Chapter 2
Alternatives Including the Proposed Action

2.1 Introduction

Five general alternatives including the Proposed Action were evaluated to meet the purpose and need to increase the reliability and capacity of the transmission system to the Las Vegas Valley and the western United States. These alternatives are listed as follows:

- No Action
- Proposed Action
- Siting Alternatives
- Alternative Transmission Technologies
- Energy Conservation and Load Management

The Proposed Action and the no-action alternative are discussed in Section 2.2 as alternatives evaluated in detail. The remaining three alternatives are discussed in Section 2.3, Alternatives Considered but Eliminated.

2.2 Alternatives Evaluated in Detail

2.2.1 No Action

The no-action alternative is required under the National Environmental Policy Act (NEPA) and by the Council of Environmental Quality (CEQ) regulation (40 CFR 1500-1508). Under the no-action alternative, the facilities to increase transmission capacity would not be constructed. The no-action alternative would not meet the purpose and need of the Proposed Action.

If the no-action alternative were selected, Nevada Power would most likely be required to take additional measures to compensate for the anticipated shortfall in the supply of electric power for the Las Vegas Valley. Additionally, Nevada Power is mandated by the Federal Energy Regulatory Commission (FERC) to provide reasonable transmission access to the competing independent power providers in and around the Las Vegas Valley. The no-action alternative would not meet this requirement nor would it fulfill the Refiled 2001 Resource Plan approved by the Public Utility Commission (PUC).

2.2.2 Proposed Action

Nevada Power has developed the Proposed Action scenario to provide the best balance of objectives including 1) needed power capacity, 2) use of existing utility corridors to minimize environmental impacts, and 3) design/construction techniques to avoid unnecessary costs for the proposed project. This balance was conceived to provide an action and transmission route that would be acceptable to local administrative agencies with jurisdiction over the project and the affected public. The Proposed Action meets the mandates of the Federal Lands Policy and Management Act (FLPMA) of 1976, which requires the Bureau of Land Management (BLM) to consolidate corridors on public lands to the extent practicable. The Proposed Action also complies with the corridor stipulation and guidelines of the BLM's Resource Management Plan (1998).

Nevada Power has applied for appropriate permits and licenses to construct, operate and maintain a 500kV transmission line within a 200-foot right-of-way for a distance of 48 miles. In areas where the proposed alignment would cross over or under existing transmission lines, the right-of-way width may have to expand up to 400 feet to accommodate the crossing structures.

Proposed Route

Three route alternatives (shown in Figure 2-1) were identified for the transmission line running from the Harry Allen Substation to the Mead Substation. A siting study was conducted by Nevada Power (2001) to assess the three alternatives and to determine the "best route," considering use of existing corridors and minimizing environmental and engineering impacts.

The three alternative routes have 40 miles in common; however, the Proposed Route (Route C) is the shortest route at 48 miles. The Proposed Route provides a balance of 1) paralleling existing transmission lines, 2) using existing corridors, 3) minimizing environmental impacts, and 4) employing best engineering design/routing to reduce costs. For more information about the two routes considered but eliminated from further study, refer to Section 2.3 later in this chapter.

Substation Requirements

Improvements to accommodate the termination of the proposed line have been completed at the Harry Allen Substation. At Mead Substation, improvements would involve a 500kV line terminal expansion of the 500kV substation yard, 500kV to 230kV transformer and 230kV line terminal. This work at the Mead Substation would be within existing fence lines on previously disturbed areas. Western would manage all work within the Mead Substation.

Transmission Line Design

The Proposed Action's design, construction, operation and maintenance would meet or exceed the requirements of the National Electrical Safety Code (NESC), U.S. Department of Labor, Occupational Safety and Health Standards and Nevada Power's own requirements for safety and protection of construction and maintenance workers, landowners and their property.

The electrical characteristics of the Harry Allen–Mead 500kV Transmission Line are shown in Table 2-1. Specific details of the design elements follow.

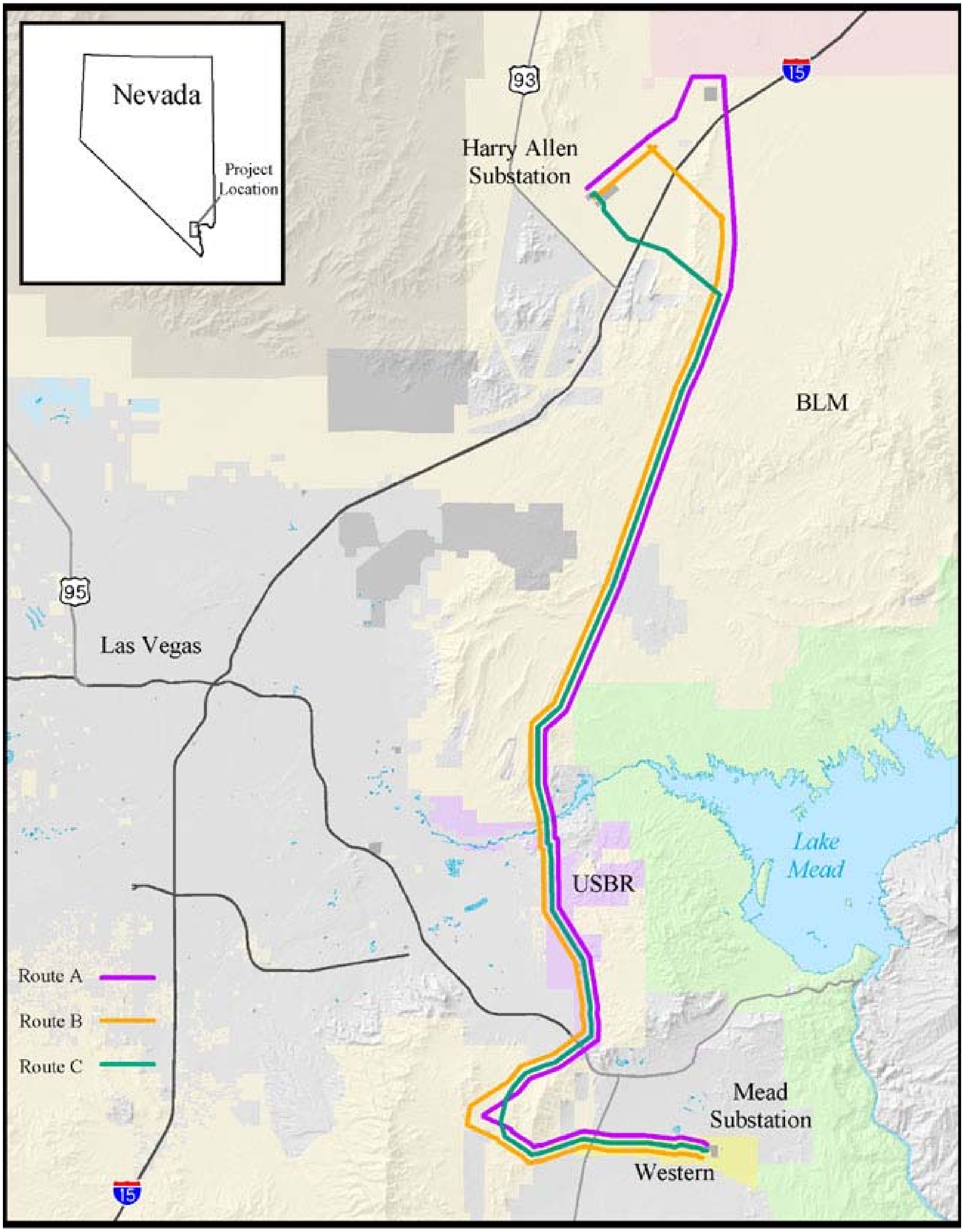

Figure 2-1 Alternative Routes

Table 2-1 Electrical Design Characteristics of the Harry Allen–Mead 500kV Transmission Line

Feature	Description
Line Length	48 miles
Type of Structure	Self-supporting steel lattice towers and tubular steel poles
Structure Height	Lattice towers – 125 to 190 feet Poles – 130 to 190 feet
Average Ruling Span Length	Lattice towers – 900 to 1,400 feet Poles – 600 to 800 feet
Number of Structures per Mile	4-9
Right-of-Way Width	200 feet and 400 feet at line crossings
Land Temporarily Disturbed	
Structure Work Area	200 to 250 feet x right-of-way width per structure
Wire-Pulling Sites	right-of-way width x 700 feet approx. every 6 miles
Wire-Tensioning Sites	right-of-way width x 700 feet approx. every 6 miles
Wire-Splicing Sites	100 x 100 feet approx. every 6 miles
Construction Yards	To be determined in Final Plan of Development
Guard Structure Work Area	100 feet x right-of-way width adjacent to roads/electrical lines
Crossings Work Area	400 X 200 feet per crossing
Land Permanently Required	
Structure Base (lattice and poles)	100 x 100 feet per structure
Line Crossings	300 x 100 feet per crossing
Permanent crane pads	250 X 200 feet approx. 30
Access Roads	
New Roads Required	Approximately 1 mile per mile of transmission line where new roads are required and 1/10 mile per mile of transmission line where new spur roads are needed
Upgrade Existing Roads	To be determined in Final Plan of Development
Electrical Properties	
Nominal Voltage	525,000 volts (500kV) Alternating Current (AC)
Capacity	1500 to 2000 MW
Circuit Configuration	Single circuit with 3 phases per structure, double circuit with 6 phases per structure, 3 subconductors per phase
Conductor Size	1590 kcmil, aluminum conductor steel reinforced (ACSR)
Ground Clearance of Conductor	31 feet minimum at 212°F
Communication	Fiber Optic Cable - ADSS Cable for Single Circuit and OPGW for Double Circuit

Transmission Line Structures

The majority of the transmission line would be designed with lattice structures because of this type of structure's lower maintenance costs and design flexibility on uneven terrain (Figures 2-2 and 2-3). Lattice towers are well suited for complex terrain, such as is found in most of the plan area.

