

# 1 INTRODUCTION

The Office of Surface Mining Reclamation and Enforcement (OSMRE) is the regulatory authority for coal mining operations under the Surface Mining Reclamation and Control Act of 1977 that occur on Hopi Tribe and Navajo Nation surface. As such, OSMRE is responsible for the review and decisions on all permit applications to conduct surface coal mining operations. The Peabody Western Coal Company (PWCC) permit area, located on both Navajo Nation and Hopi Tribe surface area, is required to have a cumulative hydrologic impact assessment (CHIA), prepared by the regulatory authority, which assesses whether the proposed operation has been designed to prevent material damage to the hydrologic balance outside the permit area (30 Code of Federal Regulations (CFR) § 780.21(g)).

A CHIA is an assessment of the probable hydrologic consequences (PHC) of the proposed operation and all anticipated coal mining upon surface and groundwater systems in the cumulative impact area (CIA). The PHC is prepared by the applicant as required by 30 CFR § 780.21(f), and approved by the regulatory authority. Congress identified in the Surface Mining Coal and Reclamation Act (SMCRA) (U.S. Congress, 1977) that there is “a balance between protection of the environment and agricultural productivity and the Nation’s need for coal as an essential source of energy” (SMCRA, 1977 Sec 102(f)). The hydrologic reclamation plan required by the rules at 30 CFR § 780.21(h) recognizes that disturbances to the hydrologic balance within the permit and adjacent area should be minimized, material damage outside the permit area should be prevented, applicable Federal, Tribal, and State water quality laws should be met, and the rights of present water users protected. Additionally, 30 CFR § 816.42 states “discharges of water from areas disturbed by surface mining activities shall be made in compliance with all applicable State and Federal water quality laws and regulations and with the effluent limitations for coal mining promulgated by the United States Environmental Protection Agency (USEPA) set forth in 40 CFR part 434.” Discharges of disturbed area runoff at the Kayenta Complex are conducted in accordance with the terms and conditions of two separate National Pollutant Discharge Elimination System (NPDES) permits issued by the USEPA and certified by the Navajo Nation and Hopi Tribe under the Clean Water Act (CWA).

OSMRE considered USEPA approved water quality standards for the Hopi Tribe and Navajo Nation as part of the impact assessment. Additionally, protection of existing and foreseeable water uses within the various delineated cumulative impact areas was a focus of this assessment. The following summary table identifies water resources evaluated and approach for impact assessment (Table 1). It should be noted that OSMRE has identified material damage thresholds which are not enforceable, but provide a preliminary assessment level of material damage so that measures may be taken to prevent material damage to the hydrologic balance outside the permit area before occurring. Table 1 indicates that; (1) the hydrologic monitoring program is adequate for OSMRE’s CHIA, (2) impacts within the permit area have been minimized, and (3) material damage outside the permit area has been prevented. This CHIA supersedes the CHIA prepared in 2008 (OSMRE, 2008) and 1989 (OSMRE, 1989).

Kayenta Complex – Material Damage Summary						
Water Resource	Assessment Approach	Material Damage Threshold	Material Damage Limit	Material Damage Outside Permit Area	Impact Minimization	Adequate Monitoring Program
Surface Water Quality	Downstream Comparison to Upstream Samples	4 of 4 Sample Events > WQS	Change Resource Use	No	Sediment Control Structures	Yes
Surface Water Quantity	Percent CIA Managed with Impoundments	30-Percent CIA	> 50-Percent CIA	No	Contemporaneous Reclamation	Yes
Alluvial Quality	Downstream Comparison to Upstream Samples	Agricultural Livestock Use WQS	Continued Monitoring	No	Mining Limited to Ephemeral Channels	Yes
Alluvial Quantity	Darcy's Law Flow Equation	Continued Monitoring	Continued Monitoring	No	Water Retention for Livestock and Wildlife	Yes
Wepo Quality	Backfill Spoil and Adjacent Area Monitoring	Continued Monitoring	Continued Monitoring	No	Water Supply Replacement	Yes
Wepo Quantity	Modeling, Monitoring, and Visual Observation	Continued Monitoring	Continued Monitoring	No	Water Supply Replacement	Yes
N-Aquifer Quality	USGS and PWCC NAV Well Data	4 of 4 Sample Events > MCLs	Drinking Water Quality Standards	No	Alternating Pumping Wells	Yes
N-Aquifer Quantity	USGS and PWCC Monitoring, and PWCC Model Lift Costs	26-Percent Lift Cost Increase at Supply Wells	> 50-Percent Lift Cost Increase at Supply Wells	No	System Recovery due to Reduced Pumping (70% Reduction After 2005)	Yes
N-Aquifer Baseflow	Approved PWCC Model and Model Verification	21-Percent Reduction In Modeled Baseflow	> 30-Percent Reduction In Modeled Baseflow	No		Yes - Predictions Modeled

