United States Department of the Interior

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

Memorandum

To: State Supervisor, Nevada Fish and Wildlife Office, Reno, Nevada

From: Penelope Dunn Woods, Project Manager, Nevada Groundwater Projects Office, Bureau of Land Management, Reno, Nevada pdw

Subject: Submittal of Revised Biological Assessment for Formal Consultation Pursuant to Section 7 of the Endangered Species Act and 50 CFR 402.14 for the Clark, Lincoln, and White Pine Counties Groundwater Development Project

The Nevada Groundwater Projects Office of the Bureau of Land Management (BLM) submitted a Biological Assessment (BA) analyzing the effects on listed species from issuance of a right-of-way for a groundwater conveyance system to Southern Nevada Water Authority (SNWA). The BA was submitted on April 10, 2012. The attached document replaces the BA and is hereby revised.

This revised BA includes analysis of the amount of water granted to SNWA by the Nevada State Engineer (NSE) rulings on March 22, 2012 rather than the amount of water analyzed by Alternative F, which was the Proposed Action in the April 2012 BA. Specific changes are shown in the table below:

Valley	April 2012 BA Analysis Water Amounts (in acre-feet-per-year)	May 2012 BA Supplement Analysis Water Amounts (in acre-feet-per-year)
Spring Valley	84,370	61,127
Delamar Valley	6,591	6,042
Cave Valley	11,584	5,235
Dry Lake Valley	11,584	11,584
Total	**114,129**	**83,988**

These changes were made at the request of the Service due to concerns regarding the White River spinedace (*Lepidomeda albivallis*). The Service and BLM have met in person and via conference calls to discuss these concerns. Revising the BA was determined to be the most expedient and viable way to address these concerns. The change in water quantities resulted in minor changes to the number of wells, miles of pipeline, and acres of potential disturbance. These minor changes occur throughout the document, but did not result in significant changes to the analysis or the conclusions. The different water quantities did result in more substantive changes to the analysis in the Groundwater Pumping Effects and Aggregate Effects sections for three species: White River spinedace, Pahrump poolfish (*Empetrichthys latos*), and Ute ladies'-tresses (*Spiranthes diluvialis)*. The new analyses changed our conclusion for White River spinedace from "may affect, is likely to adversely affect" to "may affect, is not likely to adversely affect." Furthermore, the critical habitat conclusion changed from "may affect, is likely to disturb or destroy critical habitat" to "may affect, is not likely to disturb or destroy critical habitat." The conclusions did not change for Pahrump poolfish and Ute ladies'-tresses.

Electronic copies of the revised BA in MS Word and pdf format have been posted to the SNWA ftp site. For your convenience, we have sent hard copies of these documents directly to your Southern Nevada Las Vegas Office and the Utah Ecological Services West Valley City Office.

Should you wish to discuss any aspect of the revised BA, or if you have any questions regarding this request, please contact Wildlife Biologist Alicia Styles (astyles@blm.gov) at (775) 726-8128, or Deputy Project Manager Kim Dow (kdow@blm.gov) at (775) 861-6681. Thank you for your assistance in this matter.

Attachment
Revised Biological Assessment

cc:

Field Supervisor, Utah Ecological Services Office, U.S. Fish and Wildlife Service, West Valley City, Utah (Attn: Amy Defreese)
Assistant Field Supervisor, Nevada Fish and Wildlife Office, U.S. Fish and Wildlife Service, Las Vegas, Nevada (Attn: Brian Novosak)
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State Director, Utah State Office, Bureau of Land Management, Salt Lake City, Utah (Attn: Justin Jimenez)
Field Manager, Caliente Field Office, Bureau of Land Management, Caliente, Nevada (Attn: Alicia Styles)

U.S. Department of the Interior
Bureau of Land Management

Revised Biological Assessment

May 11, 2012

Clark, Lincoln, and White Pine Counties Groundwater Development Project
Case File # N-78803

Location:

Clark, Lincoln, and White Counties, Nevada

Applicant/Address:

