

SECTION 36

POST-RECLAMATION SOIL

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36. POST-RECLAMATION SOIL

In 2024, OSMRE approved an NTEC permit revision which removed total and soluble selenium from the Navajo Mine permit (NM-00031) root-zone suitability criteria. Total and soluble selenium are still included as required parameters for root-zone suitability criteria in the Pinabete Mine permit (NM-0042B) and No Name Mine permit. NTEC will continue to evaluate root-zone material in the Pinabete Mine and No Name Mine permit areas using the root-zone suitability criteria and specifications including total and soluble selenium. The root-zone suitability criteria for the permit area are presented in Section 36.5.2.

The same geologic formations are present throughout the lease area, and all operations extract coal from the Fruitland Formation. Because the same geologic formations are present in all operations, the overburden material characteristics are similar for the No Name, Pinabete, and Navajo permit areas. The overburden analyses, presented in Section 17 Geologic Information, concluded that the materials in the No Name Mine permit area are net alkaline and there are no widespread occurrences of potentially acid- or toxic- forming materials (PATFM) or material that exceeds the OSM and Navajo Mine root-zone suitability criteria for selenium (total and soluble), boron, and pH. These results are similar to overburden characterizations performed for Navajo Mine. Lastly, the same soil-forming factors (parent material, biota, climate, topography, and time) exist across the NTEC mining lease and have resulted in soils with consistent physical and chemical properties (Keetch 1980).

The use of consistent topdressing and root-zone suitability criteria for the Pinabete and No Name is justified given the proximity of these operations and the similarity of controlling factors including climate, vegetation, soils, and geology.

36.1 Soil Resources

NTEC classifies the soil resources used for reclamation within the permit as topdressing, regolith, root-zone, unconsolidated spoil, or spoil material. How the soil resource is classified is a function of its position within the soil profile.

- Topdressing refers to unconsolidated material capable of supporting plant growth in the upper five feet of the native in situ soil profile. This includes all topsoil material (A and E soil horizons) and suitable topsoil substitute material (B and C soil horizons). Topdressing is replaced on top of the regraded root-zone and/or spoil material during the reclamation process.
- Regolith is unconsolidated material which can support plant growth and is located deeper than five feet in the native in situ soil profile. Regolith material may be used as either root-zone or topdressing replacement material, depending upon its chemical and physical characteristics.
- Root-zone material is the upper four feet of the overburden material, which has been regraded to the approximate original contour, or final surface configuration (FSC).
- Unconsolidated spoil material is material located deeper than five feet of the native in situ soil profile and is salvaged without sampling. Unconsolidated spoil material may be used for general construction and maintenance activities, e.g., road base, pond embankments, culvert fill, and other construction structural fills.

If unconsolidated spoil material is placed in the root-zone or as topdressing in reclamation areas, the material will be sampled after placement to ensure it meets the appropriate suitability criteria.

- Spoil is the remainder of the regraded overburden material (i.e., deeper than four feet) in the reclamation soil profile, which was removed and replaced to facilitate surface coal mining.

In 1998 and 2008, Buchanan Consultants, Ltd. (BCL) conducted Order 2 soil surveys to describe the soil resources in the No Name permit area and the southern part of the Pinabete permit area. These two soil surveys were compiled into a composite survey report, which is described in Section 14 (Soil). The resulting soil survey report (Appendix 14-A) identifies and describes the location and estimated volumes of available topdressing material within the survey area. In 2025, the soil survey data were reviewed to determine the estimated volumes available within the No Name permit area. The estimated volume of available topdressing material within the No Name permit area is 24,830,271 bank cubic yards (bcy), information is located in Table 14-6 in Section 14. Considering a conservative handling loss of 10%, this volume will provide for a topdressing replacement depth of 14.8 inches for reclamation of the No Name permit area.

The interpretations made in the baseline soil surveys regarding topdressing suitability are limited to the upper five feet of unconsolidated material. The No Name permit area likely contains sources of material below a depth of five feet that are capable of supporting plant growth (i.e., regolith). The baseline soil surveys did not evaluate and describe the potential volume of available regolith resources that may exist within the permit area. NTEC does not anticipate needing the regolith material for reclamation purposes within the No Name Mine permit area. If a need is identified, the regolith resources will be handled according to the procedures and processes described in Section 36.2.2.

36.1.1 Topsoil Substitutes and Supplements

The Surface Mining Control and Reclamation Act of 1977 (SMCRA) defines topsoil as the A and E soil horizons (30 CFR 701.5). These are the uppermost soil horizons of a soil profile and are characterized by accumulations of organic matter (A horizon) or intensely weathered and leached horizons that have not accumulated organic matter (E horizon) (Brady and Weil 1996). The baseline soil resources within the No Name permit area consist of Aridisols and Entisols soil types (Section 14). These soil types contain negligible resources that meet the SMCRA topsoil definition; therefore, NTEC relies on topsoil substitute material, or topdressing, for reclamation.

36.1.2 Borrow Areas

NTEC does not anticipate the need for topdressing borrow areas to facilitate reclamation of the No Name permit area. This section will be updated in consultation with OSMRE if topdressing borrow areas are determined to be needed in the future.

NTEC may require soil borrow areas to provide additional fill material for the construction of roads and other support facilities. This fill material is necessary to achieve and/or maintain the designed grade of the structures and for structural backfill material.

Borrow areas will be sampled and tested for topdressing resources according to the topdressing sampling and testing plan discussed in Section 36.2.1. Suitable topdressing resources will be salvaged and stockpiled or hauled directly to regraded areas in accordance with Section 37 (Post-Reclamation Vegetation) and Section 38 (Post-Reclamation Surface Stabilization and Sediment Control). The borrow areas within the planned pit disturbance areas will be temporarily reclaimed and stabilized, regraded, and seeded in accordance with Section 37 and Section 38. Borrow areas outside of planned pit disturbance areas will be regraded and reclaimed according to this section and Section 37.

NTEC will notify OSMRE prior to disturbance of any potential borrow areas. As part of this notification process, NTEC will provide an estimate of the volume of materials to be salvaged and the acreage of borrow area land planned for disturbance during the topdressing salvage operations.

36.2 Topdressing Sampling and Testing Plan

NTEC will conduct a pre-salvage soil-sampling program (i.e., pre-strip survey) to identify soil material that is suitable for use as topdressing. Soil surveys will be performed within 1,800 feet of the highwall or other planned disturbances, e.g., sediment control ponds and soil borrow areas. The purpose of this program is to refine estimates and locations of available topdressing resources. The methodologies utilized in the topdressing sampling plan are based on the baseline soil surveys conducted for the NTEC mining lease and are described below.

36.2.1 Topdressing Sampling Plan

The conditions observed during the baseline soil survey, discussed in Section 14, served as a guideline to develop the topdressing sampling methodologies presented in this section. NTEC will use a square grid with a maximum of 200-foot centers to establish test sites for evaluations of potential topdressing sources. This spacing results in a sampling density of approximately one test pit per acre and further refines the detailed baseline soil survey (Section 14) map unit delineations. This topdressing sampling density provides adequate representation within the most heterogeneous mapping unit.

