4. ENVIRONMENTAL CONSEQUENCES

The Proposed Action can have many environmental consequences if approved. The impacts are defined as any change or alteration in the pre-existing condition of the environment produced by the Proposed Action. Under the No Action Alternative, coal would continue to be supplied to the FCPP from Area III and existing stockpiles through 2016; however, no mining would occur in Area IV North. In addition, the new Pinabete Permit Area (permitted through a separate SMCRA process) mine plan requires mining through Area IV North. Therefore, one outcome of No Action could be that after 2016, the FCPP would shut down. A complete evaluation of the No Action Alternative involving shut-down of the FCPP and Navajo Mine after 2016 was conducted as part of the FCPP/NMEP EIS and is incorporated by reference here. An alternative outcome of No Action could be that NTEC would submit a Mine Plan Revision to the Pinabete SMCRA Permit that does not mine through Area IV North, but includes a new boxcut in the Pinabete permit area. Under this scenario, a NEPA review would be conducted of the Mine Plan Revision. This section analyzes the environmental consequences of the Proposed Action and the No Action Alternative from 2012 to 2016.

Impacts can be direct, indirect, or cumulative. For this EA, direct and indirect effects are discussed in Section 4 and cumulative effects are discussed in Section 5. Direct effects are caused by the action and occur at the same time and place. Indirect effects are caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable.

In the following sections, potential direct and indirect impacts to resources are characterized based on their duration, severity, and geographic extent. In general, short-term impacts refer to those that would affect the environment during the proposed mining and reclamation activities. Long-term impacts are those that would last beyond the life of the Proposed Action. Duration of impacts, as well as severity and geographic extent is described in detail for each resource.

As described in Section 1.1 of this EA, on April 6, 2015, the Colorado District Court vacated the 2012 EA/FONSI and the 2012 SMCRA permit revision for Area IV North. The Court's decision noted that all parties agreed that OSMRE may be able to comply with NEPA in regards to its obligations relating to its consideration of the SMCRA permit revision application by "tiering" to the comprehensive EIS for the FCPP/NMEP EIS, published May 1, 2015. The approach to the impact analysis in this EA is therefore to incorporate by reference relevant analyses from the EIS.

The vacatur of the 2012 EA/FONSI followed a March 2, 2015 decision by the Colorado District Court ruling that OSMRE failed to adequately consider the reasonably foreseeable combustion-related effects of NTECs proposed expansion of operations at the Navajo Mine. The decision ruled that the reasonably foreseeable combustion-related effects at FCPP of NTECs proposed expansion of operations at the Navajo Mine were indirect effects under NEPA. This EA analyzes the effects of coal combustion at FCPP as indirect effects.

This EA has been prepared to add additional analysis to that provided in the original 2012 EA. The 2012 EA assessed the potential environmental consequences of the proposed mining, reclamation, and road realignment activities, allowed for public involvement in the process, and assisted decision makers by disclosing the potential effects of proposed mining activities in both Area IV North and Area III. The

2012 EA addressed all the Federal actions proposed in support of pre-2016 mining under the current coal supply agreement. That analysis is included in this EA. Post-July 6, 2016 mining activities are associated with a new and different coal supply agreement that was the subject of a subsequent NEPA analysis (OSMRE 2015). Any remaining coal from Area IV North that would be combusted after July 2016 is directly considered in the FCPP/NMEP EIS to which this EA is tiered.

The analysis of the indirect effects of coal combustion at FCPP between 2012 and July 2016 are derived from the results of analysis from the 2015 FCPP/NMEP EIS, which has been incorporated by reference to this EA. The analysis of coal combustion at FCPP includes two distinct periods:

1. 2012 to December 30, 2013, during which Units 1-5 were operating at FCPP;
2. January 1, 2014 to July 7, 2016, during which only Units 4 and 5 operate, and SCR emission control devices have not yet been installed.

As described in Section 1, owing to the reduced coal demand at FCPP as a result of the permanent shutdown of Units 1-3, there is a lesser coal demand during the time period between 2014 and July 2016. Any coal remaining from mining at Area IV North would be combusted at FCPP after July 2016; these effects have been comprehensively analyzed in the 2015 FCPP/NMEP EIS.

If coal combustion were to occur at FCPP at the rate of coal mining analyzed in the 2012 EA, then the effects through July 2016 would be on par with those analyzed in this section for the time period 2012 to December 30, 2013. Although these effects provide a theoretical upper bound on possible environmental consequences, they do not correspond to actual circumstances on the ground (Units 1-3 were permanently shut down on December 30, 2013), and such operations would be in violation of EPAs FIP for BART at FCPP (which required that Units 1-3 be permanently shut down by January 1, 2014). This theoretical condition is therefore not analyzed further in this EA.

4.1 Geological Resources

4.1.1 Impact Assessment Methodology

As defined in Section 3.1, the assessment area for geology within the geological resource assessment includes the Lowe Arroyo to the north, lands to 5 miles east of BNCC’s coal lease boundary, the No Name Arroyo to the south, and the Chaco River to the west. The assessment area for soils and paleontological resources includes just the areas of proposed mining in Area III and Area IV North, and the proposed corridor of the Burnham Road realignment. The assessment of geology impacts includes the removal of coal and surrounding geologic layers and the potential for effect to water resources. The assessment of potential impacts to soils includes removal, erosion, changes in productivity and contamination. Severe impacts would include the loss of substantial amounts of soil to erosion by wind and water, long-term loss of soil productivity or contamination from accidental spills that results in risks to human health. The assessment of paleontological impacts includes the removal of resource-bearing geologic layers. Specific water resources effects discussion is included as Section 4.2 – Water Resources.

Though no specific geological resources-related comments were received from the public during public review of the 2012 EA, concerns on impacts resulting from coal dust and fugitive dust on other area resources were considered in development of this section. The assessment of potential effects on geological resources in this EA, including how surface coal mining potentially affects regional geology, water resources, soils and related geological features such as paleontology, is conducted in consideration of SMCRA criteria for protection of such elements. The Proposed Action wholly incorporates these SMCRA-based requirements. Specific discussions on related air quality effects are included in Section 4.5 – Air Quality.

There are no Navajo Nation designated protected soils, geology, or features within or adjacent to the geological resources assessment area. Erosion and contamination of soils would be routinely monitored and reduced through current BNCC geological resource protection measures, and in accordance with existing plans as described below.

4.1.2 Impacts

4.1.2.1 Proposed Action

4.1.2.1.1 Geology and Paleontology

Impacts to geology and paleontological resources resulting from the proposed mining activities include the removal of coal, overburden and interburden materials, including any paleontological resources these layers may contain. The return of overburden and interburden material to the mine pit as backfill material would have a permanent impact on paleontological resources that may occur in overburden and interburden layers, removing them from their geological context. The impacts would be moderate in severity due to the permanent nature of the impact in the mining areas, and the expected presence of similar paleontological resources outside the mine. Specifically, as described in Section 4.3 of the FCPP/NMEP EIS, two known significant paleontological resources would be impacted within the pre-2016 striplines of Area III. Localities 30 and 42 found during the 1974 survey of the Navajo Mine Lease Area are located in two portions of Area III that would be mined under the current SMCRA permit that expires in 2016. The destruction of, or damage to, these significant localities would be considered a major impact to paleontological resources. However, an inadvertent discoveries plan is part of the condition of the Navajo Mine SMCRA permit. Therefore, while ground-disturbing activities associated with the Project may damage or destroy paleontological resources; these protocols would ensure that the Navajo Nation is not deprived of the opportunity to realize benefits from these ITAs. No unique or sensitive geologic formation areas would be impacted. Geologic formations located stratigraphically below the target coal formation would not be mined or impacted by the Proposed Action. The proposed mining activities are not anticipated to impact geologic formations outside of the geology assessment area. No impacts to geologic or paleontological resources are expected to result from the proposed realignment of Burnham Road.

During active mining, the surface topography would be modified due to removal of overburden and interburden material and coal. Reclamation would backfill and restore or recreate original surface topography to the extent possible while providing stable slopes. Spoil material within mined areas are required to be graded to the approved FSC as described in the Mine Plan Revision (BNCC 2011). The Proposed Action would result in low to moderate and long-term alterations to the topography of the mine area. Based on the amount of disturbance and the low relief terrain, impacts to topography at the Burnham Road realignment would be low.

4.1.2.1.2 Soils

The proposed mining activities would result in the removal and redistribution of soils within approximately 1,400 acres of Area III and Area IV North. Approximately half of these acres occur within Area III, which is already permitted by OSMRE to be mined. Soils suitable for use as topdressing would be either immediately transported to reclamation areas or salvaged and stockpiled for later use. Some mixing of soils occurs during stockpiling and redistribution of soils during reclamation. Mining activities use non-salvaged surface soils, overburden and interburden for use as mine pit backfill material during reclamation.

All soil material handling activities currently occurring in Area III, and those activities proposed for Area IV North, are and would be conducted in compliance with SMCRA regulations and the approved and proposed mine plans, which prescribe measures to ensure a suitable rooting medium for vegetation establishment (BNCC 1994, 2009a). These measures include salvage of suitable topdressing, and if needed regolith, materials ahead of mining activities to prevent contamination; stockpiling topdressing and regolith not used immediately for later use; the use of berms surrounding topdressing and regolith stockpiles to reduce erosion; and mulching stockpiles left unused for more than 6 months.

Post-mining reclamation of disturbed areas includes backfill and grading to establish approximate FSC or approximate original contour. Placement of suitable topdressing and/or regolith material as part of final grading provides a root zone for establishment of vegetation. A minimum 4-foot thickness of suitable root-zone material is placed on the top of all reclaimed areas. Replaced overburden or regolith material is chemically and physically tested prior to top soil placement to ensure root zone suitability criteria are met for reclaimed areas. Annual reports documenting the results of root-zone sampling are prepared and submitted to OSMRE. Soil removed from proposed mining areas would be redistributed during reclamation, on average, approximately 5 years after mining has been completed.

To minimize erosion and sediment transport on post reclamation surfaces, BNCC would implement best management practices (BMPs) as described in the Navajo Mine's Reclamation Surface Stabilization Handbook and Stormwater Pollution Prevention Plan (SWPPP).

Contamination of soils could result from accidental spills of fuel, oil, or other substances from mine equipment. These would be handled according to the Navajo Mine Spill Prevention Control and Countermeasures Plan. If necessary, petroleum contaminated soils would be managed using the existing land farming facilities at Navajo Mine, as described in the current SMCRA Permit (BNCC 2009a). Should soil contamination occur, it would be a short-term impact.

Reclamation activities are expected to have long-term positive impacts on soils. The establishment of vegetation consistent with the post-mining land use of grazing would result in a higher percent of vegetative cover, improving soil stability, reducing soil loss and increasing productivity over pre-mining conditions (BNCC 2011).

Approximately 75 acres of soils would be disturbed during construction of the Burnham Road. Following construction, areas disturbed outside the driving surface and drainage ditches would be reclaimed. Soils within the roadway would be displaced, mixed, and compacted. This long-term disturbance would impact approximately 23 acres. Soil erosion from wind and/or water during construction activities would be moderate to severe based on the erodibility of soils, but would be minimized to low-to-moderate levels by implementation of BMPs described in the SWPPP. Accidental leaks or spills of fuel, oil, or other substances from construction equipment could contaminate and compromise the productivity of affected soils. Impacts to project area soils would be low and short term, limited to the duration of construction activities. As discussed in Section 2, these impacts occurred following publication of the 2012 EA/FONSI. Therefore, for the purposes of this EA, no new impacts are identified.

Indirect Impacts Related to CCR Disposal at the FCPP

Although the surface relief of the land would change as a result of emplacement of the new DFADA, no unique geologic features exist in or around the proposed DFADA; therefore, impacts to geology are expected to be negligible.

4.1.2.2 Proposed Action with Conditions

Under this Alternative, impacts would be the same as those described for the Proposed Action.

4.1.2.3 No Action Alternative

Under the No Action Alternative, the current mining activities in Area III would continue, but no further mining disturbance would occur in Area IV North. The type, severity, and duration of impacts to soils, geology, and paleontological resources from mining and reclamation activities in Area III would be the same as those described for mining under the Proposed Action. The approximately 268 acres of existing surface disturbance (mining disturbance, ancillary roads, and power lines) in Area IV North that occurred following the previous authorization to mine in Area IV North (Permit NM-0003-F-R-01), would be reclaimed as directed by OSMRE. Reclamation of these acres would result in similar adverse and beneficial impacts to geologic surface resources as described for the Proposed Action, but would be limited to approximately 268 acres.

Under the No Action Alternative, the combustion-related impacts at the FCPP would remain as described for the Proposed Action through July 2016 as the current coal stockpiles are used. Following July 2016, should additional mining not be approved in Area IV North, NTEC may elect to proceed with mining in the Pinabete Permit Area under a revised SMCRA permit. However, after the revised permit is submitted, OSMRE would be required to comply with NEPA prior to making a decision on any potential SMCRA permit revision to the Pinabete Permit. Alternatively, under the No Action Alternative, the Navajo Mine and FCPP could potentially shut down once all coal reserves are combusted. The effects of this shut-down have been evaluated in Section 4.3.4.5 of the FCPP/NMEP EIS and is incorporated by reference as follows:

> ***Topography, Soils Geology, and Mineral Resources***
>
> *Under the No Action Alternative, the Navajo Mine would close, and Areas IV North and IV South would not be mined. Reclamation mandated under the existing SMCRA permit would occur and the mine and all its associated facilities would be closed. As such, no impacts to topography, soils, geology, or mineral resources would occur within Areas IV North and South from mining operations or road construction. All areas within the existing Navajo Mine permit area would be reclaimed in accordance with SMCRA*

regulations; however, a slight permanent alteration in topographic relief would occur compared to pre-mining conditions. These impacts are considered minor.

Paleontological Resources

Under the No Action Alternative, the Navajo Mine would close. The Pinabete SMCRA Permit area (Areas IV North and South) would not be mined. Burnham Road would not be realigned. Mining in the Navajo SMCRA Mine Permit Area (Areas III and IV North) would continue until the ROD is issued in 2015. Areas I and II, which are also part of the Navajo SMCRA Mine Permit Area, have already been reclaimed and no new mining would occur in these areas. Upon permit expiration, NTEC would begin reclamation activities in Areas III and IV North. Reclamation activities would continue until OSMRE provides approval that all requirements have been met. It is expected that all reclamation would be completed by June 2021. All ancillary buildings and facilities (e.g., communication lines, railroad) would be removed and the land would be reclaimed.

Under the No Action Alternative, two known significant paleotological resources would be impacted within the pre-2016 striplines of Area III. Localities 30 and 42 found during the 1974 survey of the Navajo Mine Lease Area are located in two portions of Area III that would be mined under the current SMCRA permit that expires in 2016. Locality 30 contains a bed of freshwater shells with turtle bone fragments and dinosaur bone fragments above and below it. Locality 42 contains an abundance of fossil wood and reptile bone fragments including dinosaur bones and turtle shell. The destruction of, or damage to, these significant localities would be considered a major impact to paleontological resources. However, an inadvertent discoveries plan is part of the condition of the Navajo Mine SMCRA permit. Therefore, while ground-disturbing activities associated with the Project may damage or destroy paleontological resources; these protocols would ensure that the Navajo Nation is not deprived of the opportunity to realize benefits from these ITAs.

Four Corners Power Plant

Topography, Soils Geology, and Mineral Resources

Under the No Action Alternative, Units 4 and 5 of the FCPP would shut down in 2016 and soon after be decommissioned. The DFADA would not be constructed under the No Action Alternative. Soil disturbance would occur during reclamation of the decommissioned facilities and ash disposal area. This would be a short-term minor impact. Reclamation activities would not impact topography, geology, or mineral resources within the area of the FCPP.

Paleontological Resources

Under the No Action Alternative, Units 4 and 5 would be shut down when the lease expires in 2016. The plant facilities would be decommissioned and dismantled if the current lease were allowed to expire and the units were shut down. The three switchyards would also be decommissioned and dismantled. Under the No Action Alternative, no *known significant paleontological resource within the current FCPP Lease Area would be affected.*

4.2 Water Resources

4.2.1 Impact Assessment Methodology

Impact assessment considers the severity of potential direct and indirect impacts as well as the geographic extent, duration, and overall context of potential impacts. Duration of impacts is described as short term, intermediate term, and long term. Short-term impacts include temporary impacts during project implementation (e.g., 5 to 10 years). Intermediate-term impacts are temporary impacts that extend for a period of up to 20 years beyond the particular action associated with the active mining and reclamation operations. Long-term impacts are impacts that extend more than 20 years beyond the Proposed Action and include permanent impacts. Some of the long-term impacts may be a consequence of mining and reclamation actions and might not occur for a significant period. These delayed, long-term impacts are classified as indirect impacts. In addition, indirect impacts to water quality resulting from combustion of the coal and disposal of coal combustion residue at FCPP are considered in this EA. The severity of impact is described in terms of the magnitude of resource loss, degradation, or depletion. The magnitude of impacts for the purposes of this section are defined as major, moderate, minor, and negligible as outlined in Table 4.2-1.

Table 4.2-1. Magnitude of Impacts

Magnitude	Groundwater Quantity	Surface Water Runoff	Water Quality
Major	Irretrievable loss of the groundwater resource to support existing uses that cannot be provided by alternate water supplies	Impacts that preclude existing uses outside of the permit area that cannot be provided by alternate water supplies	Long-term changes in water quality outside the permit area that preclude the current or potential future use of the resource
Moderate	Irretrievable loss of the groundwater resource to support existing uses that are mitigated by alternate water supplies	Impacted areas or runoff volumes are greater than 30 percent	Long-term changes in water quality that consistently exceed the water quality observed in the baseline fluctuations, but do not preclude the current or potential future use potential of the resource
Minor	Short-term loss of the groundwater resource to support existing uses that can be mitigated by provision of alternate water supplies	Impacted areas or runoff volumes are between 10 and 30 percent	Short-term or long-term changes in water quality that occasionally exceed the water quality observed in the baseline fluctuations, but do not preclude the current or potential future use potential of the resource

Magnitude	Groundwater Quantity	Surface Water Runoff	Water Quality
Negligible	Impacts to groundwater that is not capable of providing a sustainable water supply for use or that are similar to fluctuations caused by natural processes	Impacted areas or runoff volumes are less than 10 percent (10 percent is considered within the range of background levels)	Impacts to water quality that are within the water quality observed in the baseline fluctuations

Several models were used to assess impacts. Assessment of pre-mine and post-mine flows and sediment loss were performed using SEDCAD™ 4 (SEDCAD), an integrated hydrologic model that evaluates flows, water, and sediment yield and effects of sediment control measures, including sediment ponds on downstream resources. SEDCAD uses the Modified Universal Soil Loss Equation (MUSLE) to generate storm-based erosion predictions. Groundwater flow and chemical transport modeling was also performed using the FEFLOW (Finite Element subsurface FLOW system) software. The FEFLOW model was used to predict changes in the groundwater flow system expected to occur as a result of the proposed mining and reclamation within Area IV North. The model was also used to assess the rate of recovery of water in the mine spoil backfill and in the adjacent Fruitland coals and PCS and the long-term fate and transport of spoil water. Further discussion of FEFLOW and SEDCAD including detailed modeling results are included in Section 11 of the mine permit revision for Area IV North (BNCC 2011).

Impact assessment also relied upon relevant published and unpublished reports and papers, experience from past mining and reclamation operations at Navajo Mine and other mines located along the western rim of the San Juan Basin, and observations made by BNCC staff during the day-to-day operations of the mine as well as surface water and groundwater monitoring performed in conjunction with historic and ongoing mining and reclamation activities at Navajo Mine.

4.2.2 Impacts

4.2.2.1 Proposed Action

4.2.2.1.1 Groundwater Impacts

Groundwater Flow and Drawdown

Mining will occur in the Fruitland Formation and PCS units; however, mining will not occur within the alluvium along the main stem of Cottonwood Arroyo. Mining will result in limited drawdown of groundwater levels in the adjacent coal units and underlying PCS but is not expected to result in a drawdown of groundwater levels in the alluvium within the main stem of Cottonwood Arroyo (BNCC 2011 § 11.6).

The direct effect of overburden and coal removal is that each successive open cut acts as a drain causing drawdown of water levels in the adjacent coals and a reduction of potentiometric heads in the underlying PCS. The drawdown in the Fruitland Formation and PCS is expected to be localized and minor based on the results of groundwater monitoring at Navajo Mine Areas II and III as described in the PHC, Section 11.6 of the Mine Permit Revision (BNCC 2011). Based on past mining experience in Areas II and III, groundwater inflows to the future mine pits in Area III would be negligible and not likely to be observable as seeps along the highwall or as seepage in the pit floor. The pit floors are expected to remain dry except on rare occasions when storm runoff is captured. Model simulations of proposed open pit mining in Area IV North show very limited extent of drawdown in the coal units and the PCS beyond the limits of Area IV North mining. These results also indicate that proposed mining in Area IV North is not expected to result in a drawdown in water levels or depletion of groundwater in the Cottonwood alluvium downgradient of mining (BNCC 2011 § 11.6).

Post reclamation, groundwater flow rates from Area III may increase in the long-term due to a likely increase in recharge rates following reclamation due to removal of badland topography and inter-bedded coal units, and placement of topdressing materials within reclaimed areas. The more homogenous topdressing materials permit higher rates of infiltration and groundwater recharge relative to pre-mining conditions. Despite an increase in recharge rates, the rate of recharge will still be quite low and the time period required for water levels to recover to near steady-state level in the mine backfill is estimated to be on the order of 100-years or longer, unless other sources (such as NAPI) enhance irrigation seepage and return flows.

In the groundwater model predictions performed for the PHC, recharge rates were estimated to increase from a baseline of 0.02 – 0.03 inches per year to a post-mine estimate of 0.04 inches per year (BNCC 2011). Even with the estimate of higher recharge rates for post-reclamation conditions, the transient groundwater model simulations show that it may take approximately 400 years for recovery of water levels to approach steady-state conditions in the PCS and in the mine backfill (BNCC 2011). The groundwater modeling also indicated that upward gradients from the PCS to the mine backfill occur until about 85 years after the start of mining. After that time, the recovery in the backfill is sufficient that gradients are reversed and are downward from the backfill to the PCS.

The modeling results also show that a long-term change resulting from the removal of the inter-bedded coal, shales, mudstones, and sandstone strata and replacement with a more homogeneous mine backfill in Area IV North there would be an increase in the rate of vertical flow into the PCS from the mine backfill compared with the vertical flow into the PCS from the Fruitland Formation prior to mining (BNCC 2011). Removal of the coals by mining will result in greater depth to the water table within the mine backfill compared to pre-mine conditions. Any perched groundwater in the shallow coal seams (#7 and #8 coals) adjacent to the mine will flow toward the mine backfill. The impact of these changes is considered negligible because the coal units within Area IV are not capable of providing a sustainable water supply for use and do not supply water for springs or seeps.

These groundwater-modeling predictions were also used to help assess the approximate magnitude of changes in groundwater flow and TDS concentrations in the Cottonwood alluvium that might occur as a result of mining in Area IV North. The groundwater model predicted a steady-state post-reclamation alluvial groundwater flow at the mouth of Cottonwood Arroyo of about 4.6 gallons per minute (gpm) compared to the pre-mine alluvial groundwater flow estimate of 4.3 gpm (BNCC 2011). However actual groundwater flows in the Cottonwood alluvium are never at steady state and vary considerably seasonally and from year to year and will continue to vary throughout mining and after reclamation. The model predicted 0.3 gpm increase in groundwater flow in the Cottonwood alluvium is quite low relative to the baseline variability in the alluvial groundwater. Thus, mining and reclamation within Area IV North is not expected to result in a long-term measurable change to the alluvial groundwater flow or potential well yield from the alluvium. Groundwater flows in the Cottonwood alluvium have historically been insufficient to sustain a reliable water supply at two of the three wells that were monitored for baseline conditions. This is not expected to change even with the modeled flow increase of 0.3 gpm (BNCC 2011 § 11.6). Impacts to the Cottonwood alluvial quantity are considered to be negligible because they are similar to fluctuations caused by natural processes.

The estimated changes in groundwater flow are not expected to result in any change in surface water availability or surface water quality as groundwater does not discharge to surface water in the area. Groundwater in the Fruitland coals and the PCS near the Project Area are not used by area residents due to low yields and poor water quality (BNCC 2011 § 11.6). Impacts to the Fruitland and PCS groundwater quantity are considered to be negligible as these systems are not capable of providing a sustainable water supply for use.

Water Quality

Spoil leaching tests were performed in support of the PHC assessment for the Navajo Mine SMCRA permit revision (BNCC 2011 § 11.6). The spoil leaching test results show a considerable range in the concentrations of TDS and sulfate. These results show TDS and sulfate to be the primary constituents of concern with respect to spoil leachate. The leaching test results are fairly consistent with the results for the Bitsui #5 spoil well completed in the mine spoils in the Bitsui Pit, located at the north end of the BNCC Navajo Mine (BNCC 2011 § 11.6, Table 11-14i). The Bitsui Pit was backfilled in the 1980s and is the only pit at Navajo Mine where saturation of mine spoils has been observed. Arsenic and selenium were below detection in most of the leaching test results and in the Bitsui 5 spoil well. Fluoride is also lower in the spoil water leachate than in the coal water and is attenuated in flow through mine spoil. Boron and manganese concentrations are elevated in mine spoil water but concentrations are below the criteria for livestock use (BNCC 2011 § 11.6).

A post-reclamation increase in TDS and sulfate concentrations in mine spoil backfill may in the long-term result in increased TDS and sulfate concentrations in the coal and PCS adjacent to Area III mining and in the groundwater in the Cottonwood alluvium downstream of the mine area. Spoil leaching test results found an increase in TDS concentrations in spoil water leachate ranging from 400 to 2,700 mg/l and an increase in sulfate concentrations in spoil water leachate ranging from 630 to 2,580 mg/l (BNCC 2011, Appendix 11-VV).

Direct intermediate-term impacts to the groundwater quality changes beyond the active mine area at Area IV North are not expected to occur during mining and reclamation operations. During active mining, hydraulic gradients and groundwater flow directions in the Fruitland Formation and in the underlying PCS would be toward the mine pits and backfill areas. Thus, it is expected that there would be little change in the quality of groundwater beyond the limits of the mine pit and mine backfill during mining and reclamation operations.

The TDS concentrations are lower in the Fruitland coals in the vicinity of Area IV North in comparison with the baseline TDS concentrations in the Fruitland coals further north in the vicinity of Areas I and II (BNCC 2011 § 11.6). These results show that in addition to increases in concentrations of TDS and sulfate, concentrations of boron and manganese may also increase relative to the baseline coal water but are unlikely to exceed livestock use criteria.

Long-term TDS transport modeling simulations were performed using a lower bound source concentration of 3,550 mg/l and an upper bound TDS concentration of 11,850 mg/l (BNCC 2011). Based on these results, the long-term post-reclamation TDS concentrations in the groundwater in the Cottonwood alluvium may be expected to increase downgradient of the Area IV North mine area. Groundwater modeling results indicate a delayed long-term increase in the TDS concentrations in the Cottonwood alluvium that may be within a magnitude of 0 to 22 percent increase near the mouth of Cottonwood after more than 500 years. A 22 percent increase would result in a predicted TDS concentration of 3,687 mg/L. TDS concentrations between 3,000 and 5,000 mg/L may not cause adverse effects to adult livestock; however, growing/young livestock could be affected by looseness or poor feed conversion (Lardy et al. 2008). There is no NNEPA 2007 TDS standard for livestock watering.

The natural variability in the baseline TDS concentrations in the Cottonwood alluvium is comparable to or greater than the magnitude of the model predicted changes in TDS concentrations. For example, the median plus one median absolute deviation of the TDS concentrations measured in baseline samples at Cottonwood alluvial wells QACW-2 and QACW-2B are 22 percent and 10 percent higher than the median, indicating wide natural variation in TDS concentrations in the alluvium. Cottonwood alluvial monitoring QACW-1 had insufficient water for sampling so it is not possible to assess the variability in TDS concentrations at this location. The median plus one median absolute deviation of the TDS concentrations measured in baseline samples at alluvial well GM-17 on the North Fork of Cottonwood was 3 percent higher than the median. However, the median TDS concentration in baseline samples from this well was 15,210 mg/l making the alluvial groundwater at this location on the North Fork of Cottonwood unsuitable for use. In summary, the baseline median plus one median absolute deviation range from 3 to 22 percent higher relative to the medians.

While the predicted TDS change of 0 to 22 percent could result in TDS concentrations above criteria recommended by Lardy, Stoltenow, and Johnson for growing/young livestock, the predicted change is within the variability of 3 to 22 percent observed in baseline fluctuations. Thus, the impact of the model predicted changes in TDS concentrations in the Cottonwood alluvium are considered to be negligible as the predicted long-term changes in water quality are within the variability observed in the baseline fluctuations. Additionally, changes unrelated to mining could result in a greater magnitude of change in TDS concentrations in the Cottonwood alluvium, within the 500 year modeled timeframe. Any changes in alluvial groundwater quality are not expected to affect surface water quality or potential ecological receptors, as groundwater does not discharge to the surface in the area.

One commenter indicated concerns regarding water quality impacts of CCB disposal at the Navajo Mine. No CCB disposal is proposed as part of the Proposed Action. The proposed realignment of Burnham Road would have no impacts to groundwater quality or quantity.

Indirect Impacts Related to CCR Disposal at the FCPP

Coal produced at the Navajo Mine under the Proposed Action would be transported by train to the FCPP where it will be burned to produce energy. As such, production of coal combustion residue at the FCPP is a reasonably foreseeable consequence of mining coal at the Navajo Mine. Approximately 20 percent of the coal combustion residue has been beneficially reused since 1997; the remainder is stored at dry fly ash disposal areas at FCPP. The FCPP/NMEP EIS analyzed the potential effects of CCR disposal at the FCPP on groundwater quality in detail. This analysis is incorporated by reference into this EA:

As described in the Affected Environment, selenium concentrations in the DFADA exceed EPA drinking water quality standards. Boron, nickel, and uranium are also elevated in some instances. Although boron and uranium are naturally-occurring elements found in the geologic formations of the region, it is unclear if the ash ponds or native material is the source of these and the other constituents. TDS concentration is a general indicator of total metals within the groundwater. A statistical analysis was conducted of TDS data (APS 2013) for 10 wells selected in order to cover the entire ash pond area. Mann-Kendall time series tests were conducted to analyze TDS levels over time to determine if there is any trend in the data. For those monitoring wells near Ash Pond 6 and heading west, all selected wells showed a statistically significant downward trend in TDS, thus indicating that metals have decreased over time. South of Ash Pond 6, monitoring wells nearest to the lined evaporation ponds showed no correlation between TDS concentration and time; however, wells further west did. The lack of correlation could be due to a disconnect between CCR in the lined ponds and the groundwater (i.e., little to no seepage into groundwater beneath these ponds, thus TDS concentrations may be indicative of background levels). In accordance with the Final Rule for Disposal of CCR at Electric Utilities, APS will continue groundwater monitoring at the ash disposal area at FCPP, on at least a semi-annual basis and data will be analyzed to detect potential leaching. If sample analysis determines the presence of leaching, APS will take implement appropriate corrective measures, as outlines in the Final Rule. Groundwater monitoring records will be kept in the FCPP operating records and posted on a public website, as specified in the Final Rule.

Previous studies found two primary areas of groundwater seepage beneath the ash disposal areas, the "north seep" and "south seepage area" (APS 2013). In 1977, APS constructed an open ditch system to collect seepage water from the ash disposal facilities as part of the NPDES permits for the FCPP. In 1993 and 2011, extraction wells were installed. These systems are designed to prevent contamination of the Chaco wash. In October 2011, APS constructed a north intercept trench excavated to the Lewis shale formation. A review of groundwater level data and water quality data in three wells located downgradient of the trench show declines in all constituents and groundwater level. APS installed a second south intercept trench to remediate groundwater in early 2014. The finished project entailed the construction of two French drains adjoining each other in a north to south direction. Both French drains are approximately 2 miles long and the trenches for the drains were excavated to the Lewis shale formation. The bottom of the trench was filled with a granular media and slotted pipe, to allow the collection of water at two points approximately mid-length in location. Water that is collected at these points is pumped to FCPP's Lined Decant Water Pond. With the operation of the intercept trenches, continued operation of wet ash ponds and expansion of the DFADAs would have less potential to contaminate local groundwater and water quality in Chaco Wash.

4.2.2.1.2 Surface Water

Previously permitted mining in Area III would consist of mining 701 acres. That mining would directly impact about 1.3 acres of waters of the U.S. within the Lowe and Dixon Pits. Impacts to waters of the U.S. within Area IV North would include an additional 0.5 acre associated with the proposed mining activities and 0.1 acre associated with the proposed Burnham Road realignment (these activities were permitted by the USACE following publication of the 2012 EA/FONSI and have been completed). Mining activities would effectively remove these ephemeral channels, resulting in containment or diversion of surface flows and divert them around the mine until reclamation occurs and hydraulic functions return to mined areas.

BNCC mining construction and operations must comply with CWA regulations, which require that surface-water runoff from constructed surfaces be controlled such as to “prevent, to the extent possible using the best technology currently available, additional contributions of suspended solids to streamflow, or runoff outside the permit area.” The CWA also requires that discharges to streams meet all applicable water quality standards. OSMRE approval procedures for controlling sediment transport include berms, terraces, sediment ponds, and other energy dissipative channel structures that allow water to pond and sediment to accumulate.

Surface Flows and Sediment Transport

The mining of several ephemeral drainages in Area III may result in minor and infrequent decreases in storm-related flows in tributaries to the Chaco River. These streams rarely carry storm runoff that reaches the Chaco River, and the watersheds are small in comparison to the Chaco River watershed. The Navajo Mine is located in a desert-type environment which receives an average of 5 inches of precipitation per year. When precipitation occurs, infiltration is high and rising temperatures after a storm result in evaporation. BNCC utilizes highwall impoundments to intercept upgradient flow above the active Lowe and Dixon Pits to ensure the miners’ safety and to minimize the potential for water in the pits and to decrease the potential for discharges from the downgradient sediment ponds. Upgradient highwall impoundments and downgradient sediment ponds for Area III result in retention of approximately 83.5 percent of the 12.3 square mile Lowe watershed during active mining operations. SEDCAD modeling of the Lowe Arroyo predicts a 12 percent decrease in sediment yield and 44 percent decrease in peak flow storm pre- to post-mining. There are no existing uses of the Lowe Arroyo; therefore, no uses of the Lowe Arroyo outside of the permit boundary are precluded. As impacts to drainage area and surface water runoff are predicted to be greater than 30 percent, impacts are considered to be moderate. The closest surface water used to the Lowe Arroyo is along the Chaco River. The Lowe watershed is approximately 0.27 percent of the Chaco River watershed, and the area retained is 0.2 percent of the Chaco River watershed. Consequently, the impact on the flows in the Chaco River is determined to be negligible.

The North Fork (Cottonwood) Diversion intercepts flow within the North Fork upgradient of current and proposed mining in Area III and diverts these flows into the Middle Fork of the Cottonwood Arroyo. Highwall impoundments and downgradient sediment ponds retain approximately 5.2 percent of the Cottonwood watershed and approximately 0.1 percent of the Chaco River watershed. The impact to drainage area for both Cottonwood and Chaco is therefore considered to be negligible, as less than 10 percent of both the Cottonwood and Chaco watersheds will be impacted.

The sediment ponds have the capability to discharge during and/or following large storm events but contain surface runoff from events smaller than the 10-year, 24-hour precipitation in accordance with the NPDES permit. There have been five discharge events from sediment ponds between 1977 and 2005 at Navajo Mine. The North Fork diversion and the highwall impoundments above the active Lowe and Dixon Pits in Area III minimize the flow contained by sediment ponds and the magnitude of any discharges from these ponds.

BNCC has established a stream buffer zone along the main stem of Cottonwood Arroyo, in accordance with SMCRA regulations (BNCC 2011). Land disturbance associated with surface mining activities is not permitted within this stream buffer zone, unless approved by OSMRE. The stream buffer protects approximately 3.1 acres of the main stem of Cottonwood Arroyo from mining activities in Area III. Cottonwood Arroyo would not be impacted by mining activities within Area IV North except for the existing mining haul road crossing north of the Area IV North mine disturbance and the proposed 0.1 acres of waters of the U.S. crossing impacts from realignment of Burnham Road.

Ground disturbance associated with construction and mining has the potential to increase sediments carried by storm flows. However, all discharges from mining and mine-related disturbed areas are subject to NPDES permitting requirements. The largest source of potential runoff from the proposed mining operation is stormwater. All BNCC operations are conducted in accordance with an individual NPDES permit to cover possible discharges from the mine permit area. In addition, BNCC acquires general NPDES stormwater permits as applicable, such as the Multi-Sector General Permit (MSGP) under Sector H for coal mining (i.e., haul roads and access roads). Runoff from disturbed mining and reclamation areas is managed in evaporation ponds designed and certified by Professional Engineers to contain runoff from 10-year, 24-hour storm event. Should discharges occur from these ponds, they would be subject to the applicable NPDES discharge effluent limitations.

BNCC has already constructed one retention pond upstream of mining activities in Area IV North to intercept and detain flow on the western side of Area IV North and another one on the eastern side. These retention ponds are constructed to prevent run-on from entering the active mining areas of Area IV North for the protection of employees and to prevent surface water from commingling with potential contaminants. Direct short-term impacts of Area IV mining would include decreases in storm-related flows to the Cottonwood Arroyo due to the construction of highwall impoundments and sediment ponds. Since these impoundments and ponds have already been constructed in Area IV North, only the duration of the impact is extended under the Proposed Action. As described below, the impacts to area watersheds from the reduced surface flow is considered negligible.

SEDCAD modeling of worst case impacts associated with full mine development of Area IV North indicate a 2 percent change in sediment yields and a 1 percent change in storm runoff downgradient of mining after reclamation in comparison with pre-mine conditions (BNCC 2011 § 11.6). Therefore, impact to Cottonwood Arroyo surface water runoff are considered to be negligible, as they are less than 10 percent and considered to be within background levels.

BNCC would not discharge any water not covered under the final rule 40 CFR Part 434 or the NPDES MSGP. Stormwater runoff that is not permitted under the MSGP within the mine site would be retained on site in sediment ponds until it evaporates or infiltrates. Retention of a majority of the stormwater would reduce impacts to downstream channels due to discharge from the mine site. Through the MSGP, the mine would be required to maintain a SWPPP to mitigate potential impacts from discharges allowed under the permit. The mine site would be returned to approximate original contour during the reclamation process, as required by 30 CFR 816.102. This means discharge from the reclaimed mine site would be similar to pre-mine conditions.

Surface water controls required by SMCRA regulations would result in containment of surface runoff from mining areas on the BNCC lease area. Sediment ponds are designed to detain water long enough to allow settling of suspended sediment, and surface-water impoundments retain water permanently. Use of sediment ponds would allow some amount of surface water to be lost, either through infiltration into the ground or evaporation from the surface. This lost surface flow may represent a depletion of surface water quantity at the permit boundary, relative to the reaches of the local drainage system that are not under a sediment management system. These direct impacts would be intermediate in duration, yet negligible in severity, since the mine site is in a desert environment, and due to the small contribution of the watersheds within the regional Chaco watershed. The sum total of retained watersheds in Areas III and IV North are 0.6 percent of the Chaco watershed.

Reclamation would incrementally re-establish topography with positive drainage towards the Chaco River. Sediment yields in runoff from the reclaimed areas would soon decline below the pre-mine conditions due to improved post-mine vegetation cover resulting from revegetation activities, including mulching, seeding, and irrigating. The runoff from reclaimed areas could have lower sediment yields than the spoils due to the use of topdressing materials, which improve infiltration, as reclamation soils (BNCC 2011 § 11.6).

A direct long-term impact would be the re-establishment of drainages in the post-mine topography. Approximately 10,660 feet of the North Fork of Cottonwood Arroyo would be permanently re-aligned following reclamation. There would be a 93-acre reduction in the post-mining watershed, due to the change in the alignment of the North Fork of Cottonwood following reclamation. This reflects a 0.19 percent change in 80-square mile Cottonwood watershed, and no change in the Chaco watershed, as any long-duration flows would still make it to the Chaco River. Therefore the impact to Cottonwood Arroyo and Chaco River is considered to be negligible as the predicted change is within 10 percent and considered to be within background levels.

Water Quality

Anticipated direct, short-term impacts may include increases of TDS and sulfate concentrations in runoff from disturbed areas, regraded mine spoils, and newly reclaimed areas. During mining, surface runoff from disturbed areas would be retained by BMPs, such as retention ponds, and are unlikely to reach the Chaco River as these structures are designed to contain a 100-year, 6-hour event. Nevertheless, TDS and sulfate concentrations may result from dissolution of weathered geologic materials on the surface (spoils). The water quality of runoff from newly exposed strata and mine spoils in Area III show TDS and sulfate concentrations of 1,200 mg/l and 670 mg/l, respectively (BNCC 2011 § 11.6, Table 11-14i). Ten samples were acquired from sediment ponds in 1976 (SM-series). TDS values ranged from 303 mg/L 21 to 1,363 mg/L with a median value of 1,300 mg/L. The sulfate and TDS concentrations are above the median average concentrations of 692 and 285, respectively, observed in surface water baseline samples from Cottonwood Arroyo. The median values plus one median absolute deviation for TDS and sulfate are 1,116 mg/L and 525 mg/L, respectively. The median sediment pond TDS of 1,300 mg/L is 16 percent higher than baseline median plus one median absolute deviation, and synthetic precipitation leaching procedure (SPLP) runoff from newly exposed strata and mine spoils in Area III sulfate concentrations are 21 percent higher than baseline median plus one median absolute deviation. Therefore, it is possible that water quality could occasionally exceed water quality observed in baseline fluctuations during active mining. There are no NNEPA 2007 water quality standards for TDS or sulfate; however, the highest sediment pond sample TDS concentrations of 1,363 mg/L and the SPLP sulfate value of 670 mg/L are both well below livestock criteria recommended by Lardy, Stoltenow, and Johnson. Consequently, current and potential future use for livestock watering is not expected to be precluded. Given the potential for short term occasional exceedances of water quality observed in baseline fluctuations during active mining, and that uses will not be precluded, impacts are considered to be minor.

Trace constituents in spoil leachate are below detection limits—except for fluoride and boron. These parameters are well below their corresponding Navajo Nation livestock and wildlife use criteria. Manganese was also detected, but has no livestock and wildlife use criterion (NNEPA 2008). Post-mining, once reclamation criteria are met and ponds are removed, TDS and sulfate concentrations in flows downstream of the mine, are likely to be comparable to baseline conditions. Thus, there would be a negligible impact on downstream surface water quality.

Post-reclamation, direct intermediate-term impacts may include a beneficial improvement in the water quality of surface runoff from reclaimed areas in Area IV North, as most of the area proposed for mining is comprised of sodic badland soils and areas disturbed by accelerated weathering from uncontrolled natural combustion of shallow coals. However, the water quality improvement in runoff from reclaimed areas is unlikely to result in measurable changes in surface water quality in Cottonwood Arroyo. This will be a negligible impact, due to the small acreage of mine reclamation relative to the total drainage area of Cottonwood Arroyo, and due to the high variability in the baseline surface water quality. The variation in the source of flow, whether it be NAPI return flow, snow melt, or storm events, contributes more to the actual water quality than any anticipated change from runoff over better reclaimed soils.

During review of the 2012 EA, comments were raised about the potential impacts of mining and from coal dust from mining operations on water quality of stock ponds. Two samples were obtained in year 2008 from Stevenson’s Pond located immediately adjacent to Area IV North. The results of these samples are presented in Table 4.2-2. Results from both samples meet applicable surface water criteria for livestock use. The samples meet all the relevant aquatic use criteria except for cadmium, which exceeds the chronic aquatic criteria for the estimated hardness of the pond water. These results indicate that stock ponds located adjacent to active mining operations are not expected to have major impact with respect to livestock use.

Table 4.2-2. Surface Water Quality at Stevenson's Ponds

Analysis Parameter	Sample Date July 21, 2008	Sample Date August 1, 2008
Alkalinity as CaCO3 (mg/L)	312	-
Aluminum, D (mg/L)	< 0.10	
Aluminum, T (mg/L)	-	1.83
Arsenic, D (mg/L)	< 0.005	
Arsenic, T (mg/L)		< 0.0025
Barium, D (mg/L)	0.208	-
Barium, T (mg/L)	-	0.1550
Bicarbonate as CaCO3 (mg/L)	312	-
Boron, D (mg/L)	0.2	0.1
Cadmium, D (mg/L)	0.0083	0.01397
Calcium, D (mg/L)	44.6	-
Carbonate as CaCO3 (mg/L)	< 10	
Chloride (mg/L)	19	-
Chromium, D (mg/L)	< 0.01	< 0.01
Cobalt, D (mg/L)	-	0.00030
Electrical conductivity (EC) (µs/cm)	608	-
Copper, D (mg/L)	0.014	0.0068
Fluoride (mg/L)	1.2	-
Hydroxide as CaCO3 (mg/L)	< 10	
Iron, D (mg/L)	0.05	-
Iron, T (mg/L)	383	-
Lead, D (mg/L)	< 0.001	< 0.0016
Magnesium, D (mg/L)	< 0.5	
Manganese, D (mg/L)	0.357	-
Manganese, T (mg/L)	9.26	-
Mercury, T (mg/L)	0.0008	< 0.0002
Nitrate/Nitrite as N (mg/L)	0.03	
pH (su)	7.80	-
Phosphorous, T (mg/L)	< 0.05	
Potassium, D (mg/L)	7.5	-
Sodium adsorption ratio (SAR)	0.7	-

Analysis Parameter	Sample Date July 21, 2008	Sample Date August 1, 2008
Selenium, D (mg/L)	< 0.010	
Selenium, T (mg/L)		< 0.002
Settleable solids (mL/L)	37.9	
Silver, D (mg/L)	< 0.0005	
Sodium, D (mg/L)	86.4	-
Sulfate (mg/L)	39	
Total dissolved solids (mg/L)	380	-
Total suspended solids (mg/L)	9200	-
Vanadium, D (mg/L)	-	0.0064
Zinc, D (mg/L)	0.02	0.006

Surface Water Use

No change to surface water use is expected. Due to generally poor water quality, water uses in the Project Area are limited to stock watering. NTEC has provided water to local permittees in tanks for livestock use in areas around the coal mine. Within Area III, the upland highwall pond—Lowe Impoundment #1—would be retained as a permanent impoundment to provide a stock watering water supply. NTEC is continuing discussions with the local community to address the concern raised in scoping regarding coal dust in stock ponds located near disturbance areas and stockpiles. Water quality data are not available for this impoundment although the water is expected to be suitable for livestock use given the samples from the Stevenson Pond and from sediment ponds as discussed above. No changes in surface water uses are expected from mining in Area IV North.

