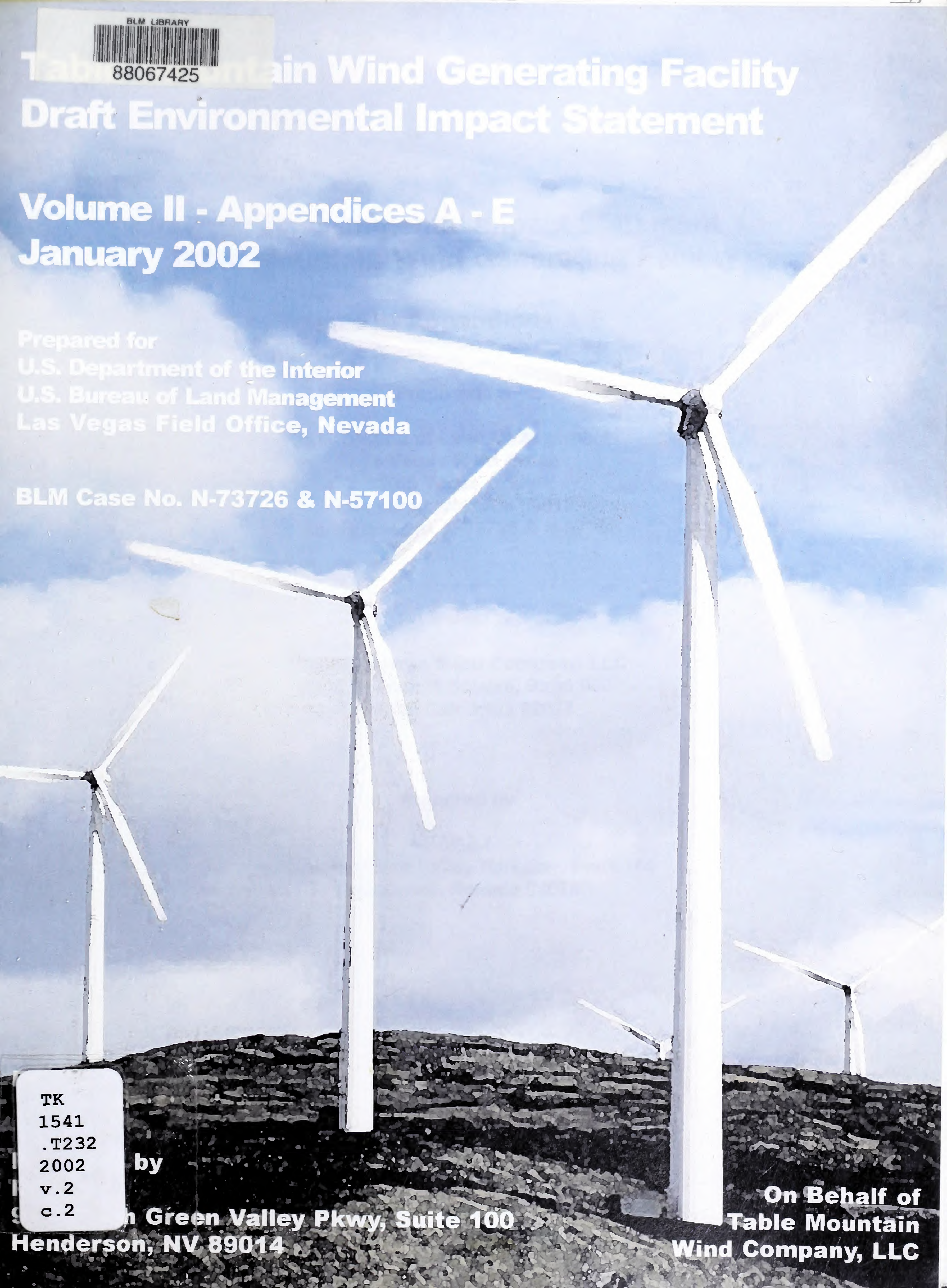
Table Mountain Wind Generating Facility Draft Environmental Impact Statement

Volume II - Appendices A - E
January 2002



Prepared for
U.S. Department of the Interior
U.S. Bureau of Land Management
Las Vegas Field Office, Nevada

BLM Case No. N-73726 & N-57100

by

n Green Valley Pkwy, Suite 100
Henderson, NV 89014

On Behalf of
Table Mountain
Wind Company, LLC

Draft Environmental Impact Statement
Table Mountain Wind Generating Facility

Volume II - Appendices A-E

Prepared for

U.S. Bureau of Land Management
Las Vegas Field Office
4765 Vegas Drive
Las Vegas, Nevada 89018
BLM Case No. N-73726 & N-57100

On Behalf of

Table Mountain Wind Company, LLC
4225 Executive Square, Suite 950
La Jolla, California 92037

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January 2002

PBS&J Job No. 511339.00

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Appendix A

BLM Right-of-Way Grant Applications, Table Mountain Wind Company, LLC (N-73726) and Valley Electric Association (N-57100)

This application revises and supercedes all previously submitted and revised applications for the proposed Table Mountain Wind Generating Facility under Western Renewable Energy Project, LLC application# N73726.

STANDARD FORM 299 (1/99)
Prescribed by DOI/USDA/DOT
P.L. 96-487 and Federal
Register Notice 5-22-95

FORM APPROVED
OMB NO. 1004-0060
Expires: December 31, 2001

APPLICATION FOR TRANSPORTATION AND UTILITY SYSTEMS AND FACILITIES ON FEDERAL LANDS

FOR AGENCY USE ONLY

Application Number N73726

Date filed

NOTE: Before completing and filing the application, the applicant should completely review this package and schedule a preapplication meeting with representatives of the agency responsible for processing the application. Each agency may have specific and unique requirements to be met in preparing and processing the application. Many times, with the help of the agency representative, the application can be completed at the preapplication meeting.

1. Name and address of applicant *(include zip code)*

Sebastian J. Nola, V.P.
Table Mountain Wind Co. LLC
4225 Executive Square #1650
La Jolla, CA 92037

2. Name, title, and address of authorized agent if different from Item 1 *(include zip code)*

Same as #1.

3. TELEPHONE (area code)

Applicant (858) 558-1550

Authorized Agent

4. As applicant are you? *(check one)*

a. ☐ Individual
b. ☒ Corporation* LLC
c. ☐ Partnership/Association*
d. ☐ State Government/State Agency
e. ☐ Local Government
f. ☐ Federal Agency

* *If checked, complete supplemental page*

5. Specify what application is for: *(check one)*

a. ☒ New authorization
b. ☐ Renewing existing authorization No.
c. ☐ Amend existing authorization No.
d. ☐ Assign existing authorization No.
e. ☐ Existing use for which no authorization has been received*
f. ☐ Other*

* *If checked, provide details under Item 7*

6. If an individual or partnership are you a citizen(s) of the United States? ☒ Yes ☐ No

7. Project description *(describe in detail)*: (a) Type of system or facility, *(e.g., canal, pipeline, road)*; (b) related structures and facilities; (c) physical specifications *length, width, grading, etc.)*; (d) term of years needed; (e) time of year of use or operation; (f) Volume or amount of product to be transported; (g) duration and timing of construction; and (h) temporary work areas needed for construction *(Attach additional sheets, if additional space is needed.)*

Please see attached.

8. Attach a map covering area and show location of project proposal EXHIBIT B & B-I through IV

9. State or local government approval: ☐ Attached ☐ Applied for ☐ Not required Please see attached.

10. Nonreturnable application fee: ☒ Attached ☐ Not required $125.00 W/ORIGINAL SUBMISSION 5/18/00

11. Does project cross international boundary or affect international waterways? ☐ Yes ☒ No *(If "yes," indicate on map)*

12. Give statement of your technical and financial capability to construct, operate, maintain, and terminate system for which authorization is being requested.

Please see attached.

(Continued on page 2)

This form is authorized for local reproduction.

13a. Describe other reasonable alternative routes and modes considered.

PLEASE SEE ATTACHED.

b. Why were these alternatives not selected?

No alternate sites are feasible. Please see attached 13A.

c. Give explanation as to why it is necessary to cross Federal Lands.

From all detailed investigations as described above, The Table area is best suited for wind generation. The proposed site is on federal land, managed by the BLM.

14. List authorizations and pending applications filed for similar projects which may provide information to the authorizing agency. *(Specify number, date, code, or name)*

NONE

15. Provide statement of need for project, including the economic feasibility and items such as: (a) cost of proposal *(construction, operation, and maintenance)*; (b) estimated cost of next best alternative; and (c) expected public benefits.

PLEASE SEE ATTACHED

16. Describe probable effects on the population in the area, including the social and economic aspects, and the rural lifestyles.

PLEASE SEE ATTACHED

17. Describe likely environmental effects that the proposed project will have on: (a) air quality; (b) visual impact; (c) surface and ground water quality and quantity; (d) the control or structural change on any stream or other body of water; (e) existing noise levels; and (f) the surface of the land, including vegetation, permafrost, soil, and soil stability.

PLEASE SEE ATTACHED

18. Describe the probable effects that the proposed project will have on (a) populations of fish, plantlife, wildlife, and marine life, including threatened and endangered species; and (b) marine mammals, including hunting, capturing, collecting, or killing these animals.

PLEASE SEE ATTACHED

19. State whether any hazardous material, as defined in this paragraph, will be used, produced, transported or stored on or within the right-of-way or any of the right-of-way facilities, or used in the construction, operation, maintenance or termination of the right-of-way or any of its facilities. "Hazardous material" means any substance, pollutant or contaminant that is listed as hazardous under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended, 42 U.S.C. 9601 et seq., and its regulations. The definition of hazardous substances under CERCLA includes any "hazardous waste" as defined in the Resource Conservation and Recovery Act of 1976 (RCRA), as amended, 42 U.S.C. 9601 et seq., and its regulations. The term hazardous materials also includes any nuclear or byproduct material as defined by the Atomic Energy Act of 1954, as amended, 42 U.S.C. 2011 et seq. The term does not include petroleum, including crude oil or any fraction thereof that is not otherwise specifically listed or designated as a hazardous substance under CERCLA Section 101(14), 42 U.S.C. 9601(14), nor does the term include natural gas.

The proposed project will not pose any health hazards nor the use or discharge of hazardous substances. The project, once operational will not produce such materials.

20. Name all the Department(s)/Agency(ies) where this application is being filed.

We expect the BLM to be the lead agency for siting and permitting this proposed WTG project. Any required environmental assessment will be coordinated through the BLM.

I HEREBY CERTIFY, That I am of legal age and authorized to do business in the State and that I have personally examined the information contained in the application and believe that the information submitted is correct to the best of my knowledge.

Signature of Applicant Sebastian J Nola

Date 5/28/01

Title 18, U.S.C. Section 1001 and Title 43 U.S.C. Section 1212, make it a crime for any person knowingly and willfully to make to any department or agency of the United States any false, fictitious, or fraudulent statements or representations as to any matter within its jurisdiction.

APPLICATION FOR TRANSPORTATION AND UTILITY SYSTEMS AND FACILITIES ON FEDERAL LANDS

GENERAL INFORMATION

ALASKA NATIONAL INTEREST LANDS

This application will be used when applying for a right-of-way, permit, license, lease, or certificate for the use of Federal lands which lie within conservation system units and National Recreation or Conservation Areas as defined in the Alaska National Interest Lands Conservation Act. Conservation system units include the National Park System, National Wildlife Refuge System, National Wild and Scenic Rivers System, National Trails System, National Wilderness Preservation System, and National Forest Monuments.

Transportation and utility systems and facility uses for which the application may be used are:

1. Canals, ditches, flumes, laterals, pipes, pipelines, tunnels, and other systems for the transportation of water.
2. Pipelines and other systems for the transportation of liquids other than water, including oil, natural gas, synthetic liquid and gaseous fuels, and any refined product produced therefrom.
3. Pipelines, slurry and emulsion systems, and conveyor belts for transportation of solid materials.
4. Systems for the transmission and distribution of electric energy.
5. Systems for transmission or reception of radio, television, telephone, telegraph, and other electronic signals, and other means of communications.
6. Improved rights-of-way for snow machines, air cushion vehicles, and all-terrain vehicles.
7. Roads, highways, railroads, tunnels, tramways, airports, landing strips, docks, and other systems of general transportation.

This application **must** be filed simultaneously with each Federal department or agency requiring authorization to establish and operate your proposal.

In Alaska, the following agencies will help the applicant file an application and identify the other agencies the applicant should contact and possibly file with:

Department of Agriculture
Regional Forester, Forest Service (USFS)
Federal Office Building, P.O. Box 21628
Juneau, Alaska 99802-1628
Telephone: (907) 586-7847 *(or a local Forest Service Office)*

Department of the Interior
Bureau of Indian Affairs (BIA)
Juneau Area Office
9109 Mendenhall Mall Road, Suite 5, Federal Building Annex
Juneau, Alaska 99802
Telephone: (907) 586-7177

Bureau of Land Management (BLM)
222 West 7th Ave., Box 13
Anchorage, Alaska 99513-7599
Telephone: (907) 271-5477 *(or a local BLM Office)*

National Park Service (NPS)
Alaska Regional Office 2525 Gambell St., Rm. 107
Anchorage, Alaska 99503-2892
Telephone: (907) 257-2585

U.S. Fish & Wildlife Service (FWS)
Office of the Regional Director
1011 East Tudor Road
Anchorage, Alaska 99503
Telephone: (907) 786-3440

Note-Filings with any Interior agency may be filed with any office noted above or with the: Office of the Secretary of the Interior, Regional Environmental Officer, Box 120, 1675 C Street, Anchorage, Alaska 99513.

Department of Transportation
Federal Aviation Administration
Alaska Region AAL-4, 222 West 7th Ave., Box 14
Anchorage, Alaska 99513-7587
Telephone: (907) 271-5285

NOTE - The Department of Transportation has established the above central filing point for agencies within that Department. Affected agencies are: Federal Aviation Administration (FAA), Coast Guard (USCG), Federal Highway Administration (FHWA), Federal Railroad Administration (FRA).

OTHER THAN ALASKA NATIONAL INTEREST LANDS

Use of this form is not limited to National Interest Conservation Lands of Alaska.

Individual departments/agencies may authorize the use of this form by applicants for transportation and utility systems and facilities on other Federal lands outside those areas described above.

For proposals located outside of Alaska, applications will be filed at the local agency office or at a location specified by the responsible Federal agency.

SPECIFIC INSTRUCTIONS

(Items not listed are self-explanatory)

Item

7 Attach preliminary site and facility construction plans. The responsible agency will provide instructions whenever specific plans are required.

8 Generally, the map **must** show the section(s), township(s), and range(s) within which the project is to be located. Show the proposed location of the project on the map as accurately as possible. Some agencies require detailed survey maps. The responsible agency will provide additional instructions.

9, 10, and 12 - The responsible agency will provide additional instructions.

13 Providing information on alternate routes and modes in as much detail as possible, discussing why certain routes or modes were rejected and why it is necessary to cross Federal lands will assist the agency(ies) in processing your application and reaching a final decision. Include only reasonable alternate routes and modes as related to current technology and economics.

14 The responsible agency will provide instructions.

15 Generally, a simple statement of the purpose of the proposal will be sufficient. However, major proposals located in critical or sensitive areas may require a full analysis with additional specific information. The responsible agency will provide additional instructions.

16 through 19 - Providing this information in as much detail as possible will assist the Federal agency(ies) in processing the application and reaching a decision. When completing these items, you should use a sound judgment in furnishing relevant information. For example, if the project is not near a stream or other body of water, do **not** address this subject. The responsible agency will provide additional instructions.

Application must be signed by the applicant or applicant's authorized representative.

If additional space is needed to complete any item, please put the information on a separate sheet of paper and identify it as "Continuation of Item."

(For supplemental, see page 4)

SUPPLEMENTAL

NOTE: The responsible agency(ies) will provide additional instructions	CHECK APPROPRIATE BLOCK	
I - PRIVATE CORPORATIONS Limited Liability Co.	ATTACHED	FILED*
a. Articles of Incorporation Cert. of Formation - Previously Submitted	☒	☐
b. Corporation Bylaws Oper. Agreement - Previously Submitted	☒	☐
c. A certification from the State showing the corporation is in good standing and is entitled to operate within the State. Previously Submitted	☒	☐
d. Copy of resolution authorizing filing N/A	☐	☐
e. The name and address of each shareholder owning 3 percent or more of the shares, together with the number and percentage of any class of voting shares of the entity which such shareholder is authorized to vote and the name and address of each affiliate of the entity together with, in the case of an affiliate controlled by the entity, the number of shares and the percentage of any class of voting stock of that affiliate owned, directly or indirecty, by that entity, and in the case of an affiliate which controls that entity, the number of shares and the percentage of any class of voting stock of that entity owned, directly or indirectly, by the affiliate. Previously Submitted	☒	☐
previous applications.	☐	☐
g. If application is for an oil and gas pipeline, identify all Federal lands by agency impacted by proposal.	☐	☐
II- PUBLIC CORPORATIONS N/A		
a. Copy of law forming corporation	☐	☐
b. Proof of organization	☐	☐
c. Copy of Bylaws	☐	☐
d. Copy of resolution authorizing filing	☐	☐
e. If application is for an oil or gas pipeline, provide information required by Item "I-f" and "I-g" above.	☐	☐
III - PARTNERSHIP OR OTHER UNINCORPORATED ENTITY N/A		
a. Articles of association, if any	☐	☐
b. If one partner is authorized to sign, resolution authorizing action is	☐	☐
c. Name and address of each participant, partner, association, or other	☐	☐
d. If application is for an oil or gas pipeline, provide information required by Item "I-f" and "I-g" above.	☐	☐

* If the required information is already filed with the agency processing this application and is current, check block entitled "Filed." Provide the file identification information *(e.g., number, date, code, name)*. If not on file or current, attach the requested information.

DATA COLLECTION STATEMENT

The Federal agencies collect this information from applicants requesting right-of-way, permit, license, lease, or certifications for the use of Federal lands.

Federal agencies use this information to evaluate your proposal.

No Federal agency may request or sponsor, and you are not required to respond to a request for information which does not contain a currently valid OMB Approval Number.

BURDEN HOURS STATEMENT

The public burden for this form is estimated to vary from 30 minutes to 25 hours per response, with an average of 2 hours per response, including the time for reviewing instructions, gathering and maintaining data, and completing and reviewing the form. Direct comments regarding the burden estimate or any other aspect of this form to: U.S. Department of the Interior, Bureau of Land Management, Information Clearance Officer (W0-630), 1849 C Street, Mail Stop 401LS, Washington, D.C. 20240

A reproducible copy of this form may be obtained from the Bureau of Land Management, Division of Lands, 1620 L Street, Rm. 1000LS, Washington, D.C. 20036.

NOTICE

NOTE: This applies to the Department of the Interior/Bureau of Land Management (BLM).

The Privacy Act of 1974 provides that you be furnished with the following information in connection with the information provided by this application for an authorization.

AUTHORITY: 16 U.S.C. 310 and 5 U.S.C. 301.

PRINCIPAL PURPOSE: The primary uses of the records are to facilitate the (1) processing of claims or applications; (2) recordation of adjudicative actions; and (3) indexing of documentation in case files supporting administrative actions.

ROUTINE USES: BLM and the Department of the Interior (DOI) may disclose your information on this form: (1) to appropriate Federal agencies when concurrence or supporting information is required prior to granting or acquiring a right or interest in lands or resources; (2) to members or the public who have a need for the information that is maintained by BLM for public record; (3) to the U.S. Department of Justice, court, or other adjudicative body when DOI determines the information is necessary and relevant to litigation; (4) to appropriate Federal, State, local, or foreign agencies responsible for investigating prosecuting violation, enforcing, or implementing this statute, regulation, or order; and (5) to a congressional of lice when you request the assistance of the Member of Congress in writing.

EFFECT OF NOT PROVIDING THE INFORMATION: Disclosing this information is necessary to receive or maintain a benefit. Not disclosing it may result in rejecting the application.

Table Mountain Wind Co. LLC

Attachments to Standard Form 299

7. **Project Description:** The proposed 150 MW wind generation facility will be located near Jean, NV approximately 20 miles southwest of Las Vegas and within Clark County. The project will be developed by Table Mountain Wind Co. LLC, a joint venture between M & N Wind Power and Siemens Corp. The proposed project sites encompass portions of Goodsprings, Shenandoah Peak, Cottonwood Pass, and Potosi Quadrangles and are more fully described below.

Wind Turbine Generators (WTG)

Approximately 187 NEG Micon WTG's rated at 800 KW will be utilized to produce in excess of 460,000,000 KWh of "green" energy annually. Each wind turbine has a rotor diameter (3 blades) of 52 meters and will be erected on a tubular steel towers up to 54 meters high.

Each WTG foundation will be approximately 15 feet in diameter, and 30 feet deep, utilizing approximately 80 cubic yards of concrete. Each WTG site will require a 20' x 20' foundation pad accompanied by a 75' x 125' crane pad for erection and an 8' x 8' transformer pad. Alternatively, The NEG Micon 1.5 MW WTG could be utilized in fewer numbers to maximize the wind resource. These machines are in the prototype development stage in Europe. They would be erected on tubular steel towers 80 meters high and have a rotor diameter of 64 meters.

Technical specifications for the WTG's are more fully described in Exhibit A. WTG locations are shown on the attached maps in Exhibit B.

Access Roads

Approximately 25 miles of new and improvements to existing roads will be required to gain access to WTG site locations and to service each WTG.

Main access roads will be approximately 30 feet in width and constructed in a manner to meet Clark County standards. Service roads adjacent to the WTG's will be approximately 20 feet in width to provide access for maintenance of each turbine.

For WTG's located on Table Mountain, access will require improvement of the existing dirt road at Columbia Pass off the Sandy Valley Road.

For WTG's located in the Shenandoah peak area, access will be from the existing Goodsprings – Sandy Valley Road with road improvements required on the existing access roads to the YellowPine Mine area with new construction required to Shenandoah Peak.

Access for WTG's located in the Potosi/Wilson Pass area will be from the existing Goodsprings – Sandy Valley road with new construction / improvement to existing dirt roads required for actual turbine access.

Access roads are shown on the attached maps in Exhibit B.

Electric Transmission & Distribution Facilities

Each WTG will be connected electrically to a 600 volt to 34.5 KV step up pad mounted transformer located adjacent to each WTG tower. Each WTG transformer will be connected to an underground/overhead 34.5 KV distribution line located along and within the WTG service road right of way.

Overhead 34.5 KV distribution lines will transmit the generated power from the major site locations along the new and/or improved access roads or specific rights-of-way depicted on the attached site maps in Exhibit B to parallel rights-of-way to the existing Valley Electric Association (VEA) Pahrump-Mead 230 KV transmission line.

The overhead 34.5 KV distribution system will be constructed within a 60 foot wide right-of-way on single and/or double wood pole structures approximately 60-80 feet high in a single and/or double circuit configuration conforming to standard utility practices. Distribution facilities are shown on the attached maps in Exhibit B.

A 34.5to 230KV substation will be constructed in the southwest corner of the intersection of Sandy Valley Road and VEA's Pahrump – Mead 230 KV line on a 10- acre site to interconnect the proposed wind turbine generation to the electric transmission grid. This facility is more fully described in VEA's BLM application of March, 2001 prepared by Electric Consultants, Inc. of Billings, MT.

A wind generation Control/ Maintenance Facility will be located within this 10-acre site and will act as the central operations terminal for the generating facility.

Communications/Control Systems

Voice and data communications and control functions will connect via underground fiber optic cable each WTG along and within access roads and/or distribution line rights-of-way to the Control/Maintenance Facility.

Alternatively, the fiber optic cabling will terminate at a microwave relay site located on east Table Mountain as shown on Exhibit B-IV for transmission of control and communications functions to the Control/Maintenance Facility.

Metering, Relaying, and Communication/Operations Functions for electric transmission network integration will consist of microwave links at VEA's proposed Table Mountain Substation (Windy Sub.) to East Table Mountain; from East Table Mountain to West Table Mountain; and from West Table Mountain to VEA's proposed Sandy Valley Warehouse (not associated with this project). This system is shown on the attached maps in Exhibit B-IV.

Lay Down & Batch Plant Construction Areas

Three 5-acre fenced construction lay down areas are shown on the attached maps to provide for storage and material handling and concrete batching during construction. These areas will be reduced to 2 acres for each location after the construction period.

Anemometers

Anemometers erected under BLM application No. N-66778 will be incorporated as permanent structures as part of this application.

9. **State or Local Government Approval:** Permitting will be through Clark County along with any required environmental assessment.

12. **Statement of your technical and financial capability to construct, operate, maintain, and terminate system for which authorization is being requested:**

Wind power is the fastest growing energy technology in the world since it has double its production. In fact, over the past five years, the wind energy industry has been developing at an average of 25% per year, far faster than growth rates for conventional fuel industries. In 1999 alone, more than 4,100 MW of wind generating capacity was added to the world electric grid and exceeding the previous years installation record of 2,000 MW. Over 900 MW of new and replacement wind turbines were installed in the United States in 1999. By 2005, cumulative wind development is forecasted to be in excess of 20,000 MW.

Much of this growth is fueled by environmental concerns that are emerging as global initiative. Today's energy crisis and "Green" issues have grown in urgency requiring action and accountability rather than good intentions. Today, consumers demand environmental responsibility, and seek businesses producing recycled, renewable and non-polluting energy at a competitive price. M & N Wind Power is one such enterprise. M&N with the Siemens Corp. have formed the Table Mountain Wind Co. LLC to develop the proposed project.
M&N is a joint venture between two of the most powerful and influential organizations in the wind energy sector – NEG Micon A/S of Denmark and Nichimen Corporation of Japan. M&N Wind Power exists to research, develop and build wind generating facilities of the highest quality.

M&N Wind Power acts as a joint developer of wind generating facilities, and plays a key role in establishing co-developments in this growing energy sector. The company understands the technical and economic aspects of wind generation enabling it to balance environmental concerns without uncertainly or risk and to achieve business and financial goals for itself and its partners.

M&N Wind Power has been active in Europe for the past five years, and over the past two years has become a leader in the restructuring of the wind energy industry in the United States. M&N Wind Power is actively involved in the

management and operations of over 1500 wind turbines in California including the world's largest project at Altamont Pass near San Francisco. Others include wind projects in the San Gorgonio Pass, near Palm Springs and the Tehachapi Pass, near Los Angeles. M&N Wind Power researches sites all over the world and is currently involved in developing new wind generating facilities and repowering others with a total capacity of more than 1,000 MW. M&N has developed Canada's largest wind power project at Le Nordais in Quebec. This 100 MW project is a technological achievement supplying enough energy for a city of 10,000 households with a heavy heating demand in a very hostile climate.

M&N Wind Power is staffed by professionals representing the strengths of both its parent companies. The Danish company, NEG Micon was created from the merger in 1997 of Nordtank Energy Group (NEG)and companies. Its wind turbine generators offer capabilities beyond 1.5 MW. By 1998 NEG Micon had installed nearly 7,000 turbines worldwide totaling more than 1,200 MW of generating capacity, of which 2800 machines or 250 MW are installed in North America. In fact, NEG Micon was the largest or second largest wind turbine manufacturer in the world the past five years. The Nichimen Corporation of Japan is one of the world's leading trading houses with the 100 years of operation. It has offices in over 90 cities worldwide and net sales of over $29 billion in 1998. Its involvement in wind power stems from its strategy of emphasizing new business opportunities which meet contemporary needs and its concern for the environment.

M&N Wind Power is dedicated to the expansion and utilization of renewable resources in meeting the growing energy needs of its customers while enhancing the energy security of the United States. The enclosed M&N Wind Power brochure as Exhibit C gives expanded details on our company and our approach to wind development.

The Siemens Corp. is the fourth largest employer in the world and is a leading industrial manufacturer of electrical, control, communications and medical systems.

13 A. **Describe other reasonable alternative routes and modes considered:**
An investigation into wind generation potential is Southern Nevada began as early as 1986 by Desert Research Institute at the University of Nevada. Subsequently more detail wind speed data was gathered by Kennetech in 1995-96 in the vicinity of Table Mountain through the use of several anemometers. The conclusion of these studies showed that the proposed sites for which this application is based, was found to be a good location with wind speeds of such magnitude to make a wind generation facility economical even in today's growing green energy market. The sites are also hidden from view from any major city so the visual impacts would be negligible. We also considered a location at Boulder City, Nevada and The James Hardie Mine site near Blue Diamond. These locations

have significant visual and environmental impacts. Because of these impacts we chose the proposed sites as a best location with proven wind regimes.

15. **Provide a statement of need for the project, including the economic feasibility and items such as (a) cost proposal (construction, operation, maintenance); (b) estimated cost of next best alternative and (c) expected public benefits:** The wind turbine generating facility proposed by Table Mountain Wind Co, LLC is a joint effort of M&N Wind Power Inc. and the Siemens Corp. for the purpose of developing renewable and alternative energy projects for the green markets in California, Nevada, and Arizona.

The proposed project is supported by both Senators Bryan and Reid as a means to create jobs and promote renewable energy development in Nevada.

It is estimated that the project can generate energy for less than 4 cents/KWh and will cost $160 million to construct utilizing 50 highly skilled and technical people.
Construction will total more than $10.5 million. Operation and maintenance will be staffed at 10 people at an annual cost of $750,000. Personnel for construction and operations and maintenance will be provided from the Southern Nevada area. Target operation date is 12/31/02.

A wind generation facility such as proposed will provide substantial economic and environmental benefits, including a lesser dependence on conventional fossil fuels; a clean environmentally benign energy source; requires no water to operate; reduces global warming; provides enough energy to support a community of 125,000 people; jobs; material purchases; tax revenue, and revenue to BLM.

The following environmental benefits examples show the magnitude of such emissions savings:

Two 825 kW WTG will displace the following:

2,700 tons of CO2, the leading greenhouse gas
14 tons of SO2, the leading components of acid rain
9 tons of NO, the leading component of smog

Please note that a forest measuring 1.5 sq. miles would absorb the same amount of CO2 as two WTGs.

16. **Describe probable effects on the population in the area, including the social economic aspects, and the rural lifestyles:** The proposed project is remote and small compared to existing construction projects within Clark County, and as such, will have negligible impact on the county's economy and

social patterns. However, as discussed in our answer to questions 15, the project will make a contribution both economically and socially to the area.

17. **Describe the likely environmental effects that the proposed project will have on: (a) air quality; (b) visual impact; (c) surface and ground water quality and quantity; (d) the control or structural change on any stream or other body of water; (e) existing noise levels; and (f) the surface of the land, including vegetation, permafrost, and soil stability:**

A. **Air quality:** Wind is a benign energy source that provides substantial benefits to air quality compared to fossil fuel generation facilities with best available control technology (BACT). Proposed production and emission savings are as follows:

Wind Generating Facility (150 MW)
Annual production: 460,000,000 KWh
Reduced oil/gas consumption: 540,000 bbls equiv.

Emission Savings	
SO2:	1,315 tons
CO2:	250,000 tons
NO:	840 tons

B. **Visual:** The proposed sites are remote with sparse vegetation at an elevation of approximately between 5,000 and 6,000 feet. Existing dirt roads serve apparent mining activities and service microwave towers and other facilities. Low voltage distribution lines provide electrical service to these towers and traverse the area.

The unincorporated communities of Jean, Goodsprings, and Sandy Valley would be in the closest proximity to the project. Turbines would be erected in rows along the ridges on tubular steel poles 240 feet high. From one to two miles these towers may be visible from the valley floor. At greater distances there should be little or no visible impact.

C. **Water Quality:** No impacts are expected. The project will not consume water during its operation nor required any discharge to the native surroundings.
Water required during construction will be trucked to the construction sites for concrete batching and fugitive dust control.

D. **Stream Impacts:** No such impacts are expected.

E. **Noise:** Wind turbines will produce noise from their rotating blades causing a slight increase over ambient noise levels in close proximity to the WTGs. Overall noise levels will be masked by the wind itself and any

mining activity. Any noise from the WTGs will not be noticeable beyond a quarter of a mile.

F. **Land/Soil/Vegetation:** Since WTGs are erected individually requiring a foot print of approximately 15 feet in diameter, actual land use will be minimal compared to the required wind regime site. As stated previously, road improvement will be required. Electrical connections to each WTG will be underground as terrain will permit to a collector substation requiring a 10-acre site. Distribution facilities will parallel the rows of wind turbines. Collectively actual land for WTG sites, access roads, rights of way and substation should be less than 300 acres.

18. **Describe the probable effects that the proposed project will have on (a) population of fish, plant life, wildlife, marine life, including threatened and endangered species and (b) marine mammals, including hunting capturing, collecting, or killing these animal:** The proposed sites area remote and devoid of any water ways which present no impacts to fish/marine wildlife. From our cursory inspection of the sites , it does not appear any known threatened or endangered specifies is impacted. From our limited survey, Big Horn sheep migrate through the area. The WTGs pose no restriction to their movement. Any bird migration will do so at higher altitudes far above the WTG rotors. We do not expect avian mortality impacts.

I HEREBY CERTIFY, that I am of legal age and authorize to do business in the state that I have personally examined the information in the application and believe that the information submitted is correct to the best of my knowledge.

Sebastian J. Nola 5/28/01

Sebastian J. Nola, Vice-President
Table Mountain Wind Co. LLC
(M & N Wind Power, Inc.)
4225 Executive Square, Suite 1650
La Jolla, CA 92037
Phone (858) 558-1550; FAX (858) 558-2672

EXHIBIT B

Table Mountain Wind Generating Facility

LEGAL LOCATIONS FOR PLAN OF DEVELOPMENT

Prepared May 28, 2001

A. TURBINE LOCATIONS

TURBINES SITES NORTHERN SECTION
T25S R58E - Turbines 1-61

1,2,3 – Section 6 SW1/4 NE1/4
4,5,6, 7 –Section 6 NW1/4 SE1/4
8,9,10 – Section 6 NW1/4 NE1/4
11 – Section 5 SE1/4NW1/4
12&13 – Section 5 NE1/4SW1/4
14 –Section 5 NW1/4 SE1/4
15&16 –Section 5 SW1/4 SE1/4
17&18 – Section 5 SE1/4 SE1/4
19, 20, 21, 22-Section 8 NE1/4 NE1/4
23&24-Section 8 SE1/4 NE1/4
25&26 – Section 18 SE1/4 NW1/4
27 – Section 18 SW1/4 NE1/4
28, 29, 30-Section 18 NW1/4 SE1/4
31 – Section 18 SW1/4 SE ¼
32, 33, 34- Section 18 SE1/4 SE ¼
57,58,59- Section 18 SW1/4 NW1/4 (Lot?)
60&61- Section 18 NE1/4 SW1/4
35 – Section 19 NE1/4NE1/4
36, 37-Section 19 NW1/4 NE1/4
38, 39, 40- Section 19 SW1/4 NE1/4
41&42- Section 19 NW1/4 SE1/4
43,44, 45 -Section 19 SW1/4 SE1/4
46, 47, 48 - Section 30 NW1/4 NE1/4
49, 50, 51 - Section 30 SW1/4 NE1/4
52 - Section 30 NW1/4 SE1/4
53, 54- Section 30 NE1/4 SE1/4
55 &56- Section 30 SE1/4 SE1/4

TURBINE SITES SOUTHERN SECTION

T24S R58E Turbines

57A-Section 33 SW1/4 NE1/4
58A, 59A, 60A, 61A- Section 33 SE1/4 NE1/4
62&63- Section 33 NE1/4 SE1/4
82&83-Section 33 SW1/4 SE1/4
84&85- Section 33 SE1/4 SW1/4
129,130,&130A Section 33 SW1/4 SW1/4
64, 65, 66- Section 34 SW1/4 SW1/4

T25S R58E Turbines

67- Section 3 Lot 4,
68&69- Section 3 Lot 3
70, 71, 72, 73- Section 3 SE1/4 NW1/4
74&75 –Section 3 NW1/4 SE1/4
76- Section 3 NE1/4 SW1/4
97, 98, 99- Section 3 SW1/4 SW1/4
77, 78- Section 2 SW1/4 SW1/4
79-Section 2 SE1/4 SW1/4
87&88- Section 4 Lot 6
86- Section 4 Lot 3
89, 90, 91- Section 4 SW1/4 NE1/4
92-Section 4 NW1/4 SE1/4
93, 94, 95- Section 4 NE ¼ SE1/4
96- Section 4 SE1/4 SE1/4
112, 113,114- Section 4 SW1/4 SE1/4
132, 133, 134- Section 4 SW1/4 NW1/4
135, 136, 137-Section 4 NW1/4 SW1/4
138-Section 4 SW1/4 SW1/4
139- Section 4 SE1/4 SW1/4
131- Section 5 Lot 1
115&116- Section 9 NW1/4 NE1/4
117, 118,119-Section 9 SE1/4 NE1/4
120, 121, 122- Section 9 NE1/4 SE1/4
123- Section 9 SE1/4 SE1/4
140, 141, 142- Section 9 NE1/4 NW1/4
143- Section 9 SE1/4 NW1/4
144- Section 9 SW1/4 NE1/4
145, 146, 147, 148- Section 9 NW1/4 SE1/4
149, 150, 151- Section 9 SW1/4 SE1/4
100, 101, 102-Section 10 NW1/4 NW1/4
103- Section 10 NE1/4 NW1/4
104- Section 10 SE1/4 NW1/4

105, 106,107- Section 10 NW1/4 NE1/4
108- Section 10 NE1/4 NE1/4
124- Section 10 SW1/4 SW1/4
171&172-Section 10 NW1/4 SE1/4
173- Section 10 NE1/4 SE1/4
174, 175, 176- Section 10 SE1/4 SE1/4
125&126- Section 10 SW1/4 SE1/4
109, 110, 111- Section 11 NW1/4 SW1/4
80&81-Section 11 NW1/4 NE1/4
177, 178, 179 - Section 15 NE1/4 NE1/4
127, 128- Section 15 NW1/4 NE1/4
154A-Section 15 SW1/4 NW1/4
155A&156-Section 15 SE1/4 NW1/4
157, 158,159-Section 15 NE1/4 SW1/4
160&161- Section 15 SE1/4 SW1/4
152&153- Section 16 NW1/4 NE1/4
154&155- Section 16 SE1/4 NE1/4
162&163-Section 22 NW1/4 NE1/4
164&165- Section 22 SW1/4 NE1/4
166, 167, 168-Section 22 NW1/4 SE1/4
169&170-Section 22 SW1/4 SE1/4

B. PROPOSED LAYOUT AND BATCH SITES LOCATIONS

Northern Section
  A- T24S R58E Section 16 NW1/4NW1/4,
  B- T24S R58E Section 20 SE1/4NW1/4,
Southern Section
  C- T25S R58E Section 4 Lot 3

C. PROPOSED TABLE MOUNTAIN SUBSTATION LOCATION

T24S R58E Section 34 SE1/4NE1/4

D. PROPOSED 34.5 KV DISTRIBUTION LINE LOCATION (ties into existing line)

Main Line PI-II

T24S R58E
Section 7 NW1/4NE1/4, SW1/4NE1/4, NE1/4SE1/4
Section 8 NW1/4 SW1/4, SW1/4SW1/4,SE1/4SW1/4, SW1/4SE1/4
Section 17 NE1/4 NE1/4
Section 16 NW1/4NW1/4, NE1/4NW1/4, SE1/4NW1/4, NW1/4 SE1/4, SW1/4SE1/4
Section 21 E1/2NE1/4
Section 22 SW1/4NW, NW1/4SW1/4, SW1/4SW1/4, SE1/4SW1/4
Section 27 NE1/4NW1/4, SE1/4NW1/4, SW1/4NE1/4, NW1/4SE1/4, SW1/4SE1/4, SE1/4SE1/4
Section 34 NE1/4NE1/4, SE1/4NE1/4

Section 35 SW1/4NW1/4, NW1/4SW1/4, SE1/4SW1/4

T25S R58E
Section 2 NW1/4NE1/4, SW1/4NE1/4

Secondary DL-I
T24S R58E Section 8 SE1/4NE1/4, E1/2SE1/4

Secondary DL-II (location would follow existing road from the powerline to alice mine)
T24S R58E
Section 19 SW1/4SE1/4, SE1/4SE1/4, NE1/4SE1/4
Section 20 NW1/4SW1/4, NE1/4SW1/4, SW1/4NE1/4, NW1/4NE1/4
Section 17 SW1/4SE1/4, SE1/4SE1/4
Section 16 SW1/4SW1/4, SE1/4SW1/4, SW1/4SE1/4

Secondary DL-III
T24S R58E Section 33 SE1/4NE1/, SW1/4NE1/4, NW1/4SE1/4, NE1/4SW1/4, SW1/4SW1/4

Secondary DL-IV
T25S R58E
Section 2 SW1/4NE1/4, NE1/4SW1/4, SE1/4SW1/4, SW1/4SW1/4
Section 3 SE1/4 SE1/4
Section 10 NE1/4NE1/4, NW1/4NE1/4

E. ACCESS ROAD LOCATIONS TO SHENANDOAH PEAK (North Section)

Access from Kingston Road beginning on existing road up Keystone Wash
Alternate #1 Keystone Wash existing road
T24S R57E
Section 23 NW1/4NE1/4, NE1/4NE1/4. SE1/4NE1/4
Section 24 SW1/4NW1/4, SE1/4NW1/4 SW1/4NE1/4, SE1/4NE1/4
T24S R58E
Section 19 Lot 4

Construction Alternate # 1
T24S R58E
Section 19 Lot 4, SE1/4SW1/4, SW1/4SE1/4
Section 30 NE1/4NW1/4, NW1/4NE1/4,

Construction Alternate #2
T24S R58E
Starting off Wilson Pass road
Section 7 NW1/4SE1/4,NE1/4SW1/4, SE1/4SW1/4
Section 18 NE1/4NW1/4,SE1/4NW1/4,SW1/4NE1/4, NE1/4SE1/4

Access from Wilson Pass Road in Section 16
Use of existing road to Alice mine in section 20
T24S R58W
Section 16 NE1/4SE1/4, NW1/4SE1/4, NE1/4SW1/4, NW1/4SW1/4, SW1/4SW1/4
Section 17 SE1/4SE1/4,SW1/4SE1/4
Section 20 W1/2NE1/4,NE1/4SW1/4 (road ends)
New Construction (continue section 20)
Section 20 NE1/4SW1/4,NW1/4SW1/4
Section 19 NE1/4SE1/4, SE1/4SE1/4, SW1/4SE1/4, (between turbines 35&36)
South of turbine 35
Section 19 SW1/4SE1/4
Section 30 NW1/4NE1/4, SW1/4NE1/4 NW1/4SE1/4, NE1/4SE1/4, SE1/4SE1/4
Continue North above turbine 36
Section 19 SW1/4SE1/4, NW1/4SE1/4, W1/2NE1/4,NE1/4NE1/4
Section 18 SE1/4SE1/4, SW1/4SE1/4,NW1/4SE1/4, NE1/4SW1/4,SE1/4NW1/4,
West branch at turbine 30
Section 18 NE1/4 SW1/4, Lot 3, Lot 4

F. ACCESS ROAD LOCATIONS TO RADIO TOWER (North Section)

Alternate #3
T24N R58E
Starting in Section 17 off Wilson Pass road
Section 17 NE1/4NE1/4
Section 8 E1/2SE1/4,E1/2NE1/4
Section 5 SE1/4SE1/4, SW1/4SE1/4, NW1/4SE1/4, NW1/4SW1/4
At turbine #12 use existing road (R/w 022045)
Section 5 E1/2SW1/4, SW1/4SW1/4
Section 8 NW1/4NW1/4
New construction
Section 7 SE1/4NE1/4, NE1/4NE1/4, NE1/4NW1/4
Section 6 W1/2SE1/4, SW1/4NE1/4

G. ACCESS ROAD LOCATIONS TO TABLE MOUNTAIN (South Section)

Leaving the Sandy Valley at Columbia Pass
T24S R58W
Section 33 NE1/4NW1/4, SE1/4NW1/4, SW1/4NE1/4, W1/2SE1/4
Section 34 SW1/4SW1/4
North toward turbines 63 – 57A
Section 33 E1/2SE1/4, SE1/4NE1/4,SW1/4NE1/4
North to turbine 64
Section 33 SE1/4SE1/4
East to turbine 66
Section 34 SW1/4SW1/4
T25S R58E
Section 3 Lot 4, Lot 3 SE1/4NW1/4, SW1/4NE1/4, NW1/4SE1/4

Leaving section 33 heading toward Radio tower or turbine 86
Section 4 lots 5, 6, & 3
South to turbine 104 & east to power line
Section 4 Lot 6, Lot 4, SW1/4NE1/4, NW1/4SE1/4, NE1/4SE1/4, SE1/4SE1/4
Section 3 SW1/4SW1/4
Section 10 NW1/4NW1/4, NE1/4NW1/4, NW1/4NE1/4, NE1/4NE1/4
Section 2 SW1/4SW1/4, SE1/4SW1/4, NE1/4SW1/4, SW1/4NE1/4

Spur to turbine 124
Section 4 SE1/4NE1/4, SE1/4NW1/4,NE1/4SW1/4, NW1/4SE1/4,SW1/4SE1/4
Section 9 NW1/4NE1/4, SE1/4NE1/4, E1/2SE1/4

Spur to turbine 84

T25S R85E Section 4 Lot 3
T24S R85E Section 33 SE1/4SW1/4

Access from turbine 86 to 129
T25S R85E Section 4 Lots 3&4
T24S R85E Section 33 SW1/4SW1/4

Table Mountain Access
T24S R85E
Section 4, Lot 4, SW1/4NW1/4, W1/2SW1/4,SE1/4SW1/4
Section 9 NE1/4NW1/4, SE1/4NW1/4, NW1/4SE1/4, SW1/4SE1/4
Section 16 NW1/4NE1/4, SE1/4NE1/4
Section 15 SW1/4NW1/4, SE1/4NW1/4, NE1/4NW1/4, NW1/4NE1/4, NE1/4NE1/4

TM 1 Access (to turbine 170)
Section 15 SW1/4NW1/4, SE1/4NW1/4, E1/2SW1/4
Section 22 NE1/4NW1/4, W1/2NE1/4, W1/2SE1/4

TM 2 Access (to turbine 125)
Section 15 NW1/4NE1/4
Section 10 SW1/4SE1/4

TM 3 Access (to turbine 171)
Section 10 SE1/4SE1/4, NE1/4SE1/4, NW1/4SE1/4

TM 4 Access (to turbine 179)
Section 15 NE1/4NE1/4

TM 5 Access (from turbine 173 to 111)
Section 10 NE1/4 SE1/4,
Section 11 NW1/4 SW1/4

H. MICROWAVE TOWER LOCATIONS – Table Mountain

TABLETOP EAST
Latitude: N35 degrees 48.598 minutes
Longitude: W115 degrees 27.955 minutes
Township: 24 South
Range: 58 East
Section: 34 SWSW

TABLETOP WEST
Latitude: N35 degrees 48.328 minutes
Longitude: W115 degrees 29.170 minutes
Township: 25 South
Range: 58 East
Section: 4 NWNW

5/28/01

M&N Wind Power

September 13, 2001

Anna Wharton
4765 Vegas Drive
Las Vegas, NV 89105-2135

Dear Anna:

SUBJECT: REVISIONS TO THE TABLE MOUNTAIN WIND COMPANY LLC APPLICATION N-73726

Enclosed are the proposed revisions to the subject application. These revisions encompass an expanded project description to include the use of the 1.5 MW Wind Turbine Generator (WTG) as a complete substitution for the originally specified 800 KW WTG or some combination thereof.

Also, I have revised the access road location to the Shenandoah section of the project. In addition, I have asked Larry Sip to prepare any legal description changes that are required to support these proposed revisions.

I have enclosed a check for $10,000 to be deposited in our BLM Cost Recovery account for this project.

If you have any questions or would like further clarification, please do not hesitate to call.

Sincerely,

Sebastian J. Nola
Vice President
MNS Wind

RECEIVED
Bureau of Land Management
07:30
SEP 14 2001
LAS VEGAS
FIELD OFFICE
Las Vegas, Nevada

Enclosure (2)

cc: John Johansen-GREP
Rick t' Hart-Siemens
Ed Taylor-M&N Wind Power
Larry Sip

M & N Wind Power Ltd.
Latham House, 16 Minories
London
UK EC3N 1EY
Tel: 0171 886 7073 Fax: 0171 886 7074

☐ M & N Wind Power inc.
Suite 450, 800 Rene-Levesque Blvd West
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☐ M & N Wind Power, Inc.
4225 Executive Square
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La Jolla, California 92037, USA
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☐ M & N Wind Power Ltd.
15E Cuxhaven Way, Longrock
Penzance, Cornwall
UK TR20 8HX
Tel: 01736 330171 Fax: 01736 362025

ISO9001

United States Department of the Interior
Bureau of Land Management
LAS VEGAS FIELD OFFICE
4765 WEST VEGAS DRIVE
LAS VEGAS, NV 89108 -2135
Phone: (702) 647-5000

Receipt	
No:	378383

Transaction #: 397260
Date of Transaction: 09/14/2001

CUSTOMER:	GLOBAL RENEWABLE ENERGY PARTNERS 4225 EXECUTIVE SQURE #950 LA JOLLA,CA 92037

LINE #	QTY	COMMODITY / SUBJECT / ACTION / PRODUCT	REMARKS	UNIT PRICE	TOTAL
1	1.00	LANDS & REALTY MANAGEMENT / RIGHT OF WAY / MONITOR FEE-FLPMA CAT V ACTUAL COST (5101)		- n/a -	$10,000.00
				TOTAL:	**$10,000.00**

PAYMENT INFORMATION				
1	AMOUNT:	$10,000.00	POSTMARKED:	N/A
	TYPE:	CHECK	RECEIVED:	09/14/2001
	CHECK NO:	001039		
	NAME:	GLOBAL RENEWABLE ENERGY PART 4225 EXECUTIVE SQURE #950 LA JOLLA CA 92037		

REMARKS

DATE 09/12/01
CHECK NO. 001039
VENDOR KEY BLM01

INVOICE#	INV.DATE	PAY AMOUNT	DISC TAKEN	VOUCHER NO.	NET AMOUNT
	09/12/01	10000.00	0.00	VOUCHER 000071	10000.00

RECEIVED
Bureau of Land Management
07:30
SEP 14 2001
LAS VEGAS
FIELD OFFICE
Las Vegas, Nevada

TOTALS ▶

BLM PERMIT APPLICATION N -73726

Table Mountain Wind Co. LLC
Attachments to Standard Form 299

****Revised 8/24/01**

7. ****Project Description:** The proposed 150 to 205 MW (Approx.) wind generation facility will be located near Jean, NV approximately 20 miles southwest of Las Vegas and within Clark County. The project will be developed by Table Mountain Wind Co. LLC, a joint venture between M & N Wind Power and Siemens Corp. The proposed project sites encompass portions of Goodsprings, Shenandoah Peak, Cottonwood Pass, and Potosi Quadrangles and are more fully described below.

****Wind Turbine Generators (WTG)**

Approximately 187 NEG Micon WTG's or equivalent manufacture rated at 800 KW will be utilized to produce in excess of 460,000,000 KWh of "green" energy annually. Each wind turbine has a rotor diameter (3 blades) of 55 meters and will be erected on a tubular steel tower up to 70 meters high.

Each WTG foundation will be approximately 15 feet in diameter, and 30 feet deep, utilizing approximately 80 cubic yards of concrete. Each WTG site will require a 20' x 20' foundation pad accompanied by a 75' x 125' crane pad for erection and an 8' x 8' transformer pad. Alternatively, up to 135 NEG Micon 1.5 MW WTG or equivalent manufacture could be utilized to maximize the wind resource. These machines are in the prototype development stage in Europe. They would be erected on tubular steel towers 85 meters high and have a rotor diameter of 77 meters.

Technical specifications for the WTG's are more fully described in Exhibit A. WTG locations are shown on the attached maps in Exhibit B-I through B-III for the 800 KW machines and Exhibit B-V for the larger 1.5 MW machines. Described above is considered the bounds for development utilizing either all 800 KW WTG's or all 1.5 MW WTG's within the area depicted for the proposed Table Mountain Wind Generating Facility.

A more likely scenario may encompass the utilization of a combination 800 KW WTG and 1.5 MW WTG to optimize siting and electric generation production given specific wind regime patterns. This scenario could entail 10 – 800 KW WTG's and 10 – 1.5 MW WTG on the Potosi/Wilson Pass portion of the Project; 28-800 KW WTG's and 8-1.5 MW WTG's within the Shenandoah section; and 17 – 800 KW WTG's and 80 – 1.5 MW WTG's on Table Mountain proper. Under this scenario, the total project would encompass 55 – 800 KW WTG's and 98 – 1.5 MW WTG's for a total installed capacity of approximately 191 MW.

**Access Roads

Approximately 25 miles of new and improvements to existing roads will be required to gain access to WTG site locations and to service each WTG.
Main access roads will be approximately 30 feet in width and constructed in a manner to meet Clark County standards. Service roads adjacent to the WTG's will be approximately 20 feet in width to provide access for maintenance of each turbine.

For WTG's located on Table Mountain, access will require improvement of the existing dirt road at Columbia Pass off the Sandy Valley Road.

**For WTG's located in the Shenandoah peak area, access will be from the South access road to Goodsprings along an existing dirt road to a point north of the Cosmopolitan Mine. New construction will be required from that point to the top of Shenandoah Peak.

Access for WTG's located in the Potosi/Wilson Pass area will be from the existing Goodsprings – Sandy Valley road with new construction / improvement to existing dirt roads required for actual turbine access.
Access roads are shown on the attached maps in Exhibit B.

Electric Transmission & Distribution Facilities

Each WTG will be connected electrically to a 600 volt to 34.5 KV step up pad mounted transformer located adjacent to each WTG tower. Each WTG transformer will be connected to an underground/overhead 34.5 KV distribution line located along and within the WTG service road right of way.
Overhead 34.5 KV distribution lines will transmit the generated power from the major site locations along the new and/or improved access roads or specific rights-of-way depicted on the attached site maps in Exhibit B to parallel rights-of-way to the existing Valley Electric Association (VEA) Pahrump-Mead 230 KV transmission line.

The overhead 34.5 KV distribution system will be constructed within a 60 foot wide right-of-way on single and/or double wood pole structures approximately 60-80 feet high in a single and/or double circuit configuration conforming to standard utility practices. Distribution facilities are shown on the attached maps in Exhibit B.

A 34.5to 230KV substation will be constructed in the southwest corner of the intersection of Sandy Valley Road and VEA's Pahrump – Mead 230 KV line on a 10- acre site to interconnect the proposed wind turbine generation to the electric transmission grid. This facility is more fully described in VEA's BLM application of March 2001 prepared by Electric Consultants, Inc. of Billings, MT.

A wind generation Control/ Maintenance Facility will be located within this 10-acre site and will act as the central operations terminal for the generating facility.

Communications/Control Systems

Voice and data communications and control functions will connect via underground fiber optic cable each WTG along and within access roads and/or distribution line rights-of-way to the Control/Maintenance Facility.

Alternatively, the fiber optic cabling will terminate at a microwave relay site located on east Table Mountain as shown on Exhibit B-IV for transmission of control and communications functions to the Control/Maintenance Facility.

Metering, Relaying, and Communication/Operations Functions for electric transmission network integration will consist of microwave links at VEA's proposed Table Mountain Substation (Windy Sub.) to East Table Mountain; from East Table Mountain to West Table Mountain; and from West Table Mountain to VEA's proposed Sandy Valley Warehouse (not associated with this project). This system is shown on the attached maps in Exhibit B-IV.

Lay Down & Batch Plant Construction Areas

Three 5-acre fenced construction lay down areas are shown on the attached maps to provide for storage and material handling and concrete batching during construction. These areas will be reduced to 2 acres for each location after the construction period.

Anemometers

Anemometers erected under BLM application No. N-66778 will be incorporated as permanent structures as part of this application.

9. **State or Local Government Approval:** Permitting will be through Clark County along with any required environmental assessment.

12. **Statement of your technical and financial capability to construct, operate, maintain, and terminate system for which authorization is being requested:**

Wind power is the fastest growing energy technology in the world since it has double its production. In fact, over the past five years, the wind energy industry has been developing at an average of 25% per year, far faster than growth rates for conventional fuel industries. In 1999 alone, more than 4,100 MW of wind generating capacity was added to the world electric grid and exceeding the previous years installation record of 2,000 MW. Over 900 MW of new and

replacement wind turbines were installed in the United States in 1999. By 2005, cumulative wind development is forccasted to be in excess of 20,000 MW.

Much of this growth is fueled by environmental concerns that are emerging as global initiative. Today's energy crisis and "Green" issues have grown in urgency requiring action and accountability rather than good intentions. Today, consumers demand environmental responsibility, and seek businesses producing recycled, renewable and non-polluting energy at a competitive price. M & N Wind Power is one such enterprise. M&N with the Siemens Corp. have formed the Table Mountain Wind Co. LLC to develop the proposed project.

M&N is a joint venture between two of the most powerful and influential organizations in the wind energy sector – NEG Micon A/S of Denmark and Nichimen Corporation of Japan. M&N Wind Power exists to research, develop and build wind-generating facilities of the highest quality.

M&N Wind Power acts as a joint developer of wind generating facilities, and plays a key role in establishing co-developments in this growing energy sector. The company understands the technical and economic aspects of wind generation enabling it to balance environmental concerns without uncertainly or risk and to achieve business and financial goals for itself and its partners.

M&N Wind Power has been active in Europe for the past five years, and over the past two years has become a leader in the restructuring of the wind energy industry in the United States. M&N Wind Power is actively involved in the management and operations of over 1500 wind turbines in California including the world's largest project at Altamont Pass near San Francisco. Others include wind projects in the San Gorgonio Pass, near Palm Springs and the Tehachapi Pass, near Los Angeles. M&N Wind Power researches sites all over the world and is currently involved in developing new wind generating facilities and repowering others with a total capacity of more than 1,000 MW. M&N has developed Canada's largest wind power project at Le Nordais in Quebec. This 100 MW project is a technological achievement supplying enough energy for a city of 10,000 households with a heavy heating demand in a very hostile climate.

M&N Wind Power is staffed by professionals representing the strengths of both its parent companies. The Danish company, NEG Micon was created from the merger in 1997 of Nordtank Energy Group (NEG) and companies. Its wind turbine generators offer capabilities beyond 1.5 MW. By 1998, NEG Micon had installed nearly 7,000 turbines worldwide totaling more than 1,200 MW of generating capacity, of which 2800 machines or 250 MW are installed in North America. In fact, NEG Micon was the largest or second largest wind turbine manufacturer in the world the past five years. The Nichimen Corporation of Japan is one of the world's leading trading houses with the 100 years of operation. It has offices in over 90 cities worldwide and net sales of over $29 billion in 1998. Its involvement in wind power stems from its strategy of emphasizing new business

opportunities which meet contemporary needs and its concern for the environment.

M&N Wind Power is dedicated to the expansion and utilization of renewable resources in meeting the growing energy needs of its customers while enhancing the energy security of the United States. The enclosed M&N Wind Power brochure as Exhibit C gives expanded details on our company and our approach to wind development.

The Siemens Corp. is the fourth largest employer in the world and is a leading industrial manufacturer of electrical, control, communications and medical systems.

13 A. **Describe other reasonable alternative routes and modes considered:**
An investigation into wind generation potential is Southern Nevada began as early as 1986 by Desert Research Institute at the University of Nevada. Subsequently more detail wind speed data was gathered by Kennetech in 1995-96 near Table Mountain through the use of several anemometers. The conclusion of these studies showed that the proposed sites for which this application is based, was found to be a good location with wind speeds of such magnitude to make a wind generation facility economical even in today's growing green energy market. The sites are also hidden from view from any major city so the visual impacts would be negligible. We also considered a location at Boulder City, Nevada and The James Hardie Mine site near Blue Diamond. These locations have significant visual and environmental impacts. Because of these impacts, we chose the proposed sites as a best location with proven wind regimes.

15. **Provide a statement of need for the project, including the economic feasibility and items such as (a) cost proposal (construction, operation, maintenance); (b) estimated cost of next best alternative and (c) expected public benefits:**
The wind turbine generating facility proposed by Table Mountain Wind Co, LLC is a joint effort of M&N Wind Power Inc. and the Siemens Corp. for the purpose of developing renewable and alternative energy projects for the green markets in California, Nevada, and Arizona.

The proposed project is supported by both Senators Bryan and Reid as a means to create jobs and promote renewable energy development in Nevada.

It is estimated that the project can generate energy for less than four cents/KWh and will cost $160 million to construct utilizing 50 highly skilled and technical people.

Construction will total more than $10.5 million. Operation and maintenance will be staffed at 10 people at an annual cost of $750,000. Personnel for

construction and operations and maintenance will be provided from the Southern Nevada area. Target operation date is 12/31/02.

A wind generation facility such as proposed will provide substantial economic and environmental benefits, including a lesser dependence on conventional fossil fuels; a clean environmentally benign energy source; requires no water to operate; reduces global warming; provides enough energy to support a community of 125,000 people; jobs; material purchases; tax revenue, and revenue to BLM.

The following environmental benefits examples show the magnitude of such emissions savings:

Two 825 kW WTG will displace the following:

2,700 tons of CO2, the leading greenhouse gas
14 tons of SO2, the leading components of acid rain
9 tons of NO, the leading component of smog

Please note that a forest measuring 1.5 sq. miles would absorb the same amount of CO2 as two WTG's.

16. **Describe probable effects on the population in the area, including the social economic aspects, and the rural lifestyles: C** The proposed project is remote and small compared to existing construction projects within Clark County, and as such, will have negligible impact on the county's economy and social patterns. However, as discussed in our answer to questions 15, the project will contribute both economically and socially to the area.

17. **Describe the likely environmental effects that the proposed project will have on: (a) air quality; (b) visual impact; (c) surface and ground water quality and quantity; (d) the control or structural change on any stream or other body of water; (e) existing noise levels; and (f) the surface of the land, including vegetation, permafrost, and soil stability:**

A. **Air quality:** Wind is a benign energy source that provides substantial benefits to air quality compared to fossil fuel generation facilities with best available control technology (BACT). Proposed production and emission savings are as follows:

Wind Generating Facility (150 MW)
Annual production: 460,000,000 KWh
Reduced oil/gas consumption: 540,000 bbls equiv.

Emission Savings

SO2:	1,315 tons
CO2:	250,000 tons
NO:	840 tons

B. **Visual:** The proposed sites are remote with sparse vegetation at an elevation of approximately between 5,000 and 6,000 feet. Existing dirt roads serve apparent mining activities, service microwave towers, and other facilities. Low voltage distribution lines provide electrical service to these towers and traverse the area.

The unincorporated communities of Jean, Goodsprings, and Sandy Valley would be in the closest proximity to the project. Turbines would be erected in rows along the ridges on tubular steel poles 240 feet high. From one to two miles, these towers may be visible from the valley floor. At greater distances, there should be little or no visible impact.

C. **Water Quality:** No impacts are expected. The project will not consume water during its operation nor will it discharge to the native surroundings.

Water required during construction will be trucked to the construction sites for concrete batching and fugitive dust control.

D. **Stream Impacts:** No such impacts are expected.

E. **Noise:** Wind turbines will produce noise from their rotating blades causing a slight increase over ambient noise levels in close proximity to the WTG's. Overall, noise levels will be masked by the wind itself and any mining activity. Any noise from the WTG's will not be noticeable beyond a quarter of a mile.

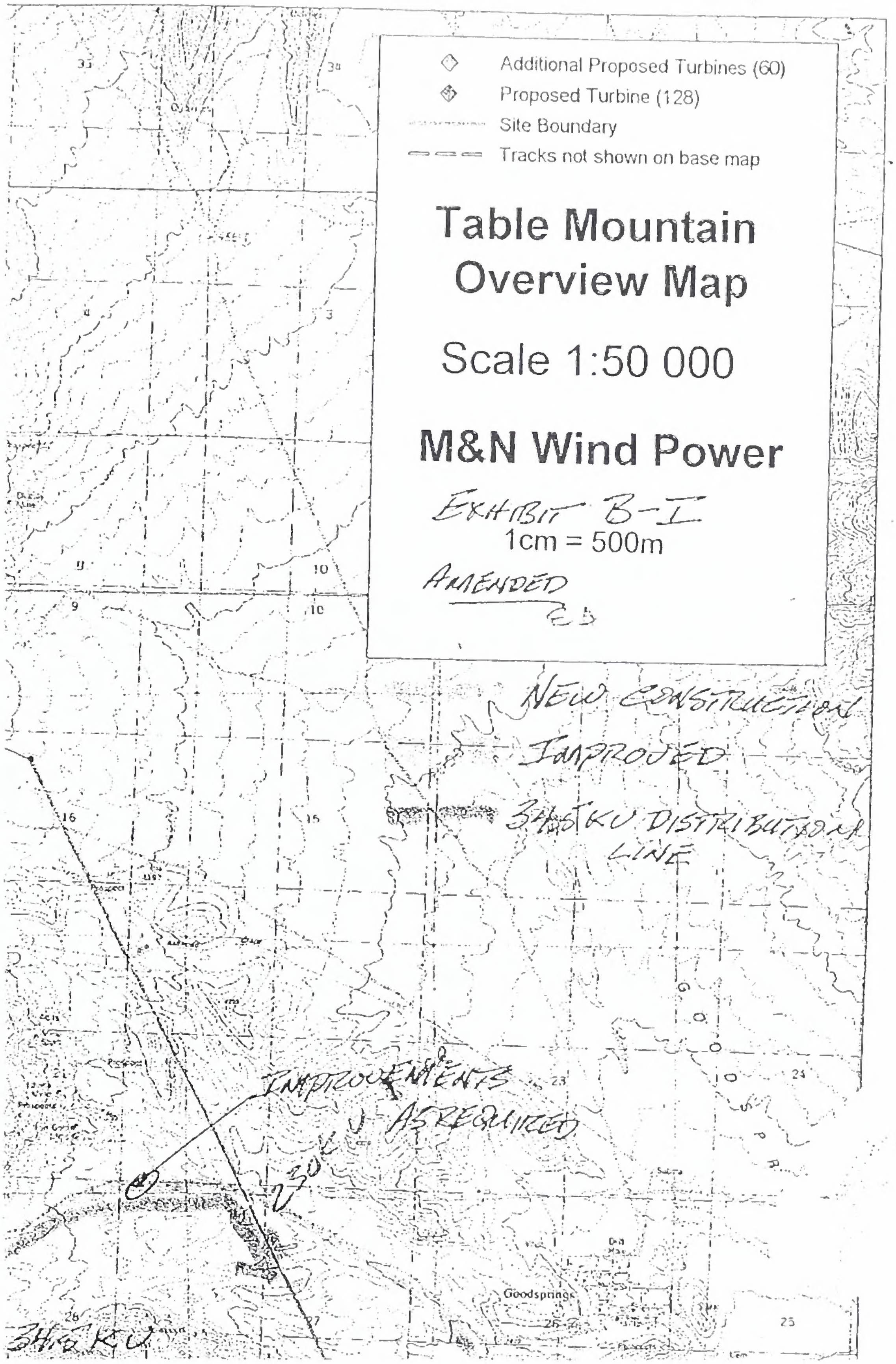
F. **Land/Soil/Vegetation:** Since WTG's are erected individually requiring a footprint of approximately 15 feet in diameter; actual land use will be minimal compared to the required wind regime site. As stated previously, road improvement will be required. Electrical connections to each WTG will be underground, as terrain will permit to a collector substation requiring a 10-acre site. Distribution facilities will parallel the rows of wind turbines. Collectively actual land for WTG sites, access roads, rights of way and substation should be less than 300 acres.

18. **Describe the probable effects that the proposed project will have on (a) population of fish, plant life, wildlife, marine life, including threatened and endangered species and (b) marine mammals, including hunting capturing, collecting, or killing these animal:** The proposed sites area remote and devoid of any water ways which present no impacts to fish/marine wildlife. From our cursory inspection of the sites, it does not appear any known threatened or endangered specifies is impacted. From our limited survey, Big Horn sheep migrate through the area. The WTG's pose no restriction to their movement. Any bird migration will do so at higher altitudes far above the WTG rotors. We do not expect avian mortality impacts.

I HEREBY CERTIFY that I am of legal age and authorize to do business in the state that I have personally examined the information in the application and believe that the information submitted is correct to the best of my knowledge.

Sebastian J Nola

Sebastian J. Nola, Vice-President
Table Mountain Wind Co. LLC
(M & N Wind Power, Inc.)
4225 Executive Square, Suite 1650
La Jolla, CA 92037
Phone (858) 558-1550; FAX (858) 558-2672



◇ Additional Proposed Turbines (60)
◈ Proposed Turbine (128)
┈┈ Site Boundary
— — Tracks not shown on base map

Table Mountain Overview Map

Scale 1:50 000

M&N Wind Power

EXHIBIT B-I

1cm = 500m

AMENDED

EB

"Engineering with Distinction"

ELECTRICAL CONSULTANTS, INC

CORPORATE OFFICE: 1127 ALDERSON AVE., BILLINGS, MT 59102-4217 • PHONE: 406-259-9933 • FAX: 406-259-3441 • EMAIL ADDRESS: eciblgs@elec-cons.com

March 27, 2001

Ms. Anna Wharton
U.S Department of Interior
Bureau of Land Management-
Las Vegas Nevada Office
4765 Vegas Drive
Las Vegas, NV 89108

RECEIVED
Bureau of Land Management
07:30
MAR 27 2001
LAS VEGAS
FIELD OFFICE
Las Vegas, Nevada

RE: VEA/M&N Wind Power-Table Mountain Project

Dear Anna:

Enclosed you will find the Application for Transportation and Utility Systems and Facilities on Federal Lands, Standard Form 299, requesting the amendment of Authorization No. N-57100. This right-of-way request is for a new 230 kV substation delivery point located southwest of Goodsprings, NV. The purpose for this delivery point is to accommodate proposed wind generation being developed by the M&N Wind Power group.

Also included with this submittal is a complete Plan of Development identifying the proposed facilities, including a conceptual general arrangement plan, as well as an enlarged Site Topo Plan, depicting the project location. For your information, we are also including a copy of the Southern Transmission System map, which identifies all projects currently being planned and/or evaluated by Valley Electric Association.

It is our understanding that work associated with the environmental impact studies for the proposed project will be included as part of the overall Environmental Impact Statement for the proposed Table Mountain Wind Generation Development project. Consequently, environmental work associated directly with construction of the proposed VEA substation will be included with the proposed Table Mountain project.

If you require any additional information, please do not hesitate to contact either myself or Mr. Bill Matheson, VEA.