Southern Nevada Water Authority

Groundwater Resources Department

P.O. Box 99956

Las Vegas, Nevada 89193

U.S. Department of the Interior

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TABLE OF CONTENTS

TABLE OF CONTENTS i
LIST OF FIGURES iii
LIST OF TABLES iv
ACRONYMS AND ABBREVIATIONS vi
1.0 INTRODUCTION 1-8
1.1 Purpose of the Document 1-8
1.2 Federal Action Selected for Consultation 1-9
1.2.1 Tier 1 – Primary Water and Power Conveyance Facilities 1-12
1.2.2 Subsequent Tiers - Groundwater Development Facilities 1-12
1.2.3 Groundwater Development Volumes 1-13
1.3 Scope of this BA and Section 7 Consultation 1-14
1.3.1 Analysis Timeframes 1-17
1.3.2 Reconsultation Commitment 1-18
1.4 Organization of the Biological Assessment 1-18
2.0 PROJECT DESCRIPTION 2-1
2.1 Tier 1 Rights-of-Way 2-2
2.1.1 Pipeline Conveyance System 2-9
2.1.2 Power Transmission Facilities 2-11
2.1.3 Other Ancillary Facilities 2-13
2.1.4 Construction Procedures 2-17
2.1.5 Operation and Maintenance 2-28
2.2 Future Facilities and Groundwater Production 2-30
2.2.1 Future Groundwater Production Wells 2-31
2.2.2 Future Collector Pipelines 2-33
2.2.3 Future Power Facilities 2-33
2.2.4 Future Ancillary Facilities 2-36
2.2.5 Future Construction and Operation Procedures 2-36
2.2.6 Abandonment 2-37
2.2.7 Applicant-Committed Environmental Protection Measures 2-37
2.3 Interrelated and Interdependent Activities 2-38
2.4 Stipulations and Agreements 2-38
2.4.1 Spring Valley Stipulation 2-39
2.4.2 Delamar, Dry Lake, and Cave Valleys Stipulation 2-42
2.4.3 Coyote Spring Valley Stipulation 2-44
2.4.4 Muddy River Memorandum of Agreement 2-44
2.5 BLM-Recommended Measures 2-45
3.0 DESCRIPTION OF THE ACTION AREA 3-1
3.1 Tier 1 ROWs 3-1
3.1.1 Delineation of the Action Area 3-1
3.1.2 Listed Species within ROWs 3-1
3.1.3 Ecological Setting 3-1
3.1.4 Delineation of the Action Area 3-5
3.1.5 Listed Species within Groundwater Development and Groundwater Pumping Effects Areas 3-7
3.1.6 Ecological Setting 3-10

3.2 Regional Groundwater Flow Model 3-10
3.2.1 Model Uncertainties and Limitations 3-13
3.2.2 High Diffusivity Model Simulation 3-14
3.2.3 Model Simulated Spring Flows 3-15
3.3 Climate Change 3-17
3.3.1 Historical Regional Climate 3-18
3.3.2 Predicted Future Trends 3-19
3.3.3 Climate Change Considerations for the Federal Action 3-20
4.0 SPECIES ACCOUNTS 4-1
4.1 Federally Listed Species in the Action Area 4-2
4.1.1 Southwestern Willow Flycatcher (Empidonax traillii extimus) 4-2
4.1.2 Agassiz's Desert Tortoise (Gopherus agassizii) 4-8
4.1.3 Pahrump Poolfish (Empetrichthys latos) 4-16
4.1.4 White River Spinedace (Lepidomeda albivallis) 4-20
4.1.5 Hiko White River Springfish (Crenichthys baileyi grandis) 4-24
4.1.6 Pahranagat Roundtail Chub (Gila robusta jordani) 4-27
4.1.7 White River Springfish (Crenichthys baileyi baileyi) 4-28
4.1.8 Moapa Dace (Moapa coriacea) 4-30
4.1.9 Ute Ladies'-Tresses (Spiranthes diluvialis) 4-33
5.0 EFFECTS ANALYSIS FOR THE FEDERAL ACTION 5-1
5.1 Introduction 5-1
5.1.1 Analysis Methodology 5-1
5.1.2 Reasonably Foreseeable Future Uses 5-2
5.2 Effects of the Federal Action 5-5
5.3 Federally Listed Species in the Action Area 5-6
5.3.1 Southwestern Willow Flycatcher 5-6
5.3.2 Desert Tortoise 5-12
5.3.3 Pahrump Poolfish 5-20
5.3.4 White River Spinedace 5-22
5.3.5 Hiko White River Springfish 5-28
5.3.6 Pahranagat Roundtail Chub 5-31
5.3.7 White River Springfish 5-34
5.3.8 Moapa Dace 5-37
5.3.9 Ute Ladies'-Tresses 5-40
6.0 EFFECTS MINIMIZATION 6-1
6.1 Southwestern Willow Flycatcher 6-1
6.1.1 Tier 1 ROW 6-1
6.1.2 Groundwater Development Facilities 6-1
6.1.3 Groundwater Pumping 6-1
6.2 Agassiz's Desert Tortoise 6-2
6.2.1 Tier 1 ROW 6-2
6.2.2 Groundwater Development Facilities 6-22
6.2.3 Groundwater Pumping 6-22
6.3 Pahrump Poolfish 6-23
6.3.1 Tier 1 ROW 6-23
6.3.2 Groundwater Development Facilities 6-23

