Ute Mountain Ute Tribe

COMMERCIAL SCALE RENEWABLE ENERGY PROJECTS

CONSIDERATIONS AND TRANSMISSION POTENTIAL

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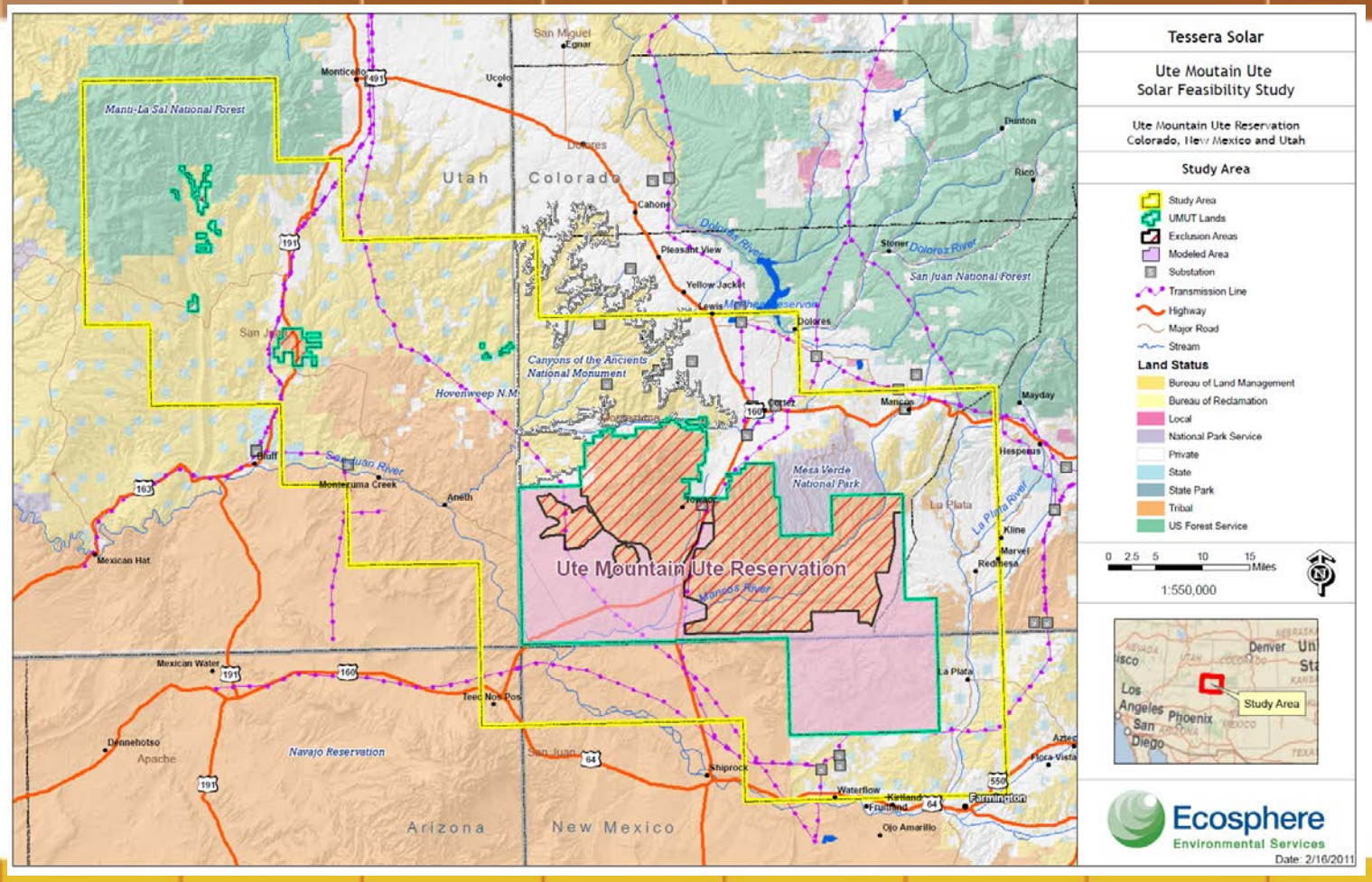
Environmental Programs Director

DOE-WAPA Webinar March 30, 2016

Commercial Scale Feasibility Studies Undertaken to Date

- Commercial Scale Solar Site Feasibility
  - GIS assessment model including available information on cultural resources, water resources, visual resources, road access, proximity to transmission, slope, aspect, exclusion areas and additional related projects
  - Transmission Interconnect Analysis
- Preliminary work towards FERC licensing for a pumped-storage hydroelectric project
- Pre-Feasibility Interconnection Study for a 25 MW Solar Generation Facility on the Ute Mountain Reservation (WAPA and DOE)

