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November 16, 2016

Shelly Lemon
Acting Bureau Chief
Surface Water Quality Bureau
Harold Runnels Building, N2110
1190 South Saint Francis Dr.
Santa Fe, NM 87505

Sent via FedEx to:
P.O. Box 5469
Santa Fe, NM 87502

Dear Ms. Lemon,

Enclosed you will find four (4) copies of a revised Use Attainability Analysis (UAA) sampling plan for streams in the vicinity of Lee Ranch Coal Mine. Peabody Natural Resources Company (PNRC) believes that we have addressed all questions and concerns identified by the Surface Water Quality Bureau (SWQB) during your previous review of this document. We respectfully request a final review of the sampling plan by Surface Water Quality Bureau staff to ensure that all parties have the same understanding of the UAA sampling plan and are working towards a common outcome. It is our intent to conduct the UAA sampling in the spring/summer of 2017, consistent with the Hydrology Protocol (late-May through mid-July).

If you have any additional questions or concerns raised during your review of this document, please contact me at (505) 285-3076 or cgaines@peabodyenergy.com.

Respectfully,

Chad Gaines
Environmental Specialist
505-285-3076
Peabody Natural Resources Company

ec: Mark Rochlitz, Senior Manager Engineering, Peabody Natural Resources Company
Randolph Lehn, Director Environmental Services Southwest, Peabody Energy Corporation
Jimmy Boswell, Manager Environmental, Peabody Energy Corporation
Bryce West, VP Environmental Services - Americas, Peabody Investments Corp.

Lee Ranch Mine
Use Attainability Analysis
Sampling Plan

November 2016

Contents

1 Introduction and Background

The Lee Ranch Mine (LRM) is a surface coal mine located in McKinley County New Mexico (Figure 1), and operates under Surface Mining Permit No. 19-2P issued by the New Mexico Mining and Minerals Division. Streams in the vicinity of Lee Ranch Mine are Mulatto Canyon, Arroyo Tinaja, San Isidro Arroyo, Doctor Arroyo, and tributaries thereof. These streams are not included in a classified Water Quality Standards segment (§20.6.4.101-899 NMAC) and consequently are unclassified waters of the State (§20.6.4.98 NMAC). Water quality standards for unclassified streams in New Mexico are based upon stream hydrology. By determining the correct hydrologic nature of the stream (i.e., perennial, intermittent, or ephemeral) LRM, NMED and the EPA can ensure that the appropriate designated uses and water quality standards are applied to and enforced for each surface water drainage.

In 2011, the New Mexico Environment Department (NMED) completed field work using the New Mexico Environment Department Surface Water Quality Bureau (SWQB) Hydrology Protocol (HP) on the Mulatto Canyon drainage (Figure 1) within the LRM permit boundary. This action was part of a study of 18 unclassified non-perennial stream segments associated with several facilities that hold NPDES permits in New Mexico. The results of the study were incorporated into a UAA developed in June 2012, and clearly indicated Mulatto Canyon and a portion of San Isidro Arroyo drainages are ephemeral (NMED 2012).

Due to uncertainty regarding the status of tributary drainages to Mulatto Canyon within and adjacent to the LRM permit boundary, LRM intends to study the tributary drainages using the HP and determine the hydrologic regime designation for these drainages, which will inform the development of a Use Attainability Analyses for submittal to the NMED and other agencies for review. The classifications resulting from this UAA will affect NMED application of water quality standards, NPDES effluent limits imposed at the LRM, and future permitting actions with the New Mexico Mining and Minerals Division (MMD) associated with the LRM surface mining permit (No. 19-2P).

The HP utilizes hydrologic, geomorphic, and biologic indicators to determine the persistence of water within a stream reach. The HP consists of two levels of evaluation, Level 1 and Level 2. The Level 1 evaluation consists of preparatory office procedures and a field evaluation that relies on 12 primary indicators and 2 supplemental indicators. If a hydrologic determination cannot be made following the Level 1 evaluation, a Level 2 evaluation must be conducted, which again consists of office procedures and a field evaluation. The Level 2 field evaluation includes 7 additional indicators to aid in defining the appropriate hydrologic determination. LRM staff will initiate the study of the stream reaches with a Level 1 evaluation and, if results indicate additional information is required to make an accurate determination, continue the study with a Level 2 evaluation.

2 Purpose and Objectives

This work plan describes LRM's proposed implementation of the NMED HP to San Isidro Arroyo and tributaries thereof. The tributaries include the Arroyo Tinaja, Mulatto Canyon, and Doctor Arroyo

drainages (Figure 1). Information collected during implementation of the work plan is expected to support determinations of the appropriate classification of surface waters using an expedited UAA process for the San Isidro Arroyo and tributaries. Two major objectives of this work plan are: 1) determine the proper hydrologic regime for surface waters that are tributary to San Isidro Arroyo based on the HP; and 2) support the development and submittal of a UAA and requests for stream re-classification as appropriate.

This work plan may be expanded as needed. If additional locations are identified, the rationale for selecting locations and the additional information collected will be included in reports submitted under this work plan.

3 Proposed Survey and Analysis Plan (HP Application)

3.1 Watershed Description

The San Isidro Arroyo confluences with the Arroyo Chico downstream of the LRM. The San Isidro Arroyo watershed above this confluence encompasses all of the stream reaches in question, including Arroyo Tinaja, Mulatto Canyon, Doctor Arroyo, and tributaries thereof, and corresponds to the USGS 12-digit Hydrologic Unit Codes (HUC) 130202050205 and 130202050206 (Figure 1). The San Isidro Arroyo headwaters are predominantly in the southern and southwestern edges of this watershed and streams flow to the northeast. There is a definitive break in the watershed topography between the uppermost headwaters and the lower reaches. The uppermost headwater reaches originate in steep, deeply incised canyons. However, these streams quickly drop in elevation to the middle and lower portions of the watershed, which is characterized by rolling hills and broader stream channel bed widths.

The LRM is located in the middle portion of this watershed. Arroyo Tinaja, Mulatto Canyon, San Isidro Arroyo, and Doctor Arroyo originate upgradient of the LRM, and flow across the mine permit boundary. Dikes and diversions have been used to route upgradient streams around the active areas of the mine. However, the use of dikes and diversions has not significantly altered the overall watershed characteristics of these streams such as slope, stream length, and watershed area. Therefore, the dikes and diversions have an insignificant effect on the hydrologic characteristics both within and downstream of the LRM permit boundary.

