**IN THE UNITED STATES COURT OF APPEALS**

**FOR THE NINTH CIRCUIT**

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| **In Re: U.S. EPA, REGION 9** ) | **PETITION FOR WRIT OF MANDAMUS PURSUANT TO 28 U.S.C. § 1651 33 U.S.C. §1369(B)(1)(F)** |
| DINE' CITIZENS AGAINST RUINING THE ENVIRONMENT ) | |
| SAN JUAN CITIZENS ALLIANCE ) | |
| CENTER FOR BIOLOGICAL DIVERSITY ) | **Case No.____________** |
| AMIGOS BRAVOS ) | |
| SIERRA CLUB ) | |
| Petitioners. ) | |
| **v.** ) | |
| U.S. ENVIRONMENTAL PROTECTION AGENCY, REGION 9 ) | |
| ALEXIS STRAUSS, ACTING REGIONAL ADMINISTRATOR US EPA REGION 9 ) | |
| TOMAS TORRES, DIRECTOR, WATER DIVISION, US EPA REGION 9 ) | |
| Respondents. ) | |

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**RULE 26.1 CORPORATE DISCLOSURE STATEMENT**

Pursuant to Rule 26.1 of the Federal Rules of Appellate Procedure, Dine' Citizens Against Ruining the Environment ("Dine' CARE"), San Juan Citizens Alliance ("SJCA"), Center for Biological Diversity ("CBD"), Amigos Bravos, and Sierra Club, collectively referred to herein as "Petitioners", respectfully submit this disclosure statement. Dine' CARE is a non-profit organization based on the Navajo Nation and is composed of Navajo members. Dine' CARE has no parent corporation nor is there any publicly held corporation that owns stock or other interests in the organization. SJCA is a non-profit environmental organization incorporated in the State of Colorado. San Juan Citizens Alliance has no parent corporation nor is there any publicly held corporation that owns stock or other interests in the organization. CBD is a non-profit membership corporation incorporated in the State of Arizona. The Center for Biological Diversity has no parent corporation nor is there any publicly held corporation that owns stock or other interests in the organization. Amigos Bravos is a non-profit membership corporation incorporated in the State of Arizona. Amigos Bravos has no parent corporation nor is there any publicly held corporation that owns stock or other interests in the organization. Sierra Club is a non-profit membership corporation incorporated in the State of California. The Sierra Club has no parent corporation nor is there any publicly held corporation that owns stock or other interests in the organization.

## I. INTRODUCTION

Petitioners request that this Court issue a writ of mandamus compelling the Environmental Protection Agency ("EPA") Region 9 to take long overdue action on a National Pollution Discharge Elimination System ("NPDES") permit application, which has been pending since 2006, related to the coal fired Four Corners Power Plant ("FCPP" or "power plant"), as required by the federal Clean Water Act ("CWA" or "Act"), 33 U.S.C. § 1342(b)(1)(B). This action is necessary to ensure the facility is operating in compliance with the current mandates of the Act and its implementing regulations, and to protect the people, livestock, wildlife, and waters of the Navajo Nation Reservation and areas downstream from unnecessary harm and preventable degradation.

The current FCPP NPDES permit was issued by EPA in 2001 and expired over 12 years ago. Since that time EPA has failed to take final action on a NPDES renewal permit application pending since 2006. EPA is in patent violation of the mandates and procedures of the CWA and EPA's own regulations governing the processing of the NPDES permit application for the FCPP.

## II. PARTIES, JURISDICTION, AND VENUE

Plaintiff Diné CARE is an all-Navajo membership organization comprised of a federation of grassroots community activists in the Four Corners region of Arizona, New Mexico, Colorado, and Utah, and the Tribal lands within the borders of those states. Diné CARE's goal is to protect all life in their ancestral homeland by empowering local and traditional people to organize, speak out, and assure conservation and stewardship of the environment through civic involvement, engagement, and oversight in decision-making processes relating to tribal development, and oversight of government agencies' compliance with all applicable environmental laws. Diné CARE members live, use, and enjoy the waters and areas that are affected by the FCPP, including areas in Arizona. Diné CARE members include customers of the Arizona utilities who own the FCPP. Diné CARE brings this action on its own behalf and on behalf of its adversely affected members. Its primary office is located in Dilkon, Arizona. The declaration of Dailan Long, a member of Dine' CARE is attached as Exhibit 1 and describes how EPA's failure to render final action of the pending NPDES permit application adversely impacts his interests and those of Dine' CARE. Mr. Long is a member of Dine' CARE. Exhibit 1, p. 1, ¶1. Mr. Long lives on the Navajo Nation and his homestead is located on the east and west side of the Chaco River. *Id* at p. 2, ¶3. Mr. Long raises sheep on Navajo lands near the Chaco River. *Id* at p. 1, ¶1.

The FCPP is visible from Mr. Long's home. *Id* at p. 3, ¶8. Mr. Long also recreates along the Chaco River. *Id* at p. 2, ¶4. Mr. Long is forced to haul water from a well 15 miles away from his homestead because tribal members downstream of the FCPP experience livestock mortality when consuming water from the Chaco River. *Id* at p. 3, ¶7. Mr. Long is adversely impacted by EPA's failure to make a final determination on the pending NPDES permit application because EPA's inaction exacerbates public health concerns associated with pollution discharges from the plant, denies Mr. Long data and information on coal ash water pollution discharges that would be regulated under a new permit, and impacts water quality in the Chaco River thus creating a risk to his personal health, his property, his livestock, and the agricultural use of his property. *Id* at p. 3, ¶10. Issuance of a final decision by EPA would remedy some of the harms of inaction by providing more information about water pollution discharges and its impact on the Chaco River and endangered species. *Id* at p. 4, ¶12. Issuance of a final decision by EPA would also provide a procedural right to appeal any deficiencies with the permit, which is currently being thwarted by EPA's inaction. *Id* at p. 4, ¶11.

Petitioner SJCA is a non-profit membership organization with over 500 members in the Four Corners region. The declaration of Mike Eisenfeld, a member of SJCA, Amigos Bravos, and Sierra Club is attached as Exhibit 2 and describes how EPA's failure to render final action of the pending NPDES permit application adversely impacts his interests and those of the conservation organizations of which he is a member. More specifically, Mr. Eisenfeld lives in Farmington, New Mexico about 15 miles from the FCPP. Exhibit 2 at p. 1, ¶¶ 2& 3 and p. 3 ¶7. Mr. Eisenfeld is an avid river runner and has boated on the San Juan River on numerous occasions. *Id* at p. 2, ¶4. Mr. Eisenfeld also frequently visits Morgan Lake, into which the FCPP directly discharges pollutants. *Id* at p. 3, ¶6. Mr. Eisenfeld has physical contact with the San Juan River and Morgan Lake when he recreates in those waterbodies and is concerned about health impacts to himself and his family from exposure to pollution. *Id* at pp. 8-9, ¶17. Mr. Eisenfeld is concerned with impacts of the FCPP on endangered species living in the San Juan River, namely the Colorado pikeminnow and razorback sucker. *Id.* EPA's failure to take final action on the permit application harms Mr. Eisenfeld because it results in unregulated pollution discharges into the Chaco River watershed, fails to address impacts to endangered fish species, and interferes with his recreational interests in Morgan Lake and the San Juan River. *Id.* at p. 9, ¶19. Mr. Eisenfeld's concerns would be eased if EPA would take final action on the permit because he would have more information about water pollution discharges, impacts to endangered fish species, and would diminish his concerns about health risks to himself and his family. *Id.* at pp. 9-10, ¶20.

Petitioner CBD is a non-profit membership corporation with offices in Arizona. CBD is actively involved in species and habitat protection issues worldwide, including throughout the western United States. The Center, its members, and staff members use the lands and waters near the FCPP —in particular the San Juan River—for recreational, scientific, and aesthetic purposes. The Center brings this action on its own behalf and on behalf of its adversely affected members. The declaration of Taylor McKinnon, a member of CBD is attached as Exhibit 3 and describes how EPA's failure to render final action on the pending NPDES permit application adversely impacts his interests and those of CBD. Mr. McKinnon is also an avid river runner and used to be a river guide on the San Juan River. Exhibit 3 hereto at pp. 3-4, ¶7. Mr. McKinnon also has a personal and professional interest in protecting the endangered fish species that live in the San Juan River and the critical habitat that supports the fish species. *Id.* Mr. McKinnon has concerns that pollution from the FCPP is adversely impacting these endangered fish species. *Id.* at p. 5, ¶9. Mr. McKinnon is also concerned that the Four Corner Power Plant cooling water intake structure that pulls large volumes of water from the San Juan River may be contributing to adverse impact and mortality to the endangered fish species. *Id.* at p. 6, ¶9. Mr. McKinnon is concerned that the EPA's refusal to take final action on the permit may contribute to further poisoning, endangerment and rarity of its endangered species, all of which he cares deeply about. Some of his concerns would be redressed by issuance of a final permit by EPA because it would begin to regulate these problems. *Id.* at p. 6, ¶9. In addition, he would be able to appeal any deficiencies in a final permit. *Id.* EPA's failure to finalize a permit has denied him of this legal opportunity. *Id.*

Amigos Bravos is a non-profit conservation membership organization. Amigos Bravos is dedicated to preserving and restoring the ecological and cultural integrity of New Mexico's water and the communities that depend on it.

Sierra Club is America's oldest and largest grassroots environmental organization with more than 820,000 members and supporters nationwide including more than 30,000 members residing in Arizona, Utah, and New Mexico. The Sierra Club's concerns encompass the protection of the San Juan River and the endangered species found therein. Sierra Club's main office is located in Oakland, California.

As outlined above, Petitioners have standing to bring this case on their own behalf and through their members.

Environmental Protection Agency, Region 9, is a federal government agency with the primary responsibility for taking final action on the long pending FCPP NPDES Permit application and is located in San Francisco, California.

Alexis Strauss is the Acting Regional Administrator for EPA Region 9, whose office is located in San Francisco, California. Ms. Strauss was previously the Director of Region 9's Water Division and personally signed the 2001 NPDES permit. Exhibit 4 hereto, page 1 of the 2001 NPDES Permit.

Tomas Torres is the current Director of the Water Division at US EPA Region 9. The Water Division is responsible for issuing NPDES Permits for water pollution discharges located on the Navajo Nation, such as those from the FCPP.

Water pollution and other impacts from the power plant will occur on the Navajo Nation and in tributary downstream waters in Arizona. The majority owner of the coal plant, Arizona Public Service, is based in Arizona. The Salt River Project and Tucson Electric Company, minority owners of the FCPP, are also based in Arizona. The seat of the Navajo Nation is also in Arizona.

This Court has jurisdiction to issue the writ of mandamus sought by this Petition pursuant to the All Writs Act, 28 U.S.C. § 1651. The CWA grants this Court jurisdiction to review EPA's NPDES permitting actions, 33 U.S.C. § 1369(b)(1)(F), and the All Writs Act empowers this Court to issue a writ to protect its "prospective jurisdiction" by compelling EPA to make substantive decisions that once made will be reviewable by this Court. *Telecommunications Research & Action Center v. FCC*, 750 F.2d 70, 76 (D.C. Cir 1984) ("*TRAC*"). EPA's years of inaction constitute both unlawfully withheld action and unreasonable delay pursuant to 5 U.S.C. § 706(1), and warrant a writ of mandamus from this Court ordering EPA to take final action on the pending permit application.

This Court is a proper venue for this action pursuant to 33 U.S.C. § 1369(b)(1)(F) which directs that cases be filed "in the Circuit Court of Appeals of the United States for the Federal judicial district in which such person resides or transacts business which is directly affected by such action upon application by such person."

## II. STATUTORY AND REGULATORY BACKGROUND

### A. The Clean Water Act

The CWA prohibits the "discharge of any pollutant" from a point source—"any discernible, confined and discrete conveyance"—to navigable waters "except in compliance with law." 33 U.S.C. §§ 1311, 1362. The CWA authorizes EPA, or states with permit programs approved by EPA, to issue NPDES permits allowing for the discharge of pollutants into waters of the United States. 33 U.S.C. § 1342. EPA Region 9 in San Francisco is responsible for the issuance of NPDES Permits for sources of water pollution on the Navajo Nation.

Every NPDES permit must establish "effluent limitations" for the pollutants being discharged. *Waterkeeper Alliance*, *Inc. v. U.S. EPA,* 399 F.3d 486, 491 (2nd Cir. 2005 (citing *S. Fla. Water Mgmt. Dist. v. Miccosukee Tribe of Indians*, 541 U.S. 95, 102 (2004)). NPDES permits must also contain conditions requiring both monitoring and reporting of pollutants in any discharge. 33 U.S.C. § 1342(a)(2); 40 C.F.R. § 122.44(i)(1) & (2). EPA's regulations specify that NPDES permits shall include conditions requiring monitoring "[t]o assure compliance with permit limitations." 40 C.F.R. § 122.44(i)(1). Specifically, a permit must include "requirements to monitor . . . each pollutant limited in the permit" to ascertain whether the pollutants in the discharge stay within the permitted limits. *Id*. at § 122.44(i)(1)(i). Such conditions are necessary to verify compliance with effluent limitations and to facilitate permit enforcement. *NRDC v. Cnty of Los Angeles*, 725 F.3d 1194, 1208 (9th Cir. 2013).

In addition, section 316(b) of the CWA requires that NPDES permits for facilities with cooling water intake structures ensure that the location, design, construction, and capacity of the structures reflect the best technology available for minimizing adverse environmental impact. 33 U.S.C. § 1326(b); *see also* 40 C.F.R. § 401.14 (same). The chosen technology must reduce the adverse aquatic impact, impingement or entrainment, to the smallest amount, extent or degree reasonably possible. 40 C.F.R. §125.92(r) (2014). Under the permitting scheme in effect at the time EPA Region 9 issued the last permit for the FCPP, permits were issued on a case-by-case basis, with the permitting agency using its "best professional judgment" to impose conditions necessary to meet Best Technology Available ("BTA"). 40 C.F.R. § 125.90(b).

Section 402(b)(1)(B) of the CWA specifies that NPDES permits are to be issued for fixed terms not to exceed five years. 33 U.S.C. § 1342(b)(1)(B). The five-year limit on a NPDES permit's maximum duration establishes a mandatory expiration date at which the permit must be reviewed and updated to reflect changes in the law, the conditions of discharge and receiving waters, or the requirements applicable to the permittees.

### B. EPA's National Pollutant Discharge Elimination System Permitting Regulations

EPA regulations mandate a specific process designed to lead to timely final action expiring NPDES permits before or shortly after they expire that EPA has simply declined to follow with respect to the FCPP. An applicant initiates the NPDES process when it files a permit application providing information regarding the facility and its proposed discharges. *See* 40 C.F.R. § 124.3. Once the application is complete, EPA then prepares and issues a draft permit and explanatory fact sheet. *See* 40 C.F.R. §§ 124.6, 124.8, and 124.56. EPA provides public notice of these documents, and holds a thirty–day public comment period. *See id.* § 124.10(a)(1)(ii) and (b)(1). After the close of the public comment period, the Regional Administrator determines whether a final permit should be issued, based on the administrative record compiled during the public comment period. *See id.* §§ 124.15, 124.18.

After EPA issues a final permit decision, an interested party may request an evidentiary hearing to contest the resolution of any questions raised during the public comment period. *Id.* § 124.74(a). The Regional Administrator then grants or denies the request for a hearing. *See id.* § 124.75(a)(1). If a Regional Administrator denies a request for an evidentiary hearing, the denial becomes final agency action within thirty days unless an appeal is made to the Environmental Appeals Board ("EAB"). *Id.* §§ 124.60(c)(5) and 124.91. An EAB order denying review renders the Regional Administrator's previous decision final. *Id.* § 124.91(f)(1). Finally, once an EPA permit decision has become final, any interested person may obtain judicial review of the decision by petitioning for review in the Circuit Court of Appeals. 33 U.S.C. § 1369(b)(1).

## III. FACTUAL BACKGROUND

### A. The Coal Plant

The Four Corners Power Plan is located on the Navajo Nation, near Farmington, New Mexico. The power plant began operations in 1963 and is scheduled to continue operating until at least 2041.

The power plant is owned and operated by Arizona Public Service Company on behalf of itself as well as the Salt River Project Agricultural Improvement and Power District, El Paso Electric Company, Public Service Company of New Mexico, and Tucson Electric Power Company.

The FCPP provides electrical power to utilities in Arizona, Texas, and New Mexico. Units 1-3 of the coal plant were built in 1963 and operated for over half a century through 2013. In 2013 the owners of the coal plant opted to retire Units 1-3 rather than retrofit them to meet federally mandated air pollution limits. The much larger Units 4-5 of the coal plant, totaling 1540 MW of capacity, have been operating since 1970. Arizona Public Service intends to operate Units 4-5 through 2041, at which time the coal plant will be 71 years old.

Units 4-5 burn approximately 19,000 tons of coal per day. The coal boils water to create steam, which turns a turbine to generate electricity. The coal plant diverts up to 48 million gallons of water per day from the San Juan River. On average the coal plant pumps approximately 27,500 af/yr from the river. The water is withdrawn via two 8 by 8.5-foot screened intake bays located just above a gated weir. The weir dams water to assure the intake bays are adequately submerged. Water drawn from the San Juan River is stored in Morgan Lake, a man-made reservoir adjacent to the coal plant.

Coal combustion waste results from burning coal at the coal plant. This waste—fly ash, bottom ash, and boiler slag—is collected in the plant's boilers and pollution control equipment and then disposed of in lined and unlined liquid surface impoundments at the site. Over the past 50 years, Arizona Public Service has disposed of approximately 33.5 million tons of coal combustion waste.

Coal ash contains numerous toxic constituents including heavy metals such as antimony, arsenic, barium, beryllium, cadmium, chromium, lead, mercury, nickel, selenium, and thallium. Pollutants from coal combustion waste have leached through the bottom of existing coal combustion waste impoundments at the site and entered the groundwater migrating toward the Chaco River. Arizona Public Service has constructed various intercept trenches and pump-back wells beginning in 1977 and continuing through the present attempting to minimize the migration of this pollution to the adjacent Chaco River.

### B. The San Juan River, Morgan Lake, and the Chaco River

The second largest of the three sub-basins of the Colorado River, the San Juan River is one of the most important waterways in the Southwest. Morgan Lake and the Chaco River, both located on the power plant property, are tributary to the San Juan River. The Chaco River flows into the San Juan River near Shiprock, New Mexico.

Morgan Lake is a 1,200 acre cooling pond for the power plant that is also operated as a public recreation area.[1] Primary contact recreation is allowed on the lake, including windsurfing, boating, fishing, and other activities which can result in ingestion, inhalation, and direct contact with the waters of Morgan Lake.

### C. Endangered Colorado Pikeminnow and Razorback Sucker

[1] https://farmingtonnm.org/listings/morgan-lake/ (last visited November 30, 2017).

The Colorado pikeminnow was federally listed as endangered in 1973. Critical habitat for the Colorado pikeminnow, designated in 1994, includes the 100-year floodplain of the species' historic range in San Juan County, New Mexico, and San Juan County, Utah. This critical habitat includes the stretch of the San Juan River adjacent to the FCPP and Navajo mine. Remnant populations exist in the segment of the San Juan River.

The razorback sucker was federally listed as endangered in 1991. The Service designated the segment of the San Juan River from the Hogback Diversion to Lake Powell as critical habitat for the razorback sucker in 1994. This critical habitat includes the stretch of the San Juan River adjacent to the FCPP.

In 2015, as required by section 7 of the ESA, the Fish and Wildlife Service issued a Biological Opinion analyzing the effects of continued operation of the power plant and related coal mine on endangered species as part of the lease extension allowing operation of the plant from 2016- 2041. Exhibit 5. The Biological Opinion acknowledged the already dire state of the Colorado pikeminnow and razorback sucker populations in the San Juan River and cataloged substantial adverse impacts to these populations and their critical habitat from the continued operation of the FCPP and Navajo Mine, including impacts from water pollution and the FCPP cooling water intakes. Exhibit 5 at pp. 105-119.

The Biological Opinion found that entrainment in the coal plant's water intake system, as well as other impacts, would decrease the population viability of Colorado pikeminnow and razorback sucker in the San Juan River basin. Exhibit 5 at p. 134.

**D. The NPDES Permit**

On April 3, 2001 Alexis Strauss, then Director of EPA Region 9's Water Division, issued the most recent effective NPDES permit for the FCPP, NPDES Permit No. NM0000019. Exhibit 4, p. 1. The permit became effective on April 7, 2001, and expired on April 6, 2006. *Id*.

Under the terms of the permit and EPA regulation, the permittee was required to submit a renewal application at least 180 days prior to the expiration of the permit. APS submitted an application for a new NPDES permit on October 5, 2005. After sitting dormant at EPA for over 7 years, on October 30, 2012 EPA acknowledged that "much time has elapsed since [APS] submitted the original application for renewal" and requested an updated application. Exhibit 6, p. 1. EPA indicated at that time that it "plan[ned] to draft and issue a renewed NPDES permit for the APS Four Corners Power Plant in 2013." *Id.*

APS submitted a revised permit application on February 15, 2013. On February 19, 2013, EPA stated that it would "draft a proposed renewed NPDES permit within 6 months" after receiving the revised application. Exhibit 7, p. 1.

EPA failed to issue a draft permit by its stated deadline of August 15, 2013. On May 16, 2014, Petitioners issued a 60-day notice of intent to sue letter to EPA alleging, *inter alia,* that EPA had illegally delayed in issuing a final NPDES permit for the FCPP. Exhibit 8.

On November 13, 2014, EPA released a draft permit and opened a public comment period. Exhibit 9. On February 18, 2015 Petitioners and other conservation organizations submitted timely written comments on EPA's draft permit. Exhibit 10. The public comment period closed on February 18, 2015.

Over three years after the close of the public comment period EPA still has not taken final action on the pending permit application. On February 28, 2018, EPA stated that it "will issue the permit for the Four Corners Power Plant in the immediate future." Exhibit 11, Response to Comments, p. 1, Response 1. On March 8, 2018, Petitioners asked EPA Region 9 for a more precise schedule for its issuance of the FCPP Permit. Exhibit 12. On that same day, EPA's permit engineer responded that it would issue the permit in April 2018. *Id.* But again, EPA Region 9 failed to render a final decision on the permit application in April 2018. EPA has again delayed its timeline for acting on the permit application, this time until June 2018. Exhibit 13. As of the date of this Petition, EPA has not taken final action on the permit application.

**E. The Discharges and Cooling Water Intake**

FCPP discharges a suite of pollutants including copper, iron, chlorine, heated water, suspended solids, among others to Morgan Lake, the Chaco River, and ultimately the San Juan River.

**1. The discharge into Morgan Lake, No Name Wash, Chaco River, and the San Juan River.**

a. Outfall 001

The FCPP discharges pollutants from Morgan Lake to No Name Wash, which flows to the Chaco River and then the San Juan River. Exhibit 9, Fact Sheet, pp. 2-3. The flow rate of this discharge is approximately 4.2 million gallons/day. *Id* at p.2. This discharge is used to regulate total dissolved solids (TDS) build up in the lake, which must be controlled because the lake water is also used for cooling the generation units. *Id.* The current and proposed draft permit sets a flow limit of 14.7 million gallons per day from this Outfall and allows a maximum daily temperature discharge of up to 95 degrees Fahrenheit (35 degrees Celsius), and regulates pH. *Id.* The permits also require monitoring for TDS from Outfall 001. *Id.*

b. The "Internal" Outfalls

The draft permit also regulates discharges from the following so-called "internal outfalls":

i. Internal Outfall 01A: FCPP also discharges condensor cooling water into an effluent channel which flows to Morgan Lake. This discharge is referred to as

"Internal Outfall 01A." FCPP chlorinates the cooling water to act as a biocide to prevent fouling of the generating units. This permit allows a discharge of 954 pounds per day of Total Residual Chlorine into Morgan Lake, and also regulates pH, oil and grease, and requires flow and toxicity monitoring. *Id.*

ii. Internal Outfall 01B: This internal outfall was used for disposing of chemical cleaning wastewater to an ash pond. APS claims that Internal Outfall 01B is not in use but wishes to retain the possibility of discharging through the outfall in the future. *Id.*

iii. Internal Outfall 01E: This outfall discharges water pollution from the combined waste treatment pond that receives 8-13 million gallons per day of waste streams from various pollution sources at the power plant. *Id.* The wastewater from this pond is channeled into a culvert which is regulated prior to mixing with the condenser cooling water discharged from Internal Outfall 01A. The combined discharges from Internal Outfall 01E and Internal Outfall 01A are then discharged into Morgan Lake. A large component of Internal Outfall 01E is bottom ash transport water. This discharge is regulated for total suspended solids (TSS), pH, and oil and grease.

2. **The leaking coal ash impoundments**

Since at least 1977, the coal ash impoundments at the FCPP have leaked contaminated seepage into the Chaco River Basin. Exhibit 14 at p. 4.5-61 (FEIS, Section 4.5 Water Resources-Hydrology). The Final Environmental Impact Statement documents the history of coal ash seepage into the Chaco River Basin by stating:

> 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 collect 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 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.

*Id.* EPA was a cooperating agency with regard to the 2015 FEIS. Exhibit 15, p. 2. (EPA ESA memo 11/10/2014).

The coal ash seepage is believed to contain mercury, selenium, boron, nickel, uranium, zinc, and total dissolved solids. The coal ash seepage is also expected to exceed pollution concentrations standards enacted to protect human health, livestock, and aquatic life. However, EPA's 2001 NPDES permit does not require monitoring, reporting, or pollution effluent limits for the coal ash discharges into the Chaco River Basin.

EPA's 2014 Draft Renewal Permit for the FCPP would require the following:

> "A Seepage Monitoring and Management Plan shall be established and implemented to determine the source of and pollutants in seepages below all ash ponds that receive or received coal combustion residue either currently or in the past. The Plan shall be established and submitted to EPA within 120 days of the issuance of this permit. The Plan shall at a minimum do the following:
> 1. Identify all seeps within 100 meters down gradient of such impoundments;
> 2. Conduct sampling (or provide summary of current data if sufficient and valid) of seepages for boron, mercury, nickel, selenium, uranium, zinc and total dissolved solids.
> 3. Provide information about number of flows observed and range of flows observed
> 4. Provide information about exceedances of any human health, livestock, or chronic or acute aquatic life standards as established in the 2007 NNWQS in the samples collected for analysis.

Exhibit 9 at p. 15 (Draft Permit).

### 3. The cooling water intake structure

As noted above, cooling water intake structures are regulated by EPA upon issuance of an NPDES permit. The 2001 NPDES permit does not regulate the intake structure or require publicly available reporting on the impacts the intake structure is having on endangered fish species. In contrast, EPA's 2014 draft permit states:

"The Permittee shall submit all the material required under 40 CFR 122.21

(r) (1)-(8) upon submittal of their next renewal application."

Exhibit 9 at p. 11 (Draft Permit). This regulatory requirement requires the operator of existing cooling water intake structures to identify threatened and endangered species in the affected watershed and biological data on mortality and impacts to such species. The Service has found that Colorado pikeminnow and Razorback sucker exist in the area of the San Juan River impacted by the FCPP. Exhibit 16 p. 6 of pdf (USFS 9/2/2014 Memo). The Service also found that the project area contains critical habitat for these endangered fish species. *Id.* at p. 8 of pdf. The cooling water intake system at the FCPP can cause injury or death to these critically endangered native species due to impingement on the intake structure screens and entrainment in the cooling water system itself. EPA has acknowledged that adverse effects to endangered fish species can also result from "entrainment at the APS Weir on the San Juan River." Exhibit 15, p. 2 (Region 9 11/10/14 ESA memo). To date, a thorough assessment of the impacts to Colorado pikeminnow and razorback sucker from impingement and entrainment in the cooling water intake system has never been submitted for public review and comment.

## IV. ARGUMENT

### A. This Court has Jurisdiction to Issue a Mandamus Order

This Court has jurisdiction to issue the writ of mandamus sought by Petitioners pursuant to the All Writs Act, 28 U.S.C. § 1651. Section 509(b)(1)(F) of the Clean Water Act, 33 U.S.C § 1369(b)(1)(F), grants jurisdiction to the Courts of Appeals to review EPA's NPDES permitting actions and the All Writs Act empowers this Court to issue a writ to protect its "prospective jurisdiction" by compelling EPA to make substantive decisions that once made will be reviewable by this Court. *TRAC*, 750 F.2d at 76; *Air Line Pilots Association, International("ALPA") v. CAB*, 750 F.2d 81, 84 (D.C. Cir. 1984). Section 509 effectively assigns exclusive jurisdiction to the Court of Appeals for claims concerning *delay* in agency action on NPDES permits because the agency action Petitioners seek—action on the delayed permit reissuance applications—will be reviewable by this Court under section 509(b)(1)(F) once it happens. *See FTC v. Dean Foods Co*., 384 U.S. 597, 604 (1966); *Pub. Util. Comm'r v. Bonneville Power Admin.*, 767 F.2d 622, 626, 630 (9th Cir. 1985); *TRAC*, 750 F.2d at 79; *see also Clark v. Busey*, 959 F.2d 808, 811 (9th Cir. 1992) (reasoning that because the Court of Appeals' jurisdiction to review the final FAA order is exclusive, jurisdiction to review any procedural irregularities preceding the final order is also exclusive) (citations omitted).[2]

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[2] There appears to be no controlling authority specifically addressing the type of inaction alleged by Petitioners in this case, *i.e.,* unreasonable delay in acting on NPDES permit reissuance application. However, the Supreme Court and other Circuit Courts of Appeals have found jurisdiction in the Courts of Appeals over various claims attendant to or related to the issuance of CWA section 402 permits. 33. U.S.C. § 1342. In *Crown Simpson Pulp Co. v. Costle*, 445 U.S. 193, 196 (1980), the Supreme Court found that EPA's denial of a variance and disapproval

### B. A Writ Should Issue Because EPA has Unreasonably Delayed Issuing the Final Permit

EPA is in violation of the CWA and its own implementing regulations for failing to take final action on the FCPP application. When a permit is required by federal law and a valid application is pending, the APA states that the permitting agency must act "within a reasonable time" and "with due regard for the rights of interested parties and those adversely affected." 5 U.S.C. § 558(c). Here, EPA's over-decade long failure to take final action, and its over three year-long failure to act since it closed the comment period on the draft permit are both unreasonable.

The D.C. Circuit in *TRAC* first laid out the test for determining whether an agency's delay is "so egregious as to warrant mandamus." 750 F.2d at 80. The *TRAC* test, which has been adopted in this Circuit, requires courts to consider the following factors: (1) the time agencies take to make decisions must be governed by a "rule of reason"[;] (2) where Congress has provided a timetable or other

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of effluent restrictions contained in a State-issued 402 permit was a denial of an NPDES permit within the CWA's grant of jurisdiction under section 509(b)(1)(F) and remanded the case to the Ninth Circuit. Similarly, this Court has found that CWA section 509(b)(1)(F) grants jurisdiction to the Courts of Appeals to hear challenges involving agency extensions of NPDES permits and the issuance of NPDES regulations. *See Pacific Legal Found. v. Costle*, 586 F.2d 650, 654-55 (9th Cir. 1978) (finding the extension of an NPDES permit was tantamount to a permit issuance and thus within grant of jurisdiction under CWA section 509(b)(1)(F)), *rev'd* on other grounds by 445 U.S. 198 (1980); *Natural Res. Def. Council, Inc. v. EPA*, 966 F.2d 1292, 1296-97 (9th Cir. 1992) (finding that CWA section 509 grants circuit court jurisdiction to review "rules that regulate the underlying permit procedures").

indication of the speed with which it expects the agency to proceed in the enabling statute, that statutory scheme may supply content for this rule of reason[;] (3) delays that might be reasonable in the sphere of economic regulation are less tolerable when human health and welfare are at stake[;] (4) the court should consider the effect of expediting delayed action on agency activities of a higher or competing priority[;] (5) the court should also take into account the nature and extent of the interests prejudiced by the delay[;] and (6) the court need not "find any impropriety lurking behind agency lassitude in order to hold that agency action is unreasonably delayed." *Id.* (citations omitted); *See Independence Mining Co. v. Babbitt,* 105 F.3d 502, 507 (9th Cir. 1997) (adopting *T.R.A.C.* factors); *Biodiversity Legal Found. v. Badgley,* 309 F.3d 1166, 1177 n. 11 (9th Cir. 2002) (noting *T.R.A.C.* factors apply "in the absence of a firm deadline")

EPA's inaction over the FCPP NPDES application presents one of the circumstances where mandamus relief is appropriate. In this Circuit, the Court has granted a writ requiring a final decision when, as here, the agency's delay is harming human health or the environment and the agency lacks a "concrete timeline" for its decision. *See, In re A Cmty. Voice*, 878 F.3d 779, 787 (9th Cir. 2017) (granting a writ mandating EPA take action on lead-based paints were EPA had delayed for more than eight years, offered only "speculative dates" and failed to offer a "concrete timetable" for final action, and "there is a clear threat to human welfare"); *In re Pesticide Action Network*, 798 F.3d 809, 813 (9th Cir. 2015) (granting a writ where EPA failed to take final action as promised, had delayed for more than eight years, lacked a "concrete timeline" for final action, and the action involved a pesticide harmful to human health).

EPA's ongoing delay frustrates this Court's role in providing a forum for review of the final permits, and as discussed below, the above factors support a finding that EPA has unreasonably delayed action and mandamus is the appropriate remedy. *TRAC*, 750 F.2d 70.

**1. The Clean Water Act's Statutory Framework and the Rule of Reason Supports a Finding that EPA's Delay is Unreasonable.**

Congress mandated that NPDES permits be for fixed terms, no greater than five years. 33 U.S.C. § 1342(b)(1)(B). The five-year limit for NPDES permits establishes a mandatory expiration date at which point the permit must be reviewed and updated to reflect changes in the law, the conditions of receiving waters, or the requirements applicable to the permittees. Congress could not have intended that permits be for fixed five year terms and yet allow EPA to leave an expired NPDES Permit in place to serve as the *de facto* permit for more than three additional five year permit cycles, as is the case here, without EPA review and update.

As one court has stated, although "there is no per se rule as to how long is too long to wait for agency action . . . a reasonable time for agency action is typically counted in weeks or months, not years." *In re Am. Rivers & Idaho Rivers United*, 372 F.3d 413, 419 (D.C. Cir. 2004) *citing Midwest Gas Users Asso. v. FERC*, 833 F.2d 341, 359 (D.C. Cir. 1987) ("This court has stated generally that a reasonable time for an agency decision could encompass 'months, occasionally a year or two, but not several years or a decade.'" (*quoting MCI Telecommunications Corp. v. FCC*, 627 F.2d 322, 340 (D.C. Cir. 1980)).

Numerous courts have issued mandamus orders for regulatory delays that were far shorter in length than the current over twelve year delay in issuing the FCPP NPDES permit. *See, Potomac Elec. Power Co. v. ICC*, 702 F.2d 1026, 1035 (D.C. Cir. 1983) (eight year delay unreasonable); *Public Citizen Health Research Group v. Auchter,* 702 F.2d 1150, 1157- 1159 (D.C. Cir. 1983) (three year delay unreasonable); *MCI*, 627 F.2d at 324-25 (four year delay unreasonable); *Nader v. FCC*, 520 F.2d 182, 206 (D.C. Cir. 1975) (ten year delay unreasonable). In sum, the CWA's mandate for five year permit terms and prevailing case law finding delays of several years to be unreasonable underscore EPA's ongoing over twelve year delay in acting on the FCPP permit application is unreasonable.

EPA's own regulations impose a duty on the agency to act after it issues a draft NPDES permit. More specifically, EPA's regulations state, "[a]fter the close of the public comment period under §124.10 on a draft permit, the Regional

Administrator ***shall issue a final permit decision…"*** 40 C.F.R. §124.15(a)(emphasis added).

**2. Public Health and Welfare Interests are Negatively Prejudiced by EPA's Delay.**

EPA's ongoing inaction harms Petitioners because EPA has delayed the issuance of permits with potentially stricter requirements that would result in cleaner water and protection of endangered fish species. As envisioned by Congress, Petitioners and the general public have a legally cognizable interest in clean water. *C.f. Ecological Rights Foundation v. Pacific Lumber Company*, 230 F.3d 1141, 1151 (9th Cir. 2000) (citing *Friends of the Earth v. Gaston Copper Recycling Corp*., 204 F.3d 149, 155-61 (4th Cir. 2000) (*en banc*) (the increased risk of harm based on CWA permit violations is an injury in- fact.)).

Congress intended NPDES permits to be for fixed terms, so that every five years the permitting agency would update the permit and where applicable, include any more stringent effluent limitations that are warranted. In other words, Congress intended that EPA would review NPDES permits every five years to determine whether improvements in available technology warranted more stringent technology-based effluent limitations or deterioration in water quality warranted more stringent water quality based effluent limits. In the twelve years that EPA has delayed taking final action on the expired NPDES Permit, there have been both advances in the available and economically achievable water pollution reduction technology for coal-fired power plants and a deterioration in the water quality of the applicable water bodies into which the facility discharges. EPA's delay has postponed an assessment of compliance with current effluent limitation guidelines, CWA, 33 U.S.C. §§ 1311(b), 1314(b) and assessment of best available technology economically achievable ("BAT"), which EPA can set based upon "best professional judgment" ("BPJ") on a case-by-case basis in individual NPDES permits. 33 U.S.C. § 1342(a)(1); 40 C.F.R. § 122.41(a)(1).

EPA's inaction has also delayed the regulation of coal ash discharges into the Chaco River watershed resulting from seepage from the FCPP coal ash disposal facilities. Finally, EPA's inaction has also delayed collection and public dissemination of the impacts to endangered fish species in the San Juan River. These delays can be remedied by an order from this Court directing EPA to take final action on the long pending NPDES application by a reasonable date certain.

**3. EPA's inaction is inexcusable**

EPA may claim that it has other priorities, but "[h]owever many priorities the agency may have, and however modest its personnel and budgetary resources may be, there is a limit to how long it may use these justifications to excuse inaction in the face of the congressional command to act." *In re United Mine Workers of Am. Int'l Union*, 190 F.3d 545, 554 (D.C. Cir. 1999). EPA's failure to issue a final permit and allow the 2001 permit to remain in effect for over 3 five-year permit cycles is inexcusable.

### 4. The Public Has Been Precluded From Participating in Environmental Decision-Making Processes For the Coal Plants.

EPA's failure to take final action has denied Petitioners the opportunity to appeal a final NPDES permit. EPA's failure to take final action has delayed regulation of unpermitted discharges of coal ash seepage into the Chaco River watershed thus posing a risk to public health and the endangered aquatic species living downstream. EPA's inaction has also resulted in inexcusable delay in the collection and public dissemination of information regarding the impacts to endangered fish species resulting from operation of the cooling water intake structure on the San Juan River.

## V. CONCLUSION

Petitioners respectfully request that the Court issue a writ of mandamus compelling EPA Region 9 to take final action on the long pending NPDES permit application for the FCPP by a reasonable date certain within 3 months of its decision. In addition, the Petitioners request that the Court awards fees and costs to Petitioners under CWA section 509(b)(3), 33 U.S.C. § 1369(b)(3), in an amount to be determined following subsequent motion practice and briefing.

## VI. STATEMENT OF RELATED CASES

Petitioners are not aware of any related cases pending in this Court.

Respectfully submitted,

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**Certification of Compliance**

I certify pursuant to Circuit Court Rule 21-2(c) that this Petition complies with the type-volume limitation of 30 pages, excluding items allowed by rules or local rules.

s/ John Barth

**Certification of Service**

I certify that this Petition for Writ of Mandamus and was served by U.S. Priority Mail upon the following this 23rd day of May 2018.

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Acting Regional Administrator
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San Francisco, CA 94105

Tomas Torres
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s/ John Barth

______________________________

John Barth

**Exhibit List- Petition for Mandamus, *In re: U.S. EPA Region 9***

Exhibit 1- Dailan Long Declaration

Exhibit 2- Mike Eisenfeld Declaration

Exhibit 3- Taylor McKinnon Declaration

Exhibit 4- EPA's 2001 Final Permit for the Four Corners Power Plant

Exhibit 5-Final Biological Opinion

Exhibit 6-EPA email dated 10/30/12

Exhibit 7-EPA email dated 2/19/13

Exhibit 8-Sixty-day notice letter

Exhibit 9-EPA Region 9 Draft Permit and Fact Sheet 11/13/14

Exhibit 10-Comment letter on draft permit dated 2/18/15

Exhibit 11-EPA Response to Comments- Navajo Mine permit dated 2/28/18

Exhibit 12-EPA email dated 3/8/18

Exhibit 13-EPA email dated 05/04/2018

Exhibit 14-Section 4.5 of Final Environmental Impact Statement

Exhibit 15- EPA Endangered Species Act Memo dated 11/10/14

Exhibit 16- U.S. Fish and Wildlife Memo dated 9/2/14.

# Exhibit 1

**IN THE UNITED STATES COURT OF APPEALS
FOR THE NINTH CIRCUIT**

| | | |
|---|---|---|
| DINE' CITIZENS AGAINST RUINING THE ENVIRONMENT, ET AL<br>Petitioners,<br>v. | ) | |
| | ) | No. ________ |
| U.S. ENVIRONMENTAL PROTECTION AGENCY, REGION 9, ET AL<br><br>Respondents | ) | |

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**DECLARATION OF DAILAN JAKE LONG**

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I, Dailan Jake Long, declare as follows:

1. I am a Board member of Dine Citizens Against Ruining Our Environment (Dine CARE) and am a resident of Burnham Navajo Chapter in the eastern portion of the Navajo Nation called Eastern Navajo, New Mexico. I am a registered voter of the Navajo Nation, the U.S., and also of the local Burnham Navajo Chapter. I am a lifelong resident of Burnham, New Mexico and reside alongside the Chaco River, approximately 3 miles west of the Chaco River and its tributaries. I reside in this area and raise livestock (sheep) for traditional cultural and economic purposes within the livestock grazing area permitted by Newcomb Navajo Chapter House.

2. I am a 35-year resident of Burnham, New Mexico and work as a Medicaid Consultant and Navajo Tribal Resource Facilitator, contracted with the New Mexico Self-Directed Community Benefit and Long-Term Medicaid Waiver programs. I work in Burnham, New Mexico and coordinate long-term care services, develop care plans, and health risk assessments with tribal medicaid recipients in the region, including non-tribal members residing

outside the Navajo Nation. The aim of these services identify medical needs and reduce risk factors for individuals with developmental disabilities, aging and elderly, brain injury, medically fragile, and high risk of institutionalization. I provide direct advocacy services to non-English speaking Navajo tribal members and assist in the development of their direct care needs in coordination with physicians at Northern Navajo Medical Center and network with Managed Care Organizations to implement and review clientele long-term care plans. I support the mission of these programs in identifying and directly addressing risks factors that directly affect the health and welfare of tribal medicaid recipients as my comprehensive needs assessment identify environmental hazards and external risk factors such as environmental pollution and lack of infrastructure in these tribal communities.

3. The Chaco River flows adjacent to my homestead. My family and I inhabit both the west and eastern side of the Chaco River, which flows in a South to North direction. Our property is located south of the Four Corners Power Plant.

4. I am an avid runner and run alongside the Chaco River from south to north, completing approximately 10-miles per day. The Chaco River watershed and its tributaries are directly affected by the Four Corners Power Plant and adjacent coal ash waste sites located immediately east of Chaco River. These coal ash combustion waste sites are large powdery manmade mounds with discharge leakages flowing into the Chaco River watershed. These manmade mounds contain their own “roads” as service vehicles can be seen driving adjacent to these mounds.

5. Depending on seasonal weather conditions, I am unable to run alongside the Chaco River due to airborne coal ash creating a snow effect over the Chaco River and downwind communities.

6. The federal Environmental Impact Statement (EIS) for the Four Corners Power Plant states that the coal ash impoundments at the Plant are experiencing seepage into the Chaco River watershed. This coal ash seepage is captured in a collection system constructed by the owners of the plant. Other than the EIS, I have never seen any data regarding how this seepage is impacting the Chaco River, groundwater in the area of the seepage, and the soil underlying the seepage. EPA's Draft NPDES permit for the first time will require the owners of the plant to monitor these coal ash seeps into the Chaco River watershed.

7. I haul water for my livestock from a well located approximately 15 miles west of my home because tribal members downstream of the Four Corners Power Plant experience livestock mortality when consuming water from Chaco River and its tributaries. Pollutant discharge from coal ash seepage impact these endangered species and, if left unregulated, will directly affect my livestock use.

8. I am very familiar with the coal-fired Four Corners Power Plant. I reside approximately 20 minutes south of the Four Corners Power Plant, which is viewable from my home. I actively participate in the tribal government chapter monthly meetings and provide input on public comment periods regarding all processes related to Four Corners Power Plant, coal ash disposal, and impacts to water bodies such as Chaco River.

9. I am aware that the power plant has not had a renewed water pollution discharge permit (NPDES Permit) since 2001. I understand that NPDES Permits are effective for 5-years and renewed every 5 years. I understand that federal regulatory processes on Navajo Nation lands are under jurisdiction of EPA Region 9, which is the federal government agency responsible for updating NPDES permits for the Four Corners Power Plant.

10. EPA's failure to take final action on the pending Four Corners Power Plant

NPDES application exacerbates public health concerns. EPA must issue a final NPDES permit, which includes data collection and the agency must disseminate data associated with pollutant discharge for public review. I am directly impacted by EPA's failure to comply with the Clean Water Act as pollution discharge directly impact areas adjacent to my home and affect livestock, subsistence, and agricultural use.

11. Issuance of a final permit would also allow a legal challenge of any deficiencies, which has been denied for over 12 years by EPA's failure to take action on a final permit. If the EPA were required to comply with the Clean Water Act my concerns would be eased.

12. If EPA were to issue a final permit to require monitoring of the coal ash discharges into the Chaco River and San Juan River, I would have more information about the impacts water quality, endangered species, and a result, the usability of water for my livestock and agricultural. This information would help ensure that the federal government is doing everything it can to protect the Chaco River, thus partially redressing my concerns. In other words, if the EPA complied with the Clean Water Act, my livelihood, agricultural and pastoral use along Chaco Creek would be significantly enhanced and the health impacts from pollutant discharge would be diminished. I would feel more at ease living in Burnham with reduced overall health risks.

Pursuant to 28 U.S.C. § 1746 I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge.

Executed in Burnham, New Mexico on March 9, 2018.

Dailan Jake Long

# Exhibit 2

**IN THE UNITED STATES COURT OF APPEALS
FOR THE NINTH CIRCUIT**

| | | |
|---|---|---|
| DINE' CITIZENS AGAINST RUINING THE ENVIRONMENT, ET AL<br>Petitioner,<br>v. | ) | |
| | ) | No. ________ |
| U.S. ENVIRONMENTAL PROTECTION AGENCY, REGION 9, ET AL<br><br>Respondents | ) | |

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**DECLARATION OF MIKE EISENFELD**

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I, Mike Eisenfeld, declare as follows:

1. The facts set forth in this declaration are based on my personal knowledge. If called as a witness in these proceedings, I could and would testify competently to these facts.

2. I am a member of San Juan Citizens Alliance, Center of Biological Diversity, Amigos Bravos, and Sierra Club—petitioners in this case. These organizations are non-profit environmental organizations dedicated to protecting and restoring the environment, wild places, wildlife, and wild rivers throughout the American West. I support the mission of these organizations personally and professionally.

3. I am a 22-year resident of Farmington, New Mexico. I live here with

my wife and two children. We intend to continue living in Farmington for the foreseeable future. We are engaged in the community and both work with nonprofit organizations. I work as the Energy and Climate Program Director for San Juan Citizens Alliance. As part of my work, I advocate for stronger pollution controls at the Four Corners Power Plant and work with others in the region, including members of the Navajo Nation, with the aim of convincing federal regulators to strengthen environmental oversight of the facility.

4. The San Juan River also flows through Farmington. My family and I enjoy floating numerous stretches of the San Juan River. I normally float several sections of the river each year. We have a raft and our friends have river boats as well. We float the San Juan River near Farmington, as well as on stretches downstream in Utah. We swim in the river when we float. We enjoy floating the river, but normally avoid the most polluted sections as we enjoy floating in areas that are more natural and that seem cleaner. We normally float the San Juan three times a year and intend to do so throughout the foreseeable future. We intend to float the river in June and July of this summer.

5. At least four or five times per year, my family and I take walks along the "River Walk" near Farmington that goes along the Animus River (a tributary of the San Juan River, part of the Colorado River System). I intend to walk along there several times this summer and look at the river.

6. I also regularly visit Morgan Lake, a man-made lake adjacent to the Four Corners power plant. The lake was built as a reservoir for use at the power plant. The power plant discharges pollution and heated water into the lake. The lake is also a recreation area, allowing fishing, boating, windsurfing, wading, and other recreational activities. The last time I visited the lake was in December 2017 and January 2018. I have visited the lake on numerous occasions and plan to visit it in the future.

7. I am very familiar with the coal-fired Four Corners Power Plant. Living in Farmington, I always see the Four Corners Power Plant. The plant is located only about 15 miles west of town just south of the San Juan River. It is a very large facility (one of the largest industrial facility in the region) consisting of two active coal-fired units. I can view it from near my home, which is located in the highlands north of Farmington. It is very visible from Highway 64, which travels east-west between Farmington and the town of Shiprock. It is impossible not to notice the power plant and its smokestacks (including one very tall smokestack). I often see pollution coming from the smokestacks of the power plant. They frequently leave a brownish to orange-ish and sometimes black plume that tarnishes the sky.

8. I am generally familiar with the Four Corners Power Plant and its workings. Because of my professional interests, I have become very familiar with

the facility and have become more aware of its impacts to communities, the land, the air, and water of the region, including harm to wildlife and fish.

9. I am aware that the power plant has not had a renewed water pollution discharge permit (NPDES Permit) since 2001. I am aware that NPDES Permits have a 5 year life and are supposed to be updated every 5 years. I am also familiar with the fact that EPA Region 9 is the federal government agency responsible for updating NPDES permits on the Navajo Nation, such that the NPDES permit for the Four Corners Power Plant.

10. Personally, I am very concerned about water pollution from the Four Corners Power Plant. For nearly the past 50 years, the power plant has disposed of, and continues to dispose, coal ash in surface impoundments located at the site. The federal government recently authorized the continued operation of the plant for another 30 years, thus requiring an expansion of the existing coal ash impoundments. These coal ash contaminated seepage is being released from these coal ash impoundments into the Chaco Creek watershed. This seepage has been ongoing for numerous years. Arizona Public Service, the operator of the plant has been forced to install a collection and pump system to capture the coal ash seepage. However, the coal ash seepage has never been regulated under the plant's NPDES permit. The draft renewal NPDES permit for the first time will begin imposes requirements to regulate this coal ash seepage. EPA's failure to take action on the

final NPDES permit delays regulation of these coal ash discharges into the Chaco Creek watershed and also prevents the petitioner organizations from challenging the adequacy of EPA's regulation of the discharges.

11. The Chaco Creek watershed is tributary to the San Juan River. I am concerned that the coal ash seepage may impact aquatic life and wildlife in the Chaco Creek watershed as well as in the San Juan River. I am concerned the coal ash seepage may adversely impact fish species listed under the Endangered Species Act that are present in the San Juan River, including the Colorado pikeminnow and razorback sucker, both endangered fish that live in the San Juan River of northwestern New Mexico. Critical habitat for these fish has also been designated on portions of the San Juan River, including portions of the San Juan River that flow near the Four Corners Power Plant.

12. In my work at the San Juan Citizens Alliance, I have spent many hours reviewing an October 15, 2009 U.S. Fish and Wildlife Service assessment (a draft Biological Opinion prepared under the Endangered Species Act) of the impacts of the proposed Desert Rock coal-fired power plant to the pikeminnow and sucker and their habitats in the San Juan River. This assessment found that mercury and selenium released from a number of activities in the region, including air pollution from the operation of the Four Corners Power Plant, is being deposited on the land and within the water of the region, jeopardizing the

continued existence of and adversely affecting the pikeminnow and sucker and their designated critical habitat in the San Juan River. At the time the 2009 U.S. Fish and Wildlife Service assessment was prepared, the agency concluded that the construction of a proposed coal-fired power plant in the area would jeopardize the continued existence of the Colorado pikeminnow and razorback sucker and adversely modify their critical habitat. Their conclusion was based on the fact that the species and their critical habitat are faring poorly in the San Juan River. Additional coal ash seepage from the Four Corners Power Plant could additionally adversely impact these endangered fish species. I want EPA to finalize its Four Corner Power Plant NPDES permit and to regulate the coal ash seepage into the Chaco Creek watershed.

13. I am also aware that the Four Corners Power Plant operates a cooling water system that pulls large volumes of water from the San Juan River to cool the power plant's boilers. Part of this system includes a cooling water intake structure, which is the plumbing system that pulls water from the San Juan River. These intake structures are know to have an adverse impact on aquatic life and the endangered fish species can become impinged on the screens covering the intake structure or entrained in the cooling system if they bypass the screens. Arizona Public Service has never publicly released data on the impact to endangered fish species resulting from operation of the intake structure. EPA's draft permit will,

for the first time, begin to regulate the intake structure and require the collection and dissemination of data on the impact to aquatic species. I want EPA to issue a final NPDES permit for this regulation and data collection becomes mandatory and so I can plan my review of the data upon its public release.

14. I derive scientific, recreational, conservation, educational, and aesthetic benefits from the existence and observation of native fish in the Colorado River System, and I rely on federal agencies' compliance with the Clean Water Act to protect water resources and endangered fish such as the Colorado pikeminnow and razorback sucker.

15. I know that the Colorado pikeminnow was once so prevalent in the Colorado River Basin that farmers would take them out of irrigation ditches with pitchforks to use as fertilizer for their fields. Now the species exists in only a handful of sites throughout the Colorado River system. Although the razorback sucker was once prevalent throughout the Colorado River Basin, some biologists now estimate that approximately 500 razorback suckers exist in the wild.

16. I enjoy looking for and viewing all species of fish in the San Juan River. When I am rafting in the San Juan River or taking a walk by the river in Farmington, I often look for fish, including the Colorado pikeminnow and razorback sucker. Unfortunately, their diminished numbers makes them very hard to find. I will continue to recreate in and around the San Juan River and its

tributaries, and will continue to look for fish, including the Colorado pikeminnow and razorback sucker. I hope to point out one of these fish to my children in the future. My enjoyment of the Colorado River System would be increased if the Colorado pikeminnow and razorback impacts from the Four Corners Power Plant were publicly disclosed and regulated by an updated final NPDES permit.

17. The EPA's failure to a final NPDES permit allows unregulated pollution to discharged into the environment and fails to protect endangered fish species in the San Juan River. The power plant's affect on the Colorado pikeminnow and razorback sucker and their critical habitat in accordance with the Endangered Species Act worries me. The Colorado pikeminnow and razorback sucker are indicators of healthy southwestern rivers, like the San Juan. Since they were once abundant in the Colorado River Basin, their diminished numbers in the San Juan River causes me concern that the river is now not healthy and clean. The EPA's failure to address how the water pollution and the intake structure may affect the Colorado pikeminnow and razorback sucker and their critical habitat, means that the EPA is leaving the San Juan River at risk from further degradation, including extended water contamination that not only may affect the fish, but also affect my health and the health of my family as we recreate on the San Juan River. I have physical contact with the San Juan River and Morgan Lake when I recreate in these areas. I want to ensure that pollution discharges into Morgan Lake and the

Chaco Creek watershed, and the cooling water intake structure, are properly regulated and that permits are regularly updated to protect my personal health, the health of my family, and the health of the endangered species living in the river.

18. The EPA's failure to comply with the Clean Water Act therefore harms me because it will lead to continued water contamination and diminished recreational enjoyment of the San Juan River. I worry about how continued pollution discharges and the intake structure is harming the San Juan River, where I enjoy recreating, and harming endangered fish that I care about.

19. Given my use of the San Juan River and Morgan Lake, I have a direct personal interest in having EPA take final action on APS's 2006 water pollution discharge permit application. I care about the health of the San Juan River and the fish that live there. I also care about the water quality in Morgan Lake. My concerns described herein would be eased if EPA were to issue a final permit regulating the pollution discharges from the Four Corners Power Plant and the intake structure. Issuance of a final permit would also allow a legal challenge of any deficiencies, which has been denied for over 12 years by EPA's failure to take action on a final permit. If the EPA was required to comply with the Clean Water Act my concerns would be eased.

20. If EPA were to issue a final permit to require monitoring of the coal ash discharges into Chaco Creek and impacts to endangered species from the

intake structure, I would have more information about the impacts from the Four Corners Plan on such species. This information would help ensure that the federal government is doing everything it can to protect and recover endangered fish in the Colorado River Basin, redressing injuries described herein. In other words, if the EPA complied with the Clean Water Act, my recreational and aesthetic enjoyment of the San Juan River and the region would be significantly enhanced, concerns over the impacts of the Four Corners Power Plant to my health and the health of my family would be diminished, and I would feel more at ease living in Farmington and raising my family.

Pursuant to 28 U.S.C. § 1746 I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge.

Executed in Farmington, New Mexico on May 2, 2018.

Mike Eisenfeld

Mike Eisenfeld

# Exhibit 3

**IN THE UNITED STATES COURT OF APPEALS
FOR THE NINTH CIRCUIT**

| | | |
|---|---|---|
| DINÉ CITIZENS AGAINST RUINING OUR ENVIRONMENT, ET AL | ) | |
| Petitioners, | ) | |
| vs. | ) | Case No. _______ |
| UNITED STATES ENVIRONMENTAL PROTECTION AGENCY, REGION 9, ET AL | ) | |
| Respondents | ) | |

**DECLARATION OF TAYLOR MCKINNON**

I, Taylor McKinnon, declare under penalty of perjury as follows:

1. I submit this declaration in support of the Center for Biological Diversity *et al.'s* Petition in the above-captioned matter, challenging the U.S. EPA Region 9's failure to take final action on an NPDES Permit application for he Four Corner's Power Plant pending since 2006. I have personal knowledge of each of the facts set forth below, and if called upon to do so, could and would testify regarding the following.

**Organizational Interests**

2. I am a member of the Center for Biological Diversity, Sierra Club, and San Juan Citizens Alliance. I have been a member of the Center for Biological Diversity since 2007, a member of Sierra Club since 2016, and a member of San Juan Citizens

Alliance since 2016. These organizations are non-profit corporations dedicated to the preservation, protection, and restoration of biodiversity and ecosystems. I am also an employee and member of the Center for Biological Diversity.

**3.** Sierra Club's main office is in Oakland, California. The Center for Biological Diversity's ("Center") main office is located in Tucson, Arizona. The Center has maintained a field office in Flagstaff, Arizona since 2007. The Center has an extensive history of working to protect ecosystems, rivers, lakes, air, climate, and biodiversity, including the San Juan River and its endangered species, including but not limited to the Colorado pikeminnow, razorback sucker, humpback chub and bonytail chub, from industrialization, pollution and other direct, indirect and cumulative impacts of coal mining, combustion and other energy development. Pollution, discharges, and operations at the Four Corners power plant has the potential to impact the San Juan River, Morgan Lake, Chaco Creek and other cause harm to endangered fish and other species.

**Background and Expertise**

4. I live in Flagstaff, Arizona. I have live in Flagstaff since I was 8 years old, with two or three years living in each of Prescott, Arizona, Cobb, California, Bluff, Utah, and Salida, Colorado. I attended and graduated from Flagstaff High School and from Prescott College with a degree in Environmental Studies.

5. I have a long history of public lands and wildlife advocacy. I am a public lands campaigner for the Center for Biological and have served in this position and other positions there on and off since 2007.

6. My career choice also reflects a strong interest in and knowledge of the management of wildlife, plants, rivers, and energy resources. With the exception of 2005-2007, when I was a natural history guide on the San Juan River, since 1999 I have worked for non-governmental conservation organizations whose missions involve protecting and restoring public lands and their native biological diversity. In 2013 and 2014 I was energy program director at Grand Canyon Trust. Grand Canyon Trust, like the Center for Biological Diversity, is a non-profit conservation organization focused on protecting land and species of the Colorado Plateau, including the San Juan River. My professional experience with the lands and species relevant to this lawsuit spans several years. For Center for Biological Diversity, for example, I reviewed and submitted formal comments on government documents relating to coal mining and combustion in the Four Corners region, including at Navajo Mine and Desert Rock Energy Project. I've reviewed dozens of peer-reviewed studies, government analyses and data sets relating to endangered fish of the Colorado River and management of their habitat. I've given several public presentations on the endangered fish and factors affecting their survival and recovery, including coal pollution. For Grand Canyon Trust, I worked on issues relating to the management of wildlife, water, and energy development on the Colorado Plateau, including fossil fuel development and its impacts on the endangered fish of the Colorado River Basin.

7. In addition to my professional interest in protection of the natural features of the Four Corners area, I have a long-standing personal interest and experience in the natural history of the San Juan River in particular, including its endangered fish. From

2005-2007 I co-owned, operated and guided river trips on the San Juan River at Wild Rivers Expeditions in Bluff, Utah. Natural history interpretation while guiding involved educating the public (passengers on the trips) about the San Juan River ecosystem and its endangered species, including its endangered fish. I believe that this education allows the public to appreciate these species and their ecology as I do, and that it enriches their lives, as mine is and has been, with a deeper and closer understanding and relationship to the web of life that, as a matter of individual, spiritual, or religious significance, contributes to one's happiness and existential satisfaction. Though my days as a commercial guide are over, I still sometimes serve as an interpreter on educational San Juan River trips for school children, and have done that as recently as 2011. Endangered species are a focal point of the educational program of those trips. I also continue to use the San Juan River as a private boater; as recently as July of 2013 I floated from Sand Island to Mexican Hat with several friends. Sharing with them my knowledge of the river, its ecology, and its biodiversity, including its endangered species, contributed to our enjoyment of the trip. Except for one instance, I have unsuccessfully looked for endangered fish in the San Juan, Green, and Colorado Rivers. I do so in the shallows of backwaters during floods, in eddies and pools during low, clear water, and in the mouths of side canyons where they are known to congregate and would be visible. In 2011 I photographed a humpback chub at the mouth of the Little Colorado River in Grand Canyon National Park; I would like to observe and photograph endangered fish on the San Juan River as well. In 2013 I visited the Ouray National Wildlife Refuge and Fish Hatchery. This is where the Department of the Interior raises all four of the endangered fish species of the Colorado River for its stocking programs in the Upper Colorado River Basin. This hatchery is central to the survival and recovery of the endangered fish; absent hatchery fish placed in the wild, including in the San Juan River, those species are functionally extinct—unable to maintain self-sustaining populations on their own.

8. I have taken dozens, if not hundreds of San Juan River trips, and I plan to continue to do so in the future, perhaps as early as this fall, but certainly within the next year. While on those trips I will continue to study and observe the river's ecology, including its endangered species, and I will attempt to observe and photograph endangered fish in shallows, eddies, or clear pools during low water when the likelihood of being able to see them is greatest.

9. As a result of professional duties and personal curiosity about the San Juan River and its endangered fish, I have learned that pollution from coal mining and power plant operations contributes to the rarity of endangerment of fish that I would like to observe in the San Juan River. For example, the Department of Interior's draft biological opinion for the Desert Rock Energy Project included data and analysis showing that 64% of the Colorado Pikeminnow sampled in the San Juan River exhibited tissue concentrations of mercury exceeding thresholds for reproductive impairment. It also showed that razorback sucker are at risk of reproductive impairment in the San Juan River owing to selenium pollution. It showed both trends would worsen with additional coal pollution, because coal combustion, including the combustion of coal mined at Navajo Mine, contributes to deposition of mercury and selenium in the San Juan River, and to the poisoning, endangerment, and rarity of endangered fish. I am keenly aware of

these facts. I have also learned that the coal ash impoundments at the Four Corners Power Plant are leaking into the Chaco Creek watershed, which is a tributary of the San Juan River. I am concerned these coal ash seeps could exacerbate the pollution problem in the San Juan River and further harm the endangered species. The currently effective 2001 NPDES permit fails to require and monitoring or regulation of these coal ash seeps. EPA's draft permit would begin to regulate these seeps, however EPA has failed to finalize the permit. In addition, I am aware that the operation of the Four Corners power plant cooling water intake structure on the San Juan River has the significant potential to impinge, entrain, and otherwise harm or kill the endangered fish species in the river. Again, EPA's draft NPDES permit begins to regulate the intake structure, but EPA has failed to finalize the permit. Some of my concerns would be redressed by issuance of a final permit by EPA because, if consistent with draft permit, a final permit would begin to regulate these problems. In addition, I would be able to appeal any deficiencies in a final permit. EPA's failure to finalize a permit has denied me of this legal opportunity.

10. EPA Region 9's failure to take final action on the NPDES renewal permit application for the Four Corners Power Plant pending since 2006 also precludes the government, the public, and me from understanding the environmental impacts of operation of that plant on the environment. I am therefore concerned that the government's unlawful refusal to take final action on the permit may contribute to further poisoning, endangerment and rarity of its endangered species, all of which I care deeply about and whose further decline spiritual and mental well being.

11. I am also concerned that the government's failure to require monitoring, public analysis, or mitigation of pollution and operational impacts to endangered fish is furthering those species' decline, increasing their rarity, and is further foreclosing my ability to ever observe species as part of the San Juan River ecosystem.

12. The government's failure to require monitoring and public dissemination of information also forecloses my ability to tell others, such as those with whom I take San Juan River trips. This will cause me and others despair with regard to the future of the San Juan River ecosystem and its endangered species. To avoid such despair, I will likely talk less about the river and its endangered fish on future river trips, eroding the quantity and quality of discourse and interaction relating to natural history that would otherwise occur. This will erode my enjoyment of future river trips.

13. I am less willing to serve as a natural history interpreter for school children on river trips since learning of EPA's inaction. Despite invitations, I have declined participation on such trips because I find it difficult and uncomfortable to explain to school children that, in the face of known pollution and operational problems and species perilously close to extinction, their government is sidestepping environmental laws that, if followed, could help alleviate those problems. Children can have visceral reactions to the idea of extinction; explaining government indifference, negligence, or lawlessness in the face of extinction threats implies hopelessness about their future that I prefer not share. In this way, EPA's inaction also prevent me from sharing a more hopeful picture of species conservation and recovery, as I would enjoy doing and would be the case if EPA were to diligently and thoroughly implement environmental laws.

14. EPA's failure to take final action on the pending 2006 permit application means that I do not fully know what effect the power plant is having or will have on the San Juan River, its endangered and threatened species and their designated critical habitat. I have serious concerns that the government's violation of the law will have serious impacts to the San Juan River ecosystem and its endangered and threatened species at the landscape level. If EPA were to require monitoring of all pollution discharges and impacts caused by the intake structure it may determine that additional actions are necessary to protect the health of the San Juan River ecosystem, or with the survival and recovery of endangered species. For example, it might impose more stringent effluent limitations or require modifications to the intake structure to protect the San Juan River ecosystem. But because EPA is not requiring monitoring or public dissemination of this information in a final NPDES permit it cannot ensure against such pollution or harm to endangered species, and it has broken the law. This violation threatens my concrete interests in being able to observe and enjoy a healthy San Juan River ecosystem and endangered and threatened species in the wild.

15. My personal, recreational and conservation interests will be harmed if EPA continues to fail to take final action on the NPDES permit application pending since 2006. My ability to enjoy the San Juan River and experience threatened and endangered species will be adversely impacted as a result of EPA's inaction.

Pursuant to 28 U.S.C. § 1746, I DECLARE, under penalty of perjury, that the foregoing is true and correct.

Signed this 29th day of April, 2018, in Flagstaff, Arizona

______________________________
Taylor McKinnon

# Exhibit 4

NPDES Permit No. NM0000019

AUTHORIZATION TO DISCHARGE UNDER THE
NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM

In compliance with the provisions of the Clean Water Act, as amended (33 U.S.C. 1251 et seq.; the "Act"),

Arizona Public Service Company
P.O. Box 53999
Phoenix, Arizona 85072-3999

is authorized to discharge from the APS Four Corners Power Plant, located in San Juan County, approximately 20 miles southwest of Farmington, New Mexico,

Latitude: 36° 42' 27" N
Longitude: 108° 28' 07" W

to receiving waters named Morgan Lake, a tributary to the No Name Wash, a tributary to the Chaco River, and then to Segment 2-401 of the San Juan River basin, in accordance with effluent limitations, monitoring requirements and in the attached 14 pages of EPA Region 9 "Standard Federal NPDES Permit Conditions," dated May 10, 1990.

This permit shall become effective on April 7, 2001.

This permit and the authorization to discharge shall expire at midnight, April 6, 2006.

Signed this 3rd day of April 2001.

For the Regional Administrator

Alexis Strauss, Director
Water Division
EPA, Region 9

## SECTION A. EFFLUENT LIMITATION AND MONITORING REQUIREMENTS

### I. OUTFALL 001 - Cooling Pond Discharge

During the period beginning on the effective date of this permit and lasting through the date of expiration, the permittee is authorized to discharge from Outfall Number 001.

Such discharge shall be limited and monitored by the permittee as specified below. Samples shall be collected and flow measurements taken at the point where Morgan Lake blowdown water discharges through the existing parshall flume.

| Effluent Parameter | Units | Monthly Average | Weekly Average | Daily Maximum[(1)] | Monitoring Frequency | Sampling Type |
|---|---|---|---|---|---|---|
| Flow[(2)] | MGD | – | -- | 14.7 | Once/Week | Calculated |
| TDS[(3)] | mg/l | -- | -- | -- | Once/Month | Discrete |
| pH | std. units | between 6.0 to 9.0 | | | Once/Month | Discrete |
| Temp | deg F | 32.2°C | -- | 35.0°C | Continuous | Recorded |

NOTES:
(1) Instantaneous maximum.
(2) Report both average and maximum daily flows.
(3) During Periods of Discharge. Total Dissolved Solids shall be determined by the "calculation method" (sum of constituents) as described in the 1979 edition of "Techniques of Water Resources Investigations of the United States Geological Survey - Methods for Determination of Inorganic Substances in Water and Fluvial Sediments," or any subsequent editions.

### II. INTERNAL OUTFALL 01A - Condenser Cooling Water Discharge

*A.* During the period beginning on the effective date of this permit and lasting through date of expiration, the permittee is authorized to discharge from Internal Outfall 01A.

Such discharge shall be limited and monitored by the permittee as specified below. Stormwater runoff is included in this discharge. Samples shall be collected at the point where condenser cooling water from units 1, 2, 3, 4 and 5 is discharged from the circulating water canal to Morgan Lake.

| Effluent Parameter | Units | Monthly Average | Weekly Average | Daily Maximum (1) | Monitoring Frequency | Sampling Type |
|---|---|---|---|---|---|---|
| Flow | MGD | -- | -- | -- | Once/Week | Calculated(2) |
| TRC(3,4) | lb/day | -- | -- | 954 | Once/Week | Discrete |
| | mg/l | -- | -- | 0.2 | Once/Week | Discrete |
| Oil & Grease | mg/l | 15.0 | -- | 20.0 | Once/Week | Discrete |
| pH | std. units | between 6.0 to 9.0 | | | Once/Week | Discrete |

NOTES:

(1) Instantaneous maximum.

(2) Based upon pumping records. Report both average and maximum daily flows.

(3) As defined in 40 CFR 423.11. Limits for total residual chlorine are set in accordance with 40 CFR 423.13(b)(1) for once through cooling water. Internal Outfall 01A discharge is further restricted by 40 CFR 423.13(2) in that total residual chlorine may not be discharged from any single generating unit for more than two hours per day. Simultaneous multi-unit chlorination is permitted.

(4) Samples shall be collected during periods of chlorination. Permittee shall report both concentration and mass loading values.

*B.* Effluent Toxicity Testing:

Effluent toxicity shall be monitored and defined as follows. The permittee shall only be required to conduct chronic toxicity testing if discharges from Internal Outfall 01A are known to occur during at least five (5) consecutive days. The permittee shall conduct monthly toxicity tests on 24-hour composite effluent samples. Samples shall be taken at the NPDES sampling location. If, during the first year of toxicity testing, there is no chronic toxicity (as defined in Section 2), then the permittee may request a reduction in the frequency of chronic toxicity monitoring required by this permit, in accordance with 40 CFR 122.62. This request for permit modification should be submitted in writing to U.S. EPA, Region 9.

| EFFLUENT CHARACTERISTIC | DISCHARGE LIMITATION | MONITORING REQUIREMENTS | |
|---|---|---|---|
| | Daily Maximum | Measurement Frequency | Sample Type |
| Chronic Toxicity Testing | (1) | Once/Month | Composite |

NOTES:

(1) There is no discharge limitation for chronic toxicity at this time. Monitoring and reporting for chronic toxicity are specified in Sections 1 and 2 below.

1. Chronic Toxicity Test Species and Methods:

(a) The permittee shall conduct short-term tests with the cladoceran, water flea, *Ceriodaphnia dubia* (survival and reproduction test), the fathead minnow, *Pimephales promelas* (larval survival and growth test) and the green alga, *Selanastrum capricornatum* (growth test) for the first three suites of tests. After this screening period, monitoring shall be conducted using the most sensitive species.

(b) Every calendar year, the permittee shall re-screen for one month at different times from the prior year and continue to monitor with the most sensitive species.

(c) The presence of chronic toxicity shall be estimated as specified by the methods listed in the most recent edition of Table IA, Parameter 8, 40 CFR Part 136.3(a), as clarified by final EPA guidance.

2. Definition of Chronic Toxicity

(a) Chronic toxicity measures a sublethal effect (e.g., reduced growth, reproduction) to experimental test organisms exposed to an effluent or ambient waters compared to that of the control organisms. Chronic toxicity is defined as: 1) greater than 1.0 TUc based on any monthly median of test results, and 2) any one test result with a daily maximum value (MD) greater than 2.0 TUc.

(b) Results shall be reported in TUc, where TUc = 100/NOEC. The no observed effect concentration (NOEC) is the highest concentration of toxicant to which organisms are exposed in a chronic test, that causes no observable adverse effect on the test organisms (e.g., the highest concentration of toxicant to which the values for the observed responses are not statistically significantly different from the controls).

3. Chronic Toxicity Quality Assurance

(a) A series of at least five dilutions and a control will be tested. Effluent concentrations for the tests will be 100%, 75%, 50%, 25%, and 12.5% unless written permission from EPA to use other effluent concentrations is provided.

(b) If organisms are not cultured in-house, concurrent testing with reference toxicants shall be conducted. Where organisms are cultured in-house, monthly reference toxicant testing is sufficient. Reference toxicants shall also be conducted using the same test conditions as the effluent toxicity tests (e.g., same test duration, etc).

(c) If either of the reference toxicant test or the effluent tests do not meet all test acceptability criteria as specified in the manual, then the permittee must re-sample and re-test within 14 days.

(d) Control and dilution water should be lab water, as described in the manual. If the dilution water used is different from the culture water, a second control, using culture water shall also be used.

4. Preparation of Initial Investigation TRE Workplan

The permittee shall submit to EPA a copy of the permittee's initial investigation Toxicity Reduction Evaluation (TRE) workplan (1-2 pages) within 90 days of the effective date of this permit. This plan shall describe the steps the permittee intends to follow if toxicity is detected, and should include, at a minimum:

(a) A description of the investigation and evaluation techniques that would be used to identify potential causes/sources of toxicity, effluent variability, and treatment system efficiency.

(b) A description of the facility's methods of maximizing in-house treatment efficiency and good housekeeping practices.

(c) If a toxicity identification evaluation (TIE) is necessary, who will conduct it (including whether in-house expertise, or the study will be sent out to contractors.)

5. Accelerated Testing

(a) If chronic toxicity, as defined in Section 2, is detected above the specified triggers, then the permittee shall conduct six more tests, approximately every two weeks, over a twelve-week period. Testing shall commence within two weeks of receipt of the sample results of the exceedance of the WET monitoring trigger.

(b) If initial investigation indicates the source of toxicity (for instance, a temporary plant upset), then only one additional test is necessary. If toxicity as defined above is detected in this test, then Section 6 below shall apply.

(c) If none of the six tests indicate toxicity as defined above, then the permittee may return to the normal testing frequency (i.e., monthly testing).

6. Toxicity Reduction Evaluation (TRE) and Toxicity Identification Evaluation (TIE)

(a) If chronic toxicity, as defined in Section 2, is detected in any of the six (6) additional tests, then, in accordance with the facility's TRE workplan and, at a minimum, using as guidance EPA manuals EPA/600/2-88/070, the permittee shall initiate a TRE within thirty (30) days of the exceedance to reduce the cause(s) of toxicity. The permittee will expeditiously develop a more detailed TRE workplan, which includes:

(i) Further actions to investigate and identify the cause of toxicity;

(ii) Actions the permittee will take to mitigate the impact of the discharge and to prevent the recurrence of toxicity;

(iii) A schedule for these actions.

(b) The permittee may initiate a TIE as part of the TRE process using as guidance EPA acute and chronic manuals, EPA/600/6-91/005F (Phase I), EPA/600/R-92/080 (Phase II), and EPA-600/R-92/081 (Phase III) to identify the cause(s) of toxicity.

7. Toxicity Reporting

(a) The permittee shall submit the results of the toxicity tests, including any accelerated testing conducted during the month, in TUs with the discharge monitoring reports (DMR) for the month in which the test is conducted, if possible, or the following month's DMR if results are not available (in which case the permittee shall notify EPA.) If an initial investigation indicates the source of toxicity and accelerated testing is unnecessary, pursuant to Section 5, then those results shall also be submitted with the DMR for the quarter in which the investigation occurred.

(b) The full report shall be submitted by the end of the month in which the DMR is submitted. Results from retesting required due to failure of a previous test to achieve test acceptability criteria shall be submitted as soon as validated retest results are available.

(c) The full report shall consist of: (1) the results of routine monthly and any accelerated monitoring conducted; (2) the dates of sample collection and initiation of each toxicity test; (3) the applicable chronic toxicity trigger as described in Section 2 above.

(d) Test results for chronic tests shall also be reported according to the chronic manual chapter on Report Preparation, and shall be attached to the DMR.

(e) The permittee shall notify EPA in writing within fifteen (15) days of receipt of the results which exceed a trigger as described in Section 2 above. The notification will describe actions the permittee has taken or will take to investigate and correct the cause(s) of toxicity. It may also include a status report on any actions required by the permit, with a schedule for actions not yet completed. Where no actions have been taken, the reasons for not taking action will be given.

## III. INTERNAL OUTFALL 01E - Combined Waste Treatment Pond Discharge

40 CFR 423.12(b)(3)

During the period beginning on the effective date of this permit and lasting through date of expiration, the permittee is authorized to discharge from Internal Outfall 01E.

Such discharges shall be limited and monitored by the permittee as specified below. Samples shall be collected prior to mixing with any other waste source stream and/or release to the circulating water canal.

| Effluent Parameter | Units | Monthly Average | Weekly Average | Daily Maximum(1) | Monitoring Frequency | Sampling Type |
|---|---|---|---|---|---|---|
| Flow(2) | MGD | -- | -- | -- | Daily | Estimated |
| TSS | mg/l | -- | 30 | 100 | Once/Week | Discrete |
| Oil & Grease | mg/l | -- | 15 | 20 | Once/Week | Discrete |
| pH | std. units | between 6.0 to 9.0 | | | Once/Week | Discrete |

NOTES:
(1) Instantaneous maximum.
(2) Report both average and maximum daily flows.

## IV. INTERNAL OUTFALL 01B - Chemical Metal Cleaning Wastewater

40 CFR 423.12(b)(5)

During the period beginning on the effective date of this permit and lasting through date of expiration, the permittee is authorized to discharge from Internal Outfall 01B.

Such discharges shall be limited and monitored by the permittee as specified below. Samples shall be collected prior to mixing with any other waste source stream and/or discharge to the circulating water canal.

0 CFR
§423.12(b)(5)
§423.12(b)(5)

| Effluent Parameter | Units | Monthly Average | Weekly Average | Daily Maximum(1) | Monitoring Frequency | Sampling Type |
|---|---|---|---|---|---|---|
| Flow(2) | MGD | -- | -- | -- | Once/Day | Estimated |
| TSS | mg/l | -- | 30 | 100 | 1/occurrence | Discrete |
| Oil & Grease | mg/l | -- | 15 | 20 | 1/occurrence | Discrete |
| Iron | mg/l | -- | 1.0 | 1.0 | 1/occurrence | Discrete |
| Copper, total | mg/l | -- | 1.0 | 1.0 | 1/occurrence | Discrete |
| pH | std. units | between 6.0 to 9.0 | | | 1/occurrence | Discrete |

40CFR 423.12(b)(1)

NOTES:
(1) Instantaneous maximum.
(2) Defined in 40 CFR 423.11.

## SECTION B. GENERAL DISCHARGE SPECIFICATIONS

1. PCB Fluids - There shall be no discharge of polychlorinated biphenyl (PCB) fluids. 40 CFR 423.12(b)(2)

2. Floating Solids - Discharge waters shall be free of scum and other floating materials in other than trace amounts.

3. Surface Seepage - Surface seepage intercept systems shall be constructed and operated for existing and future unlined ash ponds. Water collected by these intercept systems shall be returned to the ash ponds, or evaporation ponds.

## SECTION C. PERMIT REOPENER

Should any of the monitoring indicate that the discharge causes, has the reasonable potential to cause, or contributes to excursion above applicable water quality criteria, the permit may be reopened for the imposition of water quality based limits and/or whole effluent toxicity limits. Also, this permit may be modified in accordance with the requirements set forth at 40 CFR Parts 122 and 124.

## SECTION D. MONITORING AND REPORTING

### I. Reporting of Monitoring Results

*A.* Monitoring results shall be reported on Discharge Monitoring Report (DMR) forms (EPA No. 3320-1) to be supplied by the EPA Regional Administrator, to the extent that the information reported may be entered on the forms. The results of all monitoring required by this permit shall be submitted in such a format as to allow direct comparison with the limitations and requirements of the permit.

Unless otherwise specified, discharge flows shall be summarized and reported in terms of the average flow over each monthly period and the maximum daily flow over that monthly period. Each monthly report is due by the 28$^{th}$ of the following month (i.e. the January report is due by February 28.) Duplicate signed copies of these, and all other reports required herein, shall be submitted to the Regional Administrator at the following address:

Regional Administrator
Environmental Protection Agency
Region IX, Attn: WTR-7
75 Hawthorne Street
San Francisco, CA 94105

*B.* For effluent analyses, the permittee shall utilize an EPA-approved analytical method with a Method Detection Limit (MDL) that is lower than the effluent limitations (or lower than applicable water quality criteria for trace substances where monitoring is required but no effluent limitations have been established.) MDL is the minimum concentration of an analyte that can be detected with 99% confidence that the analyte concentration is greater than zero, as defined by the specific laboratory method listed in 40 CFR Part 136. The procedure for determination of a laboratory MDL is in 40 CFR Part 136, Appendix B.

*C.* If all published MDLs are higher than the effluent limitations (or applicable criteria concentrations), the permittee shall utilize the EPA-approved analytical method with the lowest published MDL.

*D.* The permittee shall develop a Quality Assurance (QA) Manual/QA Plan. The purpose of the QA Manual is to assist in planning for the collection and analysis of samples and explaining data anomalies if they occur. As appropriate and applicable, the QA Manual shall include the details enumerated below. The QA Manual shall be retained on the permittee's premises and be available for review upon request by EPA or an authorized representative. The permittee shall review its QA Manual annually and revise it when appropriate. Throughout all field sampling and laboratory analyses, the permittee shall use quality assurance/quality control (QA/QC) procedures as documented in its QA Manual.

1. Project Management including roles and responsibilities of the participants; purpose of sample collection; matrix to be sampled; the analytes or compounds being measured; applicable technical, regulatory, or program-specific action criteria; personnel qualification requirements for collecting samples.

2. Sample collection procedures; equipment used; the type and number of samples to be collected including QA/QC samples (i.e., background samples, duplicatives, and equipment or field blanks); preservatives and holding times for the samples (see 40 CFR Part 136.3).

3. Identification of the laboratory to be used to analyze the samples; provisions for any proficiency demonstration that will be required by the laboratory before or after contract award such as passing a performance evaluation sample; analytical method to be used; required QC results to be reported (e.g., matrix spike recoveries, duplicate relative percent differences, blank contamination, laboratory control sample recoveries, surrogate spike recoveries, etc.) and acceptance criteria; and corrective actions to be taken by the permittee or the laboratory as a result of problems identified during QC checks.

4. Discussion of how the permittee will perform data review and requirements for reporting of results to EPA to include resolving of data quality issues and identifying limitations on the use of the data.

*E.* Sample collection shall be performed as stated in the QA Manual. The QA Manual shall include a discussion on the preservation and handling, preparation and analysis of samples as described in the most recent edition of 40 CFR 136.3, unless otherwise specified in this permit.

## II. Monitoring and Records

Records of monitoring information shall include:

*A.* Date, exact location, and time of sampling or measurements performed, preservatives used;
*B.* Individual(s) who performed the sampling or measurements;
*C.* Date(s) analyses were performed;
*D.* Laboratory(ies) which performed the analyses;
*E.* Analytical techniques or methods used;
*F.* Any comments, case narrative or summary of results produced by the laboratory. These should identify and discuss QA/QC analyses performed concurrently during sample analyses and should specify whether they met project and 40 CFR Part 136 requirements. The summary of results must include information on initial and continuing calibration, surrogate analyses, blanks, duplicates, laboratory control samples, matrix spike and matrix spike duplicate results, sample receipt condition, holding times, and preservation.
*G.* Summary of data interpretation and any corrective action taken by the permittee.
*H.* Effluent limitations for analytes/compounds being analyzed.

## III. Twenty-Four-Hour Reporting of Noncompliance

The permittee shall report any noncompliance which may endanger health or the environment. Any information shall be provided orally within 24 hours from the time the permittee becomes aware of the circumstances to the following person or office:

CWA Compliance Office Chief
U.S. EPA
(415) 744-1905

If the permittee is unsuccessful in contacting the person above, the permittee shall report by 9 a.m. on the first business day following the noncompliance. A written submission shall also be provided within five (5) days of the time the permittee becomes aware of the circumstances. The written submission shall contain a description of the noncompliance and its cause; the period of noncompliance, including dates and times, and, if the noncompliance has not been corrected, the time it is expected to continue; and steps or plans to reduce, eliminate, and prevent reoccurence of the noncompliance.

## SECTION E. INSPECTION AND ENTRY

The permittee shall allow the Director, or an authorized representative, upon the presentation of credentials and such other documents as may be required by law, to perform inspections under authority of Section 10: Inspection and Entry of the "EPA Region 9 Standard Federal NPDES Permit Conditions," dated May 10, 1990, as attached.

## SECTION F. DEFINITIONS

The following definitions shall apply unless otherwise specified in this permit:

1. "Discrete sample" means any individual sample collected in less than 15 minutes.

2. "Daily discharge" means the discharge of a pollutant measured during a calendar day or any 24-hour period that reasonably represents the calendar for purposes of sampling. For pollutants with limitations expressed in terms of mass, the "daily discharge" is calculated as the total mass of the pollutant discharged over the sampling day. For pollutants with limitations expressed in other units of measurement, the "daily discharge" is calculated as the average measurement of the pollutant over the sampling day. "Daily discharge" determination of concentration made using a composite sample shall be the concentration of the composite sample. When grab samples are used, the "daily discharge" determination of concentration shall be the arithmetic average (weighted by flow value) of all samples collected during that sampling day.

3. "Daily average" discharge limitation means the highest allowable average of "daily discharges" over a calendar month, calculated as the sum of all "daily discharges" measured during a calendar month divided by the number of "daily discharges" measured during that month.

6. "Daily maximum" concentration means the measurement made on any single discrete sample or composite sample.

7. "Daily maximum" mass limit means the highest allowable "daily discharge"

by mass during any calendar day.

8. A "composite sample" means, for flow rate measurements, the arithmetic mean of no fewer than 8 individual measurements taken at equal intervals for eight (8) hours or for the duration of discharge, whichever is shorter. A composite sample means, for other than flow rate measurement, a combination of eight (8) individual portions obtained at equal time intervals for eight (8) hours or for the duration of the discharge, whichever is shorter. The volume of each individual portion shall be directly proportional to the discharge flow rate at the time of sampling. The sampling period shall coincide with the period of maximum discharge flow.

9. A "monthly or weekly average" concentration limitation means the arithmetic mean of consecutive measurements made during a calendar monthly or weekly period, respectively. The "monthly or weekly average" concentration for fecal or total coliform bacteria means the geometric mean of measurements made during a monthly or weekly period, respectively. The geometric mean is the "nth" root of the product of "n" numbers.

10. A "monthly or weekly average" mass limitation means the total discharge by mass during a calendar monthly or weekly period, respectively, divided by the number of days in the period that the facility was discharging. Where less than daily sampling is required by this permit, the monthly or weekly average value shall be determined by the summation of all the measured discharges by mass divided by the number of days during the monthly or weekly period when the measurements were made.

# Exhibit 5

United States Department of the Interior
FISH AND WILDLIFE SERVICE
New Mexico Ecological Services Field Office
2105 Osuna Road, NE
Albuquerque, N.M. 87113

Consultation No. 02ENNM00-2014-F-0064

Memorandum

To: Manager, Indian Program Branch, Office of Surface Mining Reclamation and Enforcement, Western Regional Office, Denver, Colorado

From: Supervisor, Fish and Wildlife Service, New Mexico Ecological Services, Albuquerque, New Mexico

Subject: Biological Opinion for the Four Corners Power Plant and Navajo Mine Energy Project

This transmits the U.S. Fish and Wildlife Service (Service) biological opinion (BO) regarding effects of actions associated with the Office of Surface Mining Reclamation and Enforcement (OSMRE) proposed Four Corners Power Plant and Navajo Mine Energy Project on federally listed species and their critical habitats in accordance with section 7(b) of the Endangered Species Act of 1973, as amended (ESA; 16 U.S.C. 1531 et seq.) and implementing regulations (50 CFR 402). Species affected by the proposed action are: endangered Colorado pikeminnow (*Ptychocheilus lucius*) and its critical habitat, endangered razorback sucker (*Xyrauchen texanus*) and its critical habitat, endangered southwestern willow flycatcher *(Empidonax traillii extimus*) (flycatcher), threatened yellow-billed cuckoo (*Coccyzus americanus*) (cuckoo), endangered California condor (*Gymnogyps californianus*), threatened Mexican spotted owl (*Strix occidentalis lucida*), endangered Mancos milkvetch (*Astragalus humillimus*), endangered Fickeisen plains cactus (*Pediocactus peeblesianus* var. *fickeiseniae*), threatened Mesa Verde cactus (*Sclerocactus mesae-verdae*), and threatened Zuni fleabane (*Erigeron rhizomatus*). You determined that the proposed action is likely to adversely affect Colorado pikeminnow and its critical habitat, razorback sucker and its critical habitat, as well as the flycatcher and the cuckoo. You also determined that the proposed action may affect, but is not likely to adversely affect, California condor, Mexican spotted owl, Mancos milk vetch, Fickeisen plains cactus, Mesa Verde cactus and Zuni fleabane.

We concur with OSMRE's determinations (provided in the biological assessment (BA) (OSMRE 2014b)), which justify the findings that the proposed action is not likely to adversely affect California condor, Mexican spotted owl, Mancos milk vetch, Fickeisen plains cactus, Mesa Verde cactus and Zuni fleabane. We base our concurrence on the rationales provided in the BA and additional Service review and analysis. We conclude informal consultation under section 7 of the ESA for California condor, Mexican spotted owl, Mancos milk vetch, Fickeisen plains cactus, Mesa Verde cactus and Zuni fleabane. Please contact the Service if the proposed action is changed and new information reveals effects of the proposed action to these species or critical habitat to an extent not addressed in the BA or this BO.

This BO does not rely on the regulatory definition of "destruction or adverse modification" of critical habitat at 50 CFR 402.02; instead, we have relied upon the statute and the August 6, 2004, Ninth Circuit Court of Appeals decision in Gifford Pinchot Task Force v. USDI Fish and Wildlife Service (CIV No. 03-35279) to complete the following analysis with respect to critical habitat. This consultation analyzes the effects of the action and the relationship of those effects to the function and conservation role of critical habitat for the Colorado pikeminnow and razorback sucker to determine whether the current proposal destroys or adversely modifies critical habitat for these species.

During formal consultation, we found that the proposed action will not jeopardize the continued existence of the Colorado Pikeminnow and razorback sucker; or the flycatcher or cuckoo, and will not adversely modify or destroy their respective designated critical habitats in the San Juan River Basin. Working with OSMRE and others, we developed Conservation Measures, Reasonable and Prudent Measures (RPM), and Terms and Conditions that can be implemented in a manner consistent with the intended purpose of the proposed action, and that can be implemented consistent with the scope of the Federal agencies' legal authorities and jurisdiction. The RPMs are economically and technologically feasible and we believe would avoid the likelihood of jeopardizing the continued existence of Colorado pikeminnow and razorback sucker, flycatcher, and cuckoo or result in the destruction or adverse modification of their designated critical habitats in the San Juan River Basin. The RPMs are necessary and appropriate to minimize the effect of incidental take associated with the proposed action.

In accordance with section 7 of the ESA and its implementing regulations, the BA and this BO represents the best scientific and commercial information available on the effects of the proposed action to federally listed species and their critical habitats, including from any release of nonnative species, water withdrawal, entrainment, or mercury and selenium emissions and subsequent deposition and accumulation in listed species in the San Juan River Basin. A complete administrative record of this consultation is on file at the Service's New Mexico Ecological Services Field Office, in Albuquerque, New Mexico.

If you have questions regarding this consultation, please contact David Campbell at (505) 761-4745.

Field Supervisor

Attachment

cc: (w/attch)

Regional Director, BIA, Navajo Region, Gallup, New Mexico (Attn. H. Yazzie) (electronic copy)
Director, Water Division, USEPA, Region 9, San Francisco, California (Attn. G. Sheh) (electronic copy)
Commander, USACE, Albuquerque District, Albuquerque, New Mexico (Attn. D. Cummings) (electronic copy)
Assistant Regional Director, Ecological Services, U.S. Fish and Wildlife Service, Region 6, Denver, Colorado (electronic copy)
Field Supervisor, U.S. Fish and Wildlife Service, Grand Junction Ecological Services Field Office, Grand Junction, Colorado (electronic copy)
Field Supervisor, U.S. Fish and Wildlife Service, Arizona Ecological Services Field Office, Phoenix, Arizona (electronic copy)

# Endangered Species Act – Section 7 Consultation

# Biological Opinion

## Four Corners Power Plant and Navajo Mine Energy Project, New Mexico

| | |
|---|---|
| Agency: | Office of Surface Mining Reclamation and Enforcement |
| Consultation Conducted By: | U.S. Fish and Wildlife Service,<br>New Mexico Ecological Services Field Office |
| Date Issued: | April 8, 2015 |
| Approved by: | Wally Murphy<br>Field Office Supervisor |
| Biological Opinion Number: | 02ENNM00-2014-F-0064 |

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## LIST OF ACRONYMS

| | |
|---|---|
| AFY | acre-feet per year |
| Age 0 | age of fish prior to its first anniversary date of hatch, young of year |
| APS | Arizona Public Service Company |
| BA | biological assessment |
| BBNMC | BHP Billiton New Mexico Coal, Inc. |
| BIA | Bureau of Indian Affairs |
| BHP | Broken Hill Proprietary |
| BLM | Bureau of Land Management |
| BMP | best management practice |
| BO | biological opinion |
| BOR | Bureau of Reclamation |
| C | Celsius |
| CCR | coal combustion residues |
| cfs | cubic feet per second |
| CI | confidence interval |
| cm | centimeter |
| CNAP | Colorado Natural Area Program |
| CNHP | Colorado Natural Heritage Program |
| COPEC | chemicals of potential environmental concern |
| CPC | Center for Plant Conservation |
| DEIS | draft Environmental Impact Statement |
| DOI | U.S. Department of the Interior |
| DW | dry weight |
| EIS | Environmental Impact Statement |
| EPA | U.S. Environmental Protection Agency |
| ESA | Endangered Species Act |
| F | Fahrenheit |
| FCPP | Four Corners Power Plant |
| FGD | flue gas desulfurization |
| ft | feet |
| g | gram |
| GWPRF | Ground Water Protection Research Foundation |
| ha | hectare |
| hg | mercury (all forms) |
| in | inch |
| IPCC | Intergovernmental Panel on Climate Change |
| ITS | incidental take statement |
| kg | kilogram |
| km | kilometer |
| kV | kilovolt |
| LANL | Los Alamos National Laboratories |
| lb | pound |
| m | meter |
| meHg | methylmercury |

| | |
|---|---|
| mi | miles |
| mg/kg | milligrams per kilogram (equivalent to ug/g) |
| mg/L | milligrams per liter |
| mm | millimeter |
| MMCo | BHP Billiton Mine Management Company |
| MW | megawatt |
| ng/L | nanograms per liter |
| NIIP | Navajo Indian Irrigation Project |
| NMEP | Navajo Mine Energy Project |
| NNDFW | Navajo Nation Department of Fish and Wildlife |
| NNEPA | Navajo Nation Environmental Protection Agency |
| NNHP | Navajo Natural Heritage Program |
| NOAEL | no observed adverse effect level |
| NWR | National Wildlife Refuge |
| NTEC | Navajo Transitional Energy Company, LLC. |
| ORV | off road vehicle |
| OSMRE | Office of Surface Mining Reclamation and Enforcement |
| PAH | polycyclic aromatic hydrocarbon |
| PCE | primary constituent element |
| PNM | Public Service Company of New Mexico |
| POD | plan of development |
| ppm | parts per million |
| Reclamation | U.S. Bureau of Reclamation |
| RM | river mile |
| ROW | right of way |
| RPM | reasonable and prudent measure |
| Service | U.S. Fish and Wildlife Service |
| SJGS | San Juan Generating Station |
| SJRRIP | San Juan River Recovery Implementation Program |
| SL | standard length of a fish is its total length excluding the length of the caudal fin |
| SMCRA | Surface Mining Control and Reclamation Act of 1977 |
| $SO_2$ | sulfur dioxide |
| TL | total length of a fish from tip of snout to flattened end of caudal fin |
| USFWS | U.S. Fish and Wildlife Service |
| ug/g | micrograms per gram (equivalent to mg/kg) |
| ug/L | micrograms per liter |
| WW | wet weight |
| YOY | young of year |

# INTRODUCTION

The Office of Surface Mining Reclamation and Enforcement (OSMRE) and several cooperating agencies are preparing an Environmental Impact Statement (EIS; OSMRE 2014a) for the proposed action under formal consultation (OSMRE 2014b). The proposed action involves federal agency approvals related to the continued operation (from 2016-2041) of the Four Corners Power Plant (FCPP), ongoing mining at Navajo Mine to provide a coal supply to FCPP operations, and issuance or renewal of right-of-ways (ROWs) for several transmission lines and roads associated with the operations of the FCPP and Navajo Mine. The proposed action is collectively termed the Four Corners Power Plant and Navajo Mine Energy Project (FCPP and NMEP, the Project). The OSMRE serves as the Lead Agency for Section 7 consultation on the proposed action with the Service. OSMRE (2014b) described the proposed action in their Biological Assessment (BA) and as supplemented (OSMRE 2014c,d) (the BA and these supporting documents are incorporated herein by reference). The proposed action will require the approval of several other federal Cooperating Agencies including the Bureau of Indian Affairs (BIA), U.S. Environmental Protection Agency (USEPA), U.S. Army Corps of Engineers (USACE or Corps), and Bureau of Land Management (BLM) (OSMRE 2014a,b).

The Project Proponents are Arizona Public Service Company (APS), BHP Billiton Mine Management Company (MMCo), Public Service Company of New Mexico (PNM), and the Navajo Transitional Energy Corporation, LLC (NTEC). APS is part owner of FCPP and represents the ownership of FCPP for the proposed action. APS owns and operates two of the transmission lines that are part of the proposed action. Public Service Company of New Mexico (PNM) is part owner of the FCPP, owns, and operates two of the transmission lines that are part of the proposed action. The NTEC owns and (through a mine management contract with MMCo) operates Navajo Mine.

### *Background and Consultation History*

The BA (OSMRE 2014a) adequately describes the consultation history for the proposed action. The best scientific and commercial data available on mercury (Hg) and selenium (Se) dynamics in the San Juan River Basin have been updated during the ESA consultation on the proposed action (OSMRE 2014a,b; EPRI 2014). Information about the numbers and distribution of endangered fish in the San Juan River Basin and their life history has also been updated (Freques 2010; Houston et al. 2010; Ryden 2012; USFWS 2011, 2012; Durst and Franssen 2014; Franssen et al. 2014; Osmundson and White 2009, 2014; Valdez 2014). Assessments of various trace element emissions, their risks, their bioaccumulation, their effects to endangered fishes in the San Juan River Basin have been updated too (Osmundson and Lusk 2011; AECOMM 2013; EPRI 2014; OSMRE 2014a,b; Miller 2014). Several effects studies specific to Hg in fish were published (Dillon et al. 2010; AECOM 2013; ERM 2014a, b, including references therein). Additionally, BIA has agreed to reconsider its effects findings associated with the Navajo Indian Irrigation Project (NIIP) and other irrigation projects. BIA has begun developing additional scientific information that may be necessary to supplement their BA (BIA 1999). Therefore, potential future Se discharges potentially from BIA irrigation projects and associated effects to listed species were not considered part of cumulative effects during this ESA consultation.

Since issuance of the BA, several additional meetings have occurred between staff and personnel representing OSMRE, the Service, BIA, APS, PNM, MMCo, and NTEC, as well as various contractors and legal representatives of these entities, to discuss options for ameliorating potential effects to listed species and their critical habitat. In addition, a work group developed a population viability analysis (PVA) for Colorado pikeminnow to identify actions that could potentially be taken to improve its status in the San Juan River Basin (Miller 2014).

On March 13, 2015, OSMRE (2015) and the Project Proponents amended the BA to include a suite of Conservation Measures that are made part of the proposed action, and thereby substantially reduced the Projects' impacts on listed species and their critical habitats. This BO analyzes the effects of the proposed action with those Conservation Measures.

# DESCRIPTION OF THE PROPOSED ACTION

## ACTION AREA

The action area includes all areas that the proposed action may directly or indirectly affect endangered species or their critical habitat. The proposed action, FCPP and NMEP, is located on the Navajo Nation approximately 15 miles southwest of Farmington, New Mexico (Figure 1). The proposed action includes continued use and maintenance of associated transmission lines that cross Navajo Nation and allotted lands, the Hopi Reservation, the Zia Pueblo, BLM lands, the Petroglyph National Monument, New Mexico State Land Office lands, as well as private land (OSMRE 2014a) (Figure 1).

The action area where direct effects occur includes the Navajo Mine lease areas (Figure 2) and proposed Pinabete Permit Area (Figure 3), the lease area for the FCPP and associated facilities (Figure 4), the APS Weir, and the ROWs for PNM transmission lines to the San Juan Generating Station and West Mesa Switchyard and two ROWs for APS transmission lines within the Navajo Nation boundary (Figure 1) (OSMRE 2014b). The action area where direct and indirect effects occur includes the area that atmospheric trace element deposition from the FCPP emissions would likely occur, as modeled by AECOM (2013) and EPRI (2014), which includes vast portions of the San Juan River Basin and in the Four Corners region (Figure 5). The focus of several analyses in the BA were from the upstream end of the Deposition Area downstream to, and inclusive of, the San Juan Arm of Lake Powell, which may be affected by runoff of materials from the proposed action including the Deposition Area (AECOM 2013; Figure 6).

Geographically, the action area for the proposed project is located in the Four Corners region of the United States; an area associated with the quadripoint consisting of the southwestern corner of Colorado, northwestern corner of New Mexico, northeastern corner of Arizona, and southeastern corner of Utah, and including lands owned by the Navajo Nation and the Hopi. The Four Corners region is part of a larger region known as the Colorado Plateau Provence and is mostly rural, rugged, and arid (OSMRE 2014a).

The San Juan River originates in the San Juan Mountains of southwestern Colorado. It flows approximately 31 miles south to the Colorado/New Mexico border, 190 miles westward to the New Mexico/Arizona border, and 136 miles into Lake Powell, at the western edge of the action area (Figure 6). The San Juan River has few perennial tributaries (the Animas River is the largest) and numerous ephemeral drainages that receive substantial seasonal summer flows. In 1962, the U.S. Bureau of Reclamation (Reclamation or BOR 2001) constructed Navajo Dam in the mainstem of the San Jan River just south of the Colorado border in New Mexico to store flows from the San Juan, Los Pinos, and Piedra Rivers (BOR 2001) (Figure 6).

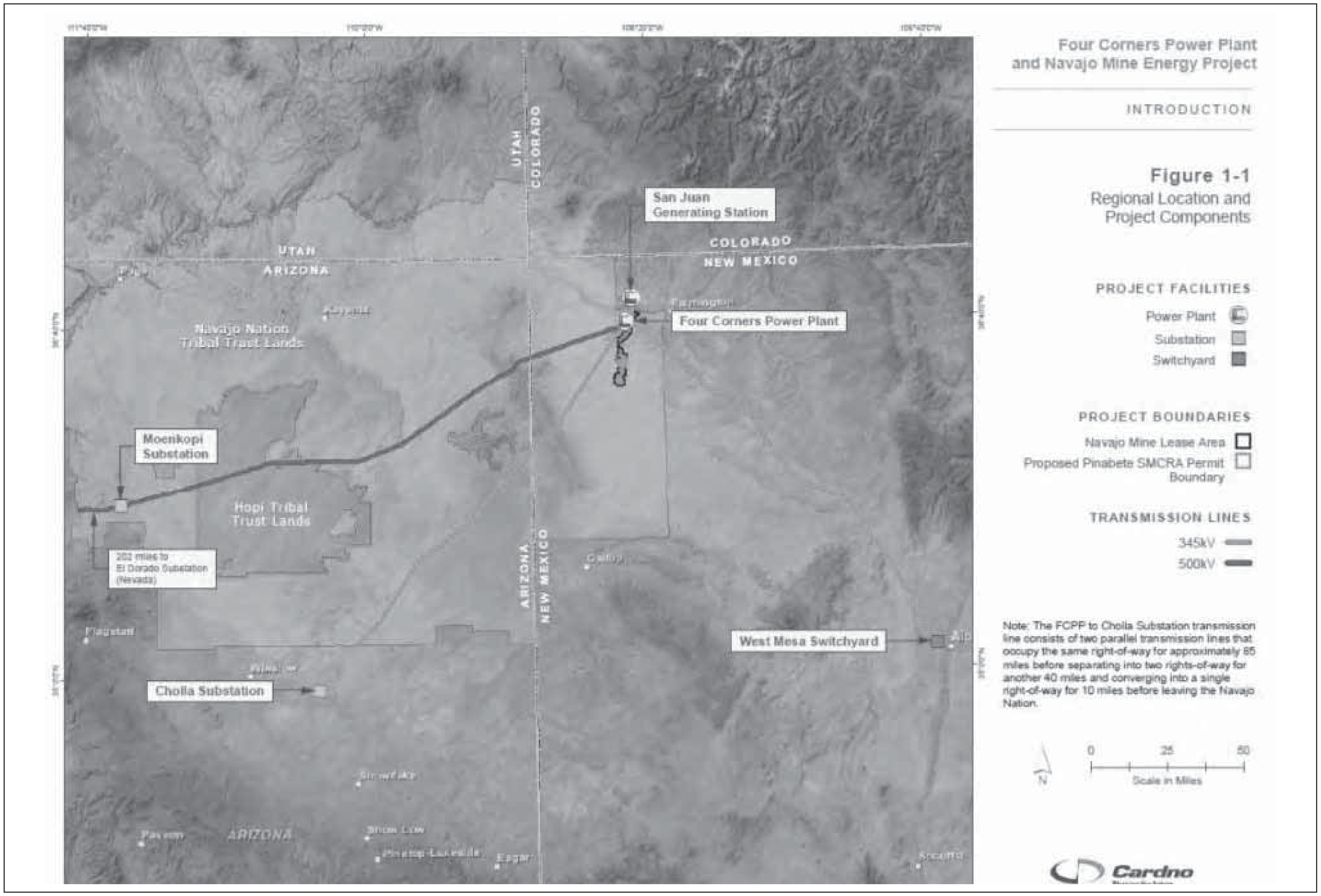



Figure 1. Location of the Four Corners Power Plant and Navajo Mine Energy Project action area (Source: OSMRE 2014a).

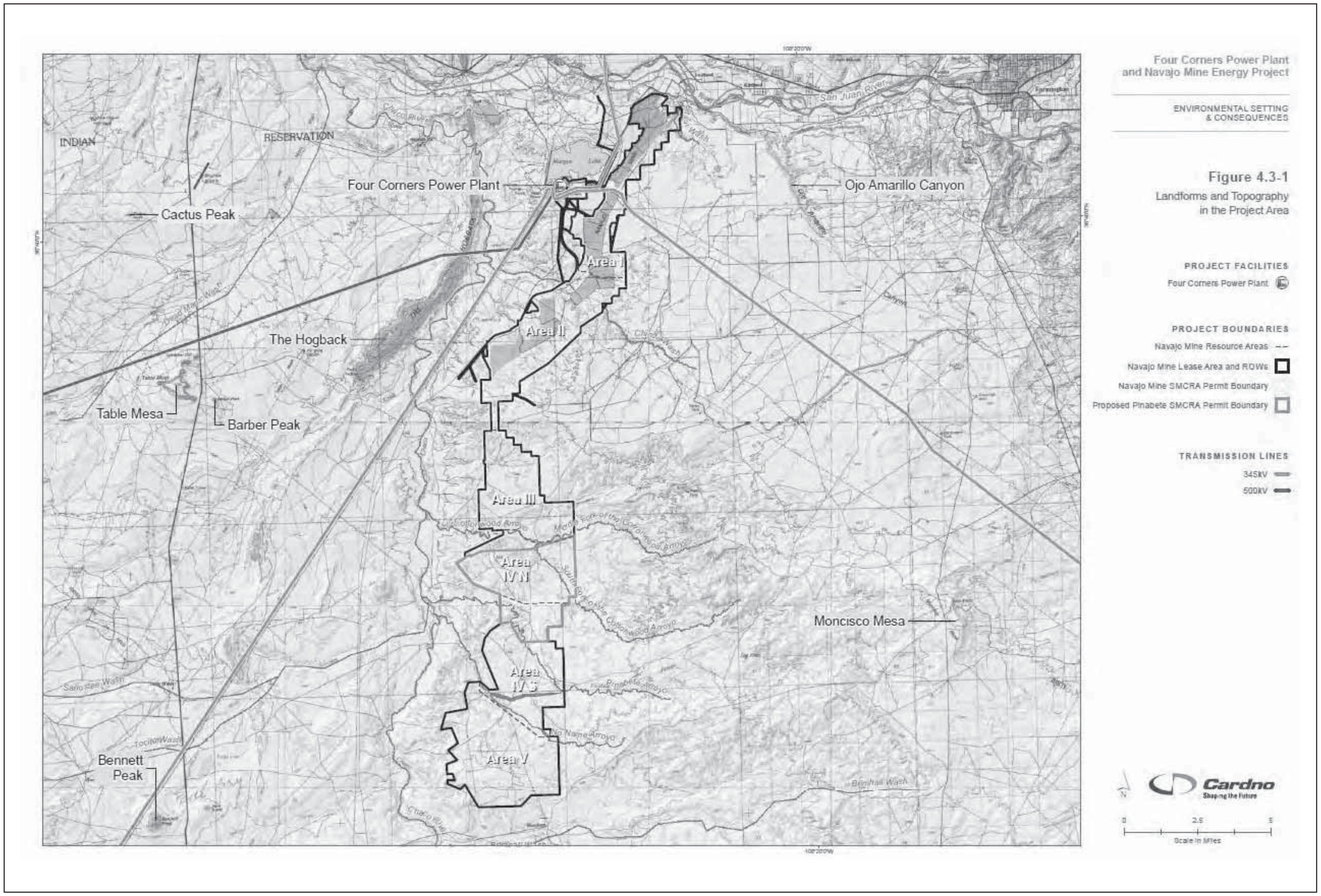



Figure 2. Location of the Navajo Mine operations in the landscape (Source: OSMRE 2014a)

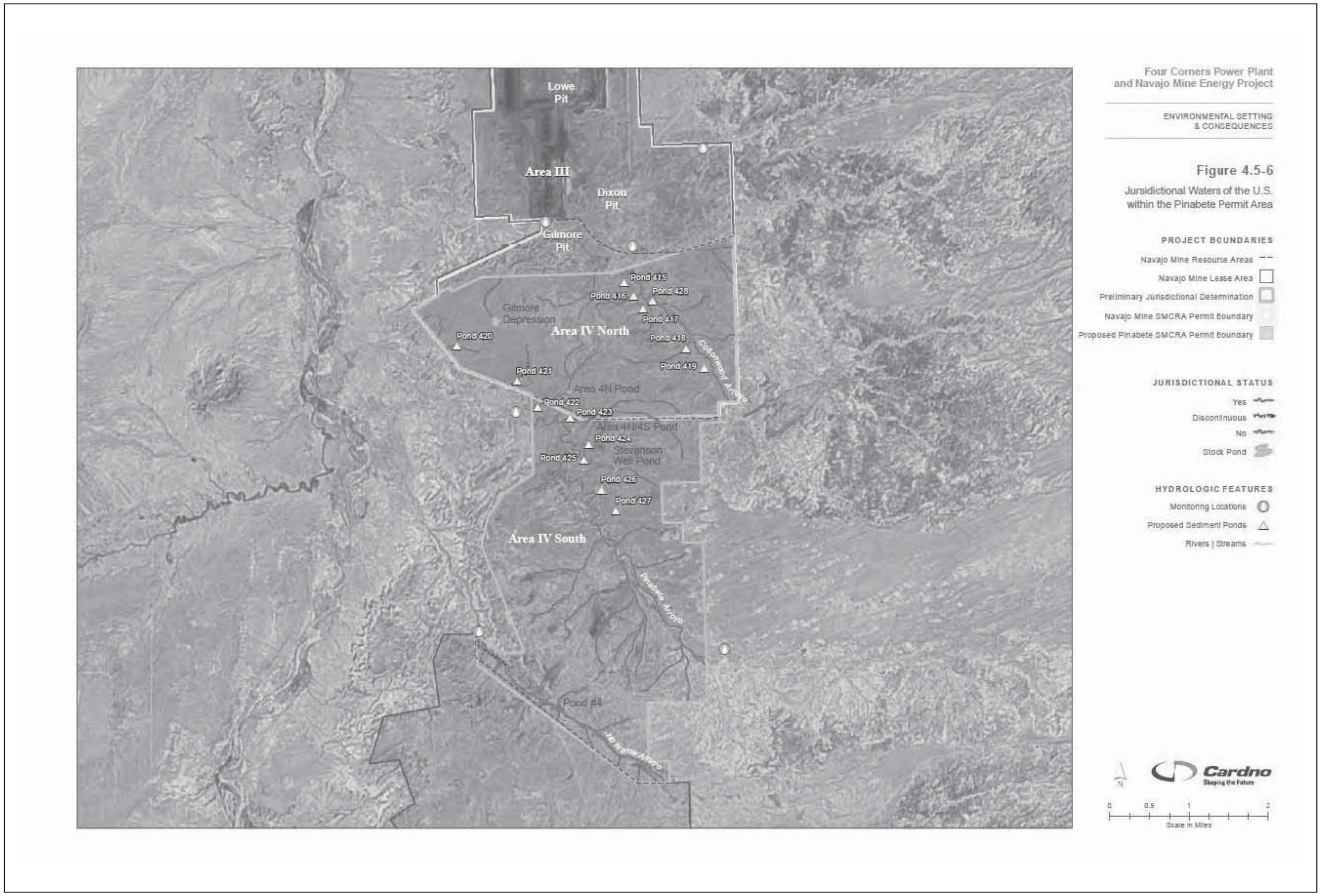



Figure 3. Location of jurisdictional waters on Pinabete Permit Area of Navajo Mine Areas IV North and IV South (OSMRE 2014a).

