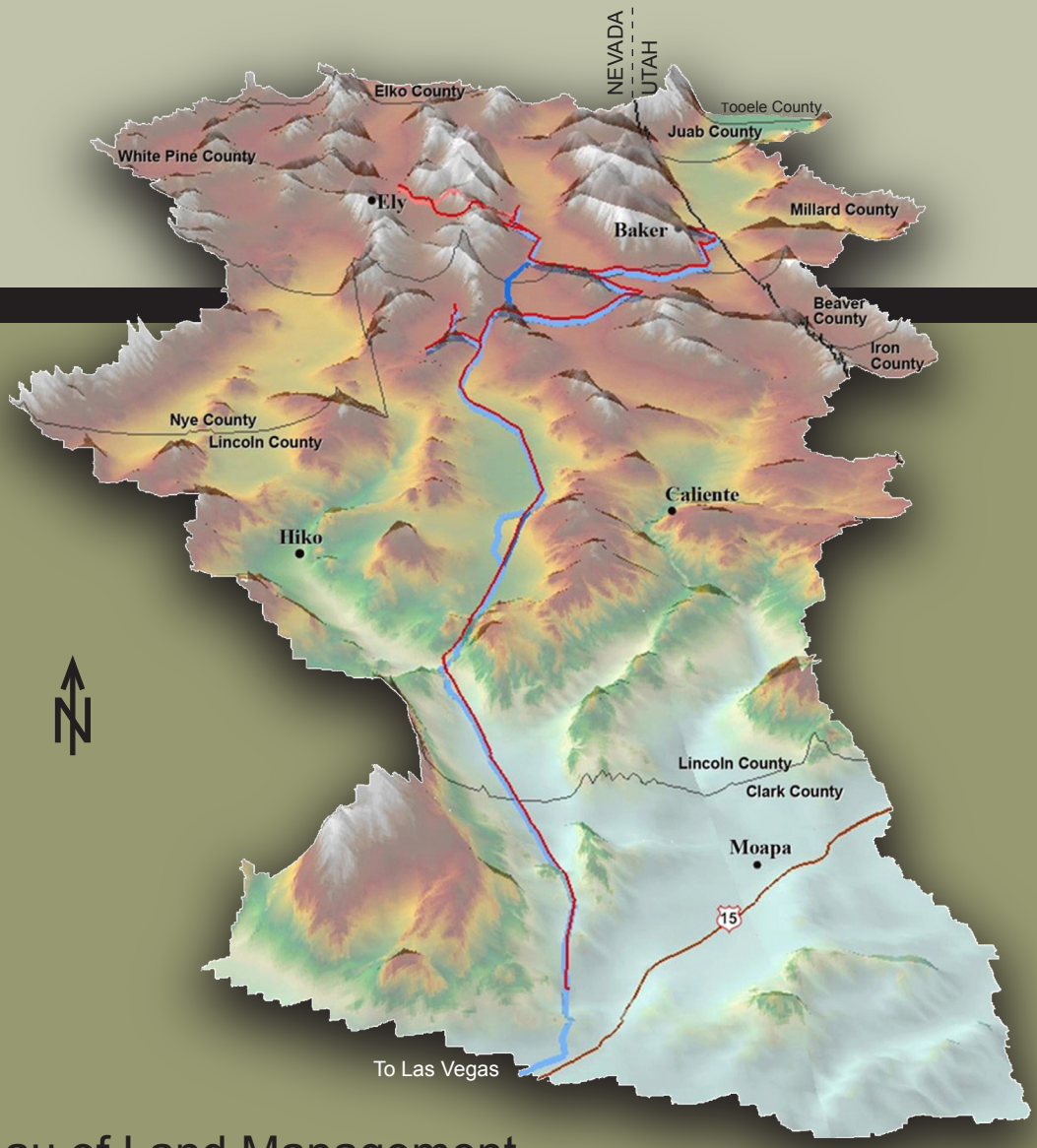
Clark, Lincoln, and White Pine Counties Groundwater Development Project Final Environmental Impact Statement

Book 1 of 2



Bureau of Land Management

August 2012
FES 12-33

Cooperating Agencies

Army Corps of Engineers
Bureau of Indian Affairs
Bureau of Reclamation
Central Nevada Regional Water Authority
Clark County, NV
Juab County, UT
Lincoln County, NV
Millard County, UT
National Park Service
Nellis Air Force Base
Nevada Department of Wildlife
State of Utah
Tooele County, UT
U.S. Fish and Wildlife Service
U.S. Forest Service
White Pine County

BLM
Nevada State Office

Mission Statement

The BLM's multiple-use mission is to sustain the health, diversity, and productivity of the public lands for the use and enjoyment of present and future generations.

BLM/NV/NV/ES/11-17+1793

United States Department of the Interior

BUREAU OF LAND MANAGEMENT
Nevada State Office
1340 Financial Boulevard
Reno, Nevada 89502-7147
http://www.blm.gov/nv

In Reply Refer To:
2800 (NV910)
N-78803

August 2012

Dear Reader:

Enclosed is the *Clark, Lincoln, and White Pine Counties Groundwater Development Project Final Environmental Impact Statement* (Final EIS). The full text of the Final EIS including responses to comments on the Draft EIS is contained within the disk found inside the back cover of Book 2. You may also download the Final EIS from www.blm.gov/5w5c. The Bureau of Land Management (BLM) has prepared this Final EIS in response to a right-of-way (ROW) application submitted by the Southern Nevada Water Authority (SNWA) for construction and operation of a pipeline system and associated infrastructure to support the proposed future conveyance of groundwater to Las Vegas Valley from five hydrologic basins in east-central Nevada. Sixteen Cooperating Agencies have assisted the BLM in developing this Final EIS:

U.S. Forest Service	U.S. Fish and Wildlife Service	Clark County, NV
Nellis Air Force Base	National Park Service	Lincoln County, NV
Army Corps of Engineers	State Of Utah	White Pine County, NV
Bureau of Indian Affairs	Nevada Department of Wildlife	Juab County, UT
Bureau of Reclamation	Central Nevada Regional Water Authority	Millard County, UT
		Tooele County, UT

Some of the above Cooperating Agencies will be using the Final EIS in their decision-making process for other permits and licenses associated with the proposed project.

The BLM completed a Draft EIS that analyzed a conceptual plan of development submitted to BLM by SNWA, which included information about the proposed project. The Draft EIS was released to the public on June 10, 2011, with publication of a Notice of Availability (NOA) in the Federal Register. The NOA initiated a 90-day public comment period (extended for an additional 30 days) ending on October 11, 2011. Public meetings were held August 2, 2011 through August 18, 2011. The BLM received comments on the Draft EIS through more than 460 letters and emails (plus over 20,000 email action alert submissions). The BLM reviewed the comments and provided written responses in this Final EIS (included within Appendix H). Some comments resulted in modifications to text in the EIS. Substantive changes in the Final EIS are marked with a text bar in the margin. The Final EIS is a "full text" document that contains the entire EIS and supersedes the Draft EIS.

This Final EIS considers the expected environmental effects associated with granting the ROW across public land and subsequent construction and operation of SNWA's proposal. In addition to SNWA's proposal, seven alternatives including the No Action alternative also are presented and analyzed in the Final EIS. One additional alternative was prepared and analyzed specifically for this Final EIS. Specifics of associated future water development currently are unknown and, therefore, are treated programmatically and conceptually in the EIS. As part of the EIS process for this project, a comprehensive groundwater model was prepared. The model report was updated for the additional alternative and is included on a separate disk included with the Final EIS.

Although water rights, pumping rates, volume of water proposed for transport to the Las Vegas Valley, and the point of use of water proposed for transport across public land all are outside the jurisdiction of the BLM, these issues have been included in the analysis in this document. Water rights and pumping rates are under the purview of the Nevada State Engineer. Water distribution and use associated with the importation of water in the Las Vegas Valley have been addressed by local and regional planning agencies in accordance with Nevada Revised Statutes.

The purpose of this Final EIS is to document and disclose the expected environmental effects associated with the proposed project and seven alternatives. The BLM will use the Final EIS to render a decision on whether to grant a ROW or under what conditions the ROW should be granted. This Final EIS is not a decision document; however, BLM has selected a preferred alternative, which, at this time, would best accomplish the purpose and need of the proposed action while fulfilling BLM's statutory mission and responsibilities.

The *Clark, Lincoln, and White Pine Counties Groundwater Development Project Final Environmental Impact Statement* will be available for 30 days. A description of new or missed information within this Final EIS may be submitted within the thirty day availability period to:

Penny Woods, Project Manager
Bureau of Land Management
Nevada Groundwater Projects Office
Nevada State Office (NV-910.2)
1340 Financial Blvd
Reno, NV 89502
FAX: 775.861.6689
Email: nvgwprojects@blm.gov

The BLM will issue one or more records of decision (ROD) based on this Final EIS. The ROD(s) will not be issued until other agency permits and approvals have been finalized and their conditions of approval will be incorporated into the ROD(s). For more information, Please contact Penny Woods at 775.861.6466.

Environmental Impact Statement
For the Clark, Lincoln and White Pine Counties Groundwater Development Project Right-of-Way

( ) Draft (X) Final

Lead Agency: United States Department of the Interior
Bureau of Land Management

Cooperating Agencies: White Pine County, Nevada
Lincoln County, Nevada
Clark County, Nevada
Juab County, Utah
Tooele County, Utah
Millard County, Utah
Central Nevada Regional Water Authority
Nevada Department of Wildlife
State of Utah
United States Air Force – Nellis Air Force Base
United States Army Corps of Engineers
United States Bureau of Indian Affairs
United States Bureau of Reclamation
United States Fish and Wildlife Service
United State Forest Service
National Park Service

Counties Directly Affected: Clark, Lincoln and White Pine Counties, Nevada

Environmental Impact Statement Contact:

Penny Woods, Nevada Groundwater Projects Manager
Bureau of Land Management, Nevada State Office
1340 Financial Blvd
Reno NV 89502
775.861.6466

Date Filed with the Environmental Protection Agency: August 3, 2012

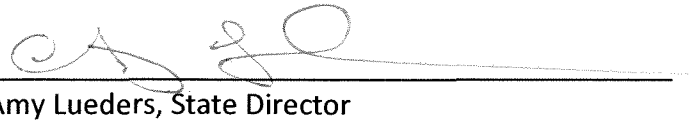
The Nevada State Office of the Bureau of Land Management (BLM) has prepared this Final Environmental Impact Statement (EIS) in response to a right-of-way (ROW) application filed by

the Southern Nevada Water Authority (SNWA or applicant), a subdivision of the State of Nevada, to construct and operate the Clark, Lincoln, and White Pine Counties Groundwater Development Project (proposed action), a system of groundwater conveyance facilities including main and lateral pipelines, power lines, pumping stations, substation, pressure reduction stations, an underground water reservoir, a water treatment plant and associated ancillary facilities. The project would be located in northern Clark County, Lincoln County, and southeastern White Pine County, primarily within the 2,640-foot wide corridor established by the Lincoln County Conservation, Recreation, and Development Act (LCCRDA) under public law 108-424. Enacted on November 30, 2004, the LCCRDA designated utility corridors to be used for ROWs for roads, wells, pipelines, and other infrastructure needed for construction and operation of water conveyance systems in Lincoln and Clark Counties. The requested ROW extends beyond the northern boundary of the designated corridor into White Pine County in Spring and Snake valleys. For engineering feasibility reasons and/or to minimize environmental impacts, the requested ROW deviates from the corridor in a few locations in Clark and Lincoln Counties. The ROW would be processed in accordance with the Federal Land Policy and Management Act of 1976, which authorizes the Secretary of the Interior to grant ROWs across public lands administered by the BLM. In addition, the Southern Nevada Public Lands Management Act of 1998 also directs the Secretary of the Interior to issue ROWs in Clark County to units of local or regional government for pipelines and systems needed for the impoundment, storage, treatment, transportation, and distribution of water.

This Final EIS considers the expected environmental effects of granting of a ROW across public lands and subsequent construction and operation of the proposed action, no action, and six action alternatives. The BLM will use the EIS when rendering a decision on whether to grant the requested ROW. The BLM action is to either grant or deny the request for ROWs through public land administered by the BLM. This Final EIS satisfies the requirements of the National Environmental Policy Act, which mandates that federal agencies analyze the environmental consequences of major federal actions.

This Final EIS also includes a programmatic agreement (PA) prepared under the provisions of Section 106 of the National Historic Preservation Act of 1966. The PA has been executed by the BLM, the Advisory Council on Historic Preservation, the Nevada State Historic Preservation Officer, and the SNWA to guide roles of the involved agencies and provide procedures on inventorying for historic properties and mitigation of adversely-affected historic properties. The PA was developed with the involvement of Indian Tribes and other consulting parties as well as the public.

Official responsible for the environmental impact statement:



Amy Lueders, State Director

August 3, 2012

Date

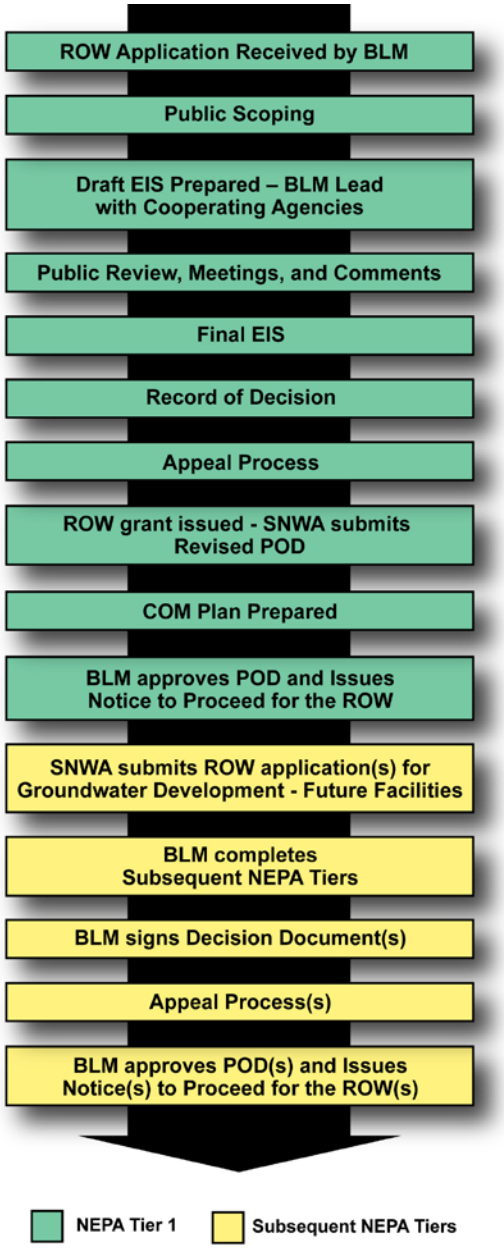
Executive Summary

The United States (U.S.) Bureau of Land Management (BLM) received an application from the Southern Nevada Water Authority (SNWA) for a right-of-way (ROW) grant to provide access to public lands for the purpose of constructing and operating pipelines, power lines, and ancillary facilities for groundwater conveyance. These facilities are associated with groundwater rights either awarded to SNWA or for which applications are pending with the Nevada State Engineer (NSE). Approved groundwater withdrawals would occur in central-eastern Nevada and transported via pipeline to the Las Vegas Valley.

The National Environmental Policy Act (NEPA) mandates federal agencies prepare a detailed study of potential effects of "major federal actions significantly affecting the quality of the human environment." BLM's grant of a ROW to SNWA for these facilities is considered a major federal action, and therefore, must undergo the NEPA review process; in this case by the preparation of an Environmental Impact Statement (EIS). The NEPA process requires a number of steps including public involvement, description of the affected environment, and disclosure of anticipated impacts from the Proposed Action and reasonable alternatives, including those that the BLM has no authority to implement. Decision-makers must consider environmental effects on social, cultural, economic, natural, and other resources.

The BLM, as the lead federal agency, developed this Final EIS with assistance from 16 cooperating agencies and additional Department of Interior staff. The document has been prepared to comply with applicable laws and regulations, consider the issues and concerns identified during scoping, provide a reasonable range of alternatives for analysis, and supply a robust analysis to support the Record of Decision (ROD) that will be issued by the BLM for this action.

The Executive Summary for the Clark, Lincoln, and White Pine Counties Groundwater Development Project (GWD Project) Final EIS is intended to supply information about the project, present BLM's decision regarding the Agency's Preferred Alternative, and help locate information in the Final EIS that may be of particular interest. The Executive Summary is presented in a "Question and Answer" format that generally parallels the presentation of the Final EIS main document.



1. What does the Executive Summary contain?

The Executive Summary provides an overview of the Final EIS prepared by the BLM for the SNWA (also referred to as the applicant) proposed GWD Project in Clark, Lincoln, and White Pine counties, Nevada. The report generally follows the order of presentation found in the Final EIS (**Figure ES-1**), beginning with essential background information about the NEPA process, continuing with a description of project facilities and the Final EIS alternatives, and concluding with summaries of project environmental impacts. **Figure ES-2** provides an overview of the project area and proposed facilities.

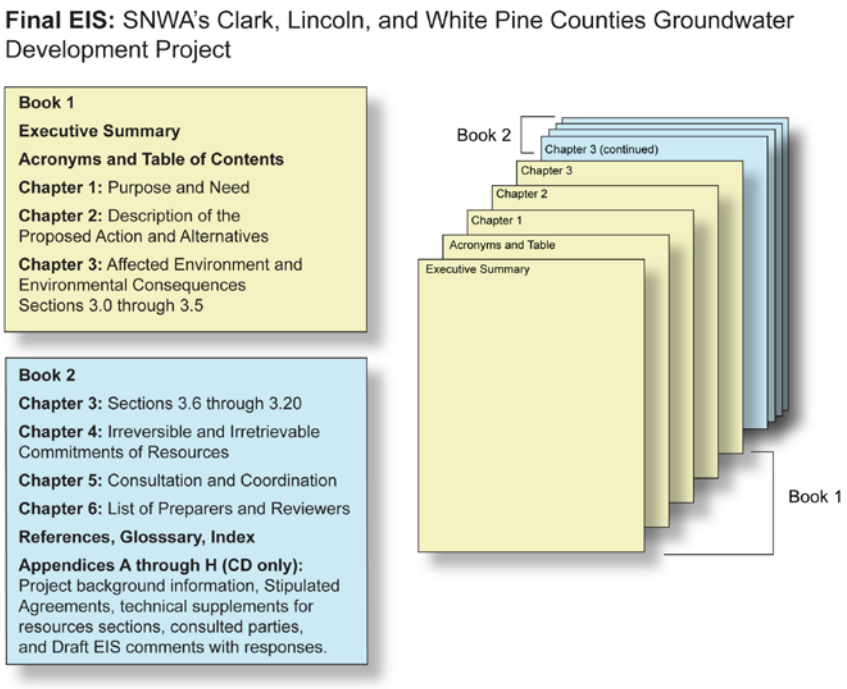


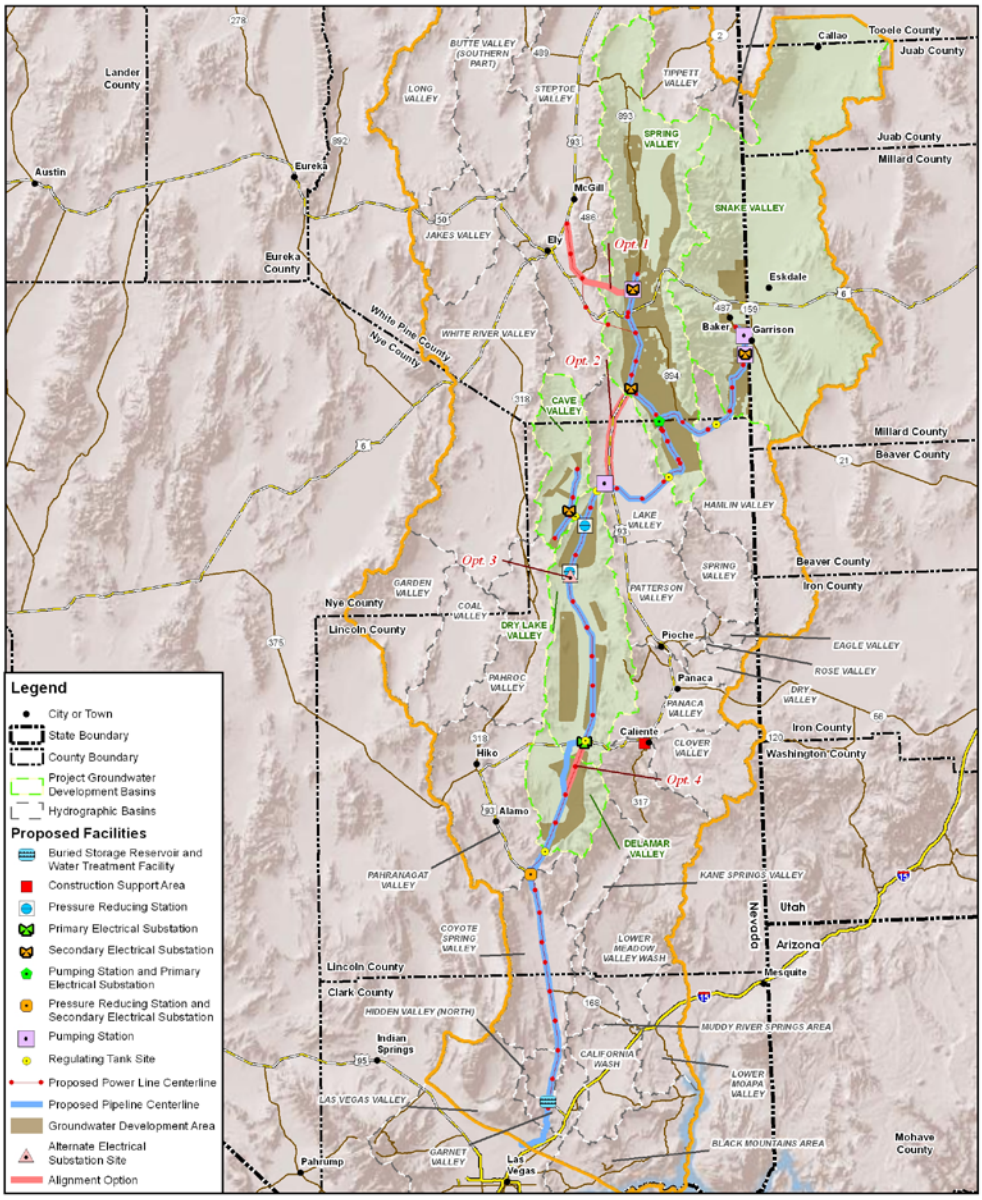
Figure ES-1 Organizational Overview of the Final EIS

The Executive Summary uses a "Question and Answer" presentation style to bring forward important questions surrounding this project. An electronic version of the full Final EIS, including all graphics, is contained on the CD enclosed with the printed Executive Summary. Availability of this Final EIS was published in the Federal Register by the BLM and U.S. Environmental Protection Agency (USEPA). Following a 30-day availability period, the BLM will complete a ROD concerning the GWD Project. The complete Final EIS can be accessed on the BLM's groundwater projects website at: http://www.blm.gov/5w5c.

For mail recipients, you have received a printed copy of the Executive Summary and an electronic version on the enclosed Final EIS CD. When you open the electronic version, clicking on the green boxes (see example) will open pertinent sections of the Final EIS.

Appendix A

Additional information is available from the BLM Groundwater Projects Website:
http://www.blm.gov/5w5c



KEY ACRONYMS	
afy	Acre-feet per year
BLM	Bureau of Land Management
COM Plan	Construction, Operation, Maintenance, Monitoring, Management, and Mitigation Plan
EIS	Environmental Impact Statement
FLPMA	Federal Land Policy and Management Act of 1976
GWD	Groundwater Development (as in reference to this project)
NEPA	National Environmental Policy Act
NSE	Office of the Nevada State Engineer
SNWA	The Southern Nevada Water Authority (the applicant for this project)
ROW	Right-of-way

Figure ES-2 **SNWA Proposed Groundwater Development Main Right-of-way and Future Groundwater Development Basins**

2. Why was this EIS prepared?

On August 19, 2004, the BLM received a ROW application from the SNWA to support construction and operation of a buried pipeline system to convey groundwater from central-eastern Nevada to the Las Vegas Valley (**Figure ES-2**). The requested ROWs would be located in Clark, Lincoln, and White Pine counties.

The SNWA proposes to construct and operate main and lateral pipelines, power lines, and ancillary facilities. This environmental study analyzes site-specific impacts of ROW construction and pipeline operation and provides a programmatic analysis of the potential impacts of future lateral lines, groundwater production facilities, including wells and collector lines, and drawdown from pumping groundwater on environmental resources. Additional environmental studies will be required before specific, local well fields can be defined and evaluated.

The FLPMA gives the Secretary of the Interior general authority to grant ROWs across public lands administered by the BLM, including ROWs for facilities and systems for the storage, transportation and distribution of water.

The BLM need for a federal action arises from its multiple-use mission which includes managing activities on federal land such as ROW authorizations, while conserving natural, historical, cultural, and other resources on the public lands. The BLM is required by the Federal Land Policy and Management Act of 1976 (FLPMA) and other legislation to consider and respond to the applicant's ROW requests.

Future groundwater development and production in Spring, Snake, Delamar, Dry Lake, and Cave valleys would be consistent with the approval of water rights by the NSE and associated future ROW grants from the BLM, neither of which are part of this Proposed Action.

As part of its review of ROW applications, BLM policy requires that an applicant demonstrate the technical and financial capability to construct, operate, maintain, and terminate its project; SNWA has demonstrated that capability. BLM is not required by NEPA, FLPMA, or other regulations, to independently validate an applicant's estimated costs or make a determination of overall project feasibility; neither is a benefit-cost analysis required.

2.1 Why is the Southern Nevada Water Authority seeking to develop this groundwater?

The SNWA is a political subdivision of the State of Nevada, established in 1991 by agreement among the seven municipal water providers serving the Las Vegas Valley. Its mission is to address the regional water needs of southern Nevada by acquiring and managing water resources, building and managing regional water facilities, and promoting responsible water use (SNWA 2009). The SNWA allocates and delivers water to meet the demands of its member agencies. Each member agency is individually responsible for and has sole authority over the allocation and delivery of retail water to customers within its respective service areas, which collectively include the Las Vegas Valley, Boulder City, and Laughlin.

The SNWA depends on the Colorado River for 90 percent of its current water needs.

Appendix A

As required by state law, (Nevada Revised Statute Section 704) the SNWA develops long-term water demand forecasts for its service area. The SNWA *Water Resource Plan 09* addressed forecasted water demand through 2060. The planning outcomes documented in that plan indicate that SNWA's long-term water demands, including allowances for further conservation, are greater than what could be served with existing resources. In addition, the *09 Water Plan* identified the benefits of having additional resources to respond to drought conditions in the Colorado River Basin that could affect SNWA's withdrawals from Lake Mead, its principal reservoir which stores its primary supply. Based on expected growth in demand at the time the *09 Water Plan* was produced, SNWA anticipated needing groundwater from this proposed project by 2020. The long-term demand outlined in the *09 Water Plan* is even greater than the quantity of water proposed for conveyance through the Proposed Action, which would eventually require yet further supply. The SNWA decided to move forward with the groundwater development.

Between 1991 and 2008, conservation efforts in Clark County have reduced average water use by 28 percent, to 248 gallons per capita per day.

In 2009, the SNWA adopted a conservation goal to reduce water use to 199 gallons per capita per day by 2035.

2.2 Why doesn't the SNWA withdraw more water from the Colorado River system?

The Colorado River is governed by a unique body of law, consisting of interstate compacts, statutes, Supreme Court decisions, contracts, treaties, regulations, and policies that together constitute the *Law of the River* and govern how Colorado River water is used. Many elements have been added to the *Law of the River* over the past 30 years, allowing river management to accommodate social and economic change. These changes have been integrated into the legal framework that respects the historic rights and obligations and conforms to statutory, treaty and decree requirements.

The *Law of the River* dates back to the signing of the Colorado River Compact ("Compact") in 1922; the Compact was negotiated by the seven Colorado River Basin States and the federal government. The Compact divided the Colorado River into Upper and Lower Basins at Lee's Ferry, a point just south of the Utah-Arizona border, and apportioned, in perpetuity, the exclusive consumptive beneficial use of 7.5 million acre-feet per year (afy) to each basin.

The 1928 Boulder Canyon Project Act gave Congressional approval to the Colorado River Compact and provided for comprehensive federal management of flood control, power generation, and use of Colorado River water resources within the Lower Basin (primarily through operation of Lake Mead). This act also appointed the Secretary of the Interior as the sole contracting authority for permanent water delivery contracts with users in the Lower Basin. The Boulder Canyon Project Act also apportioned the Lower Basin's 7.5 million afy among Arizona (2.8 million afy), California (4.4 million afy), and Nevada (0.3 million afy) and authorized the construction of Hoover Dam and related facilities, the completion of which created Lake Mead.

The Mexican Water Treaty of 1944 allotted 1.5 million afy of the Colorado River's annual flow to Mexico, increasing to 1.7 million afy in years of surplus and reduced in years of extraordinary drought.

The total annual allocation of Colorado River water is 16.5 million afy. Between 1906 and 2008, the annual average natural inflow was about 16.3 million afy. The Colorado River has experienced below average inflow for 10 of the past 13 years (2000-2012, inclusive).

In May 2005, in response to continuing drought in the Colorado River Basin and reduced storage levels in Lakes Powell and Mead, the Secretary of the Interior (Secretary) initiated a process to develop Lower Basin shortage guidelines and explore coordinated management operations for lakes Powell and Mead. In April 2007, the Basin States reached agreement on actions to improve management and augment the supply of water available for use in the Colorado River System. Under the Seven States' Agreement, the Basin States recommended the Secretary conjunctive management of Lakes Powell and Mead and agreed to diligently pursue development of interim water supplies, system augmentation, system efficiency and water enhancement projects within the Colorado River system. SNWA's Groundwater Development is an example of long-term augmentation project contemplated by the Basin States' Agreement.

The 2007 Interim Guidelines, adopted by the Secretary, define criteria for reductions in deliveries to the Lower Division states based on Lake Mead surface water elevations. When Lake Mead is at or below elevation 1,075 feet and at or above 1,050 feet, the shortage is 0.333 million afy; when Lake Mead is below elevation 1,050 feet and at or above 1,025 feet, the shortage is 0.417 million afy; when Lake Mead is below 1,025 feet, the shortage is 0.500 million afy. Of these shortage volumes listed, Nevada will take reductions in deliveries of 13,000 acre-feet, 17,000 acre-feet, and 20,000 acre-feet, respectively. In the event that Lake Mead's surface water elevation falls below 1,025 feet, the Secretary will consult with the Basin States in the development of further measures, consistent with applicable Federal law, to reduce the possibility of Lake Mead's surface water elevation falling below 1,000 feet.

In January 2010, the Bureau of Reclamation, in collaboration with the seven Colorado River Basin States initiated the "Colorado River Basin Water Supply and Demand Study". The study, anticipated to be completed in the fall of 2012, will define current and future imbalances in water supply and demand in the Colorado River Basin and adjacent areas over the next half-century, and develop and analyze adaptation and mitigation strategies to resolve those imbalances and assess risks to Basin resources. These resources include water allocations and deliveries consistent with apportionments under the Law of the River; hydroelectric power generation; recreation; fish, wildlife, and their habitats; water quality; flow and water dependent ecological systems; and flood control.

2.3 Who is responsible for preparing this EIS?

The BLM is the lead federal agency for the EIS process in compliance with the NEPA and the Council on Environmental Quality (CEQ) regulations implementing NEPA (40 Code of Federal Regulations [CFR] 1500-1508). This Final EIS conforms with policy guidance provided in BLM Handbook H-1790-1 and with land management plans currently in place for the affected lands.

As provided for by NEPA, 16 agencies with either jurisdiction by law, or special expertise, elected to enter into a Memorandum of Understanding with the BLM to assist as a cooperating agency in the EIS process. These agencies are listed below.

Cooperating Agencies for the SNWA Groundwater Project EIS

U.S. Army Corps of Engineers • U.S. Bureau of Indian Affairs
• U.S. Bureau of Reclamation
Central Nevada Regional Water Authority • Clark County, NV • Juab County, UT
• Lincoln County, NV
Millard County, UT • National Park Service • Nellis Air Force Base
• Nevada Department of Wildlife
State of Utah • Tooele County, UT • U.S. Fish and Wildlife Service
• U.S. Forest Service • White Pine County, NV

Federal law requires the Secretary to grant the ROWs requested by the SNWA in Clark and Lincoln counties in accordance with the FLPMA and other applicable regulations, subject to NEPA review.

In White Pine County, the BLM may grant the ROWs under its own FLPMA general authority.

Federal law also requires an agreement between Utah and Nevada on the division of water resources from those interstate flow systems from which water would be diverted, prior to any transbasin diversion.

2.4 Under what laws is the BLM acting?

The ROWs requested by the SNWA for this GWD Project must be processed in accordance with the FLPMA, and other laws, as well as the BLM ROW regulations. FLPMA requires that, each ROW shall contain such terms and conditions deemed necessary to: protect federal property and economic interest; protect life and property; protect the interest of individuals who rely on the fish, wildlife, and other biotic resources; and protect the public interest in lands (Sec 505 [43 United States Code (USC) 1765]). BLM is also generally obligated to avoid unnecessary or undue degradation of the public lands (43 USC §1732). In addition, Congress specifically directed the BLM to grant ROWs for water resource development and conveyance projects in Lincoln and Clark counties pursuant to the Lincoln County Conservation, Recreation, and Development Act of 2004. This law established "*…a 2,640 foot wide corridor for utilities in Lincoln County and Clark County, Nevada…*" The law requires the BLM to issue to the SNWA and the Lincoln County Water District "*…nonexclusive ROW to federal land in Lincoln County and Clark County, Nevada for any roads, wells, … other facilities necessary for the construction and operation of a water*

conveyance system,… within that corridor." The law also directs the BLM to conduct environmental studies to identify and consider the potential impact to fish and wildlife resources and habitat. The law contains a provision that "*…the State of Nevada and the State of Utah shall reach an agreement regarding the division of water resources of those interstate groundwater flow system(s) from which water will be diverted and used by the project. The agreement should allow for the maximum sustainable beneficial use of the water resources and protect existing water use."* Additionally, the Southern Nevada Public Lands Management Act of 1998 requires the BLM to issue ROW to units of local or regional government on federal lands. The Southern Nevada Water Authority is a qualified unit of regional government.

Simply put, federal law mandates the BLM to grant the ROWs requested by the SNWA in Clark and Lincoln counties. The ROW grant will contain appropriate conditions to ensure compliance with FLPMA and to avoid unnecessary or undue degradation of the public lands. The SNWA's requested ROWs in White Pine County may be granted pursuant to the BLM's authority under the FLPMA.

When issuing ROWs, the BLM may formulate monitoring and mitigation strategies including conditions to minimize environmental impacts resulting from the construction and operation of the GWD Project (see Final EIS Sections 2.4, Environmental Inspection, Compliance Monitoring, and Post Approval Variances, and 3.20, Monitoring and Mitigation Summary).

