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UNITED STATES OF AMERICA
FEDERAL ENERGY REGULATORY COMMISSION

Nature and People First Arizona PHS, LLC Docket No. P-15233-000

Preliminary-Permit Application for the
Black Mesa Pumped Storage Project – North

The Grand Canyon Trust's Motion to Intervene

I. Introduction

The Grand Canyon Trust moves to intervene in this proceeding under Federal Energy Regulatory Commission Rule 214.[1] At this stage, the Trust is neither supporting nor opposing the preliminary-permit application at issue here, but rather, is seeking to intervene to be added to the service list for this proceeding and to add several observations as a party about the proposed hydropower project in question.

II. Background

The "Black Mesa Project" at issue here is a three-part plan for a hydropower development on the Navajo Nation that, at full scale, could string reservoirs for nearly 50 miles—from Tsegi to Rough Rock, and beyond—along both the rim of Black Mesa and the lands below.[2] According to the preliminary-permit applications, it could take 450,000 acre-feet of water to fill these reservoirs, if they all were built.[3] That is more

[1] 18 C.F.R. § 385.214.
[2] *See* Nature and People First Arizona PHS, LLC ("Arizona PHS"), *Application for Preliminary Permit: Black Mesa Pumped Storage Project – North*, P-15233, Ex. 3, Att. B. at Drawing 1-N (Sep. 1, 2022) ("N App."); Arizona PHS, *Application for Preliminary Permit: Black Mesa Pumped Storage Project – East*, P-15234, Ex. 3, Att. B. at Drawing 1-E (Sep. 1, 2022) ("E App."); Arizona PHS, *Application for Preliminary Permit: Black Mesa Pumped Storage Project – South*, P-15235, Ex. 3, Att. B. at Drawing 1-S (Sep. 1, 2022) ("S App.").
[3] N App. at Ex. 1, p. 2 (100,000 acre-feet of capacity in upper reservoir and the same in lower reservoirs); E App. at Ex. 1, p. 2 (same); S App. at Ex. 1, p. 2 (250,000 acre-feet).

water than best estimates say the Navajo Nation uses in total each year, where lack of access to water is a persistent problem that constrains the Nation's water use.[4] It is five times more water than can be held today in all the significant reservoirs and lakes on the Navajo Nation combined.[5]

At that scale, this proposal raises questions. What does the Navajo Nation and what do the Navajo people think of this idea? What are the Hopi Tribe's views? Is this the best use of the scarce water in this dry place? Where would the water come from? Exactly how much water would be needed to fill the project's reservoirs? What about refilling them after evaporative losses? Does the applicant hope to build just one of the projects for which it is seeking preliminary permits or all three? Who would be served by the electricity generated? Would the surrounding communities benefit? The Navajo Nation as a whole? The Hopi Tribe? How? At what cost to the surrounding landscape and the life it sustains? At what cost to the Navajo, Coconino, or other groundwater aquifers? The San Juan River? The Colorado River?

III. The Trust, for now, takes no position on the permit applications.

Because the foregoing questions, and others, lack good answers as yet, the Trust is not now supporting or opposing the preliminary permit sought here,[6] recognizing that the permit will do nothing more than put the applicant first in line if it chooses to seek a hydropower license from the Commission.[7] At the least, the Trust

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[4] U.S. Bureau of Reclamation, *Colorado River Basin Ten Tribes Partnership Tribal Water Study*, Table 5.5-I (Dec. 2018) (estimating annual diversions from 2009–2013 of 361,315 acre-feet and depletions of 235,079 acre-feet), attached hereto as Exhibit 1 (excerpts).
[5] *Id.* at Table 5.5-H (listing capacity for 26 lakes and reservoirs at 87,946 acre-feet).
[6] *See* 18 C.F.R. § 385.214(b)(1).
[7] *See In re Pumped Hydro Storage LLC*, P-14994, 171 FERC ¶ 61,138, p. 15 (May 21, 2020).

does not intend to take a position on the proposed project until the Navajo Nation and Navajo people have been afforded more time to consider the proposal and express their views, for the project is entirely on the Navajo Nation's lands.

IV. The Trust's intervention is in the public interest.

The public interest will be served by the Trust's participation in this proceeding.[8] The Trust is a nonprofit with over 3,000 members. We are headquartered in Flagstaff, Arizona; have an office in Denver, Colorado; and have staff who work remotely in Utah, Colorado, Arizona, and on the Navajo Nation. Our mission is to safeguard the wonders of the Grand Canyon and the Colorado Plateau, while supporting the rights of its Native peoples.

For years, we have sought to support entrepreneurship in tribal communities in this region that balances economic needs with cultural preservation and environmental protection. And when Native communities or governments have invited our support, we have advocated against developments on tribal lands that would irresponsibly use water, otherwise harm the environment, or damage Native lifeways or culture. In recent years, for example, we intervened in three preliminary-permit proceedings that pitched the idea of building dams on the Navajo Nation in the Little Colorado River and its tributaries for pumped hydropower.[9] Beginning many years before that, we have worked in support of local families advocating at the chapter level of the Navajo Nation in opposition to a developer's proposal to build a

[8] *See* 18 C.F.R. § 385.214(b)(2)(iii).
[9] *See* 171 FERC ¶ 61,138 at p. 19; *In re Pumped Hydro Storage LLC*, P-14992, 171 FERC ¶ 61,137, p. 19 (May 21, 2020); *In re Pumped Hydro Storage LLC*, P-15024, Mot. to Intervene by Save the Colorado, *et al.*, (Aug. 3, 2020).

gondola and mega-resort where the Little Colorado River flows into the Colorado River in the Grand Canyon.

We have also resisted other developments around the Grand Canyon and in the surrounding region that could pollute water, use it irresponsibly, or otherwise harm the landscape. One example is a proposal for a massive development in Tusayan, Arizona that, like the project proposed here, might use water from the Colorado River. Another is uranium mining around the Grand Canyon, which could contaminate water, dry up springs, and desecrate lands sacred to tribes in the region.

It would serve the public interest to allow our intervention so that we may contribute the perspective we have gained from this past advocacy and other efforts to safeguard the Grand Canyon and Colorado Plateau for more than three decades.

V. Comments

It is with the perspective described above that we offer three observations at this preliminary stage.

First, the permit applications assert that the project developer intends to evaluate its proposal in consultation with the Navajo Nation.[10] While we do not question the developer's *bona fides* in this regard, the Commission has held, and should reiterate here, that studies for the project can move forward not simply in consultation with the Navajo Nation, but only with the Nation's consent, where the Nation's laws and regulations require authorization.[11] "[L]ack of access to the project

[10] N App. at PDF p. 1; E App. at PDF p. 1; S App. at PDF p. 1.
[11] *See* 171 FERC ¶ 61,138 at 8 ("[P]ermittee[s] must obtain any necessary authorizations and comply with any applicable laws and regulations to conduct any field studies.").

site for studies," for example, "could preclude the preparation of an adequate [license] application."[12]

Second, the developer did not in its applications identify the Hopi Tribe as a tribe who "may be affected by the project" when that possibility is obvious.[13] The Hopi reservation occupies the southwestern part of Black Mesa, and the reservation boundary comes within fifteen miles of some of the project's proposed reservoirs.[14] Groundwater beneath Black Mesa is critical to the Tribe, as is the fate of other sources of water in the region that the proposed project might use.[15] If the proposal advances toward licensing, consultation both between the applicant and the Hopi Tribe and the Commission and the Tribe would be required.[16]

Third, while we recognize that the Commission as a matter of practice does not specify in preliminary permits the studies and outreach that must be completed before a license application is filed,[17] we wish to stress at this early stage that the developer is required by Commission rules to "consult with appropriate state and federal resource agencies and affected Indian tribes, conduct all reasonable studies requested by the agencies, and solicit comments on draft license applications before

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[12] *Id.*
[13] N App. at p. 5 of 6; E App. at p. 5 of 6; S App. at p. 6 of 7.
[14] *Compare* E App. Ex. 3, Att. B at Drawing 1-E *with* U.S. Geological Survey, *Groundwater, Surface-Water, and Water-Chemistry Data, Black Mesa Area, Northeastern Arizona—2012–2013*, Figure 1 (2016), attached hereto as Exhibit 2 (excerpts).
[15] *See, e.g.*, Hopi Tribe Office of Community Planning and Economic Development and Land Information Systems, *Hopi Tribe Comprehensive Economic Development Strategy*, pp. 40–41 (2018) ("The nature, occurrence, and availability of groundwater are critical concerns of the Hopi Tribe."), attached hereto as Exhibit 3.
[16] *See* 18 C.F.R. § 4.38; 54 U.S.C. § 306108; *see also* 18 C.F.R. § 2.1C.
[17] *See, e.g.*, 171 FERC ¶ 61,138 at 5–6.

they are filed."[18] It is difficult for us to foresee how a project of this nature could move forward with sensitivity to the Native people on whose homelands it would be built and with sensitivity to the delicate lands and waters it would use. But gaining an understanding of the questions we have asked above, along with many others, is an essential prerequisite if the project is to make any further progress.

VI. Conclusion

The Trust requests that the Commission grant its motion to intervene and add the undersigned counsel to the service list for this proceeding.

Respectfully submitted this 30th day of December, 2022.

s/ Aaron M. Paul
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[18] *Id.* at 6.

CERTIFICATE OF SERVICE

I hereby certify that I have this day served the foregoing document upon each person designated on the official service list compiled by the Secretary in this proceeding.

Dated at Denver, Colorado this 30th day of December, 2022.

s/ Aaron M. Paul
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Exhibit 1

Colorado River Basin
Ten Tribes Partnership Tribal Water Study

Study Report

December 2018

Mission Statements

The Department of the Interior (DOI) conserves and manages the Nation's natural resources and cultural heritage for the benefit and enjoyment of the American people, provides scientific and other information about natural resources and natural hazards to address societal challenges and create opportunities for the American people, and honors the Nation's trust responsibilities or special commitments to American Indians, Alaska Natives, and affiliated island communities to help them prosper.

The mission of the Bureau of Reclamation is to manage, develop, and protect water and related resources in an environmentally and economically sound manner in the interest of the American public.

The mission of the Colorado River Basin Tribes Partnership is to assist in developing, protecting, and maximizing the water rights of the member Tribes. To that end, the Partnership Tribes shall:

- **Consult, Collaborate, and Coordinate** with each other, the United States, and other affected governmental agencies and user groups on matters concerning Tribal water rights, including but not limited to proposed legislative, administrative, or other actions that may affect the water supplies and demands of the Colorado River Basin, its management, or the administration of Colorado River water entitlements.

- **Educate** the United States, state and local agencies, and the public as to the nature and extent of Tribal water rights and the concerns of the Partnership with respect to matters affecting such rights.

Colorado River Basin
Ten Tribes Partnership Tribal Water Study

Study Report

U.S. Department of the Interior | Bureau of Reclamation | Ten Tribes Partnership

December 2018

Commissioner of Reclamation Foreword

Traveling over 1,400 miles from its headwaters in Wyoming and Colorado to the Gulf of California, the Colorado River is a lifeline to seven states within the United States, 29 Native American Reservations, and two states in northern Mexico.

Within the Colorado River Basin, ten tribes have come together to form the Ten Tribes Partnership. The Partnership Tribes[1] have reserved water rights, including unresolved claims, to the Colorado River and its tributaries. In many cases, these rights are senior to other uses. Recognizing the importance of furthering the understanding of tribal water (both currently and in the decades ahead), the Bureau of Reclamation and the Ten Tribes Partnership collaborated in this Study to document Partnership Tribes' water use and potential future water development to better facilitate planning and decision-making throughout the Basin.

The comprehensive, Basin-wide analysis of tribal water in the Colorado River Basin Ten Tribes Partnership Tribal Water Study builds on the 2012 Colorado River Basin Study, and allows each of the tribes to provide, from their own perspective, their views on the challenges and opportunities ahead. The Tribal Water Study strengthens a Department of the Interior commitment to address water issues facing tribes and recognizes that the Colorado River is an essential foundation for the physical, economic, and cultural sustenance of tribes in the Basin.

Today, we face a prolonged drought that represents one of the driest 20-year periods in the last 1,200 years. This Study is an important next step in understanding the Colorado River, its resources, and the demands that will likely be placed on it. In addition, this Study explores ways to provide a wide range of benefits to both Partnership Tribes and other water users. The partnerships forged and strengthened during this Study will prove to be critical as we collaboratively address the significant challenges ahead.

Brenda Burman

Commissioner, Bureau of Reclamation

[1] Chemehuevi Indian Tribe, Cocopah Indian Tribe, Colorado River Indian Tribes, Fort Mojave Indian Tribe, Jicarilla Apache Nation, Navajo Nation, Quechan Indian Tribe, Southern Ute Indian Tribe, Ute Indian Tribe, Ute Mountain Ute Tribe

Ten Tribes Partnership Foreword

The concepts and values conveyed by the well-known phrase "water is life" are neither unique to tribes, nor to this century:

> In the debate leading to approval of the first congressional appropriation for irrigation of the Colorado River Indian Reservation, the delegate from the Territory of Arizona made this statement: "Irrigating canals are essential to the prosperity of these Indians. Without water, there can be no production, no life."[1]

The Colorado River Basin Tribes Partnership (a.k.a. Ten Tribes Partnership) and the Bureau of Reclamation (Reclamation) initially undertook the Colorado River Basin Tribal Water Study to augment the data produced for the Colorado River Basin Supply and Demand Study of 2012. With five tribes in the Upper Basin and five tribes in the Lower Basin, and between us, holding rights to more than 2.8 million acre-feet per year of water from the Colorado River and its tributaries, the Ten Tribes Partnership was uniquely positioned to explore these issues. However, in so doing, we learned that the effort would also serve to facilitate a broader and, we hope, a better understanding of the role tribal water plays, and will play, in the Colorado River Basin over the coming decades.

In addition to producing technical information, the Tribes had other goals. First, we wanted to better understand how, at present, each of our individual water use scenarios fits into the overall scheme of Colorado River Basin management. Second, we wanted to know how future development of tribal water resources will alter Basin operations and affect other water users who are now using water to which a tribe may hold legal title, but which the title-holding tribe has not yet developed for its own use. Finally, we wanted to assess – to the extent present information allows – the role future development of tribal water rights will have on Basin operations.

Along the way, we encountered data gaps, modeling limitations, and uncertainties, but nonetheless, with the support of Reclamation, we managed to address those issues sufficiently that we now provide this Report. If there is a 'take-away' that was surprising, it is that, even under the most favorable of circumstances for rapid tribal water development, the amount of water that will be used by the Tribes is dramatically overshadowed by the effect of climatic conditions on the overall supply of water in the Basin. Nature is still in charge.

Challenges remain, but opportunities are in the offing. We hope this Report informs, resolves some uncertainty about how tribes perceive the future for their water uses, and establishes a baseline for discussions and development of relationships among tribes, states, the federal government, water managers, and water users throughout the Basin.

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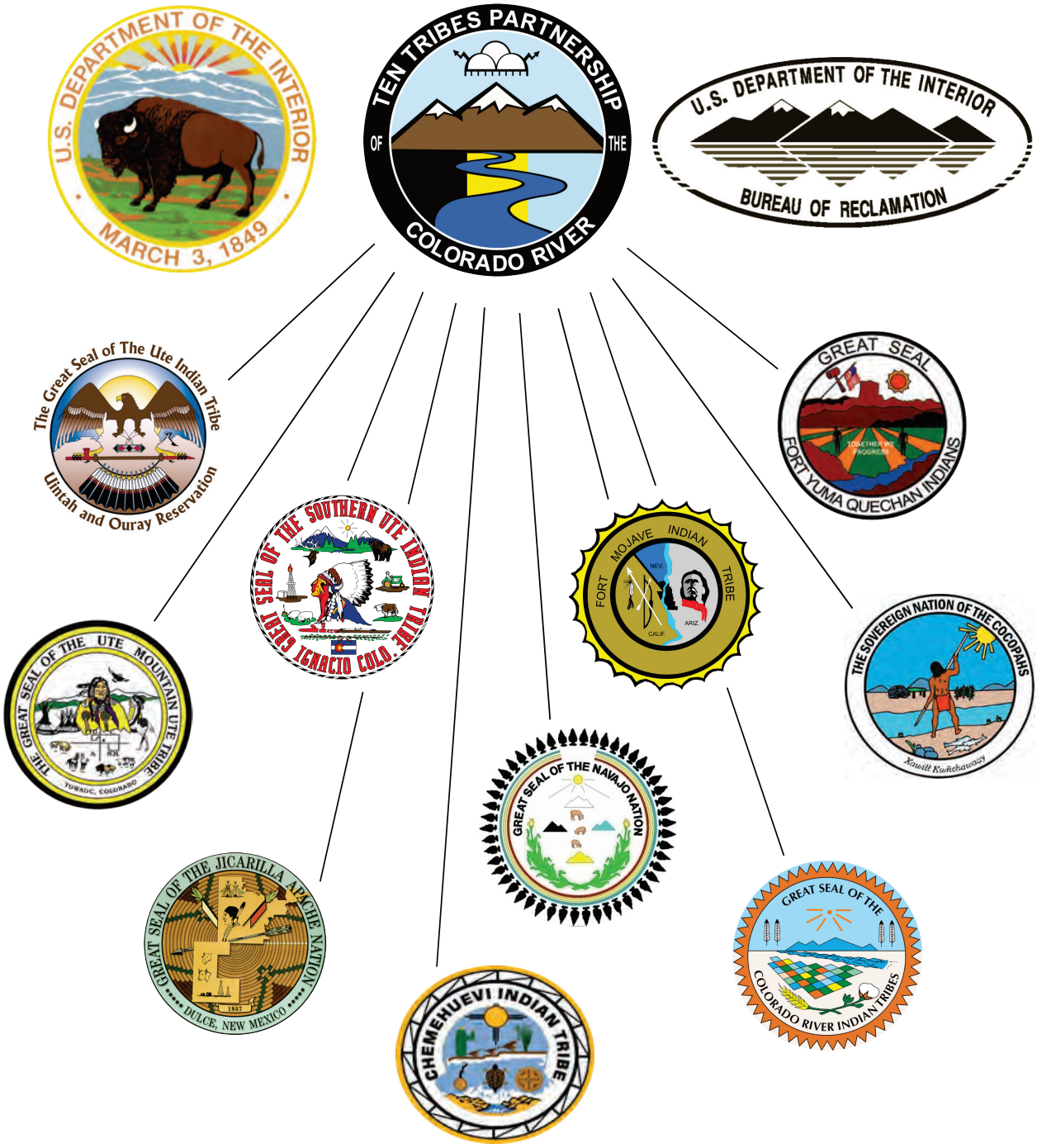
[1] CONG.GLOBE, 38th Cong., 2d Sess. 1321 (1865). *Arizona v. California*, 373 U.S. 546, 598-599 (1963).

Acknowledgement

Funding, time, and expertise provided by the Department of Interior, the Bureau of Reclamation, and the member Tribes of the Ten Tribes Partnership made the Colorado River Basin Ten Tribes Partnership Tribal Water Study possible.



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Chapter 8 – Study Limitations

Chapter 9 – Future Considerations and Next Steps

Disclaimer

References

Glossary

Acronyms and Abbreviations

ADWR	Arizona Department of Water Resources
AF	acre-foot (feet)
AFY	acre-foot (feet) per year
AG	irrigated agriculture and livestock
A-LP	Animas-La Plata
Basin	Colorado River Basin
Basin States	Colorado River Basin States
Basin Study	Colorado River Basin Water Supply and Demand Study
BIA	Bureau of Indian Affairs
cfs	cubic foot (feet) per second
CHIA	Cumulative Hydrologic Impact Assessment
CRIP	Colorado River Irrigation Project
CRIR	Colorado River Indian Reservation
CRIT	Colorado River Indian Tribes
CRSS	Colorado River Simulation System
CUP	Central Utah Project
CUPCA	Central Utah Project Completion Act
CUWCD	Central Utah Water Conservancy District
CWCB	Colorado Water Conservation Board
DCMI	domestic, commercial, municipal, and industrial
DNR	Department of Natural Resources
DOI	U.S. Department of the Interior
DWCD	Dolores Water Conservancy District
ENV	environmental, cultural, and recreational
EPA	Environmental Protection Agency
EQIP	Environmental Quality Incentives Program
ESA	U.S. Endangered Species Act
°F	degree(s) Fahrenheit

FRE	Farm and Ranch Enterprise
GCM	Global Climate Model
gpm	gallons per minute
ICS	Intentionally Created Surplus
IHS	Indian Health Service
KAF	thousand acre-feet
KAFY	thousand acre-feet per year
kWh	kilowatt-hours
LCR MSCP	Lower Colorado River Multi-Species Conservation Program
MAF	million acre-feet
MAFY	million acre-feet per year
Mexico	United Mexican States
mg/L	milligrams per liter
msl	above mean sea level
MVIC	Montezuma Valley Irrigation Company
MWD	Metropolitan Water District of Southern California
M&I	municipal and industrial
NAPI	Navajo Agricultural Products Industry
NAWMAs	Native American Water Masters Associations
NDOH	Navajo Department of Health
NDWR	Navajo Department of Water Resources
NEPA	National Environmental Policy Act
NGWSP	Navajo-Gallup Water Supply Project
NIIP	Navajo Indian Irrigation Project
NMISC	New Mexico Interstate Stream Commission
NNDA	Navajo Nation Department of Agriculture
NNEPA	Navajo Nation Environmental Protection Agency
NPS	National Park Service
NRCS	Natural Resources Conservation Service
NTUA	Navajo Tribal Utility Authority

ONF	Observed Natural Flow
O&M	operation & maintenance
Partnership	Colorado River Basin Tribes Partnership
PNM	Public Service Company of New Mexico
PPR	Present Perfected Right
PRIIP	Pine River Indian Irrigation Project
PWCC	Peabody Western Coal Company
Reclamation	Bureau of Reclamation
ROD	Record of Decision
SCADA	Supervisory Control and Data Acquisition
SCS	Soil Conservation Service
SJRBRIP	San Juan River Basin Recovery Implementation Program
TTP	Ten Tribes Partnership
TRAN	transfers, leases, and exchanges
Tribal Water Study	Colorado River Basin Ten Tribes Partnership Tribal Water Study
UCRC	Upper Colorado River Commission
UIIP	Uintah Indian Irrigation Project
USACE	U.S. Army Corps of Engineers
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey

5.5 Navajo Nation

5.5.1 Introduction

The Navajo Indian Reservation (Reservation) was established in 1868, and has been expanded through a series of executive orders, public land orders, and acts of Congress to become the largest Indian reservation in the United States covering more than 27,000 square miles (roughly the same size as West Virginia) in the Four Corners Region in Arizona, New Mexico and Utah. The tribe's official name is the Navajo Nation (Nation). The Hopi Tribe's Reservation lies within the boundaries of the Navajo Reservation. The land holdings in the Navajo Nation are varied, especially in New Mexico, as summarized in Table 5.5-A.

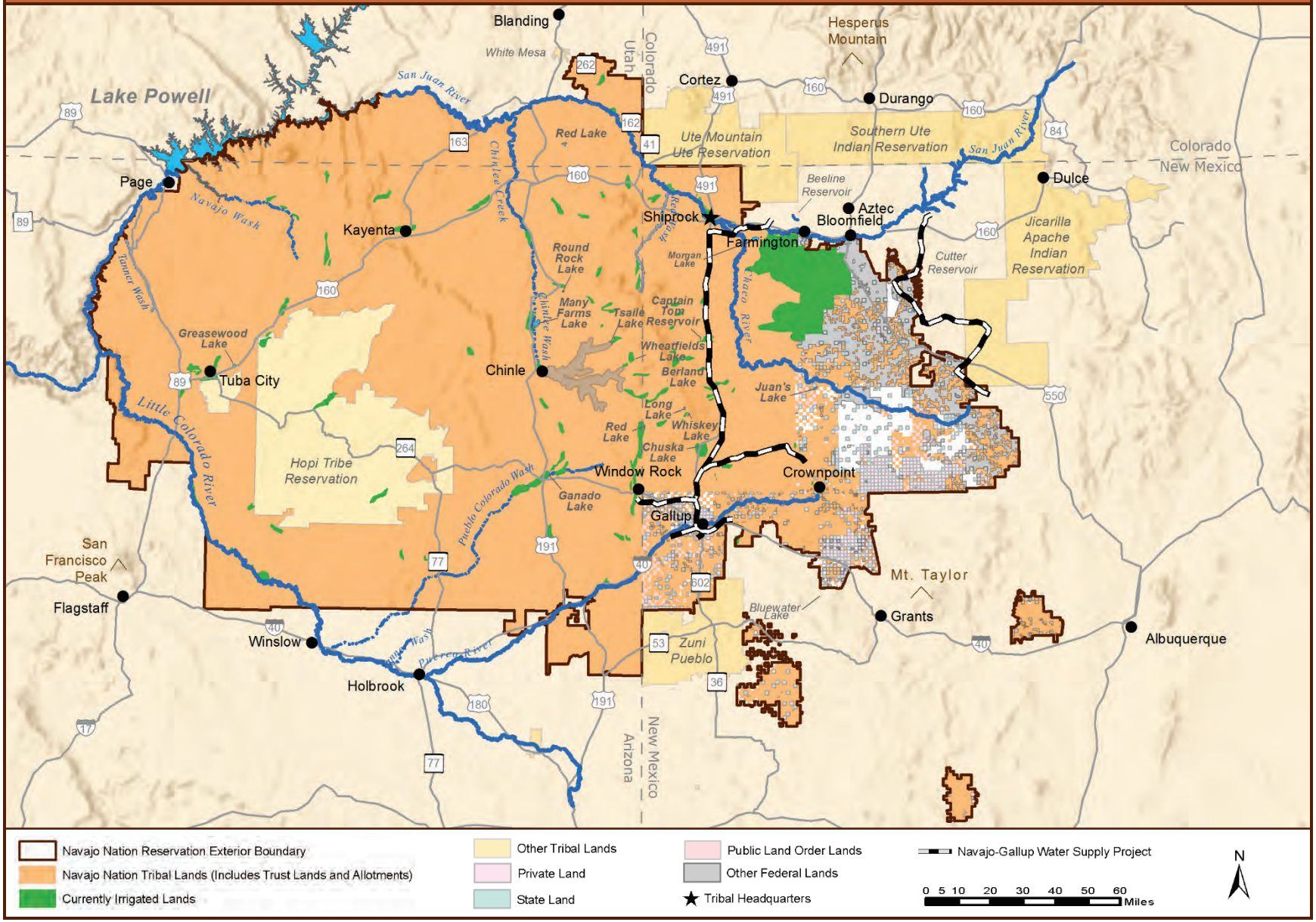
Figure 5.5-A presents a general location map with Reservation boundaries, communities, and other important features.

TABLE 5.5-A
Acreage Summary of Navajo Nation Lands as of 1998 (Navajo Division of Economic Development, 2010)

Types of Lands	Arizona	New Mexico	Utah	Total
Navajo Nation Trust	10,158,784.82	2,795,418.96	1,223,933.96	14,178,137.74
Navajo Nation Fee	585,169.98	357,000.00	424.90	942,594.88
Individual Indian Allotment	81,963.81	671,043.50	9,741.80	762,749.11
State Lands Lease	256,905.79	126,760.10		383,665.89
BLM Leases		150,002.23		150,002.23
U.S. Forest Service Permit	174,000.00			174,000.00
Government E.O. PLO & School Tract		91,838.99	5.99	91,844.98
New Lands	345,032.00			345,032.00
Total	11,601,856.40	4,192,063.78	1,234,106.65	17,028,026.83

The Navajo Nation is divided into 110 chapters. Each chapter has a local governing body. There are a variety of land status within some chapters, especially in the eastern and southeastern chapters in New Mexico. Each chapter has a main community where most activity occurs. There are several larger communities such as Shiprock, NM; Window Rock, AZ; Chinle, AZ; Kayenta, AZ; Tuba City, AZ; and Crownpoint, NM that are key areas of economic activity.

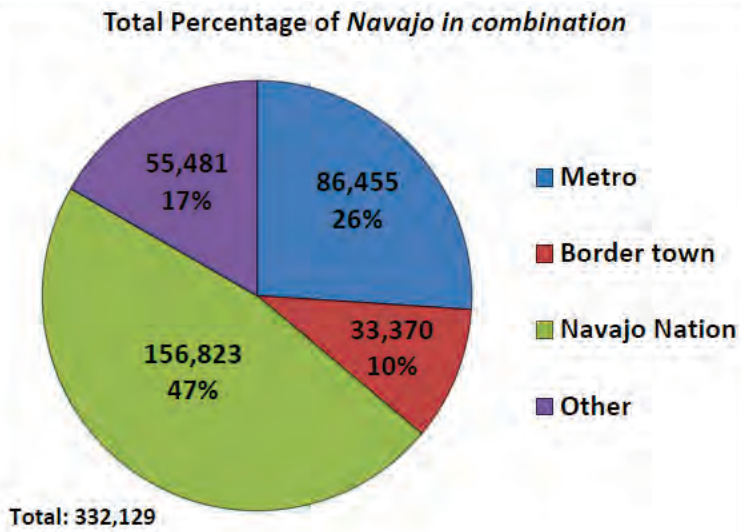
FIGURE 5.5-A
Navajo Nation Reservation Map



See the Disclaimer and Introduction to Chapter 5.0.

In 2013, the Navajo Division of Heath analyzed the 2010 Census data for the Navajo population and identified three categories: 1) Navajo alone; 2) Navajo in combination; and 3) All races. Navajo alone are Navajos claiming only to be of Navajo ancestry and no other race. Navajo in combination are Navajos who claim to be of Navajo ancestry in combination with other races. In 2010, there were a total of 332,129 individuals claiming to have Navajo ancestry (Navajo in combination). According to the 2010 Census, there were 156,823 Navajos (in combination) living on the Navajo Nation (Figure 5.5-B) and the total population (all races) on the Navajo Nation was 173,667. The twelve border towns included Aztec, Bloomfield, Farmington, Grants, and Gallup, New Mexico; Flagstaff, Holbrook, Page, and Winslow, Arizona; Cortez and Durango, Colorado; and Blanding, Utah. From 2000 to 2010, there was an overall increase in the Navajo population from 298,197 to 332,129 (11.3 percent) but a decline in the Navajo population living on the Navajo Nation from 167,539 to 156,823 (-6.3 percent) (Navajo Department of Health [NDOH], 2013).

FIGURE 5.5-B
Navajo population by location (NDOH, 2013)



The Navajo Nation operates under an Executive, Legislative and Judicial Branch. The Executive Branch operates under the direction of an elected president and vice-president. Within the Executive Branch, the Navajo Nation Division of Natural Resources and the Navajo Nation Environmental Protection Agency (NNEPA), manage the Navajo Nation's water resources.

The Navajo Nation Council was established in 1938. In 2010, the Council was reduced from 88 members to 24 members. The Legislative Branch has five standing committees, including: 1) Resources & Development, 2) Budget & Finance, 3) Law & Order, 4) Health, Education & Human Services, and 5) the Naa'bik'iyati' Committee. These committees provide oversight for the Executive Branch programs. The Resources & Development Committee works in cooperation with the Executive Branch President and other committees of the Navajo Nation Council on proposed legislation or actions affecting natural resources. The Resources & Development Committee provides legislative oversight authority for the Division of Natural Resources.

The Navajo Department of Water Resources (NDWR) is the primary department within the Navajo Nation Division of Natural Resources that is responsible for the protection, management and development of the water resources of the Navajo Nation. Through its branches, the NDWR is responsible for the long-term stewardship of the Nation's water resources. The NDWR is well positioned to coordinate the review of proposed water projects to ensure an assured water supply with appropriate entities.

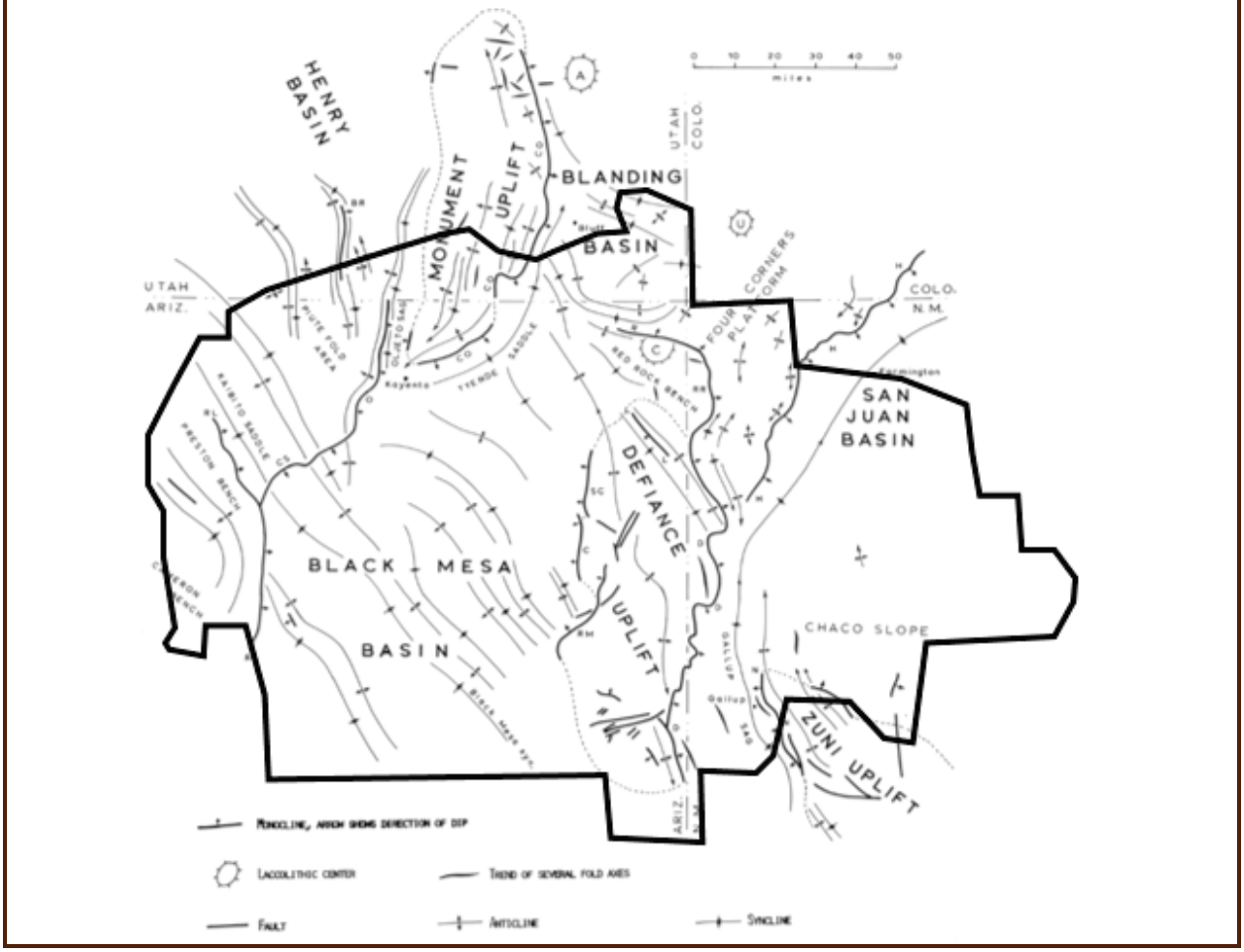
5.5.2 Physical Setting

The Navajo ancestral lands are characterized as being within and near the four sacred Mountains of Blanca Peak in Colorado (eastern mountain), Mt. Taylor in New Mexico (southern mountain), San Francisco Peaks in Arizona (western mountain) and Hesperus Peak in Colorado (northern mountain) as illustrated in the Navajo Nation flag and Figure 5.5-A.

Almost all the Navajo Nation is located within the high desert of the Colorado Plateau physiographic province. The complex topography of Navajo Nation is characterized by arid deserts at elevations as low as 5,500 feet and elevations as high as 10,500 feet. The three most prominent landforms are the Chuska Mountains with elevations greater than 9,000 feet along the Arizona-New Mexico border, the Defiance Uplift with elevations greater than 7,000 feet to the southwest of the Chuska Mountains, and Black Mesa in the west-central portion of the Navajo Nation. Black Mesa covers about 2,000 square miles and is characterized by 2,000-foot-high cliffs on its northern and northeastern sides, but slopes gradually down to the south and southwest.

The three most extensive basins on and adjacent to Navajo Nation lands are the San Juan Basin to the east of the Defiance Uplift and Chuska Mountains, the Black Mesa Basin to the west of the Defiance Uplift, and the Blanding Basin to the north, mainly in southeastern Utah (Figure 5.5-C).

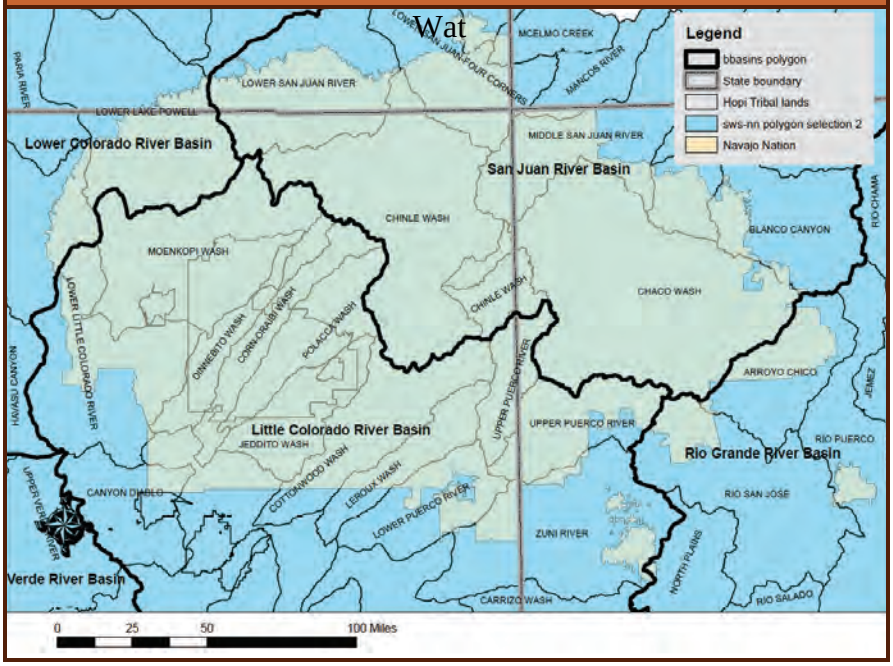
FIGURE 5.5-C
Major structural features on and around the Navajo Nation (Woodward, 1973)



5.5.2.1 Watersheds

The majority of the Navajo Nation is located within the Upper and Lower Colorado River Basins. A portion of the western boundary borders the Colorado River mainstem and most of the northern boundary borders or encompasses the San Juan River (Figure 5.5-A). The Navajo Nation also has lands within the Rio Grande Basin. Navajo Nation lands within the San Juan Basin of New Mexico, Utah and Arizona are tributary to the Upper Colorado River Basin and lands within the Little Colorado River Basin of New Mexico and Arizona are tributary to the Lower Colorado River Basin. The remaining Navajo Nation lands to the southeast in New Mexico are within watersheds tributary to the Rio Grande. There are multiple watersheds within the basins (Figure 5.5-D).

FIGURE 5.5-D
Watersheds on and near the Navajo Nation lands



5.5.2.2 Hydrogeology

The Navajo Nation currently accesses approximately 20 groundwater aquifers ranging in various depth and capacities. Some of these aquifers are hydrologically connected and can be grouped into systems. Access to groundwater can be valuable during times of drought since most deep and larger aquifers are not affected by drought to the same extent as surface water and alluvial supplies.

A majority of the Navajo Nation's current water demands are met by groundwater. These aquifers can be characterized as either confined or unconfined. The two major groundwater basins on the Navajo Nation are the San Juan Basin in New Mexico and the Black Mesa Basin in Arizona (Figure 5.5-C). There are additional smaller basins such as the Blanding Basin, which is primarily in Utah, that provide additional smaller quantities of water.

The more extensive and more utilized aquifers for domestic and municipal purposes are described below. These aquifers include, from shallow to deep, several alluvial aquifer systems: the Mesaverde Group aquifer, the Dakota (D) aquifer that includes the Morrison (M) aquifer, the Navajo (N) aquifer, and the Coconino (C) aquifer.

Alluvial Aquifers

Quaternary alluvium is found in arroyos, washes, and stream channels and is a source of limited water for domestic, stock and municipal uses.

FIGURE 5.5-E
Mesaverde aquifer system on the Colorado Plateau (USGS, 1996) with Navajo Nation exterior boundary for reference

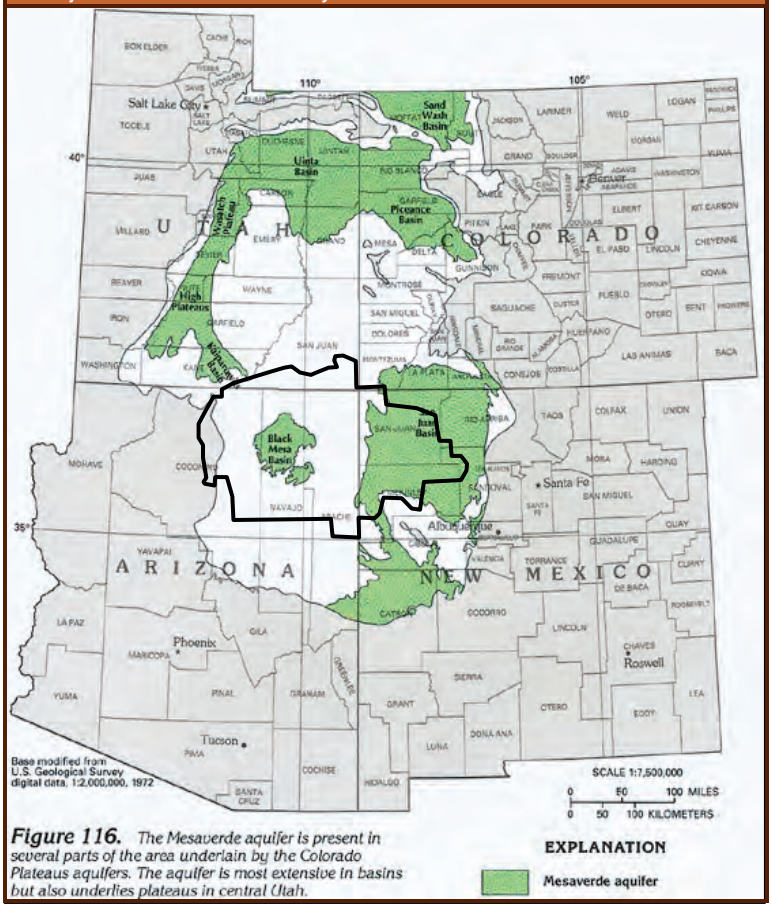


Figure 116. *The Mesaverde aquifer is present in several parts of the area underlain by the Colorado Plateaus aquifers. The aquifer is most extensive in basins but also underlies plateaus in central Utah.*

Mesaverde Group Aquifer

The Mesaverde Group formations provide water mostly for small domestic or stock uses mostly in the San Juan Basin of New Mexico and Black Mesa region of Arizona. Around the Black Mesa region in Arizona the Mesaverde Group includes the Yale Point, Wepo and Toreva sandstones and yields from these formations are low. Figure 5.5-E depicts the Mesaverde aquifer areas.

Dakota (D) Aquifer

The D aquifer is a multiple aquifer system composed of the Dakota Sandstone, Westwater Canyon Member of the Morrison Formation, and the Cow Springs Member of the Entrada Sandstone (Lopes and Hoffman, 1997). The D aquifer has been described by Cooley and others (1969) as consisting of several thin isolated semi-connected sandstone water-bearing units that are separated by thick sequences of mudstone and siltstone. The rocks of the D aquifer are about 700 feet thick in the southeastern part of the Black Mesa and thicken to about 1,300 feet thick near the center of the Mesa before thinning to less than 100 feet to the northwest (Lopes & Hoffman, 1997). The D aquifer overlies the N aquifer throughout much of the Black Mesa area.

In the southern areas of the Navajo Nation in New Mexico, the Dakota Sandstone is generally less than 100 feet thick and consists of cross-bedded sandstone, carbonaceous siltstones, shales, and coal (New Mexico Interstate Stream Commission [NMISC], 2017). The Dakota Sandstone produces generally fair water quality with well yields of approximately 50 gallons per minute (gpm) (Dam, 1995). The Westwater Canyon Member of the Morrison Formation in New Mexico consists of fluvial sandstones and can yield up to 50 gpm. Water quality is variable due to uranium mineralization in some areas northeast of Gallup, NM. These formations are deeper and more saline in the deeper portions of the San Juan Basin.

Figure 5.5-F includes the D aquifer (Dakota) and N aquifer (Glen Canyon) systems.

Navajo (N) Aquifer

The N aquifer exists solely within the Navajo and Hopi Reservations and is one of the most extensively studied aquifers in the region. The N aquifer is comprised of both an unconfined and a confined region. The N aquifer is confined where it is overlain by the Carmel Formation. A majority of the confined region underlies Black Mesa. The N aquifer extends into Utah east of Comb Ridge and thins to the east and is not present in New Mexico (Figure 5.5-G).

The N aquifer consists of three formations that function as a single aquifer: the Navajo Sandstone, the Kayenta Formation, and the Lukachukai Member of the Wingate Sandstone (U.S. Geological Survey [USGS], 2005). It is characterized by deep saturated thickness, relatively high water quality, but limited recharge due to its confined nature (HDR Engineering Inc., 2003).

FIGURE 5.5-F
Dakota-Glen Canyon aquifer system on the Colorado Plateau (USGS, 1996) with Navajo Nation exterior boundary for reference

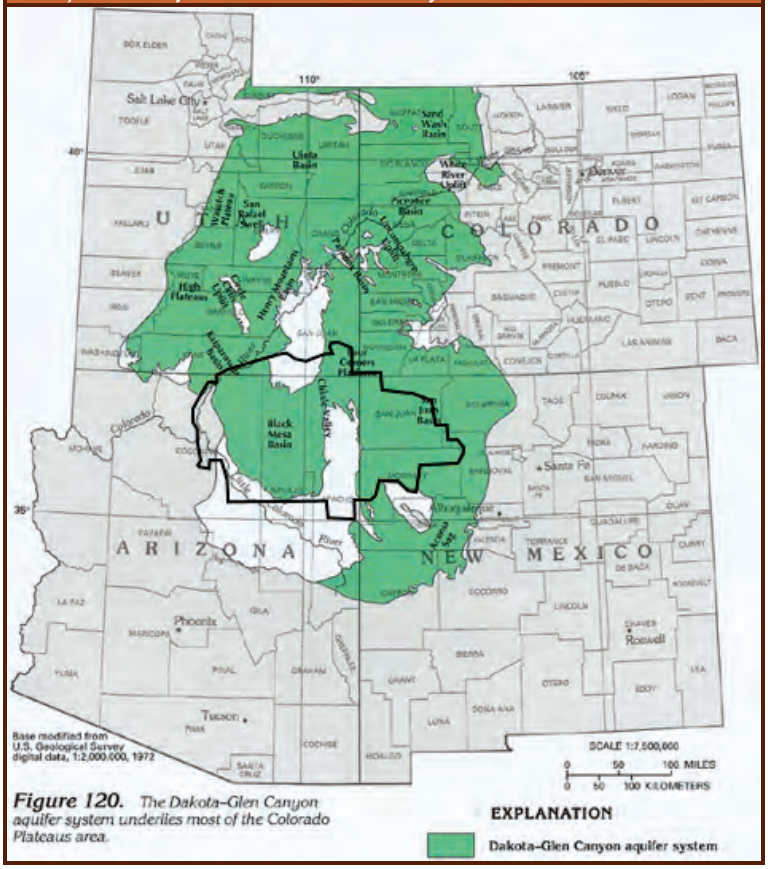
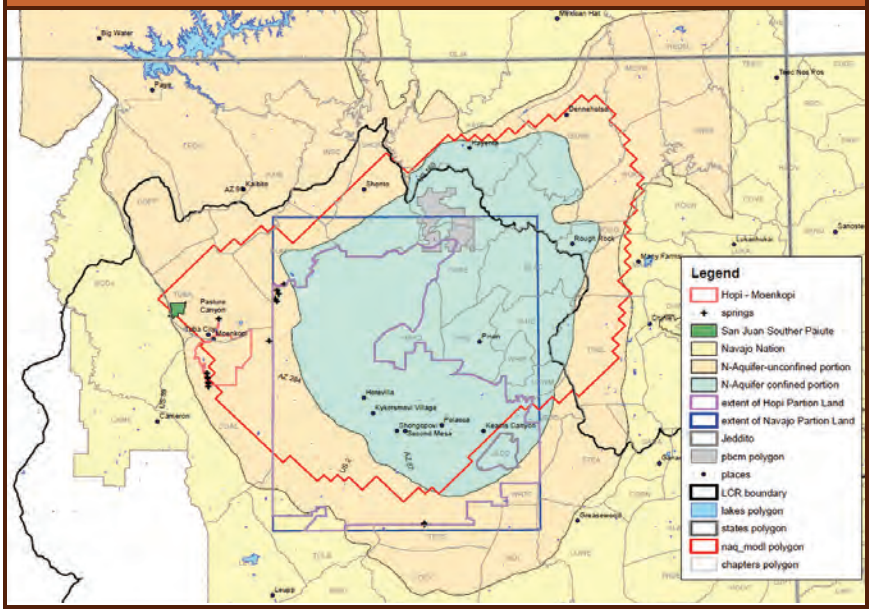


Figure 120. The Dakota–Glen Canyon aquifer system underlies most of the Colorado Plateaus area.

FIGURE 5.5-G
N Aquifer Information Map



A desire to monitor the N aquifer water supply as a shared resource for primary drinking water for the Navajo and Hopi Tribes in the area of Black Mesa led to the establishment of a monitoring program of the water resources in 1971 by the USGS, the Arizona Department of Water Resources (ADWR), and the two tribes. In 1983 the BIA joined the cooperative monitoring effort. Since 1983, the Navajo Tribal Utility Authority (NTUA), Peabody Western Coal

Company, the Hopi Tribe, BIA Navajo Region, and the Hopi Agency of the BIA have assisted in the collection of hydrologic data. The USGS publishes an annual monitoring report and established a website[1] to provide information on the Black Mesa Monitoring Program.