6.3.3 Groundwater Pumping 6-23
6.4 White River Spinedace 6-25
6.4.1 Tier 1 ROW 6-25
6.4.2 Groundwater Development Facilities 6-25
6.4.3 Groundwater Pumping 6-25
6.5 Hiko White River Springfish 6-27
6.5.1 Tier 1 ROW 6-27
6.5.2 Groundwater Development Facilities 6-27
6.5.3 Groundwater Pumping 6-27
6.6 Pahranagat Roundtail Chub 6-29
6.6.1 Tier 1 ROW 6-29
6.6.2 Groundwater Development Facilities 6-29
6.6.3 Groundwater Pumping 6-29
6.7 White River Springfish 6-31
6.7.1 Tier 1 ROW 6-31
6.7.2 Groundwater Development Facilities 6-31
6.7.3 Groundwater Pumping 6-31
6.8 Moapa dace 6-32
6.8.1 Tier 1 ROW 6-32
6.8.2 Groundwater Development Facilities 6-33
6.8.3 Groundwater Pumping 6-33
6.9 Ute Ladies'-Tresses 6-33
6.9.1 Tier 1 ROW 6-33
6.9.2 Groundwater Development Facilities 6-33
6.9.3 Groundwater Pumping 6-37
7.0 CONCLUSIONS 7-1
7.1 Federal Listed Species in the Action Area 7-2
7.1.1 Southwestern Willow Flycatcher 7-2
7.1.2 Desert Tortoise 7-3
7.1.3 Pahrump Poolfish 7-4
7.1.4 White River Spinedace 7-5
7.1.5 Hiko White River Springfish 7-6
7.1.6 Pahranagat Roundtail Chub 7-7
7.1.7 White River Springfish 7-8
7.1.8 Moapa Dace 7-9
7.1.9 Ute Ladies'-Tresses 7-10
8.0 REFERENCES 8-1
9.0 LIST OF PREPARERS 9-1

LIST OF FIGURES

Figure 1-1 Regional Location of Proposed GWD Project 1-11
Figure 2-1 Federal Action - Potential Timeline 2-1
Figure 2-2 Tier 1 ROWs Key Map 2-4
Figure 2-3 Tier 1 ROWs - Sheet 1 of 4 2-5
Figure 2-4 Tier 1 ROWs– Sheet 2 of 4 2-6
Figure 2-5 Tier 1 ROWs – Sheet 3 of 4 2-7
Figure 2-6 Tier 1 ROWs – Sheet 4 of 4 2-8