Study Area


Tessera Solar
Ute Moutain Ute
Solar Feasibility Study
Ute Mountain Ute Reservation
Colorado, New Mexico and Utah
Study Area
Study Area
UMUT Lands
Exclusion Areas
Modeled Area
Substation
Transmission Line
Highway
Major Road
Stream
Land Status
Bureau of Land Management
Bureau of Reclamation
Local
National Park Service
Private
State
State Park
Tribal
US Forest Service
0 2.5 5 10 15 Miles
1:550,000
Ute Mountain Ute Reservation
Manti-La Sal National Forest
Canyons of the Ancients National Monument
Mesa Verde National Park
San Juan National Forest
Navajo Reservation
Utah
Colorado
Arizona
New Mexico
Study Area
Ecosphere
Environmental Services
Date: 2/16/2011

Results Site 1

Site 1: New Mexico

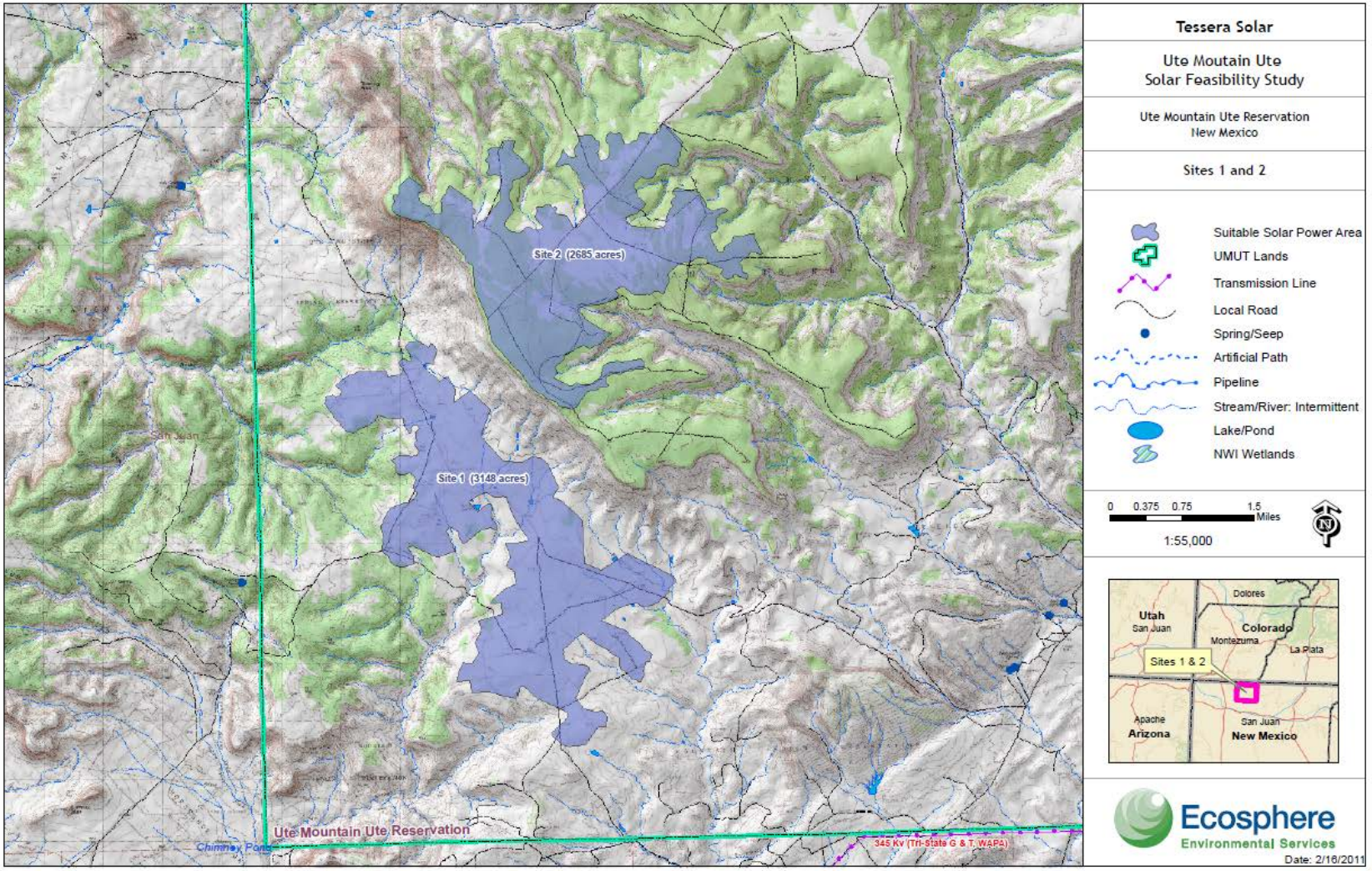
- 3,148 acres
- Very close or adjacent to proposed pumped hydro project
- Within 3 miles of a WAPA 345 kV transmission line
- Within 5 miles of the Shiprock and San Juan substations
- Access on established roads
- Close to established UMUT water sources (2 to 3 miles)
- Below mesa so less visible from UMU Tribal Park
- Presence of threatened or endangered species is somewhat uncertain