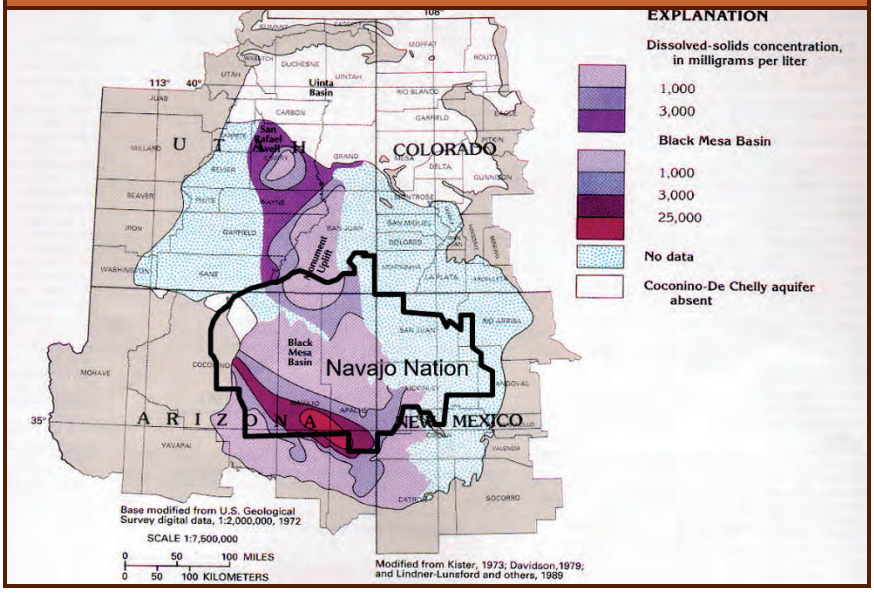
Pursuant to the Surface Mining, Control and Reclamation Act of 1977, a Cumulative Hydrologic Impact Assessment (CHIA) was performed in 1989 and updated in 2016 by the Office of Surface Mining Reclamation and Enforcement. Hydrologic concerns identified as part of the CHIA are related to the industrial pumping of the N aquifer.

Several groundwater models were developed to characterize the N aquifer. The models attempted to incorporate available information concerning aquifer hydraulic parameters, depths of geologic formations, recharge areas, and discharge areas to make the model project realistic groundwater responses to historic and future groundwater withdrawals.

Coconino (C) Aquifer

The C aquifer is a much larger aquifer than the N aquifer and extends into Utah and New Mexico with variable water quality (Figure 5.5-H). The main stratigraphic unit of the C aquifer is the Coconino Sandstone or its equivalent, the De Chelly Sandstone. The C aquifer generally dips toward the center of the Black Mesa Basin from its outcrops. In the center of the Black Mesa Basin, the aquifer is buried beneath more than 4,900 feet of overlying sediments. The C aquifer can yield up to 500 gpm in the southwest portion of the Navajo Nation and up to 100 gpm from the De Chelly Sandstone in the Ganado/Chinle region.

FIGURE 5.5-H
Extent and Total Dissolved Solids Concentration of C Aquifer



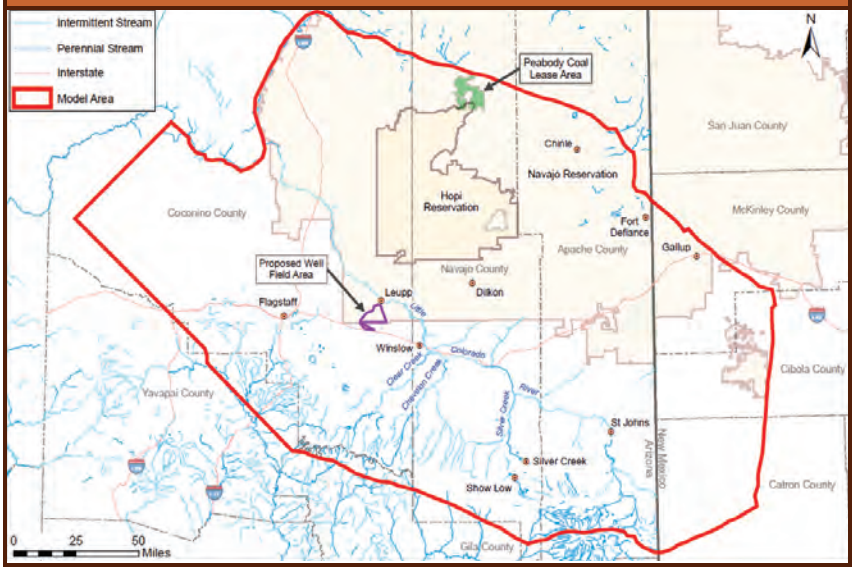
On the eastern edge of Arizona, the De Chelly Sandstone is uplifted by the north-northwest trending Defiance Anticline. Monoclines on either side of this ridge dip to the west and east under younger rocks in the Black Mesa (Arizona) and San Juan (New Mexico) Basins, respectively.

In the southern region of the Navajo Nation in New Mexico, the San Andres Limestone and Glorieta Sandstone are the equivalent to the C aquifer formations. The combined San Andres and Glorieta aquifer system produces good amounts of water in some areas on and near the Zuni Reservation and communities adjacent to Interstate 40 east of Gallup, NM. Wells have variable yields, potentially producing 50 to 200 gpm, and water quality is generally good.

[1] Available at: https://www.usgs.gov/centers/az-water/science/black-mesa-monitoring-program

In 2005, the Navajo Nation actively participated in a study to assess a proposed well field from the C aquifer south of Leupp, Arizona and to evaluate potential impacts to existing wells in the vicinity of the proposed project well field. A groundwater model was developed by S.S. Papadopulos & Associates, Inc. to evaluate the impact of the proposed pumping (Figure 5.5-I). The model structure was based upon the geologic, hydrologic, and topographic constraints in the basin. The model used historical pumping and water use data, estimates of aquifer properties, and historical water level and stream flow data.

FIGURE 5.5-I
C Aquifer Groundwater Model Boundary (SSP&A, 2005)



5.5.2.3 Climate

The climate of the Navajo Nation is arid to semi-arid, as most areas receive less than 10 inches of precipitation annually. The Navajo Nation is subject to extreme seasonal temperatures, with rather cold winters and hot summers. The annual average temperature across the Navajo Nation ranges from about 40 °F to about 55 °F, with differences driven by elevation and latitude.

5.5.3 Historical Use and Cultural Importance of Water

The Navajo Nation's historical use of water is extensive. The largest uses of water are for irrigation, industrial, municipal and domestic purposes. Lesser amounts are used for livestock and other purposes.

5.5.4 Navajo Nation Water Supply

Navajo Nation lands are within the Upper Colorado River Basin, Lower Colorado River Basin, and the Rio Grande Basin. The Navajo Nation has extensive water rights which are largely unquantified except in the San Juan River Basin of New Mexico. The Navajo Nation claims historic, appropriative and reserved rights to the use of all the water necessary for the Navajo Nation to be the permanent homeland for the Navajo people. Both the United States and Arizona Supreme Courts have recognized that water is necessary for tribes to secure permanent homelands. See *Winters v. United States*, 207 U.S. 564, 567 (1908) and *In re the General Adjudication of All Rights to Use Water in the Gila River System and Source*, 35 P. 3d 68, 76 (2001). These rights are not lost through non-use and cannot be abandoned.

5.5.4.1 Diversion and Depletion Rights

San Juan River Basin, Utah

The Navajo Nation has negotiated a proposed water rights settlement agreement for the San Juan River Basin of Utah and is in the process of obtaining congressional ratification.

Lower Colorado River Basin, Arizona

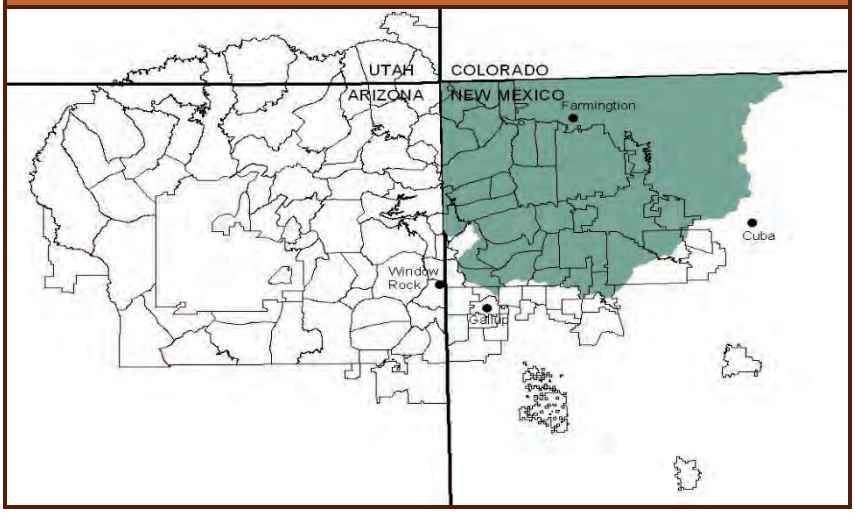
The Navajo Nation negotiated proposed settlement agreements to the Little Colorado River Basin of Arizona in 2010 and 2012 but those agreements were never realized. The 2010 agreement also included a proposed Lower Basin mainstem Colorado River allocation that was not realized. Currently, the adjudication of water rights for the Little Colorado River Basin in Arizona is proceeding, and the court has set a schedule to quantify the Hopi Tribe and Navajo Nation claims in the next several years.

Upper Colorado River Basin, Arizona

There is no active water rights adjudication for waters in the Upper Colorado River Basin of Arizona. The Navajo Nation continues to make use of waters within this basin.

San Juan River Basin, New Mexico

FIGURE 5.5-J
San Juan River Basin in New Mexico



On March 30, 2009, Congress enacted Public Law 111-11, the Northwestern New Mexico Rural Water Projects Act (Act), which authorized the United States of America, acting through the Secretary of the Interior, to execute an agreement among the Navajo Nation, the State of New Mexico, and the United States, settling the Navajo Nation's reserved water rights to the San Juan River Basin in New Mexico (Figure 5.5-J). The settlement agreement was executed by the parties on December 17, 2010 and approved by the adjudication court in 2013. There are several deadlines that must be met in order for the settlement to be considered final. While all deadlines are specifically identified in the Act, as a general matter, all deadlines must be met by December 31, 2024 for the settlement to be considered effective.

Through the settlement, the Navajo Nation is entitled to divert more than 633,000 acre-feet per year (AFY) and deplete more than 327,000 AFY of water (Table 5.5-B). The settlement provides for reductions of certain Navajo Nation diversions if needed to accommodate New Mexico's obligations under the Colorado River Compact. Part of the Navajo Nation's Upper Basin San Juan River rights in the State of New Mexico will be met with water from Nighthorse Reservoir in Colorado, a facility of the Animas-La Plata (A-LP) Project. The amount involved is a diversion of 4,680 AFY and a depletion of 2,340 AFY.

TABLE 5.5-B
Navajo Nation Water Rights for San Juan Basin in New Mexico

Summary of the Water Rights of the Navajo Nation San Juan River in New Mexico Settlement		
Component	**Diversion (AFY)**	**Depletion (AFY)**
Navajo Indian Irrigation Project (110,630 acres)	508,000[1]	270,000
Hogback Irrigation Project (8,830 acres)	48,550	21,280
Fruitland Irrigation Project (3,335 acres)	18,180	7,970
Animas-La Plata Project	4,680	2,340
Navajo-Gallup Water Supply Project	22,650	20,780
Misc. Municipal Uses	2,600	1,300
Tributary Groundwater	2,000	2,000
Tributary Surface Water (Small Historic & Existing Uses)	26,871	11,309
Total	**633,531**	**336,979[2]**

[1] Navajo Indian Irrigation Project (NIIP) average diversion limited to 353,000 AFY.
[2] Net San Juan River depletion 327,489 AFY.

The reserved water rights of the Nation are more fully described in the Partial Final Judgment and Decree of the Water Rights of the Navajo Nation and Supplemental Partial Final Judgment and Decree of the Water Rights of the Navajo Nation, entered in *New Mexico v. United States*, CV-75-184 (11th Judicial District Court, San Juan County, NM).

Rio San Jose Basin, New Mexico

The Navajo Nation has some lands within the Rio San Jose Basin of New Mexico. The Rio San Jose adjudication case is State of New Mexico ex rel. State Engineer v. Kerr-McGee Corporation, et al., Case No, CG-83-190-CV and CB-83-220-CV (Consolidated) (13th Judicial District Court, Cibola County, NM). The current proceeding is Subproceeding 1: The Adjudication of the Pueblos of Acoma and Laguna's Past and Present Water Uses (NMISC, 2017).

5.5.4.2 Federal Project Water Allocations

The Navajo Nation has three federal water projects: A-LP Water Project, NIIP, and the Navajo-Gallup Water Supply Project.

Animas-La Plata Project

The A-LP Project was authorized through Public Law 106-554 – Colorado Ute Settlement Act Amendments of 2000 (Act). The Act was signed on October 25, 2000, and amended in 2000, 2006, and 2008. The Act authorized the construction of Lake Nighthorse near Durango, CO and a water line to augment the existing water distribution system on the Navajo Nation between Farmington and Shiprock, NM with up to 4,680 AFY. The Navajo Nation's water allocation for A-LP is included in the water rights settlement for the San Juan Basin in New Mexico.

The Farmington to Shiprock Pipeline is 90 percent complete. Completion of the pipeline has been delayed due to a failure of a slope which broke the pipeline in Upper Fruitland Chapter; however, completion is expected in 2018 or 2019. The administration of recreation at Lake Nighthorse is currently in discussions.

Navajo Indian Irrigation Project

NIIP was authorized in June 1962 through Public Law 87-483. The project is located in the northeast part of the Reservation in northwest New Mexico and, when completed, is to serve 110,630 acres. The water allocation for NIIP is included in the water rights settlement for the San Juan Basin in New Mexico.

Project construction began in 1964 and construction funding is transferred from the BIA to Reclamation. The BIA is responsible for project oversight and environmental compliance. The BIA is responsible for the irrigation delivery system and the Navajo Nation is responsible for on-farm activities and operation and maintenance (O&M) on NIIP.

NIIP has not realized its full economic potential, and it is only 70 percent complete. The Navajo Nation has made several specific suggestions to realize NIIP's potential, including: 1) increase the annual construction funds to complete both the distribution systems and on-farm components in a shorter period of time, 2) vertically integrate to increase economic returns and employment, and 3) adequately fund the O&M. The Navajo Nation, BIA, and Reclamation have assembled a project team to address the long-range plans for NIIP.

Navajo-Gallup Water Supply Project

The Navajo-Gallup Water Supply Project (NGWSP or Project) was authorized for construction in 2009 as part of the Omnibus Public Land Management Act of 2009, Title X Part III (Public Law 111-11). Project beneficiaries include the Navajo Nation, Jicarilla Apache Nation, and City of Gallup. The purpose is to construct water transmission pipelines capable of conveying treated San Juan River water to Navajo Nation communities in northwestern New Mexico and northeastern Arizona; the southwestern portion of the Jicarilla Apache Nation; and the City of Gallup for domestic, commercial, municipal and light industrial purposes (Figure 5.5-A).

The Project is comprised of a Cutter Lateral and a San Juan Lateral. The Cutter Lateral will divert water from Cutter Reservoir, which is supplied from Navajo Reservoir, and will serve eastern Navajo communities and the Jicarilla Apache Nation. The San Juan Lateral will divert water from the San Juan River and extend south, roughly following US Highway 491 through Gallup with laterals to Crownpoint, NM and Window Rock, AZ (Table 5.5-C). Each lateral will have a water treatment plant, numerous pumping plants, and storage tanks. The Project is being designed to serve a 2040 population of approximately 250,000. The Project has been divided into 27 Reaches for construction. In order to meet the legislated deadline for completion, simultaneous construction is occurring at sections (Reaches) throughout the Project area by various project participants including Reclamation, Navajo Nation, City of Gallup, and Navajo Area Indian Health Service (IHS). Reclamation is the lead construction agency and has developed Financial Assistance Agreements with project participants to assist in construction.

The water allocation for NGWSP is included in the water rights settlement for the San Juan Basin in New Mexico.

The Project will tie into existing and future public water systems. The 6,411 AFY designated for Navajo communities in Arizona would come from a block of Arizona's Colorado River allocation. The water is available for uses in New Mexico, but the water for Arizona communities (6,411 AFY) is contingent upon a Navajo Nation agreement with Arizona for water rights in Arizona as mandated by Public Law 111-11.

TABLE 5.5-C
Navajo-Gallup Water Supply Project Allocations

Project Lateral	Capacity (AFY)
Cutter Lateral	
- Navajo Nation	3,445
- Jicarilla Apache Nation	1,200
San Juan Lateral	
- Navajo Nation	
- New Mexico	19,208
- Arizona	6,411
- City of Gallup	7,500
Total	37,764

5.5.4.3 Surface Water Supplies

The Navajo Nation has access to on-Reservation surface water. The amount of surface water available for use depends on location, drainage area, precipitation and quality. Surface water sources for the main Reservation include the mainstem of the Colorado River, the Little Colorado River, the San Juan River, and ephemeral streams and washes. The major surface water supplies are described below.

Colorado River

The Navajo Nation water rights claims in the mainstem of the Colorado River remain unquantified. For the Navajo Nation, access to mainstem water is limited by legal, physiographic, and environmental factors.

Little Colorado River

ADWR (1994) estimates the median annual flow of the Little Colorado River at the Reservation border is 162,900 AFY. The erratic flow regime and high sediment load of the Little Colorado River create challenges to water development.

San Juan River

According to reports from the San Juan River Recovery Implementation Program (Holden, 1999) the median annual flows of the San Juan River at Bluff, Utah is 1,620,000 AFY. A limiting factor for water development in this Basin is the protection of the endangered Colorado pike minnow and the razorback sucker.

Tributary Washes

There is a lack of flow data for the tributary washes and streams to precisely quantify flows. However, the washes are generally ephemeral with erratic flow regimes and they may not be reliable water supplies for municipal purposes. Water is frequently stored in large shallow reservoirs, which are subject to high infiltration and evaporation losses. Consequently, the firm yield from these washes is far less than the average annual flow. At higher elevations, the perennial streams provide the recharge to the aquifers.

Other River Systems

The Navajo Nation has important land holdings in the Rio Grande, Rio Puerco, Rio San Jose, Zuni River, Bill Williams, and Verde River watersheds.

5.5.4.4 Groundwater Supplies

Groundwater is the most heavily utilized and dependable municipal water source for the Navajo Nation. It is found in the major water-bearing formations described below, as well as other minor aquifers. Although groundwater storage greatly exceeds the annual demand, only a small fraction of the groundwater in storage can be readily developed. It is also important that domestic groundwater withdrawals in the future remain within sustainable limits to ensure an adequate supply of water for future generations of Navajo people.

Coconino (C) Aquifer

The C aquifer underlies most of the Reservation in the Little Colorado River Basin. It is recharged from outcrops on the Defiance Plateau, the Mogollon Rim, and the San Francisco Mountains. The communities of Cameron, Leupp, Ganado and Chinle, among others, depend on the C aquifer for much of their municipal water supply. It is also a major source of industrial water for neighboring communities in the Little Colorado River Basin.

Navajo (N) Aquifer

The N aquifer has less storage than the C aquifer, but overall it has better water quality. The communities of Kaibeto, Kayenta, Pinon, Tuba City, and the Peabody Coal Mine, among others, depend on the N aquifer.

Dakota (D) Aquifer

The D aquifer is on the eastern portion of the Reservation and is considered to have poor water quality. However, the communities of Tsayatoh, Sanostee, Smith Lake, and Casamera Lake, among others, rely on it as their primary source of water.

The San Juan Structural Unit includes several formations that are primarily located within the State of New Mexico. The major water-bearing formations that provide water to Navajo public water systems are the Morrison and Mesa Verde. The communities of Crownpoint, Tohatchi, and Sanostee depend on the Morrison Aquifer. Several communities in the Eastern Agency including Coyote Canyon and Two Grey Hills rely on the Mesa Verde Aquifer. The Glorietta Aquifer and the Gallup Sandstone provide water to many of the neighboring communities in New Mexico including the City of Gallup.

Alluvial Aquifers

Alluvial aquifers underlie many of the washes on the Navajo Nation, but their total available volume has not been evaluated. The communities of Fort Defiance and Saint Michaels receive 70 percent of their water supply from the Black Creek alluvial aquifer, which recharges rapidly. Dilkon, Cameron, and Lower Greasewood also rely on alluvial systems. Typically, these aquifers have very limited storage capacity and development potential, and are more prone to droughts. Furthermore, water quality problems such as high dissolved solids limit use.

5.5.4.5 Water Supply Planning Efforts and Potential Future Projects

On July 17, 2000, the Navajo Nation and Reclamation signed a memorandum of understanding to support the Navajo Nation's efforts to develop its water resources. This strategy is articulated in *Water Resource Development Strategy for the Navajo Nation, NDWR 2001* (Strategy Document). The Strategy Document describes the tremendous overall need for water development on the Navajo Nation, and lays out a strategy for meeting the need. The Development Strategy includes:

- Developing large regional water supply projects.
- Developing and rehabilitating local domestic and agricultural water projects.
- Assistance for water haulers.
- Preparing Reservation-wide chapter water plans based on municipal sub-areas to assess needs and prioritizing projects.
- Completing NIIP.
- Continuing to address deficiencies in water storage facilities.
- Improving drought response and mitigation.
- Improving flood plain management.
- Continuing with watershed restoration projects.
- Establishing technical advisory committees for major water projects or initiatives; these committees will coordinate technical and fiscal resources of the Navajo Nation and Federal agencies.

Regional Water Supply Projects

The cornerstone of the Strategy Document is several large, regional water supply projects that will provide safe, new, and reliable water supplies for municipal use and will stimulate sustainable economic development on the Reservation. These regional projects will maximize the number of water users that will have reasonable access to the mainline delivery systems. Most of these projects have made significant progress since July 2000. The proposed regional water supply projects will convey municipal water to many chapters on the Reservation. The proposed regional projects are estimated to cost billions of dollars to construct. They include, but are not limited to:

- Navajo Gallup Water Supply Project/Gallup Regional System
- North Central Arizona Water Supply Project/Western Navajo Pipeline
- Tuba City Regional Water Plan
- Southwest Navajo Rural Water Supply Appraisal Study
- Leupp-Dilkon Regional Water Supply Development Project
- Kayenta Regional Water Supply Development Project

Local Water Supply Projects

Even with the large regional projects, without additional local infrastructure, conveyance and treatment capacity will be inadequate to deliver potable water from the regional systems to many of the water users. If the regional projects and the associated local distribution systems are fully constructed, approximately 40 percent of the chapters will rely on local water sources and facilities. Many of these areas have systems that require rehabilitation, and many areas require

new systems. In 2016 the Indian Health Service identified almost 500 projects with a total cost of approximately $600 million on the Sanitation Deficiency System list.

A partial list compiled by the NDWR of strategically significant municipal projects includes:

- Page-LeChee Water Supply Project
- To'hajiilee Water Planning and Construction
- Manymules Water Supply Project
- Navajo Mountain Water Supply Project
- Coyote Canyon Regional Water Plan
- White Rock Planning Project

The rehabilitation and development of local irrigation and livestock water systems is also an important component of the Strategy Document. Reclamation has supported the completion of numerous projects.

Assistance for Water Haulers

For areas where distribution systems are currently infeasible, community wells and watering points need to be upgraded or constructed to improve access for water haulers, perhaps utilizing a water-hauling truck service. The IHS and State of New Mexico have been funding this work. According to IHS statistics, since 2000 the percentage of homes hauling water has declined by almost 10 percent. In 2010 the NDWR initiated a $2 million pilot water hauling program funded by EPA in Leupp chapter.

Chapter and Regional Water Plans to Assess Needs and Prioritize Projects

To effectively meet these deficiencies, the Navajo Nation is systematically identifying the full scope and need on the Reservation. With assistance from state and federal agencies, the Navajo Nation is preparing Chapter and Regional Water Plans across the Reservation. The plans develop alternatives based on a short-term, mid-term, and long-term basis.

Address Deficiencies in Storage Facilities

The U.S. Department of the Interior (DOI) Dam Safety Program's nationwide technical priority rating includes 15 high hazard dams on the Navajo Nation. Dam safety work has been completed on Canyon Diablo, Round Rock, Ganado, Wheatfield, and Many Farms Dams. Five others, Captain Tom, Tsaile, Charlie Day, Red Lake, and Asaayi, are ranked in the top ten by the DOI. In 2006 the NDWR Safety of Dams Branch estimated that approximately $47 million of improvements are needed over the next ten years to address operational deficiencies in the remaining unsafe dams. These improvements include conducting deficiency verification analyses, developing standard operating procedures, preparing emergency action plans, establishing early warning systems, and addressing structural problems.

Drought Response and Mitigation

Since the signing of the MOU in July 2000, the Navajo Nation has been subject to extremely dry years. Reclamation and the BIA funded the Navajo Nation's 2003 Drought Contingency Plan which follows the National Drought Mitigation Center guidelines. This plan was adopted by the Navajo Emergency Management Commission. Reclamation funded drought mitigation projects at Navajo Mountain, Alamo, Toadlena, Window Rock, Bird Springs, and Bodaway-Gap and

many other places. Reclamation funded new projects at Lupton and Lower Greasewood, and also played a key role in recent shortage sharing agreements for the San Juan River Basin in New Mexico. Additional studies and mitigation of climate change impacts are needed.

Flood Plain Management

Throughout most of the U.S., 100-year flood plans have already been delineated. With these delineations, entities can participate in Federal Emergency Management Agency flood insurance programs. Addressing flood hazards is required for essentially all federally funded construction programs. Typically, on the Navajo Nation, adequate delineations are not available. Consequently, the Navajo Nation worked with the U.S. Army Corps of Engineers (USACE) to produce, in a phased approach, floodplain delineations throughout the Navajo Nation.

Watershed Restoration

Almost all the watersheds on the Navajo Nation are degraded due to land use practices that occurred without sufficient attention to their impact on the watershed. Overgrazing has had a major impact on the watersheds, resulting in more intense runoff events. When these events occur on degraded watersheds, they produce additional sediment loads in the reservoirs. These events incise channels which de-waters the alluvial groundwater, destroying riparian areas and reducing the carrying capacity of the land. With a restored watershed, floods can be attenuated and recharge can be increased. Wetland values can also be enhanced. With proper grazing management the fodder production can be increased.

NDWR has participated in several watershed restoration projects and continues to partner with the EPA in implementing Section 319 projects, the BLM in watershed restoration activities in the Rio Puerco Watershed, and the USACE in watershed assessments.

5.5.5 Current Water Use and Operations

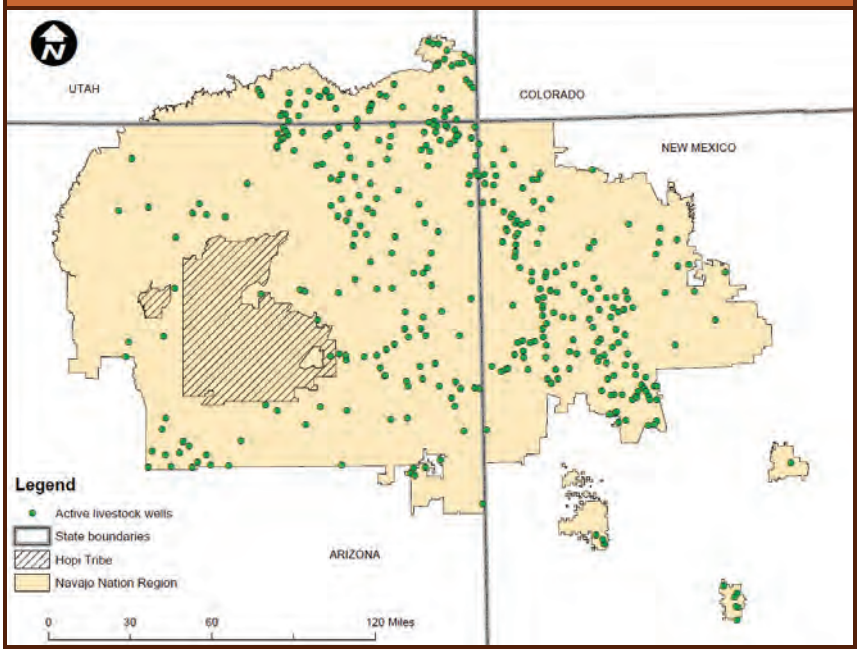
The majority of the Navajo Nation's current water use is for agricultural irrigation, although approximately 11 percent is used for domestic, commercial, municipal, and industrial purposes.

5.5.5.1 Irrigated Agriculture and Livestock Water Use Category

The Navajo Nation Department of Agriculture estimates that livestock on the Navajo Nation require approximately one to two million gallons per day or 1,000 to 2,000 AFY of water. The water for livestock comes primarily from surface water impoundments and livestock wells (Figure 5.5-K). NDWR maintains approximately 900 livestock wells throughout the Navajo Nation. In 1993 the NDWR estimated that the total water supply for livestock from the windmill-powered wells was 865 AFY. NDWR estimates there are approximately 7,500 stock ponds on the Navajo Reservation.

In 1986 the Soil Conservation Service (SCS) conducted an inventory of irrigation projects across the Navajo Nation. The SCS investigated 83 irrigation projects to determine existing conditions, consolidate resource data, and prioritize projects for possible rehabilitation (SCS, 1986) (Figure 5.5-L). According to BIA records, by 1950 these small projects irrigated 46,219 acres of land. In 1960, pursuant to Public Law 86-636, Navajo Tribe Transfer of Irrigation Project Works,

FIGURE 5.5-K
Active livestock wells during the 1990s and 2000s

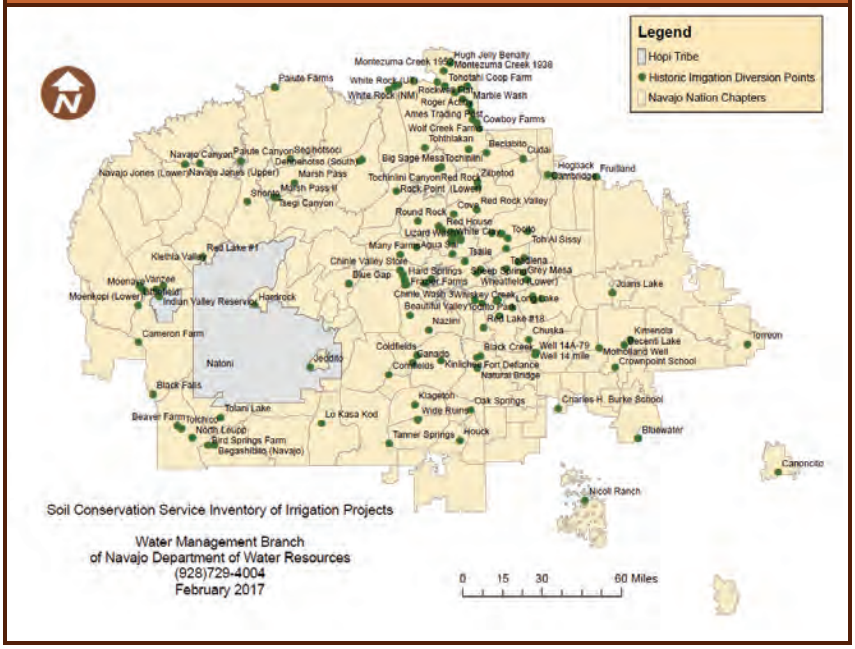


Congress transferred O&M responsibilities for the Navajo irrigation systems from the BIA to the Navajo Nation (NDWR, 2003).

During the 1980s, these small irrigation projects were capable of irrigating approximately 55,000 acres of land (SCS, 1986). Since that time, due to inadequate management and inadequate funding for operation, maintenance and replacement, many of these systems have deteriorated and are in need of funding. The survey did not include a survey of the NIIP.

The Fruitland and Hogback Irrigation Projects are receiving funds through the Navajo Nation in the New Mexico San Juan Basin Water Rights Settlement which was authorized for funding through Public Law 111-11. These projects will continue to utilize water on an annual basis. The NDWR, San Juan River Farm Board and San Juan River Dineh Water Users Association coordinate the O&M activities through a tri-party agreement.

FIGURE 5.5L
Navajo Nation Irrigation Projects Inventory by USDA SCS in 1986



While a majority of historic irrigation projects are not actively monitored there are existing efforts to improve several of these irrigation systems. In 2016, the Navajo Nation allocated funds to improve the Many Farms, Tsaile-Wheatfields, and Hogback Irrigation Systems over a 5-year period. In addition, the proposed Navajo Utah Water Rights Settlement Agreement proposes to provide funds for an agriculture management and conservation program.

The Navajo Nation continues to advocate for the completion of the NIIP. Approximately 70,000 acres of the planned 110,000 acres is developed. Public Law 111-11 clarified additional uses of NIIP water that will assist Navajo Agricultural Products Industry (NAPI) in developing additional projects. In 2016, NIIP diverted approximately 237,000 AFY of water.

The Fruitland Irrigation Project, Hogback Irrigation Project, and NIIP have participated in a San Juan Basin shortage sharing agreement entitled *Recommendations for San Juan River Operations and Administration* to limit the diversion of water since 2003 in coordination with other major water users in the San Juan Basin. The agreement is renewed periodically, and the most recent expires in 2019. Table 5-5-D shows the six years of diversions for the participating entities.

TABLE 5.5-D
Annual Diversion Limits for Navajo Nation in the *Recommendations for San Juan River Operations and Administration*

Project	Year (AFY)						Rate (cfs)	Period
	2011	2012	2013	2014	2015	2016		
Navajo Indian Irrigation Project	209,546	214,730	230,000	232,000	235,000	237,000	--	3/15 – 11/15
Fruitland Irrigation Project	--	--	--	--	--	--	100	4/01 – 10/31
Hogback Irrigation Project	--	--	--	--	--	--	170	4/01 – 10/31

cfs – cubic feet per second

5.5.5.2 Domestic, Commercial, Municipal, and Industrial Water Use Category

Domestic and Municipal

The total municipal water consumption on the Reservation is approximately 12,000 AFY. According to NNEPA, in 2017 there were 182 public water supply systems on the Navajo Reservation. Between 1998 and 2006 the number of connections increased from 28,789 to 40,766 (NDWR, 2001). The vast majority of these systems rely on groundwater.

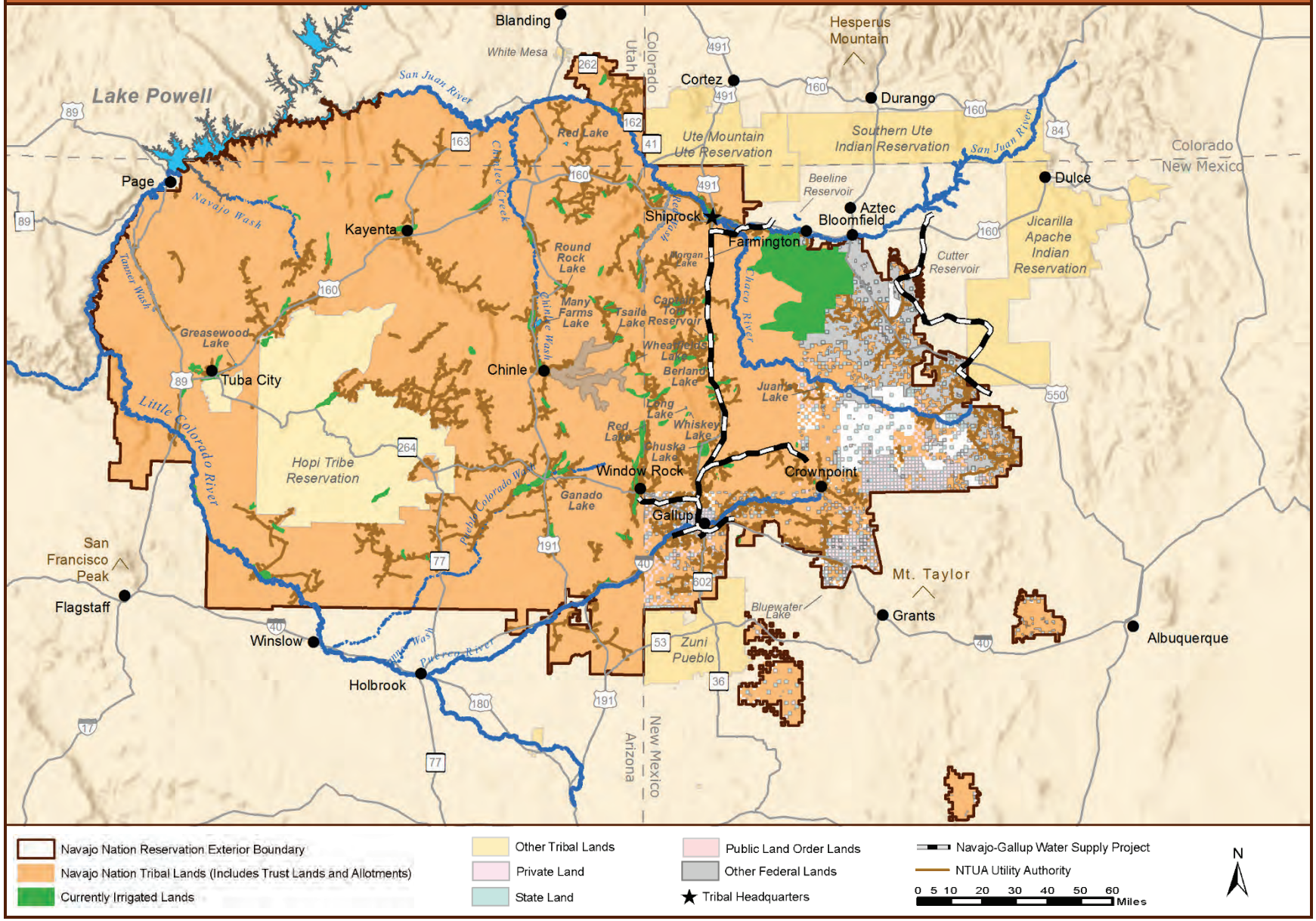
Navajo Tribal Utility Authority (NTUA) is the largest supplier of domestic and municipal water on the Navajo Nation and currently operates approximately 90 public water systems, delivering approximately 12,000 AFY of residential water serving approximately 65 percent of the on-Reservation population (Table 5.5-E and Figure 5.5-M). In 2010 NTUA reported 35,000 connections serving approximately 130,000 people, most of whom are on the Reservation.

TABLE 5.5-E
Public Water Systems

Number of Water Systems by Owners	# of Systems
Navajo Tribal Utility Authority (NTUA)	94
Tribal, government (Navajo Nation Water Resources, Navajo Parks & Recreation, etc.)	9
Tribal, chapters	4
Tribal, utilities (Ramah Navajo Utility Authority)	4
Businesses (Black Mesa Shopping Center, Tségi Anasazi Inn, Burnham Junction Mustang)	8
Companies (Peabody Western Coal Company, El Paso Natural Gas, TWP)	5
Federal, government (National Park Service)	2
Institutions, health (Ganado Sage Memorial Hospital, MV Mission Hospital, etc.)	2
Missions & Churches (Navajo Gospel Mission, White Post Mission)	2
Schools, BIA	33
Schools, Grant	7
Schools, Private (St. Michaels Indian School and Immanuel Mission)	2
Schools, Public (Ganado Public School, Tohatchi Public Schools, Tsé Yí Gai H.S., etc.)	9
Grand Total of PWS's	**182**

Source: NNEPA Public Water Supervision Program website (2017)

FIGURE 5.5-M
NTUA Water Systems



See the Disclaimer and Introduction to Chapter 5.0.

The Navajo Nation departments operate a few water systems that are largely subsidized by Tribal funds and community block grants. These systems are typically smaller than the NTUA systems, are typically not metered, and generally have worse economies of scale. Consequently, they generate inadequate revenue for proper administration and maintenance. The NDWR has made it a priority to upgrade these systems to NTUA standards and convey the O&M to NTUA.

In addition to these systems, the BIA operates approximately 40 water systems. Almost all were intended for BIA schools and school-related housing. The remaining smaller systems are operated by other chapters, schools, missions, trading posts, and private commercial operators.

The NDWR worked with NTUA to acquire historic water delivery to public water systems operated and maintained by NTUA and a complete data set was developed for the years 1996 through 2005. Efforts to obtain additional data post-2005 have been difficult and limited to specific project areas (Table 5.5-F).

Per capita water use on the Reservation for NTUA public water systems is approximately 80 gallons per capita per day. The average per capita use for 80 neighboring communities in the Western United States is 190 gallons per day (NDWR, 2001). It is estimated that the current annual municipal water production on the Navajo Reservation by NTUA is approximately 12,000 AFY.

Several public water systems utilize, either partially or fully, alluvial groundwater and are susceptible to drought (Table 5.5-G). Jeddito and Cameron previously used alluvial source wells but are now intertied long distances to other groundwater sources.

TABLE 5.5-F
NTUA Water Delivery to Public Water Systems (1996 – 2005)

Year	AF
1996	9,211
1997	7,617
1998	9,935
1999	9,570
2000	10,080
2001	12,934
2002	10,906
2003	11,822
2004	12,277
2005	11,851

Source: NTUA

TABLE 5.5-G
Water Systems with Alluvial Sources

Public Water System and Operator	Source
Alamo, NM - CHAPTER	Alluvial
Church Rock, NM - NTUA	Alluvial and sandstone in Chinle Formation
Lake Valley, NM - NTUA	Alluvial
Dilkon, AZ - BIA	Alluvial
Dilkon, AZ - NTUA	Alluvial
Fort Defiance/Window Rock, AZ - NTUA	Alluvial and Gallup Sandstone
Chinle, AZ - NTUA	Alluvial and DeChelly Sandstone
Rough Rock, AZ - NTUA	Alluvial
Wheatfields, AZ - NTUA	Alluvial
Lower Greasewood/Whitecone/etc., AZ - NTUA	Alluvial
Rock Point, AZ - NTUA	Alluvial
Oljato, AZ/UT - NTUA	Alluvial
Two Grey Hills, NM - NTUA	Alluvial
Houck, AZ - NTUA	Alluvial

Commercial and Industrial Use

Peabody Western Coal Company (PWCC) is the principal industrial water user permitted through the Navajo Nation. PWCC began operating a coal strip mine in the northern part of the study area in 1968. From 1968 through 2005, PWCC used N aquifer water to slurry coal along a 273-mile pipeline from Black Mesa to a power plant in Laughlin, Nevada. The quantity of water from the PWCC N aquifer well field increased from about 100 acre-feet (AF) in 1968 to about 4,480 AF in 2005. In 2006, PWCC reduced industrial pumping to about 1,200 AFY due to the closure of the power plant at Laughlin, Nevada which resulted in a shutdown of the slurry line.

Another major industrial water user on the Navajo Nation is the Navajo Generating Station (NGS). NGS has a contract with Bureau of Reclamation to divert water from Lake Powell and consume up to 34,100 AFY for the generation of thermal power. The Arizona Legislature authorized NGS to divert water from Lake Powell and to consume up to 34,100 AFY for the operation of a thermal generating plant. Ariz. Rev. Stat. § 45-166. The most recent permitted water right for NGS is 28,709 AFY (Certificate Nos. 4050.0001 and 4050.0003). In 2017, the owners of NGS and the Navajo Nation executed an agreement to retire NGS at the end of 2019.

TABLE 5.5-H
Navajo Nation Lakes and Reservoirs

Name	Storage Capacity (AF)
Asaayi[1]	682
Antelope Lake	75
Aspen Lake	68
Beeline Reservoir	1,000
Berland Lake	7
Blue Canyon[1]	1,905
Captain Tom[1]	1,170
Charlie Day	4
Chuska Reservoir	3,345
Cutter Reservoir[1]	1,793
Ganado Lake[1]	3,750
Greasewood Lake	1,980
Juan's Lake	2,650
Long Lake	3,255
Many Farms[1]	14,500
Morgan Lake	16,750
Red Lake[1]	10,650
Red Lake	4,480
Round Rock[1]	1,070
To'Hajiilee Lake[1]	1,344
Todacheene[1]	80
Trout Lake	120
Tsaile Lake[1]	5,100
Wheatfields[1]	4,500
Whiskey Lake[1]	7,458
Window Rock[1]	210
Total	**87,946**

[1] NDWR Safety of Dams Plan of Operation.

5.5.5.3 Environmental, Cultural, and Recreational Water Use Category

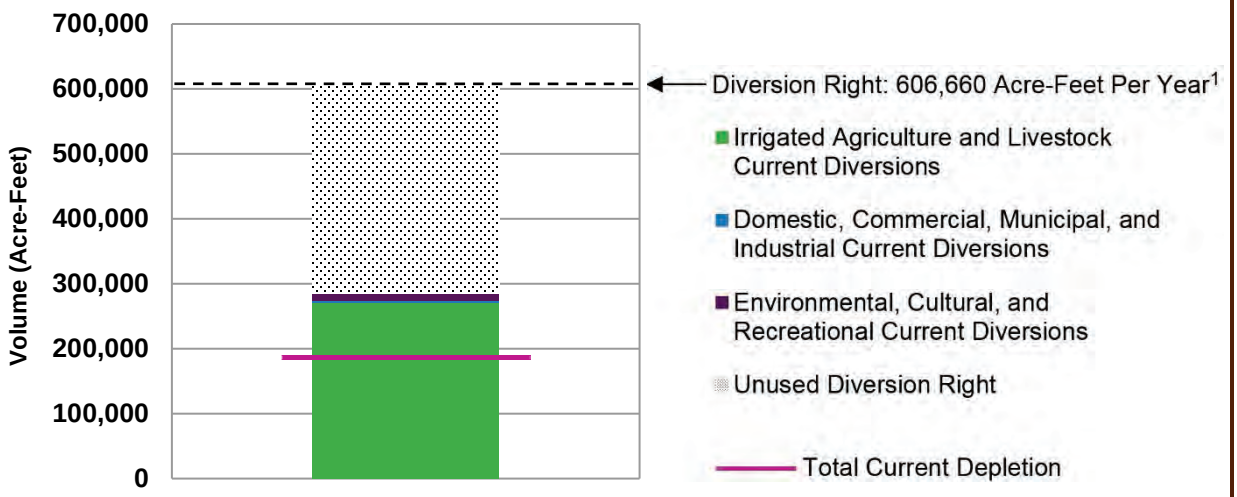
The reservoirs on the Navajo Nation provide storage for irrigation water, livestock, wildlife and recreation. There are more than 20 significant storage facilities (Table 5.5-H). A reservoir was considered significant if it has a surface area greater than 200 acres, is included in the NDWR Safety of Dams Plan of Operation, or is stocked by the Navajo Department of Fish & Wildlife. The lakes and reservoirs have a combined storage capacity greater than 80,000 AF.

5.5.5.4 Summary of Current Water Use

The Navajo Nation's recent average annual water use for the states of New Mexico, Utah, and Arizona are presented in Figure 5.5-N through 5.5-P and Table 5.5-I. Due to a lack of

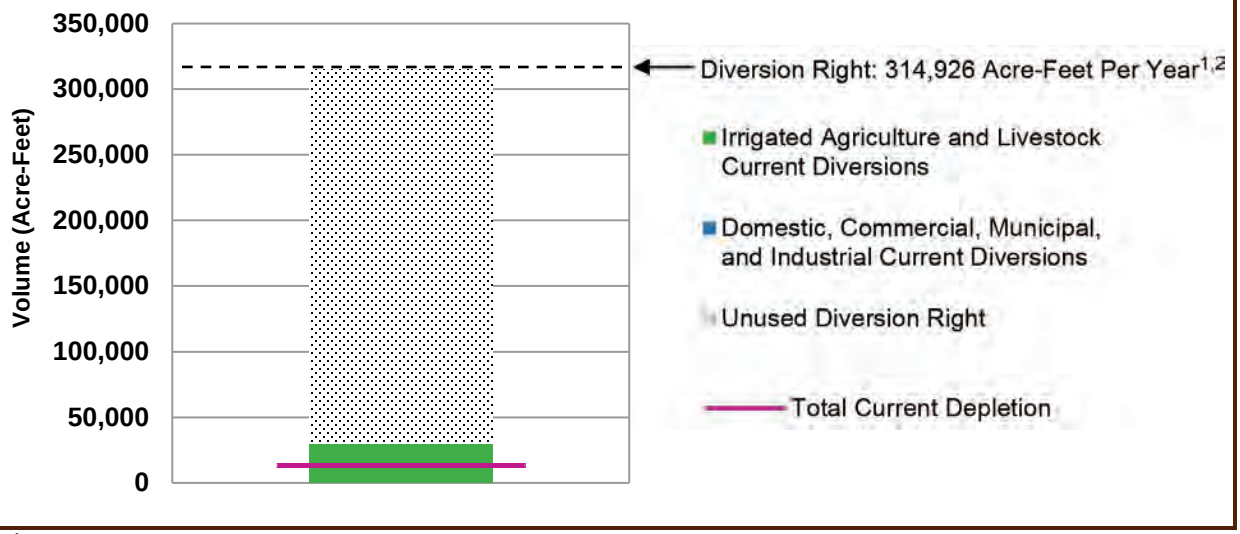
measurement on many smaller water sources, reasonable standardized assumptions were used to determine their diversion amounts. Depletion amounts were then derived from the diversion numbers using standard engineering efficiency estimates and assigned based on water use category and structure type.

FIGURE 5.5-N
Navajo Nation Current Average Annual Water Use in New Mexico



[1] Navajo Nation reserved diversion water right in New Mexico is 606,660 AFY and depletion right is 325,670 AFY; does not include tributary surface water depletions of 26,871 AFY.