At each site, a test pit is excavated with a backhoe, or similarly effective piece of equipment, to either an observable unsuitable layer (e.g., bedrock, paralithic contact, extreme clay accumulations, rock fragments, or extremely hard consistence) or to a depth of five feet, whichever is shallower. Five feet is the maximum depth that NTEC will allow personnel to sample within a pit. At depths greater than five feet, the possibility of the wall collapsing increases and the test pit becomes a safety hazard. The test pit side walls will be benched during excavation to mitigate the risk of collapse. If no unsuitable layer is observed within the upper five feet of material, and if observations of material in the test pit at five feet deep indicate that material deeper than five feet may be suitable as topdressing replacement, then

excavations may be extended beyond five feet. Methodologies for excavations deeper than five feet are discussed in Section 36.2.2 Regolith Sampling Plan. A soil hydraulic probe outfitted with a Shelby tube sampler, or similar sampling method, may be used as an alternative to an excavated backhoe test pit to sample surficial soils (upper five feet of material).

A Certified Professional Soil Scientist (CPSS), or similarly qualified environmental specialist, shall oversee the sampling of each test pit. The scientist will identify the soil profile horizons, and for each horizon, will record depth, dry consistence, texture, and other physical characteristics to aid in the taxonomic classification of the soil type. The soil scientist will collect samples from representative soil horizons for topdressing suitability analysis. Sample container labeling will include the following information: date of collection, sample site, and depth interval. The soil scientist will record field notes and/or soil profile descriptions for each test site (200-foot grid centers) or test pit. NTEC will maintain copies of these pre-disturbance field notes or soil profile descriptions at the mine site. If it is not feasible to remove a sample of the unsuitable layer, the characteristics and depth of the layer are included as part of the field notes.

Badland and Natric (Natrargids and Natrigypsid) soil types typically lack perennial vegetation and historically have been unsuitable sources of topdressing. Therefore, NTEC will not collect samples from these soil types when field observations of the soil characteristics support classifying the soil as Badland or Natric. Because the natric soil types present within the mine lease area are typically unsuitable sources of topdressing, it is unnecessary to classify these soil types to the taxonomic subgroup or series level. For mapping and reporting purposes, NTEC will identify all natric soil types as “Natric” (NA) map units. However, if perennial vegetation is observed, and, if depositional soil over the natric solum is observed, then NTEC may elect to collect samples from areas that were classified as Badland or Natric during the baseline soil surveys (Section 14). If suitable topdressing material is identified in these areas, then NTEC will determine the taxonomic classification to either the series level, as Natric Overblown (NO), or as Natric Outwash (NOw).

NTEC will submit the collected soil samples to a soil analytical laboratory for analyses. Prior to salvage, NTEC will determine the suitability of all potential topdressing sources according to the methods and criteria provided in Table 36-1 and Table 36-2, respectively. Soils that do not meet all of the Table 36-2 suitability criteria are classified as unsuitable and will not be salvaged for use as topdressing.

The suite of parameters used to evaluate topdressing suitability at Navajo Mine was revised from the “Office of Surface Mining Reclamation and Enforcement Topsoil and Topsoil Substitute Suitability Criteria for The Southwestern United States” (OSMRE 1999) based upon an analysis of historical sample data, conducted in December 2001 from more than 5,000 collected samples (PAP NM-0042B). This analysis provided the justification for eliminating carbonate percentage, acid-base potential, boron, and total selenium from the analytical suite. The justification showed that eliminating these parameters from analysis would not adversely affect the suitability of

reconstructed soils or reclamation success. The use of consistent topdressing suitability criteria for the Navajo Mine, Pinabete Mine, and No Name Mine is justified given the proximity of these operations to each other, and the similarity of controlling factors including climate, vegetation, soils, and geology.

NTEC performed a comprehensive evaluation to calculate site-specific erosion factor, or K factor, values of the topdressing material within the No Name Mine permit area. The purpose of this evaluation was to assist in developing the baseline flood flow and sediment yield modeling presented in Section 18 (Water Resources). The baseline soil mapping units, presented in Section 14, were assigned a soil texture class (i.e., fine, fine loamy, coarse loamy, and sandy) based on surface texture. A composite sample for each surface texture class was created from multiple samples randomly located within the respective soil texture delineation. Inter-Mountain Laboratories, of Sheridan, Wyoming, analyzed each of the composite samples according to the algebraic approximation of the Wischmeier nomograph described by Renard et al. (1996) and Wischmeier and Smith (1978). The calculated erodibility values for topdressing resources range from 0.10 for coarse loamy soil textures to 0.27 for sandy and fine loamy textures (Table 36-3). OSMRE has recommended a 0.37 erodibility value for all topsoil and topsoil substitute materials (OSMRE 1999). The results of NTEC's evaluation indicate that soil materials from No Name Mine that will be used for topdressing have erodibility values less than OSMRE's recommended values and continued analysis is unnecessary. Results of the topdressing sampling and analysis will be submitted annually to OSMRE in the annual soil resource report described in Section 36.6.

36.2.2 Regolith Sampling Plan

As stated earlier, NTEC does not anticipate a need to use regolith to meet the No Name reclamation goals. However, regolith material may be salvaged and used either as topdressing or root-zone material or it may be spoiled if deemed necessary. The decision to whether to salvage or spoil regolith will be based on the reclamation needs determined in the future.

If in situ regolith is encountered and it is to be used as topdressing or root-zone material, it will be sampled in situ and evaluated using the topdressing suitability criteria in Table 36-2. The topdressing criteria are prescribed for suitability determinations because salvaged regolith may be stockpiled and used as either topdressing or root-zone material. Topdressing suitability criteria are generally more stringent than root-zone suitability criteria, and determination of suitability from a single suite of suitability criteria eliminates the need for segregated regolith stockpiles. Regolith sampling will be conducted with a drill rig using a core barrel auger, or similarly effective piece equipment, in areas where the baseline soil survey (Section 14) and pre-strip topdressing sampling indicate potential sources of suitable regolith below five feet (deeper than five feet).

Other than as described above, NTEC will sample potential in situ regolith resources concurrently with the pre-strip soil survey. If the presence of regolith suitable as topdressing or root-zone material is thought to be probable at depths greater than five feet, then pre-strip survey test-pit excavations may be extended beyond five feet to collect regolith

samples for laboratory analysis and determination of suitability for use as topdressing replacement or root-zone material. In order to collect samples from depths greater than five feet, the scientist will direct excavations to proceed in one-foot depth intervals. Each one-foot interval will be excavated with a backhoe, or similarly effective piece of equipment. The backhoe will place the excavated material from each one-foot interval into discrete piles. The scientist will evaluate the material from each interval to describe the material's physical characteristics, and to collect representative samples for laboratory analysis. The depth of incremental excavations will be verified by physically measuring the face of the pit with a measuring tape, or with a laser-enabled measuring device, either method allows personnel to remain outside of the pit and away from potential hazards. The collected regolith samples will be handled in the same manner, and using the same methodologies as described in Section 36.2.1 Topdressing Sampling Plan.

