Appendix E


San Juan Power Plant
San Juan River
Morgan Lake
Four Corners Power Plant
Chaco River
Navajo Nation

APPENDIX E

Waters of the U.S. Mapping Report

Waters of the U.S. Mapping Report
for the
Desert Rock Energy Project
San Juan County, New Mexico

Prepared for:
Sithe Global Power, LLC
Three Riverway, Suite 1100
Houston, TX 77450

Prepared by:
Basin Hydrology, Inc. &
Ecosphere Environmental Services
2243 Main Avenue
Durango, CO 81301
970.382.7256

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INTRODUCTION

A new coal-fired power plant is being proposed on the Navajo Indian Reservation in San Juan County in northwest New Mexico. Related project components span some 35 miles in length. Since this project will cross jurisdictional waters of the U.S. (i.e., those lands that fall under the jurisdiction of Section 404 of the Clean Water Act), this study was conducted to identify the location and type of waters of the U.S. present within specific project boundaries (e.g., power plant site and water well field) and along linear project components (e.g., overhead transmission lines, waterlines and roads).

This Report (i.e., delineation) is required by the Army Corps of Engineers (Durango Regulatory Office - Albuquerque District) in order to obtain a Jurisdictional Determination letter from that office. Once the mapping is approved, via a Jurisdictional Determination letter, the location, size and type of Waters of the U.S. impacted by the project will be evaluated using the contents of the Report. Should additional project features be proposed beyond what can reasonably be approximated using results of Report, additional field mapping may be required by the Army Corps of Engineers.

As with any delineation, the Army Corps of Engineers makes the final determination. Waters of the U.S. identified herein represent required features that qualify as jurisdictional based on current Section 404 guidelines.

LOCATION

This large project area is located in northwest New Mexico approximately 21 miles south of Shiprock, New Mexico and 24 miles southwest of Farmington. The proposed power plant will be located approximately 14 miles south of the existing coal-fired Four Corners Power Plant. High voltage overhead transmission lines will run northward from the plant towards the Four Corners Power Plant, continue northward over the San Juan River and tie into the existing Navajo Transmission Project power lines located fives miles northeast of Shiprock. Project components and study area are located within the Navajo Indian Reservation (see Location – Project Component Map).

The project area is located in an arid, high elevation desert. Project area elevations range between 5,000 and 5,500 feet (MSL). The majority of the project area is rural with only a few scattered tribal member home sites, except near the San Juan River. Vehicular access to most project components is limited since most roads are unimproved or non-existent. Fences and washed out roads make access even more difficult, except by foot or four-wheeler.

METHODS

Determinations, measurements of waters of the U.S. (*Waters*) and mapping was performed in the field on May 18, June 12 - 15, June 17, June 20, August 30 and November 6, 2006 by Mark Oliver and Tyler Scheid. Project area boundaries (e.g., power plant, well fields) and linear features (e.g., power lines, waterlines, roads) were loaded into a GPS unit to accurately locate them in the field. Linear project features were traveled and surveyed using a combination of walking, four-wheeler and vehicle. *Waters* were only mapped where they intersected with a linear project feature (i.e., Waters were not mapped along existing access roads, two-tracks, etc. in the vicinity of a

linear feature since it is unclear where actual temporary or permanent road crossings will occur). Mapping within the well fields and power plant site also relied on foot, four-wheeler and vehicular access using meandering transects in an attempt to identify *Waters* within the project component boundary. To connect *Waters* mapped in the upper portion of the watershed with the same feature mapped in the lower watershed (i.e., not every *Waters* was walked for its full length with a project boundary), some interpolation was required using topographic maps and aerial photographs.

Protocols specified in the Army Corps of Engineers' *Wetland Delineation Manual* (1987) were used to make upland-wetland determinations, where wetlands were encountered. Where wetlands were encountered, a Wetland Data Form was completed. No Wetland Data Forms were completed for "non-wetland" *Waters* features (i.e., channels). The vast majority of the project area does not support wetland conditions, based on the lack of all three wetland indicators (vegetation, hydrology and soils). Soil pits were only dug at two locations where hydrophytic vegetation was present. Areas adjacent to these soil pits were inundated as a result of a pond and water discharging from an artesian well. Due to the arid nature of the area, jurisdictional areas were limited to landforms that convey flowing water frequently enough that erosional and depositional processes have created defined bed and bank features.

Water conveyance features with a defined channel bed and bank wider than 12 inches were mapped as jurisdictional *Waters.* Channel width and depth was based on ordinary high water mark (OHWM) concepts. However, OHWM determinations are less clear in arid environments compared to lakes and perennial channels. OHWM determinations for this study relied on a working knowledge of fluvial geomorphologic processes. Geomorphic channel features, such as the elevation and location of a depositional bar were the primary indicators used to identify the OHWM.

Professional judgment and applied experience were used to identify the appropriate geomorphic feature, differentiate which feature to use when two or more similar features existed and make width and depth measurements. The elevation of the OHWM was determined first based on physical features. The horizontal channel width at the OHWM elevation and the vertical distance between the channel thalweg and the OHWM elevation were measured and recorded. A color digital photograph and a GPS point were taken at each encountered *Waters.*

The GPS unit used for mapping is a Trimble Geo XT, which typically has sub-meter accuracy (horizontal) with post-processing. Survey points were downloaded, processed and overlain onto GIS project maps.

RESULTS

The foldout Waters of the U.S. Maps show the various project components and mapped *Waters*. For each mapped *Waters*, a sample point identification label has been assigned. The spreadsheet lists for each sample point, the photograph number, whether wetland indicators were present (if so, the wetland community type) and whether a defined channel was present (if so, the width and depth of the OHWM). Photographs are contained on a CD in the back of this Report.

In addition to the topographic maps showing project components and mapped *Waters*, they also show drainage channels which were obtained from the U.S. Geological Survey

(USGS) National Hydrography Dataset (blue lines). Not all USGS-defined channels contain defined bed and bank features. Some defined bed and bank channels were encountered that were not mapped by the USGS National Hydrography Dataset. The blue lines have been included on these maps for informational purposes only.

Vegetation

The vast majority of the project area supports vegetation typical of the region's arid climate. In general, there was little, if any, difference in vegetation along channels determined to be jurisdictional compared to adjacent lands since the hydrologic regime of the channels has little affect on vegetation. A few scattered tamarisks (*Tamarix spp.*) exist along some of the larger washes but their presence was not common or dominant.

Vegetation present within the project area are presented below.

Species List

Common Name	Scientific Name	Indicator Status
Alkali sacaton	*Sporobolis airoides*	FAC
4 wing salt bush	*Atriplex canescens*	UPL
Shadscale saltbush	*Atriplex confertifolia*	NL – UPL
Rabbitbrush	*Chyrothamnus spp.*	NL – UPL
Galleta	*Pleuraphis spp.*	NL – UPL
Indian Ricegrass	*Oryzopsis hymenoides*	FACU-
Tumbleweed	*Salsola tragus*	FACU
Tamarisk	*Tamarix spp.*	NI
Broom snakeweed	*Gutierrezia sarothrae*	NL - UPL
Greasewood	*Sarcobatus vermiculatus*	FACU+

Two small areas were encountered that supported a dominance of hydrophytic vegetation. One is located near the proposed power plant access road (sample point RWET1) and the other is near Alternative B water well field (sample point WFWET1). Vegetation at sample point RWET1 was dominated by tamarisk (canopy) and an unidentifiable forb understory (unidentifiable due to intensive livestock grazing at this site). Vegetation at sample point WFWET1 was dominated by "marsh" species which was a result of a flowing artesian well. Although this area was also intensely grazed, vegetation to at least the genus level was identified. See Wetland Data Forms for vegetation data.

Hydrology

Based on long-term data from Shiprock, New Mexico, the area receives approximately 7 inches of precipitation annually. Monsoonal rains, which provide a large percentage of the annual moisture, produce high intensity short duration thunderstorms. Runoff from these rainfall events produce the dominant channel forming flows but are inadequate to provide long duration hydrologic conditions necessary to support wetland conditions in most years.

In addition to the aforementioned two wetland areas, only one channel contained saturated soils. Soil saturation was related to flowing water (~ 0.25 ft^3/second), which appeared to be very sporadic in nature since vegetation along the channel was not significantly different that any of the other washes encountered. The water source in this *Waters* (sample point T25) was assumed to be from irrigation runoff associated with the

Navajo Agricultural Products Industry (NAPI) project and/or the active coal mine operation. All other channels and on-channel impoundments were dry.

Sheet flow within broad concave topography is somewhat common within the project area. Organic debris accumulated on the upstream side of rooted vegetation indicates runoff does occur through these areas. However, many of these areas do not support a defined bed and bank feature and were therefore not mapped as *Waters.*

The two wetland areas have soil saturation in the upper 12" of the soil horizon. The source of hydrology at wetland RWET1 was from an on-channel impoundment and reportedly from an artesian well, although no well feature was observed. The majority of this area supported open water with vegetation only along its mildly sloping eastern side. Wetland near WFWet1 was supported by an artesian well. Water from the well spilled into a watering trough and then discharged onto the ground where it spread out creating a wetland area that supports surface saturation and shallow inundation for several hundred feet downstream. At the downstream end of the wetland, a large on-channel impoundment had been constructed which supported open water. Both wetland areas were used intensively by livestock.

Soils

Project area soil information was obtained from the Soil Survey of San Juan County, New Mexico, Eastern Part (1977, USDA Soil Conservation Service) and Soil Survey of Shiprock Area, Parts of San Juan County New Mexico and Apache County, Arizona (1992, USDA Natural Resources Conservation Service). Due to large area encompassed by this project, only general soil map units are presented. The General Soil Map Unit map and corresponding project-area soil descriptions for each soil unit are provided herein. The Chaco River is the approximate boundary between the two soil surveys.

East of Chaco River Soils east of the Chaco River within the project area are General Soil Map Units 6 and 8. Map Unit 6 (Sheppard-Huerfano-Notal) soils are shallow to deep, level to steep, well drained to somewhat excessively well drained that formed in alluvial and eolian materials. Surface layers have light soils colors. Map Unit 8 (Badland-Rock outcrop-Monierco) soils are level to gently sloping, well drained soils that formed in alluvial and eolian materials. Where soils do exist, surface soils are light in color.

West of Chaco River Soils west of the Chaco River and north of the San Juan River within the project area are General Soil Map Units 1, 2, 3 and 4. Map Unit 1 (Nageezi-Fruitland-Bebeevar), along the San Juan River, is characterized by deep, well drained to moderately well drained soils on flood plains, river terraces and fan terraces. Surface soils contain a high percentage of sand and are light in color. Map Unit 2 (Persayo-Fordbutte-Ravola) soils are shallow to deep, well drained on alluvial fans, flood plains and plateaus. Surface soils are light colored and contain a high percentage of sand. Map Unit 3 (Kimbeto-Farb-Denazar) soils are shallow to deep, well drained to somewhat excessively well drained on plateaus and mesas. Surface soils are light colored and contain a high percentage of sand. Map Unit 4 (Tewa-Kimbeto-Shiprock) soils are deep to very deep, well drained on fans and plateaus. Surface soils are light colored and contain a high percentage of sand.

Based on a limited number of soil pits, soils characteristics observed in the field match those presented above (i.e., soils were generally sandy and light colored). None of the project area soils were listed as hydric nor were hydric soils encountered except at the two wetland sites. Soil pits dug at the two wetland areas support hydric soil conditions. Indicators include low chromas and redox features. The remainder of the study area does not have appropriate soil and hydrology conditions required for the development of hydric soils.

SUMMARY

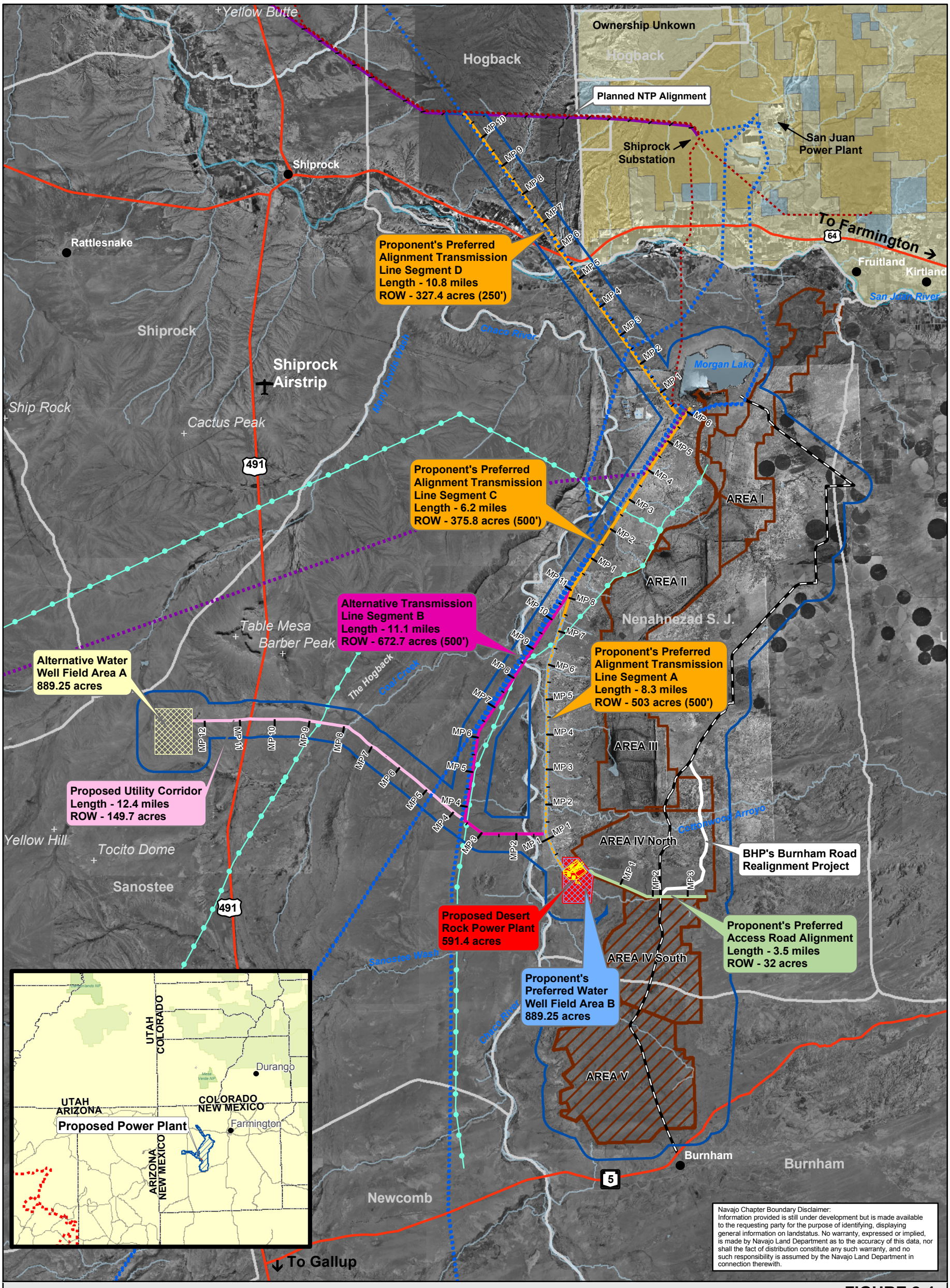
As part of the environmental review and permitting process for the proposed Desert Rock Energy Project located east and south of Shiprock, New Mexico, a field determination was performed to identify jurisdictional *Waters* per Section 404 of the Clean Water Act. Field work for this first phase of mapping was performed from May 18 through November 6, 2006. Mapping herein is limited to where a linear project component (i.e., waterline, road, transmission line) crosses a *Waters* and to areas within project component boundaries (i.e., power plant site and well fields). This Report will be submitted to the Army Corps of Engineers for the purposes of obtaining a Jurisdictional Determination letter. Once the JD Letter is obtained, the contents of this Report will form the basis for quantifying impacts to Waters of the U.S.