Results Site 2

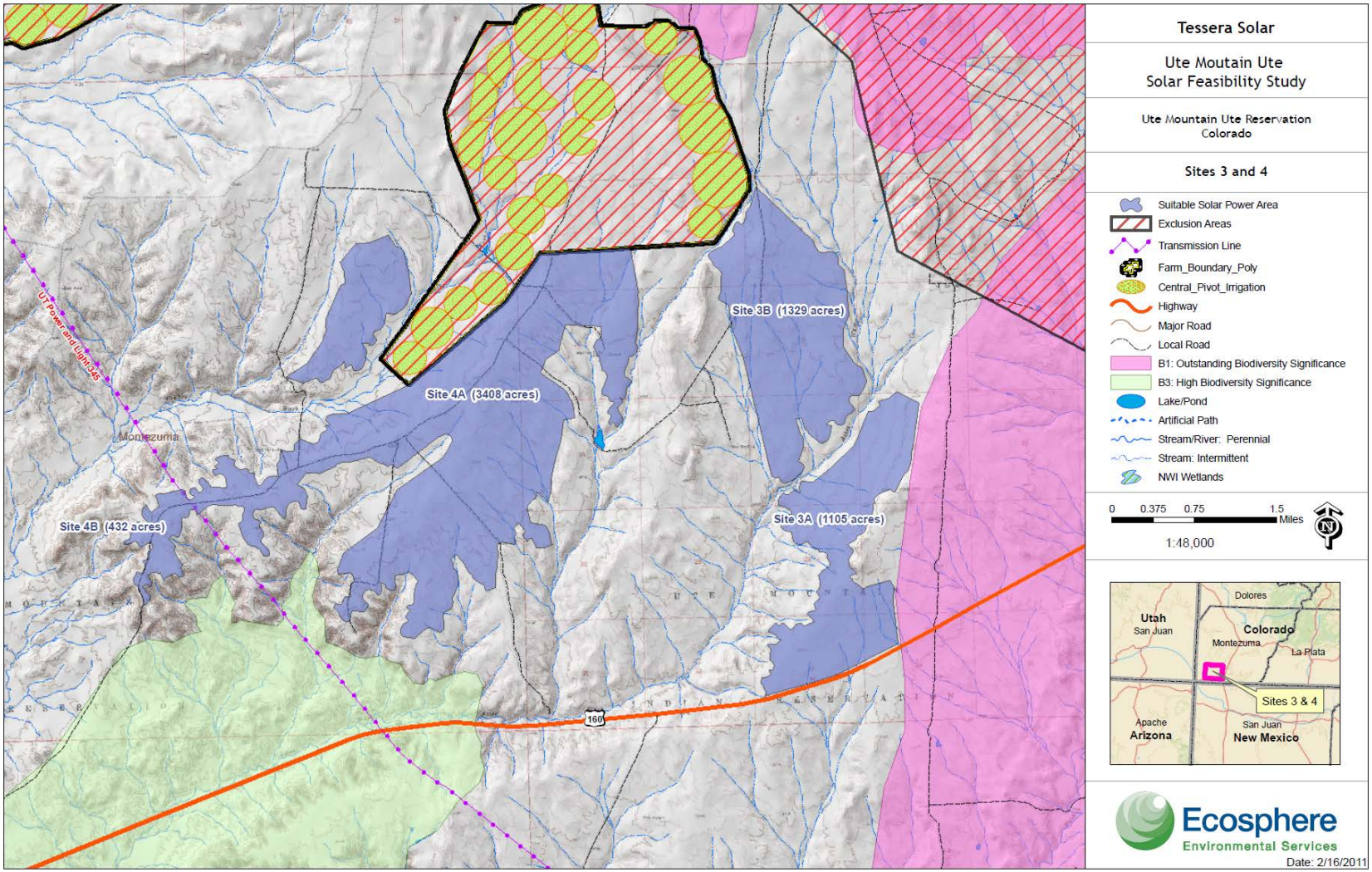
Site 2: New Mexico

- 2,685 acres
- Very close or adjacent to proposed pumped hydro project
- Within 5.5 miles of a WAPA 345 kV transmission line
- Approximately 8 miles to the Shiprock and San Juan substations
- Close to UMUT water sources (2 to 3 miles)
- On top of mesa so more visible to UMU Tribal Park and longer road access
- Transmission line connection must ascend 1200 feet to the top of mesa
- Presence of threatened or endangered species is somewhat uncertain