Waters of the U.S.

Proposed mining in Area III would impact about 1.0 acre of ephemeral channels; about 0.7 acre in Area IV North; and 0.1 acre along Burnham Road. No special aquatic sites are located here or would be impacted by the Proposed Action. In its 404 permit application, BNCC proposed to avoid and minimize impacts to waters of the U.S. by employing BMPs to control runoff, erosion, and sedimentation; by providing stream buffers during mining; by reclaiming mined areas and restoring long-term hydrologic balance; and by compensating for temporal loss of aquatic functions by creation and enhancement of riparian and wetland habitats. As discussed in Section 2, these impacts occurred following publication of the 2012 FONSI and approval of the Individual Permit for the Navajo Mine. Additional details were provided in the 404(b)(1) Analysis prepared in support of the CWA permit. NTEC is responsible for implementing the conditions and mitigation defined in the permit. Therefore, for the purposes of this EA, no new impacts are identified.

Burnham Road Realignment

The proposed Burnham Road realignment included seven crossings of waters of the U.S. including two crossings of Cottonwood Arroyo. Each of the crossings would be constructed with culverts to ensure safe travel during precipitation events. Appendix A includes detailed descriptions of each crossing including the width and depth of the channels, the acres of impacts, and the anticipated amount of fill within the streambed. The Burnham Road crossings were designed and constructed to minimize their effect on a channel's flow hydraulics and sediment transport ability. The 404(b)1 Alternatives Analysis prepared by the USACE includes engineered drawings of each waters of the U.S. crossing. Water would continue to flow past each culvert road crossing with only minimal and localized hydraulic affect. Water and sediment control for the Burnham Road realignment construction would be performed in accordance with the project SWPPP. BMPs would be implemented under this plan to control water and sediment. As discussed in Section 2, these impacts occurred following publication of the 2012 FONSI and approval of the Individual Permit for the Navajo Mine and approval of the realignment by BIA. NTEC is responsible for implementing the conditions and mitigation defined in the permit. Therefore, for the purposes of this EA, no new impacts are identified.

Indirect Impacts of FCPP

In addition to the direct impacts to surface water hydrology and water quality that are described at the Navajo Mine, continued operation of the ash disposal areas at FCPP could potentially affect surface water quality through seepage and stormwater runoff. These potential impacts were evaluated in the FCPP/NMEP EIS and are incorporated by reference below:

> *In 2009, a survey was conducted of the existing LAI and lined decant water impoundment located on top of old Ash Pond 3. The impoundments were assessed for their potential for failure…[Although], failure of the impoundments is unlikely; if an impoundment failed, the potential exists for wet ash to enter Chaco River. If this were to occur, it would be regulated under the CWA and EPA would have regulatory oversight and the area of inundation is expected to be smaller than the evacuation area shown. In the event of a dam failure at the LAI, the dry material would result in the dry ash contents slumping downslope. This material is unlikely to extend much past the angle of repose. As such, if there were a release, the material is unlikely to reach the Chaco River. This may result in some slight increase in turbidity in the Chaco River if there were flow in the river at the time of the failure (the area where the ash would enter the river is upstream of the area that is perennially wetted). In the event of a dam failure at the LDWP, a maximum of 517 acre-feet of water would be released, although the normal operating level is 135 to 435 acre-feet. This water would likely carry some ash with it, as well as material from the dam. This would result in increased flow, turbidity, and sedimentation in the Chaco River. Most of the solid materials would settle close to the dam, and the amount of material carried along would attenuate with distance from the breach. The assessment also provides insight into the potential for surficial runoff from the facilities to Chaco River. The assessment found no evidence of substantial seepage from the embankments. At the time of the survey, some minor seepage was observed at the southern toe of the LAI embankment, which was associated with construction activity occurring at the time (GEI Consultants 2009). Flow rate of the seep, as measured during the latter half of 2011, was*

0.0 gpm (i.e., no seepage) from July to August, peaked at 0.60 gpm at the beginning of August 2011 and then steadily decreased to 0.0 gpm by the beginning of October, where it remained dry through the rest of the year. The embankment serves as an impediment to discharge of stormwater or drainage from the two areas. APS plans to raise the embankment in 10-foot rise construction intervals until the embankment is 70 feet. Continued operation of these facilities would, therefore, have no adverse impact on nearby surface waters.

Ash Pond 6, located on the northwest side of the existing Ash Disposal Area, is currently inactive, and was used to impound the fly ash and solids from Units 1, 2, and 3. The final lift of Ash Pond 6 is approximately 80 feet higher than natural grade on the West Embankment. This embankment serves as an impediment to discharge of stormwater drainage from this area; therefore, no adverse impacts to nearby surface waters would result from the existence of this area.

In addition, combustion of coal at the FCPP would result in impacts to surface water quality through deposition of metals from air emissions, as has been evaluated in the FCPP/NMEP EIS for operations beginning in 2014, following the shutdown of Units 1, 2, and 3 and is incorporated by reference below:

"In addition to potential water quality impacts resulting from operations at the plant lease site itself, coal-fired power plants represent a source of atmospheric mercury and selenium in the Four Corners region. As emissions deposit in the region, recent studies have determined that emissions from coal-fired power plants in the region contribute mercury, selenium, and other pollutants to local surface waters (EPRI 2013). Because prevailing winds are generally from the southwest to the north and northeast, emissions from the FCPP have the potential to affect surface water quality beyond the Navajo Nation. Air quality modeling and emissions deposition modeling have defined the area that would be affected by FCPP emissions as less than 50 km (31 miles). …[I]t is estimated that the FCPP would emit approximately 136 pounds of mercury and 566 pounds of selenium annually for the duration of the Project. The emitted mercury and selenium would consist of both particulates and vapors. However,… these emissions would represent a 72 and 93 percent reduction over baseline conditions. Therefore, while mercury and selenium would continue to be deposited into the San Juan River watershed, surface water quality impacts would be minor compared to baseline conditions."

Therefore, for the post-2014 period under consideration in this EA, deposition of mercury and selenium would occur within the modeled deposition area at a rate of approximately 136 pounds of mercury and 566 pounds of selenium per year. Deposition of metals from FCPP between 2012 and 2014 when all 5 units were operational are considered to be equivalent to the estimated historic deposition values, presented in Table 4.1-8 of the FCPP/NMEP EIS for the period of 2000-2011, of 719 pounds of mercury and 11,262 pounds of selenium per year. Therefore, for the entire 2012-2016 period average deposition values are estimated to be 428 pounds of mercury and 5,914 pounds of selenium per year, which would represent a 40 and 47 percent reduction over baseline conditions. Although baseline water quality conditions in the San Juan River are impaired (TMDLs have been set for selenium, sedimentation, and bacteria), the reduced emissions and associated deposition from 2012-2016 represent a moderate impact compared to deposition prior to 2012.

The continued operation of the FCPP also requires the use of water from San Juan River via Morgan Lake for cooling the units. An analysis of this potential impact on surface water quantity and quality is provided in the FCPP/NMEP EIS and is incorporated herein by reference:

> *"Surface water drawn from the San Juan River into Morgan Lake for use at the FCPP is obtained according to water rights held by BBNMC. The final disposition of the water rights is still pending and will be resolved between BNCC and NTEC. No changes to the water use would occur under the Proposed Action and NTEC (and the FCPP) would maintain the ability to draw as much water as the rights allow for the Project life. Given the current water right appropriations, water drawn from the San Juan River would continue as stated in the agreement; therefore, impacts to surface water quantity in the San Juan River would be negligible and would not change under the Proposed Action….*
>
> *Water used at the FCPP is cycled from Morgan Lake through the power plant condenser for cooling and discharged back into the lake. The continued operation of Units 4 and 5 would result in no changes to the quality of water released to Morgan Lake or ultimately the San Juan River. The temperature of the water discharged into Morgan Lake and ultimately No Name Canal and the Chaco River is greater than that brought into the FCPP. However, this increase in temperature allows for year-round recreation at Morgan Lake and does not increase temperature in No Name Canal or Chaco River above water quality standards. Therefore, continued operations regarding uptake and discharge of water from Morgan Lake would not adversely affect surface water quality of water bodies in the vicinity of the plant."*

4.2.2.2 Proposed Action with Conditions

Under this Alternative, impacts would be the same as those described for the Proposed Action; however, additional surface water monitoring information would help ensure the accurate characterization of stream flow variability in the area that would be used for the North Fork permanent channel design.

This additional condition is authorized under OSMRE Performance Standard 816.41(a) – Hydrologic-balance protection. This regulatory authority enables OSMRE to require additional preventative, remedial, or monitoring measures to assure that material damage to the hydrologic balance outside the permit area is prevented. As such, this alternative is expected to reduce impacts to water resources relative to those impacts described under the Proposed Action.

4.2.2.3 No Action Alternative

Under the No Action Alternative, the mine permit revisions would not be approved and no further mining activities would occur in Area IV North and the area would be reclaimed per BNCC's SMCRA permit. Burnham Road would not be realigned. Mining activities would continue as permitted in Area III. Impacts from mining activities in Area III have been assessed previously and are not expected to differ appreciably in nature from what is described above; however, the intensity of mining activities would be expected to decrease over time as mineable coal is depleted.

In addition, the combustion-related impacts at the FCPP would remain as described for the Proposed Action through July 2016 as the current coal stockpiles are used. Following July 2016, should additional mining not be approved in Area IV North, NTEC may elect to proceed with mining in the Pinabete Permit Area under a revised SMCRA permit. However, after the revised permit is submitted, OSMRE would be required to comply with NEPA prior to making a decision on any potential SMCRA permit revision to the Pinabete Permit. Alternatively, under the No Action Alternative, the Navajo Mine and FCPP could potentially shut down once all coal reserves are combusted. The effects of this shut-down has been evaluated in Section 4.5.4.5 of the FCPP/NMEP EIS and is incorporated by reference as follows:

Navajo Mine

Groundwater

During demolition activities associated with the Navajo Mine, short-term impacts to near-surface groundwater quality could occur; however, prior to conducting any demolition activities, NTEC would be required to obtain the necessary permits which prescribe BMPs to minimize impacts to groundwater.

Areas that had previously been mined or altered would be reclaimed in accordance with the Reclamation Plan; therefore, impacts to subsurface hydrogeology would be beneficial over the long-term. In addition, reclamation of mined lands would potentially restore natural groundwater flow.

Surface Water Resources

Under the No Action Alternative, the Pinabete SMCRA Permit would not be approved, and mining at the Navajo Mine SMCRA Permit Area would cease when the ROD is issued in 2015 and previously mined areas would be reclaimed in accordance with approved reclamation plans. During demolition activities associated with the Navajo Mine, NTEC would maintain the same level of BMPs and sediment control as during mining operations. Short-term impacts to surface water quality could occur; however, prior to conducting any such demolition (building removal, etc.), MMCo would be required to obtain necessary permits which may include a Construction Stormwater General Permit under CWA Section 402. Compliance with this permit requires the preparation of an Erosion Control and Sediment Plan and SWPPP describing BMPs to prevent discharge into waters of the U.S. Implementation of the plans would minimize impacts to nearby waters of the U.S. In addition, NTEC would be required to satisfy existing USACE mitigation requirements as specified in the pre-2016 Individual 404 permit for the Navajo Mine SMCRA Permit Area.

Drainages and watersheds that had previously been mined or altered would be reclaimed in accordance with the Reclamation Plan; there would be no change in its management of surface water or ground water during reclamation activities. Therefore, impacts to surface water hydrology would be beneficial over the long-term. In addition, reclamation of mined lands would restore surface water drainage and natural stormwater flow; therefore, impacts to water quality would likely be beneficial as well.

Four Corners Power Plant

Under the No Action Alternative, FCPP Units 4 and 5 would shut down and remain in place until such time that a decommissioning plan is approved and implemented. Under the No Action Alternative, APS would cease drawing water from the San Juan River to operate the plant and would also cease discharges into Morgan Lake. If the river pumping plant and the pipeline to Morgan Lake were removed, Morgan Lake would evaporate and cease to exist over time. If APS chooses to leave the river pumping plant and the pipeline intact, and the Navajo Nation took possession of those facilities, it is not known the extent to which the river pump station would be operated. If the river pump station was not operated to provide water to Morgan Lake, it would evaporate and cease to exist over time. As a result of the evaporation there may be concentrations of metals in the resultant salts overlaying the remaining sediment. To address this concern OSMRE has recommended a mitigation measure to sample the lake bed sediments. Without the warm discharge from Morgan Lake, water temperature in San Juan River and Chaco Wash would be reduced.

Similarly, with the shutdown of the power plant, emissions of criteria pollutants and GHGs would cease (see Section 4.1, Air Quality); deposition of mercury, selenium, and other pollutants from the FCPP would also stop. As a result, water quality in surface water bodies within the deposition area, particularly the San Juan River, would improve at least incrementally, since deposition from FCPP was only one of the sources of deposition into these water bodies. With regard to groundwater, since the historic ash ponds would remain in place and the DFADAs are lined, impacts would be similar as described for the Proposed Action. Further, in accordance with the Final Rule for disposal of CCR at Electric Utilities, APS would implement post-closure monitoring of water resources and corrective action if impacts are detected.

4.3 Noise and Vibration

4.3.1 Impact Assessment Methodology

4.3.1.1 Noise

Although there are no regulatory limits for noise impacts from the project, the EPA guidelines established under the Noise Control Act of 1972 can be used to assess the acceptability of project-related noise. The EPA guideline uses the 24-hour noise metric and sets a noise level of 55 dBA L_{dn} as the acceptable limit for outdoor use areas (EPA 1974). Because there are no other enforceable noise standards that apply to the project, the EPA acceptable noise level is used as the criteria for evaluating noise impacts from the project.

The methodology for evaluating potential noise impacts from mining activities from the Proposed Action is based on the procedures of ISO 9613-2:1996, Acoustics – Attenuation of Sound during Propagation Outdoors – Part 2: General Method of Calculation. This international standard procedure is widely used for propagation and evaluation of environmental noise over distances and is the basis for calculation protocols in numerous computer models, including CadnaA and SoundPlan. Such computer models require complex information on scheduling and daily duration of each noise-producing activity to be able to calculate and propagate noise levels. Since detailed information was not available, the methodology involved simple spreadsheet calculations based on the ISO 9613-2:1996 standard. The procedure essentially involved determining the L_{max} during the various stages of mining activities, based on noise data from equipment manufacturers, the Federal Highway Administration's (FHWA's) database of construction equipment noise levels (FHWA 2006), and field measurements around the existing mining areas, and then propagating those L_{max} from Area IV North and Area III to the nearest residential dwellings.

4.3.1.2 Vibration

Vibration impacts for this analysis are described based on the OSMRE Blasting Performance Standards contained in 30 CFR 816.67. A chart of the Blasting Criteria Level from the regulations is contained in Figure 3.3-2 of this document. To ensure that no adverse impacts occur from blasting operations, BNCC typically uses the scaled-distance equation contained in the regulations to determine the allowable charge weight of explosives. The scaled-distance equation includes a factor of safety to ensure that the maximum PPV is not exceeded. Seismic monitoring would be needed if the scaled-distance equation shows that the maximum PPV may be exceeded for a certain blast.

The methodology for evaluating potential vibration impacts relies on existing seismic monitoring provided by BNCC, along with standard vibration propagation rates to calculate potential vibration levels at the nearest residential dwellings to the planned blasting areas.

4.3.2 Impacts

4.3.2.1 Proposed Action

Noise levels and noise impacts from the Proposed Action are directly related to the number and types of heavy equipment being used for the specific activity. The most comprehensive database of construction and heavy equipment source noise is maintained by the FHWA (2006). The database was created in conjunction with the EPA and is widely used for highway and non-highway projects.

Table 4.3-1 lists equipment noise source data and the quantity of equipment to be used in the permit area at Navajo Mine and likely for the Proposed Action. The acoustical usage factor is the percentage of time that the equipment is typically in use over a given period of time. Noise levels are determined based on the average noise level or L_{eq}, which is calculated from the peak noise level (L_{max}) and the acoustical usage factor using the following equation (FTA 2006):

$$L_{eq} = L_{max} + 10 \log(\text{usage factor})$$

These data were compared with, and are consistent with, field measurements throughout the Navajo Mine. Though not all equipment used in the existing SMCRA permit area would be used for the Proposed Action, these sources represent the maximum number that would be expected.

Table 4.3-1. Equipment Source Noise and Quantity in Permit Area

Equipment	Peak Noise Level at 50 feet (dBA L_{max})	Acoustical Usage Factor (percent)	Quantity
Draglines	87	40	3
Overburden drills	81	20	3
Coal drills	81	20	1
Dozers	82	40	12
Rubber tire dozers	82	40	1
Front-end loaders, large	79	40	7
Front-end loaders, small	79	40	3
Graders	85	40	4
Scrapers	84	40	3
Coal haul trucks	76	40	5
End dump haul trucks	76	40	8
Mix trucks	79	40	2
Water trucks	76	40	3
Cable reels	75	20	2
Locomotives (electric)	78	50	2
Rail cars	65	50	40
Stemming trucks	75	40	1

Source: FHWA 2006.

The closest receiver is approximately 4,000 feet from the mining operations. Vibration levels from surface mining operations are typically less than 0.10 to 0.20 inches per second (in/sec) at 10 feet from the source. Ground-borne vibration dissipates very rapidly with distance, reducing the typical mining-related vibrations to an imperceptible level at about 200 feet from the source—well before reaching the nearest residence at 4,000 feet. Consequently, mining-related vibrations are generally not an issue for receivers at that distance, except for blasting activities. Therefore, impacts from ground-borne vibration were evaluated only for blasting activities.

Finally, because noise levels diminish with increasing distance from the noise-generating activity, noise levels are directly related to the distance to the nearest noise-sensitive receiver or residential home. As mentioned in Section 3.3.2.1, the nearest residence is approximately 4,000 feet from the edge of the proposed mining disturbance area and approximately 4,500 feet from the nearest proposed dragline. All residences within approximately 1 mile of the mining disturbance area for Area IV North and Area III were evaluated for noise and vibration impacts.

4.3.2.1.1 Mining Activities

The vast majority of activities under the Proposed Action fall under the general category of mining activities, which consists of a progression of activities listed and described in Section 2 of this document. These activities would use most of the equipment listed in Table 4.3-1. The noise evaluation is based on the data in the table along with the actual ambient noise measurements conducted around the active portions of the Navajo Mine, which were presented in Table 3.3-4.

The highest noise levels from mining activity would be associated with coal removal, producing an estimated noise level of 83 dBA L_{eq} at 50 feet from operating equipment. Vegetation and topdressing removal activities throughout the disturbance area would produce an estimated noise level of 81 dBA L_{eq} at 50 feet from the operating equipment. Overburden and interburden removal near the coal seams would produce an estimated noise level of nearly 78 dBA L_{eq} at 50 feet from the operating equipment.

Impacts for noise are based on the 24-hour L_{dn} noise metric, rather than a 1-hour L_{eq} noise metric. As defined in Section 3.3.1.1, the 24-hour L_{dn} noise metric is an overall noise level incorporating noise over an entire 24-hour period and includes a 10-dBA nighttime penalty for noise occurring between 10 p.m. and 7 a.m. Conversely, the 1-hour L_{eq} noise metric is an average over a shorter time period and does not include any penalties for nighttime noise. The noise evaluation, therefore, propagated the estimated short-term noise levels to the nearby residences, and then calculated the 24-hour L_{dn} noise level. The evaluation assumed that the estimated noise levels from activities along the coal seams were constant around the clock, but that estimated noise levels from other activities within the disturbance area, such as the vegetation and topdressing removal, were constant for only 12-hours of the day, from 7:00 a.m. to 7:00 p.m. The evaluation also assumed an average nighttime noise level of 35 dBA L_{eq}, consistent with the lowest measured ambient noise levels at nearby residences.

Although blasting activities cause high instantaneous noise levels measured at 94 dBA L_{max} at 300 feet or nearly 110 dBA L_{max} at 50 feet from the blast, the duration of the noise is very brief, lasting only a few seconds. Blasting is typically only conducted during the daytime; therefore, nighttime noise standards would not apply to blasting. Nighttime blasting would only occur during emergencies, where there are safety or equipment hazards that would require detonation outside of daytime hours. When averaged over time for either the 1-hour L_{eq} or the 24-hour L_{dn} noise metrics, the influence of blasting activities to the overall noise environment is small.

Table 4.3-2 shows the calculated noise levels at each of the surrounding receivers, which are all residences, including the peak hourly daytime L_{eq} noise level, the 24-hour L_{dn} noise level, and whether the noise level constitutes a noise impact based on the EPA guideline, 24-hour noise levels of 55 dBA L_{dn} or greater are considered to be impacted.

Table 4.3-2. Calculated Noise Levels and Impact Determination at Surrounding Residences for Mining Activities

Receiver ID	Distance and Direction from Area IV North or Area III Activity Area	Hourly Noise Level (dBA L_{eq})	24-hour Noise Level (dBA L_{dn})	Impact
Removal of vegetation and topdressing – daytime only activity				
A4N-3	4,500 feet west	41.9	43.0	None
A3-1	3,880 feet north	43.2	43.6	None
A3-2	3,990 feet north	43.0	43.5	None
A3-3	4,325 feet east	42.3	43.2	None
A3-4	4,500 feet east	41.9	43.0	None
Blasting of overburden, interburden, and coal* – daytime only activity				
A4N-3	4,850 feet west	41.9	43.0	None
A3-1	4,180 feet north	43.2	43.6	None
A3-2	4,290 feet north	42.9	43.4	None
A3-3	4,625 feet east	42.3	43.2	None
A3-4	4,800 feet east	42.0	43.0	None
Drilling and removal of overburden and interburden – daytime and nighttime activity				
A4N-3	4,850 feet west	38.3	44.7	None
A3-1	4,180 feet north	39.6	46.0	None
A3-2	4,290 feet north	39.3	45.7	None
A3-3	4,625 feet east	38.7	45.1	None
A3-4	4,800 feet east	38.4	44.8	None
Removal of coal – daytime and nighttime activity				
A4N-3	4,850 feet west	43.3	49.7	None
A3-1	4,180 feet north	44.6	51.0	None
A3-2	4,290 feet north	44.3	50.7	None
A3-3	4,625 feet east	43.7	50.1	None
A3-4	4,800 feet east	43.4	49.8	None

Note:

* As noted in the text, instantaneous noise from blasts were measured at 94 dBA L_{max} at 300 feet from the blast. This calculates to peak instantaneous noise levels of 70 to 80 dBA L_{max} at the seven residences; however, this noise level would last only a few seconds and quickly dissipate.

Noise level results from mining activities shown in Table 4.3-2, range from 43.0 dBA L_{dn} to 51.0 dBA L_{dn}, which are all below the impact threshold of 55 dBA L_{dn}. The analysis revealed no noise impacts from coal removal activities.

Because ground-borne vibration dissipates rapidly with distance from the source, typically reaching an imperceptible level at 200 feet from the source, and because the nearest residence is more than approximately 4,000 feet from the edge of the mining disturbance area, there would be no perceptible impact from ground-borne vibrations from most of the mining activities in Area IV North. The possible exception would be ground-borne vibrations from blasting activities. However, BNCC typically uses the scaled-distance equation contained in the OSMRE regulations establishing blasting performance standards to determine the allowable charge weight of explosives to ensure that no adverse vibration impacts occur from blasting operations. The scaled-distance equation includes a factor of safety to ensure that the maximum PPV is not exceeded. Seismic monitoring would be needed if the scaled-distance equation shows that the maximum PPV may be exceeded for a certain blast. Because of these controls on blasting operations and because blasting does not occur at night, substantial impacts are not expected from noise or ground-borne vibrations from blasting operations.

4.3.2.1.2 Transportation of Coal

The network and infrastructure for transporting coal is already in place and operating from the FCPP down to the existing active mining areas in Area III. The Proposed Action would involve using off-highway haul trucks to transport the coal from Area III and IV North along existing haul roads to the coal stockpile located in Area III. From the Area III stockpile, the coal would be loaded into the rail cars and transported to the coal sizing and blending facility next to FCPP. The noise evaluations for this component of the project include both the continued use of the existing rail line and haul roads. As shown in Table 4.3-3, noise levels from coal transportation were calculated to range from 41.4 dBA L_{dn} to 43.0 dBA L_{dn}, which are all below the impact threshold of 55 dBA L_{dn}. Therefore, the analysis revealed no noise impacts from coal transportation.

Table 4.3-3. Calculated Noise Levels and Impact Determination at Surrounding Residences for Coal Transportation

Receiver ID	Distance and Direction from Area IV North Activity Area	Hourly Noise Level (dBA L_{eq})	24-hour Noise Level (dBA L_{dn})	Impact
Construction of haul road and rail line extensions – daytime only activity				
A4N-3	4,500 feet west	41.9	43.0	None
Operation of haul road and rail line extensions – daytime and nighttime activity				
A4N-3	4,500 feet west	32.9	41.4	None
A3-1	3,880 feet north	34.2	41.4	None
A3-2	3,990 feet north	34.0	41.4	None
A3-3	4,325 feet east	33.3	41.4	None
A3-4	4,500 feet east	32.9	41.4	None

As described above, because ground-borne vibration dissipates rapidly with distance from the source, and because the nearest residence is approximately 4,000 feet from the edge of the coal transportation area, there would be no impact from ground-borne vibrations from the coal transportation activities.

4.3.2.1.3 Burnham Road

As part of the Proposed Action, Burnham Road would be realigned further to the east to accommodate the active and proposed mining areas. The noise evaluation of this component of the project includes the construction of the realigned Burnham Road.

Only one residence, Receiver A4N-4, is located within 1 mile of the Burnham Road realignment. Noise level calculations were conducted for this receiver only. As shown in Table 4.3-4, the noise level from the Burnham Road realignment was calculated to be 46.2 dBA L_{dn}, which is below the impact threshold of 55 dBA L_{dn}. Therefore, the analysis revealed no noise impact from the realignment of Burnham Road.

Table 4.3-4. Calculated Noise Levels and Impact Determination at Surrounding Residences for Burnham Road Realignment

Receiver ID	Distance and Direction from Area IV North Activity Area	Hourly Noise Level (dBA L_{eq})	24-hour Noise Level (dBA L_{dn})	Impact
Construction of Burnham Road Realignment – daytime only activity				
A4N-4	2,310 feet south	47.7	46.2	None

Because ground-borne vibration dissipates rapidly with distance from the source, typically reaching an imperceptible level at 200 feet from the source, and because the nearest residence is more than 2,300 feet from the Burnham Road realignment area, there would be no or minimal impact from noise or ground-borne vibrations from the construction of the Burnham Road realignment. As discussed in Section 2, these impacts occurred following publication of the 2012 FONSI and approval of the realignment by BIA. NTEC is responsible for implementing the conditions and mitigation defined in the permit. Therefore, for the purposes of this EA, no new impacts are identified.

4.3.2.1.4 Reclamation

The reclamation activities would involve many of the same equipment used during active mining operations described above. Therefore, the noise evaluation for the reclamation component of the project was similar to that for the mining activities component. Reclamation consists of backfilling and grading, replacement of topdressing, revegetation, and reclamation monitoring. As shown in Table 4.3-5, noise levels from reclamation activities were calculated to range from 43.0 dBA L_{dn} to 43.6 dBA L_{dn}, which are all below the impact threshold of 55 dBA L_{dn}. Therefore, the analysis revealed no noise impacts from reclamation activities.

Table 4.3-5. Calculated Noise Levels and Impact Determination at Surrounding Residences for Reclamation Activities

Receiver ID	Distance and Direction from Area IV North Activity Area	Hourly Noise Level (dBA L_{eq})	24-hour Noise Level (dBA L_{dn})	Impact
All reclamation activities – daytime only activity				
A4N-3	4,500 feet west	41.9	43.0	None
A3-1	3,880 feet north	43.2	43.6	None
A3-2	3,990 feet north	43.0	43.5	None
A3-3	4,325 feet east	42.3	43.2	None
A3-4	4,500 feet east	41.9	43.0	None

Because ground-borne vibration dissipates rapidly with distance from the source, typically reaching an imperceptible level at 200 feet from the source, and because the nearest residence is approximately 4,000 feet from the edge of the reclamation area, there would be no impact from ground-borne vibrations from the reclamation activities for the Proposed Action.

4.3.2.1.5 Indirect Impacts Related to Four Corners Power Plant

Coal mined under the Proposed Action would be transported via train directly to the FCPP and is the only source of coal at the FCPP; therefore, consideration of the noise and vibration that would be produced from operation of the FCPP is relevant to the discussion of potential effects of the Proposed Action.

Primary noise sources in the area of the FCPP include the coal plant, rail line, pump house, and other associated facilities. Previous long-term noise levels measured approximately 700 feet from the coal plant (Site LT-1) averaged 54-dBA L_{eq} with a 78-dBA L_{max}, while a short-term noise measurement approximately 300 feet from the coal plant (Site 10) averaged 61-dBA L_{eq} with a 64-dBA L_{max} (DOI and BIA 2007). The nearest sensitive receptors are homes located greater than 1 mile from the FCPP. Noise from the FCPP is not detectable at this distance.

Ground- and air-borne-induced vibration from the power plant operation does not affect the local area. As such, no vibration impacts would occur from the power plant operation.

Analysis of noise generation and potential increases in ambient noise at the location of sensitive noise receptors was conducted as part of the FCPP and NMEP. This analysis is incorporated by reference below:

> "*Primary noise sources in the area of the FCPP include the coal plant, rail line, pump house, and other associated facilities. Previous long-term noise levels measured approximately 700 feet from the coal plant (Site LT-1) averaged 54-dBA L_{eq} with a maximum noise level of 78-dBA L_{max}, while a short-term noise measurement approximately 300 feet from the coal plant (Site 10) averaged 61-dBA L_{eq} with a maximum noise level of 64-dBA L (DOI and BIA 2007). The nearest sensitive receptors*

are homes located greater than 1 mile from the FCPP. Noise from the FCPP is not detectable at this distance."

Based on this analysis, the indirect impacts of noise generation at the FCPP are considered minor.

4.3.2.2 Proposed Action with Conditions

Under this Alternative, impacts would be the same as those described for the Proposed Action.

4.3.2.3 No Action Alternative

Under the No Action Alternative, the mine permit revisions would not be approved. No mining activities would occur in Area IV North and the area that had been previously prepared for mining would be reclaimed per BNCC's SMCRA permit. Burnham Road would not be realigned. Mining activities would continue as permitted in Area III. There would be no change to current noise or vibration levels at residential dwellings around Area IV North. Impacts from mining activities in Area III have been assessed previously and are not expected to differ appreciably in nature from what is described above, however, the intensity of mining activities would be expected to decrease over time as mineable coal is depleted in Area III.

Under the No Action Alternative, the combustion-related impacts at the FCPP would remain as described for the Proposed Action through July 2016 as the current coal stockpiles are used. Following July 2016, should additional mining not be approved in Area IV North, NTEC may elect to proceed with mining in the Pinabete Permit Area under a revised SMCRA permit. However, after the revised permit is submitted, OSMRE would be required to comply with NEPA prior to making a decision on any potential SMCRA permit revision to the Pinabete Permit. Alternatively, under the No Action Alternative, the Navajo Mine and FCPP could potentially shut down once all coal reserves are combusted. The effects of this shut-down has been evaluated in Section 4.14.6.5 of the FCPP/NMEP EIS and is incorporated by reference as follows:

Navajo Mine

Under the No Action Alternative, the Navajo Mine would close, the Pinabete SMCRA Permit Area (Areas IV North and South) would not be mined, and Burnham Road would not be realigned. Mining in the Navajo Mine SMCRA Permit Area (Areas III and IV North) would stop when the ROD is issued in 2015. Areas I and II, which are also part of the Navajo Mine SMCRA Permit Area, have already been reclaimed and no new mining would occur in these areas. Upon permit expiration, NTEC would begin reclamation activities in Areas III and Areas IV North. Reclamation activities would continue until OSMRE approval that all reclamation requirements have been met. All ancillary buildings and facilities (e.g., communication lines, railroad) would be removed and the land would be reclaimed according to OSMRE regulatory requirements. Accordingly, current noise or vibration levels at residential dwellings around Area IV North or Area IV South would not change. Impacts from existing mining activities have been assessed previously and are not expected to differ appreciably in nature from what is described above; however, the intensity of mining activities would be expected to decrease over time as mineable coal is depleted in Area III.

Four Corners Power Plant

Under the No Action Alternative, APS would shut down Units 4 and 5 in 2016 when the current lease expires and EPA BART rules go into effect. All units as well as the switchyards and facilities would eventually be decommissioned and dismantled. No noise impacts would result from the shutdown of the FCPP.

A decommissioning plan has not yet been prepared by APS. Decommissioning and dismantling activities would need to be coordinated with the Navajo Nation such that the area meets the specific needs of the planned reuse. In addition to the five units, decommissioning and dismantling would include removal of all three switchyards. In general, following shutdown, the units would be prepared for dismantlement, then the buildings and equipment would be dismantled, and the site would be remediated. The timeline for this process is not mandated in regulatory statutes and unknown at this time. Following shutdown of the Units in 2016, workforce at the FCPP would be reduced to just those needed for the decommissioning planning and implementation. APS would decommission all facilities that are not required or permitted to be left behind by the 1960 and 1966 leases. As such, decommissioning and dismantling activities would need to be coordinated with the Navajo Nation so that the area meets the specific needs of any planned reuse.

Decommissioning would require environmental abatement activities in the power block, including removal of environmental and safety hazards (e.g., asbestos, lead paint), and chemicals and oils. All waste generated during this phase would be managed and disposed of in accordance with applicable Federal environmental regulations. Dismantling and demolition would commence following the removal of asbestos, PCB, lead paint, and any other hazardous chemicals. Upon removal of structures and facilities, the structural foundations would be removed to 24 inches below grade, the site profiled to allow for proper drainage, and native vegetation planted as applicable. In addition to the five units, decommissioning and dismantling may also include removal of all three switchyards. The timeline for this process is at the discretion of APS and the Navajo Nation. For noise and vibration, these activities would result in a short-term increase in ambient noise levels until all demolition activity is completed.

4.4 Visual Resources

4.4.1 Impact Assessment Methodology

Potential effects to visual resources were determined by using BLM's visual resource methodology, which compares landscape sensitivity with the degree and type of visual change that is proposed. Adverse effects to visual resources can occur when: (1) an action perceptibly changes features of the physical environment so that they no longer appear to be characteristic of existing conditions in the subject locality or region, (2) an action introduces new features, colors or textures to the physical environment that are perceptibly uncharacteristic of the region and/or locale, or (3) aesthetic features of the landscape become less visible or are removed (BLM Handbook H-8410-1).

Potential effects to visual resources were determined using a Visual Sensitivity – Visual Change method of impact analysis (see Section 3.4) supplemented with additional BLM visual resource analysis documentation. This method analyzes the contrasts between existing conditions at KOPs (see Figure 3.4-1) and expected views following project implementation to evaluate the degree of change that may occur because of the action. Viewshed analysis mapping was used to identify areas that the project may be visible from and to help establish KOPs. Eight KOPs were identified (see Table 3.4-1). During analysis it was determined that future public access to KOP sites 2 and 3 would be restricted as a result of currently permitted mining activities. Accordingly, these KOPs were eliminated from further analysis and the remaining sites (1, 4, 5, 6, 7, and 8) were utilized in the visual resource evaluation.

Table 4.4-1 provides a breakdown of the factors used in determining potential impacts to visual resources at the KOP locations included: (1) the existing visual quality associated with the site and vicinity, (2) the level of public interest in the existing landscape characteristics and concern over potential changes, (3) visibility, frequency, and duration that the landscape is viewed, (4) viewing distance and degree to which project components would dominate the view of the observer, (5) resulting contrast of the proposed facilities or activities with existing landscape characteristics, and (6) the extent to which project features or activities would block views of higher value landscape features. All of these factors were evaluated at each of the six KOP locations considered.

Table 4.4-1. Visual Quality Rating Guide

Visual Quality Rating	Visual Quality Criteria
High	Landscape elements (landforms, vegetative patterns, water characteristics and cultural features) have high visual appeal
High	Landscape has high degrees of variety, vividness, intactness, harmony, and uniqueness (attributes)
High	Distinctive landscape that attracts people to view
Moderate-to-High	Landscape elements have moderate-to-high visual appeal
Moderate-to-High	Landscape attributes have a mix of moderate and high values
Moderate-to-High	Landscape may contain built features that neither complement nor detract from overall visual quality
Moderate	Landscape elements are moderately appealing
Moderate	Landscape attributes have common or ordinary values
Moderate	Landscape may contain discordant built features but they are subordinate
Low-to-Moderate	Landscape elements have low-to-moderate appeal
Low-to-Moderate	Landscape has weak or missing attributes
Low-to-Moderate	Landscape may have prominent though not dominant discordant built features
Low	Landscape elements have low-to-no appeal
Low	Landscape is missing some attributes
Low	Landscape is dominated by discordant built features

Under the Visual Sensitivity–Visual Change methodology, the degree of impact is a function of overall visual sensitivity and visual change. Actual parameter determinations (e.g., visual contrast, project dominance, and view blockage) are based on analyst experience and site-specific circumstances. Table 4.4-2, *Visual Resource Impact Potential* illustrates the interrelationship between overall visual sensitivity and visual change; this relationship was used in defining the potential impacts associated with the Proposed Action as discussed below. Potential impacts with regard to regional haze and visibility are evaluated in Section 4.5 – Air Quality.

Table 4.4-2. Visual Resource Impact Potential

Overall Visual Sensitivity	Overall Visual Change Low	Overall Visual Change Low to Moderate	Overall Visual Change Moderate	Overall Visual Change Moderate to High
Low	Not Substantial[1]	Not Substantial	Adverse but Less Than Substantial	Adverse but Less Than Substantial
Low to Moderate	Not Substantial	Adverse but Less Than Substantial	Adverse but Less Than Substantial	Adverse but Less Than Substantial
Moderate	Adverse but Less Than Substantial[2]	Adverse but Less Than Substantial	Adverse but Less Than Substantial	Adverse and Potentially Substantial
Moderate to High	Adverse but Less Than Substantial	Adverse but Less Than Substantial	Adverse and Potentially Substantial	Adverse and Potentially Substantial
High	Adverse but Less Than Substantial	Adverse and Potentially Substantial[3]	Adverse and Potentially Substantial	Substantial[4]

Notes:

[1] Not Substantial impacts may or may not be perceptible but are considered minor in the context of existing landscape characteristics and view opportunities.

[2] Adverse but Less Than Substantial impacts are perceived as negative but do not exceed environmental thresholds that define parameters in Table 4.4-1.

[3] Adverse and Potentially Substantial impacts are perceived as negative and may exceed environmental thresholds depending on project and site-specific circumstances.

[4] Substantial impacts with feasible mitigation may be reduced to levels that are less than significant or avoided all together. Without mitigation, substantial impacts would exceed environmental thresholds.

4.4.2 Impacts

Table 4.4-3 summarizes the visual impacts from the KOPs. Appendix C summarizes the factors used to analyze potential project effects for both the No Action Alternative and the Proposed Action, including how the information and conclusions were derived.

Table 4.4-3. Summary of Visual Impacts

Location	No Action Description of Visual Changes	No Action Overall Visual Change	No Action Potential Impact	Proposed Action Description of Visual Changes	Proposed Action Overall Visual Change	Proposed Action Potential Impact
KOP 1	Permitted mining activities in Area III would be visible to the east	Low to Moderate	Not Significant	Mining in Area IV North would be visible to the south; the proposed Burnham Road realignment will be visible; mine activities, dust and night lighting would occur over a longer duration.	Moderate	Adverse but Less Than Significant
KOP 4	Permitted mining activities in Area III would be visible on the horizon to north/northwest.	Low to Moderate	Not Significant	Mining in Area IV North would be visible to the north; the proposed Burnham Road realignment will be visible to north within a 0.25 mile; mine activities, dust and night lighting would occur over a longer duration.	Moderate	Adverse but Less Than Significant
KOP 5	Some slight increase in visibility of night lighting and dust.	Low	Not Significant	Same as No Action.	Low	Not Significant
KOP 6	Permitted mining activities would be extend to the east.	Low to Moderate	Not Significant	Mining in Area IV North would extend south and become more visible; mine activities, dust and night lighting would be visible for longer duration.	Moderate	Adverse but Less Than Significant

Location	No Action Description of Visual Changes	No Action Overall Visual Change	No Action Potential Impact	Proposed Action Description of Visual Changes	Proposed Action Overall Visual Change	Proposed Action Potential Impact
KOP 7	Permitted mining activities would be visible to the east of existing disturbance.	Low	Not Significant	Mining in Area IV North would be visible to the south of existing mining; mine activities, dust and night lighting would be visible for longer duration.	Low	Not Significant
KOP 8	No change	Low	Not Significant	Night lighting would be visible for longer duration.	Low	Not Significant

4.4.2.1 Proposed Action

Activities that would result in direct impacts to visual resources would include the continuation of permitted mining activities in Area III, the proposed expansion of mining activities into Area IV North and the realignment of Burnham Road to the east and south of existing mining activities. Indirect effects, such as construction dust, haze, and night lighting would continue through the life of the proposed mining and were accounted for in the visual impacts analysis. Implementation of dust suppression measures would reduce, but not completely eliminate, potential short-term effects to visual resources in the Project Area.

Only KOP locations 1, 4, and 6 would experience visual changes that are adverse, but not significant, largely due to the more dominant views of proposed mining, new views of the Burnham Road realignment, and the longer-term duration of visible fugitive dust and night lighting. Changes in views at KOP locations 5, 7, and 8, under the Proposed Action, would experience low degrees of visual change that are not significant, due primarily to their distance from the Project Area (middleground to seldom seen). In general, areas located within one mile of the Proposed Action activities would experience moderate visual changes that are not considered significant. More distant views would experience a lower degree of visual change.

Visual change associated with mining would be short term. Once mining operations are completed in Area III and Area IV North, reclamation in these areas would be implemented and the landscape would return to visual conditions similar to pre-mined lands. The visual change associated with the realignment of Burnham Road would be long term.

4.4.2.2 Indirect Impacts Related to FCPP

The FCPP is located on the flat top of a mesa within the Industrial Desert Plain landscape character unit. Morgan Lake is located directly north of the FCPP, and extensive reclaimed mine areas of Area I in the Navajo Mine Lease Area bound it on the east. The landscape has a very industrial appearance because it has been extensively modified by construction of the FCPP facilities, an electrical substation, and multiple transmission lines. The low to moderate visual sensitivity suggests the landscape can accommodate a fairly high degree of adverse visual change. FCPP did not undergo any structural or land use changes during this phase; therefore, there was no effect from the use of Area IV North coal to the historic baseline condition in the Industrial Desert Plain landscape.

The FCPP/NMEP EIS analyzed how continued operations of FCPP would affect the visual quality of the surrounding area. The following sections summarize the findings of the EIS analysis and incorporate these conclusions by reference into this EA (effects with regard to regional haze and visibility are evaluated in Section 4.5 – Air Quality).

> *The FCPP is visible from a limited number of locations along U.S. Highway 491 and from the mesa north of U.S. Highway 64 near the San Juan Generating Station. From along New Mexico Highway 371, it is seen from only one location in the far distance. The FCPP facilities are prominent from secondary highways BIA Highway N-36 and Navajo Nation 3005. The plumes from the stacks and the brown haze from the plant emissions are visible for short periods of time from U.S. Highway 491 and U.S. Highway 64 and from a limited number of locations along New Mexico Highway 371. The stacks and plumes are very prominent from secondary highways BIA Highway N-36 and Navajo Nation 3005. Continued operations of the FCPP would a negligible effect on the scenic integrity of the Industrial Desert plain setting the FCPP occupies. The shutdown of Units 1-3 (December 2013) reduces the visibility of plume from FCPP.*
>
> *The DFADA is located approximately 3 miles west of the FCPP between Chaco River and the escarpment at the western edge of the mesa upon which the FCPP sits. The Hogback geologic feature is very prominent directly to the west and dominates the landscape. The DFADA is located within the Industrial Desert Plain landscape character unit. The DFADAs are not visible from surrounding primary and secondary roads within the Navajo Mine Lease Area to the east. They are visible from the primary FCPP access road, the escarpment above them to the east, and from the scattered residences on the terraces on the western side of Chaco River. Viewers of the ash pits are primarily FCPP employees; there are few locations from which the public can view them.*
>
> *The addition of more material to the existing DFADAs would not change the industrial appearance of the landscape unit. The continued use of existing DFADAs 1 and 2 would have a negligible impact on the scenic integrity of the Industrial Desert Plain landscape character unit. The proposed new DFADAs would extend into the adjacent Desert Plain landscape character unit. This character unit has a moderate degree of scenic integrity because of the active and reclaimed mining lands within it and the numerous transmission lines that crisscross it. The construction of new DFADAs in the Desert Plain landscape character unit would have a moderately adverse impact on the scenic integrity of the landscape unit. Visual sensitivity analysis was not conducted for the DFADAs because the only viewers are FCPP employees with few opportunities for the public to view them.*

4.4.2.3 Proposed Action with Conditions

Under this Alternative, impacts are the same as the Proposed Action.

4.4.2.4 No Action Alternative

Direct effects to visual resources would result from currently permitted mining activities in Area III. Indirect effects, such as generation of fugitive dust and night lighting, would continue through the duration of mining and reclamation activities in Area III. These were considered in the analysis of visual effects. Dust suppression measures would reduce these short-term effects. Since coal mining is currently occurring in the area, the contrast with overall existing conditions and future permitted activities would be minimal.

Only KOPs 1 and 6 would continue to experience visual changes that are low to moderate but not significant. Changes in views at other KOPs would be low and not significant. In general, areas located within one mile of the activities would continue to experience low to moderate but not significant visual changes. Areas in more distant zones would experience low degrees of visual change. As with the Proposed Action, visual change associated with mining would be short term. Reclamation would restore the landscape to visual conditions similar to pre-mined lands.