2.5 When was the Draft EIS available and what alternatives were considered?

On June 10, 2011, a Notice of Availability was published in the Federal Register (76[112]:34097-34099) announcing the availability of the Draft EIS. The Draft EIS assessed the impacts of SNWA's Proposed Action, a full range of reasonable action alternatives, and the No Action Alternative. Each groundwater development action alternative is defined by one of the three major ROW alignment options, an assumed well development pattern and level of SNWA groundwater production, and whether future groundwater production would occur full time or on an intermittent basis.

Although the BLM is mandated by law to grant certain ROWs, the No Action Alternative is used as a benchmark for the comparison of the Proposed Action and alternatives.

The SNWA ROW request for the main pipeline extends from Clark County to a point in northern Lincoln County near its boundary with White Pine County (common to all three alignments. Three major laterals also will be constructed; one in Lincoln County (Cave Valley), and two in White Pine County (Spring and Snake valleys).

The three alignment options considered for the main project conveyance system include:

1) The SNWA's full ROW request for the main pipeline, major lateral pipelines, power lines, and other ancillary facilities;

2) The ROW mandated by Congress in Lincoln and Clark counties only (Lincoln County Conservation, Recreation, and Development Act [LCCRDA]); and

3) The ROW mandated by Congress, with an extension into Spring Valley in White Pine County.

Four levels of assumed annual groundwater production were defined for the analysis:

- Pumping at the SNWA application volumes: up to 176,655 afy;
- Pumping of up to 114,755 afy, with production in all 5 basins;
- Pumping of up to 78,755 afy, assuming no groundwater development in Snake Valley; and
- Pumping of up to 114,129 afy, assuming no groundwater development in Snake Valley.

The groundwater production assumptions also reflect options regarding well placement, and assumed frequency and duration of groundwater production.

The ROW alignments relate to the current federal action and would result in a ROD that makes a decision regarding the ROW; the other factors relate to the programmatic analysis of future groundwater development facilities. **Table ES-1** summarizes the eight alternatives for analysis and **Figure ES-3** shows the three main pipeline ROW alternatives. The Proposed Action and Alternatives A, B, and C all use the full project footprint contained in the SNWA ROW application.

Table ES-1 Summary of the Eight Alternatives for EIS Analysis

Alternatives for Analysis	Conveyance System Alignment	SNWA Groundwater Production[2]	Basins in Which SNWA Production Would Occur	Well Placement[3]	Assumed Full Build out
Proposed Action	Full ROW request [1]	Up to 176,655 afy	Spring, Snake, Delamar, Dry Lake, Cave	Distributed	Year 38
A	Full ROW request [1]	Up to 114,755 afy	Spring, Snake, Delamar, Dry Lake, Cave	Distributed	Year 38
B	Full ROW request [1]	Up to 176,655 afy	Spring, Snake, Delamar, Dry Lake, Cave	Points of Diversion	Year 38
C	Full ROW request [1]	12,000 to 114,755 afy (varies in response to drought)	Spring, Snake, Delamar, Dry Lake, Cave	Distributed	Year 38
D	LCCRDA	Up to 78,755 afy	Spring (south), Delamar, Dry Lake, Cave	Distributed	Year 33
E	Spring / Delamar, Dry Lake, and Cave	Up to 78,755 afy	Spring, Delamar, Dry Lake, Cave (no Snake)	Distributed	Year 33
F	Spring / Delamar, Dry Lake, and Cave	Up to 114,129 afy	Spring, Delamar, Dry Lake, Cave (no Snake)	Distributed	Year 33
No Action	None	None	None	None	NA

[1] Full ROW request includes the ROW for the main pipeline, three lateral pipelines, transmission line, and other ancillary facilities.

[2] Includes 3,000 afy of water rights transferred by the SNWA to the Lincoln County Water District.

[3] "Distributed" refers to siting wells based on the results of monitoring, productivity, and hydrologic modeling to reduce long-term adverse environmental effects. "Points of diversion" refers to siting wells at specific locations identified and approved by the NSE.

Each ROW alignment provides for temporary and permanent ROWs to support construction of a pipeline, power line, and other ancillary facilities.

The differences in the northern terminus among the three alignments result in different ROW lengths and corresponding differences in surface disturbance. SNWA's full ROW request involves 306 miles of ROW for the pipeline and 12,288 acres of temporary disturbance, while the LCCRDA alignment has the smallest numbers, 225 miles of pipeline ROW and 8,828 acres of temporary disturbance. Additional information about the three alignments can be found in Sections 2.5 and 2.6 of the Final EIS.

Most of the surface area disturbed during construction would be revegetated in accordance with BLM's Resource Management Plan (RMP) management actions and best management practices (BMPs). The estimated net long-term disturbance following revegetation is 999 acres under the SNWA full ROW request; 808 acres with the LCCRDA alignment; and 945 acres for the Spring/Delamar, Dry Lake, and Cave alignment.

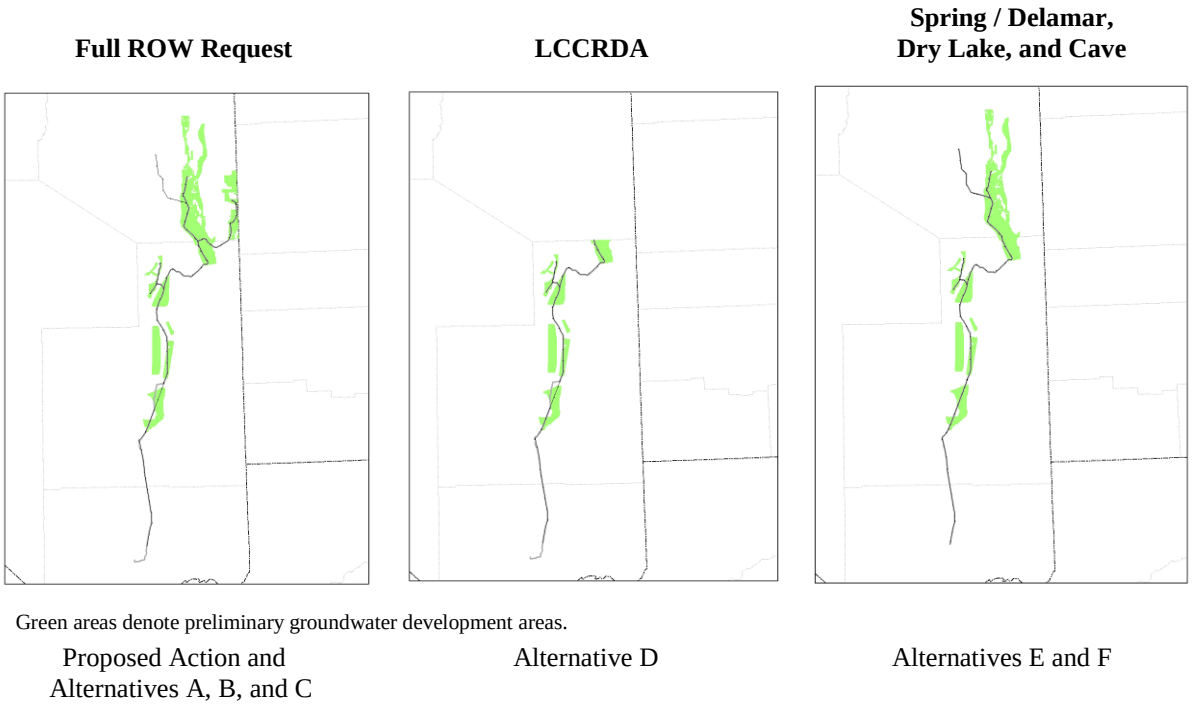


Figure ES-3 Groundwater Development Project Main Right-of-way Alignments

2.6 Alternative F was added for the Final EIS. Does CEQ allow the addition of an alternative at this point in the process?

The BLM developed and analyzed a new alternative, Alternative F, in this Final EIS. The proposed development of the main water conveyance pipeline and related facilities is consistent with that analyzed for Alternative E in the Draft EIS. The volume of groundwater developed would not exceed 114,129 afy. No water would be developed by the SNWA in Snake Valley.

The agency's decision to develop the new alternative was based upon input from the applicant, review of public comments, and the desire to analyze a broader range of alternatives in the Final EIS. The addition of this new alternative is consistent with CEQ guidance allowing an agency to develop new alternative(s) that are variations of alternatives analyzed in the Draft EIS. Alternative F is equivalent to Alternative E in regard to construction footprint and numbers and types of facilities and the assumed groundwater withdrawal volumes are within the range of those analyzed for the Proposed Action and Alternative E.

2.7 What comments were received on the Draft?

The Notice of Availability published in the Federal Register (76[112]:34097-34099) defined a 90-day public review and comment period running from June 10 through September 9, 2011. The comment period was extended by 30 days in response to public input; ending on October 11, 2011.

The BLM received more than 460 sets of written comments and oral statements made during public hearings on the Draft EIS. More than 20,000 form letters were also submitted, either in hardcopy or digital format. Comments were received on all sections and topics in the Draft EIS. The more common resource topics and concerns include the following:

General: duration of the comment period; the definition of alternatives, programmatic analysis of the future facilities; public policy issues associated with groundwater allocation; and water conservation.

Air Quality and Climate Change: potential dust-related effects on human health; visibility (especially related to Great Basin National Park [GBNP]); the potential contribution to National Ambient Air Quality Standard non-attainment areas; requests for additional Air Quality modeling; and, potential long-term effects of Climate Change on the area.

Geology: concerns related to long-term subsidence.

Water Resources: definition of the groundwater flow model area; predicted water use and drawdown under the No Action Alternative; use of the regional groundwater flow model and simulated 10-foot drawdown to define the drawdown area for the impact analysis; use of simulated changes to flow in selected springs and streams; and the development and pumping timeframes for the programmatic analysis.

Biological Resources: loss of vegetation; particularly wetlands/meadows and white sage; vegetation re-establishment and treatment/prevention of annual invasive weed species in areas of disturbance; new policies (e.g., greater sage-grouse, southwestern willow flycatcher revised proposed critical habitat); loss of hunting and fishing habitat; potential pumping effects on special status species in Utah hydrologic basins; the risks of relatively large predicted flow reductions in some springs in Spring and Snake valleys; and potential effects on special status aquatic species.

Human Resources: visual resources concerns related to project components and desertification (particularly the viewshed from GBNP); effects to recreation and tourism including visitation to the GBNP; loss or population decline of game species; inadequate tribal consultation and Native American concerns related to loss of historic lands, Traditional Cultural Properties, artifacts, plants and animals of cultural importance, and loss of water which many tribes hold sacred; project cost and the effects on ratepayers; SNWA's need for additional water given current economic conditions or projected growth in the Las Vegas Valley; potential adverse effects or benefits in Clark County if the project does/does not move forward; and the potential that the exportation of water facilitated by the project could foreclose economic development opportunities in White Pine County and the Utah portion of the Snake Valley.

Cumulative Impacts: concerns related to the projects that were included/excluded and the process for conducting the cumulative impact analysis.

Monitoring, Management, and Mitigation: requests for additional specificity in the mitigation, management, and monitoring plans; the effectiveness of proposed monitoring, management, and mitigation; assurances that long-term monitoring, management, and mitigation would occur; concerns that pumping would not be discontinued even if major adverse effects are identified; and the cost implications of monitoring, management, and mitigation.

Appendix H provides a listing of all comments and the specific responses to those comments. The Final EIS reflects many changes made in response to public input. In general, more of the comments and concerns focused on the potential long-term effects of pumping and groundwater drawdown than the effects related to the ROW grant and construction of the main pipeline.

Appendix H

2.8 What other changes were made between the Draft and this Final EIS?

In response to agency and public comments on the Draft EIS, the BLM has made numerous changes in the Final EIS. The most substantive changes are summarized below.

Chapters 1 and 2

- Added Alternative F.
- Identified the Agency Preferred Alternative.
- Summarized the NSE rulings on SNWA's water rights applications in Spring, Delamar, Dry Lake, and Cave valleys.
- Added a discussion of project capital costs.

Chapter 3

- All resource areas incorporated analysis of Alternative F.
- The Air and Atmospheric Values analysis was revised to include a regional-scale model that more clearly assesses potential project-related pumping and groundwater drawdown impacts to air quality.
- The Climate Change discussion was expanded and resource-specific Climate Change analyses incorporated into the cumulative analysis sections of each resource.
- The greater sage-grouse analysis was updated to reflect the newly implemented Instruction Memorandum No. 2012-044 which specifies increased buffer zones around leks and transmission lines.
- Additional analysis regarding potential long-term effects to the landscape as viewed from the GBNP was added for all alternatives.
- Additional information on past, present, and reasonably foreseeable future actions was incorporated into the cumulative effects section.
- The Native American Traditional Values, Section 3.17, was expanded; now including a comparison of alternatives highlighting the impacts to sites and places of tribal concern.
- Section 3.20, Monitoring and Mitigation Summary, was revised to include a new construction, operation, and monitoring (COM Plan) for the project area. Some mitigation measures have been added, removed, or modified based on agency and public comment.

Chapter 4

- The description of irreversible and irretrievable resource commitments associated with the GWD Project was revised.

Chapter 5

- A synopsis of the Public Meetings on the Draft EIS and a summary of overarching comments received on the Draft EIS was added.

Chapter 6

- The list of preparers and reviewers for the EIS was updated.

Appendices

- SNWA's summary of Applicant-committed Measures (ACMs) in **Appendix E** was revised.
- Additions were made to the consultation record presented in **Appendix G**.
- Revisions to **Appendix F** sub-appendices related to individual resources have occurred as appropriate to support changes in the main document.
- **Appendix H** was added, presenting the comments on the Draft EIS and comment responses.

2.9 What is the Agency's Preferred Alternative?

The BLM has identified the main conveyance pipeline alignment contained in Alternative F, with Alignment Option 1 - the Humboldt-Toiyabe Power Line Alignment as its Preferred Alternative.

Under the BLM's NEPA regulations (43 CFR § 46.420[d]), the BLM's "Preferred Alternative" is the alternative which the BLM believes would best accomplish the purpose and need of the proposed action while fulfilling the agency's statutory mission and responsibilities; giving consideration to environmental, technical, cultural, social, economic, and other factors. The Preferred Alternative is not a final agency decision; rather, it is an indication of the agency's current preference.

The BLM has identified the main conveyance pipeline alignment contained in Alternative F as its Preferred Alternative (**Figure ES-4**). This alternative does not include ROW in Snake Valley. Alignment Option 1 – the Humboldt-Toiyabe Power Line Alignment would be included in the Preferred Alternative selection. The alignment option routes the power line in Steptoe Valley, east of Ely, across U.S. Forest Service lands through an existing utility corridor.

Figure ES-4 ROW and Facilities, Agency Preferred Alternative

In selecting the Preferred Alternative, the BLM considered all information received; consistent with its environmental review, ROW permitting responsibilities, and the NSE's jurisdiction over water rights. Therefore, BLM's preferred alternative would be limited to the amount of water stated in the NSE's March 2012 rulings. However, the agency Preferred Alternative is not, and should not be interpreted as a factual finding or opinion by the BLM on any past ruling, or current issue before the NSE.

Alternative F was not analyzed in the Draft EIS. However, the public will recognize similarities between Alternatives F and E; most notably that the pipeline alignments are identical and do not extend into Snake Valley. The ROW in Alternative E was analyzed in the Draft EIS. Based on the quantities of water approved for development by the NSE in the March 2012 ruling, as compared to the quantities analyzed in the EIS, the BLM acknowledges that Alternative E may understate the potential impacts, while Alternative F may overstate the expected impacts of the preferred alternative (**Table ES-2**). Alternatives E and F do differ in the quantity of water to be developed and conveyed. **Figure ES-5** presents a comparison of both alternatives model-simulated drawdown at the full build out plus 75 years timeframes. Since the NSE ruling groundwater amount is a reduction of roughly 26 percent over Alternative F (future facilities, the number of wells, miles of pipeline, etc.) would be reduced accordingly and impacts to federal resources would also be reduced. Since the BLM Preferred Alternative would limit the water developed by the project to that approved in the four valleys (Spring, Delamar, Dry Lake, and Cave) by the NSE (up to 83,988 afy), the two alternatives "bracket" the water quantities granted by the NSE.

Table ES-2 Comparison of Groundwater Withdrawal Volumes Pertaining to the Preferred Alternative

	Current NSE Rulings	Alternative E	Alternative F
Spring Valley	61,127	60,000	84,370
Delamar Valley	6,042	2,493	6,591
Dry Lake Valley	11,584	11,584	11,584
Cave Valley	5,235	4,678	11,584
Total Delamar, Dry Lake, and Cave Valleys	22,861	18,755	29,759
Total	**83,988**	**78,755**	**114,129**

2.10 What decisions will the BLM make based on this EIS?

The Final EIS assesses the short and long-term effects of construction and operation of the main water conveyance pipeline, water treatment and storage facilities, and the power transmission line and other facilities associated with system operations. Construction of these facilities would occur within temporary and permanent ROW grants issued by the BLM.

The analysis in this EIS will inform the decision makers whether they should:

1) Approve, modify, or deny (only in White Pine County) the ROWs as applied for by the SNWA;

2) Apply all appropriate mitigation measures; and

3) Require the development and implementation of an integrated and comprehensive COM Plan that will direct decision-makers on appropriate action for ROW actions associated with the SNWA GWD Project. The objectives of the COM Plan are to protect federal resources and federal water rights that may be impacted by construction, operation, maintenance, and abandonment of the project. The COM Plan is designed to provide early warning of potentially adverse impacts, provide time and flexibility to implement management measures to mitigate impacts, gage their effectiveness, and recommend appropriate action.

BLM DECISIONS TIED TO THE NEPA ANALYSIS IN THIS EIS

Approve or deny ROW Grants for the main pipeline, transmission line, water storage and treatment facilities, and associated ancillary facilities.*

Develop appropriate monitoring and mitigation to address potential adverse impacts of the GWD Project.

** ROW grants for future lateral lines and groundwater production wells and facilities would be subject to additional NEPA analysis.*

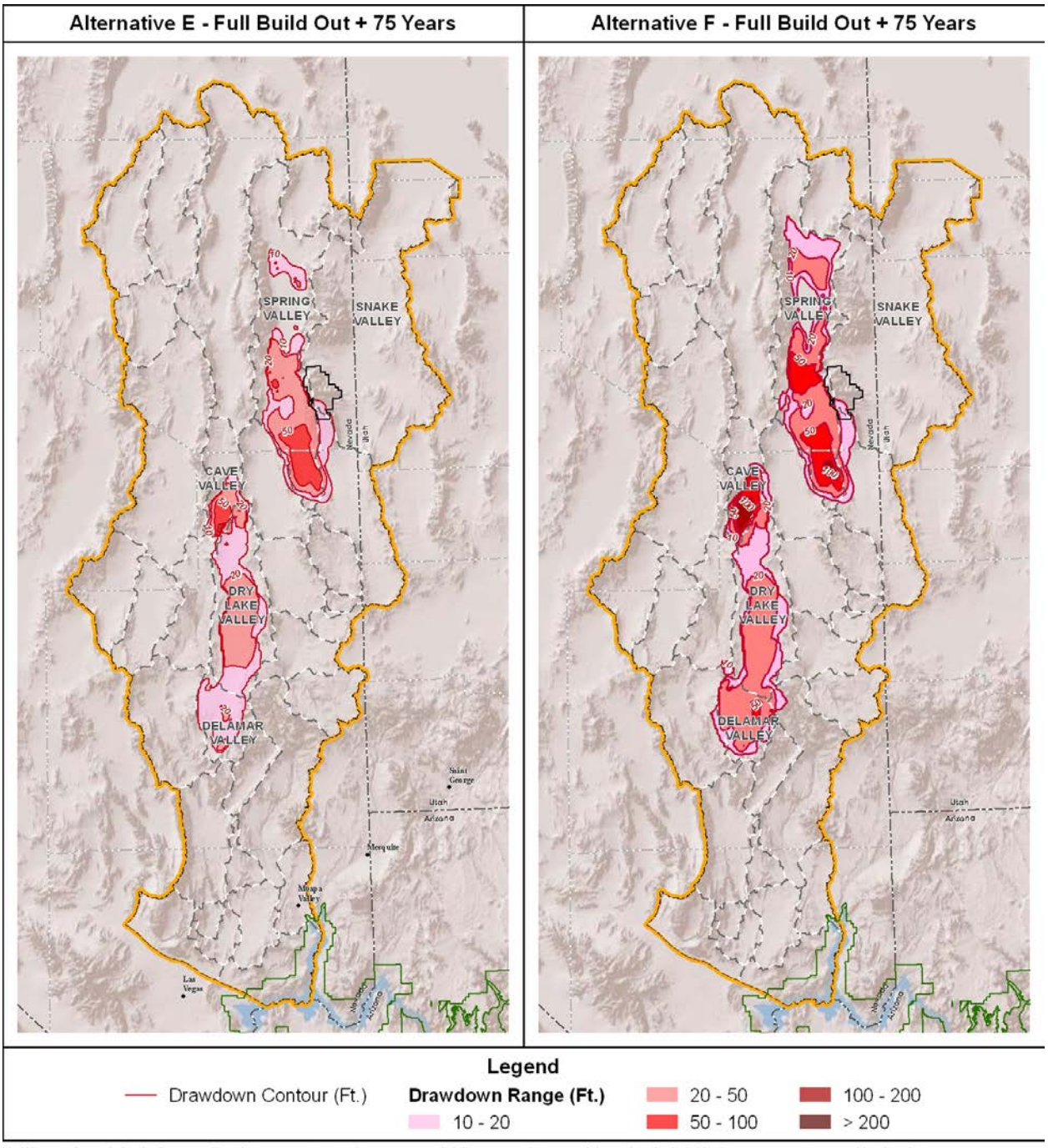


Figure ES-5 Drawdown Comparison of Alternatives E and F

If ROW grants are approved, the ROD document would contain the requirement for the applicant to prepare detailed, site-specific construction and operation plans for each project phase or facility component. These plans require BLM approval prior to surface disturbance and issuance of a Notice to Proceed for construction.

2.11 What mitigation and monitoring requirements would the BLM impose as conditions of any ROW grants for the GWD Project?

Section 3.20

It is understood that the SNWA would implement the Applicant-committed Measures (ACMs) it has proposed as part of its project unless superseded by the Ely or Las Vegas RMP management actions, BMPs, U.S. Fish and Wildlife Service Biological Opinion Terms and Conditions, or unless specifically modified by other ROW conditions. Under the FLPMA, the BLM may impose conditions on any ROW grant it permits for the GWD Project. Additional requirements and mitigation measures may be included as specific conditions to the ROD issued by the BLM for this EIS.

For the GWD Project, the BLM will require the SNWA to implement a comprehensive COM Plan. The objectives of the COM Plan are to protect federal resources and federal water rights that may be impacted by project construction, operation, maintenance, and abandonment. The COM Plan is designed to provide early warning of potential adverse impacts, provide time and flexibility to implement management and mitigation measures.

The COM Plan includes a comprehensive monitoring, management, and mitigation program for the entire project to integrate the various required monitoring, management, and mitigation actions which are provided through the following regulations and other commitments:

- BLM Land and RMP management actions and BMPs
- U.S. Fish and Wildlife Service Biological Opinion
- Section 106 Programmatic Agreement
- Mitigation from Final EIS
- Stipulated Agreements
- Applicant Committed Measures
- Clean Water Act (CWA) Section 404 Mitigation

If ROW grants for the groundwater development areas are approved in the future, the decision documents, either RODs or Findings of No Significant Impact would contain requirements for the submission of Plans of Development (PODs) containing the site specific construction and operation plans comparable to those required for the main water conveyance pipeline system.

2.12 How are Native Americans engaging in the NEPA process?

In 2007, the BLM initiated government-to-government consultation under section 106 of the National Historic Preservation Act with 28 Indian tribes and bands that may have religious or cultural ties to the project area. The executed Programmatic Agreement has been included as part of this EIS (**Appendix F3.16**). The tribes have declined to concur with the PA and their reasons are noted in the letter contained in **Appendix F3.16**.

Chapter 5 lists the Tribes that have been identified as having involvement or a particular interest in the GWD Project or project area. The BLM, with Tribal input has developed an Ethnographic Assessment report and is addressing potential properties of religious and cultural significance identified through the Ethnographic Assessment. Several of these Tribes assert federally reserved water rights claims to water potentially affected by the GWD Project. Some of these claims were addressed by the NSE in his recent rulings on Spring, Dry Lake, Delamar, and Cave Valleys. The Rulings can be accessed at http://water.nv.gov. The particular water rights claims and related resources are covered in more detail in Chapter 3.

2.13 Are other agency approvals and consultation required before the Project would move forward?

No Notice to Proceed for construction associated with this project would be issued until the detailed POD is submitted by SNWA and approved by the BLM.

Section 1.5.5

Yes, a number of other federal and state agency reviews, permits, and consultations would be required for the SNWA to move ahead with construction of the GWD Project. Many review processes are concurrent with the EIS process, while construction approvals, wildlife handling permits, and other approvals will follow the BLM's decision on the ROW application.

Prior to issuing a Notice to Proceed, the BLM ROD and the subsequent ROW grant would require the applicant to prepare and submit for BLM approval a detailed revised POD for the main water conveyance pipeline and related facilities, including all of the stipulations, conditions, and other requirements specified in the ROD. Based on the POD, BLM would prepare the COM Plan.

ROW applications for the subsequent individual groundwater development areas will be subject to NEPA analysis (subsequent/tiered NEPA), including public input. If ROW grants for the groundwater development areas are approved in the future, the RODs or Finding of No Significant Impact will contain requirements for the submission of PODs containing the site-specific construction and operation plans prior to the ROW/Notice to Proceed.

No Notice to Proceed for construction associated with this project would be issued until the detailed POD is submitted by SNWA and approved by BLM.

When the BLM is satisfied that the SNWA has developed all required plans related to construction and operation for the ROW and ancillary facilities and the COM Plan is prepared, the BLM may issue construction Notices to Proceed on a segmented basis.

Although the ROD and associated decisions do not carry an expiration date, the data, analyses, and other information used to reach a decision may change over time. A delay in project implementation of even a few years could result in the need to supplement the NEPA (EIS) process and associated processes such as section 7 and section 106 consultation.

2.14 What does "tiering" mean in the National Environmental Policy Act process and how does it relate to the GWD Project?

Tiering for NEPA purposes refers to the process of sequential assessment of regional-scale or phased projects to be developed over time; first addressing the environmental effects and issues for those project elements that are developed and ready for analysis, while deferring detailed assessment of subsequent phases (tiers) until they are ready. For the GWD Project, this EIS addresses the site-specific effects of construction and operation of the main and lateral pipeline, pumping stations, regulating tanks, pressure-reducing stations, electrical power lines, electrical substations, electronic system operations facilities, communication facilities, access roads, a water treatment facility, an underground water storage reservoir, and ancillary facilities.

"Tiering"

Tiering is a staged approach to NEPA described in CEQ's regulations (40 CFR 1500-1508). Tiering allows an assessment of some site-specific actions for which adequate information is available, addressing effects of other future actions programmatically. The other actions are subject to additional future NEPA assessment.

Programmatic assessments provide a broad characterization of potential effects over a wide area and/or period of time, with the expectation that the assessment will be refined in subsequent NEPA studies. The programmatic analysis for the GWD Project studies potential effects based on assumptions about the location and amount of disturbance involved for production wells, collector pipelines, and distribution power lines. The analysis also assumes a range of groundwater withdrawal rates and volumes. When applications for additional ROWs are submitted in the future, the environmental effects of those ROWs will be studied using data and results from the initial NEPA assessment (Tier 1), as a starting point for additional analyses. The more detailed assessments are referred to as

subsequent or tiered analysis. The tiering process is summarized in **Figure ES-6**. The SNWA has not yet applied for ROWs for groundwater production wells and collector pipelines because certain aspects of that future development are unknown. The environmental effects of that future development, including the long-term effects of groundwater production, are therefore the subject of programmatic analysis in this EIS.

In future tiered analyses, more detailed information regarding the location and type of development is used to prepare individual environmental assessments or environmental impact statements focused on a specific valley or other geographic area and the environmental issues associated with that location and development. The hydrologic model used for Tier 1 and baseline characterizations for all resources will be updated in future tiered analyses on site-specific components. The BLM will approve or deny any future proposed ROWs after environmental analysis with a decision document issued for each additional request.

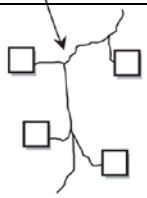
Tier 1 – this EIS **Detailed Assessment for ROWs for Main Facilities** **Programmatic Analysis of Future Facilities, Groundwater Pumping and Drawdown**			
Study Area	**NEPA Documents**	**Focus of the Analysis**	**BLM Decisions**
	*Clark, Lincoln, and White Pine Counties Environmental Impact Statement* (this EIS).	• Affected Environment described. • Detailed analysis of pipeline and power line infrastructure including construction and operation. • Programmatic analysis of groundwater pumping and conveyance. • Cumulative impacts analyzed.	• Location, alignment and extent of the ROW grant. • Notice to Proceed for construction (requires approved POD and implementation of the COM Plan). • Mitigation measures specified or proposed.
Subsequent Tiers: **Detailed Assessments for Future Facility Right-of-way and Updated Assessments for Groundwater Pumping and Drawdown**			
 Example of a cluster of 4 production wells, roads, power lines and collector lines.	Future Environmental Assessments or EISs.	• The Tier 1 EIS is incorporated by reference. • Other future NEPA preceding a specific analysis also is incorporated by reference. • Analysis focused to specific area, using more site-specific and updated information, including hydrology and monitoring. • Site-specific geographic setting and impacts.	• Location and size of ROW grants. • Notice to Proceed (requires POD and implementation of COM Plan). • Project-specific mitigation measures specified.

Figure ES-6 Overview of Tiered NEPA Analysis

2.15 Who is responsible for granting water rights?

In 1989, the Las Vegas Valley Water District applied to the Nevada Division of Water Resources (Office of the NSE) for groundwater rights in Snake, Spring, Delamar, Dry Lake and, Cave valleys. The applications were subsequently transferred to SNWA. The NSE held hearings on SNWA's applications on the latter four basins in 2011, permitting groundwater rights to SNWA in 2012. Hearings on SNWA's applications in Snake Valley have not been scheduled. The conditions of production associated with the permitted groundwater rights in the four designated basins are subject to conditions specified in Stipulated Agreements signed by appropriate Department of the Interior bureaus. The approved levels of groundwater pumping are not the BLM's decision to make but rather are the decision of the NSE. The water rights granted by the NSE do not obligate the BLM to grant additional licenses to the water rights holder to construct on, or cross, federal land.

Water rights in Nevada are administered by the Nevada State Engineer (NSE) under Nevada Revised Statute Title 48, Chapter 533. The NSE has jurisdiction to grant or deny SNWA's groundwater applications.

2.16 What are the Nevada State Engineer's responsibilities?

Nevada's first water statute was enacted in 1866 and has since been amended many times. The NSE is under the Nevada Division of Water Resources. The mission of the Nevada Division of Water Resources is to conserve, protect, manage, and enhance the State's water resources for Nevada's citizens through the appropriation and reallocation of the public waters. The NSE is responsible for gathering input and conducting a public process to evaluate the available data and testimony prior to responding to applications for water rights.

Nevada water law is based on two fundamental concepts: prior appropriation and beneficial use. Prior appropriation (also known as "first in time, first in right") allows for the orderly use of the state's water resources by granting priority to senior water rights. Nevada water law has the flexibility to accommodate new and growing uses of water in Nevada while protecting those who have used water in the past.

All water may be appropriated for beneficial use as provided in Nevada law. Irrigation, mining, recreation, commercial/industrial, and municipal uses are examples of beneficial uses, among others.

2.17 What is the Nevada water rights process?

The process to obtain a permit to develop un-appropriated groundwater or surface water begins with filing an application for a water permit with the NSE. In determining whether to grant an application, the NSE must consider if:

1) Unappropriated water exists at the proposed source of supply;
2) The proposed quantity and use of water would conflict with existing rights;
3) The proposed use of water would adversely affect domestic wells; and
4) The proposed use of the water would be detrimental to the public interest.

The BLM has no legal authority over water rights in Nevada.

The NSE has jurisdiction to grant or deny SNWA's groundwater applications in five groundwater development basins. See Nevada Revised Statute Title 48, Chapter 533 for additional factors to be considered prior to approving applications for inter-basin water transfers. More information regarding the Nevada water rights process can be found on the internet at http://water.nv.gov.

2.18 What is the relationship between the BLM environmental process and Nevada's water rights process?

There are functional interrelationships between the NEPA and NSE processes, in part because decisions and approvals made by one agency may influence the review and approval process of the other agency.

Future development proposed for locations on public lands and involving additional federal ROWs for groundwater production wells and collector pipelines would require additional environmental studies for future actions.

Figure ES-7 illustrates key points and general correspondence between the two processes.

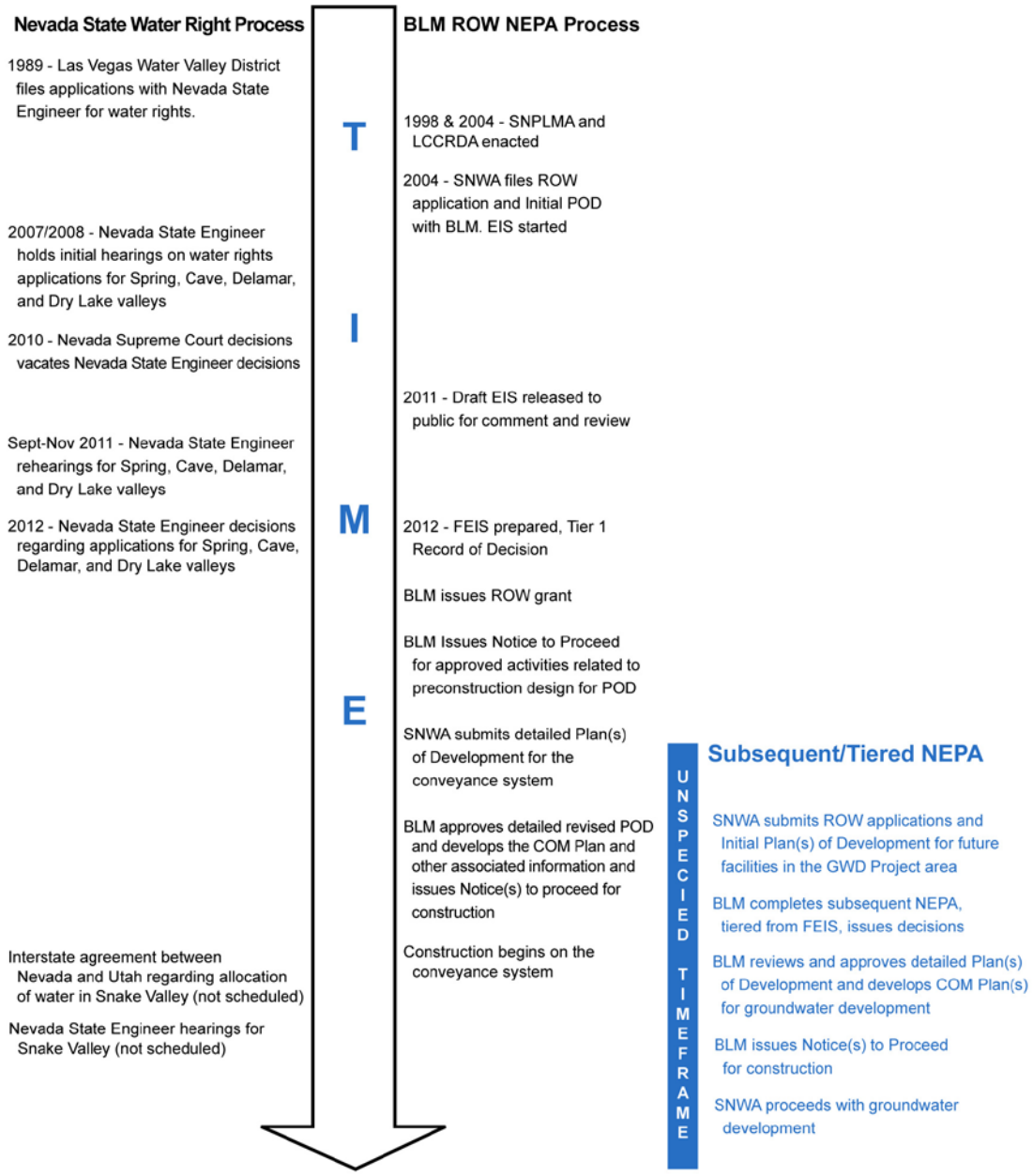


Figure ES-7 General Timing Relationship Between the BLM NEPA and the NSE Water Rights Processes

2.19 What were the Nevada State Engineer's rulings on the SNWA's water rights applications in Spring, Delamar, Dry Lake, and Cave valleys?