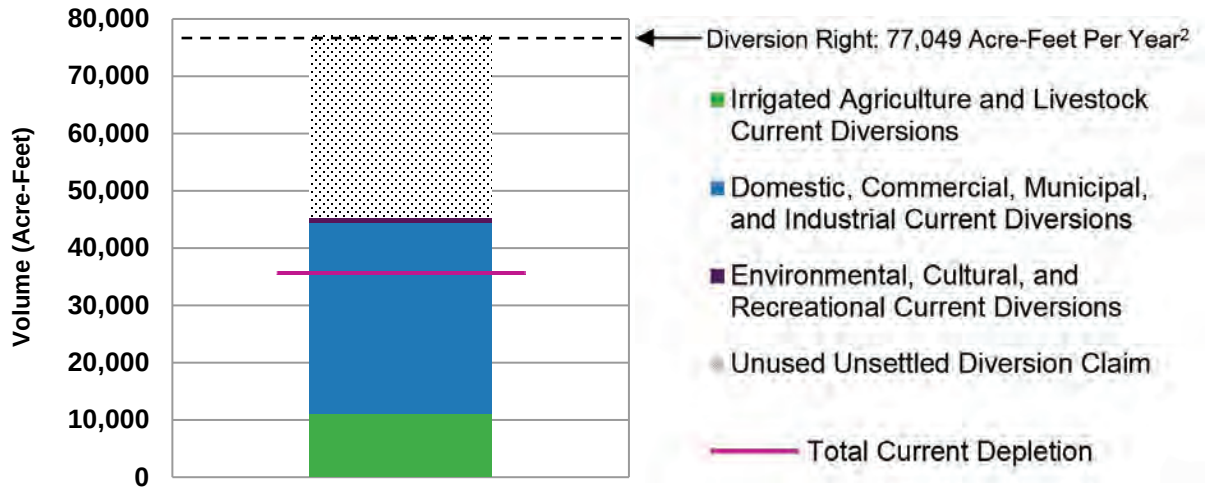
FIGURE 5.5-O
Navajo Nation Current Average Annual Water Use in Utah



[1] Navajo's proposed settlement for claims of 314,926 AFY in Utah is based on an annual diversion of 435 cubic feet per second from the San Juan River subject to a maximum depletion of 81,500 AFY. The diversion limit does not apply to diversions from groundwater or from Lake Powell, so long as total Navajo depletions in Utah do not exceed 81,500 AFY.

[2] Navajo's proposed settlement in Utah has not yet been ratified by Congress.

FIGURE 5.5-P
Navajo Nation Current Average Annual Water Use in Arizona (Upper Basin)[1]



[1] No Arizona Lower Basin water use is included.

[2] Navajo's Upper Basin unresolved depletion claim in Arizona of 47,000 AFY was converted to an unresolved diversion claim for Tribal Water Study modeling purposes by applying a 61 percent efficiency for a diversion right of 77,049 AFY.

TABLE 5.5-I
Navajo Nation Current Average Annual Water Use by State (2009 – 2013)

State	Water Use Category	Diversion (AFY)	Estimated Current Depletion (AFY)
New Mexico	AG	271,369	183,948
	DCMI	2,103	1,052
	ENV	12,090	1,209
	State Subtotal	***285,562***	***186,209***
Utah	*AG*	29,918	12,765
	DCMI	450	405
	State Subtotal	***30,368***	***13,170***
Arizona (Upper Basin)	*AG*	11,163	4,800
	DCMI	33,222	29,900
	ENV	1,000	1,000
	State Subtotal	**45,385**	**35,700**
Total		**361,315**	**235,079**

AG – Irrigated Agriculture and Livestock
DCMI – Domestic, Commercial, Municipal, and Industrial
ENV – Environmental, Cultural, and Recreational

5.5.6 Tribal Water Use Challenges

5.5.6.1 Supply Challenges

Surface water development is hindered by a variety of practical and legal constraints. Access to mainstem Colorado River water is limited by legal, physiographic, and environmental factors. The erratic flow regime and high sediment load of the Little Colorado River and other watersheds create challenges to water development. The washes are generally ephemeral with erratic flow regimes and they may not be reliable water supplies for municipal purposes. Water is frequently stored in large shallow reservoirs, which are subject to high infiltration and evaporation losses. Consequently, the firm yield from these washes is far less than the average annual flow.

Groundwater development depends on location, aquifer characteristics, and water quality. Many portions of the Navajo Nation need imported water due to the lack of local adequate groundwater supplies.

5.5.6.2 Infrastructure Challenges

The Navajo Nation has been waging an uphill battle for many years to maintain and modernize its water resource infrastructure. However, given existing agency resources, budgets, and authorizations, many of the water infrastructure deficiencies on the Reservation will continue to go unattended and the problems may become more acute. The NDWR identified a need to better define and clarify the water resource problems confronting the Navajo Nation and to develop a plan for addressing those problems. The effort resulted in the Strategy Document. This document was first produced in July 2000. It has been updated with data available in the 2010 Census, more recent information from the Division of Economic Development, and separate investigations of the Navajo water projects.

The Navajo Nation has made significant investments in recent years to obtain better insight into the water infrastructure development needs on the Navajo Nation. In 2012 and 2016, the Navajo Nation funded several regional plans that includes identifying the short-term, mid-term and long-term public water system infrastructure needs. Several of these reports are finalized, some are almost finalized, and some have just begun. These capital improvement plans incorporate an increasing population over a 40- to 50-year planning horizon combined with increasing economic development.

5.5.6.3 Agriculture

One of the purposes of the 1986 Soil Conservation Service inventory of irrigation projects was to identify and prioritize the infrastructure needs of the small Navajo Nation irrigation projects. Since that time, there has been little to no funding to address many of the deficiencies and many of the small irrigation projects continue to face many challenges.

5.5.6.4 Domestic

The NDWR estimates that approximately 30 percent of the households on the Reservation are without direct access to public water systems and haul water long distances to provide water for their families. Families, which haul water for domestic purposes, spend the equivalent of $43,000 per AF of water compared with $600 per AF for typical suburban water users in the

region. This Navajo water hauling cost is $133 per thousand gallons. This water is among the most expensive in the U.S. for a sector of the population that is among the poorest (NDWR, 2001).

These water haulers often rely on non-potable water sources such as stock tanks for drinking water. Those that do have running water depend on public water supply systems that are deteriorating and are struggling to generate adequate revenues for maintenance. Some of these water systems have exceeded the maximum sustainable withdrawal capacity of their source aquifers, have poor water quality, and are susceptible to drought.

The lack of a reliable and affordable potable water supply stifles economic growth throughout the Reservation. According to the 2010 Census, more than half of the Navajo population live off the Navajo Reservation. Assuming the economic and social conditions can be improved, and that emigration can be reduced, by the year 2050 the on-Reservation population of the Navajo Nation is projected to be over 300,000. If the disparities in water use between the Navajo people and the rest of the United States are reduced, the total annual municipal water demand on the Reservation will exceed 50,000 AFY. This demand requires more than four times the current water system capacity. Overcoming the legacy of economic neglect and the readily apparent deficits in infrastructure will require an aggressive water development program.

The Navajo Nation is committed to improving the standard of living on the Reservation. The fundamental first step in improving the socioeconomic conditions is stimulating economic developments which will, in turn, reduce demands on federal programs. Recognizing that water is integral to human health and safety and economic development, the Navajo Nation has made one of its highest priorities to be developing reliable water supplies.

If the Navajo people are to achieve a standard of living comparable with neighboring communities, the Nation must reassess future water demand on the Reservation and explore options for providing adequate water to its people. Several conditions compound this problem. First, the Navajo population has very limited economic resources, making capital investments problematic and repayment capacities of the Navajo communities very low. Second, the Navajo population is widely dispersed across the Reservation, resulting in large distances between water sources and water users, and extremely high unit O&M costs. Third, the Navajo Nation has not established a depreciation fund that can adequately repair and replace the existing water systems, many of which are at or near the end of their design life. Finally, environmental and endangered species concerns combined with scarce water make new water development, already a costly proposition, even more difficult.

These conditions result in expensive water and a constant struggle to generate adequate revenue to build and maintain water systems. Not only is the Navajo Nation unable to meet growing demands, it is struggling to operate and maintain the existing systems. This leaves the Navajo Nation caught up in a cycle of trying to catch up. The proposed regional systems have economies of scale, and will provide the core water infrastructure for more densely sited housing in the future. Due to limited funding, for systems that do have the priority and receive funding, the IHS typically designs for a domestic demand of 200 to 250 gallons per household per day, or only 50 gallons per capita per day. This rate is less than half of the other municipal per capita use in Arizona. The IHS adds 50 percent to its design capacity for future growth.

Under its current authority, the IHS cannot typically provide for the water supply needs of commercial or industrial users. These commercial users, which are critical to a robust and sustainable economy, are forced to carry the technical and financial burden of developing their own water supplies. This burden, combined with the other obstacles, makes the creation of business opportunities on the Reservation exceptionally difficult. The Navajo Nation is working to remove as many administrative obstacles as possible. However, the difficulty of securing water can only be addressed by creating an adequate water infrastructure.

The NTUA water systems face critical economic problems. The NTUA infrastructure has many miles of pipeline systems, but has few connections per mile. For some of these water systems, the operating cost exceeds the system revenue. Costlier NTUA systems are subsidized by larger, more cost efficient systems. Furthermore, NTUA does not have the financial resources to maintain an adequate depreciation fund. Consequently, funding may not be readily available when the $300 million of existing NTUA infrastructure needs to be replaced.

As challenging as the current circumstances are, without dramatically improved water resources development efforts, the future may be more challenging.

5.5.7 Projected Future Water Development

The Navajo Nation's future water development was assessed by first examining the location, quantity and type of current water use and then, by applying the Tribal Water Study's scenario planning process, envisioning a range of future water development.

The Tribal Water Study's scenarios and associated themes are listed below. Detailed descriptions of these scenarios (storylines) were created to consider a wide range of possible water development outcomes. For additional information, including the scenario storylines, see *Chapter 4 – Methodology for Assessing Current Tribal Water Use and Projected Future Water Development*.

- **Current Water Development Trends (Scenario A):** Current trends in on-Reservation water development, governance, funding, and resolution of tribal claims remain the same.
- **Slow Water Development Trends (Scenario B):** Decreases flexibility in governance of tribal water, levels of funding, and resolution of tribal claims slow tribal economic development. This results in a decline in the standard of living and delays resolution of tribal claims.
- **Rapid Water Development Trends (Scenarios C1 and C2):** Increased flexibility in governance of tribal water allows innovative water development opportunities and increased funding availability leads to tribal economic development. This results in an increase in the standard of living, thereby contributing to the fulfilment of the purpose of the reservation as a homeland and supporting the future needs of tribal communities. Scenario C1 considers partial resolution of claims and/or implementation of decreed or settled rights; and Scenario C2 considers complete resolution of claims and implementation of decreed or settled rights.

The Navajo Nation contemplated its future water development through 2060 by reviewing its current water use estimates and reflecting upon how these might change under the four scenarios. During this process, the Nation considered such elements as the scenario conditions described in the storylines, current or future planned projects, anticipated changes in water use by category,

and the extent and condition of existing water infrastructure and the need, as well as the cost, for new infrastructure to support water development. The Navajo Nation contemplated future development in the four water use categories: Irrigated Agriculture and Livestock Water Use (AG); Domestic, Commercial, Municipal, and Industrial Water Use (DCMI); Environmental, Cultural, and Recreational Water Use (ENV); and Transfers, Leases, and Exchanges (TRAN).

From this examination, the Nation extrapolated likely future use if current trends (Scenario A) continued through 2060 and prepared quantified water development schedules for its reserved water rights and unresolved claims in New Mexico, Utah, and the Upper Basin in Arizona. No water use or future development was modeled for the Lower Basin in Arizona. Subsequently, the Nation used this same approach to prepare future water development schedules reflective of how the other scenario storylines (Scenarios B, C1, and C2) could affect its future water development. The documentation for each development schedule is presented in the following sections.

5.5.7.1 Future Water Development Schedules

The assumptions used to prepare each water development schedule are described below. The schedules are presented graphically for New Mexico in Figure 5.5-Q and numerically in Table 5.5-J, for Utah in Figure 5.5-R and Table 5.5-K, and Arizona (Upper Basin) in Figure 5.5-S and Table 5.5-L.

New Mexico

Current Water Development Trends (Scenario A)

Scenario A assumes that current trends in on-Reservation water development, governance, funding, and resolution of tribal claims remain the same. Currently, almost all of the Nation's New Mexico water use is for irrigation (271,369 AFY). Under Scenario A, the Nation assumed that irrigation depletion would increase from 183,948 AFY to 297,438 AFY because the NIIP Project depletions would almost double by 2040 due to increased acreage under irrigation and increasing efficiency to 73 percent. By 2060, the Fruitland and Hogback Irrigation Projects would increase to their full diversion rights, helping to bring AG diversions to 433,698 AFY. DCMI water diversions would increase substantially from the current use of 2,103 AFY to 57,139 AFY in 2060 because of granary processing facilities such as Navajo Agricultural Products Industry's (NAPI) Flour Mill (NIIP Project), the development of the Navajo-Gallup Water Supply Project to full depletion right, the development of the A-LP to the Nation's full diversion right, the full development of San Juan tributary groundwater, and the full development of the reserved New Mexico San Juan River diversion right. ENV water use diversions would remain constant through 2060 at 12,090 AFY. There would be no TRAN water use under Scenario A.

Slow Water Development Trends (Scenario B)

Decreases in flexibility in governance of tribal water, levels of funding, and the resolution of tribal claims could slow tribal economic development in Scenario B. Under this scenario, it was assumed that by 2060 all the irrigation projects would increase at a rate that is only 25 percent of the Scenario A rate. NIIP Project DCMI diversions would double by 2060, but other DCMI diversions would increase at a rate that is 75 percent of the Scenario A rate. Total DCMI

diversions by 2060 would be 42,703 AFY. ENV water use diversions would remain constant through 2060 at 12,090 AFY. There would be no TRAN water use under Scenario B.

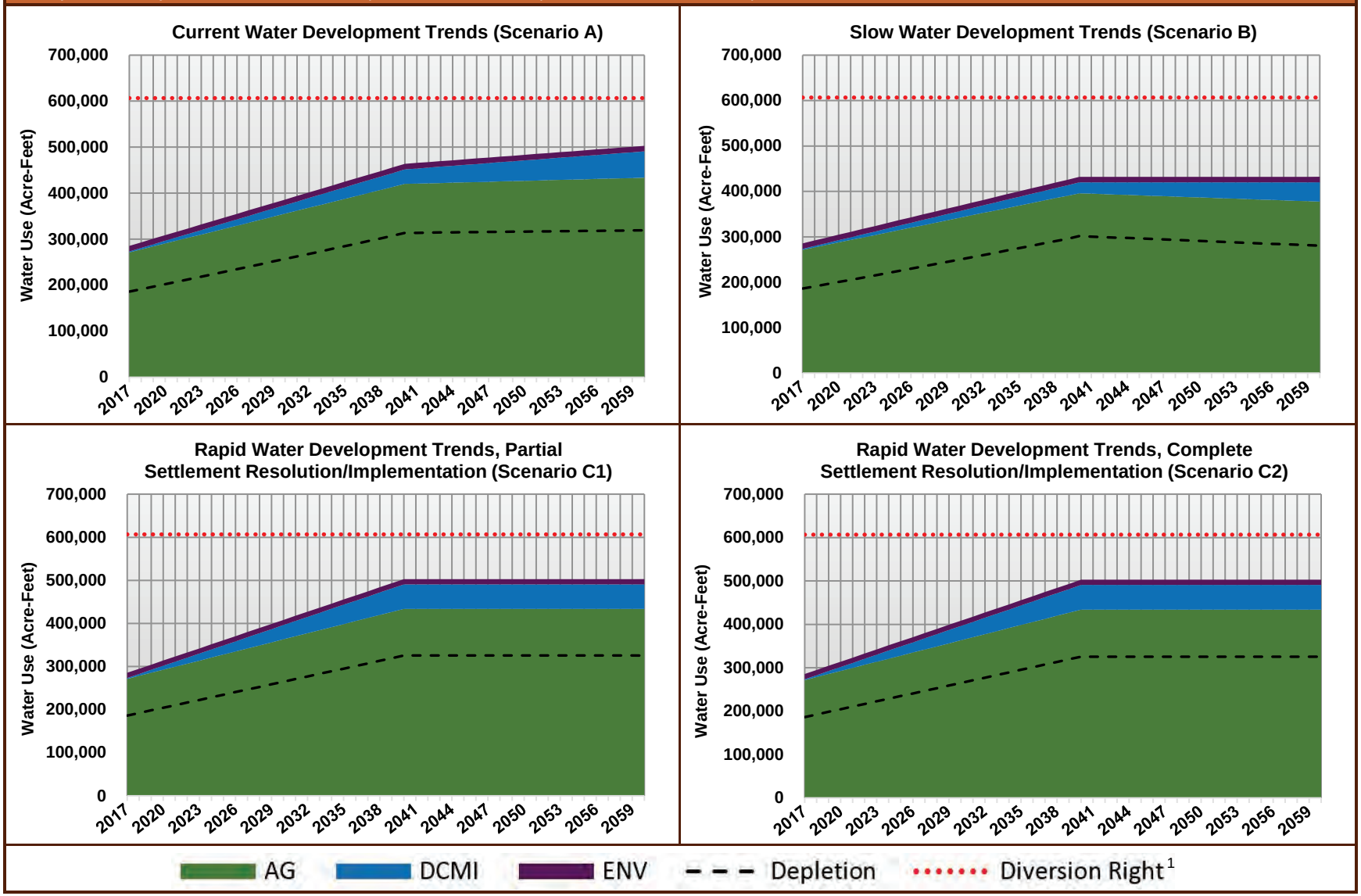
Rapid Water Development Trends, Partial Settlement Resolution/Implementation (Scenario C1)

Under Scenario C1, a partial resolution of the claims and/or implementation of decreed or settled rights leads to increased flexibility in governance of tribal water allowing innovative water development opportunities, and increased funding availability leads to tribal economic development. Under Scenario C1, the Nation assumed that irrigation diversions would increase from 271,369 AFY to 433,890 AFY by 2040 because the NIIP Project depletions would nearly triple due to increased acreage under irrigation and increasing efficiency to 73 percent. The Fruitland and Hogback Irrigation Projects would increase to their full diversion rights by 2040. DCMI water use diversions would increase substantially from current use of 2,103 AFY to 56,859 AFY in 2040. NIIP Project DCMI use would triple by 2060, and other DCMI diversions would reach their full water right at 2040. ENV water use diversions would remain constant through 2060 at 12,090 AFY. There would be no TRAN water use under Scenario C1.

Rapid Water Development Trends, Complete Settlement Resolution/Implementation (Scenario C2)

Scenario C2 builds on Scenario C1 by considering a complete resolution of claims and implementation of decreed or settled rights, which further increases water development opportunities. The Nation assumed the development schedule would be the same as Scenario C1.

FIGURE 5.5-Q
Navajo Nation Projected Future Water Development in New Mexico (Scenarios A, B, C1, and C2)



[1] Navajo Nation reserved diversion water right in New Mexico is 606,660 AFY and depletion right is 325,670 AFY; does not include tributary surface water depletions of 26,871 AFY.

Utah

Current Water Development Trends (Scenario A)

Scenario A assumes that current trends in on-Reservation water development, governance, funding, and resolution of tribal claims remain the same. Under Scenario A in Utah, the Nation assumed that AG diversions would triple by 2060 from 29,918 AFY to 89,754 AFY. DCMI water use diversions would increase from the current use of 450 AFY to 2,000 AFY by 2060. There would be no ENV or TRAN water use under Scenario A.

Slow Water Development Trends (Scenario B)

Decreases in flexibility in governance of tribal water, levels of funding, and the resolution of tribal claims could slow tribal economic development in Scenario B. Under this scenario in Utah, it was assumed that all the irrigation project diversions would increase at a rate that is 25 percent of the Scenario A development rate. DCMI water use diversions would increase slowly from the current use of 450 AFY to 563 AFY in 2060. There would be no ENV or TRAN water use.

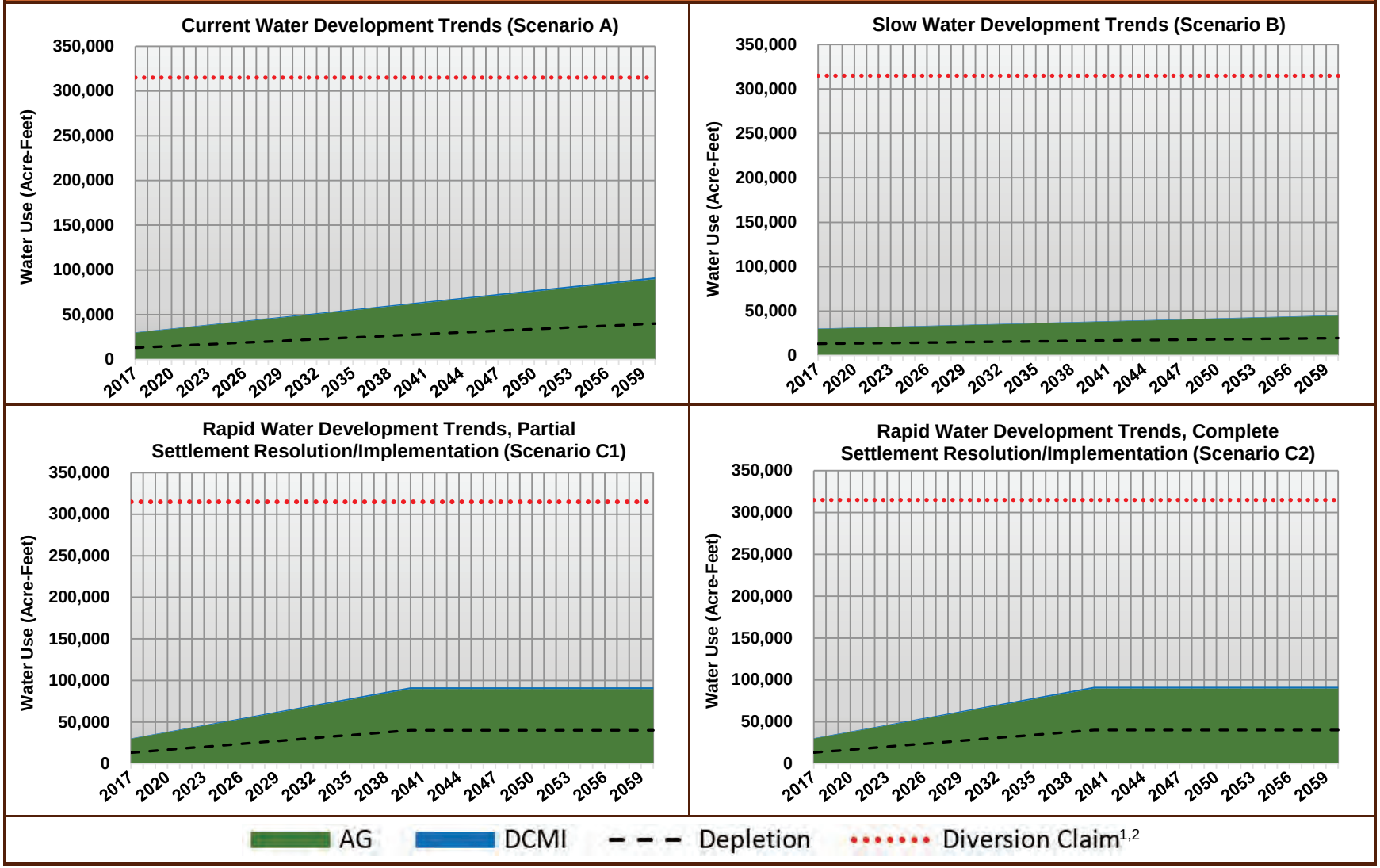
Rapid Water Development Trends, Partial Settlement Resolution/Implementation (Scenario C1)

Under Scenario C1, a partial resolution of the claims and/or implementation of decreed or settled rights leads to increased flexibility in governance of tribal water allowing innovative water development opportunities, and increased funding availability leads to tribal economic development. Under Scenario C1, the Nation assumed that irrigation diversions would triple from 29,918 AFY to 89,754 AFY by 2040. By 2040, DCMI water use diversions would increase from the current use of 450 AFY to 2,000 AFY. There would be no ENV or TRAN water use.

Rapid Water Development Trends, Complete Settlement Resolution/Implementation (Scenario C2)

Scenario C2 builds on Scenario C1 by considering a complete resolution of claims and implementation of decreed or settled rights, which further increases water development opportunities. The Nation assumed the development schedule would be the same as Scenario C1.

FIGURE 5.5-R
Navajo Nation Projected Future Water Development in Utah (Scenarios A, B, C1, and C2)



[1] Navajo's proposed settlement for claims of 314,926 AFY in Utah is based on an annual diversion of 435 cubic feet per second from the San Juan River subject to a maximum depletion of 81,500 AFY. The diversion limit does not apply to diversions from groundwater or from Lake Powell, so long as total Navajo depletions in Utah do not exceed 81,500 AFY.

[2] Navajo's proposed settlement in Utah has not yet been ratified by Congress.

Arizona (Upper Basin)

Current Water Development Trends (Scenario A)

Scenario A assumes that current trends in on-Reservation water development, governance, funding, and resolution of tribal claims remain the same. Under Scenario A in the Upper Basin portion of Arizona, the Nation assumed that AG diversions would increase from 11,163 AFY to 16,744 AFY by 2060. DCMI water use would decrease substantially because of the closing of the Navajo Generating Station (NGS). At the time the modeling was performed for the Tribal Water Study, it was assumed that one power generating unit would close in 2019, reducing NGS diversions from 25,800 AFY to 17,200 AFY. It was assumed the remaining two units would close in 2044, reducing NGS diversions from 17,200 AFY to 0 AFY. It now appears that the NGS will close in 2019, reducing DCMI use in the Upper Basin of Arizona even more quickly. ENV water use diversions would remain constant through 2060 at 1,000 AFY. There would be no TRAN water use under Scenario A.

Slow Water Development Trends (Scenario B)

Decreases in flexibility in governance of tribal water, levels of funding, and the resolution of tribal claims could slow tribal economic development in Scenario B. Under this scenario in the Upper Basin of Arizona, the Nation assumed that AG water diversions would increase at a rate that is 25 percent of the Scenario A rate. The NGS assumptions would affect DCMI use as in Scenario A, and other DCMI uses would decrease slightly through 2060 as compared to Scenario A. ENV and TRAN use would be the same as in Scenario A.

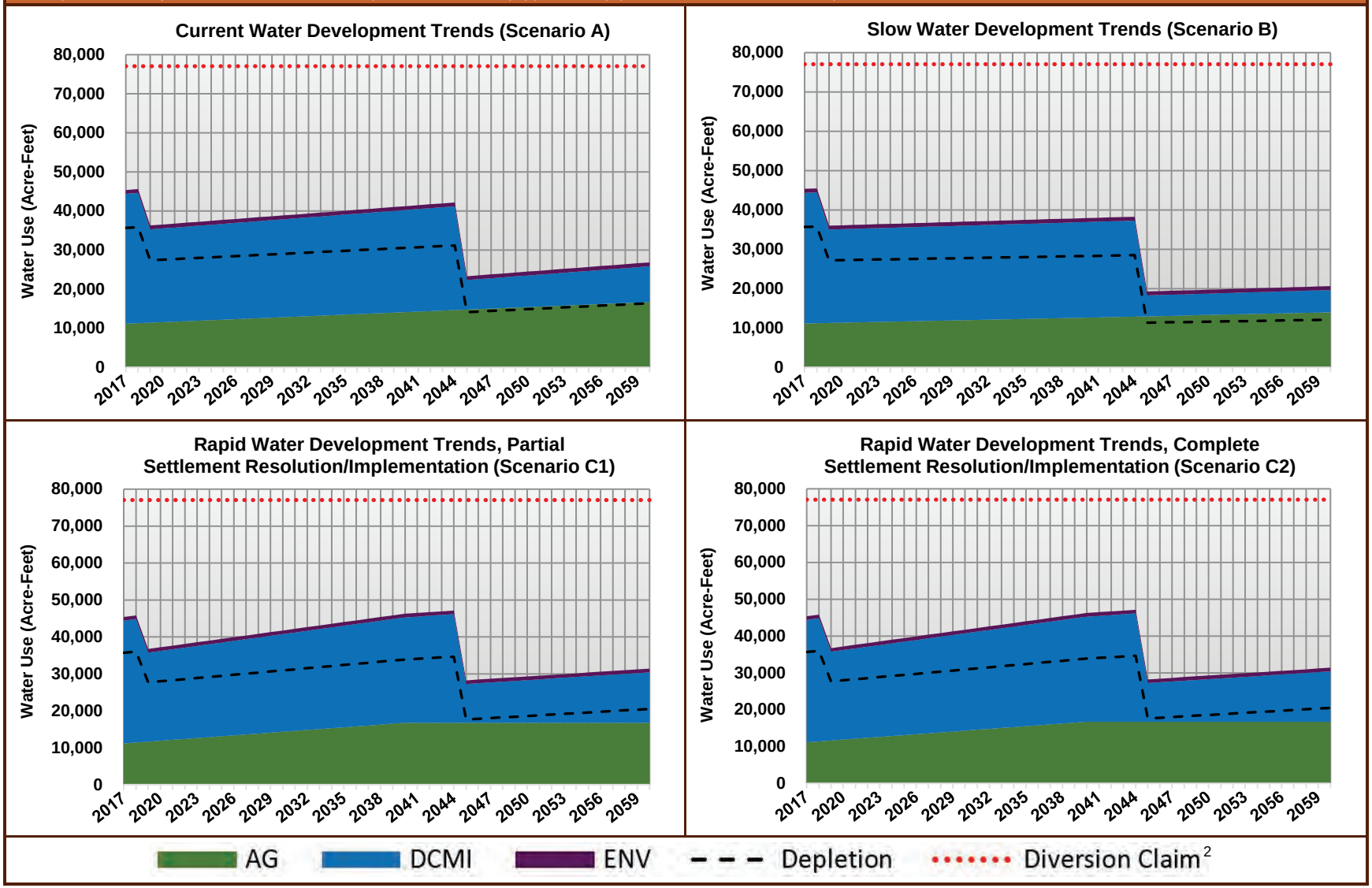
Rapid Water Development Trends, Partial Settlement Resolution/Implementation (Scenario C1)

Under Scenario C1, a partial resolution of the claims and/or implementation of decreed or settled rights leads to increased flexibility in governance of tribal water allowing innovative water development opportunities, and increased funding availability leads to tribal economic development. Under Scenario C1, the Nation assumed that irrigation diversions would increase from 11,163 AFY to 16,744 AFY by 2040. The NGS assumptions would affect DCMI use as in Scenario A, and other DCMI uses would increase slightly through 2060 as compared to Scenario A. ENV and TRAN use would be the same as in Scenario A.

Rapid Water Development Trends, Complete Settlement Resolution/Implementation (Scenario C2)

Scenario C2 builds on Scenario C1 by considering a complete resolution of claims and implementation of decreed or settled rights, which further increases water development opportunities. The Nation assumed the development schedule would be the same as Scenario C1.

FIGURE 5.5-S
Navajo Nation Projected Future Water Development in Arizona (Upper Basin) (Scenarios A, B, C1, and C2)[1]



[1] No Arizona Lower Basin water use is included.

[2] Navajo's Upper Basin unresolved depletion claim of 47,000 AFY in Arizona was converted to an unresolved diversion claim for Tribal Water Study modeling purposes by applying a 61 percent efficiency for a diversion right of 77,049 AFY.

5.5.7.2 Summary of Projected Future Water Development

Navajo's current water use and projected future water development under the Tribal Water Study's water development scenarios, and modeled for analysis purposes, is presented in Tables 5.5-J, 5.5-K, and 5.5-L.

TABLE 5.5-J
Summary of Navajo Nation Current Water Use and Projected Future Water Development in New Mexico[1]

Water Use Timeframe and Category		Scenario A (AFY)		Scenario B (AFY)		Scenario C1 (AFY)		Scenario C2 (AFY)	
		Diversion	Depletion	Diversion	Depletion	Diversion	Depletion	Diversion	Depletion
Current Use	*AG*	271,369	183,948	271,369	183,948	271,369	183,948	271,369	183,948
	DCMI	2,103	1,052	2,103	1,052	2,103	1,052	2,103	1,052
	ENV	12,090	1,209	12,090	1,209	12,090	1,209	12,090	1,209
	TRAN	0	0.00	0	0.00	0	0.00	0	0.00
	Total	**285,562**	**186,209**	**285,562**	**186,209**	**285,562**	**186,209**	**285,562**	**186,209**
Use at 2040	*AG*	420,151	297,438	395,852	289,227	433,890	297,277	433,890	297,277
	DCMI	31,539	15,028	24,126	11,325	56,859	26,984	56,859	26,984
	ENV	12,090	1,209	12,090	1,209	12,090	1,209	12,090	1,209
	TRAN	0	0	0	0	0	0	0	0
	Total	**463,780**	**313,675**	**432,068**	**301,761**	**502,839**	**325,470**	**502,839**	**325,470**
Use at 2060	*AG*	433,698	291,058	377,520	259,446	433,698	297,136	433,698	297,136
	DCMI	57,139	27,125	42,704	19,972	57,139	27,125	57,139	27,125
	ENV	12,090	1,209	12,090	1,209	12,090	1,209	12,090	1,209
	TRAN	0	0	0	0	0	0	0	0
	Total	**502,927**	**319,392**	**432,314**	**280,627**	**502,927**	**325,470**	**502,927**	**325,470**

[1] Navajo Nation reserved diversion water right in New Mexico is 606,660 AFY and depletion right is 325,670 AFY; does not include tributary surface water depletions of 26,871 AFY.

TABLE 5.5-K
Summary of Navajo Nation Current Water Use and Projected Future Water Development in Utah[1,2]

Water Use Timeframe and Category		Scenario A (AFY)		Scenario B (AFY)		Scenario C1 (AFY)		Scenario C2 (AFY)	
		Diversion	Depletion	Diversion	Depletion	Diversion	Depletion	Diversion	Depletion
Current Use	*AG*	29,918	12,765	29,918	12,765	29,918	12,765	29,918	12,765
	DCMI	450	405	450	405	450	405	450	405
	ENV	0	0	0	0	0	0	0	0
	TRAN	0	0	0	0	0	0	0	0
	Total	**30,368**	**13,170**	**30,368**	**13,170**	**30,368**	**13,170**	**30,368**	**13,170**
Use at 2040	*AG*	61,923	26,627	37,919	16,305	89,754	38,295	89,754	38,295
	DCMI	1,279	1,151	510	459	2,000	1,800	2,000	1,800
	ENV	0	0	0	0.	0	0	0	0
	TRAN	0	0	0	0	0	0	0	0
	Total	**63,202**	**27,778**	**38,429**	**16,764**	**91,754**	**40,095**	**91,754**	**40,095**
Use at 2060	*AG*	89,754	38,295	44,877	19,148	89,754	38,295	89,754	38,295
	DCMI	2,000	1,800	563	506	2,000	1,800	2,000	1,800
	ENV	0	0	0	0	0	0	0	0
	TRAN	0	0	0	0	0	0	0	0
	Total	**91,754**	**40,095**	**45,440**	**19,654**	**91,754**	**40,095**	**91,754**	**40,095**

[1] Navajo's proposed settlement for claims of 314,926 AFY in Utah is based on an annual diversion of 435 cubic feet per second until 81,500 AFY of water is depleted.

[2] Navajo's proposed settlement in Utah of 81,500 AFY has not yet been ratified by Congress.

TABLE 5.5-L
Summary of Navajo Nation Current Water Use and Projected Future Water Development in Arizona (Upper Basin)[1,2]

Water Use Timeframe and Category		Scenario A (AFY)		Scenario B (AFY)		Scenario C1 (AFY)		Scenario C2 (AFY)	
		Diversion	Depletion	Diversion	Depletion	Diversion	Depletion	Diversion	Depletion
Current Use	*AG*	11,163	4,800	11,163	4,800	11,163	4,800	11,163	4,800
	DCMI	33,222	29,900	33,222	29,900	33,222	29,900	33,222	29,900
	ENV	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000
	TRAN	0	0	0	0	0	0	0	0
	Total	**45,385**	**35,700**	**45,385**	**35,700**	**45,385**	**35,700**	**45,385**	**35,700**
Use at 2040	*AG*	14,148	6,084	12,655	5,442	16,744	7,200	16,744	7,200
	DCMI	26,103	23,493	24,276	21,848	28,540	25,686	28,540	25,686
	ENV	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000
	TRAN	0	0	0	0	0	0	0	0
	Total	**41,251**	**30,577**	**37,931**	**28,290**	**46,284**	**33,886**	**46,284**	**33,886**
Use at 2060	*AG*	16,744	7,200	13,953	6,000	16,744	7,200	16,744	7,200
	DCMI	9,111	8,200	5,694	5,125	13,667	12,300	13,667	12,300
	ENV	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000
	TRAN	0	0	0	0	0	0	0	0
	Total	**26,855**	**16,400**	**20,647**	**12,125**	**31,411**	**20,500**	**31,411**	**20,500**

[1] No Arizona Lower Basin water use is included.

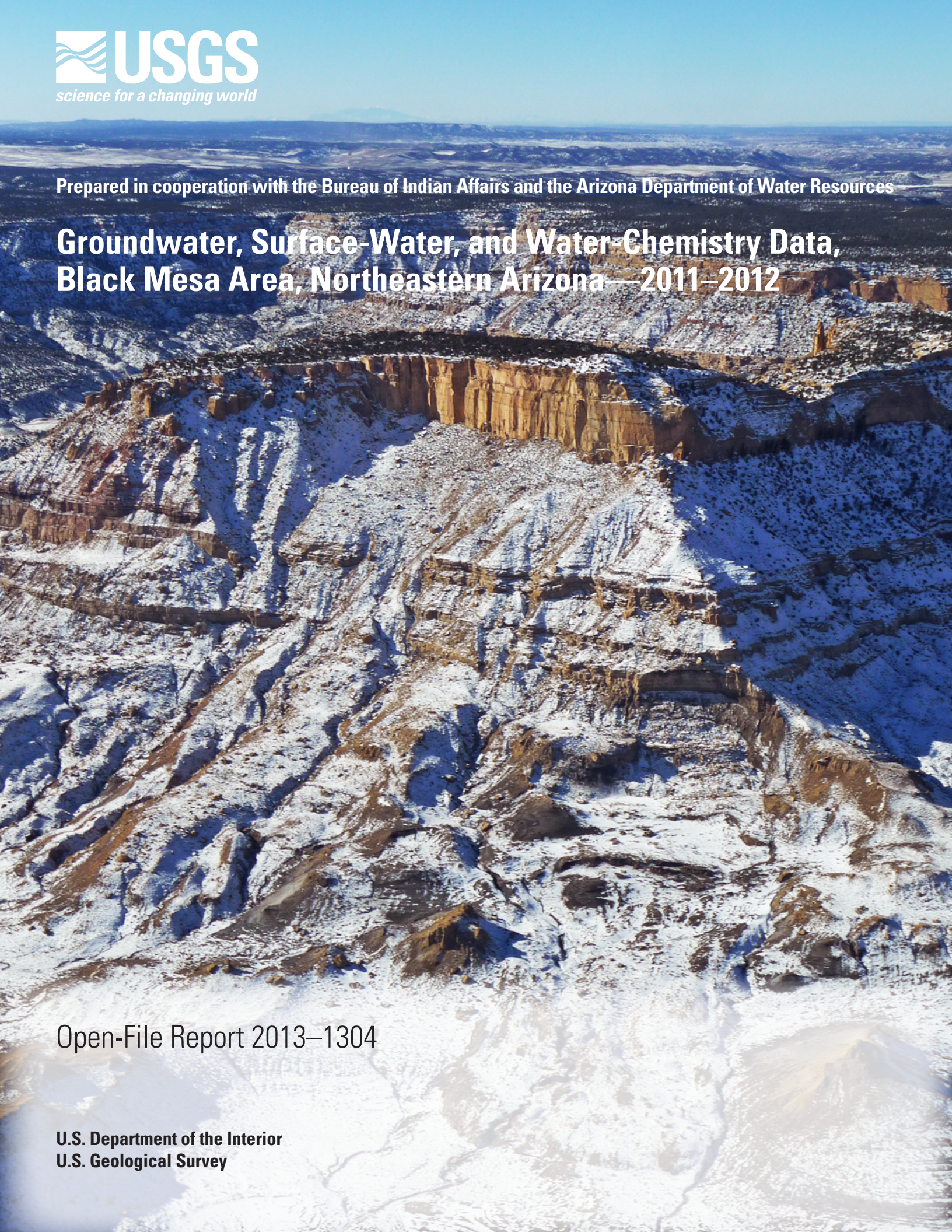
[2] Navajo's Upper Basin unresolved depletion claim of 47,000 AFY in Arizona was converted to an unresolved diversion claim for Tribal Water Study modeling purposes by applying a 61 percent efficiency for a diversion right of 77,049 AFY.

Exhibit 2

USGS
science for a changing world

Prepared in cooperation with the Bureau of Indian Affairs and the Arizona Department of Water Resources

Groundwater, Surface-Water, and Water-Chemistry Data, Black Mesa Area, Northeastern Arizona—2011–2012



Open-File Report 2013–1304

U.S. Department of the Interior
U.S. Geological Survey

FRONT COVER
Photograph of Black Mesa, Arizona, looking southwest towards the San Francisco Peaks on the horizon. U.S. Geological Survey photograph by Jon Mason.

Groundwater, Surface-Water, and Water-Chemistry Data, Black Mesa Area, Northeastern Arizona—2011–2012

By Jamie P. Macy and Joel A. Unema

Prepared in cooperation with the Bureau of Indian Affairs and the Arizona Department of Water Resources

Open-File Report 2013–1304

U.S. Department of the Interior
U.S. Geological Survey

U.S. Department of the Interior
SALLY JEWELL, Secretary

U.S. Geological Survey
Suzette M. Kimball, Acting Director

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Suggested citation:
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ISSN 2331-1258 (online)

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Conversion Factors and Datums

Multiply	By	To obtain
	Length	
inch (in.)	2.54	centimeter (cm)
inch (in.)	25.4	millimeter (mm)
foot (ft)	0.3048	meter (m)
mile (mi)	1.609	kilometer (km)
	Area	
square mile (mi^2)	2.590	square kilometer (km^2)
Volume		
acre-foot (acre-ft)	0.001233	cubic hectometer (hm^3)
	Flow rate	
cubic foot per second (ft^3/s)	0.02832	cubic meter per second (m^3/s)
gallon per minute (gal/min)	0.06309	liter per second (L/s)
gallon per year (gal/yr)	3.785	liter per year (L/yr)

Temperature in degrees Celsius (°C) may be converted to degrees Fahrenheit (°F) as follows: °F=(1.8×°C)+32
Vertical coordinate information is referenced to the National Geodetic Vertical Datum of 1929 (NGVD 29).
Altitude, as used in this report, refers to distance above the vertical datum.
Horizontal coordinate information is referenced to the North American Datum of 1927 (NAD 27).
Specific conductance is given in microsiemens per centimeter at 25 degrees Celsius (µS/cm at 25°C).
Concentrations of chemical constituents in water are given either in milligrams per liter (mg/L) or micrograms per liter (µg/L).

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Groundwater, Surface-Water, and Water-Chemistry Data, Black Mesa Area, Northeastern Arizona—2011–2012

By Jamie P. Macy, and Joel A. Unema

Abstract

The Navajo (N) aquifer is an extensive aquifer and the primary source of groundwater in the 5,400-square-mile Black Mesa area in northeastern Arizona. Availability of water is an important issue in northeastern Arizona because of continued water requirements for industrial and municipal use by a growing population and because of low precipitation in the arid climate of the Black Mesa area. Precipitation in the area typically is between 6 and 14 inches per year.

The U.S. Geological Survey water-monitoring program in the Black Mesa area began in 1971 and provides information about the long-term effects of groundwater withdrawals from the N aquifer for industrial and municipal uses. This report presents results of data collected as part of the monitoring program in the Black Mesa area from January 2011 to September 2012. The monitoring program includes measurements of (1) groundwater withdrawals, (2) groundwater levels, (3) spring discharge, (4) surface-water discharge, and (5) groundwater chemistry.

In 2011, total groundwater withdrawals were 4,480 acre-ft, industrial withdrawals were 1,390 acre-ft, and municipal withdrawals were 3,090 acre-ft. Total withdrawals during 2011 were about 39 percent less than total withdrawals in 2005 because of Peabody Western Coal Company's discontinued use of water to transport coal in a slurry. From 2010 to 2011 total withdrawals increased by 11 percent; industrial withdrawals increased by approximately 19 percent, and total municipal withdrawals increased by 8 percent.

From 2011 to 2012, annually measured water levels in the Black Mesa area declined in 8 of 15 wells that were available for comparison in the unconfined areas of the N aquifer, and the median change was -0.1 feet. Water levels declined in 9 of 18 wells measured in the confined area of the aquifer. The median change for the confined area of the aquifer was 0.0 feet. From the prestress period (prior to 1965) to 2012, the median water-level change for 34 wells in both the confined and unconfined areas was -13.4 feet; the median water-level changes were -2.1 feet for 16 wells measured in the unconfined areas and -39.1 feet for 18 wells measured in the confined area.

Spring flow was measured at four springs in 2012. Flow fluctuated during the period of record for Burro and Unnamed Spring near Dennehotso, but a decreasing trend was apparent at Moenkopi School Spring and Pasture Canyon Spring. Discharge at Burro Spring has remained relatively constant since it was first measured in the 1980s and discharge at Unnamed Spring near Dennehotso has fluctuated for the period of record. Trend analysis for discharge at Moenkopi and Pasture Canyon Springs yielded a slope significantly different from zero.

Continuous records of surface-water discharge in the Black Mesa area were collected from streamflow-gaging stations at the following sites: Moenkopi Wash at Moenkopi 09401260 (1976 to 2010), Dinnebito Wash near Sand Springs 09401110 (1993 to 2010), Polacca Wash near Second Mesa 09400568 (1994 to 2010), and Pasture Canyon Springs 09401265 (2004 to 2010). Median winter flows (November through February) of each water year were used as an index of the amount of groundwater discharge at the above-named sites. For the period of record of each streamflow-gaging station, the median winter flows have generally remained constant, and there are no significant statistical trends in groundwater discharge.

In 2012, water samples collected from 10 wells and 4 springs in the Black Mesa area were analyzed for selected chemical constituents, and the results were compared with previous analyses. Concentrations of dissolved solids, chloride, and sulfate have varied at all 10 wells for the period of record, but neither increasing nor decreasing trends over time were found. Dissolved solids, chloride, and sulfate concentrations increased at Moenkopi School Spring during the more than 12 years of record at that site. Concentrations of dissolved solids, chloride, and sulfate at Pasture Canyon Spring have not varied significantly since the early 1980s, and there is no increasing or decreasing trend in those data. Concentrations of dissolved solids, chloride, and sulfate at Burro Spring and Unnamed Spring near Dennehotso have varied for the period of record, but there is no increasing or decreasing trend in the data.

Introduction

The 5,400-mi^2 Black Mesa study area in northeastern Arizona contains diverse topography that includes flat plains, mesas, and incised drainages (fig. 1). Black Mesa, a topographic high at the center of the study area, encompasses about 2,000 mi^2. It has 2,000-foot-high cliffs on its northern and northeastern sides, but it slopes gradually down to the south and southwest. Availability of water is an important issue in the study area because of continued groundwater withdrawals, the growing population, and an arid to semiarid climate with average annual precipitation ranging between 6 and 14 in. (U.S. Department of Agriculture, 1999). The Navajo (N) aquifer is the major source of water for industrial

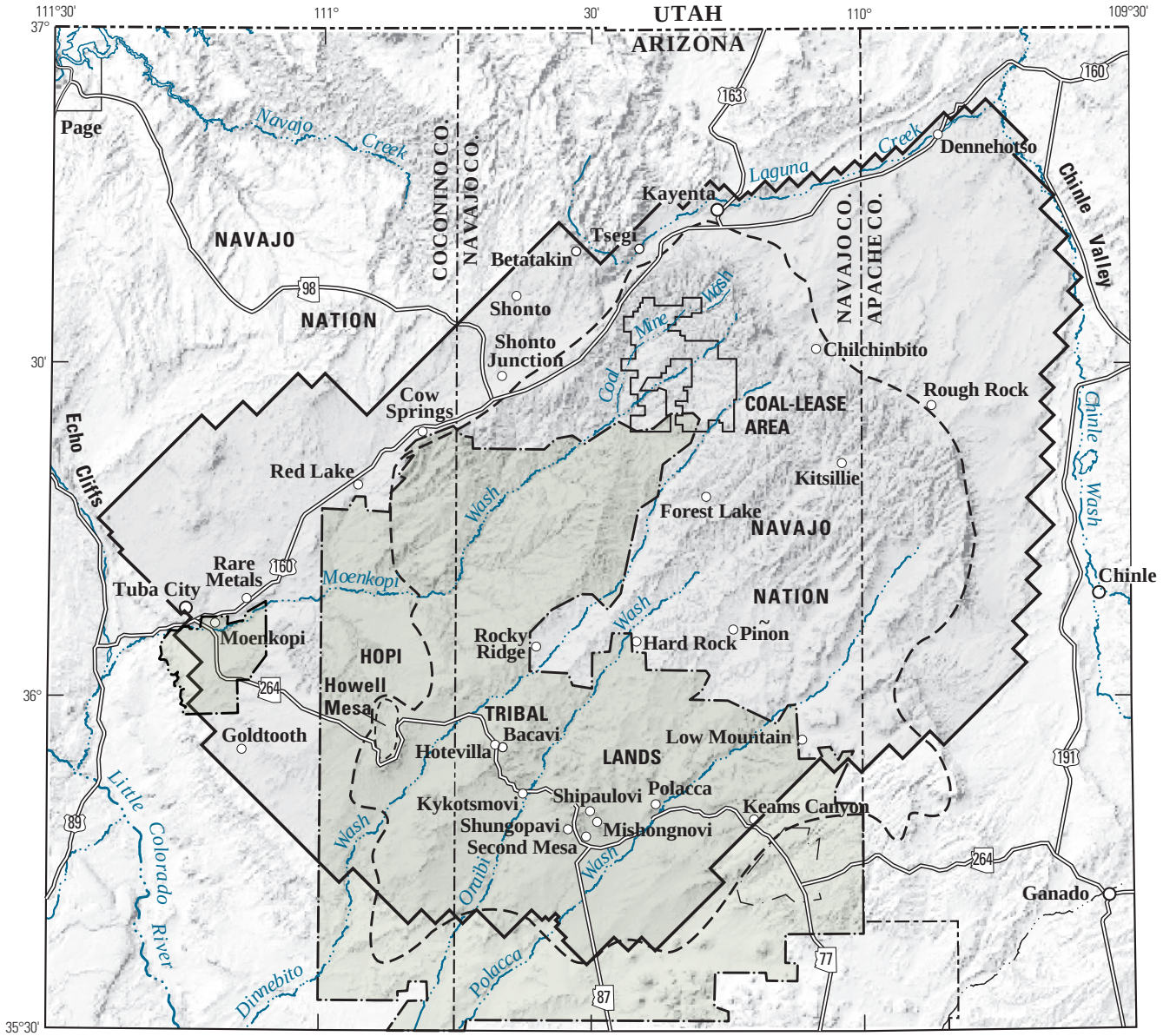


Figure 1. Map showing location of study area, Black Mesa area, northeastern Arizona.