Sincerely,

Dale M. Broveak

Dale M. Broveak, E.E.

DMB:mb
Enclosures
xc: R.L. McComish, P.E.
Bill Matheson, P.E., VEA
Sebastian Nola, P.E., M&N Wind Power

BILLINGS OFFICE:
1127 ALDERSON AVENUE
BILLINGS, MT 59102
PHONE: 406-259-9933
FAX: 406-259-3441
EMAIL: eciblgs@elec-cons.com

SALT LAKE CITY OFFICE:
1410 SOUTH 600 WEST
WOODS CROSS, UT 84087
PHONE: 801-292-9954
FAX: 801-292-9177
EMAIL: ecislc@utah-inter.net

TUCSON OFFICE:
7493 N. ORACLE RD. # 203
TUCSON, AZ 85704
PHONE: 520-219-9933
FAX: 520-219-9949

MADISON FIELD OFFICE:
2215 REGENT STREET
MADISON, WI 53705
PHONE: 608-231-9933
FAX: 608-231-9920

TANDARD FORM 299 (1/99)
rescribed by DOI/USDA/DOT
L. 96-487 and Federal
egister Notice 5-22-95

APPLICATION FOR TRANSPORTATION AND UTILITY SYSTEMS AND FACILITIES ON FEDERAL LANDS

RECEIVED
Bureau of Land Management
07:30
MAR 27 2001
LAS VEGAS
FIELD OFFICE
Las Vegas, Nevada

FORM APPROVED
OMB NO. 1004-0060
Expires: December 31, 2001

FOR AGENCY USE ONLY

Application Number

Date filed

NOTE: Before completing and filing the application, the applicant should completely review this package and schedule a preapplication meeting with representatives of the agency responsible for processing the application. Each agency may have specific and unique requirements to be met in preparing and processing the application. Many times, with the help of the agency representative, the application can be completed at the preapplication meeting.

1. Name and address of applicant *(include zip code)*

Valley Electric Association
Attn: Bill Matheson, P.E.
800 E. Highway 372, PO Box 237
Pahrump, NV 89041

2. Name, title, and address of authorized agent if different from Item 1 *(include zip code)*

3. TELEPHONE (area code)

Applicant
(775) 727-5312

Authorized Agent

4. As applicant are you? *(check one)*

a. ☐ Individual
b. ☐ Corporation*
c. ☒ Partnership/Association*
d. ☐ State Government/State Agency
e. ☐ Local Government
f. ☐ Federal Agency

* *If checked, complete supplemental page*

5. Specify what application is for: *(check one)*

a. ☐ New authorization
b. ☐ Renewing existing authorization No.
c. ☒ Amend existing authorization No. N-57100
d. ☐ Assign existing authorization No.
e. ☐ Existing use for which no authorization has been received*
f. ☐ Other*

* *If checked, provide details under Item 7*

6. If an individual or partnership are you a citizen(s) of the United States? ☐ Yes ☐ No

7. Project description *(describe in detail)*: (a) Type of system or facility, *(e.g., canal, pipeline, road)*; (b) related structures and facilities; (c) physical specifications *length, width, grading, etc.)*; (d) term of years needed; (e) time of year of use or operation; (f) Volume or amount of product to be transported; (g) duration and timing of construction; and (h) temporary work areas needed for construction *(Attach additional sheets, if additional space is needed.)*

230 kV Substation located adjacent to the existing Pahrump to Mead 230 kV transmission line (Authorization No. N-57100). This project is part of the proposed wind generation project in the Table Mountain area. Developers of the wind generation project have requested interconnection facilities with VEA for the purpose of delivering energy to the power grid. The requested site is 10 acres, which includes the substation, access roads and construction work area. Construction of the project is scheduled to be in concurrence with construction of the development of wind generation. The project site is located south-southwest of Goodsprings, NV, South of Highway 161 in Section 34 & 35, Township 24S, Range 58E. Refer to Plan of Development of additional details.

8. Attach a map covering area and show location of project proposal

9. State or local government approval: ☐ Attached ☐ Applied for ☐ Not required

0. Nonreturnable application fee: ☐ Attached ☐ Not required

1. Does project cross international boundary or affect international waterways? ☐ Yes ☒ No *(If "yes," indicate on map)*

2. Give statement of your technical and financial capability to construct, operate, maintain, and terminate system for which authorization is being requested.

Valley Electric Association is an electrical distribution association incorporated in the state of Nevada. VEA currently owns, operates and maintains 85 miles of 230 kV line and 187 miles of 138 kV transmission line located primarily in southwestern Nevada. In addition, VEA owns, operates and maintains nine (9) 138 or 230 kV substations. VEA's manager of engineering is a registered engineer in the State of Nevada. In addition, VEA's consulting engineer has several engineers registered in the state.

tinued on page 2)

This form is authorized for local reproduction.

13a. Describe other reasonable alternative routes and modes considered.

Project site is approximately 1 mile east of proposed generation on Table Mountain and directly adjacent to VEA's existing 230 kV transmission line. Other options included construction of substation facilities on top of Table Mountain.

b. Why were these alternatives not selected?

Alternatives required construction of a 230 kV switchyard adjacent to the existing 230 kV line and construction of 230 kV transmission lines from the new switchyard to a substation on top of Table Mountain.

c. Give explanation as to why it is necessary to cross Federal Lands.

All alternatives are located on Federal lands.

14. List authorizations and pending applications filed for similar projects which may provide information to the authorizing agency. *(Specify number, date, code, or name)*

VEA is currently working on transmission projects between Vista Substation and NPC Northwest Sub. Additional projects include possible wind generation on the NIS. In addition, VEA has been contacted by other Independent Power Producers proposing generation in the Sandy-Goodsprings-Jean areas. Additional facilities associated with these projects have not been defined, but may include construction of transmission facilities to NPC Arden or WAPA Mead Substations.

15. Provide statement of need for project, including the economic feasibility and items such as: (a) cost of proposal *(construction, operation, and maintenance)*; (b) estimated cost of next best alternative; and (c) expected public benefits.

The Table Mountain generation provides additional generation resources to help meet demand for electrical energy in the region. Except for construction of the proposed substation facilities, the project utilizes transmission capacity either existing within the current system or otherwise planned improvements.

16. Describe probable effects on the population in the area, including the social and economic aspects, and the rural lifestyles.

There will be a short-term need for construction personnel as well as increased business for local hotels, restaurants and businesses associated directly with construction of the substation.

17. Describe likely environmental effects that the proposed project will have on: (a) air quality; (b) visual impact; (c) surface and ground water quality and quantity; (d) the control or structural change on any stream or other body of water; (e) existing noise levels; and (f) the surface of the land, including vegetation, permafrost, soil, and soil stability.

Air quality will be impacted slightly during construction phases only. Visual impacts of the substation will be considered during all phases of design. Surface disturbance will occur in the general vacinity of the substation including access roads.

18. Describe the probable effects that the proposed project will have on (a) populations of fish, plantlife, wildlife, and marine life, including threatened and endangered species; and (b) marine mammals, including hunting, capturing, collecting, or killing these animals.

Construction of the substation will affect plant and wildlife in the areas involving surface disturbance.

19. State whether any hazardous material, as defined in this paragraph, will be used, produced, transported or stored on or within the right-of-way or any of the right-of-way facilities, or used in the construction, operation, maintenance or termination of the right-of-way or any of its facilities. "Hazardous material" means any substance, pollutant or contaminant that is listed as hazardous under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended, 42 U.S.C. 9601 et seq., and its regulations. The definition of hazardous substances under CERCLA includes any "hazardous waste" as defined in the Resource Conservation and Recovery Act of 1976 (RCRA), as amended, 42 U.S.C. 9601 et seq., and its regulations. The term hazardous materials also includes any nuclear or byproduct material as defined by the Atomic Energy Act of 1954, as amended, 42 U.S.C. 2011 et seq. The term does not include petroleum, including crude oil or any fraction thereof that is not otherwise specifically listed or designated as a hazardous substance under CERCLA Section 101(14), 42 U.S.C. 9601(14), nor does the term include natural gas.

Modern substation equipment includes relatively large amounts of insulating oil associated with instrument and power transformers as well as SF6 gas in breakers. Equipment will be closely monitored and corrective actions taken in the event of fluid or gas leaks.

20. Name all the Department(s)/Agency(ies) where this application is being filed.

Department of Interior, Bureau of Land Management

I HEREBY CERTIFY, That I am of legal age and authorized to do business in the State and that I have personally examined the information contained in the application and believe that the information submitted is correct to the best of my knowledge.

Signature of Applicant Bill	Date 3/28/01

Title 18, U.S.C. Section 1001 and Title 43 U.S.C. Section 1212, make it a crime for any person knowingly and willfully to make to any department or agency of the United States any false, fictitious, or fraudulent statements or representations as to any matter within its jurisdiction.

SUPPLEMENTAL

NOTE: The responsible agency(ies) will provide additional instructions	CHECK APPROPRIATE BLOCK	
I - PRIVATE CORPORATIONS	ATTACHED	FILED*
a. Articles of Incorporation	☐	☐
b. Corporation Bylaws	☐	☐
c. A certification from the State showing the corporation is in good standing and is entitled to operate within the State.	☐	☐
d. Copy of resolution authorizing filing	☐	☐
e. The name and address of each shareholder owning 3 percent or more of the shares, together with the number and percentage of any class of voting shares of the entity which such shareholder is authorized to vote and the name and address of each affiliate of the entity together with, in the case of an affiliate controlled by the entity, the number of shares and the percentage of any class of voting stock of that affiliate owned, directly or indirecty, by that entity, and in the case of an affiliate which controls that entity, the number of shares and the percentage of any class of voting stock of that entity owned, directly or indirectly, by the affiliate.	☐	☐
previous applications.	☐	☐
g. If application is for an oil and gas pipeline, identify all Federal lands by agency impacted by proposal.	☐	☐
II- PUBLIC CORPORATIONS		
a. Copy of law forming corporation	☐	☐
b. Proof of organization	☐	☐
c. Copy of Bylaws	☐	☐
d. Copy of resolution authorizing filing	☐	☐
e. If application is for an oil or gas pipeline, provide information required by Item "I-f" and "I-g" above.	☐	☐
III - PARTNERSHIP OR OTHER UNINCORPORATED ENTITY		
a. Articles of association, if any	☐	☐
b. If one partner is authorized to sign, resolution authorizing action is	☐	☐
c. Name and address of each participant, partner, association, or other	☐	☐
d. If application is for an oil or gas pipeline, provide information required by Item "I-f" and "I-g" above.	☐	☐

* If the required information is already filed with the agency processing this application and is current, check block entitled "Filed." Provide the file identification information *(e.g., number, date, code, name)*. If not on file or current, attach the requested information.

DATA COLLECTION STATEMENT

The Federal agencies collect this information from applicants requesting right-of-way, permit, license, lease, or certifications for the use of Federal lands.

Federal agencies use this information to evaluate your proposal.

No Federal agency may request or sponsor, and you are not required to respond to a request for information which does not contain a currently valid OMB Approval Number.

BURDEN HOURS STATEMENT

The public burden for this form is estimated to vary from 30 minutes to 25 hours per response, with an average of 2 hours per response, including the time for reviewing instructions, gathering and maintaining data, and completing and reviewing the form. Direct comments regarding the burden estimate or any other aspect of this form to: U.S. Department of the Interior, Bureau of Land Management, Information Clearance Officer (W0-630), 1849 C Street, Mail Stop 401LS, Washington, D.C. 20240

A reproducible copy of this form may be obtained from the Bureau of Land Management, Division of Lands, 1620 L Street, Rm. 1000LS, Washington, D.C. 20036.

APPLICATION FOR TRANSPORTATION AND UTILITY SYSTEMS AND FACILITIES ON FEDERAL LANDS

GENERAL INFORMATION
ALASKA NATIONAL INTEREST LANDS

This application will be used when applying for a right-of-way, permit, license, lease, or certificate for the use of Federal lands which lie within conservation system units and National Recreation or Conservation Areas as defined in the Alaska National Interest Lands Conservation Act. Conservation system units include the National Park System, National Wildlife Refuge System, National Wild and Scenic Rivers System, National Trails System, National Wilderness Preservation System, and National Forest Monuments.

Transportation and utility systems and facility uses for which the application may be used are:

1. Canals, ditches, flumes, laterals, pipes, pipelines, tunnels, and other systems for the transportation of water.
2. Pipelines and other systems for the transportation of liquids other than water, including oil, natural gas, synthetic liquid and gaseous fuels, and any refined product produced therefrom.
3. Pipelines, slurry and emulsion systems, and conveyor belts for transportation of solid materials.
4. Systems for the transmission and distribution of electric energy.
5. Systems for transmission or reception of radio, television, telephone, telegraph, and other electronic signals, and other means of communications.
6. Improved rights-of-way for snow machines, air cushion vehicles, and all-terrain vehicles.
7. Roads, highways, railroads, tunnels, tramways, airports, landing strips, docks, and other systems of general transportation.

This application must be filed simultaneously with each Federal department or agency requiring authorization to establish and operate your proposal.

In Alaska, the following agencies will help the applicant file an application and identify the other agencies the applicant should contact and possibly file with:

Department of Agriculture
Regional Forester, Forest Service (USFS)
Federal Office Building, P.O. Box 21628
Juneau, Alaska 99802-1628
Telephone: (907) 586-7847 *(or a local Forest Service Office)*

Department of the Interior
Bureau of Indian Affairs (BIA)
Juneau Area Office
9109 Mendenhall Mall Road, Suite 5, Federal Building Annex
Juneau, Alaska 99802
Telephone: (907) 586-7177

Bureau of Land Management (BLM)
222 West 7th Ave., Box 13
Anchorage, Alaska 99513-7599
Telephone: (907) 271-5477 *(or a local BLM Office)*

National Park Service (NPS)
Alaska Regional Office 2525 Gambell St., Rm. 107
Anchorage, Alaska 99503-2892
Telephone: (907) 257-2585

U.S. Fish & Wildlife Service (FWS)
Office of the Regional Director
1011 East Tudor Road
Anchorage, Alaska 99503
Telephone: (907) 786-3440

Note-Filings with any Interior agency may be filed with any office noted above or with the: Office of the Secretary of the Interior, Regional Environmental Officer, Box 120, 1675 C Street, Anchorage, Alaska 99513.

(For supplemental, see page 4)

Department of Transportation
Federal Aviation Administration
Alaska Region AAL-4, 222 West 7th Ave., Box 14
Anchorage, Alaska 99513-7587
Telephone: (907) 271-5285

NOTE - The Department of Transportation has established the above central filing point for agencies within that Department. Affected agencies are: Federal Aviation Administration (FAA), Coast Guard (USCG), Federal Highway Administration (FHWA), Federal Railroad Administration (FRA).

OTHER THAN ALASKA NATIONAL INTEREST LANDS

Use of this form is not limited to National Interest Conservation Lands of Alaska.

Individual departments/agencies may authorize the use of this form by applicants for transportation and utility systems and facilities on other Federal lands outside those areas described above.

For proposals located outside of Alaska, applications will be filed at the local agency office or at a location specified by the responsible Federal agency.

SPECIFIC INSTRUCTIONS
(Items not listed are self-explanatory)

Item

7 Attach preliminary site and facility construction plans. The responsible agency will provide instructions whenever specific plans are required.

8 Generally, the map **must** show the section(s), township(s), and range(s) within which the project is to be located. Show the proposed location of the project on the map as accurately as possible. Some agencies require detailed survey maps. The responsible agency will provide additional instructions.

9, 10, and 12 - The responsible agency will provide additional instructions.

13 Providing information on alternate routes and modes in as much detail as possible, discussing why certain routes or modes were rejected and why it is necessary to cross Federal lands will assist the agency(ies) in processing your application and reaching a final decision. Include only reasonable alternate routes and modes as related to current technology and economics.

14 The responsible agency will provide instructions.

15 Generally, a simple statement of the purpose of the proposal will be sufficient. However, major proposals located in critical or sensitive areas may require a full analysis with additional specific information. The responsible agency will provide additional instructions.

16 through 19 - Providing this information in as much detail as possible will assist the Federal agency(ies) in processing the application and reaching a decision. When completing these items, you should use a sound judgment in furnishing relevant information. For example, if the project is not near a stream or other body of water, **do not** address this subject. The responsible agency will provide additional instructions.

Application must be signed by the applicant or applicant's authorized representative.

If additional space is needed to complete any item, please put the information on a separate sheet of paper and identify it as "Continuation of Item."

Valley Electric Association
Pahrump, Nevada

TABLE MOUNTAIN SUBSTATION PROJECT

CLARK COUNTY, NEVADA

PLAN OF DEVELOPMENT

"Engineering with Distinction"

ECI ELECTRICAL CONSULTANTS, INC.
BILLINGS MONTANA

Valley Electric Association
Pahrump, Nevada

TABLE MOUNTAIN SUBSTATION PROJECT

CLARK COUNTY, NEVADA

PLAN OF DEVELOPMENT

Prepared by:

ELECTRICAL CONSULTANTS, INC.
1127 Alderson Avenue
Billings, MT 59102

March, 2001

RECEIVED
Bureau of Land Management
07:30
MAR 27 2001
LAS VEGAS
FIELD OFFICE
Las Vegas, Nevada

PLAN OF DEVELOPMENT

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- 4.3 Abandonment and Reclamation

5.0 RIGHT-OF-WAY LOCATION

6.0 PROJECT SCHEDULE

LIST OF DRAWINGS:

General Arrangement Plan............18-D-P210
Area Plan – Topo Map 18-D-P211
Site Plan – Topo Map 18-D-P212
Southern Transmission System 18-E-M001

1.0 INTRODUCTION

Plan of Development

M & N Wind Power has approached Valley Electric Association (VEA) regarding the interconnection of wind generation on the Table Mountain site. M & N Wind Power will complete construction of all wind turbines, distribution collection systems and access road requirements for the wind generation site. VEA responsibilities include interconnecting the generation with the existing Pahrump to Mead 230 kV transmission line. Interconnection facilities include 230 kV switching and transformation equipment. VEA's consultant, Electrical Consultants, Inc. (ECI), has performed interconnection studies associated with the proposed generation and has identified transmission and substation improvements associated with the proposed action. These impacts are more fully identified in the Project Description (Section 3.0) of this Plan of Development. The project location is located approximately 1 mile east of the proposed Table Mountain wind generation site, adjacent to the existing Pahrump to Mead 230 kV line. A drawing representing the proposed project is attached to this document. As proposed, the project is located on federal lands. Prior to construction on federal land, VEA is required to submit an application to amend the existing Pahrump to Mead authorization No. N-57100. The application is being submitted to the lead of federal agency, the Bureau of Land Management (BLM). This Plan of Development describes the proposed project, the purpose and need and potential impacts to environmental resources.

In addition, the Plan of Development for the Table Mountain Substation is submitted concurrently with the application for wind generation in the area. As such, a single Environmental Impact Statement (EIS) identifying impacts to resources located on federal lands will be completed encompassing the overall project.

2.0 PURPOSE AND NEED

Joint Engineering Studies

M & N Wind Power and Valley Electric Association have completed joint engineering studies to determine the impacts to existing VEA transmission system resulting from development of wind generation at Table Mountain. These studies indicate that the proposed generation utilizes surplus capacity within VEA's transmission system, including existing facilities and otherwise planned improvements.

For information purposes, the following discussion is presented to identify otherwise planned improvements to VEA's electrical system. As presented in previous documents, which have been submitted to the BLM, the Pahrump Valley has experienced unprecedented population growth. This has resulted in an accelerated increase of electrical demand for residential and commercial use. The existing electrical system constructed 30 years ago, which serves this area, is not sufficient to meet present and future load growth requirements. This unprecedented growth is coupled with an additional concern over reliability of the existing system and associated maintenance problems for handling of power outages. Otherwise planned improvements, which VEA has either received authorization or are applying for authorization from the Bureau of Land Management, include:

Otherwise Planned Improvements

- Vista – Mercury 138/230 kV Line (BLM Serial # N-62861)
- Continuation of Vista – Mercury 138/230 kV Line to Northwest Substation (currently discussing with BLM)

Additional facilities currently planned, but not requiring authorization from the BLM.

- Gamebird – Thousandaire 138 kV Transmission (Under construction-located entirely on private properties)
- Thousandaire – Vista 138 kV Transmission (scheduled for construction in 2002 - located entirely on private properties)

Additional Facilities

Specific facilities associated with the Table Mountain project include the 230 kV Substation, located directly east of the Table Mountain site. Other impacts to VEA's electrical system beyond the aforementioned, would include the possible change in selection of conductor for new transmission lines, to optimize line loading and system losses associated with the interconnected generation. In addition, ongoing studies, performed by Nevada Power Company have also impacted studies previously performed by VEA. As a result, these studies will need to be re-evaluated to verify that the current 500 kV improvements, proposed by NPC, will not negatively impact VEA's transmission system.

3.0 PROJECT DESCRIPTION

The Table Mountain 230 kV Substation Project is proposed to connect M & N Wind Power's Generator Collector System to VEA's Mead to Pahrump 230 kV transmission line. Wind power

generated on Table and Shenandoah Mountains will be transmitted to the Table Mountain Substation where it will be transformed to 230 kV and placed on the transmission grid.

Field investigation has been conducted by VEA, ECI and M & N Wind Power to determine a preliminary substation site. The proposed site is shown on the Area Plan – Topo Map, drawing 18-D-P211.

The proposed site is located near the intersection of the Mead to Pahrump 230 kV transmission line and State Highway 161, approximately 1.3 miles from Goodsprings, Nevada.

The proposed facility is a modern low-profile substation comprised of four major components: the collector structure, step-up transformers, 230 kV switchyard and a control building.

The collector structure consists of a main-and-transfer bus, disconnect switches, power circuit breakers, and takeoff structures. Power will be delivered to the collector structure via four overhead circuits terminating on the takeoff structures. Under normal operating conditions, two circuits will be combined and fed to each step-up transformer. Under contingency condition, up to all four circuits could be combined and fed to a single transformer.

The step-up transformers will have a base rating of 60 MVA. The units will be fan cooled with two stages of fans, which increase the rating to 100 MVA. Fans are thermostatically controlled and will only run during periods of continuous high generator output.

The 230 kV Switchyard consists of a four position ring bus, disconnect switches, power circuit breakers, and the 230 kV takeoff structures. The existing Mead to Pahrump Transmission Line will be tapped into the switchyard where power flowing through the transformers will be added.

The control building will house protective relaying and control equipment for the substation. It will also contain communication equipment for protective relaying and wind generator control purposes. The control building may also contain office space and a small restroom.

4.0 PROJECT ACTIVITIES

4.1 Construction

The proposed project would be constructed using conventional methods. A description of the proposed conventional methods is presented below:

Construction of the substation would generally follow a sequential set of activities performed by specialized crews. Construction activities would include:

Surveying

1. Surveying – Surveying includes locating the project site and tying it to section corners. It also includes creating a detailed comprehensive topographic plan of the site and surrounding areas, which will be used to determine earthwork requirements. After the site has been prepared, a survey will be used to establish baselines, which will be used to determine the locations of structures and equipment.

Geotechnical Investigation

2. Geotechnical Investigation – After the project site has been located, a geotechnical investigation will be performed to determine soil characteristics. This data will be used to design foundations for structures and equipment. During the investigation, several 6" diameter holes will be drilled up to 30 feet deep. These holes will be backfilled immediately with soil removed from the holes.

Site Work

3. Site Work – Site work includes all of the work necessary to prepare the site for construction. The site will be cleared of all vegetation and organic material. This material will be disposed of as approved by the BLM. For BLM identified species of concern, BLM removal procedures will be used.

   The site will then be graded to a manageable slope, with 1% grade being optimum and 3% grade being maximum. The area surrounding the site will be graded to form a smooth transition between the site and surrounding area. Where steep transitions are required, erosion control techniques will be used.

   The substation will be encompassed by a 7 foot high chain link fence with an additional foot of barbed wire on bayonet arms. Where possible, all construction materials and equipment will be stored inside the fence. However, delivery schedules of major equipment may necessitate storage outside the fence.

Substation Erection

4. Substation Erection – The substation will be erected using modern construction techniques. Concrete foundations will be required for all equipment and structures. Structures will be galvanized steel. Bus work will be aluminum pipe and aluminum cable. All substation insulators and bushings will be light gray porcelain.

   PVC conduits will be buried to facilitate the routing of control cables to equipment. Station lighting will be installed per National Electrical Safety Code requirements. Lights will not be on automatic control and will be lit only when personnel are inside the substation.

Substation Grounding

5. Substation Grounding – A grounding system will be designed per available fault current at the substation that meets or exceeds RUS standards. The system will be comprised of a grid of bare copper wire direct-buried in the ground approximately 18 inches below the surface. Copper leads will be attached to all structures and equipment. The perimeter fence will be grounded at intervals of not more than 40 feet and at all gates. In addition, the ground grid will extend to 3 feet outside the fence to protect anyone who may come in contact with the fence. At the conclusion of construction, the entire substation will be covered with crushed rock surfacing suitable for substation use.

Transmission Line Work

6. Transmission Line Work – Transmission line work covered by this document includes only the work associated with tapping the Mead to Pahrump 230 kV transmission line into the substation. Two new full-tension deadends will be installed which will terminate the new Mead to Table Mountain and Table Mountain to Pahrump line segments. Conductor will then be strung to the takeoff structures inside the substation. These structures will require concrete caisson foundations. Transmission line work will be consistent with modern construction practices.

Clean-up

7. Post Construction Cleanup -- The Contractor will be required to have a continuous cleanup program throughout construction. The Contractor will restore land surrounding the substation to its pre-construction condition. Restoration will include the removal of deep ruts and the disposal of foreign objects such as: stumps, chunks of concrete, pile cut-off, materials, etc. Restoration includes recontouring and reseeding impacted areas with vegetation similar to the original, cleaning trash out of gullies and restoring terraces.

The Contractor will be required to keep a clean, work area and will have a covered dumpster on site to contain any trash that can be blown away. After completion of the project, a final walk-through will be completed by the Project Engineer. The Project Engineer will note any waste or material left on site and any ruts or terrain damage or vegetation disturbance that has not been repaired. The Contractor will be given this list and final payment will not be received until all items are completed.

4.2 Operation and Maintenance

O & M

Maintenance of the proposed project will occur continuously over the life of the project. All normal operation and maintenance activities will take place on the developed areas of the project site. The substation will be designed such that certain operations may be performed remotely.

4.3 Abandonment and Reclamation

At the end of the useful life of the proposed Table Mountain Substation, the equipment would either be replaced or removed. The useful life of the facility will be determined largely by the useful life of the wind generation project and system loads in the region.

Assuming the substation is abandoned at some point in the future, the areas disturbed during removal of the facilities would be restored in accordance with applicable regulations at that time and in accordance with federal agency requirements. The site would be re-graded as near as is feasible to its original condition. Native vegetation would also be re-introduced.

5.0 RIGHT-OF-WAY LOCATION

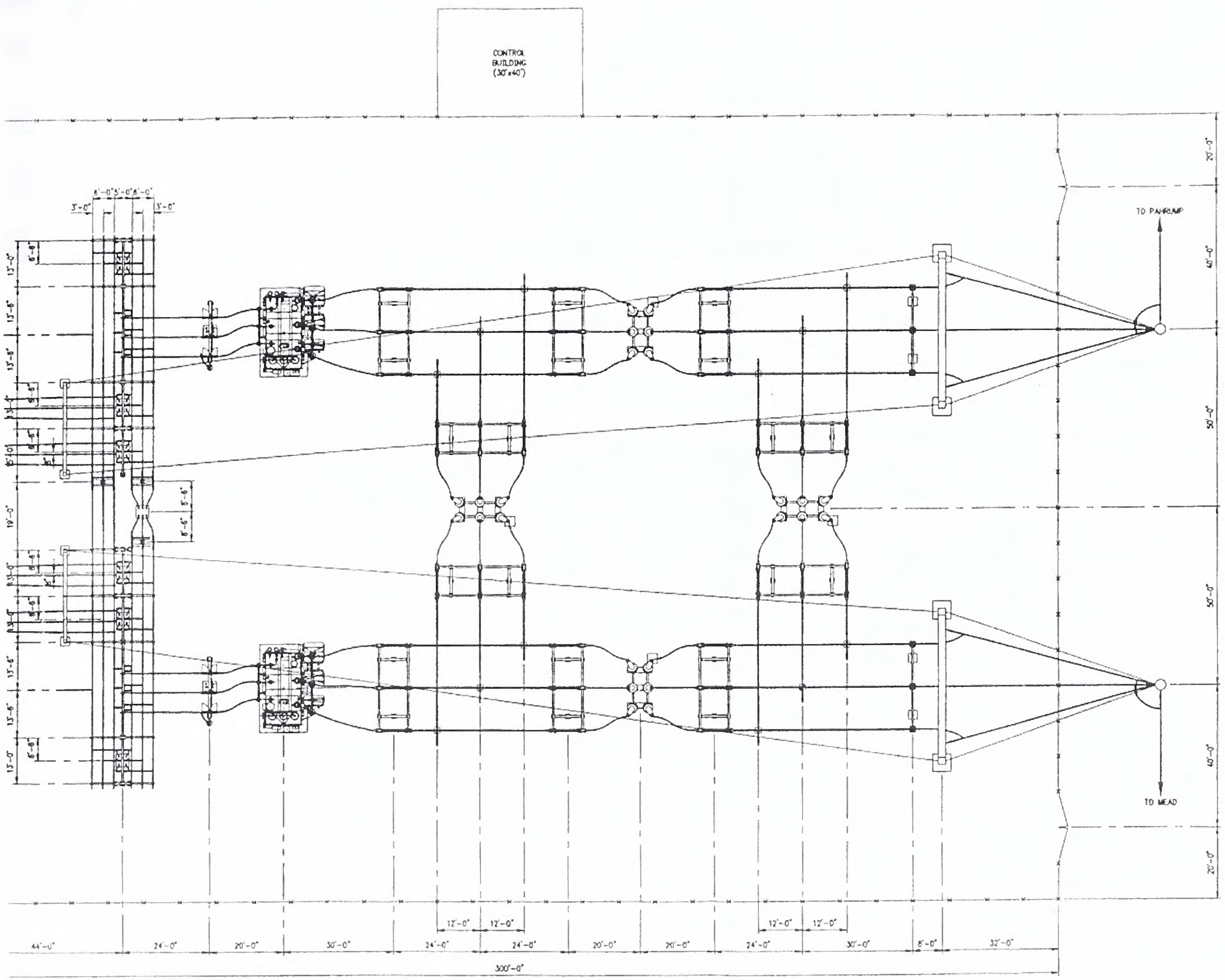
Right-of-Way Location

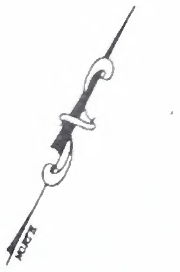
This right-of-way grant request amends the existing authorization No. N-57100 for the Mead to Pahrump Transmission line. The parcel in question is located in the Northeast corner of Section 34 and the Northwest corner of Section 35, Township 24S, Range 58E, Clark Co., Nevada. A legal description of the parcel has not yet been prepared. The requested parcel is 10 acres, with approximate boundaries shown on drawing 18-D-P212.

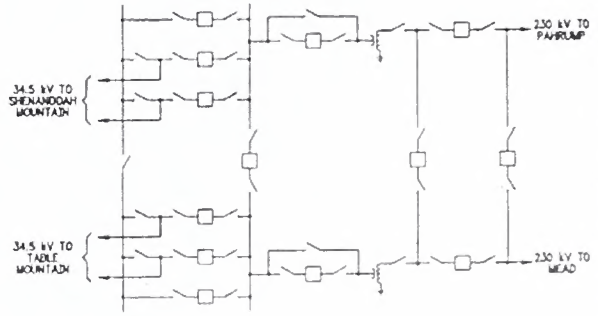
6.0 PROJECT SCHEDULE

Project Schedule

The Project Schedule for the Table Mountain Substation has been broken out into three phases including environmental permitting, project construction and online service. It is anticipated that in order to obtain all of the required permitting including completion of the final EIS will require 7 to 10 months and be completed by late 2001. It is assumed that development of the entire Table Mountain generation site will be included under a single EIS. Pending completion of the EIS, project construction could start in early 2002 with a construction period of approximately 4-6 months. Initial energization of the substation is anticipated during mid-2002 with an overall on-line service date of December 31, 2002. The schedule for the proposed project is entirely dependent upon improvements associated with the Table Mountain wind generation project and is not directly related to serving VEA consumers. Consequently, this schedule is subject to change based upon the M & N Wind Power Project Schedule.







SWITCHING DIAGRAM

STRUCTURE DESIGN CRITERIA

230 kV CLEARANCE:
LIVE PARTS: MIN Ø-G=71"
MIN Ø-Ø=89"

TO GRADE: 15'-0" (BUS)
27'-0" (DRIVEWAY)

34.5 kV CLEARANCE:
LIVE PARTS: MIN Ø-G=13"
MIN Ø-Ø=18"

10'-0" (BUS)
22'-0" (DRIVEWAY)

NO	VISION	DATE	BY	APR

TS, INC.

VALLEY ELECTRIC ASSOCIATION
PAHRUMP, NEVADA

M&N Wind Power

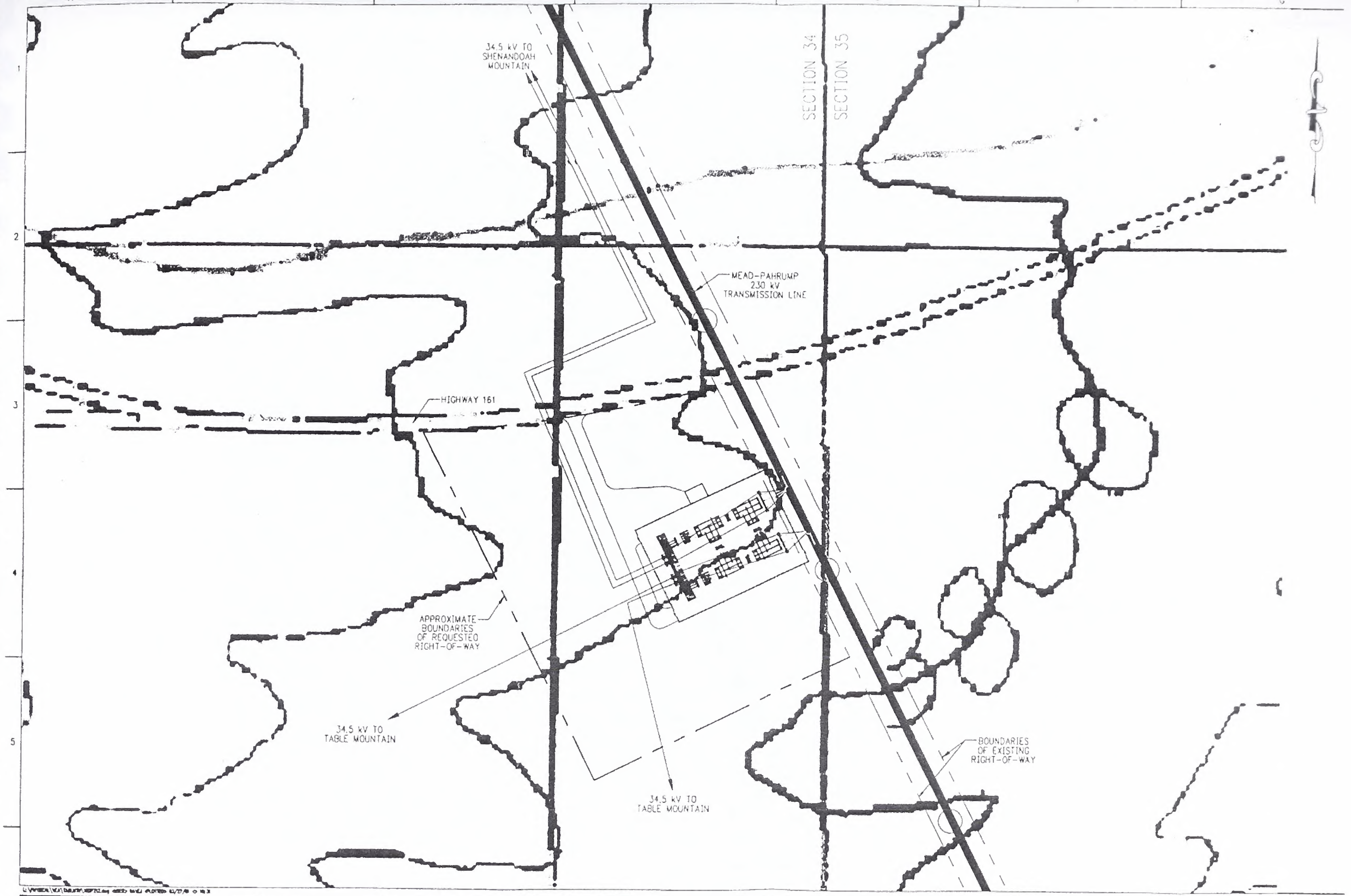
ENGINEERING RECORD		DATE
DRAWN	JRG	3-22-01
DESIGNED	BORMANN	3-22-01
CHECKED		
APPROVED		
DWG SCALE: 1/16"=1'-0"	PLT SCALE: 1:192	

TABLE MOUNTAIN 230–34.5 kV SUB.
GENERAL ARRANGEMENT
PLAN

FILE NO.: 18DP210

18-D-P210

REVISION NO.: 0



"Engineering with Distinction"
ECI ELECTRICAL CONSULTANTS, INC

NO | REVISION | DATE | BY | APR

VALLEY ELECTRIC ASSOCIATION
PAHRUMP, NEVADA

M&N Wind Power

ENGINEERING RECORD		DATE
DRAWN	ECI	3/01
DESIGNED	ECI	3/01
CHECKED		
APPROVED		
DWG SCALE: 1"=100'	PLT SCALE: 1:1	

TABLE MOUNTAI
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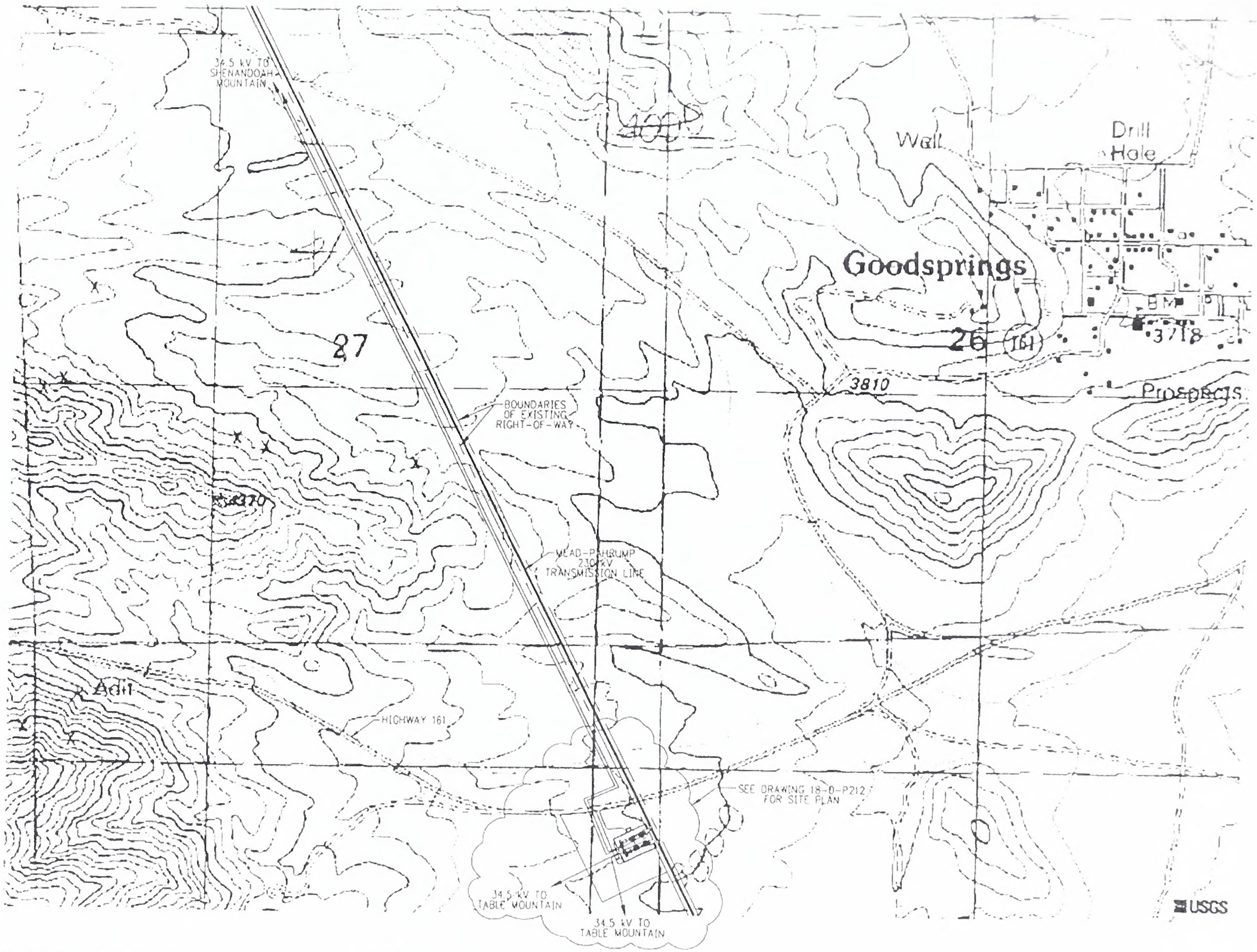

ECI ELECTRICAL CONSULTANTS, INC

NO	REVISION	DATE	BY	APR

VALLEY ELECTRIC ASSOCIATION
PAHRUMP, NEVADA

M&N Wind Power

	ENGINEERING RECORD	DATE
DRAWN	ECI	3/01
DESIGNED	ECI	3/01
CHECKED		
APPROVED		
DWG SCALE: 1"=500'	PLT SCALE: 1:1	

TABLE MOUNTAI
ARE
TO

FILE NO: 180P211

Appendix B

Clark County Road Standards

STREETS AND HIGHWAYS DOCUMENTS

Uniform Standard Specifications, Clark County Area

- Uniform Standard Specifications
  Table of Contents - Sections 101-503, 504-660, 701-729 **(Revised 05/17/01)**
  Index - A-C, D-O, P-R, S-Z **(Revised 05/17/01)**

- List of Revisions
  - 1997 Release - Revision Set I
  - 1999 Release - Revision Set II
  - 2000 Release - Revision Set
    - Table of Contents - Sections 101-503, 504-660, 701-729
    - Index - A-C, D-O, P-R, S-Z
  - Latest Revisions (January 1, 2001 Thru Present)
  - Proposed Revisions In Committee

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Last modified: August 03, 2001

STREETS AND HIGHWAYS DOCUMENTS

Uniform Standard Specifications and Drawings
Approved Revisions

In accordance with procedures adopted by the Regional Transportation Commission (RTC) on November 10, 1999, revisions to the Uniform Standard Specifications and Drawings for the Clark County Area, will be posted to the Internet and will be effective on the first day of the month following approval by the RTC. If you wish to be notified of future revisions to the specifications and drawings via FAX or e-mail, please complete the notification form provided on the previous page.

*Revised table of contents and index available for drawings and specifications.

January 1, 2002 -- No Changes

December 1, 2001

Specifications -- (RTC approved 11/8/01)

Section 401
"Plantmix Bituminous Pavements - General"
a) Subsection 401.02.01 - Revision to Marshall Design Criteria Table to change ESAL (Equivalent Single Axle Load) to TI (Traffic Index)
b) Subsection 401.03.12 - Revision to field density testing requirements including deleting the use of zinc stearate.

Section 705
"Aggregates for Bituminous Courses" - Subsection 705.03.01 - Revision to include new test methods (methylene blue, fine aggregate angularity, stripping, etc.) and change the requirements for fractured faces.

November 1, 2001 -- No Changes

October 1, 2001 -- No Changes

September 1, 2001 -- No Changes

August 1, 2001

Volume II Drawings -- (RTC approved 7/12/01)

No. 404.141
"Pull Box Foundation" - Replaces 1/2" rock requirement with the use of compacted native material or sand.

July 1, 2001

Volume I Drawings -- (RTC approved 6/14/01)

No. 254A
"Crosswalk Markings" - Eliminates the transverse markings from the current "ladder" type marking used. (City of Las Vegas excluded from the standard)

June 1, 2001

Specifications -- (RTC approved 5/17/01)

Section 208
"Trench Excavation and Backfill"
a) Subsection 208.02.08 - Revision to Type III table to add a #200 sieve gradation limit.
b) Subsection 208.03.02 - Revision to change the requirement for the use of crushed rock as a pipe bedding material.
c) Subsections 208.02.06, 208.03.02, 208.03.03, 208.03.04 and 208.03.05 - Revision to change references of flowable backfill to controlled low strength material (CLSM).
d) Subsection 208.03.05 - Revision to clarify the mechanical placement requirement for asphalt.

Section 505
"Reinforcing Steel" - Subsection 505.02.02 - Revision to clarify how rebar is sampled.

Section 629
"Water Distribution Facilities" - Subsection 629.02.24 - Revision to replace concrete specification with reference to Section 501, "Portland Cement Concrete".

Volume I Drawings

No. 502
"Trench Backfill - Unpaved Areas and Areas Outside Existing or Future Proposed Street Right-of-Way" - Revision to change the requirement for the use of crushed rock as a pipe bedding material, change references of flowable backfill to controlled low strength material (CLSM) and add Type III aggregate as backfill material.

No. 503
"Trench Backfill - Paved Areas (Streets with 60' or Less R/W)" - Revision to change the requirement for the use of crushed rock as a pipe bedding material, to change references of flowable backfill to controlled low strength material (CLSM), add Type

III aggregate as backfill material and to clarify the mechanical placement of asphalt.

No. 504
"Trench Backfill with Flowable Backfill Paved Areas (Streets Greater Than 60' R/W)" - Revision to change the requirement for the use of crushed rock as a pipe bedding material, to change references of flowable backfill to controlled low strength material (CLSM), add Type III aggregate as backfill material and to clarify the mechanical placement of asphalt.

No. 505
"Pipe Trench Bedding Methods" - Revision to change the requirement for the use of crushed rock as a pipe bedding material

Volume II Drawings

No. 404.1419
"Installation of Conduit" - Revision to change references of flowable backfill to controlled low strength material (CLSM) and to clarify the requirement for mechanical placement of asphalt

May 1, 2001

Specifications -- (RTC approved 4/12/01)

Section 610
"Slope and Channel Protection" - Subsection 610.02.04 - Revision to remove 500 revolution rotation from Percent of Wear Source Requirement.

April 1, 2001 -- No Changes

March 1, 2001

Specifications -- (RTC approved 2/8/01)

Section 508
"Piling" - Subsection 508.01.10 (b) - Revision to add specification for crosshole sonic logging of piles.

Section 701
"Portland Cement" - Revision to reduce the required minimum cement content in concrete used for precast products, pipe and box culverts, with zero slump mix design.

February 1, 2001 -- No Changes

January 1, 2001

Specifications -- (RTC approved 12/14/00)

Section 301
"Selected Material Base or Surface" - Subsection 301.03.01 - Revision to establish a tolerance for the preparation of subgrade.

Section 302
"Aggregate Base Courses" - Subsections 302.03.01 and 302.03.06 - Revisions to establish tolerances for the preparation of subgrade and aggregate base.

Section 401
"Plantmix Bituminous Pavements" - Subsections 401.01.02, 401.02.05, 401.03.04 and 401.03.12 - Revisions to establish pavement acceptance criteria and pavement structural design standards which are in accordance with AASHTO.

Section 613
"Concrete Curb, Walk, Gutters, Driveways and Alley Intersections" - Subsection 613.03.06 - Paragraphs five and seven removed.

Section 706
"Aggregate for Portland Cement Products" - Subsection 706.02.01 - revisions to aggregate grading table and the addition of alternative to the mix design submittal process using qualified mix designs available on the Internet.

Section 208 (208.03.02), Section 213 (213.02.10), Section 501 (501.03.05), Section 502 (502.01.01, 502.03.09, 502.04.01), Section 508 (508.03.10), Section 601 (601.05.01), Section 609 (609.03.02), Section 611 (611.02.01), Section 613 (613.01.01), Section 616 (616.03.01, 616.03.03), Section 617 (617.02.01), Section 618 (618.03.01), Section 621 (621.02.01), Section 623 (623G.03.06) Specifications revised to eliminate references to specific class of concrete.

Volume I Drawings -- (RTC approved 12/14/00)

No. 200
"Pavement Structure Design Guideline Chart for Major Collector and Arterial Roadways" - New drawing to provide design guidelines for street structural sections (corresponds to revisions made to Section 401 of the Specifications).

No. 200A
"Pavement Structure Design Chart for Minor Collector and Residential Roadways" - New drawing to provide design guidelines for street structural sections (corresponds to revisions made to Section 401 of the Specifications).

No. 209A
"Access Roads" - Additional drawing for access roads for use within PM-10 compliant areas only.

No. 210
"Private Street Sections" - Revision to allow gravel street sections within PM-10 compliant areas only.

Drawing Nos.: 214, 215, 216, 218, 219, 220, 221, 223, 224, 226, 226.1, 226.2,

227, 228, 234, 234.1, 235, 237, 238, 239, 240, 242, 252, 253, 401, 408, 411, 413, 414, 416, 505, 512, 513, 514, 516, 517
Drawings revised to eliminate reference to specific class of concrete.

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DIVISION II

CONSTRUCTION DETAILS

SECTION 201

CLEARING AND GRUBBING

DESCRIPTION

201.01.01 GENERAL: This work shall consist of clearing, grubbing, removing, and disposing of all vegetation and debris within the limits of construction, except such objects as are designated to remain or be removed in accordance with other sections of these specifications. This work shall also include the preservation from injury or defacement of all vegetation and objects designated to remain.

CONSTRUCTION

201.03.01 GENERAL: The Engineer will establish clearing limits and designate all trees, shrubs, plants, and other things to remain. Areas to be cleared will be as set forth in Subsection 201.03.02, "Areas to be Cleared." The Contractor shall preserve all things designated to remain. Paint required for cut or scarred surfaces of trees or shrubs selected for retention shall be an approved asphaltum base paint prepared especially for tree surgery. Subsection 107.21, "Dust Nuisance" shall be complied with.

201.03.02 AREAS TO BE CLEARED: Areas to be cleared shall be one or more of the following:

(a) The entire area upon which the project construction is to be performed to the width of the excavation and embankment slope lines.
(b) Ditch and dike areas to the width of the slope lines.
(c) Areas on which service roads or ramps, streets, approaches, and all other accessory roads and connections are to be constructed, such areas to extend to the width of the excavation and embankment slope lines.
(d) Designated material sites and designated borrow pits.
(e) Areas designated in the plans or Special Provisions.

201.03.03 CLEARING AND GRUBBING: Surface objects and trees, stumps, roots, and other protruding obstructions, designated for removal, shall be cleared or grubbed or both. Unless otherwise specified, the Contractor may leave stumps and nonperishable solid objects provided they do not extend more than six (6) inches (15 centimeters) above the ground line or low water level, and are a minimum of three (3) feet (1 meter) below subgrade or embankment slope.

The Engineer may permit sound stumps to be cut off not more than six (6) inches (15 centimeters) above the ground and to be left outside of the construction limits of cut and embankment areas, except in the area to be rounded at the top of backslopes where stumps are to be cut off flush with or below the surface of the final slope line.

Where feasible, trees shall be felled toward the center of the area to be cleared. Where trees cannot be felled without danger to traffic or injury to other trees, structures, or property, they shall be cut in sections from the top down.

There shall be no burning unless approval has been given in writing by the Clark County Air Pollution Control -- Air Pollution Control Officer and this approval concurred in by the Engineer. If perishable material is burned, it shall be burned under the constant care of competent watchmen at such times and in such a manner that anything designated to remain on the right-of-way, the surrounding forest cover, or other adjacent property will not be jeopardized. Burning shall be done in accordance with applicable laws, regulations and ordinances.

When permitted by the Engineer, materials, debris and perishable materials may be removed from the right-of-way and disposed of at locations off the project outside the limits of view from the project with the written permission of the property owner on whose property the materials and debris are placed. The Contractor shall make all necessary arrangements with property owners for obtaining suitable disposal locations and the cost involved shall be included in the unit price bid. Attention is directed to Subsection 107.14, "Disposal of Material Outside Right-of-Way."

Except in areas to be excavated, stump holes and other holes from which obstructions are removed shall be backfilled with suitable materials and compacted in accordance with Subsection 203.03.17, "Compaction, Dirt Embankment" or 203.03.18, "Compaction, Rock Embankment" if within the staked prism. Payment for backfilling and compacting will be considered subsidiary to other items of the work and no further compensation will be made therefor.

All merchantable timber in the clearing area shall become the property of the Contractor unless otherwise provided. Timber and debris may be stored or decked within the right-of-way only in areas approved by the Engineer and must be removed prior to final acceptance of the project.

Low hanging branches and unsound or unsightly branches on trees or shrubs designated to remain shall be removed as directed. Branches of trees extending over the road shall be trimmed to give a clear height of twenty (20) feet (6 meters) above the road surface. All trimming shall be done by skilled workmen and in accordance with good tree surgery practices.

Scalping shall include the removal of material such as brush, roots, sod, grass, residue of agricultural crops, sawdust, and decayed vegetable matter from the surface of the ground.

Unless otherwise permitted by the Engineer, the Contractor shall scalp areas where excavation or embankment is to be made; except that mowed sod need not be removed where the embankment to be constructed is four (4) feet (1.2 meters) or more in height to subgrade elevation.

METHOD OF MEASUREMENT

201.04.01 MEASUREMENT: Measurement will be by one or more of the following alternate methods:

(a) **Area Basis.** The work to be paid for will be the number of acres (hectares) and fractions thereof acceptably cleared or grubbed or both within the limits staked for clearing and grubbing by the Engineer. Unless otherwise specified, material sites, borrow pits, and areas not shown on the plans or not staked for clearing and grubbing will not be measured for payment.

(b) **Lump Sum Basis.** When the bid schedule contains a clearing and grubbing lump sum item, no measurement of area will be made.

(c) **Linear Basis.** When a linear unit quantity is shown on the bid schedule, the length will be measured along the construction centerline in stations or miles (meters or kilometers).

(d) **Individual Unit Basis.**

(1) The diameter of trees will be measured at a height of twenty-four (24) inches (61 centimeters) above the ground. Trees less than six (6) inches (15 centimeters) in diameter will be classed as brush.
(2) Stumps of over six (6) inches (15 centimeters) in diameter will be measured by individual count.

All measurements will be made in accordance with Subsection 109.01, "Measurement of Quantities."

BASIS OF PAYMENT

201.05.01 PAYMENT: The accepted quantities of clearing and grubbing measured as provided in Subsection 201.04.01, "Measurement," will be paid for at the contract prices as follows:

(a) **Area Basis.** The quantities determined will be paid for at the contract unit price bid per acre (hectare).

(b) **Lump Sum Basis.** When the bid schedule contains a lump sum item the contract lump sum price bid will be paid and shall be full compensation for the work.

(c) **Linear Basis.** When linear quantities are shown in the bid schedule, the quantities will be paid at the contract unit price bid for this item.

(d) **Individual Unit Basis.** When individual unit quantities are shown on the bid schedule, the accepted quantities will be paid for at the contract unit price bid for the respective items.

Where trees are designated for removal on a unit "each" basis, payment therefor will be for their complete removal unless stumps are permitted to remain as set forth in Subsection 201.03.03, "Clearing and Grubbing."

(e) **Exclusion.** When the bid schedule does not contain an estimated quantity or lump sum item for clearing and grubbing, the work will not be paid for directly, but will be considered as a subsidiary obligation of the Contractor under other contract items.

All payments will be made in accordance with Subsection 109.02, "Scope of Payment."

Payment will be made under:

PAY ITEM	**PAY UNIT**
Clearing and Grubbing	Acre (hectare), Station (30 meters), Miles (kilometers), Lump Sum
Remove Trees	Each
Remove Stumps	Each

SECTION 203

EXCAVATION AND EMBANKMENT

DESCRIPTION

203.01.01 GENERAL: This work shall consist of grading and excavating the roadway, excavating borrow pits, removing slide material, and excavating ditches and stream channels and satisfactorily disposing of all excavated material and all work necessary for the construction and completion of cuts, embankments, slopes, ditches, dikes, stream channels, approaches, parking areas, intersecting driveways and highways, and subsidiary work. Exceptions are slope rounding, structure excavation, or other separately designated pay items of work which are made a part of the contract. All work shall be in conformity with the alignment, grades, and cross sections shown on the plans or established by the Engineer.

203.01.02 GRADE TOLERANCE: Immediately prior to placing subsequent layers of material thereon, the grading plane shall conform to one of the following:

(1) When the material to be placed on the subgrade is to be paid for by the ton, the subgrade shall not vary more than 0.10 foot above or below the grade established by the Engineer.
(2) When the material to be placed on the subgrade is to be paid for by the cubic yard, the surface of the subgrade at any point shall not vary more than 0.05 foot above the grade established by the Engineer.

MATERIALS

203.02.01 ROADWAY EXCAVATION: Roadway excavation shall consist of all excavation involved in grading and constructing the roadway and appurtenances, irrespective of the nature or type of material encountered; except excavation designated as structure excavation, drainage excavation, channel, and borrow excavation when these items are provided as items of work under the contract. Dividing the project into construction stages shall not be construed as separate material classifications.

203.02.02 DRAINAGE EXCAVATION: Drainage excavation shall include all excavation in the construction of open ditches less than twelve (12) feet (3.7 meters) in bottom width, excepting ditches that are part of the roadway prism as shown in the plans. The nature or type of material encountered shall have no bearing on the classification of material.

203.02.03 CHANNEL EXCAVATION: Channel excavation shall include all excavation in the construction of open ditches or stream channels with a bottom width of twelve (12) feet (3.7 meters) or more with the exception of ditches that are part of the roadway prism as shown in the plans. The nature or type of material encountered shall have no bearing on the classification of material.

203.02.04 BORROW: Borrow shall consist of approved material excavated and used in the construction of fills, or for other construction purposes. Borrow shall be material which is excavated from sources specified in the

Special Provisions or designated by the Engineer. The source of material to be excavated shall be approved in advance by the Engineer. Borrow shall be excavated to the lines and grades established by the Engineer.

The Contractor shall notify the Engineer sufficiently in advance of opening any borrow site so that adequate time will be allowed for testing the material and establishing cross section elevations and measurements of the ground surface. The widening of roadway cuts shall be considered as roadway excavation and not as borrow, unless otherwise specified. Borrow excavation will not be classified according to type or character of material encountered in the borrow area unless otherwise required in the Special Provisions.

203.02.05 SELECTED BORROW: Selected borrow shall consist of approved material required for the construction of embankments within the required limits shown on the plans or directed by the Engineer, and shall be obtained from approved sources.

Selected borrow shall conform to the requirements set forth in the Special Provisions.

CONSTRUCTION

203.03.01 ROADWAY: All excavation shall be made true to lines and grades staked by the Engineer and shall be so conducted as to avoid removing or loosening any material outside the required slopes. If any material is so disturbed, it shall be replaced and thoroughly compacted to the required cross section, unless such replacement is impractical as determined by the Engineer.

The work done under this section shall begin at some definite point or points on the project subject to the approval of the Engineer, and the work shall progress toward completion in an orderly manner. The roadway shall be graded to full cross section width before placing base or surfacing of any type, unless otherwise specified.

Intersecting roads, service highways, ramps, approaches, and driveways shall be graded as shown on the plans or established by the Engineer.

All suitable material removed from the excavation shall be used as far as practicable in the formation of embankments, subgrade, shoulders, slopes, dikes, and backfill for structures, unless otherwise indicated on the plans or disposed of in a manner satisfactory to the Engineer. Excavated material shall not be wasted without permission.

203.03.02 UNSUITABLE MATERIAL: Unsuitable material shall be defined as soil or organic matter not suitable for foundation material regardless of moisture content. Material that is unsuitable for planned use, including material below the natural ground surface in embankment areas, shall be excavated and disposed of in a manner approved by the Engineer or as specified in the contract documents.

When unsuitable material is removed and disposed of, the resulting space shall be filled with material suitable for the planned use. Such suitable material shall be placed and compacted in layers as hereinafter specified under embankment.

Disposal of material outside the right-of-way shall be in accordance with Subsection 107.14, "Disposal of Material Outside Project Right-of-Way."

203.03.03 BLASTING: Any material outside the authorized cross section on the backslopes which may be shattered or loosened because of blasting shall be removed by the Contractor at his expense. Shattered or loosened material below the bottom limits of required excavation shall be uniformly distributed and compacted or otherwise disposed of in a manner satisfactory to the Engineer. The Contractor shall discontinue any method

of blasting which leads to overshooting or is dangerous to the public or destructive to property or to natural features.

The use of coyote holes in blasting is prohibited. Attention is directed to Subsection 107.10, "Explosives."

203.03.04 ROCK CUTS: In excavating side hill rock cuts and rock cliffs, the Contractor shall exercise care and use precautionary methods so as not to break down, loosen, or otherwise damage supporting rock below the bottom limits of required excavation. In general, such cuts shall be worked from the top of lifts of such height that will not damage the bench of rock below the bottom limits of required excavation. The Contractor shall be responsible for the methods used, and for any damage to the roadbed resulting from his operations.

The slope of all rock cuts shall be scaled and dressed to a safe, stable condition by removing all loose spalls and rock not firmly keyed to the rock slope. Overhanging rock shall be removed when, in the opinion of the Engineer, it may be a hazard to public use of the roadway.

In solid rock excavation, slopes shall be constructed to the approximate neat lines staked by the Engineer. No rock shall project or overhang more than twelve (12) inches (30 centimeters) from the true slope.

203.03.05 OVERBREAK: Overbreak is that portion of material excavated, displaced or loosened outside and beyond the slopes or grade as staked or re-established, regardless of whether any such overbreak is due to blasting, the inherent character of any formation encountered, or to any other cause. Slides and slipouts as defined in Subsection 203.03.10, "Slides and Slipouts," and that portion of rock subgrade as hereinafter set forth, shall not be considered overbreak. All side slope overbreak as so defined shall be removed by the Contractor and shall be disposed of in the same manner as provided for the surplus under the heading of "Surplus Material," but at his own expense and without any allowance for overhaul.

Rock removed to a maximum depth of six (6) inches (15 centimeters) below subgrade will be measured for payment as described in Subsection 203.04.01(b), "Overbreak."

203.03.06 SLOPES: All excavation and embankment slopes, except in solid rock, shall be trimmed to the lines staked by the Engineer. The degree of smoothness shall be that normally obtained by hand shovel operations, or blade grader operations.

203.03.07 WIDENING CUTS: If the Engineer directs the Contractor to excavate beyond the limits of the typical cross section originally proposed and within the limits of the right-of-way, the Contractor shall do so and compensation therefore will be as set forth in Subsection 203.04.01(c), "Widening Cuts."

203.03.08 SURPLUS MATERIAL: Unless otherwise specified in the contract documents, surplus excavated material shall be used to widen embankments uniformly, or to flatten slopes, or at other locations, all in a manner satisfactory to the Engineer. No surplus material shall be disposed of above the grade of the adjacent roadbed nor shall the Contractor waste any material unless approved in writing by the Engineer.

If the quantity of surplus material is specified in the contract documents, such quantity shall be considered approximate only. The Contractor shall satisfy himself that there is sufficient material available for the completion of the embankments within the areas involved before disposing of any indicated surplus material inside or outside the right-of-way. Any shortage of material caused by premature disposal of the indicated surplus material by the Contractor shall be replaced by him and no compensation will be allowed the Contractor for such replacement.

203.03.09 SELECTED MATERIAL: When specified in the contract documents, or when selected by the Engineer, suitable selected material encountered in excavating or widening the roadway prism or any other excavation within the highway right-of-way, or in the excavation or borrow, shall be used for finishing the top portion of the subgrade.

Selected material shall be defined as material which is excavated from one or more of the above sources and which is used for selective purposes.

When practicable, selected material shall be hauled directly from excavation to its final position on the roadbed and compacted in place, and such work shall be paid for at the contract unit price for the excavation item involved. Attention is directed to Subsection 104.05, "Rights in and Use of Materials Found on the Work."

When the transporting of selected material directly from excavation to its final position on the roadway is impractical, the selected material shall be left in place until it can be placed in final position and no additional compensation will be made because of the delayed excavation. If, however, the conditions are such that the undisturbed selected material will hamper ordinary grading operations or cause unnecessary movements of equipment, the Engineer may order in writing the removal of sufficient selected materials and the stockpiling thereof to enable practical hauling operations. If the excavation and stockpiling of selected material is specified in the contract documents or is ordered by the Engineer, the excavation shall be from, and the stockpiling at, locations designated by the Engineer. The selected material shall be removed from the stockpile and placed in final position on the roadbed when approved by the Engineer.

Measurement for payment of selected material stockpiled as above provided will be in accordance with Subsection 203.04.01(d), "Selected Material."

203.03.10 SLIDES AND SLIPOUTS: Material outside the planned roadway or ditch slopes which is unstable and constitutes potential slides in the opinion of the Engineer, material from slides which has come into the roadway or ditch, and material which has slipped out of new or old embankments shall be excavated and removed. The material shall be excavated to designated lines or slopes either by benching or in such manner as approved by the Engineer. Such material shall be used in the construction of the embankments or disposed of as approved by the Engineer.

The above provisions shall not be so construed as to relieve the Contractor from the duty of maintaining all slopes true and smooth. Erosion, regardless of amount or extent, caused by the action of the elements which results in damage to work or materials, shall in no case be considered a slide or slipout. Measurement for payment will be in accordance with Subsection 203.04.01(f), "Slides and Slipouts."

203.03.11 DRAINAGE: During construction of the roadway, the roadbed shall be maintained in such condition that it will be well drained at all times.

V-type ditches shall be formed to the cross section and dimensions on the plans by means of suitable equipment which will deposit all loose material on the downhill side so that the bottom of the finished ditches shall not be less than two (2) feet six (6) inches (2.5 meters) below the crest of the loose material piled on the downhill side.

In going from cut to fill, the roadway ditches shall be so cut as to avoid damage to embankments by erosion.

The flat-bottom ditches indicated on the plans, or staked by the Engineer, shall be excavated to the required cross section and grade. Materials so obtained shall be used to construct roadway embankments or dikes or both, to form a continuous diversion channel as staked by the Engineer.

203.03.12 CHANNELS: To avoid destruction of natural growth during construction of ditches, channels, or dikes, travel of equipment shall be confined to the construction limits. Where ditches, channels or dikes are nearly parallel to the roadway, turn-arounds shall not be located closer than two hundred (200) feet (60 meters) apart. Attention is directed to Subsection 107.12, "Protection and Restoration of Property and Landscape."

Fine grading of channel bottoms will not be required unless paving is specified.

203.03.13 BORROW: A possible source of borrow material may be indicated in the contract documents. If the Contractor desires to use borrow materials from sources other than those described in the contract documents, he shall, at his own expense, acquire the necessary right to take materials and pay all costs involved. All costs of exploring such alternate sources shall be borne by the Contractor. Use of material from these sources will not be permitted until approved in writing by the Engineer.

The successful bidder shall, at the time of execution of the contract, execute an "Agreement" for all borrow deposits obtained under an "Option and Agreement for Sale of Materials" when said "Option" is contained in the Special Provisions. This agreement shall be executed whether the material is to be used or not.

In case designated borrow deposits fail to contain the necessary quantity of acceptable material, the Contractor shall immediately notify the Engineer in writing. The Engineer shall thereupon investigate, and if his investigation shows that there is not sufficient quantity of acceptable material, he shall designate an alternate deposit in which to obtain the deficit.

In all borrow pits having undesirable material, including overburden, refuse, organic and deleterious substances, the material shall be removed and wasted or redistributed, in a manner satisfactory to the Engineer. All costs incurred therefor shall be considered as incidental and subsidiary to the borrow.

Borrow shall not be obtained until all other excavation items are complete to the extent necessary to determine the need for borrow.

The Contractor shall notify the Engineer sufficiently in advance of opening any borrow areas so that cross section elevations and measurements of the ground surface after stripping may be taken, and the borrow materials can be tested before being used. Sufficient time for testing the borrow shall be allowed.

Borrow deposits shall be excavated to regular lines as staked to permit accurate measurement. The dimensions of the borrow deposit will be designated and the Contractor shall not excavate below the depth or outside limits given, except with prior approval. The depth of excavation throughout the area of the borrow pits shall be as uniform as practicable and the side slopes shall conform to the requirements of Section 626, "Final Clean Up." Unless otherwise permitted, borrow pits shall be excavated so that they will drain to the nearest natural outlet.

All materials which are not satisfactory for use for the purposes intended shall be rejected at the pit and disposed of in a manner satisfactory to the Engineer.

If the Contractor excavates more material than is required, the excess will not be measured for payment.

All work and materials required to build and maintain borrow haul roads and obliteration of haul roads in accordance with Section 626, "Final Clean Up" shall be considered subsidiary to the "borrow" item and no further compensation will be allowed therefor.

203.03.14 FOUNDATION: When embankment is to be placed and compacted on hillsides, or when new embankment is to be compacted against existing embankments, or when embankment is to be built one half width at a time, the slopes that are steeper than four to one (4:1), when measured at right angles to the roadway, shall be continuously benched as the work is brought up in layers. Benching shall be of sufficient width to permit operations of placing and compacting equipment. Each horizontal cut shall begin at the intersection of the original ground and the vertical sides of the previous cuts. Material thus cut out shall be recompacted along with

the new embankment material at the Contractor's expense, unless the width of excavation required by the Engineer exceeds six (6) feet (1.8 meters), in which case the excavated material excess of six (6) feet (1.8 meters) will be measured and paid for as roadway excavation.

All foundations for embankment shall be cleared and grubbed in accordance with Section 201, "Clearing and Grubbing."

In designated areas, unsuitable material shall be removed and disposed of as prescribed in Subsection 203.03.02, "Unsuitable Material."

Where twelve (12) inches (30 centimeters) or less of embankment is placed over existing bituminous surface, such surface shall be removed and incorporated in the embankment or otherwise disposed of as approved by the Engineer. Where more than twelve (12) inches (30 centimeters) of embankment is placed over existing bituminous surface, such surface shall be left undisturbed. Measurement for removal of existing bituminous material will be as prescribed in Subsection 203.04.01, "Measurement," and paid for as roadway excavation unless the contract documents specifically called for payment under Section 202, "Removal of Structures and Obstructions."