The NSE held a hearing on the Spring, Delamar, Dry Lake, and Cave valleys applications in the fall of 2011. On March 22, 2012, the NSE issued Rulings #6164, #6165, #6166, and #6167 permitting water rights to SNWA totaling up to 83,988 afy in Spring, Delamar, Dry Lake, and Cave valleys. In Spring Valley, SNWA was permitted up to 61,127 afy, in 3 stages of development (Ruling #6164). In Delamar, Dry Lake, and Cave valleys, SNWA was permitted 5,235 afy, 11,584 afy, and 6,042 afy, respectively (Rulings #6165, #6166, and #6167). All of the rulings require compliance with hydrologic and biological monitoring and mitigation plans, preparation of annual reports, completion of baseline studies, and periodic updating of a groundwater flow model.

State Water Rights Hearings

The NSE held hearings on SNWA's applications for water rights in the Spring, Delamar, Dry Lake, and Cave Valley basins in 2011, issuing decisions approving the applications in March 2012. Hearings for the Snake Valley application are not presently scheduled.

The NSE has not identified a schedule for the Snake Valley water rights proceedings.

2.20 What controversies are associated with this Project?

The BLM recognizes that there are differing opinions among experts and others on a variety of issues regarding SNWA's GWD Project. Conflicting ideas and areas of controversy related to this project include:

- Potential climate change effects on long-term water needs and availability;
- Water need and availability and the equity of water transfers;
- Groundwater modeling and results, including use of faults as barriers to flow;
- The timing and significance of possible future impacts in Snake Valley and vicinity of GBNP; and
- The relationship of groundwater to economic and population growth in the Las Vegas Valley.

While recognizing these controversies, it should be noted that many aspects of these issues are outside the jurisdiction of the BLM.

3. Environmental Consequences – Tier 1 Facilities

3.1 What project facilities and effects does this EIS address?

The SNWA current ROW request covers only the main conveyance pipeline, three lateral pipelines, power lines, and ancillary facilities. Details regarding future facilities for groundwater development, including the number and location of wells, presently are unknown. The Final EIS includes both the site-specific analysis for the mainline conveyance system and a programmatic analysis for future facilities, including the long-term effects of groundwater production (see Sections 4 and 5 of this Executive Summary).

3.2 How would the Project be constructed?

Standard pipeline, power line, and facility construction techniques would be used. Descriptions of construction methods and procedures, including manpower and equipment estimates, are provided in SNWA's POD in **Appendix E** of the Final EIS.

Appendix E SNWA's POD

The ROW boundaries would first be surveyed and staked. Plant and topsoil salvage would occur and the ROW would be cleared as required for the type of construction. Access roads within the ROW would be constructed or improved at the beginning of construction. Portable sanitation and water storage facilities would be provided for construction personnel.

Pipeline construction would use a standard cut and cover technique, with an open trench, in most locations. **Figure ES-8** depicts a general layout of facilities and cut-and-cover construction within the ROW. Pipe sections would be placed and welded, and the trench backfilled and compacted. Blasting might be necessary if caliche (consolidated calcium carbonate layer) or large boulders are encountered during excavation. At stream crossings with flowing water, construction would either involve jack-and-bore under the channel or open-cut with temporary diversion of water flow, in accordance with applicable laws.

The SNWA Proposed Action calls for a main pipeline of up to 96 inches in diameter. The pipeline could be resized during final design. For this analysis, it is assumed that neither the ROW width or amount of temporary disturbance would be affected by the diameter of the main pipeline.

The regulating tanks and access roads would be constructed in conjunction with the pipelines.

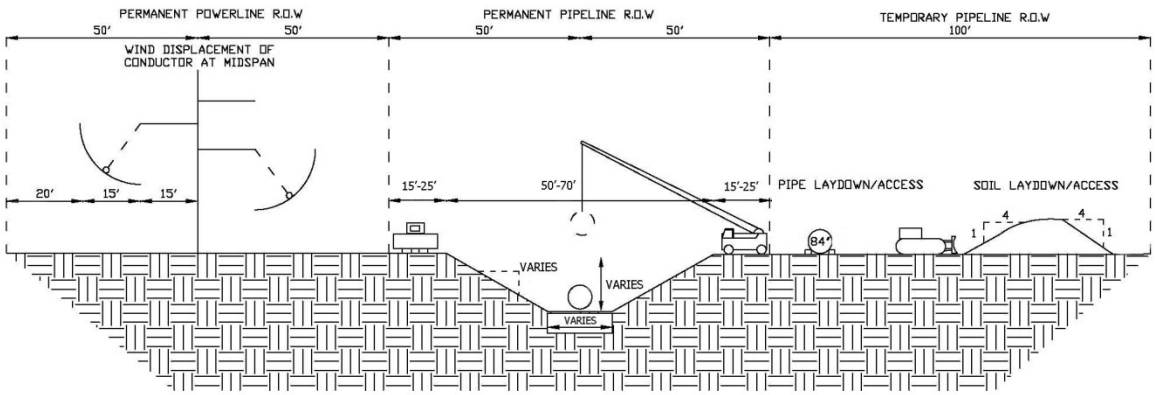


Figure ES-8 Preliminary Pipeline and Power Line ROW Cross Section

Water would be required for dust control, pipe bedding, trench backfill compaction, hydrostatic testing, and other purposes. The SNWA assumes that this water would be obtained from existing or exploratory wells drilled at the time of construction. A construction water supply well would be needed approximately every 10 miles along the pipeline alignment. If needed, additional temporary water wells would be drilled within construction staging areas. Hydrostatic testing would be conducted to pressure-test the pipeline when construction is completed; this testing might be done as individual segments are completed.

Figure ES-9 illustrates typical power line configurations. Power line construction would not require clearing and grading the entire ROW. Work sites of up to 0.5-acre would be cleared for each power pole location and an access road or road spur to the pole location would be rough-graded. A truck-mounted rotary auger would bore the pole locations, and then install the poles on site. Conductor lines would be strung using conventional tensioning equipment. Electrical equipment would be tested and the power lines energized after being connected to substations and facilities.

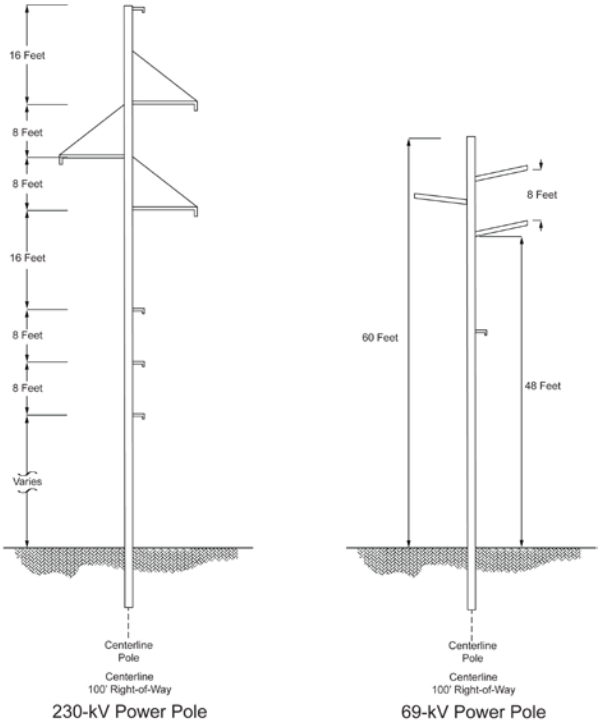


Figure ES-9 Typical Power Pole Designs

Ancillary facility sites would be staked and then plant and topsoil salvage would be conducted and the sites would be cleared, graded, and fenced. Excavation would be conducted as needed, and then the structures would be installed on site. Following the completion of construction, the temporary ROWs would be reclaimed.

The service life of water pipelines is estimated at 65 to 95 years. Future replacement of substantial portions of the pipeline would require additional approvals from the BLM and may be subject to additional NEPA. Future reclamation and abandonment of the ROW would be subject to approval by the BLM.

3.3 What is the schedule for Project construction?

During the time the Draft EIS was being prepared, SNWA had assumed that ROW grants and permits, and rulings by the NSE on SNWA's water applications would occur by early 2012, followed by the initiation of construction. Given the requirements to develop a final POD and implement the COM Plan, the need to obtain other permits, and other factors, SNWA has not identified a revised date for the anticipated beginning of project construction.

Actual construction of the project could be deferred for several years, accelerated, or be completed in phases depending on SNWA's needs for water, securing project financing, and other factors. The following is a conceptual construction sequence for the project.

For purposes of this EIS, a 12-year project construction schedule is assumed for the Proposed Action. That schedule is outlined in SNWA's POD (**Appendix E**), but is not tied to a specific start date.

The estimated annual number of direct construction jobs over the 12-year period, which provide an indication of the level of construction activity, is shown in **Figure ES-10**. Construction would likely be year-round, although seasonal wildlife stipulations may preclude activity in specific locations during certain periods.

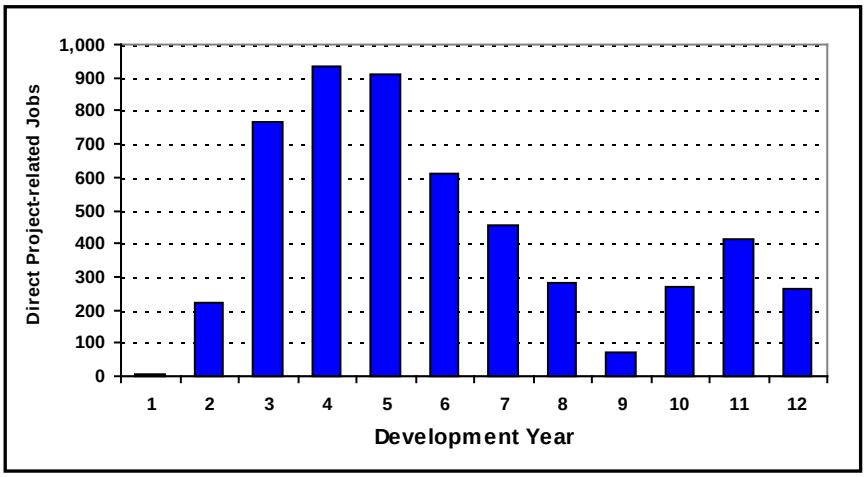


Figure ES-10 Projected Direct Construction Workforce – Proposed Action

Construction of the project would begin at the southern terminus, where the pipeline would connect to the SNWA's existing system, proceeding generally northward into Lincoln County. Construction of the main pipeline and transmission facilities to the juncture for the Spring and Snake Valley laterals would occur by year 8. An additional 2 years would then be required to complete the Spring Valley lateral and pump stations, followed by completion of the Snake Valley lateral and pump stations in year 12. The water treatment facility, buried water storage reservoir, and connections to SNWA's existing system would be completed within the first 4 or 5 years. Conveyance of water through the system is not contingent upon completion of the entire system, but could begin following completion of system and associated groundwater production facilities in the Delamar, Dry Lake, and Cave valleys.

Construction employment would increase over the first 3 years, peaking in year 4, when construction of the pipeline and water treatment, storage, and other facilities in Clark County would occur concurrently (**Figure ES-10**). Construction employment would decline for 5 or 6 years thereafter until increasing for completion of the Snake Valley lateral. Construction of the conveyance system associated with Alternatives D, E, and F could be accomplished in a shorter time period.

3.4 How much would the overall GWD Project cost to build and how would project activities be financed?

Development of the proposed system would require major capital investment on the part of the SNWA. SNWA presented conceptual construction cost and financing information for the project at the NSE's hearing on the Authority's water rights applications in the Spring, Delamar, Dry Lake, and Cave valleys. That information

SNWA's project costs do not factor into BLM's decision on the ROW application. A cost summary for the Proposed Action and EIS alternatives is presented in the Final EIS in response to public comments to the Draft EIS.

outlined a conceptual construction cost estimate of $3.22 billion; expressed in terms of 2007 dollars (SNWA 2011). That sum did not include contingencies, long-term financing costs, or implementation of the COM Plan.

A more recent estimate for the Proposed Action, prepared by SNWA for the EIS, is $3.87 billion. Corresponding cost estimates for the EIS alternatives range between the $3.87 billion for the Proposed Action and a low of $2.42 billion for Alternative D (**Figure ES-11**); a 37 percent difference. However, because the two alternatives also vary in the amount of water conveyed, it should not be interpreted that the differences represent savings, or a lower cost option.

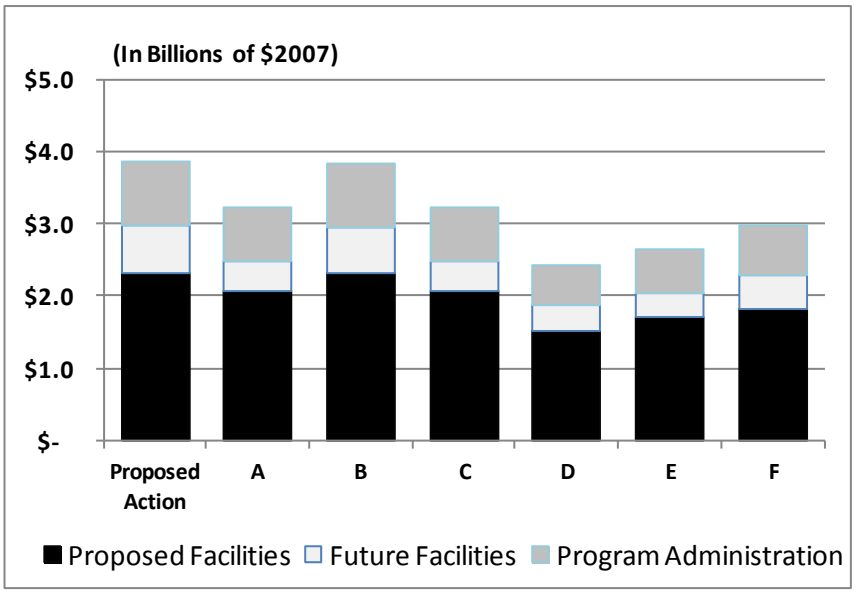


Figure ES-11 Conceptual Construction Costs for the EIS Alternatives

The SNWA recently adopted a 3-year infrastructure surcharge, effective April 2012, to help pay for large water system projects, such as the GWD Project. The financing plan indicates that water commodity charges would need to increase substantially over the life of the project to provide the necessary debt service.

3.5 What methods were used to assess potential environmental effects?

Environmental effects for construction and operation of the pipeline and other facilities were based on an understanding of the location, extent, and timing of development.

The first step in assessing the potential environmental impacts was to define the geographic area likely to be affected and to understand the current environmental and socioeconomic conditions within that area. For the GWD Project, this study area includes the ROW corridors and nearby areas because some potential effects may extend beyond the immediate facility construction area.

The ROW corridors and facility locations proposed by the SNWA were mapped using data from geographic information system and other sources. This information yielded estimates of the extent and location of temporary and long-term surface disturbance. These maps were then used to focus the collection, compilation, and analysis of data for resources that may be affected by the project.

Methods and assumptions for impact analysis were developed for each resource. Impacts to resources were then determined and interpreted in terms of magnitude, duration, context, and intensity (BLM NEPA Handbook 2008). The estimated impact levels were then reassessed considering the effects of application of the BLM RMP Management Actions, BMPs and ACMs. Additional mitigation measures were developed and applied to certain impact issues (See Section 3.6 of this Executive Summary).

Conclusions concerning residual impacts after application of protection measures and mitigation measures were prepared. Quantified impact results were displayed in figures and tables to allow a comparison of alternatives. Impact summaries are included at the end of Chapter 2 in the Final EIS.

3.6 How does the EIS address mitigation of potential short and long-term environmental effects?

The anticipated effects from project construction and maintenance on a particular resource were evaluated to determine how effects could be avoided or reduced through the application of monitoring, management, and mitigation measures. Four sources of protection or mitigation were considered; the BLM management direction established in management documents, RMP management actions, BMPs, ACMs, and additional mitigation.

BLM Best Management Practices

BMPs *are state-of-the-art mitigation measures applied to help ensure that facility development is conducted in an environmentally responsible manner. BMPs protect wildlife, air quality, and landscapes as we work to develop vitally needed minerals, energy, water, and other resources.*

BMPs have been identified for implementation as part of the GWD Project
(see **Appendix D** of the Final EIS)

Air Resources • Water Resources • Soil Resources • Vegetation Resources • Fish and Wildlife
Special Status Species • Wild Horses • Cultural Resources • Paleontological Resources
Visual Resources • Travel Management and Off-Highway Vehicle Use • Recreation • Livestock Grazing
Fire Management • Noxious and Invasive Weed Management • Health and Safety

The BLM Ely District RMP (2008) and the BLM Las Vegas RMP (1998) provide management direction for all BLM-managed lands that would be occupied by the GWD Project facilities. The Ely District RMP management actions, BMPs, and U.S. Fish and Wildlife Service's Biological Opinion terms and conditions applicable to the GWD Project were identified. Las Vegas RMP management actions also will be identified.

In addition to implementing BLM RMP Management Actions and BMPs, SNWA has agreed to an extensive series of ACMs in conjunction with the GWD Project. The SNWA's ACMs address construction procedures and operational practices, and identify specific mitigation to address potential environmental resource impacts. The ACMs include measures to address future development, operations, and regional water-related effects. The resources and topics addressed by one or more ACMs are listed in the adjacent box.

APPLICANT-COMMITED MEASURES

A. **ROW Measures**

1. General Construction Measures
2. General Operation Practices
3. Geologic Hazards and Soils
4. Water Resources
5. Biological Resources
6. Paleontological Resources
7. Cultural Resources
8. Land Use and Range Management
9. Noise
10. Air Quality
11. Visual Resources
12. Socioeconomics

B. **Programmatic Measures – Future ROWs**

1. Planning and Design
2. General Construction Practices
3. General Operation Practices
4. Water Resources
5. Biological Resources

C. **Regional Water-Related Effects**

D. **Measures from SNWA Agreements and NSE Permit Conditions**

Two critical measures include:

- SNWA must complete a detailed POD, to be approved by the BLM, for the ROW noted in the ROD for the main pipeline and associated facilities. Additional PODs and specific plans will be required for subsequent NEPA tiers. The detailed construction, operation, and monitoring plans will incorporate all BLM RMP Management Actions, BMPs, ACMs, and other required mitigation contained in the ROD or other decision documents. The BLM will prepare the COM Plan before issuing a Notice to Proceed for any construction or surface disturbance activity. This COM Plan will include an interagency process for the setting of monitoring parameters and triggers with related measures to mitigate adverse effects.
- The general extent of regional water-related effects associated with the proposed groundwater withdrawal for the GWD Project is estimated using groundwater modeling. Because the precise nature, extent, timing, and location of

water-related effects cannot be determined, SNWA has identified ACMs that may be implemented, as needed, to avoid, minimize, or mitigate potential water-related effects associated with future withdrawals. ACMs include a series of monitoring, management, and mitigation plans, conservation agreements, and adaptive management plans to address adverse effects associated with groundwater production. These will be further analyzed during NEPA review processes in the future. A complete listing of SNWA ACMs for this project can be found in **Appendix E** in the Final EIS.

3.7 What are the environmental impacts of implementing the three main conveyance pipeline alignments?

There are relatively few major surface disturbance differences among the GWD Project alignments because all three main pipeline ROWs would be the same for most of their respective lengths.

The environmental impacts include the effects to natural and human resources from surface disturbance and the human and mechanical activities associated with creating that disturbance and reclamation. The extent of many of the environmental effects associated with pipeline and associated facilities construction depend on the length and width of the ROW and the temporary disturbance during construction, and later, the permanent disturbance after reclamation. In this case the three major ROW alignments are the same from Clark County to the White Pine County line. The differences in environmental effects among alignments are largely related to the Spring and Snake valley laterals. ROW requirements for roads and power lines among the three ROW alternatives also would factor into differences in impacts. **Figure ES-12** illustrates the pipeline ROW miles and acres of temporary disturbance for the three main ROW alignments.

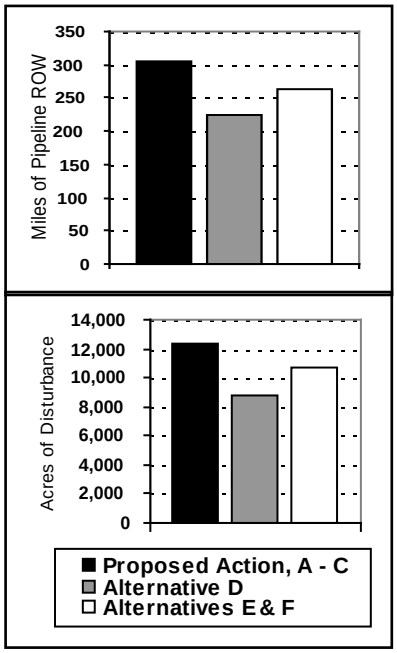


Figure ES-12 Pipeline ROW and Temporary Disturbance

Approximate differences between the Proposed Action alignment and the alternatives are:

- Alternatives A, B, and C are the same as the Proposed Action,
- Alternative D is 28 percent lower in terms of acres of surface disturbance and 26 percent lower in terms of the miles of pipeline ROW, and
- Alternatives E and F are 13 percent less in terms of both surface disturbance and miles of pipeline ROW.

A summary of the environmental impacts from construction related to the Proposed Action main pipeline and associated facilities follows. Generally, compared to the Proposed Action, impacts would be less and would occur over shorter periods of time for Alternatives D, E, and F. There would be few environmental impacts in White Pine County under Alternative D. Under Alternatives E and F, environmental effects would extend into northern Spring Valley, but not into Snake Valley.

The summary that follows includes the effects for the Proposed Action and Alternatives A through C. Unless differences are identified for Alternatives D, E, and F, the expected effects are similar for all alternatives.

Air Quality and Atmospheric Resources:

- Air pollutant emissions related to construction, disturbance and reclamation associated with activities on approximately 12,288 acres over an 11-year period. Emissions are expected to be less for Alternatives D, E, and F because of smaller surface disturbance areas, and fewer pipeline miles.

See Section 3.1

- Minor increase in air pollutant emissions, including greenhouse gas emissions, from operation and maintenance activities.

Geologic/Paleontological Resources

- Some scientifically valuable fossils may be disturbed and lost during excavation and ROW grading.

See Section 3.2

Water Resources:

- A temporary channel alteration resulting in temporary water quality effects would occur on one perennial stream crossed by the pipeline ROW. There would be no perennial stream crossings by the pipeline ROW under Alternatives D, E, and F.
- Water quality effects may occur on two perennial streams crossed by the power line ROW. No perennial streams would be crossed by the power line ROW under Alternatives D, E, and F.
- There is a potential for channel alteration and water quality effects on numerous intermittent and ephemeral streams by the pipeline and power line ROWs.

See Section 3.3

Soil Resources:

- Short-term disturbance would occur on the following number of acres of sensitive soils: highly wind erodible (1,474), highly water erodible (614), compaction prone (123), and vegetation growth limitations (10,568).
- Short-term disturbance of approximately 2,335 acres of land with prime farmland characteristics may occur. Under Alternative D, 2,295 acres of lands with prime farmland characteristics may occur, compared to 2,350 acres under Alternatives E and F.

See Section 3.4

Surface Disturbance

Up to 12,288 acres of surface disturbance would occur (Proposed Action or Alternatives A through C).

Disturbed areas that do not support aboveground facilities would be reclaimed as soon as construction segments are completed.

Permanent disturbance would be less than 1,000 acres for all alternatives.

Vegetation:

- Clearing of approximately 12,288 acres would be required during construction, with 11,289 acres to be reclaimed. Alternative D would require clearing of 8,828 acres during construction with 8,020 acres reclaimed. Alternatives E and F would require clearing 10,681 acres during construction with 9,736 acres to be reclaimed.
- Temporary clearing would increase the potential for spread of noxious weeds by construction traffic, particularly in and near cleared areas.
- Construction activities would result in increased risk of wild land fires.
- The areas of temporary disturbance include some suitable habitat for six BLM sensitive plant species.
- There would be some loss of yucca and cacti during salvage, interim storage, and subsequent replanting.

Section 3.5

Wildlife Resources:

ROW vegetation clearing would affect important big game range in the project area. The majority of the affected areas would be located in northern portions of the study area. The estimated affected areas include:

See Section 3.6

- antelope (7,952 acres),
- elk (4,019 acres),
- mule deer (3,917 acres), and
- desert bighorn sheep (259 acres).

Less big-game range would be affected under Alternatives D, E, and F. The affected areas for those alternatives are as follows:

- Alternative D: antelope (4,571 acres), elk (2,704 acres), mule deer (2,949 acres), and desert bighorn sheep (260 acres).
- Alternatives E and F: antelope (6,345 acres); elk (4,019 acres); mule deer (3,547 acres), and desert big horn sheep (260 acres).

- ROW vegetation clearing would alter habitats for special status wildlife species, including desert tortoise, sage-grouse, pygmy rabbit, western burrowing owl, bald eagle, golden eagle, ferruginous hawk, bats, dark kangaroo mouse, Gila monster, and Mojave Poppy Bee. Habitat alterations for Mojave Poppy Bee would be the same, but habitat alterations for the other special status wildlife species would be reduced for Alternatives D, E, and F.
- Potential effects associated with the electrical power lines include bird collisions, electrocution, and increased predation on desert tortoise, pygmy rabbit, and other wildlife species by raptors.

Aquatic Biology:

- Habitat alteration and potential water quality effects would occur on one perennial stream containing game fish species crossed by the pipeline ROW under the Proposed Action. There would be no perennial stream crossings by the pipeline ROW under Alternatives D, E, and F.

See Section 3.7

- No springs with aquatic biological resources are located in ROWs for any of the alternatives.
- Temporary water quality effects could occur in two perennial streams containing game fish species crossed by the power line ROW. No perennial streams would be crossed by the power line ROW under Alternatives D, E, and F.
- Potential habitat alteration and water quality effects on numerous intermittent streams potentially containing macroinvertebrates crossed by the pipeline and power line ROWs.
- Potential amphibian mortalities could occur near waterbodies crossed by vehicles.

Land Use:

- ROW vegetation clearing would affect surface uses (grazing and recreation) on 12,288 acres of land, 97 percent of which is managed by the BLM. Up to 999 acres would be converted for aboveground facility uses which would preclude existing uses. ROW clearing would be less for Alternatives D, E , and F (see Section 3.5, Vegetation Resources).

See Section 3.8

- Short-term disturbance would occur over several years, with reclamation occurring once all construction in a segment is completed.
- BLM lands for disposal would not be limited by ROW construction or operation.
- Approximately 25 percent of the estimated short-term disturbance would be located outside of designated utility corridors. Approximately 10 percent of the Alternative D disturbance would be located outside of designated utility corridors. For Alternatives E and F, approximately 15 percent would be located outside of disignated utility corridors.
- ROWs and ancillary facilities would cross two ROW avoidance areas – Coyote Springs and Kane Springs Areas of Critical Environmental Concern (ACEC) – where additional stipulations may be imposed.

Recreation:

- Construction activities in some locations may result in short-term conflicts with off-highway vehicle race routes.

See Section 3.9

- ROW vegetation clearing would affect some lands within the Caliente Special Recreational Permit, Chief Mountain Special Recreational Management Area, Las Vegas Valley Special Recreational Management Area, Loneliest Highway Special Recreational Management Areas, Pioche Special Recreational Permits, and Steptoe Valley Wildlife Management Area A. The Loneliest Highway and Steptoe Valley Special Recreational Management Areas would not be crossed under Alternative D.
- Short-term interference with hunting access and other dispersed recreation use on public lands, with the location of such interference shifting over time as construction moves along the ROW.
- Long-term effects on recreation would result from alteration of the recreational setting with above-ground structures and vegetation alteration.
- Project road improvements would result in an increased potential for off-highway vehicle route proliferation and unauthorized public use of project ROWs that could degrade the recreation setting.

Transportation:

- Construction would result in short-term increases in vehicular traffic on roads and highways in the area, resulting in increased risk for vehicular accidents, vehicle/animal collisions, and traffic delays. Long-term effects would be limited due to relatively low maintenance and operation-related traffic numbers.

See Section 3.10

Minerals:

- Potential short-term access restrictions to ongoing mineral extraction sites until roadways are restored after construction is completed.

See Section 3.11

Rangeland:

- ROWs for the Proposed Action and Alternatives A through C would cross 23 grazing allotments; resulting in surface disturbance to 10,544 acres during construction. Alternative D would cross 14 grazing allotments and Alternatives E and F would cross 20 allotments. The total area of surface disturbance would be 7,083 acres for Alternative D and 8,937 acres for Alternatives E and F.
- Following reclamation, there would be permanent commitment of 708 acres in 18 allotments associated with aboveground facilities for the Proposed Action and Alternatives A through C. Permanent land commitments for Alternative D would affect a total of 564 acres in 11 allotments, while 562 acres in 16 allotments would be the permanent disturbance for Alternatives E and F.

See Section 3.12

Wild Horses:

- ROW vegetation clearing would affect 3,015 acres in 2 wild horse management areas, and long-term aboveground facility commitments of 164 acres within 2 herd management areas. Short term construction activities could affect movement and forage use by wild horse herds within herd management areas. Due to the location of the herd management areas, the same effects would occur under Alternatives D, E, and F.

See Section 3.13

Special Designations:

- ROW vegetation clearing would affect two special designation areas: Coyote Spring ACEC and Kane Springs ACEC. Due to the locations of these special designation areas, the same effects would occur under Alternatives D, E, and F.

See Section 3.14

Visual Resources:

- Given climatic constraints on successful re-vegetation, potential visual impacts resulting from changes in woody vegetation in disturbed areas would be visible in the long term until woody vegetation becomes re-established, especially in the linear pipeline/power line ROW.
- While texture and color contrasts might be partially mitigated by using appropriate earth-toned building materials and colors, in general, new buildings, structures, and their shadows would be prominent in the landscape foreground.
- The scale of linear aboveground and surface-disturbing activities (across more than 300 miles), high visibility from scenic byways and special designation areas, and long duration within view from Highway 93 would result in long-term visual impacts from sensitive viewpoints.
- Although outside the GBNP boundary, the surface disturbance associated with the Proposed Action, and Alternatives A, B, C, E, and F facilities would not meet the intent of National Park Service scenery management objectives for GBNP. Alternative D facilities would be located entirely within Lincoln County, and 15 or more miles from the nearest GBNP boundary.

See Section 3.15

Cultural Resources:

- Potential adverse effects to sites listed in the National Register of Historic Places would be mitigated prior to construction.
- Some unanticipated discoveries and potential loss of cultural resources would occur during construction.
- Accidental disturbance, vandalism, and illegal collecting most likely would occur where the proposed GWD Project may result in increased public areas.

Section 3.16

Native American Traditional Values:

- Potential short- and long-term effects to traditional cultural properties, sacred sites, and areas of cultural or religious importance could occur during the construction period.

Section 3.17

Socioeconomics:

- Temporary gains in employment, income, population, and related effects would occur, with the focus of activity shifting over time, from south (Clark County) to north (southern White Pine County).
- Short-term demand for temporary housing may exceed availability especially in Lincoln County.
- Short-term demands on local law enforcement and emergency services may strain capacity in rural communities.
- Fiscal pressures on budgets could result in White Pine and Lincoln counties due to temporary demand on county services. Project construction would generate substantial sales and use taxes, some of which would accrue to these affected local governments.
- The existing agreement between SNWA and White Pine County provides payments in lieu of taxes to cover reductions in tax revenues associated with SNWA purchases of private ranches.
- SNWA facilities would be exempt from local property taxes.
- Limited direct long-term employment, population, or population related effects would occur during operations.
- Onset of construction of the project would be a "signal" event, with potentially widespread and long-term social concerns related to quality of life and outlook for the future, both from opponents and proponents of the project. In the rural areas, the effects are likely to be perceived as negative; in the Las Vegas Valley perceptions would be more favorable. The perception of long-term social effects in the rural areas would be lower in White Pine County under Alternatives D, E, and F.

Section 3.18

Socioeconomic Effects

Short-term: increases in jobs, income, demand for temporary housing, demand on law enforcement and emergency medical services, effects on individual and community social conditions.

Alternatives D, E, and F would result in fewer social and economic effects in White Pine County, particularly Snake Valley.

Long-term: Social and economic effects directly related to system operations would be limited.

Public Health and Safety:

- There would be a short-term potential for spills or leaks from use of hazardous materials mostly consisting of fuels and lubricants during construction and operation.

Section 3.19

3.8 Four localized alignment options are analyzed. What are they and how would the environmental effects differ with these options?

The EIS assesses the potential environmental effects of four localized alignment options. Each option involves a selected segment of the main pipeline or power line alignments. Each of these options involves potential trade-offs in terms of environmental effects; some also depend on factors beyond SNWA's or the BLM's control, e.g., completion of another transmission line. **Table ES-3** below describes the options, the rationale for each option, and the compatibility of a specific option with each of the 3 major ROW alignments. **Figure ES-13** shows the locations of these localized alignment options.

Table ES-3 Local Alignment Options

Alignment Option	Option Description/Rationale	Would the Option Be Compatible with the Following ROW Alignment Alternatives?		
		Proposed Action and Alternatives A through C	Lincoln County Conservation, Recreation, and Development Act (Alternative D)	Spring / Delamar, Dry Lake, and Cave (Alternatives E and F)
1	**Humboldt-Toiyabe Electrical Power Line Alignment:** Locate the Gonder to Spring Valley segment of the electrical power line in an existing corridor across U.S. Forest Service land to reduce new disturbance. It would also limit disturbance in sagebrush habitat and the species dependent on that habitat.	**Yes**	**No**	**Yes**
2	**North Lake Valley Pipeline and Electrical Power Line Alignment:** Locate a segment of the main pipeline and power line within an existing transportation utility corridor (U.S. 93).	**Yes**	**No**	**Yes**
3	**Muleshoe Substation and Power Line Alignment Option:** Utilize an alternative electrical power supply from a new regional transmission line, thereby avoiding construction of the Gonder to Spring Valley power line.	**Yes**	**No**	**Yes**
4	**North Delamar Valley Pipeline Alignment:** Locate segments of both the pipeline and power line within the Lincoln County Conservation, Recreation, and Development Act corridor to reduce new disturbance.	**Yes**	**Yes**	**Yes**

Note: Alignment Options 1 and 3 are mutually exclusive.