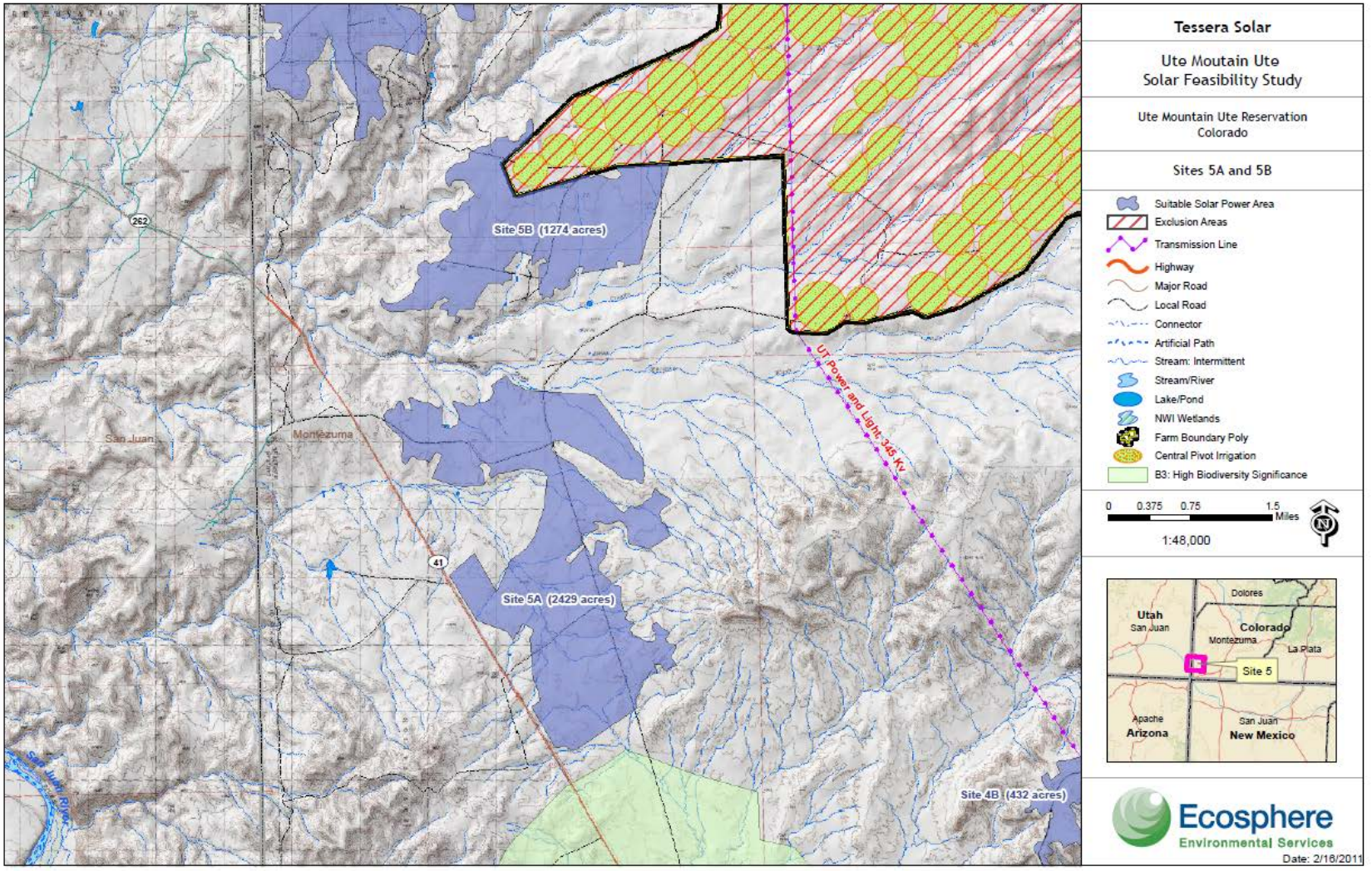
Sites 1 and 2


Site 2 (2685 acres)
Site 1 (3148 acres)
Ute Mountain Ute Reservation
345 Kv (Tri-State G & T, WAPA)
Tessera Solar
Ute Moutain Ute
Solar Feasibility Study
Ute Mountain Ute Reservation
New Mexico
Sites 1 and 2
Suitable Solar Power Area
UMUT Lands
Transmission Line
Local Road
Spring/Seep
Artificial Path
Pipeline
Stream/River: Intermittent
Lake/Pond
NWI Wetlands
0 0.375 0.75 1.5 Miles
1:55,000
Utah
San Juan
Colorado
Montezuma
La Plata
Dolores
Sites 1 & 2
Apache
Arizona
San Juan
New Mexico
Ecosphere
Environmental Services
Date: 2/16/2011