Exhibit 3

THE HOPI TRIBE

[1]

[1] Second Mesa Culture Center Website 2016

Hopi Tribe
Comprehensive Economic Development Strategy

2018

U.S. Economic Development Administration

Prepared by:
Hopi Tribe Office of Community Planning and Economic Development and Land Information Systems
OCPEDLIS

Hopi Tribal Council

Executive Branch
Timothy L. Nuvangyaoma, Hopi Tribal Chairman
Clark W. Tenakhongva, Hopi Tribe Vice Chairman
Wilfred L. Gaseoma, Tribal Treasurer
Theresa Lomakema, Tribal Secretary
Alfonso Sakeva Jr., Sergeant at Arms

Village of Bakabi
Clifford Qotsaquahu
Lamar Keevama
Davis Pecusa

Upper Village of Moencopi
Robert Charley
Leroy Shingoitewa
Bruce Fredericks
Philton Talahytewa, Sr.

Village of Sipalouvi
Norene Kootswatewa
Alverna Poneoma
Rosa Honani

Village of Kykotsmovi
David Talyumptewa
Jack Harding Jr.
Phillip Quochytewa Sr.
Herman G. Honanie

Village of Mishongnovi
Pansy K. Edmo
Craig Andrews
Annette F. Talayumptewa

First Mesa Consolidated Villages
Albert T. Sinquah
Wallace Youvella, Sr.

THE FOLLOWING VILLAGES CHOOSE TRADITIONAL GOVERNMENT AND DO NOT HAVE VILLAGE REPRESENTATION ON THE TRIBAL COUNCIL.

Village of Shungopavi
Village of Oraibi
Village of Hotevilla
Village of Lower Moencopi

Table of Contents

Executive Summary

The Hopi Comprehensive Economic Development Strategy (herein after known as –CEDS") has been prepared by the Hopi Tribe to serve as a guide to assist the tribe in promoting greater economic development and economic self-sufficiency for the Hopi people and their reservation communities. The CEDS examines and evaluates the current state of the Hopi Tribe's infrastructure and facilities as necessary components of the tribe's overall plan to develop and maintain its reservation lands as a permanent sustainable homeland for the Hopi people. The CEDS will also identify the economic development challenges facing Hopi through an examination of the policies and procedures that either help or hinder Hopi in the pursuit of its strategic objectives, along with an analysis of proposed projects and their possible impacts on the Tribe's present and future economic development and upon its members. The assertion of its sovereignty and establishing a strong strategic plan and organization, along with good leadership will enhance the ability of the Hopi Tribe to implement the CEDS framework. The framework or viewpoint of the CEDS will be to assess the Tribe's current situation and offer recommendations and strategies for improving and to continuing a resilient and sustainable Tribal nation. The CEDS is a living document that reviews all projects whether under EDA or other Federal funding and actively annually updated by consultant Joelynn Ashley 2015 to 2017. The tribe intends to review and update the CEDS annually as a collaborative effort lead by OCPEDLIS.

The CEDS had identified and reviewed the current external national and state policies regarding climate change and the economic challenges and threats posed by this issue for the Hopi Tribe through the Clean Air Act (CAA). The national movement has swayed the pendulum from fossil fuels to renewable energy, given the decline with natural gas. Having no tax base, the Hopi Tribe over the last 40 years has relied on its Black Mesa coal leases with Peabody Energy to produce the bulk of its governmental revenues. The coal revenues have been relied on historically to produce 88%[2] of the Hopi Tribe's General Fund – the revenues that are used to fund the essential

[2] *Analysis of Economic Impacts on the Hopi Tribe and Navajo Nation of a Stringent NOx BART Decision for the Navajo Generating Station, March 1, 2010*, Pg. 39. Prepared for the Hopi Tribe. ICF Resources, LLC, Fairfax, VA 22031 *Letter Dated March 1, 2010 from Leroy Shingoitewa, Chairman, Hopi Tribal Council, to Jared Blumenfeld, EPA; Document number 0211 in the docent for the ANPRM: EPA-OAR-2009-0598.*

governmental services provided by the Tribe to its people. Fueled by growing concerns over global climate change, dramatic changes in federal environmental policies with respect to coal-fired energy production pose huge economic challenges for the Tribe, which will essentially face a collapse of its economy if its coal sales were to end with a potential closure of the Navajo Generating Station (NGS) located in Page, Arizona.

The Hopi Tribe is among the most underdeveloped and most vulnerable populations in the United States and has already suffered enough from stringent and inflexible environmental regulations.[3] The shutdown of the Mohave Generating Station (MGS) has already imposed a highly disproportionate economic burden on the Tribe. The shutdown of NGS, the sole remaining buyer of Hopi coal after environmental regulations shut down MGS ten years ago, would devastate the Hopi Tribe…"[4] The Hopi have suffered lost the revenues from MGS, a lost between $3.6 million to $6.8 million[5], as a result of these challenges and that the loss of NGS will spell economic calamity in the absence of alternative revenue sources and a diversified economy that is not heavily dependent on a single revenue source.

The CEDS will discuss how the climate change and the change in the energy industry continues to affect the tribe's future finances and will review current tribal policies, plans and proposed projects in light of the challenges posed for the Hopi Tribe by climate change and the current state of the energy market. In order to deal with the continued challenges the Hopi Tribe's goal will be to increase jobs opportunities, housing, and overall economic growth by creating and developing a sustainable economy for the future generations of Hopi members. At the same time, the CEDS must be used to implement in a way that protects and respects the cultural and natural resources of the Hopi People, in particular, their land and water.

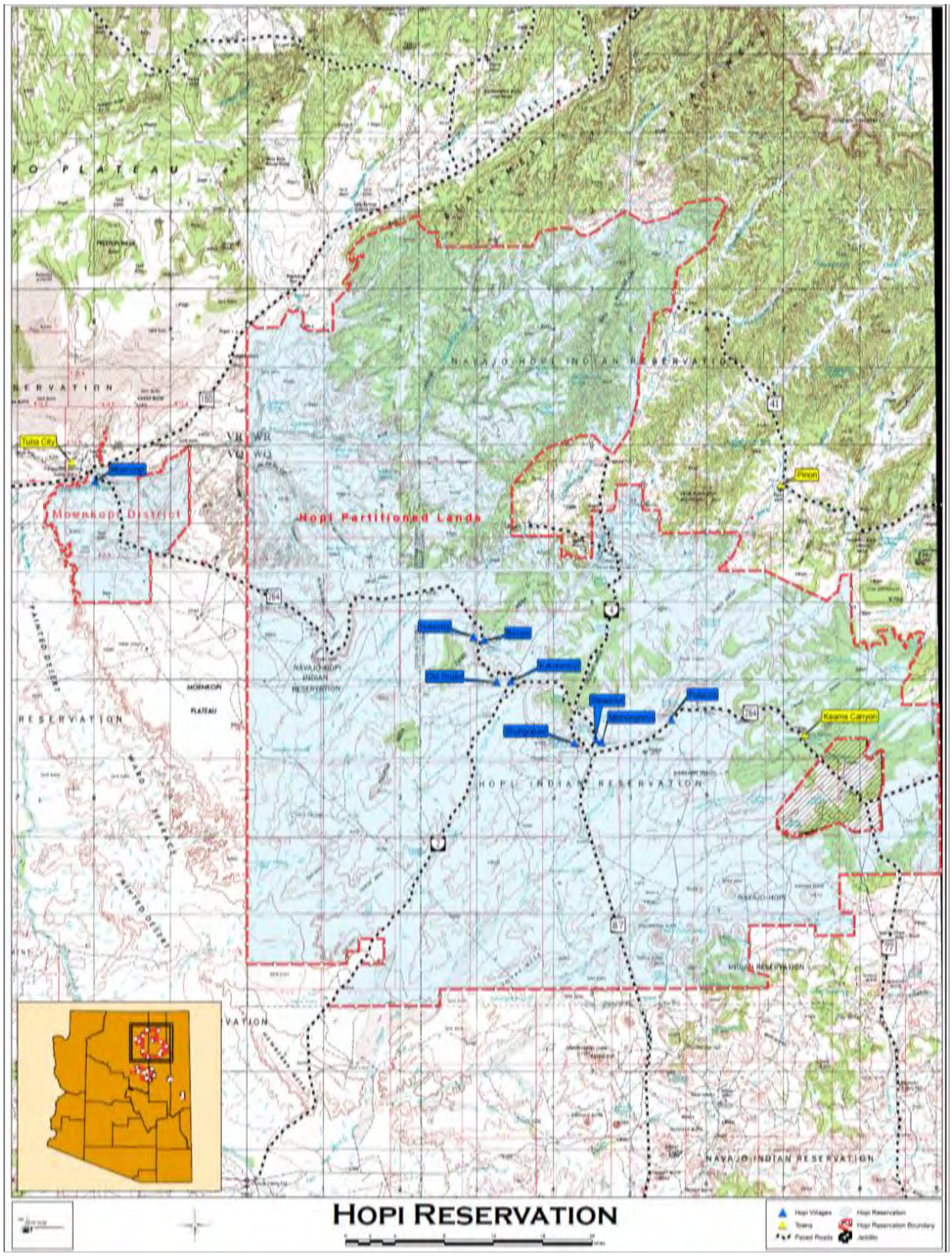
The CEDS is comprehensive in nature and is intended to create a collective inventory of the critical needs, projects/problems, and opportunities for a resilient Hopi economic development plan. The CEDS focuses on the critical need for water, sewer and electrical infrastructure and need to strengthen the Tribe's ability to organize and move a project moving forward towards completion, including actual construction. The strategy

[3] *Ibid at pg 7.*
[4] *Ibid at pg 7.*
[5] *Ibid at pg 7.*

will incorporate input and guidance from the Hopi Tribe‘s Tribal Government, as well as from the autonomous Hopi Villages, and individual community members.

The Village and Clan authority over lands and sacred sites are included as part of the CEDS. The CEDS will be utilized as a document not only for planning economic development, but also as a means of protecting the Village‘s right to develop their own plans for future housing, small to major infrastructure improvements/developments and other initiatives within each village‘s jurisdiction. The Villages are in control of planning and development, both by growth in housing or by other economic development. Village efforts are included into the CEDS so that the document can create awareness for all members; even where no development is planned leaving the village to handle its own growth, according to its own decisions as time goes forward.

The Hopi Comprehensive Economic Development Strategy will be a guide for the Tribal Council, the Villages and the people to be utilized for applying for federal, state, and local funding opportunities that will assist the tribe in facing the challenges of building a sustainable homeland in a remote reservation environment with few direct links to the regional and national economies.


Hopi Partitioned Lands
Moenkopi District
Tuba City
Pinon
Keams Canyon
HOPI INDIAN RESERVATION
NAVAJO-HOPI INDIAN RESERVATION
HOPI RESERVATION

Scope of Plan

This plan has a ten – fifty-year scope and focuses on the essential framework of where the Tribe and its internal departments and programs will be over the years leading to the next 2017 CEDS summary through a strategic analysis utilizing the SWOT analysis, consisting of identifying the Strengths, Weaknesses, Opportunities and Threats. The 2017 CEDS SWOT analysis will then work on identifying the strategic direction and action plan, followed by an evaluation framework, through various public meetings and work sessions conducted over a period of time. Each section has identified tribal departments/programs, which have set a goal and list of priorities that will be setting the short or long terms plans through the CEDS. The recovery from the projected future loss of the tribe‘s coal revenues will be critical in lessening the economic impacts on the Hopi Tribe and its members. This plan will serve as the foundation for both direct short term and future long range planning in that effort.

The CEDS will compile the list or inventory for all major projects and identify the priority listing for key or necessary projects. Those projects will then be reviewed to determine their strengths, weaknesses, opportunities and threats (SWOT) through continued updates for the CEDS.

Looking to the Future

The Hopi Tribe‘s elected officials will set the policies and plans that will guide the departmental staff in implementing strategies aimed at diversifying the tribe‘s economy away from dependency on coal revenues through development of other forms of revenue income. By diversifying the tribe‘s economy through strategically planned and implemented economic development, the Hopi Tribal Council will have the opportunity to create a self-sustaining economy that reflects the core Hopi traditional and cultural values that have sustained the Hopi in their homeland over many hundreds of years. The approach will be to set goals/recommendations to implement the work.

Community and Economic Development Strategies

- Energy and Renewable Energy Development
- Businesses such as Solar and/or Wind Development
- Eco and Cultural Tourism –Center of the World" concept
- Tawa'ovi as a main destination
- Traveling Tourists visit to a Hopi Visitor Center
- Traditional Hopi Farming
- Light industrial and manufacturing
- Hopi Constitution and creating a tax base
- Hopi Tribe Gaming
- Hopi Business Council
- Hopi Tribe Elections and Terms

Improvement to the Quality of Life

- Safe Drinking Water
- Housing
- Veterans Center
- Senior Citizen Center
- Youth Center and/or Boys and Girls Club
- Self-Sustaining Hopi Tribal Utility Authority
- Utility infrastructure (water, sewer and energy

The vision statement, goals and objective should respond to the analysis of the area's development potential and problems (i.e., SWOT analysis). The goals should reflect the desires of most regional stakeholders and should also be realistic and limited to a manageable number.[6] Some should address things that can be realized within a short period of time, while others require a longer period for implementation. The vision, goals, and measureable objectives will provide a strategic framework for public and tribal decision-making and serve as the basis for the formulation and focus of the action plan.

[6] CEDS Content Guidelines FY 2015 pdf.

Introduction

The Hopi Tribe's Office of Community Planning and Economic Development (OCPED) has secured a grant through the U.S. Department of Economic Development Administration. The objective of the grant has been to help the Hopi Tribe update the Hopi Tribe Comprehensive Economic Development Strategy (CEDS). The Hopi Tribe has faced a series of events that have lead the Hopi Tribe's Tribal Revenue to dwindle due to national to local policies surrounding the sale of the Hopi coal.

With the close of the Mohave Generating Station (MGS) in 2005, the Hopi Tribe suffered a devastating economic loss of many millions of dollars previously generated by coal sales to MGS. The Black Mesa mining operation supplied coal to the Mohave Generating Station from 1970 until December 2005, when the Black Mesa mining operation ceased delivering coal due to the suspension of Mohave Generating Station operation.[7] The Hopi Tribe is the tribe most dependent on a single source of coal revenues in the United States.[8] The Hopi Tribe must emphasize once more: the shut-down of NGS, the only remaining buyer of Hopi coal after environmental regulations shut down the Mohave Generating Station, would devastate the Hopi Tribe and greatly harm the Navajo Nation.[9]

The Hopi Tribe has never recovered from the economic impacts of the lost MGS revenues. Since 2010, the Hopi Tribe's comments on Climate Change Legislation and to the U.S. Environmental Protection Agency *In Re the Environmental Protection Agency's Advanced Notice of Proposed Rulemaking Regarding Best Available Retrofit Technology for Nitrogen Oxide Emissions at the Navajo Generating Station Docket Number EPA-R09-OAR-2009-0598*, have stressed the economic relationship of the Tribe to the Navajo Generating Station (NGS).

The March 2010 report prepared by the Hopi Tribe, and the ICF International Report on the *Analysis of Economic Impacts on the Hopi Tribe and Navajo Nation of a*

[7] Black Mesa Project EIS, ES-3 Executive Summary, November 2008.
[8] *Analysis of Economic Impacts on the Hopi Tribe and Navajo Nation of a Stringent NOx BART Decision for the Navajo Generating Station, March 1, 2010*, Pg. 38. Prepared for the Hopi Tribe. ICF Resources, LLC, Fairfax, VA 22031. *Letter Dated March 1, 2010 from Leroy Shingoitewa, Chairman, Hopi Tribal Council, to Jared Blumenfeld, EPA; Document number 0211 in the docent for the ANPRM: EPA-OAR-2009-0598.*
[9] *Ibid at pg. 38*

Stringent NOx BART Decision for the Navajo Generating Station, March 1, 2010[10] provided an overview of the tribe's historical economic relationship to the NGS plant. National Climate Change Policy has hit the Hopi Tribe once with the closure of MGS; the next chapter may well see those negative economic impacts magnified many times over if, as may be likely, the NGS plant eventually faces the same fate as MGS back in 2005.

The recent discussion will be the current proposed shut-down of NGS in December 31, 2017 or December 31, 2019. With the proposed imminent closure, the Hopi Tribe will directly lose 544 jobs and indirectly between 816-1,360 jobs. That will total 1,360 – 1,904 of jobs lost from the NGS plant closure. The total in payroll and benefits will be a total in 2009 dollars $8 million dollars for the Hopi Tribe. NGS and Federal Resource Planning Volume 1: Sectoral, Technical and Economic Trends Report by NREL, November 2016 states: (1) Electricity produced at NGS is currently more expensive than electricity purchased on the wholesale spot market; (2) Loss of revenue from surplus NGS power sales could harm water delivery and economic development, which is called the Arizona Water Banking Authority (AWBA), affecting future Federal Indian Water Rights Settlements; (3) Renewable energy, both utility scale wind and solar is in decline; (4) Arizona does have some productive solar resource potential in the U.S.; and (5) However, the State of Arizona continues to push for new developments of solar, wind and geothermal generation, which could all be used as part of the NGS transition strategy.

A recent report titled, Navajo Generating Station (NGS) and Federal Resource Planning Volume 1: Sectoral, Technical, and Economic Trends prepared by National Renewable Energy Laboratory (NREL), November 2016 was generated to work with stakeholders to develop a Navajo Generating Station roadmap.[11] The NGS Working Group intends to work with stakeholders, including NGS plant owners, Navajo Nation, Hopi Tribe, CAP, Gila River Indian Community and other Arizona Indian tribes who receive water from CAP, non-Indian CAP water users, and environmental and

[10] *Analysis of Economic Impacts on the Hopi Tribe and Navajo Nation of a Stringent NOx BART Decision for the Navajo Generating Station, March 1, 2010*. Prepared for the Hopi Tribe. ICF Resources, LLC, Fairfax, VA 22031 *Letter Dated March 1, 2010 from Leroy Shingoitewa, Chairman, Hopi Tribal Council, to Jared Blumenfeld, EPA; Document number 0211 in the docent for the ANPRM: EPA-OAR-2009-0598.*

[11] Navajo Generating Station & Federal Resource Planning Volume 1: Sectoral, Technical, and Economic Trends. November 2016 Prepared by National Renewable Energy Laboratory (NREL) pg. iv.

community groups, to develop a roadmap for accomplishing the goals described above.[12] The roadmap should include action recommendations and initial steps to begin implementing key recommendations.[13] It should be consistent with Federal trust responsibilities to federally recognize Indian tribes in the region[1].[14] The discussion with the stakeholders had met on January 4, 2013, the Department of the Interior, Department of Energy, and the Environmental Protection Agency formed a working group and released a Joint Federal Agency Statement that committed to a broad set of long-term goals for "producing clean, affordable, and reliable power, affordable and sustainable water supplies, and sustainable economic development, while maximizing negative impacts on those who currently obtain significant benefits from NGS, including tribal nations."[15]

July 1, 2017, the NGS agreements to allow for decommissioning after 2019 must be executed by the Navajo Nation and delivered to NGS participants. December 1, 2017, all necessary approvals of those agreements must be received, including any compliance required by U.S. December 22, 2019, unless agreements have been executed and all necessary approvals obtained to transfer ownership and operation of NGS to the Navajo Nation or other parties, decommissioning activities will commence.

The Navajo Generating Station (NGS) is a three-unit, 2,250 megawatt (MW) coal-fired power plant located on tribal trust lands lease from the Navajo Nation (Nation) near Page, Arizona.[16] The plant operates pursuant to the "Navajo Project Indenture Lease" (1969 Lease), which expires in December 2019.[17] In February 2017, the non-Federal NGS Participants (utility owners known as the Lessees) announced they no longer intend to operate NGS after December 2019.[18] The 1969 Lease generally requires the retirement[19] of certain NGS facilities after operations end, and the Lessees expect that

[12] *Ibid* at pg. iv.
[13] *Ibid* at pg. iv.
[14] *Ibid* at pg. iv.
[15] *Ibid* at pg. iv.
[16] Memorandum: Public Scoping for an Environmental Assessment Covering Navajo Generating Station Operations Through December 2019 and Retirement Activities Beginning in 2020 (Action by June 9, 2017), May 23, 2017 Pages 1-3.
[17] *Ibid* at pg. 1
[18] *Ibid* at pg. 1
[19] "Retirement" in this document refers to all work that will occur on the NGS lease site after power generation ends, including: decommissioning, demolition, and removal of facilities, restoration of lands, post-closure monitoring, and access. Retirement does not include reclamation activities associated with the Kayenta Mine, as required by the Surface Mining Control and Reclamation Act and as detailed the approved reclamation plan.

retirement activities will require two or more years to complete.[20] The NGS Lessees are in ongoing discussions with the Nation for a land use arrangement to allow NGS operations to continue through December 2019, and have retirement activities begin in 2020.[21] Without such an agreement, NGS would need to stop generating electricity by December 2017, so that retirement could be completed before the 1969 Lease expires in December 2019.[22]

The NGS Lessees and the Navajo Nation are considering options that would allow NGS operations to continue through December 2019, and provide for retirement beginning in January 2020.[23] Associated transmission uses also are being considered.[24] These matters are the subject of ongoing negotiations between the Navajo Nation and the NGS operator, the Salt River Project Agricultural Improvement, and Power District (SRP).[25] The form and terms of a potential agreement, are unknown at this time. Regardless of the form and terms of a potential agreement, the current Lessees do not plan on to generate coal-fired electrical energy at NGS after December 2019.[26]

National coal fired energy sales and national climate policy will eventually affect a major key aspect of the Hopi economy – the reliable source of electrical energy currently delivered to the reservation from the Arizona Public Service (APS) coal-fired power plant located in Joseph City, Arizona. This energy supply is delivered to the Hopi Tribe through a single 64 KV line to a small substation located in Keams Canyon Arizona. This substation then feeds one single line, with many spurs off the line from Keams Canyon to Third Mesa. National policy will take a heavy toll on the Hopi tribe, creating both the challenge and the urgency to create and implement an independent economic development strategic plan over the course of the next ten – fifty years.

The Hopi Tribal Government and its elected officials recognize that the urgency to commit the Tribe to reviewing and considering other options that will either diversify its coal revenues through developing avenues into other markets for its coal, -knowing well the foreseen closure of NGS at the end of December 2019 through the development

[20] Memorandum: Public Scoping for an Environmental Assessment Covering Navajo Generating Station Operations Through December 2019 and Retirement Activities Beginning in 2020 (Action by June 9, 2017), May 23, 2017 Pages 1
[21] *Ibid* at pg. 1.
[22] *Ibid* at pg. 1.
[23] *Ibid* at pg. 1.
[24] *Ibid* at pg. 1.
[25] *Ibid* at pg. 1.
[26] *Ibid* at pg. 1.

of other economic development revenue sources through renewable energy such as solar and/or wind. Proposed projects will be identified with a necessity to set priorities for implementation in the near future. The Hopi Tribe CEDS will identify possible future projects to increase employment and create a quality of life for all ages of Hopi Tribal members.

Hopi Tribal Organization

Hopi Tribal Government existed for many hundreds of years before the founding of the United States. Hopi governmental authority was traditionally exercised at the local village level through the religious leadership. In 1934 the Hopi chose to organize under a constitutional form of government under federal legislation known as "the Indian Reorganization Act of 1934". The Hopi Constitution established the Hopi Tribal Council as the governing body for all issues affecting the Tribe as a whole, while local matters were largely left to the village governments.

Hopi Traditional Sovereignty

As stated in one report concerning traditional Hopi government structure, "They remained largely self-sufficient communities, an agricultural and pastoral society under the leadership of village governments, each village continuing to exist as an independent sovereignty. Being a profoundly religious people, each Hopi Village government was headed by its principal spiritual leader, the Kikmongwi. The Kikmongwis and other religious leaders chosen by the various clans governed the religious and secular life of the village as their ancestors had for centuries before. Under the Hopi system, property rights were determined village by village, according to clan membership as determined by a system of matrilineal descent."[27]

Hopi Tribal Constitutional Government

Following a vote by the Hopi people adopting a constitution, on December 19, 1936, (As Amended on August 1, 1969; February 14, 1980 and December 7, 1993); the U.S. Secretary of the Interior approved a constitution for the Hopi Tribe under the Indian

[27] Report to the Hopi Kikmongwis and other Traditional Hopi Leaders on Docket 196 and the Continuing Threat to Hopi Land and Sovereignty. (1979). Indian Law Resource Center: Washington, D.C.

Reorganization Act of 1934. The Hopi Constitution established the Hopi Tribal Council and gave it the responsibility to protect traditional Hopi lands and its people, and to carry out the tribe's government-to-government relationship with the United States. The Hopi Constitution provides in Article III – Organization, that the following (list) villages are recognized: First Mesa (consolidated villages of Walpi, Shitchumovi, and Tewa); Mishongnovi, Sipaulavi, Shungopavi; Oraibi, Kykotsmovi, Bakabi, Hotevilla and Moenkopi.[28]

By organizing the Hopi Tribal Council, the Traditional Villages did not accept the modern form of government as reported back to the U.S. Federal Government. The traditional long-standing sovereignty of each village by way of the Kikmongwi had been challenged. Today, as recognized in the current Hopi Tribal Council organizational chart: the First Mesa Consolidated Villages: Walpi, Sichomovi, Tewa; Village of Shungopavi; Village of Oraibi; Village of Hotevilla and the Village of Lower Moencopi remain constant to historical and cultural religious beliefs of the traditional Kikmongwi.

Villages

All Hopi villages seem to be experiencing annual population growth. The traditional villages must deal with land ownership issues, of which are complicated in nature when it comes to clan, farm, home and/or village lands. However, under the Hopi Tribal government, some lands are being set aside for future communities that do not fall under strict land classifications per the traditional Kikmongwi. With this parallel plan for future economic development, the difficult dilemma facing the Hopi people is the task of maintaining Hopi values and other community values, while living and operating within a larger, more dominant society characterized by an entirely different set of values.[29] Finding a delicate balance to co-exist within the two worlds is difficult but necessary to achieve the Tribe's vision for the future without having to sacrifice the Hopi way.[30]

However, as such, the Hopi constitution's concept of the ~~"~~majority rule" defined by the U.S. Government, can sometimes lead to tensions between the council's leadership and that of the village leaders. The western principle of ~~"~~majority rule", by empowering

[28] Constitution and By-Laws of the Hopi Tribe Approved 19, 1936 and as Amended on August 1, 1969, February 14, 1980 and December 7, 1993. United States Department of Interior Office of Indian Affairs.
[29] Hopi Potskwaniat, November 29, 2011, pg 11.
[30] *Ibid at pg* 1.

the Council to make decisions by majority vote, rather than through the traditional religious leadership, was viewed by many Hopi as undercutting the rightful authority of the traditional Kikmongwi. Meanwhile, the "two world" concept is developing as a new way for villages to move forward into the future with ideas in developing new housing, schools, and small to large economic ventures, while at the same time remaining true to fundamental religious practices and teachings. Today, many villages continue to practice the traditional form of leadership and do not have elected individuals representing them on the Hopi Tribal Council. The "majority rule" western perception continues to be a point of contention when long time respect and understanding for the Kikmongwi traditional knowledge and ways have been in existence for hundreds of years prior to the "majority vote".[31]

Village Government

The Hopi Constitution states under Article VII – Land, Section 1. Assignment of use of farming land within the traditional clan holdings of Villages, as recognized by the Constitution, shall be made by each village according to its established custom, or such rules as it may lay down under a village Constitution adopted according to the provisions of Article III, Section 4. Unoccupied land beyond the clan and village holdings mentioned shall be open to the use of any member of the Tribe, under the supervision of the Tribal Council.[32] Each village has either a Community Service Administrator or appointed individual(s) as representatives to handle daily village matters.

Tribal Government

As the Hopi Constitution reads in the Preamble: This Constitution, to be known as the Constitution and By-Laws of the Hopi Tribe, is adopted by the self-governing Hopi and Tewa villages of Arizona to provide a way of working together for peace and agreement between the villages, and of preserving the good things of Hopi life, and to

[31] Note: The Hopi Tribal Government and its relationship to the various sovereign villages continue to have a variety of interpretations when dealing with who is a representative from a traditional village; either through a majority vote ruling or a kikmongwi appointment. This causes government to move slowly in its need to create a self-reliant government and economy. Voting is a challenge when many do not even come out to vote in Tribal elections.

[32] Constitution and By-Laws of the Hopi Tribe Approved 19, 1936 and as Amended on August 1, 1969, February 14, 1980 and December 7, 1993. United States Department of Interior Office of Indian Affairs.

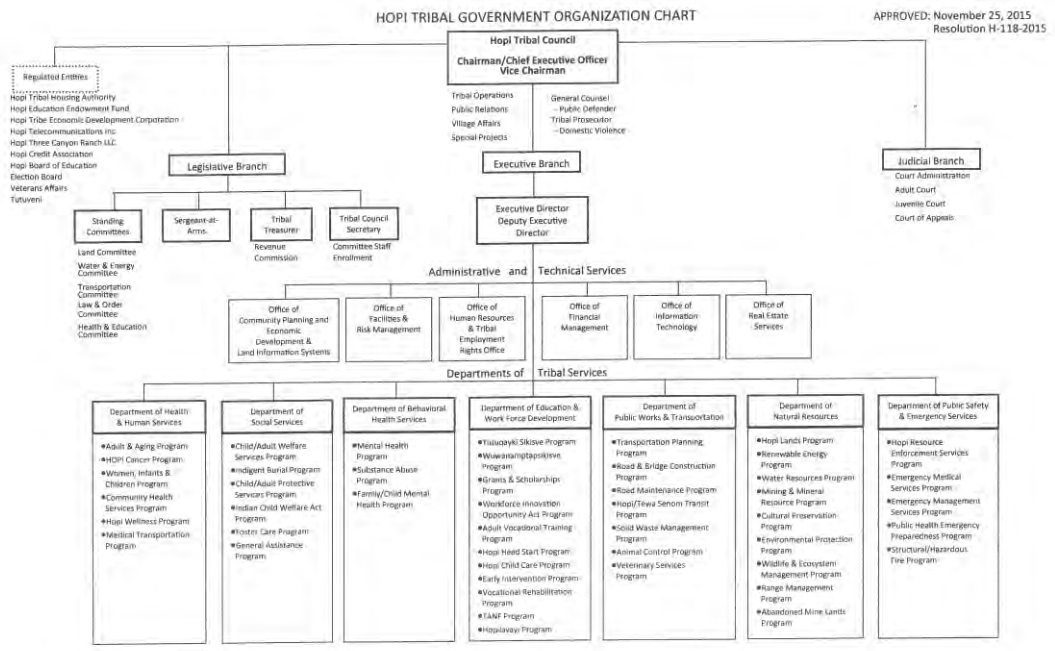
provide a way of organizing to deal with modern problems, with the United States Government and with the outside world generally.[33]

The Hopi Tribal Council votes to make tribal law/tribal ordinances and policy and conducts the day-to-day tribal business for both tribal village matters to the government-to-government relationships with the state and federal entities before the Hopi Tribal Council. The Tribal Council includes a Chairman, Vice Chairman, Secretary, and Treasurer and Village representatives based on the population of each village.

The Hopi Tribal Council recently adopted the Hopi Tribal Government Organizational Chart and Hopi Tribal Council Policy Statement Establishing Hopi Tribal Government Organizational Structure and Function, including appropriate funding to fully implement the new Organization Plan to become effective January 1, 2016; and hereby rescinds Resolution H-017-2001 and shall supersede and replace all prior resolutions that are inconsistent or in conflict with the intent, purpose and provisions of this Resolution.[34]

[33] Constitution and By-Laws of the Hopi Tribe Approved 19, 1936 and as Amended on August 1, 1969, February 14, 1980 and December 7, 1993. United States Department of Interior Office of Indian Affairs.
[34] Hopi Tribe Memorandum dated November 30, 2015, Approval of Hopi Tribal Government Organizational Chart and Hopi Tribal Council Policy Statement – A.I. #142-2015/Resolution H-118-2015.

Hopi Tribal Council Resolution H-118-2015[35]



November 30, 2015, the Hopi Tribal Council approved the Hopi Tribal Resolution H-118-2015.

The proposed reorganizational changes had been set below in two phases where the Hopi Tribal Government, worked to implement over time. Each of the phase have been completed with the newly approved H-118-2015 resolution.

Phase I:

- The Vice Chairman has no direct authority over the departments/programs that were under the office from the last reorganization of 1988/1989.
- The Council in the reorganization has created the Chief Executive Officer/Executive Director (CEO/ED) as the direct line of authority/supervision/accountability of all Department Managers and Directors. Departments include: Department of Natural Resources; Department of Community Health; and Department of Social Services;

[35] Note: Exhibit A: Currently the Hopi Tribal Council Reorganizational Chart is being reviewed for policy changes to implement Phase II of the organizational chart.

- Two Departments were abolished: Department of Human Services (DHS) and Tribal Department Manager.
- Three Departments realigned as separate departments are: Department of Education; Department of Social Services and Community Health Services.

Phase II:

- Two new Departments include: Public Works and Public Safety & Emergency Services.
- The CEO/ED has oversight of Administrative and Technical Services offices: the Offices of Finance, Human Services (Personnel), Management Information Systems (MIS) under the Hopi Office of Community Planning and Economic Development (OCPED).
- The Office of Realty Services; reporting as a department to the CEO/ED.
  (Phase II is currently being reviewed by Hopi Tribal Council task team.)

Recent Hopi Tribal Council H-118-2015 effective January 1, 2016

The Hopi Tribe, Executive Branch is accountable for implementing the laws, policies and ordinances approved and/or adopted by the Tribal Council. The Chairman and/or in his absence the Vice Chairman is responsible to conduct the day-to-day business of the Hopi Tribal government. The Executive Director is responsible for overseeing all tribal departments and programs. The Executive Director reports to the Hopi Tribal Council. The executive branch approvals include but are not limited to economic development, health, education, administrative services and support, natural resources and financial management. With the newly approved H-118-2015, the various committees reside under the Executive Branch consisting of: Hopi Tribal Housing Authority (HTHA), Hopi Education Endowment Fund (HEEF), Hopi Tribe Economic Development Corporation (HTEDC), Hopi Telecommunications, Inc, (HTI), Hopi Three Canyon Ranch, LLC, Hopi Credit Association, Hopi Board of Education, Election Board, Veterans Affairs, and Tutuveni.

The Hopi Tribe, Legislative Brach consists of the Standing Committees, Sergeant-at-Arms, Tribal Treasurer with the Revenue Commission and Tribal Council Secretary. The Standing Committees consist of: Land Committee (H-13-98; H-30-2016), Water and Energy Committee, Transportation Committee, Law and Order Committee and the Health and Education Committee.

The Hopi Tribe, Judicial Branch and court system interpret the Hopi Tribe's Constitution and enforce the tribe's ordinances and laws.

Current State of Hopi

The current state of the Hopi Tribe's investments has created a base or foundation to begin creating jobs. Hopi continues to lag behind other surrounding communities, such as neighboring communities on the Navajo Nation and other bordering towns. The possibilities and need for economic growth are clearly apparent when driving through the Hopi reservation, where only a few restaurants, grocery stores or even gas stations exist. The Hopi Government and surrounding villages rely heavily on federal funds for support. The Hopi government maintains all Indian Education and Self-Determination Act Public Law (P.L.) 93-638 funds that are in the form of contracts for various projects for Hopi. Other funds from the federal government constitute valuable sources of tribal revenues; however the key revenue income comes from the coal sales to Peabody Energy.

Background

The Hopi Tribe is located in northeastern Arizona estimates about 90 miles one-way from Flagstaff through, Coconino County, Navajo County, through the Navajo Nation lands along Indian Route 2. The main Hopi "1882 reservation" is isolated and entirely surrounded by the Navajo Nation. The location is remote and extremely rural, with the closest large economic centers being about 90 – 100 miles away from the main reservation. This isolation creates economic challenges for purchasing basic food and necessities when the people are forced to regularly travel to communities such as Flagstaff, Winslow and Gallup, just to shop and conduct the basic business activities of life. The Hopi Tribe's total membership is approximately 14,390[36] of which only an estimated 7,815 live and work on the reservation.

The Hopi Reservation, approximately 3,000 square miles in area, is comprised of lands surrounding the main population center (District 6), the adjoining Hopi Partitioned Lands (HPL), and the separated Moenkopi District[37] Additionally, Hopi lands are

[36] Hopi Tribal Enrollment Office, May 26, 2017 pdf file

located within two non-contiguous geographic areas referred to in this report as the 1882 Executive Order Reservation and the 1934 Act Reservation.[38] Lands within the 1882 Executive Order Reservation consist of areas known as District 6 and Hopi Partitioned Lands.[39] The 1882 Executive Order Reservation consists of approximately 2.5 million acres and was established by an Executive Order dated December 16, 1882 issued by President Chester A. Arthur.[40] The 1882 Executive Order Reservation is surrounded by the Navajo Reservation.[41] Lands within the 1934 Act Reservation consist of Moenkopi Village (sometimes referred to as Moenkopi Island) and allotted lands.[42]

Approximately 14,390[43] residents live on /off the Hopi Reservation within 14 residential communities or villages.[44] The majority of these residents live along the State Highway 264 corridor in villages near First, Second, and Third Mesas.[45] However, three outlying communities exist – Spider Mound and Keams Canyon to the east, and to the west the Villages of Moenkopi located adjacent to the Navajo community of Tuba City.[46]

The remote location creates challenges for responding to job opportunities, due to the one-way driving route of 90+ miles, take for example from Flagstaff driving to and from a job either living on the reservation or driving to the main Hopi headquarters. If housing for workers is not available on the reservation, commuting by the Hopi Senom Transit System is an option from any Hopi Village to, for example, the City of Flagstaff totaling a 180 mile round trip. This sort of commute is often mandatory if one wants to either find a job off reservation or work at a job on the reservation. This is a loss as far as travel time, and it is a double loss when the only large economic centers for groceries, clothing and other amenities are located in these various non-Indian communities. Because of this lack of a vibrant economy of businesses on the reservation, the Hopi Tribe and its members contribute a steady stream of tribal dollars to the economies of these surrounding non-Indian communities – all at the expense of much need on-

[38] *Final Hydrographic Survey Report for the Hopi Indian Reservation: In re The General Adjudication of the Little Colorado River System and Source.* Arizona Department of Water Resource. December 2015. Pg.1-1.
[39] *Ibid at pg 1-2*
[40] *Ibid at pg 1-2*
[41] *Ibid at pg 1-2*
[42] *Ibid at pg 1-2*
[43] Hopi Tribal Enrollment Office, May 26, 2017 pdf file
[44] 2010 Hopi Comprehensive Economic Development Strategy Prepared by The Office of Planning and Evaluation under an award from the U.S. Department of Economic Development Administration Project #07-84-06439.
[45] *Ibid at pg 5*
[46] *Ibid at pg 5*

reservation development. This economic loss is a significant loss to the Hopi Tribe; in that, a high percentage of a person's paycheck is spent off reservation for daily living necessities, such as food, clothing, and other household needs.

The Hopi cultural traditions and beliefs are intricately intertwined into the decision-making process when it comes to allocating land for use in economic development projects. The November 29, 2011 Hopi Potskwaniat (Hopi Strategic Plan) defines Hopi Values as: Preservation, practice and protection of the religion and ceremonies, cultural customs and practices; language, arts and crafts, etc., of the Hopi.[47] Because of its importance in Hopi culture, land use issues can sometimes present challenges (due to approvals and permits) to economic development by way of capital construction for housing, commercial buildings and other types of infrastructure. Traditional Hopi practices have strong ties to the land and natural resources. For example, the ongoing traditional practice of dry farming in an arid homeland continues to be a very visible aspect of Hopi life. Land practices and relations to clans and clan lands create binding limits for each village as they work to create their own economic development ventures through land approvals for housing and small commercial business sites. Across the main reservation as a whole, land use will continue to be constrained by traditional land values. The Hopi Tribe will continue to face case-by-case decision-making resolution of land use issues when it comes to deciding locations for future economic development.

Since at least the late 1990's, the Hopi tribal government has worked to generate economic development through the purchase of commercial developments off the main reservation, as a source of revenue and as an investment for the tribe. The ranch lands located on I-40, the Hart & Drye Ranch, the Clear Creek and Chevelon Ranch, and Aja Ranch; 26 Bar ranch near Springerville, AZ. There are also the agricultural lands in La Paz County, the Cibolla property. Additionally, Hopi lands that have been purchased include: commercial properties in Flagstaff, Sedona, Winslow, and Holbrook. The purchase of all these assets will help the Tribe improve and diversify the tribal government revenues.

[47] Hopi Potskwaniat, November 29, 2011 pg 10

The Tribal government will continue to look to increase and diversify economic revenue through commercial land purchases for the Tribe through Hopi development corporations overseen by a Board of Directors. The Tribal government has created the Hopi Tribe Economic Development Corporation (HTEDC) to examine future investments and other types of economic ventures that will allow the Tribe to increase its revenue. The Tawa'ovi Project is a master planned project overseen by the Hopi Tribal Council looking at creating a "new community" where tribal and non-tribal individuals can live, work and create other economic venues, such as small retail, visiting centers and tribal government expansion.

The Hopi Tribal Planning Ordinance No. 55, along with the Hopi Tribe Strategic Land Use and Development Plan give some indication for planning new proposed communities. The Hopi Tribe has proposed planned community developments such as: Yu Weh Loo Pahki known as Spider Mound; Tawa'ovi; Side Rock Well and Hollow Mesa East. The new communities could include: housing, commercial, government/institutional buildings, recreation, tourism/museum facilities and other small light industrial developments. These new developments would all be located on the main Hopi reservation lands. Off reservation community planned locations can be found on the Hopi ranch lands or at the Hopi Industrial Park location in Winslow, Arizona.

Socio Economic

The information gathered on the current 2017 Hopi population and economy is evolving and thus a best estimate may have to suffice for purposes of the CEDS used from the online Census.gov website that shows the latest from 2010-2015 census data for the Hopi Tribe. The Tribe collects data from various entities such as: U.S. Bureau of Indian Affairs (BIA), U.S. Bureau of Census, Arizona Department of Commerce Navajo and Coconino County offices as well as from other recent or ongoing projects utilizing recently collected statistics on household income, unemployment, labor force and other economic movement.

The census data, tribal enrollment records and tribal database are all ways to collect the data, however, due to the demographics; the definitions to analyze the data

must accommodate the current living conditions. This results in varying data and how to understand and utilize the data creates a unique analytical result.

Population

Census data has always been problematic for Hopi especially for the Tribe‘s use for applying for federal or other types of funding for proposed projects. There are traditional Hopi members who will decline to participate in any type of survey or count that may be conducted by the U.S. Census Bureau or the Tribe/Village. This reluctance to take a survey is due to historical trans-generational trauma from outsiders, especially from the people representing the U.S. federal government. There are other aspects, such as having a Hopi home on the reservation but, living and working off the reservation for part of the year, making it difficult to include such part-time residents in the count, and difficult to qualify for residential purposes. A varying percentage of Hopis live and work off the main reservation; however, return for ceremonies and other family obligations.

Hopi‘s Current Socio Overview

The current socio economic outlook set forth for the Hopi Tribe and its membership with the closure of NGS at the end of December 2019 will be re-evaluated to show even more changes in population migration to border towns to seek employment, or even further locations to seek housing, schools and employment.

The population of the Hopi Tribe grew moderately at 3.4% in the 2010 Census when compared to the previous ACS report 2000 Census. This increase in tribal members, however, may not truly reflect the actual change in the tribe between the census periods, because this rate reflects growth by birthrate alone and not growth through migration, as is the case with both the State and the County. The American Community Survey (ACS) data accounts for only the population within the exterior boundaries of the tribal lands. Both the State (24.6%) and the County (10.2%) grew at

much faster rates between the 2000 and 2010 Censuses.[48] The current 2010 – 2015 census data below from the table below states the current population of 14,390.[49]

Table 1. Total Population & Trends

Total Population and Trends	Arizona	Navajo County	The Hopi Tribe
Total Population 1990	3,665,228	77,658	8,258
Total Population 2000	5,130,632	97,470	10,571
Total Population 2010	6,392,017	107,449[50]	13,532[51]
Total Population 2014	6,479,703	108,101[52]	13,532
Total Population 2015	6,817,565[53]	108,277[54]	14,152[55]
Total Population 2016	6,931,071[56]	110,026[57]	14,282[58]
Total Population 2017	6,392,017[59]	107,656[60]	14,390[61]
Change in Population 2000-2010	24.6%	10.2%	*3.4%*

[48] *Demographic Analysis of the Hopi Tribe Using 2010 Census and 2010 American Community Survey Estimates*. Completed by: Arizona Rural Policy Institute, Center for Business Outreach, W.A. Franke College of Business Northern Arizona University.

[49] Hopi Tribe Office of Enrollment, May 26, 2017 pdf file

[50] US Census Bureau website for Navajo County, Arizona 2010 census.

[51] Hopi Tribal Enrollment office statistics by year.

[52] US Census Bureau website for Navajo County, Arizona 2014 estimate.

[53] Annual Estimates of the Resident Population: April 1, 2010 to July 1, 2016 census.gov

[54] Annual Estimates of the Resident Population: April 1, 2010 to July 1, 2016 census.gov

[55] Hopi Tribal Enrollment office telephone conversation June 2015.

[56] Annual Estimates of the Resident Population: April 1, 2010 to July 1, 2016 census.gov

[57] 2016 census.gov population estimate as of July 1, 2016.

[58] Hopi Tribal Enrollment Office, July 2016 email.

[59] 2010 Census Annual Estimates of the Resident Population: April 1, 2010 to July 1, 2016 census.gov

[60] 2015 census.gov ACS 5-year population estimate.

[61] Hopi Tribe Office of Enrollment, May 26, 2017 pdf file

Source: Census 1990, 2000, 2010 (census data spanning 10 year timeframes)

The average growth rate the Hopi Tribe utilized was the 2.5% increase in population over the course of 10 years. The 3.4% population increase clearly shows an increase in population growth over the last 5 years from 2010 to 2016. As such, the new percentage supports the need to increase planning and for key improvement projects both in the villages and within the tribe overall.

The Hopi on-reservation population is scattered throughout the 12 Hopi villages and other populated areas across the Hopi reservation. The main reservation is located along Arizona state highway 264 running between the Moenkopi villages in the west to Keams Canyon on the eastern side of the reservation. Another community is east, past Keams Canyon about 16 miles is the recent community named Spider Mound.

While most homes are located within or near the villages; some families obtain land leases located totally outside of the villages‘ land boundaries. Known as scattered-site housing, these home site locations are becoming important alternative places for the Hopi to build and live. If a home is outside village boundaries, then they either live near their livestock or near farmlands. Other locations include: Hopi Trust Lands in Winslow, on which are located 33 low income-housing units; all of which are occupied.

The data in Exhibit B shows the latest enrollment figures per an interview with the Hopi Tribe Enrollment Office[62]. According to the Hopi Tribe Enrollment Office, due to a lack of housing and other employment opportunities, many Hopi move off the reservation to seek housing and employment in the surrounding communities such as Holbrook, Winslow, Flagstaff and/or Phoenix, Arizona, or as far as Gallup or Albuquerque, New Mexico, where many off-reservation tribal members live.

[62] Hopi Tribal Enrollment Office, Data as of June 1, 2015.

Table B (2017)

Village	Population 2015[63]	Population 2016[64]	Population 2017[65]	Projected Population 2050[66]
Moenkopi Island	2,231	2,263	2,285	3,669
Upper Moenkopi				
Lower Moencopi				
Third Mesa				9,045
Bacavi	684	694	693	
Hotevilla	1,700	1,718	1,719	
Kykotsmovi	1,367	1,379	1,399	
Oraibi	505	506	512	
Second Mesa				6,874
Sipaulovi	711	725	733	
Mishongnovi	1,289	1,312	1,321	
Shungopavi	1,942	1,958	1,986	
First Mesa				3,241
Sichomovi	1,504	1,514	1,516	
Tewa	1,463	1,476	1,485	
Walpi	731	737	741	
Currently living ON HOPI	7,815	7,803	7,800	
Currently living OFF HOPI	6,312	6,479	6,590	
Total Hopi Enrollment	14,127	14,282[67]	14,390[68]	23,693[69]

Population Adjustment

[63] Note: 2015 data from Hopi Tribal Enrollment Office.
[64] Hopi Tribal Enrollment Office, July 2016 email.
[65] Hopi Tribe Office of Enrollment, May 26, 2017 pdf file
[66] Note: 2050 population numbers reflect the BOR Report of Findings October 2006. Current water supplies and demands will be unmet for the Hopi Tribe's projected population in 2050. The NCAWSS continued work will look at a regional alternative to meet the future demand.
[67] Hopi Tribal Enrollment Office, July 2016 email.
[68] Hopi Tribe Office of Enrollment, May 26, 2017 pdf file
[69] Note: The Hopi 2050 population column in Table B represents the overall projected population with trends of movement to proposed planned villages/communities. The numbers reflect growth through existing Census 2050 with the 2.5% increase in population projections; however, the percentage has gone from 2.5% to 3.4% over the course of time.