Table 1. Kayenta Complex Material Damage Summary

The finding that the mining operation is designed to prevent material damage to the hydrologic balance outside the permit area is supported by the following chapters. The CHIA is organized as follows:

- Chapter 1
  - Describes the regulatory environment.
  - Describes general background of the Kayenta Complex.
- Chapter 2
  - Assesses cumulative impact potential with active coal mines.
  - Delineates the surface water CIAs.
  - Delineates the groundwater CIAs.
- Chapter 3 identifies water resource uses and designations in the CIAs.
- Chapter 4 provides a description of baseline surface and groundwater quantity and quality within the CIAs.
- Chapter 5 contains an impact assessment of the Kayenta Complex on surface water and groundwater quantity and quality, and includes a determination of:
  - The minimization of impacts within the permit area;
  - The prevention of material damage outside the permit area;
  - The adequacy of the monitoring program to assess potential impacts; and,
  - Establishes material damage thresholds and limits.

## 1.1 Regulatory Environment

Surface coal operations on Hopi Tribe and Navajo Nation surface are managed through the coordinated collaboration of several regulatory agencies. Depending on the permitting action, multiple regulatory agencies may be involved in the review, comment, and public participation process. Regulatory agencies that may have a permitting action or compliance interest on the PWCC permit include:

- OSMRE (regulatory authority for coal mining operations on Hopi Tribe and Navajo Nation surface)
- Bureau of Indian Affairs (protect and improve trust assets of the Tribes)
- Hopi Tribe Water Resources Program (develop and administer water quality standards)
- Navajo Nation EPA (develop and administer water quality standards)
- Navajo Nation Minerals Department (represent Tribal mineral interests)
- Navajo Nation Water Management Branch (implement Navajo Nation's Water Code)
- U.S. Environmental Protection Agency (issue and administer NPDES permits)
- U.S. Fish and Wildlife Service (ensure protection of threatened and endangered species)
- Bureau of Land Management (ensures maximum resource recovery)
- U.S. Army Corps of Engineers (issue permits and associated impact assessments for the discharge of fill material into waters of the United States, including wetlands under section 404 of the CWA)

The 2011 CHIA update was developed based on regulatory review and comment by the Bureau of Indian Affairs, Hopi Tribe Water Resources Program, Navajo Nation EPA, Navajo Nation Minerals Department, Navajo Nation Water Management Branch, and OSMRE peer reviews.

### 1.1.1 CHIA Revision Purpose

The CHIA is not updated at a specified interval. 30 CFR § 780.21(g)(2) states “an application for permit revision shall be reviewed by the regulatory authority to determine whether a new or updated CHIA shall be required.” A revision to PWCC's permit application package (PAP) was submitted to OSMRE in September, 2010. Revision updates include additions to the PHC (PAP Chapter 18), the protection of the hydrologic balance (PAP Chapter 17), and the hydrologic monitoring program (PAP Chapter 16). The revisions were in response to reduced PWCC wellfield pumping within the permit area. Based on the factors below, OSMRE determined that an updated CHIA for the PWCC permit area was warranted.

Compared to the 2008 CHIA, the 2011 CHIA for PWCC operations:

- 1) Defines “material damage to the hydrologic balance” outside the permit area.
- 2) Updates hydrologic monitoring data sets through 2010.
- 3) Evaluates surface water using 2007 Navajo Nation Surface Water Quality Standards (NNSWQS).
- 4) Evaluates water resources using 2008 Hopi Tribe Water Quality Standards (HTWQS).
- 5) Identifies material damage thresholds that are less than material damage criterion.
- 6) Assesses recovery of the Navajo aquifer due to a reduction of pumping in 2006.

### 1.1.2 Cumulative Impact Area

A CIA is defined at 30 CFR § 701.5 as, “. . . the area, including the permit area, within which impacts resulting from the proposed operation may interact with the impacts of all anticipated mining on surface- and ground-water systems.” The CIA is an area where impacts from the coal mining operation, in combination with additional coal mining operations, may cause material damage (OSMRE, 2002). The size and location of a given CIA will depend on the surface water and groundwater system characteristics,

the hydrologic resources of concern, and projected impacts from the operations included in the assessment (OSMRE, 2007). For this CHIA, two surface water CIAs and two groundwater CIAs are delineated to assess impacts associated within these distinct hydrologic resource areas.