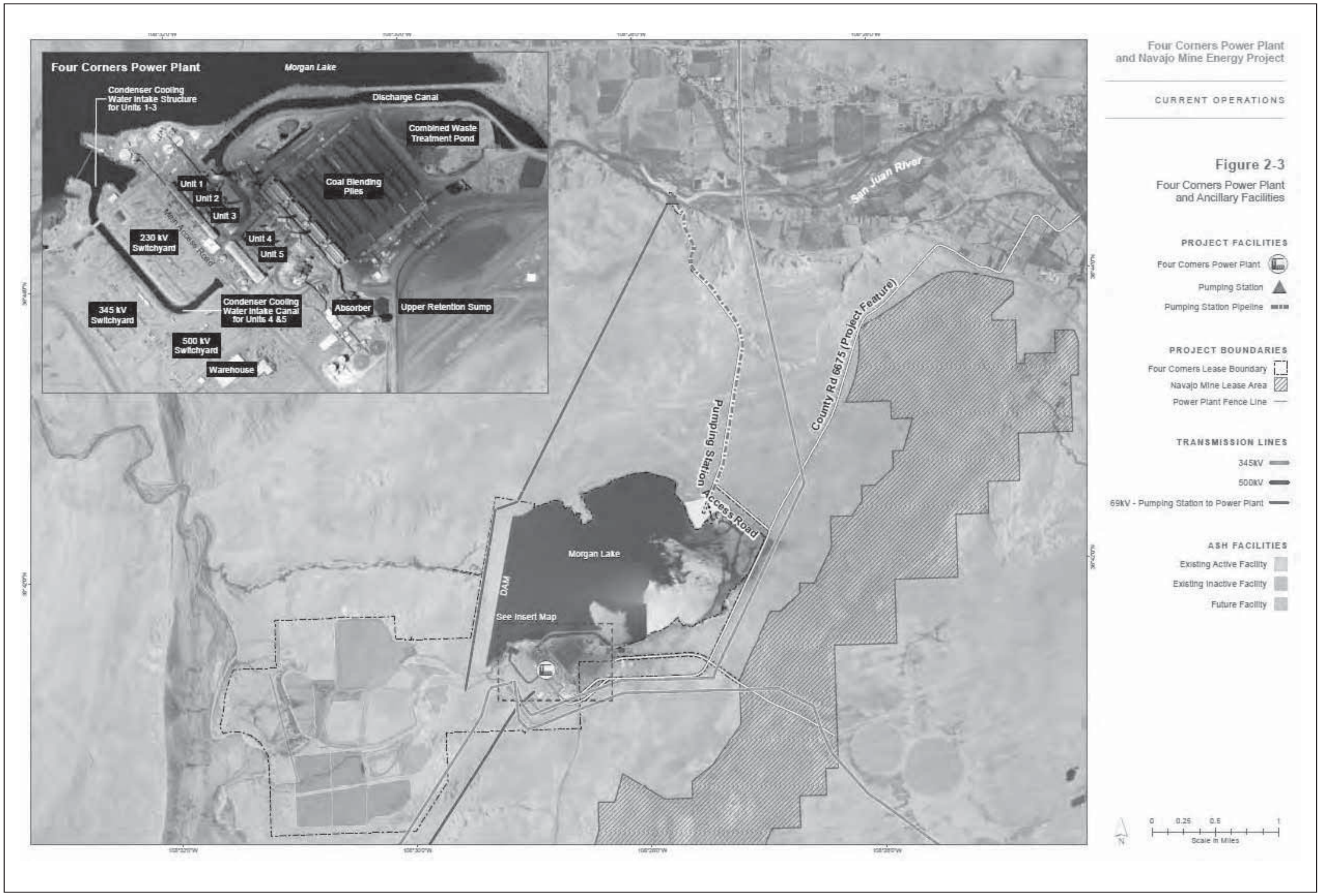



Figure 4. Location of the Four Corners Power Plant and associated facilities in New Mexico (Source: OSMRE 2014a)

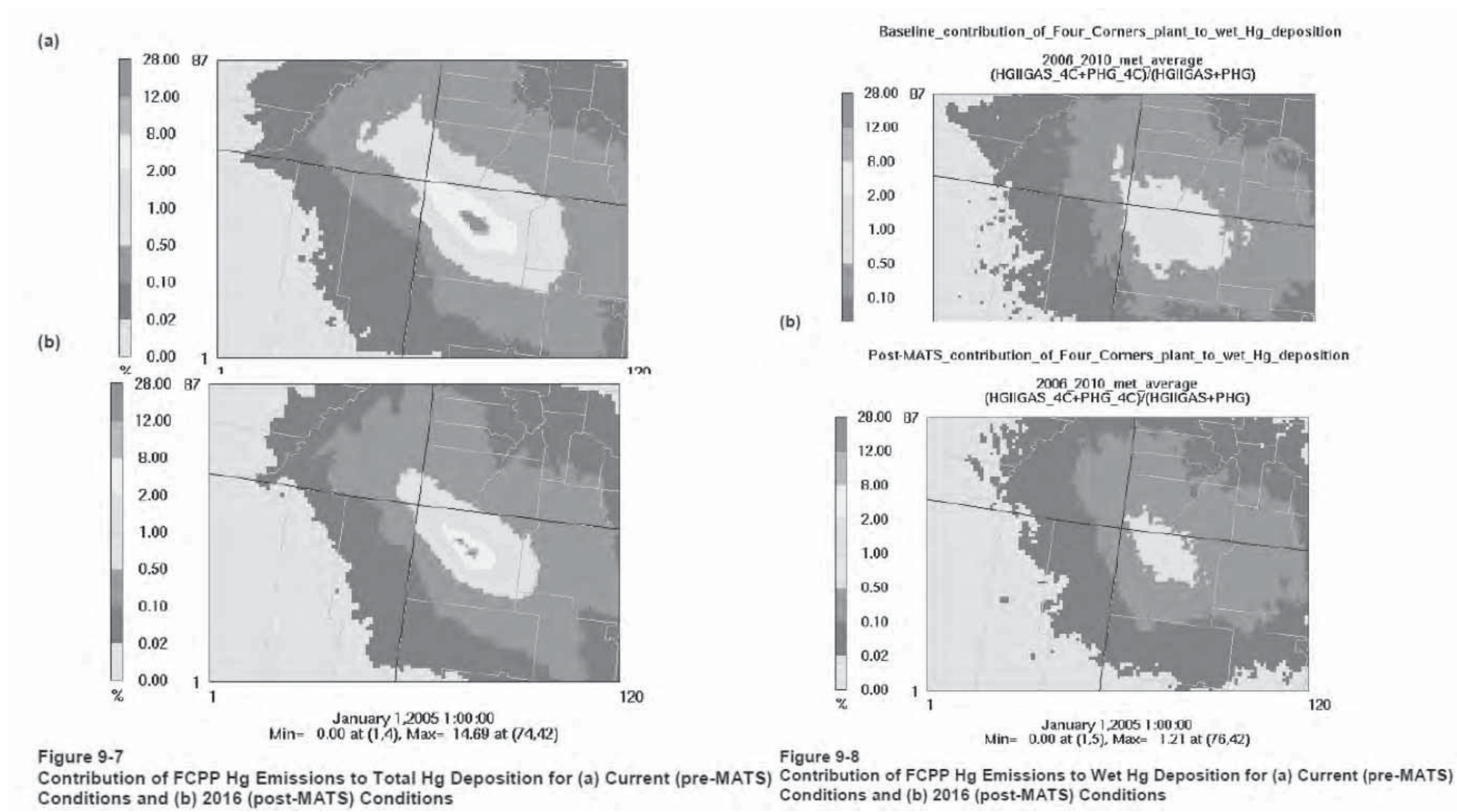



Figure 5. Modeled location and portion of Four Corners Power Plant Hg emissions that are deposited in the San Juan River Basin and in Four Corners region before (~2005) and after implementation of the Mercury Air Toxic Standards rule (2016) (Source EPRI 2014).

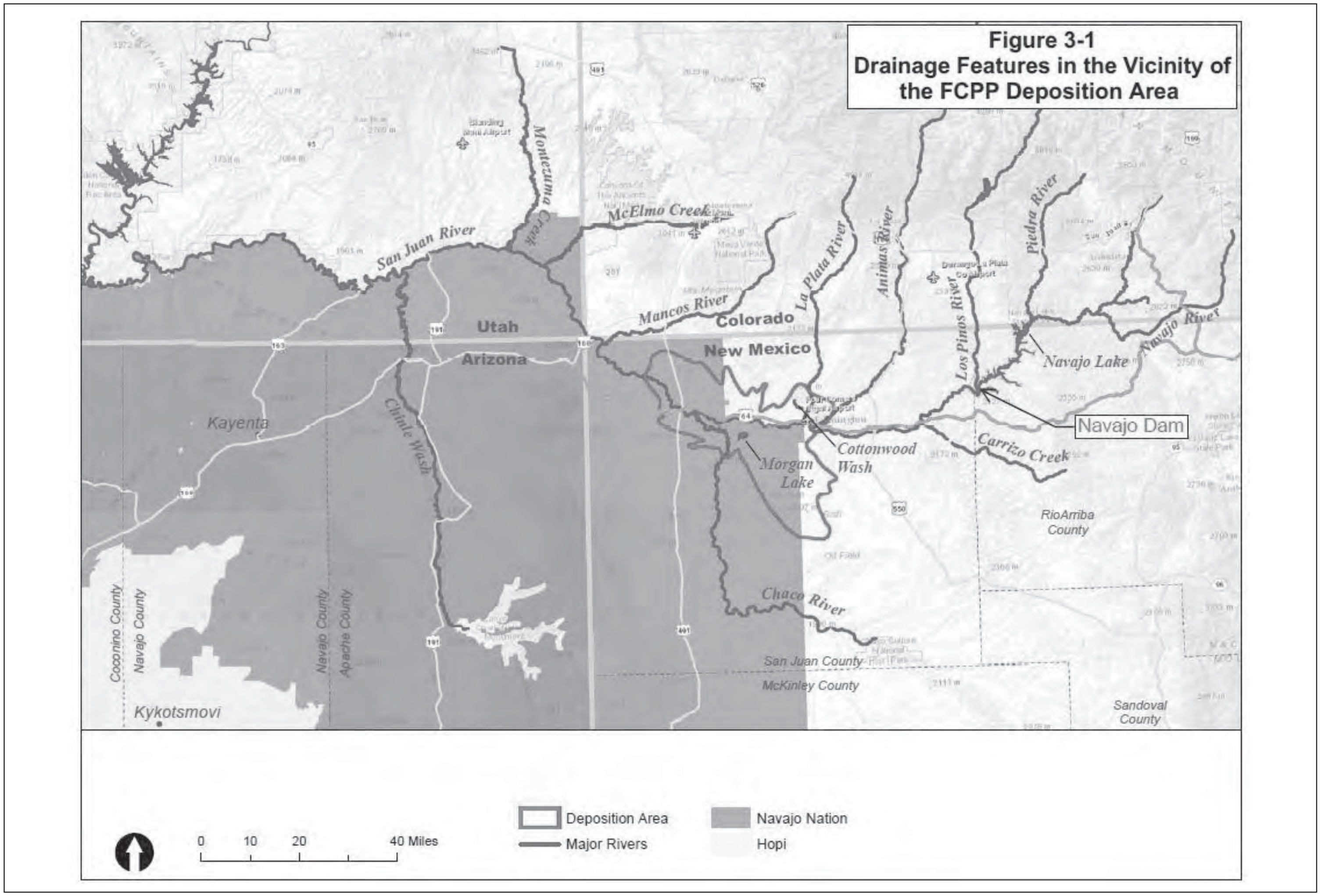



Figure 6. AECOMM (2013) focus area from upstream end of the Deposition Area downstream to the San Juan Arm of Lake Powell.

## PROPOSED ACTION

The proposed action consists of the continued operation of the FCPP and NMEP from July 6, 2016, for 25 years into 2041. Based on the EPRI (2014) model, atmospheric deposition and the fate and transport of trace elements from the proposed action into the San Juan River Basin, mercury would remain in the watershed system and potentially contribute downstream after FCPP operations ceased (EPRI 2014). Therefore, the EPRI model of bioaccumulation of mercury in fish was extended through 2074 (a total of 59 years).

The BA (OSMRE 2014b) evaluates the direct and indirect effects of the proposed action to federally listed species and their critical habitats that lie within the action area. The BA also evaluates the effects of actions or activities that are interrelated and interdependent with the proposed action and cumulative effects on these species in the action area. Additional voluntary Conservation Measures were made part of the proposed action in March 2015 and minimize for Project effects on listed species and their critical habitats (OSMRE 2015). The general federal actions included in the effects analysis of this BO are as follows.

### *Navajo Mine*

The Navajo Nation granted a 24,000-acre coal lease in July 1957 to Utah Construction and Mining Company. The Navajo Mine lease area was subsequently increased to approximately 33,600 acres (Areas I through V, Figure2). Since December 30, 2013, NTEC holds the Navajo Mine lease and the lease surface and mineral rights. Under a Mine Management Agreement with NTEC, MMCo will continue to operate and manage the Navajo Mine through 2016. As operator of the mine, MMCo will conduct surface mining and reclamation on the Navajo Mine lease area as approved in OSMRE's SMCRA Permit #NM-0003F and in future revisions or renewals.

Navajo Mine will continue to supply coal to FCPP to support operations from 2016 through 2041. For that purpose, NTEC is working with MMCo for OSMRE approval to renew the Navajo Mine SMCRA Permit NM0003F, effective September 2014, for continued access to coal reserves and to permit the Pinabete Permit Area, a new approximately 5,568-acre surface mine area within Area IV North and Area IV South of the Navajo Mine Lease Area (Figures 2 and 3). Development of coal reserves in the existing Navajo Mine lease area including the proposed Pinabete Permit Area would supply low-sulfur coal to FCPP for up to 25 years at a rate of approximately 5.8 million tons per year.

Within the Pinabete Permit Area, approximately 4,100 acres would be disturbed from surface mining, construction of haul roads (approximately 5.2 miles), light vehicle roads (approximately 20.8 miles), power lines (approximately 7.7 miles), and construction of related infrastructure such as sediment and drainage control ponds, arroyo crossings, and soil and coal stockpiles (approximately 278 acres). Approximately 2.8 miles of Burnham Road, a public access road, will be realigned as planned mining activities approach the road segment, expected to occur in 2022. Coal extraction, coal haulage, coal processing (crushing), road and infrastructure construction, and site reclamation techniques would occur at Navajo Mine. Coal would be extracted utilizing blasting, draglines, trucks, and loaders. Operators will transport mined coal to coal stockpiles using haul trucks, load it onto an existing rail transport system, and deliver it to the on-site coal preparation plant. The coal preparation plant is a stacking and reclaiming facility and not a coal cleaning operation. Water usage at the coal preparation plant is primarily limited to dust suppressant spray and equipment wash down. Surface-water runoff is collected in sediment basins and allowed to evaporate or percolate.

Land and prominent drainage features disturbed by mining and related operations would be reclaimed and restored to their approximate pre-mining conditions in a manner compatible with the designated post-mining land use of livestock grazing and wildlife habitat. Successful reclamation of mined lands would be guaranteed by a surety bond that can only be released after OSMRE determines reclamation areas meet approved performance standards.

The USEPA and/or Corps will authorize Clean Water Act permits to manage effluent discharges to surface waters and fill of five acres of jurisdictional Waters of the United States (WOUS) associated with operations within the Pinabete Permit Area. The proposed action includes the present and future issuance of National Pollutant Discharge Elimination System (NPDES) permits by USEPA for discharges associated with various activities such as coal mining, stormwater runoff, and other discharges (BA, Section 2).

Under the Proposed Action, Navajo Mine Operators would be authorized by USEPA (with certification by the Navajo Nation EPA) to discharge pollutants through various conveyance facilities (e.g., pipes, ditches, etc.) through a new or existing, or modified NPDES Permit No. NN0028193 (the permit number may also change). Additionally, stormwater discharges are authorized with implementation of a Stormwater Pollution Prevention Plan under the Multi-Sector General Permit NPDES Permit No. AZR05001 or under a general Construction Permit. The Construction and Multi-Sector General Permits authorizes discharges associated with coal mining roads, railroad lines, the storage, handling, transportation, and backfilling operations of the coal combustion byproducts, and removal of dams, berms, and ditches, to convey surface water from contact with active mining operations to pits, sumps, or ponds where the water is evaporated, or used for dust suppression. When stormwater runoff exceeds the storm event design holding capacity of the pits, sumps or ponds, or other Best Management Practices (BMPs), then effluents may be discharged to the environment or WOUS under NPDES Permit No. NN0028193, or as authorized by another USEPA-issued NPDES permit.

The U.S. Army Corps of Engineers (USACOE) may also issue an Individual Permit under Section 404 of the Clean Water Act in association with the proposed 5-acre fill of WOUS on the Navajo Mine, as authorized by Corps. Compensatory mitigation will be completed to offset the impacts to WOUS and the temporal loss of their functionality during mining and reclamation activities. USACE will condition any fill discharge authorization associated with the mine to include compensatory mitigation for loss of aquatic resource function during mining activities until reclamation occurs. Compensatory mitigation requirement development will follow USACE South Pacific Division standard operating procedures for establishment of mitigation ratios. Navajo Mine will be required to evaluate and report on the performance of the mitigation efforts on an annual basis until approved performance standards are reached.

The Bureau of Land Management's (BLM) may also approve or disapprove the revised Mine Plan for the proposed maximum economic recovery of coal reserves in the Pinabete Permit Area Resource Recovery and Protection Plan application.

Between 1971 and January 2008, Coal Combustion Residues (CCRs) from FCPP operations were used as mine backfill material in mined-out pits or ramps in Areas I and II at Navajo Mine. The USEPA (2014c) recently classified CCRs as nonhazardous, solid waste and identified management goals for CCRs.

***Four Corners Power Plant***

The proposed action includes the ongoing operation of FCPP under a new 25-year lease starting on July 6, 2016. In 1966, the Navajo Nation granted a lease for the FCPP and BIA granted ROWs for the plant site and various transmission lines and related facilities (Figure 1 and 4). In 2011, the Navajo Nation approved a new 25-year lease, Lease Amendment No. 3, for operation of the FCPP and forwarded it to BIA for approval. BIA is also considering APS's application to extend its FCPP ROW through 2041. Prior to 2014, the FCPP operated five units to generate approximately 2,100 MW of power. To continue to operate beginning 2016, APS has taken (and will take) a number of steps to make future operations viable over the next 25 years.

On August 6, 2012, the USEPA (2012) issued a source specific Federal Improvement Plan (FIP) requiring FCPP to achieve certain air particulate and oxide emissions reductions under the Clean Air Act (Best Available Retrofit Technology or BART provisions). To achieve air emissions reductions under the BART provisions, APS shut down Units 1, 2, and 3 on December 30, 2013. Additionally, APS proposed to install Selective Catalytic Reduction (SCR) on Units 4 and 5 by 2018 (AECOM 2014). The shutdown of Units 1, 2, and 3 substantially reduced coal consumption and air emissions from historic amounts and lowered the power output of the plant from 2,100 to 1,540 MW. The retirement of Units 1, 2, and 3 and the use of SCR on Units 4 and 5 will result in the decrease of all air pollutants (including Hazardous Air Pollutants (HAPs) emitted (Table 1).

Reductions of HAPs concentrations began in 2014 and preceded the proposed action in 2016. Because the proposed action is scheduled to begin in 2016, the actions taken to shutdown FCPP Units 1, 2, and 3 are part of the Environmental Baseline for this ESA consultation. APS had not yet prepared a final decommissioning plan for the demolition and removal of Units 1, 2, and 3 by the time of this ESA consultation, but committed to complying with all environmental laws and regulations applicable at the time of decommissioning as part of the proposed action.

Transportation and use of urea and hydrated lime are part of the proposed action because both are required for operation of the SCR on Units 4 and 5. Urea solid will be delivered to FCPP by truck and stored on site prior to use. Urea will be converted to ammonia, which will be used to reduce NOx. The use of SCR equipment tends to oxidize some $SO_2$ to $SO_3$, which results in increased emission of sulfuric acid ($H_2SO_4$) mist. Because of these emissions, FCPP requires a Prevention of Significant Deterioration permit from EPA because $H_2SO_4$ emissions will be above the PSD significant emission threshold. To minimize $H_2SO_4$ emissions, APS will install a sorbent injection system using hydrated lime as the sorbent. Pursuant to section 7, EPA analyzed the effects of issuance of the permit to listed species and critical habitat and determined that the issuance of the permit may affect, but is not likely to adversely affect southwestern willow flycatcher, Mexican spotted owl, Yellow-billed cuckoo, Colorado pikeminnow, razorback sucker, Mancos milk-vetch, Mesa Verde cactus, and designated critical habitat for these species within the Deposition Area (AECOM 2014, OSMRE 2014a). The USFWS issued their concurrence with these findings on June 20, 2014 (USFWS 2014).

Other than SCR installation, Units 4 and 5 would continue operating as they have historically.

Table 1. Historical and proposed FCPP Hazardous Air Pollutant (HAP) emissions

| FCPP Hazardous Air Pollutants (Metals) Emissions | 2000-2011 FCPP HAPs Emissions | | | 2014-2041 FCPP HAPs Emissions | Comparison of Historical FCPP Emissions |
|---|---|---|---|---|---|
| | Units 1 to 5 (lb/yr) | Units 1 to 3 (lb/yr) | Units 4 & 5 (lb/yr) | Units 4 & 5 (lb/yr) | Reduction (%) |
| Antimony (Sb) | 32 | 10 | 22 | 20 | 37% |
| Arsenic (As) | 81 | 25 | 56 | 51 | 37% |
| Beryllium (Be) | 31 | 10 | 22 | 20 | 37% |
| Cadmium (Cd) | 57 | 17 | 39 | 36 | 37% |
| Chromium (Cr) | 397 | 120 | 277 | 250 | 37% |
| Cobalt (Co) | 84 | 25 | 59 | 53 | 37% |
| Copper[2] | 876 | 264 | 612 | 552 | 37% |
| Lead (Pb) | 465 | 142 | 323 | 292 | 37% |
| Manganese (Mn) | 1113 | 336 | 777 | 702 | 37% |
| Mercury (total) (Hg)[3] | 447 | 311 | 136 | 149 | 67% |
| Nickel (Ni) | 358 | 108 | 251 | 226 | 37% |
| Selenium (Se)[4] | 2450 | 1971 | 479 | 523 | 79% |

Emission estimates based on emission factors from "Updated Hazardous Air Pollutants (HAPs) Emissions Estimates and Inhalation Human Health Risk Assessment for U.S. Coal-Fired Electric Generating Units" (Report 1017980, December), except as noted.
1 Based on BART PM limit of 0.015 lb/MMBtu
2 Copper based on chromium (metal with closest boiling point) and 2010 FCPP TRI Cu/Cr ratio of 2.21
3 Source of this information is OSMRE (2014a,b,c)
4 Based on EPRI Western coal data and 98% efficiency for Units 4 and 5 and 80% efficiency for Units 1,2 and 3.

Under the proposed action, the size of the Dry Fly Ash Disposal Area (DFADA) within the existing FCPP lease area will increase in size. The Ash Disposal Area currently consists of the Lined Ash Impoundment, reclaimed Evaporation Ponds, the Lined Decant Water Pond, inactive ash disposal areas, and the DFADA. The USEPA CCR rule will govern the future management of CCRs at FCPP as solid wastes. OSMRE (2014a,b) reported that there is an extremely low probability that a containment failure of an ash pond could occur and a Spill Contingency Countermeasures plan would address that risk.

Under the proposed action, operators of the FCPP could be authorized by USEPA (with certification by the Navajo Nation EPA) to discharge pollutants through various conveyance facilities (e.g., pipes, ditches, etc.) through a new or existing, or modified NPDES Permit No. NN0000019. Similarly, discharges of stormwater could occur under a Stormwater Pollution Prevention Plan authorized by Multi-Sector General Permit NPDES Permit No. AZR05001 or by a General Construction Permit. The USEPA's NPDES permits set technology-based limits on FCPP effluent discharges at three outfalls to Morgan Lake from condenser-cooling water, chemical metal cleaning water, and from a combined waste treatment pond, and one outfall from Morgan Lake to No Name Wash.

*Transmission Lines and Ancillary Facilities*

The proposed action includes BIA ROW renewals for three existing APS transmission lines (FCPP to Moenkopi 500-kilovolt (kV) line and the FCPP to Cholla 345 kV lines [2 lines]) within the Navajo Nation boundary and two PNM transmission lines (FCPP to West Mesa 345-kV line and the FCPP to San Juan 345-kV line) as well as a BLM ROW renewal for PNM's West Mesa 345-kV line. These lines will continue to be maintained and repaired as required. No new roads or access routes were anticipated under the proposed action. Other than routine maintenance and repair, no changes or modifications are anticipated for the transmission lines, the three FCPP switchyards, Moenkopi Substation, 12-kV lines, or access roads to ensure continued operation of FCPP through 2041.

***San Juan River Diversion and Water Withdrawal***

Surface water for industrial use is pumped from the San Juan River into Morgan Lake and then pumped from the lake into FCPP and used for cooling purposes. The intake structure on the river consists of two, 8-by8.5-foot intake bays, which are covered by screens and are placed perpendicularly to the flow of the river just upstream of the APS Weir. APS Weir is an existing concrete slab structure that crosses the entire river and has a gate and sluiceway assembly on the south side of the river. Operation of the gate at APS Weir controls the local water surface elevation to provide adequate water coverage of the intakes bays and pumping operations (Stamp et al. 2005; OSMRE 2014b). During 2001-2011, an average of 27,682 AFY of water was used by the FCPP (OSMRE 2013a, b). The closure of FCPP Units 1 to 3 is expected to reduce water use by 5,000 to 7,000 AFY.

In 1958, the State of New Mexico granted Utah International, the predecessor in interest to, BHP Billiton New Mexico Coal Inc. (BBNMC), a permit (NMOSE Permit No. 2838) for consumptive use (39,000 acre-feet per year [af/yr]) and diversion (51,600 af/yr) of surface water from the San Juan River. This water is diverted at the APS Weir through the intake bays. The State permit authorizes use of water for coal mining, coal processing and beneficiation, coal utilization including electric power generation and production of coal chemicals. Permit 2838 has provided and will continue to provide all the necessary water supply to support operations at FCPP and Navajo Mine including all water use associated with the Proposed Action.

The BA provides an itemized list of the various activities, permits, and approvals that will occur under the proposed action (OSMRE 2014a,b) that are included here by reference. A number of Conservation Measures are included as part of the proposed action to avoid or reduce the effects on listed species and their critical habitats. Such measures include those that will be or are required by the permits described in the BA, as well as conservation measures proposed by FCPP and NMEP, which include the ongoing implementation and adherence to numerous standard operating procedures and BMPs. Those conservations measures are described in the BA (OSMRE 2014b) and include updates to the best commercial and scientific information available on endangered species in the San Juan River Basin (AECOM 2013a,b; EPRI 2014; Miller 2014). Additional Conservation Measures were incorporated into the proposed action (OSMRE 2015) that minimize for Project effects on listed species.

***Conservation Measures***

OSMRE is the lead federal agency responsible for preparing the BA for the FCPP and NMEP as required the ESA. The BIA, as a key cooperating agency, has closely coordinated with OSMRE with the consultation in accordance with the requirements of the ESA. On August 8, 2014, OSMRE provided the US Fish and Wildlife Service New Mexico Ecological Service Field Office (NMESFO) the final BA for the project.

The BA evaluated the Proposed Action in sufficient detail to determine to what extent the Proposed Action may affect any ESA threatened, endangered, proposed or candidate species and designated or proposed critical habitat that may occur in the Action Area. In preparing this assessment, OSMRE used best scientific and commercial information available, pursuant to statutory requirements. However, since submission of the BA, OSMRE, BIA, and the USFWS had extensive conversations regarding potential effects the Proposed Action (without the Conservation Measures) could have on listed species and their critical habitats that occur in the Action Area. These conversations focused on the Colorado pikeminnow, the razorback sucker, flycatcher and cuckoo and their critical habitat. These discussions have allowed OSMRE and BIA to have a more comprehensive perspective of the measures necessary to help ameliorate those impacts. These conversations allowed OSMRE and BIA, working with the Project Proponents, to develop several voluntary conservation measures that they understand are critical to reducing the effects of the Proposed Action on listed species and critical habitats.

OSMRE amended (OSMRE, 2015) the Final BA with the following 11 Conservation Measures:

> As the lead federal agency conducting consultation under Section 7 of ESA for FCPP/NMEP, and acting under the provisions of the Surface Mining Control & Reclamation Act, OSMRE will evaluate and consult with the Service on all discretionary OSMRE permitting actions within OSMRE's authority that have the potential to deposit mercury (Hg) in the San Juan River. OSMRE will conduct this evaluation every two years and consult with USFWS upon completion of the evaluation. In evaluating and consulting on such actions, if adverse Hg effects to the Colorado pikeminnow, or adverse modification of its critical habitat due to Hg deposition, are determined likely, OSMRE will initiate formal ESA consultation to reduce these likely effects; and will ensure implementation of any subsequently developed measures to offset Hg effects to this species.

1. As a key cooperating agency coordinating with OSMRE in the ESA consultation process, BIA will obligate funding in fiscal year 2015 for the purposes of a Razorback sucker Selenium Effects Study. This study is

expected to assist with clarifying what level of selenium causes adverse impacts to razorback sucker in the San Juan Basin.

2. OSMRE will work with USEPA and the Project Proponents to minimize the effects of the Proposed Action on Colorado pikeminnow, razorback sucker, southwestern willow flycatcher, or yellow-billed cuckoo, by developing comprehensive guidelines and criteria for ESA review of future USEPA-issued NPDES permits for the Project.
3. OSMRE will coordinate with USEPA and the Project Proponents to review the likelihood and pathways of effluent exposure, the concentrations of Hg and Se necessary to protect endangered species in suitable habitats, and results of the monitoring program funded in Conservation Measure 7 to identify such concentrations in their habitats, and coordinate an approach toward subsequent ESA review of future proposed NPDES permits for the Project, as described in RPM 5.
4. Project Proponents will develop and implement a Pumping Plan to reduce the magnitude and types of entrainment of Colorado pikeminnow and razorback sucker. The Pumping Plan will optimize avoidance of entrainment of larvae and impingement of larger fishes through measures that are deemed feasible without altering the current operating configuration at the river pump station.
   a. The Pumping Plan measures shall be developed with the oversight of OSMRE and the approval of the Service.
   b. The final Pumping Plan shall be implemented within 2 years of issuance of a Record of Decision.
5. Project Proponents will develop and implement a Non-native Species Escapement Prevention Plan, which will include the following measures to minimize: (a) the risk of nonnative species (plants, invertebrates, and fish) that inhabit Morgan Lake invading San Juan River; and (b) the introduction of additional nonnative species into Morgan Lake.
   a. Project Proponents will develop and disseminate public education materials regarding the threat of non-native species targeted to recreational users of Morgan Lake. The materials will recommend practices to prevent the introduction of new nonnative species to Morgan Lake or the transfer of existing nonnative species from Morgan Lake to the San Juan River.
   b. Project Proponents will install and operate a device designed to prevent the transfer of nonnative fish species from Morgan Lake to the San Juan River.
6. Project Proponents will work with the Service to support the San Juan River Basin Recovery Implementation Program (SJRRIP) efforts to ensure that a fish passage is designed and constructed by the SJRRIP at the APS Weir by contributing funds for the fish passage, as outlined in Conservation Measure 7 below.
7. As a Conservation Measure Project Proponents shall contribute to the survival and recovery of the Colorado pike minnow and razorback sucker by funding specific Recovery Actions identified in Table 1 (see below). The

Service, in coordination and collaboration with the SJRRIP, will determine the most appropriate method for implementing these Recovery Actions.

a. Funding will be provided to the SJRRIP through the National Fish and Wildlife Foundation (NFWF) on an initial and annual basis every year that the Project remains in operation. Annual Funding will be adjusted according to the annual Consumer Price Index (CPI). Funding will contribute to both new and existing SJRRIP Recovery Actions.
b. Funding through NFWF will be managed and administered by the SJRRIP Program Office according to the terms and conditions set forth in a contract with NFWF, including a condition that the SJRRIP provide reports on implementation of Recovery Actions.
    i. Propagation of endangered fishes will contribute towards the offset of losses associated with the proposed action.
    ii. Nonnative fish removal, combined with the measures in Conservation Measure 5, will reduce the adverse effects to Colorado pikeminnow and razorback sucker designated Critical Habitat.
    iii. Protection, management and augmentation of fish habitat will contribute towards the offset of losses associated with the proposed action.
    iv. Monitoring of fish and habitat is required to track implementation of the Conservation Measures and contribute scientific information to support adaptive management by the SJRRIP.
    v. Modification of APS Weir with a fish passage will allow endangered fish increased access of up to 18 miles of fish habitat, including new portions of Colorado pikeminnow critical habitat.
    vi. Monitoring of Hg and Se in endangered fish every 5 years is required to track implementation of the Funded Recovery Actions and will contribute scientific information to support adaptive management by the SJRRIP.
    vii. Conducting Hg Studies in Colorado pikeminnow will assist the tracking of implementation of the Funded Recovery Actions and contribute scientific information to support adaptive management by the SJRRIP.
    viii. Funding a USFWS senior biologist will facilitate Hg/Se reviews and contribute towards implementation of Recovery Actions.

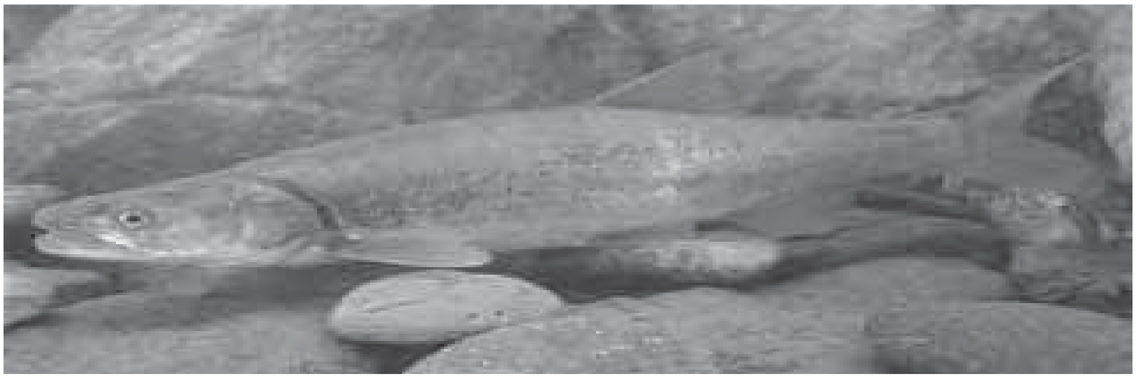
Table 1. Recovery Actions to be funded by Project Proponents and implemented by the SJRRIP. (* Annual costs subject to Consumer Price Index)

| Funded Recovery Action | One-time Cost | Annual Cost* |
|---|---|---|
| Propagate Endangered fish | | $40,600 |
| Remove Nonnative fish | | $50,361 |
| Protect, Manage and Augment fish habitat (including flood plains) | | $153,045 |
| Monitor fish habitat | | $103,463 |
| Partial funding of fish passage at the APS weir | $620,000 | |
| Conduct Monitoring of Hg and Se in endangered fish or their surrogates | | $60,000 |
| Conduct studies of Hg in Colorado pike minnow | $600,000 | |
| Contribute towards SJRRIP staff biologist to conduct these and other Recovery Actions | | $126,000 |
| Conduct a Navajo Dam Temperature Modification Feasibility Study | $100,000 | |
| Totals | $1,320,000 | $533,469 |

8. Project Proponents shall provide a Spill Contingency Countermeasures Plan which addresses potential Ash Pond Failure impacts on suitable habitat of Colorado pikeminnow, razorback sucker, southwestern willow flycatchers or yellow-billed cuckoos.
    a. All necessary equipment, training, and materials will be made available for emergency response to a potential Ash Pond Failure.
    b. A practice response table-top drill with appropriate authorities will be conducted every 10 years.
9. Project Proponents shall conduct standard protocol surveys for southwestern willow flycatchers and yellow-billed cuckoos.
    a. Within at least 85 acres of the Deposition Area beginning in 2016 and continuing until 2042 or until the Project ceases operation, to monitor the effects of Hg and Se deposition to nesting flycatchers and cuckoos.
    b. Presence/absence flycatcher and cuckoo surveys will be conducted within at least one optimal or suitable habitat (AECOM 2013c,d) on the Navajo Mine Lease Area during the spring migration period to monitor the potential effects of noise and disturbance to migrant flycatchers from 2016 until 2042 or until the Project ceases operation.
10. Project Proponents shall mitigate effects of endangered plants within the rights-of-way of transmission line maintenance activities through implementation of the Environmental Screening Program.
11. Project Proponents shall share data and report to the Service and OSMRE annually on implementation of the Conservation Measures and their implementing terms and conditions.

# STATUS OF THE SPECIES (INCLUDING IN THE ACTION AREA)

## COLORADO PIKEMINNOW



The Colorado pikeminnow is the largest cyprinid (member of the minnow family, Cyprinidae) native to North America and it evolved as the top predator in the Colorado River system. It is an elongated pike-like fish that once grew as large as 1.8 m (6 ft) in length and weighed nearly 45 kg (100 lbs) (Behnke and Benson 1983); such fish were estimated to be 45-55 years old (Osmundson et al. 1997). Today, Colorado pikeminnow rarely exceed 1 m (approximately 3 ft) in length or weigh more than 8 kg (18 lbs). The mouth of this species is large and nearly horizontal with long slender pharyngeal teeth (located in the throat), adapted for grasping and holding prey. The diet of Colorado pikeminnow longer than 80 to 100 mm (3 or 4 in.) consists almost entirely of other fishes (Vanicek and Kramer 1969). Adults are strongly counter-shaded with a dark, olive back, and a white belly. Young are silvery and usually have a dark, wedge-shaped spot at the base of the caudal fin.

Based on early fish collection records, archaeological finds, and other observations, the Colorado pikeminnow was once found throughout warm water reaches of the entire Colorado River Basin down to the Gulf of California, including reaches of the upper Colorado River and its major tributaries, the Green River and its major tributaries, the San Juan River and some of its tributaries, and the Gila River system in Arizona (Seethaler 1978, Platania 1990; Houston et al. 2010). Colorado pikeminnow apparently were never found in colder, headwater areas. Seethaler (1978) indicated that the species was abundant in suitable habitat throughout the entire Colorado River Basin prior to the 1850s. By the 1970s, they were extirpated from the entire lower basin (downstream of Glen Canyon Dam) and from portions of the upper basin as a result of major alterations to the riverine environment. Having lost approximately 75-80 percent of its former range, the Colorado pikeminnow was federally listed as an endangered species in 1967 (Service 1967, Miller 1961, Moyle 1976, Tyus 1991, Osmundson and Burnham 1998).

Critical habitat was designated for the Colorado pikeminnow in 1994 within the 100-year floodplain of the species' historical range in the following areas of the San Juan River Basin (59 FR 13374): San Juan County, New Mexico, and San Juan County, Utah, including the San Juan River from the New Mexico State Route 371 Bridge in Township 29 North, Range 13 West, section 17 (of the New Mexico Principal Meridian), to the full pool elevation at the mouth of Neskahai Canyon on the San Juan arm of Lake Powell in Township 41 South, Range 11 East, in section 26. The primary constituent elements (PCEs) of critical habitat are the same for both the Colorado pikeminnow and the razorback sucker.

The PCEs of Colorado pikeminnow critical habitat include:

Water: a quantity of water of sufficient quality (i.e., temperature, dissolved oxygen, lack of contaminants, turbidity, etc.) that is delivered to a specific location in accordance with a hydrologic regime that is required for the particular life stage for the species;

Physical habitat: areas of the Colorado River system that are inhabited or potentially habitable for spawning, feeding, rearing, as a nursery, or corridors between these areas, including oxbows, backwaters, and other areas in the 100-year floodplain which when inundated provide access to spawning, nursery, feeding, and rearing habitats; and,

Biological environment: adequate food supply and ecologically appropriate levels of predation and competition.

### *Colorado Pikeminnow Life History*

The life history phases that appear to be most limiting for Colorado pikeminnow populations include spawning, egg hatching, development of larvae, and the first year of life. These phases of pikeminnow development are closely tied to specific habitat requirements. Natural spawning of pikeminnow is initiated on the descending limb of the annual hydrograph as water temperatures approach the range of 16 ˚C (60.8 ˚F) to 20 ˚C (68 ˚F) (Vanicek and Kramer 1969; Hamman 1981; Haynes et al. 1984; Tyus 1990; McAda and Kaeding 1991). However the temperatures when spawning is initiated varies by river, 20-23 ˚C (68-73 ˚F) in the Green River; 16-23 ˚C (61-68 ˚F) in the Yampa River (Bestgen et al. 1998); 18-22 ˚C (64-72 ˚F) in the Colorado River (McAda and Kaeding 1991); and 16-22 ˚C (61-72 ˚F) in the San Juan River. Spawning, both in the hatchery and under natural riverine conditions, generally occurs in a 2-month period between late June and late August. However, sustained high flows during wet years may suppress river temperatures and extend spawning into September (McAda and Kaeding 1991). Conversely, during low flow years, when the water warms earlier, spawning may commence in mid-June. On the San Juan River, based on the collection of larval fish from 1993 to 2013, spawning occurred between 23 May and 18 July (Farrington et al. 2013, 2014).

Temperature also has an effect on egg development and hatching success. In the laboratory, egg development was tested at five temperatures and hatching success was found to be highest at 20 ˚C (68 ˚F), and lower at 25 ˚C (77 ˚F). Mortality was 100 percent at 5, 10, 15, and 30˚C (41, 50, 59, and 86 ˚F). In addition, larval abnormalities were twice as high at 25 ˚C (77 ˚F) than at 20 ˚C (68 ˚F) (Marsh 1985). Experimental tests of temperature preference of yearling and adult pikeminnow indicated that 25 ˚C (77 ˚F) was the most preferred temperature for both life phases (Bulkley et al. 1981; Black and Bulkley 1985a). Additional experiments indicated that optimum growth of yearlings also occurs at temperatures near 25 ˚C (77 ˚F) (Black and Bulkley 1985b).

Males become sexually mature earlier and at a smaller size than do females, though all are mature by about age 7 and 500 mm (20 in) in length (Vanicek and Kramer 1969; Seethaler 1978; Hamman 1981). Hatchery-reared males became sexually mature at four years of age and females at five years. Of 24 nine-year-old females, average fecundity was 77,400 eggs/female (range, 57,766 – 113,341) or 55,533 eggs/kg, and average fecundity of nine 10-year old females was 66,185 eggs/female (range, 11,977 – 91,040) or 45,451 eggs/kg (Hamman 1986). Valdez (2014) summarized a relationship between number of eggs produced and female Colorado pikeminnow body weight as y = 39907.24 + 11.4117 * Female Body Weight (g). For Age 7 through Age 10 female Colorado pikeminnow the average number of eggs was 62,133/female.

Collections of Colorado pikeminnow larvae and young-of-year (YOY or Age 0) downstream of known spawning sites in the Green, Yampa, and San Juan Rivers demonstrate that downstream drift of larval pikeminnow occurs following hatching (Haynes et al. 1984; Nesler et al. 1988; Tyus 1990; Tyus and Haines 1991; Platania 1990; Ryden 2003a). Studies on the Green and Colorado rivers found that YOY used backwaters almost exclusively (Holden 2000). During their first year of life, Colorado pikeminnow prefer warm, turbid, relatively deep (averaging 0.4 m [1.3 ft]) backwater areas of zero velocity (Tyus and Haines 1991). After about 1 year, young are found rarely in such habitats, although juveniles and subadults are often located in large deep backwaters during spring runoff (Service, unpublished data; Osmundson and Burnham 1998).

Colorado pikeminnow often migrate considerable distances to spawn in the Green and Yampa Rivers (Miller et al. 1982; Archer et al. 1986; Tyus and McAda 1984; Tyus 1985; Tyus 1990), and similar movement has been noted in the main channel San Juan River. A fish captured and tagged in the San Juan arm of Lake Powell in April 1987, was recaptured in the San Juan River approximately 80 miles upstream in September 1987 (Platania 1990). Ryden and Ahlm (1996) reported that a pikeminnow captured at river mile (RM) 74.8 (between Bluff and Mexican Hat) made a 50 to 60 mile migration during the spawning season in 1994, before returning to within 0.4 miles of its original capture location. Although migratory behavior has been documented for adult Colorado pikeminnow in the San Juan River (Platania 1990, Ryden and Ahlm 1996), the majority of adults in the San Juan River appear to reside near the area in which they spawn (Ryden and Ahlm 1996; Miller and Ptacek 2000), in contrast to Colorado pikeminnow adults in the Green and Yampa Rivers. Ryden and Ahlm (1996) and Miller and Ptacek (2000) documented Colorado pikeminnow in the San Juan River aggregating at the mouth of the Mancos River prior to spawning, a behavior not documented in other rivers. Movements of juvenile Colorado pikeminnow in the San Juan River, upstream from spring to summer and back downstream over winter, may be associated with maximizing growth along longitudinal and seasonal temperature regimes (Durst and Franssen 2014).

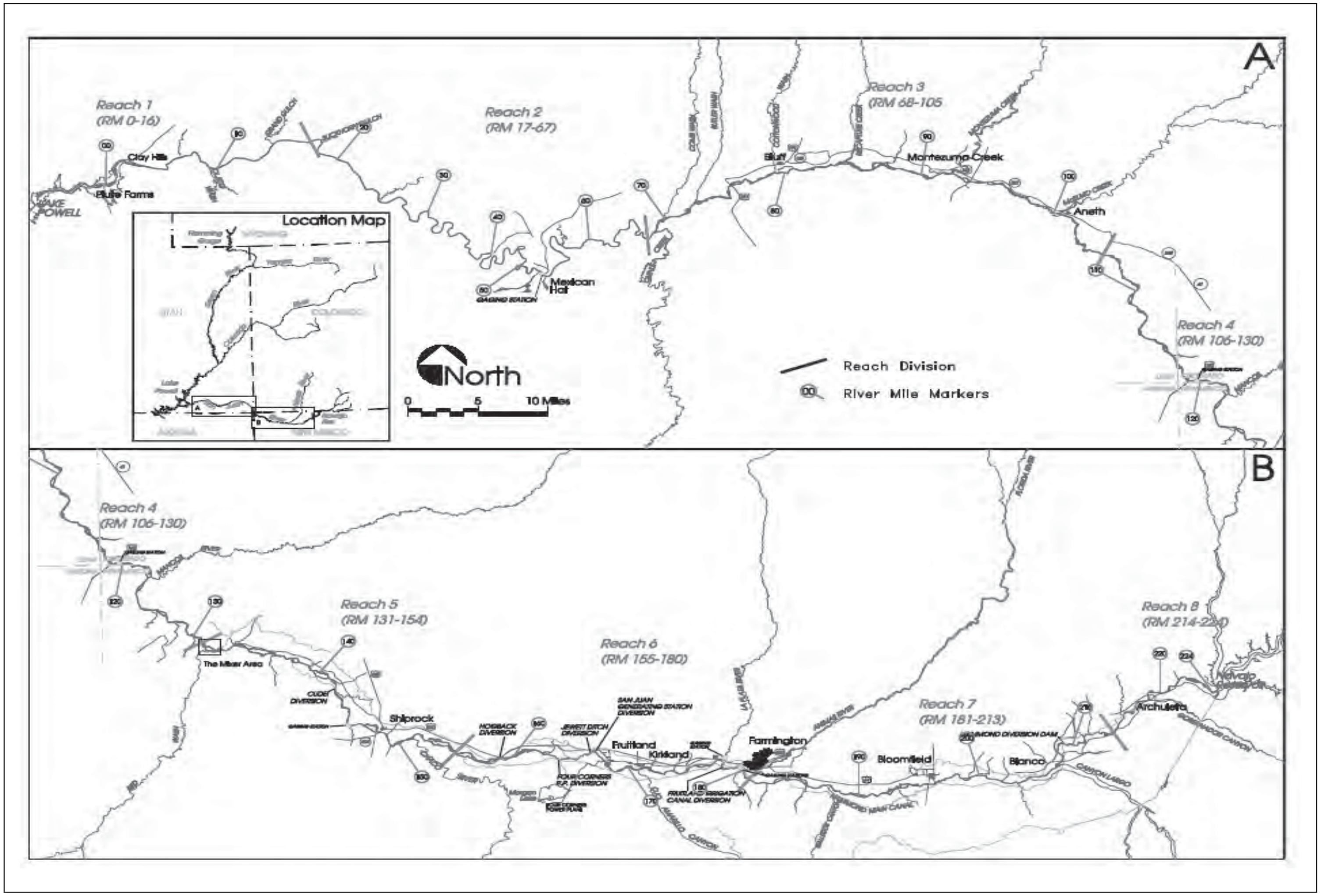



Figure 7. San Juan River location map indicating River Miles, River Reaches, and the Mixer Area.

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On the Green River, tributaries are an important habitat component for pikeminnow (Holden 2000). Both the Yampa River and White River were heavily used by Colorado pikeminnow subadults and adults, apparently as foraging areas (Tyus 1991). The tributaries were the primary area of residence to which the adults returned after spawning. Nearly all tributaries to the San Juan River no longer provide habitat for adults because they are dewatered or access is restricted (Holden 2000).

However, Colorado pikeminnow utilized the Animas River in the late 1800s, and this river or other perennial portions of tributaries could still provide suitable habitat (Zimmerman et al. 2005; Fresques et al. 2013). Five stocked Colorado pikeminnow were documented in the lower reaches of the Animas River in 2004 (Zimmerman et al. 2005). Since the installation of the selective fish passage structure at RM 166 in 2003, over 800 Colorado pikeminnow have passed upstream (SJRIP unpublished data), increasing the probability that the Animas River, 15 miles upstream, will once again be used by this species. Colorado pikeminnow aggregated at the mouth of the Mancos River prior to spawning in the early 1990s (Ryden and Ahlm 1996; Miller and Ptacek 2000). One individual was found almost 0.5 miles upstream in the Mancos River on two separate occasions (Ryden pers. obs.). Colorado pikeminnow were detected in Yellow Jacket Canyon (a tributary of McElmo Creek) each year from 2007 to 2010 (Fresques et al. 2013). All 11 pikeminnow (168-425 mm TL) detected in Yellow Jacket Canyon were thought to have originated from juvenile fish stocked in the mainstem San Juan River but only one was captured with a previously implanted PIT tag to confirm their origin (Fresques et al. 2013).

Very little information is available on the influence of turbidity on the endangered Colorado River fishes. Osmundson and Kaeding (1989) found that turbidity allows use of relatively shallow habitats, ostensibly by providing adults with cover; this allows foraging and resting in areas otherwise exposed to avian or terrestrial predators. Tyus and Haines (1991) found that young Colorado pikeminnow in the Green River preferred backwaters that were also turbid. Bestgen et al. (2006) found that in a laboratory setting, turbidity provided some protection to larval Colorado pikeminnow from predation by red shiner (Cyprinella lutrensis). Clear water conditions in shallow backwaters might expose larval and juvenile fish to predation from wading birds or non-native, sight-feeding, piscivorous fish. It is unknown whether the river was as frequently turbid historically as it is today. Currently, it is assumed that endemic fishes evolved under conditions of frequently elevated turbidity, particularly in association with high spring runoff. Therefore, the retention of seasonally appropriate turbidity is probably an important factor in maintaining the ability of Colorado pikeminnow to compete with or avoid predation by non-native fish or other predators that may not have evolved under similar conditions.

### *Colorado Pikeminnow Population Dynamics*

Between 1991 and 1995, 19 (17 adult and 2 juvenile) wild Colorado pikeminnow were collected in the San Juan River by electrofishing between RM 142 (the former Cudei Diversion) and Four Corners at RM 119 (Ryden 2000a; Ryden and Ahlm 1996). The multi-threaded channel, habitat complexity, and mixture of substrate types in this area of the river appear to provide a diversity of habitats favorable to Colorado pikeminnow on a year-round basis (Holden and Masslich 1997). Estimates made during the seven-year research period between 1991 and 1997 suggested that there were fewer than 50 adult Colorado pikeminnow in a given year (Ryden 2000a).

Monitoring for adult Colorado pikeminnow occurs every year on the San Juan River. In 2013, 149 Colorado pikeminnow were collected during monitoring from RM 180-77 (Figure 7), the eighth consecutive year that more than 100 Colorado pikeminnow were caught in this reach (Schleicher 2014). However, only 7 of these fish were greater than 450 mm (18 in). In addition, 19 Colorado pikeminnow greater than 450 mm (18 in) were collected during the non-native fish removal trips in 2013 (Duran 2014). River wide population estimates for age-2+ pikeminnow that have been in the San Juan River at least one year was approximately 4,600 and 5,400 individuals in 2009 and 2010, respectively (Duran et al. 2011). However, because few adult Colorado pikeminnow were detected in the San Juan River, this population estimate largely consists of juveniles. Other Colorado pikeminnow abundance estimates exhibit substantial annual variation, likely due to the effects of short-term retention from recent stocking events, but no clear population trends were evident in the San Juan River Basin (Durst 2014, Figure 8).

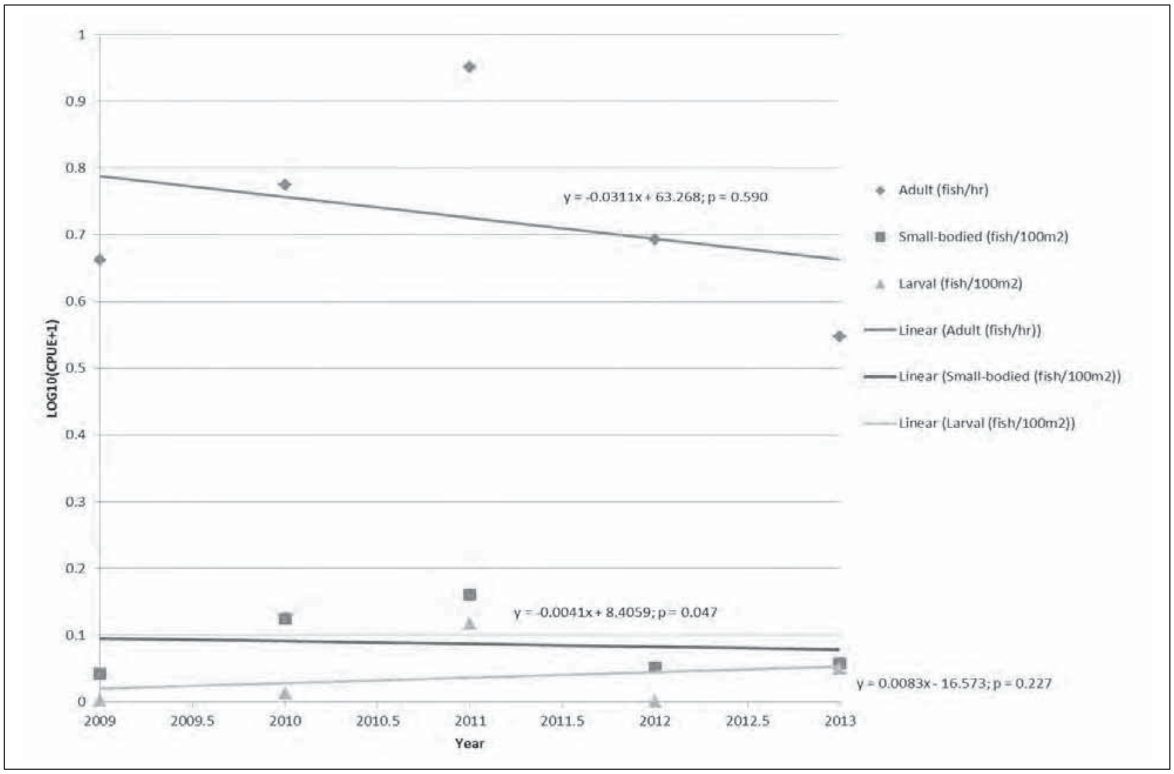



Figure 8. Summary of the recent catch (CPUE) of various life stages of Colorado pikeminnow and other small-bodied fish in the San Juan River (Durst 2014).

Successful Colorado pikeminnow reproduction was documented in the San Juan River in 1993, 1995, 1996, 2001, 2004, 2007, 2009-2011, and 2013 (Farrington et al. 2014). A total of 58 larval Colorado pikeminnow were collected since 1993 (Farrington et al. 2014); however, there has been little to no recruitment documented in the San Juan River. A total of 48 Age-1+ Colorado pikeminnow were collected in 2013; all presumably the result of augmentation efforts (Farrington et al. 2014). Since 1998, Colorado pikeminnow were collected during small-bodied monitoring every year except 2001-2003; however, YOY Colorado pikeminnow were stocked in each of these years prior to monitoring efforts so these fish were likely hatchery-reared (Gilbert

2014). Larval Colorado pikeminnow detections occurred in throughout the San Juan River from Reach 4 (RM 106-130) downstream to Reach 1 (RM 0-16) (Farrington et al. 2013, Farrington et al. 2014). Franssen et al. (2007) found that maintenance of a natural flow regime favored native fish reproduction and provided prey at the appropriate time for Age-1 Colorado pikeminnow.

Tissue samples from Colorado pikeminnow caught during research conducted under the Recovery Program have been analyzed as part of a basin-wide analysis of endangered fish genetics. The results of that analysis indicate that the San Juan River fish exhibit less genetic variability than the Green River and Colorado River populations, likely due to the small population size, but were very similar to pikeminnow from the Green, Colorado, and Yampa rivers (Morizot in litt. 1996). These data suggest that the San Juan population is probably not a separate stock (Holden and Masslich 1997; Houston et al. 2010).

***Competition and Predation of Colorado Pikeminnow by Nonnative Fishes***

Nearly 70 nonnative fish species have been introduced into the Colorado River Basin and at least 20 nonnative fish species live with endangered fishes in the San Juan River (Sublette et al. 1990; Maddux et al. 1993; USFWS 2002a,b; Propst and Gido 2004) and nonnative fish are predators, competitors, and vectors for parasites and diseases (Hawkins and Nessler 1991; Maddux et al. 1993; Bestgen 1997; Brandenburg and Gido 1999; Brooks et al. 2000; Tyus and Sanders 2000; Marsh et al. 2001; Drake and Bossenbroek 2004; Mueller 2005; Weber and Brown 2009; Martinez 2012; Ricciardi et al. 2013; Pigneur et al. 2014; USFWS 2002a,b, 2014). Nonnative fish in the San Juan River include striped bass (*Morone saxatilis*), walleye (*Sander vitreus*), channel catfish (*Ictalurus punctatus*), black bullhead (*Ameiurus melas*), yellow bullhead (*Ameiurus natalis*), largemouth bass (*Micropterus salmoides*), smallmouth bass (*Micropterus dolomieui*), green sunfish (*Lepomis cyanellus*), longear sunfish (*Lepomis megalotis*), bluegill (*Lepomis macrochirus*), white crappie (*Pomoxis annularis*), fathead minnow (*Pimephales promelas*), red shiner (*Cyprinella lutrensis*), sand shiner (*Notropis stramineus*), western mosquitofish (*Gambusia affinis*), common carp (*Cyprinus carpio*), white sucker (*Catostomus commersonii*) (as well as white sucker hybrids), gizzard shad (*Dorosoma cepedianum*), threadfin shad (*Dorosoma petenense*), grass carp (*Ctenopharyngodon spp.*), and plains killifish (*Fundulus zebrinus*) (Sublette et al. 1990; SJRRIP 1990; Ryden 2000a; Buntjer 2003; Propst and Gido 2004). Because of the extreme and persistent threat posed by nonnative species, their eradication and management is the first priority in the endangered fish recovery plans (USFWS 2002a,b, 2014).

Small-bodied, nonnative fishes are widespread, invasive, and are predatory of larval native fish in nursery backwaters, and low-velocity habitats, where they can affect survival and recruitment of Colorado pikeminnow (Haines and Tyus 1990; Muth and Nesler 1993; Bestgen 1997; McAda and Ryel 1999; Valdez et al. 1999). Adult red shiners are predators of larval native fish in backwaters of the upper basin (Ruppert et al. 1993). In laboratory experiments on behavioral interactions, Karp and Tyus (1990) observed that red shiner, fathead minnow, and green sunfish shared activity schedules and space with young pikeminnow and exhibited antagonistic behaviors to smaller Colorado pikeminnow. Young pikeminnow exhibit high spatial overlap in habitat use with red shiner, sand shiner (Notropis stramineus), and fathead minnow (Pimephales promelas); Colorado pikeminnow may be at a competitive disadvantage in an environment that is resource limited.

Channel catfish (Ictalurus punctatus) have been identified as a threat to juvenile, subadult, and adult Colorado pikeminnow in the San Juan River. Channel catfish were first introduced in the upper Colorado River Basin in 1892 (Tyus and Nikirk 1990) and are now considered common to abundant throughout much of the upper Colorado River Basin (Tyus et al. 1982; Hawkins and Nessler 1991; Nelson et al. 1995; Duran et al. 2013; Gerig and Hines 2013). The species is one of the most prolific predators in the upper basin and is thought to have the greatest adverse effect on endangered fishes due to predation on juveniles and resource overlap with subadults and adults (Hawkins and Nesler 1991, Lentsch et al. 1996, Tyus and Saunders 1996). Adult channel catfish predation of stocked juvenile Colorado pikeminnow has been documented in the San Juan River (Jackson 2005). Stocked juvenile and adult Colorado pikeminnow that have preyed on channel catfish have died from choking on the pectoral spines (McAda 1983; Pimental et al. 1985; Quarterone 1995; Ryden and Smith 2002; Lapahie 2003).

Although mechanical removal (electrofishing, seining) of channel catfish began in 1995, intensive efforts covering limited portions of the San Juan River (10 trips/year) did not begin until 2001 (Davis 2003; indicated as “after” in Figure 9). Intensive removal efforts expanded to include nearly all critical habitats in the San Juan River starting in 2006. Mechanical removal has not yet led to a positive population response in Colorado pikeminnow, but attributing a population response to nonnative fish removal would be extremely difficult (Davis 2003; SWCA 2010).

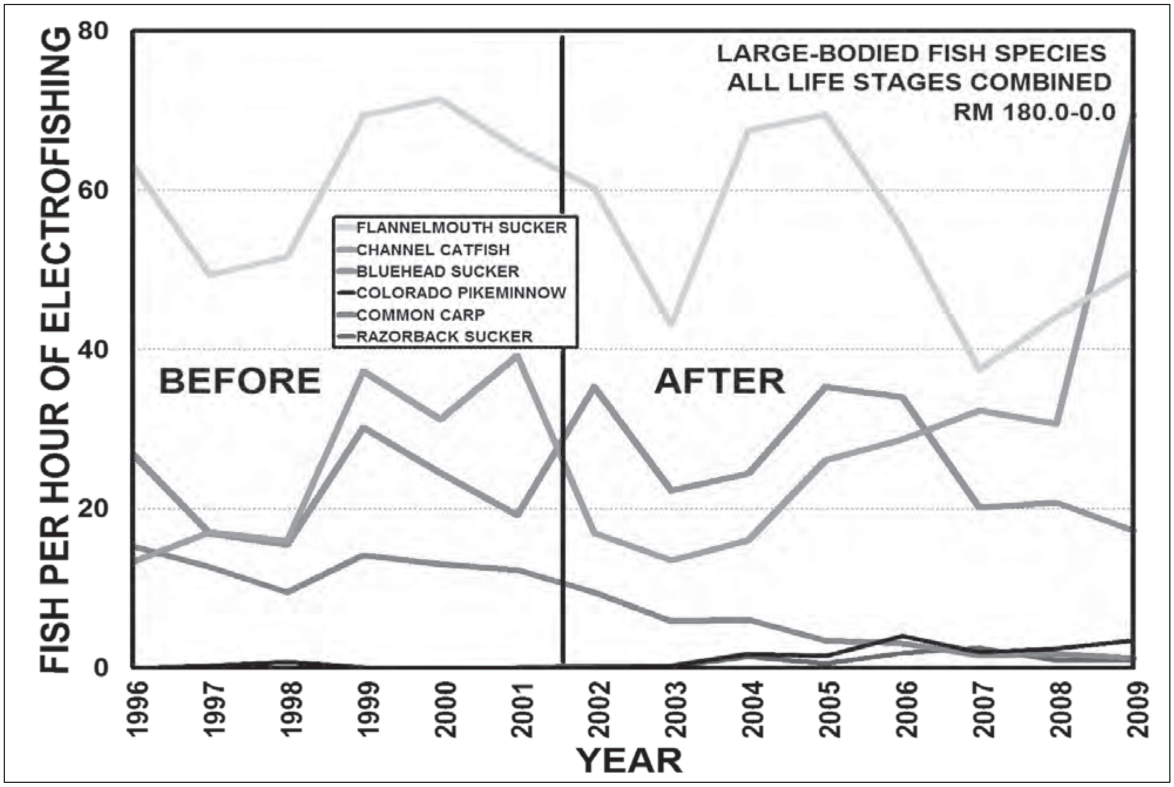



Figure 9. Summary of 14 years of catch (per hour of electrofishing) of various large-bodied fish species in the San Juan River (Ryden 2012) (See Figure 7 for River Miles (RM)).

***Colorado Pikeminnow Status and Distribution***

The Colorado pikeminnow was designated as endangered prior to enactment of the ESA. Construction and operation of main channel dams, nonnative fish, and local eradication of native minnows and suckers in the early 1960s were recognized as early threats (Miller 1961, Holden 1991). The Colorado Pikeminnow Recovery Plan (USFWS 2002a, 2014) summarize threats to this species as follows: stream regulation, habitat modification, competition with and predation by nonnative fish, and pesticides and pollutants.

Major declines in Colorado pikeminnow populations occurred in the lower Colorado River Basin during the dam-building era of the 1930s through the 1960s. Behnke and Benson (1983) summarized the decline of the natural ecosystem, pointing out that dams, impoundments, and water use practices drastically modified the river's natural hydrology and channel characteristics throughout the Colorado River Basin. Dams on the main channel fragmented the river ecosystem into a series of disjunctive segments, blocked native fish migrations, reduced water temperatures downstream of dams, created lake habitat, and provided conditions that allow competitive and predatory nonnative fishes to thrive both within the impounded reservoirs and in the modified river segments that connect them. The highly modified flow regime in the lower basin coupled with the introduction of non-native fishes decimated populations of native fish and led to the listing of the majority (7 of 10) of native, mainstem fishes as endangered (Mueller

2005). Historical, current range, and critical habitat for the Colorado Pikeminnow is provided below (Figure 10) (USFWS 2002a, 2014).

Colorado pikeminnow populations in the San Juan River are supported by stocking (or augmentation) with hatchery-reared fish to try to reestablish a sustainable population in this river. Approximately 3.2 million pikeminnow were stocked between 2002 and 2011 (Furr 2012). More Colorado pikeminnow (433) were caught during the large-bodied fish monitoring effort in 2010 than in any previous effort (Ryden 2012). In the 2012 monitoring event, 272 pikeminnow were captured (Schleicher and Ryden 2013) and over the last several years the SJRRIP has captured several hundred stocked pikeminnow of varying sizes (Furr 2012). Catch per unit effort (CPUE) of fish that had been in the river for one or more winters has an increasing trend since 2003, but this trend is mainly a reflection of Age 0+ fish (fish within their 1st year after birth) surviving to recapture at Age 1+ (fish that are 1 year old or older). The number of larger fish remains small, although the number of these larger fish continues to increase.

The increasing trend in catch-per-unit-effort (CPUE) is likely the result of augmentation. Schleicher and Ryden (2013) estimated that close to 1,000 pikeminnow > 300 mm TL may be in the river (based on capture of 22 individuals of this size). The observation of adult fish proves that some of the stocked fish are surviving. Between the large-bodied fish monitoring program and the more intensive non-native fish removal program 29 adults were captured in 2012, which substantially exceeds the total of 17 adults captured between 1991 and 1994.

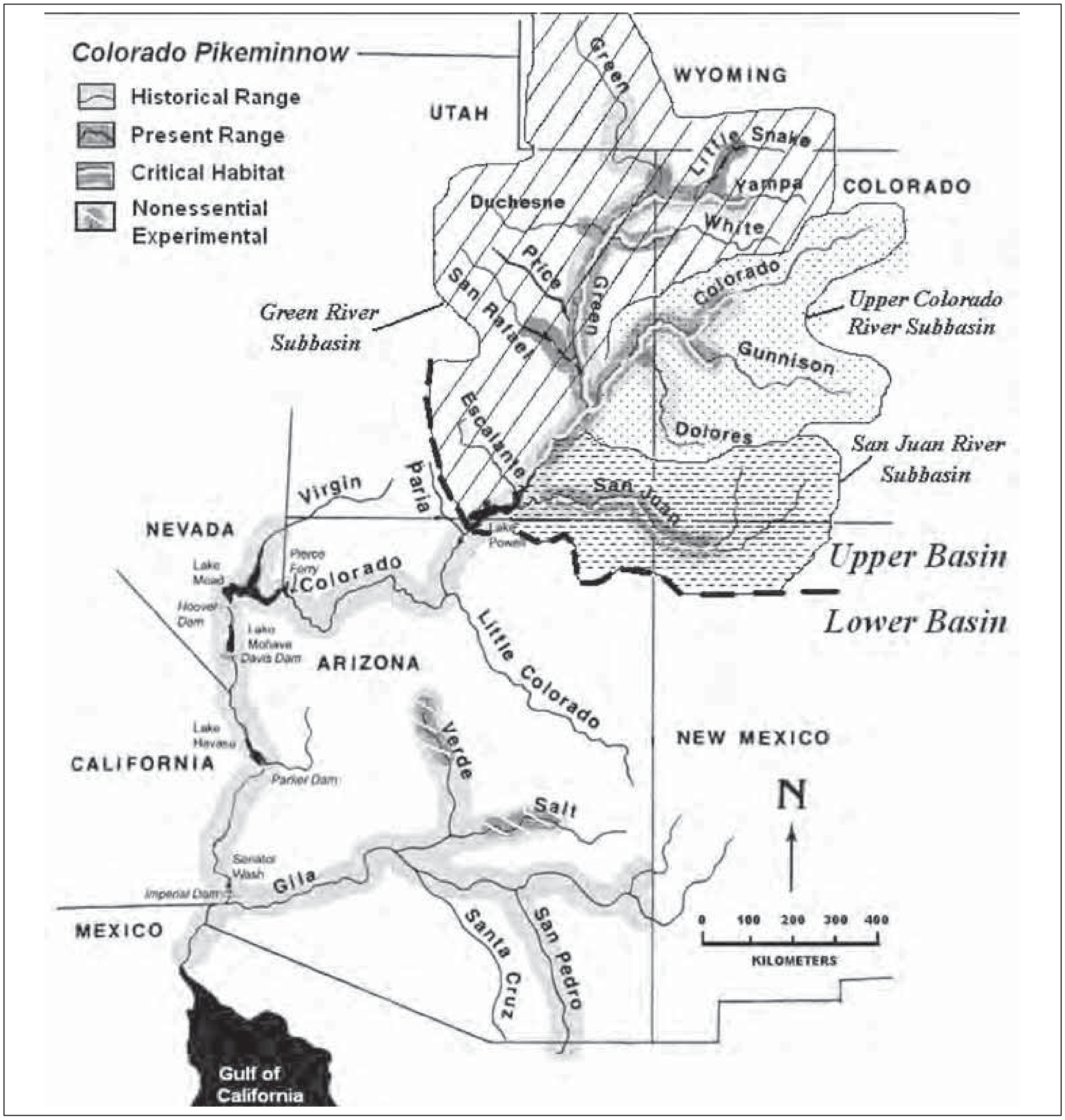



Figure 10. Historical, current range, and critical habitat distribution of Colorado pikeminnow.

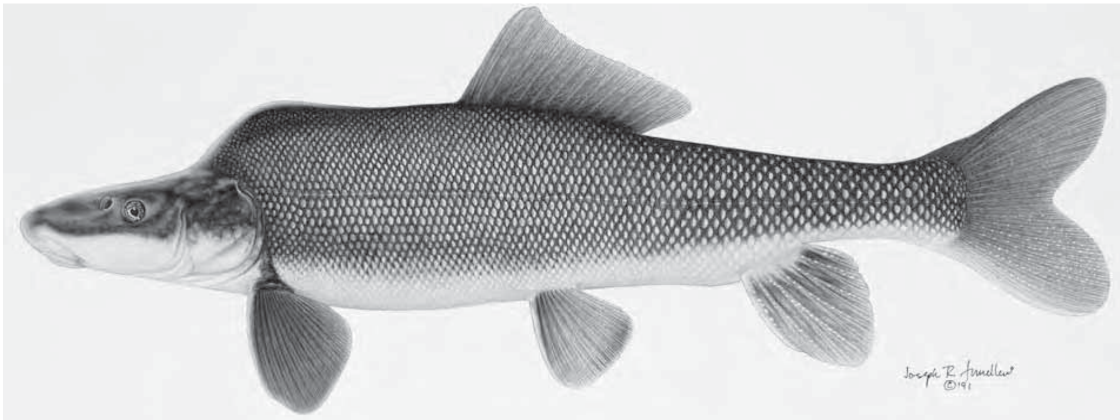
Population estimates for Colorado pikeminnow were generated in 2010, using three complete river wide non-native fish removal passes made in 2010. Two separate models yielded the following population estimates: 5,418 (CI = 4,049-7,549 Model M(t)) and 5,466 (CI = 4,082-7,614; Model M(o)) (Duran et al. 2011). Only Age 2+ Colorado pikeminnow that had been in the river for at least one, over-winter period were used in this estimate, so the total number of Colorado pikeminnow could be higher than this estimate.

While the numbers of stocked subadult and adult Colorado pikeminnow may sometimes appear to be increasing, they are not yet a self-supporting wild population. Larval Colorado pikeminnow collected over the last several years (in low numbers) give an indication that some reproduction is occurring in the wild, although not at levels sufficient to support recruitment. In spite of the positive trends in numbers of stocked fish retaining in the system, the species' long-term viability remains uncertain because of the relatively limited habitat available between Navajo Dam and Lake Powell, competition and predation from non-native fishes, water quality, and the physical changes associated with climate change that will continue to impact the San Juan River Basin. Without active recovery efforts, the Colorado pikeminnow population (as modeled) would be extirpated from the San Juan River Basin within 20-30 years (Miller 2014).

At total of 24 Colorado pikeminnow were collected in the San Juan arm of Lake Powell in 2011 and four were of adult size. All of the Colorado pikeminnow detected in Lake Powell were likely the result of stocking efforts in the San Juan River (Francis et al. 2013). These results indicate at least some of the fish stocked in the San Juan River are moving into the reservoir and surviving. Additional sampling is planned by the San Juan Recovery Implementation Program (SJRRIP) to determine the status of the species in Lake Powell.

The status of Colorado pikeminnow in other basins was summarized by Osmundson and White (2009, 2014) and the Service (USFWS 2014). In the upper Colorado River Basin, declines in Colorado pikeminnow populations occurred primarily after the 1960s, when the following dams were constructed: Glen Canyon Dam on the main channel Colorado River, Flaming Gorge Dam on the Green River, Navajo Dam on the San Juan River, and the Aspinall Unit dams on the Gunnison River. Some native fish populations in the upper basin have managed to persist, while others are nearly extirpated. River reaches where native fish have declined more slowly, more closely resemble pre-dam hydrologic regimes, where adequate habitat for all life phases still exists. The ability of the pikeminnow to withstand adverse impacts to its populations and its habitat is difficult to discern given the longevity of individuals and their scarcity within the San Juan River Basin. Younger life stages are considered the most vulnerable to predation, competition, the effects of toxic chemicals, and ongoing fish habitat degradation.

## RAZORBACK SUCKER



Like all suckers (family Catastomidae, meaning "down mouth"), the razorback sucker has a ventral mouth with thick lips covered with papillae and no scales on its head. In general, suckers are bottom browsers, sucking up or scraping off small invertebrates, algae, and organic matter with their fleshy, protrusible lips (Moyle 1976). The razorback sucker is the only sucker with an abrupt sharp-edged dorsal keel behind its head. The keel becomes more massive with age. The head and keel are dark, the back is olive-colored, the sides are brownish or reddish, and the abdomen is yellowish white (Sublette et al. 1990). Adults often exceed 3 kg (6 lbs) in weight and 600 mm (2 ft) in length. Like Colorado pikeminnow, razorback suckers may live to be greater than 40 years.

Historically, razorback suckers were found in the main channel of the Colorado River and major tributaries in Arizona, California, Colorado, Nevada, New Mexico, Utah, Wyoming, and in Mexico (Ellis 1914; Minckley 1983; USFWS 2002b) (Figure 11). Bestgen (1990) reported that this species was once so numerous that it was commonly used as food by early settlers and that a commercially marketable quantity was caught in Arizona as recently as 1949. In the upper Colorado River Basin, razorback suckers were reported to be very abundant in the Green River near Green River, Utah, in the late 1800s (Jordan 1891). An account in Osmundson and Kaeding (1989) reported that residents living along the Colorado River near Clifton, Colorado, observed several thousand razorback suckers during spring runoff in the 1930s and early 1940s. Platania (1990) documented occurrence of razorback sucker in the main channel of the San Juan River in 1988. Two adult razorback suckers were also collected from an irrigation pond attached to the San Juan River by a canal in 1976 (Platania 1990). Razorback sucker likely occurred in the main channel as far upstream as Rosa, New Mexico (now inundated by Navajo Reservoir) (Ryden 1997).

The razorback sucker was designated as endangered under the ESA in 1991 (56 FR 54957), due to little evidence of natural recruitment and declining numbers of adult fish. Threats identified at the time included diversion and depletion of water, introduction of nonnative fishes, and construction and operation of dams. Recruitment of larval razorback suckers to juveniles and adults continues to be a problem.

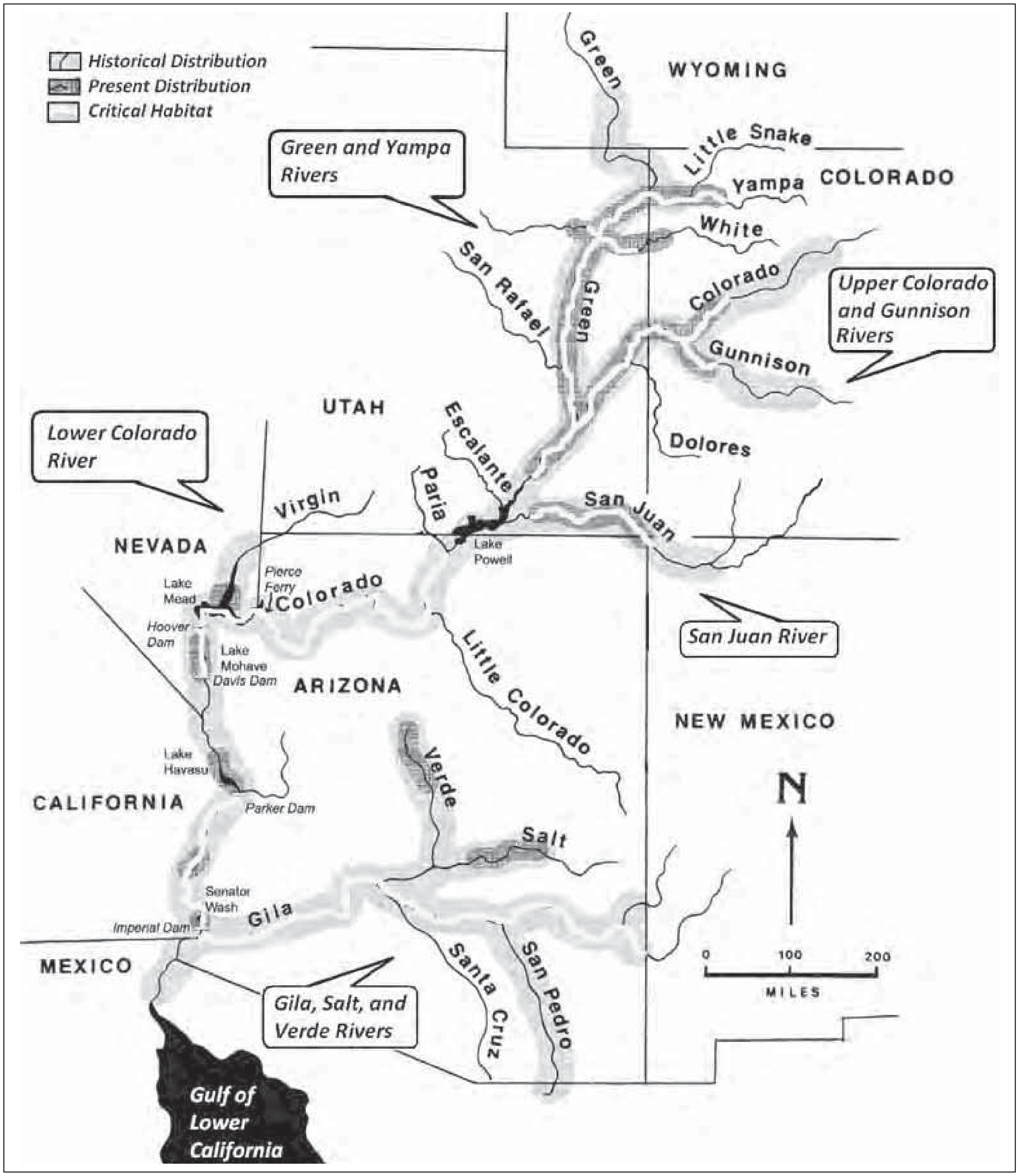


Figure 11. Historical, current range, and critical habitat distribution of razorback sucker.

Critical habitat was designated in 1994 within the 100-year flood plain of the razorback sucker historical range in the following areas of the San Juan River Basin (59 FR 13374): San Juan County, New Mexico, and San Juan County, Utah, including the San Juan River from the Hogback Diversion in Township 29 North, Range 16 West, in section 9 to the full pool elevation at the mouth of Neskahai Canyon on the San Juan arm of Lake Powell in Township 41 South,

Range 11 East, in section 26. The primary constituent elements of critical habitat are the same as those described earlier for Colorado pikeminnow.
The PCEs of razorback sucker critical habitat include:

1. Water: a quantity of water of sufficient quality (i.e., temperature, dissolved oxygen, lack of contaminants, turbidity, etc.) that is delivered to a specific location in accordance with a hydrologic regime that is required for the particular life stage for the species;

2. Physical habitat: areas of the Colorado River system that are inhabited or potentially habitable for spawning, feeding, rearing, as a nursery, or corridors between these areas, including oxbows, backwaters, and other areas in the 100-year floodplain which when inundated provide access to spawning, nursery, feeding, and rearing habitats; and,

3. Biological environment: adequate food supply and ecologically appropriate levels of predation and competition.

***Razorback Sucker Life History***

McAda and Wydoski (1980) and Tyus (1987) reported springtime aggregations of razorback suckers in off-channel habitats and tributaries; such aggregations are believed to be associated with reproductive activities. Tyus and Karp (1990) and Osmundson and Kaeding (1991) reported off-channel habitats to be much warmer than the main channel river and that razorback suckers presumably moved to these areas for feeding, resting, sexual maturation, spawning, and other activities associated with their reproductive cycle.

While razorback suckers have never been directly observed spawning in turbid riverine environments within the upper Colorado River Basin, ripe males and females have been captured in the Yampa, Green, Colorado, and San Juan rivers (Valdez et al. 1982, McAda and Wydoski 1980, Tyus 1987, Osmundson and Kaeding 1989, Tyus and Karp 1989, Tyus and Karp 1990, Osmundson and Kaeding 1991, Platania 1990, Ryden 2000b, Jackson 2003, Ryden 2005). Because of the relatively steep gradient in the San Juan River and lack of a wide floodplain, razorback sucker likely spawn in low velocity, turbid, main channel habitats. Based on captures of larval fish, razorback suckers have expanded their spawning range upstream over time (Farrington et al. 2014).

Sexually mature razorback suckers are generally collected on the ascending limb of the hydrograph from mid-April through June and are associated with coarse gravel substrates. Both sexes mature as early as Age-4 (McAda and Wydoski 1980). Fecundity, based on ovarian egg counts, ranged from highs of 75,000-144,000 eggs (Minckley 1983) while McAda and Wydoski (1980) reported an average fecundity (N=10) of 46,740 eggs/fish (27,614–76,576). During spawning, several males (often 3) attend each female and no nest is built. The adhesive eggs briefly drift and hatch at the bottom of the substrate (Sublette et al. 1990). In laboratory experiments, the percentage of egg hatch was greatest at 20 ˚C (68 ˚F) and all embryos died at incubation temperatures of 5, 10, and 30 ˚C (41, 50, and 86 ˚F) (Marsh 1985). Bestgen (2008) found that growth of early life stages was positively related to water temperature and that fastest growth occurred at 25.5˚C (79.9˚F). Average weight of razorback suckers reared in 25.5˚C (79.9˚F) water was about four times that of those in 16.5˚C (61.7˚F) (Bestgen 2008).

Larval or juvenile razorback suckers are rarely encountered in the wild, therefore, their habitat requirements in the wild are not well characterized. However, it is assumed that low-velocity backwaters and side channels are important for YOY and juveniles, as it is to the early life stages of most riverine fish. Prior to construction of large dams on the main channel and the suppression of spring peak flows, low velocity, off-channel habitats (seasonally flooded bottomlands and shorelines) were commonly available throughout the upper Colorado River Basin (Tyus and Karp 1989, Osmundson and Kaeding 1991).

Reduction in spring peak flows eliminates or reduces the frequency of inundation of off-channel habitats and floodplain habitats. The absence of these seasonally flooded riparian habitats are believed to be a limiting factor in the successful recruitment of razorback suckers in other upper Colorado River tributaries (Tyus and Karp 1989, Osmundson and Kaeding 1991). Wydoski and Wick (1998) identified loss of floodplain habitats that provide adequate zooplankton densities for larval food as one of the most important factors limiting razorback sucker recruitment; low zooplankton densities in the main channel result in starvation of larval razorback suckers. Maintaining low velocity habitats is important for the survival of larval razorback suckers.

Outside of the spawning season, adult razorback suckers occupy a variety of shoreline and main channel habitats including slow runs, shallow to deep pools, backwaters, eddies, and other relatively slow velocity areas associated with sand substrates (Tyus 1987, Tyus and Karp 1989, Osmundson and Kaeding 1989, Valdez and Masslich 1989, Osmundson and Kaeding 1991, Tyus and Karp 1990). Their diet consists primarily of algae, plant debris, and aquatic insect larvae (Sublette et al. 1990).

***Razorback Sucker Population Dynamics***

Because wild razorback sucker a long-lived fish, are rarely encountered it is difficult to determine natural fluctuations in their population. Currently, wild razorback sucker are rare throughout their historic range and extremely rare in the main channel of the San Juan River, although over 130,000 hatchery-reared razorback sucker have been stocked there since the mid-1990s (Furr 2014). While wild-produced larval razorback sucker have been collected every year since 1998 (Farrington et al. 2014), there is limited evidence indicating natural recruitment to any population of razorback sucker in the Colorado River Basin (Bestgen 1990, Platania 1990, Platania et al. 1991, Tyus 1987, McCarthy and Minckley 1987, Osmundson and Kaeding 1989, Modde et al. 1996). However, Age-0 razorback suckers in the juvenile ontogenetic stage are regularly captured during larval fish monitoring (Farrington et al. 2014). In 2003 two juvenile (Age-2) razorback sucker, 249 and 270 mm (9.8 and 10.6 in.), thought to be wild-produced from stocked fish, were collected in the lower San Juan River (RM 35.7 and 4.8) (Ryden 2004a) and at least four wild juvenile razorback sucker were collected downstream of RM 37.4 in 2004 (Golden and Holden 2006) indicating limited recruitment may be rarely occurring.

***Competition with and Predation of Razorback Suckers***

Many species of nonnative fishes are predators, competitors, and vectors of parasites and diseases (Tyus et al. 1982, Lentsch et al. 1996, Pacey and Marsh 1999, Marsh et al. 2001). Many researchers believe that nonnative species are a major cause for the lack of recruitment and that nonnative fish are the most important biological threat to the razorback sucker (e.g., McAda and Wydoski 1980, Minckley 1983, Tyus 1987, USFWS 1991, 1998, 2002b, Muth et al. 2000). There are reports of predation of razorback sucker eggs and larvae by common carp, channel catfish, smallmouth bass, largemouth bass, bluegill, green sunfish, and red-ear sunfish (Jonez and Sumner 1954, Marsh and Langhorst 1988, Langhorst 1989).

Marsh and Langhorst (1988) found higher growth rates in larval razorback sucker in the absence of predators in Lake Mohave, and Marsh and Brooks (1989) reported that channel catfish and flathead catfish were major predators of stocked razorback sucker in the Gila River. Juvenile razorback sucker (average total length [TL] 171 mm [6.7 in.]) stocked in isolated coves along the Colorado River in California, suffered extensive predation by channel catfish and largemouth bass (Langhorst 1989).

Carpenter and Mueller (2008) tested nine non-native species of fish that co-occur with razorback sucker and found that seven species consumed significant numbers of larval razorback suckers. The seven species consumed an average of 54 – 99 percent of the razorback sucker larvae even though alternative food was available (Carpenter and Mueller 2008). Lentsch et al. (1996) identified six species of nonnative fishes in the upper Colorado River Basin as threats to razorback sucker: red shiner, common carp, sand shiner, fathead minnow, channel catfish, and green sunfish. Smaller fish, such as adult red shiner, are known predators of larval native fish (Ruppert et al. 1993). Large predators, such as walleye, northern pike (*Esox lucius*), and striped bass, also pose a threat to subadult and adult razorback sucker (Tyus and Beard 1990).

***Razorback Sucker Status and Distribution***

A marked decline in populations of razorback suckers can be attributed to construction of dams and reservoirs, introduction of nonnative fishes, and removal of large quantities of water from the Colorado River Basin (USFWS 1991, 1994). Dams on the main channel of the Colorado River and its major tributaries have fragmented populations and blocked migration routes. Dams also have drastically altered flows, water temperatures, and channel geomorphology. These changes have modified habitats in many areas so that they are no longer suitable for breeding, feeding, sheltering, or nursery areas. Major changes in species composition have occurred due to the introduction of nonnative fishes, many of which have thrived due to human-induced changes to the natural riverine system. Habitat has been significantly degraded to a point where it impairs the essential life history functions of razorback sucker, such as reproduction and recruitment into the adult population.

Currently, the largest numbers of wild adult razorback sucker remaining in the Colorado River Basin is in Lake Mohave. Estimates of the wild stock in Lake Mohave have fallen precipitously in recent years from 60,000 in 1991, 25,000 in 1993 (Marsh 1993, Holden 1994), to fewer than 3,000 in 2001 (Marsh et al. 2003). A repatriation program began in Lake Mohave in 1991, and repatriated fish have apparently begun to contribute to larval cohorts (Turner et al. 2007). Until recently, efforts to introduce young razorback sucker into Lake Mohave have failed because of predation by nonnative species (Minckley et al. 1991, Clarkson et al. 1993, Burke 1994, Marsh et al. 2003). Razorback suckers elsewhere in the Colorado River Basin have not maintained a secure, self-sustaining wild population or have been extirpated (Marsh et al. 2003).

In the upper Colorado River Basin, above Glen Canyon Dam, razorback suckers are found in limited numbers in both lentic (lake-like) and riverine environments. Lanigan and Tyus (1989) estimated a population of 948 adults (95% CI: 758-1,138) in the upper Green River. Eight years later, the population was estimated at 524 adults (95% CI: 351-696) and the population was characterized as stable or declining slowly with some evidence of recruitment (Modde et al. 1996). They attributed this recruitment to unusually high spring flows during 1983-1986 that inundated portions of the floodplain used as nurseries by young. In the Colorado River, most razorback suckers occur in the Grand Valley area near Grand Junction, Colorado; however, they are increasingly rare. Osmundson and Kaeding (1991) reported that the number of razorback sucker captures in the Grand Junction area has declined dramatically since 1974. Between 1984 and 1990, intensive collecting effort captured only 12 individuals in the Grand Valley (Osmundson and Kaeding 1991). The wild population of razorback sucker is considered extirpated from the Gunnison River (Burdick and Bonar 1997). While the role of Lake Powell in the recovery of razorback sucker is unclear, 75 individuals were detected in the San Juan arm of Lake Powell in 2011 (Francis et al. 2013).

Scientifically documented records of wild razorback sucker adults in the San Juan River are limited to two fish captured in a riverside pond near Bluff, Utah in 1976, and one fish captured in the river in 1988, also near Bluff (Platania 1990). In 1976, large numbers of razorback suckers were anecdotally reported from a drained pond near Bluff, Utah, but no specimens were preserved to verify species. During the 7-year research period (1991-1997) of the San Juan River Recovery Implementation Program (SJRRIP), no wild razorback suckers were observed (Holden 1999). Hatchery-reared razorback suckers, especially those greater than 350 mm (13.8 in.), introduced into the San Juan River in the 1990s have survived and reproduced, as evidenced by recapture data and collection of larval fish (Farrington et al. 2014, Schleicher 2014). River wide razorback sucker population estimates of 268 in October 2000 (Ryden 2001) have since grown to 1,200 in October 2004 (Ryden 2005b), and to about 2,000 and 3,000 in 2009 and 2010, respectively (Duran et al. 2011). Additional mark-recapture data indicates increasing razorback sucker abundance estimates (Durst 2014) (Figure 12). However, since there is little to no documented recruitment in the San Juan River, this population increase should be attributed almost entirely to augmentation with hatchery-reared razorback suckers.

The razorback sucker recovery goals identified streamflow regulation, habitat modification, predation by nonnative fish species, and pesticides and pollutants as primary threats to the species (USFWS 2002b). Within the upper Colorado River Basin, recovery efforts include the capture and removal of razorback suckers from all known locations for genetic analyses and development of brood stocks. In the short term, augmentation (stocking) may be the only means to prevent the extirpation of razorback sucker in the upper Colorado River Basin. However, in the long term it is expected that natural reproduction and recruitment will occur. Genetics management and augmentation plans have been implemented for razorback sucker (Crist and Ryden 2003, Ryden 2003).

At the time of listing, few razorback suckers remained in the San Juan River. Since the initiation of the SJRRIP, razorback sucker numbers have increased, due to augmentation. The long-term population viability remains uncertain because of the relatively limited or degraded habitat available to razorback sucker between Navajo Dam and Lake Powell, competition and predation from nonnative fishes, degraded water quality, and the uncertainty surrounding the changes that climate change will bring to the San Juan basin.

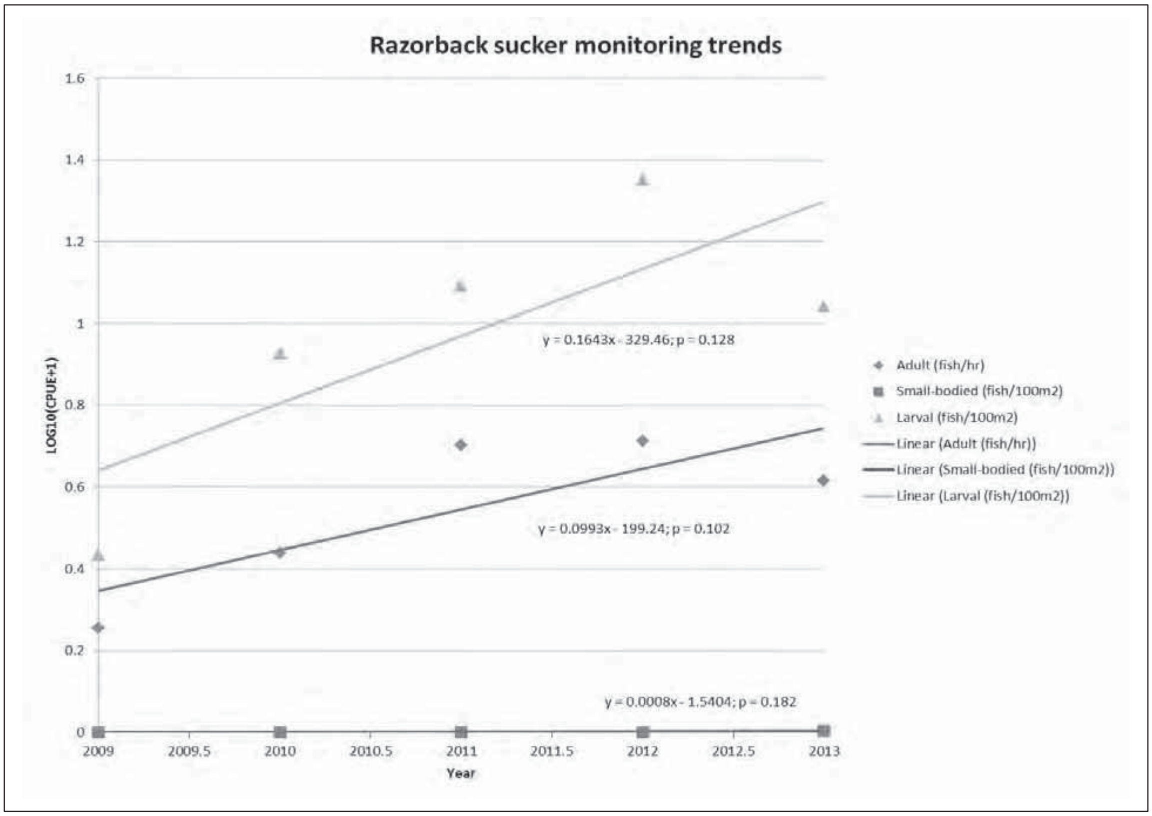



Figure 12. Summary of the recent catch (CPUE) of various life stages of razorback sucker and various small-bodied fish in the San Juan River (Durst 2014).

## Endangered Fishes Propagation and Augmentation

Because of these extremely low numbers of wild Colorado pikeminnow and poor recruitment into the population, a stocking program was initiated to augment fish stocks in the San Juan River. Experimental stocking of 100,000 YOY Colorado pikeminnow upstream of Shiprock, New Mexico was conducted in November 1996 to test habitat suitability and quality for young life stages (Lentsch et al. 1996). Monitoring in late 1996 and 1997 found these fish scattered in suitable habitats from just below the Shiprock site to the inflow of Lake Powell. During the fall of 1997, the fish stocked in 1996 were caught in relatively high numbers and exhibited good growth and survival rates (Holden and Masslich 1997). In August 1997, an additional 100,000 YOY Colorado pikeminnow were stocked in the river. In October 1997, the YOY stocked two months previously were found distributed below stocking sites and in relatively large numbers nearly ten miles above the Shiprock stocking location. On average, the 1997 stocked fish were smaller than those stocked in 1996 and were able to move about the river to find suitable habitats (Holden and Masslich 1997). Because of the initial success of the stocked fish, Colorado pikeminnow have been stocked every year since 1996. Approximately 3.2 million pikeminnow have been stocked between 2002 and 2011 (Furr 2012).

Between 1994-2007, a total of 54,472 hatchery and pond raised razorback suckers were stocked into the San Juan River (Ryden 2008c). From 1994 through 2012, 130,473 razorback suckers were stocked. Between 2009 and 2012, the number released has ranged from 8,418 to 28,485, with an average of 17,889 razorback suckers released per year (Furr 2013). Razorback suckers that have been stocked in the river for six or more overwinter periods have been collected every year since 2001 (Ryden 2008c). Larval razorback suckers have been collected each year since 1998, indicating that the stocked fish are successfully spawning in the San Juan River (Brandenburg and Farrington 2008). The number of endangered fishes stocked in the San Juan River is reported annually (see http://www.fws.gov/southwest/sjrip/).

The status of razorback sucker critical habitat in the San Juan River Basin is described in the environmental baseline of this BO.

## SOUTHWESTERN WILLOW FLYCATCHER

The flycatcher is a small grayish-green passerine bird measuring approximately 5.75 in (146 mm) in height. It has a grayish-green back and wings, whitish throat, light gray-olive breast, and pale yellowish belly. Two white wing bars are visible in adults, while juveniles have buffy wing bars. The eye ring is faint or absent. The upper mandible is dark, and the lower is light yellow grading to black at the tip. The song is a sneezy "fitz-bew" or a "fit-a-bew" and the call is a repeated "whitt" (Howell and Webb 1995).

The flycatcher is one of four currently recognized willow flycatcher subspecies (Phillips 1948, Unitt 1987, Browning 1993). It is a neotropical migrant that breeds in the southwestern U.S.A. and migrates to Mexico, Central America, and possibly northern South America during the non-breeding season (Phillips 1948, Stiles and Skutch 1989, Peterson 1990, Ridgely and Tudor 1994, Howell and Webb 1995). The historic breeding range of the flycatcher included southern California, Arizona, New Mexico, western Texas, southwestern Colorado, southern Utah, extreme southern Nevada, and extreme northwestern Mexico (Sonora and Baja) (Unitt 1987).

The flycatcher was listed as endangered in 1995 (60 FR 10694; USFWS 1995) without critical habitat designation. Critical habitat was designated for the flycatcher on July 22, 1997 along 599 river miles in Arizona, California, and New Mexico (USFWS 1997a). A correction notice was later published in the Federal Register on August 20, 1997 (USFWS 1997b). In May 2001, citing a faulty economic analysis, the 10th Circuit Court of Appeals vacated the designation of critical habitat and instructed the Service to issue a new flycatcher critical habitat designation. On October 19, 2005, critical habitat was re-designated on approximately 48,896 ha (120,824 acres) or 1,186 km (737 mi) within Arizona, California, Nevada, New Mexico and Utah (USFWS 2005). On July 13, 2010, the Service agreed to revise critical habitat for the flycatcher; while the 2005 critical habitat designation remained in place. On January 3, 2013, a final rule to designate revised critical habitat was published in the Federal Register (USFWS 2013) for the flycatcher on approximately 1,975 stream kilometers (1,227 stream miles) on a combination of Federal, State, tribal, and private lands in California, Nevada, Utah, Colorado, Arizona, and in New Mexico.

The specific physical or biological features required for the flycatcher from studies of its habitat, ecology, and life history was described by the Service (USFWS 2011c). In general, the physical or biological features of critical habitat for nesting flycatchers are found in the riparian areas within the 100-year floodplain or flood-prone areas. Flycatchers use riparian habitat for feeding, sheltering, and cover while breeding, migrating, and dispersing. It is important to recognize that flycatcher habitat is ephemeral in its presence, and its distribution is dynamic in nature because riparian vegetation is prone to periodic disturbance (such as flooding). The PCEs of critical habitat for flycatcher (USFWS 2013) include:

1. Primary Constituent Element 1— Riparian vegetation. Riparian habitat in a dynamic river or lakeside, natural or manmade successional environment (for nesting, foraging, migration, dispersal, and shelter) that is comprised of trees and shrubs (that can include Trees and shrubs that include Gooddings willow (Salix gooddingii), coyote willow (S. exigua), Geyers willow (S. geyerana), arroyo willow (S. lasiolepis), red willow (S. laevigata), yewleaf willow (S. taxifolia), pacific willow (S. lasiandra), boxelder (Acer negundo), tamarisk (Tamarix ramosissima; also known as salt cedar), Russian olive (Elaeagnus angustifolia), buttonbush (Cephalanthus occidentalis), cottonwood (Populus fremontii), stinging nettle (Urtica dioica), alder (Alnus spp.), velvet ash (Fraxinus velutina), poison hemlock (Conium maculatum), blackberry (Rubus ursinus), seep willow (Baccharis salicifolia, B. glutinosa), oak (Quercus agrifolia, Q. chrysolepis), rose (Rosa californica, R. arizonica, R. multiflora), sycamore (Platinus wrightii), false indigo (Amorpha californica), Pacific poison ivy (Toxicodendron diversilobum), grape (Vitis arizonica), Virginia creeper (Parthenocissus quinquefolia), Siberian elm (Ulmus pumila), and walnut (Juglans hindsii).

2. PCE 1 and some combination of:

    a. Dense riparian vegetation with thickets of trees and shrubs that can range in height from about 2 meters (m) to 30 m (about 6 to 98 feet (ft)). Lower-stature thickets (2 to 4 m or 6 to 13 ft tall) are found at higher elevation riparian forests and tall-stature thickets are found at middle and lower-elevation riparian forests; and/or

    b. Areas of dense riparian foliage at least from the ground level up to approximately 4 m (13 ft) above ground or dense foliage only at the shrub or tree level as a low, dense canopy; and/or

    c. Sites for nesting that contain a dense (about 50 percent to 100 percent) tree or shrub (or both) canopy (the amount of cover provided by tree and shrub branches measured from the ground); and/or

    d. Dense patches of riparian forests that are interspersed with small openings of open water or marsh or areas with shorter and sparser vegetation that creates a variety of habitat that is not uniformly dense. Patch size may be as small as 0.1 hectares (ha) (0.25 acres (acres)) or as large as 70 ha (175 acres); and

3. Primary Constituent Element 2— Insect prey populations. A variety of insect prey populations found within or adjacent to riparian floodplains or moist environments, which can include: flying ants, wasps, and bees (Hymenoptera); dragonflies (Odonata); flies (Diptera); true bugs (Hemiptera); beetles (Coleoptera); butterflies, moths, and caterpillars (Lepidoptera); and cicada (Homoptera).

The PCEs of flycatcher critical focused on the end result of all the components that culminate in the development of flycatcher breeding habitat (USFWS 2013). The Service (USFWS 2005) described those components (e.g., broad floodplain, surface water, fine sediments, hydrologic regime, channel-floodplain connectivity, elevated groundwater, etc.) in detail in the supporting text for the PCEs (69 FR 60712–60715). All the PCEs of critical habitat for the flycatcher are found in the riparian ecosystem within the 100-year floodplain or flood prone area (USFWS 2013).

Flycatcher critical habitat (27 mi (43.5 km)) occurs along the northern bank of San Juan River upstream of Chinle Creek in San Juan County, Utah. This reach of the San Juan River is part of the San Juan Management Unit in the Upper Colorado Recovery Unit (USFWS 2002c). The goal for recovery of flycatchers in the Upper Colorado Recovery Unit, San Juan Management Unit, is 25 territories (USFWS 2002, p.84). In 2002, flycatchers were known to breed at only four sites in the San Juan Management Unit, with only three flycatcher territories (less than one percent of the rangewide total) documented (USFWS 2002c). All occupied sites occurred in native (willow) habitats between 1,400 to 2,420 m elevation (USFWS 2002c). The specific river reaches within the San Juan Management Unit, where recovery efforts were considered essential to meet recovery goals included the Los Pinos River, in Colorado; and the San Juan River (north bank) in Utah (USFWS 2002c). The San Juan River near Shiprock, New Mexico, from Malpais Arroyo, one mile upstream to one mile downstream, was identified as a river segment that could contribute substantially to recovery, but was not considered essential (USFWS 2002c, 2013)

***Flycatcher Life History***

The flycatcher breeds in dense riparian habitat from sea level in California to approximately 8,500 ft elevation in Arizona and southwestern Colorado. Historical eggs/nest collections and species descriptions throughout its range describe widespread use of willow (Salix spp.) for nesting (Phillips 1948, Phillips et al. 1964, Hubbard 1987, Unitt 1987). Currently, flycatchers primarily use Geyer's willow, coyote willow, Goodding's willow, boxelder, saltcedar, Russian olive, and live oak for nesting. Other plant species less commonly used for nesting include buttonbush, black twinberry (Lonicera involucrata), cottonwood, white, blackberry, and stinging nettle. Saltcedar is an important component of nesting and foraging habitat in Arizona and other parts of the species' range. During 2001 in Arizona 323 of the 404 (80 percent) known flycatcher nests (in 346 territories) were in saltcedar (Smith et al. 2002). Four habitat types have been described for the flycatcher: monotypic willow, monotypic exotic, native broadleaf dominated, and mixed native/exotic (Sogge et al. 1997).

Throughout their range, the generalized breeding chronology of flycatchers begins with the arrival at breeding grounds in late April and May (Sogge and Tibbitts 1992; Sogge et al. 1993; Muiznieks et al. 1994; Sogge and Tibbitts 1994; Maynard 1995; Sferra et al. 1995, 1997; USFWS 2002; Sogge et al. 2010). Nesting and egg laying may begin as early as late May, but more often starts in early to mid-June. Flycatchers typically lay three to four eggs per clutch (range = 1 to 5). Eggs are laid at one-day intervals and are incubated by the female for approximately 12 days (Bent 1960, Walkinshaw 1966, McCabe 1991). Chicks can be present in nests from mid-June through early August and will typically fledge approximately 12 to 13 days after hatching (King 1955, Harrison 1979), from late June through mid-August. Young will remain in the natal area for up to 15 days (Brown 1988a,b; Sogge and Tibbitts 1992; Muiznieks et al. 1994; Maynard 1995). Adults depart from breeding territories as early as mid-August, but may stay until mid-September in later nesting efforts. Fledglings likely leave the breeding areas a week or two after adults.

Typically, one brood is raised per year, but birds have been documented raising two broods during one season and re-nesting after a failure (Whitfield 1990, Sogge and Tibbitts 1992, Sogge et al. 1993, Sogge and Tibbitts 1994, Muiznieks et al. 1994, Whitfield 1994, Whitfield and Strong 1995). The entire breeding cycle, from egg laying to fledging, is approximately 28 days. Each stage of the breeding cycle represents a greater energy investment in the nesting effort by the flycatcher pair and may influence their fidelity to the nest site or their susceptibility to quickly abandon if the conditions in the selected breeding habitat become adverse, decadent, or result in nest failure.

***Flycatcher Population Dynamics, Status, and Distribution***

Since the mid-1900s, populations of southwestern willow flycatcher have declined rapidly (USFWS 2002c). The historical breeding range of southwestern willow flycatcher included southern California, southern Nevada, southern Utah, Arizona, New Mexico, western Texas, southwestern Colorado, and extreme northwestern Mexico. The flycatcher's current range is similar to the historical range, but the quantity of suitable habitat within that range is much reduced from historical levels. There are currently 288 known flycatcher breeding sites in California, Nevada, Arizona, Utah, New Mexico, and Colorado (all sites from 1993 – 2007 where a resident flycatcher has been detected) holding an estimated 1,299 territories (Durst et al. 2008) (Table 3). Currently, rangewide population stability is believed to be largely dependent on the presence of four large populations (Cliff/Gila Valley, New Mexico; Roosevelt Lake, Arizona; San Pedro/Gila River confluence, Arizona; middle Rio Grande, New Mexico) where approximately 50 percent of the 1,299 territories currently exist. Therefore, the result of catastrophic events or losses of significant populations in either size or location could greatly change the status and survival of the species. Conversely, expansion into new habitats or discovery of other populations will improve the known stability and status of the flycatcher.

Since 1998, surveys for flycatcher have been completed in association with various mining, power generation, and energy transmission projects, and recently around Morgan Lake and the DFADA (OSMRE 2014b). Flycatchers have been detected sporadically near Morgan Lake and the San Juan River; however, no confirmed nesting locations of this species have been reported. In 2012, Site-specific flycatcher surveys were conducted along corridors near APS and PNM transmission lines, ROWs, and switchyards (Marron 2012a,b; AECOM 2013d). Flycatcher habitat was considered marginal on the Navajo Mine lease and therefore, flycatcher protocol surveys ceased in 1995 (OSMRE 2014b). The Navajo Nation Department of Fish and Wildlife (NNDFW) reported a male flycatcher making territorial displays near the Hogback in 2014, but protocol surveys were not completed (OSMRE 2014b).

We reviewed all available flycatcher survey reports from 1994 to 2013 conducted at all locations within the San Juan River Basin in New Mexico. Of the 143 areas surveyed in suitable habitats along the San Juan, Animas, and La Plata Rivers, flycatchers were documented 127 times, or about 88.9 percent in the 143 areas surveyed. However, the vast majority of these flycatchers were migrants and even fewer exhibited territorial behavior. Only five nesting pairs of flycatchers have been documented nesting at two locations (Shiprock, New Mexico, and below the Navajo Reservoir Dam) along the San Juan River in 1997-1998 (USFWS 2002; BOR 2006; BA, p. 6-3). The average annual flycatcher-nesting rate from survey results in suitable habitat along the San Juan River was (5 nesting pairs in 20 years of surveys) or 1.25 percent per year, over 20 years.

Riparian habitat occurs along the San Juan River along with water, wetlands, native willows, salt cedar and Russian olive for nesting substrate. Several agencies have or are conducting restoration efforts to improve riparian habitat conditions there. According to the NNDFW (2014), "there are likely patches of riparian habitat suitable for breeding in the San Juan River Deposition Area, or habitats that may become suitable for breeding during the life of the project." Therefore, we assume the San Juan River currently supports (AECOM 2013) and in the future will continue to support suitable nesting habitat for flycatchers.

Table 2. Rangewide population status for the southwestern willow flycatcher based on 1993 to 2007 survey data for Arizona, California, Colorado, New Mexico, Nevada, Utah, and Texas. (There is no recent survey data or other records to know the current status and distribution within the state of Texas.) (Durst et al. 2008).

| State | Number of sites with territories as of 2007 | Percentage of sites with territories as of 2007 | Number of territories as of 2007 | Percentage of total territories as of 2007 |
|---|---|---|---|---|
| Arizona | 124 | 43.1 % | 459 | 35.3 % |
| California | 96 | 33.3 % | 172 | 13.2 % |
| Colorado | 11 | 3.8 % | 66 | 5.1 % |
| Nevada | 13 | 4.5 % | 76 | 5.9 % |
| New Mexico | 41 | 14.2 % | 519 | 40.0 % |
| Utah | 3 | 1.0 % | 7 | 0.5% |
| Total | 288 | 100 % | 1299 | 100 % |

Total territory numbers recorded are based upon the most recent year's survey information from that site between 1993 and 2007.

## YELLOW-BILLED CUCKOO

Western yellow-billed cuckoo (cuckoo) is a medium-sized bird about 12 inches (30 cm) in length and weighing about 2 ounces (57 grams [g]). Morphologically, cuckoos throughout the western continental United States and Mexico are generally larger, with significantly longer wings, longer tails, and longer and deeper bills compare to their eastern counterparts (Franzreb and Laymon 1993). The species has a slender, long-tailed profile, with a fairly stout and slightly down-curved bill, which is blue-black with yellow on the basal half of the lower mandible. Plumage is grayish-brown above and white below, with rufous primary flight feathers. The tail feathers are boldly patterned with large white spots on a black background on the underside of the tail. The legs are short and bluish-gray, and adults have a narrow, yellow eye ring. Juveniles resemble adults, except the tail patterning is less distinct, and the lower bill may have little or no yellow. Males and females differ slightly. Males tend to have a slightly larger bill and the white in the tail tends to form oval spots, whereas in females the white spots tend to be connected and less distinct (USFWS 2011b).

On October 3, 2013, the Western U.S. Distinct Population Segment (DPS) of yellow-billed cuckoo was listed as a threatened species under the ESA (USFWS 2014). The area for the western DPS of yellow-billed cuckoo is west of the crest of the Rocky Mountains. Critical habitat is proposed along the San Juan River where flycatcher critical habitat is designated on the north shore near Chinle Wash, in Utah (USFWS 2013c).

### *Cuckoo Life History*

The breeding range of the entire yellow-billed cuckoo species formerly included most of North America from southeastern and western Canada (southern Ontario and Quebec and southwestern British Colombia) to the Greater Antilles and northern Mexico (AOU 1957, AOU 1983, AOU 1998). Western populations of cuckoos breed in dense riparian woodlands, primarily of cottonwood, willow, and mesquite (Prosopis spp.), along riparian corridors in otherwise arid areas (Laymon and Halterman 1989, Hughes 1999). Dense undergrowth may be an important factor in selection of nest sites. Narrow bands of riparian woodland can contribute to the overall extent of suitable habitat. Adjacent habitat on terraces or in the upland (such as mesquite) can enhance the value of these narrow bands of riparian woodland.

In the Lower Colorado River this species occupies riparian areas that have higher canopies, denser cover in the upper layers of the canopy, and sparser shrub layers when compared to unoccupied sites. Although this species is generally associated with breeding and nesting in large wooded riparian areas dominated by cottonwood trees, they have been documented nesting in salt cedar between Albuquerque and Elephant Butte Reservoir and along the Pecos River in southeastern New Mexico.

Throughout the cuckoo's range, a large majority of nests are placed in willow trees, but alder (Alnus spp.), cottonwood, mesquite, walnut (Juglans spp.), box elder, sycamore, netleaf hackberry (Celtis laevigata var. reticulata), soapberry (Sapindus saponaria), and tamarisk are also used (Laymon 1980, Hughes 1999, Corman and Magill 2000 , Corman and Wise-Gervais 2005, Holmes et al. 2008

Cuckoos reach their breeding range later than most other migratory breeders, often in June (Rosenberg et al. 1982). They construct an unkempt stick nest on a horizontal limb in a tree or large shrub. Nest height ranges from 4 ft to (rarely) 100 ft, but most are typically below 30 ft (Hughes 1999). The incubation period for cuckoo is 9 to 11 days, and young leave the nest at 7 to 9 days old. Nesting usually occurs between late June and late July, but can begin as early as late May and continue until late September (Hughes 1999).

The cuckoo primarily breeds in riparian habitat along low-gradient (surface slope less than 3 percent) rivers and streams, and in open riverine valleys that provide wide floodplain conditions (greater than 325 ft [100 m]). In the southwest, it can also breed in narrower reaches of riparian habitat. The moist conditions that support riparian plant communities that provide cuckoo habitat typically exist in lower elevation, broad floodplains, as well as where rivers and streams enter impoundments.

The optimal size of habitat patches for the species are generally greater than 200 ac (81 ha) and have dense canopy closure and high foliage volume of willows and cottonwoods (Laymon and Halterman 1989) and thus provide adequate space for foraging and nesting. Tamarisk, a nonnative tree species, may be a component of the habitat, especially in Arizona and New Mexico. Sites with a monoculture of tamarisk are unsuitable habitat for the species. The association of breeding with large tracts of suitable riparian habitat is likely related to home range size. Individual home ranges during the breeding season average over 100 ac (40 ha), and home ranges up to 500 ac (202 ha) have been recorded (Laymon and Halterman 1987, Halterman 2009, Sechrist et al. 2009, McNeil et al. 2011, McNeil et al. 2012).

In addition to the dense nesting grove, western yellow-billed cuckoos need adequate foraging areas near the nest. Foraging areas can be less dense or patchy with lower levels of canopy cover and often have a high proportion of cottonwoods in the canopy. Optimal breeding habitat contains groves with dense canopy closure and well-foliaged branches for nest building with nearby foraging areas consisting of a mixture of cottonwoods, willows, or mesquite with a high volume of healthy foliage (USFWS 2010e).

Cuckoos forage primarily by gleaning insects from vegetation, but they may also capture flying insects or small vertebrates such as tree frogs and lizards (Hughes 1999). They specialize on relatively large invertebrate prey, including caterpillars (Lepidoptera sp.), katydids (Tettigoniidae sp.), cicadas (Cicadidae sp.), and grasshoppers (Caelifera sp.)(Laymon et al. 1997). Minor prey includes beetles (Coleoptera sp.), dragonflies (Odonata sp.), praying mantis (Mantidae sp.), flies (Diptera sp.), spiders (Araneae sp.), butterflies (Lepidoptera sp.), caddis flies (Trichoptera sp.), crickets (Gryllidae sp.), wild berries, and bird eggs and young (Laymon et al. 1997, Hughes 1999). Prey species composition varies geographically. Their breeding season may be timed to

coincide with outbreaks of insect species, particularly tent caterpillars (Hughes 1999, USFWS 2001a) or cicadas (Johnson et al. 2007, Halterman 2009).
Cuckoos spend the winter in South America, east of the Andes, primarily south of the Amazon Basin in southern Brazil, Paraguay, Uruguay, eastern Bolivia, and northern Argentina (Ehrlich et al. 1992, AOU 1998, Johnson et al. 2008b). The species as a whole winters in woody vegetation bordering fresh water in the lowlands to 1,500 m (4,921 ft), including dense scrub, deciduous broadleaf forest, gallery forest, secondary forest, subhumid and scrub forest, and arid and semiarid forest edges (Hughes 1999). Wintering habitat of the cuckoo is poorly known.

***Cuckoo Population Dynamics, Status, and Distribution***

Since 1980, statewide surveys from New Mexico, Arizona, and California indicate an overall estimated 52 percent decline with numbers too low to establish trends from Idaho, Montana, Utah, Nevada, and Colorado. Trend information is also lacking from west Texas and Mexico. Yellow-billed cuckoo has been extirpated as a breeding bird in Washington, Oregon, and British Columbia (USFWS 2011b). Comparisons of historic and current information suggest that the western yellow-billed cuckoo's range and population numbers have declined substantially across much of the western U.S. over the past 50 years.

Although the overall population size of this species remains large, western populations in many areas have decreased dramatically. Major declines among western populations in the 20th century are attributed to habitat loss and fragmentation. Although once considered a common nester in Arizona river bottoms, fewer than 50 pairs were estimated present in the state in the early 1990s. The greatest declines have been in California, from an estimated 15,000 pairs in the late 19th century to a few dozen pairs by the mid-1980s (New Mexico Partners in Flight 2014).

Based on historic accounts, the species was widespread and locally common in California and Arizona, locally common in a few river reaches in New Mexico, locally common in Oregon and Washington, generally local and uncommon in scattered drainages of the arid and semiarid portions of western Colorado, western Wyoming, Idaho, Nevada, and Utah, and probably uncommon and local in British Columbia (USFWS 2011b). The largest remaining breeding areas are in southern and central California, Arizona, along the Rio Grande in New Mexico, and in northwestern Mexico (USFWS 2010e). The current breeding population is low, with estimates of approximately 350 to 495 pairs north of the Mexican border and another 330 to 530 pairs in Mexico for a total of 680 to 1,025 breeding pairs (USFWS 2010e).

In New Mexico, the species was historically rare statewide, but common in riparian areas along the Pecos River and Rio Grande, as well as uncommon to common locally along portions of the Gila, San Francisco, and San Juan Rivers. A review on the status of the species in New Mexico concluded that the species would likely decline in the future due to loss of riparian woodlands (USFWS 2011b). In the eastern third of the state, non-native salt cedar has provided habitat for approximately 1,000 pairs of yellow-billed cuckoos in historically unforested areas (USFWS 2011b). Few cuckoo surveys have been conducted on the San Juan River (Reclamation 2006; OSMRE 2014b; USFWS 2013, 2014).

No habitat capable of supporting cuckoo is present within the Navajo Mine Lease Area or Pinabete Permit Area due to lack of riparian woodland habitats and perennial water resources (BNCC 2012b). Some marginally suitable habitat for yellow-billed cuckoo occurs in the FCPP Lease Area along the riparian vegetation around Morgan Lake and within the salt cedar vegetation within the DFADA (AECOM 2013d). Along the PNM transmission line ROWs, areas identified as potentially capable of supporting yellow-billed cuckoo habitat were identified near the Rio Puerco, San Juan River, and at Morgan Lake. Each of these areas were considered to be marginal habitat as it occurs immediately adjacent to area affected by noise and disturbance and consisted of a dense, low-growing Russian olive trees or salt cedar. After timbering, these areas lack the overstory structure that cuckoo usually prefers. Suitable habitat along the San Juan River and Morgan Lake were subject to protocol surveys in June and July 2012 (Marron 2012b). No yellow-billed cuckoos were identified during those surveys.