3.2 Watershed Approach

This work plan is intended to collect sufficient information using the HP process to determine the proper hydrologic regime of the San Isidro Arroyo and 3 principal tributaries; Arroyo Tinaja, Mulatto Canyon, and Doctor Arroyo.

Watersheds were categorized in three tiers. The first tier consists of lower order headwater streams (watersheds 1A, 1B, 1C, 1D). Two of these watersheds exist in the uppermost headwaters characterized by steep canyons and terrain (1A and 1B), while the other two are headwater watersheds within the lower portion of the watershed characterized by rolling topography (1C and 1D). The second watershed

tier (watershed 2ABC) is located on San Isidro Arroyo further downstream and encompasses the Tier 1 watersheds of Arroyo Tinaja, Mulatto Canyon, and San Isidro Arroyo. This is an intermediate tier that collects drainage from both the upper canyon area and the lower plains area. The third watershed tier (watershed 3ABCD) is located the furthest downstream on San Isidro Arroyo prior to its confluence with Arroyo Chico and encompasses all subwatersheds analyzed.

Use of a tiered approach ensures that all hydrologic regime types are characterized within the San Isidro watershed. Furthermore, all tributaries to San Isidro Arroyo are accounted for by sampling points within the tributary itself or by those further downstream in the larger channels.

3.3 Initial Field Reconnaissance

An initial field reconnaissance was conducted to ensure that the sampling locations selected would accurately characterize the stream reaches / assessment units (AU). The field reconnaissance was conducted on September 2 – 3, 2015. The photos of select arroyo locations taken during the September 2015 field reconnaissance are found in Attachment 1 and correspond to sites P1 – P5, P7 – P14, and P17 in Figure 1. These sites were selected based on USGS maps and topography, aerial photography, and knowledge of the primary drainages across the site. Stream sections were reviewed and field evaluations were not made until a minimum reach of 150 meters (m) in length of the stream channel was observed. The field reconnaissance for each AU began upstream and worked downstream as appropriate.

During the field site reconnaissance, geomorphic, hydrologic and biological features of the surface water drainage channel were observed for consistency to ensure that the appropriate sample reach was chosen to be representative of the larger stream segment to which the UAA will apply.

3.4 Stream Reach and Sampling Site Selection

Additional information taken into account for selecting sampling locations included geology, surrounding topography, stream morphology, vegetation, incoming tributaries, and any other feature that may affect the hydrology of the system. Following the field reconnaissance and collection of additional information, individual sites were established in locations that give an accurate representation of the stream reaches in question. Representative reaches were identified near the downstream end of each sub-watershed to ensure all upstream runoff processes are included.

In summary, application of the HP is proposed for the following: 2 sampling sites in Arroyo Tinaja, 1 sampling site in Mulatto Canyon, 3 sampling sites in San Isidro Arroyo (1 upper, 2 lower), and 3 sampling sites in Doctor Arroyo. Table 1 summarizes the sampling locations selected, the stream reach, the corresponding subwatershed, and spatial relationship to current NPDES outfalls. The locations of all sampling sites are shown on Figure 1. Determination of the appropriate classification for all tributaries to San Isidro Arroyo will rely on the application and interpretation of Level 1 Office and Field Procedures as provided in the HP.

Table 1: This table shows the proposed sample sites, corresponding stream reaches and subwatersheds, and rationale. Sites are arranged by subwatershed, from Tier 1 to Tier 3.

Site ID	Stream Reach	Subwatershed	NPDES Outfall Proximity	Rationale
U18	Arroyo Tinaja	1A	Upstream of outfalls	Headwater watershed representative of steep canyon terrain. Site located at base of canyons.
U07	Arroyo Tinaja	1A	Upstream of outfalls	Headwater watershed representative of steep canyon terrain. Site located at base of canyons.
U11	Mulatto Canyon	1B	Upstream of outfalls	Headwater watershed representative of steep canyon terrain. Site located at base of canyons. In approximate location of 2011 NMED UAA site.
U01	San Isidro Arroyo	1C	Upstream of outfalls	Headwater watershed representative of rolling hills.
U09	Doctor Arroyo	1D	Upstream of outfalls	Headwater watershed representative of rolling hills. Upstream of Doctor Springs.
U10	Doctor Arroyo	1D	Downstream of outfalls	Headwater watershed representative of rolling hills. Downstream of Doctor Springs.
U03	Doctor Arroyo	1D	Downstream of outfalls	Headwater watershed representative of rolling hills. Downstream of Doctor Springs.
U02	San Isidro Arroyo	2ABC	Downstream of outfalls	Tier 2 watershed downstream of confluence of Arroyo Tinaja, Mulatto Canyon, and San Isidro Arroyo. In approximate location of 2011 NMED UAA site.
U27	San Isidro Arroyo	3ABCD	Downstream of outfalls	Tier 3 watershed downstream of confluence of Arroyo Tinaja, Mulatto Canyon, San Isidro Arroyo, and Doctor Arroyo. This site encompasses the San Isidro Arroyo watershed in its entirety. Located just upstream of its confluence with Arroyo Chico.

3.5 Level 1 Office Procedures

3.5.1 Primary Data Review

A review of existing hydrology, meteorological, watershed and geomorphic data will be performed prior to performing any fieldwork. These data are likely to include:

- Mine use maps, historic aerial photographs and hydrology maps developed and incorporated into the Permit Application Package that provides the basis for the MMD Surface Mining Permit (No. 19-2P).
- Recent surface water flow and analytical data, depth to groundwater and other pertinent hydrologic information collected at the LRM in accordance with the Surface Mining Permit (No. 19-2P) will be reviewed prior to selecting AUs.
- Downstream USGS gauges will be reviewed for data availability and applicability to the streams in question at LRM. Streamflow characteristics of downstream USGS gauges will be analyzed and interpreted.
- The LRM has constructed numerous sediment ponds downgradient of active and reclaimed mining areas and other areas associated with surface coal mining including haulage and access roads, shops, buildings, and material storage areas to provide treatment of stormwater runoff from disturbed areas. These ponds are permitted as NPDES point-source outfall structures under the LRM individual NPDES Permit No. NM0029581. LRM does not believe that these outfalls have a significant effect on tributaries or drainages associated with the HP. The history of the discharges submitted to the EPA and Annual Pond reports show that the sediment structures only receive runoff from the mining area, rarely discharge, completely contain the sediment during flow events, and do not store significant volumes of water. Discharge history and annual pond reports will be reviewed.
- Eleven springs have been identified within and around the LRM permit boundary. Data and documentation of spring persistence and flow rates will be reviewed.