Because of the localized nature of these alignment options, the differences in environmental consequences also are localized. Although these options result in minor net changes in the overall surface disturbance, the location changes also affect a variety of resources. After consideration of the potential resource effects of implementing each option, the following are brief conclusions concerning the tradeoffs as compared to the Proposed Action, and other applicable alternatives:

- Alignment Option 1 - Humboldt-Toiyabe Power line. This option provides an opportunity to reduce both surface disturbance area and visual resource effects to scenic byways by locating the transmission line in an existing U.S. Forest Service transmission line corridor. By routing along an existing utility corridor, this option would also reduce disturbance in new sage brush habitat and to the species (e.g., sage grouse) dependent on that habitat. The options also would avoid passing within 4 miles of 3 active sage grouse leks.
- Alignment Option 2 - North Lake Valley Pipeline. This option allows reduction in transmission line voltage, but increases the number of aboveground facilities near and adjacent to Highway 93, thereby increasing the overall project visibility from a scenic byway. This alignment would result in additional impacts to one perennial stream and three springs compared to the Proposed Action.
- Alignment Option 3 - Muleshoe Substation. This option would eliminate the need for constructing a 230-kilovolt transmission line from Gonder Substation to Spring Valley, with a consequent reduction in long term visible surface disturbance in the vicinity of a scenic byway, and an overall reduction of wildlife habitat disturbance. The feasibility of this option is substantially improved by the current construction of the ON Line Transmission Project where the Muleshoe Substation would interconnect, however, it is dependent on whether SNWA could obtain power supply contracts with ON Line.
- Alignment Option 4 - North Delamar Valley Pipeline. This option would reduce the overall surface disturbance effects to Mojave Desert shrublands (including mature Joshua trees) by using an existing utility ROW. However, this option would require construction of a new pumping station which would be located very close to Highway 93, adding a new aboveground structure that would be visible to highway travelers.

Figure ES-13 Localized Alignment Options for the Main Pipeline and Transmission Line

3.9 What cumulative surface disturbance impacts are anticipated in conjunction with the Tier 1 aspects of the GWD Project?

Cumulative impacts are defined as "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time" (40 CFR 1508.7).

Interrelated projects and actions defined for this EIS are those past, present, and reasonably foreseeable future actions that could interact with the Proposed Action. The cumulative effects analysis for the EIS is separated into two parts; those with potential to interact with the Tier 1 facilities in terms of surface disturbance (this section) and those with potential to interact with groundwater development (pumping [see Section 5]). The primary unit of geographic analysis is the hydrographic basin, specifically those basins where surface disturbance from project-related activities would be anticipated.

Tier 1 Project Facilities

This analysis focuses primarily on the interactions of:

1) GWD Project facilities; mainline pipeline, ancillary facilities, and future facilities;
2) Past and present actions: existing energy and transportation infrastructure, areas burned by large wildfires, current land uses (mining, grazing, and recreation); and
3) Surface disturbing projects and activities that meet the reasonably foreseeable criteria for inclusion.

Section 2.9

Past and Present Actions for the Cumulative Analysis
(see Section 2.9 of the Final EIS for more information)

Roads and Railroads • Populated Places • Agricultural Lands • Wildland and Forest Fires
Vegetation treatment areas • Mining districts • Section 386 Energy Corridors Zones • ROWs

Reasonably foreseeable future actions were compiled to determine overlapping relationships with the GWD Project. An initial screening of reasonably foreseeable future actions used a variety of resources:

- The BLM Ely District and Las Vegas District pending project lists;
- The Nevada Division of Environmental Protection list of mining projects;
- The Nevada Wind Energy Projects list;
- Projects that are addressed in the cumulative impact sections of other water project NEPA analysis (e.g., Kane Springs Groundwater Development EIS [BLM 2008]) in the area of interest;
- Internet and literature searches; and
- Pending Utah projects gathered from the BLM Fillmore and Cedar City web sites.

The project lists and descriptions were then reviewed and compared to the following three criteria to determine the projects to be included in the cumulative analysis.

1. If a project is subject to an existing proposal, such as the filing with BLM of a ROW application or plan of development, the cumulative impact analysis should describe the types of facilities, land requirements, and other infrastructure needed (roads, electrical service, water). In general, evidence of project viability, funding and progress show that the project is highly probable.
2. If a proposed project has been approved and may already be underway, those facts could also be included in the cumulative impacts analysis.

3. Development on private land that shows evidence of project viability, funding and progress, based on filings with local governments, evidence of construction from aerial photo reviews, or other documented information should also be included in the cumulative impacts analysis.

Based on these criteria the following reasonably foreseeable projects and associated development areas (hydrologic basins) were identified.

Wilson Creek Wind Project: Located between southern Spring and northern Lake Valley within an overall proposed development area of approximately 31,000 acres.

Spring Valley Wind Project: Located north of the intersection of Highways 93 and 6&50 in Spring Valley within an overall development area of 7,653 acres.

ON Line Transmission Project: Located in a 200-foot-wide ROW within an approved BLM utility corridor between a substation west of Ely and a terminus at the Harry Allen Power Plant in Clark County.

Kane Springs Valley Groundwater Development Project: This groundwater development and pipeline system is located in Kane Springs and Coyote Spring valleys northeast of the Lincoln/Clark County line, Nevada. Other residential, commercial, industrial, and recreational development also will occur in the Coyote Springs Investments development.

Coyote Springs Development: Located east of U.S. Highway 93 near the Lincoln-Clark County line, the development consists of 21,454 acres of residential land (mostly undeveloped) and 13,767 acres of conservation land.

Silver State Energy Association Eastern Nevada Transmission Project: This project is proposed in two separate alignments in Clark County, Nevada. One alignment extends 21 miles from the Gemmill substation near the U.S. Highway 93 and Nevada Highway 168 intersection (south of the Coyote Spring private land block) to the Tortoise Substation near Moapa. The second alignment extends 33 miles from the Silverhawk power plant to a Newport Substation south of Henderson. The temporary surface disturbance associated with the two alignments is estimated at 252 and 396 acres, respectively, with permanent commitments of 25 and 40 acres, respectively.

TransWest Express Transmission Project: One of the alternatives proposed for this proposed high voltage transmission line overlaps with the LCCRDA corridor from Las Vegas north to a point where it heads east towards Caliente.

Zephyr Transmission Project: Located in a 200-foot wide ROW, one alternative routing of which overlaps with the LCCRDA corridor from a point near Highway 93 in the Delamar Valley to a point near the Harry Allen Power Plant in Clark County.

Geographic Information System mapping was used to estimate the surface disturbance for the past, present, and reasonably foreseeable future projects within the 14 hydrographic basins where groundwater development facilities would be constructed and operated. These basins encompass 8.6 million acres. Estimated past and present cumulative disturbance in the area is approximately 917,100 acres (10.6 percent) (**Figure ES-14**).

The GWD Project Proposed Action surface disturbance for Tier 1 facilities is estimated to be 12,288 acres, less than 0.2 of 1 percent of the total area of hydrographic basins where groundwater development facilities would be located; the foreseeable projects also would contribute less than 1 percent.

The cumulative effects of the Proposed Action, and Alternatives A through C would be similar, and are discussed below. The cumulative surface disturbance effects of Alternatives D, E, and F would be less than the other alternatives because no groundwater development would occur in Snake Valley.

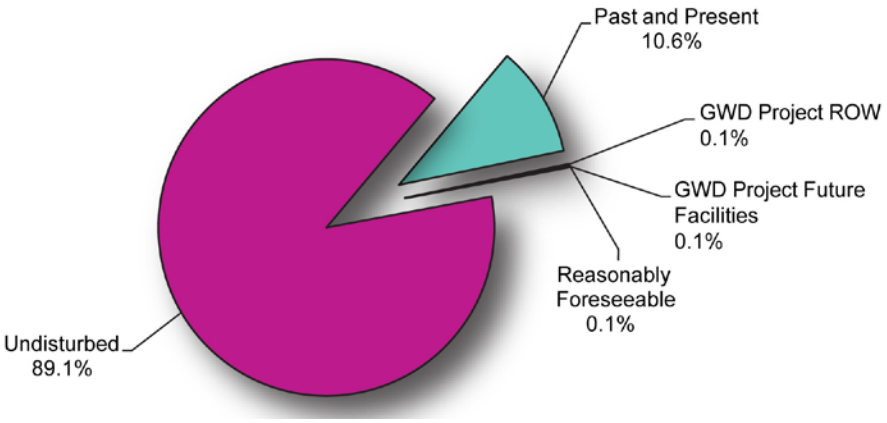


Figure ES-14 Summary of Surface Disturbing Actions for Past, Present, and Reasonably Foreseeable Future Actions in 14 Hydrographic Basins Crossed by the GWD Project Facilities

Summary of GWD Project Tier 1 Cumulative Surface Disturbance Effects

The cumulative effects of the Proposed Action, and Alternatives A through C would be similar, and are discussed below. The cumulative surface disturbance effects of Alternatives D, E, and F would be less than the other alternatives because no groundwater development would occur in Snake Valley.

Note that for some resources, the potential for cumulative short-term effects is higher during periods of concurrent construction activity in close proximity to one or more other projects. Uncertainty regarding the development schedules of several of the RFFAs (e.g., the Zephyr and TransWest Express Transmission Projects) that may share portions of the same utility corridor generally limits the risks for short-term adverse cumulative effects associated with the GWD Project. Furthermore, the risks for cumulative effects in conjunction with these projects also are limited by the fact they also are linear projects, where the locations of construction activity move along the corridor, thereby reducing the duration of concurrent activity in an area.

Air and Atmospheric Values
Groundwater development facilities would be constructed several years after some of the RFFA projects (ON Line Transmission Project, Wilson Creek Wind, and Spring Valley Wind) that would share portions of the same utility corridor. Therefore the individual project construction periods would not overlap and the GWD Project would not contribute to cumulative increases in construction equipment emissions and fugitive dust. Potential cumulative effects could occur with other projects, but these effects would be localized.

Geologic Resources
Geologic hazards (e.g. fissures, faults, karst voids, caves) generally are not cumulative in their effects. A hazard encountered by one project typically decreases the damage risks for subsequent projects in the same corridor because the hazards become better known and engineering solutions improve.

Surface disturbance of paleontological resources by the GWD Project could result in cumulative losses of valuable fossil material as the result of excavations by all projects sharing the same utility corridor. The BLM would implement paleontological monitoring and appropriate fossil material recovery to limit losses.

Water Resources
The GWD Project and other actions would contribute small, localized cumulative increases in soil erosion and sediment yield to ephemeral and intermittent stream channels crossed by ROWs, and in new areas of surface disturbance caused by foreseeable projects. The majority of these cumulative sediment increases would occur in the

existing utility corridors and in the Spring Valley Wind Development area where new road and construction disturbance would occur.

Soils

The GWD Project would temporarily disturb approximately 12,288 acres of native rangeland soils; less than 0.2 of 1 percent of the total area of these hydrographic basins.

The GWD Project and other projects located in the same utility corridor (ON Line, TransWest Express and Zephyr Transmission Projects, Wilson Creek Wind, and Spring Valley Wind) would contribute to cumulative increases in soil erosion from disturbed surfaces, however, the GWD Project and each foreseeable project would be required by BLM BMPs to control soil erosion, and to revegetate disturbed surfaces.

Vegetation

The GWD Project would remove approximately 12,288 acres of vegetation from ROWs in the hydrographic basins where the GWD Project facilities would be located. This vegetation removal increase represents less than 0.2 of 1 percent of the total area of these hydrographic basins. The primary vegetation communities affected by cumulative surface disturbance sources include sagebrush shrubland, greasewood/salt desert shrubland, and Mojave mixed desert shrubland.

The GWD Project and other projects constructed in the same utility corridors would incrementally contribute to reduced plant community productivity and diversity because of long vegetation recovery times, losses of individuals of sensitive species populations, an increased risk for non-native invasive species invasion, and small reductions in populations of plants used traditionally by Native Americans. GWD Project facilities would be constructed several years after other foreseeable projects that would share the same utility corridor (ON Line Transmission Project, Eastern Nevada Transmission Line, Wilson Creek Wind, and Spring Valley Wind).

Terrestrial Wildlife

The GWD Project would remove approximately 12,288 acres of wildlife habitats from ROWs in the hydrographic basins where GWD Project facilities would be located. This habitat removal represents less than 0.2 of 1 percent of the total area of these hydrographic basins.

GWD Project facilities would be constructed several years after other foreseeable projects that would share the same utility corridor. However, the long vegetation recovery times would result in increases in habitat fragmentation as new project surface disturbance is added to utility corridors over time. These disturbed corridors would contain vegetation at varying levels of recovery.

The primary surface disturbance cumulative effects on wildlife habitats and populations would be:

- Overall wildlife habitat fragmentation where new and existing ROWs overlap, or intersect, resulting in changes in wildlife population habitat occupation and movement.
- Habitat fragmentation and increased human activity in pronghorn and mule deer winter ranges in Spring Valley.
- Fragmentation and loss of desert tortoise and Gila monster habitat in the Mojave Desert region (Delamar, Coyote Springs, Hidden, and Garnet valleys), and increased predator perching sites provided by electrical distribution lines. Fragmentation of greater sage grouse habitat in valleys dominated by big sagebrush vegetation (Spring, Snake, Cave, and Lake valleys). Of specific fragmentation concern are the shared utility ROWs in these valleys, as well as the overlap with the Spring Valley Wind development.
- Fragmentation of pygmy rabbit habitat in sagebrush and desert shrubland habitats in Dry Lake, Cave, Lake, and Spring valleys, and an increase in predator perching sites provided by electrical distribution lines.

Aquatic Biological Resources

The GWD Project would expand the network of roads and pipelines throughout the primary groundwater development basins. It is not expected that the cumulative development would substantially increase the surface disturbance to aquatic biological resources, because only three perennial streams (Snake Creek and Big Wash in Snake Valley, and Steptoe Creek in Steptoe Valley) would be crossed by the GWD Project facilities. Based on the use of avoidance criteria, the GWD Project would not contribute incremental sedimentation effects on Bonneville cutthroat trout

streams. Increased traffic on roadways could locally affect northern leopard frog populations in Spring Valley where the GWD Project would overlap with the Spring Valley Wind Project.

Land Use
The GWD Project would convert approximately 1,000 acres of land used for a combination of livestock grazing and wildlife habitat to long-term (life of project) industrial uses (permanent ancillary facilities). This conversion represents less than one percent of the total area of the hydrographic basins where GWD Project facilities would be constructed.

Recreation
The GWD Project would contribute to cumulative short and long-term effects on recreation resources, including access and recreation setting, where other RFFAs are share the same utility corridor or are in close proximity to one another (e.g., GWD and the ON Line, Zephyr and Trans West Express Transmission Projects west of Caliente). Effects would be greater near popular use areas in the southern portions of the project area. Projects that occur concurrently or sequentially would have greater and more noticeable effects on recreation uses.

Transportation
Construction of the GWD Project is not expected to contribute to cumulative traffic congestion and increased accident risks on state and federal highways, and county roads because GWD Project facilities would be constructed several years after other foreseeable projects that would share the same utility corridor (ON Line Transmission Project, Wilson Creek Wind, and Spring Valley Wind).

Mineral Resources
The GWD Project is not expected to contribute to a cumulative reduction in access to mineral resources, because none of the GWD Project alternatives are expected to interfere, or preclude the extraction of minerals.

Rangelands and Grazing
Construction of the GWD Project would remove approximately 12,288 acres of vegetation from ROWs in the hydrographic basins where GWD Project facilities would be located. The incremental vegetation removal affects less than 1 percent of the total area of all cumulative surface disturbance in these basins. No changes in livestock stocking rates in BLM allotments are anticipated.

The GWD Project would not contribute to cumulative livestock movements across grazing allotments, or access to water sources because GWD Project facilities would be constructed several years after other foreseeable projects (ON Line Transmission Project, Wilson Creek Wind, and Spring Valley Wind) that would share the same utility corridors.

Wild Horses
Construction of the GWD Project would remove approximately 3,015 acres of wild horse forage in the Silver King and Eagle Horse Management Areas. Combined with other cumulative surface disturbance, the net effect represents less than 1 percent of the area of these two wild horse management areas. These cumulative forage reductions are not expected to affect wild horse herd sizes established by the BLM appropriate management levels for these areas.

Construction of the GWD Project would not contribute to cumulative changes in herd movement across herd management areas and to water sources because GWD Project facilities would be constructed several years after other foreseeable projects (TransWest Express, Zephyr, and ON Line Transmission Projects, Wilson Creek Wind, and Spring Valley Wind) that would share the same utility corridor.

Special Designations
Construction of the GWD Project may result in surface disturbance in five BLM ACECs. ACECs are managed as avoidance areas, but BLM may grant ROWs if minimal conflicts exist with identified resource values, and if impacts can be mitigated.

The GWD Project and the TransWest Express, Zephyr, and ON Line Transmission Projects would construct on ROWs through the Coyote Spring Areas of Critical Environmental Concern. This portion of the Areas of Critical Environmental Concern overlaps with the Lincoln County Conservation, Recreation, and Development Act utility corridor, which allows utility project construction and operation. The GWD Project would cross portions of the Kane

Springs Areas of Critical Environmental Concern, and the ON Line Transmission Project would disturb an area adjacent to the Areas of Critical Environmental Concern boundary. The GWD Project would be located within the LCCRDA corridor. The cumulative surface disturbance of these two projects, combined with existing ROWS in the same corridor (including Highway 93) would cumulatively reduce the natural values for which the Areas of Critical Environmental Concern was designated (desert tortoise habitat protection).

Visual Resources

The GWD Project ROWs and facilities would result in cumulative visual resource changes where project ROWs parallel or cross existing roads and utility. The addition of wind energy projects on valley floors (Spring Valley Wind) and on ridge lines (Wilson Creek Wind) where GWD Project facilities would be located, and the co-location of the GWD Project facilities with the ON Line Transmission Project, and the Eastern Nevada Transmission Line in a common utility corridor would incrementally change the natural character of the hydrographic basins where these projects would be constructed. The following are visual resource cumulative effect conclusions by hydrographic basin:

- Dry Lake Valley, Delamar Valley, Coyote Springs Valley – strong contrasts and cumulative effects from the GWD Project main pipeline and groundwater development areas, combined with existing utility ROWs, new high voltage power lines, surface water developments, and roads. These projects and actions would be visible from the Silver State Trail Backcountry Byway and Highway 93.
- Lake Valley – strong contrasts and cumulative effects from the GWD Project main pipeline, combined with the Wilson Creek Wind Project, high voltage power lines, surface water developments, and roads. These projects and actions would be visible from the U.S. 93 scenic byway and the Silver State Trail Backcountry Byway.
- Spring Valley – strong contrasts and cumulative effects from the GWD Project main pipeline and groundwater development areas, the Spring Valley Wind Project, roads, surface water development, and fiber optic lines. These projects and actions would be visible from the U.S. 6/50/93 scenic byway, the Loneliest Highway special recreation management area, developed recreation and bird watching sites, Humboldt National Forest, and GBNP. Alternative D facilities would not overlap with the Spring Valley Wind Project.
- Steptoe Valley – strong contrasts and cumulative effects resulting from the GWD Project power line combined with roads, surface water developments, and existing power lines. These projects and actions would be visible from the U.S. 6/50/93 scenic byway, designated fishing and bird watching areas, and the Loneliest Highway and Egan Crest special recreation management areas.

The GWD Project's contribution to landscape changes may potentially conflict with BLM Visual Resource Management Classes II and III when considered with existing and foreseeable projects and actions where these projects and actions share viewsheds. The GWD Project, when considered with past, present, and foreseeable actions, would conform with the U.S. Forest Service and GBNP for lands these agencies directly administer, but would not meet the intent of GBNP viewshed preservation objectives outside the National Park boundaries.

Cultural Resources and Native American Traditional Values

The GWD Project would temporarily disturb approximately 12,288 acres of land in the hydrographic basins where GWD Project facilities would be located. This surface disturbance could result in cumulative losses of archaeological resources or traditional or religious sites as the result of grading and excavations by the foreseeable projects (ON Line Transmission Project, Eastern Nevada Transmission Line, Wilson Creek Wind, and Spring Valley Wind) sharing the same utility corridors. The BLM would implement pre-construction surveys to identify and avoid archeological sites where possible for all projects. The BLM would implement construction monitoring and unanticipated discovery plans to comply with its responsibilities under the federal cultural heritage regulations, and under its obligations to consult with affected Tribes. Consultation also would identify traditional, cultural, or religious areas of importance through government-to-government consultation or tribal monitoring.

Socioeconomics and Environmental Justice

The GWD Project would require temporary construction workers, demands for temporary housing, and demands on local law enforcement and emergency services. Based on the preliminary construction schedules of the foreseeable projects ON Line Transmission Project, Eastern Nevada Transmission Line, Wilson Creek Wind, Spring Valley Wind, and Kane Springs Valley Water Development Project), it appears that the GWD Project peak construction period would occur after these projects are completed.

Public Health and Safety

Because health and safety issues are specific to the GWD Project pipelines and water development construction and operation locations, GWD Project facility construction and operations are not expected to contribute to cumulative effects with the identified past and present actions, or foreseeable projects.

3.10 How is climate change addressed in the EIS?

In accordance with Secretarial Orders 3289 and 3226, the Final EIS considers and analyzes the potential effects of climate change. Secretarial Order No. 3289 establishes a Department-wide approach for applying scientific tools to increase understanding of climate change and to coordinate an effective response to its impacts on tribes and the land, surface and subsurface waters, fish and wildlife, and cultural heritage resources that the Department manages. Secretarial Order No. 3289 also reestablished the requirements set forth in Secretarial Order No. 3226 that each bureau and office of the Department must consider and analyze potential climate change impacts when undertaking long-range planning exercises, setting priorities for scientific research and investigations, developing multi-year management plans, and making major decisions regarding potential use of resources under the Department's purview. Secretarial Order No. 3289 did not alter or affect any existing duty or authority of individual bureaus. Consistent with Secretarial Order No. 3289 and Secretarial Order No. 3226, and to the extent reasonably possible, the BLM considers and analyzes potential climate change impacts in the EIS. Climate change effects are addressed for all affected resources as part of the cumulative effects assessment. In addition, the findings of the Final EIS associated with the project's contribution to climate change were considered when making decisions regarding the selection of the preferred alternative for this project. Finally, the information in the Final EIS will be considered when setting priorities for developing appropriate project monitoring and mitigation plans.

4. Environmental Consequences - Programmatic Assessment of Long-Term Pumping Effects

4.1 What Future Facilities would be required for groundwater development?

Completion of the future groundwater production facilities, including wells, power lines, access roads, collector pipelines, and ancillary facilities, would result in additional temporary and long-term disturbance. The exact number and locations of wells is presently unknown. Consequently, a series of assumptions were developed to allow programmatic analysis of the environmental effects of the future development. Additional ROW requests and subsequent NEPA compliance would be conducted for specific sites after the SNWA establishes their locations. The programmatic level of development, including a range of temporary and permanent ROW associated with the future facilities for each alternative is summarized below in **Table ES-4**.

Table ES-4 Future Facilities Summary of the Alternatives for Analysis in this EIS

ROW and Facility Requirements	Proposed Action	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E	Alternative F
Groundwater Production Wells (number)	144 to 174	97 to 117	136	97 to 117	69 to 83	69 to 83	96 to 117
Collector Pipelines (miles)	177 to 434	100 to 246	236	100 to 246	127 to 206	86 to 210	134 to 344
Staging Areas (number of 1-acre sites)	59 to 145	33 to 82	79	33 to 82	42 to 69	29 to 70	45 to 115
Electric Power Lines (miles)	177 to 434	100 to 246	236	100 to 246	127 to 206	86 to 210	134 to 344
Permanent ROW (acres)	2,374 to 5,536	1,370 to 3,171	3,077	1,370 to 3,171	1,655 to 2,635	1,158 to 2,683	1,782 to 4,359
Temporary ROW (acres)	1,216 to 2,874	699 to 1,643	1,587	699 to 1,643	858 to 1,370	595 to 1,396	916 to 2,270

4.2 When and how will additional NEPA compliance be completed for these Future Facilities?

The SNWA does not anticipate filing ROW applications for groundwater production wells and collector pipelines until after the ROD on this EIS and submittal of a detailed POD for the main pipeline. Consequently, the level of detail regarding future facilities development, including the number and location of wells, lengths and routes of collector pipeline and distribution power lines, and road access, currently is inadequate to support site-specific NEPA analysis in this EIS process.

After the SNWA identifies specific groundwater development component details, it will submit additional ROW applications to the BLM. Based on these applications, the BLM will address the site-specific effects in subsequent NEPA documents (see 2.14 above regarding "tiering").

4.3 What would be the relative environmental effects of implementing these future facilities?

The environmental effects of future development, including the long-term effects of groundwater production, have been the subject of conceptual analysis in this EIS. The conceptual analysis encompasses the groundwater development areas where production wells, collector pipelines, and distribution power lines might be located and assumptions regarding the type and range of facilities to be developed. The range of facilities reflects the assumed level of groundwater pumping associated with each alternative. (See **Table ES-5** and Chapter 2 and **Appendix E** in the Final EIS, for more information regarding future facilities development.)

Appendix E

Like the pipeline, future facility development and pumping would be phased, beginning in the southern basins (Delamar, Dry Lake, and Cave), moving northward into Spring and Snake valleys in later years. SNWA's proposed development schedule for future facilities extends over nearly 35 years, beginning in Delamar Valley in year 5 (**Table ES-5**). The proposed schedule provides for complete system build out and achieving full pumping volume by year 38 for the Proposed Action and Alternatives A through C. The time frame for build out of Alternatives D, E, and F is year 33 as no facilities would be constructed in Snake Valley, resulting in an earlier project completion date. The actual timing of future facility development would depend on water availability from SNWA's other sources, water demand, and drought status.

Table ES-5 Timing of Future Facility Development, By Basin and Alternative

Groundwater Basin	Production Well Development Period [1]	Basin Included In Alternative					
		Proposed Action	A	B	C	D	E and F
Delamar, Dry Lake and Cave	Years 5 thru 8	Yes	Yes	Yes	Yes	Yes	Yes
Spring Valley – south (Lincoln County)	Years 9 thru 11	Yes	Yes	Yes	Yes	Yes	Yes
Spring Valley – north (White Pine County)	Years 27 and 28	Yes	Yes	Yes	Yes	No	Yes
Snake Valley	Years 36 thru 38	Yes	Yes	Yes	Yes	No	No

[1] Exploratory development would occur in each basin prior to the production well development. Specific development plans would be submitted to the BLM based on exploratory drilling and Tier II NEPA completed for the specific plans.

Environmental effects associated with the future facility development would be similar to those described for ROW facilities, but smaller in scale. Unlike the relatively wide, linear corridor associated with the pipeline ROW, the disturbance area for each groundwater production well would be a rectangular parcel, accessed via an improved road that would be co-located with the collector pipelines in a 50-foot permanent ROW. **Table ES-6** summarizes the environmental impacts for the future facilities.

Table ES-6 Summary of Future Groundwater Development Impacts Associated with Surface Disturbance for the Proposed GWD Project Alternatives

Disturbance/Impacts	Proposed Action	Alternatives A and C	Alternative B	Alternative D	Alternative E	Alternative F
Disturbance (Acres)[1]						
Spring Valley	1,206-2,853	826-1,905	2,504	1,586-1,832	826-1,905	1,136-2,605
Snake Valley	450-985	316-735	1,183	0	0	0
Cave Valley	575-1,652	230-751	312	230-751	230-751	577-1,651
Dry Lake Valley	402-849	402-849	323	402-849	402-849	405-864
Delamar Valley	957-2,071	296-573	342	296-573	296-573	580-1,509
Total	3,590-8,410	2,069-4,814	4,664	2,513-4,005	1,754-4,079	2,698-6,629
Pumping Stations	2	2	2	2	2	2
Substations	2	2	2	2	2	2
Air Resources, Geology, Soils, Vegetation, Terrestrial Wildlife, Land Use, Transportation, Minerals, Rangeland, Wild Horses, Cultural Resources, Native American Traditional Values, Public Health and Safety	Construction and operation-related disturbance impacts could occur in all five groundwater development basins with relative effects related to the range in acres listed above. The types of impacts would be the same as those discussed for ROWs.			Construction and operation-related disturbance impacts could occur in four groundwater development basins (Snake Valley eliminated) with relative effects related to the range in acres listed above. The types of impacts would be the same as those discussed for ROWs.		
Water Resources (Stream reaches and springs potentially affected by disturbance)	• 28 perennial stream reaches in Spring and Snake valleys. • 60 springs in the 5 valleys.	• Same as the Proposed Action.	• 3 perennial stream reaches in Snake Valley. • 7 springs in Snake Valley.	• No disturbance to perennial stream reaches. • 13 springs in Spring, Cave, Dry Lake, and Delamar valleys.	• 23 perennial stream reaches in Spring Valley. • 49 springs in Spring, Cave, Dry Lake, and Delamar valleys.	• Same as Alternative E.
Aquatic Biological Resources Disturbance effects to aquatic habitat and species (game fish, special species or native species)	Number of waterbodies with game fish or special status amphibian species: • 17 perennial streams in Spring and Snake valleys. • 3 springs. • Potential mortalities to amphibians during movement periods from vehicle traffic.	• Same as the Proposed Action.	Number of waterbodies with non-game and non-special status species: • 1 perennial stream in Snake Valley and 1 spring in Snake Valley. • Potential mortalities to amphibians during movement periods from vehicle traffic.	• No disturbance to perennial streams or springs with game fish or special status species. • Potential mortalities to amphibians during movement periods from vehicle traffic.	Number of waterbodies with game fish or special status species: • 13 perennial streams in Spring valley. • 3 springs in Spring Valley. • Potential mortalities to amphibians during movement periods from vehicle traffic.	• Same as Alternative E.

Table ES-6 Summary of Future Groundwater Development Impacts Associated with Surface Disturbance for the Proposed GWD Project Alternatives (Continued)

Disturbance/Impacts	Proposed Action	Alternatives A and C	Alternative B	Alternative D	Alternative E	Alternative F
Recreation	• Potential disturbance to 6 recreation areas.	• Same as Proposed Action.	• Same as Proposed Action	• Potential disturbance to 4 recreation areas.	• Same as Proposed Action	• Same as Proposed Action.
Special Designations	• Potential disturbance to 3 special designation areas in Spring and Snake valleys.	• Same as Proposed Action.	• Same as Proposed Action.	• No special designations would fall within the groundwater development areas.	• Potential disturbance to 2 special designation areas in Spring Valley.	• Same as Alternative E.
Socioeconomics	Temporary employment and population gains. Limited scale and duration for each well. Multiple rigs could operate simultaneously in different locations. Increased intensity of social effects, both for those opposed and supporting the project.			Same as the Proposed Action but less intense in White Pine County.	Same as the Proposed Action but less intense in White Pine County.	Same as the Proposed Action but less intense in White Pine County.
Visual	• 23,409 acres of disturbance in VRM Class II. • Meets intent of GBNP Visual Objectives.			• 12,822 acres of disturbance in VRM Class II. • Meets intent of GBNP Visual Objectives.	• 22,938 acres of disturbance in VRM Class II. • Does not meet intent of GBNP Visual Objectives.	• 22,938 acres of disturbance in VRM Class II. • Does not meet intent of GBNP Visual Objectives.

[1] Disturbance was estimated based on the addition of temporary and permanent ROWs (pipeline and power line), wells, and other ancillary facilities.

4.4 How were the effects of long-term pumping on water resources determined?

A groundwater flow model was developed for this Final EIS to evaluate the probable long-term effects of groundwater withdrawal on a regional scale. The study area for water resources encompasses all or part of 35 hydrographic basins shown in **Figure ES-15** and covers over 20,000 square miles. **Figure ES-15** also indicates the locations of inventoried springs and identified perennial stream reaches located within the region. Generally speaking, the analysis of pumping effects on environmental resources followed a series of steps that links the results of groundwater flow modeling to those resources with dependence on surface water and/or groundwater as a source of water or habitat.

The computerized model was calibrated to water levels and flow measurements in the field. The groundwater model represents a generalized understanding of the surface and underground water and hydrogeologic conditions over this large region. The model was used to simulate groundwater withdrawal for the eight alternatives for analysis (i.e., the Proposed Action, six action alternatives, and the No Action Alternative). The assumed time frame for full build out under the Proposed Action is 38 years from BLM issuance of a Notice to Proceed. The modeling results were evaluated at three future time frames: full build out, full build out plus 75 years, and full build out plus 200 years.

The BLM established a technical review team to assist it by reviewing the model documentation reports and provide recommendations for improving the model. The team included hydrology specialists from the BLM Nevada and Utah State Offices, and National Operations Center in Denver; the U.S. Geological Survey: and AECOM (BLM EIS Contractor).

An electronic copy of the modeling report is included with this EIS.

Despite inherent uncertainty associated with hydrogeologic conditions over this broad region, the calibrated model is a reasonable tool for estimating probable regional-scale drawdown patterns and trends over time resulting from the various pumping alternatives. Impacts were evaluated in terms of the potential impacts to flows of seeps, springs and streams, potential impacts on water rights, and drawdown effects on subsurface water.

The potential for impacts to individual seeps, springs, or stream reaches depends on:

1) the source of groundwater that sustains the perennial flow;
2) the interconnection (or lack of interconnection) between the perennial surface waters and the groundwater aquifers; and
3) the drawdown that results from the groundwater development.

Results of the regional groundwater flow model were used to evaluate the effects on water resources at three time frames that correspond to full build out of the system (approximately 38 years after Notice to Proceed), and at full build out plus 75 and full build out plus 200 years after full build out.

This evaluation identifies areas where there is likely to be a high or moderate risk of impacts to perennial surface water sources from groundwater development.

The water rights impact evaluation discloses potential effects to existing surface and groundwater rights resulting from the various proposed pumping alternatives. The assessment was conducted by overlaying maps of the predicted drawdown on the maps of existing water rights. For surface water rights, it was assumed that water rights located within the projected 10-foot drawdown area and located within the identified high and moderate risk areas previously described for perennial water could be affected. It was also assumed that groundwater rights located within the same defined drawdown area could be affected.

The impact evaluation identifies perennial water resources located in areas where there is a high or moderate risk of impacts.

Figure ES-15 Perennial Streams and Springs in the Region of Study

4.5 Where and how large are the areas that would likely experience long-term drawdown effects?

Table ES-7 summarizes the groundwater production rates assumed for the various groundwater development alternatives. Groundwater modeling for the Proposed Action and Alternatives A through F, all show drawdown expanding progressively as pumping continues over time. The alternatives with the highest groundwater withdrawal volumes (Proposed Action and Alternative B) show the greatest drawdown effects; and the alternatives with the lower groundwater withdrawal volume (Alternatives C, D, E, and F) show the least drawdown effects.