The Hopi Tribal data base shows an upward trend in population growth, increasing by 3.4% between 2000 and 2010, with little change in 2017 from 2016. As of June 2015, the Hopi total population is 14,127 with 7,815 living on the reservation and 6,312 living off the reservation. As of May 2017, the Hopi total population in one year has increased to 14,390 with 7,800 living on the reservation and 6,590 living off the reservation. Within one year the on reservation of membership shows a slight decrease by 12 members; where the number for the off reservation increased significantly by 167 members. An additional 650 non-tribal members live and work on the reservation for a total population living on the reservation 8,465. In the past, the Tribe will utilize the growth rate of 2.5% to project Hopi population figures. Due to the increase of 3.4% in population growth within a five-year time frame, the Tribe should use the current percentage of 3.4%.

The tribal members that live off the reservation seek other job opportunities as well as higher secondary education by way of obtaining a post-secondary college degree or vocational certification. Other reasons for living off the reservation may be seeking housing and other common household amenities that are not available on the reservation due to lack of water, sewer and electrical infrastructure.

Enrollment

The Hopi Constitution provides under Article II, the membership qualifications all Hopi have to meet. In some instances, some Hopis are not officially enrolled due to the membership requirements, although they speak Hopi fluently and live on/off the Hopi reservation. The Hopi tribal requirements for enrollment depend on documentation of parents and grandparents and the degree of Indian Hopi blood. Tribal membership provides individual eligibility of the various tribal programs such as: tribal housing, land assignments and grazing permits, scholarships, jobs and other various social service programs of the tribal government.

Population Change

The regional population change during the 2000's Arizona grew by 29% to over 6.6 million people.[70] The region grew ranging from Flagstaff's leading 22% growth to Winslow's less than 7%.[71] The only area included in the region's trade area that shrank was Gallup, New Mexico with a 2% decrease.[72]

POPULATION CHANGE[73]			
	April 2010	April 2014	Change
ARIZONA	5,130,632	6,629,455	29.20%
Apache County	69,423	76,156	9.70%
Coconino County	116,320	135,613	16.60%
Navajo County	97,470	114,780	17.80%
Flagstaff, AZ	52,894	64,693	22.30%
Holbrook, AZ	4,917	5,611	14.10%
Winslow, AZ	9,520	10,194	7.10%
Gallup, NM	20,209	19,979	-2.13%
Hopi Reservation	6,312	7,815	6.68%[74]

With net 9.7% increase of a -5,407 in Apache County to the east and net 17.8% for Navajo County (which contains most of the Hopi Reservation) and 16.6% for Coconino County to the west, the region not only lags the state in population growth, it is losing people relative to Arizona's population growth.[75] Given the region's relatively poor economic performance and low-income levels, it seems clear that lack of economic opportunity is a key factor driving this regional population loss.[76] The population trends is slight with a few percentages in different with the regional population statistics from 2016 to 2017. The continued numbers and percentages continues to stay steady with 2017 comparison numbers from 2010 to 2017, only slightly increasing by 1%. As the

[70] 2010 Hopi Comprehensive Economic Development Strategy Prepared by The Office of Planning and Evaluation under an award from the U.S. Department of Economic Development Administration Project #07-84-06439.
[71] *Ibid at pg 12.*
[72] *Ibid at pg 12*.
[73] *Ibid at pg 12*.
[74] Census.gov 2017 update with percentage
[75] *Ibid at pg 13*.
[76] *Ibid at pg 13*.

economy continues to grow, the population growth will continue to increase to catch up with regional population loss.

Trade Area Population

The relatively small population base of the Hopi Reservation at about 8,465 persons, even with the additional 10,194 population of Winslow, comprises a fairly small local trade area and labor market. The regional trade area grows to nearly 33,000 with the inclusion of neighboring Navajo towns such as Tuba City, adjacent to the Hopi village of Moenkopi, which occupies the southwest corner of the intersection of State Route 264 and US Route 160 on the northwestern portion of the reservation. Adding Flagstaff, Arizona and Gallup, New Mexico as well as bordering Navajo Census Designated Place (CDP), the trade area expands to just over 120,000.[77]

TRADE AREA POPULATION		
		April 2013
Hopi Reservation		8,435
Holbrook, AZ		5,611
Winslow, AZ		10,194
Flagstaff, AZ		64,693
Gallup, NM		20,209
Total Neighboring Places		12,326
Dilkon CDP	1,265	
Jeddito CDP	390	
Pinon CDP	1,190	
Tuba City CDP	8,225	
Hard Rock CDP	1,256	
Total Trade Area		**121,468**

[77] 2010 Hopi Comprehensive Economic Development Strategy Prepared by The Office of Planning and Evaluation under an award from the U.S. Department of Economic Development Administration Project #07-84-06439.

Given the importance of family to the Hopi culture, for Hopis not living on their homelands and participating in their religious ceremonies, the population out-flow has special meaning that far exceeds the economic impact.[78] The greatest impact for the economically displaced off reservation could be reality of a situation where their children and grandchildren will not be able to interact with their elders and are not exposed to the Hopi language or the guidance of learning the Hopi traditional ways on a daily basis.

Employment Area Population

The main reservation population of 7,800 members travel to local bordering towns, both out on the Navajo Reservation such as Tuba City and Jeddito as well as communities likes Winslow, Holbrook, Gallup and Flagstaff in order to satisfy the demand for jobs and other amenities that cannot be purchased on the main Hopi reservation. Driving long distances to these bordering communities on a daily basis is not unusual for Hopi tribal members.

Income

The percentage of families living below poverty on the national level has increased, making the local Hopi poverty rate increase across the reservation. Many Hopi are self-employed, earning varying incomes in the local arts, crafts and jewelry business. The data on levels of income from the ACS (American Community Survey) source is inconclusive. Occasional sales of crafts generate an estimate of $1.9 million, which is probably not only unreported but also unrecorded as it is used almost immediately to purchase needed items.[79]

The 2001 Tribal database shows an average annual on-reservation household income was between $8,637 to $15,776. Between 11% -13.6 of the households‘ income exceeds the Housing Urban Development (HUD) standards for poverty. By Hopi Health Services (HHS) standards, 61% of the households are below poverty level. By HUD standards, another 23% are in the Low and Very Low income categories and 6% are in

[78] *Ibid at pg 13*
[79] 2010 Hopi Comprehensive Economic Development Strategy Prepared by The Office of Planning and Evaluation under an award from the U.S. Department of Economic Development Administration Project #07-84-06439.

the moderate category. [80] The median family income on the Reservation has increased from $15,875 in 1999 to as much as $41,250 in 2007,[81] which continues to fluctuate with the new mean income of $43,778, yet the median is $37,754, still below the national average of $53,889.[82] The census reported the median family income for Hopi residents in 2005 as $15,875, which is less than one-half the median family income for Navajo County, Coconino County, and the state of Arizona. In 2005, the median family income for Hopi residents living in Moenkopi was substantially higher (more than double) than on the Reservation; this disparity is because Moenkopi residents have better income opportunities, i.e., working for Peabody Western Coal Company (currently Peabody Energy).[83]

Expenses such as mortgage payments, rental payments, utility and public service fees are not considered in determining poverty levels. Half the households are living in other forms such as rental housing or shelter. Of the owner occupied housing, 33.8% have no mortgage payments and only 2.4% are paying more than 30% of their income on mortgage payments.

Hopi Reservation and Off-Reservation Trust Land, AZ

Source: 2011-2015 American Community Survey 5-Year Estimates

Income and Benefits (In 2015 inflation-adjusted dollars)	Estimate	ACS Margin of Error
Total households	2,042	(+/- 123)
Less than $10,000	304	(+/- 73)
$10,000 to $14,999	158	(+/- 50)
$15,000 to $24,999	278	(+/- 79)
$25,000 to $34,999	218	(+/- 63)
$35,000 to $49,999	360	(+/- 77)
$50,000 to $74,999	449	(+/- 85)
$75,000 to $99,999	131	(+/- 45)
$100,000 to $149,999	100	(+/- 45)
$150,000 to $199,999	34	(+/- 26)
$200,000 or more	10	(+/- 12)
Median household income (dollars)	$37,754	(+/- 3,347)
Mean household income (dollars)	$43,778	(+/- 3,049

- See more at: https://www.census.gov/tribal/application/#sthash.Mu2JKLYR.dpuf

[80] *Ibid. at pg 10*
[81] Hopi Indian Reservation Socioeconomic Study prepared by SWCA, April 30 , 2008
[82] census.gov
[83] Hopi Indian Reservation Socioeconomic Study prepared by SWCA, April 30 , 2008

The 2017 Hopi median household income is $37,754[84], with an average $43,778[85] for the Navajo County, which continues to be lower than the average U.S. income of $53,889[86] utilizing the 2011-2015 American Community Survey 5-year estimates. The challenges for jobs on the Hopi given the median income summary of the 5-year estimate.

The Hopi reservation's major employment centers are through governmental agencies and/or government funded programs. The government jobs are dependable with the better salaries, health/insurance and retirement packages. The list includes: Hopi Tribal Government, the various schools (contract/grant), the Indian Health Services (IHS), the Bureau of Indian Affairs (BIA) and Bureau of Indian Education (BIE).

The table below shows the Hopi Tribe's major employers are:

Business/Employment	2015	2016	2017
Hopi Tribal Administration	491	564	561
U.S. Indian Health Service	261	260	262
Moencopi Legacy Inn/Denny's Restaurant/ affiliates	113	112	110
McGee's Trading Post/affiliates	50	50	49
Hopi Cultural Center Hotel/Restaurant	49	48	50
U.S. Department of Interior Law Enforcement Services	43	43	43
Kykotsmovi Village Store	39	38	38
U.S. Bureau of Indian Affairs (BIA)	20	20	20
Hotevilla Co-op Store	14	13	12
Total	**1,080**	**1,148**	**1,145**

There are 9 schools that start kindergarten through 12th grade in high school located within the Hopi Reservation. There are pre-kindergarten, Hopi Head start with facilities located throughout the Hopi communities.

[84] Census.gov
[85] Census.gov
[86] Census.gov

K-12 Schools	2015	2016	2017
Jeddito Public School (Arizona Public school)	40	40	41
Keams Canyon, (Grant School)	26	25	26
Hopi Jr. – Sr. High School (Grant school)	85	80	81
Hopi Mission (Parochial School)	20	20	20
Hopi Day School (Grant School)	41	40	40
First Mesa Day School (Grant School)	40	40	40
Second Mesa Day School (Grant School)	52	52	52
Hotevilla-Bacavi Community School (Grant School)	14	13	13
Moencopi Day School (Grant School)	42	42	42
Total	**360**	**352**	**355**

Note:[87]

The Hopi Tribe has recently faced revenue decreases due to the last 3 years of national to local economic reductions by hiring freezes, wage cutbacks, and other aspects that affect hiring and income revenue projections. This prediction of hiring freezes and/or budget restrictions due to budget cuts may occur over the next projected fiscal year of the Hopi Tribe. Current discussions by the Hopi Tribal Council indicate that there may be budget cuts and or restrictions. This proposed action would affect many in the way of reduction in force (RIF) and/or salary adjustments.

The major employment sectors on the Reservation in 2000-2017, according to the Strategic Land Use Development plan were: Manufacturing at 40%; Educational, Health and Social Services at 33%; Public Administration sectors that include Hopi Governmental Services, Bureau of Indian Affairs (BIA) and Indian Health Services at 26%; Wholesale and Trade at 7%; Transportation and Utilities at 4%, Construction and Agriculture at 11% each; and Finance, Insurance and Real Estate at 1%.[88] A majority of the jobs and the income are from income earned from the public administration sector; tribal government jobs, Indian Health Service and social services. In 2016 the centers

[87] Note: Many of the schools mentioned in the table are going through changes from being under Bureau of Indian Education (BIE) to grant schools.

[88] Socioeconomic Study in Support of a Hydrographic Survey Report for the Hopi Indian Reservation Socioeconomic Study April 30, 2008. Prepared by SWCA Environmental Consultants for Arizona Department of Water Resources. Pg. at 16

for major employment have not changed, showing that the percentages may have only changed slightly. From 2016 to 2017, the major employment centers continue to stay steady with job employment.

Exhibit II-2
Tribal Job and Revenue Loss if NGS Shuts Down

	PERMANENT JOB LOSS (#)		
	HOPI	**NAVAJO NATION**	**TOTAL**
Tribal Government[1]	400	N/A	400
Hopi Villages[2]	144	N/A	144
NGS[3]	-	436	436
Kayenta Mine[4]	-	380	380
Other Office[5]	N/A	N/A	N/A
Total Direct Job Loss[6]	544	816	1,360
Indirect Job Loss	816 – 1,360	1,224 – 2,040	2,040 – 3,400
Total Job Loss	1,360 – 1,904	2,040 – 2,855	3,400 – 4,759
	ANNUAL REVENUE LOSS (Million $)		
	HOPI	**NAVAJO NATION**	**TOTAL**
NGS[7]	14	N/A	N/A
Payrolls & Benefits[8]	8	N/A	N/A
Indirect Payrolls & Benefits[9]	12 - 20	N/A	N/A
Total[10]	34 - 42	140	174 - 182
CAP Water Repayment to Both Tribes (Million$/Year)[11]			$60-$90 (2016-2023)

[1] Hopi Tribal government employees totaled about 475. If NGS shuts down it assumes that the government would require 75 employees to maintain basic service. No information available for the Navajo Nation
[2] There are 12 Hopi Villages and assumes 12 employees from each village would lose jobs.
[3] 80% of 545 NGS employees are Navajos. (Source: Bureau of Reclamation /DOI comments to EPA date October 28, 2009, page 3)
[4] 90% of 422 Kayenta mine employees are Navajos. (Source: Bureau of Reclamation /DOI comments to EPA date October 28, 2009, page 3)
[5] Hopi Flagstaff offices
[6] Assumes multiplier effect of 1.5 to 2.5.
[7] Includes royalties, bonus, scholarships, and water payments. Annual Hopi revenue is projected for the period of 2019-2039. Navajo Nation revenue loss is estimated by subtracting payrolls & benefits from the total revenue and payrolls & benefits loss reported in the AZ governor's comments to EPA dated October 13, 2009.
[8] Hopi payrolls & benefits are estimated assuming Hopi per capita income in 2008 of $11,364 (Source: city-data.com) , 2.5% inflation, 30% benefits. For the Navajo Nation, information is not available.
[9] Assumes multiplier effect of 1.5 to 2.5.
[10] AZ Governor's comments to EPA dated October 13, 2009 on page 4 stated that NGS and Kayenta mine provide $140 MM in revenue and wages to the Navajo Nation and its tribal members. No breakdown is given.
[11] Source: CAP

Exhibit II-2[89]

The Hopi Tribal government loss of jobs was projected in this Exhibit II-2 to show the devastation if NGS revenue should either decrease or be eliminated for the 2016 CEDS. The concern today will be the decision announced NGS Lessees and the Navajo

[89] *Analysis of Economic Impacts on the Hopi Tribe and Navajo Nation of a Stringent NOx BART Decision for the Navajo Generating Station, March 1, 2010*, Pg. 39. Prepared for the Hopi Tribe. ICF Resources, LLC, Fairfax, VA 22031 *Letter Dated March 1, 2010 from Leroy Shingoitewa, Chairman, Hopi Tribal Council, to Jared Blumenfeld, EPA; Document number 0211 in the docent for the ANPRM: EPA-OAR-2009-0598.*

Nation are considering options that would allow NGS operations to continue through December 2019, and provide for retirement beginning in January 2020.[90]

According to an Economic Base Analysis prepared by the Arizona Department of Commerce, total employment on the Hopi Reservation is estimated to have been approximately 3,064 in 2010.[91] The employment was a low 149 per 1,000 residents, which is the lowest of all Arizona unincorporated areas. The number of jobs located on the Hopi Reservation (in 2001) was less than the 2,964 employed residents counted in the 2010 census, indicating that some residents commute to work in other communities.[92] The 2017 labor force was 2,876, with 2,507 employed and 369 unemployed.[93]

Between 2001 and 2004, the Hopi Reservation's employment fell nearly 25%, one of the largest declines in the state.[94] A gain was registered in utilities, but retail trade, accommodation and food services, and real estate and rental posted declines.[95] There was also a large drop in other general merchandise stores.[96]

Hopi Reservation and Off-Reservation Trust Land, AZ
Source: 2011-2015 American Community Survey 5-Year Estimates

Employment Status	Estimate	ACS Margin of Error
Population 16 years and over	5,947	(+/- 418)
In labor force	2,876	(+/- 282)
Civilian labor force	2,876	(+/- 282)
Employed	2,507	(+/- 256)
Unemployed	369	(+/- 119)
Armed Forces	0	(+/- 17)
Not in labor force	3,071	(+/- 319)
Civilian labor force	2,876	(+/- 282)
Unemployment Rate	12.8%	(+/- 3.8%)

Commuting to Work	Estimate	ACS Margin of Error

[90] Memorandum: Public Scoping for an Environmental Assessment Covering Navajo Generating Station Operations Through December 2019 and Retirement Activities Beginning in 2020 (Action by June 9, 2017), May 23, 2017 Pages 1-3.
[91] *Analysis of Economic Impacts on the Hopi Tribe and Navajo Nation of a Stringent NOx BART Decision for the Navajo Generating Station, March 1, 2010*, Pg. 39. Prepared for the Hopi Tribe. ICF Resources, LLC, Fairfax, VA 22031 *Letter Dated March 1, 2010 from Leroy Shingoitewa, Chairman, Hopi Tribal Council, to Jared Blumenfeld, EPA; Document number 0211 in the docent for the ANPRM: EPA-OAR-2009-0598.Ibid at pg 14*
[92] *Ibid at pg 14*
[93] See more at: https://www.census.gov/tribal/application/#sthash.Mu2JKLYR.dpuf
[94] *Ibid at pg. 14*
[95] *Ibid at pg. 14*
[96] *Ibid at pg 14*

Employment Status	Estimate	ACS Margin of Error
Workers 16 years and over	2,500	(+/- 259)
Car, truck, or van -- drove alone	1,432	(+/- 199)
Car, truck, or van -- carpooled	207	(+/- 73)
Public transportation (excluding taxicab)	53	(+/- 49)
Walked	190	(+/- 66)
Other means	23	(+/- 20)
Worked at home	595	(+/- 132)
Mean travel time to work (minutes)	17.3	(+/- 1.8)

Occupation	Estimate	ACS Margin of Error
Civilian employed population 16 years and over	2,507	(+/- 256)
Management, business, science, and arts occupations	924	(+/- 154)
Service occupations	527	(+/- 131)
Sales and office occupations	481	(+/- 102)
Natural resources, construction, and maintenance occupations	194	(+/- 70)
Production, transportation, and material moving occupations	381	(+/- 104)

Industry	Estimate	ACS Margin of Error
Civilian employed population 16 years and over	2,507	(+/- 256)
Agriculture, forestry, fishing and hunting, and mining	60	(+/- 50)
Construction	93	(+/- 47)
Manufacturing	159	(+/- 70)
Wholesale trade	0	(+/- 17)
Retail trade	256	(+/- 87)
Transportation and warehousing, and utilities	112	(+/- 48)
Information	9	(+/- 13)
Finance and insurance, and real estate and rental and leasing	50	(+/- 47)
Professional, scientific, and management, and administrative and waste management services	102	(+/- 67)
Educational services, and health care and social assistance	911	(+/- 137)
Arts, entertainment, and recreation, and accommodation and food services	248	(+/- 87)
Other services, except public administration	43	(+/- 31)
Public administration	464	(+/- 100)

Class of Worker	Estimate	ACS Margin of Error
Civilian employed population 16 years and over	2,507	(+/- 256)
Private wage and salary workers	685	(+/- 138)
Government workers	1,373	(+/- 190)
Self-employed in own not incorporated business workers	449	(+/- 107)

Employment Status	Estimate	ACS Margin of Error
Unpaid family workers	0	(+/- 17)

- See more at: https://www.census.gov/tribal/application/#sthash.va0uc7Cz.dpuf

The U.S. Department of Interior listed a labor force at only 6,123 in 2010, current 2017 labor force is 5,987 with the potential unemployment rate to increase up to 86.0% for the Hopi Reservation in 2017. The Center for Economic Advancement at the Arizona Department of Commerce lists the following unemployment figures for the first quarter of 2010.[97]

Moenkopi CDP[98]	21.5%
First Mesa CDP	16.0%
Second Mesa CDP	24.7%
Hotevilla-Bacavi CDP	14.2%
Kykotsmovi CDP	20.9%
Shongopovi CDP	45.3%
Keams Canyon CDP	18.6%
Jeddito CDP	28.3%

The Hopi Tribe showed an increase in job losses experienced throughout the reservation. The data collected shows the percentages for unemployment for Navajo County only; not including the national average. The Hopi Tribe continues to remain far below current national, state and county unemployment rates. The Hopi Tribe continues to remain at the percentages set in 2010-2017 with no increase in economic development, therefore no jobs.

The statistics show various perceptions for the Hopi Tribe and where the current job centers may be located; however, the challenges that continue would be the lack of jobs for all that live on the Hopi reservation. The Hopi Tribe and its government will need to identify the main goal and set policies or plans on increasing the standards of living and close the income gap.

Goal: Increase public facilities and generate jobs along with the local Hopi economy.
Objectives:

[97] *Ibid at pg 14*
[98] Note: CDP stands for Census Designated Place.

1. The Tribe will identify all Hopi investments and assets that can create jobs.
2. The Tribe shall continue to pursue funding opportunities for small to large commercial start up projects from small commercial to large tribal projects.
3. Include educational programs and work force workshops for all ages.
4. Provide support for increased law enforcement and other public safety awareness.
5. Support an on-going fire safety program, including local schools for inspections to make buildings fire safe. This includes having the water infrastructure to ensure fire protection for all private, schools, public and other tribal infrastructures throughout Hopi.

Education

Hopi‘s current education system includes 7 elementary schools, Moenkopi Day School, Hotevilla-Bacavi School, Hopi Day School, Second Mesa Day School, First Mesa Day School, and Hopi Mission School, Keams Canyon Elementary School. These 6 of the 7 schools receive full funding from the Bureau of Indian Education (BIE); Hopi Mission School is privately funded.

The Hopi Board of Education, made up of Members from each school, is regulated entity that reports directly to the Hopi Tribal Council. The purpose is to develop a more consistent education policy. The existing education ordinance was developed under the BIA, now known as the Bureau of Indian Education. The Department‘s goal is to structure the ordinance to meet the education needs of the Hopi people according to the current Arizona State Standards on providing a quality education.

The Hopi Tribe‘s Education office indicated, through direct conversation with Director, Dr. Noreen Sakiestewa, the changes that will be required in order to meet the challenges of education on Hopi. According to Dr. Sakiestewa, the needed change will be in the form of having the Hopi Tribal Education Department take control of the grant schools. These schools would then be under the direct supervision and oversight of the Hopi Education Department.

The purpose or strategy behind this change would be to provide a quality education that incorporates strengthening the Hopi language, culture and history into the curriculum and strengthens nation building through K-12 education. The core values of Hopi would be able to be translated to the children through western teachings through

academia; however, strengthening the Hopi'lavayi into the K-12 core curriculum would enhance values of sovereignty at an early age of 5.

Education has been a high priority for the Hopi people. In 2000 the tribal council established a Hopi Education Endowment Fund (HEEF) of $10 million. HEEF was created by tribal ordinance, through a tribal resolution, to preserve and protect the education fund. The Hopi Endowment Education Fund receives most of its annual funding from Peabody Energy (formally Peabody Western Coal Company) – based coal revenues.[99] The Hopi Tribe's goal is to help Hopi members further their education through the education fund. The Hopi Tribe's Higher Education program works with graduating seniors and other tribal members who want to further their education. As a result of the Mohave Generating Station closure in 2005, funding has been cut dramatically for Hopi education, including individual scholarships.[100] For example, in 2005 the Hopi Tribe received just over $1.9 million in educational funding from Peabody Western Coal Company stated in a letter from Hopi Vice Chairman Honyaoma, Letter to OSMRE, February 6, 2007. In 2006 the figure dropped to $169,000 and in 2007 the figure remained at $170,000[101] due to the shutdown of Mohave Generating Station. The future scholarship funds will continue to decline given the current situation of the NGS power plant and imminent closure at the end of 2019.

All vocational training programs are off-reservation in Flagstaff or even as far as Albuquerque and Phoenix. The training options are limited to demand occupations where graduates can get jobs. There are options for local training provided by Northland Pioneer College (NPC). Northland Pioneer College is located in a separate permanent structure. It has issued Certificates of Proficiency in Restaurant Operations, accounting, Emergency Medical Training (EMT) and Medical Assistant; all of which are careers needed on Hopi.

The 2010 tribal database shows, 68.2% of the Hopi population over the age of 18 are high school graduates. Of the 68.2%, 27.7% have attended at least some college and

[99] Socioeconomic Study in Support of a Hydrographic Survey Report for the Hopi Indian Reservation Socioeconomic Study April 30, 2008. Prepared by SWCA Environmental Consultants for Arizona Department of Water Resources. Pg. at 27
[100] *Ibid at pg 27*
[101] *Ibid at pg 27*

18.6% have earned a college/university degree; 2.1% have attended business school and 12.7% have attended a vocational school.

The Hopi Opportunity Youth Initiative (HOYI) has a recent report from 2014, titled Itam Lomapootavyani: Working together to build positive pathways for our future generations, updated April 2015. This recent event had a variety of participants from 18 local organizations and agencies to come together to discuss issues and challenges heard from the youth. The Hopi Schools have now all changed from Bureau of Indian Education to grant school.

Goal: Continue education K-12 through post-secondary incorporating the Hopi'lavayi program of Hopi language and culture curriculum.

Objectives:

1. Continue working on Hopi core curriculum for all K-12 schools throughout the Hopi reservation.
2. The Tribe will work on incorporation of the Hopi language and culture in the core curriculum.
3. The Tribe will work with all schools to support Hopi Education through challenges and changes in curriculum standards.

Water

The Hopi Tribe is currently in the midst of working through the General Stream Adjudication of the Little Colorado River System and Source, No. 6417, pending in the Superior Court for Apache Country (LCR adjudication). The Hopi Tribe submits its Third Amended Statement of Claimant amending its original Statement of Claimant, filed November 29, 1985, its Amended Statement of Claimant, filed January 29, 2004, and its Second Amended Statement of Claimant, filed November 12, 2009 and its Third Amended Statement of Claimant, filed June 3, 2015. The Hopi Tribe reserves the right to further amend or supplement its Statement of Claimant. The LCR is a judicial proceeding and the Department (Arizona Water Resources Department) is technical

advisor to the LCR adjudication court.[102]

The nature, occurrence, and availability of groundwater are critical concerns of the Hopi Tribe.[103] Groundwater, and more specifically the Navajo sandstone aquifer (N-aquifer), is the primary source of water for the 11 Hopi villages and numerous Navajo communities that adjoin the Hopi Reservation in the Black Mesa, Arizona area.[104] The N-aquifer is also the source of water to numerous springs and perennial water flows within the area's washes.[105] The springs have special religious significance within Hopi cultural practices, and the perennial flows in the washes allow for a small amount of irrigated subsistence and cultural farming.[106]

Infrastructure

The Hopi Tribal Council delegated authority to the Hopi Water Resources Program (WRP) to implement and enforce policies intended to ensure safe and dependable supply of water on the Reservation.[107] Policies have been developed in accordance with federal Safe Drinking Water Act (SDWA) and Clean Water Act (CWA) requirements.[108] More specifically, Hopi Tribe Resolution H-107-97 enacted the Hopi Water Code, made up of three guidance documents developed in accordance with principals of sound water management and protection.[109] Since April 2008, the Hopi Tribe was authorized as Treatment as State (TAS) status, giving them the authority to oversee Clean Water Act Section 401 certification of National Pollutant Discharge Elimination System (NPDES) for discharge. This certification and approvals for all NPDES permits are under the authority of the Hopi Tribe Water Resources Program (WRP). This includes, but is not limited to; the Peabody Energy NPDES permits to construction site NPDES permits.

- Hopi Tribe Water Quality Standards (Hopi, 1997a)[110]

[102] *Final Hydrographic Survey Report for the Hopi Indian Reservation: In re The General Adjudication of the Little Colorado River System and Source.* Arizona Department of Water Resource. December 2015. Pg.1-1.
[103] Daniel B. Stephens & Associates, Inc., *Hopi Water Resources and the Effects of PWCC and Other N-aquifer Pumping. Prepared for the Hopi Tribe, September 2, 2010.*
[104] *Ibid at pg 13*
[105] *Ibid at pg 14.*
[106] *Ibid at pg 14.*
[107] Tetra Tech EM Inc. *Hopi Source Water Assessments 2009*.
[108] *Ibid at pg 14*
[109] *Ibid at page 14*
[110] Note: the current Hopi Tribe Water Code is going through some revisions and amendments from the Water Resources Program so existing water policy may be amended.

- Hopi Tribe Wellhead Protection Manual (Hopi 1996a, and as amended in 2001)
- Standard Specifications for Well Construction and Pump Installation (Hopi, 1996b)
- The Preliminary Hopi Wastewater Code
- Treatment as a State (TAS) for CWA Sections 106 and 319; 401 Certification for National Pollution Discharge Elimination System (NPDES) permits and Storm water Protection Plan (SWAPP) approval.
- Ordinance #58 Wellhead and Source Water Protection
- Clean Water Action Section 106 Program
- Clean Water Action Section 319 Program
- Clean Water Action Section 104(b)(3) Program.

Most villages have access to public utilities – water, sewer, electricity and telephone. The traditional villages maintain their beliefs and are unwilling to accept federal financial aid for an upgrade to modern amenities and infrastructure.

The traditional villages like Hotevilla has electricity, water and a sewer system that was completed in the late 1990s; only on the outskirts of the traditional Hopi village housing. Oraibi and Walpi do not have water, electricity and sewage systems and do not allow utilities within their village.

All water and sewer systems have been developed with federal assistance from the Department of Housing and Urban Development (HUD), the Indian Health Service (IHS), US Environmental Protection Agency (US EPA), Office of Environmental Health (OEH) through Indian Health Service, and the Bureau of Indian Affairs (BIA). To determine if future water and sewer infrastructure projects will meet local needs and desires, the IHS and EPA requests each village to identify and set priorities for its water and sanitation needs on a yearly basis. Supplemental information, such as areas of planned village expansions, is also gathered to help plan future projects. The IHS OEH program work with villages on plans designs and constructs most water systems on Hopi.

The funds provided by various entities do allow for upgrades in existing village infrastructure; however, what is key with IHS/OEH funds is that the future growth or expansion for small commercial development is not incorporated into that equation for growth. Many projected village expansions or planned economic development structures at most are not built due to not having the infrastructure for the facility, or the added cost

to upgrade infrastructure to take on this additional commercial load on top of the existing village load. This is the story throughout the villages, which is not only an issue for economic development, but also for adding on additional homes for families seeking home sites. The load just cannot, in some cases meet growth demands. Therefore, federal funds through IHS and OEH limits the villages' future capacity building not just for the increase in housing developments, but for other indirect commercial development of those individuals wanting to start their own business due to having a home built on Hopi.

Water Quality

The Hopi Tribe faces challenges in ensuring high-quality water for all reservation residents – water that meets national drinking standards by the EPA.[111] The villages throughout the Hopi Reservation depend almost exclusively on the N-aquifer for drinking water.[112] The water quality of the N-aquifer as a source of drinking water on the Reservation, with a few notable exceptions, is generally good to excellent.[113] At Second Mesa and First Mesa, the N-aquifer thickness shrinks to around 200 feet, leaving very little room for well expansion and giving rise to overlapping drawdown zones produced by competing village wells.[114] In addition, overlying aquifers with power quality/ high total dissolved solids (TDS), such as the D-aquifer, lead into the N-aquifer and case water quality issues for villages located on the two mesas.[115] Many villages have a concern for these water quality occurrences. As stated by the Water Resources Program, much of what has been researched in the area the leakage is naturally occurring. The wells are outdated as far as full construction; old wells currently do not meet the current Hopi Water Code for well construction and specifications.

The villages at First and Second Mesa have high levels of arsenic, beginning from 17 up to 26 parts per billion (ppb), which exceed the EPA standards of 10 ppb, and treatment is required.[116] The Hopi Tribe applied for and was approved for various funds

[111] Socioeconomic Study in Support of a Hydrographic Survey Report for the Hopi Indian Reservation Submitted to Arizona Department of Water Resources by SWCA Environmental Consultants April 2008.
[112] *Ibid at pg. 30*
[113] *Ibid at pg. 30*
[114] *Ibid at pg. 30*
[115] *Ibid at pg. 30*
[116] Tetra Tech Inc. 2006. Source Water Assessment for Communities and Villages of the Hopi Reservation.

through US EPA and OEH for feasibility studies to be conducted and have concluded through the Hopi Arsenic Mitigation Project (HAMP) the alternative for improving water quality from First to Second Mesa villages.

Water/Wastewater

In the Hopi villages many homes lack indoor plumbing facilities compared to other Indian Reservations. The difficulty of bringing in water lines is shown by the percentage of homes having to get water from "some other source" which might be a village well (hauling water to and from location), a spring or, more recently, the purchase of bottled water as the usual sources become too polluted to use for drinking and cooking purposes.[117]

Hopi Infrastructure Compared to All Reservations[118]

		All Reservations
	HOPI	**and trust lands**
Water from public system or private company	76.5%	70.3%
Water from individual well	7.7%	22.8%
Water from some other source	15.8%	7.0%
Percent lacking complete kitchen facilities	30.6%	17.5%
Percent lacking complete plumbing facilities	46.7%	20.2%

Villages depend uniquely on the groundwater source, Navajo Sandstone Aquifer (N-aquifer) from the wells for their water supplies. Current wells range from 150 to 1,800 feet deep (in the N-aquifer) and yield an average 10 to 200 gallons per minute. The deepest well on reservation is 3,200 feet and is drilled into the Coconino aquifer at Upper Village of Moenkopi.[119] Villages that do not have water piped to individual homes rely on public water faucets/spigots located in the villages. The Navajo Tribal Utility Authority (NTUA) provides water to the Spider Mound community, because the local well exceeds fluoride limits per Safe Drinking Water Act (SDWA). NTUA does offer a pay for water system from Tuba City; however, a majority of the residents that do haul

[117] 2010 Hopi Comprehensive Economic Development Strategy Prepared by The Office of Planning and Evaluation under an award from the U.S. Department of Economic Development Administration Project #07-84-06439.
[118] *The Current State of Technology Infrastructure in Native Communities,* Prepared for the Economic Development Administration
[119] Note: The Coconino Aquifer (C-Aquifer) was tested with having high Total Dissolved Solids (TDS); however yield is high. The Villages in Moenkopi are utilizing this well through reverse osmosis treatment.

water get it from the spring and taps in the Villages of Upper and Lower Moenkopi. Lower Moenkopi utilized water from the local spring for domestic purposes by hauling water. Other rural homes/scattered home sites can be served by cistern or water hauled in by pickup truck from local Moenkopi wells and springs. The Lower Village of Moencopi has a facility for restroom and bath house facilities for those residents that do not have running water in the home and for hauling water.

The treatment for drinking water varies by village or location on the Hopi reservation. The Keams Canyon's water supply is chlorinated. Water supplied to the villages of Upper Moenkopi, Kykotsmovi, Shungopavi, Mishongnovi, and Sipaulovi is chlorinated, which is treatment to satisfy the Safe Drinking Water Act (SDWA) requirements for a public drinking water system. Water fluoridation is the controlled addition of fluoride to a public water supply to reduce tooth decay. No village fluoridates its water, there is some naturally occurring fluoride in some water systems but none is added. The villages sample and test their water supply for quality. All drinking water systems on Hopi report water samples to the United States Environmental Protection Agency (EPA) through the Safe Drinking Water Act and Clean Water Act (wastewater) all Public Water Supply System (PWSS) report to EPA Region 9. Region 9 covers the states of Arizona, Nevada, California and the Pacific Islands. All systems must do a Consumer Confidence Report (CCR) and report the prior year's sampling that may have exceeded any Maximum Contaminate Levels (MCLs) and any other violations that the PWSS may have received during the year to the public and give a certified copy to EPA.

Of the 15 wells serving villages, three are threatened with contamination[120] and three are contaminated.[121] Village wells in the past were drilled too close together creating an overlapping use of one source. The Hopi WRP has a well drilling ordinance that looks at spacing future planned wells so that wellhead protection exists.

A majority of existing water and wastewater treatment systems were not built to accommodate growth of the local population or for economic development purposes since implemented 60 years ago. The operation, maintenance and repairs for the systems

120 There has been extensive investigative work done by US EPA and there has been no evidence that these wells are threatened by the gas plume from the Leaking Underground Storage Tank (LUST) site per WRP ongoing oversight.
121 Note: the Mishungnovi new well is contaminated with sulphur reducing bacteria, which creates a rotten egg smell. This well is off-line, and not being used. The Spider Mound well has elevated fluoride levels, and is operating under a variance from the EPA. Spider Mound receives water from NTUA and is no longer utilizing the well. The Shungopavi well has been contaminated with shigella. It is still being used, but chlorination is occurring very regularly to prevent disease.

tends to be heavily subsidized by village governments' annual budget. The majority of the villages do charge flat rate fee, however some villages such as Sipaulovi charge a metered rate and many more need to move in this direction. There is no separate charge for sewage system disposal. Most villages experience significant problems with their water infrastructure, including:[122]

- Broken pumps
- Pumping for long periods of time without resting the equipment (i.e., water is hauled for livestock watering; systems were designed for domestic demand only).
- Erratic pressure, small pipe diameters, and insufficient storage capacity obstruct fire suppression.
- Unaccountable losses (leaks or aging pipes)

Many Hopi villages have deficient sewage treatment systems while other villages have none at all. There are no tribal restrictions on construction of wastewater systems in floodplains.[123] Existing village systems tend to be located in wash channels, using a gravity-fed line, which reduces the capital cost of systems, as well as maintenance costs.[124] However, it also makes the systems vulnerable to erosion caused by flooding, with the potential for system failure and contamination of nearby streams or farmlands.[125] The Indian Health Services OEH office continues to be are aware of these problems, and working with the Villages, the Hopi Tribe departments and programs, as well as other consultants/experts to remedy them through IHS funds.

Although there are functioning systems to be found across the reservation, wastewater management tends to be crisis driven and, therefore, is more expensive in the long run. Case by case crisis mode is not cost efficient in the long term, especially when planning on growth and expansion for housing and small commercial economic development. Many wastewater treatment systems, in the past were not lined and did not have a wastewater code to follow. Environmental and groundwater contaminants exist in most sewage lagoons, which depend in part on seepage into the alluvium for effective functioning. Some villages still have outhouses (outdoor bathrooms) that are

[122] 2010 Hopi Comprehensive Economic Development Strategy Prepared by The Office of Planning and Evaluation under an award from the U.S. Department of Economic Development Administration Project #07-84-06439.
[123] *Ibid*.
[124] *Ibid*.
[125] The Water Resources Program is developing a Hopi Wastewater Code at the time of writing the IRMP. The Preliminary Draft was received in January 2001. As of 2010 the Code has still not been approved.

not lined and are unsanitary. Most wastewater treatment locations and facilities must be improved to both sanitary and capacity planning and growth.

Continue protecting public health and safety by minimizing the risk of contamination of surface water, groundwater, soils, and all other natural resources by wastewater systems so that they will be available for drinking water, irrigation, and cultural uses for future generations.[126]

Goal: Increase water infrastructure for adequate delivery of safe drinking water.

Objectives:

1. The Hopi Tribe shall continue to work on drinking water infrastructure improvements throughout the villages.
2. The Hopi Tribe shall continue to pursue funding opportunities for drinking water and wastewater infrastructure.
3. Proposed housing, commercial, small to light industrial and other proposed public facilities shall consult and work with Water Resources Program and Villages as part of the planning process for water and wastewater infrastructure.
4. Identify proposed Hopi Public Utility Authority (HPUA) goals and objectives to align with the Hopi Water Resources water codes.
5. Assure an adequate water supply for present and future uses for drinking and for planned sustainable economic development.
6. Develop and implement Navajo Sandstone aquifer (N-aquifer) management plan.
7. Balance water protection and use between religious and subsistence uses.
8. Increase and improve infrastructure for domestic and small to light industrial/commercial uses.

Solid Waste

In earlier days, Hopi disposed of their refuse off the sides of the mesas in village designated community dumps. Many dumps had poor physical characteristics that compounded problems. Several were located in natural washes contributing to surface water and ground water contamination. Other dumpsites were located close to the villages and have a steep, high dumping face. These sites were often visible from miles

[126]Tetra Tech EM Inc. *Hopi Source Water Assessments 2009.*

away. In a few villages, combustible refuse was burned in masonry incinerators or simply thrown over the side of the mesas.

The Hopi Solid Waste Management Plan provides a system of public refuse collection with a centralized sanitary landfill. The current Hopi Solid Waste Sanitary Landfill occupies 100 acres and is projected to serve the Tribe and villages' needs for 25 years based on IHS projections of population and generated waste.

The Tribal government does subsidize solid waste collection on the reservation. Residents must rent dumpsters as well as paying additional fees for collection of large items or dumping additional loads at the landfill. As a result, some individuals illegally dump their solid waste in remote locations, most often in washes, to bypass these fees.

The Hopi Solid Waste Program cleaned up all historic mesa-side dumps. However, since there was no education component to change people's disposal habits, some dumps are being re-used again. Even when villagers make an effort for proper disposal, other village residents who do not rent dumpsters dispose of their refuse in the rented dumpsters of others, over the side of the mesa, or into the wash.

The year-round presence, and healthy populations of crows and ravens, which are pest species, can be traced to this continuous source of food for these –garbage" birds. The improper disposal of trash in illegal dumpsites has the effect of increasing the populations of these undesirable birds (crows and pigeons), thereby threatening the success of farmer fields and harvest. There is also a concern that wildlife may be picking up diseases from litter as well as the possibility that illegal dumps near raptor nests attract crows to the vicinity, thereby increasing the chances of them stealing raptor nests.

Goal: The Hopi Tribe shall continue to work on illegal dumps and help educate people on the issues surrounding solid waste.

Objectives:

1. The Tribe shall be a leader in reducing solid waste and strive for a cleaner homeland.
2. The Tribe shall continue to pursue funding opportunities for solid waste, educational programs for solid waste flying all over the lands, and other aspects surrounding solid waste.

3. The Tribe shall work with the Navajo and Coconino County on future solid waste agreements and transfer stations.
4. Proposed housing, commercial, small to light industrial and other proposed public facilities shall consult and work with Solid Waste Program and Villages as part of the planning.

Public Utilities

Arizona Public Service (APS) and the Navajo Tribal Authority (NTUA) provide electrical services on the Hopi reservation. Approximately 65% of the Hopi homes have electricity. A majority of the homes and businesses with electricity are served by APS. A 69-kilovolt-transmission line provides electrical service from Holbrook (through the Navajo Nation) to a substation several miles west of Keams Canyon. From the substation, two 21-kilovolt lines branch off from substation east to Keams Canyon and finally westward to the villages ending on Third Mesa. The electrical lines within the villages usually range from 1.2 to 2.4 kilovolts. NTUA provides electrical service to seven Hopi relocation families who live several miles south of Jeddito to the new Hopi community Spider Mound. Another new Hopi proposed community could use NTUA for it has electric lines adjacent to the Hopi Reservation that could be extended as a power source for new development. The Villages of Moenkopi (northeast of the main Hopi reservation) have electricity service from APS that comes in to service the Navajo Community of Tuba City.

The cost of new service is dependent on the customer‘s location and power requirements. All extensions are considered on the basis of economic feasibility and each utility authority prepared separate cost estimates for each project. In 1999, APS and NTUA estimated an average cost of $15,000 per mile for service that extends beyond present service areas.

Service from APS has ~~“b~~***brown out***” issues, which may last for several days, causing many to rely on back-up generators to ensure powered water service for drinking water. Delivery of clean safe drinking water is a priority. APS continues to work with the Hopi Tribe to address the number of brownouts that occur throughout the Hopi reservation causing continued struggle for reliance on energy sources for the tribal homelands. Due to the ~~“b~~rown out” issues, the Hopi Telecommunications, Inc. (HTI)

works with the Hopi Healthcare and the BIA Law Enforcement offices to ensure that _life threatening emergencies" are not affected. HTI goes to both facilities to ensure that the back-up generators are fully charged in case of an emergency.

Given the geography of the Hopi Tribe, the regional location for all Hopi Villages are in need of energy improvements for future energy security for present and future growth. The Hopi Tribe's future energy may be jeopardized due to the decrease in energy from coal-fired power plants, leaving the Hopi Tribe paralyzed when it comes to future energy. Current questions need to be answered, such as, how much energy does the current Hopi electricity system generate and use? Capacity building through infrastructure both by crisp energy and renewable energy will need to be analyzed to obtain a better understanding of the existing system of the Hopi Tribe. Other questions may deal with production, transmission, and distribution both for basic village use, along with future housing growth along with small economic development. The Hopi Tribe's priority in obtaining all available data to help create a current energy feasibility study, as well as future energy projections by each village will be valuable to help planning and zoning for all.

Telephone

The landline service provider for the Hopi Reservation is Hopi Tribe owned Hopi Telecommunications, Inc. (HTI). Service is provided to most of the Hopi villages and outlying communities. The Hopi phone service only offers the most basic features and has not kept up with technology available in the rest of the country.

The cell phone service provider CellularOne of Northeast Arizona, serves the Hopi reservation. It offers a low-cost cellular phone service plan to tribal residents who previously were unable to obtain or afford cellular service. With support from the Universal Service Fund, individuals who meet eligibility requirements[127] are able to receive basic cellular service for as little as $1.00 per month. CellularOne was the first wireless company in the United States to provide this service for low income areas.

[127] Adult tribal members (18 years or older) who demonstrate their participation in one or more social or medical service programs operated by a Federal, State or Tribal Agency.

CellularOne has the capacity to upgrade the Hopi Tribe with better internet speed options than current internet options.

Internet

The Tribe received a 5-year grant from the Economic Development Administration (EDA) to create a wireless, satellite, broadband connection to the Internet at two initial sites. The project has been delayed due to changes in personnel and tribal leadership. National Environmental Policy Agency (NEPA) clearances took a full year.

The Hopi Police Department, Tribal Courts, Hopi Health Care Center, Hopi High School and Northland Pioneer College were the first to be connected. One of the conditions of the grant is to partner with HTI to ensure proper operation, maintenance and repairs. The finished project will be operated by the HTI as a tribal utility for broadband Internet and other wireless services for the Hopi tribe.

This project showcases the power of instant, global communication and creates e-commerce for economic development and job training opportunities for all members of the Hopi Tribe. The project will provide a fully operational system that addresses the need for Internet access, which the Hopi need in order to carry out a wide range of activities.

Upon completion, Hopi will be able to receive broadband, high speed Internet service and begin the implementation of e-commerce (specifically buying original art/jewelry/paintings/sculptures/baskets from many Hopi artists), distance learning and on-site educational programs for secondary education. The proposal builds in the on-site job training of local operators and the development of entrepreneurial training opportunities in the areas of medical transcribing, graphics, drafting and other jobs that can be done via a personal computer at home.

Goal: Continue to create reliable high speed Internet and other telecommunication infrastructure both as upgrades and installation for future safety, growth and development throughout the Villages.

Objectives:

1. The Tribe shall utilize and continue to work on telecommunication infrastructure throughout the homeland.
2. The Tribe shall continue to pursue funding opportunities for telecommunication and other Internet infrastructure for future growth.
3. Proposed housing, commercial, small to light industrial and other proposed public facilities shall consult and work with the Hopi Telecommunications Inc. and Villages as part of the planning process for future infrastructure.
4. The Tribe will pursue grants that will identify a connection to the Hopi Public Utility Authority (HPUA) process.

Public Utilities on a Village Level

To promote quality of life, public utilities will provide and promote a healthful living environment. The Hopi Tribe passed a resolution H-039-2013 creating the Hopi Public Utility Authority (HPUA). The Hopi Tribe, through its Energy/Water Task Team (the ―Team") and advisors, has developed a Hopi Tribal ordinance entitled ―Hopi Public Utility Authority and Hopi Public Utility Commission Establishment Act" (the ―Ordinance") under Hopi Tribal Council Resolution H-039-2013. HPUA will work on the following: management, operation, and maintenance of utility systems and services that are vital to the spiritual, cultural and economic welfare of the Hopi Tribe, the several self-governing Hopi Villages (the ―Villages"), and other approved users of utilities of the Hopi Reservation.[128]

On June 6th, 2017, Hopi Tribal Council passed Resolution H-062-2017 establishing the Hopi Utilities Corporation (HUC) and its Charter of Incorporation. It also authorized transfer of funds and property ―to be dedicated to Reservation water or electric power services or systems" to HUC and rescinded and repealed H-039-2013 in its entirety.

Goal: The desire for self-determination and economic growth.

Objectives:

1. The Tribe shall continue to pursue funding opportunities for the growth of public utilities under current legislative incentives for tribal enterprises.

[128] Hopi Tribal Council Resolution H-039-2013, Passed May 15, 2013.

2. The Village will work with existing electric utility continues to evolve and improve.
3. The Village will work with existing electric utility may be reluctant to expand service at a reasonable cost.
4. The Tribe will continue to work on the development of ordinances and policies for implementation parallel with a village improvement plan.
5. Proposed housing, commercial, small to light industrial and other proposed public facilities shall consult and work with Water Resources Program and Villages as part of the planning process for water and wastewater infrastructure alongside the proposed Hopi Public Utilities.
6. Encourage villages will continue to upgrade and build new water and sewer systems that will meet current growth and quality of life due to old and outdated infrastructure;
7. New residential communities and commercial development could be located in areas where power, telephone service, water and sewer services can be provided.
8. Technical assistance for transmission studies.
9. Work with approved rate-payers and participants in order to provide safe and reliable utility services at reasonable costs.