Under the No Action Alternative, the combustion-related impacts at the FCPP would remain as described for the Proposed Action through July 2016 as the current coal stockpiles are used. Following July 2016, should additional mining not be approved in Area IV North, NTEC may elect to proceed with mining in the Pinabete Permit Area under a revised SMCRA permit. However, after the revised permit is submitted, OSMRE would be required to comply with NEPA prior to making a decision on any potential SMCRA permit revision to the Pinabete Permit. Alternatively, under the No Action Alternative, the Navajo Mine and FCPP could potentially shut down once all coal reserves are combusted. The effects of this shut-down has been evaluated in Section 4.13.4.5 of the FCPP/NMEP EIS and is incorporated by reference as follows:

Navajo Mine

Under the No Action Alternative, the Navajo Mine would close. The Pinabete SMCRA Permit Area (Areas IV North and South) would not be mined. Burnham Road would not be realigned. Mining in the Navajo Mine Permit Area (Areas III and IV North) would continue until the current SMCRA permit expires. Areas I and II, which are also part of the Navajo Mine Permit Area, have already been reclaimed, and no new mining would occur in these areas. Upon permit expiration, NTEC would begin reclamation activities in Areas III and IV North. Reclamation activities would continue until OSMRE approval, indicating that all requirements have been met. It is expected that all reclamation would be completed by June 2021. All ancillary buildings and facilities (e.g., communication lines, railroad) would be removed, and the land would be reclaimed.

Alternative E would have a high beneficial (as opposed to adverse) impact on scenic integrity and overall visual sensitivity. The scenic integrity of the Reclaimed Mine Lands is currently evaluated as low. The reclamation of Areas III and Area IV North and removal of the ancillary buildings and facilities would add substantially to the overall scenic integrity of this landscape character unit. Impacts on the visual sensitivity from Alternative E would also be high. Visual quality would be increased substantially with the removal of the cultural modifications from the landscape. Viewer sensitivity and overall viewer exposure would not be affected. The overall impact on the landscape from Alternative E would, thus, be highly beneficial.

Four Corners Power Plant

Under the No Action Alternative, Units 4 and 5 would be shut down when the current lease expires in 2016. The plant facilities would be decommissioned and dismantled. The impacts on the scenic integrity of the Industrial Desert Plains landscape character type would be negligible. Visual quality would be increased substantially with the removal of the cultural modifications from the landscape. Viewer sensitivity and overall viewer exposure would not be affected. The overall impact on the landscape would be highly beneficial.

4.5 Air Quality

4.5.1 Impact Assessment Methodology

Under the CAA, a proposed change at a new or modified major source of air pollutants generally is first examined in terms of the emissions increase resulting from that change. Quantitative "Significance" levels are defined by rule for such increases to identify projects that may have a discernable effect on air quality. If a project may have increased emissions above the Significance levels, then the proposed change is subsequently evaluated in more detail to assess its potential impact on air quality in accordance with EPA's methodology for new or modified sources.

Key CAA criteria provide useful metrics that define whether project emissions or ambient air quality impacts that warrant description in an environmental assessment with respect to air quality resources. In particular, the CAA regulations establish "Significant Impact Levels" (SILs) that are quantitative, ambient air concentrations for each criteria pollutant below which it is presumed a project will not have a discernable effect on air quality. The SILs are lower than the comparable health-based NAAQS, and offer a suitable screening tool for air quality effects. Predicted ground level concentrations from refined air dispersion modeling of project emissions can be compared to applicable SILs to assess whether that project may have discernable effects on local air quality.

4.5.1.1 Navajo Mine

The AQRA for this EA first considered project emission changes relative to CAA Significance criteria. The methodology for quantifying emission levels for the various mining and support activities associated with active mining at Navajo Mine, including the Proposed Action, was described in Section 3.5.2. EPA and other regulatory bodies have published emission factors or emission equations for PM emissions from numerous fugitive dust sources at western surface coal mines (e.g., EPA Document AP-42, § 11.9). Particulate-emitting activities addressed in AP-42 include topsoil removal by scraper, drilling of overburden or coal, blasting of overburden or coal, dragline for overburden, truck loading by power shovel, bulldozing overburden or coal, grading, haul truck, bottom dump truck unloading, end dump truck unloading, train loading, overburden replacement, active coal storage piles, and wind erosion of exposed areas. In those instances where AP-42 does not provide an emission factor or equation for a particular surface mining activity, an AP-42 emission factor or equation for the same general type of activity in a related minerals product industry has been applied. In addition, this analysis also includes estimates of gaseous tailpipe emissions from mining vehicles and equipment, and assessment of GHG emissions from the Proposed Action.

Estimates of PM emissions from mining and reclamation activities in existing Area III, and Area IV North under the Proposed Action, have been based generally on applicable AP-42 emission factors for western surface coal mining. This methodology (EPA 1995) has been used to calculate estimated PM_{10} and $PM_{2.5}$ emissions from each of the individual pollutant-emitting activities associated with the existing mine baseline (No Action) and for the Proposed Action. Table 3.5-3 presents the published emission factors and correlations used to quantify particulate emissions from Navajo Mine operations.

Dispersion modeling tools offer an accepted method to assess project impacts to ambient PM_{10} and $PM_{2.5}$ concentrations within the AQRA. After establishing emission levels for PM_{10} and $PM_{2.5}$, EPA's AERMOD model was applied in a non-regulatory, screening manner in concert with two pre-processor codes: AERMET to process the meteorological data for input and AERMAP to process terrain elevation data and generate receptor information for input. This modeling was completed to estimate the distance from the mine boundary for potential impacts associated with the generation of fugitive dust and deposition associated with particulates. For this comparison, the regulatory SILs were used as the criteria to identify the extent of discernable effects, even though the predicted ground level concentrations were well below the health-based NAAQS thresholds (see Table 3.5-1).

4.5.1.2 Four Corners Power Plant

Extensive modeling efforts were conducted for the FCPP/NMEP EIS (OSMRE 2015) in order to assess the potential effects to air quality. Studies supporting the EIS analysis included a NAAQS Modeling Study, an Ozone Impact Assessment, and a plume visibility assessment. The results of these models were critically reviewed by Federal agencies (e.g., NPS, EPA). The analyses predict the rate and mass of air emissions and atmospheric deposition, typically presenting the rates by year or as annual averages.

An updated emissions inventory for 2005 and a projected inventory for 2018 were developed for analyses associated with the FCPP/NMEP EIS (OSMRE 2015). Inventories previously developed for the Western Regional Air Partnership were used as the main starting points for these inventories. The 2005 and 2018 inventories comprised emissions from electric power generation, oil and gas exploration and production, other proximate anthropogenic sources, along with applicable mobile source, fugitive dust, biogenic, and wildfire emissions. Emissions past 2016 are analyzed in the FCPP/NMEP EIS (OSMRE 2015).

Significance thresholds for evaluating air quality impacts with regard to criteria pollutants are defined in the CAA. With regard to visibility, significance thresholds have been defined by the EPA. In terms of potential impacts of HAPs on sensitive receptors, no EPA, NNEPA, or other local regulatory threshold has been defined; therefore, the threshold used by air quality agencies outside of the Four Corners region is used to evaluate potential impacts. No significance thresholds are defined with regard to deposition of air emissions.

Pursuant to 40 CFR 51.166(23)(i), PSD significance thresholds related to NAAQS are shown below. Per the regulatory definition, *significant* means a net emissions increase at an existing source (e.g., FCPP) or the potential of a new source to emit air pollutants that would equal or exceed any of the mass rates in units of short tpy as listed in Table 4.5-1.

Table 4.5-1. PSD Emission Significance Thresholds

PSD Pollutant	Significance Threshold
Carbon monoxide	100 tpy
Nitrogen oxides	40 tpy
Sulfur dioxide	40 tpy
Particulate matter	25 tpy (total) or 15 tpy of PM_{10}
$PM_{2.5}$	10 tpy of direct $PM_{2.5}$ emissions; 40 tpy of SO_2 emissions; 40 tpy of NO_X emissions unless demonstrated not to be a $PM_{2.5}$ precursor
Ozone	40 tpy VOCs or NO_X precursors
Lead	0.6 tpy
Fluorides	3 tpy
Sulfuric acid mist (H_2SO_4)	7 tpy
Hydrogen sulphide	10 tpy
Total reduced sulphur (including H_2S)	10 tpy
Reduced sulphur compounds (including H_2S)	10 tpy

Key concepts in projecting future emissions are capacity factor and potential-to-emit (PTE), as defined below:

- Capacity factor is defined as actual utilization divided by theoretical design capacity. For generating units, this factor is typically expressed as actual MW-hrs generated in a year versus design rating in MW times 8,760 hours per year (maximum theoretical MW-hrs). Since generating units must be periodically shut down for maintenance and seldom operate at full design rating (load) to extend equipment life, capacity factor is always less than 100 percent, typically in the range of 80 to 95 percent for base load generating units, depending on overall reliability.
- PTE is defined as maximum theoretical emissions for a pollutant at permitted operating conditions. Traditionally, PTE is determined assuming maximum allowable emission rate at 100 percent capacity factor; however, since actual capacity factor is less than 100 percent, theoretical PTE is never normally achieved unless limited by permit condition.

4.5.1.2.1 Stack Emissions – SO_2, NO_x, CO, Pb, Filterable PM_{10}, and $PM_{2.5}$, Condensable H_2SO_4, and Organics

Modeled mass emission rates from the Units 4 and 5 stacks were based on historic hourly data, Title V permit conditions, EPA emission estimation techniques (EETs), and BART limits for NO_x and PM. Modeled stack temperature and exhaust velocity were based on actual hourly data recorded from 2009 through 2011. Per guidance received from the EPA, APS modeled 3 years of actual 1-hour SO_2 emissions from Units 4 and 5. Since the BART emission rate for NO_x is based on a 30-day rolling average, which is appropriate for visibility impacts, both 30-day and 1-hour average emission rates for NO_x were modeled. In addition, modeled PM_{10} and $PM_{2.5}$ emission rates included condensable emissions consistent with increased sulfuric acid mist (H_2SO_4) conversion, a byproduct of SCR operation; however, this part of the BART implementation is beyond the timeframe of this EA, but is addressed in the FCPP/NMEP EIS (OSMRE 2015).

4.5.1.2.2 Materials Handing Emissions – PM_{10} and $PM_{2.5}$

For the two lime silos equipped with baghouses for dust control, PM emissions were estimated using the permissible outlet loading in units of grains[1] per cubic foot of exhaust air from the baghouses and the volumetric displacement of air when lime is loaded into a silo. The fly ash waste disposal area has five silos, all equipped with baghouses, and three pug mills with scrubbers for processing fly ash. Fly ash baghouse and scrubber emissions were estimated and modeled using the outlet grain loading and air flowrate for each control device. For the lime slurry mixing process, fugitive droplets were modeled as volume sources. Open transfer points within the coal transport system were also modeled as volume sources.

4.5.1.2.3 Plant Traffic – PM_{10} and $PM_{2.5}$

Paved and unpaved road source characteristics were developed to represent vehicular traffic at FCPP. Based on EPA guidance, roads were represented by lines of volume sources. For daytime operations, fly ash disposal trucks, fly ash sales trucks, lime delivery trucks, road-watering trucks, and company and employee vehicles (autos, pickups, sport utility vehicles, vans) were included. Vehicular traffic during overnight hours was assumed to be minimal, and roads are watered several times a day. Fugitive dust from paved and unpaved roads was calculated using EETs published by the EPA, taking into account road watering as an effective dust control method. Fugitive dust controls can cut emissions by at least 50 percent and up to 90 percent if applied copiously (EPA 2006).

4.5.1.2.4 Lime and Ash Piles – PM_{10} and $PM_{2.5}$

Area sources at FCPP consist of stockpiles located at the lime processing area and the ash disposal area. Wind erosion of stockpiles is highly intermittent due to the relatively high threshold wind speeds needed to entrain lime and ash. To facilitate modeling, triggered wind events were evaluated by reviewing on-site wind speed data correlated to threshold friction velocity guidance and EETs published by the EPA. The fly ash has high moisture content when transported and unloaded by the haul trucks. Surfactant is applied regularly to reduce the amount of fugitive dust that can become airborne during triggering wind events.

4.5.1.2.5 Plume Visibility

A screening analysis was conducted per guidance contained in the *Workbook for Plume Visual Impact Screening and Analysis* (EPA 1992a), with additional recommendations provided by the NPS. EPA's screening-level plume visibility model VISCREEN was used with site-specific meteorological data to calculate plume visibility parameters corresponding to worst-case conditions. As a screening model, VISCREEN does not calculate plume height above the ground, but hypothetically places the observer at plume height, looking horizontally at various sun-time intervals through the plume centerline. VISCREEN then computes the combinations of sun-plume-observer geometry that the result in the largest

[1] One pound of material has 7,000 grains, or 1 gram of material has 15.432 grains.

degree of plume visual impact. Because of this simplified line-of-sight geometry, the results from VISCREEN are conservative; thus, actual visual impacts would be less than otherwise predicted.

The model calculates linear Gaussian[1] dispersion of PM and NO_2, the two pollutants known to contribute most to visible plumes, notwithstanding condensing water vapor in cold weather. However, as a near-field model, VISCREEN does not address the secondary formation of nitrate and sulfate particles which are known to contribute to regional haze at longer distances. The model outputs two visual impact parameters: plume contrast and plume perceptibility. According to the EPA, plume contrast (Cp) values exceeding an absolute value of 0.05 should be used as a screening threshold, inferring that a 5 percent change in intensity is likely to be noticed by a casual observer,[2] Plume perceptibility (ΔE) evaluates the degree to which a plume can be seen either against a background sky or terrain. The EPA has established a ΔE threshold of 2.0 to indicate the presence of a visible plume against a background sky or terrain (EPA 1992a). Therefore, for the purposes of this analysis, a vista is significantly improved if the baseline ΔE exceeds 2.0 and the future ΔE is less than 2.0. Conversely, a vista is significantly degraded if the baseline ΔE is less than 2.0 and the future ΔE exceeds 2.0.

No criteria exist for evaluating visible plumes from sources beyond the boundaries of Federal Class I areas, While no Class I areas exist in the 50-mile radius study area, the Class I criterion was used to determine if emissions from the Proposed Action would affect visibility within 50 miles of the project.

4.5.2 Impacts

The following sections present the results of the quantitative assessment of emissions from FCPP and the Navajo Mine from 2012 to 2016. Predicted emissions from FCPP are based on historic operating data reported to the EPA. For FCPP, projected PM emissions are calculated based on EPA data, permit conditions, and process rates. In addition to criteria pollutants, estimated future emissions of noncriteria HAPs from FCPP are based on historic operating data and regulatory air emission factors published by the EPA.

4.5.2.1 Proposed Action

Under the current Proposed Action, Navajo Mine's annual coal production rate is about 30 percent lower than the mine's baseline coal production rate of 8.5 Mtpy, or about 5.8 Mtpy. Further, implementation of the Proposed Action means that mining will commence for the first time in Area IV North. From 2012 through 2016, a targeted amount of annual coal production will come from new mining activities in Area IV North, and the remainder of the mine's total production of 5.8 Mtpy will come from existing, continued mining operations that remain in Area III. Estimated mining emissions presented in the following sections are conservative because they are based on a full production rate of approximately 8.5 Mtpy. Relative to FCPP Units 4 and 5, estimated mining emissions comprise about 1.5 percent of baseline emissions (e.g., NO_x). Thus, lowered mining emissions would total about 1 percent of power plant emissions under the current Proposed Action.

[1] Normal functions developed by German mathematician Karl Friedrich Gauss (1777-1855) that express natural phenomena.

[2] A positive Cp means the plume is a lighter color than the sky, a negative Cp means the plume looks darker than the sky.

Under the Proposed Action, FCPP Units 1, 2, and 3 operated until December 30, 2013 and Units 4 and 5 would continue to operate and emit criteria and noncriteria pollutants through 2016. On-road vehicles and off-road equipment owned by FCPP are used for plant and switchyard maintenance. These vehicles and equipment emit air contaminants in engine exhaust during normal use. All equipment and vehicle engines used at the plant meet Federal emissions standards applicable on the date of manufacture.

4.5.2.1.1 Assessment of Emissions from Mining

Navajo Mine's estimated air pollutant emissions with the Proposed Action can be compared to current estimates of those emissions from the mine. This analysis serves to demonstrate that mine emissions, including those of PM_{10} and $PM_{2.5}$, will remain essentially at current levels with emissions from some sources slightly decreasing while from others increasing. In total, it can be shown that the balance of these changes does not cause increases that approach the regulatory significance quantities for each criteria pollutant.

Sources of emissions from Areas III and IV North have been sub-divided into the following categories, as listed in Table 4.5-2 to quantify the mine's total emissions for the existing baseline condition and with the Proposed Action.

Table 4.5-2. Roster of Emission Source Categories at Area III and Area IV North

Area III Emission Source	Area IV North Emission Sources
Overburden Drilling and Blasting	Overburden Drilling and Blasting
Coal Seam Drilling and Blasting	Coal Seam Drilling and Blasting
Overburden Dragline Stripping	Overburden Dragline Stripping
Mine Extraction Operations and Loading	Mine Extraction Operations and Loading
Coal Haul Truck to Stockpiles	Coal Haul Truck to Stockpiles
Unloading at Stockpile & Railcar Loading	Unloading at Stockpile and Railcar Loading
Plant Vehicle Travel	Plan Vehicle Travel
Wind Erosion – Soil/Overburden Spoil Pile	Wind Erosion – Soil/Overburden Spoil Pile
Wind Erosion – Coal Stockpile	Wind Erosion – Coal Stockpile
Reclamation – Mine Pit Backfilling, Grading, and Topdressing	Reclamation – Mine Pit Backfilling, Grading, and Topdressing
Preparation Plant	Wind Erosion – Un-reclaimed Open Area

The same types of mining activities, vehicle travel, reclamation activities, and wind erosion will occur in both Navajo Mine Areas. The Area III baseline case also includes emissions from the existing coal preparation plant, encompassing coal transfer from railcar unloading to the conveyance to the FCPP. Under the Proposed Action, all emissions from the existing coal preparation plant continue to be designated as occurring in Area III, even though some coal going to the preparation plant will be mined from Area IV North.

Particulate emissions from Navajo Mine under the Proposed Action were estimated by applying the same methodology used for estimating Navajo Mine's baseline emissions, as explained in Section 3.5. Particulate emission rates for individual operations were estimated using accepted emission factor correlations for western surface coal mining in EPA Document AP-42, primarily from Sections 11.9, and 13.2 (EPA 1995). For each pollutant-generating activity at the mine, the estimated emissions were calculated based on:

- An applicable emission factor or emissions equation for that activity.
- An operating "rate" of that particular activity such as tons processed, or vehicle miles traveled (these parameters were based on an underlying annual combined coal production of 8.5 Mtpy from Areas III and IV North), which declined by approximately 30 percent due to the shutdown of Units 1, 2, and 3 in compliance with the FIP for BART.
- A "control efficiency," if applicable, for the equipment, device, work practice, or combination thereof used for suppressing generation of emissions and/or for removing emitted particulate matter from the subject activity (based on representative efficiencies for the particular equipment, device, etc. reported primarily in AP-42).

Annual emissions for other criteria pollutants, primarily gaseous pollutants from blasting and vehicle exhaust, were quantified using agency-approved emissions factors (see details in Appendix E). Operation of diesel-fueled non-road mining vehicles and equipment generates emissions of NO_x, CO, PM_{10}/$PM_{2.5}$, and VOC. The SCAQMD has compiled a set of emissions factors for diesel-engine powered construction equipment and off-road vehicles published as part of the SCAQMD Emissions Handbook (SCAQMD 2008). The SCAQMD emissions factors are used in this analysis because they are considered the most complete set of emissions factors for construction-equipment sources and are used in air quality impact evaluations throughout the U.S. These SCAQMD factors account for the adoption of increasingly stringent diesel engine performance standards (e.g., EPA Tier II and Tier III diesel engine standards), and incorporate the benefit of reduced emissions as new construction vehicles and equipment enter into use. Values of the SCAQMD emissions factors and emission calculations are provided in tables provided in Appendix E.

Table 4.5-3 provides estimates of annual emissions of criteria pollutants from Area III's different mining and reclamation activities, its processing facilities, and wind erosion under the Proposed Action. Table 4.5-3 includes annual estimates of gaseous pollutant emissions from blasting, mine vehicles, and from the mine's various non-road engines.

Table 4.5-4 provides comparable estimates of annual emissions of each criteria pollutant from Area IV North under the Proposed Action. This tabulation is based on the operating assumption that Area III and Area IV North combined production closely matched the representative annual Proposed Action production level of 8.5 Mtpy; however, as previously stated, mine production declined by about 30 percent. Detailed calculations for this inventory are provided in Appendix E.

Navajo Mine's total emissions after implementation of the Proposed Action would be represented by the aggregate annual emissions from Areas III and IV North, as shown below in Table 4.5-5.

Table 4.5-3. Estimated Emissions from Area III under the Proposed Action

Emission Source Category [1]	Area III Emissions (tons/yr)				
	PM_{10}	$PM_{2.5}$	NO_X	CO	VOC
Overburden Drilling and Blasting	1.72	0.50	2.50	9.84	--
Coal Seam Drilling and Blasting	2.47	0.72	30.70	121.0	--
Overburden Dragline Stripping	32.20	2.85	--	--	--
Mine Extraction Operations and Loading	105.9	11.60	68.06	31.13	7.40
Coal Haul Truck to Stockpiles	138.8	13.88	62.96	34.19	7.11
Plant Vehicle Travel	130.9	13.09	17.25	5.07	1.72
Unloading at Stockpile and Railcar Loading	0.36	0.11	--	--	--
Reclamation	65.73	13.15	--	--	--
Preparation Plant (ex. storage piles)	13.89	4.05	--	--	--
Wind Erosion (coal and spoils piles)	30.15	10.78	--	--	--
TOTAL - Area III Emissions with Proposed Action	522.3	70.7	181.5	201.2	16.2

Note:

[1] Listing of the individual emission sources and equipment within each category is shown in Appendix E tables. Equipment roster and "rate" of a particular activity reflect BNCC average baseline level of equipment working in Area III. Applicable emission factors or emission equations have been addressed in previous sub-section. All estimates incorporate the control measures outlined in the preceding sub-section. Calculations for each pollutant and category are provided in Appendix E.

Table 4.5-4. Estimated Emissions from Area IV North under the Proposed Action

Emission Source Category [1]	PM_{10} (tons/yr)	$PM_{2.5}$ (tons/yr)	NO_X (tons/yr)	CO (tons/yr)	VOC (tons/yr)
Overburden Drilling and Blasting	1.64	0.47	2.50	9.84	--
Coal Seam Drilling and Blasting	2.36	0.68	30.70	121.0	--
Overburden Dragline Stripping	30.76	2.72	--	--	--
Mine Extraction Operations and Loading	77.63	8.98	73.68	34.44	8.04
Coal Haul Truck to Stockpiles	137.6	13.76	62.42	33.89	7.05
Plant Vehicle Travel	49.8	4.98	16.48	4.84	1.64
Unloading at Stockpile and Railcar Loading	0.35	0.11	--	--	--
Reclamation	58.78	11.76	--	--	--
Wind Erosion (coal and spoils piles)	28.67	10.25	--	--	--
TOTAL - Area IV North Emissions with Proposed Action	387.6	53.7	185.8	204.0	16.7

[1] Listing of the individual emission sources and equipment within each category is shown in Appendix E tables. Equipment roster and "rate" of a particular activity reflect BNCC average baseline level of equipment working in Area III. Applicable emission factors or emission equations have been addressed in previous sub-section. All estimates incorporate the control measures outlined in the preceding sub-section. Calculations for each pollutant and category are provided in Appendix E.

Table 4.5-5. Estimated Total Emissions from Navajo Mine with Proposed Action

Emission Source Category [1]	PM_{10} (tons/yr)	$PM_{2.5}$ (tons/yr)	NO_X (tons/yr)	CO (tons/yr)	VOC (tons/yr)
Overburden Drilling and Blasting	3.36	0.97	5.00	19.68	--
Coal Seam Drilling and Blasting	4.83	1.40	61.4	242.0	--
Overburden Dragline Stripping	62.96	5.57	--	--	--
Mine Extraction Operations and Loading	183.59	20.58	141.74	65.57	15.44
Coal Haul Truck to Stockpiles	276.4	27.64	124.4	68.08	14.16
Plant Vehicle Travel	180.7	18.07	33.73	9.91	3.36
Unloading at Stockpile and Railcar Loading	0.71	0.22	--	--	--
Reclamation	124.72	24.91	--	--	--
Preparation Plant (ex. storage piles)	13.89	4.05	--	--	--
Wind Erosion (coal and spoils piles)	58.82	21.03	--	--	--
TOTAL - Areas III & IV North Emissions with Proposed Action	909.86	124.43	367.3	405.2	32.9

[1] Listing of the individual emission sources and equipment within each category is shown in Appendix E tables. Equipment roster and "rate" of a particular activity reflect BNCC average baseline level of equipment working in Area III. Applicable emission factors or emission equations have been addressed in previous sub-section. All estimates incorporate the control measures outlined in the preceding sub-section. Calculations for each pollutant and category are provided in Appendix E.

The emissions changes due to the Proposed Action compared to the Area III baseline case can be compared to the regulatory Significance levels provided under CAA regulations. Table 4.5-6 compares the total emissions from the mine under the Proposed Action (Table 4.5-5) to the mine's total baseline emissions before the Proposed Action (see Table 3.5-4).

Table 4.5-6. Emission Increase (Decrease) from Proposed Action

Selected Action Scenario	PM_{10} (tons/yr)	$PM_{2.5}$ (tons/yr)	NO_X (tons/yr)	CO (tons/yr)	VOC (tons/yr)
Area III & Area IV North Emissions Under the Proposed Action	909.9	124.4	367.3	405.2	32.9
Area III Baseline Emissions (Table 3.5-4)	906.3	128.3	362.5	408.0	32.2
Emissions Increase (Decrease) Due to Proposed Action	3.6	(3.9)	4.8	(2.8)	0.7
CAA Emissions Increase Significance Levels	15	15	40	100	40

Table 4.5-6 confirms the Proposed Action is projected to result in small relative increases in annual emissions of PM_{10} (3.6 tpy), NO_x (4.8 tpy), and VOC (0.7 tpy). These are well below the CAA Significance levels of 15 tpy for direct PM_{10} and 40 tpy each for NO_x and VOC. In sum, the Proposed Action will not cause a "significant" air emission increase, as defined by the CAA, for any pollutant from the Navajo Mine. Consequently, for purposes of regulatory analysis and permitting the Proposed Action does not result in emissions changes that would warrant in-depth analysis. While it can be assumed that the location of the mining emissions sources would be in different locations under the Proposed Action than under current operations, the modeling analysis discussed in the next section illustrates that the extent of particulate concentrations beyond the mine's boundary would not be substantially affected.

4.5.2.1.2 Analysis of Particulate Impacts from Mining

Although changes in emissions due to the Proposed Action do not exceed regulatory Significance criteria, refined dispersion modeling of particulate emissions was completed in order to quantify the extent to which these emissions from the Navajo Mine tend to disperse. The object of the modeling exercise was to identify the distances from the mine boundary to which ground-level concentrations may reach the SIL levels described in Section 4.5.1. These regulatory SIL concentrations are well below the health-based NAAQS for particulates, and are generally accepted as indicators of minimal air quality effects resulting from a project.

EPA's AERMOD model (40 CFR Part 51, Appendix W) was applied in a non-regulatory, screening manner in concert with two pre-processor codes: AERMET to process the meteorological data for input and AERMAP to process terrain elevation data and generate receptor information. One year of on-site meteorological data collected at Navajo Mine from April 2009 through March 2010 was used to operate the model, as representative of current and future year meteorological conditions.

Design of the dispersion model followed accepted regulatory assessment practices. Specific areas within the mine that are projected for overburden removal, coal extraction and reclamation over the course of a year during the Proposed Action were represented in the model as a set of large, rectangular area sources. Haul roads were included in the model as a sequence of volume sources positioned along the paths of those roads. A radial receptor grid was constructed with the centroid at the center of the boundary separating Area III from Area IV, a set of radii were laid out at 10-degree intervals, and receptors for AERMOD concentration calculations were spaced 5 kilometers apart along each radius.

For the Proposed Action case, AERMOD predicted the highest 24-hour PM_{10} concentration that would occur at each receptor location. These concentration values, in units of $\mu g/m^3$ appear on the topographic plots provided in this section. The receptor point was identified along each radial grid line where the highest predicted 24-hour PM_{10} concentration was equal to the 24-hour PM_{10} SIL of 5.0 $\mu g/m^3$. These receptors having 5.0 $\mu g/m^3$ concentrations were connected to form an isopleth representing the extent of SIL concentrations for 24-hour PM_{10}. The 5.0 $\mu g/m^3$ isopleth shown in Figure 4.5-1 indicates that the farthest predicted extent of Navajo Mine's PM_{10} impact above the regulatory SIL on a 24-hour basis is located due north of the mine at a distance of about 12.5 km from the origin of the receptor grid, or roughly 6 to 6.5 kilometers beyond the boundary of the mine. The remaining concentration values on the figure show how the concentrations decay with distance outward from the mine.

This modeled result can be compared to typical monitored 24-hour PM_{10} concentration within the AQRA of 140 $\mu g/m^3$ near the mine boundary. This suggests that airborne PM_{10} levels near the mine may be reduced by dispersion as much as 95 percent (i.e., to 5 $\mu g/m^3$ or less) at a distance no greater than 6 to 6.5 kilometers from the mine's boundary. This rapid decay in airborne concentrations is reasonable, because mining emissions are released near ground level with relatively low potential for long-range transport. In addition, it should be recognized that because the mine total particulate emission rates are virtually unchanged under the Proposed Action, the extent of particulate concentration affects modeled here would be similar to those that occur currently.

AERMOD was also used to predict the maximum extent of average annual PM_{10} concentrations. In a similar manner, the model identified the location on each radial grid line where the PM_{10} annual concentration was 1.0 $\mu g/m^3$ (i.e., the SIL level for annual concentrations of PM_{10}). The annual 1.0 $\mu g/m^3$ isopleth shown in Figure 4.5-2 was constructed following the technique described for the 24-hour average modeling. In this case, the farthest extent to which the airborne PM_{10} emissions attributable to mine sources caused ground level concentrations above the SIL on an annual basis was located about 5 kilometers and due north from the mine's boundary. This indicates that longer-term ambient air affects due to mine emissions are less than short-term predicted concentrations.

The same modeling process with AERMOD was repeated using estimated $PM_{2.5}$ emissions from Navajo Mine under the Proposed Action. As shown in Figure 4.5-3, the isopleth corresponding to the extent of predicted $PM_{2.5}$ concentrations that are equal to or above the 24-hour SIL of 1.2 $\mu g/m^3$ for extends to a distance of about 10 kilometers from the mine's boundary in three different directions (i.e., north-northeast, southeast and southwest). Similarly, AERMOD predicted annual $PM_{2.5}$ concentrations and extent of concentrations at or above the annual SIL of 0.3 $\mu g/m^3$ for $PM_{2.5}$ due to the mine's emissions. Figure 4.5-4 shows the resulting isopleth line that defines annual $PM_{2.5}$ affects, which extend to a distance of about 5 kilometers from the mine boundary.

The ambient air impacts due to $PM_{2.5}$ emissions under the Proposed Action are also predicted to be abated by normal dispersion. Unlike $PM_{10,}$ ambient $PM_{2.5}$ concentrations are not monitored inside the AQRA. As noted previously for emissions estimates, the ratio of $PM_{2.5}$ emissions to PM_{10} emissions at a typical western surface coal mine is typically about 0.10 (EPA 1995, Pace 2005). Therefore, based on monitored levels of PM_{10} at the mine, high levels of $PM_{2.5}$ emissions near the mine boundary are estimated to be on the order of 14 $\mu g/m^3$ (i.e., 10 percent of the typical 140 $\mu g/m^3$ PM_{10} monitored level by Navajo Mine within the AQRA). Based on the modeled extent of the SIL concentration due to the mine's $PM_{2.5}$ emissions, this suggests that $PM_{2.5}$ levels at the mine may be reduced by natural dispersion by as much as 90 percent at a distance of 10 kilometers from the mine boundary. In the case of $PM_{2.5}$, it was also found that mine total particulate emission rates are virtually unchanged under the Proposed Action, so that the extent of particulate concentration affects modeled here would be similar to those that occur currently.

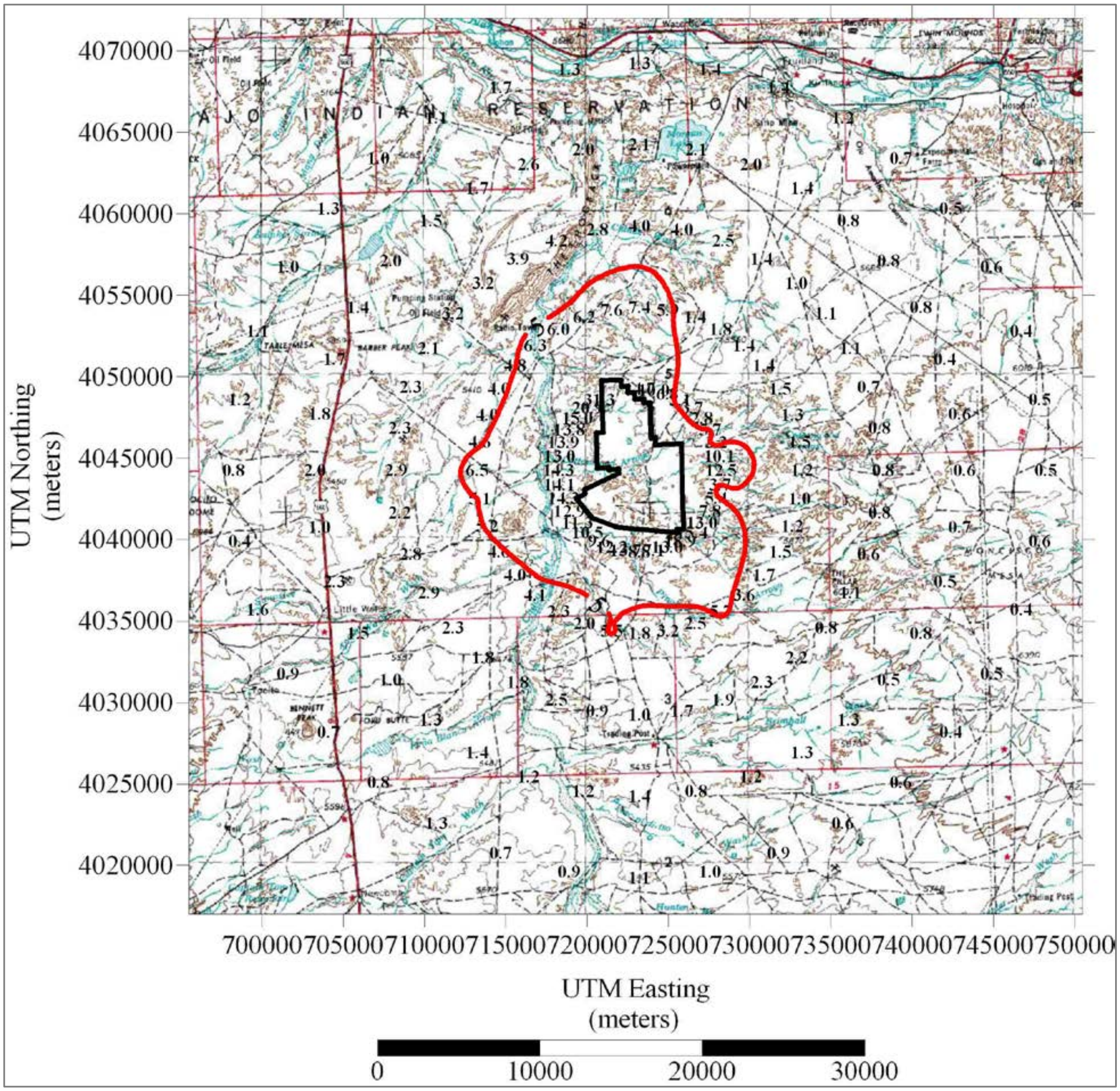

Figure 4.5-1. 24-hour PM_{10} SIL Isopleth and Surrounding Concentrations

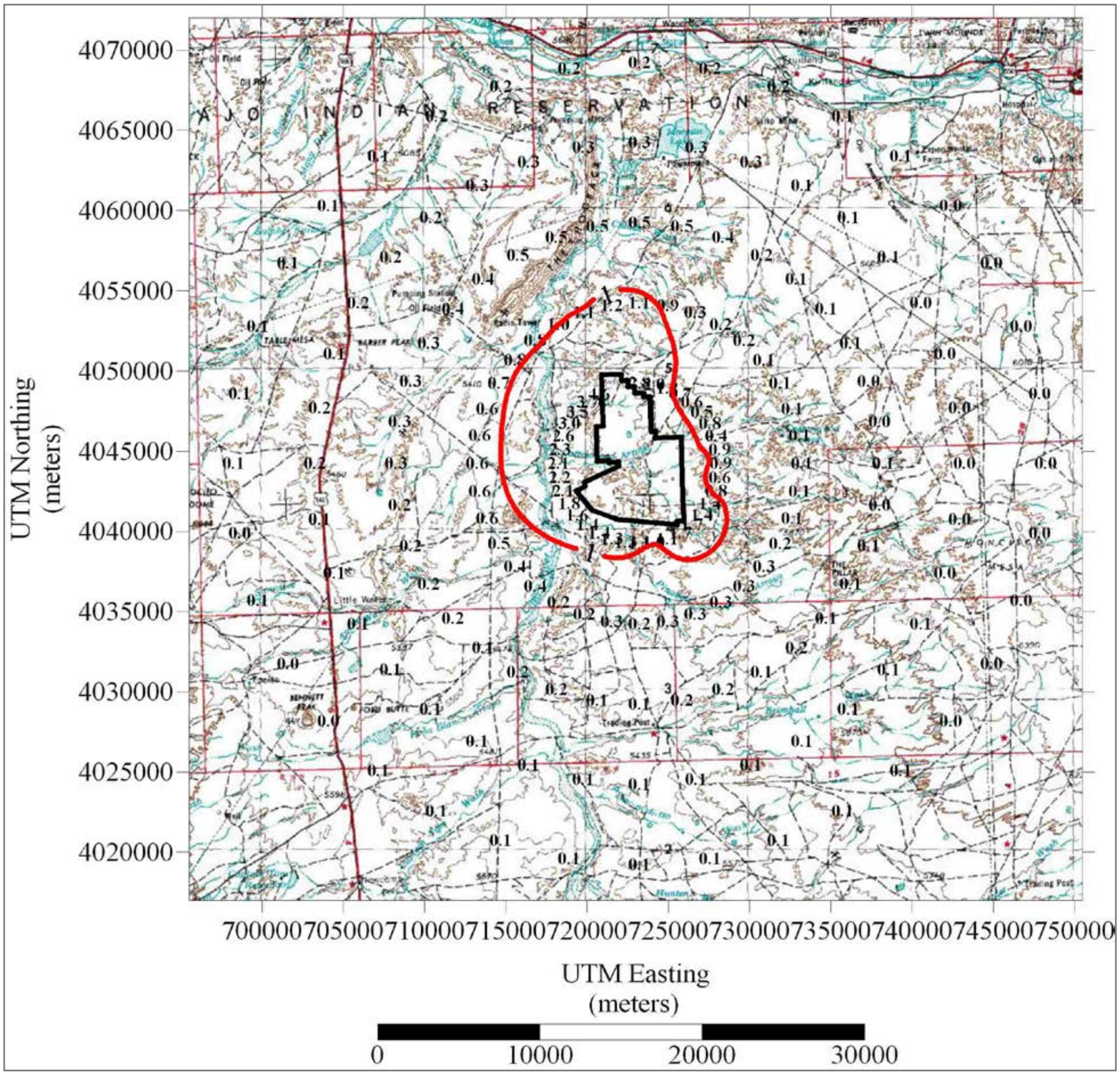

Figure 4.5-2. Annual PM_{10} SIL Isopleth and Surrounding Concentrations

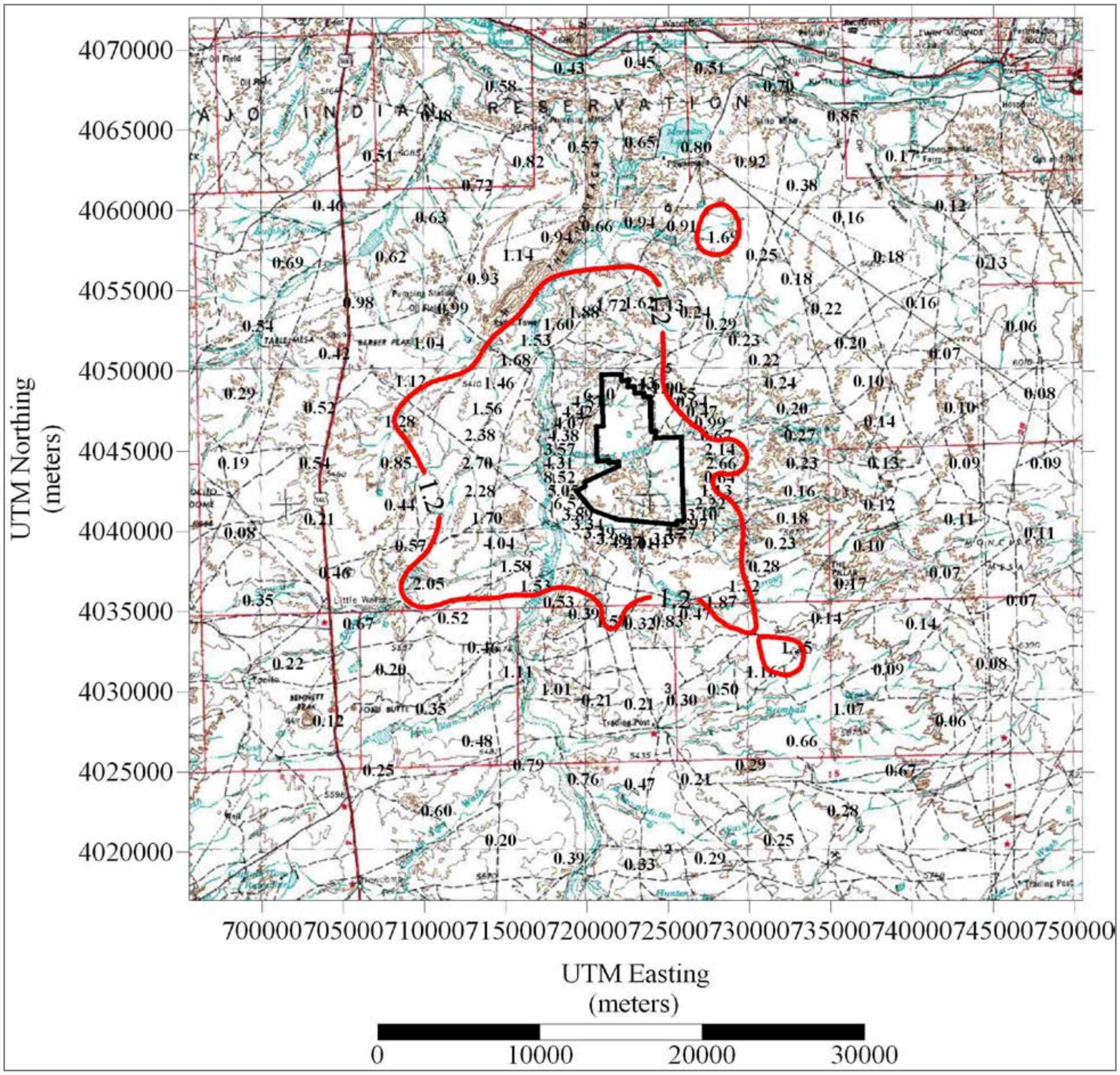

Figure 4.5-3. 24-Hour $PM_{2.5}$ SIL Isopleth and Surrounding Concentrations

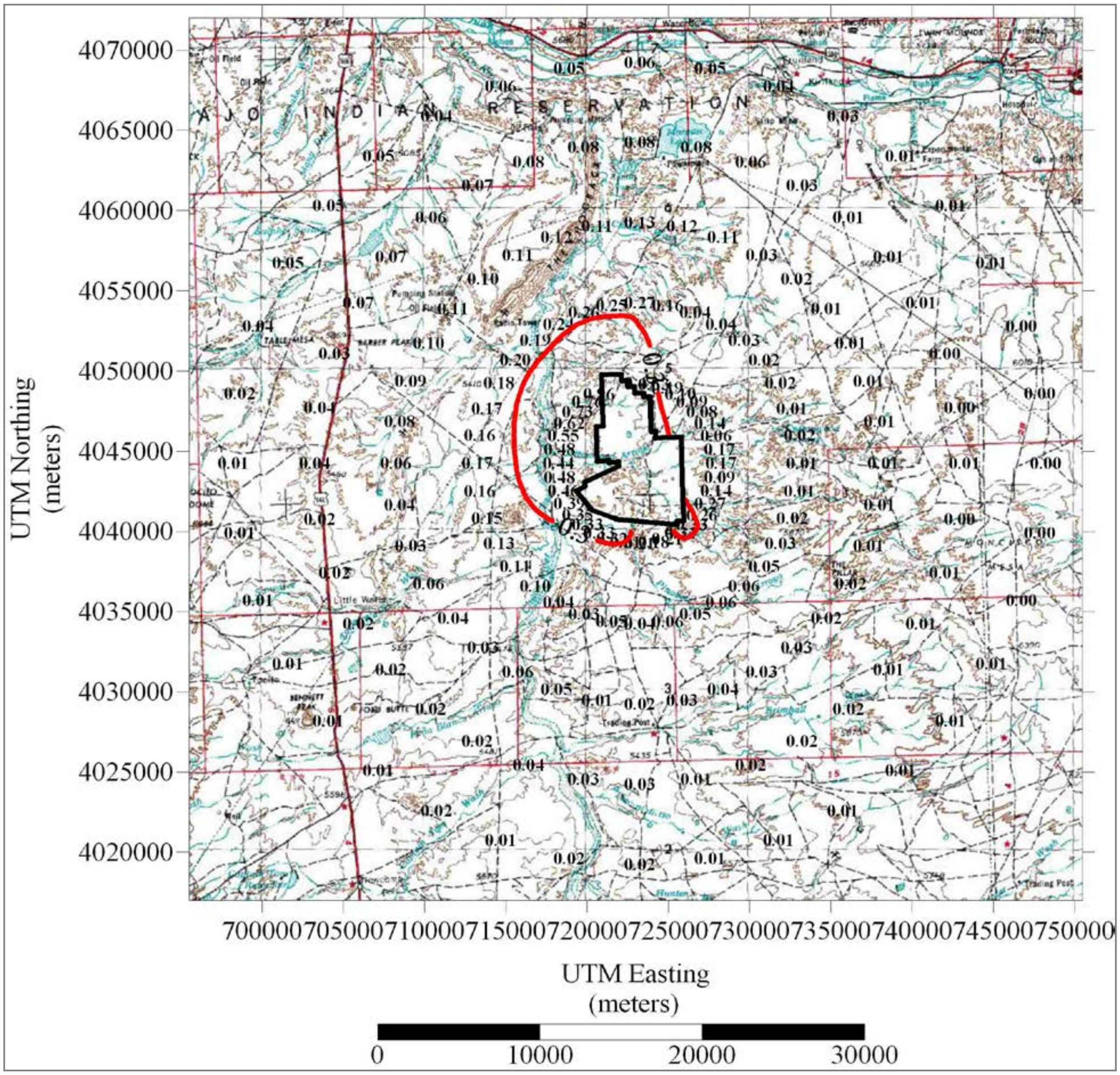

Figure 4.5-4. Annual $PM_{2.5}$ SIL Isopleth and Surrounding Concentrations

Dispersion modeling of air quality impacts from Navajo Mine's particulate emissions also allows for estimation of the dry deposition rate of those particles. The average annual ambient PM_{10} concentration near the San Juan River due to mine sources alone is predicted to be on the order of 0.1 µg/m^3. A representative value for the dry deposition velocity of large (>2 micrometers) particles on exterior surfaces is 1.0 centimeter per second (EPA 2001). Multiplying the above PM_{10} concentration times that deposition velocity results in an annual average particle dry deposition rate of 3.6 µg PM_{10}/hr-m^2 for mine-related emissions in the area of the San Juan River closest to the mine.