Figure 2-7 Preliminary Pipeline and Power Line ROW Cross Section for a 84-inch Pipe..... 2-10
Figure 2-8 Groundwater Development Areas……2-32
Figure 3-1 Action Area..... 3-2
Figure 3-2 Model Simulated Drawdown Areas..... 3-8
Figure 3-3 Regional Groundwater Flow Model Area 3-11
Figure 4-1 Southwestern Willow Flycatcher Breeding Habitat Locations……...4-4
Figure 4-2 Range of the Desert Tortoise……4-10
Figure 4-3 Desert Tortoise Occurrences (1 of 2 maps)……..4-12
Figure 4-4 Desert Tortoise Occurrences (2 of 2 maps)..... 4-13
Figure 4-5 Pahrump Poolfish Occurrences & Groundwater Development Areas…….4-18
Figure 4-6 Pahrump Poolfish Occurrences & Groundwater Drawdown……..4-19
Figure 4-7 White River Spinedace Occurrences……4-22
Figure 4-8 Hiko White River Springfish, Pahranagat Roundtail Chub, and White River Springfish Occurrences……..4-26
Figure 4-9 Moapa Dace Occurrences……4-31
Figure 4-10 Ute Ladies'-Tresses Potential Habitat……4-37
Figure 6-1 Adaptive Management Flow Diagram Department of Interior Adaptive Management Technical Guide (2009)..... 6-40
Figure 6-2 Conceptual Adaptive Management Process for GWD Project..... 6-49

LIST OF TABLES

Table 1-1 Federal Action Selected for Consultation 1-8
Table 1-2 Comparison of Water Quantities Between EIS Alternatives E and F, and the NSE March 2012 Appropriation……1-9
Table 1-3 Threatened and Endangered Species……..1-15
Table 2-1 Permanent and Temporary Right-of-Way Requirements 2-3
Table 2-2 Land Ownership for Tier 1 ROWs..... 2-9
Table 2-3 Pipeline Characteristics..... 2-10
Table 2-4 Power Lines..... 2-12
Table 2-5 Electrical Substations..... 2-13
Table 2-6 Preliminary Construction Schedule for the Groundwater Conveyance Facilities 2-26
Table 2-7 Estimated Peak Construction Manpower by Year 2-27
Table 2-8 Representative Construction Equipment..... 2-28
Table 2-9 Anticipated Operational Power Requirements for the Groundwater Conveyance Facilities 2-30
Table 2-10 Groundwater Development Areas Permanent and Temporary Right-of-Way Requirements..... 2-34
Table 2-11 Estimates for Future Collector Pipelines 2-35
Table 3-1 Waterbodies in the Action Area with Aquatic Listed Species..... 3-9
Table 3-2 Project Specific Model-Simulated Changes in Spring Flow for Springs with Listed Species……3-16
Table 3-3 Aggregate Model-Simulated Changes in Spring Flow for Springs with Listed Species……3-17
Table 4-1 Federally Listed Species within the Action Area..... 4-1
Table 4-2 Desert Tortoise Densities within the Action Area……4-14
Table 4-3 Ute-Ladies'-Tresses Presence Data and Potential Habitat……..4-36

Table 5-1 Reasonably Foreseeable Future Groundwater Uses..... 5-3
Table 5-2 Tier 1 ROWs within Non-Designated Desert Tortoise Habitat 5-14
Table 5-3 Federal Action Tier 1 ROWs within Desert Tortoise Critical Habitat in Mormon Mesa CHU 5-19
Table 7-1 Federally Listed Species and Critical Habitat in the Action Area –Conclusions 7-1

ACRONYMS AND ABBREVIATIONS

ACM	applicant-committed environmental protection measure(s)
afy	acre feet per year
ags	above ground surface
AMP	Adaptive Management Plan
APLIC	Avian Power Line Interaction Committee
ACEC	Area of Critical Environmental Concern
BA	Biological Assessment
bgs	below ground surface
BIA	Bureau of Indian Affairs
BLM	Bureau of Land Management
BO	Biological Opinion
BRT	Biologic Resources Team
BWG	Biological Working Group
CCRP	Central Carbonate-Rock Province
CHU	Critical Habitat Units
cfs	cubic feet per second
CSI	Coyote Spring Investment
DDC	Delamar, Dry Lake, and Cave valleys
DOI	U.S. Department of the Interior
DWMA	Desert Wildlife Management Area
EC	Executive Committee
EIS	Environmental Impact Statement
ESA	Endangered Species Act
°F	Fahrenheit
FLPMA	Federal Land Policy and Management Act of 1976
GBNP	Great Basin National Park
GIS	Geographical Information System
GWD Project	Clark, Lincoln, and White Pine Counties Groundwater Development Project
IBMA	Initial Biological Monitoring Area
kV	kilovolts
LCCRDA	Lincoln County Conservation, Recreation, and Development Act of 2004
LDS	Line Distance Sampling