However, cuckoos have been documented as occurring along the San Juan River from Navajo Reservoir to the Arizona state line (New Mexico Partners in Flight 2014). Staff from the BLM, Farmington Field Office, have documented this species at five of their San Juan River parcels during 2002 and 2003 surveys between the Hogback and Bloomfield, New Mexico. The closest potential habitat for this species was documented along the San Juan River (Ecosphere 2011). Approximately 6,726 acres of potentially suitable cuckoo habitat was identified within the Deposition Area (AECOM 2013b, 2014).

## Environmental Baseline

Under section 7(a)(2) of the ESA, when considering the effects of the action on federally listed species, the Service is required to take into consideration the environmental baseline. Regulations implementing the ESA (50 CFR 402.02) define environmental baseline as the past and present impacts of all Federal, State, or private actions and other human activities in the action area; the anticipated impacts of all proposed Federal actions in the action area that have already undergone formal or early section 7 consultation; and the impact of State and private actions that are contemporaneous with the consultation in process. All projects previously built or consulted on, and those State, Tribal, or private projects presently being built or considered that deplete water from the San Juan River basin are in the Environmental Baseline for this proposed action. The environmental baseline does not include the effects of the action under review, only actions that have occurred previously.

Federally authorized (or unauthorized) Hg-emitting activities were difficult to categorize as either part of the environmental baseline or part of cumulative effects. Therefore, we aggregated those into the environmental baseline. Numerous activities, natural sources, and legacy sources have emitted Hg in the past or currently and some of that Hg has variously deposited in the San Juan River Basin over time (EPRI 2014). Since the surface area of water is low in the San Juan River Basin, almost all Hg deposition falls on land, primarily as elemental or ionic mercury. The deposited Hg either evades back to the atmosphere or sequesters to soil. Over time, when overland flow takes place, soil is eroded from the catchment surface and carries adsorbed Hg (e.g., Hg ions; EPRI 2014) with it to the river. About 0.1 percent of ionic deposited in the watershed enters surface waters (EPRI 2014). Because of the relatively large amount of Hg deposited to San Juan River Basin soils from local, regional and global sources, Hg in water and fish are slow to respond to changes in Hg deposition, including reductions (EPRI 2014). Thus, Hg emission and deposition in the San Juan River Basin that may have occurred in the past, and may continue to affect the listed species and critical habitat today, or will affect the listed species and habitat in the future are considered as part of the environmental baseline.

The EPRI (2014) model predicts gradually rising Hg concentrations in water and fish tissue because the watershed has not yet reached equilibrium with the rate of atmospheric deposition the watershed has been receiving. Modeled reductions in Hg emissions (with concordant changes in Hg deposition, transport, methylation, and bioaccumulation) also never exceeded a 0.2 percent reduction in Colorado pikeminnow tissue burdens within the 85-year model simulation period (EPRI 2014). Therefore, except for Hg deposition associated with the proposed action, we characterize Hg deposition from past and current activities and Hg deposition from non-USA sources (e.g., East Asia) in the San Juan River Basin all as part of the environmental baseline (and do not separate it further into cumulative effects). In preparing this BO, we evaluated the direct and indirect effects of the proposed action and added those effects to the environmental baseline (see 50 CFR 402.02).

### Factors affecting Listed Species and Critical Habitat in Action Area

The San Juan River is a tributary to the Colorado River and drains a basin of approximately 25,000 $mi^2$ (65,000 $km^2$) located in Colorado, New Mexico, Utah, and Arizona (BOR 2002).

From its origins in the San Juan Mountains of southwestern Colorado (at an elevation exceeding 13,943 ft; 4,250 m), the river flows westward through New Mexico, Colorado, and into Lake Powell, Utah. The majority of water that feeds the 345 mi (570 km) of river is from the mountains of Colorado. From a water resources perspective, the area of influence for the proposed action begins at the inflow areas of Navajo Reservoir and extends west from Navajo Dam approximately 224 mi (359 km) along the San Juan River to Lake Powell. Reclamation operates and maintains Navajo Dam (BOR 2002). Navajo Dam regulates river flows, provides flood control, and contributes to recreational and fishery activities (BOR 2002). The major perennial tributaries below Navajo Dam are the Animas, La Plata, and Mancos Rivers, and McElmo Creek (Figure 6). In addition, numerous ephemeral arroyos and washes that contribute little flow but large sediment loads to the San Juan River occur. The Chaco River is an intermittent tributary to the San Juan River that passes just to the west of Navajo Mine and FCPP.

Reclamation (BOR 2006) described, in its Final Environmental Impact Statement for Navajo Reservoir Operations, changes in biodiversity associated with the historical San Juan River that occurred after installation of Navajo Dam (1957-1962). The reservoir physically altered the San Juan River and surrounding terrain and modified the pattern and quality of flows downstream (Holden 1999; BOR 2002, 2006, 2008; USFWS 2006). Similar to rivers downstream of other dam operations in the southwestern United States, the San Juan River below the dam became clearer due to sediment retention, and downstream water became colder, because water was released from deep in the reservoir. All species of plants and animals that existed along the river channel were affected to varying degrees (BOR 2006?). The disruption of natural patterns of flow caused changes to the vegetation along the riverbanks by altering the previously established conditions under which the plants reproduced and survived. Compounding these changes has been the intentional and non-intentional introduction of non-native species of fish that compete with and prey on native species (BOR 2002).

Platania and Young (1989) summarized historic fish collections in the San Juan River drainage that indicate that Colorado pikeminnow once inhabited reaches above what is now Navajo Dam and Reservoir near Rosa, New Mexico (now inundated by Navajo Reservoir). The creation of Lake Powell and Navajo Reservoir resulted in the direct loss of approximately 161 km (100 mi) of San Juan River habitat for the Colorado pikeminnow and razorback sucker (Holden 2000). Since closure of Navajo Dam in 1963, the accompanying fish eradication program, physical changes associated with the dam, and barriers to movement, wild Colorado pikeminnow have been eliminated from the upper San Juan River upstream of Navajo Dam. In addition to the changes caused to the river by dam operations, there were changes to how nearby lands were used (BOR 2002). Irrigation water provided by Navajo Dam contributed to large agricultural developments in this arid region (Abell 1990; Blanchard et al. 1993; Thomas et al. 2008).

Navajo Reservoir stores water for the Navajo Indian Irrigation Project (NIIP), the Hammond Irrigation Project, and various municipal and industrial uses making it possible to nearly double the amount of irrigation in the basin. At present, the NIIP diverts an annual average of approximately 160,000 AFY from the reservoir for irrigation south of Farmington (BOR 2002). In the future, the use of San Juan River water is expected to approximately double (BOR 2002). These demands will further affect the river and the native species dependent on the river both directly, through flow diversions, and indirectly, through changes in water quality, as a result of the transportation of sediment, metals, salts, pesticides, and nutrients from irrigated lands through seepage and return flows (Blanchard et al. 1993; BOR 2002; Thomas et al. 2008). In addition to the effects of Navajo Dam and Reservoir, over the last century the San Juan River has been diverted for a variety of uses, resulting in a variety of return flows to the river, including variously-treated municipal wastewater, industrial wastewater, and urban and natural stormwater runoff and seepage (Abell 1990; BIA 1999; USFWS 2009).

Although there are impacts to the river ecosystem from dam construction itself, dams have many impacts that continue after the structure is complete. Dams affect the physical, chemical, and biological components of a stream ecosystem (Williams and Wolman 1984; USFWS 1998, 2002; Collier et al. 2000; Mueller and Marsh 2002). Some of these effects include a change in water temperature, a reduction in lateral channel migration, channel scouring, blockage of fish passage, transformation of riverine habitat into lake habitat, channel narrowing, changes in the riparian community, diminished peak flows, changes in the timing of high and low flows, and a loss of connectivity between the river and its flood plain (e.g., Sherrard and Erskine 1991; Power et al. 1996; Kondolf 1997; Collier et al. 2000; Polzin and Rood 2000; Shields et al. 2000). Of these, changes in water temperature, water depletions, blockage of fish passage, transformation of riverine habitat, changes in the timing and magnitude of high and low flows, and changes in channel morphology, and water quality are discussed in greater detail below. The conditions below, plus nonnative species predation and competition adversely affect both endangered fishes and their critical habitat in the San Juan River.

***Water temperature***

Below Navajo Dam, summer water temperatures are colder and winter water temperatures are warmer than the pre-dam condition. The first 10 km (6.2 mi) below the dam have substantially reduced suspended sediment concentrations, resulting in the clearest water of any reach (Miller and Ptacek 2000). Colorado pikeminnow are currently found from near the confluence of the Animas River downstream to Lake Powell, although temperatures in the upper reach of this area may be colder than the species prefers (Durst and Franssen 2014).

The cold water released from Navajo Reservoir limits the potential spawning habitat of the endangered fishes in the San Juan River (Holden 1999; Cutler 2006; Lamarra 2007). Prior to dam construction, water temperatures at Archuleta (approximately 10 km [6.1 mi] below the dam) were above the threshold spawning temperature of 20º C (68º F) for approximately two months (Holden 1999). Based on cumulative degree-days, spawning could have occurred at Archuleta by July 11 each year prior to dam closure (Lamarra 2007). Since dam construction, water temperature at that site is rarely over 15º C (59º F) and is too cold for successful Colorado pikeminnow spawning (Holden 1999, Cutler 2006, Lamarra 2007). The threshold temperatures for spawning at Shiprock (approximately 125 km [78 mi] below the dam) occur about two weeks later on average than prior to dam construction (Holden 1999, Lamarra 2007). Spawning is unlikely to occur from Navajo Dam to the confluence of the Animas River (approximately 72 km [45 mi] below the dam) and may also be delayed for two weeks or more from the confluence with the Animas River down to Shiprock, New Mexico (Lamarra 2007).

Water temperatures near Shiprock before the construction of Navajo Dam were above 20º C (68º F) from approximately mid-June until mid-September (Holden 1999). Projected temperatures at Shiprock from 1993-1996 were above 20º C (68º F) for more than one month (August) (Holden 1999). Because fish are cold-blooded, their metabolism and growth are dependent upon water temperature. The amount of food eaten, assimilation efficiency, and time to sexual maturity are largely governed by water temperature (Lagler et al. 1977). Cold water typically decreases food consumption, assimilation efficiency, and growth rate, and increases the time to sexual maturity (Lagler et al. 1977).

Development time of Colorado pikeminnow and razorback sucker embryos is inversely related to temperature, and survival is reduced at temperatures that depart from 20º C (68ºF) (Bulkley et al. 1981, Hamman 1982, Bestgen 2008). Marsh (1985) found that for razorback suckers, time to peak hatch was nine days at 15ºC (59ºF) and 3.5 days at 25ºC (77ºF) and that the percent of eggs hatched was highest at 20ºC (68ºF). Bestgen (2008) found that fastest growth of razorback sucker occurred at 25.5ºC (77.9ºF). Fast larval growth may be linked to higher survival rates because the faster the larval fish grow, the less time they are highly susceptible to predation.

All Colorado pikeminnow eggs tested died at incubation temperatures of 15ºC (59ºF) or lower, and survival and hatching success were maximized near 20º C (68º F) (Marsh 1985). Bestgen and Williams (1994) found a relatively wide range of acceptable incubation temperatures above 18ºC (64.4 ºF). In addition, Bestgen et al. (2006) found that early hatching Colorado pikeminnow larvae in the Green River were almost twice the size of late hatching ones because they had more time to grow.

Because the combination of a suitable spawning bar (an area of sediment-free cobbles) and suitable temperatures occur low on the San Juan River at the Mixer, there is a greater chance that larval fish will drift into Lake Powell and be lost from the population. Dudley and Platania (2000) found that drifting larval Colorado pikeminnow would be transported from the Mixer Area to Lake Powell in as little as three days. For those larval fish not carried into Lake Powell, a delay in spawning (which reduces the amount of time YOY have to grow before winter) and overall colder water temperatures (resulting in slower growth) could lead to smaller, less fit YOY and reduce survival. There is speculation that the large volume of cold water in the upper Green River may be a major reason why larval Colorado pikeminnow drift so far downstream (Holden 2000). The same pattern may also occur on the San Juan River.

Cold water released from Navajo Dam has affected razorback sucker and Colorado pikeminnow in a number of ways. Water temperatures that were once suitable for spawning for Colorado pikeminnow near Archuleta are no longer suitable, and, if spawning were to occur near Shiprock, it would be delayed by approximately two weeks compared to pre-dam conditions and thereby desyncing the phenology of their emergence during periods of appropriate food resources. A delay in spawning reduces the amount of time that larval fish have to grow before winter, and colder temperatures reduce growth rate, increasing the amount of time that the larval fish are highly susceptible to predation.

***Blockage of fish passage***

Like other major dams on the Colorado River and its tributaries, Navajo Dam blocked all fish passage. While native fish once could move unimpeded from the San Juan River into the Colorado River and its tributaries, they are now confined to a relatively short reach of 362 km (225 mi) between Lake Powell and Navajo Dam. Razorback sucker and Colorado pikeminnow that may have been trapped above the reservoir have all died or were killed during treatment with rotenone (Olson 1962, Holden 1999). In addition to the major dams, the diversion structures constructed in the San Juan River have also created barriers to fish passage.

Dams have fragmented razorback sucker and Colorado pikeminnow habitat throughout the Colorado River system. Within the San Juan River, fish passage was once impeded by five instream structures. One of these structures has been removed, two have been equipped with fish passage structures, and two remain as impediments to fish passage for part of the year depending on flow. However, no remaining structures are complete barriers within critical habitat.

The five identified diversion structures (Cudei, Hogback, FCPP, SJGS [PNM weir], and Fruitland Irrigation Canal diversions) between Farmington, New Mexico, and the Utah state line were barriers to fish passage at certain flows. When radio telemetry studies were initiated on the San Juan River in 1991, only one radio-tagged Colorado pikeminnow was recorded moving upstream past one of the diversions. In 1995, an adult Colorado pikeminnow moved above the Cudei Diversion and then returned back downstream (Miller and Ptacek 2000). Other native fish had been found to move either upstream or downstream over all five of the weirs (Buntjer and Brooks 1997, Ryden 2000a). In 2001, Cudei Diversion (RM 142) was removed from the river and Hogback Diversion (previously an earth and gravel berm structure), which had to be rebuilt every year, was made into a permanent structure with non-selective fish passage. It is likely that Colorado pikeminnow, razorback sucker, and other native fishes can negotiate the ladder. The removal of Cudei Diversion and installation of the fish ladder at Hogback Diversion improved access for native fishes over a 24.5 mi (39.4 km) reach of river.

Until 2003, the PNM Weir (RM 166) was also a barrier to fish passage. Because of funding and technical assistance from the SJRRIP and operation and maintenance by the Navajo Nation, the PNM selective fish ladder was completed and has been operational since 2003. This has allowed passage past that structure by Colorado pikeminnow and razorback suckers. From 2003 – 2007, 65,596 native fish used the passage including 27 Colorado pikeminnow and 21 razorback suckers (LaPahie 2007 in litt). However, the FCPP Diversion at RM 163.3 can act as a fish barrier when the control gate for the structure is closed (Masslich and Holden 1996). Above the PNM weir, at the Fruitland Irrigation Canal Diversion (RM 178.5), model results suggest that the rock dam structure does not significantly hinder fish passage, expect perhaps at very high discharges (8,000 cubic feet per second [cfs] and greater) (Stamp and Golden 2005).

Colorado pikeminnow and razorback sucker can potentially navigate from Lake Powell, past the Animas River, and up to Hammond Diversion Dam, a total of approximately 338 km (210 mi).

An additional passage barrier exists where the San Juan River enters Lake Powell (Schleicher and Ryden 2013). When Lake Powell is not full, the San Juan River has changed course and enters Lake Powell over a sandstone ledge and creates an approximately 30-foot-high waterfall, which prevents fish from moving upstream into the San Juan River. This barrier is not absolute as the waterfall is occasionally inundated by Lake Powell level fluctuations during wetter periods (approximately one in ten years, on average), temporarily allowing fish access. Pikeminnow and razorback sucker that pass over this waterfall cannot return to the San Juan River to contribute to the population. Additionally, larval fish could be transported from the Mixer Area to Lake Powell in as little as 3 days (Dudley and Platania 2000). Surveys conducted in 2011 in the San Juan arm of Lake Powell documented both Colorado pikeminnow and razorback sucker (Schleicher and Ryden 2013. Razorback sucker are able to reproduce within the lake, but Colorado pikeminnow likely cannot. Razorback sucker tagged on the San Juan River have been documented in the upper Colorado River, indicating that some exchange of individuals from the San Juan River to the upper Colorado River through Lake Powell can occur.

***Water Diversion and Withdrawal***

As discussed previously, natural flow regimes are essential to the ecological integrity of large western rivers (USFWS 1998) and for the maintenance or restoration of native aquatic communities (Lytle and Poff 2004, Propst and Gido 2004, Propst et al. 2008). The flow regime works in concert with the geomorphology of the basin to establish and maintain the physical, chemical, and biological components of a stream ecosystem (Williams and Wolman 1984, Allan 1995, USFWS 1998, Collier et al. 2000, Mueller and Marsh 2002). Depletions play a major role in limiting the amount of water available as potential fish habitat as well as for achieving the Flow Recommendations (Holden 1999; BOR 2006).

Significant depletions and redistribution of flows of the San Juan River have occurred because of other major water development projects, including the NIIP and the San Juan-Chama Project. At the current level of development, average annual flows at Bluff, Utah, already have been depleted by 30 percent (Holden 1999). By comparison, the Green and Colorado Rivers have been depleted approximately 20 percent (at Green River) and 32 percent (at Cisco), respectively (Holden 1999). These depletions have likely contributed to the decline in Colorado pikeminnow and razorback sucker populations (USFWS 1994, 1998). To the extent that water is exported out of the basin (San Juan-Chama Project) or consumptively used (e.g., evaporation from fields, irrigation canals, reservoir surface) it is not available to maintain flows within the river.
Water depletion projects, including Project diversions that were in existence prior to November 1, 1992, are considered to be historic depletions because they occurred before the initiation of the SJRRIP. The depletions associated with the FCPP and Navajo Mine are considered historic depletions as diversion and consumptive use associated with Permit 2838 have been part of the basin depletions since the 1960s. However, the effects of those depletions are fully considered in this consultation. Projects that began after this date are considered new projects. On May 21, 1999 the Service determined through section 7 consultation that new depletions of 100 af or less, up to a cumulative total of 3,000 AFY, would not: 1) limit the provision of flows identified for the recovery of the Colorado pikeminnow and razorback sucker, 2) be likely to jeopardize the endangered fish species, or 3) result in the destruction or adverse modification of their critical habitat. Consequently, any new depletions under 100 AFY, up to a cumulative total of 3,000 AFY, may be incorporated under the 1999 BO but would still require ESA consultation.

Consultations contributing to the baseline depletions used reoperation of Navajo Reservoir in accordance with the Flow Recommendations as part of their section 7 compliance. Some of these projects have been completed (e.g., PNM Water Contract with Jicarilla Apache Nation), some are partially complete (e.g., NIIP), and some have not been fully implemented (e.g., Animas-La Plata Project).

As discussed under "Changes in the Timing and Magnitude of Flow" it is anticipated that climate change will create additional depletions to the San Juan River. The magnitude and timing of the depletions cannot be predicted with certainty at this time. Several studies project a decrease in stream flow from eight to 45 percent depending on the model used, the time frame, and the methods (Christensen and Lettenmeier 2006, Hoerling 2007, Seager et al. 2007, Udall 2007, Ray et al. 2008). Although the San Juan River was not modeled independent of the entire Colorado River basin in these studies, based on the projections of the IPCC (in Christensen et al. 2007) for warmer temperatures and an increase in the frequency of hot extremes and heat waves, it is reasonable to expect that there will be a decrease in stream flow in the future.

***Transformation of Riverine Habitat into Lake Habitat***

Lake Powell inundated the lower 54 miles of the San Juan River and Navajo Reservoir inundated about 27 miles. This inundation reduced the total amount of available habitat by over 30 percent and reduced the amount of endangered fish habitat in the lower end of the river (USFWS 2002a, 2006). Lake Powell is also home to several nonnative predators and competitors. In years when the falls are inundated, these fish may travel up the San Juan and prey upon and compete with endangered fishes.

***Flow Changes***

Prior to the construction of Navajo Dam, mean monthly flows in the San Juan River ranged from less than 50 cfs during the late summer/early fall to nearly 20,000 cfs in May (USFWS 2006). Spring peak flows of more than 15,000 cfs occurred 25 percent of the time, and the highest peak flow recorded was 52,000 cfs. Construction of the dam decreased peak discharges by more than half and elevated base flows by 168 percent on average. The USFWS (2006) estimated that average annual flows in the San Juan River at Bluff, Utah, had been depleted by 30 percent, and that these depletions likely contributed to the decline in Colorado pikeminnow and razorback sucker populations. The Navajo Reservoir BO cited total New Mexico diversions of 617,128 af/yr and total basin diversions of 854,376 af/yr.

Surface water drawn from the San Juan River into Morgan Lake for use at the FCPP is obtained according to water rights for 51,600 af/yr diversion, 39,000 af/yr consumptive held by BBNMC under New Mexico Office of the State Engineer Permit 2838. No changes to the water rights or water use would occur under the Proposed Action, and the ability to draw as much water as the rights allow for the Project life is maintained. However, future operations at FCPP are expected to have reduced quantity of both diversions and consumptive use from historical operations (see above).

Flow Recommendations were developed through the SJRRIP during the 1990s to better support populations of native fish, including the Colorado pikeminnow and razorback sucker (Holden 1999). Navajo Dam has been operated to meet these flow recommendations since they were published and completed an EIS in support of these modified operations in 2006 (BOR 2006) the USFWS issued a BO for those operations (USFWS 2006). The BO indicates that the reoperation of the dam provides native fish with the proper cues at the proper times to trigger spawning and appropriate habitat at the appropriate time to support young fish. Therefore, the operation of Navajo Dam and the water rights considered would not adversely affect listed species, provided sufficient progress is made toward endangered fish recovery.

***Channel Morphology***

The timing and magnitude of flows and the amount of sediment input into the system influences channel form and morphology, which creates habitat for fish and other aquatic organisms. The channel of the San Juan River has narrowed considerably since the 1930s because of upland habitat degradation and erosion (Holden 1999) and may also be associated with climate changes. These changes to the active river channel have been exacerbated by the reduction of high spring peak flows following the closure of Navajo Dam. The lack of flood flows has allowed nonnative riparian vegetation, such as tamarisk and Russian olive, to encroach on the river channel. These nonnative plants are very resistant to erosion, resulting in channel narrowing and a subsequent increase in water velocity. Narrow channels have few backwater habitats or active secondary channels that are important for some life stages of the endangered fishes. Narrowing of the channel increases water velocity and decreases the amount of low-velocity habitat important to young Colorado pikeminnow and razorback sucker (USFWS 2006).

Channel complexity increased between 1960 and 1988 to near historical levels, due in part to a number of wet years and despite the closure of Navajo Dam near the beginning of this period. Channel narrowing appears to have stopped or been substantially reduced by 1988 (Holder 1999), which may be due in part to higher flows implemented in 1992 to mimic natural flows. The amount of backwater habitat decreased since 1992, relative to the period prior to 1991, but this may have been due to an unusually large amount of backwater habitat prior to 1991 as a result of several wet years. The amount of other low-velocity habitats did not change significantly after 1992 (Holden 1999) and channel complexity has remained stable (USFWS 2006).

Navajo Dam's operations have been modified to include flows that may continue to support geomorphic processes, the formation of backwaters, and promote channel complexity. However, because of the various droughts in the basin, not all of the flow recommendation targets have been met in recent years. The last time all of the flow targets were met was in 2005. The goal of 10,000 cfs for 5 or more days has not been met since 2005, with the exception of 4 days of high flows that were provided in 2008. The last time the target number of days of flow of 8,000 and 5,000 cfs were met was in 2008. The 2,500-cfs flow target has been met consistently since 2003 (BOR 2012).

***Water of Sufficient Quality***

Water quality is of concern in the San Juan River Basin with many water bodies, including the San Juan River, being impaired for one or more factors, including metals, sediment, salinity, temperature, fecal matter, and dissolved oxygen (USFWS 2006). Land uses within the basin contribute metals, salts, fossil fuel residuals (e.g., polycyclic aromatic hydrocarbons (PAHs)), and pesticides to the San Juan River and its tributaries. The USEPA (1979), Abell (1994), and Reclamation (2002) and Thomas et al. (1998, 1999) conducted comprehensive contaminants reviews of the San Juan River Basin water quality and identified irrigation and mineral extraction, processing, and utilization as major sources of pollution.

Fish consumption advisories for mercury in fish tissue have been issued for Navajo Reservoir and other smaller reservoirs in the basin (NMED 2012; fishadvisoryonline.epa.gov/Advisories.aspx). The Nature Conservancy (2013) along with others, reported that aquatic integrity of the San Juan River Basin was generally fair. A summary of their ranking of aquatic integrity based partially on water quality is in Figure 13.

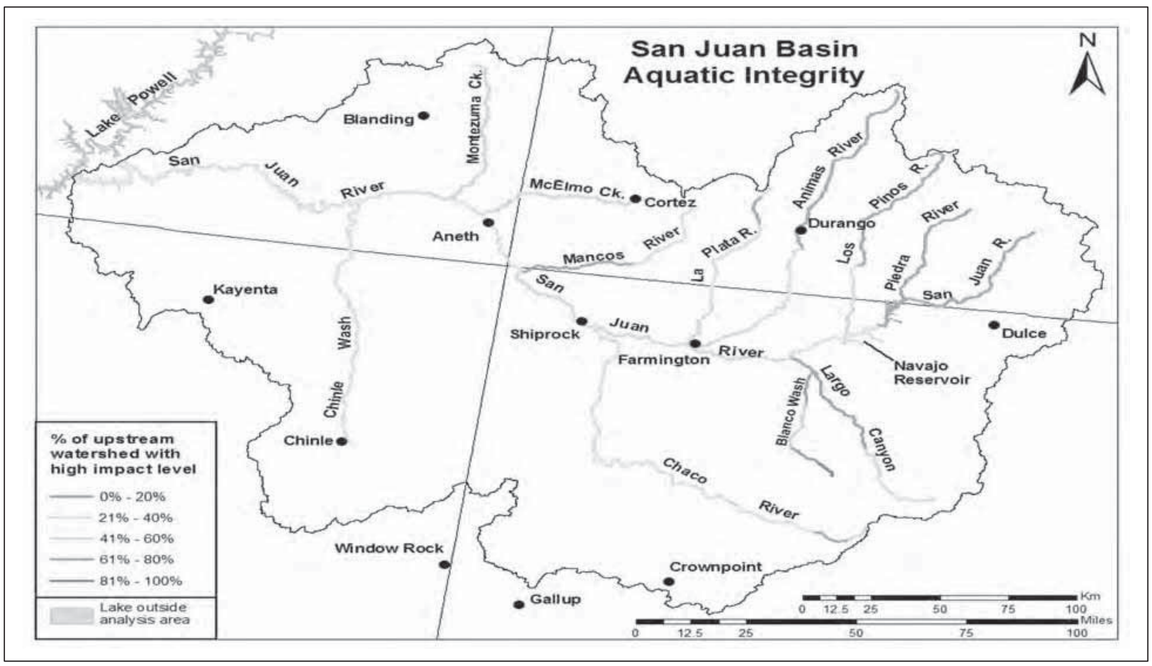



Figure 13. San Juan River Basin aquatic integrity ranking by the Nature Conservancy (2013).

Service (USFWS 2011a, 2012c) reviews of threats to endangered fishes identify potential contaminants, including pesticides and other pollutants as potentially affecting Colorado pikeminnow and razorback sucker critical habitat. Pesticide concentrations generally were low and varied seasonally and across land uses (Blanchard et al. 1993; Thomas et al. 1998,1999). Thomas et al. (1998, 1999); Simpson and Lusk (1999); Hinck et al. (2006); Osmundson and Lusk (2011); AECOM 2013; and EPRI (2014) identified mercury or selenium as moderately elevated contaminants of concern in biota and fish tissues collected from the San Juan River Basin.

The concentrations of Hg and Se in fish and wildlife tissues are the most relevant to the understanding of effects to endangered fishes or birds (Hamilton and Lemly; USEPA 2014). We used tissue and dietary concentrations as the foundation of our effects analysis below, rather than focusing entirely upon Hg and Se concentrations in air or water. However, Hg and Se in water are discussed as they are part of the PCEs of critical habitat ("water of sufficient quality). Concentrations of Hg and Se in different type of tissues (e.g., muscle, whole body, eggs) are relevant to different types and magnitudes of physiological effects. We begin with a discussion of various conversions of Hg and Se concentrations in one type of tissue to other types of tissues provided below.

Conversion of Hg or Se in Fish or Wildlife Tissues from a Dry Weight to a Wet Weight Basis

Biologists and chemists often measure, quantitate, and interpret environmental contaminants (e.g., Hg, Se, pesticides, etc.) in fish and wildlife tissues (Keith 1996). Because the main component of fish tissue is water, the moisture content of fish tissues is often determined from samples that are analyzed for environmental contaminants. Samples are weighed fresh, oven or freeze dried and weighed again. Moisture content as a percent is calculated from the wet and dry weights of the samples. Thereafter, contaminant data in fish tissues can be reported in either dry weight (DW) or wet weight (WW) concentrations and are so indicated in this BO. Using Equation (1), DW concentrations of contaminants in fish and wildlife tissues were converted into WW concentrations using Equation 1 (or solved for DW to convert to WW concentrations):

$$WW = DW \times [1 - (\text{percent sample moisture}/100)] \qquad \text{Equation (1)}$$

Conversion of Hg in Fish Muscle Tissue to Hg in Whole Body Fish

Since Hg accumulates in fish muscle, rather than fat, skin, or organs, the manner in which fish samples are analyzed may affect the reported concentrations (USEPA 2000). Using whole fish samples will generally give a reduced Hg concentration, relative to muscle tissues (fillets), due to a dilution effect from lower concentrations in non-fillet portions of the fish (Peterson et al. 2005). Sampling of fish to determine Hg concentration is a routine part of many environmental studies and traditionally requires that numerous fish be killed to acquire sufficient tissue volume for analysis (Baker et al. 2004). Methods of Hg detection in fish tissue have improved over time (Cizdzeil et al. 2002). As regulatory authorities are reluctant to permit destructive sampling of numerous rare or endangered fish species, there was a need for wide-scale application of nonlethal techniques that could reliably measure Hg concentrations in fish muscle over time (Waddell and May 1995; Baker et al. 2004; Osmundson et al. 2010).

Several studies have reported relationships between concentrations of Hg or Se measured in biopsied muscle plugs (and fillets) collected from fish and concentrations in similar whole body fish (Waddell and May 1995; Buhl and Hamilton 2000; Osmundson et al. 2000; Baker et al. 2004; Hamilton et al. 2005; Peterson et al. 2005; GEI Inc. et al. 2008; Osmundson and Skorupa 2011; USEPA 2004, 2014). After review, we used the following equations to extrapolate between Hg or Se in muscle (MP), in egg/ovary (EO) tissues, or in whole body (WB) fish.

Colorado Pikeminnow Tissue Conversions:

$$\text{WB Hg WW} = 10^{\wedge}(-0.2387+(0.9048*\text{Log}_{10}(\text{MP Hg WW}))) \quad \text{Equation (2)}$$
(Source: Peterson et al. 2005 for Northern Pikeminnow (*Ptychocheilus oregonensis*)

$$\text{EO Se DW} = \exp(0.8150 + (0.9384*\text{Ln}(\text{MP Se DW}))) \quad \text{Equation (3)}$$
(Osmundson and Skorupa 2011 for prespawn Roundtail Chub (*Gila robusta*)

$$\text{EO Se DW} = 2.04*(\text{MP Se DW}) \quad \text{Alternate Equation (4)}$$
(USEPA 2014 for all Roundtail Chub)

$$\text{EO Se DW} = -3.412 + (5.049*(\text{MP Se DW})) \quad \text{Alternate Equation (5)}$$
(Buhl and Hamilton 2000 for Colorado pikeminnow)

Razorback Sucker Tissue Conversions:

$$\text{WB Hg WW} = 10^{\wedge}(-0.3203+(0.9048*\text{Log}_{10}(\text{MP Hg WW}))) \quad \text{Equation (6)}$$
(Source: Peterson et al. 2005 for White Sucker)

$$\text{EO Se DW} = -1.51 + (2.66*(\text{MP Se DW})) \quad \text{Equation (7)}$$
(Hamilton et al. 2005 for Razorback sucker)

$$\text{EO Se DW} = 1.12*(\text{MP Se DW}) \quad \text{Alternate Equation (8)}$$
(USEPA 2014 for Razorback sucker)

Conversions Used For All Fishes:

$$\text{WB Se DW} = \exp(0.1331 + (0.8937*\ln(\text{MP Se DW}))) \quad \text{Equation (9)}$$
(Source: USEPA 2004 for all fishes)

$$\text{Percent Egg/Early Life Stage Survival} = 100*(0.8981 - (0.011*(\text{EO Se DW})) \quad \text{Equation (10)}$$
(Source: derived for this BO, see below and Lusk 2015)

$$\text{Dietary selenium toxicity to larval fish} = (e^{\wedge}(10.0768+(-7.5758)*\text{Ln}(\text{dietary Se DW}) / (1+ e^{\wedge}(10.0768 +(-7.5758)*\text{Ln}(\text{dietary Se DW})))*100 \quad \text{Equation (11)}$$
(Source: derived for this BO, see below and Lusk 2015)

***Mercury***

Once atmospheric Hg is deposited to land or water, it can be converted into a biologically available form, methylmercury (MeHg), through a methylation process by bacteria mostly in wetlands and anoxic conditions (USEPA 1997, Lorey 2001, Wiener et al. 2007; EPRI 2014). The biological uptake of Hg is also exceedingly complex, but generally, MeHg enters an aquatic food chain involving plants, zooplankton and benthos, herbivorous fish, and then carnivorous fish (Potter et al. 1975, Grieb et al. 1990, EPA 1997, UNEP 2002). Uptake of MeHg by aquatic organisms is both more rapid and more extensive than uptake of inorganic Hg (Biesinger et al. 1982, EPA 1997), and uptake of MeHg differs from inorganic Hg. Toxicologically, MeHg bioaccumulates in food chains, and particularly in aquatic food chains, meaning that organisms exposed to MeHg in their food can build up concentrations that are many times higher than ambient concentrations in the environment. Atmospheric Hg deposition, and subsequent overland transport, is the predominant pathway delivering Hg to aquatic systems and into fish tissues (Downs et al. 1998; Cocca 2001; Bullock 2005; USEPA 2005; Engstrom 2007; Harris et al. 2007), including into the endangered fish tissues of the San Juan River Basin (EPRI 2014).

*Current Hg Deposition in the San Juan River Basin*

Sather et al. (2013) measured the atmospheric deposition of Hg at various stations within San Juan River Basin. Sather et al. (2013) reported Hg deposition at Mesa Verde National Park to range from 14.6 to 19.2 Hg $g/m^2$, which comports with modeled estimates of EPRI (2014) of ~20.3 Hg $g/m^2$. Sather et al. (2013) described the regional data pattern of Hg deposition recorded at five other sites within the San Juan River Basin and found them strongly correlated suggesting that many locations within the basin are similarly impacted by the same regional/natural/global Hg emission sources. Results of the National Atmospheric Deposition Program - Mercury Deposition Network show total mercury concentrations in dry deposition and/or precipitation at Mesa Verde National Park in the San Juan River Basin are among the highest measured in the United States (Weidner 2007; Sather et al. 2013). Weidner (2007) identified a majority high deposition samples measured at Mesa Verde National Park have trajectories that trace back to within 50 km of the FCPP and SJGS, which supports the theory that air masses passing from near these coal-fired power plants are contributing to Hg deposition in the San Juan River Basin. Sather et al. (2013) also used back trajectory analysis and reported fewer air masses passing near the FCPP during 2009 to 2011.

The USEPA (through contractor ISC, International 2008) reported that in 2001, 712 kilograms (kg) (~1,569 lbs) per year of Hg were deposited into the San Juan River Basin. Sources of that Hg deposition in the basin were attributed to the global pool of Hg (95.8 percent), followed by other sources (1.8 percent), the SJGS (1.8 percent), FCPP (1.0 percent), and Mexico (0.6 percent). Recently, two local coal-fired power plants (SJGS and FCPP) have reduced their Hg emissions approximately 66 percent, while other sources have or are likely to increase (EPRI 2014, p 9-7) (OSMRE 2014a,b). Deposition of Hg into the San Juan River Basin currently ranges from 13.9 to 16.5 ug/m2 at various locations within the basin (Figure 14). Source contributions to Hg Deposition at Shiprock, New Mexico, is approximately 16.5 ug/m2-yr, with 78 percent coming from the global pool, 15 percent coming from sources in China, 2 percent coming from other sources in the USA, and up to 5 percent coming from the three local coal-fired power plants (SJGS, FCPP, and NGS) combined (EPRI 2014).

The EPRI (2014) model predicts gradually rising Hg concentrations in water and fish tissue because the San Juan River Basin has not yet reached equilibrium with the rate of atmospheric Hg deposition the Basin will continue to receive in the foreseeable future. Modeled reductions in Hg emissions (with concordant changes in Hg deposition, transport, methylation, and bioaccumulation) never exceed a 0.2 percent reduction in adult Colorado pikeminnow tissue burdens within the 85-year model simulation period (EPRI 2014).

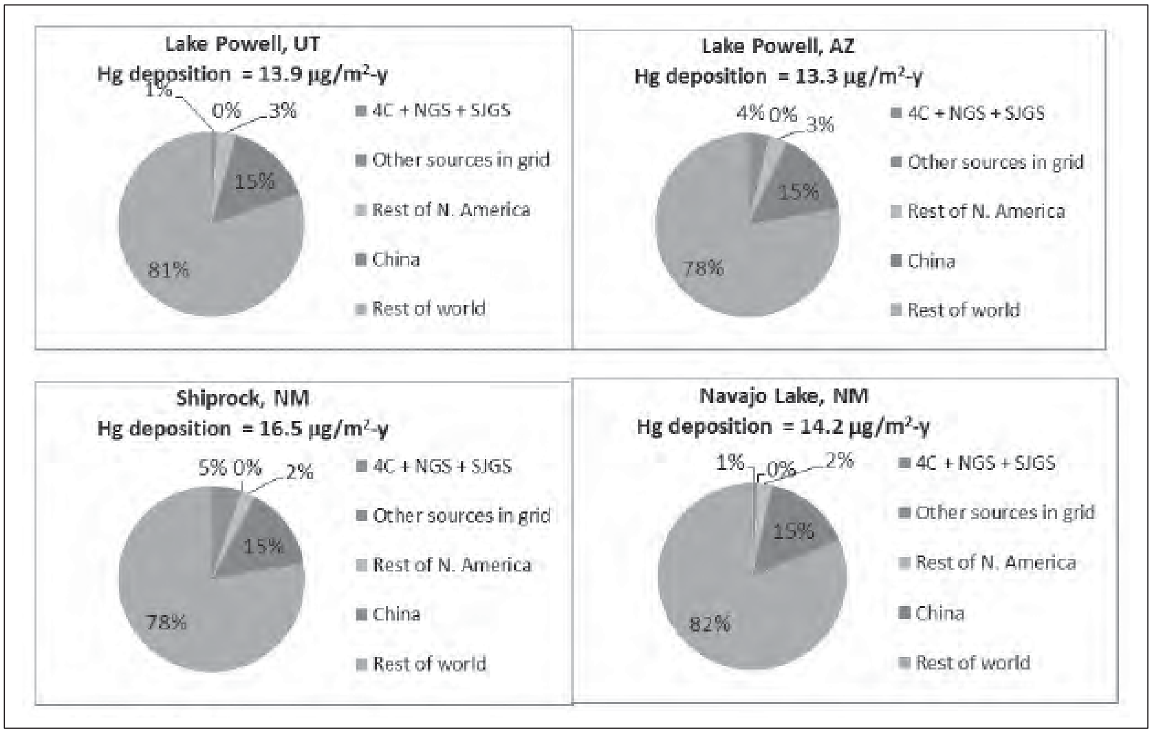



Figure 14. Source contributions to current Hg deposition at selected location in the San Juan River Basin and at Glen Canyon Dam at Lake Powell in Arizona (EPRI 2014).

*Mercury Concentrations in Surface Waters, Sediments, and Invertebrates*

The available in-stream Hg concentration data were of questionable integrity for the San Juan River Basin during the time period of this study (EPRI 2014). A search of the literature, the USEPA STORET database, and the USGS NWIS database resulted in data that were either unverifiable, unreasonably high, or non-existent (EPRI 2014). Additionally, because the San Juan River Basin is so large, Hg loading endpoints were based on flow, other water quality data at various USGS gages: (potentially Archuleta, Farmington, Shiprock, Bluff near Mexican Hat, UT) and fish tissue data (EPRI 2014). Using modeling, EPRI (2014) estimated Hg concentrations ranging from 0.0005 to 0.012 ug/L in San Juan River Basin (Figure 15). Using an alternative modeling approach, AECOM (2014) estimated that maximum Hg (as HgCl) concentration in water at 0.4 ug/L.

The average Hg concentration in (converted) whole body Colorado pikeminnow greater than 400 mm in TL was 0.26 mg/kg WW (n=5; 0.2 to 0.4 mg/kg WW). Using the Bioaccumulation Factors (BAFs) for trophic level 4 fish of 3,530 (described in the BA, OSMRE 2014b) or 53,000 (described by USEPA 1997, 2002) we back calculate the total Hg concentration of (0.07 ug/L using OSMRE 2014b BAF) or 0.005 ug/L (using USEPA 1997, 2002 BAF) and therefore, find the EPRI (2014) model estimated total Hg concentration in water is reasonable and would be approximated by the orange-colored line category (~5 ng/L) in Figure 15.

AECOM (2014) estimated a maximum Hg concentration of 0.02 mg/kg DW in San Juan River Basin sediment. Nydick (2008) reported Hg concentrations in sediment collected from the Los Pinos River Basin (in Colorado) ranging from less than 0.010 to 0.08 mg/kg DW. Nydick and Wright (2008) also collected sediment cores from several lake bottoms in southwestern Colorado to demonstrate a clear increase in mercury deposition in the 1960s and 1970s and then some lakes sediment Hg declined in the 1990s. Nydick (2008) attributed that decline partly to reduced erosion and sedimentation rates as Hg concentrations appeared relatively stable in the 1990s.

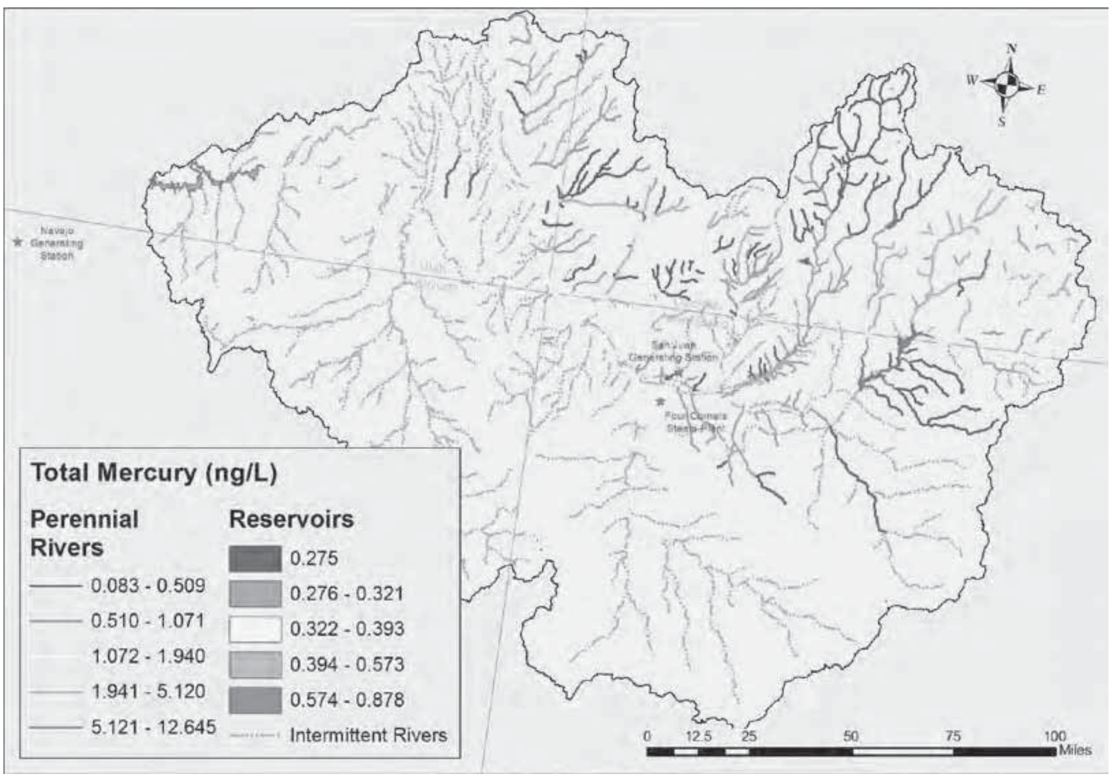



Figure 15. Estimated total Hg concentrations in San Juan River Basin waters (EPRI 2014).

Simpson and Lusk (1999) reported a geometric mean Hg concentration 0.06 mg/kg DW in 86 invertebrate samples collected in the San Juan River Basin. AECOM (2014) using similar data reported a maximum concentration in benthic and aquatic invertebrates ranging from 0.03 to 0.04 mg/kg DW. Invertebrates accumulate and partition Hg in tissues similar to the trends exhibited by fish (Fowler 1978; Riisgard and Famme 1986; Saouter et al. 1991; Saouter et al. 1993. This wide variation of Hg content in invertebrates is most likely a function of different feeding strategies (and trophic levels) and different environmental exposures.

*Mercury concentrations in Endangered Fish and Listed Birds*

Osmundson and Lusk (2011) reported on the collection, locations, methods, chemical analyses, laboratory quality assurance and quality control, and interpretation of Hg and Se in Colorado pikeminnow from Upper Colorado River Basins, including from the San Juan River during 2008-2009. Similarly, the collection, analysis of Se, and results for razorback sucker from the San Juan River were also evaluated from 2008-2009. The Hg and Se in Colorado pikeminnow muscle tissues collected from the San Juan, Green, Upper Colorado, White, and Yampa Rivers are summarized in Table 4. Mercury and Se in Razorback sucker muscle tissues collected from the San Juan River are also provided in Table 4. As piscivorous fish size is strongly related to Hg levels (Hope 2003; Peterson et al. 2007), we assumed that the lower average Hg concentrations in Colorado pikeminnow from San Juan River were related to the small sizes of the fish collected (Osmundson and Lusk 2011).

Table 3. Average and range of mercury (Hg mg/kg WW) and selenium (Se mg/kg WW) in Colorado pikeminnow and Razorback sucker muscle tissues from San Juan River and from other Upper Colorado River Basins 2008-2009 (Osmundson and Lusk 2011).

| River Basin and Species | Average Hg in Muscle Tissue (min - max) | Average Se in Muscle Tissue (min - max) |
|---|---|---|
| San Juan River Colorado pikeminnow > 400 mm TL | 0.37 (0.31 - 0.43) | 0.8 (0.6 – 0.9) |
| San Juan River Razorback sucker > 400 mm TL | 0.12 (0.04 – 0.24) | 0.8 (0.4 – 1.4) |
| Middle Green River Colorado pikeminnow | 0.77 (0.68 - 0.87) | 1.0 (0.9 – 1.1) |
| Upper Colorado River Colorado pikeminnow | 0.60 (0.31 – 1.04) | 1.9 (0.9 – 2.2) |
| White River Colorado pikeminnow | 0.95 (0.43 – 1.83) | 0.9 (0.6 – 1.2) |
| Yampa River Colorado pikeminnow | 0.49 (0.44 – 0.53) | 0.6 (0.4 – 0.7) |

<u>Estimation of Hg in Muscle Tissue and Whole Body fish by Age and Size (Total Length)</u>

Although there was variation in Hg in Colorado pikeminnow muscle tissues collected from different rivers within the Upper Colorado River Basin, based on Peterson et al. (2005, 2007) we assumed that the majority of the variation was strongly related to pikeminnow size. We used all Colorado pikeminnow Hg in muscle tissue data from all the Upper Colorado River Basins to describe the relationship between Hg in (converted) whole body by total length (TL) using a sigmoidal (fitted) model (Figure 16). The equation for the sigmoidal model of Colorado pikeminnow whole body Hg (mg/kg WW) by their size (TL in millimeters (mm)) is:

WB Hg WW = e^(-6.5 + 5.6/(1+10^((226.5 – TL)*0.00415))) Equation (11)
(Sources: Miller 2014, Attachment A; ERM 2014a; Osmundson and Lusk 2011)

Therefore, Hg concentrations (Hg mg/kg WW) in Colorado pikeminnow whole body and muscle tissue expected in the San Juan River Basin by their size (in increments), are provided in Table 4. Actual Hg concentrations in muscle tissues collected from Colorado pikeminnow are equivalent (Osmundson and Lusk 2011).

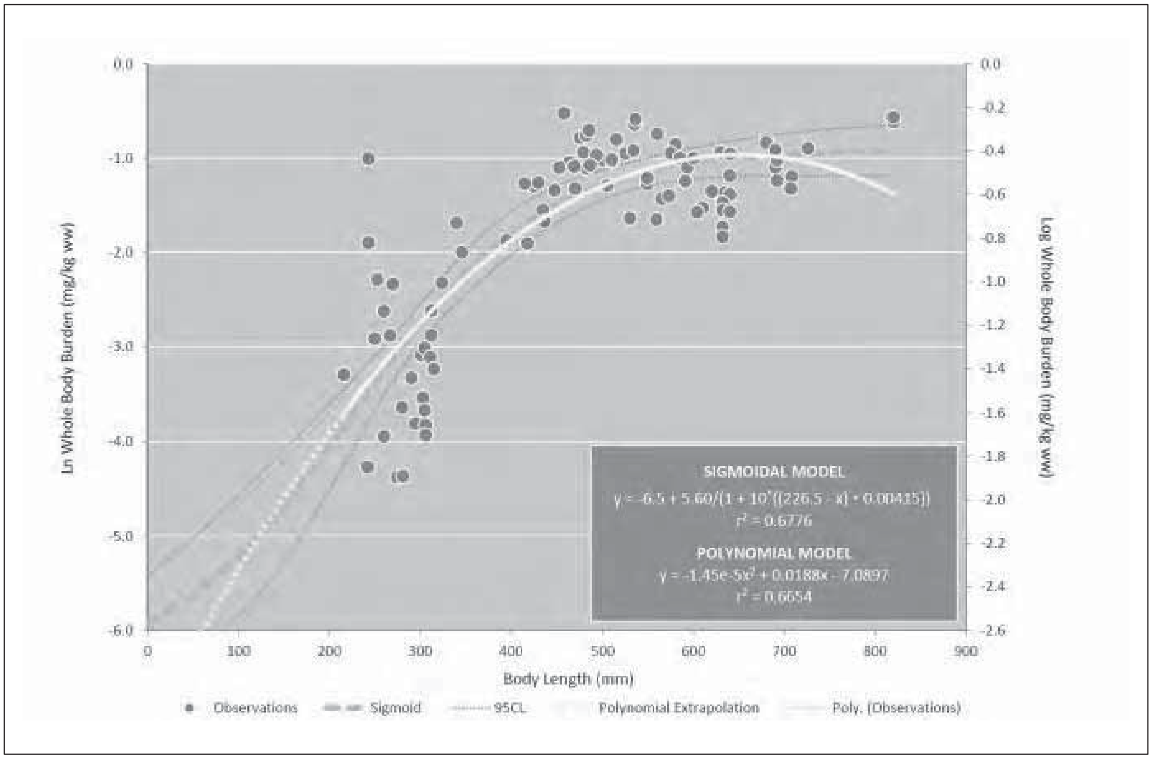



Figure 16. Relationship of Colorado pikeminnow total length and whole body Hg (mg/kg WW). (Source: ERM 2014).

Table 4. Modeled Mercury (Hg mg/kg WW) in Muscle and Whole Body (WB) in San Juan River Colorado Pikeminnow (CPM) by Total Length (TL in mm) using Equations 2 and 11.

| CPM TL > | 50 | 150 | 200 | 250 | 300 | 350 | 400 | 450 | 550 | 650 | 750 | 850 | 950 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Muscle (mg/kg WW) | 0.006 | 0.011 | 0.028 | 0.038 | 0.08 | 0.16 | 0.26 | 0.35 | 0.52 | 0.61 | 0.65 | 0.67 | 0.68 |
| WB Hg mg/kg WW | 0.004 | 0.01 | 0.02 | 0.03 | 0.06 | 0.11 | 0.17 | 0.22 | 0.32 | 0.37 | 0.39 | 0.40 | 0.40 |

EPRI (2014) also spatially modeled the current, whole body Hg concentrations (mg/kg WW) in smaller (less than 400 mm TL; Figure 17) and larger (greater than 400 mm TL; Figure 18) Colorado pikeminnows and in larger razorback suckers (greater than 400 mm TL) in the San Juan River Basin. Hg concentrations in Colorado pikeminnow muscle tissues were used to calibrate the EPRI (2014) modeled concentrations.

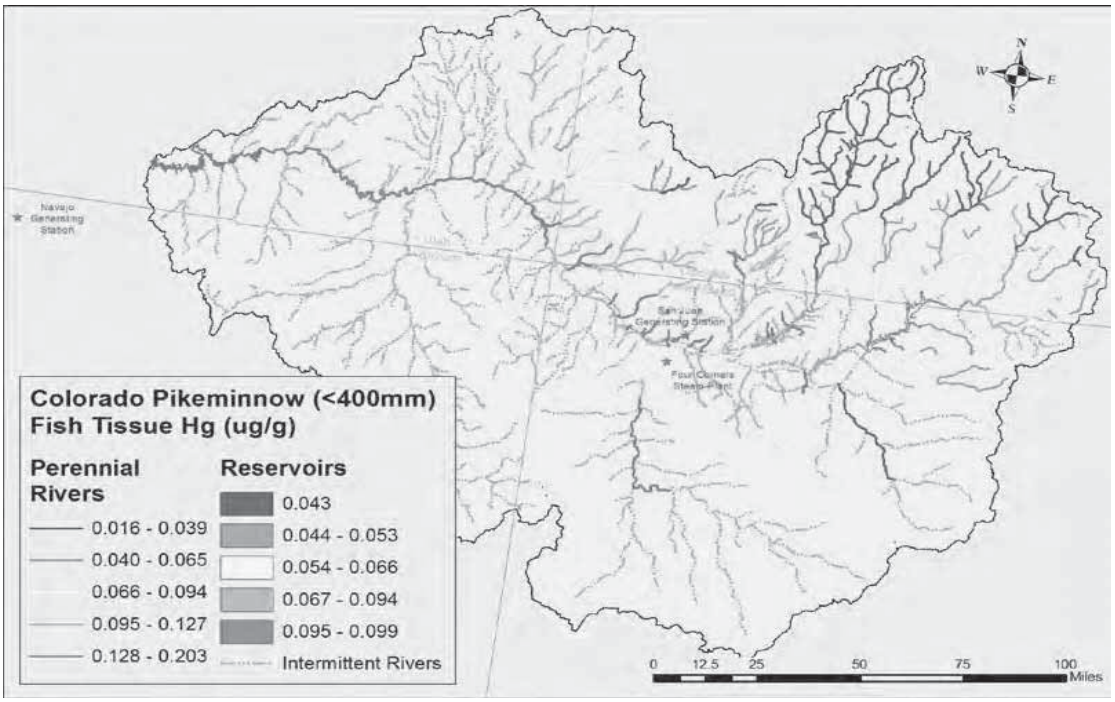



Figure 17. Current Hg concentrations (mg/kg WW) in small whole body Colorado pikeminnow in the action area as modeled by EPRI (2014) (Note change in color scale in Figures 17 and 18).

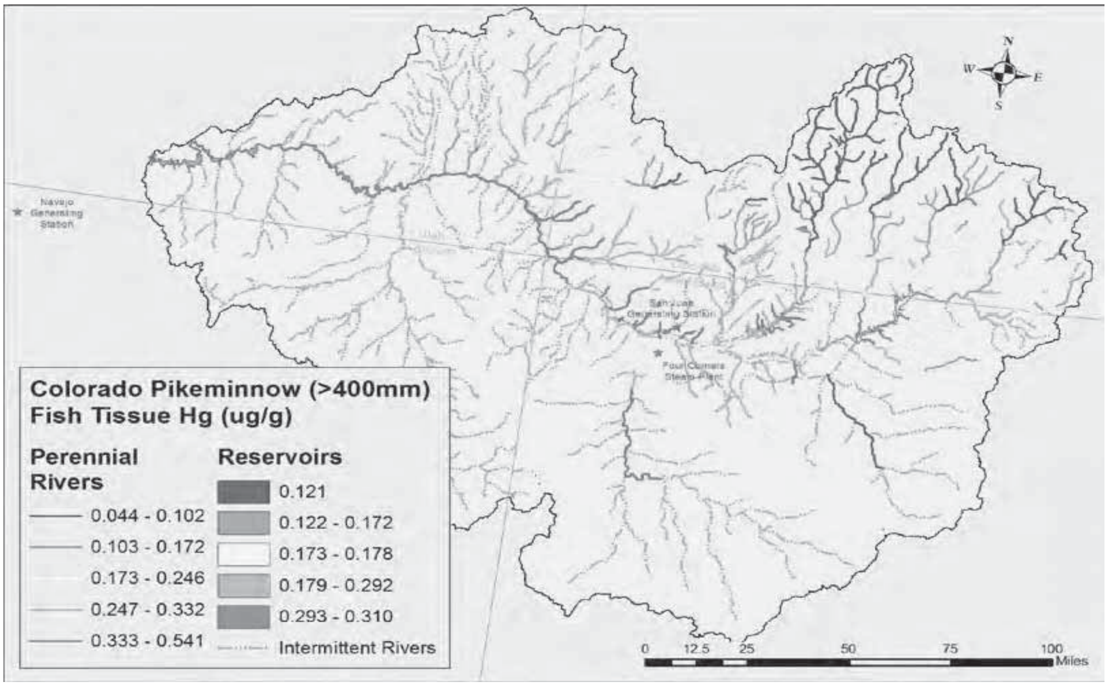



Figure 18. Current Hg concentrations (mg/kg WW) in large whole body Colorado pikeminnow in the action area as modeled by EPRI (2014) (Note change in color scale in Figures 17-18).

Estimation of Hg in Whole Body Colorado Pikeminnow by Size an Over Time

EPRI (2014; including subcontractors ENVIRON and Systech Water Resources, Inc.) assessed the trace metal atmospheric emissions and their aquatic impacts in the San Juan River Basin. Three coal-fired power plants, FCPP, the Navajo Generating Station (NGS), and San Juan Generating Station (SJGS), are located in the San Juan River Basin. EPRI (2014) specifically modeled their Hg deposition within the San Juan River Basin. EPRI's (2014) modeling study tracked the contributions of Hg and Se (and arsenic) emissions from the three coal-fired power plants as well as other sources to model the atmospheric Hg deposition in the basin, near the facilities, as well as model their long-term impact on Hg and Se in surface water and fish tissue. EPRI's (2014) modeling assessment was critical to the understanding of Hg and Se cycling in the San Juan River Basin, and the results are summarized here, but it and all assumptions and uncertainty associated with this analysis is incorporated here by reference.

EPRI (2014) used a meteorological model to produce five years of meteorological outputs to drive the regional/local-scale air quality modeling at a four km horizontal grid resolution. The five-year period was modeled to address inter-annual variability of meteorological fields, such as winds, temperature, and precipitation that affect the deposition of atmospheric pollutants. The worldwide emissions, chemical transformations, dispersion and wet and dry deposition of atmospheric Hg was simulated using an advanced multi-scale modeling system comprising the

GEOS-Chem model (applied globally), the continental CMAQ model (applied over the United States) and regional/local CMAQ-APT model (applied over the approximate extent of the San Juan River Basin). Atmospheric model simulations were conducted over the basin for each of the five years of meteorology for four emissions scenarios: a baseline scenario reflecting the status quo, a 2016 scenario (reflecting a post-MATS scenario), a 2050 case with a lower bound on China Hg emissions and a 2050 case with a higher bound on China Hg emissions. Model simulations included the tagging of Hg from various worldwide source categories to identify relative contributions of these categories.

For the baseline scenario (that is, the current conditions), the FCPP contributions to total Hg deposition near the facility ranged from 2 percent to a maximum of 28 percent southeast of the FCPP. Over the remainder of the San Juan River Basin, FCPP contributions are less than 2 percent. Baseline contributions of Hg emissions from sources outside the United States to Hg deposition in the San Juan River Basin range from 70 percent to 98 percent. Hg emissions from China contribute from 13 to 16 percent to Hg deposition in the San Juan River Basin in the post-2016 baseline (i.e., the baseline 2050 scenario with a medium estimate of China Hg emissions). In the high estimate of China emissions scenario, the range of China Hg contributions to total Hg deposition ranged from 16 percent to 19 percent. In the low estimate of China emissions scenario, in which emissions of elemental Hg decrease compared to the baseline case, the China Hg contributions to Hg deposition in the San Juan River Basin range from 9 percent to 12 percent, a reduction of about 4 percent compared to the medium China, post-2016 scenario.

Hg deposition contributions were calculated at selected receptor locations: including Lake Powell below the San Juan River in Utah, the San Juan River at Shiprock, New Mexico, and Navajo Lake near the Colorado-New Mexico border. At the Lake Powell location, the three coal-fired power plants contribute about 4 percent to total Hg deposition in the baseline case, and other North American emissions contribute about 3 percent. The remainder is attributed to sources outside North America, with 15 percent coming from China sources and 78 percent from the global pool. At the Shiprock location, contributions to Hg deposition from China Hg emissions and other sources outside North America were the similar. The contribution of the three coal-fired power plants is about 5 percent, while Hg emissions from the rest of North America contribute about 2 percent.

The wet and dry Hg deposition predictions from the atmospheric modeling in various model scenarios were linked with the watershed modeling system through various temporal and spatial transformations. The results of the tagged Hg and Se simulations were used to construct past, present and future deposition records for the watershed scenarios from 1990 to 2074. The model WARMF (Watershed Analysis Risk Management Framework) was used by EPRI (2014) to simulate Hg and Se concentrations in each catchment, river segment, and reservoir in the San Juan River Basin for each day of the simulation period. By combining other outputs of WARMF, the model provided useful information about the origin of pollutants to augment the understanding of the watershed system and assisted development of management alternatives.

The atmospheric model was linked to the WARMF model that provided Hg and Se inputs to the San Juan River Basin including atmospheric deposition, mineral weathering, irrigation, inflow from the land, inflow from upstream rivers and reservoirs, point sources, production by chemical

reaction, and re-suspension from riverbeds (EPRI 2014). Outputs of Hg and Se by outflow to surface water via surface or subsurface flow, settling to the river/reservoir beds, diversion, and decay by chemical reactions were also estimated by EPRI (2104
EPRI (2014) used a plume-in-grid approach to represent the behavior of reactive plumes in the atmosphere from point and other sources as well as meteorology as model inputs to produce spatially detailed atmospheric deposition to the land surface of the San Juan River Basin as an output. The atmospheric model to watershed analysis linkage was upgraded to allow the atmospheric output to be modeled as deposition amounts within grid points rather than concentrations and deposition velocities. The grid cells are lined up with the WARMF catchment and lake boundaries to determine the area of overlap. Deposition to each river catchment and at area lakes was calculated with an area-weighted average.

For EPRI (2014) modeled Hg deposition in the San Juan River Basin, the effect of high and low Chinese emissions clearly had the largest impact, altering the deposition by 3.5 and 5 percent respectively. The removal of FCPP had a clear but lesser effect, reducing Hg deposition by 0.68 percent before 2014 and about 0.35 percent after 2016 (after 3 units are shut down, with 2 units remaining active and emitting approximately 102 lbs Hg/year). WARMF scenario simulations generated time series outputs of fish tissue Hg concentrations and water column concentrations for Se and a wide range of chemical species. Examples of these output time series plotted and depicted in Figures 5, 17 through 20, and 22, for locations within the San Juan River Basin. AECOM (2014) identified pathways of Hg and Se accumulation in endangered fish, listed birds and their prey (Figure 21).

EPRI (2014) generated daily average Hg concentrations in large (>400 mm TL) and small (<400 mm TL) Colorado pikeminnow with large seasonal variations, including maximum Hg accumulation during fall and winter at several locations within the San Juan River Basin (Figure 22). For this BO, we averaged the maximum annual Hg concentrations in whole fish from model runs from two locations on the San Juan River (above Lake Powell in Utah and near Shiprock, New Mexico) in order to characterize annual Hg concentrations in endangered fish over time. The Hg concentrations in whole body Colorado pikeminnow by different sizes and over time are summarized in Tables 5 and 6. We used information on annual Hg accumulation in whole body Colorado pikeminnow by size and time to estimate age- and size-specific Hg body burdens that are associated with adverse effects, based on toxicological studies, and to compare EPRI's different APS scenarios over time (Figure 23; Table 7). Note that because Colorado pikeminnow were collected and analyzed in 2009 (Osmundson and Lusk 201) the year 2009 established the baseline to which additional Hg deposition accumulation in fish tissue was added or compared.

Estimation of the Type and Magnitude of Effects based on Hg in Whole Body Fish

Colorado pikeminnow and razorback sucker would be exposed to Hg deposition from the rest of the world, particularly sources in China and the global pool of Hg (as well as the proposed action by FCPP) through Hg deposition, runoff into downstream aquatic habitats, and subsequent bioaccumulation through the food chain. Mercury bioaccumulates in endangered fish in the San Juan River and is a potent neurotoxin that affects their fitness and reproductive health (Crump and Trudeau 2009). Once Hg enters the body, it poses the highest threats of toxicity because it can be absorbed into living tissues and blood. Once in the blood it crosses into the brain and accumulates, there is no known way to be expelled from the brain (Gonzalez et al. 2005).

The accumulation of Hg from water occurs via the gill membranes as well as through ingestion (Beckvar 1996; USEPA 1997). MeHg is eventually transferred from the gills to muscle and other tissues where it is retained for long periods of time (Julshamn et al. 1982; Riisgård and Hansen 1990). Probably less than 10 percent of the Hg in fish tissue residues is obtained by direct (gill) uptake from water (Francesconi and Lenanton 1992; Spry and Wiener 1991). Hg taken up with food initially accumulates in the tissues of the posterior intestine of fish (Boudou et al. 1991). Hg ingested in food is transferred from the intestine to other organs including muscle tissues (Boudou et al. 1991). MeHg has been reported to constitute from 70 to 95 percent of the total mercury in skeletal muscle in fish (Huckabee et al. 1979; EPA 1985; Riisgård and Famme 1988; Greib et al. 1990; Spry and Wiener 1991). MeHg accounted for almost all of the Hg in muscle tissue in a wide variety of both freshwater and saltwater fish (Bloom 1992).

Hg in fish tissues can be transferred to ovary and eggs (Beckvar 1996; Wiener and Spry 1996; McKim et al. 1976). Exposure of the parent population to Hg concentrations of 0.03 to 2.93 ug/l in the laboratory resulted in Hg concentrations as high as 2 mg/kg in their embryos (McKim et al. 1976). Other studies reported a maternal burden transfer to eggs ranging from 0.2 to 36 percent (Hammerschmidt et al. 1999; Hammerschmidt and Sandheinrich 2005; Alvarez et al. 2006; Nye et al. 2007). Hatching success and embryonic survival in fish are inversely correlated with Hg concentrations in the egg (Whitney 1991; Dillon et al. 2010; ERM 2014b). Without additional information about the maternal transfer rate of Hg from the adult female to Colorado pikeminnow eggs, we assumed a transfer of 0.2 percent of the adult female whole body burden Hg concentration. Total mercury concentrations in eggs of several species of adult fish from Swedish lakes are much lower than concentrations in other tissues (Lindqvist 1991). Fish (including eggs and larvae) continue take up Hg from the water column and their prey (McKim et al. 1976; Pentreath 1976a; 1976b).

The toxicity of Hg to aquatic organisms is affected by both abiotic and biotic factors including the form of Hg (inorganic versus organic), environmental conditions (e.g., temperature, salinity, and pH), the sensitivity of individual species and life history stages, and the tolerance of individual organisms. Toxicological effects include neurological damage, reproductive impairment, growth inhibition, developmental abnormalities, mortality, and altered behavioral responses (Beckvar 1996, Beckvar et al. 2005, Dillon et al. 2010, ERM 2010a,b). Wiener and Spry (1996) concluded that neurotoxicity seems to be the most probable chronic response of wild adult fishes to Hg exposure, based on observed effects such as incoordination, inability to feed, diminished responsiveness, abnormal movements, lethargy, and brain lesions. In laboratory studies, reproductive endpoints are generally more sensitive than growth or survival, with embryos and the early developmental stages being the most sensitive (Hansen 1989).

Beckvar et al. (2005) reviewed 10 Hg residue-effects publications for fish to identify whole body tissue concentrations of Hg that were of concern to fish. Laboratory dosing studies with fish indicate that ecologically relevant methylmercury exposures can cause significant behavioral, physiological, reproductive, histological changes as well as mortality. Beckvar et al. (2005) associated adverse effects to survival, growth, reproduction, and behavior with whole body Hg concentrations and recommended that greater than 0.2 mg/kg WW Hg. Beckvar et al. (2005) noted that attempts to derive protective tissue residues for fish continue to be hampered by a paucity of high quality, toxicological studies specifically designed to link residues and biological effects and encouraged investigators to conduct studies designed specifically to produce technically sound residue-effect information.

Dillon et al. (2010) reviewed 11 laboratory toxicity studies involving fish. The test endpoints were distilled to a control-normalized response and extrapolated to a percent injury for both early life stages of fish, and juveniles and adult fish. Recently ERM (2014a,b) reviewed 14 Hg residue-effects publications, selected dose-responsive data, and calculated control-normalized response for different life stages of fish and types of injury (e.g., reproductive injury, behavioral injury, and survivorship injury).

A comparison of the types of injury identified by Dillon et al. (2010) and by ERM (2014a,b) is also provided in Figure 23. Using Dillon et al (2010), there is comparatively more injury estimated for adults, but the type of injury to adults is not readily identified as to mortality, behavioral injury, or injury to growth. Using ERM (2014a,b), there is comparatively more injury estimated for early life stages and less expected mortality for subadults and adults, but the type of injury to subadults and adults is readily identified as to mortality (survivorship injury), behavioral injury, or reproductive injury. Therefore, we used the effects relationships described by ERM (2014a,b) to estimate the type and magnitude of adverse effects associated with whole body Hg in modeled Colorado pikeminnow and razorback suckers in the San Juan River Basin.

Based on these studies we used:

a. The ERM (2014a, b) injury relationships to estimate magnitude and type of adverse effects to eggs, early life stages, subadult and adult Colorado pikeminnows in the San Juan River based on EPRI (2014) modeled whole body Hg concentrations over time and estimated in eggs as well as estimated mortality associated with behavioral injury (Table 7, Table 8).

b. ERM (2014a, b) estimate the type and magnitude of adverse effects associated with whole body Hg in modeled Colorado pikeminnow and razorback suckers in the San Juan River Basin.

We found that ERM (2014a, b) description of behavioral injury associated with Hg whole body was particularly important. The brain and central nervous system are very sensitive to Hg (ATSDR 1999; USEPA 2001, 2005; Krey et al. 2014). The effects of Hg on the nervous system are primarily the consequence of the reaction of Hg with sulfur atoms of brain proteins, enzymes, and other macromolecules, which detrimentally affects a fish brain's normal function (Rabenstein 1978, Eccles and Annau 1987, Wiener and Spry 1996, ATSDR 1999, Clarkson and Magos 2006, Crump and Trudeau 2009; Berg et al. 2010). MeHg in the brain causes death of cells of the central nervous system (Rabenstein 1978). Because nervous system cells are replenished only during an organism's development, cell death by MeHg in fish may result in permanent brain damage. Thus, nerve cell damage is irreversible and cumulative (Rabenstein 1978, Eccles and Annau 1987, Clarkson and Magos 2006, Crump and Trudeau 2009).

In five studies, trout, striped bass, and walleye were fed methylmercury, and after accumulation and observations for effect, both muscle and brain tissues were analyzed (Scherer et al. 1975, McKim et al. 1976, Niimi and Kissoon 1994, Mason et al. 2000, Cizdziel et al. 2003). Berntssen et al. (2003) identified lesions and impairment of locomotor and feeding activity of Atlantic salmon when brain concentrations were measured at 0.68 mg/kg WW. Using the muscle-to-brain ratio of 0.9, the concentration of Hg in muscle would be approximately 0.75 mg/kg WW, whole body concentration would be 0.45 mg/kg WW, would be associated with brain injuries. MeHg is lipid soluble, allowing rapid penetration of the blood-brain barrier (Feltier et al. 1972, Giblin and Massaro 1973; McKim et al. 1976; Olson et al. 1978; Beijer and Jernelov 1979). Injury to the central nervous system results from accumulation of Hg in the cerebellum and cerebral cortex where it binds tightly to sulfhydryl groups resulting in pathological changes (Sastry and Sharma 1980). Inside the cell, Hg inhibits protein synthesis/RNA synthesis and affects other brain proteins (Yoshino et al. 1966; Chang et al. 1972; Basu et al. 2014).

Furthermore, recent studies have clearly indicated adverse effects of Hg on fish migration and spawning behavior (Basu et al. 2014). Fish have likely provided the most evidence of Hg toxicant-associated neurochemical change (Basu et al. 2014). Many researchers (Fjed et al. 1998; Tanan et al. 2006; Crump and Trudeau 2009; Berg et al. 2010; Farina et al. 2010; Mela et al. 2010; Richetti et al. 2010; and Le Page et al. 2011; Xu et al. 2012) outline associations between Hg exposures and neurochemical changes in fish brains, and also make linkages to adverse effects on fish behavior, endocrine function, visual systems, and reproduction.

Numerous studies have reported on the behavioral effects of mercury exposure to fish. A study by Webber and Haines (2003) provides quantitative estimates of behavioral effects in golden shiner exposed to dietary MeHg at concentrations of 0.012 (control), 0.455, and 0.959 mg/kg mercury under standard laboratory conditions for 90 days. At the end of the exposure period, whole body fish tissue mercury concentrations were 0.041 (control), 0.230, and 0.536 mg/kg WW. No mortality or effects on growth were observed at any dose. Predator-avoidance behavior to a model belted kingfisher was evaluated for multiple behavioral responses. The authors reported statistically significant behavioral impairment for shoal vertical dispersal, time to return to pre-exposure activity, and greater shoal area after return to pre-exposure activity levels for fish with 0.54 mg/kg WW whole body fish tissue Hg concentrations. The authors referred to these responses as hyperactive responses, which can make the prey more easily detected and more easily fatigued. Hyperactive behavioral responses from Hg exposure to fish have also been observed in rainbow trout and largemouth bass (Hartmann 1978; Morgan 1979). Fjeld et al. (1998) reported impaired feeding efficiencies and reduced competitive abilities in 13-day old graylings fed a diet containing MeHg. The resulting whole body concentrations ranged from 0.09 to 3.8 mg/kg WW for the lowest and highest exposure groups. The authors reported statistically significant behavioral effects at concentrations of 0.27 mg/kg WW and higher.

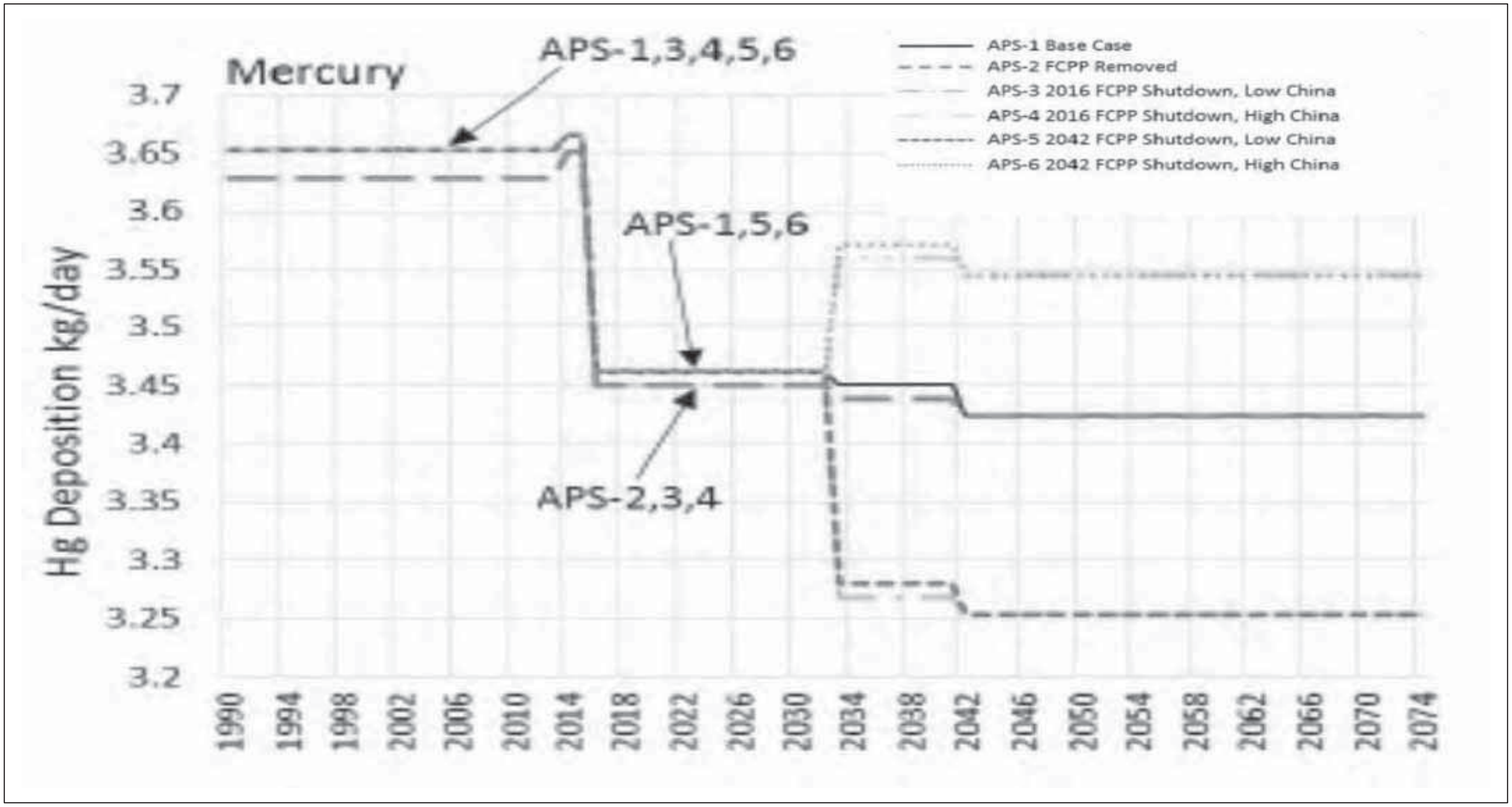



Figure 19. Average atmospheric Hg deposition in the San Juan River Basin over time for various scenarios including with or without the FCPP and low, medium, and high Hg deposition amounts from sources in China (EPRI 2014). (Scenario APS-1; baseline with FCPP operating until 2042 and medium China Hg deposition. Scenario APS-2; baseline with medium China Hg deposition and all FCPP Hg deposition removed. Scenario APS-3; FCPP shutdown in 2016 and low China Hg deposition. Scenario APS-4; FCPP shutdown in 2016 and high China Hg deposition. Scenario APS-5; FCPP shutdown in 2042 and low China Hg deposition. Scenario APS-6; FCPP shutdown in 2042 and high China Hg deposition.).

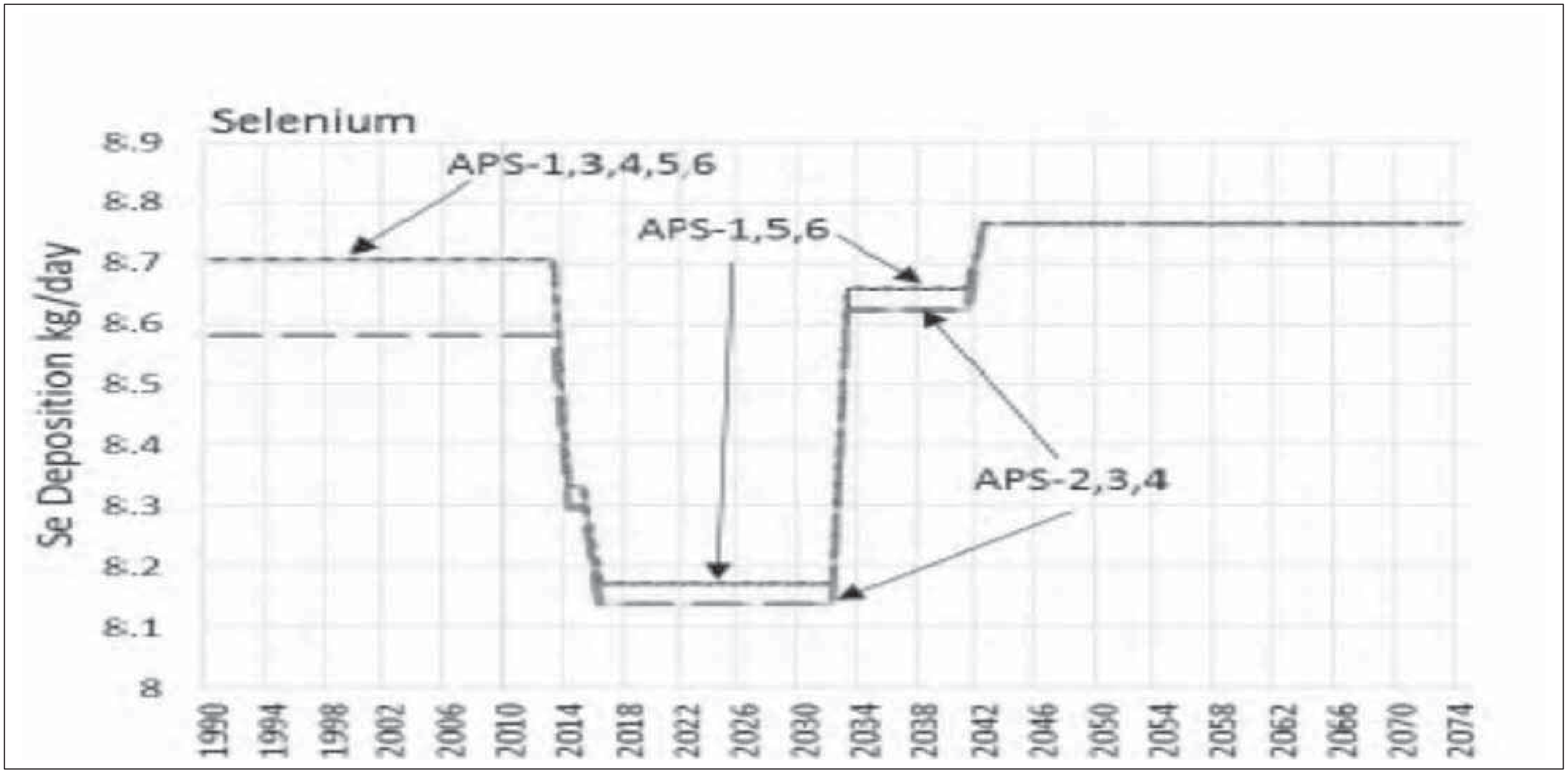



Figure 20. Average atmospheric Se deposition (kg/day) in the San Juan River Basin over time for various scenarios including with or without the FCPP and with low, medium, and high Se deposition amounts from sources in China (EPRI 2014). (Scenario APS-1; baseline with FCPP operating until 2042 and medium China Se deposition. Scenario APS-2; baseline with medium China Se deposition and all FCPP Se deposition removed. Scenario APS-3; FCPP shutdown in 2016 and low China Se deposition. Scenario APS-4; FCPP shutdown in 2016 and high China Se deposition. Scenario APS-5; FCPP shutdown in 2042 and low China Se deposition. Scenario APS-6; FCPP shutdown in 2042 and high China Se deposition. However, note that Se deposition from China was always assumed low and therefore did not change by scenario). (See footnotes in Figure 19 for description of lines).

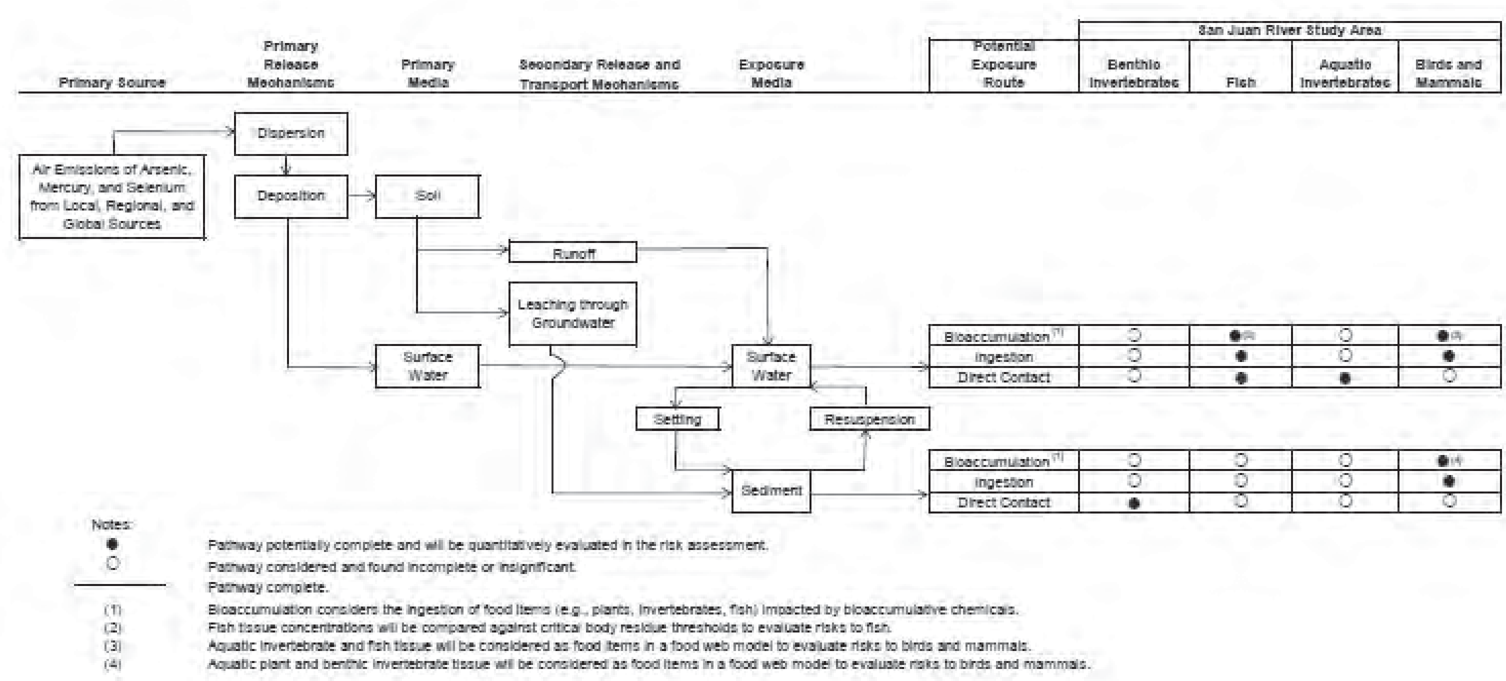



Figure 21. Conceptual exposure model for Hg and Se in the San Juan River Basin and ecological risk assessment (AECOMM 2013).

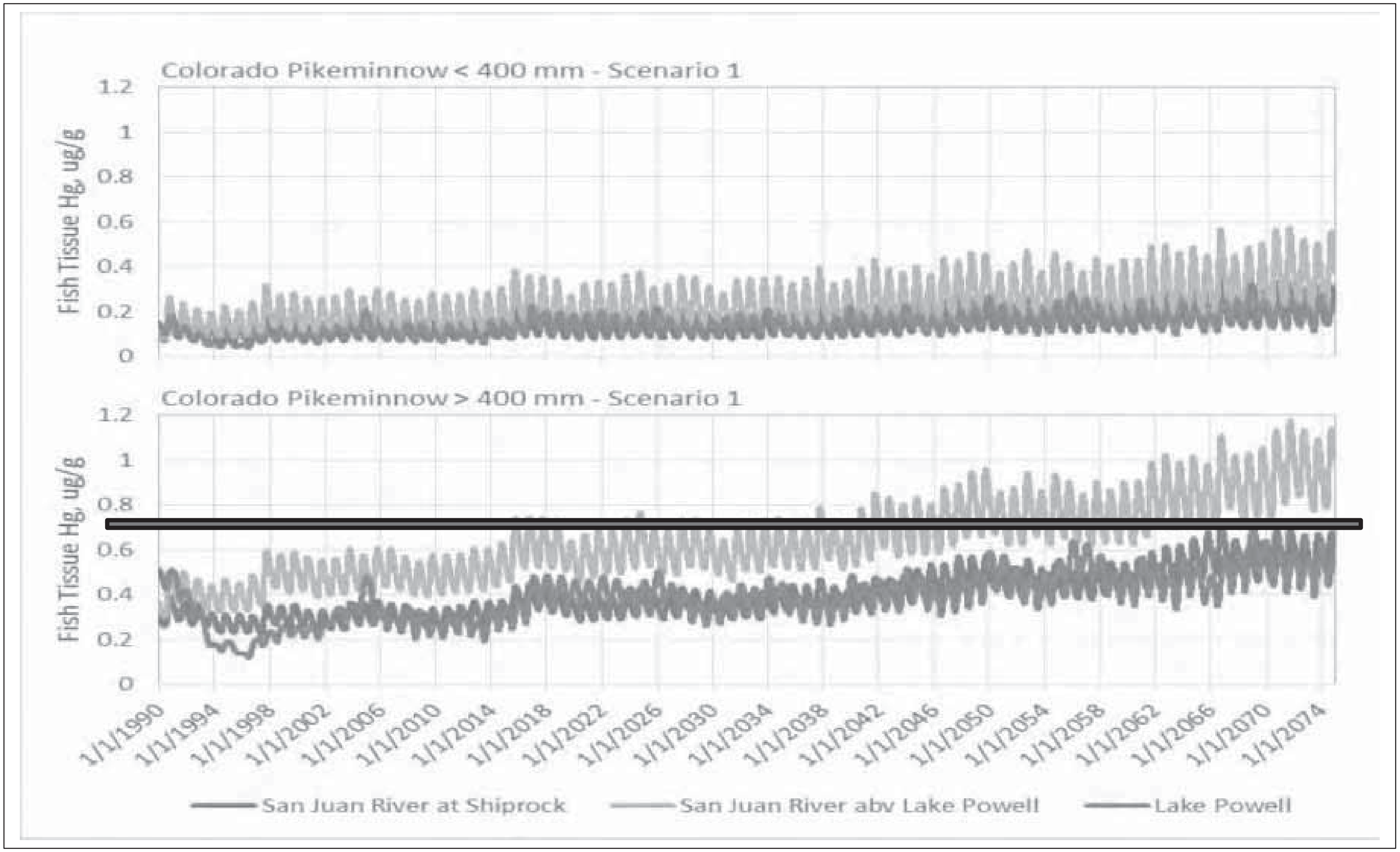



Figure 22. EPRI (2104) modeled annual average mercury concentrations (ug/g WW) in smaller (< 400 mm TL) and larger (>400 mm TL) Colorado pikeminnow at three locations on the San Juan River showing seasonal fluctuation and accumulation in mercury whole body burdens for Scenario 1 (included an estimate of medium range Hg deposition from China and FCPP operation until 2042). (Note black and red line at 0.7 mg/kg WW in whole body Colorado pikeminnow represents Service determination of adverse modification of critical habitat in San Juan River Basin)

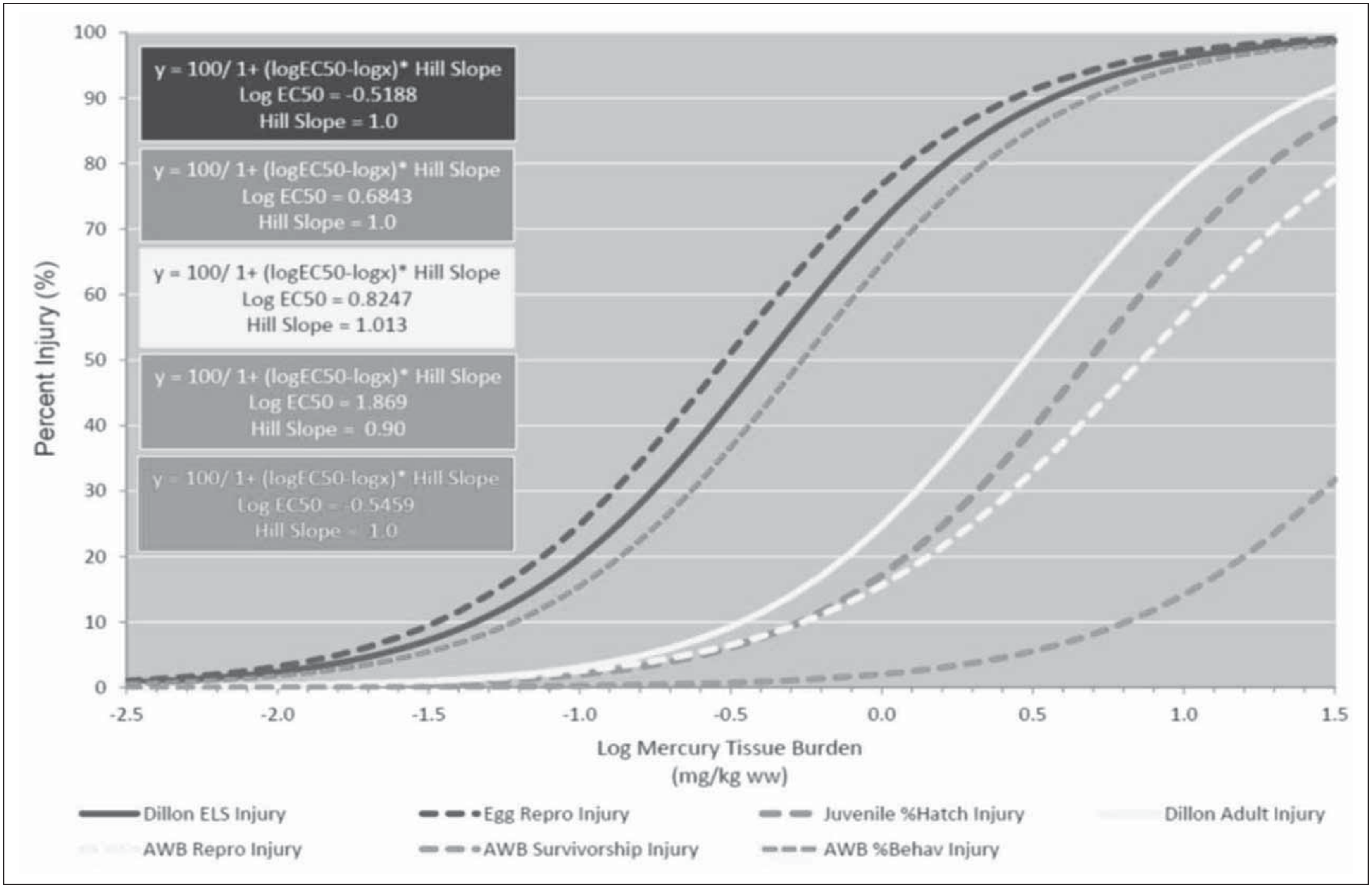



Figure 23. Comparison of Dillon et al. (2010) and ERM (2014b) percent injury relationships with base-10 logarithm of Hg burden (mg/kg WW) in whole body fish.

Table 5. Estimate of Hg concentrations (mg/kg WW) in large, whole body adult (>400 mm TL), smaller (<400 mm TL), and early life stages of Colorado pikeminnow (CPM) in the San Juan River Basin as modeled by EPRI (2014) and extrapolated by the Service to Age Classes based on TL at age. Note: some year's data were omitted for clarity. Egg Hg estimated using 0.2 percent of adult Hg.

| | Average of EPRI (2014) SJR sites | | Hg in Eggs and Early Stages | | Juvenile CPM | Hg in subadult CPM (< 400 mm TL) | | | | | Hg in adult CPM (> 400 mm TL) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Modeled Deposition Year | Max Annual Average Hg in SJR CPM <400 mm whole body based on EPRI 2014 and APS Scenario 1 | Max Annual Average Hg in SJR CPM >400 mm whole body based on EPRI 2014 and APS Scenario 1 | Est Hg in Eggs = 0.2 % Avg Adult Female | Est Hg in Age 0 CPM | Est Hg in Age 1 CPM | Est Hg in Age 2 CPM | Est Hg in Age 3 CPM | Est Hg in Age 4 CPM | Est Hg in Age 5 CPM | Est Hg in Age 6 CPM | Est Hg in Age 7 CPM | Est Hg in Age 8 CPM | Est Hg in Age 9 CPM | Est Hg in Age 10+ CPM |
| 2009 | 0.22 | 0.46 | 0.0008 | 0.004 | 0.008 | 0.024 | 0.073 | 0.169 | 0.287 | 0.391 | 0.36 | 0.40 | 0.43 | 0.44 |
| 2010 | 0.22 | 0.46 | 0.0008 | 0.004 | 0.008 | 0.023 | 0.071 | 0.166 | 0.282 | 0.384 | 0.36 | 0.40 | 0.43 | 0.44 |
| 2015 | 0.30 | 0.59 | 0.0011 | 0.006 | 0.011 | 0.033 | 0.100 | 0.233 | 0.397 | 0.540 | 0.47 | 0.52 | 0.55 | 0.57 |
| 2016 | 0.29 | 0.60 | 0.0011 | 0.006 | 0.011 | 0.031 | 0.094 | 0.220 | 0.374 | 0.508 | 0.48 | 0.53 | 0.56 | 0.58 |
| 2019 | 0.22 | 0.51 | 0.0009 | 0.004 | 0.008 | 0.024 | 0.072 | 0.167 | 0.283 | 0.385 | 0.41 | 0.45 | 0.48 | 0.50 |
| 2020 | 0.25 | 0.52 | 0.0009 | 0.005 | 0.009 | 0.027 | 0.082 | 0.191 | 0.324 | 0.441 | 0.42 | 0.46 | 0.49 | 0.51 |
| 2025 | 0.24 | 0.54 | 0.0010 | 0.005 | 0.009 | 0.026 | 0.078 | 0.182 | 0.310 | 0.422 | 0.43 | 0.48 | 0.51 | 0.53 |
| 2029 | 0.25 | 0.55 | 0.0010 | 0.005 | 0.009 | 0.027 | 0.083 | 0.193 | 0.328 | 0.445 | 0.44 | 0.49 | 0.52 | 0.54 |
| 2030 | 0.22 | 0.51 | 0.0009 | 0.004 | 0.008 | 0.024 | 0.074 | 0.173 | 0.294 | 0.399 | 0.41 | 0.45 | 0.48 | 0.50 |
| 2035 | 0.26 | 0.58 | 0.0010 | 0.005 | 0.010 | 0.029 | 0.087 | 0.203 | 0.345 | 0.469 | 0.46 | 0.51 | 0.54 | 0.56 |
| 2039 | 0.26 | 0.57 | 0.0010 | 0.005 | 0.010 | 0.028 | 0.086 | 0.201 | 0.342 | 0.465 | 0.45 | 0.50 | 0.53 | 0.55 |
| 2040 | 0.30 | 0.62 | 0.0011 | 0.006 | 0.011 | 0.033 | 0.099 | 0.231 | 0.394 | 0.535 | 0.49 | 0.54 | 0.58 | 0.60 |
| 2041 | 0.33 | 0.67 | 0.0012 | 0.006 | 0.012 | 0.036 | 0.109 | 0.254 | 0.432 | 0.587 | 0.53 | 0.59 | 0.62 | 0.64 |
| 2042 | 0.30 | 0.65 | 0.0012 | 0.006 | 0.011 | 0.033 | 0.099 | 0.230 | 0.392 | 0.533 | 0.52 | 0.57 | 0.61 | 0.63 |
| 2043 | 0.30 | 0.64 | 0.0011 | 0.006 | 0.011 | 0.033 | 0.099 | 0.231 | 0.392 | 0.533 | 0.51 | 0.57 | 0.60 | 0.62 |
| 2044 | 0.32 | 0.67 | 0.0012 | 0.006 | 0.012 | 0.035 | 0.107 | 0.248 | 0.422 | 0.574 | 0.53 | 0.59 | 0.63 | 0.65 |
| 2045 | 0.31 | 0.67 | 0.0012 | 0.006 | 0.011 | 0.034 | 0.103 | 0.239 | 0.407 | 0.553 | 0.53 | 0.59 | 0.63 | 0.65 |
| 2049 | 0.36 | 0.77 | 0.0014 | 0.007 | 0.013 | 0.039 | 0.120 | 0.280 | 0.476 | 0.647 | 0.61 | 0.68 | 0.72 | 0.74 |
| 2050 | 0.30 | 0.69 | 0.0012 | 0.006 | 0.011 | 0.032 | 0.098 | 0.229 | 0.389 | 0.529 | 0.55 | 0.61 | 0.65 | 0.67 |
| 2055 | 0.32 | 0.71 | 0.0013 | 0.006 | 0.012 | 0.035 | 0.106 | 0.247 | 0.420 | 0.572 | 0.56 | 0.62 | 0.66 | 0.68 |
| 2059 | 0.34 | 0.72 | 0.0013 | 0.007 | 0.013 | 0.037 | 0.112 | 0.262 | 0.445 | 0.605 | 0.57 | 0.63 | 0.67 | 0.70 |
| 2060 | 0.35 | 0.73 | 0.0013 | 0.007 | 0.013 | 0.038 | 0.115 | 0.268 | 0.457 | 0.621 | 0.58 | 0.64 | 0.68 | 0.71 |
| 2065 | 0.39 | 0.83 | 0.0015 | 0.007 | 0.014 | 0.042 | 0.128 | 0.297 | 0.506 | 0.687 | 0.66 | 0.73 | 0.77 | 0.80 |
| 2069 | 0.40 | 0.84 | 0.0015 | 0.008 | 0.015 | 0.043 | 0.132 | 0.308 | 0.524 | 0.712 | 0.67 | 0.74 | 0.79 | 0.82 |
| 2070 | 0.45 | 0.91 | 0.0016 | 0.009 | 0.017 | 0.049 | 0.148 | 0.345 | 0.587 | 0.798 | 0.72 | 0.80 | 0.85 | 0.88 |
| 2074 | 0.43 | 0.91 | 0.0016 | 0.008 | 0.016 | 0.047 | 0.144 | 0.334 | 0.568 | 0.772 | 0.72 | 0.80 | 0.85 | 0.88 |

Table 6. Estimate of the magnitude and types of adverse effects using ERM (2014a,b) and based on Hg concentrations (mg/kg WW) in large, whole body adult (>400 mm TL), smaller subadult (<400 mm TL), and early life stages of Colorado pikeminnow (CPM) in the San Juan River Basin as modeled by EPRI (2014) and extrapolated to Age Class based on TL at age. Note: some year's data were omitted for clarity. Egg Hg concentrations (mg/kg W) were estimated using 0.2 percent of female whole body Hg burden.

| Modeled Deposition Year | Max Annual Average Hg in SJR CPM <400 mm whole body based on EPRI 2014 and APS Scenario 1 | Max Annual Average Hg in SJR CPM >400 mm whole body based on EPRI 2014 and APS Scenario 1 | ERM 2014 % Egg Reproductive Injury using Estimated Egg Hg burden | ERM 2014 % Egg Reproductive Injury using Age 0 Hg burden | ERM 2014 % Adult Reproductive Injury using Avg Adult Hg burden | ERM 2014 % Behavioral Injury using average subadult CPM Hg burden | ERM 2014 % Behavioral Injury using average adult CPM Hg burden | ERM 2014 % Juv&Adult Survivorship Injury applied using Age 1 Hg burden | ERM 2014 % Juvenile/Adult Survivorship Injury averaged for all subadult Age Classes | ERM 2014 % Juvenile/Adult Survivorship Injury averaged for all adult Age Classes |
|---|---|---|---|---|---|---|---|---|---|---|
| 2009 | 0.22 | 0.46 | 0.3 | 1.4 | 5.7 | 25.7 | 42.9 | 0.03 | 0.4 | 0.9 |
| 2010 | 0.22 | 0.46 | 0.3 | 1.4 | 5.7 | 25.4 | 42.9 | 0.03 | 0.4 | 0.9 |
| 2015 | 0.30 | 0.59 | 0.3 | 1.9 | 7.2 | 32.3 | 49.1 | 0.04 | 0.6 | 1.2 |
| 2016 | 0.29 | 0.60 | 0.4 | 1.8 | 7.3 | 31.0 | 49.5 | 0.03 | 0.6 | 1.2 |
| 2019 | 0.22 | 0.51 | 0.3 | 1.4 | 6.4 | 25.4 | 45.7 | 0.03 | 0.4 | 1.0 |
| 2020 | 0.25 | 0.52 | 0.3 | 1.6 | 6.5 | 28.1 | 46.2 | 0.03 | 0.5 | 1.0 |
| 2025 | 0.24 | 0.54 | 0.3 | 1.5 | 6.7 | 27.2 | 47.1 | 0.03 | 0.5 | 1.1 |
| 2029 | 0.25 | 0.55 | 0.3 | 1.6 | 6.8 | 28.3 | 47.6 | 0.03 | 0.5 | 1.1 |
| 2030 | 0.22 | 0.51 | 0.3 | 1.4 | 6.4 | 26.1 | 45.8 | 0.03 | 0.5 | 1.0 |
| 2035 | 0.26 | 0.58 | 0.3 | 1.7 | 7.1 | 29.3 | 48.5 | 0.03 | 0.5 | 1.1 |
| 2039 | 0.26 | 0.57 | 0.3 | 1.6 | 7.0 | 29.1 | 48.4 | 0.03 | 0.5 | 1.1 |
| 2040 | 0.30 | 0.62 | 0.4 | 1.9 | 7.5 | 32.1 | 50.3 | 0.04 | 0.6 | 1.2 |
| 2041 | 0.33 | 0.67 | 0.4 | 2.1 | 8.1 | 34.2 | 52.2 | 0.04 | 0.6 | 1.3 |
| 2042 | 0.30 | 0.65 | 0.4 | 1.9 | 7.9 | 32.0 | 51.5 | 0.04 | 0.6 | 1.3 |
| 2043 | 0.30 | 0.64 | 0.4 | 1.9 | 7.8 | 32.1 | 51.3 | 0.04 | 0.6 | 1.2 |
| 2044 | 0.32 | 0.67 | 0.4 | 2.0 | 8.1 | 33.7 | 52.3 | 0.04 | 0.6 | 1.3 |
| 2045 | 0.31 | 0.67 | 0.4 | 1.9 | 8.1 | 32.9 | 52.3 | 0.04 | 0.6 | 1.3 |
| 2049 | 0.36 | 0.77 | 0.5 | 2.3 | 9.2 | 36.4 | 55.7 | 0.04 | 0.7 | 1.5 |
| 2050 | 0.30 | 0.69 | 0.4 | 1.9 | 8.4 | 31.9 | 53.2 | 0.04 | 0.6 | 1.3 |
| 2055 | 0.32 | 0.71 | 0.4 | 2.0 | 8.5 | 33.6 | 53.7 | 0.04 | 0.6 | 1.4 |
| 2059 | 0.34 | 0.72 | 0.4 | 2.1 | 8.7 | 34.8 | 54.1 | 0.04 | 0.7 | 1.4 |
| 2060 | 0.35 | 0.73 | 0.4 | 2.2 | 8.8 | 35.4 | 54.6 | 0.04 | 0.7 | 1.4 |
| 2065 | 0.39 | 0.83 | 0.5 | 2.4 | 9.9 | 37.8 | 57.6 | 0.05 | 0.7 | 1.6 |
| 2069 | 0.40 | 0.84 | 0.5 | 2.5 | 10.0 | 38.6 | 58.0 | 0.05 | 0.8 | 1.6 |
| 2070 | 0.45 | 0.91 | 0.5 | 2.8 | 10.7 | 41.4 | 59.8 | 0.05 | 0.8 | 1.7 |
| 2074 | 0.43 | 0.91 | 0.5 | 2.7 | 10.7 | 40.6 | 59.9 | 0.05 | 0.8 | 1.7 |

Table 7. Estimates of the type and magnitude of injuries to endangered fish in the San Juan River Basin using Dillon et al. (2010) or ERM (2014), and with Service estimates of mortality associated with maladaptive behavioral injury for whole body Hg (mg/kg WW). The red-colored cells at 0.7 mg/kg WW in whole body that is associated with 9.2 percent reproductive injury and 1.5 percent survivorship injury was used to identify Hg concentrations associated with impaired endangered fish population fitness (Miller 2014).

| Fish WB Hg Burden (mg/kg ww) | Log10(Hg burden) | Dillon % ELS Injury | Dillon % Juvenile/Adult Injury | ERM % Behavioral Injury | ERM % Egg Reproductive Injury | ERM % Adult Reproductive Injury | ERM % Survivorship Injury | USFWS = Estimated % Mortality due to Maladaptive Behaviors = 0.0012*[WB Hg] + 0.01 |
|---|---|---|---|---|---|---|---|---|
| 0.0000000001 | -10.0 | 0.00000002 | 0.000000002 | 0.00000002 | 0.000000033 | 0.0000000011 | 0.000000002 | n/a |
| 0.000000001 | -9.0 | 0.0000002 | 0.00000002 | 0.0000002 | 0.00000033 | 0.00000001 | 0.0000002 | n/a |
| 0.00000001 | -8.0 | 0.000002 | 0.0000003 | 0.000002 | 0.0000033 | 0.0000001 | 0.0000001 | n/a |
| 0.0000001 | -7.0 | 0.00002 | 0.000003 | 0.00002 | 0.000033 | 0.000001 | 0.000001 | n/a |
| 0.000001 | -6.0 | 0.0002 | 0.00003 | 0.0002 | 0.00033 | 0.00001 | 0.00001 | n/a |
| 0.00001 | -5.0 | 0.002 | 0.0003 | 0.002 | 0.0033 | 0.0001 | 0.0001 | n/a |
| 0.0001 | -4.0 | 0.02 | 0.003 | 0.02 | 0.033 | 0.001 | 0.001 | n/a |
| 0.001 | -3.0 | 0.2 | 0.03 | 0.2 | 0.33 | 0.01 | 0.004 | n/a |
| 0.01 | -2.0 | 2.4 | 0.3 | 1.8 | 3.2 | 0.1 | 0.03 | n/a |
| 0.05 | -1.3 | 11.0 | 1.5 | 8.4 | 14.2 | 0.7 | 0.1 | 1% |
| 0.1 | -1.0 | 19.8 | 3.1 | 15.5 | 24.8 | 1.4 | 0.3 | 1% |
| 0.2 | -0.7 | 33.0 | 6.0 | 26.8 | 39.8 | 2.8 | 0.5 | 1% |
| 0.3 | -0.5 | 42.5 | 8.8 | 35.5 | 49.8 | 4.1 | 0.7 | 1% |
| 0.4 | -0.4 | 49.6 | 11.5 | 42.3 | 56.9 | 5.5 | 0.9 | 1% |
| 0.5 | -0.3 | 55.2 | 14.0 | 47.8 | 62.3 | 6.7 | 1.1 | 1% |
| 0.6 | -0.2 | 59.6 | 16.3 | 52.4 | 66.5 | 8.0 | 1.3 | 1% |
| 0.7 | -0.2 | 63.3 | 18.6 | 56.2 | 69.8 | 9.2 | 1.5 | 1% |
| 0.8 | -0.1 | 66.3 | 20.7 | 59.4 | 72.5 | 10.4 | 1.7 | 1% |
| 0.9 | 0.0 | 68.9 | 22.7 | 62.2 | 74.8 | 11.6 | 1.9 | 1% |
| 1.0 | 0.0 | 71.1 | 24.7 | 64.7 | 76.8 | 12.7 | 2.0 | 1% |
| 1.1 | 0.0 | 73.0 | 26.5 | 66.8 | 78.4 | 13.9 | 2.2 | 1% |
| 1.2 | 0.1 | 74.7 | 28.2 | 68.7 | 79.8 | 14.9 | 2.4 | 1% |
| 1.3 | 0.1 | 76.2 | 29.9 | 70.4 | 81.1 | 16.0 | 2.6 | 1% |
| 1.4 | 0.1 | 77.5 | 31.5 | 71.9 | 82.2 | 17.0 | 2.7 | 1% |
| 1.5 | 0.2 | 78.7 | 33.0 | 73.3 | 83.2 | 18.1 | 2.9 | 1% |
| 1.6 | 0.2 | 79.8 | 34.5 | 74.6 | 84.1 | 19.0 | 3.1 | 1% |
| 1.7 | 0.2 | 80.7 | 35.9 | 75.7 | 84.9 | 20.0 | 3.2 | 1% |
| 1.8 | 0.3 | 81.6 | 37.2 | 76.7 | 85.6 | 20.9 | 3.4 | 1% |
| 1.9 | 0.3 | 82.4 | 38.5 | 77.7 | 86.3 | 21.9 | 3.6 | 1% |
| 2.0 | 0.3 | 83.1 | 39.8 | 78.6 | 86.8 | 22.8 | 3.7 | 1% |
| 2.1 | 0.3 | 83.8 | 41.0 | 79.4 | 87.4 | 23.6 | 3.9 | 1% |
| 2.2 | 0.3 | 84.4 | 42.1 | 80.1 | 87.9 | 24.5 | 4.1 | 1% |
| 2.3 | 0.4 | 85.0 | 43.2 | 80.8 | 88.4 | 25.4 | 4.2 | 1% |
| 2.4 | 0.4 | 85.5 | 44.3 | 81.5 | 88.8 | 26.2 | 4.4 | 1% |
| 2.5 | 0.4 | 86.0 | 45.3 | 82.1 | 89.2 | 27.0 | 4.5 | 1% |
| 2.6 | 0.4 | 86.5 | 46.3 | 82.6 | 89.6 | 27.8 | 4.7 | 1% |
| 2.7 | 0.4 | 86.9 | 47.2 | 83.2 | 89.9 | 28.5 | 4.8 | 1% |
| 2.8 | 0.4 | 87.3 | 48.1 | 83.7 | 90.2 | 29.3 | 5.0 | 1% |
| 2.9 | 0.5 | 87.7 | 49.0 | 84.2 | 90.5 | 30.0 | 5.1 | 1% |
| 3.0 | 0.5 | 88.1 | 49.9 | 84.6 | 90.8 | 30.8 | 5.3 | 1% |

Crump and Trudeau (2009) found that accumulation of Hg in the fish brain has resulted in reduced hormone secretion, hypothalamic neuron degeneration, and alterations in neurotransmission. The inhibitory effect of Hg on reproduction in fish has been suggested to occur at multiple sites within the reproductive system, including the hypothalamus, pituitary, and gonads (Crump and Trudeau 2009). At the level of the pituitary, Hg exposure would reduce and/or inactivate gonadotropin-secreting cells necessary for reproduction. Studies that have examined the effects of Hg on the reproductive organs demonstrated a range of effects, including reductions in gonad size, circulating reproductive steroids, gamete production, and spawning success. Laboratory experiments have shown diminished reproduction and endocrine impairment in fish exposed to dietary Hg at environmentally relevant concentrations, with documented effects on production of sex hormones, gonadal development, egg production, spawning behavior, and spawning success. Field studies have found declining levels of sex hormones with increased Hg exposure (Crump and Trudeau 2009). Compared to pairs of fish raised on normal diets, of those that ate contaminated diets, fewer spawned, and those that did spawned later and produced fewer eggs. Currently, not all females do spawn (Valdez 2014).

Condition of Water Quality PCE of Colorado Pikeminnow Critical Habitat

Water of sufficient quality is a primary constituent element (PCE) of Colorado pikeminnow physical critical habitat. We used the rates of Hg-related impairments associated with a modeled long-term population decline of Colorado pikeminnow in the San Juan River Basin (AECOM 2013; Miller 2014; ERM 2014a,b) to characterize when those conditions would be associated with adverse modification of critical habitat. That is, critical habitat would be adversely modified when Hg concentrations in water are associated with fish whole body concentrations of 0.7 mg/kg WW (which are related to a greater than 8 percent reproductive injury and above 1.5 percent adult mortality). The PCEs of critical habitat likely occur associated with 0.7 mg/kg WW in whole body Colorado pikeminnow and using Bioaccumulation Factors provided in the BA (OSMRE 2014, p 6-18), would be from 0.002 ug/L MeHg in water or 0.2 ug/L total Hg in water.

We used models (with various assumptions) to assess, describe, evaluate, and estimate what is happening now and what will happen in the San Juan River Basin and to the endangered species that reside there over time (Osmundson and Lusk 2011; ERM 2014a,b; Miller 2014; OSMRE2014; and the administrative record supporting the BA and BO).

There remain issues with the accuracy and precision of measurement-based estimates that depend on the validity of extrapolating measurements made at infrequent intervals to longer periods, or measurements made at one place to other areas. However, the best available scientific and commercial information supports the following regarding Hg in the San Juan River Basin:

1. Currently, anthropogenic Hg emissions far surpass those derived from natural processes Mason and Sheu, 2002; Fitzgerald et al., 2005; Pacnya 2010; UNEP 2013; EPRI 2014). Much of the Hg in the environment originates from combustion of coal and can travel long distances in the atmosphere before being deposited (Landis and Keeler 2002; Hammerschmidt and Fitzgerald 2006; EPRI 2014). The global pool and sources in Asia

account for the majority all anthropogenic Hg emissions (Pacyna et al. 2010, Pirrone, et al. 2010; EPRI 2014). However, local sources also contribute dry Hg deposition or to locally elevated concentrations within the San Juan River Basin (Lyman et al. 2007; Mountain Studies Institute 2010; USEPA 2011a; Huang and Gustin 2012; Sather et al. 2013; EPRI 2014). Without improved pollution controls or other actions taken to reduce Hg deposition, Hg concentrations are likely to remain at the levels they are today.

2. In the San Juan River Basin, some amount of the Hg deposited is converted to MeHg, which ultimately bioaccumulates in the endangered fish. The rate of Hg methylation, varies greatly in time and space, and depends on numerous environmental factors, including temperature, and amounts of oxygen, organic matter, and sulfate that are present, but few actions can be taken that significantly alter those natural watershed processes (Gilmour and Henry 1991). Hg enters aquatic food webs where it is taken up from water by algae and other microorganisms and increases in concentrations with fish at the top of the food web. The native, top predator fish is the endangered Colorado pikeminnow, which consumes other fish and tends to accumulate high Hg concentrations in their tissues.