Table ES-7 Summary of Pumping Assumptions for the Alternatives for Analysis

Alternatives for Analysis	SNWA Groundwater Production	Basins in Which SNWA Production Would Occur
Proposed Action	Up to 176,655 afy	Spring, Snake, Cave, Delamar, Dry Lake
A	Up to 114,755 afy	Spring, Snake, Cave, Delamar, Dry Lake
B	Up to 176,655 afy	Spring, Snake, Cave, Delamar, Dry Lake
C	12,000 to 114,755 afy (varies in response to drought)	Spring, Snake, Cave, Delamar, Dry Lake
D	Up to 78,755 afy	Spring (southern portion), Cave, Delamar, Dry Lake (no Snake)
E	Up to 78,755 afy	Spring, Cave, Dry Lake, Delamar (no Snake)
F	Up to 114,129 afy	Spring, Cave, Dry Lake, Delamar (no Snake)
No Action	None	None

Section 3.3 – Water Resources and **Appendix F3.3** present extensive discussion and graphical results of the water modeling and effects analyses prepared for this EIS. Example outputs from the analysis are presented in a series of side-by-side figures on the following pages.

Section 3.3

Figure ES-16 shows the projected groundwater drawdown effects under the Proposed Action and No Action at full build out plus 75 years. For the No Action Alternative, the groundwater pumping analysis shows the potential future effects from continuing current water use by agricultural, municipal, mining and milling, industrial, and power plant users. This includes pumping SNWA's existing water rights from its agricultural property in Spring Valley. The No Action pumping scenario does not include any groundwater pumping associated with the water rights applications included in the Proposed Action. As shown, drawdown effects occur in northern Lincoln County under the No Action, with some drawdown in excess of 50 feet. The groundwater pumping scenario for the Proposed Action assumes pumping at the full development quantities (approximately 177,000 afy) for the 5 proposed pumping basins.

For the Proposed Action, at the full build out plus 75 year time frame, there are 2 distinct drawdown areas, with the affected areas separate from those affected under the No Action alternative (**Figure ES-16**). The northern drawdown area encompasses most of the valley floors in Spring Valley, southern Snake Valley, and northern Hamlin Valley. The southern drawdown area extends north-south across the Delamar, Dry Lake, and Cave valleys and into the eastern edge of Pahranagat Valley and northwestern edge of Lower Meadow Valley Wash.

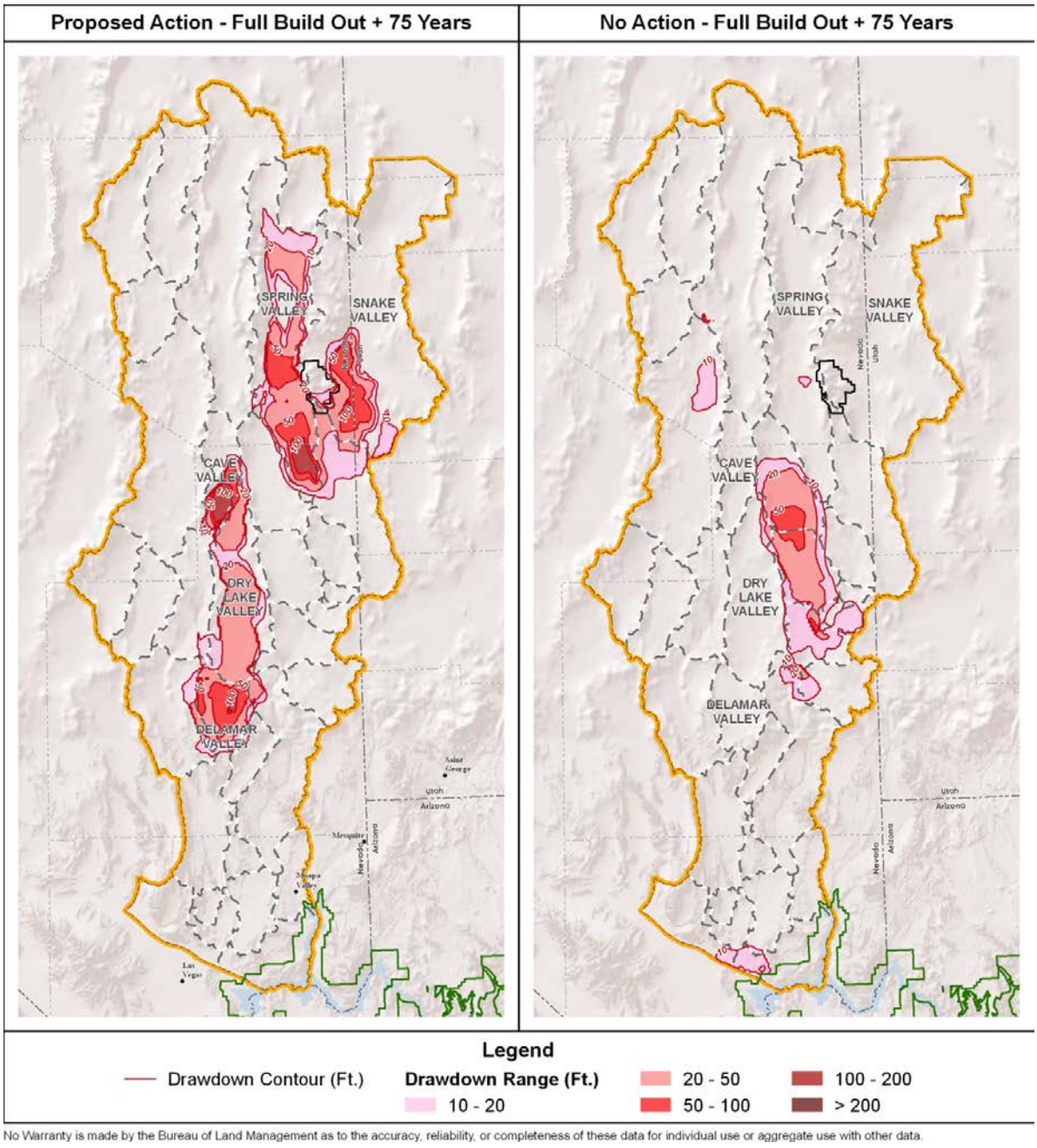


Figure ES-16 Model Simulated Drawdown for the Proposed Action and No Action at the Full Build Out Plus 75 Years Time Frame

Figure ES-17 shows the areal extent and magnitude of the projected groundwater drawdown effects under the Proposed Action and Alternative A at full build out plus 75 years. Alternative A assumes groundwater pumping at reduced quantities (approximately 115,000 afy) in the 5 proposed production basins. As shown, the reduced quantity pumping under Alternative A, as compared to the Proposed Action, would reduce the drawdown area particularly in northern Spring Valley, northern Lake Valley, and along the southern edge of the drawdown area.

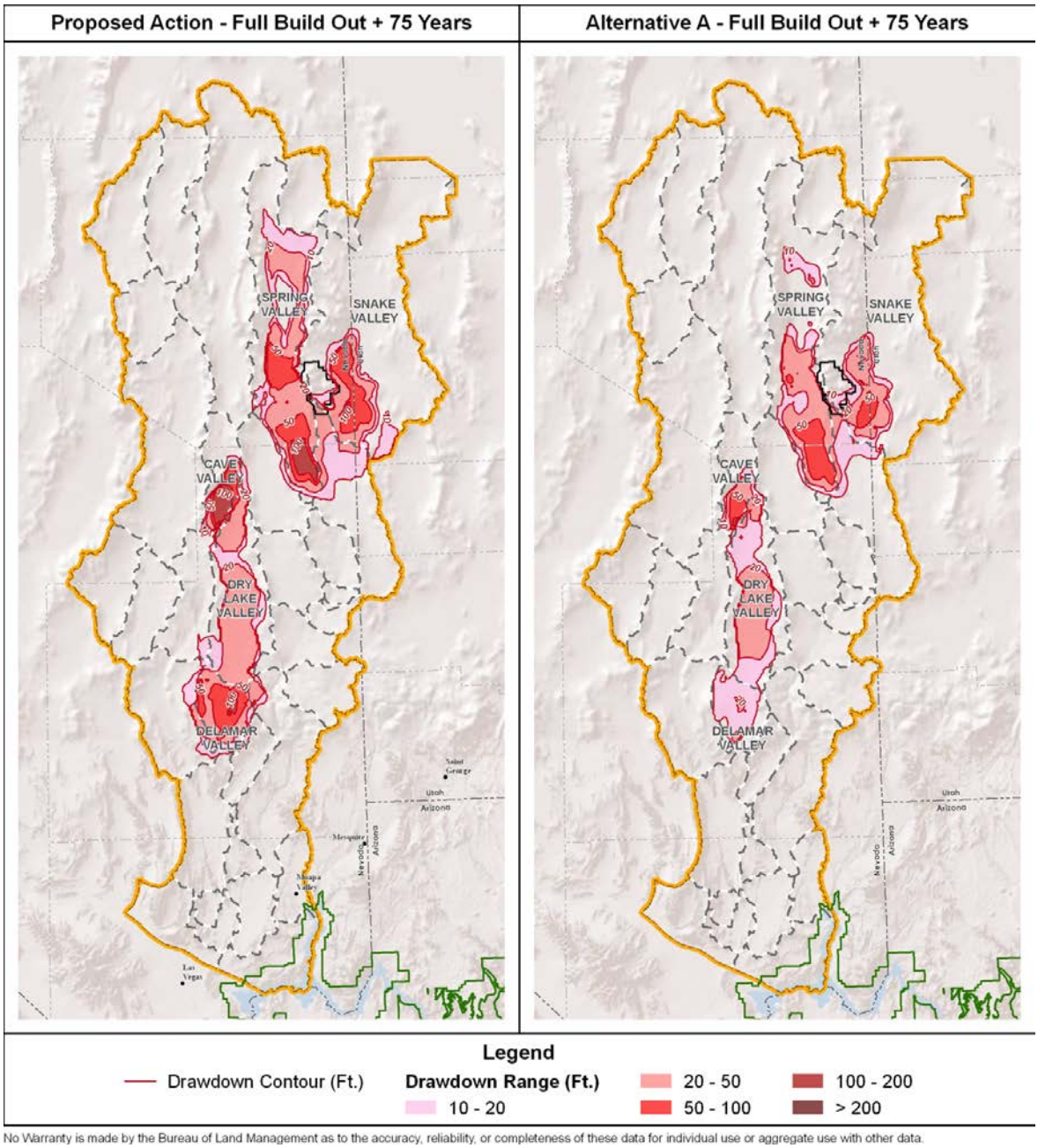
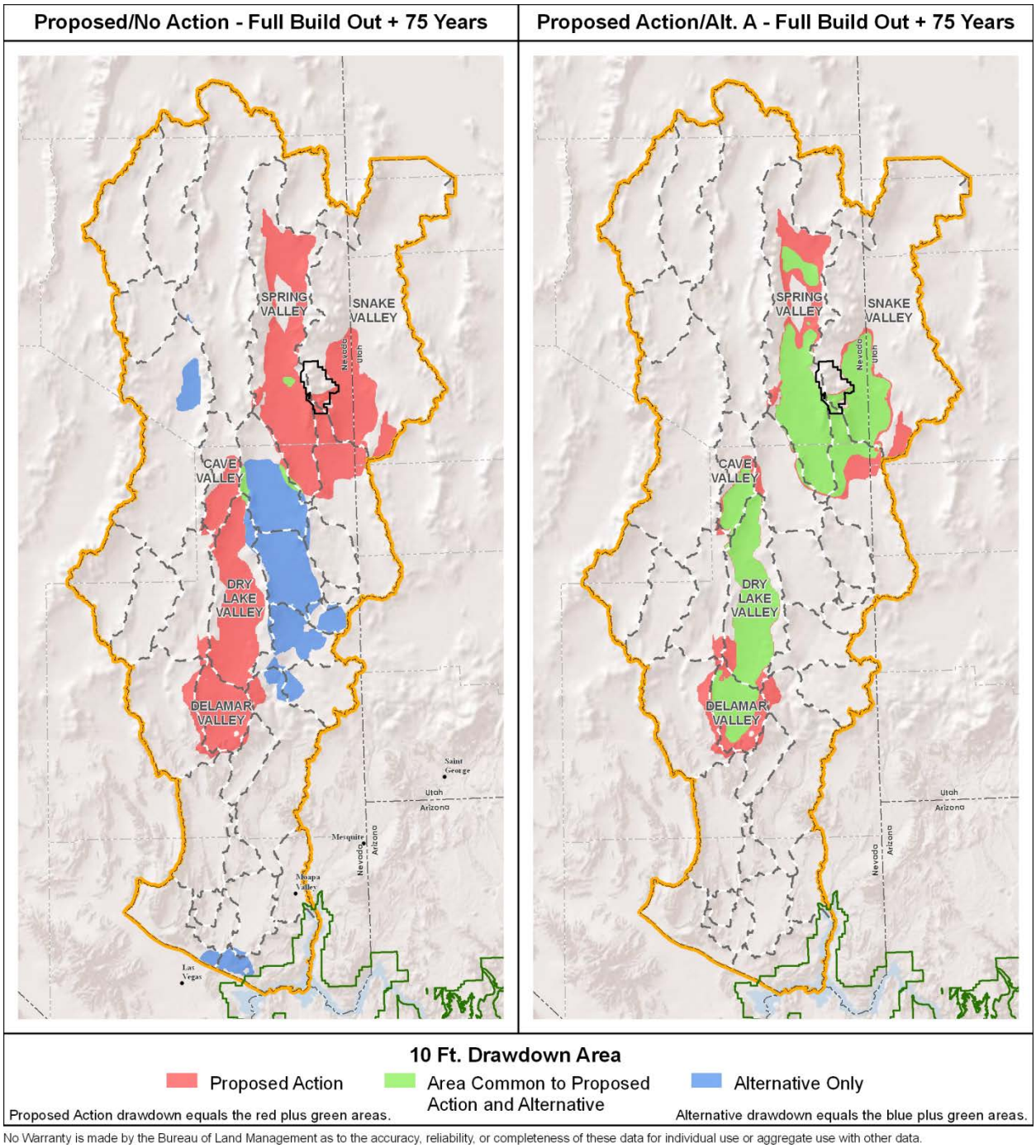


Figure ES-17 Model Simulated Drawdown for the Proposed Action and Alternative A at the Full Build Out Plus 75 Years Time Frame

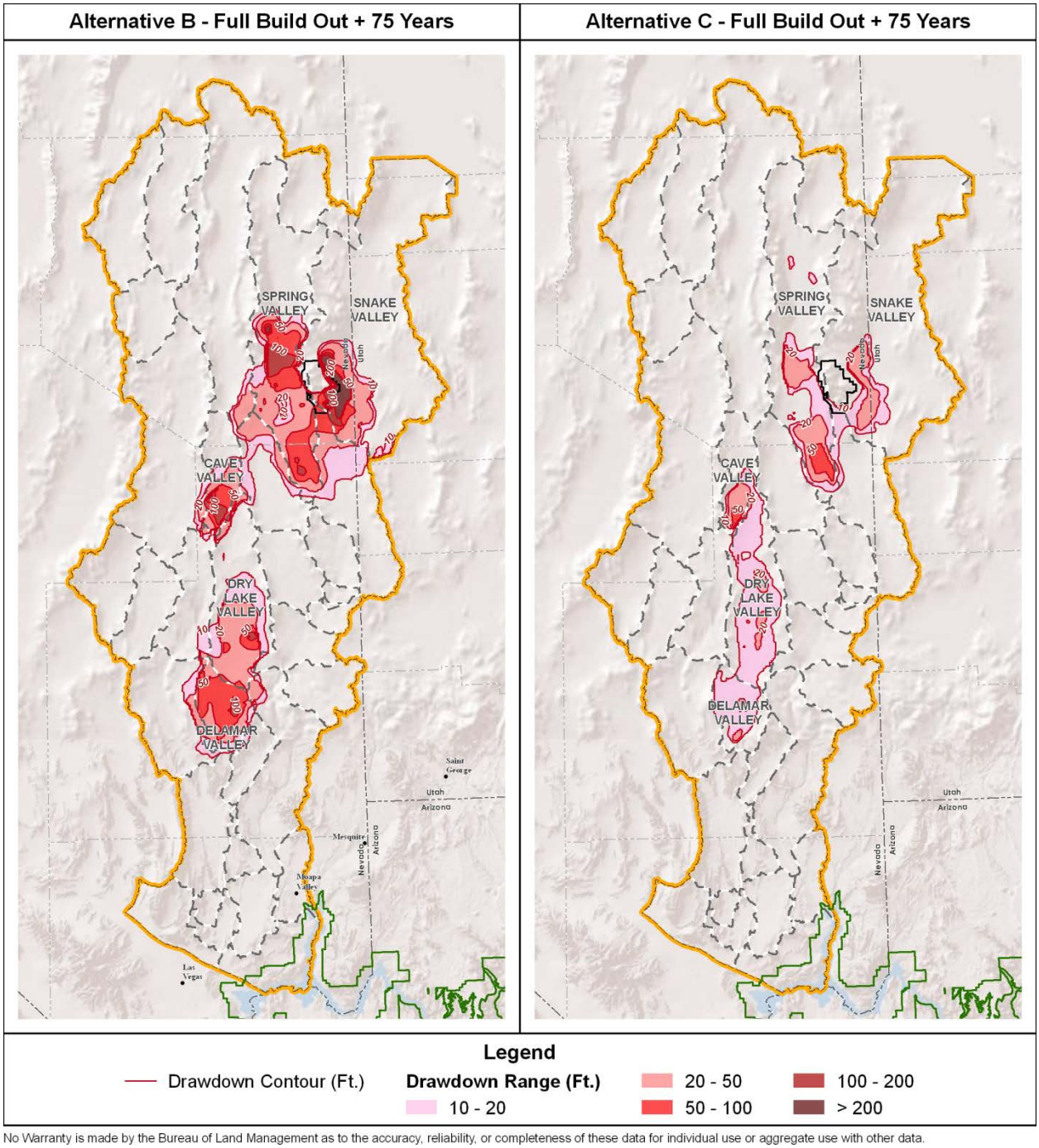
Figure ES-18 presents a different perspective on the projected drawdown area at full build out plus 75 years, showing the overall area projected to be affected by 10-foot or greater drawdown under the Proposed Action and No Action (left panel) and the Proposed Action and Alternative A (right panel). In these figures, the area shaded green represents the affected area under either of the two alternatives, the reddish/brown area is the incremental area affected by the Proposed Action, and the blue area is the area affected by the alternative but not the Proposed Action.



No Warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual use or aggregate use with other data.

Figure ES-18 Comparative Drawdown Areas, Proposed Action and No Action (Left) and Proposed Action and Alternative A (Right) at the Full Build Out Plus 75 Years Time Frame

Figure ES-19 shows the areal extent and magnitude of the projected groundwater drawdown effects under Alternatives B and C at full build out plus 75 years. Alternative B assumes groundwater pumping at the full quantities (i.e., approximately 177,000 afy) listed on the SNWA pending water rights application from the 5 proposed project pumping basins, assuming that wells would be developed at the actual points of diversion listed on the applications. The Alternative C pumping scenario assumes the same groundwater production wells defined for Alternative A but instead of pumping at a sustained rate (as in Alternative A) pumping rates would cycle from minimum to maximum pumping rates every 5 years, as a way of simulating increased reliance on groundwater during periods of drought.



No Warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual use or aggregate use with other data.

Figure ES-19 Model Simulated Drawdown for Alternative B and Alternative C at the Full Build Out Plus 75 Years Time Frame

Figure ES-20 shows the incremental differences in the projected drawdown area to be affected by 10-foot or greater drawdown at full build out plus 75 years under the Proposed Action and Alternative B (left panel) and the Proposed Action and Alternative C pumping scenarios (right panel).

Compared to the Proposed Action, the Alternative B pumping scenario would expand the area of drawdown along the southern edge of Steptoe Valley, in the southern Snake Range between Spring and Snake Valley, and in southern Lake Valley. The drawdown area for Alternative B does not extend into northern Spring Valley or Tippett Valley (**Figure ES-20**). The model results indicate that the reduction in groundwater withdrawal under Alternative C would further reduce the magnitude of drawdown area compared to the Proposed Action and Alternatives A and B.

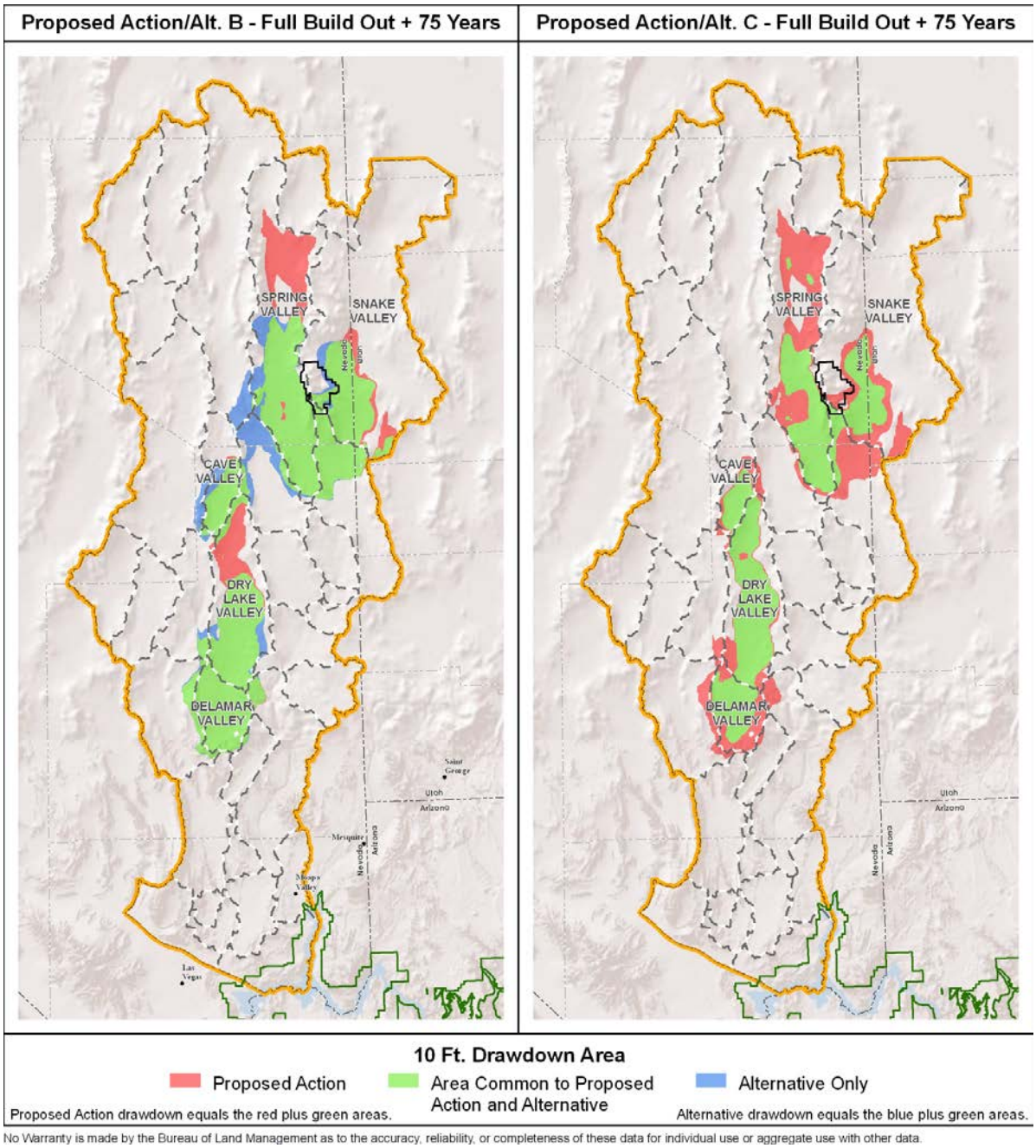
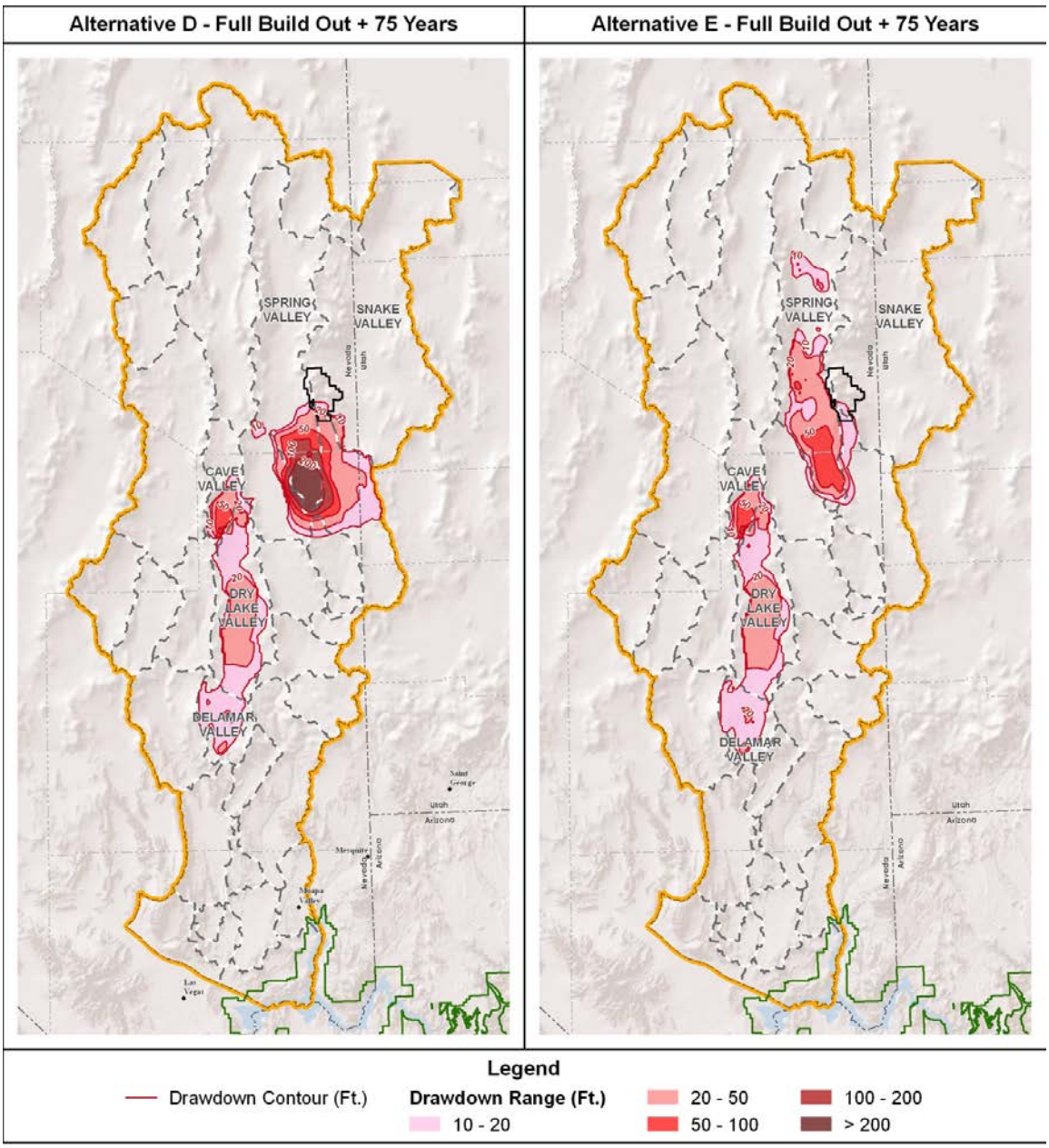


Figure ES-20 Comparative Drawdown Areas, Proposed Action and Alternative B (Left) and Proposed Action and Alternative C (Right) at the Full Build Out Plus 75 Years Time Frame

Figure ES-21 shows the areal extent and magnitude of the projected groundwater drawdown effects under the Alternatives D and E at full build out plus 75 years. Alternative D assumes no groundwater pumping in Snake Valley, and pumping in Spring Valley would be restricted to the southern portion of the valley that is in Lincoln County. The maximum groundwater production rate for this alternative is approximately 79,000 afy from the four pumping basins (Spring and Delamar, Dry Lake, and Cave valleys), the same maximum pumping rate assumed for these basins under Alternatives A, C, and E. The Alternative E pumping scenario includes the same spatial distribution of wells included in Alternative A for Spring, Delamar, Dry Lake, and Cave valleys but assumes no pumping in Snake Valley.



No Warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual use or aggregate use with other data.

Figure ES-21 Model Simulated Drawdown for Alternative D and Alternative E at the Full Build Out Plus 75 Years Time Frame

Figure ES-22 shows the incremental differences in the projected drawdown area at full build out plus 75 years, showing the overall area projected to be affected by 10-foot or greater drawdown under the Proposed Action and Alternative D (left panel) and the Proposed Action and Alternative E (right panel).

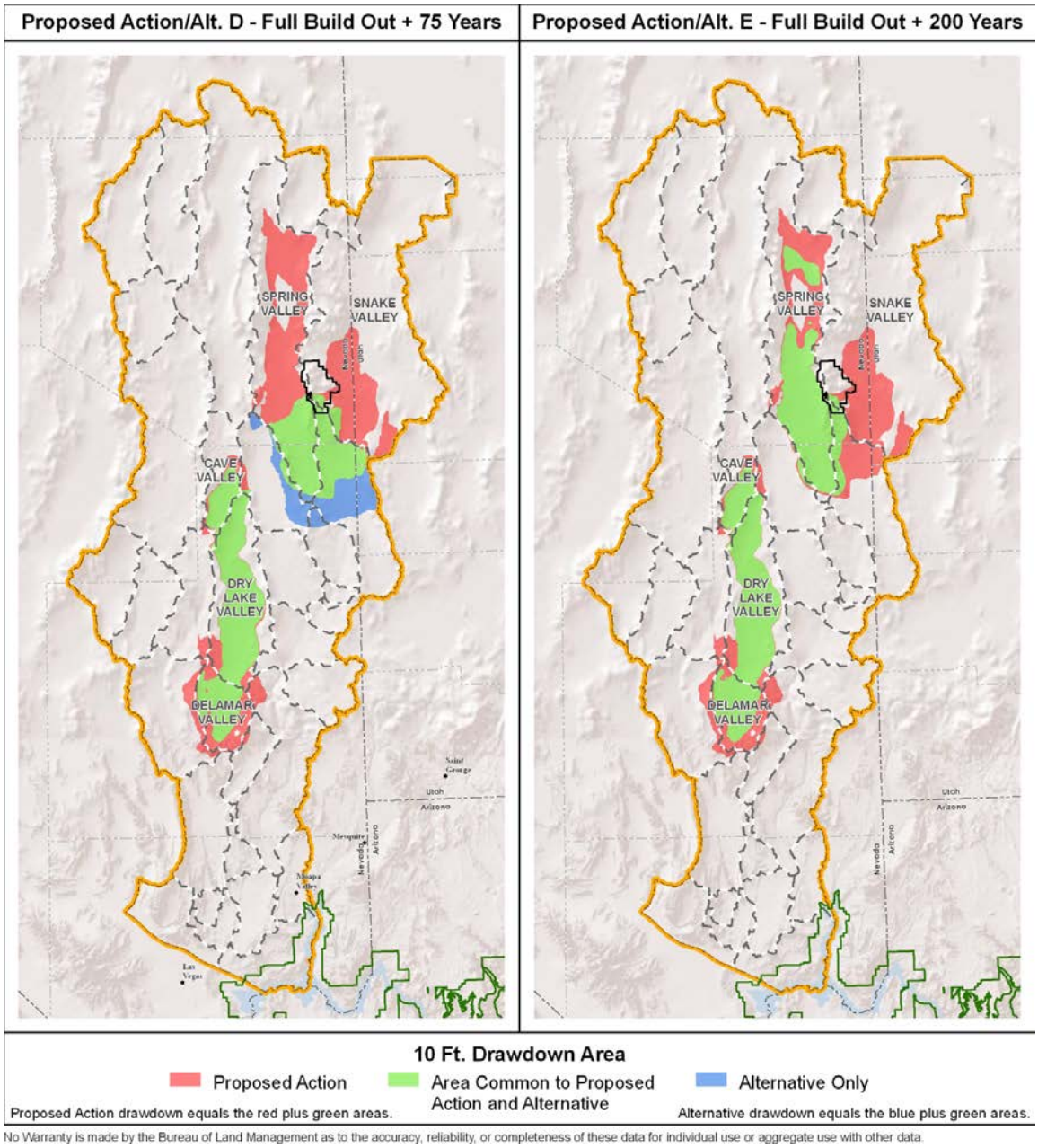


Figure ES-22 Comparative Drawdown Areas, Proposed Action and Alternative D (Left) and Proposed Action and Alternative E (Right) at the Full Build Out Plus 75 Years Time Frame

Compared to the Proposed Action, Alternative D limits drawdown in the central and northern portion of Spring Valley (Hydrographic Area [HA] 184) in White Pine County and southern portion of Snake Valley; but expands drawdown in Lake Valley, Hamlin Valley, and northern Spring Valley (HA 201) in east-central Lincoln County (the hydrographic areas are identified in **Figure 3.3.1-1** of the Final EIS). The concentration of pumping in southern Spring Valley (HA 184) under Alternative D results in projected drawdown of greater than 200 feet across the entire southern portion of the valley (**Figure ES-20**).

Because the pumping schedules for Alternatives E and A are identical for Spring, Delamar, Dry Lake, and Cave valleys, so too are the predicted drawdowns in those valleys (**Figure ES-16**). Alternative E would substantially reduce the drawdown area in Snake Valley compared with the Proposed Action and Alternative A.

Figure ES-23 shows the areal extent and magnitude of projected groundwater drawdown effects under Alternative F at full build out plus 75 years (left panel) and the incremental difference in the projected area affected by 10-foot or greater drawdown under the Proposed Action and Alternative F (right panel) at full build out plus 75 years.