LVRMP	Las Vegas Resource Management Plan
LVVWD	Las Vegas Valley Water District
MMM Plan	Monitoring, Management, and Mitigation Plan
MOA	Memorandum of Agreement
MVWD	Moapa Valley Water District
NAIP	National Agriculture Imagery Program
NDEP	Nevada Division of Environmental Protection
NDOW	Nevada Department of Wildlife
NDWR	Nevada Division of Water Resources
NEPA	National Environmental Policy Act
NPS	National Park Service
NSE	Nevada State Engineer
NWR	National Wildlife Refuge
OSHA	Occupational Safety and Health Administration
PCEs	Primary Constituent Elements
POD	Plan of Development
RMP	Resource Management Plan
ROW	right-of-way
RU	Recovery Units
SNPLMA	Southern Nevada Public Land Management Act of 1998
SNWA	Southern Nevada Water Authority
SWCA	SWCA Environmental Consultants
the Parties	SNWA, the USFWS, Bureau of Indian Affairs, BLM, and National Park Service
TRP	Technical Review Panel
ULT	Ute ladies'-tresses
USACE	U.S. Army Corps of Engineers
USDA	U.S. Department of Agriculture
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
WMA	Wildlife Management Area
WSNA	Warm Springs Natural Area
ZOI	zone of influence

1.0 INTRODUCTION

1.1 PURPOSE OF THE DOCUMENT

On April 10, 2012 the Bureau of Land Management (BLM) submitted a Biological Assessment (BA) to the U.S. Fish and Wildlife Service (USFWS). The original BA was based upon a Federal action that evaluates a quantity for groundwater development derived from SNWA's original groundwater applications based upon SNWA estimates of perennial yield in these basins. On March 22, 2012, the Nevada State Engineer (NSE) issued water rights rulings on SNWA's groundwater applications in Spring, Cave, Dry Lake, and Delamar valleys (NSE, 2012a-d). This revised BA, as requested by USFWS, updates and revises the original BA to conform with these NSE groundwater rights rulings.

Major changes to groundwater quantities resulted in Cave and Spring Valley from the NSE ruling (**Table 1-1**). Therefore, analysis for the White River spinedace, Pahrump poolfish, and Ute ladies'-tresses (ULT) have been revised and are presented in this revised BA.

The Southern Nevada Water Authority (SNWA) submitted a right-of-way (ROW) application to the U.S. Bureau of Land Management (BLM) on August 19, 2004, to construct, operate, and maintain the Clark, Lincoln, and White Pine Counties Groundwater Development Project (GWD Project) in south and central eastern Nevada (**Figure 1-1**). The GWD Project would convey groundwater produced from existing and new water rights which SNWA is permitted by the Nevada Division of Water Resources (NDWR) Office of the State Engineer (Nevada State Engineer). The GWD Project also provides capacity for future conveyance by Lincoln County.

Pursuant to Section 7(a)(2) of the Endangered Species Act (ESA) (16 U.S.C. § 1536(a)(2)), all Federal agencies must consult with the Secretary of the Interior to ensure that any action they authorize, fund, or carry out is not likely to jeopardize the continued existence of listed species, or result in the destruction or adverse modification of habitat of listed species. The BLM issuance of ROW would constitute a Federal action. The GWD Project constitutes a "major construction activity," which requires the preparation of a biological assessment (50 CFR § 402.02). In accordance with 50 C.F.R. § 402.12(a), "[a] biological assessment shall evaluate the potential effects of the action on listed and proposed species and designated and proposed critical habitat and determine whether any such species or habitat are likely to be adversely affected by the action and is used in determining whether formal consultation or a conference is necessary." In addition, "[t]he Director may use the results of the biological assessment in (i) determining whether to request the Federal agency to initiate formal consultation or a conference, (ii) formulating a biological opinion, or (iii) formulating a preliminary biological opinion." Id. § 402.12(k)(2). The U.S. Army Corps of Engineers (USACE) would issue nationwide or individual permits under Section 404 of the Clean Water Act for the GWD Project. The USACE has designated the BLM as the lead Federal agency to act on their behalf for purposes of compliance with Section 7 of the ESA (Appendix A).