3. Mercury is a persistent toxic element. It is becoming increasingly evident that the scope and severity of the Hg problem for wildlife has been substantially underestimated (Wentz et al. 2014). Recent findings show that at high concentrations, Hg impairs the health and reproduction of fish and birds at much lower dietary or tissue concentrations than previously recognized (Evers et al. 2011; Sandheinrich and Wiener 2011; Depew et al. 2012a). For example, concentrations of Hg in adult Colorado pikeminnow frequently will exceed threshold levels of concern (0.2 mg/kg WW in whole fish) that are associated with altered biochemical processes, altered behaviors, damage to cells and tissues, mortality, and diminished reproduction (Beckvar 1996; USEPA 1997; Crump and Trudeau 2009; Dillon et al 2010; Sandheinrich and Wiener 2011; ERM 2014a,b)

<u>Estimation of Hg in Whole Body Razorback Sucker</u>

EPRI (2014) modeled the spatial distribution of Hg in larger, adult whole body razorback suckers in the San Juan River Basin (Figure 24). Concentrations of Hg in Razorback sucker are much lower as (converted) whole body ranged from 0.03 to 0.13 mg/kg WW and averaged 0.07 mg/kg WW (Table 5). This level of whole body Hg was similar to that in an Age 3 Colorado pikeminnow, and therefore, we used a similar method to estimate the number of Razorback suckers that could be adversely affected by the proposed action.

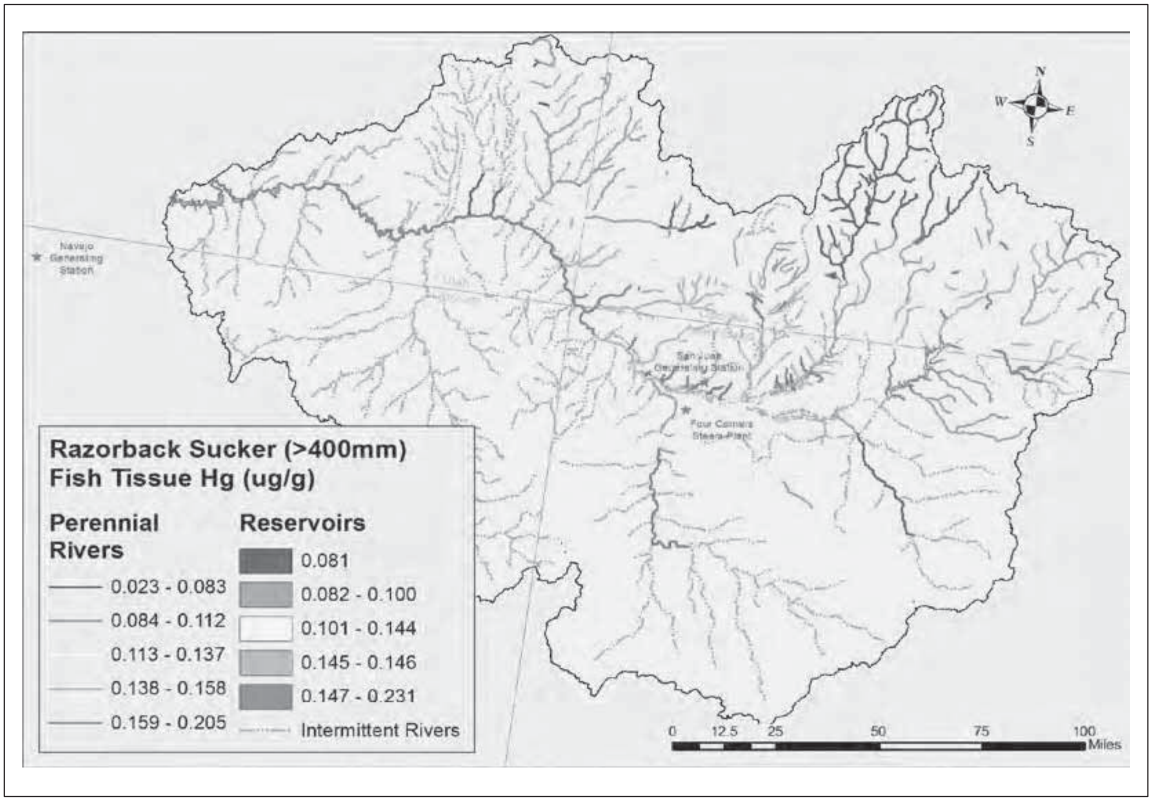



Figure 24. Current Hg concentrations (mg/kg WW) in whole body razorback sucker in the action area as modeled by EPRI (2014) (Note change in color scale in Figures 17, 18, and 24).

Effects of Hg deposition on Southwestern Willow Flycatcher and Yellow-billed Cuckoo

AECOM (2013) prepared an ecological risk assessment (ERA) to support the EIS and OSMRE's BA. A conceptual site model was developed to describe the exposure pathways linking Hg (and Se and other pollutant) releases to the environment and then to ecological receptors such as federally listed birds (Figure 21). The ERA focused on San Juan River habitat from the Deposition Area downstream into the San Juan River arm of Lake Powell. The ERA was intended to evaluate the risks posed by exposure of federally listed birds to pollutants associated with the environmental baseline, cumulative effects and the future FCPP stack emissions from 2016 to 2041 (AECOMM 2013). Federally listed bird exposures were evaluated using a traditional daily dose approach where dose was expressed in units of mg/kg per day (mg/kg-day) of the pollutants ingested. Toxicity reference values (TRVs) were developed, in units of mg/kg-day, which are doses below which adverse ecological effects are not expected. The risks were characterized in terms of a hazard quotient (HQ) where values greater than 1 indicate a potential for adverse ecological effects to individual birds. Hazard quotients for riparian birds in the San Juan River including southwestern willow flycatchers and yellow-billed cuckoos were less than 6.7 for methylmercury and less than 5.9 for selenium indicating potential adverse effects to federally listed birds (AECOMM 2013). The proposed action was only a very small portion of these effects and those were removed and discussed below.

Habitat modeling by AECOM (2013d, 2014) identified approximately 6,726 acres of potentially suitable southwest willow flycatcher habitat within the Deposition Area. The ratio of flycatcher nesting habitat (632 acres; BOR 2012) to flycatcher critical habitat in the Middle Rio Grande (47,844 acres) was (632/47844=) 0.013. If we assume a similar ratio of flycatcher nesting habitat to suitable flycatcher habitat within the Deposition Area, we estimate that as many as (6726 acres x 0.013=) 87.4 acres of nesting habitat could occur within any year. In a recovered flycatcher population, the average suitable nesting habitat size is 5.4 acres (USFWS 2013). The total maximum number of nesting flycatchers that could occupy the Deposition Area in any year would be (87.4 acres/5.4 acres =) 16 nesting pairs. However, not all flycatcher habitats in the Deposition Area are currently suitable nesting habitat nor would they be expected to remain suitable nesting habitats over time.

Hg is an environmental contaminant that can also have adverse effects on riparian wildlife (Scheuhammer et al. 2012; Wentz et al. 2014). For riparian birds such as flycatchers and cuckoos, mercury is accumulated via ingestion of aerial insects emerging from benthic life stages in aquatic environments containing mercury or from associated predatory spiders (Cristol et al. 2008; Edmonds et al. 2012; Evers et al. 2012; Buckland-Nicks et al. 2014; Gann et al. 2014). Dietary total Hg concentrations associated with adverse effects to birds are generally greater than 0.1 mg/kg WW (DOI 1998). Once ingested, MeHg rapidly moves into the bird's central nervous system, resulting in behavioral and neuromotor disorders (Tan et al. 2009; Scheuhammer et al. 2007, 2012). The developing central nervous system in avian embryos is especially sensitive to this effect, and permanent brain lesions and spinal cord degeneration are common (DOI 1998, Young 1998; Bryan et al. 2003; Scheuhammer et al. 2007; Heinz et al. 2009). Therefore, adverse effects are described for the eggs, embryos, nestlings and/or fledglings associated with elevated Hg burdens in the female parent and due to foraging.

Hg concentrations in invertebrates from the San Juan River Basin are generally (0.03 to 0.04 mg/kg WW) less than this threshold concentration (AECOM 2013). No modeling of Hg in invertebrates over time was conducted. Therefore, we expected that no more than one third of invertebrate Hg concentrations would be greater than the 0.1 mg/kg WW threshold. Therefore, we applied the average annual flycatcher-nesting rate from 20 years of survey results in the San Juan River Basin to estimate the likelihood of that suitable nesting habitat within the Deposition Area would be occupied by nesting flycatchers (16 nesting pairs x 1.25 percent flycatcher nesting rate per year = 0.2) to be 20 percent during any one year.

***Selenium***

Selenium, a trace element, is a natural component of coal and soils in the area and can be released to the environment by the irrigation of selenium-rich soils and the burning of coal in power plants with subsequent emissions to air and deposition to land and surface water (EPRI 2014). Sources of selenium, both anthropogenic and natural, in the San Juan River have been reported by O'Brien (1987), Abell (1994), Blanchard et al. (1993), and Thomas et al. (1997, 1998). Selenium, although required in the diet of fish at very low concentrations (<0.5 micrograms per gram [ug/g] on a dry weight [DW] basis), is toxic at higher levels (>3 ug/g) and may be adversely affecting endangered fish in the upper Colorado River basin (Hamilton 1999, Hamilton et al. 2005). Excess dietary selenium causes elevated concentrations of selenium to be deposited into developing eggs, particularly the yolk (Buhl and Hamilton 2000, Lemly 2002). If concentrations in the egg are sufficiently high, developing proteins and enzymes become dysfunctional or result in oxidative stress, conditions that may lead to embryo mortality, deformed embryos or embryos that may be at higher risk for mortality (Lemly 2002). Additional selenium risks are associated with dietary toxicity.

*Selenium in water*

Selenium concentrations can be elevated in areas where irrigation occurs on soils which are derived from or overlie Upper Cretaceous marine sediments. Thomas et al. (1998) found that water samples from DOI project irrigation-drainage sites developed on Cretaceous soils contained a mean selenium concentration about 10 times greater than those in samples from DOI project sites developed on non-Cretaceous soils. Percolation of irrigation water through these soils and sediments leaches selenium into receiving waters. Other sources of selenium likely include power plant fly ash and oil refineries in the basin (Abell 1994). Water depletions, by reducing dilution effects, can increase the concentrations of selenium and other contaminants in water, sediments, and biota (Osmundson et al. 2000).

Some tributaries to the San Juan River carry higher selenium concentrations than found in the mainstem of the river (Thomas et al. 1998; EPRI 2014; Figure 25). Increased selenium concentrations may also result from the introduction of groundwater to the mainstem of the river along its course (BIA 1999). Although these levels are diluted by the San Juan River flow, the net effect is a gradual accumulation of the element in the river as it travels downstream. For example, selenium concentrations in water samples collected from the mainstem of the San Juan River exhibited a general increase in maximum recorded values with distance downstream from Archuleta, New Mexico, to Bluff, Utah (<1 microgram per liter [ug/L] to 4 ug/L) (Wilson et al. 1995). The safe level of selenium concentrations for protection of fish and wildlife in water is considered to be less than 2 ug/L, and chronically toxic levels are considered to be greater than2.7 ug/L (Lemly 1993; Maier and Knight 1994; Wilson et al. 1995). Dietary selenium is the primary source for selenium in fish (Lemly 1993). Thus, sediment and biotic analyses are necessary to further elucidate the risk of selenium in water to fish and wildlife.
Estimations of selenium concentrations in the San Juan River include the contributions of the Navajo Indian Irrigation Project (NIIP) and other irrigated agricultural projects. Irrigation return flows from irrigation projects result in increased selenium concentrations in the San Juan River (Blanchard et al. 1993; Thomas et al. 1999).

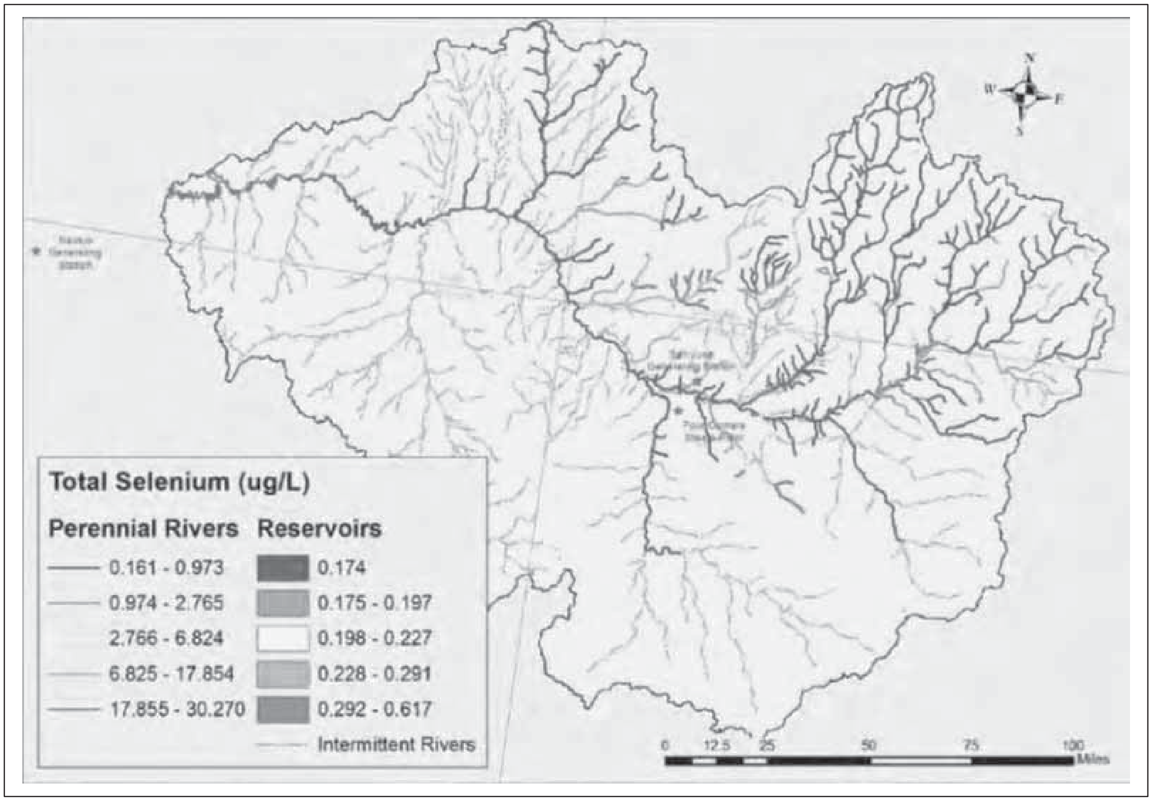



Figure 25. Total selenium concentrations in San Juan River Basin waters (EPRI 2014).

*Evaluation of Selenium Effects in Endangered Fish, Critical Habitat, and Listed Birds*
Selenium in water may be less important than dietary exposure when determining the potential for chronic effects to a species (USEPA 1998). A number of studies have recommended tissue-based selenium tissue benchmarks for fish and birds (Lemly 1993a, 1996b; USDOI 1998; DeForest et al. 1999; Hamilton 2003; Ohlendorf 2003; Adams et al. 2003; Chapman 2007; USEPA 2014). Although there is not always consensus on the recommended tissue benchmarks, there is consensus that tissue-based selenium benchmarks are the most appropriate medium for evaluating selenium toxicity. Therefore, in this BO, estimates of effects from selenium are based on concentrations of selenium in fish tissues and their estimated dietary concentrations.

*Selenium in Invertebrates*

Thomas et al. (1998) reported that selenium concentrations in algae, odonates (dragonflies and damselflies), and western mosquitofish (Gambusia affinis) collected from aquatic habitats underlain by Cretaceous soils were significantly greater than in those collected from similar habitats underlain by non-Cretaceous soils. Median selenium concentrations were less than 2 ug/g DW for plant samples, less than 7 ug/g DW for invertebrate samples, and less than 6 ug/g DW for whole-fish samples collected from aquatic habitats underlain by non-Cretaceous soils. Similar samples collected from aquatic habitats underlain by Cretaceous soils contained median selenium concentrations two to five times greater. Blanchard et al. (1993) and Thomas et al.

(1997) reported the concentrations of selenium in biota from aquatic habitats away from the river mainstem including biota collected from irrigation drains and ponds, which had much higher concentrations of selenium in plants (20 ug/g DW), in invertebrates (32.5 ug/g DW), and in whole fish (41.7 ug/g DW) than those found in the mainstem.

*Selenium in Fish*

Simpson and Lusk (1999) reported on selenium concentrations in biota collected from the San Juan River mainstem (only) using data from Thomas et al. (1997, 1998) and others (Blanchard et al. 1993, O'Brien 1987, Wilson et al. 1995). Simpson and Lusk (1999) and Osmundson and Lusk (2011) reported on the concentrations of selenium in muscle tissues collected from Colorado pikeminnow and razorback suckers from the San Juan River mainstem. Selenium concentrations in razorback sucker muscle plugs collected from the San Juan River ranged from 1.1 – 5.4 mg/kg DW and averaged 3.5 mg/kg DW. Selenium concentrations in Colorado pikeminnow muscle plugs collected from the San Juan River ranged from 1.6 – 4.6 mg/kg DW and averaged 3.0 mg/kg DW (Table 5). There were no statistically significant spatial differences found using razorback sucker or the Colorado pikeminnow muscle plug selenium concentrations. Concentrations of Se in endangered fish tissues would be expected to reflect changes in decreasing atmospheric deposition after FCPP shut down of Units 1-3 in December 2013 (EPRI 2014), and then would be expected to increase slightly after 2031.

*Mechanisms of Selenium Toxicity*

Selenium has been shown to elicit a wide range of adverse effects in fish including mortality, reproductive impairment, effects on growth, and developmental and teratogenic effects including edema and finfold, craniofacial, and skeletal deformities (Hamilton 2004; Holm et al. 2005). Excessive selenium concentrations in fish tissues can cause a wide variety of toxic effects at the biochemical, cellular, organ, and tissue levels (Sorensen 1991). Selenium is beneficial in small amounts but can be toxic to animals at slightly higher concentrations (Sharma and Singh 1984). Maier et al. (1987) suggest the safety margin between recommended and toxic dietary concentrations may only be 10-fold. Selenium is generally one of the most toxic elements to fish, and researchers (Hilton et al. 1980; Hodson and Hilton 1983; Sorenson 1991) have reported selenium toxicity to occur at dietary concentrations only 7 to 30 times greater than those considered essential for proper nutrition (i.e., > 3 mg Se/kg DW). However, toxicity varies with fish species, temperature, life stage, exposure concentration, chemical form, the presence of pathogens, and other factors (Sorenson 1991).

<u>Selenium Effects to Fish Ovaries and Eggs</u>

Lemly (1998) reported that one of the outward manifestations of selenium toxicities in fish is teratogenic deformity. Teratogenic deformities (or terata) are permanent congenital malformations that have been attributed to excessive selenium in eggs (Lemly 1998). Excess dietary selenium of the female is deposited into the developing egg, particularly in the yolk (Lemly 1993b, 1998). In fish, yolk precursors (vitellogenin) are synthesized in the maternal liver, exported via blood, and incorporated into the developing ovarian follicle and become yolk proteins (Arukwe and Goksøyr 2003). When eggs hatch, larval fish use the selenium-contaminated yolk, both as an energy supply and as a source of protein for building new body tissues. During this life stage (fry), permanent developmental anomalies (e.g., spinal curvatures, missing or deformed fins, and craniofacial deformities) and other effects (e.g., edema) in fish can be related to elevated selenium in eggs (Hodson and Hilton 1983; Lemly 1993a; Maier and Knight 1994; Hamilton 2003). While hatchability is not affected, Lemly (1996) reported an increase in the incidences of teratogenic deformities when selenium concentrations in egg exceed 10 µg/g DW.

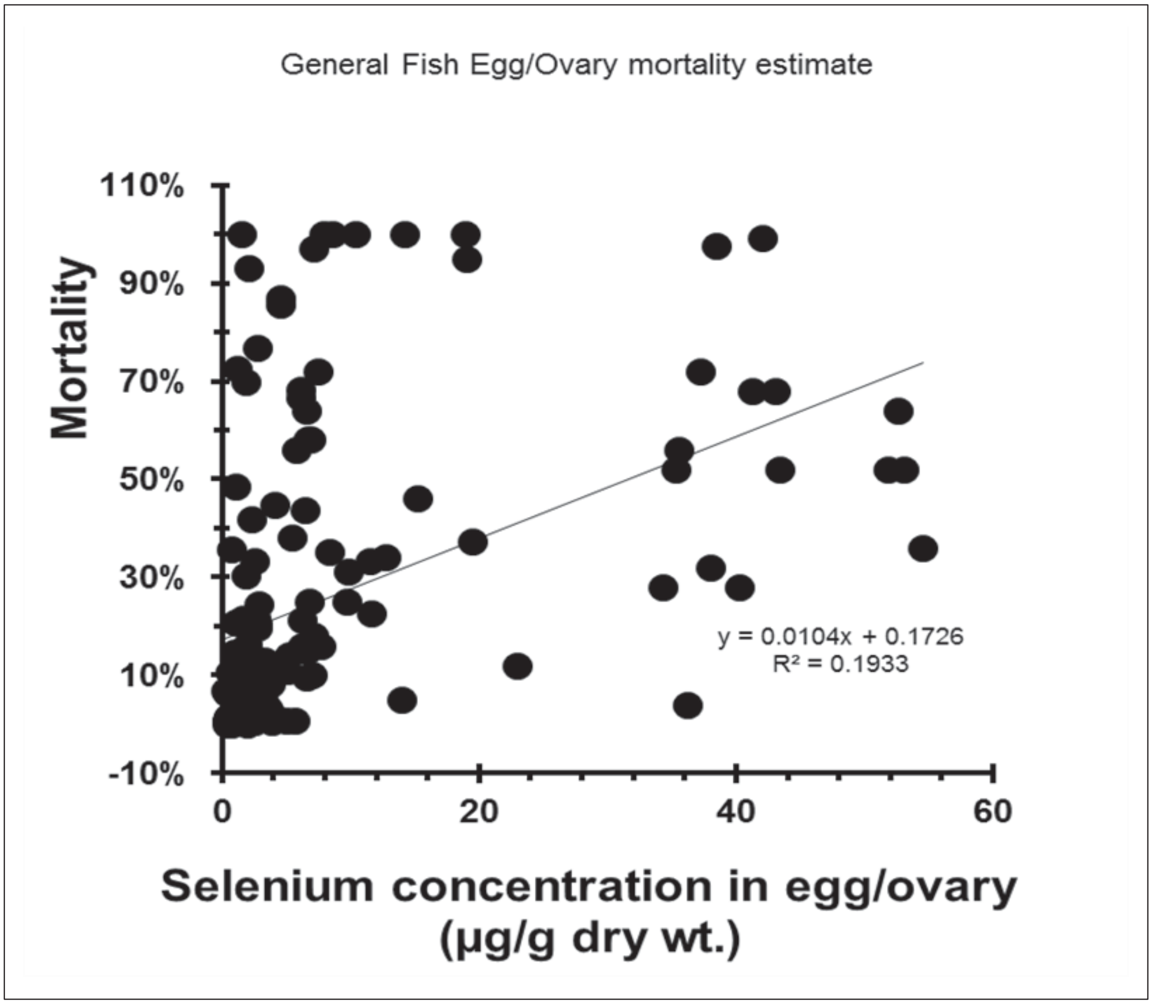



Figure 26. Selenium concentration (mg/kg DW) in fish eggs and relationship with associated mortality, deformity, or failure to hatch from a variety of toxicity studies (see text; Lusk 2015).

<u>Dietary Selenium Toxicity to Fish</u>

Studies have shown that diet is the primary route of exposure that controls chronic toxicity to certain fish (Coyle et al. 1993, Hamilton et al. 1990, Hermanutz et al. 1996, EPA 1998d, 2004. 2014). Selenium is required in the diet of fish at very low concentrations (< 0.5 mg/kg DW) (Hilton et al. 1980, Hodson and Hilton 1983, Doroshov et al. 1992). Threshold and concern levels encompass a range of dietary selenium of 2 to 10 mg/kg DW, with adverse effects a certainty as the upper limit is exceeded (Presser and Luoma 2006, Skorupa 1998a). Selenium concentrations in diets greater than 10 mg/kg DW have been consistently implicated in adverse effects on reproduction in a variety of avian, fish, and mammalian predators (Hodson and Hilton 1983; Woock et al. 1987; Heinz et al. 1989; Doroshov et al. 1992; Coyle et al. 1993; Lemly 1996a, 1997a; Hamilton et al. 1990, 2005b; Heinz 1996; Hamilton 2003, 2004). Reproductive failure in adults has been associated with their dietary concentration of 30 to 35 mg/kg DW (Skorupa 1998a, Woock et al. 1987, Coyle et al. 1993). Feeding excessive Se to larvae, fry, or adults does not directly cause malformations in the recipient, but survival of larvae fed elevated Se and can be severely compromised (Lemly 1998; Hamilton et al. 1990, 2001a, 2001b). Dietary Se toxicity to larval survival can occur at the same time that adult fish appear healthy.

McAda and Wydowski (1980) and Bestgen (1990) suggested that the diet of razorback sucker was composed primarily of "ooze," (e.g., plant detritus with associated bacteria, fungus and zooplankton) as well as insect larvae, such as found in low-velocity habitats of the San Juan River. Potential dietary items of larval razorback sucker would likely be small invertebrates (such as zooplankton) found in the mainstem or at the mouths of tributaries, in irrigation drains, and in associated wetlands. Papoulias and Minckley (1992) found that razorback sucker larvae exhibited prey-size selection, based on body width, and consumed prey from 0.1 to 0.4 mm. Selenium concentrations in zooplankton from the San Juan River Basin have not been reported.

From a caloric standpoint, zooplankton have similar energy content to invertebrate brine shrimp (Hamilton et al. 2001a). Chironomid worms have been identified as having elevated Se concentrations in comparison to other invertebrates (Hamilton et al. 2001). Chironomids have also been identified as an important dietary item for both Colorado pikeminnow and razorback sucker (USFWS 2002a,b). Because the caloric contents of zooplankton and aquatic invertebrates are similar (even though concentrations in zooplankton may be higher than in invertebrates), it seemed appropriate to estimate dietary concentrations to larval razorback sucker and Colorado pikeminnow based on the selenium concentrations reported in both plants (25 percent) and invertebrates (75 percent) by Simpson and Lusk (1999) and AECOM (2014). Average dietary Se concentrations in diets containing this ratio (25:75) of plants and invertebrates would be expected to have Se concentrations ranging from 2.7 to 2.9 mg/kg DW in the environmental baseline condition.

For larval razorback sucker, the range of dietary concern is approximately 2 to 5 mg/kg DW because of studies involving sensitive species, life stages, and endpoints (Beyers and Sodergren 1999; Hamilton et al. 2001a, 2001b, 2002, 2005b). Using these and other data, we developed a larval (12 to 45 days) fish survival relationship to larval dietary Se concentrations based on the assumed diet of both larval razorback sucker and larval Colorado pikeminnow in the San Juan River Basin (Equation 11).

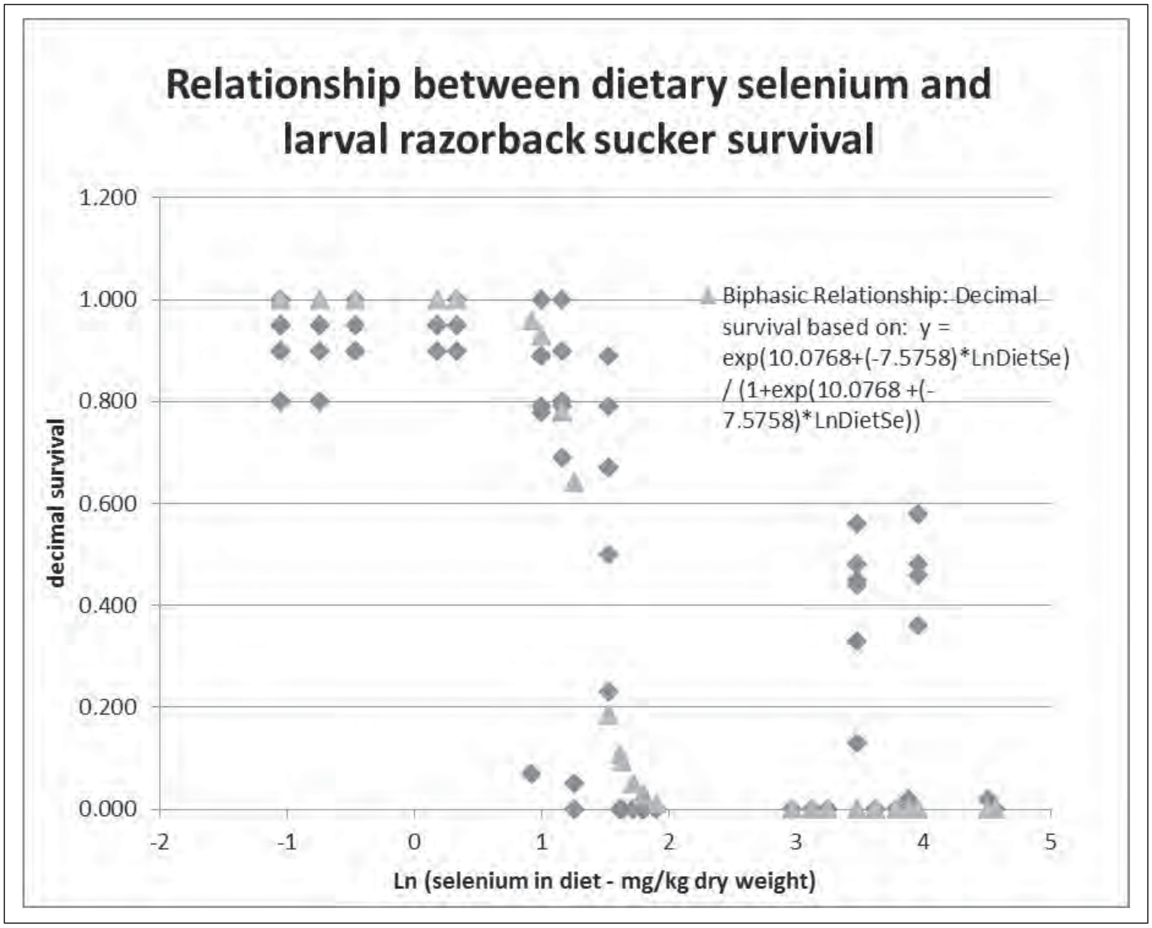



Figure 27. Biphasic relationship between dietary selenium in fish diets (in mg/kg DW) and larval survival (as a decimal) based on studies involving razorback sucker (see text; Lusk 2015).

Effects of Se to listed birds are discussed in the Hg effects section, above, and as described by AECOM (2014), and incorporated here by reference.

Population Impacts of Selenium in the Environmental Baseline

Quarterone and Young (1995) suggested that irrigation and pollution were contributing factors to razorback sucker and Colorado pikeminnow population declines. Hamilton (1999) hypothesized that historic selenium contamination of the upper and lower Colorado River basins contributed to the decline of these endangered fish by affecting their overall reproductive success, including loss of eggs and larvae. These fish can live over 40 years (Behnke and Benson 1983), increasing their frequency of exposure to both dietary and waterborne selenium. In addition, they often stage at tributary mouths such as the Mancos River before spawning, increasing their exposure to elevated levels of dietary selenium (Wilson et al. 1995).

*Interactions of selenium and other elements*

Many different compounds interact with selenium. Selenium does not aid the excretion of Hg; instead, it increases the accumulation of an inert form, including mercury-selenide (Himeno and Imura 2002), although conflicting studies exist; Huckabee and Griffith (1974) reported selenium increased the toxicity of mercury. Interactions between Se and Hg are known to be concentration-dependent (Kim et al. 1977). Interactions between Se and Hg can be synergistic at low mercury concentrations (<0.07 ppm) and antagonistic at high concentrations (>0.10 ppm) in water (Kim et al. 1977). Cuvin and Furness (1988) reported that Se protected minnows against Hg toxicity as a molar ratio of 2.5:1 Hg:Se. However, a 1.3:1 molar ratio caused increased mortality compared with 0.3 ppm Hg only. Therefore, the studies of Cuvin and Funess (1988) and Kim et al. (1977) demonstrated that antagonistic and synergistic toxic interactions between selenium and mercury are possible and are a function of the concentrations of the two elements and the molar ratio of one to the other (Sorensen 1991). The underlying mechanisms regarding the interactions between Se and Hg, the compounds that are formed in tissues and the conditions that are responsible for Hg:Se antagonism remain unclear (Kahn and Wang 2009).

Numerous pollutants are often released into the environment and result in a mixture of elements that is unique to each aquatic system. Categorization of various elemental mixtures in the environment or in the fish as synergistic or antagonistic can depend on the concentrations, their bioavailability, water temperature, the molar ratios of Se and Hg, the fish species, and other factors (Sorensen 1991). The available data also do not show whether the various inorganic and organic compounds and oxidation states of selenium are equally effective sources of selenium as a trace nutrient, or as reducing the toxic effects of various pollutants (EPA 2004). As some of the accumulations of Se and Hg will result in irreversible injury, and the optimal antagonistic molar ratios for Se and Hg in the environment (along with other elements and environmental stressors) have not been determined for the Colorado pikeminnow, razorback sucker, or their prey sufficiently to address the antagonistic interactions between Se and Hg, they were not further addressed by this analysis.

*Environmental Baseline Conditions of Flycatcher and Cuckoo Riparian Habitat*

Past and present federal, state, and private activities have affected flycatcher and cuckoo habitats within the Action Area including urbanization, agricultural conversion, irrigated agriculture, pollution impacts to prey density, river maintenance, flood control, dam operation, and water diversions (TNC 2013). There are efforts underway to restore riparian habitat in the San Juan River Basin (TNC 2013). Restoration efforts are aimed at developing suitable nesting and foraging habitat for flycatcher and cuckoo along the San Juan River over the next 25 years. Because of disturbance, infestation of Tamarisk Leaf Beetle, and riparian management, it is not anticipated that quality nesting habitat for flycatcher or cuckoo will improve near Morgan Lake.

### *Climate Change*

Climate change has and will occur and affect endangered species and their habitat over the duration of the Proposed Action and beyond, whether or not the Proposed Action occurs. Climate change over the coming decades and centuries has the potential to affect many organisms, including freshwater fish. Climate change has the potential to change precipitation patterns, including the timing, intensity, and type of precipitation received; runoff patterns based on the amount of precipitation falling as snow and when snowmelt occurs; and atmospheric temperatures, which exhibit a strong influence on water temperatures.

According to the NRC (2007), air temperature has increased by 1.4°C in the last century. The Colorado River Basin has warmed more than any other part of the U.S. Warmer air temperatures will lead to increased evaporation from Navajo Reservoir. This increase is expected to reduce water availability, operational flexibility, and the quality and quantity of fish habitat, which are important elements to native fish in the river downstream.

Native fish in the San Juan River cannot move upstream in response to climate change because their migration is blocked by Navajo Dam, which precludes migration to more favorable upstream areas as a behavioral adaptation to changing climatic conditions. However, Navajo Dam currently releases water that is colder than what would naturally be present during the summer and fall months (USFWS 2006). Thus, the temperature effect of climate change might be offset by operation of the Navajo Dam.

Climate change models agree that the southwest will get drier in the next century, with runoff decreasing 8 to 25 percent (Seager et al. 2007), resulting in decreased water availability. This reduction in precipitation will make it increasingly challenging to meet the Flow Recommendations for the San Juan River, established to protect listed fish and other native fish species, especially the high-flow requirements that provide for channel maintenance and create or renew habitat for listed fish. In the current drought, Reclamation has not been able to provide the required number of days of flow over 10,000 cfs since 2005 (BOR 2012).

Reduced flow levels may also exacerbate contaminant issues, as less dilution of contaminants in the river would occur.

## EFFECTS OF THE PROPOSED ACTION

Effects of the action means the direct and indirect effects of an action on the species or designated critical habitat, together with the effects of other activities that are interrelated or interdependent with that action, that will be added to the environmental baseline (50 CFR 402.02). Indirect effects are those that are caused by a proposed action and are contemporaneous or later in time, but are still reasonably certain to occur. Interrelated actions are those that are part of a larger action and depend on the larger action for their justification; 'interdependent actions' are those that have no independent utility apart from the action under consideration (50 CFR 402.02). If the proposed action includes offsite conservation measures to reduce net adverse impacts by improving habitat conditions and survival, the Service will evaluate the net combined effects of the proposed action and the offsite conservation measures as interrelated actions. Future Federal actions that are not a direct effect of the proposed action and not included in the environmental baseline or as indirect or interrelated effects are not considered in this BO.

The proposed action, including the specific operations of FCPP and NMEP are described above and in the EIS (OSMRE 2014a) and the BA (OSMRE 2014b); (OSMRE 2015). Types of effects were categorized by activity or by project element (Navajo Mine operations or FCPP operations):

1. Effects of Navajo Mine Operations;
2. Effects of Noise and Vibration;
3. Effects on Surface Water Hydrology;
4. Effects of Stormwater Runoff, Point source, and Other Authorized Discharges;
5. Effects of Entrainment at Cooling Water Intakes above APS Weir;
6. Effects of Operation of APS Weir on Endangered Fishes;
7. Effects of Nonnative Species Release from Morgan Lake; and
8. Effects of Atmospheric Emissions, Deposition, and Bioaccumulation;

### COLORADO PIKEMINNOW AND RAZORBACK SUCKER

***Effects of Navajo Mine Operations***

Navajo Mine Operations will not have an adverse effect on the Colorado pikeminnow and razorback sucker.

***Effects of NMEP and FCPP Operations on Surface Water Hydrology***

All of the water supply for Navajo Mine (and FCPP) Operations is obtained from the San Juan River by diversion through cooling water intakes at the APS Weir. It is then pumped into Morgan Lake, and transported to various locales for various uses (BA, pages 2-19 to 2-60). An average of 27,682 AFY of San Juan River water (ranging from 25,327 to 28,981 AFY) is used by the FCPP and Navajo Mine annually. All water supply at Navajo Mine and FCPP is supported by a water right owned by BHP Billiton New Mexico Coal Company. (BA, Section 2). The surface water right includes up to 51,600 AFY diversion and allows 39,000 AFY to be consumed.

Navajo Mine Operations in the Pinabete Permit Area are within the Chaco River Watershed (Hydrologic Unit Code 14080106), which drains 4,563 square miles of the San Juan River Basin (Hydrologic Unit Code 1408). The Navajo Mine lies on the eastern side of the Chaco River Watershed. Navajo Mine Operations would affect some portions of Cottonwood Arroyo and Pinabete Arroyo, which are the primary drainage pathways for runoff through the Pinabete Permit Area. Cottonwood and Pinabete Arroyos are ephemeral sand bed, tributary drainages that pass through the northern portion of the Pinabete Permit Area. Cottonwood Arroyo is one of the largest of the Chaco River tributaries with a drainage area of approximately 80.1 square miles (1.8 percent of the Chaco River Basin), though only approximately 6 percent of the Cottonwood Arroyo drainage area is within the permit area. Pinabete Arroyo has a drainage area of about 60 square miles (1.4 percent of the Chaco River Basin). Approximately 16 percent of the Pinabete Arroyo watershed is within the Pinabete Permit Area. Together the area of the mine drained by these arroyos is about 0.3 percent of the total area of the Chaco River watershed.

Natural runoff in these (and other) tributaries may be intercepted or diverted around mining activities or during other Navajo Mine Operations. The interception of surface water may diminish the volume of runoff from these areas that enters into the Chaco River Basin. Navajo Mine Operations conducted hydrologic modeling that indicated that intercepted flows would be approximately 757 acre feet per year (AFY) in the Pinabete Arroyo drainage, and 403 AFY in Cottonwood Arroyo drainage, assuming the entire drainage was mined in a year. In actuality, these areas would be likely mined variously over 25 years, so the potential impact would be smaller; on average about 46 AFY (757 AFY + 403 AFY = 1,160 AFY/25 years = 46.4 AFY). We compared this average intercepted water volume to the average annual flow of the Chaco River near Waterflow, New Mexico (USGS Gage 09367950) for the 18 year period of record (1977-1995), which was 35,133 AFY. The average annual volume of intercepted flows from these arroyos to that of the Chaco River was approximately 0.13 percent (=46.4 AFY/35,133 AFY=0.00132) and could range from 0.1 to 0.6 percent even if the annual rate of intercepted water were doubled in any particular year as compared to range of reported Chaco River flow). The Chaco River drains to the San Juan River near Shiprock. Average annual flow at Shiprock, approximately 2 miles downstream of the Chaco River confluence from the 2000 to 2014 water years was 415,484 cfs (USGS gaging Station 09368000), so this interception of flow represents approximately 0.05 percent of the flow of the San Juan River. After these areas are mined or modified, these drainages would be reconnected to restore their natural flow patterns (OSMRE 2014), which would be anticipated to restore surface runoff flow.

Similarly, the FCPP Operations intercept surface water flows to protect against the entry of contaminants from the Dry Fly Ash Disposal Area. This could affect flows in downstream water bodies including the Chaco and San Juan Rivers (BA, page 7-6). Because of extensive and existing water depletions from the San Juan River there is no minimum amount of water depletion that is considered insignificant in its effects to the Colorado pikeminnow and razorback sucker. This is because the Service determined that any depletion is likely to have adverse effects on the Colorado pikeminnow and razorback sucker, as well as their designated critical habitat.

***Effects of Stormwater Runoff, Point Source, and Other USEPA Authorized Discharges***

The proposed action includes the present and future issuance of National Pollutant Discharge Elimination System (NPDES) permits by USEPA for discharges associated with various activities such as coal mining, stormwater runoff, and other discharges (BA, Section 2). Under these permits, the Navajo Mine Operators are required to control all surface runoff water with the potential of being contaminated from contact with mining activities. Various polluted effluents are permitted to be discharged through conveyance facilities (e.g., pipes, ditches, etc.) that end in "outfalls" to the environment. Outfalls 1 and 2 discharge to Morgan Lake and which then eventually discharges to the Chaco River that is a tributary to the San Juan River. Outfalls 003 to Outfall 019 discharge to the Chaco River. Outfall 020 discharges to the San Juan River (USEPA 2008). There are currently 14 outfall locations on Navajo Mine Lease Areas 1, 2, and 3, and the proposed action may enable USEPA to authorize up to 26 more discharge outfalls in Areas 3, 4, and 5 (USEPA 2013). The USEPA has required monitoring at selected outfalls for arsenic, boron, cadmium, lead, Se, sulfate, and total dissolved solids. The USEPA has also established requirements that a Sediment Control Plan be designed, implemented, and maintained using BMPs at the Navajo Mine so that the Operators demonstrate that stormwater discharges will result in average, annual, sediment yields that will not be greater than similar sediment yields determined for from pre-mined or undisturbed conditions.

Effluent discharges from FCPP operations are also being authorized by NPDES permits issued by USEPA (Figure 28). The cooling water discharges will occur through an outfall to Morgan Lake, which discharges to No Name Wash (a 2.5 mile-long tributary to the Chaco River), which in turn drains approximately 7 miles of the Chaco River then to the San Juan River. These discharges are intermittent with an average of 2.5 days per week of discharge for about 6 months in a year. The rest evaporates. The average flow rate for the discharge is 4.2 million gallons a day (6.5 cfs). Discharges are mostly conducted to regulate the accumulation of salts (total dissolved solids) in Morgan Lake. Stormwater discharges associated with the electric steam generation boilers and other related facilities flows to the Combined Waste Treatment Pond for treatment and is discharged to the Condenser Cooling Water Discharge Canal. Parking lots, switchyards and other open areas are discharged to the Condenser Cooling Water Intake Canal through permitted discharge points. Stormwater in the ash disposal area is discharged to Chaco Wash after BMP treatment in accordance with a storm water construction permit. FCPP Operations also include road and vegetation maintenance activities conducted at Transmission Line crossings authorized under a General Construction Permit.

USEPA authorizes the use of a Practical Quantification Level (PQL) of a pollutant as part of the effluent limits, which is the numerical result considered accurate. In cases where the PQL exceeds the effluent limitation in a NPDES permit, an analytical result at or below the PQL is deemed by USEPA to constitute compliance with the NPDES permit effluent limitation. This practice can result in PQLs that are greater than concentrations expressed in the applicable water quality standard. We therefore expect that NPDES permits identifying outfalls with the potential to discharge Hg will provide monitoring data for Hg using Method 1631E or another sufficiently sensitive EPA-approved method. For purposes of permit applications, a method for Hg is "sufficiently sensitive" when (1) its method quantitation level is at or below the level of the applicable water quality criterion for Hg or Se (2) its method quantitation level is above the applicable water quality criterion, but the amount of Hg or Se in facility's discharge is high enough that the method detects and quantifies the level of Hg or Se in the discharge.

| NO. | TITLE | AVG. RATE (MGPD) |
|---|---|---|
| 1 | RIVER MAKE-UP; COOLING WATER INTAKE | 17-28 |
| 2 | RECIRCULATED COOLING WATER POND DISCHARGE/BLOW-DOWN | 3-14.6 |
| | SYSTEM EVAPORATION | 13.3 |
| 4 | SERVICE & RECIRCULATED COOLING WATER INTAKE* | 1000-1726.7 |
| 5 | RECIRCULATED COOLING WATER RETURN | 1000-1713.6 |
| 6 | COMBINED WASTE STREAMS * | 13.0 |
| 7 | CWTP (L.V.W.) DISCHARGE | 13.0 |
| 8 | SANITARY SEWAGE | .027-.04 |
| 9 | CHEMICAL METAL CLEANING WASTES | .100 |
| 10 | FLUE GAS DESULFURIZATION WASTEWATER | 0.8-1.4 |

* INCLUDES IN PLANT STORM WATER RUNOFF

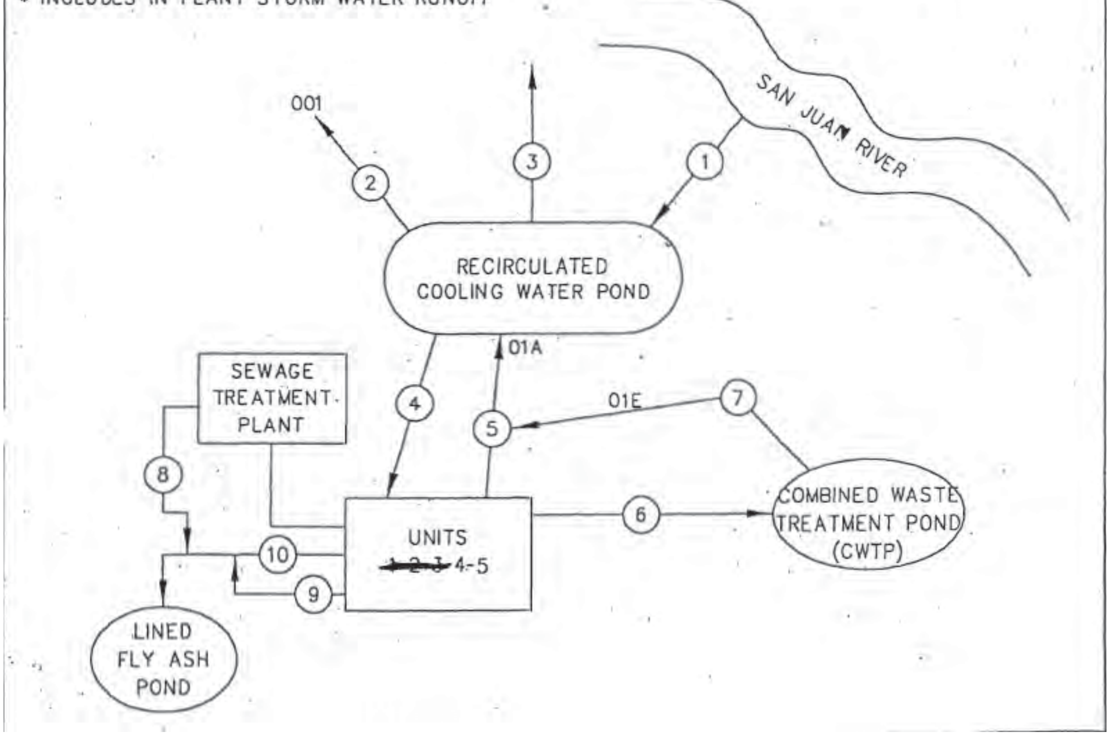



Figure 28. Effluent wastewater pathways associated with Four Corners Power Plant operations.

However, for all NPDES permit actions, we anticipate that a PQL for Se of 1 ug/L and a PQL for total Hg of 0.0002 ug/L will be used. Using the PQLs and the bioaccumulation factors (BAF) provided in the BA (OSMRE 2014, page 6-18) for Se (BAF = 485 L/mg), we expect Se in whole body razorback suckers and Colorado pikeminnow to increase to approximately 2.4 mg/kg wet weight and their egg Se concentrations would increase to 13.6 to 19.4 mg/kg DW resulting in an increase in egg mortality ranging from 4 to 5 percent. Using the PQL for Hg and the BAF provided in the BA (OSMRE 2014, page 6-18) for total Hg (BAF = 3,520), we expect Hg in whole body razorback suckers and Colorado pikeminnow to be approximately 0.1 mg/kg wet weight and therefore, associate a 2.8 percent reproductive injury and a 0.5 percent survivorship injury (Table 8). We conclude that in both cases, the PQLs used in the NPDES permits or discharges of Hg and Se would be associated with a wide range of adverse effects to the Colorado Pikeminnow and razorback sucker and their designated critical habitat.

*Discharges from the Ash Disposal Areas authorized by USEPA and OSMRE*

The DEIS reported two areas of groundwater seepage at the Ash Disposal Area known as the "north seep" and "south seepage area", which have identified contaminated groundwater (p. 4.5-57). Se concentrations beneath the Ash Disposal Area have exceeded USEPA drinking water quality standards (APS 2013). However, APS has installed extraction wells and finished a two part seepage intercept project. This project serves to intercept and prevent water seepage from both the north seep and south seepage area into the Chaco River, west of the plant in the ash disposal area. The intercept project consists of two French drains running approximately 2 miles. The trenches for the French drains were constructed down to an impermeable shale layer to ensure maximum water capture. Water is collected from the French drains and pumped to a lined pond. The operation of the intercept trenches, as well as the monitoring of groundwater by monitoring wells as well as inspection and monitoring to ensuring that any pollutant sources present in ground water that re-surfaces via seeps can be traced so that corrective actions can be undertaken. According to the BA, with the operation of intercept trenches and water extraction wells, continued operation of the ash disposal ponds should have little potential to contaminate water quality in Chaco Wash.

There are inactive ash disposal areas that previously received flue gas emission control residuals, boiler acid cleaning waste, treated sewage, chemical metal cleaning wastes, air preheater wash, co-disposal waste, and turbine foam cleaning waste. The Lined Decant Water Pond has a capacity of 517 acre-feet, although this liquid is continually pumped back to the power plant to be used in its operations, and so generally contains 135 to 435 acre feet of water (APS 2011b). These facilities are lined and all dikes are constructed in accordance with specifications approved by the New Mexico Office of the State Engineer, Dam Safety Bureau. A safety inspection, performed in 2009, found the dams and dikes associated with the ash disposal to be satisfactory.

The Ecological Risk Assessments (ERA) conducted under the EIS could not rule out risks to Colorado pikeminnow, razorback sucker, (and flycatcher, and cuckoo) in the San Juan River Basin, due to their exposure to Hg and Se. . Based on this and the factors above, the effects of the effluent discharges, likely have an adverse effect on the listed species by increasing the Hg and Se in the body burdens of Colorado pikeminnow, razorback sucker, flycatcher, and cuckoo in the action area.

***Effects of Entrainment at the Cooling Water Intakes above APS Weir***

The intakes that supply water to Morgan Lake from the San Juan River likely result in the entrainment of endangered fish from the San Juan River (BA, Section 7). These river intakes consist of two 8 by 8.5-foot intake structures that occur just upstream of the APS Weir. The west intake volume was measured at 18,250 gallons per minute (40.7 cfs) and the east intake was measured at 16,000 gpm (35.7 cfs) (R. Grimes, FCPP, pers. comm., December 16, 2014). Both intakes are fully screened with 1- by 3-inch mesh screens to keep out debris and some fish. The minimum approach velocity at the west intake is approximately 0.64 feet per second (fps) and that at the east intake is approximately 0.56 fps. During low flows, when the screens are often not fully submerged, approach velocity increases (at 6 feet of depth) to ~0.85 fps at the west intake and to ~0.74 fps at the east intake. The river intakes are operated at any time of day, as needed, with increased need during high summer temperatures. The west intake (40.7 cfs) 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 09365000, 2004 to 2013 water years). Both intakes (76.4 cfs) are generally used during the May through October timeframe, when average monthly flows in the river are between 913 to 3,316 cfs. Thus, the maximum seasonal proportion of flow diverted to Morgan Lake ranges from (=40.7/3490) 1.2 to (=40.7/784) 5.2 percent during the October to May timeframe, and (=76.4/3316) 2.3 to (=76.4/913) 8.4 percent of the flow in the June to September timeframe, when larval native fishes are known to drift within the water column and be subject to currents and flow.

The maximum diversion allowed pursuant to New Mexico Office of the State Engineer Permit 2838 is 51,600 AFY and depletion is 39,000 AFY. As noted in the BA, the full amount of the consumptive water rights under Permit 2838 has been accounted for in the SJRRIP's water accounting and factored into the flow recommendations for the San Juan River. While the FCPP and Navajo Mine would maintain the ability to divert and consumptively use as much water as the rights allow for the Project life, annual water use is expected to be reduced by 5,000 to 7,000 AFY with the closure of Units 1, 2, and 3 at the end of2013. Average consumptive use has been 27,682 AFY. Assuming a reduction of 5,000 AFY, this would equate to average consumptive use of ~22,682 AFY. The reduction in diversion would be accomplished by running the diversions in the same manner as they have been operated historically, but for shorter periods of time. Therefore, depending on the operational mode of the two intakes, approach velocities could range from 0.56 to 0.85 fps, and may depend on the mode of diversion (one intake or two) and the amount each screen is submerged. There may be time periods at which one of these intakes are on, but the range of approach velocities are expected to remain the same, even with possible reduced diversions.

No entrainment studies have been conducted at this diversion. Fish species, life stage, period of movement or migration, timing, other fish species, predator presence, human activity, fish behaviors, light and acoustic conditions, water quality, and swimming performance of the endangered fish life stages may affect the number and types of endangered fish that are entrained (drawn into the pumps, pipes, and into Morgan Lake, injured by barotrauma, or are killed).

On August 15, 2014, EPA promulgated revised regulations on the design and operation of electric steam plant intake structures, in order to minimize adverse environmental impacts. Because the facility intakes greater than two million gallons per day (mgd) 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 operates a closed-cycle recirculating system, circulating from around 1,000 up to about 1,700 million gallons a day (MGD) through Morgan Lake, a man-made cooling water impoundment.

APS will be required to undertake all appropriate measures to reduce impacts from impingement and entrainment at the river intakes (40 CFR Parts 122 and 125, EPA 2014b) , as determined by

EPA. When EPA imposes any applicable requirements, EPA will determine the specific action(s) to be taken in accordance with the regulations. All such future actions would be expected to either maintain (in the event that current operations meet USEPA standards) or reduce entrainment risk over existing levels.

*Effects of Entrainment at Cooling Water Intakes on Colorado Pikeminnow*

The maximum approach velocity of 0.85 fps in the summer would be exceeded to entrain nearly all the Age 0 Colorado pikeminnow in the vicinity of the intakes that are less than approximately 93 mm in total length (at 10C, 91 mm TL at 14C, and 87 mm TL at 20C) that have a sustained swimming ability of less than 0.85 fps (depending on water temperature, see Childs and Clarkson 1996 and Figure 29, below). For fish with planktonic larvae, such as Colorado pikeminnow, these larvae are often assumed to be entrained in proportion to the amount of flow diverted, as they tend to drift with the current. Older pikeminnow life stages are generally capable of directing their movements independently from the current. For the larger life stages, the proportion of flow diverted is less likely indicative of impingement risk. Also, Colorado pikeminnow eggs are demersal and would rarely drift and therefore, are unlikely to be entrained, and were not estimated.

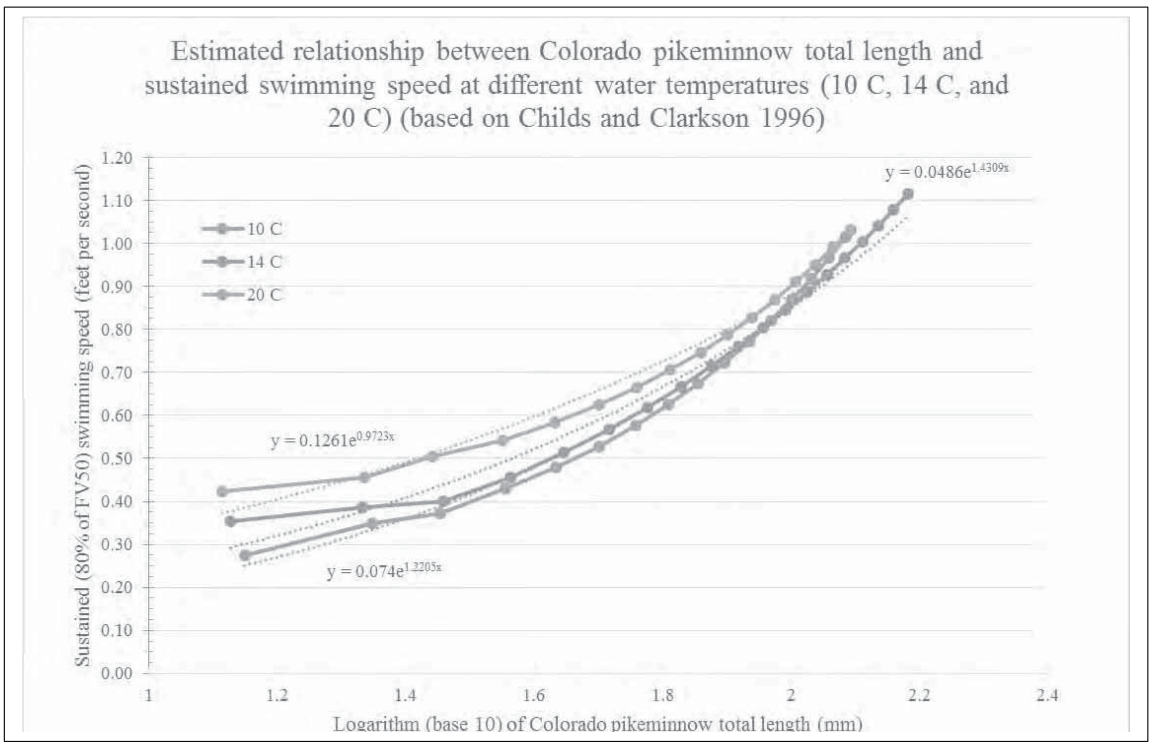



Figure 29. Estimate of swimming speed of Colorado pikeminnow by size (TL in mm) and temperature (extrapolated from three early life stages based on Childs and Clarkson 1996).

The USFWS (2009) estimated that Colorado pikeminnow spawning could potentially occur between River Miles (RM) 128 and 180. The cooling water intakes are located at APS Weir at

RM 163.3, therefore, about 26 percent of the available spawning habitat is upstream of the weir. The SJRRIP has proposed to implement fish passage around APS Weir, thereby opening up this upper reach to more spawning adults in the near future (~6 to 10 years). Lacking information on the actual distribution of spawning Colorado pikeminnow, an assumption of equal distribution within the available spawning habitat was reasonable for that minority of fish (30 percent) that do not use the preferred Mixer Area to spawn (70 percent). When Colorado pikeminnow attains recovery, as many as 203 female pikeminnow could occupy the San Juan River and as many as 30 percent of them (~61) could spawn upstream or away from the Mixer Area. We assumed that only one third of that minority population would actually spawn upstream of the APS Weir, or approximately 20 females.

The Colorado pikeminnow spawning above the APS Weir could be as many as 20 females (USFWS 2006). With each of those females producing an average of 50,000 eggs, the total produced could be as many as 1,000,000 eggs upstream of APS Weir. Valdez (2014) estimated that survivorship of eggs was approximately 30 percent and then survival of Age 0 fish was approximately 54 percent. Therefore, of the total eggs expected, as many as 300,000 eggs might hatch, and then as many as 162,000 pikeminnow larvae could be produced upstream of APS Weir. Of those, up to 8.4 percent (13,608) would be potentially entrained, assuming these fish are entrained in proportion to the amount of flow entrained. Water temperatures currently upstream of APS Weir are often likely too cool to support robust spawning and rearing of Colorado pikeminnow (Durst and Franssen 2014), which may result in a smaller proportion of adults spawning in the area above APS Weir.

We also evaluated the number of Age 0 pikeminnow entrained by other similar diversions in the San Juan River. Prior to installation of fish screens and passage at Hogback Diversion, it seasonally diverted up to 22 percent of the flow, and loss of pikeminnow larvae was estimated at 9 to 12 percent (USBR 2009). Compared to 56,000 AFY at APS Weir, the total diversion at Hogback was much less (12,100 AFY, but the daily diversion rate was more (<200 cfs versus 74.6 cfs at APS Weir) to meet seasonal agricultural demand. Diversions for the Navajo Gallup Water Supply may divert up to 59 cfs per day, or about 4 percent of flow, and is expected to entrain between 1 to 4 percent of pikeminnow larvae (5,400). Finally, estimates of loss of Age 0 pikeminnow larvae due to cold water temperatures and drift into Lake Powell was estimated at 48.3 percent of the entire Age 0 pikeminnow population (USFWS 2006).

The SJRRIP currently augments the San Juan River with hatchery-reared Colorado pikeminnow. Approximately 400,000 Colorado pikeminnow, approximately 6 months of age (50 to 65 mm total length (TL)), are stocked each year. Since 2007, nearly all of these fish have been stocked above the APS Weir and they are vulnerable to entrainment at FCPP's river station intakes. 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 only the west intake at this time and anywhere from (=40.7/1,530) 2.7 to (=40.7/728) 5.6 percent of the flow is being diverted. With a sustained swimming speed of between 0.5 to 0.6 fps, and cooling water intake velocity at approximately 0.65 fps, it is likely that some portion of the stocked pikeminnow will also be entrained. These fish swim actively so they would not be entrained in proportion to the amount of flow diverted. However, up to 5.6 percent of the pikeminnow stocked could also be entrained in the cooling water intakes. We consider 13,608 the maximum estimated number of

Age 0 pikeminnow entrained by the river station intakes per year as it also includes entrainment of some of the fish stocked in autumn .

Colorado pikeminnow may 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 (an ellipse of 1,520 $mm^2$ would fit inside each square) at the intake may be related to the size of its girth. The girth of Colorado pikeminnow has not been reported, therefore, we assumed that its shape was similar to flannelmouth sucker, whose body depth has been reported (Portz and Tyus 2004). Using the dimensions for body depth, and an estimate of 2/3rds of body depth for its width, we estimated that a Colorado pikeminnow of 385 mm TL, approximately 54 mm in depth, and about 28 mm wide, could pass through the 1 by 3 inch openings in the screens covering both cooling water intakes. In September 2012, there were 45 Colorado pikeminnow within 10 river miles of APS Weir less than 385 mm TL. In four months in 2013, there were 99 individuals less than 385 mm TL, or about 25 per month. Therefore, in any month as many as 25 pikeminnow less 385 mm TL near the cooling water intakes are entrained.

Based on entrainment, adverse effects to Colorado pikeminnow will occur.

*Effects of Entrainment at Cooling Water Intakes on Razorback Sucker*

The APS cooling water intakes might entrain some larval and older razorback suckers too. Razorback suckers spawn on the ascending limb of the hydrograph during the spring. Their larvae are found in the drift from late March to early July. Spawning is assumed to occur between RM 100 and 180, with the effort spread evenly throughout the reach (USFWS 2009). The intakes are about 16 miles below the top of the spawning reach and thus may affect about 20 percent of the potential spawning and nursery habitat. Average flow during their 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 flows and 9.9 percent of the flow at high diversion operations during lower flows. Based on the distribution of spawning and the proportion of flow diverted, it is anticipated that between 0.1 and 2 percent of recently spawned razorback sucker may be entrained.

1.

A study of entrainment at Hogback, Farmers Mutual, Jewitt Valley and Fruitland Irrigation diversions conducted in 2004 and 2005 indicates that the proportion of native sucker species entrained in the canals is considerably lower than what would be predicted based on the proportion of flow diverted (Renfro et al. 2006).

Adverse effects to razorback sucker will occur as a result of entrainment.

***Effects of Operation of APS Weir to Endangered Fishes***

The APS Weir at RM 163.3 lies within designated critical habitat for Colorado pikeminnow and upstream of designated critical habitat for razorback sucker. It impedes fish passage during some times of the year (Bio-West 2005). Some Colorado pikeminnow and razorback sucker have been observed to occur upstream (after detection downstream) and pass APS Weir under certain conditions (Bio-West 2005). Based on the conditions observed during their study, Bio-West (2005) found that both species could possibly move across the weir near its right side (looking down; north side of weir) when flows (measured at Farmington Gage) are higher than 5,000 cfs. However, for flows between 500 and 5,000 cfs, Bio-West noted that flow velocity and depth conditions are not ideal for fish passage (i.e., they do not match criteria used to design passable fishways for native species). Flows in July are typically less than 5,000 cfs, so the potential to impede spawning migrations of Colorado pikeminnow may occur in most years (Bio-West 2005). In years with low spring runoff volume, APS Weir may also impede spawning movements of razorback sucker.

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 the physical habitat quantity and quality for these species by altering depth and velocities (Bio-West 2005). The alteration of physical habitat by operation of APS Weir and sluiceway gates adversely affects the feeding, spawning and movement behavior of Colorado pikeminnow and razorback sucker.

The full extent of this blockage of movement is not known because the sustained swimming performances of larger Colorado pikeminnow and razorback sucker are not well known. Additionally, water temperatures currently upstream of APS Weir are often likely too cool to support robust spawning and rearing of Colorado pikeminnow (Durst and Franssen 2014).

However, APS Weir lies within the critical habitat for Colorado pikeminnow and its operations will adverse effects to the function and physical qualities (depth and velocity) of its critical habitat within 50 feet on either side of the weir, and prevent movement, feeding, and spawning behavior to as many as 18 miles of critical habitat upstream. The APS Weir is outside of critical habitat for razorback sucker.

***Effects of Nonnative Species Release from Morgan Lake on Colorado pikeminnow and razorback sucker***

Morgan Lake supports several species of nonnative fish, including bluegill, green sunfish, largemouth bass, white crappie, gizzard shad, common carp, plains killifish, mosquitofish, and channel catfish, as well as a novel species, such as tropical suckerfish (*Hypostomus plecostomus*) (OSMRE 2014; J.Cole, Wildlife Manager, Navajo Nation Department of Fish and Wildlife, August 28, 2014, pers. comm.). A single red pacu (subfamily Serrasalminae) was reported to inhabit Morgan Lake for over 4 years (“Toothy Fish”, Associated Press, February 28, 2004). An extensive biological survey of the type, number, and distribution of nonnative species in Morgan Lake was not available or reported.

Operations of Morgan Lake discharge water into No Name Wash, which drains to the Chaco River and from there into the San Juan River. Potential discharges from Morgan Lake could result in release of nonnative species into the San Juan River. Such discharges could be facilitated by optimal conditions for transporting live fish eggs, larvae, or fish downstream, any unauthorized or incidental transport associated with recreational fishing, or during evacuation or decommissioning of Morgan Lake, should such activities ever occur. Gustaveson (2010) presents a compelling narrative that gizzard shad, likely associated with largemouth bass stocking in Morgan Lake during 1998, had escaped into the San Juan River and by 2001 had entered Lake Powell and adversely affected the fishery there. Recent invaders, such as the gizzard shad, northern pike, and smallmouth bass, have demonstrated how quickly nonnative species can increase and expand to the detriment of native fish assemblages. No studies were available that evaluated the exposure pathways and the relative risks of nonnative fish release from Morgan Lake. Therefore, we assumed that such events could occur, and we therefore identify adverse effects associated with nonnative species releases including adverse effects to critical habitat.

While the San Juan River currently supports populations of several of these nonnative fish, release of additional individuals of these species or any new species of nonnative fish or other nonnative organisms from Morgan Lake could help support these populations or introduce novel species. Many of these nonnative fish also occur in Navajo Reservoir, which may also support populations of these species in the San Juan River. In addition, some of the nonnative 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 nonnative fish problem, as they may prey on eggs, fish larvae, or compete with native fish.

The likelihood of nonnative species release or escape from Morgan Lake is high. Their potential to survive, become established, and spread is high. Impacts on wildlife resources or ecosystems through hybridization and competition for food and habitats, habitat degradation and destruction, predation, and pathogen transfer are high. Impact to threatened and endangered species and their habitats is extreme and persistent. The adequacy or ability of regulations to prevent escape and establishment is low. The potential to extirpate or manage established populations is low. Nonnative species invasions can outstrip resources available to combat them, precluding complete eradication, and instead result in a long-term battle for control (Van Driesche et al. 2008; Green et al. 2014). The knowledge about the types and abundance of nonnative species in Morgan Lake, a body of water with unique biological, chemical, and physical properties is unknown, which creates one of the greatest uncertainties in the estimate of the risks.

Introduction of any nonnative species from Morgan Lake into the San Juan River will have an adverse effect simply by becoming integrated into the native riverine system, impacts will be negative, vary in magnitude, and can be compared through time and across space. Therefore, release of nonnative fish (or other nonnative aquatic species) from Morgan Lake will adversely affect to Colorado pikeminnow and razorback sucker.

*Effects of Nonnative Species Release from Morgan Lake on Critical Habitat*

The biological features of critical habitat include food supply, predation, and competition (Maddux et al. 1993; USFWS 2002a,b). Food supply is a function of nutrient supply, productivity, and availability to each life stage of the species. Predation, although considered a normal component of this environment, may be out of balance due to nonnative species in some areas. This may also be true of competition, particularly from nonnative fish species. Any release of nonnative species would adversely affect the endangered fishes' food, shelter from predators, competition for resources and space, movement and dispersal, and physical space to carry out normal behaviors. The duration of impacts from the nonnative species release until those species are eradicated, their impacts reduced, or they die is not known. Nonnative species introductions from Morgan Lake would adversely modify the biological features of critical habitat of these endangered fish by reducing its ability to support their recovery.

Introduction of nonnative species from Morgan Lake would preclude or significantly delay the eradication and management of nonnative species and adversely affect the biological features of the entirety of critical habitats of the Colorado pikeminnow and the Razorback sucker necessary for their recovery in the San Juan River.

Therefore, we conclude the release of nonnative species from Morgan Lake could significantly delay the development or restoration of the biological features needed to achieve recovery of Colorado pikeminnow and razorback sucker in the San Juan River relative to that which would occur without the action undergoing consultation, and therefore, is likely to result in adverse effects to their critical habitat.

***Effects of FCPP Atmospheric Emissions, Deposition, and Bioaccumulation***

In order to estimate the effects associated with the proposed action, we determined that the percentage of Hg accumulation in whole body Colorado pikeminnow associated with the proposed action was 0.3 percent from scenario APS- 1 as compared to Scenario APS-2, without FCPP having ever existed. Similarly, EPRI (2014) also estimated that the proposed action was associated with 0.35 percent of the baseline Hg deposition in the San Juan River Basin. Therefore, to estimate the effects of the proposed action, all Hg effects associated with the environmental baseline were multiplied by 0.3 percent; afterwards the environmental baseline was reduced this same amount.

Based on an annual reproductive injury from mercury accumulation from all sources of up to 8 percent and an adult mortality of up to 2 percent, there is a measurable population-level impact in Colorado pikeminnow demographic parameters. Under the conditions of an increasing Hg load, the combination of a reduction of recruitment and the loss of adults appears to result in long-term population decline as recruitment of new adults cannot keep up with adult mortality (Miller 2014). Under the assumption of an increasing environmental Hg burden in the San Juan River, the estimated injuries to both reproductive success and age-specific survival led to observable decreases in simulated Colorado pikeminnow population growth.

When Hg deposition contributes to an annual reproductive injury above 8 percent and an adult mortality above 1.5 percent, Colorado pikeminnow survival in the San Juan River is adversely affected and the function of designated critical habitat is compromised. Based on the ERM (2014a, b) analysis for adult reproductive injury, adult survivorship injury, and for the analysis conducted for this BO, those conditions occur when average adult Colorado Pikeminnow whole body Hg concentrations are at or above 0.7 mg/kg WW in the San Juan River Basin.

The Colorado pikeminnow and razorback sucker would be exposed to Hg from baseline conditions, as well as 0.3 percent from the proposed action by FCPP, through Hg deposition, runoff through into downstream aquatic habitats, and subsequent bioaccumulation through the food chain. Mercury bioaccumulates in endangered fish in the San Juan River and is a potent neurotoxin that affects their fitness and reproductive health (Crump and Trudeau 2009). Once Hg enters the body, it poses the highest threats of toxicity because it can be absorbed into living tissues and blood. Once in the blood it crosses into the brain and accumulates, there is no known way to be expelled from the brain (Gonzalez et al. 2005).

The accumulation of Hg from water occurs via the gill membranes as well as through ingestion (Beckvar 1996; USEPA 1997). MeHg is eventually transferred from the gills to muscle and other tissues where it is retained for long periods of time (Julshamn et al. 1982; Riisgård and Hansen 1990). Probably less than 10 percent of the Hg in fish tissue residues is obtained by direct (gill) uptake from water (Francesconi and Lenanton 1992; Spry and Wiener 1991). Hg taken up with food initially accumulates in the tissues of the posterior intestine of fish (Boudou et al. 1991). Hg ingested in food is transferred from the intestine to other organs including muscle tissues (Boudou et al. 1991). MeHg has been reported to constitute from 70 to 95 percent of the total mercury in skeletal muscle in fish (Huckabee et al. 1979; EPA 1985; Riisgård and Famme 1988; Greib et al. 1990; Spry and Wiener 1991). MeHg accounted for almost all of the Hg in muscle tissue in a wide variety of both freshwater and saltwater fish (Bloom 1992).

Hg in fish tissues can be transferred to ovary and eggs (Beckvar 1996; Wiener and Spry 1996; McKim et al. 1976). Exposure of the parent population to Hg concentrations of 0.03 to 2.93 ug/l in the laboratory resulted in Hg concentrations as high as 2 mg/kg in their embryos (McKim et al. 1976). Other studies reported a maternal burden transfer to eggs ranging from 0.2 to 36 percent (Hammerschmidt et al. 1999; Hammerschmidt and Sandheinrich 2005; Alvarez et al. 2006; Nye et al. 2007). Hatching success and embryonic survival in fish are inversely correlated with Hg concentrations in the egg (Whitney 1991; Dillon et al. 2010; ERM 2014b). Without additional information about the maternal transfer rate of Hg from the adult female to Colorado pikeminnow eggs, we assumed a transfer of 0.2 percent of the adult female whole body burden Hg concentration to eggs. Total mercury concentrations in eggs of several species of adult fish from Swedish lakes are much lower than concentrations in other tissues (Lindqvist 1991). Fish (including eggs and larvae) continue take up Hg from the water column and their prey (McKim et al. 1976; Pentreath 1976a; 1976b).

The toxicity of Hg to aquatic organisms is affected by both abiotic and biotic factors including the form of Hg (inorganic versus organic), environmental conditions (e.g., temperature, salinity, and pH), the sensitivity of individual species and life history stages, and the tolerance of individual organisms. Toxicological effects include neurological damage, reproductive impairment, growth inhibition, developmental abnormalities, mortality, and altered behavioral responses (Beckvar 1996, Beckvar et al. 2005, Dillon et al. 2010, ERM 2010a,b). Wiener and Spry (1996) concluded that neurotoxicity seems to be the most probable chronic response of wild adult fishes to Hg exposure, based on observed effects such as incoordination, inability to feed, diminished responsiveness, abnormal movements, lethargy, and brain lesions. Mercury exposure can affect Colorado pikeminnow populations through reproductive impairments. In laboratory studies, reproductive endpoints are generally more sensitive than growth or survival, with embryos and the early developmental stages being the most sensitive (Hansen 1989).

Of the 43 to 60 percent of Colorado pikeminnow that experience behavioral injury, some percentage of those may experience brain lesions and thus impairment of essential feeding, breeding, migrations or sheltering behaviors. We based this relationship on the ratio of survivorship injury to behavioral injury using ERM (2014a,b), and estimated that approximately 1.1 percent of adult Colorado pikeminnow annually that experience behavioral injury will also exhibit extreme maladaptive behaviors and will subsequently die, fail to spawn, or fail to migrate to appropriate areas in time for spawning. Therefore, we conclude that Colorado pikeminnow will be adversely affected by the proposed action.

*Effects of Hg deposition on Colorado Pikeminnow Critical Habitat*

Average concentrations in whole body adult Colorado pikeminnow associated with the environmental baseline, cumulative effects, and residuals associated with proposed action may equal or exceed 0.7 mg/kg WW by the year 2046, after the cessation of the proposed action Hg deposition have ceased. Therefore, the proposed action Hg deposition contributes to the adverse effects to Colorado pikeminnow critical habitat. However, Hg contributions to the San Juan River Basin are largely associated with the degraded environmental baseline and cumulative effects would be expected to adversely affect Colorado Pikeminnow critical habitat by the year 2046. There could be reductions in amount of Hg deposited in the San Juan River Basin over time, but modeling indicates Hg in whole body fish were not significantly different over the 85-year modeled simulation period (EPRI 2014).

*Estimation of Hg in Muscle Tissue and Whole Body Razorback Sucker by Size (Total Length)*

Concentrations of Hg in Razorback sucker are much lower as (converted) whole body ranged from 0.03 to 0.13 mg/kg WW and averaged 0.07 mg/kg WW (Table 5). This level of whole body Hg was similar to that in an Age 3 Colorado pikeminnow, and therefore, we used a similar method to estimate the number of razorback suckers that would be adversely affected by the proposed action.

*Effects of Hg deposition on Razorback Sucker Critical Habitat*

No information was available to determine the Hg-related impairments associated with a long-term population decline of razorback suckers necessary to characterize Hg concentrations associated with adverse modification of their critical habitat. Similar to Colorado pikeminnow, we assumed that razorback sucker critical habitat would also be adversely modified when Hg concentrations in water bioaccumulate to whole body concentrations that were are associated with at least 8 percent reproductive injury and with at least 1.5 adult mortality. Those conditions occur with 3.5 Hg mg/kg WW in whole body razorback sucker. Using Bioaccumulation Factors provided in the BA, a water concentration associated with 3.5 mg/kg WW could result from 0.05 ug/L methylmercury in water or 1.0 ug/L total Hg in water for razorback sucker. Concentrations associated with the proposed action do not increase concentrations of methylmercury or total Hg to those levels. Therefore, Hg deposition from the proposed action adversely affects the razorback sucker, but does not adversely affect its critical habitat.

*Effects of Se Deposition on Listed Species and Critical Habitat*

Using the same analyses as described in the environmental baseline, the effects to Colorado pikeminnow and razorback sucker was estimated for the proposed action. We expect as many as 25,503 Colorado pikeminnow eggs/ovaries and 291,510 razorback sucker eggs/ovaries to be harmed by the proposed action from 2016-2074. We expect as many as 42 Colorado pikeminnow larvae and 301 razorback sucker larvae to be harmed by the proposed action from 2016-2074. For the duration of Se deposition from the FCPP, we would expect as many as (58 years x 0.2 per year x 0.33 = 4) four nesting pairs to be exposed to the Hg deposited pollutants in their habitat and Hg burdens may adversely affect up to 12 eggs, nestlings, or fledglings of either the flycatcher or the cuckoo. We conclude critical habitat will be adversely affected by additional Se deposition.

## SOUTHWESTERN WILLOW FLYCATCHER

### *Effects of Navajo Mine Operations*

No flycatcher nesting habitat occurs on the Navajo Mine Lease area (BA). However, within the Navajo Mine Lease Area suitable migratory flycatcher stopover habitat occurs in widely scattered patches of tamarisk in Cottonwood Arroyo, Chinde Wash, Pinabete Arroyo and at a small stock pond in the southern portion of the and Pinabete Permit Area (BA, page 6-4; Ecosphere 2012, p. 6). This suitable migratory flycatcher stopover habitat is subject to removal, disturbance, and reclamation under the proposed action.

For a variety of reasons, the proposed action cannot avoid removal or disturbance of these areas during May through August, when migrant flycatchers could likely occur. Therefore, during seasonal presence periods, when these suitable habitats are scheduled for removal, flycatcher protocol surveys will need to be conducted to identify when migrant flycatchers occupy these areas, and to the extent possible, activities and disturbances should be minimized until flycatchers leave of their own volition (or are possibly harassed by noise). Measures to protect other nesting migratory birds may also be necessary during habitat removal. Although likely a rare occurrence, and based on the observation of one migrant flycatcher at the DFADA in 18 years, we expect as many as 1.5 migrant flycatchers could be disturbed or harassed per habitat while these habitats are disturbed, removed, or remediated (that is, 3 habitats lost x 1.5 flycatchers per 25 years = 5 possible migrant flycatchers that may be subject to harassment by Navajo Mine Operations) and therefore adversely affected through 2041.

### *Effects of Noise and Vibration*

The level at which fish and wildlife can detect sound depends upon the level of ambient noise. We assume that ambient noise near the San Juan River (and near other water bodies in the action area) would have characteristic noise similar to that in nearby unaffected sites with ambient background noise levels (average 35 dB, peak noise 55 dB; EIS page 4.14-8). There is no information available on sound and vibration frequencies in the San Juan River as systematic measurement of sounds underwater have not taken place, or any such records are incomplete or unpublished. We assumed the ambient underwater ambient acoustic habitat range of sound of 10 to 30 decibels with respect to 1 micropascal pressure (dB re 1 uPa), but it could depend on many factors including frequencies, and ambient noise levels affected by waterfalls, wind, rain, and reflectance off the water surface (Cavanaugh and Tocci 1998; Popper et al. 2014). These factors are used in complex numerical models to estimate the conductance of noise over distance in air and during transfer to the water column. As sound pressure (amplitude) falls inversely proportional to the distance (1/r) from the sound source, we identified that the peak noise levels travel approximately 3.5 additional miles to the San Juan River and would be 65 dB. We then used a 62 dB correction factor (developed by the US Navy) to estimate the sound levels in water column (conversions made using website at http://www.sengpielaudio.com/Calculations03.htm). At Station 1, at the southern edge of Morgan Lake, the maximum noise measured was 78 dBlmax. Therefore, at a distance 3.5 miles further to the San Juan River, the noise level would be 65 dB.

Migrant flycatchers may have the potential to occur in the Action Area from May through August, but autumn flycatcher migration may vary from year to year, from site to site, and in response to environmental conditions (Finch et al. 2000). Migratory flycatchers have been documented occasionally near Morgan Lake, San Juan River, Rio Puerco, and once near the DFADA (~15 miles away from the Pinabete Permit Area arroyos) during previous 16 years of surveys (BA, page 6-4; Ecosphere 2012a; Marron 2012a, b). Although there is uncertainty regarding detection frequency, this is about 0.06 flycatchers per year, or 1.5 flycatchers per 25 years. Modification and loss of migratory "stopover" habitat used by flycatchers to replenish energy reserves during their long-distance migration may also contribute to the decline of flycatcher survival and reproduction.

Because flycatchers have been documented in the Action Area and migratory stopover habitat occurs in Cottonwood Arroyo, Chinde Wash, Pinabete Arroyo, and at the small stock pond (and unlike the cuckoo), the presence of migrant flycatchers in these habitats is possible. Should flycatchers be using these migratory stopover habitats when they are disturbed, then adverse effects (in the form of harassment) could occur. Flycatchers disturbed from their migratory stopover habitats might not replenish their fat and protein stores, which may affect their flight performance and ability to overcome obstacles (inclement weather, landscape barriers, predators, and discontinuity of stopover habitats) or migrate successfully (Finch et al. 2000, citing Moore 2000).

For a variety of reasons, the proposed action cannot avoid removal or blasting disturbance of these areas during May through August, when migrant flycatchers could likely occur. Based on the observation of one migrant flycatcher at the DFADA observed since 1998 (~0.06/year), we expect as many as 1.5 migrant flycatchers could be disturbed or harassed per suitable habitat while these habitats are removed or when blasting occurs nearby (estimated as 3 habitats with 1.5 migrant flycatchers per year over 25 years = 5 migrant flycatcher harassments or temporary hearing loss due to noise associated with Navajo Mine Operations).

Therefore, during seasonal presence periods, when these suitable habitats are scheduled for removal or prior to loud blasting noise disturbances, flycatchers are likely to be adversely affected and protocol surveys will need to be conducted to identify when migrant flycatchers occupy these stopover habitats, and to the extent possible, activities and disturbances should be minimized until any flycatchers leave of their own volition.

***Effects of Stormwater Runoff, Point Source, and Other USEPA Authorized Discharges***

The proposed action includes the present and future issuance of National Pollutant Discharge Elimination System (NPDES) permits by USEPA for discharges associated with various activities such as coal mining, cooling plant water, stormwater runoff, and other discharges (BA, Section 2). Under these permits, the Navajo Mine Operators are required to control all surface runoff water with the potential of being contaminated from contact with mining activities. Various polluted effluents are permitted to be discharged through conveyance facilities (e.g., pipes, ditches, etc.) that end in "outfalls" to the environment. Outfalls 1 and 2 discharge to Morgan Lake and which intermittently discharges to the Chaco River that is a tributary to the San Juan River. Outfalls 003 to Outfall 019 discharge to the Chaco River. Outfall 020 discharges to the San Juan River (USEPA 2008). There are currently 14 outfall locations on Navajo Mine Lease Areas 1, 2, and 3, and the proposed action may enable USEPA to authorize up to 26 more discharge outfalls in Areas 3, 4, and 5 (USEPA 2013). The USEPA has required monitoring at selected outfalls for arsenic, boron, cadmium, lead, Se, sulfate, and total dissolved solids. The USEPA has also established requirements that a Sediment Control Plan be designed, implement, and maintained using BMPs at the Navajo Mine so that the Operators demonstrate that stormwater discharges will result in average, annual, sediment yields that will not be greater than similar sediment yields determined for from pre-mined or undisturbed conditions.

Effluent discharges from FCPP operations are also being authorized by NPDES permits issued by USEPA (Figure 28). The cooling water discharges will occur through an outfall to Morgan Lake, which discharges to No Name Wash (a 2.5 mile-long tributary to the Chaco River), which in turn drains approximately 7 miles of the Chaco River then to the San Juan River. These discharges are intermittent with an average of 2.5 days per week of discharge for about 6 months in a year. The rest evaporates. The average flow rate for the discharge is 4.2 million gallons a day (6.5 cfs). Discharges are mostly conducted to regulate the accumulation of salts (total dissolved solids) in Morgan Lake. Stormwater discharges associated with the FCPP operations, associated with the electric steam generation boilers and other related facilities flows to the Combined Waste Treatment Pond and is discharged to the Condenser Cooling Water Discharge Canal. Parking lots, switchyards, and other open areas are discharged to the Condenser Cooling Water Intake Canal through permitted discharge points. Stormwater in the ash disposal area is discharged to Chaco Wash after BMP treatment in accordance with a storm water construction permit.

USEPA authorizes the use of a Practical Quantification Level (PQL) of a pollutant as part of the effluent limits, which is the numerical result considered accurate. In cases where the PQL exceeds the effluent limitation in a NPDES permit, an analytical result at or below the PQL is deemed by USEPA to constitute compliance with the NPDES permit effluent limitation. This practice can result in PQLs that are greater than concentrations expressed in the applicable water quality standard. We therefore expect that future NPDES permits will be issued in accordance with evaluation methods developed through RPM 5.

*Discharges from the Ash Disposal Areas authorized by USEPA and OSMRE*

The DEIS reported two areas of groundwater seepage at the Ash Disposal Area known as the "north seep" and "south seepage area", which have identified contaminated groundwater (p. 4.5-57). APS has installed extraction wells and finished a two part seepage intercept project. This project serves to intercept and prevent water seepage from both the north seep and south seepage area into the Chaco River, west of the plant in the ash disposal area. The intercept project consists of two French drains running approximately 2 miles. The trenches for the French drains were constructed down to an impermeable shale layer to ensure maximum water capture. Water is collected from the French drains and pumped to a lined pond. . The operation of the intercept trenches, as well as the monitoring of groundwater by monitoring wells as well as inspection and monitoring to ensuring that any pollutant sources present in ground water that re-surfaces via seeps can be traced so that corrective actions can be undertaken. With the operation of intercept trenches and water extraction wells, continued operation of the ash disposal ponds should have little potential to contaminate water quality in Chaco Wash.

The Ecological Risk Assessments (ERA) conducted under the EIS could not rule out risks to flycatcher (and cuckoo) in the San Juan River Basin, due to their exposure to Hg and Se. Therefore, the effects of the effluent discharges likely have an adverse effect on the listed species by increasing the Hg and Se in the body burdens of flycatcher (and cuckoo) in the action area.

***Effects of FCPP Atmospheric Emissions, Deposition, and Bioaccumulation***

*Effects of Hg of Se deposition on Flycatcher and Cuckoo in the Deposition Area*

AECOM (2013) prepared an ecological risk assessment (ERA) to support the EIS and OSMRE's BA. A conceptual site model was developed to describe the exposure pathways linking Hg (and Se and other pollutant) releases to the environment and then to ecological receptors such as federally listed birds (Figure 21). The ERA focused on San Juan River habitat from the Deposition Area downstream into the San Juan River arm of Lake Powell. The ERA was intended to evaluate the risks posed by exposure of federally listed birds to pollutants associated with the environmental baseline, cumulative effects and the future FCPP stack emissions from 2016 to 2041 (AECOMM 2013). Federally listed bird exposures were evaluated using a traditional daily dose approach where dose was expressed in units of mg/kg per day (mg/kg-day) of the pollutants ingested. Toxicity reference values (TRVs) were developed, in units of mg/kg-day, which are doses below which adverse ecological effects are not expected. The risks were characterized in terms of a hazard quotient (HQ) where values greater than 1 indicate a potential for adverse ecological effects to individual birds. Hazard quotients for riparian birds in the San Juan River including flycatchers (and cuckoos) were less than 6.7 for MeHg and less than 5.9 for selenium indicating the potential for adverse effects to federally listed birds (AECOMM 2013).

Habitat modeling by AECOM (2013d, 2014) identified approximately 6,726 acres of potentially suitable southwest willow flycatcher habitat within the Deposition Area. The ratio of flycatcher nesting habitat (632 acres; BOR 2012) to flycatcher critical habitat in the Middle Rio Grande (47,844 acres) was (632/47844=) 0.013. If we assume a similar ratio of flycatcher nesting habitat to suitable flycatcher habitat within the Deposition Area, we estimate that as many as (6726 acres x 0.013=) 87.4 acres of nesting habitat could occur within any year. In a recovered flycatcher population, the average suitable nesting habitat size is 5.4 acres (USFWS 2013). The total maximum number of nesting flycatchers that could occupy the Deposition Area in any year would be (87.4 acres/5.4 acres =) 16 nesting pairs. However, not all flycatcher habitats in the Deposition Area are currently suitable nesting habitat nor would they be expected to remain suitable nesting habitats over time.

Hg is an environmental contaminant that can also have adverse effects on riparian wildlife (Scheuhammer et al. 2012; Wentz et al. 2014). For riparian birds such as flycatchers and cuckoos, Hg is accumulated via ingestion of aerial insects emerging from benthic life stages in aquatic environments containing Hg or from associated predatory spiders (Cristol et al. 2008; Edmonds et al. 2012; Evers et al. 2012; Buckland-Nicks et al. 2014; Gann et al. 2014). Dietary total Hg concentrations associated with adverse effects to birds are generally greater than 0.1 mg/kg WW (DOI 1998). Once ingested, MeHg rapidly moves into the bird's central nervous system, resulting in behavioral and neuromotor disorders (Tan et al. 2009; Scheuhammer et al. 2007, 2012). The developing central nervous system in avian embryos is especially sensitive to this effect, and permanent brain lesions and spinal cord degeneration are common (DOI 1998, Young 1998; Bryan et al. 2003; Scheuhammer et al. 2007; Heinz et al. 2009). Therefore, adverse effects are described for the eggs, embryos, nestlings and/or fledglings associated with elevated Hg burdens in the female parent and due to foraging.

Hg concentrations in invertebrates from the San Juan River Basin are generally (0.03 to 0.04 mg/kg WW) less than this threshold concentration (AECOM 2013). No modeling of Hg in invertebrates over time was conducted. We expected that no more than one third of invertebrate Hg concentrations would be greater than the 0.1 mg/kg WW threshold. Therefore, we applied the average annual flycatcher-nesting rate from 20 years of survey results in the San Juan River Basin to estimate the likelihood that suitable nesting habitat within the Deposition Area would be occupied by nesting flycatchers (16 nesting pairs x 1.25 percent flycatcher nesting rate per year = 0.2) to be 20 percent probability during any one year.

In a recovered flycatcher population, the average suitable nesting habitat size is 5.4 acres (USFWS 2013). Additionally, as many as 25 territories, or at most 25 nesting pairs would occur within the San Juan Management Unit. Therefore, in a recovered population, we would expect as many 25 nesting pairs at 0.2 per year for a duration of over 50 years or 250 pairs to form territories of nest within the entire San Juan Management Unit and approximately one-third of them (82) might be at risk of Hg toxicity, with the majority of these occurring beyond 2050 where there is greater uncertainty. There are no PCEs including Hg or water of sufficient quality for either flycatcher critical habitat or for cuckoo proposed critical habitat and therefore, none is affected.

Therefore, the proposed action will have adverse effects on nesting flycatchers (including their eggs, embryos, nestling, and/or fledglings) through Hg and Se deposition, transport, and bioaccumulation to levels associated with delayed or impaired development, and/or mortality.

## YELLOW-BILLED CUCKOO

### *Effects of Noise and Vibration*

Operations of Navajo Mine and Four Corners Power Plant will generate noise and vibration and the effects of noise to wildlife were described in the EIS (OSMRE 2014 PFEIS, pages 4.14-1 to 4.14-28). Noise levels associated with the proposed action included an average of 54 dBleq and maximum of 78 dBlmax measured at the southern portion of Morgan Lake (EIS, page 4.14-13) (the noise monitoring stations closest to the San Juan River. Noise levels at the pump house or at APS Weir along the San Juan River were not reported). During Navajo Mine Operations, including habitat removal activities range from an average of 82 dBleq and maximum of 110 dBlmax (EIS< page 4.14-19). Blasting activities can range from an average of 94 dBlmax to 113 dBlmax (EIS< pages 4.14-11 to 4.14-19) with a maximum ground-borne vibration of 0.18 inches per second). Noise levels associated with transmission lines ranged from an average of 40 to 60 dBleq and up to 65 dB during maintenance activities (EIS page 4.14-13).

Similarly, the effect of noise on avian wildlife are also highly varied and is dependent on noise intensity, frequency, duration of exposure and the sensitivity of the species affected (USBOR 2008). Based on reviews by Goudie and Jones (2004) and Dooling and Popper (2007), we surmise that hearing injury to birds can occur at noise levels > 125 dB, with recoverable injury occurring at > 93 dB, and the masking of song and behavioral changes associated with continuous noise sources would occur above ambient noise levels (that is, >50 to 60 dB). Yellow-billed cuckoos appear to be more sensitive to noise than flycatchers and tend to abandon habitats at sound levels > 55 dB when exposed to traffic noise over 10 weeks (Goodwin and Shriver 2011). Ambient noise near the San Juan River (and near other riparian areas near perennial surface water bodies in the action area) may have characteristic noise similar to that measured in nearby unaffected areas with ambient noise levels reported in the EIS (EIS page 4.14-8; average 35 dB, and maximum peak noise was 55 dB).

Noise levels associated with the proposed action included an average of 54 dBleq and maximum of 78 dBlmax measured at the southern portion of Morgan Lake (EIS, page 4.14-13). Using the 3.5-mile distance to the San Juan River, we expect noise levels there would average about 41 dB and maximum noise levels would be about 65 dB. When peak noise levels occur, we would expect that the cuckoo would experience minor behavioral changes such as a startle response, but would not have adversely effects because peak noise would be low and the average noise levels expected (41 dB) are below levels of concern (50 to 60 dB) near the San Juan River.

### *Effects of Stormwater Runoff, Point Source, and Other USEPA Authorized Discharges*

There is insufficient information to estimate nesting habitat or potential nesting rates of cuckoos within the San Juan River Basin at this time. Therefore, the analysis for the flycatcher served as a proxy for the cuckoo Hg and Se effects analysis, estimation of potential habitat, and estimation of incidental take. Cuckoo surveys will be required within the same or similar riparian habitats within the Deposition Area as are conducted for flycatchers.

### *Effects of FCPP Atmospheric Emissions, Deposition, and Bioaccumulation*

*Effects of Hg of Se deposition on Flycatcher and Cuckoo in the Deposition Area*

There is insufficient information to estimate nesting habitat or potential nesting rates of cuckoos within the San Juan River Basin at this time. Therefore, the analysis for the flycatcher served as a proxy for the cuckoo Hg and Se effects analysis, estimation of potential habitat, and estimation of incidental take. Cuckoo surveys will be required within the same or similar riparian habitats within the Deposition Area as are conducted for flycatchers.

Table 8. Summary of Effects of Hg Deposition from the Proposed Action and associated with the Environmental Baseline and Cumulative Effects to endangered fishes, critical habitat and birds. (Note: Hg burden, mercury and/or methylmercury in fish or bird tissues; dph, days post hatch; FCPP and NMEP, Four Corners Power Plant and Navajo Mine Energy Project operations are proposed to cease by 2042, but residual Hg in San Juan River Basin will continue to affect listed species until 2074).

| Table 8. Species or Habitat | Life stage or Habitat Effected | Type of Adverse Effect to Species or Critical Habitat | Estimated Take or Critical Habitat Affected by Proposed Action (FCPP and NMEP for 2016-2074) | Estimated Loss or Critical Habitat Affected in the Environmental Baseline and/or by Cumulative Effects |
|---|---|---|---|---|
| Colorado pikeminnow | egg/ovary/embryo/larvae <6dph | Adverse Effect | 250,340 | 66,978,395 |
| Colorado pikeminnow | larvae > 5 dph /Age 0 | Adverse Effect | 2,975 | 796,688 |
| Colorado pikeminnow | subadult / Age 1 through Age 6 | Adverse Effect | 1,118 | 301,154 |
| Colorado pikeminnow | adult / greater than Age 6 | Adverse Effect | 47 | 1,940 |
| Colorado pikeminnow | subadult / Age 2 through Age 6 | Adverse Effect | 25 | 6,861 |
| Colorado pikeminnow | adult / greater than Age 6 | Adverse Effect | 2 | 419 |
| Colorado pikeminnow | adult / greater than Age 6 | Adverse Effect | 7 | All adults after 2046 |
| Colorado pikeminnow critical habitat | Physical features of critical habitat | Adverse Effect | All Critical Habitat in San Juan River | N/A |
| Colorado pikeminnow critical habitat | Physical features of critical habitat | Adverse Effect | N/A | All Critical Habitat in San Juan River in ~2046 |
| Razorback sucker | egg/ovary/embryo/larvae <6dph | Adverse Effect | 34,694 | 9,282,671 |
| Razorback sucker | larvae greater than 5dph/Age 0 | Adverse Effect | 552 | 148,042 |
| Razorback sucker | subadult / Age 2 through Age 4 | Adverse Effect | 34 | 9,137 |

| Table 8. Species or Habitat | Life stage or Habitat Effected | Type of Adverse Effect to Species or Critical Habitat | Estimated Take or Critical Habitat Affected by Proposed Action (FCPP and NMEP for 2016-2074) | Estimated Loss or Critical Habitat Affected in the Environmental Baseline and/or by Cumulative Effects |
|---|---|---|---|---|
| Razorback sucker | adult / greater than Age 1 | Adverse Effect | 12 | 3,085 |
| Razorback sucker | subadult / Age 2 through Age 4 | Adverse Effect | 1 | 224 |
| Razorback sucker | adult / greater than Age 4 | Adverse Effect | 4 | 1,084 |
| Razorback sucker | adult / greater than Age 1 | Adverse Effect | 1 | 286 |
| Razorback sucker critical habitat | Physical features of critical habitat | Adverse Effect | None | All Critical Habitat in San Juan River |
| Southwestern willow flycatcher | egg/embryo/nestl ing/fledgling | Adverse Effect | 4 nests of up to 12 | 25 nests and up to 89 |
| Yellow-billed cuckoo | egg/embryo/nestl ing/fledgling | Adverse Effect | 4 nests of up to 12 | 25 nests and up to 89 |

Table 9. Summary of Effects of Se Deposition from the Proposed Action and associated with the Environmental Baseline and Cumulative Effects to endangered fishes, critical habitat and birds. (Note: Se burden, mercury and/or methylmercury in fish or bird tissues; dph, days post hatch; FCPP and NMEP, Four Corners Power Plant and Navajo Mine Energy Project operations are proposed to cease by 2042, but residual Se in San Juan River Basin will continue to affect listed species until 2074).

| Table 9. Species or Habitat | Life stage or Habitat Effected | Type of Adverse Effect to Species or Critical Habitat | Estimated Take or Critical Habitat Affected by Proposed Action (FCPP and NMEP for 2016-2074) | Estimated Loss or Critical Habitat Affected in the Environmental Baseline and/or by Cumulative Effects |
|---|---|---|---|---|
| Colorado pikeminnow | egg/ovary/embryo/larvae | Adverse Effect | 25,503 | 66,978,395 |
| Colorado pikeminnow | larvae > 5dph/Age 0 | Adverse Effect | 42 | 547,751 |
| Colorado pikeminnow | adult / greater than Age 6 | Adverse Effect | ~1 | 2,594 |
| Colorado pikeminnow critical habitat | Physical features of critical habitat | Adverse Effect | All Critical Habitat in San Juan River | all Critical Habitat in San Juan River |
| Razorback sucker | egg/ovary/embryo/larvae | Adverse Effect | 291,510 | 1,361,956,116 |
| Razorback sucker | larvae > 5dph/Age 0 | Adverse Effect | 301 | 3,881,323 |
| Razorback sucker | adult / greater than Age 1 | Adverse Effect | 6 | 29,139 |
| Razorback sucker critical habitat | Physical features of critical habitat | Adverse Effect | All Critical Habitat in San Juan River | All Critical Habitat in San Juan River |
| Southwestern willow flycatcher | egg/embryo/nestling/fledgling | Adverse Effect | 4 nests, or up to 12 | 25 nests, or up to 89 |
| Yellow-billed cuckoo | egg/embryo/nestling/fledgling | Adverse Effect | 4 nests, or up to 12 | 25 nests, or up to 89 |

# CUMULATIVE EFFECTS

Cumulative effects include the effects of future State, tribal, local, or private actions on endangered or threatened species or critical habitat that are reasonably certain to occur in the foreseeable future in the action area considered in this BO. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the ESA. Cumulative effects analysis as stated here applies to section 7 of the ESA and should not be confused with the broader use of this term in the National Environmental Policy Act or other environmental laws.

## COLORADO PIKEMINNOW AND RAZORBACK SUCKER AND CRITICAL HABITAT

***Coalbed methane development***

The San Juan basin in southwestern Colorado and northwestern New Mexico is rich in coalbed methane, and development of this resource has increased rapidly in the last ten years. There are currently more than 3,000 coalbed methane wells in the San Juan basin in the Fruitland Coal Formation. Historically, one well per 320 acres was allowed in this area; however, the Colorado Oil and Gas Commission approved an increase of the well spacing to one well per 160 acres. Potentially more than 700 additional wells may be drilled and approximately 250 of these could occur on private or State land. Coalbed methane development requires the extraction of groundwater to induce gas flow. It was estimated that the wells would be drilled by 2013, but because of slow groundwater movement water depletion effects would not be incurred until at least 2025.

A study was initiated in 1998 to determine the effects of groundwater extraction from the Fruitland Formation. The study is called the 3M Project (mapping, modeling, and monitoring) and was being conducted by the Colorado Oil and Gas Conservation Commission in cooperation with the Southern Ute Indian Tribe, BLM, the Forest Service, and the industry. The mapping and modeling studies were completed in 2000. A follow-up project was funded by the Ground Water Protection Research Foundation (GWPRF).

The Fruitland Formation and the underlying Pictured Cliffs Sandstone were shown to be an aquifer system. In general terms, the groundwater produced from near-outcrop coalbed methane wells is recent recharge water that would, under predevelopment conditions, discharge to the Animas, Pine, Florida and Piedra Rivers. These rivers provide flow to the San Juan River. Coalbed methane wells occur on Federal, State, Tribal and private lands. Future section 7 consultations are not expected for coalbed methane development on private or State lands; therefore, these water depletions are considered a cumulative effect that is reasonably certain to occur within the action area.

The GWPRF used a groundwater model and a reservoir model to determine water budgets and depletions associated with coalbed methane development. Three areas around the Animas, Pine, and Florida Rivers were modeled using three-dimensional multi-layer models to account for aquifer-river interactions and the effects of coalbed methane development. Baseline conditions were simulated with a single-phase ground water flow model (MODFLOW), and predictive runs were made using two-phase flow models (EXODUS and COALGAS). The predictive model run results are summarized in Table 11.

Table 10. Surface Water Depletions: Model Summaries

| River | Pre-CBM Discharge (AFY) | Current Depletion (AFY) | Maximum Depletion (AFY) | Year when Max Depletions Begin |
|---|---|---|---|---|
| Animas | 66 | 41 | 66 | 2045 |
| Pine | 61 | 31 | 61 | 2025 |
| Florida | 17.5 | 2 | 12.5 | 2050 |
| Piedra* | 60 | 0 | 60 | ** |
| Total | 204.5 | 74 | 199.5 | |

*Piedra River depletions are estimated based on discharges simulated from the 3M Project and the depletions modeled in the GWPRF at other rivers.
**Maximum depletions at the Piedra River will depend on the rate of coalbed methane development in the northeastern portion of the San Juan basin.

The model results show that prior to coalbed methane development, the Fruitland Formation discharged approximately 205 AFY to the San Juan River. Modeling shows approximately 74 AFY is currently being depleted with existing wells and predicts the maximum depletions to be approximately 200 AFY.

The RiverWare Model, which is used to evaluate hydrologic conditions in the San Juan River and its tributaries, requires a defined project to determine project compatibility with the San Juan River Flow Recommendations (Holden 2000). Because future coalbed methane development on State and private land is not a defined project and the depletions associated with it are relatively small and not specifically quantified, the RiverWare Model is not an appropriate tool to assess these effects.

***Other depletions and diversions from the San Juan River basin***

We believe most of these depletions, including the FCPP diversions to Morgan Lake, are accounted for in the environmental baseline depletions .. Irrigation ditches and canals below Navajo Dam could entrain Colorado pikeminnow and razorback sucker, including Citizens, Hammond, Fruitland, San Juan Generating Station, Jewett Ditch, and Hogback. Increased urban and suburban use of water, including municipal and private uses, will increase demands for water. Further use of surface water from the San Juan River will reduce river flow and decrease available habitat for the razorback sucker and Colorado pikeminnow. Livestock grazing may adversely impact razorback sucker and Colorado pikeminnow by removal of water for drinking and the reduction in soil water holding capacity in the floodplain, and resulting reduction in base flows.

Increases in development and urbanization in the historic floodplain result in reduced peak flows because of the flooding threat. Development in the floodplain makes it more difficult to transport large quantities of water that would overbank and create low velocity habitats that the razorback sucker and Colorado pikeminnow need for their various life history stages.

## NON-NATIVE FISH SPECIES IN LAKE POWELL

The presence of striped bass, walleye and channel catfish in Lake Powell constitutes a future threat to Colorado pikeminnow and razorback sucker in the San Juan River. When the water elevation of Lake Powell is high enough to inundate a barrier created by a waterfall, striped bass, walleye, channel catfish, and other non-native fish species can enter the San Juan River.

***Increased boating, fishing, ORV use, and camping in the San Juan River basin is expected to increase as the human population increases.***

Potential impacts include angling pressure, non-point source pollution, increased fire threat, the introduction of additional non-native species, and the potential for harassment of native fishes.

## CUMULATIVE EFFECTS TO FLYCATCHER AND CUCKOO IN THE ACTION AREA

Cumulative effects to the flycatcher would result from human activities, wildfire, and global warming.

***Increases in development and urbanization***

Increases in development and urbanization in the historic floodplain would affect the flycatcher by reducing peak flows because of the flooding threat. Development in the floodplain makes it more difficult, if not impossible, to transport large quantities of water that will overbank and create low velocity habitats and contribute to the riparian successional processes that create habitat for flycatchers.

***Increased urban use of water***

Increased urban use of water, including municipal and private uses, would affect the flycatcher by reducing river flow and decreasing available habitat for the flycatcher.

***Water contamination***

Contamination of the water from sources such as sewage treatment plants, runoff from small feed lots and dairies, and residential, industrial, and commercial development could adversely affect the flycatcher. A decrease in water quality and gradual changes in floodplain vegetation could adversely affect the flycatcher, its prey base and its habitat.

***Other human activities***

Human activities may adversely impact the flycatcher by decreasing the amount and suitability of habitat. These activities include dewatering the river for irrigation, increasing water pollution from non-point sources; habitat disturbance from recreational use, suburban development, and removal of large woody debris.

***Wildfire***

Wildfires and wildfire suppression in riparian areas may have an adverse effect on flycatchers. Wildfires are a fairly common occurrence in riparian areas. The spread of the highly flammable saltcedar and drying of river areas due to river flow regulation, water diversion, lowering of groundwater tables, and other land practices are largely responsible for the increase in fuel loading along riparian areas. Wildfires have the potential to destroy flycatcher habitat.

***Non-native vegetation removal***

The removal of non-native vegetation, such as saltcedar and Russian olive, can adversely affect the amount of available flycatcher habitat in the short term. In areas where non-native trees are removed and replaced with native vegetation as part of a restoration project, habitat may be created. Where phreatophyte removal is not followed by restoration, habitat for the flycatcher is lost.

***Climate change***

The effect climate change may have on the flycatcher is still unpredictable. However, mean annual temperature in Arizona increased by one degree per decade beginning in 1970 and 0.6 degrees per decade in New Mexico (Lenart 2005). In both New Mexico and Arizona the warming is greatest in the spring (Lenart 2005). Higher temperatures lead to higher evaporation rates which may reduce the amount of runoff, groundwater recharge, and lateral extent of rivers such as the Rio Grande. Increased temperatures may also increase the extent of area influenced by drought (Lenart 2003).

The Service anticipates that these conditions and types of activities will continue to threaten the survival and recovery of the flycatcher by reducing the quantity and quality of habitat through the continuation and expansion of habitat degrading actions. Future restoration activities along the San Juan River have the potential to increase flycatcher habitat, and the effects described above may limit habitat expansion.

## CONCLUSION

The SJRRIP was created to offset jeopardy resulting from hydrologic modifications to the San Juan River Basin associated with the Animas LaPlata project. The SJRRIP provides a suite of recovery actions to ensure recovery of the endangered fish in the San Juan River Basin. These recovery actions include addressing habitat loss, population augmentation, nonnative fish removal, and population monitoring. Miller (2014) suggested that the Colorado pikeminnow would likely be extirpated without the measures provided through the SJRRIP, especially augmentation. The historic and ongoing recovery benefits provided by the actions taken by the SJRRIP, plus the Conservation Measures provided by the action agencies and FCPP and NMEP proponents as part of the proposed action subject to this consultation create a package of cumulative beneficial actions that offset the adverse effects which would otherwise occur as a result of the proposed action when considered in relation to the environmental baseline, and cumulative effects. The Service has the authority and discretion to view the balance of the effects of the action, when added to environmental baseline, along with cumulative effects, and conclude whether the Conservation Measures, and the historic and future recovery benefits provided by the SJRRIP, are adequate to offset the magnitude and duration of the effects of the proposed action and provide sufficient certainty for the continued existence and recovery of the Colorado pikeminnow and razorback sucker. Additionally, there is a greater range of uncertainty associated with Hg deposition in future years (EPRI 2014). The cumulative Hg deposition to the San Juan River Basin, associated with levels of adverse modification of critical habitat, would not be expected to occur until 2046, well past the duration of the proposed action and the reasonably foreseeable future, in addition those future conditions are subject to great uncertainty associated with level of Hg emissions outside USA.

***Colorado Pikeminnow and Razorback Sucker***

After reviewing the current status of both endangered fish, the environmental baseline for the action area, the effects of the proposed action which includes the Conservation Measures, and the cumulative effects, it is our biological opinion that implementation of the FCPP and NMEP, as proposed, is not likely to jeopardize the continued existence of the Colorado pikeminnow and the razorback sucker.

Mercury in the environment accumulates in watercourses through emissions, deposition, and runoff into the waterbody. Fish are exposed to mercury through diet; mercury in the water column accumulates up the food chain and primarily affects top predators, such as the Colorado pikeminnow. Mercury is a potent neurotoxin that affects the reproductive health of fish through affecting the portions of the brain that regulate the production and timing of sex steroids; therefore, it primarily impacts fecundity rather than directly killing individuals exposed to it. Once ingested and absorbed into the blood, there is no known way for an organism to excrete it. A threshold for adverse effects has been shown to be 0.2 mg/kg WW in a number of species of fish; in the absence of data specific to the Colorado pikeminnow and razorback sucker, we employ this threshold. Colorado pikeminnow is the top predatory of the San Juan River that accumulates mercury over their long life span. Chronic exposure to mercury is thought to compromise survival rates and long-term reproductive outputs of this long-lived organism, thus inducing population decline in combination with other physical and biological threat factors. Using the results of various population modeling (EPRI 2014, BO analysis), we projected demographic decline in response to an increase in Hg concentrations in Colorado pikeminnow whole body burden. This decline in population growth rate would be exacerbated by other anthropogenic perturbations, such as nonnative species invasion, hydrologic alterations, water withdrawal, and other mortality factors in the San Juan River Basin.

The FCPP contributions to total Hg deposition near the facility ranged from 2 percent to a maximum of 28 percent southeast of the FCPP. Over the remainder of the San Juan River Basin, FCPP contributions are less than 2 percent. In contrast, baseline contributions of Hg emissions from sources outside the United States to Hg deposition in the San Juan River Basin range from 70 percent to 98 percent. Hg emissions from China contribute from 13 to 16 percent to Hg deposition in the San Juan River Basin in the post-2016 baseline (i.e., the baseline 2050 scenario with a medium estimate of China Hg emissions).

By comparison, the removal of FCPP had a clear but lesser effect, reducing Hg deposition by 0.68 percent before 2014 and about 0.35 percent after 2016 (after 3 units are shut down, with 2 units remaining active and emitting approximately 102 lbs Hg/year).

In order to estimate the effects associated with the proposed action, we determined that the ratio of Hg accumulation in whole body Colorado pikeminnow associated with the proposed action was 0.3 percent from Scenario APS- 1 (proposed action) as compared to Scenario APS-2 (FCPP never existed). Similarly, EPRI (2014) also estimated that the proposed action was associated with 0.35 percent of the baseline Hg deposition in the San Juan River Basin. Therefore, to estimate the effects of the proposed action, all Hg effects associated with the environmental baseline were multiplied by 0.3 percent; afterwards the environmental baseline was reduced this same amount.

The San Juan River Basin is one of only three subbasins inhabited by the Colorado pikeminnow. In the Recovery Goals for the Colorado Pikeminnow in the San Juan River Recovery Area (USWFS 2002a), criteria for downlisting and delisting the species are identified. In order to downlist the species, the San Juan River population of Colorado pikeminnow must reach at least 1,000 Age 5 (or greater) fish. Given the baseline levels of Hg and Se in the system as well as the amounts added to the system due to the proposed action, when added to the environmental baseline and cumulative effects, 6 to 11 percent of adults will experience reproductive injury, and 26 to 60 percent will experience behavioral injury in the foreseeable future. Of those that successfully reproduce, as many as 6 to 11 percent of eggs and 7 to 13 percent of Age 0 larvae would die due to Hg burdens. As many as 1.7 to 3.0 percent subadults and 1.7 to 9.1 percent of adults (summed across age classes) could also die due to all Hg burden. Additionally, 13 percent of eggs and ovaries of Colorado pikeminnow would perish, fail to hatch, or produce deformed embryos due to their Se burden. Those larvae that survive would also experience up 7 to 9 percent loss of Age 0 larvae due to dietary selenium toxicity. These factors, combined with the 7 to 15 percent loss due to entrainment, and the indeterminate losses due to negative nonnative species interactions, loss of habitat, alteration of hydrology, and water withdrawal from the proposed action, the environmental baseline, and cumulative effects decrease their population viability.

These numbers specifically express the outcome of the total accumulation of Hg in the system from all sources. However, in a Population Viability Analysis (PVA) (Miller 2014) the results showed that because of the actions taken by the SJRRIP the population of Colorado pikeminnow was stable to increasing. To the extent any additional Hg is contributed by the proposed action, those contributions represent a very small proportion of Hg deposition in the Action Area overall and any increases in Hg deposition are due, not to the proposed action, but attributable to global sources. The interplay of the degraded baseline and the contribution of global sources to Hg deposition creates significant uncertainty with regard to Hg deposition in the basin. However, to the extent a degraded baseline exists, the proposed action does not contribute to the deepening of such degradation, and the significant Conservation Measures proposed will contribute to the recovery of the endangered fish in the basin.

In the Recovery Goals for the Razorback Sucker (USFWS 2002b) for the San Juan River Recovery Area, the San Juan River system is one of two that must show stable or increasing trends in order to achieve downlisting or delisting. Given the baseline levels of Hg and Se in the system as well as the amounts added to the system due to proposed action, when added to the environmental baseline and cumulative effects, 0.9 to 1.8 percent of adults will experience reproductive injury, and 1.0 to 18 percent will experience behavioral injury in the foreseeable future. Of those that successfully reproduce, as many as 0.04 to 0.08 percent of eggs and 0.9 to 1.9 percent of Age 0 larvae would die due to Hg burdens. As many as 1.0 percent subadults and 1.8 percent of adults (summed across age classes) could also die due to Hg burden. Additionally, 16 percent eggs and ovaries of razorback sucker would perish, fail to hatch, or produce deformed embryos due to their Se burden. Those larvae that survive would also experience up 16 percent loss of Age 0 larvae due to dietary selenium toxicity. It should be noted that these numbers are a result of total deposition within the San Juan basin and are not specifically attributable to the Four Corners project's proposed action.

The environmental baseline is clearly degraded due to historic contributions of Hg to the San Juan Basin. Future projections predict an increasing global contribution of Hg to the San Juan Basin. However the actions of the SJRRIP are clearly offsetting those effects and, in combination with the Conservation Measures, will continue to do so. The Conservation Measures address all of the other project specific effects. As a whole, we find that the proposed action is not anticipated to appreciably reduce the likelihood of both the survival and recovery of the species. In conclusion, we find that proposed action will not jeopardize the continued existence of the Colorado pikeminnow and razorback sucker.

***Colorado Pikeminnow and Razorback Sucker Critical Habitat***

This BO does not rely on the regulatory definition of "destruction or adverse modification" of critical habitat (50 CFR 402.02); instead, we have relied upon the statute and the August 6, 2004, Ninth Circuit Court of Appeals decision in Gifford Pinchot Task Force v. USDI Fish and Wildlife Service (CIV No. 03-35279) to complete the following analysis with respect to critical habitat. This consultation analyzes the effects of the action and its relationship to the function and conservation role of razorback sucker and Colorado pikeminnow critical habitat to determine whether the current proposal destroys or adversely modifies critical habitat for these species.