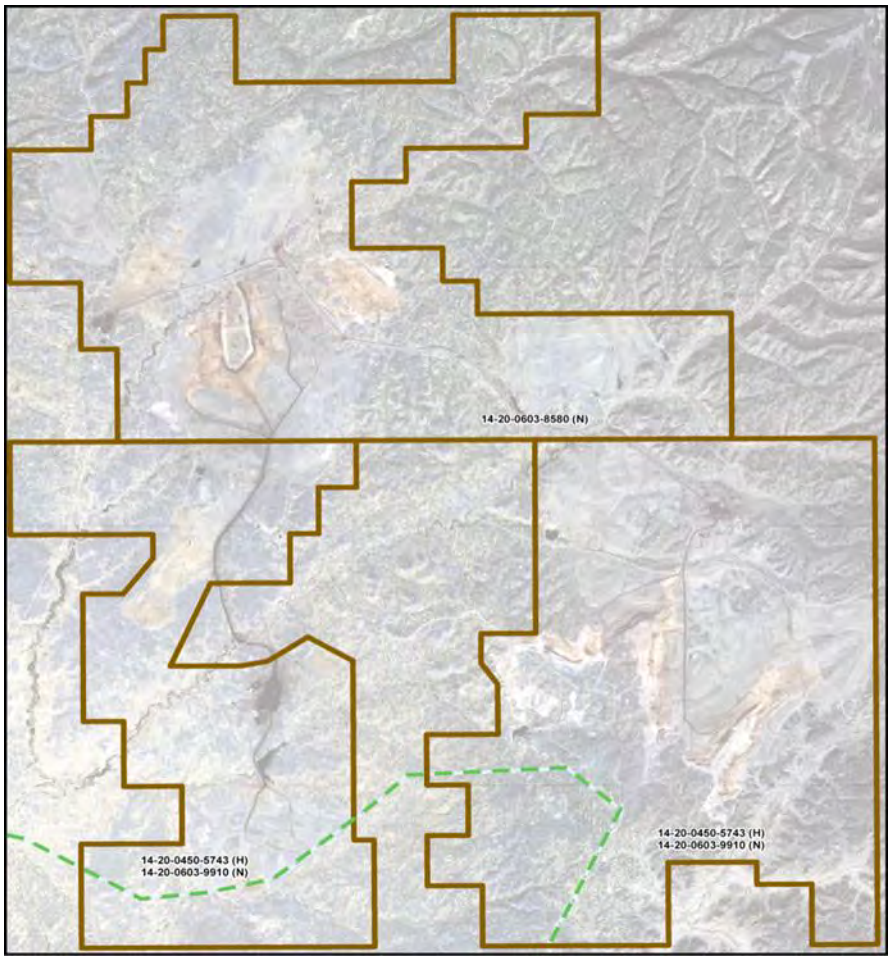
Energy

The Hopi Tribe has had a partnership with the Navajo Nation and with Peabody Energy (formerly known as Peabody Western Coal Company) for over 40 years to provide energy through the Navajo Generating Station (NGS) power plant and the former Mohave Generating Station (MGS), shut down in December 2005. The next decade for this partnership may be occupied trying to preserve the Hopi and Navajo coal-based economies in the every changing and emerging clean coal and carbon constrained movement, in response to current climate change policies both regional, national and internationally.

The Hopi Tribe continues to work on developing an energy resource development policy that will serve as a guide in developing Hopi energy resources. The Hopi Tribe under the proposed policy would in fact develop and manage all energy resources, identify ways to generate economic development of these resources, while maintaining protection of lands and cultural resources of the Hopi lands. The Hopi resources are diverse, to include: coal, coal-bed methane, natural gas, oil, solar and wind. Energy

development is key to infrastructure improvements to provide economic development opportunities. However, current cost trends on the economic competitiveness of NGS electricity produced is currently more expensive than electricity purchased on the wholesale spot market.[129]

Lease Areas at the Black Mesa Complex



[129] Navajo Generating Station & Federal Resource Planning Volume 1: Sectoral, Technical, and Economic Trends. November 2016 Prepared by National Renewable Energy Laboratory (NREL) pg. viii.

The national policy on climate change seeks to lower overall carbon dioxide (CO_2) emissions. CO_2 emissions from coal-fired power plants are deemed a major contributor to global warming and climate change. This federal policy has led to the imposition of more stringent regulatory requirements for coal-fired power plants. The American Clean Energy and Security Act of 2009 (the –Act") was passed by Congress and requires stricter regulation of existing power plants. The economic impact on coal from increased regulatory emissions restrictions forcing coal, once the Tribe's most valuable economic asset, into retreat in the new clean coal and carbon-constrained economy. The Act has set up a downward spiral for coal, a national trend that already forced the loss of the MGS power plant in 2005; along with the revenues it once provided the tribe. While Hopi coal sales from the Kayenta Mine complex to NGS continue to provide significant and absolutely critical revenues to the Hopi Tribe, the future of that revenue source is increasingly uncertain in the face of federal climate change policies. The future outlook for NGS remaining may foresee continual analysis past 2019 due to national and even future state climate policy.

The mine has three coal leases with Peabody Energy, one Hopi Lease and two Navajo leases. The former Joint Use Area (JUA) coal owned jointly by Navajo and Hopi, which is about 40,000 acres leased in 1966. The Hopi Partitioned Land (HPL) is about 6,137 acres. The Navajo Partitioned Lands (NPL) is about 33,863 acres. The Lease is north of the 1882 Hopi Reservation the coal is exclusively Navajo Nation about 24,858 acres which were leased in 1964. Most of the minable surface is on the Navajo Nation Reservation.

The histories of the leases are as follows: the Leases and their amendments, as negotiated by the Hopi and Navajo tribes, determine the amount of coal that Peabody can mine. OSM does not make this determination. OSM determines the scope of the mining Permit and the mining Plan under which the coal under contract with the Tribes will be mined. Hopi and Navajo 1966 Joint Use Lease area set initial coal tonnage at 200 million tons. In 1987 the Hopi and Navajo Tribes agreed to Lease amendments that added an additional 180 million tons under the Joint Use Area Leases for a total of 380 million tons. Of this amount, 200 million tons was mined out by 2006. The Navajo exclusive area lease of 1964 set initial coal tonnage at 200 million tons. In 1987, the Navajo Nation

agreed to lease amendments that added an additional 90 million tons under the Navajo exclusive use area lease for a total of 290 million tons. Of this amount, the original 200 million tons will be mined out by about 2011.

The Hopi Tribe will review the tonnages and other aspects to the lease agreements due to the proposed Kayenta Mine Complex Environmental Impact Statement (KMC EIS) which is underway for the Navajo Generating Station (NGS) coal fire power plant located in Page, Arizona. The Kayenta Mine Permit (AZ-0001D) Environmental Assessment August 2011 (Navajo County, Arizona) by the U.S. Department of the Interior Office of Surface Mining Reclamation and Enforcement (Western Region). The Office of Surface Mining Reclamation, Western Region (OSM) received an application from Peabody Western Coal Company (PWCC) for the renewal of Permit AZ-0001D.[130] This renewal application addresses mining operations during the period of July 6, 2010, through July 5, 2015, for the Kayenta Mine located in Navajo County, Arizona (Map A-1).[131] This environmental assessment (EA) is being prepared in compliance with the National Environmental Policy Act (NEPA) to analyze and disclose the probable effects of renewing the permit that authorizes mining operations for the Kayenta Mine from July 2010 to July 2015.[132]

This approval would authorize the continuation of ongoing mining operations in coal resource areas N-9, J-19, and J-21 from July 6, 2010 through July 5, 2015. Surface coal mining and reclamation activities are authorized in up to five-year incremental periods to provide an opportunity for OSM to review the mine's compliance with applicable terms and conditions of permits. Federal regulations in accordance with the Surface Mining Control and Reclamation Act (SMCRA) grant a right of successive renewal within the approved boundaries of an existing mining permit.1 Based on 30 CFR 774.15(c)(1), OSM must approve a complete and accurate application for a permit renewal unless it finds, in writing that at least one of the following criteria exists:

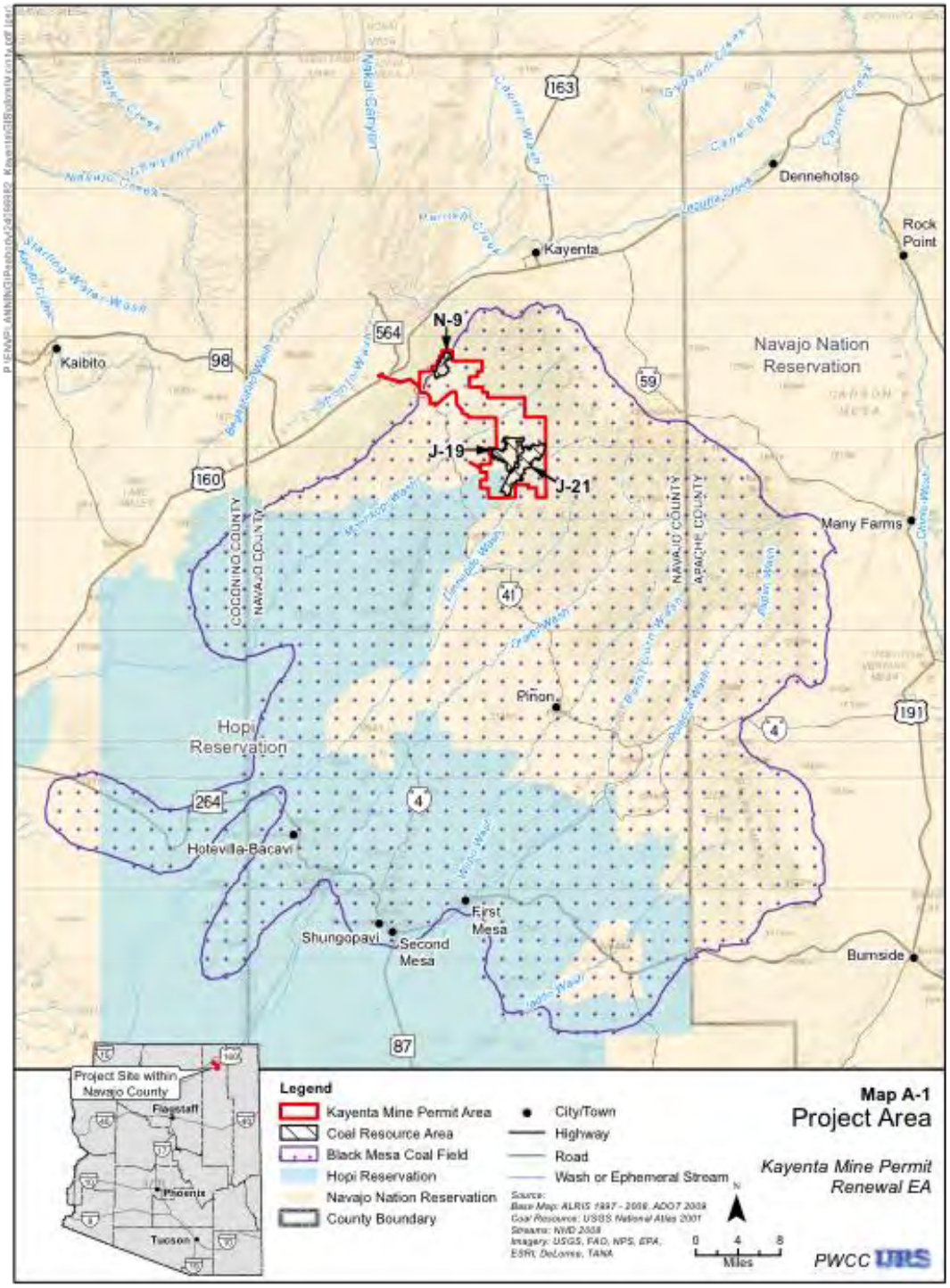
> *(1) The terms and conditions of the existing permit are not being satisfactorily met;*
> *(2) The present surface coal mining and reclamation operations are not in compliance with the environmental protection standards of the Act and the regulatory program;*
> *(3) The requested renewal substantially jeopardizes the operator's continuing ability to comply with the Act and the regulatory program on existing permit areas;*
> *(4) The operator has not provided evidence of having liability insurance or self-insurance as required in [30 CFR 800.60];*
> *(5) The operator has not provided evidence that any performance bond required to be in effect for the operation will continue in full force and effect for the proposed period of*

[130] The Kayenta Mine Permit (AZ-0001D) Environmental Assessment, August 2011 by the U.S. DOI OSM, pg. 1.
[131] *Ibid at pg. 1*
[132] *Ibid at pg. 1*

renewal, as well as any additional bond the regulatory authority might require pursuant to subchapter J of [Title 30, Volume 3, Chapter VII of the Code of Federal Regulations]; or
(6) Additional revised or updated information required by the regulatory authority has not been provided by the applicant.[133]

OSM has determined that PWCC has submitted a complete and accurate application for permit renewal. Consequently, OSM's jurisdiction to deny the renewal request is limited to the criteria listed above. Preliminary review by OSM has not identified that any of the six criteria has been met for denial, and therefore OSM does not have the authority to deny the permit renewal.[134]

[133] *Ibid at pg. 1*
[134] *Ibid at pg. 2*



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[135] *Ibid at pg.32*

The National Environmental Protection Act (NEPA) policy process for conducting an EIS is going to evaluate the Hopi Tribe and how the socioeconomics, the water and other aspects linked to the NGS power plant.

The Navajo Generating Station-Kayenta Mine Complex Project Environmental Impact Statement continues to move along from the Kayenta Mine EA dated August 2011. The Kayenta Mine had employed 422, and 87 percent of the workers live on either the Hopi or Navajo Reservations.[136] Recent developments regarding the Navajo Generating Station (NGS) in relation to the coal reserves from Peabody Energy, the termination of employment of 17 workers at the mine continues as the employment has decreased to 243 employees.[137] This trend gives a future outlook of what will be foreseen as more lay-offs occur at the Peabody mine and at the NGS power plant.

The Kayenta Mine is the sole commercial supplier of coal to the NGS and is operated by Peabody Western Coal Company.[138] The Hopi and the Navajo Nations are both dependent on their abundant coal and mineral resources as the backbone of their local economies. Current coal revenues represent 88%[139] of the Hopi Tribe‘s annual income and annual operating budget. Potential Hopi economic development projects aimed at developing new coal markets have included a rail delivery system to transport the coal off the reservation to other markets via the BNSF rail. Such plans may not be feasible in light of federal policies and environmental opposition that does not favor expanded coal development. The Hopi Tribe continues to explore, and supports the funding of economic projects for coal gasification, solar/wind generation and other energy alternative strategies.

This CEDS plan recognizes the need to increase support for energy diversification for the Hopi people on both ends – new energy alternatives as a back-up or potential replacement for energy currently provided by APS as the reservation‘s sole energy provider and for sources of revenue as alternatives to the heavy reliance on sale of coal to the NGS power plant as the Tribe‘s chief revenue source. Continued reliance by Hopi on

[136] www.NGSKMC-EIS.net June 2014 EIS Fact sheet pg. 2.
[137] Phone conversation with Peabody Mine office, Kayenta, AZ, July 2016.
[138] *Ibid at pg. 2.*
[139] *Analysis of Economic Impacts on the Hopi Tribe and Navajo Nation of a Stringent NOx BART Decision for the Navajo Generating Station, March 1, 2010*, Pg. 39. Prepared for the Hopi Tribe. ICF Resources, LLC, Fairfax, VA 22031 *Letter Dated March 1, 2010 from Leroy Shingoitewa, Chairman, Hopi Tribal Council, to Jared Blumenfeld, EPA; Document number 0211 in the docent for the ANPRM: EPA-OAR-2009-0598.*

this single source of revenues will prove catastrophic to the Hopi economy as the transition for closure of the NGS plant. Given the current direction of federal policy on climate change and carbon emissions, the Hopi government must precede on the assumption that the NGS plant will close.

Sustainability for current and proposed land development and use is key to economic development decisions. The Tribe has a responsibility to be a leader in a variety in proposed and innovative energy and renewable energy, including natural resource management while supporting secure and clean energy technologies for its people.

The Hopi Tribe has an opportunity to seek funding and technical assistance through the U.S. Department of Energy (DOE) Office, under the Office of Indian Energy Policy and Programs, which was established by Congress to provide Tribes, Alaska Natives, and eligible tribal entities with technical and financial assistance to encourage, energy infrastructure development in Indian Country. Energy development and technology changes daily, requiring continued updates by way of education, training and other types of course preparation and curriculum. The Hopi Tribe could work with DOE on various aspects of technical assistance looking at how to develop an energy policy that will strengthen both energy security and energy infrastructure (if clean coal energy or renewable energy is projected in the near future) creating and promoting continued tribal sovereignty.

Reliable energy is critical to the health, safety and prosperity of all residents of the Hopi Tribe. Energy is vital in creating and maintaining a homeland through everyday life; from safe drinking water to the traditional values of the Hopi way of life. Sustainability for current and proposed land development and use is key to economic development decisions. The Tribe has a responsibility to be a leader in a variety for proposed and innovative energy and renewable energy, including natural resource management while supporting secure and clean energy technologies for its people.

Overview

A Renewable Energy policy is being developed to work parallel to create sustainable energy for Hopi. Solar energy development has increased through various

technologies that fit the physical characteristics of the Hopi land areas being surrounded by the Navajo Nation. Wind energy development for small domestic use to small/light industrial use can create sustainable back-up generation for homes when the main APS line has failures causing brownouts.

National policy on climate change is setting the stage for mandatory renewable generation requirements and/or goals; at least 34 states have passed voluntary standards or goals. The state of California has increased renewable generation at almost 50% of all energy consumed by its ratepayers. The state of Hawaii has passed state law increasing renewable generation to 100% by 2045. This trend is creating more incentives to collect renewable energy credits (RECs), of which these sales serve as supplemental revenue stream to energy and capacity revenues for the energy companies.

The Hopi Tribe has obtained funding to begin to ask questions such as: How much power does Hopi currently use? How many people does Hopi serve? What is the population growth over the next 25, 50 or 100 years and what power will be foreseen for Hopi? Where will the energy that Hopi will need for its present and future use come from? Will it be crisp power, power generated by coal fired power plant, or will it be energy from a renewable source, such as wind, solar and or other source? Will the energy power be generated on Hopi or will the energy source be brought in as it currently is from the APS Cholla Plant by way of a 69 KV line beginning at Keams Canyon, Arizona. Many questions need to be asked in order to be answered, where additional feasibility studies are needed in order to get the correct information to continue helping not only the Hopi tribe as a whole, but to help each individual village with their community planning and or expansion for future housing and small economic developments.

Renewable Energy

The Hopi Tribe has identified various plans that look at continuing coal development. Various reports exist that identify more coal reserves other than what is leased to Peabody Energy. However, given the land constraints to export coal to the larger market is a challenge. The various reports give a mining plan as well as economic

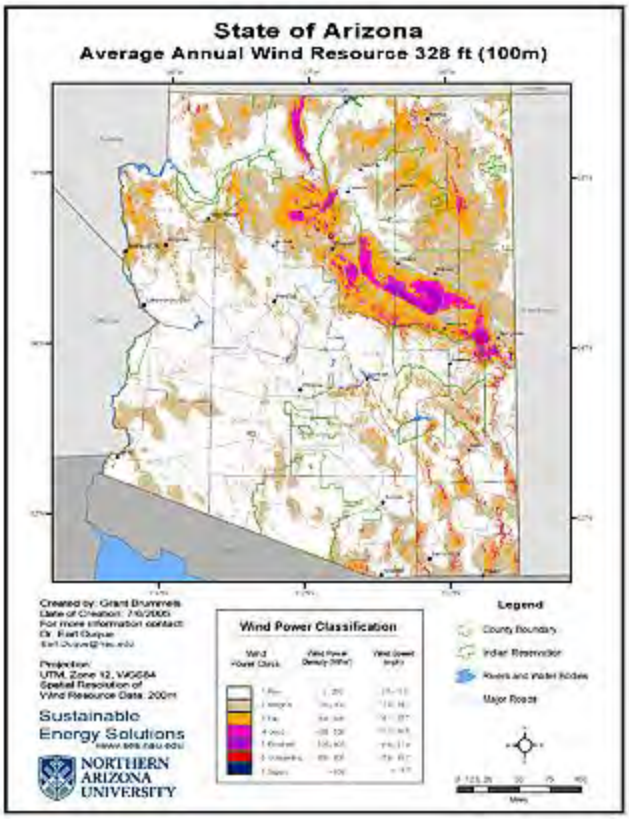
models show potential markets. This has drastically changed due to the EPA Climate Change policy, creating obstacles to market Hopi coal.

Clean Coal Energy

Potential liquefaction and gasification of coal could provide options to continue to identify other revenue based coal development projects. The Hopi Tribe has potential to identify funding to seek more information about other coal energy development projects. This type of venture could potentially be built on Hopi creating another employment center for many Hopi tribal members. Plants similar to the Peabody Energy mining complex from construction to ongoing daily operations would generate a stable economy. However, the economic analysis referencing a viable market would be key from the southwest to the Midwest would be ideal power markets.

Wind Power

Federal and state renewable energy maps indicate that there may be some potential to develop a wind power plant on Hopi and thereby generate new revenues. The average U.S. wind plant is approximately 50 MW (megawatt), which could be a potential energy source for Hopi and its members. However, small projects could be identified for a home located remotely, a school and/or tribal or other government structure to help subsidize energy use and save energy. The Hopi Tribe could utilize strategic ways to create and encourage renewable energy through wind power generation.



Wind maps and power classifications are updated daily and the map above is from the Northern Arizona University Sustainable Energy Solutions program that conducts wind studies as well as continues to work with tribes on renewable energy education and research.

It must be pointed out that the return on investment in wind powered generation pales in comparison to current coal revenues. The estimates that have been generated show Hopi receiving revenues of $233,333 per year ($4,666 per MW per year) from a 50 MW wind plant verses the annual NGS revenues of $13.5 million (varies due to the coal sales and market).[140] The Hopi Tribe would need approximately 57 wind plants of 50 megawatts each, just to replace current coal sales revenues. All of these wind power plants would likely never be constructed given Hopi cultural constraints on land use.

[140] *Analysis of Economic Impacts on the Hopi Tribe and Navajo Nation of a Stringent NOx BART Decision for the Navajo Generating Station, March 1, 2010*, Pg. 39. Prepared for the Hopi Tribe. ICF Resources, LLC, Fairfax, VA 22031 *Letter Dated March 1, 2010 from Leroy Shingoitewa, Chairman, Hopi Tribal Council, to Jared Blumenfeld, EPA; Document number 0211 in the docent for the ANPRM: EPA-OAR-2009-0598.*

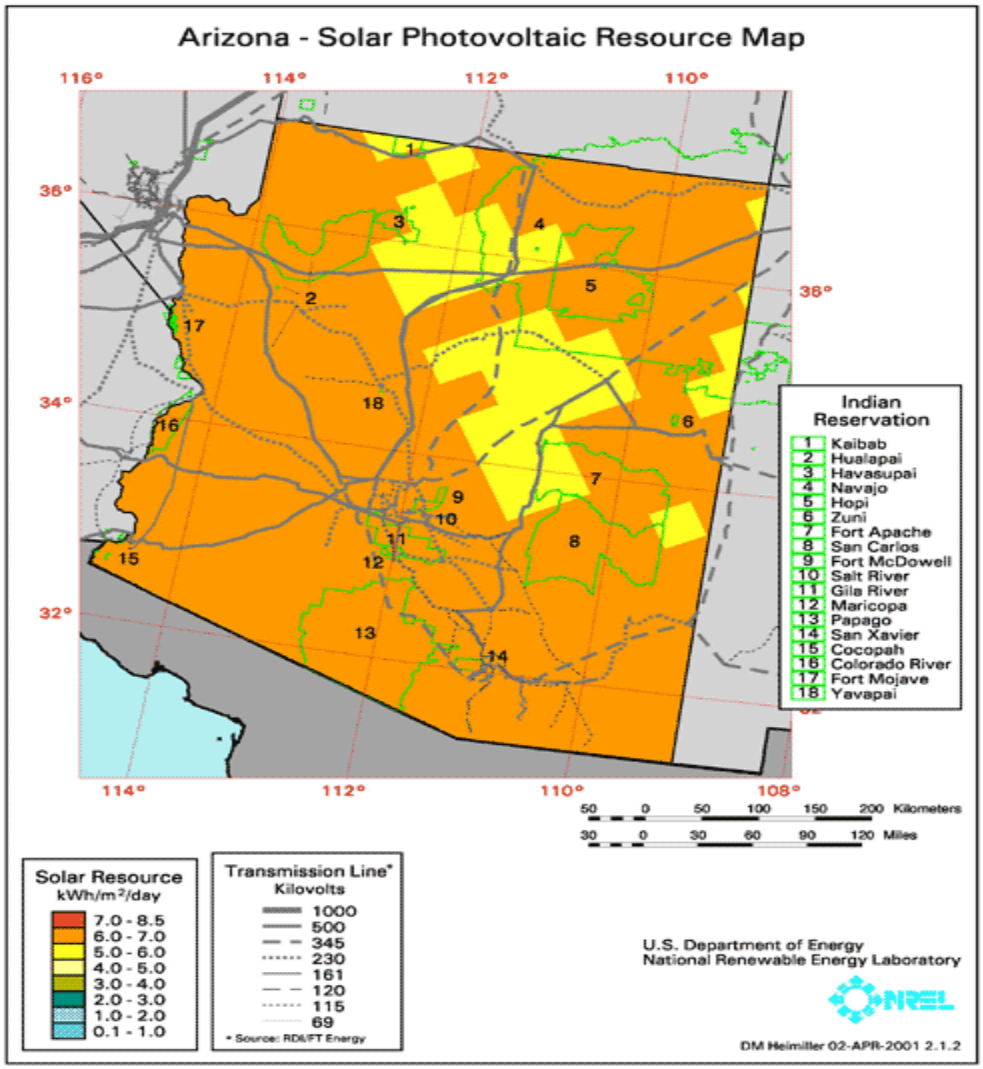
While wind resource development should be explored, it is likely to be a limited economic resource for the Hopi.

Reviewing the wind maps, it appears that the Hopi reservation would be a Class 2/Marginal and Class 3/Fair location for wind energy development; making Hopi marginally economically feasible to construct a wind plant. These classifications are according to the Energy Information Administration and the map does include the Hopi ranches, south of the main reservation near I-40. However, there is one Class 4 location; however it is not located on the Hopi reservation, but rather on the Hopi ranches. This Class 4 location does have potential for both wind and solar projects, more research and current technology could continue for the future renewable energy potential. An economic analysis and an updated feasibility study would need to be conducted to continue this concept for a wind plant.

Solar energy

There are many options when it comes to solar energy and the market demand to increase the use of renewable energy. Some photovoltaic (PV) plants average 2 MW, which could create reliable capacity by looping with existing energy infrastructure for Hopi. However, on a larger scale for revenue base solar plants, larger PV, micro grids, smart grids to solar thermal plants are beginning to increase. Technology for many of these solar options has increased over the last 5 years, due to increased research and development.

Solar energy maps from NM to AZ and its energy outlook with energy hubs. Arizona Solar Photovoltaic Resource map shows various locations for the resource and what transmission hubs that is near tribal reservations in Arizona.



The solar energy market over the years has increased and the potential with new improved technologies. The geographical solar maps have increased, creating competition throughout the southwest. Land base will be the key factor in the potential in creating a solar plant to be included into the regional to national solar market. The relationship between APS and the Tribe has potential to garner increased solar through PV.

Large land areas of the southwest show high potential for solar, however the costs of utility-scale solar and wind power have continued to decline.[141] Arizona has some of the most productive solar resource potential in the United States, which significantly improves the amount of energy generated for every dollar of capital investment.[142] This trend in the NREL November 2016 report indicates a levelized cost of energy (LCOE), compared to the all-in cost verses a newly built natural gas combined cycle (NGCC) generator for generating power per megawatt. Continued studies on future coal, natural gas, solar and other energy generating options will need to re-evaluated given the United States Energy Information Administration (EIA) data on a month-to-month update.

Microgrid

New solar technology through integrating both energy and renewable energy sources in one distribution line for secured power is increasing through research and development. Key components have been identified through research and development. The need for enhancing microgrid technology are summarized as:

- Facilities integration of combined heat and power (CHP);
- Promotes energy efficiency and reduces losses by locating generation near demand;
- Potential to reduce large capital investments by meeting increased consumption with locally generated power, (local generation may lower investment in the microgrid);
- Encourages third-party investment in the local grid and power supply.

These points give an outlook as the capital investment into some types of renewable energy developments; however, the question remains in the economic analysis and the basic question of reliability of the energy resource. The Hopi Tribe currently, as stated, continues to experience ~~–b~~rown outs", which are of great concern due to compliance with the Safe Drinking Water Act (SDWA). Will wind be continuous or will it be only seasonal? Will solar be reliable or seasonal?

Transmission

[141] Navajo Generating Station & Federal Resource Planning Volume 1: Sectoral, Technical, and Economic Trends. November 2016 Prepared by National Renewable Energy Laboratory (NREL) pg. ix.
[142] Navajo Generating Station & Federal Resource Planning Volume 1: Sectoral, Technical, and Economic Trends. November 2016 Prepared by National Renewable Energy Laboratory (NREL) pg. iv.

Of all the various options to renewable energy, one key aspect that needs further research would be the understanding how the Hopi Tribe can put this excess generated power on these large transmission lines, if the tribe created a large solar plant. The transmission highway will incorporate power purchase agreements (PPA), where the Hopi would need to have full knowledge of how these transmission lines are managed. The first step would be to first look at the power needs of the Hopi reservation. As such, when the Hopi power assessment is complete the next step would be the understanding of how the system is operated, maintained and repaired (OMR). On a smaller scale with room to grow and expand, the next assessment would be to work on a larger scale concept for renewable energy development. Questions may arise from the OMR analysis through an economic model showing how this may or may not be feasible. The Hopi Tribe‘s Office of Renewable Energy will be conducting a Hopi Renewable Generation Interconnection Pre-Feasibility Study analyzing the Tribe‘s ability to connect its solar producing land to nearby transmission lines. The feasibility of any renewable energy system will then reveal to the Hopi tribe the bigger picture to the overall economic analysis. Power supply options for existing village needs, as well as future power supplies for proposed Hopi communities are solar, micro grid, wind and crisp power.

Goals: Development and management of its own energy resources in a sustainable manner for proper development and management of energy resource development.

Objectives:

1. The Office of Community Planning and Economic Development, in coordination with the Villages and Renewable Energy Office, will prepare a planning document to set land aside for future renewable energy development.
2. The Tribe will continue to work on an overall Hopi Tribal Energy Policy (or Ordinance) that will include all key renewable energy policy that is in line with the challenges of renewable energy development.
3. The Tribe will evaluate the potential demand drivers and the policy behind the demand.
4. The Tribe will contribute to funding energy infrastructure for domestic and small/large to light industrial/commercial uses.
5. The Tribe shall continue to pursue funding opportunities for technical assistance, public education, research and development, and outlook on future challenges and changes for renewable energy.

6. The Tribe will continue to update and review current data and technology upgrades for both solar and wind energy potentials for future development.
7. The Tribe shall monitor and become educated on national policy regarding renewable energy changes in national policy that could affect the energy market.
8. The Tribe will work on a 10-50 year strategic plan that will be reviewed to ensure task items are being implemented.
9. The Tribe will continue to educate the public on energy and renewable energy technology, equipment and policy.

Mineral Resources

The Hopi Tribe has other types of minerals or natural deposits that could be potential economic development. There are various reports on the coal deposits that have not been mined. In other areas of Hopi, the development for other minerals such as sand, gravel and stone to meet local demands for construction materials. Review more sustainable mineral exploration and mining practices that do not degrade renewable resources. Conserve and protect mineral resources used for religious and subsistence purposes.

Energy tax

The Hopi Tribe under Amendment G of the Constitution and Bylaws of the Hopi Tribe amended by adding a new article entitled ARTICLE XI – TAXATION to read as follows:

Section 1. The Hopi Tribal Council shall, subject to the express limitations contained in this Constitution and the laws of the United States, have the power to impose duties, fees, taxes and assessments on any person, corporation or association residing or doing business within the Hopi Reservation, PROVIDED, that the Tribal Council shall not have the power to impose a personal income tax.[143] This means that the Tribe could work with the new renewable energy projects and other clean coal energy projects to generate

[143] Constitution and By-Laws of the Hopi Tribe Approved 19, 1936 (and as Amended on August 1, 1969, February 14, 1980 and December 7, 1993), United States Department of Interior Office of Indian Affairs.

tribal revenue through an energy tax. However, the Hopi Tribal Council will have to send this to the Hopi people as a referendum.

Market and Maps

Transmission studies showing viable existing markets to sell renewable energy due to the updates on the renewable energy capacity on transmission lines. A few years ago in 2014, the total renewable energy sharing electricity generation on main transmission lines was only at 9% according to the Energy Information Administration leaving coal generation on transmission lines still at a high of 48% of the U.S. electricity use. Dependability of wind and solar could be seasonal depending on the weather, but could be used as back up through storage. The projects suggest that NGS could remain more expensive than power purchased at market prices – at least until 2018 if natural gas prices increase and possibly until 2025 if prices for natural gas and wholesale power remain low.[144]

Goal: Overall will be to identify other energy sources that could be implemented in place or in parallel with outlooks to replace coal revenue.

Objectives:

1. The Tribe shall work on an overall Hopi Tribal Energy Policy (Ordinance) that will include all energy development and mineral resources.
2. The Tribe will conduct various transmission studies for all future energy proposed projects.
3. The Tribe shall seek technical assistance funding opportunities for all energy and renewable energy. The technical assistance will evaluate proposed energy use as well as conservation measures.
4. Tribal Council has the authority to approve locations for new communities, subdivisions and individual home sites on the Hopi Partitioned Lands.
5. Villages maintain policies for new housing, land assignments, and other home site areas in and around villages.

[144] Navajo Generating Station & Federal Resource Planning Volume 1: Sectoral, Technical, and Economic Trends. November 2016 Prepared by National Renewable Energy Laboratory (NREL) pg. viii.

6. The Tribe shall continue to pursue funding opportunities for weatherization programs, educational programs for energy consumption and energy conservation.
7. Proposed housing, commercial, small to light industrial and other proposed public facilities to work on energy for Villages as part of the planning process for energy infrastructure alongside the proposed Hopi Public Utilities.
8. Create renewable energy to diversify mineral development such as continued coal diversification.

Transportation

The transportation system on the Reservation includes highways, local roads, an airstrip, and two helicopter landing pads.[145] There are 668.9 miles of BIA roads (both paved and unpaved), 99.1 miles of paved, Arizona Department of Transportation (ADOT) owned roads, and 467.1 miles of paved and unpaved tribal roads. There is a total of 1235.1 system miles in the Hopi Indian Reservation Roads Program.[146] There are no Coconino or Navajo County constructed or maintained roads on the Hopi reservation. Of these, the Integrated Reservation Roads System, a multi-jurisdictional road system that incorporates the State of Arizona, Coconino County, the Bureau of Indian Affairs Hopi Agency, the Hopi Tribe and the Navajo Nation road maintenance agencies, manages approximately 800 miles.[147] The remaining roads, most of which are little better than tracks, are "non"-system roads (not part of ADOT or BIA governmental entity), and therefore are a Tribal responsibility to maintain or manage.

The Hopi Office of Range Management has developed and maintains a few "ranch roads" that are used by local cattlemen and farmers to access remote areas of the Reservation. In addition, there are approximately 3,580 miles of non-maintained 4x4 trails and tracks mapped on the main reservation.[148]

No U.S. highways pass through the main reservation. Arizona State Highway 264 runs in an east-west direction and is the busiest highway on the reservation linking the villages. At the Arizona Highway 160 and 264 junctions in Moenkopi starts the east-

[145] Socioeconomic Study in Support of a Hydrographic Survey Report for the Hopi Indian Reservation Submitted to Arizona Department of Water Resources by SWCA Environmental Consultants April 2008.
[146] Indian Reservation Roads Program FY 2016 Inventory, Hopi Department of Transportation
[147] Socioeconomic Study in Support of a Hydrographic Survey Report for the Hopi Indian Reservation Submitted to Arizona Department of Water Resources by SWCA Environmental Consultants April 2008, pg. 27
[148] *Ibid at pg. 26*

west road across the reservation, ending at Ya-Ta-Hey, 8 miles north of Gallup, New Mexico. Arizona Highway 87 is a secondary road that begins at Second Mesa and connects with Interstate 40 near Winslow. The third route is Indian Route 6 to Spider Mound, which is partially maintained by Arizona Department of Transportation (ADOT) Indian Route 6 runs north to south and connects on Interstate 40 near Holbrook.

The BIA Roads Branch maintains all Indian Route roads both paved and dirt, constituting over 700 miles of roads on the reservation. Indian Route 2 (Luepp Road) and Indian Route 6 (Holbrook Road) are paved secondary roads. The majority of BIA roads are unpaved local roads. The majority of these local roads are maintained due to school bus routes. These local roads are dirt, fair-weather roads that are often impassable in the winter snows and summer thunderstorms. Indian Route 2 links Kykotsmovi with Flagstaff covering 92 miles one-way. Indian Route 6 begins 8 miles east of Keams Canyon and ends at Interstate 40 covering 70 miles east of Holbrook.

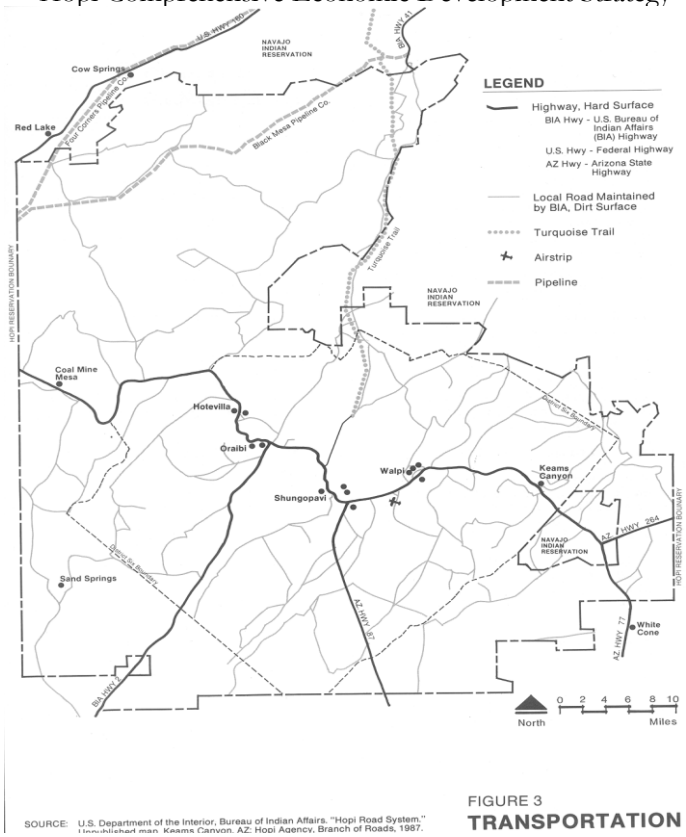
Interstate 40 and U.S. Highway 160 are major routes that influence traffic patterns throughout Northern Arizona. Interstate 40 lies about 35 miles south of the reservation and is one of the principle east-west Interstate highways in the United States. The Hart Ranch, part of the Hopi Three Canyon Ranch lies on both sides of Interstate 40 that runs east/west through the northern edge of the ranch. The ranch is accessible from Interstate 40 by the Twin Arrows, Buffalo Range, Two Guns and Meteor Crater interchanges. U.S. Highway 160 runs northeast/southwest on the northwest boarder of the Hopi Reservation adjacent to the communities of Upper and Lower Moenkopi.

Polacca Airstrip, located 2 miles west of Polacca, is available for charter or private usage. The primary use is medical evacuation and personal transportation. The airstrip consists of a 4,200-foot paved and lighted runway, a paved parking apron for 12 aircraft, a graded entrance road and a parking lot. Polacca Airstrip requires frequent maintenance because of weeds, local flooding and poor soils. The road to the airstrip is on the inventory, the airstrip is not on the inventory for maintenance services. The Hopi Tribe is a limited sponsor due inclusion of the FAA Airport Capital Improvement Program, for reconstructing the runway in the future.

The present airport facilities need numerous improvements to increase safety and accessibility. These include extending and resurfacing the runway, paving the entrance

road, fencing the airport perimeter and upgrading the runway lights. A site study and master plan was prepared in 1977.[149] It proposed improving the existing airport to meet immediate tribal needs and developing a new airport on Second Mesa. The Airport Capital Improvement Grant is being used to complete an Airport Layout Plan and Narrative. The Hopi Tribe's Tribal Council recently declined by a vote to reject the Transportation Investment Generating Economic Recovery (TIGER) $2.9M in funds for 2016, which would have helped with the Tawa'ovi to build new roads up at the proposed project site. The Hopi Department of Transportation (HDOT) is working on the Hopi Long Range Transportation Plan (LRTP). The LRTP will help guide the Hopi Tribe with future community planning for economic development and basic road improvements.

[149] PRC-R Dixon Speas Associates, 1977



SOURCE: U.S. Department of the Interior, Bureau of Indian Affairs, "Hopi Road System," Unpublished map, Keams Canyon, AZ: Hopi Agency, Branch of Roads, 1987.

FIGURE 3
TRANSPORTATION

Goal: Provide safety of roads through continued maintenance for all roads through the Hopi reservation.

Objectives:

1. The Tribe will be working on a Long Range Transportation Program (LRTP) for the entire road transportation system with an inventory for all roads and road maintenance will be updated.
2. The Tribe shall continue to work on the safety through data collection of car accidents in order to obtain funds to have safer roads.
3. The Tribe shall continue to pursue funding opportunities for existing roads and proposed roads.
4. Encourage a safe and efficient transportation system for the reservation for a positive impact to economic development.
5. Inventory of all roads and road maintenance, including identifying roads for schools and emergency responder‘s routes.
6. New roads and streets should be located in areas with suitable soils, slopes and drainage to consult with the Hopi Department of Transportation.
7. Continued road safety through roads safety outlets of roads and bridges.

Economic Development

The Hopi Tribe continues to develop a working framework to continue creating feasible economic development by and for the Hopi People. Economic development is not new to the Hopi government and its people. The coal deposits found on the Hopi reservation began the idea of economic development through jobs, revenue and independence over four decades ago through the negotiations over coal and water leases with the now Peabody Energy (formally known as Peabody Western Coal Company). The foundation set forth through historic coal negotiations have set the stage for creating and working to diversify the state of economics for the Hopi people.

Over the course of time and new policy changes from federal to state EPA climate change policy, the future of coal development through sales to coal fire generated power plants, the Hopi tribe has been working on utilizing Hopi revenue to begin to diversify the economic base to create other ways of income. Although EPA climate change policy is a challenge the Hopi Tribe will continue to seek alternative ways to utilize its coal assets, yet to be mined.

The Hopi Tribe over the years has worked on off reservation economic opportunities, such as purchasing ranch land for a cattle business, purchasing commercial properties such as a truck stop, hotel, commercial shopping centers and even agricultural lands. Most of these lands are far from the main Hopi reservation and are in communities such as Holbrook and Flagstaff.

A list of off reservation properties include:

- Hopi Three Canyon Ranch - Winslow, AZ
    - Cattle ranching business owned by the Tribe, which operates the Drye, Hart, Clear Creek, Aja, and 26 Bar Ranches, Springerville, AZ
- Full service truck stop and travel plaza in Holbrook, Arizona
    - The Travel Center is comprised of a gas station with maintenance service; profit centers (such as leased space to Burger King, Full Service Restaurant and a store). The travel center employs 58 people. The travel center is a full service truck stop with all capacities of fuel, food and other amenities.
- Flagstaff Commercial Properties – Flagstaff, AZ
    - Continental Plaza Shopping Center, Kachina Square Shopping Center and Heritage Square Shopping Center are real estate property investments of the Hopi Development Corporation. The revenue stream derived from these properties is steady and predictable given the current market and property values in Flagstaff, Arizona. There are no employees, as the business is run and managed entirely under a contract with First Commercial Real Estate
- Kokopelli Hotel in Oak Creek Village/Sedona, Arizona

  - The Kokopelli Inn has a total of 48 rooms and 1 conference center/breakfast room. A total of 7 employees are currently employed (housekeeping; front desk and maintenance). The Inn currently breaks even because of recurring maintenance issues.

A short list of on reservation properties include:

- Hopi Cultural Center on Second Mesa
  - The Cultural Center currently employs 46 people (from the hotel to the restaurant). The business is currently above the monthly average of profit by 40%, due to the tourist season beginning a bit early this year.

- Housing unit to rent 75 homes near the Hopi Health Care Center
  - The Walpi Housing is managed by the HTEDC. The housing units are located next to the Hopi Health Care Center and the tenants are Hopi Tribal government and Indian Health Service employees. The numbers of employees are estimated at 15. The housing is not a big economic profit and breaks even with maintenance and up keep of the housing units on a day-to-day basis.

Both on and off reservation investments are being sought to create jobs both on and off Hopi. A 13,200 acre Dobell Ranch and the 210 acre Twin Arrows parcel located on Interstate 40, 15 miles east of Flagstaff.

The Hopi economy through these various purchases encourages great opportunities through innovation and entrepreneurships for further investments. The Hopi Tribe Economic Development Corporation (HTEDC) both has a responsibility to set the guidelines, policies and procedures for development of a new business or continue as a regulated entity on and off the reservation lands. These procedures incorporate the Department of Natural Resources (DNR) as far as those departments that carryout the Hopi Tribal Ordinances that help protect as well as create the Tribe‘s land, water, mineral and other resources. Each of these Hopi entities will create the foundation to create and build an economy, to support sustainable living.

The location for many Hopi land purchases are along the Interstate 40 (I-40) corridor which is a major outlet for tourists wanting to visit one of the seven wonders of the world, the Grand Canyon National Park. The attraction creates traffic of 33.2 million visitors from around the world to come see this spectacular wonder. The future Hopi potential business ventures that could conceivably include: RV parks, hotel/motels, restaurants, campgrounds, convenience stores with gasoline stations, small tourism galleries or museums, billboards, and small travel center with shopping centers. Other potential concepts could include small apartments to small single living units that could evolve into other small businesses. The list can be longer,

however, the feasibility and financial analysis has to be profitable down the road in order to seek financial investors for such a big step. Various options utilizing the data collected should factor in the other surrounding variables such as the market and construction costs.

The Hopi Tribe‘s economic portfolio will include but not be limited to: Increase employment opportunities through construction and planning documents from village to tribal government sectors; Increase economic ventures through land planning and development policy for future for light to small industrial development, such as proposed subdivisions, commercial, industrial, multifamily residential and public and semi-public use in compliance with the tribal ordinances. Strategic planning, setting and creating priority projects will be a necessary first step to economic development.

Goal: Increase and expand the Hopi Tribe‘s regional economic portfolio.

Objectives:

1. The Tribe shall continue to pursue funding opportunities for all equitable economic development projects from developers and federal/state grants.
2. The Tribe shall create land use planning maps that have set aside commercial and industrial sites from encroachment by residential and other uses as the planning and zoning process.
3. Increase Tribal investments in support for local economic development
4. Encourage individual self-entrepreneurship to establish small business enterprises
5. Support and increase job-training programs for all ages.
6. Protect the scenic and cultural vistas of the Hopi Reservation from roadside disorder that results from scattered, unplanned development.
7. Expand on ecotourism – educate on ecotourism
8. Cooperation and outreach to neighboring land owners for future cooperative ventures.
9. Invest funds to refurbish and upgrade existing economic development centers, such as the Hopi Travel Center, Holbrook, AZ and other locations to attract visitors and to rent out office space.

There are land, cultural and historical factors that account for the lack of development on and off Hopi, results in nonexistence of capital investments into key utilities such as water, sewer and energy infrastructure.

Tourism and Travel

The new friendly term for tourism is eco-tourism, which through Hopi history, the people and the Tribe have been practicing for many years. On a regional level as far as the state of

Hopi, tourism is key to Hopi. The tourism that reaches Hopi is part of the $1.9 billion dollars that comes in to the State of Arizona by way of the Grand Canyon and through the continued traditional ways of living by native peoples of the Southwest. The ways in which to capitalize on the tourism is undetermined due to lack of permanent facilities or a central area to help Hopi entrepreneurs and the Hopi Tribe successfully capitalize on all tourism through buses or individual vehicles with tourists.

The data trends and research from the Arizona Office of Tourism dating from 2014 indicate that Arizona's warm weather and magnificent natural beauty makes tourism one of the state's top export industries.[150] In 2013, ***33.8 million people*** visited Arizona collectively spending ***$19.8 billion*** in the state. The money spent by visitors supports jobs and generates tax revenue.[151] The ***$2.7 billion*** in 2013 tax revenue equals an annual tax savings of $1,100 for every Arizona household and supported ***163,500*** industry jobs.[152]

The data trends reported by the Arizona Office of Tourism reports continue to increase spending by resident and foreign visitors was $909 billion in 2015 in current dollars.[153] This reflects virtually no increase over 2014, largely due to lower prices in motor fuel.[154] When adjusted for changes in prices (real dollars), spending increased by 4.4 percent from 2014 to 2015 – compared to a 3.1 for the preceding year.[155] Total direct travel spending in Arizona was $21.0 billion in 2015.[156] The increase was only 1.3 percent because of the significant decline in motor fuel prices.[157] Non- transportation visitor spending increased by 5.6 percent, following a 5.0 percent increase from 2013 to 2014.[158] Over the past two years, travel spending in real (inflation-adjusted) dollars has increased by 3.9 percent per year.[159] Real travel spending increased by 1.8 percent per year during the preceding four-year period (2009 through 2013).[160]

This data resource from the Arizona Office of Tourism indicates the visitors that could visit Hopi lands for the historic culture, education and purchase of arts and crafts. The Grand

[150] Arizona Office of Tourism 2015 website http://tourism.az.gov/ (bold emphasis on numbers).
[151] *Ibid*.
[152] *Ibid*.
[153] Arizona Travel Impacts 1998-2015p Prepared for the Arizona Office of Tourism, Phoenix, Arizona June 2016. report by Dean Runyan Associates. Pg 2.
[154] *Ibid* at pg. 2.
[155] *Ibid* at pg. 2.
[156] *Ibid* at pg. 6.
[157] *Ibid* at pg.6..
[158] *Ibid* at pg. 6.
[159] *Ibid* at pg. 6.
[160] *Ibid* at pg. 6.

Canyon, Interstate 40 and other National Parks in the area attract the regional diverse economic presence. The businesses that generate revenue are: hotels, restaurants, and shopping and southwestern artifacts, directly creating jobs. Continued research into tourism commission with the knowledge of traditional and private culture, the social and cultural education can be incorporated into the creation of economic tourism. The tourism concept can generate more awareness and opportunities for growth and expansion on and off the Hopi reservation utilizing all existing properties. For the tribe to capitalize on the work of its Hopi artisans that live on/off reservation through silver/gold jewelry, turquoise jewelry, kachina carvings, sculptures, weaving and traditional designs, southwest clothing, pottery, plaques/baskets, paintings, moccasins and many other valued artwork. Although the world wide web through online sales for local artisans is also a viable way, sales from direct artisans is still a demand through local art galleries and shops (majority are out of the homes of the artisan) that are located in villages throughout Hopi.