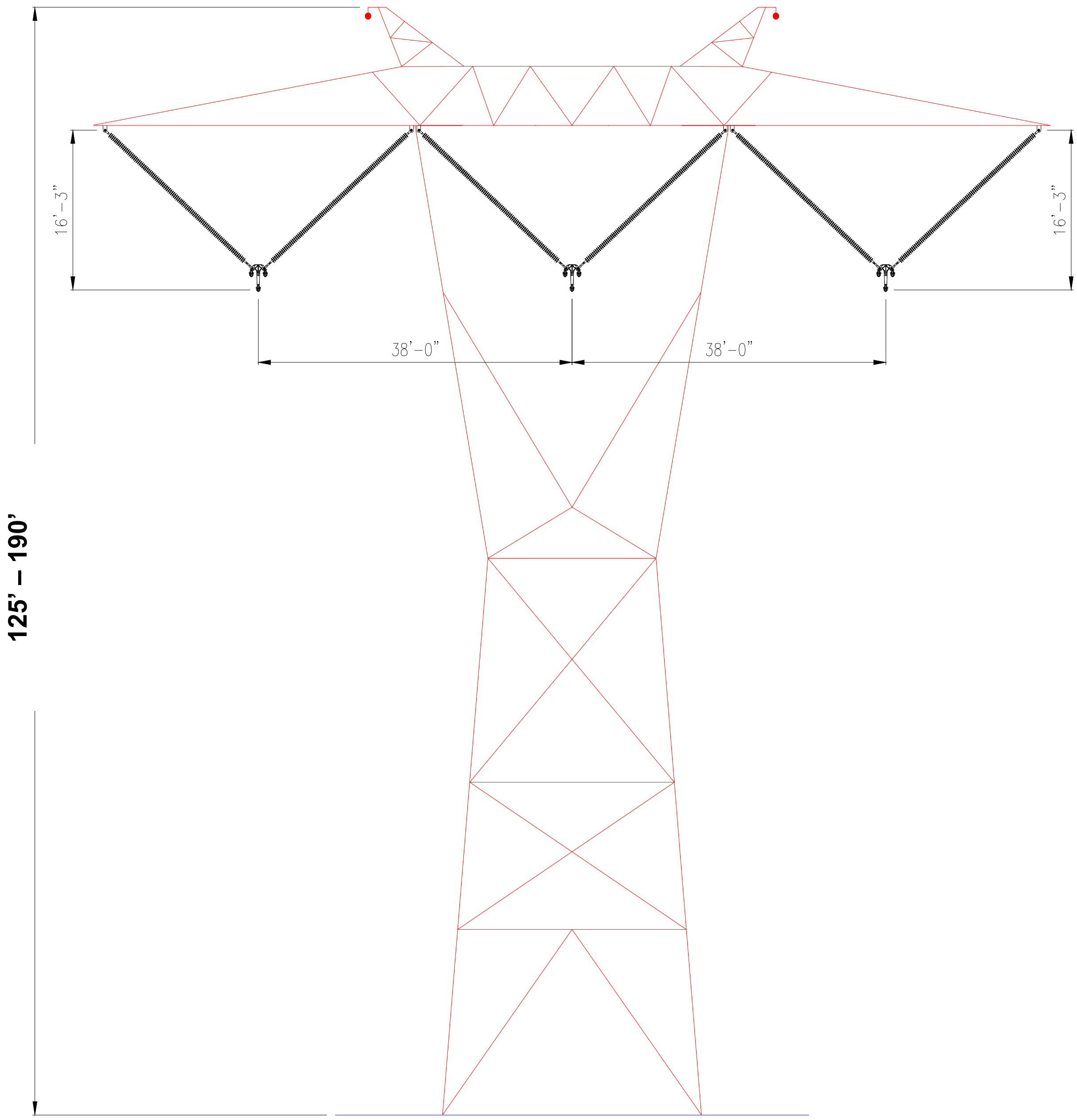

Figure 2-2 Typical Single-Circuit Lattice Tower

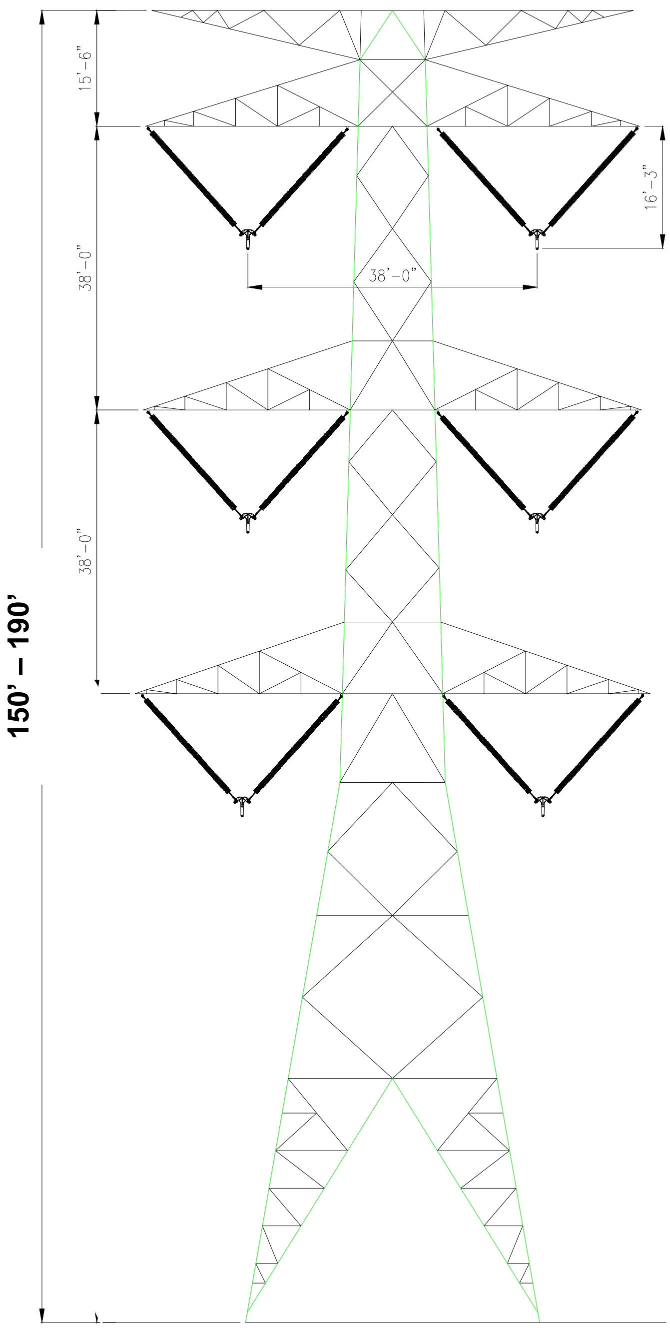

Figure 2-3 Typical Double-Circuit Lattice Tower

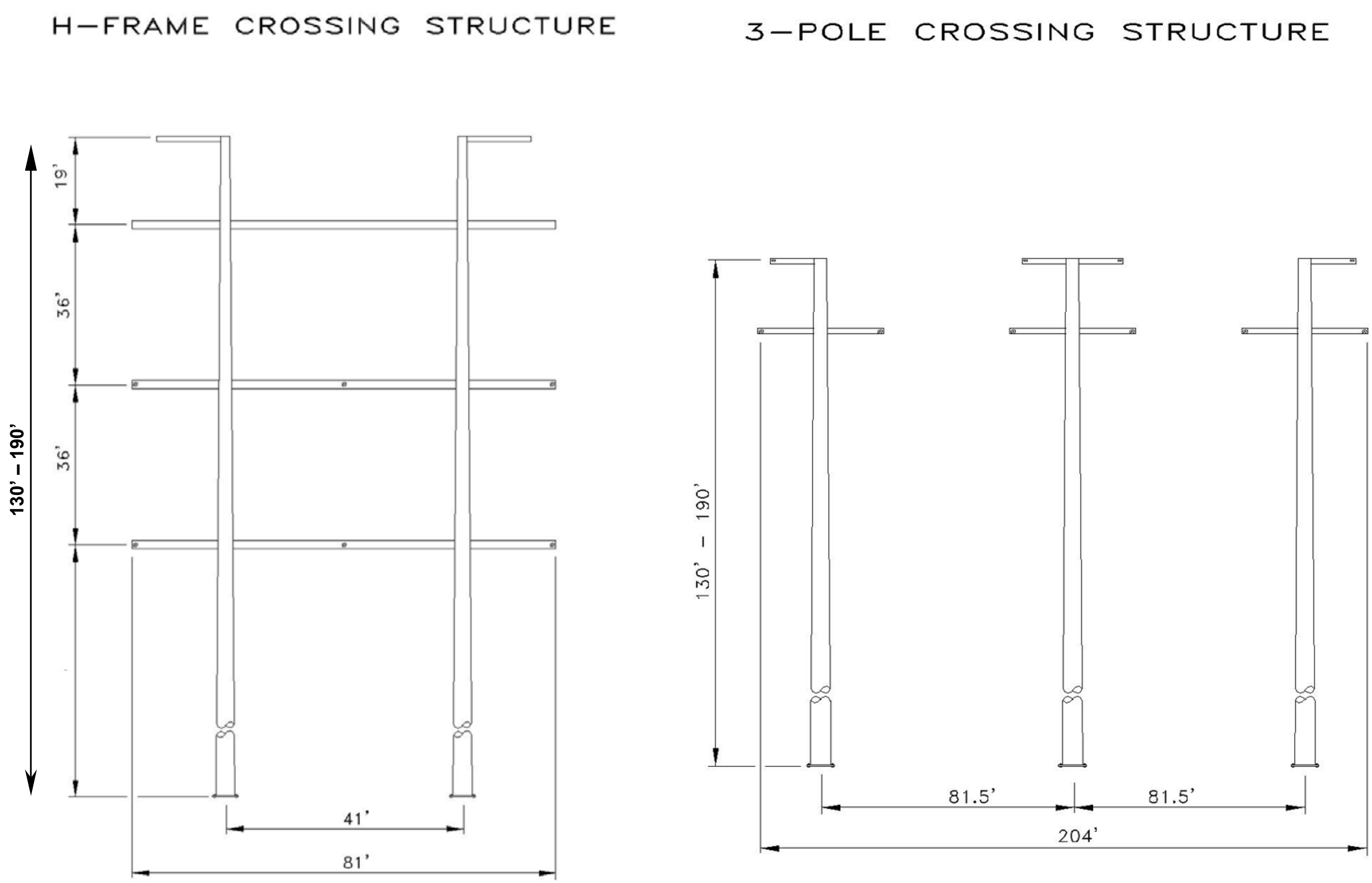

Figure 2-4 Structures Used for Crossing Existing Transmission Lines

In several instances, steel poles would be utilized where specific engineering design is needed to meet conductor clearance requirements (Figure 2-4). Final determination for use of steel poles in place of lattice structures would be included in the Final Plan of Development. Currently the use of steel poles has been identified for the area adjacent to the Lakes Las Vegas Resort. At the request of this landowner, steel poles would be used for approximately 1-1/2 miles. Refer to the Right of Way and Line Crossing section on page 15 for more details regarding this and other crossings.

In order to comply with the Migratory Bird Treaty Act of 1918 and subsequent amendments (16 USC 703-711) that require measures to prevent the taking of covered birds (for list of species see 50 CFR 10.13), transmission structure design addresses the prevention of bird mortalities. Bird mortalities from electrocution can occur when birds contact two-phase conductors, a conductor and a neutral wire, grounded wire or cross-arm brace, or a transformer and jumper wire. Recommendations by Avian Power Line Interaction Committee (Avian Power Line Interaction Committee, 1996) state that transmission lines should be designed with adequate spacing between conductors (8 feet or greater based on the wingspan of the female bald eagle) to minimize avian electrocution.

This issue was addressed in two ways: 1) the inherent protection this size of line provides, and 2) through the use of insulated and non-conductive hardware. Typically, bird electrocutions are not a problem on 500kV transmission lines because the structures are designed with adequate spacing between conductors so that harmful contacts do not occur. Further, the proposed design incorporates insulating hardware and conductors and non-conductive cross-arm braces and transformers.

Steel Lattice Towers

Self-supporting lattice towers used in the proposed project would be constructed of galvanized steel. The proposed single-circuit tower configuration and design is illustrated in Figure 2-2 (refer to Appendix B for visual simulation photos). Single-circuit tower-to-tower spans (ruling span) range from 900 feet to 1,400 feet. Tower heights would be approximately 125 feet to 190 feet. The exact height and span of towers would be governed by topography and safety requirements for conductor clearance.

Double-circuit lattice towers would be used for approximately 18 miles of the line (between mileposts 19 and 37 on Map 1: Proposed Alignment, Appendix A). This would minimize impacts to land use and the environment by reducing the need for future construction of additional lines if expansion of transmission were needed in these areas. The double-circuit tower configuration and design is illustrated in Figure 2-3. Double-circuit lattice tower heights would be approximately 150 feet to 190 feet and would span 900 feet to 1,400 feet.

The self-supporting steel lattice towers require four footings. The footings for the lattice towers would be construction of cast-in-place concrete approximately two feet to four feet in diameter for single-circuit structures and three feet to six feet in diameter for double-circuit structures. Each leg of the structures would be buried 12 feet to 24 feet deep.

Steel Poles

Steel poles utilized where conductor clearance dictates would be self-supporting, painted steel. Steel pole structures would be treated with a carboline topcoat in medium gray in accordance with Nevada Power's standard specification. The proposed pole configuration and design is illustrated in Figure 2-4. Pole-to-pole spans would range from 600 feet to 800 feet. Pole heights would be approximately 130 feet to 190 feet. Combination steel pole structures used to cross the existing transmission lines would include two or three poles placed approximately 75-95 feet apart.

Footings for the steel poles would be constructed of cast-in-place concrete approximately 9 feet to 13 feet in diameter and would be buried 20 feet to 40 feet deep.

Conductors and Associated Hardware

The 500kV transmission line would consist of three phases (six phases for double-circuit portions), with a three-conductor bundle (i.e., three subconductors) per phase in an equilateral triangle. Each conductor would be aluminum stranded with a steel stranded reinforced core. Minimum conductor height above the ground for the 500kV line would be 31 feet at 212° F, based on NESC standards and Nevada Power's standards. The distances between phases are indicated in Figures 2-2 through 2-4.

Overhead Ground Wire

An overhead ground (static) wire would protect the single-circuit 500kV transmission line from direct lightning strikes. Two overhead ground (static) wires, 7/16-inch in diameter, would be strung on the top of the structures. Current from lightning strikes would be transferred through the ground wires and structures into the ground.