### **1.1.3 Material Damage to the Hydrologic Balance**

Sections 507(b)(11) and 510(b)(3) of SMCRA, and 30 CFR § 780.21(g) require OSMRE to determine that a mining and reclamation operation has been designed to prevent material damage to the hydrologic balance outside the permit area. “Hydrologic balance” is defined at 30 CFR § 701.5 as, “the relationship between the quality and quantity of water inflow to, water outflow from, and water storage in a hydrologic unit such as a drainage basin, aquifer, soil zone, lake or reservoir. It encompasses the dynamic relationships among precipitation, runoff, evaporation, and changes in ground and surface water storage.”

“Material damage to the hydrologic balance” is not defined in SMCRA or at 30 CFR § 701.5. The intent of not developing a programmatic definition for “material damage to the hydrologic balance” was to provide the regulatory authority the ability to develop a definition based on regional environmental and regulatory conditions. Therefore, for the purpose of this CHIA;

Material damage to the hydrologic balance outside the permit area means any quantifiable adverse impact from surface coal mining and reclamation operations on the quality or quantity of surface water or groundwater that would preclude any existing or reasonably foreseeable use of surface water or groundwater outside the permit area.

### **1.1.4 Material Damage Criteria and Thresholds**

Except for water quality standards and effluent limitations required at 30 CFR § 816.42, the determination of material damage criteria is the discretion of the regulatory authority (48 Federal Register (FR) 43972-43973, 1983 and 48 FR 43956, 1983). Material damage criteria for both groundwater and surface water are related to existing standards, and based on the protection of water uses. The 2011 Kayenta Complex CHIA also provides material damage thresholds that are less than material damage criteria. The material damage criteria and thresholds are reviewed after submittal of the PWCC annual reclamation status report to OSMRE.