Channels that support a defined and bed feature with an OHWM width greater than 12" were mapped as jurisdictional (per Deanna Cummings, USACOE Durango Regulatory Branch). OHWM width and depth, a photograph and a GPS point were taken at each encountered *Waters*. OHWM was based on geomorphic features present within the subject channel and identified using professional judgment and fluvial geomorphic experience. As a result of artesian wells and/or on-channel impoundment, two wetland areas that support wetland indicators were identified. Wetland Data Forms for the two wetland areas are in the Appendix.

USGS topographic base maps are attached that show project component alignments and locations, a sample point number for each mapped *Waters* and USGS National Hydrography Dataset (e.g., channels designated by a blue line). The attached spreadsheets list each sample point, provide the corresponding photograph number, state whether wetland indicators were present (if so, the wetland community type) or a defined channel was present (if so, the width and depth of the OHWM). A photograph of each mapped *Waters* is contained on a CD.

APPENDIX

Location - Project Component Map
Index Map for Waters of the U.S. Maps
Waters of the U.S. Maps 1 through 8
Characteristics of Jurisdictional Waters of the U.S. Spreadsheet
Soil Maps & Descriptions
Wetland Data Forms
Examples of Surveyed Waters of the U.S. (Photographs)
Photographs (on CD)



Legend

- Planned NTP 500kV
- Existing Pipeline
- Existing 230kV Transmission Line
- Existing 345kV Transmission Line
- Existing 500kV Transmission Line
- Navajo Chapter Boundaries
- BHP Navajo Coal Company Lease Area (approximate)
- BHP's Burnham Road Realignment Project
- Burnham Road
- Rivers/Streams
- Facilities Study Area
- Bureau of Land Management
- Navajo Nation
- Private Land
- State Land

Project Components

Transmission Facilities
- Proponent's Preferred Alignment Transmission Line
- Alternative Transmission Line

Other Facilities
- Proposed Utility Corridor

Access Road
- Proponent's Preferred Access Road Alignment

Well Field
- Alternative Water Well Field Area A
- Proponent's Preferred Water Well Field Area B

Coal Source
- Areas IV South and V of the BNCC Lease Area

Source:
URS Corporation 2005, 2006
Navajo Nation Land Department 2006
BHP Billiton 2005
Bureau of Land Management 2004
Environmental Systems Research Institute 2004
New Mexico Resource Geographic Information System (RGIS) 1988

P:\Sithe\gis\plots\Base_Map_11x17.pdf UTM, NAD83, Zone12, Meters

FIGURE 2-1
BASE MAP

Sithe Global Power, LLC
Desert Rock
Energy Project

Working Draft - July 21, 2006

0 2.5 5
Miles

N W E S

WATERS OF THE US KEY MAP

Ecosphere Environmental Services
7/20/2006
Updated 1/3/2006

MAP 1
MAP 2
MAP 3
MAP 4
MAP 5
MAP 6
MAP 7
MAP 8

San Juan Powerplant
Four Corners Powerplant
Desert Rock Powerplant

THE HOGBACK

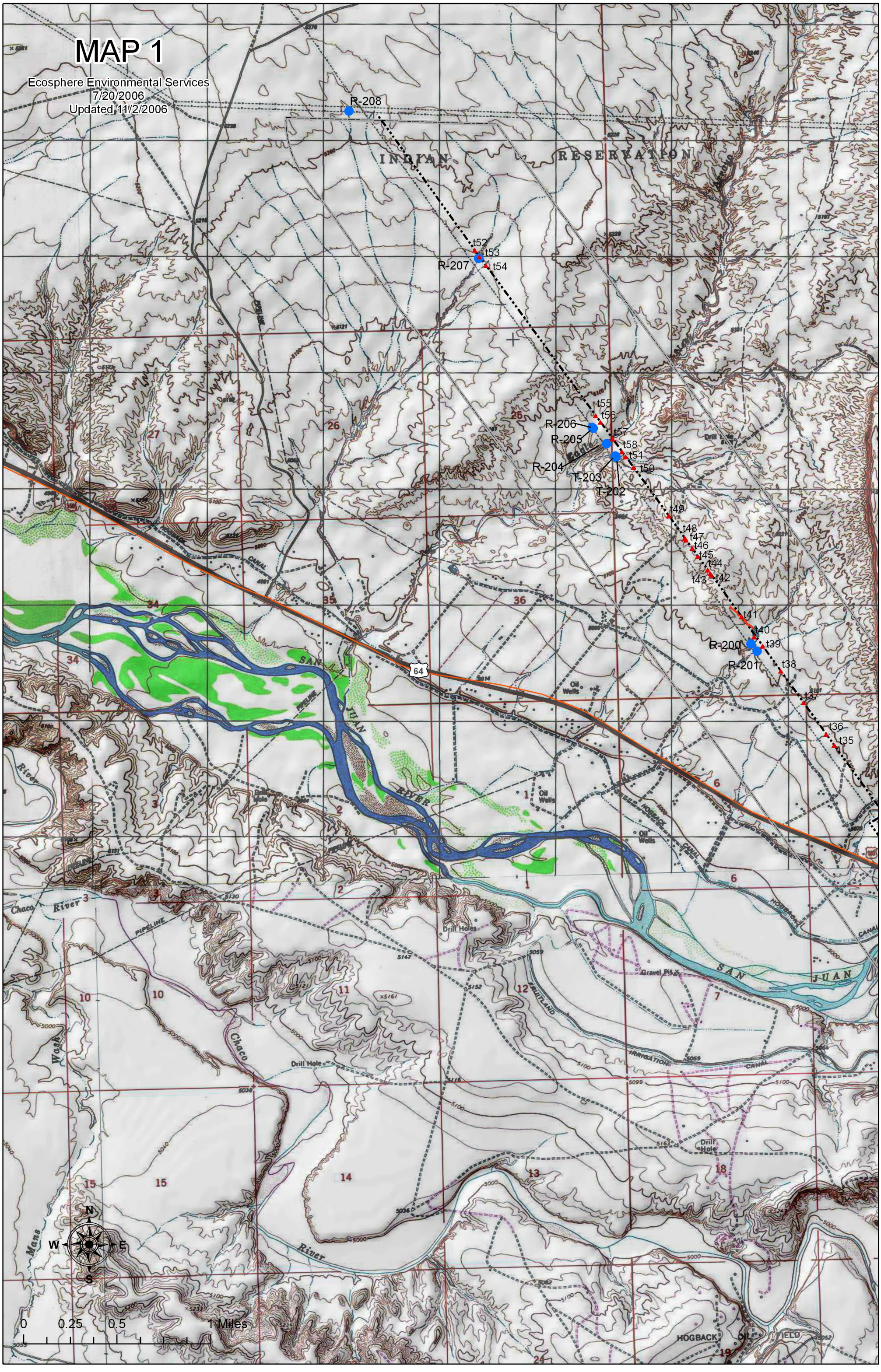
666
64
Shiprock
Salt Creek Wash
Rattlesnake Wash
Many Devils Wash
Chaco River
Coal Mine Creek
Wauchan Arroyo
Westwater Arroyo
Shumway Arroyo
San Juan River
Morgan Lake
Chinde Wash
Tocito Wash
Tocito Lake
Sanostee Wash
Pe?a Blanca Arroyo
Pinabete Arroyo
Brimhall Wash

N
W
E
S

0 1 2 4 Miles

MAP 1

Ecosphere Environmental Services
7/20/2006
Updated 11/2/2006



MAP 2

Ecosphere Environmental Services
7/20/2006
Updated 11/2/2006

t37
t36
t35
t34
34-1
t33
t32

Ordinary High Water Mark
(Approximate)

Transmission Line Segment D

N
W
E
S

0 0.25 0.5 1 Miles

MAP 3

Ecosphere Environmental Services
7/20/2006

Transmission Line Segment D

Transmission Line Segment C

t19
t20
t21
t22
t23
t24
t25
t26
t27
t28
t29
t30
t31

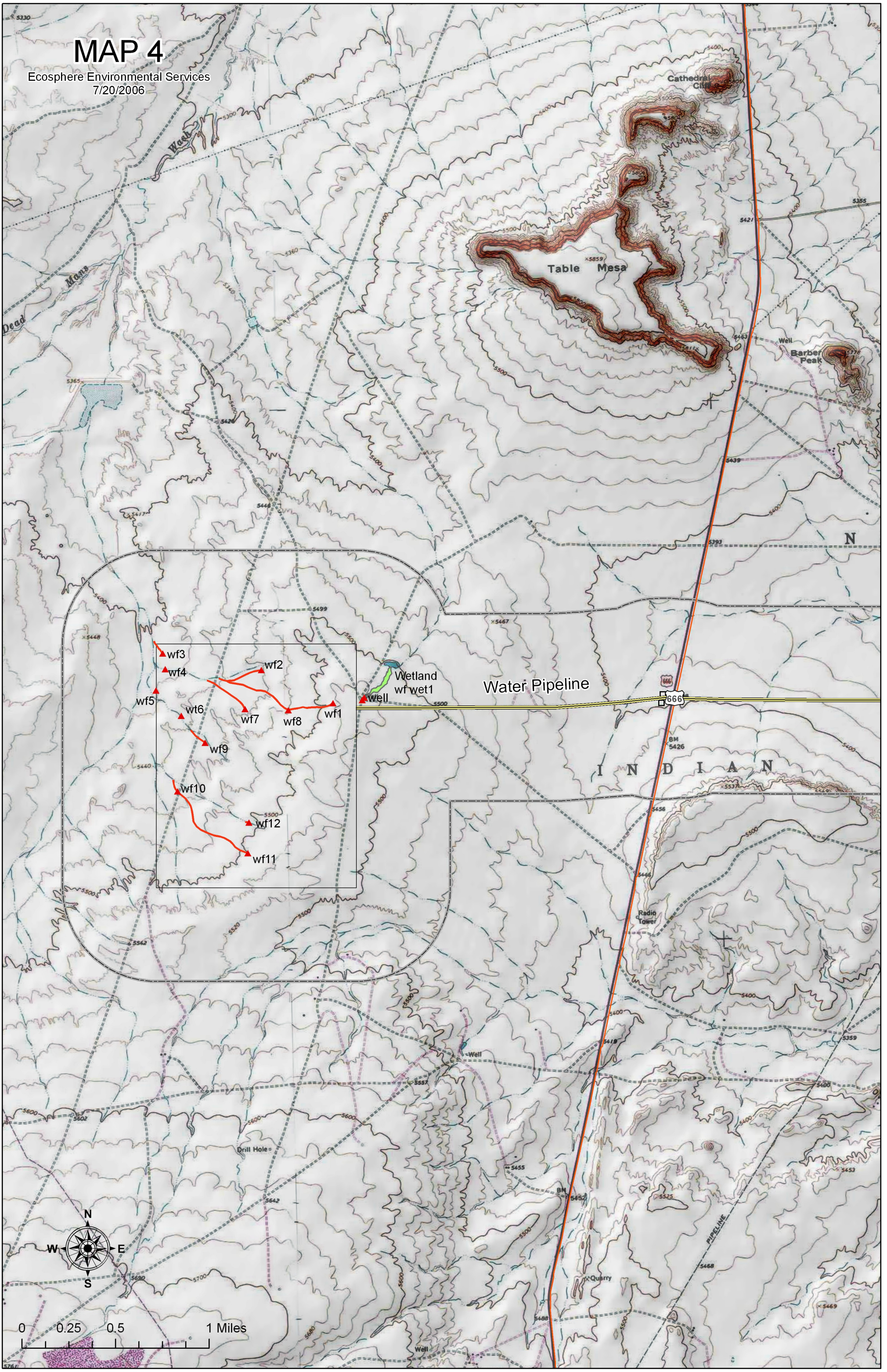
Radio Facility
SPILLWAY ELEV 5326
Borrow Pit
TAILINGS PONDS
Stacks
Four Corners Powerplant
Substation
Radio Tower
Drill Hole
T 29 N
PIPELINE
Chaco
Riv

