

RECLAMATION

Managing Water in the West

Navajo Generating Station Update

Northern Arizona University

March 16, 2017



U.S. Department of the Interior
Bureau of Reclamation

Agenda

- Introductions
- Opening statements
- NGS Update
- NGO Presentation/Comments
- Discussion
- Next Steps

RECLAMATION

Colorado River Basin Project Act of 1968

- P.L. 90-537, § 303 (a) “...nothing in this section or in this Act contained shall be construed to authorize the study or construction of any dams on the main stream of the Colorado River between Hoover Dam and Glen Canyon Dam.
- P.L. 90-537, § 303 (b) “... the Secretary may enter into agreements with non-Federal interests proposing to construct thermal generating powerplants whereby the United States shall acquire the right to such portions of their capacity, including delivery of power and energy over appurtenant transmission facilities to mutually agreed upon delivery points, as he determines is required in connection with the operation of the Central Arizona Project. When not required for the Central Arizona Project, the power and energy acquired by such agreements may be disposed of...so as to produce the greatest practicable amount of power and energy that can be sold at firm power and energy rates.”

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Bureau of Reclamation & CAP

- Approximately two-thirds of the U.S. share of NGS power (reserve power) provides approximately 90% of the power used to deliver CAP water in Arizona.
- The U.S. share of NGS power not used to operate the CAP pumps, approximately one-third, is sold at market rates as “surplus” power.

Reclamation & Central Arizona Project (CAP)

- CAP
 - 336-mile distribution system
 - Delivers ~1.5 million acre-feet of Colorado River water in AZ annually
- U.S. participation in Navajo Generating Station (NGS)
 - provide primary CAP power supply





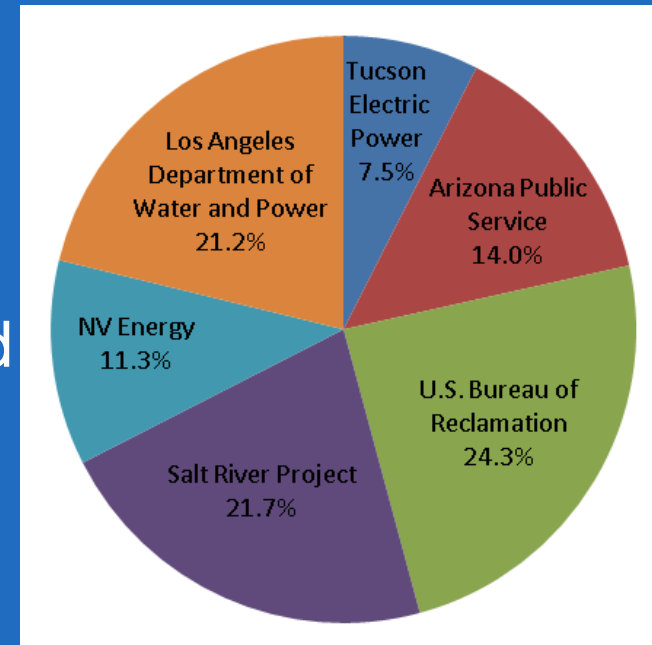
Navajo Generating Station

- **NGS is a 3-unit, 2,250 MW coal fired power plant**
 - **Located on Navajo tribal trust lands near Page, Arizona**
- **Coal supplied exclusively by the Kayenta Mine**
 - **Located on Navajo and Hopi tribal trust lands, ~80 miles SE of NGS**
- **Significant economic benefit to NGS-affected Tribes**

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NGS Owners

- Salt River Project for the Use and Benefit of the United States* (24.3%)
- Salt River Project** (21.7%)
- Los Angeles Department of Water and Power (21.2%)
- Arizona Public Service (14.0%)
- Nevada Energy*** (11.3%)
- Tucson Electric (7.5%)



*The United States is referred to as a “Participant.”

**SRP is the NGS Operating Agent. In 2015, SRP purchased the Los Angeles Department of Water & Power’s 21.2% entitlement share to operation until the end of 2019

*** Nevada Energy is actively seeking to divest its entitlement share

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Joint Federal Agency Workgroup

- EPA, DOI, and DOE have committed to work together to support stakeholder interests in NGS
 - Create a long-term EPA-DOI-DOE Working Group
 - Work with stakeholders, including the owners of NGS, tribes and other CAP water users, and environmental and community groups, to develop a roadmap to achieve long-term goals related to clean energy, sustainable water supplies, and sustainable economic development
 - Complete the Phase 2 report on clean energy options for NGS
 - Support shorter term investments that align with long term clean energy goals

Technical Work Group (TWG)

- Established by Salt River Project, as the NGS Operating Agent, to develop a potential additional “Better than BART” alternative.
- TWG Agreement signed in 2013
- Largely adopted by EPA final rule in 2015