On the double-circuit 500kV portion of the transmission line, there would be one 7/16-inch diameter, overhead static wire and one Optical Ground Wire (OPGW). The OPGW would provide both communications and lightning strike protection for one side of the structures and the static wire would protect the other side. The OPGW and static wires would be grounded at regular intervals.

Fiber Optics

A fiber optic line would be strung on the transmission line to provide line safety and relay control communications between the Harry Allen and Mead substations. A separate application for an overriding 10-foot right-of-way to accommodate the fiber line has been submitted to BLM.

On single circuit 500kV lines, Nevada Power uses an All Dielectric Self-Supporting (ADSS) cable with 24 fibers. The ADSS would be suspended approximately two feet below the static wire. However, because of damage that can result to the ADSS jacket based on electric field studies, OPGW would be used on the double-circuit 500kV structures.

For the Harry Allen–Mead Transmission Line, this cable would be suspended from the tower in place of the ground wires because, like ground wire, it would protect the line from lightning strikes. The cable diameter would be approximately 0.6 inches, with 12 active fibers and 12 inactive fibers reserved for emergency spares. There would be no in-line amplifiers or warning markers. If cable repairs would need to be made, splicing vaults would allow for repairs. Splice vaults probably would be buried at the bottom of the transmission structures, but also could be box-mounted on the side of the structures. Re-generation facilities would not be required. Nevada Power would have sole ownership and use of the fiber optic line.

Right-of-Way Acquisition

New land rights for the transmission line right-of-way, temporary work areas and permanent access roads would be required for the transmission line. Nevada Power is requesting a grant of right-of-way from BLM for transmission line facilities located on BLM-managed public lands, a grant of license for the portion of the transmission line managed by USBR, and a license agreement from Western for those lands under its management. Rights-of-way for transmission line facilities on private lands would be obtained as perpetual easements. Every effort would be made to purchase the land and/or obtain easements on private lands through reasonable negotiations with the landowners. Land rights would be obtained in the name of Nevada Power.

Right-of-Way and Line Crossings

The Proposed Action would require crossing existing transmission lines, railroad tracks and highways owned and/or managed by Nevada Power, Western, Nevada Department of Transportation (NDOT), BMI Basic Management Inc. (BMI), Union Pacific, Colorado River Commission (CRC), Los Angeles Department of Water and Power (LADWP) or Southern California Edison (SCE). Refer to Table 2-2 for information regarding these crossings.

The location of existing transmission facilities relative to final transmission routing, topographical constraints and any utility corridor boundary constraints that may exist would dictate the number and location of crossings. The proposed line crossings have been coordinated with each property owner or manager. Nevada Power would have letters of agreement in place for all crossings.

Table 2-2 Transmission Line, Railroad and Highway Crossings

	Crossing Type			
Configuration	Transmission Lines	Railroad Tracks	Highways	Crossing Owner/Manager
Single Circuit Mileposts 1-19	Harry Allen-Unit #3 230kV			Nevada Power
	Reid Gardner-Harry Allen #2 230kV			Nevada Power
	Reid Gardner-Harry Allen #1 230kV			Nevada Power
	Utah Tie Line 345 kV			Nevada Power
	Crystal-Harry Allen #3&4 230kV			Nevada Power
	Crystal-Harry Allen #1&2 230kV			Nevada Power
			I-15	NDOT
		RR @ MM 3.6		Union Pacific

Configuration	Crossing Type: Transmission Lines	Crossing Type: Railroad Tracks	Crossing Type: Highways	Crossing Owner/Manager
		RR @ MM 15.4		Union Pacific
	NCA2 69kV			Nevada Power
Double Circuit Mileposts 19-37			Lake Mead Hwy 147	NDOT
	Intermountain DC 500kV			LADWP
	Navajo-McCullough 500kV			LADWP
			Lake Mead Hwy 146	NDOT
	BMI 69kV			BMI
	Newport-Foothills 69kV			CRC
	Lindquist-Mead 69kV			Nevada Power
	Las Vegas #3 69kV			Nevada Power
	Las Vegas #1 69kV			Nevada Power
	Newport-Mead #1 230kV			CRC
	Equestrian-Mead #1 230kV			Nevada Power
	Hoover-Henderson 230kV			Western
	Newport-Mead #1 230kV			CRC
	Equestrian-Mead #1 230kV			Nevada Power
			Hwy 95	NDOT
	Henderson-Mead 230kV			Western
		RR@ MM 35.5		Union Pacific
	Navajo-McCullough 500kV			LADWP
	Intermountain DC 500kV			LADWP
Single Circuit Mileposts 37-40	Mead-Decatur 230kV (2)			Nevada Power
	*Mead-Winterwood 230kV (2)			Nevada Power
			Hwy 95	NDOT
	Hoover #2 230kV			SCE/Western
	Hoover #3 230kV			SCE/Western
	Newport-Mead #1 230kV			CRC
	Equestrian-Mead #1 230kV			Nevada Power
	Las Vegas #2 69kV			Nevada Power
	Las Vegas #1 69kV			Nevada Power
	Henderson-Mead 230kV			Western
	Hoover #6 230kV			LADWP/Western
	Hoover #7 230kV			LADWP/Western
	Hoover #8 230kV			LADWP/Western
	Marketplace-Mead 500kV			Western

* No Construction at Mead-Winterwood crossing from January-July to avoid impacts to bighorn sheep.