Based on the concentrations of specific elements typically contained within the mined material, it is possible to estimate deposition rates of those individual elements from the mine. Total mercury concentrations in overburden materials at Navajo Mine range from <0.1 to 0.8 milligram per kilogram (mg/kg) with a median of 0.2 mg/kg. The inventory of air emissions in Table 4.5-5 show that 60 percent of PM_{10} emissions are from coal-based activities (e.g., blasting, extraction, and transportation) while the remaining 40 percent of the emissions are from non-coal sources (e.g., overburden). Multiplying the weighted median mercury concentration in overburden and coal (0.104 mg mercury/kg PM_{10}) times the previously calculated annual average PM_{10} dry deposition rate results in an estimated annual average dry deposition rate of mercury equal to 3.2 nanogram mercury/yr-m^2. This amount equates to three-billionth of a gram deposited over an entire year, a vanishingly small quantity in the natural environment. It can be concluded that the estimated rate of annual dry deposition of mercury in the area of the San Juan River due to Navajo Mine's emissions is extremely low, and not likely to create additional environmental effects.

Similar analysis for selenium deposition is based on measured concentrations of selenium in coal at Navajo Mine that range from <0.3 to 1.2 mg/kg with a median of 0.35 mg/kg. Likewise, total selenium concentrations in overburden materials at Navajo Mine range from <1 to < 2 mg/kg with a median of 1.5 mg/kg. With the previously noted 60:40 ratio of coal-based activities to overburden operations, the weighted mean selenium relatively concentration in particles emitted from Navajo Mine is estimated to be 0.81 mg selenium/kg PM_{10}. Multiplying that concentration of selenium in the PM, times the previously calculated annual average PM_{10} dry deposition rate results in an estimated annual average dry deposition rate of selenium equal to 24.9 nanogram selenium/yr-m^2.

From both NEPA and CAA perspectives, this assessment of predicted increases in ambient levels of PM_{10} and $PM_{2.5}$ indicate that total emissions from the Proposed Action standing alone will not cause discernable alteration of currently acceptable ambient levels of PM_{10} and $PM_{2.5}$ in the AQRA. Moreover, the finding that criteria pollutant emissions increases due to the Proposed Action are well below regulatory significance levels implies that the project will not affect current ambient conditions in the AQRA.

Regional Haze Impacts from Mining

In preparing its regional haze assessment, the SIP and the NMED examined regional emissions of the following pollutants believed to either cause or contribute to visibility impairment in mandatory Federal Class I areas:

- Fine particulate matter (Soil-$PM_{2.5}$)
- Coarse particulate matter ($PM_{2.5\text{-}10}$)
- Elemental carbon
- Primary organic aerosol
- NO_x
- SO_2
- VOCs and ammonia (New Mexico Section 309(g) SIP at 48)

From that group of pollutants, Navajo Mine emits, in total, major source amounts of fine PM (Soil-$PM_{2.5}$), coarse PM ($PM_{2.5\text{-}10}$) and NO_x.

Mining associated with the Proposed Action will result in slight increases in PM_{10} and NO_x, and a decrease in $PM_{2.5}$ emissions, as shown in Table 4.5-5. Regional haze is affected by large emissions sources, typically from elevated stacks with the potential to be transported substantial distances and participate in atmospheric reactions that create haze particles. In light of the small emissions changes and the near ground-level emission characteristics of the Navajo Mine sources, it is reasonable to conclude that the Proposed Action will not result in increased long-range pollutant transport or visibility impairment in any mandatory Federal Class I area.

4.5.2.1.3 Analysis of Emissions from Burning Coal at FCPP

Stack Emissions – SO_2, NO_X, CO, Pb, Filterable PM_{10}, and $PM_{2.5}$, Condensable H_2SO_4, and Organics

Modeled mass emission rates from the Units 4 and 5 stacks were based on historic hourly data, Title V permit conditions, EPA EETs, and BART limits for NO_x and PM. Modeled stack temperature and exhaust velocity were based on actual hourly data recorded from 2009 through 2011. Per guidance received from the EPA, APS modeled 3 years of actual 1-hour SO_2 emissions from Units 4 and 5. Since the BART emission rate for NO_x is based on a 30-day rolling average, which is appropriate for visibility impacts, both 30-day and 1-hour average emission rates for NO_x were modeled. In addition, modeled PM_{10} and $PM_{2.5}$ emission rates included condensable emissions consistent with increased H_2SO_4 mist conversion, a byproduct of SCR operation; however, this part of the BART implementation is beyond the timeframe of this EA, but is addressed in the FCPP/NMEP EIS (OSMRE 2015). Table 4.5-7 reproduces the mass emission rates used for modeling future operations of Units 4 and 5 assuming an average historic annual capacity factor of 86 percent.[1] Surface meteorological data comprised 5 years (2006 through 2010) from Navajo Met Towers 1 and 3 along with concurrent upper air data from Albuquerque International Airport.

Table 4.5-7. Modeled Future Criteria Pollutant Emissions Rates - ORISPL 2442 Units 4 and 5

Criteria Pollutant	Factor lb/mmBTU	Facto Reference Notes	Units 4 and 5 Combined mmBTU/hr	Units 4 and 5 Combined lbs/hr	Units 4 and 5 Combined g/sec
Sulfur Dioxide (SO_2)	0.190	40 CFR 75 historic average (1-hour)	14,822	2,816	354.83
Nitrogen Oxides (NO_X), average	0.098	40 CFR 49 BART Rule (30-day rolling average)	14,822	1,453	183.02
Nitrogen Oxides (NO_X), maximum	0.190	1-hour average	14,822	2,816	354.83
Carbon Monoxide (CO)	0.028	AP-42 Table 1.1-3; 17.632 mmBTU/ton	14,822	415	52.29
Lead (Pb)	1.2E-06	40 CFR 63 Subpart UUUUU Table 2	14,822	0.02	0.0022
Filterable Particulate (PM)	0.01500	40 CFR 49 BART Rule	14,822	222.33	28.01

[1] Expressed as a continuous heat input of 7,411 mmBTU/hr for each generating unit rated at 8,612 mmBTU/hr, determined as the 99^{th} percentile of boiler operating data for the 3-year period 2009 through 2011.

Criteria Pollutant	Factor lb/mmBTU	Facto Reference Notes	Units 4 and 5 Combined mmBTU/hr	Units 4 and 5 Combined lbs/hr	Units 4 and 5 Combined g/sec
Total Filterable PM_{10}	0.01380	AP-42 Table 1.1-6; 92% of filterable PM	14,822	204.54	25.77
"Coarse" Filterable PM_{10}	0.00585	difference (total filterable - fine filterable)	14,822	86.71	10.93
Fine Filterable $PM_{2.5}$	0.00795	AP-42 Table 1.1-6; 53% of filterable PM	14,822	117.83	14.85
Fine "Soil" $PM_{2.5}$	0.00766	difference (fine filterable - fine elemental carbon)	14,822	113.48	14.30
Fine Elemental Carbon $PM_{2.5}$	0.00029	EPA 68-D-98-046 Table 6; 3.7% of $PM_{2.5}$	14,822	4.36	0.55
Total Condensable PM_{10} / $PM_{2.5}$	0.00835	sum (sulfuric acid + organics)	14,822	123.81	15.60
Condensable Sulfuric Acid (H_2SO_4)	0.00435	Stack test and EPRI removal efficiency (%)	14,822	64.52	8.13
Condensable Organics	0.00400	AP-42 Table 1.1-5; 20% of 0.02 lb/mmBTU	14,822	59.29	7.47
Grand Total PM_{10}	0.02215	Total Filterable + Total Condensable	14,822	328.35	41.37
Grand Total $PM_{2.5}$	0.01630	Fine Filterable + Total Condensable	14,822	241.64	30.45

Source: AECOM 2013a.

Notes:

g/sec = grams per second

lb/mmBTU = pound(s) per million British thermal units

lbs/hr = pounds per hour

mmBTU/hr = million British thermal unit(s) per hour

Future Criteria Emissions

Table 4.5-8 shows estimated future potential criteria emissions (SO_2, NO_x, and calculated PM) from 2012 through 2016 from Units 4 and 5 assuming a maximum annual generation capacity factor of 92 percent based on the 7-year period from 2005 to 2011 when FGD became active on Units 4 and 5. Pre-project metals emissions are based on historical capacity factor of 84 percent and AP-42 regulatory default emission factors as "uncontrolled" emissions. Post-project metal emissions are based on projected maximum capacity factor of 92 percent and 40 CFR 63 Subpart UUUUU emission factors as "controlled" emissions. The large reductions in metals emissions are because the Subpart UUUUU controlled factors are much lower than the AP-42 uncontrolled factors. For nonmetal HAPs, the same set of AP-42 regulatory default emission factors are used for both pre- and post-project emissions estimates as these are not subject to Subpart UUUUU (except hydrogen chloride). Because the maximum annual capacity factor (92 percent) is 9 percent higher than the historic capacity factor (84 percent), the nonmetal HAPs potential-to-emit is also 9 percent higher. To be conservative, this 92 percent capacity factor is 9 percent higher than the historic average of 84 percent for the same period. For the 12-year period beginning in 2000, a 92 percent capacity factor was achieved only during 2 years, 2003 and 2006, all other years were less. Thus, the probability of achieving 92 percent capacity factor is estimated to be 1 in 6 or about 17 percent overall, which is a reasonable contingency over the long run.

Table 4.5-8. Estimated Future Maximum Part 75 Emissions - ORISPL 2442 Units 4 and 5

Year	Generation MW-hrs/yr	Sulfur Dioxide tons/yr	Sulfur Dioxide kg/MW-hr	Nitrogen Oxides tons/yr	Nitrogen Oxides kg/MW-hr	Particulate Matter tons/yr	Particulate Matter kg/MW-hr
2012	15,066,300	11,800	0.71	38,700	2.33	1,850	0.11
2013	15,066,300	11,800	0.71	38,700	2.33	1,850	0.11
2014	12,410,900	9,800	0.72	27,100	1.98	830	0.06
2015	12,410,900	9,800	0.72	27,100	1.98	830	0.06
2016	12,410,900	9,800	0.72	27,100	1.98	830	0.06
TOTAL		53,000 tons	48,201,690 kg	158,700 tons	143,929,704 kg	6,190 tons	5,548,548 kg

Source: EPA 2012b.

Notes:

2012 and 2013 data are assumed to be the same as the 2011 historic baseline

PM calculated per AP-42 Chapter 1.1 support document Tables 4-7 and A-3; 40 CFR 49 final rule (Units 4 and 5).

Maximum annual capacity factor = 92% based on historic operations (average historic annual capacity factor = 84%).

kg/MW-hr = kilogram(s) per megawatt-hour

MW-hrs/yr = megawatt hours per year

tons/yr = tons per year

All air emissions from FCPP in 2012 and 2013 would remain as described in the baseline, and would decrease in 2014, 2015, and 2016 due to the shutdown at the end of 2013 of Units 1, 2, and 3.

Table 4.5-9 shows estimated criteria emissions from FCPP vehicles and mobile equipment (APS 2012). In comparison to boiler (stack) emissions, FCPP mobile source NO_x emissions are only 0.05 percent, which would result minor impact in the short- or long-term.

Table 4.5-9. Estimated Criteria Emissions from FCPP Mobile Sources

Mobile Sources	VOC tons/yr	CO tons/yr	NO_X tons/yr	SO_X tons/yr	PM_{10} tons/yr	$PM_{2.5}$ tons/yr
Power Plant Off-road Equipment	0.31	3.69	2.05	0.004	0.13	0.11
Power Plant On-road Vehicles	0.11	0.76	0.86	0.002	0.04	0.03
Annual Totals	**0.42**	**4.46**	**2.90**	**0.006**	**0.16**	**0.14**
Total During Project 2012-2016	**2.1 tons**	**22.3 tons**	**14.5 tons**	**0.03 tons**	**0.8 tons**	**0.7 tons**

Sources: APS 2012, EPA 2011c, SCAQMD 2008.

Note:

PM_{10} and $PM_{2.5}$ for exhaust only, fugitive dust accounted for in OSMRE 2012.

tons/yr = tons per year

Future HAP Emissions

Estimated HAP emissions are based on historic operating data, projected operating data, and regulatory defined emission factors published by the EPA (EPA 2011a). Compliance with 40 CFR 63 Subpart UUUUU for Units 4 and 5 would reduce estimated annual hydrogen chloride emissions by about 98 percent due to acid gas removal (absorption and neutralization) by the caustic wet scrubbers used to control SO_2 emissions.

Deposition Modeling

Clean Air Status and Trends Network

Continued operation of the FCPP under the Proposed Action would be expected to contribute to overall downward trends in regional deposition rates measured by CASTNET over the last decade because of the emission reductions required by BART. Assuming that these trends would be consistent over time, Table 4.5-10 shows projected sulfur and nitrogen compound deposition rates from 2012 to 2016.

Table 4.5-10. Projected Normalized CASTNET Deposition Rates for Region

Year	Normalized Precipitation dm	Total Nitrogen kg/ha-dm	Total Sulfur kg/ha-dm
2012	1.0	0.62	0.27
2013	1.0	0.62	0.27
2014	1.0	0.57	0.26
2015	1.0	0.55	0.25
2016	1.0	0.52	0.24

Source: EPA 2013e

Note:

Based on aggregated historic data for four existing sites: CAN407, GRC474, MEV405, PET427.

2012 and 2013 data are assumed to be the same as the 2011 historic baseline

dm = decimeter

kg/ha-dm = kilogram(s) per hectare per decimeter

National Trends Network

The NTN measures free acidity (H^+ as pH), calcium, magnesium, sodium, potassium, sulfate, nitrate, chloride, and ammonium ions, also total inorganic nitrogen. These 10 analytes have been trending upward over the past 12 years; however, the lower rates of increase for sulfate and nitrate, 14 and 7 percent, respectively, suggests that regional emissions of SO_2 and NO_x from stationary and mobile sources may not be increasing as rapidly overall due to improved emission controls and lower-polluting fuels in the region which could reduce future NO_x emissions by about 20 percent (NMED 2009). Similarly, reduced NO_x and SO_2 emissions from FCPP (also San Juan and Navajo Generating Stations) not fully accounted for in the Four Corners Air Quality Study — as a result of compliance with BART— could also marginally contribute to lowering regional nitrogen and sulfur acid deposition rates measured by NTN by several percent, as conservatively projected in Table 4.5-11 for 2012 to 2016. However, the apparently increasing deposition of calcium, magnesium, sodium, potassium, and chloride may be attributable to increased soil dust transport brought on by drought conditions. Specifically, with respect to sulfate and nitrate deposition in the region, implementation of approved BART alternatives would reduce nitrate precursor (NO_x) emissions by approximately 87 percent at FCPP, 62 percent at SJGS, and 84 percent at Navajo Generating Station. Similarly, approved BART alternatives would reduce sulfate precursor (SO_2) emissions by approximately 18 percent at FCPP and 67 percent at SJGS. However, Navajo Generating Station is currently emitting approximately 90 percent less SO_2 than in the past due to installation and operation of FGD scrubbers and no further reductions are planned. Thus, due to the potential for large decreases in future mass emissions of SO_2 and NO_x from power plants in the region, mass deposition rates of sulfates and nitrates in the region could nominally decrease by several percent with respect to the past (EPA 2012b, 2012e, 2013f; PNM 2012; National Geographic Society 2013).

Table 4.5-11. Projected Normalized NTN Deposition Rates for Region

Year	Normalized Precipitation dm	Total Nitrate kg/ha-dm	Total Sulfate kg/ha-dm
2012	1.0	3.16	2.02
2013	1.0	3.16	2.02
2014	1.0	3.12	2.02
2015	1.0	3.06	2.00
2016	1.0	3.00	1.98

Sources: NADP 2013, EPA 2013e.

Note:

Based on aggregated historic data for seven existing sites: AZ03, AZ97, CO00, CO99, NM07, UT09, UT98.

2012 and 2013 data are assumed to be the same as the 2011 historic baseline

dm = decimeter

kg/ha-dm = kilogram(s) per hectare per decimeter

Mercury Deposition Network

Normalized MDN results shown in Table 4.5-12 suggest an upward trend in the measured rate of mercury deposition in the region over a decade. The trending analysis suggests that mercury deposition measured in the western region has been increasing, due in large part to trans-Pacific transport from sources in Asia. EPRI (2013) indicate that “Baseline contributions of Hg emissions from non-U.S. sources to Hg deposition in the San Juan basin range from 70% to 98%. Hg emissions from China contribute from 13 to 16% to Hg deposition in the basin in the post-2014 scenario.” Table 4.5-12 shows projected mercury deposition rates, which could be measured by MDN from 2012 to 2016 based on the following assumed conditions: (1) trans-Pacific transport continues historic trend due to economic growth in Asia, (2) regional power plants continue to emit proportionally, and (3) FCPP achieves MATS compliance in concert with the Proposed Action. The latter two conditions help define conservative upper and lower bounds for broadly estimating regional and local impacts of reduced mercury emissions from FCPP against apparent transport from outside the region:

- The historic trend extrapolates historic data, which could represent a worst-case scenario, however unlikely.

- The upper bounding estimate assumes an 80 percent reduction of 19 percent of emissions, the FCPP regional share.
- The lower bounding estimate assumes an 80 percent reduction of 45 percent of emissions, the FCPP state/local share.

Table 4.5-12. Projected Normalized MDN Deposition Rates for Region

Year	Normalized Precipitation dm	Historic Trend $\mu g/m^2$-dm	Proposed Action Range Upper $\mu g/m^2$-dm	Proposed Action Range Lower $\mu g/m^2$-dm
2012	1.0	2.13	1.81	1.36
2013	1.0	2.20	1.87	1.41
2014	1.0	2.27	1.93	1.45
2015	1.0	2.34	1.98	1.50
2016	1.0	2.41	2.04	1.54
Change	**—**	**37%**	**16%**	**-13%**

Sources: NADP 2013; EPA 2012h, 2011a; 40 CFR 63 Subpart UUUUU

Notes: Based on aggregated historic data for 4 MDN sites: AZ02, NM98, CO96, CO99. Historic trend assumes ongoing status quo, including trans-Pacific transport. Estimated action assumes 80% reduction of Hg emissions from FCPP in compliance with MATS; upper and lower ranges reflecting regional and local shares. 2012 and 2013 data are assumed to be the same as the 2011 historic baseline

dm = decimeter

$\mu g/m^2$-dm = microgram(s) per square meter-decimeter

Based on historic trends, the zone between the estimated upper and lower bounds could represent a range of normalized mercury deposition ($\mu g/m^2$-dm),[1] which could be measured in aggregate by MDN over the long term as a result of the Proposed Action.

Ammonia Monitoring Network

There is no applicable significance criteria for ammonia mass emissions, only concentrations in ambient air. Under certain conditions, ammonia and H_2SO_4 can combine to form ammonium sulfate ($[NH_4]_2SO_4$), a crystalline salt and a source of nitrogen nutrient deposition measured by NTN. Table 4.5-13 shows projected ambient ammonia concentrations in northwestern New Mexico which could be measured by AMoN sites from 2012 to 2016.

[1] To convert $\mu g/m^2$-dm to ng/m^2-mm multiply by 10.

Table 4.5-13. Projected AMoN Ambient Concentrations - Northwestern New Mexico

Year	Historic Composite ng/m^3	Proposed Action Range Upper ng/m^3	Proposed Action Range Lower ng/m^3
2012	870	1.351	446
2013	919	1.428	471
2014	979	1,509	504
2015	1,038	1,613	532
2016	1,098	1,717	560

Source: NADP 2013; EPA 2011b, 1992b; CDC 2013.

Notes: Based on aggregated historic data for 2 AMoN sites: NM98 Navajo Lake (lower), NM99 Farmington (upper). 2012 and 2013 data are assumed to be the same as the 2011 historic baseline. Historic composite trend assumes ongoing status quo.

NIOSH Recommended Exposure Limit (REL) = 25 ppmv = 17,370 μg/m3 = 17,370,000 ng/m3.

ng/m^3 = nanogram(s) per cubic meter

For occupational exposure to ammonia, the National Institute of Occupational Safety and Health (NIOSH) reference exposure level (REL) for ammonia (CAS No. 7664-41-7) is 25 ppmv or 17,300 μg/m^3 on a time-weighted average basis (Centers for Disease Control [CDC] 2013). No EPA standard has been adopted for public exposure to ammonia; therefore, the California Office of Environmental Health and Hazard Assessment (2013) REL is provided as a conservative benchmark from which to compare the project concentrations. As such, acute (1 hour) REL is 3,200 μg/m^3 and the chronic (long-term) REL is 200 μg/m^3.

Measured mean ambient ammonia concentrations range from about 0.74 μg/m^3 (historic) to about 1.34 μg/m^3 (projected). These airborne concentrations represent less than 1 percent of the 200 μg/m^3 chronic REL; thus, no significant risk to public health from airborne ammonia is indicated for northwestern New Mexico since the chronic REL is not exceeded.

Visibility Impacts

The following discussion applies only to emissions from the FCPP. Because long-range visibility impacts are principally caused by emissions of NO_x and PM from power plant stacks (the regulatory aim of 40 CFR Part 49), visibility impacts from continued operation of the Navajo Mine (ground-level fugitive dust) would be minor in comparison to the FCPP. Implementation of the mining aspects of the Proposed Action would not have any impacts on long-range regional visibility or O_3 levels.

Regional Haze

The *Source Specific Federal Implementation Plan for Implementing Best Available Retrofit Technology for Four Corners Power Plant: Navajo Nation* (40 CFR 49) requires FCPP to reduce emissions of NO_x and defines emission limits for PM based on emission rates currently achieved at FCPP. These pollutants contribute to visibility impairment (regional haze) in the 16 mandatory Class I Federal areas surrounding FCPP within a 300-kilometers (186-mile) radius. For PM, Units 4 and 5 must meet an emission limit of 0.015 lb/mmBTU, while retaining the existing 20 percent opacity limit (77 Federal Register 51620).

Compared to plantwide historic levels, implementation of 40 CFR 49 will reduce potential NO_x emissions 87 percent, from about 41,100 to 5,400 tpy over the long term, and will reduce potential PM emissions 58 percent, from about 1,980 to 830 tpy. While these reductions are very significant on a plantwide basis, they are somewhat less significant on a regional scale. Controlled NO_x emissions from FCPP would presumably comprise about 5 percent of regional NO_x emissions by 2020, and about 3 to 8 percent of regional PM emissions, depending on future control actions taken at other power plants. These regional percentages suggest that reducing emissions from FCPP would result in an incremental improvement in regional haze and visibility if emissions for the Proposed Action would affect visibility in Class I areas; however, at present, no major improvement would require effective control efforts at other power plants in the region.[1]

Average visibility in the region has improved by about 15 percent over the 11-year period from 2000 to 2010, apparently due to improved control of air pollution from sources such as power plants. If this historic trend continues into the future, average deciviews could improve at a rate of about -0.12 per year. Thus, during the period 2014 to 2016 (when Units 1, 2, and 3 are shutdown), an average improvement of about -0.36 deciviews could be possible (Table 4.5-14).

Table 4.5-14. Projected Regional Visibility

Year	Lowest Mean dV	Highest Mean dV	Average Mean dV
2012	2.2	10.2	6.0
2013	2.1	10.1	5.9
2014	1.9	9.9	5.8
2015	1.8	9.8	5.6
2016	1.7	9.7	5.5

Source: CSU 2013b.

Notes: 2012 and 2013 data are assumed to be the same as the 2011 historic baseline

dV = deciview

Plume Visibility Assessment Summary

A screening-level plume visibility analysis for a land area within 50 kilometers (31 miles) of FCPP was conducted (AECOM 2013c) to assess whether a plume from the Units 4 and 5 stack would be visible to casual observers during daylight hours in fair weather, and to what extent. For the study, 16 roadside viewpoints were identified that provide vistas of natural landmarks in the vicinity of FCPP:

1. Ford Butte West Viewpoint (U.S. Route 491)
2. Bennet Rock East Viewpoint (U.S. Route 491)
3. Barber Peak West Viewpoint (U.S. Route 491)
4. Table Mesa East Viewpoint (U.S. Route 491)

[1] Assessing future control strategies elsewhere is beyond the scope of this analysis.

5. Cathedral Cliff South Viewpoint (U.S. Route 491)
6. Shiprock South Viewpoint (Red Rock Highway/Indian Route 13)
7. Shiprock North Viewpoint (U.S. Route 64)
8. Chimney Rock West Viewpoint (U.S. Route 491)
9. Chimney Rock East Viewpoint (Mancos Canyon Road)
10. Hogback West Viewpoint (U.S. Route 64)
11. Hogback East Viewpoint (U.S. Route 64)
12. Piñon Mesa East Viewpoint (New Mexico State Route 170)
13. Piñon Mesa South Viewpoint (New Mexico State Route 170)
14. Angel Peak West Viewpoint (U.S. Route 550)
15. Bisti Badlands West Viewpoint (County Road 7260)
16. Bisti Badlands West Viewpoint (New Mexico State Route 371)

Tables 4.5-15 and 4.5-16 summarize the screening-level results in terms of the vistas with greatest change, the least change as a percent of significance threshold for each parameter, and the number of vistas for which the visibility parameters would be improved or be degraded.

As shown in Tables 4.5-15 and 4.5-16, the assessment of plume visibility from Units 4 and 5 indicates likely times when a downwind plume would be perceptible from various viewpoints in the area. This indication is because maximum values of the plume visibility parameters Cp and ΔE for worst-case meteorological conditions would exceed the contrast and perceptibility thresholds established by the EPA. The overall results suggest that the Proposed Action would improve view aesthetics in the area surrounding FCPP due to reduced visible plumes compared to present-day conditions. No criteria exist for evaluating visible plumes from sources beyond the boundaries of Federal Class I areas; therefore, this criteria was used to determine if emissions from the Proposed Action would affect visibility within Class I areas. However, at present, no Federal Class I areas exist within the 50-kilometers analysis area (AECOM 2013c).

Ozone Impacts

Based on the Ozone Impact Assessment conducted for the FCPP and NMEP, local O_3 is expected to decrease by about 3 ppbv or 6 $\mu g/m^3$ on an 8-hour basis. The primary reduction in O_3 precursor (VOCs and NO_x) emissions would occur due to the shut-down of Units 1, 2, 3. The Four Corners area is currently in NAAQS attainment for O_3. Decreasing or unchanged O_3 levels would support continuing NAAQS attainment, notwithstanding unpredicted meteorological conditions or significant new sources of precursors NO_x and VOC originating elsewhere. Thus, impacts on O_3 are minor due to NAAQS attainment status remaining unchanged. Refer to the FCPP/NMEP EIS (OSMRE 2015) for additional detail.

Table 4.5-15. Plume Perceptibility (ΔE) Modeling Results

Visual Parameter	Morning Plume Perceptibility (ΔE)[5] Terrain Forward	Morning Plume Perceptibility (ΔE)[5] Terrain Backward	Morning Plume Perceptibility (ΔE)[5] Sky Forward	Morning Plume Perceptibility (ΔE)[5] Sky Backward	Afternoon Plume Perceptibility (ΔE)[5] Terrain Forward	Afternoon Plume Perceptibility (ΔE)[5] Terrain Backward	Afternoon Plume Perceptibility (ΔE)[5] Sky Forward	Afternoon Plume Perceptibility (ΔE)[5] Sky Backward
Vista with Most Improvement[1]	-3.78	-11.85	-9.13	-5.30	-1.67	-16.73	-8.08	-6.73
Vista with Least Improvement[1]	0.25	-0.16	-3.62	-0.40	0.31	-0.41	-1.90	-0.55
EPA Significance Threshold (ΔE)	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Number of Vistas Evaluated[2]	16	16	16	16	16	16	16	16
Number of Vistas Improved	7	16	16	16	7	16	16	16
Number of Vistas Degraded	9	0	0	0	9	0	0	0
Number of Vistas Significantly Improved[3]	0	5	0	0	0	11	0	0
Number of Vistas Significantly Degraded[4]	0	0	0	0	0	0	0	0

Source: AECOM 2013c.

Notes:
ΔE = plume perceptibility
[1] A negative value represents an improvement in visibility.
[2] From 16 viewpoints a sky background is observed and for 16 viewpoint-landmark combinations a terrain background is observed.
[3] A vista is significantly improved if the baseline ΔE exceeds 2.0 and the future ΔE is less than 2.0.
[4] A vista is significantly degraded if the baseline ΔE is less than 2.0 and the future ΔE exceeds 2.0.
[5] Two theta (Θ) angles represent the sun being in front of the observer (forward scatter) where Θ = 10° or behind the observer (backward scatter) where Θ = 140.

Table 4.5-16. Plume Contrast (Cp) Modeling Results

Visual Parameter	Morning Plume Contrast (Cp)[5] Terrain Forward	Morning Plume Contrast (Cp)[5] Terrain Backward	Morning Plume Contrast (Cp)[5] Sky Forward	Morning Plume Contrast (Cp)[5] Sky Backward	Afternoon Plume Contrast (Cp)[5] Terrain Forward	Afternoon Plume Contrast (Cp)[5] Terrain Backward	Afternoon Plume Contrast (Cp)[5] Sky Forward	Afternoon Plume Contrast (Cp)[5] Sky Backward
Vista with Most Improvement[1]	-0.10	-0.19	0.06	-0.06	-0.07	-0.08	0.08	-0.05
Vista with Least Improvement[1]	0.00	0.00	0.35	-0.03	0.00	0.00	0.24	-0.03
EPA Significance Threshold [Cp]	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Number of Vistas Evaluated[2]	16	16	16	16	16	16	16	16
Number of Vistas Improved	15	16	0	16	15	16	1	16
Number of Vistas Degraded	0	0	16	0	0	0	15	0
Number of Vistas Significantly Improved[3]	0	0	0	0	0	0	0	0
Number of Vistas Significantly Degraded[4]	0	0	0	0	0	0	0	0

Source: AECOM 2013c.

Notes:
Cp = plume contrast
[1] A negative value represents an improvement in visibility.
[2] From 16 viewpoints a sky background is observed and for 16 viewpoint-landmark combinations a terrain background is observed.
[3] A vista is significantly improved if the baseline Cp exceeds 0.05 and the future Cp is less than 0.05.
[4] A vista is significantly degraded if the baseline Cp is less than 0.05 and the future Cp exceeds 0.05.
[5] Two theta (Θ) angles represent the sun being in front of the observer (forward scatter) where Θ = 10° or behind the observer (backward scatter) where Θ = 140.

4.5.2.1.4 Assessment of Emissions from Burnham Road Relocation

Relocation of Burnham Road—a component of the Proposed Action—is estimated to result in a maximum land disturbance of approximately 75 acres. That conventional surface road-building project will result in temporary emissions of fugitive dust and engine exhausts that normally accompany such construction. As addressed in prior environmental assessments, particulate matter is the primary pollutant emitted by a road project of this nature. A typical emissions assessment using applicable emission factors and equipment activity rates can provide a conservative estimate of this project's temporary emissions. Measures such as watering and restrictions on vehicle speeds in active work areas can reduce the amounts of particulate matter emitted during road construction. OSMRE previously approved this proposed road realignment after a 2008 EA of the project, and the road realignment was completed after issuance of the 2012 FONSI.

The realigned road will be properly graded, compacted, and maintained to avoid the accumulation of fine particles on the road surface, which can easily become entrained in the air by passing vehicles. Because of minimizing particle accumulation on the new road, the level of particulate matter emitted per vehicle mile traveled on the new road is expected to be less than the particulate emission rate from the current roadway. However, at this time there is no reliable means for quantifying that anticipated reduction in traffic-generated particulate emissions once the relocation of Burnham Road has been completed.

4.5.2.2 Proposed Action with Conditions

Under this Alternative, air quality impacts would be the same as those described for the Proposed Action.

4.5.2.3 No Action Alternative

The No Action Alternative is often an appropriate baseline against which to compare predictions of air quality effects due to a proposed action and from past, present, and reasonably foreseeable actions. In this instance, the No Action Alternative does not constitute an appropriate baseline because under this alternative it is expected that historic annual coal production of typically 8.5 Mtpy would begin to decline. Baseline conditions for the study of air quality resource affects under Proposed Action are those associated with the mine's recent historical operations (e.g., a nominal coal production rate of 8.5 Mtpy from all areas, including Area III). The corresponding annual production in Area III alone under the No Action Alternative is expected to range from 4.9 million to 7.4 million tons of coal per year.

4.5.2.3.1 Operational and Emissions Changes

The No Action Alternative for this study means that no coal would be mined from Area IV North. Coal production from Area III during the period from 2012 to 2016 would nevertheless need to remain at the production rates anticipated for Area III under the Proposed Action (i.e., 4.9 – 7.4 Mtpy, or roughly from 58 percent to 83 percent of the mine's baseline operating rate). Consequently, overall air emissions under the No Action Alternative are expected to gradually decline in proportion to the reduction in production rates below the baseline case of 8.5 Mtpy and the shutdown of FCPP Units 1, 2, and 3.

Navajo Mine's PM_{10} and $PM_{2.5}$ emissions from Area III alone as part of the mine's baseline coal production rate of 8.5 Mtpy are presented in Section 3.5.2.1. Because the rate of surface coal mine PM emissions is roughly proportional to its production rate, Navajo Mine's annual emissions of PM_{10} and

$PM_{2.5}$, under the No Action Plan, would likely vary over a range of roughly 60-80 percent of the mine's baseline emission levels shown in Table 3.5-4.

4.5.2.3.2 Air Quality Impacts under the No Action Alternative

Under the No Action Alternative, the currently permitted supply of coal from Navajo Mine areas II and III and available stockpiled coal would run out in 2016, and mining operations would cease in currently permitted areas. Compared to the modeled levels for the Proposed Action, ambient concentrations of PM_{10} and $PM_{2.5}$ in the AQRA under the No Action Alternative would not change appreciably, or may decline from current conditions. Because annual emissions of PM_{10} and $PM_{2.5}$ under the No Action Alternative would likely be reduced compared to Navajo Mine's recent baseline emissions, the mine's PM_{10} and $PM_{2.5}$ annual impacts will not extend as far from the mine boundary. However, as explained below, the extent of the mine's short-term PM_{10} or $PM_{2.5}$ impacts on a 24-hour basis with the No Action Alternative are not expected to decrease from their counterparts with the Proposed Action.

The distance to which particulate emissions from the mine will have a discernible ambient impact on a short-term (24-hour) basis, is a function of the emission rate and dispersion characteristics on a daily basis. As described in Section 3.5.2, elevated short-term monitored concentrations of PM_{10} and $PM_{2.5}$ inside the Mine's boundary during baseline operations, have typically been 140 $\mu g/m^3$ and 14 $\mu g/m^3$, respectively. While the No Action Alternative will have less annual emissions than the mine's annual baseline emissions, the No Action Alternative will still have localized mining events that may cause elevated levels of fugitive dust near the mine's boundary. Those elevated concentrations of PM_{10} and $PM_{2.5}$ emissions inside the mine's boundary during the No Action Alternative could still cause elevated 24-hour impacts of PM_{10} and $PM_{2.5}$. Based on AERMOD modeling of the Area III sources, concentrations above the SILs of PM_{10} and $PM_{2.5}$ may occur at distances as far as 6.5 kilometers and 10 kilometers from the mine's boundary, respectively.

With the No Action Alternative from 2012 to 2016, the annual amount of Navajo Mine's emissions of gaseous pollutants (SO_2, NO_x, CO, and VOCs) from its numerous non-road engines and motor vehicles would be reduced in a given year roughly in proportion to the 20 – 40 percent reduction in mine production relative to the annual baseline rate. However, annual gaseous pollutant emissions from the mine's baseline operation, as shown in Table 3.5-4, are very small relative to the aggregate amounts of each pollutant emitted within San Juan County. Consequently, any reduction in gaseous emissions from the mine's non-road engines and motor vehicles under the No Action Alternative is not expected to have a discernible effect on the ambient air concentrations of those pollutants within the AQRA.

Concentrations of some of those gaseous pollutants recently measured at New Mexico's SLAMS monitoring site at the San Juan Substation, near Shiprock are shown in Table 3.5-14. Any reduction in gaseous emissions from the mine's non-road engines and motor vehicles during the No Action Alternative should not cause a perceptible change in those measured levels at Shiprock or elsewhere.

The Navajo Mine is the sole supplier of coal to FCPP. Because the Pinabete Area of the Navajo Mine SMCRA Permit Area has been permitted under a separate permit application process concluded in June 2015, it is assumed that power plant operation and resultant emissions will continue through 2016, as analyzed under the Proposed Action. Therefore, Under the No Action Alternative, the combustion-related impacts at the FCPP would remain as described for the Proposed Action through July 2016 as the current coal stockpiles are used. Following July 2016, should additional mining not be approved in Area IV North, NTEC may elect to proceed with mining in the Pinabete Permit Area under a revised SMCRA permit. However, after the revised permit is submitted, OSMRE would be required to comply with NEPA prior to making a decision on any potential SMCRA permit revision to the Pinabete Permit. Alternatively, under the No Action Alternative, the Navajo Mine and FCPP could potentially shut down once all coal reserves are combusted. The effects of this shut-down has been evaluated in Section 4.1.4.6 of the FCPP/NMEP EIS and is incorporated by reference as follows:

> *Under the No Action Alternative, criteria emissions would continue through 2015 until the FCPP shuts down; after this time, stack emissions would cease. The following section provides a summary of estimated emissions under this alternative. Deposition impacts under the No Action Alternative would be the same as described in the environmental setting; therefore, no additional analysis is provided. O_3 precursor (VOCs and NO_x) emissions from the FCPP would continue through 2015. An analysis of regional visibility as a result of the No Action Alternative is provided below.*

Future Criteria Emissions

[Table 4.5-17] below shows estimated stationary and mobile source emissions of SO_2, NO_X, and PM under this scenario during 2014 and 2015.

Table 4.5-17 Estimated No Action Criteria Emissions - FCPP and Navajo Mine

Year	Stationary Sources SO2 tons/yr	Stationary Sources NOX tons/yr	Stationary Sources PM tons/yr	Mobile Sources SO2 tons/yr	Mobile Sources NOX tons/yr	Mobile Sources PM tons/yr
2014	12,000	41,100	2,000	12	550	1,350
2015	12,000	41,100	2,000	12	550	1,350
2-Year Total	**24,000**	**82,200**	**4,000**	**24**	**1,100**	**2,700**

Sources: EPA 2012h, 2011a; OSMRE 2011; APS 2012; SCAQMD 2008.

Notes: Stationary - power plant emissions per 2005-11 baseline period when all Units (1, 2, 3, 4, and 5) were operational.

Mobile - mining equipment and mine and power plant support vehicles (includes fugitive dust).

Stationary sources rounded to nearest 100 tons; mobile sources NOX and PM rounded to nearest 10 tons.

NO_X = nitrogen oxide

PM =- particulate matter

SO_2 = sulfur dioxide

Four Corners Power Plant

Under the No Action Alternative, FCPP would continue to operate in 2014 and 2015. Beginning in 2016, power plant decommissioning would involve dismantling and salvage work. Estimated stationary source emissions for the baseline period (2005-2011) years are shown in [[Table 4.5-17].

Navajo Mine

Beginning in 2016, mine closure would involve land reclamation and equipment removal activities, along with disposition of water rights. Reclamation would occur as described for the Proposed Action; however, at an earlier time. Estimated mobile source emissions for the preceding 2 years are shown in Table 4.5-17.

Visibility Impacts

Four Corners Power Plant

As discussed above, under the No Action Alternative, following 2015, all stationary source emissions from the FCPP would cease. The Ozone Impact Assessment conducted for the proposed Project included a comparison of the regional O_3 precursor (VOCs and NO_x) emissions between the Proposed Action and the No Action Alternative. [Table 4.5-18] shows the five largest differences in regional O_3 levels between the Proposed Action and No Action scenarios for 1-hour averaging times. The maximum predicted O_3 impacts attributable to FCPP would occur in July and August. The largest impact (16 ppbv) would be about 12 miles southeast of FCPP, while the fifth largest impact (13 ppbv) would be located about 29 miles southeast of FCPP.

Table 4.5-18 Maximum 1-Hour Ozone Impacts - Five Largest Differences

Difference Between Proposed Action and No Action[1] ppbv	Difference Between Proposed Action and No Action[1] month	Former NAAQS[2] ppbv	Nearest Local Maximum[3] ppbv	Furthest Local Maximum[4] ppbv	Former NAAQS status
15.8	July	120	77	90	Meet
15.1	August	120	77	90	Meet
14.9	August	120	77	90	Meet
13.3	July	120	77	90	Meet
13.1	August	120	77	90	Meet

Source: AECOM 2013b

Notes:

1 Maxima occur between 12 and 29 miles (19 and 46 km) southeast of FCPP.

2 The 1979 1-hour NAAQS for ozone was rescinded in 1997 (attainment was defined as one or fewer days per calendar year where the maximum hourly average ozone concentration was greater than 120 ppbv).

3 Site 35-45-0009: 28 miles (45 km) east of FCPP monitored maximum for 2011.

4 Site 35-45-0018: 47 miles (75 km) east of FCPP monitored maximum for 2011.

ppbv = part(s) per billion (by volume)

[Tables 4.5-19 and 4.5-20] show predicted fourth-highest maximum 8-hour impacts for PSD Class I and affected sensitive Class II areas as defined by the NAAQS. [Table 4.5-21] shows 8-hour EPA design values for five O3 monitoring sites in the vicinity as predicted by the NAAQS attainment test methodology. For the No Action Alternative, regional average O3 concentrations decreased from 64 to 62 ppbv. The greatest changes occurred in the western and central areas of the region where predicted fourth-highest daily maximum 8-hour average O3 concentrations decreased by about 5 to 7 ppbv. In contrast, under the Proposed Action, the only locations where O_3 increased were immediately downwind of FCPP [possibly due in part to predicted meteorological conditions used for the modeling and increased utilization of Units 4 and 5]. The maximum increase in the fourth-highest 8-hour O_3concentrations was less than 4 ppbv (AECOM 2013b). Thus, since predicted O_3concentrations in the region are expected to decrease or remain about the same and the overall region is currently in NAAQS attainment, the Proposed Action would have minor impact on ambient O_3in the region in the short- or long-term.

Table 4.5-19 Fourth-Highest Maximum 8-Hour Ozone Impacts - PSD Class I Areas

Sixteen Class I Areas	Proposed Action Ozone[1] ppbv	No Action Ozone[1] ppbv	Difference Between Proposed Action and No Action ppbv	Endpoint NAAQS status
Petrified Forest National Park (AZ)	67.9	67.9	0.0	Meet
Grand Canyon National Park (AZ)	—	—	—	—
Capitol Reef National Park (UT)	—	—	—	—
Canyonlands National Park (UT)	61.0	61.0	0.0	Meet
Arches National Park (UT)	—	—	—	—
Mesa Verde National Park (CO)	65.0	64.7	0.3	Meet
Black Canyon of the Gunnison Wilderness (CO)	—	—	—	—
Weminuche Wilderness (CO)	74.7	74.7	0.0	Meet
La Garita Wilderness (CO)	**75.4**	**75.4**	0.0	Exceed
West Elk Wilderness (CO)	—	—	—	—
Maroon Bells – Snowmass Wilderness (CO)	—	—	—	—
Great Sand Dunes National Monument (CO)	—	—	—	—
Wheeler Peak Wilderness (NM)	—	—	—	—
Pecos Wilderness (NM)	66.8	66.8	0.0	Meet
Bandelier National Monument (NM)	66.8	66.3	0.5	Meet
San Pedro Parks Wilderness (NM)	67.5	67.4	0.1	Meet

Note:
[1] Year 2018.
ppbv = part(s) per billion (by volume)

Table 4.5-20 Fourth-Highest Maximum 8-Hour Ozone Impacts - Affected Sensitive Class II Areas

Affected Sensitive Class II Areas	Proposed Action Ozone[1] ppbv	No Action Ozone[1] ppbv	Difference Between Proposed Action and No Action ppbv	Endpoint NAAQS status
Carson National Forest	72.0	71.9	0.1	Meet
Grand Mesa, Uncompahgre, and Gunnison National Forests	**75.4**	**75.4**	0.0	Exceed
Handies Peak Wilderness Study Area	74.3	74.3	0.0	Meet
Jicarilla Apache Indian Reservation	72.3	71.8	0.5	Meet
Navajo Nation	74.9	74.3	0.6	Exceed
Redcloud Peak Wilderness Study Area	74.0	74.0	0.0	Meet
Rio Grande National Forest	**75.2**	**75.2**	0.0	Exceed
San Juan National Forest	74.2	74.2	0.0	Meet
Uncompahgre Wilderness Area (BLM managed)	74.1	74.1	0.0	Meet
Uncompahgre Wilderness Area (USFS managed)	74.1	74.1	0.0	Meet

Note:

[1] Year 2018.

ppbv = part(s) per billion (by volume)

Table 4.5-21 Attainment Test 8-Hour Ozone Design Values - Four Corners Region

Areas and Monitoring Sites	Proposed Action Ozone[1] ppbv	No Action Ozone[1] ppbv	Difference Between Proposed Action and No Action ppbv	Endpoint NAAQS status
San Juan County, New Mexico (35-45-0009)	66.5	66.2	0.3	Meet
San Juan County, New Mexico (35-45-1005)	68.1	67.1	1.0	Meet
La Plata County, Colorado (08-67-1004)	69.8	69.6	0.2	Meet
La Plata County, Colorado (08-67-7003)	60.3	60.1	0.2	Meet
Montezuma County, Colorado (08-83-0101)	65.1	64.7	0.4	Meet

Source: AECOM 2013b.