NTEC may propose to conduct a regolith characterization study for the No Name permit area. If NTEC does conduct the regolith characterization study, a plan describing the areas of investigation and the sampling methods will be submitted to OSMRE for approval prior to commencing the study. Similar characterization studies completed for the Navajo Mine permit area were conducted on 800-foot centers using a drill rig outfitted with core barrel auger. NTEC may use these same general methods or modify them to best characterize the regolith resource found within the permit area.

Within the No Name permit area, NTEC may utilize regolith for topdressing or root-zone material prior to developing and implementing a characterization study. In the absence of a complete characterization study, the regolith resource will be sampled in situ, or after placement according to the appropriate suitability criteria each time it is used.

Results of any regolith sampling and analysis will be submitted annually to OSMRE in the annual soil resources report (Section 36.6).

36.3 Soil Handling Plan

The following describes the methods and procedures NTEC will use for the removal of vegetation and soils and the stockpiling of suitable topdressing material for the No Name permit. This information is also presented in Section 20 (Mining Operations).

36.3.1 Vegetation and Soil Removal

NTEC will salvage suitable soil materials for use as topdressing during reclamation. Topdressing salvage operations may occur anytime during the calendar year as equipment and personnel are available. Existing vegetation will be removed with the salvaged topdressing to improve the organic content. If the existing vegetation is too large to facilitate topdressing salvage operations, NTEC will use a bulldozer, or similarly effective piece of equipment, to grub the vegetation in advance of salvage operations. NTEC will conduct topdressing salvage operations with haul trucks and front-end loaders, tractor scrapers, or similarly effective equipment. Where practical and feasible, NTEC will salvage and direct haul suitable topdressing material to graded areas. If direct haul is not practical or feasible, the

salvaged topdressing material will be stockpiled in approved stockpiles in accordance with the procedures described in Section 22 (Support Facilities).

NTEC will salvage topdressing material from all areas affected by mining operations or construction of major structures. Certain topdressing resources cannot be salvaged without jeopardizing the safety of the operators and equipment or diminishing the quality of the topdressing removed. Due to these limitations, topdressing is not salvaged where:

1. Slopes are greater than 3 horizontal to 1 vertical (3h:1v or > 33%)
2. Suitable surface deposits are less than 6 inches (this soil is too shallow to allow removal without considerable contamination from underlying unsuitable material)
3. Areas less than 1 acre in size (pockets)
4. Areas where rock rims and/or rock outcrops exist

The maximum allowable limit of topdressing removal in advance of the active mining area is 1,800 feet beyond the current extent of mining (i.e., highwall crest). Topdressing is removed far enough ahead of highwall drilling and blasting to prevent contamination from blasting flyrock, and to accommodate mining support infrastructure such as roads and power lines. In the event that a greater area is needed for topdressing removal, OSMRE will be notified prior to topdressing removal and the appropriate adjustments to the reclamation bond will be made. The extent of topdressing removal will fully consider and comply with the applicable hydrology performance standards.

36.3.2 Topdressing Storage

NTEC shall use stockpiles within the No Name permit area for topdressing storage and, if needed, regolith material. The locations and information regarding the construction, operation, and maintenance of the topdressing stockpiles are presented in Section 22 (Support Facilities). Methods used to stabilize the surface of the topdressing stockpiles are presented in Section 25 (Sediment Control Plan). NTEC shall place signs at all stockpiles indicating the stockpile name and the type of material (i.e., topdressing or regolith) contained within the stockpile.

36.3.3 Topdressing Replacement

All areas disturbed by mining or mining-related activities (e.g., ramps, primary haul roads, or support facilities) will have topdressing material replaced for reclamation. Topdressing will be removed from stockpiles or direct hauled from salvage areas and redistributed on regraded areas. Traffic on replaced topdressing is limited to reclamation activities to minimize compaction of topdressing materials. Prior to the placement of topdressing materials, NTEC will determine the required volume of topdressing for the specific area. After which, NTEC will apply the appropriate volume of topdressing to the area.

Prior to the placement of topdressing materials, heavily compacted regraded surfaces will be ripped or disked to alleviate compaction. Alternative implements, such as a V-ripper, may be used in lieu of ripping. Compaction of final

regraded surfaces is minor when dozers are used for final shaping activities. Compaction can be more prevalent when rubber-tired equipment, such as haul trucks and scrapers, repeatedly follow the same travel route. These heavy traffic areas will be deep ripped or disked to minimize compaction. With consideration to safety of operators and equipment, ripping and disking will be done on the contour whenever possible.

Topdressing will be replaced year-round with the equipment (i.e., scrapers or haul trucks) best suited for the conditions of the reclamation area. Compaction resulting from replacing topdressing material will be alleviated as discussed above and in Section 37 (Post-Reclamation Vegetation). An average depth of 14.4 inches of topdressing will be applied to all reclamation blocks within the No Name Mine permit area. The replaced topdressing depth will be approximated by load counts per reclamation block or survey staking. Variations in topdressing depth will be opportunistic and result from the equipment and process used for topdressing replacement. The average topdressing depth will be calculated over the entire reclamation block. NTEC will conduct topdressing depth verification surveys to ensure each area meets the average topdressing depth requirement. The methods used to verify the replaced topdressing depths are described in Section 36.3.3.2 (Topdressing Verification).

NTEC will also place coarse-textured alluvial type material within the defined bed and bank area of the reconstructed Pinabete Arroyo to support the hydrologic recovery and groundwater recharge capacity of the watershed. This same material may be placed near the confluences of the secondary drainages and the reconstructed Pinabete Arroyo, as well. NTEC will not place this material in the upper reaches or subchannels of the secondary drainages. The placement of this material is discussed further in Section 35 (Hydrologic Reclamation Plan) and Section 41 (Probable Hydrologic Consequences).

Aside from the Pinabete Arroyo, NTEC will not operationally place topdressing material within channel bottoms. However, topdressing material may migrate to the channel bottoms due to mechanical (e.g., equipment operations and placement activities) or natural means (e.g., wind and water movement of material).

If the top 12 inches of root zone material meets topdressing suitability guidelines, then no topdressing will be required for that area. When the top 12 inches of root zone material is used as topdressing, NTEC will analyze an additional foot of root zone material to ensure that the total depth of suitable material (root zone plus topsoil substitute) is five feet, see Section 36.5 Root-Zone and Mitigation Sampling.

Previously reclaimed lands that require re-disturbance to facilitate the revision of a final surface configuration will be handled in the following method. Prior to re-disturbance all topdressing that can practicably be recovered by standard mining equipment and practices will be removed prior to any re-disturbance and reclamation work. Topdressing recovered from these areas will either be placed in an approved stockpile for storage, or it will be directly hauled from the removal area to another regraded area for final placement.