Lakes Las Vegas Crossing

Topography at the proposed crossing under two existing 500kV lines just south of the Las Vegas Wash would require excavation for an electrical safety clearance between the proposed conductors and the ground of approximately 31 feet as required by national code. The crossing is located at approximately milepost 37, entirely on land that is currently administered by the BLM but is under contract for purchase by the Lakes Las Vegas Resort development. Nevada Power has requested an increase to 400 feet for the right-of-way in this area to accommodate the three poles required for a horizontal crossing under these existing lines.

The land identified for the transmission line crossing is adjacent to ongoing development by the Resort, a major Henderson thoroughfare (Magic Way) and SNWA for their second-source water pipeline. The area is highly disturbed with numerous roads, piles of soil and trails.

BLM has agreed to sell land that had been previously slated for exchange to Lakes Las Vegas Resort. The area required for crossing under the existing lines is included in this land sale. The Resort placed a down payment in October 2003 and plans to close on the property within their allocated 180 days (D. Rainey, Lakes Las Vegas Resort, Personal Communication, October 2003). The Resort plans to install a driving range and other resort amenities and would utilize excess material from grading operations. According to Lakes Las Vegas representatives, the excavation required for the transmission line crossings would be consistent with their planned excavation and would be in place prior to the start of construction to meet the needs of the Resort. The Resort has agreed to incorporate the excavation specifications required by Nevada Power to meet safety clearances in the designs for this area. A Memorandum of Understanding is being developed between the Resort and Nevada Power to ensure the cooperation and understanding of both parties. The Resort would obtain the appropriate permits for the excavation work.

In the unlikely event that the property is not purchased by the Resort, Nevada Power would be required to perform the necessary excavation for the transmission line crossings. Excavation for the 500kV transmission line crossing would consist of grading to remove earth materials underneath the two existing transmission lines within the proposed 400-foot corridor. The general shape of the excavation would follow the profile of the proposed line conductors producing a scalloped shaped depression approximately 750 feet long and 300 feet wide. Impact to the existing natural drainage patterns would be minimal and limited to the periphery of the broad, flat wash east of the site. Appropriate permits would be obtained from Henderson and Clark County to ensure compliance with stormwater and drainage regulations. Refer to Figure 2-5 for a preliminary grading plan created by Nevada Power for the crossing site.

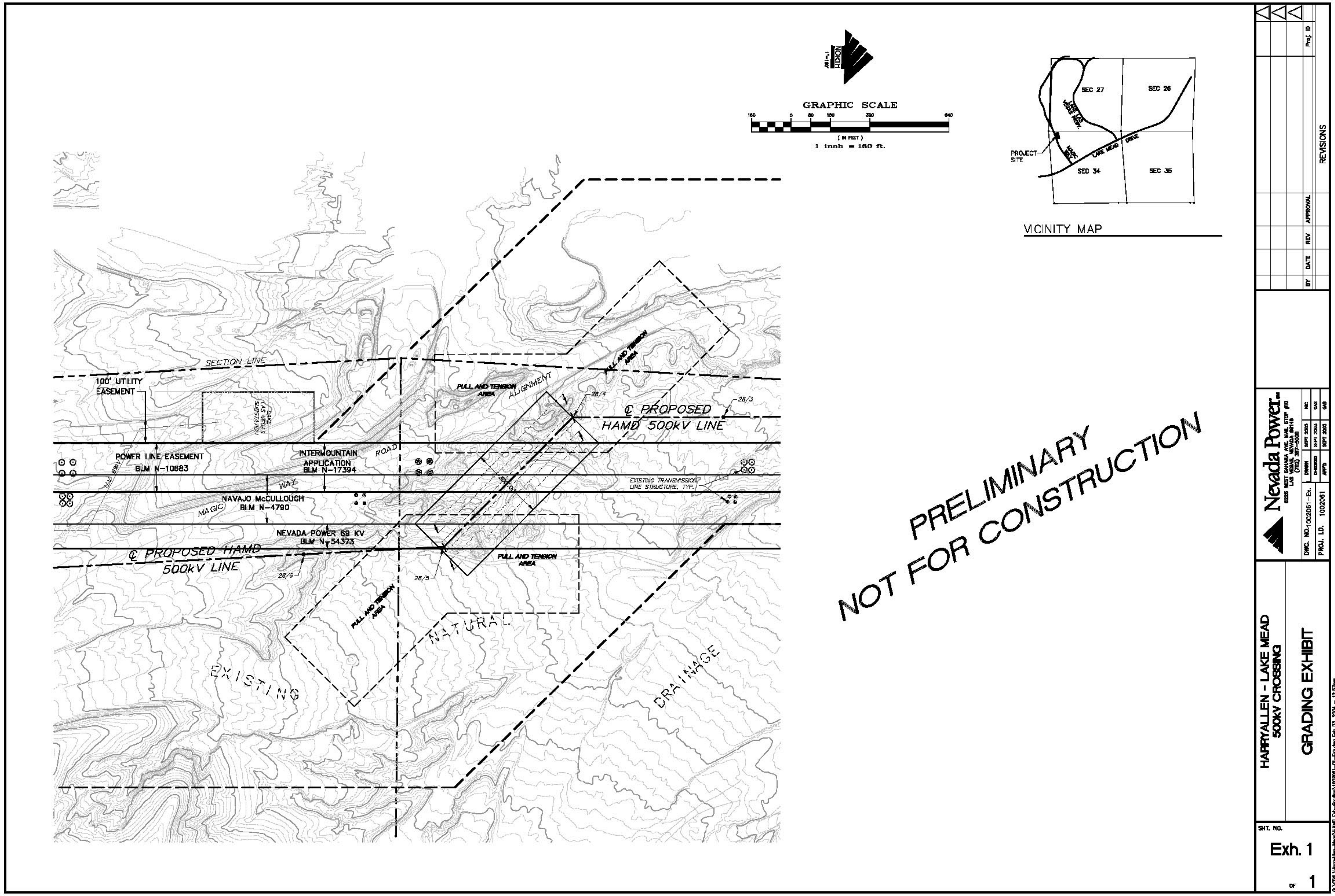

Figure 2-5 Lakes Las Vegas Crossing Site

Harry Allen Generation Interconnection

In order to obtain sufficient clearance for the Harry Allen–Mead 500kV circuits to cross over the existing 230kV transmission lines that connect the Harry Allen Generation Station to the existing Harry Allen 230kV Substation, Nevada Power would have to remove one double circuit 230kV structure and install two, single circuit, H-frame structures and associated hardware. The area around this structure is highly disturbed from previous work around the Harry Allen Generation Station and the Harry Allen Substation. The work would need to be completed prior to start of construction on the Proposed Action, anticipated to be mid-2005.

Nevada Power would apply to amend the right-of-way grant for this 230kV transmission line (N12873) and follow the mitigation and stipulations identified with that right-of-way grant. All work would be confined to the existing 100-foot right-of-way and the proposed Harry Allen–Mead right-of-way.

Equestrian-Mead/Newport-Mead 230kV

These two 230kV transmission lines are supported on double circuit lattice towers, with the Equestrian-Mead line owned and operated by Nevada Power and the Newport-Mead line owned and operated by the Colorado River Commission (CRC)/Southern Nevada Water Authority (SNWA). The Harry Allen–Mead 500kV circuits would cross over the 230kV circuits. In order to meet required code clearances, the double circuit 230kV line must be lowered. Nevada Power proposes to remove one 230kV double circuit lattice tower and install four shorter, single-circuit 230kV tubular steel structures.

All work would be confined to the 230kV Equestrian-Mead/Newport-Mead 130 foot right-of-way and the expanded right-of-way proposed for the Harry Allen–Mead crossing at this location. The crossing would be coordinated with CRC/SNWA.

The work would need to be completed prior to start of construction on the Proposed Action, anticipated to be mid-2005. Nevada Power would apply for an amendment to the Contract and Grant of Easement from USBR, No. 9-07-30-L0493. Nevada Power would comply with the mitigation and grant stipulations identified with that document.

Management Practices for Safety and Environmental Protection

Linear electric infrastructure projects typically traverse multiple jurisdictional boundaries, natural resource features and wildlife habitat types. Until final design and in some cases until installation, utility projects necessarily remain more flexible in the definition of their ultimate configuration and placement than most non-linear projects. The majority of the Proposed Action is within BLM jurisdictional boundaries and would encounter unique geographical and natural features along the route, such as valuable natural and wildlife resources, soil conditions and engineering hurdles. These unique features often require utility projects to modify or adjust final design during the installation phase in order to maximize overall project feasibility, while avoiding or minimizing impacts to sensitive environmental resources. This flexibility is part of the reason linear utility projects have, in general, the potential to result in far fewer impacts to the environment than most non-linear projects.

The Proposed Action incorporates certain management practices to minimize impacts to the environment and improve safety conditions, as described in Table 2-3, below. Management practices and any mitigation measures determined necessary would be detailed in the Final Plan of Development and included in the agency authorization documents.