N
W
E
S

0 0.25 0.5 1 Miles

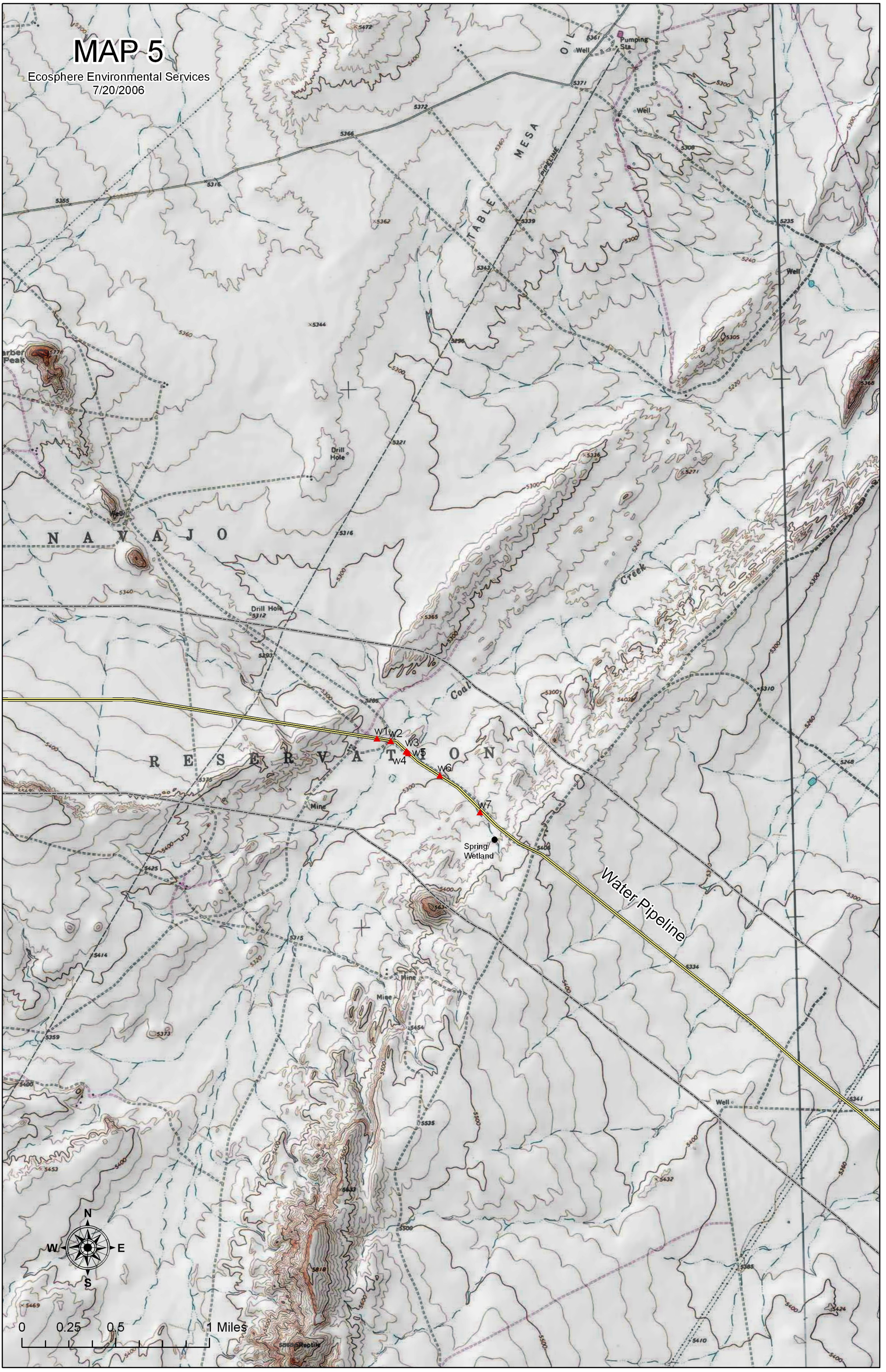
MAP 4

Ecosphere Environmental Services
7/20/2006



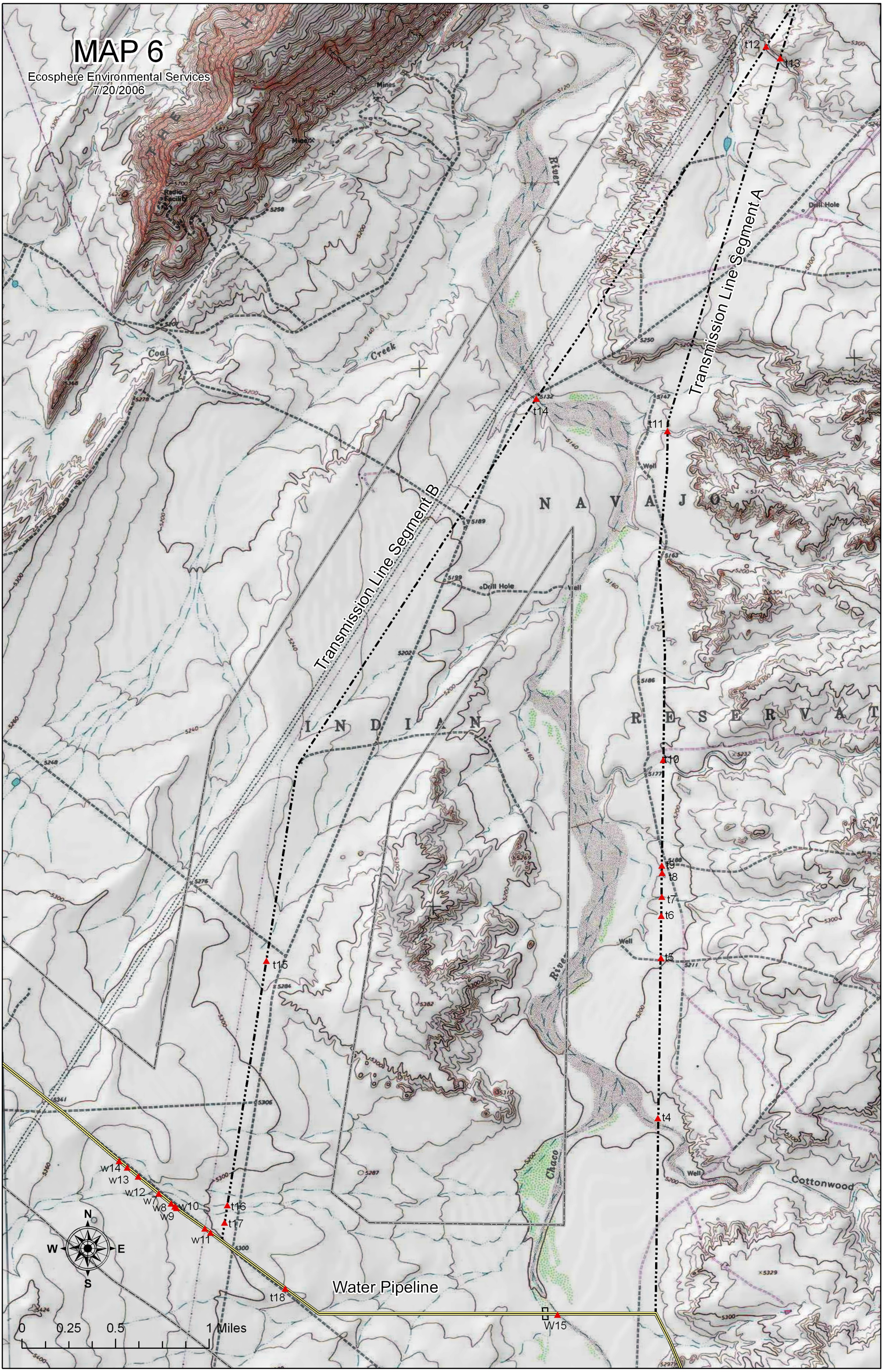
MAP 5

Ecosphere Environmental Services
7/20/2006



MAP 6

Ecosphere Environmental Services
7/20/2006



MAP 7

Ecosphere Environmental Services
7/20/2006
Updated 11/9/2006

Coal Processing Plant Lease

Power Plant Lease

Well Field Alternative

5400
5345
5300
5328

cp4
cp3
cp5
cp2
cp10
cp8
cp7
cp9
cp6
pp100
t3
t2
t1
pp108
pp105
cp1
pp107
pp104
pp102
pp101
pp106
pp1
pp7
pp10
pp4
pp6
pp5
pp9
pp8
new wf1

Pinabete Arroyo

N
W
E
S

0 250 500 1,000 Feet

MAP 8

Ecosphere Environmental Services
7/20/2006
Updated 1/9/2007

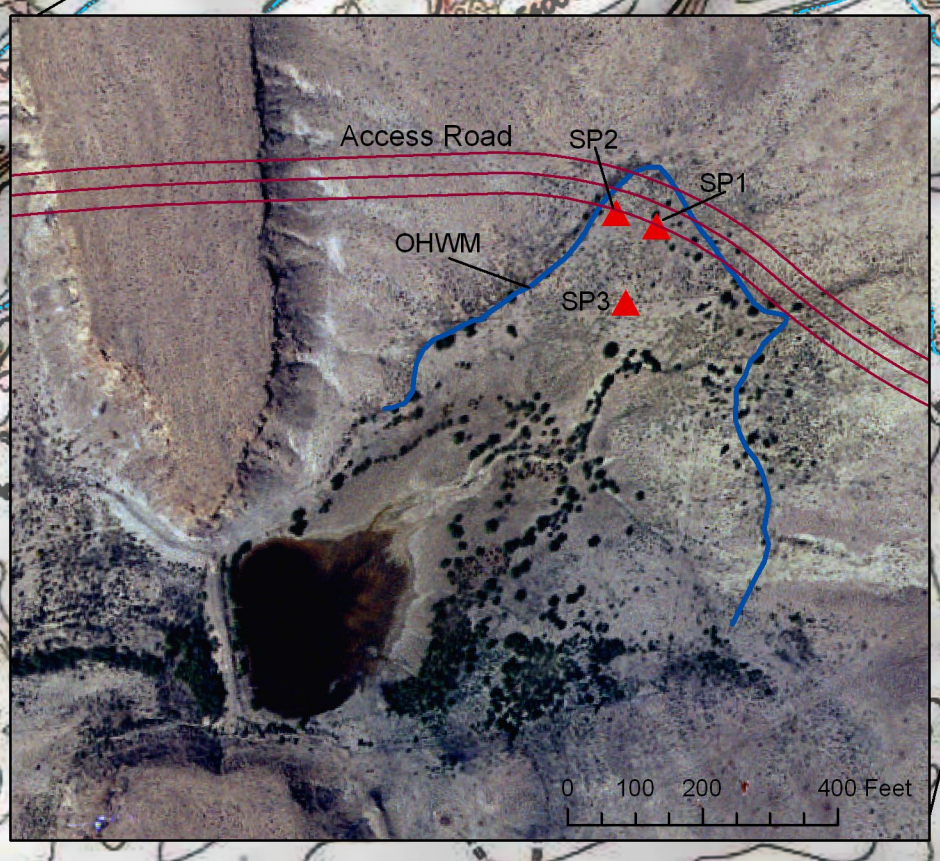
BR 1

BR 2

BR 3

r 3

Wetland
OHWM



0 500 1,000 2,000 Feet

Desert Rock Power Project

Characteristics of Jurisdictional Waters of the U.S.

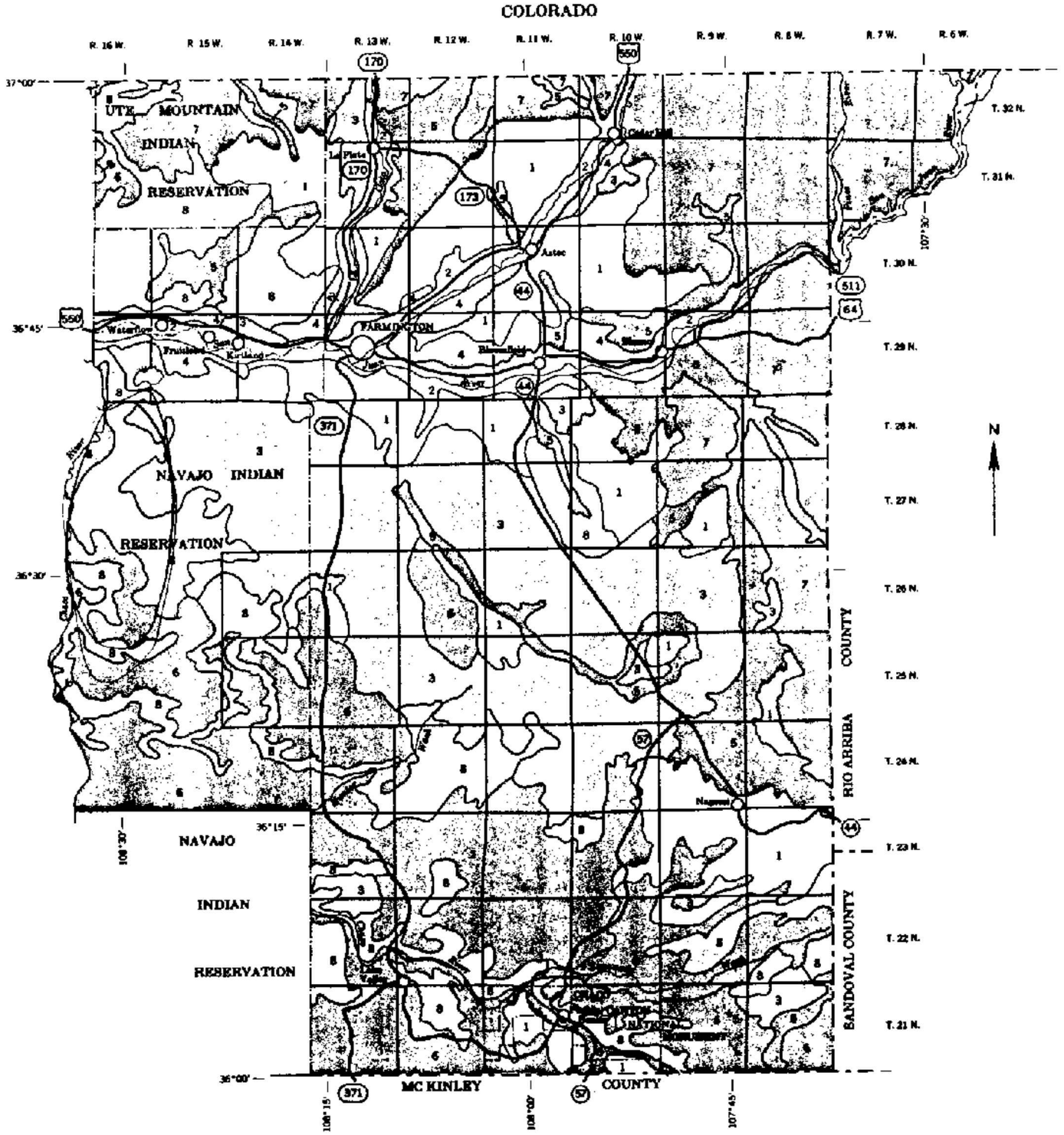
prepared by: *Basin Hydrology, Inc. & Ecosphere Environmental Services*
Nov. 9, 2006 (updated 1-8-07)