3.5.2 Determining Drought Conditions

Weather conditions will be determined by using the Palmer Drought Severity Index (PDSI), Standardized Precipitation Index (SPI) and the Palmer Z index.

The 12-month Standardized Precipitation Index (SPI) was obtained through the High Plains Regional Climate Center (HPRCC) Climate Maps website (HPRCC 2016). The SPI is a way of measuring drought that is based on probability of precipitation. The NDMC map shows that McKinley County, New Mexico currently has a 12-month SPI value between 0 and -1. The SPI at this time scale is representative of longer-term precipitation patterns. A value between 0 and -1 is indicative of below-average precipitation conditions.

The Palmer Z-index was obtained through the National Oceanic and Atmospheric Administration (NOAA) website (NOAA 2016). The Palmer Z-Index measures short term drought on a monthly scale. Northwestern New Mexico is shown as a range of -1.24 and +0.99 in September 2016, which is indicative of normal conditions.

The PDSI can be obtained from the NOAA website (NOAA 2016). The PDSI is used to measure the duration and intensity of long-term drought patterns. The September 2016 PDSI map shows that northwestern New Mexico is within the PDSI range of -1.99 to +1.99, again indicative of normal conditions.

These indices will be evaluated again during the office procedures and prior to conducting the field evaluation.

3.6 Level 1 and 2 Field Evaluation

To ensure the UAA is completed with utmost accuracy LRM intends to use onsite and regional technical staff to conduct the UAA. The staff conducting the UAA has a combined 58 years of experience in hydrology, hydrogeology and geology including experience in the arid southwest United States. The names and experience of the personnel are provided in (Attachment 2).

To ensure that the highest attainable use is appropriately determined, physical, biological, and chemical parameters will be analyzed. Physical characteristics will be characterized primarily using the Hydrology Determinations Field Sheet as provided in the NMED HP. During field evaluations any other relevant physical information that may provide clarification on the stream classification will also be documented and used to properly assess the stream.

AUs will be reach based (150 m minimum) and will begin upstream and worked downstream as appropriate. Stream characteristics will be documented by photo-documentation. Field assessments will follow the NMED HP and will begin with Level 1 indicators of: Water in Channel, Fish, Benthic Macroinvertebrates, Filamentous Algae and Periphyton, difference in vegetation, and absence of Rooted Upland Plants in the Streambed. If after these evaluations, the stream score is ≤ 2 and no other biological, chemical, or physical characteristics imply other stream conditions exist, the stream will be characterized as ephemeral and the field evaluation will be complete. However, if the score is >2 the level 1 Indicator field work will continue and sinuosity, floodplain and channel dimensions, in channel structures, stream substrate size and sorting, hydric soils, presence of sediment on plants and/or debris, seeps and springs, iron oxidizing bacteria/fungi will be evaluated for. Field evaluations will continue with Level 2 office and field procedures until an accurate determination of the stream hydrology can be made.

Based on baseline information collected on stream channels, channel widths for most sampling sites will be less than 4 meters, and the corresponding sampling lengths of 150 meters will be utilized. However, for channels wider than 4 meters, representative channel lengths 40 times the average channel width will be used as prescribed in the NMED HP. Representative reaches higher in each watershed may also be identified if necessary to evaluate potential variability in hydrologic regimes within different geologic

or geomorphologic settings. The LRM sampling team will perform one field replicate to assure the repeatability of the methods in accordance with recommendations in the SWQB Quality Assurance Project Plan.

If an AU defined in this work plan needs to be modified or changed for any reason, the NMED will be notified and provided with the reason and proposed new AU. If an AU is changed, field work will not continue until the proposed AU is approved by NMED.

3.7 Additional HP Scoring Considerations

LRM understands there is some potential for erroneous classification of high desert arroyos and stream channels in semi-arid regions of the Southwestern U.S., such as exist at the LRM. For instance, a lack of rooted upland plants (HP Indicator 1.6) along sand-bed channels with low gradients may be driven by conditions that do not support upland plants due to appreciable sediment transport and associated scour and deposition during flash floods. In addition, surrounding bedrock outcrops or hillslopes can encroach on the floodplain and stream channel creating stream sinuosity (HP Indicator 1.7) that is not reflective, or determined, by the frequency or permanency of flow. Finally, the degree of channel entrenchment (HP Indicator 1.8) can be driven more by infrequent but large flash floods and alternating reaches of scour or sediment deposition along channel reaches. These potential scoring issues as applied to survey information collected as part of this work plan will be considered when applying the HP to LRM streams.

3.8 Evaluation Results

In summary the evaluation of the field analysis and office procedures will provide sufficient information to determine the appropriate use classification for all arroyos and tributaries within the San Isidro watershed upstream of site U27. Results from the work plan will be compiled into a UAA report that will be submitted to NMED and USEPA Region 6 for agency review and public notification and comment process.

4 Public Notice and Agency Consultation

Section 20.6.4.15.D NMAC requires that a work plan for a UAA shall provide for public notice and comment and for consultation with appropriate state and federal agencies. This work plan will be reviewed and approved by a multi-stakeholder technical review committee comprised of staff from LRM and Peabody Energy, New Mexico Environment Department, and USEPA. This will occur by review of this work plan by NMED and USEPA Region 6, response to comments, and meetings as necessary to resolve comments.

The Statewide Water Quality Management Plan and Continuing Planning Process document (the Plan), adopted by the WQCC on May 10, 2011, specifies that the Surface Water Quality Bureau (SWQB) determines whether to proceed with the expedited UAA process if the UAA demonstrates that limited aquatic life and secondary contact are the highest attainable uses, and that no existing Section 101(a)(2)

uses would be removed. LRM will comply with all notice requirements provided by Section 20.6.4.15 regarding public notice based on the SWQB's determination to implement an expedited or regular UAA.

The lands on which the waters of interest are located on lands owned by Lee Ranch and controlled by LRM via leases. Accordingly, the appropriate agencies for consultation on this work plan are NMED and the USEPA Region 6. That will be accomplished through review of this work plan and the report by those agencies. Based on the outcome of the work proposed, LRM and/or NMED may petition the Commission to modify designated uses, which will require further public notice and provide additional opportunity for public comment before the Commission.