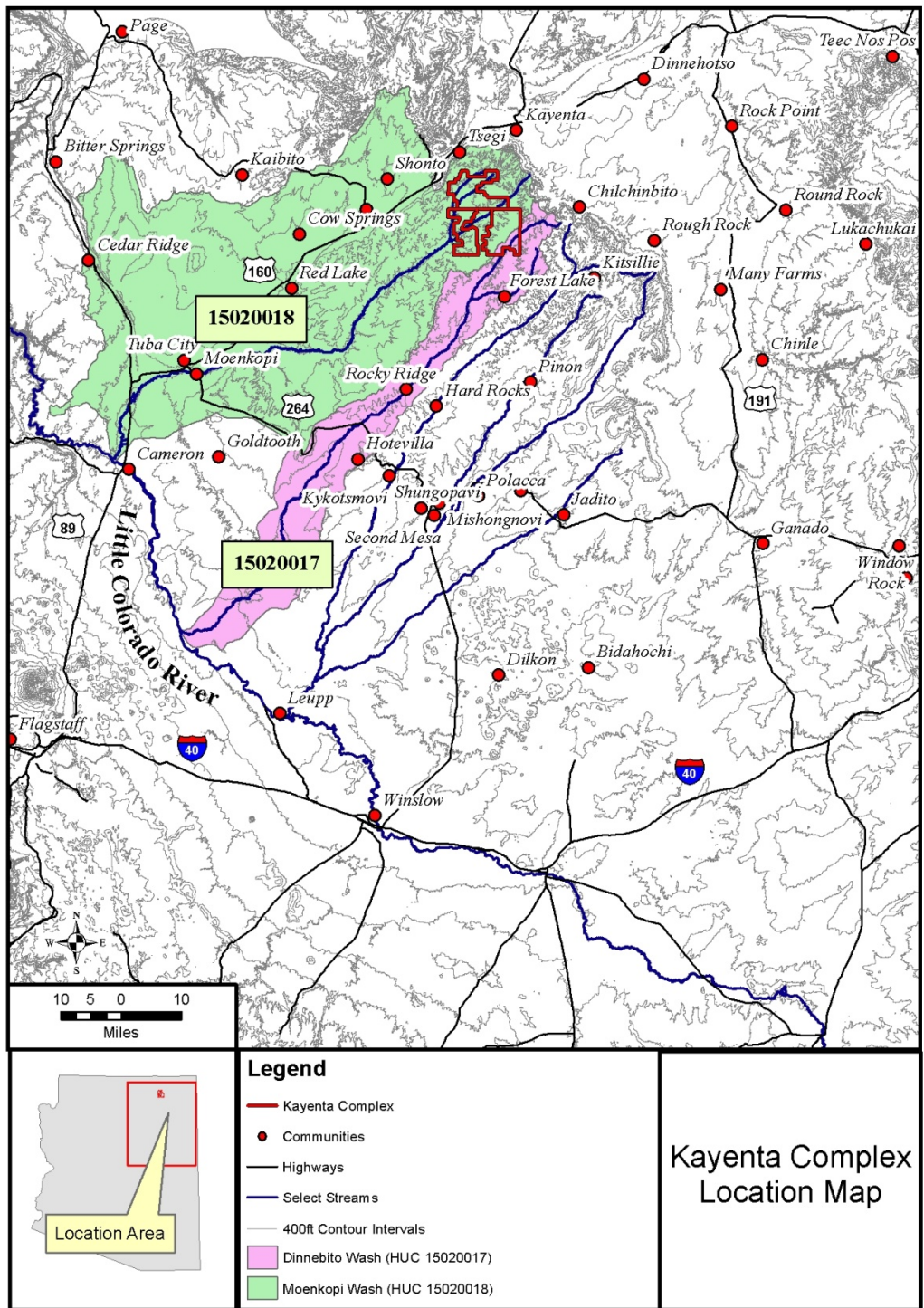
## **1.2 Kayenta Complex Background**

The Kayenta Mine is located within the boundaries of the Hopi Tribe and Navajo Nation reservations and has operated since 1973. The Black Mesa Mine operated in a permit area adjacent to the Kayenta Mine and was active from 1970 through 2005. The two surface mine operations are collectively considered the Kayenta Complex. The Black Mesa Mine operated under Initial Program and Administrative Delay pursuant to 30 CFR 750.11(c). The Kayenta Mine operates under Permit AZ-0001D based upon the Permanent Program Permit Application submitted in 1985. In 1990, OSMRE approved an operation plan and granted Permit AZ-0001C under the Permanent Indian Lands Program, supported by an environmental impact statement (EIS) (OSMRE, 1990). OSMRE has renewed Permit AZ-0001C every five years and converted the permit number to AZ-0001D in 1995. OSMRE approved two revisions of Permit AZ-0001D in 2004 and 2005 to add N-11 Extension and N-9 to the mine plan sequence along with other operational approvals. In September 2010, PWCC submitted a permit revision “Revisions to Chapter 18, Probable Hydrologic Consequences; and Chapter 17, Protection of the Hydrologic Balance”, upon which this CHIA is based. Since technical updates to the PAP are ongoing, reference to specific chapters in the PAP use the year 2011 as reference since the permit is complete and up to date at the publishing of this CHIA document.