Table 2-3 Proposed Management Practices for Safety and Environmental Protection

1.	An independent third-party contractor would be hired to oversee compliance with the stipulations of this project. All questions or concerns regarding compliance shall be directed to the BLM as the lead agency through this third-party compliance contractor.
2.	All construction vehicle movement outside the right-of-way on dirt roads normally would be restricted to predesignated access or contractor-approved access. Should unforeseeable circumstances occur during construction that require more road access than initially requested, permission must be granted by the land manager prior to disturbance and appropriate remuneration fees would be assessed.
3.	The aerial limits of construction activities normally would be predetermined with activity restricted to and confined within those limits. No paint or permanent discoloring agents would be applied to rocks or vegetation to indicate limits of survey or construction activity.
4.	In construction areas where recontouring is not required, vegetation would be left in place wherever possible and original contour would be maintained to avoid excessive root damage and allow for resprouting.
5.	In temporary construction areas (e.g., pull and tension sites, structure sites) where ground disturbance is substantial or where recontouring is required, surface restoration would occur as required by the land management agency. The method of restoration normally would consist of removing and stockpiling topsoil and large rocks from disturbed areas to return temporarily disturbed areas back to original contours. Other methods include reseeding (if required), installing cross drains for erosion control, placing water bars in the road and filling ditches.
6.	Existing improvements would be repaired or replaced if they are damaged or destroyed by construction activities to their condition prior to disturbance as agreed to by the parties involved.
7.	Structures and/or ground wire would be marked with highly visible devices where required by governmental agencies (e.g., Federal Aviation Administration).
8.	Prior to construction, all supervisory construction personnel would be instructed on the protection of cultural, paleontological and ecological resources. To assist in this effort, the construction contract would address: (a) Federal, state and tribal laws regarding antiquities, fossils, plants and wildlife, including collection and removal; (b) the importance of these resources and the purpose and necessity of protecting them.
9.	Cultural resources would continue to be considered during post-environmental assessment (EA) phases of plan implementation. In consultation with appropriate land managing agencies and state historic preservation officers, specific mitigation measures would be developed and implemented to mitigate any identified adverse impacts. These may include plan modifications to avoid adverse impacts, monitoring of construction activities and data recovery studies.
10.	Nevada Power would respond to complaints of radio or television interference generated by the transmission line by investigating the complaints and implementing appropriate mitigation measures. The transmission line would be patrolled on a regular basis (generally twice annually, once by air and once by ground), so that damaged insulators or other transmission line materials, which could cause interference, are repaired or replaced.
11.	Nevada Power would apply mitigation needed to eliminate problems of induced currents and voltages onto conductive objects sharing a right-of-way to the mutual satisfaction of the parties involved.
12.	Nevada Power would continue to monitor studies performed to determine the effects of audible noise and electrostatic, electric and magnetic fields.
13.	Roads would be built at right angles to the washes to the extent practicable. Culverts would be installed where needed. All construction and maintenance activities would be conducted in a manner that would minimize disturbance to vegetation and drainage channels. All existing roads would be left in a condition equal to or better than their condition prior to the construction of the transmission line.

14.	All requirements of those entities having jurisdiction over air quality matters would be adhered to and any permits needed for construction activities would be obtained. Open burning of construction trash would not be allowed.
15.	Fences and gates would be repaired or replaced to their original condition prior to disturbance as required by the landowner or the land management agency if they are damaged or destroyed by construction activities. Temporary gates would be installed only with the permission of the landowner or the land management agency and, if required, would be restored to original condition prior to disturbance following construction.
16.	A bundle configuration and large diameter conductors would be used to limit the audible noise, radio interference and television interference due to corona. Tension would be maintained on all insulator assemblies to assure positive contact between insulators, thereby avoiding sparking. Caution would be exercised during construction to avoid scratching or nicking the conductor surface, which may provide points for corona to occur.
17.	No nonbiodegradable debris would be left in the right-of-way.
18.	Hazardous materials would not be drained onto the ground or into streams or drainage areas. Totally enclosed containment would be provided for all trash. All construction waste including trash and litter, garbage and other solid waste, petroleum products and other potentially hazardous materials would be removed to a disposal facility authorized to accept such materials by the proponent or their agent.
19.	Fueling of vehicles would take place outside of the 500kV transmission line right-of-way.
20.	Workers would be instructed not to drive or park vehicles where catalytic converters can ignite dry vegetation and to exhibit care when smoking in natural areas. Fire protective mats or shields would be used during grinding or welding. Vehicles would carry water and shovels or fire extinguishers during times of high fire hazards.
21.	Non-specular conductors would be used to reduce visual impacts.
22.	The contractor would use weed-free, native seed mixes if revegetation were required. No species on the “state noxious weed list” would be included in the revegetation seed mixes.
23.	All vehicles brought in from out of state would go through high pressure washing prior to arriving on site and before they can be used on the project.
24.	In compliance with Clark County and the Federal Clean Water Act, all necessary permits relating to water resources would be obtained.
25.	In compliance with the Clark County Department of Air Quality Management (DAQM) dust permit, all roads and structure pads would be watered prior to and during all construction activities. All project personnel would be educated on the site dust mitigation plan.
26.	Construction and operation vehicles would be properly maintained to reduce emissions.
27.	A speed limit of 25 mph is required on the project site at all times.
28.	All appropriate NDOW and FWS permits must be obtained prior to initiation of the project
29.	In observance of NRS 503.597 and other applicable NRS and Nevada Administrative Codes, measures, and actions (including mitigation) concerning wildlife not under joint purview of the FWS and Nevada Division of Wildlife, would be reviewed by the Nevada Division of Wildlife.

Construction

Construction of a transmission line follows the sequence of surveying the centerline, access road construction, installing foundations, assembling and erecting the structures, installing ground wires and conductors, installing ground rods/counterpoise, and cleanup and site reclamation. Various phases of construction would occur at different locations throughout the construction process and in some cases at the same time at different locations. Typical transmission line construction activities are depicted in Figure 2-6. The estimated number of workers and types of equipment required to construct the proposed transmission line is shown in Table 2-4, at the end of the construction discussion.

Surveying Activities

Construction survey work would consist of identifying the centerline location, structure center hub and right-of-way boundaries, where dictated by the Federal land manager. These activities normally would begin prior to the start of construction but after approval from Federal land managers.

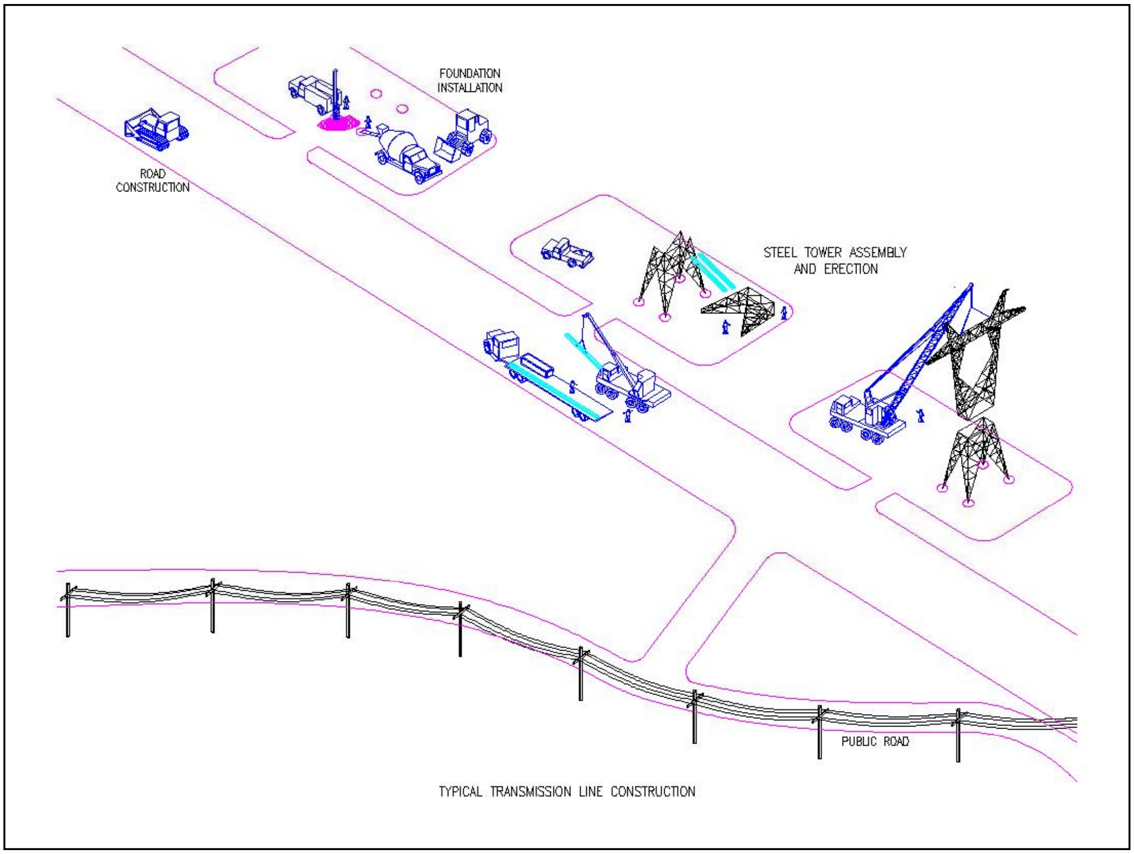

Figure 2-6 Typical Transmission Line Construction Activities

Access Road Construction

Surface access is required to each transmission structure. Because the Proposed Action falls mostly within a transmission corridor, existing transmission line access roads are readily available and would be utilized wherever practical, thus keeping new access roads to a minimum. Where access roads currently exist, short roads would be graded from existing transmission line roads to the structure locations. Approximately one mile of new or improved road would be required for each mile of transmission line where no access roads currently exist.