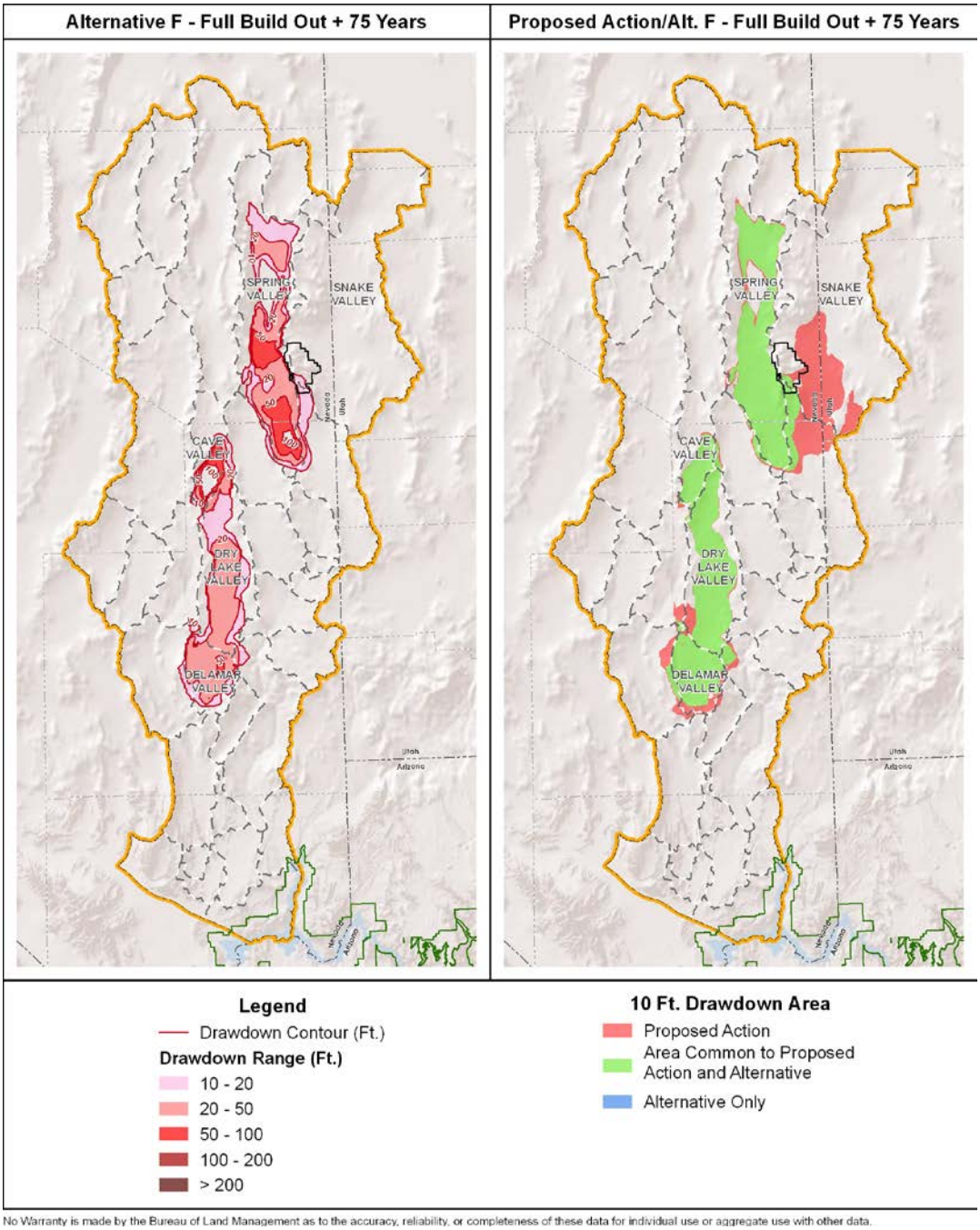


Figure ES-23 Model Simulated Drawdown for Alternative F at the Full Build Out Plus 75 Years Time Frame (Left) and Comparative Drawdown Areas for the Proposed Action and Alternative F (Right) at the Full Build Out Plus 75 Years Time Frame

The maximum groundwater production rate for Alternative F is approximately 114,129 afy for the 4 pumping basins (Spring and Delamar, Dry Lake, and Cave valleys). Under Alternative F, the same number of wells would be developed in Cave and Dry Lake valleys as for the Proposed Action. Spring and Delamar valleys would have fewer wells, with no wells or pumping in Snake Valley. Alternative F would substantially reduce the drawdown area in Snake Valley compared with the Proposed Action.

4.6 Does the area affected by 10-feet or more of drawdown continue to expand beyond the full build out plus 75 years time frame?

Yes. The groundwater modeling shows continued expansion of the groundwater drawdown area, for all alternatives, including No Action, assuming continued pumping beyond full build out plus 75 years. For example, **Figure ES-24** shows the expansion of the model simulated drawdown for the Proposed Action Alternative between the full build out plus 75 years and full build out plus 200 years time frames.

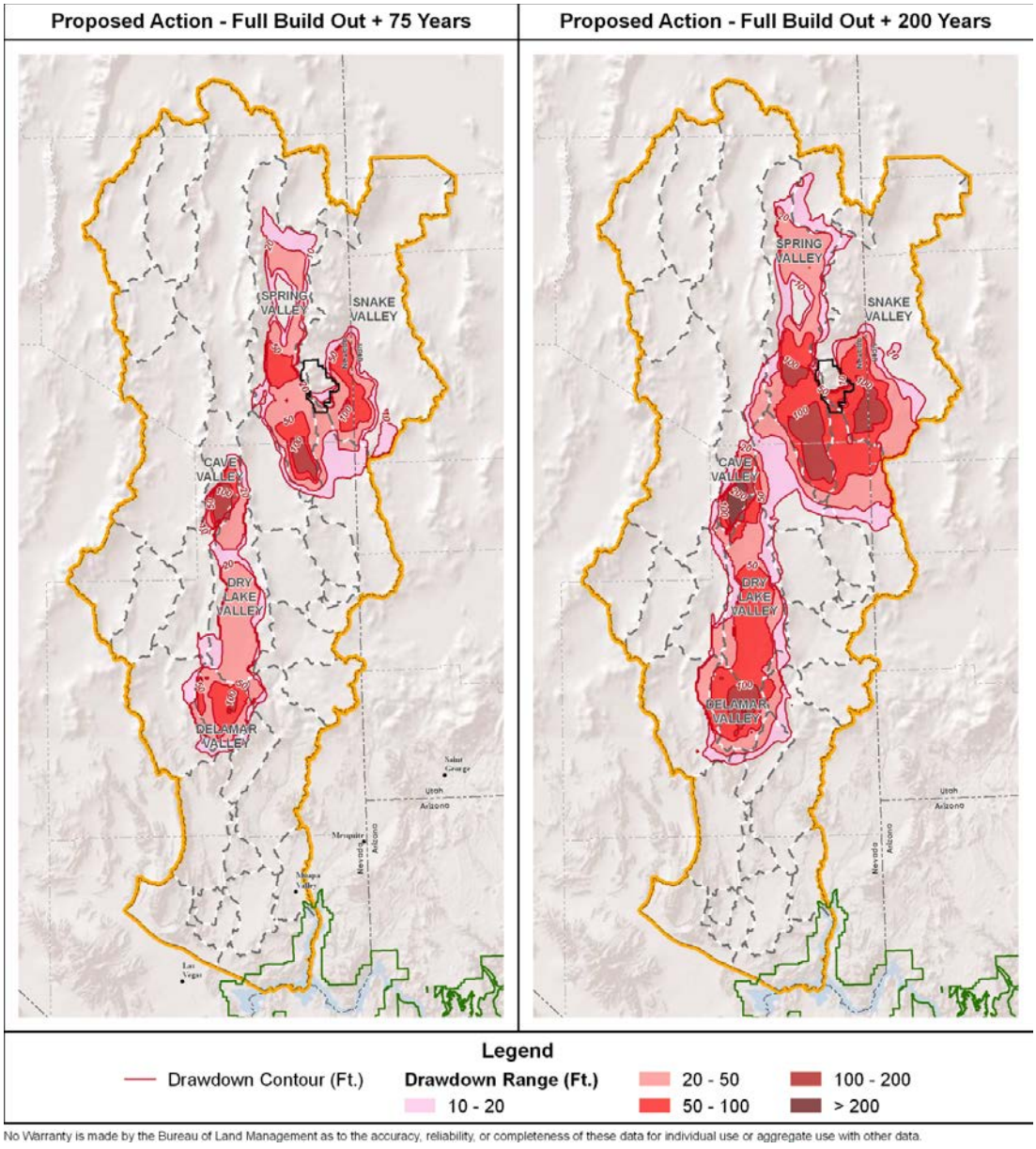


Figure ES-24 Model Simulated Drawdown for the Proposed Action at the Full Build Out Plus 75 years and Full Build Out Plus 200 Years Time Frames

4.7 How would long-term pumping affect water resources in the study area?

Table ES-8 provides a comparison of the potential impacts to water resources in the region of study associated with the various alternative pumping scenarios.

Table ES-8 Potential Incremental Effects to Water Resources at the Full Build Out Plus 75 Years and Full Build Out Plus 200 Years Time Frame Resulting from the Alternative Pumping Scenarios[1]

Water Resource Issue	Proposed Action	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F	No Action
Full Build Out Plus 75 Years								
Drawdown effects on perennial springs:								
• Number of inventoried springs located in areas where impacts to flow could occur[2]	44	29	54	19	13	19	30	12
Drawdown effects on perennial streams:								
• Miles of perennial stream located in areas where impacts to flow could occur[2]	80	58	91	37	4	7	21	19
Drawdown effects on surface water rights:								
• Number of surface water rights located in areas where impacts to flow could occur[2]	145	109	141	78	23	60	88	105
Drawdown effects on groundwater rights:								
• Total groundwater rights in areas with >10 feet of drawdown	199	174	184	133	27	70	84	372
• Number of groundwater rights in areas with >100 feet of drawdown	2	0	8	0	2	0	1	0
Percent reduction in groundwater discharge to evapotranspiration:								
• Spring Valley	77%	51%	66%	37%	18%	52%	73%	7%
• Snake Valley	28%	23%	18%	15%	4%	0%	1%	3%
• Great Salt Lake Desert Flow System	48%	34%	37%	24%	10%	21%	30%	5%
Full Build Out Plus 200 Years								
Drawdown effects on perennial springs:								
• Number of inventoried springs located in areas where impacts to flow could occur[2]	59	46	78	26	31	30	41	20
Drawdown effects on perennial streams:								
• Miles of perennial stream located in areas where impacts to flow could occur[2]	112	81	120	59	48	23	46	52
Drawdown effects on surface water rights:								
• Number of surface water rights located in areas where impacts to flow could occur[2]	212	151	186	98	56	94	132	164
Drawdown effects on groundwater rights:								
• Total groundwater rights in areas with >10 feet of drawdown	264	223	301	171	213	110	131	409
• Number of groundwater rights in areas with >100 feet of drawdown	34	2	45	0	6	2	5	0
Percent reduction in groundwater discharge to evapotranspiration:								
• Spring Valley	84%	57%	73%	37%	28%	56%	80%	7%
• Snake Valley	33%	27%	24%	17%	8%	3%	3%	3%
• Great Salt Lake Desert Flow System[1]	54%	39%	44%	25%	16%	24%	34%	5%

[1] Supporting information used to develop these estimated effects are provided in **Appendices F3.3.6** through **F3.3.16**.
[2] Total located in high or moderate risk areas.

Potential Impacts to Springs and Streams

Springs and streams that are controlled by discharge from (or interconnected with) the regional groundwater system and located where a reduction in groundwater levels would occur, would likely experience a reduction in flow. The number of inventoried springs and miles of perennial streams located within the modeled drawdown area and located within areas at moderate to high risk of impacts are shown in **Figures ES-25** and **ES-26**.

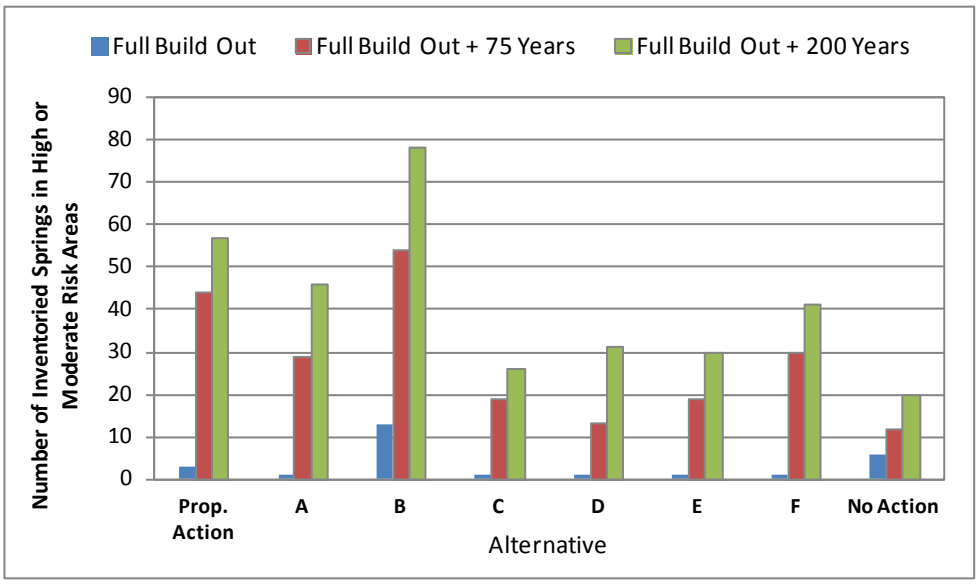


Figure ES-25 Number of Inventoried Springs Located in Areas Where Impacts to Flow Could Occur (High or Moderate Risk Areas)

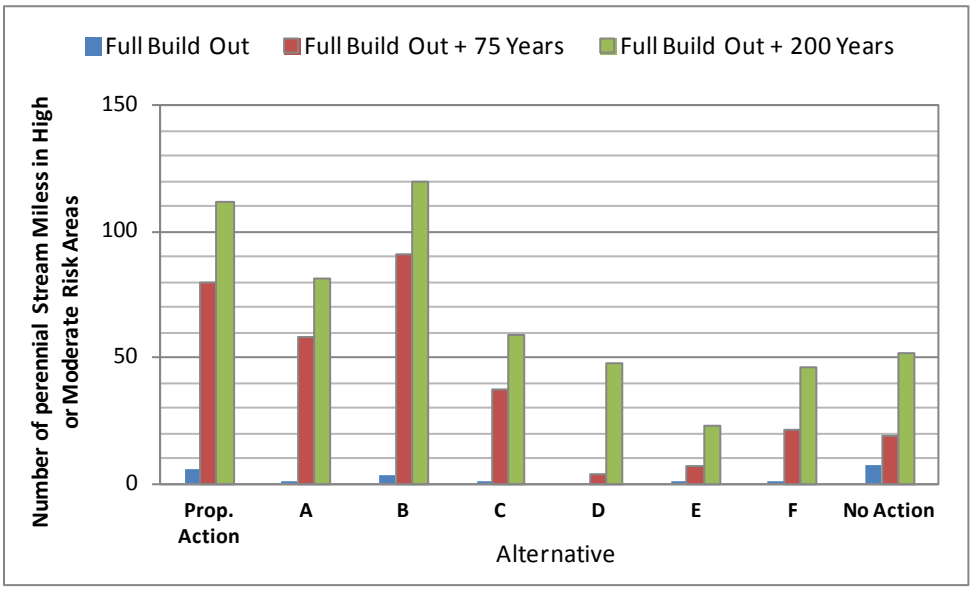


Figure ES-26 Miles of Perennial Streams Located within the Drawdown Area and Areas Where Impacts to Flow Could Occur (High or Moderate Risk Areas)

Construction of current pumping under the No Action Alternative pumping scenario would put 12 inventoried springs at high to moderate risk of being affected at the full build out plus 75 years time frame. The number of springs increases to 20 at the full build out plus 200 year time frame in areas where there is a high to moderate risk of drawdown impacts. The total estimated lengths of perennial streams at high to moderate risk of impacts from the model simulated drawdown increases from about 19 miles at full build out plus 75 years time frame to 52 miles at full build out plus 200 years time frame.

The springs and perennial stream reaches that are at high to moderate risk are identified in:

Section 3.3

The model indicates that continuing the existing pumping under the No Action Alternative would not result in a measurable flow reduction (i.e. >5 percent) in discharge at regional springs in Pahranagat Valley. However, existing pumping in the Muddy River Springs Area, Lower Meadow Valley Wash, and Lower Moapa Valley Hydrologic basins is predicted to cause a progressive reduction of flow over time in the Muddy River.

The simulated drawdown under the Proposed Action and Alternative B, the two alternatives with the largest groundwater withdrawal rate, potentially could impact flows in the largest number of springs and greatest number of miles of perennial stream reach. Compared to the Proposed Action, the reduced drawdown areas resulting from the Alternative A pumping scenario would reduce the number of springs and miles of streams potentially impacted. The Alternatives C, D, E, and F pumping scenarios would further reduce the drawdown area compared to Alternative A, and would potentially impact the fewest number of inventoried springs and fewer miles of perennial stream reach in the region.

Impacts to individual springs and streams would depend on the actual drawdown in these areas and the hydraulic connection between the impacted groundwater systems and the perennial water source. Perennial water sources that are hydraulically connected to the impacted groundwater system in the drawdown area would likely experience a reduction in baseflow that, depending on the severity, could result in springs drying up or a reduction in the length of the perennial stream reaches and their associated riparian areas.

Potential Impacts to Water Rights

The number of surface water rights located in areas where impacts to surface water resources could occur, and the number of groundwater rights located within the areas where the model simulations predict a drawdown of 10 feet or more are listed in **Table ES-8**. There are a large number of existing surface water rights located in areas where impacts from drawdown could occur under both the No Action Alternative and various pumping scenarios. The model indicates that drawdown for the two alternatives with the highest groundwater withdrawal rate (Proposed Action and Alternative B) could impact the largest number of water rights. The reduced drawdown areas under Alternatives A through F would decrease the number of water rights impacted.

The actual impacts to individual surface water rights would depend on the site-specific hydrologic conditions that control surface water discharge. Only the waters that depend on discharge from (or interconnected with) the regional groundwater system that would be affected by pumping would be potentially impacted.

For this evaluation, it is assumed that wells located within the areas affected by drawdown of 10 feet or more could be impacted. Effects on individual wells would depend on the: 1) well construction, including pump setting, depth, yield, predevelopment static, and groundwater pumping levels; 2) interconnection between the aquifer where the well is located and the aquifer targeted by the GWD Project; and 3) the magnitude and timing of the drawdown at each location. Impacts to wells could include a reduction in yield, increased pumping cost, or if the water level were lowered below the pump setting or the bottom of the well, the well could be rendered unusable.

Potential Reduction in Groundwater Discharge to Evapotranspiration Areas

Groundwater pumping is anticipated to result in a reduction in the amount of groundwater that discharges to evapotranspiration areas. These evapotranspiration areas are surface areas where water is lost to the atmosphere through evaporation (including evaporation from surface water, soil, or from the capillary fringe of the water table) and

through plant transpiration. Reductions in groundwater discharge to evapotranspiration areas would likely affect vegetation resources within these areas.

Potential changes in the water balance for the groundwater system within the region of study were estimated using the groundwater flow model. The estimated reductions in groundwater discharge to evapotranspiration areas for selected basins and flow systems are summarized in **Table ES-8** and illustrated in **Figure ES-27**.

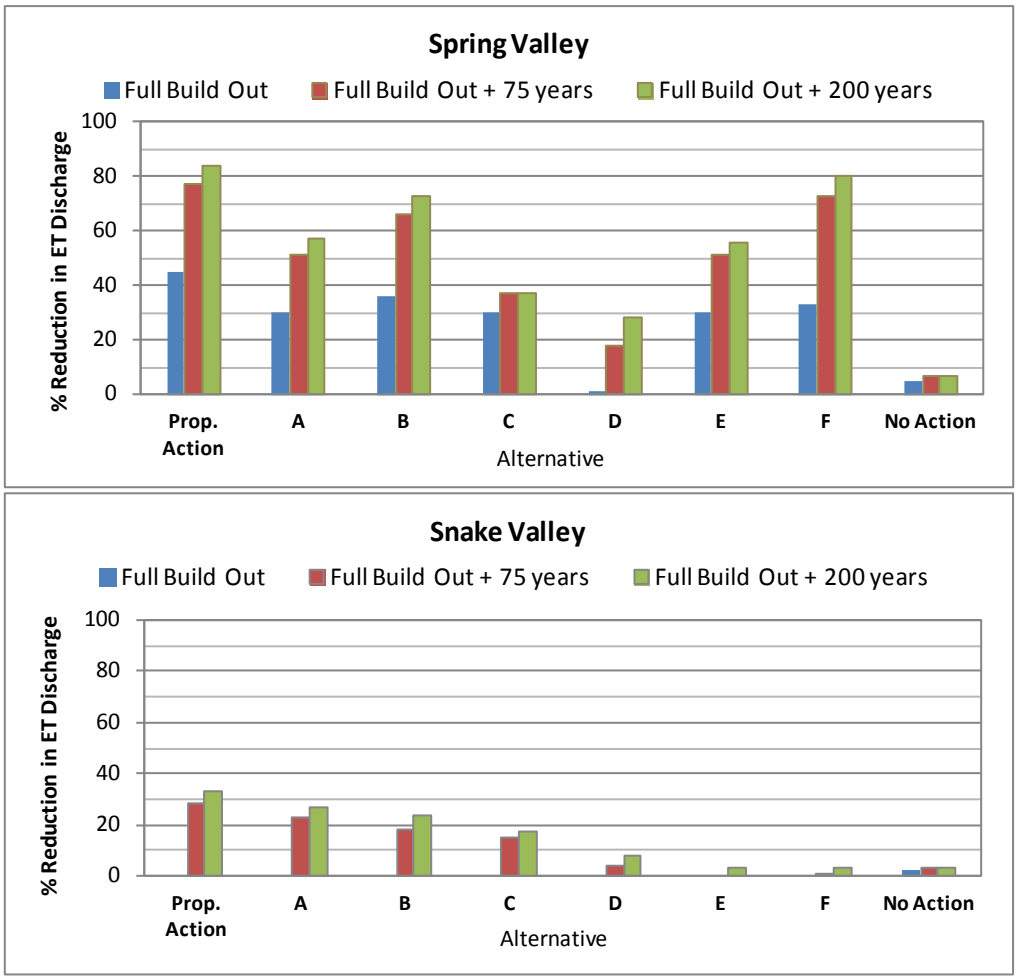


Figure ES-27 Model Simulated Reductions in Groundwater Discharge to Evapotranspiration Areas in Spring and Snake Valleys

The Proposed Action would result in the largest reductions in groundwater discharge to evapotranspiration areas within Spring and Snake valleys, with estimated reductions of up to 84 percent in such discharge in Spring Valley, and up to 34 percent in Snake Valley. For Snake valley, most of the reductions of discharge to areas would occur in the southern portion of the valley. The model results indicate that Alternative D would have the least impact to evapotranspiration areas in Spring Valley because the pumping is concentrated in the southern end of the valley away from much of the evapotranspiration areas. However, the concentrated pumping under Alternative D results in the deepest drawdown cone indicating that a higher percentage of the groundwater withdrawn under this scenario is from groundwater storage compared to the other groundwater development alternatives. Alternative E would result in the smallest impacts to evapotranspiration area in Snake Valley. These predicted reductions in evapotranspiration discharge rates indicate that spring discharge within and associated with these evapotranspiration areas would be reduced. Estimates of the potential impacts to vegetation within evapotranspiration areas are summarized under Vegetation Resources.

4.8 How would long-term pumping affect other resources in the study area?

The groundwater flow model was used to simulate reductions in groundwater elevation (i.e., drawdown) occurring over time from pumping under the Proposed Action or other action alternatives. In addition to the groundwater drawdown, the groundwater flow model was used to simulate potential flow changes in selected springs, streams, and rivers. The model results were used to define the area of projected drawdown of 10 feet or more, relative to current groundwater elevations. An expected drawdown of 10 feet or more is used to identify the area of potential environmental effects, including those on surface water and associated habitat (springs, ponds, wetlands, meadows, perennial streams, playas, and swamp cedar woodlands), and phreatophytic shrubland vegetation. For phreatophytic shrubland vegetation, a 10-foot or greater drawdown was also used to identify areas where loss of vegetation may occur.

For other environmental resources, functional connections to surface water, vegetation and habitat, or groundwater were used to evaluate potential effects. Examples of resource effects due to drawdown include:

- Air and Climate – dust generation risk from soil surface drying.
- Geology – pumping induced ground surface subsidence.
- Soils – potential structural and functional changes in hydric soils.
- Wild Horses – changes in water availability and forage quality and quantity resulting in a possible decrease of the appropriate management levels of horses.
- Rangeland and Livestock Grazing – changes in water sources and forage resulting in possible changes to the carrying capacity of a grazing allotment.
- Special Designations – potential changes in the natural and cultural values for which areas were designated.
- Native American Concerns – changes in water quantity and quality that could affect resources, places of traditional value and sacred sites.

The connections between pumping effects on surface waters and other resources are illustrated in **Figure ES-28**.

The effects of groundwater pumping for the Proposed Action, Alternatives A through F, and the No Action for several other key resources are summarized below. For some resources, impact parameter information is used to show the magnitude of effects on the resource. Except for transportation and public safety, the resource effects are directly related to surface water sources such as springs and perennial streams or indirectly linked to water for moisture, plant growth, or habitat (**Figure ES-28**). A comparison of potential effects among alternatives for air resources, geology, soils, vegetation, aquatic biological resources, and land use is provided in **Figures ES-29** through **ES-39**. As shown previously for water resources, these figures illustrate that for all resources, the two alternatives with the largest groundwater withdrawal rate (Proposed Action and Alternative B), would potentially have the largest effect on these resources. The reduced pumping assumed for Alternative A is estimated to result in a reduction in potential impacts (compared to the Proposed Action and Alternative B) for most of the resources. Groundwater pumping under Alternatives C, D, and E would further reduce potential effects compared to Alternative A. However, the magnitude of the potential reduction in effects for Alternatives C, D, E, and F varies by resource.

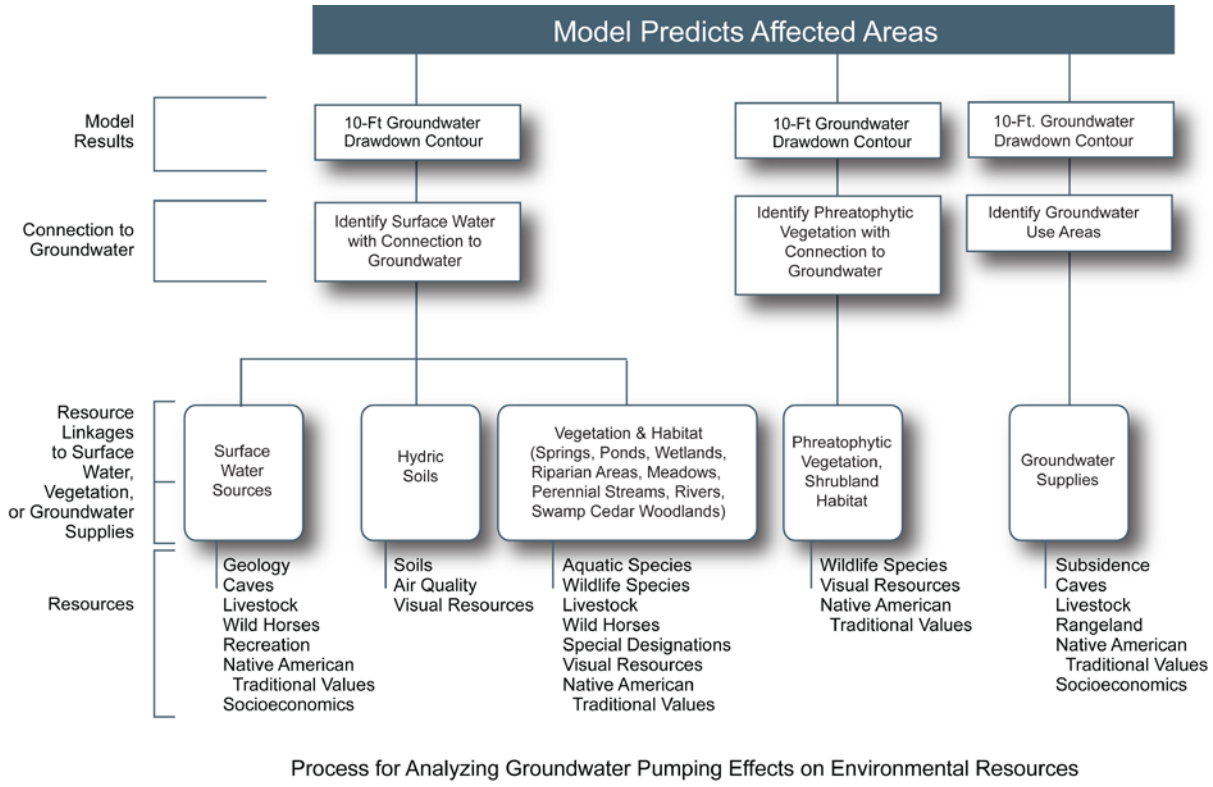


Figure ES-28 Process for Analyzing Groundwater Pumping Effects on Environmental Resources

Air Resources

- Groundwater drawdown would likely result in windblown dust emissions due to drying of hydric soils and loss or reduction of basin shrubland vegetation. The estimated particulate matter for a size of 10-micrometer emissions by alternative are shown on **Figure ES-29**. The particulate matter emissions for a size of 2.5 micrometers would show the same pattern of drawdown effects by alternative, although the magnitude would be less than the 10-micrometer size.
- The level and extent of these predicted dust emissions are highly uncertain due to the assumptions involving dust increases from changes in vegetation.
- Based on predicted power requirements, indirect emissions of greenhouse gases associated with electricity generation would range from approximately 182,000 (Alternative D) to 327,000 tonnes (U.S. metric ton) per year (Proposed Action).

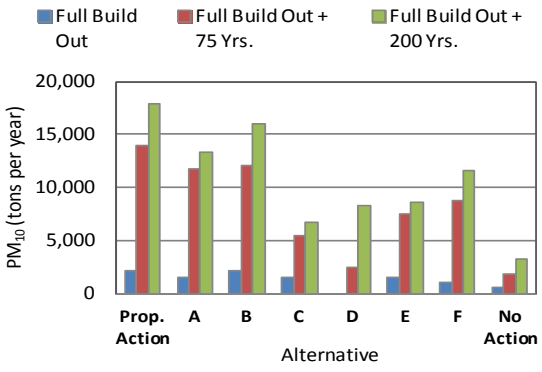


Figure ES-29 Comparison by Alternative of Particulate Matter Emissions Estimated from Groundwater Pumping

Geology

- The major geologic hazard associated with groundwater pumping would be the risk of subsidence of the ground surface as a result of withdrawal of groundwater. A measure of potential subsidence was estimated based on model-simulated drawdowns and the assumption that every 20 feet of long-term drawdown could result in 1 foot of surface subsidence. **Figure ES-30** illustrates the estimated area that could potentially experience subsidence of 5 feet or greater for each alternative. Predictions for subsidence for Alternative B are especially high because pumping would occur at a small number of points of diversion, resulting in deep aquifer drawdowns in Spring and Snake valleys, with consequent risks of subsidence.
- There is a lack of data on water resources and hydrological linkages of cave systems to groundwater to make conclusions regarding cave susceptibility to groundwater pumping.

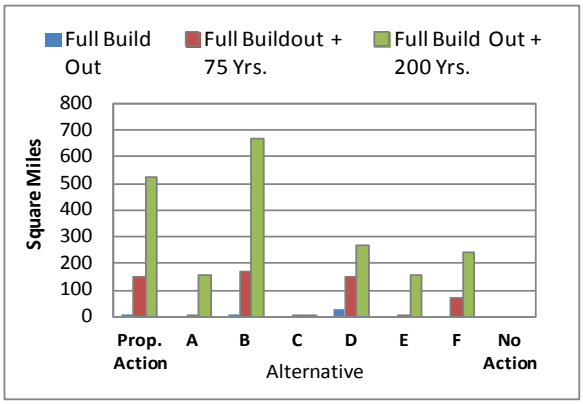


Figure ES-30 Comparison by Alternative of Areas at Risk of Subsidence > 5 Feet from Drawdown

Soils

- Reductions in groundwater levels and input from surface flows could reduce the area and functionality of hydric soils to support wetland and other water-dependent vegetation for all pumping alternatives. The magnitude of effects on acres of hydric soils are shown in **Figure ES-31**.

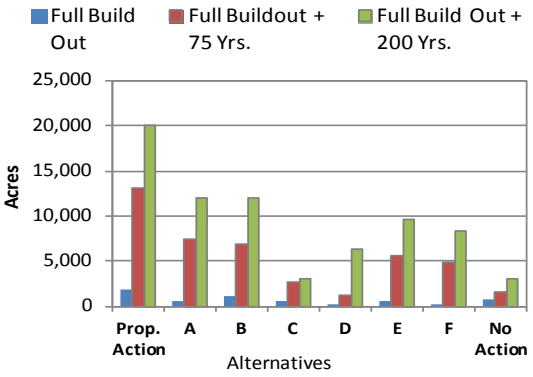


Figure ES-31 Hydric Soil Acres at Risk from Drawdown (≥ 10 feet)

Vegetation

- Groundwater pumping would potentially reduce available moisture in the root zones of vegetation communities that transpire (evaporate) large quantities of soil water through plant leaves. The Wetland/Meadow and Basin Shrubland vegetation are the primary sources of transpiration water from the hydrographic basins to be developed by the GWD Project.
- The Wetland/Meadow cover type depends on shallow groundwater (generally 10 feet or less) and surface flows, and are often supported from surface and subsurface flows from springs, and other areas of shallow groundwater. This cover type occupies relatively small areas in Spring, Snake, and Lake valleys.
- The Basin Shrubland cover type consists of a variety of shrub species, with greasewood (*Sarcobatus vermiculatus*) the most abundant. Greasewood and some other species of shrubs can extend their root systems to depths of 50 feet to take advantage of both shallow and deep groundwater. The Basin Shrubland cover type occupies very large areas across basin floors in Spring, Snake, Lake, and Hamlin valleys.
- Based on drawdown effect studies in other desert basins, it is anticipated that groundwater drawdown of 10 feet or more would result in the drying out, and then conversion of Wetland/Meadow cover types to upland shrub-dominated areas. It is anticipated that the greatest risk of compositional change to these communities would occur under the Proposed Action, and Alternatives A and B in Spring and Snake valleys (**Figure ES-32**).
- Groundwater drawdown may affect spring and stream flows, which in turn may affect water availability to riparian shrubs, grasses, and herbs. These vegetation communities may become less vigorous or extensive under decreased spring and stream flow over time (**Figure ES-33**). The relative drawdown effects of various alternatives to spring and stream dependent vegetation are indicated by the Aquatic Biological Resource figures in the next section.

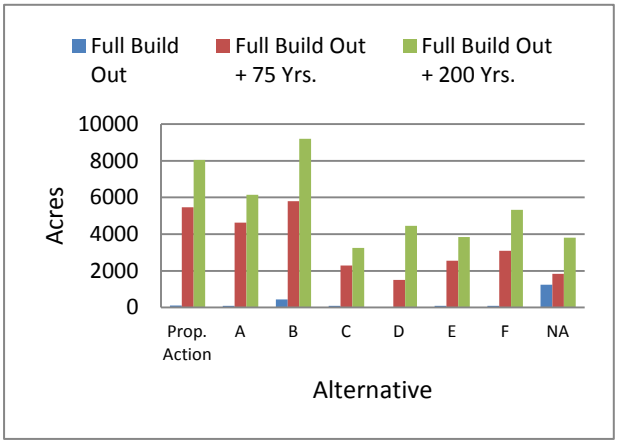


Figure ES-32 **Wetland/Meadow Acres at Risk from Drawdown (≥ 10 feet)**

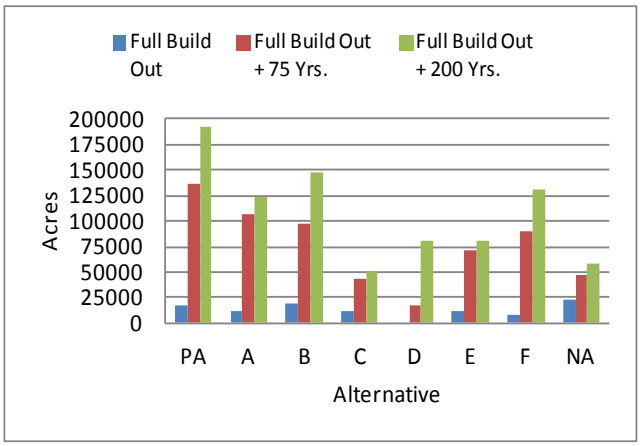


Figure ES-33 **Basin Shrub Acres At Risk from Drawdown (≥ 10 feet)**

- It is anticipated that the Basin Shrubland cover type would retain its dominant shrubs, but shrub densities may decline, and there is a risk of invasion by invasive annual species (**Figure ES-33**). The overall risk of wildland fires would increase in areas dominated by annual species. The alternatives and valleys where there would be a risk of compositional change would be the same as for the Wetland/Meadow cover type.
- The vegetation community compositional changes identified above may affect the availability and extent of tribal traditional use plants in the hydrographic basins affected by the GWD Project.
- Plant species in vegetation communities that are directly dependent on perennial spring and stream flows would experience the greatest potential change in plant species composition. Under drawdown conditions, wetland communities consisting of sedges, rushes, and cattails would progressively change toward a community dominated by deep-rooted grasses. The overall surface area occupied by wetland species would decrease, with persistence only in areas that continue to receive sufficient surface and groundwater for long-term survival. Dominant phreatophytic shrubs likely would persist over the long term, but potentially at lower densities and vigor as the result of reduced availability of soil moisture at greater depths, and lower suitability for shrub seedling re-establishment and growth.