		WetlandCharacteristics				OHWM Characteristics				
Sample Point ID	**Photograph #**	**Vegetation?**	**Hydrology?**	**Soils?**	**Comm. Type**	**Defined Channel?**	**Width**		**Depth**	
		(Yes/No)	(Yes/No)	(Yes/No)		(Yes/No)	(inches)	(feet)	(inches)	(feet)
POWER PLANT SITE										
PP1	186	N	N	N		Y	30		8	
PP4	339	N	N	N		Y	18		3	
PP5	340	N	N	N		Y	25		3	
PP6	341	N	N	N		Y	40		4	
PP7	342	N	N	N		Y	19		3	
PP8 (Pinabete Wash - west)	343	N	N	N		Y		22	14	
PP9 (Pinabete Wash - east)	344	N	N	N		Y		36	15	
PP10	346	N	N	N		Y	16		3	
PP11	4	N	N	N		Y	35		8	
PP12	6	N	N	N		Y		9.5	15	
PP100 (top)	1205	N	N	N		y	25		6	
PP101	1216	N	N	N		Y	44		12	
PP102 (bottom)	1217	N	N	N		Y	15		3	
PP103 (top)	1218	N	N	N		Y	14		3	
PP104 (bottom)	1219	N	N	N		Y	24		4	
PP105 (top)		N	N	N		Y	24		4	
PP106 (bottom)	1220	N	N	N		Y	19		5	
PP107 (top)		N	N	N		Y	19		5	
PP108 (main channel)	1221	N	N	N		Y	55		12	
PP108 (tributary)	1222	N	N	N		Y	33		6	
COAL PROCESSING PLANT SITE										
CP1	1205	N	N	N		Y	54		9	
CP2	1206	N	N	N		Y	15		3	
CP3 (top)	1207	N	N	N		Y	15		2	
CP4	1211	N	N	N		Y	30		3	
CP5	1212	N	N	N		Y	42		5	
CP6	1214	N	N	N		Y	19		5	
CP7	1215	N	N	N		Y	14		3	
CP8 (end tributary)	1216	N	N	N		Y	13		3	
CP9 (confluence)	1217	N	N	N		Y	19		5	
CP10		N	N	N		Y	19		3	
POWER PLANT ACCESS ROAD										
R1	184	N	N	N		Y	30		7	
R2		N	N	N		Y	33		8	
R3	185	N	N	N		Y	72		18	
RWET1	*29*	*Y*	*Y*	*Y*	*seasonal pond*	*N*				
					scrub-shrub/OW					
SP1	1376	Y	N	N	below OHWM	N				
SP2	1383	N	N	N	below OHWM	N				
SP3	1389	Y	N	N	below OHWM	N				
EXISTING BURNHAM ROAD										
BR1 (Trib. of Cottonwood Wash)	1327	N	N	N		Y		25	20	
BR2 (Cottonwood Wash)	1330	N	N	N		Y		39	32	
BR3 (Pinabete Wash)	1330	N	N	N		Y		39	33	

		WetlandCharacteristics				OHWM Characteristics				
Sample Point ID	**Photograph #**	**Vegetation?**	**Hydrology?**	**Soils?**	**Comm. Type**	**Defined Channel?**	**Width**		**Depth**	
		(Yes/No)	(Yes/No)	(Yes/No)		(Yes/No)	(inches)	(feet)	(inches)	(feet)
OVERHEAD TRANSMISSION LINE										
T1	188	N	N	N		Y	52		10	
T2	190	N	N	N		Y	23		7	
T3	191	N	N	N		Y	23		7	
T4	194	N	N	N		Y		61	30	
T5	195	N	N	N		Y	52		7	
T6	196	N	N	N		Y	14		4	
T7	197	N	N	N		Y	28		6	
T8	198	N	N	N		Y	21		4	
T9	199	N	N	N		Y	20		4	
T10	200	N	N	N		Y		13	16	
T11	201	N	N	N		Y	86		17	
T12	202	N	N	N		Y	46		20	
T13	203	N	N	N		Y	46		20	
T14 (Chaco River)	206-207	N	N	N		Y		76	36	
T17	210	N	N	N		Y	17		4	
T18	211	N	N	N		Y	12		3	
WT2	212	N	N	N		Y	22		4	
T19	213	N	N	N		Y	13		5	
T20	214	N	N	N		Y	21		6	
T21	215	N	N	N		Y	14		3	
T22	216	N	N	N		Y	23		4	
T23	217	N	N	N		Y		22		3
T24	219	N	N	N		Y	30		15	
T25	220	N	N	N		Y		23	32	
T26	221	N	Y???	N		Y	16		3	
T27	222	N	N	N		Y	16		4	
T28	223	N	N	N		Y	49		7	
T29	225	N	N	N		Y		15		3
T30	226	N	N	N		Y	15		2	
T31	227	N	N	N		Y	24		5	
T32 (abv headcut)	228	N	N	N		Y	18		2	
T33 (blw headcut)	229	N	N	N		Y	18		2	
T34	230	N	N	N		Y	45		7	
T34-1 (San Juan River)	444	N	N	N		Y		475		???
T35	231	N	N	N		Y	27		4	
T36	232	N	N	N		Y	17		3	
T37	233	N	N	N		Y	84		13	
T38	234	N	N	N		Y	27		4	
T39	235	N	N	N		Y	65		10	

		WetlandCharacteristics				OHWM Characteristics				
Sample Point ID	**Photograph #**	**Vegetation?**	**Hydrology?**	**Soils?**	**Comm. Type**	**Defined Channel?**	**Width**		**Depth**	
		(Yes/No)	(Yes/No)	(Yes/No)		(Yes/No)	(inches)	(feet)	(inches)	(feet)
OVERHEAD TRANSMISSION LINE (cont.)										
T40	236-237	N	N	N		Y	58		16	
T41	238	N	N	N		Y	56		7	
T42	239	N	N	N		Y	20		5	
T43	240	N	N	N		Y	22		5	
T44	241	N	N	N		Y	25		6	
T45	242	N	N	N		Y	25		4	
T46	243	N	N	N		Y	18		3	
T47	244	N	N	N		Y	16		3	
T48	245	N	N	N		Y	15		3	
T49	246	N	N	N		Y	13		3	
T50	247	N	N	N		Y		11.6	18	
T51	248	N	N	N		Y	64		12	
T52	249	N	N	N		Y	30		4	
T53	250	N	N	N		Y	84		12	
T54.1	251	N	N	N		Y	22		3	
T54.2		N	N	N		Y	12		2	
T55	252	N	N	N		Y	27		3	
T56	253	N	N	N		Y	30		4	
T57	254	N	N	N		Y		23	18	
T58	255	N	N	N		Y	60		3	
TRANSMISSION LINE CONSTRUCTION ROAD NORTH OF HWY. 64										
R200	448	N	N	N		Y		14	24	
R201	449	N	N	N		Y		6	16	
R202	450	N	N	N		Y	40		12	
R203	451	N	N	N		Y		6	16	
R204 (T57)	452	N	N	N		Y		*23*	*18*	
R205	453	N	N	N		Y	24		4	
R206	454	N	N	N		Y	40		6	
R207 (T53)	*250*	N	N	N		Y	*84*		*12*	
R208		N	N	N		Y	38		14	

		WetlandCharacteristics				OHWM Characteristics				
Sample Point ID	**Photograph #**	**Vegetation?**	**Hydrology?**	**Soils?**	**Comm. Type**	**Defined Channel?**	**Width**		**Depth**	
		(Yes/No)	(Yes/No)	(Yes/No)		(Yes/No)	(inches)	(feet)	(inches)	(feet)
WATER WELL FIELD (ALT. A)										
WF1	292	N	N	N		Y	17		3	
WF2	293	N	N	N		Y	12		2	
WF3	294	N	N	N		Y	20		2	
WF4	295	N	N	N		Y	16		3	
WF5	296	N	N	N		Y	17		2	
WF6	297	N	N	N		Y	16		3	
WF7	298	N	N	N		Y	16		2	
WF8	299	N	N	N		Y	20		2	
WF9	300	N	N	N		Y	16		2	
WF10	301	N	N	N		Y	16		3	
WF11	302	N	N	N		Y	18		3	
WF12	303	N	N	N		Y	16		2	
WFWET1	*307*	*Y*	*Y*	*Y*	*artesian well fed*	*N*				
					wet meadow					
WATER TRANSMISSION LINE (ALT. A)										
W1	256-257	N	N	N		Y	40		5	
W3	259	N	N	N		Y	27		6	
W4	260	N	N	N		Y	30		8	
W5	261	N	N	N		Y	22		5	
W6	262	N	N	N		Y	30		5	
W7	266	N	N	N		Y	17		4	
W8	267	N	N	N		Y	17		4	
W9	268	N	N	N		Y	15		2	
W10	269	N	N	N		Y	17		2	
W11	270	N	N	N		Y	18		3	
W12	271	N	N	N		Y	17		2	
W13	272	N	N	N		Y	16		2	
W14	273	N	N	N		Y	16		2	
W15 (Chaco River)	18	N	N	N		Y		35		3.5
WATER WELL FIELD (ALT. B)										
NEW WF1	345	N	N	N		Y	23		3	



MAP UNITS

1 — Persayo-Fruitland-Sheppard: Very shallow to deep, nearly level to very steep, well drained to excessively drained soils that formed in alluvial, residual, and eolian material; on uplands and fans

2 — Fruitland-Riverwash-Stumble: Deep, nearly level to moderately steep, well drained to somewhat excessively drained soils that formed in alluvium, and Riverwash; on fans and in valleys

3 — Shiprock-Sheppard-Doak: Deep, nearly level to moderately steep, well drained to somewhat excessively drained soils that formed in alluvial and eolian material; on uplands

4 — Haplargids-Blackston-Torriarthents: Very shallow to deep, nearly level to steep, well drained to excessively drained soils that formed in alluvium and residuum; on terraces, mesas, and plateaus

5 — Blancot-Notal: Deep, nearly level to gently sloping, well drained to somewhat excessively drained soils that formed in alluvium; on valley sides, valley bottoms, and fans

6 — Sheppard-Haplargids-Notal: Shallow to deep, nearly level to steep, well drained to somewhat excessively drained soils that formed in eolian material, alluvium, and

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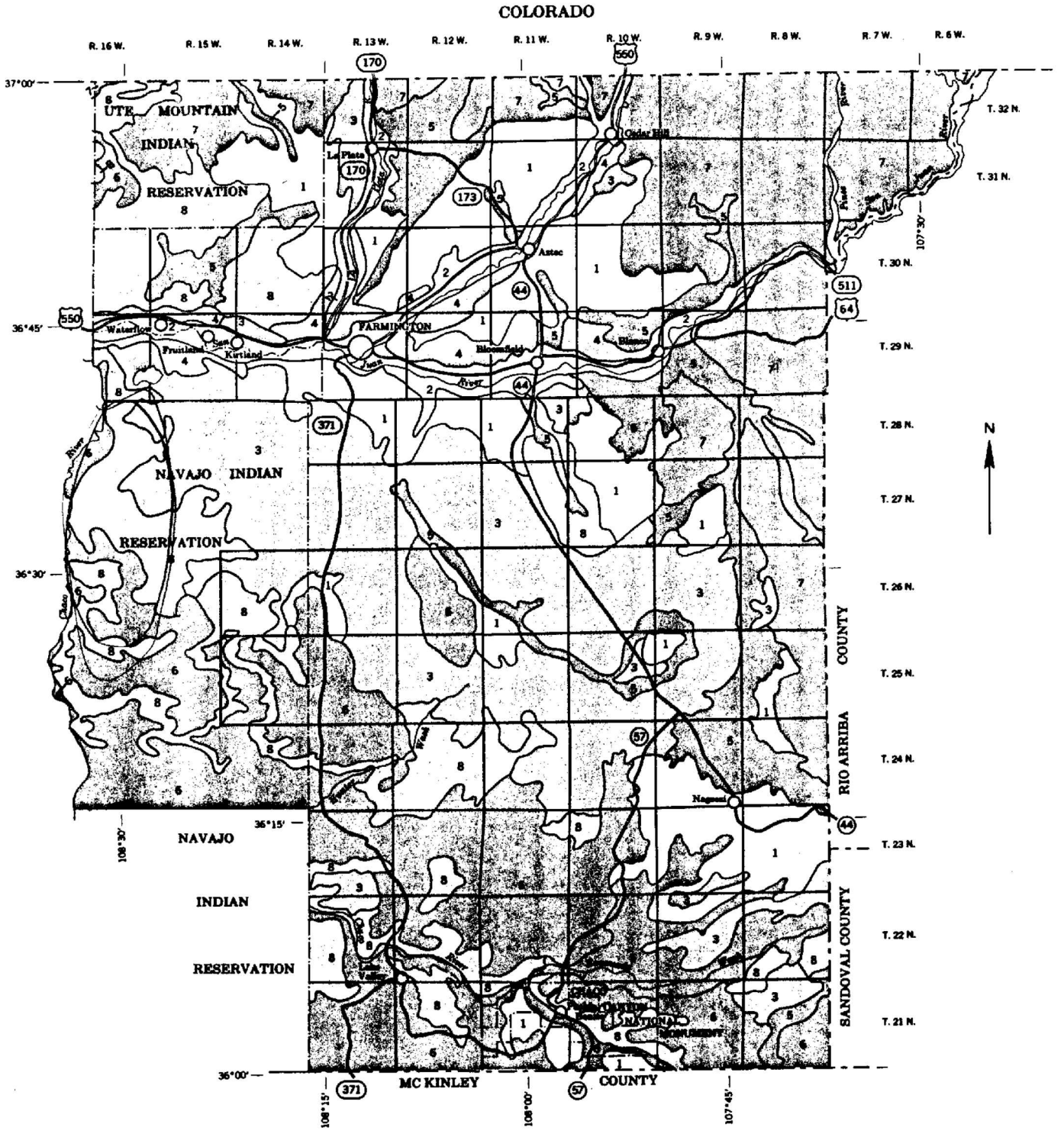
NEW MEXICO AGRICULTURAL EXPERIMENT STATION

GENERAL SOIL MAP

SAN JUAN COUNTY, NEW MEXICO, EASTERN PART

1977



MAP UNITS

1 — Persayo-Fruitland-Sheppard: Very shallow to deep, nearly level to very steep, well drained to excessively drained soils that formed in alluvial, residual, and eolian material; on uplands and fans