After reviewing the current status of both fish, the environmental baseline for the action area, the effects of the proposed action, and the cumulative effects, it is our biological opinion that implementation of the proposed action, as proposed, is not likely to adversely modify critical habitat for the Colorado pikeminnow. We reached this conclusion based on the following findings, the basis for which is presented in the preceding Environmental Baseline, Effects of the Action, and Cumulative Effects sections of this document. Based on the PVA of Colorado pikeminnow in the San Juan River Basin (Miller 2014), there is a significant decline in the population associated with Hg concentrations in whole body pikeminnow over 0.7 mg/kg WW if the actions of the SJRRIP were to cease. However, the Conservation Measures will continue to offset any projected decline. These Hg concentrations (that is, the average Hg in the population) are projected to occur sometime after 2046, if the rate of Hg deposition, transport, and bioaccumulation in these Colorado pikeminnow continues as expected. However, the Service's regulation (USFWS 1986), only allow cumulative assessment analysis until the end of the project which is 2041. Therefore, Critical Habitat is not adversely modified by this project's actions.

Additionally, there is a reasonable potential that a nonnative species could be released into the critical habitat of both the Colorado pikeminnow and razorback sucker in the San Juan River Basin. The ecological damages and injuries to these endangered fishes were not calculable, but would be extensive and persistent. However, the Conservation Measures include actions to prevent nonnative species release and to fund nonnative species removal. These measures will offset nonnative species impacts.

The conservation role of Colorado pikeminnow and razorback sucker critical habitat is to provide spawning and rearing habitat conditions necessary for successful pikeminnow and sucker recruitment at levels that will provide for the conservation of the species. Appropriate water (PCE 1), physical habitat (PCE 2), biological environment (PCE 3) are essential for successful Colorado pikeminnow and razorback sucker spawning and survival. Past and present activities within the San Juan River basin have degraded these habitat elements to the extent that their co-occurrence at the appropriate places and times is insufficient to support successful Colorado pikeminnow and razorback sucker recruitment at levels that will provide for the species' conservation. While implementation of the proposed action is expected to exacerbate the very limited co-occurrence of PCEs at appropriate places and times, the implementation of the Conservation Measures will offset that impact. The increased Hg deposition in the basin, the contamination of the physical properties of the water, and the prey of Colorado pikeminnow could lead to an irreversible loss of reproductive success and adult survival necessary to sustain the species beyond the proposed action. As previously noted, these effects are attributable to the degraded environmental baseline, the proposed action and future predicted increased global contributions of Hg to the basin. However the actions of the SJRRIP are clearly offsetting those effects and, in combination with the Conservation Measures, will continue to do so.

Therefore, the proposed action is not anticipated to appreciably reduce the likelihood of both the survival and recovery of the species, and we find that proposed action will not appreciably diminish the value of designated critical habitat to satisfy the function and conservation role of critical habitat during the time frame of the proposed action. Therefore, we find that the proposed action will not result in destruction or adverse modification of designated critical habitat.

***Southwestern Willow Flycatcher and Yellow-billed Cuckoo***

After reviewing the current status of the flycatcher, the environmental baseline for the action area, the effects of the proposed action, and the cumulative effects, it is our biological opinion that implementation of the proposed action, is not likely to jeopardize the continued existence of the southwestern willow flycatcher. Flycatchers are currently found to nest in the San Juan River Basin only rarely and even fewer nesting attempts have occurred within the Deposition Area. While some loss of nesting attempts, eggs, or young may be expected due occur due to the proposed action and the environmental baseline, the recovery goals for the San Juan Management Unit can still be met. Additionally, proposed action will not affect critical habitat.

After reviewing the current status of the cuckoo, the environmental baseline for the action area, the effects of the proposed action, and the cumulative effects, it is our biological opinion that implementation of the proposed action, is not likely to jeopardize the continued existence of the yellow-billed cuckoo. Cuckoos have been found to nest in the San Juan River Basin only extremely rarely and no nesting attempts have been reported to occur in the Deposition Area. While some future loss of nesting attempts, eggs, or young may be expected to occur due to the proposed action, and the environmental baseline, contributions of recovery support by habitat of cuckoo in the San Juan River can still be met. Additionally, the proposed action is not anticipated to affect their critical habitat.

We find that implementation of the proposed action is not likely to jeopardize the continued existence of the southwestern willow flycatcher or the yellow-billed cuckoo because it is not expected to result in high levels of mortality in the future. No nesting flycatchers or cuckoos are known to inhabit the Deposition Area at this time, and the Project proposes continued surveys within the San Juan River basin for flycatchers and cuckoos. Therefore, the Service will be able to monitor presence of the species in the action area as habitat increases.

The regulations (50 CFR 402.02) implementing section 7 of the ESA define reasonable and prudent measure (RPM) as alternative measures, identified during formal consultation, that: 1) can be implemented in a manner consistent with the intended purpose of the action; 2) can be implemented consistent with the scope of the action agency's legal authority and jurisdiction; 3) are economically and technologically feasible; and, 4) would, the Service believes, avoid the likelihood of jeopardizing the continued existence of listed species or resulting in the destruction or adverse modification of critical habitat.

The Service has developed the following elements of an RPM to actions proposed in the OSMRE (2014b,c,d) BA, as amended (OSMRE 2015). Where the SJRRIP is implementing the Conservation Measures, they should be implemented using an adaptive management approach within specific constraints. The elements of the Conservation Measure are incorporated into the following RPMs and are based on the best scientific information available regarding what is necessary to avoid adverse to Colorado pikeminnow, razorback sucker, and adverse modification of Colorado pikeminnow and razorback sucker critical habitat. Elements 1 through 3 of the RPM will be monitored by the New Mexico Ecological Services Field Office (NMESFO); and Element 4 will be funded by the Project Proponents and implemented by the San Juan River Recovery Implementation Program (SJRRIP). As new information becomes available, the RPMs may be modified by the Service consistent with the need to avoid adverse effects and adverse modification of critical habitat.

## Incidental Take Statement

Section 9 of the Act and Federal regulation pursuant to section 4(d) of the Act prohibit the take of endangered and threatened species, respectively, without a special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harm is further defined by the Service to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns including breeding, feeding, or sheltering. Harass is defined by the Service as intentional or negligent actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to breeding, feeding or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), take that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the Act provided that such take is in compliance with the terms and conditions of an incidental take statement.

The Reasonable and Prudent Measures described below are non-discretionary and must be undertaken by OSMRE or delegated to the other federal action agencies, so that they become binding conditions of any grant or permit issued to any applicants, as appropriate, for the exemption in section 7(o)(2) to apply. OSMRE has a continuing duty to regulate the activity covered by this incidental take statement. If OSMRE (1) fails to assume and implement the terms and conditions, or (2) fails to require applicants to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to the permit or grant document, the protective coverage of section 7(o)(2) may lapse. In order to monitor the impact of incidental take, OSMRE must report the progress of the action and its impact on the species to the Service as specified in the incidental take statement. [50 CFR §402.14(i)(3)]

Proposed actions will result in the increased likelihood of noise and disturbance, water withdrawal, effluent discharges either pursuant to NPDES permits or in the unlikely event of ash pond failure, entrainment, APS Weir operations, nonnative species release, and the emission, subsequent deposition, and bioaccumulation of Hg and Se. These conditions will adversely affect the Colorado pikeminnow, razorback sucker, flycatcher, and cuckoo as described below (Table 12). Note that only activities that adversely affect listed species are provided in Table 12.

Table 11. Incidental takes of endangered fishes and listed birds authorized for the action proposed with implementation of the Conservation Measures and Reasonable and Prudent Measures, by activity, species, species life stage, number authorized, time period of ITS estimate, and injury type.

| (Table 11) Activity | Species | Life stage | Number ITS authorized | ITS Time Period | Injury Type |
|---|---|---|---|---|---|
| Disturbances at the NMEP | flycatcher | Migrants | 5 | 2016-2041 | harass or harm |
| Water withdrawal | Colorado pikeminnow | All | indeterminate | 2016-2041 | harm, harass or kill |
| Water withdrawal | razorback sucker | All | indeterminate | 2016-2041 | harm, harass or kill |
| effluent discharges | Colorado pikeminnow | All | indeterminate | 2016-2041 | harm, harass or kill |
| effluent discharges | razorback sucker | All | indeterminate | 2016-2041 | harm, harass or kill |
| effluent discharges | flycatcher | All | indeterminate | 2016-2041 | harm, harass or kill |
| effluent discharges | cuckoo | All | indeterminate | 2016-2041 | harm, harass or kill |
| entrainment or impingement | Colorado pikeminnow | Larvae | 2, up to 4 percent | annually 2016-2041 | harm, harass or kill |
| entrainment or impingement | Colorado pikeminnow | juveniles & subadults | less than or equal to 3 | annually 2016-2041 | harm, harass or kill |
| entrainment or impingement | razorback sucker | Larvae | 1, up to 2 percent | annually 2016-2041 | harm, harass or kill |
| entrainment or impingement | razorback sucker | juveniles & subadults | less than or equal to 10 | annually 2016-2041 | harm, harass or kill |
| APS Weir operations | Colorado pikeminnow | All | indeterminate | 2016-2021 | harm or harass |
| APS Weir operations | razorback sucker | All | indeterminate | 2016-2021 | harm or harass |
| nonnative species release | Colorado pikeminnow | All | indeterminate | 2016-2041 | harm, harass or kill |
| nonnative species release | razorback sucker | All | indeterminate | 2016-2041 | harm, harass or kill |
| Hg emission & deposition | Colorado pikeminnow | egg, ovary, embryo, fry | up to 250,340 | 2016-2074 | harm or kill |
| Hg emission & deposition | Colorado pikeminnow | Age 0, larvae | up to 2,975 | 2016-2074 | harm or kill |
| Hg emission & deposition | Colorado pikeminnow | subadult (Age 1 to 6) | up to 1,118 | 2016-2074 | harass or harm |
| Hg emission & deposition | Colorado pikeminnow | adult (Age 7 to Age10+) | up to 47 | 2016-2074 | harass or harm |
| Hg emission & deposition | Colorado pikeminnow | adult (Age 7 to Age10+) | up to 7 | 2016-2074 | reproductive harm |
| Hg emission & deposition | Colorado pikeminnow | subadult (Age 1 to 6) | up to 25 | 2016-2074 | harm or kill |

| (Table 11) Activity | Species | Life stage | Number ITS authorized | ITS Time Period | Injury Type |
|---|---|---|---|---|---|
| Hg emission & deposition | Colorado pikeminnow | adult (Age 7 to Age10+) | up to 2 | 2016-2074 | harm or kill |
| Hg emission & deposition | razorback sucker | egg, ovary, embryo, fry | up to 34,694 | 2016-2074 | harm or kill |
| Hg emission & deposition | razorback sucker | Age 0, larvae | up to 552 | 2016-2074 | harm or kill |
| Hg emission & deposition | razorback sucker | subadult (Age 1 to 6) | up to 34 | 2016-2074 | harass or harm |
| Hg emission & deposition | razorback sucker | adult (Age 7 to Age10+) | up to 12 | 2016-2074 | harass or harm |
| Hg emission & deposition | razorback sucker | adult (Age 7 to Age10+) | up to 1 | 2016-2074 | reproductive harm |
| Hg emission & deposition | razorback sucker | subadult (Age 1 to 6) | up to 1 | 2016-2074 | harm or kill |
| Hg emission & deposition | razorback sucker | adult (Age 7 to Age10+) | up to 4 | 2016-2074 | harm or kill |
| Hg emission & deposition | flycatcher | eggs to fledglings | up to 12 | 2016-2074 | harm or kill |
| Hg emission & deposition | cuckoo | eggs to fledglings | up to 12 | 2016-2074 | harm or kill |
| Se emission & deposition | Colorado pikeminnow | egg, ovary, embryo, fry | up to 25,503 | 2016-2074 | harm or kill |
| Se emission & deposition | Colorado pikeminnow | Age 0, larvae | up to 42 | 2016-2074 | reproductive harm |
| Se emission & deposition | Colorado pikeminnow | adult (Age 7 to Age10+) | up to 1 | 2016-2074 | reproductive harm |
| Se emission & deposition | razorback sucker | egg, ovary, embryo, fry | up to 291,510 | 2016-2074 | harm or kill |
| Se emission & deposition | razorback sucker | Age 0, larvae | up to 301 | 2016-2074 | reproductive harm |
| Se emission & deposition | razorback sucker | adult (Age 7 to Age10+) | up to 6 | 2016-2074 | reproductive harm |
| Se emission & deposition | flycatcher | eggs to fledglings | up to 12 | 2016-2074 | harm or kill |
| Se emission & deposition | cuckoo | eggs to fledglings | up to 12 | 2016-2074 | harm or kill |

There are several activities that are associated with indeterminate take estimates. This is either due to the nature of the activity, such as with programmatic consultations on effluent discharges, or the nature of the effects, such as with nonnative species release. NPDES permits subject to this consultation will be subject to the indeterminate take estimate in the table above. Take estimates for any subsequent individually issued NPDES permits will be estimated on a site specific basis using guidelines developed in conjunction with the Project Proponents, the federal agencies and the Service.

Take estimates due to blockage of fish passage and modification of the depth and velocity of habitat are indeterminate at this time, but likely would not exceed up to 500 individual Colorado pikeminnow or razorback sucker in any one year. The incidental take estimate is authorized for a period prior to implementation of fish passage at APS Weir, however, the Project Proponents are not lead for that action. Therefore, the Service reserves its ability to modify and adjust the incidental take associated with any blockage of fish passage after 2021, if fish passage is not provided by the SJRRIP. Take estimates for the potential release of nonnative species from Morgan Lake were indeterminate and would be persistent. However, with implementation of the RPMs, the estimated take is reduced, but still indeterminate. Take estimates for nonnative species releases from Morgan Lake that are not novel are subject to the indeterminate take estimate in the table above. However, the Service notes that the demonstrative introduction of *a single*, novel, nonnative species from Morgan Lake to the San Juan River that occurs through the Project Facilities and that is adverse to endangered fishes would exceed the incidental take for this activity.

The Service notes that this represents a best estimate of the extent of take that is likely during the proposed action along with implementation of the RPMs. In several cases, for actions associated with Hg or Se deposition, the incidental take was estimated using a fish population modeled at its recovery potential. Therefore, actual estimates of incidental takes may be less than those authorized above. Incidental takes associated with Hg and Se deposition will be verified by monitoring endangered fishes (or suitable surrogates) and compared with those estimated by EPRI (2014) or the Service. Should the average Hg or Se burdens in endangered fish be significantly greater than was estimated, then additional information collection may be necessary to verify these conditions, and if attributable to the proposed action, reinitation of ESA consultation may be warranted. Thus, estimated incidental take may be modified from the above should population monitoring information or other research indicate substantial deviations from the estimated extent of incidental take, or if it allows for a calculation of the amount of take that will occur. In this case further consultation may be necessary. If any actual incidental take is found to meet or exceed the predicted incidental take levels, consultation must be reinitiated.

## Reasonable and Prudent Measures

While the proposed Conservation Measures are substantial in helping to reduce impacts to listed species and their critical habitats, the Service nonetheless believes that the following reasonable and prudent measures (RPMs) are necessary and appropriate to minimize impacts of incidental take of the Colorado pikeminnows, razorback suckers, flycatchers, and cuckoos resulting from the Project:

1. RPM 1) Federal agencies shall use all available authorities and agency discretion to reduce atmospheric Hg deposition (and Se loading) in the San Juan River Basin to ameliorate adverse effects to Colorado pikeminnow and adverse effects to its critical habitat.

    a. As the lead federal agency conducting consultation under Section 7 of ESA for FCPP/NMEP, and acting under the provisions of the Surface Mining Control & Reclamation Act, OSMRE will evaluate and consult with the Service on all discretionary OSMRE permitting actions within OSMRE's authority that have the potential to deposit mercury (Hg) in the San Juan River. OSMRE will conduct this evaluation every two years and consult with USFWS upon completion of the evaluation. In evaluating and consulting on such actions, if adverse Hg effects to the Colorado pikeminnow, or adverse modification of its critical habitat due to Hg deposition, are determined likely, OSMRE will initiate formal ESA consultation to reduce these likely effects; and will ensure implementation of any subsequently developed measures to offset Hg effects to this species.

    b. As a key cooperating agency coordinating with OSMRE in the ESA consultation process, BIA will obligate funding in fiscal year 2015 for the purposes of a Razorback sucker Selenium Effects Study. This study is expected to assist with clarifying what level of selenium causes adverse impacts to razorback sucker in the San Juan Basin.

*Rationale. Because Colorado pikeminnow is a top predator, it has bioaccumulated high levels of Hg in its tissues that are known to be associated with reproductive injury, behavioral injury, and mortality (based on surrogate fish toxicity studies). When the populations' average Hg concentration in its whole body achieves 0.7 mg/kg WW, the breeding adult population will lose approximately 1 percent of its population every year, the majority of breeding adults will experience reproductive and behavioral injuries, and the recruitment of eggs and larvae to older life stages will be reduced by as much as 8 to 10 percent. These injuries are multiplicative given the Colorado pikeminnow life history and therefore, there is an Hg-mediated demographic impact to the Colorado pikeminnow population that results in the loss of individuals, a reduction of reproductive success, an increased probability of population decline, an increased probability of extinction, and inability to achieve recovery in the San Juan River Basin without additional action taken by the federal agencies.*

*Water of sufficient quality is a necessary primary constituent element for all Colorado pikeminnow history stages as it reduces Hg in water, soils, and Hg bioaccumulation in the food web and provides for adequate food to maintain reduced body burdens of Hg in Colorado pikeminnow adults, subadults, larvae and eggs. Elements 1a and 1b will provide the primary constituent elements needed to sustain the Colorado pikeminnow, which include water in sufficient quality as well as a cleaner food supply; prevent water quality degradation as a result of Hg deposition or Se loading to the San Juan River Basin and therefore benefit all life stages. Reducing the deposition of Hg, particularly ionic Hg, into the San Juan River Basin will improve the quality of soils, sediments, plants, invertebrates, and fish prey necessary for Colorado pikeminnow to provide for increased survival of breeding adults and recruitment. The concentrations of Hg and Se in Colorado pikeminnow, or other appropriate surrogates, will be routinely monitored so that achievements in the reduction of Hg in their critical habitat, prey, or body burdens can be quantified and further evaluated. Future mercury controls on mercury contributors to deposition in the San Juan River Basin are expected to have additional benefits and alleviate adverse modification of critical habitat.*

*We recognize that Hg pollution is a global problem that requires global action because it moves with air and water, transcends political borders, and can be transported thousands of miles in the atmosphere. Mercury pollution is more extensive than previously thought. Past mercury controls have been successful. In the United States, we are significantly reducing our use and emissions of mercury, but these efforts alone may not be sufficient to address the effects of mercury pollution in the San Juan River Basin. The effects of probable long-term Hg deposition in the San Juan River Basin create significant challenges to management of Colorado pikeminnow and critical habitat. Without creative, intensive, and focused management by the federal agencies on reducing Hg deposition, these impacts could contribute to the extinction of the Colorado pikeminnow and adverse modification of its critical habitat in the San Juan River Basin.*

*While there is uncertainty about the Hg reductions necessary to reverse the trend of bioaccumulation in Colorado pikeminnow and critical habitat, there is a strong likelihood that federal action agencies have available authorities, discretion, and a duty to work towards the reduction of local, regional, national and international sources of Hg deposition to the San Juan River Basin and thereby improve the physical and biological factors of Colorado pikeminnow critical habitat The long-term goal for federal agencies would be to take action at the regional, national, or international level to identify exposed Colorado pikeminnow populations, minimize exposures, and appropriately reduce anthropogenic Hg emissions and deposition into the San Juan River Basin.*

*The Service recognizes that the involved federal agencies (OSMRE, USEPA, BIA, BLM) each have different authorities and agency discretion that will be necessary to insure that any action it authorizes, funds, or carries out, is not likely to jeopardize the continued existence of Colorado pikeminnow or results in the destruction or adverse modification of critical habitat. Therefore, the role of the lead federal agency, OSMRE, is to collect those periodic agency reviews and provide them as part of their report to the Service identifying which actions they or other federal agencies have taken to improve critical habitat. No failure to report will be considered a trigger for reinitiation as it is a mandatory duty of federal agencies to insure that any action it* *authorizes, funds, or carries out, is not likely to result in the destruction or adverse modification of critical habitat and their actions must be maintained until adverse modification of critical habitat is alleviated.*

2. RPM 2) Project Proponents will develop and implement a Pumping Plan to reduce the magnitude and types of entrainment of Colorado pikeminnow and razorback sucker. The Pumping Plan will optimize avoidance of entrainment of larvae and impingement of larger fishes through measures that are deemed feasible without altering the current operating configuration at the river pump station.

    a. The Pumping Plan measures shall be developed with the oversight of OSMRE and the approval of the Service.

    b. The final Pumping Plan shall be implemented within 2 years of issuance of a Record of Decision.

*Rationale. As proposed, we estimate up to 340,200 larval Colorado pikeminnow or approximately 15 percent of the maximum estimated Colorado pikeminnow larval population and up to 426,975 razorback sucker larvae or 10 percent of the maximum razorback sucker larval population above APS Weir could be injured or entrained by the high velocities of water being pumped into and through the APS cooling water intakes for 25 years. Additional injuries and mortalities to as many as 375 subadult Colorado pikeminnows and 725 subadult razorback suckers could also occur should these fishes approach the cooling water intakes and be unable to swim away or be impinged.*

*Therefore, the Project Proponents shall develop a Pumping Plan that optimizes when cooling water pumps can be reasonably and prudently halted or reduced that are during times at which there is a seasonal abundance of either larval Colorado pikeminnow or larval razorback suckers drifting near the APS cooling water intakes. The Pumping Plan shall also evaluate and implement management practices or options for finer screen mesh or other reasonable and prudent technological solutions that reduce the number of subadult endangered fishes that may be impinged or entrained at the APS cooling water intakes. Similar pumping plans and water intake modifications have resulted in the reduction of endangered fish larvae and subadults elsewhere in the Upper Colorado River Basin. We have confidence that development and implementation of a Pumping Plan for APS cooling water intakes will reduce the number and types endangered fish larval losses to between 2 to 5 percent. Individual larvae and subadults that survive will contribute to population numbers, help alleviate adverse effects, and contribute towards self-sustaining populations of Colorado pikeminnow and razorback suckers in the San Juan River Basin. Survivability of endangered larval fish will be investigated so that appropriate reduction of entrainment can be achieved.*

3. RPM 3) Project Proponents will develop and implement a Non-native Species Escapement Prevention Plan, which will include the following measures to minimize: (a) the risk of non-native species (plants, invertebrates, and fish) that inhabit Morgan Lake invading San Juan River; and (b) the introduction of additional nonnative species into Morgan Lake.

a. Project Proponents will develop and disseminate public education materials regarding the threat of non-native species targeted to recreational users of Morgan Lake. The materials will recommend practices to prevent the introduction of new nonnative species to Morgan Lake or the transfer of existing nonnative species from Morgan Lake to the San Juan River.

b. Project Proponents will install and operate a device designed to prevent the transfer of nonnative fish species from Morgan Lake to the San Juan River.

*Rationale: Colorado pikeminnow and razorback sucker are threatened with extinction due to the cumulative effects of environmental impacts that have resulted in habitat loss, proliferation of nonnative introduced fish, and other man-induced disturbances. Because of the extreme and persistent threat posed by nonnative species, their eradication and management is the first priority in the endangered fish recovery plans (USFWS 2002a,b, 2014). Even nonnative species that already exist in the San Juan River pose a risk because they will likely displace, compete, or prey, or transmit diseases or parasites upon endangered fishes for many years after their potential release, thereby reducing the numbers, distribution, fitness, and population viability of endangered fishes in the San Juan River Basin. Predation and competition, although considered normal components of this environment, are out of balance due to introduced nonnative fish species in many areas including the San Juan River.*

Morgan Lake provides a unique aquatic habitat in this arid region with a direct hydrological connection to the San Juan River. The environmental (e.g., warm, deep, clear) and societal conditions (e.g., recreational fishing and boating) there have resulted in novel, nonnative species such as tropical suckerfish and pacu that inhabit Morgan Lake and that have never been reported anywhere else in the San Juan River.

Allegations are that novel, nonnative species such as gizzard shad from Morgan Lake have escaped and colonized the San Juan River and Lake Powell to the detriment of the fisheries there. Ease of access, lack of comprehensive knowledge of nonnative species in Morgan Lake and lack of appropriate containment exacerbates the risks of nonnative species escapement and their potential ecological and societal impacts to the San Juan River and effects to endangered fish, and their critical habitat. As Morgan Lake is an industrial water supply that is managed by the Navajo Nation Department of Fish and Wildlife as a recreational fishery, APS is encouraged to coordinate with this agency. Implementation of a Nonnative Species Escapement Prevention Plan (in addition to funding nonnative removal efforts, see below) will reduce the number of nonnative fish in a particular area, including in Colorado pikeminnow and razorback sucker critical habitats.

4. RPM 4) Project Proponents shall fund implementation of the following Recovery Actions to continue working towards endangered fish survival and recovery in the San Juan River Basin and create, maintain, or improve habitat for Colorado Pikeminnow and Razorback Sucker through the SJRRIP.

   a. Funding will be provided to the SJRRIP through the National Fish and Wildlife Foundation (NFWF) on an initial one time and annual basis. Annual funding will be subject to annual adjustments determined by the Consumer Price Index (CPI).

   b. Funding will be managed and administered by the SJRIP Program Office according to the terms and conditions set forth in a contract with NFWF which shall conform to the obligations of this BO.

   c. The following Recovery Actions shall be funded (Table 12).

Table 12. The following Recovery Actions shall be implemented by the SJRRIP.

| Funded Recovery Action | One-time Costs | Annual Costs |
|---|---|---|
| Propagate endangered fish | | $40,600 |
| Remove nonnative species | | $50,361 |
| Protect, manage and augment fish habitat | | $153,045 |
| Monitor fish habitat | | $103,463 |
| Partial funding of fish passage at APS Weir | $620,000 | |
| Conduct monitoring of Hg and Se in endangered fish or their surrogates | | $60,000 |
| Conduct studies of Hg in Colorado pikeminnow | $600,000 | |
| Contribute towards SJRRIP staff biologist to conduct these and other Recovery Actions | | $126,000 |
| Conduct a Navajo Dam Temperature Modification Feasibility Study | $100,000 | 0 |
| Total | $1,320,000 | $533,469 |

*Rationale: The Project Proponents, federal agencies, and the Service identified that the project poses direct and indirect adverse effects and injuries to Colorado pikeminnow and its critical habitat, razorback sucker and its critical habitat, and to a lesser extent, the cuckoo and the flycatcher, through Hg and Se deposition, nonnative species escapement and entrainment. Colorado pikeminnow and razorback sucker are threatened with extinction due to the cumulative effects of environmental impacts that have resulted in habitat loss, proliferation of nonnative introduced fish, and other man-induced disturbances.*

*Recognizing the long-term need for recovery, the federal agencies and Project Proponents have agreed to fund these substantial actions to help remove the adverse effects to the endangered species and their critical habitats including:*

*Propagation of endangered fishes to offset of losses associated with the proposed action.*

*Nonnative fish removal, combined with the Nonnative Species Escapement Prevention Plan (RPM 3), to alleviate adverse effects to endangered fishes and adverse modification of their critical habitats.*

*Protection, management, and augmentation of fish habitat, including aquatic and floodplain habitats, to contribute towards the offset of losses to endangered fishes listed birds by increasing areas for their recovery.*

*Monitoring of habitat is required to track implementation of the RPM and contribute scientific information to support adaptive management by the SJRRIP. Fish passage at APS Weir will allow endangered fish increased access of up to 18 miles of fish habitat, including portions of Colorado pikeminnow critical habitat.*

*Monitoring of Hg and Se in endangered fish (or suitable surrogates) will be conducted by the Service every 5 years and is required to track implementation of the RPM and contribute scientific information to allow adaptive management by the SJRRIP.*

*Conducting Hg Studies in Colorado pikeminnow to address uncertainty will assist the tracking of implementation of the RPM and contribute scientific information to support adaptive management by the SJRRIP.*

*Funding a SJRRIP staff biologist will facilitate Hg and Se reviews, investigation, and monitoring, and contribute towards implementation of these and other Recovery Actions.*

*Funding a Navajo Dam Temperature Modification Feasibility Study was an additional effort identified by federal agencies and Project Proponents. This could benefit the recovery of Colorado pikeminnow in the San Juan River by determining whether or not temperature modifications to the outflow from Navajo Dam would increase survival of larval Colorado pikeminnow downstream.*

*The conservation needs of the Colorado pikeminnow and razorback sucker at this time are primarily associated with: 1) reduction of mercury and selenium loading to the San Juan River Basin; 2) reducing the entrainment or impingement of larval, juvenile, and larger Colorado pikeminnow and razorback sucker into the APS cooling water intakes; 3) detection, prevention, and removal of nonnative species from the San Juan River; 4) increased access to endangered fish habitat above APS Weir; 5) improving fish habitat conditions for Colorado pikeminnow and razorback sucker to improve recruitment, growth, survival, and recovery. Additional measures funded through RPM 4 will result in scientific information necessary to track incidental takes, track sufficient progress* *towards recovery, and allow for an adaptive management by the SJRRIP. The first four RPMs specifically address the Hg and Se threats identified in the Environmental Baseline and address the threats posed by the proposed action. Implementation of these RPMs will minimize the effect of incidental take associated with the proposed action and increase the likelihood that Colorado Pikeminnow and Razorback Suckers will survive and the conditions of their habitat including attributes for migration, spawning, recruitment, growth, survival, and recovery will be improved. For these reasons, the Service finds that implementation of the RPMs described above is likely to avoid adverse effects to the Colorado pikeminnow and razorback sucker and their critical habitats in the San Juan River Basin.*

5. RPM 5) OSMRE will work with USEPA and the Project Proponents to minimize the effects of the Proposed Action on Colorado pikeminnow, razorback sucker, southwestern willow flycatcher, or yellow-billed cuckoo, by coordinating with the Service in developing the analytical methods and conduct an analysis of duration, magnitude, concentration and contribution of discharges associated with NPDES permitting actions that will be used to conduct ESA review prior to development of future USEPA-issued NPDES permits for the Project.
    a. In developing methods to evaluate the potential for effects of the future NPDES permits for the Project, OSMRE will coordinate with USEPA and the Project Proponents to identify how available water column and fish tissue Hg and Se data, including data collected as part of the monitoring program funded in Conservation Measure 7, will be evaluated to ensure protection of listed species and their suitable habitats.
    b. OSMRE will work with USEPA and the Project Proponents to ensure that Se and Hg water column data collected pursuant to NPDES permit requirements will be analyzed using test methods that are sufficiently sensitive to enable measurement below the applicable water quality standards or associated review thresholds for purposes of evaluating reasonable potential effects and setting water quality based effluent limitations, if required. For example, we will require use of method 1631 or any similarly sensitive method to conduct Hg monitoring under the NPDES permits.

c. Pending completion of the coordination steps identified in RPM 5.a. above, customary ESA review will occur for future proposed NPDES permit or renewal for the Project.

6. RPM 6) FCPP Project Proponents will minimize potential takes of Colorado pikeminnows, razorback suckers, flycatchers, or cuckoos by providing a Spill Contingency Countermeasures Plan which addresses potential Ash Pond Failure impacts on suitable habitat.
    a. All necessary equipment, training, and materials will be made available for emergency response to a potential Ash Pond Failure as soon as feasible.
    b. A practice response table top drill with appropriate authorities will be conducted every 10 years for the duration of the Project.

7. RPM 7) Project Proponents will minimize takes of flycatchers and cuckoos by conducting standard protocol surveys within the Deposition Areas and contribute to improved riparian or floodplain habitat conditions along the San Juan River Basin (as identified in RPM 3 (f)) or as described by the Project conservation measures).

    a. FCPP Project Proponents will conduct flycatcher and cuckoo protocol surveys within at least 85 acres of the Deposition Area from 2016-2042 or until the Project ceases operation to monitor the effects of Hg and Se deposition to flycatchers and cuckoos.

    b. NMEP Project Proponents will conduct flycatcher protocol surveys within at least one optimal location of suitable flycatcher habitat within the Navajo Mine Lease Area during the spring migration period from 2016-2042 or until the Project ceases operation to monitor the potential effects of noise and disturbance to migrant flycatchers.

    c. RPM 8) OSMRE will coordinate the provision of data and an annual report to the Service at a frequency that is specifically identified by the RPMs on implementation of the proposed action, and their implementing terms and conditions.

## Terms and Conditions

In order to be exempt from the prohibitions of section 9 of the ESA, the agencies must comply with the following terms and conditions. These terms and conditions implement the Reasonable and Prudent Measures described above and outline required reporting and monitoring requirements. These terms and conditions are non-discretionary.

1. To implement RPM 1 (Federal agencies shall use all available authorities and agency discretion to reduce atmospheric Hg deposition (and Se loading) in the San Juan River Basin).

    a. Federal action agencies shall review their authorities and determine whether there is agency discretion to reduce Hg deposition (or Se loading) to the San Juan River Basin;

    b. If there is agency discretion under existing authorities to reduce Hg within the San Juan River Basin, then ESA consultation with the Service shall be initiated;

    c. For Se loading, BIA will obligate funding in fiscal year 2015 for the purposes of a Razorback Sucker Selenium Effects study. This study is expected to assist with clarifying what level of selenium causes adverse impacts to razorback sucker in the San Juan River Basin.

d. The lead federal agency shall report on any of their agency reviews and ESA consultation involving Hg deposition to the San Juan River Basin that may adversely affect Colorado pikeminnow or their critical habitat prior to the next OSMRE permit issuance, or by October 1, 2020, whichever comes first.

e. Failure to report will not be considered a trigger for reinitiation as it is a mandatory duty of federal agencies to insure that any action it authorizes, funds, or carries out, is not likely to result in the destruction or adverse modification of critical habitat and their actions must be maintained until adverse modification of critical habitat is alleviated.

2. To implement RPM 2 (Project Proponents shall minimize entrainment and impingement losses of Colorado pikeminnow and razorback sucker through measures taken at the APS cooling water intakes above APS Weir).

   a. Project Proponents, in consultation with the Service, will develop a Pumping Plan that will identify optimal times to restrict pumping, provided the restrictions are reasonable and prudent and, that will minimize the entrainment injury of endangered fish larvae; and, that will use screening technology to minimize injury to endangered fishes

   b. Project Proponents will implement the Pumping Plan within two years of issuance of a Record of Decision.

3. To implement RPM 3 (Federal agencies and Project Proponents shall develop and implement a Nonnative Species Escapement Prevention Plan).

   a. Federal agencies and Project Proponents will work with others to develop and implement a Nonnative Species Escapement Prevention Plan.

   b. A risk management approach will be used to identify, evaluate, treat, monitor, and prevent existing or novel nonnative species in Morgan Lake from invading the San Juan River

   c. The Project Proponents will contribute information to the Navajo Nation Department of Fish and Wildlife for the comprehensive inventory of nonnative species that occur in Morgan Lake that may pose a threat to endangered fishes in the San Juan River. . This may include, but are not limited, invasive plants, invertebrates including mollusks, and especially nonnative fish.

   d. Educational materials and the device installed to prevent nonnative fish release will be developed and designed based on risk posed by the nonnative species detected, their life histories and any potential for those species to transport or disperse through the FCPP facilities, the risks of escapement, and the consequences of such escapement to endangered fishes in the San Juan River.

e. Working with the federal agencies, the Proponents will select and implement those reasonable and prudent educational measures and device design necessary to contain, treat, or manage nonnative species that pose the greatest risks of escapement into the San Juan River and to the endangered fishes or their critical habitat

f. Monitor the containment or treatment implemented and report on nonnative species in Morgan Lake, their risks of escapement, and the measures implemented to contain or treat those risks, and any educational and outreach efforts within three years of issuance of a Record of Decision.

4. To implement RPM 4 (fund implementation of the following Recovery Actions to continue working towards endangered fish survival and recovery in the San Juan River Basin, create, maintain, or improve habitat for Colorado Pikeminnow and Razorback Sucker through the SJRRIP).

   a. Funding will be provided to the SJRRIP through the National Fish and Wildlife Foundation (NFWF) on an initial and triannual basis;

   b. Funding will be managed and administered by the SJRIP Program Office according to the terms and conditions set forth in a contract with NFWF consistent with the terms and obligations of this BO;

   c. The Recovery Actions identified in Table 13 shall be implemented during the proposed project (2016 to 2041 or for the life of the project).

   d. The Service and the SJRRIP shall be responsible for implementation of any and all Funded Recovery Actions and any adaptive management necessary to appropriately continue to ensure the recovery of the endangered fish. In no event shall any adaptive management by the Service or the SJRRIP result in any further or increased financial obligations to the project proponents than as otherwise set forth in this BO.

5. To implement RPM 5 (Develop Evaluation Methods for future NPDES reviews) USEPA and OSMRE shall consider the following factors:

   a. USEPA will consider how the effluent limits, if any, are expressed in the NPDES permit and evaluate whether a water column translation to an endangered fish tissue guideline concentration is available at the time of permit issuance. USEPA will consider guidance and scientific information available at the time of permit issuance in selecting an appropriate method for translating fish tissue guidelines to water column values used to evaluate reasonable potential effects and calculate effluent limitations if needed.

b. In evaluating potential effects of NPDES discharges in future permitting actions for the Project, USEPA will use the Navajo Nation's fish tissue criterion of methylmercury in fish of 0.3 mg/kg wet weight and the USEPA (2014) draft freshwater selenium ambient chronic water quality criterion for protection of aquatic life of 15.2 mg/kg dry weight in fish egg/ovaries (or water column equivalent), or other appropriate and scientifically defensible values, for purposes of evaluating the relationship between water discharges and potential species effects. As necessary these current endangered fish tissue evaluation thresholds may be modified to reflect new information, monitoring data, and in coordination with the Service.

c. USEPA will, in association with future NPDES permitting actions for the Project, provide an analysis of the duration, magnitude, concentration and contribution of the flows in the vicinity downstream from the NPDES permitted discharges to clarify the potential contribution of such flows to the overall impacts from Hg and Se to threatened and endangered species and critical habitat in the project area.

d. If the fish tissue guideline of Hg or Se in the receiving water is below and not close to the endangered fish tissue guidelines, depending on the particular facts, the permitting authority may reasonably conclude that the discharge does not have reasonable potential, but tier 2 antidegradation provisions should be considered.

e. If the review of available Hg and Se data collected in the vicinity downstream from the NPDES permitted discharges indicates that permitted discharges cause or contribute to exceedances of applicable water quality standards, as evaluated based on the best available water column, translator, and fish tissue threshold values, water quality based effluent limitations will be included in the NPDES permit.

f. NPDES permits shall contain a special condition requiring the permittee to monitor effluents for Se and Hg using a sufficiently sensitive EPA-approved method. The selection of a sufficiently sensitive method relates method quantitation levels to the water column criterion value. If a water column criterion or a water column translation of an endangered fish tissue guideline is not available to allow for selecting an alternate sufficiently sensitive method, use of the most recent approved version of method 1631, where feasible, to characterize effluent discharges will be required. The frequency of such monitoring shall be quarterly or once per discharge in the case of intermittent discharge for a sufficient period of time to accurately assess the long-term concentration levels of Se and Hg in the effluent regulated under the NPDES permits.

6. To implement RPM 6 (Provide Spill Contingency Countermeasures Plan for Ash Pond Failure) the federal action agencies shall:

    a. Direct Project Proponents to submit for review and approval. a Spill Contingency Countermeasures Plan which addresses potential Ash Pond Failure impacts on suitable habitat, including plans to make available all necessary equipment, training;

    b. Promptly submit the final amended Spill Contingency Countermeasures Plan to the federal action agencies and the Service's NMESFO

    c. Direct Project Proponents to conduct an initial practice response (table-top) drill with appropriate authorities within ten years of issuance of a record of decision

7. To implement RPM 7 (Conduct flycatcher and cuckoo protocol surveys) the federal action agencies shall require flycatcher and cuckoo protocol surveys conducted by the Project Proponents as follows:

    a. All flycatcher and cuckoo protocol surveys shall be conducted by persons in possession of a valid Federal Fish and Wildlife Permit (note Federal Fish and Wildlife Permits are only valid with possession of an appropriate state and/or tribal permit).

        i. As appropriate, have assigned staff or contractors submit an application for a Federal Fish and Wildlife Permit, Native Endangered and Threatened Species -Scientific Purposes, Enhancement of Propagation or Survival Permits (i.e., Recovery Permits that is available online at http://www.fws.gov/forms/3-200-55.pdf) as soon as possible to insure enough time to allow for attendance of flycatcher and cuckoo protocol survey training and application reviews of methods and expertise.

        ii. All flycatcher and cuckoo protocol surveys conducted must provide all data and reports as required by the Federal Fish and Wildlife Permit.

    b. Federal agencies shall require appropriate Project Proponents to conduct flycatcher and cuckoo protocol surveys within at least 85 acres of the Deposition Area from 2016-2042 or until the Project ceases operation to monitor the effects of Hg and Se deposition to nesting flycatchers and cuckoos.

        i. Selection of 85 acres of flycatcher and cuckoo protocol survey sites can be done considering riparian habitat qualities within suitable habitat described by AECOM (2014), land ownership, and other legal, practical, or logistic factors.

        ii. Flycatcher and cuckoo protocol surveys done by any others (e.g., BIA, BLM, NNDFW, Reclamation, etc.) in possession of a valid Federal Fish and Wildlife Permit can be substituted or used to meet the requirement for these surveys, however, responsibility for completion of all protocol surveys rests with federal action agencies and the Project Proponents.

c. Federal agencies shall require appropriate Project Proponents to conduct presence/absence flycatcher and cuckoo surveys within at least one optimal or suitable habitat (AECOM 2014) on the Navajo Mine Lease Area during the spring migration period to monitor the potential effects of noise and disturbance to migrant flycatchers from 2016-2042 or until the Project ceases operation.

    i. The specific survey design, location, and evaluation of the data necessary to quantify the potential effects of noise and disturbance to migrant flycatchers on the Pinabete Mine Lease Area may be modified over time based on new information, successful efforts, and other emerging needs.

d. Summaries of these flycatcher and cuckoo surveys shall be provided in the annual reports to the Service described in RPM 9.

8. To implement RPM 8 (Reporting Requirements) the OSMRE shall prepare and submit a report summarizing the status of all RPMs, and the Terms and Conditions and any additional data or relevant information to the Service's NMESFO annually, no later than May 30 for the previous calendar year's activities.

    a. Ensure that the Service receives electronic copies of all reports and plans related to implementation of these RPMs and terms and conditions, including but not limited to, the progress or completion of the Project that identifies any significant modifications to the proposed action; any anticipated outcomes to actual outcomes; any anticipated level of incidental take or any actual observations or quantification of take associated with the proposed action, any summaries of species monitoring and protocol surveys, a summary of the annual estimated atmospheric emissions of Hg and Se (as submitted to any federal agency or publically and with any confidential business information removed), any habitat mapping and monitoring, any relevant water quality monitoring associated with NPDES permits and that exceeds any permit limits, any Spill Contingency Countermeasure plans or drills conducted, and any relevant information and status of the Recovery Actions taken.

    b. Reports should reference the appropriate consultation number: Consultation # 02ENNM00-2014-F-0064 and should be sent to the email address nmesfo@fws.gov (or individual email addresses affirmed through discussion) or by mail to the Service's New Mexico Ecological Services Field Office, Attn: San Juan River Recovery Implementation Program Office, 2105 Osuna Road NE, Albuquerque, New Mexico 87113. (And note that the NMESFO will relocate within 4 years).

# CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the ESA directs Federal agencies to utilize their authorities to further the purposes of the ESA by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information. The recommendations provided here relate only to the proposed action and do not necessarily represent complete fulfillment of the agency's section 7(a)(1) responsibility for these species. In order for the Service to be kept informed of actions that either minimize or avoid adverse effects or that benefit listed species and their habitats; we request notification of the implementation of the conservation recommendations. We suggest the following conservation recommendations be implemented:

1. OSMRE could work with Bureau of Reclamation and other agencies to further quantify the effects of cold water releases and minimize cold water impacts to Colorado Pikeminnow and its critical habitat in the San Juan River.
2. USEPA could work with states and tribes to develop a Total Maximum Daily Load or Mercury Minimization Plan for the San Juan River that reduces all inputs of Hg so as to protect piscivorous fish and wildlife.
3. BLM could evaluate the Hg emission and deposition associated with fossil fuel extraction, and any ozone or particulates that may affect Hg dynamics in the San Juan River Basin;
4. USEPA could draft Hg ambient freshwater water criterion guidelines that include fish tissue guidelines that protect top level predators and wildlife, particularly for any watersheds that contain Colorado pikeminnow or its critical habitat.
5. BIA could post signage and provide educational materials (using symbols and all major languages used in the region) that alert people who might dispose of aquarium fish into Morgan Lake about the hazards such disposal would pose to native fish and wildlife.
6. BIA, BLM and OSMRE should report any collection of Mesa Verde cacti within the action area to the Service.
7. BIA could survey populations of Mesa Verde cactus in Colorado on the Ute Mountain Ute Reservation.
8. OSMRE, BIA, and BLM could continue to participate in the development, approval, and management of the Mesa Verde Cactus Conservation Areas.
9. Determine how water savings from water conservation and water use efficiency improvements or water acquired through purchase or lease can be used directly for in-stream flow and other direct benefits to the species.
10. Research the effects and benefits of turbidity and suspended sediment on Colorado pikeminnow, razorback sucker, and their critical habitat to identify thresholds of concern.
11. Conduct studies of razorback sucker and Colorado pikeminnow diets.
12. Reduce risks of catastrophic hazardous material or petroleum spills as they are likely to remain even if annual risks are low. Hazard assessments, pollution prevention, and Area Contingency Plans should be developed and refined over time to address potential oil spills and leaks of hazardous materials into the San Juan River Basin. Spill response

drills specific to the likely hazards posed to critical habitats in the San Juan River should be conducted.

13. Develop a contingency plan in the event of wildfire in flycatcher and cuckoo habitat that would reduce impacts to these listed species.
14. Transplant Mancos Milk vetch and Mesa Verde cactus to establish new populations.
15. Develop and implement a plan to limit encroachment of permanent dwellings into areas that could be flooded on the San Juan River.
16. Implement ecosystem restoration on a broad watershed scale.
17. Research razorback sucker predation and competition relationships.
18. Trap Brown-headed cowbirds and control feral hogs as needed.
19. Manage livestock grazing to avoid impacts to flycatchers, cuckoos and their habitats.

In order for the Service to be kept informed of actions minimizing or avoiding adverse effects or benefiting listed species or their habitats, we request notification of the implementation of any conservation recommendations.

## REPORTING REQUIREMENTS

Documentation and reporting on the implementation of the RPMs and terms and conditions will occur within 1 year following the completion of the Record of Decision for the Project and annually thereafter for a period of up to twenty five years or until the Project ceases operation. The nearest Service Law Enforcement Office must be notified within 24 hours in writing should any listed species be found dead, injured, or sick. Notification must include the date, time, and location of the carcass, cause of injury or death (if known), and any pertinent information. Care should be taken in handling sick or injured individuals and in the preservation of specimens in the best possible state for later analysis of cause of death. In conjunction with the care of sick or injured endangered species or preservation of biological materials from a dead animal, the finder has the responsibility to ensure that evidence associated with the specimen is not unnecessarily disturbed. If necessary, the Service will provide a protocol for the handling of dead or injured listed animals. In the event that OSMRE suspects that a listed species has been taken in violation of Federal, State, or local law, all relevant information should be reported in writing within 24 hours to the Service's New Mexico Law Enforcement Office (505) 883-7814 and/or the New Mexico Ecological Services Field Office (505) 346-2525.

## REINITIATION NOTICE

This concludes formal consultation on the Four Corners Power Plant and Navajo Mine Energy Project. As required by 50 FR 402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if: 1) the amount or extent of incidental take is exceeded (see section on Amount or Extent of Take), 2) new information reveals effects of the agency action that may impact listed species or critical habitat in a manner or to an extent not considered in the BA or this BO, 3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in this opinion, 4) a new species is listed or critical habitat designated that may be affected by the action, 5) if the Project Proponents elect to cease the Project, they will notify the Service as soon as possible, they will fund Recovery Actions per the NFWF agreement, and this BO will become invalid by the end of the notification year, and a final report must be submitted, as required.

In future communications regarding this project please refer to consultation number 02ENNM00-2014-F-0064. If you have any questions or would like to discuss any part of this BO, please contact David Campbell of my staff at (505) 761-4745.

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# Exhibit 6

R

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IX
75 Hawthorne Street
San Francisco, CA 94105

October 30, 2012

Certified Mail No. 7008 3230 0000 3863 1437
Return Receipt Requested

David Bloomfield, Plant Manager
Four Corners Power Plant
P. O. Box 355, MS 4913
Fruitland, NM 87416

**RE: APS Four Corners Power Plant NPDES Application for Permit Renewal (Permit No. NN0000019)**

Dear Mr. Bloomfield

This office timely received the original application for renewal of the above referenced NPDES permit in late 2005 as well as subsequent updates to it, allowing the facility to operate under an administrative extension of the currently expired permit.

Since much time has elapsed since you submitted the original application for renewal, and there have been, or likely will be, significant changes in operations including removal of several units from service and changes in wastewater disposal methods and locations, etc., USEPA recommends that you to submit a fully revised application that reflects current operations, as well as future plans for the next permit cycle, i.e. for the next five years, for the facility.

This office will review the application, as well as other relevant information, and plans to draft and issue a renewed NPDES permit for the APS Four Corners Power Plant in 2013. If you have any questions, please contact Gary Sheth of this office at (415) 972-3516 or at sheth.gary@epa.gov.

Sincerely,

David Smith, Manager
NPDES Permits Office, WTR-5

cc: Carl Woolfolk, Environmental Section Leader, APS Four Corners Power Plant.
Patrick Antonio, NNEPA, Water Quality/NPDES Program.

# Exhibit 7

EXHIBIT 3

Gmail by Google

**John Barth <barthlawoffice@gmail.com>**

## Re: FOIA Response for EPA-R9-2013-002707; Four Corners Pwr Plant 2 of 8

4 messages

**Tinger.John@epamail.epa.gov** <Tinger.John@epamail.epa.gov> Tue, Feb 19, 2013 at 12:54 PM

To: John Barth <barthlawoffice@gmail.com>
Cc: Sheth.gary@epa.gov

Hi John , For the four corners npdes permit, we are currently seeking and will, when received, review the revised permit renewal application from APS in order to draft a proposed renewed NPDES permit within 6 months after that. The proposed permit will incorporate information from the permittee about all the relevant process and operational changes that have occurred as well as those likely to occur over the next permit cycle.

- John

John Tinger
U.S. EPA Region IX
NPDES Permits Branch
(415) 972-3518

-----John Barth <barthlawoffice@gmail.com> wrote: -----

=======================
To: John Tinger/R9/USEPA/US@EPA
From: John Barth <barthlawoffice@gmail.com>
Date: 02/13/2013 10:03PM
Cc: meisenfeld@frontier.net
Subject: Re: FOIA Response for EPA-R9-2013-002707; Four Corners Pwr Plant 2 of 8
=======================
Mr. Tinger

Thank you again for sending me the response to our Four Corners Power Plant FOIA request. Could you please also tell me the status of the renewal of the NPDES permit for the facility. The current permit was issued in 2001 and expired in 2006. Thus, it have been almost 12 years since EPA renewed an NPDES permit for the facility. Please let me know your timeline for issuing a draft renewal permit. Thank you.

John Barth
Attorney at Law
P.O. Box 409
Hygiene, CO 80533
(303) 774-8868

# Exhibit 8

LAW OFFICE OF
JOHN M. BARTH

P.O. BOX 409 HYGIENE, COLORADO 80533 (303) 774-8868 BARTHLAWOFFICE@GMAIL.COM

May 16, 2014

CERTIFIED MAIL/RETURN RECEIPT REQUESTED

Gina McCarthy
Administrator
U.S. Environmental Protection Agency
Washington, D.C. 20460

Jared Blumenfeld
Regional Administrator
U.S. Environmental Protection Agency, Region 9
75 Hawthorne Street
San Francisco, CA 94105

Eric H. Holder, Jr.
Attorney General of the United States
950 Pennsylvania Avenue NW
Washington, DC 20530-0001

Tucson Electric Power
88 E. Broadway Blvd.
Tucson, AZ 85701

Arizona Public Service
P.O. Box 53933 Sta. 3200
Phoenix, AZ 85072-3933

Public Service Company of New Mexico
Main Offices
Albuquerque, NM 87158

Salt River Project
1521 N. Project Drive
Tempe, Arizona 85281-1298

El Paso Electric Company
P.O. Box 982
El Paso, TX 79960

To whom it may concern:

On behalf of San Juan Citizens Alliance ("SJCA"), 1309 E. 3rd Ave. Suite B-3 Durango, Colorado 81302 970-259-3583 and Center for Biological Diversity ("the Center"), 351 California Street, Suite 600, San Francisco, California 94104 (415) 436-9682, I am providing notice, under Section 1365 and 1369(b) of the Clean Water, 33 U.S.C. §§1365,1369(b) and 40 C.F.R. Part 135, of intent to sue either the U.S. Environmental Protection Agency ("EPA") and/or Arizona Public Service ("APS"), Tucson Electric Power, Public Service Company of New Mexico, Salt River Project, and El Paso Electric Company for the legal violations identified herein.

Background

This notice letter pertains to the Four Corners Power Plant ("FCPP") located on the Navajo Nation. Arizona Public Service Company is the operator, and partial owner of, the FCPP. The other partial owners of the FCPP are: Public Service Company of New Mexico

(PNM), Salt River Project ("SRP"), Tucson Electric Power ("TEP") and El Paso Electric Company. EPA Region 9 is the Clean Water Act permitting authority for the FCPP because it is located on Indian lands. On April 3, 2001 EPA Region 9 issued the most recent NPDES permit for the FCPP, which is NPDES Permit No. NM0000019.[1] The permit became effective on April 7, 2001 and expired on April 6, 2006. To date, EPA has not issued a renewal NPDES permit for the FCPP.

The original application for a renewal permit was submitted in late 2005, followed subsequent updates to the application. Exhibit 1 hereto. On October 30, 2012, EPA Region 9 acknowledged that "much time has elapsed since [APS] submitted the original application for renewal" and EPA requested an updated application. *Id.* EPA indicated at that time that it "plans to draft and issue a renewed NPDES permit for the APS Four Corners Power Plant in 2013." *Id.* APS submitted a revised permit application on February 15, 2013. Exhibit 2 hereto. On February 19, 2013, EPA stated that it would "draft a proposed renewed NPDES permit within 6 months" after receiving the revised application. Exhibit 3 hereto. It has been over 14 months since EPA received APS's revised NPDES permit application and EPA has not issued a proposed renewal permit for public comment.

<u>Claims against EPA</u>

SJCA and the Center claim that EPA has unreasonably delayed issuing a National Pollutant Elimination System Permit. Alternatively, SJCA and the Center claim that EPA's attempt to administratively extend Permit NM0000019 beyond the statutorily-limited 5 year term is illegal and renders the permit void by operation of law.

EPA's failure to timely issue a renewal NPDES permit for the FCPP constitutes an unreasonable delay for rendering its decision under the Administrative Procedures Act, 5 U.S.C. § 558(c). It has been over 8 years since NPDES Permit No. NM0000019 has expired and 13 years since an NPDES permit for the FCPP has been issued by EPA. This delay by EPA is arbitrary, capricious, and/or unreasonable under the law.

Alternatively, Congress has determined that NPDES permits may only be issued "for fixed terms not exceeding five years." 33 U.S.C. § 1342(b)(1)(B). EPA's permit program "shall be subject to the same terms, conditions, and requirements as apply to a State permit program and permits issued thereunder" including the maximum 5-year term. 33 U.S.C. § 1342(a)(3). It follows that EPA does not have the statutory authority to administratively extend an NPDES permit beyond the statutory 5-year time period. *ONRC Action v. Columbia Plywood, Inc.,* 286 F.3d 1137, 1146 (9$^{th}$ Cir. 2002, dissent by Reinhardt). Likewise, a continuing shield under 40 C.F.R. §122.6 may in no event last more than five years, the term of a properly issued renewal permit under 33 U.S.C. §1342(b)(1)(B) and 40 C.F.R. 122.6. Permit #NM0000019 expired on April 6, 2006 and thus may only be administratively extended by EPA through April 6, 2011.

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[1] A copy of the permit can be found at: http://www.epa.gov/region9/water/npdes/pdf/navajo/AZ-PublicServiceC0-permit.pdf.

EPA's attempt to administratively extend Permit NM000019 and the continuing shield beyond 5 years is illegal. EPA has refused to act for almost ten years, and by its inaction, attempted to allow APS and the other owners of the FCPP to receive not only the equivalent of one additional NPDES permits (until 2011), but the equivalent of two additional permits. In doing so, EPA has illegally ignored the plain language of Congress limiting the term of NPDES permits to 5 years. Permit NM0000019 became void by operation of law on April 7, 2011.

Claims against APS and the other owners of the FCPP

For the reasons stated above, SJCA and the Center claim that APS and the other owners of the FCPP are illegally discharging pollutants from the FCPP without a valid NPDES permit. As noted above, NPDES Permit No. NM0000019 expired on April 6, 2006. EPA does not have the legal authority to extend a NPDES permit for longer than 5 years. Therefore, APS and the other owners of the FCPP have been illegally discharging pollutants (including but not limited to Total Dissolved solids, selenium, temperature, Total Suspended Solids) from the FCPP (and its pipes, point sources and appurtenances) into navigable waters (including but not limited to No Name Wash, Chaco Wash, the San Juan River, and/or Morgan Lake) without a permit from April 7, 2011 to date. APS and the other owners of the FCPP are jointly and severally liable for civil penalties on each and every day it has discharged pollutants without a permit from April 7, 2011 to date. As noted above, APS and the other owners may not rely on a continuing shield defense because EPA is without authority to administratively extend NPDES Permit No. NM0000019 beyond five years.

Please contact me if you have any questions about this notice letter or if you would like to discuss resolution of this matter without protracted litigation.

Sincerely,

s/ John M. Barth

John M. Barth

cc: Mike Eisenfeld, SJCA
Michael Saul, The Center for Biological Diversity

# Exhibit 9

**UNITED STATES ENVIRONMENTAL PROTECTION AGENCY**
**REGION IX**
**75 Hawthorne Street**
**San Francisco, CA 94105**

**AUTHORIZATION TO DISCHARGE UNDER THE NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM**

**NPDES PERMIT NO. NN0000019**

In compliance with the provisions of the Clean Water Act ("CWA") (Public Law 92-500, as amended, 33 U.S.C. 1251 et seq.), the following discharger is authorized to discharge from the identified facility at the outfall location(s) specified below, in accordance with the effluent limits, monitoring requirements, and other conditions set forth in this permit:

| | |
|---|---|
| Discharger Name | Arizona Public Service Company |
| Discharger Address | P.O. Box 53999<br>Phoenix, Arizona 85072-3999 |
| Facility Name | APS Four Corners Power Plant |
| Facility Location Address | 20 Miles SW of Farmington<br>San Juan County, New Mexico 87416 |
| Facility Rating | Major |

| Outfall Number | General Type of Waste Discharged | Outfall Latitude | Outfall Longitude | Receiving Water |
|---|---|---|---|---|
| 001 | Cooling Pond Discharge | 36˚42' 16.5" N | 108˚ 29' 12" W | No-name tributary to Chaco River |

| | |
|---|---|
| This permit was issued on: | |
| This permit shall become effective on: | <1st of month following 33 days after issue date> |
| This permit shall expire at midnight on: | <Effective date + 5 years – 1 day> |
| In accordance with 40 CFR 122.21(d), the discharger shall submit a new application for a permit at least 180 days before the expiration date of this permit, unless permission for a date no later than the permit expiration date has been granted by the Director. | |

Signed this ______ day of ______________________, <201#>, for the Regional Administrator.

___________________________
Jane Diamond, Director
Water Division

# Part I. EFFLUENT LIMITS AND MONITORING REQUIREMENTS

## *A. Effluent Limits and Monitoring Requirements*

### 1. <u>Outfall Number 001 - Cooling Pond Discharge</u>

During the period beginning on the effective date of this permit and lasting through the date of expiration, the Permittee is authorized to discharge from Outfall No. 001

Such discharge shall be limited and monitored by the Permittee as specified below. Samples shall be collected and flow measurements taken at the point where Morgan Lake blowdown water discharge through the existing parshall flume.

***Table 1. Effluent Limits and Monitoring Requirements – Outfall Number 001***

| Parameter | Maximum Allowable Discharge Limits<br>Concentration and Loading | | | Monitoring Requirements[2] | |
|---|---|---|---|---|---|
| | Average Monthly | Maximum Daily | Units | Frequency | Sample Type |
| Temperature, water deg. centigrade | 32.2 | 35 | ˚C | Continuous | Discrete |
| Flow rate | (1) | 14.7 | MGD | Once/Week | Calculated |
| TDS | (2) | (2) | mg/L | Once/Month | Discrete |
| pH | between 6.0 to 9.0 | | | Once/Week | Discrete |
| Priority Pollutant Scan | | | | Once /In year 4 of the Permit Term | 24 Hour-Composite |

NOTES:

1. Report both average weekly/monthly and maximum daily flows
2. During Periods of Discharge. Total Dissolved Solids shall be determined by the “calculation method” (sum of constituents) as described in the 1979 edition of “Techniques of Water Resources Investigations of the United States Geological

survey-Methods for Determination of Inorganic Substances in Water and Fluvial Sediments," or any subsequent editions.

2. **Outfall Number 001 - Narrative Surface Water Quality Standards**

Discharge from Outfall 001 shall be free from pollutants in amounts or combinations that, for any duration:

a. Cause injury to, are toxic to, or otherwise adversely affect human health, public safety, or public welfare
b. Cause injury to, are toxic to, or otherwise adversely affect the habitation, growth, or propagation of indigenous aquatic plant and animal communities or any member of these communities; of any desirable non-indigenous member of these communities; of waterfowl accessing the water body; or otherwise adversely affect the physical, chemical, or biological conditions on which these communities and their members depend.
c. Settle to form bottom deposits, including sediments, precipitates and organic materials, that cause injury to, are toxic to, or otherwise adversely affect the habitation, growth, or propagation of indigenous aquatic plant and animal communities or any member of these communities; of any desirable non-indigenous member of these communities; of waterfowl accessing the water body; or otherwise adversely affect the physical, chemical, or biological conditions on which these communities and their members depend.
d. Cause physical, chemical, or biological conditions that promote the habitation, growth, or propagation of undesirable, non-indigenous species of plant or animal life in the water body
e. Cause solids, oil, grease, foam, scum, or any other form of objectionable floating debris on the surface of the water body; may cause a film or iridescent appearance on the surface of the water body; or may cause a deposit on a shoreline, on a bank, or on aquatic vegetation.
f. Cause objectionable odor in the area of the water body
g. Cause objectionable taste, odor, color, or turbidity in the water body.
h. Cause objectionable taste in edible plant and animal life, including waterfowl, that reside in, on, or adjacent to the water body.
i. Cause the growth of algae or aquatic plants that inhibit or prohibit the habitation, growth, or propagation of other aquatic life or that impair recreational uses.

3. **Internal Outfall 01A – Condenser Cooling Water Discharge**

a. During the period beginning on the effective date of this permit and lasting through date of expiration, the Permittee is authorized to discharge from Internal Outfall 01A.

   Such discharge shall be limited and monitored by the Permittee as specified below. Stormwater runoff is included in this discharge. Samples shall be collected at the point where condenser cooling water from 4 and 5 is discharged from the circulating water canal to Morgan Lake

***Table 2.1 Effluent Limits and Monitoring Requirements – Outfall Number 01A***

| Parameter | Maximum Allowable Discharge Limits Concentration and Loading | | | | Monitoring Requirements | |
|---|---|---|---|---|---|---|
| | Average Monthly | Average Weekly | Maximum Daily | Units | Frequency | Sample Type |
| Flow | - | - | - | MGD | Once/Week | Calculated (1) |
| TRC(2,3) | - | - | 954 | lbs/day | Once/Week | Discrete |
| | - | - | 0.2 | mg/L | Once/Week | Discrete |
| Oil & Grease | 15.0 | | 20.0 | mg/L | Once/Week | Discrete |
| pH | between 6.0 to 9.0 std. units | | | | Once/Week | Discrete |

NOTES:

(1) Based upon pumping records. Report both average and maximum daily flows
(2) As defined in 40 CFR 423.11. Limits for total chlorine are set in accordance with 40 CFR 423.13(b)(1) for once through cooling water. Internal Outfall No. 01A discharge is further restricted by 40 CFR 423.13(2) in that total residual chlorine may not be discharged from any single generating unit for more than two hours per day. Simultaneous multi-unit chlorination is permitted.
(3) Samples shall be collected during periods of chlorination. Permittee shall report both concentration and mass loading values.

b. Effluent Toxicity Testing:

Effluent toxicity shall be monitored and defined as follows. The Permittee shall only be required to conduct chronic toxicity testing if discharges from Internal Outfall No. 01A are known to occur during at least five (5) consecutive days. If there is continuous discharge from Outfall No. 01A, the Permittee shall conduct toxicity tests on 24-hour composite effluent samples on a quarterly basis. Following a year of quarterly testing, and if there is evidence that there is no reasonable potential for chronic toxicity, the Permittee may apply to EPA for a reduction in toxicity testing frequency and also request toxicity testing using the single, most sensitive species. The most sensitive species is the fish, invertebrate, or alga species which demonstrates the largest percent effect level at the In-stream Waste Concentration (IWC), where:

IWC percent effect level = [(Control mean response − IWC mean response) ÷ Control mean response] × 100.

Chronic toxicity test samples shall be taken at the NPDES sampling location. A split of each sample shall also be analyzed for all other monitored parameters at the minimum frequency specified for that parameter. See Table 2.1 above

2. Freshwater Species and Test Methods

Species and short-term test methods for estimating the chronic toxicity of NPDES effluents are found in the fourth edition of *Short-term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms* (EPA/821/R-02/013, 2002; Table IA, 40 CFR 136).

The permittee shall conduct static renewal toxicity tests with the fathead minnow, *Pimephales promelas* (Larval Survival and Growth Test Method 1000.0); the daphnid, *Ceriodaphnia dubia* (Survival and Reproduction Test Method 1002.01); and the green alga, *Selenastrum capricornutum* (also named *Raphidocelis subcapitata*) (Growth Test Method 1003.0).

3. Chronic WET Permit Trigger

For this discharge, the determination of "Pass" or "Fail" from a single-effluent concentration chronic toxicity test at the IWC of 100 percent effluent is determined using the Test of Significant Toxicity (TST) approach described in *National Pollutant Discharge Elimination System Test of Significant Toxicity Implementation Document* (EPA 833-R-10-003, 2010). For any one chronic toxicity test, the chronic WET permit trigger that must be achieved is rejection of the null hypothesis ($H_o$):

IWC (100 percent effluent) mean response $\leq 0.75 \times$ Control mean response.

A test result that rejects this null hypothesis is reported as "Pass" on the DMR form. A test result that does not reject this null hypothesis is reported as "Fail" on the DMR form. To calculate either "Pass" or "Fail", the Permittee shall follow the instructions in *National Pollutant Discharge Elimination System Test of Significant Toxicity Implementation Document*, Appendix A. If a test result is reported as "Fail", then the Permittee shall follow Section 6 (Accelerated Toxicity Testing and TRE/TIE Process) of this permit.

4. Quality Assurance

a. Quality assurance measures, instructions, and other recommendations and requirements are found in the chronic test methods manual previously referenced. Additional requirements are specified below.

b. This discharge is subject to a determination of "Pass" or "Fail" from a single-effluent concentration chronic toxicity test at the IWC (for statistical flowchart and procedures, see *National Pollutant Discharge Elimination System Test of Significant Toxicity Implementation Document*, Appendix A, Figure A-1). The chronic IWC for this discharge is 100 percent effluent.

d. If organisms are not cultured in-house, then concurrent testing with a reference toxicant shall be conducted. If organisms are cultured in-house, then monthly reference toxicant testing is sufficient. Reference toxicant tests and effluent toxicity tests shall be conducted using the same test conditions (e.g., same test duration, etc.).

e. All multi-concentration reference toxicant test results must be reviewed and reported according to EPA guidance on the evaluation of concentration-response relationships found in *Method Guidance and Recommendations for Whole Effluent Toxicity (WET) Testing (40 CFR 136)* (EPA 821-B-00-004, 2000).

f. If either the reference toxicant or effluent toxicity tests do not meet all test acceptability criteria in the test methods manual, then the Permittee shall resample and retest within 14 days.

g. If the discharged effluent is chlorinated, then chlorine shall not be removed from the effluent sample prior to toxicity testing without written approval by the permitting authority.

h. pH drift during a toxicity test may contribute to artifactual toxicity when pH-dependent toxicants (e.g., ammonia, metals) are present in the effluent. To determine whether or not pH drift is contributing to artifactual toxicity, the permittee shall conduct three sets of side-by-side toxicity tests in which the pH of one treatment is controlled at the pH of the effluent while the pH of the other treatment is not controlled, as described in Section 11.3.6.1 of *Short-term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms* (EPA/821/R-02/013, 2002). Toxicity is confirmed to be artifactual and due to pH drift when no toxicity above the chronic WET permit limit or trigger is observed in the treatments controlled at the pH of the effluent. Upon this confirmation and following written approval by the permitting authority, the Permittee may use the procedures outlined in Section 11.3.6.2 of the chronic freshwater test methods manual to control effluent sample pH during the toxicity test.

5. Initial Investigation TRE Work Plan

Within 90 days of the permit effective date, the Permittee shall prepare and submit to the permitting authority a copy of its Initial Investigation Toxicity Reduction Evaluation (TRE) Work Plan (1-2 pages) for review. This plan shall include steps the permittee intends to follow if toxicity is measured above the chronic WET trigger and should include the following, at minimum:

a. A description of the investigation and evaluation techniques that would be used to identify potential causes and sources of toxicity, effluent variability, and treatment system efficiency.

b. A description of methods for maximizing in-house treatment system efficiency, good housekeeping practices, and a list of all chemicals used in operations at the facility.

c. If a Toxicity Identification Evaluation (TIE) is necessary, an indication of who would conduct the TIEs (i.e., an in-house expert or outside contractor).

6. Accelerated Toxicity Testing and TRE/TIE Process

a. If the chronic WET trigger is exceeded and the source of toxicity is known (e.g., a temporary plant upset), then the Permittee shall conduct one additional toxicity test using the same species and test method. This toxicity test shall begin within 14 days of receipt of a test result exceeding the chronic WET permit trigger. If the additional toxicity test does not exceed the chronic WET permit trigger, then the Permittee may return to the regular testing frequency.

b. If the chronic WET trigger is exceeded and the source of toxicity is not known, then the Permittee shall conduct six additional toxicity tests using the same species and test method, approximately every two weeks, over a 12-week period. This testing shall begin within 14 days of receipt of a test result exceeding the chronic WET permit trigger. If none of the additional toxicity tests exceed the chronic WET permit trigger, then the Permittee may return to the regular testing frequency.

c. If one of the additional toxicity tests (in paragraphs 6.a or 6.b) exceeds the chronic WET permit trigger, then, within 14 days of receipt of this test result, the Permittee shall initiate a TRE using, according to the type of treatment facility, EPA manual *Toxicity Reduction Evaluation Guidance for Municipal Wastewater Treatment Plants* (EPA/833/B-99/002, 1999) or EPA manual *Generalized Methodology for Conducting Industrial Toxicity Reduction Evaluations* (EPA/600/2-88/070, 1989). In conjunction, the Permittee shall develop and implement a Detailed TRE Work Plan which shall include the following: further actions undertaken by the Permittee to investigate, identify, and correct the causes of toxicity; actions the Permittee will take to mitigate the effects of the discharge and prevent the recurrence of toxicity; and a schedule for these actions.

d. The Permittee may initiate a TIE as part of a TRE to identify the causes of toxicity using the same species and test method and, as guidance, EPA manuals: *Methods for Aquatic Toxicity Identification Evaluations: Phase I Toxicity Characterization Procedures* (EPA/600/6-91/003, 1991); *Methods for Aquatic Toxicity Identification Evaluations, Phase II Toxicity Identification Procedures for Samples Exhibiting Acute and Chronic Toxicity* (EPA/600/R-92/080, 1993); *Methods for Aquatic Toxicity Identification Evaluations, Phase III Toxicity Confirmation Procedures for Samples Exhibiting Acute and Chronic Toxicity* (EPA/600/R-92/081, 1993); and *Marine Toxicity Identification Evaluation (TIE): Phase I Guidance Document* (EPA/600/R-96-054, 1996).

7. Reporting of Chronic Toxicity Monitoring Results

   a. The Permittee shall report on the DMR for the month in which the toxicity test was conducted: "Pass" or "Fail" (based on the Welch's t-test result) and the calculated "percent mean response at IWC", where:

      percent mean response at IWC = ((Control mean response – IWC mean response) ÷ Control mean response)) × 100

   b. The Permittee shall submit a full laboratory report for all toxicity testing as an attachment to the DMR for the month in which the toxicity test was conducted. The laboratory report shall contain: the toxicity test results; the dates of sample collection and initiation of each toxicity test; all results for effluent parameters monitored concurrently with the toxicity test(s); and progress reports on TRE/TIE investigations.

   c. The Permittee shall notify the permitting authority in writing within 14 days of exceedance of the chronic WET trigger. This notification shall describe actions the Permittee has taken or will take to investigate, identify, and correct the causes of toxicity; the status of actions required by this permit; and schedule for actions not yet completed; or reason(s) that no action has been taken.

8. Permit Reopener for Chronic Toxicity

   In accordance with 40 CFR 122 and 124, this permit may be modified to include effluent limitations or permit conditions to address chronic toxicity in the effluent or receiving waterbody, as a result of the discharge; or to implement new, revised, or newly interpreted water quality standards applicable to chronic toxicity.

***Table 2.2. Toxicity Limits and Monitoring Requirements – Outfall Number 01A***

| Parameter | Discharge Limitation | Monitoring Requirements(2) | |
|---|---|---|---|
| | Daily Maximum | Frequency | Sample Type |
| Chronic Toxicity Testing | (1) | (2) | Composite |

NOTES:

(1) There is no discharge limitation for chronic toxicity at this time. Monitoring and reporting for chronic toxicity are specified in Section 1 and 2 below.

(2) See discussion in Section 3.b. above for determination of frequency of Chronic toxicity testing.

**4. Internal Outfall 01B – Chemical Metal Cleaning Wastewater**

During the period beginning on the effective date of this permit and lasting through date of expiration, the Permittee is authorized to discharge from Internal Outfall No. 01B.

Such discharges shall be limited and monitored by the Permittee as specified below. Samples shall be collected prior to mixing with any other waste source stream and/or discharge to the circulating water canal.

***Table 3. Effluent Limits and Monitoring Requirements – Outfall Number 01B***

| Parameter | Maximum Allowable Discharge Limits Concentration and Loading | | | | Monitoring Requirements[(2)] | |
|---|---|---|---|---|---|---|
| | Average Monthly | Average Weekly | Maximum Daily | Units | Frequency | Sample Type |
| Flow[(1)] | - | - | - | MGD | Once/Day | Estimated |
| TSS | - | 30 | 100 | mg/L | 1/Occurrence | Discrete |
| Oil & Grease | - | 15 | 20 | mg/L | 1/Occurrence | Discrete |
| Iron | - | 1.0 | 1.0 | mg/L | 1/Occurrence | Discrete |
| Copper, total | - | 1.0 | 1.0 | mg/L | 1/Occurrence | Discrete |
| pH | between 6.0 to 9.0 std. units | | | | 1/Occurrence | Discrete |

NOTES:

(1) Defined in 40 CFR 423.11

5. **Internal Outfall 01E – Combined Waste Treatment Pond Discharge**

During the period beginning with the effective date of this permit and lasting through the date of expiration, the Permittee is authorized to discharge from Internal Outfall No. 01E.

Such discharges shall be limited and monitored by the Permittee as specified below. Samples shall be collected prior to mixing with any other waste source stream and/or release to the circulating water canal.

***Table 4. Effluent Limits and Monitoring Requirements – Outfall Number 01E***

| Parameter | Maximum Allowable Discharge Limits Concentration and Loading | | | | Monitoring Requirements | |
|---|---|---|---|---|---|---|
| | Average Monthly | Average Weekly | Maximum Daily | Units | Frequency | Sample Type |
| Flow | - | - | - | MGD | Once/Week | Estimated (1) |
| TSS | - | 30 | 100 | mg/L | Once/Week | Discrete |
| Oil & Grease | 15.0 | | 20.0 | mg/L | Once/Week | Discrete |
| pH | between 6.0 to 9.0 std. units | | | | Once/Week | Discrete |

NOTES:

(1) Report both average and maximum daily flows.

### *B. General Discharge Specification*

1. **PCB Fluids**

As per 40 CFR 423.13 There shall be no discharge of polychlorinated biphenyl (PCB) fluids from any waste streams.

2. **Surface Seepage**

Surface seepage intercept systems shall be constructed and operated for existing and future unlined ash ponds. Water collected by these intercept systems shall be returned to the ash ponds, or evaporation ponds. All provisions of the Seepage Monitoring and Management Plan as described below in the Special Conditions Section must be implemented.

3. **Cooling Water Requirements**

The Permittee shall submit all the material required under 40 CFR 122.21 (r) (1)-(8) upon submittal of their next renewal application.

### *C. General Monitoring and Reporting*

1. All monitoring shall be conducted in accordance with 40 CFR 136 test methods, unless otherwise specified in this permit. For influent and effluent analyses required in this permit, the Permittee shall utilize 40 CFR 136 test methods with MDLs and MLs that are lower than the effluent limits in this permit and the water quality criteria concentrations in the National Recommended Water Quality Criteria. If all MDLs or MLs are higher than these effluent limits or criteria concentrations, then the Permittee shall utilize the test method with the lowest MDL or ML. In this context, the Permittee shall ensure that the laboratory utilizes a standard calibration where the lowest standard point is equal to or less than the ML. Influent and effluent analyses for metals shall measure "total recoverable metal", except as provided under 40 CFR 122.45(c).

2. As an attachment to the first DMR, the Permittee shall submit, for all parameters with monitoring requirements specified in this permit:

a. The test method number or title and published MDL or ML,

b. The preparation procedure used by the laboratory,

c. The laboratory's MDL for the test method computed in accordance with Appendix B of 40 CFR 136,

d. The standard deviation (S) from the laboratory's MDL study,

e. The number of replicate analyses (n) used to compute the laboratory's MDL, and

f. The laboratory's lowest calibration standard.

As part of each DMR submittal, the Permittee shall certify that there are no changes to the laboratory's test methods, MDLs, MLs, or calibration standards. If there are any changes to the laboratory's test methods, MDLs, MLs, or calibration standards, these changes shall be summarized in an attachment to the subsequent DMR submittal.

3. The Permittee shall develop a Quality Assurance ("QA") Manual for the field collection and laboratory analysis of samples. The purpose of the QA Manual is to assist in planning for the collection and analysis of samples and explaining data anomalies if they occur. At a minimum, the QA Manual shall include the following:

   a. Identification of project management and a description of the roles and responsibilities of the participants; purpose of sample collection; matrix to be sampled; the analytes or compounds being measured; applicable technical, regulatory, or program-specific action criteria; personnel qualification requirements for collecting samples;

   b. Description of sample collection procedures; equipment used; the type and number of samples to be collected including QA/Quality Control ("QC") samples; preservatives and holding times for the samples (see 40 CFR 136.3); and chain of custody procedures;

   c. Identification of the laboratory used to analyze the samples; provisions for any proficiency demonstration that will be required by the laboratory before or after contract award such as passing a performance evaluation sample; analytical method to be used; MDL and ML to be reported; required QC results to be reported (e.g., matrix spike recoveries, duplicate relative percent differences, blank contamination, laboratory control sample recoveries, surrogate spike recoveries, etc.) and acceptance criteria; and corrective actions to be taken in response to problems identified during QC checks; and

   d. Discussion of how the Permittee will perform data review, report results, and resolve data quality issues and identify limits on the use of data.

4. Throughout all field collection and laboratory analyses of samples, the Permittee shall use the QA/QC procedures documented in their QA Manual. If samples are tested by a contract laboratory, the Permittee shall ensure that the laboratory has a QA Manual

on file. A copy of the Permittee's QA Manual shall be retained on the Permittee's premises and available for review by regulatory authorities upon request. The Permittee shall review its QA Manual annually and revise it, as appropriate.

5. Samples collected during each month of the reporting period must be reported on Discharge Monitoring Report forms, as follows:

   a. For a *maximum daily* permit limit or monitoring requirement when one or more samples are collected during the month, report either:

      The *maximum value*, if the maximum value of all analytical results is greater than or equal to the ML; or
      *NODI (Q)*, if the maximum value of all analytical results is greater than or equal to the laboratory's MDL, but less than the ML; or
      *NODI (B)*, if the maximum value of all analytical results is less than the laboratory's MDL.

   b. For an *average weekly* or *average monthly* permit limit or monitoring requirement when only one sample is collected during the week or month, report either:

      The *maximum value*, if the maximum value of all analytical results is greater than or equal to the ML; or
      *NODI (Q)*, if the maximum value of all analytical results is greater than or equal to the laboratory's MDL, but less than the ML; or
      *NODI (B)*, if the maximum value of all analytical results is less than the laboratory's MDL.

   c. For an *average weekly* or *average monthly* permit limit or monitoring requirement when more than one sample is collected during the week or month, report:

      The *average value* of all analytical results where 0 (zero) is substituted for *NODI (B)* and the laboratory's MDL is substituted for *NODI (Q)*.

6. In addition to information requirements specified under 40 CFR 122.41(j)(3), records of monitoring information shall include: the laboratory which performed the analyses and any comment, case narrative, or summary of results produced by the laboratory. The records should identify and discuss QA/QC analyses performed concurrently during sample analyses and whether project and 40 CFR 136 requirements were met. The summary of results must include information on initial and continuing calibration, surrogate analyses, blanks, duplicates, laboratory control samples, matrix spike and matrix spike duplicate results, and sample condition upon receipt, holding time, and preservation.

7. All monitoring results shall be submitted in such a format as to allow direct comparison with the effluent limits, monitoring requirements, and conditions of this permit. Monitoring results are to be reported on EPA Form 3320-1, a pre-printed Discharge Monitoring Report form ("DMR") provided by the EPA Region 9 DMR

Coordinator for NPDES. Monthly DMR forms shall be submitted by the 28th day of the month following the previous reporting period. For example, under monthly submission the DMR form for January is due by February 28th, and under quarterly submission, the three DMR forms for January, February, and March are due on April 28th. Monitoring and reporting schedules are as follows:

| Sampling Frequency | Monitoring Period Begins On… | Monitoring Period | DMR Due Date |
|---|---|---|---|
| Continuous | Permit effective date | Continuous | 28th day of the month following calendar quarter |
| Once/Day | Permit effective date | Midnight through 11:59 p.m. | 28th day of the month following calendar quarter |
| Once/Week | Permit effective date | Sunday through Saturday | 28th day of the month following calendar quarter |
| Once/Month | Permit effective date | First day of the calendar month through last day of the calendar month | 28th day of the month following calendar quarter |
| Once/Quarter | Closest of January 1, April 1, July 1, or October 1 following (or on) permit effective date | January 1 through March 31<br>April 1 through June 30<br>July 1 through September 30<br>October 1 through December 31 | 28th day of the month following calendar quarter |
| Once/Year | January 1 following permit effective date | January 1 through December 31 | January 28, each year |

A DMR form must be submitted for the reporting period even if there was not any discharge. If there is no discharge from the facility during the reporting period, the Permittee shall submit a DMR indicating no discharge as required. Duplicate signed copies of these, and all other reports required herein, shall be submitted to EPA at the following addresses:

NPDES Data Team (WTR-7)
EPA Region IX
75 Hawthorne Street
San Francisco, CA 94105

The Discharger has the option to submit all monitoring results in the electronic reporting format approved by EPA. The Discharger may submit DMRs electronically using EPA's NetDMR application. NetDMR is a national tool for regulated Clean Water Act Permittees to submit DMRs electronically via a secure Internet application to EPA. By using NetDMR, dischargers can discontinue mailing hard copy forms under 40 CFR 122.41 and 403.12

## Part II. STANDARD CONDITIONS

The Permittee shall comply with all EPA Region 9 Standard Conditions included in an attachment to this permit (see Attachment A).

## Part III. SPECIAL CONDITIONS

### *A. Seepage Management and Monitoring Plan*

A Seepage Monitoring and Management Plan shall be established and implemented to determine the source of and pollutants in seepages below all ash ponds that receive or received coal combustion residue either currently or in the past. The Plan shall be established and submitted to EPA within 120 days of the issuance of this permit. The Plan shall at a minimum do the following:

1. Identify all seeps within 100 meters down gradient of such impoundments;
2. Conduct sampling (or provide summary of current data if sufficient and valid) of seepages for boron, mercury, nickel, selenium, uranium, zinc and total dissolved solids.
3. Provide information about number of flows observed and range of flows observed
4. Provide information about exceedances of any human health, livestock, or chronic or acute aquatic life standards as established in the 2007 NNWQS in the samples collected for analysis.

### *B. Permit Reopener(s)*

In accordance with 40 CFR 122 and 124, this permit may be modified by EPA to include effluent limits, monitoring, or other conditions to implement new regulations, including EPA-approved water quality standards; or to address new information indicating the presence of effluent toxicity or the reasonable potential for the discharge to cause or contribute to exceedances of water quality standards.

### *C. Twenty-four Hour Reporting of Noncompliance*

The Permittee shall report any noncompliance which may endanger human health or the environment. The Permittee is required to provide an oral report by directly speaking with an EPA staff person within 24 hours from the time the Permittee becomes aware of the circumstances. If the Permittee is unsuccessful in reaching a staff person, the Permittee shall provide notification by 9 a.m. on the first business day following the noncompliance. The Permittee shall notify EPA at the following telephone numbers:

U.S. Environmental Protection Agency
CWA Compliance Office (WTR-7)
(415) 972-3577

The Permittee shall follow up with a written submission within five days of the time the Permittee becomes aware of the circumstances. The written submission shall contain a description of the noncompliance and its cause; the period of noncompliance, including exact dates and times; and if the noncompliance has not been corrected, the anticipated time it is expected to continue; and steps taken or planned to reduce, eliminate, and prevent reoccurrence of the noncompliance.

1. The following shall be included as information which must be reported within 24 hours under this paragraph.

    a. Any unanticipated bypass which exceeds any effluent limit in the permit (see 40 CFR 122.44(g)).

    b. Any upset which exceeds any effluent limit in the permit.

    c. Violation of a maximum daily discharge limit for any of the pollutants listed by the director in the permit to be reported within 24 hours (see 40 CFR 122.44(g)).

2. The Director may waive the written report on a case-by-case basis for reports required under paragraph B.2, if the oral report has been received within 24 hours.

# Part IV. ATTACHMENTS

## Attachment A: Definitions

1. "Average monthly discharge limitation" means the highest allowable average of "daily discharges" over a calendar month, calculated as the sum of all "daily discharges" measured during a calendar month divided by the number of "daily discharges" measured during that month.

2. "Average weekly discharge limitation" means the highest allowable average of "daily discharges" over a calendar week, calculated as the sum of all "daily discharges" measured during a calendar week divided by the number of "daily discharges" measured during that week.

3. "Best Management Practices" or "BMPs" are schedules of activities, prohibitions of practices, maintenance procedures, and other physical, structural, and/or managerial practices to prevent or reduce the pollution of waters of the U.S. BMPs include treatment systems, operating procedures, and practices to control: plant site runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage. BMPs may further be characterized as operational, source control, erosion and sediment control, and treatment BMPs.

4. A "composite" sample means a time-proportioned mixture of not less than eight discrete aliquots obtained at equal time intervals (e.g., 24-hour composite means a minimum of eight samples collected every three hours). The volume of each aliquot shall be directly proportional to the discharge flow rate at the time of sampling, but not less than 100 ml. Sample collection, preservation, and handling shall be performed as described in the most recent edition of 40 CFR 136.3, Table II. Where collection, preservation, and handling procedures are not outlined in 40 CFR 136.3, procedures outlined in the 18th edition of Standard Methods for the Examination of Water and Wastewater shall be used.

5. A "daily discharge" means the "discharge of a pollutant" measured during a calendar day or any 24-hour period that reasonably represents the calendar day for purposes of sampling. For pollutants with limitations expressed in units of mass, the "daily discharge" is calculated as the total mass of the pollutant discharged over the day. For pollutants with limitations expressed in other units of measurement, the "daily discharge" is calculated as the average measurement of the pollutant over the day.

6. A "daily maximum allowable effluent limitation" means the highest allowable "daily discharge."

7. A "DMR" is a "Discharge Monitoring Report" that is an EPA uniform national form, including any subsequent additions, revisions, or modifications for reporting of self-monitoring results by the Permittee.

8. A "grab" sample is a single sample collected at a particular time and place that represents the composition of the discharge only at that time and place. Sample collection,

preservation, and handling shall be performed as described in the most recent edition of 40 CFR 136.3, Table II. Where collection, preservation, and handling procedures are not outlined in 40 CFR 136.3, procedures outlined in the 18th edition of Standard Methods for the Examination of Water and Wastewater shall be used.

9. The "method detection limit" or "MDL" is the minimum concentration of an analyte that can be detected with 99% confidence that the analyte concentration is greater than zero, as defined by a specific laboratory method in 40 CFR 136. The procedure for determination of a laboratory MDL is in 40 CFR 136, Appendix B.

10. The "minimum level" or "ML" is the concentration at which the entire analytical system must give a recognizable signal and acceptable calibration point. The ML is the concentration in a sample that is equivalent to the concentration of the lowest calibration standard analyzed in a specific analytical procedure, assuming that all the method-specific sample weights, volumes, and processing steps have been followed (as defined in EPA's draft National Guidance for the Permitting, Monitoring, and Enforcement of Water Quality-Based Effluent Limitations Set Below Analytical Detection/Quantitative Levels, March 22, 1994). If a published method-specific ML is not available, then an interim ML shall be calculated. The interim ML is equal to 3.18 times the published method-specific MDL rounded to the nearest multiple of 1, 2, 5, 10, 20, 50, etc. (When neither an ML nor MDL are available under 40 CFR 136, an interim ML should be calculated by multiplying the best estimate of detection by a factor of 3.18; when a range of detection is given, the lower end value of the range of detection should be used to calculate the ML.) At this point in the calculation, a different procedure is used for metals, than non-metals:

    a. For metals, due to laboratory calibration practices, calculated MLs may be rounded to the nearest whole number.

    b. For non-metals, because analytical instruments are generally calibrated using the ML as the lowest calibration standard, the calculated ML is then rounded to the nearest multiple of (1, 2, or 5) x 10n, where n is zero or an integer. (For example, if an MDL is 2.5 µg/l, then the calculated ML is: 2.5 µg/l x 3.18 = 7.95 µg/l. The multiple of (1, 2, or 5) x 10n nearest to 7.95 is 1 x 101 = 10 µg/l, so the calculated ML, rounded to the nearest whole number, is 10 µg/l.)

11. A "NODI(B)" means that the concentration of the pollutant in a sample is not detected. NODI(B) is reported when a sample result is less than the laboratory's MDL.

12. A "NODI(Q)" means that the concentration of the pollutant in a sample is detected but not quantified. NODI(Q) is reported when a sample result is greater than or equal to the laboratory's MDL, but less than the ML.

13. "Average monthly discharge limitation" means the highest allowable average of "daily discharges" over a calendar month, calculated as the sum of all "daily discharges"

measured during a calendar month divided by the number of "daily discharges" measured during that month.

14. "Average weekly discharge limitation" means the highest allowable average of "daily discharges" over a calendar week, calculated as the sum of all "daily discharges" measured during a calendar week divided by the number of "daily discharges" measured during that week.

15. "Best Management Practices" or "BMPs" are schedules of activities, prohibitions of practices, maintenance procedures, and other physical, structural, and/or managerial practices to prevent or reduce the pollution of waters of the U.S. BMPs include treatment systems, operating procedures, and practices to control: plant site runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage. BMPs may further be characterized as operational, source control, erosion and sediment control, and treatment BMPs.

16. A "composite" sample means a time-proportioned mixture of not less than eight discrete aliquots obtained at equal time intervals (e.g., 24-hour composite means a minimum of eight samples collected every three hours). The volume of each aliquot shall be directly proportional to the discharge flow rate at the time of sampling, but not less than 100 ml. Sample collection, preservation, and handling shall be performed as described in the most recent edition of 40 CFR 136.3, Table II. Where collection, preservation, and handling procedures are not outlined in 40 CFR 136.3, procedures outlined in the 18th edition of Standard Methods for the Examination of Water and Wastewater shall be used.

17. A "daily discharge" means the "discharge of a pollutant" measured during a calendar day or any 24-hour period that reasonably represents the calendar day for purposes of sampling. For pollutants with limitations expressed in units of mass, the "daily discharge" is calculated as the total mass of the pollutant discharged over the day. For pollutants with limitations expressed in other units of measurement, the "daily discharge" is calculated as the average measurement of the pollutant over the day.

18. A "daily maximum allowable effluent limitation" means the highest allowable "daily discharge."

19. A "DMR" is a "Discharge Monitoring Report" that is an EPA uniform national form, including any subsequent additions, revisions, or modifications for reporting of self-monitoring results by the Permittee.

20. A "grab" sample is a single sample collected at a particular time and place that represents the composition of the discharge only at that time and place. Sample collection, preservation, and handling shall be performed as described in the most recent edition of 40 CFR 136.3, Table II. Where collection, preservation, and handling procedures are not

outlined in 40 CFR 136.3, procedures outlined in the 18th edition of Standard Methods for the Examination of Water and Wastewater shall be used.

21. The "method detection limit" or "MDL" is the minimum concentration of an analyte that can be detected with 99% confidence that the analyte concentration is greater than zero, as defined by a specific laboratory method in 40 CFR 136. The procedure for determination of a laboratory MDL is in 40 CFR 136, Appendix B.

22. The "minimum level" or "ML" is the concentration at which the entire analytical system must give a recognizable signal and acceptable calibration point. The ML is the concentration in a sample that is equivalent to the concentration of the lowest calibration standard analyzed in a specific analytical procedure, assuming that all the method-specific sample weights, volumes, and processing steps have been followed (as defined in EPA's draft National Guidance for the Permitting, Monitoring, and Enforcement of Water Quality-Based Effluent Limitations Set Below Analytical Detection/Quantitative Levels, March 22, 1994). If a published method-specific ML is not available, then an interim ML shall be calculated. The interim ML is equal to 3.18 times the published method-specific MDL rounded to the nearest multiple of 1, 2, 5, 10, 20, 50, etc. (When neither an ML nor MDL are available under 40 CFR 136, an interim ML should be calculated by multiplying the best estimate of detection by a factor of 3.18; when a range of detection is given, the lower end value of the range of detection should be used to calculate the ML.) At this point in the calculation, a different procedure is used for metals, than non-metals:

    a. For metals, due to laboratory calibration practices, calculated MLs may be rounded to the nearest whole number.

    b. For non-metals, because analytical instruments are generally calibrated using the ML as the lowest calibration standard, the calculated ML is then rounded to the nearest multiple of (1, 2, or 5) x 10n, where n is zero or an integer. (For example, if an MDL is 2.5 µg/l, then the calculated ML is: 2.5 µg/l x 3.18 = 7.95 µg/l. The multiple of (1, 2, or 5) x 10n nearest to 7.95 is 1 x 101 = 10 µg/l, so the calculated ML, rounded to the nearest whole number, is 10 µg/l.)

23. A "NODI(B)" means that the concentration of the pollutant in a sample is not detected. NODI(B) is reported when a sample result is less than the laboratory's MDL.

24. A "NODI(Q)" means that the concentration of the pollutant in a sample is detected but not quantified. NODI(Q) is reported when a sample result is greater than or equal to the laboratory's MDL, but less than the ML.

## Attachment B: Standard Permit Condition

## Attachment C: Location Map

**Attachment D: Wastewater Flow Schematic**

# NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM PROPOSED PERMIT FACT SHEET

| | |
|---|---|
| Permittee Name: | Arizona Public Service Company |
| Mailing Address: | P.O. Box 53999<br>Phoenix, AZ 85072 |
| Facility Address: | Four Corners Power Plant<br>P.O. Box 355, Station 4900<br>Fruitland, NM 87416 |
| Contact Person(s): | Tom Livingston, Site Manager<br>Tel: (505) 598-8200 |
| NPDES Permit No.: | NN0000019 |

## I. STATUS OF PERMIT

The United States Environmental Protection Agency (hereinafter "EPA Region 9" or "EPA") re-issued the current National Pollutant Discharge Elimination System Program (NPDES) Permit (No. NN0000019) for the discharge of treated wastewater from the Arizona Public Service Company's (hereinafter "APS" or "the Permittee" or "the Applicant") Four Corners Power Plant (hereinafter "FCPP" or "the Plant") to No Name Wash in the Navajo Nation on January 24, 2001 with an expiration date of Jaunary 24, 2006. On October 5, 2005 APS as co-owner and operator of the FCPP applied to the United States Environmental Protection Agency, Region 9 (hereinafter "EPA Region 9" or "EPA") for renewal of APS' permit for discharge of wastewater to waters of the United States, and the permit was administratively extended. APS subsequently provided updates to their initial application, allowing the facility to operate under the administrative extension. Via a letter dated October 30, 2012, EPA Region 9 requested that APS submit a fully revised application that reflected current operations, as well as future plans for the next permit cycle. On or about February 15, 2013 APS submitted a revised application, which included a description of the planned shutdown of Units 1, 2, and 3. as well as likely impacts on surface water discharges to be regulated under a renewed NPDES permit. On December 30, 2013 APS shutdown Units 1, 2, and 3. EPA Region 9 has developed this permit and fact sheet based on the latest information regarding operations and pursuant to Section 402 of the Clean Water Act, which requires point source dischargers to control the amount of pollutants that are discharged to waters of the United States through obtaining a NPDES permit.

## II. GENERAL DESCRIPTION OF FACILITY

The APS FCPP is located in San Juan County about 20 miles southwest of Farmington, New Mexico. The plant is located on Navajo Nation and is partially owned and operated by APS on behalf of itself as well as the Salt River Project Agricultural Improvement and Power District, El

Paso Electric Company, Public Service Company of New Mexico, and Tucson Electric Power Company. The permittee originally operated five generating units. Pursuant to EPA air pollution rules, the FCPP was provided the flexibility to choose between two compliance strategies for reducing NOx emissions: EPA's Best Available Retrofit Technology determination requiring new NOx controls on all five generating units by 2017, or APS' alternative to retire units 1,2, and 3 by 2014 and install new NOx controls on units 4 and 5 by mid-2018. Plant's total generation capacity was originally 2100 megawatts, but following the shutdown of Units 1, 2, and 3 which occurred on December 30, 2013 the capacity is now 1540 megawatts. The Plant burns low sulfur coal obtained from the adjacent Navajo Mine, owned by the Navajo Transitional Energy Company, LLC (NTEC) and operated by BHP minerals. The cooling water for the two remaining operational units, Unit 4 and 5 comes from the man-made Morgan Lake, adjacent to the Plant. The 1200 acre lake receives its water from the San Juan River at an average rate of about 24.5 million gallons per day. The plant provides electrical power to utilities in Arizona, Texas, and New Mexico.

APS has applied for authorization to continue discharge from the following outfalls:

Outfall No. 001: Cooling Pond Discharge

Internal Outfall Nos:
- 01A: Condenser Cooling Water Discharge
- 01B: Chemical Waste Cleaning Wastewater
- 01E: Combined Waste Treatment Pond Discharge

## III. DESCRIPTION OF RECEIVING WATER

Outfall No. 001 discharges from Morgan Lake to the No Name Wash which is tributary to the Chaco River, which in turn drains to Segment 2-401 of the San Juan River. The discharges according to the permit application submitted by APS from Outfall No. 001 are intermittent with an average of 2.5 days per week of discharge for about 6 months in a year. The average flow rate for the discharge is 4.2 million gallons a day. The length of the No Name Wash from Outfall 001 (parshall flume) to the Chaco River is about 2.5 miles and the point where the No Name Wash meets the Chaco River is about 7 miles from where the Chaco eventually meets the San Juan River. APS mostly discharges in order to regulate total dissolved solids (TDS) build up in the lake which is used for once through cooling of the generating units.

Internal Outfall No. 01A discharges condenser cooling water from Units 4 and 5 into an effluent channel to be recirculated through and cooled off in Morgan Lake. In addition effluent from Outfall No. 01E is mixed with the cooling water before entering Morgan Lake.

Internal Outfall No. 01B is not in use. The plant currently disposes chemical metal cleaning wastewater to its lined ash pond pursuant to the Dietrich exemption under the Resource Conservation and Recovery Act, but APS wishes to retain Outfall No. 01B for potential future use.

Internal Outfall No. 01E discharges from the combined waste treatment pond (CWTP). The CWTP is a treatment lagoon that treats about 8-13 million gallons per day (MGD) of various waste streams, including in plant storm water runoff. Effluent from the CWTP enters a culvert leading to the cooling water discharge canal and Outfall No. 01E. Water from Outfall No. 01E is then blended with condenser cooling water discharges prior to discharge from Outfall No. 01A into Morgan Lake.

The facility has its own domestic treatment package plant with capacity of 30,000 gallons per day (GPD). Chemical metal cleaning and flue gas desulfurization (FGD) wastewater is sent to a series of two lined ash ponds. Underflow from units 4 and 5, metal cleaning wastes, and sanitary wastewater effluent form the package plant are combined before being sent to the ash ponds. Two ash ponds operate in series. The first is a single-lined pond where solids settle and floatables are removed and sold for revenue. The effluent from the single-lined pond is sent through a siphon drain system downhill to the double-lined pond. The double-lined pond serves as retention basin holding the effluent before it is pumped for desulfurization reuse. Sanitary waste and FGD blowdown wastewater is not regulated in the NPDES permit.

For a schematic representation of the various outfalls and flows see the attached Flow Diagram attached herewith at Appendix A.

## IV. DESCRIPTION OF DISCHARGE

### A. Application Discharge Data

As part of the application for permit renewal, the Permittee provided data from an analysis of the facility's treated wastewater discharge, shown in Appendix B. The Permittee also provided data from a priority pollutant scan on the effluent sample collected 20-24 August 2012 and reported in September 2012, which is also shown in Appendix B. The data meet existing permit effluent limits.

### B. Recent Discharge Monitoring Report (DMR) Data

The last inspection of the APS facility was conducted in May 2012. The inspection report indicated that there were no DMR violations at the facility since the previous inspection. DMR data for the last 2 years, between May 2012 and May 2014 was reviewed and the facility has not reported any instances of violations in their Discharge Monitoring Reports.

## V. DETERMINATION OF NUMERICAL EFFLUENT LIMITATIONS

The discharge limitations are based on 40 CFR Part 423 – Effluent Limitation Guidelines (ELGs). EPA has established national standards based on the performance of treatment and control technologies for wastewater discharges to surface waters for certain industrial categories. ELGs represent the greatest pollutant reductions that are economically achievable for an industry, and are based on Best Practicable Control Technology (BPT), Best Conventional Pollutant Control Technology (BCT), and Best Available Technology Economically Achievable (BAT). (Sections 304(b)(1), 304(b)(4), and 304(b)(2) of the CWA respectively). These requirements are described below. The current ELGs for Steam Electric regulations, were last updated in 1982, and EPA proposed revisions to the regulations to strengthen controls by revising effluent limitations guidelines and standards for the steam electric power generating point source category on April 19, 2013. As of date of this fact sheet a final updated rule has not been adopted and therefore the existing regulations are applicable

**Outfall No. 001 – Cooling Pond Discharge**

The permit sets flow (14.7 million gallons per day) temperature (32.2 degrees centigrade monthly average and 35 degrees daily maximum), pH limits (no less than 6.0 or greater than 9.0 standard pH units). Temperature is to be monitored continuously and flow must be monitored on a weekly basis. Monitoring for pH and total dissolved solids (TDS) is required on a monthly basis. Total dissolved solids monitoring is required for discharges to tributaries of the San Juan River. These requirements are consistent with those of the previous permit.

**Internal Outfall No. 01A – Condenser Cooling Water Discharge**

This internal outfall meets the definition of 40 CFR 423.11(g) for "once-through cooling water", which is water passed through the main cooling condensers in or two passes for the purpose of removing waste heat. As once-through cooling water, Outfall No. 01A is subject to limitations outlined in 40 CFR 423.13(b) (1) and 423.13 (b) (2) for chlorine.

Intermittent chlorination is used as a system biocide in once through cooling waters. The regulations at 40 CFR Part 423 limit chlorination duration and frequency (two hours/unit/day) to protect the receiving water from chlorine toxicity. The permit limits chlorine residual in the discharge based on the calculations described below.

Total Residual Chlorine: In accordance with 40 CFR 423.13 (b) (1), for any plant with a total rated electric generating capacity of 25 or more megawatts, the quantity of pollutants discharged in once-through cooling water from each discharge point shall not exceed the quantity determined by multiplying the flow of the once-through cooling water from each discharge point times the daily maximum concentration of 0.2 milligrams per liter (mg/L). The total maximum flow from the two units during periods of chlorination (571.6 million gallons a day) is used in the following calculation:

$$\frac{571.6 \text{ million gal}}{\text{Day}} \times \frac{0.2 \text{ mg}}{\text{L}} \times \frac{8.345 \text{ lbs/million gal}}{1 \text{ mg/L}} = 954 \text{ lbs/day}$$

Oil and Grease: Daily maximum and 30-day average concentration limits for oil and grease are established at Outfall No. 01A at 20.0 and 15.0 mg/L respectively.

Other requirements: The pH restricted range is 6.0 to 9.0 standard pH units. Chronic toxicity monitoring is required on a quarterly basis during the first year following issuance of this permit. APS may petition for a reduced measurement frequency after the first year provided there is no reasonable potential for chronic toxicity demonstrated. Flow rates must be calculated and reported.

**Internal Outfall No. 01B Chemical metal cleaning**

Outfall No. 01B meets the definition of chemical metal cleaning waste under 40 CFR 423.11 (c) and is regulated as such under 40 CFR 423.12 (b) (5) and 423.13 (e). The limits for total suspended solid (TSS) and oil and grease are as follows: The permit sets daily maximum concentration limits of 100.0 and 20.0 mg/L for TSS and oil and grease, respectively. Weekly average concentration limits are 30.0 and 15.0 mg/L for TSS and oil and grease respectively. Limits for copper and iron are each set at 1.0 mg/L for both the daily maximum and weekly average limits. In addition the permit restricts pH to a range of 6.0 to 9.0 standard pH units. These requirements are consistent with those of the previous permit.

**Internal Outfall No. 01E Combined Waste Treatment Pond**

A large component of the Outfall No. 01E discharge is bottom ash transport water, with low-volume wastewater constituting a smaller component of the discharge. (See 40 CFR 423.11(f) for definition of bottom ash.) As such, Outfall No. 01E is regulated under 40 CFR 423.12 (b) (4) for total suspended solids (TSS) and oil and grease. TSS and oil and grease are subject to the same limits as those for Outfall No. 01B above. The permit also restricts pH to a range of 6.0 to 9.0 standard pH units, and flows must be estimated and reported. These requirements are consistent with those of the previous permit.

In addition to technology-based effluent limitations, Sections 402 and 301(b)(1)(C) of the Clean Water Act require that an NPDES permit contain effluent limitations that, among other things, are necessary to meet water quality standards. An NPDES permit must contain effluent limits for pollutants that are determined to be discharged at a level which has "the reasonable potential to cause or contribute to an excursion above any State [or Tribal] water quality standard, including State [or Tribal] narrative criteria for water quality." 40 C.F.R. § 122.44(3)(1)(i). To determine whether the discharge causes, has the reasonable potential to cause or contributes to an excursion of a numeric or narrative water quality criterion for individual toxicants, the regulatory authority must consider a variety of factors. 40 CFR Section122.44(d)(1)(ii). These factors include the following:

- Dilution in the receiving water;
- Existing data on toxic pollutants;
- Type of industry;
- History of compliance problems and toxic impacts; and
- Type of receiving water and designated use.

Based on an application of these factors to the APS FCPP operations and projected wastewater quality data provided in the application, EPA concluded that the discharges do not present a "reasonable potential" to cause or contribute to an exceedance of water quality standards. Due to the facility potentially discharging to dry washes, EPA has not considered available dilution, which may be present in the receiving waters. Therefore, EPA has made the most conservative and protective assumption of no available dilution in its analysis and that water quality standards must be met at the end of pipe prior to discharge. Therefore, based on sampling data and an evaluation of discharge characteristics, EPA has concluded, consistent with the previous permit, that other than the effluent limitations for pH, TSS, Oil and Grease, which are promulgated under the Steam Electric Power Generation ELGs as described in 40 CFR Section 423, that there is no reasonable potential for other pollutants to cause or contribute to a violation of receiving water standards. However, EPA has included monitoring in the permit for several additional parameters in order to further verify these assumptions.

Although EPA has determined that the discharges do not have a reasonable potential to cause or contribute to an exceedance of water quality standards, the permit sets general conditions based on narrative water quality standards contained in Section 202 of the Navajo Nation Surface Water Quality Standards 2007. These standards are set forth in the Section entitled General Discharge Specifications of the permit.

## VI. ANTI-BACKSLIDING/ANTIDEGRADATION

### A. Anti-Backsliding

Section 402(o) of the CWA prohibits the renewal or reissuance of an NPDES permit that contains effluent limits less stringent than those established in the previous permit, except as provided in the statute. The permit does not establish any effluent limits less stringent than those in the previous permit and does not allow backsliding.

### B. Antidegradation Policy

EPA's antidegradation policy at 40 CFR 131.12 and Navajo Nation Water Quality Standards require that existing water uses and the level of water quality necessary to protect the existing uses be maintained. As described in this document, the permit establishes effluent limits and monitoring requirements to ensure that all applicable water quality standards are met. The permit does not include a mixing zone, therefore these limits will apply at the end of pipe without consideration of dilution in the receiving water. A priority pollutant scan has been conducted of the effluent, demonstrating that most pollutants will be discharged below detection levels. Although the permit allows loadings of oil and grease, receiving water monitoring data show that existing mass loadings of oil and grease have not resulted in a violation of the narrative standards which states that “the discharge shall be substantially free from visible floating materials, grease, oil, scum, foam, and other floating material attributable to sewage, industrial wastes, or other activities of man”. Furthermore, the waterbody is not listed as an impaired waterbody for total suspended solids, turbidity or oil and grease under section 303(d) of the CWA. Therefore, the discharge is not expected to adversely affect receiving water bodies or result in any degradation of water quality.

## VII. OTHER APPLICABLE WATER QUALITY EFFLUENT NT LIMITS

### A. Narrative Limits

The Navajo Nation water quality standards contains narrative water quality standards applicable to the receiving water. Therefore, the permit incorporates applicable narrative water quality standards

### B. General Discharge Specifications

In the previous permit the discharge of polychlorinated biphenyl (PCB) fluids was prohibited. Based on best professional judgment and the requirements of the Clean Water Act, this prohibition continues to apply.

### C. Surface Seepage

Based on best professional judgment and consistent with the requirements imposed in the previous permit cycle surface seepage intercept systems are required to be constructed and operated for existing unlined ash ponds. Water collected by these intercept systems shall be returned to the double lined decant pond. Additionally, a Seepage Monitoring and Management Plan shall be established and implemented to determine the source of and pollutants in seepages below all ash ponds that receive or received coal combustion residue either currently or in the past. The Plan shall at a minimum do the following:

1. Identify all seeps within 650 meters down gradient of such impoundments;
2. Conduct sampling (or summary of current data if sufficient and valid) of seepages for boron, mercury, nickel, selenium, uranium, zinc and total dissolved solids (TDS)d The details of the requirements of such a plan are provided in the relevant section of the permit.
3. Provide information about number of flows observed and range of flows observed
4. Provide information about exceedances of any human health, livestock, or chronic or acute aquatic life standards in the samples collected for analysis.

### D. Cooling Water Regulation

APS operates a closed-cycle recirculating system, circulating from around 1000 up to about 1,700 million gallons a day (MGD) through Morgan Lake, a man-made cooling water impoundment. The applicant withdraws up to a maximum of 48 MGD of water from the San Juan River as make-up water to replenish losses that have occurred due to blowdown, drift, evaporation within Morgan Lake and the cooling system. Currently The San Juan River intake system is equipped with a weir and a channel with a gate. If the water in the river is too low at the intake screens to supply the pumps, the gate in the channel is lowered. The gate and the weir together increase the level at the intake screens to supply the pumps. The intake screens are periodically changed out for cleaning.

Because the facility intakes greater than 2 MGD of cooling water, it must meet requirements under CWA Section 316(b), regulating the design and operations of intake structures for cooling water operations. A rule for existing facilities was adopted by EPA on May 19, 2014 and effective October 14, 2014, requires facilities to minimize environmental impacts due to impingement and entrainment in the intake structure. In order to meet requirements for facilities withdrawing less than 125 MGD from a Water of the U.S., the applicant must submit applicable materials under 40 CFR Section 122.21(r) (1)-(8) along with the submission of their next renewal application. For the current permit cycle, the existing intake system on the San Juan River is equivalent to interim best technology available (BTA) under the regulations.

## VIII. MONITORING AND REPORTING REQUIREMENTS

The permit requires the permittee to conduct monitoring for all pollutants or parameters where effluent limits have been established, at the minimum frequency specified. Additionally, where effluent concentrations of toxic parameters are unknown or where data are insufficient to determine reasonable potential, monitoring may be required for pollutants or parameters where effluent limits have not been established.

### A. Effluent Monitoring and Reporting

The permittee shall conduct effluent monitoring to evaluate compliance with the proposed permit conditions. The permittee shall perform all monitoring, sampling and analyses in accordance with the methods described in the most recent edition of 40 CFR 136, unless otherwise specified in the proposed permit. All monitoring data shall be reported on monthly DMR forms and submitted quarterly as specified in the proposed permit.

### B. Priority Toxic Pollutants Scan

A Priority Toxic Pollutants scan shall be conducted during the fourth year of the five-year permit term to ensure that the discharge does not contain toxic pollutants in concentrations that may cause a violation of water quality standards. The permittee shall perform all effluent sampling and analyses for the priority pollutants scan in accordance with the methods described in the most recent edition of 40 CFR 136, unless otherwise specified in the proposed permit or by EPA. 40 CFR 131.36 provides a complete list of Priority Toxic Pollutants. The Priority Toxic Pollutants scan shall be conducted on two samples. One from the discharge from Outfall No. 01E and the other from Outfall No. 001.

### C. Whole Effluent Toxicity Testing

The permit establishes monitoring for chronic toxicity for discharge from internal Outfall 01A. The permittee shall be required to conduct chronic toxicity testing if discharges from Internal Outfall 01A are known to occur during at least five (5) consecutive days. During the previous permit cycle the permittee after demonstrating by monthly toxicity testing during the the first year of permit term, that there was no chronic toxicity, requested a reduction in chronic toxicity testing in accordance with 40 CFR 122.62, by submitting a request for permit modification in writing to EPA Region 9. EPA Region 9 approved this reduced frequency of toxicity testing for the rest of the permit term. As the actual processes that contribute to discharges from Internal Outfall 01A are still basically the same as in the previous permit term, the renewed permit will require quarterly toxicity monitoring in the first year following the issuance of this permit, and then the permittee may request a reduced frequency of toxicity testing and limitation on testing using the most sensitive species upon demonstrating that there is no reasonable potential for chronic toxicity from Outfall 01A.

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## IX. OTHER CONSIDERATIONS UNDER FEDERAL LAW

## A. Impact to Threatened and Endangered Species

Section 7 of the Endangered Species Act (ESA) of 1973 requires federal agencies to ensure that any action authorized, funded, or carried out by a federal agency does not jeopardize the continued existence of a listed or candidate species, or result in the destruction or adverse modification of its habitat. 16 U.S.C. § 1536(a)(1). A federal agency must consult with the relevant Service, either U.S. Fish and Wildlife Service (FWS) or the National Marine Fisheries Service, if it determines that an endangered or threatened species is present in the area affected by the federal action and that the implementation of such action will likely affect the species. ESA §7(a)(3); 16 U.S.C. § 1536(a)(3).

To identify the endangered and threatened species that are present in the action area, EPA used the list generated for the Office of Surface Mining Reclamation and Enforcement (OSMRE) for the related but much broader Proposed Action related to the Four Corners Power Plant and Navajo Mine Energy project. OSMRE obtained a list of species to be considered from FWS on January 23, 2014. A total of 39 species were identified as potentially occurring in the Action Area of the project which is much larger than, but overlaps the location of the Outfalls covered by this permit. A separate species list was obtained by EPA from FWS on September 2, 2014 for the limited area that is the subject of this action. Six threatened or endangered species were identified. These species are listed below:

**Birds**
- Southwestern willow flycatcher (*Empidonax traillii extimus*): Endangered
- Yellow-billed cuckoo (*Coccyzus americanus*): Proposed Threatened

**Fish**
- Colorado pikeminnow (*Ptychocheilus lucius*) Endangered,
- Razorback sucker (*Xyrauchen texanus*) Endangered

**Plants**
- Mancos milk-vetch (*Astragalus humillimus)* Endangered
- Mesa Verde cactus (*Sclerocactus mesae-verdae)* Threatened

The scope of the ESA consultation on the Federal Action by EPA in the proposed renewal of APS FCPP's NPDES permit is limited to impacts directly from the permitted discharge of pollutants from Outfall No. 001 and the impacts from impingement and entrainment at the APS intake from the San Juan River. The atmospheric emissions of contaminants are not part of the scope of the proposed renewal of APS FCPP's NPDES permit. There is no nexus beyond incidental contact between the permitted discharge of wastewater and the two bird and two plant species identified above.

The permitted discharge in the past has previously met, and must continue to meet, all water quality standards which have been set at a level necessary to protect aquatic wildlife. Also, APS has shut down generation units 1, 2, and 3 due to new air quality requirements which it estimates will reduce the need for cooling water by about 30%, thus reducing any impacts proportionately from the current existing baseline. Finally APS has undertaken appropriate measures as to reduce impacts from impingement and entrainment at the APS intake on the San Juan River.

In analyzing the impacts of this federal action is relying on the Biological Assessment that the OSMRE prepared on the boarder Proposed Action related to the Four Corners Power Plant and Navajo Mine Energy project. Therefore based on the cumulative impacts, including impacts not related directly to this NPDES permit renewal, but part of the broader Proposed Action, EPA Region 9 concludes that a determination of may affect, likely to adversely affect for the above referenced two fish species is appropriate for this federal action. A copy of the draft fact sheet and permit was sent to the US Fish and Wildlife Service and the Navajo Nation Department of Game and Fish Department for review and comment prior to the 60-day public review period.

EPA is a signatory to the Biological Assessment that the OSMRE submitted and expects that the USFWS will issue an incidental take permit to the appropriate federal action agency or agencies for any impingement and entrainment impacts at the APS intake in the final Biological Opinion. EPA intends to rely on such an incidental take provision as well as any mitigation measures developed to minimize impacts on federal Threatened and Endangered Species.