After topdressing has been redistributed, it may be disked, or chiseled, along the contour to minimize erosion and reduce compaction of the topdressing.

Areas of minimal surface disturbance (e.g., ancillary roads, power-line disturbances, or drill sites) will not receive additional topdressing material. These features are typically constructed in the existing landscape without salvaging the topdressing material. The surface materials at these sites will be disked to create a suitable seedbed and seeded according to the methods and procedures described in Section 37 (Post-Reclamation Vegetation).

Occasionally, spoil fires may naturally ignite within the regraded spoil material. NTEC will not redistribute topdressing on areas of known active coal spoil fires. The measures NTEC will use to address coal spoil fires are presented in Section 20 (Mining Operations).

36.3.3.1 Topdressing Replacement Schedule

Mitigation and topdressing will be completed contemporaneously with mining operations. Section 34 (Post-Reclamation Topography) provides a summary of the regrading schedule. Topdressing material can be direct-placed by mobile equipment, stockpiled as necessary, or selectively handled with the dragline. Selective handling will occur when the material source is large enough and the dragline sequencing allows for it.

Factors which may affect the timely completion of topdressing replacement include:

- Proximity of in situ topdressing resources to facilitate direct haul and respread of this material
- Economic considerations
- Scheduling and capacity constraints

36.3.3.2 Topdressing Verification

The replaced topdressing depth will be approximated by load counts per reclamation block or by survey staking. Variations in topdressing depth will be opportunistic and are resultant from the equipment and processes used for topdressing replacement. The average topdressing depth will be calculated over the entire reclamation block. NTEC will conduct topdressing depth verification surveys to ensure each area meets the average topdressing depth requirement. The methods used to verify the replaced topdressing depths include physically sampling the topdressing depths, using surveyed elevation information, or using grade stakes.

When physical sampling of replaced topdressing depths occurs, it will be conducted at sample points arranged in a regular 330-foot grid. These topdressing verification sample points are coincidental with the 2.5-acre root-zone sampling points discussed in Section 36.5.1. The 2.5-acre plot will be divided into four equal subplots using the same methodology as approved for the regraded spoil monitoring plan (see Figure 36-1 for sampling layout). Each subplot will represent 0.625 acres. Test holes are dug at each of the centroid of each subplot and the depth of topdressing

material is recorded for that location. The topdressing thickness for each 2.5-acre plot will be determined from the average topdressing depth recorded at each subplot within the given 2.5-acre plot.

Survey elevation information may be used in lieu of physically digging samples, in which case the depth of topdressing replacement is calculated from the difference between the topdressing and regrade surface surveyed elevations. If grade stakes are used in an area to direct topdressing replacement, these may be used to verify replacement depth. Wooden lath will be placed throughout the regraded area with the appropriate replacement depth indicated on each side of the lath. The lath will be clearly marked and visible to the equipment operators. The lath shall remain in place until an OSMRE inspector has verified the topdressing depth.

If any of these methods determine that the redistributed topdressing depth within the verification area does not meet the required average topdressing depth, or if any of the sample points do not have a minimum sample depth of one half the required average depth, then NTEC will spread additional topdressing material until the area meets the average topdressing depth requirement.

The location of topdressing verification points and topdressing depths sampled between January 1 and December 31 will be submitted annually to OSMRE 60 days after the end of the calendar year in the annual soil resource report (Section 36.6).

36.3.3.3 Variance from Redistribution of Topsoil on Embankments

An embankment is an artificial deposit of material that is raised above the surface of the land used to contain, divert, or store water, support roads or railways, or for similar purposes (30 CFR 701.5). OSMRE may grant applicants a variance, allowing them not to redistribute topsoil or topsoil substitute on post-reclamation embankments (30 CFR 816.22(d)(3)) provided the embankments will be stabilized and prevent sedimentation. NTEC is not requesting this variance, since structures meeting the definition of embankments are not anticipated in the post-reclamation surface for the No Name permit area.

The methods and practices NTEC will utilize to stabilize and prevent sedimentation in post-reclamation surfaces are presented in Section 38 (Post-Reclamation Surface Stabilization and Sediment Control). Sediment and drainage control associated with operational embankments are discussed in Section 25 (Sediment Control Plan) and Section 26 (Drainage Control Plan).

36.3.4 *Topdressing Balance*

The pre-mine topdressing material balance and summary of topdressing resources within the permit area is determined based on the soil survey information presented in Section 14 (Soil). NTEC will estimate the topdressing material balance from multiple sources of information including stockpile volumes, pre-salvage topdressing survey results, and baseline soil survey information. Topdressing stockpile volumes will be estimated by aerial flight, vehicle load

counts, or survey data. The pre-salvage topdressing survey (Section 36.2) will estimate the volume of in-situ topdressing within the 1,800-foot pit disturbance limits. The volume of topdressing resources away from the active mining areas is calculated using the baseline soil survey information, presented in Section 14 (Soil). From the in-situ surveys and volume estimations, NTEC predicts a 10% loss of suitable topdressing material as a result of salvage, transportation, storage, and respread. Topdressing balance information will be submitted to OSMRE 60 days after the end of the calendar year (December 31) as part of the annual soil resources report (Section 36.6).

36.4 Spoil

36.4.1 Unconsolidated Spoil Material

Unconsolidated spoil material may be stockpiled for future use. It is anticipated that much of the unconsolidated material will be used as road base during road construction and maintenance activities, but it may be used for other purposes such as pond embankment, culvert fill, mitigation material, etc. If unconsolidated spoil material is placed in the root-zone (top four feet of soil/spoil) or used as topdressing in reclamation areas, the unconsolidated spoil will be tested after placement to ensure it meets root-zone or topdressing suitability criteria.

36.4.2 Disposal of Excess Spoil

There is no disposal of excess spoil at the No Name permit area because of the mining method used. Section 20 and Section 34 describe NTEC's spoil handling operations. The process of backfilling each strip with spoils from the next strip eliminates excess spoil areas and allows all the spoil to be included in the FSC.

36.5 Root-Zone and Mitigation Sampling

The root-zone in reclaimed areas is subdivided into two zones based on spoil depth. The primary root-zone extends from the surface of regraded spoil to one foot below the spoil surface, and the secondary root-zone consists of the interval from one to four feet below the spoil surface. The classification of these root-zone intervals is based on the root development characteristics of revegetation species in soil/spoil, including rooting depths and densities, and the resulting differences in utilization of the two zones by revegetation species. Various studies have demonstrated that revegetation species rely predominantly on the primary root-zone for initial establishment and long-term subsistence rather than the secondary root-zone as evidenced by the greater concentration of roots within the primary root-zone.