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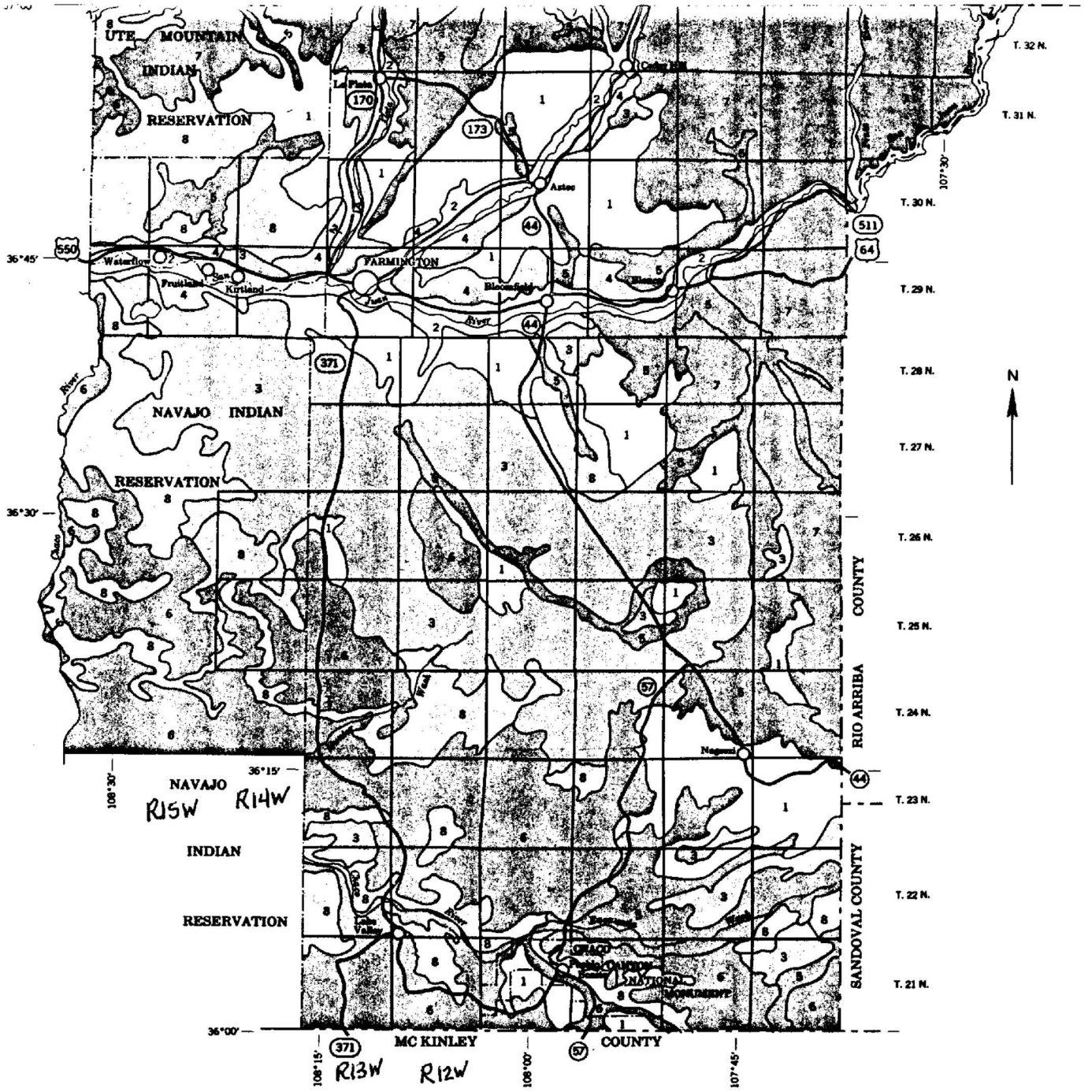
NEW MEXICO AGRICULTURAL EXPERIMENT STATION

GENERAL SOIL MAP

SAN JUAN COUNTY, NEW MEXICO, EASTERN PART

1977



MAP UNITS

1 — Persayo-Fruitland-Sheppard: Very shallow to deep, nearly level to very steep, well drained to excessively drained soils that formed in alluvial, residual, and eolian material; on uplands and fans

2 — Fruitland-Riverwash-Stumble: Deep, nearly level to moderately steep, well drained to somewhat excessively drained soils that formed in alluvium, and Riverwash; on fans and in valleys

3 — Shiprock-Sheppard-Doak: Deep, nearly level to moderately steep, well drained to somewhat excessively drained soils that formed in alluvial and eolian material; on uplands

4 — Haplargids-Blackston-Torriorthents: Very shallow to deep, nearly level to steep, well drained to excessively drained soils that formed in alluvium and residuum; on terraces, mesas, and plateaus

5 — Blancot-Notal: Deep, nearly level to gently sloping, well drained to somewhat excessively drained soils that formed in alluvium; on valley sides, valley bottoms, and fans

6 — Sheppard-Huerfano-Notal: Shallow to deep, nearly level to steep, well drained to somewhat excessively drained soils that formed in eolian material, alluvium, and residuum; on uplands, bottom lands, and fans

7 — Travessilla-Rock outcrop-Weska: Very shallow to deep, nearly level to extremely steep, well drained soils that formed in alluvium, residuum, and eolian material, and Rock outcrop; on uplands

8 — Badland-Rock outcrop-Monierco: Badland, Rock outcrop, and shallow, nearly level to gently sloping, well drained soils that formed in alluvial and eolian material; on uplands

Compiled 1979

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BUREAU OF INDIAN AFFAIRS

NEW MEXICO AGRICULTURAL EXPERIMENT STATION

GENERAL SOIL MAP

SAN JUAN COUNTY, NEW MEXICO, EASTERN PART

Scale 1: 506,880
1 0 1 2 3 4 5 6 7 Miles

Each area outlined on this map consists of more than one kind of soil. The number thus

This unit is suited to rangeland wildlife habitat. It provides food and cover for such wildlife as antelope, mule deer, coyote, prairie dog, scaled quail, chukar, and hawks. The main limitations are low precipitation and varying degrees of salinity and alkalinity. Suitable wildlife habitat improvement practices include installation of wildlife watering facilities and proper use of forage by livestock and wildlife.

6. Sheppard-Huerfano-Notal

Shallow to deep, nearly level to steep, well drained to somewhat excessively drained soils that formed in eolian material, alluvium, and residuum; on uplands, bottom lands, and fans

This map unit consists of irregularly shaped areas in the southwestern part of the survey area. It is nearly level to gently sloping soils on valley bottoms and fans and nearly level to steep soils on mesas and plateaus. Slope is 0 to 40 percent. The vegetation is dominantly grasses. Elevation is 5,500 to 6,400 feet. The average annual precipitation is 6 to 10 inches, and the average annual air temperature is 51 to 55 degrees F.

This unit makes up about 15 percent of the survey area. It is about 25 percent Sheppard and similar soils, 23 percent Huerfano and similar soils, 13 percent Notal and similar soils, 6 percent Avalon soils, and 6 percent Doak and similar soils. The remaining 27 percent is Muff, Uffens, Blancot, Stumble, Shiprock, and Fruitland soils and other soils of minor extent.

Sheppard soils are on mesas and plateaus. These soils are deep and somewhat excessively drained. They formed in eolian material derived from mixed sources. Typically, the surface layer is light brown loamy fine sand. The substratum is light brown loamy fine sand and fine sand.

Huerfano soils are on mesas and upland valley bottoms. These soils are shallow and well drained. They formed in alluvium and residuum derived dominantly from shale and siltstone. Typically, the surface layer is light yellowish brown sandy clay loam. The subsurface layer is light gray sandy clay loam. The subsoil is brown, dark yellowish brown, and yellowish brown clay loam and sandy clay loam. Shale is at a depth of 15 inches.

Notal soils are on valley bottoms and fans. These soils are deep and well drained. They formed in alluvium derived from sandstone and shale. Typically, the surface layer is brown silty clay loam. The subsoil and substratum are grayish brown clay.

Avalon soils are on mesas and plateaus. These soils are deep and well drained. They formed in eolian and alluvial material derived dominantly from sandstone and shale. Typically, the surface layer is brown sandy loam. The subsoil is light brown fine sandy loam. The upper part of the substratum is white sandy clay loam, and the lower part is pink gravelly sandy clay loam.

Doak soils are on mesas, plateaus, and terraces. These soils are deep and well drained. They formed in eolian and alluvial material derived dominantly from sandstone and shale. Typically, the surface layer is brown loam. The subsoil is brown and light brown silty clay loam and clay loam. The substratum is light yellowish brown clay loam.

This unit is used for irrigated crops, livestock grazing, urban development, and wildlife habitat.

This unit is suited to rangeland wildlife habitat. It provides food and cover for such wildlife as coyote, jackrabbit, prairie dog, and hawks. The main limitations are low precipitation and varying degrees of salinity and alkalinity. Suitable wildlife habitat improvement practices include installation of wildlife watering facilities and proper use of forage by livestock and wildlife.

7. Travessilla-Rock outcrop-Weska

Very shallow to deep, nearly level to extremely steep, well drained soils that formed in alluvium, residuum, and eolian material, and Rock outcrop; on uplands

This map unit consists of irregularly shaped areas in the northern and eastern parts of the survey area. It is on hills, mesas, and plateaus. Slope is 0 to 100 percent. The vegetation is dominantly grasses and scattered pinyon and juniper. Elevation is 4,800 to 7,200 feet. The average annual precipitation is 6 to 13 inches, and the average annual air temperature is 48 to 55 degrees F.

This unit makes up about 16 percent of the survey area. It is about 27 percent Travessilla and similar soils, 27 percent Rock outcrop, 17 percent Weska and similar soils, and 11 percent Penistaja and similar soils. The remaining 18 percent is Buckle, Twick, Silver, Notal, Blancot, and Blackston soils, Torriorthents, Haplargids, and other soils of minor extent.

Travessilla soils are on hills and mesas. These soils are very shallow and shallow and are well drained. They formed in residuum derived dominantly from sandstone. Typically, the surface layer is brown sandy loam. The underlying material is brown sandy loam. Sandstone is at a depth of 12 inches.

Rock outcrop is on cliffs, ridges, breaks, and ledges. It is nearly level to extremely steep exposures of barren sandstone.

Weska soils are on hills and mesas. These soils are very shallow and shallow and well drained. They formed in residuum derived dominantly from shale. Typically, the surface layer is grayish brown silty clay loam. The underlying material is grayish brown clay loam. Shale is at a depth of 7 inches.

Penistaja soils are on mesas and plateaus. These soils are deep and well drained. They formed in alluvial and eolian material derived from sandstone and shale. Typically, the surface layer is brown loam. The subsoil is brown clay loam. The substratum is light brown clay loam.

This unit is used for livestock grazing, woodland, recreation, and wildlife habitat.

This unit is suited to rangeland wildlife habitat. It provides food and cover for mule deer, coyote, porcupine,

jackrabbit, cottontail, squirrel, turkey, and sage grouse. The main limitations are low precipitation in some areas and extremely steep slopes. Suitable wildlife habitat improvement practices include installation of wildlife watering facilities and proper use of forage by livestock and wildlife.

8. Badland-Rock outcrop-Monierco

Badland and Rock outcrop, and shallow, nearly level to gently sloping, well drained soils that formed in alluvial and eolian material; on uplands

This map unit consists of irregularly shaped areas in the western part of the survey area. It is nearly level to gently sloping soils on uplands and moderately sloping to extremely steep areas of Badland on upland hills, ridges, and in canyons. Slope is 0 to 100 percent. The vegetation is dominantly grasses. Elevation is 4,800 to 7,200 feet. The average annual precipitation is 6 to 10 inches, and the average annual air temperature is 51 to 55 degrees F.

This unit makes up about 16 percent of the survey area. It is about 74 percent Badland, 15 percent Rock outcrop, and 8 percent Monierco soils. The remaining 3 percent consists of Riverwash and of Notal, Turley, Blancot, Uffens, and Sheppard soils and other soils of minor extent.

Badland is on uplands that are dissected by deep, intermittent drainageways and gullies. It is moderately sloping to extremely sloping, nonstony, barren shale.

Rock outcrop is on cliffs, ridges, breaks, and ledges. It is moderately sloping to extremely steep exposures of barren sandstone.

Monierco soils are on mesas, knolls, and plateaus. These soils are shallow and well drained. They formed in alluvial and eolian material derived dominantly from sandstone and shale. Typically, the surface layer is light yellowish brown fine sandy loam. The subsoil is brown, yellowish brown, and pale brown fine sandy loam and clay loam. Shale is at a depth of 13 inches.

This unit is used for livestock grazing and wildlife habitat.

This unit is suited to rangeland wildlife habitat. It provides some food and cover for such wildlife as coyote, jackrabbit, prairie dog, and hawks. The main limitations are shallow soil depth, low precipitation, and low productivity of plants. Suitable wildlife habitat improvement practices include installation of wildlife watering facilities and proper use of forage by livestock and wildlife.

Soil maps for detailed planning

The map units on the detailed soil maps at the back of this survey represent the soils in the survey area. The map unit descriptions in this section, along with the soil maps, can be used to determine the suitability and potential of a soil for specific uses. They also can be used to plan the management needed for those uses. More information on each map unit, or soil, is given under "Use and management of the soils."

Each map unit on the detailed soil maps represents an area on the landscape and consists of one or more soils for which the unit is named.

A symbol identifying the soil precedes the map unit name in the soil descriptions. Each description includes general facts about the soil, a brief description of the soil profile, and a listing of the principal hazards and limitations to be considered in planning management.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer or of the underlying material, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer or of the underlying material. They also can differ in slope, stoniness, salinity, wetness, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Werlog loam is one of several phases in the Werlog series.

Some map units are made up of two or more major soils. These map units are called soil complexes and soil associations.

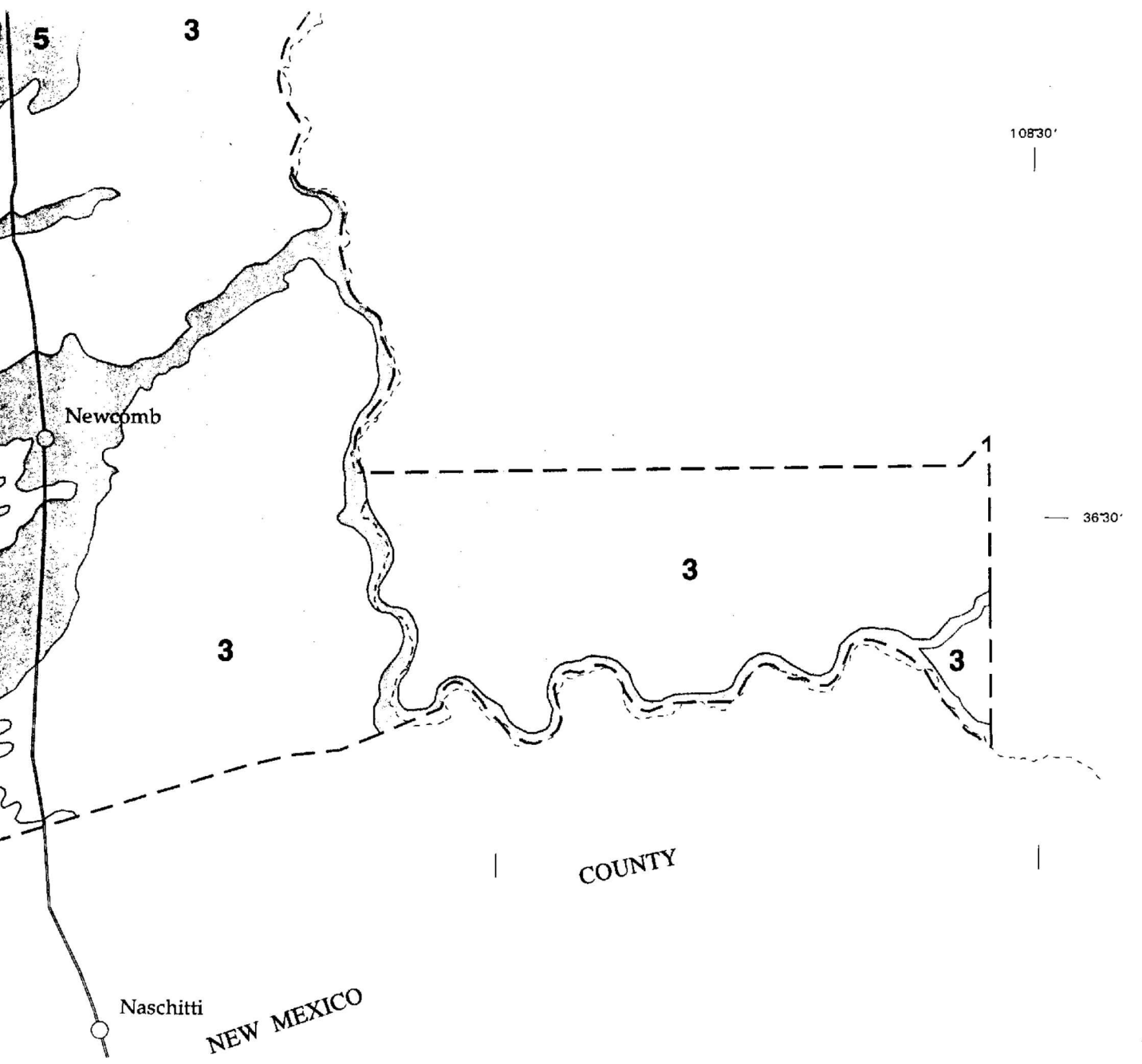
A *soil complex* consists of two or more soils in such an intricate pattern or in such small areas that they cannot be shown separately on the soil maps. The pattern and proportion of the soils are somewhat similar in all areas. Fruitland-Slickspots complex, 0 to 3 percent slopes, is an example.