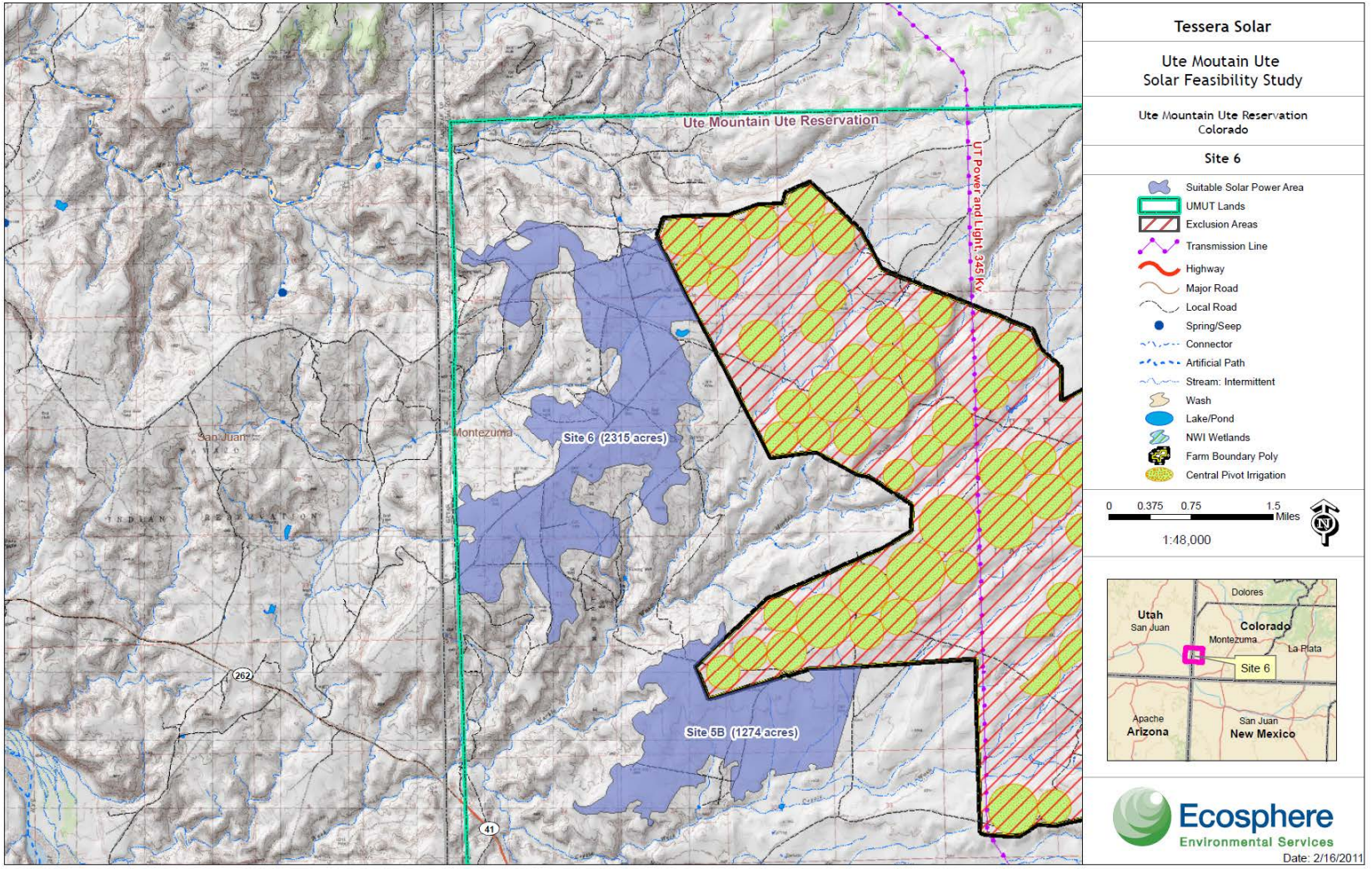
Sites 3 and 4


Site 3B (1329 acres)
Site 4A (3408 acres)
Site 4B (432 acres)
Site 3A (1105 acres)
Montezuma
UT Power and light 345
160
Tessera Solar
Ute Moutain Ute
Solar Feasibility Study
Ute Mountain Ute Reservation
Colorado
Sites 3 and 4
Suitable Solar Power Area
Exclusion Areas
Transmission Line
Farm_Boundary_Poly
Central_Pivot_Irrigation
Highway
Major Road
Local Road
B1: Outstanding Biodiversity Significance
B3: High Biodiversity Significance
Lake/Pond
Artificial Path
Stream/River: Perennial
Stream: Intermittent
NWI Wetlands
0 0.375 0.75 1.5 Miles
1:48,000
Dolores
Utah
San Juan
Colorado
Montezuma
La Plata
Sites 3 & 4
Apache
Arizona
San Juan
New Mexico
Ecosphere
Environmental Services
Date: 2/16/2011