5 Schedule and Reporting

Lee Ranch Mine has outlined the above work plan that will be undertaken in mid-May through early-June of 2017, prior to the onset of the monsoon season. All completed scoring sheets, the output of the Level 1 Office Procedures, and all collected photographic documentation will be provided in a consolidated report. The report will include maps showing the extent of each of the reaches surveyed with the calculated numeric HP scores. Based on the results provided in the report, recommendations regarding appropriate classifications will be proposed and supported by the data collected. Any significant uncertainties and/or potential additional data needs will be identified in the report.

6 References

Energy Minerals and Natural Resources Department, New Mexico Mining and Minerals Division (MMD). Life of mine surface mining permit No. 19-2P.

High Plains Regional Climate Center (HPRCC) Climate Maps, 2016. 12-Month Standardized Precipitation Index. http://hprcc.unl.edu/maps.php?map=ACISClimateMaps

National Oceanic and Atmospheric Administration (NOAA), 2016. Historical Palmer Drought Indices, Z-Index. http://www.ncdc.noaa.gov/temp-and-precip/drought/historical-palmers/zin/201510-201609

National Oceanic and Atmospheric Administration (NOAA), 2016. Historical Palmer Drought Indices, Palmer Drought Severity Index. http://www.ncdc.noaa.gov/temp-and-precip/drought/historical-palmers/psi/201510-201609

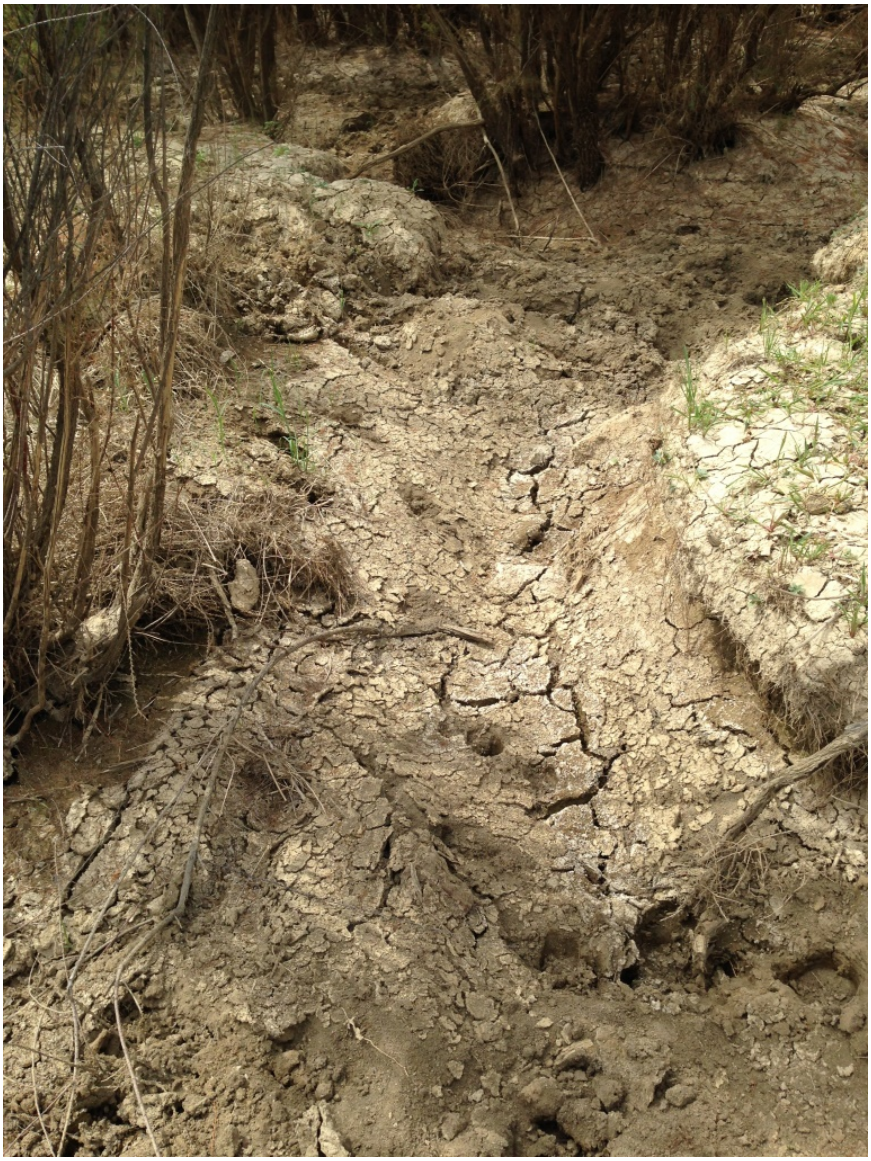
New Mexico Administrative Code (NMAC) Title 20 Environmental Protection Chapter 6 Water Quality, November 2016. http://164.64.110.239/nmac/parts/title20/20.006.0004.pdf

New Mexico Environmental Department (NMED), 2011. Statewide Water Quality Management Plan and Continuing Planning Process, Appendix C: Hydrology Protocol for the Determination of Uses Supported By Ephemeral, Intermittent, and Perennial Waters. Surface Water Quality Bureau. May 2011. https://www.env.nm.gov/swqb/Hydrology/