A *soil association* is made up of two or more geographically associated soils that are shown as one unit on the maps. Because of present or anticipated soil uses in the survey area, it was not considered practical or necessary to map the soils separately. The pattern and relative proportion of the soils are somewhat similar. Doak-Avalon association, gently sloping, is an example.

Most map units include small scattered areas of soils other than those for which the map unit is named. Some of these included soils have properties that differ substantially from those of the major soil or soils. Such differences could significantly affect use and management of the soils in the map unit. The included soils are identified in each map unit description. Some small areas of strongly contrasting soils are identified by a special symbol on the soil maps.

This survey includes *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Badland is an example. Miscellaneous areas are shown on the soil maps. Some that are too small to be shown are identified by a special symbol on the soil maps.

Table 3 gives the acreage and proportionate extent of each map unit. Other tables (see "Summary of tables")



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BUREAU OF INDIAN AFFAIRS
NEW MEXICO AGRICULTURAL EXPERIMENT STATION
ARIZONA AGRICULTURAL EXPERIMENT STATION
SHIPROCK SOIL AND WATER CONSERVATION DISTRICT

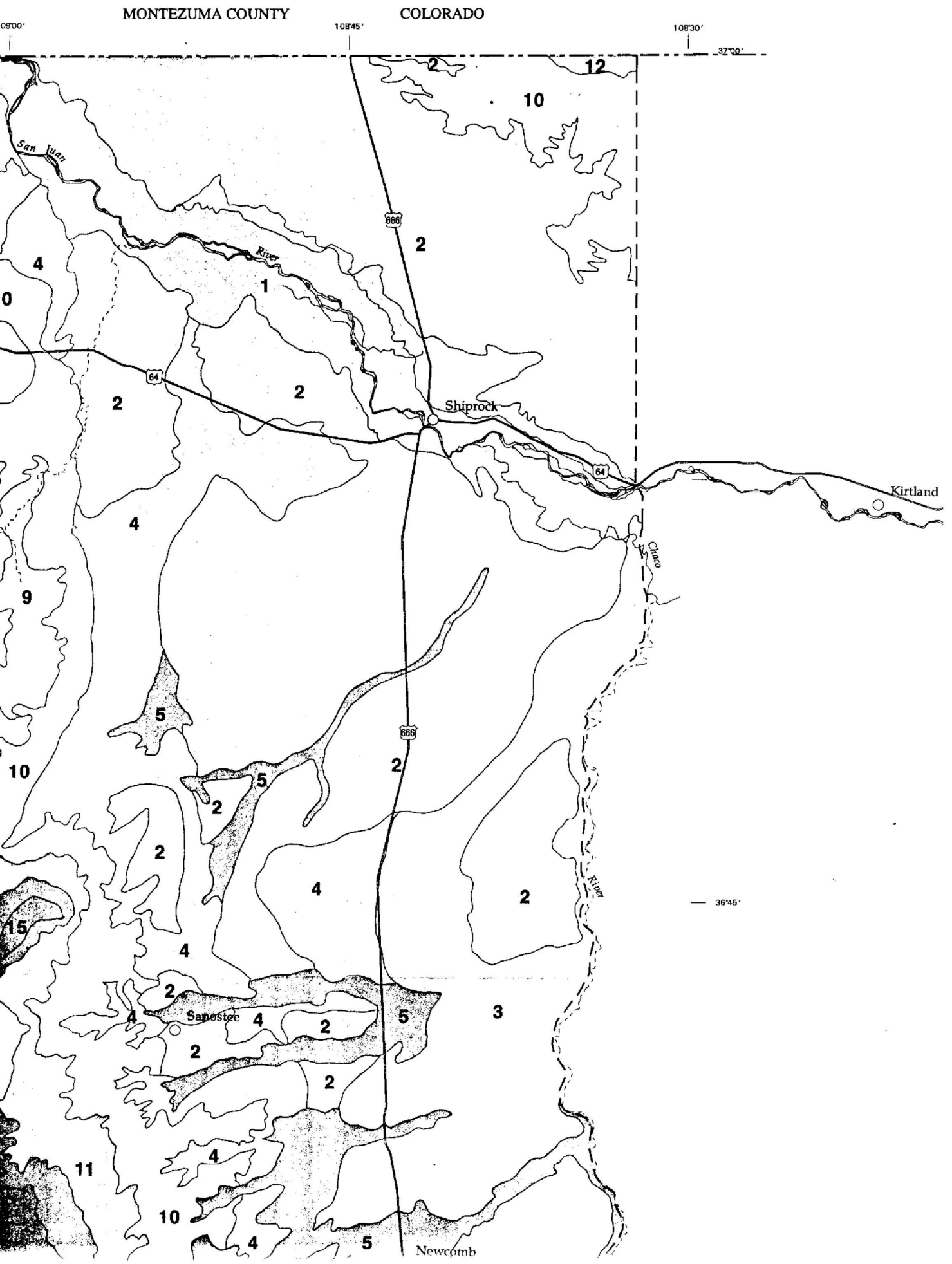
GENERAL SOIL MAP
SHIPROCK AREA,
PARTS OF SAN JUAN COUNTY, NEW MEXICO
and APACHE COUNTY, ARIZONA

1992

Scale 1:250000

4 0 4
MILES

8 0 8
KILOMETERS


MONTEZUMA COUNTY
COLORADO
108°45'
108°30'
37°00'
San Juan
River
666
64
Shiprock
Kirtland
Chaco
River
36°45'
Sanostee
Newcomb

General Soil Map Units

David W. Seery, biologist, Natural Resources Conservation Service, helped to prepare this section.

The general soil map at the back of this publication shows broad areas that have a distinctive pattern of soils, relief, and drainage. Each map unit on the general soil map is a unique natural landscape. Typically, it consists of one or more major soils or miscellaneous areas and some minor soils or miscellaneous areas. It is named for the major soils or miscellaneous areas. The components of one map unit can occur in another but in a different pattern.

The general soil map can be used to compare the suitability of large areas for general land uses. Areas of suitable soils can be identified on the map. Likewise, areas where the soils are not suitable can be identified.

Because of its small scale, the map is not suitable for planning the management of a farm or field or for selecting a site for a road or building or other structure. The soils in any one map unit differ from place to place in slope, depth, drainage, and other characteristics that affect management.

The general soil map units in this survey have been grouped by climate and Major Land Resource Area for broad interpretive purposes. Each of the broad groups and the map units in each group are described in the following pages.

Soil Descriptions

Soils in a warm, arid climate in Major Land Resource Area 37

This group consists of five map units. It makes up about 42 percent of the survey area.

The average elevation is about 5,300 feet. The average annual precipitation is about 7 inches, the average annual air temperature is about 52 degrees F., and the average frost-free period is about 150 days. The vegetation is mainly a mixture of warm and cool-season grasses and shrubs. Many of the shrubs are various species of saltbush *(Atriplex)* (Hodgkinson, 1987). The major soils in this group are brown or gray in color, are generally saline-sodic and gypsiferous, and formed in materials derived from sandstone, siltstone, and shale bedrock of Cretaceous age.

This group is used for livestock grazing, irrigated cropland and pasture, urban development, and wildlife habitat. Major management concerns are the very low average annual precipitation, soil salinity and sodicity, and the hazards of water erosion and soil blowing.

1. Nageezi-Fruitland-Bebeevar

Very deep, well drained to moderately well drained soils on high stream terraces, fan terraces, and flood plains

Composition

Nageezi and similar soils: 31 percent
Fruitland and similar soils: 16 percent
Bebeevar and similar soils: 13 percent
Camac and similar soils: 12 percent
Badland: 6 percent
Minor components: 22 percent

Minor Components

Benally, Razito, and Gyptur soils; Hydric soils in small marshes; Water and Riverwash

Setting

Percent of survey area: 4
Location: Along the San Juan River valley in New Mexico
Landform: **Nageezi**—treads of high stream terraces; **Fruitland**—fan terraces; **Bebeevar**—flood plains; **Camac**—risers of high stream terraces
Slope: **Nageezi**—1 to 6 percent; **Fruitland**—1 to 3 percent; **Bebeevar**—0 to 2 percent; **Camac**—15 to 60 percent
Present vegetation: **Nageezi**—Indian ricegrass, broom snakeweed, galleta, and sand dropseed; **Fruitland**—irrigated crops such as alfalfa, apples, and corn or native plants such as galleta, Indian ricegrass, alkali sacaton, and fourwing saltbush; **Bebeevar**—New Mexico olive, threadleaf rubber rabbitbrush, alkali sacaton, and

Fremont cottonwood; **Camac**—cheatgrass, galleta, Indian ricegrass, and shadscale
Elevation: 4,600 to 5,300 feet
Average annual precipitation: 5 to 8 inches
Average annual air temperature: 51 to 54 degrees F.
Frost-free period: 140 to 160 days

Characteristics of the Nageezi Soils

Typical profile

- 0 to 2 inches—light brown loamy fine sand
- 2 to 12 inches—light brown fine sandy loam
- 12 to 42 inches—light brown and pink fine sandy loam
- 42 to 64 inches—light brown loamy sand

Depth class: Very deep
Parent material: Alluvium and eolian material derived from sandstone
Drainage class: Well drained
Permeability: Moderately rapid
Salinity: Slightly saline

Characteristics of the Fruitland Soils

Typical profile

- 0 to 7 inches—yellowish brown sandy clay loam
- 7 to 42 inches—yellowish brown fine sandy loam
- 42 to 65 inches—light yellowish brown sandy clay loam

Depth class: Very deep
Parent material: Alluvium derived from sandstone and shale
Drainage class: Well drained
Permeability: Moderate
Salinity: Very slightly saline

Characteristics of the Bebeevar Soils

Typical profile

- 0 to 4 inches—pale brown loamy sand
- 4 to 13 inches—pale brown loamy fine sand
- 13 to 36 inches—pale brown gravelly coarse sand and very gravelly coarse sand
- 36 to 65 inches—light brownish gray sand

Depth class: Very deep
Parent material: Alluvium derived from sandstone, granite, and quartzite
Drainage class: Moderately well drained
Permeability: Moderately rapid
Salinity: Very slightly saline
Flooding frequency: Occasional, very brief periods
Depth to seasonal high water table: 3.5 to 5.0 feet

Characteristics of the Camac Soils

Typical profile

- 0 to 3 inches—brown very cobbly fine sandy loam
- 3 to 17 inches—light yellowish brown and pale brown gravelly loam
- 17 to 22 inches—grayish brown clay loam
- 22 to 31 inches—gray clay loam
- 31 inches—siltstone bedrock

Depth class: Moderately deep
Parent material: Alluvium derived from quartzite and residuum derived from siltstone
Drainage class: Well drained
Permeability: Moderately slow
Salinity: Slightly saline
Sodicity: Slightly sodic

Characteristics of Badland

Badland consists of exposures of shale and siltstone bedrock. It occurs as steep, convex cones, and some vertical faces.

Major Uses

Livestock grazing, irrigated cropland and pasture, urban development, wildlife habitat

Management Concerns

- Continuous, intensive year-round grazing results in a deteriorated plant community that has low value as forage.
- The suitability for range seeding is poor because of very low average annual precipitation.
- Irrigation should be provided for crops and pastures.
- The hazard of soil blowing is severe on this unit.
- Bebeevar soils are poorly suited for urban development because of occasional flooding and a seasonal high water table.
- Overgrazing reduces available food and cover for wildlife species.
- Competition between domestic livestock and wildlife is high year-round.
- This unit is well suited to the production of herbaceous plants, shrubs, and riparian plants for wildlife habitat.
- Riparian plants such as Fremont cottonwood and coyote willow will grow near water courses where soil moisture is adequate. These types of plants provide habitat for a large number of wildlife species.
- Riparian vegetation should be replanted along drainages where the soil is moist. Protection from livestock grazing is essential.

• Wetlands provide important habitat for wildlife and provide flood protection, recreation opportunities, and water quality enhancement.