Aquatic Biological Resources

- Spring, pond, lake, and perennial stream habitats located within the 10-foot drawdown contour and characterized as having moderate or high risks of flow reductions could be adversely affected by pumping from all alternatives. The number of affected waterbodies would vary by alternative, as indicated below in the spring and stream figures. Game fish, native fish, special status species, and other aquatic species would be adversely affected by flow reductions.
- Flow reductions would modify habitat by decreasing depths, water velocities, and wetted area in spring/pond/lake and stream habitats. A complete loss of habitat and species could occur in small springs and larger springs where all or most of the flow input is affected. Flow reductions could adversely affect aquatic species by reducing abundance and diversity, altering composition, reducing food sources, limiting spawning or early life stage development, and decreasing overall health condition.

Impact differences among the alternatives at the three model time frames are shown in **Figures ES-34** through **ES-37** for some of the key impact parameters.

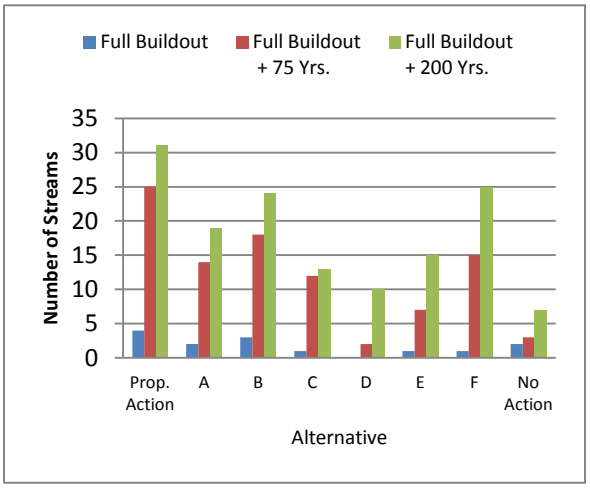


Figure ES-34 **Streams with Aquatic Biology Resources with Potential Flow Reductions**

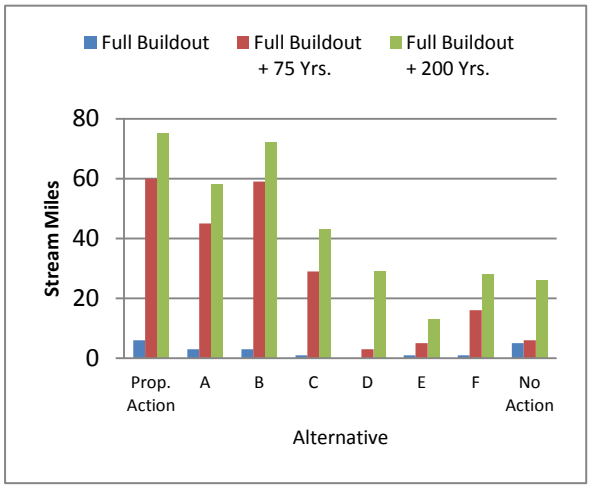


Figure ES-35 **Miles of Game Fish and Special Status Species Streams with Potential Flow Reductions**

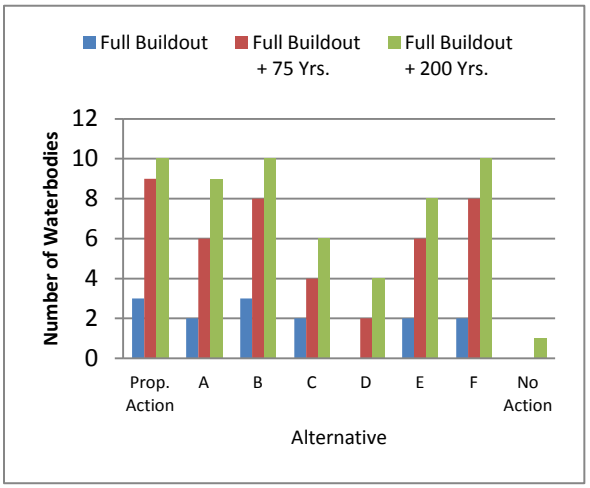


Figure ES-36 **Springs/Ponds/Lakes Containing Special Status Amphibian Species with Potential Flow Reductions**

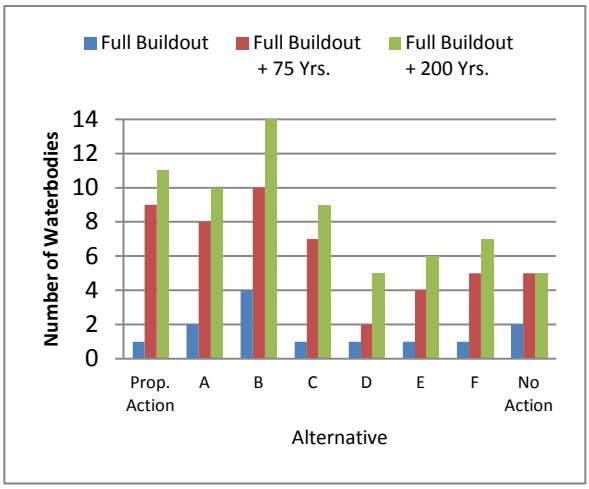


Figure ES-37 **Springs/Ponds/Lakes Containing Game Fish and Special Status Species with Potential Flow Reductions**

- Pumping by all alternatives could adversely affect two federally listed fish (Pahrump poolfish and White River spinedace), northern leopard frog, and special status fish and invertebrate species (springsnails, freshwater mussel, and California floater). Pumping by all alternatives would conflict with recovery or conservation management objectives for the two federally listed species: northern leopard frog, and Bonneville cutthroat trout.
- Fish species considered to be traditional values to regional Tribes could be affected in Snake, Spring, and Lake valleys to varying degrees by the pumping alternatives.

Land Use

- Groundwater pumping would result in the drawdown of groundwater levels on public lands that are available for disposal and private agricultural lands. The magnitude of effects on these two land use parameters are shown below (**Figures ES-38** and **ES-39**).

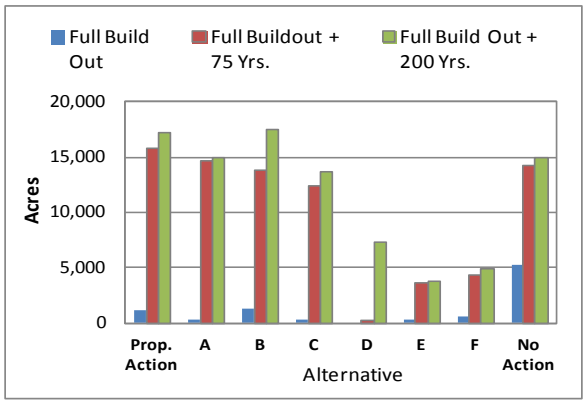


Figure ES-38 **Private Agricultural Lands (Acres) at risk from Drawdown**

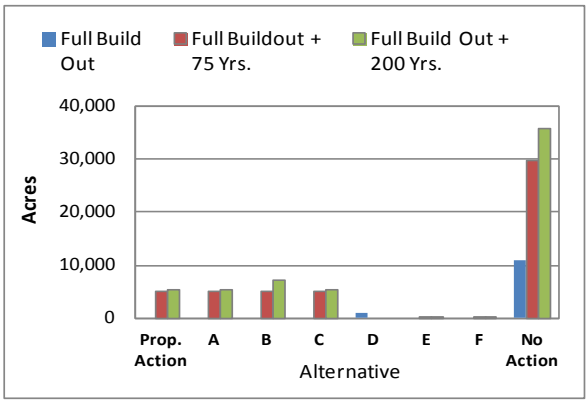


Figure ES-39 **Public Lands Available for Disposal (Acres) at Risk for Drawdown**

Wildlife

- Reductions in groundwater levels and input to surface flows would affect wildlife habitats such as springs, perennial streams, wetland/meadow, and basin shrublands. The potential reduction or loss of these habitats would result in reduction or loss of cover, breeding sites, foraging areas, and changes in both plant and animal community structure. The degree of impacts to wildlife resources would depend on a number of variables such as the existing habitat values and level of use, species' sensitivity to the water-dependent habitats, and the magnitude of the habitat reduction. Species groups with potential adverse effects would include big game, small and large mammals, upland game birds, waterfowl, nongame birds, bats, reptiles, and invertebrates.
- Pumping by all alternatives could adversely affect two federally listed birds (southwestern willow flycatcher and Yuma clapper rail), one federal candidate bird species (yellow-billed cuckoo), greater sage-grouse (federal candidate), other special status bird and bat species, pygmy rabbit, and invertebrates. Pumping by all alternatives could conflict with recovery or conservation management objectives for the federally listed species.
- The pattern of effects by pumping alternatives on wildlife habitat are assumed to be similar to the effects shown in **Figures ES-25** and **ES-26** for springs and streams and **Figures ES-32** and **ES-33** for wetland/meadow and shrubland evapotranspiration values, which serve as indicators of potential adverse effects to wildlife habitat.

Recreation

- Groundwater pumping could result in flow reductions in perennial streams, springs, and ponds and alter wetland meadow and basin shrubland vegetation, which could change the recreation setting, wildlife use patterns, fish abundance, and recreation use of these resources.
- Surface and/or groundwater sources in the GBNP and the Loneliest Highway and North Delamar Special Recreation Management Area, Cave Lake State Park, and Pioche Special Recreation Permit Area could be indirectly affected by drawdown from groundwater pumping under one or more of the alternative. The number of areas potentially affected areas for each alternative are: 4 for the Proposed Action; 3 for Alternative F; 2 for Alternatives A, C, D, and E; and 5 for Alternative B.

Rangelands and Grazing

- Reductions in groundwater levels and input to surface flows would affect water sources (springs and perennial streams) and alter forage vegetation (wetland meadow and basin shrubland) within grazing allotments. The pattern of effects by alternatives would be the same as shown in figures for water resources and vegetation.
- The capacity of habitat within grazing allotments to sustain livestock includes consideration of adequate forage, water, space, and cover. Reduced stream and spring flows could adversely affect forage production on a given allotment and cause overgrazing near existing water sources.

Wild Horses

- The capacity of habitat within wild horse herd areas includes consideration of adequate forage, water, space, and cover. Water is a limiting factor in some herd management areas. Reduced stream and spring flows could adversely affect forage production on a given Herd Management Area and cause overgrazing near existing water sources.
- The pattern of effects by pumping alternatives on wildlife habitat are assumed to be similar to the effects shown in **Figures ES-25** and **ES-26** for springs and streams and **Figures ES-32** and **ES-33** for wetland/meadow and shrubland evapotranspiration values, which serve as indicators of potential adverse effects to wild horse habitat.

Visual Resources

- Groundwater pumping potentially could reduce soil moisture and stress wetland meadow and basin shrubland vegetation. These changes in vegetation communities could gradually change the scenic views in terms of color, texture, density, and vegetation patterns. The pattern of effects for each of the alternatives is shown in the vegetation figures.

Special Designations

- Water level changes in springs and streams in the Baking Powder Flat, Shoshone Ponds, and Swamp Cedar ACECs, under all action alternatives, could affect those resources protected by the ACEC designation, compromising the objective of the designation. In addition, the Proposed Action and Alternative B could affect water levels in springs and streams in the Lower Meadow Valley ACEC.
- Drawdown effects in the Pahranagat National Wildlife Refuge under the Proposed Action and Alternatives B and F could affect migratory bird habitat, but would not be anticipated to compromise the objectives of the National Wildlife Refuge designation.
- Drawdown effects on springs and streams in the High Schells (Proposed Action and Alternatives B and F) and Mount Grafton (all but Alternative C) Wilderness Areas could affect some primitive recreation dependent on water sources, but would not be anticipated to compromise the objectives of the wilderness designation. Alternative D could have similar effects on the Parsnip Peak and White Rock Range Wilderness Areas.
- Groundwater pumping could result in flow reductions in springs, ponds, and perennial streams and alter vegetation (stream riparian areas and associated wetlands) within GBNP (Proposed Action and Alternatives A through C). The pattern of effects by alternatives would be the same as shown in figures for vegetation.

Cultural Resources

- Groundwater pumping by all alternatives could result in impacts to subsurface archaeological sites. The extent and significance of these potential impacts are difficult to define and quantify given the lack of specific location information for buried sites.
- Potential subsidence effects associated with drawdown could contribute to the integrity of standing structures.

Native American Traditional Values

- The location and availability of plants used for food and traditional uses, fishery quality, and flows of streams and springs may be modified by groundwater pumping.
- The location and availability of plants used for food and traditional uses, fishery quality, and flows of streams and springs may be modified by groundwater pumping. The pattern of effects by pumping alternatives would be similar to the effects shown in **Figures ES-25** and **ES-26** for springs and streams, **Figures ES-32** and **ES-33** for wetland/meadow and shrubland evapotranspiration values, and **Figures ES-34** and **ES-35** for aquatic resources, which serve as indicators of potential effects to Native American Traditional Values within the study area.

Socioeconomics

- Potential social and economic effects related to the groundwater pumping and drawdown are inherently long-term, materializing over time as pumping and groundwater drawdown continue, and tend to be directly correlated with the volume of pumping and drawdown.
- The likelihood that some effects of drawdown may be irreversible are themselves dimensions of project-related impacts to social and economic conditions in the rural areas of the region.

- Drawdown poses long-term risks to the agricultural sector in the rural areas through potential effects on grazing, irrigation and well development costs, and streams and seeps that serve as livestock water supplies.
- Groundwater production and conveyance would generate interbasin water transfer fees in White Pine and Lincoln counties which must be used for economic development, health care, and education.
- Residents of the rural area express concern about potential long-term indirect socioeconomic effects could result from impacts on wildlife, rangeland, air quality and visibility, and long-term economic development.
- The onset of groundwater pumping would cause increasing distress for many residents of the rural area; stemming from their perceived risks to the local environment and concern for detrimental long-term effects on their health, quality of life and livelihoods, and those of successive generations. For some residents, particularly in Snake and Spring valleys, personal distress would stem from the risk of loss of a valued rural way of life.
- The potential for adverse social and economic effects in the Snake Valley would be avoided under Alternatives D, E, and F. Alternative D also would reduce such effects in northern Spring Valley.
- The availability of groundwater in Clark and Lincoln counties, conveyed by the pipeline and facilities associated with the Proposed Action and other action alternatives could, in combination with other factors, enable a portion of the growth anticipated by those two counties, but only if other necessary underlying economic and environmental factors to stimulate growth are in place. Water availability would not be a driving force for growth.
- For some Las Vegas Valley residents, organizations, community and political leaders, and development interests, initiation of groundwater pumping may provide a measure of assurance that additional water will be available to enable growth in the Las Vegas Valley and provide a buffer against future water shortages due to episodic drought or climate change.

4.9 What are the residual effects (impacts) of the Groundwater Development Project?

Tier 1 Activities

The BLM National Environmental Policy Act Handbook (BLM 2008) defines residual effects as "those effects remaining after mitigation has been applied to the proposed action or an alternative". Residual effects of Tier 1 GWD Project components (mainline pipeline and ancillary facilities) and activities (including reclamation) are presented because these project facilities are proposed for specific surface locations at specific time frames, enabling detailed analysis of environmental consequences. The residual effects (impacts) related to Tier 1 activities are presented at the end of each resource issue topic in the Final EIS Chapter 3 Resource Sections 3.1 through 3.19, and summarized in Chapter 2 (**Table 2.10-1**).

Subsequent Tier Activities

As discussed in the Water Resources section (Section 3.3) of the Final EIS, groundwater drawdown effects, as predicted by the groundwater model, would extend for at least the time frame corresponding to pumping, full build out plus 200 years, and the time required for recovery following the cessation of pumping. Although it is not possible to identify residual impacts for subsequent tiers, each resource section of the Final EIS contains a summary statement of potential impacts after mitigation is applied. The residual effects of subsequent NEPA analyses for groundwater well field development and groundwater pumping could occur during the time frame of this analysis or beyond. As the knowledge of groundwater regimes in the pumping basins improves with additional study and groundwater development plans are more clearly defined in the future, a better analysis can be made of the residual impacts of groundwater well field development and operation, and groundwater pumping on water-dependent and other resources. Implementation of the COM Plan, ACMs, monitoring and mitigation recommendations, and adaptive management likely would reduce adverse effects at some locations. In particular, objectives of the COM Plan are to avoid or minimize impacts to groundwater-dependent ecosystems and biological communities and provide a process for mitigating impacts to ensure compliance with appropriate laws, policies, and regulations. However, the BLM lacks the site specific information to assess the level of impacts or impact mitigation at this time. Thus, while some residual impacts on resources could occur at some locations, the long-term residual effects of subsequent tier activities are uncertain but will be developed in subsequent NEPA tiers.

5. Cumulative Groundwater Drawdown Effects

The hydrologic study area for cumulative impacts from groundwater withdrawal encompasses the 35 hydrographic basin regions included in the model that was developed to evaluate the potential effects of the GWD Project. The groundwater model also was used to evaluate the potential cumulative effects assuming continuation of existing pumping; project-related pumping; and reasonably foreseeable future pumping in the region over the same time period as the project-related pumping, that is, full build out plus 200 years.

5.1 What level of cumulative groundwater pumping is assumed for this EIS?

The cumulative analysis of groundwater drawdown effects is based on the results of groundwater model simulations. The past and present actions reflect the best available information on consumptive uses in the groundwater basins included in the model. The reasonably foreseeable projects were those that were known at the time the modeling simulations were conducted.

The pumping scenarios were developed to simulate the combined effects associated with: 1) the continuation of existing pumping in the region included under the No Action pumping scenario; 2) additional pumping associated with the proposed groundwater development project, or alternative groundwater development scenarios (i.e., Alternatives A through F); and 3) additional reasonably foreseeable groundwater developments that have been identified within the cumulative study area.

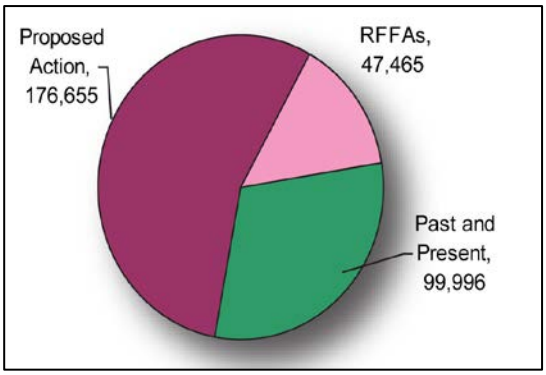


Figure ES-40 Cumulative Groundwater Development (afy)

Figure ES-40 summarizes the total cumulative groundwater consumptive use for the hydrologic basins within the overall hydrologic region of study included under the Proposed Action cumulative effects analysis. The Proposed Action represents the GWD Project alternative with the maximum potential groundwater withdrawal from the five project basins. No past or current pumping is occurring in Cave, Delamar, and Dry Lake valleys. Little or no incremental change in pumping is foreseeable in the five project basins. Based on these estimates, the GWD Project would be the primary groundwater user in all five groundwater development proposed pumping basins.

As discussed earlier, site-specific NEPA analysis would be conducted for the various groundwater development basins. Therefore, the cumulative analysis would be reviewed and updated as necessary during subsequent NEPA analyses.

5.2 What are the potential cumulative drawdown effects to water resources?

The potential cumulative drawdown effects were evaluated using results of the groundwater modeling over the same time frame as the project-related pumping, that is, full build out plus 75 years and full build out plus 200 years. The effects are summarized below.

No Action Alternative Cumulative Pumping. The predicted changes in groundwater levels attributable to the No Action Alternative cumulative pumping results in the development of new or expanded drawdowns in the Steptoe, Clover, Kane Springs, and Coyote Springs valleys. The model indicates that existing and reasonably foreseeable future pumping under the No Action Alternative cumulative scenario does not substantially contribute to drawdowns in Spring and Snake valleys.

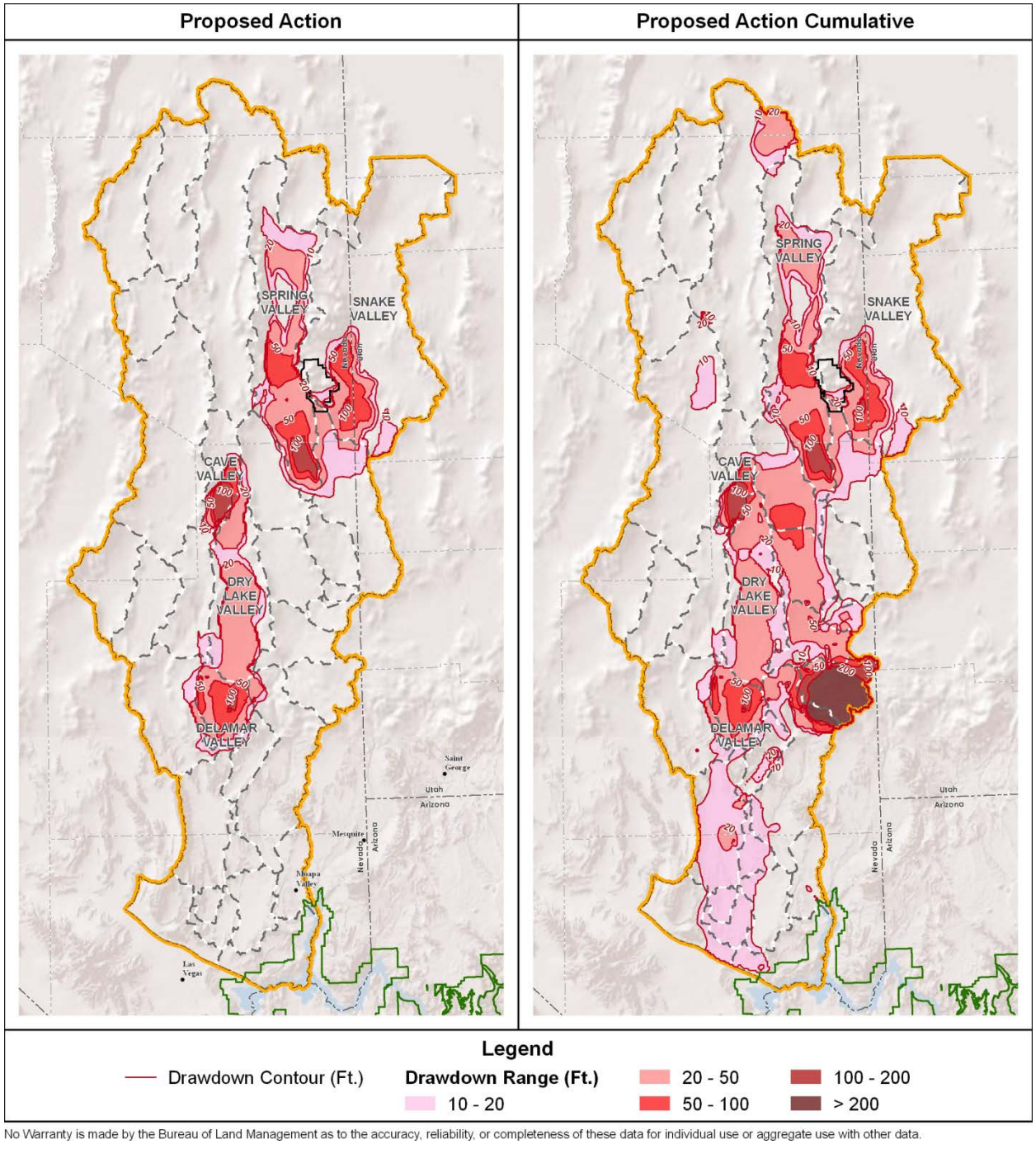
Groundwater Development Pumping Scenarios. The cumulative drawdown predicted for each of the seven groundwater development pumping alternatives (Proposed Action and Alternatives A through F) reflect the combined effects associated with the No Action Alternative cumulative drawdown and the incremental effects attributable to the GWD Project pumping under the specific alternative described previously.

The Proposed Action provides an example of the maximum cumulative drawdown predicted for the seven groundwater development scenarios (**Figure ES-41**. Comparison of the No Action Alternative scenario with the seven project alternative scenarios results in the following observations.

- Spring and Snake Valleys: The continuation of existing pumping and reasonably foreseeable pumping is not expected to substantially increase drawdown effects over those for the project specific effects.
- White River, Cave, Dry Lake, and Lake Valleys: Predicted drawdown from project pumping would overlap with the drawdown for the No Action Alternative in Lake Valley and adjacent areas. The overlapping drawdown effects from the proposed project pumping and existing pumping in Lake Valley would increase drawdown in Lake Valley and in Cave and Dry Lake valleys. The proposed groundwater development is predicted to contribute to a reduction in flow to springs located near the eastern margin of the valley floor in the southern portion of White River Valley.
- Delamar Valley, Lower Meadow Valley Wash, and Clover Valley: The proposed groundwater development is not anticipated to contribute to additional drawdown in Clover Valley. However, the overlapping drawdown from pumping in Clover and Delamar valleys is predicted to increase drawdown in the northern portion of the Lower Meadow Valley Wash.
- Coyote Spring, Muddy River Springs, Hidden Valley North, Garnet Valley, Black Mountain Area, and Las Vegas Valley: The drawdown effects in these basins are essentially the same under both the No Action Alternative cumulative and the project related cumulative scenarios. The incremental drawdown attributable to project pumping is not anticipated to substantially contribute to drawdowns beyond those simulated for the No Action Alternative in Coyote Spring, Muddy River Springs, Hidden Valley North, Garnet Valley, Black Mountain Area, and Las Vegas Valley.

These observations generally apply to all seven alternative cumulative pumping scenarios unless otherwise noted. However, the alternatives with the highest groundwater withdrawal volumes (Proposed Action and Alternative B) show the largest overlapping drawdown effects; and the alternative with the lowest groundwater withdrawal volume (Alternative C) show the smallest amount of overlapping drawdown effects.

Potential effects to water resources resulting from the cumulative pumping scenario at the full build out plus 75 years and full build out plus 200 years time frame are summarized in **Table ES-9**. The following discussion provides a summary of potential major effects and compares the results for the alternative pumping scenarios.



No Warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual use or aggregate use with other data.

Figure ES-41 Drawdown Area Proposed Action at Full Build Out Plus 75 years and Proposed Action Cumulative at Full Build Out Plus 75 years

Table ES-9 Comparison of Potential Cumulative Effects to Water Resources at the Time Frames Associated with Full Build Out Plus 75 and Full Build Out Plus 200 Years[1]

Water Resource Issue	Proposed Action	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F	No Action
Full Build Out Plus 75 Years								
Drawdown effects on perennial springs:								
• Number of inventoried springs located in areas where impacts to flow could occur[2]	65	53	77	42	34	42	51	19
Drawdown effects on perennial streams:								
• Miles of perennial stream located in areas where impacts to flow could occur[2]	131	110	137	98	53	56	69	42
Drawdown effects on surface water rights:								
• Number of surface water rights located in areas where impacts to flow could occur[2]	305	274	299	257	198	224	245	159
Drawdown effects on groundwater rights:								
• Total groundwater rights in areas with >10 feet of drawdown	683	667	679	635	541	558	567	500
• Number of groundwater rights in areas with >100 feet of drawdown	21	19	27	19	21	19	21	19
Percent reduction in evapotranspiration and spring discharge:								
• Spring Valley	78%	55%	69%	43%	24%	55%	76%	6%
• Snake Valley	30%	25%	21%	17%	7%	4%	4%	2%
• Great Salt Lake Desert Flow System[1]	50%	38%	41%	28%	14%	25%	33%	4%
Full Build Out Plus 200 Years								
Drawdown effects on perennial springs:								
• Number of inventoried springs located in areas where impacts to flow could occur[2]	82	74	102	63	53	62	70	28
Drawdown effects on perennial streams:								
• Miles of perennial stream located in areas where impacts to flow could occur[2]	193	166	201	151	119	120	140	79
Drawdown effects on surface water rights:								
• Number of surface water rights located in areas where impacts to flow could occur[2]	422	372	393	341	302	315	352	228
Drawdown effects on groundwater rights:								
• Total groundwater rights in areas with >10 feet of drawdown	783	752	754	730	672	642	650	555
• Number of groundwater rights in areas with >100 feet of drawdown	181	76	171	66	139	76	97	66
Percent reduction in groundwater discharge to evapotranspiration:								
• Spring Valley	86%	61%	76%	42%	35%	60%	82%	9%
• Snake Valley	35%	29%	27%	20%	11%	6%	6%	3%
• Great Salt Lake Desert Flow System[1]	56%	42%	47%	29%	21%	28%	37%	5%

[1]Supporting information used to develop these estimated effects are provided in **Appendices F3.3.6** through **F3.3.16**.

[2]Total located in high or moderate risk areas.

Potential Impacts to Springs and Streams

As described previously, springs that are controlled by discharge from (or hydraulically connected to) the regional groundwater system and located in areas that experience a reduction in groundwater levels would likely experience a reduction in flow.

The number of inventoried springs and miles of perennial stream located within the modeled cumulative drawdown area and located in areas at high or moderate risk are presented in **Figures ES-42** and **ES-43**. These charts show that the number of springs and miles of streams at risk increases over time for all of the cumulative pumping scenarios. For

the No Action Alternative at the full build out for both full build out plus 75 years and full build out plus 200 years timeframes, there are 19 and 28 inventoried springs located in areas where impacts to perennial water could occur. Because the No Action Alternative cumulative pumping scenario is a component of the other alternative pumping scenarios, the total number of springs and miles of perennial stream identified for the No Action Alternative is included in the other seven alternatives (i.e. Proposed Action and Alternatives A through F).

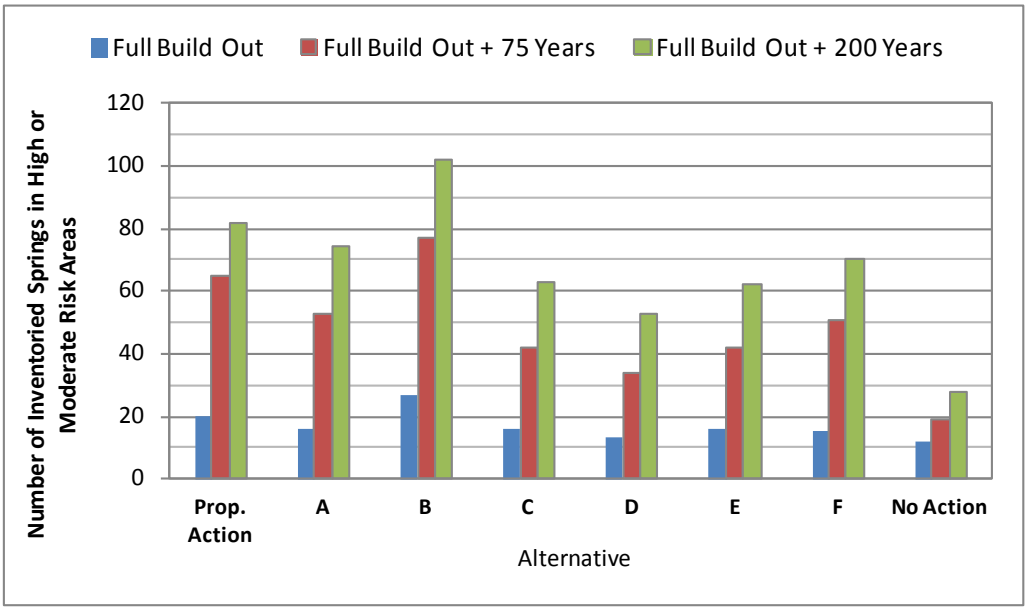


Figure ES-42 Number of Inventoried Springs Located within the Cumulative Drawdown Area and Areas Where Impacts to Flow Could Occur

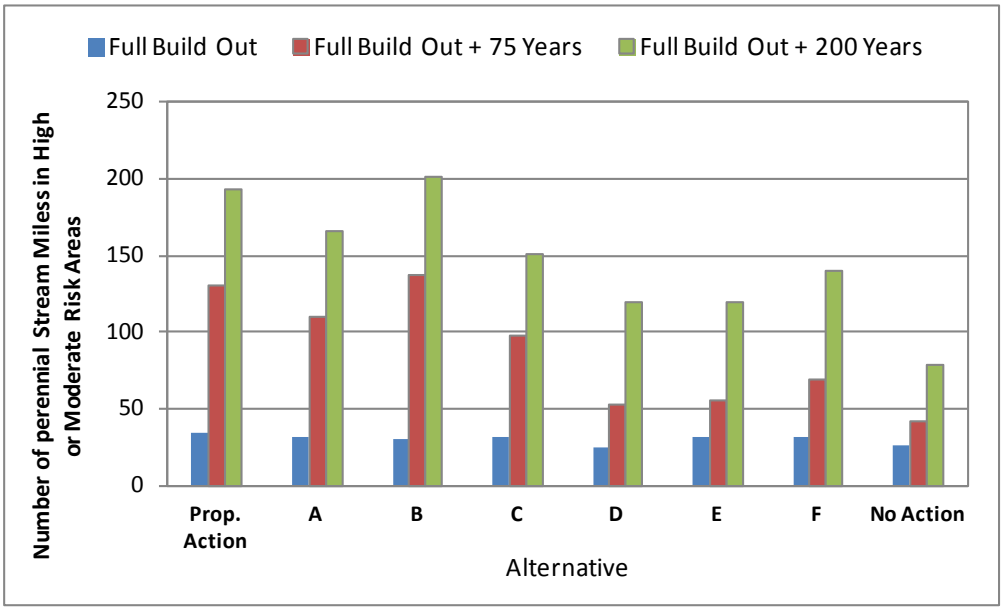


Figure ES-43 Miles of Perennial Stream Located within the Cumulative Drawdown Area and Areas Where Impacts to Flow Could Occur

The simulated drawdown for the two alternatives with the largest groundwater withdrawal rate (Proposed Action and Alternative B) could impact flows in the largest number of springs and greatest number of miles of perennial stream reach. The reduced drawdown areas resulting from the Alternative A cumulative pumping scenario could reduce the number of springs and miles of streams impacted. The Alternatives C, D, E, and F cumulative alternatives would further reduce the drawdown area compared to Alternative A, and would potentially impact the fewest number of inventoried springs and fewer miles of perennial stream reach.