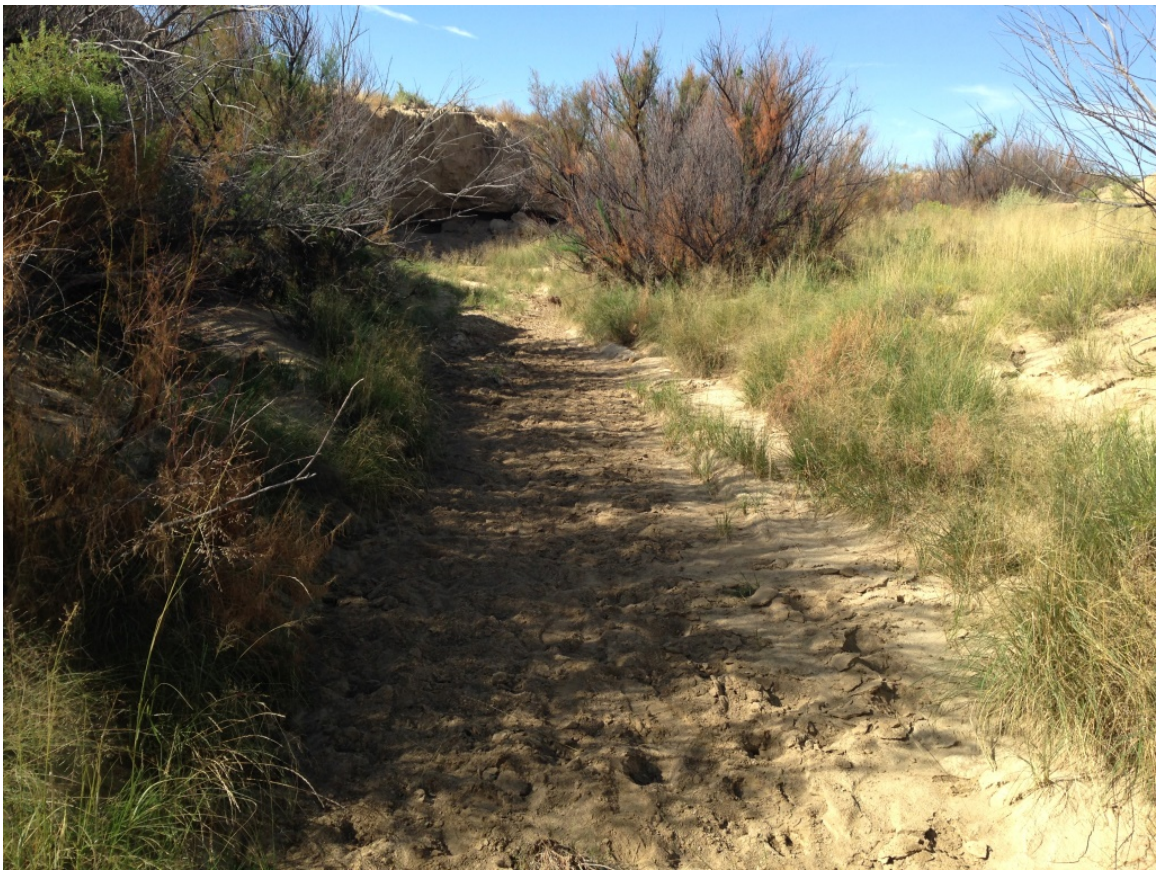
New Mexico Environment Department (NMED), 2012. Use Attainability Analysis for Unclassified Non-Perennial Watercourses with NPDES Permitted Facilities. Surface Water Quality Bureau. June 2012. https://www.env.nm.gov/swqb/UAA/HP/index.html