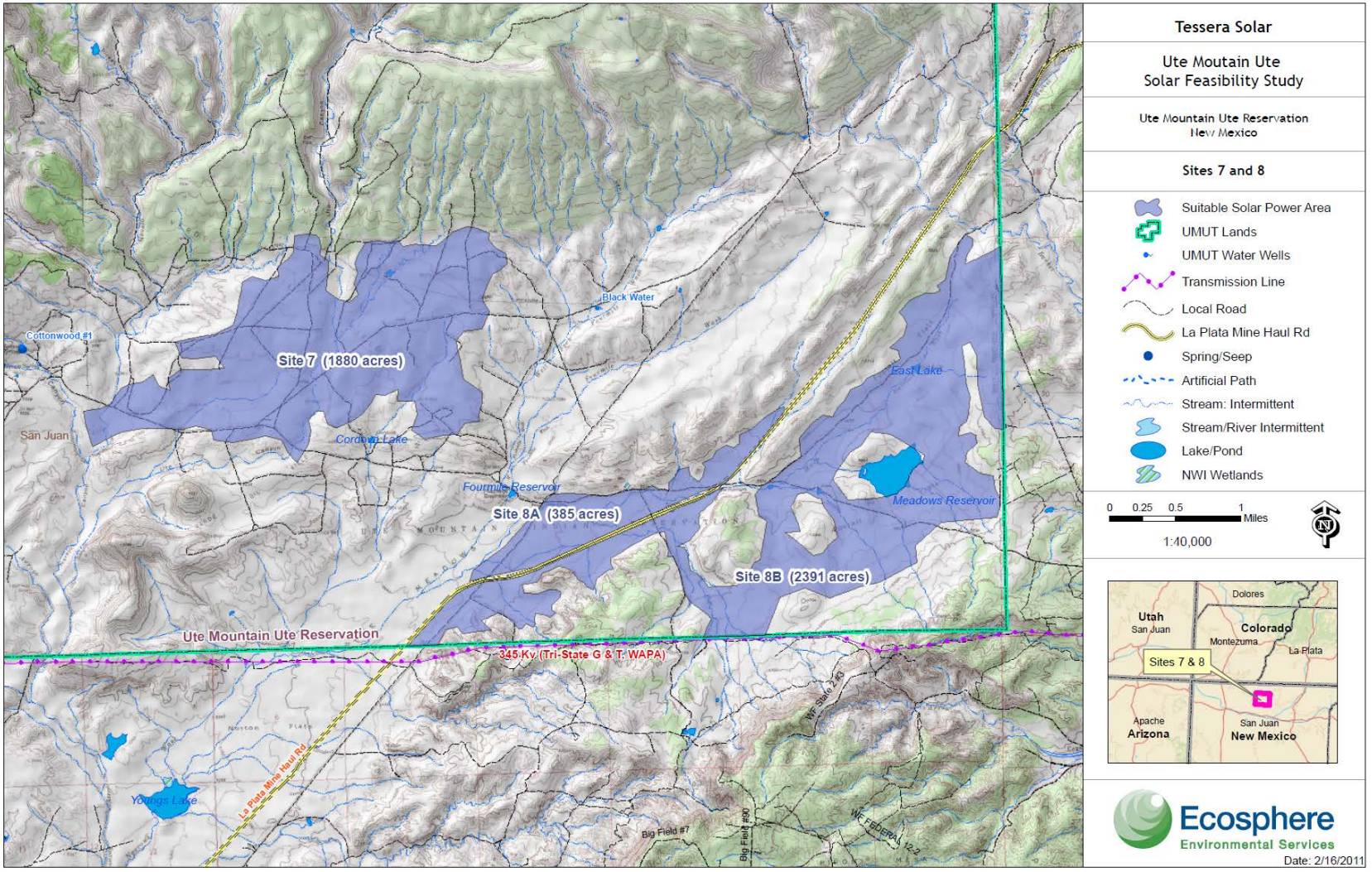
Site 5


Tessera Solar
Ute Moutain Ute
Solar Feasibility Study
Ute Mountain Ute Reservation
Colorado
Sites 5A and 5B
Suitable Solar Power Area
Exclusion Areas
Transmission Line
Highway
Major Road
Local Road
Connector
Artificial Path
Stream: Intermittent
Stream/River
Lake/Pond
NWI Wetlands
Farm Boundary Poly
Central Pivot Irrigation
B3: High Biodiversity Significance
0 0.375 0.75 1.5 Miles
1:48,000
Site 5B (1274 acres)
Site 5A (2429 acres)
Site 4B (432 acres)
UT Power and Light 345 Kv
San Juan
Montezuma
262
41
Utah
San Juan
Colorado
Montezuma
Dolores
La Plata
Site 5
Apache
Arizona
San Juan
New Mexico
Ecosphere
Environmental Services
Date: 2/16/2011