Sandia National Laboratories evaluated the rooting depth and root distribution of galleta (*Pleuraphis jamesii*), spike dropseed (*Sporobolus contractus*), and fourwing saltbush (*Atriplex canescens*) at a laboratory located near Albuquerque, New Mexico (Peace et.al. 2004). These native species are either present in the baseline vegetation communities or included in the revegetation species mixes for the No Name permit area. Sandia National Laboratories' study concluded that galleta and spike dropseed have the greatest concentration of roots within the upper foot (30 cm) of the soil profile. Fourwing saltbush has a different root structure than grass species and is characterized by a well-developed, pronounced taproot and a lateral root system. Within the Sandia National Laboratories study, Peace et.al. (2004) observed fourwing saltbush plants had the greatest concentration of roots within the upper 5.5 feet (170 cm)

of the soil profile. Rooting depth studies on fourwing saltbush conducted at Navajo Mine observed similar results (Stutz and Buchanan 1987). Stutz and Buchanan observed that on native and reclaimed lands, fourwing saltbush had 92% and 68% of total root mass within upper the 4.9 feet (150 cm), respectively. Within reclaimed lands of the study, fourwing saltbush had 35% and 54% of its root mass in the upper 10 in (25 cm) and 20 in (50 cm), respectively.

To ensure that spoil material within the primary and secondary root-zones is suitable for plant establishment and growth, NTEC will evaluate root-zone material after spoil placement. The procedures used to sample and determine root-zone suitability and mitigate unsuitable root-zone sites are described below.

36.5.1 Root-Zone Sampling

Final regraded material will be sampled to determine its suitability for use as root-zone material prior to placement of topdressing. The regraded root-zone material sampling takes place on a 330-foot regular square grid with the intersection of the northing and easting grid lines serving as the centroid of a 2.5-acre plot.

Each 2.5-acre plot is subdivided into four equal subplots (0.625-acre subplot area). A backhoe, or similar piece of equipment, will excavate a 5-foot deep test pit at the center of each subplot (Figure 36-1). Samples of root-zone material will be collected from the following vertical intervals along a 3-foot horizontal cross-section of the test pit profile: 0-1 foot, 1-4 foot, 1-2 foot, 2-3 foot, 3-4 foot, and 4-5 foot vertical intervals. Collecting the samples along a horizontal cross-section improves the representativeness of each sample. The individual samples will be passed through a 1-inch sieve and sampling continues until approximately 2 liters of material are collected from the 0-1 foot and 1-4 foot intervals and 1 liter of material is collected from the 1-2 foot, 2-3 foot, 3-4 foot intervals, and 4-5 foot intervals. The 0-1 foot and 1-4 foot interval samples will be saved and set aside for further mixing. The 1-2 foot, 2-3 foot, 3-4 foot, and 4-5 foot interval samples will be retained and archived for a minimum of 6 months while laboratory analyses of plot and subplot composite samples are performed. This process is repeated at all subplot test pits within the 2.5-acre plot.

Once all subplots have been sampled, the eight individual samples (four 0-1 foot interval samples and four 1-4 foot interval samples) are split in the field using a corner-to-corner tarp sampling technique (USDA 1996). An equal volume of sample (approximately 1 liter) is collected from each subplot interval split and combined into a single composite sample representing the specific interval (i.e., 0-1 foot and 1-4 feet) for the respective plot. The remaining sample material from each subplot interval is retained and archived for a minimum of 6 months while laboratory analysis of plot composite samples is performed. If the results from laboratory analysis show a plot composite sample to be unsuitable (Section 36.5.2), then the archived subplot composite sample materials (0-1 foot and 1-4 feet) is analyzed for root-zone suitability. If the laboratory analysis results show an archived composite subplot sample to be unsuitable then the correlated archived subplot interval sample are analyzed for root-zone suitability. The 4-5 foot subplot interval sample material is analyzed if the subplot 0-1 foot composite sample material is shown to be unsuitable for use as topdressing. The process of analyzing the plot, subplot, and subplot interval samples assists NTEC in

identifying the extent of unsuitable material and not placing unnecessary mitigation material on suitable subplots. The composite sampling procedure is presented in detail in Figure 36-2.

Only disturbed and regraded root-zone materials are sampled using the above procedure. When native materials are encountered (i.e., the area has not been mined), the following field observations will be collected:

1. Depth and thickness of interval
2. Identification of lithological constituents
3. Munsell color
4. If incompetent/unconsolidated, texture-by-feel analysis will be recorded to define each horizon
5. A photograph will be taken of the test pit wall clearly showing the in-place native materials

In the case where native materials are encountered within the top one foot of final graded root-zone material, the top one foot of the final graded root-zone material, including the native materials, shall be sampled and analyzed in accordance with the sampling methodologies described above. To substantiate the existence of native materials, field observations and photographs will be included in the annual soil resource report submitted to OSMRE (Section 36.6).

36.5.2 Root-Zone Suitability

Root-zone suitability will be determined using the methods of analysis listed in Table 36-1 and the suitability criteria listed in Table 36-4. When unsuitable material is identified from the plot composite samples, the archived subplot samples will be analyzed to further identify the extent of the unsuitable material. Results of the root-zone suitability analysis will be submitted to OSMRE in the annual soil resource report described in Section 36.6.

In December 2001, an analysis of historical spoil data from 9,068 samples justified eliminating the requirement for boron analysis in spoil materials. This data showed that removing boron from analysis would not adversely affect the suitability of root-zone reconstruction materials or reclamation success (Pinabete Mine permit NM-0042B and Navajo Mine permit NM-0003I).

36.5.3 Mitigation

The No Name permit area does not contain widespread occurrences of unsuitable or PATFM based on the overburden characterization conducted in Section 17 (Geologic Information) and an analysis of spoil and root-zone samples collected at Navajo Mine. The overburden characterization for the No Name permit area indicated the occurrences of unsuitable strata within the geologic column are largely isolated to thin interburden layers between the coal seams. However, when the geologic column is analyzed as a composite of all the overburden and interburden layers, these occurrences are attenuated, and chemical and physical analytes are within the suitability criteria limits. This is demonstrated by the suitability of the majority of spoil and root-zone samples collected at Navajo Mine. NTEC analyzed over 13,000 spoil and root-zone samples, sampled between August 1990 and December 2011, to characterize the central tendency and variability of the chemical and physical analytes of the spoil and root-zone material at Navajo

Mine (Table 36-5). This analysis of the Navajo Mine spoil and root-zone samples indicates there are no widespread occurrences of unsuitable materials present at Navajo Mine. This characterization is applicable for the No Name Mine permit area, as the No Name and Navajo Mine permit areas are in the same geologic region, the same coal seams will be mined, and the same overburden and interburden layers will be spoiled. In addition to the permit area overburden characterization and the analysis of Navajo Mine's spoil and root-zone samples, the Section 17 overburden analysis demonstrates that there is a sufficient amount of suitable overburden above the first coal seam to be mined to establish a suitable root-zone throughout the permit area.

NTEC will establish a minimum of four feet of suitable root-zone prior to topdressing replacement. When unsuitable root-zone material is identified using the process described in Section 36.5.1, the extent and depth of unsuitable root-zone material will determine the appropriate mitigating action. This may include one or more of the following options:

1. Removing the unsuitable material and placing it in a mining pit, resulting in burial with at least four feet of suitable root-zone material.
2. Covering the affected area with suitable root-zone material (i.e., suitable spoil or regolith) to the required depth.
3. Treating or amending the unsuitable material. If this option is selected, OSMRE will be consulted to discuss the alternative plan prior to implementation.