203.03.15 EMBANKMENT MATERIALS: Embankments shall be constructed with suitable materials, excavated as prescribed and with any excess materials from other operations which are acceptable and suitable for use.

All materials used in embankment shall be free from objectionable material such as leaves, grass, roots, logs, stumps, brush, or other perishable material.

When there is a choice of material, the excavation shall be made so the best material will be placed on top of the embankment for at least one (1) foot (30 centimeters) in depth. This paragraph shall not be interpreted as to require the Contractor to stockpile and subsequently rehandle embankment materials except as provided in Subsection 203.03.09, "Selected Material."

Material shall not be placed in the embankment when either the material, foundation or the embankment on which it would be placed is frozen.

Where embankments are to be made of material from rock cuts or other material which is unsuitable for finishing the roadbed, the upper six (6) inches (15 centimeters) of the roadbed shall be formed of approved material.

203.03.16 PLACING EMBANKMENT: For embankment or backfill deposited against structures, attention is directed to Subsection 207.03.02, "Placing and Compacting at Abutments, Piers, Wingwalls, and Retaining Walls."

Where structure abutments are placed on embankment, the embankment shall be constructed to subgrade elevation prior to excavating for the construction of the abutment. Where the abutment is supported on piles, the embankment shall be constructed to the elevation of the bottom of the footing.

Where a structure is to be covered by a rockfill, it shall be covered with not less than two (2) feet (0.6 meters) of satisfactory soil or granular materials before the rock embankment is placed over the structure.

Embankments shall, except as hereinafter specified, be constructed in layers. The construction of an embankments shall begin at the lowest point of the fill below the grade or the bottom of ravines. Individual layers shall be spread evenly to uniform thickness throughout and parallel with the finished grade for the full width of the embankment, unless otherwise permitted. The thickness of the layer shall be as necessary to secure the required compaction with an eight (8) inch (20 centimeters) maximum thickness before compaction. Excepted

provisions are hereinafter outlined for placing in marsh and placement of rock. Hauling equipment shall be routed to obtain uniform compaction and channelization of haul routes and rutting of the fill shall be avoided.

When embankments are constructed across wet or swampy ground which will not support the weight of heavy hauling and spreading equipment, the Contractor will be expected to choose such methods of embankment construction and to use such hauling and spreading equipment as will least disturb the soft foundation. When soft foundations are encountered, and when approved by the Engineer, the lower part of the fill may be constructed by dumping and spreading successive vehicle loads in a uniformly distributed layer of a thickness not greater than that necessary to support the vehicle while placing subsequent layers, after which the remainder of the embankment shall be constructed in layers and compacted as specified.

It is not the policy of the Contracting Agency to allow an increase in the planned depth of embankment material over soft, wet, or swampy ground for the sole purpose of providing support for heavy hauling and spreading equipment, unless the Contractor proves to the satisfaction of the Engineer that the planned depth is inadequate to support light hauling vehicles. If it proves necessary for the Contractor to use smaller hauling vehicles or different methods of embankment construction than he had originally contemplated in order to comply with the foregoing, such shall not be the basis for a claim for extra compensation against the Contracting Agency. The unit contract price for the various pay items involved shall be full compensation for all labor, materials and equipment necessary to perform the work as outlined herein.

Embankment which, in the opinion of the Engineer, contains enough rock larger than four (4) inches (10 centimeters) to make it impractical to place and compact in eight (8) inch (20 centimeters) lifts shall be considered as "Rock Embankment." The materials shall be spread in a uniform horizontal layer over the full width of the embankment. The layer thickness shall not exceed one and one-third (1-1/3) times the vertical dimension of maximum size material larger than eight (8) inches (20 centimeters). The largest size rock allowed in the embankment will be three (3) feet (1 meter) measured in vertical direction and rocks larger than this shall be broken up before being placed in the embankment. Rock to be wasted may exceed three (3) feet (1 meter) and be disposed of in an inconspicuous manner approved by the Engineer.

In rock fills where end dumping is employed, direct end dumping upon the previously constructed layer of embankment will not be permitted. Rock shall be dumped on the layer of embankment being constructed and dozed ahead into place. Care shall be exercised to work the fines and smaller rock into the spaces between the larger rock. Compaction will be required as provided in Subsection 203.03.18, "Compaction, Rock Embankment."

To the extent of project requirements for embankments, all rock from excavation shall be used for embankment. The Contractor shall plan his grading operation to use rock which may be encountered in excavation in accordance with the following provisions:

Rock, in general, shall be placed so as to form the base of embankment for the full width of the cross section; on the side slope or slopes of a new embankment being placed; on the side slope or slopes of an embankment already in place requiring widening or where excess rock may be wasted; or on the side slopes and top of rolled embankment made of embankment materials other than rock.

The Contractor shall not place large rock in embankments where piles will be driven. The Contractor shall be responsible for penetrating the embankment with specified piles.

When rock and other embankment materials are excavated at approximately the same time, the rock shall be distributed throughout the fill and not nested in one location.

When there is insufficient material other than rock in the excavation to permit properly compacted layers, the rock shall be placed for the full cross section width with the larger rocks well distributed and the void spaces filled with the smaller rocks and fragments.

When shown on the plans or considered necessary by the Engineer, embankments shall be built to such elevation above required grade to allow for settlement, or sufficient surcharge shall be placed above the required elevation of earth grade over deposits of unstable material to secure displacement or settlement. Surcharge shall be removed only after the fill has reached stability or the required settlement time has been reached.

203.03.17 COMPACTION, DIRT EMBANKMENT: Optimum moisture content of the various soils will be determined by the Engineer. At the time of compaction, the moisture content of the various soils shall be within the following ranges:

Optimum Moisture Content	Tolerances
0% - 20%	+2% to -4%
20% - 30%	+2% to -5%
31% or more	+3% to -6%

When necessary, each layer before being compacted, shall be processed as required in order to bring its moisture content within the prescribed limits. The material shall be wetted by the application of water or dried as necessary and either process may be carried out either on the embankment or at the source of the material or otherwise as approved by the Engineer. Full compensation of any work involved in wetting or drying embankment material to obtain the required moisture content shall be considered as included in the contract unit price bid for excavating or furnishing the material and no additional compensation will be allowed therefor.

Hauling and leveling equipment shall be routed and distributed full width over each layer of the fill in such a manner as to uniformly distribute the compaction afforded thereby. In addition to hauling and leveling equipment, the Contractor shall provide compaction equipment that is specifically designed and manufactured for the purpose of compacting dirt embankments. Said compaction equipment shall work continuously with the grading equipment.

The top 8 inches of the base of cuts and natural ground having less than five (5) feet (1.5 meters) of embankment, measured from the subgrade, and all embankment material, shall be compacted to not less than ninety (90) percent relative compaction. When natural ground material is encountered that cannot be compacted to the required density, compaction requirements shall be determined by the Engineer.

All selected borrow and structure backfill placed within the limits of embankment shown on the plans for approaches to bridges shall be compacted to not less than ninety-five (95) percent relative compaction.

It is to be expected that a loss of density in the upper portion of earth subgrade may occur due to the elements, or for lapse of time, or for other reasons. Recompaction to the specified density will be required prior to placement of any subsequent course and no additional compensation will be allowed therefor.

203.03.18 COMPACTION, ROCK EMBANKMENT: Field density tests will not be required on rock embankments. In lieu thereof, the required compaction shall be tested by proof rolling. In this case, compaction shall be attained and tested by using construction methods and equipment as follows:

(a) **Methods.** The material for the embankment shall be deposited, spread and leveled the full width of the embankment, and the layer of thickness may be one and one-third (1-1/3) times the vertical dimension of maximum size material. The maximum size rock shall not exceed three (3) feet (1 meter).

Hauling and leveling equipment shall be routed and distributed over each layer of the fill in such a manner as to make use of the compaction afforded thereby. Rollers, vibrators, or compactors shall compact the embankment full width with a minimum of three (3) complete passes for each layer of embankment. The compacting equipment shall not exceed a speed of five (5) miles (8 kilometers) per hour and shall work continuously with the grading equipment.

Rolling shall be done in a longitudinal direction along the embankment and shall generally begin at the outer edges and progress toward the center. The travel paths of traffic and construction equipment shall be kept dispersed over the entire width of the embankment so as to aid in obtaining uniform compaction. Weights of equipment used in making embankments over soil having an excessive moisture content may be limited, if, in the judgment of the Engineer, such limitations are necessary in order to maintain the fill in a satisfactory condition.

Water shall be applied to the embankment in the amount necessary to obtain the required compaction.

(b) **Equipment.** Compaction equipment shall be adequately designed to obtain compaction requirements without adverse shoving, rutting, displacement, or loosening and shall meet the requirements hereinafter specified. Rollers shall have displayed thereon in permanent legible characters, the manufacturer's guaranteed net operating weights as distributed on each axle.

The proof roller shall be a pneumatic-tired roller or pneumatic-tired compactor weighing not less than fifty (50) tons (45 metric tons), and capable of applying to the ground loads of not less than twenty-five thousand (25,000) pounds (11,300 kilograms) per wheel. All tires shall be of equal size and diameter and shall be capable of operating at an air pressure of at least ninety (90) pounds per square inch (620 KPa). They shall be kept uniformly inflated so that the difference in pressure in any two tires shall never exceed five (5) pounds per square inch (0.35 kilograms per square centimeter) and means shall be provided by the Contractor for checking the tire pressure on the job at any time.

(c) **Tests.** Subsequent layers shall not be placed until the previous layer of the embankment is compacted to the degree that no further appreciable deflection is evidenced under the action of proof rolling equipment, as determined by the Engineer.

Rolling and proof rolling may be deleted on any layer or portion thereof when, in the judgment of the Engineer, accomplishment is physically impractical.

Payment for rolling and proof rolling or for the correction of any subgrade weakness or deficiencies disclosed by the proof rolling operation shall be considered subsidiary to the price bid for the "Excavation" item.

203.03.19 MAINTENANCE: Embankment material which may be lost or displaced as a result of natural settlement of the ground or foundation upon which the embankment is constructed shall be replaced by the Contractor with acceptable material from excavation or borrow, etc. The quantity of material required will be paid for at the regular contract price for the type of material used, also overhaul, if applicable, and no additional compensation will be allowed therefor.

The Contractor shall, at his expense, remove and replace with acceptable material any embankment or portion thereof which has been constructed with unapproved material as well as remove and replace portions of the embankment which may become unstable or displaced as the result of carelessness or negligence on his part.

203.03.20 SUBGRADE TOLERANCE: Subgrade upon which pavement, sidewalk, curb and gutter, driveways, or other structures are to be directly placed shall not vary more than 1/4 inch from the specified grade and cross section. Subgrade upon which sub-base or base material is to be placed shall meet the tolerances as specified in Subsection 203.01.02, "Grade Tolerance." Variations within the above specified tolerances shall be compensating so that the average grade and cross section specified are met.

METHOD OF MEASUREMENT

203.04.01 MEASUREMENT: Unless otherwise specified, excavation will be measured on a volume basis by cross sectioning the area to be excavated and computing neat lines for an end area. The average end area method will be used with no allowance made for curvature. If for any reason it is impossible or impractical to measure quantities by average end areas, the Engineer will compute the quantities by a method which, in his opinion, is best suited to obtain an accurate determination.

The quantity of excavation to be measured for payment will be the number of cubic yards (cubic meters) excavated and placed as required. The estimated quantities shown on the plans, plus or minus authorized changes will be the quantity used for payment. The Contracting Agency or the Contractor may, however, request a final measurement in which case final cross sections will be taken. When final cross sections are taken the determination of quantities derived therefrom will be the quantities used for payment. Furthermore, when the Contractor requests final measurement and the quantities thus determined are less than the planned quantities plus authorized changes, the Contractor shall reimburse the Contracting Agency for the Agency's expenses incurred by such final measurement and calculation.

When changes are made during construction such as widening cuts, changing grades, disposing of unsuitable material, stockpiling selected material, and other changes resulting in increases or decreases in quantities, then additional measurements for payment will be made by the Engineer as hereinafter outlined:

(a) **Unsuitable Material.** When the removal and disposal of unsuitable material is shown in the contract documents, such material will be measured for payment as excavation for the related item.

Removal and disposal of unsuitable material, not shown on the plans, will be measured and paid for as "Roadway Excavation." However, if removal and disposal of unsuitable material not shown on the plans required special equipment or unusual operations, it may be paid for as extra work according to the provisions of Subsection 104.03, "Extra Work."

No measurement will be made of suitable material temporarily removed and replaced to facilitate compaction of material.

(b) **Overbreak.** All sideslope overbreak as defined in Subsection 203.03.05, "Overbreak," shall not be paid for.

Rock removed to a maximum depth of six (6) inches (15 centimeters) below subgrade will be measured for payment provided the rock has been removed sufficiently to permit accurate cross sectioning. Replacement to this depth shall be with material designated on the plans approved by the Engineer and will be measured and paid for at the contract unit price for the material used.

Rock loosened or removed in excess of six (6) inches (15 centimeters) below subgrade will not be measured nor paid for. When ordered by the Engineer, the loosened material will be removed and the resultant space refilled with approved material at the expense of the Contractor.

(c) **Widening Cuts.** If the Engineer directs the Contractor to excavate beyond the limits of the typical cross section and before the excavation is substantially completed, the material shall be classified as "Roadway Excavation" and shall be paid for at the contract bid price. However, if widening cuts requires special equipment, or unusual and extra expense, it may be paid for as extra work according to the provisions of Subsection 104.03, "Extra Work."

(d) **Selected Material.** Selected material stockpiled as provided in Subsection 203.03.09, "Selected Material" will be measured for payment as roadway excavation both in its original position and also from the stockpile. Measurement of the material taken from stockpile will be made of the volume actually removed.

(e) **Surplus Material.** Surplus excavated material will be measured for payment as roadway excavation and no further compensation will be allowed by virtue of the method of disposing, placing, or widening embankments caused from such surplus material.

(f) **Slides and Slipouts.** In the event of slides and slipouts, the Engineer and Contractor shall negotiate in each case and decide the relative difficulty of performing the work, and payment will be made either as "Roadway Excavation" or as "Extra Work" as provided in Subsection 104.03, "Extra Work."

Where slopes have been previously completed by the Contractor, the cost of resloping required in areas where unstable material is removed will be paid for as extra work as provided in Subsection 104.03, "Extra Work."

The cost of pioneering work necessary to make slide or slipout areas accessible to normal excavation equipment and the cost of necessary clearing and grubbing will be paid for as extra work as provided in Subsection 104.03, "Extra Work."

Only those quantities of slide or slipout material which are authorized and actually removed will be measured for payment.

Excavation in excess of the staked or authorized cross section will not be measured for payment, except as outlined above.

Material used for surcharge, whether shown on the plans or called for by the Engineer, will be measured for payment as roadway excavation both in its original position and when removed from the surcharge position.

Earthwork quantities within the limits of "Slope Rounding" will not be measured for payment.

V-type ditches will be measured parallel to the ground and each one hundred (100) linear feet (30 meters) shall constitute a unit of measure. The volume of excavation for such ditches will not be measured for payment.

The quantity of Selected Borrow or Selected Borrow Excavation to be measured for payment will be the number of cubic yards or tons (cubic meters or metric tons) measured as set forth in the Special Provisions.

All measurements will be made in accordance with Subsection 109.01, "Measurement of Quantities."

BASIS OF PAYMENT

203.05.01 PAYMENT: The accepted quantities of excavation measured as specified in Subsection 203.04.01, "Measurement," will be paid for at the contract unit price bid for each of the pay items listed in the bid schedule. Such price shall include excavating, loading, hauling, depositing, spreading, compacting, and maintaining the material complete and in place.

The accepted quantities of selected borrow or selected borrow excavation will be paid for at the contract unit price bid per cubic yard or ton (cubic meter or metric ton) for "Selected Borrow" or "Selected Borrow Excavation" which price shall be full compensation for furnishing all materials, loading, hauling, depositing, spreading, watering, compacting and maintaining the material complete and in place.

The contract unit price bid per cubic yard for roadway excavation, borrow excavation and channel excavation shall be considered as including payment for all haul.

All payments will be made in accordance with Subsection 109.02, "Scope of Payment."

Payment will be made under:

PAY ITEM	**PAY UNIT**
Roadway Excavation	Cubic Yard (Cubic Meter)
Drainage Excavation	Cubic Yard (Cubic Meter)
Channel Excavation	Cubic Yard (Cubic Meter)
Borrow Excavation	Cubic Yard (Cubic Meter)
V-type Ditches	Stations (30 Meters)
Selected Borrow	Cubic Yard or Ton (Cubic Meter-Metric Ton)
Selected Borrow Excavation	Cubic Yard or Ton (Cubic Meter-Metric Ton)

SECTION 204

ROUNDED AND TRANSITION SLOPES

DESCRIPTION

204.01.01 GENERAL: This work shall consist of rounding and shaping slopes in accordance with the plans and where designated by the Engineer.

CONSTRUCTION

204.03.01 GENERAL: The top of cut slopes shall be rounded by excavating to blend the cut slopes with the adjacent natural terrain. At the intersections of cuts and fills, slopes shall be adjusted and warped to blend into each other or into the natural ground surface without noticeable break.

Slopes will be staked for flattening and rounding in places where the material is other than solid rock. Rock formations such as shales, decomposed sandstone and granite that can be readily excavated by means of hand tools, shall have the slopes flattened and rounded the same as earth slopes. A layer of earth overlying a rock cut shall be rounded above the rock the same as earth slopes. Where the depth of cut is insufficient to provide the full rounding required, the distance for rounding shall be proportionately adjusted.

Slope rounding and warping shall also apply to all drainage ditches when such rounding will improve the appearance of the roadside.

Whenever the treatment of the slopes may destroy or injure standing timber, trees or other vegetation which should be preserved, adjustments in slope grading will be made. These adjustments shall be effected by a gradual transition from the theoretical grading section required.

The degree of smoothness required in rounding and warping slopes shall be as specified in Subsection 203.03.06, "Slopes."

METHOD OF MEASUREMENT

204.04.01 MEASUREMENT: The quantity of rounded cut slopes to be paid for shall be measured in linear feet of slopes, treated as specified, measured along the roadway ditch each side of the roadway centerline. The quantity of rounded embankment slopes to be paid for shall be measured in linear feet (meters), treated as specified, measured along the centerline of the embankment to be rounded, and each side shall be considered separately. In all cases, each one hundred (100) feet (30 meters) shall constitute the unit of one station. Earthwork quantities within the limits of "Slope Rounding" will not be measured for payment.

All measurements will be made in accordance with Subsection 109.01, "Measurement of Quantities."

BASIS OF PAYMENT

204.05.01 PAYMENT: The accepted quantity of slope rounding measured as specified in Subsection 204.04.01, "Measurement," will be paid for at the contract unit price bid per station of the completed work.

All payments will be made in accordance with Subsection 109.02, "Scope of Payment."

Payment will be made under:

PAY ITEM	PAY UNIT
Slope Rounding	Stations (30 Meters)

SECTION 205 - BLANK

SECTION 206

STRUCTURE EXCAVATION

DESCRIPTION

206.01.01 GENERAL: This work shall consist of the removal of all material of whatever nature encountered in the construction of foundations for bridges, retaining walls, headwalls for culverts and other structures; the excavation of trenches for pipe culverts, box culverts, cut-off walls for slope paving and concrete aprons, footings for riprap and other excavation specifically designated on the plans, in these specifications or in the Special Provisions as structure excavation, which shall include the work of disposing of surplus material and cleaning up the sites. Structure excavation shall include dewatering and the furnishing of all equipment and the construction or installation of all cofferdams, cribs, and other facilities which may be necessary to perform the excavations and the subsequent removal of such facilities except where they are required or permitted by the plans or specifications to remain in place. It shall also include all the necessary clearing and grubbing within the proposed structure area and removing old structures or parts thereof as required if the proposal does not include separate bid items for such work.

For separate requirements pertaining to the excavation involved in the installation of pipe culverts and underground piping, attention is directed to those sections of these specifications governing such work.

206.01.02 CLASSIFICATION: Classification of structure excavation will not be made on the basis of materials or conditions encountered. Classification of excavation, if made, will be on the basis of the material removed between certain elevations, and such classification as shown on the plans or set forth in the Special Provisions shall not be changed regardless of the material encountered.

CONSTRUCTION

206.03.01 GENERAL: The Contractor shall notify the Engineer a sufficient time in advance of the beginning of excavation for structures so that elevations and measurements may be taken of the existing ground before it is disturbed and of existing substructure units within the limits of excavation for structures before they are removed. Any material excavated or removed before these measurements have been taken will not be paid for.

The excavated area shall conform to the outlines of the footings, as shown on the plans, and shall be of sufficient size to permit placing of the full width and length of the footings shown. The elevation of the bottoms of footings as shown on the plans shall be considered as approximately only, and the Engineer may order, in writing, such changes in dimensions or elevation of footings as may be necessary to secure a satisfactory foundation.

Unless otherwise permitted by the Engineer, foundations for culvert pipe and structures shall be compacted to not less than ninety (90) percent relative compaction. Test method to be determined by the Engineer.

All rock or other hard foundation material shall be freed from all loose material, cleaned and cut to a firm surface, either level, stepped or serrated, as may be permitted by the Engineer. All seams and crevices shall be cleaned out and filled with concrete mortar or grout.

Where masonry is to rest on material other than rock or boulders, special care must be given not to destroy its bearing value.

Should the Contractor remove structure excavation below grade, he shall backfill to the required elevation at his own expense with backfill in a manner satisfactory to the Engineer.

Wet pits shall be dewatered for inspection and for construction of foundations unless otherwise provided.

Excavated material which is suitable for backfilling shall be so utilized or used in embankments, in a manner satisfactory to the Engineer. Surplus or unsuitable material shall be disposed of so as to cause no obstruction to flow of streams; or otherwise impair the efficiency or appearance of the structure. It shall be disposed of in such a manner as to prevent damage to property or the creation of unsightly conditions, and shall not be placed where it will interfere with the operation of drains or impair the roadway ditches, etc.

206.03.02 INSPECTION: After each excavation is completed, the Contractor shall notify the Engineer, and no masonry shall be placed until the Engineer has approved the depth of excavation and the character of the foundation material.

BASIS OF PAYMENT

206.05.01 PAYMENT: Unless otherwise provided in the Special Provisions or Proposal, no payment will be made for structure excavation or backfill as such. The cost thereof under normal circumstances being considered as included in the price bid for the construction or installation of the items to which such excavation or backfill is incidental or appurtenant. Payment for such excavation or backfill will be made only when the Special Provisions or Proposal so provides.

SECTION 207

STRUCTURE BACKFILL

DESCRIPTION

207.01.01 GENERAL: This work shall consist of placing and compacting, to the lines designated on the plans or as established by the Engineer, backfill material in excavations for bridges, retaining walls, headwalls for culverts, and other structures; placing and compacting backfill material for box culverts and other culverts; and other backfill specifically designated in the contract documents as structure backfill. This item does not include backfilling pipes within a trench or minor miscellaneous structure excavations outside the limits of the roadway.

MATERIALS

207.02.01 SELECTED BACKFILL: Selected backfill shall be of a quality acceptable to the Engineer and may consist of suitable material from excavation. It shall be free from sod, frozen earth, organic materials, rubbish, or debris. The backfill material shall have a sufficient amount of fine material to fill the voids between the coarser aggregate. In addition thereto, the material shall conform to the following requirements:

Sieve Sizes	Percentage of Weight Passing
6"	100
3"	80-100
No. 4	35-100

Percentage by Weight Passing No. 200 Sieve	Plasticity Index Maximum
0-10.0	15
10.1-20.0	12
20.1-50.0	10
50.1-80.0	8
80.1-100.0	6

The liquid limit of the material shall not exceed fifty (50) percent maximum.

Stones or lumps exceeding three (3) inches (75 millimeters) shall not be used within the zones twelve (12) inches (300 millimeters) or less from the structure, twelve (12) inches (300 millimeters) or less from the finish subgrade in unpaved areas, or sixteen (16) inches (400 millimeters) or less below the pavement in paved areas.

Acceptable material from excavation "Selected Backfill" may be used for structure backfilling unless "Granular Backfill" is specified.

207.02.02 GRANULAR BACKFILL: Granular backfill shall consist of natural sand or a mixture of sand with gravel. Broken Portland cement concrete and bituminous type pavement will be permitted, subject to the gradation

limits specified herein. The granular backfill material shall have a sufficient amount of fine material to fill the voids between the coarser aggregate. In addition thereto, the material shall conform to the following requirements:

Sieve Sizes	Percentage of Weight Passing
3"	100
No. 4	35-100
No. 16	25-100
No. 200	5-15

The plasticity index of the material shall be as specified in Subsection 704.02.03, "Plastic Limits."
The soluble sulfate content of the material shall not exceed 0.3 percent by dry soil weight.

CONSTRUCTION

207.03.01 GENERAL: Compaction of backfill or embankment around all structures shall be secured with mechanical tamping units and the material shall be placed in layers of thickness compatible with the characteristics of the backfill and the type of equipment being used subject to approval by the Engineer.

Unless otherwise permitted by the Engineer, foundation materials for structures shall be compacted to not less than ninety (90) percent of the maximum density.

Backfill material shall be placed in uniform horizontal layers and shall be brought up uniformly on all sides of the structure or improvement. Each layer of backfill shall be moistened as necessary and thoroughly compacted until ninety (90) percent of the maximum density is achieved, except that each layer of backfill so placed within the limits shown on the plans for selected borrow embankments for approaches to bridges shall be thoroughly compacted until ninety-five (95) percent of the maximum density is achieved. Test method shall be as specified in Section 111, "Soils and Aggregate Tests."

Compaction of structure backfill by jetting will be permitted when, as determined by the Engineer, the following conditions are met:

1) The backfill material contains no more than 10% passing the No. 200 sieve.
2) The adjacent material and foundation materials will not soften or be otherwise damaged by the applied water.
3) The structure will not be damaged as a result of hydrostatic pressure.

Compaction of structure backfill by ponding will be permitted when, as determined by the Engineer, the above conditions are met, and in addition, the gradation of the backfill material is such that not more than five (5) percent passes the No. 200 sieve. The backfill material shall be leveled prior to compaction by ponding.

As used in these specifications, jetting shall be defined as compaction by the use of a jet pipe to which is supplied a continuous flow of water under pressure, and ponding shall be defined as the inundation of backfill with water.

When the character of the backfill and surrounding material is such that jetting, or ponding methods of compaction are permitted, and the Contractor elects to use one of these methods, compaction of the backfill shall be accomplished in a manner such that the water will thoroughly saturate the thickness of the lift being compacted, and cause it to settle and densify. When using the jetting method, the jet pipe shall penetrate the full depth of the

lift being compacted at intervals not to exceed five (5) feet (1.5 meters) in both a longitudinal and transverse direction. Supplemental vibratory or other compaction equipment shall be used when necessary to obtain the required compaction.

The thickness of each lift of backfill to be compacted by jetting or ponding shall not exceed four (4) feet (1.2 meters).

The upper sixteen (16) inches (400 millimeters) below finish grade shall be compacted by mechanical means only.

Backfill material to be used around buried structures where water is present or anticipated to be present, shall be carefully selected so that it will protect the surrounding soil from infiltrating into the backfill as determined by the Engineer. This select material shall serve as a filter material. If the drain material is to remove an appreciable quantity of water, graded filter drains using separate fine-grained layers for filters and coarse-grained layers to conduct the water may be required. As an alternate to using a filter material, a filter fabric may be placed between the backfill material and surrounding soil.

Material resulting from structure excavation and not used as structure backfill shall be deposited in roadway embankments in accordance with the requirements specified elsewhere or otherwise disposed of in a manner approved by the Engineer and no additional compensation will be allowed for such work.

Structure backfill shall not be placed until the structure or facilities have been inspected by the Engineer and approved for backfilling. Backfill material shall not be deposited against the back of concrete abutments, concrete retaining walls or the outside walls of concrete box culverts until the concrete has reached an age of twenty-eight (28) days or the concrete has developed 100 percent of the design strength in compression as determined by Test Method ASTM C 39 using cylinders cured per ASTM Test Method C 31.

Where backfill is placed against waterproofed surfaces, care shall be taken that no damage is done to the waterproofing material.

207.03.02 PLACING AND COMPACTING AT ABUTMENTS, PIERS, WINGWALLS AND RETAINING WALLS: With the approval of the Engineer, all spaces excavated and not occupied by abutments, piers, or other permanent work shall be refilled with earth up to the surface of the surrounding ground or to the limits designated on the plans or as described herein. All backfill shall be thoroughly compacted in accordance with the provisions set forth in Subsection 207.03.01, "General."

Where backfill is to be placed on one side of an abutment, wingwall, pier, or headwall, care shall be exercised to prevent placing line or batter or both.

Existing slopes which are shaped so as to cause wedge action in the backfill, shall be step-cut or benched before backfilling.

207.03.03 PLACING AND COMPACTING AT CULVERTS: After the bedding has been prepared and the culverts installed or constructed as required by the pertinent specifications, "Selected Backfill" or "Granular Backfill" shall be placed along both sides of the culvert equally in uniform layers such that the elevation of the top of the backfill on either side of the culvert does not exceed the elevation of the top of the backfill on the other side of the culvert by more than six (6) inches (150 millimeters). The thickness of each layer shall be compatible with the characteristics of the backfill and the type of equipment being used, but shall not exceed eight (8) inches (200 millimeters) in depth (loose measurements) before compaction when hand-directed compaction equipment is used, unless otherwise approved by the Engineer. Each layer shall be wetted as required and thoroughly compacted to the density requirements as set forth in Subsection 207.03.01, "General." Jetting or ponding methods of compaction will not be permitted for backfilling around corrugated metal pipe culverts or thermoplastic pipe.

Special care shall be taken in placing and thoroughly compacting the material under the haunches of all pipe culverts.

Unless otherwise directed, the backfilling shall continue as directed to the level of the ground or to an elevation six (6) inches (150 millimeters) above the structure in the case of a pipe culvert in projection, or even with the top of the structure in the case of reinforced concrete box culvert in projection.

No construction equipment or other traffic shall be permitted to cross any culvert until a safe minimum depth of fill above the culvert has been placed and compacted in accordance with these specifications. The Contractor shall be solely responsible for protecting the structure from superimposed loading by construction equipment and shall repair any damage to the structure or replace the structure as ordered without extra compensation.

Special care shall be taken in backfilling arches, particularly half-circle arches. The arch shall be covered in layers, each layer conforming to the shape of the arch and tamped thoroughly.

207.03.04 PLACING AND COMPACTING OF BIN-TYPE RETAINING WALLS: Placing and compacting backfill material for bin-type retaining walls shall progress concurrently with the assembly of the bins, and backfilling around the outer sides thereof shall be kept approximately level with the inside fills. The materials shall be thoroughly tamped and meet the density requirements as set forth in Subsection 207.03.01, "General." Care shall be exercised to completely fill the depressions of stringers and spacers without displacing them from established line and batter.

BASIS OF PAYMENT

207.04.01 PAYMENT: Unless otherwise provided in the Special Provisions or Proposal, no payment will be made for structure excavation or backfill as such; the cost thereof under normal circumstances being considered as included in the price bid for the construction or installation of the items to which such excavation or backfill is incidental or appurtenant. Payment for such excavation or backfill will be made when the Special Provisions or Proposal provides.

SECTION 210

WATERING

DESCRIPTION

210.01.01 GENERAL: This work shall consist of, but is not limited to furnishing, hauling, and applying all water required for compaction of embankment foundation areas, embankments, subgrade, mineral aggregate base and surfacing materials, structure backfill, processing lime treated base or subgrade material, or cement treated base, and for laying dust caused by grading operations, traffic, and natural conditions.

MATERIALS

210.02.01 GENERAL: All materials shall conform to the requirements set forth in Section 722, "Water."

CONSTRUCTION

210.03.01 EQUIPMENT: Equipment used for applying water required for compacting embankment materials, subgrade, base and surfacing materials, and for laying dust shall be pressure type distributors equipped with a spray system that will ensure uniform application of water. All the watering equipment used for the application of water shall be equipped with a positive means of shutoff and the use of equipment not so equipped will not be permitted. An approved pump, pipe, hose, and nozzle equipment may be used in embankment construction. Where the head is sufficient to provide enough pressure, the pump requirement may be eliminated.

The Contracting Agency does not require that watering equipment be provided with measuring or metering devices.

210.03.02 GENERAL: Water for dust control shall be applied in the amounts and on the areas designated by the Engineer.

The Contractor shall apply water in the amount necessary to attain the compaction in those materials requiring a specified density. In certain areas of the base courses, water may be introduced into the aggregate at the plant and when necessary to attain the specified compaction, shall be supplemented by additional wetting as specified above.

Excavation areas and borrow pits may be watered prior to excavating the material.

When water is applied directly to the roadbed, the material shall be processed by suitable equipment until the layer is uniformly wet. Care shall be taken to avoid disturbing layers which have been previously placed and compacted.

The Contractor shall make all arrangements for providing an adequate water supply. He shall negotiate with owners of supply and sign an agreement with each owner prior to removing the water. A copy of said agreement shall be furnished to the Engineer. He shall pay all royalties occurring under such agreements and shall also obtain any necessary right-of-way.

METHOD OF MEASUREMENT

210.04.01 MEASUREMENT: The developing of an adequate water supply the furnishing of all necessary equipment for obtaining water from the source or sources, water, and the furnishing of equipment necessary to apply the water, will not be measured for payment.

BASIS OF PAYMENT

210.05.01 PAYMENT: Full compensation for developing an adequate water supply, for furnishing all necessary equipment, for obtaining water from the source or sources, for water, and for furnishing of equipment necessary to apply the water, shall be considered as included in the contract unit price paid for other appropriate items and no separate payment will be made therefor.

SECTION 211

EROSION CONTROL

DESCRIPTION

211.01.01 GENERAL: This work shall consist of preparing slopes, placing and compacting top soil, seeding, fertilizing, jute matting, and mulching graded and disturbed areas in accordance with these specifications and the details shown in the contract documents.

MATERIALS

211.02.01 GENERAL: The materials used shall be those prescribed for the several items which constitute the finished work and shall conform to the applicable requirements of Section 726, "Roadside Materials."

211.02.02 PLANTING SOIL: Unless designated in the contract documents, the Contractor shall make his own arrangements for obtaining soil and he shall pay all costs involved. Soil shall be transported directly from the source to final position unless otherwise permitted. Soil shall not be obtained from an area known to have noxious weeds growing in it.

Prior to removal of planting soil from the source, the Contractor shall contact the County Weed Control Agency or the State Quarantine Officer for the inspection and destruction of injurious and noxious weeds. Soil that has been treated with herbicides or sterilizers shall be tested by the Nevada State Department of Agriculture to determine the residual in the soil.

211.02.03 SEED: All seeds shall conform with all laws and regulations pertaining to the sale and shipment of seed required by the Nevada State Department of Agriculture and the Federal Seed Act. All shipments of seed shall be reported to the Nevada State Department of Agriculture for inspection. Seed shall be of the varieties and proportions specified in the contract documents.

211.02.04 FERTILIZER AND AGRICULTURAL MINERALS: All fertilizer and agricultural minerals shall conform with all "Rules and regulations governing the registration, and collection of license tonnage fees for commercial fertilizer in the State of Nevada" as required by the Nevada State Department of Agriculture. Commercial fertilizer formulation and rate of application shall be as specified in the contract documents and subject to sampling for verification of analysis.

211.02.05 MULCH:

(a) **Hay or Straw.** Hay or straw shall be acceptable to the Engineer. All shipments of hay or straw shall be free of noxious weeds as defined by Nevada State Department of Agriculture. Rate of application shall be as specified in the contract documents.

(b) **Wood Cellulose Fiber.** Wood cellulose fiber shall be manufactured in such a manner that after addition and agitation in slurry tanks with fertilizers, seeds, water, and other approved additives, the fibers in the

material will become uniformly suspended to form a homogeneous slurry. When hydraulically sprayed on the ground, the material shall be uniformly impregnated with seed. Rate of application shall be as specified in the contract documents.

(c) **Wood Chips.** Wood chips shall be as specified in Subsection 726.03.04(c), "Roadside Materials."

(d) **Bark.** Bark shall be as specified in Subsection 726.03.04(d).

211.02.06 ASPHALT EMULSION: Asphalt emulsion used as a tie-down for mulch shall be as described in the contract documents.

CONSTRUCTION

211.03.01 PREPARATION: Excavation slopes shall be thoroughly cultivated to the depth shown in the contract documents, after which planting soil, if required by the contract, shall be uniformly spread to an approximate thickness of four (4) inches (10.2 centimeters), the exact thickness will be determined by the Engineer.

Cultivation of embankment slopes shall be required before placing planting soil unless otherwise specified in the contract documents or ordered by the Engineer. Such cultivation shall be considered subsidiary to other portions of the work and no direct payment will be made for such work.

Cultivation shall not be performed until all equipment is through working in the area, except equipment required to cultivate the area and spread planting soil.

After cultivation and prior to seeding, all rocks one (1) inch (2.5 centimeters) in smallest dimension and larger shall be removed from all slopes to be seeded and shall be disposed of as approved by the Engineer.

211.03.02 PLACEMENT OF PLANTING SOIL: Planting soil shall be evenly spread over the specified areas to the depth shown on the plans unless otherwise approved by the Engineer. After the planting soil has been spread, all large clods, hard lumps, rocks, and litter shall be raked up, removed, and disposed of by the Contractor.

Planting soil shall not be placed when the ground is frozen, excessively wet, or, in the opinion of the Engineer, in a condition detrimental to the work.

All damage occurring to existing roadbeds, shoulders, walks, curbs, or other existing adjacent structures or areas due to the Contractor's operation in hauling and placing the planting soil shall be repaired by the Contractor at his own cost and expense.

211.03.03 FIRMING OF PLANTING SOIL: Planting soil shall be made firm by use of a heavy or weighted disk set at an acute angle. The entire planting area shall be firmed by a minimum of three passes of the disk. The planting soil surface shall be brought to finished grade by one pass of a toothed harrow with teeth set at a 45 degree angle or by one pass of a steel-wire mat. Soil firming operations shall be performed by traveling at right angle to the slope, except slopes greater than 30 percent shall be firmed by equipment conveyed up and down the slope by means devised by the Contractor. After firming operations, the planting soil shall be two (2) inches (5 centimeters) below the top of all structures.

211.03.04 SEEDING AND FERTILIZING: The Contractor shall notify the Engineer not less than twenty-four (24) hours in advance of any seeding operation and he shall not begin the work until areas prepared or designated for seeding have been approved. Following the Engineer's approval, seeding and fertilizing of the approved slopes shall begin immediately.

Seeding shall not be done during windy weather or when the ground is frozen. Seed and fertilizer shall be uniformly spread over the area at the rate and mix specified in the contract documents. Seed and fertilizer may be sown by one of the following methods:

(a) An approved type hydro-seeder which utilizes water as the carrying agent and maintains a continuous agitator action that will keep seed and fertilizer mixed in uniform distribution until pumped from the tank. Pump pressure shall be such as to maintain a continuous, nonfluctuating stream of solution.

(b) Approved blower equipment with an adjustable disseminating device capable of maintaining a constant, measured rate of material discharge that will ensure an even distribution of seed and fertilizer at the rate herein specified.

(c) Helicopters properly equipped for aerial seeding and fertilizing. Helicopters so equipped shall have the following:

1. Two hoppers or seed compartments each capable of containing a minimum of one hundred (100) pounds (45 kilograms) of grass seed or granular fertilizer.
2. Powerdriven, readily adjustable disseminating mechanisms capable of maintaining a constant, measured rate of distribution of grass seed or granular fertilizer.
3. Where liquid fertilizer is furnished in lieu of dry granular fertilizer, the helicopter shall be equipped with two barrels or containers capable of containing a minimum of fifteen (15) gallons (57 liters) each. Distribution shall be a spray boom of sufficient size and length, fitted with proper nozzles to distribute uniformly, liquid fertilizer as herein specified.

(d) Approved power-drawn drills, with double-disc front delivery openers, and depth bands for positive depth control. Depth control shall be set at a depth of 3/4 inch (2 centimeters) for consistent furrow bottom placement.

An approved deep furrow drill may be used where it is determined the seedbed is firm and there is little danger of soil blowing. An approved spreader may be used for fertilizer placement. Drills and spreaders shall be calibrated before use on the project.

Areas inaccessible to above methods of application shall be seeded and fertilized by approved hand methods. Distribution of the material shall be uniform and at the rates specified.

It shall be the Contractor's responsibility to provide qualified personnel experienced in all phases of the seeding and fertilizing operation, equipment, and methods as herein specified.

211.03.05 SPREADING MULCH:

(a) **Hay or Straw.** Hay or straw mulch shall be furnished, hauled, and evenly applied at the rates indicated, and shall be spread by means of an approved type mulch spreader. The spreader shall produce a uniform distribution of the hay, without cutting or breaking it into short stalks. Areas beyond the range of the mulch spreader shall be mulched by approved hand methods. Distribution of the material shall be uniform and at the rate specified in the contract documents.

Straw, or hay unless otherwise specified, shall be anchored into the soil by use of a heavy disc with flat serrated discs approximately 1/4 inch (0.6 centimeters) thick, having dull edges and spaced no more than 9 inches (23 centimeters) apart. Anchoring shall be to a depth of 2 inches (5 centimeters) across the slope, and with no more than one pass of the equipment on the same surface.

(b) **Wood Cellulose Fiber.** Wood cellulose fiber utilized as a mulch may be applied with seed and fertilizer in one operation by approved hydraulic equipment. The equipment shall have a built-in agitation system with an operating capacity sufficient to agitate, suspend and homogeneously mix a slurry of the specified amount of fiber, fertilizer, seed, and water. Distribution and discharge lines shall be large enough to prevent stoppage and shall be equipped with a set of hydraulic discharge spray nozzles which will provide a uniform distribution of the slurry.

(c) **Wood Chips.** Wood chips utilized as a mulch may be applied by available mechanical chip spreaders or by approved hand methods. The wood chips shall be spread to an average depth of three inches (7.6 centimeters).

(d) **Bark.** Bark utilized as a mulch may be applied by available mechanical spreaders or by approved hand methods. The bark shall be spread on open slope areas to an average depth of three inches (7.6 centimeters). Bark applied as a mulch for tree and shrub rings shall be spread to an average depth of four inches (10 centimeters).

211.03.06 APPLYING ASPHALT EMULSION: When called for in the contract documents, mulch material shall be anchored in place with asphalt emulsion as herein specified. Asphalt emulsion shall be sprayed into the mulch as it leaves the blower pipe and shall be uniformly mixed with the mulch. Asphalt emulsion as specified shall be applied at the rate of two hundred fifty (250) gallons per acre (2,300 liters per hectare). Any mulch disturbed or displaced following application shall be removed, reseeded, and remulched as specified.

211.03.07 PLACING JUTE MATTING: Jute matting shall be unrolled and placed parallel to the flow of water immediately following the bringing to finished grade the area specified in the plans or the placing of seed and fertilizer. Where more than one strip is required to cover the given areas, they shall overlap a minimum of four (4) inches (10 centimeters). Ends shall overlap at least six (6) inches (15 centimeters) with the up-grade section on top. The up-slope end of each strip of matting shall be buried in six (6) inch (15 centimeters) slots with the soil firmly tamped against it. The Engineer may require that any other edge exposed to more than normal flow of water or strong prevailing winds be buried in a similar manner. Check slots shall be placed

between the ends of strips by placing a tight fold of the matting at least six (6) inches (15 centimeters) vertically into the soil. These shall be tamped and stapled the same as up-slope ends. Check slots must be spaced so that one check slot or one end occurs within each fifty (50) feet (15 meters) of slope.

Edges of matting shall be buried around the edges of catch basins and other structures as herein described. Matting must be spread evenly and smoothly and in contact with the soil at all points.

Jute matting shall be held in place by approved wire staples, pins, spikes, or wooden stakes driven vertically into the soil. Matting shall be fastened at intervals not more than three (3) feet (1 meter) apart in three rows for each strip of matting, with one row along each edge and one row alternately spaced in the middle. All ends of the matting and checks slots shall be fastened at six (6) inch (15 centimeters) intervals across their width. Fastening devices shall anchor the matting against the soil and be driven flush with the finished grade.

METHOD OF MEASUREMENT

211.04.01 MEASUREMENT: The quantity of planting soil measured for payment will be the number of cubic yards (cubic meters) placed in the work. The quantity of seeding, fertilizing and mulching to be measured for payment will be the actual number of acres or square yards (hectares or square meters) completed and measured along the ground slope. The quantity of jute matting to be measured for payment will be the number of square yards (square meters) covered and measured along the ground slope.

All measurements will be made in accordance with Subsection 109.01, "Measurement of Quantities."

BASIS OF PAYMENT

211.05.01 PAYMENT: The accepted quantity of planting soil measured as provided in Subsection 211.04.01, "Measurement," will be paid for at the contract unit price bid per cubic yard (cubic meter) of planting soil which price shall include hauling and placing.

The accepted quantities of seeding, fertilizing, mulching, and jute matting will be paid for at the contract unit price bid per acre or square yard as set forth in the proposal.

The contract unit price bid for seeding shall also be considered for compensation for removing and disposing of rocks, one (1) inch (2.54 centimeters) in smallest dimension and larger, from slopes as specified in Subsection 211.03.01, "Preparation."

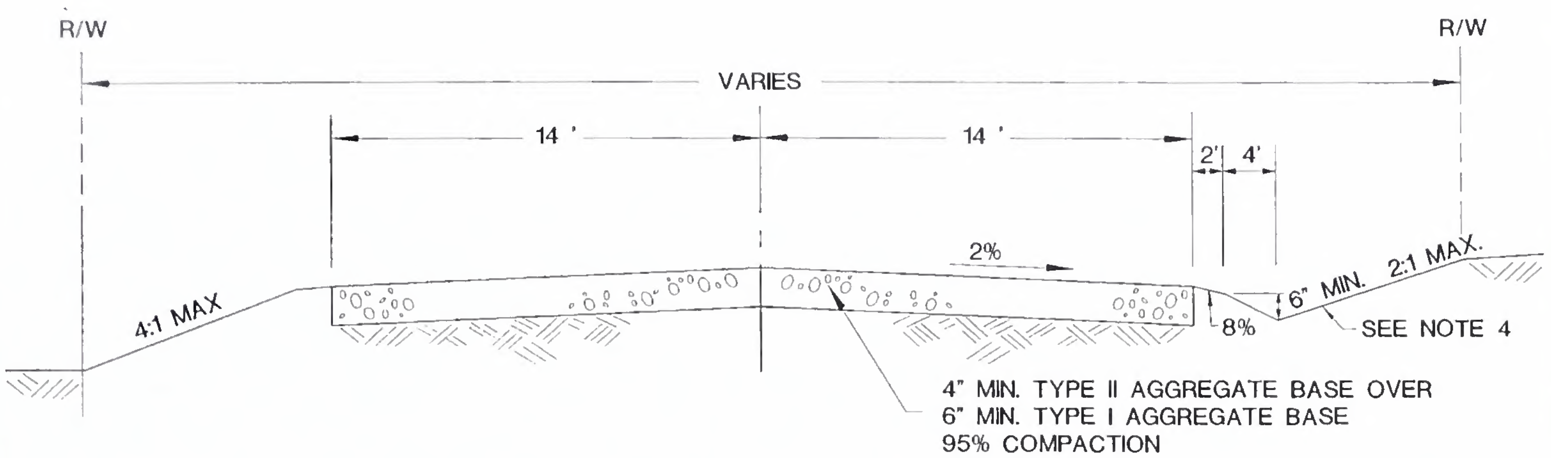
Water will be considered subsidiary to the major items of work and no further compensation will be allowed therefor.

Asphalt emulsion will be considered subsidiary to the item "Mulching" and no further compensation will be allowed therefor.

All payments will be made in accordance with Subsection 109.02, "Scope of Payment."

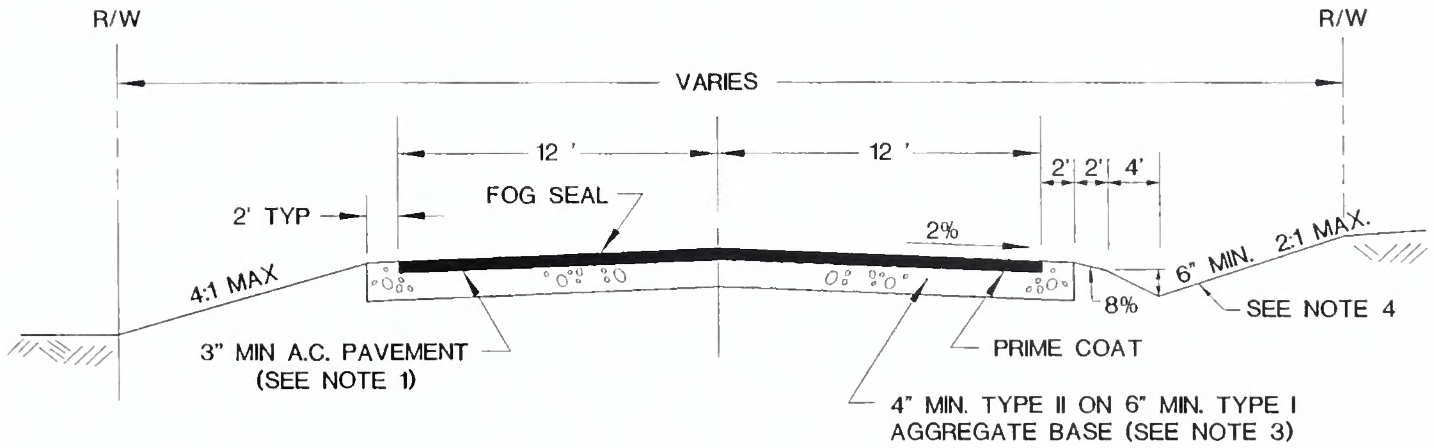
Payment will be made under:

PAY ITEM	**PAY UNIT**
Planting Soil	Cubic Yard (Cubic Meter)
Seeding (Type)	Acre, Square Yard (Hectare, Square Meter)
Mulching (Type)	Acre, Square Yard (Hectare, Square Meter)
Jute Matting	Square Yard (Square Meter)
(Type) Matting	Square Yard (Square Meter)



4" MIN. TYPE II AGGREGATE BASE OVER
6" MIN. TYPE I AGGREGATE BASE
95% COMPACTION

GRAVEL



3" MIN A.C. PAVEMENT
(SEE NOTE 1)

4" MIN. TYPE II ON 6" MIN. TYPE I
AGGREGATE BASE (SEE NOTE 3)

PAVED

NOTES:

1. INTERSECTIONS SHALL HAVE 25 FOOT MINIMUM EDGE OF OIL RADII.
2. COMPACTION OF AGGREGATE BASE AND SUBGRADE PREPARATION SHALL BE IN ACCORDANCE WITH THE "STANDARD SPECIFICATIONS".
3. STRUCTURAL SECTION SHOWN IS BASED ON A SUBGRADE "R" VALUE OF 20. OTHER STRUCTURAL SECTIONS MAY BE APPROVED IF BASED ON ENGINEERING ANALYSIS BASED ON "R" OR "CBR" VALUES DETERMINED BY SOIL TESTING. IN NO CASE SHALL THE A.C. THICKNESS BE LESS THAN THAT SHOWN, NOR SHALL THE BASE BE LESS THAN 4".
4. CULVERTS MAY BE REQUIRED AT DRIVEWAYS.

SPECIFICATION REFERENCE	
302	AGGREGATE BASE
401	BITUMINOUS PAVEMENT
406	PRIME COAT
407	FOG SEAL

UNIFORM STANDARD DRAWINGS
CLARK COUNTY AREA

ACCESS ROADS
(FOR USE IN PM-10 COMPLIANT AREAS)

DATE 12-14-00	DWG. NO. 209A	PAGE NO. 15A

Appendix C

Paleontological Resources

PALEONTOLOGIC RESOURCES MITIGATION PLAN

TABLE MOUNTAIN WIND POWER PROJECT

CLARK COUNTY, NEVADA

Prepared for:

PBS&J
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SECTION OF GEOLOGICAL SCIENCES
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April 2001

Confidential -- Not for Public Distribution

MANAGEMENT SUMMARY

The Section of Geological Sciences of the San Bernardino County Museum (SBCM) has prepared this *Paleontologic Resources Mitigation Plan (PRMP)* for the Table Mountain Wind Farm Project, Clark County, Nevada. The PRMP reviews the paleontologic sensitivity of sediments exposed within proposed areas of development. The results of this review demonstrate that exposures of several fossil-bearing lithologic units are present and may be impacted by development of the Table Mountain Wind Farm. These units include (from oldest to youngest): the Goodsprings Dolomite, the Sultan Limestone, the Monte Cristo Limestone, and the Bird Spring Formation. Pleistocene cave deposits and/or woodrat middens may also be present, and if present would have high paleontologic sensitivity.

Mitigation measures recommended within the PRMP include:

- PA-1: Preparation and presentation of an orientation workshop to explain paleontologic mitigation guidelines and procedures to construction personnel.

- PA-2: Pre-construction field reconnaissance of the Table Mountain Wind Farm Project site and all associated areas of potential impact (access roads, power lines, substations, etc.) by qualified professional vertebrate paleontologists with regional experience and under permit from the Bureau of Land Management, to recover representative samples of exposed marine limestone formations and to reconnoiter exposures of rock units having undetermined paleontologic sensitivity in order to assess the potential for these units to yield significant fossil remains.

- PA-3: Spot-check paleontologic monitoring in rock units determined to have undetermined paleontologic sensitivity by a qualified professional vertebrate paleontologist with regional experience, under permit from the Bureau of Land Management. Salvage will include recovery of exposed significant paleontologic resources and sampling where necessary to recover microfossil remains.

- PA-4: Stabilization, documentation and reburial of resources that cannot safely be recovered or otherwise preserved (e.g., avoided).

- PA-5: Preparation of recovered paleontologic resources to a point of identification and permanent preservation, including stabilization of large remains and screen washing of fossiliferous sediments to recover significant microfossil remains.

- PA-6: Preservation and curation of recovered significant fossil resources, including all associated contextual data, at a qualified professional repository with long-term retrievable storage.

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PALEONTOLOGIC RESOURCES MONITORING PLAN
TABLE MOUNTAIN WIND POWER PROJECT
CLARK COUNTY, NEVADA

Prepared by:

SECTION OF GEOLOGICAL SCIENCES
SAN BERNARDINO COUNTY MUSEUM

1: INTRODUCTION

1.1 SCOPE AND PURPOSE OF PLAN

The Section of Geological Sciences of the San Bernardino County Museum (SBCM) has reviewed the pertinent paleontologic and geologic literature and prepared this *Paleontologic Resources Mitigation Plan* (PRMP) for the Table Mountain Wind Power Project in Clark County, Nevada. The proposed wind power development area encompasses approximately 4,500 acres of public lands. The legal description of the public land proposed to be available for wind power development is as follows (all sections fall within the Mount Diablo Base and Meridian):

Township 24 South, Range 57 East	Eastern ½ of section 13
Township 24 South, Range 58 East	All of sections 7, 8, 18, 19, 30 and 33 Portions of sections 5, 6, 29, 31, 32, 34 and 35
Township 25 South, Range 58 East	All of sections 3, 4, 10 and 15 Portions of sections 2, 5, 9, 16 and 22

This PRMP is intended to detail the procedures employed to mitigate the impacts and effects of development-related excavation within the proposed development areas upon scientifically significant paleontologic resources. It provides for the discovery and retrieval of paleontologic resources, evaluation of the scientific significance of said resources, and mitigation of adverse impacts/effects to these resources as caused by excavation and construction-related activities. The PRMP also reviews existing relevant paleontologic locality information, discusses the geologic and paleontologic context of sediments present within the area of potential effect, and presents guidelines for paleontologic site evaluations and mitigation through data recovery, thereby providing important background and contextual information useful for the paleontologic resources management program. The logistics, procedures and methods outlined herein ensure compliance with Federal regulations subject to review by the Bureau of Land Management (BLM).

The PRMP is a work plan for all of the paleontologic activities that will ensue during the course of development of the Table Mountain Wind Power Project. It is not the intent to present herein a comprehensive list of sites with discussions of all significant taxa that have been recovered from the vicinity of the Table Mountain Wind Power Project and its environs. A full treatment of all resource sites and taxa from the area of potential effect will be presented as a part of the final report of findings generated as a result of paleontologic mitigation activities. The PRMP offers a research-oriented framework and accompanying logistical guidelines to ensure that significant nonrenewable paleontologic resources unearthed by development of the Table Mountain Wind Power Project will be managed appropriately and in a timely manner, thereby effectively mitigating adverse impacts to said resources.

1.2 LEGAL CITATIONS REGARDING THE PROTECTION OF PALEONTOLOGIC RESOURCES

1.2.1 Federal Regulations

Statutes of the United States of America that incorporate provisions for the protection of paleontologic resources include:

Federal Antiquities Act of 1906 (P.L. 59-209, 32 Stat. 225).

> Forbids and establishes criminal sanctions for disturbance of any object of antiquity on Federal land without a permit issued by an authorizing authority.

National Environmental Policy Act of 1969

> (P.L. 91-190, 83 Stat. 852, 42 USC 4321-4327). Mandates policies to "preserve important historic, cultural and natural aspects of our national heritage" (Section 101.b4).

1.2.2 State of Nevada Regulations

Statutes of the State of Nevada which incorporate provisions for the protection of paleontologic resources include the following:

State of Nevada Antiquities Law of 1959 (Nevada Revised Statutes 381.195-227).

> Made the Board of Trustees of the Nevada State Museum responsible for the preservation of prehistoric and historic sites on state lands through the issuance of antiquities permits to qualified persons and institutions.

2: INTERPRETING PALEONTOLOGIC SENSITIVITY

2.1 PALEONTOLOGIC RESOURCES

Paleontologic resources are the fossilized evidence of past life found in the geologic record. Despite the tremendous volume of sedimentary rock deposits preserved world-wide, and the enormous number of organisms that have lived through time, preservation of plant or animal remains as fossils is an extremely rare occurrence. Because of the infrequency of fossil preservation, fossils -- particularly vertebrate fossils -- are considered to be nonrenewable resources. Because of their rarity, and because of the scientific information they can provide, fossils are highly significant records of ancient life. They can provide information about the interrelationships of living organisms, their ancestry, their development and change through time, and their former distribution. Progressive morphologic changes observed in fossil lineages may provide critical information on the evolutionary process itself -- that is, the ways in which new species arise and adapt to changing environmental circumstances. Fossils can also serve as important guides to the ages of the rocks and sediments in which they are contained, and may prove useful in determining the temporal relationships of rock deposits from one area to another and the timing of geologic events. Time scales established by fossils provide chronologic frameworks for geologic studies of all kinds.

The United States Federal Government has officially recognized fossils as nonrenewable resources having scientific, educational and (in some cases) recreational value. In May of 2000, Secretary of the Interior Bruce Babbitt released the report "Assessment of Fossil Management on Federal & Indian Lands." The Secretary of the Interior was assisted in the production of this report by the BLM as well as by the United States Forest Service (USFS), the National Park Service (NPS), the Fish and Wildlife Service (FWS), the Bureau of Reclamation (BOR), the Bureau of Indian Affairs (BIA), and the Smithsonian Institution (SI). This landmark report determined that the following principles and recommendations should be uniformly applied to fossils occurring on Federal lands:

Principle 1: Fossils on Federal Lands are a Part of America 's Heritage

- Fossils are unique resources. Without fossils, human beings would have little understanding of the development of ancient life on earth.
- Of all the organisms that have ever lived, only a tiny proportion have been preserved, exposed to view, discovered and appropriately collected.
- The condition, availability and scientific significance of the fossils on federal lands are among the best in the world.
- Federal agencies' current management practices further the paramount scientific and educational values of fossils.

Recommendation: *Future actions should reaffirm the current use of federal fossils for their scientific, educational and, where appropriate, recreational values.*

Principle 2: Most Vertebrate Fossils are Rare

- Relatively few sites worldwide contain dense accumulations of vertebrate fossils, and only a fraction of these sites are located on federal lands in the United States. Advocates for increased collection of vertebrate fossils on federal lands often overestimate these fossils' abundance.
- Federal agencies therefore uniformly limit the collection of vertebrate fossils to qualified scientific and/or educational personnel.

Recommendation: *Future actions should reaffirm the restriction of vertebrate fossil collection to qualified personnel, with the fossils remaining in federal ownership in perpetuity.*

Principle 3: Some Invertebrate and Plant Fossils are Rare

- Although invertebrate and plant fossils generally are more abundant than vertebrate fossils, some are nonetheless extremely rare.
- The agencies' varying collection policies for invertebrate and plant fossils reflect the agencies' missions and attempt to satisfy the wide range of public interest in these fossils.
- The agencies will work to reduce the potential public confusion about the varying collection policies.

Recommendation: *Future actions should reaffirm mission-specific agency approaches to the management of plant and invertebrate fossils.*

Principle 4: Penalties for Fossil Theft Should be Strengthened

- Hundreds of fossils are stolen from federal lands every year. Such thefts reduce access by scientists and the general public to scientifically significant and/or instructive fossils and destroy the contextual information critical for interpreting the fossils.
- The difficulties of establishing the commercial value of a stolen or damaged fossil may hinder effective prosecutions of fossil theft and damage. Commercial value also does not necessarily reflect the scientific and educational values of fossils.
- Agency efforts to enhance awareness on the part of the public, scientists and law enforcement personnel about the various values of fossils and the damage caused by fossil theft would eventually facilitate effective prosecutions. This, in turn, would more effectively deter future theft and damage.
- Notwithstanding public education campaigns and increased penalty provisions, fossils will continue to be stolen from federal lands unless agencies can place more trained personnel in the field.

Recommendation: *Future actions should penalize the theft of fossils from federal lands in a way that maximizes the effectiveness of prosecutions and deters future thefts. Penalties should take into account, among other factors, the value of fossils themselves, as well as any damage resulting from their illegal collection. Future program strategies should emphasize education of federal managers, prosecutors, law enforcement personnel and the judiciary regarding the value of fossils and the techniques for the appropriate protection of fossil resources.*

Principle 5: Effective Stewardship Requires Accurate Information

- Inventories and monitoring of fossils on federal lands are critical for sound fossil management. Thorough inventory data enables informed decision making and enhances interagency collaboration.
- New technologies, the help of amateurs and volunteers and partnerships can improve the cost effectiveness of information gathering and analysis. However, on-the-ground inventories by professionals will remain important in assessing agency fossil resources.

Recommendation: *Future actions should acknowledge the need for gathering and analyzing information about where fossils occur, in particular the critical role of inventory in the effective management of fossil resources. Increased emphasis on fossil inventory should take into consideration, where possible ,regional approaches across agency lines, using modern technology such as Geographic Information Systems (GIS). Such work could also address specific issues, such as the impact of erosion on the loss of resources.*

Principle 6: Federal Fossil Collections Should be Preserved and Available for Research and Public Education

- Scientifically valuable fossils must remain in public ownership in order to be adequately preserved and available for science and public education.
- Federal agencies currently strive to meet the needs of scientists and the general public by housing fossils in both large research institutions and small community-based institutions, as well as federal repositories.
- Enhanced use of online databases, images and other information technology would maximize the availability of existing and future museum fossil collections to scientists and the public.

Recommendation: *Future actions should affirm the importance of curating scientifically valuable fossils as federal property, often in partnership with non-federal institutions. Future program approaches should emphasize the use of modern technology to improve curation and access, as well as the sharing of information between and among government agencies and other institutions.*

Principle 7: Federal Fossil Management Should Emphasize Opportunities for Public

Involvement

- The public, including properly-trained amateurs and volunteers, have been and should continue to be a critical part of the management of fossils on federal lands.
- Public education is critical in the management of fossils on federal lands.

Recommendation: *Future actions should include an emphasis on public education and participation in the stewardship of fossil resources. Future program approaches should emphasize the use of technology to increase public education and awareness of the importance and benefit of fossil resources.*

2.2 DEFINING PALEONTOLOGIC SIGNIFICANCE

As stated previously, preservation of plant or animal remains as fossils is an extremely rare occurrence. Because of the infrequency of fossil preservation, fossils are considered to be nonrenewable resources. Because of their rarity, and because of the scientific information they provide, fossils can be highly significant records of ancient life. Given this, fossils can be considered to be of significant scientific interest if one or more of the following criteria apply:

1. The fossils provide data on the evolutionary relationships and developmental trends among organisms, both living and extinct;

2. The fossils provide data useful in determining the age(s) of the rock unit or sedimentary stratum, including data important in determining the depositional history of the region and the timing of geologic events therein;

3. The fossils provide data regarding the development of biological communities or interaction between paleobotanical and paleozoological biotas;

4. The fossils demonstrate unusual or spectacular circumstances in the history of life;

5. The fossils are in short supply and/or in danger of being depleted or destroyed by the elements, vandalism, or commercial exploitation, and are not found in other geographic locations.

As so defined, significant paleontologic resources are determined to be fossils or assemblages of fossils that are unique, unusual, rare, uncommon, diagnostically or stratigraphically important, and/or those that add to an existing body of knowledge in specific areas--stratigraphically, taxonomically, and/or regionally. They can include fossil remains of large to very small aquatic and terrestrial vertebrates (including animal trackways), remains of plants and animals previously not represented in certain portions of the stratigraphy, and fossils that might aid stratigraphic correlations, particularly those offering data for the interpretation of tectonic events, geomorphologic evolution, paleoclimatology, and the relationships of aquatic and terrestrial species.

2.3 DETERMINATIONS OF ROCK UNIT SENSITIVITY

Sedimentary units that are paleontologically sensitive are those units with a high potential for containing significant paleontologic resources--that is, rock units within which vertebrate fossils or significant invertebrate fossils have been determined by previous studies to be present or likely to be present. These units include, but are not limited to, sedimentary formations that contain significant paleontologic resources anywhere within their geographical extent, as well as sedimentary rock units temporally or lithologically suitable for the preservation of fossils. Determinations of paleontologic sensitivity must therefore consider not only the potential for yielding abundant vertebrate fossils but also the potential for production of a few significant fossils, large or small, vertebrate or invertebrate, that may provide new and significant taxonomic, phylogenetic, and/or stratigraphic data. Areas that may contain datable organic remains older than Recent and areas that may contain unique new vertebrate deposits, traces, and/or trackways must also be considered paleontologically sensitive.

2.4 DEFINITIONS

Literature research and institutional records searches presented herein have resulted in the designation of excavation areas associated with development of the Table Mountain Wind Power Project as having high, low or undetermined paleontologic sensitivity. Provisions for mitigation of adverse impacts to significant nonrenewable paleontologic resources exposed during development-related construction along the project corridor are based upon these determinations of potential paleontologic sensitivity. The terms "high sensitivity," "low sensitivity" and "undetermined sensitivity" are described below.

2.4.1 High Sensitivity

Sedimentary units with a high potential for containing significant nonrenewable paleontologic resources are determined to have high paleontologic sensitivity. In these cases the sedimentary rock unit contains a high density of recorded vertebrate fossil sites, has produced vertebrate fossil remains in the near vicinity of the project, and is very likely to yield additional remains during excavation associated with project development.

2.4.2 Low Sensitivity

The rock unit contains no or very low density of recorded resource localities, has produced little or no fossil remains in the vicinity of the project, and is not likely to yield any fossil remains. [Note: it can happen that sedimentary exposures with few or no prior recorded sites prove abundantly fossiliferous during paleontologic mitigation activities. For example, the Diamond Valley Lake site in Hemet, Riverside County, California was originally determined to have "low to moderate" sensitivity, but subsequently has yielded thousands of well-preserved fossils of terrestrial Pleistocene

Epoch vertebrates (Springer and Scott 1994; Scott, 1997; Springer *et al.*, 1998, 1999)].

2.4.3 Undetermined Sensitivity

The rock unit has limited exposure(s) in the project area, is poorly studied, and contains no recorded paleontologic resource localities. However, in other areas, the same or a similar rock unit contains sufficient paleontologic resource localities to suggest that exposures of the unit in the project area would have at least a moderate potential for yielding fossil remains.

3: GEOLOGIC / PALEONTOLOGIC BACKGROUND

3.1 INTRODUCTION

This section of the PRMP describes the geology and paleontology of the Table Mountain Wind Power Project, in order to provide a context for understanding the types, nature, and scientific significance of the paleontologic resources present within this region. The nature, age, and preservation of paleontologic resources presumed to be present in the subsurface will be variable, given that different rock units are exposed within the study area.

3.2 CHARACTERISTICS OF THE STUDY REGION

3.2.1 Geologic / Paleontologic Background

3.2.1.1 Goodsprings Dolomite

The Goodsprings Dolomite, originally described by Hewett (1931), is exposed in Clark County in the southern half of the Spring Mountains, in the Bird Spring Range, and at Sheep Mountain (Longwell *et al.*, 1965). This formation consists of a monotonous sequence of thin-bedded, light to dark grey mottled dolomite, with a 50' to 75' layer of dolomitic limestone and sandy shale present near the top of the formation locally. Hewett (1931) reported to thickness of this formation to be 2,500' at Sheep Mountain, the only complete section exposed. The Goodsprings Dolomite is roughly 3,000' thick approximately 30 miles north of Sheep Mountain (Longwell *et al.*, 1965).

Analysis of fossils recovered by Hewett (1931) suggest that the Goodsprings Dolomite ranges in age from the later Cambrian Period to the Devonian Period. Hazzard and Mason (1953) reported that the vast majority of the formation as exposed near Goodsprings dated to the middle Cambrian, with overlying beds of Devonian age separated from the older deposits by an unconformity. These authors also recognized in the Goodsprings area two units of the Goodsprings Dolomite that, about 50 miles to the southwest, were assigned the names Bonanza King Formation and Cornfield Springs Formation. The lower portion of the former unit dates to the middle Cambrian Period, while the upper portion of the Bonanza King Formation and the entirety of the Cornfield Springs Formation date to the late Cambrian (Palmer and Hazzard, 1956).

3.2.1.2 Sultan Limestone

Hewett (1931) described rocks of Devonian age in the Goodsprings area as the Sultan Limestone; Longwell *et al.*, 1965) considered these rocks to be in large part equivalent with the Muddy Peak Limestone, but separated these two units on the basis of geography, confining the Sultan Limestone

to the western and northwestern regions of Clark County while limiting the Muddy Peak Limestone to exposures in the Muddy and Virgin Mountains. Hewett (1931) reported a maximum thickness of 765 feet in the Goodsprings area for the Sultan Limestone, and subdivided the formation into three members: the basal Ironside Dolomite Member (up to 125 feet thick), the middle Valentine Limestone Member (up to 380 feet thick), and the upper Crystal Pass Limestone Member (up to 260 feet thick). The Ironside Dolomite Member is "invariably" dolomite in composition; the Valentine Limestone Member ranges in composition from nearly all limestone at some localities to almost exclusively dolomite at others; and the Crystal Pass Limestone Member is virtually all limestone.