7 Attachment 1 – Field Reconnaissance Photos

Upstream Sites – P01

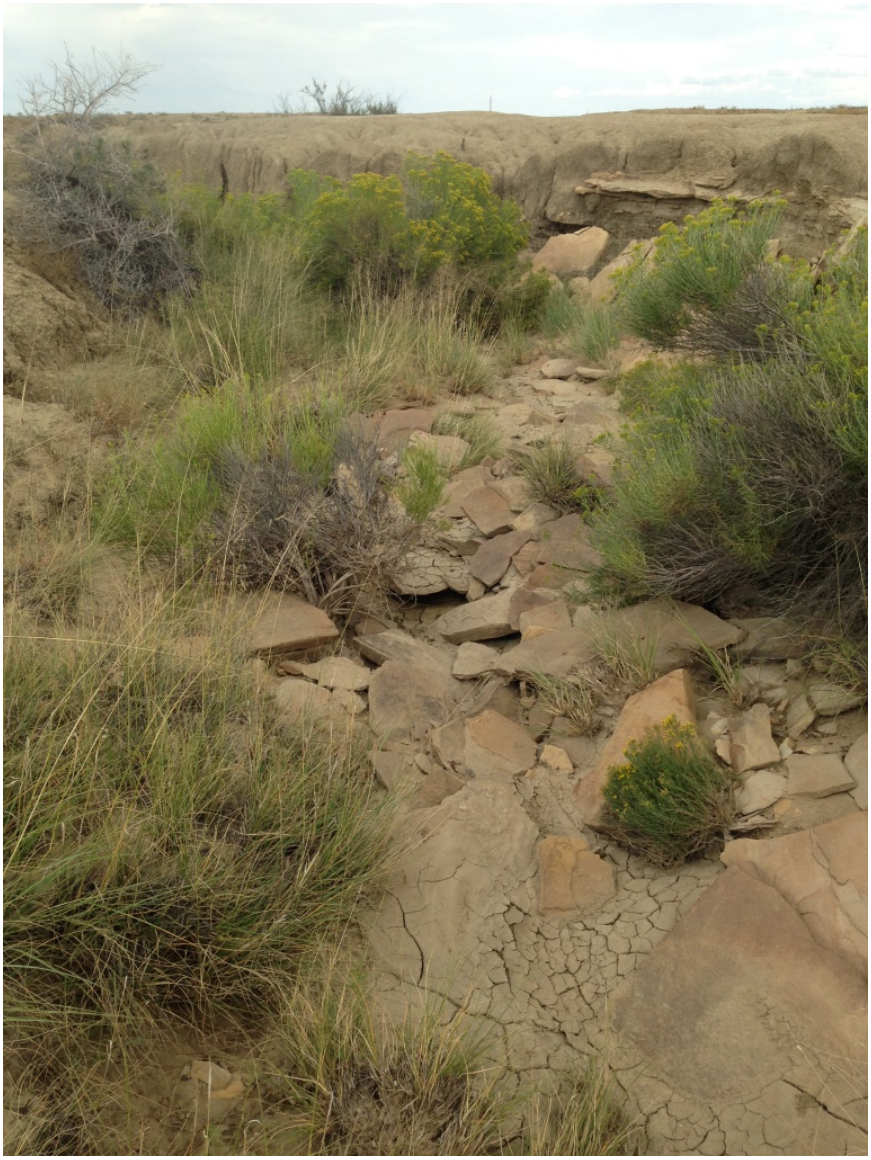


Downstream Sites – P02



Downstream Sites – P03

Upstream Sites – P04

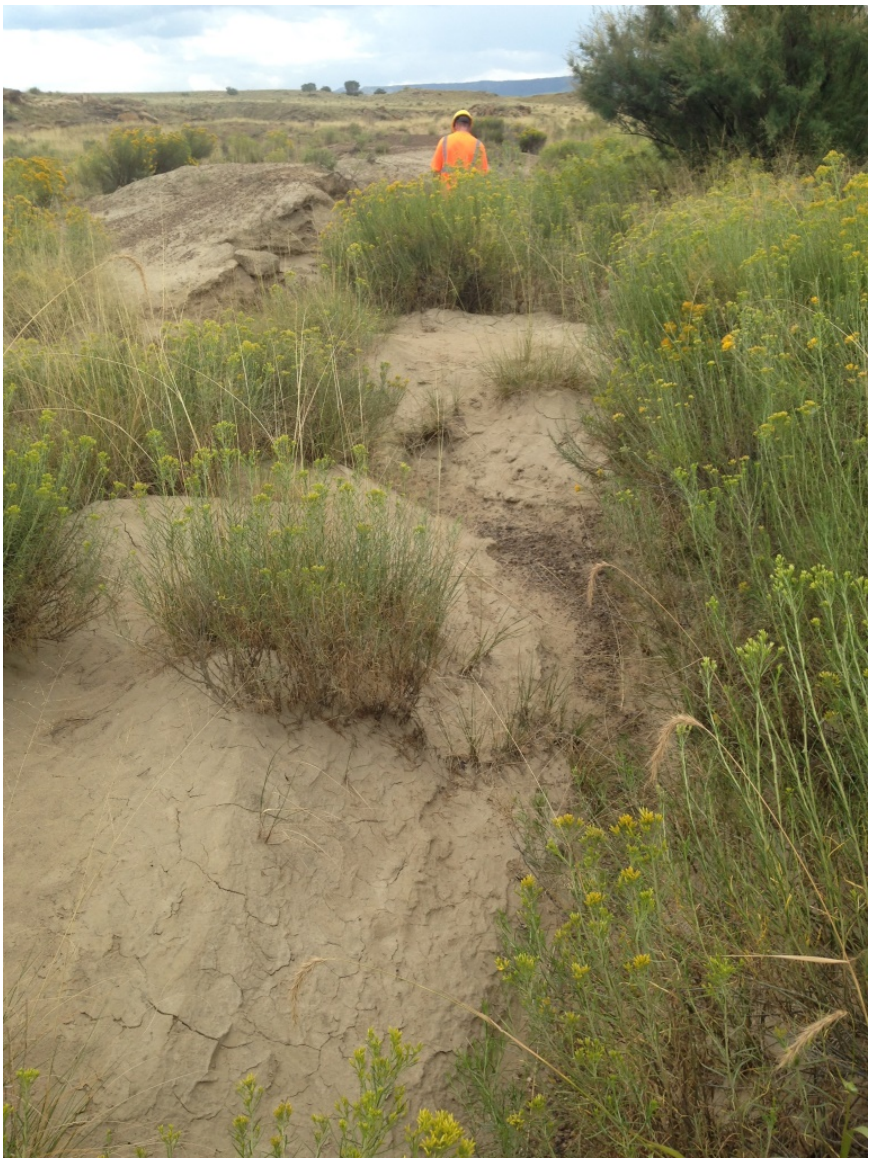


Upstream Sites – P05

Upstream Sites – P07

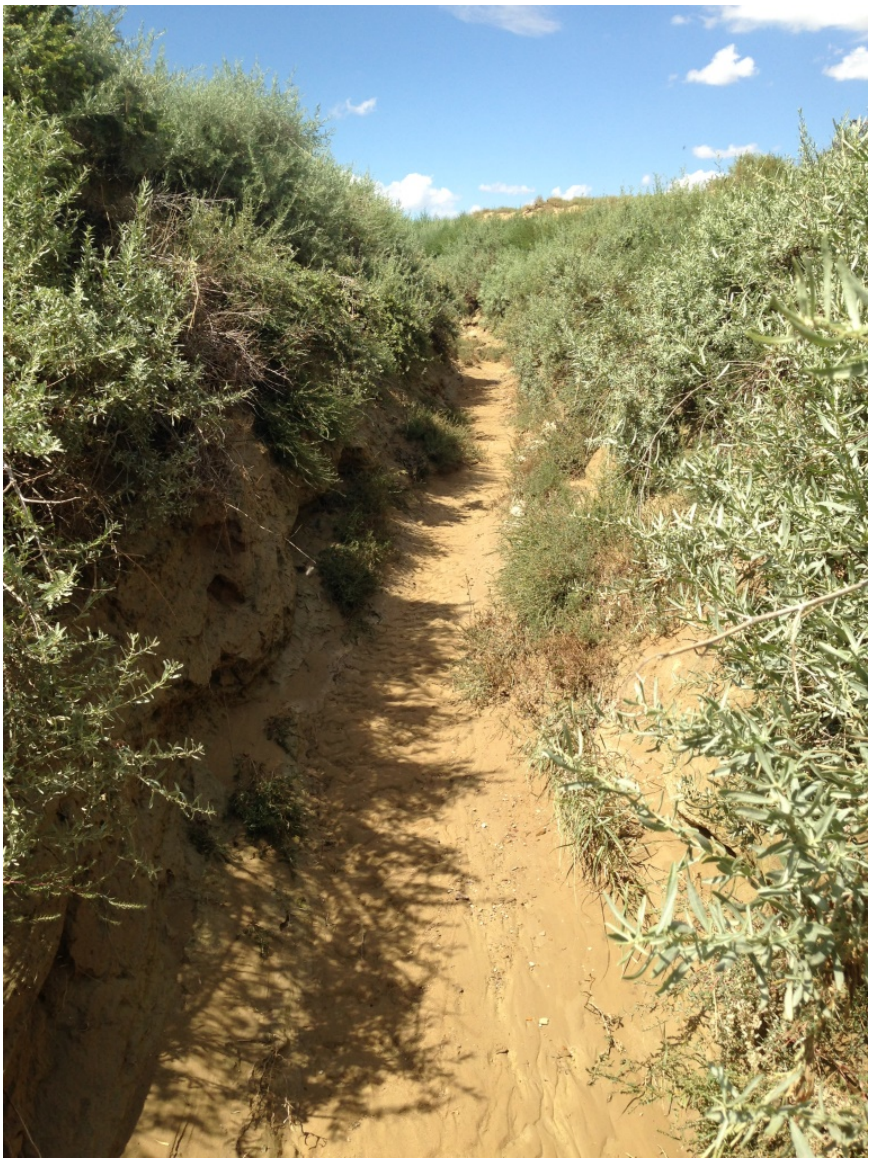
Downstream Sites – P08

Upstream Sites – P09

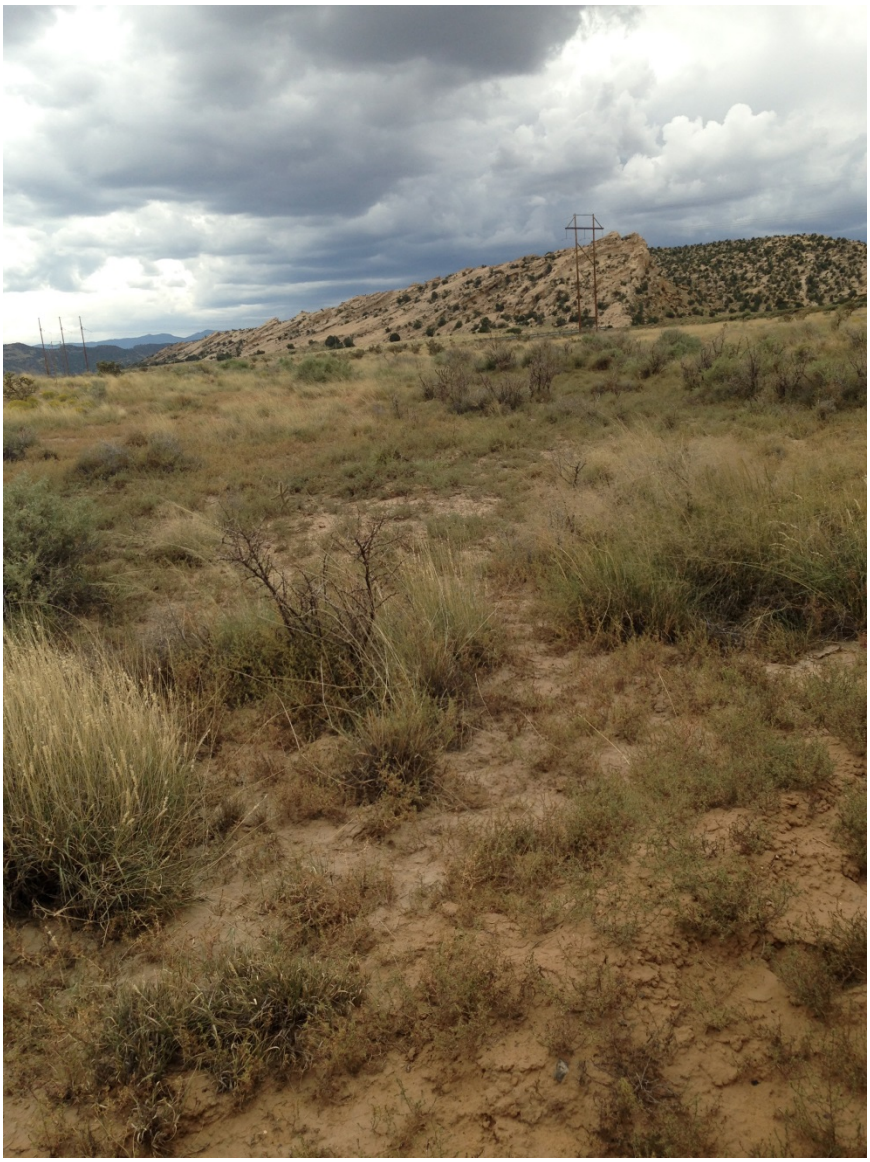


Upstream Sites – P10

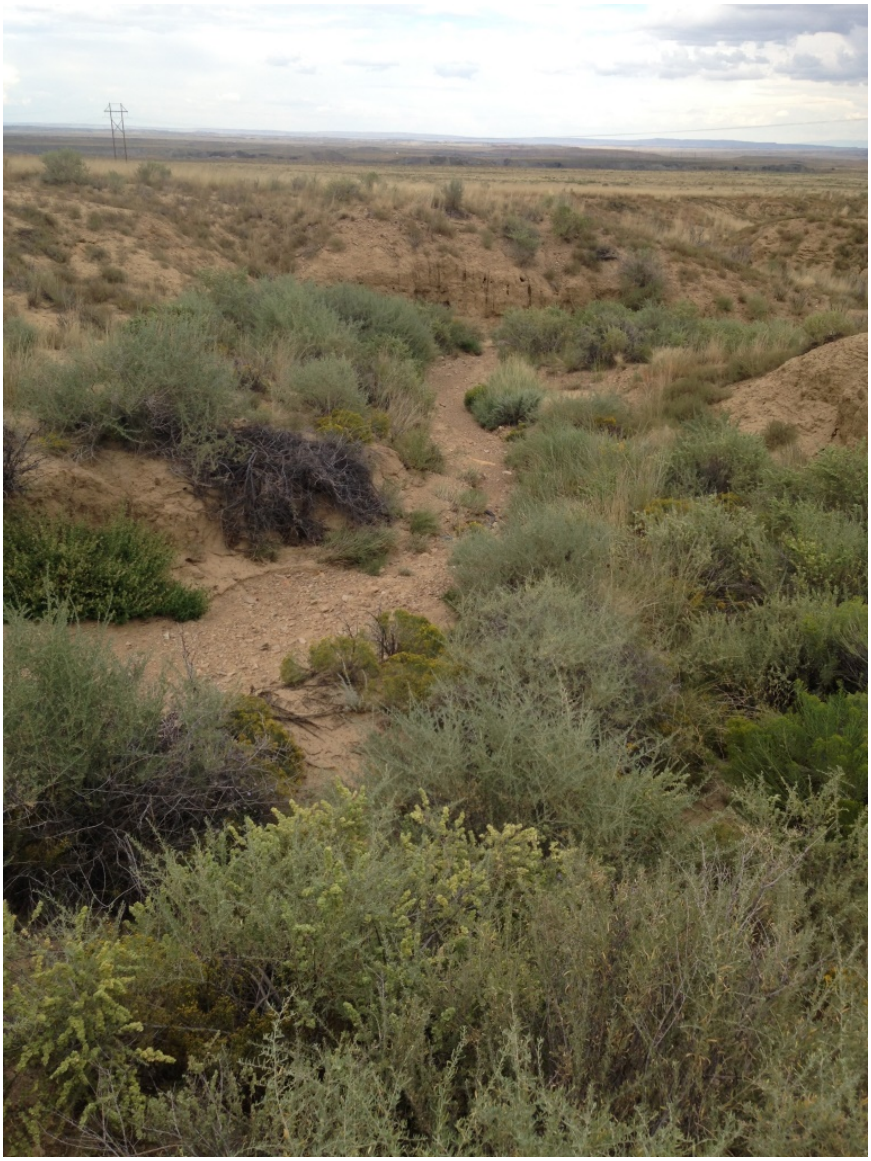
Upstream Sites – P11



Upstream Sites – P12

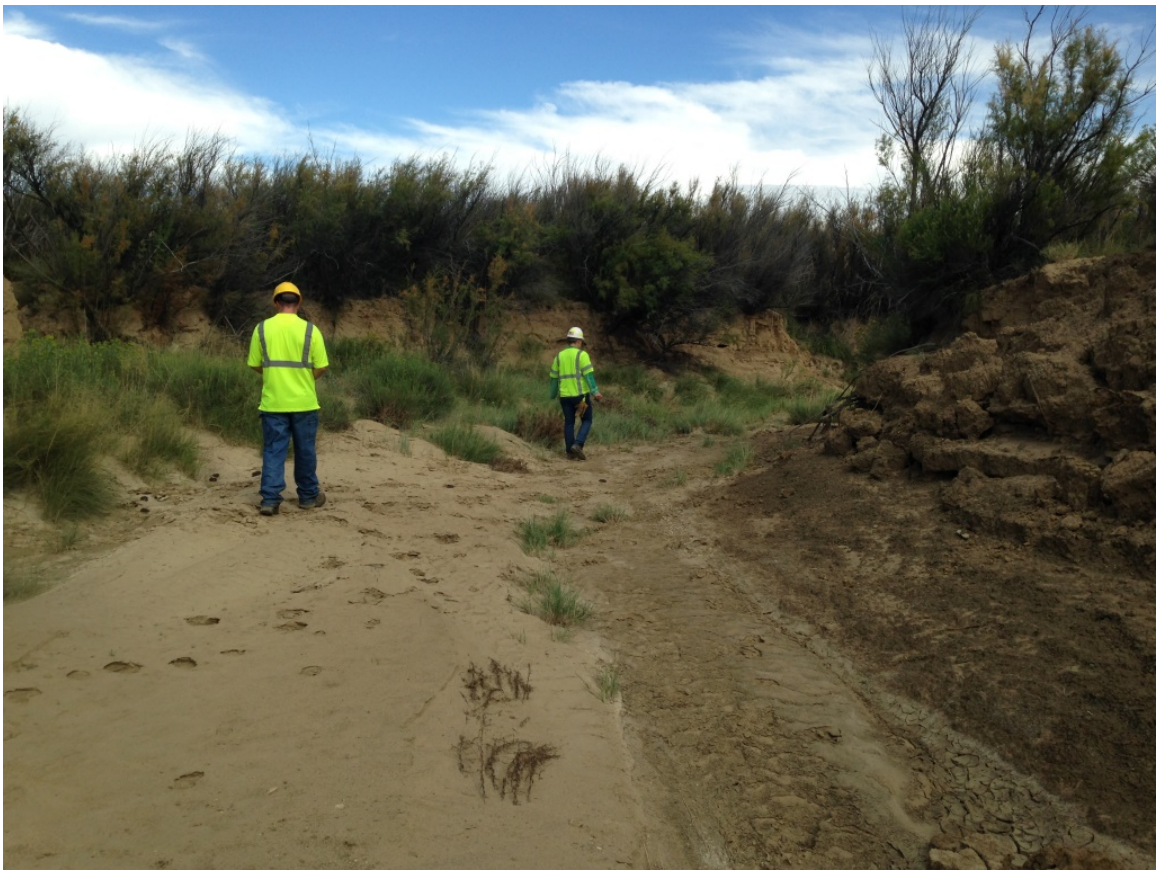


Upstream Sites – P13



Upstream Sites – P14

Downstream Sites – P17



8 Attachment 2 – UAA Team Experience

John Cochran is a retired Peabody Energy employee now consulting with Peabody's regional office. John received his B.S. degree in hydrology from the University of Arizona. John has been practicing hydrology and hydrogeology in the arid southwest for 34 years.