### B. Impact to National Historic Properties

Section 106 of the National Historic Preservation Act (NHPA) requires federal agencies to consider the effect of their undertakings on historic properties that are either listed on, or eligible for listing on, the National Register of Historic Places. EPA used the analysis conducted by the Office of Surface Mining Reclamation and Enforcement (OSMRE) for the related by much broader Proposed Action related to the Four Corners Power Plant and Navajo Mine Energy project for which EPA is a signatory agency. Pursuant to the analysis conducted by OSMRE there are no projected disturbances related to construction activities from the reissuance of the NPDES permit. Therefore, pursuant to the NHPA and 36 CFR §800.3(a)(1), EPA is making a determination that issuing this proposed NPDES permit does not have the potential to affect any historic properties or cultural properties. As a result, Section 106 does not require EPA to undertake additional consulting on this permit issuance.

## XI. STANDARD CONDITIONS

### A. Reopener Provision

In accordance with 40 CFR 122 and 124, this permit may be modified by EPA to include effluent limits, monitoring, or other conditions to implement new regulations, including EPA-approved water quality standards; or to address new information indicating the presence of effluent toxicity or the reasonable potential for the discharge to cause or contribute to exceedances of water quality standards.

### B. Standard Provisions

The permit requires the permittee to comply with EPA Region 9 Standard Federal NPDES Permit Conditions, dated July 27, 2011.

## XII. ADMINISTRATIVE INFORMATION

### A. Public Notice (40 CFR 124.10)

The public notice is the vehicle for informing all interested parties and members of the general public of the contents of a draft NPDES permit or other significant action with respect to an NPDES permit or application.

### B. Public Comment Period (40 CFR 124.10)

Notice of the draft permit will be placed in a daily or weekly newspaper within the area affected by the facility or activity, with a minimum of 60 days provided for interested parties to respond in writing to EPA. After the closing of the public comment period, EPA is required to respond to all significant comments at the time a final permit decision is reached or at the same time a final permit is actually issued.

### C. Public Hearing (40 CFR 124.12(c))

A public hearing may be requested in writing by any interested party. The request should state the nature of the issues proposed to be raised during the hearing. A public hearing will be held if EPA determines there is a significant amount of interest expressed during the 60-day public comment period or when it is necessary to clarify the issues involved in the permit decision.

### D. Water Quality Certification Requirements (40 CFR 124.53 and 124.54)

For States, Territories, or Tribes with EPA approved water quality standards, EPA is requesting certification from the affected State, Territory, or Tribe that the proposed permit will meet all applicable water quality standards. Certification under section 401 of the CWA shall be in writing and shall include the conditions necessary to assure compliance with referenced applicable provisions of sections 208(e), 301, 302, 303, 306, and 307 of the CWA and appropriate requirements of Territory law.

## XIII. CONTACT INFORMATION

Comments, submittals, and additional information relating to this proposal may be directed to:

U.S. Environmental Protection Agency, Region 9
NPDES Permits Section, Water Division (WTR-2-3)
Attn: Gary Sheth
Hawthorne Street
San Francisco, CA 94105
Telephone: (415) 972-3516 or email to sheth.gary@epa.gov

## XIV. REFERENCES

APS 2005 and 2013 *NPDES Permit Reapplication and Supporting Documents*.

EPA. 1991. *Technical Support Document for Water Quality-based Toxics Control*. Office of Water, EPA. EPA/505/2-90-001.

EPA. 1996. *Regions IX & X Guidance for Implementing Whole Effluent Toxicity Testing Programs*, Interim Final, May 31. 1996.

EPA. 2002a. *Methods for Measuring the Acute Toxicity of Effluents and Receiving Waters to Freshwater and Marine Organisms* - Fifth Edition. Office of Water, EPA. EPA-821-R-02-012.

EPA. 2010. *U.S. EPA NPDES Permit Writers' Manual*. Office of Water, EPA. EPA-833-K-10-001.

EPA 2012. *Compliance Evaluation Inspection Report for APS Corners Power Plant*. Final, August 9, 2012.

NNEPA Water Quality Program. 2008. *Navajo Nation Surface Water Quality Standards 2007*

OSMRE 2014. *Four Corners Power Plant and Navajo Mine Energy Project Biological Assessment*

USFWS 2014. *List of threatened and endangered species for the APS Four Corners Power Plant*. Consultation Tracking Number 02ENNM00-2014-SLI-0511.

# Exhibit 10

LAW OFFICE OF
JOHN M. BARTH

P.O. Box 409 Hygiene, Colorado 80533 (303) 774-8868 barthlawoffice@gmail.com

February 18, 2015

By email: sheth.gary@epa.gov

Gary Sheth (WTR-2-3)
Water Division
U.S. EPA Region 9
75 Hawthorne Street
San Francisco, CA 94105

Re: Comments on draft renewal NPDES permit for Four Corners Power Plant, Permit NN0000019

Dear Mr. Sheth:

On behalf of San Juan Citizens Alliance, Center for Biological Diversity, Dine Citizens Against Ruing the Environment, Amigos Bravos, Sierra Club, Earthjustice, and Western Environmental Law Center (collectively referred to as the "Conservation Organizations") I am submitting comments on EPA's Draft renewal NPDES Permit for the Four Corners Power Plant, NPDES Permit # NN0000019 to Arizona Public Service Company "that would permit the discharge of effluent from Morgan Lake to the No Name Wash, a tributary of the Chaco River which eventually drains to Segment 2-401 of the San Juan River…"[1] On February 17, 2015 a copy of the exhibits to this comment letter were sent to you by overnight mail on two CD/DVDs. Please confirm receipt of this comment letter and the CD/DVDs.

I. Factual Background

The Four Corners Power Plant ("FCPP"), a coal burning power plant, is located on the Navajo Nation. The FCPP has operated as a 5-unit coal plant, but units 1, 2, and 3 were retired from service on December 31, 2013. Units 4 and 5 continue to operate and are required to install selective catalytic reduction ("SCR") on or before July 31, 2018 to reduce nitrogen oxide

[1] EPA Public Notice, p. 1. On January 15, 2015, EPA Region 9 sent me a letter along with an index to its Administrative Record for this permit proceeding, which included the Public Notice. *See,* Exhibit 28 hereto. This comment letter incorporates by reference all of the documents identified in EPA's Index to the Administrative Record. Since EPA admits that these documents will be part of its Administrative Record for this proceeding, the Conservation Organizations are generally not attaching to this comment letter the documents that are already part of the Administrative Record.

emissions pursuant to EPA's Clean Air Act regional haze Best Available Retrofit Technology ("BART") determination for the plant.[2]

The FCPP currently disposes of its coal combustion residuals ("CCR's") in on-site ponds. FCPP historically disposed of CCRs in mine pits at the adjacent and related Navajo coal mine. The federal government is currently preparing a comprehensive environmental impact statement ("EIS") pursuant to the National Environmental Policy Act ("NEPA") that focuses largely on the proposed expansion of CCR disposal facilities to allow FCPP to continue operating for up to 30 more years.[3] EPA is a cooperating agency in this EIS process. A coalition of environmental organizations submitted written comments on the draft EIS for the FCPP/Navajo Mine, a copy of which is attached hereto and incorporated herein by reference.[4]

An NPDES permit was originally issued to the FCPP on July 1, 1977.[5] The term of an NPDES permit cannot exceed 5 years in length. The last NPDES renewal permit for FCPP was issued by EPA in 2001, or nearly 14 years ago. On May 16, 2014, San Juan Citizens Alliance and Center for Biological Diversity issued a 60-day notice of intention to sue letter to EPA alleging that EPA has unreasonably delayed reissuing the renewal NPDES permit.[6]

On November 13, 2014 EPA issued a Notice of Proposed Action proposing to issue a renewal NPDES Permit, which is the subject of this comment letter. Under the terms of EPA's public notice, the comment period was scheduled to expire on January 12, 2015. However, at the time it issued its public notice, EPA had failed to make publicly available a number of documents in EPA's administrative record for its proposed decision. As such, the Conservation Organizations requested that EPA make these documents available to the public to allow a thorough review of EPA's proposed action. As of December 29, 2014 EPA had posted some, but not all, additional administrative record material to its website. Thus, on December 29, 2014 SJCA requested an extension of time to submit comments on EPA's draft renewal NPDES permit.[7] EPA formally granted an extension of the comment period until February 18, 2015.[8] As such, this comment letter is timely submitted.

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[2] 77 Fed. Reg. 51620 (August 24, 2012).
[3] The Office of Surface Mining, Reclamation, and Enforcement issued a Draft Environmental Impact Statement which is available at: http://www.wrcc.osmre.gov/initiatives/fourCorners/documentLibrary.shtm. The DEIS is incorporated herein by reference.
[4] Exhibit 1 hereto (FCPP DEIS comment letter). A copy of the conservation organization's exhibits to the DEIS comment letter were included on a CD/DVD sent to Gary Sheth at EPA Region 9 by overnight mail on February 17, 2015.
[5] Exhibit 2 hereto (EPA Inspection Report, p. 3). In order to conduct a proper anti-backsliding analysis, we request that the EPA produce to the Conservation Organizations all prior FCPP NPDES permits and allow for public comment on the same prior to finalizing this permit.
[6] Exhibit 3 hereto (60-day notice of intent letter).
[7] Exhibit 4 hereto (emails between Barth and Sheth requesting comment period extension).
[8] Exhibit 2 hereto.

II. Legal Background

According to EPA, coal-fired power plants are the second largest discharger of toxic pollutants in the United States. The toxicity of these discharges is primarily due to metals associated with coal combustion waste handling.[9] Toxic metal discharges from steam electric power can pose a serious threat to public health and the environment.[10] EPA has acknowledged that even relatively small amounts of coal ash pollutants can pose a threat to aquatic organisms, wildlife and human health due to the persistent and bioaccumulative nature of these pollutants.[11]

Under the Clean Water Act, an NPDES permit must contain effluent limits that "restore" and "maintain" the quality of the receiving water body.[12] At a minimum, EPA must set technology based effluent limits ("TBELs") that reflect the ability of available technologies to reduce or eliminate pollution discharges.[13] If a discharge could cause or contribute to a violation of water quality standards in the receiving water, EPA must include water quality-based effluent limitation ("WQBELs") in the NPDES permit to prevent the exceedence. [14]

EPA is in the process of revising its effluent limitations and guidelines ("ELGs") to control discharges of pollutants into the waters of the U.S. from coal-fired power plants.[15] These revised ELGs will update the TBEL requirement.[16] These ELGs have not been updated since 1982.[17] The 1982 ELGs were based on settling ponds as the technology for removing only Total Suspended Solids ("TSS").[18] EPA has found that such ponds are ineffective for removing toxic pollutants such as dissolved metals and nutrients.[19] A coalition of environmental organizations submitted written comments on EPA's June 2013 proposed revision to the ELGs.[20] We request that EPA review the environmental coalition comment letter and incorporate our suggestions into the FCPP renewal NPDES permit.

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[9] Notice of Availability of Preliminary 2008 Effluent Guidelines Program Plan, 72 Fed. Reg. 61,335- 61,342 (Oct. 30, 2007).
[10] *See,* U.S. Envtl. Prot. Agency, Steam Electric Power Generating Point Source Category: Final Detailed Study http://www.epa.gov/waterscience/guide/stream/finalreport.pdf.U.S.
[11] *Id.*
[12] 33 U.S.C. §1251(a)(2011).
[13] 33 U.S.C. §§1311, 1342(a).
[14] 33 U.S.C. §1312(a); 40 C.F.R. §122.44(d)(i)(2010).
[15] 78 Fed. Reg. 34432. *See also, http://www.gpo.gov/fdsys/pkg/FR-2013-06-07/html/2013-10191.htm* which is incorporated herein by reference.
[16] 33 U.S.C. §§1311(b), 1314(b).
[17] EPA August 20, 2013 Power Point Presentation "Reducing Toxic Water Pollution from Power Plants" p. 6 attached hereto as Exhibit 5.
[18] *Id.*
[19] *Id.*
[20] *See,* Comments of Thomas Cmar, Earthjustice, et. al., attached hereto as Exhibit 6 and also found at Docket Number EPA–HQ–OW–2009–0819 at www.regulations.gov (which comments and attachments are incorporated herein by reference).

Where EPA has not promulgated ELGs for a particular category of discharger, or where the existing ELGs do not address all waste streams or pollutants discharged by a facility, EPA must use Best Professional Judgment ("BPJ") and set TBELs based on Best Available Technology ("BAT") for each pollutant.[21] Some of these best available technologies are described in the attached comment letter on EPA's proposed revision to the ELGs.

The existing ELGs for the Steam Electric Category do not address pollutants in scrubber discharges or discharges from coal combustion waste landfills and impoundments. EPA has made clear that "state(s) must include technology-based effluent limitations in its permits for pollutants not addressed by the effluent guidelines" for the Stream Electric category, noting that the "CWA requires permitting authorities to conduct the 'BPJ' analysis…on a case-by-case basis for those pollutants in each permit."[22]

This Clean Water Act requirement does not only apply to discharges of FGD wastewater; rather, EPA must conduct a BPJ analysis for any pollutant not addressed by the ELGs, including discharges from coal combustion waste landfills and impoundments.[23] In fact, EPA stressed the importance of BPJ limitations for these types of discharges over ten years ago when it promulgated ELGs for the landfills point source category.[24] EPA declined to promulgate effluent guidelines for leachate generated at captive landfills, which are landfills "associated with an industrial or commercial operation" such as power plant ash landfills "because NPDES writers must impose limitations on discharges of these wastewater sources that are developed on a case-by-case, best professional judgment (BPJ) basis."[25] EPA emphasized that the decision would "not [] allow these wastewater sources to escape treatment. Landfill wastewater at captive facilities is and will remain subject to treatment and controls on its discharge. The CWA requires wastewater discharges to meet technology-based effluent limitations on the discharge whether the mechanism for imposing these limitations is EPA-established national effluent limitation guidelines or a permit writer's imposition on a case-by-case basis of BPJ limitations."[26]

The longstanding legal obligation to set TBELs in NPDES permits for all pollutants not addressed by the Steam Electric ELGs was recently confirmed by EPA commenting on NPDES permits for Steam Electric plants.[27] Because toxic pollutants in scrubber and other coal

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[21] *Id.* at 183. 33 U.S.C. §1311(b)(2)(A); 40 C.F.R. §122.44.
[22] *See,* Memorandum from the Director of the Office of Wastewater Mgmnt., U.S. Envtl. Prot. Agency on NPDES Permitting of Wastewater Discharges from Flue Gas Desulfurization and Coal Combustion Residuals Impoundments at Steam Electric Power Plants 2 (June 7, 2010)(emphasis added) attached hereto as Exhibit 7.
[23] *Id. (emphasis added);* 33 U.S.C. §1311(b); 40 C.F.R. §§122.44(a)(1), 123.25, 125.3.
[24] 65 Fed. Reg. 3008, 3012 (Jan. 19, 2000).
[25] *Id.*
[26] *Id.*
[27] Letter from James A. Hanlon, Director, Office of Wastewater Management, EPA Headquarters to Jennifer Peterson, Environmental Integrity Project and Dianne Dasalu-Joffee, Chesapeake Climate Action Network, Inc. (April 26, 2012)(attached hereto as Exhibit 8).

combustion wastewater are not addressed in ELGs, EPA must set TBELs on a case-by-case basis for the pollutants in these wastewater discharges.

The Conservation Organizations submit these comments on EPA's Draft renewal NPDES Permit for the FCPP and request that EPA amend the Draft permit to incorporate these comments.

III. Comments

**1. EPA's Draft permit arbitrarily relies on apparently unenforceable Navajo Nation Water Quality Standards.**

EPA's Draft permit arbitrarily relies on Navajo Nation Water Quality Standards despite the fact that such standards apparently cannot be used to regulate the discharge of pollutants from the FCPP. On December 1, 1960, the Navajo Nation and the developers of the FCPP entered into an "Indenture of Lease" governing the construction and operation of the FCPP on the Navajo Nation.[28] The lease was subsequently revised.[29] The currently effective lease between the FCPP owners and the Navajo Nation includes the following provision:

> The Tribe covenants that, other than as expressly set out in the New Lease or in the Amended Original Lease, respectively, it will not directly or indirectly regulate or attempt to regulate the Lessees under the New Lease or Arizona under the Amended Original Lease or the construction, maintenance or operation of the Enlarged Four Corners Generating Station and the transmission systems of the Lessees and Arizona, or their rates, charges, operating practices, procedures, safety rules, or other policies or practices, or their sales of power…"[30]

In 2000-2001, EPA issued a final NPDES permit for the FCPP that relied on the Navajo Nation Water Quality Standards. The permit was appealed by APS, which argued that EPA could not rely on such water quality standards.[31] APS relied on the court decision in *Arizona Public Service Company v. Aspaas*, 77 F.3d 1128 (9th Cir. 1995) for the proposition that the Navajo Nation could not directly or indirectly regulate operations of the FCPP.[32] In light of this appeal, EPA amended its final NPDES permit for the FCPP removing certain provisions applying the Navajo Nation Water Quality Standards and allowing regulation by the Navajo Nation.[33]

In 2006 EPA approved Navajo Nation's Section 518 "treatment as State" application to

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[28] Exhibit 9 hereto (Indenture of Lease excerpt).
[29] Exhibit 10 (September 1978 Lease Amendment) and Exhibit 11 (April 1985 Lease Amendment).
[30] Exhibit 10, p. 41, ¶ 22.
[31] Exhibit 31 hereto.
[32] *Id.*
[33] *Id.*

adopt tribal water quality standards, but this approval did not include Morgan Lake.[34] As discussed more fully below, Morgan Lake is a "water of the United States", "navigable water", "water of the State of New Mexico", and "water of the Navajo Nation" and thus discharges into Morgan Lake must be regulated in this NPDES permit. In approving the "treatment as State" application, EPA stated:

> "In approving the Tribe's Application, EPA is not making any findings about the Tribe's authority over Morgan Lake or the Four Corners Power Plant and Navajo Generating Station or their owners and operators. EPA is also deferring the issue of whether the Tribe's water quality standards, if and when approved by EPA, would apply to any CWA-permitted discharges from these facilities to Tribal waters. To the extent necessary, EPA will consider these issues, and how they relate to the lease provisions, in the context of future permitting or other relevant action taken by EPA."[35]

EPA subsequently approved the Navajo Nation's Water Quality Standards, including those for Morgan Lake.[36] The Navajo Nation's promulgation of water quality standards (approved by EPA) for Morgan Lake, No Name Wash, Chaco River, and/or the San Juan River appears to constitute a direct and/or indirect regulation of the FCPP owners, operation of the FCPP, its operating practices, and/or procedures because these water quality standards could restrict the water pollution being emitted from the plant. Under the terms of the current lease, the Navajo Nation's Water Quality Standards for these watersheds appear unenforceable against the owners of the FCPP. Accordingly, EPA's reliance on the 2007 Navajo Nation Water Quality standards appears to be arbitrary and capricious because such standards may not be applied to the operations of the FCPP.

EPA may not defer, or delay, any further its identification of which water quality standards apply to this permitting action. As such, EPA must apply state, federal, or tribal water quality standards to the operation of the FCPP that protect all uses, including but not limited to aquatic life, wildlife, livestock watering, primary recreational contact, and domestic water use.[37] EPA acknowledged this issue in a September 15, 2006 Inspection Report and concluded that "U.S. EPA may opt to use either Navajo Nation or New Mexico standards."[38] EPA needs to explain its legal basis for this statement in light of the lease, and relevant statues and case law.

EPA should amend its Draft permit, fact sheet, and reasonable potential analysis to specifically identify which water quality standards (state, federal, or tribal) it is applying to each receiving water (Morgan Lake, No Name Wash, Chaco River, and the San Juan River) and why.

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[34] Exhibit 30 hereto, page 2 of Decision Document.
[35] Exhibit 30, p. 11, footnote 4 of Decision Document.
[36] Exhibits 16 and 18 hereto.
[37] In the event EPA ignores this comment and continues to rely on the 2007 Navajo Nation Water Quality Standards for this permit, EPA's reliance on such standards is also arbitrary and capricious for the additional reasons discussed in this comment letter.
[38] Exhibit 2, p. 3.

After this clear identification of water quality standards and the legal basis for each, we request that EPA re-issue its Draft permit, fact sheet, and reasonable potential analysis for a new public comment period.

We also note that this Draft permit should be subject to a water quality certification under Section 401 of the Clean Water Act ("CWA"). 33 U.S.C. § 1341. EPA's administrative record for this permit proceeding is silent on this issue. EPA should amend it's Draft permit and fact sheet to specifically whether a 401 certification is required, if so why, if not why not, and identify the governmental entity that will issue any such certification (the state of New Mexico or the Navajo Nation). After providing this explanation including the legal support, we request that EPA re-issue its Draft permit and fact sheet for a new public comment period on this issue.

**2. EPA's Draft Permit Fails to Regulate All Point Sources that Discharge or May Discharge Into Navigable Waters**

Section 301 of the Clean Water Act mandates that all "discharge of pollutants" be subject to a permit or otherwise comply with the CWA. 33 U.S.C. §1311(a). The term "discharge of pollutant" is defined as "any addition of any pollutants to navigable waters from any point source…" 33 U.S.C. §1362(12). The term "point source" is defined to include "any discernable, confined and discrete conveyance…from which pollutants are **or may be discharged."** 33 U.S.C. §1362(14)(emphasis added). EPA's Draft Permit is deficient because it fails to require permitting for all point sources of water pollution that discharge, or may discharge, pollutants into waters of the United States from the FCPP: namely, 1) seepage from the coal ash facilities and related contamination; 2) the seepage from the garage fueling area and related contamination; 3) the discharge from the Morgan Lake spillway; and, 4) the discharge of Total Dissolved Solids and other pollutants into Morgan Lake from the FCPP and from Morgan Lake into receiving waters.

2.1 EPA must permit the seepage from the coal ash facilities.

An October 4, 2007 EPA Region 9 site inspection report of FCPP revealed seepage from the FCPP coal ash disposal facilities along the eastern bank of the Chaco River.[39] These seeps have been previously documented to be emanating from the FCPP coal ash facilities. These seeps are more fully described in a letter from APS to OSM dated April 3, 2013.[40] The May 8, 2012 EPA Inspection Report also states:

> Sanitary, fly ash and FGD blowdown wastewater is not regulated in the NDPES Permit. Although there is no discrete outfall from the fly ash ponds, the ponds do have a potential to discharge to Waters of the U.S. through subsurface leaching.[41]

The lease between the Navajo Nation and the owners of the FCPP specifically allows the

[39] Exhibit 12 hereto. (EPA Inspection Report (October 4, 2007).
[40] Exhibit 13 hereto (APS letter to OSM April 3, 2013).
[41] Exhibit 12 at p. 5.

discharge of coal ash seepage into Chaco River and its tributaries.[42] More specifically, the Lease states,

> "In addition, the Company shall have the right to dispose of waste water on the Reservation by permitting waste water from the power plant to flow from the ash disposal area into the Chaco Wash."[43]

This lease provision makes it clear that the Navajo Nation has authorized the discharge of wastewater from the ash disposal areas into surface waters. The FCPP power plant and related coal ash facilities are man-made point sources. Pollutants "are or may be discharging" from these point sources into navigable waters. 33 U.S.C. §1362(14). As such, EPA has a duty to subject the historic and existing seepage from the coal ash facilities to NPDES permitting requirements. EPA's Draft permit fails to comply with this obligation. The Draft permit fails to undertake a BPJ analysis of pollutants discharging from the coal ash facilities, fails to impose TBELs for pollutants discharging from the coal ash facilities, and fails to impose WQBELs for pollutants discharging from the coal ash facilities.

Instead of imposing effluent limitations and monitoring requirements on the seepage, the Draft permit contains the following conditions to deal with the substantial problem of seepage from coal ash disposal facilities at the FCPP, a problem that has been documented for at least the past 10 years.

> "2. Surface Seepage
> "Surface seepage intercept systems shall be constructed and operated for existing and future unlined ash ponds. Water collected by these intercept systems shall be returned to the ash ponds, or evaporation ponds. All provisions of the Seepage Monitoring and Management Plan as described below in the Special Conditions Section must be implemented.
> "Part III. SPECIAL CONDITIONS
> "A. Seepage Management and Monitoring Plan
> A Seepage Monitoring and Management Plan shall be established and implemented to determine the source of and pollutants in seepages below all ash ponds that receive or received coal combustion residue either currently or in the past. The Plan shall be established and submitted to EPA within 120 days of the issuance of this permit. The Plan shall at a minimum do the following:
> 1. Identify all seeps within 100 meters down gradient of such impoundments;
> 2. Conduct sampling (or provide summary of current data if sufficient and valid) of seepages for boron, mercury, nickel, selenium, uranium, zinc and total dissolved solids.
> 3. Provide information about number of flows observed and range of flows observed.
> 4. Provide information about exceedances of any human health, livestock, or chronic or acute aquatic life standards as established in the 2007 NNWQS in the samples collected for analysis."

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[42] Exhibit 9 hereto, p. 6, ¶2)c. (Indenture of Lease)
[43] *Id.*

EPA's proposed Seepage Monitoring and Management Plan is likewise deficient. Although preparation of the Seepage Monitoring and Management Plan is a time bound requirement (120 days), the timeframe for the obligation to construct and operate surface seepage intercept systems for existing and future unlined ash ponds, is not specified in the Draft permit. As such, the Plan is unenforceable, arbitrary, and capricious. The Seepage Plan is also deficient because it only requires the FCPP owners to "[i]dentify all seeps within 100 meters down gradient of such impoundments." The language of the Seepage Plan must be amended to trace the flow of all seeps from their source to the point where they either terminate or reach a receiving water. The Seepage Plan should require a calculation of flow for all seeps as they enter any receiving water and also require a full suite of water quality sampling of all seeps that enter receiving waters. The Seepage Plan should require monthly monitoring of flow and water quality and require that the FCPP owners submit to EPA such information in monthly Discharge Monitoring Reports. The final permit should also specify either that the obligation to finalize construction and operation surface seepage intercept systems is subject to the 120 day deadline, or impose a separate short deadline for the applicant to do so. The Seepage Plan should also require the FCPP owners to produce all existing studies on the hydrological connection of the coal ash facilities with all waters of the United States. The Seepage Plan should also require monthly water quality sampling immediately upstream and downstream in the receiving water both before and after any influence by any seepage. The Seepage Plan should also require the FCPP owners to conduct dye testing or some other technical study to definitively confirm the hydrologic connection between the coal ash facilities and the receiving waters.

As described above, EPA has arbitrarily failed to subject the seepage from the coal ash facilities to CWA permitting requirements. Because these discharges have never been subject to NPDES permitting, they may constitute "new" or "increased" discharges that are subject to both anti-degradation review and impaired waters limitations. EPA's administrative record for this proceeding is silent on both these issues. Please identify which government's (federal, state, or tribal) anti-degradation and impaired waters requirements apply to this permit proceeding and why. Then please reissue the draft permit, fact sheet, anti-degradation analysis, and impaired waters analysis/Total Maximum Daily Limit ("TMDL") analysis for public review.

2.2. <u>The Draft permit fails to regulate discharges from the garage fueling area and contamination.</u>

A February 2013 report prepared for APS by Mogollan Environmental Services documents continuing and ongoing releases of petroleum, benzene, and other petroleum byproducts from the FCPP Garage Fueling Area into soil, groundwater, and Morgan Lake.[44] The FCPP Garage Fueling Area is immediately adjacent to, and nearly surrounded by, Morgan Lake.[45] In the mid-1980's it was reported that "diesel was bubbling up" to the surface of Morgan

[44] Exhibit 14 hereto (2013 Petroleum Spill Report) and Exhibit 15 (Field Sampling Plan 2013).
[45] Exhibit 14 at Figure 1. *See also,* Exhibit 15 hereto (2013 FCPP Field Sampling Plan at Figure 1 and 2).

Lake.[46] It was found that there were releases of petroleum substances from the FCPP Garage Fueling Area into Morgan Lake.[47] The results of the 2013 investigation revealed that petroleum substances are still present in the soil and groundwater at the FCPP Garage Fueling Area.[48]

The Draft permit fails to impose permitting requirements on the discharge of petroleum substances from the FCPP Garage Fueling Area into Morgan Lake. The Draft permit fails to undertake a BPJ analysis, fails to impose TBELs, and fails to impose WQBELs for the discharges from the FCPP Garage Fueling Area. The permit should include effluent limits for all pollutants expected to be found in fuels used at FCPP, including, but not limited to benzene. The discharges from the FCPP Garage Fueling Area also violates the Navajo Nation narrative water quality standards because they "[c]ause solids, oil, grease, foam, scum, or any other form of objectionable floating debris on the surface of the water body; may cause a film or iridescent appearance on the surface of the water body; or that may cause a deposit on a shoreline, on a bank, or on aquatic vegetation."[49] The permit must ensure that both numerical and narrative water quality standards are complied with.

The FCPP and/or Garage Fueling Areas are point sources under the CWA. As discussed below, Morgan Lake is a "water of the United States", "navigable water", "water of the Navajo Nation" and "water of the State of New Mexico." As such, EPA must properly regulate this discharge of pollutants into Morgan Lake and downstream watersheds. In the event EPA claims that these discharges are covered under some other CWA discharge permit (i.e., stormwater) please identify the permit and the basis for such coverage. Then please reissue the draft permit and fact sheet for public comment on this issue.

2.3. <u>The Draft permit fails to regulate discharges from Morgan Lake via the spillway.</u>

As discussed below, Morgan Lake is a "water of the United States", "navigable water", "water of the Navajo Nation" and "water of the State of New Mexico" and discharges into the Lake must be permitted and regulated. However, if EPA refuses to do so, it still must require a permit for discharges from the Morgan Lake spillway into No Name Wash, Chaco River, and/or the San Juan River. EPA's 2012 Inspection Report notes, there are discharges from the Morgan Lake spillway into No Name Wash and/or Chaco River during high wind events.[50] EPA's Draft permit states that Morgan Lake is a man-made cooling water pond and fails to treat it as a water of the United States. While we disagree with this conclusion, under EPA's theory it must treat Morgan Lake as a point source and regulate all discharges from it. EPA's inspection report admits that such discharges should be permitted.[51] EPA's Draft permit is deficient because it fails to do so. EPA must permit all discharges from Morgan Lake and undergo the appropriate BPJ analysis, and impose TBELs and/or WQBELs in this renewal permit.

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[46] *Id.*
[47] *Id.*
[48] *Id.*
[49] Exhibit 16 hereto (Navajo Nation 2007 Water Quality Standards, §202A.5.).
[50] Exhibit 17 hereto (EPA 2012 Inspection Report, p. 4).
[51] *Id.* at p. 5.

2.4. EPA's permit must regulate discharge of TDS into and/or from Morgan Lake

An EPA Region 9 site inspection report of the FCPP on May 8, 2012 states: "Total Dissolved Solids are built-up in Morgan Lake before being discharged to the receiving water. Elevated TDS may adversely impact downstream beneficial uses, however there is no criterion for TDS in the Navajo Nation Water Quality Standards."[52]

As discussed below, Morgan Lake itself is a "water of the United States" and "navigable water" and thus EPA must establish effluent limitations for the discharge of TDS ***into*** Morgan Lake from the FCPP and/or all related point sources.

In 2004 the Navajo Nation adopted a numerical TDS water quality standards for livestock watering of 2212 mg/l.[53] Livestock watering is a current use of Morgan Lake, as well as primary contact recreation, aquatic life, and other uses.[54] The 2004 TDS standard cannot be found in the 2007 Navajo Nation water quality standards. It is unclear why this standard was not carried forward into the 2007 Standards. We request that EPA explain why it approved the 2007 standards that appear to omit the 2004 TDS standard. Nevertheless, Morgan Lake is used for livestock watering and aquatic life and these uses must be protected by adopting TDS effluent limits and monitoring requirements into the current permit.

Even if EPA refuses to regulate discharges of TDS into Morgan Lake, it still must incorporate effluent limitations in the permit for the discharge of TDS from Morgan Lake into No Name Wash, Chaco River, and the San Juan River. EPA's permit is deficient because it fails to do so. EPA incorrectly and arbitrarily states that there are no TDS water quality standards for discharges from the FCPP. To the contrary, the current lease between the FCPP owners and the Navajo Nation contains the following provision establishing a concentration-based TDS standard:

> "Total dissolved solids in the surface return flow ***shall be measured at the plant release point***, and the effect of such release on the total dissolved solids in the river computed. The Lessees and Arizona agree that such water return will not increase the total dissolve solids of the San Juan River as so computed an average of more than 100 parts per million in any three calendar month period, or an average of more than 400 parts per million in any 24-hour period, provided that the river flow passes such point of return averages 200 cfs or more over such three months' period. If the river averages less than 200 cfs in such a three-month period, such returned water will not increase the total dissolved solids in the river as so computed an average of more than 100 parts per million multiplied by a factor equal to 200 cfs divided by the average actual river flows in cfs in said three-month period."[55] (emphasis added).

[52] Exhibit 17 at p. 4.
[53] Exhibit 18 attached, p. 30 (2004 Navajo Nation water quality standards).
[54] Exhibit 16.
[55] Exhibit 10 (Supplemental and Additional Indenture of Lease, Four Corners) pp. 54-55, ¶35a.

The above lease provision requires monitoring of TDS "at the plant release point" prior to Outfall 001A and requires adoption of an effluent limitation at the same point of release from the plant to ensure that TDS is not increased above the limits established in the lease. Alternatively, this language imposes a water quality standard for TDS in the San Juan River that must be utilized by EPA in making a reasonable potential analysis. EPA's Draft permit is defective because it fails to impose TDS monitoring requirements at the point of release of the discharge from the FCPP, fails to impose a TDS effluent limit from the FCCP plant to ensure compliance with the TDS water quality standard for the San Juan River contained in the lease, fails to require flow monitoring in the San Juan River above the point of discharge, and fails to require TDS monitoring upstream and downstream of the discharge in the San Juan River. Please include such requirements in the permit.

In addition, EPA's March 2001 NPDES permit fact sheet states that, "[t]otal dissolved solids monitoring is required for discharges to tributaries of the San Juan River. These requirements are consistent with those of the previous permit."[56] It appears that EPA's Draft permit violates the anti-backsliding provisions of the Clean Water Act by eliminating effluent limitations and/or required monitoring requirements for TDS. We request that EPA produce all previous NPDES permits for the FCPP so the public can determine whether EPA's Draft permit violates anti-backsliding requirements of the CWA. We then request that EPA allow for public comment on this issue before finalizing the Draft permit.

As noted earlier, we ask that the EPA apply federal, state, lease, or tribal standards for TDS and other pollutant discharges into Morgan Lake, No Name Wash, Chaco River, and the San Juan River. Alternatively, we request that EPA apply the 2004 Navajo Nation TDS standard to Morgan Lake, No Name Wash, and the Chaco River, and apply the lease TDS standards to the San Juan River. We also request that EPA perform a reasonable potential analysis and submit the same for public notice and comment. We also request that EPA collect from the FCPP owners the flow data and water quality data necessary to determine historic compliance with the TDS lease standards for the San Juan River. We ask that this compliance analysis, and EPA's reasonable potential analysis, be released for public review and comment prior to the issuance of the final permit.

**3. Morgan Lake is a "navigable water", "water of the United States", "water of the Navajo Nation" and "water of the State of New Mexico" and all discharges into Morgan Lake must comply with water quality standards.**

The Draft permit incorrectly labels Outfall 01A (Condenser Cooling Water Discharge) as an "Internal Outfall" when in fact it discharges to a water of the United States (Morgan Lake). EPA's Draft permit is deficient because it fails to assure compliance with all water quality standards for pollutant discharges into Morgan Lake, which is a "navigable water", "water of the United States", "water of the Navajo Nation", and "water of the State of New Mexico." Instead, the Draft permit only purports to regulate pollutant discharges "of effluent from Morgan Lake to the No Name Wash, a tributary of the Chaco River which eventually drains to Segment 2-401 of

[56] Exhibit 32 hereto, p. 3.

the San Juan River…"[57]

First, Morgan Lake is a "water of the Navajo Nation" as defined in the Navajo Nation's Water Quality Standards, which includes:

> ***all surface waters*** including, but not limited to, portions of rivers, streams (including perennial, intermittent and ephemeral streams and their tributaries), lakes, ponds, dry washes, marshes, waterways, wetlands, mudflats, sandflats, sloughs, prairie potholes, wet meadows, playa lakes, impoundments, riparian areas, springs, and ***all other bodies or accumulations of water, surface, natural or artificial, public or private, including those dry during part of the year, which are within or border the Navajo Nation. This definition shall be interpreted as broadly as possible to include all waters which are currently used, were used in the past, or may be susceptible to use in interstate, intertribal or foreign commerce.***[58] (emphasis added).

The Navajo Nation has adopted water quality standards for all waters on the reservation.[59] EPA has approved the Navajo Nation's water quality standards.[60] Morgan Lake is designated for the following uses: primary human contact, fish consumption, aquatic and wildlife habitat, and livestock watering.[61] The Navajo Nation water quality standards include both narrative and numerical water quality standards for Morgan Lake.[62] As noted by EPA, Section 402 and 301(b)(1)(C) of the CWA require that NPDES permits contain effluent limits necessary to meet water quality standards.[63] Morgan Lake has numeric water quality standards for a large variety of organic, inorganic, and physical pollutants.[64]

3.1. Morgan Lake is a 'traditional navigable water' because it supports or could support commercial waterborne recreation.

Under 40 CFR § 122.2:

> *Waters of the United States* or *waters of the U.S.* means:
> (a) All waters which are currently used, were used in the past, or may be susceptible to use in interstate or foreign commerce, including all waters which are subject to the ebb and flow of the tide;

In May 2011 the U.S. EPA issued "Draft Guidance on Identifying Waters Protected by the Clean

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[57] EPA Public Notice, p. 1.
[58] Exhibit 16 hereto (Navajo Nation water quality standards 2007, §104, XX.).
[59] Exhibit 16 hereto (Navajo Nation water quality standards 2007).
[60] *See,* http://water.epa.gov/scitech/swguidance/standards/wqslibrary/tribes.cfm (last visited on 1/2/15).
[61] Exhibit 16, p. 27 (Navajo Nation water quality classifications for Morgan Lake 2007).
[62] Exhibit 16 (Navajo Nation water quality standards 2007).
[63] EPA Fact Sheet, p. 5.
[64] Exhibit 16 hereto (2007 Navajo Nation Water Quality Standards).

Water Act" clarifying the meaning of these traditional navigable waters:

> "For purposes of CWA jurisdiction and this guidance, waters will be considered traditional navigable waters if….
>
> • They are waters currently being used for commercial navigation, including commercial waterborne recreation (for example, boat rentals, guided fishing trips, or water ski tournaments); or
>
> • They have historically been used for commercial navigation, including commercial waterborne recreation; or
>
> • They are susceptible to being used in the future for commercial navigation, including commercial waterborne recreation. Susceptibility for future use may be determined by examining a number of factors, including the physical characteristics and capacity of the water to be used in commercial navigation, including commercial recreational navigation (for example, size, depth, and flow velocity.), and the likelihood of future commercial navigation, including commercial waterborne recreation. A likelihood of future commercial navigation, including commercial waterborne recreation, can be demonstrated by current boating or canoe trips for recreation or other purposes. A determination that a water is susceptible to future commercial navigation, including commercial waterborne recreation, should be supported by evidence.

Morgan Lake is currently used for boating, including windsurfing.[65] Therefore, Morgan Lake is a traditional navigable water under the Clean Water Act.

3.2 Morgan Lake is a tributary of a Water of the United States because it contributes flow to a traditional navigable water

Under 40 CFR 122.2:

> *Waters of the United States* or *waters of the U.S.* means:
>
> (e) Tributaries of waters identified in paragraphs (a) through (d) of this definition;

In May 2011 the U.S. EPA issued "Draft Guidance on Identifying Waters Protected by the Clean Water Act" clarifying the meaning of tributaries:

> "EPA and the Corps will assert jurisdiction over tributaries under either the plurality standard or the Kennedy standard, as described below.
>
> "For purposes of this guidance, a water may be a tributary if it contributes flow to a traditional navigable water or interstate water, either directly or indirectly by means of

[65] Exhibit 19 hereto (APS website). See also,
http://www.emnrd.state.nm.us/SPD/BOATINGWeb/MorganLake.html;
https://www.aps.com/en/communityandenvironment/environment/morganlakewebcam/Pages/home.aspx

> other tributaries. A tributary can be a natural, man-altered, or man-made water body. Examples include rivers and streams, as well as lakes and certain wetlands that are part of the tributary system and flow directly or indirectly into traditional navigable waters or interstate waters. A tributary is physically characterized by the presence of a channel with defined bed and bank. The bed of a stream is the bottom of the channel. The lateral constraints (channel margins) are the stream banks. Channels are formed, maintained, and altered by the water and sediment they carry, and the forms they take can vary greatly."

Morgan Lake contributes flow to the San Juan River via No Name Wash and Chaco River as described in the draft permit (see below).

> "Outfall No. 001 discharges from Morgan Lake to the No Name Wash which is tributary to the Chaco River, which in turn drains to Segment 2-401 of the San Juan River. The discharges according to the permit application submitted by APS from Outfall No. 001 are intermittent with an average of 2.5 days per week of discharge for about 6 months in a year. The average flow rate for the discharge is 4.2 million gallons a day. The length of the No Name Wash from Outfall 001 (parshall flume) to the Chaco River is about 2.5 miles and the point where the No Name Wash meets the Chaco River is about 7 miles from where the Chaco eventually meets the San Juan River. APS mostly discharges in order to regulate total dissolved solids (TDS) build up in the lake which is used for once through cooling of the generating units."

Morgan Lake is therefore a tributary even though it is a "man-altered or man-made water body."

3.3 Morgan Lake is not a 'waste treatment system' excluded from the definition of a water of the United States.

Under 40 CFR 122.2:

> "Waste treatment systems, including treatment ponds or lagoons designed to meet the requirements of CWA (other than cooling ponds as defined in 40 CFR 423.11(m) which also meet the criteria of this definition) are not waters of the United States. This exclusion applies only to manmade bodies of water which neither were originally created in waters of the United States (such as disposal area in wetlands) nor resulted from the impoundment of waters of the United States."

The referenced section that supposedly defines "cooling ponds" does not exist in the current Code of Federal Regulations. However, at the time the original definition of "waters of the United States" was promulgated, "cooling ponds" were defined as "any manmade water impoundment which does not impede the flow of a navigable stream and which is used to remove heat from condenser water . . . ." 40 C.F.R. §423.11(m) (1979).

Because Morgan Lake is a manmade water impoundment that does not impede the flow of a navigable stream and is used to remove heat from condenser water, Morgan Lake is a 'cooling pond' and not a waste treatment system excluded from the definition of a water of the United

States.

3.4 EPA's failure to regulate discharges into Morgan Lake from FCPP is arbitrary and capricious.

EPA's failure to regulate water pollution discharges into Morgan Lake is arbitrary and capricious because EPA has taken the opposite position in its NPDES permit for the Navajo Mine. In 2008 EPA issued a final permit for the adjacent Navajo Mine. EPA's permit regulates discharges into Morgan Lake from the Navajo Mine and imposes effluent limitations based on water quality standards for the Lake.[66] Likewise, APS has previously admitted that Morgan Lake is "a water of the U.S."[67]

In summary, EPA's treatment of Morgan Lake as a "water of the United States," "navigable water", "water of the Navajo Nation" and "water of the State of New Mexico" for purposes of the CWA. EPA's failure to regulate discharges into Morgan Lake is arbitrary and capricious.

**4. The Draft Permit erroneously concludes that 'discharges do not present a "reasonable potential" to cause or contribute to an exceedance of water quality standards.**

The Fact Sheet for the Draft Permit states:

> "In addition to technology-based effluent limitations, the Clean Water Act (CWA) Sections 402 and 301(b)(1)(C) require that an NPDES permit contain effluent limitations that, among other things, are necessary to meet water quality standards. An NPDES permit must contain effluent limits for pollutants that are determined to be discharged at a level which has "the reasonable potential to cause or contribute to an excursion above any State [or Tribal] water quality standard, including State [or Tribal] narrative criteria for water quality." 40 CFR 122.44(3)(1)(i). …

Based on an application of these factors to the APS FCPP operations and projected wastewater quality data provided in the application, EPA concluded that the discharges do not present a "reasonable potential" to cause or contribute to an exceedance of water quality standards. Due to the facility potentially discharging to dry washes, EPA has not considered available dilution, which may be present in the receiving waters. Therefore, EPA has made the most conservative and protective assumption of no available dilution in its analysis and that water quality standards must be met at the end of pipe prior to discharge. Therefore, based on sampling data and an evaluation of discharge characteristics, EPA has concluded, consistent with the previous permit, that other than the effluent limitations for pH, TSS, Oil and Grease, which are promulgated under the

[66] Exhibit 20 hereto (EPA's Navajo Mine NPDES Permit #NN0028193).
[67] Exhibit 33 hereto, p. 1.

Steam Electric Power Generation ELGs as described in 40 CFR Section 423, that there is no reasonable potential for other pollutants to cause or contribute to a violation of receiving water standards. However, EPA has included monitoring in the permit for several additional parameters in order to further verify these assumptions."

Outfall 01A and outfall 01E of the FCPP discharge wastewaters into Morgan Lake, which enjoys the following designated uses under the 2007 Navajo Nation Surface Water Quality Standards:[68]

**Table 205.1 (continued) Designated Uses for Navajo Nation Surface Waters**

| Surface Water Body | Basin | Cataloging Unit | Domestic Water Supply (Dom) | Primary Human Contact (PrHC) | Secondary Human Contact (ScHC) | Agricultural Water Supply (AgWS) | Fish Consumption (FC) | Aquatic & Wildlife Habitat (A&WHbt) | Livestock Watering (LW) |
|---|---|---|---|---|---|---|---|---|---|
| Morgan Lake | San Juan | Chaco | | PrHC | ScHC | | FC | A&WHbt | LW |

Outfall 001 discharges from Morgan Lake to the Chaco River/Chaco Wash a tributary of the San Juan River, which enjoy the following designated uses under the 2007 Navajo Nation Surface Water Quality Standards.[69]

**Table 205.1 (continued) Designated Uses for Navajo Nation Surface Waters**

| Surface Water Body | Basin | Cataloging Unit | Domestic Water Supply (Dom) | Primary Human Contact (PrHC) | Secondary Human Contact (ScHC) | Agricultural Water Supply (AgWS) | Fish Consumption (FC) | Aquatic & Wildlife Habitat (A&WHbt) | Livestock Watering (LW) |
|---|---|---|---|---|---|---|---|---|---|
| Chaco River/Chaco Wash, mouth to mouth of Dead Man's Wash | San Juan | Chaco | | PrHC | ScHC | | FC | A&WHbt | LW |
| San Juan River and perennial tributaries (except as listed below) | San Juan | *Numerous* | Dom | PrHC | ScHC | AgWS | FC | A&WHbt | LW |

Because Morgan Lake, Chaco River/Chaco Wash, and the San Juan River enjoy these designated uses, they are protected by a large set of numerical water quality standards for metals and other pollutants that are enriched in discharges from coal-fired power plants.[70]

Of particular concern are mercury and selenium. Selenium levels in fish from Morgan Lake have been found to be elevated to the point where public health advisories, such as the one below, have been issued:[71]

> **<u>Navajo Nation Fish Consumption Health Advisory</u>**
>
> The Navajo Nation Environmental Protection Agency (NNEPA) in cooperation with the Navajo Nation Division of Health and Navajo Nation Fish and Wildlife Department is issuing a fish consumption advisory for Red Lake near Navajo, NM, and Morgan Lake, NM. A recent fish tissue study completed by the U.S. Fish and Wildlife Service and NNEPA concluded that methylmercury concentrations in catfish caught from Red Lake exceeded the U.S. Environmental Protection Agency (USEPA) recommended human health criterion. Selenium concentrations in bass and catfish caught from Morgan Lake also exceeded the USEPA human health criterion.

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[68] Exhibit 16.
[69] Exhibit 16.
[70] Exhibit 16 at Table 206.1
[71] http://www.navajonationepa.org/Pdf%20files/unsavefish.pdf

The U.S. EPA erroneously concluded that the discharges from the FCPP "do not present a 'reasonable potential' to cause or contribute to an exceedance of water quality standards" based on effluent quality analyses that employed detection limits far too high to ascertain whether discharges from the FCPP would impair water quality.

The Navajo Nation Water Quality Standard for mercury for water bodies with a designated use of Aquatic & Wildlife Habitat (including Morgan Lake, Chaco River/Chaco Wash and the San Juan River) is 0.001 micrograms per liter (0.001 µg/L) on a long-term (chronic) basis. Yet, the test method that was employed in the priority pollutant scans for outfalls 001, 01A and 01E to ascertain whether discharges from the FCPP would impair water quality (EPA Test Method 200.7) has a detection limit for mercury of 0.2 µg/L – 200 times the applicable water quality standard.

Similarly, the Navajo Nation Water Quality Standard for selenium for water bodies with a designated use of Aquatic & Wildlife Habitat (including Morgan Lake, Chaco River/Chaco Wash and the San Juan River) is 2 µg/L on a long-term (chronic) basis.[72] Yet, the test method that was employed in the priority pollutant scans for outfalls 001, 01A and 01E to ascertain whether discharges from the FCPP would impair water quality has a detection limit for mercury of 100 µg/L – 50 times the applicable water quality standard.

In addition to these inadequacies with respect to mercury and selenium, the test method that was employed in the priority pollutant scans for outfalls 001, 01A and 01E has a detection limit for **arsenic** of 100 µg/L compared to the water quality standard of 30 µg/L for waters with a designated use of Primary Human Contact, and 10 µg/L for waters with a designated use of Domestic Water Supply (the San Juan River); a detection limit for **antimony** 40 µg/L compared to the chronic water quality standard of 30 µg/L for waters with a designated use of Aquatic & Wildlife Habitat; and a detection limit for **thallium** of 100 µg/L compared to the water quality standard of 1 µg/L for waters with a designated use of Fish Consumption.

EPA relied largely on the 2012 priority pollutant scan ("PPS") submitted by the FCPP owners in its determining that there is no reasonable potential for water quality standards to be violated by discharges from FCPP.[73] As stated above, EPA's reliance on the 2012 PPS is arbitrary and capricious because the FCPP owners did not employ appropriate minimum detection limits to determine whether there could be a violation of water quality standards. The use of inappropriate detection limits violates the terms of the current NPDES Permit for the FCPP.[74] EPA's reliance on the 2012 PPS is arbitrary and capricious because it fails to employ detection limits necessary to determine whether the discharge has the reasonable potential to violate water quality standards.

Finally, all waters of the Navajo Nation are protected by the following narrative water

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[72] The federal water quality criteria for selenium is 5ug/l. *See,* Exhibit 21 attached hereto.
[73] Exhibit 22 hereto (Priority Pollutant Scan).
[74] Exhibit 23, p. 7, §E.1.b. (Current NPDES Permit for FCPP).

quality standard:[75]

> "A. All Waters of the Navajo Nation shall be free from pollutants in amounts or combinations that, for any duration:
> "1. Cause injury to, are toxic to, or otherwise adversely affect human health, public safety, or public welfare.
> "2. Cause injury to, are toxic to, or otherwise adversely affect the habitation, growth, or propagation of indigenous aquatic plant and animal communities or any member of these communities; of any desirable non-indigenous member of these communities; of waterfowl accessing the water body; or otherwise adversely affect the physical, chemical, or biological conditions on which these communities and their members depend."

The Draft permit is defective because it fails to include any analysis of how permitted discharges would impair narrative water quality standards in Morgan Lake despite the following evidence that such discharges have and are causing water quality impairments:

> "There have been several investigations into the quality of water or fish collected from Morgan Lake (Sanchez 1972, 1973; Blinn et al. 1976, Westinghouse Electric Corporation 1975; Geotz and Abeyta 1987; USFWS 1988; Esplain 1995, Bristol et al. 1997; and this study). Sanchez (1972) reported on the quality of water, sediment and invertebrates collected from 1966 to 1972. In 1973, a fish kill occurred during August 10 through 17, 1973. An estimated 33,674 fish ranging in total length from 5 to 24 inches (127 to 609 mm) were lost during the die-off (Sanchez 1973). A blue-green algal bloom and high surface water temperatures (32.2 to 40C) were thought to be contributing factors. In 1975, the Northern Arizona University was contracted to evaluate the probable causes of previous fish kills in the lake (Blinn et al. 1976). Blinn et al. (1976) identified the relationship between bluegreen (Cyanophyta) algal blooms, elevated water temperatures, early summer warming, and anoxic conditions. Westinghouse Electric Corporation (1975) also reported on the quality of Morgan Lake fish collected during 1973 and 1975. Management of the lake was changed to reduce the potential for frequent fish kills."[76]

Under Table 204.1 "Numeric Targets for Lakes and Reservoirs" of the Navajo Nation Surface Water Quality Standards 2007, Lakes designated for use as Primary Human Contact may not contain more than 20,000 blue-green algae per milliliter. No analysis is provided in the record for the draft permit showing how the hot water discharges from outfall 01A, which were measured at 42.4 degrees Celsius (108.3 degrees Fahrenheit) during the summer,[77] will affect levels of blue-green algae in Morgan Lake.

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[75] Exhibit 16 at § 202.
[76] Exhibit 24 hereto (United States Fish and Wildlife Service and the Navajo Nation Environmental Protection Agency (2005) "Methylmercury and Other Environmental Contaminants in Water and Fish Collected from Four Recreational Fishing Lakes on the Navajo Nation" at page 12).
[77] Exhibit 25 hereto (EPA Consolidated Permit Program Wastewater Discharge Information Form 2C for permit NN000019.

The draft permit is defective because it fails to include any analysis of how permitted discharges would comply with the numerical water-quality standard for temperature contained in the Navajo Nation Surface Water Quality Standards 2007, reproduced below.

F. **Temperature:** The maximum allowable increases in ambient water temperature, expressed in degrees Celcius, due to a thermal discharge are as follows:

| A&WHbt (warm water) | A&WHbt (cold water) |
|---|---|
| 3.0 | 1.0 |

This does not apply to a stormwater discharge.

Morgan Lake should be considered a warm water because it typically has temperatures exceeding 20$^{o}$ Celsius.[78] Therefore, permitted discharges from the FCPP should not increase the ambient water temperature of Morgan Lake by more than 3$^{o}$ Celsius even though Morgan Lake is a cooling pond. Under Navajo Nation Surface Water Quality Standards 2007 at § 209: "A wastewater mixing zone is a defined and limited part of a surface water body with define boundaries adjacent to a point source of pollution, in which initial dilution of wastewater occurs, and in which certain numeric water quality standards may apply. .... Mixing zones shall be limited to perennial streams, lakes and reservoirs. All mixing zones shall have defined boundaries, beyond which applicable water quality standards shall be met. In no instance shall mixing zones constitute more than 10% of the surface area of a lake or reservoir ..." Therefore, any permitted discharges from the FCPP that increase the ambient water temperature of Morgan Lake by more than 3$^{o}$ Celsius must be limited to a defined boundary of Morgan Lake that comprises 10% or less of this water body.

For the reasons stated above, EPA's conclusions that discharges from FPCC "do not present a 'reasonable potential' to cause or contribute to an exceedance of water quality standards" lacks a defensible foundation.[79]

**5. EPA's draft permit fails to identify impaired waters and need for TMDLs.**

EPA's Draft permit fails to determine whether the FCPP impacts any impaired waters and whether additional effluent limitations should be placed in the permit as part of a Total Maximum Daily Load. As part of the permitting for this facility, EPA should determine whether Morgan Lake, No Name Wash, Chaco River and the San Juan River are impaired by any pollutant. If so, EPA must impose restrictive effluent limits to achieve compliance with water quality standards. EPA's Draft permit is defective because it fails to perform such an analysis and include any such effluent limitations.

[78] Exhibit 16 at § 205 A
[79] Exhibit 26 (EPA's Reasonable Potential Analysis).

**6. There is no evidence that the intake system on the San Juan River is equivalent to interim best technology available (BTA) under EPA's regulation for minimizing impacts due to entrainment.**

Under 40 CFR Part 125, Subpart J—Requirements Applicable to Cooling Water Intake Structures for Existing Facilities Under Section 316(b) of the Clean Water Act, the following provisions apply:

40 CFR §125.94(a):

> "a) Applicable Best Technology Available for Minimizing Adverse Environmental Impact (BTA) standards. (1) **On or after October 14, 2014**, the owner or operator of an existing facility with a cumulative design intake flow (DIF) greater than 2 mgd is subject to the BTA (best technology available) standards for impingement mortality under paragraph (c) of this section, **and** entrainment under **paragraph (d)** of this section including any measures to protect Federally-listed threatened and endangered species and designated critical habitat established under paragraph (g) of this section.

40 CFR §125.94(d) states:

> "BTA standards for entrainment for existing facilities. The Director **must** establish BTA standards for entrainment for each intake on a site-specific basis. These standards must reflect the Director's determination of the **maximum reduction in entrainment** warranted after consideration of the relevant factors as specified in §125.98. The Director may also require periodic reporting on your progress towards installation and operation of site-specific entrainment controls."

40 CFR §125.98(f) states:

> "(f) Site-specific entrainment requirements. The Director must establish site-specific requirements for entrainment after reviewing the information submitted under 40 CFR 122.21(r) and §125.95. These entrainment requirements must reflect the Director's determination of the maximum reduction in entrainment warranted after consideration of factors relevant for determining the best technology available for minimizing adverse environmental impact at each facility. These entrainment requirements may also reflect any control measures to reduce entrainment of Federally-listed threatened and endangered species and designated critical habitat (e.g. prey base). The Director may reject an otherwise available technology as a basis for entrainment requirements if the Director determines there are unacceptable adverse impacts including impingement, entrainment, or other adverse effects to Federally-listed threatened or endangered species or designated critical habitat. ….
>
> (1) The Director must provide a written explanation of the proposed entrainment determination in the fact sheet or statement of basis for the proposed permit under 40 CFR 124.7 or 124.8. The written explanation must describe why the Director has rejected

any entrainment control technologies or measures that perform better than the selected technologies or measures, and must reflect consideration of all reasonable attempts to mitigate any adverse impacts of otherwise available better performing entrainment technologies.

(2) The proposed determination in the fact sheet or statement of basis must be based on consideration of any additional information required by the Director at §125.98(i) and the following factors listed below. The weight given to each factor is within the Director's discretion based upon the circumstances of each facility.

(i) Numbers and types of organisms entrained, including, specifically, the numbers and species (or lowest taxonomic classification possible) of Federally-listed, threatened and endangered species, and designated critical habitat (e.g., prey base); ….

EPA's duty to make a site-specific determination of the best technology available that would attain the maximum reduction in entrainment for the FCPP is not dependent on receipt of further information from the applicant. 40 CFR §125.98 (g) states:

"(g) **Ongoing permitting proceedings. In the case of permit proceedings begun prior to October 14, 2014.** Whenever the Director has determined that the information already submitted by the owner or operator of the facility is sufficient, the Director may proceed with a determination of BTA standards for impingement mortality and entrainment without requiring the owner or operator of the facility to submit the information required in 40 CFR 122.21(r). The Director's BTA determination may be based on some or all of the factors in paragraphs (f)(2) and (3) of this section and the BTA standards for impingement mortality at §125.95(c). In making the decision on whether to require additional information from the applicant, and what BTA requirements to include in the applicant's permit for impingement mortality and site-specific entrainment, the Director should consider whether any of the information at 40 CFR 122.21(r) is necessary."

The record for the draft permit reveals the following correspondence between the US EPA and the permit applicant relevant to the issue of best technology available for minimizing impacts due to entrainment:

**From:** Sheth, Gary
**Sent:** Tuesday, June 10, 2014 1:08 PM
**To:** Michele.Robertson@aps.com
**Subject:** RE: Questions about Morgan Lake Intake

Hi Michele,

Please provide a full description of the intake structure, mechanism, and process for intake of water from the San Juan River to Morgan Lake. Please include information about the exact location of the intake structure, design capacity, average intake volume, as well as any measures in place to minimize entrainment and impingement of biota resulting from the intake of water.

Thanks,

Gary Sheth
NPDES Permits Office (WTR-5)

The answer in the record from the permit applicant that is relevant to the issue of best technology available for minimizing impacts due to entrainment is reproduced below:

**From:** Michele.Robertson@aps.com
**Sent:** Friday, August 08, 2014 11:16 AM
**To:** Sheth, Gary
**Cc:** Pamela.Norris@aps.com
**Subject:** RE: Questions about Morgan Lake Intake
**Attachments:** removed.txt

Gary,

I apologize for the delay in responding to your request. Here is the information on the river station intake.

Morgan Lake Intake

The intake structure on the San Juan River consists of two 10- by 10-foot intake bays, placed perpendicularly to the flow of the river. These intake bays are located just upstream of the APS Weir. The weir includes a control gate that provides the ability to control water depths at the intake location. The intakes are screens with an approximately 1-inch by 3-inch opening. Approach velocities toward the screens are approximately 0.38 foot per second. No fish collection or return facilities are associated with the intake

The administrative record is lacking in the collection and presentation of data, information, and discussion of fish impingement/entrainment and whether the FCPP intakes reflect the best technology available that would attain the maximum reduction in entrainment. Maintaining the intake flow velocity to below 0.5 feet per second will reduce losses due to impingement, but not entrainment. Intake structures with screens having a mesh size of 1-inch by 3-inches, and no fish collection or return facilities, is well short of best technology available that would attain the maximum reduction in entrainment. For example, fine mesh screens with a mesh size of less than 1/5 inch (less then 5 millimeters) would significantly reduce losses from entrainment of eggs, larvae and juvenile forms of fish by the FCPP.[80]

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[80] U.S. EPA (2004) "Technical Development Document for the Final Section 316(b) Phase II Existing Facilities Rule: Chapter 4: Efficacy of Cooling Water Intake Structure Technologies." http://water.epa.gov/lawsregs/lawsguidance/cwa/316b/upload/Cooling-Water_Phase-

It should be noted that the FCPP owners began collection of data on fish impingement and/or entrainment in 2005.[81] The Conservation Organizations issued a Freedom of Information request to EPA requesting certain information submitted by APS to the agency on fish impingement/entrainment and intake structure alternatives.[82] Despite apparently receiving such information from APS, EPA was unable to produce these documents to the Conservation Organizations.[83] There is no evidence in the record for this permitting proceeding that EPA has requested the results of any fish impingement/entrainment studies, impacts on threatened or endangered species, or any intake structure alternatives from the FCPP owners. This information is vital to a determination of BTA at the FCPP. This data is especially important due to the verified presence of several threatened and endangered fish species living in the San Juan River in the vicinity of the FCPP intake structures and discharge point. The Conservation Organizations request that EPA use its information gathering authority under the CWA and/or other federal statutes to obtain all fish impingement/entrainment data and intake structure alternatives from the FCPP owners and release the information for public comment prior to finalization of the NPDES permit for the FCPP.

**7. To reduce impingement and entrainment losses, the NPDES permit should place a cap on water intake from the San Juan River to reflect the applicant's retirement of three units**

According to the permit Fact Sheet:

> "Plant's total generation capacity was originally 2100 megawatts, but following the shutdown of Units 1, 2, and 3 (which occurred on December 30, 2013) the capacity is now 1540 megawatts. …
>
> "D. Cooling Water Regulation
>
> "APS operates a closed-cycle recirculating system, circulating from around 1000 up to about 1,700 million gallons a day (MGD) through Morgan Lake, a man-made cooling water impoundment. The applicant withdraws up to a maximum of 48 MGD of water from the San Juan River as make-up water to replenish losses that have occurred due to blowdown, drift, evaporation within Morgan Lake and the cooling system. Currently the San Juan River intake system is equipped with a weir and a channel with a gate. If the water in the river is too low at the intake screens to supply the pumps, the gate in the channel is lowered. The gate and the weir together increase the level at the intake screens to supply the pumps. The intake screens are periodically changed out for cleaning."

The administrative record for the Draft permit contains the following additional information:

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2_TDD_2004.pdf
[81] Exhibit 27 hereto (Fish Impingement Studies).
[82] Exhibit 29 hereto.
[83] *Id.*

## Impacts of Units 1-2-3 Shutdown

It is estimated that the shutdown of units 1-2-3 will occur about mid-year 2013. The shutdown of these three units will impact some of the water and wastewater discharges. These include:

1. The closed cycle recirculating cooling water volume will decrease by about 30%.

Because the applicant has retired more than 25% of its total generation capacity, a withdrawal of up to 48 MGD from the San Juan River is no longer necessary. Impingement and entrainment losses are proportional to the amount of water intake from the San Juan River. As a means of attaining the maximum reduction in impingement/entrainment as required by Section 316(b) of the Clean Water Act, the Draft permit must cap the applicant's intake of water from the San Juan River to a rate not more than is necessary for the applicant's reduced need for cooling water. The Conservation Organizations request, at a minimum, that the allowable water withdrawal from the San Juan River be reduced by 30% and such limitation be included as an enforceable requirement in any final permit.

**8. EPA Failed to Comply With the Endangered Species Act.**

The Endangered Species Act ("ESA") implements a Congressional policy that "all Federal Departments and agencies shall seek to conserve endangered species and threatened species." 16 U.S.C. § 1531(c)(1). An "endangered species" is a species of plant or animal that is "in danger of extinction throughout all or a significant portion of its range," while a "threatened species" is one which is likely to become endangered within the foreseeable future. 16 U.S.C. § 1532(6), (20). The operative core of the ESA is a list maintained by the Secretary of the Interior of threatened and endangered species, and the ESA permits citizens to petition the Secretary to add species to that list. 16 U.S.C. § 1533(b)(3)(A).

At the heart of Congress's plan to preserve endangered and threatened species is Section 7 of the ESA, which places affirmative obligations upon federal agencies. Section 7(a)(1) provides that all federal agencies "shall, in consultation with and with the assistance of the Secretary [of Commerce or the Interior], utilize their authorities in furtherance of the purposes of this chapter by carrying out programs for the conservation of endangered species and threatened species." 16 U.S.C. § 1536(a)(1). The mandate of section 7(a)(2) is even clearer:

> Each Federal agency shall, in consultation with and with the assistance of the Secretary [of Commerce or the Interior], insure that any action authorized, funded, or carried out by such agency ... is not likely to jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of habitat of such species which is determined . . . to be critical, unless such agency has been granted an exemption for such action . . . pursuant to subsection (h) of this section.

16 U.S.C. § 1536(a)(2). Thus, section 7(a)(2) imposes two obligations upon federal agencies. The first is *procedural* and requires that agencies consult with the FWS to determine the effects of their actions on endangered or threatened species and their critical habitat. *See* 16 U.S.C. § 1536(b). The second is *substantive* and requires that agencies insure that their actions not jeopardize endangered or threatened species or their critical habitat. *See* 16 U.S.C. § 1536(a)(2); *see also, Florida Key Deer v. Paulison,* 522 F.3d 1133, 1138 (11th Cir. 2008).

The requirements of the ESA are triggered by "any 'agency action' which may be likely to jeopardize the continued existence of the species or its habitat." 16 U.S.C. § 1536(a). By this process, each federal agency must review its "actions" at "the earliest possible time" to determine whether any action "may affect" listed species or critical habitat in the "action area." 50 C.F.R. § 402.14; 50 C.F.R. § 402.02. When there exists a chance that such species "may be present," the agency must conduct a biological assessment ("BA") to determine whether or not the species "may be affected" by the action. *See* 16 U.S.C. § 1536(c). The term "may affect" is broadly construed by FWS to include "[a]ny possible effect, whether beneficial, benign, adverse, or of an undetermined character," and is thus easily triggered. 51 Fed. Reg. at 19926. If a "may affect" determination is made, "formal consultation" is required and a biological opinion ("BiOp") must be prepared.

In determining whether an agency action jeopardizes listed species or adversely modifies critical habitat, the Services must "evaluate the current status of the listed species" and "[e]valuate the effects of the action and cumulative effects on the listed species or critical habitat." 50 C.F.R. §§ 402.14(g)(2)-(3). This requires the Services to distinguish between the pre-action condition of all affected species and critical habitat and the direct, indirect, and cumulative effects of the agency's action:

> "Effects of the action" include both direct and indirect effects of an action that will be added to the "environmental baseline." The environmental baseline includes "the past and present impacts of all Federal, State or private actions and other human activities in the action area" and "the anticipated impacts of all proposed Federal projects in the action area that have already undergone formal or early section 7 consultation."

*Nat'l Wildlife Fed'n v. Nat'l Marine Fisheries Serv.*, 422 F.3d 782, 790 (9th Cir. 2005) (citing regulatory definitions found at 50 C.F.R. § 402.02). This environmental baseline includes the existence of structures such as dams and power plants, but does not include fish kills or other adverse effects resulting from the *operation* of such structures and facilities, where such ongoing operation is within the control of the action agency. "The environmental baseline is a 'snapshot' of a species' health at a specified point in time. *It does not include the effects of the action under review in the consultation.*"[84] Just as the Ninth Circuit held in the recent case of *National Wildlife Federation v. National Marine Fisheries Service*, 524 F.3d 917 (9th Cir. 2008), agencies cannot manipulate the environmental baseline in order to ignore or minimize the effects of future

[84] U.S. Fish and Wildlife Service, Endangered Species Act Consultation Handbook 4-22 (1998) (emphasis added).

operation of already-built projects such as the FCPP. In *NWF v. NMFS*, the court held that it was illegal for federal agencies to attempt to disregard certain ongoing impacts of FCRPS operations, rather than focusing "on whether the action effects, when added to the underlying baseline conditions, would tip the species into jeopardy." *Nat'l Wildlife Fed'n v. Nat'l Marine Fisheries Serv.*, 524 F.3d 917, 929 (9th Cir. 2008). The court explained that there was a critical difference between the basic existence of the dams and the discretionary federal decision about how to continue operating them:

> The current existence of the FCRPS dams constitutes an "existing human activity" which is already endangering the fishes' survival and recovery. See ALCOA, 175 F.3d at 1162 n.6 (citing 50 C.F.R. § 402.02). Although we acknowledge that the existence of the dams must be included in the environmental baseline, *the operation of the dams is within the federal agencies' discretion* under both the ESA and the Northwest Power Act, 16 U.S.C. § 839.

*Nat'l Wildlife Fed'n v. Nat'l Marine Fisheries Serv.*, 524 F.3d 917, 930-931 (9th Cir. 2008) (emphasis added).

Issuance of a (discretionary) NPDES permit is plainly a federal action subject to the requirements of ESA section 7, and compliance with the substantive minimum requirements of the CWA does not, in and of itself, necessarily satisfy the independent substantive requirements of ESA Section 7(a)(2). *See National Association of Home Builders v. Defenders of Wildlife*, 551 U.S. 644, 666-68 (2007) (CWA, ESA, and implementing regulations require consultation and jeopardy determination for discretionary permit issuance).

Here, EPA, seeks to rely on the ongoing, but not yet completed, consultation process for the Office of Surface Mining Reclamation and Enforcement's (OSMRE) Four Corners Power Plant and Navajo Mine Energy (FCPP/NM) Project.[85] OSMRE has prepared a Biological Assessment ("BA") finding adverse effect and adverse modification of critical habitat for the FCPP/NM project, beginning formal consultation, but the Fish and Wildlife Service has not yet issued its Biological Opinion ("BO"), including findings on jeopardy and adverse modification and reasonable and prudent alternatives, if any.[86] The BA finds that OSMRE's proposed operation of the FCPP "may affect and is likely to adversely affect" both the Colorado pikeminnow and the razorback sucker,[87] and that its proposed action will adversely modify designated critical habitat for both these listed fish species.[88] These jeopardy and adverse modification findings result from several adverse impacts, including but not limited to

[85] Memorandum from Gary Speth, United States Environmental Protection Agency, Re: Review of Information and Literature to Assess Impacts on Threatened and Endangered Species and Critical Habitat Pursuant to the Federal Endangered Species Act (Nov. 10, 2014) in the Administrative Record.
[86] Office of Surface Mining and Reclamation, Four Corners Power Plant and Navajo Mine Energy Project Biological Assessment (August 2014) (hereinafter FCPP/NM BA) in the Administrative Record.
[87] FCPP/NM BA at 9-1.
[88] FCPP/NM BA at 9-4.

entrainment of razorback sucker at the APS weir, release of non-native fish from Morgan Lake, and impaired passage of Colorado pikeminnow at the APS weir.[89] "Because of the impairment of fish passage at the APS Weir and potential release of non-native fish from Morgan Lake, it is concluded that the Proposed Action would adversely modify critical habitat for Colorado pikeminnow and razorback sucker."[90]

EPA states that "EPA as a cooperating agency plans to use the review and analysis conducted by OSMRE and rely on the Biological Opinion developed by the USFWS to complete its obligations under ESA for this permit."[91] It goes on to claim that "[h]owever, it should be noted that because the Federal Action that EPA is simply to reissue a NPDES permit for the discharge of cooling water to a surface water on Tribal land, the impacts evaluated for this Action relate only to the uptake of water from the San Juan River to the cooling water system and discharge of cooling water to the receiving surface water."[92] EPA's apparent attempted partial reliance on the OSMRE FCPP/NM consultation process to fulfill its ESA obligations is misplaced for two reasons.

First, as discussed in detail below, the BA relies on erroneous legal and factual assumptions and methodologies in an effort to obscure or downplay the effects of continued FCPP operations on listed species and their critical habitat. For EPA to meet its obligations under section 7(a)(2) to ensure that federal actions do not jeopardize listed species or adversely modify their critical habitat, it must address and rectify these errors and omissions.

Second, the EPA memorandum apparently attempts to argue that its Section 7 obligations include consideration only of the uptake of San Juan River water and discharge of cooling water. Under the law and FWS guidance, this constitutes improper segmentation of interrelated and interdependent actions. Under FWS consultation guidelines, "effects of the action under consultation are analyzed together with the effects of other activities that are interrelated to, or interdependent with, that action."[93] These terms are defined as follows:

> Interrelated actions are those that are part of a larger action and depend on the larger action for their justification. Interdependent actions are those that have no independent utility apart from the action under consideration.[94]

EPA's issuance of a NPDES permit for the discharge of FCPP cooling water is both an interrelated activity and an interdependent activity for purposes of the larger FCPP/NM decision. There would be no justification for the uptake and discharge of cooling water absent the continued operation of the mine and coal combustion at FCPP, nor would water intake and discharge have any utility whatsoever save for operation of the plant and its cooling needs. When federal agencies are interdependent and/or interrelated, they must be combined in consultation, and a lead agency determined for the

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[89] FCPP/NM BA at 9-1 to 9-3.
[90] FCPP/NM BA at 9-4.
[91] Speth ESA Memo at 2.
[92] Speth ESA Memo at 2.
[93] ESA Consultation Handbook 4-26.
[94] 50 C.F.R. § 402.02.

overall consultation.[95] NPDES permit issuance is an interrelated and interdependent action for purposes of the larger FPDES/NM action, and thus the consultation obligation to consider effects of the action includes the entirety of the actions at issue – not merely water intake and outflow.

8.1 The BA incorrectly defines the environmental baseline.

The BA relies improperly on two arguments to contend that FCPP mercury and selenium emissions are "very small" in their impacts to listed fish and birds. First, it contends, misleadingly, that FCPP emissions alone are insufficient to cause risk to listed individuals or populations, ignoring the fact that those emissions, and resulting deposition of mercury and selenium, impact waterways and aquatic food webs already sufficiently impacted to cause harm to substantial proportions of listed fish within the San Juan River. BA at 7-15 ; *see* also FCPP/NM Draft Environmental Impact Statement (DEIS) at 4.8-69. This overly-narrow definition of risk ignores the fact that Section 7 analyses must consider baseline conditions in the action area – "[t]he baseline includes State, tribal, local, and private actions already affecting the species or that will occur contemporaneously with the consultation in progress,"[96] and that, by its own admission, "current mercury body burdens are at levels that may result in adverse effects to Colorado pikeminnow populations in the San Juan River," BA at 6-20, and that selenium poses high levels of population hazard to both Colorado pikeminnow and razorback sucker, *see* BA at 6-20 to 6-23 ("cumulative mercury and selenium concentrations are likely to adversely affect Colorado pikeminnow and razorback sucker in the 4 ERA modeling reaches of the San Juan River downstream into the San Juan River arm of Lake Powell.").

Second, the BA minimizes the contribution risk from FCPP emissions because toxicity risks to aquatic species such as the Colorado pikeminnow and razorback sucker are predicted to remain high from other sources:

> The ERAs reported that the Proposed Action (e.g., future emissions from the FCPP) by itself would not result in harm to Colorado pikeminnow and razorback sucker. The ERAs reported that HQs were much less than one for exposures relating to future FCPP emissions in Morgan Lake and in the San Juan River within the Deposition Area and downstream into the San Juan River arm of Lake Powell. The HQs reported in the ERAs are based on the maximum predicted future fish tissue concentrations. As shown in Tables 7-2 and 7-3, comparison of ERA results for both Morgan Lake and the San Juan River show that the contribution of the Proposed Action is very small relative to Current Concentrations. These very small contributions would not measurably increase the existing effects associated with the environmental baseline. However, the combined concentrations under baseline conditions, with future contributions

[95] 50 C.F.R. § 402.02 ("*Effects of the action* refers to the direct and indirect effects of an action on the species or critical habitat, together with the effects of other activities that are interrelated or interdependent with that action, that will be added to the environmental baseline.").
[96] United States Fish and Wildlife Service, Endangered Species Consultation Handbook 4-22.

> from the other regional and global sources, and future contributions from FCPP may affect and are likely to adversely affect Colorado pikeminnow, razorback sucker, and their critical habitat.

FCPP/NM BA 7-15. Just as in the DEIS, this reasoning is logically flawed. Simply because FCPP emissions alone (absent other sources of mercury and selenium deposition) would not be sufficient to cause population-level effects (i.e., have HQ of 1 or higher) does not excuse EPA from analyzing whether FCPP's additional contribution to an already-compromised environmental baseline will be sufficient to jeopardize the continued existence of the species or adversely modify their critical habitat.

8.2 Baseline mercury levels combined with additional mercury and selenium jeopardize endangered species.

The BA acknowledges that "the available data on San Juan River mercury body burdens and mercury toxicity in fish clearly indicates that current mercury body burdens are at levels that may result in adverse effects to Colorado pikeminnow populations in the San Juan River."[97] The FWS has previously determined that baseline mercury levels in the San Juan River basin are causing reproductive impairment in 64 percent of pikeminnow, a number which is expected to rise to 72 percent by 2020. Desert Rock BiOp at 96. Even with the shutdown of Units 1-3 and the anticipated installation of pollution controls on Units 4-5, the FCPP is a major source of these mercury concentrations in the San Juan River basin, and its emissions of mercury are significantly contributing to these effects. The San Juan River basin is one of only three sub-basins where pikeminnow still survive, and it is critical to their long-term recovery from the brink of extinction.[98]

Mercury is an element that occurs naturally, but it is also a local, regional, and global pollutant that is harmful to wildlife and human health.[99] Atmospheric mercury is produced from, among other things, combustion of coal at power plants, which releases mercury into the air where it is then deposited by precipitation water bodies, where micro-organisms convert it to methyl mercury – a particularly toxic form – at which point it becomes biomagnified through the food chain.[100] A recent study by the Mountain Studies Institute reports that coal-fired power plants are the largest human source of mercury emissions in the United States, and atmospheric deposition appears to be the dominant source of mercury contamination in North America.[101]

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[97] FCPP/NM BA at 6-20.
[98] *See* United States Fish and Wildlife Service, Colorado pikeminnow (*ptychocheilus lucis*) recovery goals: amendment and supplement to the Colorado squawfish recovery plan (2002).
[99] MSI Report attached hereto as Exhibit 38.
[100] *See* U.S. Dep't of the Interior, U.S. Fish and Wildlife Service, *Draft Biological Opinion for the Desert Rock Energy Project, U.S. Bureau of Indian Affairs, Gallup, New Mexico* at 9-10 (Oct. 2009) [hereinafter "Desert Rock BiOp"] (attached as Exhibit 35 hereto).
[101] *See* MSI Report.

There are high mercury levels in southwestern Colorado and northwestern New Mexico. The state of Colorado has posted advisories warning against eating fish from McPhee, Totten, Narraguinnep, and Vallecito reservoirs and Navajo Lake due to mercury accumulation.[102] Nine water bodies in northwestern New Mexico have mercury consumption advisories.[103] Sediment cores at four high-elevation lakes in the San Juan Mountains show mercury concentrations that are up to six times above pre-industrial times. San Juan County, New Mexico is among the highest emitters of mercury among U.S. counties due to its coal-fired power plants including FCPP.[104] Data collected from Mesa Verde National Park show mercury deposition levels that are among the highest in the western U.S.[105] Modeling of 47 single storm events from 2002 to 2008 and subsequent identification of storm source direction indicate that 87 percent of mercury deposition came from south of the Park – in particular, from air-pollution plumes from FCPP and the San Juan Generating Station ("SJGS"), another coal-fired power plant located nearby.[106] [107]

FCPP is a "significant source" of mercury deposition at the Park.[108] FCPP has installed air pollution measures for sulfur dioxide and nitrogen oxides, and these emission reductions correlate with decreasing trends of sulfate, nitrate, and chloride, and an increasing trend in pH in precipitation, at the Park.[109] Unlike SJGS, however, FCPP has not installed mercury pollution control measures, and there has been no change in mercury concentrations and deposition in the Park.[110] Current rates of mercury deposition in the San Juan River basin from FCPP are expected to be unchanged over the next decade.[111]

The Colorado pikeminnow is a critically-endangered fish and top natural predator in the Colorado River that has been federally protected since 1967. The pikeminnow is imperiled due to widespread destruction and modification of the Colorado River basin, including its tributaries, where it once occurred. It currently survives as a result of stocking programs in some areas of the upper and lower Colorado River basins, and in a limited stretch of the San Juan River. The San Juan River is critical to the long-term survival and recovery of the Colorado pikeminnow.

In considering the effects of the Desert Rock Energy Project ("Desert Rock") – a coal-fired plant that was proposed to be cited on the Navajo Nation within 20 km of FCPP – FWS

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[102] *Id.*
[103] *Id.*
[104] *Id.*
[105] *Id.*
[106] *Id.*
[107] Public Resources New Mexico ("PNM"), the operator of SJGS, recently installed new pollution controls at SJGS as part of a court-ordered Consent Decree. These new improvements include mercury removal on Units 3 and 4 of SJGS. The improvements were completed in early 2009, and are expected to reduce mercury emissions by 62 percent. APS has not taken steps to install any such improvements at FCPP.
[108] MSI Report.
[109] *Id.*
[110] *Id.*
[111] *See* Desert Rock BiOp, Appendix A.

considered the effects of atmospheric mercury deposition to endangered and threatened species including the Colorado pikeminnow.[112] Using a threshold for adverse effects of 0.2 mg/kg WW, 64 percent of Colorado pikeminnow experience reproductive impairment due to mercury presently.[113] By 2020, the Desert Rock BiOp finds that mercury deposition in the San Juan River basin is expected to increase by 35.4 percent without or 35.5 percent with the construction of the proposed Desert Rock Energy Project.[114] For this reason, FWS's draft biological opinion predicts that 72 percent of Colorado pikeminnow in the San Juan River basin will experience mercury-induced reproductive impairment by 2020 – which "is likely to *jeopardize* the continued existence of the Colorado pikeminnow."[115] Neither the DEIS nor either of the ERAs even attempts to provide such quantitative assessment of probable levels of reproductive impairment. The Deposition ERA, acknowledging risks to fish from mercury and selenium, goes on to state that "[a]lthough risks to mobile adult fish are likely overestimated by the [critical body residues "CBRs"], and in particular by the [No Observed Effect Concentration] CBRs, <u>the potential for risks to sensitive life stages and listed species cannot be ruled out</u>." Deposition ERA at 7-4 (emphasis added).

Given OSMRE and FWS's obligations to avoid jeopardy and contribute to the recovery of listed species under the ESA, it is not sufficient for the BA to simply conclude that the proposed action contributes to risks that would exist with or without continued FCPP operation.[116] Rather, it must actually take a hard look at what the levels of harm are, including

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[112] *See* Desert Rock BiOp at 106; The Desert Rock BiOp was prepared by FWS pursuant to section 7(a)(2) of the ESA, which imposes a "substantive duty on federal agencies" to "insure" that any action they undertake or authorize is "not likely to jeopardize the continued existence of any endangered species or threatened species"; it is each agency's duty to "insure no jeopardy." 16 U.S.C. § 1536(a)(2); 51 Fed. Reg. at 19926. The ESA's implementing regulations set forth a process by which an action agency ensures that its affirmative duties under section 7(a)(2) are satisfied. 50 C.F.R. § 402.14(a); *Sierra Club v. Babbitt*, 65 F.3d 1502, 1504-05 (9th Cir. 1995). By this process, each federal agency must review its "actions" at "the earliest possible time" to determine whether any action "may affect" listed species or critical habitat in the "action area." 50 C.F.R. § 402.14. If the biological assessment concludes that the action is "likely" to adversely "affect listed species," the agency must enter into "formal consultation," with FWS. *Id.* §§ 402.14(a), 402.01(b), 402.12(k); *Gifford Pinchot Task Force v. U.S. Forest Service*, 378 F.3d 1059, 1063 (9th Cir. 2007). In formal consultation, after evaluating all relevant information, FWS prepares a "biological opinion," which considers the current status of the species, the environmental baseline, and the effects of the proposed action, and concludes "whether the action, taken together with cumulative effects, is likely to jeopardize the continued existence of listed species… ." *Id.* § 402.14(g)(2)-(4). If "jeopardy" is likely to occur, FWS must prescribe in the BiOp "reasonable and prudent alternatives" to avoid that result. 50 C.F.R. § 402.14(i)(1)(ii).
[113] *Id.*
[114] *Id.* at 3.
[115] *Id.* at 120 (emphasis added).
[116] FCPP/NM BA 9-4 ("Atmospheric emissions from FCPP were reduced substantially at the end of the baseline period due to the shutdown of Units 1, 2, and 3, but some emissions will continue

reproductive and other sublethal effects, under all scenarios (including comparing FCPP operation and closure), against a baseline that includes existing conditions and other local, regional, and global sources. In 2009, FWS determined that Desert Rock would jeopardize the continued existence of the Colorado pikeminnow and would adversely modify its critical habitat. FWS reached this determination, which is set forth in the peer-reviewed Desert Rock BiOp, in part due to existing coal-fired power plants, including FCPP, which have degraded the environmental baseline to such a degree that the emissions from an additional coal plant, Desert Rock, would have driven the pikeminnow to extinction in the San Juan River, one of only three sub-basins where it still survives.[117] FWS determined that 64 percent of Colorado pikeminnow currently experience reproductive impairment due to mercury.[118] FWS also determined that by 2020, mercury deposition in the San Juan River basin is expected to result in 72 percent of pikeminnow being reproductively impaired. [119]

The Desert Rock BO and its conclusions are based on conservative estimates. Among other things, the Desert Rock BO does not specifically consider the significant contribution of mercury from CCW disposal at the Navajo Mine. According to EPA's TRI, which provides BHP reported data from 2000-2007, thousands of pounds of mercury have been disposed of in the Navajo Mine annually as "minefill."[120] The CCW is not treated prior to disposal and a liner system or other control mechanism is not used, *i.e.*, to prevent saturation and migration of the mercury or other constituents into surface or ground waters which flow directly into the San Juan River. The DEIS acknowledges, but does not analyze at all, the fact that releases are occurring from CCW disposal sites and that CCW leachate contains selenium. DEIS 4.5-14, 4.5-57 ("Previous studies found two primary areas of groundwater seepage beneath the ash disposal areas, the "north seep" and "south seepage area" (APS 2013)").

In reaching its conclusions in the Desert Rock BO, FWS relied on: (1) muscle tissue samples ("plugs") collected from Colorado pikeminnow collected throughout the Upper Colorado River Basin, including within the San Juan River;[121] (2) estimates of brain-tissue

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to occur and add to this condition, although the amount of this contribution is anticipated to be minute and would not increase the potential effects on these species.")

[117] The Desert Rock Energy Project has been on hold following the EPA's Environmental Appeals Board ("EAB") remand of a Prevention of Significant Deterioration permit to EPA, in part due to violations of ESA in connection with the analysis of Desert Rock's effects to endangered and threatened species. *See In re Desert Rock Energy Company, LLC*, 2009 EPA App. LEXIS 28 (EPA App. 2009).

[118] Desert Rock BiOp.

[119] *Id.* Adult fish with diets high in mercury do not typically experience associated mortality; rather, they deposit excess mercury or selenium in the yolks of developing eggs that fry then use as an energy and protein source; it is at this stage that developmental anomalies occur. *Id.* at 120-21. The deformities are either lethal or cause the fry to be more susceptible to predators or other environmental stressors. *Id.*

[120] *See* Environmental Protection Agency, *Toxics Release Inventory*, available at: http://www.epa.gov/tri/.

[121] Environmental Contaminants Data Management System (ECDMS) Catalogs, *Hg in San Juan*

population-scale mercury concentrations derived from muscle-brain mercury tissue concentration ratios established in peer-reviewed literature;[122] and, (3) peer-reviewed brain tissue mercury concentration thresholds for reproductive impairment derived.[123] The BA should have been supported by similar reliance on actual physical evidence, not merely statistical models. Moreover, although the ERAs advocate consideration of "alternative" and more permissive thresholds for toxic exposure, they nevertheless acknowledge that the scientific-consensus exposure levels used in the Desert Rock BiOp are appropriate for listed species and sensitive life stages. Deposition ERA at 7-4.

Because, even under conservative estimates baseline mercury levels already exceed thresholds for reproductive impairment in a majority of individuals within Colorado pikeminnow, FCPP's past and ongoing mercury emissions already jeopardize Colorado pikeminnow by polluting the fish's critical habitat and preventing its survival and recovery. Because already-deposited mercury that has bio-accumulated in the San Juan River ecosystem will persist for decades, any future mercury emissions from FCPP will worsen baseline conditions for Colorado pikeminnow and other listed species. The fact that these species are already at risk does not excuse EPA/OSMRE from taking a hard look and disclosing the extent of, intensity of, and comparative effects of various alternatives on those risks.

8.3 The BA mischaracterizes APS's own ecological risk analyses.

For its evaluation of potential effects of future emissions, the BA relies almost exclusively on two Ecological Risk Analyses prepared on behalf of Arizona Public Service.[124] These ERA's attempt to quantify a "hazard quotient," a method of determining whether a particular constituent of potential ecological concern ("COPEC") poses a risk to a specified biological receptor. San Juan ERA at 4-5; BA at 4-7. The actual quotient in question refers to an exposure point concentration ("EPC") divided by an ecological screening value ("ESV"). San Juan ERA at 4-1, 4-5. The DEIS relies on the fact that hazard quotients for mercury and selenium exposure would be extremely high even without future FCPP emissions to avoid engaging in any quantitative or even qualitative analysis of the incremental effects of either FCPP emissions or cumulative emissions on pikeminnow and sucker toxicity, mortality, reproduction, or recovery. The ERA makes clear, however, that the hazard quotient method is designed only to determine whether or not a risk exists (i.e. whether or not the HQ is greater than 1), and that it does not quantify or describe the scope or severity of that risk. *See* San Juan ERA at 6-19 to 6-20 ("The simple 'HQ' approach provides a conservative measure of the potential for risk based on a 'snapshot' of conditions and the hazard quotient approach has no predictive capability. HQs are measures of levels of concern, not measures of risk.") ("The HQ is not a

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*River Colorado Pikeminnow Muscle* (obtained from Desert Rock BiOp record) (attached as Exhibit 36).

[122] *See* Appendix E, *Mercury concentrations in both brain and muscle tissues from fish toxicity studies* (obtained from Desert Rock BiOp record) (attached as Exhibit 34).

[123] Raw data on effects to Pikeminnow (obtained from Desert Rock BiOp record) (attached as Exhibit 37).

[124] *See* BA at 4-1 to 4-12.

measure of risk . . . the HQ is not a population-based measure, HQs do not refer to the number of individuals or percentage of the exposed population that is expected to be impacted . . . HQs are not linearly scaled, the level of concern for a receptor with a HQ of 10 may not be twice the concern over a HQ of 5.") Because risk does not scale linearly with HQ nor does HQ quantify the extent of potential population effects, the existence of extremely high HQs alone does not excuse EPA from at least making some reasoned attempt to quantify or otherwise describe the numbers of endangered fish that will be adversely affected both with and without FCPP, and to assess the resulting impacts on species survival and/or recovery.

The BA acknowledges briefly, but then fails to act upon, substantial limitations the hazard quotient approach in addressing community- and population-level effects:

> It is important to recognize that these ERAs do not directly address potential effects to species communities or populations, but rather address potential effects to individuals. For generic ecological receptors, population-level effects may be of greater relevance than effects to individuals. It is generally assumed that as the number of affected individuals increases, the likelihood of population-level effects also increases. However, effects on individual organisms may occur with little or no population or community-level effects and, therefore, the analysis presented here is considered conservative in the context of population-level risk. Nevertheless, for special-status species and, in particular, federally listed species, potential effects to individuals may be relevant, especially for immobile early life-stage individuals.[125]

Despite this acknowledgment, the DEIS's treatment of listed species, including the Colorado pikeminnow, razorback sucker, and southwestern willow flycatcher, fails to undertake any informed analysis of population-level effects or effects on sensitive life stages.

8.4 The BA must address reactive gaseous mercury deposition.

EPA must better evaluate FCPP/Navajo Mine Complex's impact on endangered Colorado pikeminnow, the razorback sucker and their critical habitat. Both fish would be exposed to mercury emissions through surface and groundwater contamination and ambient air exposure, deposition, and runoff into aquatic habitats, and subsequent bioaccumulation through the food chain.[126] Upon entering the San Juan River ecosystem, microorganisms convert mercury to methylmercury, a highly toxic form of mercury.[127] Because methylmercury is stable and accumulates through the food chain, the highest mercury concentrations are found in top predators, such as the Colorado pikeminnow, causing reproductive impairment, behavioral changes, and brain damage.[128] The FWS and OSM must evaluate the relative contribution of reactive gaseous mercury deposition from FCPP and other coal-fired power plants in the action

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[125] FCPP/NM BA at 4-7.
[126] Desert Rock BiOp, at 120.
[127] *Id.*
[128] *Id.*

area. The Desert Rock BiOp notes that "[t]he reactive form of mercury is often deposited to land or water surfaces much closer to their sources due to its chemical reactivity and high water solubility" and that "[p]articulate mercury is transported and deposited at intermediate distances depending on aerosol diameter or mass."[129] Data from Mesa Verde National Park show mercury concentrations in precipitation that are "among the highest measured in the United States" and "have trajectories that trace back to within 50 km of the FCPP and SJGS," supporting the theory that "air masses passing from south Arizona and near these coal-fired power plant facilities [FCPP and SJGS] are contributing to high deposition of mercury there."[130] There is also a "clear increase" in mercury deposition in lake bottoms in southwestern Colorado that correlates with the construction of FCPP and SJGS between 1963 and 1977.[131] These two plants "are among the largest sources of mercury emissions in the western U.S."[132] The BiOp suggests but does not explicitly link the reactive form of mercury presumably coming from FCPP and SJGS and the fact that pikeminnow are experiencing reproductive impairment due to mercury.

8.5 Analysis of mercury in muscle plugs and emissions sources.

EPA and FWS should undertake an analysis to determine whether and how much of the tissue-bound mercury in endangered Colorado pikeminnow is derived from mercury deposited by FCPP and other regional coal-fired power plants. The BA does not answer this question. The ERAs, by focusing solely on the narrow question of whether a hazard quotient is greater or less than 1 (whether a risk exists or not) under various scenarios, also fail to address the relative contribution of FCPP and other four corners plants to mercury accumulation in fish tissues. In order to determine the sources from which mercury in endangered fish muscle tissue samples is derived, OSM, USFWS and USGS must, as part of the EIS and Biological Opinion process, undertake a study to compare isotopic signatures of mercury in endangered fish tissue samples to isotopic signatures of mercury from FCPP and other regional and pan-regional mercury sources. Short of undertaking of this or another such analyses, neither EPA nor USFWS can ensure that FCPP's past, ongoing, and future mercury deposition is not significantly responsible for elevated mercury and corresponding jeopardy in endangered San Juan River fish.

8.6 Impingement and Entrainment Will Jeopardize Colorado Pikeminnow and Razorback Sucker and Adversely Modify Critical Habitat

Operation of water intake structures will adversely modify critical habitat for Colorado pikeminnow and kill and injure adult and larvae Colorado pikeminnow and razorback sucker through impingement and entrainment. Considered alongside the current status of the fish and an environmental baseline of jeopardy from mercury and selenium contamination, operation of intake structures will jeopardize the continued existence of listed species.

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[129] *Id.* at 74.
[130] *Id.* at 75; *see also* MSI Report.
[131] *Id.*
[132] *Id.* at 76.

The APS Weir at RM 163.3 is located in designated critical habitat for Colorado pikeminnow and upstream of designated critical habitat for razorback sucker. The weir extends across the San Juan River and impeding its flow, bank to bank. The weir diverts water from the San Juan River into two 10 by 10 ft. intakes. BA at 7-12. Each intake is covered by 1 by 3 inch wire mesh screen. *Id.* The intakes run in two modes at all times of day, extracting either 31 (17,000 gpm, 24.5 million gpd) or 71 (32,000 gpm, 46 million gpd) cubic feet of river water per second. *Id.* The former mode runs from October to May; the latter, higher flow, from May to October. *Id.*

The weir adversely modifies critical habitat for Colorado pikeminnow by impeding migration within critical habitat:

> [t]he 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).g Factor A, USFWS 2002a, b).[133]

Larval or adult Colorado pikeminnow and razorback sucker can be killed or injured when entrained or impinged. Death from impingement and entrainment can occur immediately or later as a result of injuries sustained during contact with a cooling water intake system. EPA defines impingement and entrainment as follows:

> Impingement takes place when organisms are trapped against intake screens by the force of the water being drawn through the cooling water intake structure. The velocity of the water withdrawal by the cooling water intake structure may prevent proper gill movement, remove fish scales, and cause other physical harm or death of affected organisms through exhaustion, starvation, asphyxiation, and descaling.
>
> Entrainment occurs when organisms are drawn through the cooling water intake structure into the cooling system. Organisms that become entrained are typically relatively small, aquatic organisms, including early life stages of fish and shellfish. As entrained organisms pass through a facility's cooling system they may be subject to mechanical, thermal, and at times, chemical stress.[134]

The BA acknowledges that intakes will entrain and kill endangered Colorado pikeminnow:

> 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

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[133] *See* BA at 7-12.
[134] Final Rule: National Pollutant Discharge Elimination System-Final Regulations to Establish Requirements for Cooling Water Intake Structures at Phase II Existing Facilities, 69 Fed. Reg. 41,576, 41,586 (Jul. 9, 2004) [hereinafter "2004 Cooling Water Intake Structures at Phase II Rule"].

> 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.
>
> The SJRRIP 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.[135]

And:

> The Proposed Action, in combination with baseline conditions and reasonably foreseeable future conditions, may affect and is likely to adversely affect Colorado pikeminnow, as a result of entrainment at the Arizona Public Service Company (APS) Weir, release of non-native fish from Morgan Lake into the San Juan River via No Name Wash and the Chaco River, and atmospheric emissions of contaminants that are already present in watershed in quantities that may adversely affect the species.[136]

And:

> OSMRE concludes that the Proposed Action may affect and is likely to adversely affect Colorado pikeminnow as a result of entrainment at the APS Weir, release of non-native fish from Morgan Lake into the San Juan River via No Name Wash and the Chaco River, and atmospheric emissions of contaminants, which are already present in watershed in quantities that may adversely affect the species. [137]
>
> OSMRE concludes that the Proposed Action may affect and is likely to adversely affect razorback sucker, as a result of entrainment at the APS Weir, release of non-native fish from Morgan Lake into the San Juan River via No Name Wash and the Chaco River, and atmospheric emissions of contaminants, which are already present in watershed in quantities that may adversely affect the species.[138]

[135] BA at 7-13.
[136] *Id* at xiv.
[137] *Id* at 9-1.
[138] *Id.*

In formal consultation, after evaluating all relevant information, EPA/FWS must prepare a "biological opinion," which considers the current status of the species, the environmental baseline, and the effects of the proposed action, and concludes "whether the action, taken together with cumulative effects, is likely to jeopardize the continued existence of listed species…." *Id.* § 402.14(g)(2)-(4). If "jeopardy" is likely to occur, EPA/FWS must prescribe in the BiOp "reasonable and prudent alternatives" to avoid that result. 50 C.F.R. § 402.14(i)(1)(ii).

Here, the proposed action will adversely modify critical habitat for Colorado pikeminnow and kill and injure adult, juvenile and larvae Colorado pikeminnow and razorback sucker through impingement and entrainment. Considered alongside the current status of the fish, including an environmental baseline of jeopardy from mercury and selenium contamination, *any* impingement or entrainment at intake structures will jeopardize the continued existence of Colorado pikeminnow and razorback sucker. EPA/FWS must therefore prescribe in the BiOp "reasonable and prudent alternatives" that avoid jeopardy from impingement and entrainment. 50 C.F.R. § 402.14(i)(1)(ii).

### 8.6 EPA/FWS must require closed-cycle or dry cooling technology in a reasonable and prudent alternative(s) (RPA).

Closed-cycle cooling systems recirculate cooling water in low- profile towers, reducing water withdrawals and fish kills between 95 and 98 percent over once-through cooling systems. In its Clean Water Act 316(b) rulemaking process, analyses and comments thereto, EPA has at its disposal, and must make available to FWS in this instance, extensive information on the benefits of closed-cycle cooling technology for river fish, including San Juan River endangered fish. Commenters provide as reference information for closed-cycle cooling systems comments provided by Riverkeeper et al. to EPA's rulemaking.[139] In that rulemaking, EPA analyzed and concluded the effectiveness of closed-cycle cooling system for reducing impingement or entrainment:

> In evaluating technologies that reduce impingement or entrainment mortality as the possible basis for section 316(b) requirements, EPA assessed a number of different technologies. Based on this technology assessment, EPA concluded that closed-cycle cooling reduces impingement and entrainment mortality to the greatest extent.[140]

The ESA demands that federal agencies "afford first priority to the declared national policy of saving endangered species" in light of the "conscious decision by Congress to give endangered species priority over the 'primary missions' of federal agencies." *Tennessee Valley Auth. v. Hill*, 437 U.S. 153, 185 (1978). This means that "[w]hen an agency, acting in furtherance of a broad Congressional mandate, chooses a course of action which is not specifically mandated by Congress and which is not specifically necessitated by the broad mandate, that action is, by definition, discretionary and is thus subject to Section 7 consultation." *Nat'l Wildlife Fed'n v.*

[139] Exhibit 39 hereto.
[140] 76 Fed. Reg. at 22,207.

*Nat'l Marine Fisheries Serv.*, 524 F.3d 917, 929 (9th Cir. 2008). In this case, EPA's discretion in carrying out its duty under the Clean Water Act must be exercised in a manner that neither jeopardizes the recovery or survival of listed species nor adversely modifies critical habitat. *See, e.g.*, *Am. Rivers, Inc. v. U.S. Army Corps of Eng'rs.*, 421 F.3d 618, 631 (8th Cir. 2005) ("[T]he FCA does not mandate a particular level of river flow or length of navigation season, but rather allows the Corps to decide how best to support the primary interest of navigation in balance with other interests. . . . Because the Corps is able to exercise its discretion in determining how best to fulfill the purposes of the reservoir system's enabling statute, the operation of the reservoir system is subject to the requirements of the ESA.").

Because closed-cycle and dry cycle cooling systems would sharply reduce or eliminate endangered fish kills in the San Juan River, installation of those technologies at Four Corners Power Plant would avoid the likelihood of jeopardizing the continued existence of listed species and avert the destruction or adverse modification of critical habitat. FWS must therefore require the installation and use of those technologies in a reasonable and prudent alternative to the proposed action. By reducing or eliminating river water withdrawals within designated critical habitat, the use of closed-cycle or dry cooling technology at the Four Corners Power Plant can sharply reduce or eliminate endangered fish kills, adverse modification of critical habitat, and jeopardy to Colorado pikeminnow and razorback sucker.

In satisfying its duty to avoid jeopardy of threatened and endangered species, an agency must formally consult with the FWS if, as here, a biological assessment finds that the action "may affect" a threatened or endangered species. 16 U.S.C. § 1536(b); 50 C.F.R. § 402.14; also see 51 Fed. Reg. 19,926, 19,949 (June 3, 1986) ("may affect" includes "[a]ny possible effect, whether beneficial, benign, adverse, or of an undetermined character"). Following this formal consultation, the Service issues a biological opinion ("BO") summarizing its findings and determining whether the proposed action is likely to jeopardize the continued existence of the species and/or result in adverse modification of designated critical habitat. 50 C.F.R. § 402.14(h). If FWS finds the action likely to jeopardize the continued existence of the listed species, the BO must suggest "reasonable and prudent alternative" that could be taken by the action agency to avoid such jeopardy. 16 U.S.C. § 1536(b)(3)(A). § 402.14(h)(3). "[R]easonable and prudent alternatives" are alternative actions identified during formal consultation that (1) can be implemented in a manner consistent with the intended purpose of the action, (2) can be implemented consistent with the scope of the action agency's legal authority, (3) are economically and technologically feasible, and (4) would avoid the likelihood of jeopardizing the continued existence of listed species and/or avert the destruction or adverse modification of critical habitat.

In this case, and as discussed elsewhere in these comments, the requirement of closed-cycle cooling system at Four Corners Power Plant is entirely consistent with the intended purpose of the action; closed-cycle cooling systems can cool electric generating facilities with fewer environmental impacts, and fewer impacts to endangered species and designated critical habitat, than once-through cooling systems. Requiring a closed-system cooling system at Four Corners Power Plant is also well within EPA's legal authority to regulate facilities using cooling water intake structures (CWISs) under Section 316(b) the Clean Water Act (CW A), and it is entirely within the U.S. Fish and Wildlife Service's authority to regulate federal actions to avoid jeopardy to endangered species or adverse modification of critical habitat under the Endangered Species Act. 16 U.S.C. § 1536(a)(1), (a)(2).[141] The Riverkeeper comments on the Section 316(b) rule, which we incorporate here by reference, provide extensive discussion and analysis demonstrating the technical and economic feasibility of installing closed-cycle cooling systems on existing facilities. Finally, insofar as: (1) existing direct, indirect and cumulative impacts create baseline conditions, such as contamination of endangered fish with mercury, that jeopardize endangered fish and adversely modify critical habitat; and, (2) operation of the APS weir and intakes would further contribute to jeopardy of Colorado pikeminnow and razorback sucker by adversely modifying critical habitat and injuring and killing endangered fish through impingement and entrainment, requiring installation and use of a closed-cycle or dry cooling system at Four Corners Power Plant in the context of a reasonable and prudent alternative to the proposed action would avoid the likelihood of jeopardizing the continued existence of listed species and/or avert the destruction or adverse modification of critical habitat.

## IV. Conclusion

Thank you for the opportunity to submit comments on EPA's Draft NPDES permit for the FCPP. We ask that you incorporate all of our comments into EPA's final permitting decision. In addition to sending you this letter by email, I also sent you by overnight mail on February 17, 2015 two CD/DVDs containing the exhibits referenced in this letter. Please confirm receipt of this comment letter and the CD/DVDs. Please contact me at (303) 774-8868 if you have any questions. Thank you.

Sincerely,

s/ John Barth

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[141] Exhibit 39 (Riverkeeper 316(b) comments).

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# Exhibit 11

**RESPONSE TO COMMENTS**
**NTEC Navajo Mine**
**NPDES Permit No. NN0028193**

EPA received comments from the Law Office of John M. Barth on behalf of San Juan Citizens Alliance, Center for Biological Diversity, on EPA's Draft renewal NPDES Permit for the NTEC Navajo Mine, NPDES Permit No. NN0028193. EPA has summarized the comments and responded to the comments below.

**COMMENT 1:** While we are pleased that EPA is updating the Navajo Mine permit in a relatively prompt timeframe, we remain concerned with the unreasonable delay in the reissuance of the related Four Corners Power Plant NPDES permit. As you know, these two permits are related because the Navajo Mine provides the coal that is burned at the neighboring Four Corners Power Plant. The last time the Four Corners Power Plant NPDES was reissued by EPA was on April 3, 2001. Thus, it has been nearly 15 years (or 3 five-year permit cycles) since EPA Region 9 has updated the Four Corners Power Plant NPDES permit. On May 16, 2014, SJCA and CBD issued a notice of intent to sue EPA for its unreasonable delay in issuing the Four Corners Power Plant (FCPP) NPDES permit. See attached. While EPA subsequently issued a draft reissued permit on November 13, 2014, and a coalition of conservation organizations submitted comments on February 18, 2015, EPA has yet to issue a final renewal permit for the facility. Please promptly issue the final NPDES permit for the Four Corners Power Plant.

**RESPONSE 1:** Comment noted. EPA is issuing the final permit for the Navajo Mine now and will issue the permit for the Four Corners Power Plant in the immediate future.

**COMMENT 2:** As noted in EPA's Fact Sheet, some of the discharges and impacts from the Navajo Mine cross into the Four Corners Power Plant lease area. In addition, the Fact Sheet states that coal combustion byproducts (CCB) from the Four Corners Power Plant have been disposed of on the Navajo Mine, but then states "[t]he disposal of all CCB material produced by FCPP is the responsibility of the Arizona Public Service Co. ("APS")." Given the interrelationship of the discharges and sources of pollution between the Navajo Mine and the Four Corners Power Plant, we request that APS be listed as an additional "permittee" under this permit because it is responsible for potential discharges of CCB into receiving waters. Likewise, we request that NTEC and/or BHP be included as additional permittees under the Four Corners Power Plant NPDES permit because they contribute discharges to receiving waters located within the FCPP lease area.

**RESPONSE 2:** The NPDES statutory scheme and accompanying regulations impose the obligations of a permit on the operator and/or owner of the site where the discharge occurs. See, generally, 40 CFR Sections 122.1 and 122.2. Although activities at Navajo Mine and the Four Corners Power Plant are interdependent, both the legal ownership and the functional operations are clearly distinct. The mine is presently owned by Navajo Transitional Energy Company

(NTEC) and operated by Bisti Fuels Company, LLC ("BFC"). The Four Corners Power Plant is operated on leased lands on the Navajo Nation by the Arizona Public Service Co. ("APS"). For that reason, EPA is issuing two distinct NPDES permits, one of which covers discharges on the Navajo Mine property.

**COMMENT 3:** EPA's Fact Sheet acknowledges that extensive CCB materials from the FCPP have been disposed of in unlined mine pits located on the Navajo Mine. In comments on the Draft Environmental Impact Statement (DEIS) for the FCPP/Navajo Mine complex, EPA stated,

"Contamination from coal combustion residue (CCR) placed at the Navajo Mine has leached, and will continue to leach, directly into groundwater of the Fruitland Formation coal seams and the Pictured Cliffs Sandstone Formation. The DEIS acknowledges "high levels of chemical constituents of concern exist within the wells in the historic mining area" (p. 4.5-44). The DEIS concludes, however, that "Thus far, negligible impacts have resulted from the CCR placement. It is also unlikely that any significant future effects will ensue from the CCR placement at the Navajo Mine because of the very slow groundwater movement and the likely attenuation of contaminants of concern as they migrate through the subsurface" and that "Therefore, past CCR placement at the Navajo Mine is determined to have no impact in the short- or long-term" (p. 4.5-14). Elsewhere it states that the potential impacts to current and future water uses from CCR placement at the Navajo Mine are minor (p. 4.5-44), despite the identified major impacts for pH, boron, selenium, fluoride and sulfate (p. 4.5-44), with concentrations of boron, fluoride, sulfate, and total dissolved solids (TDS) exceeding the criteria for livestock watering, a designated post reclamation land use. These conclusions, especially that of "no impact", do not appear to be supported. The modeling assumption that contaminants would be attenuated as they migrate through the subsurface has not been confirmed. Additionally, the assumption that pollutants would be diluted by the larger San Juan River groundwater flow, even if they are not attenuated during transport to the Fruitland Formation, is brought into question since the transport modeling and sampling that occurred seems to have not fully recognized the possibility of a significant vertical (fracture) flow in the Fruitland Formation. The DEIS indicates that the general flow direction of groundwater in the Fruitland Formation is downward through the interbedded shale and coal units to the lower strata of the Fruitland Formation, with marginal upward movement from the Pictured Cliffs Sandstone into the Fruitland Formation (p. 4.5-13). One can infer from the vertical flow directions that fracture flow might play a prominent role in the movement of bedrock groundwater in the FCPP area. This parameter was not considered in the groundwater modeling of the FCPP area. If vertical (and lateral) fracture flow is substantial, the assumed attenuation would not occur because fracture flow results in a much smaller residence time of groundwater in the bedrock formations and a limited opportunity for the contaminants to be adsorbed by bedrock clay. This would lead to a potentially larger groundwater impact downgradient of CCR placement than is predicted in the DEIS. The DEIS is not clear whether any ongoing groundwater or surface water monitoring would occur as a condition of this project. The DEIS seems to indicate that only groundwater and surface water monitoring that are part of the new SMCRA permit groundwater monitoring plan (originally from BHP Navajo Coal Company, but which the Navajo Transitional Energy Company will implement) would occur,

which relates to the new mine areas and the Pinabete and Cottonwood arroyos. It does not specify any monitoring of the historic contamination areas nor confirm that contaminated groundwater is not reaching the San Juan or Chaco River surface water or alluvia.
Recommendation: The FEIS should include additional information to support its groundwater and surface water impact assessment conclusions. We recommend that monitoring of groundwater quality at Areas I and II of the Navajo Mine and the San Juan River alluvium occur to confirm the model predictions that constituents of concern would be attenuated as groundwater travels towards the San Juan River and the Chaco River. Because the groundwater of the Fruitland and Pictured Cliffs Sandstone formations that enter into the alluvium also discharges into the San Juan River in the area of the Navajo Mine, monitoring of the San Juan River surface water quality upstream, along the mine reach, and downstream should occur if the groundwater monitoring results identify elevated levels of pollutants in the San Juan River alluvium that exceed Navajo Nation Water Quality Standards. In addition, the baseline groundwater quality should be clarified. The DEIS summarizes baseline results for Cottonwood, Pinabete, and No Name Arroyo alluvial wells in Table 4.5-5; however the presentation of this information is not useful. EPA previously commented that this summary does not allow an assessment of ground water impacts by source, and we recommended including some monitoring results by well in the DEIS. In addition, the identification/location of these baseline wells is of importance in order to confirm they do, indeed, represent baseline conditions and do not include contamination that is related to past CCR disposal. This information should be included in the FEIS." EPA DEIS Comment Letter dated June 26, 2014 attached hereto.

In light of EPA's comment letter, it is clear that the Navajo Mine CCR mine pits are, or may be, a point source of pollution to the San Juan River and/or its tributaries that must be regulated under this NPDES permit. Please regulate these CCR mine pit point sources in this permit, include appropriate monitoring for a vast array of constituents from the CCR mine pits, and impose TBELs and WQBELs.

**RESPONSE 3:**

EPA is issuing this NPDES permit under the authority of the Clean Water Act, which regulates the discharge of a pollutant through a point source to a water of the U.S. EPA does not have the authority under the Clean Water Act to regulate groundwater generally, to mandate the type of treatment employed to meet effluent limitations, or to regulate the disposal practices or other conditions on the mine which do not result in the discharge of a pollutant through a point source to a surface water. EPA recognizes that there are several authorities providing for regulatory control over the activities at a coal mine. The Office of Surface Mining Reclamation and Enforcement has direct authority over mining operations in accordance with the Surface Mining Control and Reclamation Act (SMCRA). Industrial solid waste handling and disposal may be regulated under the authority of the Resource Conservation and Recovery Act (RCRA). The Navajo Nation EPA has regulatory jurisdiction over the protection of groundwater on the Navajo Nation. Additionally, the Navajo Nation EPA has the authority under the Clean Water Act to certify that EPA's permitting actions are in compliance with the Tribe's surface water quality standards.

EPA notes that the question of mine waste discharging into surface waters was evaluated extensively at the time of the reissuance of the NPDES permit for the mine in 2008 (2008 NPDES Permit). At that time, based on ongoing monitoring required under the previous permit and on additional studies submitted by commenters and the mine operator, EPA concluded that the evidence did not support a finding that the CCR had an adverse effect on surface water. *See* Response to Comments for the 2008 NPDES Permit (included in the Administrative Record). Subsequent monitoring required under the 2008 NPDES Permit has not identified any significant changes that would require a reevaluation of the conclusions in the 2008 NPDES Permit Response to Comments. Disposal of CCR at the Mine stopped in 2008, and the permittee has no current nor future plans to use CCR materials as backfill for any future reclamation within the Navajo Mine Lease. The new permit requires a continuation of monitoring to determine whether any adverse effects are occurring. In addition, the new permit has added monitoring requirements for mercury, given the elevated concern in the broader basin over the effects of mercury on aquatic resources.

Should monitoring indicate that the discharge causes, has the reasonable potential to cause, or contributes to excursions above water quality criteria, the permit may be reopened for the imposition of water quality based limits and/or whole effluent toxicity limits. Also, this permit may be modified, in accordance with the requirements set forth at 40 CFR Sections 122.44 and 124.14, to include appropriate conditions or limits to address demonstrated effluent toxicity based on newly available information, or to implement any EPA approved new Tribal water quality standards. (*See* Section D "Permit Reopener" of the permit).

The commenter raises a related concern that at least some sources of pollution at the site constitute additional "point sources" requiring NPDES permits under the federal Clean Water Act. Consistent with the discussion above, EPA notes that monitoring done to date does not establish any clear hydrological connection between the CCR deposits and the discharge of a pollutant from a point source into any water of the U.S. This must be established before NPDES requirements would apply. Nevertheless, as noted, EPA is continuing and upgrading the monitoring requirements included in the 2008 NPDES Permit, so that any discharges can be identified and, where appropriate, addressed through the permit reopener provision or a distinct NPDES permit for a wholly different discharge.

**COMMENT 4:** EPA's Fact Sheet for the reissued Navajo Mine NPDES permit correctly states that "[a]n approved mine plan revision for Area IV North was vacated on April 6, 2015 by the U.S. District Court for Colorado pending further analysis under NEPA by the Office of Surface Mining Reclamation and Enforcement (OSM)." Fact Sheet, p. 1. As such, NTEC is not presently authorized to mine in Area IV North. EPA's Fact Sheet also states NTEC's NPDES renewal permit application seeks authorization to discharge from 26 new outfalls, many of which are located in proposed mining area Area IV North. See also FCPPNM BiOp 107. However, EPA has not provided a map showing the location of each proposed new outfall and which outfalls are located in Area IV North. We suggest that EPA provide such a map prior to finalizing the permit for the Navajo mine.

**RESPONSE 4:** A map will be provided in the factsheet with the permit issuance. The proposed draft also provided information about the location of the proposed new outfalls. EPA notes that the mine operator has withdrawn its request to include two outfalls (identified as Outfalls 001 and 002 in the draft permit) in this NPDES permit. *See* Letter from Brien J. Flanagan (Schwabe et al.) to Gary Sheth (EPA) dated October 18, 2017(included in the Administrative Record). Therefore, any discharges from Outfalls 001 and/or 002 would not be covered by this new permit.

**COMMENT 5:** EPA's draft permit proposes to approve discharge from as many as 26 new outfalls located in unapproved mining areas. EPA is putting the cart ahead of the horse. Since NTEC is not authorized to mine in Area IV North, it is arbitrary and capricious for EPA to authorize discharges from mining activities in this unapproved proposed mining area. Stated another way, EPA may only authorize mining related discharges in areas that are approved for mining. Accordingly, we ask EPA to remove from the final permit all authorizations to discharge from outfalls located in unapproved mining areas, including but not limited to Area IV North. If NTEC ever receives authorization to mine in this new area, it can reapply to EPA for authorization to discharge at that time.