Wildlife Habitat

Types of wildlife habitat supported by this unit: grassland, cropland, badland, riparian, wetland, river
Characteristic wildlife: coyote, Gambel quail, chukar, raccoon, mule deer, songbirds, shorebirds, waterfowl, beaver, ringneck pheasant
Endangered species: bald eagle, peregrine falcon, river otter; Colorado squawfish, humpback chub, and razorback sucker in the San Juan River

2. Persayo-Fordbutte-Ravola

Shallow to very deep, well drained soils on undulating plateaus, cuestas, flood plains, and alluvial fans

Composition

Persayo and similar soils: 40 percent
Fordbutte and similar soils: 16 percent
Ravola and similar soils: 13 percent
Gyptur and similar soils: 9 percent
Badland: 6 percent
Minor components: 16 percent

Minor Components

Cairn, Nageezi, Littlehat, Razito, and Blackston soils

Setting

Percent of survey area: 18
Location: Northeastern part of the survey area in New Mexico
Landform: **Persayo**—plateaus and cuestas; **Fordbutte**—plateaus and cuestas; **Ravola**—flood plains and alluvial fans; **Gyptur**—plateaus
Slope: **Persayo**—1 to 15 percent; **Fordbutte**—1 to 3 percent; **Ravola**—1 to 3 percent; **Gyptur**—0 to 3 percent; minor components range to 45 percent
Present vegetation: **Persayo**—alkali sacaton, Indian ricegrass, galleta, and sickle saltbush; **Fordbutte**—alkali sacaton, galleta, Indian ricegrass, and shadscale; **Ravola**—alkali sacaton, galleta, sickle saltbush, and mound saltbush; **Gyptur**—Indian ricegrass, alkali sacaton, galleta, and Castle Valley clover
Elevation: 4,800 to 6,000 feet
Average annual precipitation: 5 to 8 inches
Average annual air temperature: 51 to 54 degrees F.
Frost-free period: 140 to 160 days

Characteristics of the Persayo Soils

Typical profile

• 0 to 2 inches—light yellowish brown very fine sandy loam
• 2 to 18 inches—light brownish gray and light yellowish brown loam
• 18 inches—siltstone bedrock
Depth class: Shallow
Parent material: Alluvium and residuum derived from siltstone
Drainage class: Well drained
Permeability: Moderate or moderately slow
Salinity: Moderately saline
Sodicity: Slightly sodic

Characteristics of the Fordbutte Soils

Typical profile

• 0 to 4 inches—light yellowish brown very fine sandy loam
• 4 to 26 inches—light yellowish brown loam
• 26 to 34 inches—light yellowish brown loam
• 34 inches—siltstone bedrock
Depth class: Moderately deep
Parent material: Alluvium and residuum derived from siltstone
Drainage class: Well drained
Permeability: Moderate
Salinity: Slightly saline
Sodicity: Moderately sodic

Characteristics of the Ravola Soils

Typical profile

• 0 to 10 inches—pale brown and light yellowish brown very fine sandy loam
• 10 to 70 inches—stratified light yellowish brown and pale brown loam and very fine sandy loam
Depth class: Very deep
Parent material: Alluvium derived from siltstone
Drainage class: Well drained
Permeability: Moderate
Flooding frequency: Occasional, very brief periods

Characteristics of the Gyptur Soils

Typical profile

• 0 to 2 inches—light yellowish brown very fine sandy loam
• 2 to 5 inches—brown silty clay loam
• 5 to 17 inches—light brownish gray gypsiferous material which is an apparent loam

- 17 to 46 inches—light brownish gray loam
- 46 inches—siltstone bedrock

Depth class: Deep
Parent material: Alluvium and residuum derived from siltstone and shale
Drainage class: Well drained
Permeability: Moderately slow
Salinity: Strongly saline
Sodicity: Strongly sodic

Characteristics of Badland

Badland consists of exposures of shale and siltstone bedrock. It occurs as steep, convex cones and some vertical faces.

Major Uses

Livestock grazing, wildlife habitat

Management Concerns

- Continuous, intensive year-round grazing results in a deteriorated plant community that has low value as forage.
- The suitability for range seeding is poor because of very low average annual precipitation.
- The hazard of soil blowing is severe on this unit.
- Overgrazing reduces available food and cover for wildlife species.
- The small amount of vegetation produced on this unit is offset by the variety of plants, which attracts many species.
- Badland and rock outcrop grow little or no vegetation but are important for nest sites, resting cover, hunting perches, escape sites, and dens.
- Steep slopes and broken topography provide safety from danger for wildlife.

Wildlife Habitat

Types of wildlife habitat supported by this unit: grassland, badland
Characteristic wildlife: coyote, mule deer, ground squirrels, prairie dogs, gopher, badger, horned lark, red-tailed hawk

3. Kimbeto-Farb-Denazar

Shallow to deep, well drained to somewhat excessively drained soils on plateaus, structural benches, mesas, and cuestas

Composition

Kimbeto and similar soils: 19 percent
Farb and similar soils: 16 percent
Denazar and similar soils: 15 percent
Huerfano and similar soils: 13 percent
Badland: 8 percent
Minor components: 29 percent

Minor Components

Hamburn, Genats, Jeddito, Notal, Escavada, and Nageezi soils

Setting

Percent of survey area: 11
Location: Southeastern part of the survey area in New Mexico
Landform: **Kimbeto**—plateaus and cuestas; **Farb**—plateaus, mesas, structural benches, and cuestas; **Denazar**—plateaus and structural benches; **Huerfano**—plateaus and cuestas
Slope: **Kimbeto**—0 to 4 percent; **Farb**—1 to 25 percent; **Denazar**—0 to 5 percent; **Huerfano**—0 to 3 percent; minor components range to 60 percent
Present vegetation: **Kimbeto**—alkali sacaton, galleta, Indian ricegrass, and shadscale; **Farb**—galleta, alkali sacaton, shadscale, and Bigelow sagebrush; **Denazar**—Indian ricegrass, galleta, sand Mormon tea, and fourwing saltbush; **Huerfano**—alkali sacaton, galleta, ribscale, and mound saltbush
Elevation: 4,900 to 5,900 feet
Average annual precipitation: 5 to 8 inches
Average annual air temperature: 51 to 54 degrees F.
Frost-free period: 140 to 160 days

Characteristics of the Kimbeto Soils

Typical profile

- 0 to 3 inches—light brown loamy fine sand
- 3 to 10 inches—light brown fine sandy loam
- 10 to 18 inches—brown sandy clay loam
- 18 to 29 inches—very pale brown and white fine sandy loam
- 29 to 42 inches—brownish yellow loamy fine sand
- 42 inches—soft sandstone bedrock

Depth class: Deep
Parent material: Eolian material, alluvium, and residuum derived from sandstone
Drainage class: Well drained
Permeability: Moderate
Salinity: Moderately saline
Sodicity: Moderately sodic

Characteristics of the Farb Soils

Typical profile

- 0 to 2 inches—pale brown channery loamy fine sand

• 2 to 5 inches—very pale brown fine sandy loam
• 5 to 8 inches—very pale brown channery fine sandy loam
• 8 inches—sandstone bedrock
Depth class: Very shallow
Parent material: Alluvium and residuum derived from sandstone
Drainage class: Well drained
Permeability: Moderately rapid

Characteristics of the Denazar Soils

Typical profile

• 0 to 14 inches—yellowish brown fine sand
• 14 to 31 inches—very pale brown and light yellowish brown loamy fine sand
• 31 to 42 inches—brownish yellow fine sand
• 42 inches—sandstone bedrock
Depth class: Deep
Parent material: Eolian material and residuum derived from sandstone
Drainage class: Somewhat excessively drained
Permeability: Rapid

Characteristics of the Huerfano Soils

Typical profile

• 0 to 1 inch—pale brown sandy clay loam
• 1 to 11 inches—brown sandy clay loam
• 11 to 18 inches—light brownish gray clay loam
• 18 inches—shale bedrock
Depth class: Shallow
Parent material: Alluvium and residuum derived from shale and sandstone
Drainage class: Well drained
Permeability: Moderately slow
Salinity: Moderately saline
Sodicity: Strongly sodic

Characteristics of Badland

Badland consists of exposures of shale bedrock. It occurs as steep, convex cones intermixed with areas of soil.

Major Uses

Livestock grazing, wildlife habitat

Management Concerns

• Continuous, intensive year-round grazing results in a deteriorated plant community that has low value as forage.
• The suitability for range seeding is poor because of very low average annual precipitation.
• The hazard of soil blowing is severe on this unit.
• Overgrazing reduces available food and cover for wildlife species.
• The small amount of vegetation produced on this unit is offset by the variety of plants, which attracts many species.
• Badland and rock outcrop grow little or no vegetation but are important for nest sites, resting cover, hunting perches, escape sites, and dens.
• Steep slopes and broken topography provide safety from danger for wildlife.

Wildlife Habitat

Types of wildlife habitat supported by this unit: grassland, Rock outcrop, badland
Characteristic wildlife: coyote, ground squirrels, gopher, badger, prairie dogs, horned lark, red-tailed hawk

4. Tewa-Kimbeto-Shiprock

Deep to very deep, well drained soils on fan terraces, structural benches, plateaus, and cuestas

Composition

Tewa and similar soils: 23 percent
Kimbeto and similar soils: 17 percent
Shiprock and similar soils: 16 percent
Farb and similar soils: 16 percent
Badland: 6 percent
Minor components: 22 percent

Minor Components

Jeddito, Blueflat, Notal, and Ravola soils

Setting

Percent of survey area: 6
Location: Central part of the survey area in New Mexico
Landform: **Tewa**—fan terraces; **Kimbeto**—plateaus and structural benches; **Shiprock**—plateaus and cuestas; **Farb**—plateaus, structural benches, and cuestas
Slope: **Tewa**—2 to 15 percent; **Kimbeto**—0 to 4 percent; **Shiprock**—1 to 5 percent; **Farb**—1 to 25 percent
Present vegetation: **Tewa**—galleta, blue grama, bottlebrush squirreltail, and broom snakeweed; **Kimbeto**—alkali sacaton, galleta, Indian ricegrass, and shadscale; **Shiprock**—Indian ricegrass, galleta, blue grama, and broom snakeweed; **Farb**—galleta, alkali sacaton, shadscale, and Bigelow sagebrush
Elevation: 5,400 to 6,100 feet

Average annual precipitation: 5 to 8 inches
Average annual air temperature: 51 to 54 degrees F.
Frost-free period: 140 to 160 days

Characteristics of the Tewa Soils

Typical profile

- 0 to 3 inches—yellowish brown fine sandy loam
- 3 to 27 inches—light yellowish brown and pale brown fine sandy loam and loam
- 27 to 66 inches—pale brown fine sandy loam and sandy clay loam

Depth class: Very deep
Parent material: Alluvium derived from sandstone
Drainage class: Well drained
Permeability: Moderate
Salinity: Slightly saline
Sodicity: Slightly sodic

Characteristics of the Kimbeto Soils

Typical profile

- 0 to 3 inches—light brown loamy fine sand
- 3 to 10 inches—light brown fine sandy loam
- 10 to 18 inches—brown sandy clay loam
- 18 to 29 inches—very pale brown and white fine sandy loam
- 29 to 42 inches—brownish yellow loamy fine sand
- 42 inches—soft sandstone bedrock

Depth class: Deep
Parent material: Eolian material, alluvium, and residuum derived from sandstone and shale
Drainage class: Well drained
Permeability: Moderate
Salinity: Moderately saline
Sodicity: Moderately sodic

Characteristics of the Shiprock Soils

Typical profile

- 0 to 3 inches—light brown loamy fine sand
- 3 to 36 inches—brown fine sandy loam
- 36 to 66 inches—brown fine sandy loam

Depth class: Very deep
Parent material: Eolian material and alluvium derived from sandstone
Drainage class: Well drained
Permeability: Moderately rapid
Salinity: Slightly saline

Characteristics of the Farb Soils

Typical profile

- 0 to 2 inches—pale brown channery loamy fine sand
- 2 to 5 inches—very pale brown fine sandy loam
- 5 to 8 inches—very pale brown channery fine sandy loam
- 8 inches—sandstone bedrock

Depth class: Very shallow
Parent material: Alluvium and residuum derived from sandstone
Drainage class: Well drained
Permeability: Moderately rapid

Characteristics of Badland

Badland consists of exposures of shale bedrock. It occurs as steep, convex cones intermixed with areas of soil.

Major Uses

Livestock grazing, wildlife habitat

Management Concerns

- Continuous, intensive year-round grazing results in a deteriorated plant community that has low value as forage.
- The suitability for range seeding is poor because of very low average annual precipitation.
- The hazard of soil blowing is severe on this unit.
- Overgrazing reduces available food and cover for wildlife species.
- The small amount of vegetation produced on this unit is offset by the variety of plants, which attracts many species.
- Badland and rock outcrop grow little or no vegetation but are important for nest sites, resting cover, hunting perches, escape sites, and dens.
- Steep slopes and broken topography provide safety from danger for wildlife.

Wildlife Habitat

Types of wildlife habitat supported by this unit: grassland, badland, Rock outcrop
Characteristic wildlife: coyote, ground squirrels, badger, gopher, prairie dogs, burrowing owl, red-tailed hawk

5. Jeddito-Notal-Suwanee

Very deep, well drained soils on low stream terraces, fan terraces, and flood plains

Composition

Jeddito and similar soils: 33 percent
Notal and similar soils: 25 percent
Suwanee and similar soils: 12 percent
Benally and similar soils: 6 percent
Minor components: 24 percent

DATA FORM

ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site	DESERT ROCK ENERGY PROJECT	Date	5/18/06
Applicant / Owner	SITHE GLOBAL POWER	County	SAN JUAN
Investigator	T MARK OLIVER	State	NM
Do Normal Circumstances exist on the site?	(YES) NO	Community ID	
Is the site significantly disturbed (Atypical Situation)?	YES (NO)	Transect ID	
Is the area a potential Problem Area? (If needed, explain on reverse)	YES (NO)	Plot ID	RWET1

VEGETATION

	Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
80%	1 TAMARIX SPP	S	NI	9		
15%	2 CHENOPODIUM ALBUM(?)	H	FAC-	10		
30%	3 UNKNOWN FORB	H	?FAC-FACW	11		
	4			12		
	5			13		
	6			14		
	7			15		
	8			16		

Percent of Dominant Species that are OBL, FACW, or FAC (excluding FAC-) 0/2 – 1/2 (?)

Remarks SEASONAL POND W/HEAVY GRAZING – TAMARISK AT OHWM & ABOVE

HYDROLOGY

☐ Recorded Data (Describe in Remarks)
- ☐ Stream, Lake, or Tide Gauge
- ☒ Aerial Photographs
- ☐ Other

☐ No Recorded Data Available

FIELD OBSERVATIONS		
Depth of Surface Water	–	(in)
Depth to Free Water in Pit	–	(in)
Depth to Saturated Soil	9	(in)

WETLAND HYDROLOGY INDICATORS

Primary Indicators:
- ☐ Inundated
- ☒ Saturated in Upper 12 Inches
- ☒ Water Marks
- ☒ Drift Lines
- ☐ Sediment Deposits
- ☐ Drainage Patterns in Wetlands

Secondary Indicators (2 or more Required):
- ☒ Oxidized Root Channels in Upper 12 Inches
- ☐ Water-Stained Leaves
- ☐ Local Soil Survey Data
- ☐ FAC-Neutral Test
- ☒ Other (Explain in Remarks)

SOILS

Map Unit Name (Series and Phase): SHEPPARD-HUERFANO - NOTAL GENERAL MAP UNIT	Drainage Class: WELL
Taxonomy (Subgroup) NOTAL?	Field Observations Confirm Mapped Type? YES (NO)

PROFILE DESCRIPTION

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-9		10YR 3/1	5YR 5/6	MED., COMMON, PROM.	silty clay loam
9-12		10YR 3/2	5YR 5/6	MED., " "	sand
12+		10YR 3/2	—		sandy silt

HYDRIC SOIL INDICATORS:

- ☐ Histosol
- ☐ Histic Epipedon
- ☐ Sulfidic Odor
- ☐ Aquic Moisture Regime
- ☒ Reducing Conditions
- ☒ Gleyed or Low-Chroma Colors
- ☐ Concretions
- ☐ High Organic Content in Surface Layer in Sandy Soils
- ☐ Organic Streaking in Sandy Soils
- ☐ Listed on Local Hydric Soils List
- ☐ Listed on National Hydric Soils List
- ☐ Other (Explain in Remarks)

Remarks: LOTS OF LIVESTOCK TRAMPLING IN AREA & DEPOSITIONAL AREA OF IMPOUNDMENT

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	YES (NO)	Is this Sampling Point Within a Wetland? (YES) NO
Wetland Hydrology Present?	(YES) NO	
Hydric Soils Present?	(YES) NO	

Remarks

VEG - HYDROPHYTIC VEG. NOT DOMINANT BUT DUE TO INTENSIVE GRAZING IN CONJUNCTION W/ SEASONAL HYDROLOGY, HYDROPHYTIC VEG. MAY EXIST W/OUT GRAZING (AND UNIDENTIFIABLE FORB MAY BE HYDROPYTIC - TOO SMALL TO ID.)