Fossils are not uniformly distributed throughout the Sultan Limestone. Hewett (1931) reported that the Ironside Dolomite Member contained relatively few fossils, although these were widespread throughout the member and could "be found with close search at most exposures" (Hewett, 1931, p. 14). Fossils recovered from this member include corals (*Alveolites* sp., *Cladopora* sp., *Cyathophyllum* sp., *Diphyphyllum* sp., *Pachyphyllum woodmani*, *Stromatopora* sp., *Striatopora* sp., *Syringopora* sp., *Aulopora* sp.), brachiopods (*Atrypa missouriensis*, *A. reticularis*, *Cyrtia cyrtiniformis*, *Spirifer argentarius*),and infrequent gastropods (*Platyschisma mccoya*) (Hewett, 1931). The overlying Valentine Limestone Member of the Sultan Limestone was distinguished by Hewett (1931) as having two distinct, alternating lithologies with differing fossiliferous potential: "beds of massive limestone 5 to 30 feet thick, which rather persistently bear a few fossils, and ... beds of platy limestone, which show no trace of fossils" (Hewett, 1931, p. 14 - 15). Fossils recovered from the massive limestone lithology of this member include coral (*Diphyphyllum* sp.), brachiopod (*Atrypa reticularis*), and gastropod (*Platyschisma mccoya*) (Hewett, 1931).

3.2.1.3 Monte Cristo Limestone

The Monte Cristo Limestone was named by Hewett (1931) based upon exposures of rocks of Mississippian age in the Goodsprings region of Nevada. The geographic distribution of the Monte Cristo Limestone closely corresponds with that of the Sultan Limestone, which unit it overlies. Hewett (1931) considered the Monte Cristo Limestone to be roughly equivalent to the Mississippian-age Rogers Spring Formation described by Longwell (1921) from the Muddy Mountains.

Five members of the Monte Cristo Limestone have been recognized. The basal member, termed the Dawn Limestone Member, consists of thinly bedded dark grey limestone with some chert; fossils are present in this member, appearing white against weathered surfaces. Taxa reported from this member by Hewett (1931) include:

Corals

- *Cladochonus* sp.
- *Cyathaxonia* sp. aff. *C. minor*
- *Michelinia* sp. aff. *M. meekana*
- *Syringopora* sp. aff. *S. surcularia*
- *Triplophyllum* sp. aff. *T. excavatum*
- *Triplophyllum* sp.

Brachiopods

- *Avonia* sp.
- *Camarotoechia* sp.
- *Chonetes logani*
- *?Cliothyridina* sp. aff. *C. incrassata*
- *?Cliothyridina* sp.
- *Productus gallatinensis*
- *P. keokuk*
- *Productus* sp. aff. *P. burlingtonensis*
- *P. ovatus*
- *P. setiger*
- *Pseudosyrinx* sp.
- *Pustula* sp. aff. *P. pustulosa*
- *Rhipidomella pulchella*
- *Rhipidomella* sp. aff. *R. burlingtonensis*
- *Reticularia cooperensis*
- *Schuchertella chemungensis*
- *Schizophoria* sp. aff. *S. swallowi*
- *Schizophoria* sp.
- *Spirifer centronatus*
- *Spirifer* sp. aff. *S. grimesi*
- *Spirifer* sp. aff. *S. keokuk*
- *Spiriferina solidirostris*
- *Spiriferina* sp.

Pelecypods

- *Pernipecten ?shumardianus*

Gastropods

- *?Loxonema* sp.
- *Holopea* sp.
- *Platyceras* sp.

Cephalopods

- *Orthoceras* sp.

Above the Dawn Limestone Member of the Monte Cristo Limestone is the Anchor Limestone Member, a limestone with abundant chert in thin layers and lenses that contains abundant fossils (Hewett, 1931; Longwell *et al.*, 1965) including:

Corals

- *?Cyathophyllum* sp.
- *?Lithostrotion* sp. aff. *L. ?harmodites*

?Lithostrotion sp.
Syringopora sp. aff. *S. surcularia*
Syringopora sp.
Triplophyllum sp.
Zaphrentis sp.

Echinoderms
Schizoblastus lotoblastus

Bryozoans
Fenestella sp.
Ptilopora sp.

Brachiopods
Brachythyris sp.
Camarotoechia metallica
Camarotoechia sp.
Chonetes loganensis var.
?Cliothyridina monticola
?Cliothyridina sp. aff. *C. incrassata*
Composita sp. aff. *C. immatura*
Composita sp. aff. *C. humilis*
Dielasma sp. aff. *D. burlingtonense*
Dielasma sp.
Laptaena analoga
?Orthotetes kaskaskiensis
?Orthotetes sp.
Productus gallatinensis
Productus sp. aff. *P. burlingtonensis*
P. ovatus
P. semireticulatus
Productella sp. aff. *P. hirsutiformis*
Pustula sp. aff. *P. curtirostris*
Pustula sp.
Reticularia cooperensis
Schuchertella chemungensis
Schizophoria sp. aff. *S. swallowi*
Spirifer centronatus
Spirifer sp. aff. *S. grimesi*
Spirifer sp. aff. *S. montgomeryensis*
Spiriferina solidirostris
Syringothyris sp.

Pelecypods
- *Cypricardinia* sp. aff. *C. scitula*
- *Schizodus* sp.

Gastropods
- *Euomphalus utahensis*
- *Straparollus spergenensis*

The Bullion Dolomite Member of the Monte Cristo Limestone overlies the Anchor Limestone member. This member, a massive, light-grey, coarse-grained limestone, locally altered to dolomite and forming prominent whitish cliffs (Hewett, 1931; Longwell *et al.*, 1965), is less fossiliferous than the preceding two members, but nevertheless has yielded the following taxa (Hewett, 1931):

Corals
- *?Cyathophyllum* sp. aff. *C. subcaespitosum*
- *?Lithostrotion* sp.
- *Syringopora* sp. aff. *S. surcularia*
- *Triplophyllum* sp. aff. *T. excavatum*
- *Triplophyllum* sp.

Echinoderms
- *Schizoblastus lotoblastus*

Bryozoans
- *Fenestella* sp.

Brachiopods
- *?Cliothyridina* sp. aff. *C. incrassata*
- *Productus* sp.
- *Pustula* sp.
- *Rhipidomella thiemei*
- *Spirifer centronatus*

The Arrowhead Limestone Member of the Monte Cristo Formation is a bluish-grey limestone in thin beds with some shale, overlying the Bullion Dolomite Member. Fossils are abundant from this member, and include the following taxa (Hewett, 1931):

Corals
- *?Cyathophyllum* sp. aff. *C. subcaespitosum*
- *Triplophyllum* sp.

Echinoderms
- *Echinocrinus* sp.

Dichocrinus sp.
Rhodocrinus sp.

Bryozoans

Cystodictya sp.
Fenestella sp. aff. *F. tenax*
Fenestella sp.
Polypora sp.
Stenopora sp.

Brachiopods

Camarotoechia sp. aff. *C. purduei*
Camarotoechia sp.
Chonetes loganensis
Composita immatura
?Orthotetes kaskaskiensis
?Orthotetes sp.
Productus ovatus
Pustula sp.
Rhipidomella ?nevadensis
Spirifer n. sp.
Spiriferina n. sp.

Pelecypods

Conocardium sp.
Edmondia sp.
Leptodesma sp. aff. *L. spergenense*

Gastropods

?Naticopsis sp.
Pleurotomaria sp.
Straparollus spergenensis

Crustacea

Paraparchites sp. aff. *P. carbonarius*
?Phillipsia sp.

Finally, the Yellowpine Limestone Member of the Monte Cristo Limestone is the uppermost subunit of the formation. This member is composed of dark grey limestone in thick beds, and forms prominent cliffs. Fossils are extremely sparse from this member, so much so that none were described according to taxon by Hewett, although such fossils as were recovered were presumed to date to the middle Mississippian (Hewett, 1931, p. 19). However, a subsequent investigation (Moore, 1991) has demonstrated that the Yellowpine Limestone Member is more abundantly

fossiliferous than previously reported. Locality SBCM 01.001.029 yielded the Stateline Mine Fauna, a composite fauna including the following taxa (Moore, 1991):

Coelenterata
- Indeterminate corals

Echinodermata
- Indeterminate crinoids

Bryozoa
- *Fenestella* spp.

Brachiopoda
- Chonetidae
- *Anthracospirifer* sp.
- Linoproductidae
- Orbiculoideinae
- Discinidae
- Rhynchonellidae
- *Dorsisinus* sp.
- Schuchertidae

Pelecypoda
- Myacea
- Corbulidae
- Pachydontinaeitiza

Gastropoda
- Pseudozygopleuridae
- Sinuitidae
- *Anematina* sp.
- Loxonematadae
- *Straparollus* sp.

Arthropoda
- *Paladin* sp.
- *Kaskia chesterensis*
- ?*Sevilla* sp.

Crustacea
- *Kokbya* sp.
- *Glyptopleura* sp.
- *Cauellina* sp.

Beyrichiopsis sp.
Paraparchitidae

The recovery of a representative sample of diagnostic fossils from exposures of the Monte Cristo Formation in the areas of potential effect of the Table Mountain Wind Power will help to preserve a physical record of which of the above fossil-bearing units were present prior to excavation.

3.2.1.4 **Bird Spring Formation**

The Table Mountain Wind Power Project site also traverses outcrops of the fossiliferous Bird Springs Formation (Longwell *et al.*, 1965). This formation was initially named by Hewett (1931), who described the formation from a thick sequence of marine rock beds in the Bird Spring Range, northeast of Goodsprings (Longwell *et al.*, 1965). The Bird Spring Formation overlies the cliff-forming limestone and dolomites of the Monte Cristo Formation. The basal portion of the Bird Spring Formation consists of sandstone, shale and thin limestone layers; these are overlain predominantly by limestone and dolomite. Layers of shale and sandstone also recur at many horizons, however. Also, many of the formation's carbonate beds are impure and numerous zones are relatively thin-bedded, due to which the formation on the whole is less resistant than the underlying Monte Cristo Formation (Longwell *et al.*, 1965).

Exposures of the Bird Spring Formation have proven abundantly fossiliferous in southern Nevada. The United States Geological Survey (USGS) has recorded several localities from the nearby Las Vegas Range that have produced the following marine fossil faunas (Longwell *et al.*, 1965):

USGS f-12077	Calcareous alga Textulariidae *Climacammina* sp. *Endothyra* sp. *Bradyina* sp. *Globivalvulina* sp. *Textrataxis* sp. Millerellid sp. *Triticites* sp. (= *Dunbarinella*) *Triticites* sp. or *Pseudofusulina* sp. *Triticites ventricosus* Stenoporoid bryozoan
USGS f-12078	*Climacammina* sp. *Endothyra* sp. *Tetrataxis* spp. *Schwagerina* sp. cf. *S. compacta* *Schwagerina* sp. aff. *S. hessenis*

USGS f-12079	Calcareous alga *Climacammina* sp. *Endothyra* sp. *Bradyina* sp. *Tetrataxis* sp. *Millerella marblensis* *Millerella* sp. *Fusulinella stouti* *?Syringopora* sp. *Chaetetes* sp. *Productus (Antiquatonia)* sp.
USGS f-12080	*Climacammina* sp. *?Millerella* sp. *Wedekindellina* sp. (early form) *Fusulinella ?stouti* *Fusulina* sp. aff. *F. serotina* *Spirifer* sp.

The following two localities are recorded by the USGS from the Meadow Valley Mountains (Longwell *et al.*, 1965):

USGS f-12081	*Endothyra* sp. *Millerella* sp. aff. *M. marblensis* Corals Stenoporoid bryozoan *Productus* sp. aff. *P. inflatus* *Schizophoria* sp. *Spirifer* sp. aff. *S. increbescens* *Punctospirifer transversus* *Reticulariina campestris*
USGS f-17272	Solitary coral Fistuliporoid bryozoan Crinoid columnals *Dictyoclostus* sp. aff. *D. inflatus* *Linoproductus* sp. Buxtoniid productid *Rhipidomella nevadensis* *Spirifer* sp. aff. *S. fayettevillensis* *Composita* sp.

The faunas from the Las Vegas Range have been dated to the Pennslylvanian and Permian Periods of

the Paleozoic Era. In contrast, the faunas from the Meadow Valley Mountains have been tentatively dated to the later Mississippian Period (Longwell *et al.*, 1965). The recovery of a representative sample of diagnostic fossils from exposures of the Bird Spring Formation in the area of potential effect of the Table Mountain Wind Power may help refine and augment understanding of the time of deposition of the Bird Spring Formation.

Fossils recovered from the lower member of the Bird Spring Formation include some taxa also recovered from the Bluepoint Limestone of the Muddy Mountains, as well as forms found in the lower part of the Callville Limestone in the Virgin Mountains (Longwell *et al.*, 1965). It is possible that, with the addition of fossils recovered from the Bird Spring Formation, from the area of potential effect of the Table Mountain Wind Power, a more complete fauna and lithologic correlation would be enabled among the Bird Spring Formation, the Bluepoint Limestone and the Callville Limestone.

3.2.1.5 Undifferentiated ?Cretaceous and Tertiary volcanics

Undifferentiated volcanic rocks dating to the early Cenozoic Era and possibly to the Cretaceous Period of the Mesozoic Era have low potential to contain significant fossil resources.

3.2.1.6 Pleistocene cave deposits

In addition to the fossil-bearing rock units described above, there is also potential to encounter fossil deposits that have accumulated in caves opened into the earlier limestone rocks. Such highly-significant fossil accumulations, most of which date to the later Pleistocene Epoch, have been previously reported from localities in or near the Goodsprings/Stateline region, including Kokoweef Cave in the Ivanpah Mountains (Goodwin and Reynolds, 1986; Force, 1991; Reynolds *et al.*, 1991b; Scott, 1997), Antelope Cave in the Mescal Range (Reynolds *et al.*, 1991c; Scott, 1997) and Devil Peak in the southern Spring Mountains (Reynolds *et al.*, 1991a). An early Holocene-age vertebrate fauna has also been reported from Quien Sabe Cave in the Ivanpah Mountains (Whistler, 1991). These fossil accumulations, which are frequently of large size, exhibit significant species diversity, and trend towards preservation of microvertebrates, are cached in caves opened into the existing limestone; Kokoweef Cave, for example, developed as "a large, steeply-dipping solution chamber etched along the brecciated zones parallel to the Clark Mountain Fault and near the contact of the ... Sultan Limestone and the ... Monte Cristo Limestone" (Reynolds *et al.*, 1991b, p. 97).

3.2.1.7 Pleistocene wood rat middens

In addition to the above-named modes of fossil preservation, there is also the possibility that wood rat middens -- that is, plant middens amassed through many years by wood rats (*Neotoma* sp.) -- may also be present within the area of potential effect. *Neotoma* middens have been known to accumulate through decades, centuries and even millennia as successive generations of packrats add collected plant matter to the midden. These middens can in some cases be paleontologic "treasure troves" in that they can provide:

- sequences of well-preserved plant fossils that enable reconstructions of past climatic conditions;
- potentially, time-stratified sequences of radiometric dates that enable more accurate interpretations of paleoenvironmental change through time; and
- occasionally, identifiable microfossil bones that permit comparisons with other, undated microfossil faunas to be advanced.

Wood rat middens have been previously employed to track climatic shifts and changes in plant distribution in the Great Basin and the Mojave Desert throughout the later part of the Pleistocene Epoch (± 40,000 years BP to ± 11,000 years BP), as well as through much of the Holocene Epoch (< 11,000 years BP) (Van Devender, 1977; Van Devender *et al.*, 1987; Spaulding *et al.*, 1990; Spaulding, 1995). Such middens are therefore highly paleontologically sensitive. If encountered, such middens will need to be salvaged and studied in order to determine their age and potential paleontologic significance.

3.2.1.8 Quaternary alluvium

Portions of the proposed Table Mountain Wind Power Project are also situated on sediments mapped by Longwell *et al.* (1965) as Recent and possibly Pleistocene alluvium (Qal). This alluvium has low potential to contain significant nonrenewable paleontologic resources. However, this alluvium may very well overlie undisturbed sediments of other fossil-bearing rocks units discussed above; should such uneroded sediments be present at depth, they would have high paleontologic sensitivity (see above).

3.2.2 Review of Existing Localities

A review of the Regional Paleontologic Locality Inventory (RPLI) was conducted by the staff of the Section of Geological Sciences, SBCM. The results of this review indicate that no paleontologic resource localities are recorded anywhere within the area of potential effect of the Table Mountain Wind Power.

4: RESEARCH QUESTIONS

4.1 INTRODUCTION

The significance of paleontologic resources can be determined by placing the recovered fossils and their associated contextual data in a pertinent research framework. A broad-based, initial research framework can be established that presents questions of scientific interest that can be asked of any sizeable paleontologic assemblage.

4.2 CATEGORIES FOR POTENTIAL RESEARCH

The criteria advanced for interpretations of paleontologic resource significance constitute the foundation for any research design. Since a fossil is not generally considered to be significant unless it corresponds to one or more of these classes, any research program must be designed to reflect this fact. Research questions that do not incorporate one or more of the significance criteria should not be considered or included in the research design.

As has been previously stated, resource significance can be determined by examining the recovered fossils in light of the following criteria:

1. The resources provide data on the evolutionary relationships and developmental trends among organisms, both living and extinct;

2. The resources provide data useful in determining the age(s) of the rock unit or sedimentary stratum, including data important in determining the depositional history of the region and the timing of geologic events therein;

3. The resources provide data regarding development of paleobiological communities and/or the interaction between paleobotanical and paleozoological biotas;

4. The resources represent unusual or spectacular circumstances in the history of life;

5. The resources are in short supply and/or in danger of being depleted or destroyed by the elements, vandalism, or commercial exploitation, and are not found in other geographic locations.

Based upon these criteria, then, several broad and basic categories for potential research are presented here as being of significant scientific interest, as well as being pertinent to the geologic and paleobiologic history of the many fossil strata that might be impacted by development of the Table Mountain Wind Power Project. These categories do not in and of themselves comprise a complete

research framework; rather, they provide a starting point from which to address the significance of any assemblage(s) identified from the project property. These categories include:

- Faunal composition of the assemblage
- Age(s) of the assemblage
- Depositional environment of the sedimentary sequence
- Taphonomic factors influencing the assemblage
- Population structure/dynamics of individual species within the assemblage
- Paleoenvironment of the region at the time(s) of deposition
- Questions specific to individual species represented within the assemblage

5: PALEONTOLOGIC RESOURCES MONITORING PLAN

5.1 MITIGATION MEASURES

The following are mitigation guidelines to be employed during construction conducted in association with development of the Table Mountain Wind Power Project. The mitigation measures will effectively mitigate adverse impacts to paleontologic resources to less than significant levels. These measures are summarized below as Paleontology Actions (PA) 1 through 6. The specifics of the mitigation efforts, including monitoring of excavation, curation, preparation of the final report and storage of specimens, are detailed subsequently (Section 6). These mitigation measures are subject to review by the BLM.

Prior to construction

PA-1 An orientation workshop shall be prepared, reviewed by the BLM, and presented by a professional paleontologist to explain paleontologic mitigation guidelines and procedures to the contractor and construction workers. This workshop, which may be pre-recorded and displayed via video or digital media subject to approval by the BLM, can be presented in conjunction with any pre-grade meetings conducted prior to excavation. The workshop will review the Paleontologic Resources Mitigation / Salvage Plan (PRMP), and will endeavor to explain the nature, appearance and importance of fossil vertebrates, invertebrates and plants. The responsibilities of construction personnel in a paleontologic mitigation context will also be detailed. Construction workers shall not collect any fossils found during construction before their significance can be assessed by a qualified paleontologist. An outline for the paleontology workshop is provided in Appendix A (attached). A document entitled "Checklist for Paleontologic Resources and Guidelines for Construction Personnel" has also been prepared for this task and is also provided in Appendix A. These documents are subject to review by the BLM.

All construction inspectors and environmental monitors shall be briefed on the locations of high sensitivity areas for paleontologic resources as part of a training program including information on all aspects of the project. This training program will cover items addressed in the paleontology workshop, but more training and detail will be included. It will be stated during the paleontology briefing that it is unlawful for construction inspectors or environmental monitors to collect significant fossils from the grade separation or any other construction area during construction, as these fossils belong to the public and will be placed in a recognized curation facility such as a museum or university, where they will be treated, stored, maintained and made available for scientific study.

PA-2 A field reconnaissance of the area of potential effect for the proposed Table Mountain Wind Power Project shall be conducted in advance of excavation, under permit from the BLM. This survey will examine existing rock units exposed within the area of potential effect of the project that might be impacted by the development of new access roads or other construction-related activities. The survey will traverse both the sites of the proposed wind towers and all associated features (access roads, etc.) to confirm geologic mapping, locate and recover any significant nonrenewable paleontologic resources exposed at the surface, and assess paleontologic sensitivity with more precision. Small samples of the exposed rock units will be collected during this survey, particularly from the Monte Cristo Limestone and the Bird Spring Formation, to determine which of the members of these formations are present in the area of potential effect, and to preserve a small remnant of such exposures for future study. Rock quarrying may be necessary in these instances, in which case available construction personnel may be requested to provide appropriate equipment for most efficient and timely removal of the resource(s). Cracks, fissures and/or other openings at the surface leading to possible subsurface Pleistocene caves will be assessed for paleontologic potential. Geotechnical techniques capable of detecting larger voids in the limestone that lack surface expression may also be employed at this time. Wood rat middens present in the area of potential effect will be identified and collected for analysis and preservation. The results of the field reconnaissance will be presented in report form at the conclusion of the study.

During construction

PA-3 It is highly likely that paleontologic resources will be encountered throughout construction in those geologic formations designated as having paleontologic potential. However, in most cases these fossils will be marine invertebrates from Paleozoic limestone formations that are present in such abundance and over such a broad geographic extent in Clark County that excavation will not cause significant adverse impacts. As a result, full-time monitoring of excavation is not required. However, as stated there is potential to encounter previously-unrecorded subsurface cave deposits during excavation, as well as wood rat middens. If encountered, these resources would have high paleontologic sensitivity. In these cases work shall be redirected to another area nearby so that the scientific significance of the find may be assessed by a qualified professional paleontologist. Construction monitors shall notify the onsite construction monitoring coordinator. A qualified professional vertebrate paleontologist with regional experience shall then assess the significance of the find and recommend additional mitigation measures, as necessary. The paleontologist shall be retained to perform inspection of the excavation and to salvage exposed significant resources as necessary. Where feasible, standard samples [2,724 kg (= 6,000 lbs or 2.4 cubic meters) each] of fossiliferous sediment may be collected for recovery and identification of terrestrial microvertebrates (rodents,

birds, rabbits). Monitors shall also determine whether the fossil is part of an archaeological deposit; if so, it shall then be considered a cultural resource discovery and treated according to the procedures specified in the Cultural Resource Monitoring Plan prepared prior to construction. In the event that substantial subsurface cave deposits too large and/or widespread to be mitigated in a timely fashion are encountered, the construction monitoring authority and the BLM shall be contacted to discuss procedures for avoiding the site until an appropriate, research-based program of excavation and recovery can be designed and effected.

This measure will be implemented by requiring periodic (once a week at the outset; subject to modification based upon need, excavation schedules, etc.) paleontologic monitoring in rock units wherein cave deposits may be likely to have formed. Paleontologic monitors will be qualified professional vertebrate paleontologists with regional experience, under permit from the BLM. These paleontologic monitors will be empowered to determine significance in the field and if possible to recover the data immediately.

This paleontologic measure will be further implemented by the retention of a qualified professional vertebrate paleontologist to provide "on-call" paleontologic services in the event significant paleontologic resources are encountered in the absence of a paleontologic monitor. If fossils are discovered by environmental monitors and/or construction personnel, work shall be redirected to another area nearby so that the on-call paleontologist may be contacted and the scientific significance of the find assessed. Construction crew members should proceed as outlined in Section 5.3.1, below.

If subsurface Pleistocene cave deposits are encountered, and if these deposits are of a size and distribution that they can be effectively dealt with using standard paleontologic mitigation techniques, fossils will be salvaged only when determined upon examination in the field to be diagnostic or potentially diagnostic. Large vertebrate fossils exposed by excavation will be expeditiously jacketed with plaster bandages or strips of burlap saturated with plaster, then removed and returned to the paleontology laboratory for preparation, identification and permanent storage. Standard samples [2,724 kg (= 6,000 lbs or 2.4 cubic meters) of sediment, as modified from Wolff (1975)] of fossiliferous sediments will be salvaged from designated microfossil sampling localities. This sedimentary matrix will be stockpiled on-site, and subsequently processed; recovered specimens will be identified and curated. Contextual data associated with the resources will be recorded in the field, and sites will be photodocumented.

This measure will be further implemented by the mobilization of additional paleontologic field monitors of the discovery if unusually large finds are encountered

during excavation. This procedure will optimize data recovery and avoid construction delays.

PA-4 The preservation of significant fossils (if found during construction) by removal will occur as described in PA-3, unless it is not feasible. In cases where the fossil(s) cannot be removed immediately, the location of the fossil(s) shall be stabilized to prevent further deterioration prior to data recovery under the direction of a qualified vertebrate paleontologist. Stabilization in these cases can (as necessary and safely feasible) include the following: removal of overburden; exposure of the resource(s); application of an appropriate hardening agent (e.g., Vinac for vertebrate fossils); and (in those cases where the resource cannot be recovered at all) reburial of the resource. Data recovery in these cases will include documentation of pertinent data (lithology, stratigraphy, taphonomy, etc.) as well as photodocumentation where possible.

After construction

PA-5 For all macro- and microfossils (vertebrate, invertebrate and/or plant) recovered during the field reconnaissance or during construction, a data recovery program shall be undertaken that includes preparation of recovered specimens to a point of identification and permanent preservation (including screen washing of fossiliferous sediment samples to recover small to microscopic vertebrate fossils); preparation of large vertebrate fossils recovered in plaster jackets; long-term stabilization of all recovered significant fossils; and analysis. The paleontologic monitoring and salvage team shall include an expert in vertebrate paleontology. A final report, including an itemized and accessioned inventory of recovered specimens, shall be prepared by a professional vertebrate paleontologist and distributed to the appropriate lead agencies. This report shall include any important megainvertebrate fossil localities and/or fossil plant localities. These items and procedures are discussed elsewhere under "Curation Plan."

PA-6 All fossil remains recovered during construction and associated development activity shall be curated at the expense of the developer at a qualified research facility (e.g., the Nevada State Museum or SBCM). A Memorandum of Agreement (MOA) for curation shall be reviewed and approved among the developers, the BLM, and the designated curation facility providing rights to these materials for guaranteed future research access.

5.2 FIELD MONITORING PROCEDURES

The SBCM has established the following procedures and guidelines to ensure the proper protection, salvage and recovery of paleontologic resources as they are encountered. Procedures for monitoring

and fossil recovery by qualified paleontologic field monitors are addressed as well as guidelines for construction personnel and excavation contractors who may encounter paleontologic resources in the course of their activities during excavation.

A qualified, professional vertebrate paleontologist thoroughly trained in paleontologic salvage guidelines and techniques will be on-site periodically during all excavation activities conducted in rock units that have been identified to have high paleontologic sensitivity. Field monitoring and fossil salvage will be conducted under permit from the BLM. Paleontologic monitors will be equipped to efficiently salvage fossils as they are unearthed in order to avoid excavation/construction delays.

Paleontologic monitors and/or their necessary equipment (including trucks) will be working intermittently in the area(s) of active excavation. Construction equipment operators will be instructed to give these monitors a wide berth (≈ six meters/twenty feet at least) for safety reasons. The paleontologic monitors will be prepared to quarry rock samples where necessary, and to remove samples of sediments that are likely to contain the remains of small to microscopic fossil invertebrates and vertebrates; the monitors may enlist the assistance of construction personnel and equipment in this undertaking, in order to avoid delays in excavation activities. The monitors will be empowered to temporarily halt or divert equipment to allow removal of abundant or large specimens.

The paleontologic monitors will be provided with appropriate safety materials (hard hats, orange vests with reflective yellow tape, steel-toed boots, et cetera) in order to promote safety and to facilitate ease of observation by the equipment operators.

Because the monitors will be performing their duties in close proximity to the excavation equipment, they have been trained to make themselves visible to equipment operators while in the field, and will usually endeavor to make eye contact with the operators prior to entering a potentially hazardous area. They will frequently be required to operate vehicles or equipment near active excavation areas. For this reason, the operators must be alert at all times to the presence of paleontologic monitors and their equipment in the excavation area.

5.3 CONSTRUCTION PERSONNEL PROCEDURES

As addressed in the attached document, "Guidelines for Construction Personnel and Supervisors" (provided in Appendix A), crews and supervisors should be on the lookout at all times for fossils, bones, animal trackways, charcoal, ash or other paleontologic resources exposed during all excavation activities. Although paleontologic monitors will be present periodically during excavation in rock units with high fossil potential, onsite personnel and/or other construction contractors may provide invaluable assistance in the salvage and recovery of these resources.

Upon encountering an exposed fossil or other paleontologic resource, the paleontologic monitor(s)

will stake off and flag an area of ± two (2) meters on all sides of the find, in order to alert equipment operators to the presence of a potential resource. The monitor(s) will then further expose the find in order to assess the potential significance of the find and determine the appropriate recovery requirements. Construction crews must avoid these staked off/flagged areas by a minimum of six (6) meters until the paleontologists have authorized continued excavation.

5.3.1 Fossils discovered by construction personnel during excavation

As stated above, a qualified paleontologic monitor will be on-site periodically during all excavation activities conducted in rock units that have been identified to have high paleontologic sensitivity: the Goodsprings Dolomite, the Sultan Limestone, the Monte Cristo Limestone, and the Bird Spring Formation. However, it is possible that construction crew members or equipment operators may be the first individuals to observe paleontologic resources exposed by excavation. It is also possible that fossils or other resources will be encountered at times when no paleontologic monitor is present. In these cases, *it is unlawful for construction workers and other construction contractor personnel to collect scientifically significant fossils from any construction area during construction.* The following guidelines are therefore to be employed in these cases.

In the event that the construction crew or the equipment operators suspect that they've uncovered *significant* fossils such as wood rat middens or evidence of subsurface cave deposits (invertebrate fossils are abundant and likely to be encountered, but are not here considered to be significant), preservation of these resource(s) and notification of the paleontologic monitor are of prime importance. Upon uncovering a potential resource, construction personnel should immediately divert excavation activities away from the potential site. Suspected resource localities should be avoided by a *minimum* of six (6) meters until the paleontologic monitor has approved further excavation. Subsequent to diverting construction equipment, operators and crew members must *immediately* endeavor to catch the attention of the paleontologic monitor, if present. The sooner the paleontologic monitor is alerted to the presence of the find, the sooner he or she can stake off and flag the area, assess the significance of the remains, recover the resource (if necessary), and permit excavation to continue in that area. Excavation in the affected area must not continue until authorized by the paleontologic monitor.

If the paleontologic monitor is not in the immediate vicinity, or is not on site, the operator or crew member should immediately stake off and flag the affected area, so that subsequent excavation equipment does not further damage or destroy the resource. Equipment operators are advised to carry lathe stakes and colored flagging with them at all times, to facilitate this mitigation effort. Once the affected area is staked off and flagged (if possible), the operator or crew member must then *immediately* contact the construction inspector. It is this inspector's responsibility to contact the paleontologic monitor or the lead paleontologist in this situation. The paleontologic monitor will respond to the construction inspector's request for assistance as soon as it is possible for him or her to do so. Construction crews and their supervisors must keep in mind that the paleontologic monitor may be involved in recovering resources elsewhere in the excavation, so an immediate response may

not always be possible.

In every case, supervisors and crew members should *avoid moving or disturbing the resource(s)* until the paleontologist(s) have determined the significance of the find. Again, *it is unlawful for construction workers or other construction contractor personnel to collect significant fossils from any construction areas during construction.* Work may not continue in the affected area until the paleontologic monitor(s) have removed or otherwise mitigated impacts to the find(s) and authorized further excavation.

5.4 RECORDATION AND DOCUMENTATION OF PALEONTOLOGIC RESOURCES

All paleontologic field monitors are trained in standardized methods and procedures to ensure that data collection is equitable among all identified paleontologic resource localities. All data collection and recordation techniques, as well as standard safety equipment and safety procedures will be reviewed prior to the project start-up.

During the paleontologic mitigation monitoring program, all observed pertinent data will be recorded on waterproof field notebooks with permanent ink on-site at the time the resource has been exposed and recovered. All paleontologic field notes will be retained at the appropriate paleontologic resource repository; photocopies will be generated frequently to ensure that there are always permanent copies in the event a field notebook is lost or misplaced.

Monitors will be equipped with Brunton or equivalent compasses with built-in clinometers to permit precise elevational siting of fossil horizons; it is imperative that accurate stratigraphic information is obtained in this way. The use of Global Positioning System (GPS) units will allow monitors to accurately plot paleontologic resource localities on the project maps that will be provided for them.

Characterization of the sedimentary lithology is important in paleontologic studies. The character of the sediment surrounding the resources provides many clues as to the environment of deposition. Lithologic description is enhanced by the use of rock color charts to uniformly assess sediment color. Additionally, details such as grain size, shape, sorting, roundness, and sphericity of lithologic samples will be determined by the monitor in the field with a hand lens. Small samples of sediment will be collected at each resource site. Monitors will also sketch measured stratigraphic sections of the area surrounding a resource locality. Photodocumentation will be conducted where judged appropriate by the field monitor.

For taphonomic studies, magnetic north will be noted using a Brunton or equivalent compass and written on the fossil specimens (or plaster jackets that encase them) so that the original orientation of the specimen(s) in the sediment is preserved. Other taphonomic data (evidence of trampling, weathering, etc) will be noted where pertinent; however, in most cases these determinations are better performed in the laboratory.

For safety purposes, paleontologic field monitors will be equipped with hard hats, bright orange vests with a reflective coating, and steel-toed boots.

5.5 RECOVERY OF PALEONTOLOGIC RESOURCES

5.5.1 Megafaunal Sampling Plan

The potential distribution of subsurface cave deposits likely to be impacted by excavation cannot be known *a priori*. The megafaunal sampling plan will therefore be strictly dictated by the excavation activities planned for the development project. The paleontologists will provide spot-check monitoring *only* in the areas that are being excavated in rock units that have high paleontologic potential.

Where a paleontologic monitor discovers a vertebrate megafaunal resource locality exposed by excavation, the fossils will be expeditiously jacketed with plaster bandages or strips of burlap saturated with plaster, then removed and returned to the appropriate, professionally-recognized and accredited curatorial facility for preparation, identification and permanent storage.

5.5.2 Microfaunal Sampling Plan

The sampling of microvertebrates is critical to understanding both the temporal and the paleoecological aspects of the sediments encountered in conjunction with development. Microvertebrates (especially rodents) can be useful to paleontologists in determining the age of the sediments in which they are deposited; this relative age dating application is called biochronology. This method is ideally utilized in conjunction with methods of absolute dating such as the radiometric dating of ashes, charcoal or dating of bone collagen to obtain a clear picture of the age of the sediments. Recovery and analysis of fossil pollen can potentially enable determination of changes in plant distributions and microclimate through time.

Microfauna are also extremely useful in determining the paleoenvironment in existence at the time the sediments were deposited. Small animals such as amphibians and reptiles are very specific to certain environments (pond turtles, for instance, live near water). Amphibians in a sample are also indicative of a wet environment since they must reproduce in water. Analysis of the microfauna can therefore enable us to determine what the climate was like during the time periods that span the rock units exposed during development. Large vertebrates are less useful for paleoenvironmental analysis, due to their proclivity for traveling large distances during their lifetime; it follows, therefore, that small animals which have restricted geographic ranges would be more likely to yield environmental data.

5.5.2.1 Details of Microfaunal Sampling Plan

The microfaunal sampling plan is designed to allow for the recovery of microvertebrates at appropriate locales within the area of potential effect of the Table Mountain Wind Power Project.

The recovery of bulk samples of sediment that contain microvertebrate remains has been standardized by Wolff (1975). Standard samples of fossiliferous matrix are generally accepted to be 2,724 kg (6,000 lbs = 2.4 cubic meters) per lithologic horizon. As discussed in PA-3 above, the sampling calls for standard samples of matrix to be collected within members or formations that have proved to produce terrestrial vertebrate fossils, or that have undetermined potential to produce such fossils. This sedimentary matrix will be stockpiled on-site, and subsequently processed; recovered specimens will be identified and curated.

5.5.3 Marine Invertebrate Sampling Plan

Surface exposures of the Goodsprings Dolomite, the Sultan Limestone, the Monte Cristo Limestone, and the Bird Spring Formation have high potential to contain marine invertebrate fossils. Samples of these geologic formations containing a representative sample of the fossil assemblages will be recovered from areas of potential impact (possibly by quarrying if necessary) and removed for laboratory preparation and storage. The size and nature of the recovered samples will be determined at the time of recovery, during preconstruction field reconnaissance.

5.6 CURATION PLAN

Curation of fossil specimens collected during the paleontologic mitigation program includes the preparation of recovered specimens to a point of identification and permanent preservation, including screen washing of fossiliferous sediment samples to recover small to microscopic vertebrate fossils. Large specimens encased in plaster jackets taken from the site will be prepared in the paleontology laboratory.

5.6.1 Processing and Curation Techniques

The curation plan calls for laboratory preparation of recovered vertebrate fossil remains to a point of identification and permanent preservation (*not* exhibition). This preparation generally requires exposure of the recovered resource(s) by removal of the surrounding sedimentary matrix from the jacket; this matrix is saved for later microfossil processing. Once all of the matrix has been removed and the specimen has been cleaned, the fossil is hardened with Vinac, a modified polyvinyl acetate homopolymer, that has been thinned with acetone in order to enable the hardener to more fully penetrate the fossil. Vinac may be applied several times before the fossil is deemed to be sufficiently sturdy for permanent storage. Excess plaster from the jacket is then trimmed, to reduce the amount of storage space required by the specimen.

The curation plan also includes the processing of standard samples of fossiliferous matrix.

Sedimentary matrix will be water-washed through stacked sets of 20- and 30-mesh screens and sun-dried; select sediment samples may be washed through more finely-meshed screens to enable the recovery of microscopic ostracodes or fossil pollen, where appropriate. To accelerate the breakdown of fossiliferous matrix, sediments will be oven-roasted to promote drying, then re-submerged in water to facilitate disaggregation of clays and fine silts. Subsequent screen washing will remove these fine sediments and leave fossil specimens in a clean concentrate. This concentrate will be visually examined -- when necessary with the aid of binocular microscopes -- and hand-sorted to remove fossil specimens.

The curation plan further includes sampling for fossil pollen. In those cases where pollen is identified from bulk samples in the field, additional sampling should be initiated where warranted in a series of more precise (e.g., 2 cm) sampling horizons; this will potentially enable determination of changes in plant distributions and microclimate through time.

Should plant macrofossils be exposed or identified during a mitigation program, such fossils should be collected and prepared to a point of identification and permanent preservation (*not* exhibition). This preparation generally requires full exposure of the recovered resource(s) followed by application of a hardening agent. Misting with a 10:1 water/white glue mixture is usually sufficient for preserving such fossils; application of nitrocellulose thinned with acetone is also recommended in some instances (Lepage and Basinger, 1993).

Samples of marine invertebrates collected from Paleozoic rocks will be preserved as representative samples of the members of the geologic formations exposed. Some preparation, including abrasion excavation and/or acid etching to more completely expose fossils preserved in limestone blocks, may be initiated. In some cases, at the discretion of the Principal Investigator, select rock slabs containing fossilized invertebrates may be left intact for future researchers, so that these individuals will be able to prepare the rock slabs themselves and observe the appearance of the fossil(s) immediately upon exposure.

Other curatorial tasks will include the identification, curation and accessioning of all recovered specimens into the retrievable storage collections of an approved, accredited curation facility. All data pertaining to the specimens will be recorded in the collections database of the repository. Resource locality information will also be plotted on topographic maps and entered into a computerized locality database. Card stock printouts of all pertinent faunal, floral, locational, and lithologic data pertaining to each resource locality will be produced and filed. Card stock files from the locality database will also be printed and kept on file.

Following preparation, fossils will be stored in steel cabinets with steel geologic specimen trays. Accession and locality data will be written in permanent black ink on acid-free paper tags associated with each specimen; specimen identifications will be written in pencil. Accession numbers of large fossils will be written on the bone in permanent ink. Large fossils will be stored in their plaster jackets where necessary to help retain the integrity of the bone; excess plaster will be cut away prior

to storage, to maximize storage space. Microfossils will be stored in glass vials with cork stoppers; extremely small specimens (e.g., ostracodes) will be placed in gelatin capsules within the glass vials. Accession data slips inside each of the glass vials will prevent inadvertent shuffling of the collection and provide a means of "earthquake-proofing" the collection. The glass vials will be placed in cardboard jewelers boxes with their data slips, then permanently stored in the geologic specimen trays. Fossil-bearing limestone blocks will be stored in heavy-duty steel drawers. Labels bearing accession number data shall be glued to these rock slabs, in such a manner so as not to damage or obscure the fossil(s).

Specimens recovered during the course of the mitigation program will be identified by professional paleontologists who have appropriate expertise in vertebrate and invertebrate paleontology and paleobotany.

The fossils will be curated and stored and accessioned into the permanent retrievable collections of a recognized, accredited repository. All paleontologic resources will be catalogued and accessioned under a unique number, which would identify the appropriate property and/or development project as the source of the fossils.

A final report of methods and results of the paleontologic mitigation plan will be provided at the cessation of each mitigation program. The report will include a detailed discussion of how the research goals of the project have been met, in addition to descriptions of significant finds, discussion of the curation of the resources, and results of sampling and analysis as well as an itemized accession inventory of all specimens recovered. A discussion of the significance of each taxon discovered will be provided where feasible. All resource locality information will be presented as a confidential appendix and a printout of all locality data, as well as pull-out maps with all paleontologic resource localities plotted.

6: MITIGATION RECOMMENDATIONS BY GEOLOGIC UNIT

This section summarizes the results of the literature search and review of the Regional Paleontologic Locality Inventory (RPLI), and applies the mitigation measures described in the previous section to the potential project excavation areas according to geologic unit. Preconstruction surveying of the areas where development-related excavation is planned (mitigation recommendation PA-2) is expected to provide additional, more precise geologic detail for assessing paleontologic sensitivity.

6.1 *GEOLOGIC DEPOSITS: GOODSPRINGS DOLOMITE*

Age: Cambrian to Devonian?

Sensitivity: *UNDETERMINED* (*HIGH* if Pleistocene cave deposits encountered)

Description: Exposures of the fossiliferous Goodsprings Dolomite in Columbia Pass at the base of the proposed access road.

Recommendations: The "Prior to Construction" general mitigation measures should be applied to this area of excavation. These measures include worker education and briefing of archaeologists and construction inspectors (PA-1) and pre-construction reconnaissance of the area of potential impact with collection of a small representative sample of fossil-bearing rock for laboratory preparation and storage (PA-2), unless such fossiliferous rocks are not present. If fossil-bearing exposures are located during the survey, periodic monitoring of construction by a professional paleontologist under permit from the BLM (PA-3) is also required. If *significant* fossil deposits are observed during the survey or during the spot-check monitoring, including evidence of subsurface cave deposits and/or wood rat middens, PA-4 through PA-6 will apply.

6.2 *GEOLOGIC DEPOSITS: SULTAN LIMESTONE*

Age: Devonian

Sensitivity: *UNDETERMINED* (*HIGH* if Pleistocene cave deposits encountered)

Description: Exposures of the fossiliferous Sultan Limestone in Columbia Pass above the Goodsprings Dolomite near the base of the proposed access road.

Recommendations: The "Prior to Construction" general mitigation measures should be applied to this area of excavation. These measures include worker education and briefing of archaeologists and construction inspectors (PA-1) and pre-construction reconnaissance of the area(s) of potential impact with collection of a small representative sample of fossil-bearing rock for laboratory preparation and storage (PA-2). Periodic "spot-check" monitoring of construction by a professional paleontologist under permit from the BLM (PA-3) is also required. If *significant* fossils are observed, including evidence of subsurface cave deposits and/or wood rat middens, PA-4 through PA-6 will apply.

6.3 *GEOLOGIC DEPOSITS: MONTE CRISTO LIMESTONE*

Age: Mississippian

Sensitivity: *UNDETERMINED* (*HIGH* if Pleistocene cave deposits encountered)

Description: Exposures of the fossiliferous Monte Cristo Limestone north and east of the summit of Table Mountain.

Recommendations: The "Prior to Construction" general mitigation measures should be applied to this area of excavation. These measures include worker education and briefing of archaeologists and construction inspectors (PA-1) and pre-construction reconnaissance of the area(s) of potential impact with collection of a small representative sample of fossil-bearing rock for laboratory preparation and storage (PA-2). Periodic "spot-check" monitoring of construction by a professional paleontologist under permit from the BLM (PA-3) is also required. If *significant* fossils are observed, including evidence of subsurface cave deposits and/or wood rat middens, PA-4 through PA-6 will apply.

6.4 *GEOLOGIC DEPOSITS: BIRD SPRING FORMATION*

Age: Pennsylvanian to Permian; possibly also Mississippian

Sensitivity: *UNDETERMINED* (*HIGH* if Pleistocene cave deposits encountered)

Description: Exposures of the fossiliferous Bird Spring Formation north and east of Wilson Pass,

north and south of Shenandoah Peak, and north and east of the summit of Table Mountain above the Monte Cristo Limestone.

Recommendations: The "Prior to Construction" general mitigation measures should be applied to this area of excavation. These measures include worker education and briefing of archaeologists and construction inspectors (PA-1) and pre-construction reconnaissance of the area(s) of potential impact with collection of a small representative sample of fossil-bearing rock for laboratory preparation and storage (PA-2). Periodic "spot-check" monitoring of construction by a professional paleontologist under permit from the BLM (PA-3) is also required. If *significant* fossils are observed, including evidence of subsurface cave deposits and/or wood rat middens, PA-4 through PA-6 will apply.

6.5 *GEOLOGIC DEPOSITS: VOLCANICS*

Age: Tertiary (?Miocene); also possibly Cretaceous

Sensitivity: *LOW*

Description: Exposures of volcanic andesite, latite, rhyolite and basalt at the summit of Table Mountain.

Recommendations: Worker education and briefing of archaeologists and construction inspectors (PA-1) should be conducted prior to excavation.

6.6 *GEOLOGIC DEPOSITS: ALLUVIUM*

Age: Recent

Sensitivity: *LOW* (*HIGH* if Pleistocene cave deposits encountered)

Description: Recent alluvial deposits that are too young to contain significant nonrenewable paleontologic resources, and are therefore assigned low paleontologic sensitivity. ***NOTE:*** **Recent sediments present at the surface throughout the extent of the area of potential effect of the Table Mountain Wind Power Project may be underlain throughout their extent by fossil-bearing rock units. Excavation in the younger alluvium may expose paleontologically-sensitive sediments.**

Recommendations: Worker education and briefing of archaeologists and construction inspectors (PA-1) should be conducted prior to excavation. Spot-check monitoring of excavation in these sediments should be conducted as deemed appropriate by a qualified vertebrate paleontologist. *If previously-unmapped sediments having high paleontologic sensitivity are encountered during excavation,* ***as is possible at depth****, PA-3 through PA-6 will apply.*

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Section of Geological Sciences
San Bernardino County Museum
27 April 2001

APPENDIX A

Outline of Orientation Meeting for Construction Personnel,

Checklist for Paleontologic Resources

and

Guidelines for Construction Personnel and Supervisors: Field Recovery of Paleontologic Resources, Table Mountain Wind Power Project

ORIENTATION MEETING FOR CONSTRUCTION PERSONNEL AND SUPERVISORS

FIELD RECOVERY OF PALEONTOLOGIC RESOURCES TABLE MOUNTAIN WIND POWER PROJECT

Prepared by:

SECTION OF GEOLOGICAL SCIENCES
SAN BERNARDINO COUNTY MUSEUM

I. INTRODUCTION

- ♦ Project Location and Description
- ♦ Scope and Purpose of Paleontologic Resource Mitigation Plan
    - -- What is a paleontologist?
    - -- What is "paleontologic mitigation?"
    - -- What do paleontologic monitors do?

II. FOSSIL RESOURCES

- ♦ What are paleontologic resources?
- ♦ Why are fossils important?
    - -- Definitions of a "significant resource"
- ♦ How do we determine rock unit sensitivity?
    - -- High sensitivity
    - -- Low sensitivity
    - -- Undetermined sensitivity

III. GEOLOGY / PALEONTOLOGY OF THE TABLE MOUNTAIN WIND POWER PROJECT

- ♦ Goodsprings Dolomite
- ♦ Sultan Limestone
- ♦ Monte Cristo Limestone
- ♦ Bird Spring Formation
- ♦ Volcanic rocks
- ♦ Pleistocene cave deposits
- ♦ Recent alluvium

IV. PALEONTOLOGIC RESOURCE MONITORING PLAN

- ♦ Mitigation measures
- ♦ Field monitoring procedures
- ♦ Construction personnel procedures
    - -- How do I recognize fossils?
    - -- What do I do if I find a fossil?
- ♦ Recovery of paleontologic resources and associated contextual data
    - -- Megafaunal sampling
    - -- Microfaunal sampling
    - -- Trackways

V. SUMMARY

CHECKLIST FOR PALEONTOLOGIC RESOURCES
TABLE MOUNTAIN WIND POWER PROJECT

➔ CONSTRUCTION CREWS -- BE ALERT FOR THESE ITEMS / CONDITIONS ➔

Materials:

- ____ Bones
- ____ Ancient plant remains (chunks of fossil wood, branches, logs, etc.)
- ____ Charcoal
- ____ Shells, in sediments or in rock (limestone)
- ____ Stones which appear to have been shaped or which have an unusual shape
- ____ Any objects which appear to be unusual or out of place.
- ____ Openings or fissures into existing limestone

Conditions:

- ____ Ash or ash-like sediments (grey to white, very fine-grained; often powdery in texture and appearance)
- ____ Lake sediments (greenish, fine-grained; silts & clays)
- ____ Marine sediments (fine sands and silts; ancient limestone)
- ____ Stream or river sediments (grey to reddish gravels; water-rounded pebbles and/or cobbles)
- ____ Playa sediments (red-brown, fine-grained clays and silts w/ mud cracks)
- ____ Any unusual or out-of-place sedimentary layers or strata.

IF YOU UNCOVER ANY OF THE ABOVE MATERIALS / CONDITIONS --
OR OTHER OBJECTS YOU SUSPECT MIGHT BE PALEONTOLOGIC RESOURCES:

CONTACT THE SITE PALEONTOLOGIST
OR YOUR CONSTRUCTION MONITOR IMMEDIATELY!

NOTE: IT IS *UNLAWFUL* FOR CONSTRUCTION MONITORS OR OTHER CONSTRUCTION CONTRACTOR PERSONNEL TO COLLECT SIGNIFICANT FOSSIL RESOURCES FROM THE RIGHT-OF-WAY OR FROM ANY OTHER EXCAVATION AND/OR CONSTRUCTION AREAS DURING CONSTRUCTION!!

GUIDELINES FOR CONSTRUCTION PERSONNEL AND SUPERVISORS: FIELD RECOVERY OF PALEONTOLOGIC RESOURCES TABLE MOUNTAIN WIND POWER PROJECT

Prepared by:

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Excavation conducted in conjunction with development of the proposed Table Mountain Wind Power Project has potential to encounter significant nonrenewable paleontologic resources (= fossils) that are likely to be destroyed unless proper monitoring and mitigation procedures are employed. For this reason, qualified professional vertebrate paleontologists with regional experience will provide paleontologic monitoring on-site periodically during all phases of excavation in rock units sediments that have been targeted to contain fossil resources. To aid in this endeavor, the following procedures have been formulated and established by the SBCM, subject to review by the Bureau of Land Management (BLM), to instruct and assist development personnel and/or other construction contractors in the proper protection, salvage and recovery of these resources as they are encountered.

In brief, the following guidelines should be applied at all times during excavation:

- Be alert for paleontologic monitors and/or their equipment (including trucks) in the area(s) of active excavation and the along haul roads. When monitors are excavating a find, give them a wide berth (≈ six meters or more).

- Be alert for fossils and other significant resources (see attached checklist). *Immediately* alert the paleontologic monitors in the event that paleontologic resources are encountered. If the monitors are not in the vicinity, stake the affected area off with lathe stakes and colored flagging. *Immediately* thereafter, contact your designated construction inspector. Avoid moving or disturbing the resource(s) until the paleontologists have determined the significance of the find.

- Be alert for areas that have been flagged and/or staked off by the paleontologic monitors. Give these areas a wide berth (≈ six meters or more) regardless of whether or not a paleontologist is present.

FIELD PROCEDURE FOR MONITORING AND RECOVERY

Professional, qualified paleontologic field monitors will be on-site periodically during excavation activities conducted in potentially-fossiliferous sediments. These monitors will be equipped to salvage fossils as they are unearthed, in order to avoid excavation/construction delays. The paleontologic monitors will also be prepared to remove samples of sediments that are likely to contain the remains of small to microscopic fossil invertebrates and vertebrates; the monitors may enlist the assistance of construction personnel and equipment in this undertaking, in order to avoid delays in excavation activities. The monitors will be empowered to temporarily halt or divert equipment to allow removal of abundant or large specimens.

FIELD MONITORING

1.) ***Construction crews and supervisors must be alert for paleontologic monitors and/or their equipment in the area(s) of active excavation.***

Paleontologic monitors will be present in the field as necessary for drilling, augering or other excavation in high potential sediments. They will be provided with appropriate safety materials (hard hats, orange vests w/ reflective yellow tape, steel-toed boots, etc.) in order to promote safety and to facilitate ease of observation by the equipment operators. The paleontologic monitors will also be provided by the developers with hand-held radios if deemed necessary to streamline communications with construction personnel.

Monitors will performing their duties in close proximity to the excavation equipment. They are trained to make themselves visible to equipment operators while in the field, and will usually endeavor to make eye contact with the operators prior to entering a potentially hazardous area. They will frequently be required to operate vehicles or equipment in the excavation or along the haul roads. For this reason, the operators must be alert at all times to the presence of paleontologic monitors and their equipment in the excavation area.

2.) ***Construction crews and supervisors must be alert for fossils and other significant resources.***

Construction crews and supervisors should be on the lookout at all times for fossils, bones, charcoal, ash or other paleontologic resources exposed during excavations. Although paleontologic monitors will be present periodically during excavation, development personnel and/or other construction contractors may provide invaluable assistance in the salvage and recovery of these resources as they are encountered. All personnel have a responsibility to protect paleontologic resources on the project.

This is everyone's responsibility. Be on the lookout for:

- Bones
- Ancient plant remains (chunks of wood, branches, logs, etc.)
- Charcoal
- Ash or ash-like sediments
- Stones that appear to have been shaped
- Cracks, openings or fissures into limestone rock units
- Fossil-bearing horizons or strata (see attached checklist)

3.) ***Construction crews must divert or stop work*** <u>***immediately***</u> ***when they encounter what they suspect to be a fossil, a group of fossils, or other paleontologic resources.***

In the event that the construction crew or the equipment operators *suspect* that they've uncovered fossils or other resources during excavation activities, they should immediately divert excavation activities away from the potential site. Suspected resource localities should be avoided by a *minimum* of six (6) meters until the paleontologic monitor has approved further excavation.

Upon uncovering a potential resource and diverting equipment, operators and crew members should then *immediately* endeavor to catch the attention of the paleontologic monitor. The sooner the monitor is alerted to the presence of the find, the sooner he or she can stake off and flag the area, assess the significance of the remains, recover the resource (if necessary), and permit excavation to continue in that area. *Excavation in the affected area will not continue until authorized by the paleontologic monitor!* Stakes and flagging will be removed subsequent to resource recovery, and excavation will then be allowed to proceed.

If the monitor is not on site, or is present but not in the immediate vicinity, the operator or crew member should immediately stake off and flag the affected area, so that subsequent excavation equipment does not further damage or destroy the resource. (Note: Operators are advised to carry lathe stakes and flagging with them at all times, to facilitate this mitigation effort.) Once the affected area is staked off and flagged (if possible), the operator or crew member must then *immediately* contact the construction inspector. It is the construction inspector's responsibility to contact the paleontologic monitor and/or the lead paleontologist in this situation. (Note: The nearest paleontologic monitor will respond to the supervisor's request for assistance as soon as it is possible for him or her to do so. However, the construction crews and their supervisors must keep in mind that the monitors may be involved in recovering resources elsewhere in the excavation, so an immediate response may not always be possible.)

In the event that fossils are exposed in sediments that were determined to have low paleontologic sensitivity, the operator or crew member should immediately stake off and flag the affected area so that subsequent excavation equipment does not further damage or destroy the resource. Equipment operators are advised to carry lathe stakes and flagging with them at all times, to facilitate this mitigation effort. Once the affected area is staked off and flagged (if possible), the operator or crew member must then *immediately* contact the construction inspector. It is the construction inspector's responsibility to contact the paleontologist in this situation. Paleontologic field monitors will respond to the construction inspector's request for assistance as quickly as they possibly can.

In every case, supervisors and crew members should *avoid moving or disturbing the resource(s)* until the paleontologists have determined the significance of the find. Work should not continue in the affected area until the paleontologic monitors have removed the find and authorized continued excavation.

RESOURCE RECOVERY

1.) ***Construction crews and supervisors must be alert for areas that have been flagged and/or staked off by the paleontologic monitor(s).***

Upon encountering an exposed fossil or other paleontologic resource, the monitor(s) will stake off and flag an area of ± two (2) meters on all sides of the find, in order to alert equipment operators to the presence of a potential resource. The monitor(s) will then further expose the find in order to assess the potential significance of the find and determine the appropriate recovery requirements. Vertebrate fossils, plant fossils and representative samples of vertebrate and invertebrate fossil resources will be collected and preserved in this manner. Samples of marine fossils may be quarried. Construction crews must avoid all such staked off/flagged areas by a minimum of six (6) meters until the paleontologists have authorized continued excavation.

2.) ***Construction crews and supervisors may be required to assist paleontologic personnel in the recovery of fossiliferous sediments and/or of unusually large or abundant resources.***

When bulk samples of sedimentary matrix need to be recovered during excavation for vertebrate/invertebrate microfossil sampling, the most expeditious and cost-effective manner to remove this material is to employ the construction crew members and equipment for a brief period to remove the sediment in bulk (spoils piles from the augering facilitate this task). Exceptionally large fossils, assemblages of fossils, or fossil horizons are also most easily and economically recovered in this manner.

3.) ***Construction crews and their supervisors must avoid disturbing areas that have been staked***

off for data acquisition (sediment profiles, stratigraphic studies, photodocumentation, etc.) until these areas have been cleared for further excavation by the paleontologic monitor.

The paleontologic mitigation program is designed to recover not only exposed paleontologic resources, but also significant contextual data associated with these resources. For this reason, site paleontologists will often be required to stake off and flag some areas within the excavation in order to plot resource localities, measure stratigraphic sections, map fossiliferous horizons, photograph exposures, and so forth. Again, the equipment operators must avoid these staked off and flagged areas until the paleontologists have authorized continued excavation.

Appendix D

Biological Survey Report

Table Mountain Wind Generating Facility
Clark County, Nevada
Biological Survey Report

Prepared for

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4765 Vegas Drive
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BLM Case No. N-73726

On Behalf of

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January 2002

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ATTACHMENTS

A Eremico 2001 Botanical Survey Transects
B Agency Coordination Letters
C List of Plant Species
D Results of Plant Survey Transects
E List of Wildlife Species

Acronyms and Abbreviations

ac	acre
ACEC	Area of Critical Environmental Concern
BEPA	Bald Eagle Protection Act
BLM	Bureau of Land Management
CFR	Code of Federal Regulations
DCP	Desert Conservation Plan
EO	Executive Order
F	Fahrenheit
ft	foot
GREP	Global Renewable Energy Partners
HMA	Herd Management Area
I-15	Interstate 15
kV	kilovolt
kWh	kilowatt-hour
LOP	life-of-project
LOS	level of service
LVMPD	Las Vegas Metropolitan Police Department
LVMSA	Las Vegas Metropolitan Statistical Area
MBTA	Migratory Bird Treaty Act
mi	mile
mph	miles per hour
MSHCP	Multiple Species Habitat Conservation Plan (Clark County)
msl	mean sea level
MW	megawatt
NAC	Nevada Administrative Code
NDF	Nevada Division of Forestry
NDOW	Nevada Division of Wildlife
NRS	Nevada Revised Statutes
ROW	right-of-way
RRCNCA	Red Rock Canyon National Conservation Area
sq mi	square mile
TMWC	Table Mountain Wind Company, LLC
WGF	wind-powered electric generation facility/wind power plant

WTG	wind turbine generator
U.S.C.	United States Code
USDA	U.S. Department of Agriculture
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey

1.0 INTRODUCTION

Table Mountain Wind Company, LLC (TMWC), a joint venture between Global Renewable Energy Partners, (GREP) and Siemens Energy and Automation, Inc. TWMC is proposing to develop a 150- to 205-megawatt (MW) wind-powered electric generation facility (WGF) and ancillary facilities approximately 20 mi southwest of Las Vegas, at the south end of the Spring Mountain Range between the communities of Goodsprings, Sandy Valley, Jean, and Primm, in Clark County, Nevada (Figure 1). TMWC has applied for a 20-year term right-of-way (ROW) grant from the Bureau of Land Management (BLM) Las Vegas Field Office to construct, operate, and maintain a WGF and ancillary facilities on approximately 325 acres (ac) of public land located about 5 mi west of the junction of Interstate 15 (I-15) and the community of Jean, Nevada. The 4,500-ac study area includes portions of Table Mountain, Shenandoah Peak, and an area north of Wilson Pass (Figure 2).

The WGF would operate up to 24 hours per day, 365 days per year, with a generating capacity of more than 460 million kilowatt-hours (kWh). Ancillary facilities would include new and improved access roads, electric distribution lines, communication cables, meteorological towers, a substation, and a communications control building. Total land disturbance under the Proposed Action would involve approximately 325 ac.

The purpose of this report is to provide the results of biological surveys performed in the proposed Table Mountain Wind Generating Facility project area, to discuss potential impacts on sensitive species, and to recommend minimization and mitigation measures. This report focuses on the desert tortoise protocol survey results and also supplements the Botanical Survey Report, M&N Table Mountain Wind Power Plant, Spring Mountains, Clark County, Nevada (Eremico 2001, Attachment A).

1.1 Regional Setting

The proposed project is located in the Spring Mountains of southern Nevada. The proposed project encompasses portions of Potosi Mountain, Shenandoah Peak, and Table Mountain of the Spring Mountain Range. This region of the Spring Mountains is geographically bound by the Goodsprings Valley on the east and the Mesquite Valley on the west. The Spring Mountains are part of the Basin and Range Physiographic Province that comprises most of Nevada and portions of Utah, California, and Arizona. This physiographic province is characterized by a varied topography that consists of small, generally north-south trending mountain ranges.

The project area also lies within the East Mojave Desert. The Mojave is the smallest of the four North American deserts, lying primarily in California, but also including the southern quarter of Nevada and two small extensions into western Arizona (Larson 1977). It is bordered by the southern Sierra Nevada Mountains on the west, the Great Basin Desert to the north, the Colorado River to the east, and the San Bernardino Mountains and the Sonoran Desert to the south. This region is marked by extreme conditions. The climate is arid, accompanied by extreme temperatures ranging from 20°F to more than 100°F. Overall precipitation is very low, with erratic rainfall patterns that tend to be localized. Distribution of vegetation is strongly influenced by variations in elevation and soil.

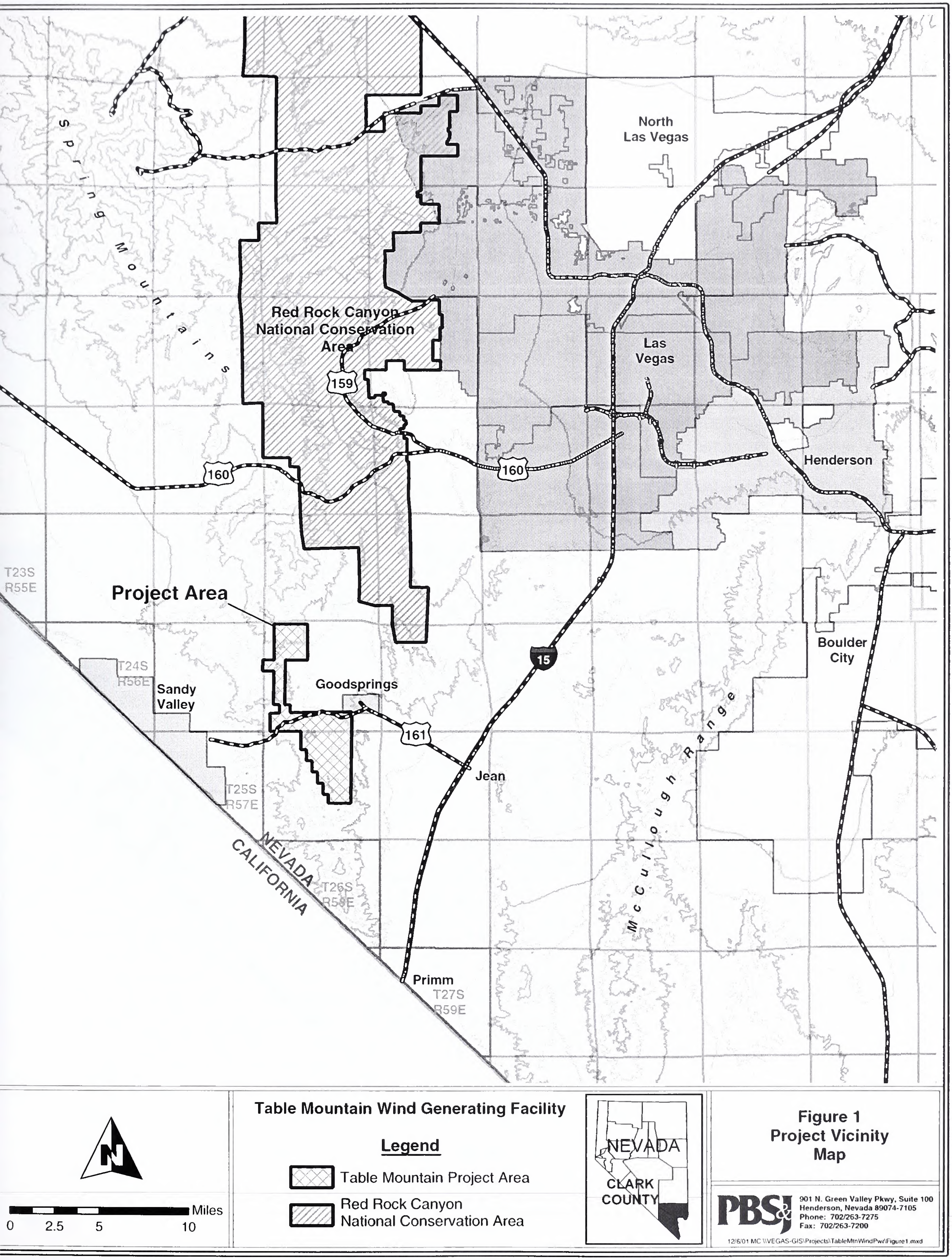
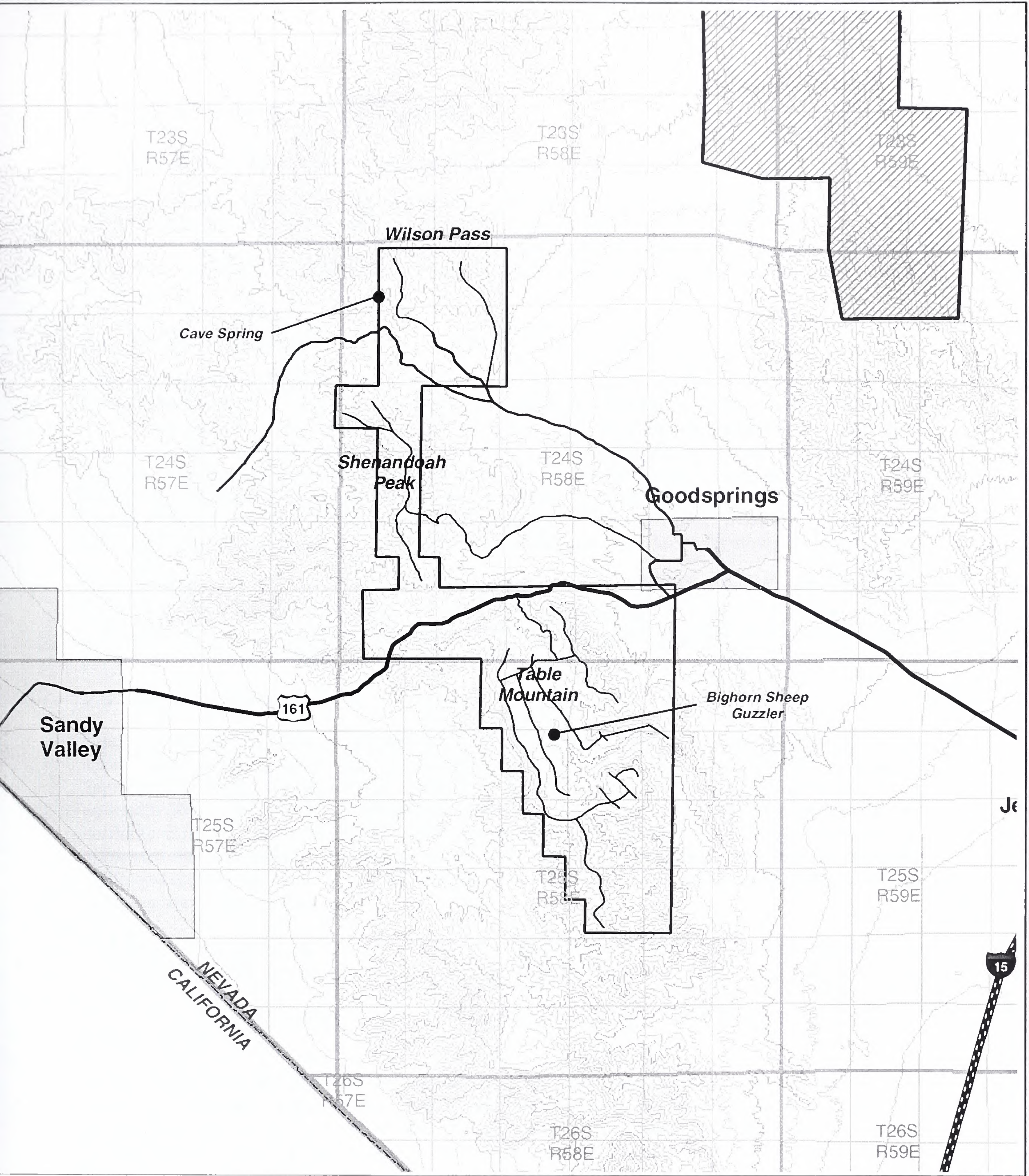


Table Mountain Wind Generating Facility

Figure 1
Project Vicinity Map

PBS&J
901 N. Green Valley Pkwy, Suite 100
Henderson, Nevada 89074-7105
Phone: 702/263-7275
Fax: 702/263-7200

12/6/01 MC \\VEGAS-GIS\Projects\TableMtnWindPwr\Figure1.mxd



Miles
0 0.5 1 2

Table Mountain Wind Generating Facility

Legend

▭ Table Mountain Project Area

— Proposed Access and Service Roads

Figure 2
Proposed Action
Site Location

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12/7/01 MC \\VEGAS-GIS\Projects\TableMtnWindPwr\Figure2.mxd

2.0 INVESTIGATIVE METHODS

2.1 Literature Review and Agency Contacts

Lists were compiled of sensitive plant and wildlife species that have potential to occur in the study area using information provided by the Nevada Natural Heritage Program (Miskow 2001) and the U.S. Fish and Wildlife Service (USFWS) (Burroughs 2001a) (see Attachment B). Coordination with the Nevada Division of Wildlife (NDOW) was also conducted to obtain information on sensitive species that have potential to occur in the study area.