**RESPONSE 5:** As a general matter, EPA does not agree with the commenter's suggestion that it cannot issue an NPDES permit unless and until the discharger has secured all other regulatory permissions to conduct the action. An NPDES permit is one of several permits or approvals that may need to be secured for a proposed action, and the issuance of an NPDES does not have the effect of amending any other regulatory or legal requirements for the mine. At this point, NTEC has received authorization from OSMRE to mine in the new areas. *See* SMCRA Permit No. NM-003G and SMCRA (NM-0042A) Permit (July 17, 2015). EPA action in issuing this NPDES permit is timely.

**COMMENT 6:** EPA's Fact Sheet states that NTEC submitted a letter dated November 22, 2013 in which BNCC identified 10 corrective actions to be taken pursuant to the facility's MSGP and that it would "meet all requirements of the 2008 MSGP and the Memo (9/27/13 EPA Giles Guidance Memo) and will notify the EPA NPDES permitting authority prior to the discharge of any storm water associated with industrial activity." We ask that EPA make publicly available the November 22, 2013 letter, the related 2012 inspection report, and identify any corrective actions that remain to be implemented. Moreover, as stated above, EPA may not authorize any discharge of storm water from industrial activity is areas that have not received authorization for mining.

**RESPONSE 6:** The material referenced in the comment is included in the Administrative Record for this permit. We note, however, that the 2008 Multi-Sector General Permit (MSGP) has been superseded and that the applicant has submitted its required notice to be covered under the new MSGP. That information is also included in the Administrative Record for this permit. *See also* Comment 10, below.

**COMMENT 7:** Section 7(a)(2) of the Endangered Species Act requires that: Each Federal agency shall, in consultation with and with the assistance of the Secretary [of Commerce or the Interior], insure that any action authorized, funded, or carried out by such agency ... is not likely to jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of habitat of such species which is determined . . . to be critical, unless such agency has been granted an exemption for such action . . . pursuant to subsection (h) of this section. 16 U.S.C. § 1536(a)(2). Section 7(a)(2) imposes two obligations upon federal agencies.
The first is procedural and requires that agencies consult with the FWS to determine the effects of their actions on endangered or threatened species and their critical habitat. See 16 U.S.C. § 1536(b). The second is substantive and requires that agencies ensure that their actions do not jeopardize endangered or threatened species or their critical habitat. See 16 U.S.C. § 1536(a)(2); see also, Florida Key Deer v. Paulison, 522 F.3d 1133, 1138 (11th Cir. 2008).

Issuance of a (discretionary) NPDES permit is plainly a federal action subject to the requirements of ESA section 7, and compliance with the substantive minimum requirements of the CWA does not, in and of itself, necessarily satisfy the independent substantive requirements of ESA Section 7(a)(2). See National Association of Home Builders v. Defenders of Wildlife, 551 U.S. 644, 666-68 (2007) (CWA, ESA, and implementing regulations require consultation and jeopardy determination for discretionary permit issuance). EPA acknowledges the presence of seven listed species present within the immediate area of the outfalls. Fact Sheet 9-10. It then proceeds to rely upon, for compliance with ESA Section 7(a)(2), "the Biological Opinion issued by USFWS on April 8, 2015, which considers the entire Four Corners Power Plant and Navajo Mine Energy Project Proposed Action, including explicitly the U.S. EPA's action on this NPDES Permit NN0028193." Fact Sheet 10. As detailed below, reliance on the Biological Opinion for the Four Corners Power Plant and Navajo Mine Energy Project ("FCPPNM BiOp") is invalid to satisfy EPA's obligations to determine the effects of its actions on listed species and critical habitat and to ensure those actions do not jeopardize the species or adversely affect critical habitat.

The FCPPNM BiOp briefly discusses this proposed action under the heading "Effects of Stormwater Runoff, Point Source, and Other USEPA Authorized Discharges." FCPPNM BiOp 107-109. Its analysis does not appear to distinguish Navajo Mine discharges from FCPP operational discharges, but considers them collectively. It addresses two bioaccumulative toxic pollutants, mercury (Hg) and selenium (Se) that are causes of serious behavioral, reproductive, and other impairment to the listed Colorado pikeminnow and razorback sucker. See FCPPNM BiOp 72-103, 116-119. The BiOp addresses NPDES-permitted outfalls under the assumption that "a PQL [Practical Quantification Level] for Se of 1 ug/L and a PQL for total Hg of 0.0002 ug/L will be used." FCPPNM BiOp 108.[1] Assuming these limits on EPA-authorized discharges of Se and Hg, the BiOp concludes that:

> Using the PQLs and the bioaccumulation factors (BAF) provided in the BA (OSMRE 2014, page 6-18) for Se (BAF = 485 L/mg), we expect Se in whole body razorback suckers and Colorado pikeminnow to increase to approximately 2.4 mg/kg wet weight and their egg Se concentrations would increase to 13.6 to 19.4 mg/kg DW resulting in an increase in egg mortality ranging from 4 to 5 percent. Using the PQL for Hg and the BAF provided in the BA (OSMRE 2014, page 6-18) for total Hg (BAF = 3,520), we expect Hg in whole body razorback suckers and Colorado pikeminnow to be approximately 0.1 mg/kg wet weight and therefore, associate a 2.8 percent reproductive injury and a 0.5 percent survivorship injury (Table 8). We conclude that in both cases, the PQLs used in the NPDES permits or discharges of Hg and Se would be associated with a wide range of adverse effects to the Colorado Pikeminnow and razorback sucker and their designated critical habitat.

FCPPNM BiOp 108-109 (emphasis added). Thus, the BiOp finds significant adverse effects on the Colorado pikeminnow and razorback sucker, and their designated critical habitat, from what it assumes to be effluent limits of 1 ug/L for selenium and 0.0002 ug/L for mercury. BiOp 108.[2]

EPA's reliance on the FCPPNM BiOp to satisfy its Section 7(a)(2) obligations with regard to the Navajo Mine NPDES permit is invalid for the simple reason that the FCPPNM BiOp assumes effluent limitations and/or monitoring not present in the draft permit. The draft permit contains no effluent limitations for either mercury or selenium, see Draft NPDES Permit No. NN0028193 at 3-5 Tables A-1 and A-2, and does not even contain a monitoring requirement for mercury. This lack of even a monitoring requirement for mercury appears to contradict the BiOp's assumption that "We therefore expect that NPDES permits identifying outfalls with the potential to discharge Hg will provide monitoring data for Hg using Method 1631E or another sufficiently sensitive EPA-approved method," BiOp 107. Without even monitoring for mercury from the outfalls, it is impermissible for the NPDES permits to rely on the BiOp's assumption that their mercury contribution will be less than 0.0002 ug/L. If the BiOp's assumptions regarding maximum mercury loading are unsupported by permit terms, its conclusions regarding reproductive and survivorship injury are similarly unsubstantiated, and clearly inconsistent with the ESA's requirement to utilize best available science.

Relying on the FCPPNM BiOp to establish ESA compliance for the Navajo Mine's water outfalls is also inappropriate because the BiOp improperly excludes all consideration of the cumulative effects of selenium loading from the Navajo Indian Irrigation Project ("NIIP").[3] The NIIP is a major source of selenium loading in the San Juan River system, see Bureau of Indian Affairs, Navajo Indian Irrigation Project Biological Assessment (June 11, 1999). Selenium is in turn a major source of bioaccumulative toxicity to fish, particularly at the ovary, egg, and fry stage. FCPPNM BiOp 99-103. Baseline selenium levels in the San Juan Basin are already sufficiently elevated to cause reproductive and other harm to the Colorado pikeminnow and razorback sucker. BiOp 98. The BiOp acknowledges that, discounting all NIIP contributions, selenium from FCPP and Navajo Mine will harm "as many as 25,503 Colorado pikeminnow eggs/ovaries and 291,510 razorback sucker eggs/ovaries," and that critical habitat will be adversely affected by the project's added selenium deposition. BiOp 119. Any conclusion that the population-level effects of Navajo Mine selenium discharge will not jeopardize razorback sucker or critical habitat, however, is invalid if it declines to consider the contribution of one of the basin's largest selenium sources, runoff from the NIIP. The BiOp acknowledges that, in the future, NIIP "use of San Juan River water is expected to approximately double." BiOp 63. The FCPPNM FEIS similarly acknowledges "if increased water is required for agricultural uses, it could result in increased runoff of pesticides and selenium from agricultural return flows." Four Corners Power Plant and Navajo Mine Energy Project Any Final Environmental Impact Statement 4.18-45 (May 2015). Yet the BiOp explicitly excludes consideration from cumulative effects of any potential future discharges from BIA irrigation projects. The explicit refusal to consider these reasonably foreseeable contributions to San Juan Basin selenium loads from BIA actions contravenes the ESA's mandate to utilize best available science.

Finally, reliance on the FCPPNM BiOp is inappropriate because it omits any consideration of a significant new event and significant new information that post-dates that BiOp – the release of large quantities of pollutants from the Gold King Mine into the Animas River and from there into the San Juan River, its sediments, and its biota. EPA states "we will be evaluating long-term impacts associated with exposure to the plume and the impacts of deposited sediments over time. EPA will be working with the States of Colorado, New Mexico and the Navajo Nation to evaluate these and other ecological impacts as we move forward." US EPA, Frequent Questions Related to Gold King Mine Response, available at http://www2.epa.gov/goldkingmine/frequent-questions-related-gold-king-mine-response (last visited Sept. 18, 2015). The FCPPNM BiOp, predating the Gold King release, contains no consideration of the effects of acidity, metals, or other toxins on water quality, sediment, invertebrates, or fish stemming from either the initial Gold King release or its continuing discharge of contaminated water. Without additional analysis of the effect of this substantial new information on water quality and toxin concentrations in fish and invertebrates, reliance on the April FCPPNM BiOp fails to meet the ESA's mandate to utilize the best available science.

**RESPONSE 7:** EPA agrees with commenter that it must comply with the Endangered Species Act when it issues the Clean Water Act NPDES permit renewal for the Navajo Mine NPDES Permit.

At the outset, EPA emphasizes that ESA Section 7(a)(2) and the underlying regulations at 50 CFR Section 401.10, et seq., establish a process whereby the federal action agency consults with the USFWS about the anticipated effects of the proposed federal action on listed species and their critical habitat. During this consultation process, the action agency is responsible for alerting the USFWS of the proposed action, requesting a species list, initiating early, informal and/or formal consultations as appropriate, developing a biological assessment, reviewing the USFWS biological opinion on the proposed action, and implementing appropriate project changes and "reasonable and prudent measures" to ensure that the federal action is not likely to jeopardize the continued existence of the listed species or destroy or adversely modify critical habitat. The USFWS is responsible for evaluating the available information about the relevant listed species, relying on both the biological assessment prepared by the action agency and other scientific information that is "otherwise available," and developing a biological opinion. *See* 50 CFR Section 402.14(g). The regulations anticipate that this will be a collaborative process, but it is clear that the USFWS, as the expert agency, is responsible for the scientific analysis and conclusions in the biological opinion.

A review of the record demonstrates that EPA consistently carried out its responsibilities as an action agency under the ESA.

The first challenge was to determine the scope of the analysis. Early discussions with the USFWS and other federal action agencies suggested that a broader analysis including all of the interrelated federal actions associated with the renewal of the FCPP permit and the expansion of the Navajo Mine would provide the best evaluation of potential impacts. *See* Final Environmental Impact Statement for the Four Corners Power Plant and Navajo Mine Energy Project (FEIS), Executive Summary, May 8, 2015, at page VI (Table of related federal actions considered in the NEPA and ESA reviews). A broader analysis would better identify direct, cumulative and indirect effects from all of the federal activities involved in the Four Corners Power Plant and Navajo Mine Energy Project ("Energy Project") and would enable a coordinated and comprehensive response to any identified issues. For that reason, the Office of Surface Mining Reclamation and Enforcement (OSMRE), the Bureau of Land Management (BLM), the Bureau of Indian Affairs (BIA), the U.S Army Corps of Engineers (USACE), the National Park Service (NPS), and EPA developed a single Biological Assessment under the ESA and a single FEIS under the National Environmental Policy Act (NEPA). This approach is consistent with the ESA regulations, which encourage agencies to coordinate environmental reviews under the different statutes. *See* 50 CFR 402.06. Commenter has not provided a reason why this consolidated approach was not warranted or legally cognizable for meeting the federal agencies' collective ESA consultation obligations.

OSMRE was the lead agency for purposes of preparing these analyses, and BLM, BIA, USACE, NPS, and EPA were formal cooperating agencies for the FEIS and consulting federal agencies for purposes of ESA consultations. *See* 50 CFR 402.07 (designating a lead agency); Letter from David Smith (EPA) to Marcello Calle (OSMRE) dated October 11, 2012 (NEPA and NHPA cooperation); Final Biological Opinion for the Four Corners Power Plant and Navajo Mine Energy Project (April 8, 2015) (Final Biological Opinion) at p. 24 (formally including EPA's permitting actions in the project description for purposes of Endangered Species Act consultations.) The ESA Biological Assessment (ESA BA) chronicles the significant early consultation (50 CFR 402.11) carried out by the USFWS and action agencies, as the agencies considered the scope of the necessary analyses. See ESA BA at pp. 1-6 to 1-9. The species list was developed and verified in the November 2013 to January 2014 timeframe (50 CFR 402.11(c) and (e)).

The ESA BA was finalized on August 8, 2014, and was amended primarily to reflect revised "reasonable and prudent measures" in a letter to USFWS dated March 13, 2015. The ESA BA made "not likely to adversely affect" findings as to certain listed species, and the USFWS concurred with those findings in its letter dated April 8, 2015. The ESA BA also concluded that formal consultation was appropriate as to other listed species. *See* 50 CFR 402.12 and 402.14. The USFWS issued its Final Biological Opinion on April 8, 2015. As noted below, EPA incorporated those reasonable and prudent measures and terms and conditions of the Final Biological Opinion that were pertinent to EPA into the proposed NPDES permits.

The FEIS for the Energy Project was released on May 8, 2015.

The commenter submitted his comment letter on the draft Navajo Mine permit on September 19, 2015.

On April 20, 2016, the commenter filed a lawsuit against OSMRE, BLM, USFWS, and BIA. The lawsuit alleged that certain actions (including an extended lease of the power plant property, an extension of the transmission line rights-of-way, and the permit to mine the new areas of the Navajo Mine) taken by the federal agencies to enable the continued mining and power plant operations at Navajo Mine and the Four Corners Power Point were based on an inadequate NEPA document and an inadequate Final Biological Opinion under the ESA. As noted above, all of the federal actions were evaluated in a single EIS and Biological Opinion for the federal actions comprising the Energy Project. *See* Dine Citizens Against Ruining Our Environment, et al. v. OSMRE, et al., Case No. 3:16-cv-08077, D. AZ (04/20/16.) That lawsuit was dismissed by the Court on September 11, 2017. The plaintiffs filed an appeal of the dismissal with the Ninth Circuit Court of Appeals on November 9, 2017.

At this time, no court has restricted federal agency use of the underlying documents (the Final Biological Opinion and the FEIS). EPA continues to believe that the ESA and NEPA compliance reflected in the Final Biological Opinion and the EIS fully complied with EPA's obligations under those federal laws, and EPA intends to rely on those documents and analyses as it issues its NPDES permit to the Navajo Mine.

Commenter raises a number of specific points about the Final Biological Opinion. As noted, the statutory scheme of the ESA provides that the expert agency – USFWS – develops and is responsible for the content of the Final Biological Opinion. The commenter had and took advantage of opportunities to comment directly on the Biological Opinion and the FEIS during the public comment processes for those separate exercises. Disagreements about the adequacy of the Final Biological Opinion or the FEIS may ultimately be resolved in the ongoing litigation. EPA, in this response to comments, is primarily responding to comments raised about the draft NPDES permit. Nevertheless, EPA believes that the Final Biological Opinion adequately addresses the points raised by the commenter.

First, the commenter asserts that the Final Biological Opinion is flawed because it relies on "effluent limitations and/or monitoring not present in the draft permit." The final permit does include monitoring for both selenium and mercury, and also requires monitoring protocols that are sufficiently sensitive to identify issues with discharged materials. *See* Final Permit, pages 4, 5, 8 and 10.

Second, the commenter believes that the Final Biological Opinion inadequately considers the impact of additional diversions by the Navajo Indian Irrigation Project (NIIP) and the related increases in contaminant loads resulting from those diversions. Again, this is a comment of the Final Biological Opinion itself, and not on any term or condition contained in EPA's permit. However, to the extent that EPA has any ability or authority to respond to this comment we note that the current NIIP diversions and impacts were included in the environmental baseline. *See* Final Biological Opinion at pages 97 and 102. By identifying pollutant contributions from the NIIP diversions as part of the "baseline," the Final Biological Opinion serves the same purpose as that achieved by identifying any increase in pollutants as part of a "contribution" from the NIIP diversions. The Final Biological Opinion also projects that diversions in the basin from all water users will increase over time, and that this, when combined with other actions in the basin, may lead to an increased contaminant loading in listed species. *See* Final Biological Opinion at pages 99, 102, and 130. EPA believes, therefore, that the USFWS adequately considered the possible impact of additional future diversions in the basin.

EPA notes that the Final Biological Opinion conclusions are not based on the absence of projected adverse impacts; instead, the conclusions reflect a permissible balancing of projected adverse impacts and the anticipated benefits of the San Joaquin River Basin Recovery Implementation Program (SJRRIP). *See* Final Biological Opinion at page 132.

Finally, the commenter contends that the Final Biological Opinion is flawed because it did not account for the recent contaminant spill at the Gold King Mine site. The accidental release of stored mine drainage at the Gold King Mine near Silverton, Colorado on August 5, 2015, generated an immediate and comprehensive response from EPA and its state, tribal and federal agency partners. The discharge created a short term plume of enhanced toxicity as it traveled downstream from the mine to the Animas River, the San Juan River, and the Colorado River. The EPA has evaluated the impacts this release in a number of reports, including "Analysis of the Transport and Fate of Metals Released from the Gold King Mine in the Animas and San Juan Rivers (Final Report)," U.S. Environmental Protection Agency, Washington, DC, EPA/600/R-16/296, 2016. The findings of the investigations as to fish and wildlife impacts are summarized at https://www.epa.gov/goldkingmine/frequent-questions-related-gold-king-mine-response. These studies have found no significant short term impacts to fish and wildlife resources from the spill. EPA and its partner agencies have also instituted a long term monitoring program to consider whether there are any long term adverse impacts for aquatic and aquatic dependent resources caused by the spill. If those investigations identify adverse impacts or suggested remedial actions, the USWFS has the capability under the Final Biological Opinion to reinitiate consultation to deal with this new information as it is developed. *See* Final Biological Opinion at page 157.

EPA received comments from BHP Billiton Mine Management Company (MMCo) on September 18, 2015 via a letter on EPA's Draft renewal NPDES Permit for the NTEC Navajo Mine, NPDES Permit No. NN0028193. EPA has summarized and responded to the comments below.

**Fact Sheet Comments**

**COMMENT 8:** OSMRE approved the Navajo Mine SMCRA Permit (NM-0003F) renewal application on July 15, 2015, and issued a new Navajo Mine SMCRA Permit number as NM003G. All references to SMCRA Permit No. NM-003F referenced in the fact sheet and permit can be updated to SMCRA Permit No. NM-003G. OSMRE completed its environmental review of the Pinabete SMCRA (NM-0042A) Permit and signed the Record of Decision on July 17, 2015. This reference in the proposed permit can be updated.

**RESPONSE 8:** Comment noted and updates will be incorporated.

**COMMENT 9:** Page 1, Section I. Status of Permit, second paragraph: MMCo is requesting the U.S. EPA to consider updating the fact sheet to include that the previous permit has 14 outfalls. Outfall 016 in the previous permit is located in the middle of an active reclamation area in Dixon Ramp 4. This outfall no longer functions as an NPDES outfall location and therefore is not included in the renewal.

**RESPONSE 9:** Comment noted and updates will be incorporated.

**COMMENT 10:** Page 2, Section I. Status of Permit, second paragraph: The text mentions only the 2012 Multi-Sector General Permit (MSGP) Annual Comprehensive Inspection. To more fully describe MMCo's compliance with the MSGP Annual Inspection requirement, MMCo is providing information about subsequent inspections for consideration as an addition to the fact sheet. MMCo as BNCC, completed a 2013 MSGP Annual Comprehensive Inspection. MMCo completed a 2014 MSGP Annual Comprehensive Inspection with the most recent inspection completed on June 29, 2015 that satisfied the 2015 MSGP annual Comprehensive Inspection and identified 52 corrective actions taken. Additionally, MMCo submitted a Notice of Intent for coverage under the 2015 MSGP on September 2, 2015. Coverage under the MSGP is expected to begin at the conclusion of the 30-day waiting period.

**RESPONSE 10:** Comment noted and updates will be incorporated.

**COMMENT 11:** Page 7, Section V (2), Water Quality-Based Effluent Limitations: The effluent limitation for sulfate was included in the previous permit and is mentioned in the fact sheet but was not included in the tables of effluent parameters. MMCo requests that the parameter table be updated to reflect the expectations of the U.S. EPA.

**RESPONSE 11:** Comment noted. The final permit will include limitation for sulfate to be consistent with the previous permit. The non-inclusion of sulfate in the proposed draft was inadvertent.

**COMMENT 12:** MMCo is providing more information to the U.S. EPA for consideration to include in the fact sheet. The Final Biological Opinion indicates that the OSMRE and the Bureau of Indian Affairs worked with the Project Proponents to develop several voluntary conservation measures to minimize the impacts of the proposed action on the listed species. Furthermore, the findings from the Four Corners Power Plant (FCPP) and Navajo Mine Energy Project Final Environmental Impact Statement for Environmental Justice Impacts indicated that the proposed action, including the continuing operations of the Navajo Mine and FCPP would not result in adverse impacts that would disproportionally affect low-income or minority populations.

**RESPONSE 12:** Comment noted. USEPA will use the additional information provided by MMCo. and update the fact sheet as appropriate.

**Permit Comments**

**COMMENT 13:** Page 6, Section A(4)(a)(b), Discharges resulting from precipitation events: The text describes authorization to discharge runoff resulting from precipitation greater than or equal to a 10-year, 24-hour event or equivalent to 1.80 inches within a 24-hour period. MMCo employs a Type II-70, 10-year, 24-hour storm event for design of its ponds and spillways which is equivalent to 1.56 inches within a 24-hour period. This depth is comparable to the National Ocean{ic} and Atmospheric Agency's (Sic) (NOAA) frequency estimates at the Fruitland 3E station for a 10-year, 24-hour storm event; however, this value varies from the proposed 1.80 inches. We request that U.S. EPA update the proposed precipitation depth to NOAA's 10-year, 24-hour storm event definition as the NOAA dataset is used in the design of ponds and spillways at Navajo Mine and Pinabete Mine.

**RESPONSE 13:** Comment noted. USEPA will use the updated NOAA estimates for the 10-year, 24-hour precipitation event.

**COMMENT 14:** Page 11, Section B(1)(3): The first sentence reads "may cause a Elm or iridescent appearance on the surface of the water body;". "Elm" appears to be a typographical error.

**RESPONSE 14:** Comment noted. The world "Elm" will be corrected to "film."

**COMMENT 15:** Page 11, Section C. Best Management Practices, *Residue Hauling Vehicles*: As described in the SWPPP, the haul trucks and end dump trucks are not equipped with load covering systems. MMCo ensures that haul trucks are not overfilled with coal and that operators are trained to watch for and report coal spillage on the haul road. Additionally, drainages from the roads are directed towards BMPs and sediment ponds to stop any coal or coal residue from entering the waterways. These controls and practices are described in more detail in the current Navajo Mine SWPPP. We are requesting the U.S. EPA to updated this section of the permit to reflect the controls and practices described in the Navajo Mine SWPPP, as they will also be applied to Pinabete Mine.

**RESPONSE 15:** Comment noted and updates will be incorporated.

# Exhibit 12

Gmail **John Barth <barthlawoffice@gmail.com>**

# Re: Final Permit for NTEC Navajo Coal Mine (NN0028193)

**Andrew Hawley** <hawley@westernlaw.org> Tue, Apr 17, 2018 at 2:28 PM
To: John Barth <barthlawoffice@gmail.com>

see below.

On Thu, Mar 8, 2018 at 9:57 AM, John Barth <barthlawoffice@gmail.com> wrote:

> ---------- Forwarded message ----------
> From: **Sheth, Gary** <Sheth.Gary@epa.gov>
> Date: Thu, Mar 8, 2018 at 10:32 AM
> Subject: RE: Final Permit for NTEC Navajo Coal Mine (NN0028193)
> To: John Barth <barthlawoffice@gmail.com>
> Cc: "Smith, DavidW" <Smith.DavidW@epa.gov>, "Marincola, JamesPaul" <Marincola.JamesPaul@epa.gov>, "Hagler, Tom" <Hagler.Tom@epa.gov>
>
> John,
>
> EPA anticipates issuing the permit by April 2018.

Gary Sheth

NPDES Permits Section (WTR-2-3)

Water Division

USEPA Region 9

75 Hawthorne Street

San Francisco, CA 94105

Tel: 415.972.3516

Fax: 415.947.3549

**From:** John Barth [mailto:barthlawoffice@gmail.com]
**Sent:** Thursday, March 8, 2018 8:19 AM
**To:** Sheth, Gary <Sheth.Gary@epa.gov>
**Cc:** mike@sanjuancitizens.org
**Subject:** Re: Final Permit for NTEC Navajo Coal Mine (NN0028193)

Gary
Thank you for sending me a link to the Final Renewal NPDES Permit for the Navajo Mine. In response to comment #1, you state that EPA "will issue the permit for the Four Corners Power Plant in the immediate future." Please provide me with a more precise schedule for taking final action on that renewal permit application. Thank you.

John Barth

On Wed, Mar 7, 2018 at 3:05 PM, Sheth, Gary <Sheth.Gary@epa.gov> wrote:

> Hello All,
>
> The Final Renewal NPDES Permit for the NTEC Navajo Coal Mine was signed on Monday. The Permit has an effective date of May 1, 2018. The final permit, factsheet, and response to comment document are available on EPA's website at : https://www.epa.gov/npdes-permits/navajo-coal-mine-san-juan-county-nm-nn0028193 Hardcopies of these documents have also been mailed.
>
> Thanks,
>
> Gary Sheth

NPDES Permits Section (WTR-2-3)

Water Division

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# Exhibit 13

Gmail **John Barth <barthlawoffice@gmail.com>**

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# Status of Four Corners NPDES permit

2 messages

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**John Barth** <barthlawoffice@gmail.com> Fri, May 4, 2018 at 9:38 AM

To: "Sheth, Gary" <Sheth.gary@epa.gov>, "Smith, DavidW" <Smith.DavidW@epa.gov>
Bcc: Andrew Hawley <hawley@westernlaw.org>, Michael Saul <msaul@biologicaldiversity.org>, John Barth <barthlawoffice@gmail.com>

Gary/David:

I am following up on an email I sent to Gary on Tuesday May 1, 2018. I have not received a response back to the questions I posed below.

On March 8, 2018 I contacted you about the status of EPA's decision on the pending NPDES renewal permit application for the Four Corners Power Plant. You responded that the EPA would issue a permit decision in April 2018. Did EPA issue a decision? If so, can you please forward me all relevant documents? If not, what is EPA's new schedule for making a permitting decision?

Thank you.

--
John Barth
Attorney at Law
P.O. Box 409

Hygiene, CO 80533
(303) 774-8868
barthlawoffice@gmail.com

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**Smith, DavidW** <Smith.DavidW@epa.gov> Fri, May 4, 2018 at 10:05 AM

To: John Barth <barthlawoffice@gmail.com>, "Sheth, Gary" <Sheth.Gary@epa.gov>

Hi John- Gary had to take some unexpected leave and has been out of the office for awhile; this has delayed final issuance of the permit. We expect it to issue by June. We will send you the relevant documents when the decision is made. Thanks

Dave Smith

**From:** John Barth [mailto:barthlawoffice@gmail.com]
**Sent:** Friday, May 4, 2018 8:39 AM
**To:** Sheth, Gary <Sheth.Gary@epa.gov>; Smith, DavidW <Smith.DavidW@epa.gov>
**Subject:** Status of Four Corners NPDES permit

[Quoted text hidden]

# Exhibit 14

## 4.5 Water Resources/Hydrology

This section describes the surface water and groundwater systems in the ROI and impacts of the Proposed Action and alternative actions on those systems.

The ROI for groundwater resources is contained within the San Juan Basin, and is limited to the area within the Basin that could be affected by the actions taken at the Navajo Mine SMCRA Permit Area, proposed Pinabete SMCRA Permit Area, and FCPP. The discussion describes the local groundwater hydrology and water quality of the San Juan Basin, including water balance and a description of the geologic formations and aquifers that comprise the basin. The discussion then provides data related to site-specific hydrology and water quality beneath the Navajo Mine SMCRA Permit Area and Pinabete SMCRA Permit Area and the FCPP. The subject transmission line ROWs are located over the San Juan Basin; however, since operation and maintenance activities associated with these lines would not involve deep excavation or use of water wells, detailed description of the groundwater hydrology or water quality beneath these lines is not provided.

The ROI for surface water is the entire San Juan Basin and includes all perennial, intermittent, and ephemeral streams and lakes that intersect the Navajo Mine SMCRA Permit Area, Pinabete SMCRA Permit Area, FCPP Lease Area, and associated existing transmission lines. The deposition of metals in emissions from power plants has the potential to adversely affect surface water quality. Since FCPP emissions have the potential to travel and deposit a substantial distance from the power plant site itself, the ROI also includes all surface water features within the defined deposition area for the power plant, which extends less than 50 kilometers in all directions as described in Section 4.1, Air Quality and shown on Figure 4.5-4. The affected environment includes a description of the surface water features, existing water quality conditions, and current water uses within the ROI.

### 4.5.1 Regulatory Compliance Framework

#### *4.5.1.1 Federal Regulations*

**Clean Water Act**

CWA Sections 401, 402, and 404 pertain to regulating impacts to waters of the U.S. and are applicable to the Project. The following subsections discuss each of these CWA sections in detail.

Section 401

Section 401 requires that any applicant pursuing a Federal permit to conduct any activity that may result in a discharge of a pollutant must obtain a water quality certification (or waiver). The NNEPA issues water quality certifications for activities that occur within the Navajo Nation. Under the CWA, the NNEPA must issue or waive Section 401 water quality certification for the Project to be permitted under Section 404. The NNEPA also issues water quality certifications for Section 402 NPDES permits within the Navajo Nation. Water quality certification requires the evaluation of water quality considerations associated with dredging or placement of fill materials into waters of the U.S. and imposes project-specific conditions on development. A Section 401 waiver establishes standard conditions that apply to any project that qualifies for a waiver. Prior to implementation of the Project, MMCo would be required to obtain Section 401 water quality certification or waiver from the NNEPA, if the USACE finds that a Section 404 permit is required.

Section 402

Section 402 establishes the NPDES permit program to control discharges of pollutants from point sources. The EPA administers and enforces the NPDES program for the Navajo Nation. Section 402 addresses both construction and industrial activities, as described below.

Both the Navajo Mine SMCRA Permit Area and FCPP are covered under individual Industrial NPDES permits. APS is authorized to discharge effluent from FCPP to Morgan Lake and an unnamed wash tributary to the Chaco River under NPDES permit NM0000019. NTEC is also authorized to discharge effluent from the coal storage facility to Morgan Lake under NPDES permit NN0028193, held by MMCo (MMCo's permit also authorizes discharges to the San Juan River and Chaco River). The APS NPDES permit sets limits on discharge from four discharge points at the FCPP: the cooling ponds, condenser cooling water, chemical metal cleaning water, and combined waste treatment pond. Monitoring requirements under both the APS and MMCo permits vary by parameter and sampling location. A review of monthly discharge reports submitted to EPA for 2012 indicated that no discharge was released from the chemical metal cleaning water during the year. Discharge from the cooling ponds and condenser cooling water met the permit limits. A review of EPA records also verified that no violations occurred under permit NM0000019 and one violation is recorded for BNCC under permit NN0028193 for non-compliance with discharge limits for total suspended solids and total iron for discharge which occurred between October and December 2013. Reporting violations have been recorded for the subsequent quarters. No enforcement actions are reported to date (EPA 2013f). Table 4.5-1 provides a summary of the FCPP permit limits (EPA 2001; APS 2012b). Table 4.5-2 summarizes the Navajo Mine permit limits (EPA 2008).

**Table 4.5-1 FCPP NPDES Discharge Limits into Morgan Lake**

| | **Cooling Ponds (Discharge from Morgan Lake to No Name Wash)** | **Condenser Cooling Ponds** | **Chem Metal Cleaning Water** | **Combined Waste Treatment Pond** |
|---|---|---|---|---|
| Temperature | 32.2 moving average/ 36 daily max | N/A | N/A | N/A |
| pH | Min 6/ max 9 | Min 6/ max 9 | Min 6/max 9 | Min 6/ max 9 |
| Flow | 14.7 million gallons daily max | Required monitoring/ no limit | Required monitoring/ no limit | Required monitoring/no limit |
| TDS | Required monitoring/no limit | N/A | N/A | N/A |
| TSS | N/A | N/A | N/A | 30 mg/L weekly average/ 100 daily max |
| Chlorine | N/A | 954 mg/L daily max | | N/A |
| Oil and grease | N/A | N/A | 15 mg/L weekly average/ 20 mg/L daily max | 15 mg/L weekly average/ 20 mg/L daily max |
| Copper | N/A | N/A | 1 mg/L weekly average/1 mg/L daily max | N/A |
| Iron | N/A | N/A | 1 mg/L weekly average/1 mg/L daily max | N/A |
| Static 4 day chronic selenium | N/A | Required monitoring/no limit | N/A | N/A |
| Static 7 day chronic *Ceriodaphnia dubia* | N/A | Required monitoring/no limit | N/A | N/A |
| Static 7 day chronic *Pimphales promelas* | N/A | Required monitoring/no limit | N/A | N/A |

**Table 4.5-2 Navajo Mine NPDES Discharge Limits**

| | Outfall 002 to Morgan Lake | Outfall 003 to Chaco River |
|---|---|---|
| TSS | 35 mg/L monthly average/ 70 mg/L daily max | 35 mg/L monthly average/ 70 mg/L daily max |
| Iron, total | 3.5 mg/L monthly average/ 7 mg/L daily max | 3.5 mg/L monthly average/ 7 mg/L daily max |
| Manganese, total | 2 mg/L monthly average/ 4 mg/L daily max | N/A |
| Arsenic | Required monitoring/no limit | Required monitoring/no limit |
| Boron | Required monitoring/no limit | Required monitoring/no limit |
| Cadmium | Required monitoring/no limit | Required monitoring/no limit |
| Lead | Required monitoring/no limit | Required monitoring/no limit |
| Selenium | Required monitoring/no limit | Required monitoring/no limit |
| Sulfate | Required monitoring/no limit | Required monitoring/no limit |
| TDS | Required monitoring/no limit | Required monitoring/no limit |
| pH | 6-9 | Required monitoring/no limit |
| Flow | N/A | Required monitoring/no limit |

Construction activities that disturb greater than 1 acre are regulated under the NPDES General Permit for Discharges of Storm Water Runoff Associated with Construction Activity (General Construction Permit), Coverage under the General Construction Permit requires the preparation of a SWPPP and Notice of Intent. The SWPPP includes pollution prevention measures (erosion and sediment control measures and measures to control non-stormwater discharges and hazardous spills), demonstration of compliance with all applicable local and regional erosion and sediment control standards, identification of responsible parties, a detailed construction timeline, and a BMP monitoring and maintenance schedule. The Notice of Intent includes site-specific information and the certification of compliance with the terms of the General Construction Permit. NTEC will be required to obtain a construction general permit for extension of transmission lines and construction of new roads associated with the development of the Pinabete SMCRA Permit Area.

Section 404

Section 404 regulates the discharge of dredged and fill materials into "waters of the U.S.," which include oceans, bays, rivers, streams, lakes, ponds, and wetlands. Before any actions that may affect surface waters are implemented, a delineation of jurisdictional waters of the U.S. must be completed, following USACE protocols, to determine whether a project area contains wetlands or other waters of the U.S. that qualify for CWA protection. Such areas include:

- Areas within the ordinary high water mark of a stream, including non-perennial streams with a defined bed and bank and any stream channel that conveys natural runoff, even if it has been realigned; and
- Seasonal and perennial wetlands, including coastal wetlands.

Wetlands are defined for regulatory purposes as areas "inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions" (33 CFR 328.3; 40 CFR 230.3).

Project proponents must obtain a permit from the USACE for discharges of dredged or fill material into jurisdictional waters of the US before proceeding with a proposed activity. Delineations of potential waters of the U.S. have been conducted for both the Pinabete SMCRA Permit Area and the proposed DFADA for the FCPP. These studies have been submitted to the USACE. NTEC preferred to move forward a preliminary jurisdictional determination, evaluation, and permitting for the Pinabete SMCRA Permit Area. USACE reviewed and accepted APS/FCPP's delineation materials and approved jurisdictional request showing one isolated exhibit of OHWM and one isolated wetland; USACE moved forward with an isolated-and-not–jurisdictional determination for those isolated waters under current regulations governing isolated waters. As such, USACE has determined that a permit is required for the Pinabete SMCRA Permit Area, but not the FCPP.As per the regulation, the USACE will conduct an alternatives analysis and is required to permit the least environmentally damaging practicable alternative (USACE 2013). This alternatives analysis and permit review process is being conducted concurrent to the OSMRE's review of the Project. USACE's draft decision document is provided in Appendix C.

Other Federal Programs

Under the CWA, states and tribes with approved programs typically establish water quality standards based on EPA-recommended criteria for surface waters. If surface water does not meet standards, the CWA generally requires the state to set a Total Maximum Daily Load (TMDL) to be established that identifies the maximum amount of pollutant that can enter the water and still meet standards. For point sources of pollution, such as an outfall from a sewage treatment plant, CWA permitted discharge limits are to be consistent with the TMDL. However, there is no similar regulatory requirement for nonpoint sources of pollution, such as atmospheric deposition over states, tribal lands, or other regions. States and tribes may take actions, such as providing technical or financial assistance to limit pollution from nonpoint sources through nonpoint source management controls, but legal obstacles arise when atmospheric deposition affecting state waters originates in emissions from another state (GAO 2013).

The EPA has issued numerous CAA regulations over the years (e.g., Acid Rain, Cross-State Air Pollution Rule [CSAPR], MATS) that have reduced stationary- and mobile-source emissions of $NO_X$ and $SO_2$, and more recently, mercury. In addition to reducing airborne contaminants, these rules also serve to limit the amount of pollution in surface waters. However, even with reduced emissions, $NO_X$, $SO_2$, and mercury continue to impact the nation's waters. One control strategy proposed by the EPA is to establish new secondary NAAQS (i.e., standards to protect public welfare) that target the effects of acid rain caused by $NO_X$ (as $NO_2$) and $SO_2$ on water bodies. However, initial agency efforts were unsuccessful due to uncertainty in atmospheric modeling results and limitations in available data, which prevented determination of secondary NAAQS adequate to protect against the effects of acid rain. No alternative strategies have been identified; however, the EPA recently announced an integrated nitrogen research effort that includes approaches to reducing atmospheric deposition of nitrogen compounds into waters already impaired by nutrient over-enrichment due to fertilizer runoff (GAO 2013).

On June 7, 2013, EPA proposed a rule to amend the effluent limitations guidelines and standards for the Steam Electric Power Generating category (40 CFR Part 423), within which the FCPP falls. The proposed rule aims to strengthen the existing controls on discharges from these plants; it sets the first federal limits on the levels of toxic metals in wastewater that can be discharged from power plants, based on technological advances over the last three decades. The current effluent guidelines were last updated in 1982 and focus on settling out particulates rather than treating dissolved pollutants, as do the proposed rules. The updated regulation is also proposed because new technologies in the industry and implementation of pollution controls have altered wastewater streams.

The proposed rule would establish new or additional requirements for wastewater streams from flue gas desulfurization, fly ash, bottom ash, flue gas mercury control, and gasification of fuels, including coal. The proposed standards are based on data collected from industry and are designed to provide flexibility in implementation; the rules propose phasing in new requirements between 2017 and 2022. It should be noted that the required new technology is already installed at a number of plants. The proposed rule identifies four possible regulatory options that vary in the number of waste streams covered, size of the units controlled, and stringency of controls. EPA will take comment on all of these options, which it will use to help inform the most appropriate final standard (EPA 2013g).

On December 19, 2014, EPA issued a final rule for the disposal of CCR from electric utilities. The rule establishes technical requirements for existing and new CCR landfills and surface impoundments under solid waste provisions, Subtitle D, of the Resource Conservation and Recovery Act (RCRA). These requirements include:

- structural integrity requirements to reduce the risk of catastrophic failure for surface impoundments,
- liner design criteria (all landfills, impoundments and lateral expansions must have composite liners and a leachate collection system)
- new operating criteria (run-on and run-off controls, erosion control, and air criteria to limit windborne dust)
- groundwater monitoring and corrective action
- closure and post-closure monitoring standards
- record-keeping, notification, and internet posting requirements (compliance records are to be kept in the facility's operating record, submitted to the appropriate state/tribal authorities, and posted on a public website)

The regulations are minimum federal criteria with which facilities must comply without the engagement of another state or federal regulatory authority (e.g., self-implementing regulations). States are not required to adopt these regulations, to develop a permitting program, or to submit a program to EPA for approval. EPA has no formal role in implementation of the rule. EPA does not issue permits, nor can EPA enforce the requirements of the rule (EPA 2014a).

#### *4.5.1.2 State Regulations*

**New Mexico Standards for Interstate and Intrastate Surface Waters**

Water quality standards for the San Juan Basin are set forth in the New Mexico Standards for Interstate and Intrastate Surface Waters (New Mexico Administrative Code 20.6.4). The administrative code specifies general standards that apply to all waters in the state at all times, unless otherwise noted. Specific water quality standards for pH and bacteria (fecal coliform), phosphorus, and temperature have been set for the La Plata and Animas rivers. Specific water quality standards for temperature, phosphorus, bacteria and conductance have been set for all but one segment of the San Juan River.

#### *4.5.1.3 Tribal Standards*

The Navajo Nation has adopted the Navajo Nation Surface Water Quality Standards (NNEPA 2008), which establish various surface water use quality standards and have been approved by the EPA. These standards apply to all waters of the Navajo Nation, which include, but are not limited to, ephemeral, intermittent, and perennial streams, springs, wetlands, and any natural or man-made depressions or basins that impound water within the Navajo Nation's jurisdiction. However, NNEPA water quality standards do not apply to Morgan Lake, which is the only surface water into which the FCPP discharges. The Navajo Nation Water Quality Standards do apply to the surface waters into which that Navajo Mine discharges. The standards associate specific uses within specific stream reaches, including Cottonwood Arroyo and Chaco River. Specific uses have not been identified for No Name Arroyo or Pinabete Arroyo. Designated uses for Cottonwood Arroyo and Chaco River include livestock water, aquatic and wildlife habitat, fish consumption, and secondary human contact standards. Applicable standards for the designated uses are provided in Table 4.5-3. The NNEPA has no water quality standard for total dissolved solids (TDS), sulfate, or fluoride. The NNEPA surface water quality standard for suspended sediment applies only to surface water that is at or near baseflow and does not apply to surface water during or soon after a precipitation event and is, therefore, not applicable to ephemeral flows (NNEPA 2008).

**Table 4.5-3 Navajo Nation Water Quality Standards for Designated Uses (all in mg/L except pH)**

| Constituent | Livestock | Aquatic and Wildlife Habitat Acute | Aquatic and Wildlife Habitat Chronic | Secondary Human Contact | Fish Consumption |
|---|---|---|---|---|---|
| Aluminum | | 0.75 | 0.087 | | |
| Arsenic | 0.2 | 0.34 | 0.15 | 0.28 | 0.08 |
| Barium | | | | 98 | |
| Boron | 5 | | | 126 | |
| Cadmium | 0.05 | 0.00217 | 0.00026 | 0.47 | 0.008 |
| Chromium III | | 0.6068 | 0.0789 | 1400 | 75 |
| Chromium IV | | 0.016 | 0.011 | 2.8 | 0.15 |
| Copper* | 0.5 | 0.01445 | 0.00956 | 9.33 | |
| Lead* | 0.1 | 0.07022 | 0.00274 | 0.015 | |
| Mercury | | 0.0024 | 0.000001 | 0.28 | 0.00015 |
| Nitrate | 132 | | | 1493.33 | |
| pH | 6.5-9.0 | 6.5-9.0 | 6.5-9.0 | | |
| Radium 226+228 | 30 | | | | |
| Selenium | 0.05 | 0.033 | 0.002 | 4.67 | 0.67 |
| Silver* | | 0.00367 | | 0.00467 | 8 |
| Zinc* | 25 | 0.1251 | 0.1261 | 280 | 5.1 |

Source: NNEPA 2008.

Notes:

*Aquatic and Wildlife Habitat Criterion are hardness dependent and calculated for a hardness of 108 mg/L as calcium carbonate (CaCO3), which is the median for Pinabete and Cottonwood arroyos.

mg/L = milligram(s) per liter

The Navajo Nation released Draft 2013 Surface Water Standards for public review in 2013. These standards are not yet adopted by the NNEPA and it is uncertain when they will go into effect. As of February 2014, the standards had been given preliminary approval by EPA and were under review by the Navajo Nation Resources Council. Primary changes from the prior standards approved by EPA and Navajo Nation Resources Council include a revision of waterbodies addressed to include only those reaches within the jurisdiction of the Navajo Nation. In addition, a hardness-based standard for aluminum for aquatic and wildlife habitat was developed for waters with pH greater than 7. Water quality standards were also set for mercury and methylmercury with regard to chronic impacts to aquatic and wildlife habitat (NNEPA 2013).

## 4.5.2 Affected Environment Pre-2014

### *4.5.2.1 Groundwater*

#### Local Groundwater Overview

The ROI is contained within the San Juan hydrologic basin (Figure 4.5-1). The specific geologic formation and characterization is described in Section 4.3, Geology. The primary source of groundwater used in the San Juan Basin is from wells constructed in the surficial valley-fill deposits of Quaternary age and sandstones of Tertiary, Cretaceous, Jurassic, and Triassic age (Stone et al. 1983). Groundwater found in sandstone formations is generally under confined conditions resulting in artesian flow. Artesian flows occur when subsurface sources contain groundwater under positive pressure, and if the overlying natural pressure is high enough, the groundwater may reach the ground surface.

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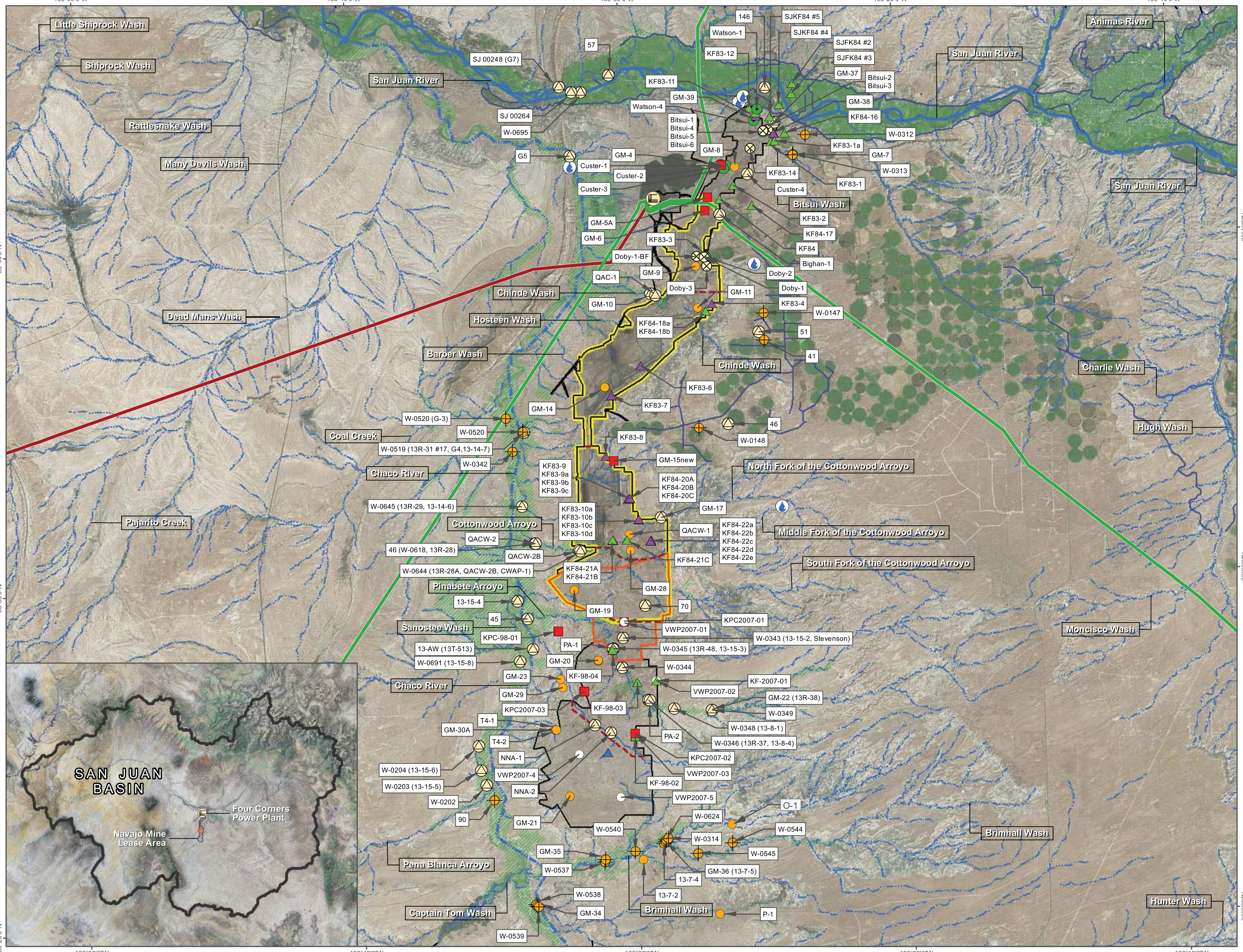
## Figure 4.5-1

Water Wells and Springs




**PROJECT FACILITIES**

Four Corners Power Plant

**PROJECT BOUNDARIES**

Navajo Mine Resource Areas
Proposed Pinabete SMCRAPermit Boundary
Navajo Mine Lease Area and ROWs
Navajo Mine SMCRA Permit Boundary

**TRANSMISSION LINES**

345kV
500kV

**WATER FEATURES**

Springs and Seeps [1]
Perennial Stream [2]
Intermittent Stream [2]
Intermittent Canal [2]

**NAVAJO MINE WELLS**

Abandoned Well [3]
Active Fruitland Well [3]
Active Pictured Cliffs Sandstone Well [3]
Active Piezometer [3]
Backfill Monitoring Well [3]
CCB Monitoring Well [3]
Coal Seam Monitoring Well [3]

**NAVAJO NATION WELLS**

Alluvial Wells [1]
Unpermitted Well [1]
Wells [4]

**Data Sources:**
[1] Navajo Nation Hydrographic Survey (2010)
[2] USGS National Hydrography Data
[3] Navajo Mine (2011)
[4] USGS Geology Maps: MF-1026, MF-1076, MF-1077, MF-1080, MF-1092, MF-1093, and I-1978

N

0 1.75 3.5 7
Scale in Miles

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Local groundwater resources considered in this EIS include any groundwater source that could be affected directly or indirectly by the proposed Project and alternatives. These resources include the unconsolidated alluvial sediment or alluvium in the valleys of the San Juan River, the Chaco River, and associated tributaries, including Cottonwood and Pinabete arroyos. Cottonwood and Pinabete arroyos originate in agricultural areas 10 to 12 miles east of the ROI and flow westward across the permit area and into the Chaco River. The Fruitland Formation underlies the alluvial sediment and is the formation that contains the coal resources for the mine. Since the coal seams are discontinuous throughout the formation, the Fruitland Formation is generally treated as a single aquifer unit (Billings and Associates, Inc. 1987). The PCS lies beneath the Fruitland Formation. Available site specific data from within the immediate vicinity of the Project area, used for modeling conducted as part of the CHIA for the Navajo Mine, shows low hydraulic conductivity and does not suggest the presence of significant vertical fracture flow of groundwater between the PCS and Fruitland Formation (insert reference to CHIA). However vertical fracture flow has been observed at other areas in the San Juan Basin (insert reference to document supplied by EPA reference in comment matrix). The evidence of fracture flow at other locations within the San Juan Basin, presents a modeling uncertainty as it presents the possibility that fracture flow may exist within the vicinity of the Project area.

The alluvium, Fruitland Formation, and PCS units have been defined and characterized in a number of technical reports (Thorn 1993; Stone et al. 1983; Myers and Villanueva 1986). In addition, a number of groundwater and hydrogeology studies have been conducted at and around the ROI. BNCC, the New Mexico Bureau of Mines, and the USGS have conducted these studies, which have added to the understanding of the hydrogeologic setting and groundwater flow system of the area.

Almost all of the known water supply wells within the ROI were completed within the alluvium formation, which is characterized by a loose, unconsolidated soils or sediments. No known water supply wells are completed in the Fruitland Formation or the PCS within the ROI or adjacent areas. Four wells are believed to be completed in bedrock formations. These wells are not in the Navajo Mine SMCRA Permit Area or Pinabete SMCRA Permit Area and are under no potential threat or impact from the proposed mining activities.

Groundwater use in the ROI is extremely limited, except from withdrawals in the San Juan River alluvium. A regional study identified no water supply wells constructed in the Fruitland Formation or underlying PCS within several miles of the Navajo Mine Lease Area. This study also concluded that these geologic units are not important water supplying aquifers within the San Juan Basin because of low yields and high salinity. As described in greater detail below, baseline water quality in the Fruitland Formation (based on data collected from monitoring wells in Areas IV North and South and Area V) is poor and exceeds NNEPA surface water quality standards[1] for livestock watering and drinking water. As such, the only groundwater in the area is derived from a few stock wells constructed in the alluvium formation in portions of the San Juan Basin (see Figure 4.5-1) (Stone et al. 1983). Each of these formations is described in more detail below.

Alluvium

Per definitions in 30 CFR 701.5, an Alluvial Valley Floor is "the unconsolidated stream laid deposits holding streams where water availability is sufficient for sub-irrigation or flood irrigation agricultural activities", and does not include upland areas. Under SMCRA, coal-mine related impacts to Alluvial Valley Floors are generally not permitted if the Alluvial Valley Floor is deemed significant to agricultural operations. Baseline characterization was performed for the Chaco River, No Name Wash, and Pinabete and Cottonwood arroyos to determine if the alluvium deposits are considered to be Alluvial Valley Floors. A 1981 study performed by the New Mexico Bureau of Mines and Mineral Resources and additional studies conducted by

[1] Note that there are no NNEPA groundwater quality standards. Comparison to surface water quality standards is provided to indicate general water quality and potential beneficial uses, but is not an enforceable criteria.

BNCC were used to form the Alluvial Valley Floors determination, taking into consideration both geomorphic/geologic and water availability criteria. Alluvial well drilling along Pinabete and Cottonwood arroyos revealed the occurrence of unconsolidated stream-laid deposits, meeting the geologic criteria for an Alluvial Valley Floors. However, water is inadequate to support agriculture; the arroyos are ephemeral and only flow in response to precipitation events, making flood irrigation implausible. As such, it was concluded that no Alluvial Valley Floors are within the Navajo Mine SMCRA Permit Area and Pinabete SMCRA Permit Area (BNCC 2012a).

Fruitland Formation

Groundwater availability in the Fruitland Formation is limited by its low rates of recharge and relatively low hydraulic conductivity (0.002 to 0.00013 feet per day), which means that water cannot move easily through pores or fractures in the formation. Based on past mining within the Fruitland Formation of the Navajo Mine SMCRA Permit Area, the coals, overburden, and interburden do not yield much water during mining. The existing mine pits have generally remained dry except during precipitation events when surface flows are captured in the pits.

Pictured Cliffs Sandstones

Although water is found throughout most of the Navajo Mine Lease Area in the PCS, no known water supply wells are completed in this formation within or adjacent to the current Navajo Mine SMCRA Permit Area or FCPP. One water supply well was completed near the Burnham Chapter house but was abandoned due to poor yield and poor water quality (BNCC 2012a). Water yields from monitoring wells in the vicinity are low (most are pumped dry within minutes; the yield of one well that can sustain a constant rate during a pump test was 0.4 gpm). The PCS is also a natural gas reservoir in the San Juan Basin. The PCS cannot be considered a major aquifer and it is important primarily because it is the water-bearing horizon immediately underlying the coals in the Fruitland Formation (Stone et.al. 1983).

### Springs and Seeps

No springs or seeps have been observed during hydrologic investigations conducted within and adjacent to the ROI (BNCC 2012a). However, springs and seeps do occur along upper Chinde Wash, above the Navajo Mine Lease Area boundary. These springs and seeps are due to NAPI irrigation return flows. Individual springs have not been verified but approximate locations are shown on Figure 4.5-1. In addition, comments from the Navajo Nation have indicated the presence of a seep at the base of the Hogback near the mouth of the Chinde Wash that may be the result of an abandoned well. Two areas of groundwater seepage are also present within the FCPP Lease Area near the ash disposal areas.

### Groundwater Quantity

Extensive exploration drilling and data from the active Navajo Mine SMCRA Permit Area provides information about the groundwater hydrology for the ROI Monitoring wells and vibrating wire piezometers where installed in the alluvium of the Pinabete and No Name arroyos, in the Fruitland Formation and in the PCS to characterize the baseline hydrogeology setting of Areas III, IV North, IV South, and V. Additional monitoring wells and piezometers were installed in various coal seams in these resource areas (Table 4.5-4). Figure 4.5-1 shows the location of all the monitoring wells and piezometers.

**Table 4.5-4 Groundwater Monitoring Wells Installed in Navajo Mine Lease Area Coal Seams**

| Coal Seam | Number of Monitoring Wells | Number of Piezometers |
|---|---|---|
| No. 2 | 2 | 4 |
| No. 3 | 5 | 3 |
| No. 6 | 1 | 1 |
| No. 7 | 5 | 1 |
| No. 8 | 16 | 1 |

Historical water level data collected during the mid-1970s are also available for six wells that were completed in the PCS within or adjacent to the NTEC mining lease. These data, together with data from NTEC and other local sources, supplement the recent baseline groundwater information obtained for Area IV South and Area V of the Navajo Mine Lease Area and are summarized below (BNCC 2012a).

Pressure testing on monitoring wells within the Navajo Mine SMCRA Permit Area also provides the range of hydraulic conductivity and transmissivity of each formation. Hydraulic conductivity is the ability of water (or other fluids) to move through the soil or rock. Transmissivity is the rate at which groundwater flows through the formation. Only one well (well KF 2007-0), completed in the No. 8 coal seam within Area IV South, has sufficient yield to allow for a constant rate-pumping test to determine hydraulic characteristics of the coal. The majority of the wells are quickly pumped or bailed dry during conventional sampling. Table 4.5-5 below summarizes the results of BNCC's tests.

**Table 4.5-5 Groundwater Aquifer Properties in the San Juan Basin**

| Formation | Transmissivity | Hydraulic Conductivity |
|---|---|---|
| Pinabete Arroyo alluvium | 230.7 square foot per day and 75.6 square foot per day | 51.3 feet per day and 11.1 foot/day |
| No Name alluvium | No measurement provided | Insufficient yield to measure |
| Cottonwood alluvium | No measurement provided | No measurement provided |
| • Fruitland Formation No. 3 | 0.01 to 0.001 square foot per day | 0.002 to 0.00013 foot/day |
| • Fruitland Formation No. 2 | 0.09 to 0.1 square foot per day | 0.001 foot/day |
| • Fruitland Formation No. 4, 5, 6 | 0.04 square foot per day | 0.0014 foot/day |
| • Fruitland Formation No. 7 | 0.01 to 0.04 square foot per day | 0.003 foot/day |
| • Fruitland Formation No. 8 | 1.398 square foot per day | 0.056 foot/day |
| Pictured Cliffs Sandstone | 0.12 to 0.79 square foot per day | 0.032 foot/day to 0.0001 foot/day |

Source: BNCC 2012a
Note:
These results are only for the No. 8 coal seam wells within Area IV North and Area IV South. The test results for No. 2, No. 4-6, and No. 7 coal seams are from wells located in Area III. The PCS results include tests at wells within Area IV North, Area IV South, Area V and adjacent to Area V.

*Alluvium Aquifer*

Baseline alluvium monitoring has been conducted within the Navajo Mine Lease Area at four alluvial monitoring wells in Cottonwood Arroyo, two alluvial monitoring wells in the Pinabete Arroyo alluvium, two alluvial monitoring wells in the No Name Arroyo alluvium, and 44 alluvial monitoring wells at the FCPP in the vicinity of the existing ash disposal areas. Based on data collected from these wells, groundwater beneath the Navajo Mine Lease Area is considered perched in localized areas.

Within the Navajo Mine Lease Area, water levels for the Cottonwood and Pinabete alluvial monitoring wells were measured monthly to capture seasonal variation. Water levels in the Pinabete Arroyo alluvium monitoring wells ranged from approximately 8-12 feet below ground surface between 1998 and 2008, and elevation was approximately 5,340 and 5,420 feet above mean sea level in the two wells. Water levels in the Cottonwood Arroyo alluvium monitoring wells ranged from approximately 8-21 feet below ground surface between 1974 and 2004, when water was detected. All wells were dry during tests from 2005 to 2008 (the most recent data provided).

A pump test was conducted at two wells to measure hydraulic conductivity in the Pinabete Arroyo alluvium (one well near Pinabete Arroyo in Area IV North and the other in Area IV South). The measured conductivity was 51.3 feet per day and 11.1 feet per day, respectively. These results are within the range expected for sand. Well yields from the alluvium are limited by a low saturated thickness (the vertical thickness in which pores are filled with water) of about 5 feet or less. Saturated thickness in the No Name alluvial wells was insufficient to permit a pumping test or slug test, which is a test used to determine hydraulic conductivity of a material. The hydraulic conductivity of the No Name alluvium is expected to be considerably lower than the Pinabete Arroyo alluvium due to the high percentage of fine-grained alluvial silts and clays, as evidenced by the well logs.

Beneath the ash disposal ponds at the FCPP, groundwater flows to the west, mainly in the weathered shale and in local alluvial channels that drain towards the Chaco River. APS began groundwater evaluations in 1971 and installed initial monitoring wells in 1974 to determine the source of water in the alluvium (e.g., if the hydraulic head was either the ash disposal ponds or Morgan Lake). Figure 4.5-2 shows the location of existing monitoring wells. Wells 1 through 23 were first installed and have the longest period of record. Wells 25 through 44 were installed after 2009. A review of monitoring data over the period of 1987 to 2012 indicates that groundwater levels in the vicinity of the ash disposal ponds is variable; water level in some wells has remained relatively constant, others have increased and some slightly decreased over time (APS 2013). The hydraulic gradient calculated based on water level data for monitoring wells 41, 42, and 43 (all upgradient of the ash disposal area) indicates that groundwater flows northwest from Morgan Lake at a rate of approximately 0.017 foot per foot. The hydraulic gradient calculated based on water level data for monitoring wells 41, 43, and 12R indicates that groundwater flows southwest from Morgan Lake at a rate of approximately 0.005 foot per foot. Based on these calculations Morgan Lake is a hydraulic mound and groundwater flows radially in all directions, including beneath the FCPP ash disposal area.

Fruitland Formation

Groundwater production within the Fruitland Formation is limited. The majority of exploratory drill holes within the Navajo Mine Lease Area have not produced measurable groundwater during drilling, and measurable water was only encountered at a few locations. Specifically, three boreholes located within the northeastern portion of Area IV South produced water at rates estimated at greater than 10 gpm. This groundwater is believed to be associated with the No. 6 and the No. 8 coal seams. Measurable groundwater was encountered in the unconsolidated sand and gravel above the No. 8 coal seam at a depth of about 22 feet below ground surface. The No. 8 coal seam was encountered in the 24 to 38 foot depth interval. Water was produced at a rate of about two to three gpm from the coal and the overlying sand and gravel. The general flow direction of groundwater in the Fruitland Formation is north toward the San Juan River and downward through the interbedded shale and coal units to the lower strata of the Fruitland Formation, with marginal upward movement from the PCS into the Fruitland Formation.

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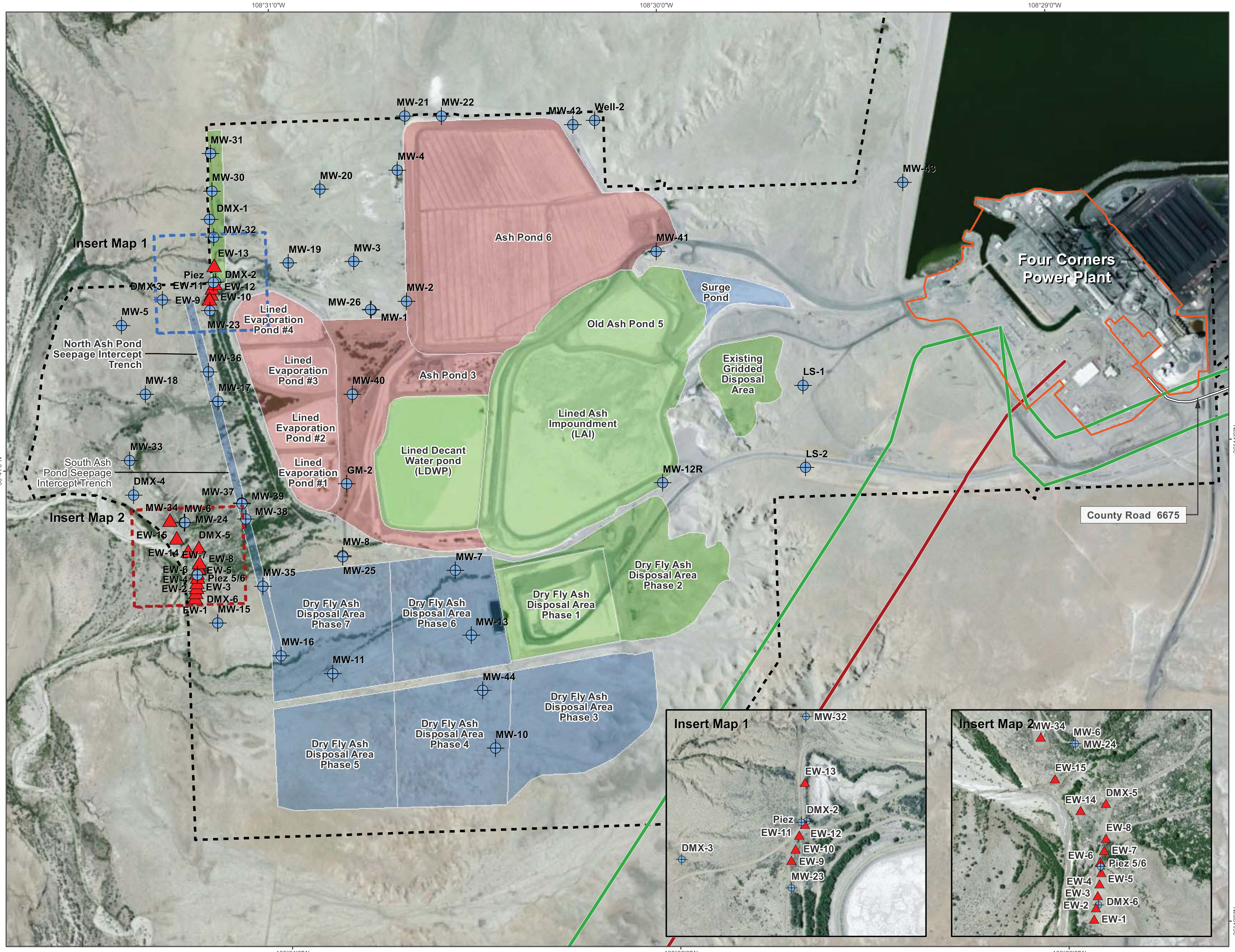
**Figure 4.5-2**
Monitoring and Extraction
Well Locations




**PROJECT BOUNDARIES**
Power Plant Lease Boundary
Fence Line

**TRAMISSION LINES**
345kV
500kV

**WELL LOCATIONS**
Extraction Well
Monitor Well

**ASH FACILITIES**
Existing Active Facility
Existing Inactive Facility
Future Facility

N

0 1,000 2,000
Feet

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Pictured Cliffs Sandstone

The PCS underlies the Fruitland Formation and follows the structure of the Fruitland coal seams. It is a marginal water resource due to low permeability, poor water quality, gas production, and low yields (Stone et al. 1983). The PCS appears to be in the range of 110 to 120 feet thick within the ROI.

Water levels in the PCS were also measured using piezometers installed at six locations in the Navajo Mine Lease Area. The measurements were used to estimate potentiometric surfaces and gradients. The potentiometric gradients in both the No. 2 and No. 3 coal units indicate groundwater flow components toward the north-northeast in the vicinity of these monitoring wells and piezometers. Flow directions in the upper coal seams are expected to be generally toward the northeast, similar to the gradients observed in the No. 2 and No. 3 coals, although local gradients may be influenced by the lower elevations along Pinabete, No Name, and Cottonwood arroyos. The No. 6, No. 7, and No. 8 coal seams outcrop along the valleys of Pinabete, No Name, and Cottonwood arroyos.

Historical water level data collected during the mid-1970s was reviewed for six wells that were completed in the PCS within or adjacent to the Navajo Mine Lease Area (BNCC 2012a). Recent and historical water level data were used to estimate the potentiometric surface and flow gradients. The potentiometric gradients in PCS indicate an overall northerly gradient and a slight easterly component in the gradients at the southern end of the site due to a structural high in the formation along the southeast perimeter of Area V. Also, local gradients exist toward the topographic lows along No Name, Pinabete, and Cottonwood arroyos.

Historical water level data collected during the mid-1970s was reviewed for six wells that were completed in the PCS within or adjacent to the Navajo Mine Lease Area (BNCC 2012a). Recent and historical water level data were used to estimate the potentiometric surface and flow gradients. The potentiometric gradients in PCS indicate an overall northerly gradient and a slight easterly component in the gradients at the southern end of the site due to a structural high in the formation along the southeast perimeter of Area V. Also, local gradients exist toward the topographic lows along No Name, Pinabete, and Cottonwood arroyos.

**Groundwater Quality**

The water quality characteristics of Cottonwood, Pinabete, and No Name arroyos, the Fruitland coal seams, and the underlying PCS have been determined from the baseline groundwater monitoring. These results show that the groundwater within and adjacent to the Pinabete SMCRA Permit Area is poor and suitable only for marginal livestock use. Table 4.5-6 provides a summary of groundwater quality monitoring results by formation within the Navajo Mine Lease Area.

**Table 4.5-6 Summary of Groundwater Quality Monitoring within the Navajo Mine Lease Area**

| Constituents[1] | Average Values for Water Quality in the Fruitland Coals at the BNCC Lease[2] (2007–2008) | Average Values for Water Quality in the Pinabete Arroyo Alluvium[3] (2008) | Average Values for Water Quality in the Picture Cliffs Sandstone[4] (2008) | Average Values for Water Quality in the No Name Arroyo Alluvium[5] (1998) | Median Values for Water Quality in the Cottonwood Arroyo Alluvium[6] (1974-1999) |
|---|---|---|---|---|---|
| pH (SU) | 8.405 | 7.47 | 8.59125 | 7.6 | 7.8 |
| TDS | 3310 | 2895 | 6061.25 | 13000 | 3015 |
| Arsenic | 0.002 | 0.001 | 0.013 | <0.005 | NS |
| Barium | 0.03 | 0.017 | 0.033 | 0.46 | NS |
| Bicarbonate as $HCO_3$ | 1409.5 | 366.55 | 825 | 679 | 9 |
| Boron | 0.3645 | 0.45 | 0.5875 | 1.62 | NS |
| Cadmium | <0.0005 | 0.00005 | 0.00005 | <0.001 | NS |
| Calcium | 5.05 | 108.61 | 18.78 | 8625 | NS |

| Constituents[1] | Average Values for Water Quality in the Fruitland Coals at the BNCC Lease[2] (2007–2008) | Average Values for Water Quality in the Pinabete Arroyo Alluvium[3] (2008) | Average Values for Water Quality in the Picture Cliffs Sandstone[4] (2008) | Average Values for Water Quality in the No Name Arroyo Alluvium[5] (1998) | Median Values for Water Quality in the Cottonwood Arroyo Alluvium[6] (1974-1999) |
|---|---|---|---|---|---|
| Carbonate as $CO_3$ | 150 | <10 | 745 | <1 | 12.25 |
| Chloride | 631.5 | 30.63 | 318.13 | <0.01 | 14 |
| Chromium | 0.028 | 0.005 | 0.019 | <0.01 | NS |
| Copper | 0.057 | 0.01515 | 0.127275 | <0.01 | NS |
| Fluoride | 2.175 | 2.6 | 1.525 | 1.45 | NS |
| Iron, total | 0.40 | 11.21 | 68.33 | .865 | 0.62 |
| Lead | 0.007 | 0.0002 | 0.0002 | <0.005 | 9 |
| Magnesium | 1.3 | 17.91 | 6.98 | 0.267 | 22.7 |
| Manganese, total | 0.026 | 0.93 | 1.28 | 0.395 | 0.37 |
| Mercury | 0.0002 | 0.0002 | 0.0002 | NS | NS |
| Nitrate as N | 0.16 | 0.0675 | 1.475 | 5.26 | NS |
| Potassium | 15.25 | 2.29 | 21.76 | 21.65 | NS |
| Selenium | 0.005 | 0.008 | 0.006 | 0.0255 | 0.0025 |
| Silver | 0.0003 | 0.00006 | 0.00005 | <0.01 | NS |
| Sodium | 1175 | 705 | 1906 | 2930 | NS |
| Sulfate | 429.5 | 1632 | 2610 | 8625 | 1605 |
| Uranium | 0.0005 | 0.026 | 0.006 | NS | NS |
| Zinc | 0.006 | 0.015 | 0.014 | <0.1175 | NS |

Source: BNCC 2012a

Notes:

[1] All units in mg/l, unless indicated otherwise.

[2] As sampled at monitoring well KF-98-02.

[3] As sampled at monitoring wells PA-1 and PA-2.

[4] As sampled at monitoring wells KPC-98-01 and KPC-2007-01.

[5] As sampled at monitoring well NNA-1.

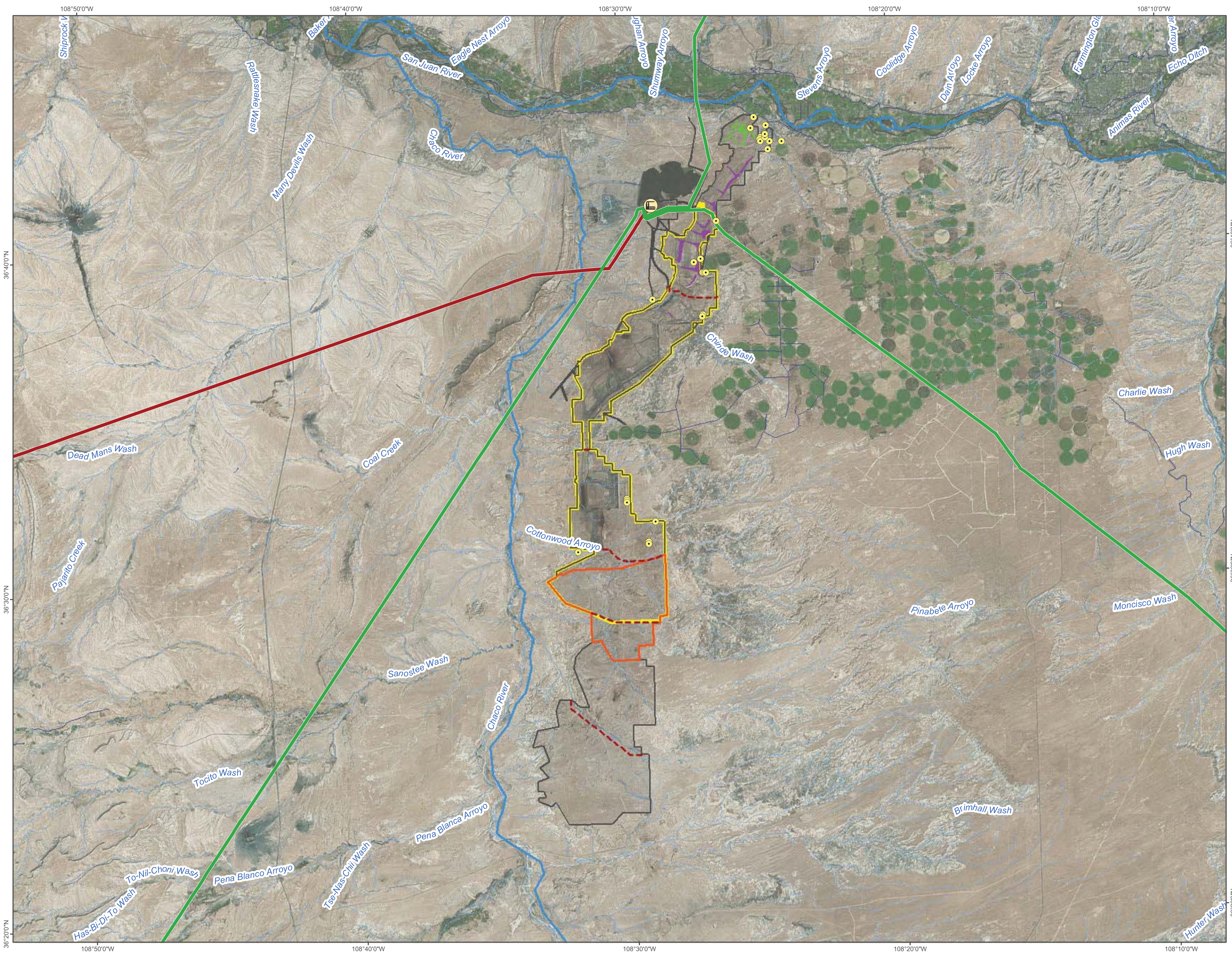
[6] As sampled at monitoring wells QACW-2, QACW-2B, GM-17.

NS = Not Sampled

Water Quality Data provided in the Pinabete SMCRA Permit application for the Cottonwood Arroyo was provided as median values.

Historic CCR Placement

Materials that remain after burning coal (including fly ash, bottom ash, coal slag, and flue gas desulfurization residue) are referred to as coal combustion byproducts when placed in the mine (a practice discontinued in 2008) and as CCR when disposed in the FCPP ash disposal area (the current and ongoing practice). CCR from FCPP was placed in mined out pits or ramps within the Navajo Mine SMCRA Permit Area during the period from 1971 to 2008. Continued operations of the FCPP do not include placement of CCR materials in the mine backfill for reclamation at the Navajo Mine SMCRA Permit Area or Pinabete SMCRA Permit Area. Historic CCR placement occurred primarily within Area I with limited placement in Area II. Figure 4.5-3 shows the locations of the CCR placement along with the monitoring wells used to monitor possible contaminants of concern from these areas.




Four Corners Power Plant
and Navajo Mine Energy Project

ENVIRONMENTAL SETTING
& CONSEQUENCES

**Figure 4.53**

Monitoring Wells in the Vicinity
of Former CCR Placement Areas
at the Navajo Mine

**PROJECT FACILITIES**

Four Corners Power Plant

Groundwater Monitoring Wells

Coal Combustion Residue Placement

Approximate Coal Combustion
Residue Placement

**PROJECT BOUNDARIES**

Navajo Mine Resource Areas

Navajo Mine Lease Area and ROWs

Navajo Mine SMCRA Permit Boundary

Proposed Pinabete SMCRA Permit Boundary

**TRANSMISSION LINES**

345kV

500kV

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A National Academy of Sciences study (NRC 2006) identified potential impacts to water quality from CCR which was conducted in response to national public concern. The study suggested that, while no cases existed where water quality exceedances were directly attributable to CCR burial, concern about proper management was warranted. The report recommended characterization of a power plant CCR disposal site and the materials placed in it, including recommended characterization methods and leach tests. Reclamation plans need to specify how CCR would be used and what sorts of covers are placed to prevent root invasion and uptake of trace elements. The report also suggested design of monitoring plans to target potential releases from CCR disposal areas and establishment of performance standards.

The potential impacts of CCR to groundwater for Navajo Mine have been previously addressed in the Cumulative Hydrological Impact Assessment (CHIA). It was concluded that "[t]he reclamation of the CCR placement areas at the mine has been sufficient in part because of the natural conditions prevalent in the area and also because precautions were taken when engineering the CCR placement and reclamation. Thus far, negligible impacts have resulted from the CCR placement. It is also unlikely that any significant future impacts will ensue from the CCR placement within the Navajo Mine Lease Area because of the very slow groundwater movement and the likely attenuation of contaminants of concern as they migrate through the subsurface;" however, there is no hydrologic connection between Areas III /IV and Area I/II. Further, transport directions for mine spoil water would be laterally down dip in the Fruitland Formation, toward the outcrop areas to the south and west of Area III, and vertically into the Pictured Cliff Sandstone. Lateral flow from the mine spoils through the Fruitland Formation and vertical fracture flow into the Pictured Cliff Sandstone is very low due to the low hydraulic conductivity of these units and due to the relatively flat gradients that can be expected based on pre-mine conditions. Therefore, OSMRE's CHIA analysis found that past CCR placement within the Navajo Mine SMCRA Permit Area would not impact groundwater in the short- or long-term (OSMRE 2012c). Lack of impact from previous CCR placement within Areas I and II is further substantiated through the following analysis.

Unsaturated conditions currently exist at CCR backfill placement locations except for two locations at the northern end of Area I. CCR materials placed in the Bitsui Pit are saturated as are an isolated location of basal saturation of CCR material around the Watson-4 well. Current groundwater flow directions from the Bitsui Pit are toward the subcrop of the Fruitland Formation along the alluvium of the San Juan River (BNCC 2011a). Any groundwater flow in the future from Area I and portions of Area II is also expected to be to the northeast toward Fruitland Formation subcrop along the alluvium of the San Juan River. Consequently, groundwater from CCR placement locations and associated mine backfill within Areas I and II are not expected to affect the alluvium of the Chaco River.

A supplemental groundwater study program and monitoring well installation was implemented to assess possible impacts to groundwater from historic mine placement of CCR at the Navajo Mine SMCRA Permit Area (BNCC 2009). BNCC also completed a series of detailed laboratory batch leaching studies of the constituents leached from CCR and mine spoil for the Probable Hydrologic Consequences determination (BNCC 2011a). Both of these results—the field monitoring and the laboratory leach studies—show that TDS and sulfate concentrations do not increase in CCR that become saturated with spoil water (water that flows through the backfilled mine spoils after mining). Arsenic, boron, fluoride, and selenium concentrations may increase in CCR leachate. Boron and fluoride in the CCR monitoring wells were above the livestock watering criteria. Arsenic concentrations in the CCR wells were close to the livestock watering criteria, while selenium concentrations were below the livestock watering criteria. Other trace constituents were below detection limits in the majority of the samples from both CCR and spoil wells (BNCC 2011a). The arsenic, boron, and fluoride concentrations in a spoil monitoring well immediately downgradient of a CCR well showed that spoil attenuates or reduces the concentrations of these constituents (BNCC 2011a).

Transport modeling of spoil water from Area I through the Fruitland Formation to its discharge location at the formation subcrop beneath the alluvium of San Juan River indicates that changes in sulfate concentrations in the San Juan River alluvial groundwater are not expected to occur. Furthermore, groundwater flow in the

San Juan River alluvium is estimated to be approximately two orders of magnitude higher than the estimates of groundwater flow discharging to the San Juan River alluvium from the Fruitland Formation (BNCC 2011a). Thus, TDS and trace constituents such as boron that may be above livestock suitability levels in CCR or mine spoil leachate would be reduced by mixing with the groundwater in the San Juan River alluvium even if they are not attenuated during transport to the Fruitland Formation. The existing water quality in the San Juan River alluvial aquifer is quite variable as indicated by the available water quality data from San Juan River alluvial wells provided in the Mine Plan Revision (BNCC 2011a). There are no cumulative adverse impacts to surface water quality from CCR placement at the Navajo Mine SMCRA Permit Area. CCR materials have not been placed within mine backfill in Area III and there are no plans for placement of CCR within mine backfill within either Area III or Area IV North or South. CCR materials were placed within Area I and portions of Area II but there is no cumulative groundwater impact or connection between Areas III and IV North and South and Area I and II.

Within the Pinabete SMCRA Permit Area, groundwater quality samples have been gathered from monitoring wells installed in Pinabete Arroyo, Cottonwood Arroyo, and the No Name alluvium. Analytical results for the water quality samples from these wells are summarized in Table 4.5-6 (BNCC 2012a).

The baseline results for the Cottonwood alluvial wells show water quality to be a sodium-sulfate type with relatively high but variable TDS concentrations. TDS concentrations ranged from 2,590 to 3,615 milligrams per liter (mg/L). Median sulfate concentrations exceed recommended livestock use criteria at all the Cottonwood alluvial wells. Median concentrations of TDS and sulfate in the groundwater within the Cottonwood alluvial wells also exceed EPA's Secondary Drinking water use criteria. Fluoride concentrations fluctuate in the alluvial groundwater and are often above relevant criteria for livestock and drinking water use.

The baseline results for the Pinabete alluvial wells show the water quality to be a sodium-sulfate type with TDS concentrations ranging from 1,500 to 4,300 mg/L. Water within the alluvium is unsuitable for drinking water use due to TDS, sulfate, fluoride, iron, and manganese concentrations above secondary drinking water standards. The quality of the alluvial groundwater varies, although the TDS, sulfate, and fluoride concentrations usually exceed relevant criteria for livestock use.

The baseline results for the No Name Arroyo alluvial wells show the water to be a sodium-sulfate type similar to Pinabete Arroyo but with much higher sulfate, sodium, and TDS concentrations. Water quality within the alluvium downstream of the No Name Impoundment is unsuitable for either drinking water or livestock water use.

Alluvium Aquifer

Water derived from alluvial wells in the vicinity of the FCPP and the Navajo Mine Lease Area is predominantly used for livestock watering; therefore, alluvial water quality is compared to the applicable livestock water criteria. The criteria are not enforceable standards with respect to groundwater and are included only as a reference for the suitability of the groundwater quality for livestock use. Generally the alluvial systems are of sodium-sulfate type with variable TDS concentrations.

Pinabete Arroyo alluvium generally shows consistent pH at all monitoring wells, although iron and mercury tends to increase moving downstream while arsenic, boron, cadmium, copper, lead, selenium, zinc, and nitrate tends to decrease, and other constituents did not show any apparent trend. All pH values for samples within the Pinabete Arroyo alluvium were within the ranges for livestock water criteria. Arsenic, selenium, chloride, fluoride, sulfate and TDS exceeded livestock criteria for the Pinabete Arroyo alluvium for 5 percent, 4 percent, 4 percent, 86 percent, 75 percent and 46 percent of all samples, respectively. All median values for arsenic, selenium, and chloride were below the criteria indicating that the criteria exceedances are generally more characteristic of the high variability in the data set as compared to the general water quality. The median fluoride, sulfate and TDS values exceed the livestock criteria. Based on these relevant use criteria, the water in the Pinabete Arroyo alluvium system is a poor source of supply for livestock watering use. This is especially apparent when considering fluoride, sulfate, and TDS concentrations. These water quality parameters often exceed relevant criteria for livestock use, although the alluvium has been historically and is currently used for this purpose.

Moving downstream along the Cottonwood Arroyo alluvium pH, selenium, and fluoride tended to increase while boron, manganese, mercury, nitrate, sulfate and TDS tended to decrease, and other constituents did not show any apparent trend.

All pH values for all samples within the No Name Wash alluvium were within the appropriate range. Sulfate and TDS exceeded livestock criteria for the No Name Wash alluvium for 100 percent and 100 percent of all samples, respectively. The median sulfate and TDS values exceed the livestock criteria. Based on these relevant use criteria, the water in the No Name alluvium system is a poor source of supply for livestock watering use. This is especially apparent when considering sulfate and TDS concentrations. These water quality parameters often exceed relevant criteria for livestock use, although the alluvium has been historically used for this purpose (OSMRE 2012c).

Most of the monitoring wells at the FCPP are in the Alluvial Aquifer (two are located in the Lewis Shale). The FCPP ash ponds are built upon the Lewis Shale, a marine shale that contains substantial amounts of evaporite deposits, including gypsum, and tends to cause relatively high levels of TDSs in the water. All monitoring wells at the FCPP, including those that would represent "background" or pre-power plant levels have relatively high boron concentrations (greater than the State of New Mexico surface water standard of 0.75 mg/L) at various times during the period of record (1987-2012) (APS 2013). Wells considered “background” are those upgradient of the ash disposal areas (MW-43, MW-12R, MW-41, LS-1, LS-2). Table 4.5-7 provides a summary of groundwater quality monitoring results beneath the ash disposal area at the FCPP.

**Table 4.5-7 Summary of Groundwater Quality Monitoring Results at FCPP**

| Constituent | Non-Baseline Monitoring Wells Minimum | Non-Baseline Monitoring Wells Maximum | Non-Baseline Monitoring Wells Average | Baseline Monitoring Wells (MW-41, MW-12R, MW-43) Minimum | Baseline Monitoring Wells (MW-41, MW-12R, MW-43) Maximum | Baseline Monitoring Wells (MW-41, MW-12R, MW-43) Average | EPA MCL | NNEPA |
|---|---|---|---|---|---|---|---|---|
| **Primary Drinking Water Standards** | | | | | | | | |
| Antimony[1] | 0.0001 | 0.0060 | 0.0021 | <0.001 | <0.0025 | <0.001 | 0.006 | 0.006 |
| Arsenic | <0.001 | 0.2260 | 0.0244 | 0.0041 | 0.0085 | 0.0063 | 0.010 | 0.010 |
| Barium | 0.0036 | 1.10 | 0.03 | 0.05 | 0.54 | 0.24 | 2.0 | 2.0 |
| Beryllium | <0.0005 | 0.001 | 0.001 | 0.0012 | 0.0023 | 0.0016 | 0.004 | 0.004 |
| Cadmium | 0.00013 | 0.0160 | 0.0029 | <0.001 | <0.001 | <0.001 | 0.005 | 0.005 |
| Chromium | <0.0001 | 0.240 | 0.0136 | 0.0029 | 0.065 | 0.028 | 0.10 | 0.10 |
| Copper | 0.0015 | 0.551 | 0.0780 | 0.0093 | 0.013 | 0.011 | 1.3 | 1.3 |
| Fluoride | 0.05 | 100 | 1.0 | <2.0 | 8.0 | 6.0 | 4.0 | 4.0 |
| Lead | 0.0002 | 0.130 | 0.0155 | 0.011 | 0.013 | 0.012 | 0.015 | 0.015 |
| Mercury | 0.0001 | <0.001 | 0.0001 | <0.0002 | <0.0002 | <0.0002 | 0.002 | 0.002 |
| Nitrate (N) | 0.0100 | 1,422 | 134 | N/A | N/A | N/A | 10 | 10 |
| Selenium | 0.0018 | 1.710 | 0.2595 | 0.0064 | 0.59 | 0.2988 | 0.05 | 0.050 |
| Thallium | 0.0001 | 0.2030 | 0.0239 | 0.0004 | 0.002 | 0.0012 | 0.002 | 0.002 |

| Constituent | Non-Baseline Monitoring Wells Minimum | Non-Baseline Monitoring Wells Maximum | Non-Baseline Monitoring Wells Average | Baseline Monitoring Wells (MW-41, MW-12R, MW-43) Minimum | Baseline Monitoring Wells (MW-41, MW-12R, MW-43) Maximum | Baseline Monitoring Wells (MW-41, MW-12R, MW-43) Average | EPA MCL | NNEPA |
|---|---|---|---|---|---|---|---|---|
| Uranium | 0.0028 | 270 | 3.518 | 0.056 | 0.098 | 0.079 | 30 | 30 |
| **Secondary Drinking Water Standards** | | | | | | | | |
| Chloride | 200 | 12,051 | 1,385 | 620 | 1,800 | 1,180 | 250 | 250 |
| Iron | 0.0030 | 12.3 | 0.941 | N/A | N/A | N/A | 0.3 | 0.3 |
| Manganese | 0.0371 | 204 | 3.0 | N/A | N/A | N/A | 0.05 | 0.05 |
| pH | 5.52 | 8.17 | 7.18 | N/A | N/A | 6.85[3] | 6.5-8.5 | 6.5-8.5 |
| Silver | 0.0001 | 0.1160 | 0.0165 | N/A | N/A | N/A | 0.10 | 0.1 |
| Sulfate | 2,039 | 131,822 | 23,602 | 4,700 | 35,000 | 26,925 | 250 | 250 |
| TDS | 5,230 | 186,360 | 38,959 | 7,500 | 55,000 | 40,875 | 500 | 500 |
| Zinc | 0.0060 | 0.2500 | 0.0391 | N/A | N/A | N/A | 5.0 | 5.0 |
| **Constituents with No Applicable Drinking Water Standards** | | | | | | | | |
| Temperature (C) | 8.23 | 22.5 | 15.53 | N/A | N/A | 18.61[3] | | |
| Field Conductance (µmhos) | 962 | 101,800 | 26,368 | N/A | N/A | 35,662[3] | | |
| Alkalinity ($CaC0_3$) | 140 | 13,750 | 713 | 730 | 900 | 842 | | |
| Boron | 0.20 | 70.7 | 8.91 | 0.58 | 0.94 | 0.70 | | |
| Calcium | 30 | 7,800 | 448 | 220 | 420 | 333 | | |
| Bicarbonate ($HCO_3$) | 0 | 16,775 | 870 | N/A | N/A | N/A | | |
| Magnesium | 144 | 17,000 | 2,656 | 370 | 2,900 | 1,656 | | |
| Nickel | 0.0140 | 0.750 | 0.0998 | N/A | N/A | N/A | | |
| Silica (Si02) | 0.0 | 96 | 10 | N/A | N/A | N/A | | |
| Sodium | 220 | 56,000 | 7,092 | 1,500 | 14,000 | 10,750 | | |
| Potassium | 8 | 360 | 80 | 28 | 130 | 103 | | |

Source: APS 2013

Notes:

1 All results and limits are in mg/L, unless indicated otherwise.

2 NNEPA Domestic Water Supply Standards are part of the surface water quality standards. No specific groundwater quality standards have been adopted by the Navajo Nation.

3 Results are for a single well (either MW-41, 43, or 12R) for a single sample event.

Fruitland Formation

The pH levels within the No. 3 coal seam range from 7 to 9, which is characteristic of the Fruitland coals within the San Juan Basin. The water quality is unsuitable for drinking water use due to concentrations of TDS, chloride, and boron above the Navajo Nation surface water quality criteria for drinking water (the Navajo Nation does not have groundwater quality standards). The TDS concentrations also exceed the relevant criterion for livestock use. The groundwater in the No. 3 coal seam is a sodium-bicarbonate-chloride type, with TDS of about 3,300 mg/L. The ion composition results are consistent with the baseline coal water quality monitoring data at the Navajo Mine Lease Area.

Water quality monitoring data from the coal wells located within or adjacent to the Navajo Mine SMCRA Permit Area show very high TDS concentrations in the coal seam groundwater, with median concentrations at individual wells ranging from 2,770 to 13,400 mg/L. The coal seam water quality results show that TDS concentrations increase with depth and distance from the outcrop. Furthermore, TDS concentrations as high as 50,000 mg/L have been observed in the Fruitland coal units located east and down slope of the Navajo Mine SMCRA Permit Area.

Water quality analytical results from the baseline sampling of the No. 8 coal seam are unsuitable for drinking water due to concentrations of TDS, chloride, fluoride, and sulfate that are above EPA's secondary drinking water use criteria. The sulfate and TDS concentrations often exceed relevant criteria for livestock use and would not be sufficient to use for livestock water supply.

Based on the trends observed from sampling of coal wells within the permit area, concentrations of TDS, bicarbonate, and chloride appear to increase with depth and distance from the outcrop, but sulfate concentrations appear to decrease. The groundwater chemistry changes as soluble minerals dissolve and cation exchange processes reduce the proportion of calcium and increase the proportion of sodium in solution. Sulfate reduction also occurs when groundwater transitions from oxidizing to reducing conditions, particularly within the coals.

Pictured Cliffs Sandstone

Data from monitoring wells located within and adjacent to the permit area indicate the groundwater in the PCS has high TDS concentrations, ranging from 5,000 to over 9,000 mg/L. Sulfate is the dominant anion, although the concentrations of chloride and bicarbonate are also relatively high. Sodium is the dominant cation. Magnesium and calcium concentrations are quite low and are typically less than potassium concentrations, although potassium was not included in the historic samples collected during the 1970s.

The high concentrations of TDS, sulfate, chloride, and boron in the water from the PCS within and adjacent to the permit area preclude its use for domestic purposes. The PCS is also a poor source for livestock watering due to the very high TDS and sulfate concentrations, as well as low permeability and low yield.

Table 4.5-7 depicts the summary of groundwater quality monitoring results at the FCPP and compares results to the EPA Maximum Contaminant Level and the NNEPA drinking water standards.

#### *4.5.2.2 Surface Water (including waters of the US)*

The Navajo Mine, FCPP, and associated existing transmission lines are located within the San Juan Basin Watershed, which extends across portions of four states, including northwestern New Mexico, southwestern Colorado, southeastern Utah, and northwestern Arizona (Figure 4.5-4). The San Juan Basin Watershed encompasses a 24,908-square-mile drainage within USGS Hydrologic Unit Code (HUC) 1408. The northern portion of the Navajo Mine Lease Area is located within the Middle San Juan River HUC 14080105. The other resources areas of the Navajo Mine Lease Area and FCPP Lease Area are within Chaco River Watershed HUC 14080106, which drains 4,563 square miles. The transmission lines intersect numerous HUCs within the San Juan Basin Watershed. The following subsections provide an overview of surface water resources and water quality issues within the FCPP's region of influence, based on an air deposition model conducted for the proposed Project (EPRI 2013), as well as a description of the surface water resources present at the Navajo Mine Lease Area, and FCPP Lease Area. Water quality data and existing water use at the Navajo Mine and FCPP are also described below. As described in Chapter 2, no water is used in the operation or maintenance of the subject transmission lines; therefore, details regarding water quality and water use of the water bodies crossed by the lines are not provided below.

**Regional Surface Water Resources**

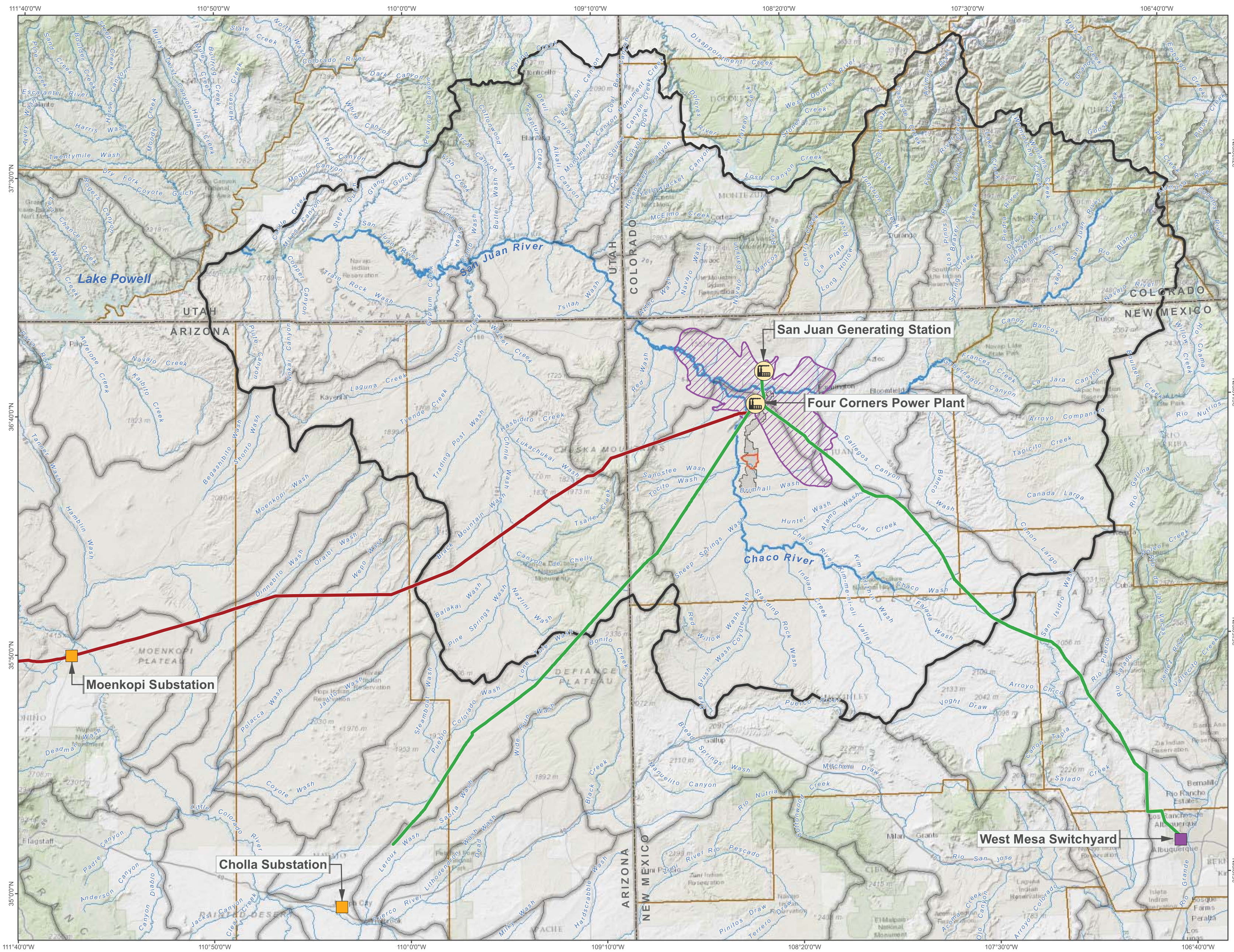
The ROI is located within the main portion of San Juan Basin Watershed, which covers approximately 4,600 square miles and encompasses most of the Four Corners geographic region. An estimated 670,000 acre-feet of water are available from the San Juan Basin for domestic, agricultural, commercial, and industrial use (BNCC 2012a). The most prominent surface water feature in the watershed is the San Juan River, which flows generally east to west, originating along the southern slope of the San Juan Mountains in southwestern Colorado. The San Juan River flows through Farmington and passes about 5 miles north of the FCPP before it drains into the Colorado River at Lake Powell in Utah. Other major surface water bodies in the area include the Animas, La Plata, and Chaco rivers. The Animas River flows south from its headwaters in the San Juan Mountains in southwestern Colorado. The La Plata River originates in the La Plata Mountains, also in southwestern Colorado, 35 miles north of the New Mexico Border. Both the Animas and La Plata rivers join the San Juan River just west of Farmington. The Chaco River is an intermittent wash that flows northwest through Chaco Canyon. It joins the San Juan River west of Farmington and the FCPP. Other water features in the watershed include numerous arroyos and washes. Two larger arroyos near the Navajo Mine Lease Area, Pinabete and Cottonwood, are intermittent waterways with only seasonal water present. Most other washes are ephemeral, receiving and carrying water only during heavy rains that come during the spring rains or the summer monsoons (San Juan Water Commission 2003).

The USGS located three stream gaging stations along the San Juan River in the Project vicinity. Station 09368000 is active and located on the San Juan River approximately 0.9 mile south of Shiprock, New Mexico, and 2 miles west of the Chaco River confluence. Station 09367540 is inactive and located approximately 0.4 mile west of Fruitland, New Mexico, 13.8 miles east of the Chaco River confluence, and 8.3 miles west of the La Plata River confluence. Station 09365000 is active and located approximately 0.9 mile southwest of Farmington, New Mexico, 1.7 miles southeast of the La Plata River confluence, and 0.7 mile northwest of the confluence with the Animas River (Figure 4.5-5). Review of data collected at these three stations demonstrates variability of flow along the San Juan, with a general decreasing flow trend for the period of record (1931-2010). Although flows initially increased upstream to downstream along the San Juan, this trend reversed around 1972 such that downstream flows were less than upstream flows (OSMRE 2012c). Recent drought conditions in the Southwest have further decreased flow rates in the San Juan River.

The NMED set a standard for temperature of 32.2°C or less for the main stem of the San Juan River from the Navajo Nation boundary to its confluence with the Animas River. The San Juan River is listed as impaired for sedimentation between the Animas River and Canon Largo. The Navajo Reservoir is also listed as impaired for mercury in fish tissue and temperature (NMED 2014). TMDLs for the San Juan River Watershed were approved in 2005 for sedimentation, bacteria, and selenium (NMED 2005). Additional TMDLs were approved in 2006 for nutrients in the Animas River and dissolved oxygen in the La Plata River (NMED 2006). An additional TMDL for E. coli was approved for San Juan River in 2010 and Animas River in 2013 (EPA 2010c).

# Figure 4.5-4

Regional Surface Water Resources




**PROJECT FACILITIES**

Four Corners Power Plant

Substation

Switchyard

**PROJECT BOUNDARIES**

Navajo Mine Lease Area

Proposed Pinabete SMCRA Permit Boundary

**TRANSMISSION LINES**

345kV

500kV

**HYDROLOGY FEATURES**

Rivers | Streams

Watershed Boundaries

San Juan Basin Watershed

FCPP 1% Deposition Area

N

0 12.5 25 50

Scale in Miles

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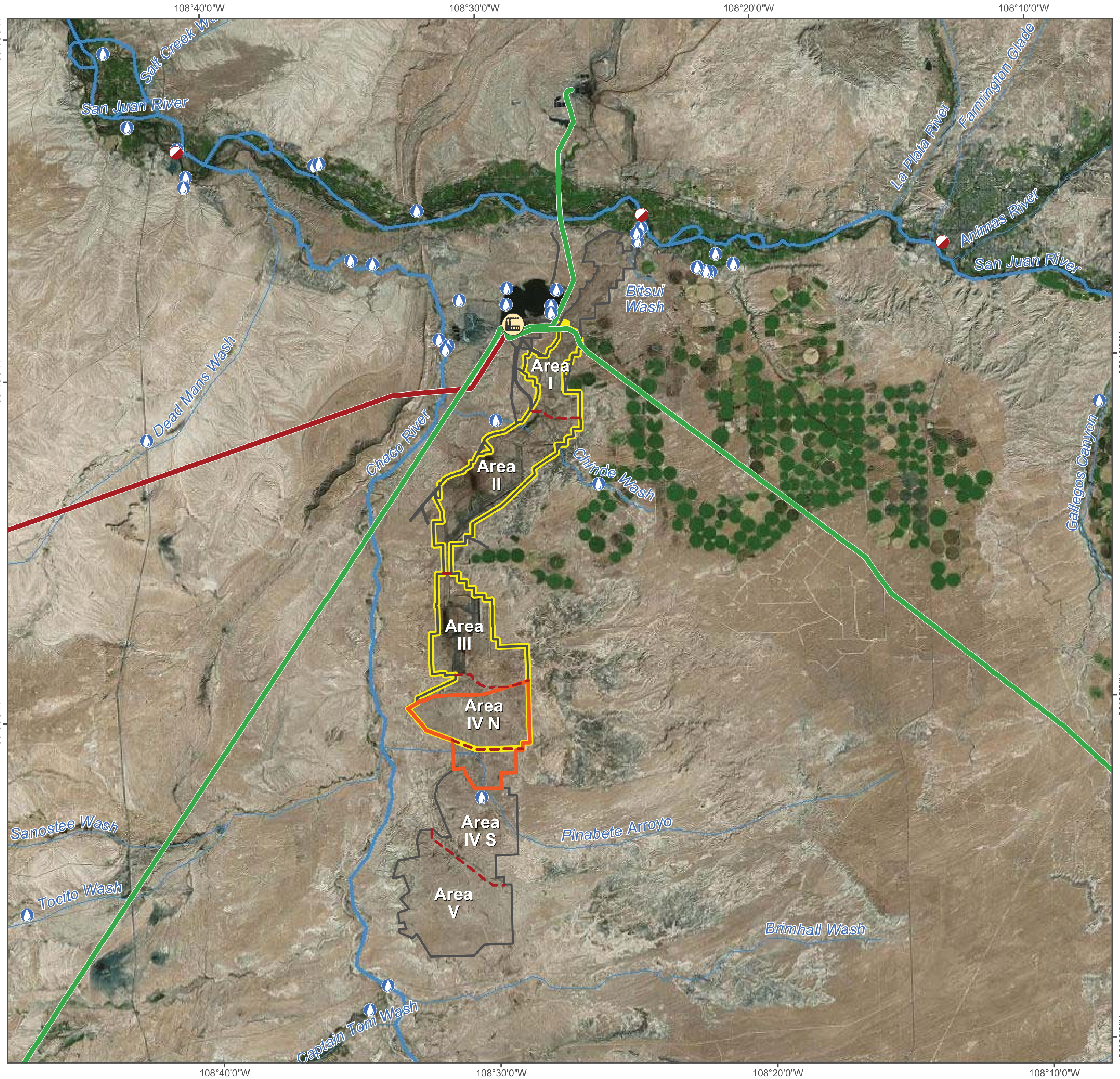


Four Corners Power Plant and Navajo Mine Energy Project

ENVIRONMENTAL SETTING & CONSEQUENCES

## Figure 4.5-5
Water Quality Stations

**PROJECT FACILITIES**
Four Corners Power Plant
NNEPA Water Quality Station

**PROJECT BOUNDARIES**
Navajo Mine Resource Areas
Navajo Mine Lease Area and ROWs
Navajo Mine SMCRA Permit Boundary
Proposed Pinabete SMCRA Permit Boundary

**TRANSMISSION LINES**
345kV
500kV

**OTHER FEATURES**
USGS Gaging Station

N

0 5 10
Scale in Miles

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The NNEPA maintains a number of water quality monitoring sites along surface waterbodies in the Navajo Nation. Monitoring locations are located along the Chaco River, Chinde Wash, Bitsui Wash, and the San Juan River. Monitoring data for all sample locations for all years collected was compared to NNEPA surface water quality standards for designated uses (NNEPA 2008). The Chaco River had the longest dataset of record with sampling from 1998 to 2013. Chinde Wash data covered the period 2001, 2003, 2004, and 2009-2011; Bitsui Wash only had data for 2001-2003, 2010, and 2011. Based on the data collected, nearly all sample sites met the standards for the designated beneficial uses. The exceptions are listed below:

- Mercury levels in Chaco River in all samples in which it was detected are above the standards for acute and chronic wildlife habitat and fish consumption. Concentrations detected range from 0.000001 mg/L to 0.002 mg/L.
- Two samples in 2005 and two in 2011 in the Chaco River were above the acute and chronic wildlife habitat standards for cadmium. One sample collected during a sample event in 2013 was above the standard for acute and chronic wildlife habitat for aluminum and cadmium.
- A sample collected during one sample event in the Bitsui Wash in 2011 was above the standards for secondary human contact and acute wildlife habitat for lead.

NNEPA collected data at various stations in the San Juan River in 2006 and 2011-2013. Based on the data collected a number of exceedances of standards for designated beneficial uses were observed. All stations exceeded standards for chronic Samples collected in the San Juan River at various stations were above surface water quality standards:

- San Juan River at Hogback: two samples in 2012 above the standard for acute wildlife habitat for aluminum, two samples in 2011 and two samples in 2012 above the standard for chronic wildlife habitat for aluminum. One sample in 2006 and two samples in 2012 above the standard for chronic wildlife habitat for mercury. One sample in 2006 and one sample in 2011 above the standard for domestic water supply and primary and secondary human contact for lead.
- San Juan River Upstream from Shiprock WWTF: two samples in 2011 above the standard for acute wildlife habitat for aluminum and chronic wildlife habitat for mercury, three samples in 2011 above the standard for chronic wildlife habitat for aluminum. One sample in 2011 was above the standard for domestic water supply and primary and secondary human contact for lead.
- San Juan River Downstream from Shiprock WWTF: two samples in 2011 above the standard for acute wildlife habitat for aluminum and chronic wildlife habitat for mercury, three samples in 2011 above the standard for chronic wildlife habitat for aluminum.
- San Juan River 15 Miles Downstream from Shiprock: two samples in 2011 and 2012 above the standards for acute and chronic wildlife habitat for aluminum. One sample in 2006, two samples in 2011 and two samples in 2012 above the standard for chronic wildlife habitat for mercury. One sample in 2012 above the chronic aquatic and wildlife habitat for selenium. One sample in 2006 and 2012 above the standard for domestic water supply for arsenic and barium. One sample in 2006 above the standard for domestic water supply for beryllium and chromium; fish consumption for mercury; and livestock watering for lead. One sample in 2012 above the standard for fish consumption for thallium.
- San Juan River Near Four Corners: one sample in 2012 and three samples in 2013 above the standard for both acute and chronic wildlife habitat for aluminum, Two samples in 2012 and three samples in 2013 above the standard for chronic wildlife habitat for mercury. One sample in 2013 above the standard for domestic water supply for thallium, uranium, and zinc; above the standard for fish consumption for mercury and thallium, and above the standard for primary human contact for arsenic.

- San Juan River Near Montezuma Creek: Two samples in 2012 and three samples in 2013 above the standards for acute and chronic wildlife habitat for aluminum. Three samples in 2013 above the standard for chronic wildlife habitat for mercury and selenium; above the standard for domestic water supply for arsenic, barium, beryllium, chromium, and lead; above the standard for livestock watering for lead; above the standard for fish consumption for thallium; and above the standard for primary human contact for arsenic. One sample in 2013 above the standard for domestic water supply for thallium and zinc. One sample in 2012 above the standard for fish consumption for mercury.
- San Juan River Near Bluff: Two samples in 2012 and three samples in 2013 above the standards for acute and chronic wildlife habitat for aluminum. Three samples in 2013 above the standard for chronic wildlife habitat for mercury. Three samples in 2013 above the standard for chronic wildlife habitat for mercury and selenium; above the standard for domestic water supply for arsenic, barium, beryllium, chromium, and lead; above the standard for livestock watering for lead; and above the standard for primary human contact for arsenic. One sample in 2013 above the standard for chronic wildlife habitat for selenium. One sample in 2013 above the standards for domestic water supply and fish consumption for thallium (NNEPA 2014).

**Navajo Mine**

The San Juan River is a perennial water body located adjacent to the northern boundary of the Navajo Mine Lease Area, which lies on the terrace above the floodplain. Surface water in the Navajo Mine SMCRA Permit Area, Pinabete SMCRA Permit Area, and immediately adjacent areas is characterized by ephemeral or intermittent streams that convey water only after precipitation events. The climate of the ROI includes summer rains that fall almost entirely during brief, but frequently intense, thunderstorms. As such, stream flows are widely variable, going from no discharge (dry channels) to peak discharge followed by a gradually diminishing discharge over several subsequent hours. These rapidly varying flows can transport large amounts of sediment and cause extensive changes in the shape of the channels after single events.

<u>Navajo Mine SMCRA Permit Area</u>

The primary ephemeral or intermittent streams that pass through the Navajo Mine SMCRA Permit Area and adjacent areas include the Chaco River, Bitsui Wash, Chinde Wash, Hosteen Wash, Barber Wash, Neck Arroyo, Lowe Arroyo, Cottonwood Arroyo, and Pinabete Arroyo, all described in more detail below. All eventually drain into the San Juan River to the north of the permit area.

Cottonwood Arroyo is a major sand bed intermittent drainage that passes through the southern portion of the permit area. Cottonwood Arroyo is one of the largest of the Chaco River tributaries with a drainage area of approximately 80.1 square miles, though only approximately six percent of the drainage area is within the permit area. Approximately half of the watershed is located on badlands, which accounts for the high discharge and sediment load. Cottonwood Arroyo is also seasonally influenced by irrigation activities in the NAPI lands just east of the Navajo Mine Lease Area.

Bitsui Wash is located near the northernmost portion of the permit area. It originates to the east of the permit area at the Navajo Indian Irrigation Project (NIIP), flows into the permit area, and then flows north into the San Juan River. Chinde Wash is located near the southern boundary of Navajo Mine Area I. It flows from east to west across the permit area, originating near the NIIP and flowing into the Chaco River. Under natural conditions, Bitsui and Chinde washes would flow ephemerally after large precipitation events, but both flow intermittently due to irrigation and direct discharges associated with the NIIP. Chinde Wash flows throughout the year with short-term peak flows caused by precipitation or NIIP direct canal discharges.

Hosteen Wash, Barber Wash, Neck Arroyo, and Lowe Arroyo are all ephemeral streams that flow in response to precipitation events. All flow across the permit area from east to west and into the Chaco River. Hosteen Wash is located in the northern portion of Area II and originates near the NIIP. The Hosteen Wash watershed area is about 9.1 square miles, approximately 3.7 square miles of which is disturbed by mining activity. Barber Wash originates just east of the permit boundary; the watershed area is about 5.3 square miles, approximately 1.4 square miles of which is disturbed by mining activities. Neck Arroyo is located south of the Area III shop complex and just north of Lowe Pit in the Area III mining area. The Neck Arroyo watershed area is 1.88 square miles, approximately 14 percent of which is within the permit area. The South Barber Drainage is a tributary to the Neck Arroyo that is 0.82 square mile, approximately 0.03 square mile of which is disturbed by mining activities. Lowe Arroyo flows through the middle of the Navajo Mine SMCRA Permit Area and has a drainage area of about 11.25 square miles, approximately 41 percent of which lies within the permit area.

## Pinabete SMCRA Permit Area

BNCC conducted a delineation of jurisdictional waters of the U.S. and wetlands within the Pinabete SMCRA Permit Area in April 2012 (Ecosphere 2012b). The delineation identified three primary surface water features in the Pinabete SMCRA Permit Area: Pinabete Arroyo, the south forks of Cottonwood and No Name arroyos. The arroyos in the Pinabete SMCRA Permit Area all eventually drain into the Chaco River to the west, and ultimately to the San Juan River to the north. The mainstem of Cottonwood Arroyo is outside of the Pinabete SMCRA Permit Area, but the arroyo (described in detail above) passes through Area IV North and borders the permit area to the northwest. Pinabete and No Name arroyos pass through Area IV South and border the permit area to the southwest and south, respectively. Pinabete Arroyo has a drainage area of about 60 square miles; approximately 16 percent is within the Navajo Mine Lease Area. No Name Arroyo has a drainage area of about 11 square miles, of which approximately 16 percent lies within the lease area. The headwaters of No Name Arroyo are within the Navajo Mine Lease Area. Table 4.5-8 provides the dimensions of these drainages within the ROI.

**Table 4.5-8 Intermittent and Ephemeral Drainages within or in Proximity to the Pinabete SMCRA Permit Area**

| Drainage | Length (miles) | Area (acres) |
|---|---|---|
| Cottonwood Arroyo | 7.6 | 10.4 |
| Pinabete Arroyo | 19.2 | 34 |
| No Name Arroyo | 2.8 | 1.1 |
| Total | 29.8 | 46.5 |

Source: Ecosphere 2012b.