HYDRO - SEASONAL POND FEATURE W/ AN OHWM ONLY ON THE WESTERN END (NO VEG). REPORTEDLY AN ARTESIAN WELL IN POND (NOT OBSERVED) - H2O PRESENT IN POND AT TIME OF EVALUATION -

DATA FORM

ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site	DESERT ROCK ENERGY PROJECT	Date	6/17/06
Applicant / Owner	SITHE GLOBAL POWER	County	SAN JUAN
Investigator	T MARK OLIVER	State	NM
Do Normal Circumstances exist on the site?	(YES) NO	Community ID	–
Is the site significantly disturbed (Atypical Situation)?	YES (NO)	Transect ID	–
Is the area a potential Problem Area? (If needed, explain on reverse)	YES (NO)	Plot ID	WET1

VEGETATION ~70% ground cover

	Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
20	1 POA SPP.	H	FACW-FACW	9		
10	2 RANUNCULUS SPP.	H	FACW-OBL	10		
20	3 JUNCUS SPP.	H	FACW-OBL	11		
20	4 SCIRPUS SPP	H	OBL	12		
10	5 POLYPOGON MONSPELIENSIS	H	FACW+	13		
	6			14		
	7			15		
	8			16		

Percent of Dominant Species that are OBL, FACW, or FAC (excluding FAC-) 2/3 (MIN) – 60% (MIN.)

Remarks HEAVILY LIVESTOCK-GRAZED AREA – DIFFICULT TO ID SPECIES.

HYDROLOGY

☐ Recorded Data (Describe in Remarks)
- ☐ Stream, Lake, or Tide Gauge
- ☒ Aerial Photographs
- ☐ Other

☐ No Recorded Data Available

FIELD OBSERVATIONS		
Depth of Surface Water	–	(in)
Depth to Free Water in Pit	–	(in)
Depth to Saturated Soil	9	(in)

WETLAND HYDROLOGY INDICATORS

Primary Indicators:
- ☒ Inundated (IN MUCH OF CONCAVE AREA)
- ☒ Saturated in Upper 12 Inches
- ☐ Water Marks
- ☐ Drift Lines
- ☐ Sediment Deposits
- ☒ Drainage Patterns in Wetlands

Secondary Indicators (2 or more Required):
- ☒ Oxidized Root Channels in Upper 12 Inches
- ☐ Water-Stained Leaves
- ☐ Local Soil Survey Data
- ☐ FAC-Neutral Test
- ☐ Other (Explain in Remarks)

SOILS

Map Unit Name (Series and Phase): TEWA - KIMBETO - SHIPROCK GENERAL MAP UNIT	Drainage Class: WELL
Taxonomy (Subgroup) KIMBETO ?	Field Observations Confirm Mapped Type? YES (NO)

PROFILE DESCRIPTION

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0 - 5	A	10YR 2/2	5YR 5/8	SMALL, FEW, FAINT	silt loam
5 - 13	B	10YR 4/1	5YR 5/8	SMALL, FREQ, PROM.	silty clay loam

HYDRIC SOIL INDICATORS:

- ☐ Histosol
- ☐ Histic Epipedon
- ☐ Sulfidic Odor
- ☐ Aquic Moisture Regime
- ☒ Reducing Conditions
- ☒ Gleyed or Low-Chroma Colors
- ☐ Concretions
- ☐ High Organic Content in Surface Layer in Sandy Soils
- ☐ Organic Streaking in Sandy Soils
- ☐ Listed on Local Hydric Soils List
- ☐ Listed on National Hydric Soils List
- ☐ Other (Explain in Remarks)

Remarks: LOTS OF LIVESTOCK TRAMPLING THRU WETLAND AREA - MIXING SOILS

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	(YES) NO	Is this Sampling Point Within a Wetland? (YES) NO
Wetland Hydrology Present?	(YES) NO	
Hydric Soils Present?	(YES) NO	

Remarks

HYDRO - WATER SOURCE IS A FLOWING ARTESIAN WELL

DATA FORM

ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site	DESERT ROCK ENERGY PROJECT	Date	1/8/07
Applicant / Owner	SITHE GLOBAL POWER	County	SAN JUAN
Investigator	T. MARK OLIVER	State	NM
Do Normal Circumstances exist on the site?	(YES) NO	Community ID	–
Is the site significantly disturbed (Atypical Situation)?	YES (NO)	Transect ID	–
Is the area a potential Problem Area? (If needed, explain on reverse)	YES (NO)	Plot ID	SP1

VEGETATION ~ 30% GRD COVER

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
20% 1 ATRIPLEX POWELLII	H	NL-FACU	9		
20% 2 VERBENA BRACTEATA	H	FAC	10		
30% 3 SPOROBOLES AIROIDES	H	FAC	11		
40% 4 TAMARIX SPP.	S	FACW	12		
5			13		
6			14		
7			15		
8			16		

Percent of Dominant Species that are OBL, FACW, or FAC (excluding FAC-) 2/3 – 67%

Remarks

HYDROLOGY

☐ Recorded Data (Describe in Remarks)
- ☐ Stream, Lake, or Tide Gauge
- ☒ Aerial Photographs
- ☐ Other

☐ No Recorded Data Available

FIELD OBSERVATIONS		
Depth of Surface Water	–	(in)
Depth to Free Water in Pit	–	(in)
Depth to Saturated Soil	–	(in)

WETLAND HYDROLOGY INDICATORS

Primary Indicators:
- ☐ Inundated
- ☐ Saturated in Upper 12 Inches
- ☐ Water Marks
- ☒ Drift Lines
- ☒ Sediment Deposits
- ☒ Drainage Patterns in Wetlands

Secondary Indicators (2 or more Required):
- ☐ Oxidized Root Channels in Upper 12 Inches
- ☐ Water-Stained Leaves
- ☐ Local Soil Survey Data
- ☐ FAC-Neutral Test
- ☐ Other (Explain in Remarks)

SOILS

Map Unit Name (Series and Phase): TEWA - KIMBETE - Stiprock GMU A	Drainage Class: WELL
Taxonomy (Subgroup) KIMBETE ?	Field Observations Confirm Mapped Type? YES (NO)

PROFILE DESCRIPTION

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-3	A	10YR 4/2	-		silty clay
3-7	B	10YR 4/3	-		Sandy clay loam
7-15	B	10YR 4/3	-		clay loam

HYDRIC SOIL INDICATORS:

- ☐ Histosol
- ☐ Histic Epipedon
- ☐ Sulfidic Odor
- ☐ Aquic Moisture Regime
- ☐ Reducing Conditions
- ☐ Gleyed or Low-Chroma Colors
- ☐ Concretions
- ☐ High Organic Content in Surface Layer in Sandy Soils
- ☐ Organic Streaking in Sandy Soils
- ☐ Listed on Local Hydric Soils List
- ☐ Listed on National Hydric Soils List
- ☐ Other (Explain in Remarks)

Remarks:
NO INDICATORS

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	YES (NO)	Is this Sampling Point Within a Wetland? YES (NO)
Wetland Hydrology Present?	(YES) NO	
Hydric Soils Present?	YES (NO)	

Remarks
SITE LIES BELOW MAPPED OHWM, NO SOIL INDICATORS BUT WITH HYDROPHYTIC VEG. PRESENT

(IN PROPOSED ROAD ROW)

DATA FORM

ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site	DREP	Date	1/8/07
Applicant / Owner	SITE GLOBAL POWER	County	SAN JUAN
Investigator	TM OLIVER	State	NM
Do Normal Circumstances exist on the site?	(YES) NO	Community ID	–
Is the site significantly disturbed (Atypical Situation)?	YES (NO)	Transect ID	–
Is the area a potential Problem Area? (If needed, explain on reverse)	YES (NO)	Plot ID	SP2

VEGETATION ~ 30% GRD COVER

	Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
30%	1 VERBENA BRACTEATA	H	NL-FACW	9		
20%	2 SPOROBOLES AIROIDES	H	FAC	10		
~10%	3 TAMARIX SPP.	S	FACW	11		
10%	4 GRINDELIA SQUARROSA	H	FACW-	12		
	5			13		
	6			14		
	7			15		
	8			16		

Percent of Dominant Species that are OBL, FACW, or FAC (excluding FAC-) 1/2 – 50%

Remarks NOT GREATER THAN 50% OF FAC, FACW OR OBL

HYDROLOGY

☐ Recorded Data (Describe in Remarks)
- ☐ Stream, Lake, or Tide Gauge
- ☒ Aerial Photographs
- ☐ Other

☐ No Recorded Data Available

FIELD OBSERVATIONS		
Depth of Surface Water	–	(in)
Depth to Free Water in Pit	–	(in)
Depth to Saturated Soil	–	(in)

WETLAND HYDROLOGY INDICATORS

Primary Indicators:
- ☐ Inundated
- ☐ Saturated in Upper 12 Inches
- ☒ Water Marks
- ☒ Drift Lines
- ☒ Sediment Deposits
- ☐ Drainage Patterns in Wetlands

Secondary Indicators (2 or more Required):
- ☐ Oxidized Root Channels in Upper 12 Inches
- ☐ Water-Stained Leaves
- ☐ Local Soil Survey Data
- ☐ FAC-Neutral Test
- ☐ Other (Explain in Remarks)

SOILS

Map Unit Name (Series and Phase): TEWA - KIMBETE - SHIPROCK GMU	Drainage Class: WELL
Taxonomy (Subgroup) KIMBETE ?	Field Observations Confirm Mapped Type? YES (NO)

PROFILE DESCRIPTION

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-4	A	10YR 4/3	–		CLAY LOAM
4-16	B	10YR 4/6	–		SANDY LOAM

HYDRIC SOIL INDICATORS:

- ☐ Histosol
- ☐ Histic Epipedon
- ☐ Sulfidic Odor
- ☐ Aquic Moisture Regime
- ☐ Reducing Conditions
- ☐ Gleyed or Low-Chroma Colors
- ☐ Concretions
- ☐ High Organic Content in Surface Layer in Sandy Soils
- ☐ Organic Streaking in Sandy Soils
- ☐ Listed on Local Hydric Soils List
- ☐ Listed on National Hydric Soils List
- ☐ Other (Explain in Remarks)

Remarks: NO INDICATORS

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	YES (NO)	Is this Sampling Point Within a Wetland? YES (NO)
Wetland Hydrology Present?	(YES) NO	
Hydric Soils Present?	YES (NO)	

Remarks

SITE LIES BELOW OHWM BUT NO VEG OR SOIL INDICATORS (IN PROPOSED ROAD ROW)

DATA FORM

ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site	DREP	Date	1/8/07
Applicant / Owner	SITE GLOBAL POWER	County	SAN JUAN
Investigator	TM OLIVER	State	NM
Do Normal Circumstances exist on the site?	(YES) NO	Community ID	–
Is the site significantly disturbed (Atypical Situation)?	YES (NO)	Transect ID	–
Is the area a potential Problem Area? (If needed, explain on reverse)	YES (NO)	Plot ID	SP3

VEGETATION ~70% GRD COVER

	Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
30%	1 SPOROBOLES AIRIDES	H	FAC	9		
30%	2 ATRIPLEX POWELLII	H	NL-FACW	10		
20%	3 VERBENA BRACTEATA	H	FAC	11		
20%	4 TAMARISK	S	FACW	12		
	5			13		
	6			14		
	7			15		
	8			16		

Percent of Dominant Species that are OBL, FACW, or FAC (excluding FAC-) 3/4 - 75%

Remarks

HYDROLOGY

☐ Recorded Data (Describe in Remarks)
- ☐ Stream, Lake, or Tide Gauge
- ☒ Aerial Photographs
- ☐ Other

☐ No Recorded Data Available

FIELD OBSERVATIONS		
Depth of Surface Water	–	(in)
Depth to Free Water in Pit	–	(in)
Depth to Saturated Soil	15-16	(in)

WETLAND HYDROLOGY INDICATORS

Primary Indicators:
- ☐ Inundated
- ☐ Saturated in Upper 12 Inches
- ☒ Water Marks
- ☒ Drift Lines
- ☒ Sediment Deposits
- ☐ Drainage Patterns in Wetlands

Secondary Indicators (2 or more Required):
- ☐ Oxidized Root Channels in Upper 12 Inches
- ☐ Water-Stained Leaves
- ☐ Local Soil Survey Data
- ☐ FAC-Neutral Test
- ☐ Other (Explain in Remarks)

SOILS

Map Unit Name (Series and Phase): TEWA - KIMBETE - STHIPROCK GMU	Drainage Class: WELL
Taxonomy (Subgroup) KIMBETE?	Field Observations Confirm Mapped Type? YES (NO)

PROFILE DESCRIPTION

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-4	A	10YR 3/2	-		silty clay loam
4-16	B	10YR 3/3	-		silty clay

HYDRIC SOIL INDICATORS:

- ☐ Histosol
- ☐ Histic Epipedon
- ☐ Sulfidic Odor
- ☐ Aquic Moisture Regime
- ☐ Reducing Conditions
- ☐ Gleyed or Low-Chroma Colors
- ☐ Concretions
- ☐ High Organic Content in Surface Layer in Sandy Soils
- ☐ Organic Streaking in Sandy Soils
- ☐ Listed on Local Hydric Soils List
- ☐ Listed on National Hydric Soils List
- ☐ Other (Explain in Remarks)

Remarks:
NO INDICATORS

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	YES (NO)	Is this Sampling Point Within a Wetland? YES (NO)
Wetland Hydrology Present?	(YES) NO	
Hydric Soils Present?	YES (NO)	

Remarks
SITE BELOW OHWM, NO SOIL INDICATORS BUT W/ HYDROPHYTIC VEG. PRESENT

(SITE BETWEEN OPEN WATER & PROPOSED ROAD ROW)

Desert Rock Power Plant
Examples of Surveyed Waters of the U.S.

6-13-06 #213 (T19 – 13” x 5”)

6-14-06 #241 (T44 – 25” x 6”)

5-18-06 #4 (PP11 – 35” x 8”)

6-15-06 #254 (T57 – 23’ x 18”)