RECLAMATION

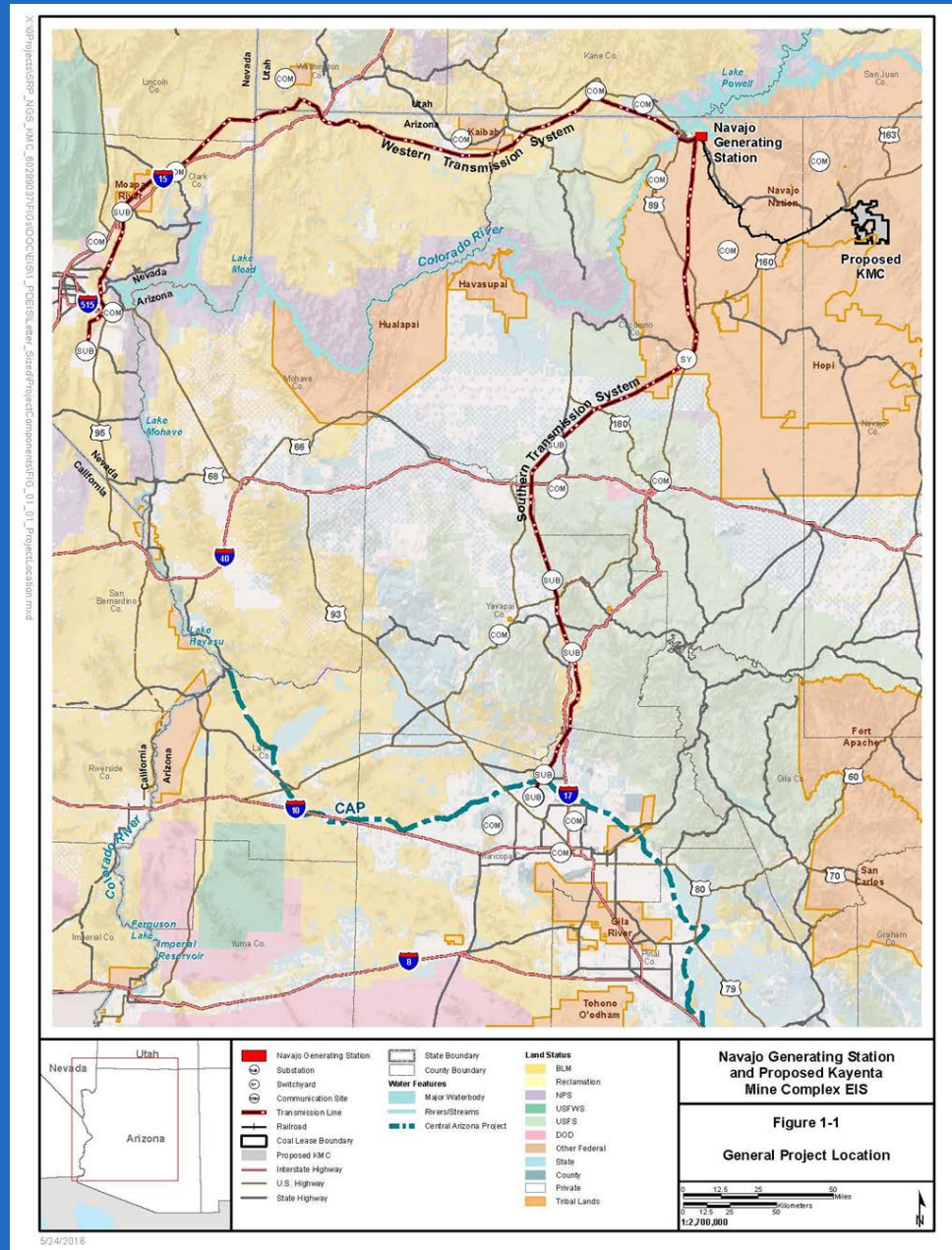
TWG Key Assumptions

- Assumed plant operations from 2019 – 2044 with pollution controls installed by 2030
- Assumed a “glidepath” development of NGS alternatives over the post 2019 operations period
- Appendix “B” included “Better than BART” alternative adopted by EPA in final rule
- Appendix “C” (DOI Commitments)
 - Accounting Implementation Guide – COMPLETE
- Appendix “E” NREL Phase II Study
 - Volume One – Baseline COMPLETE
 - Technical Assistance to Tribes (Navajo, Hopi, GRIC)
 - Funding agreements executed and technical assistance ongoing

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Environmental Compliance

- EIS started in 2014
- General Project Area:
 - Arizona, Nevada, Utah
- Major Components
 - NGS and associated facilities
 - Kayenta Mine
 - Transmission systems and communication sites



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Key Dates

- Sept 2016: Draft EIS published;
Start of public comment period
- Oct/Nov 2016: 11 public meetings across Arizona
- Dec 2016: 90-day public comment period ended
- February 2017: Non-US owners press release

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NGS Coordinating Committee

- Comprised of representatives from each participant
- Each representative holds equal voting rights
- February 13, 2017 Meeting

SRP Press Release – 2/13/17

“The current utility owners of Navajo Generating Station today voted not to continue operations at the plant beyond the end of the current lease term. The vote means SRP efforts will now focus on reaching an agreement with the Navajo Nation that lets the plant run through December 2019 by allowing access after that date for removal and restoration work.”

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Potential Operations Alternatives

- 2019
 - Coal generation through end of 2019 with 2 year decommissioning
 - Requires extension of current lease (for retirement purposes)
- 2017
 - Coal generation through end of 2017 with 2 year decommissioning
 - Does not require extension of current lease
- 2019 +
 - Would require costs to appeal to current or new Co-Tenants

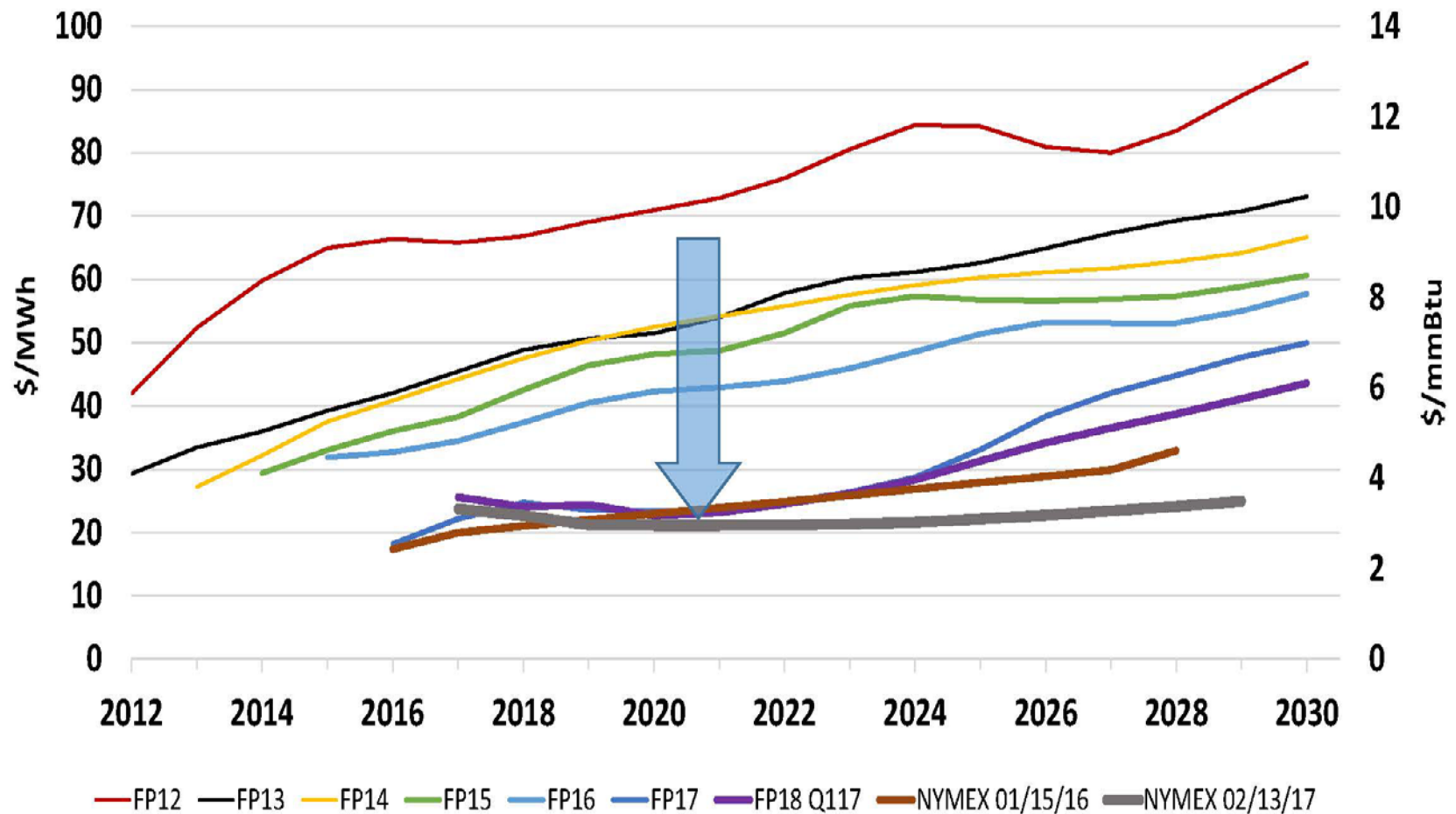
What Changed?

- Energy Market Economics
- Natural Gas – sets wholesale market energy price
- Available generation in the mass electric system
- Utility obligations to provide best price power to customers
- Salt River Project projects NGS costs 2017-2019: ~\$40/MWh and 2020-2030 between \$50/MWh and \$60/MWh
- Mead Hub wholesale energy rate < \$30/MWh
- Natural gas prices projected to remain competitive alternative to NGS

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Gas Price Forecasts Dropping over Time