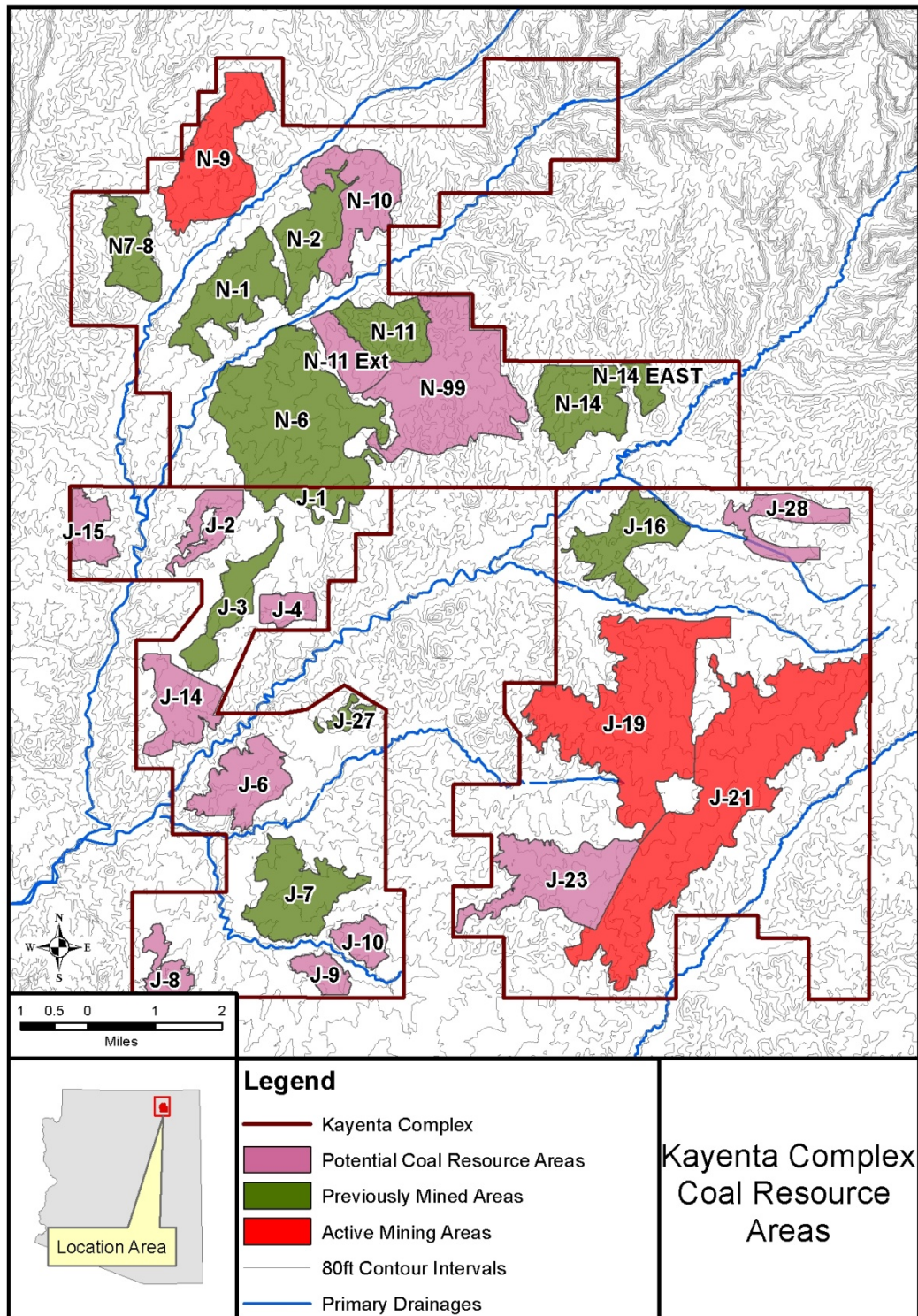
The Kayenta Complex encompasses an area of 65,387 acres and is located in northeastern Arizona on Black Mesa, southwest of Kayenta, Arizona (Figure 1). The Navajo Nation has exclusive surface and mineral interests for 24,858 acres in the northern portion of the Kayenta Complex. In the remaining 40,529 acres of the Kayenta Complex, the Hopi Tribe and Navajo Nation have joint and equal interests in the mineral resources that underlie the land surface. Navajo Nation coal resource areas are identified as “N” areas, and joint coal resource interest areas are identified as “J” area (Figure 2). Active coal mining occurs in the N-9, J-19, and J-21 coal resource areas. Coal royalties are based on surface area, and water royalties for PWCC’s wellfield pumping are paid equally to the Hopi Tribe and Navajo Nation based on metered wellfield production. Royalty payments for PWCC wellfield production averaged \$1.86 million annually for each tribe during the 1988-2005 pumping period, and reduced to approximately \$0.6 million per tribe annually after Black Mesa coal slurry pipeline operations discontinued and Kayenta Complex pumping reduced approximately 70-percent, averaging 1,243 acre-feet (ac-ft) per year from 2006 to 2009 (Macy and Brown, 2011).

From 1970 to 2005, coal mined at the Black Mesa mine was shipped approximately 273 miles to the Mohave Generating Station near Laughlin, Nevada via a coal slurry pipeline. The Mohave Generating Station consumed approximately four to five million tons of coal annually (PWCC, v.1, ch.2, 2011). Coal produced at Kayenta Mine is transported approximately 83 miles to the Navajo Generating Station near Page, Arizona via an electric railroad. The Navajo Generating Station consumes seven to eight million tons of coal annually (PWCC, v.1, ch.2, 2011).

PWCC uses the strip mining method to recover the coal resources at the Kayenta Complex. Strip mining involves the removal of overburden material covering the coal using blasting and draglines. The coal is then removed by shovels or front-end loaders and transported to coal preparation facilities using haulage trucks. After the coal removal, the overburden material is regraded to the approximate original topographic contours, conforming to topography to support the approved post-mining land uses. Stockpiled topsoil and other suitable material are then spread on top of the graded overburden material to support the re-establishment of approved post-mining vegetation. PWCC must then demonstrate the persistence of re-established vegetative cover sufficient to support post-mining land use.



**Figure 1: Kayenta Complex Location Map.**



**Figure 2: Kayenta Complex Coal Resource Areas.**