Regardless of the mitigation option used, once mitigation has been accomplished, the regraded areas will fulfill the required depth of four feet of suitable root-zone material.

36.6 Annual Soil Resources Reporting

NTEC will submit post-mining annual soil resources information, when available, this information will be included in the annual soil resource report submitted 60 days after the last day of the calendar year (December 31). The annual soil resources information presented in this report will be from the period of January 1 through December 31.

36.6.1 Topdressing Resource Information

If pre-strip topdressing sampling and/or replacement depth verification is conducted within the calendar year, it will be included in the annual soil resources report. The annual reporting will include the following:

- Pre-salvage sampling results (sample sites, depths, laboratory analyses, and maps of survey area at 1:6,000 scale [1 in = 500 feet]).
- Topdressing replacement results (sample sites, depths, and maps of survey area at 1:6,000 scale).
- Topdressing balance (estimated volume of soil stockpiles and in-situ resources [pre-salvage topdressing sampling and baseline soil survey]).

When grade staking is used to verify topdressing replacement depths, the following information will be included in the annual report:

- Documentation will be provided indicating the date, methods and results of field inspections conducted by OSMRE inspectors to verify topdressing replacement depths for each reclamation plot.
- Volumetrics of topdressing material respread in each reclamation plot will be provided.
- Grid location for each sample noted on a 1:6,000 scale map which delineates the topdressed area.
- Annual topdressing balance calculations.

Elevation data of the root-zone suitability sample sites will only be provided, if NTEC uses survey data or elevations to verify topdressing thickness.

36.6.2 Regolith Sampling

If regolith sampling is conducted within the calendar year, it will be included in the annual soil resources report. The annual reporting will include the following:

- Data analysis sheets reporting depth of suitable regolith from each sampling point sampled during the reporting period.
- Grid location for each sample noted on a 1:6,000 scale map which delineates the topdressed area.

36.6.3 Root-Zone Sampling

If root-zone sampling is conducted within the calendar year, it will be included in the annual soil resources report. The annual reporting will include the following:

- Data analysis sheets, i.e., analytical results, from each grid location sampled during the reporting period, including pre and post mitigation data,
- Recorded field observations and photographs of native material encountered during sampling.
- Grid locations noted on 1:6,000 scale map which delineates the regraded area.
- Plot locations requiring root-zone mitigation (locations and maps of mitigated sites presented at 1:6000).
- Northing, easting, and elevation of each 330-foot grid sample site.
- Annual mitigation material balance calculations

36.7 References

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Table 36-1: Analysis Methods for Topdressing and Root-Zone Samples for the No Name Mine Permit Area

Analysis	Method
pH	Page, A.L., Miller, R.H. and Keeney, D.R., eds. Methods of Soil Analysis, Part 2 - Chemical and Microbiological Properties. ASA Monograph No. 9, 2nd edition. Madison, Wisconsin: American Society of Agronomy; 1982. Methods 9-3.1.2, pp. 160-161.
Electrical conductivity (EC)	Page, A.L., Miller, R.H. and Keeney, D.R., eds. Methods of Soil Analysis, Part 2 - Chemical and Microbiological Properties. ASA Monograph No. 9, 2nd edition. Madison, Wisconsin: American Society of Agronomy; 1982. Methods 9-3.1.2, pp. 160-161. Method 10-2.3.1,; pp 169. Method 10.3.3; pp 172. Richards, L.A., ed. Diagnosis and Improvement of Saline and Alkali Soils. USDA Handbook No. 60. Washington, D.C.: USDA; 1954. Method (4a), pp. 89.
Soluble calcium (Ca), magnesium (Mg), and sodium (Na)	Extraction: USDA Handbook 60, Method 3a-Saturation Extract, pp. 84. Analysis: Inductively Coupled Argon Plasma Atomic Emission Spectrometer (ICP).
Sodium adsorption ratio (SAR)	Extraction: USDA Handbook 60, Method 3a-Saturation Extract, pp. 84. Analysis: Inductively Coupled Argon Plasma Atomic Emission Spectrometer (ICP). Equation: USDA Handbook 60, Method 20b - Estimation of Exchangeable Sodium - Percentage and Exchangeable - Potassium - Percentage from Soluble Cations, pp. 102.
Texture	EPA 300/2-78-054. Field and Laboratories Methods Applicable to Overburden and Mine Soils. Method 3.4.3.5, pg 122. Black, C.A., Evans, D.D., White, J.L., Ensminger, L.E., and Clark, F.E. ASA Monograph No. 9; Methods of Soil Analysis, Part One. Method 43-5, p. 562. ASTM D422-68.
Saturation percent	Richards, L.A., ed. Diagnosis and Improvement of Saline and Alkali Soils. USDA Handbook No. 60, Washington, D.C.: USDA; 1954. Method 27a, pp. 107. Miller, R.H. and Keeney, D.R., eds. Methods of Soil Analysis: Part 2 - Chemical and Microbiological Properties. ASA Monograph No. 9, 2nd edition. Madison, Wisconsin: American Society of Agronomy; 1982: Method G10.2.3 pp. 169.

Analysis	Method
Boron	Page, A.L., Miller, R.H., and Keeney, D.R., eds. Methods of Soil Analysis: Part 2 - Chemical and Microbiological Properties. ASA Monograph No. 9. 2nd Edition. Madison, Wisconsin: American Society of Agronomy; 1982. Method 25-9.1, pp. 443-444.
Soluble selenium	Page, A.L., Miller, R.H., and Keeney, D.R., eds. Methods of Soil Analysis: Part 2 - Chemical and Microbiological Properties. ASA Monograph No. 9. 2nd Edition. Madison, Wisconsin: American Society of Agronomy; 1982. Method 25-9.1, pp. 443-444.
Total selenium, bajo, sexto	Analytical Chemistry, Vol. 50(4), 649-651-1978, Modified.
CaCO ₃ percent	USDA. Handbook 60, 1954, Method 23c, pp. 105.
Neutralization potential	USDA. Handbook 60, 1954, pp. 105, Methodology 23c. EPA 600/2-78-054. Field and laboratory methods applicable to overburden and mine soils method 3.2.3., pp. 47-50.
Total sulfur	Field and Laboratory Methods Applicable to Overburdens and Mine soils. EPA 600/2-78-054, Method 3.2.6., 1978.
Total sulfur - acid-base	Field and Laboratory Methods Applicable to Overburdens and Mine soils. EPA 600/2-78-054, Method 3.2.6 and 1.3.1., 1978.
Sulfate sulfur percent	ASTM D 2492-84 with modification. Field and Laboratory Methods Applicable to Overburdens and Mine soils. EPA 600/2-78-054, Method 3.2.6., 1978. Mine Spoil Potentials for Soils and Water Quality. EPA 670/2-74-070. Pg. 49.
Pyritic sulfur percent	ASTM D 2492-84 with modification. Field and Laboratory Methods Applicable to Overburdens and Mine soils. EPA 600/2-78-054, Method 3.2.6., 1978. Mine Spoil Potentials for Soils and Water Quality. EPA 670/2-74-070. Pg. 49.
Organic sulfur percent	ASTM D 2492-84 with modification. Field and Laboratory Methods Applicable to Overburdens and Mine soils. EPA 600/2-78-054, Method 3.2.6., 1978. Mine Spoil Potentials for Soils and Water Quality. EPA 670/2-74-070. Pg. 49.
Pyritic sulfur acid-base	Field and Laboratory Methods Applicable to Overburdens and Mine soils. EPA 600/2-78-054, Method 1.3.1., 1978.