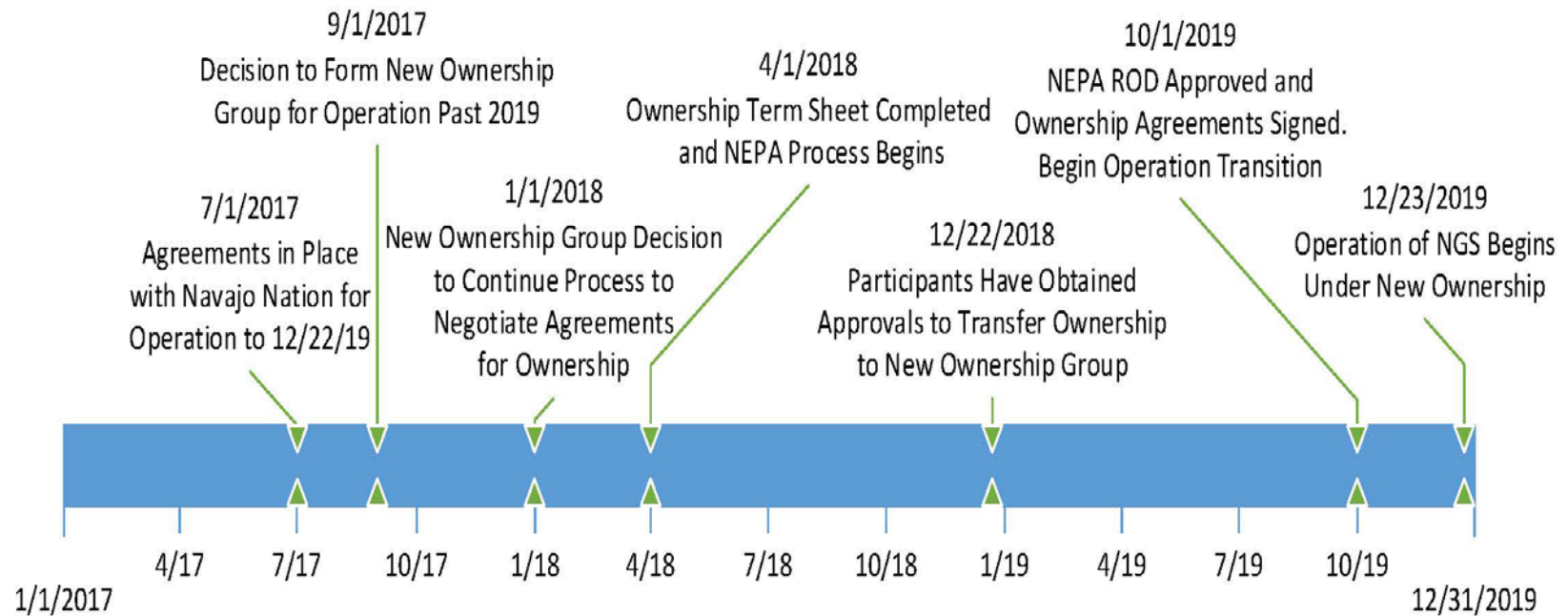
Combined Cycle Plant with 7,400 heat rate



March 1, 2017 Meeting

- The Department of the Interior hosted a meeting with multiple stakeholders to discuss their views about the future of the NGS.
- Discussion
- Outcome
 - Individual groups will be discussing follow-up topics
 - Two topics relate to tribes/tribal interests
 - Exploring ways to minimize impacts to affected tribes
 - CAP Tribal matters
- Next Meeting April 12, 2017, in Washington DC