Therefore, as part of the interagency consultation process the BLM has prepared this Biological Assessment (BA) to support consultation under Section 7. The contents of a BA are discretionary and in the action agency's judgment. *Id*. § 402.12(f). This BA contains the information necessary to support an analysis of the potential effects of the proposed action, and otherwise to provide the U.S. Fish and Wildlife Service (USFWS) with the necessary

information to allow its development of a Biological Opinion (BO) consistent with the requirements of the Section 7 regulations.

1.2 FEDERAL ACTION SELECTED FOR CONSULTATION

The BLM has selected an action to initiate formal consultation with the USFWS (hereinafter referred to as the Federal action). This action includes facilities to convey up to 124,988 acre feet per year (afy). The quantities of water analyzed in this action are between those analyzed for Alternatives E and F (**Table 1-2**), which will be presented in the Final Environmental Impact Statement (FEIS).

Table 1-1 Federal Action Groundwater Development and Conveyance Volumes

Hydrographic Basin	Existing Groundwater Rights[c] (afy)	New Groundwater Considered under Federal Action (afy)
SNWA Water		
Spring Valley	8,000	61,127
Cave Valley		5,235
Dry Lake Valley[a]		11,584
Delamar Valley[a]		6,042
Subtotal: SNWA	8,000	83,988
Lincoln County Water		
Lake Valley	11,300[b]	
Additional Capacity – Future Sources to be Determined	21,700	
Subtotal : Lincoln County	33,000	
TOTAL	**124,988**	

[a] 3,000 afy of water rights from these valleys would be transferred to Lincoln County in accordance with a 2003 cooperative agreement.
[b] Privately owned water rights (allocated to Tuffy Ranch Properties, now owned by CSI) are anticipated to be conveyed for Lincoln County.
[c] These are considered as part of baseline conditions.

Table 1-2 Comparison of Water Quantities Between EIS Alternatives E and F, and the NSE March 2012 Appropriation

	EIS Alternative E	EIS Alternative F	NSE Appropriation
	No Snake Alternative	**No Snake Alternative w/ Increased Pumping (compared to E)**	**NSE Groundwater Appropriation to SNWA**
Valley	**AFY**	**AFY**	**AFY**
Snake	0	0	0
Spring	60,000	84,370	61,127
Cave	11,584	11,584	5,235
Dry Lake	11,584	11,584	11,584
Delamar	6,591	6,591	6,042
Total	**78,755**	**114,129**	**83,988**

On March 22, 2012, the Nevada State Engineer (NSE) issued water rights rulings on SNWA's groundwater applications in Spring, Cave, Dry Lake, and Delamar valleys (NSE, 2012a-d). This revised BA, as requested by USFWS, updates and revises the original BA to conform with these NSE groundwater rights rulings.

A tiered approach is being used for development of the GWD Project. Tiering is appropriate when it helps the lead agency focus on the issues which are ripe for decision, and exclude from consideration issues already decided or not yet ripe. For the GWD Project, site-specific details are currently known for the primary water and power conveyance system. The BLM is addressing those facilities in this BA as Tier 1. Details regarding future facilities for groundwater development are not yet known and cannot be determined at this time. Thus, those facilities are being considered programmatically in this BA, and will be subject to additional ESA consultations as part of subsequent tiers, when site-specific information is known.

Those subsequent ESA consultations will be tiered to this consultation, and will provide an opportunity to incorporate new information, data and updated analyses as such information becomes available, ensuring that the USFWS' analysis of the effects of the current and future federal actions is based on the best available scientific information. Subsequent ESA consultations for future groundwater development facilities will provide an opportunity to update this analysis with new information as the NSE authorizes specific points of diversion and ROW requests are made to the BLM. A summary of the Tier 1 facilities and programmatic assumptions on future facilities is provided below, with a more detailed description included in Section 2.0.