Site 6


Ute Mountain Ute Reservation
UT Power and Light 345 Kv
Site 6 (2315 acres)
Site 5B (1274 acres)
Montezuma
San Juan
262
41
Tessera Solar
Ute Moutain Ute
Solar Feasibility Study
Ute Mountain Ute Reservation
Colorado
Site 6
Suitable Solar Power Area
UMUT Lands
Exclusion Areas
Transmission Line
Highway
Major Road
Local Road
Spring/Seep
Connector
Artificial Path
Stream: Intermittent
Wash
Lake/Pond
NWI Wetlands
Farm Boundary Poly
Central Pivot Irrigation
0 0.375 0.75 1.5 Miles
1:48,000
Dolores
Utah
San Juan
Colorado
Montezuma
La Plata
Site 6
Apache
Arizona
San Juan
New Mexico
Ecosphere
Environmental Services
Date: 2/16/2011

Sites 7and 8


Tessera Solar
Ute Moutain Ute
Solar Feasibility Study
Ute Mountain Ute Reservation
New Mexico
Sites 7 and 8
Suitable Solar Power Area
UMUT Lands
UMUT Water Wells
Transmission Line
Local Road
La Plata Mine Haul Rd
Spring/Seep
Artificial Path
Stream: Intermittent
Stream/River Intermittent
Lake/Pond
NWI Wetlands
0 0.25 0.5 1 Miles
1:40,000
Site 7 (1880 acres)
Site 8A (385 acres)
Site 8B (2391 acres)
Black Water
East Lake
Cortez Lake
Fourmile Reservoir
Meadows Reservoir
Cottonwood #1
San Juan
Ute Mountain Ute Reservation
345 Kv (Tri-State G & T, WAPA)
La Plata Mine Haul Rd
Youngs Lake
Big Field #7
Big Field #90
WF Federal 12-2
Dolores
Utah
San Juan
Colorado
Montezuma
La Plata
Sites 7 & 8
Apache
Arizona
San Juan
New Mexico
Ecosphere
Environmental Services
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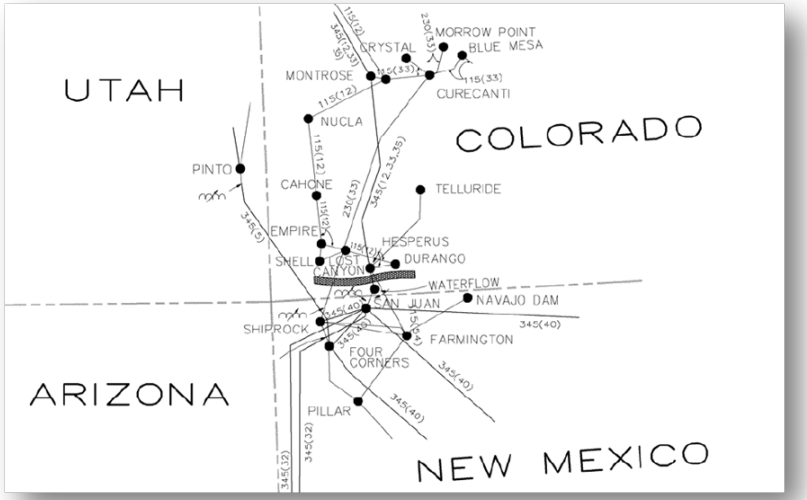
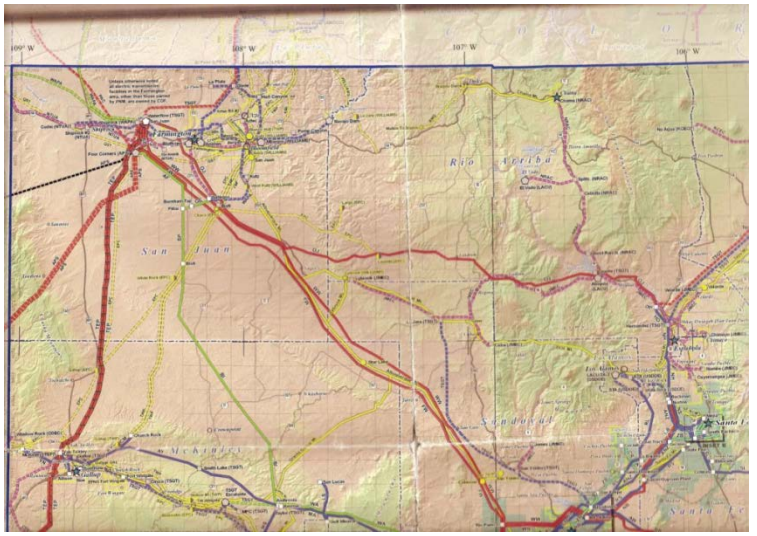
Pre-Feasibility Interconnection Study for a 25 MW Solar Generation Facility on the Ute Mountain Reservation (WAPA and DOE)

