panoramic image. Using recognizable existing landmarks visible in both, the DEM perspective was aligned with the panorama. The portions of the Project in the DEM image were then isolated and placed over the panoramic image. The DEM image of the Project was then rendered in Photoshop using the colors and textures that are expected to result from the Project.

With respect to the printed size of the visual simulations, the simulated image was created with the intention that it be printed on 11” x 17” paper, to be included as a figure in the visual analysis.

3. RESULTS

The images of the existing landscapes associated with each KOP and the rendered simulations for Ripsey Wash Alternative 3 and Hackberry Guleh Alternative 2 are presented as figures following this text.
Figure E-1

LEGEND
- Key Observation Point and Direction

EXISTING FEATURES
- Florence-Kelvin Highway
- Overhead Electric
- Arizona National Scenic Trail

RIPSEY WASH ALTERNATIVE 3
- Ripsey Wash Alternative 3
- Tailings Storage Facility Footprint
- Ripsey Wash Tailings Delivery and Reclaim Water Pipelines
- Stormwater Diversion Pipeline
- Cutoff Wall
- Surface Water Diversion Channel
- Realignment of Florence-Kelvin Highway
- Ripsey Wash Project Power Line
- SCIP Overhead Electric Realignment

HACKBERRY GULCH ALTERNATIVE 2
- Hackberry Gulch Alternative 2
- Tailings Storage Facility Footprint
- Hackberry Gulch Tailings Delivery and Reclaim Water Pipelines
- Surface Water Diversion Channel
- Hackberry Gulch Route for Overhead Electric

LAND OWNERSHIP
- Bureau of Land Management
- Bureau of Reclamation
- Private Land (No Color)
- State Trust Land

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Ray Mine Tailings Storage Facility Visual Simulations

KEY OBSERVATION POINT (KOP) LOCATIONS
Path: M:\Jobs\200's\203.25\VisualAnalysis\KeyObservationPoints\MXD\REV_JUNE2014\Fig1_OverviewKOP_June2014.mxd
PHOTOGRAPHIC INFORMATION

- Time of Photograph: 2:09 PM
- Date of Photograph: 03.04.2014
- Weather Condition: Mostly sunny
- Viewing Direction: Northeast

- Latitude: 33.07087
- Longitude: -111.026569
- Elevation: 2545
- Distance: Not applicable

Figure E-2: KOP 1 – Florence-Kelvin Highway, Existing Condition
Figure E-3: KOP 1 – Florence-Kelvin Highway, Ripsey Wash Alternative 3, Completion of Centerline Construction

Note: Simulation indicates impoundment at completion of centerline construction before reclamation with rock surfacing.
Figure E-4: KOP 1 – Florence-Kelvin Highway, Ripsey Wash Alternative 3, Project Completion

Note: Simulation indicates impoundment at completion of the project before reclamation of the top 30 feet of tailings and surface of the tailings.
PHOTOGRAPHIC INFORMATION

Time of Photograph: 3:58 PM  
Date of Photograph: 02.05.2014  
Weather Condition: Lightly overcast  
Viewing Direction: South to southeast

Latitude: 33.111533  
Longitude: -111.009503  
Elevation: 1897  
Distance: Not applicable

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Ray Mine Tailings Storage Facility
Visual Simulations

Figure E-5: KOP 2 – Arizona Trail, Mile 4.3, Existing Condition
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Figure E-6: KOP 2 – Arizona Trail, Mile 4.3, Ripsey Wash Alternative 3, Completion of Centerline Construction

Note: Simulation indicates tailings impoundment at completion of centerline construction before reclamation with rock surfacing.
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Visual Simulations

Figure E-7: KOP 2 – Arizona Trail, Mile 4.3, Ripsey Wash Alternative 3, Project Completion

Note: Simulation indicates tailings impoundment at completion of the project before reclamation of the top 30 feet of tailings.
PHOTOGRAPHIC INFORMATION

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<tr>
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<td>Elevation:</td>
<td>2128</td>
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<td>Distance:</td>
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Visual Simulations

Figure E-8: KOP 3 – Arizona Trail, Jake’s Overlook, Existing Condition

WestLand Resources, Inc.
Engineering and Environmental Consultants
PHOTOGRAPHIC INFORMATION

Time of Photograph: 1:57 PM
Date of Photograph: 02.05.2014
Weather Condition: Lightly overcast
Viewing Direction: South to southwest

Latitude: 33.1057
Longitude: -110.994414
Elevation: 2128
Distance: 0.27 miles to nearest feature of relocated highway

Figure E-9: KOP 3 – Arizona Trail, Jake’s Overlook, Relocated Florence-Kelvin Highway (uncolored retaining walls) & SCIP Transmission Line
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Visual Simulations

Figure E-10: KOP 3 – Arizona Trail, Jake’s Overlook, Relocated Florence-Kelvin Highway (colored retaining walls) & SCIP Transmission Line

Note: Simulation is intended to demonstrate the effectiveness of the use of colored concrete as a proposed mitigation measure.
PHOTOGRAPHIC INFORMATION

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Latitude: 33.106491
Longitude: -110.979205
Elevation: 1795
Distance: Not applicable
Figure E-13: KOP 4 – Arizona Trail Access, Relocated Florence-Kelvin Highway (colored retaining walls) & SCIP Transmission Line

Note: Simulation is intended to demonstrate the effectiveness of the use of colored concrete as a proposed mitigation measure.
PHOTOGRAPHIC INFORMATION

Time of Photograph: 12.01 PM
Date of Photograph: 03.04.2014
Weather Condition: Lightly overcast
Viewing Direction: North

Latitude: 33.085821
Longitude: -110.92717
Elevation: 2030
Distance: Not applicable
Figure E-15: KOP 5 – State Route 177, Hackberry Gulch Alternative 2, Project Completion

Note: Simulation indicates tailings impoundment at completion of the project before reclamation of the top 30 feet of the tailings.
PHOTOGRAPHIC INFORMATION

Time of Photograph: 1:21 PM  
Date of Photograph: 02.05.2014  
Weather Condition: Lightly overcast  
Viewing Direction: East

Latitude: 33.107156  
Longitude: -110.988557  
Elevation: 2037  
Distance: Not applicable

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Visual Simulations

Figure E-16: KOP 6 – Arizona Trail, Mile 2, Existing Condition
PHOTOGRAPHIC INFORMATION

Time of Photograph: 1:21 PM
Date of Photograph: 02.05.2014
Weather Condition: Lightly overcast
Viewing Direction: East

Latitude: 33.107156
Longitude: -110.988557
Elevation: 2037
Distance: 1.87 miles to nearest portion of Hackberry Gulch Alternative 2

Note: Simulation indicates tailings impoundment at completion of the project before reclamation of the top 30 feet of the tailings.

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Figure E-17: KOP 6 – Arizona Trail, Mile 2, Hackberry Gulch Alternative 2, Project Completion