Some portion of the existing road network would likely require maintenance or upgrading. This maintenance or upgrading may involve clearing overgrown vegetation, re-grading and/or installation of drainage structures. Typically, access roads would be constructed or improved to a 20-foot-wide travel area with two feet of berm on each side. New roads would meander to avoid sensitive plants and wildlife habitat features. In some steeper terrains, existing roads cannot be widened. Therefore, to avoid creating additional disturbance, turnout and passing of vehicles/equipment would occur in previously disturbed areas along the roadways or at structure sites.

The number of new roads would be consistent with their intended use and would be part of the permanent right-of-way for maintenance. Because the exact location of roads cannot be determined until final design of the transmission line, the specific information on total miles and location of new and improved roads would be provided as part of the Final Plan of Development.

Work Areas

A temporary work area approximately 200 by 200 feet (right-of-way width) would be required for the location and assembly of structures, the necessary crane maneuvers and to facilitate the safe operation of equipment at most structure sites. Within these temporary work areas, an area of 100 by 100 feet (0.2 acres) would be retained as a permanent structure location for future maintenance access. The work area would only be cleared of vegetation as necessary. In general, existing brush and vegetation would be crushed rather than cleared in order to foster its regeneration.

A larger permanent work area would be required for approximately 30 structure locations that are located in steep terrain. These steeper areas would require a 250 by 200 feet work area to accommodate the necessary grading and crane equipment for construction and maintenance.

The transmission line crossing sites would require larger temporary work areas to accommodate construction of the two- and three-pole structures. The temporary work areas would be up to 400 by 200 feet and the permanent structure locations would be 300 by 100 feet.

After line construction, all work areas not needed for normal transmission line maintenance would be recontoured as necessary to blend with the natural slopes.

Clearing Right-of-Way

The clearing of natural vegetation is not anticipated for the transmission line but may be required in some specific cases. Selective clearing would be performed only when necessary to provide for surveying, electrical clearance, line reliability and construction and maintenance operations. Rights-of-way would not be chemically treated unless necessary to comply with requirements of a permitting agency.

Foundation Installation

Excavations for foundations would be made with power auger and backhoe-type equipment. Where the soil permits, a vehicle-mounted power auger or backhoe would be used. Spoil material would be used for fill where suitable. The foundation excavation and installation requires equipment access to the foundation sites. In rocky areas, foundations may be excavated by drilling and blasting and may require special rock anchors to be installed.

Where blasting is required, safeguards such as blasting mats would be employed when needed to protect the adjacent property. All applicable state, local and Federal laws would be followed and copies of required permits would be forwarded to the land managers. Stipulations would be followed relating to protection of desert tortoise as well as notification to appropriate fire officials at BLM, USBR, Western and Clark County.

In extremely sandy areas, soil stabilization by water or a gelling agent may be used prior to excavation. After excavations are completed, cast-in-place concrete footings would be installed by placing reinforcing steel in the excavated foundation hole and encasing it in concrete. Concrete for use in constructing foundations would be obtained commercially.

Foundation holes left open or unguarded would be covered and/or fenced where practical to protect the public and wildlife. Soil removed from foundation holes would be stockpiled on the work area. These piles would be used to backfill holes and the topmost layer would be distributed over the work area. To wash concrete chutes, a hole would be dug in the center of the permanently disturbed 100 by 100-foot structure location site. The first six inches of topsoil would be placed on one side of the hole and the remainder of the soil on the other side. The chute would be washed into the hole and the soil would be replaced in the same order it was removed, thereby salvaging the seed bank

Construction Yards

Existing fenced and graded Nevada Power property would be used to the maximum extent for construction staging and personnel reporting. Temporary construction yards would be located at the existing substations, pulling and tensioning sites, other previously disturbed areas or private property areas, depending on which is more feasible. Because the location of these sites cannot be determined until final transmission line design is completed, they would be identified on the Final Plan of Development prior to the start of construction. Concrete for use in constructing foundations would be available from commercial sources in the Las Vegas area; therefore, no remote batch plants would be anticipated.

Tower Assembly and Erection

Bundles of lattice steel members or pole sections and associated hardware would be shipped to each structure site by truck. Structures would be assembled into subsections of convenient size and weight. The assembled subsections would be hoisted into place by a large crane and then fastened together to form a complete structure. Table 2-4 estimates the typical equipment and personnel necessary to assemble and erect transmission structures.

Guard Structures

For public safety and property protection during wire installation, temporary guard structures would be erected over highways, railroads, power lines, structures and other obstacles. Guard structures normally consist of H-frame structures placed on either side of an obstacle. Construction would require a temporary work area of 100 by 100 feet. These structures are designed to prevent ground wire or conductor from contacting an obstacle. Equipment for erecting guard structures includes augers, line trucks, pole trailers and cranes. Guard structures may not be required for small roads. On such occasions, other safety measures such as barriers, flagmen or other traffic control would be used.

Conductor Installation

After the structures are erected, insulators, hardware and stringing sheaves would be delivered and installed at each structure site to accommodate the installation of conductor and/or ground wire.

Pilot lines would be pulled (strung) from structure to structure and threaded through the stringing sheaves. A large diameter pulling line is then attached to the pilot line and strung. The pulling line would be attached to the conductor/ground wire and used to pull the conductor and ground wire through the sheave. This process would be repeated until the ground wire or conductor would be pulled through all sheaves.

Ground wire and conductor would be installed under controlled tension using powered pulling equipment at one end and powered braking or tensioning equipment at the other end. The tensioner in concert with the puller would maintain tension on the ground wire or conductor. Maintaining tension maintains ground clearance and would be necessary to avoid damage to ground wire, conductor or any objects below them during the stringing operation.

Sites for tensioning equipment and pulling equipment would require an area of approximately the right-of-way width by 700 feet. A tensioner, line trucks, wire trailers and tractors would be needed for stringing and anchoring the ground wire or conductor at the tensioning site. Pullers, trucks and tractors would be needed for pulling and for temporarily anchoring the ground wire and conductor at the pulling site (as shown in Figure 2-7). When construction occurs in steep and rough terrain, these sites would require larger, less symmetrical pulling and tensioning sites. These sites would be identified on the structure location drawings submitted with the Final Plan of Development.

Helicopter Use

Helicopters would be used to move personnel and equipment (e.g., pulling lines, assembling structures, installing marker balls, etc.). Helicopters would set down only in previously surveyed areas identified as temporary work areas.

Spill protection measures would be in place and all Federal Aviation Administration regulations would be followed. Notification would be made to coordinate the air space with other possible helicopters in the area being used for seeding, fire support, military maneuvers or other use.

Counterpoise

Structure footing resistance along the route would be measured as part of standard construction practices prior to wire installation. When the resistance to remote earth for each transmission structure would be greater than 25 ohms, counterpoise (grounds) would be installed to lower the resistance to 25 ohms or less. Counterpoise consists of a bare copper-clad or galvanized-steel cable buried a minimum of 12 inches deep, extending from structures (from one or more legs of lattice towers) for approximately 200 feet within the right-of-way.

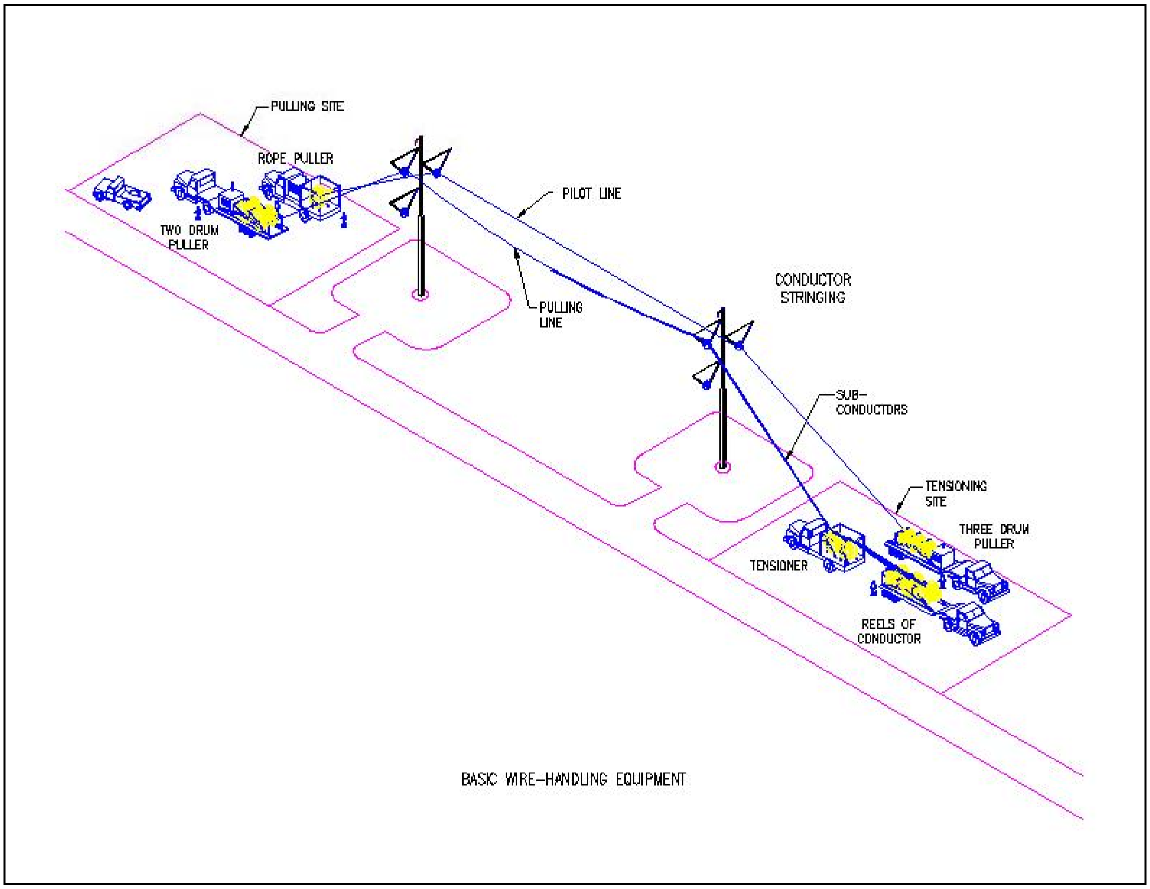

Figure 2-7 Basic Wire Handling Equipment

Cleanup and Reclamation

Construction sites, material storage yards and access roads would be kept in an orderly condition and free of trash throughout the construction period for the Proposed Action. Refuse and trash would be collected at the temporary construction yards in a closed container and would be removed from the sites and disposed of in an approved manner. Oils and fuels would not be dumped along the construction areas. Waste oils or chemicals would be hauled to an approved site for disposal. No open burning of construction trash would occur. The right-of-way for the Proposed Action would be restored as identified in an agency-approved Restoration Plan submitted as part of the Final Plan of Development.