2.2 Field Investigations

Field investigations for botanical resources and for the Mojave desert tortoise (Gopherus agassizii) were conducted by biologists for the Proposed Action and Alternatives A and B, including ancillary facilities and access road alternatives, in April, May, and November 2001. Field investigations for sensitive plants conducted by Eremico Biological Services and PBS&J on April 30 through May 3, and May 8 through 14, 2001, are discussed in Botanical Survey, M&N Table Mountain Wind Power Plant, Spring Mountains, Clark County, Nevada (Eremico 2001, Attachment A). Botanical and desert tortoise surveys were performed by PBS&J on May 7 through 10, 24, 25, and 29, and November 14, 16, and 17, 2001. Wildlife observations were noted while conducting protocol surveys for the desert tortoise and also during the spring botanical surveys.

Biologists that participated in the field investigations included Kelly Shook, Dick Davis, Bobby Tuttle, Darin Busby, Gary Galbraith, Ken MacDonald, and Billye Jean Sisler of PBS&J, Inc.; Denise Laberteaux and Bruce Garlinger of Eremico Biological Services; Mike McGovern, Biological Consultant; Hermi Hiatt, Biological Consultant; and Jason Williams, Biological Consultant.

2.3 Botanical Surveys

Timing of the botanical surveys corresponded with the standard flowering periods of the sensitive plant species that have potential to occur in the project area. Biologists walking parallel transects spaced at approximately 50-ft intervals performed botanical surveys. Surveys along the proposed turbine strings covered a 200-ft-wide corridor. A 100-ft-wide corridor was surveyed along the proposed distribution line corridors. A 60- to 120-ft-wide corridor was surveyed for new road locations, and a 50-ft-wide survey was conducted along the edges of existing roads proposed for widening. Each 5-ac laydown area was surveyed to 100% coverage using 50-ft-wide parallel pedestrian transects. Project areas surveyed for sensitive botanical resources are shown in Figure 3.

Botanical surveys conducted within the standard flowering periods in late May, revealed many plants were dried and unidentifiable in the following areas; the Table Mountain access road, the proposed wind turbine string located south of Deadmans Canyon, and the northernmost proposed above ground transmission line. Therefore, surveys of these three areas focused on assessing habitat for sensitive species and estimating cacti and yucca numbers.

Additional field surveys were conducted in November 2001 to assess habitat along the new access road to Shenandoah Peak and at the relocation of the proposed substation one-quarter mile west of the existing VEA Mead-to-Pahrump 230-kV transmission line. Field surveys of the new access road to Shenandoah Peak new substation location and were performed outside the accepted time frame for sensitive plant surveys, therefore, surveys of these two areas focused on assessing habitat for sensitive species and estimating cacti and yucca numbers. Approximately 700 ac were surveyed for botanical resources.

Table Mountain Wind Generating Facility

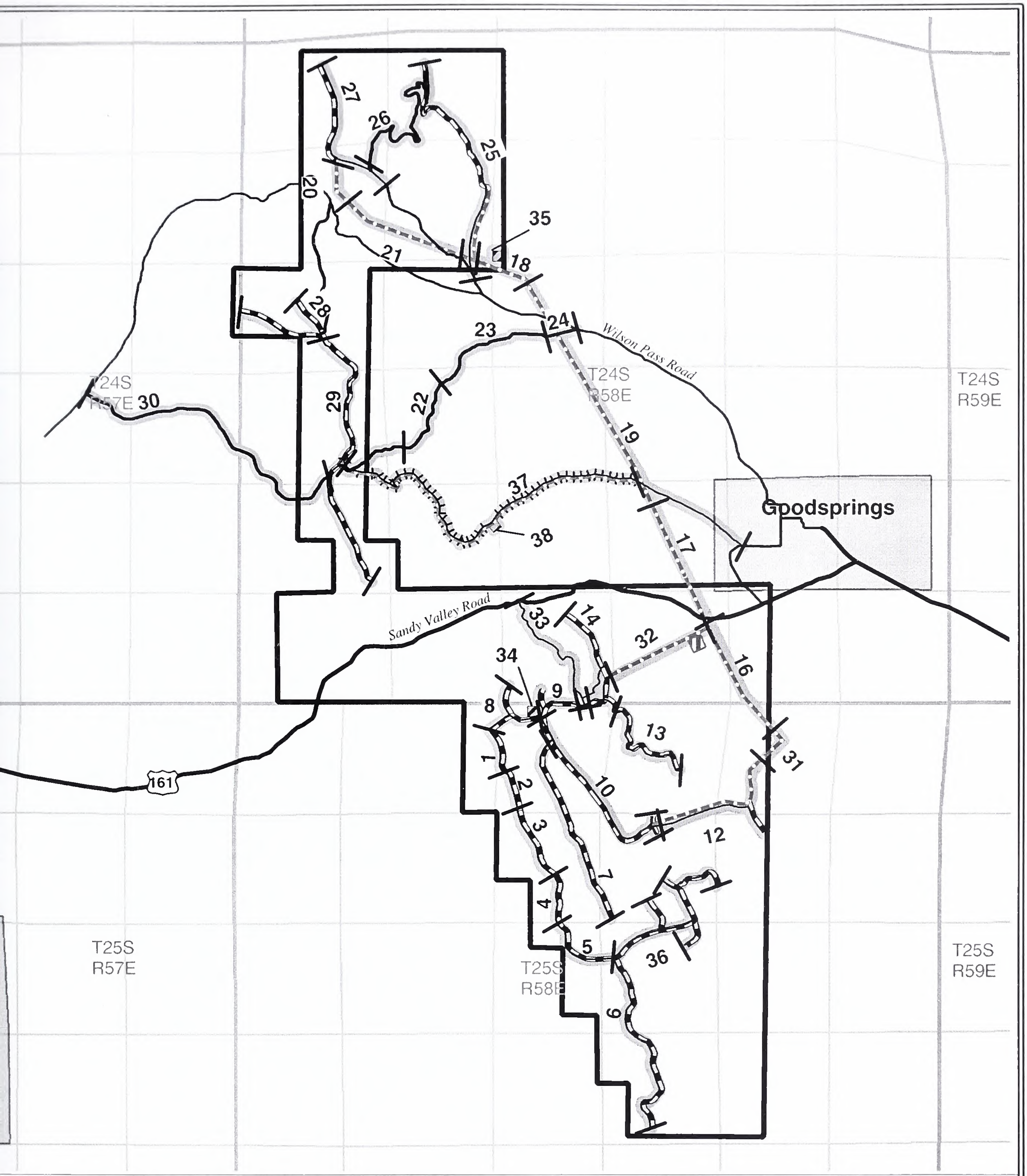

Figure 3
Plant Survey Locations in the Project Study Area

PBSJ
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Fax: 702/263-7200

12/7/01 MC \\Vegas-gis\Projects\TableMtnWindPower\Figure3.mxd

2.4 Mojave Desert Tortoise Surveys

Field surveys for the desert tortoise were conducted from May 7 through 10, 2001. Surveys along the proposed turbine strings covered a 200-ft-wide corridor. A 100-ft-wide corridor was surveyed along the proposed distribution line corridors. A 60- to 100-ft-wide corridor was surveyed for new road locations, and a 30-ft-wide survey was conducted along the edges of existing roads proposed for widening. Each 5-ac laydown area was surveyed to 100% coverage using 30-ft-wide parallel pedestrian transects. On November 14, 16, and 17, 2001, field surveys were performed for the new access road to Shenandoah Peak and the new 10-ac substation location.

The USFWS-approved Mojave desert tortoise survey protocol was used in order to determine tortoise density in the project area (Burroughs 2001b). Approximately 300 ac of project area, occurring at or below 5,000 ft in elevation, were surveyed to 100% coverage for desert tortoise using 30-ft-wide parallel pedestrian transects and 1.5-mi triangular transects. The locations of these linear and triangular tortoise survey transects are shown on Figure 4.

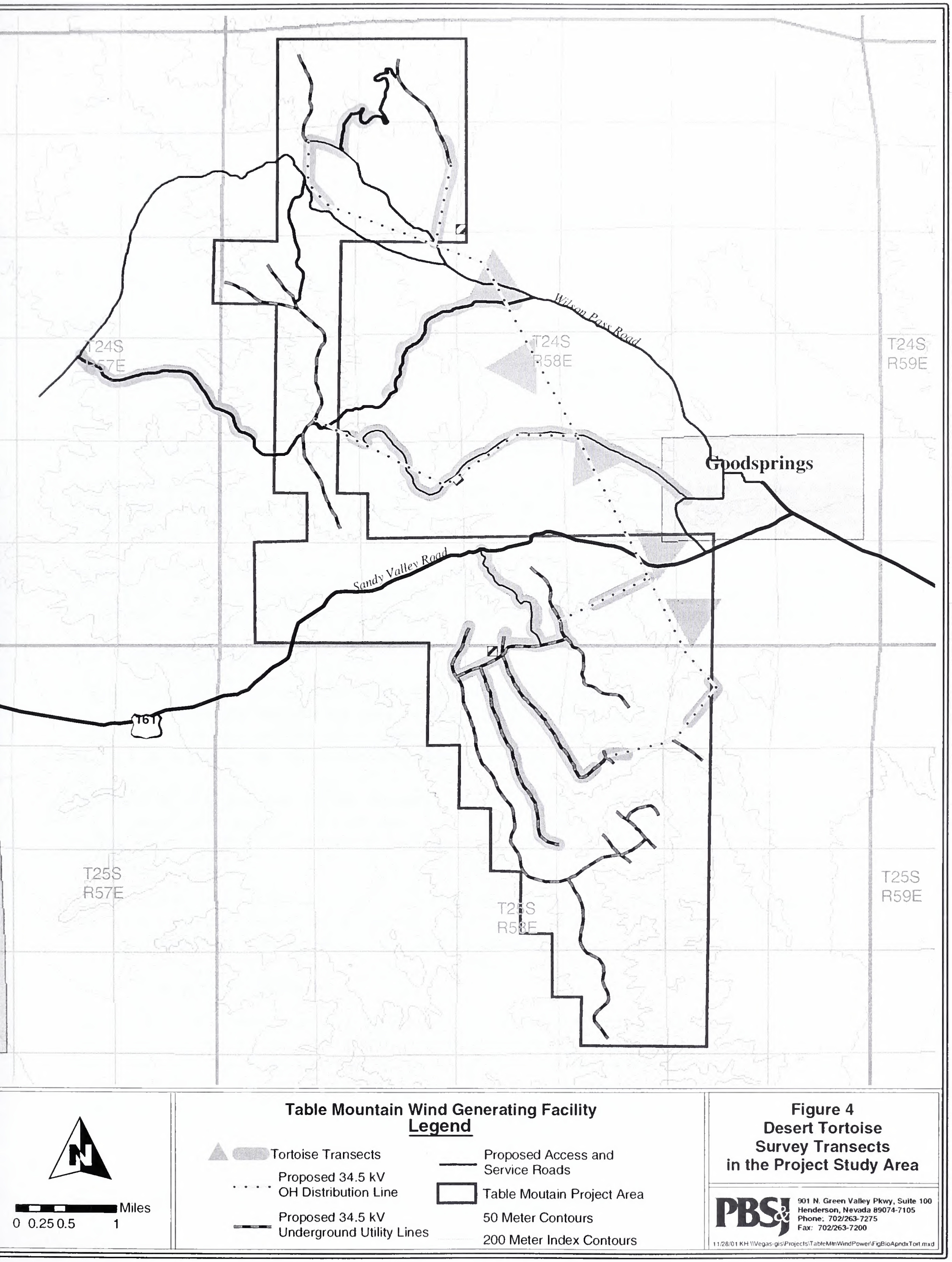

Figure 4
Desert Tortoise
Survey Transects
in the Project Study Area

PBS&J
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Henderson, Nevada 89074-7105
Phone: 702/263-7275
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3.0 REGULATORY FRAMEWORK FOR PROTECTION OF SENSITIVE BIOTA

3.1 Federal Endangered Species Act

The USFWS performs most administrative and regulatory actions under the Endangered Species Act (ESA) of 1973. The ESA and its implementing regulations prohibit any action that would "take" a federally listed threatened or endangered species, or its critical habitat. Under the ESA, the definition of "take" includes to harass, harm, or kill any federally listed species.

Each agency must ensure that any action they authorize, fund, or carry out is not likely to jeopardize the continued existence of a listed species in the wild, or destroy or adversely modify its critical habitat. If an agency determines that a proposed action may adversely affect such a species, it must formally consult with the USFWS pursuant to Section 7 of the ESA. A discussion of federally listed species and habitat that may be affected by the project is provided in this report.

3.2 Migratory Bird Treaty Act and Bald Eagle Protection Act

All birds, with the exception of house sparrows, starlings, pigeons, and resident game birds, are protected by international treaty under the Migratory Bird Treaty Act (MBTA) of 1918 (16 U.S.C. 703-711), as amended. The MTBA is enforced by the USFWS.

Eagles are protected under the Bald (and Golden) Eagle Protection Act of 1940 (BEPA) which prohibits the take, transport, sale, barter, trade, import and export, and possession of eagles, making it illegal for anyone to collect eagles and eagle parts, nests, or eggs without a permit. The BEPA is also enforced by the USFWS.

3.3 BLM Policies

Special status species are those species found on public lands administered by the BLM whose survival is of concern due to limited distribution, low numbers of individuals or populations, and potential threats to habitat. The BLM uses the term "special status species" to include (1) federally listed as endangered, threatened, proposed, and candidate species, (2) Nevada state protected species, and (3) Nevada BLM sensitive species.

The list of Nevada state protected species includes (1) only those state-protected animals that have been determined to meet BLM's policy definition of "listing by a state in a category implying potential endangerment or extinction" and (2) all plant species designated by the state of Nevada as "critically endangered."

Nevada state protected species are to be provided with the same level of protection and consideration as is provided for federal candidate species; that is, to "ensure that actions authorized, funded, or carried out do not contribute to the need to list any of these species as threatened or endangered" (BLM 1988).

3.4 Nevada Regulations

The Nevada Division of Wildlife (NDOW) and the Nevada Division of Forestry (NDF) have established a list of species that are declining in all or portions of their natural range within the state of Nevada and are "protected" under Nevada Revised Statutes (NRS) 501.100 to 503.585 (wildlife) and NRS 527.270–.300 (plants). NDOW performs administrative and regulatory actions involving state game and furbearer species. NDF performs administrative and regulatory actions involving state-protected plants.

Cacti, yuccas, and Christmas trees (evergreen trees are protected under NRS 527.260–.300 and federal regulations (43 CFR 5400). The statute states, "it is unlawful to cut, destroy, mutilate, remove, or possess any Christmas tree, cactus, or yucca without written permission from the legal owner."

4.0 RESULTS AND DISCUSSION

4.1 Topography and Geology

The proposed project area is undeveloped and generally undisturbed. The site is located within the basin and range physiographic province in the eastern Mojave Desert. The Basin and Range is characterized by bedrock mountain ranges separated by broad alluvial valleys formed by normal and thrust faulting.

The majority of the project area is above 4,500 ft above mean sea level; however, the elevation ranges from approximately 3,780 ft north of Crystal Pass to 6,070 ft north of Wilson Pass. The topography ranges from rolling to extremely steep with slopes that exceed 75% in some areas.

Geology at the site generally consists of well-consolidated sedimentary rock. Barren rock outcrops consisting of limestone, basalt, and andesite are located on the ridges. Surrounding slopes consist of well-drained sandy soils on erosional fan remnants; these are covered with a desert pavement of pebbles and cobbles that overlay a lime-cemented hardpan.

The climate is arid, accompanied by extreme temperatures ranging from 20°F to more than 100°F. Overall precipitation is very low, with erratic rainfall patterns that tend to be localized (Bradley and Deacon 1965).

4.2 Botanical Resources

4.2.1 Plant Communities

The study area is composed of four plant communities including blackbrush scrub, Mojave creosote bush scrub, Mojavean pinyon-juniper woodlands, and Mojave wash scrub. The variation in the plant species throughout the project area is related to the change in elevation, soil, topography, and drainage patterns. Plant communities typically transition into one another across ecotonal boundaries and rarely change abruptly. The majority of the project area is above 4,500 ft; however, the elevation ranges from approximately 3,780 ft above mean sea level (msl) north of Crystal Pass to 6,070 ft above msl ft north of Wilson Pass. The topography ranges from rolling to extremely steep with slopes that exceed 60%. The majority of the WTGs would be located along ridges to optimize the exposure to wind. Blackbrush scrub communities dominate these ridges. Information regarding the four plant communities in the project area, as discussed below, was summarized from the Eremico (2001) (Attachment A) report.

Blackbrush Scrub

Blackbrush scrub typically consists of low, often intricately branched shrubs that are 0.5 to 1.0 m tall. It occurs on dry, well-drained slopes and on flats that are comprised of shallow, often calcareous, soils with very low water-holding capacity. The community is named for the blackbrush shrub (*Coleogyne ramosissima*), which is dominant in this assemblage. Generally, this community type occurs between 4,000 and 7,000 ft in elevation and often intergrades with Great Basin Sagebrush scrub, Joshua tree woodland, or pinyon-juniper woodland (Holland 1986). Within the study area, blackbrush scrub occurs on the mountaintops, ridges, mountain slopes, and upper bajadas. Individual species that compose this community vary slightly throughout the project area due to differences in terrain and soil type. Blackbrush scrub is the most dominant of the four communities that occur within the study area.

On Table Mountain, Joshua trees (*Yucca brevifolia*) and dwarf Joshua trees (*Yucca brevifolia* var. *jaegeriana*) are abundant overstory species. Dominant shrubs include blackbrush, Shockley goldenhead (*Acamptopappus shockleyi*), desert tomato (*Lycium andersonii*), spiny menodora (*Menodora spinescens*), Nevada ephedra (*Ephedra nevadensis*), prince's plume (*Stanleya pinnata*), fourwing saltbush (*Atriplex canescens*), cliffrose (*Purshia mexicana*), and winterfat (*Krascheninnikovia lanata*). The dominant herbaceous species are

California buckwheat (*Eriogonum fasciculatum* ssp. *Polifolium*), skeleton weed (*E. deflexum* var. *deflexum*), and woolly Heermann buckwheat (*E. heermannii* var. *floccosum*), Mojave prickly pear cactus (*Opuntia erinacea* var. *erinacea*), beehive cactus (*Escobaria vivipara* ssp. *desertii*), beavertail cactus (*Opuntia basilaris* var. *basilaris*), and Mojave mound cactus (*Echinocereus triglochidiatus*) are the dominant cacti. Blackbrush and Joshua trees have not recovered in the same areas of Table Mountain that burned in the recent past. The dominant shrubs in these burned areas are desert tomato and fourwing saltbush. Various grass species comprise the herbaceous layer.

Common shrubs along the Shenandoah Peak ridge are big sagebrush (*Artemisia tridentata*), spiny menodora, and green ephedra (*Ephedra viridis*). On extensive slabs of limestone and exposed ridges Utah agave (*Agave utahensis*), yellow cryptantha (*Cryptantha confertifolia*), and cottontop cactus (*Echinocactus polycephalus* var. *polycephalus*) are common. On the slopes below the ridges and on the upper bajadas, the community consists of a high diversity of species, including Joshua tree, Mojave yucca (*Yucca schidigera*), banana yucca (*Y. baccata*), spiny menodora, desert tomato, Nevada ephedra, Shockley goldenhead, cheesebush (*Hymenoclea salsola*), spiny hopsage (*Grayia spinosa*), and fourwing saltbush.

North of Wilson Pass, Joshua tree, Mojave yucca, and banana yucca comprise the overstory. Dominant shrub species include apache plume (*Fallugia paradoxa*) and turpentine broom (*Thamnosma montana*), while Parish golden-eye (*Viguiera parishii*) and California buckwheat dominate the herbaceous layer. Dominant cacti include Mojave prickly pear and beehive cactus. The community integrates with Mojavean pinyon-juniper woodlands above 5,600 ft near the northern terminus of the project area.

Mojave Creosote Bush Scrub

Mojave creosote bush scrub is a widespread plant community and the most common type found in the Mojave Desert below about 4,000 ft (Holland 1986; Rowlands et al. 1982; Vasek and Barbour 1977). It is characterized by widely spaced shrubs that are 2- to 8-ft tall. Creosote bush (*Larrea tridentata*) and burro bush (*Ambrosia dumosa*) often are the co-dominants in this community type. Creosote bush scrub is usually found on well-drained soils, often on bajadas and low hills, and is not found in soils with high salt or alkaline concentrations (Holland 1986).

The proposed project area supports a Mojave creosote bush scrub community at the lower elevations. This plant community mainly occurs along the proposed overhead distribution line and proposed substation in the southeastern most segments of the project area. These areas are dominated by creosote bush, burro bush, Nevada ephedra, range ratany (*Krameria parvifolia*), winterfat, and prince's plume (*Stanleya pinnata*). The dominant herbaceous species include red brome (*Bromus rubens*), desert larkspur (*Delphinium parishii*) and globe mallow (*Sphaeralcea ambigua*). Mojave yucca and Joshua trees occur in the overstory. Cacti in these areas include cottontop cactus, silver cholla (*Opuntia echinocarpa*), beavertail cactus, Mojave prickly pear, and beehive cactus.

The Mojave creosote bush scrub vegetation transitions to blackbrush scrub as elevation increases. The replacement of white bursage by blackbrush typically demarcates this ecotonal boundary. Creosote bush bridges this boundary and tends to slightly obscure the community borders. This transitional zone is comprised of plant species from both assemblages and includes creosote bush, blackbrush, Joshua tree, Mojave yucca, sweetbush (*Bebbia juncea*), spiny menodora, desert tomato, Nevada ephedra, green ephedra, Shockley goldenhead, cheesebush, spiny hopsage, fourwing saltbush, Pima ratany (*Krameria erecta*), burro bush, turpentine broom, Apache plume, Mojave sage (*Salvia mohavensis*), blue sage (*Salvia dorrii*), desert marigold (*Baileya multiradiata*), and desert tobacco (*Nicotiana obtusifolia*). In addition to the cacti noted to occur in the creosote scrub community, species inhabiting the transitional zone include hedgehog cactus (*Echinocereus engelmannii*) and barrel cactus (*Ferocactus cylindraceus* var. *lecontei*).

Pinyon-Juniper Woodland

Pinyon-juniper woodland is open woodland co-dominated by singleleaf pinyon (*Pinus monophylla*) and one of several species of juniper (*Juniperus* sp.), with an open shrubby understory of species commonly found in adjacent communities. Pinyon-Juniper Woodland occurs in desert mountain ranges, usually between 4,000 and 8,000 ft in elevation.

A small area of pinyon-juniper woodland occurred at the extreme northern end of the study area. The vegetation in this area is dominated by singleleaf pinyon and Utah juniper (*Juniperus osteosperma*). Dominant woody shrubs include blackbrush and cliff rose, and the herbaceous vegetation includes California buckwheat.

Mojave Wash Scrub

In the project area, a wash scrub community was distinguished from the adjacent community type due to the differences in the structure and species composition. The wash communities are generally composed of species from the adjacent communities, but tend to have higher plant density and support greater species diversity than the adjacent areas. The wash scrub community occurs in Keystone Wash, the washes east and northeast of Shenandoah Peak near Yellow Pine Mine and Pilgrim mine, respectively. Common plants in Keystone Wash included paper-bag bush (*Salazaria mexicana*), cheesebush, blackbrush, Joshua tree, and Mojave yucca. An additional common plant in the upper portion of the wash was green ephedra. Additional common plants in the lower portion included desert tomato, Nevada ephedra, creosote bush, and blue sage. In the Yellow Pine Mine wash, apache plume, paper-bag bush, matchweed (*Gutierrezia microcephala*), desert almond, and scented beardtongue were common. Common plants in the drainages, which bisected the bajada, included apache plume, desert almond (*Prunus fasciculata*), and scented beardtongue (*Penstemon palmeri*).

4.2.2 Threatened, Endangered, and Sensitive Plant Species

Federal-, state-, and BLM-listed sensitive plant species with potential to occur in the study area are discussed in this section. The list of sensitive plant species with potential to occur in the project area, provided in Table 1, is a result of a Nevada Natural Heritage Program search and coordination with the BLM Las Vegas District Office and USFWS Ecological Services office (Marrs-Smith 2001; Miskow 2001; Burroughs 2001a). Table 1 includes one species that is listed by the state of Nevada as critically endangered and 13 that are listed as either a federal Species of Concern (SOC) and/or a Nevada special status species. Based on a habitat assessment, literature research, and pedestrian surveys of the study area, it was determined that nine sensitive plant species have the potential to occur within the area of the Proposed Action.

During field surveys of the Proposed Action and Alternatives A and B, biologists identified a total of 187 plant taxa representing 43 families. A list of all plant species observed in the project area during the field surveys is provided in Attachment C of this report.

Rough Angelica

Rough angelica (*Angelica scabrida*), a federal SOC and a BLM special status species, is endemic to the Spring Mountains. The species occurs in mixed conifer plant communities near springs, on moist gravelly soils of washes, ephemeral streams, gullies, montane slopes, and avalanche chutes. It also occurs along wash margins in riparian woodlands and shrublands at lower elevations and along stream courses and adjacent overbank areas at upper elevations. Based on known habitat requirements, this species is not expected to occur in the project area.

Table 1. Federal, State, and BLM Sensitive Plant Species with Potential to Occur in the Table Mountain Project Area.

Plant Species		Status		
Scientific Name	**Common Name**	**USFW**	**NV**	**BLM**
Angelica scarbrida[a]	Rough Angelica	SOC[b]	—	N[c]
Arctomecon californica[a]	Las Vegas Bearpoppy	SOC	CE[d]	S[e]
Arctomecon merriamii[a]	White Bearpoppy	SOC	—	N
Astragalus funereus	Black Woollypod	SOC	—	N
Astragalus mohavensis var. *hemigyrus*	Halfring Milkvetch	SOC	CE	S
Astragalus remotus[a]	Spring Mountain Milkvetch	SOC	—	N
Eriogonum bifurcatum[a]	Pahrump Valley Buckwheat	SOC	—	N
Eriogonum heermannii var. *clokeyi*	Clokey Buckwheat	SOC	—	N
Glossopetalon pungens var. *glabra*[a]	Smooth Dwarf Greasebush	SOC	—	N
Glossopetalon pungens var. *pungens*[a]	Dwarf Greasebush	SOC	—	N
Ivesia jaegeri[a]	Jaeger Ivesia	SOC	—	N
Penstemon bicolor ssp. *bicolor*	Yellow Twotone Beardtongue	SOC	—	N
Penstemon bicolor ssp. *roseus*	Rosy Twotone Beardtongue	SOC	—	—
Penstemon fruticiformis ssp. *amargosae*	Death Valley Beardtongue	SOC	—	N
Selaginella utahensis	Utah Spikemoss	SOC	—	—

Source: Miskow 2001; Burroughs 2001.

a. Covered species under the Clark County MSHCP.

b. SOC = species of concern.

c. N = Nevada special status species.

d. CE = critically endangered.

e. S = BLM sensitive species.

White Bearpoppy

White bearpoppy (*Arctomecon merriamii*), a BLM special status species, is endemic to eastern California and portions of Nevada. This species is found in loose, rocky slopes associated with creosote bush scrub at elevations of 2,000 to 4,500 ft above msl. The white bearpoppy has the potential to occur along the washes and rocky outcrops at the lower elevations of the project area.

Black Woollypod

Black woollypod (*Astragalus funereus*) is a federal SOC and a BLM special status species. This small perennial herb occurs on dry, open, scree, talus, or gravelly alluvium derived from light-colored volcanic tuff. It has been recorded from elevations of 3,200 to 7,680 ft above msl. Its range encompasses southern Nevada and California. This species has the potential to occur in the project area.

Halfring Milkvetch

Halfring milkvetch (*Astragalus mohavensis* var. *hemigyrus*) is a federal SOC, a BLM sensitive species, and is listed as critically endangered by the state of Nevada. This perennial occurs at elevations ranging from 4,065 to 6,070 ft above msl on limestone ledges and gravelly hillsides (Mozingo and Williams 1980). This species has the potential to occur within the project area at upper elevations.

Spring Mountains Milkvetch

Spring Mountains milkvetch (*Astragalus remotus*), a federal SOC and BLM special status species, is a locally abundant endemic perennial known only from Rocky Gap in Red Rock Canyon to Goodsprings along the southeastern slopes of the Spring Mountains. This species occurs in gravelly soils, rocky hillsides, and along desert washes, typically associated with pinyon-juniper, sagebrush, grassland, blackbrush, and Mojave desert scrub communities. This species has the potential to occur within all reaches of the project area.

Pahrump Valley Buckwheat

Pahrump Valley buckwheat (*Eriogonum bifurcatum*), a federal SOC and a BLM Nevada special status species, occurs mostly in barren, saline, heavy clay or silty hardpan soils on or near playa margins. This species range includes Clark and Nye Counties, Nevada, and eastern California. Based on known geographic range of the species and habitat requirements, this species is unlikely to occur in the study area.

Clokey Buckwheat

Clokey buckwheat (*Eriogonum heermannii* var. *clokeyi*), a BLM special status species, is endemic to Nevada and is known to occur in Clark and Nye Counties. Habitat for Clokey buckwheat includes carbonate outcrops, talus, scree, and gravelly washes and banks in the creosote-bursage, shadscale, and blackbrush zones. This species has potential to occur in the project area.

Smooth Dwarf Greasebush

Smooth dwarf greasebush (*Glossopetalon pungens* var. *glabra*), a federal SOC and a BLM special status species, is endemic to the mountain ranges throughout southern Nevada and the Clark Mountains in San Bernardino, California. This species is typically associated with pinyon-juniper and sagebrush communities in limestone cliffs and rocky slopes between 4,000 and 6,500 ft above msl. Within Clark County, the species is found in the Sheep Range and Spring Mountains at elevations of 6,000 to 7,000 ft above msl. This species has the potential to occur within the extreme northern portion of the project area.

Dwarf Greasebush

Dwarf greasebush (*Glossopetalon pungens* var. *pungens*), a federal SOC and BLM special status species, is a southern Nevada endemic found in the Spring Mountains and Sheep Range within Clark County. This species typically occurs within pinyon-juniper and sagebrush communities, and on limestone cliffs and rocky slopes. Dwarf greasebush has the potential to occur within the extreme northern portion of the project area.

Jaeger Ivesia

Jaeger ivesia (*Ivesia jaegeri*), a federal SOC and BLM special status species, is endemic to both the Spring Mountains in Nevada, and the Clark Mountains in San Bernardino, California. This species is associated with Bristlecone pine (*Pinus longaeva*) mixed conifer communities, and can be found in bedrock and crevices of vertical and near-vertical cliff faces of limestone and dolomite outcrops at elevations from 5,200 to 11,200 ft above msl. Within Clark County, the Jaeger ivesia population includes about 10,000 individuals occurring at 35 sites on approximately 80 ac in Lee, Deer, Kyle, and Carpenter canyons in the Spring Mountains and in the La Madre Mountains to Potosi Mountain. This species has the potential to occur within the extreme northern portion of the project area.

Yellow Twotone Beardtongue

Yellow twotone beardtongue (*Penstemon bicolor bicolor*), a federal SOC and BLM special status species, is a perennial that grows in shallow gravelly washes and on roadsides at elevations ranging from 1,970 to 5,480 ft above msl. It is typically associated with creosote bush habitats, and its known distribution is Clark County, Nevada, and portions of Arizona. This species was observed during the botanical surveys within the washes of the proposed Wilson Pass laydown area in Section 16 of Township 24 South, Range 58 East.

Rosy Twotone Beardtongue

Rosy twotone beardtongue (*Penstemon bicolor roseus*), a federal SOC, grows in shallow gravelly washes and on roadsides at elevations ranging from 1,970 to 5,480 ft above msl. This perennial is typically associated with creosote bush scrub habitat, and its known distribution includes Clark County, Nevada, and portions of Arizona. The species occurs within the proposed Wilson Pass laydown area in Section 16 of Township 24 South, Range 58 East.

Death Valley Beardtongue

Death Valley beardtongue (*Penstemon fruticiformis amargosae*) is a federal SOC and a BLM special status species. Habitat for this species is poorly understood. The species is known to occur in creosote bush scrub habitat at locations in Nye County, Nevada, and California, but is not known to occur in Clark County, Nevada (CalFlora 2001). Based on the known geographic range of the species, it is unlikely to occur in the project area.

Utah Spikemoss

Utah spikemoss (*Selaginella utahensis*), a federal SOC, is a perennial, moss-like plant that forms dense, flat mats of intertwined branches. It occurs on sandstone ledges near water in deep canyons. Its range includes southern Nevada and Utah. In Nevada, it is known only from Red Rock Canyon in Clark County. Based on the known geographic range of the species and habitat requirements, this species is unlikely to occur in the study area.

4.2.3 Cacti, Yuccas, and Christmas (Evergreen) Trees

All cacti, agaves, yuccas, and Christmas (evergreen) trees are protected and regulated by the state of Nevada (NRS 527.060–.120). Ten species of cactus, three species of yucca, one agave species, and two evergreen tree species were observed throughout the project area during the surveys. Habitat and descriptions of these species are discussed in detail in Eremico (2001) (Attachment A). Since most of these species were quite numerous and occurred in nearly all areas of the project site, populations were not specifically mapped. However, estimated numbers of each species that were observed along the transects are provided in Attachment D and in Table 2. Locations of the botanical survey transects are reflected in Figure 3.

Results of the botanical surveys, performed by PBS&J in May and November 2001, are shown in Table 2 for the following areas: the southern above-ground transmission line (Transect 31); the old substation location and northern proposed above-ground transmission line (Transect 32); the Table Mountain access road (Transect 33); the Table Mountain laydown area (Transect 34); the Wilson Pass laydown area (Transect 35); the proposed wind turbine string located south of Deadmans Canyon (Transect 36); the new Shenandoah access road (Transect 37); the Shenandoah lay down area (Transect 38), and the new substation location (Transect 39). Surveys of most of these areas focused on assessing habitat for sensitive species and estimating cacti and yucca numbers. Numbers of individual plant species, shown in Table 2 of this document, are in addition to those noted in Eremico (2001) (Attachment A) for Transects 1 through 30.

4.2.4 Noxious Weeds

Federal Executive Order (EO) 13112, signed in February 1999, directs all federal agencies to prevent, monitor, and control the introduction of invasive nonnative species. The BLM and USDA maintain lists of noxious plants of economic and ecological concern. Noxious weeds have become a growing concern in the United States and in southern Nevada because they can increase in cover relative to surrounding vegetation and exclude native plants from an area. The spread of noxious weeds has resulted in substantial economic

Table 2. Estimated Number of Cacti, Agaves, Yuccas, and Christmas (Evergreen) Trees that Occur in the Project Area.

		Survey Transect										
Scientific Name	Common Name	31	32	33	34	35	36	37	38	39	Total for Transects 31–39[a]	Total for Project Area B
Echinocactus polycephalus var. *polycephalus*	Cottontop cactus	48	132	5	—	—	3	—	—	—	188	1,120
Echinocereus engelmannii	Hedgehog cactus	21	249	4	—	—	7	6	—	—	287	1,750
Echinocereus triglochidiatus	Mojave mound cactus	4	—	—	—	—	5	—	—	—	9	614
Escobaria vivipara ssp. *desertii*	Beehive cactus	—	114	—	—	—	20	48	28	23	210	1,735
Ferocactus cylindraceus var. *lecontei*	Mojave barrel cactus	—	319	4	—	—	—	14	—		337	883
Mammillaria tetrancistra	Little fishhook cactus	—	—	—	—	—	—	10	—	—	10	13
Opuntia acanthocarpa	Buckhorn cholla	—	—	—	—	8	—	—	—	—	8	647
Opuntia basilaris var. *basilaris*	Beavertail cactus	15	104	6	—	6	17	24	2	—	174	612
Opuntia echinocarpa	Silver cactus	17	148	7	4	18	7	131	—	26	358	1,225
Opuntia erinacea var. *erinacea*	Mojave prickly pear	43	45	5	—	5	16	104	—	—	218	4,513
Agave utahensis	Utah agave	58	192	23	—	—	—	264	—	—	537	7,653 to 10,003
Yucca baccata	Banana yucca	—	—	—	—	12	—	—	—	—	12	3,076
Yucca brevifolia (includes var. *brevifolia* and var. *jaegeriana*)	Joshua tree	—	—	—	1	45	—	1,860	478	120	2,504	14,240 to 18,210
Yucca schidigera	Mojave yucca	29	82	—		34	20	1,734	778	165	2,842	9,145 to 9,995
Juniperus osteosperma	Utah juniper	—	—	—	—	—	—	—	—	—	0	at least 20 to 40
Pinus monophylla	Singleleaf pinyon	—	—	—	—	—	—	—	—	—	0	at least 7

a. Results of surveys performed by PBS&J in May and November 2001.

b. Combined results of survey for Transects 1–30 performed by Eremico (2001) and survey for Transects 31–39 performed by PBS&J in April, May, and November 2001.

impacts on some sectors of the state. Recognizing these impacts, the BLM established a goal that NEPA documents consider and analyze the potential for weed spread and preventative rehabilitation measures for each management action involving surface disturbance.

Chapter 555.005 of the Nevada Revised Statutes (NRS) defines a noxious weed as "any species of plant which is, or is likely to be, detrimental or destructive and difficult to control or eradicate." A list of currently designated noxious weeds can be found in the Nevada Administrative Code (NAC), Chapter 555.

For the purpose of this document, and with assistance from the Nevada Division of Agriculture and the National Park Service, the Nevada state noxious weed list was narrowed down to reflect only those species known to occur in southern Nevada. Noxious weeds with the potential to occur in southern Nevada, and in the project area, are shown in Table 3.

Eight nonnative plant species were noted in the proposed project area, but none are on the official noxious weed list for the state of Nevada (NAC, Chapter 555). These species include wild mustard (*Brassica tournefortii*), flixweed (*Descurainia sophia*), tumble mustard (*Sisymbrium altissimum*), Oriental mustard (*Sisymbrium orientale*), Russian thistle (*Salsola tragus*), red-stemmed filaree (*Erodium cicutarium*), red brome (*Bromus madritensis* ssp. *rubens*), and cheatgrass (*Bromus tectorum*). The bromus grasses and filaree were common throughout the project area. The red brome was most abundant in the burned areas on Table Mountain. The other nonnative species were commonly observed in the project area along existing roads, in mining areas, and at the radio towers.

4.3 Wildlife Resources

Wildlife observations were noted while conducting the spring botanical surveys and protocol surveys for the desert tortoise. All wildlife species observed within the project area or identified by indirect evidence (such as tracks, burrows, carcasses, or scat) are listed in Attachment E. These species are adapted to desert scrub and pinyon-juniper habitats. Due to the scarcity of permanent water resources, no aquatic species are expected to occur in the project area and none was observed during field investigations.

Table 3. Noxious Weeds with Potential to Occur in the Table Mountain Study Area.

Scientific Name	Common Name
Alhagi camelorum	Camelthorn
Sorghum halepense	Johnson grass
Lepidium latifolium	Tall whitetop
Tribulus terrestris	Puncturevine
Acroptilon repens	Russian knapweed
Onapordum acanthium	Scotch thistle
Centaurea maculosa	Spotted knapweed
Linaria dalmatica	Toadflax, dalmation
Solanum elaeagnifolium	White Horse Nettle
Cardaria draba	Hoary cress
Centaurea solstiltialis	Yellow starthistle

Source: Rafferty and O'Brien 2000; NRS 555.010; Deuser 2000.

Reptilian fauna common to the project area include the western whiptail (*Cnemidophorous tigris*), zebratail lizard (*Callisaurus draconoides*), side-blotched lizard (*Uta stansburiana*), longnose leopard lizard (*Gambelia wislizenii*), Great Basin collared lizard (*Crotaphytus insularis bicinctores*), desert spiny lizard (*Sceloporus magister*), sagebrush lizard (*Sceloporus graciosus graciosus*), banded Gila monster (*Heloderma suspectum cinctum*), chuckwalla (*Sauromalus obsesus*), western patch-nosed snake (*Salvadora hexalepis mojavensis*), red coachwhip (*Masticophis flagellum piceus*), gopher snake (*Pituophis catenifer*), speckled rattlesnake (*Crotalus mitchelli*), and desert tortoise (*Gopherus agassizii*).

Avifauna common to the project area include the violet-green swallow (*Tachycineta thalassina*), Brewer's sparrow (*Spizella breweri*), black-throated sparrow (*Amphispiza belli*), black-tailed gnatcatcher (*Poiloptila nigriceps*), northern mockingbird (*Mimus polyglottos*), Bewick's wren (*Thryomanes bewickii*), white-throated swift (*Aeronautes saxatallis*), common raven (*Corvus corax*), and red-tailed hawk (*Buteo jamaicensis*). A formal bird census has not been conducted for the study area. Avifauna observed in the study area, during both desert tortoise and botanical surveys, are listed in Attachment E. The Great Basin Bird Observatory (GBBO [2001]) provided bird sighting information for the extreme northern and extreme southern portions of the project area. The U.S. Geologic Survey (USGS [2001a]) annual breeding bird survey was performed along Sandy Valley Highway (SR 53) in the project area. The USGS (2001a) and the GBBO (2001) bird information gathered within or near the study area is also included in Attachment E.

Mammalian species common to the project area include desert cottontail (*Sylvilagus audubonii*) black-tailed jackrabbit (*Lepus californicus),* antelope ground squirrel (*Ammospermophilus leucurus*), kangaroo rat (*Dipodomys* spp.), desert woodrat (*Neotoma lepida*), kit fox (*Vulpes macrotis*), bobcat (*Lynx rufus*), and coyote (*Canis latrans*). Desert bighorn sheep (*Ovis canadensis nelsoni*) sign, including pellets, urine spots, tracks, and beds were observed throughout the project area.

4.3.1 Threatened, Endangered, and Sensitive Wildlife Species

Federal-, state-, and BLM-listed sensitive wildlife species that have potential to occur in the study area are discussed in this section. The list of sensitive wildlife species with the potential to occur in the project area (provided in Table 4) is the result of a Nevada Natural Heritage Program search and coordination with the BLM Las Vegas District Office and USFWS Ecological Services office (Marrs-Smith 2001; Miskow 2001; Burroughs 2001a). Sensitive wildlife species include federal SOCs, BLM special status species, and those species recognized by the state of Nevada under NRS 501 as threatened with extinction, on the state watch list, or protected and regulated. A brief description of each species and its habitat is included in this section.

Species protection status is shown in Table 5 and includes one federally listed threatened species, twenty-six federal species of concern (SOC), one delisted endangered species, and one species with partial federal protection, in that a subspecies or a portion of a taxon's range has listed or candidate status, but not in Nevada. Table 5 also includes 16 species listed by the state of Nevada and BLM as special status species, which also may have protection under Nevada Revised Statute 501. Eight of the taxa listed in Table 5 are also covered species under the Clark County Multiple Species Habitat Conservation Plan (MSHCP). Since the BLM is a signatory to that plan, management actions on public lands administered by the BLM must consider species covered by the MSHCP. During field surveys of the Proposed Action and Alternatives A and B, biologists identified a total of 102 wildlife taxa. Based on a habitat assessment, literature research and pedestrian surveys of the study area, it was determined that 20 sensitive wildlife species have the potential to occur within the area of the Proposed Action.

Table 4. Federal, State, and BLM Sensitive Wildlife Species with Potential to Occur in the Table Mountain Project Area.

Species		Status		
Scientific Name	**Common Name**	**USFWS**	**NV**	**BLM**
Reptiles				
Gopherus agassizii[a]	Desert tortoise	T[b]	—	—
Heloderma suspectum cinctum	Banded Gila monster	SOC[c]	P[d]	S[e]
Sauromalus ater	Chuckwalla	SOC	—	N[f]
Birds				
Athene cunicularia hypugea	Western burrowing owl	SOC	P	—
Contopus borealis	Olive-sided flycatcher	SOC	P	—
Empidonax wrightii	Gray flycatcher	SOC	P	—
Falco peregrinus anatum	American peregrine falcon	DL[g]	P	—
Phainopepla nitens[a]	Phainopepla	SOC	P	S
Mammals				
Corynorhinus townsendii pallescens	Townsend's big-eared bat	PS[h]		N
Euderma maculatum	Spotted bat	SOC	T	N
Eumops perotis californicus	Greater western mastiff bat	SOC	—	N
Idionycteris phyllotis	Allen's big-eared bat	SOC	—	N
Macrotus californicus	California leaf-nosed bat	SOC	—	N
Myotis ciliolabrum	Small-footed myotis	SOC	—	N
Myotis evotis[a]	Long-eared myotis	SOC	—	—
Myotis thysanodes	Fringed myotis	SOC	—	N
Myotis volans[a]	Long-legged myotis	SOC	—	—
Myotis yumanensis	Yuma myotis	SOC	—	—
Nyctinomops macrotis	Big free-tailed bat	SOC	—	N
Invertebrates				
Chlosyne acastus robusta[a]	Spring Mountains acastus checkerspot	SOC	—	—
Euphilotes enoptes pupurea[a]	Dark blue butterfly	SOC	—	—
Euphydryas anicia morandi[a]	Morand's checkerspot butterfly	SOC	—	—
Hesperia comma mojavensis[a]	Spring Mountains comma skipper	SOC	P	S
Limenitus weidemeyerii nevadae	Nevada admiral butterfly	SOC	—	—
Icaricia icarioides austinorum[a]	Spring Mountains icarioides blue	SOC	—	—
Icaricia shasta charlestonensis[a]	Mt. Charleston blue butterfly	SOC	—	—
Speyeria zerene carolae[a]	Carole's silverspot butterfly	SOC	—	—
Lasius nevadensis	Charleston ant	SOC	—	—
Pyrgulopsis deaconi[a]	Spring Mountains springsnail	SOC	—	—

Source: Miskow 2001; Burroughs 2001.

a. Covered species under the Clark County MSHCP.

b. T = threatened.

c. SOC = species of concern.

d. P = species protected under NRS 501.

e. S = BLM sensitive species.

f. N = Nevada special status species.

g. DL = Delisted.

h. PS = partial status.

Table 5. Relationship Between Sign Count per Triangular-Strip Transect Survey, Sign Observed per Acre, and Tortoise Density Estimates.

Number of Corrected Sign/Triangle Transect			Density Range	
California[a]	Nevada[b]	Regression Equation	California[a]	Nevada[b]
0	1	0	0–20	0–10
1–3	1–3	8–15	20–50	10–45
4-9	—	26–81	50–100	—
—	4–7	—	—	45–90
10–15	—	92–148	100–250	—
—	8–11	—	—	90–40
15+	—	159+	250+	—
—	12+	—	—	140+

a. Berry and Nicholson 1984. Regression equation used: Tortoises per square mile (sq mi) (640 ac) = 4[(CS-1.68)/0.35], where CS = corrected sign.

b. From information developed by the Las Vegas District of BLM (Karl 1980). Density ranges were developed for the District because it was believed that estimated ranges for California overestimated actual tortoise population densities in Nevada.

4.3.1.1 Federally Listed as Threatened and Endangered Wildlife Species

Desert Tortoise

On April 2, 1990, the USFWS listed the Mojave desert tortoise (*Gopherus agassizii*) population as threatened as a result of significant population decline and habitat loss, thereby bringing it under full protection of the ESA, as amended. In Nevada, the desert tortoise has been categorized as "protected" pursuant to NRS 501.110 and Nevada Administrative Code (NAC) 503.080 and 503.090. Critical habitat for the desert tortoise was designated on March 10, 1994 (59 Federal Register 5820). No designated critical habitat occurs in the study area.

The desert tortoise occurs on arid lands, typically in association with the creosote bush scrub community. This community is dominant below elevations of 5,000 ft above msl in the Mojave desert and is characterized by perennial shrubs, creosote bush, bursage, Joshua trees, cacti, grasses, and a variety of other perennial and annual plants. Preferred desert tortoise habitat includes scattered shrubs and a sufficient herbaceous understory layer to provide food and water needs. The desert tortoise occurs most often on flats and bajadas characterized by sandy to sandy-gravelly soils, but may also occur on slopes and in rocky soils.

Field surveys for the desert tortoise were conducted from May 7 through 10, 2001. Areas surveyed include WTG corridors, access roads, laydown areas, the substation location, and the proposed 34.5-kV distribution line, part of which would parallel the VEA 230-kV transmission line. On November 14, 16, and 18, 2001, field surveys were performed along the access road to Shenandoah Peak, and the new substation location. The locations of survey transects and triangle transects are shown in Attachment D.

Approximately 290 ac were surveyed for desert tortoise. A total of 34 tortoise sign (burrows, tracks, live tortoises, droppings, skeletal parts, or carcasses) were observed over the area surveyed. Consideration of only total sign would result in overestimation of tortoise population densities; therefore, total sign was adjusted to account for sign clearly attributable to the same tortoise. Corrected sign was 33. Results of all surveys were calculated based upon the linear regression model created by Berry and Nicholson (1984) and amended by the

Las Vegas District of BLM (based on work by Karl 1980) (Tables 5 and 6). The BLM-amended model was used to estimate tortoise densities for this survey. Survey results demonstrate that desert tortoise population densities range from very low-to-low in the project area (Tables 7 and 8).

No additional federally listed as threatened or endangered wildlife species were observed during the survey of the project site.

4.3.1.2 Federal Species of Concern and other Sensitive Wildlife Species

Banded Gila Monster

The banded Gila monster (*Heloderma suspectum cinctum*), a federal SOC and a BLM sensitive status species, is most commonly found on the lower slopes of rocky canyons and arroyos, but is also associated with flats that support desert scrub and succulents. This large venomous reptile is generally found in canyon bottoms or arroyos with permanent or intermittent streams, where it digs burrows. It also seeks shelter in mammal burrows and under rocks (Stebbins 1985). Active at night and on cloudy days, gila monsters can be found in arid and semiarid regions of gravelly and sandy soils throughout the Mojave Desert. Habitat occurs in the project area for the banded Gila monster. The species was not observed during the field surveys, but is a known inhabitant of the project area (Miskow 2001; Hobbs 2001).

Chuckwalla

The chuckwalla (*Sauromalus obesus*), a federal SOC, is found throughout the deserts of the southwestern United States and northern Mexico. Chuckwallas inhabit rock outcrops where cover is available between boulders or in rock crevices typically on slopes and open flats below 6,100 ft in elevation (Stebbins 1985). Typical habitat includes rocky hillsides and talus slopes, boulder piles, lava beds, or other clusters of rock, usually in association with desert scrub habitat, including Mojave desert scrub, blackbrush, salt desert scrub, and mesquite/catclaw vegetation communities. The chuckwalla requires shady, well-drained soils for nests. Warm rock surfaces are used for basking and as lookout positions for predators.

The chuckwalla is a widespread species, but is regionally limited by its requirement for rock outcrops. Chuckwalla are known to occur throughout the project area (Miskow 2001; Hobbs 2001). Several individuals of the species and their sign were observed during field surveys in April and May 2001.

Table 6. Estimated Tortoise Density Ranges Related to Survey Results.

		Density Estimates	
Number of Corrected Sign per Triangular-Strip Transect	Corrected Sign/Ac[a]	Nevada Range (number per sq mi)	Relative Density
0	0	0–10	Very Low
1–3	0.1–0.5	10–45	Low
4–7	0.6–1.1	45–90	Moderate
8–11	1.3–1.8	90–40	High
12+	1.9+	140+	Very High

a. Based on an approximation of 6 ac surveyed during a typical triangular survey.

Table 7. Estimated Desert Tortoise Density Ranges Related to Results of Linear Transect Surveys Conducted in the Table Mountain Project Area.

Site	Area Surveyed (ac)	Burrows[a]	Scat	Carcasses[b]	Total Sign	Corrected Sign	Corrected Sign (per ac)	Density Estimates[c]	Relative Density[c]
Wilson Pass lay down area	5.7	—	—	—	0	0	0	0–10	Very Low
Original Shenandoah lay down area	5.7	—	—	—	0	0	0	0–10	Very Low
New Shenandoah lay down area	5.0	2	—	—	2	1	0.20	10–45	Low
Original substation location	11.2	1	—	—	1	1	0.09	10–45	Very Low
New substation location	10.0	—	—	1	1	1	0.10	10–45	Low
Table Mountain lay down area	5.7	—	—	—	0	0	0	0–10	Very Low
Access roads	136.4	9	2	3	14	14	0.10	10–45	Low
Tower array	81.0	11	2	1	14	14	0.17	10–45	Low
Total	260.7	23	4	4	32	31	0.15	10–45	Low

a. Burrows also include caves and rock or caliche dens. Tortoise burrows currently active, recently active, and/or in good, fair, and poor condition were used in these calculations (Murphy 2000).

b. Carcasses include bones, scutes, plastrons, and shells.

c. Tortoise population densities based on Tables 5 and 6.

Table 8. Estimated Desert Tortoise Population Density Ranges Related to Results of Triangle Transect Surveys Conducted along the Transmission Line Corridor in the Proposed Table Mountain Project Area.

Transect[a]	Area Surveyed (ac)	Burrows[b]	Scat	Live Tortoise	Total Sign	Corrected Sign	Tortoises per sq mi[c]	Relative Density[c]
1	6	—	—	—	—	—	0–10	Very low
2	6	—	—	—	—	—	0–10	Very low
3	6	—	—	—	—	—	0–10	Very low
4	6	2	—	—	2	2	10–45	Low
5	6	—	—	—	—	—	0–10	Very low
Total	30	2	—	—	2	2	0–10d	Very low[d]

a. Based on an approximation of 6 ac surveyed during a typical triangle survey.

b. Burrows also include caves and rock or caliche dens. Burrows definitely attributable to desert tortoise were considered in these calculations.

c. Tortoise population densities based on Tables 5 and 6.

d. Two corrected sign per 30 ac surveyed using this methodology = 0.7 sign/ac = very low tortoise population density (Table 6).

Western Burrowing Owl

The western burrowing owl (*Athene cunicularia hypugea*) is a federal SOC and is protected under the MBTA. This species is found in a variety of open habitats throughout its range, including desert floor. This species is a year-round resident in open, dry, grassland, Mojave Desert scrub, sagebrush/perennial grassland, and open shrub stages of pinyon-juniper and mixed conifer habitats. It is distributed throughout Clark County in the Mojave Desert and lower elevations of the Great Basin units in appropriate habitat. A strong association exists between burrowing mammals and this owl. The presence of a nest burrow is a critical requirement, and the species often utilizes desert tortoise burrows. Habitat occurs in the project area for the western burrowing owl. Though signs were not observed during the field surveys, the species is a known inhabitant of the project area.

Olive-sided Flycatcher

The olive-sided flycatcher (*Contopus borealis*) is considered a federal SOC. It is an uncommon summer visitor in Clark County (Titus and Weeks 1991). Habitat for this species in southern Nevada consists of montane forests and riparian areas. This species was not observed during the field surveys, but potentially may occur in the northern portion of the project area.

Gray Flycatcher

The gray flycatcher is also a federal SOC and is considered a common spring and fall migrant in Clark County (Titus and Weeks 1991). In southern Nevada, it can be found in riparian area, foothills ranging in elevation from 4,000 to 7,000 ft, and montane forests (Titus and Weeks 1991). Although this species was not observed in the project area, it has potential to pass through the area during migration.

American Peregrine Falcon

The American peregrine falcon (*Falco peregrinus anatum*) was recently removed from the federal list of endangered and threatened species, but is protected under the MBTA. American peregrine falcons occur in a wide range of open country habitats from desert mountains to seacoasts. The presence of tall cliffs is the most characteristic feature of the peregrine's habitat and is considered to be a limiting factor for this species. Cliffs provide the peregrine falcon with both nesting and perching sites and an unobstructed view of the surrounding area. Where cliffs are lacking, manmade structures such as buildings and bridges are occasionally used as substitutes. A nearby source of water that supports an adequate prey base of small- to medium-sized birds is another common feature of peregrine falcon habitat that influences their distribution and abundance. In southern Nevada, the peregrine falcon breeds within the Lake Mead National Recreation Area and at sites near Lake Mohave.

Breeding habitat for the American peregrine falcon does not exist in the study area, but the species has the potential to pass through the area during migration.

Phainopepla

The phainopepla (*Phainopepla nitens*), a federal SOC- and BLM-listed sensitive species, breeds from central California, southern Nevada, southern Utah, southern New Mexico, and western Texas south to Baja California and into Mexico. It is also known to winter in southern California, southern Nevada, central Arizona, southern New Mexico, and western and southern Texas. In the Mojave Desert, it primarily inhabits washes, riparian areas, and other habitats that support dense growth of mesquite and catclaw. Special habitat requirements include trees or shrubs and berries, especially mistletoe. This species builds nests in the forked limbs of mesquite (*Prosopis* spp.), cottonwood (*Populus* spp.), hackberry (*Celtis* spp.), willow (*Salix* sp.), sycamore (*Plananus* sp.), and oak (*Quercus* sp.) trees and often in clumps of mistletoe 4 to 5 ft above the ground. The species was observed in the project area. The phainopepla is a known resident of southern Nevada (BLM 1999).

Desert Kit Fox

The desert kit fox is known to inhabit much of the desert southwest. It is a year-round resident throughout southern Nevada. Its primary habitat includes blackbrush, saltbush, and creosote bush scrub. It is also found in pinyon-juniper, sagebrush, grassland, and lowland riparian habitats. While the desert kit fox is not federally or state-listed as threatened or endangered, it is considered sensitive by the BLM, and a furbearer species protected by NDOW. Such kit fox sign as burrows and droppings was observed during the field surveys.

Townsend's Big-eared Bat

Townsend's big-eared bat (*Corynorhinus townsendii pallescens*) is a federal SOC and is considered a Nevada special status species by the BLM. The Townsend's big-eared bat occurs throughout the west, and is distributed from the southern portion of British Columbia south along the Pacific Coast to central Mexico and east into the Great Plains, with isolated populations occurring in the south and southeastern United States (Sherwin 1998).

In Nevada, the species is typically found in low desert to mid-elevation montane habitats, although sightings have been reported up to 10,800 ft (Philpott 1997; Sherwin 1998). Habitat associations include desert, native prairies, coniferous forests, mid-elevation mixed conifer forests, mixed hardwood-conifer forests, riparian communities, active agricultural areas and coastal habitat types (Kunz and Martin 1982; Brown 1996; Sherwin 1998). Distribution of this species is strongly correlated with the availability of caves and cave-like roosting habitat (Sherwin 1998). Populations have incurred serious declines over the past 40 years in parts of the southwest (Brown 1996). Townsend's big-eared bat is a year-round Nevada resident and may inhabit the project area.

Spotted Bat

The spotted bat (*Euderma maculatum*) is a federal SOC and has a scattered distribution throughout Nevada that is linked to the availability of cliff roosting-habitat. This mammal is also listed as a Nevada special status species. It is found in a wide variety of habitats from low elevation desert scrub to high elevation coniferous forest habitats, and is closely associated with rocky cliffs. It day roosts primarily in crevices on cliff faces, but there is some indication that mines and caves may occasionally be used, primarily in winter. The species hibernates, but periodically arouses and actively forages and drinks throughout the winter. Its diet includes a variety of insects but predominantly consists of moths. In desert settings, foraging occurs in canyons, in the open, or over riparian vegetation. In montane habitats, individuals forage over meadows, along forest edges, or in open coniferous woodland. The major threats to this species include recreational climbing and mining and quarry operations. This species may occur in the project area.

Greater Western Mastiff Bat

The greater western mastiff bat (*Eumops perotis californicus*) is a federal SOC and is considered by the BLM as a Nevada special status species. This bat generally seeks refuge in crevices in rocks that form vertical or nearly vertical cliffs. Roost sites are usually chosen where there is an unobstructed drop of several ft so that emerging bats can drop and gain sufficient momentum to become airborne (Davis 1978). The species feeds on a variety of insects, but the majority of its diet consists of moths. This species may inhabit the project area.

Allen's Big-Eared Bat

Allen's big-eared bat (*Idionycteris phyllotis*) is a federal SOC and a BLM Nevada special status species. This animal is found in southern Nevada, and can be found in various localities in the Spring Mountains Range and near Gold Butte. In the summer, the species generally occupies high elevation pine and oak woodland but also uses a variety of riparian woodland across a wide range of elevation gradients. In the winter, it is generally found at lower elevations from creosote bush to pinyon-juniper habitats. The species is generally a year round resident, but shifts elevations from summer to winter. The species hibernates, but may periodically forage and drink throughout the winter. It primarily day-roosts in trees (large dead snags), but there is some indication

that mines and caves are also used for roosting. The species feeds on a variety of insects, predominantly moths. The major threats to this species include mine and quarry operations. This species has potential to inhabit the project area.

California Leaf-Nosed Bat

The California leaf-nosed bat (*Macrotus californicus*) historically roosted in the Las Vegas Valley and along the Colorado River, but roosts have been destroyed by abandoned mine closures and the formation of Lakes Mead and Mojave. This species is listed as a federal SOC and a BLM Nevada special status species. Only a few roosts are known to exist, although there may be some foraging activity along the Virgin River, based on Arizona reports from the confluence of Virgin River and Beaver Dam Wash. The species inhabits low elevation desert scrub habitats, and roosts are located below 3,000 ft above msl in proximity to desert riparian areas. The species is a year round resident and does not hibernate.

The species is dependent on mines and caves for diurnal roosting. Night roosting occurs in a variety of places, including buildings, cellars, porches, bridges, rock shelters, and mines. Summer colonies may contain up to several hundred individuals, while winter colonies range from 100 to more than 1,000 individuals. Although it is believed that this species does not migrate, local movements among roosts occur, particularly on a seasonal basis. Prey items include grasshoppers, cicadas, moths, butterflies, dragonflies, beetles, and caterpillars. This species forages for prey items close to vegetation and the ground surface. The species does not require hydration from a direct water source, as it can obtain moisture from prey items. The major threats to this species include recreational caving, mining, and habitat destruction to riparian vegetation. The species is behaviorally sensitive to roost disturbance. This species is not likely to occur in the project area due to lack of preferred habitat.

Small-Footed Myotis Bat

The small-footed myotis bat (*Myotis ciliolabrum*) is a federal SOC and is also a BLM Nevada special status species. Small-footed myotis is a year-round resident found throughout the state of Nevada. In southern Nevada, it is primarily found at mid and high elevations (> 6,000 ft above msl), and is occasionally found at lower elevations. In the central and northern part of the state, it is more common at valley bottoms (3,500 ft). The species inhabits a variety of habitats including desert scrub, grasslands, sagebrush steppe, and pinyon-juniper woodlands, into pine forests. The species hibernates in the winter, and roosts have been found in caves, mines, and trees. The species forages in the open for small moths, flies, ants, and beetles. The small-footed myotis has been recorded near Wilson Tank (Heindl 2001), located northeast of the study area, and is likely to occur in the project area.

Long-Eared Myotis Bat

Long-eared myotis bat (*Myotis evotis*) is a federal SOC and a year-round resident found throughout the state, primarily at the higher elevations associated with coniferous forest. The species is more widespread and common in the northern half of the state. In southern Nevada, it is only found in ponderosa pine (*Pinus ponderosa*) and higher elevation communities. The species is presumed to be nonmigratory and to hibernate locally. It day roosts in hollow trees, under exfoliating bark, crevices in small rock outcrops, and occasionally in mines, caves, and buildings. Night roosts have been found in caves, mines, and under bridges. The species forages for moths, small beetles, and flies along rivers and streams, over ponds, and within dense forests. It appears to have a flexible foraging strategy, catching insects by both substrate and aerial pursuit. This species is not likely to occur in the project area due to lack of preferred habitat.

Fringed Myotis Bat

Fringed myotis bat (*Myotis thysanodes*), a federal SOC and a BLM Nevada special status species, is a year-round resident found throughout central and southern Nevada. It is found in a wide range of habitats from low desert scrub habitats to high elevation coniferous forests. The species hibernates but is capable of periodic

winter activity. Day and night roosting occurs in mines, caves, trees, and buildings. The majority of roosts documented in California have been in buildings or mines. The species has been radio tracked to tree hollows, particularly large conifer snags in Oregon and Arizona, and rock crevices in cliff faces in southern California. Hibernacula are generally mines or caves. The species forages among vegetation primarily for beetles, but also for a variety of other insects, including moths. The species is very sensitive to roost disturbance. The major threats to this species include recreational caving, mining, building demolition, pest control, and timber harvest. The fringed myotis bat has the potential to occur in the project area.

Long-Legged Myotis Bat

Long-legged myotis bat (*Myotis volans*), a federal SOC, is a year-round resident throughout Nevada, but is more widespread and common in the northern half of the state. The species occurs from mid- to high elevations, and is absent from the low desert. It is associated with pinyon-juniper, Joshua tree woodland, and montane coniferous forest habitats. It is suspected that there are elevational and latitudinal movements between summer and winter roosts. The species hibernates but is capable of winter activity. Day roosting primarily occurs in hollow trees, particularly large diameter snags or live trees with lightning scars. The species also uses rock crevices, caves, mines, and buildings when available. Caves and mines may be used for night roosts. The species forages in open areas, often at canopy height, and feeds primarily on moths, but also on other taxa, including beetles, flies, and termites. Population declines have been observed in the Spring Mountains of southern Nevada. The major threats to this species include timber harvest, aerial pesticide spraying, recreational caving, mining, building demolition, and pest control. This species has potential to occur in the project area.

Yuma Myotis Bat

The Yuma myotis bat (*Myotis yumanensis*), a federal SOC, is more closely related with water than most other North American bats. It is found in a wide variety of upland and lowland habitats in western North America, including riparian, desert scrub, moist woodlands, and forests, but is usually found near open water (NatureServe 2001). Its daytime retreats include caves, tunnels, abandoned mines, and abandoned buildings. It is one of the more common species of *Myotis* in the western United States and has potential to occur in the project area.

Big Free-Tailed Bat

The big free-tailed bat (*Nyctinomops macrotis*) is a federal SOC and a BLM special status species. The range of this species includes the arid southwest, and northward into the Pacific Northwest (Burt and Grossenheider 1976). Roosting habitat for the bat includes crevices in cliffs, caves, and abandoned buildings. The species diet consists primarily of large moths, but also can include grasshoppers, flying ants, stinkbugs, beetles, and leafhoppers (Davis 1978). Habitat for this species occurs in the study area and its presence within the project area is likely.

Spring Mountains Acastus Checkerspot Butterfly

The Spring Mountains acastus checkerspot (*Chlosyne acastus robusta*) is a federal SOC and a BLM Nevada sensitive status species. It is endemic to the Spring Mountains range, feeds on the nectar of the showy goldeneye (*Viguiera multiflora*), and inhabits primarily mixed conifer and pinyon-juniper (Clark County 2000). It can also be found in sagebrush (NatureServe 2001). Habitat for this species occurs within the northern extent of the project area at higher elevations on Potosi Mountain, but its presence is unlikely due to lack of preferred habitat.

Dark Blue Butterfly

The dark blue butterfly (*Euphilotes enoptes pupurea*) is a federal SOC and a BLM Nevada sensitive status species. It is endemic to the Spring Mountains and is typically found at mid-elevations ranging from 5,900 to 8,200 ft above msl (USGS 2001b). The dark blue butterfly inhabits pinyon-juniper and mixed conifer forest

habitat and feeds on the nectar of sulfur flower (*Eriogonum umbellatum*) (Clark County 2000). Habitat for this species is known to occur within the northern extent of the study area at higher elevations on Potosi Mountain, but its presence in the project area is unlikely due to lack of preferred habitat.

Morand's Checkerspot Butterfly

The Morand's checkerspot butterfly (*Euphydryas anicia morandi*) is a federal SOC that occurs at elevations of 6,800 to 11,280 ft above msl within the Spring Mountains. This endemic prefers meadows within bristlecone pine habitat, but would also occur in mixed conifer and pinyon-juniper (NatureServe 2001). Known nectar species include dandelion (*Taraxacum offininale*) and Western wallflower (*Erysimum asperum*) (Clark County 2000). Because of the presence of pinyon-juniper vegetation near the northern terminus of the project, this species has the potential to occur in the study area.

Spring Mountains Comma Skipper

The Spring Mountains comma skipper (*Hesperia comma mojavensis*) is a federal SOC and a BLM Nevada sensitive status species that is endemic to the Spring Mountains (NatureServe 2001). It occurs in bristlecone pine and woodland and forest belts at elevations of 5,000 to 11,300 ft above msl. This species feeds on the nectar from bee's flower (*Cirisium* sp.), dandelion (*Taraxacum offininale*), and scented penstemon (*Penstemon palmeri*) (Clark County 2000). Habitat for this species occurs within the project area and its presence is likely.