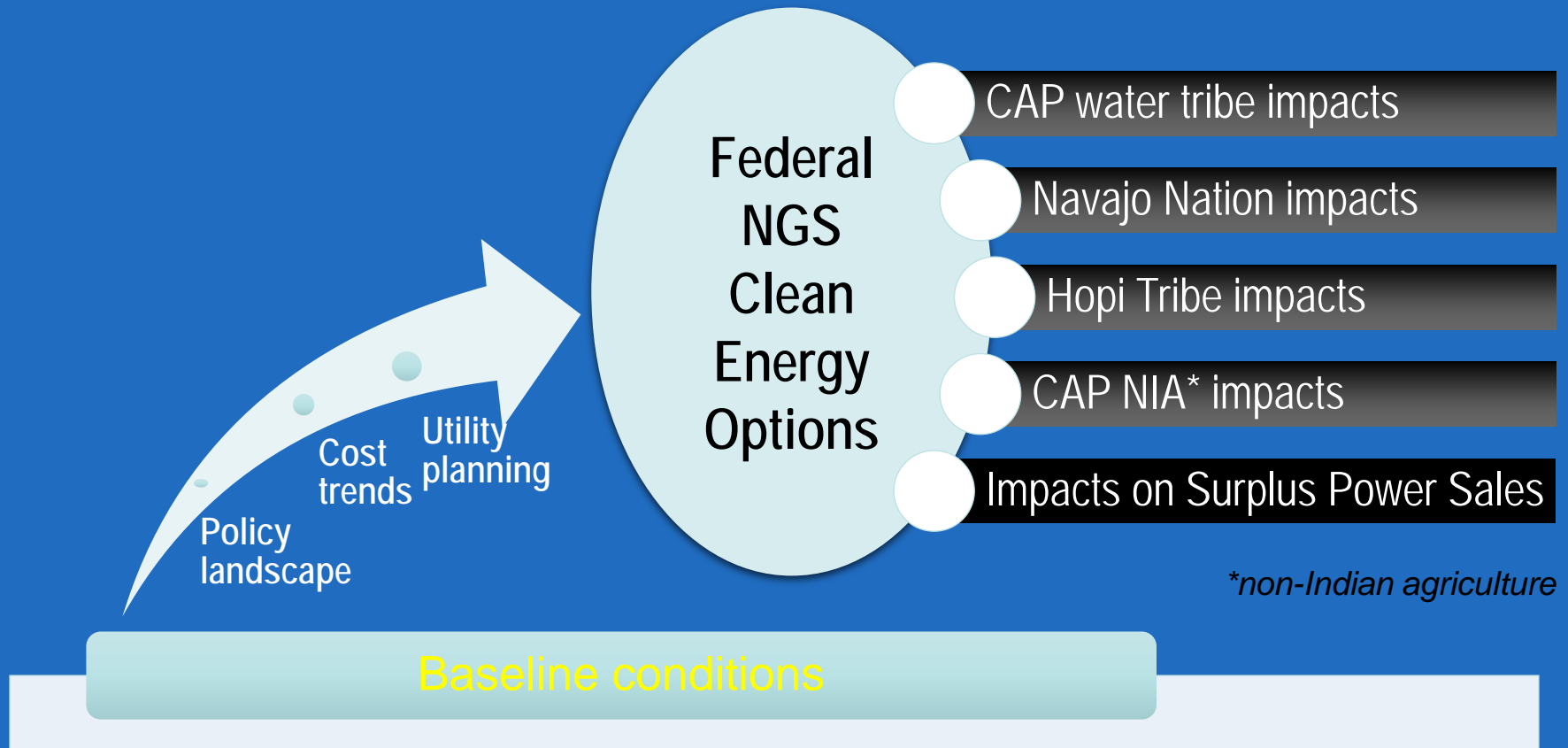
NGS Ownership Transition Timeline



NE Arizona Tribal Clean Energy and Water Development Planning

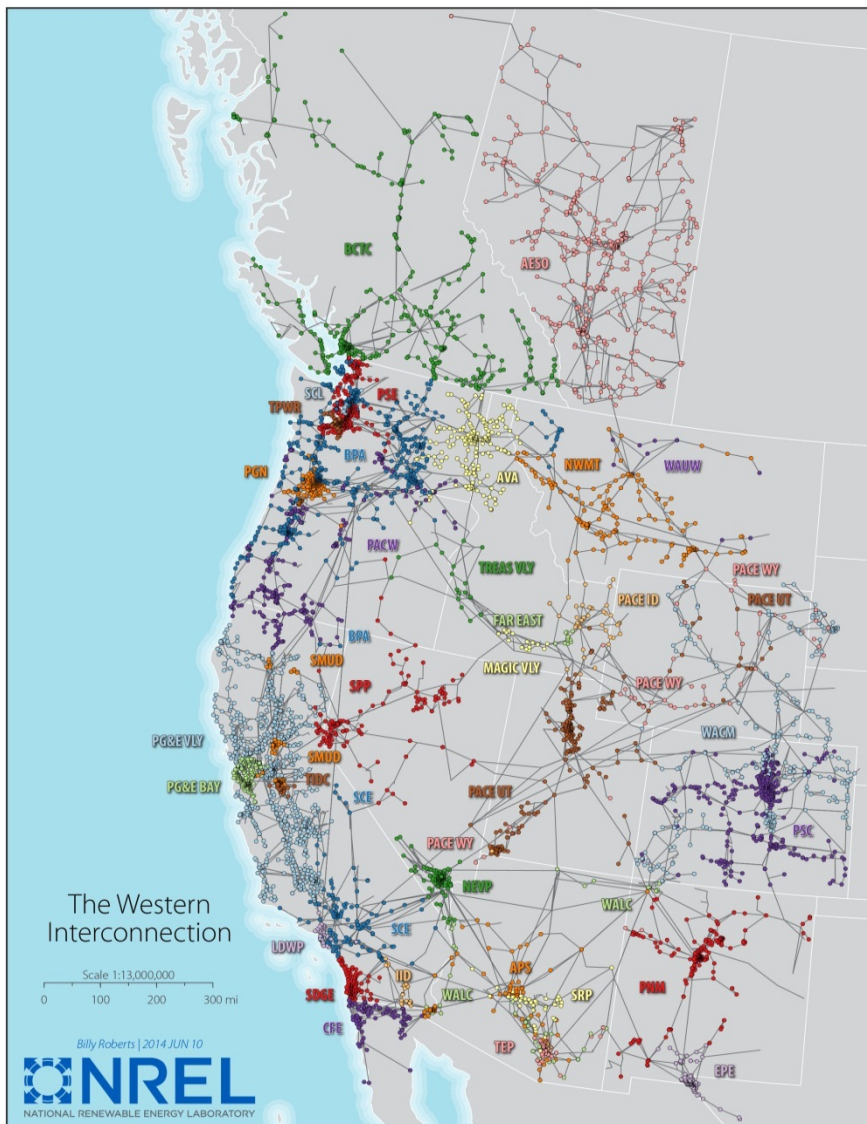
- **National Renewable Energy Laboratory**
 - Utility Resource Planning
 - Market Economics
 - NGS Operations Scenarios
- **Technical Assistance**
 - Navajo
 - Hopi
 - GRIC

Elements of NREL Phase 2 Study

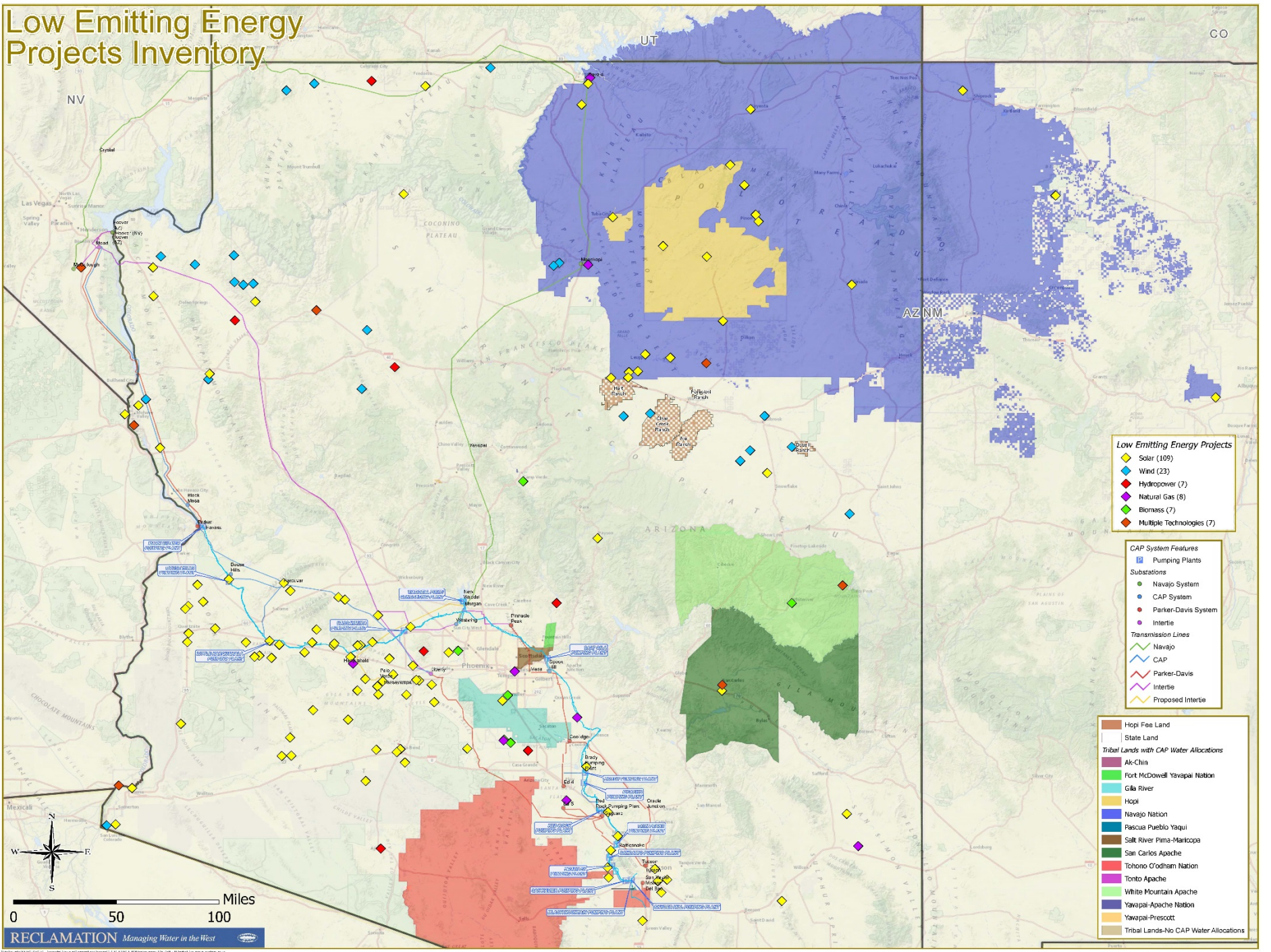


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Resource Planning Model Retirements and Expansions



Low Emitting Energy Projects Inventory



Renewable Energy Suitability Analysis Central Arizona Project Canal System

DATA INPUT AND ANALYSIS

SUITABILITY CRITERIA	Screening Criteria and Rankings				
	Least Suitable	Low Suitability	Moderate Suitability	High Suitability	Weighting
CAP ROW Site Average	8 - 25 acres (1 - 5 MW)	26 - 135 acres (15 - 15 MW)	136 - 275 acres (20 - 30 MW)	>275 (31 - 60 MW)	10
Distance to Power Transmission	1.5 miles - 5.00 miles	1.5 miles - 5.00 miles	1.5 miles - 5.00 miles	< 0.5 miles	10
BLM Lands adjacent to CAP Right-of-Way (PWS)	0 - 40 acres (1 - 5 MW)	41 - 135 acres (15 - 15 MW)	136 - 275 acres (20 - 30 MW)	>275 (31 - 60 MW)	10
Distance to Access Roads	1.5 miles - 2 miles	1.5 miles - 2 miles	1.5 miles - 2 miles	< 0.5 miles	10
Slope	> 3.5 % (steep) 1 - 10	4.0 - 5.0 %	5.0 - 6.0 %	< 3.5 %	10
Photovoltaic Feed Rate (Global Horizontal Insolation)	5.0 - 5.2 kWh/m ² /day	5.21 - 5.4 kWh/m ² /day	5.41 - 5.6 kWh/m ² /day	>5.6 kWh/m ² /day	10
Photovoltaic Single Axis (Global Tilt Insolation)	5.75 - 5.8 kWh/m ² /day	5.81 - 6.0 kWh/m ² /day	6.01 - 6.2 kWh/m ² /day	>6.2 kWh/m ² /day	10
Concentrating Solar Power Dual Axis (Direct Normal Insolation)	6.75 - 7.0 kWh/m ² /day	7.01 - 7.2 kWh/m ² /day	7.21 - 7.4 kWh/m ² /day	>7.4 kWh/m ² /day	10
WILDLIFE TO EXCLUDE	Outside	Excluded resources weighted	Excluded resources weighted	Excluded resources weighted	10
Recreation Excluded Lands	Outside	Outside	Outside	Outside	10
USFS & BLM Designated Wilderness	Outside	Outside	Outside	Outside	10
Recreation Management Plan Lands	Outside	Outside	Outside	Outside	10

Map Algebra Layers:

Central Arizona Project Canal Right of Way
Streets Suitability Buffers
Transmission Suitability Buffers
Global Horizontal Insolation
Global Horizontal Insolation
Latitude Tilt Insolation
Slope
Solar Suitability Model

SYNOPSIS

The U.S. Bureau of Reclamation (BOR) is the largest holder of water in the United States and is charged with the management, development, and protection of water resources. BOR holds extensive lands that may well be suited for the development of renewable energy that could supplement the supplemental power supplies the agency uses for the transmission of water.