Hazardous Materials Handling

Petroleum products such as gasoline, diesel fuel, helicopter fuel, crankcase oil, lubricants and cleaning solvents would be present within the right-of-way during construction activities. These products would be used to fuel, lubricate and clean vehicles and equipment. These products would be stored in fuel trucks or approved containers. When not in use, hazardous materials would be properly stored to prevent accidental releases.

Totally enclosed containment would be provided for all trash. Spill kits would be on site and diapers would be placed under leaking equipment immediately to prevent ground contamination. All construction waste, including trash and litter, garbage or solid waste, petroleum products and other potentially hazardous materials would be removed to a disposal facility authorized to accept such materials.

All construction, operation and maintenance activities would comply with all applicable Federal, state and local laws and regulations regarding the use of hazardous substances. The construction or maintenance crew foreman would be responsible for maintaining compliance with all applicable laws and regulations. In addition, an onsite inspector would be present during construction to make sure all hazardous materials are used and stored properly. A handling plan would be developed as part of the Plan of Development during the engineering and pre-construction phase of the transmission line.

Fire Protection

All applicable fire laws and regulations would be observed during the construction period. All personnel would be advised of their responsibilities under the applicable fire laws and regulations.

Construction Monitoring

A resource compliance program would be developed with appropriate agencies to address mitigation requirements associated with the avoidance of sensitive plant and animal species, cultural sites or other sensitive features located within or adjacent to the Proposed Action. Resource protection measures committed to by Nevada Power for this Proposed Action are described in Table 2-3. Prior to construction, these measures would be described in detail, as required and included in the Final Plan of Development.

Operation, Maintenance and Abandonment

Operational Characteristics

The nominal voltage for the Proposed Action would be 500kV AC. There may be minor variations of up to 5 percent above the nominal level, depending upon load flow.

Permitted Uses

After the transmission line has been energized, land uses compatible with safety and local regulations would be permitted in and adjacent to the right-of-way. Existing land uses such as agriculture and grazing are generally permitted within the right-of-way. Incompatible land uses within the right-of-way include construction and maintenance of inhabited dwellings and any use requiring changes in surface elevation that would affect electrical clearances of existing or planned facilities.

Compatible uses of the right-of-way on public lands would have to be approved by the managing Federal agency. Permission to use the right-of-way on private lands would have to be obtained from Nevada Power.

Safety

Safety is a primary concern in the design of this 500kV transmission line. An AC transmission line would be protected with power circuit breakers and related line relay protection equipment. If conductor failure occurs, power would be automatically removed from the line. Lightning protection would be provided by overhead ground wires along the line. Electrical equipment and fencing at the substation would be grounded. All fences, metal gates, pipelines, etc. that cross or are within the transmission line right-of-way would be grounded to prevent electrical shock. If applicable, grounding outside the right-of-way may also occur.

Right-of-Way Maintenance

Nevada Power would maintain the right-of-way in accordance with Federal land managers' stipulations. The Harry Allen–Mead 500kV Transmission Line would be inspected semi-annually by ground and air patrols. Maintenance would be performed as needed. When access is required for non-emergency maintenance and repairs, Nevada Power would adhere to the same precautions taken during the original construction.

Emergency maintenance would involve prompt movement of crews to repair or replace any damage. Crews would be instructed to protect plants, wildlife and other environmental resources. Restoration procedures following completion of repair work would be similar to those prescribed for normal construction. Limiting noise, dust and the danger caused by maintenance vehicle traffic provide for the comfort and safety of local residents.

Abandonment

At the end of the useful life of the line, if the facility were no longer required, the transmission line would be abandoned. Subsequently, conductors, insulators and hardware would be dismantled and removed from the right-of-way. Structures would be removed and foundations broken off below the ground surface. If the line and associated right-of-way were abandoned at some future date, the right-of-way would be available for the same uses that existed prior to construction of the line.

Following abandonment and removal of the transmission line from the right-of-way, any areas disturbed to dismantle the line would be restored and rehabilitated as near as possible to their original condition.

Construction Work Force and Schedule

The maximum total work force required to complete the phases of construction described above would be 125 people. Table 2-4 lists the personnel and equipment that would be needed to support the construction activities.

The target date for commercial operation of the Harry Allen–Mead 500kV Transmission Line is January 2007. Right-of-way procurement would begin in 2004 and construction would be scheduled to commence in mid 2005 through 2006.

Table 2-4 500kV Transmission Line Construction – Estimated Personnel and Equipment

Activity	People	Quantity of Equipment	
Survey	4	2	pickup trucks
Road Construction	4-8	1	bulldozers (D-8 Cat)
		2	motor graders

Activity	People	Quantity of Equipment	
		2	pickup trucks
		2	water trucks (for construction and maintenance)
Footing Installation	28	6	hole diggers
		2	bulldozers
		1	truck
		6	concrete trucks
		2	water trucks
		4	pickup trucks
		1	carry all
		1	hydro crane
		1	wagon drill
Structure Steel Haul	6	4	steel haul trucks
		2	water trucks
		2	yard and field cranes
		1	fork lift
Structure Assembly Per crew HA-Mead= 4 Crews	8/crew	1	pickup truck
		2	carry alls
		1	cranes (rubber tired)
		2	water trucks
		1	truck (2 ton)
Structure Erection Per crew HA-Mead= 1 Crew	6-8	1	cranes (120 Ton)
		1	truck (2 ton)
		2	pickup trucks
		2	water trucks
		1	carry all
Wire Installation	36	6	wire reel trailers
		6	diesel tractors
		4	cranes (2 19-Ton, 2 30-Ton)
		2	trucks (5 ton)
		4	pickup trucks
		2	splicing trucks
		2	water trucks
		4	3-drum pullers (2 medium, 2 heavy)
		1	single Drum Puller (large)
		1	double bull-wheel tensioner (heavy)

Activity	People	Quantity of Equipment	
		2	sagging equipment (D-8 Cat)
		4	carry all
		2	static wire reel trailer
Wire Clean Up	4	3	trucks
		1	pickup truck
		2	water trucks
		1	(D-6 Cat)
Road Rehabilitation (Right-of-Way Restoration)	4	1	bulldozer
		1	motor grader
		2	pickup trucks
		2	water trucks

Maximum total personnel required considering all tasks (actual personnel at any one time would be less) = 125

Note: Depending on schedule requirements, multiple crews may be required.

2.3 Alternatives Considered But Eliminated

2.3.1 Siting Alternatives

From May to July 2001, a siting study was conducted in the Las Vegas area to determine reasonable and feasible transmission line alignments connecting the Harry Allen Substation to the Mead Substation. Approximately 70 miles of potential links were identified. Each of the links was examined for environmental issues, public acceptability and engineering constraints. Nevada Power met with planning staff from Las Vegas, Henderson, Boulder City and Clark County to discuss issues, concerns and opportunities. Those discussions focused on the respective agencies' policies and concerns about new or expanded transmission line rights-of-way.

A major concern identified in discussions with agency personnel was avoiding the proliferation of new transmission line rights-of-way by paralleling existing transmission lines and using designated utility corridors as much as feasible. Federal legislation was required to allow the Centennial Plan to utilize a portion of the BLM-designated utility corridor that would cross through the Sunrise Mountain Interim Study Area.

Nevada Division of Wildlife (NDOW) identified another concern regarding the impact to bighorn sheep around the McCullough Mountains in the southwestern portion of the route. This portion of the route is outside the designated corridor. A field visit was conducted with NDOW to identify routing in this area that would minimize impacts to the areas of concern.

Input from the public was gathered at community open house workshops and other formal and informal discussions and presentations (refer to Chapter 5 for details of meetings/discussions). Data was also obtained from existing informational sources such as:

- Master plan documents from each of the political subdivisions within the study area
- Federal, state and county agency management plans and documents
- GIS data and maps from Clark County, BLM and Nevada Power

Based on information, data and comments collected, criteria were developed to help determine opportunities and constraints for siting alternatives for the 500kV transmission line.

The route was intended to optimize the use of existing utility corridors, minimize environmental impacts and minimize engineering and constructability expense as is defined in Chapter 1, Purpose and Need. Refer to Figure 2-1 for a map of the potential routes assessed. Of the 70 miles of siting identified, Routes A and B were eliminated from further consideration for one or more of the following reasons (Figure 2-1):

1. Impacts, as determined by the siting study, to an existing or planned land use feature or other environmental resource that was determined to be unacceptable to land use plans, local officials and/or the public.
2. Impacts, as determined by the siting study, were similar among the three routes, therefore additional miles would create greater environmental impacts (Alternative A: ~56 miles and Alternative B: ~51 miles) while an "acceptable" shorter alternative link existed (Proposed Route: ~47 miles).
3. Operational issues, engineering constraints and increased costs were identified, while an "acceptable" shorter alternative link existed.