Table 36-1

Analysis	Method
Pyritic sulfur - acid-base potential	Field and Laboratory Methods Applicable to Overburdens and Mine soils. EPA 600/2-78-054, Method 1.3.1., 1978.

Table 36-2: Topdressing Suitability Criteria for the No Name Mine Permit Area^{1,2}

Parameter	Suitable		
	Good	Marginal	Unsuitable
pH	≥ 6.0 to ≤ 8.4	≥ 5.5 to < 6.0 > 8.4 to ≤ 8.8	< 5.5 > 8.8
Electrical Conductivity (EC) (mmhos/cm)	≤ 4.0	> 4.0 to ≤ 12.0	> 12.0
Sodium Adsorption Ratio (SAR) ³			
silt loam and coarser	≤ 12.0	> 12.0 to ≤ 18.0	> 18.0
loam and clay loam	≤ 10.0	> 10.0 to ≤ 16.0	> 16.0
40% clay	≤ 8.0	> 8.0 to ≤ 14.0	> 14.0
Texture	$\leq 35\%$ clay	> 35 to $\leq 45\%$ clay	$> 45\%$ clay
Saturation percent	$\geq 20\%$ to $\leq 80\%$		$< 20\%$ $> 80\%$
Selenium			
Selenium			
Hot-water soluble	≤ 0.15 ppm		> 0.15 ppm

¹ These suitability criteria may be modified on a case-by-case basis if sufficient data are submitted to support the modifications and the submitted data technically represent the site-specific nature of the modification.

² When spoil/overburden materials are used as topdressing, then these materials must also be analyzed for total selenium and acid-base potential (ABP). Analysis of these constituents is in addition to the parameters listed in this table. Materials that exceed 0.80 mg/kg total selenium or have pyritic sulfur ABP $< -5t/Kt$ are unsuitable for use as topdressing.

³ SAR values can be modified if adequate data are submitted to support proposed modifications.

Table 36-3: Soil Texture Class Erodibility Factors (K-Factor) for the No Name Mine Permit Area

Soil Texture Class ¹	K-factor ²
Fine ³	0.20
Fine loamy ³	0.27
Coarse loamy ³	0.10
Sandy ³	0.27
OSM recommended erodibility factor guideline ⁴	< 0.37

¹ All baseline soil types present at the No Name Mine are assigned to one of the four listed soil texture classes.

² Calculated per the algebraic approximation of the Wischmeier nomograph described by Renard et al. (1996) and Wischmeier and Smith (1978).

³ Reported values are mean values, calculations performed as part of the baseline SEDCADtm modeling of baseline flood flows and sediment yields reported in Section 18.

⁴ Erodibility factor suitability guideline proposed by the Office of Surface Mining Reclamation and Enforcement (OSM 1999)

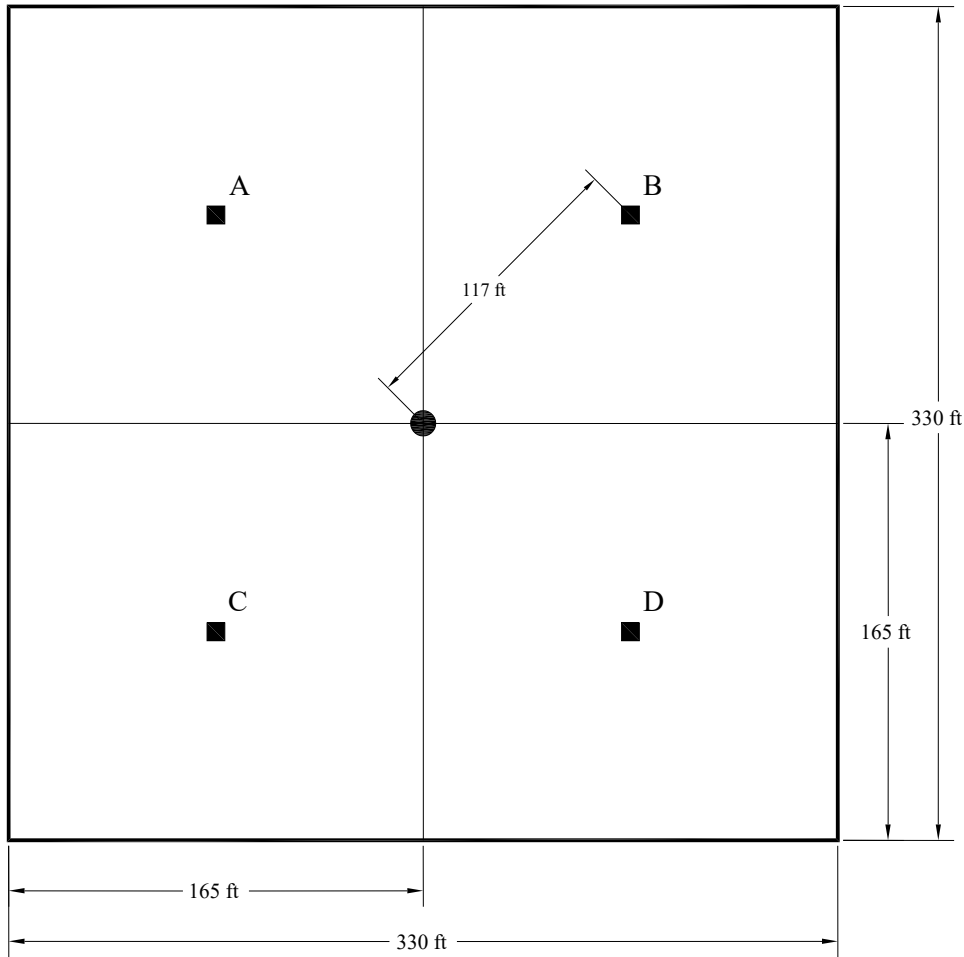
Table 36-4: Root-Zone Suitability Criteria for the No Name Mine Permit Area

Characteristic ¹	Suitability limits
pH	> 5 and < 9
Electrical conductivity (EC)	< 16 mmhos/cm
	< 85%
	or
Saturation percent	< 100% only if EC > 4 mmhos/cm
	< 18
	or
Sodium Adsorption Ratio (SAR)	< 40 only if EC > 4 mmhos/cm
Texture	< 50% Clay
Acid base account	> -5t CaCO ₃ /1000t
Selenium (total)	< 2.5 ppm
Selenium (soluble)	< 0.26 ppm

¹ Criteria to be applied to each separate sample interval.