Notes:

[1] Year 2018.

ppbv = part(s) per billion (by volume)

4.6 Climate Change

The CEQ provided draft guidance on addressing climate change in NEPA documents in 2010. In this guidance, the CEQ states that, "in the agency's analysis of direct effects, it would be appropriate to: 1) quantify cumulative emissions over the life of the project; 2) discuss measures to reduce GHG emissions…., and 3) qualitatively discuss the link between such GHG emissions and climate change."

In part to provide a unified Federal approach to climate change analysis in NEPA, the CEQ published additional draft guidelines in December 2014 on incorporating climate change analysis into NEPA documents. The EA is responsive to the new guidance because it contains: (1) effects of climate change on regional resources including the Project; (2) consideration of alternatives to mitigate the effects of climate change; (3) consideration of both long-term and short-term effects and benefits; and (4) full emissions monetization.

This section presents the results of the quantitative assessment of potential future GHG emissions from FCPP and Navajo Mine Area IV North, and compares them to the emissions of the 16 other power plants in the region from 2012 to 2016. This comparison is made in order to provide context for the GHG emissions from the action alternatives on a regional level.

In the assessment of environmental consequences, the analysis considers reductions in GHG emissions as a result of BART compliance starting in 2014 and continuing through 2016. Consequences are evaluated based on the operation of Units 4 and 5 alone after the end of 2013, as well as the mobile source emissions. The shutdown of Units 1, 2, and 3 represents a loss of about 4,711,000 MW-hrs of annual generation capacity from FCPP, based on historic operating data.

Predicted emissions from FCPP and 16 other regional plants are based on historic operating data reported to the EPA referencing the 7-year historic baseline period of 2005 to 2011 when FGD became active on Units 4 and 5. It is necessary to define this historic baseline period because FGD affects boiler performance by a small amount, mainly due to increased exhaust backpressure. In turn, turbine-generator output is affected by a small amount (CARB 2012).

The 40 CFR 98 Subpart D electricity generation source category comprises generating units (i.e., individual boiler-turbine-generator systems) that are required to monitor and report to EPA CO_2 emissions year-round. Normally this monitoring is accomplished using a fuel emission factor. For FCPP, the Part 75 CO_2 emission factor is fixed at 205 pounds CO_2 per mmBTU heat input for the bituminous coal combusted in the boilers. For this analysis, an EPA-referenced correction factor is applied to account for CH_4 and N_2O and convert to CO_2e using GWPs. For FCPP, this correction factor is 1.0055, which means that 0.55 percent is added to reported 40 CFR Part 98 CO_2 emissions to obtain CO_2e.

Key concepts in projecting future emissions are capacity factor and PTE, as defined below:

- Capacity factor is defined as actual utilization divided by theoretical design capacity. For generating units, this factor is typically expressed as actual MW-hrs generated in a year versus design rating in megawatts times 8,760 hours per year (maximum theoretical MW-hrs). Since generating units must be periodically shut down for maintenance and seldom operate at full design rating (load) to extend equipment life, capacity factor is always less than 100 percent, typically in the range of 80 to 95 percent for base load generating units, depending on overall reliability.

- PTE is defined as maximum theoretical emissions for a pollutant at permitted operating conditions. Traditionally, PTE is determined assuming maximum allowable emission rate at 100 percent capacity factor; however, since actual capacity factor is less than 100 percent, theoretical PTE is never normally achieved unless limited by permit condition.

In addition, on-road vehicles and off-road equipment owned by FCPP are used for plant and switchyard maintenance. Segments of the transmission lines nearest FCPP are also maintained using plant vehicles and equipment. These vehicles and equipment emit air contaminants in engine exhaust during normal use. All equipment and vehicle engines used at the plant meet Federal emissions standards applicable on the date of manufacture.

Mining activity would also cause emissions from diesel-powered off-road equipment and on-road vehicles, explosives detonation, fugitive methane CH_4 liberated from coal seams, and fugitive dust. All equipment and vehicle engines used at the mine meet Federal emissions standards applicable on the date of manufacture. In comparison to stationary source GHG emissions from FCPP, mobile and fugitive source GHG emissions comprise a small fraction of total Project GHG emissions, only 0.5 percent of total GHG emissions. This percentage is within EPA limits of precision of -2 to +5 percent for fossil fuel combustion (EPA 2015a, 2012f). Therefore, GHG emissions from power plant stacks such as FCPP and SJGS can be used as a general measure of overall GHG emissions from all sources at such mine-and-plant facilities: mobile, fugitive, and stationary. This corollary enables general assessments and comparisons of facility-wide emissions based on Part 75 data without the need to conduct detailed emissions inventories of mining and support operations.

4.6.1 Alternative A - Proposed Action

FCPP and Navajo Mine emit GHGs and, therefore, contribute incrementally to climate change; however, these emissions comprise less than 1 percent of the U.S. GHG inventory and the national electric power sector.

4.6.1.1 Stationary Sources

Table 4.6-1 shows estimated future (2012 through 2016) potential GHG emissions from Units 4 and 5 assuming a maximum (worst-case) annual generation capacity factor of 92 percent based on the 7-year baseline period from 2005 to 2011 when FGD became active on Units 4 and 5. To be conservative, this 92 percent capacity factor is 8 percent higher than the historic average of 84 percent for the baseline period. For the 12-year period beginning in 2000, a 92 percent capacity factor was achieved only during 2 years, 2003 and 2006, all other years were less. Thus, the probability of achieving a 92 percent capacity factor is estimated to be 1 in 6 or about 17 percent overall, which is a reasonable contingency over the long run.

Table 4.6-1. Estimated Annual Potential GHG Emissions

Year	Generation MW-hrs/yr	CO_2e MT/yr	CO_2e kg/MW-hr
2012	16,048,500	14,006,400	873
2013	16,048,500	14,006,400	873
2014	12,410,900	10,339,030	833
2015	12,410,900	10,339,030	833
2016	12,410,900	10,339,030	833
5-Year Cumulative Emissions	**69,329,700**	**59,029,890**	**—**

Sources: EPA 2012a, b, f.

Notes: Assumes maximum future annual capacity factor for Units 4 and 5 based on historic operating data; Values rounded to nearest 100 metric tons (MT); 5-year cumulatives are for 2012-2016 (inclusive).
CO_2e = carbon dioxide equivalents
kg/MW-hr = kilograms per megawatt-hour (same as grams per kilowatt-hour)
MT = metric ton, 1,000 kg or 2,204.6 lbs
MT/yr = metric tons per year
MW-hrs/yr = megawatt-hours per year

Table 4.6-2 shows estimated future regional GHG emissions and composite rates for the 17 regional electric power producers in Arizona, Colorado, Navajo Nation, and New Mexico, including FCPP. These projections are based on the following assumptions; however, actual future occurrences may differ from predictive estimates:

- *2014:* FCPP and regional emissions consistent with 2010 and 2011 emissions.
- *2014 to 2016:* APS operates FCPP Units 4 and 5 at historic 84 percent annual capacity factor and regional GHG emissions grow due to load demand growth on underutilized capacity at an annual rate of 0.75 percent calculated from historic GHG emissions data during the 7-year baseline period 2005 to 2011.

Table 4.6-2. Estimated Annual Regional GHG Emissions and Composite Rates

Year	Generation MW-hrs/yr	CO_2e MT/yr	CO_2e kg/MW-hr
2012	88,960,400	80,008,900	899
2013	89,670,200	80,647,300	899
2014	90,385,600	81,290,800	899
2015	91,101,000	81,903,400	899
2016	91,822,100	82,520,700	899
5-Year Cumulative Emissions	451,939,300	406,371,100	—

Sources: EPA 2012a, b, f.

Notes: For 17 regional electric power producers in Arizona, Colorado, Navajo Nation, and New Mexico, Aggregated values rounded to nearest 100 metric tons (MT). 5-year cumulatives are for 2012-2016 (inclusive).
CO_2e = carbon dioxide equivalents
kg/MW-hr = kilograms per megawatt-hour (same as grams per kilowatt-hour)
MT = metric ton, 1,000 kg or 2,204.6 lbs
MT/yr = metric tons per year
MW-hrs/yr = megawatt-hours per year

Table 4.6-3 shows the relative annual contribution of FCPP to regional generation and GHG emissions from 2012 to 2016 (estimated). As shown in the table, FCPP would contribute approximately 12 percent of GHG emissions in the region resulting from electrical power generation. This table does not account for GHG emissions from other sources in the region (i.e., oil and gas development, other mining operations).

Table 4.6-3. Estimated Relative Annual Regional Contribution of FCPP GHG Emissions (Future 2014 to 2016)

Year	Percent of Regional Electrical Power Generation	Percent of Regional CO_2e Emissions
2012	18.0%	17.5%
2013	17.9%	17.4%
2014	13.7%	12.7%
2015	13.6%	12.6%
2016	13.5%	12.5%

Sources: EPA 2012a, b, f.

Notes:
For 17 regional electric power producers in Arizona, Colorado, Navajo Nation, and New Mexico. 2014-41 estimated values.
CO_2e = carbon dioxide equivalents

4.6.1.2 Mobile Sources

Table 4.6-4 shows maximum estimated GHG emissions from mining operations in the existing Navajo Mine SMCRA Permit Area and related activities, and Table 4.6-5 shows maximum estimated GHG emissions from FCPP vehicles and mobile equipment. These mobile sources, although quantifiable, are relatively small compared to future power plant emissions, about 0.7 percent maximum of the potential to emit, and well within EPA limits of precision of -2 to +5 percent for fossil fuel combustion (EPA 2012f).

Table 4.6-4. Estimated GHG Emissions from Navajo Mining Operations

Mobile and Fugitive Sources	CO_2 MT/yr	CH_4 MT/yr	N_2O MT/yr	CO_2e MT/yr
Mine Extraction Operations and Loading	7,557	5.18	2.32	8,385
Coal Hauling Trucks to Stockpiles	2,010	0.11	0.05	2,028
Mining Support Vehicle Travel	2,134	0.11	0.04	2,150
Mine Fugitive Methane Emissions	—	2,747	—	57,687
Annual Totals	**11,701**	**2,752**	**2.42**	**70,251**
5-Year Cumulative Emissions	**58,505**	**13,760**	**12.1**	**351,255**

Source: OSMRE 2011.

Notes:
CH_4 = methane
CO_2 = carbon dioxide
CO_2e = carbon dioxide equivalents
MT = metric ton (1,000 kg or 2,204.6 lbs)
N_2O = nitrous oxide

Table 4.6-5. Estimated GHG Emissions from FCPP Mobile Sources

Mobile Sources	CO_2 MT/yr	CH_4 MT/yr	N_2O MT/yr	CO_2e MT/yr
Power Plant Off-road Equipment	149	0.01	0.00	151
Power Plant On-road Vehicles	160	0.01	0.01	162
Annual Totals	**309**	**0.01**	**0.01**	**313**
5-Year Cumulative Emissions	**1,545**	**0.05**	**0.05**	**1,565**

Sources: APS 2012; EPA 2012f, 2011a; SCAQMD 2008.

Notes:
CH_4 = methane
CO_2 = carbon dioxide
CO_2e = carbon dioxide equivalents
MT = metric ton (1,000 kg or 2,204.6 lbs)
N_2O = nitrous oxide

Future operation of FCPP and the Navajo Mine Area IV North would emit GHGs and, therefore, contribute incrementally to climate change; however, these emissions would continue to comprise a negligible fraction – less than 1 percent – of the U.S. GHG inventory and the national electric power sector and about 12 percent of regional GHG emissions from electric power generation.

Fugitive GHG emissions from the Navajo Mine are shown in Table 4.6-4. GHG emissions are conservative, because they were based on a prior production rate of approximately 8.5 Mtpy and the Proposed Action is for a reduced production rate of approximately 6 Mtpy, a decrease of about 30 percent.

4.6.1.3 Emissions Monetization

The social cost of carbon (SCC) is a monetization of the effects associated with an incremental increase in carbon emissions. It is intended to quantify climate change-induced effects to net agricultural productivity, human health, property damage from increased flood risk, the value of ecosystem services, and other factors. No Federal, tribal, or state rules or regulations currently limit or curtail emissions of GHGs from FCPP, Navajo Mine, or other sources in the state of New Mexico or Navajo Nation. Also, notwithstanding the GHG reporting rule, no Federal regulations currently limit or curtail GHG emissions of CO_2 and CH_4, and EPA cap-and-trade programs currently apply only to acid rain precursors SO_2 and NO_x (EPA 2012e). Therefore, at present no regulatory mechanism exists for assessing the significance of the GHG emissions. Qualitatively, the societal costs of GHG emissions and climate change generally refer to the financial, environmental, and societal costs resulting from sea level rise, diminishing water supplies, loss of plant and wildlife species, changes in ecosystems, increased wildfires, etc. These issues are addressed in detail in reports prepared by the IPCC referenced in the beginning of this section.

In Federal rulemaking proceedings, Executive Order 12866 requires that agencies "assess both the costs and the benefits of the intended regulation and, recognizing that some costs and benefits are difficult to quantify, propose or adopt a regulation only upon a reasoned determination that the benefits of the intended regulation justify its costs." In the context of including the SCC in cost-benefit analysis for rulemaking, a 12-member Interagency Working Group[1] was formed to assess the calculation of SCC. The Interagency Working Group released its initial Technical Support Document: *Social Cost of Carbon for Regulatory Impact Analysis* in February 2010, which was subsequently updated in May 2013.

According to the Interagency Working Group (2010): "[i]t is important to recognize that a number of key uncertainties remain, and that current SCC estimates should be treated as provisional and revisable since they will evolve with improved scientific and economic understanding. The interagency group also recognizes that the existing models are imperfect and incomplete. The National Academy of Science (2009) points out that there is tension between the goal of producing quantified estimates of the economic damages from an incremental ton of carbon and the limits of existing efforts to model these effects."

In particular, "[t]he choice of a discount rate, especially over long periods of time, raises highly contested and exceedingly difficult questions of science, economics, philosophy, and law. Although it is well understood that the discount rate has a large influence on the current value of future damages, there is no consensus about what rates to use in this context" (Interagency Working Group 2010).

Draft Guidance on climate change analysis was published by the CEQ in December 2014, and indicates that emissions monetization is not required in every project-level NEPA analysis:

"Monetizing costs and benefits is appropriate in some, but not all, cases and is not a new requirement. A monetary cost-benefit analysis need not and should not be used in weighing the merits and drawbacks of the alternatives when important qualitative considerations are being considered. If a cost-benefit analysis is relevant to the choice among different alternatives being considered, it must be incorporated by reference or appended to the statement as an aid in evaluating the environmental consequences. When an agency determines it is appropriate to monetize costs and benefits, then, although developed specifically for regulatory impact analyses, the Federal SCC, which multiple Federal agencies have developed and used to assess the costs and benefits of alternatives in rulemakings, offers a harmonized, interagency metric that can provide decision makers and the public with some context for meaningful NEPA review. When using the Federal SCC, the agency should disclose the fact that these estimates vary over time, are associated with different discount rates and risks, and are intended to be updated as scientific and economic understanding improves."

OSMRE chose to include emissions monetization of SCC in this EA according to the Interagency Working Group methods to provide further context and enhance the discussion of climate change impacts in the NEPA analysis.

The full analytical methods and results of SCC quantification following the Interagency Working Group method are described in Technical Appendix A of the FCPP/NMEP EIS. The GHG emissions (expressed as CO_2-equivalent emissions, CO_2e) are based on operating Units 4 and 5 of FCPP from 2014 through 2016, and the associated coal mining at the Navajo Mine. The uncertainty in the results is expressed by

[1] Council of Economic Advisers; Council on Environmental Quality; Department of Agriculture; Department of Commerce; Department of Energy; Department of Transportation; Environmental Protection Agency; National Economic Council; Office of Energy and Climate Change; Office of Management and Budget; Office of Science and Technology Policy; and Department of the Treasury.

using the range of discount rates presented in Interagency Working Group (2013), which provides a range in calculated SCC for each alternative.

As recommended by the Interagency Working Group, the 3 percent net present value discount rate represents the central value for this analysis and yields an amortized SCC (in 2014 dollars) of $42/metric ton (MT) CO_2e over the 5-year project life, with a range of $13/MT CO_2e to $121/MT CO_2e based on the range of Interagency Working Group-recommended discount rates.

Tables 4.6-6a and 4.6-6b compare the calculated SCC for the entire 5-year period for each alternative in billions of dollars. The results are presented in both 2007 dollars (Table 4.6-6a) and 2014 dollars (Table 4.6-6b). The central value recommended by the Interagency Working Group, based on a 3 percent net present value, is provided in bold, and the values for the range in discount rates are presented to represent a range in values.

The SCC values for the Proposed Action, the Alternative, and the No Action Alternative are all the same for the 5-year period analyzed ($2.5 billion).

Table 4.6-6a. Cumulative Social Cost of Carbon – Discount Rate Comparison (2007$)

Alternatives	Cumulative Cost (Billion $) at each Discount Rate 5%	Cumulative Cost (Billion $) at each Discount Rate 3%	Cumulative Cost (Billion $) at each Discount Rate 2.5%	Cumulative Cost (Billion $) at each Discount Rate 95th 3%
Proposed Action	0.67	**2.17**	3.36	6.19
Alternative: proposed Action with Conditions	0.67	**2.17**	3.36	6.19
No Action Alternative	0.67	**2.17**	3.36	6.19

Sources: EPA 2014a, b; APS 2014; Interagency Working Group 2013; U.S. Bureau of Labor Statistics 2014.

Table 4.6-6b. Cumulative Social Cost of Carbon – Discount Rate Comparison (2014$)

Alternatives	Cumulative Cost (Billion $) at each Discount Rate 5%	Cumulative Cost (Billion $) at each Discount Rate 3%	Cumulative Cost (Billion $) at each Discount Rate 2.5%	Cumulative Cost (Billion $) at each Discount Rate 95th 3%
Proposed Action	0.79	2.50	3.85	7.12
Alternative: proposed Action with Conditions	0.79	2.50	3.85	7.12
No Action Alternative	0.79	2.50	3.85	7.12

Sources: EPA 2014a, b; APS 2014; Interagency Working Group 2013; U.S. Bureau of Labor Statistics 2014.

As described above, the Proposed Action would comprise approximately 12 percent of GHG emissions resulting from electrical power generation in the region through 2041. Electrical power generation accounts for 34 percent of GHG emissions nationwide. Owing to compliance with EPA's FIP for BART, GHG emissions at FCPP would be reduced by 26 percent. Therefore, while the Proposed Action would contribute to the effects of climate change, its contribution relative to other sources would be minor in the short- and long-term (i.e., within EPA precision limits of -2 to +5 percent) since FCPP contributes about 0.6 percent of GHG emissions from electric power generation nationwide and about 0.2 percent of all GHG emissions nationwide, as shown in Table 4.6-5. The contribution would be approximately 26 percent less than historic emission levels owing to compliance with EPA's FIP for BART (99.9 percent of the reduction stems from closure of Units 1, 2, and 3).

4.6.2 No Action Alternative

The Navajo Mine is the sole supplier of coal to FCPP, and the Pinabete Permit Area of the Navajo Mine has been permitted under a separate permit application process that concluded in June 2015. Under the No Action Alternative, the combustion-related impacts at the FCPP would remain as described for the Proposed Action through July 2016 as the current coal stockpiles are used. The SCC for the No Action Alternative is the same as under the Proposed Action Alternative, because it is assumed that FCPP will continue to operate at current levels through 2016. Following July 2016, should additional mining not be approved in Area IV North, NTEC may elect to proceed with mining in the Pinabete Permit Area under a revised SMCRA permit. However, after the revised permit is submitted, OSMRE would be required to comply with NEPA prior to making a decision on any potential SMCRA permit revision to the Pinabete Permit. Alternatively, under the No Action Alternative, the Navajo Mine and FCPP could potentially shut down once all coal reserves are combusted.

The effects of this shut-down has been evaluated in Section 4.2.4.5 of the FCPP/NMEP EIS and this discussion is incorporated by reference as follows:

> *Under the No Action Alternative, the currently permitted supply of coal from Navajo Mine SMCRA Permit Area would run out in 2016, and mining operations and resultant emissions would permanently cease. Since the mine is the sole supplier of coal to FCPP, power plant operation and resultant emissions would also permanently cease in 2016. Navajo Mine would be closed and FCPP would be decommissioned. [Table 4.6-7] shows estimated stationary and mobile source emissions under this scenario during 2014 and 2015. Beginning in 2016, mine closure would involve reclamation and conservation work, and power plant decommissioning would involve dismantling and salvage work; however, not all of these tasks are presently defined, therefore this analysis is beyond the scope of this study. Emissions resulting from equipment used to demolish and abandon FCPP (post 2016) would be minor in comparison to the action alternatives.*

Table 4.6-7 Estimated GHG Emissions under the No Action Alternative – FCPP and Navajo Mine (Including the Navajo Mine SMCRA Permit Area and Pinabete SMCRA Permit Area)

Year	CO_2e Sources Stationary MT/yr	CO_2e Sources Mobile MT/yr	CO_2e Sources Combined MT/yr
2014	14,006,400	104,400	14,110,800
2015	14,006,400	104,400	14,110,800
2-Year Total	28,012,800	208,800	28,221,600

Sources: EPA 2012b, h.

Notes: Values rounded to nearest 100 metric tonnes (MT)
CO_2e = carbon dioxide equivalents
Mobile = mining equipment and mine and power plant support vehicles
MT = 1,000 kg or 2,204.6 lbs
MT/yr = metric tonnes per year
Stationary = power plant emissions per 2005-11 baseline period (Units 1, 2, 3, 4, and 5)

4.6.3 Climate Change Mitigation Measures

EPA issued its FIP for BART at FCPP to control NO_x emissions, which led to changes in the affected environment. As a result of the BART ruling, APS shut down Units 1, 2, and 3 on December 30, 2013. This step results in a substantial reduction in the GHG emissions from FCPP. As a result of implementing the steps required for BART compliance, GHG emissions from the FCPP would be reduced by a minimum of 26 percent (future PTE vs. historic baseline), and as a result of the GHG emission reductions from BART compliance, the percentage contribution of FCPP to regional GHG emissions will decrease from approximately 17 percent to approximately 12 percent.

The Proposed Action, including the continuing operations of Navajo Mine, FCPP, and the transmission lines, by itself, would not result in a major contribution to adverse effects associated with climate change. Therefore, no additional mitigation is recommended. Draft CEQ guidance on climate change analysis (CEQ 2014) proposes that agencies should consider mitigation measures to reduce GHG emissions, subject to reasonable limits based on feasibility and practicality. The FCPP/NMEP EIS considered alternatives to coal combustion. The Navajo Mine proponents explored the feasibility of methane capture similar to the drilling processes used in commercial coalbed methane extraction. Methane in the Navajo Mine coal seams exists in a very low pressure environment, which would require the seams to be pressurized during the extraction process. Additionally no infrastructure, such as pipeline collection systems, is near enough to the mine to make collection and resale feasible. Therefore, due to low pressure in the coal seams and lack of infrastructure to bring captured methane to market, mine methane capture was determined to be infeasible.

4.7 Vegetation

4.7.1 Impact Assessment Methodology

Impact analyses and conclusions are based on the best available scientific literature, a thorough analysis of the potential effects of the project, and the professional judgment of the biologists and ecologists who completed the evaluation. Impacts are quantified where possible. In the absence of quantitative data, best professional judgment was used. For vegetation resources, an impact would be considered significant if it resulted in a substantial loss of habitat function or the disruption of life history requirements of a species, or plant population, which would make them eligible for listing under the Federal ESA, or would limit the recovery of a listed species.

This analysis was developed using existing reports and Geographic Information System (GIS) data, collected from past field surveys and inventories. Acres of surface disturbance for each plant community were calculated by overlaying the Project Area boundaries on the vegetation maps. The affected area includes all portions of the Project Area that would be directly disturbed by mining activities and indirectly impacted by fugitive dust.

4.7.2 Impacts

The types of impacts to vegetation would be common to both alternatives. The differences between the alternatives would be the amount and type of vegetation impacted. Table 4.7-1 shows impacts to vegetation by community for the No Action and Proposed Action. Surface disturbance in mining areas, or areas disturbed for transportation, would physically remove native vegetation resulting in direct impacts. Vegetation removal would result in short- or long-term impacts depending on the plant community, the extent of the impact, and the success of revegetation.

Table 4.7-1. Impacts to Vegetation Communities

Vegetation Community	No Action (Acres)	Proposed Action (Acres)
Alkali Wash	100	238
Arroyo Shrub	28	32
Badlands	479	689
Dunes	0	10
Sands	89	206
Thinbreaks	5	89
Disturbed*	626	626
Total**	1,327	1,890

Notes:
* This classification accounts for areas previously cleared in preparation for mining in Area IV North, as well as those affected by the construction of power lines and ancillary roads. A description of these areas is provided in Section 3.7.
** Acreage totals approximate those presented in Section 2 due to rounding per component and vegetation community type.

Reclamation would restore vegetation to the disturbed areas of the Project Area using an approved native seed mix. Revegetation would replace existing plant communities with native grass, forb, and shrub species to establish a post-mining land use of grazing and wildlife habitat. As a result, not only would species composition change, but also post reclamation vegetation cover would increase in most areas reclaimed, especially where badlands communities are replaced with plant communities suitable for the post-mining land uses.

Vegetation adjacent to surface disturbance may be affected by windborne dust, off-road travel, and weed invasion (Elliott et al. 2009). Fugitive dust that settles on plants can block photosynthesis, respiration, and transpiration and can cause physical injuries to plants (Trombulak and Frissell 2000). Airborne dust concentrations decrease with increasing distance from the source, with the majority that can impact plant photosynthesis settling within 100 meters in arid conditions (Ellis et al. 2006). With surface disturbance, the potential for the spread or introduction of noxious weeds increases. Vehicles, people, wind, or water may transport seeds and deposit them in disturbed soils, or existing seeds may be encouraged to germinate in disturbed soils. Noxious weeds that spread can degrade habitat quality and decrease productivity of native forage. As with fugitive dust, the effects of noxious weeds can extend beyond the immediate area of disturbance. BNCC's Noxious Weed Management Plan employs multiple measures to minimize the introduction and spread of noxious weeds within Navajo Mine. These measures include the purchase of certified native seed and grass-hay mulch from credible sources.

The FCPP/NMEP EIS (OSMRE 2015) evaluated the potential effects of future emissions from the FCPP based on two ecological risk assessments (ERAs) (AECOM 2013a, b). One ERA was conducted to evaluate ecological risks to both terrestrial and aquatic environments within the area identified by air dispersion modeling as having a 1 percent future increase in soil metals concentrations above current condition (baseline) metals concentrations (AECOM 2013a). This area was defined as the deposition area, and the ERA is hereafter referred to as the Deposition Area ERA. The second ERA was conducted to evaluate the ecological risks associated with current conditions, future FCPP emissions, as well as future regional global emissions to the aquatic environment of the San Juan River within the deposition area and downstream of the deposition area into the San Juan River arm of Lake Powell (AECOM 2013b). This ERA is hereafter referred to as the San Juan River ERA. The ERA process is used to inform environmental decision making by evaluating the potential for adverse ecological effects that may occur as a result of exposure to one or more environmental stressors. The approach used in the ERAs for evaluating the potential impacts of the Proposed Action is consistent with the EPA's Guidelines for ERA (EPA 1998), ERA Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments (EPA 1997), and the Screening Level ERA Protocol for Hazardous Waste Combustion Facilities (EPA 1999). The tiered approach for risk assessment recommended by the EPA (1997, 1998) has been adopted in these ERAs. Consistent with the Screening Level ERA Protocol (EPA 1999), a conservative screening level evaluation was conducted first using maximum media concentrations and conservative assumptions. A more refined evaluation was conducted for receptors and scenarios that indicated potential risks in the screening level evaluation.

The ERA results are expressed as Hazard Quotients (HQs) whereby the target HQ of 1 represents a threshold below which adverse ecological effects are not likely and above which adverse ecological effects are possible. A summary of these methods can be found in Section 4.6.2.5 of the FCPP/NMEP EIS (OSMRE 2015), with detailed methods provided in AECOM (2013a, b).

Impacts of the Proposed Action and alternatives were based on a qualitative comparison achieved by overlaying the location of proposed activities and disturbance areas on known vegetated areas, to determine potential acreages of impacts. For vegetation resources, an impact would be considered major if it resulted in a substantial loss of habitat function or the disruption of life-history requirements of a species, or plant population, which would make them eligible for listing under the Federal ESA, or would limit the recovery of a listed species. The following criteria are used to determine impacts:

- Major. Effects that result in economically, technically, or legally eliminating the resource and subsequently make it eligible for listing under the Federal ESA, or which limit recovery of a listed species.
- Moderate. Effects that are outside of the random fluctuations of natural processes but do not cause a significant loss of the resource.
- Minor. Changes that would affect the quality of vegetation but are similar to those caused by random fluctuations in natural processes.
- Negligible. Impacts of lesser magnitude, but still predictable under current technology (e.g., computer models) or measurable under commonly employed monitoring technology.
- None. Effects that are not predicted or cannot be measured.

4.7.2.1 Proposed Action

4.7.2.1.1 Mining Activities

Under the Proposed Action, direct impacts would include removal of vegetation in the footprint of the proposed disturbance areas. Table 4.7-2 lists the acres of each plant community that would be removed by mining operations. Impacts to vegetation associated with the realignment of Burnham Road are discussed below. Badlands, Alkali Wash, and Sands vegetation community types comprise the majority of vegetation within the area. Vegetation removal would result in short-term high intensity impacts, which would last the duration of mining operations. All areas proposed to be mined would be reclaimed which would reduce impacts to vegetation in the long-term, increasing cover. Fugitive dust from mining activities could impact vegetation, particularly in areas downwind. Potential impacts from fugitive dust would be localized and decreased through the implementation of fugitive dust control measures. Surface disturbance from mining could introduce or spread existing noxious or invasive weeds resulting in long-term impacts.

Table 4.7-2. Acres of Vegetation Community Types and Percent of Total Affected by Mining Activities Under the Proposed Action (not including the Burnham Road Realignment)

Vegetation Community Type	Total (Acres)	Percent of Total
Alkali Wash	213	12
Arroyo Shrub	29	2
Badlands	657	37
Sands	192	11
Thinbreaks	88	5
Dunes	10	1
Disturbed	571	32
Total Mining *	1760	

Notes:

* The total acreage of disturbance is for proposed mining activities only and does not account for existing disturbance associated with power lines and ancillary roads or the proposed realignment of Burnham Road, which is assessed below.

4.7.2.1.2 Transportation of Coal

No new direct impacts to vegetation would occur because use is not expected to increase above baseline conditions. Traffic along existing roads and rail may result in minor quantities of dust settling on adjacent vegetation. This indirect impact would be long term and could be mitigated by use of fugitive dust control measures. Use of roads could also potentially introduce or spread noxious or invasive weeds.

4.7.2.1.3 Burnham Road

Construction of the Burnham Road realignment would remove a maximum of 75 acres of vegetation. Approximately 23 acres of vegetation associated with the driving surface and drainage structures would be permanently removed, resulting in long-term impacts. Short-term impacts would occur on the remaining acres, which would be reclaimed following construction. As shown in Table 4.7-3, Badlands comprise nearly half the total of vegetation community types within the proposed alignment.

Burnham Road realignment use would result in long-term impacts from fugitive dust settling on adjacent vegetation and the potential for introduction and spread of noxious or invasive species, which is currently occurring with the road in its present location. The only difference is the impact location would move with the proposed realignment. As described in Section 1, realignment of Burnham Road was completed following publication of the 2012 FONSI and subsequent approval by BIA. As such, no new impacts would occur.

Table 4.7-3. Acres of Vegetation Community Types and Percent of Total Affected by the Burnham Road Realignment Under the Proposed Action

Vegetation Community Type	Total (Acres)	Percent of Total
Alkali Wash	25	33%
Arroyo Shrub	3	3%
Badlands	32	43%
Dunes	0	0%
Sands	14	19%
Thinbreaks	1	1%
Total	75	100%

4.7.2.1.4 Indirect Impacts of FCPP

The ERA conducted for non-special status terrestrial plants in the FCPP/NMEP EIS (OSMRE 2015) was based on the comparison of conservative plant-protective soil screening levels to the concentrations of constituents in soils within the deposition area under current conditions as well as the predicted concentrations in soils following 25 years of future FCPP operation, 2016 through 2041. This analysis, summarized in Section 4.6 of the FCPP/NMEP EIS is incorporated by reference and included below.

> *The results for plants are presented in Table… [4.7-4]. ERA results for special status plants are presented in Section 4.8.2.*

Table 4.7-4. Comparison of HQs for Current Conditions, Future FCPP Emissions, and Current Conditions + Future FCPP Emissions for Non-Special-Status Plants

Constituent	Current Conditions Soil EPC (mg/kg)	Current Conditions HQ	Future FCPP Emissions Soil EPC (mg/kg)	Future FCPP Emissions HQ	Total HQ	% HQ from Future FCPP Emissions
Boron	8.9	18	1.5E-04	3.0E-04	18	0.0017
Chromium	11	11	4.2E-04	4.2E-04	11	0.0038
Chromium, hexavalent	1.3	1.3	5.1E-05	5.1E-05	1.3	0.0039
Selenium	0.74	1.4	5.9E-08	1.1E-07	1.4	7.9E-06
Vanadium	24	12	0.0031	0.0015	12	0.013

Notes: The EPC used to calculate HQs for non-special-status plants is the 95 percent upper confidence limit on the mean concentration (95 percent UCL), defined in the AECOM (2013a) ERA as the "Refined Maximum EPC". Only those constituents with HQs exceeding 1 for either Current Conditions or Future FCPP Emissions are shown. Total HQ is the sum of the Current Conditions HQ and the Future FCPP Emissions HQ. Values less than or equal to 0.0001 are expressed in scientific notation (e.g., 1.0E-04 = 0.0001, 1.0E-05 = 0.00001, 1.0E-06 = 0.000001, etc.).
EPC = exposure point concentration
mg/kg = milligram per kilogram
HQ = hazard quotient

The ERA results show that HQs exceed 1 for some metals under current conditions, indicating a potential for adverse ecological effects to plants. As described in AECOM (2013a) these HQs for plants are likely overestimated due to the very conservative soil screening levels used to estimate the HQs. The ERA results also show that HQs for the Proposed Action are well below 1 and contribute less than 0.01 percent to the Total HQ. This estimate is based on 25 years of continued operation of FCPP. The volume of COPECs emitted from the plant from 2012 to 2016 is a fraction of this, and thus would present a lesser risk. Based on this, the Proposed Action is not expected to increase risks above those already present, nor would they increase the risk of metals not currently identified as potential risks to a level of concern.

An organism may be at risk to adverse effects if a toxicological threshold is exceeded for a substance regardless of whether the substance is of natural or anthropogenic origin. For example, the EPA's soil ecological screening levels for barium protective of plants and invertebrates are 500 and 330 mg/kg, respectively (AECOM 2013a), yet naturally occurring soil barium concentrations are reported to range up to 1,300 mg/kg in New Mexico (USGS 1981) and up to 2,000 mg/kg across the U.S. (USGS 1984). This suggests that plants and invertebrates may be at risk of adverse effects in areas of higher naturally occurring barium concentrations.

In both the Deposition Area ERA and the San Juan River ERA, current conditions were characterized as measured COPEC concentrations in soil, sediment, surface water, and fish tissue. It is reasonable to assume that these media concentrations integrate past and present contributions over space and time that are of natural origin with those of anthropogenic origin including local, regional, and global sources, as well as historical FCPP impacts over the past 50 years. While it is not possible to accurately estimate the contribution of COPECs from each of these sources, it is possible to put the soil metals concentrations in perspective with soil metals concentration reported by the USGS for New Mexico and the continental U.S. Table… [4.7-5] compares maximum soil metals concentrations recently measured within the future FCPP deposition area (e.g., current conditions) with the range of soil metal concentrations reported for the U.S.

Table 4.7-5. Comparison of Soils Metals Concentrations in the U.S. to Soil Metals Concentration in the Future FCPP Deposition Area

Metal	Range for U.S. Soils from 1961 to 1974	Range for New Mexico Soils in 1971	Maximum for FCPP Deposition Area
Barium	10 – 5,000	250 – 1,300	836
Cadmium	<0.005 - 2	-	1.27
Chromium	1 – 2,000	7.9 – 41	17
Copper	<1 - 700	2.3 – 33	35
Lead	<10 - 700	6.5 – 22	76.1
Manganese	<2 – 7,000	58 – 710	489
Mercury	<0.01 – 4.6	0.01 – 0.07	0.055
Molybdenum	<3 - 15	0.4 – 3.5	3
Nickel	<5 - 700	3.1 – 24	23
Selenium	<0.1 – 4.3	1.4 – 10	1.77
Vanadium	<7 - 500	18 – 110	42
Zinc	<20 – 2,000	13 – 100	101

Source of data for U.S.: Shacklette and Boerngen (USGS 1984).
Source of data for New Mexico: Severson and Gough (USGS 1981).
Note: All concentrations are in units of mg/kg.

From the comparison of these data, it can be seen that recently measured soil metals concentrations within the future FCPP deposition area are generally within the range reported by the USGS for New Mexico and for the U.S. While regional variation in soil metals concentrations would be expected across the U.S., these data show that the metals concentrations currently within the deposition area (e.g., current conditions) would not be unexpected based on geological origin alone. However, it is also possible that metals concentrations measured in soils across the U.S. by the USGS in 1984 reflect a mixture comprising both a natural geologic source as well as long-term historical anthropogenic contributions. Regardless of source, the current conditions data relates directly to past and present cumulative impacts since they integrate across time and space all local, regional, and global sources including naturally occurring metals and those released from the first 50 years of FCPP emissions that may have been deposited in the San Juan basin.

4.7.2.2 Proposed Action with Conditions

Under this Alternative, impacts are the same as the Proposed Action.

4.7.2.3 No Action Alternative

Under this alternative, Area III mining would continue as permitted and would have the same impacts for mining activities described in the Proposed Action. Approximately 701 acres within Area III would be mined under this alternative. The approximately 268 acres (mine development, power lines, and ancillary roads) impacted in Area IV North following the 2005 mine plan revision approval, would be reclaimed in accordance with the existing SMCRA mine plan. Under the No Action Alternative, the combustion-related impacts at the FCPP would remain as described for the Proposed Action through July 2016 as the current coal stockpiles are used. Following July 2016, should additional mining not be approved in Area IV North, NTEC may elect to proceed with mining in the Pinabete Permit Area under a revised SMCRA permit. However, after the revised permit is submitted, OSMRE would be required to comply with NEPA prior to making a decision on any potential SMCRA permit revision to the Pinabete Permit. Alternatively, under the No Action Alternative, the Navajo Mine and FCPP could potentially shut down once all coal reserves are combusted. The effects of this shut-down has been evaluated in Section 4.6.4.5 of the FCPP/NMEP EIS and is incorporated by reference as follows:

> ***Navajo Mine***
>
> *Under the No Action Alternative mining would cease and reclamation would be conducted through 2021. Removal of ancillary mining facilities could result in some temporary disturbance of vegetated areas during demolition but these areas would be revegetated according to the approved reclamation plan. No additional disturbance to vegetation would occur under the No Action Alternative.*
>
> ***Four Corners Power Plant***
>
> *Under the No Action Alternative, the FCPP would shut down and the DFADAs would not be constructed. Demolition and dismantling of the power plant components is unlikely to result in disturbance to vegetation as power plant units and buildings are on paved areas. It is unknown if these areas would be revegetated following demolition. No direct adverse or beneficial impacts to vegetation would be anticipated as a result of the No Action Alternative.*
>
> *FCPP shutdown would eliminate deposition of air emissions from the power plant, which would reduce potentially adverse indirect effects of mercury and selenium and other metal uptake by plants in the ROI over the long term. However, since the FCPP contributes a small proportion of the COPECs in the watershed, relative to global, U.S. and other regional sources potential metal uptake by plants would not be eliminated and it is unknown if any beneficial impacts to vegetation would occur as a result of FCPP shutdown.*

4.8 Wildlife

The Analysis Area for assessing potential impacts to wildlife is the same as is considered for Federal and Navajo Nation listed species (refer to Section 3.8). The Action Area was determined based on maximum distance that a particular impact from mining could reasonably be expected to affect species. Based on the results of the noise, water, and air impact pathway analyses completed in this EA, a 1-mile radius around the Project Area is a conservatively large Action Area to assess potential impacts to wildlife from the Proposed Action.

Impacts to wildlife may include direct impacts from habitat loss, alteration, and fragmentation, as well as incidental mortality from animal-vehicle collisions, vegetation clearing with heavy equipment, or construction activities. Impacts may also include indirect impacts from noise, human presence, and the combustion of coal at the FCPP.

4.8.1 Impact Assessment Methodology

Mining, reclamation, transportation of coal, and the realignment of Burnham Road have potential to impact wildlife in the Action Area. Potential impacts are analyzed based on the best available data for the species that are known or are likely to occur in the Action Area. Indirect impacts to wildlife and habitat resulting from FCPP air emissions were evaluated through two ERAs (AECOM 2013a, b), as described in Section 4.6.1. For purposes of the wildlife impacts analysis, the severity of impacts is defined as the following:

- Low – Impacts that are detectable, but slight; that is, habitat loss in relatively small proportion (e.g., in the presence of available similar habitat).
- Moderate – Impacts that could affect individuals either through mortality, habitat loss, or stress.
- High – Impacts that could affect a species at the population level.

4.8.2 Impacts

4.8.2.1 Proposed Action

4.8.2.1.1 Navajo Mine

Mining Activities

Loss and fragmentation of wildlife habitats are inevitable consequences of surface disturbance when vegetation is removed (Crooks 2002). Therefore, direct impacts to wildlife primarily include the loss and fragmentation of Badlands, Alkali Wash, Sands, Thinbreaks, Dune, and Arroyo Shrub habitats (see Table 4.7-1). More than one-third of the vegetation removed would be Badland habitat, which has the lowest species abundance and diversity of the habitat types represented in the Project Area. Sands and Alkali Wash would be secondarily impacted by mining activities. These habitat types are relatively abundant in large areas adjacent to the mine and the western portion of the San Juan Basin. Generalist species such as coyote, black-tailed jackrabbit, desert cottontail, lizards, and small mammals utilize these habitats and are commonly documented in the reclaimed areas north of the Project Area (Areas I and II) (Ecosphere 2008, 2009a, 2009c; Hawks Aloft 2000-2007). Small mammal densities are historically low in the Project Area (BNCC 2009a) and concentrated in Arroyo Shrub habitat (Ecosphere 2004b, 2009a) due to greater availability of food and shelter relative to other area habitats.

Direct impacts from habitat loss and fragmentation would be confined to the proposed Project Area. These impacts would have low to moderate effects on wildlife in the short term, limited in severity due in part to the availability of thousands of acres of similar habitats adjacent to the Project Area. Impacts would be reduced to low in the long term after reclamation of the mined area is complete. Further, impacts would likely be limited to specialist species, such as burrowing owl and kit fox, which are less able to adapt to changes in their environment. Other direct impacts could include incidental mortality to wildlife from heavy equipment used for mining. Small, burrowing, or less mobile animals may be especially susceptible to mortality. Impacts to migratory birds, including ground and shrub-nesting species that may be present in the Project Area are discussed in Section 4.8. These direct impacts would be short term, limited to the mined area during mining activities.

Noise and human presence during mining activities would also cause direct impacts to wildlife. Wildlife species tend to avoid humans and associated disturbances. Impacts to wildlife from noise is confounded by multiple variables such as the magnitude and duration of the noise generated, proximity to the noise source, life history of the species affected, time of year (e.g., breeding vs. non-breeding season), time of day, and the influence of other environmental stressors such as heat. Wildlife that moves away from noise generally displays their response as either mild annoyance or panic behavior (Fletcher 1980). Such displacement would be localized to areas where the noise generated may cause a flee, annoyance or panic response. Based on the noise analysis described in Section 4.3, potential impacts would largely be confined to within 1-mile of the Project Area. Beyond this distance, noise attenuates to approximately ambient background noise levels. Ultimately, potential impacts depend upon the sensitivity of the species or individual subjected to the noise. Instantaneous noise such as that generated from a blasting event is more acute (louder) but of very short duration, lasting several seconds. Instantaneous noise may cause these same impact responses in wildlife at a further distance than one-mile depending upon the sensitivity of species in the area or individual to the noise. It is important to note that both constant and instantaneous noise events are part of the environmental baseline in the Action Area from ongoing mining at Navajo Mine. As the Proposed Action essentially maintains current coal production levels to 2016, there would be no quantifiable increase in Action Area noise relative to current conditions. There would be a spatial shift in where the noise is generated to Area IV North with a commensurate reduction in noise in areas currently being mined such as Hosteen/Yazzie pits in Area II and Lowe Pit in Area III.