Nevada Admiral Butterfly

The Nevada admiral butterfly (*Limenitis weidemeyerii nevadae*) is a federal SOC and BLM Nevada sensitive status species. It is endemic to the Spring and Sheep Mountains. Known from 46 sites between 3,000 ft and 9,200 ft above msl, this species occurs primarily in bristlecone pine and in wet areas near high elevation springs (NatureServe 2001). Preferred nectar species include narrow-leaved yerba santa (*Eriodictyon angustifolium*), buttercup (*Clematis liquiticifolia*), and horehound (*Marrubium vulgare*) (Clark County 2000). Although habitat for this species is known to occur within the northern extent of the project area at higher elevations on Potosi Mountain, its presence is unlikely due to lack of preferred habitat.

Spring Mountains Icarioides Blue

The Spring Mountains icarioides blue (*Icaricia icarioides austinorum*) is a federal SOC and a BLM Nevada sensitive status species. It is endemic to the Spring Mountains at elevations of 5,900 ft to over 9,800 ft above msl (NatureServe 2001). The icarioides blue feeds on the nectar of the sulfur flower (*Eriogonum umbellatum*), dusty maiden (*Chaenactis douglasii*), and blue flax (*Linum lewisii*), and prefers disturbed areas, such as road cuts and campsites, but also occurs in the bristlecone pine and mixed conifer (Clark County 2000). The species may also utilize pinyon-juniper and sagebrush, which occur within the northern extent of the project area, but presence of the species is unlikely due to lack of preferred habitat.

Mount Charleston Blue Butterfly

The Mount Charleston blue butterfly (*Icaricia shasta charlestonensis*) is a federal SOC with seventeen documented occurrences in the Spring Mountains (NatureServe 2001). This endemic butterfly inhabits primarily bristlecone pine habitat, but has been known to occur in mixed conifer between 6,000 and 8,000 ft above msl. Known nectar plants include Lemmon's rubberweed (*Hymenoxys lemmonii),* Asters (*Aster* sp.), and buckwheat (*Eriogonum* sp.) (Clark County 2000). This species is unlikely to occur within the project area due to lack of preferred habitat and due to elevational requirements (Clark County 2000).

Carole's Silverspot Butterfly

Carole's silverspot butterfly (*Speyeria zerene carolae*) is a federal SOC and a BLM Nevada sensitive status species. This endemic species is widely distributed throughout the central portion of the Spring Mountains at elevations of 5,000 to 10,500 ft above msl (NatureServe 2001). The species prefers bristlecone pine habitat,

but is known to occur in mixed conifer, pinyon-juniper, and sagebrush. Known nectar species include bee's flower (*Cirisium arizonicum*), Western wallflower (*Erysimum asperum*), and rough angelica (*Angelica scabrida*) (Clark County 2000). Habitat for this species occurs within the northern extent of the study area at higher elevations on Potosi Mountain, but its presence in the project area is unlikely due to lack of preferred habitat.

Spring Mountains Spring Snail

The Spring Mountains Spring Snail (*Pyrgulopsis deaconi*) is a federal SOC and a BLM Nevada sensitive status species. Distribution of the species occurs in Clark County in Willow and Red Springs, in Red Rock Canyon NCA, Kiup Spring in the Spring Mountains NRA, and in Pahrump Springs on private land in Nye County (NatureServe 2001). The species is believed to be extirpated from Willow, Red, and Pahrump Springs (Clark County 2000). Habitat for this species does not occur in the study area.

Charleston Ant

The Charleston ant (*Lasius nevadensis*) is a federal SOC that is known only to occur in open coniferous forest in Kyle Canyon, located in the Spring Mountain Range, Clark County, Nevada. Habitat for this species does not occur in the study area (NatureServe 2001).

4.4 Game Animals

Desert Bighorn Sheep

Desert bighorn sheep are typically divided into four subspecies: *Ovis canadensis (O.c.) weemsi*, *O. c. cremnobates*, *O. c. mexicana*, and *O. c. nelsoni*. The Table Mountain project area is part of the winter range for desert bighorn sheep (*O. c. nelsoni*) and is an important year-round lambing area in the south Spring Mountain Range (Cummings 2001).

Bighorn sheep are a sociable species, and some, but not all, members of each sheep band migrate between seasonal ranges (Monson and Sumner 1980). They typically utilize broad upland habitats in the summer and concentrate in sheltered valleys during the winter. Bighorn sheep are known to inhabit rugged terrain in elevations between 5,000 and 7,000 ft above msl, venturing to lower elevations for food and water when necessary.

Rough topography is an important feature of bighorn habitat. Bighorn sheep have cloven front hooves 50% larger than their hind ft and are adapted to climbing steep surfaces. The heavy musculature of the front shoulders make bighorn sheep more suited for climbing than for outbursts of speed to escape danger (McQuivey 1978). In order to increase the chance of avoiding predation, selection of forage and water sources by bighorn sheep is influenced by this physical characteristic. Potential predators of lambs include coyotes (*Canis latrans*), bobcats (*Felis rufus*), mountain lions (*Felis concolor*), and golden eagles (*Aquila chrysaetos*). Habitat throughout the Table Mountain project area is conducive to bighorn sheep survival, as it is rugged and rocky and is bisected by ephemeral washes and canyons.

Desert bighorn rutting season may occur almost any time of year; however, the peak period of the rut includes the latter part of July and extends through much of September. Lambing in the southwest can occur at any month, but the majority of lambs are born in late winter and early spring (Monson and Sumner 1981). The gestation period for bighorn sheep is approximately 180 days. Gravid ewes become solitary and seek remote areas with precipitous terrain prior to parturition. Desert bighorn sheep require steep rugged areas for lambing and escape terrain (Ferrier and Bradley 1970; Douglas and Kingsley 1981). Traditional lambing areas, such as the Table Mountain project area, are utilized by bighorn sheep because of key features including isolation, shelter, and expansive, unobstructed views.

On the Desert National Wildlife Range, a wildlife refuge located 27 mi north of Las Vegas, Nevada, lambs are usually born in the roughest terrain (Monson and Sumner 1981). Such terrain generally has caves or overhanging rocks that offer lambs protection from predators and weather, although ewes do not always seek out rough areas and may have their lambs on open desert slopes (Simmons 1969). Ewes may remain isolated from the herd and restrict movement for a period of 1–2 weeks after birthing.

Bighorn sheep tend to spend the hottest part of the day relatively inactive, bedding down in the shade or in a cave. Nighttime foraging during the hottest period of the year has been observed in the past and may be a behavior to conserve water. Desert bighorn ewes typically have a daily movement radius of up to one mile depending upon the availability of surface water. Rams tend to be less restricted by range and move about more freely. Seasonally, desert bighorns may move a distance of 30–50 mi for more preferable water and foraging conditions.

Water availability is a major limiting factor for size and distribution of bighorn herds in the desert (Monson and Summer 1981; Welles and Welles 1961). Surface water utilization by bighorn sheep is dependent on several factors including environmental heat load and complementary water available through vegetation. Surface water use by bighorn sheep increases seasonally due to: (1) greater amount of evaporative loss as temperatures rise and (2) greater amount of water required by lactating ewes. Moisture content in food resources also affects the requirement for obligatory surface water resources.

All of the drainages within the project area are ephemeral, flowing only after storm events. Cave Spring is located north of Wilson Pass in the northern portion of the project study area. A water catchment facility (guzzler) was constructed by the Nevada Division of Wildlife (NDOW) and volunteers in Deadmans Canyon on Table Mountain. These are the only two water sources known to occur in the project area. The location of these water sources is shown in Figure 2.

Desert bighorn forage on a variety of grasses, forbs, and browse. Available food resources within the study area include needlegrass (*Stipa* spp.), *Hilaria rigida,* Indian ricegrass (*Achnatherum hymenoides*), fluffgrass (*Erioneuron pulchellum*), Mormon teas, winterfat, cliffrose, turpentine broom, hopsage, four-wing saltbush, shadscale, California buckwheat, desert trumpet, Mojave thistle, and the buds of Mojave yucca, Joshua tree, banana yucca, and Utah agave. Bighorn sheep diet may reflect seasonal changes in vegetation with an increase in grass and forb utilization during the spring growing season and after summer rains, and an increase in the use of browse during the fall and winter.

The desert bighorn sheep is known to inhabit and migrate through the entire project area, and were directly observed on Shenandoah Peak during the cultural resources survey for the proposed Table Mountain wind power facility (Roberts 2001). Desert bighorn sheep sign, including pellets, urine spots, tracks, and beds, was observed throughout the project area. High concentrations of sign were noted along ridgelines in the southern half of the project study area, from Table Mountain south to the project terminus and in the vicinity of Cave Spring.

Mule Deer

Mule deer (*Odocoileus hemionus)* potentially occur in the project area. The Wilson Pass area likely serves as the southern margin of the traditional deer use area on Potosi Mountain. No mule deer were observed during the field survey, but the species likely occurs north of Wilson Pass.

Gambel's Quail

Gambel's quail (*Callipepla gambelii*) is a common resident in southern Nevada. It inhabits desert scrub and thickets, usually near a permanent water source. It was observed along the existing VEA 230-kV transmission line corridor at the eastern base of Table Mountain. This species may occur in low numbers throughout the project area.

Chukar

Chukar (*Alectoris chukar*) is an introduced gamebird species that inhabits rocky, arid mountainous areas of the west. Like the Gambel's quail, this species usually occurs near areas with a permanent water source. Chukar were observed at Table Mountain, along the access road to Shenandoah Peak, and along the Keystone Mine road. They are well-established in the Cave Spring.

Mourning Dove

Mourning dove (*Zenaida macroura*) is a common, statewide resident. Habitat for this species includes desert scrub, open wood, and grassland. Mourning dove was observed in low numbers throughout the project area.

Furbearers

Furbearers are protected under NAC 503.025 (furbearing animals) and NAC 503.102 (factors for classification of wildlife as furbearing mammals). Nevada furbearers occurring within the project area include the coyote, kit fox, and bobcat. All three species likely occur throughout the project area and vicinity. Signs of all three were observed on Table Mountain.

4.5 Wild Horses and Burros

On December 15, 1971, Congress passed the Wild Free Roaming Horses and Burros Act (Public Law 92-195) to protect, manage, and control wild horses (*Equus caballus*) and burros *(E. asinus)* on public lands. The BLM and the U.S. Forest Service (USFS) are charged with administering this law, which specifies how wild horses and burros are to be managed on the range. Section 3 (a) of the act requires the Secretary of Interior to manage free-roaming horses and burros in a manner designed to achieve and maintain a thriving natural ecological balance on public lands. The law also specifies requirements for inventorying, monitoring, establishing appropriate management levels, relocating excess animals, and establishing criteria for destruction of animals.

Wild horses and burros found in the American southwest today, were introduced by the Spanish in the early fifteenth century, and feral populations were established as early as the 1600s (Woodward 1976; Walker and Ohmart 1978). The exact number of wild horses and burros introduced in this manner is unknown, but feral populations quickly became well established in the region (Breyen 1971). With few predators and with protection from humans, wild horse and burro populations on public lands quickly grew until control of the populations and the effect on their habitat became a major concern.

In response, BLM and USFS developed a strategy that established herd areas and formed herd management areas (HMA). There are currently 103 throughout Nevada, 9 located within the Las Vegas District. The northern one-third of the proposed action area is within the Red Rock HMA, which occurs north of the Sandy Valley Road. The Red Rock HMA currently has approximately 75 horses and 75 burros (McFadden 2001). Use by wild horses and burros in the southern portion of their HMA has been limited to spring, fall, and winter when physiological water requirements are lower. The burro population extends further south of the HMA boundary to Sandy Valley Road.

5.0 ENVIRONMENTAL CONSEQUENCES

An environmental consequence or impact is defined as a modification of the existing environment brought about by development activities. Impacts can be beneficial or adverse, can be a primary result of the action (direct), or a secondary result (indirect), and can be permanent or long-lasting (long-term) or temporary and of short duration (short-term). Impacts can vary in degree from only slightly discernible to a total change in the environment.

Short-term impacts are effects on the environment that occur during and immediately after construction commencement and final testing. For this project, short-term impacts are defined as lasting 5 years or less. Long-term impacts are changes made in the environment during construction and operation of the project that remain for the life of the project or after final reclamation has been completed.

For purposes of this report, impacts on biological resources due to project implementation may include one or more of the following:

- Loss of individual plants and wildlife
- Loss of habitat for plants and wildlife
- Introduction of noxious weeds into a previously uninfested area
- Decline in raptor or migratory bird populations
- Interference with the movement of resident or migratory avian or wildlife species
- Abandonment of the project area by bighorn sheep during construction.

5.1 Impacts on Vegetation

Direct impacts on vegetation would include temporary losses during the construction phase and permanent habitat loss associated with the operation and maintenance of the proposed facility. The temporary losses to the existing vegetation would occur during the construction of the WTGs, underground collection lines, new access roads and improvements to existing roads. Permanent impacts would result from loss of vegetation at the WTG locations, substation, and from the conversion of undeveloped land into access roads. Most vegetation in the direct footprint of the facilities would be permanently removed.

Temporary Disturbance from Construction Activities. The construction activities associated with the proposed project would result in the temporary disturbance of blackbrush scrub, creosote bush scrub, pinyon-juniper woodlands, and Mojave wash scrub vegetation communities. Estimates for project impacts on these communities are provided in Table 9. For this analysis, it is assumed that a 200-ft corridor would be disturbed along the length of each WTG string, which would include the WTGs and transformers, meteorological towers, service roads, underground collection lines, and underground communication cables. Access roads would disturb a maximum 60-ft width in flat to moderate terrain. Access roads constructed in steep terrain, such as the approach to Shenandoah Peak, would require a 100-ft-wide temporary construction ROW. Overhead distribution lines would require a 100-ft-wide temporary ROW during construction. The greatest amount of temporary disturbance would be 553.7 ac to the blackbrush scrub community. The least impacted vegetational community would be Mojave wash scrub at 3.7 ac.

Impacts on vegetation along electric distribution lines and staging areas would be temporary, allowing vegetation to regenerate following construction.

Table 9. Temporary Impacts on Existing Vegetation within the Proposed Project Area.

Facility Type	Area of Impact by Vegetation Community			
	Blackbrush Scrub (ac)	Creosote Bush Scrub (ac)	Pinyon-Juniper Woodland (ac)	Mojave Wash Scrub (ac)
Wind turbine generator corridor	392.7	0	18.3	0
Wind turbine generator[a]	(2.5)	0	(0.19)	0
Meteorological tower[a]	(0.0014)	0	(0.0001)	0
Underground distribution line	24	0	(11.5)	0
Service road[a]	(64.5)	0	(24.6)	0
Access road	48.5	18.1	0	1.4
Overhead distribution line	78.5	89.2	0	2.3
Laydown areas and batch plant	10	5	0	0
Substation	0	10	0	0
Total	553.7	122.3	18.3	3.7

a. All acreages in parentheses (#) are accounted for within the WTG corridor acreage total.

Long-Term Disturbance from Construction Activities. The project would have long-term impacts on native vegetation in the project area. Vegetation would be cleared for construction of the WTGs, underground and above ground distribution lines, substation, and access and service roads. Table 10 provides acreages of permanent impacts on vegetation associated with implementation of the Proposed Action.

Most vegetation in the footprint of the facilities and upgraded and new access roads would be permanently removed. Additional impacts on vegetation communities would include soil compaction, loss of topsoil, and removal or reduction in seed bank.

Indirect impacts on vegetation at and adjacent to the proposed WGF and ancillary facilities include increased human presence that could lead to unauthorized off-road vehicle use, increased recreational use, potential illegal dumping, and illegal collection of plants.

Threatened, Endangered, and Sensitive Plant Species. No federally listed as threatened or endangered plant species are known to occur in the project area. Construction and operation of the proposed WGF and ancillary facilities would have no impact on federally listed endangered or threatened plant species.

The proposed project would result in impacts on two federal plant SOCs observed within the proposed Wilson Pass laydown area in Section 16 of Township 24 South, Range 58 East. Approximately 1.1 ac of rosy twotone beardtongue and yellow twotone beardtongue habitat would be impacted during the use of the Wilson Pass laydown area. This may include loss of individual plants due to equipment movement, which could crush or move individual plants, displacement of seed banks, loss of essential habitat features, and permanent loss of habitat. Approximately 45 individual plants were observed within the washes throughout the proposed laydown area. Mitigation for impacts on these two species would be required.

The project would also disturb a large number of cacti and yuccas. Nevada State Law (NRS 527.060–.120) protects any species in the Cactaceae family and members of the genus *Yucca* and *Agave*. The entire project area supports a large and diverse cactus and yucca population. Because ground disturbance poses a potential for impacts on these species, mitigation measures would be necessary.

Table 10. Permanent Impacts on Existing Vegetation within the Proposed Project Area.

Facility Type	Area of Impact (ac) by Plant Community			
	Blackbrush Scrub (ac)	Creosote Bush Scrub (ac)	Pinyon-Juniper Woodland (ac)	Mojave Wash Scrub (ac)
Wind turbine generator corridor	137.5	0	6.5	0
Wind turbine generator[a]	(2.5)	0	(0.19)	0
Meteorological tower[a]	(0.0014)	0	(0.0001)	0
Underground distribution line	9.6	0	(4.6)	0
Service road[a]	(43)	0	(16.4)	0
Access road	23.8	9	0	0.9
Overhead distribution line	47.1	53.2	0	1.4
Laydown areas and batch plant	4	2	0	0
Substation	0	10	0	0
Total	222.0	74.2	6.5	2.3

a. All acreages in parentheses (#) are accounted for within the WTG corridor acreage total.

Noxious Weeds. Land that has been graded and cleared is vulnerable to noxious weed invasion. Seeds can then be easily introduced into these areas via construction vehicles that have been in other areas where noxious weeds are present. Seeds or plant material may become lodged between tire treads, in the coils of a winch, behind the license plate, or in cracks and crevices on the undercarriage of the vehicle. Residual impacts may occur after project construction and implementation of the vegetation reclamation plan through natural processes and by increased human access and use of the area. The construction and operation activities associated with this project could introduce noxious weeds into the vegetation communities in the project area. Other adverse impacts from the spread of noxious weeds include:

- Decrease in biological diversity of native ecosystems
- Reduction in water quality and availability for native wildlife species
- Decrease in the quality of habitats for native wildlife
- Alterations in habitats utilized by threatened and endangered species
- Increase direct and indirect competition with native species
- Health hazards, as some species are poisonous to humans, wildlife, and livestock.

5.2 Impacts on Wildlife

This section evaluates potential impacts on wildlife species that are known or likely to occur in the project area. The primary direct adverse impact of construction activities on wildlife would be the removal or disturbance of wildlife habitat. Construction activities associated with the project would cause a temporary and permanent disturbance to wildlife in the area. The temporary loss of wildlife habitat is estimated to be approximately 754 ac with a permanent disturbance of 325 ac. Clearing and grading activities would result in the direct destruction of some forms of wildlife that are not mobile enough to avoid construction operations.

These impacts would be limited primarily to reptilian species, burrowing mammals, and possibly some age classes of birds.

Larger, more mobile species of wildlife might avoid the initial clearing activity and move into adjacent areas. It is assumed that adjacent habitats are at their carrying capacity for the species that live there. Competition for resources would occur where new individuals are forced into adjacent habitats, potentially resulting in decreased birth rates or increased mortality rates such that populations are reduced to that which the habitat can support (Dempster 1975). An influx of wildlife into adjacent areas might also cause changes in species composition and community dynamics.

Impacts on wildlife habitat are closely associated with vegetation impacts. Due to the arid nature of the project area climate, the vegetation would recover slowly over several years. Reclamation of the disturbed vegetation would restore the wildlife habitat that was temporarily disturbed during construction.

Most wildlife habitat in the footprint of the facilities and both upgraded and new access roads would be permanently removed. The improvements to existing roadways and the construction of new access roads might lead to increased human access to the area and could result in an increase in wildlife disturbance, off-road vehicle use, and illegal hunting. The improvement and construction of new roadway facilities might increase the use of the area by feral animals. An increase in feral animal populations would have a negative impact on resident wildlife populations.

Increased noise and dust levels, nighttime illumination, and human activity during construction would disturb or disrupt foraging and breeding of resident wildlife species in the project area. These effects would occur within and adjacent to the perimeter of the construction area and are expected to be temporary in most cases.

Impacts on wildlife along electric distribution lines and staging areas would be temporary. Vegetation would regenerate following construction and wildlife would eventually return to the area.

The construction and operation of the proposed WGF is not expected to substantially reduce or diminish habitat for most forms of wildlife in the region. Wildlife habitat impacts due to the long-term operation of the proposed facility would be substantially less than temporary construction impacts. Estimates for long-term project impacts on wildlife habitat are provided in Table 10.

5.2.1 Threatened, Endangered, and Sensitive Wildlife Species

Impacts on Desert Tortoise

As discussed in Section 4.3.1, desert tortoise population densities in the project area range from low to very low. Direct impacts on the desert tortoise resulting from construction activity would include removal of habitat, loss or displacement of habitat features such as cover and forage, and crushing and/or loss of individual animals. The Proposed Action would result in the temporary disturbance of approximately 270 ac of tortoise habitat. Permanent impacts on tortoise habitat would total approximately 110 ac.

Indirect impacts would occur during construction and operation activities associated with the Proposed Action (Table 11). Construction activity would result in indirect degradation of habitat due to soil disturbance, habitat fragmentation, increased levels of noise, traffic, equipment movement, increased human activity. Raptors might utilize the distribution line structures for perching sites, which might facilitate increased predation of juvenile tortoises by ravens.

Table 11. Potential Disturbance of Desert Tortoise Habitat within the Table Mountain Wind Generation Facility Project Area.

Project Component	Subtotal of Permanent Disturbance (ac)
Wind turbine generator corridor	116
Wind turbine generators[a]	(2.0)
Meteorological towers[a]	(0.0014)
Underground utility line[b]	0.0
Service roads[a]	(5)
Access roads	30
Overhead electric distribution line	101
Materials laydown	6
Electric substation	10
Total	270

a. Acreage is included in the total acreage for the WTG string.

b. Seventeen of the 21 total mi of underground lines fall within the WTG corridor and impacts are included in corridor.

The proposed project would require formal consultation under Section 7 of the ESA of 1973, as amended. A result of that consultation would be a Biological Opinion issued by the USFWS. The Biological Opinion would specify reasonable and prudent measures and conservation recommendations to minimize impacts on the desert tortoise. Since the proposed project "might affect" the desert tortoise, remuneration fees would likely be required for impacts on desert tortoise habitat. In accordance with the Desert Conservation Plan, mitigation fees of $623 per ac (adjusted to year 2001) of disturbance to tortoise habitat on BLM land would be paid by the project proponent to Clark County. This project would disturb 270 ac of desert tortoise habitat, for a total of $168,210, if paid in the year 2002.

Impacts on Bats

To date, most research concerning WGFs and wildlife has concentrated on avian mortality. Bats can also be impacted from WGFs, communications towers, and other utility structures. In 1998 and 1999, 184 bat fatalities were recorded at Buffalo Ridge, Minnesota, where 354 wind turbines are in operation (Anderson et al. 2000). Bat fatalities at the Minnesota WGF have ranged from 0.26 fatalities/turbine/year to 2.04 fatalities/turbine/year. At VanSycle Ridge, Oregon, 10 bats were found dead in the first year of carcass searches (Anderson et al. 2000). An interesting trend in bat mortality at WGFs reflects that the majority of bat mortalities tend to be tree-dwelling bats of the genus *Lasiurus* (Keeley 1999; Anderson et al. 2000).

Potential impacts on bats from construction and operation of the Proposed Action could range from moderate to significant. Foraging patterns could be temporarily impacted by nighttime illumination and construction activity. Numerous caves and mines occur in the project area and are likely to be used by several species of bats; however, none of the construction or operations and maintenance activities are anticipated to directly impact any of the caves or mines in the project area that may provide roosting habitat for bats.

Impacts on Banded Gila Monster and Chuckwalla

The banded Gila monster and chuckwalla are two sensitive reptile species that may be impacted from construction and operation of the proposed WGF. Suitable habitat is present to support both species. Direct impacts on the banded Gila monster and chuckwalla resulting from construction activity would include

removal of habitat, loss or displacement of habitat features such as cover and forage, and crushing and/or loss of individual animals. Construction and operation of the proposed project is not expected to adversely impact populations of either species.

Impacts on Threatened and Endangered Aquatic Species

No direct impacts on listed aquatic species would occur from the construction or maintenance of the Proposed Action.

Impacts on Desert Bighorn Sheep

The Proposed Action would result in habitat reduction and fragmentation both in the short-term and the long-term. Desert bighorn sheep generally tend to favor their hereditary ranges and the herd(s) that regularly or seasonally utilize the proposed project area may not be able to migrate to other locations with more preferable habitat conditions during the project construction phase. Geist (1971) raises concerns that range expansion by ewes may not occur for several years because bighorn sheep are not very exploratory and do not colonize new areas rapidly. Habitat fragmentation is a major cause of population reduction and sometimes extinctions (Wilcox 1980).

Desert bighorn sheep utilize much of the upper elevations of the project area as foraging and lambing habitat. These areas would be substantially disturbed during construction of the proposed project. During construction of the project, these animals would be prohibited from utilizing the area for breeding, foraging, lambing, escape from predation, shelter, and movement to areas with more favorable conditions. In many parts of a bighorn's range, lambing areas are limited. Construction activities would restrict movement and access to this regionally important lambing area (Cummings 2001), and the desert bighorns may be forced into an area that is likely already at carrying capacity. This impact would be considered significant, and mitigation measures would be required.

Lambing areas are particularly critical, and permanent human occupancy near key lambing areas would cause bighorn sheep to move away (Monson and Sumner 1980). Permanent project structures in the center or periphery of bighorn sheep escape terrain can have disturbing effects, which can impact continued use of the area as escape cover by bighorn sheep (Monson and Sumner 1980). Bighorn sheep generally seek escape by climbing uphill away from danger. Conversely, when surprised from above, they take headlong flight down steep escarpments and flee until comfortably distanced from the source of perceived danger. This survival strategy may be affected by the placement of WTGs on the mountain ridges within the project area.

Three surface water sources are known to occur in the project area. Cave Spring and North Cave Spring are located north of Wilson Pass in the northwest portion of the project study area. A water catchment facility (guzzler) was constructed by the Nevada Division of Wildlife (NDOW) and volunteers in Deadman's Canyon on Table Mountain. Surface water utilization by bighorn sheep is dependent on several factors, including environmental heat load and complementary water available through vegetation. The removal of, and prohibition of access to, vegetation in the project area during construction activities might require bighorn sheep to utilize surface water resources more than they normally would in a given season.

Widening of access roads might cause an increase in recreational use of the area, such as target shooting and off-road vehicle use. Increased visitation to the area may result in increased wildlife harassment and an increase in number of wildlife road kills. Disturbance from construction, operation, and maintenance activities, and increased human visitation to the site would adversely impact desert bighorn sheep.

Impacts on Avifauna

Over the last decade, avian mortality studies have been conducted at WGFs in the U.S. and abroad. Results of studies performed in California, Minnesota, and Oregon, suggest that turbine-caused avian mortality would likely occur due to the operation of the proposed project.

Given the range of avian fatality data among the various WGFs, it is evident that significant raptor mortality is occurring at those facilities that were sited in areas with high raptor concentrations and a high prey base. Using the range of avian fatalities cited at Buffalo Ridge, Minnesota, and Vansycle Ridge, Oregon (Anderson et al. 2000), the proposed project could experience bird fatalities ranging from 0.57 to 1.95 fatalities/turbine/year. This range may be overestimated since the proposed project would not be sited near agricultural land, water, or wetlands, as were the WGFs in Minnesota and Oregon. The birds most likely at risk would be nocturnal migrants. Since the death of one migratory bird could be considered a violation of the MBTA, potential impacts on birds would be considered significant and would require mitigation.

Construction and operation of the proposed WGF would have direct and indirect impacts on avian populations. Direct impacts would include a short- and long-term loss of foraging and nesting habitat; an increased risk of avian mortality from collisions with WTGs, meteorological tower guy wires, and overhead distribution lines; and electrocution hazards from the electric substation and overhead distribution lines.

Indirect impacts would include increased human use of the area for operations and maintenance, increased recreation in the area, and changes in the vegetation communities. Changes in vegetation may indirectly affect mortality rates and/or avifaunal reproductive success, or changes in prey distribution and abundance. Direct impacts on avian species are potentially significant and would require some form of mitigation or minimization.

Impacts on Wild Horse and Burro

The construction of the project is not expected to negatively impact wild horse or burro populations or their habitat. Access roads will utilize existing roads to the greatest extent possible. Improvements to existing roads will slightly reduce available habitat in the HMA. Within the HMA, most project facilities are located along steep ridgelines, which provide little habitat for burros and no habitat for horses. Habitats disturbed on Table Mountain are outside the HMA and are not utilized by wild horses and burros. A BLM-approved restoration plan will be incorporated into the project to restore all temporary use areas. Speed restrictions on access and service roads, in addition to warning signs, will reduce the potential for vehicular collisions with animals.

Increased human presence and construction noise may cause wild horses and burros to temporarily avoid the project area; however, the HMA herd does not heavily use this area due to the lack of reliable surface water. The only available natural water sources, Cave Spring and North Cave Spring, are located over 1,500 ft away from the proposed project facilities in the Wilson Pass area. The project is not expected to affect the limited water resources available to horses or burros. Burros are known to utilize Cave Spring, but there is no evidence they use the guzzler in Deadman's Canyon. Wild horses are not known to utilize any of the water sources in the project area.

While some researchers maintain that there significant habitat overlap exists and therefore, competition, it has been sufficiently demonstrated that bighorn sheep prefer higher elevations and steep rugged slopes (slopes of 35% or greater), whereas wild horses and burros range predominantly on gentler slopes, open spaces, washes, and at slightly lower elevations (Dunn 1984; Leslie and Douglas 1979). The major source of food for the wild horse and burro tends to be forbs. The opposite appears to be the case for the bighorn, having a preference for grasses and shrubs over forbs (Breyen 1971; Ginnett 1982; McMichael 1964).

Operation of the proposed project is not expected to alter use of the HMA by the wild horses or burro populations. The project is not expected to affect the limited water resources available to horse or burros. Given the known range of the wild horse and burro populations of the Spring Mountains, and the terrain, habitats, and available water sources within the project area, it is unlikely that construction, maintenance, or operation of the project would contribute to habitat and resource competition between bighorn sheep and wild horses and burros.

6.0 RECOMMENDED MINIMIZATION AND MITIGATION MEASURES

Mitigation measures, approved by federal and state agencies, would be incorporated into the proposed project to minimize direct and indirect impacts on acceptable levels or to prevent these impacts altogether. To reduce potential physical effects on species within the proposed project area, a mitigation plan for construction activities would be implemented, upon USFWS approval, before proceeding with earthmoving and construction activities. Implementation of these measures would reduce the potential to adversely affect the environment.

6.1 Minimization Measures for Impacts on Sensitive Plant Species

To minimize potential effects on species within the project area, a mitigation plan for construction activities should be implemented before proceeding with earthmoving and construction activities. All areas to be disturbed by project activities should have boundaries flagged before beginning the activity, and all disturbances should be confined to flagged areas. Vehicular access to the site should be restricted to designated roads to avoid unnecessary damage to sensitive native plant species.

Project facilities should be located to avoid and/or minimize impacts in areas of high value such as sensitive plant habitats, where feasible. Minimal vegetation removal should be employed during all construction activities. Brush and rock should be used for revegetation (vertical mulch), and rocks should be used as natural barriers on restored areas or other sites to control access.

6.1.1 Sensitive Plant Species

Portions of the project area not previously surveyed for sensitive plants in 2001 should be surveyed in the spring season, prior to beginning construction activities. It is also recommended that prior to construction, the top 6 in of topsoil be removed to preserve the seed bank and staged during construction activities. After construction commences, the preserved topsoil should be placed over denuded areas and may be supplemented by hydroseeding with an approved native seed mixture. Vehicular access should be restricted to designated roads to allow for regrowth. The revegetated areas should be monitored annually for reclamation success.

Two of the special status plant species were observed during field investigations. The Rosy twotone beardtongue and the Yellow twotone beardtongue were identified along washes in Section 16, Township 24 South and Range 58 East. Preconstruction surveys for the beardtongue would be conducted during the spring, and individual plants would be marked. Large areas where beardtongue is found would be flagged for possible avoidance and would not be disturbed without prior approval by the BLM. Seed collection might be required to reseed the area following construction. In addition, vehicular access to the site would be restricted to designated access roads only.

If any other special status plant species are found during construction, proper BLM protocol would be followed regarding relocation of individual plants or recovery and stockpiling of the seeds for future propagation.

Native cacti and yucca plants are protected and regulated by the state of Nevada (NRS 527.060–.120 and NAC 527). The avoidance of as many cacti, agaves, yuccas, and Christmas (evergreen) trees as possible is preferred. However, because of the high densities of these species in the project area, avoidance of all individuals will not be possible. In these cases, individuals, excluding mature Christmas (evergreen) trees, should be translocated to adjacent areas prior to ground disturbance. These plants would be used as part of the reclamation plan to revegetate the area. A monitoring program should be established to evaluate the success of the translocations.

Areas that might be suitable as translocation sites include the burned areas on Table Mountain. These areas are recovering from a recent fire; however, because of the slow growth of Joshua trees and some cactus species, it may take decades before these species can fully reestablish themselves in the area. Hence, translocating Joshua trees and cacti into the burned areas may hasten the recovery process. Because deeper soils occur in the burned areas, these areas might not be suitable for all cactus species.

Species preferring shallow, rocky soils might not transplant well and include cottontop cactus, hedgehog cactus, Mojave mound cactus, beehive cactus, Mojave barrel cactus, little fishhook cactus, and Mojave prickly pear. However, recovery attempts should be made for all protected species. Mature Christmas (evergreen) trees that cannot be avoided should be felled and left in the area to provide cover for wildlife.

A permit is required for removal and/or possession of state-protected plants for commercial salvaging on BLM land. Because the plants are widely dispersed in the area surveyed, the number of cacti and yucca plants that could be disturbed by facility construction is relatively high. Suitable native cacti and yucca plants found on BLM lands would be salvaged in compliance with a permit from the BLM. Transport of native cacti or yucca plants off-Reservation requires a Nevada Division of Forestry permit for commercial salvaging and transportation.

6.1.2 Noxious Weeds

The chances of spreading noxious weeds would be greatly reduced by implementation of the following mitigation measures:

- All personnel entering the project construction site would be advised that their activities must be confined to locations within flagged or fenced areas. Cross-country travel and travel outside construction zones would be prohibited.

- The undercarriages of vehicles that were to be used during construction would be washed prior to entering the project area at designated wash stations. Wash station locations would be selected to reduce the potential for infestations from vehicular traffic during construction. While washing the construction vehicles, focus would be on the tires, axles, bumpers and undercarriage.

- If straw bales were to be used in the project area as a stormwater pollution prevention measure, they should be certified weed free.

- Upon commencement of construction activities, the denuded areas should be reseeded with a BLM approved seed mixture. The revegetated areas should be monitored according to BLM standards for reclamation success and for potential noxious weed encroachment.

6.2 Minimization Measures for Impacts on Sensitive Wildlife Species

To minimize potential effects on species within the project area, a mitigation plan for construction activities should be implemented before proceeding with earthmoving and construction activities. All areas to be disturbed by project activities should have boundaries flagged before beginning the activity, and all disturbances should be confined to flagged areas. Vehicular access to the site should be restricted to designated roads to avoid unnecessary damage to wildlife species or their habitat. Where feasible, project facilities should be located to avoid and/or minimize impacts in areas of high value such as sensitive wildlife habitats. Minimal vegetation removal should be employed during all construction activities. Brush and rock should be used for revegetation (vertical mulch), and rocks should be used as natural barriers on restored areas or other sites to control access.

Mitigation measures recommended for the proposed project are based on those found in MSHCP and in existing Biological Opinions rendered by USFWS on other projects affecting the desert tortoise. The discussion below outlines specific mitigation measures for desert tortoise, desert bighorn sheep, avifauna, bats, banded Gila monster, and chuckwalla.

6.2.1 Desert Tortoise

Mitigation measures for the desert tortoise would include the following elements:

- Desert tortoise protection education
- Flagging construction boundaries
- Tortoise removal
- Speed limits and signage
- Trash and litter control
- Spill handling procedures
- Construction monitoring
- Habitat compensation
- Reporting requirements.

Desert Tortoise Protection Education

A desert tortoise education program would be presented to all personnel on-site during construction and operation. This program would contain information concerning the biology and distribution of the desert tortoise, its legal status and occurrence in the proposed project area, the definition of "take" and associated penalties, measures designed to minimize the effects of construction activities, the means by which employees can help facilitate this process, and reporting procedures to be implemented when desert tortoises are encountered.

Flagging Construction Boundaries

All areas to be disturbed would have boundaries flagged before beginning the activity, and all disturbances would be confined to the flagged areas. All project personnel would be instructed that their activities must be confined to locations within the flagged areas. Disturbance beyond the actual construction zone would be prohibited.

Tortoise Removal

Before surface-disturbing activities, a qualified biologist would conduct a clearance survey of tortoise habitat to be disturbed to locate and remove tortoises using USFWS-approved techniques. Two complete passes of 100% coverage would be accomplished. All desert tortoise burrows, and other species' burrows that may be used by tortoises, would be examined to determine occupancy by desert tortoises.

All burrows found within areas proposed for disturbance, whether occupied or vacant, would be excavated by a qualified biologist and collapsed or blocked to prevent desert tortoise reentry. All burrows would be excavated with hand tools to allow for safe removal of tortoises or tortoise eggs. All tortoise handling and

burrow excavations, including nests, would be conducted by a qualified biologist in accordance with USFWS-approved protocol (Desert Tortoise Council 1994, revised 1999). Desert tortoises and tortoise eggs found in the project area would be relocated 1,000 ft from the project area boundary in adjacent, undisturbed habitat.

Speed Limits and Signage

Vehicles should not exceed 25 mph on access roads during periods of highest tortoise activity (March 1 through November 1). Speed limit signage would be installed along access and service roads. Caution signs indicating the presence of desert tortoise would be posted along access roads and service roads. Qualified onsite biologists would monitor speed limit compliance during construction.

Trash and Litter Control

Trash and food items would be disposed of promptly in predator-proof containers with re-sealing lids. Trash containers would be emptied daily, and waste would be removed and disposed of in an approved off-site landfill. Trash removal would reduce the attractiveness of the area to opportunistic predators such as desert kit fox, coyotes, and common ravens. Construction waste, including, but not limited to, broken parts, wrapping material, cords, cables, wire, rope, strapping, twine, buckets, metal or plastic containers, boxes, and welding rods would be removed from the site daily and disposed of properly.

Spill Handling Procedures

All fuel, transmission or brake fluid leaks, or other hazardous waste leaks, spills, or releases would be reported immediately to a designated environmental supervisor. The environmental supervisor would be responsible for enforcing and implementing the project spill prevention and containment plan, which would include spill material removal and disposal to an approved off-site landfill, and possibly notifying the appropriate federal agency.

Construction Methods

The following construction methods would be implemented:

- Cross-country travel and travel outside construction zones would be prohibited.
- Open trenches or holes that pose a tortoise entrapment and injury risk would be covered and/or escape ramps would be located not less than every 1,000 ft.
- Stockpiled pipes that could attract tortoises would be capped or checked by a biological monitor before use.

Construction Monitoring

During construction activities, qualified on-site biologists would monitor for tortoises and move them if necessary; provide instruction as needed; and monitor and report on compliance. If approved tortoise fencing were installed along the perimeter of the proposed facilities, the number of onsite biologists needed would be reduced or eliminated.

Habitat Compensation

In accordance with the USFWS Biological Opinion (pending), remuneration fees of $623 per ac (adjusted to year 2001) would be paid to compensate for impacts on tortoise habitat on public lands. The Proposed Action would disturb approximately 270 ac, for a total of $162,810, if paid in the year 2001. This fee is indexed annually for inflation, and would be adjusted for the year the ROW grant is approved.

Reporting Requirements

The on-site biologist would record each observation of desert tortoise handled. Information would include the following: location, date and time of observation, whether tortoise was handled, general health and whether it voided its bladder, location tortoise moved from and location moved to, and unique physical characteristics of each tortoise. Reports documenting effectiveness and compliance with the tortoise protection measures would be prepared every 6 months. A final report would be reviewed and approved by the BLM and then submitted to USFWS within 90 days of construction completion.

6.2.2 Desert Bighorn Sheep

Implementation of the proposed project would pose a significant impact on the desert bighorn sheep during construction. Coordination with the NDOW is ongoing with regard to potential mitigation measures. TMWC is committed to minimizing and mitigating impacts on this important species through the use of state-of-the-art facility design, construction, and O&M strategies. TMWC proposes to provide funds to support a variety of construction and postconstruction studies that will be prioritized and implemented at the discretion of NDOW.

6.2.3 Avifauna

In compliance with the Migratory Bird Treaty Act of 1918 (MBTA) (Executive Order 13186) and the Bald (and Golden) Eagle Protection Act of 1940 (BEPA), a preconstruction survey should be conducted by qualified biologists for migratory birds during the nesting season. According to the USFWS, the nesting season for migratory birds in this area is from March to September. Maximum effort should be made to schedule land-clearing activities outside of the breeding season. If construction must occur within the breeding season, a qualified biologist should survey the area of Project Action for active nests. If nests are located, the USFWS should be contacted.

Mitigation measures might be used to prevent birds from nesting in the area prior to land clearing. These pre-emptive measures might include activities such as collapsing burrows prior to burrowing owl nesting season, sounding air horns, or other nonthreatening hazing methods. In order to be in compliance with the MBTA, if active nests were located, the USFWS would be contacted and the nests would be avoided entirely until the chicks fledge. Residential and migratory birds with potential to occur in the project area are listed in Attachment F.

Mitigation measures could include the following:

- Use of tubular WTG towers to reduce perching sites
- Burying electrical collection lines to reduce perching sites
- Use of state-of-the-art fixed-speed turbines that revolve at lower speeds than the variable-speed turbines
- Locating facilities away from known avian concentration areas
- Design distribution line structures with antiperching devices
- Conduct postconstruction avian studies to monitor avian risk and mortality for a period of 1 or 2 years.

6.2.4 Bats

Project facilities should be constructed to minimize impacts, such as collision and electrocution to bat species. Much of the electrical distribution line would be buried beneath the ground surface, minimizing collision potential.

Project facilities should be constructed to minimize disturbance to existing mines and caves that may serve as roosts. Because these species are sensitive to the presence of humans, areas known to be inhabited by bats should be avoided, particularly in or around maternity roosts. If identified as roosts, cave and abandoned mine entrances could be fitted with bat gates that will prevent human access, but allow bats to pass through freely. Additionally, fences could be built around the entrances according to Nevada Department of Mines standards.

Nightlighting of the WGF and ancillary facilities should be kept to a minimum public safety level to avoid attracting insects and bats to the WTGs.

Surveys for bat mortalities, in conjunction with postconstruction avian studies, should be performed. Postconstruction efforts might also involve acoustic surveys, biannual flyway surveys, and monitoring of bat risk and mortality associated with operations and maintenance.

6.2.5 Other Wildlife

The banded Gila monster is a sensitive reptile species that might be impacted during construction and operations and maintenance of the proposed project. All banded Gila monsters or chuckwallas, observed in the project area, would be reported immediately to NDOW. Live banded Gila monsters would be held for NDOW inspection and possible pit tagging. Once tagged, the reptiles would be relocated away from construction activity into nearby suitable habitat. In order to safely relocate this species, they would be captured and detained in a cool, shaded environment by the on-site biologist. Should there be an encounter when NDOW is unavailable to respond, an overhead photograph would be taken of the lizard and also the head. The Gila monster would then be translocated out of harm's way. Proper documentation including legal description of the capture and release sites would be included. Gila monster carcasses would be preserved, by freezing, for NDOW. Off-road vehicle travel would be restricted and construction employees would be provided education about these species by the biologist of the project.

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Attachment A

Eremico 2001 Botanical Survey Report

BOTANICAL SURVEY,
M&N TABLE MOUNTAIN WIND POWER PLANT,
SPRING MOUNTAINS, CLARK COUNTY, NEVADA

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5 June 2001

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INTRODUCTION

The Bureau of Land Management has recently filed a notice of intent to prepare an Environmental Impact Statement focusing on wind power projects and other planned energy projects in the Table Mountain, Shenandoah Peak, and Potosi Peak areas of the Spring Mountain Range in Clark County, Nevada. The projects would involve the construction of an array of wind turbines and ancillary facilities on approximately 4,500 acres of public lands. Ancillary facilities include access roads, new distribution lines, laydown areas, and substations.

The purpose of this botanical survey is to provide information on the native vegetation presently existing on the site, which will subsequently be used in preparation of the Environmental Impact Statement. Special attention is given to sensitive species of plants including federal and state listed and proposed threatened and endangered species and species of concern.

METHODS

PRE-FIELD INVESTIGATIONS

A search list of sensitive plant species that appear to have some potential of occurring in the project area was prepared using information provided by the U.S Fish and Wildlife Service (USFWS) (USFWS 2001) and the Nevada Natural Heritage Program (Department of Conservation and Natural Resources 1999a, 1999b). A species is considered sensitive if it is 1) a federally listed threatened or endangered species, or proposed as such (USFWS 1992, 1993); 2) a federal species of concern (USFWS 2001); or 3) a State of Nevada listed or protected species (Department of Conservation and Natural Resources 1999a, 1999b). A species was judged to have some potential for occurring in the project area if it is known to occur in the region, in a similar habitat, and at the same elevation range as the project site.

Eighteen sensitive plant species were determined to potentially occur in the project area (Table 1). These plants make up the search list used in planning and conducting the surveys. No federally endangered or threatened species were determined to occur in the area. Twelve species, however, are considered species of concern by the USFWS. Two species are recognized by the State of Nevada as threatened with extinction, and two species is on its watch list. Several other species are considered sensitive by the BLM and/or U.S. Forest Service (FS) (Table 1). None of the sensitive species have previously been reported to occur on the project site. In addition, 2 evergreen trees (i.e., Christmas trees), 11 species of cacti, 1 agave species, and 3 yucca species have some potential of occurring in the project area and are protected and regulated by the State. (Table 1). The search list was designed to alert the field team to possible occurrences of sensitive species and to provide a focus for the field survey. Drawings and descriptions of each species were reviewed and carried in the field.

FIELD INVESTIGATIONS

Field investigations were conducted on 30 April – 3 May and 8 – 14 May 2001. The timing of the surveys corresponded to the flowering periods of the majority of potentially occurring sensitive plant species. Denise LaBerteaux of EREMICO Biological Services was the principle field investigator. Other biologists that participated in the field investigations included Kelly Shook, Dick Davis, Bobby Tuttle, Billye Jean Sisler, and Gary Galbraith of PBS&J, Inc.; Bruce Garlinger of EREMICO Biological Services; Mike McGovern, Biological Consultant; and Hermi Hiatt, Biological Consultant.

Table 1. Sensitive plant species that have some potential of occurring in the project area.

SPECIES		STATUS		
Scientific Name	Common Name	USFWS[1]	Nevada[2]	Other[3]
Angelica scabrida	Rough angelica	C		
Arctomecon californica	Las Vegas bearpoppy		E	
Arctomecon merriamii	White bearpoppy			BLM
Astragalus funereus	Death Valley milk-vetch	C		BLM, FS
Astragalus mohavensis var. *hemigyrus*	Halfring milk-vetch	C	E	BLM, FS
Astragalus mohavensis var. *mohavensis*	Mojave milk-vetch		W	
Astragalus nyensis	Nye milk-vetch		D	
Astragalus remotus	Spring Mountain milk-vetch	C		BLM, FS
Cryptantha tumulosa	New York Mountains catseye		W	FS
Eriogonum bifurcatum	Pahrump Valley buckwheat	C		BLM
Eriogonum heermannii var. clokeyi	Clokey buckwheat			BLM, FS
Glossopetalon pungens var. *glabra*	Smooth dwarf greasebush	C		
Glossopetalon pungens var. *pungens*	Dwarf greasebush	C		
Ivesia jaegeri	Jaeger ivesia	C		
Penstemon bicolor ssp. bicolor	Yellow twotone beardtongue	C		BLM, FS
Penstemon bicolor ssp. rosea	Rosy twotone beardtongue	C		FS
Penstemon fruticiformis ssp. *amargosae*	Death Valley beardtongue	C		
Selaginella utahensis	Utah spikemoss	C		
Echinocactus polycephalus var. *polycephalus*	Cottontop cactus		P	
Echinocereus engelmannii	Hedgehog cactus		P	
Echinocereus triglochidiatus	Mojave mound cactus		P	
Escobaria vivipara ssp. *desertii*	Beehive cactus		P	
Ferocactus cylindraceus var. *lecontei*	California barrel cactus		P, W	
Mammillaria tetrancistra	Fish-hook cactus		P	
Opuntia acanthocarpa var. *coloradensis*	Buckhorn cholla		P	
Opuntia basilaris var. *basilaris*	Beavertail cactus		P	
Opuntia echinocarpa	Silver cholla		P	
Opuntia erinacea var. *erinacea*	Mojave prickly-pear		P	
Opuntia ramosissima	Pencil cholla		P	
Agave utahensis	Utah agave		P	
Yucca baccata	Fleshy-fruited yucca		P	
Yucca brevifolia var. *brevifolia*	Joshua tree		P	
Yucca brevifolia var. *jaegeriana*	Dwarf Joshua tree		P	
Yucca schidigera	Mojave yucca		P	
Juniperus osteosperma	Utah juniper		P	
Pinus monophylla	Singleleaf pinyon		P	

[1] U.S. Fish and Wildlife Service Status: C = species of concern

[2] Nevada Status: E = threatened with extinction; P = protected and regulated; W = watch list; D = recently delisted from watch list.

[3] Other: BLM = BLM sensitive species; FS = Forest Service sensitive species

The major vegetation communities occurring in the project area were identified during the surveys of the project area. Classification of the natural communities follows Holland (1986). Each community type was characterized based on field observations of the dominant species. Dominant and associating species were recorded in each geomorphic type within each plant community.

One hundred percent coverage surveys were conducted over 71% of the turbine sites, access roads, and distribution lines, combined. Areas that were surveyed are mapped on Enclosure 1. The remaining turbine sites, access routes and distribution line routes along with the proposed laydown areas and the proposed substation were not surveyed due to insufficient time. The sites were surveyed by 2 biologists walking 50-ft wide parallel transects. For the turbine sites and associated access roads, a 200-ft wide corridor connecting the turbines in a given area was surveyed. The survey corridor along new distribution lines and new access roads also measured 200 ft in width. Access routes proposed along existing roads were surveyed by walking one, 50-ft wide transect on each side of the road. Transect s are identified on Enclosure 1.

The surveys were floristically based, that is, all plant species encountered during the surveys were identified to at least genus and to the level necessary to ensure that they were not sensitive species. Voucher collections were made for all species that were not readily identifiable in the field or which are closely related to plants on the sensitive species search list.

If a sensitive plant species, other than a Nevada protected and regulated plant species, was found in the project area, its location was mapped, the number of individuals occurring along the survey route was estimated, and the microhabitat was described. A handheld Global Positioning System unit was used to obtain the Universal Transverse Mercator (UTM) coordinates for the location of the sensitive plant population. A Nevada Native Species Site Survey Report form was also completed. The number of each Christmas tree, cactus, agave, and yucca species (i.e., the Nevada protected and regulated plant species) was obtained by counting individuals encountered along the transects. If densities of these plants in a given area were high, ranging from the hundreds to thousands, numbers were only estimated.

RESULTS AND DISCUSSION

PLANT COMMUNITIES

Four plant communities were recognized in the project area: blackbush scrub, Mojave creosote bush scrub, Mojavean pinyon-juniper woodland, and wash scrub. Blackbush scrub occurred over the majority of the project area. Mojave creosote bush scrub occurred on the bajadas in a transitional zone below the blackbush scrub on adjacent slopes. Mojavean pinyon-juniper woodland occurred in a small area, at the northern end of the project area, above 5600 ft. Wash scrub occurred in two major washes, Keystone Wash and in the wash in the vicinity of the Yellow Pine Mine, east of Shenandoah Peak. Each community is described in more detail below.

Blackbush Scrub. Blackbush scrub typically consists of low, often intricately branched shrubs that are 0.5 to 1 m tall. Canopies of adjacent shrubs usually do not abut. It occurs on dry, well-drained slopes and on flats will shallow, often calcareous, soils with very low water holding capacity. Generally, this community type occurs between 4000 and 7000 ft in elevation and often intergrades with Great Basin Sagebrush scrub, Joshua tree woodland, or pinyon-juniper woodland. The dominant shrub is blackbush (*Coleogyne ramosissima*) (Holland 1986).

Blackbush scrub was the dominant community type of the project area, occurring on the mountain tops, ridges, mountain slopes, and upper bajadas (Enclosure 1). It intergraded with Mojave

creosote bush scrub on the lower bajadas and Mojavean pinyon-juniper woodland above 5600 ft at the north end of the project area. The species which associated with blackbush in this community varied slightly throughout the project site, probably due to varying soil type and terrain. On Table Mountain Joshua trees (*Yucca brevifolia* var. *brevifolia*) and dwarf Joshua trees (*Y. b.* var. *jaegeriana*) were very abundant in this community and may even be considered co-dominants. Associating shrub species on Table Mountain included Shockley goldenhead (*Acamptopappus shockleyi*), desert tomato (*Lycium andersonii*), spiny menodora (*Menodora spinescens*), Nevada ephedra (*Ephedra nevadensis*), desert plume (*Stanleya pinnata*), and winterfat (*Kraschenennikovia lanata*). Some portions of the Table Mountain area had burned in the recent past (Enclosure 1). In these areas the blackbush and the Joshua trees had not yet recovered. Hence, the dominant shrubs in these burned areas were desert tomato and fourwing saltbush (*Atriplex canescens*).

On the limestone ridges in the vicinity of Table Mountain common associates included spiny menodora, apache plume (*Fallugia paradoxa*), fourwing saltbush, Mojave prickly pear (*Opuntia erinacea* var. *erinacea*), beehive cactus (*Escobaria vivipara* ssp. *desertii*), and cliff rose (*Purshia mexicana*). On the limestone ridges in the northern portion of the project area, north of Wilson Pass, Joshua tree and Mojave yucca (*Yucca schidigera*) were abundant and comprised the overstory. Other associating species included apache plume, banana yucca (*Yucca baccata*), Parish golden-eye (*Viguiera parishii*), Mojave prickly pear, beehive cactus, California buckwheat (*Eriogonum fasciculatum* ssp. *polifolium*), and turpentine broom (*Thamnosma montana*). Along the Shenandoah Peak ridge big sagebrush (*Artemisia tridentata*), spiny menodora, and green ephedra (*Ephedra viridis*) were common associates. On extensive slabs of limestone on exposed ridges Utah agave (*Agave utahensis*), yellow cryptantha (*Cryptantha confertifolia*), and cottontop cactus (*Echinocactus polycephalus* var. *polycephalus*) were very common. On the slopes below the ridges and on the upper bajadas the community contained a high diversity of species, including Joshua tree, Mojave yucca, banana yucca, spiny menodora, desert tomato, Nevada ephedra, Shockley goldenhead, cheesebush (*Hymenoclea salsola*), spiny hopsage (*Grayia spinosa*), and fourwing saltbush.

Mojave Creosote Bush Scrub. Mojave creosote bush scrub is a widespread community type and the most common type found in the Mojave Desert below about 4000 feet (Holland 1986, Rowlands et al. 1982, Vasek and Barbour 1977). It is characterized by widely space shrubs that are 2 ft to 8 ft tall. Creosote bush (*Larreatridentata*) and burro bush (*Ambrosia dumosa*) often are the co-dominants in this community type. Creosote bush scrub is usually found on well drained soils, often on bajadas and low hills, and is not found in highly salty or alkaline soils (Holland 1986).

The project site did not support a true Mojave creosote bush scrub community. The area between the blackbush scrub community on the upper bajadas and the Mojave creosote bush scrub on the lower bajadas, outside the project area, was a transitional zone between the two communities (Enclosure 1). Hence, the area was comprised of a mixture of plants from both community types. Common plants in this transitional zone included creosote bush, blackbush, Joshua tree, Mojave yucca, spiny menodora, desert tomato, Nevada ephedra, Shockley goldenhead, cheesebush, spiny hopsage, fourwing saltbush, Pima ratany (*Krameria erecta*), burro bush, and turpentine broom. Common plants in the drainages, which bisected the bajada, included apache plume, blue sage (*Salvia dorrii*), desert almond (*Prunus fasciculata*), and scented beardtongue (Penstemon palmeri).

Mojavean Pinyon-Juniper Woodland. Mojavean pinyon-juniper woodland is an open woodland co-dominated by singleleaf pinyon (*Pinus monophylla*) and one of several species of juniper (*Juniperus* sp.) with an open shrubby understory of species commonly found in adjacent communities. It occurs in desert mountain ranges, usually between 4000 ft and 8000 ft.

Within the project area Mojavean pinyon-juniper woodland occurred only in a small area, at the extreme northern end (Enclosure 1). It was dominated by singleleaf pinyon and Utah juniper

(*Juniperus osteosperma*). Associating shrubs included those plants from the adjacent blackbush scrub and included blackbush, cliff rose, and California buckwheat.

Wash Scrub. In the project area a wash scrub community was distinguished from the adjacent community type due to the differences in the structure and species composition found in each community. Even though the washes may have contained species from the adjacent community, the washes had a higher plant density and supported species that did not occur in adjacent areas.

The wash scrub occurred in Keystone Wash and in the wash in the vicinity of the Yellow Pine Mine, east of Shenandoah Peak (Enclosure 1). Common plants in Keystone Wash included paper-bag bush (*Salazaria mexicana*), cheesebush, blackbush, Joshua tree, and Mojave yucca. An additional common plant in the upper portion of the wash was green ephedra. Additional common plants in the lower portion included desert tomato, Nevada ephedra, creosote bush, and blue sage. In the Yellow Pine Mine wash apache plume, paper-bag bush, matchweed (*Gutierrezia microcephala*), desert almond, and scented beardtongue were common.

GENERAL PLANT INVENTORY

A species list of all plants encountered within the project area was compiled from field check lists and voucher specimens and is presented in Appendix A. The number of taxa recorded during the surveys totaled 187 in 43 families.

SENSITIVE PLANT SPECIES

No federal or state listed threatened or endangered plant species were observed during the surveys in the Table Mountain Wind Power Plant project area. In addition, no U.S. Fish and Wildlife Service species of concern were found on the project site. Three species on the watch list were observed, however. These species include the Mojave milk-vetch (*Astragalus mohavensis* var. *mohavensis*), the New York Mountains catseye (*Cryptantha tumulosa*), and the Mojave barrel cactus (*Ferocactus cylindraceus* var. *lecontei*). The catseye is also a Forest Service sensitive species. The Nye milk-vetch (*Astragalus nyensis*) was also found on the project site, but this species was recently removed from the watch list. The number of each of these species was estimated along each transect and is provided in Appendix B.

Mojave Milk-vetch. The Mojave milk-vetch was observed in three areas of the project site, including Table Mountain, the limestone ridge that lies south of Table Mountain, and the wash in the vicinity of the Yellow Pine Mine (Enclosure 1). Completed Nevada Native Species Site Survey Report forms for these populations are in Appendix C. On Table Mountain the Mojave milk-vetch occurred along the rocky western edge of the mesa. A mix of basalt and limestone rocks occurred in this area. The subsurface was comprised of loamy soils. Only 5 plants were found at this location. Common plants in the area included blackbush, Joshua tree, Nevada ephedra, and desert tomato.

Along the ridge south of Table Mountain, 64 Mojave milk-vetch plants were found. These plants were scattered on both sides and just downslope of the ridge (Enclosure 1). They occurred on a rocky limestone substrate with shallow soils. Common plants in the area included blackbush, apache plume, apricot mallow (*Sphaeralcea ambigua*), wild honeysuckle (*Gaura coccinea*), and five-needled fetid (*Thymophylla pentachaeta* var. *belenidium*).

In the vicinity of the Yellow Pine Mine, 23 Mojave milk-vetch plants were observed at two locations in the gravel/cobble wash along the proposed distribution line/access road corridor (Enclosure 1). Other plants at these locations included blue sage, matchweed, apache plume, and paper-bag bush.

New York Mountains Catseye. Several New York Mountain catseyes were observed in two general locations in the project area, on Table Mountain and in the north portion of the project site (Enclosure 1). The majority of plants were found amongst the basalt rocks along the western edge of Table Mountain (Table 1). Here, a population of 628 plants was estimated. Another 52 plants were counted along the limestone ridge lying south of Table Mountain (Enclosure 1). The other concentration of plants occurred in the northern portion of the project site, along the existing access road to the radio towers (80 plants) and along the existing distribution line near Wilson Pass (7 plants) (Enclosure 1). The catseye at these latter locations grew on limestone. Completed Nevada Native Species Site Survey Report forms for these populations are in Appendix C.

Mojave Barrel Cactus. Mojave barrel cacti were found in scattered locations throughout the project area. Areas of concentration, however, included two on Table Mountain. One of these areas was on a west-facing slope just below the top of Table Mountain and included 87 plants (Enclosure 1). The other area was on a south-facing slope in the southeast portion of Table Mountain (Enclosure 1). Here, a population of 365 plants was estimated. At both of these locations the substrate consisted of basalt boulders and limestone cobble with a shallow loamy subsurface. Other common plants at these locations included blackbush, fourwing saltbush, and spiny menodora. Completed Nevada Native Species Site Survey Report forms for these two populations are in Appendix C.

Nye Milk-vetch. The Nye milk-vetch was found in only 2 areas. Several plants were scattered on both sides and just downslope of the limestone ridge lying south of Table Mountain (Enclosure 1). Plants in this area totaled 361. It generally occurred on deeper soils downslope of the rocky limestone ridge. The surface contained a caliche cap. Common plants in the area included blackbush, Joshua tree, apricot mallow, fourwing saltbush, winterfat, red-stemmed filaree (*Erodium cicutarium*), and Patagonia plantain (*Plantago patagonica*). The other population was found south of Shenandoah Peak, on a south-facing slope just below the limestone ridge (Enclosure 1). The site was rocky with a loamy subsurface, and crytogammic soil was present. Common plants in the area included blackbush, green ephedra, Joshua tree, spiny menodora, red-stemmed filaree (*Erodium cicutarium*), and Patagonia plantain (*Plantago patagonica*).

CACTI, AGAVES, YUCCAS, CHRISTMAS TREES

In addition to the four species discussed above, nine additional species of cactus, three species of yucca, one agave species, and two Christmas tree species were observed throughout the project area during the survey period. These species are discussed below. Since most of these species were quite numerous and occurred in nearly all areas of the project site, populations were not specifically mapped. However, the estimated number of each species that were observed along the transects is provided in Appendix B, and these transects are mapped on Enclosure 1. All cacti, agaves, yuccas, and evergreen trees are protected and regulated by the State of Nevada (Department of Conservation and Natural Resources 1999a).

Cottontop Cactus. Cottontop cactus occurred along 11 of the 30 transects. Areas of concentration included the two limestone ridges east of Table Mountain (Transects 12, 13, and 14, Enclosure 1). It occurred most often on exposed limestone ridges.

Hedgehog Cactus. Hedgehog cactus occurred along 24 of the 30 transects. It was the third most common cactus species in the project area. It was very common along the rocky ridges and slopes in the northern portion of the project site (Transects 21 and 25, Enclosure 1).

Mojave Mound Cactus. Mojave mound cactus was observed along 18 transects. It was most commonly found on limestone ridges throughout the project area.

Beehive Cactus. The beehive cactus was the second most common cactus species in the project area, occurring along all but one transect (Appendix B). It frequented the limestone ridges and slopes but also occurred in the washes and on the bajadas. The lowest numbers were found on the basalt rock areas of Table Mountain .

Little Fishhook Cactus. Only 3 little fishhook cacti were found in the project area, one each on Transects 12, 17, and 25 (Enclosure 1).

Buckhorn Cholla. Buckhorn cholla was infrequent in project area, occurring only along 5 transects. It was most abundant on a limestone ridge and adjacent bajada in the northern portion of the site (Transects 18, 21, and 25, Enclosure 1)

Beavertail Cactus. Beavertail cactus was frequently encountered, detected along 24 of 30 transects. However, it occurred in low to moderate numbers. It was most abundant on Table Mountain.

Silver Cholla. Silver cholla occurred in all areas except on the narrow limestone ridges. It was detected on 22 of 30 transects.

Mojave Prickly Pear. The Mojave prickly pear was the most abundant cactus in the project area. It occurred on 24 of 30 transects. It was nearly absent, however, from Table Mountain but very common on the limestone ridges.

Utah Agave. The Utah agave was observed on 16 of 30 transects. It occurred exclusively on limestone and was most abundant on a ridge in the northern portion of the project area (Transect 25, Enclosure 1). It was a dominant plant on the extensive slabs of limestone.

Banana Yucca. The banana yucca occurred mainly in the washes and on the upper bajadas and lower slopes of the project site. It was absent from the Table Mountain area, the tall ridges, and the extremely steep slopes.

Joshua Tree. Several thousands of Joshua trees occurred throughout the project area. The only areas it was uncommon were in the burned areas on Table Mountain and on extensive limestone outcrops. The two varieties (*Yucca brevifolia* var. *brevifolia* and *Y. b.* var. *jaegeriana*) were combined for the population estimates. The dwarf Joshua trees (*Y. b.* var. *jaegeriana*) occurred most frequently on Table Mountain.

Mojave Yucca. The Mojave yucca occurred in most areas, with a notable exception being Table Mountain. It was most abundant on the lower slopes and bajadas.

Utah Juniper. The Utah juniper occurred in low numbers and only in the northern end of the project area, in the Mojavean pinyon-juniper woodland (Enclosure 1).

Singleleaf Pinyon. Singleleaf pinyon occurred in very low numbers with the Utah juniper in the Mojavean pinyon-juniper woodland the northern portion of the project area (Enclosure 1).

NON-NATIVE PLANTS SPECIES

Eight species that are not native to North America were recorded in the project area. These species are identified in Appendix A and include wild mustard (*Brassica tournefortii*), flixweed (*Descurainia sophia*), tumble mustard (*Sisymbrium altissimum*), oriental mustard (*Sisymbrium orientale*), Russian thistle (*Salsola tragus*), red-stemmed filaree (*Erodium cicutarium*), red brome (*Bromus madritensis* ssp. *rubens*), and cheatgrass (*Bromus tectorum*). The bromus grasses and the filaree were common throughout the project area. The red brome was most abundant in the burned areas on Table Mountain. The other species were most common along existing roads, in mining areas, and at the radio towers.

MITIGATION RECOMMENDATIONS

Avoidance of the Mojave milk-vetch, the New York Mountains catseye, and the Mojave barrel cactus populations during placement of wind power facilities is preferred. However, if avoidance is not possible, then individuals of these species should be translocated to suitable habitat in neighboring areas prior to ground disturbing activities at the project site. These populations should be monitored to evaluate the success of the translocations.

The avoidance of as many cacti, agaves, yuccas, and Christmas trees as possible is also preferred. However, because of the high densities of these species in the project area, avoidance of all individuals will not be possible. In these cases, individuals, excluding mature Christmas trees, should be translocated to adjacent areas prior to ground disturbance. Again, a monitoring program should be established to evaluate the success of the translocations. Areas that may be suitable as translocation sites include the burned areas on Table Mountain. These areas are recovering from a recent fire; however, because of the slow growth of Joshua trees and some cactus species, it may take decades before these species can fully reestablish themselves in the area. Hence, translocating Joshua trees and cacti into the burned areas may hasten the recovery process. Because deeper soils occur in the burned areas, these areas may bot be suitable for all cactus species. Species preferring shallow, rocky soils may not transplant well and include cottontop cactus, hedgehog cactus, Mojave mound cactus, beehive cactus, Mojave barrel cactus, little fishhook cactus, and Mojave prickly pear. However, all species should be attempted.

Mature Christmas trees that cannot be avoided should be felled and left in the area to provide cover for wildlife.

A program to remove non-native vegetation in the project area should be investigated. In addition, a program to reduce the spread of non-native plants from the project site to other areas should be adopted. The program may include, but is not limited to, washing of vehicles and equipment and removing plant parts from shoes and clothing prior to leaving the project site.