This map was generated from identifying BOR project lands along the Central Arizona Project Canal system to assess suitability for utility scale solar development. Utility scale solar developments are considered to be 1 MW or greater. BOR lands were screened for suitability to employ photovoltaic (PV) or concentrating solar power (CSP) technologies. To accomplish this screening, Geographic Information Systems (GIS) suitability analysis using raster data was selected as the most appropriate method. Additionally, consistency across and alongside existing criteria regarding importance, involved in identifying the most suitable areas for solar development.

Data Sources

U.S. Bureau of Reclamation
NREL
USGS
Global Energy Development
FSA
Reclamation
Managing Water in the West

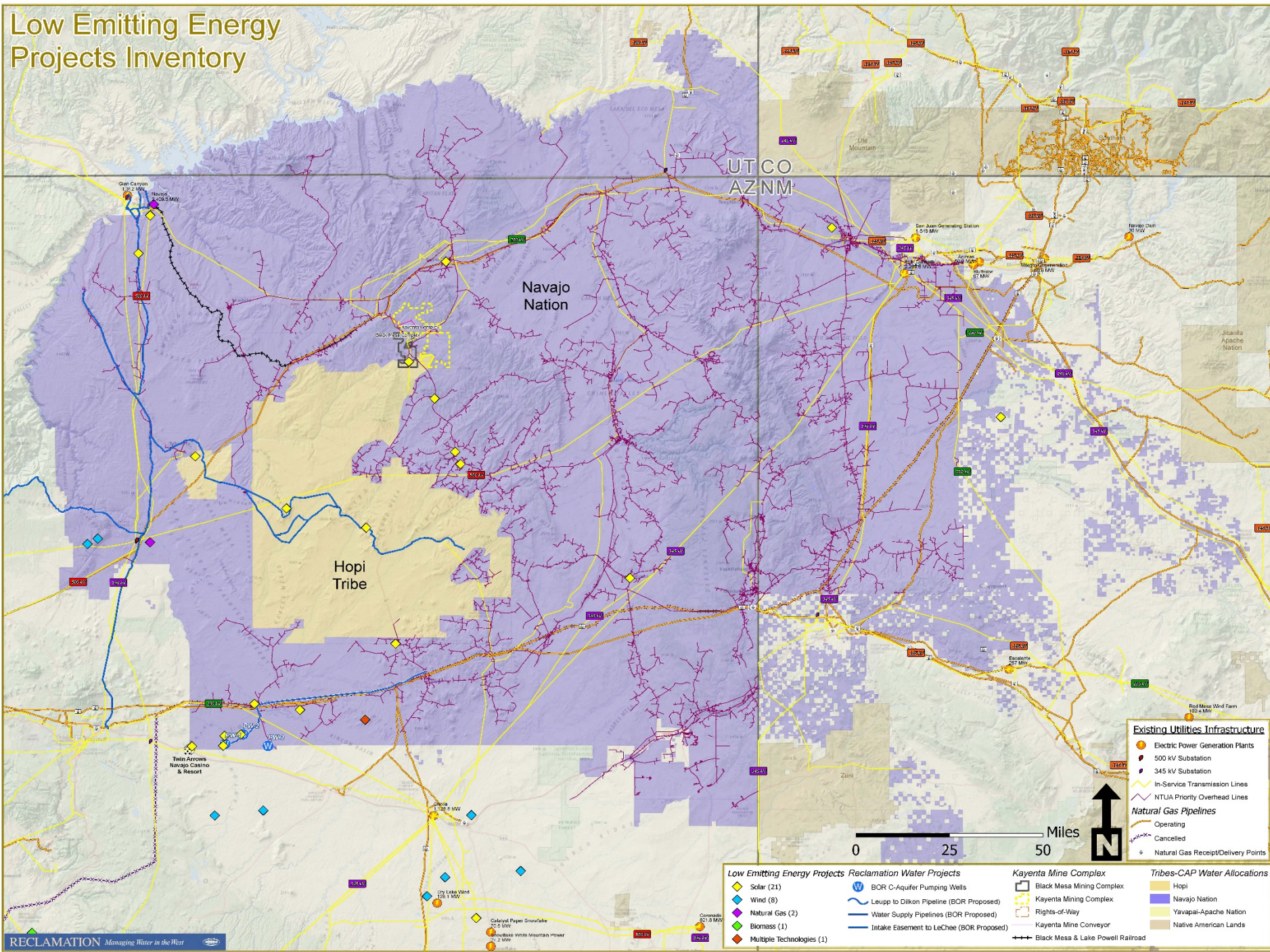
MAP FEATURES

CAP Right-of-Way
CAP Pumping Plants
Transmission Lines
Suitability Rating
Highest
Lowest

Renewable Energy Suitability Analysis Central Arizona Project Canal System

Adam Ricks, GIS Specialist
Contact:
Mitch Hanes, Program Manager: mhanes@bwr.gov
Daniel A. Ricks, GIS Lead: dricks@bwr.gov
Glendale, Arizona August 8, 2012