Displacement could push individuals from preferred habitat into less suitable habitat. These impacts can also predispose an individual to predation or increase the potential for animal-vehicle collisions. Stress can also reduce fitness and reproductive success. Indirect impacts dependent on the aforementioned variables, would initially be low to moderate over the short term until the area is reclaimed, decreasing in severity to low over the long term. Conversely, some predator species may benefit from stressed or less-fit prey that is easier to catch. Raptor species may avoid such areas and potentially alter nesting and roosting sites to avoid disturbances (Larkin 1996). Noise and human presence may also disrupt breeding, cause nest abandonment, or loss of young if disturbances occur during the breeding season of raptors and other migratory birds. Although direct impacts from noise and human presence are expected to be low to moderate over the short term, some wildlife may permanently leave the area or, especially in the case of raptors, choose to nest elsewhere. With that said, raptors have been monitored at Navajo Mine since 1993 and although such impacts may be detrimental to an individual, raptor populations in the Action Area have remained stable.

Fugitive dust generated by mining activities would also directly impact individual wildlife in the vicinity of mining activities by impairing visibility and possibly respiration. Fugitive dust emissions would likely be greatest near mining activities, especially during high winds. Impacts to individuals near mining activities would likely be low to moderate and occur over the short term depending on the proximity, intensity, and duration of exposure, as well as the species, time of year, and other environmental conditions.

Coal Transportation

Transportation of coal from Area IV North and Area III to the FCPP would involve use of existing roads and rail system at Navajo Mine. Mine activities for the Proposed Action would not create an increase above the current condition in the number and type of vehicles using the roads or train trips to transport coal. Infrequent animal vehicle collisions with truck and train travel would be expected to occur at levels commensurate with current truck and rail activity. These low, short-term impacts would persist until coal-hauling activities begin to decline around 2016.

Burnham Road

Realigning Burnham Road would result in a maximum of 75 acres of new surface disturbance. The primary habitat affected by the Burnham Road realignment would again be Badlands and Alkali Wash (see Table 4.7-3). Vegetation removal would result in direct habitat loss for wildlife as previously described. Wildlife habitat would be fragmented because of the Burnham Road realignment. Alkali Wash habitat is typically associated with minor waterways and therefore may serve as discrete travel corridors for predators needing to travel large distances with some relative cover. Other vegetation communities that would be lost include Sands, Thinbreaks, and Arroyo Shrub. Those individuals in the path of the realignment would be permanently impacted by habitat loss, alteration, and fragmentation, but the number of acres lost is relatively small and considering the surrounding available habitat impacts would be low. Small mammals have been documented utilizing Alkali Wash habitats, as well as Sands and Arroyo Shrub habitats, albeit in low abundance. Herptiles are also common in these habitats. Carnivore and raptor species dependent on small mammal species and herptiles for prey could also be indirectly impacted, both beneficially (carrion availability along the roadway) and adversely (indirect impacts associated with human activity). Habitat loss and fragmentation would be permanent. Therefore, direct impacts from habitat loss would be low to moderate and long term. Direct and indirect impacts are similar in type as those previously described under mining activities and would be low and long term. As discussed in Section 1, realignment of Burnham Road is already complete. This action was completed following publication of the 2012 FONSI and approval from BIA. As such, no new impacts would occur.

Reclamation

All areas proposed to be mined under the Proposed Action would be reclaimed. BNCC performs reclamation at Navajo Mine pursuant to its SMCRA permit (BNCC 2009a) commencing once an area is mined out, and as soon as practical considering that some infrastructure may impede immediate reclamation. Reclamation would result in the restoration of vegetative cover, though the species composition and density would be different from that which was disturbed. Wildlife could return to mined areas following reclamation, although the species that use the areas may be different.

4.8.2.1.2 Indirect Impacts of FCPP

The FCPP/NMEP EIS (OSMRE 2015) included a detailed analysis of the potential impacts of emissions from the FCPP on wildlife in Section 4.7. This analysis is incorporated here and is summarized below for reference.

Wildlife may be affected by air pollutants through direct inhalation, consumption, and absorption of gases through the skin. In general, only soft-bodied invertebrates or amphibians are affected by the absorption of air pollutants through their skin. Compounds including O_3, SO_2, and NO_2 have particularly negative impacts on the respiratory systems of animals. Other chemical pollutants may accumulate in the tissues of both plants and wildlife, which can lead to tissue damage and genetic mutations (AECOM 2013a). The accumulation of chemical pollutants in the tissues of wildlife can also have additive impacts among higher trophic levels. Wildlife at higher food chain (trophic) levels, such as carnivores, may accumulate much greater concentrations of chemicals through their regular diet, as they consume organisms lower in the food chain. The rate of biomagnification or bioaccumulation varies depending on the chemical, species involved, frequency and magnitude of exposure, and trophic level, among other factors. Concentrations of compounds in wildlife at higher trophic levels can reach levels to cause adverse impacts to behavior, reproduction, longevity, or disease resistance, and even cause death. The concentrations of chemical air pollutants to which wildlife in the ROI would be exposed are expected to be variable and dependent upon location and local environmental factors.

The results for non-special status wildlife and fish are presented in Tables 4.8-1 and 4.8-2, respectively. ERA results for special status wildlife and fish are presented in Section 4.8.4. The ERA results show that HQs for some metals exceed 1 for some species under current conditions, indicating a potential for adverse ecological impacts to wildlife. The ERA results also show that all wildlife HQs for the Proposed Action are well below 1 and with two exceptions contribute less than 1 percent to the Total HQ. The two exceptions are willow flycatcher exposure to methylmercury in Morgan Lake and willow flycatcher exposure to mercury in the San Juan River, corresponding to 4.4 percent and 8.7 percent contributions to the Total HQ, respectively. The ERA results show fish HQs exceeding 1 under current conditions indicating a potential for adverse ecological impacts to fish already exist. The ERA results also show that fish HQs for the Proposed Action are well below 1 and contribute less than 1 percent to the Total HQ. The San Juan River ERA also evaluated potential risks to fish in the San Juan River downstream to San Juan River arm of Lake Powell for arsenic, mercury, and selenium (AECOM 2013b). Wildlife and fish HQs reported in the risk assessment for San Juan River reaches downstream of the deposition area and into the San Juan River arm of Lake Powell were on the same order of magnitude as reported for the San Juan River within the deposition area, with contributions from future emissions from FCPP to the Total HQs being less than 1 percent for all constituents and receptors evaluated. These ERA results are based on 25 years of continued operation of FCPP. The emissions associated with operations from 2012 to 2016 would be a fraction of this, and would have a lesser impact. Based on these evaluations, while risks associated with chemical exposure occur within the ROI under current conditions, no substantive additional risks to wildlife and fish are expected to occur within the deposition area as a result of operations of the FCPP from 2012 to 2016, and impacts from the Proposed Action are not expected to increase the concentration of metals whose current HQ is less than 1 to a level of concern.

Table 4.8-1. Comparison of HQs for Current Conditions, Future FCPP Emissions, and Current Conditions + Future FCPP Emissions for Non-Special-Status Wildlife

Species / Constituent	Current Conditions ADD (mg/kg-d)	Current Conditions NOAEL-based HQ	Current Conditions LOAEL-based HQ	Future FCPP Emissions ADD (mg/kg-d)	Future FCPP Emissions NOAEL-based HQ	Future FCPP Emissions LOAEL-based HQ	Total LOAEL-based HQ	Percent HQ from Future FCPP Emissions
Little brown bat								
Cadmium	2.3	3.0	0.30	2.6E-06	3.4E-06	3.4E-07	0.30	1.1E-04
Nickel	3.4	2.0	1.0	5.3E-08	3.1E-08	1.6E-08	1.0	1.6E-06
Selenium	0.33	2.3	1.5	2.1E-06	1.5E-05	9.7E-06	1.5	6.5E-04
Zinc	130	1.7	0.44	0.14	1.9E-03	4.8E-04	0.44	0.11
Dusky shew								
Cadmium	0.94	1.2	0.12	1.1E-06	1.4E-06	1.4E-07	0.12	1.2E-04
Willow Flycatcher – Morgan Lake								
Chromium	6.2	2.3	0.40	0.0011	4.0E-04	6.8E-05	0.40	0.017
Copper	12	2.9	0.97	0.0023	5.6E-04	1.9E-04	0.97	0.020
Lead	26	16	7.9	3.5E-04	2.1E-04	1.1E-04	7.9	0.0014
MeHg	0.017	2.6	0.26	7.7E-04	0.12	0.012	0.27	4.4
Selenium	2.8	9.8	4.9	9.8E-05	3.4E-04	1.7E-04	4.9	0.0035
Mallard Duck – Morgan Lake								
Lead	7.4	4.5	2.3	7.7E-05	4.7E-05	2.4E-05	2.3	0.0010
Selenium	0.80	2.8	1.4	2.9E-05	9.9E-05	4.9E-05	1.4	0.0035
Bald Eagle – Morgan Lake								
Selenium	0.74	2.6	1.3	2.0E-05	6.8E-05	3.4E-05	1.3	0.0026
Willow Flycatcher – San Juan River								
Copper	5.9	1.5	0.49	0.0025	6.1E-04	2.0E-04	0.49	0.041

Species / Constituent	Current Conditions ADD (mg/kg-d)	Current Conditions NOAEL-based HQ	Current Conditions LOAEL-based HQ	Future FCPP Emissions ADD (mg/kg-d)	Future FCPP Emissions NOAEL-based HQ	Future FCPP Emissions LOAEL-based HQ	Total LOAEL-based HQ	Percent HQ from Future FCPP Emissions
Lead	2.4	1.5	0.74	1.1E-04	6.8E-05	3.4E-05	0.74	0.0046
Mercury	0.041	1.1	0.23	0.0036	0.091	0.020	0.23	8.7
MeHg	0.043	6.6	0.66	2.8E-05	0.0044	4.4E-04	0.66	0.067
Selenium	0.70	2.4	1.2	2.7E-05	9.2E-05	4.6E-05	1.2	0.0038
Mallard Duck – San Juan River								
MeHg	0.0082	1.3	0.13	4.4E-06	6.8E-04	6.8E-05	0.13	0.052
Canvasback Duck – San Juan River								
Chromium	3.8	1.4	0.24	1.3E-08	5.0E-09	8.4E-10	0.24	3.5E-07
Lead	6.5	4.0	2.0	3.6E-05	2.2E-05	1.1E-05	2.0	5.5E-04
MeHg	0.0081	1.3	0.13	3.1E-08	4/8E-06	4.8E-07	0.13	3.7E-04
Bald Eagle – San Juan River								
MeHg	0.020	3.1	0.31	5.1E-06	7.9E-04	7.9E-05	0.31	0.025
Muskrat – San Juan River								
Chromium	3.4	1.4	0.35	1.1E-08	4.5E-09	1.1E-09	0.35	3.1E-07
Lead	5.8	1.2	0.65	3.3E-05	3.7E-06	3/7E-06	0.65	5.7E-04

Notes: The EPC used to calculate HQs for non-special-status plants is the 95percent upper confidence limit on the mean concentration (95 percent UCL), defined in the AECOM (2013a) ERA as the "Refined Maximum EPC." Only those constituents with HQs exceeding 1 for either Current Conditions or Future FCPP Emissions are shown. Total LOAEL-based HQ is the sum of the Current Conditions LOAEL-based HQ and the Future FCPP Emissions LOAEL-based HQ. Values less than or equal to 0.0001 are expressed in scientific notation (e.g., 1.0E-04 = 0.0001, 1.0E-05 = 0.00001, 1.0E-06 = 0.000001, etc.).

EPC = exposure point concentration

HQ = hazard quotient

LOAEL = lowest observable adverse effect level

MeHg = methyl mercury

NOAEL = no observable adverse effect level

Table 4.8-2. Comparison of HQs for Current Conditions, Future FCPP Emissions, and Current Conditions + Future FCPP Emissions for Non-Special-Status Fish

Constituent	Current Conditions Sediment EPC (mg/kg)	Current Conditions Early Life HQ	Current Conditions Adult HQ	Future FCPP Emissions Sediment EPC (mg/kg)	Future FCPP Emissions Early Life HQ	Future FCPP Emissions Adult HQ	Total HQ	Percent HQ from Future FCPP Emissions
Fish – Morgan Lake								
Chromium	1.1	8.9	NC	4.9E-08	3.8E-07	NC	8.9	4.3E-06
Chromium, hexavalent	0.14	1.1	NC	2.7E-07	2.1E-06	NC	1.1	1.9E-04
Nickel	0.57	29	NC	5.1E-08	2.5E-06	NC	29	8.6E-06
Selenium	3.5	6.5	190	1.2E-07	2.2E-07	6.6E-06	190	3.5E-06
Zinc	26	6.7	NC	1.7E-08	4.3E-09	NC	6.7	6.4E-08
Fish – San Juan River								
Chromium	0.44	3.5	NC	3.7E-08	2.9E-07	NC	3.5	8.3E-06
Lead	0.37	NC	1.1	7.8E-07	NC	2.3E-06	1.1	2.1E-04
Mercury	0.093	3.7	NC	9.7E-06	3.9E-04	NC	3.7	0.011
MeHg	0.093	1.3	NC	2.4E-05	3.4E-04	NC	1.3	0.026
Nickel	0.42	21	NC	1.1E-08	5.4E-07	NC	21	2.6E-06
Selenium	0.85	1.6	47	2.5E-05	4.7E-05	0.0014	47	0.0030
Zinc	34	8.7	NC	1.9E-08	5.0E-09	NC	8.7	5.7E-08

Notes: The EPC used to calculate HQs for non-special-status fish is the 95percent upper confidence limit on the mean concentration (95 percent UCL), defined in the AECOM (2013a). ERA as the "Refined Maximum EPC." Only those constituents with HQs exceeding 1 for either Current Conditions or Future FCPP Emissions are shown. Total HQ is the sum of the Current Conditions HQ and the Future FCPP Emissions HQ. The Total HQ shown is the higher of the Total Early Life HQ and the Total Adult HQ. Values less than or equal to 0.0001 are expressed in scientific notation (e.g., 1.0E-04 = 0.0001, 1.0E-05 = 0.00001, 1.0E-06 = 0.000001, etc.).

EPC = exposure point concentration

HQ = hazard quotient

MeHg = methyl mercury

Diversions from the San Juan River

Surface water drawn from the San Juan River into Morgan Lake for use at the FCPP is obtained according to water rights for diversion of 51,600 acre-feet per year, 39,000 acre-feet per year consumptive use held by BBNMC, with average withdrawals of 27,682 acre-feet per year. With the closure of Units 1-3, the diversion of water for use at the FCPP is expected to decrease by approximately 5,000-7,000 acre-feet per year. No changes to the water rights or water use would occur under the Proposed Action, and NTEC (and the FCPP) would maintain the ability to draw as much water as the rights allow for the Project life. This may affect the amount and quality of habitat available for fish, including Colorado pikeminnow and razorback sucker (USFWS 2002a, b). The full amount of the consumptive water right available under Permit 2838 has been accounted for in the San Juan River Recovery Implementation Program's water accounting and factored into the flow recommendations for the San Juan River (BOR 2006, USFWS 2006). The consumptive water rights of 39,000 acre-feet per year represent approximately 6 percent of the total depletions of the San Juan River in New Mexico and about 4.5 percent of the total basin depletions. Taking the average historic use and subtracting the 5,000 acre-feet per year not used due to the shutdown of Units 1-3, results in about 3.7 percent of New Mexico depletions and 2.7 percent of total basin depletions. Based on the amount of flow affected, the effect of Project specific depletions would not be expected to substantially affect aquatic species or their habitat, relative to baseline conditions. This diversion has occurred since the water right was granted, and does not represent a new impact.

Fish Entrainment

The intakes to supply water to Morgan Lake from the San Juan River likely result in the entrainment of fish from the San Juan River. These intakes consist of two 10- by 10-foot intakes at the APS diversion and are screened with 1- by 3-inch mesh screens. The approach velocity to these screens is 0.38 foot per second. The intakes are run in two modes, pumping either 17,000 or 32,000 gpm (approximately 37 and 71 cfs, or 24.5 and 46 million gallons per day, respectively) from the San Juan River. The intake is operated at any time of day, as needed. The 17,000 gpm mode is generally used during the October to May timeframe, when average monthly flows in the river at Farmington are between 784 to 3,490 cfs (USGS Gaging Station 9365000, 2004 to 2013 water years). The 32,000 gpm mode is generally used during the May through October timeframe, when average monthly flows in the river were between 913 to 3,316 cfs. Thus, the maximum proportion of flow diverted to Morgan Lake is 4.7 percent during the October to May timeframe, and 7.8 percent in the June to September timeframe.

No entrainment studies have been conducted at this diversion. Fish species, behavior, and swimming performance affect entrainment risk, as do the configuration of the diversion, and conditions in the river. These factors are poorly known for the species in the San Juan River. For fish with planktonic larvae, these larvae are often assumed to be entrained in proportion to the amount of flow diverted, as they tend to drift with the current. However, older lifestages are generally capable of directing their movements independently from the current. For these species, the proportion of flow diverted is likely less indicative of entrainment risk. A study of entrainment at four other diversions (Hogback, Fruitland, Farmers Mutual, and Jewett canals) along the San Juan River was conducted in 2004 and 2005 (Renfro et al. 2006). This study found that most fish captured in the diversions were either small species, or younger lifestages of larger species, although some larger individuals were captured. At Hogback Canal, 70 percent of the fish captured were red shiner and 17 percent were speckled dace. Flannelmouth sucker and bluehead sucker represented 4.8 and 3.3 percent of the total catch, respectively. All other species represented 10 percent of the catch. Catch at both Fruitland Canal and Jewett Canal was dominated by flannelmouth sucker and bluehead sucker, with speckled dace being the third most abundant species. The catch at Farmers Mutual Canal was much smaller than at other diversions and dominated by young lifestages of largemouth bass, with flannelmouth sucker and speckled dace being similar in abundance. Some Colorado pikeminnow were captured, but no razorback suckers were observed. Entrainment of these species is discussed in Section 4.9. The study shows a pattern of decreasing fish catch with the size of diversion, with most fish being captured at Hogback Diversion, where diversion rates ranged from 100 to 150 cfs, and the fewest fish being captured at Farmers Mutual Canal, where diversion rates were estimated to be about 50 cfs and the other diversions falling in between. The amount of water diverted to Morgan Lake (37 or 71 cfs) is near the lower end of this spectrum, suggesting relatively low entrainment rates, although other factors may influence entrainment, as described above. Based on this information, entrainment at the project intakes would not be expected to have a population level effect on fish populations in the San Juan River. This entrainment would decrease with reduced diversions associated with the shutdown of Units 1-3. As the entrainment associated with diversions has occurred since FCPP was brought on line in 1963, this would not represent a new impact over existing conditions.

Fish Passage at APS Weir

The APS weir may impede upstream passage for fish. This was studied for Colorado pikeminnow and razorback sucker at flows between 500 and 5,000 cfs (Bio-West 2005), and is discussed in Section 4.9.2. This study did not evaluate passage conditions for other species in the San Juan River, but it is reasonable some impairment of upstream fish passage at this structure occurs, although the flow range would vary depending on the species swimming abilities. Most fish species in the San Juan are abundant both above and below the APS Weir, with the exception of the two listed species. Thus, while the weir may present some discontinuity in between the populations downstream of the weir and those upstream, the native fish populations in both areas are strong and expected to remain so. Downstream movement of fish is not impaired, and upstream movement is expected to occur over portions of most years so that the two sub-populations would continue to operate as a single population. Thus, this upstream passage impairment is not expected to reduce survival of individuals or to have population level impacts. This is an ongoing effect of the project and does not represent a new impact.

Release of Non-native Fish from Morgan Lake

Morgan Lake discharges into No Name Wash, which drains to the Chaco River and from there into the San Juan River. Morgan Lake supports several species of non-native fish, including bluegill, largemouth bass, white crappie, gizzard shad, common carp, and channel catfish. Discharges from Morgan Lake could result in the release of non-native species into the San Juan River. No studies have been conducted to evaluate this potential. Non-native fish, particularly channel catfish and common carp (Duran et al. 2013, Gerig and Hines 2013), have been identified as one of the threats to both Colorado pikeminnow and razorback sucker, and may also affect other native fish. Non-native fish have the potential to compete with and prey upon native fish and may also serve as vectors for disease and parasites. While the San Juan River currently supports populations of several of these non-native fish, release of these fish from Morgan Lake could help support these populations. These non-native fish also occur in Navajo Reservoir, which may also support populations of these species in the San Juan River. Some of the non-native fish in Morgan Lake (e.g., gizzard shad) do not have populations in the San Juan River, and if such populations became established, they could exacerbate the existing non-native fish problem, as they may prey on eggs, larval and post-larval fish. The San Juan River tends to have a relatively high gradient, and thus may not provide much suitable habitat for these non-native fish, and as many of these fish also occur in Navajo Lake, it is likely that those fish that the San Juan provides suitable habitat for have already established populations (i.e., channel catfish and carp are already the focus of invasive species control efforts, bass and sunfish have been observed in the San Juan River in low numbers [Ryden 2012, Gilbert et al. 2012, Schleicher and Ryden 2013]). The degree to which non-native fish released from Morgan Lake may support existing populations of non-native fish, or may consume or compete with native fish is unknown. Given existing populations of non-native fish in the San Juan River, the length of time that Morgan Lake has been in operation and has served as a source of non-native fish, other sources of non-native fish in the basin, it is unlikely that continued operation of Morgan Lake would cause a substantial impact in the future, but the potential for moderate impacts is present. This potential impact has been in existence for many years, and does not represent a new impact to native fish in the San Juan River.

4.8.2.2 Proposed Action with Conditions

Under this Alternative, impacts would be the same as those described for the Proposed Action.

4.8.2.3 No Action Alternative

Under the No Action Alternative, none of the described mine activities would take place in Area IV North and Burnham Road would not be realigned. Mining would continue as permitted in Area III. Impacts to wildlife from mining in Area III would be similar to that described above for the Proposed Action, except that there would be fewer acres of surface impacts (see Table 4.8-1). The approximately 268 acres (mine development, power lines, and ancillary roads) impacted in Area IV North following the 2005 mine plan revision approval would be reclaimed in accordance with the existing SMCRA mine plan. Under the No Action Alternative, the combustion-related impacts at the FCPP would remain as described for the Proposed Action through July 2016 as the current coal stockpiles are used. Following July 2016, should additional mining not be approved in Area IV North, NTEC may elect to proceed with mining in the Pinabete Permit Area under a revised SMCRA permit. However, after the revised permit is submitted, OSMRE would be required to comply with NEPA prior to making a decision on any potential SMCRA permit revision to the Pinabete Permit. Alternatively, under the No Action Alternative, the Navajo Mine and FCPP could potentially shut down once all coal reserves are combusted. The effects of this shut-down has been evaluated in Section 4.7.4.5 of the FCPP/NMEP EIS and is incorporated by reference as follows:

> ***Navajo Mine***
>
> *Under the No Action Alternative, the Navajo Mine would close; therefore, no additional loss or modification of wildlife habitat, direct impacts, or indirect impacts to wildlife would occur. Upon permit expiration, NTEC would begin reclamation activities within the Navajo Mine until all requirements of the existing SMCRA permit are met.*
>
> ***Four Corners Power Plant***
>
> *Under the No Action Alternative, Units 4 and 5 would be shut down and the FCPP would be decommissioned and demolished. Wildlife would be disturbed as a result of increased noise and dust during demolition; however, these impacts would be short term. Upon*

completion of demolition activities, wildlife could return to the area depending on site conditions after either the decommissioning or the demolition.

4.9 Threatened and Endangered and Sensitive Species

4.9.1 Impact Assessment Methodology

Impacts to threatened and endangered species would be considered significant if the action were to result in serious, long-term affects to the species or their habitat. Impacts would be considered significant if for example it resulted in: (1) habitat loss or fragmentation to the extent that wildlife could not maintain viable populations on the Navajo reservation, (2) disturbance to or removal of potential habitat for current Federally listed or candidate species to the extent that such populations could not exist or become established in the Action Area, or (3) loss of any Federally listed species, or loss of critical habitat of such species, that would be considered a take under the ESA.

The methodology for determining impacts to threatened and endangered species was based upon evaluations of existing data, consideration of the environmental baseline, habitat associations, discussions with the NNDFW and the USFWS, and field investigations and analyses. Potential impacts related to atmospheric emissions from the FCPP were evaluated based on a review of the results of deposition modeling for the FCPP and the ERAs prepared for the FCPP and NMEP (AECOM 2013a, b), described in detail in Section 4.7. This section summarizes the impacts and effect determinations made in the 2012 BE (Appendix D) for Navajo Nation species of concern, and the 2015 BA addressing the potential effects of the combustion of the coal to be mined under the Proposed Action (Appendix G) as well as the BO for the FCPP and NMEP.

4.9.2 Impacts

A detailed assessment of impacts and assessment methodologies can be found in the BE and BAs prepared for this project (Appendices D and G). Impacts are summarized below.

4.9.2.1 Proposed Action

4.9.2.1.1 Federally Listed Species

Effects to Federally listed species resulting from the Proposed Action are summarized in Table 4.9-1. No adverse impacts, as described above, have the potential to occur to any Federally-listed species. Pursuant to the 2012 Section 7 consultation conducted for the Proposed Action, the proposed project "may affect but is not likely to adversely affect" the Southwestern willow flycatcher, primarily through disturbance from human presence and noise from mining activities. Impacts are considered improbable as they relate to infrequent occurrences of this species in adjacent poor quality habitats coinciding with instantaneous noise events (e.g., blasting event) and possibly from blowing fugitive dust. There would be no adverse impacts to this species post mining and reclamation and possibly beneficial impacts associated with CWA mitigation requirements dealing with riparian habitat enhancement and creation along the San Juan River (refer to the BE in Appendix D).

In addition, OSMRE prepared a separate BA addressing the deposition of emissions from the FCPP from coal burned during the time period of the Proposed Action, from September 1, 2015 to July 6, 2016 in accordance with informal consultation with the USFWS. The BA concludes that the project "may affect but is not likely to adversely affect" the Colorado pikeminnow and razorback sucker, southwestern willow flycatcher and yellow-billed cuckoo, as a result of deposition of emissions from the FCPP. Given the limited term of the Proposed Action, the fact that the environmental conditions beginning in January 2016 will include legally binding conservation measures and reasonably prudent measures that will ameliorate the conditions for the listed species, the incorporation of conservation measures in the Proposed Action to (1) not authorize mining of Area IV North coal until after the 2015 spawning season for Colorado pikeminnow and razorback sucker, and (2) to temporarily shut down the San Juan River water intakes during the fall 2015 stocking season for these fish species, OSMRE concludes that the Proposed Action will not affect the continued existence of endangered or threatened species or result in destruction or adverse modification of their critical habitats, as determined under the ESA of 1973 (16 USC 1531 et seq.). The analysis includes species considered threatened or endangered by the Navajo Nation. This is discussed in greater detail in 4.9.2.1.4.

Table 4.9-1. Effects to Federally Listed Species

Species	Preliminary Determination of Effect
Mexican spotted owl	No Effect
California condor	No Effect
Southwestern willow flycatcher	May affect, not likely to adversely affect
Yellow-billed cuckoo	May affect, not likely to adversely affect
Sprague's pipit	No Effect
Colorado pikeminnow	May affect, not likely to adversely affect
Razorback sucker	May affect, not likely to adversely affect
Zuni bluehead sucker	No Effect
Knowlton's cactus	No Effect
Mancos milkvetch	No Effect
Mesa Verde cactus	No Effect
Canada lynx	No Effect

4.9.2.1.2 Navajo Nation Listed Species

Potential impacts to Navajo Nation listed species resulting from the Proposed Action are summarized in Table 4.9-2 below. Those species dually listed under the Federal ESA (southwestern willow flycatcher, Mancos milkvetch, and Mesa Verde cactus) are addressed above in Table 4.9-1.As described in Section 3.9, based on field surveys and discussions with the NNDFW, and USFWS, detailed evaluations were not conducted for the black-footed ferret, peregrine falcon, or mountain plover as it was determined that no impacts would occur to these species. Impacts to kit fox, golden eagle, ferruginous hawk, western burrowing owl, and San Juan milkweed result primarily from habitat loss and modification and secondarily from disturbance from mine-related noise and human presence in the area. Impacts to the listed animal species are expected to be short term, as reclamation would create suitable habitat for these species. The loss of 10 acres of dune habitat suitable for San Juan milkweed is expected to have minor but long-term effects since that habitat would not be restored post reclamation. Given the abundance of suitable habitat within this species distribution, habitat loss under the Proposed Action would result in impacts to individuals, but would not be expected to result in population level impacts. Impacts are not likely to result in a loss of species viability range-wide.

Table 4.9-2. Impacts to Navajo Nation Listed Species

Species	Determination of Effect
Black-footed ferret	No Impacts
Kit fox	May Impact Individuals
Ferruginous hawk	May Impact Individuals
Golden eagle	May Impact Individuals
American peregrine falcon	No Impacts
Mountain plover	No Impacts
Western burrowing owl	May Impact Individuals
San Juan milkweed	May Impact Individuals

4.9.2.1.3 Migratory Birds

Direct effects associated with mining and the construction of Burnham Road would include the temporary loss of potential nesting and foraging habitat for ground and shrub-nesting birds. Mined areas would eventually be reclaimed—creating new habitat for migratory birds. As discussed above for Federally and tribally protected species, there may be disturbance to individuals from noise and increased human presence during mining, transportation of coal, and road construction and use. Direct effects to migratory birds would be greater should ground clearing occur during the breeding season of April 15 through July 15 when nests and nestlings could be lost. Indirect effects could include nest abandonment during mining or construction in adjacent areas, degradation of habitat from invasive species introduction, mortalities associated with use of area haul and public roads, and decreased mammal prey base for raptors due to loss of habitat. Short-term effects would include avoidance of the area during mining and mining-related activities and road construction, and displacement of individuals to adjacent habitats. Once the area is reclaimed, migratory birds would be expected to return to the area for nesting and foraging.

Although some individuals would be displaced to suitable adjacent habitats for the duration of mining activities, there is the potential for nest destruction or abandonment—the amount of habitat affected for the short term would impact only a few individual territories. Therefore, no population level impacts are expected to occur under the Proposed Action.

4.9.2.1.4 FCPP Coal Combustion

The assessment of ecological risks to non-special status plants and non-special status wildlife and fish associated with current conditions and the Proposed Action were presented in Sections 4.6.2.1.2 and 4.7.2.1.2, respectively. For State of New Mexico and Navajo Nation special status species plants, wildlife, and fish, the generic plant and fish HQs presented in those sections would apply. The relationship between representative wildlife species and special status species, as summarized by AECOM (2013a), is presented in Table 4.9-3. The ERA results indicate that the HQs resulting from FCPP emissions are all much less than one, and further indicate that those emissions would not substantially increase the risk to those species over baseline conditions. Note that these results evaluate the potential risks of 25 years of additional operation of FCPP. Operations from 2012 through 2016 would represent a fraction of the volume of COPECs evaluated and thus would have a lesser risk.

Table 4.9-3. Representative Wildlife Receptors Corresponding to Special Status Species that may occur within the Deposition Zone

Special Status Species	Representative Wildlife Receptors
Mexican spotted owl (U.S.-threatened, NESL G3), golden eagle (NESL G3; Hopi Cultural Sensitive Species), ferruginous hawk (NESL G3; BLM-sensitive), peregrine falcon (NM-threatened), western burrowing owl (BLM-sensitive)	Red-tailed hawk
Bald eagle (NESL G2; Hopi Cultural Sensitive Species; NM Threatened), common black-hawk (NM-threatened)	Bald eagle
American dipper (NESL G3)	Mallard duck
Gray vireo (NM-threatened)	American robin
Southwestern willow flycatcher (U.S.-endangered; NESL G2; NM- endangered), yellow-billed cuckoo (U.S.-candidate, NESL G2)	Willow flycatcher
Pronghorn (NESL G3)	Meadow vole
Spotted bat, big-freetail bat, small-footed bat, long-legged myotis, Yuma myotis, occult little brown bat, fringed myotis (BLM Sensitive species)	Little brown bat

Notes: Federally listed species that could be impacted from future FCPP emissions include two plant species (Mancos milk-vetch and Mesa Verde cactus within the Deposition Area), two avian species (southwestern willow flycatcher and yellow-billed cuckoo at Morgan Lake and along the San Juan River), and two fish species (Colorado pikeminnow and razorback sucker in the San Juan River). For immobile early life stage Federally listed species (e.g., plants, fish eggs adhered to sediment bed substrate) the maximum concentration was used to represent the EPC. For mobile Federally listed species, the 95 percent UCL concentration was used to represent the EPC as was done for non-special status species.

EPC = exposure point concentration

HQ = hazard quotient

The Deposition Area ERA results indicate that current soil conditions may pose a risk to the two Federally listed plants, Mancos milk-vetch and Mesa Verde cactus (Tables 4.9-4 and 4.9-5). As described in AECOM (2013a), these HQs for plants are likely overestimated due to the very conservative soil screening levels used to estimate the HQs, and because these toxicity reference values were developed from crop plants that grow in very different soils and environmental conditions than found in the ROI. Mancos milk-vetch and Mesa Verde cactus are also restricted to substrates that have elevated metals concentrations and thus may be tolerant of these higher concentrations. The ERA results also show that HQs for the Proposed Action are well below one and contribute less than 0.1 percent to the total HQ.

Table 4.9-4. Comparison of HQs for Current Conditions, Future FCPP Emissions, and Current Conditions + Future FCPP Emissions for Mancos Milk-Vetch

Constituent	Current Conditions Soil EPC (mg/kg)	Current Conditions HQ	Future FCPP Emissions Soil EPC (mg/kg)	Future FCPP Emissions HQ	Total HQ	% HQ from Future FCPP Emissions
Boron	8.8	18	1.5E-04	3.0E-04	18	0.0017
Chromium	15	15	04.2E-04	4.2E-04	15	0.0027
Vanadium	25	13	0.0031	0.0015	13	0.012

Notes: The EPC used to calculate HQs for Federally listed plants is the maximum concentration, defined in the AECOM (2013a) ERA as the "Maximum EPC." Only those constituents with HQs exceeding 1 for either Current Conditions or Future FCPP Emissions are shown. Total HQ is the sum of the Current Conditions HQ and the Future FCPP Emissions HQ. Values less than or equal to 0.0001 are expressed in scientific notation (e.g., 1.0E-04 = 0.0001, 1.0E-05 = 0.00001, 1.0E-06 = 0.000001, etc.).

EPC = exposure point concentration

HQ = hazard quotient

Table 4.9-5. Comparison of HQs for Current Conditions, Future FCPP Emissions, and Current Conditions + Future FCPP Emissions for Mesa Verde Cactus

Constituent	Current Conditions Soil EPC (mg/kg)	Current Conditions HQ	Future FCPP Emissions Soil EPC (mg/kg)	Future FCPP Emissions HQ	Total HQ	% HQ from Future FCPP Emissions
Boron	19	37	1.5E-04	3.0E-04	37	8.1E-04
Chromium	17	17	4.2E-04	4.2E-04	17	0.0025
Molybdenum	3.0	1.5	2.3E-05	1.1E-05	1.5	7.3E-04
Selenium	1.7	3.3	5.9E-08	0.00000011	3.3	3.3E-06
Vanadium	35	18	0.0031	0.0015	18	0.0083

Notes: The EPC used to calculate HQs for Federally listed plants is the maximum concentration, defined in the AECOM (2013a) ERA as the "Maximum EPC." Only those constituents with HQs exceeding 1 for either Current Conditions or Future FCPP Emissions are shown. Total HQ is the sum of the Current Conditions HQ and the Future FCPP Emissions HQ. Values less than or equal to 0.0001 are expressed in scientific notation (e.g., 1.0E-04 = 0.0001, 1.0E-05 = 0.00001, 1.0E-06 = 0.000001, etc.).

EPC = exposure point concentration

HQ = hazard quotient

For both Morgan Lake and San Juan River exposures to the two Federally listed birds, the southwestern willow flycatcher and the yellow-billed cuckoo, the ERAs show that current conditions may pose a risk to these species (Tables 4.9-6 and 4.9-7). However, Morgan Lake does not provide suitable nesting habitat for either species, nor is there currently suitable nesting habitat along the San Juan River. However, such habitat could develop along the San Juan River over the life of the project as a result of riparian restoration efforts, such as the San Juan Watershed Woody Invasives Initiative (San Juan Watershed Woody-Invasives Initiative 2006). Habitat for these species is not expected to improve above current conditions at Morgan Lake, as the lake would continue to be managed as it has been and there are no plans to improve or restore the riparian vegetation around the lake. The ERA results show that HQs for the Proposed Action are well below one and, with two exceptions, contribute less than 0.1 percent to the total HQ. The two exceptions are Morgan Lake exposure to methylmercury which contributes 4.4 percent to the total HQ and San Juan River exposure to selenium which contributes 0.23 percent to the Total HQ.

For the Federally listed Colorado pikeminnow and razorback sucker, ERA results indicate that current conditions in the San Juan River may pose a risk to these species (Table 4.9-8). The ERA results also show that HQs for the Proposed Action are well below one and contribute less than 0.1 percent to the total HQ.

While the ERAs identified a number of COPECs with elevated HQs related to existing conditions, future FCPP emissions associated with the Proposed Action did not contribute significantly to this risk for any species. HQs associated with future FCPP emissions were much less than 1.0 and representing less than 0.1 percent of the total HQ for most species. The ERAs evaluated the potential risk associated with 25 years of future emissions of FCPP. The emissions associated with operation of FCPP from 2012 to 2016 would be a fraction of the volume evaluated and would have a much lesser effect on all threatened, endangered and sensitive species.

As discussed in Section 4.7.2, the operation of FCPP requires diversion of water from the San Juan River and releases of water, and potentially fish, from Morgan Lake. This has the potential to adversely affect Colorado pikeminnow and razorback sucker. These potential impacts were evaluated for the operation of the plant from 2016 to 2041 in the FCPP/NMEP EIS (OSMRE 2015). The impacts associated with operations between 2012 and 2016 would be similar and the findings of the EIS are incorporated by reference and summarized below.

4.9.2.1.5 Diversions from the San Juan River

Surface water diversions the San Juan River are described in Section 4.7.25. The consumptive water rights of 39,000 acre-feet per year represent approximately 6 percent of the total depletions of the San Juan River in New Mexico and about 4.5 percent of the total basin depletions. Average historic use (27,682 acre-feet per year) less 5,000 acre-feet per year following the shutdown of Units 1-3, represents about 3.7 percent of New Mexico depletions and 2.7 percent of total basin depletions. Based on the findings of the Navajo Reservoir BO (USFWS 2006), which evaluated the effects of the operations of Navajo Reservoir and all known diversions, including those described above, these depletions may affect, but are not likely to adversely affect Colorado pikeminnow and razorback sucker or their critical habitat. These effects are therefore determined to be minor and no new impacts would result from the Proposed Action.

Table 4.9-6. Comparison of HQs for Current Conditions, Future FCPP Emissions, and Current Conditions + Future FCPP Emissions for Morgan Lake Exposures to the Southwestern Willow Flycatcher and Yellow-Billed Cuckoo

Constituent	Current Concentrations Sediment Concentration (mg/kg)	Current Concentrations Water Concentration (mg/L)	Current Concentrations HQ	Future FCPP Emissions Sediment Concentration (mg/kg)	Future FCPP Emissions Water Concentration (mg/L)	Future FCPP Emissions HQ	Total HQ	% HQ from Future FCPP Emissions
Chromium	7.0	0.0030	2.3	9.3E-07	4.9E-08	4.0E-04	2.3	0.017
Copper	10	0.0045	2.9	7.3E-07	2.1E-08	5.6E-04	2.9	0.019
Lead	8.7	0.0076	16	5.9E-05	6.6E-08	2.1E-04	16	0.0013
Methylmercury	0.0024	3.7E-08	2.6	3.2E-05	3.6E-08	0.12	0.27	4.4
Selenium	0.35	0.0034	9.8	5.9E-07	1.2E-07	3.4E-04	9.8	0.0034

Notes: The EPC used to calculate HQs for mobile Federally listed wildlife is the 95 percent upper confidence limit on the mean concentration (95 percent UCL), defined in the AECOM (2013a) ERA as the "Refined Maximum EPC." Only those constituents with HQs exceeding 1 for either Current Conditions or Future FCPP Emissions are shown. Total HQ is the sum of the Current Conditions HQ and the Future FCPP Emissions HQ. Values less than or equal to 0.0001 are expressed in scientific notation (e.g., 1.0E-04 = 0.0001, 1.0E-05 = 0.00001, 1.0E-06 = 0.000001, etc.)

EPC = exposure point concentration

HQ = hazard quotient

MeHg = methyl mercury

Table 4.9-7. Comparison of HQs for Current Conditions, Future FCPP Emissions, and Current Conditions + Future FCPP Emissions for San Juan River Exposures to Southwestern Willow Flycatcher and Yellow-Billed Cuckoo

Constituent	Current Concentrations Sediment Concentration (mg/kg)	Current Concentrations Water Concentration (mg/L)	Current Concentrations HQ	Future FCPP Emissions Sediment Concentration (mg/kg)	Future FCPP Emissions Water Concentration (mg/L)	Future FCPP Emissions HQ	Total HQ	% HQ from Future FCPP Emissions
Copper	11	0.028	1.5	9.2E-07	2.6E-08	6.1E-04	1.5	0.041
Lead	24	0.020	1.5	1.5E-05	1.7E-08	6.8E-05	1.5	0.0045
Mercury	0.020	2.0E-04	6.6	2.1E-06	2.9E-09	0.0044	6.6	0.067
Selenium	0.13	0.0095	2.9	1.6E-07	2.3E-06	0.0066	2.9	0.23

Notes: The EPC used to calculate HQs for mobile Federally listed wildlife is the 95 percent upper confidence limit on the mean concentration (95 percent UCL), defined in the AECOM (2013a) ERA as the “Refined Maximum EPC.” Only those constituents with HQs exceeding 1 for either Current Conditions or Future FCPP Emissions are shown. Total HQ is the sum of the Current Conditions HQ and the Future FCPP Emissions HQ. Values less than or equal to 0.0001 are expressed in scientific notation (e.g., 1.0E-04 = 0.0001, 1.0E-05 = 0.00001, 1.0E-06 = 0.000001, etc.).

EPC = exposure point concentration

HQ = hazard quotient

MeHg = methyl mercury

Table 4.9-8. Comparison of HQs for Current Conditions, Future FCPP Emissions, and Current Conditions + Future FCPP Emissions for San Juan River Exposures to Federally Listed Fish

Constituent/ Species	Current Concentrations Tissue Concentration (mg/kg)	Current Concentrations Hazard Quotient	Future FCPP Emissions Tissue Concentration (mg/kg)	Future FCPP Emissions Hazard Quotient	Total HQ	% HQ from Future FCPP Emissions
Chromium	2.0	15	4.0E-08	3.2E-07	15	2.1E-06
Copper	3.0	1.8	0.00	0.00	1.8	NA
Lead	1.7	5.0	8.5E-07	2.5E-06	5.0	5.0E-05
Mercury/FF	0.31	12	5.3E-05	0.0021	12	0.018
Mercury/CPM1	0.31	12	1.6E-04	0.0063	12	0.053
Mercury/CPM2	0.31	12	2.5E-04	0.010	12	0.083
Mercury/RS1	0.31	12	4.7E-05	0.0019	12	0.016
Mercury/RS2	0.31	12	7.3E-05	0.0029	12	0.024
Selenium	3.9	220	0.0018	0.10	220	0.045
Zinc	70	18	2.1E-08	5.5E-09	18	3.1E-08

Notes: The EPC used to calculate HQs for Federally listed fish is the maximum concentration, defined in the AECOM (2013a) ERA as the "Maximum EPC." Only those constituents with HQs exceeding 1 for either Current Conditions or Future FCPP Emissions are shown. Total HQ is the sum of the Current Conditions HQ and the Future FCPP Emissions HQ. Values less than or equal to 0.0001 are expressed in scientific notation (e.g., 1.0E-04 = 0.0001, 1.0E-05 = 0.00001, 1.0E-06 = 0.000001, etc.).

CPM1 = Colorado pikeminnow (<400 mm)
CPM2 = Colorado pikeminnow (>400 mm)
EPC = exposure point concentration
FF = forage fish
HQ = hazard quotient
RS1 = Razorback sucker (<400 mm)
RS2 = Razorback sucker (>400 mm)
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4.9.2.1.6 Fish Passage at APS Weir

The APS Weir at river mile (RM) 163.3 lies within the designated critical habitat for Colorado pikeminnow and upstream of designated critical habitat for razorback sucker. It may impede fish passage during some times of the year (Bio-West 2005), but Colorado pikeminnow and razorback sucker and other species have been observed to pass this structure under some conditions. Bio-West found that both species would likely be able to pass over the right embankment of the dam at flows higher than 5,000 cfs, but passage is likely somewhat impaired at flows between 500 and 5,000 cfs; however, they note that Colorado pikeminnow, razorback sucker, and other species have moved upstream past the APS Weir, although the specific flows at which they did so is unknown because recaptures "were separated by hundreds of days." One Colorado pikeminnow was observed to pass the weir at flows between 671 and 741 cfs (Bio-West 2005).

The full extent of this blockage is not known at this time because the swimming performance of Colorado pikeminnow and razorback sucker are not well known; however, the Bio-West study documents that the hydraulic drop associated with the weir may prevent these species from swimming over the crest of the weir at flows below 2,000 cfs, and high velocities may prevent them from swimming over the crest of the weir at flows of 2,000 to 5,000 cfs. Fish may be able to move through the sluiceway of the weir when flows are less than 500 cfs, particularly if the gate is fully open. The impairment of fish passage at the weir could limit the ability of Colorado pikeminnow and razorback sucker to move within the river to different areas in response to changing needs and environmental conditions. This could reduce the amount of accessible spawning and rearing habitat under some conditions, and may reduce habitat availability for the species. Temperatures upstream of the APS Weir are likely too cool to support spawning and rearing of Colorado pikeminnow (Durst and Franssen 2014). However, the weir lies within the critical habitat for Colorado pikeminnow, and may affect, and is likely to adversely affect the function of the habitat for the conservation and recovery of the species, as this structure may impede the migration of Colorado pikeminnow within its critical habitat (Listing Factor A, USFWS 2002a, b). The weir lies upstream and outside of the designated critical habitat for razorback sucker; therefore, no effect on designated critical habitat would occur for this species.

4.9.2.1.7 Entrainment of Listed Species

The intake structure and operation of the diversion is described in Section 2.2.4. The operation of this diversion has the potential to result in entrainment of listed fish species. No entrainment studies have been conducted at this diversion[1].