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APPENDIX A

PLANT TAXA OBSERVED DURING THE SURVEY PERIOD (30 APRIL – 14 MAY 2001) ON THE PROPOSED TABLE MOUNTAIN WIND POWER PLANT PROJECT SITE, SPRING MOUNTAINS, CLARK COUNTY, NEVADA

DIVISION	FAMILY	Scientific Name[1]	Common Name[2]
PTERIDOPHYTA			
	PTERIDACEAE		
		Cheilanthes parryi	Parry lace fern
		Pentagramma triangularis	Goldback fern
GNETOPHYTA			
	CUPRESSACEAE		
		Juniperus osteosperma	Utah juniper
	EPHEDRACEAE		
		Ephedra nevadensis	Nevada ephedra
		Ephedra viridis	Green ephedra
	PINACEAE		
		Pinus monophylla	Singleleaf pinyon
ANTHOPHYTA: DICOTYLEDONES			
	ANACARDIACEAE		
		Rhus trilobata	Squaw bush
	APIACEAE		
		Lomatium sp.	Parsley
	ASTERACEAE		
		Acamptopappus shockleyi	Shockley goldenhead
		Adenophyllum cooperi	Cooper adenophyllum
		Ambrosia acanthicarpa	Sand bur
		Ambrosia dumosa	Burro-bush
		Artemisia ludoviciana	Mugwort
		Artemisia tridentata	Big sagebrush
		Baileya multiradiata	Desert marigold
		Bebbia juncea	Sweet bush
		Brickellia arguta	Pungent brickellbush
		Brickellia multiflora	Inyo brickellbush
		Brickellia oblongifolia	Brickellbush
		Calycoseris wrightii	White tack-stem
		Chaenactis fremontii	Fremont pincushion
		Chaenactis stevioides	Gray-leaved pincushion
		Chaenactis xantiana	Xanthus pincushion
		Chrysothamnus paniculatus	Wash rabbitbrush
		Chrysothamnus teretifolius	Green rabbitbrush
		Circium neomexicanum	New Mexico thistle
		Encelia actoni	Bush sunflower
		Encelia virginensis	Bush sunflower

DIVISION

FAMILY

Scientific Name[1]	Common Name[2]
Ericameria linearifolia	Showy goldenbush
Erigeron concinnus	Fleabane daisy
Gutierrezia microcephala	Matchweed
Heliomeris multiflora var. *nevadensis*	Nevada golden-eye
Hymenoclea salsola	Cheesebush
Malacothrix coulteri	Snake's-head
Malacothrix glabrata	Desert dandelion
Psilostrophe cooperi	Paper-daisy
Senecio flaccidus var. *monoensis*	Mono senecio
Senecio multilobatus	Basin senecio
Stephanomeria parryi	Parry rock pink
Stephanomeria pauciflora	Desert milk-aster
Stylocline sp.	Nest straw
Tetradymia axillaris var. *axillaris*	Cotton-thorn
Tetradymia axillaris var. *longispina*	Cotton-thorn
Thymophylla pentachaeta var. *belenidium*	Five-needled fetid
Uropappus lindleyi	Silver-puffs
Viguiera parishii	Parish golden-eye
Xylorhiza tortifolia	Mojave aster
BORAGINACEAE	
Amsinckia tessellata	Fiddleneck
Cryptantha barbigera	Fuzzy forget-me-not
Cryptantha circumscissa	Capped cryptantha
Cryptantha confertifolia	Yellow cryptantha
Cryptantha dumentorum	Flexuous cryptantha
Cryptantha holoptera	Rough-stemmed cryptantha
Cryptantha micrantha	Purple-rooted forget-me-not
Cryptantha pterocarya	Wing-nut forget-me-not
Cryptantha tumulosa	New York Mountains catseye
Cryptantha utahensis	Fragrant forget-me-not
Cryptantha virginensis	Virginia forget-me-not
Tiquilia canescens var. *canescens*	Shrubby tiquilia
Tiquilia plicata	String plant
BRASSICACEAE	
Arabis glaucovalvula	Blue-podded rock-cress
**Brassica tournefortii*	Wild mustard
Caulanthus crassicaulis var. *crassicaulis*	Thick-stemmed wild cabbage
Caulanthus cooperi	Cooper caulanthus

DIVISION FAMILY	Scientific Name[1]	Common Name[2]
	Descurainia pinnata	Tansy mustard
	*Descurainia sophia	Flixweed
	Draba cuneifolia	Desert draba
	Guillenia lasiophylla	California mustard
	Lepidium fremontii	Bush peppergrass
	Lepidium lasiocarpum var. lasiocarpum	Modest peppergrass
	*Sisymbrium altissimum	Tumble mustard
	*Sisymbrium orientale	Oriental mustard
	Stanleya elata	Prince's plume
	Stanleya pinnata	Desert plume
	Streptanthella longirostris	Streptanthella
BUDDLEJACEAE		
	Buddleja utahensis	Panamint butterfly bush
CACTACEAE		
	Echinocactus polycephalus var. polycephalus	Cottontop cactus
	Echinocereus engelmannii	Hedgehog cactus
	Echinocereus triglochidiatus	Mojave mound cactus
	Escobaria vivipara ssp. desertii	Beehive cactus
	Ferocactus cylindraceus var. lecontei	Mojave barrel cactus
	Mammillaria tetrancistra	Little fishhook cactus
	Opuntia acanthocarpa	Buckhorn cholla
	Opuntia basilaris var. basilaris	Beavertail cactus
	Opuntia echinocarpa	Silver cholla
	Opuntia erinacea var. erinacea	Mojave prickly pear
CAMPANULACEAE		
	Nemacladus sp.	Thread-plant
CAPRIFOLIACEAE		
	Symphoricarpos longiflorus	Desert snowberry
CARYOPHYLLACEAE		
	Arenaria macradenia var. macradenia	Mojave sandwort
CELASTRACEAE		
	Mortonia utahensis	Mortonia
CHENOPODIACEAE		
	Atriplex canescens	Fourwing saltbush
	Atriplex confertifolia	Shadscale
	Grayia spinosa	Spiny hopsage
	Kraschenennikovia lanata	Winterfat
	*Salsola tragus	Russian thistle

DIVISION FAMILY	Scientific Name[1]	Common Name[2]
CUCUBITACEAE		
	Cucurbita foetidissima	Calabazilla
EUPHORBIACEAE		
	Chamaesyce setiloba	Yuma spurge
FABACEAE		
	Astragalus acutirostris	Keel beak
	Astragalus layneae	Layne milk-vetch
	Astragalus lentiginosus	Milk-vetch
	Astragalus mohavensis var. *mohavensis*	Mojave milk-vetch
	Astragalus newberryi	Newberry milk-vetch
	Astragalus nuttallianus	Nuttall's milk-vetch
	Astragalus nyensis	Nye milk-vetch
	Lupinus concinnus	Bajada lupine
	Lupinus flavoculatus	Yellow-eyes
	Psorothamnus fremontii	Fremont indigo bush
GERANIACEAE		
	**Erodium cicutarium*	Red-stemmed filaree
HYDROPHYLLACEAE		
	Nama demissum	Purple mat
	Phacelia crenulata	Purple phacelia
	Phacelia fremontii	Yellow-throats
	Phacelia rotundifolia	Round-leaved phacelia
	Phacelia vallis-mortae	Death Valley phacelia
	Tricardia watsonii	Three-hearts
KRAMERIACEAE		
	Krameria erecta	Pima rhatany
LAMIACEAE		
	Hedeoma nanum var. *californicum*	Small pennyroyal
	Salazaria mexicana	Paper-bag bush
	Salvia dorrii	Blue sage
	Salvia mohavensis	Mojave sage
LINACEAE		
	Linum lewisii var. *lewisii*	Blue flax
LOASACEAE		
	Mentzelia albicaulis	Little blazing star
	Mentzelia oreophila	Inyo blazing star

DIVISION FAMILY	Scientific Name[1]	Common Name[2]
MALVACEAE		
	Eremalche exilis	White mallow
	Sphaeralcea ambigua var. *ambigua*	Apricot mallow
NYCTAGINACEAE		
	Mirabilis bigelovii var. *bigelovii*	Wishbone bush
	Mirabilis multiflora	Giant four-o'clock
OLEACEAE		
	Menodora spinescens	Spiny menodora
ONAGRACEAE		
	Camissonia boothii	Primrose
	Camissonia brevipes	Yellow cups
	Gaura coccinea	Wild honeysuckle
	Oenothera caespitosa	Evening primrose
PAPAVERACEAE		
	Argemone corymbosa	Mojave prickly poppy
	Eschscholtzia glyptosperma	Desert gold-poppy
	Eschscholtzia minutiflora	Little gold-poppy
PLANTAGINACEAE		
	Plantago ovata	Woolly plantain
	Plantago patagonica	Patagonia plantain
POLEMONIACEAE		
	Gilia spp.	Gilia
	Langloisia setosissima ssp. *setosissima*	Bristly langloisia
	Linanthus demissus	Desert snow
	Phlox stansburyi	Stansbury phlox
POLYGONACEAE		
	Chorizanthe rigida	Rosy-thorn
	Eriogonum deflexum var. *deflexum*	Skeleton weed
	Eriogonum fasciculatum ssp. *polifolium*	California buckwheat
	Eriogonum heermannii var. *floccosum*	Woolly Heermann buckwheat
	Eriogonum inflatum var. *inflatum*	Desert trumpet
	Eriogonum nidularium	Bird's-nest buckwheat
	Eriogonum trichopes var. *trichopes*	Little trumpet
	Eriogonum wrightii	Wright buckwheat
	Oxytheca perfoliata	Saucer plant
	Rumex hymenosepalus	Wild rhubarb
PHILADELPHACEAE		
	Fendlerella utahensis	Yerba desierto

DIVISION FAMILY	Scientific Name[1]	Common Name[2]
RANUNCULACEAE		
	Anemone tuberosa	Desert windflower
	Delphinium parishii ssp. *parishii*	Desert larkspur
ROSACEAE		
	Cercocarpus intricatus	Little-leaf mahogany
	Coleogyne ramosissima	Blackbush
	Fallugia paradoxa	Apache plume
	Petrophyton caespitosa ssp. *caespitosa*	Rock spiraea
	Prunus fasciculatus	Desert almond
	Purshia mexicana	Cliff rose
RUBIACEAE		
	Galium sp.	Bedstraw
RUTACEAE		
	Thamnosma montana	Turpentine broom
SCROPHULARIACEAE		
	Castilleya sp.	Indian paintbrush
	Mimulus bigelovii	Bigelow mimulus
	Mimulus rubellus	Red-stemmed mimulus
	Penstemon eatonii var. *eatonii*	Eaton firecracker
	Penstemon palmeri	Scented beardtongue
SOLANACEAE		
	Lycium andersonii	Desert tomato
	Nicotiana obtusifolia	Desert tobacco
	Physalis crassifolia	Thickleaf ground-cherry
ZYGOPHYLLACEAE		
	Larrea tridentata	Creosote bush
ANTHOPHYTA: MONOCOTYLEDONES		
LILIACEAE		
	Agave utahensis	Utah agave
	Calochortus flexuosus	Straggling mariposa
	Dichelostemma capitatum ssp. *capitatum*	Blue dicks
	Yucca baccata	Banana yucca
	Yucca brevifolia var. *brevifolia*	Joshua tree
	Yucca brevifolia var. *jaegeriana*	Dwarf Joshua tree
	Yucca schidigera	Mojave yucca
	Zigadenus sp.	zygadene
	Allium nevadense	Single-leaf onion

DIVISION

FAMILY

Scientific Name[1]	Common Name[2]
POACEAE	
Achnatherum hymenoides	Indian ricegrass
Achnatherum speciosum	Desert needlegrass
**Bromus madritensis* ssp. *rubens*	Red brome
**Bromus tectorum*	Cheat grass
Erioneuron pulchellum	Fluffgrass
Muhlenbergia sp.	Muhly
Pleuraphis rigida	Big galleta
Poa sp.	Bluegrass

[1] Scientific names follow Hickman (1993).

[2] Common names follow Hickman (1993) or Jaeger (1969).

* indicates a non-native (introduced) species.

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APPENDIX B

THE NUMBER OF SENSITIVE PLANTS OBSERVED ALONG EACH TRANSECT DURING THE SURVEY PERIOD (30 APRIL – 14 MAY 2001) ON THE PROPOSED TABLE MOUNTAIN WIND POWER PLANT PROJECT SITE, SPRING MOUNTAINS, CLARK COUNTY, NEVADA

Species		Transect						
Scientific Name	**Common Name**	**1**	**2**	**3**	**4**	**5**	**6**	**7**
Astragalus mohavensis var. *mohavensis*	Mohave milk-vetch	5					64	
Astragalus nyensis	Nye milk-vetch					4	357	
Cryptantha tumulosa	New York Mountains catseye	100	200	55	178	95	52	
Echinocactus polycephalus var. *polycephalus*	Cottontop cactus	3		1		1	14	
Echinocereus engelmannii	Hedgehog cactus			2	13	5	13	
Echinocereus triglochidiatus	Mojave mound cactus	2			4	44	62	
Escobaria vivipara ssp. *desertii*	Beehive cactus		2	3	26	47	164	6
Ferocactus cylindraceus var. *lecontei*	Mojave barrel cactus		1	9	2	75		
Mammillaria tetrancistra	Little fishhook cactus							
Opuntia acanthocarpa	Buckhorn cholla					24		
Opuntia basilaris var. basilaris	Beavertail cactus	24	54	27	34	42	29	46
Opuntia echinocarpa	Silver cactus	5	21	25	27	116		82
Opuntia erinacea var. *erinacea*	Mojave prickly pear					290	483	32
Agave utahensis	Utah agave				8	208	300	
Yucca baccata	Banana yucca							
Yucca brevifolia (including var. *brevifolia* and var. *jaegeriana)*	Joshua tree	300-500	300-500	300-500	300-500	300-500	100-200	500-1000
Yucca schidigera	Mojave yucca						1	
Juniperus osteosperma	Utah juniper							
Pinus monophylla	Singleleaf pinyon							

NC = not counted

Species		Transect							
Scientific Name	**Common Name**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
Astragalus mohavensis var. *mohavensis*	Mohave milk-vetch								
Astragalus nyensis	Nye milk-vetch								
Cryptantha tumulosa	New York Mountains catseye	5				1			
Echinocactus polycephalus var. *polycephalus*	Cottontop cactus					165	340	300	
Echinocereus engelmannii	Hedgehog cactus			2		12	30	1	1
Echinocereus triglochidiatus	Mojave mound cactus					50	85	74	19
Escobaria vivipara ssp. *desertii*	Beehive cactus	1	1	12	2	50	210	106	4
Ferocactus cylindraceus var. *lecontei*	Mojave barrel cactus					365	28	1	
Mammillaria tetrancistra	Little fishhook cactus					1			
Opuntia acanthocarpa	Buckhorn cholla								
Opuntia basilaris var. basilaris	Beavertail cactus	10	1	22	7	52	9	5	
Opuntia echinocarpa	Silver cactus	50	49	155	17	31		11	4
Opuntia erinacea var. *erinacea*	Mojave prickly pear		5		5	260	300	420	51
Agave utahensis	Utah agave					1000-1100	560	865	21
Yucca baccata	Banana yucca								
Yucca brevifolia (including var. *brevifolia* and var. *jaegeriana)*	Joshua tree	100-200	20-40	500-1000	50-100	50-100	50-100	50-100	20-40
Yucca schidigera	Mojave yucca					170		17	
Juniperus osteosperma	Utah juniper								
Pinus monophylla	Singleleaf pinyon								

NC = not counted

Species Scientific Name	Common Name	Transect								
		16	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**
Astragalus mohavensis var. *mohavensis*	Mohave milk-vetch							4	19	
Astragalus nyensis	Nye milk-vetch									
Cryptantha tumulosa	New York Mountains catseye						7			
Echinocactus polycephalus var. *polycephalus*	Cottontop cactus	18	67				22			
Echinocereus engelmannii	Hedgehog cactus	20	71	24	3	17	235	17	42	1
Echinocereus triglochidiatus	Mojave mound cactus					6	1	13	1	
Escobaria vivipara ssp. *desertii*	Beehive cactus	19	53	7	5	58	127	78	60	1
Ferocactus cylindraceus var. *lecontei*	Mojave barrel cactus									
Mammillaria tetrancistra	Little fishhook cactus		1							
Opuntia acanthocarpa	Buckhorn cholla		1	84			80			
Opuntia basilaris var. basilaris	Beavertail cactus	7	11	2	7		7	5	20	1
Opuntia echinocarpa	Silver cactus	43	49	21	17		37	21	54	7
Opuntia erinacea var. *erinacea*	Mojave prickly pear	20	42	23	14	138	201	36	70	1
Agave utahensis	Utah agave					65	68	281		
Yucca baccata	Banana yucca			80	40	152	582	15	631	18
Yucca brevifolia (including var. *brevifolia* and var. *jaegeriana)*	Joshua tree	1000	500-1000	300-500	120-150	300	700-1000	330	1700	46
Yucca schidigera	Mojave yucca	1500	500-1000	150	100	250	850-1200	440	370	33
Juniperus osteosperma	Utah juniper									
Pinus monophylla	Singleleaf pinyon									

NC = not counted

Species		Transect						
Scientific Name	**Common Name**	**25**	**26**	**27**	**28**	**29**	**30**	**TOTAL**
Astragalus mohavensis var. *mohavensis*	Mohave milk-vetch							92
Astragalus nyensis	Nye milk-vetch					3		364
Cryptantha tumulosa	New York Mountains catseye	2	80					775
Echinocactus polycephalus var. *polycephalus*	Cottontop cactus				1			932
Echinocereus engelmannii	Hedgehog cactus	890	1	42	2	4	15	1463
Echinocereus triglochidiatus	Mojave mound cactus	100	4	9	20	110	1	605
Escobaria vivipara ssp. *desertii*	Beehive cactus	310	9	58	14	86	6	1525
Ferocactus cylindraceus var. *lecontei*	Mojave barrel cactus	54				1	10	546
Mammillaria tetrancistra	Little fishhook cactus	1						3
Opuntia acanthocarpa	Buckhorn cholla	450						639
Opuntia basilaris var. basilaris	Beavertail cactus				1		15	438
Opuntia echinocarpa	Silver cactus						25	867
Opuntia erinacea var. *erinacea*	Mojave prickly pear	282	48	444	79	1044	7	4295
Agave utahensis	Utah agave	3000-5000	89	500-750	16	121	14	7116-9466
Yucca baccata	Banana yucca	150	386	1000		10		3064
Yucca brevifolia (including var. *brevifolia* and var. *jaegeriana)*	Joshua tree	1000-1500	320	1327	126	530	497	11736-15706
Yucca schidigera	Mojave yucca	800	20	404			698	6303-7153
Juniperus osteosperma	Utah juniper	20-40	NC	NC				at least 20-40
Pinus monophylla	Singleleaf pinyon	7	NC	NC				at least 7

NC = not counted

APPENDIX C

COMPLETED NEVADA NATIVE SPECIES SITE SURVEY REPORT FORMS FOR SENSITIVE SPECIES OBSERVED DURING THE SURVEY PERIOD (30 APRIL – 14 MAY 2001) ON THE PROPOSED TABLE MOUNTAIN WIND POWER PLANT PROJECT SITE, SPRING MOUNTAINS, CLARK COUNTY, NEVADA

rev. W97-1999-09

NEVADA NATIVE SPECIES SITE SURVEY REPORT

SEND TO: NEVADA NATURAL HERITAGE PROGRAM, 1550 East College Parkway, suite 145, Carson City, NV 89706-7921 (775) 687-4245

PLEASE ENTER ALL INFORMATION AVAILABLE TO YOU.

OFFICE USE ONLY

Source Code: Map Code:
Element Code: Occurrence #
Copy Sent to:

Scientific name (no codes): Astragalus mohavensis var. mohavensis

Surveyor/Reporter (incl. email if any): Denise LaBerteaux eremico@aol.com Phone: (760) 378-3021

Address: 211 Snow St., Weldon, CA 93283

Date of Survey: 30 (day) April (month) 2001 (year) County: Clark Collection # Museum/Herb.:

LOCATION (please attach map showing population boundaries and routes / areas searched): On western edge of Table Mountain in the southern Spring Mountains 0.65 ~~mi~~ km south of benchmark labeled "Table" UTM Zone 11 0636890E 3962623N

Map Name: Goodsprings, NV Field # T R ¼ of ¼ Sect.

scale=1: Elevation: 5060 to [✓ ft]/m T R ¼ of ¼ Sect.

Land Manager: BLM Size of Area: 50 sq. m

\# of individuals/ramets: 5 if zero, reason:

\# of colonies/genets: if different, explain:

Is this a new location record (Yes/No/Unknown)?: yes a subsequent visit?: no Compared to last visit: more same fewer

Phenologic Stages (plants): % dormant 60 % vegetative % budding 20 % flowering 20 % fruiting % seeding

Age Structure (all): % senescent % adult/mature % juvenile 100 % first-year % newborn/seedling

Site Functions/Uses (animals): breeding foraging wintering roosting denning other

INTERACTIONS (disease, predation, competition, parasitism, symbiosis, pollination, hybridization, dispersal, etc.):

HABITAT DESCRIPTION (community dominants, associates, other rare species, moisture, substrate / soils, aspect / slope, light, air / water temperature, time, weather, etc.): Blackbush scrub w/ Coleogyne ramosissima, Yucca brevifolia, Ephedra nevadensis, Lycium andersonii. On S-facing + flat slope. Slight slope. Open, dry site. Rocks/boulders of basalt + limestone. Subsurface loamy.

CURRENT SITE USE / Visible Disturbances and Impacts / Possible Threats: Dirt road nearby; hanggliding ramps nearby. Proposed wind power site.

Overall Relative Site Quality: Excellent X Good Fair Poor

COMMENTS ON QUALITY:

SHOULD/COULD THIS SITE BE PROTECTED? How?:

OTHER COMMENTS:

IDENTIFICATION OF TAXON (Fill in all applicable blanks):

Keyed in reference: Jepson Manual; Flora of Nevada
Compared w/photo/drawing in:
Compared with specimen at:
By another person (include below; name):
By personal knowledge (yes/no):
Other:

PHOTOGRAPHS (check all applicable):

Subject:	Type:
Diagnostic feature	Slide
Whole organism(s)	Print
Habitat or site	Digital

Other:
May we obtain copies at our cost?

OTHER KNOWLEDGEABLE PEOPLE (Name / Address / Phone / E-mail):

NEVADA NATIVE SPECIES SITE SURVEY REPORT

rev. W97-1999-09

SEND TO: NEVADA NATURAL HERITAGE PROGRAM, 1550 East College Parkway, suite 145, Carson City, NV 89706-7921 (775) 687-4245

PLEASE ENTER ALL INFORMATION AVAILABLE TO YOU.

OFFICE USE ONLY

Source Code: ______ Map Code: ______
Element Code: ______ Occurrence #: ______
Copy Sent to: ______

Scientific name (no codes): Astragalus mohavensis var. mohavensis

Surveyor/Reporter (incl. email if any): Denise LaBerteaux eremico@aol.com Phone: (760) 378-3021

Address: 211 Snow St., Weldon, CA 93283

Date of Survey: 09 May 2001 (day month year) County: Clark Collection #: ______ Museum/Herb.: ______

LOCATION (please attach map showing population boundaries and routes / areas searched):
On a limestone ridgeline (N-S trending) south of Table Mountain. Scattered along a 2.5 km stretch (all that was searched). Width searched 100m on each side of ridge.

Map Name: Goodsprings, NV Field #: ______ *UTM Zone 11 from 0638960E, 3959630N to 0639360, 3957505N

scale=1: ______ Elevation: 5100 to ______ [✓ ft] m T ______ R ______ ¼ of ______ ¼ Sec. ______

Land Manager: BLM Size of Area: 50 ha

# of individuals/ramets: 64 if zero, reason: ______

# of colonies/genets: ______ if different, explain: ______

Is this a new location record (Yes/No/Unknown)?: yes a subsequent visit?: no Compared to last visit: ___ more ___ same ___ fewer

Phenologic Stages (plants): ___ % dormant 40 % vegetative ___ % budding 30 % flowering 30 % fruiting ___ % seeding

Age Structure (all): ___ % senescent ___ % adult/mature ___ % juvenile 100 % first-year ___ % newborn/seedling

Site Functions/Uses (animals): ___ breeding ___ foraging ___ wintering ___ roosting ___ denning ___ other

INTERACTIONS (disease, predation, competition, parasitism, symbiosis, pollination, hybridization, dispersal, etc.):

HABITAT DESCRIPTION (community dominants, associates, other rare species, moisture, substrate / soils, aspect / slope, light, air / water temperature, time, weather, etc.): Blackbush Scrub w/ Coleogyne ramosissima, Fallugia paradoxa, Sphaeralcea ambigua, Gaura coccin
On steep, west + east facing slopes, just below ridge. Loose rocky limestone + limestone outcrops
open, dry site.

CURRENT SITE USE / Visible Disturbances and Impacts / Possible Threats:
Bighorn sheep bedding areas. Proposed wind power site

Overall Relative Site Quality: X Excellent ___ Good ___ Fair ___ Poor

COMMENTS ON QUALITY:

SHOULD/COULD THIS SITE BE PROTECTED? How?:

OTHER COMMENTS:

IDENTIFICATION OF TAXON (Fill in all applicable blanks):
Keyed in reference: Jepson Manual; Flora of Nevada
Compared w/photo/drawing in: ______
Compared with specimen at: ______
By another person (include below; name): ______
By personal knowledge (yes/no): ______
Other: ______

PHOTOGRAPHS (check all applicable):
Subject:
___ Diagnostic feature
___ Whole organism(s)
___ Habitat or site
Type:
___ Slide
___ Print
___ Digital
Other: ______
May we obtain copies at our cost? ______

OTHER KNOWLEDGEABLE PEOPLE (Name / Address / Phone / E-mail):

NEVADA NATIVE SPECIES SITE SURVEY REPORT

rev. W97-1999-09

SEND TO: NEVADA NATURAL HERITAGE PROGRAM, 1550 East College Parkway, suite 145, Carson City, NV 89706-7921 (775) 687-4245

PLEASE ENTER ALL INFORMATION AVAILABLE TO YOU.

OFFICE USE ONLY

Source Code: ____ Map Code: ____

Element Code: ____ Occurrence #: ____

Copy Sent to: ____

Scientific name (no codes): Astragalus mohavensis var. mohavensis

Surveyor/Reporter (incl. email if any): Denise LaBerteaux eremico@aol.com Phone: (760) 378-3021

Address: 211 Snow St., Weldon, CA 93283

Date of Survey: 13 May 2001 (day month year) County: Clark Collection #: ____ Museum/Herb.: ____

LOCATION (please attach map showing population boundaries and routes / areas searched): 2 locations in a wash 1.5km East of Shenandoah Peak, Spring Mtns. 1. 150m SE of Yellow Pine Mine UTM zone 11 0636030E, 3968110N. 2. 1km NE of Yellow Pine Mine UTM 0636610E, 3968870N + 250m NE of Prairie Mine

Map Name: Goodsprings, NV Field #: ____ T ____ R ____ ¼ of ____ ¼ Sect. ____

scale=1: ____ Elevation: 4440 to 4720 [✓ ft]/m T ____ R ____ ¼ of ____ ¼ Sect. ____

Land Manager: BLM Size of Area: 1. 4 sq. m 2. 10 sq. m

# of individuals/ramets: 23 if zero, reason: ____

# of colonies/genets: ____ if different, explain: ____

Is this a new location record (Yes/No/Unknown)?: Yes a subsequent visit?: no Compared to last visit: ____ more ____ same ____ fewer

Phenologic Stages (plants): ____ % dormant 25 % vegetative ____ % budding ____ % flowering 75 % fruiting ____ % seeding

Age Structure (all): ____ % senescent 75 % adult/mature ____ % juvenile 25 % first-year ____ % newborn/seedling

Site Functions/Uses (animals): ____ breeding ____ foraging ____ wintering ____ roosting ____ denning ____ other

INTERACTIONS (disease, predation, competition, parasitism, symbiosis, pollination, hybridization, dispersal, etc.):

HABITAT DESCRIPTION (community dominants, associates, other rare species, moisture, substrate / soils, aspect / slope, light, air / water temperature, time, weather, etc.): gravel, cobble wash w/ Fallugia paradoxa, Gutierrezia microcephala, Salvia dorrii, Coleogyne ramosissima, Salazaria mexicana, Ericameria linearifolia

CURRENT SITE USE / Visible Disturbances and Impacts / Possible Threats: Road nearby, historic mining area. Proposed wind power site
Feral burros

Overall Relative Site Quality: ____ Excellent X Good ____ Fair ____ Poor

COMMENTS ON QUALITY:

SHOULD/COULD THIS SITE BE PROTECTED? How?:

OTHER COMMENTS:

IDENTIFICATION OF TAXON (Fill in all applicable blanks):

Keyed in reference: Jepson Manual, Flora of Nevada

Compared w/photo/drawing in: ____

Compared with specimen at: ____

By another person (include below; name): ____

By personal knowledge (yes/no): ____

Other: ____

PHOTOGRAPHS (check all applicable):

Subject: ____ Diagnostic feature ____ Whole organism(s) ____ Habitat or site

Type: ____ Slide ____ Print ____ Digital

Other: ____

May we obtain copies at our cost? ____

OTHER KNOWLEDGEABLE PEOPLE (Name, Address, Phone, E-mail):

NEVADA NATIVE SPECIES SITE SURVEY REPORT

rev. W97-1999-09

SEND TO: NEVADA NATURAL HERITAGE PROGRAM, 1550 East College Parkway, suite 145, Carson City, NV 89706-7921 (775) 687-4245

PLEASE ENTER ALL INFORMATION AVAILABLE TO YOU.

OFFICE USE ONLY
Source Code: Map Code:
Element Code: Occurrence #
Copy Sent to:

Scientific name (no codes): Cryptantha tumulosa

Surveyor/Reporter (incl. email if any): Denise LaBerteaux eremico@aol.com Phone: (760) 378-3021

Address: 211 Snow St., Weldon, CA 93283

Date of Survey: 30 April 2001 (day month year) County: Clark Collection # Museum/Herb.:

LOCATION (please attach map showing population boundaries and routes / areas searched): along entire western edge of Table Mountain, in the southern Spring Mountains, measuring 4-5 Km. And along adj. ridge to South (0.5 Km) UTM Zone 11 from 0636980E, 3963110N to 0638970E, 3959400 N

Map Name: Goodsprings, NV Field #

scale=1: Elevation: 4840 to 5100 [✓ ft]/m T R ¼ of ¼ Sect.

Land Manager: BLM Size of Area: 100 ha

\# of individuals/ramets: 680 if zero, reason:

\# of colonies/genets: if different, explain:

Is this a new location record (Yes/No/Unknown)?: yes a subsequent visit?: no Compared to last visit: more same fewer

Phenologic Stages (plants): % dormant % vegetative 8 % budding 90 % flowering 2 % fruiting % seeding

Age Structure (all): % senescent 100 % adult/mature % juvenile % first-year % newborn/seedling

Site Functions/Uses (animals): breeding foraging wintering roosting denning other

INTERACTIONS (disease, predation, competition, parasitism, symbiosis, pollination, hybridization, dispersal, etc.):

HABITAT DESCRIPTION (community dominants, associates, other rare species, moisture, substrate / soils, aspect / slope, light, air / water temperature, time, weather, etc.): Blackbush scrub w/ Coleogyne ramosissima, Yucca brevifolia, Lycium andersonii, Ephedra nevadensis, Menodora spinescens, some Ferocactus cylindraceus. On slight, west-facing + flat slope. Open, dry site. Rocks/boulders w/ loam subsurface. Limestone + basalt.

CURRENT SITE USE / Visible Disturbances and Impacts / Possible Threats: Road + hanggliding ramps in area. Proposed wind power site

Overall Relative Site Quality: Excellent X Good Fair Poor

COMMENTS ON QUALITY:

SHOULD/COULD THIS SITE BE PROTECTED? How?:

OTHER COMMENTS:

IDENTIFICATION OF TAXON (Fill in all applicable blanks):
Keyed in reference: Jepson Manual, Flora of Nevada
Compared w/photo/drawing in:
Compared with specimen at:
By another person (include below; name):
By personal knowledge (yes/no):
Other: previous experience with species

PHOTOGRAPHS (check all applicable):
Subject: Diagnostic feature; Whole organism(s); Habitat or site
Type: Slide; Print; Digital
Other:
May we obtain copies at our cost?

OTHER KNOWLEDGEABLE PEOPLE (Name / Address / Phone / E-mail):

NEVADA NATIVE SPECIES SITE SURVEY REPORT

rev. W97-1999-09

SEND TO: NEVADA NATURAL HERITAGE PROGRAM, 1550 East College Parkway, suite 145, Carson City, NV 89706-7921 (775) 687-4245

PLEASE ENTER ALL INFORMATION AVAILABLE TO YOU.

OFFICE USE ONLY

Source Code: Map Code:
Element Code: Occurrence #
Copy Sent to:

Scientific name (no codes): Cryptantha tumulosa

Surveyor/Reporter (incl. email if any): Hermi Hiatt Phone: (702) 361-1171

Address: 8180 Placid St. Las Vegas, NV 89123

Date of Survey: 12 May 2001 (day month year) County: Clark Collection # Museum/Herb.:

LOCATION (please attach map showing population boundaries and routes / areas searched): Along edge of access road to radio towers that are NE of Wilson Pass, Spring Mountain UTM zone 11 0635700E, 3972730N to 0635660E, 3972110N

Map Name: Cottonwood Pass, NV Field #

scale=1: Elevation: 5600 to 5840 [✓ ft]/m T R ¼ of ¼ Sect.

Land Manager: BLM Size of Area:

# of individuals/ramets: 80 if zero, reason:

# of colonies/genets: if different, explain:

Is this a new location record (Yes/No/Unknown)?: yes a subsequent visit?: no Compared to last visit: more same fewer

Phenologic Stages (plants): % dormant 10 % vegetative % budding 80 % flowering 10 % fruiting % seeding

Age Structure (all): % senescent % adult/mature % juvenile % first-year % newborn/seedling

Site Functions/Uses (animals): breeding foraging wintering roosting denning other

INTERACTIONS (disease, predation, competition, parasitism, symbiosis, pollination, hybridization, dispersal, etc.):

HABITAT DESCRIPTION (community dominants, associates, other rare species, moisture, substrate / soils, aspect / slope, light, air / water temperature, time, weather, etc.): Pinyon-juniper woodland w/ Juniperus osteosperma, Yucca brevifolia, Yucca baccata along edge of road + on undisturbed benches. Steep SW-facing slope. Open, dry site rocky limestone slope.

CURRENT SITE USE / Visible Disturbances and Impacts / Possible Threats: road ; Proposed wind power site

Overall Relative Site Quality: Excellent Good ✓ Fair Poor

COMMENTS ON QUALITY:

SHOULD/COULD THIS SITE BE PROTECTED? How?:

OTHER COMMENTS:

IDENTIFICATION OF TAXON (Fill in all applicable blanks):

Keyed in reference:
Compared w/photo/drawing in:
Compared with specimen at:
By another person (include below; name):
By personal knowledge (yes/no):
Other:

PHOTOGRAPHS (check all applicable):

Subject: Type:
Diagnostic feature Slide
Whole organism(s) Print
Habitat or site Digital
Other:
May we obtain copies at our cost?

OTHER KNOWLEDGEABLE PEOPLE (Name / Address / Phone / E-mail):

NEVADA NATIVE SPECIES SITE SURVEY REPORT

rev. W97-1999-09

SEND TO: NEVADA NATURAL HERITAGE PROGRAM, 1550 East College Parkway, suite 145, Carson City, NV 89706-7921 (775) 687-4245

PLEASE ENTER ALL INFORMATION AVAILABLE TO YOU.

OFFICE USE ONLY
Source Code: Map Code:
Element Code: Occurrence #
Copy Sent to:

Scientific name (no codes): Cryptantha tumulosa

Surveyor/Reporter (incl. email if any): Denise LeBerteaux eremica@aol.com Phone: (760) 378-3021
Address: 211 Snow St., Weldon, CA 93283

Date of Survey: 14 May 2001 (day month year) County: Clark Collection #: Museum/Herb.:

LOCATION (please attach map showing population boundaries and routes / areas searched): 1.1 km SE of Wilson Pass, Spring Mountains UTM zone 11 0635310 E, 3970530 N

Map Name: Shenandoah Peak, NV Field #: T R ¼ of ¼ Sect.
scale=1: Elevation: 4760 to [✓ ft]/m T R ¼ of ¼ Sect.

Land Manager: BLM Size of Area: 9 sq. m.

# of individuals/ramets: 7 if zero, reason:
# of colonies/genets: if different, explain:

Is this a new location record (Yes/No/Unknown)?: yes a subsequent visit?: no Compared to last visit: more same fewer

Phenologic Stages (plants): % dormant % vegetative % budding 90 % flowering 10 % fruiting % seeding
Age Structure (all): % senescent % adult/mature % juvenile % first-year % newborn/seedling
Site Functions/Uses (animals): breeding foraging wintering roosting denning other

INTERACTIONS (disease, predation, competition, parasitism, symbiosis, pollination, hybridization, dispersal, etc.):

HABITAT DESCRIPTION (community dominants, associates, other rare species, moisture, substrate / soils, aspect / slope, light, air / water temperature, time, weather, etc.): Blackbush scrub w/ Coleogyne ramosissima, Yucca brevifolia, Yucca schidigera, Menodora spinescens; lower, s-facing, 10° slope. Cobble limestone surface, loamy subsurface

CURRENT SITE USE / Visible Disturbances and Impacts / Possible Threats: Distribution line + adj. road nearby. Proposed wind power dist. line site

Overall Relative Site Quality: Excellent [✓ Good] Fair Poor

COMMENTS ON QUALITY:

SHOULD/COULD THIS SITE BE PROTECTED? How?:

OTHER COMMENTS:

IDENTIFICATION OF TAXON (Fill in all applicable blanks):
Keyed in reference: Jepson Manual, Flora of NV.
Compared w/photo/drawing in:
Compared with specimen at:
By another person (include below: name):
By personal knowledge (yes/no):
Other:

PHOTOGRAPHS (check all applicable):
Subject: Diagnostic feature; Whole organism(s); Habitat or site
Type: Slide; Print; Digital
Other:
May we obtain copies at our cost?

OTHER KNOWLEDGEABLE PEOPLE (Name, Address, Phone, E-mail):

NEVADA NATIVE SPECIES SITE SURVEY REPORT

rev. W97-1999-09

SEND TO: NEVADA NATURAL HERITAGE PROGRAM, 1550 East College Parkway, suite 145, Carson City, NV 89706-7921 (775) 687-4245

PLEASE ENTER ALL INFORMATION AVAILABLE TO YOU.

OFFICE USE ONLY

Source Code: Map Code:

Element Code: Occurrence #

Copy Sent to:

Scientific name (no codes): Ferocactus cylindaceus var. lecontei

Surveyor/Reporter (incl. email if any): Denise La Berteaux eremico@aol.com Phone: (760) 378-3021

Address: 211 Snow St., Weldon, CA 93283

Date of Survey: 02 May 2001 (day month year) County: Clark Collection # Museum/Herb.:

LOCATION (please attach map showing population boundaries and routes / areas searched):

~~[illegible]~~ Along ridge east of Table Mountain. At 2 locations. UTM zone 11
1. 0639830E, 3961960N to 0640310E, 3962100N 2. 0640600E, 3962530N to 0640740E, 3962650N

Map Name: Goodsprings, NV Field # T R ¼ of ¼ Sect.

scale=1: Elevation: 4100 to 4640 [✓ ft]/m T R ¼ of ¼ Sect.

Land Manager: Size of Area:

# of individuals/ramets: 365 if zero, reason:

# of colonies/genets: if different, explain:

Is this a new location record (Yes/No/Unknown)?: unk. a subsequent visit?: no Compared to last visit: more same fewer

Phenologic Stages (plants): % dormant 100 % vegetative % budding % flowering % fruiting % seeding

Age Structure (all): % senescent 90 % adult/mature 10 % juvenile % first-year % newborn/seedling

Site Functions/Uses (animals): breeding foraging wintering roosting denning other

INTERACTIONS (disease, predation, competition, parasitism, symbiosis, pollination, hybridization, dispersal, etc.):

HABITAT DESCRIPTION (community dominants, associates, other rare species, moisture, substrate / soils, aspect / slope, light, air / water temperature, time, weather, etc.): Blackbush Scrub w/ Coleogyne ramosissima, Menodora spinescens, Atriplex canescens.
rate, S-facing slope just below ridge. Rock/cobble of limestone and basalt or just limestone.

CURRENT SITE USE / Visible Disturbances and Impacts / Possible Threats:

no current impacts. Proposed wind power site

Overall Relative Site Quality: X Excellent Good Fair Poor

COMMENTS ON QUALITY:

SHOULD/COULD THIS SITE BE PROTECTED? How?:

OTHER COMMENTS:

IDENTIFICATION OF TAXON (Fill in all applicable blanks):

Keyed in reference:

Compared w/photo/drawing in:

Compared with specimen at:

By another person (include below; name):

By personal knowledge (yes/no):

Other:

PHOTOGRAPHS (check all applicable):

Subject: Type:

Diagnostic feature Slide

Whole organism(s) Print

Habitat or site Digital

Other:

May we obtain copies at our cost?

OTHER KNOWLEDGEABLE PEOPLE (Name / Address / Phone / E-mail):

NEVADA NATIVE SPECIES SITE SURVEY REPORT

rev. W97-1999-09

SEND TO: NEVADA NATURAL HERITAGE PROGRAM, 1550 East College Parkway, suite 145, Carson City, NV 89706-7921 (775) 687-4245

PLEASE ENTER ALL INFORMATION AVAILABLE TO YOU.

OFFICE USE ONLY

Source Code: Map Code:

Element Code: Occurrence #

Copy Sent to:

Scientific name (no codes): Ferocactus cylindraceus var. lecontei

Surveyor/Reporter (incl. email if any): Denise LaBerteaux eremico@aol.com Phone: (760) 378-3021

Address: 211 Snow St., Weldon, CA 93283

Date of Survey: 01 MAY 2001 (day month year) County: Clark Collection #: Museum/Herb.:

LOCATION (please attach map showing population boundaries and routes / areas searched): Southwest portion of Table Mountain, Spring Mountains, approx. 3.5 km south of benchmar labeled "Table". UTM zone 11 0637900E, 3960350N to 0638[illegible]080E, 3959980N

Map Name: Field #: T R ¼ of ¼ Sect.

scale=1: Elevation: 4880 to 492 [✓ ft]/m T R ¼ of ¼ Sect.

Land Manager: BLM Size of Area:

# of individuals/ramets: 75 if zero, reason:

# of colonies/genets: if different, explain:

Is this a new location record (Yes/No/Unknown)?: unk. a subsequent visit?: Compared to last visit: more same fewer

Phenologic Stages (plants): % dormant 100 % vegetative % budding % flowering % fruiting % seeding

Age Structure (all): % senescent 90 % adult/mature 10 % juvenile % first-year % newborn/seedling

Site Functions/Uses (animals): breeding foraging wintering roosting denning other

INTERACTIONS (disease, predation, competition, parasitism, symbiosis, pollination, hybridization, dispersal, etc.):

HABITAT DESCRIPTION (community dominants, associates, other rare species, moisture, substrate / soils, aspect / slope, light, air / water temperature, time, weather, etc.): Blackbush scrub w/ Coleogyne ramosissima, Menodora spinescens, Atriplex Canoscens. Mod. W-facing slope just below ridge. Rock/cobble of limestone + basalt. W/ Crytantha tumulosa Dry, open site

CURRENT SITE USE / Visible Disturbances and Impacts / Possible Threats: no current disturbances. Proposed wind power site

Overall Relative Site Quality: X Excellent Good Fair Poor

COMMENTS ON QUALITY:

SHOULD/COULD THIS SITE BE PROTECTED? How?:

OTHER COMMENTS:

IDENTIFICATION OF TAXON (Fill in all applicable blanks):

Keyed in reference:

Compared w/photo/drawing in:

Compared with specimen at:

By another person (include below; name):

By personal knowledge (yes/no):

Other:

PHOTOGRAPHS (check all applicable):

Subject: Type:

Diagnostic feature Slide

Whole organism(s) Print

Habitat or site Digital

Other:

May we obtain copies at our cost?

OTHER KNOWLEDGEABLE PEOPLE (Name Address Phone E-mail):

Attachment B

Agency Coordination Letters

United States Department of the Interior

FISH AND WILDLIFE SERVICE
NEVADA FISH AND WILDLIFE OFFICE
1340 FINANCIAL BOULEVARD, SUITE 234
RENO, NEVADA 89502

December 5, 2001
File No. 1-5-02-SP-433

Ms. Kelly Shook
PBS&J
901 North Green Valley Parkway, Suite 100
Henderson, Nevada 89014-6139

Dear Ms. Shook:

Subject: Updated Species List for the Proposed Table Mountain Wind Power Project in the Spring Mountains, Clark County, Nevada

This responds to your letter we received on December 4, 2001, requesting an updated list of threatened and endangered species and species of concern that may occur in the subject project area. The list we previously provided to you on March 14, 2001, has not changed. We are enclosing the list with our letter. This fulfills the requirement of the U.S. Fish and Wildlife Service (Service) to provide information on threatened and endangered species pursuant to section 7(c) of the Endangered Species Act of 1973, as amended, for projects that are authorized, funded, or carried out by a Federal agency. Please reference the species list file number shown above in all subsequent correspondence concerning this project.

Please contact Jeri Krueger of the Southern Nevada Field Office at 702-647-5230, if you have questions regarding the enclosed list.

Sincerely,

For Robert D. Williams
Field Supervisor

Enclosure

ENCLOSURE A

LISTED SPECIES AND SPECIES OF CONCERN
THAT MAY OCCUR IN THE VICINITY OF
THE PROPOSED TABLE MOUNTAIN WIND POWER PROJECT,
SPRING MOUNTAINS,
CLARK COUNTY, NEVADA

File Number: 1-5-02-SP-433
December 5, 2001

Listed Species

Reptile

Desert tortoise (T)	*Gopherus agassizii*

T = Threatened

Species of Concern

Birds

Western burrowing owl	*Athene cunicularia hypugea*
Olive-sided flycatcher	*Contopus borealis*
Gray flycatcher	*Empidonax wrightii*
American peregrine falcon	*Falco peregrinus anatum*
Phainopepla	*Phainopepla nitens*

Mammals

Pale Townsend's big-eared bat	*Corynorhinus townsendii pallescens*
Spotted bat	*Euderma maculatum*
Greater western mastiff bat	*Eumops perotis californicus*
Allen's big-eared bat	*Idionycteris phyllotis*
California leaf-nosed bat	*Macrotus californicus*
Small-footed myotis	*Myotis ciliolabrum*
Long-eared myotis	*Myotis evotis*
Fringed myotis	*Myotis thysanodes*
Long-legged myotis	*Myotis volans*
Yuma myotis	*Myotis yumanensis*
Big free-tailed bat	*Nyctinomops macrotis*

Reptiles

Banded Gila monster	*Heloderma suspectum cinctum*
Chuckwalla	*Sauromalus obesus*

ENCLOSURE A (cont)

File Number: 1-5-02-SP-433
December 5, 2001

Invertebrates

Spring Mountains acastus checkerspot butterfly	*Chlosyne acastus robusta*
Dark blue butterfly	*Euphilotes enoptes purpurea*
Morand's checkerspot butterfly	*Euphydryas anicia morandi*
Spring Mountains comma skipper	*Hesperia comma mojavenis*
Charleston ant	*Lasius nevadensis*
Nevada admiral butterfly	*Limenitus weidemeyerii nevadae*
Spring Mountains icarioides blue butterfly	*Plebejus icarioides austinorum*
Spring Mountains blue butterfly	*Plebejus shasta charlestonensis*
Spring Mountains springsnail	*Pyrgulopsis deaconi*
Carole's silverspot butterfly	*Speyeria zerene carolae*

Plants

Rough angelica	*Angelica scabrida*
Black woolypod	*Astragalus funereus*
Halfring milkvetch	*Astragalus mohavensis* var. *hemigyrus*
Spring Mountains milkvetch	*Astragalus remotus*
Smooth dwarf greasebush	*Glossopetalon pungens* var. *glabra*
Dwarf greasebush	*Glossopetalon pungens* var. *pungens*
Jaeger ivesia	*Ivesia jaegeri*
Yellow twotone beardtongue	*Penstemon bicolor* ssp. *bicolor*
Death Valley beardtongue	*Penstemon fruticiformis* ssp. *amargosae*
Utah spikemoss	*Selaginella utahensis*

RECEIVED

MAR 15 2001

United States Department of the Interior

FISH AND WILDLIFE SERVICE
NEVADA FISH AND WILDLIFE OFFICE
1340 FINANCIAL BOULEVARD, SUITE 234
RENO, NEVADA 89502

March 14, 2001
File No. 1-5-01-SP-464

Ms. Kelly Shook
PBS&J
901 North Green Valley Parkway, Suite 100
Henderson, Nevada 89014-6139

Dear Ms. Shook:

Subject: Species List for the Proposed Table Mountain Wind Power Project in the Spring Mountains, Clark County, Nevada

This responds to your letter dated March 1, 2001, requesting information on threatened and endangered species that may occur in the subject project area. Enclosure A lists the threatened and endangered species that *may* be present within the proposed project site. This fulfills the requirement of the U.S. Fish and Wildlife Service (Service) to provide information on threatened and endangered species pursuant to section 7(c) of the Endangered Species Act of 1973, as amended, for projects that are authorized, funded, or carried out by a Federal agency. Please reference the species list file number shown above in all subsequent correspondence concerning this project.

Enclosure A also lists the species of concern to the Service that may occur in the project area. The Service has used information from State and Federal agencies and private sources to assess the conservation needs and status of these species. Further biological research and field study are needed to resolve the conservation status of these taxa. One potential benefit of considering these species during project planning, is that by exploring alternatives early in the planning process, it may be possible to provide long-term conservation benefits for these species and avoid future conflicts that could otherwise develop.

We also recommend that you contact the Nevada Natural Heritage Program (1550 East College Parkway, Suite 145, Carson City, Nevada 89710, 775-687-4245) and the appropriate regional office of the Nevada Division of Wildlife, as well as other local, State, and Federal agencies, for distribution data and information on conservation needs for these and other species of concern that may occur in your project area. Potential impacts to species of concern should be considered during the environmental documentation process.

The proposed project may necessitate the removal of vegetation during construction. We recommend vegetation clearing (or other surface disturbance) be timed to avoid potential destruction of active bird nests or young of birds that breed in the area. Such destruction may be in violation of the Migratory Bird Treaty Act (15 U.S.C. 701-718h). Under this act, active nests (nests with eggs or young) of migratory birds may not be harmed, nor may migratory birds be killed. Therefore, we recommend that land clearing be conducted outside the avian breeding season. If this is not feasible, we recommend that a qualified biologist survey the area prior to land clearing. If active nests are located, or if other evidence of nesting (mated pairs, territorial defense, carrying nesting material, transporting food) is observed, a protective buffer (the size depending on the requirements of the species) should be delineated and the entire area avoided to prevent destruction or disturbance to nests until they are no longer active.

We are concerned with the possible effects of wind power turbines on migratory birds, especially in areas such as the Spring Mountains where forested landscapes and cooler climates may be particularly attractive to birds. Impacts to migratory birds from operation of wind power turbines should be considered during the environmental assessment process, as well as alternatives for location, design, and operation of this facility that may reduce potential impacts to migratory birds.

Please contact Jeri Krueger of the Southern Nevada Field Office, at 702-647-5230 if you have questions regarding the enclosed list.

Sincerely,

Robert D. Williams
Field Supervisor

Enclosure

ENCLOSURE A

LISTED SPECIES AND SPECIES OF CONCERN THAT MAY OCCUR IN THE VICINITY OF THE PROPOSED TABLE MOUNTAIN WIND POWER PROJECT, SPRING MOUNTAINS, CLARK COUNTY, NEVADA

File Number: 1-5-01-SP-464
March 14, 2001

Listed Species

Reptile

Desert tortoise (T)	*Gopherus agassizii*

E = Endangered; T = Threatened

Species of Concern

Birds

Western burrowing owl	*Athene cunicularia hypugea*
Olive-sided flycatcher	*Contopus borealis*
Gray flycatcher	*Empidonax wrightii*
American peregrine falcon	*Falco peregrinus anatum*
Phainopepla	*Phainopepla nitens*

Mammals

Pale Townsend's big-eared bat	*Corynorhinus townsendii pallescens*
Spotted bat	*Euderma maculatum*
Greater western mastiff bat	*Eumops perotis californicus*
Allen's big-eared bat	*Idionycteris phyllotis*
California leaf-nosed bat	*Macrotus californicus*
Small-footed myotis	*Myotis ciliolabrum*
Long-eared myotis	*Myotis evotis*
Fringed myotis	*Myotis thysanodes*
Long-legged myotis	*Myotis volans*
Yuma myotis	*Myotis yumanensis*
Big free-tailed bat	*Nyctinomops macrotis*

Reptiles

Banded Gila monster	*Heloderma suspectum cinctum*
Chuckwalla	*Sauromalus obesus*

ENCLOSURE A (cont)

File Number: 1-5-01-SP-464
March 14, 2001

Invertebrates

Spring Mountains acastus checkerspot butterfly	*Chlosyne acastus robusta*
Dark blue butterfly	*Euphilotes enoptes purpurea*
Morand's checkerspot butterfly	*Euphydryas anicia morandi*
Spring Mountains comma skipper	*Hesperia comma mojavenis*
Charleston ant	*Lasius nevadensis*
Nevada admiral butterfly	*Limenitus weidemeyerii nevadae*
Spring Mountains icarioides blue butterfly	*Plebejus icarioides austinorum*
Spring Mountains blue butterfly	*Plebejus shasta charlestonensis*
Spring Mountains springsnail	*Pyrgulopsis deaconi*
Carole's silverspot butterfly	*Speyeria zerene carolae*

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Rough angelica	*Angelica scabrida*
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Death Valley beardtongue	*Penstemon fruticiformis* ssp. *amargosae*
Utah spikemoss	*Selaginella utahensis*

Nevada Natural Heritage Program
Department of Conservation and Natural Resources
1550 East College Parkway, Suite 145 * Carson City, Nevada 89706-7921
voice: (775) 687-4245 fax: (775) 687-1288 web: www.state.nv.us/nvnhp/

6 March 2001

Kelly Shook
PBS & J
901 North Green Valley Parkway, Suite 100
Henderson, NV 89014

RE: Data request received 5 March 2001

Dear Kelly:

We are pleased to provide the information you requested on endangered, threatened, candidate, and/or sensitive plant and animal taxa recorded within or near the Table Mountain Wind Power project area. We searched our database and maps for the following:

Township 24S	Range 57E	Section all
Township 24S	Range 58E	Section all
Township 25S	Range 58E	Section all

The enclosed printout lists the taxa recorded within the given area. Please be aware that habitat may also be available for: the desert tortoise, *Gopherus agassizii*, a Federally Threatened Taxon; the chuckwalla, *Sauromalus ater*, a Nevada Bureau of Land Management (BLM) Sensitive Species; the New York Mountains catseye, *Cryptantha tumulosa*, a U.S. Forest Service Region 4 sensitive species; the white bearpoppy, *Arctomecon merriamii*, a Nevada BLM Sensitive Species; and the Las Vegas bearpoppy, *Arctomecon californica*, a Nevada BLM Special Status Species also protected under Nevada state law (NRS 527.260-.300) as critically endangered. A further concern is Raptors, wind power strutures can be a significant threat to Raptors as evidenced by many studies. We do not have complete data on various raptors that may also occur in the area; for more information contact Ralph Phenix, Nevada Division of Wildlife at (775) 688-1565. Please note that all cacti, yuccas, and Christmas trees are protected by Nevada state law (NRS 527.060-.120), including taxa not tracked by this office.

Please note that our data are dependent on the research and observations of many individuals and organizations, and in most cases are not the result of comprehensive or site-specific field surveys. Natural Heritage reports should never be regarded as final statements on the taxa or areas being considered, nor should they be substituted for on-site surveys required for environmental assessments.

Thank you for checking with our program. Please contact us for additional information or further assistance.

Sincerely,

Eric S. Miskow
Biologist III/Data Manager

Sensitive Taxa Recorded near the Table Mountain Wind Power project area

Compiled by Nevada Natural Heritage Program for PBS & J

6 March 2001

Scientific name	Common name	Usfws	Blm	Usfs	State	Grank	Township	Section	Lat	Long	Prec	Last Observed
Plants												
Astragalus mohavensis var. *hemigyrus*	halfring milkvetch	<C2	S	S	CE	G3T2	024S057E	14	35.855833	-115.550556	M	1999-05-07
Astragalus mohavensis var. *hemigyrus*	halfring milkvetch	<C2	S	S	CE	G3T2	024S057E	23	35.849167	-115.550833	M	1999-05-07
Astragalus mohavensis var. *hemigyrus*	halfring milkvetch	<C2	S	S	CE	G3T2	024S057E	26	35.835000	-115.563056	M	1999-05-07
Astragalus mohavensis var. *mohavensis*	Mojave milkvetch					G3T3?	025S058E	14	35.767222	-115.443889	M	1999-05-14
Astragalus mohavensis var. *mohavensis*	Mojave milkvetch					G3T3?	025S058E	34	35.731667	-115.453611	G	1999-05-20
Astragalus mohavensis var. *mohavensis*	Mojave milkvetch					G3T3?	024S058E	32	35.820556	-115.486389	M	1999-05-14
Astragalus nyensis	Nye milkvetch					G3	024S058E	26	35.830000	-115.435000	M	1980-04-21
Astragalus remotus	Spring Mountains milkvetch	<C2	N	S		G2	024S058E	26	35.837500	-115.434722	G	1905-05-01
Eriogonum bifurcatum	Pahrump Valley buckwheat	<C2	N			G2G3	024S057E	32	35.820556	-115.603611	S	1988-05-11
Eriogonum heermannii var. *clokeyi*	Clokey buckwheat		N	S		G5T2	024S058E	31	35.816389	-115.504167	M	1938-06-11
Penstemon bicolor ssp. *bicolor*	yellow twotone beardtongue	<C2	N	S		G3T2Q	024S058E	25	35.834722	-115.427500	S	1990-05-02
Penstemon bicolor ssp. *bicolor*	yellow twotone beardtongue	<C2	N	S		G3T2Q	024S058E	11	35.870833	-115.434722	S	1979-05-06
Penstemon bicolor ssp. *roseus*	rosy twotone beardtongue	<C2		S		G3T3Q	024S058E	01	35.896667	-115.423056	M	1999-05-14
Penstemon bicolor ssp. *roseus*	rosy twotone beardtongue	<C2		S		G3T3Q	024S058E	25	35.834722	-115.427500	S	1990-05-02
Lepidoptera												
Hesperia colorado mojavensis	Spring Mountains comma skipper	<C2	N			G5T3	024S058E	05	35.891944	-115.493611	S	1996-PRE
Reptiles												
Heloderma suspectum cinctum	banded Gila monster	<C2NL	S		YES	G4T4	025S058E				S	1996-05

U. S. Fish and Wildlife Service (Usfws) Categories for Listing under the Endangered Species Act:

<C2	Former Category 2 Candidate, now species of concern
<C2NL	Former Category 2 Candidate, now a species of concern, Not Listed in parts of its range

Bureau of Land Management (Blm) Species Classification:

S	Nevada Special Status Species - USFWS listed, proposed or candidate for listing, or protected by Nevada state law
N	Nevada Special Status Species - designated Sensitive by State Office

United States Forest Service (Usfs) Species Classification:

S	Region 4 (Humboldt-Toiyabe NF) sensitive species

Nevada State Protected (State) Species Classification:

Fauna:	
YES	Species protected under NRS 501.
Flora:	
CE	Critically endangered - species whose survival requires assistance because of overexploitation, disease or other factors, or because their habitat is threatened with destruction, drastic modification or severe curtailment (NRS 527.260-.300)

Precision (Prec) of Mapped Occurrence:

Precision, or radius of uncertainty around latitude/longitude coordinates:

S	Seconds: within a three-second radius
M	Minutes: within a one-minute radius, approximately 2 km or 1.5 miles
G	General: within about 8 km or 5 miles, or to map quadrangle or place name

Nevada Natural Heritage Program Global (Grank) and State (Srank) Ranks for Threats and/or Vulnerability:

G	Global rank indicator, based on worldwide distribution at the species level		
T	Global trinomial rank indicator, based on worldwide distribution at the infraspecific level		
S	State rank indicator, based on distribution within Nevada at the lowest taxonomic level		
	1	Critically imperiled and especially vulnerable to extinction or extirpation due to extreme rarity, imminent threats, or other factors	
	2	Imperiled due to rarity or other demonstrable factors	
	3	Vulnerable to decline because rare and local throughout its range, or with very restricted range	
	4	Long-term concern, though now apparently secure; usually rare in parts of its range, especially at its periphery	
	5	Demonstrably secure, widespread, and abundant	
		A	Accidental within Nevada
		B	Breeding status within Nevada (excludes resident taxa)
		H	Historical; could be rediscovered
		N	Non-breeding status within Nevada (excludes resident taxa)
		Q	Taxonomic status uncertain
		U	Unrankable
		Z	Enduring occurrences cannot be defined (usually given to migrant or accidental birds)
		?	Assigned rank uncertain

Attachment C

List of Plant Species

Attachment C

Plant Species Observed in the Proposed Table Mountain Wind Power Study Area, Spring Mountains, Clark County, Nevada[+]

DIVISION	
FAMILY	
Scientific Name[a]	**Common Name[b]**
PTERIDOPHYTA	
PTERIDACEAE	
Cheilanthes parryi	Parry lace fern
Pentagramma triangularis	Goldback fern
GNETOPHYTA	
CUPRESSACEAE	
Juniperus osteosperma	Utah juniper
EPHEDRACEAE	
Ephedra nevadensis	Nevada ephedra
Ephedra viridis	Green ephedra
PINACEAE	
Pinus monophylla	Singleleaf pinyon
ANTHOPHYTA: DICOTYLEDONES	
ANACARDIACEAE	
Rhus trilobata	Squaw bush
APIACEAE	
Lomatium sp.	Parsley
ASTERACEAE	
Acamptopappus shockleyi	Shockley goldenhead
Adenophyllum cooperi	Cooper adenophyllum
Ambrosia acanthicarpa	Sand bur
Ambrosia dumosa	Burro-bush
Artemisia ludoviciana	Mugwort
Artemisia tridentata	Big sagebrush
Baileya multiradiata	Desert marigold
Bebbia juncea	Sweet bush
Brickellia arguta	Pungent brickellbush
Brickellia multiflora	Inyo brickellbush
Brickellia oblongifolia	Brickellbush
Calycoseris wrightii	White tack-stem
Chaenactis fremontii	Fremont pincushion

DIVISION	
FAMILY	
Scientific Name[a]	**Common Name[b]**
Chaenactis stevioides	Gray-leaved pincushion
Chaenactis xantiana	Xanthus pincushion
Chrysothamnus paniculatus	Wash rabbitbrush
Chrysothamnus teretifolius	Green rabbitbrush
Circium neomexicanum	New Mexico thistle
Encelia actoni	Bush sunflower
Encelia virginensis	Bush sunflower
Ericameria linearifolia	Showy goldenbush
Erigeron concinnus	Fleabane daisy
Gutierrezia microcephala	Matchweed
Heliomeris multiflora var. *nevadensis*	Nevada golden-eye
Hymenoclea salsola	Cheesebush
Malacothrix coulteri	Snake's-head
Malacothrix glabrata	Desert dandelion
Psilostrophe cooperi	Paper-daisy
Senecio flaccidus var. *monoensis*	Mono senecio
Senecio multilobatus	Basin senecio
Stephanomeria parryi	Parry rock pink
Stephanomeria pauciflora	Desert milk-aster
Stylocline sp.	Nest straw
Tetradymia axillaris var. *axillaris*	Cotton-thorn
Tetradymia axillaris var. *longispina*	Cotton-thorn
Thymophylla pentachaeta var. *belenidium*	Five-needled fetid
Uropappus lindleyi	Silver-puffs
Viguiera parishii	Parish golden-eye
Xylorhiza tortifolia	Mojave aster
BORAGINACEAE	
Amsinckia tessellata	Fiddleneck
Cryptantha barbigera	Fuzzy forget-me-not
Cryptantha circumscissa	Capped cryptantha
Cryptantha confertifolia	Yellow cryptantha
Cryptantha dumentorum	Flexuous cryptantha
Cryptantha holoptera	Rough-stemmed cryptantha
Cryptantha micrantha	Purple-rooted forget-me-not
Cryptantha pterocarya	Wing-nut forget-me-not
Cryptantha tumulosa	New York Mountains catseye

DIVISION	
FAMILY	
Scientific Name[a]	**Common Name**[b]
Cryptantha utahensis	Fragrant forget-me-not
Cryptantha virginensis	Virginia forget-me-not
Tiquilia canescens var. *canescens*	Shrubby tiquilia
Tiquilia plicata	String plant
BRASSICACEAE	
Arabis glaucovalvula	Blue-podded rock-cress
**Brassica tournefortii*	Wild mustard
Caulanthus crassicaulis var. *crassicaulis*	Thick-stemmed wild cabbage
Caulanthus cooperi	Cooper caulanthus
Descurainia pinnata	Tansy mustard
**Descurainia sophia*	Flixweed
Draba cuneifolia	Desert draba
Guillenia lasiophylla	California mustard
Lepidium fremontii	Bush peppergrass
Lepidium lasiocarpum var. *lasiocarpum*	Modest peppergrass
**Sisymbrium altissimum*	Tumble mustard
**Sisymbrium orientale*	Oriental mustard
Stanleya elata	Prince's plume
Stanleya pinnata	Desert plume
Streptanthella longirostris	Streptanthella
BUDDLEJACEAE	
Buddleja utahensis	Panamint butterfly bush
CACTACEAE	
Echinocactus polycephalus var. *polycephalus*	Cottontop cactus
Echinocereus engelmannii	Hedgehog cactus
Echinocereus triglochidiatus	Mojave mound cactus
Escobaria vivipara ssp. *desertii*	Beehive cactus
Ferocactus cylindraceus var. *lecontei*	Mojave barrel cactus
Mammillaria tetrancistra	Little fishhook cactus
Opuntia acanthocarpa	Buckhorn cholla
Opuntia basilaris var. *basilaris*	Beavertail cactus
Opuntia echinocarpa	Silver cholla
Opuntia erinacea var. *erinacea*	Mojave prickly pear
CAMPANULACEAE	
Nemacladus sp.	Thread-plant
CAPRIFOLIACEAE	

DIVISION	
FAMILY	
Scientific Name[a]	**Common Name**[b]
Symphoricarpos longiflorus	Desert snowberry
CARYOPHYLLACEAE	
Arenaria macradenia var. *macradenia*	Mojave sandwort
CELASTRACEAE	
Mortonia utahensis	Mortonia
CHENOPODIACEAE	
Atriplex canescens	Fourwing saltbush
Atriplex confertifolia	Shadscale
Grayia spinosa	Spiny hopsage
Kraschenennikovia lanata	Winterfat
**Salsola tragus*	Russian thistle
CUCUBITACEAE	
Cucurbita foetidissima	Calabazilla
EUPHORBIACEAE	
Chamaesyce setiloba	Yuma spurge
FABACEAE	
Astragalus acutirostris	Keel beak
Astragalus layneae	Layne milk-vetch
Astragalus lentiginosus	Milk-vetch
Astragalus mohavensis var. *mohavensis*	Mojave milk-vetch
Astragalus newberryi	Newberry milk-vetch
Astragalus nuttallianus	Nuttall's milk-vetch
Astragalus nyensis	Nye milk-vetch
Lupinus concinnus	Bajada lupine
Lupinus flavoculatus	Yellow-eyes
Psorothamnus fremontii	Fremont indigo bush
GERANIACEAE	
**Erodium cicutarium*	Red-stemmed filaree
HYDROPHYLLACEAE	
Nama demissum	Purple mat
Phacelia crenulata	Purple phacelia
Phacelia fremontii	Yellow-throats
Phacelia rotundifolia	Round-leaved phacelia
Phacelia vallis-mortae	Death Valley phacelia
Tricardia watsonii	Three-hearts
KRAMERIACEAE	

DIVISION	
FAMILY	
Scientific Name[a]	**Common Name[b]**
Krameria erecta	Pima rhatany
LAMIACEAE	
Hedeoma nanum var. *californicum*	Small pennyroyal
Salazaria mexicana	Paper-bag bush
Salvia dorrii	Blue sage
Salvia mohavensis	Mojave sage
LINACEAE	
Linum lewisii var. *lewisii*	Blue flax
LOASACEAE	
Mentzelia albicaulis	Little blazing star
Mentzelia oreophila	Inyo blazing star
MALVACEAE	
Eremalche exilis	White mallow
Sphaeralcea ambigua var. *ambigua*	Apricot mallow
NYCTAGINACEAE	
Mirabilis bigelovii var. *bigelovii*	Wishbone bush
Mirabilis multiflora	Giant four-o'clock
OLEACEAE	
Menodora spinescens	Spiny menodora
ONAGRACEAE	
Camissonia boothii	Primrose
Camissonia brevipes	Yellow cups
Gaura coccinea	Wild honeysuckle
Oenothera caespitosa	Evening primrose
PAPAPERACEAE	
Argemone corymbosa	Mojave prickly poppy
Eschscholtzia glyptosperma	Desert gold-poppy
Eschscholtzia minutiflora	Little gold-poppy
PLANTAGINACEAE	
Plantago ovata	Woolly plantain
Plantago patagonica	Patagonia plantain
POLEMONIACEAE	
Gilia spp.	Gilia
Langloisia setosissima ssp. *setosissima*	Bristly langloisia
Linanthus demissus	Desert snow
Phlox stansburyi	Stansbury phlox

DIVISION	
FAMILY	
Scientific Name[a]	**Common Name**[b]
POLYGONACEAE	
Chorizanthe rigida	Rosy-thorn
Eriogonum deflexum var. *deflexum*	Skeleton weed
Eriogonum fasciculatum ssp. *polifolium*	California buckwheat
Eriogonum heermannii var. *floccosum*	Woolly Heermann buckwheat
Eriogonum inflatum var. *inflatum*	Desert trumpet
Eriogonum nidularium	Bird's-nest buckwheat
Eriogonum trichopes var. *trichopes*	Little trumpet
Eriogonum wrightii	Wright buckwheat
Oxytheca perfoliata	Saucer plant
Rumex hymenosepalus	Wild rhubarb
PHILADELPHACEAE	
Fendlerella utahensis	Yerba desierto
RANUNCULACEAE	
Anemone tuberosa	Desert windflower
Delphinium parishii ssp. *parishii*	Desert larkspur
ROSACEAE	
Cercocarpus intricatus	Little-leaf mahogany
Coleogyne ramosissima	Blackbush
Fallugia paradoxa	Apache plume
Petrophyton caespitosa ssp. *caespitosa*	Rock spiraea
Prunus fasciculatus	Desert almond
Purshia mexicana	Cliff rose
RUBIACEAE	
Galium sp.	Bedstraw
RUTACEAE	
Thamnosma montana	Turpentine broom
SCROPHULARIACEAE	
Castilleya sp.	Indian paintbrush
Mimulus bigelovii	Bigelow mimulus
Mimulus rubellus	Red-stemmed mimulus
Penstemon eatonii var. *eatonii*	Eaton firecracker
Penstemon palmeri	Scented beardtongue
Penstemon bicolor var. *bicolor*	Yellow twotone beardtongue
Penstemon bicolor var. *roseus*	Rosy twotone beardtongue
SOLANACEAE	

DIVISION	
FAMILY	
Scientific Name[a]	**Common Name[b]**
Lycium andersonii	Desert tomato
Nicotiana obtusifolia	Desert tobacco
Physalis crassifolia	Thickleaf ground-cherry
ZYGOPHYLLACEAE	
Larrea tridentata	Creosote bush
ANTHOPHYTA: MONOCOTYLEDONES	
LILIACEAE	
Agave utahensis	Utah agave
Calochortus flexuosus	Straggling mariposa
Dichelostemma capitatum ssp. *capitatum*	Blue dicks
Yucca baccata	Banana yucca
Yucca brevifolia var. *brevifolia*	Joshua tree
Yucca brevifolia var. *jaegeriana*	Dwarf Joshua tree
Yucca schidigera	Mojave yucca
Zigadenus sp.	Zygadene
Allium nevadense	Single-leaf onion
POACEAE	
Achnatherum hymenoides	Indian ricegrass
Achnatherum speciosum	Desert needlegrass
**Bromus madritensis* ssp. *rubens*	Red brome
**Bromus tectorum*	Cheat grass
Erioneuron pulchellum	Fluffgrass
Muhlenbergia sp.	Muhly
Pleuraphis rigida	Big galleta
Poa sp.	Bluegrass

[a] Scientific names follow Hickman (1993).