Model-simulated Spring and Stream Discharge Estimates

The groundwater flow model was used to simulate changes in flow for selected springs and streams for each of the cumulative pumping scenarios. The selected springs and streams simulated with the model included major groundwater discharge areas located within the White River Valley, Pahranagat Valley, Muddy River Springs Area, Panaca Valley, and Snake Valley discussed below.

The White River Valley is located in the upper portion of the White River Flow System and is characterized by numerous perennial surface-water features, which include approximately 13 major spring discharge areas. Example results for two major spring discharge areas located in White River Valley are presented in **Figure ES-44**. Preston Big Springs is located in the northern portion of White River Valley, and Butterfield Springs is located near the eastern edge of the valley floor.

The model simulations indicate that the flow at Preston Big Springs would be reduced by up to 7 percent from groundwater withdrawals included in the No Action Alternative cumulative pumping scenario. Additional reductions in flow resulting from the pumping included in the groundwater development alternatives would be negligible. The model-simulated flow changes at Cold Spring and Nicolas Spring, located in the same general area, show essentially the same results.

Butterfield Springs is located near the eastern edge of the valley floor in the southern portion of White River Valley. The model results indicate that the No Action cumulative pumping scenario would result in a small reduction in flow (up to 3 percent) over the model-simulation period (**Figure ES-44**). The model simulations indicate that all of the groundwater development alternatives would result in reduced flow at these springs. These potential flow reductions result from pumping in Cave Valley. The maximum pumping rate in Cave Valley would occur under the Proposed Action and Alternative B, and the greatest flow reduction at these springs would occur under Alternative B. The model simulations indicate that distributed pumping from the Proposed Action would substantially reduce the potential flow reduction in these springs compared to Alternative B. The reduced pumping in Cave Valley under Alternatives A, C, D, E, and F pumping scenarios is anticipated to also lessen the effects to flows at these springs.

Pahranagat Valley is located near the middle of the White River flow system. Major surface-water resources in Pahranagat Valley include groundwater discharge at Hiko, Crystal, and Ash springs, along with Brownie Spring and other smaller springs and seeps in the southern portion of the discharge area. Discharge from the springs supports perennial flows and riparian vegetation along Pahranagat Wash in the Pahranagat hydrographic basin. The regional springs that discharge in Pahranagat Valley (i.e. Hiko, Crystal and Ash Springs) are predicted to experience small flow reductions (up to 4 percent) under the No Action Alternative scenario. These simulated flow changes are essentially the same for all of the scenarios indicating that additional reductions in flow resulting from the GWD Project would be negligible for all alternatives.

Muddy River Springs near Moapa is the headwaters for Muddy River and represents the largest groundwater discharge at the lower end of the White River flow system. The model simulations indicate that groundwater withdrawal included in the No Action cumulative pumping scenario would eventually result in up to a 61 percent reduction in flow at the Muddy River Springs (**Figure ES-45**). Note that the numerical model simulations do not account for the existing Muddy River Memorandum of Agreement regarding groundwater withdrawal in Coyote Spring Valley and California Wash basins, among the SNWA, Moapa Valley Water District, Coyote Springs Investment, Moapa Band of Paiutes, and the U.S. Fish and Wildlife Service, which includes minimum in-stream flow levels. Most of the reduction in flow can be attributed to the pumping included under reasonably foreseeable future actions in the region. These flow

changes are essentially the same for all of the groundwater development cumulative pumping scenarios, indicating negligible further reductions in flow from the project for all alternatives.

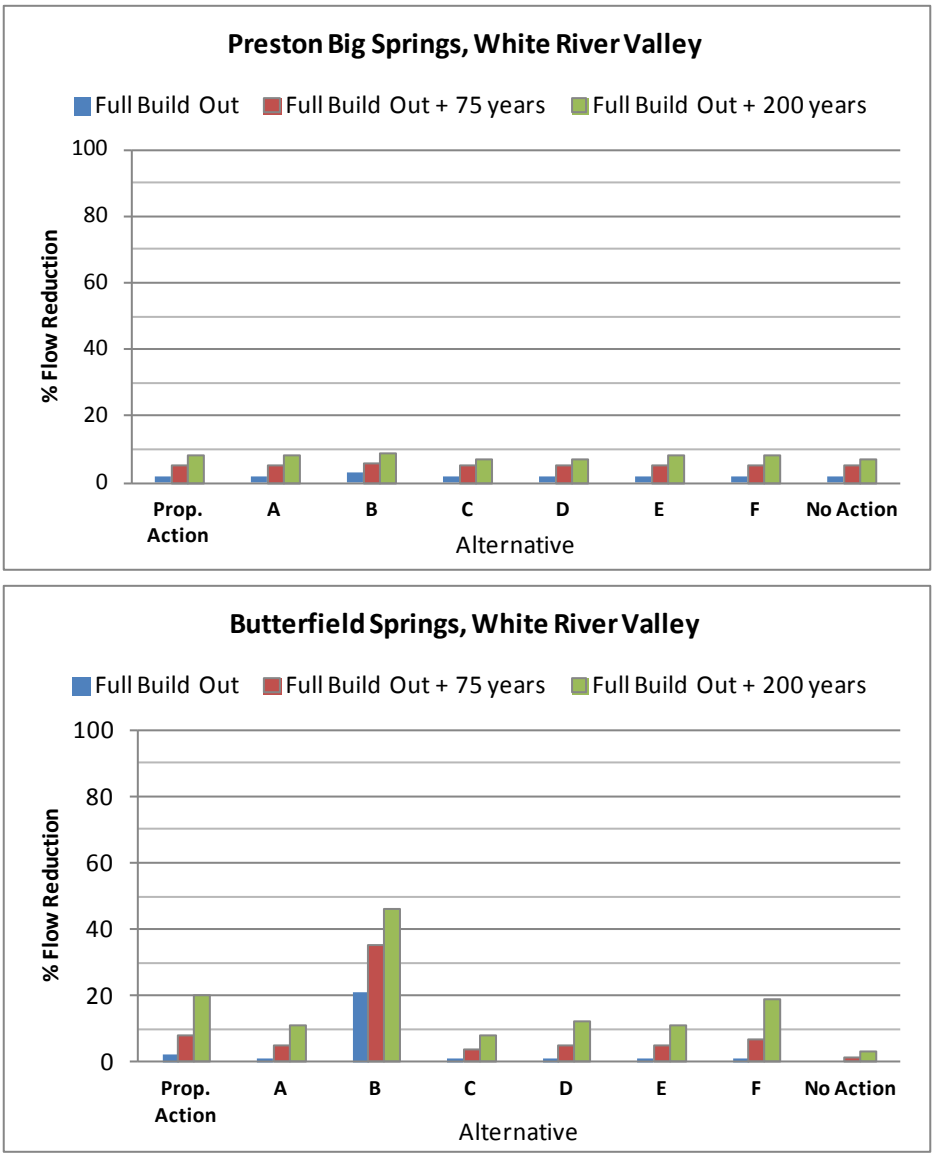


Figure ES-44 Model Simulated Cumulative Reduction in Flows at Preston Big Spring and Butterfield Springs, White River Valley

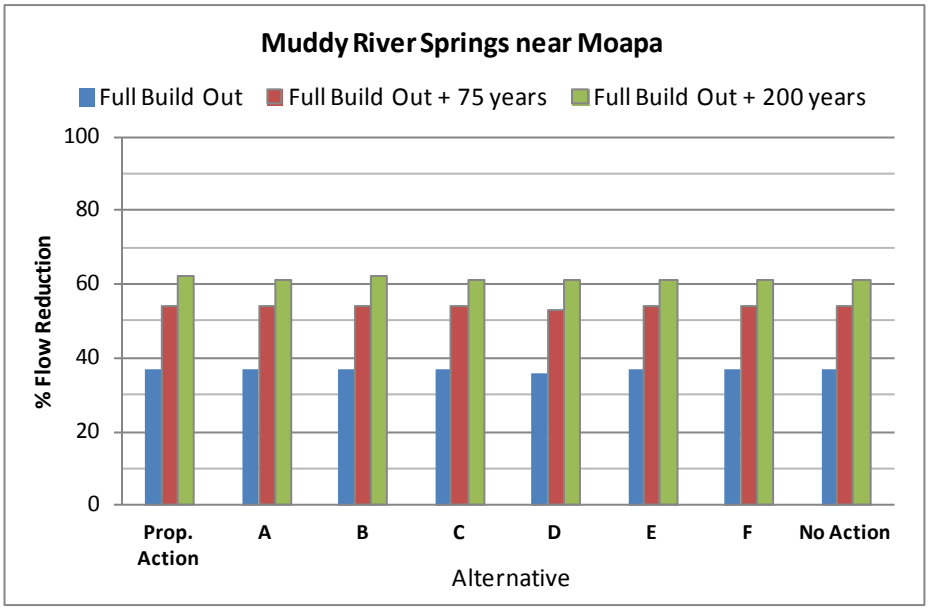


Figure ES-45 Model Simulated Cumulative Reduction in Flows at Muddy River Springs near Moapa

Panaca Spring is a major spring located in Panaca Valley in the Meadow Valley Flow System. The model simulations results indicate that flow at Panaca Spring located in Panaca Valley would experience flow reductions from pumping under the No Action Alternative cumulative pumping scenario, but the groundwater development pumping (under the Proposed Action and Alternatives A through F) would not contribute to these reductions.

Big Springs is the largest spring located in southern Snake Valley and is located relatively close to the groundwater development area within Snake Valley. For Big Springs, the model simulations indicate that flow reductions for the No Action Alternative cumulative scenario are similar to those in the No Action Alternative scenario. All of the groundwater development alternatives are expected to result in substantial reduction in flow (or potentially eliminate discharge) at Big Springs (**Figure ES-46**). Reductions of flow at Big Springs would reduce flows in Big Springs Creek, and reduce flows to Lake Creek and into Pruess Lake. These results suggest that the springs located on the valley floor in the southern portion of the valley likely would experience a reduction in flow. The simulations indicate that none of the cumulative pumping scenarios would reduce flows in the three other springs located in the central portion of Snake Valley (Foote Reservoir Spring, Kell Spring, and Warm Creek near Gandy).

Potential Impacts to Water Rights

The number of surface water rights located in areas where cumulative impacts to surface water resources could occur and the number of groundwater rights in the areas where the simulations predict drawdown of 10 feet or more are listed in **Table ES-9**. There are a large number of existing surface water rights located in areas where impacts from drawdown could occur under both the No Action Alternative and groundwater development cumulative pumping scenarios. The model indicates that drawdown for the two alternatives with the greatest groundwater withdrawal rate (Proposed Action and Alternative B) could potentially impact the highest number of water rights. The reduced drawdown areas resulting from the other alternatives (Alternatives A, C, D, E, and F) would decrease the number of water rights impacted. Potential impacts to individual water rights are the same as previously summarized.

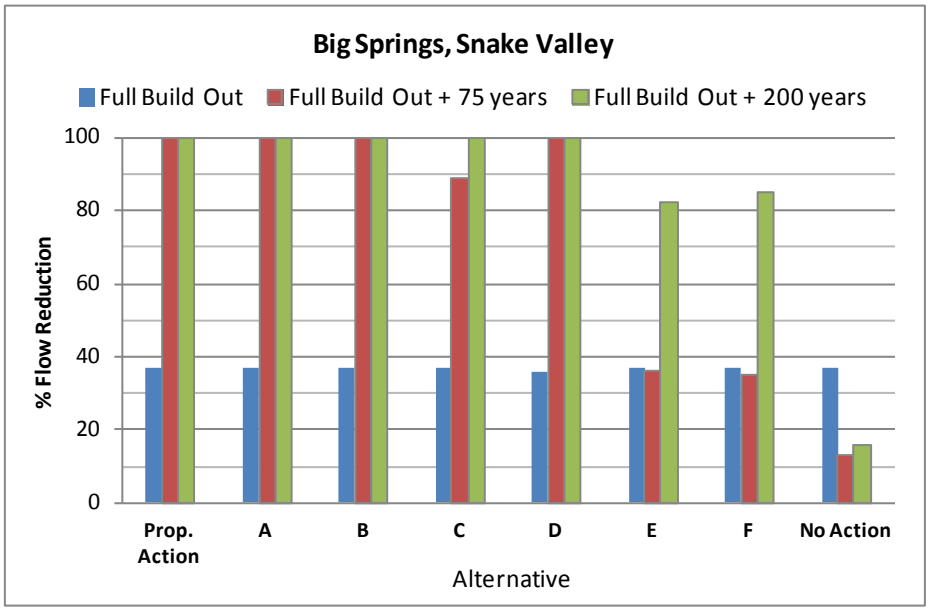


Figure ES-46 Model Simulated Cumulative Reduction in Flows at Big Springs, Snake Valley

Potential Reduction in Groundwater Discharge to Evapotranspiration Areas

Potential changes in the water balance for the groundwater system in the study area were estimated using the groundwater flow model (SNWA 2010b). The estimated cumulative reductions in groundwater discharge to evapotranspiration areas for selected basins and flow systems are summarized in **Table ES-9** and illustrated in **Figure ES-47**. The model indicates that groundwater withdrawal included in the No Action Alternative cumulative pumping scenario would have a small effect on the groundwater discharge to evapotranspiration areas in the Great Salt Lake Desert Flow System. For Spring Valley, the No Action Alternative pumping is estimated to result in a 6 and 9 percent reduction of groundwater discharge for evapotranspiration at the full build out plus 75 years, and full build out plus 200 years time frames, respectively. In Snake Valley, pumping is expected to result in minimal reductions (<4 percent) of groundwater discharge to support evapotranspiration.

The Proposed Action would result in the largest reductions in groundwater discharge to evapotranspiration areas within Spring and Snake valleys; with estimated reductions of up to 86 percent in Spring Valley, and up to 35 percent in Snake Valley. The model indicates that Alternative D would have the least impact to evapotranspiration areas in Spring Valley because pumping is concentrated in the south end of the valley away from much of the evapotranspiration areas. The concentrated pumping under Alternative D results in the deepest drawdown cone indicating that a higher percentage of the groundwater withdrawn under this scenario is from storage compared to the other groundwater development alternatives. For Snake Valley, most of the reductions would occur in the south portion of the valley. Alternative E would result in the least impacts to evapotranspiration areas in Snake Valley.

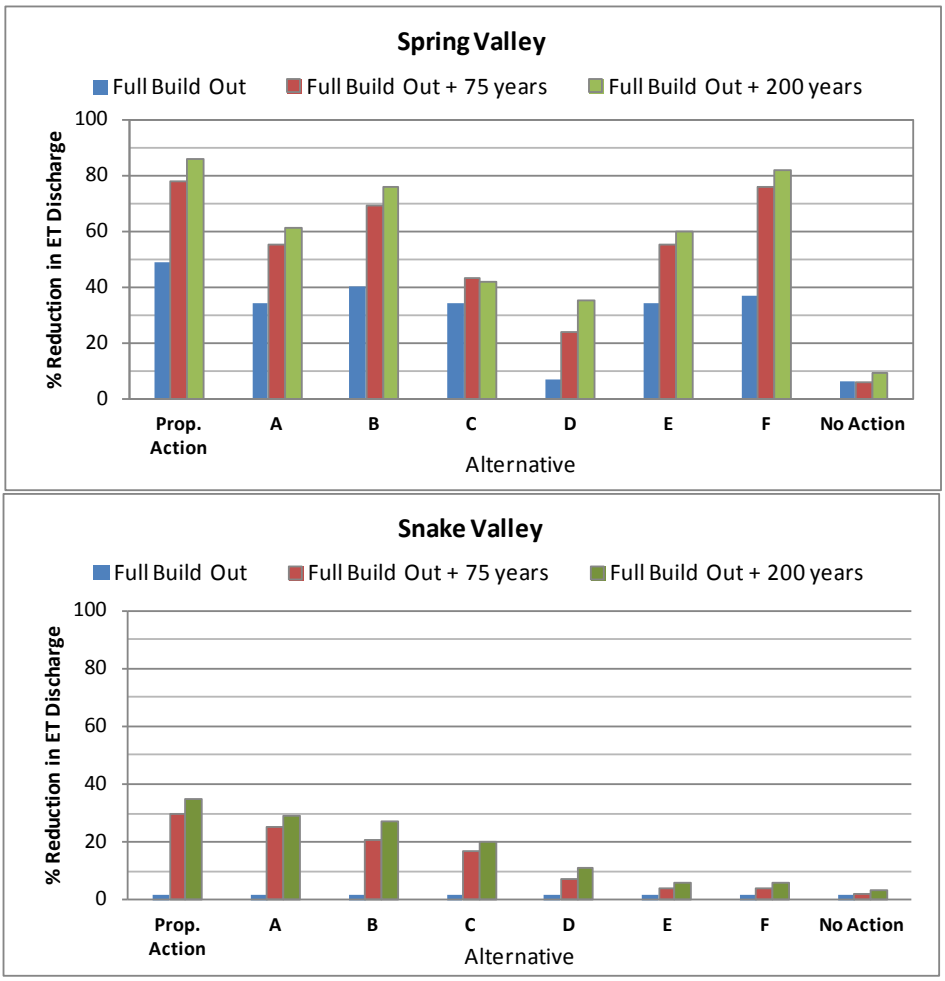


Figure ES-47 Model Simulated Cumulative Reductions in Groundwater Discharge to Evapotranspiration Areas in Spring and Snake Valleys

Other Resources

The cumulative effects of groundwater pumping on other resources are summarized in **Table ES-10**. Cumulative effects on resources from the action alternatives and No Action are presented using key impact indicators. The table provides the following information:

- Results are presented for the full build out plus 75 years time frame. The main body of the EIS provides additional results for 2 additional time frames (i.e., full build out and full build out plus 200 years).
- For comparison, the table provides the estimated incremental and cumulative effects associated with each specific pumping alternative. The estimated incremental effects represent those effects that are directly attributable to the specific pumping alternative. The cumulative effects include the combined effects resulting from the total pumping included in:
  1) The No Action pumping scenario (i.e., continuation of existing pumping into the future);
  2) Reasonably foreseeable future pumping (i.e., estimated additional pumping that may occur in the future from other projects in the region); and
  3) Pumping attributable to the specific pumping alternatives.

- The incremental contribution of each alternative to the cumulative effects can be estimated by comparing the impact indicator information for the incremental and cumulative effects under each alternative. The difference between the incremental effects and the overall cumulative effects for a specific alternative is assumed to be the result of the additional pumping included under No Action and reasonably foreseeable groundwater development projects included in the cumulative pumping scenarios.
- The cumulative impact patterns for water dependent resources closely follow the patterns and interactions identified for water resources. In general, the GWD Project would be the dominant contributor of cumulative effects in the hydrographic basins where project well development would occur.

Table ES-10 Summary of Resource Impact Parameters for Individual Alternatives and Cumulative Pumping - Full Build Out Plus 75 Years

Resource	Impact Parameter	Proposed Action	Cumulative with Proposed Action	Alternative A	Cumulative with Alternative A	Alternative B	Cumulative with Alternative B	Alternative C	Cumulative with Alternative C	Alternative D	Cumulative with Alternative D	Alternative E	Cumulative with Alternative E	Alternative F	Cumulative with Alternative F	No Action	Cumulative with No Action
Air	PM_{10} emissions (tons per year) from windblown dust	14,046	18,173	11,826	15,784	12,104	25,537	5,416	10,185	2,474	7,150	7,464	11,588	8,747	12,754	1,869	3,827
	PM_{10} emissions ($\mu g/m^3$) from windblown dust	• Air quality impacts are not anticipated to contribute to nearby nonattainment areas such as Clark County or the Wasatch Front. • Model-predicted impacts indicate that air quality standards at GBNP would be met. However, windblown dust emissions from groundwater drawdown could possibly impair visibility conditions at GBNP.														Some increase in fugitive dust generation would occur due to continued ground-water pumping.	
Geology	Square miles of area with potential ground surface subsidence of > 5 feet	147	283	5	131	172	323	<1	126	152	281	5	131	71	208	0	126
Water	Number of inventoried springs with moderate or high risk of flow reductions	44	65	29	53	54	77	19	42	13	34	19	42	30	51	12	19
	Miles of perennial streams with moderate or high risk of flow reductions	80	131	58	110	91	137	37	98	4	53	7	56	21	69	19	42
	Number of surface water rights in drawdown area with moderate or high risks of flow reductions	145	305	109	274	141	299	78	257	23	198	60	224	88	245	105	159
Soils	Acres of hydric soils within high or moderate risk zones within drawdown areas	13,143	26,936	7,374	19,839	6,817	18,022	2,626	16,110	1,143	12,712	5,586	17,854	4,949	14,727	1,571	8,798

Table ES-10 Summary of Resource Impact Parameters for Individual Alternatives and Cumulative Pumping - Full Build Out Plus 75 Years (Continued)

Resource	Impact Parameter	Proposed Action	Cumulative with Proposed Action	Alternative A	Cumulative with Alternative A	Alternative B	Cumulative with Alternative B	Alternative C	Cumulative with Alternative C	Alternative D	Cumulative with Alternative D	Alternative E	Cumulative with Alternative E	Alternative F	Cumulative with Alternative F	No Action	Cumulative with No Action
Vegetation	Wetland/meadows with composition/growth effects (acres)	5,460	7,789	4,624	6,881	5,794	9,008	2,287	4,718	1,507	4,067	2,548	4,805	3,096	3,655	261	1,840
	Basin shrublands with composition/growth effects (acres)	136,990	187,887	106,414	158,531	97,174	152,528	42,703	96,911	16,747	71,537	71,429	122,805	89,049	133,132	32,229	47,358
Wildlife	Pumping effects on spring, stream, wetland, and basin shrubland habitats	Wildlife habitats may be modified by changes in composition of groundwater dependent vegetation, and seasonal availability of surface water. For this alternative, see: • Water – risks to springs and streams; and • Vegetation – risks to Wetland/ Meadows and Basin Shrublands.														No additional changes in wildlife habitats would occur because no groundwater pumping would occur in project hydrographic basins.	
Aquatic Biological Resources	Miles of perennial streams with game fish and special status species with moderate or high risks of flow reductions	60	92	45	77	59	89	29	87	3	34	5	37	16	48	6	26
	Number of springs with game and special status fish species with moderate or high risk of flow reductions	9	31	8	31	10	26	7	16	2	14	4	13	5	15	5	6
Land Use	Acres of private agricultural land in the drawdown area	15,792	32,183	14,605	31,220	13,865	30,449	12,359	29,891	299	19,228	3,635	20,178	4,400	20,978	14,204	17,921

Table ES-10 Summary of Resource Impact Parameters for Individual Alternatives and Cumulative Pumping - Full Build Out Plus 75 Years (Continued)

Resource	Impact Parameter	Proposed Action	Cumulative with Proposed Action	Alternative A	Cumulative with Alternative A	Alternative B	Cumulative with Alternative B	Alternative C	Cumulative with Alternative C	Alternative D	Cumulative with Alternative D	Alternative E	Cumulative with Alternative E	Alternative F	Cumulative with Alternative F	No Action	Cumulative with No Action
Rangeland	Number of perennial springs in grazing allotments with risk of flow reductions	210	297	118	227	156	243	63	168	41	127	55	167	131	217	46	78
	Perennial stream miles within grazing allotments with risk of flow reductions	73	119	52	99	78	119	37	89	5	48	6	51	21	65	19	37
Wild Horses	Number of perennial springs in herd management areas with risk of flow reductions	2	28	2	28	2	28	2	28	7	31	2	28	2	28	19	26
	Acres of basin shrublands and wetlands/meadows in herd management areas and drawdown areas	0	2,664	0	2,664	0	2,664	0	2,664	0	2,664	0	2,664	0	2,664	2,511	2,664
Recreation	Number of springs in recreation areas with risks of flow reductions	20	44	13	39	40	64	3	35	0	23	5	30	9	35	14	24
	Miles of game fish streams in recreation areas with risks of flow reductions	8	25	7	21	17	32	1	19	0	12	0	14	0	14	<1	12
Special Designations	Acres of wetland/meadow and basin shrubland vegetation in special designations and drawdown area	13,730	14,296	11,223	11,744	13,534	14,142	4,911	5,743	11,223	9,377	11,222	11,744	13,334	13,900	0	488

Table ES-10 Summary of Resource Impact Parameters for Individual Alternatives and Cumulative Pumping - Full Build Out Plus 75 Years (Continued)

Resource	Impact Parameter	Proposed Action	Cumulative with Proposed Action	Alternative A	Cumulative with Alternative A	Alternative B	Cumulative with Alternative B	Alternative C	Cumulative with Alternative C	Alternative D	Cumulative with Alternative D	Alternative E	Cumulative with Alternative E	Alternative F	Cumulative with Alternative F	No Action	Cumulative with No Action
Visual Resources	Acres of disturbance in Visual Resource Management Class I	402	7,789	402	6,881	402	9,008	402	4,718	402	4,067	402	4,805	402		402	1,840
	Acres of disturbance in Visual Resource Management Class II	23,412	187,887	23,412	158,531	23,412	152,528	23,412	96,911	12,822	71,537	22,938	122,805	22,938		23,412	47,358
	Changes in appearance of wetland/meadows and shrublands from draw-down effects	Changes in the appearance of the landscape from groundwater drawdown may result from broadscale vegetation changes. See also: • Water – risks to springs and streams; and • Vegetation – risks to wetlands/meadows and basin shrublands.														No changes in visual resources would occur because no groundwater pumping would occur in project hydrographic basins.	
Native Americans Traditional Values	Drawdown effects on water and vegetation aquatic biological and wildlife resources	The location and availability of plants used for food and traditional uses, fishery quality, and flows of streams and springs may be modified by groundwater pumping. For all action alternatives, see: • Water – risks to springs and streams; • Aquatic Biology – risks to game fish and special status species. • Vegetation – risks to Wetland/ Meadows and Basin Shrublands														No additional changes in the availability of plants used for food and traditional uses, and flows in springs and streams because no groundwater pumping would occur in project hydrographic basins.	

Table ES-10 Summary of Resource Impact Parameters for Individual Alternatives and Cumulative Pumping - Full Build Out Plus 75 Years (Continued)

Resource	Impact Parameter	Proposed Action	Cumulative with Proposed Action	Alternative A	Cumulative with Alternative A	Alternative B	Cumulative with Alternative B	Alternative C	Cumulative with Alternative C	Alternative D	Cumulative with Alternative D	Alternative E	Cumulative with Alternative E	Alternative F	Cumulative with Alternative F	No Action	Cumulative with No Action
Socioeconomics	Acres of agricultural land potentially affected by drawdown of ≥10 feet in Snake and Spring valleys	15,792	15,978	14,605	14,943	13,865	14,172	12,359	1,3613	299	3,024	3,635	39,014	3,383	3,618	1,654	1,654
	Acres of public lands identified for potential disposal with drawdown risks ≥10 feet	4,918	47,666	4,918	47,666	4,918	47,666	4,918	47,666	107	42,197	107	42,847	107	42,847	29,612	42,493

Acronyms and Abbreviations

°C	Degrees Celsius
°F	Degrees Fahrenheit
µg/m^3	micrograms per cubic meter
µS/cm	microSiemens per centimeter
3M Plan	Monitoring, Mitigation, Management Plan
AADT	Annual Average Daily Traffic
AAQS	Ambient Air Quality Standard
AC	alternating current
ACEC	Area of Critical Environmental Concern
ACHP	Advisory Council on Historic Preservation
ACM	Applicant-committed Protection Measure
AFB	Air Force Base
afy	acre-feet per year
AGI	American Geological Institute
AIRFA	American Indian Religious Freedom Act
AML	appropriate management level
amsl	above mean sea level
APE	area of potential effects
APLIC	Avian Power Line Interaction Committee
ARPA	Archaeological Resources Protection Act
ASCE	American Society of Civil Engineers
BARCAS	Basin and Range Carbonate-Rock Aquifer System
BCS	Bird Conservation Strategy
BGEPA	Bald and Golden Eagle Protection Act
BIA	Bureau of Indian Affairs
BLM	Bureau of Land Management
BMP	Best Management Practices
BO	Biological Opinion
BRT	Biological Resource Team
CAA	Clean Air Act
CAP	Conservation Action Plan
CASTNet	Clean Air and Trends Network
CBER	Center for Business and Economic Research
CCRP	Central Carbonate-Rock Province

CEQ	Council on Environmental Quality
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Register
cfs	cubic feet per second
CO	carbon monoxide
CO_2	carbon dioxide
COM Plan	Construction, Operation, Maintenance, Monitoring, Management, and Mitigation Plan
CRWC	Colorado River Water Consultants
CWA	Clean Water Act
dB	decibels
dBA	decibels A-weighted scale
DCNR	Department of Conservation and Natural Resources
DOI	Department of the Interior
DRI	Desert Research Institute
EA	Environmental Assessment
EIS	Environmental Impact Statement
EMS	Emergency Medical Services
ENWU	Eastern Nevada-Western Utah
EO	Executive Order
ESA	Endangered Species Act
ET	evapotranspiration
FBO	full build out
FEMA	Federal Emergency Management Agency
FLAG	Federal Land Managers Air Quality Related Values Workgroup
FLPMA	Federal Land Policy and Management Act of 1976
FONSI	Finding of No Significant Impact
FRCC	Fire Regime Condition Class
GBBO	Great Basin Bird Observatory
GBCAAS	Great Basin carbonate and alluvial aquifer system
GBNP	Great Basin National Park
GID	General Improvement District
GIS	Geographic Information System
GPCD	gallons per capita per day
gpm	gallons per minute
GPS	Global Positioning System
GWD Project	SNWA's Clark, Lincoln, and White Pine Counties Groundwater Development Project

HA	hydrogeologic area
HFB	hydraulic flow barrier
HGU	hydrogeologic units
HMA	herd management area
IM	Instruction Memorandum
IMPROVE	Iinteragency Monitoring of Protected Visual Environments
IPCC	Intergovernmental Panel on Climate Change
ISA	Instant Study Area
ITA	Indian Trust Assets
KEA	key reclamation potential
KOP	key observation points
kV	kilovolts
LCCRDA	Lincoln County Conservation, Recreation, and Development Act
LCWD	Lincoln County Water District
LDS	Church of Jesus Christ of Latter Day Saints
LMVW	Lower Meadow Valley Wash
LRP	low reclamation potential
LUTAQ	Land Use Transportation and Air Quality
LVCVA	Las Vegas Convention and Visitors Authority
LVVWD	Las Vegas Valley Water District
LWC	Lands with Wilderness Characteristics
MBTA	Migratory Bird Treaty Act
MCL	Maximum Contaminant Level
mg/m^3	milligrams per cubic meter
MLRA	Major Land Resource Areas
Mm^{-1}	inverse megameters
MOA	Memorandum of Agreement
MOU	Memorandum of Understanding
mph	mile per hour
MW	megawatt
NAC	Nevada Administrative Code
NAGPRA	Native American Grave Protection and Repatriation Act of 1990
NBMG	Nevada Bureau of Mines and Geology
NCAI	National Congress of American Indians
NDEP	Nevada Division of Environmental Protection
NDOT	Nevada Department of Transportation

NDOW	Nevada Department of Wildlife
NDWR	Nevada Department of Water Resources
NEPA	National Environmental Policy Act
NGO	Non-governmental Organization
NGSCT	Nevada Governor's Sage-Grouse Conservation Team
NHPA	National Historic Preservation Act
NI	none identified
NMD	no measureable discharge
NNHP	Nevada Natural Heritage Program
NO_2	nitrogen dioxide
NOA	Notice of Availability
NOAA	National Oceanographic and Atmospheric Administration
NOI	Notice of Intent
NO_X	nitrogen oxides
NPCA	National Parks Conservation Association
NPDES	National Pollutant Discharge Elimination System
NPS	National Park Service
NRCS	Natural Resources Conservation Service
NRG	Natural Resources Group
NRHP	National Register of Historic Places
NRS	Nevada Revised Statute
NSE	Nevada State Engineer
NWR	National Wildlife Refuge
OHV	off-highway vehicle
ON	One Nevada
PA	Programmatic Agreement
PGH	Preliminary General Habitat
PHMSA	Pipeline and Hazardous Materials Safety Administration
PILT	Payment in Lieu of Taxes
PM	particulate matter
PM_{10}	particulate matter with an aerodynamic diameter of 10 microns or less
$PM_{2.5}$	particulate matter with an aerodynamic diameter of 2.5 microns or less
PMU	Population Management Unit
POD	Plan of Development
PPA	past and present actions
PPH	Preliminary Priority Habitat

ppm	parts per million
ppmw	parts per million weight
PRCS	Properties of Religious and Cultural Significance
PRISM	Parameter-elevation Regression on Independent Slopes Model
PWR	Public Water Resources
RASA	Regional Aquifer Systems Analysis
RFFA	reasonably foreseeable future actions
RFRA	Religious Freedom Restoration Act
RMIS	Recreation Management Information System
RMP	Resource Management Plan
RNA	Research Natural Area
ROD	Record of Decision
ROW	right-of-way
RV	recreational vehicle
SH	State Highway
SHPO	State Historic Preservation Officer
SIL	Significant Impact Levels
SLD	Salt Lake Desert (flow system as opposed to Spring [201])
SNPLMA	Southern Nevada Public Land Management Act
SNRPC	Southern Nevada Regional Planning Coalition
SNWA	Southern Nevada Water Authority
SO_2	sulfur dioxide
SR	State Route
SRMA	Special Recreational Management Areas
SRP	Special Recreation Permit
SSURGO	Soil Survey Geographic Database
STATSGO	U.S. General Soil Map
SWIP	Southwest Intertie Project Transmission Line
SWPP Plan	Storm Water Pollution Prevention Plan
SWReGAP	Southwest Regional Gap Analysis Project
TCP	Traditional Cultural Properties
TCWCP	Tri-County Weed Control Project
TDS	total dissolved solids
TIGER©	Topologically Integrated Geographic Encoding and Referencing
TM	Thematic Mapper
Tonnes	metric tons

TSP	total suspended particulate
TSS	total suspended solids
TWE	TransWest Express
U.S.	United States
UDAQ	Utah Division of Air Quality
UDWR	Utah Division of Wildlife Resources
UDWRi	Utah Division of Water Rights
UGS	Utah Geological Society
UNLV	University of Nevada, Las Vegas
UNR	University of Nevada, Reno
USACE	U.S. Army Corps of Engineers
USC	United States Code
USDA	U.S. Department of Agriculture
USDOE	United States Department of Energy
USDOT	U.S. Department of Transportation
USEPA	U.S. Environmental Protection Agency
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
USGCRP	United States Global Change Research Program
USGS	U.S. Geological Survey
UTM	Universal Transverse Mercator
VOC	volatile organic compounds
VQO	Visual Quality Objectives
VRI	Visual Resource Inventory
VRM	Visual Resource Management
WEG	Wind Corrodibility Group
WMA	Wildlife Management Area
WRAP	Western Region Air Partnership
WRMP	Water resources monitoring plan
WSA	Wilderness Study Area
WWI	World War I

Table of Contents

List of Tables

List of Figures