Colorado pikeminnow larvae typically enter the drift from mid-July to early August and drift passively for 3 to 6 days after emergence (USFWS 2009). Larvae would be subject to loss at the diversion for about 30 days. Because the fish drift with the currents, it is assumed that they would be entrained in direct proportion to the amount of flow diverted and the proportion of larvae that enter the drift upstream of the diversion point. Mean daily flows from mid-July to mid-August averaged about 1,030 cfs during this time period from 2003 to 2013 (USGS Gage 09365000). During this timeframe, approximately 71 cfs, or

[1] APS submitted a Proposal for Information Collection to EPA in 2005, in compliance with proposed Section 316(b) rules. These studies were initiated for the cooling intakes in Morgan Lake, but never completed, as the proposed rules were withdrawn by EPA. These studies were never initiated at the San Juan River intakes (R. Grimes, APS, pers. comm.).

approximately 7 percent of the flow, would be diverted to Morgan Lake. With the reduced diversions of 5,000 to 7,000 acre-feet per year resulting from the shutdown of Units 1-3, total diversions would be 18 to 25 percent less. These reductions would be attained by operating the diversion less frequently, so when the diversion was in operation, approximately 7 percent of the flow would be taken, but the total amount of water diverted would be less than 7 percent of the total flow. The USFWS (2009) estimated that spawning potentially could occur between RMs 128 and 180. The APS Weir is located at approximately RM 163.3, so about 26 percent of the available spawning habitat could lie above the weir, assuming an equal distribution of spawning habitat throughout the reach. While no spawning activity has been observed above the weir, spawning activity has been poorly documented because of the very limited number of adult pikeminnow in the system. Lacking information on the spawning distribution of Colorado pikeminnow, an assumption of equal distribution of spawning habitat is reasonable. Based on about 26 percent of the population spawning above the APS Weir and 7 percent loss of those individuals, it is estimated that about 1.8 percent of the population of larvae could be lost to the diversion. With the reduced diversions described above and assuming an equal distribution of larvae over time, the loss would be reduced to 1.4 to 1.5 percent of the population.

However, water temperatures near Farmington (RM 180), generally do not exceed 20°C and only exceed 18°C from mid-July to mid-August (Durst and Franssen 2014). Colorado pikeminnow generally spawn at temperatures of 18 to 23°C (USFWS 2002a). These cold temperatures make conditions less suitable for spawning near Farmington and for some distance downstream. Known spawning locations are located further downstream in “the Mixer” (RM 130-134) and in the Four Corners area RM 119), and spawning has not been documented above the APS Weir (USFWS 2009). Thus, it is likely that the area above the APS Weir would not be used for spawning to the same extent as areas further downstream, if it is used at all. Therefore, it is likely that entrainment of larval Colorado pikeminnow will be substantially less than the 1.4 to 1.8 percent cited above.

The San Juan River Recovery Implementation Plan currently stocks the San Juan River with Colorado pikeminnow. Approximately 300,000 to 400,000 Colorado pikeminnow approximately 6 months of age (50 to 65 mm in size) are stocked each year. Historically, larger fish have been stocked, but there are no plans to do so in the future. Since 2007, nearly all of these fish have been stocked above the APS Weir. These fish could also be vulnerable to entrainment at the diversion. These fish are stocked in October and November when flows in the San Juan River are 728 to 1,530 cfs (USGS Gage 09365000). The diversion is typically operating in the 17,000 gpm mode during this time (37 cfs), and is diverting between 2.4 and 5.1 percent of the flow. These fish actively swim and do not drift passively, as the larvae do, so they would not necessarily be entrained in proportion to the amount of flow diverted. Behavioral characteristics are known to influence the entrainment risk of fish. However, these characteristics are unknown for Colorado pikeminnow, and so it cannot be predicted whether their entrainment risk would be higher or lower than that predicted by the proportion of water diverted. Therefore, it is assumed that these fish could be entrained in proportion to the amount of flow diverted.

A study of entrainment at Hogback, Farmers Mutual, Jewitt Valley, and Fruitland Irrigation diversions conducted in 2004 and 2005 indicates that the proportion of stocked Colorado pikeminnow entrained in the canals is considerably lower than what would be predicted based on the proportion of flow diverted (Renfro et al. 2006). This study found that between 0.002 and 0.004 percent of Colorado pikeminnow stocked shortly before the study was conducted were observed in Hogback and Fruitland Irrigation diversions (no razorback sucker were observed, although other native suckers were). While this study likely did not capture every Colorado pikeminnow entrained, it provides an indication that the magnitude of the effect is likely to be less than 0.5 percent of the abundance of recently stocked fish, even allowing for a 100-fold underestimate by the study of the number of fish actually entrained.

Colorado pikeminnow would remain vulnerable to entrainment for some time after the initial stocking. The exact size of a pikeminnow vulnerable to entrainment at the 1- by 3-inch screens at the intake is unknown at this time. The most vulnerable time for these fish is shortly after release as these fish distribute themselves within the river. It is not known how far or how rapidly these fish would disperse. Fish that successfully move downstream of the APS Weir would be less likely to be subsequently entrained because of the passage restrictions at the APS Weir.

Currently, few naturally produced Colorado pikeminnow are present in the San Juan River, so little, if any, entrainment of wild fish would occur. As the species moves toward recovery and more natural reproduction occurs, then entrainment would be more likely to occur. It is probable that most natural reproduction would occur primarily below the APS Weir, because of the cool temperatures near Farmington, however, the proportion of spawning that might take place above the weir is unknown. Currently, the only known natural spawning occurs downstream of the APS Weir, and no known spawning sites have been observed upstream of the APS Weir (USFWS 2009); therefore, the larvae and young fish produced would not be exposed to entrainment at the Project intakes.

Because Colorado pikeminnow are currently stocked above the APS Weir and because they could spawn in this area in the future, entrainment at the APS diversion will affect Colorado pikeminnow. Due the low proportion of the population anticipated to be entrained (well below natural mortality rates); this would be expected to have a minor impact at the population level.

The diversion of water to Morgan Lake from the San Juan River could entrain razorback sucker. Razorback sucker spawn on the ascending limb of the hydrograph during the spring. Larvae are found in the drift from late March to early July. Spawning is assumed to potentially occur between RM 100 and 180, with the effort spread evenly throughout the reach (USFWS 2009); however, no spawning has been documented to occur above the APS Weir. The intakes are about 16 miles below the top of the potential spawning reach and thus affect about 20 percent of the potential habitat. Average flow during the spawning season between 2003 and 2007 ranged from 717 to 6,455 cfs (USFWS 2009). During the spawning season, the Proposed Action would divert 37 cfs in March and April and 71 cfs in May and June. Thus, the Proposed Action would divert between 0.6 percent of the flow in low diversion operations at high river flows and 9.9 percent of the flow at high diversion operations at low river flows. The potential entrainment of recently, naturally spawned fish would be 0.12 to 2.0 percent of the fish spawned. With the shutdown of Units 1-3, the diversion operated would be 18 to 25 percent less often, but the relative volume of water diverted would be as described above. The reduced operation would reduce entrainment below the levels described above. Razorback suckers spawn at cooler temperatures than Colorado pikeminnow (>14°C, USFWS 2002b, with spawning occurring at temperatures between 11.3 and 15.6 in the Gunnison and Colorado rivers [Osmundson and Seal 2009]), and therefore the cooler temperatures at Farmington would not have as great an effect on their spawning.

Razorback sucker are stocked into the river at a length of approximately 300 mm (approximately 1 foot). These stocked fish would not be anticipated to be vulnerable to entrainment and low approach velocities would not result in impingement of these fish on the screens.

Renfro et al. (2006) did not observe any razorback sucker in the Hogback, Farmers Mutual, Jewitt Valley, and Fruitland Irrigation diversions during an entrainment study conducted in 2004 and 2005. This may indicate this species is somewhat less likely to be entrained, particularly at the sizes at which they are stocked into the San Juan River. However, this may also be the result of other factors such as the timing of the study (September to November) in relation to the life history activities of razorback sucker. It is possible that entrainment may occur at other times of year. Based on the potential for natural spawning to occur above APS Weir, the entrainment at the diversion is likely to have a minor impact on the species at the population level.

On August 15, 2014, EPA promulgated revised regulations on the design and operation of intake structures, in order to minimize adverse environmental impacts. Because the facility intakes greater than 2 million gallons per day of cooling water from the San Juan River, it must meet requirements under CWA Section 316(b), regulating the design and operations of intake structures for cooling water operations. APS will be required to undertake all appropriate measures to reduce impacts from impingement and entrainment at the APS Weir (40 CFR Parts 122 and 125, EPA 2014b). As an existing facility, APS will be required to comply with one of seven options to reduce entrainment, and must meet site-specific entrainment standards as required by the Director of EPA. The specific action to be taken will be determined in accordance with the regulations, but has not been determined at this time. All such actions would be expected to either maintain (in the event that current operations meet standards) or reduce entrainment risk over existing levels.

NTEC proposes to avoid diverting water during the stocking period for the listed species in 2015 in order to avoid the entrainment effects identified above. Therefore, impacts with regard to entrainment would be minor.

4.9.2.1.8 Release of Non-Native Fish from Morgan Lake

As described in Section 4.7.2, Morgan Lake discharges into No Name Wash, which drains to the Chaco River and from there into the San Juan River, which has the potential to result in the release of these fish into habitat occupied by Colorado pikeminnow and razorback sucker. Non-native fish, particularly channel catfish, and common carp (Duran et al. 2013, Gerig and Hines 2013), have been identified as one of the threats to both Colorado pikeminnow and razorback sucker. Non-native fish have the potential to compete with and prey upon native fish, including Colorado pikeminnow and razorback sucker, and may also serve as vectors for disease and parasites. While the San Juan River currently supports populations of several of these non-native fish, release of these fish from Morgan Lake could help support these populations. These non-native fish also occur in Navajo Reservoir, which may also support populations of these species in the San Juan River. Some of the non-native fish in Morgan Lake (e.g., gizzard shad) do not have populations in the San Juan River, and if such populations became established, they could exacerbate the existing non-native fish problem, as they may prey on eggs, larval and post-larval fish. The San Juan River tends to have a relatively high gradient, and thus may not provide much suitable habitat for these non-native fish, and as many of these fish also occur in Navajo Lake, it is likely that those fish that the San Juan provides suitable habitat for have already established populations (i.e., channel catfish and carp are already the focus of invasive species control efforts, bass and sunfish have been observed in the San Juan River in low numbers [Ryden 2012, Gilbert et al. 2012, Schleicher and Ryden 2013]). The degree to which non-native fish released from Morgan Lake may support existing populations of non-native fish, or may consume or compete with Colorado pikeminnow and razorback sucker is unknown. Release of non-native fish from Morgan Lake is likely to adversely impact Colorado pikeminnow and razorback sucker and their critical habitat. The magnitude of this effect cannot be determined from the available information, but would not increase above baseline conditions, unless new species are introduced to Morgan Lake. This potential impact has been in existence for many years, and does not represent a new impact to native fish in the San Juan River.

4.9.2.2 Proposed Action with Conditions

Under this Alternative, impacts would be the same as those described for the Proposed Action.

4.9.2.3 No Action Alternative

Impacts resulting from the No Action Alternative to Federally and tribally listed species and migratory birds would be similar in nature to those that would result from implementing the Proposed Action. Habitat loss, modification, and the presence of humans and mine-associated noise would be limited to the additional 701 acres of Area III where future disturbance is currently permitted by OSMRE. The 268 acres of existing disturbance in Area IV North would be reclaimed. Under the No Action Alternative, the combustion-related impacts at the FCPP would remain as described for the Proposed Action through July 2016 as the current coal stockpiles are used. Following July 2016, should additional mining not be approved in Area IV North, NTEC may elect to proceed with mining in the Pinabete Permit Area under a revised SMCRA permit. However, after the revised permit is submitted, OSMRE would be required to comply with NEPA prior to making a decision on any potential SMCRA permit revision to the Pinabete Permit. Alternatively, under the No Action Alternative, the Navajo Mine and FCPP could potentially shut down once all coal reserves are combusted. The effects of this shut-down has been evaluated in Section 4.8.4.6 of the FCPP/NMEP EIS and is incorporated by reference as follows:

> ***Navajo Mine***
>
> *Under the No Action Alternative, mining would cease and The Pinabete SMCRA Permit Area would not be mined. Burnham Road would not be realigned. Upon permit expiration, NTEC would begin reclamation activities in Areas III and IV North. Reclamation activities would continue until OSMRE approval that all reclamation requirements have been met and OSMRE jurisdiction is terminated. It is expected that all reclamation would be completed by June 2021. All ancillary buildings and facilities (e.g., communication lines, railroad) would be removed, and the land would be reclaimed according to OSMRE requirements and performance standards. No loss of habitat would be associated with the No Action Alternative, so for special-status species, these activities would not lead to adverse effects and could result in potential beneficial impacts due to replacement of habitat.*
>
> ***Four Corners Power Plant***
>
> *Under the No Action Alternative, FCPP would shut down and the DFADAs would not be constructed. APS would decommission all facilities that are not required or permitted to*

be left behind by the 1960 and 1966 leases. As such, decommissioning and dismantling activities would need to be coordinated with the Navajo Nation so that the area meets the specific needs of any planned reuse. APS has not yet prepared a decommissioning plan, but any demolition activities would comply with all environmental laws and regulations applicable at the time, potentially including NEPA review. Decommissioning would require environmental abatement activities in the power block, including removal of environmental and safety hazards (e.g., asbestos, lead paint), and chemicals and oils. All waste generated during this phase would be managed and disposed of in accordance with applicable Federal environmental regulations. Dismantling and demolition would commence following the removal of asbestos, PCB, lead paint, and any other hazardous chemicals. Upon removal of structures and facilities, the structural foundations would be removed to 24 inches below grade, the site profiled to allow for proper drainage, and native vegetation planted as applicable. In addition to the five units, decommissioning and dismantling may also include removal of all three switchyards. The timeline for this process is at the discretion of APS and the Navajo Nation. For special-status species, these activities and this time would not lead to adverse effects and could result in potential beneficial impacts due to reduction in emissions and revegetation efforts.

4.10 Socioeconomics

4.10.1 Impact Assessment Methodology

The potential social and economic impacts of the alternatives are analyzed for the affected area defined as the eight counties surrounding Navajo Mine and the Navajo Nation (see Section 3.10). Economic impacts are measured in terms of changes to population, employment, income, and government revenue. Social impacts are expressed as changes to community infrastructure—such as access to social services and quality health care services related to the rate of change in demand for these social services or in the ability of local governments to provide these services. Section 4.12 of this document evaluates the environmental justice impacts related to such changes.

The impact assessment criteria for economic impacts are based on changes to employment, wages, and tax payments at the Navajo Mine associated with each alternative. The criteria for social impacts include the previous indicators as well as the rate and scale of change of employment, income, and tax revenues, as sudden shifts in these measures tend to reduce the ability of local governments to respond to changes in demand for social services because of the lag time between employment changes and receipt of tax or royalty revenues.

4.10.2 Impacts

4.10.2.1 Proposed Action

Employment, wages, and tax revenues generated by mining activities would not change measurably from the baseline under the Proposed Action because the volume of coal mined at Navajo Mine, and thus burned at FCPP for energy generation, would not differ appreciably from current levels. The realignment of Burnham Road would not have any measurable changes to baseline socioeconomic conditions.

4.10.2.2 Indirect Effects of Coal Use at FCPP

The coal mined in Area IV North supported operations of five boiler units at FCPP which resulted in the continuation of approximately 1,000 jobs at both Navajo Mine and FCPP. There were no changes to employment or income at Navajo Mine or FCPP from the historic baseline before the shutdown of Units 1-3.

Continued operations of FCPP would not result in an effect measurably different than the existing employment, incomes, and revenues presently generated. The shutdown of Units 1-3 would result in a reduced demand for coal; however, this downscaling would not result in a significant decrease to employment and/or income, as the FCPP workforce will be reduced through attrition (i.e., retirement, leaving for another job) and not layoffs.

4.10.2.3 Proposed Action with Conditions

Under this Alternative, impacts would be the same as those described for the Proposed Action.

4.10.2.4 No Action Alternative

Under the No Action Alternative, approximately 30 percent less coal would be mined at Navajo Mine relative to the Proposed Action. Table 2.1-2 shows the scheduled annual coal volumes for each alternative. Therefore, it is assumed that employment, taxes, and royalty payments for BNCC would be reduced by as much as one-third from baseline conditions. Using this assumption, the direct economic impacts of the No Action Alternative would be a reduction in employment at BNCC and a reduction in annual Federal, state, and Navajo Nation tax and royalty payments. A reduction in annual coal production at the mine would likely have similar effects on employment, taxes, and royalties at the FCPP.

Many commenters noted concerns about loss of jobs, income, and related negative effects of not proceeding with pre-2016 mining, including ability to educate children, provide housing, and a stable life.

The indirect impacts of the No Action Alternative estimated with the IMPLAN model using 2009 data for San Juan County would be an additional loss of jobs in the local economy. Compared to the size of the local economy, these job losses may not be substantial. However, because more than four-fifths of the NTEC workforce is Native American, the Navajo population would experience a larger impact compared to the non-Navajo workforce and available employment in San Juan County, New Mexico (see Section 3.10.2.3 for details). The No Action Alternative would increase Navajo unemployment by as much as 1 percent. However, because mining jobs pay wages more than twice the San Juan County average, the impacts to individuals and families would be larger.

Similarly, the reductions in tax payments to the state and in royalty and tax payments to the Navajo Nation would be small compared to total state and tribal government revenues. A reduction in tax and royalty payments of $9 million per year would reduce total gross general fund revenue to the Navajo Nation by as much as 3 percent.

The social impacts of the No Action Alternative are not quantifiable because the change in taxes and royalty payments, although measurable, do not directly translate into changes in the amount or availability of social services. It is not possible to predict which programs or services local governments would decide to cut in association with reductions in government revenues. Another consideration is that relative size and timing of these revenue reductions. The potential increase in demand for social services associated with the employment and income reductions would be small compared to total demand for these services in the affected area. In addition, these revenue reductions would likely be experienced over a 5-year period giving local governments' sufficient time to adjust to the revenue changes. Therefore, there would be no substantial changes to ability of local governments to fund social services.

Under the No Action Alternative, the combustion-related impacts at the FCPP would remain as described for the Proposed Action through July 2016 as the current coal stockpiles are used. Following July 2016, should additional mining not be approved in Area IV North, NTEC may elect to proceed with mining in the Pinabete Permit Area under a revised SMCRA permit. However, after the revised permit is submitted, OSMRE would be required to comply with NEPA prior to making a decision on any potential SMCRA permit revision to the Pinabete Permit. Alternatively, under the No Action Alternative, the Navajo Mine and FCPP could potentially shut down once all coal reserves are combusted. The effects of this shut-down has been evaluated in Section 4.10.4.5 of the FCPP/NMEP EIS and is incorporated by reference as follows:

> ### *Population and Demographics*
>
> *Under the No Action Alternative, the shutdown of the FCPP and Navajo Mine may result in a population decline, as net immigration to the area may slow, causing a reduction in population growth rates.*
>
> *No expected major changes would occur to baseline condition demographics in the ROI due to the No Action Alternative.*
>
> ### *Economic Background*
>
> *Under the No Action Alternative, all activity at the FCPP would cease in 2016. Unless other economic activities, such as production of renewable energy, develop to replace the employment and income opportunities at the FCPP and Navajo Mine, the ROI's economy would become smaller. A total loss of 2,070 jobs, both direct and indirect, a total annual loss of $152.9 million in labor income, and an annual reduction in GSP of $372 million is projected to occur.*
>
> *The fiscal contributions derived from FCPP and Navajo Mine operations would decline to $0. While this decline would affect local, state, and Federal governments, it would most significantly affect the Navajo Nation. The Navajo Nation would be expected to lose between $40 and $60 million per year; because this revenue constitutes a large portion (approximately 1/3) of Navajo Nation revenues, this is considered a major adverse impact. Further, it is estimated that the Navajo Nation would lose approximately $17.9 million per year in tax exemptions which would result from NTEC's ownership of the Navajo Mine.*
>
> ### *Indicators of Social and Economic Well-Being*
>
> *Under the No Action Alternative, social and economic well-being would be reduced. While it is recognized that a portion of existing FCPP and Navajo Mine employees would*

be re-tasked for abandonment and reclamation activities, these assignments would likely only last a few years after shutdown and ultimately render the loss of 2,070 jobs (see Table 4.10-22 [of the FCPP/NMEP EIS]). This loss of jobs would add to the already high unemployment rate (approximately 51 percent) in the Navajo Nation as 410 direct jobs at the Navajo Mine and 380 direct jobs at the FCPP are staffed by tribal members; these jobs are relatively high-skill, high-income jobs. The even higher unemployment rate and reductions in income could exacerbate some of the "pressing health challenges" identified by the San Juan Community Health Department, including those associated with financial burdens and related stress.

The end of economic and fiscal contributions from the operations of the FCPP and Navajo Mine could lead to reductions in education attainment, reduced economic well-being, increased recidivism, and a reduced ability to maintain or upgrade the housing stock. The ability of individuals to obtain healthcare could be negatively impacted as well. In summary, the weakened economy could result in moderate adverse impacts to overall social and economic well-being.

Navajo Public Services

Under the No Action Alternative, after 2016 no more tax revenues would be received from the operations and production associated with the FCPP and Navajo Mine. The net effect of the loss of all tax royalties paid to the Navajo Nation are shown in [Table 4.10-1]. All tax royalties paid to the Navajo Nation revenues associated with the Navajo Mine and FCPP would be eliminated. Unless replaced with revenue from other sources, this reduction in revenues would negatively impact the quality and quantity of the public services offered on the Navajo Nation. For example, the Navajo Nation Fire Department relies on money generated by the Navajo Nation to pay its firefighters. The Fire Department is already struggling to retain firefighters because it cannot pay wages that are competitive with neighboring fire departments, and the Fire Department is currently understaffed. A reduction in revenue would negatively impact the Navajo Nation Fire Department and other Navajo Nation public service providers and their ability to provide services to the Navajo Nation people.

Table 4.10-1 Navajo Mine and Four Corners Power Plant Combined – Alternative E Compared to Baseline Economic Contribution, Annual Until 2041

	Jobs	Labor Income (Millions of 2011 $s)	GSP (Millions of 2011 $s)
Direct Impacts from Navajo Mine and FCPP Operations	-760	-$101.9	-$287.6
Indirect Impacts from Navajo Mine and FCPP Supplier Purchases	-340	-$14.5	-$23.4
Induced Impacts	-970	-$36.5	-$60.6
Total Economic Contribution	**-2,070**	**-$152.9**	**-$371.6**

Source: ASU 2013.

4.11 Land Use

4.11.1 Impact Assessment Methodology

The land use resource assessment area considers land use within the proposed mining areas and related features and 1-mile area surrounding proposed mining and Burnham Road realignment. Assessment of potential effects on land use resources, including effects on CUA and grazing uses, surface access, and water sources, is based on criteria defined by SMCRA's land use provisions (30 CFR 761.11(a)) and from issues identified during the public workshops and the informal conference. Land use-related comments raised during the public workshops and the informal conference include concerns about reclamation of mined lands, timing of release of reclaimed lands, and the effect that the Proposed Action may have upon tribal member rights and customary use areas. Associated concerns include how fugitive dust may affect land use management and livestock water sources.

Under SMCRA regulations, BNCC is required to develop adequate resource protection measures to eliminate, minimize, and/or mitigate land use effects. The Proposed Action wholly incorporates these SMCRA-based requirements. Likewise, the success, timing and release of mine-land reclamation areas are administered by OSMRE in facilitation of and compliance with Federal SMCRA requirements (30 CFR 800.40), and are also coordinated with the Navajo Nation and BIA prior to release of lands.

For analysis within this EA, it is assumed that during construction, operation, and reclamation of the mine, current grazing use within the land use resource area would be restricted and/or modified during mining and reclamation, but would be reinstated following reclamation and release of lands. Issues developed include the impact upon CUAs, the impact on surface access, and the impact on important water sources. To analyze these issues within the land use resource area, criteria includes potential for change or disruption in current land use, access, and dwellings; potential for change or modification to current surface use; potential for changes in grazing capacity; and displacement of livestock from water sources. Potential impacts include relocation of grazing uses, changes in grazing capacity and access to grazing areas, and displacement of livestock from water sources from the Project Area. Water sources and related assessment criteria are discussed in depth in Section 4.2 – Water Resources.

4.11.2 Impacts

4.11.2.1 Proposed Action

No residences or dwellings would be affected or relocated due to mining. Relocation of the Burnham Road would not limit access to nearby dwellings. Water sources and related assessment criteria are discussed in depth in Section 4.2 – Water Resources. Transportation issues are discussed in Section 4.14.

In the short term, the Proposed Action would directly reduce the livestock grazing area for local permittees, reduce wildlife habitat, and restrict public access on two-track roads in the land uses resource assessment area. The Proposed Action would restrict or modify access to approximately 183 acres from current grazing use in CUA Area .0396, approximately 100 Acres in CUA Area .0049, approximately 801 acres in CUA Area .0362, and approximately 804 acres in CUA Area .0394. The existing network of unimproved two-track roads would be restricted and or eliminated in area of active mining for the life of the operation. Realignment of the Burnham Road is not anticipated to result in loss of grazing rights in any CUAs. Impacts to wildlife habitat resulting from the Proposed Action are discussed in Section 4.8.

BNCC has entered into agreements with holders of impacted grazing permits and CUAs within the land use resource assessment area to compensate them for the value of disrupted grazing production and relocation or replacement of improvements to their grazing area. These agreements comply with 13 Navajo Tribal Code Section 1401-1403, which requires compensation for all surface use. Agreements have been reviewed by the Navajo Land Administration and BIA to ensure fair and equitable compensation. To minimize impacts to grazing permittees, as a result of modification of surface use due to mining, BNCC would continue to provide water (in tanks) for livestock use in areas around the Navajo Mine. Permanent impacts to grazing permittees and allotment use would be minimized by retaining the existing Lowe Impoundment #1 for stock watering in Area III.

The indirect impacts that could affect land uses include increased dust, noise, and blasting vibrations from mining activities and traffic along haul roads. These would have minor to moderate short-term and life of operation effects on management and quality of surface land use due to the distance of mining from dwellings and surrounding CUAs. BNCC would coordinate with local users regarding stock pond locations and conditions. Impact assessment associated with fugitive dust, noise and blasting vibrations is included in Section 4.5.1, and Section 4.3.2 respectively. In addition to the resource protection measures to minimize the impacts to these related resources included in as part of the Proposed Action, plans for minimizing adverse impacts from noise and vibration (based on 30 CFR 816.67) and fugitive dust would be required within the associated SMCRA permit for the life of the operation.

In the long term, the surface and vegetation affected by the Proposed Action would be reclaimed and returned to a condition similar to or better than its original status. Post-mine land use would be designated for livestock grazing and wildlife habitat, and would again be open to grazing and other tribal surface uses. The construction of impoundments incorporated into the post-mining landscape would support livestock grazing and wildlife habitat.

4.11.2.2 Indirect Effects of Coal Usage at FCPP

The FCPP is located 20 miles west of Farmington, New Mexico on Navajo Nation tribal trust land. Its primary components include five power generating units, Morgan Lake - a 1,200-acre human-made reservoir that provides water - a series of wet DFADAs, a coal handling and processing system, and an electric rail line that transports coal from the Navajo Mine to FCPP. The FCPP site is currently used for electricity production, fly ash disposal, and coal transport. Continued operations of FCPP would not require any change of land use. All of the transmission lines stemming from FCPP have established ROWs and would not require any changes to existing land use for continued transmission operations.

4.11.2.3 Proposed Action with Conditions

Under this Alternative, impacts would be the same as those described for the Proposed Action.

4.11.2.4 No Action Alternative

Under the No Action Alternative, existing land status, access, and prior rights within the land use resource assessment area would remain unchanged. Mining and reclamation in Area III would proceed according to the existing approved Mine Plan and reclamation requirements, but mining in Area IV North would not occur. Lands already disturbed within Area IV North would be reclaimed to grazing and wildlife habitat.

Impacts would continue to be minor (slight but detectable) to moderate (readily apparent, measurable long-term change) and short term to long term within the existing Navajo Mine. Under the No Action Alternative, the combustion-related impacts at the FCPP would remain as described for the Proposed Action through July 2016 as the current coal stockpiles are used. Following July 2016, should additional mining not be approved in Area IV North, NTEC may elect to proceed with mining in the Pinabete Permit Area under a revised SMCRA permit. However, after the revised permit is submitted, OSMRE would be required to comply with NEPA prior to making a decision on any potential SMCRA permit revision to the Pinabete Permit. Alternatively, under the No Action Alternative, the Navajo Mine and FCPP could potentially shut down once all coal reserves are combusted. The effects of this shut-down has been evaluated in Section 4.9.4.5 of the FCPP/NMEP EIS and is incorporated by reference as follows:

> ***Navajo Mine***
>
> *Alternative E would result in no change in land use for the Pinabete SMCRA Permit Area and, therefore, no relocation of the three affected dwellings in the permit area would be required. Also, grazing and CUAs would not change. Alternative E would result in no additional noise, dust, and traffic during the road realignment construction period.*
>
> *Additionally, under Alternative E, the existing CUAs and access roads to the grazing areas within the proposed Pinabete SMCRA Permit Area would not change. It is assumed that these lands would continue to be used for livestock grazing through the entire Project timeline (2041). In the Navajo Mine Permit Area, NTEC would mine until the ROD is issued in 2015 and then reclaim the land, as described in the existing Navajo Mine Permit.*
>
> ***Four Corners Power Plant***
>
> *Alternative E would result in a shutdown of FCPP Units 4 and 5. Wet and DFADAs would be closed via evapotranspiration covers and therefore, the land use would not change. APS would decommission all facilities that are not required or permitted to be left behind by the 1960 and 1966 leases. As such, decommissioning and dismantling activities would need to be coordinated with the Navajo Nation so that the area meets the specific needs of any planned reuse. Several potential future uses of the site are possible. It could continue as an energy generation site with several potential technology scenarios. The infrastructure could also be demolished and the site redeveloped for industrial, commercial, or residential uses. It is entirely speculative at this time to predict the likely alternative future uses for the site. Any decisions regarding the future uses must be with the concurrence of the other owners. Currently, the site is undivided by all of the owners; future uses may therefore require subdivision of the property.*
>
> *APS has not yet prepared a decommissioning plan, but any demolition activities would comply with all environmental laws and regulations applicable at the time, potentially including NEPA review. Decommissioning would require environmental abatement activities in the power block, including removal of environmental and safety hazards (e.g., asbestos, lead paint), and chemicals and oils. All waste generated during this phase would be managed and disposed of in accordance with applicable Federal environmental*

regulations. Dismantling and demolition would commence following the removal of asbestos, PCB, lead paint, and any other hazardous chemicals. Upon removal of structures and facilities, the structural foundations would be removed to 24 inches below grade, the site profiled to allow for proper drainage, and native vegetation planted as applicable. In addition to the five units, decommissioning and dismantling may also include removal of all three switchyards. The timeline for this process is at the discretion of APS and the Navajo Nation.

In the absence of FCPP operations, no water would be drawn from the San Juan River for use at the power plant and then subsequently discharged into Morgan Lake, so the lake would evaporate and cease to exist. If APS chose to leave the river pumping plant and the pipeline behind, and the Navajo Nation took possession of those facilities, it is not known if or how the river pump station would be operated. Following the possible dismantlement of the power plant and any associated remediation activities, additional land may be available for grazing, although it is uncertain at this time.

4.12 Environmental Justice

4.12.1 Impact Assessment Methodology

Executive Order 12898 requires that the Federal government identify and estimate disproportionate impacts to low-income or minority populations of proposed Federal actions. There are both low-income and minority populations that would be affected by the Proposed Action and alternatives that are identified in Section 3.12.

To determine whether human health effects are disproportionately high and adverse on such populations, three factors are to be considered to the extent practicable: (1) whether the risks and rates of health effects are significant (as employed by NEPA), or above generally accepted norms, (2) whether the risk or rate of exposure to an environmental hazard is significant (as employed by NEPA) and appreciably exceeds or is likely to appreciably exceed the risk or rate to the general population or other appropriate comparison group, and (3) whether the health effects occur in a minority population, low-income population, or Indian tribe affected by cumulative or multiple adverse exposures from environmental hazards (CEQ Environmental Justice Guidance, p. 26).

To determine whether environmental effects are disproportionately high and adverse, three factors are to be considered to the extent practicable: (1) whether there is or will be an impact on the natural or physical environment that significantly (as employed by NEPA) and adversely affects a minority or low-income population or Indian tribe, (2) whether environmental effects are significant (as employed by NEPA) and are or may be having an adverse impact on a minority or low-income population or Indian Tribe that appreciably exceeds or is likely to appreciably exceed those on the general population or other appropriate comparison group, and (3) whether the environmental effects occur or would occur in a minority or low-income population or Indian tribe affected by cumulative or multiple adverse exposures from environmental hazards (CEQ, Environmental Justice Guidance, p. 26).

4.12.2 Impacts

4.12.2.1 Proposed Action

In general, the Proposed Action would result in limited environmental and health effects, not above generally accepted norms or appreciable exceeding those experienced by other populations, on the local community due to the limited magnitude and geographic range of expected impacts and extensive mitigation and protective measures incorporated in project operations. See Section 4.5 on dust dispersion; Section 4.15.2.1 on public health issues; Sections 3.5 and 4.5 for air quality; Sections 4.2.2 and 4.9.1 on limited extent of groundwater surface water impacts and effects on biological resources; Section 4.13.2.1 on limited cultural resource impacts; and Section 4.11.2.1 on limited effects on grazing rights.

There is no opportunity for traditional and ceremonial resource use in the Project Area because the Navajo Mine lease area, including the Project Area, is excluded from public access and use because it is an active surface mine. Therefore, there would be no disproportionate impacts associated with ceremonial or traditional resource use for this alternative. In considering "special exposures related to cultural or traditional use of resources near the Project Area," it is important to understand the Navajo relationship with the land based on the principle of Diné Natural Law that "The rights to use the land, natural resources, sacred sites, and other living beings must be accomplished through the protocol of offering and these practices must be protected" (Navajo Nation Code Sections 201-206). In applying this principal to extraction of coal resource at Navajo Mine, it would be appropriate for Navajos to make offerings to support the rights to use this natural resource. BNCC has built and maintains a ceremonial Hogan on Navajo Mine property. This Hogan was built so that BNCC employees and their families could conduct traditional ceremonies. Information about this ceremonial Hogan and how Diné Natural Law informs environmental justice analysis was presented to the public at the OSMRE workshops held in Nenahnezad and Burnham Chapter houses (see Section 1.5).

The realignment of Burnham Road would not have any disproportionate adverse human health or environmental effects to minority or low-income populations in the affected area. There would be a small benefit to these populations with the Burnham Road realignment because travel on the Burnham Road would be safer after the realignment.

4.12.2.2 Indirect Impacts from Coal Use at FCPP

The burning of coal to fire boilers for energy generation at FCPP would result in the deposition of mercury and other contaminates in soils and surface waters. Crops and farm products grown in these crops are ingested by humans, as with fish harvested from local waters. Even in the worst-case scenario, assuming high consumption of fish and local farm products, risk assessment indicates that exposure would be below thresholds protective of human health. In December 2013, Units 1-3 were shut down per the CAA FIP agreement between APS and EPA. The resulting reduction in energy production would result in less overall emissions from FCPP; however, the emissions resulting from the burning of Area IV North coal would remain static between the past operations phase and the continued operations phase.

Extensive analysis on ambient air monitoring, FCPP emissions modeling, adherence to NAAQS, and human health risk assessments (HHRAs) was performed as part of the EIS prepared for the FCPP and NM Energy Project. The objective of that environmental justice analysis is the same for this EA – to evaluate both the Proposed Action's contribution of harmful contaminants in the ambient air and whether or not that contribution has a disproportionate impact on the local population. The following sections summarize the findings of the EIS analysis and incorporate these conclusions by reference into this EA.

San Juan County's most recent Community Health Profile includes a comprehensive overview of health indicators including respiratory health (San Juan County 2010). This study found that San Juan County has a higher incidence of chronic lower respiratory disease comprised of chronic bronchitis, asthma, and emphysema compared to New Mexico or the rest of the U.S. The study also points out that both teen and adult smoking is higher in San Juan County than all of New Mexico and the U.S. In addition, San Juan County's most recent Community Health Profile found that elevated levels of O_3 in San Juan County were linked to incidence of asthma-related medical visits (New Mexico Department of Health 2007).

Another study, whose area of analysis included the FCPP, was undertaken to better understand the relationship between the perceived risk to respiratory health from ambient air quality and the risk presented by coal combustion inside of dwellings for cooking and heating. The study considered special exposures for vulnerable populations, and examined the relationship between coal combustion in homes in the Shiprock area and impacts on respiratory health. The study did not directly evaluate inhalation of coal dust from area mines or emissions from area power plants. The results from this study suggest that the risk of adverse impacts from home burning of coal could be reduced by making relatively simple and inexpensive changes to methods of home heating (Bunnell et al. 2010).

The results of the EIS's HHRA, the fugitive dust risk assessment, and the diesel particulate matter risk assessment (all found in Section 4.17, Health and Safety of the EIS) indicated that continued operations of FCPP would be considered protective of sensitive subpopulations, such as children, the elderly, and the sick. Sensitive subpopulations such as the environmental justice community are protected by these values because the toxicity values used are considered by EPA to be protective of sensitive subpopulations.

With respect to O_3, APS conducted photochemical modeling on a regional level to assess the impacts of NO_x emissions from FCPP. The assessment was conducted by modeling FCPP emissions in combination with other regional sources and comparing the resulting O_3 concentrations to the current 8-hour O_3 NAAQS and also the former (1979-97) 1-hour O_3 NAAQS. O_3 impacts were assessed near FCPP (maxima), in nearby PSD Class I and sensitive Class II areas, and at existing O_3 monitoring sites (AECOM 2013d).

Continued operation of the FCPP (including the shutdown of Units 1-3) would emit SO_2, NO_x, PM_{10} and $PM_{2.5}$ (also VOC and CO) and, therefore, contribute incrementally to ambient air quality deterioration, visibility impairment, and dry and wet deposition in the surrounding area. However, based on the findings of the EIS Air Quality analysis (Section 4.1 of the EIS), the Four Corners Region complies with the NAAQS, and as such the existing levels do not pose an adverse condition. For particulate matter (PM_{10} and $PM_{2.5}$) the EPA (2009) has noted that toxicity associated with exposure to airborne PM can vary by PM composition with the implication that the NAAQS for PM may not be health protective in all cases. The EIS risk analysis indicates that the metals present in Navajo Mine coal and assumed to be present in fugitive dusts at the primary NAAQS for $PM_{2.5}$ of 12 $\mu g/m^3$ would not pose an unacceptable risk to public health and, therefore, not result in a disproportionate effect to environmental justice populations.

4.12.2.3 Proposed Action with Conditions

Under this Alternative, impacts would be the same as those described for the Proposed Action.

4.12.2.4 No Action Alternative

The No Action Alternative would not result in any change in baseline environmental or health factors for local residents, Navajo Nation tribal members and other community members in the short term. However, once mining is complete in Area III, mining impacts would cease and would not extend into Area IV North as proposed in the Proposed Action.

As mining operations are reduced with the completion of mining in Area III, there would be a disproportionate reduction in employment and income to vulnerable populations because more than four-fifths of the workforce at BNCC is Native American. As noted in Section 4.10 on socioeconomic impacts, the extent of these employment reductions are not known, but it is expected that they would be small compared to the employment and revenue opportunities for the Navajo Nation as a whole or employment and income for Navajo workers in San Juan County, New Mexico. However, the unemployment rate on the Navajo Nation is estimated to be 4 to 5 times higher than the rate for San Juan County, New Mexico so these job losses would add to this elevated rate (see Tables 3.10-4 and 3.10-5).

In addition, the estimated $9 million reduction in annual tax and royalty revenues to the Navajo Nation associated with the lower coal production for the No Action Alternative would reduce the ability of the tribal government to provide support services to its members at time when revenues from other energy and extractive industry resources are also being reduced.

In 2006, revenues from Navajo coal resources amounted to about $81 million and comprised 35 percent of total gross revenue to the Navajo Nation General Fund (NNDED 2010). Since then, coal revenues have declined because mining operations ceased at the Peabody Black Mesa Mine in 2006 and Chevron McKinley Mine in 2009. In 2010, revenues from the remaining coal operations at BNCC Navajo Mine and Peabody Kayenta mines were estimated to be about $50 million or about 25 percent of total gross revenue to the General Fund (NNDED 2010). Other foreseeable employment and revenue reductions for the Navajo Nation would include shutdown of three units at the FCPP. Since this power plant is located on Navajo Nation land and has a Native American hiring preference, the shutdown of units at FCPP would result in employment and revenue losses to the Navajo Nation. Under a new lease agreement, even if FCPP shuts down three units, revenues to the Navajo Nation would decrease from $65 million to $60 million annually and no jobs would be cut (Navajo Times 2010).

However, these revenue reductions could be offset by revenue diversification strategies that are being implemented by the Navajo Nation, such as casino gaming. The Navajo Nation recently invested more than $200 million in casino and resort properties located on Navajo Nation lands in the Four Corners region. This is more than the amount planned for all other economic development investments by the Navajo Nation (NNDED 2010). The Nation is expecting to earn $150 million a year from these investments (Navajo Nation, Navajo President Joe Shirley Jr. BIA Director Omar Bradley sign land into Trust for Twin Arrows Casino Near Flagstaff [December 23, 2010]). In 2010, it was estimated that the Fire Rock Casino near Gallup, New Mexico employed more than 350 workers and realized $40 million in net win (a measure of casino income)(Landry 2010).

There is no regular opportunity for traditional and ceremonial resource use in the Project Area because the Navajo Mine lease area including the Project Area is excluded from public access. Traditional ceremonies and collection activities may be allowed upon request once safety issues are considered. There would be no change to the current public use policy with this alternative. Therefore, there would be no disproportionate impacts associated with ceremonial or traditional resource use for this alternative.

Under the No Action Alternative, the combustion-related impacts at the FCPP would remain as described for the Proposed Action through July 2016 as the current coal stockpiles are used. Following July 2016, should additional mining not be approved in Area IV North, NTEC may elect to proceed with mining in the Pinabete Permit Area under a revised SMCRA permit. However, after the revised permit is submitted, OSMRE would be required to comply with NEPA prior to making a decision on any potential SMCRA permit revision to the Pinabete Permit. Alternatively, under the No Action Alternative, the Navajo Mine and FCPP could potentially shut down once all coal reserves are combusted. . The effects of this shut-down has been evaluated in Section 4.11.6.5 of the FCPP/NMEP EIS and is incorporated by reference as follows:

Air Quality

Navajo Mine

Under Alternative E, mobile emissions from the Navajo Mine would decrease beginning in 2015 and cease by 2021 upon the completion of reclamation activities.

Four Corners Power Plant

Under Alternative E, FCPP would continue to operate in 2014 and 2015 at which time, stationary source emissions would cease. Mobile source emissions would continue during the decommissioning of the power plant; however, these tasks are undefined and not quantified.

Environmental Justice Considerations

Air impacts from Alternative E would be greatly reduced compared to those described for Alternative A; no environmental justice impacts are anticipated.

Earth Resources

Navajo Mine

No impacts to topography, soil, geology, or mineral resources within Areas IV North and South are anticipated from mining operations or road construction. However, a slight permanent alteration in topographic relief would occur compared to pre-mining conditions, which would be considered a minor impact.

Four Corners Power Plant

No impacts to topography, soil, geology, or mineral resources are anticipated within the FCPP's area or from the dry fly ash ponds.

Environmental Justice Considerations

No impacts from noise and vibration would occur to soil productivity from Alternative E; therefore, no environmental justice impacts would occur.

Cultural Resources

Navajo Mine

The closure of the Navajo Mine would have no potential effect on cultural resources.

Four Corners Power Plant

The decommissioning and dismantling of the FCPP could impact historic properties. As potential impacts are identified, OSMRE/BIA will consult with THPO and SHPO and mitigation measures will be identified. Since potential impacts will be mitigated, no impacts would occur (see Section 4.4, Cultural Resources, for additional information).

Water Resources/Hydrology

Navajo Mine

During demolition activities associated with the Navajo Mine, short-term impacts to near-surface groundwater quality could occur. Impacts to subsurface hydrogeology would be beneficial, and reclamation of mined lands would potentially restore natural groundwater flow. Reclamation of mined lands would potentially restore natural groundwater flow, and surface water drainage and natural stormwater flow. Areas that had been previously mined or altered would be reclaimed in accordance with the Reclamation Plan; therefore, impacts to groundwater and surface water would be beneficial. In addition, reclamation of mined lands would potentially restore natural groundwater flow.

Short-term impacts to surface water quality could occur; however, implementation of all applicable plans would minimize impacts to nearby waters of the U.S. Impacts to both surface water hydrology and water quality would be beneficial. The amount of water available to other users would not change.

Four Corners Power Plant

If APS decided to shut down and decommission the power plant, water quality in surface water bodies within the deposition area, particularly the San Juan River, would improve at least incrementally, since deposition from FCPP was only one of the sources of deposition into these water bodies. Impacts to groundwater would be as described for the Proposed Action.

Environmental Justice Considerations

Impacts to water resources/hydrology would be either minimal or beneficial; no major impacts to environmental justice would occur under Alternative E.

Land Use and Transportation

Navajo Mine

Under Alternative E, the three affected dwellings in the Pinabete SMCRA Permit Area would not be relocated and grazing and CUAs would not change. Burnham Road would not be realigned; therefore, no additional noise, dust, and traffic would occur. However, the public benefits to transportation and safety would not be realized. Mine-related traffic would decrease as early as 2016 when Area III would no longer be mined.

Four Corners Power Plant

Under Alternative E, the FCPP would be dismantled slowly, which would result in an increase in traffic and associated dust, noise, and traffic of heavy machinery. Following the power plant's dismantlement and any associated remediation activities, additional land may be available for grazing, although it is uncertain at this time.

Environmental Justice Considerations

No impacts to environmental justice would be associated with Alternative E.

Socioeconomics

Population and Demographics

Under Alternative E, the shutdown of the Navajo Mine and FCPP may result in a population decline, as net immigration to the area may slow causing a reduction in population growth rates.

Economic Background

Unless and until other economic activities develop to replace the employment and income opportunities at the FCPP and the Navajo Mine, the ROI's economy would become weaker. Further, the environmental justice community of concern would be prevented from developing its tribal trust resources reserved to it under the Treaty of 1868.