[b] Common names follow Hickman (1993) or Jaeger (1969).

* Indicates a non-native (introduced) species.

*This list was compiled by PBS&J and Eremico during field surveys performed in April, May, and November 2001.

Literature Cited:

Hickman, J. C. 1993. The Jepson manual: higher plants of California. Berkeley, California: University of California Press. 1400 pp.

Jaeger, E. C. 1969. Desert wild flowers. Stanford, California: Stanford University Press. 322 pp.

Attachment D

Results of Plant Survey Transects

Table 1a. Estimated Number of Cacti, Agave, Yuccas, and Christmas (Evergreen) Trees that Occur in the Project Area (Transects 1 through 30 only)

Species		**Transect**						
Scientific Name	**Common Name**	**1**	**2**	**3**	**4**	**5**	**6**	**7**
Astragalus mohavensis var. *mohavensis*	Mohave milk-vetch	5					64	
Astragalus nyensis	Nye milk-vetch					4	357	
Cryptantha tumulosa	New York Mountains catseye	100	200	55	178	95	52	
Echinocactus polycephalus var. *polycephalus*	Cottontop cactus	3		1		1	14	
Echinocereus engelmannii	Hedgehog cactus			2	13	5	13	
Echinocereus triglochidiatus	Mojave mound cactus	2			4	44	62	
Escobaria vivipara ssp. *desertii*	Beehive cactus		2	3	26	47	164	6
Ferocactus cylindraceus var. *lecontei*	Mojave barrel cactus		1	9	2	75		
Mammillaria tetrancistra	Little fishhook cactus							
Opuntia acanthocarpa	Buckhorn cholla					24		
Opuntia basilaris var. basilaris	Beavertail cactus	24	54	27	34	42	29	46
Opuntia echinocarpa	Silver cactus	5	21	25	27	116		82
Opuntia erinacea var. *erinacea*	Mojave prickly pear					290	483	32
Agave utahensis	Utah agave				8	208	300	
Yucca baccata	Banana yucca							
Yucca brevifolia (including var. *brevifolia* and var. *jaegeriana)*	Joshua tree	300–500	300–500	300–500	300–500	300–500	100–200	500–1,000
Yucca schidigera	Mojave yucca						1	
Juniperus osteosperma	Utah juniper							
Pinus monophylla	Singleleaf pinyon							

NC = not counted

Table 1a. Estimated Number of Cacti, Agave, Yuccas, and Christmas (Evergreen) Trees that Occur in the Project Area (Transects 1 through 30 only)

Species		**Transect**						
Scientific Name	**Common Name**	**8**	**9**	**10**	**11**	**12**	**13**	**14**
Astragalus mohavensis var. *mohavensis*	Mohave milk-vetch							
Astragalus nyensis	Nye milk-vetch							
Cryptantha tumulosa	New York Mountains catseye	5				1		
Echinocactus polycephalus var. *polycephalus*	Cottontop cactus					165	340	300
Echinocereus engelmannii	Hedgehog cactus			2		12	30	1
Echinocereus triglochidiatus	Mojave mound cactus					50	85	74
Escobaria vivipara ssp. *desertii*	Beehive cactus	1	1	12	2	50	210	106
Ferocactus cylindraceus var. *lecontei*	Mojave barrel cactus					365	28	1
Mammillaria tetrancistra	Little fishhook cactus					1		
Opuntia acanthocarpa	Buckhorn cholla							
Opuntia basilaris var. basilaris	Beavertail cactus	10	1	22	7	52	9	5
Opuntia echinocarpa	Silver cactus	50	49	155	17	31		11
Opuntia erinacea var. *erinacea*	Mojave prickly pear		5		5	260	300	420
Agave utahensis	Utah agave					1,000–1,100	560	865
Yucca baccata	Banana yucca							
Yucca brevifolia (including var. *brevifolia* and var. *jaegeriana)*	Joshua tree	100–200	20–40	500–1,000	50–100	50–100	50–100	50–100
Yucca schidigera	Mojave yucca					170		17
Juniperus osteosperma	Utah juniper							
Pinus monophylla	Singleleaf pinyon							

NC = not counted

Table 1a. Estimated Number of Cacti, Agave, Yuccas, and Christmas (Evergreen) Trees that Occur in the Project Area (Transects 1 through 30 only)

Species		**Transect**						
Scientific Name	**Common Name**	**15**	**16**	**17**	**18**	**19**	**20**	**21**
Astragalus mohavensis var. *mohavensis*	Mohave milk-vetch							
Astragalus nyensis	Nye milk-vetch							
Cryptantha tumulosa	New York Mountains catseye							7
Echinocactus polycephalus var. *polycephalus*	Cottontop cactus		18	67				22
Echinocereus engelmannii	Hedgehog cactus	1	20	71	24	3	17	235
Echinocereus triglochidiatus	Mojave mound cactus	19					6	1
Escobaria vivipara ssp. *desertii*	Beehive cactus	4	19	53	7	5	58	127
Ferocactus cylindraceus var. *lecontei*	Mojave barrel cactus							
Mammillaria tetrancistra	Little fishhook cactus			1				
Opuntia acanthocarpa	Buckhorn cholla			1	84			80
Opuntia basilaris var. basilaris	Beavertail cactus		7	11	2	7		7
Opuntia echinocarpa	Silver cactus	4	43	49	21	17		37
Opuntia erinacea var. *erinacea*	Mojave prickly pear	51	20	42	23	14	138	201
Agave utahensis	Utah agave	21					65	68
Yucca baccata	Banana yucca				80	40	152	582
Yucca brevifolia (including var. *brevifolia* and var. *jaegeriana)*	Joshua tree	20–40	1,000	500–1,000	300–500	120–150	300	700–1,000
Yucca schidigera	Mojave yucca		1,500	500–1,000	150	100	250	850–1,200
Juniperus osteosperma	Utah juniper							
Pinus monophylla	Singleleaf pinyon							

NC = not counted

Table 1a. Estimated Number of Cacti, Agave, Yuccas, and Christmas (Evergreen) Trees that Occur in the Project Area (Transects 1 through 30 only)

Species		**Transect**						
Scientific Name	**Common Name**	**22**	**23**	**24**	**25**	**26**	**27**	**28**
Astragalus mohavensis var. *mohavensis*	Mohave milk-vetch	4	19					
Astragalus nyensis	Nye milk-vetch							
Cryptantha tumulosa	New York Mountains catseye				2	80		
Echinocactus polycephalus var. *polycephalus*	Cottontop cactus							1
Echinocereus engelmannii	Hedgehog cactus	17	42	1	890	1	42	2
Echinocereus triglochidiatus	Mojave mound cactus	13	1		100	4	9	20
Escobaria vivipara ssp. *desertii*	Beehive cactus	78	60	1	310	9	58	14
Ferocactus cylindraceus var. *lecontei*	Mojave barrel cactus				54			
Mammillaria tetrancistra	Little fishhook cactus				1			
Opuntia acanthocarpa	Buckhorn cholla				450			
Opuntia basilaris var. basilaris	Beavertail cactus	5	20	1				1
Opuntia echinocarpa	Silver cactus	21	54	7				
Opuntia erinacea var. *erinacea*	Mojave prickly pear	36	70	1	282	48	444	79
Agave utahensis	Utah agave	281			3,000–5,000	89	500–750	16
Yucca baccata	Banana yucca	15	631	18	150	386	1,000	
Yucca brevifolia (including var. *brevifolia* and var. *jaegeriana)*	Joshua tree	330	1,700	46	1,000–1,500	320	1,327	126
Yucca schidigera	Mojave yucca	440	370	33	800	20	404	
Juniperus osteosperma	Utah juniper				20–40	NC	NC	
Pinus monophylla	Singleleaf pinyon				7	NC	NC	

NC = not counted

Table 1a. Estimated Number of Cacti, Agave, Yuccas, and Christmas (Evergreen) Trees that Occur in the Project Area (Transects 1 through 30 only)

Species		Transect		
Scientific Name	**Common Name**	**29**	**30**	**TOTAL**
Astragalus mohavensis var. *mohavensis*	Mohave milk-vetch			92
Astragalus nyensis	Nye milk-vetch	3		364
Cryptantha tumulosa	New York Mountains catseye			775
Echinocactus polycephalus var. *polycephalus*	Cottontop cactus			932
Echinocereus engelmannii	Hedgehog cactus	4	15	1,463
Echinocereus triglochidiatus	Mojave mound cactus	110	1	605
Escobaria vivipara ssp. *desertii*	Beehive cactus	86	6	1,525
Ferocactus cylindraceus var. *lecontei*	Mojave barrel cactus	1	10	546
Mammillaria tetrancistra	Little fishhook cactus			3
Opuntia acanthocarpa	Buckhorn cholla			639
Opuntia basilaris var. basilaris	Beavertail cactus		15	438
Opuntia echinocarpa	Silver cactus		25	867
Opuntia erinacea var. *erinacea*	Mojave prickly pear	1,044	7	4,295
Agave utahensis	Utah agave	121	14	7,116–9,466
Yucca baccata	Banana yucca	10		3,064
Yucca brevifolia (including var. *brevifolia* and var. *jaegeriana)*	Joshua tree	530	497	11,736–15,706
Yucca schidigera	Mojave yucca		698	6,303–7,153
Juniperus osteosperma	Utah juniper			at least 20–40
Pinus monophylla	Singleleaf pinyon			at least 7

NC = not counted

Table 1b. Estimated Number of Cacti, Agaves, Yuccas, and Christmas (Evergreen) Trees that Occur in the Project Area (Transects 31 through 39, and Transects 1 through 39 totaled).

		Survey Transect										
Scientific Name	Common Name	31	32	33	34	35	36	37	38	39	Total for Transects 31-39[a]	Total for Project Area[b]
Echinocactus polycephalus var. *polycephalus*	Cottontop cactus	48	132	5	–	–	3	–	–	–	188	1,120
Echinocereus engelmannii	Hedgehog cactus	21	249	4	–	–	7	6	–	–	287	1,750
Echinocereus triglochidiatus	Mojave mound cactus	4	–	–	–	–	5	–	–	–	9	614
Escobaria vivipara ssp. *desertii*	Beehive cactus	–	114	–	–	–	20	48	28	23	210	1,735
Ferocactus cylindraceus var. *lecontei*	Mojave barrel cactus	–	319	4	–	–	–	14	–	–	337	883
Mammillaria tetrancistra	Little fishhook cactus	–	–	–	–	–	–	10	–	–	10	13
Opuntia acanthocarpa	Buckhorn cholla	–	–	–	–	8	–	–	–	–	8	647
Opuntia basilaris var. basilaris	Beavertail cactus	15	104	6	–	6	17	24	2	–	174	612
Opuntia echinocarpa	Silver cactus	17	148	7	4	18	7	131	–	26	358	1,225
Opuntia erinacea var. *erinacea*	Mojave prickly pear	43	45	5	–	5	16	104	–	–	218	4,513
Agave utahensis	Utah agave	58	192	23	–	–	–	264	–	–	537	7,653 to 10,003
Yucca baccata	Banana yucca	–	–	–	–	12	–	–	–	–	12	3,076
Yucca brevifolia (includes var. *brevifolia* and var. *jaegeriana)*	Joshua tree	–	–	–	1	45	–	1,860	478	120	2,504	14,240 to 18,210
Yucca schidigera	Mojave yucca	29	82			34	20	1,734	778	165	2,842	9,145 to 9,995
Juniperus osteosperma	Utah juniper	–	–	–	–	–	–	–	–	–	0	at least 20 to 40
Pinus monophylla	Singleleaf pinyon	–	–	–	–	–	–	–	–	–	0	at least 7

a. Results of surveys performed by PBS&J in May and November 2001.

b. Combined results of survey Transects 1-30 performed by Eremico (2001) and survey Transects 31-39 performed by PBS&J in April, May, and November 2001.

Attachment E

List of Wildlife Species

Attachment E

Wildlife Species Observed During Field Surveys in the Table Mountain Project Area

Scientific Name[a]	Common Name[a]	Observed by PBS&J[b]	Observed by Others[c]
Insecta	**Insects**		
Papilio sp.	Swallowtail butterfly	X	
Pogonomyrmex sp.	Harvester ant	X	
Reptilia	**Reptiles**		
Cnemidophorus tigris	Western whiptail	X	
Cnemidophorus tigris tigris	Great Basin whiptail	X	
Crotalus mitchellii pyrrhus	Southwestern speckled rattlesnake	X	
Crotaphytus insularis bicinctores	Collard lizard	X	
Eumeces gilberti rubiricaidatus	Gilbert skink	X	
Gambelia wislizenii	Longnose leopard lizard	X	
Gopherus agassizii	Desert tortoise	X	
Masticophis flagellum piceus	Red racer	X	
Pituophis melanoleucus deserticola	Great Basin gopher snake	X	
Salvadora hexalepis	Western patch-nosed snake	X	
Sauromalus obesus	Chuckwalla	X	
Sceloporus magister	Desert spiny lizard	X	
SceLoporus graciosus	Sagebrush lizard	X	
Urosaurus graciosus	Long-tailed brush lizard	X	
Urosaurus graciosus graciosus	Western brush lizard	X	
Uta stansburiana	Side-blotched lizard	X	
Aves	**Birds**		
Aeronautes saxatalis	White-throated swift	X	X
Alectoris chukar	Chukar	X	X
Amphispiza belli	Sage sparrow	X	X
Amphispiza bilineata	Black-throated sparrow	X	X
Aquila chrysaetos	Golden eagle	X	
Archilochus alezandri	Black-chinned hummingbird	X	X
Auriparus flaviceps	Verdin		X
Buteo jamaicensis	Red-tailed hawk	X	X
Callipepla gambelii	Gambel's quail	X	X
Calypte costae	Costa's hummingbird	X	X
Campylorhynchus brunneicapillus	Cactus Wren	X	X
Carpodacus mexicanus	House finch	X	X
Cathartes aura	Turkey vulture	X	
Catharus guttatus	Hermit thrush		X
Catharus ustulatus	Swainson's thrush	X	
Catherpes mexicanus	Canyon wren		X
Charadrius vociferus	Killdeer		X
Chondestes grammacus	Lark sparrow	X	X
Chordilus acutipennis	Lesser nighthawk		X
Columba livia	Rock dove		X
Contopus sordidulus	Western-wood pewee		X
Corvus corax	Common raven	X	X
Dendroica petechia	Yellow warbler		X
Empidonax hammondii	Hammond's flycatcher	X	
Eremophila alpestris	Horned lark		X

Scientific Name[a]	Common Name[a]	Observed by PBS&J[b]	Observed by Others[c]
Falco sparverius	American kestrel	X	X
Guiraca cartulea	Blue grosbeak		X
Gymnorhinus cyanocephalus	Pinyon jay	X	X
Hirundo pyrrhonota	Cliff swallow	X	X
Hirundo rustica	Barn swallow	X	X
Icterus bullockii	Bullocks's oriole		X
Icterus parisorum	Scott's oriole	X	X
Junco hyemalis	Dark-eyed junco		X
Lanius ludovicianus	Loggerhead shrike	X	X
Melanerpes lewis	Lewis' woodpecker	X	
Mimus polyglottos	Northern mockingbird	X	X
Molothrus ater	Brown-headed cowbird	X	X
Myiarchus cinerascens	Ash-throated flycatcher	X	X
Oreoscoptes montanus	Sage thrasher		X
Passer domesticus	House sparrow		X
Phainopepla nitens	Phainopepla	X	X
Phalaenoptilus nuttallii	Common poorwill	X	X
Pheucticus melanocephalus	Black-headed grosbeak	X	
Picoides scalaris	Ladder-backed woodpecker	X	X
Pipilo chlorurus	Green-tailed towhee		
Piranga ludoviciana	Western tanager		X
Polioptila caerulea	Blue-gray gnatcatcher	X	X
Polioptila melanura	Black-tailed gnatcatcher	X	X
Pooecetes gramineus	Vesper sparrow		X
Psaltriparus minimus	Common bushtit	X	X
Quiscalus mexicanus	Great-tailed grackle		X
Regulus calendula	Ruby-crowned kinglet		X
Salpinctes obsoletus	Rock wren	X	X
Sayornis saya	Say's phoebe	X	X
Spizella atrogularis	Black-chinned sparrow	X	
Spizella breweri	Brewer's sparrow	X	X
Sturnella neglecta	Western meadowlark		X
Sturnis vulgarus	European starling		X
Tachycineta bicolor	Violet-green swallow	X	X
Thryomanes bewickii	Bewick wren	X	X
Toxostoma crissale	Crissal thrasher		X
Toxostoma lecontei	Le Conte's thrasher		X
Troglodytes aedon	House wren		X
Turdus migratorius	American robin	X	
Tyrannus verticalis	Western kingbird	X	X
Vermivora luciae	Lucy's warbler		X
Vireo gilvus	Warbling vireo		X
Wilsonia pusilla	Wilson's warbler		X
Xanthocephalus xanthocephalus	Yellow-headed blackbird		X
Zenaida macroura	Mourning dove	X	X
Zonotrichia leucophrys	White-crowned sparrow		X
Mammalia	**Mammals**		
Ammospermophilus leucurus	Antelope ground squirrel	X	
Bassariscus astutus	Ringtail cat	X	
Canis latrans	Coyote	X	
Coynorhinus townsendii	Townsend's big-eared bat		X
Dipodomys spp.	Kangaroo rats	X	
Equus caballus	Horse	X	X
Felis Rufus	Bobcat	X	
Lepus californicus	Black-tailed jackrabbit	X	

Scientific Name[a]	**Common Name**[a]	**Observed by PBS&J**[b]	**Observed by Others**[c]
Myotis californicua	California myotis		X
Myotis ciliolabrum	Small-footed myotis		X
Neotoma lepida	Desert woodrat	X	X
Ovis Canadensis nelsonii	Desert bighorn sheep	X	
Sylvilagus audubonii	Desert cottontail	X	
Thomomys bottae	Gopher	X	
Vulpes macrotis arsipus	Desert kit fox	X	

[a] Scientific and common names follow: (1) for reptiles: Stebbins, R.C. (1985); (2) for mammals: Ingles, L.G. (1965); (3) for birds: Pyle, P. (1997) and AOU (2000).

[b] Species observed or identified by sign during field investigations conducted in April, May, and November 2001 by PBS&J and Eremico.

[c] Information provided by U.S. Bureau of Land Management 2001; Great Basin Bird Observatory 2001; U.S. Geological Survey 2001; Heindl 2001.

Appendix E

Biological Assessment

Table Mountain Wind Generating Facility Clark County, Nevada Draft Biological Assessment

Prepared for

U.S. Bureau of Land Management
Las Vegas Field Office
4765 Vegas Drive
Las Vegas, Nevada 89018
BLM Case No. N-73726

On Behalf of

Table Mountain Wind Company, LLC
4225 Executive Square, Suite 950
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Prepared by

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December 3, 2001

PBS&J Job No. 511339.00

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Attachment A—Agency Correspondence

Acronyms

ac	acre
BA	Biological Assessment
BLM	U.S. Bureau of Land Management
ESA	Endangered Species Act of 1973
ft	foot (feet)
I-15	Interstate 15
kV	kilovolt
kWh	kilowatt-hour
LOP	life of project
m	meter
mi	mile(s)
MW	megawatt
NAC	Nevada Administrative Code
NDOW	Nevada Division of Wildlife
NNHP	Nevada Natural Heritage Program
NRS	Nevada Revised Statute
ROW	right-of-way
RRNCA	Red Rock Canyon National Conservation Area
SH 161	State Highway 161
sq mi	square mile
T&E	threatened and endangered
TMWC	Table Mountain Wind Company, LLC
USGS	U.S. Geological Survey
USFWS	U.S. Fish and Wildlife Service
VEA	Valley Electric Association
WGF	wind powered electric generation facility
WTG	wind turbine generator

1. INTRODUCTION

Under the provisions of the Endangered Species Act of 1973, as amended (ESA), federal agencies are directed to conserve threatened and endangered (T&E) species and their habitats in which these species occupy. Federal agencies are to ensure that actions they authorize, fund, or carry out are not likely to jeopardize the continued existence of a species that is endangered, threatened, or proposed threatened or endangered or critical habitat of such a species. This Biological Assessment (BA) provides the documentation to meet federal requirements for the proposed federal action.

1.1 Project Description

Table Mountain Wind Company, LLC (TMWC), a joint venture between Global Renewable Energy Partners, Inc., (GREP) and Siemens Energy and Automation, Inc. is proposing to develop a nominal 150- to 205-megawatt (MW) wind-powered electric generation facility (WGF) and ancillary facilities on approximately 325 acres (ac) of public lands managed by the Bureau of Land Management (BLM) approximately 20 miles (mi) southwest of Las Vegas, at the south end of the Spring Mountain Range. The site is accessible from Interstate 15 (I-15), State Highway 161 (SH 161), Sandy Valley Road, and an undedicated, unimproved road known locally as Wilson Pass Road (Figure 1).

These approximately 325 ac are within a 4,500-ac project area (Figure 2) that is located in Section 13 of Township 24 South, Range 57 East; Sections 5–8, 18, 19, 21, 22, and 26–35 of Township 24 South, Range 58 East; and Sections 2–4, 10–12, 14–16, 22, and 23 of Township 25 South, Range 58 East, on the Cottonwood Pass, Potosi, Shenandoah Peak, and Goodsprings U.S. Geological Survey (USGS) 7.5-minute quadrangle maps.

The federal action associated with the proposed development would be the issuance of the right-of-way (ROW) grant by the BLM for construction, operation, and maintenance of the 150- to 205-MW WGF and ancillary facilities, including a substation, distribution lines, access roads, and meteorological towers. The ROW grant would have a 20-year term and could be renewed indefinitely. The life of project (LOP) is assumed to be 20 years.

The purpose of the Proposed Action is to provide wind-generated electricity from a site in southern Nevada to meet existing electricity needs and provide a reliable, economical, and environmentally acceptable energy resource in the region.

The Proposed Action includes the construction of approximately 153 wind turbine generators (WTGs) producing more than 460,000,000-kilowatt-hours (kWh) of electricity annually. Ninety-seven WTGs would be constructed on Table Mountain, 36 WTGs would be constructed on Shenandoah Peak, and 20 WTGs would be constructed north of Wilson Pass. The three electricity-generation areas would be linked by an overhead 34.5-kilovolt (kV) electric distribution line that would connect to a new substation. This substation would be constructed at the juncture of Valley Electric Association's (VEA's) Mead-Pahrump 230-kV transmission line and Sandy Valley Road. To access the WTGs, approximately 28 mi of access and service roads would be improved or constructed.

Fourteen meteorological towers, each requiring a 3-foot (ft)-diameter disturbance resulting in a total of 0.0015 ac, would be installed throughout the project area prior to WTG construction. Meteorological towers, or anemometers, record weather data necessary to determine the most efficient operational strategy for the WTG arrays. All 14 towers will be located within the WTG corridor.

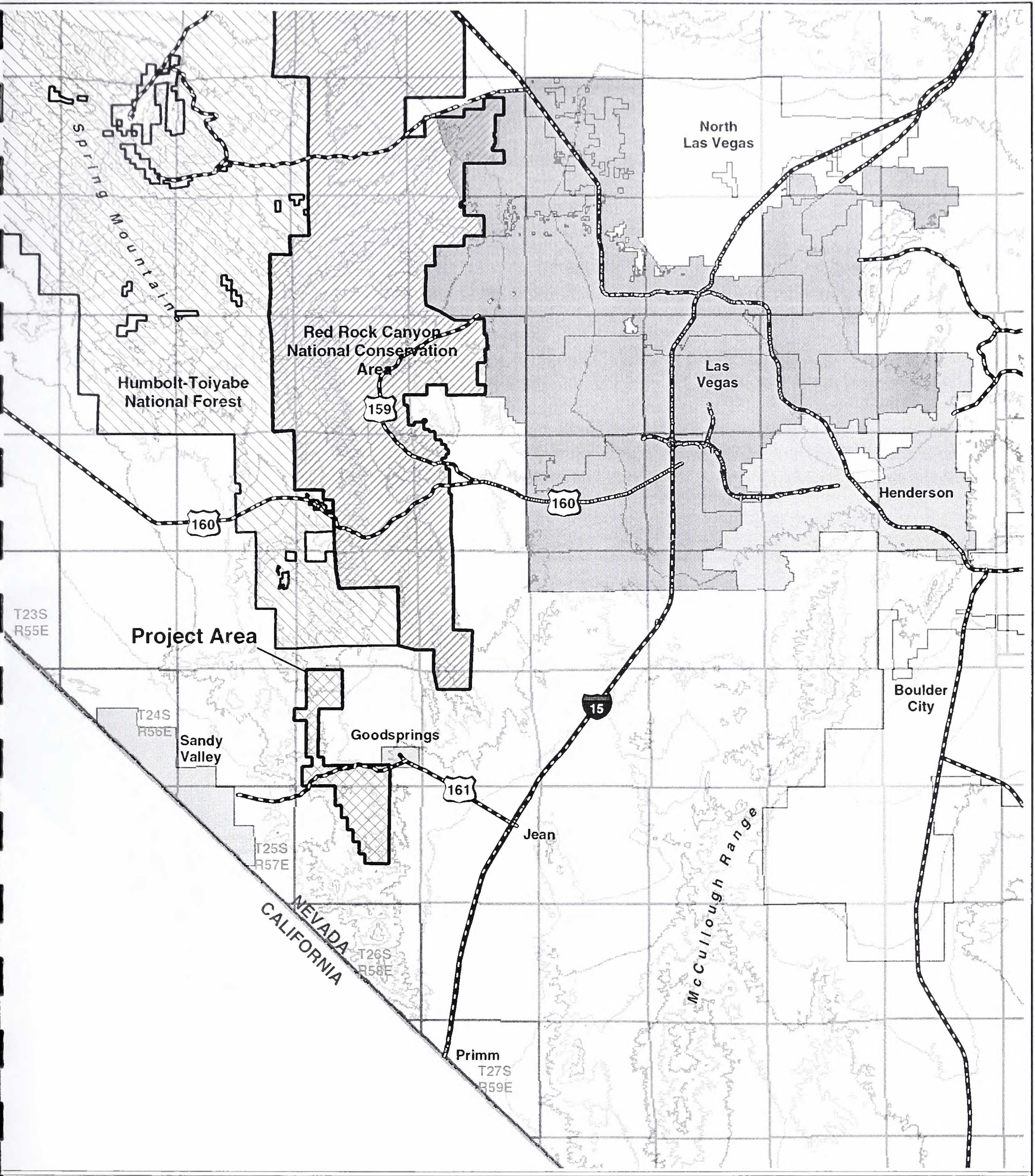

Table Mountain Wind Generating Facility

Legend

▨ Table Mountain Project Area

▨ Red Rock Canyon
National Conservation Area

▨ Humbolt-Toiyabe
National Forest

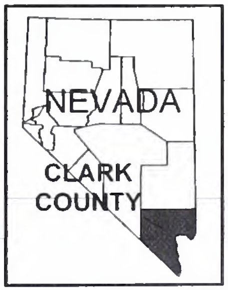

**Figure 1
Project Vicinity
Map**

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Phone: 702/263-7275
Fax: 702/263-7200

1/17/01 KH \\VEGAS-GIS\Projects\TableMtnWindPwr\Figure1.mxd

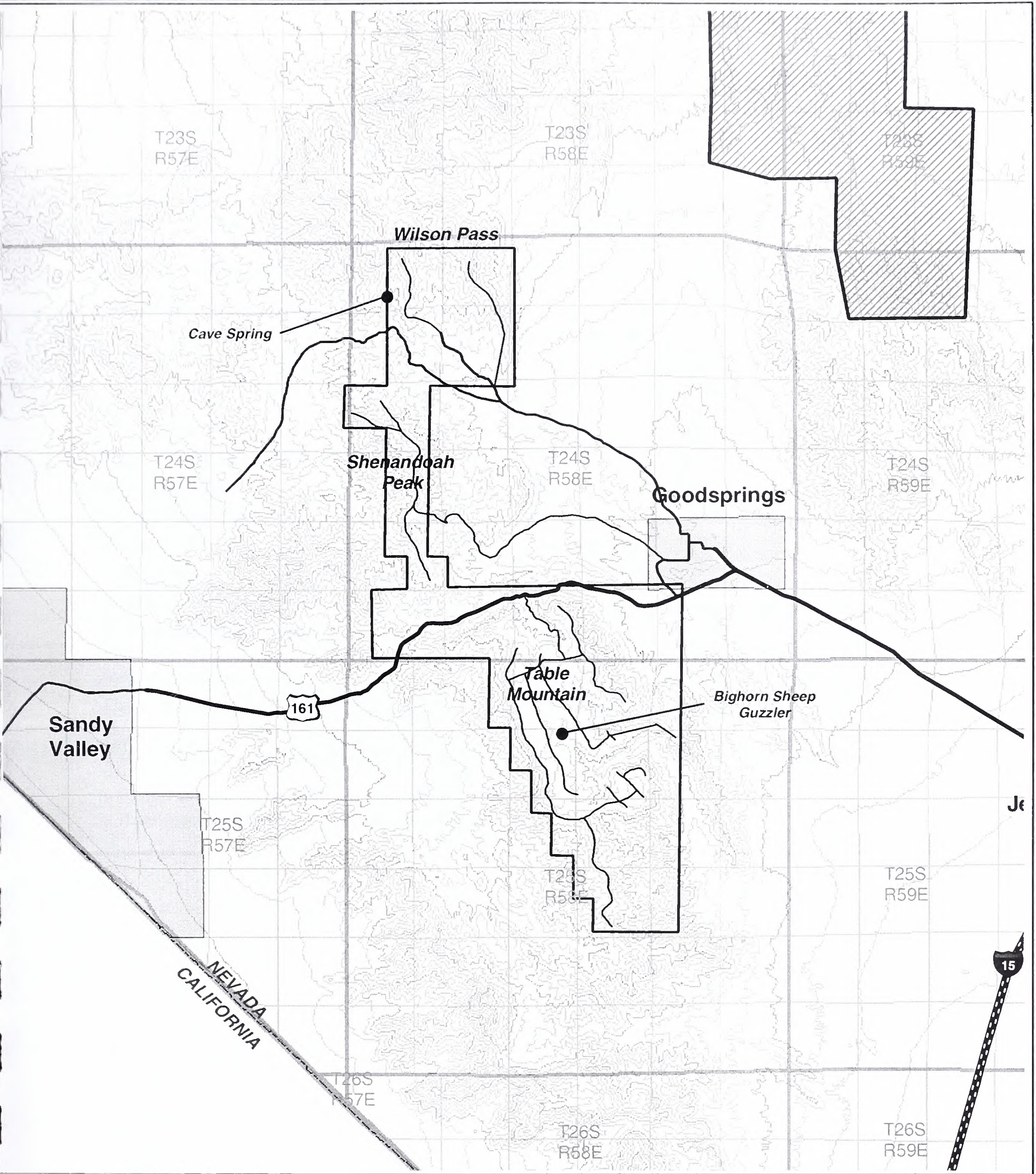


Table Mountain Wind Generating Facility

Legend

▭ Table Mountain Project Area

— Proposed Access and Service Roads

Figure 2
Proposed Action
Site Location

PBS&J
901 N. Green Valley Pkwy, Suite 100
Henderson, Nevada 89074-7105
Phone: 702/263-7275
Fax: 702/263-7200

12/7/01 MC \\VEGAS-GIS\Projects\TableMtnWindPwr\Figure2.mxd

Once operational and depending on wind speeds and conditions, the WGF could run 24 hours per day, 365 days per year, and produce in excess of 460,000,000 kWh of energy annually. The operation would require support from approximately 10 to 20 full-time employees.

The Proposed Action is expected to temporarily disturb 754 ac of undeveloped land during the construction of the project. Once project construction is complete, 449 ac of the temporary construction disturbance would be revegetated, and the remaining facility footprint would constitute a 325-ac permanent disturbance. Each of the project components and their associated temporary and permanent disturbance are described in Table 1.

Table 1. Temporary and Permanent Land Disturbances for Each of the Table Mountain Wind Generating Facility Components.

Project Component	Amount of Disturbance per Project Component	Number of Project Components	Subtotal of Temporary Disturbance (ac)	Subtotal of Permanent Disturbance (ac)
Wind turbine generator corridor	20 mi	–	483	170
Wind turbine generators	0.016 ac	153	(52)[a]	(2.4)
Meteorological towers	0.0001 ac	14	(0.80)	(.002)
Underground utility line[b]	19 mi	–	13.3	5.3
Service roads[c]	20.4 mi	–	11.4	7.5
Access roads	8.0 mi	–	61	30
Overhead electric distribution line	13.1 mi	–	160	96
Materials laydown	5 ac	3	15	6
Electric substation	10 ac	1	10	10
Total			754	325

a. The acreages shown in parentheses are included in the total acreage for the WTG string ROW and are shown here for informational purposes only.

b. 16.8 mi of the underground lines fall within the WTG corridor and impacts are included in WTG corridor.

c. 17.3 mi of service roads lie within the WTG corridor and impacts are included in the WTG corridor.

2.0 METHODOLOGY

2.1 Literature Search and Agency Contacts

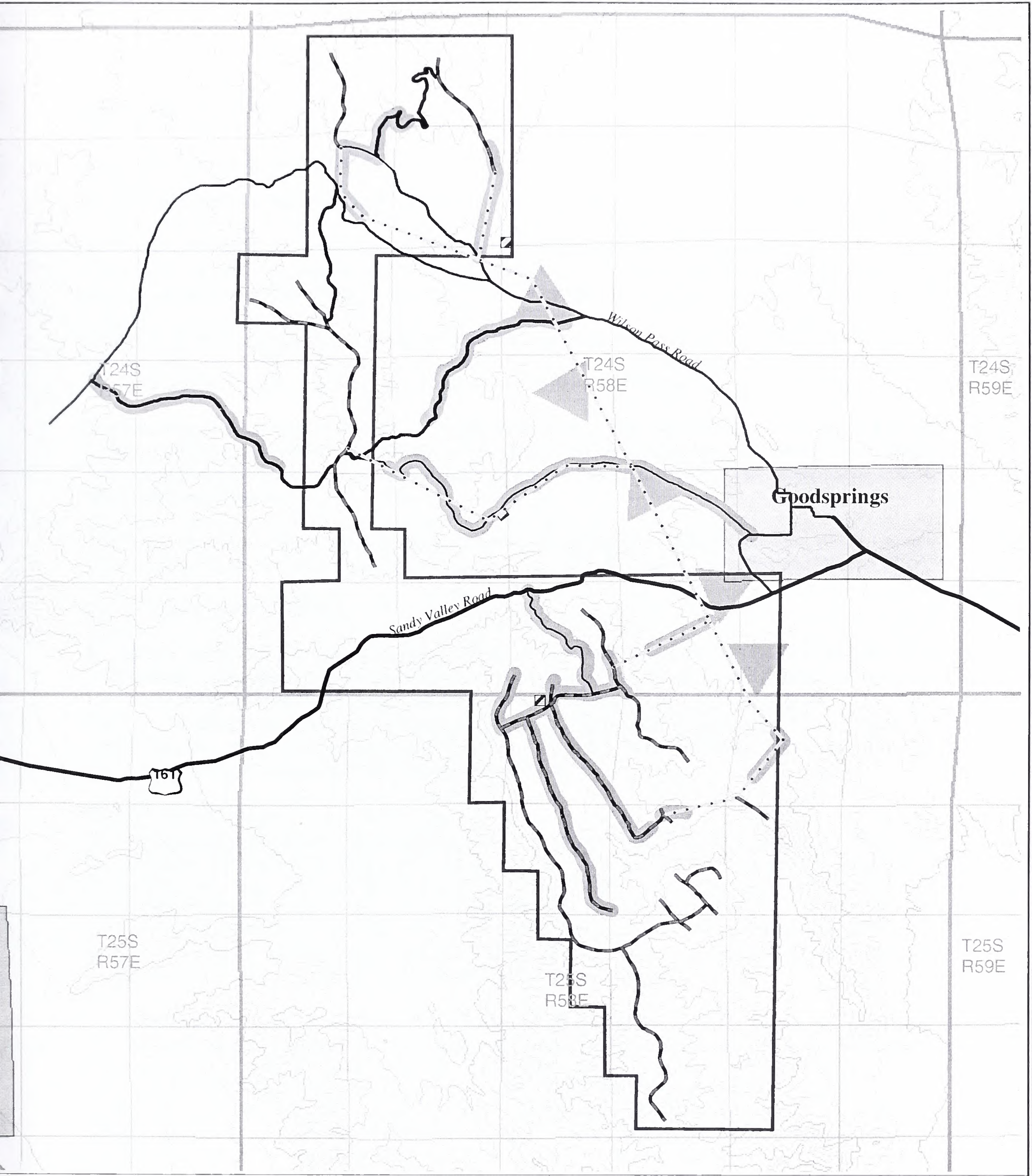
A letter dated March 1, 2001, was sent to the U.S. Fish and Wildlife Service (USFWS) requesting information on threatened and endangered species that may occur in the Table Mountain project area. A USFWS response letter (File No. 1-5-01-SP-464 and File No. 1-5-02-SP-433) dated March 14, 2001, and December 5, 2001, respectively, indicated that the federally listed threatened desert tortoise (*Gopherus agassizii*) was the only listed species that may occur in the vicinity of the proposed Table Mountain project (Attachment A).

Species information and distribution data provided by the Nevada Division of Wildlife (NDOW) and the Nevada Natural Heritage Program (NNHP) were also evaluated for the project area. Specific sources included contacts with Michael Burroughs of the Las Vegas Field Office of the USFWS and Pat Cummings of the NDOW.

2.2 Field Investigations

Field surveys for the desert tortoise were conducted from May 7 through 10, 2001. Surveys along the proposed turbine strings covered a 200-ft-wide corridor. A 100-ft-wide corridor was surveyed along the proposed distribution line corridors. A 60- to 100-ft-wide corridor was surveyed for new road locations, and a 10-meter (m)-wide survey was conducted along the edges of existing roads proposed for widening. Each 5-ac laydown area was surveyed to 100% coverage using 10-m-wide parallel pedestrian transects. On November 14, 16, and 17, 2001, field surveys were performed for the new access road to Shenandoah Peak and the new 10-ac substation location.

The USFWS-approved desert tortoise survey protocol was used to determine tortoise density in the project area. Approximately 300 ac of project area occurring at or below 5,000 ft in elevation were surveyed to 100% coverage for desert tortoise using 10-m-wide parallel pedestrian transects and 1.5-mi triangular transects. The locations of these linear and triangular tortoise survey transects are shown on Figure 3.



Miles
0 0.25 0.5 1

Table Mountain Wind Generating Facility

Legend

▲ ▬ Tortoise Transects

Proposed 34.5 kV
OH Distribution Line

Proposed 34.5 kV
Underground Utility Lines

Proposed Access and
Service Roads

☐ Table Moutain Project Area

50 Meter Contours

200 Meter Index Contours

Figure 3
Desert Tortoise
Survey Transects
in the Project Study Area

PBSJ
901 N. Green Valley Pkwy, Suite 100
Henderson, Nevada 89074-7105
Phone: 702/263-7275
Fax: 702/263-7200

11/28/01 KH \\Vegas-gis\Projects\TableMtnWindPower\FigBioApndxTort.mxd

3.0 RESULTS

3.1 Existing Environment

3.1.1 Topography and Geology

The proposed project area is undeveloped and generally undisturbed. The site is located within the Basin and Range physiographic province in the Eastern Mojave Desert. The Basin and Range is characterized by bedrock mountain ranges separated by broad alluvial valleys formed by normal and thrust faulting.

The majority of the project area is located above 4,500 ft above mean sea level; however, the elevation ranges from approximately 3,780 ft north of Crystal Pass to 6,070 ft north of Wilson Pass. The topography ranges from rolling to extremely steep with slopes that exceed 75% in some areas.

Geology at the site generally consists of well-consolidated sedimentary rock. Barren rock outcrops consisting of limestone, basalt, and andesite are located on the ridges. Surrounding slopes consist of well-drained sandy soils on erosional fan remnants; these are covered with a desert pavement of pebble and cobbles that overlay a lime-cemented hardpan.

The climate is arid, accompanied by extreme temperatures ranging from 20°F to more than 100°F. Overall precipitation is very low, with erratic rainfall patterns that tend to be localized (Bradley and Deacon 1965).

3.1.2 Plant Communities

Four plant communities represented in the project area include blackbrush scrub, Mojave wash scrub, Mojave creosote bush scrub, and pinyon-juniper woodlands. The variation in the plant species throughout the project area is related to the change in elevation, soil, topography, and drainage patterns. The topography ranges from rolling to extremely steep with slopes that exceed 75% in some areas. The WTGs would be located primarily along ridges to optimize the exposure to wind. Blackbrush scrub communities dominate these ridges. The four plant communities occurring in the project area are discussed below.

Blackbrush Scrub

Blackbrush scrub dominates the proposed project area at elevations above 4,000 ft. It typically consists of low, often intricately branched shrubs and occurs on dry, well-drained slopes and on flats that are shallow, often calcareous, soils with very low water-holding capacity. The community is named for the shrub blackbrush (*Coleogyne ramosissima*), which dominates this assemblage. Generally, this community type occurs at elevations between 4,000 and 7,000 ft and often intergrades with Great Basin sagebrush scrub, Joshua tree woodland, or pinyon-juniper woodlands (Holland 1986). Within the project area, blackbrush scrub occurs on the mountaintops, ridges, mountain slopes, and upper bajadas.

On Table Mountain, Joshua trees (*Yucca brevifolia*) and dwarf Joshua trees (*Yucca brevifolia* var. *jaegeriana*) are the most abundant canopy species. Dominant shrubs include blackbrush, Shockley goldenhead (*Acamptopappus shockleyi*), desert tomato (*Lycium andersonii*), spiny menodora (*Menodora spinescens*), Nevada ephedra (*Ephedera nevadensis),* prince's plume (*Stanleya pinnata*), fourwing saltbush (*Atriplex canescens*), cliff rose (*Purshia mexicana*), and winterfat (*Krascheninnikovia lanata*). The dominant herbaceous species are California buckwheat (*Eriogonum fasciculatum polifolium*), skeleton weed (*E. deflexum* var. *deflexum*), and woolly Hermann buckwheat (*E. heermannii* var. *floccosum*). Mojave prickly pear cactus (*Opuntia erinacea* var. *erinacea*), beehive cactus (*Escobaria vivipara desertii*), beavertail cactus (*Opuntia basilaris* var. *basilaris*), and Mojave mound cactus *(Echinocereus triglochidiatus*) are the dominant cacti.

Common shrubs along the Shenandoah Peak ridgeline are big sagebrush (*Artemisia tridentata*), spiny menodora, and green ephedra (*Ephedra viridis*). On extensive slabs of limestone and exposed ridges, Utah agave (*Agave utahensis*), yellow cryptantha (*Cryptantha confertifolia*), and cottontop cactus (*Echinocactus polycephalus* var. *polycephalus*) are common. On the slopes below the ridges and on the upper bajadas, the community consists of a high diversity of species, including Joshua tree, Mojave yucca (*Yucca schidigera*), banana yucca (*Y. baccata*), spiny menodora, desert tomato, Nevada ephedra, Shockley goldenhead, cheesebush (*Hymenoclea salsola*), spiny hopsage (*Grayia spinosa*), and fourwing saltbush.

North of Wilson Pass, Joshua tree, Mojave yucca, and banana yucca comprise the overstory. Dominant shrub species include apache plume (*Fallugia paradoxa*), and turpentine broom (*Thamnosma montana*), while Parish golden-eye (*Viguiera parishii*), and California buckwheat dominate the herbaceous layer. Dominant cacti include Mojave prickly pear and beehive cactus. This community intergrades with the pinyon-juniper woodlands community at elevations above 5,600 ft near the northern terminus of the project area.

Mojave Creosote Bush Scrub

Mojave creosote bush scrub is a widespread plant community and the most common type found in the Mojave Desert below about 4,000 ft (Holland 1986; Rowlands et al. 1982; Vasek and Barbour 1977). It is characterized by widely spaced shrubs that are 2 to 8 ft tall. Creosote bush (*Larrea tridentata*) and burro bush (*Ambrosia dumosa*) often are the codominants in this community type. The proposed project area supports a Mojave creosote bush scrub community at the lower elevations northeast of Table Mountain. These areas are dominated by creosote bush, burro bush, Nevada ephedra, range ratany (*Krameria parvifolia*), winterfat, prince's plume (*Stanleya pinnata*), red brome (*Bromus rubens*), desert larkspur (*Delphinium parishii*), and globe mallow (*Sphaeralcea ambigua*). Mojave yucca and Joshua trees comprise the overstory. Cacti in these areas include cottontop cactus (*Echinocactus polycephalus*), silver cholla (*Opuntia echinocarpa*), beavertail cactus, Mojave prickly pear, and beehive cactus.

Mojave creosote bush scrub vegetation transitions to blackbrush scrub at elevations near 4,000 ft. The replacement of white bursage by blackbrush typically demarcates this ecotonal boundary. This transitional zone is comprised of plant species from both assemblages and includes, creosote bush, blackbrush, Joshua tree, Mojave yucca, sweetbush (*Bebbia juncea*), spiny menodora, desert tomato, Nevada ephedra, green ephedra, Shockley goldenhead, cheesebush, spiny hopsage, fourwing saltbush, Pima ratany (*Krameria erecta*), burro bush, turpentine broom, Apache plume, Mojave sage (*Salvia mohavensis*), blue sage (*Salvia dorrii*), desert marigold (*Baileya multiradiata*), and desert tobacco (*Nicotiana obtusifolia*). In addition to the cacti noted to occur in the creosote scrub community, species inhabiting the transitional zone include hedgehog cactus (*Echinocereus engelmannii*) and barrel cactus (*Ferocactus cylindraceus* var. *lecontei*).

Mojave Wash Scrub

In the project area, the wash scrub community is generally composed of species from the adjacent communities, but tends to have higher plant density and supports greater species diversity than the adjacent areas. The wash scrub community occurs in Deadman's Canyon, Keystone Wash, and the washes east and northeast of Shenandoah Peak near Yellow Pine, Pilgrim, and Cosmopolitan mines. Common plants within this community type include paper-bag bush (*Salazaria mexicana*), cheesebush, blackbrush, Joshua tree, Mojave yucca, green ephedra, desert tomato, Nevada ephedra, creosote bush, blue sage, apache plume, matchweed (*Gutierrezia microcephala*), desert almond, and scented beardtongue (*Penstemon palmeri*). Common plants in the drainages include apache plume, desert almond (*Prunus fasciculata*), and scented beardtongue.

Pinyon-Juniper Woodland

Pinyon-juniper woodlands are open woodlands codominated by singleleaf pinyon (*Pinus monophylla*) and one of several species of juniper (*Juniperus* sp.), with an open shrubby understory of species commonly found

in adjacent communities. It occurs in desert mountain ranges, usually at elevations between 4,000 and 8,000 ft.

A small area of pinyon-juniper woodland occurred at the extreme northern end of the project area near Wilson Pass and Mount Potosi. The vegetation in this area is dominated by singleleaf pinyon and Utah juniper (*Juniperus osteosperma*). Dominant woody shrubs include blackbrush and cliff rose, and the herbaceous vegetation includes California buckwheat.

3.2 Federal Threatened and Endangered Species

The desert tortoise is the only federal T&E species reported to occur in the project area, based on information compiled from lists maintained by the USFWS and the NNHP.

Desert Tortoise

On April 2, 1990, the USFWS listed the Mojave desert tortoise (*Gopherus agassizii*) population as threatened as a result of significant population decline and habitat loss, thereby bringing it under full protection of the ESA, as amended. In Nevada, the desert tortoise has been categorized as "protected" pursuant to Nevada Revised Statute (NRS) 501.110 and Nevada Administrative Code (NAC) 503.080 and 503.090. Critical habitat for the desert tortoise was designated on March 10, 1994 (59 Federal Register 5820). Designated critical habitat for the desert tortoise does not occur in the project area.

The desert tortoise occurs on arid lands, typically in association with low desert creosote bush scrub communities. These communities are dominant below elevations of 5,000 ft and are characterized by perennial shrubs, creosote bush, bursage, Joshua trees, cacti, grass, and a large variety of other perennial and annual plants. Preferred desert tortoise habitat includes scattered shrubs and a sufficient herbaceous understory layer to provide food and water needs. The desert tortoise occurs most often on flats and bajadas characterized by sandy to sandy-gravelly soils, but may also occur on slopes and in rocky soils.

Results of all surveys completed for this project were calculated based upon the linear regression model created by Berry and Nicholson (1984) and amended by the Las Vegas District of BLM (based on work by Karl [1980]) because the original model is believed to overestimate tortoise population densities in Nevada (Table 2 and Table 3). Therefore, the Nevada figures were used to estimate tortoise densities for this survey (Table 4 and Table 5).

A total of 34 tortoise sign (burrows, tracks, live tortoises, scat or droppings, skeletal parts, or carcasses) were observed within the approximately 300-ac area that was surveyed. Consideration of only total sign would result in overestimation of tortoise population densities; therefore, total sign was adjusted to account for sign clearly attributable to the same tortoise. Corrected sign was 33. Survey results demonstrate that desert tortoise population densities range from very low to low in the project area.

Table 2. Relationship between Sign Count per Triangular-Strip Transect Survey, Sign Observed per Acre, and Tortoise Density Estimates.

Number of Corrected Sign/Triangle Transect			Density Range	
California[a]	Nevada[b]	Regression Equation	California[a]	Nevada[b]
0	1	0	0–20	0–10
1–3	1–3	8–15	20–50	10–45
4–9	–	26–81	50–100	–
–	4–7	–	–	45–90
10–15	–	92–148	100–250	–
–	8–11	–	–	90–40
15+	–	159+	250+	–
–	12+	–	–	140+

a. Source: Berry and Nicholson (1984). Regression equation used:
Tortoises per square mile (sq mi) (640 ac) = 4[(CS-1.68)/0.35], where CS = corrected sign.

b. From information developed by the Las Vegas District of BLM (based on work by Karl [1980]). Density ranges were developed for the Las Vegas District of BLM because it was believed that estimated ranges for California overestimated actual tortoise population densities in Nevada.

Table 3. Estimated Tortoise Density Ranges Related to Survey Results.

Number of Corrected Sign per Triangular-Strip Transect	Corrected Sign per Acre[a]	Nevada Range (Number per sq mi)	Relative Density
0	0	0–10	Very Low
1–3	0.1–0.5	10–45	Low
4–7	0.6–1.1	45–90	Moderate
8–11	1.3–1.8	90–40	High
12+	1.9+	140+	Very High

a. Based on an approximation of 6 ac surveyed during a typical triangular survey.

Table 4. Survey Results and Estimated Desert Tortoise Density Ranges Related to 100% Coverage for the Table Mountain Wind Generating Facility.

Site	Area Surveyed (ac)	Burrows[a]	Scat	Carcass[b]	Total Sign	Corrected Sign	Corrected Sign per Acre	Density Estimates[c]	Relative Density[c]
Wilson pass lay down area	5.7	–	–	–	0	0	0	0–10	Very Low
Original Shenandoah lay down area	5.7	–	–	–	0	0	0	0–10	Very Low
New Shenandoah lay down area	5.0	2	–	–	2	1	0.20	10–45	Low
Original substation location	11.2	1	–	–	1	1	0.09	10–45	Very Low
New substation location	10.0	–	–	1	1	1	0.10	10–45	Low
Table Mountain lay down area	5.7	–	–	–	0	0	0	0–10	Very Low
Access roads	136.4	9	2	3	14	14	0.10	10–45	Low
Tower array	81.0	11	2	1	14	14	0.17	10–45	Low
Total	260.7	23	4	4	32	31	0.15	10–45	Low

a. Burrows also include caves and rock or caliche dens. Tortoise burrows currently active, recently active, and/or in good, fair, and poor conditions were used in these calculations (Murphy 2000).

b. Carcasses include bones, scutes, plastrons, and shells.

c. Tortoise population densities based on Tables 1 and 2.

Table 5. Estimated Desert Tortoise Population Density Ranges Related to Results of Triangle Transect Surveys Conducted along the Transmission Line Corridor.

Transect[a]	Area Surveyed (ac)	Burrows[b]	Scat	Live Tortoise	Total Sign	Corrected Sign	Tortoises (sq mi[c])	Relative Density[c]
1	6 ac	–	–	–	–	–	0–10	Very Low
2	6 ac	–	–	–	–	–	0–10	Very Low
3	6 ac	–	–	–	–	–	0–10	Very Low
4	6 ac	2	–	–	2	2	10–45	Low
5	6 ac	–	–	–	–	–	0–10	Very Low
Total	30 ac	2	–	–	2	2	0–10[d]	Very Low[d]

a. Based on an approximation of 6 ac surveyed during a typical triangle survey.

b. Burrows also include caves and rock or caliche dens. Burrows definitely attributable to desert tortoise were considered in these calculations.

c. Tortoise population densities based on Tables 1 and 2.

d. Two corrected sign per 30 ac surveyed using this methodology = 0.7 sign/ac = very low tortoise population density (Table 3).

4.0 ENVIRONMENTAL IMPACTS

Potential direct impacts on biological resources are associated with construction activity and the associated loss of habitat and effects on individual animals. Potential indirect impacts from construction and operation of the proposed project include increased levels of noise, night lighting, increased levels of traffic, increased human presence, illegal dumping, and illegal collection of species.

4.1 Direct Impacts on Desert Tortoise

While most of Clark County is considered desert tortoise habitat, tortoise population densities within the Proposed Action area ranges from low to very low. Direct impacts on the desert tortoise resulting from construction activity would include removal of habitat, loss or displacement of habitat features such as cover and forage, and crushing and/or loss of individual animals. The Proposed Action would result in the total disturbance of approximately 270 ac of tortoise habitat as described in Table 6. Permanent impacts on tortoise habitat would total approximately 110 ac.

Since the proposed project "may affect" the desert tortoise, remuneration fees would likely be required for impacts on desert tortoise habitat. In accordance with the Desert Conservation Plan, mitigation fees of $623 per ac (adjusted to year 2001) of disturbance to tortoise habitat on BLM land would be paid by TMWC to Clark County. This project would disturb 270 ac of desert tortoise habitat, for a total of $168,210, if paid in the year 2001.

4.2 Indirect Impacts on Desert Tortoise

Indirect impacts associated with operation activities include indirect degradation of habitat due to soil disturbance, habitat fragmentation, increased human activity, and a greater risk of predation on juveniles by raptors that would use the distribution line structures for perching sites.

Potential indirect impacts associated with construction of the facility include increased levels of noise, traffic, equipment movement, and improved access and could result in increased opportunities for illegal collection.

Table 6. Potential Disturbance of Desert Tortoise Habitat within the Table Mountain Wind Generation Facility Project Area.

Project Component	Subtotal of Permanent Disturbance (ac)
Wind turbine generator corridor	116
Wind turbine generators	(2.0)[a]
Meteorological towers	(0.0014)
Underground utility line	0.0[b]
Service roads	(5)
Access roads	30
Overhead electric distribution line	101
Materials laydown	6
Electric substation	10
Total	270

a. Acreages in parentheses are included in the total acreage for the WTG corridor and shown for informational purposes only.

b. 17 of the 21 total mi of underground lines fall within the WTG corridor and impacts are included in the WTG corridor.

5.0 RECOMMENDED CONSERVATION AND RECOVERY MEASURES

Conservation and recovery measures, approved by the federal agencies, would be incorporated into the project to minimize direct and indirect impacts to acceptable levels or to prevent these impacts altogether. These measures would be implemented, upon USFWS approval, before proceeding with earthmoving and construction activities. Implementation of these measures would reduce the potential to adversely affect the desert tortoise.

Conservation and recovery measures recommended for this project are based on biological opinions rendered by USFWS on other projects affecting desert tortoise. All temporary disturbances will require restoration efforts consistent with the BLM Las Vegas Field Office draft restoration plan. This restoration plan outlines restoration techniques based on habitat sensitivity and degree of disturbance. Other mitigation measures will include:

- Desert tortoise protection education
- Flagging construction boundaries
- Tortoise removal
- Speed limits and signage
- Trash and litter control
- Spill handling procedures
- Construction methods
- Construction monitoring
- Signage
- Habitat compensation
- Reporting requirements.

5.1 Desert Tortoise Protection Education

A desert tortoise education program would be presented to all personnel on-site during construction and operation of the proposed project. This program would contain information concerning the biology and distribution of the desert tortoise, its legal status and occurrence in the proposed project area, the definition of "take" and associated penalties, measures designed to minimize the effects of construction activities, the means by which employees can help facilitate this process, and reporting procedures to be implemented when desert tortoises are encountered.

5.2 Flagging Construction Boundaries

All areas to be disturbed would have boundaries flagged before beginning the activity, and all disturbances would be confined to the flagged areas. All project personnel would be instructed that their activities must be confined to locations within the flagged areas. Disturbance beyond the actual construction zone is prohibited.

5.3 Tortoise Removal

Before surface-disturbing activities within tortoise habitat begin (below an elevation of 5,000 ft), a qualified biologist would conduct a clearance survey to locate and remove tortoises using techniques providing full coverage of all areas. Two complete passes of complete coverage would be accomplished. All desert tortoise burrows, and other species' burrows that may be used by tortoises, would be examined to determine occupancy of each burrow by desert tortoises.

All burrows found within areas proposed for disturbance, whether occupied or vacant, would be excavated by a qualified biologist and collapsed or blocked to prevent desert tortoise reentry. All burrows would be excavated with hand tools to allow removal of desert tortoises or desert tortoise eggs. All desert tortoise handling and burrow excavations, including nests, would be conducted by a qualified desert tortoise biologist in accordance with USFWS-approved protocol (Desert Tortoise Council 1994, revised 1999).

All located desert tortoises and desert tortoise eggs would be relocated off-site 300 to 1,000 ft into adjacent undisturbed habitat. Tortoises found aboveground would be placed under a marked bush in the shade. A tortoise located in a burrow would be placed in an existing unoccupied burrow of the same size and orientation as the one from which it was taken. If a suitable natural burrow is unavailable, a qualified biologist would construct one of the same size and orientation as the one from which it was removed using the protocol for burrow construction in Section B-5-f (Desert Tortoise Council 1994, revised 1999). Any tortoise found within 1 hour before nightfall would be placed in a separate clean cardboard box and held overnight in a cool and predator-free location. The box would be covered and kept upright at all times to minimize stress to the tortoise. Each box would be used once and then disposed of properly. The tortoise would be released the next day in the same area from which it was collected and using the procedures described above. Each tortoise would be handled with new disposable latex gloves. After use, the gloves would be properly discarded and a fresh set would be used for each subsequent tortoise handling.

5.4 Speed Limits and Signage

Vehicles shall not exceed 25 mi per hour on access roads during periods of highest tortoise activity (March 1 through November 1). Speed limit signage would be installed. Caution signs indicating the presence of desert tortoise would be posted at the beginning of the access road, midway to the project, and at the project site entrance. Qualified on-site biologists would monitor speed limit compliance during construction.

5.5 Trash and Litter Control

Trash and food items would be disposed of promptly in predator-proof containers with resealing lids. Trash includes, but is not limited to, cigarettes, cigars, gum wrappers, tissue, cans, paper, and bags. Trash containers would be emptied daily, and waste would be removed from the area and disposed of in an approved off-site landfill. Trash removal would reduce the attractiveness of the area to opportunistic predators such as desert kit fox, coyotes, and common ravens. Construction waste including, but not limited to, broken parts, wrapping material, cords, cables, wire, rope, strapping, twine, buckets, metal or plastic containers, boxes, and welding rods would be removed from the site daily and disposed of properly.

5.6 Spill Handling Procedures

All fuel, transmission or brake fluid leaks, or other hazardous waste leaks, spills, or releases would be reported immediately to a designated environmental supervisor. The environmental supervisor shall be responsible for spill material removal and disposal to an approved off-site landfill and possibly notifying the appropriate federal agency.

5.7 Construction Methods

The following construction methods would be implemented:

- Cross-country travel and travel outside construction zones would be prohibited.
- Stockpile sites, turnaround areas, and staging areas would be located on previously disturbed areas to the greatest extent feasible.
- Open trenches or holes that pose a tortoise entrapment and injury risk would be capped and/or escape ramps would be located not less than every 1,000 ft.
- Stockpiled pipes that could attract tortoises would be capped or checked by a biological monitor before use.
- Antiperching devices would be installed on transmission towers to reduce avian predation on juvenile tortoises.

5.8 Construction Monitoring

During construction activities, qualified on-site biologists would monitor for tortoises and move them if necessary, provide instruction as needed, and monitor and report on compliance.

5.9 Habitat Compensation

In accordance with the Desert Conservation Plan, mitigation fees of $623 per ac of disturbance to tortoise habitat on BLM land would be paid by TMWC to Clark County. This project would disturb 270 ac of tortoise habitat, for a total of $168,210, if paid in the year 2001. This cost would be indexed for inflation, and it would be adjusted for the year the right-of-way is approved.

5.10 Reporting Requirements

The on-site biologist would record each observation of desert tortoise handled. Information would include the following: location, date and time of observation, whether the tortoise was handled, the general health of the tortoise and whether it voided its bladder, the location the tortoise moved from and the location it moved to, and unique physical characteristics. Reports documenting effectiveness and compliance with the tortoise protection measures would be prepared every 6 months. A final report would be reviewed and approved by the BLM and then submitted to USFWS within 90 days of completion of construction.

6.0 REFERENCES AND LITERATURE CITED

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Attachment A

Agency Correspondence

United States Department of the Interior

FISH AND WILDLIFE SERVICE
NEVADA FISH AND WILDLIFE OFFICE
1340 FINANCIAL BOULEVARD, SUITE 234
RENO, NEVADA 89502

December 5, 2001
File No. 1-5-02-SP-433

Ms. Kelly Shook
PBS&J
901 North Green Valley Parkway, Suite 100
Henderson, Nevada 89014-6139

Dear Ms. Shook:

Subject: Updated Species List for the Proposed Table Mountain Wind Power Project in the Spring Mountains, Clark County, Nevada

This responds to your letter we received on December 4, 2001, requesting an updated list of threatened and endangered species and species of concern that may occur in the subject project area. The list we previously provided to you on March 14, 2001, has not changed. We are enclosing the list with our letter. This fulfills the requirement of the U.S. Fish and Wildlife Service (Service) to provide information on threatened and endangered species pursuant to section 7(c) of the Endangered Species Act of 1973, as amended, for projects that are authorized, funded, or carried out by a Federal agency. Please reference the species list file number shown above in all subsequent correspondence concerning this project.

Please contact Jeri Krueger of the Southern Nevada Field Office at 702-647-5230, if you have questions regarding the enclosed list.

Sincerely,

For Robert D. Williams
Field Supervisor

Enclosure

ENCLOSURE A

LISTED SPECIES AND SPECIES OF CONCERN THAT MAY OCCUR IN THE VICINITY OF THE PROPOSED TABLE MOUNTAIN WIND POWER PROJECT, SPRING MOUNTAINS, CLARK COUNTY, NEVADA

File Number: 1-5-02-SP-433
December 5, 2001

Listed Species

Reptile	
Desert tortoise (T)	*Gopherus agassizii*

T = Threatened

Species of Concern

Birds	
Western burrowing owl	*Athene cunicularia hypugea*
Olive-sided flycatcher	*Contopus borealis*
Gray flycatcher	*Empidonax wrightii*
American peregrine falcon	*Falco peregrinus anatum*
Phainopepla	*Phainopepla nitens*
Mammals	
Pale Townsend's big-eared bat	*Corynorhinus townsendii pallescens*
Spotted bat	*Euderma maculatum*
Greater western mastiff bat	*Eumops perotis californicus*
Allen's big-eared bat	*Idionycteris phyllotis*
California leaf-nosed bat	*Macrotus californicus*
Small-footed myotis	*Myotis ciliolabrum*
Long-eared myotis	*Myotis evotis*
Fringed myotis	*Myotis thysanodes*
Long-legged myotis	*Myotis volans*
Yuma myotis	*Myotis yumanensis*
Big free-tailed bat	*Nyctinomops macrotis*
Reptiles	
Banded Gila monster	*Heloderma suspectum cinctum*
Chuckwalla	*Sauromalus obesus*

ENCLOSURE A (cont)

File Number: 1-5-02-SP-433
December 5, 2001

Invertebrates	
Spring Mountains acastus checkerspot butterfly	*Chlosyne acastus robusta*
Dark blue butterfly	*Euphilotes enoptes purpurea*
Morand's checkerspot butterfly	*Euphydryas anicia morandi*
Spring Mountains comma skipper	*Hesperia comma mojavenis*
Charleston ant	*Lasius nevadensis*
Nevada admiral butterfly	*Limenitus weidemeyerii nevadae*
Spring Mountains icarioides blue butterfly	*Plebejus icarioides austinorum*
Spring Mountains blue butterfly	*Plebejus shasta charlestonensis*
Spring Mountains springsnail	*Pyrgulopsis deaconi*
Carole's silverspot butterfly	*Speyeria zerene carolae*
Plants	
Rough angelica	*Angelica scabrida*
Black woolypod	*Astragalus funereus*
Halfring milkvetch	*Astragalus mohavensis* var. *hemigyrus*
Spring Mountains milkvetch	*Astragalus remotus*
Smooth dwarf greasebush	*Glossopetalon pungens* var. *glabra*
Dwarf greasebush	*Glossopetalon pungens* var. *pungens*
Jaeger ivesia	*Ivesia jaegeri*
Yellow twotone beardtongue	*Penstemon bicolor* ssp. *bicolor*
Death Valley beardtongue	*Penstemon fruticiformis* ssp. *amargosae*
Utah spikemoss	*Selaginella utahensis*

United States Department of the Interior

FISH AND WILDLIFE SERVICE
NEVADA FISH AND WILDLIFE OFFICE
1340 FINANCIAL BOULEVARD, SUITE 234
RENO, NEVADA 89502

March 14, 2001
File No. 1-5-01-SP-464

Ms. Kelly Shook
PBS&J
901 North Green Valley Parkway, Suite 100
Henderson, Nevada 89014-6139

Dear Ms. Shook:

Subject: Species List for the Proposed Table Mountain Wind Power Project in the Spring Mountains, Clark County, Nevada

This responds to your letter dated March 1, 2001, requesting information on threatened and endangered species that may occur in the subject project area. Enclosure A lists the threatened and endangered species that *may* be present within the proposed project site. This fulfills the requirement of the U.S. Fish and Wildlife Service (Service) to provide information on threatened and endangered species pursuant to section 7(c) of the Endangered Species Act of 1973, as amended, for projects that are authorized, funded, or carried out by a Federal agency. Please reference the species list file number shown above in all subsequent correspondence concerning this project.

Enclosure A also lists the species of concern to the Service that may occur in the project area. The Service has used information from State and Federal agencies and private sources to assess the conservation needs and status of these species. Further biological research and field study are needed to resolve the conservation status of these taxa. One potential benefit of considering these species during project planning, is that by exploring alternatives early in the planning process, it may be possible to provide long-term conservation benefits for these species and avoid future conflicts that could otherwise develop.

We also recommend that you contact the Nevada Natural Heritage Program (1550 East College Parkway, Suite 145, Carson City, Nevada 89710, 775-687-4245) and the appropriate regional office of the Nevada Division of Wildlife, as well as other local, State, and Federal agencies, for distribution data and information on conservation needs for these and other species of concern that may occur in your project area. Potential impacts to species of concern should be considered during the environmental documentation process.

The proposed project may necessitate the removal of vegetation during construction. We recommend vegetation clearing (or other surface disturbance) be timed to avoid potential destruction of active bird nests or young of birds that breed in the area. Such destruction may be in violation of the Migratory Bird Treaty Act (15 U.S.C. 701-718h). Under this act, active nests (nests with eggs or young) of migratory birds may not be harmed, nor may migratory birds be killed. Therefore, we recommend that land clearing be conducted outside the avian breeding season. If this is not feasible, we recommend that a qualified biologist survey the area prior to land clearing. If active nests are located, or if other evidence of nesting (mated pairs, territorial defense, carrying nesting material, transporting food) is observed, a protective buffer (the size depending on the requirements of the species) should be delineated and the entire area avoided to prevent destruction or disturbance to nests until they are no longer active.

We are concerned with the possible effects of wind power turbines on migratory birds, especially in areas such as the Spring Mountains where forested landscapes and cooler climates may be particularly attractive to birds. Impacts to migratory birds from operation of wind power turbines should be considered during the environmental assessment process, as well as alternatives for location, design, and operation of this facility that may reduce potential impacts to migratory birds.

Please contact Jeri Krueger of the Southern Nevada Field Office, at 702-647-5230 if you have questions regarding the enclosed list.

Sincerely,

Michael Burroughs

for Robert D. Williams
Field Supervisor

Enclosure

ENCLOSURE A

LISTED SPECIES AND SPECIES OF CONCERN THAT MAY OCCUR IN THE VICINITY OF THE PROPOSED TABLE MOUNTAIN WIND POWER PROJECT, SPRING MOUNTAINS, CLARK COUNTY, NEVADA

File Number: 1-5-01-SP-464
March 14, 2001

Listed Species

Reptile

Desert tortoise (T)	*Gopherus agassizii*

E = Endangered; T = Threatened

Species of Concern

Birds

Western burrowing owl	*Athene cunicularia hypugea*
Olive-sided flycatcher	*Contopus borealis*
Gray flycatcher	*Empidonax wrightii*
American peregrine falcon	*Falco peregrinus anatum*
Phainopepla	*Phainopepla nitens*

Mammals

Pale Townsend's big-eared bat	*Corynorhinus townsendii pallescens*
Spotted bat	*Euderma maculatum*
Greater western mastiff bat	*Eumops perotis californicus*
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Long-legged myotis	*Myotis volans*
Yuma myotis	*Myotis yumanensis*
Big free-tailed bat	*Nyctinomops macrotis*

Reptiles

Banded Gila monster	*Heloderma suspectum cinctum*
Chuckwalla	*Sauromalus obesus*

ENCLOSURE A (cont)

File Number: 1-5-01-SP-464
March 14, 2001

Invertebrates

Spring Mountains acastus checkerspot butterfly	*Chlosyne acastus robusta*
Dark blue butterfly	*Euphilotes enoptes purpurea*
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Spring Mountains blue butterfly	*Plebejus shasta charlestonensis*
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Carole's silverspot butterfly	*Speyeria zerene carolae*

Plants

Rough angelica	*Angelica scabrida*
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