Low Emitting Energy Projects Inventory

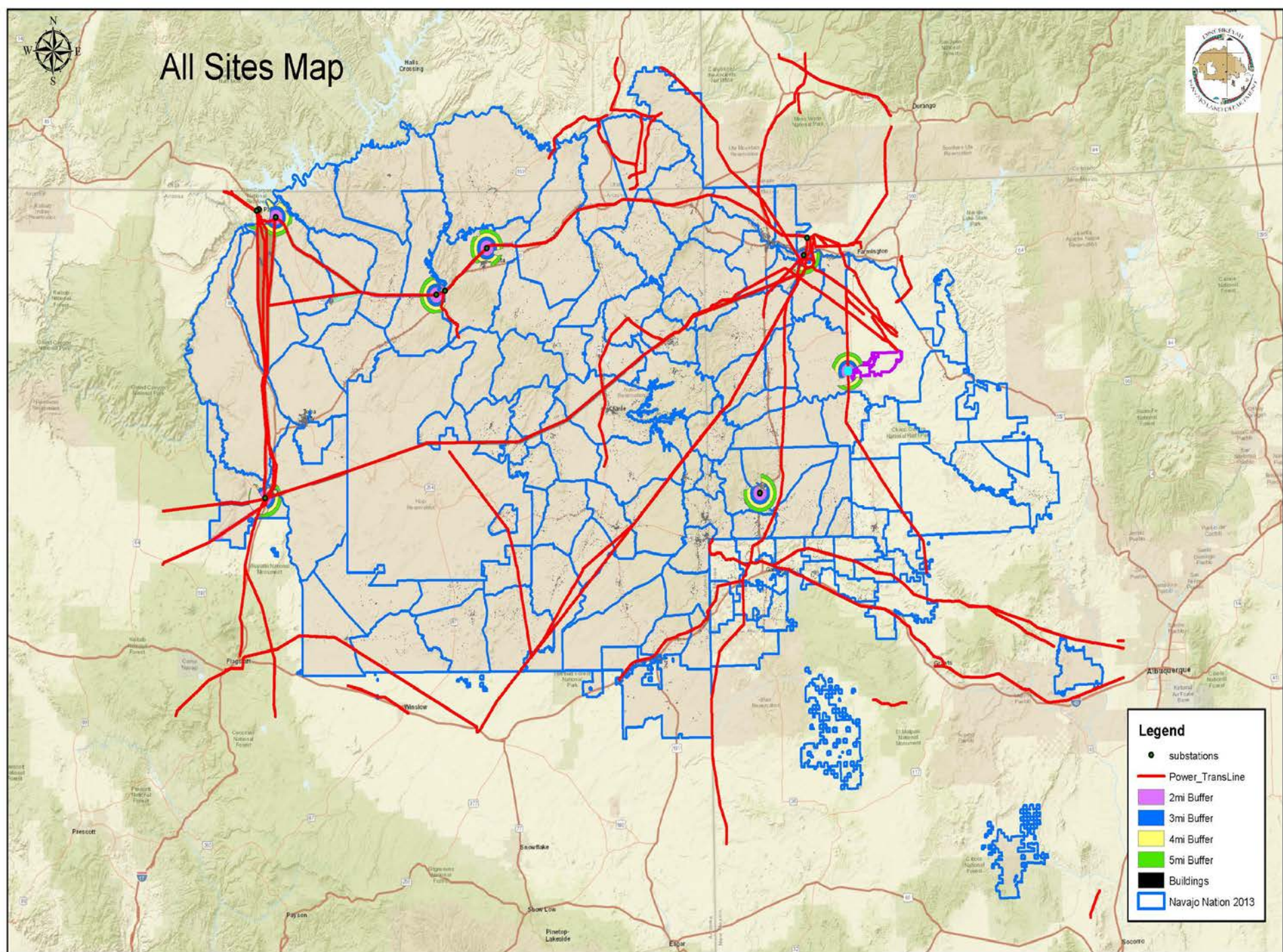


All Sites Map

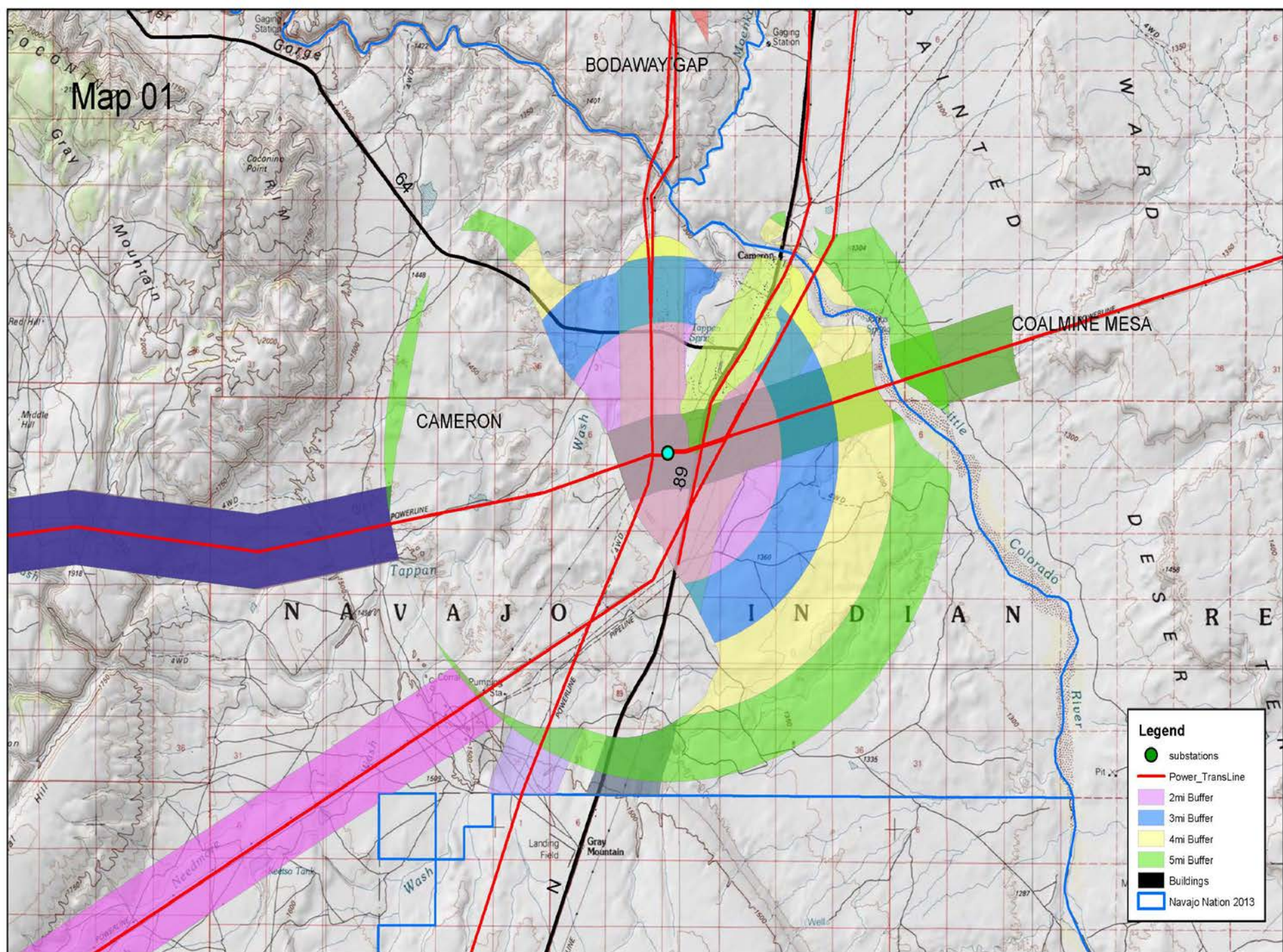


Legend

- substations
- Power_TransLine
- 2mi Buffer
- 3mi Buffer
- 4mi Buffer
- 5mi Buffer
- Buildings
- Navajo Nation 2013