Indicators of Social and Economic Well-Being

Social and economic well-being would also be reduced because of the loss of jobs, which could also exacerbate health issues of Navajo Nation members.

The end of economic and fiscal contributions from the Navajo Mine and FCPP's operations could lead to reductions in education attainment, increased crime and recidivism, and a reduced ability to maintain or upgrade the housing stock. The ability of individuals to obtain healthcare would be negatively impacted as well.

Navajo Public Services

Under Alternative E, no more tax revenues from the operations and production would be associated with the Navajo Mine and FCPP. This reduction in revenues would negatively impact the quality and quantity of the public services offered on the Navajo Nation.

Environmental Justice Considerations

- *Step 1: Are potential adverse social, economic, or health impacts associated with Alternative E?*

  Yes. Fewer employment opportunities for Navajo Nation members would exist. Social and economic well-being would be reduced leading to weaker overall social conditions. Taxes and royalties paid by the mine and power plant would cease likely leading to a reduction in the level of services provided to Navajo Nation members.

- *Step 2: Would potential adverse impacts disproportionately affect minority or low-income populations based on ROI population and participation in potentially affected activities?*

  Yes. The loss of large fiscal contributions made by NTEC and APS to the Navajo Nation government and the associated reduction in public services would disproportionately impact tribe members.

- *Step 3: Are disproportionate adverse impacts major?*

  Yes. The decline in revenues to the Navajo Nation government would be expected to exceed $40.6 million.

Visual Resources

Navajo Mine

Under Alternative E, visual quality would be beneficially impacted through the removal of structures related to the Navajo Mine and the reclamation of the land; both of which would improve the scenic quality and the integrity of the landscape.

Four Corners Power Plant

Under Alternative E, visual quality would be beneficially impacted by the FCPP's shutdown and the removal of all of the related buildings and facilities, which would improve both the scenic quality and integrity of the landscape.

Environmental Justice Considerations

Under Alternative E, no adverse impacts to environmental justice would be associated with visual resources.

Noise and Vibration

Navajo Mine

Under Alternative E, noise impacts would continue through 2012 until reclamation activities are completed. Following completion of reclamation, no noise impacts would result.

Four Corners Power Plant

Under Alternative E, upon plant closure no noise impacts would result. Noise impacts would result from the FCPP's dismantlement; however, these activities are undefined and therefore not quantified.

Environmental Justice Concerns

No adverse impacts to environmental justice would be associated with noise and vibrations under Alternative E.

Hazardous and Solid Wastes

Navajo Mine

Short-term impacts would increase due to removal of ancillary buildings, facilities, and hazardous materials. After removal, impacts from hazardous materials would be reduced to no impact due to the lack of on-site storage of hazardous materials.

Potential impacts from historical placement of CCR would remain after Navajo Mine closure. Implementation of closure and post-closure management plans would decrease these potential impacts.

Four Corners Power Plant

Impacts to hazardous waste and solid waste would be short-term and predominately associated with disposal of demolition materials. Permanent hazards would be associated with the management of existing ash disposal units; however, these permanent hazards would be reduced through the implementation of a closure plan.

Environmental Justice Considerations

Impacts to environmental justice from hazardous wastes associated with Alternative E would not be major.

Recreation

Navajo Mine

The post-reclamation land use under Alternative E would be comparable to the post-reclamation land use under the Proposed Action, although it would occur sooner under Alternative E. No access restrictions would inhibit dispersed recreation within the ROI, and indirect impacts to scenic beauty from designated recreation areas would not occur.

Four Corners Power Plant

Shut down and decommissioning of the power plant would be a beneficial impact by improving the scenic beauty in the ROI. However, the potential elimination of water to Morgan Lake would have a major, permanent impact to recreational resources in the ROI.

Environmental Justice Considerations

No adverse impacts to environmental justice would be associated with recreation under Alternative E.

Health and Safety

Navajo Mine

Mining activities that require health and safety programs would no longer be performed after closing the mine, thereby contributing a negligible improvement of long-term public health and safety.

Four Corners Power Plant

If APS decided to shut down and decommission the power plant, short-term impacts to worker safety and public health during decommissioning would be the same as the Proposed Action. The potential long-term impact would be beneficial because operational activities that could contribute to worker safety or public health issues would not occur.

Environmental Justice Considerations

No adverse impacts to environmental justice would be associated with health and safety under Alternative E.

Biological Resources

Navajo Mine

Under Alternative E, existing mining areas would be reclaimed and no additional impacts to wildlife, habitat, or vegetation would occur.

Four Corners Power Plant

Under Alternative E, no impacts to wildlife, habitat, and vegetation would occur.

Environmental Justice Considerations

No adverse impacts to environmental justice would be associated with biological resources under Alternative E.

4.13 Cultural Resources

4.13.1 Impact Assessment Methodology

Assessment of the potential effects on the cultural environment was based in part on criteria defined by regulations for *Protection of Historic Properties* (36 CFR 800), which implement the NHPA. Those regulations define an effect as a direct or indirect alteration to the characteristics of a historic property that qualify it for inclusion in the NRHP. Effects are adverse when the alterations would diminish the integrity of a property's location, setting, design, materials, workmanship, feeling, or association. Examples of adverse effects include the following:

- Physical destruction, damage, or alteration of all or part of a property.
- Alteration of a property, including restoration, rehabilitation, repair, maintenance, stabilization, hazardous material remediation, and provisions of handicapped access, that is not consistent with the Secretary of the Interior's Standards for the Treatment of Historic Properties (36 CFR Part 68) and applicable guidelines.
- Removal of a property from its physical location.
- Change of the character of the property's use or of physical features in the property's setting that contribute to its historic significance.
- Introduction of visual, atmospheric, or audible elements that diminish the integrity of the properties significant historic features.
- Neglect of a property, which causes its deterioration, except where such neglect and deterioration are recognized qualities of a property of religious and cultural significance to an Indian tribe or Native Hawaiian organization.
- Transfer, lease, or sale of the property out of Federal ownership or control without adequate and legally enforceable restrictions or conditions to ensure long-term preservation of the property's historic significance [36 CFR Part 800.5(a)(2)].

The ROI, or APE, varies for each type of potential impact on the cultural environment. Potential direct impacts to cultural resources from implementation of this project could result from the long-term mining of coal. The area of potential direct effects to cultural resources is the geographic extent of the Project Area.

There is a limited potential for indirect effects on TCPs from visual intrusion, vibrations, and increased noise. To consider these potential effects, a 1-mile buffer around the proposed Project Area is considered reasonable. For this analysis, the criterion for a substantial impact on cultural resources was defined as an adverse effect that cannot be avoided or satisfactorily mitigated through consultation with parties participating in the review of the project in compliance with Section 106 of the NHPA. Also for NEPA analysis, impacts to cultural resources need to be analyzed under regulations other than NHPA such as NAGPRA and NNCRPA.

There are no ground-disturbing activities at the FCPP that are indirect effects of the Proposed Action; therefore there are no cultural resource effects at FCPP as a result of the Proposed Action.

4.13.2 Impacts

In accordance with Section 106 of the NHPA, Federal agencies must take into account the effects of proposed actions on NRHP-eligible sites.

4.13.2.1 Proposed Action

4.13.2.1.1 Archaeological and Historical Resources

Under Proposed Action, 13 archaeological and historical resource sites would be directly impacted, 12 by mining activities, and 1 by the Burnham Road realignment (Table 4.13-1). Four of these properties were determined eligible for nomination to the NRHP; three of which have been mitigated through ethnographic research, and the remaining property was mitigated through excavation (Kelly et al. 2007, Johnson et al. 2007), including the one impacted by Burnham Road. Seven of the remaining properties were determined not eligible and two have been recommended as not eligible after testing. No further work has occurred on these ineligible sites. None of these nine sites contains deposits or attributes that are afforded protection under NAGPRA or NNCRPA.

Table 4.13-1. Directly Impacted Archaeological and Historical Resources

Site Number	Site Type	National Register Status	Mitigation
29-31	Unknown isolated feature	Not eligible	None
29-33	Navajo limited activity - Rock shelter	Not eligible[1]	Tested[1]
29-81	Navajo temp camp	Not eligible[1]	Tested[1]
29-82	Navajo historic isolated cairn	Not eligible	None
29-84	Navajo historic isolated cairn	Not eligible	None
29-89	Navajo historic mine test pit	Eligible	Mitigation/Ethnography[3]
29-91	Navajo historic wagon road wall	Eligible	Mitigation/Ethnography[3]
29-93	Navajo historic mine shaft/test pit	Eligible	Mitigation/Ethnography[3]
29-94	Navajo historic check dam	Not eligible	None
29-95	Navajo historic earthen dam	Not eligible	None
29-112	Navajo historic water control feature	Not eligible	None
29-113	Unknown isolated features	Not eligible	None
28-177	Navajo Multi-habitation	Eligible[1]	Mitigation/Excavated[2]

Sources:
[1] Johnson et al. 2007
[2] Fetterman 2011
[3] Kelly et al. 2007

4.13.2.1.2 Traditional Cultural Properties

While no TCPs have been identified in the Project Area, eight TCPs are located in the 1-mile buffer around Area IV North. There are no TCPs associated with Area III (Table 4.13-2). Seven of these properties are considered not eligible to the NRHP and one is considered as “More Data Needed” to make a determination. Six of the eight sites are eligible as Navajo Nation TCPs. In addition, the Hogback and the San Juan River have been identified in comments and other communications as culturally important. Since those comments were received, communications between OSMRE and NNHPD confirm that there will be no impact—direct or indirect—on those features. Finally, comments have suggested that certain clay gathering sites in nearby washes should be considered. The locations of these sites were not identified, and impacts to them cannot be evaluated based on current information. However, two mineral gathering sites are identified as TCP 3 and TCP 4. There would be no direct or indirect impacts to any of these properties due to noise, vibration, and visual changes would be extremely low to nonexistent and would not diminish the integrity of the properties.

Table 4.13-2. Traditional Cultural Properties within One Mile of Project Area

TCP Identification	Description	NRHP Eligible
TCP1[1]	Ntl'iz (offering place) of stones to Mother earth, rain prayer, used since 1930s	No
Kelly TCP 2[1]	Onion gathering area, (Ch'il/azee') used "for generations," plant medicine gathered by one individual for Windway ceremonies; Interviewees voiced no concerns about project impacts	No
Deenasts'aa' Bito (Wildram Spring)[1]	Location where wild sheep drank	No
Deenasts'aa' Dah Njah (Wildram Bedground)[1]	Location where wild sheep bedded	No
Teel (Chaco Wash)[1]	Plant gathering area tied to Teehooltsodii (Holy Being Who Controls the Waters) story	More Data Needed
Chavez TCP 2[2]	Lightning struck corral, ntl'iz (offering place) used from 1930s to present	No
TCP 3[2]	Mineral gathering area used from 1930s to present	No
TCP 4[2]	Mineral gathering place used from 1930s to present	No

Sources:
[1] Kelly et al. 2007
[2] Chavez 2006

4.13.2.2 Proposed Action with Conditions

Under this Alternative, impacts would be the same as those described under the Proposed Action. However, the consolidated cultural resource protection measures covered in the Cultural Resource PA will provide greater assurance that all cultural resources will be thoroughly and expeditiously considered for future actions. The PA also refines procedures for data recovery and mitigation as well as handling cases of unanticipated finds. The PA ensures that future impacts would be considered and mitigated as necessary.

4.13.2.3 No Action Alternative

Under the No Action Alternative, none of the described mine activities would take place in Area IV North but would continue as permitted in Area III. No change would occur to archaeological and historical resources or TCPs in Area IV North other than the investigative activities that were completed on sites in the area. Within Area III, previous mitigation work was conducted and no unmitigated archaeological or historical sites will be impacted by continued mining in this area. A historic burial was described in this area during ethnographic studies. However, a detailed examination of the location failed to produce physical evidence of this burial. There are no TCPs associated with Area III. Mining in this area would be closely monitored and if human remains are encountered, mining would be suspended in the area and Navajo Nation Jishchaa' and NAGPRA procedures implemented.

Under the No Action Alternative, the combustion-related impacts at the FCPP would remain as described for the Proposed Action through July 2016 as the current coal stockpiles are used. Following July 2016, should additional mining not be approved in Area IV North, NTEC may elect to proceed with mining in the Pinabete Permit Area under a revised SMCRA permit. However, after the revised permit is submitted, OSMRE would be required to comply with NEPA prior to making a decision on any potential SMCRA permit revision to the Pinabete Permit. Alternatively, under the No Action Alternative, the Navajo Mine and FCPP could potentially shut down once all coal reserves are combusted. The effects of this shut-down has been evaluated in Section 4.4.4.5 of the FCPP/NMEP EIS and is incorporated by reference as follows:

Archaeological Resources

Navajo Mine

The closure of the Navajo Mine would have no effect on historic properties. Lack of mining in Areas IV North and portions of IV South within the APE would have no effect on historic properties. No impact would occur.

Four Corners Power Plant

The decommissioning and dismantling of the FCPP could affect 14 NRHP-eligible and unevaluated archaeological resources…OSMRE consulted with the Navajo Nation THPO on determinations of eligibility and Project effects for these resources within the APE. Implementation of the FCPP and Transmission Lines PA would minimize and/or mitigate any potential impacts; therefore, impacts would be minor.

Historic Buildings and Structures

Navajo Mine

All historic buildings and structures have been determined not eligible for listing in the NRHP by OSMRE and the Navajo Nation THPO. As such, the closure of the mine and reclamation activities would have no impacts on this resource type (Appendix B).

Four Corners Power Plant

OSMRE consulted with the Navajo Nation THPO on determinations of eligibility for all resources and Project effects within the APE. As all historic buildings and structures have been determined not eligible for listing in the NRHP, the decommissioning and dismantling of the FCPP would have no impacts on historic buildings and structures.

Traditional Cultural Properties

Navajo Mine

The closure of the Navajo Mine would have no effect on the five NRHP-eligible and unevaluated TCPs... No impacts would occur.

Four Corners Power Plant

The decommissioning and dismantling of the FCPP could affect seven NRHP-eligible TCPs. OSMRE is consulting with the Navajo Nation THPO on determinations of Project effects for these resources. The PA for the FCPP and Transmission Lines provides *guidance for the ongoing evaluation of resources and if determined eligible for the NRHP, measures to minimize and/or mitigate potential impacts. Therefore, impacts would be minor.*

4.14 Traffic and Transportation

4.14.1 Impact Assessment Methodology

The traffic and transportation resource assessment area considers use of the existing transportation infrastructure within the proposed mining area and Burnham Road realignment and 1-mile area surrounding the Proposed Action. The use of the regional transportation infrastructure and associated traffic related to it would not be modified by activities associated with the Proposed Action and/or the continued operation of the Navajo Mine. It is anticipated that mine-related traffic would remain level with new mining development as part of the Proposed Action. As no increase in employee use or material transport use is anticipated on the regional highway road system during the life of the operation, this area and related traffic use is not considered as part of the resource assessment area.

Under SMCRA regulations (30 CFR 761.14), BNCC is required to develop adequate resource protection measures to eliminate, minimize, and/or mitigate any effect to public roads. BNCC would also coordinate with the Navajo Nation and their chapter houses affected by the Proposed Action. The Proposed Action wholly incorporates both of these administrative requirements.

Comments from community members indicated concern regarding access to CUAs used for grazing, and concerns for road improvements. Therefore, this analysis considers the potential for change to CUA access and management and the potential for modification of use due to proposed mining activities and Burnham Road realignment. Further discussion of direct and indirect impacts to related land use management is included in Section 4.11 – Land Use.

4.14.2 Impacts

4.14.2.1 Proposed Action

Direct impacts associated with mining operations in Area III and Area IV North would require removing, restricting, and/or relocating unimproved two-track roads used for CUA access and livestock grazing. No existing unimproved two-track roads are anticipated to be affected in Area III, though approximately 5 miles of unimproved two-track roads are anticipated to be affected by proposed mining in a portion of Area IV North. Restriction or modification of existing access routes specifically used for CUA management would result in minor to moderate short-term impacts for the life of the operation. Temporary use restrictions of up to 30 minutes would occur on public roads and unimproved access routes to ensure public safety during blasting, resulting in a minor short-term impact. Adequate signage and surface oversight would be provided to communicate timing of such activities to the public and minimize the short-term impact of this necessary protection measure.

Direct short-term to long-term beneficial impacts for realignment of the Burnham Road would modify the existing transportation infrastructure. The proposed realignment would improve road surface conditions and safety from the existing condition. The realignment would eliminate a “hairpin” corner, thus increasing transportation network safety. In addition, there would be no need to stop traffic during blasting operations at Navajo Mine after the realignment, which will improve both transportation network safety and traffic flow. Realignment of the Burnham Road would have minor to moderate beneficial effects upon traffic volumes associated with use of this road. As discussed in Section 2, these actions occurred following publication of the 2012 FONSI. For the purposes of this EA, no new impacts are identified.

No indirect impacts that could affect the transportation infrastructure are anticipated. Traffic associated with FCPP (i.e. employee commuting, deliveries) would remain the same as the current baseline conditions. Employment levels would remain similar to the existing baseline conditions and gradually lessen through worker attrition to account for the operational reduction vis-a-vis the shutdown of FCPP Units 1-3 in December 2013.

In the long term, the transportation network would provide access for post-mine land use for livestock grazing and wildlife habitat.

4.14.2.2 Proposed Action with Conditions

Under this Alternative, impacts would be the same as those described for the Proposed Action.

4.14.2.3 No Action Alternative

Under the No Action Alternative, the transportation infrastructure would continue to be affected by mining actions in Area III. Access routes and the Burnham Road would continue to experience short-term impacts associated with restricted use for the life of Area III operations. The Burnham Road would not be relocated and public benefits to transportation and safety would not be realized. No impacts to access in Area IV North would be anticipated. Traffic volume assumptions for the regional road system used by the Navajo Mine would remain as described, with anticipated mine-related traffic decreasing as early as 2016. Impacts would continue to be minor to moderate and short term to long term within the existing Navajo Mine.

Under the No Action Alternative, the combustion-related impacts at the FCPP would remain as described for the Proposed Action through July 2016 as the current coal stockpiles are used. Following July 2016, should additional mining not be approved in Area IV North, NTEC may elect to proceed with mining in the Pinabete Permit Area under a revised SMCRA permit. However, after the revised permit is submitted, OSMRE would be required to comply with NEPA prior to making a decision on any potential SMCRA permit revision to the Pinabete Permit. Alternatively, under the No Action Alternative, the Navajo Mine and FCPP could potentially shut down once all coal reserves are combusted. The effects of this shut-down has been evaluated in Section 4.9.4.5 of the FCPP/NMEP EIS and is incorporated by reference as follows:

> ***Navajo Mine***
>
> *Under Alternative E, two track access routes and Burnham Road would continue to experience short-term impacts associated with restricted use for the life of Area III operations. Burnham Road would not be rerouted and public benefits to transportation and safety would not be realized. No impacts on access in Area IV North would be anticipated. Traffic volume assumptions for the regional road system used by the Navajo Mine would remain as described until 2016 when Area III would no longer be mined. Mine-related traffic would decrease as early as 2021 when reclamation activities would be completed.*

Four Corners Power Plant

Under Alternative E, Units 4 and 5 would be shut down by 2016. During the demolition of FCPP, there would be temporarily increasing worker traffic and traffic of heavy machinery. However, future uses of the site are speculative and subject to environmental review at the tribal or Federal level at the time they are developed and proposed. Under Alternative E, the electric rail line would no longer be required to transport coal from the mine to the FCPP.

4.15 Health and Safety

4.15.1 Impact Assessment Methodology

The consequences of the alternatives on health and safety focus on public exposure to air emissions from Navajo Mine operations. Other potential health and safety risks to workers are not expected to be substantial as extensive health and safety programs designed to minimize worker risk are implemented and enforced at Navajo Mine. A recent health survey in San Juan County, New Mexico found that residents have a higher incidence of CLRD, including asthma, than the remainder of New Mexico and the United States (San Juan County 2010). Increased medical visits for asthma symptoms have been attributed to elevated levels of O_3 in the area (New Mexico Department of Health 2007). However, there is no direct link between increased ambient PM levels and increased reports of asthma symptoms or asthma incidence. The impact assessment criteria for public health are based on whether the levels of PM and O_3 precursor emissions from Navajo Mine would cause exceedances of NAAQS in San Juan County, New Mexico because the NAAQS are set by EPA to ambient concentration levels that are to be protective to human health. The analysis also considers localized effects.

4.15.2 Impacts

4.15.2.1 Proposed Action

The Proposed Action would result in the same levels of O_3 precursor emissions. Ambient air modeling found that these emissions would not cause a measurable change in ambient PM_{10} or $PM_{2.5}$ concentrations in San Juan County, New Mexico. San Juan County is currently in "attainment" status and ambient air quality does not regularly exceed the NAAQS. Therefore, there would be no substantial adverse public health consequences for this alternative. A detailed analysis supporting this conclusion is provided in the FCPP/NMEP EIS. This analysis is incorporated by reference below:

The air pollutant of primary public health concern associated with mining in Area IV North is fugitive dust containing PM_{10}. PM_{10} and $PM_{2.5}$ emission sources include blasting, overburden removal, coal extraction, transport, and handling, and general operation of mine vehicles and equipment. Operation of mine vehicles and equipment also produces emissions of other criteria pollutants, mainly CO, SO_2, NO_x, and VOCs.

4.15.2.1.1 Criteria Pollutants

Ambient air modeling found that fugitive dust emissions would not cause a measurable change in ambient PM_{10} or $PM_{2.5}$ concentrations in San Juan County, New Mexico. San Juan County is currently in "attainment" status, and ambient air quality does not *regularly exceed the NAAQS. In part, to assess whether compliance with these NAAQS is protective of health for sensitive populations, an alternative risk analysis was also applied to particulate matter whereby coal dust metal concentrations in $PM_{2.5}$ were estimated using metal concentrations for Navajo Mine coal reported by Bunnell et al. (2010) and assuming $PM_{2.5}$ concentrations were equal to the primary NAAQS for $PM_{2.5}$ of 12 µg/m^3. Excess cancer risks and hazard quotients were calculated using EPA (2013) residential air regional screening levels (RSLs) as toxicity benchmarks.*

The risk analysis for $PM_{2.5}$ shows that the metals present in Navajo Mine coal and likely to be present in fugitive dusts at the primary NAAQS for $PM_{2.5}$ of 12 µg/m^3 would not pose an unacceptable risk to public health. As shown in… [the table below], all excess cancer risks are less than the target risk level of 1×10^{-6} and all hazard quotients are less than the target hazard quotient of 1 for residential exposures. The Proposed Action would result in the same levels of O_3 precursor emissions as the existing operations. Therefore, no substantial adverse public health consequences from criteria air pollutants would occur for the Proposed Action and the NAAQS are an appropriate significance criterion.

Table 4.15-1 Risk Analysis for $PM_{2.5}$ Assuming Navajo Mine Coal Metals Composition for Fugitive Dust Emissions

Element	Coal Composition (mg/kg)	Air Concentration (µg/m3)	RSLc (µg/m3)	RSLnc (µg/m3)	Risk	Hazard Quotient
Antimony	0.512	6.1E-06	NA	2.1E-01	NA	2.9E-05
Arsenic	0.272	3.3E-06	5.7E-04	1.6E-02	5.7E-09	2.0E-04
Beryllium	0.807	9.7E-06	1.0E-03	2.1E-02	9.7E-09	4.6E-04
Cadmium	0.021	2.5E-07	1.4E-03	1.0E-02	1.8E-10	2.5E-05
Cobalt	2.57	3.1E-05	2.7E-04	6.3E-03	1.1E-07	4.9E-03
Lead	9.76	1.2E-04	NA	1.5E-01	NA	7.8E-04
Manganese	10.0	1.2E-04	NA	5.2E-02	NA	2.3E-03
Mercury	0.016	1.9E-07	NA	3.1E-01	NA	6.2E-07
Nickel	2.21	2.7E-05	9.4E-03	9.4E-02	2.8E-09	2.8E-04
Selenium	1.70	2.0E-05	NA	2.1E+01	NA	9.7E-07

Notes: Chromium was not evaluated because EPA has not derived an RSL for trivalent chromium, the form of chromium expected to be present in naturally occurring bituminous coal.

NA = not applicable

RSLc = residential air regional screening level for carcinogenic effects.

RSLnc = residential air regional screening level for noncancer effects.

4.15.2.1.2 Hazardous Air Pollutants

The population living in the vicinity of the mine is widely dispersed, and the impacts of mining are relatively short-term at any particular location, which suggests that public health impacts from operation of diesel-powered equipment have been, and would continue to be minimal. To confirm this, a screening health risk assessment was performed as part of the air quality analysis. Below is a summary of the results of the screening HRA for the Navajo Mine SMCRA Permit Area and Pinabete SMCRA Permit Area.

Diesel Particulate Matter or DPM, which is part of a complex mixture that makes up diesel exhaust, is considered a HAP by the EPA. At the mine, larger and more persistent sources of DPM could potentially present a health risk to nearby sensitive receptors. An example of this situation would be mining operations where large diesel-powered equipment and vehicles are used in active areas for extended lengths of time such as months or a year.

In order to evaluate this potential risk, a screening-level HRA for DPM was performed using conservative methodology (EPA 1992b) for maximum mining activity levels and timeframes against the target risk levels. The actual impacts would be lower than these model results; because the conservative model found that the DPM emissions were within the target risk levels, no attempt was made to refine the analysis with lower, more realistic, exposure values. Results of the screening HRA are presented in… [the table below] for two scenarios:

1. *Alternative Case 1. Two years coal extraction and loading operations in Area IV; activity in same general location (zone) impacting a receptor 0.5 mile (1,600 meters) away; DPM emission rate of 28 pounds per day; wind blowing from source toward receptor 30 percent of the time (diurnal pattern).*
2. *Alternate Case 2. Same as above, but 1 year duration.*

Table 4.15-2 Diesel Particulate Matter Health Risk Assessment

DPM Screen Parameter	Units	Alternate Case 1	Alternate Case 2
Onsite Emission Rate	lb/day g/sec	28 1.47E-01	28 1.47E-01
Receptor Distance	meters	800	800
Modeled Hourly Concentration	$\mu g/m^3$	8.1	8.1
Corrected Annual Concentration	$\mu g/m^3$	0.81	0.81
Unit Risk Value (70-year MEI)	$(\mu g/m^3)^{-1}$	3.00E-04	3.00E-04
Chronic Reference Exposure Level	$(\mu g/m^3)$	5	5
Activity Duration	days	730	365
Wind Direction	frequency	0.30	0.30
Exposure Correction[1]	fraction	8.6E-03	4.3E-03

DPM Screen Parameter	Units	Alternate Case 1	Alternate Case 2
Cancer Risk	probability per million	2E-06 2	1E-06 1
Significance Threshold	probability per million	1E-06 – 1E-04 1 - 100	1E-06 – 1E-04 1 - 100
Noncancer Hazard Quotient	unitless	0.16	0.16
Noncancer Hazard Threshold	unitless	1	1

Note:
[1] Exposure Correction is 2 years/70 years times 0.3.

AERSCREEN, the screening version of the AERMOD dispersion model developed by the EPA (2011c), was used to determine worst-case ambient concentrations of emissions. For DPM, an organic air toxic with published emission factors and unit risk values (OEHHA 2009), cumulative cancer risk was determined for the nearest receptors for working periods of 2 years and 1 year. The nearest receptor which would not be relocated, is approximately 0.5 mile from the Pinabete SMCRA Permit Area boundary and would be 0.9 mile (approximately 1,448 meters) from the proposed mining operations. Thus, the 70-year unit risk value for DPM was corrected to reflect these actual lengths of time. AERSCREEN predicts "worst case" 1-hour, 3-hour, 8-hour, 24-hour, and annual concentrations – without the need for site-specific hourly meteorological data – that are equal to or greater than generated by AERMOD; however, the degree of conservatism varies depending on the application.

The results of the screening HRA show that the risk due to inhalation of DPM at the receptor is estimated to be about 2 in a million for the first alternative case, and about 1 in a million for the second alternative case. These risk estimates fall well within the EPA's National Contingency Plan risk range for making risk management decisions (40 CFR Part 300). The noncancer hazard quotient of 0.16 is less than the noncancer hazard threshold of 1. Therefore, the results of the analysis indicate that impacts of particulate emissions during mining would not pose a health risk to sensitive receptors (e.g., residents) located downwind of the mine.

Indirect Impacts from FCPP Operations

Coal mined at the Navajo Mine is transported via dedicated railway to the FCPP and is the only source of coal for operation of the FCPP. Therefore, discussion of the potential health and safety impacts from operation of FCPP is relevant to the discussion of potential impacts of the Proposed Action. Such analysis was conducted as part of the FCPP and NMEP. This analysis, as it pertains to operations through 2016, is incorporated by reference here:

Worker Safety

Existing health and safety programs comply with MSHA and OSHA regulations and are adequately implemented to address the associated risks of the FCPP; therefore, impacts *to worker safety from the Proposed Action and the continued operation of the FCPP would be negligible.*

Public Health

Criteria Pollutants

In addition to stack emissions, modeling of fugitive dust emissions from road traffic, materials handling, and mining operations determined that the Proposed Action would not cause local exceedances of NAAQS for PM_{10} (respirable particulate) and $PM_{2.5}$ (fine particulate). Attainment of primary NAAQS is protective of public health, including sensitive receptors, as described above under Criteria Pollutants; therefore, impacts in the short- or long-term operation of the FCPP are estimated to be negligible. (AECOM 2013d).

Hazardous Air Pollutants

Three types of predictive modeling studies were conducted to evaluate impacts to public health: 1) a screening HRA was performed to evaluate the risk to sensitive receptors from diesel exhaust; 2) a model of fugitive dust emissions for comparison to particulate matter NAAQS; and 3) a model of human health risk from FCPP emissions. The section summarizes the results of the analysis of potential health risks from FCPP emissions.

4.15.2.1.3 Potential Risk from FCPP Emissions

An HHRA was performed to evaluate the health effects of HAP emissions from FCPP Units 4 and 5 (AECOM 2013d). The emissions characterization, dispersion, deposition, and fate and transport modeling conducted for the HHRA also supports the Deposition Modeling Study for the ERA.

The HHRA was conducted according to the HHRA Protocol (protocol) established by the EPA (2005b) for hazardous waste combustion facilities, which is also considered appropriate for coal-fired power plants. As such, the HHRA includes the five standard steps of risk assessment:

1. *Hazard Identification. Selects the compounds of potential concern (COPC), also referred to as "target compounds," both organic and inorganic.*
2. *Dose Response Assessment. Reviews the published risk factors developed by regulatory agencies to account for carcinogenic and noncarcinogenic (acute and chronic) health effects of chemical exposure.*
3. *Exposure Assessment. Involves modeling the dispersion, deposition, and fate and transport of COPCs in the environment and various pathways (i.e., inhalation, ingestion, absorption) by which individuals may be exposed.*
4. *Risk Characterization. Involves combining results of the dose response and exposure assessments to determine potential health risk.*
5. *Uncertainty Assessment. Provides a qualitative discussion of the factors that affect the risk estimates and how uncertainty in those factors could affect the veracity of risk estimates.*

The protocol recommends three exposure scenarios for persons living in the vicinity of a source: 1) typical residential exposure; 2) farm products consumption exposure (beef, pork, chickens, eggs, milk; although sheep are not included, their uptake factors would be encompassed by these animals recommended by EPA for these analyses); and 3) fish consumption exposure. These scenarios consider the potential exposure of adults and children through direct and indirect exposure pathways. The exposure pathways include inhalation of compounds emitted from stacks and dispersed into ambient air (a direct pathway) and ingestion of trace compounds that enter the food chain through plant uptake and animal ingestion (an indirect pathway).

Compounds enter the food chain through deposition from air to soil, deposition on crops and forage, and deposition into watersheds and their associated waterbodies. The HHRA used conservative default exposure assumptions recommended by EPA unless appropriate site-specific exposure parameters were available. For example, the HHRA applied ingestion rates of locally-caught fish based on local advisories for fish consumption instead of default values. Also, a supplemental analysis was conducted to evaluate the maximum incremental contribution of FCPP emissions to blood-borne lead levels in children using the EPA's Integrated Exposure Uptake Biokinetic Model.

Selection of COPCs was based on the following two previous studies, "Updated Hazardous Air Pollutants (HAPs) Emissions Estimates and Inhalation Human Health Risk Assessment for U.S. Coal-Fired Electric Generating Units" (EPRI 2009) and "Multi-Pathway Human Health and Ecological Risk Assessment for a Model Coal-Fired Power Plant" (EPRI 2011).

For atmospheric dispersion modeling using EPA's AERMOD program, the HHRA evaluated the following COPC emissions from Units 4 and 5:

- *2,3,7,8-TCDD, equivalents*
- *Acrolein (C3H4O)*
- *Antimony (Sb)*
- *Arsenic (As)*
- *Barium (Ba) compounds*
- *Benzene (C6H6)*
- *Benzo(a)pyrene, equivalents*
- *Beryllium (Be)*
- *Cadmium (Cd)*
- *Chlorine (as Cl2)*
- *Chromium (Cr)*
- *Cobalt (Co)*
- *Hydrogen chloride (HCl)*
- *Hydrogen cyanide (HCN)*
- *Hydrogen fluoride (HF)*
- *Lead (Pb)*
- *Manganese (Mn)*
- *Mercury, total (Hg)*
- *Naphthalene (C10H8)*
- *Nickel (Ni)*
- *Selenium (Se)*
- *Silver (Ag)*
- *Sulfuric acid (H2SO4)*
- *Zinc (Zn)*

Selection of these 24 COPCs was based on two studies in 2009 and 2011. In the 2009 study, the relative inhalation risk associated with all HAPs known to be present in coal combustion emissions were evaluated for each coal-fired electric generating unit in the United States, including FCPP Units 4 and 5. The 2011 study added several HAPs for evaluating multipathway risks from a hypothetical coal-fired power plant. The HHRA includes these as COPCs along with sulfuric acid mist, a byproduct of SCR operation (AECOM 2013d).

The HHRA used conservative methodology to analyze risks posed by the COPCs as prescribed in the protocol supplemented with site-specific information about receptors, land use, water bodies, and recommended maximum rates of fish ingestion. Calculated results were evaluated against EPA not-to-exceed risk thresholds ranging from 10-4 (1 in 10,000) to 10-6 (1 in 1,000,000) for lifetime (70-year) cancer risk and 1 (unity) for noncancer Hazard Index… [EPA 2005]. Because the HHRA lacked site-specific fugitive dust analysis, an additional analysis was conducted that specifically focused on assessing health effects associated with PM10, PM2.5, diesel particulate matter, and exposure to coal constituents in coal dusts at PM2.5 levels. The fugitive dust emission risk assessment focused on coal dust constituents based on data from the mine. The Navajo Mine has an on-going fugitive dust monitoring program, which includes triggers for taking further action.

The results of the multipathway HHRA predicted that for 25 years of future operation of FCPP, none of the estimated cancer risks exceed the strictest risk threshold of 1 in a million. For noncancer effects, the HHRA reported all Hazard Indices were below the threshold Hazard Index of 1 and the estimated blood lead concentrations were well below the CDC target blood lead concentration of 5 µg/dl. Therefore, the HHRA concludes that operation of FCPP over the next 25 years would not have a major impact on human health in the vicinity of FCPP. The HHRA also states that given the degree of conservatism purposefully built into the risk assessment methods and thresholds, this conclusion is highly protective of public health (AECOM 2013d). Specifically, the results are as follows:

- *Average case long-term cancer risk would not exceed 6 x 10-9 for adults and 2 x 10-9 for children and chronic Hazard Index would not exceed 0.01 for adults and children.*
- *Intermediate case long-term cancer risk would not exceed 1 x 10-7 for adults and 5 x 10-8 for children and chronic Hazard Index would not exceed 0.04 for adults and 0.05 for children.*
- *Worst case long-term cancer risk would not exceed 2 x 10-7 for adults and 8 x 10-8 for children and chronic Hazard Index would not exceed 0.7 for adults and 1 for children.*
- *Short-term average acute Hazard Index would not exceed 0.05 for adults and children.*

- *Short-term maximum acute Hazard Index would not exceed 0.1 for adults and children.*
- *Infant exposure to dioxins and furans through breastfeeding would not exceed 0.052 percent of the target average daily dose (permissible maximum).*
- *Child blood lead content would not exceed 0.0013 percent of the CDC recommendation (permissible maximum).*

These impacts are minor.

Based on this detailed analysis, indirect impacts to public health and safety from emissions from the FCPP are considered minor.

Other considerations of potential indirect impacts of FCPP operations include potential effects of coal combustion residue storage at the power plant and safety related to impoundments surrounding the ash disposal areas. These potential effects were addressed in the FCPP/NMEP EIS and are incorporated by reference here:

Inactive Ash Impound Areas

A figure of the ash impoundment areas is included in Section 3 [of the FCPP/NMEP EIS] as Figure 3-2. Ash Ponds 1 and 2 were constructed in the 1960s by erecting a dike on existing ground downstream from the power plant. Ash slurry was allowed to flow through existing washes until it was captured by the dike. The ash ponds were not lined and contain an average depth of approximately 24 feet of ash. Ash Ponds 1 and 2 were taken out of service when Ash Pond 3 was constructed in 1976.

In the late 1970s, Evaporation Ponds 1 through 4 were constructed on top of Ash Ponds 1 and 2. The Evaporation Ponds were constructed with a single liner of 20-mil HDPE and a 1-foot layer of earth and gravel fill placed over the liner on the sides of the ponds. The evaporation ponds were used for storage of seepage intercept water, runoff, and other industrial water from the FCPP. A phase-out of the evaporation ponds began in 2001. As of October 2011, the evaporation ponds are no longer in use, and have been reclaimed.

Ash Pond 3 is currently inactive and was used as an impoundment for the fly ash and FGD solids from Units 1, 2 and 3. The Lined Decant Water Pond (LDWP) was built over Ash Pond 3 and is lined with two layers of HDPE geosynthetic liner. It is intended to collect and retain liquid decanted from the LAI. Ash Pond 4 was constructed adjacent to Ash Pond 3, and Ash Pond 5 was constructed adjacent to Ash Pond 4. Both Ponds 4 and 5 were used as impoundments for the fly ash and FGD solids from Units 1, 2, and 3 but are currently inactive.

Ash Pond 6 is located on the northwestern side of the DFADA and was used to impound the fly ash and FGD solids from Units 1, 2, and 3, but is currently inactive. Ash Pond 6 was designed in 1984 and constructed shortly thereafter. The North Embankment of Ash Pond 6 is adjacent and parallel to the northern lease boundary of the site. Ash Pond 6 is *constructed with a clay core embankment that has been keyed into the unweathered shale bedrock.*

Gridded Disposal Area

The Gridded Disposal Area is currently inactive. It was used for disposal of asbestos-containing materials up until 1998. It also received coal dust and ash from FCPP cleanup activities, lime grit, and construction and other industrial debris until 2010. In 1984, a portion of the Gridded Disposal Area was used to land farm oil/solvent-contaminated soil as a method of remediation.

Active Ash Disposal Areas

The LAI and LDWP are the only active CCR impoundments (ponds) on site. The DFADA is an active, lined landfill facility that was constructed in 2007 and is used for disposal of dry fly ash from Units 4 and 5 as well as small amounts of construction debris.

In the future, Units 4 and 5 FGD waste will be dewatered and placed in the DFADA. DFADA Site 1 is tallest on the West Berm, approximately 110 feet above natural grade. DFADA Site 2 utilizes a composite liner system. DFADA Sites 1 and 2 are projected to reach capacity by 2016. Therefore, additional DFADA sites will be needed in the future to accommodate dry fly ash/FGD disposal through 2041…

The ash disposal areas are operated in accordance with an Operations and Maintenance Manual that has been reviewed by the New Mexico Office of the State Engineer. Daily inspection rounds are performed of the entire ash pond facilities by operations staff to observe the general condition of structures and embankments. Identified deficiencies are documented and repaired. Maintenance of the two impoundments is performed by APS staff under the guidance of APS managers and engineers. Instrument readings are reported twice annually to the New Mexico Office of the State Engineer. Inspections are made every 6 months by APS engineers and on an irregular annual to multi-year schedule by New Mexico Office of the State Engineer personnel (GEI Consultants 2009).

Due to the absence of regulatory oversight for CCR disposal prior to EPA's Final CCR Rule in December 2014, no sampling or testing data are available for either the active or inactive DFADAs. As part of EPA's TRI Program, APS is required to self-report releases to land disposal. Table 4.15-5 [of the FCPP/NMEP EIS] includes the TRI chemicals reported by APS as on-site land disposal releases. Based on the report, APS used a mass balance calculation to derive the volumes listed in the table.

Dam Safety

As part of the EPA's ongoing effort to assess the management of CCR, they performed a dam safety assessment of the coal impounds at coal-fired power plants throughout the U.S. As part of that effort, on May 19 and 20, 2009, a site assessment of the dam safety of FCPP's LAI embankment dam and LDWP was performed.

The assessment was completed by contractors who are specialists in the area of dam integrity. The report for the assessment reflects the professional judgment of the *engineering firm, and is signed and stamped by a professional engineer. The report is based on a visual assessment of the site, interviews with site personnel, and the review of geotechnical reports and studies related to the design, construction, and operation of the impoundments. The engineering firm also reviewed past state/Federal inspections of the impoundments. As part of the assessment, the contractors were asked to rate the impoundments as "satisfactory," "fair," "poor," or "unsatisfactory," terms commonly used in the field of dam safety. The site assessment for the FCPP impoundments determined they were satisfactory, which states, "No existing or potential management unit safety deficiencies are recognized. Acceptable performance is expected under all applicable loading conditions (static, hydrologic, seismic) in accordance with the applicable criteria. Minor maintenance items may be required" (GEI 2009). Suggested maintenance activities included: restoration of the uneven dam crest on the west embankment of the LDWP impoundment to full height with compact fill, and removal of tamarisk trees from the downstream toe of the west embankment of the LDWP. It was also suggested that structural analysis be performed of the HDPE decant drop inlet structure to varying water depth and the influence of multiple penetrations of the manhole sides. All suggested maintenance activities were completed by APS in 2009.*

Also, as part of the assessment the dam was given a hazard potential classification. The hazard potential classification is a rating for a dam based on the potential consequences of failure. The rating is based on the potential for loss of life, damage to property, and environmental damage that may occur in the event of dam failure. The hazard potential classification is not a reflection of the dam's condition, but of the downstream resources only. The FCPP was classified as Significant Hazard Potential in the report. Dams assigned the significant hazard potential classification are those dams where failure or misoperation would result in no probable loss of human life but could cause economic loss, environmental damage, disruption of lifeline facilities, or affect other concerns (GEI 2009).

The NMOSE performs inspections of the dams at the FCPP. These inspections have not resulted in any notices of violation or substantial areas for repair, retrofit, or replacement.

Emergency Action Plan for Active Impoundments

An Emergency Action Plan (EAP) for the LAI and the LDWP was prepared that addresses emergency procedures in the unlikely event of a dam failure (APS 2011). The EAP prepared for the LAI and LDWP is a formal document that identifies potential emergency conditions that could develop at the LAI and LDWP, provides a plan for communication of the conditions, and specifies preplanned actions to be followed to minimize property damage and loss of life. The EAP also provides procedures and information to assist FCPP in issuing early warning information of the emergency situation to responsible emergency management authorities.

Overall, the EAP's purpose is threefold:

- *Safeguard the lives and reduce property damage of the citizens living within the LAI and LDWP potential flood or inundation area.*
- *Provide effective plans for surveillance of the LAI and LDWP, prompt notification to local emergency management agencies, and citizen warning and evacuation response, when required.*
- *Assign emergency actions to be taken by the dam operator/owner, public officials, emergency personnel, and outline responsibilities of each party involved in the emergency management process in the event of a potential or imminent failure of the LAI and LDWP.*

4.15.2.2 Proposed Action with Conditions

Under this Alternative, impacts would be the same as those described for the Proposed Action.

4.15.2.3 No Action Alternative

The estimated air emissions from Navajo Mine for the No Action Alternative would be lower than baseline levels because coal production will be as much as 30 percent below current levels. San Juan County is currently in "attainment" status and ambient air quality does not regularly exceed the NAAQS. Therefore, there would be no substantial adverse public health consequences for this alternative because there would not be an increase in PM or O_3 precursor emissions levels from Navajo Mine.

Under the No Action Alternative, the combustion-related impacts at the FCPP would remain as described for the Proposed Action through July 2016 as the current coal stockpiles are used. Following July 2016, should additional mining not be approved in Area IV North, NTEC may elect to proceed with mining in the Pinabete Permit Area under a revised SMCRA permit. However, after the revised permit is submitted, OSMRE would be required to comply with NEPA prior to making a decision on any potential SMCRA permit revision to the Pinabete Permit. Alternatively, under the No Action Alternative, the Navajo Mine and FCPP could potentially shut down once all coal reserves are combusted. The effects of this shut-down has been evaluated in Section 4.17.4.5 of the FCPP/NMEP EIS and is incorporated by reference as follows:

Navajo Mine

Under the No Action Alternative, mining would cease. Mining activities which require health and safety programs would no longer be performed after closing the mine under the No Action Alternative thereby contributing a negligible improvement of long-term (beyond dismantling and reclamation activities) public health and safety. No impacts to public health would result from the anticipated mine closure; mining activity would continue to comply with all relevant laws and regulations and safety plans.

Four Corners Power Plant

Under the No Action Alternative, APS would shut down Units 4 and 5 in 2016 when the current lease expires. The FCPP would be decommissioned and held for future use. In addition to the five units, all three switchyards would also be decommissioned. Several *potential future uses of the site are possible. It could continue as an energy generation site with several potential technology scenarios. The infrastructure could also be demolished and the site redeveloped for industrial, commercial, or residential uses. It is entirely speculative at this time to predict the likely alternative future uses for the site. APS has not yet prepared a decommissioning plan. Any decisions regarding the future uses must be with the concurrence of the Navajo Nation. Currently, the site is held undivided by all of the owners; future uses may therefore require subdivision of the property. Any such uses would be subject to environmental review at either the tribal or Federal level, including potentially under NEPA, at the time they are developed and proposed.*

Short-term impacts on worker safety and public health during decommissioning would be the same as the Proposed Action. Long-term impacts would be beneficial because no mining activities that could contribute to worker safety or public health issues would occur.

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