In addition to the intermittent and ephemeral drainages, three stock ponds in the Pinabete SMCRA Permit Area were identified as jurisdictional. All three have defined channels upstream and are connected to defined channels downstream either by an active spillway or a diversion channel. These ponds catch surface flows from some tributary drainages and are often dry. Table 4.5-9 summarizes the area of each of these ponds. The USACE has reviewed the delineation report and verified its findings (USACE 2013). Figure 4.5-6 shows the location of the identified jurisdictional features within the Pinabete SMCRA Permit Area.

**Table 4.5-9 Stock Ponds in the Pinabete SMCRA Permit Area**

| Drainage | Site | Area (acre) | Classification |
|---|---|---|---|
| Pinabete Arroyo | Pond 1 | 0.58 | Palustrine unconsolidated shore |
| Pinabete Arroyo | Pond 2 | 0.34 | Palustrine unconsolidated shore |
| Pinabete Arroyo | Pond 3 | 1.13 | Palustrine unconsolidated shore |

Source: Ecosphere 2012b.

The USACE used the California Rapid Assessment Method (CRAM) to evaluate the background condition of the arid ephemeral streams and channels within Area IV North and Area IV South to estimate the effects of post-project direct and indirect impacts. CRAM is a technique that was originally intended to provide a rapid and repeatable assessment method that can be used routinely for wetland monitoring and assessment throughout the state of California; however, the constructs of CRAM can be applied to a wide range of arid, ephemeral streams similar to those found throughout the arid southwestern U.S. CRAM assesses four overarching attributes of stream condition: 1) buffer and landscape context; 2) hydrology; 3) physical structure; and 4) biotic structure. Within each of these attributes are a number of metrics that assess more specific aspects of stream condition. Metric scores under each attribute are aggregated in CRAM to yield scores at the level of attributes, and attribute scores are aggregated to yield a single overall index score, via simple arithmetic formulas. Attribute and index scores are expressed as percent possible, ranging from 25 (lowest possible to a maximum of 100). Table 4.5-10 shows the overall CRAM index and attribute scores.

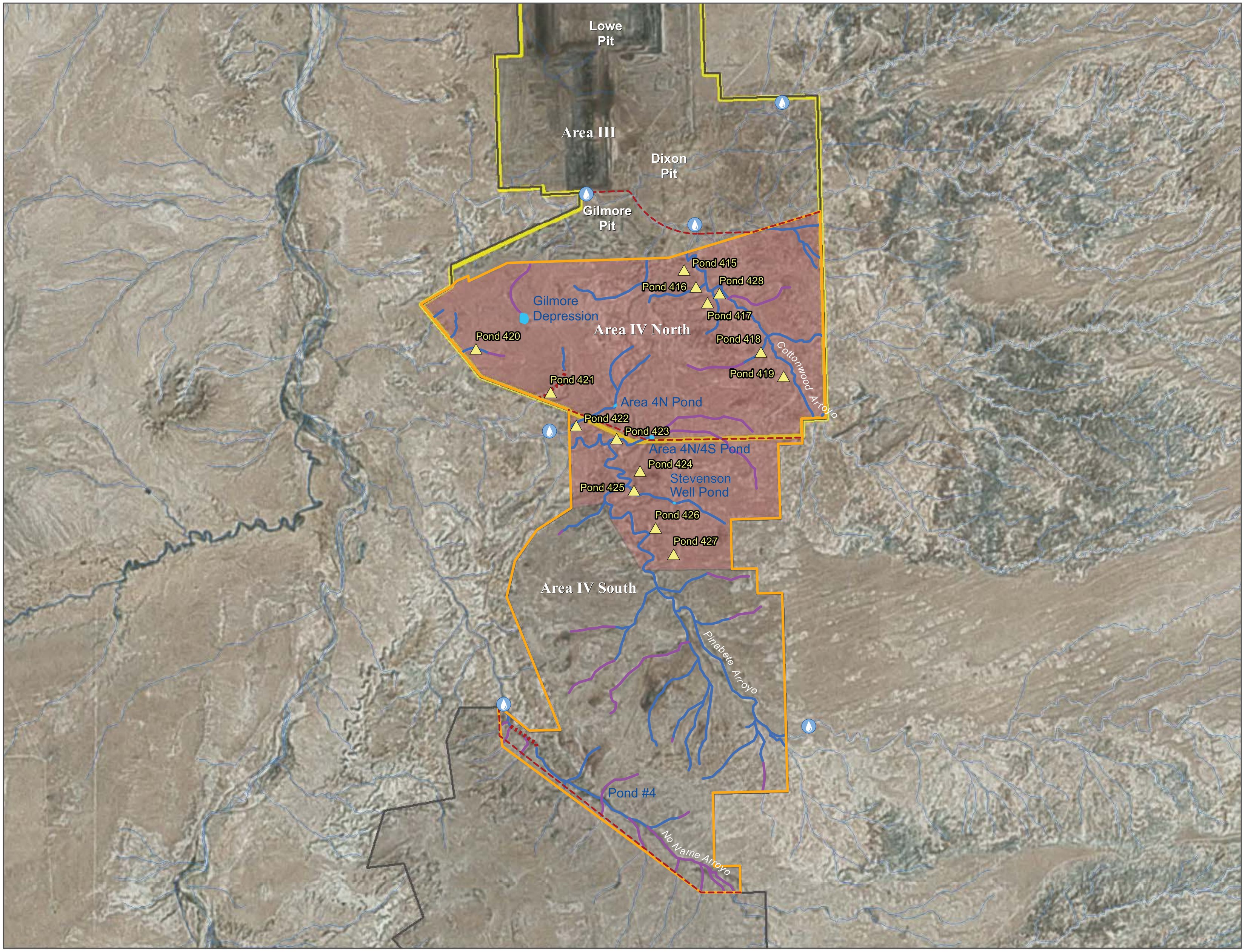
**Table 4.5-10 Overall CRAM Index and Attribute Scores**

| CRAM Index and Attribute Scores | Headwater Systems | Cottonwood and Pinabete Arroyos | Overall |
|---|---|---|---|
| Overall Index Score | 56 | 68 | 59 |
| Buffer and Landscape Context | 93 | 93 | 93 |
| Hydrology | 70 | 87 | 73 |
| Physical Structure | 32 | 43 | 34 |
| Biotic Structure | 35 | 49 | 38 |

Source: USACE 2013.

Water Quality

Historic data were analyzed for over 20 physical and chemical constituents collected by the USGS along the San Juan River at the three gaging stations between 1958 and 2010. In addition, OSMRE reviewed 2012 and 2013 water quality data collected by NNEPA along the San Juan River. The analysis indicated high variability, generally increasing pH, and generally decreasing or relatively unchanged concentrations in constituents over time (OSMRE 2012c). Naturally occurring selenium is one of the water quality issues in both the Animas and San Juan rivers. In 2005, it was determined that the background level of selenium in the Animas River exceeded the prior standard of two parts per billion. Subsequently, the standard was changed from 2 to 5 ppb by the New Mexico State Water Quality Board. The Navajo Nation also has standards for the segments of the San Juan River which flow through tribal lands, as shown on Table 4.5-3. The natural water in the region now generally complies with the EPA's adjusted livestock water quality standard for selenium (0.05 mg/L). The natural water is generally of higher quality and more consistent over time and space in the Animas River than in the San Juan River. The Animas River is a newer and steeper river than the San Juan River and as a result has weathered and eroded its watershed less (San Juan County 2007).




Four Corners Power Plant
and Navajo Mine Energy Project

ENVIRONMENTAL SETTING
& CONSEQUENCES

**Figure 4.5-6**

Jurisdictional Waters of the U.S.
within the Pinabete Permit Area

**PROJECT BOUNDARIES**

Navajo Mine Resource Areas
Navajo Mine Lease Area
Preliminary Jurisdictional Determination
Navajo Mine SMCRA Permit Boundary
Proposed Pinabete SMCRA Permit Boundary

**JURISDICTIONAL STATUS**

Yes
Discontinuous
No
Stock Pond

**HYDROLOGIC FEATURES**

Monitoring Locations
Proposed Sediment Ponds
Rivers | Streams

N

0 0.5 1 2
Scale in Miles

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Surface water studies associated with permitting of the existing Navajo Mine SMCRA Permit Area and the proposed Pinabete SMCRA Permit Area indicate that under baseline conditions, the drainages that cross the permit area carry a very high concentration of suspended solids and bed loads during storm runoff events, averaging 98,000 mg/L (BNCC 2011b, 2012a). At the active Navajo Mine SMCRA Permit Area, north of the Pinabete SMCRA Permit Area, sediment control measures prevent additional contributions of sediment to stream flow or to runoff during operations. The baseline water quality data for Cottonwood Arroyo within the Pinabete SMCRA Permit Area is from 1997 to 1999. At that time, the general characterization of water quality was alkaline with moderate saline sodium sulfate levels and hardness. The average selenium concentration ranged from 0.003 to 0.006 mg/L, and exceeded the NNEPA standard for chronic aquatic and wildlife habitat — Chronic of 0.002 mg/L. Total sediment and TDS concentrations in Cottonwood Arroyo average 97,989 and 656 mg/L, respectively (BNCC 2012a). Similarly, suspended sediment concentrations in Pinabete Arroyo during storm runoff events are very high with total suspended solids concentrations ranging from 10,200 to 521,000 mg/L as collected in samples between 1998 and 2007 (BNCC 2012a).

The NNEPA (2008) has identified designated uses of Cottonwood Arroyo to include secondary human contact (direct contact to skin associated with recreation or cultural uses), fish consumption, aquatic and wildlife habitat, and livestock watering. Water quality was collected for a brief period between 1990 and 1999 on Cottonwood Arroyo. The moderately saline (median TDS ranged from 610 to 780 mg/L) sodium sulfate waters are alkaline with a moderate hardness (BNCC 2011a). The median total selenium concentration at all sites of 0.0025 mg/L exceeds the chronic wildlife habitat standard of 0.002 mg/L. Levels of selenium were highest at the upstream, North Fork of Cottonwood Arroyo. Suspended sediment concentrations are high, greater than 100,000 mg/L, during storm runoff events, and the sandy channel bed and bank materials can be extensively modified by the larger flood events.

A comparison of surface water quality data at USGS gaging stations on the Chaco River upstream and downstream of the Navajo Mine Lease Area was conducted. The analysis indicates that the downstream gage is also downstream of the FCPP and Morgan Lake discharge; therefore, it is impossible to differentiate the impact of the Navajo Mine from the FCPP. The analysis found that water quality downstream of the two facilities had relatively high variability in comparison to the upstream data, where the median percent relative standard deviation for all constituents was 96 percent compared to 44 percent. The downstream data were also compared to NNEPA criteria. Mercury exceeded the NNEPA fish consumption criteria for 85 percent of all sample data. Cadmium exceeded NNEPA secondary human contact, fish consumption, and livestock criteria for eight percent of all samples. It is important to note however that water quality sampling conducted by NNEPA at various stations along the Chaco River have not indicated any exceedances of NNEPA standards for cadmium, secondary human contact (NNEPA 2013). NNEPA acute aquatic and wildlife habitat criteria for cadmium, copper, mercury, selenium, and zinc were exceeded for 100, 25, 100, 85, and eight percent of all samples, respectively. Further, the median cadmium, mercury, and selenium concentrations were 1.2, 300, and 3 times greater than NNEPA chronic aquatic and wildlife habitat standards. All other median values were below all criteria indicating that the criteria exceedances were generally more characteristic of the high variability in the dataset compared to the general water quality (OSMRE 2012c). NNEPA sampling also found exceedances of the lead standard for all designated beneficial uses at all stations in the Chaco River (NNEPA 2013).

A similar analysis was conducted for Chinde Wash. The watersheds include the Morgan Lake-Chaco River, Chinde Wash-Chaco River, Coal Creek-Chaco River, and Cottonwood Arroyo watersheds. The Chinde Wash and Cottonwood Arroyo Watersheds are both representative of the same hydrologic unit, and they were modeled directly in the Probable Hydraulic Consequences (OSMRE 2012c). Four monitoring stations within the Chinde Wash provided data for the analysis, two upstream of the mine and two downstream. However, both upstream stations are located downstream of NAPI activities, and therefore, are subject to direct and indirect NAPI influences. The downstream data were found to have slightly higher variability relative to the baseline data where the median percent relative standard deviation for all constituents was 100 percent compared to 85 percent. The NNEPA fish consumption criterion was not exceeded for any samples, but the acute aquatic and wildlife habitat criteria were exceeded for cadmium, chromium, selenium, silver, and zinc for 4, 100, 1, 2, and 60 percent of all samples, respectively. Lead exceeded the NNEPA secondary human contact standard for 4 percent of all samples. Livestock criteria for boron, chloride, selenium, sulfate, and TDS were exceeded for 0.5, 5, 23, 0.5, and 6 percent of all samples. All other median values were below established criteria, indicating that exceedances were generally more characteristic of high variability in the dataset rather than indicative of the general water quality (OSMRE 2012c).

Water Use

BBNMC holds all rights under New Mexico Office of the State Engineer Permit 2838 which provides a total diversionary right of 51,600 acre-feet annually and a consumptive use right of 39,000 acre-feet annually for surface water from the San Juan River. Although BBNMC also holds associated groundwater permit number SJ-2917, the water available under Permit 2838 supplies all the water needs of FCPP and Navajo Mine. Water is diverted from the San Juan River into Morgan Lake where it is stored for use at the plant, for all operations (cooling and related purposes), and the mine, for mining, coal processing, and reclamation operations, and by APS for FCPP operations. Flow in the Chaco River is ephemeral, except for releases of water from Morgan Lake that provide perennial flow in the Chaco River downstream of the discharge point in the lower, northern reaches of the watershed near its confluence with the San Juan River.

Based on monthly reports submitted to the New Mexico Water Rights Division, BNCC used approximately 301 acre-feet of water per year for dust control purposes and 340 acre-feet of water per year for irrigation of reclaimed areas in 2011 (BNCC 2012d). The previous year, water use was approximately double with 633 acre-feet used for dust control and 1,166 acre-feet for irrigation (BNCC 2011b).

Surface water within the Navajo Mine Lease Area is not used for drinking water by humans, or for irrigation, but has been used for livestock watering.

**Four Corners Power Plant**

The site of the primary FCPP facilities (Units 1-5 and associated facilities and parking lots) is a generally paved area, graded locally to surface inlets and catch basins and eventually to the discharge canal. The low-volume wastewater facility collects, treats, and disposes of surface water runoff and wastewater resulting from the operation of Units 4 and 5. Types of wastewater include chemical and oily wastewater, process wastewater, and ash-handling wastewater. More information regarding wastewater handling can be found in the Hazardous and Solid Waste Section (Section 4.15).

Outside of the area described above, the remaining portions of the FCPP lease area are unpaved and consist of Morgan Lake, the ash disposal areas, and other open, undeveloped areas. Morgan Lake, located within the FCPP lease and directly to the west of the FCPP, is a man-made lake built to support the FCPP. Water for Morgan Lake is drawn from the San Juan River, which is approximately 2.5 miles away. The lake encompasses 1,287 surface acres and has a capacity of 39,000 acre-feet of water. Built in 1961, Morgan Lake was constructed to supply water to mining and power generation activities.

A delineation of wetlands and waters of the U.S. was conducted in the existing and proposed DFADAs in April 2012. The purpose of the delineation was to determine the jurisdiction of wetlands and drainages in the ROI under CWA Section 404. Per joint USACE and EPA guidance regarding jurisdictional determinations (dated June 5, 2007), for potentially isolated waters of the U.S., or non-navigable tributaries, USACE and EPA are required to coordinate on the jurisdictional determination decision. As such, the USACE prepares the initial jurisdictional determination and submits it to the regional EPA office. The agencies coordinate and attempt to resolve any jurisdictional delineation issues at the local level within 15 calendar days after EPA's receipt of the form. EPA may notify the USACE at any time within the 15-day period that it does not intend to provide comments on a particular draft jurisdictional delineation. Within these 15 calendar days, the EPA regional office may elect to elevate the review to their Regional Administrator. If the review is elevated, the Regional Administrator has 10 days to resolve the issue. The agencies will then prepare a mutual decision document for the jurisdictional determination (USACE and EPA 2007). Accordingly, the USACE, in coordination with the EPA, has reviewed the FCPP delineation report and concurs with its findings (USACE 2013). A brief summary of the delineation findings is provided below.

The Chaco River, which flows south to north just west of the proposed DFADA, is identified as a perennial river by the National Hydrography Dataset; however, the portion of the river in the ROI was field verified as intermittent. Typical flow characteristics of this section of the river vary from low to no discharge (dry channel) to peak discharge after intense rain events followed by a recession to low discharge over several hours. In contrast, irrigation return flows from NAPI lands and discharge from Morgan Lake consistently lend to perennially wet conditions in the portion of the Chaco River near its confluence with the San Juan River. Approximately 1.7 acres of the Chaco River was delineated within the survey area (APS 2012b).

In addition to the Chaco River, three ephemeral drainages are located near the center of the proposed DFADAs (Drainages 11, 12, and 13 on Figure 4.5-7). No bed, bank, or ordinary high water mark was observed within the segments of these three drainages within the proposed DFADAs; therefore, these segments of the drainages were determined to not be jurisdictional under CWA Section 404 (AECOM 2012b).

Other surface water areas within the FCPP lease area include, the proposed surge pond area, and the lined impoundment captures generated FGD waste and historic ash seepage intercept water that is currently used as a staging area for piping and other equipment. A concrete v-ditch along the perimeter conveys slurry waste to the disposal ponds below. The area of the proposed surge pond is 9.4 acres and has no vegetation cover. The delineation determined that the v-ditch is not a jurisdictional Water of the US (AECOM 2012b).

Three potential wetland areas were surveyed within the ROI. One 0.07-acre wetland was observed along the base of the existing southwestern detention pond along Drainage 10. The wetland drains into a concrete-lined detention pond downstream at the pump house. The wetland is located along a non-jurisdictional ephemeral drainage and is considered isolated due to lack of connectivity with the Chaco River. Therefore, this wetland is considered non-jurisdictional. Two additional wetlands were observed adjacent to the ordinary high water mark of the Chaco River within the ROI. The wetlands are characterized as seeps and are approximately 0.02 and 0.09 acre in size, respectively. Based on their location adjacent to the Chaco River, both wetlands are considered jurisdictional (AECOM 2012b).

Water Quality

No tribal, state, or federal water quality standards apply to discharges from FCPP or water quality in Morgan Lake; comparison to NNEPA standards is for context only. However, the NNEPA (2008) has identified designated uses of Morgan Lake to include primary and secondary human contact, fish consumption, aquatic and wildlife habitat, and livestock watering. The NNEPA conducted water quality sampling of Morgan Lake in 2002, 2006, 2008, 2009, and 2010. The sampling included field parameters (temperature, pH, dissolved oxygen, TDS, and salinity) as well as laboratory analysis for metals and nutrients. With regard to field parameters, data for all years collected was similar. Temperature ranged between 32 and 33°C at the surface with little change with depth for all years. The only year with any noticeable change in temperature with depth was 2008, which was 33.5°C at the surface and decreased to 25°C at approximately 23 meters below surface. Similarly, pH for all years ranged between 8.3 and 8.6 at the surface and 7 and 7.5 at depth. The largest range between sampling events appeared for dissolved oxygen which ranged between 59 and 87 percent saturation at the surface and decreased to 0 to 8 percent saturation at depth. For all years, a steep decrease in dissolved oxygen levels began at 12 to 14 meters below surface. TDS levels varied year to year. In 2002 and 2010, TDS levels were between 725 and 750 mg/L. In 2006 and 2008, TDS concentration was approximately 825 mg/L. While in 2009, the concentration of TDS averaged 1,000 mg/L. APS and NNEPA also collected samples for metals and nutrients between 2003 and 2010. Figure 4.5-8 displays the results of sampling for those parameters that were detected in comparison to Navajo Nation Water Quality Standards for Aquatic and Wildlife Habitat and Secondary Fish Consumption.

Water quality data for samples collected in the Chaco River both upstream and downstream of the FCPP discharge location were also available (see Figure 4.5-9). Samples were collected by APS between October 2008 and August 2009 (APS 2013). In addition, the data includes samples collected by NNEPA between 1998 and 2013, although samples upstream and downstream of FCPP were only collected by NNEPA through 2012 (NNEPA 2013). An independent comparison of the upstream and downstream sample data was conducted and found no statistically significant difference between the sample sets for any of the constituents tested, with the exception of boron and sulfate. The data sets for sulfate, while significantly different between upstream and downstream do not exhibit a systematic pattern of either location having higher concentration than the other. All sample results for boron are well below all beneficial use water quality standards, as shown in Figure 4.5-9; however, the boron concentrations (total and dissolved) are higher downstream of the FCPP than upstream.

Designated uses of the Chaco River include aquatic and wildlife habitat, livestock watering, fish consumption, and secondary human contact. No reaches of Chaco River are defined as a drinking water source. The concentration of chemical constituents varies according to the sediment load in the river. For example, the total aluminum concentrations at the upstream station varied from 0.44 to 613 mg/L with a median concentration of 2.98 mg/L. The dissolved concentrations for the same location varied from 0.12 to 0.53 mg/L. Aluminum is found within the natural clays in the area; therefore, it is likely that instances of high aluminum in the samples are indicative of high sediment load in the river. The high concentrations of aluminum also correspond with high TDS in the river (APS 2013). A comparison of the sample results indicates that aluminum exceeded the Navajo Nation standard for aquatic and wildlife habitat (both acute and chronic) in all upstream samples and all but two of the downstream samples. The lead standard for livestock watering was exceeded on two occasions (the same date for both upstream and downstream samples). The standard for aquatic and wildlife habitat for lead is dependent on the hardness value at the time of sampling.

A comparison of the sample data found that the average lead standard for aquatic and wildlife habitat, livestock watering, fish consumption, and secondary human contact was 3.74 mg/L and all samples, both upstream and downstream, were well below this limit. The chronic aquatic and wildlife habitat standard for mercury was exceeded in all samples, while the acute standard was exceeded only in two upstream samples and three downstream samples over the monitored period. The results for all other constituents met Navajo Nation standards over the entire monitoring period (APS 2013; NNEPA 2014).

Water quality results from a single sample event in 2010 in the Chaco River at the point of Morgan Lake blowdown were also reviewed. For this sample event, pH was 8.4, TDS was 723, and all metals and other constituents met NNEPA standards, with the exception of aluminum which was elevated above acute and chronic wildlife habitat at 4 mg/L.

Water Use

The main uses of water for the FCPP are for heat transfer in the primary cooling systems, for steam production in the turbine systems, and as cooling water for the condenser cooling system. Water supply for the power plant comes from Morgan Lake which draws water from the San Juan River. Water is fed from the river to man-made Morgan Lake, adjacent to the FCPP. Water is then directed to a water treatment plant where it is treated in a lime/soda water softener to reduce the overall dissolved solids. From the treatment plant, the water is moved to cooling ponds, and then enters the on-site closed loop circulating water system. Oil-free power plant wastewater is drained to the circulating water discharge canal and released back into Morgan Lake. Water discharged into Morgan Lake is typically around 40.5°C (105°F). Water from Morgan Lake is released via canal into Chaco Wash, which flows back into the San Juan River.

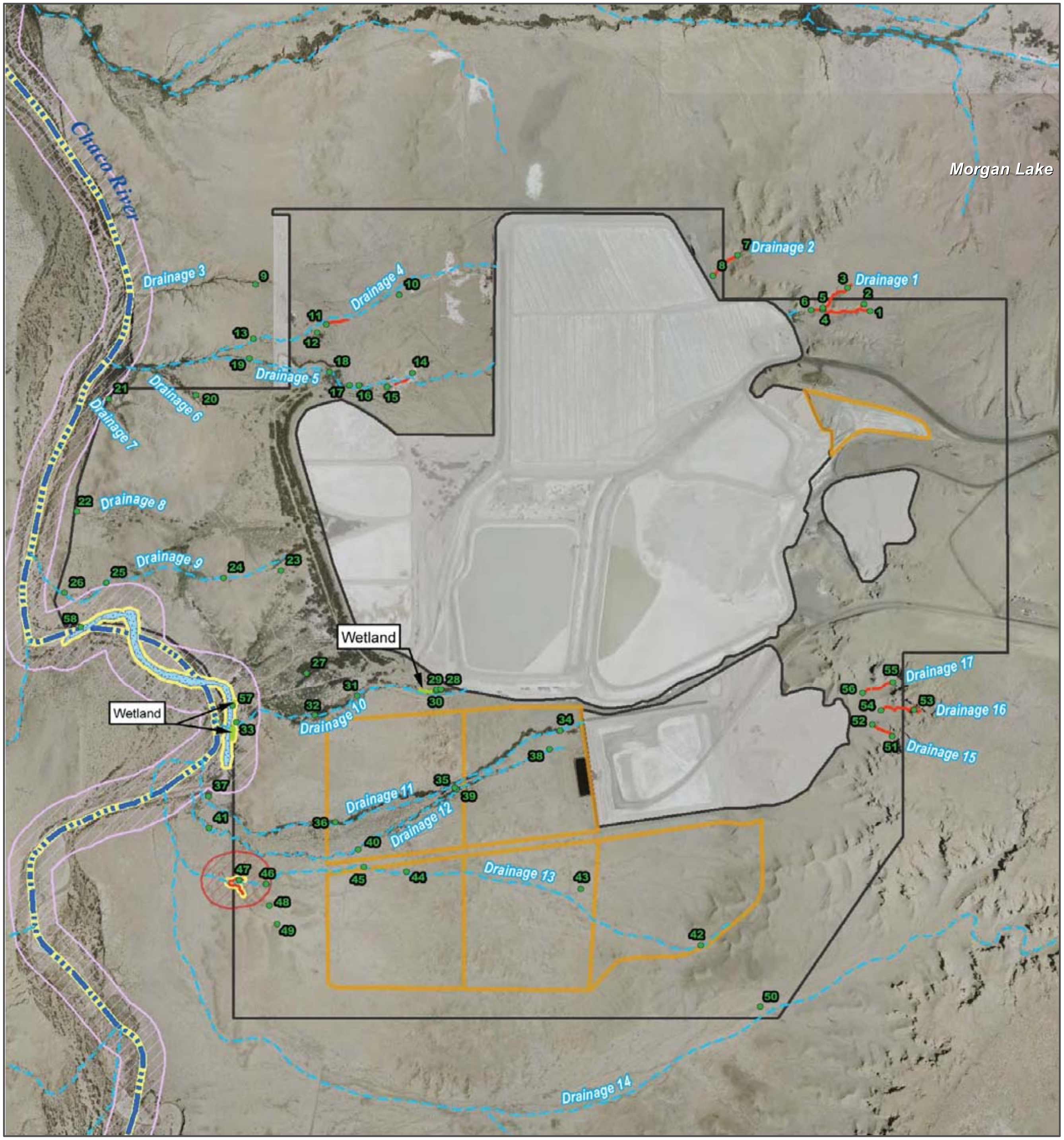


**Figure 4.5-7**

Jurisdictional Waters of the US in the Vicinity of the FCPP Proposed Ash Disposal Facility

*Observed Ordinary High Water Mark without jurisdiction is considered isolated.

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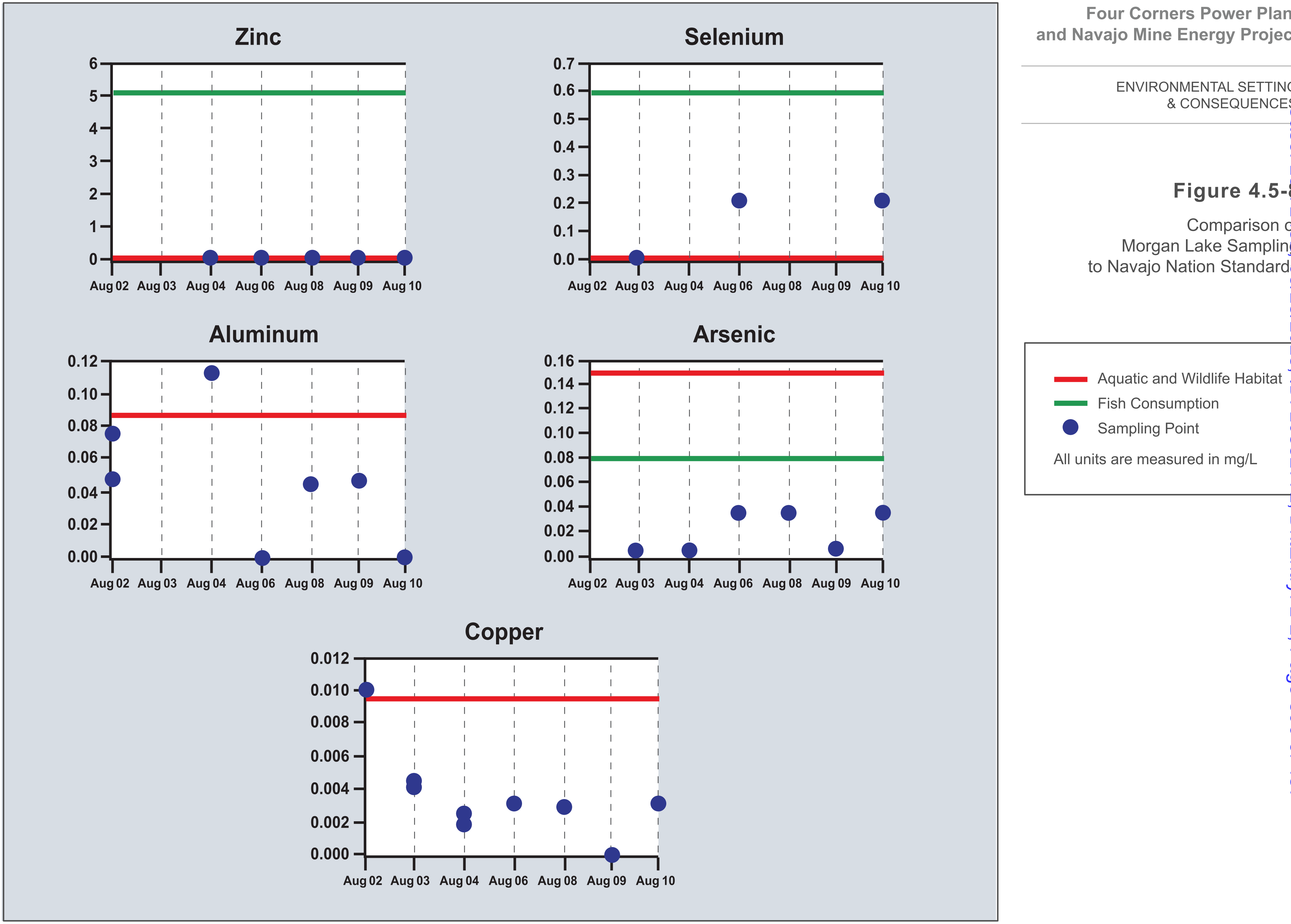


**Figure 4.5-8**

Comparison of
Morgan Lake Sampling
to Navajo Nation Standards

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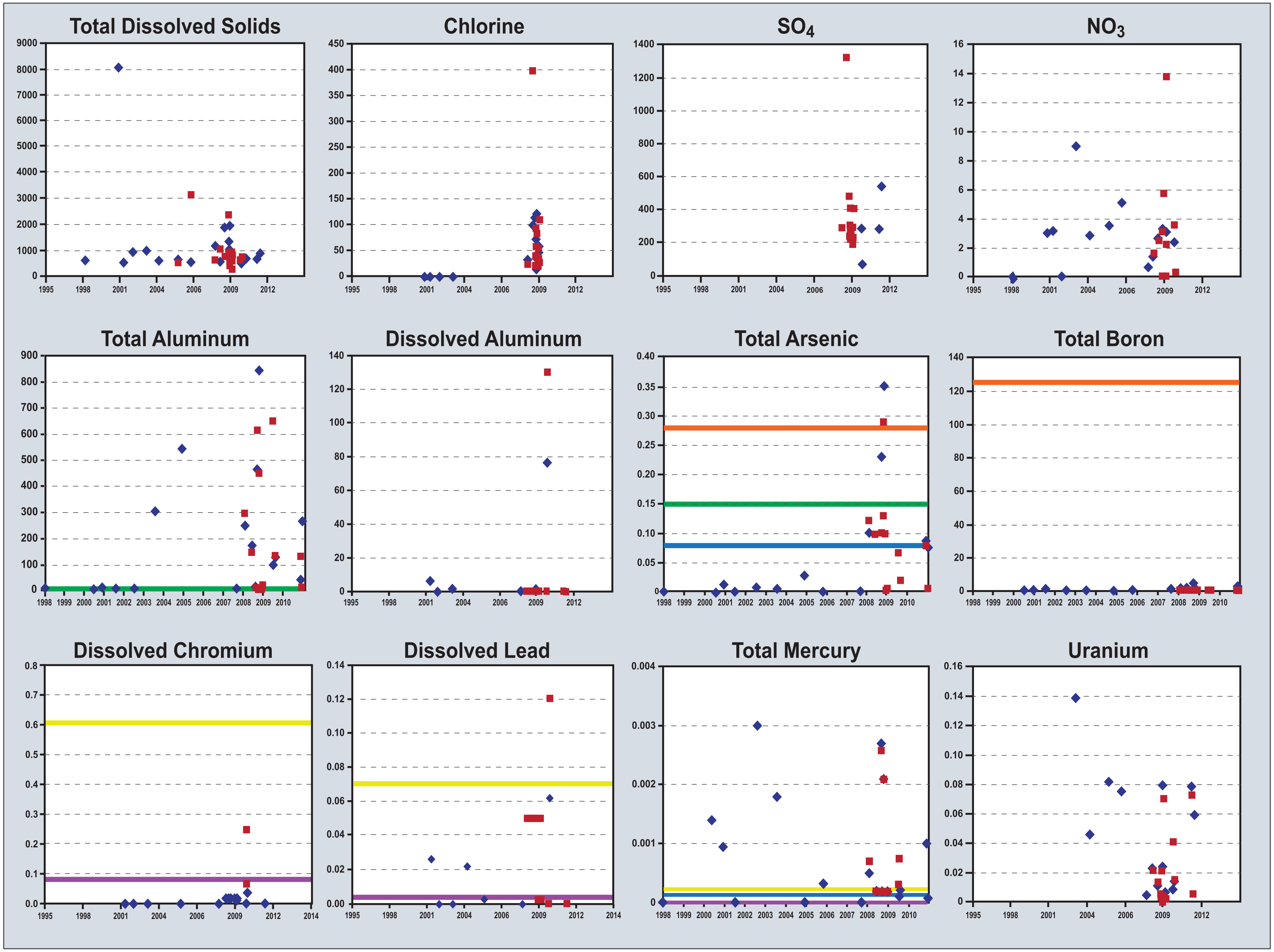
**Figure 4.5-9**

Chaco River Water Quality in the Vicinity of the FCPP




Downstream
Upstream
Aquatic and Wildlife Habitat
Aquatic and Wildlife Habitat (Acute)
Aquatic and Wildlife Habitat (Chronic)
Secondary Human Contact
Fish Consumption
Livestock Watering

All units are measured in mg/L

Upstream data is from NNEPA WQ station 06-33 and Downstream data is from NNEPA WQ station 06-01

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The circulating water system provides cooling water flow through the condensers and provides water for ash sluicing. The water comes from the cooling pond through an intake canal extending from the canal feeding the other three units. The canal is an unlined earth channel designed to sustain a flow of 1,850 cubic feet per second (cfs) for the two units at a velocity of 3 feet per second at a 5,327.5-foot low water elevation. The concrete intake structure has four wells for four vertical, half-capacity, mixed flow pumps, each rated at 206,000 gpm.

**Transmission Lines**

With the exception of the FCPP to San Juan Switchyard line, which only crosses the San Juan River, the associated existing transmission lines and associated ROWs cross numerous surface water features as displayed in Table 4.5-11 and shown on the regional surface water features map (Figure 4.5-2).

**Table 4.5-11 Surface Waters that Intersect with the Subject Transmission Lines**

| FCPP-Moenkopi | FCPP-Cholla | FCPP-West Mesa |
|---|---|---|
| Shiprock Wash | Sanostee Wash | Gallegos Canyon |
| Little Shiprock Wash | Tocito Wash | Alamo Wash |
| Lukachukai Wash | Kinlichee Creek | Kimdeto Wash |
| Agua Sal Wash | Canyon de Chelly | Betonnie Tsosie Wash |
| Sheep Dip Creek | Lone Tule Wash | Escavada Wash |
| Chinde Wash | Pueblo Colorado Wash | De na-zin Wash |
| Polacca Wash | Little Colorado River | Canada Alemita |
| Wepo Wash | | Chaco Wash |
| Oraibi Wash | | Torreon Wash |
| Dinnebito Wash | | San Isidro Wash |
| Ha Ho No Geh Canyon | | Rio Puerco Creek |
| Little Colorado River | | Arroyo de las Calabacillas |
| Tappan Wash | | Numerous unnamed creeks, washes, and arroyos |

### 4.5.3 Changes to Water Resources/Hydrology Affected Environment Post-2014

Two completed Federal actions have been incorporated into the baseline for this analysis: (1) the EPA has made its ruling with respect to BART to control air emissions, and (2) OSMRE has approved the SMCRA permit transfer from BNCC to NTEC (Section 2.4). These completed Federal actions are considered part of the environmental baseline to which the impacts of continuing operations and the Proposed Action are compared in the following section. Neither of these completed Federal actions would change the affected environment for water resources/hydrology.

### 4.5.4 Environmental Consequences

This section provides an analysis of potential environmental impacts on groundwater and surface water resources (including waters of the U.S.) that could occur under each of the Project alternatives, addressing the cumulative effects over the 25 years of continued operation. Information on existing water resources was used as the baseline to measure and identify potential impacts from the Proposed Action and alternatives. The primary focus of this impact assessment is to predict the effects of the Project alternatives on the prevailing hydrologic balance with respect to the quality and quantity of surface water and groundwater systems. The impact assessment considers the severity of potential direct and indirect impacts as well as the geographic extent, duration, and overall context of potential impacts. Magnitude of impacts to water resources (both surface water and groundwater) are determined by the following criteria:

- *Major.* Adverse impacts: Impacts that are outside the random fluctuations of natural processes that would likely result in a violation of water-quality standards (e.g., NPDES permit limits or NNEPA Surface Water Quality Standards for Beneficial Uses) or that economically, technically, or legally eliminate use of the resource. Beneficial impacts: those that would improve water quality or contribute to or restore water resources capability to the region, such as to greatly increase the potential for human or ecological use.
- *Moderate.* Impacts that are outside of the random fluctuations of natural processes but do not cause a significant loss of the use of the resource. Moderate beneficial impacts would simply extend the beneficial use beyond natural variations about the current mean value.
- *Minor.* Changes that would affect the quantity or quality but not the use of water or 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.* Impacts that are not discerned or cannot be measured.

The assessment of impacts related to the Navajo Mine SMCRA Permit Area (both during mining and after reclamation) builds on the baseline hydrologic and geologic information contained in the Navajo Mine SMCRA Permit (NM-0003F), Pinabete SMCRA Permit Application (BNCC 2012a), the Cumulative Hydrologic Impact Assessment of the Navajo Mine (OSMRE 2012c), and observations of hydrologic consequences of mining at the adjacent areas of the Navajo Mine Lease Area. This impact assessment also couples those data with detailed SEDCAD™ 4 (SEDCAD) modeling of surface flows, sediment yields, spoil leaching test results, and groundwater flow and chemical transport modeling, to develop projections about potential hydrologic impacts in the Pinabete SMCRA Permit Area. SEDCAD is 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 Revised Universal Soil Loss Equation (RUSLE) to generate storm-based erosion predictions. The impact assessment from past mining relied upon relevant published and unpublished reports and papers, experience from past mining, reclamation operations at Navajo Mine and other mines located along the western rim of the San Juan Basin, observations made by BNCC staff during day-to-day operations of the mine, and surface water and groundwater monitoring performed in conjunction with historic, ongoing mining, and reclamation activities at Navajo Mine. OSMRE has since updated the 2012 CHIA for Navajo Mine to reflect the following: (1) Change in permit applicant from BNCC to NTEC, which occurred on February 4, 2014; (2) References changes from the Navajo Mine paper permit application package to the re-organized electronic permit application package, which was accepted on June 30, 2014; and (3) Minor modifications to figures delineating the proposed Pinabete SMCRA permit area. These updates are administrative and OSMRE does not anticipate modification to the technical analysis that would cause revision to the 2012 CHIA findings.

The analysis of potential impacts to groundwater from FCPP operations is based on a qualitative assessment of water use at the power plant and a statistical analysis (Mann-Kendall Test) of groundwater movement beneath the DFADAs. The impact assessment relies upon limited groundwater monitoring and site characterization, as well as information on groundwater use and hydrogeology at the FCPP lease site provided by APS. The analysis of potential impacts to surface water from FCPP operations are based on a qualitative assessment of water use at the power plant as well as the incorporation of the results of air deposition modeling.

The analysis of potential impacts to water quality is based on a comparison of water quality monitoring data at the FCPP and Navajo Mine Lease Area to NNEPA standards. These standards, although not applicable to the FCPP[2], provide a consistent metric against which to evaluate potential changes to water quality as a result of the project alternatives. Further, the NPDES permit includes monitoring for some constituents for which NNEPA standards exist; these permit limits match the NNEPA standards.

The impact analysis of continued operation of the subject transmission lines is a qualitative assessment of potential effects of ongoing maintenance activities to water quality. No impacts to surface water hydrology would occur as a result of continued operation of the transmission lines because operation of the transmission lines would not involve water use or require any surface water diversions; therefore, these impacts are not discussed within the analysis.

#### *4.5.4.1 Alternative A – Proposed Action*

**Navajo Mine**

Groundwater

The analysis below is separated into two discussions. The first addresses potential impacts to groundwater quantity and the second addresses potential impacts to groundwater quality.

*Groundwater Quantity Impacts*

The primary groundwater impact due to mining operations would be the loss of the coal-seam aquifers within the Fruitland Formation. Mining the coal would remove the portion of the aquifer supported by the coal seam and any permeable interburden. The amount of groundwater encountered during the proposed mining is expected to be limited based on prior mining operations at the Navajo Mine SMCRA Permit Area and observations at existing monitoring wells. No water supply wells are located in the Fruitland Formation within the ROI. Additionally, the projected drawdown during mining would not affect any existing or anticipated future use based on drawdowns from the modeling simulations. The projected drawdown in the PCS would not be expected to affect any existing or anticipated future use; therefore, impacts to coal seam aquifers would be considered negligible (BNCC 2012a).

Drawdown in the Fruitland Formation could result in the subsequent groundwater drawdown in the alluvium in areas where the saturated Fruitland Formation is hydraulically connected to the alluvium. Locations may exist in Cottonwood Arroyo where drawdown could occur as a result of the proposed mining. This drawdown would likely be along the South Fork of Cottonwood Arroyo and would be short-term as precipitation and surface flow events would recharge the groundwater within the Cottonwood Arroyo once mining operations cease. Two livestock wells, W-0618 and QACW-2, could be affected by a reduction in flow, but because the water quality exceeds livestock criteria, neither well is used for livestock watering (BNCC 2012a).

As discussed in the Environmental Setting, there is limited water of suitable quality and quantity in the proposed mine areas. Proposed mining would be expected to result in limited drawdown of groundwater within the Pinabete Arroyo alluvium based on BNCC surveys of nested wells and the location of perched groundwater in the alluvium. Existing water use of the Chaco River alluvium is limited and based on drawdown modeling conducted by BNCC, groundwater in the Chaco River alluvium would not be affected by mining, as it is beyond the projected drawdown of water levels in the Fruitland Formation expected to occur as a result of mining (BNCC 2012a).

The post-mine groundwater gradients are predicted to change slightly from an overall northeastern gradient to a northwest gradient flowing towards the Cottonwood Arroyo. Based on a review of the model input parameters and results, impacts to groundwater flow within the permit area would be expected to be moderate due to the long rate of groundwater recovery (OSMRE 2012c). Mining and reclamation activities in the ROI would not adversely impact the groundwater recharge capacity of the disturbed area, as the

[2] As described in Section 3, in accordance with Lease Amendment No. 3, the Navajo Nation does not apply tribal regulation to the FCPP Lease Area.

pits are replaced with unconsolidated backfill material. BNCC modeled the post-reclamation recharge rate for the Pinabete SMCRA Permit Area as approximately 0.04 inch per year, about twice the modeled pre-mine groundwater recharge rate. The pre-mine groundwater recharge rate estimated by Stone et al. (1983) for undisturbed areas at the Navajo Mine SMCRA Permit Area and Pinabete SMCRA Permit Area ranged from 0.002 to 0.09 inch per year. Once water levels rise sufficiently in the mine backfill, groundwater would flow at a slow rate from the backfill into the lower coal seams of the Fruitland Formation, into the PCS, and toward the topographic lows along the alluvial channels of Cottonwood Arroyo. NTEC would use unconsolidated backfill material, which has a higher hydraulic conductivity than the undisturbed formation (i.e., the backfill would be less compact than the undisturbed formation and allow for quicker recharge of the aquifer). It is anticipated that the recharge rate would approximately double the historic rate (0.04 inch per year).

BNCC developed a groundwater monitoring plan, which NTEC will implement as part of the SMCRA permit, to monitor changes in the quantity of the groundwater resource during mining and subsequent reclamation. The monitoring plan will collect groundwater information from specified hydrogeologic units (coal seams from Fruitland Formation, PCS, and alluvium of Cottonwood Arroyo, and Pinabete Arroyo) as well as backfill locations. The goal of the monitoring plan is to collect data on groundwater quality and quantity to monitor any changes that may occur as a result of mining and reclamation such that if changes are detected mining and reclamation operations can be adjusted and BMPs installed to prevent adverse effects (BNCC 2012a). However, based on the lack of usable groundwater (both quality and quantity), no adverse effects are anticipated to result from mining or reclamation operations. Any impacts would be minor.

Potential use of groundwater, (i.e., livestock needs) within and adjacent to the ROI is limited, due to low permeability, low yield, and poor water quality; therefore, the potential future use of groundwater in the reclaimed area would be negligible due to the low yield and poor water quality.

*Groundwater Quality Impacts*

It is expected that mining operations may slightly alter groundwater quality; however, water quality studies of the few coal-seam aquifers at the Navajo Mine Lease Area indicate that the water available is of limited quantity and of poor water quality, with TDS up to 17,800 ppm (Thorn 1993).

Consequently, the coal-seam aquifers are not currently used for drinking or other domestic purposes. Based on water quality data collected, some of these aquifers meet Navajo Nation standards for agricultural water supply or other nondrinking water uses; however, alternate sources of higher quality water (e.g., Chaco River) can accommodate the current projected demand in the area.

Modeling conducted to assess the impact of historic CCR placement near alluvial systems showed it is unlikely that any detrimental future effect will occur from past CCR placement. This is due to very slow groundwater movement and the attenuation of contaminates of concern as they percolate through the subsurface. Therefore, impacts to groundwater from historic placement of CCR are negligible (OSMRE 2012c). Past mitigation efforts included reclamation of approximate original contour, mining limited in ephemeral channels, mixing of overburden/ backfill materials, and proper material classification and handling procedures (OSMRE 2012c). A comparison of monitoring data from wells within the areas of CCR placement to the baseline Fruitland coals (see Figure 4.5-1) showed a negligible impact for chloride; minor impacts for conductivity and manganese; moderate impacts for total iron and TDS; and major impacts for pH, boron, selenium, fluoride and sulfate. While the median pH and concentrations of selenium values met the criteria for livestock watering. The median concentrations for boron, fluoride, sulfate, and TDS exceeded livestock criteria. Therefore, groundwater beneath the reclamation areas is considered to be of concern relative to baseline and livestock criteria for boron, fluoride, sulfate and TDS (OSMRE 2012c).

While high levels of chemical constituents of concern exist within the wells in the historic mining area, there are no current economic uses of the Fruitland Formation in or adjacent to this area and no foreseeable uses other than oil and gas extraction. In order for disposal areas to have a major impact, CCR leachate would need to have sufficient mobility to reach alluvial strata within the vicinity of the historic disposal sites at high concentrations. A simple advection/dispersion modeling exercise was conducted to assess the impact of historic CCR placement relative to nearby alluvial systems, which could impact current and reasonably foreseeable uses. Modeling showed that it is unlikely that any major future impacts would ensue from the CCR placement at the Navajo Mine SMCRA Permit Area because of the very slow groundwater movement and the likely attenuation of contaminants of concern as they migrate through the subsurface (OSMRE 2012c). Based on this analysis the potential impacts to current and future water uses from CCR placement at the Navajo Mine SMCRA Permit Area are minor.

With regard to potential impacts of continued operations of the mine, changes to groundwater quality beyond the ROI would be minor during mining and reclamation operations. Since groundwater flow beneath the mine is generally perched and would be in the direction of the mining pits, little change to groundwater quality would be expected beyond the mining pit limits during mining operations. The impacts to water quality due to mine backfilling were determined through laboratory leaching tests.

The test results for spoil leached with coal seam water are believed to provide the best estimates for the groundwater source concentrations for long-term post-reclamation transport modeling. Based on the leaching test results, the concentrations of sulfate, calcium, magnesium, sodium, TDS, boron, and manganese would be expected to initially increase in surface water infiltration or groundwater as they saturate mine spoils. Fluoride, sulfate, and TDS concentrations were above the livestock water criteria in background groundwater collected from the PCS, alluvial deposits, and the Fruitland Formation. The groundwater yields from wells completed in the Fruitland Formation and in the PCS, which underlies the Fruitland Formation, are quite low and wells are typically pumped dry during testing and well purging for sampling. Also, the water quality in the PCS and Fruitland Formation is poor and is generally unsuitable for domestic or livestock use (BNCC 2012a). In summary, groundwater in the mine spoils, after reclamation, is predicted to have higher TDS concentrations than the pre-mine Fruitland Formation and Cottonwood Arroyo alluvium. However, the TDS concentrations in the alluvium of Cottonwood Arroyo are not expected to increase substantially as a result of mining because the contribution from spoil water is much smaller than the contribution from alluvial recharge and up-gradient alluvial flows.

The groundwater FEFLOW flow model was also used to quantify groundwater impacts due to the mining and reclamation operations for the chemical transport simulations. The transport model simulated the TDS migration from the mine spoil backfill. The results from the leaching tests were used as the groundwater source concentrations for the transport modeling. The primary factor controlling the fate and transport of water in mine spoils is the extremely low rate of flow from the mine backfill that would occur as a result of the low recharge rates and low hydraulic conductivity of the mine backfill. Based on these results, mining is estimated to have little effect on the long-term post-reclamation TDS concentrations in the groundwater within the PCS and the Cottonwood Arroyo alluvium down-gradient of the mine areas.

With the implementation of this alternative, groundwater beneath mine spoils is expected to have higher concentrations of TDS and sulfate than the pre-mine Fruitland Formation coal seams. This water would contribute to higher TDS and sulfate concentrations in the Cottonwood Arroyo alluvium. However, any increase in the post-reclamation concentrations of TDS and sulfate or in the trace constituents of aluminum, boron, iron, and manganese in the Cottonwood Arroyo alluvium are estimated to be minor and within the variation measured baseline concentrations of these constituents in alluvial monitoring wells. This increase however, is not expected to materially affect the suitability of the alluvial groundwater for livestock use. As stated previously, the Cottonwood Arroyo alluvium is an unreliable supply for stock water because the quality is a poor source for livestock supply due to high TDS and sulfate concentrations (BNCC 2012a).

Therefore, impact to groundwater due to a potential increase in TDS in the Cottonwood Arroyo alluvium is minor due to existing poor groundwater quality (above recommended livestock use criteria) and limited water quantity.

The modeling results for the TDS transport in the PCS show that the primary direction of TDS migration from the mine spoils is vertically into the PCS. This direction signifies the migration is moving into a water-bearing zone that has TDS concentrations similar to, if not higher than, the TDS levels expected from the spoil water. Groundwater flow and TDS transport in the PCS then flows toward the alluvium and topographic lows along Cottonwood Arroyo. Transport to the north and east is limited.

Surface Water Quality

Several recharge mechanisms influence surface water quality within the Navajo Mine Lease Area. Precipitation and NAPI discharges generate runoff in the ephemeral washes, entraining sands, silts, and clays, inducing elevated concentrations of total suspended solids. The elevated total suspended solid concentrations influence the chemical composition of the surface water. Active mining and reclamation involve use of a number of activities that could potentially affect surface water quality, including topdressing removal; overburden drilling, storage, and stripping; pits; spoil rows or piles; regraded spoils; and primary/final regrading of the last spoil row. Ground disturbance associated with construction, mining, and reclamation also has the potential to increase sediments carried by stormwater during or after a rain event. Interaction between stormwater runoff and newly exposed overburden, interburden, coals, and mine spoils may result in increases in contaminants in surface runoff. The largest source of potential runoff from the proposed mining operation is stormwater.

In accordance with OSMRE, EPA, and NNEPA regulations for surface water discharges, no surface water from disturbed areas is permitted to commingle with stormwater and discharge offsite without an NPDES permit. As described in Section 4.5.1, discharges from disturbed areas would occur only after the area is adequately reclaimed (i.e., area is regraded to approved topography, topsoil replaced, and area is revegetated) and the operator has demonstrated using established models (e.g., SEDCAD) that post-mine sediment yields would vary slightly from pre-mine levels (in the instance of Pinabete Arroyo and South Fork Cottonwood Arroyo, post-mine yields would be greater than pre-mine yields), although NPDES Regulations (40 CFR 434 Subpart H) require that post-mine yields are equal to or less than pre-mine levels. Variation in sediment yield is dependent on amount and duration of the rain event in the disturbed area. Table 4.5-12 compares sediment yield variations of the pre-mine with mine operations and post-reclamation in the Pinabete Arroyo, Cottonwood Arroyo, and the Unnamed Tributary to the Chaco River.

NTEC would implement a Sediment Control Plan to help minimize sediment loss from water and wind erosion. The Plan includes such methods as, stabilizing stockpiles by mulching and seeding, retaining sediment in disturbed areas using berms, sumps, or sediment ponds to capture runoff. The primary control measure to decrease sediment runoff would be the use of sedimentation ponds. Sedimentation ponds are designed to retain the surface runoff and sediment from either the 100 year-6 hour or 10 year-24 hour storm event. There would be no discharge onto undisturbed areas or beyond the permit area from precipitation events up to and including the 10 year-24 hour event. All discharges from the disturbed areas would be covered under an NPDES permit where required. MMCo would acquire general NPDES stormwater permits as applicable, such as the MSGP under Sector H for coal mining (i.e., haul roads and access roads). Professional Engineers would design and certify that sedimentation ponds would contain runoff from a 100-year, 6-hour or 10-year, 24-hour storm event. Should discharges occur from these ponds, they would be subject to the applicable NPDES discharge effluent limitations of MSGP Subpart H. The watershed areas for the NPDES individual permit outfall points and sediment control structures are presented in Table 4.5-12.

Ponds 415, 416, 417, 418, 419, 420, 421, 422, 423, 424, 425, and 426 are sediment ponds, within the proposed Pinabete SMCRA Permit Area, that would retain the surface runoff and sediment from the disturbed area associated with current and proposed mining and reclamation operations. Berms, v-ditches, or channels would be used to divert flows from the disturbed areas into the ponds. Retaining the effluent or surface runoff from the disturbed areas in the pond for evaporation would ensure compliance with the applicable effluent standards set forth in the NPDES permit.

**Table 4.5-12 NPDES Outfall Points and Sediment Control Measures**

| Watershed ID | NPDES Outfall Point ID | Watershed Area (acres) | Disturbed Area (acres) | Disturbance Type | Type of Control Measure | Structure ID |
|---|---|---|---|---|---|---|
| Area IV North Pond 415 | NPDES Outfall #1 | 5.6 | 5.6 | Disturbed area surface drainage | Sedimentation Pond | Pond 415 |
| Area IV North Pond 416 | NPDES Outfall #2 | 128.1 | 128.1 | Disturbed area surface drainage | Sedimentation Pond | Pond 416 |
| Area IV North Pond 417 | NPDES Outfall #3 | 261.8 | 261.8 | Disturbed area surface drainage | Sedimentation Pond | Pond 417 |
| Area IV North Pond 418 | NPDES Outfall #4 | 233.5 | 233.5 | Disturbed area surface drainage | Sedimentation Pond | Pond 418 |
| Area IV North Pond 419 | NPDES Outfall #5 | 199.3 | 199.3 | Disturbed area surface drainage | Sedimentation Pond | Pond 419 |
| Area IV North Pond 420 | NPDES Outfall #6 | 387.4 | 387.4 | Disturbed area surface drainage | Sedimentation Pond | Pond 420 |
| Area IV North Pond 421 | NPDES Outfall #7 | 148.8 | 148.8 | Disturbed area surface drainage | Sedimentation Pond | Pond 421 |
| Area IV South Pond 422 | NPDES Outfall #8 | 476.7 | 464.3 | Disturbed area surface drainage | Sedimentation Pond | Pond 422 |
| Area IV South Pond 423 | NPDES Outfall #9 | 949.3 | 900.3 | Disturbed area surface drainage | Sedimentation Pond | Pond 423 |
| Area IV South Pond 424 | NPDES Outfall #10 | 45.0 | 45.0 | Disturbed area surface drainage | Sedimentation Pond | Pond 424 |
| Area IV South Pond 425 | NPDES Outfall #11 | 218.2 | 190.4 | Disturbed area surface drainage | Sedimentation Pond | Pond 425 |
| Area IV South Pond 426 | NPDES Outfall #12 | 81.5 | 70.0 | Disturbed area surface drainage | Sedimentation Pond | Pond 426 |
| Area IV South Pond 427 | NPDES Outfall #13 | 23.1 | 23.1 | Disturbed area surface drainage | Sedimentation Pond | TS-404 Pond 427 |
| Area IV North Pond 428 | NPDES Outfall #14 | 5.4 | 5.4 | Disturbed area surface drainage | Sedimentation Pond | TS-406 Pond 428 |

Source: BNCC 2012a.

Pond 427 is a sediment pond located at NPDES Outfall #12 that would retain the surface runoff and sediment from the disturbed area associated with proposed Topdressing Stockpile TS-404. Pond 428 is a sediment pond located at NPDES Outfall #14 that would retain the surface runoff and sediment from the disturbed area associated with future Topdressing Stockpile TS-406. A perimeter berm adjacent to the toe of each stockpile would divert flows from the stockpile area to the respective pond. Retaining the surface runoff from the disturbed areas in the pond for evaporation would ensure compliance with the applicable effluent standards.

SEDCAD modeling was performed to evaluate sediment generation under pre-mine, operational, and post-reclamation conditions for drainages traversing or intersecting the permit area. Projections on sediment yield were developed based on storm-specific flows and six parameters associated with sediment yield: soil texture, soil erodibility constants, representative slopes of overland flow within the watershed, representative lengths, cover, and management practices. Operational and pre-mine sediment yield projections from SEDCAD modeling are summarized and compared in Table 4.5-13. Results are quantified by sediment yield in tons/event.

The impacts were assessed with the modeling of Pinabete Arroyo at the confluence with the Chaco River, Cottonwood Arroyo at the confluence with the Chaco River, and the unnamed tributary to Chaco River downstream of the permit boundary. As detailed in Table 4.5-13, sediment yields reaching the Chaco River from Pinabete Arroyo, Cottonwood Arroyo, and the Unnamed Tributary to Chaco River would be lower under operational conditions in comparison with the pre-mine baseline yields. In addition, the results suggest that the replacement of poor quality sodic soils with suitable topdressing materials would reduce sediment generation from pre-mine to post-reclamation levels.

As part of reclamation, NTEC would remove temporary post-reclamation structures. After erosion control measures sufficient to minimize the erosion rate to less than or equal to pre-mine levels have been installed, the reclamation areas would be reconnected to the native drainages that surround the permit area in accordance with SMCRA regulations. If the surface runoff from an active mining area has the potential to leave the permit area, or enter a reclaimed area downstream, a sediment pond would be constructed to retain the surface runoff and sediment. The pond would be located in either an existing drainage adjacent to the disturbed area or a reestablished drainage in the reclamation area. As reclamation progresses and drainages are reestablished, watershed sizes can increase. NTEC may need to place additional ponds in series to retain the runoff and meet 40 CFR Part 434 standards until the area can be completely reclaimed. In such cases, NTEC would submit a revision to the Reclamation Plan to OSMRE for review and approval at least 60 days prior to initiating construction activities for additional ponds. Berms may be used to prevent sediment and flows from leaving the disturbed area and to convey flows to sedimentation ponds.

As mining progresses, disturbed areas would be reclaimed as described in Chapter 2. To prevent possible degradation of the downstream reclaimed or topdressed and seeded areas, berms and ditches would remain in place as long as practicably possible during topdressing placement. Generally, berms would be removed by blending the material into the adjacent regraded spoils. In the process of removing the berms, positive drainage must be maintained in the drainage ways and on sloping surfaces. To achieve such drainage, the area or distance adjacent to the berm must be sufficient to spread and blend in the material. Therefore, as topdressing placement approaches a berm, the berm would be removed while sufficient distance still remains to spread and blend in the material. Impacts to surface water quality would be minor due to erosion control measures and adherence to SMCRA regulations.

If a large storm event were to occur, excess water accumulated in the pit would be pumped to one or more sediment ponds. The design volume of the ponds would be maintained; the pumping would be only to ponds with sufficient capacity to accommodate additional water without jeopardizing the design volume. If the ponds have no extra capacity, the water or effluent could be pumped to an existing drainage for discharge if the standards of the appropriate NPDES permit are met.

**Table 4.5-13 Comparison of Sediment Yield Pre-mine with Mine Operations and Post-Reclamation for Pinabete Arroyo, Cottonwood Arroyo, and Unnamed Tributary to Chaco River**

| SEDCAD Designation | Watershed Location | Sediment Yield (tons) Area (square miles) | Sediment Yield (tons) 2yr-6hr Event (0.85 inch) | Sediment Yield (tons) 10yr-6hr Event (1.28 inches) | Sediment Yield (tons) 25yr-6hr Event (1.56 inches) | Sediment Yield (tons) 50yr-6hr Event (1.76 inches) | Sediment Yield (tons) 100yr-6hr Event (2.04 inches) |
|---|---|---|---|---|---|---|---|
| Structure 7 | Pinabete upstream, pre-mine | 43.88 | 2,703 | 9,489 | 15,694 | 18,130 | 28,885 |
| Structure 9 | Pinabete at mouth, pre-mine | 59.37 | 2,821 | 9,886 | 16,325 | 18,581 | 25,646 |
| Structure 9 | Pinabete at mouth, post-reclamation | 60.83 | 2,252 | 7,839 | 13,233 | 17,349 | 24,210 |
| Structure 21 | South Fork Cottonwood, pre-mine | 21.08 | 4,561 | 11,292 | 16,455 | 20,341 | 26,631 |
| Structure 21 | South Fork Cottonwood, post-reclamation | 20.80 | 4,774 | 11,791 | 17,141 | 21,456 | 27,964 |
| Structure 37 | Cottonwood at mouth, pre-mine | 80.11 | 10,744 | 27,242 | 40,586 | 51,493 | 67,180 |
| Structure 37 | Cottonwood at mouth, post-reclamation | 79.19 | 10,915 | 27,932 | 41,715 | 52,790 | 69,580 |
| Structure 1 | Chaco Tribe , pre-mine | 0.45 | 158 | 497 | 788 | 1,023 | 1,380 |
| Structure 2 | Chaco Tribe, post-reclamation | 0.93 | 51 | 199 | 336 | 450 | 629 |

After reclamation, the following water quality changes would be anticipated:

- Sediment contributions from reclaimed areas are projected to increase slightly, or be the same as pre-mine conditions in the South Fork of Cottonwood and at the mouth of Cottonwood. These projections are approximately 5 percent, and are within the anticipated error of the SEDCAD model. Sediment contributions from the Pinabete Arroyo and the unnamed tributary of Chaco River are likely to decrease between pre-mine and post-reclamation conditions. Sediment contribution from channel erosion would be likely to decrease as incised unstable channels are replaced by stable channel and floodplain configurations.
- Poor quality and sodic soils would be buried within the backfill, and overland flow from the reclaimed areas would be expected to exhibit lower sodium and TDS concentrations.

Aluminum concentrations should decline with the reduction in suspended solids associated with reduced surface and channel erosion.

A spoil testing program was conducted (i.e., Synthetic Precipitation Leaching Procedure) to generate the information on spoil properties and leaching characteristics. The leaching test results indicate that interaction between stormwater runoff and newly exposed overburden, interburden, coals, and mine spoils may result in increases in the concentrations of sulfate, calcium, magnesium, sodium, TDS, boron, and manganese. These constituents are expected to initially increase in surface water infiltration or groundwater as they saturate mine spoils (BNCC 2012a). However, surface runoff from disturbed areas would be retained in the mine pit, sediment ponds, or berms. Thus, potential impacts to surface water quality would be expected to be negligible in Pinabete Arroyo, Cottonwood Arroyo, and the Chaco River during mining and reclamation operations as mine water is unlikely to reach these arroyos except during extreme precipitation events that exceed the designs of the containment structures.

With regard to potential impacts of mining, including coal dust, on water quality of stock ponds, two samples were obtained in 2008 from Stevenson's Well Pond located immediately adjacent to Area IV North. The results of these samples are presented in Table 4.5-14. 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 criterion for the estimated hardness of the pond water. These results indicate that impacts to stock ponds located adjacent to active mining operations would be minor with respect to livestock use.

NTEC would implement BMPs to avoid and minimize water quality impacts during mining by controlling runoff and sedimentation into nearby channels, including minimization of disturbance footprints, establishment of stream buffer zones, employment of upstream diversions or highwall impoundments, use of sediment ponds, perimeter berms or containment features, and reseeding of areas prepared for reclamation as soon as practicable. NTEC would comply with SMCRA requirements and EPA NPDES permits under CWA Section 402 to control the discharge of sediment within the active mining sectors of the Pinabete SMCRA Permit Area and Navajo Mine SMCRA Permit Area. In addition, NTEC would conduct regular monitoring of surface water quantity and quality in Pinabete and Cottonwood arroyos for the duration of the permit period. Monitoring would be conducted at five stations (three historic and two new stations) and would be collected quarterly in accordance with the Surface Water Monitoring Plan submitted as part of the Pinabete SMCRA Permit Application to OSMRE. Water quality monitoring results would be submitted quarterly to OSMRE. Motor fuel storage and equipment maintenance would be provided at the Navajo Mine facilities located outside of the Pinabete SMCRA Permit Area. Nevertheless, equipment repair may on occasion need to be conducted within the active mining or reclamation areas. NTEC maintains and implements a SPCC Plan that identifies areas of risk, specifies appropriate controls for bulk storage areas, identifies control strategies for managing potential spills, and lists procedures for safely disposing of any contaminated materials.

**Table 4.5-14 Surface Water Quality at Stevenson's Well Pond**

| Analysis Parameter | Sample Date July 21, 2008 | Sample Date August 12, 2008 |
|---|---|---|
| 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 | - |
| 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 | |
| TDS (mg/L) | 380 | - |
| Total suspended solids (mg/L) | 9200 | - |
| Vanadium, D (mg/L) | - | 0.0064 |
| Zinc, D (mg/L) | 0.02 | 0.006 |

Source: BNCC 2012a.
µS/cm = microSiemen(s) per centimeter
D = Dissolved
mg/L = milligram(s) per liter
su = standard unit(s)
T = Total

With regard to potential water quality impacts associated with the realignment of Burnham Road, no perennial water resources exist in the form of rivers, lakes, ponds, or streams within the proposed realignment of Burnham Road, nor do any wetlands or riparian habitats. However, the proposed realignment crosses six intermittent or ephemeral drainages, including Cottonwood Arroyo, with stream channels ranging from approximately one to three feet wide by approximately one foot deep. Each of the crossings would be constructed with culverts to ensure safe travel during precipitation events. Specifically, culverts would be installed where drainages cross the road. The Burnham Road crossings were designed and constructed to minimize their effect on channel flow hydraulics and sediment transport ability. Water would continue to flow past each culvert road crossing with only minimal and localized hydraulic effect. Culvert crossings would be constructed to ensure that no downstream headcutting occurred and that flow was not affected. All primary culverts would be designed to safely pass peak discharge from 10 year-6 hour event or larger and installed with erosion prevention measures (i.e., riprap at end of culvert). The culverts' length and diameter would be determined by watershed area and location. Road construction would not commence until regulatory authorities approve proposed designs (BNCC 2012a).

To control erosion, riprap would be placed in steep sloping relief and side ditches. 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. During construction activities, any spilled petroleum products would be cleaned up immediately. Should petroleum be absorbed into the soil, the stained area would be shoveled out and disposed of at an approved disposal site. Potential impacts resulting from hazardous substances spilled during construction would be negligible and short term. Overall, hydrology and water quality impacts would be minor.

<u>Impacts to Waters of the U.S.</u>

A delineation of potential waters of the U.S. within the Pinabete SMCRA Permit Area was conducted in April 2012. The survey area included approximately 10,133 acres of the Navajo Mine Lease Area. Overall 16.2 miles and 29 acres of waters of the U.S. were delineated within the Pinabete SMCRA Permit Area, as well as 2.05 acres of stock ponds, as described previously. The delineation did not identify any potential wetland areas. Any mining activities that occur in jurisdictional waters of the U.S. within the ROI would require a permit from the USACE pursuant to CWA Section 404 (33 CFR Section 320-331). Implementation of the Proposed Action would result in permanent impacts to 5.0 acres of waters of the U.S. Table 4.5-15 describes the impacts to waters of the U.S. by activity. BNCC applied for an Individual Permit from the USACE, which will be transferred to MMCo. With the implementation of post-mining compensatory mitigation requirements that would be required by the permit, impacts to waters of the US would be minimized to the extent feasible (see Section 4.5.5 for details). Appendix B includes the USACE 404B Alternatives Analysis for the submitted permit application.

**Table 4.5-15 Impacts to Waters of the U.S. by Activity**

| Type of Activity | Impacts to Waters of the U.S. (acres) | Type of Disturbance |
|---|---|---|
| Area IV North and Area IV South Mining Activity | 2.98 | Permanent |
| Haul Roads, Light Vehicle Roads, and the Burnham Road Realignment | 0.92[3] | Permanent |
| Transmission Line[1] | 0 | None |
| Infrastructure (Sediment and Drainage Control Ponds, Soil and Coal Stockpiles)[2] | 1.1[3] | Permanent |
| **Total** | **5.0** | **Permanent** |

<u>Notes:</u>

[1] The power line crosses four jurisdictional channels, but no poles would be placed within the ordinary high water mark and no access roads would cross the channels.

[2] No buildings would be located within jurisdictional streams. Retention ponds or stockpiles could be located within jurisdictional channels.

[3] Estimated acreage of impacts to waters of the US resulting from construction of haul roads, light vehicle roads, and sediment ponds.

The NPDES General Permit for Discharges of Storm Water Runoff Associated with Industrial Activity (General Industrial Permit) regulates stormwater and non-stormwater discharges of 10 specific activities, including mining operations. Accordingly, prior to operation of the Pinabete SMCRA Permit Area, MMCo would be required to obtain coverage under the General Industrial Permit. Similar to the General Construction Permit, MMCo must prepare and file a Notice of Intent with the EPA and prepare and implement a SWPPP for the operation of the mine area. MMCo would also be required to conduct monitoring to determine the amount of pollutants, if any, leaving the site. The mine would be required to amend their existing NPDES permit for potential discharges from the Pinabete SMCRA Permit Area, apply for a new individual permit or apply for coverage under EPA's MSGP. For the mine to be covered under the MSGP, a Notice of Intent must be submitted to the EPA to certify that the mine meets eligibility requirements.

Realignment of Burnham Road would require greater than 1 acre of ground disturbance; therefore, prior to implementation of the proposed construction activities, both MMCo would be required to obtain coverage under the General Construction Permit and a construction SWPPP would be prepared.

Surface Water Quantity

The primary changes in the hydrologic balance during the surface mining and reclamation operations would be changes in intermittent stream flows in Pinabete and Cottonwood arroyos that would occur as a result of the containment of surface runoff within the mine area. These changes in flow would not be expected to measurably affect the Chaco River due to the intermittent nature of tributary flows and the relatively small drainage area of the tributaries relative to the drainage area of the Chaco River. The drainage areas of Pinabete and Cottonwood arroyos represent only 1.4 and 1.8 percent, respectively, of the total Chaco River drainage basin.

Cottonwood and Pinabete arroyos would not be mined under this alternative. Mining operations would temporarily intercept precipitation runoff from the tributary drainages that flow into Cottonwood and Pinabete arroyos from the permit area. No stream diversions would be required for the Pinabete Mine Plan. The up-gradient areas that drain to the mine pits are small and would either be intercepted by the mine pit or captured in temporary pit protection ponds located up-gradient of mining. Precipitation runoff collected in the pit or in the pit protection ponds could be used for dust suppression, other mine needs, or would naturally diminish from evaporation and seepage. Once reclamation is completed within the permit area, precipitation runoff from these reclaimed areas would flow through reclaimed channels to Cottonwood Arroyo, Pinabete Arroyo, and the unnamed tributary to the Chaco River, and then into the Chaco River.

Prior to reclamation, NTEC would contain all mine-disturbed area drainage in the mine pit or in designed runoff containment structures. The bermed containment structures and the mine pit would function to contain the runoff from a 100-year, 6-hour precipitation event or larger. During reclamation, sediment ponds would be designed to retain at a minimum the volume of runoff from a 10-year storm, for 24 hours plus additional volume for sediment storage. Sediment ponds would be used to contain and treat water until approval is obtained for use of alternative sediment controls in accordance with 40 CFR Part 434 Subpart H, which applies to alkaline mine drainage from reclamation areas, brushing and grubbing areas, topsoil stockpiling area, and regraded areas at western coal mines. It allows operations to employ alternative sediment controls that are established in accordance with a sediment control plan that is designed to prevent an increase in the average annual sediment yield from pre-mine undisturbed conditions.

Post-reclamation standards include SMCRA requirements on Indian Land for reclaiming the affected land (30 USC 1265), including surface area stabilization/erosion control, revegetation, creating impoundments for water quality, minimizing disturbance to original hydrologic balances, and proper disposal of mine waste products and other requirements. These measures are designed to reduce surface erosion and sediment yield. BNCC has designed the post-reclamation topography and drainages to conform to existing drainages along the mine's perimeter to safely convey water from upstream, off-lease watersheds to either Pinabete Arroyo or Cottonwood Arroyo.

SEDCAD modeling was performed to evaluate peak flows and storm volumes under pre-mine, operational, and post-reclamation conditions on Pinabete Arroyo, Cottonwood Arroyo, and the unnamed tributary to the Chaco River. This tributary is located south of Cottonwood Arroyo and north of Pinabete Arroyo and drains an area of about 0.45 square mile on the western side of the permit area. The 2-year, 10-year, 25-year, and 100-year, 6-hour events were modeled with SEDCAD. The SEDCAD modeling results are presented in Table 4.5-16. The worst-case results in this table are based on no discharge up to the flows from a 100-year, 6-hour precipitation event in the mine area.

The SEDCAD results indicate that peak flows and runoff volumes to Pinabete and Cottonwood arroyos would be reduced during operations with maximum disturbance acreages representing worst-case projections. These direct impacts would be long-term (lasting for the duration of the mining operations, yet negligible in severity, because the mine site is in a desert environment, and the Pinabete and Cottonwood arroyos are a small portion (1.4 percent and 1.8 percent, respectively) of the regional Chaco watershed. Results show little difference between pre-mine conditions and post-reclamation conditions, except for the unnamed tributary to the Chaco River, where post-reclamation flows would increase due to an increase in drainage area following reclamation. However, the impact on the unnamed tributary and Chaco River would be considered negligible because the predicted change is considered to be within background levels.

During surface coal mining operations, a temporary reduction in surface water flows could occur in Pinabete and Cottonwood arroyos. Three ponds located within the permit area would also be removed by mining operations: Stevenson’s Well Pond, Pond 4N/4S, and one unnamed pond located within the northwestern portion of the permit area on a tributary to Cottonwood Arroyo. Pond 4N/4S and Stevenson’s Well Pond are located on tributaries to Pinabete Arroyo. No surface water right filings exist within the permit area, although livestock may occasionally use these ponds when water is available. Livestock grazing does not occur within permit area during active mining. An alternate water supply (e.g., water tanks) would be provided for any off-lease livestock grazing that has used these ponds located within the permit area.

Following reclamation, the water supplies for existing livestock use would be replaced. Additional water supplies may be available if new ponds are constructed or some of the sediment and/or drainage control ponds are converted to permanent stock water use at the request of the Navajo Nation or local water users in accordance with the Hydrologic Reclamation Plan (BNCC 2012a). Should pond retention occur, on-channel ponds would modify the hydrograph associated with each storm event by lowering the peak flows, extending the runoff over a longer period of time, and reducing storm runoff volumes. For small runoff events, the ponds may retain all of the storm runoff from upstream. Pond reconstruction would be performed to approximate the storage capacity and surface area of the original pre-mine impoundment. Accordingly, minor changes in intermittent or ephemeral flow may occur if some of the sediment and drainage control ponds are converted to permanent replacement livestock water ponds at the request of the Navajo Nation or the local water user.

Channel Morphology

Changes in runoff or in sediment yield from watersheds affected by mining have the potential to disrupt the existing stability of receiving streams, and in extreme circumstances, cause major changes in the existing channel pattern and geometry. Sediment control systems for mining operations are typically designed to yield a sediment load below equilibrium with the natural hydraulic regime. Erosion of streambeds and banks is usually expected for a short distance downstream of any discharge point, as the stream regains geomorphic equilibrium. Sediment pond discharge structures are designed in anticipation of this behavior, and allow the water (using grade-control structures, gabion aprons, and bank stabilizers) to attain equilibrium in a gradual and nondestructive fashion.

**Table 4.5-16 Pre-mine, Operation, and Post-Reclamation Flows for Pinabete Arroyo, Cottonwood Arroyo, and Unnamed Tributary to Chaco River in Area IV North**

| SEDCAD Designation | Watershed Location | Area (square miles) | 2-year, 6-hour Event (0.85 inch) Flow (cfs) | 2-year, 6-hour Event (0.85 inch) Volume (acre-feet) | 10-year, 6-hour Event (1.28 inches) Flow (cfs) | 10-year, 6-hour Event (1.28 inches Volume (acre-feet) | 25-year, 6-hour Event (1.56 inches) Flow (cfs) | 25-year, 6-hour Event (1.56 inches) Volume (acre-feet) | 50-year, 6-hour Event (1.76 inches) Flow (cfs) | 50-year, 6-hour Event (1.76 inches) Volume (acre-feet) | 100-year, 6-hour Event (2.04 inches) Flow (cfs) | 100-year, 6-hour Event (2.04 inches) Volume (acre-feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Structure 7 | Pinabete upstream, pre-mine | 47.80 | 401 | 294 | 1,113 | 802 | 1,698 | 1,217.1 | 2,159 | 1,017 | 2,851 | 2,033.0 |
| Structure 9 | Pinabete at mouth, pre-mine | 59.37 | 390 | 378 | 1,081 | 1,011 | 1,649 | 1,531.5 | 2,096 | 1,545 | 2,767 | 2,526 |
| Structure 13 | Pinabete at mouth, post-reclamation | 60.83 | 386 | 295 | 1,070 | 805 | 1,633 | 1,209 | 2,075 | 1,551 | 2,740 | 2,044 |
| Structure 21 | South Fork Cottonwood, pre-mine | 21.08 | 729 | 195 | 1,588 | 411 | 2,220 | 627.0 | 2,714 | 767 | 3,439 | 971 |
| Structure 21 | South Fork Cottonwood, post-reclamation | 20.80 | 719 | 186 | 1,574 | 424 | 2,204 | 604 | 2,693 | 740 | 3,413 | 940 |
| Structure 37 | Cottonwood at mouth, pre-mine | 80.11 | 1,250 | 460 | 2,839 | 1,165.0 | 4,049 | 1,732.0 | 4,971 | 2,175 | 6,325 | 2,836.0 |
| Structure 37 | Cottonwood at mouth, post-reclamation | 79.19 | 1,257 | 433 | 2,866 | 1,114 | 4,084 | 1,645 | 5,011 | 2,096 | 6,369 | 2,742 |
| Structure 1 | Chaco Tribe, pre-mine | 0.45 | 50 | 2.3 | 137 | 6.4 | 205 | 9.8 | 257.2 | 12.4 | 334 | 16.3 |
| Structure 1 | Chaco Tribe, post-reclamation | 0.98 | 28,8 | 3.6 | 100 | 11.4 | 162 | 18 | 211,2 | 23.2 | 286 | 31 |

Source: BNCC 2012a.

cfs = cubic feet per second

Diversions of natural stream flow also are designed to preserve geomorphic stability and prevent uncontrolled or destructive erosion and sedimentation. Channel diversions on the Navajo Mine Lease Area are designed using quantitative hydraulic modeling programs (e.g., SEDIMOT II) that simulate the geometry required to maintain geomorphic equilibrium in a natural channel. Where not possible, specific structures (such as grade-control structures) are designed and constructed in the channel to correct the problem. As with pond discharges, these channels and structures are regularly inspected and maintained by NTEC staff and reviewed by OSMRE and tribal inspectors.

BNCC has prepared, and NTEC would implement, a Hydrologic Reclamation Plan (BNCC 2012a) for the Pinabete SMCRA Permit Area and Navajo Mine SMCRA Permit Area. These plans are predicated on the use of geomorphic principles that have been employed to create the reconstructed landforms, drainage density, and channels. Drainages and watersheds that had previously been mined or altered would be reclaimed in accordance with the Reclamation Plan. Although many of the pre-mine channels are incised with little or no active floodplain, reclaimed channels for higher-order drainages are designed for long-term stability with a low-flow or pilot channel capable of accommodating average annual peak flows or flows from a 2-year, 6-hour event and a floodplain to contain more extreme flows, as appropriate, based on slope. Post-reclamation channels for first-order drainages are typically designed as vegetated swales. Accordingly, any impacts of the mine drainage system on natural stream patterns would be temporary and confined to the ROI. Because these variations would be far less than the natural variability of these arroyos and washes and would include a small proportion of the affected washes, the impact of the mine on the geometry, morphology, or location of the natural stream patterns is expected to be negligible post-reclamation.

**Four Corners Power Plant**

Groundwater

The continued operation of Units 4 and 5 would not affect groundwater quantity. The water demands for the operation of the power plant come from Morgan Lake, and no groundwater is pumped or otherwise used for this operation. No injection of material into the subsurface is planned. FCPP would continue monitoring groundwater quality and level. However, operation of the ash disposal facility, including existing trenches and extraction wells would result in a decline in groundwater flow, as described below.

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 sample results between 1986 and 2012 (APS 2013) for 9 wells selected in order to cover the entire ash pond area (monitoring wells 2, 4, 8, 15, 16, 17, 18, 19, and 20). Mann-Kendall time series tests were conducted to analyze TDS levels over time to determine if there is any trend in the data (Table 4.5-17). 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 implement appropriate corrective measures, as outlined 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.

**Table 4.5-17. Results of FCPP Groundwater Statistical Analysis**

| Monitoring Well | Sample Size | p-value | Statistical Summary |
|---|---|---|---|
| 2 | 40 | 0.00 | there is a downward trend in the series |
| 4 | 40 | <0.0001 | there is a downward trend in the series |
| 8 | 40 | 0.991 | there is no trend in the series |
| 15 | 39 | 0.672 | there is no trend in the series |
| 16 | 40 | <0.0001 | there is a downward trend in the series |
| 17 | 40 | 0.322 | there is no trend in the series |
| 18 | 41 | 0.00 | there is a downward trend in the series |
| 19 | 37 | <0.0001 | there is a downward trend in the series |
| 20 | 40 | <0.0001 | there is a downward trend in the series |

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 collect 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.

As discussed in more detail in Section 4.15, an ongoing investigation is underway at FCPP analyzing potential impacts to groundwater in the vicinity of a potential fuel release near the garage storage facility. The initial investigation found that groundwater near the garage storage facility is 6 feet below ground surface and flows northwest at a gradient of 0.009 foot per foot, away from Morgan Lake. The groundwater grab sample contained 170 mg/L of total petroleum hydrocarbon (Mongollan 2013).

A limited Phase II Environmental Site Assessment of the garage fueling area was conducted in December 2013 to identify VOCs to soil and groundwater. Analytical groundwater monitoring results indicate detections of benzene and trichloroethylene exceeding the maximum contamination level of 5 micrograms per liter in the samples collected from one of the monitoring wells (FCPP-GF-3). Vinyl chloride and 1,1-DCE were detected in excess of maximum contaminant levels of 2 and 7 micrograms per liter, respectively, in the samples collected in FCPP-GF-2. All other analytes were either detected below the respective maximum contaminant levels, where established, or below the lower reading limit. These data indicate the petroleum levels are not continuing to be released into soils or groundwater.

APS has committed to fully characterize the impacts at the site in the groundwater, identify the source of the impacts, evaluate remedial measures, and, if appropriate, initiate remediation. The objective of any proposed remedial action is to reduce contaminant concentrations in the soil to levels below appropriate risk-based cleanup criteria and to remove source material that may potentially impact or further impact the groundwater, to the extent technically feasible. To achieve the objective, the site will be remediated in a manner that ensures concentrations remaining in the soil and groundwater are protective of human health and the environment and will reclaim the site, to the extent necessary to support existing and proposed future uses (APS 2014b).

Surface Water Quality

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.

The operation of selective catalytic reduction devices on Units 4 and 5 requires the use of ammonia. Any potential spills of ammonia during transport could drain to nearby surface water features; the potential likelihood of such a spill and its associated impacts are discussed in Section 4.17, Health and Safety. Once at the FCPP, the ammonia would be used to operate the selective catalytic reduction devices and would be contained within a closed system. No ammonia would mingle with water cycled through the power plant or discharged to Morgan Lake. Therefore, no adverse impacts on surface water quality from ammonia use would be anticipated. In the unlikely event of a spill, the FCPP SPCC Plan, as described in Section 4.15, would be implemented to contain the spill and prevent adverse impacts of the spilled material to the surrounding environment.

In accordance with their NPDES permit, FCPP operates under a SWPPP. As described above, stormwater within the lease area either is contained via berms, discharged to Morgan Lake, or drains to one of three outfalls on site.

In addition, the following Structural Controls are used on site:

- Oil and chemicals stored inside buildings at Main and Chemical Warehouses;
- Reduced number of oil and chemicals stored outside, at the 345 switchyard;
- Concrete apron over the dirt bank at 4/5 Intake (SW1);
- Prompt cleanup of spills and leaks using absorbents to prevent the discharge of pollutants;
- Drip pans and absorbents used under or around leaky vehicles and equipment;
- Washwater drains to a proper collection system; and
- Rock and concrete barriers surrounding the perimeter of the plant proper next to Morgan Lake and cooling water canals leaving and entering the Lake (APS 2012b).

Should this alternative be implemented, FCPP would continue to operate in accordance with the existing NPDES permit and the SWPPP. Therefore, stormwater discharge during continued operations would have no adverse impacts on water quality.

In the ash disposal area, BMPs such as silt fences, berms, and settling basins are and will be utilized for stormwater control. The new DFADA cells would be lined with synthetic liners to minimize infiltration. The cells would be surrounded by a berm whose size is designed to capture a 100-year, 24-hour storm event without runoff. The stormwater that lands on the DFADA flows to an adjacent lined depression (stormwater pond), which is used for dust control or pumped to the Lined Decant Water Pond. Stormwater that falls on surrounding areas, outside the DFADA cells, would be channeled around the cells to the Chaco Wash by a system of berms so that the unaffected runoff does not comingle with the DFADA area.

Therefore, no adverse impacts to water quality would result from stormwater runoff associated with the proposed new DFADAs.

In 2009, a survey was conducted of the existing Lined Ash Impoundment and lined decant water impoundment located on top of old Ash Pond 3. The impoundments were assessed for their potential for failure, as discussed in greater detail in Section 4.15, Hazardous and Solid Wastes. Although as discussed in Section 4.15, 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 lined ash impoundment 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 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). As described in Section 4.1, Air Quality, it 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, as described in Air Quality, 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.

Impacts to Waters of the U.S.

Construction of the new ash pond facilities would result in the permanent filling of three ephemeral drainages that historically discharged to the Chaco River but those headwaters were previously impacted by the existing ash pond to the extent that they no longer convey flow or exhibit an ordinary high water mark. Of these drainages, only a portion of one is considered a jurisdictional water of the U.S. APS would avoid impacts to this portion of the drainage and maintain a 300-foot buffer from it during construction of the proposed ash pond. The USACE, in coordination with the EPA, concurred with the findings of the delineation (USACE 2013). Therefore, no impacts to waters of the U.S. would result from the Proposed Action. Based on a review of the delineation and the Project plans, removal of the non-jurisdictional segments of these drainages would alter stormwater runoff and hydrology in the ROI; however, these impacts would not adversely affect surface water quantity or quality. Further, expansion of the ash pond facilities would disturb greater than 1 acre; therefore, APS would be required to obtain coverage under a General Construction NPDES Permit and prepare and implement a construction SWPPP.

Surface Water Quantity

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.

**Transmission Lines**

Groundwater

Continued operation of the existing transmission lines would not be expected to impact groundwater quality or quantity. No water demands or groundwater use exist for the existing transmission lines. General maintenance of the transmission lines could affect groundwater resources by way of contamination from equipment and activities infiltrating the subsurface. To protect groundwater, hazardous fluid spill prevention and protection practices would be implemented (see Section 4.15, Hazardous and Solid Wastes). Therefore, impacts to groundwater would be considered negligible as maintenance activities and normal operation would not involve any ground disturbing activities.

Surface Water

The associated existing transmission lines and their ROWs cross numerous surface water features as displayed in Table 4.5-8. Short-term impacts to surface water from the operation of the transmission lines would occur only during maintenance and repair to the lines. Clearing of natural vegetation would be required on an as needed basis to ensure electrical safety, long-term maintenance, and reliability of the transmission line.

General transmission line maintenance activities could indirectly affect surface water resources by increased stormwater runoff from the site carrying sediment and contamination loads into surface water, and by contamination from construction equipment and activities infiltrating area surface waters. However, implementation of standard construction BMPs would prevent degradation of surface waters. During site clearing and grading activities, soils in the construction area could become exposed, rutted, and compacted. Soil exposure, rutting, and compaction have the potential to increase water yields from the site, concentrate and channelize sheetflow, increase erosion rates, and increase sediment delivery to nearby water bodies.

General maintenance activities within the ROWs could indirectly affect surface water resources by increased stormwater runoff from the site carrying sediment and contamination loads into surface water and by contamination from construction equipment and activities infiltrating area surface waters. Mitigation for these possible impacts would include revegetation of temporarily disturbed areas. Proper native seed selection would result in grasses with deep root systems and denser foliage, which would increase local retention times and reduce site outflows. Internal site drainage would be accomplished through the use of open ditches and culverts. The ditches would be constructed to encourage infiltration of stormflows and would further reduce site outflows. Specific plans or proposed measures for fugitive-dust control, erosion, and sedimentation control, site reclamation, and stormwater-runoff control would be implemented as part of the construction process.

BMPs would be implemented requiring that temporary measures, such as silt fences and straw bales, should be placed in ditches and along portions of the site perimeter to control erosion and meet NPDES requirements during all maintenance activities that involve construction or site disturbance (e.g., tower replacement, ROW clearing). To protect the water quality of area surface waters during maintenance activities, any and all of the BMPs required by the appropriate authorities should be implemented and maintained. These BMPs could include such measures as the installation of a double-walled silt curtain in the river or wash surrounding construction activities and installation of silt fencing and other erosion and sediment control measures when working in the floodplain to protect all adjacent wetland and drainage ways.

#### *4.5.4.2 Alternative B – Navajo Mine Extension Project*

**Navajo Mine**

Groundwater

Under Alternative B, NTEC would implement an alternative mine plan for the Pinabete SMCRA Permit Area. The mining for the current Navajo Mine SMCRA Permit Area would occur as described for the Proposed Action. Alternative B would directly affect a portion of Pinabete Arroyo, thereby requiring diverting the flows from the arroyo around mining activities into No Name Arroyo for the duration of the mine period. Groundwater impacts due to the diversion would be negligible because the channel design of the reconstructed Pinabete Arroyo would incorporate design features to reduce the effect of mining to the alluvial groundwater post-reclamation; therefore, impacts to groundwater quantity and quality during operation would be as described for the Proposed Action. Operation and reclamation activities would be similar to those described for the Proposed Action, except that the mine plan would involve mining through Pinabete Arroyo.

Surface Water Resources

Under Alternative B, NTEC would implement a revised mine plan for the Pinabete SMCRA Permit Area; the mining for the Navajo Mine SMCRA Permit Area would occur as described for the Proposed Action. Under this alternative, long-term impacts to waters of the U.S. would be greater than described for the Proposed Action. Mining would occur within Pinabete Arroyo; therefore, flows from the arroyo would be diverted around mining activities into No Name Arroyo for the duration of the mine period (through 2041). Engineering for the Pinabete diversion would be designed to minimize additional downcutting in No Name Arroyo by attenuation of peak flows from the diversion and stabilizing the No Name Channel at existing head cut locations downstream of the diversion. Reconstruction of Pinabete Arroyo post-mining would include geomorphic reclamation strategies designed to emulate the pre-mine channel. Based on the delineation of waters of the U.S. conducted in April 2012, approximately 33 acres of waters of the U.S. would be affected under Alternative B, in comparison to 5 acres that would be affected under the Proposed Action. To implement this mine plan, MMCo would be required to obtain a permit from the USACE under CWA Section 404. If a permit is granted, it would include required compensatory mitigation to offset impacts to waters of the U.S. such as rehabilitation or creation of an agreed upon acreage of waters of the U.S. at an off-site location. Under Alternative B, MMCo would submit a mitigation plan to the USACE for review with the USACE Section 404 permit application.

In addition to long-term impacts associated with the Pinabete Arroyo diversion, under this alternative a greater number of miles of roadway and transmission lines would require construction. As with the Proposed Action, erosion and leaks from construction equipment could result in potential impacts to surface water quality. Although the duration and extent of construction activities under Alternative B would be greater than the Proposed Action, implementation of BMPs as described in Drainage and Sediment Control Plans and SWPPP, would minimize impacts to water quality; therefore, no greater intensity of short-term impacts to surface water quality would be anticipated. Following completion of short-term construction activities, mining would occur as described for the Proposed Action. Therefore, impacts to surface water quality and hydrology, during operation, would be as described for the Proposed Action. Following completion of the mining activities, NTEC would reclaim mined areas in accordance with an approved reclamation plan. NTEC would prepare a Hydrologic Reclamation Plan for this alternative. Drainages and watersheds that were mined or altered would be reclaimed in accordance with the Reclamation Plan. Therefore, impacts to surface water quality and channel morphology would be the same as described for the Proposed Action.

**Four Corners Power Plant**

Under Alternative B, the lease for the FCPP would be renewed, and the FCPP would continue to operate as described in Chapter 2. Impacts to both surface water and groundwater resources would be as described for the Proposed Action.

**Transmission Lines**

Under Alternative B, the ROW for the subject transmission lines would be approved and the transmission lines would operate as described in Chapter 2. Impacts to surface water resources and groundwater would be negligible, as described for the Proposed Action.

#### *4.5.4.3 Alternative C – Alternative Pinabete Mine Plan*

**Navajo Mine**

Groundwater

Although Alternative C would have a greater disturbance footprint than the Proposed Action, the groundwater quantity and quality impacts during operation would be as described for the Proposed Action. Operation and reclamation activities would be the same as described for the Proposed Action.

Surface Water Resources

Under Alternative C, NTEC would seek a SMCRA permit for an alternative mine plan for the Pinabete SMCRA Permit Area; the mining for the Navajo Mine SMCRA Permit Area would occur as described for the Proposed Action. Under Alternative C, long-term impacts to waters of the U.S. would be greater than described for the Proposed Action. Based on the delineation of waters of the U.S. conducted in April 2012, approximately 6.6 acres of waters of the U.S. would be affected under this alternative, in comparison to 5 acres that would be affected under the Proposed Action. To implement this mine plan, NTEC would be required to obtain a permit from the USACE under CWA Section 404. If a permit was granted, it would include required compensatory mitigation to offset impacts to waters of the U.S., such as rehabilitation or creation of an agreed upon acreage of waters of the U.S. at an off-site location. Under Alternative C, MMCo would submit a mitigation plan to OSMRE, BIA, and the USACE for review with the USACE Section 404 permit application.

In addition, under Alternative C a greater number of miles of roadway and transmission lines would require construction. As with the Proposed Action, erosion and leaks from construction equipment could result in potential impacts to surface water quality. Although the duration and extent of construction activities under Alternative C would be greater than the Proposed Action, implementation of BMPs as described in an Erosion Control and Sediment Plan and SWPPP would minimize impacts to water quality; therefore, no greater intensity of short-term impacts to surface water quality would be anticipated. Following completion of short-term construction activities, mining would occur as described for the Proposed Action. Therefore, impacts to surface water quality and hydrology, during operation, would be as described for the Proposed Action. Following completion of the mining activities, NTEC would reclaim mined areas in accordance with an approved Reclamation Plan. As part of the SMCRA permit application, NTEC would prepare a Hydrologic Reclamation Plan for the Alternative Pinabete Mine Plan. Drainages and watersheds that had previously been mined or altered would be reclaimed in accordance with the Reclamation Plan. Therefore, impacts to surface water quality and channel morphology would be the same as described for the Proposed Action.

**Four Corners Power Plant**

Under Alternative C, the lease for the FCPP would be renewed, and the FCPP would continue to operate as described in Chapter 2. Impacts to both surface water and groundwater would be as described for the Proposed Action.

**Transmission Lines**

Under Alternative C, the ROW for the subject transmission lines would be approved and the transmission lines would operate as described in Chapter 2. Impacts to surface water resources and groundwater would be negligible, as described for the Proposed Action.

#### *4.5.4.4 Alternative D – Alternative Ash Disposal Area Configuration*

**Navajo Mine**

Under this alternative, OSMRE would approve the Pinabete SMCRA Permit application and renew the Navajo Mine SMCRA Permit. The Navajo Mine would operate as described under the Proposed Action.

Groundwater

The groundwater impacts of quantity and quality during operation would be as described for the Proposed Action. Operation and reclamation activities would be the same as described for the Proposed Action. As such, impacts would be the same as described for the Proposed Action.

Surface Water Resources

Impacts to surface water would be as described under the Proposed Action.

**Four Corners Power Plant**

Under this alternative, the area of disturbance required for the DFADA would be 350 acres instead of 385 acres. The 10 percent reduction in surface area of the DFADA would result in the same ground water and surface water related impacts as described for the Proposed Action. All other FCPP components of this alternative are the same as for the Proposed Action. Therefore, impacts would be the same as described for the Proposed Action.

**Transmission Lines**

Under this alternative, the transmission line ROWs would be approved and they would continue to be operated and maintained as described for the Proposed Action. As such, impacts would be the same as described for the proposed action.

#### *4.5.4.5 Alternative E – No Action Alternative*

**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.

**Transmission Lines**

Under the No Action Alternative, the ROWs for the transmission lines would not be approved. The transmission lines may be decommissioned or left in place. Short-term impacts to surface water and groundwater quality during decommissioning could occur; however, as with the Navajo Mine, APS and PNM would be required to comply with all environmental laws and obtain necessary permits, including a Stormwater General Permit prior to implementing such activities. Compliance with the Stormwater General Permit would include development of an Erosion Control and Sediment Management Plan and a SWPPP. Implementation of these plans would minimize runoff from decommissioning activities into waters of the U.S. Therefore, impacts would be negligible. If the transmission lines are left in place, no impacts to water resources would occur.

### 4.5.5 Water Resources/Hydrology Mitigation Measures

The Project Applicants have proposed measures that would be implemented to reduce or eliminate some of the environmental impacts of the Proposed Action. These measures include specific mitigating measures for certain environmental impacts, standard operating procedures that reduce or avoid environmental impacts, and BMPs for specific activities. These are described in Section 3.2.6.5. These measures are part of their application materials and are enforceable through permit or lease conditions. In addition, the Project Applicants must comply with additional protective regulatory requirements including laws, ordinances, regulations, and standards that are enforceable by the responsible agency over that activity. These are described in the Regulatory Compliance Framework Section for each resource category. Where the environmental analysis in this EIS recommends additional protective measures, over and above the applicant proposed measures and regulatory compliance, they are listed below as specific mitigation measures.

The Proposed Action, including the continuing operations of Navajo Mine, FCPP, and the transmission lines, would not result in major adverse impacts to water resources or hydrology. Therefore, no additional mitigation is recommended.

With regard to the proposed permanent impacts to waters of the U.S. that would occur within the Pinabete SMCRA Permit Area, the USACE will consider these impacts in its decision to approve a CWA 404 Individual Permit. In addition, consistent with USACE guidance provided in the Final Compensatory Mitigation Rule (April 10, 2008), Regulatory Guidance Letter No. 02-2 (December 24, 2002), and the Memorandum of Agreement Between the EPA and USACE Concerning the Determination of Mitigation Under the Final Compensatory Mitigation Rule, the USACE will include compensatory mitigation requirements as part of the 404 Permit for the Navajo Mine that are designed to compensate for the loss of jurisdictional areas in the Pinabete SMCRA Permit Area, so as to ensure no net loss of functions and services of waters of the U.S. as a result of the permitted activity. The primary mechanisms for mitigating the loss of jurisdictional areas are re-establishment and creation.

To offset the loss of functionality impacts of waters of the U.S. during active mining, MMCo has proposed the re-establishment of native riparian habitat and the creation of wetland habitat. Because MMCo's impacts to waters of the U.S. would occur incrementally per year of operation, the USACE is working with MMCo to prepare a phased approach when addressing compensatory mitigation requirements. Among the compensatory mitigation measures proposed, are: reestablishing wetland habitat in a section of the San Juan River; removing exotic species (e.g., tamarisk, knapweed, and Russian olive); and planting riparian species along the banks of the river.

MMCo plans to complete its compensatory mitigation requirements in two phases that correlate to the two coal supply agreements anticipated with APS. Phase I would involve mitigation within the Upper Chinde Wetland Complex within the central northeastern Navajo Mine lease boundary. Mitigation at site would include enhancement, establishment, and preservation. During Phase 2, MMCo would reclaim the remainder of the Area III mining disturbance with a hybrid geomorphic reclamation approach based on the fluvial geomorphic principles in hydrologic restorations.

Impacts to waters of the U.S. anticipated for the initial 15-year coal supply agreement are estimated at 2.0 acres. To achieve the goal of no net loss of aquatic species for the initial coal supply agreement, the USACE will establish a compensatory mitigation ratio in the Individual 404 Permit that includes specified acres of reestablishment or creation. The second 10-year coal supply agreement would result in approximately 3.0 acres of impacts to waters of the U.S. Similar to the initial coal supply agreement, the USACE will establish a compensatory mitigation ratio in the Individual 404 Permit that will include specified acres of reestablishment of native riparian habitat and specific acres of wetland creation. The ratios will be determined by analyzing the functional loss of ephemeral streams in the Project Area to the functional gain proposed by mitigation efforts along the San Juan River and Areas III and Areas IV North of the Navajo Mine, as illustrated in the South Pacific Division Mitigation Ratio-Setting Checklist. The compensatory mitigation ratio will also take into account any delays in the establishment of planted trees and shrubs, the location of the proposed mitigation sites, and any other pertinent factors. As a point of reference, the USACE required a compensatory mitigation ratio of 3.9:1 in the 2011 Pre-2016 Area III and Area IV North Mining Individual Permit (SPA-2011-00122-ABQ).

Under the No Action Alternative, the remaining salts in the evaporated Morgan Lake lakebed could potentially contain elevated levels of metals. To address this concern, OSMRE recommends that APS conduct sediment sampling and analysis for salts and metals. If the results indicate elevated levels above EPA Preliminary Remediation Goals, the need for remediation of the lakebed should be evaluated and implemented, if necessary.

# Exhibit 15

**UNITED STATES ENVIRONMENTAL PROTECTION AGENCY**
**REGION IX**
**75 Hawthorne Street**
**San Francisco, CA 94105-3901**

MEMORANDUM

DATE: November 10, 2014

SUBJECT: Review of Information and Literature to Assess Impacts on Threatened and Endangered Species and Critical Habitat Pursuant to the Federal Endangered Species Act.

FROM: Gary Sheth

TO: Administrative Record for NPDES Permit NN0000019

**Background**

The Endangered Species Act (ESA) requires and authorizes Federal agencies to evaluate the effects of their proposed actions on threatened or endangered species of fish, wildlife, or plants and habitat of such species that have been designated as critical. Specifically the ESA requires Federal agencies such as the U.S. Environmental Protection Agency (EPA) to ensure, in consultation with the U.S. Fish and Wildlife Service (USFWS), that any action authorized, funded or carried out by EPA is not likely to jeopardize the continued existence of any Federally-listed threatened or endangered species or adversely affect critical habitat of such species. [40 CFR 122.49( c)]. Since the issuance of National Pollutant Discharge Elimination System (NPDES) permits by EPA is a Federal action, consideration of a permitted discharge and its effect on any listed species is appropriate. This project relates to re-issuance of a NPDES permit to Arizona Public Service Company's Four Corners Power Plant (APS FCPP) for the discharge of cooling water from a cooling water lake called Morgan Lake to receiving water called No Name Wash, on Tribal land located within San Juan County in New Mexico. The creek is a tributary to the Chaco River, which itself flows into the San Juan River, a Water of the United States.

**Review**

The Federal Action that EPA is taking is to issue a NPDES permit for the discharge of cooling water on Tribal land. The impacts evaluated therefore relate only to direct and indirect impacts to federally listed Threatened and Endangered species from permitted discharge of cooling water to the receiving surface water.

The United States Office of Surface Mining Reclamation and Enforcement (OSMRE) is the lead federal agency that is conducting a Section 7 Endangered Species Act (ESA) consultation for the Four Corners Power Plant and Navajo Mind Energy Mine Project. The Proposed Action consists of issuance of permits by OSMRE and other cooperating agencies including EPA among several others. As part of this consultation OSMRE prepared a Biological Assessment (BA) to evaluate the effects of the Four Corners Power Plant and Navajo Mine Energy Project on species listed as threatened or endangered and for species that are proposed or candidates for listing under the ESA, that are likely to occur in the Action Area. The Action Area for the Proposed Action encompasses the lease areas for the APS FCPP and ancillary facilities, Navajo Mine, and transmission line right-of-ways (ROWs), as well as the Deposition Area for air emissions from the FCPP. With the exception of the transmission line ROWs, all the areas lie within San Juan County, New Mexico. The Action Area also extends to include the San Juan River from the upstream extent of the air Deposition Area downstream to San Juan River arm of Lake Powell.

EPA as a cooperating agency plans to use the review and analysis conducted by OSMRE and rely on the Biological Opinion developed by the USFWS to complete its obligations under ESA for this permit. However, it should be noted that because the Federal Action that EPA is simply to reissue a NPDES permit for the discharge of cooling water to a surface water on Tribal land, the impacts evaluated for this Action relate only to the uptake of water from the San Juan River to the cooling water system and discharge of cooling water to the receiving surface water.

EPA reviewed the List of Listed Species that occur in the proposed area within San Juan County, New Mexico. EPA requested information on federally listed species and important wildlife habitats that may occur in the project area from the United States Fish and Wildlife Service New Mexico Ecological Services Field Office. This information was provided via a letter dated September 02, 2014, a copy of which is included in the Administrative Record.

EPA compared the list of species with the list of 39 species to be considered by OSMRE in its BA for the larger FCPP and Navajo Mine Action Area. OSMRE concluded in its BA that there will likely be adverse affects on the listed Colorado pikeminnow (*Ptychocheilus lucius*) and Razorback sucker (*Xyrauchen texanus*). The adverse affects to these species result from various actions under the larger OSMRE Proposed Action, including impacts from air deposition pollutants from APS FCPP, entrainment at the APS Weir on the San Juan River, and release of non-native fish from Morgan Lake into the San Juan River via No Name Wash and the Chaco River. No adverse affects are attributed in the BA to the discharge of the cooling water itself from Morgan Lake.

**Conclusion**

As a cooperating and signatory agency to the BA, EPA anticipates that the USFWS will issue a final Biological Opinion (BO), including an incidental take statement and recommended reasonable and prudent measures (RPMs) that action agencies, including EPA can take to avoid jeopardizing the continued existence of listed species or destroying or adversely modifying critical habitat. EPA anticipates that appropriate implementation of applicable RPMs in the BO will allow it to meet its obligations for this NPDES permitting action under ESA.

# Exhibit 16

# United States Department of the Interior

FISH AND WILDLIFE SERVICE
New Mexico Ecological Services Field Office
2105 OSUNA ROAD NE
ALBUQUERQUE, NM 87113
PHONE: (505)346-2525 FAX: (505)346-2542
URL: www.fws.gov/southwest/es/NewMexico/;
www.fws.gov/southwest/es/ES_Lists_Main2.html

Consultation Tracking Number: 02ENNM00-2014-SLI-0511 September 02, 2014
Project Name: APS Four Corners Power Plant

Subject: List of threatened and endangered species that may occur in your proposed project location, and/or may be affected by your proposed project.

To Whom It May Concern:

Thank you for your recent request for information on federally listed species and important wildlife habitats that may occur in your project area. The U.S. Fish and Wildlife Service (Service) has responsibility for certain species of New Mexico wildlife under the Endangered Species Act (ESA) of 1973 as amended (16 USC 1531 et seq.), the Migratory Bird Treaty Act (MBTA) as amended (16 USC 701-715), and the Bald and Golden Eagle Protection Act (BGEPA) as amended (16 USC 668-668c). We are providing the following guidance to assist you in determining which federally imperiled species may or may not occur within your project area and to recommend some conservation measures that can be included in your project design.

**FEDERALLY-LISTED SPECIES AND DESIGNATED CRITICAL HABITAT**

Attached is a list of endangered, threatened, and proposed species that may occur in your project area. Your project area may not necessarily include all or any of these species. Under the ESA, it is the responsibility of the Federal action agency or its designated representative to determine if a proposed action "may affect" endangered, threatened, or proposed species, or designated critical habitat, and if so, to consult with the Service further. Similarly, it is the responsibility of the Federal action agency or project proponent, not the Service, to make "no effect" determinations. If you determine that your proposed action will have "no effect" on threatened or endangered species or their respective critical habitat, you do not need to seek concurrence with the Service. Nevertheless, it is a violation of Federal law to harm or harass any federally-listed threatened or endangered fish or wildlife species without the appropriate permit.

If you determine that your proposed action may affect federally-listed species, consultation with the Service will be necessary. Through the consultation process, we will analyze information contained in a biological assessment that you provide. If your proposed action is associated with

Federal funding or permitting, consultation will occur with the Federal agency under section 7(a)(2) of the ESA. Otherwise, an incidental take permit pursuant to section 10(a)(1)(B) of the ESA (also known as a habitat conservation plan) is necessary to harm or harass federally listed threatened or endangered fish or wildlife species. In either case, there is no mechanism for authorizing incidental take "after-the-fact." For more information regarding formal consultation and HCPs, please see the Service's Consultation Handbook and Habitat Conservation Plans at www.fws.gov/endangered/esa-library/index.html#consultations.

The scope of federally listed species compliance not only includes direct effects, but also any interrelated or interdependent project activities (e.g., equipment staging areas, offsite borrow material areas, or utility relocations) and any indirect or cumulative effects that may occur in the action area. The action area includes all areas to be affected, not merely the immediate area involved in the action. Large projects may have effects outside the immediate area to species not listed here that should be addressed. If your action area has suitable habitat for any of the attached species, we recommend that species-specific surveys be conducted during the flowering season for plants and at the appropriate time for wildlife to evaluate any possible project-related impacts.

**Candidate Species and Other Sensitive Species**

A list of candidate and other sensitive species in your area is also attached. Candidate species and other sensitive species are species that have no legal protection under the ESA, although we recommend that candidate and other sensitive species be included in your surveys and considered for planning purposes. The Service monitors the status of these species. If significant declines occur, these species could potentially be listed. Therefore, actions that may contribute to their decline should be avoided.

Lists of sensitive species including State-listed endangered and threatened species are compiled by New Mexico state agencies. These lists, along with species information, can be found at the following websites:

Biota Information System of New Mexico (BISON-M): www.bison-m.org

New Mexico State Forestry. The New Mexico Endangered Plant Program: www.emnrd.state.nm.us/SFD/ForestMgt/Endangered.html

New Mexico Rare Plant Technical Council, New Mexico Rare Plants: nmrareplants.unm.edu

Natural Heritage New Mexico, online species database: nhnm.unm.edu

**WETLANDS AND FLOODPLAINS**

Under Executive Orders 11988 and 11990, Federal agencies are required to minimize the destruction, loss, or degradation of wetlands and floodplains, and preserve and enhance their natural and beneficial values. These habitats should be conserved through avoidance, or mitigated to ensure that there would be no net loss of wetlands function and value.

We encourage you to use the National Wetland Inventory (NWI) maps in conjunction with ground-truthing to identify wetlands occurring in your project area. The Service's NWI program website, www.fws.gov/wetlands/Data/Mapper.html integrates digital map data with other resource information. We also recommend you contact the U.S. Army Corps of Engineers for permitting requirements under section 404 of the Clean Water Act if your proposed action could impact floodplains or wetlands.

**MIGRATORY BIRDS**

The MBTA prohibits the taking of migratory birds, nests, and eggs, except as permitted by the Service's Migratory Bird Office. To minimize the likelihood of adverse impacts to migratory birds, we recommend construction activities occur outside the general bird nesting season from March through August, or that areas proposed for construction during the nesting season be surveyed, and when occupied, avoided until the young have fledged.

We recommend review of Birds of Conservation Concern at website www.fws.gov/migratorybirds/CurrentBirdIssues/Management/BCC.html to fully evaluate the effects to the birds at your site. This list identifies birds that are potentially threatened by disturbance and construction.

**BALD AND GOLDEN EAGLES**

The bald eagle (*Haliaeetus leucocephalus*) was delisted under the ESA on August 9, 2007. Both the bald eagle and golden eagle (*Aquila chrysaetos*) are still protected under the MBTA and BGEPA. The BGEPA affords both eagles protection in addition to that provided by the MBTA, in particular, by making it unlawful to "disturb" eagles. Under the BGEPA, the Service may issue limited permits to incidentally "take" eagles (e.g., injury, interfering with normal breeding, feeding, or sheltering behavior nest abandonment). For information on bald and golden eagle management guidelines, we recommend you review information provided at www.fws.gov/midwest/eagle/guidelines/bgepa.html.

On our web site www.fws.gov/southwest/es/NewMexico/SBC_intro.cfm, we have included conservation measures that can minimize impacts to federally listed and other sensitive species. These include measures for communication towers, power line safety for raptors, road and highway improvements, spring developments and livestock watering facilities, wastewater facilities, and trenching operations.

We also suggest you contact the New Mexico Department of Game and Fish, and the New Mexico Energy, Minerals, and Natural Resources Department, Forestry Division for information regarding State fish, wildlife, and plants.

Thank you for your concern for endangered and threatened species and New Mexico's wildlife habitats. We appreciate your efforts to identify and avoid impacts to listed and sensitive species in your project area. For further consultation on your proposed activity, please call 505-346-2525 or email nmesfo@fws.gov and reference your Service Consultation Tracking Number.

Attachment

United States Department of Interior
Fish and Wildlife Service

Project name: APS Four Corners Power Plant

# Official Species List

**Provided by:**

New Mexico Ecological Services Field Office
2105 OSUNA ROAD NE
ALBUQUERQUE, NM 87113
(505) 346-2525
http://www.fws.gov/southwest/es/NewMexico/
http://www.fws.gov/southwest/es/ES_Lists_Main2.html

**Consultation Tracking Number:** 02ENNM00-2014-SLI-0511
**Project Type:** Wastewater Facility
**Project Description:** Approximately 1540 MW Coal fired power plant in New Mexico

United States Department of Interior
Fish and Wildlife Service

Project name: APS Four Corners Power Plant

**Project Counties:** San Juan, NM

United States Department of Interior
Fish and Wildlife Service

Project name: APS Four Corners Power Plant

# Endangered Species Act Species List

There are a total of 9 threatened, endangered, or candidate species on your species list. Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species. Critical habitats listed under the **Has Critical Habitat** column may or may not lie within your project area. See the **Critical habitats within your project area** section further below for critical habitat that lies within your project. Please contact the designated FWS office if you have questions.

| **Birds** | **Status** | **Has Critical Habitat** | **Condition(s)** |
|---|---|---|---|
| Southwestern Willow flycatcher *(Empidonax traillii extimus)*<br>Population: Entire | Endangered | Final designated | |
| Sprague's Pipit *(Anthus spragueii)* | Candidate | | |
| Yellow-Billed Cuckoo *(Coccyzus americanus)*<br>Population: Western U.S. DPS | Proposed Threatened | Proposed | |
| **Fishes** | | | |
| Colorado pikeminnow *(Ptychocheilus lucius)*<br>Population: Entire, except EXPN | Endangered | Final designated | |
| Razorback sucker *(Xyrauchen texanus)*<br>Population: Entire | Endangered | Final designated | |
| Zuni Bluehead Sucker *(Catostomus discobolus yarrowi)* | Endangered | Proposed | |
| **Flowering Plants** | | | |
| Knowlton's cactus *(Pediocactus* | Endangered | | |

United States Department of Interior
Fish and Wildlife Service

Project name: APS Four Corners Power Plant

| | | | |
|---|---|---|---|
| *knowltonii)* | | | |
| Mancos milk-vetch *(Astragalus humillimus)* | Endangered | | |
| Mesa Verde cactus *(Sclerocactus mesae-verdae)* | Threatened | | |

# Critical habitats that lie within your project area

The following critical habitats lie fully or partially within your project area.

| **Birds** | **Critical Habitat Type** |
|---|---|
| Yellow-Billed Cuckoo *(Coccyzus americanus)*<br>Population: Western U.S. DPS | Proposed |
| **Fishes** | |
| Colorado pikeminnow *(Ptychocheilus lucius)*<br>Population: Entire, except EXPN | Final designated |
| Razorback sucker *(Xyrauchen texanus)*<br>Population: Entire | Final designated |
| Zuni Bluehead Sucker *(Catostomus discobolus yarrowi)* | Proposed |

Office of the Clerk
**United States Court of Appeals for the Ninth Circuit**
Post Office Box 193939
San Francisco, California 94119-3939
415-355-8000

Molly C. Dwyer
Clerk of Court

May 23, 2018

| | |
|---|---|
| No.: | 18-71481 |
| Short Title: | Dine' Citizens Against Ruining, et al v. USEPA, et al |

Dear Petitioners/Counsel

A petition for writ of mandamus and/or prohibition has been received in the Clerk's Office of the United States Court of Appeals for the Ninth Circuit. The U.S. Court of Appeals docket number shown above has been assigned to this case. Always indicate this docket number when corresponding with this office about your case.

If the U.S. Court of Appeals docket fee has not yet been paid, please make immediate arrangements to do so. If you wish to apply for in forma pauperis status, you must file a motion for permission to proceed in forma pauperis with this court.

Pursuant to FRAP Rule 21(b), no answer to a petition for writ of mandamus and/or prohibition may be filed unless ordered by the Court. If such an order is issued, the answer shall be filed by the respondents within the time fixed by the Court.

Pursuant to Circuit Rule 21-2, an application for writ of mandamus and/or prohibition shall not bear the name of the district court judge concerned. Rather, the appropriate district court shall be named as respondent.