Routes Suggested Through Scoping Process

Eastern Route

During the public scoping process, a route east of Lava Butte was suggested as a potential alternative to the proposed routing (Route C) to lessen visual impacts to hikers using a proposed trail through part of the Rainbow Gardens Area of Critical Environmental Concern (ACEC), specifically the Valley of the Pillars area. Refer to Figure 2-8 for a map illustrating this Eastern Route.

The Eastern Route was considered and eliminated because the line would fall at least one mile outside the designated utility corridor for three to four miles. The line would then border the Lake Mead National Recreation Area and potentially encroach on existing or future development. The Draft Las Vegas Resource Management Plan and EIS analyzed locations for proposed utility corridor locations. Due to public comments received during the 90-day comment period, BLM considered 14 additional corridor locations in a Supplement to the Las Vegas RMP. This Supplement was sent out for a 90-day public comment period in May of 1994. BLM considered 3 alternative corridor locations through the Henderson/Rainbow Gardens/Sunrise area.

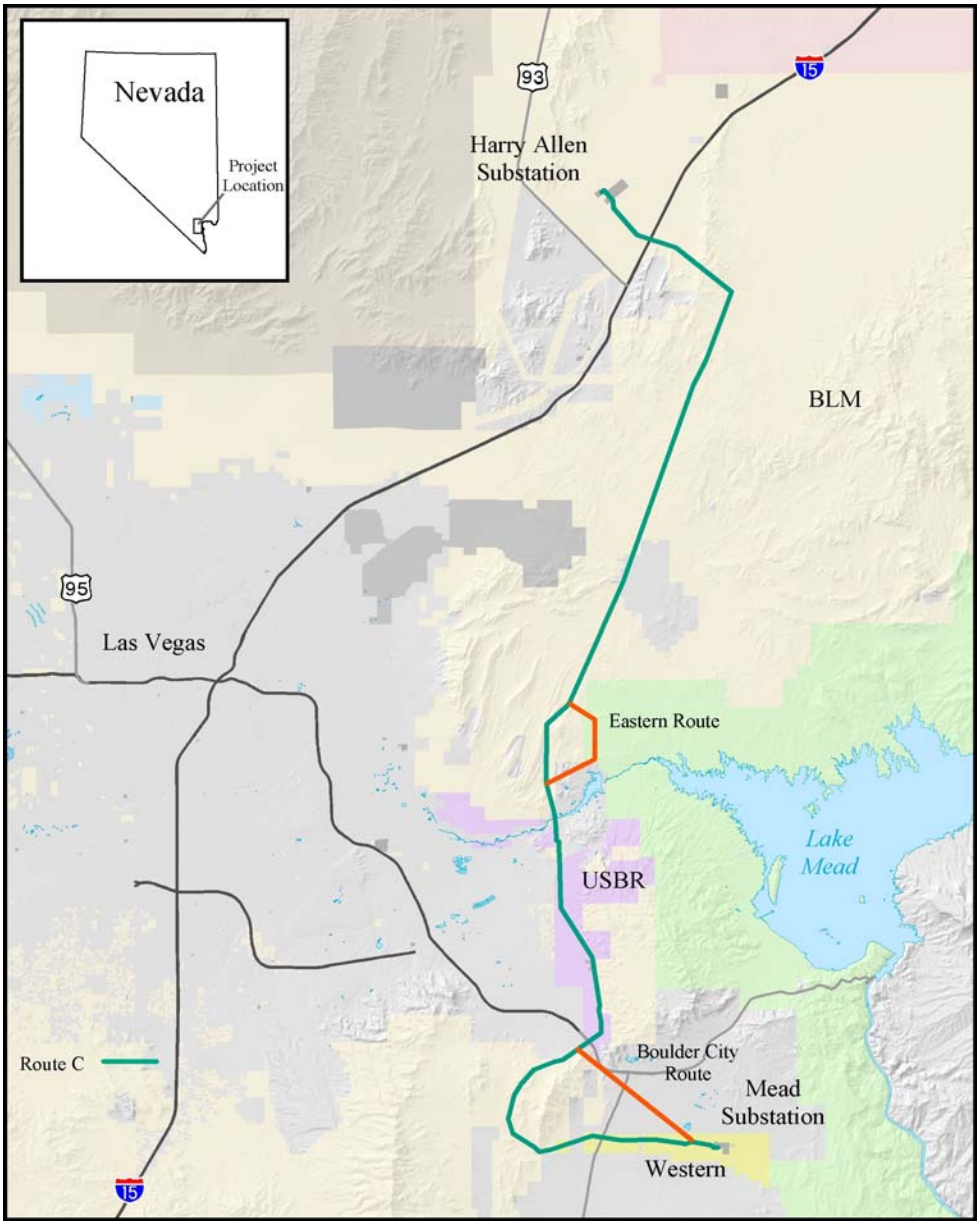

Figure 2-8 Potential Alternatives to Route C

After full consideration of all public comments on the 3 potential routes, BLM designated the utility corridor as it exists today. It is BLM's position that within the Sunrise Mountain Special Recreation Management Area, no deviation outside the designated corridor should be approved.

As such, the Eastern Route would not meet the BLM Las Vegas RMP (1989) requirements, which is part of the purpose and need for the Proposed Action to utilize existing designated corridors in special management areas.

Boulder City Route

A route crossing through Boulder City was also suggested as a potential alternative to the proposed routing (Route C) during the scoping process. Refer to Figure 2-8. This route was eliminated from further consideration based on overwhelming support expressed by Boulder City elected officials for the proposed project alignment. In recent years, Boulder City development has extended to the west and new transmission lines in the area is of significant concern. In addition, the alternative route introduces conflicts with the Boulder City airport. Also, the proposed alignment, rather than an alignment through Boulder City, better supports the extension of 500kV transmission to the Eldorado/Marketplace/McCullough Substation hub in the future.

2.3.2 Alternative Transmission Technologies

Underground High-Voltage Construction

Nevada Power has considered the option of using 500kV high-voltage underground cable for portions of the proposed transmission line. Comments from public scoping also suggested this alternative be analyzed.

The environmental impact of an underground transmission line would be significantly greater than that of an overhead transmission line. Because of the required number and size of transition sites and trenching, an underground line would cause 30 times to 55 times the permanent ground disturbance of an equivalent overhead line per mile (Jackson, Nevada Power, personal communication, August 2003). The construction of a double-circuit underground transmission line would require a contiguous disturbance. Assuming the width of disturbance is 50 feet, the total permanent disturbance for underground transmission line installation would be 6.0 acres per mile plus an additional 5.0 acres of disturbance for cable termination sites and reactor sites. In addition, the following constraints exist for under-grounding the 500kV transmission line.

- The cost of an underground transmission line would be approximately 16 times greater per mile than an overhead line.
- The reliability of an underground 500kV transmission line is unproven. Currently, there is only one known underground 500kV transmission line in the United States–a relatively short run of cable located within the Grand Coulee Dam facilities on the Columbia River.
- The time required to restore an underground line significantly exceeds the time required to restore an overhead line.

For these reasons, underground installation of 500kV cable was eliminated from further consideration.

Direct Current Transmission

Direct Current (DC) transmission systems are often considered where considerable transmission distances are involved or where a connection between two asynchronous systems is required. The nature of a DC system is such that the overhead transmission structures and conductors are less costly but terminal equipment is more costly. A minimum break-even distance is necessary for the savings in the DC structures and conductors to equal the extra cost in terminal equipment. While the break-even distance varies widely system to system, line lengths of 400 miles are generally required before DC becomes economically viable. For the Proposed Action, DC transmission would cost four to five times more than the proposed 500kV Alternating Current (AC) transmission line. Therefore, DC was eliminated from further consideration.

Alternative Voltage Systems

Two different 230kV expansion plans, the Northeast Corridor and Northwest Corridor expansions, were studied as a means of increasing the amount of power that could move from Harry Allen south to the Las Vegas Valley and beyond. Four new 230kV lines would be required from Harry Allen along with a multitude of reinforcements to the transmission grid in the Las Vegas Valley.

These detailed studies revealed that the two-230kV options, when combined with the generation capacity from the expected new generation plants, would cause unmanageable fault duty levels throughout the Nevada Power system. Fault duty mitigation measures that were evaluated included changing out breakers to potentially rebuilding entire substations. Because of the substantial cost increase of the fault duty mitigation and the potential of insurmountable implementation barriers, these transmission systems were not considered viable alternatives and were eliminated from further consideration.

2.3.3 Energy Conservation and Load Management

Nevada Power provides a number of energy conservation programs that offer financial incentives for implementing specific, energy-efficiency measures. Nevada Power also provides programs, such as online energy audits and energy conservation tips, to make customers more aware of their energy usage and ways to conserve, as well as a variety of free brochures on improving energy efficiency. While these programs play an important role in placing emphasis on energy and demand savings, these savings are substantially below what would be needed over the coming years to meet the forecasted load.

Load management programs are defined as any program that reduces peak electricity demand or has the primary effect of shifting electric demand from the hours of peak demand to non-peak times. Nevada Power has a voluntary commercial curtailment program and is currently developing a residential air conditioner curtailment program to help alleviate the strains that air conditioning can put on the power supply during peak demand times.

From a transmission system planning perspective, load reduction that results from load management programs could not come close to meeting the reliability requirements and anticipated loads in the Las Vegas Valley or provide access to the interconnected grid. Therefore, energy conservation and load management programs as a soul source were eliminated from further consideration.