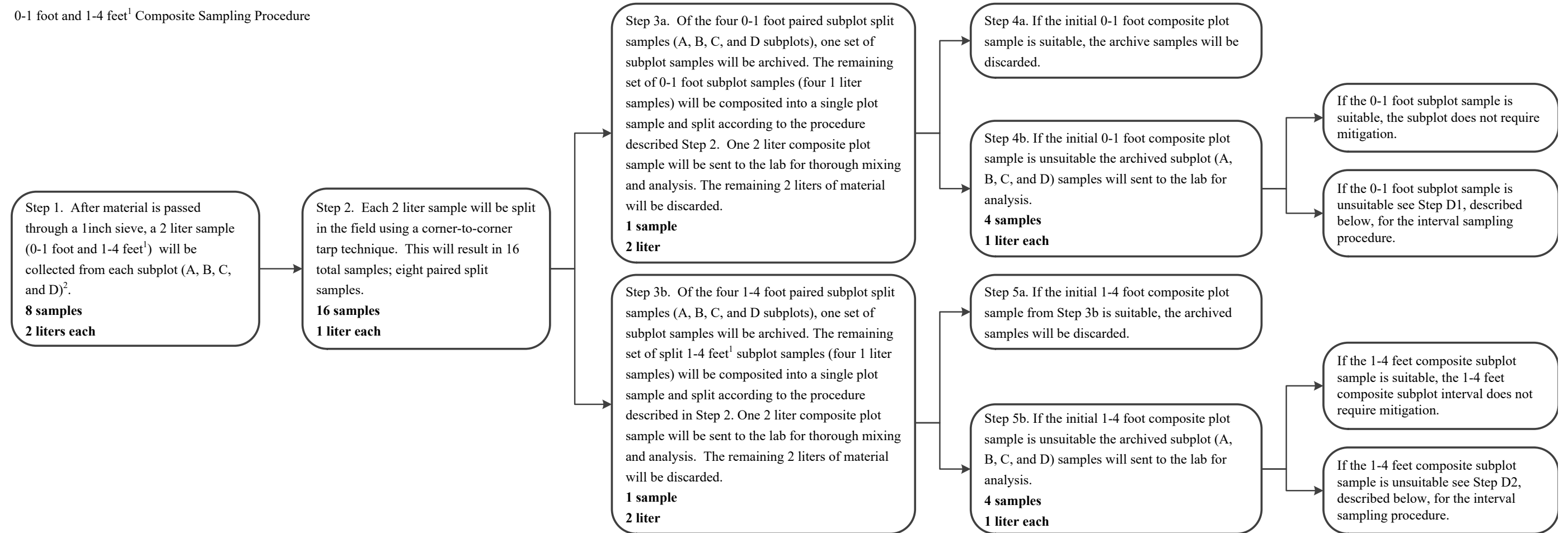
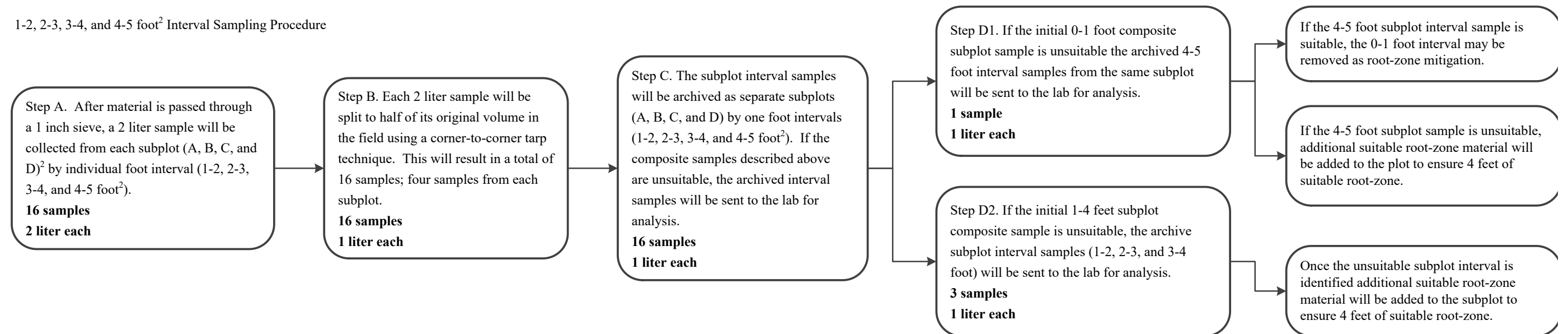
Table 36-5 : NTEC Navajo Mine Spoil Quality 1990-2011

Analyte	No. of Samples	Mean	95% confidence interval	Median	1st quartile	3rd quartile
pH (s.u.)	14638	7.24	7.2435 to 7.2427	7.40	7.00	7.70
Conductivity (mS/cm)	14638	8.42	8.4168 to 8.4131	8.66	6.10	10.40
Saturation (%)	14638	63.84	63.8548 to 63.8319	62.10	50.00	75.00
Calcium (meq/L)	14638	17.79	17.7896 to 17.7815	19.50	14.00	22.80
Magnesium (meq/L)	14638	10.74	10.7461 to 10.7254	7.26	4.51	11.80
Sodium (meq/L)	14638	80.86	80.8828 to 80.8364	80.80	50.00	107.00
SAR	14638	23.67	23.6723 to 23.6607	24.70	16.20	30.30
Sand (%)	14638	38.65	38.6586 to 38.6397	33.80	26.00	45.50
Silt (%)	14638	29.67	29.6732 to 29.6610	31.80	24.60	37.00
Clay (%)	14638	31.69	31.6897 to 31.6797	33.60	37.30	38.00
Acid-base potential total sulfur (t/kt)	14638	16.53	16.5440 to 16.5158	13.30	0.00	29.40
Boron (ppm)	14638	0.70	1.8475 to 1.8379	0.63	0.28	0.98
Total selenium (ppm)	14638	0.53	0.5326 to 0.5322	0.50	0.40	0.65
Soluble selenium (ppm)	14638	0.06	0.0565 to 0.0564	0.05	0.02	0.08



- 330-ft root-zone sample grid point
 - C Composite sample points (0.625-ac areas)
- Total root-zone sampling grid area 2.5 ac

Figure 36-1 Root-Zone Sampling Layout

0-1 foot and 1-4 feet¹ Composite Sampling Procedure1-2, 2-3, 3-4, and 4-5 foot² Interval Sampling Procedure

¹ The 1-4 feet composite sample is collected in an even distribution from the sidewall of the test pit.

² The 4-5 foot interval will be sampled and archived. This sample interval will only be analyzed if the 0-1 foot interval is unsuitable and removed from the plot.

Figure 36-2 Composite Sampling Procedures