Map 01





Map 02

NAVAJO MOUNTAIN

INSCRIPTION HOUSE

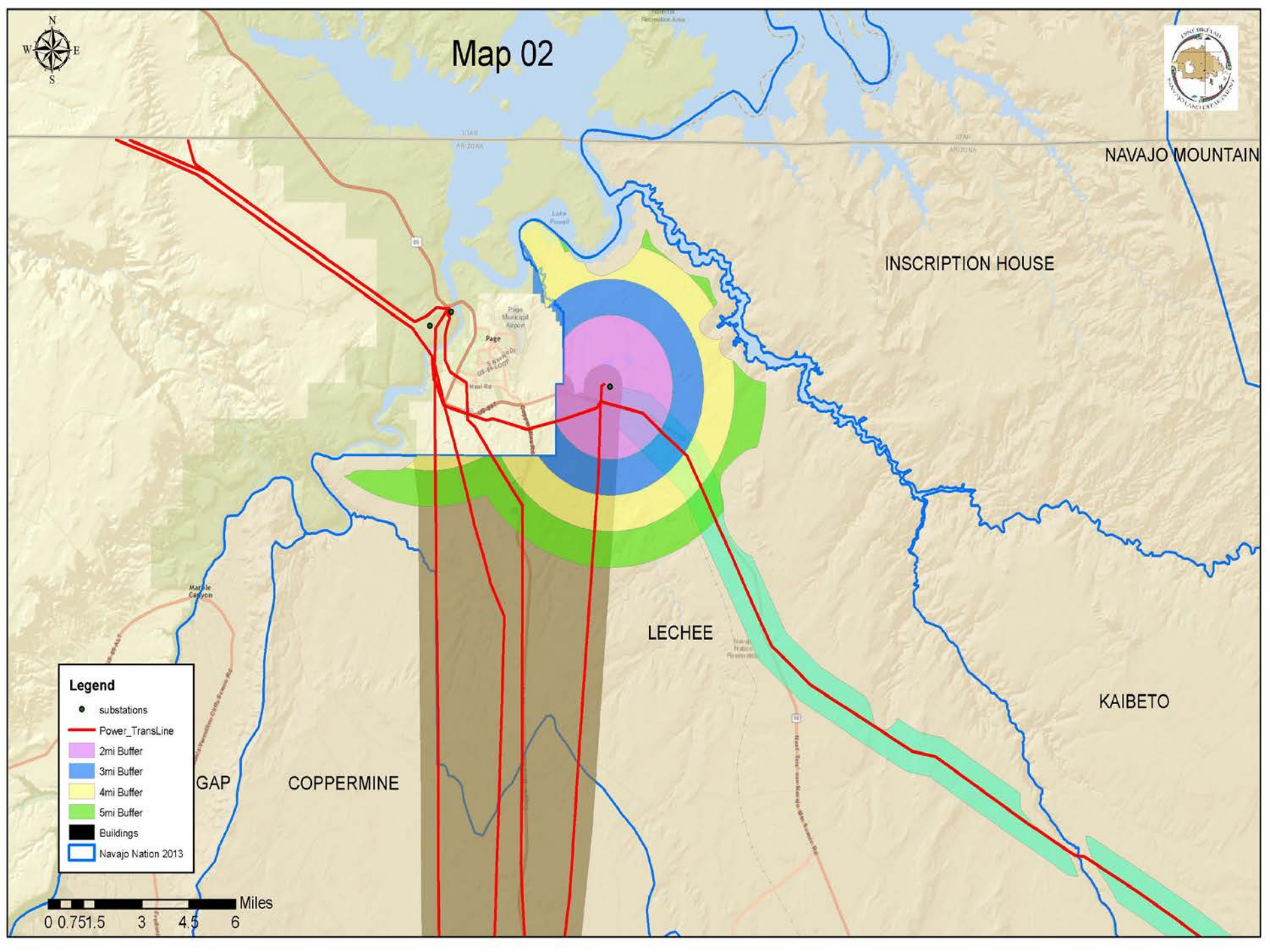
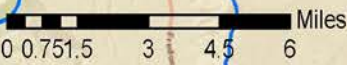
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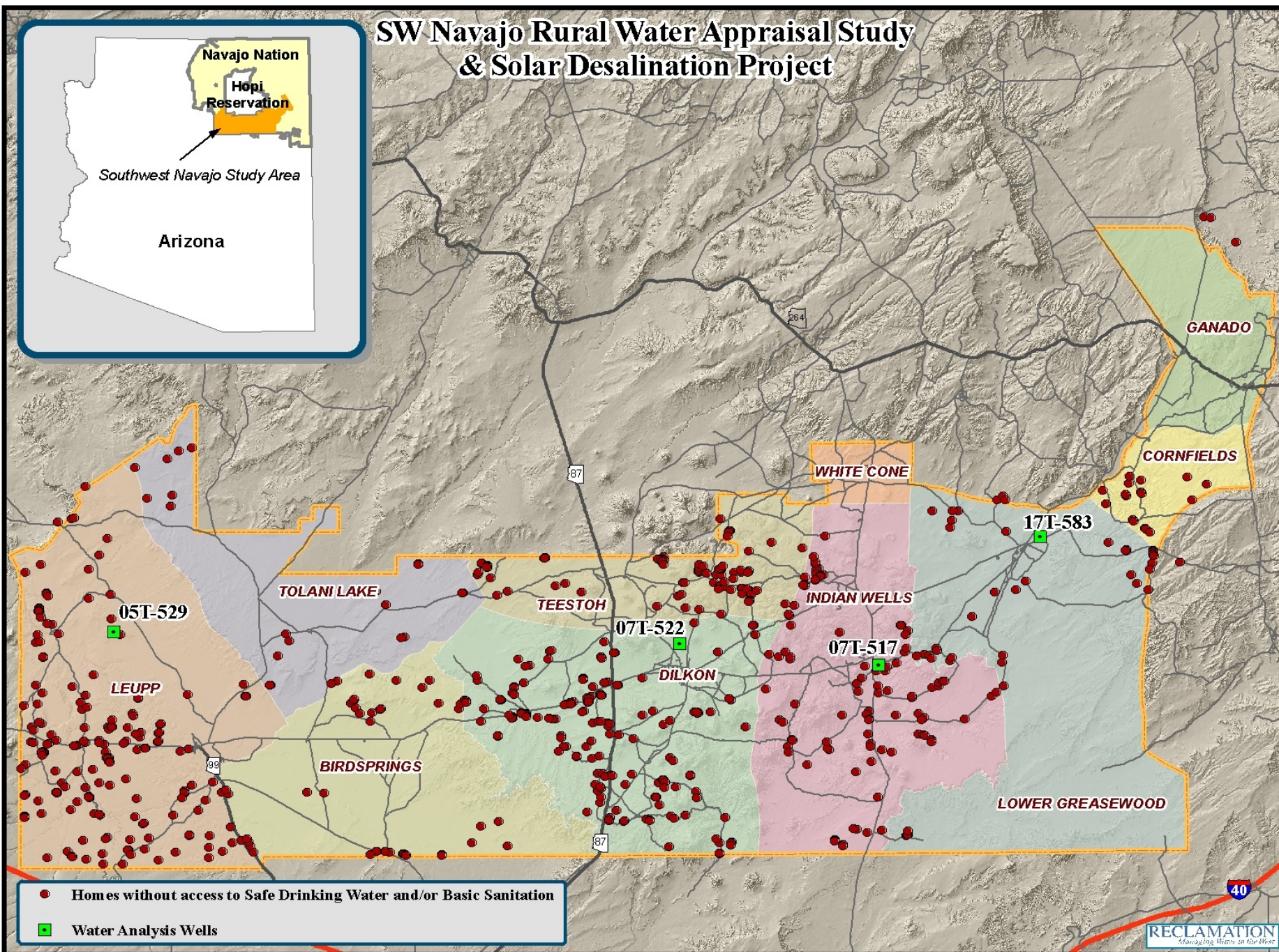
COPPERMINE

GAP

- Legend**
- substations
 - Power_TransLine
 - 2mi Buffer
 - 3mi Buffer
 - 4mi Buffer
 - 5mi Buffer
 - Buildings
 - Navajo Nation 2013



SW Navajo Rural Water Appraisal Study & Solar Desalination Project



- Homes without access to Safe Drinking Water and/or Basic Sanitation
- Water Analysis Wells