- Assessments in Study:
  - General Information about Large Generation Interconnect Potential and Processes
  - Interconnection locations and types, related costs
  - Large Generator/Small Generator Cut-off (20mW)
  - Interconnection Queue Processes
  - Transmission Issues based on Total Transfer Capacity, Available Transfer Capacity, Points of Delivery and Points of Receipt and Types of Products
  - Marketing Issues and Concerns
  - Pumped Storage Hydroelectric Interconnect Options and Analysis (project size is a major variable)

Many Potential Customers and Opportunities in a Transition away from Coal

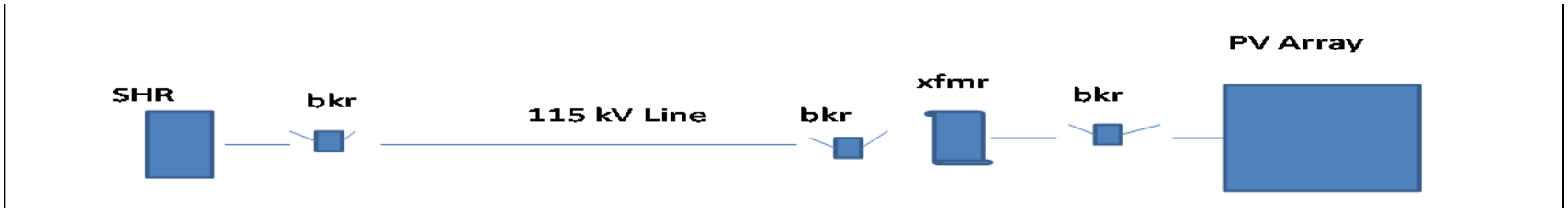
- Northern NM and 4 Corners "Common Bus"
  - 12 lines interconnected
  - 6 or more potential *major* customers
  - More Constrained to west and Southwest
  - Some Interconnect (and transmission) Options may require a WECC three-phase rating process to further evaluate potential and opportunities





Interconnect Analysis

- 3 Types of Transmission Interconnects from at Shiprock Substation 345 kV, 230 kV, 115 kV
  - 345 not feasible for smaller projects (20mW and under)
  - 230 feasible but not practical without build out plans to 100-150mW
    - Distance to interconnect is great for a small project to pay out
    - One Developer indicates this is feasible for a staged solar (PV) project - ~50mW stages
  - Analysis based on 25mW concept, without consideration of large scale pumped storage hydroelectric project or 100+ mW solar
  - ~$6m-$8m
- Plant Located Step up vs. Substation Step up 34.5 – 115 kV analyzed



Additional Interconnect Locations Considered

- San Juan Substation
  - Many lines to cross could complicate this
  - ~$14 million to upgrade and connect
- New tap/substation into 345 kV WAPA – Tri-State
  - Closest to potential generation location (2 miles)
  - ~$42 million

Summary

- Tribe has Land and other resources to build a substantial *Commercial Solar Facility* and *Pumped Storage Hydroelectric Generator*
  - Small generator potential with Farmington Electric and others
  - Large generator potential with many various customers
- Interconnect scenarios vary and present opportunities and challenges in planning and scaling
  - Project Scales and investment in interconnect
    - One Developer has a promising forecast on this if relationships can be revived and Tribe can input some initial capital
  - PPA and Queue dynamics in timeframes for marketing and building
    - Solar- short term
    - Pumped Storage – long term

Next Steps

- Tribal Renewable Energy Planners still want a local community scale demonstration project to engage Membership in understanding solar and hydroelectric projects
  - 1-2mW local project
  - Energy Deflection Structure rebuild for micro-hydro project
- Further research on Rocky Mountain Power transmission line interconnect in Colorado for commercial projects
- Tribe needs a specific staff person to lead these projects instead of an ad hoc committee

Thanks for listening ☺