Chad Gaines is the onsite environmental specialist at Lee Ranch Mine. Chad received his B.A. in Organizational Management from Ashford University. Chad has 10 years experience in coal mining at this location and 4 years experience in the environmental sector.

Jimmy Boswell is with Peabody's regional office. Jimmy received his B.S. degree in Environmental Science and M.S. degree in Geology at Indiana University. Jimmy has been practicing hydrology for 14 years, with 6 years experience in the arid southwest.

9 Figure 1

Map showing proposed UAA sampling locations.


Lee Ranch Mine Use Attainability Analysis Sampling Plan
Lee Ranch Permit Boundary
UAA Proposed Sampling Locations
Photograph Locations
NHD Streams
UAA Watersheds
Tier 3
Tier 2
Tier 1
Diversions / Dikes
Dike
Diversion
NPDES Outfalls
Existing, Permanent
Existing, Temporary
Proposed, Temporary
Elevation
7894 - 8240
7648 - 7894
7451 - 7648
7295 - 7451
7164 - 7295
7044 - 7164
6936 - 7044
6839 - 6936
6756 - 6839
6683 - 6756
6601 - 6683
6440 - 6601
N
Reference Scale: 1:24,000
0
0.5
1
2
3
Miles
Watershed 3ABCD
Watershed 1D
Watershed 2ABC
Watershed 1A
Watershed 1B
Watershed 1C
U27
U03
U02
U10
U09
U01
U18
U07
U11
P02
P03
P17
P08
P10
P09
P05
P04
P01
P07
P11
P14
P13
P12
USGS The National Map: National Boundaries Dataset, National Elevation Dataset, Geographic Names Information System, National Hydrography Dataset, National Land Cover Database, National Structures Dataset, and National Transportation Dataset; U.S. Census Bureau - TIGER/Line; HERE Road Data