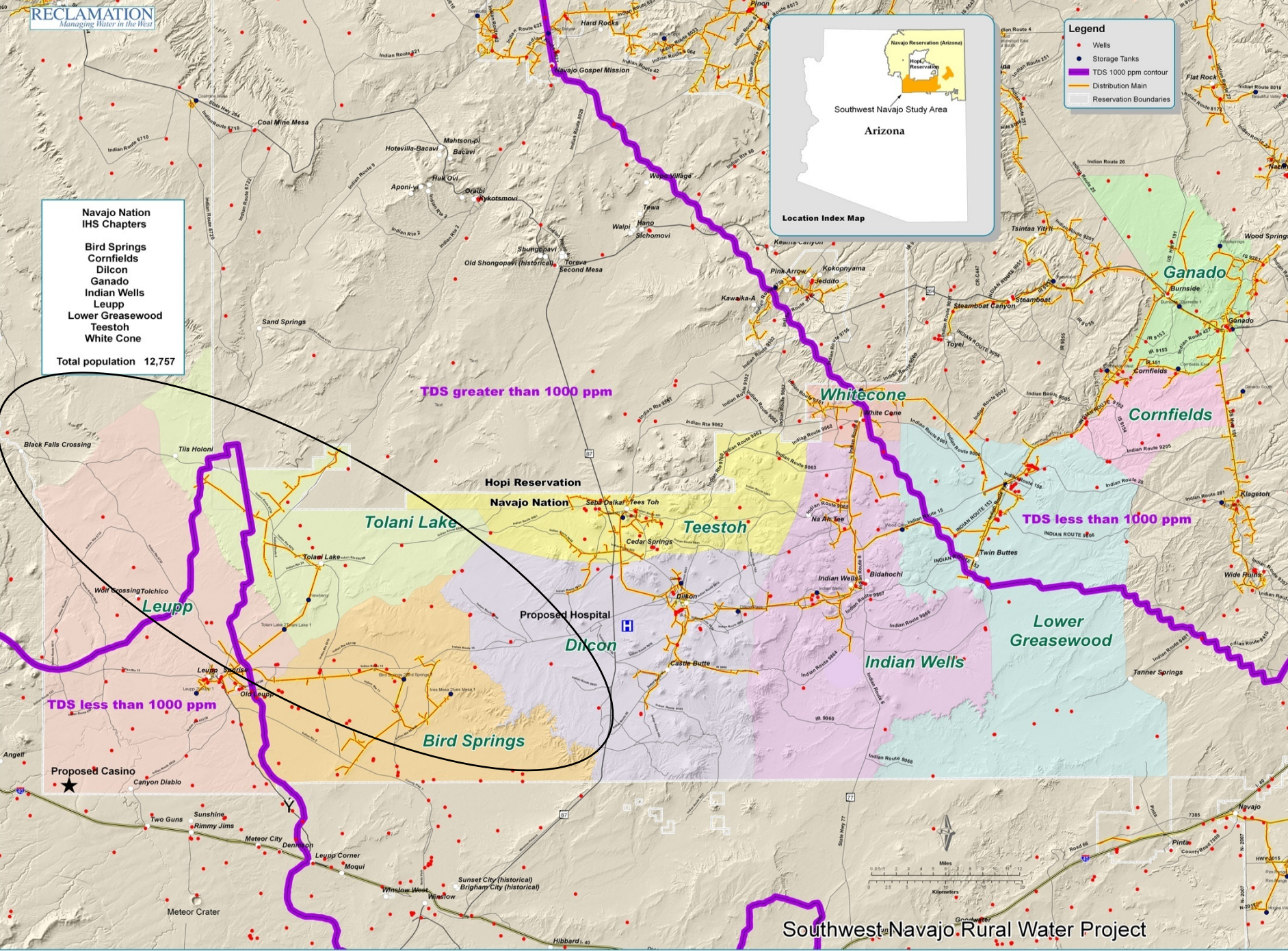
Navajo Nation IHS Chapters

Bird Springs
Cornfields
Dilcon
Ganado
Indian Wells
Leupp
Lower Greasewood
Teestoh
White Cone

Total population 12,757



- Legend**
- Wells
 - Storage Tanks
 - TDS 1000 ppm contour
 - Distribution Main
 - Reservation Boundaries



Southwest Navajo Rural Water Project

INTRODUCTION

¹Department of Chemical and Environmental Engineering, ²Institute of Environment, ³Agricultural & Resource Economics, ⁴The University of Arizona, ⁵Office of Reclamation Planning, ⁶Arizona Office.

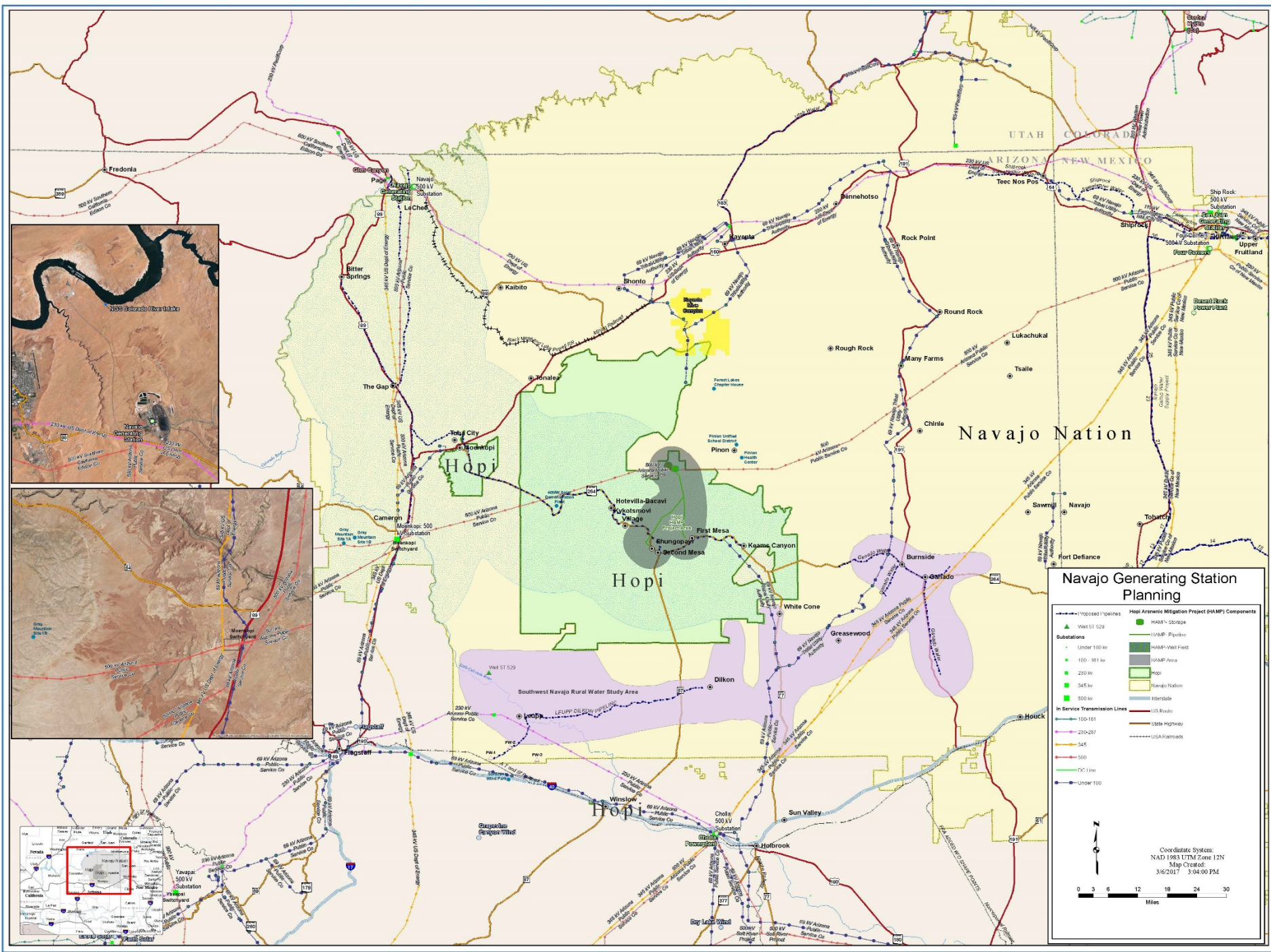
PROGRESS

BACKGROUND INFORMATION



PROJECT PARTNERS





Navajo Generating Station Planning

Legend:

- Proposed Pipelines:** Blue dashed line
- Substations:** Green triangle
- Wells:** Green circle
- Wells 100-181:** Green circle
- Wells 230-287:** Green circle
- Wells 345:** Green circle
- Wells 500:** Green circle
- Wells Under 100:** Green circle
- Wells 100-181:** Green circle
- Wells 230-287:** Green circle
- Wells 345:** Green circle
- Wells 500:** Green circle
- Wells Under 100:** Green circle

Navajo Generating Station (NGS) Components:

- NGS - Storage
- NGS - Pipeline
- NGS - Well Field
- NGS - Area
- NGS - Road
- Navajo Nation

In Service Transmission Lines:

- 100-181
- 230-287
- 345
- 500
- DC Line
- Under 100

Other Features:

- US Road
- State Highway
- USA Railroads

Coordinate System:
NAD 1983 UTM Zone 12N
Map Created: 3/6/2017 3:04:00 PM

Scale: 0 3 6 12 18 24 30 Miles