The Hopi Tribe has the Hopi Cultural Center and Moenkopi Legacy Inn and both are two prime locations that have the capacity to capitalize and manage tourism. The Hopi Cultural Center infrastructure and building is in need of improvements to become a highly beneficial asset for meeting space and hotel rooms.

The Moencopi Legacy Inn has the capacity through the Denny‘s restaurant and conference rooms to organize artisan workshops and other demonstrations, and it sits on the main corridor of Arizona highway 264 and 160 that has large tourist visitors to the four corners area for outdoor adventures and tourism. The Moencopi Legacy Inn has a swimming pool and an appealing lounge that is replicated from a Hopi house. The hotel is ~~–t~~he Gateway to Villages and Hopi”, with various tours and other attractions listed for visitors and tourists. Many artisans from throughout Hopi are invited to come give a workshop on their artwork, are there to help educate foreigners or visitors of the Hopi way and traditions. The tours include a list of existing tours within each village, such as the tourist attraction located on First Mesa. Moencopi Legacy Inn will be looking at additional construction for phasing in additional commercial development.

Rehabilitation for marketing plazas and additional museums located throughout the Hopi villages could show case each village as they have subtle distinct differences from village to village when it comes to one of kind artisan creations. The Hopi Tribe‘s Economic Development Corporation (HTEDC) can seek funds through federal, state, private including the Tribe‘s own

tribal funds to work on rehabilitation for many of the existing and future buildings; however, infrastructure is key to expansion for additional construction.

Hopi Industrial Park

The 220-acre Hopi Industrial Park is located on the western edge of Winslow, south of the Burlington Northern Santa-Fe Railroad and old Route-66, which now serves as an I-40 access road.[161] The Hopi Housing Authority currently leases 25 acres on the western portion of the property, in Coconino County, and has constructed 33 multi-family units on eight acres of its site.[162] A vacant 115,000 square foot industrial building with 12 – 18 foot ceiling heights occupies a 15-acre site south of the housing and west of non-reservation multi-family housing that borders the Hopi property to the south.[163] This mostly pre-engineered steel building was constructed in 1968 for the Western Superior Corporation, makers of BVD underwear, who occupied the building until 1974.[164] The building was vacant until 1986 when the Young An Hat Company of Korea leased it, leaving in 1995. The building has been vacant since.[165]

This property has been identified as a resort facility near Hopi Industrial Park,[166] at one point and still could entertain the possibility as being the Gateway to Hopi from the southern entrance. As such, like many buildings located throughout Hopi, building renovations along with water, sewer and other electrical capital costs need updated to current construction dollars. These estimates that the building require from the last 2014 Hopi Industrial Park assessment update estimate at $1.7 million dollars for a new roof, domestic water and fire pressure.

The Hopi OCPED office receives and reviews corporate proposals to lease and benefit from the Industrial Park building in Winslow, on Interstate 40 and near the Burlington Northern Santa-Fe Railroad, the Winslow airport and near the original Route 66. The prime location for the Industrial Park (small to light industrial commercial use) can create a large economic revenue venture. This property is located on the Hopi Reservation and is part of the trust land status, creating more complexities having the properties near a non-Indian community. This

[161] 2010 Hopi Comprehensive Economic Development Strategy Prepared by The Office of Planning and Evaluation under an award from the U.S. Department of Economic Development Administration Project #07-84-06439
[162] *Ibid*.
[163] *Ibid*.
[164] *Ibid*.
[165] *Ibid*.
[166] 2014 plans – Hopi Tribe Industrial Park Update Strategy

complexity can be a pro or con when dealing with commercial leases and or other aspects; however, case studies have proven that private corporations have worked alongside tribal entities proving medium to large commercial developments.

Goal: The goal for economic development will be to identify all assets, identify challenges, and identify the opportunities and the threats that can create obstacles that cause financial risks and will preserve the land in a sustainable manner by generating revenue.

Objectives:

1. The Tribe shall continue to pursue funding opportunities for all proposed commercial developments and expansion.
2. Regular coordination and collaboration with surrounding neighbors, such as the Coconino County, Navajo Nation, Arizona Department of Transportation (ADOT) and private landowners.
3. Continued data projects utilizing the demographics, population, labor force and economic base indicators that could shift the economic trends in the areas of potential business ventures.
4. Land use planning and development outlooks for the challenges facing economic fluctuations given the national, state to local economies. Land use inventory to include planning and development prospects.
5. The Tribe through the Land Commission can create partnerships with the Navajo Nation for various right-of-ways for on and off reservation properties such as: gas pipelines, fiber optics, water and sewer lines, roadways, electricity and other energy developments.
6. Cultural sustainability and other collaboration with the Hopi Tribe‘s Department of Natural Resources office.
7. Continued job training for all ages in areas of hospitality, food service, entertainment, recreation, education in retail, health care and transportation, and arts and crafts.

Cultural Resources

The Hopi people enrich the lands of Hopitutskwa (Hopi land) and existing Hopi lands where cultural, religious and traditional values continue. The Hopi Cultural Preservation Office (HCPO) is established to work with villages, village members and the Tribal government to help characterize the existing conditions of the cultural environment. HCPO works to help with

archaeological and historical resources for the entire Hopi lands both on and off the main reservation. HCPO conducts studies, inventories, field surveys and other components related to Hopi culture. HCPO studies of traditional cultural lifeways and resources both on the ground and traditional cultural resources working on surveying for homes and/or proposed project sites. HCPO conduct surveys relevant for Section 106 of the National Historic Preservation Act (NHPA) and other cultural clearances necessary to preserve and protect Hopi cultural sites and resources. The State Historical Preservation Office (SHPO) is part of the NEPA process, to consult under Section 106 for the Tribe for consultation.

The Hopi lands encompass the northeastern portion of Arizona, along with some areas located on Navajo lands. The traditional lands of the Hopi encompass a larger area not included into the existing reservation boundaries, leaving consultation for Section 106 having HCPO staff travel for cultural consultations.

Goal: Preserve the Hopi way of life through language and culture. Protect sacred places and subsistence gathering areas.

Objectives:

1. The Tribe will work to establish a Tribal Historic Preservation Office to review and consult for all reports and field work on culturally sensitive areas.
2. Continue to consult traditional leaders before land assignments are granted in culturally sensitive areas.
3. Develop an ordinance and applicable policies to protect culturally sensitive areas from new development and land use changes.
4. Prepare informational materials to instruct and educate tourists on the appropriate and proper behavior/mannerism that demonstrate sensitivity and respect to the Hopi people.
5. Develop necessary plans to establish a Hopi Tribal museum and cultural education facility.
6. Design and Construct a Hopi Tribal Archives for storage and maintenance of historically significant information/material and cultural/religious paraphernalia.

Hopi Lavayi (language)

1. Mandate all schools on the Hopi Reservation to include a Hopi language curriculum.

2. Seek funding to develop Hopi language programs for villages to include Hopi language and recordings/videos.
3. Develop, adopt, fund and fully support a total Hopi language and cultural immersion program to be incorporated within the villages, communities, off-reservation Hopi organizations and educational systems on the Hopi reservation.

The goal is to provide adequate staffing for the Cultural Preservation Office to meet the internal requirements of Section 106 (National Historic Preservation Act) as requested from all entities.

Land

The Office of Hopi Lands Administration's (OHL) primary function is to protect the rights and interests of the Hopi Tribe and the Hopi people on the Hopi Partitioned Lands (HPL), 1934 Hopi Partitioned Lands – Moenkopi District, District Six, Hopi Three Canyon Ranches (HTCR), and other newly acquired lands. This encompasses 1.6+ million acres and newly acquired lands consisting of 305,596 acres, of which 160,167 acres was taken into Trust Status (HTCR).

The function and mission is accomplished by four OHLA Field Monitors monitoring activities throughout the Hopi Reservation with the submission of referrals and/or reports; trespass of all livestock, fence cutting, wildlife sightings, illegal cutting of green trees and/or harvest of fire wood (without permits) and vandalism of range infrastructures on the Reservation. OHLA provides assistance to all Department of Natural Resources (DNR) programs in conducting inventories, that include the GPS of land/property and agricultural sites, surveys of water resources (springs and wet lands), illegal dumpsites (activities and monitoring), wildlife surveys, drought monitoring, livestock counts, livestock and feral horse round ups.

With the approval of the 1934 Intergovernmental Compact by the Hopi Tribe, Navajo Nation and the U.S. Secretary of Interior, the implementation of the 1934 Compact involves monitoring of the 1934 Navajo Reservation by OHLA, LIS, Hopi Cultural Preservation Office (HCPO), and Wildlife Ecosystem Management Program (WEMP) in conducting bi-annual monitoring of Non-Development Zones surrounding the golden eagle nesting sites. The program has provided extensive technical assistance in fieldwork and mapping with the implementation of the 1934 Compact, assisted and participated in the Mediation Process by providing logistical data

on issues related to land use, identified Hopi shrines, springs, gathering areas and encroachment into Non-Development Zones.

Implementation of Public Law 93-531, as amended by Public Law 96-305, the Navajo-Hopi Land Settlement Act of 1974 and Public Law 104-301 continues. The OHLA provides administrative oversight of the Accommodation Agreement Leases (A.A.L.) and has served as liaison between the HPL Navajo families and the Tribe in addressing the issues that pertain to the lease agreements. This includes housing and infrastructure i.e.; electrical power line extensions, water wells/lines, sanitary facilities, road improvements, dispute resolution process, social services, and jurisdictional issues.

OHLA conducts an annual compliance inventory report of all Accommodation Agreement Lease home sites and agricultural sites used by the HPL Navajo families. These are submitted to the BIA for Navajo rental payments.

The OHLA continues to provide technical assistance to the Hopi Land Team in dealing with issues relating to the leases i.e.; termination, transfer and Navajo requests for housing and sanitation facilities construction needing Land Team review and approvals.

Another function of the OHLA is to conduct and process land assignments for home and agricultural sites and special land use for Hopi Tribal members and tribal organizations. Issuance of assignments has been on hold, while the Land Assignment Guidelines are updated and amended.

The OHLA staff has served as first responders to emergencies, some of which have been to natural disasters i.e.; heavy snow, rain/flooding, drought, missing persons search and rescue incidents. The OHLA Director serves on the Hopi Emergency Response Team (HERT) as the Logistic Officer and has been involved in all emergency declarations.

Land Use

The predominant land uses on the Reservation are agricultural and range, recreational, industrial, and community mixed use, which includes residential, institutional, commercial uses located in 14 clustered configurations, locally referred to as villages, and five existing Planned Community

Development Districts (PCDD).[167] Land use planning efforts are key to conserve and develop the land for the benefit of tribal members and begin to minimize conflicts between land uses.

Goal: To incorporate The Integrated Resource Management Plan, (adopted May 2001) Department of Natural Resources

Objectives:

1. The Tribe shall continue pursuing funding opportunities for land use planning and policy development.
2. Hopi land use planning document to be created
3. Continue to use traditional ways to settle land disputes within District Six.
4. Recognize customary use area within District Six to continue making decisions about range management and land use planning.
5. Require all claims to land and resources on the Hopi Partitioned Land (HPL) to be supported by tribal land assignments or use permits per tribal ordinances. This policy will not restrict subsistence, religious, or traditional gathering activities on the HPL.
6. Respect to continue those uses of land and resources that sustain religious, subsistence, and economic and recreational activities.
7. Regulation and Enforcement over tribal lands through Hopi Tribal Court.

The goals below point out what has been working for the Office of Hopi Lands Administration over the years. These Goals and Objectives below are the main focus for the Office of Hopi Land Administration (OHLA) on a day-to-day basis. The goals and objectives have been highlighted to be incorporated in its entirety into the CEDS as it pertains to planning and management purposes.

Goal #1: The OHLA will look out for the interests and rights in protecting our natural resources for the Hopi Tribe and Hopi people on the HPL – Moenkopi District, District Six, 1934 Hopi Reservation and the newly acquired lands.

Objective: Continue to monitor activities that include unauthorized and illegal livestock trespass, vandalism of tribal property, fence lines, windmills, unauthorized construction by Navajo families, quit claim properties, the taking of Hopi resources i.e.; wood, sand, gravel, water and wildlife, and monitoring the Golden Eagle Nest Non-Development Zones on the 1934 Hopi Reservation.

Goal #2: Administration and implementation of the Accommodation Lease Agreements:
Objective: With the Hopi Tribe and the HPL Navajo families who have signed the

[167] Socioeconomic Study in Support of a Hydrographic Survey Report for the Hopi Indian Reservation Socioeconomic Study April 30, 2008. Prepared by SWCA Environmental Consultants for Arizona Department of Water Resources.

A.A. to remain on the HPL, implementation of the A.A. continues. Issues/activities being addressed includes the following:

- Continue to coordinate with Hopi and Navajo Nation service providers to address social service and Navajo related jurisdictional issues.

- Continue to provide education on Hopi Ordinances and laws for HPL Navajo families. Assistance has been provided by the Hopi Resource Enforcement Services (HRES) and Office of Range Management (ORM) on the tribal ordinances relating to natural resources i.e.; grazing, woodlands, wildlife, trespassing, etc., as well as poaching for all game.

- Conduct feasibility studies for infrastructure, such as electrical power line extensions, water wells, water line extensions, roads, etc. to serve Hopi and Navajo families on the HPL. Work with the Indian Health Service (IHS), Office of Environmental Health & Engineering (OEH) on the approval and design construction of water cisterns and septic systems and specifications.

- Develop the conflict process to deal with problems/issues arising from the Accommodation Agreements, thereby avoiding court litigation. Currently, emphasis has been on the jurisdictional issues regarding the Hopi Tribal Courts and jurisdiction over domestic relations.

Goal #3: To continue to Implement the 1934 Intergovernmental Compact:

Objective: With the approval of the 1934 Intergovernmental Compact by the Hopi Tribe, Navajo Nation and the U.S. Secretary of Interior, the Implementation of the Compact will involve the following:

- The program will continue to monitor the Non-Development Zones for any new developments within the zones and reports the findings. The initial monitoring report is submitted to the Hopi Land Team for their review and the findings will be forwarded to the Hopi members of the 1934 Board of Commissioners for their review and possible arbitration.

- OHLA along with OCPED, HCPO and WEMP to conduct bi-annual monitoring of eagle nesting Non-Development Zones on the Navajo Reservation. Documenting new developments such as homes, electrical power lines, water lines, roads, corrals, windmills, etc. within these Zones. Violations and reports submitted to the Hopi Land Team for their review and submittal to the 1934 Commission.

- Meetings of the Golden Eagle Advisory Task Team need to continue to strategize on lobby efforts for funds to implement the 12 year Golden Eagle study.

Goal #4: Gain Complete Jurisdiction over all Hopi Tribal Lands.

Objective: To complete the Trust Taking of Newly Acquired Lands.

Goals and Objectives #1, 2 and 3 are year round activities.

Agriculture

The largest claims for water on the Reservation are for irrigation of agricultural lands. About 63% of the Reservation, or over 1 million acres, have been determined to have soils that could potentially grow crops if irrigated (ADWR, 2008). The Hopi have a long history of dry farming and irrigation in the region and have developed traditional practices to adapt to a limited water supply and relatively harsh climate. The latter is characterized by strong winds, early and late frosts, and a semi-arid climate. Many Traditional Hopi farming practices are still being used to grow crops on the Reservation today. This section describes historic, recent, and future water demands for agriculture on the Reservation and how these demands have been, and would be, met. Methods to quantify agricultural water demands are summarized first and provide a context for later discussions.

- Encourage traditional Hopi agriculture.
- Educate on drought conditions that have affected soil erosion and other soil changes.
- Develop irrigated agriculture in a way that maximized both employment and return on tribal investment.

Recreation

Recreation

Potential recreational areas are 4 lakes in the Keams Canyon area, known as Keams Lake, Lake Maho (also known as Upper Keams Lake) Twin Dam No. 1 and Twin Dam No. 2 located on the main Hopi Reservation. The Pasture Canyon Reservoir located near Moenkopi Villages is also seen as a recreational area; however it is prioritized for irrigation purposes.[168] Pasture Canyon Reservoir, is being considered to include that into the annual stocking for the Tribe, from the USFWS Alchesay-Williams Creek National Fish Hatchery (NFH) located in Whiteriver, Arizona where the Tribe receives an annual stock. The Hopi Tribe will need to meet with both Upper and Lower villages to get their input, as any stocking may impact the use of the

water for irrigation. Some village members from both villages (Upper Moenkopi and Lower Moencopi) have requested that it be stocked, however the tribe has to see what can be worked out between the farmers and village to enter into a compromise if one exists, however, if no compromise is made, then Pasture Canyon Reservoir may not be stocked with fish.

Recently, the Hopi Tribe and USFWS worked with Hopi Wildlife Ecosystems Management Program (WEMP) to stock Beaver Dam (Pond) in Keams Canyon with 1,500 8 inch Rainbow Trout from the Whiteriver-Alchesay NFH in March 2015. However, currently the Beaver Dam (Pond) is not being stocked due to a fish health/disease issue with the USFWS Alchesay-Williams Creek NFH. Depending on the results of the from the next testing, the tribe may opt out of receiving fish from the hatchery and look at other alternatives to stock Beaver Dam (Pond). There is a regulatory Ordinance #48 (Wildlife), there Hopi is planning to continue efforts to stock both waters for recreational fishing. At this time fishing will be free to Tribal members and currently we are not allowing non-Tribal members to fish. Hopi Tribal members have in the past fished for a fee, with a fee required for Non-Hopi members. If the Hopi Tribe should purchase fish from another out of state hatchery, Hopi may implement permit fees applicable to Hopi Tribal and non-Tribal members to allow permits to offset costs. Illegal fishing will result in a fine of $50.00 per fish illegally caught.

Goals: Provide and maintain wildlife and fish stock ponds per the recreation mission.

Objectives:

1. Support initiatives by the villages to provide and equip playgrounds and facilities for small children to adults
2. Protect areas of the reservation with high scenic value or cultural ties.
3. Improve existing recreation facilities.
4. Increase the variety of recreation opportunities on the reservation.
5. Increase to work on invasive species that have changed woodland/wetland/riparian areas.

Housing

The availability of affordable housing on the Hopi Reservation is an increasing problem as the population grows. Many Hopi people have been forced to move off reservation for employment and/or the lack of housing. They cite not being able to build within the villages

which are crowded to capacity, not being able to secure an uncontested land assignment on which to build, not being able to secure funding to build a home and not having opportunity to buy an existing home as the reasons. Many returning Hopi are unable to find a home site anywhere in District Six and must choose sites in the HPL without utilities or improved roads if they want to live on the Reservation. This further isolates them from family, from fully participating in the religious ceremonies and from needed tribal services.

The problem is not unique to Hopi families. Indian Health Service professionals and school teachers who work on the Hopi Reservation agree that lack of housing is a huge problem and often the number one deterrent in seeking employment on the Hopi Reservation.

The BIA and Indian Health Services provide rental housing at Keams Canyon. In addition, there are federal rentals for BIA teachers at the Hopi Junior/Senior High School and in Polacca, Second Mesa, Kykotsmovi and Hotevilla. A small amount (33 units) of low-income housing is available on Hopi trust lands in Winslow. The Walpi Housing Project added 75 town home rental units, which are managed by Hopi Tribal Economic Development Corporation (HTEDC). These are located at First Mesa and maintain a 99% occupancy rate.

Much of the housing found on the Reservation is public housing financed under Housing and Urban Development (HUD) programs and administered through the Hopi Tribal Housing Authority (HTHA).[169] Currently, the HTHA manages 230 homes through ownership and 33 as rentals (6 are low income and 27 are tax credit).[170] The HTHA has developed a 1-year plan to include community input. A study identified most homes were built between 1969-1984[171] and are in need of repairs; of which, there are 208 housing units that need immediate work. The most serious problem is the roofs. Fifty units need complete replacement while 104 need repair. A total of 157 units need work on the building structure, stucco and other weatherization repairs. The HTHA now has a database of the condition its own housing stock and the needs of people related to housing to use for future planning. The Hopi Tribe to date does not have a recent updated reservation wide housing assessment.

According to a survey conducted in 2000 for the Hopi Strategic Land Use Development plan, it was estimated that at least an additional 315 dwelling units were needed to alleviate the perceived overcrowding conditions, and another estimated 447 units are needed to replace the

[169] Socioeconomic Study in Support of a Hydrographic Survey Report for the Hopi Indian Reservation Submitted to Arizona Department of Water Resources by SWCA Environmental Consultants April 2008.
[170] *Ibid at pg 12*
[171] *Ibid at pg 12*

number of dwelling units considered to be beyond structural repair.[172] Assuming an average of four persons per dwelling unit (DU), this represents a need for 88 new dwelling units per year, or an additional 1,760 new dwelling units over the next 20 years (Hopi Tribe 2001b). [173]

HTHA can leverage the infrastructure necessary to support housing and also to be used for economic development projects on land the villages set aside. Currently First Mesa has designated 30 acres, Sipaulovi set aside 15 acres, Hotevilla has 57 acres and Moenkopi has a large area in the expanded village area where the hotel and other commercial enterprises are located. HTHA will work with the villages to develop these areas for economic development

Currently HTHA has the list of 2016 projects proposed for the next five years are:

- Warehouse Construction at Polacca and Winslow;
- Youth Center Subsurface Drainage System
- Spider Mound Developing: housing;
- Twin Arrows Development: housing;
- First Mesa Consolidated Villages Community Development Master
- 20 unit scattered site development proposals,
- 40 unit Winslow Development and site improvement
- 2 BIA HIP Homes
- Home Rehabilitation Program

Goal: Provide every Hopi family with decent, safe, and sanitary housing according to its individual needs. Allow tribal members to choose the location of their homes, subject to tribal policies

Objectives:

1. Tribal Council has the authority to approve locations for new communities, subdivisions and individual home sites on the Hopi Partitioned Lands.
2. New housing should be located near existing housing where water and other community facilities are available or can be provided.
3. Villages maintain policies for new housing, land assignments, and other home site areas in and around villages

Community Participation

[172] *Ibid at pg 12*
[173] *Ibid at pg 12*

The Hopi Comprehensive Development Plan, Parts I and II, of 1988, called the Hopit Tunatya'at was developed to formally establish goals and policies for the development and protection of Hopi land, resources and facilities.[174] In 1990 the Tribal Council approved an amendment to the Hopit Tunatya'at by adopting Part III of the plan.[175] This third section incorporated standards of land use planning and development and established a formal review and decision-making process.[176]

The Hopi Tribal Strategic Plan of 1994 reaffirmed most of the goals previously established, but added one new major area. In 1995 it was determined that the four major planning documents developed needed to be consolidated to provide a better understanding of the comprehensive and complex strategic issues. Established by tribal resolution the Hopit Pötskwaniat (Hopi Tribal Consolidated Strategic Plan of 1995) was first developed consolidating other tribal planning documents to establish one vision and a strategic plan to realize this vision.[177] The Hopit Tunya'at 2000 is the most recent land use development plan.

The last Hopit Pötskwaniat was completed in 2011, holding public participation booths by departments/programs or other services at the Hopi Veterans Memorial Center. The responses included the various local governmental offices of BIA, IHS, Tribal and village community members. No other updates have been conducted since. The Hopi Tribe's DNR departments and programs along with the DNR Planner are currently working on outreach to the Hopi Villages and others to obtain feedback to work on improving community participation.

Public Services and Facilities

The Hopi Tribal government continues to work on improving public facilities and services on the reservation.

Goal: Improve public facilities throughout the Hopi reservation.

Ojectives:

1. Give highest priority to medical care for all especially for proposed new elderly care facilities.
2. Provide support for increased law enforcement and other public safety awareness.

[174] 2010 Hopi Comprehensive Economic Development Strategy Prepared by The Office of Planning and Evaluation under an award from the U.S. Department of Economic Development Administration Project #07-84-06439.
[175] *Ibid.*
[176] *Ibid*
[177] Hopit Pötskwaniat (Hopi Tribal Consolidated Strategic Plan) November 29, 2011.

3. Support an on-going fire safety program, including local schools for inspections to make buildings fire safe. This includes having the water infrastructure to ensure fire protection for all private, school, public and tribal infrastructure.

Department of Natural Resources

The mission for the Department of Natural Resources (DNR) is twofold as listed below all the various Tribal Ordinances have been developed through the course of time to ensure and protect all cultural and natural resources. Being two-fold, the ordinances exist to help villages and village members create a sustainable community and homeland. Some programs are amending some of the ordinances, which will be presented to the Hopi Tribal Council.

- Water Resources Program (WRP)
- Hopi Environmental Protection Office (HEPO)
  - General Assistance Program (GAP)
  - GAP Solid Waste Program
  - Pesticides Program
  - Leaking Underground Storage
- Hopi Cultural Preservation Office (HCPO)
- Office of Mining and Mineral Resources (OMMR)
  - Abandoned Mine and Lands Office (AML)
  - Hopi Surface Mining & Enforcement Program (HSMREP)
  - Equipment Rental Program
  - Uranium Mill Remedial Action Program (UMTRAP)
- Hopi Renewable Energy
- Land Information Systems (LIS)
- Range Management
  - Windmill Fence Construction & Maintenance
  - Hopi Veterinary Services
  - Hearing Board
  - Range Management Fund
  - Hopi Natural Resource Conservation Service (NRCS) Funding
  - Land Operations
  - Partitioned Lands
  - Safety of Dams
  - Dam Maintenance Program
- Hopi Resource Enforcement Services
- Hopi Solid Waste Management Program
- Office of Hopi Land Administration
- Wildlife & Ecosystems Management
- DNR Plans, Policies and Ordinances
- Hopi Integrated Resources Management Plan (Adopted May 2001)
- Hopi Tunatya‘at 2000 – Hopi Strategic Land Use and Development Plan
- Hopi Pötskwaniat 2011 – Hopi Tribal Consolidated Strategic Plan
- Hopi Integrated Woodlands Management Plan (Adopted 2006)
- Hopi – BIA Wild Land Fire Management Plan (Adopted 2006)

- Hopi – FEMA Natural Hazard Mitigation Plan (Approved 2006)
- Hopi Drought Contingency Plan (Adopted August 2000)
- Hopi Tribal NEPA Compliance Process (Adopted 2001)
- Ordinance #26 Hopi Cultural Preservation Code
- Ordinance #43 Control of Livestock and Grazing
- Ordinance #44 Solid Waste Management
- Ordinance #47 Woodlands
- Ordinance #48 Wildlife & Hunting/Furbearer Trapping Regulations
- Ordinance #53 Civil Trespass – Hopi Water Code; Water Quality, Well Construction & Wellhead Protection
- Ordinance # 55 Hopi Planning Ordinance
- Ordinance # 57 Hopi Tribe Groundwater Enforcement
- Ordinance # 58 Hopi Tribe Wellhead and Source Water Protection
- Federal Laws & Regulations applicable to Hopi Indian Trust Lands and Assets

Strategic Projects, Programs and Activities of Hopi Tribal Government

The Hopi Tribe and the departments/programs are currently working on existing projects listed that will help on the future plans for the Hopi economy diversification. These projects below are ongoing projects that work towards the goals for creating a local to regional Hopi economy. These projects may have funds or are looking at applying for funds. Continuing work for these projects and other proposed projects are all what is current and new for the Hopi Tribe, however many of these projects will take some time.

The Hopi Tribe through Hopi Office of Community Planning and Economic Development (OCPED) conducted various strategic work session beginning in February through May 2017 to bring all Hopi Departments/Programs, Hopi Tribal Council and HTEDC to work on setting priorities for the Hopi Tribe to begin first steps to identifying key economic development projects, knowing the decision made by SRP and owners to begin the process for the decommissioning of Navajo Generating Station (NGS). This process for the Hopi Nation will be devastating having an 88%[178] impact to the Hopi Nation and its employees and people. The Hopi Nation from 2016 CEDS to 2017 CEDS have had some movement in various areas, however with the updated 2017 CEDS, most of the projects continue to move forward, with some small changes, however goals and objectives continue to stay the same focusing on economic development. Many of the goals and objectives from all various departments listed throughout the document continue to be pursued, however funding, land or other issues may arise causing time lapse with proposed projects.

North Central Arizona Water Supply System (NCAWSS)

The North Central Arizona Water Supply System (NCAWSS)[179] Report of Findings is a regional water supply project that takes a look at various options for transporting water from Lake Powell

[178] *Analysis of Economic Impacts on the Hopi Tribe and Navajo Nation of a Stringent NOx BART Decision for the Navajo Generating Station, March 1, 2010*. Prepared for the Hopi Tribe. ICF Resources, LLC, Fairfax, VA 22031 *Letter Dated March 1, 2010 from Leroy Shingoitewa, Chairman, Hopi Tribal Council, to Jared Blumenfeld, EPA; Document number 0211 in the docent for the ANPRM: EPA-OAR-2009-0598.*

[179] The NCAWSS group falls under the Coconino Plateau Water Advisory Council (CPWAC) is an organization consisting of 28 federal, tribal, state and local government entities with land and water use management responsibilities, as well as public and private interests. The CPWAC was established in 2000 to facilitate and implement sound water resource management and conservation strategies on the Coconino Plateau in Northern Arizona. Since 2000, numerous studies have been completed by or at the request of the CPWAC working in concert with the U.S. Bureau of Reclamation (BOR) and the Arizona Department of Water Resources (ADWR). One such study that has been completed is the North Central Arizona Water Supply Appraisal Study (Appraisal Study).

western Navajo communities and Hopi reservations. The Appraisal Study included: 1) an identification of the current water supplies and demands, 2) an evaluation of whether or not there may be unmet municipal water demands on the Coconino Plateau through the year 2050, 3) a determination of whether or not there is at least one regional alternative to meet the future demand, and 4) a determination of whether or not there is a federal objective in which there is at least one regional alternative that can be recommended to be carried forward into Feasibility Study. The NCAWSS has a Technical Advisory Council (TAC) consists of various stakeholders from the Navajo Nation, Hopi Tribe, City of Page, City of Flagstaff, and other non-Indian communities. Bureau of Reclamation (BOR) completed and released the Report of Findings for the Appraisal Study in October 2006. The Report of Findings for this Study concluded that by the year 2050: 1) There will be an unmet water demand of more than 24,700 acre-feet of water annually for the Indian and non-Indian communities on the Coconino Plateau. 2) There is at least one alternative that exists to meet the projected unmet municipal water demands on the Coconino Plateau (the Study identified at least four); and 3) There is a federal objective to warrant going to the next phase, which is a Feasibility Study.

There are a few design solutions to transporting water from Lake Powell through the a western pipeline that would come from Lake Powell, through western Navajo Nation by way of Moenkopi Villages ending at Second Mesa. There has been one select distribution route that has been identified and Tribal Council has allocated money to conduct work in conjunction with the U.S. Bureau of Reclamation (BOR) to continue feasibility study work for the Hopi Lateral. The project dollar amounts continue to be updated; currently the cost projections for the Hopi Lateral portion do not exceed $200 million. The project work meetings are ongoing and are critical to the Hopi Tribe for future unmet water demands out to 2050.

Hopi Arsenic Mitigation Project (HAMP)

The drinking water arsenic solutions continue to evolve through the completion of the Life Cycle Cost Analysis and Comparison of Alternatives, Hopi Public Water System Strategic Plan, and Environmental Assessment, August 2014. This report gives recommended alternatives for the construction of a regional water system to serve First and Second Mesa with water on a wholesale basis. The HAMP is considered to be the more sustainable of the two primary alternatives analyzed, and will provide greater operability, reliability, efficiency, simplicity, cost

effectiveness, and safety compared to the alternative of implementing water treatment systems in each village.[180] The keystone of the HAMP are two newly drilled Turquoise Trial Wells #2 and #3, which will serve as the new arsenic compliant water source for the villages of First and Second Mesa.[181] The water quality and quantity of the wells have both proved to be outstanding, with arsenic levels of 4.7 and 4.2 ppb, both less than half the US EPA maximum contaminant level for arsenic in drinking water.[182]

Tawa‘ovi Infrastructure

Tribal Council adopted the Tawa'ovi Community Master Plan through the Office of Community Planning and Economic Development (OCPED). Under the Hopi Tribe Resolution H-044-2001, the Tawa‘ovi Community Development Team was created to oversee the master planned community. A multijurisdictional plan will be developed to establish authority and responsibilities. The Tawa‘ovi team will address development through affirming water rights, additional housing, and local economic development and Hopi tribal government expansion. The Tawa‘ovi Team has identified potable and irrigation water resources. Existing well will be having been drilled and cased. Power resources have been identified, evaluated for cost effectiveness and contracts developed for service. Environmental and cultural clearances have been completed by BIA issuing a Finding of No Significance Impact (FONSI) issued May 2014. Engineering plans will be developed along with the other elements of the infrastructure phases. Land grading plans need to be developed and the land graded in core areas. All construction will be accomplished according to the phased development plan. The Tawa‘ovi project team plan is to create a corporation to oversee the master planned, including the power source to be approved by the Hopi Tribal Council.

The Tawa‘ovi Community Development Project under Housing and Urban Development Challenge Grant #CCPAZ0043-11 produced a final report dated December 18, 2013 for the Hopi Tribe. This project is proposing a sustainable community northeast of the main reservation. This project will be a new community within a regional setting within Hopi Partitioned Lands

[180] Preliminary Engineering Report for Hopi Arsenic Mitigation Alternatives IHS Projects PH12-E73, PH11-E55, PH10-E37, PH08-T38, PH06-D33 and PH04-S63. Prepared for The Hopi Tribe by Indian Health Service, August 2014.
[181] *Ibid.*
[182] *Ibid.*

(HPL). The Tawa‘ovi Community will have the capacity for many different ways to build a community.

Well, tank and disinfection plans have been completed Phase 1 conceptual plans have been updated through use of Tawa‘ovi project funds to support Phase 1. Then the tribal action item H-034-2016 to confirm Hopi Tribal Council‘s commitment to Tawa‘ovi Development Project support of TIGER grant and action item H-013-2016 to approve a Charter of Incorporation for the Tawa‘ovi Community Development Corporation; both of the Action Items (H-034-2016; H-013-2016) were defeated in Tribal Council. The Tawa‘ovi project could be revisited as a future potential project.

Hopi Tribal Housing Authority

A BIA Consolidation Report of Tribal Inventories of Housing needs identifies approximately 800 families in need of housing assistance with an additional 300 families needing rehabilitative assistance. The Hopi Tribal Housing Authority (HTHA) program continues to work on providing assistance to families for future homes. The HTHA housing has funding for low to moderate income housing programs for construction and for rehabilitation of existing structures. HTHA operates activities through Indian housing plan to assist the community with housing, to include community awareness and input. Hopi Housing has been established at the Winslow Hopi Industrial park with 40 new home units.

Hopi Cultural Center Motel and Restaurant

The Cultural Center is in need of renovation/rehabilitation and expansion. It provides the only overnight rooms on the main reservation, thus allowing only a small percentage of visitors to full experience the countryside and, more importantly, providing a place to spend money on the reservation. Professional services will be required to assist the HTEDC and the Hopi Cultural Center Enterprises, Incorporated (HCCE, Inc.), the organizational unit of the Tribe delegated authority to plan, develop and promote commercial and business development on behalf of the Hopi Tribe. The expansion project will involve all areas of work to include feasibility, business and marketing

planning, assessment of existing facility, redesign, and engineering and final construction documents. A new wastewater treatment facility will be needed at the Cultural Center. The tourism for a tourist/information center could also be created to provide a place where visitors would have the opportunity to ask questions, learn what is acceptable and feel more comfortable while on the Hopi Reservation. It could also provide space for demonstrations of various crafts, display cases for galleries and places where individual artisans could display and sell their art. Phase II will involve actual construction and continuation of operations and expansion.

Full Development of the Hopi Industrial Park

The Tribe conducted an overview of the development of Hopi Industrial Park with Coe and Van Loo (CVL) firm in 2014. The park feasibility study identified expanding economic development for park. The purpose for the study identifies economically viable options as reasonable prior to all of the preferred set of alternatives.

Although some infrastructure is already in place, additional infrastructure, utilities, as well as police, fire and maintenance services need careful planning. The City of Winslow provides both water and sewer services to the site; however, due to current pressure problems on the site, drilling an additional on or off-site well would provide more water. Another solution would be to attach a pumping unit to the existing pipes to increase water pressure and capacity to support further development. An environmental inspection conducted by the Hopi Tribe recommended a number of improvements. Wiring within the building would need upgrading to accommodate new communication technology required by most industries. The water supply to fight fires at the site is not currently available due to an inactive water storage tank and no water connection.

The report concluded: organizing all land use plans into a cohesive plan with time frames; developing an investment requirements and strategies along with the expected returns from investments.[183] This will include the debt, equity and rental income modeling. Current projects are being proposed, however the CVL report gives a step-by-

[183] *I-40 Corridor Economic Development Feasibility Study Phase 1 Recap Phase 2 Results and Recommendations*, February 3, 2014 Prepared for The Hopi Tribe. CVL Consultants, Wadley-Donovan Growthtech LLC, Garnet Consulting Services, Inc. Economic Development Analysts & Strategies.

step guidance on what to identify when evaluating proposed projects for the Hopi Industrial Park.

Dialysis Center

The Hopi Tribe‘s Department of Health and Human Services is pursuing a location to establish a Dialysis Center on the reservation to accommodate the Hopi and Navajo dialysis patients. Several locations have been reviewed. The First Mesa Village has designated a portion of land in conjunction with the Hopi Health Care Facility. These facilities will be in addition to the dialysis facilities at the Health Care facility.

Elderly Care Center

The Hopi Tribe continues to look for a site for an Elderly Care Center to accommodate those tribal members who are currently provided services off-reservation. Hopi elders are forced to live off-reservation due to the lack of a facility and support services. A center would provide easier access for relatives to visit patients more frequently and administer care needs that incorporate cultural and traditional methods of healing.

Hopi Veteran‘s Memorial Center

The Hopi Tribe continues its efforts to expand the Hopi Veterans Memorial Center to accommodate the increased interest in indoor and outdoor activities. A Fitness Center includes a Kids Corner to care for children while parents participate in organized activities.

Broadband Internet Project

The Hopi Tribe has formed the Hopi Telecommunications Incorporation (HTI) to provide local broadband services to enable user applications that will create jobs and improve the quality of life on the Hopi Reservation. In phase II, Hopi can have pilot terrestrial wireless local area network (WLAN) services quickly developed parallel with the First Mesa pilot satellite services for current Hopi high bandwidth users. This parallel 3-phase approach provides services to more subscribers to demonstrate a sustainable economic basis for expansion of the satellite and terrestrial WLAN broadband services phase II into

the phase III Reservation wide communications upgrade. This discussion was part of the Hopi 2001 update of the CEDS process and continues to improve over time with funding grants and construction.

Navajo Generation Station Phase 2 Study and EIS

The NGS Phase II has various levels of stakeholders working, they are: the Federal Joint Working Group (USEPA, DOI, and DOE[184]) and the Technical Working Group (TWG) [185] will be conducting Phase 2 of the Navajo Generating Station (NGS), located in Page, Arizona. NGS is a 2,250 MW coal-fired power plant on lands leased from the Navajo Nation near Page, Arizona. Congress authorized construction of the Central Arizona Project (CAP) in 1968, including federal participation in the NGS. Federal share in NGS is 547 MW, with 360 MW used for the CAP pumping of water and 187 MW as surplus power. The Federal NGS surplus power to CAP needs is sold at market rates; revenues assist in CAP repayment and Indian water settlements under Arizona Water Settlement Act (AWSA). The Kayenta Mine, located on lands leased from the Navajo Nation and Hopi Tribe, exclusively supplies coal used by the NGS.

Under the National Environmental Policy Act (NEPA) an Environmental Impact Statement (EIS) will be conducted at the Kayenta Mine Complex (KMC). The KMC EIS will address the NGS lease and right of way grants that begin to expire in December 2019; significant permit revision application for Kayenta Mine under review by the Office of Surface Mining Reclamation and Enforcement (OSMRE). The Purpose and Need (P&N) for BOR is to secure, after 2019, a cost-effective reliable energy source to operate the CAP, and generate surplus revenue. The Proposed Action will be to obtain necessary Federal approvals to continue the NGS and Kayenta Mine from 2020 through 2044. The Notice of Intent (NOI) to prepare a single Environmental Impact Statement (EIS) was published in May 2014. The Hopi Tribe, with the

[184] Note: the Federal Joint Working Group consists of the following federal agencies: the United States Environmental Protection Agency, Department of Interior and Department of Energy.
[185] The TWG includes the Central Arizona Water Conservation District, the Environmental Defense Fund, the Gila River Indian Community, the Navajo Nation, Salt River Project (the Operator of Navajo Generating Station), the Department of Interior and Western Resource Advocates.

approval from Hopi Tribal Council, is currently considering being part of the Technical Working Group under the Parallel Working Agreement[186]. Upon completion of the authorizing approvals, the Hopi Tribe would fall under a Cooperative Agreement (CA). The Hopi Tribe would then become involved with all aspects of the CA for the KMC EIS. This proposed work will include a baseline study to point out the economic analysis to include the economic hardship the Hopi Tribe potentially could foresee if NGS were to be shut down. The Hopi Tribe, if approved by the Hopi Tribal Council, through the Parallel Agreement would be able to work and receive additional technical assistance for future proposed projects both for the much-needed infrastructure and other proposed economic development projects. BOR's technical consultant will help in the technical assistance will be National Renewable Energy Lab (NREL); will develop a road map for the future of the Navajo Generating Station (NGS). This additional research could help inform the development alternatives for the future of the plan, from electrical systems operations, carbon dioxide (CO_2) emissions, cost and other environmental impacts perspectives.

July 1, 2017, the NGS agreements to allow for decommissioning after 2019 must be executed by the Navajo Nation and delivered to NGS participants. December 1, 2017, all necessary approvals of those agreements must be received, including any compliance required by U.S. December 22, 2019, unless agreements have been executed and all necessary approvals obtained to transfer ownership and operation of NGS to the Navajo Nation or other parties, decommissioning activities will commence.

The Navajo Generating Station (NGS) is a three-unit, 2,250 megawatt (MW) coal-fired power plant located on tribal trust lands lease from the Navajo Nation (Nation) near Page, Arizona. [187] The plant operates pursuant to the "Navajo Project Indenture Lease" (1969 Lease), which expires in December 2019.[188] In February 2017, the non-Federal NGS Participants (utility owners known as the Lessees) announced they no longer intend to operate NGS after December 2019.[189] The 1969 Lease generally requires the retirement[190] of certain NGS facilities after

[186] Note: Parallel Agreement between the Hopi Tribe and the United States Department of Interior regarding the Navajo Generating Station (NGS).
[187] Memorandum: Public Scoping for an Environmental Assessment Covering Navajo Generating Station Operations Through December 2019 and Retirement Activities Beginning in 2020 (Action by June 9, 2017), May 23, 2017 Pages 1-3.
[188] *Ibid* at pg. 1
[189] *Ibid* at pg. 1
[190] "Retirement" in this document refers to all work that will occur on the NGS lease site after power generation ends, including: decommissioning, demolition, and removal of facilities, restoration of lands, post-closure monitoring, and access. Retirement does not include reclamation activities associated with the Kayenta Mine, as required by the Surface Mining Control and Reclamation Act and as detailed the approved reclamation plan.

operations end, and the Lessees expect that retirement activities will require two or more years to complete.[191] The NGS Lessees are in ongoing discussions with the Nation for a land use arrangement to allow NGS operations to continue through December 2019, and have retirement activities begin in 2020.[192] Without such an agreement, NGS would need to stop generating electricity by December 2017, so that retirement could be completed before the 1969 Lease expires in December 2019.[193]

The NGS Lessees and the Navajo Nation are considering options that would allow NGS operations to continue through December 2019, and provide for retirement beginning in January 2020.[194] Associated transmission uses also are being considered.[195] These matters are the subject of ongoing negotiations between the Navajo Nation and the NGS operator, the Salt River Project Agricultural Improvement, and Power District (SRP).[196] The form and terms of a potential agreement, are unknown at this time. Regardless of the form and terms of a potential agreement, the current Lessees do not plan on to generate coal-fired electrical energy at NGS after December 2019.[197]

Any agreements to allow extra time for NGS retirement will likely require Federal approvals from the Department of the Interior (Department) agencies, such as the Bureau of Indian Affairs (BIA), and the Bureau of Reclamation because of the Federal role in approving land use agreements on tribal trust lands, and due to the contracts that provide for the Federal share of NGS-generated electricity.[198] The NGS Lessees and the Nation are considering options that would allow NGS operations to continue through December 2019, and provide for retirement beginning in January 2020.[199] Associated transmission uses also are being considered.[200] These matters are being subject to ongoing negotiations between the Nation and the NGS operator, the Salt River Project Agricultural Improvement, and Power District (SRP).[201] The form and terms of a potential agreement are unknown at this time.[202] Regardless of the form and terms of a potential agreement, the current Lessees do not plan to generate coal-fired

[191] Memorandum: Public Scoping for an Environmental Assessment Covering Navajo Generating Station Operations Through December 2019 and Retirement Activities Beginning in 2020 (Action by June 9, 2017), May 23, 2017 Pages 1
[192] *Ibid* at pg. 1.
[193] *Ibid* at pg. 1.
[194] *Ibid* at pg. 1.
[195] *Ibid* at pg. 1.
[196] *Ibid* at pg. 1.
[197] *Ibid* at pg. 1.
[198] *Ibid* at pg. 1.
[199] *Ibid* at pg. 2.
[200] *Ibid* at pg. 2
[201] *Ibid* at pg. 2
[202] *Ibid* at pg. 2

electricity energy at NGS after December 2019.[203] As an NGS Participant, Reclamation may need to provide written approval for any land use agreement executed by SRP pursuant to its agreements with the NGS Participants.[204] In addition, the Secretary of the Interior of the BIA may need to approve aspects of the agreement on behalf of the Nation.[205] It is likely that one, or both, of the Federal agencies will need to complete an Environmental Assessment (EA) regarding the pending Federal approvals related to NGS.[206]

Energy Development

The Hopi Tribal Council along with tribal programs and departments are currently working on solidifying a Hopi Tribe Energy Policy that will include coal, renewable energy, and other mineral development. This document could be a guidance document or become a Tribal Ordinance to help with Energy development as well as a guidance document that helps develop natural resources in a sustainable way. As stated, the future of Hopi coal may have a steady decline as the fuel choice in the energy market. Because of this trend, it seems clear that the closure of NGS will be eminent and Hopi will acutely feel the economic impacts of that closure. The next steps will be to work on other energy elements that over time, to diversity the Hopi economy, however the location of Hopi along with the limited resources will be a challenge. The diversification for other types of energy development will continue the discussion stage as well as continued education for the Tribal departments and programs with the Hopi Tribal Council and the Water and Energy Task Teams. Current discussions include planning, education, strategic planning within the Tribal government as well as village communities will be ideal through a committee that will utilize all current and updated planning documents. The Hopi Office of Community Planning and Economic Development could help organize and make recommendations for projects and other developments for Hopi.

Plan of Action for Implementation

[203] *Ibid* at pg. 2
[204] *Ibid* at pg. 2
[205] *Ibid* at pg. 2
[206] *Ibid* at pg. 2

The purpose of Hopi Tribal Government, as stated in the Preamble of the Hopi Constitution and By-laws, is to promote the welfare of the Hopi people; to provide a way of working together for peace and agreement between villages; to preserve the good things of Hopi life; and to provide a way of organizing to deal with modern problems with the United States Government and the outside world generally.[207] The CEDS combines all past plans that have set the stage, which then sets the path for future development for the vision for planned project delivery. One may ask, how we get there, when it comes to implementing the Plan of Action that has identified both a goal and objective.

The purpose of this action plan is to support, increase and implement the goals and objectives for development plans and directing efforts to implement them. The following initiatives are current development priorities that will be given attention in shaping the development of local and outlying economic development. A timeline will be developed creating a percentage of working being completed

Hopi Tribal economic development emphasis will be concentrated on pursuing programs that will create a positive sustainable business environment on the Hopi Reservation. On-reservation development and organization is necessary to create effective communication and cooperation among the villages and the tribe to support development efforts for and on the reservation. A key component to economic development will include overall infrastructure energy, water, sewer, Internet and other basic needs to create healthy sustainable businesses.

Continued improvements in education and job training are necessary to enhance the understanding of development efforts that will benefit the Tribe, villages and community members. Regional collaborative working efforts with the villages and private sector will increase opportunities for development of projects that will create healthy employment and revenue opportunities for the tribe from Moenkopi to Keams Canyon. Therefore, the regional strategy of the Hopi Tribe is to work closely with the villages and to encourage coordination, cooperation and understanding of the economic development process through community based learning.

The community based learning perception will increase education for all Hopi members at all levels of the tribe. The understanding of policies and procedures that help protect the lands, cultural and natural resources will create a reality to build out and have local infrastructure

[207] Constitution and By-Laws of the Hopi Tribe Approved 19, 1936 and as Amended on August 1, 1969, February 14, 1980 and December 7, 1993. United States Department of Interior Office of Indian Affairs.

to create and provide a strong Hopi Tribal government and people. The Hopi Tribal departments and programs have the capacity and overall structure to continue work on tribal lands at a local level. The next steps from the large overview will be to create a strategic plan on implementation for each and all projected projects. The list of departments/programs and the proposed projects will create the framework for working towards creating a self-sustaining Hopi Tribe.

The Hopi Tribe will begin to move forward in a methodical and strategic planning approach for the plan of action approach. The key idea to the plan will be to identify each project and ensure the project‘s plan of action works within a timeline. This timeline will incorporate the task-by-task or step by step approach for completion of the project with a deliverable. The idea for each approach having a deliverable will enable the on the ground inspection so that the next task will begin and be again completed. This approach incorporates accountability both by the department/program, as well as the consultants who will report back the Hopi Tribe.

Challenges

The project team as identified will begin to set out the roles and responsibilities that are both clear and unclear. The idea of roles and responsibilities: are key when there are cost overruns, missed deadlines and disenchanted participants to follow the management protocols set forth at the forefront of the project development. When a role or a responsibility of a program is unclear the tasks identified will not be completed making a breakdown in the timeline and the task as well as funds attached to the project deliverable. The other aspect that should be included is changes or other challenges that will occur and so a plan of managing the changes should be identified. When roles and responsibilities are defined and set forth then the quality of a project will be the result ensuring a happy customer.

The Hopi Tribe‘s organizational structure identifies the Executive Director to work directly with the tribal programs and departments to ensure project implementation and accountability, then report back to the Hopi Tribal Council. This position is key to both policy implementation and accountability. Throughout the various interviews and discussions it was apparent that the role of the Executive Director is key to helping the Tribal Council approve

policy, yet at the same time the tribal departments and programs need to have that link to Tribal Council for true understanding of projects and proposed policy or tribal ordinances.

Self-Governance

The approach has been utilized by various projects similar to the planning of large construction projects where time is money and money is the product of the client. This idea for implementing a planned approach will enable the Hopi Tribe and its members to be accountable to them and to the Tribe as a whole. The foundation for successful projects, small or large are due to communication and continued education to fully understand the project from pre-start through the end when the books are closed and project is constructed or implemented. The Hopi Tribe, as a "sovereign nation" has the full capacity to take on large multimillion projects, with the key stakeholders on board, the Hopi Tribe could secure funds and have its own Hopi people begin to be independent creating both a sense of sustainable community and nation building; which is defined through development, focused path, plan, endorsement, capacity to manage change and to close a project. Of which, much is in place currently with the various tribal departments and the ordinances they oversee and maintain to protect the assets and natural resources for the Hopi Tribe.

A proposed list identifying key projects to set the stage for creating the foundation for the Hopi Tribe economic development are identified below as an example, the HAMP project: The Preliminary Engineering Report for Hopi Arsenic Mitigation Alternatives: IHS Projects PH12-E73, PH11-E55, PH10-E37, PH8-T38, PH06-D33 and PH04-S63 reports have been prepared for the Hopi Tribe by Indian Health Service, Division of Sanitation Facilities Construction, from the Eastern Arizona District Office, Lakeside, AZ, August 2014. Over the years the Hopi Arsenic Mitigation Project (HAMP) has been in the process for planning and development with participation of various federal agencies, tribal programs, tribal leaders, and village representatives. Various reports have been produced that lay out the step by step approach from conceptual design, mapping, operation, maintenance, repairs, cost breakdown for the entire proposed system.

Challenges for this project include: energy source to power the HAMP system down through the distribution line to inner connect with the existing village infrastructure. Existing

water and sewer infrastructure will be challenges as well to secure the various sources of federal funding to put forth a solid project.

These project listed above have had various reports and conducted studies that set the stage for continued efforts to identify funds to continue to work on the project. Many projects start with a report or a study, from there it continues to move forward by the department/program responsible for overseeing it.

Conclusion

The current state for Hopi lies on the history of the Hopi. The Hopi's historic relationship to the land and the historic relationship, through droughts and floods has evolved over the times brings Hopi to present day. Continued drought and other climatic challenges have sustained Hopi over the course of centuries old traditions of dry farming techniques and the historic forms of water use. Over time, the Hopi have maintained the traditional stewardship with the land, water and other natural elements. However, time has been changing bringing with it more challenges through Hopi history, culture, religion, the world view, geography, laws, policies, decisions (both at Hopi and beyond Hopi's authority through national and state legal decisions), and historical/current dealings with their neighbors the Navajo Nation.

This change and challenge lies within the population change where the statistics from the Hopi Enrollment offices shows that the enrollment numbers show almost a leverage for 7,800 members living on Hopi and 6,590 living off the reservation. This is significant to point out and to remember, for Hopi culture, traditions and livelihood may be at risk due to many Hopi's living, working and raising their families off the main Hopi reservation. These families may come back to the reservation for ceremonies or other needs; however if the trend continues and the unemployment percentage continues to increase, with continuing slow processes for housing, or other major capital improvements for safe drinking water, sewer and energy infrastructure leaving Hopi to adapt or respond to the trends. The future steps for the future of Hopi will be faced with challenges, risks as well as opportunities.

The current state of the Hopi Tribe can incorporate short term and long-term goals set forth by meeting set objectives/mission for creating an economy through various infrastructure projects to set the foundation for economic development projects both small to large. The mission of the Hopi Tribe is to work with each tribal department/program to create short term

and long-term goals and objectives under a strategic plan. Water is vital to sustaining Hopi life and culture. Securing and developing water infrastructure is foremost for a sustainable homeland. An example of a long term project, across a number of Hopi Villages, a need for water and sewer projects are struggling to obtain funding to upgrade and ensure that EPA safe drinking water standards are met for village members. Village governments are working towards a plan to achieve growth and development and guaranteed water and sewer infrastructure is a vital precursor to any future investment in various economic ventures under consideration.

The Hopi Tribe must have a will to utilize both its assets, the natural resources including land use planning as well as the proposed energy policy to begin steps moving forward to create a permanent homeland. The future coal sales, that Peabody Energy supplies Navajo Generating Station (NGS), will end December 2019[208]. Due to the Hopi Tribe being geographically isolated from employment opportunities in northeastern Arizona, possible industrial development could be a potential project within the boundaries. The Hopi have also rejected gaming as a potential source of revenue.[209] The Hopi Tribe stressed in its comments to EPA back in March 2010, "that if NGS closed, the economic impacts would be catastrophic and include curtailment of critical social programs, lost employment, and loss or slowing of critical infrastructure programs."[210]

The future of Hopi as a –sovereign nation" will be dependent upon time and a commitment plan in what manner the Tribe's will to diversify its current economic portfolio. The planning process will be time consuming, but will help identify a future process for one or more potential economically feasible energy projects. The projects could continue to utilize existing natural resources for coal reserves untapped as well as renewable energy from wind to solar projects.

The Hopi Tribe will continue to face the challenges due to limited access to capital and due to being located in a remote or isolated from distribution centers, dealing with transportation, communication systems, and major capital infrastructure such as water and sewer. Due to limited funding both from the federal government and or other resources like loans, making the potential of project financing long and stringent. The Hopi Tribe's focus will be to continue to strive on

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[208] *Ibid* at pg. 2

[209] *Analysis of Economic Impacts on the Hopi Tribe and Navajo Nation of a Stringent NOx BART Decision for the Navajo Generating Station, March 1, 2010*. Prepared for the Hopi Tribe. ICF Resources, LLC, Fairfax, VA 22031 *Letter Dated March 1, 2010 from Leroy Shingoitewa, Chairman, Hopi Tribal Council, to Jared Blumenfeld, EPA; Document number 0211 in the docent for the ANPRM: EPA-OAR-2009-0598.*

[210] *Analysis of Economic Impacts on the Hopi Tribe and Navajo Nation of a Stringent NOx BART Decision for the Navajo Generating Station, March 1, 2010*. Prepared for the Hopi Tribe. ICF Resources, LLC, Fairfax, VA 22031 *Letter Dated March 1, 2010 from Leroy Shingoitewa, Chairman, Hopi Tribal Council, to Jared Blumenfeld, EPA; Document number 0211 in the docent for the ANPRM: EPA-OAR-2009-0598.*

accessing capital to start and maintain businesses of all sizes. Economic development will continue to be a challenge for access to capital for tribal government services creating the much needed start for any business either as small business owner to the tribal government itself. This is highly significant as a challenge.

Many tribal members and others may question what the next steps will be for the Hopi Tribe and its tribal government, its tribal lands and its people as far as the future and economic growth. The Hopi Tribal Council can utilize this document to help prioritize goals, policies and objectives through strategic planning and setting a timeline to get the objective checked off the list as completed as they go through and list the challenges, the associated risks as well as seeking opportunities to develop a Hopi sustainable economy for future generations.

Appendix A[211]

[211] Note: The Appendix A was taken from the 2010 Hopi Comprehensive Economic Development Strategy Prepared by The Office of Planning and Evaluation under an award from the U.S. Department of Economic Development Administration Project #07-84-06439. Note: the Hopi Comprehensive Wetland Rehabilitation Plan Draft is a key factor in Appendix A as well, due to the overview for the geographic overview for Hopi lands and other natural resources.

PHYSICAL FEATURES

The main Hopi Reservation is located in eastern Coconino and northern Navajo Counties, Arizona. It encompasses 2,439 square miles or 1,561,054 acres, and is bounded on all sides by the Navajo Indian Reservation. Most of the reservation is open land used for traditional farming and livestock grazing. Hopi shrines, sacred features and ceremonial gathering areas are scattered throughout the main reservation.

The Hopi own a 220-acre parcel of land on the border of Winslow, Arizona, known as the Hopi Industrial Park. It is held in trust by the United States. In 1968 a 120,000 square foot building was constructed on a 15 acre parcel for apparel manufacturing (the building is now vacant and in need of repair), 25 acres has been dedicated to the Hopi Housing Authority for HUD sponsored low-income rental units. 160 acres currently remains undeveloped.

In 1997 the Hopi Tribe acquired additional aboriginal lands totaling 429,264 acres of pine, oak, juniper and piñon forest, working ranches and rangeland as partial settlement in the Navajo-Hopi Land Dispute settlement Act of 1996. These lands were and still are working cattle ranches. Currently, the ranches raise for profit Hereford registered and commercial cattle. These new lands are located in Navajo, Coconino and Apache counties. The Hopi Tribe, in coordination with Arizona State Game and Wildlife, hosted its first big game hunt during hunting season for 2015. The Hopi Tribe is completing the process to take these lands into trust status. Future development has not yet been determined by the Hopi Tribe although the potential exists for summer and winter recreation activities, Trophy big game hunts, bed and breakfast operations, executive retreats, life skills building for adults/youth, Interstate frontage billboards and a truck stop.

The main Hopi Reservation is located within the Great Basin Desert, on the Colorado Plateau, encompassing and extending beyond the southern edge of Black Mesa.[212] Black Mesa consists of sandstone belonging to the Mesa Verde Group, underlain by Mancos Shale.[213] The southern escarpment breaks off sharply to form the broad, flat Little Colorado River Valley.[214] The southern scarp of Black Mesa forms discontinuous, finger-like

[212] Hopi Comprehensive Wetlands Rehabilitation Plan, Chapter 1. Pg. 5/11
[213] Hopi Comprehensive Wetlands Rehabilitation Plan, Chapter 1. Pg. 5/11
[214] Hopi Comprehensive Wetlands Rehabilitation Plan, Chapter 1. Pg. 5/11

projections called Antelope Mesa, First Mesa, Second Mesa, Third Mesa, Howell Mesa and Coalmine Mesa.[215]

Five major washes cross the Hopi Reservation: Moenkopi, Dinnebito, Oraibi, Polacca, and Jeddito. All are tributaries of the Little Colorado River, and flow in a generally northeast to southwesterly direction. While the majority of the washes are ephemeral, intermittent and perennial reaches exist in some areas, primarily as a result of groundwater discharge.

The climate of the Hopi Reservation is semiarid, with precipitation ranging from 6 to 10 inches per year in the lower elevations, and 10 to 14 inches per year in the higher elevations. The majority of the precipitation occurs July through October. May and June are the driest months. Scattered thunderstorms are common in the summer. Snow accumulates most heavily in January and decreases steadily into May. The average seasonal snowfall is 14 inches. The climate is characterized by mild to hot summers, and cold winters. In summer the average temperature is 70°F, and the average daily maximum temperature is 87°F, as recorded at Keams Canyon. The growing season ranges from 120 days at the higher elevations to 160 days in the lowlands. Elevations within the Hopi Reservation range between 4,500-7,500 feet above mean sea level.

Reservation Vegetation Zones

The Hopi Reservation covers diverse environmental zones. These various environmental zones support plant communities that Hopi have continued to harvest and manage for a number of needs and applications, since prehistoric times. As part of Hopi stewardship, plant resources are key to sustaining the many domestic and religious needs of Hopi society. Prior to widespread grazing native vegetation supported wildlife such as small and big game, resident and migratory birds, insects, reptiles, amphibians, and many others that made up the source of annual gathering harvests for Hopi needs.

Tutskwa: Desert Scrub / Grasslands

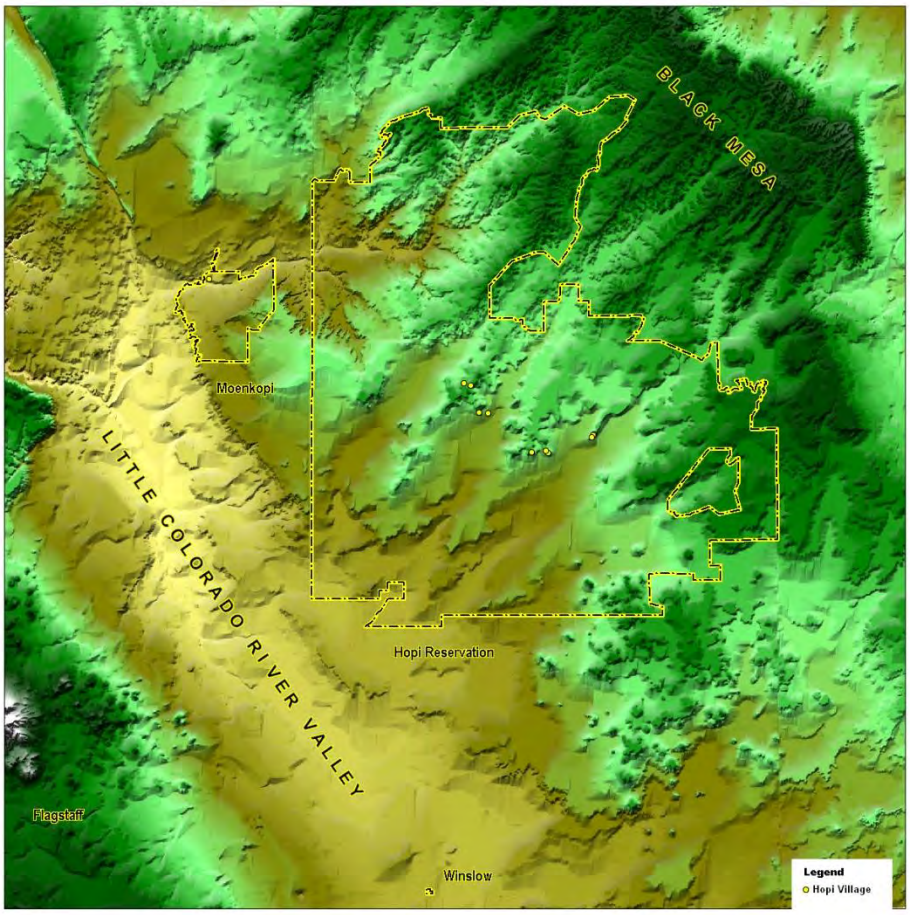
The various grasslands habitats/plant communities on the Hopi Reservation comprise approximately 1.5 million acres, or 96% of the existing trust lands. The Semi-Desert

[215] Hopi Comprehensive Wetlands Rehabilitation Plan, Chapter 1. Pg. 5/11

Grassland occurs below 5500 feet in elevation[216] and receives average annual precipitation of five to eight inches. It occupies 264,353 acres, or 17% of the Reservation. Vegetation in this zone is predominantly grasses, of which galleta (Hilaria jamesii), Indian ricegrass (Oryzopsis hymenoides), and alkali sacaton (Sporobolus airoides) are dominant. Characteristic forbs are rosemary mint (Poliomintha incana), winterfat (Eurotia lanata), and several low saltbushes (Atriplex spp.). This is a nearly treeless area, with the exception of riparian areas, or where soil moisture is concentrated.

Mixed Grassland occurs between 5500 and 6200 feet in elevation, and receives average annual precipitation of eight to twelve inches. It occupies 993,907 acres, or 64% of the Reservation. This zone is dominated by grasses when in good range condition. The presence of big sagebrush (Artemisia tridentata) indicates transition into Sagebrush-Grassland zone. Important forbs are buckwheats (Eriogonum spp.), low sagebrush (Artemisia bigelovii), and four-winged saltbush (Atriplex canescens). Scattered juniper trees are also found in shallow soils.

216 Elevations are approximate. Areas on south and west exposures are often mapped as drier climatic zones at elevations above the upper range given. On north and east slopes, the reverse often occurs. (BIA, Hopi Range Inventory Report, 1996, p. 3)



REGIONAL TOPOGRAPHY

-5 0 5 10 15
Miles

Elevation
7400'
6500'
6000'
5400'
4400'
Units: Feet

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Sagebrush-Grassland occurs between 6200 and 7000 feet and receives average annual precipitation of twelve to fifteen inches. It occupies 285,738 acres, or 18% of the Reservation.[217] Big sagebrush is the dominant shrub. Blue grama, galleta, and Indian ricegrass are the dominant grasses, but bottlebrush squirreltail (Sitanion hystrix), western wheatgrass (Agropyron smithii), and needle-and-thread (Stipa comata) are much more prevalent than in lower zones.[218] Some areas of steep, shallow soils have canopies of pinyon (Pinus edulis) and juniper (Juniperus monosperma and J. osteosperma) with understories of muttongrass (Poa fendleriana), prairie Junegrass (Koeleria pyramidata), desert needlegrass (Stipa speciosa), and elk sedge (Carex geyeri).[219]

Pasíiqölö: Wetlands - Riparian Plants and Deciduous trees

The Hopi regard the protection of Pasíiqölö as an important step towards fulfilling stewardship responsibilities due to cultural and religious links to water. Hopi ideology focuses on the propitiation and value of moisture in all its forms, including those that sustain wetland environments. Wetlands are not elevation specific ecological zones; neither do they receive more or less precipitation than surrounding environments. However, they are characterized by the presence of water, for some or all of the year, hydric soils, and wetland vegetation[220].

Riparian plants, paatusaqa, in these wetland environments are important because of their link, physically and spiritually, with the life-giving moisture that sustains them. Wetlands are found in different areas throughout the reservation such as in the major washes, seeps, springs, and drainages. A few examples of wetlands found throughout the reservation are Kalbito Springs, Wipho Wash, Keams Canyon, and Pasture Canyon. Each area is unique and historically supported many forms of native plant life. This zone occupies an estimated 8,000 acres, or less than 1% of the Reservation. Dominant vegetation species include cottonwood (Populus spp.), willow (Salix spp.), tamarisk (Tamarisk spp.) and Russian olive woody species, cattails (Typha angustifolia), rushes (Phragmites australis), reeds (Equisetum hyemale), and wetland grasses (Spartina gracilis, Polypogon monspeliensis, and others).

[217] Hopi Comprehensive Wetlands Rehabilitation Plan, Chapter 1. Pg. 5/11
[218] *Ibid. pg 5*
[219] Hopi Comprehensive Wetlands Rehabilitation Plan, Chapter 1. Pg. 5/11
[220] US Army Corps of Engineers Definition.

Habitat loss for most of these important native plant species is imminent. Most wetlands need rehabilitation due to their being overrun with noxious woody weedy species, i.e. tamarisk and Russian olive trees, which push out native plants and use water in an unsustainable manner.

Hóoqölö – Tuve'qölö: Piñon-Juniper and Great Basin Conifer Woodlands

Most woodland on the Hopi Reservation consists of Piñon-Juniper tree stands. These woodlands provide an optimum resource for many activities and have been utilized by Hopi for a multitude of purposes. Woodlands are commonly a mixture of piñon and juniper, with junipers dominant in the lower part of the Zone, and piñon increasing to become dominant in the Piñon Juniper Woodland Zone. Piñon Juniper Woodland occurs between 6500 and 7500 feet elevation, and receives average annual precipitation of fifteen to seventeen inches. Piñon-juniper canopy is the dominant feature. This zone occupies only 9,543 acres or less than 1% of the Reservation. Big sagebrush is dominant in deep soiled areas, along with bottlebrush squirreltail, blue grama, galleta and Indian ricegrass. Muttongrass, prairie Junegrass, and bottlebrush squirreltail are most prevalent under tree or shrub canopies. Gambel oak (Quercus gambelii) is a primary indicator of this Zone, along with Utah serviceberry (Amelanchier utahensis).

Yet the current condition of this resource is poor due to over-use for fuel harvesting, unmanaged roads, erosion, and human pollution. A recent study indicated that the Hopi Tribe might only have 10 years of woodland resources remaining, at current rates of consumption[221]. The major areas of woodland resources are in Range Units 262, 263, and the mesa tops above Keams Canyon.

Paavahu: Water Resources

Historically, Hopi people relied on a dense network of springs for their water. However, growing population and modern development have increased the demand for water beyond the capacity of these springs and compelled Hopi to look for alternative sources. The Hopi now rely primarily on subsurface aquifers for both human and livestock uses.

Many growing communities in northeast Arizona use these same aquifers and the surface drainage of the Little Colorado River and its tributaries. Since the area's constrained water

[221] Bruce Koyiyumptewa report, 1999 from the Hopi Comprehensive Wetland Rehabilitation Plan.

supply has to support a growing population, there is negotiation and litigation surrounding water use rights. Additionally, human impacts are compromising the quality of the region's water, both above and below ground. Since aquifers depend on infiltration of surface water for recharge, they are vulnerable to overuse, drought, contamination and harmful human activities. Source water for the Hopi Reservation is in dire straits for a variety of reasons.

Surface Water Resources

The surface water resources of the Hopi Reservation include the five major washes, Jeddito, *Polacca*, Oraibi, Dinnebito, and *Moenkopi*, which traverse the Hopi Reservation from a northeast to southwest direction. The washes are dry most of the year and only flow during high runoff events. Winter storms are of long duration and low intensity and produce little runoff. This is in contrast to the intense summer thunderstorms. Over 80 percent of the annual stream flow occurs from July through October. When stream flow does occur, it contains large amounts of silt. Short reaches of Moenkopi, Dinnebito, Oraibi, Polacca and Jeddito Washes contain flowing streams or pools of water year-round. These flows are sustained by groundwater discharge, due to unconfined aquifer conditions. Over the long-term, total stream flow on the reservation averages about 25,000 acre-feet per year, but shows extreme variability from year to year.[222]

All of the Hopi washes are listed as impaired under the Hopi Tribe's Clean Water Action Plan Unified Watershed Assessment, due to sediment load, chemical contamination, and presence of coliform bacteria. The only known current utilization of surface water on the Hopi Reservation is for cattle watering through diversions to off-stream storage and cattle ponds on tributaries to the washes. Under the settlement proposal in the Little Colorado River Adjudication, the Hopi and Navajo Tribe would share in the waters of these washes equally, according to a formula regulating impoundment storage volumes.

Ground Water Resources

The limited and highly variable supply of surface water, groundwater is an important resource. Groundwater resources will have to provide for much of the Hopi people's future needs. Groundwater originates as rainfall and surface water that seeps into the ground and is

[222] Sonosky, Chambers and Sachse, 1986

stored in porous rock and soil layers called aquifers. Aquifers under the Hopi Reservation are stacked one on the other and are generally separated by nonporous barriers of clay shale or other rock.

Perched Aquifers

Perched aquifers are sand deposits that lie within a confining soil and rock layer. Livestock, game, and human occupation easily contaminate these aquifers. The Tuba City Landfill contaminates one of the perched zones and another is contaminated by the Thriftway/Sunwest gasoline station spills at Tuba City and Munqapi. These aquifers may yield water to seeps, springs and windmills. They are limited in extent and poor in quality. In general, this water is of acceptable quality for stock watering but unsuitable for domestic use or irrigation.

Quaternary Alluvial Deposits

Sand and soil are deposited along the washes by fluvial action and wind. These deposits may contain water of variable quality and production. D.B. Stephens and Associates dug four wells into the alluvium in 1993 as part of the ongoing water source inventory conducted by the Hopi Water Resources Program. A well dug into the alluvium along upper Wepo Wash was very good in quality and production. A well dug into the alluvium near Polacca Airport was moderate in quality. Two wells dug into the alluvium along Oraibi Wash were moderate to poor in quality. Two boreholes attempted in the alluvium along upper and lower Dinnebito Wash were dry. A windmill near Polacca is dug into the alluvium and used for water hauling for drinking and livestock water. The quality is unknown.

Wepo Sandstone Aquifer

This uppermost aquifer is a rock unit high on the Hopi mesas near the Peabody Coal Company Black Mesa Mine lease. A few windmills are drilled into this aquifer, mostly on the Navajo Partitioned Lands. It is limited in extent and storage, and little is known about the quality of the water.

Toreva Sandstone Aquifer (T-Aquifer)

This aquifer outcrops along the edges of the Hopi Mesas, and supplies the springs traditionally used for drinking water supply and garden irrigation near the villages. Water supply wells have been drilled into this aquifer at First Mesa and a hand-dug well was drilled into it at Kykotsmovi early in the 20th Century. Water quality ranges from very good (potable) to poor (due to metals and bacterial contamination). Production is fair. At Hotevilla and Bacavi, the water contains radioactive gas (radon) in excess of the proposed maximum contaminant level (MCL). The exact extent of the aquifer is unknown due to poor well logs at Hopi. This aquifer is easily contaminated by human occupation, due to its nearness to the ground surface in inhabited areas.

Dakota Sandstone Aquifer (D-Aquifer)

This aquifer consists of the Dakota Sandstone and Entrada Sandstone water-bearing units. It is extensively used for windmills in cattle watering. Some people may haul water from these windmills. The aquifer water quality ranges from very good to poor. Springs in the Keams Canyon area discharging from this aquifer may contain arsenic and other metals. Saline water from this aquifer may contaminate drinking water wells in the Polacca and Hopi High School areas due to poor well construction and/or natural inter-formational leakage and seepage. The Spider Mound well is thought to penetrate this aquifer and contains fluoride in excess of the MCL. The exact extent of this aquifer is unknown due to poor well logs at Hopi. Production ranges from poor to fair. The Entrada Sandstone is unsaturated in the south Oraibi basin.

Navajo Sandstone Aquifer (N-Aquifer)

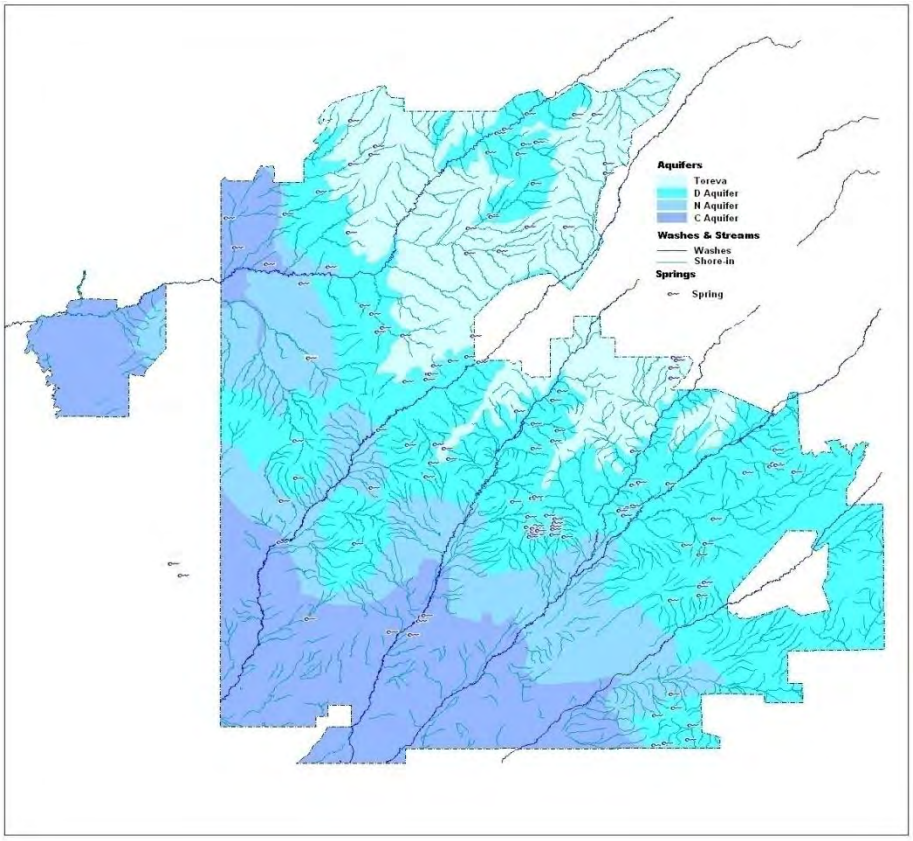
This aquifer consists of the Navajo Sandstone, the Kayenta Mudstone and the Windgate Sandstone. It is the primary drinking water aquifer on the Hopi Reservation, being the source for all village wells, except Spider Mound. In many areas, the water is sufficiently pure to use in steam irons (nearly distilled water quality). The production rate is generally good, ranging from 20-600 gallons per minute. Contamination is possible from inter-formational leakage through faults and fractures in the overlying rock. The exact extent of this aquifer is unknown due to poor well logs at Hopi.

Coconino Sandstone Aquifer (C-Aquifer)

This aquifer consists of the Coconino Sandstone and Supai formations. It is known to underlie the Hopi Reservation. It extends throughout the Little Colorado River Basin and is used for drinking water supply in the nearby cities of Flagstaff, Winslow, Holbrook, St. Johns, and others. The quality ranges from very good (at Peabody) to very poor. The production rate is very good at Winslow and very poor at the Peabody Mine. An oil exploration well in the southern part of the Hopi Reservation (Oraibi Wash Basin) was once used for water supply. This aquifer is under intense investigation by Hopi Water Resources Program Staff and D.B. Stephens and Associates for water supply in the southern portion of the Hopi Reservation and at Munqapi. The C-aquifer well has been explored down 3,200 ft. below surface. Another study is soon to be published for the southern part of the aquifer by the US Geological Survey.

Muav Limestone and Redwall Limestone Aquifer

This aquifer is used for water supply in the City of Sedona and at the Hualapai and Havasupai Indian Reservations, but is nearly 4,000 feet deep at Hopi. It is not considered a viable or affordable source of water for Hopi.



HYDROLOGY

-5 0 5 10 15
Miles

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Tutskwa niqw toko'at: Land and Mineral Resources

Hopi cultural values and traditions have always focused on the need to respect and care for the land granted to us by Maasaw with the condition that it not be negatively impacted. Prehistoric uses of the land usually came from stone, clays, sands, coal, other minerals and materials used for construction, cultural uses, and fuel. Gathering sites are governed by traditional arrangements; some sites are public, while others _bdong' to individuals who developed them

The passage of the Hopi Tribal Council Resolution H-83-79 on July 9, 1979 requires further study of Hopi energy resources before any development can take place, and places a moratorium on all additional energy resource exploration and development on all tribal lands. This moratorium is to remain in place until ~~a~~ formal energy resource development policy has been adopted by the Tribal Council." The Policy would serve as a tool to properly assess, develop and manage energy resources while protecting the cultural, religious and hydrologic resources of the Tribe, so that a balance between Hopi traditional values and economic viability can be achieved.

The 1991 *Mineral and Energy Resources on Hopi Lands* report by the Hopi Office of Mining and Mineral Resources summarizes available data on Hopi mineral and energy resources, discussing some economic, environmental, and political concerns relative to those resources and identifies policy issues pertinent to each resource as follows from the *Executive Summary*.

Owako – Coal:

The full extent of coal resources on Black Mesa is unknown. Coal production is a major economic resource of the Hopi Tribe. A long-range marketability study should be commissioned to determine the feasibility/unfeasibility for future development.

Oil and Gas

Incomplete information is available on the six oil wells drilled on District Six during the 1960's. Because of the cultural significance District Six holds for the Hopi people, it would not be practical to explore or mine in that part of Hopi land.

Coal-Bed Methane

Coal-bed methane contained in the Toreva and Dakota formations may provide a valuable energy resource for the Hopi Tribe. Coal-bed methane production requires the de-watering of the coal-bearing formations; poor quality water produced by the Toreva or Dakota aquifers as a by-product of pumping methane may be reinjected back into the aquifer, or may provide a feasible alternative to N-aquifer water now used by Peabody. Coal-bed methane should be assessed to determine the feasibility of extracting it from the coal prior to mining the coal resource itself. There is potential for deriving more economic value for the product by using or marketing both types of resource. The Hopi Tribe should look seriously at the opportunities to develop coal-bed methane for use as a fuel by the Hopi people.

Uranium

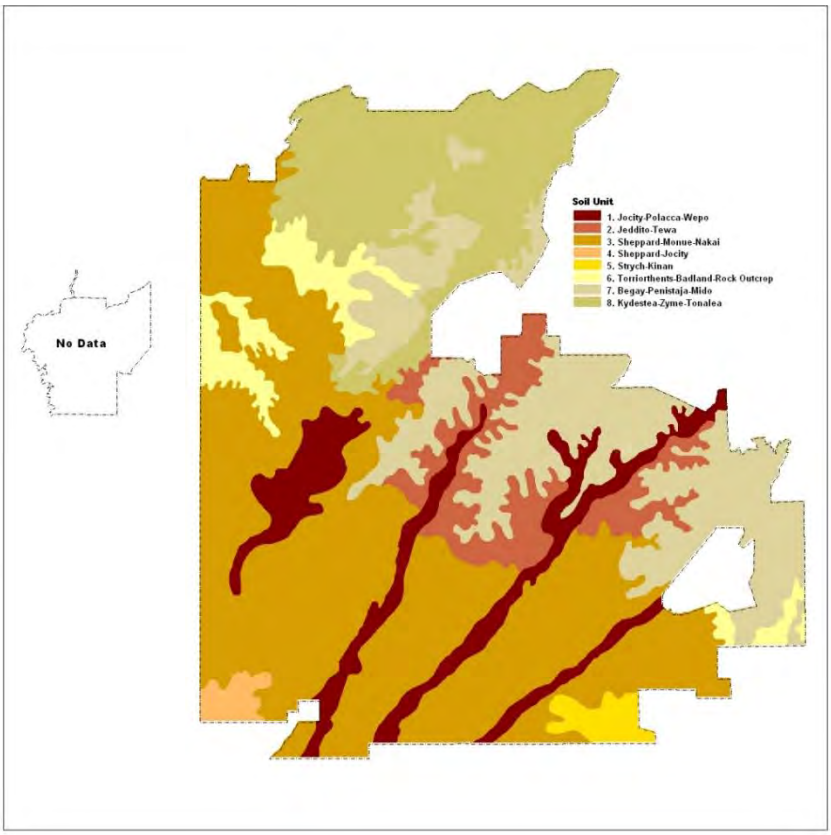
Economic uranium deposits probably underlie Hopi land. However, the Hopi Tribe would view uranium development with extreme skepticism in view of the well-known health problems and environmental damage resulting from uranium mining.

Carbon Dioxide and Helium

Both carbon dioxide and helium may underlie Hopi land. If either of these two gases is discovered in economic quantities, a significant capital investment will be required to build pumping stations, compressor plants, and pipeline facilities to transport the gases.

Tuuwa, Owa, Tusyavu, Tsöqa - Industrial Minerals

Deposits of sand, gravel, clay, building stone, and scoria are sufficient to supply Hopi demands for many generations to come. Proximity to roads and future planned developments is the most important consideration in using these resources. Needs for construction materials should be assessed to insure the efficient development of the Hopi infrastructure.



GENERAL SOILS

-5 0 5 10 15

Miles

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Major Economic Sectors

Traditional dry farming and trading was once the mainstay of the Hopi economy. The economic transition from traditional subsistence lifestyle to participation in the American western economy by way of western formal education and job creation. This change has created numerous areas of conflict for the Hopi government, Hopi Villages and the Hopi people.

The Hopi economy consists of a modern and traditional, subsistence sector. The modern sector includes conventional jobs performed for wages. Most of these jobs are service sector jobs at large, institutional places of work. Self-employment and small business activity are a vital element of the total economic profile on the Hopi Reservation, but this part of the economic base is vulnerable and still very small as compared to other off-reservation rural communities of the same size population. The reservation economy remains underdeveloped and un-diversified. Communities (non-Hopi communities) that border the reservation benefit from a tremendous drain of revenue as the Hopi people are forced to shop for goods and services that are not available on the Reservation

The traditional sector includes the use of crafts, materials, corn and other products to exchange for other articles or commodities and to give away in social and religious activity. Individuals on the Hopi Reservation devote substantial effort to production within the informal sector of the economy. The primary elements of the traditional economy are crafts production, farming and ranching.

Tribal members most often use a variety of economic strategies to survive. Many combine full-time or part-time work with livestock grazing, making and selling of traditional arts and crafts, selling surplus crops, and gathering various materials for their own use or for sale. Much of this mixed cash/subsistence/traditional economy is based on land and resource use. The two sectors of the economy are linked. Cash that originates as wages may be used to purchase goods that originate in the subsistence sector. The subsistence sector provides economic alternatives for people who are unemployed, under-employed or work seasonally.

Agriculture

Many Hopi residents are involved in farming and ranching but commercial economic activity is limited in the agriculture sector. Farming centered on raising corn remains a largely traditional activity. Only a fraction of the individuals grazing cattle pursue ranching as a profit-

driven business. The purchase of Cibolla Farms in La Paz county provides an opportunity to produce both alfalfa and cotton in commercial quantities.

The total number of farming and ranching jobs on the Hopi Reservation is estimated to be about 70, consisting of five farms and 60 ranchers. All these individuals are considered to be self-employed. Proprietors' income associated with these economically motivated agricultural operators is estimated to total about $60,000. Considerable effort is devoted to farming and ranching for traditional, social and vocational purposes.

Farming:

The majority of Hopi families farm, but only a tiny fraction of all farmers on the Hopi Reservation raise crops to earn income. Examples of income-producing crops are fruits raised for sale mainly to locals and shelled corn. Some Hopi farmers sell or trade corn with each other and with outsiders, especially for the Hopi blue corn. Some people travel to Hopi specifically to buy shelled Hopi corn.[223]

Approximately 9,000 acres of the Reservation are cultivated. Farmland is typically restricted to small, 1 to 5 acre plots located on alluvial fans and floodplains. Crop production was traditionally the mainstay of the Hopi people and is still an important cultural activity on the reservation. Most Hopi farmers do not use fertilizers or pesticides.

The quantity and imputed dollar value of the traditional corn harvest on the Hopi reservation is substantial, but has not been estimated. However, an estimate of the considerable quantity of food prepared to give away on traditional occasions gives an indication of the level of effort devoted to raising food for traditional consumption and give-aways. Food costs to an individual household for a given occasion vary in value from a minimum of $100 for ceremonies to as much as $2,000 to feed guests at a wedding pay-back. Households also give away food at most dances, with the estimated value varying from a few hundred dollars for a night dance to as much as $4,000 for a plaza dance. These estimates do not include potential or estimates of labor cost to prepare for these activities.

[223] Kathleen Manolescu, Hopi Corn Production.A Report on Research conducted for the Bureau of Indian Affairs, Phoenix Office

Livestock Production:

Although livestock production is not a traditional Hopi activity[224], it has become an integral part of modern Hopi life. The introduction of livestock into Hopi land stems from the Spanish colonization of the Southwest beginning in the mid-1600s. Hopi herdsmen have raised a variety of livestock over the course of the last 400 years, including sheep, goats, horses, cattle, and swine. It is also the most extensive land use activity on the Hopi Reservation.

The Hopi Reservation is divided into 36 range units and 15 District 6 units that are intended to provide for better distribution of livestock than was possible prior to the 1960's. Until the 1960's, sheep were the predominant livestock. In the late 1960's, after catastrophic blizzards decimated the sheep herds, sheep were replaced with cattle as the predominant livestock.

The impact of livestock production on arable lands on the Hopi reservation has been significant. Approximately 1.4 million acres of Hopi reservation land has been put into use as grazing lands for the production of beef, mainly through cow-calf operations.

The majority of Hopi ranchers do not generate sufficient income from their animals to support themselves. Most individuals are employed full-time in other income generating activities. Most Hopi ranchers raise livestock in a traditional way for occasional cash, personal consumption or social exchanges and obligations. For example a Hopi individual may start and raise a small herd of cattle over a two- or three-year period for the express purpose of sponsoring a ceremony or feeding a wedding party.

There are approximately 346 permittees on the Hopi Range, including 50 Navajo. The Hopi range supports a cattle herd recently numbered at 4,800 head, plus sheep and horses. Although most cattle raised on Hopi are sold for cash, estimates vary from 10 or 15 to more than 70, as to how many operators treat ranching as a vocation. At an assumed average individual herd size of 20, annual income per operation is estimated at a little less than $4,000, for a total income from ranching of about $280,000. The estimated income value of all cattle either consumed, given away or sold for occasional cash is about $640,000 over and above the approximately $280,000 in annual income earned by economically motivated ranchers. Even for vocational ranchers on Hopi, ranching is just one of two or more sources of income.

[224] There is a widely expressed view that Hopi people were not supposed to go into the ranching business because cattle will destroy the land and contaminate the springs

Ranchers do not bear the true cost of ranching. The tribal government provides and maintains fencing, watering facilities (windmills, drinkers and stock tanks), and rehabilitates range units, at a cost of approximately $800,000/year. The revenue from grazing permits does not cover these expenses. Ranchers have little to no investment in the infrastructure and hence have little desire to maintain or upgrade facilities. Additionally, Hopi ranchers do not bear any expense for land maintenance, as they would if ranching off-Reservation. Animal owners do bear the cost of veterinary services.

One of the main factors limiting and affecting livestock production on the Hopi Reservation is the lack of reliable water sources. Ranching has created a need to provide more access points to water sources for livestock. These water sources are usually springs, riparian areas, windmills and earth dams that have been either developed or installed specifically for livestock use. Many range units have too few wells, and rely on surface water impoundments. Areas surrounding watering points are overgrazed while areas further from water sources are over-rested. Other watering facilities are non-operational – windmills are broken, stock tanks are silted in and many water sources are infested with tamarisk (salt cedar).

The livestock industry, like other activities that utilize Hopi resources, should be managed according to Hopi land stewardship values to promote sustainable use of the range. One suggestion, intended to provide benefits to both farmers and ranchers, is to allow grazing use in the farming areas during the fallow period of late fall and winter. This idea could provide an opportunity for cooperation between the two groups, both because of the potential benefits for both groups, but also to avoid the potential disasters from this practice.

Gathering:

Hopi people gather plants and wildlife to meet subsistence and cultural needs. While most of the Hopi rangelands are used for grazing livestock, the moderate subsistence and growing ceremonial need for plants and animals also impact the Hopi environment. At a meeting for Hopi-Tewa women on subsistence gathering they indicated that over 30 percent of their fresh food is collected from Hopi land, rather than purchased from local markets. A significant number of people likewise reap economic benefits from utilizing plants and minerals in the production of arts and crafts such as Katsina dolls, baskets, and pottery.

The recent development of a commercial market for herbal healing and organic foods encourages unsustainable and excessive gathering practices of plants, mostly by non-Hopi people on Hopi land. Since these individuals have little stake in the plants growing back the next year, they may take the entire plant rather than specific parts; they may not leave enough to ensure that the plant grows back the following year. These individuals are operating an unlicensed, and therefore uncontrolled, business on the Hopi Reservation.

Construction

The construction sector on Hopi is dominated by publicly funded public works projects (roads, sanitation, health and other public facilities). A small amount of employment in construction trades rounds out the mix. In all, the construction sector on Hopi generates about 90 construction jobs and about $2.1 million in pay on an ongoing, annual basis. Increasingly, construction projects funded by allocations to the villages have generated construction employment as well. Self-employed and small business entrepreneurs in the construction trades create a small but significant number of jobs in the construction sector of the Hopi Reservation economy. They operate in a variety of specialties: concrete, home improvement and repair, plumbing and heating, masonry and specialty solar installations.

A minerals inventory prepared in the 1950‘s identified sources of sand, gravel, clay, crusher rock, and building stone that could be developed. Agencies such as the Arizona Department of Transportation and the Bureau of Indian Affairs continue to import road materials from outside the reservation. Developing those local sources could provide jobs for tribal members as well as a source of community economic development projects.

Hopi Artisans and the Crafts Industry -- Manufacturing

Artisans producing the traditional Hopi crafts remain the core of the manufacturing sector on the Hopi Reservation. Crafts production involves numerous individuals, many of whom pursue their vocation seriously but on a part-time basis and with limited access to markers, thereby reducing the ―per job" pay yield of crafts work. Work in crafts production is sometimes combined with ranching, construction or other jobs. Other small manufacturing ventures, some rooted in Hopi tradition, round out the Reservation's manufacturing sector.

Including 1,000-plus artisans – a conservative assumption about the number of individuals pursuing crafts production as a vocational commitment – the manufacturing sector generates approximately 1,075 jobs and generates an estimated $5.7 million in pay.

In addition to the production of material by Artisans noted above, other on-going manufacturing activities produce garments, trophies and corn meal.

Trade

Fifteen of 35 trade establishments on Hopi are galleries, comprising the other significant component of the crafts industry on the Reservation. Crafts galleries on the Reservation sell to both retail and a growing number of wholesale customers. There are also four restaurants, four fast food vendors and six small stores carrying various mixes of groceries, dry goods, hardware and prepared foods. These galleries, food service and general stores comprise the bulk of the Reservation's trade sector, which, as a whole generates about 145 jobs and $1.8 million in pay.

Retail Trade Leakage:

With a reservation population of about 7,000 and estimated total reservation personal income of as much as $40 million, there is considerable trade and services leakage off the reservation. Since rent or house mortgage payments are generally not required due to ownership patterns, the disposable personal income portion of this amount is larger than in off-reservation communities. A key step in improving economic conditions is to retain more of that income on the reservation through the provision of more competitive goods and services. While the entrepreneurial spirit seems to be alive and well among the Hopi people, the absence of a commercial development sector providing needed sites and buildings for lease or sale is a notable barrier to halting this trade leakage.

Recreation and Tourism:

The economic impact of the non-Hopi visitor to the Hopi Reservation is significant, estimated at somewhere between $3.2—$6 million/year. There is a significant impact upon cultural resources as well since there is a high motivation of the tourist to ~~"e~~experience" the Hopi Reservation.

An economic motivation exists on the part of many members of the Hopi community to promote tourism and tourism development on the reservation. The traditional Hopi crafts remain the core of the manufacturing sector on the Hopi Reservation. This produces approximately 1,075 jobs and generates about $5.7 million in pay. Nearly half of all trade establishments are galleries and crafts shops.[225]

Overall the environment of the Hopi country does create a sense of a pristine and healthy environment. Woodlands provide scenic landscapes that add to positive visitor experiences. The potential exists for the development of commercial recreation activities such as hunting, bird watching, hiking and camping. The Keams Canyon reservoir on the Hopi Reservation is the only place in northern Arizona still being stocked for recreational fishing by the US Fish & Wildlife Service. No native fish have been identified on the Hopi Reservation. The Hopi dry-farming tradition is a unique form of agriculture that leads to the visitor's desire to interact or purchase goods produced from this activity. There is potential for an organic food market to benefit sales of Hopi-raised produce, both on and off the Hopi reservation.

Some tour guides exploit the environment by taking their tour groups to un-permitted sites, making their own roads to get there, and causing erosion in the process. There is also the potential, however, that with increased visitation to major tourist sites, in a controlled manner, there may be a reduction in vandalism at these sites.

If the level of tourism is to increase on the Hopi Reservation, infrastructure to support those visitors must first be developed. Necessary facilities include public toilets, motels, laundromats, wastewater dumping, showers, etc. that will provide for individuals and groups who come to the Hopi Reservation.

225 Center for Applied Research. (1999). *An Economic Profile of the Hopi Reservation*. Prepared for the Hopi Tribe Office of Research and Planning.

Currently water conservation techniques are not applied in tourist-oriented businesses such as local restaurants, shops, and motels. An increase in tourism-supporting developments may exceed the water use of many Hopi homes that do not have indoor plumbing and septic systems. Most Hopi understand the need to use water conservatively; visitors are not educated about this need. This presents a conflict. Guidelines for tourism businesses to be water conservative may need to be created.

Transportation, Communications and Public Utilities

The TCU sector generates approximately 105 jobs and about $2.2 million in pay. Village water and wastewater services provide the dominant part of this category. Some jobs that might otherwise fall in this category are also provided by tribal government (solid waste, transit) but are classified in the services section.

There is no tribal policy or regulation of road construction or maintenance activities. BIA maintenance regulations specify that roads be maintained, ~~"a~~s constructed." Many roads are graded flat, some roads are angled into slopes, and other roads need ditches and culverts. Consequently, water pools or washes out these types of roads, resulting in high maintenance. The BIA prioritizes school bus routes for grading and only main non-system roads receive maintenance from the Hopi Tribe. Poorly maintained roads cause damage to the vehicles they use, and represent a significant cost to Hopi. The lack of alternative means of transport on the Reservation make roads an essential component of socio-economic and cultural life. Therefore, roads need to be managed in a manner that supports Hopi people's sustainable use of their natural resources and protects these resources from adverse impact.

There is a lack of communication regarding transportation issues between tribal programs, and between tribal and village governments. In some cases affecting villages, Tribal Council-adopted road maintenance priorities are changed without village representatives' knowledge or approval.

The development of local resources to help in road maintenance and construction efforts is viable. Use of sands and gravel for road construction and maintenance quarried locally could provide sufficient volume to help support a mining operation that could also provide materials for the construction industry locally. Individuals may also hire Abandoned Mine Land program grading equipment to grade roads although few people are aware of this opportunity. . The

public is generally unaware of which agency or organization is responsible for maintaining particular roads on the reservation.

The Hopi Senom Transit System Program is subsidized by the Arizona Department of Transportation to provide daily transportation for tribal employees across the reservation, including Flagstaff, to the tribal complex in Kykotsmovi. Services are provided on a fee basis.

Finance, Insurance and Real Estate

There is limited activity in the Finance sector, which generates about 25 jobs, and about $300,000 in pay. Significant employers in this sector are the non-profits; the Hopi Foundation and the Hopi Credit Association.

Services

The Services sector generates 990 jobs and about $26.1 million in pay, the largest payroll on the Reservation when taken as a whole. Eleven schools are the largest generator of services jobs. Grant schools and the BIA cover elementary and secondary education on Hopi. A variety of post-secondary institutions have programs on the Reservation. Because of its role providing direct services to the Reservation, the bulk of Hopi tribal government employment has been classified in the services sector. The IHS Health Clinic is the third substantial services job provider on the Hopi Reservation. Private-sector jobs are generated at establishments providing automotive repair, personal and business services (ie. Small restaurants, arts and crafts, convenience stores).