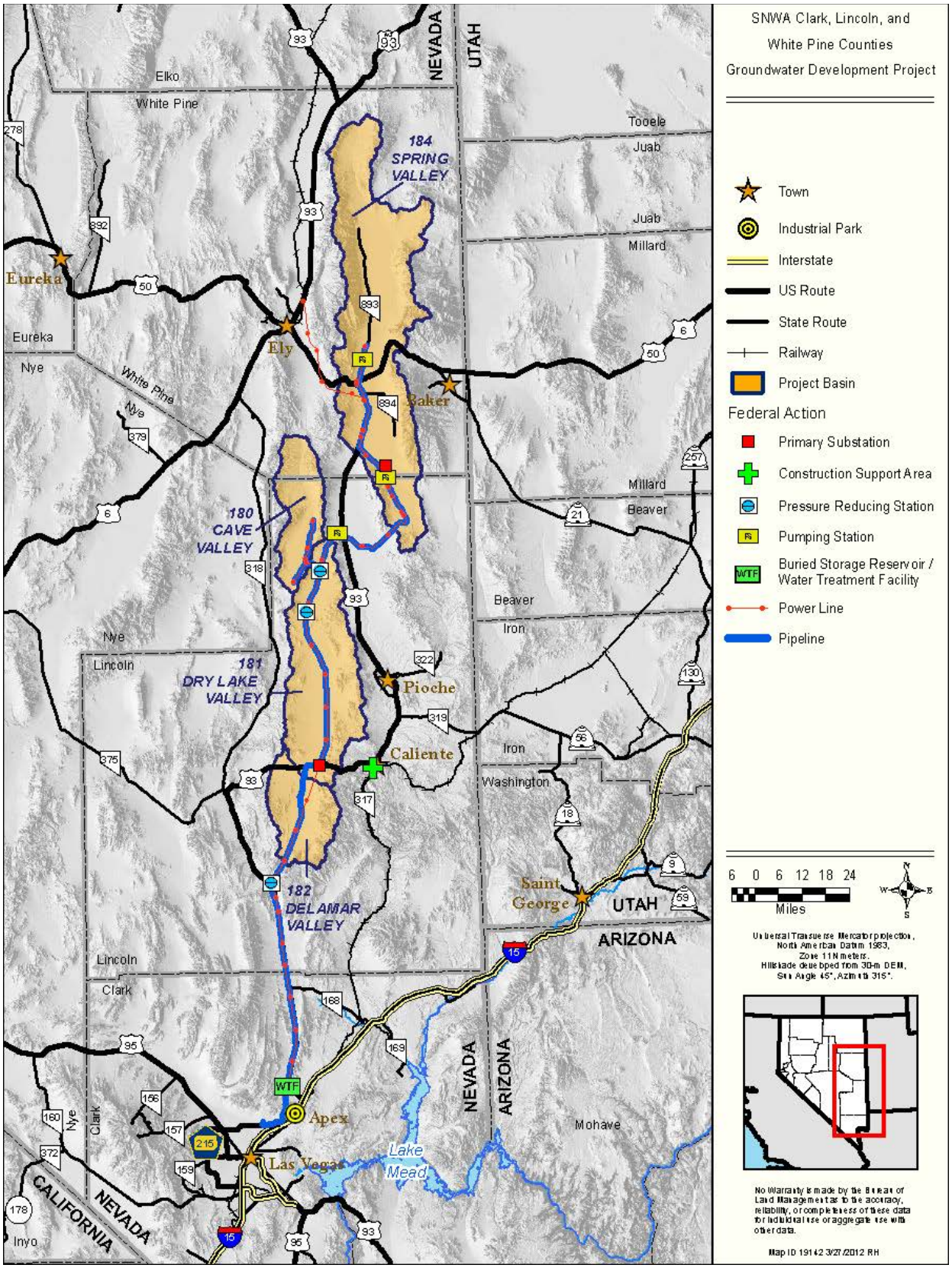

Figure 1-1 Regional Location of Proposed GWD Project

1.2.1 Tier 1 – Primary Water and Power Conveyance Facilities

The Federal action for Tier 1 would be the issuance of ROW by the BLM to SNWA for construction, operation, and maintenance of GWD Project water and power conveyance facilities. These facilities include:

- Main and Lateral Pipelines – approximately 263 miles of buried water pipelines, between 24 and 84 inches in diameter
- Pumping Stations – three facilities
- Regulating Tanks – five tanks, each approximately 3 to 10 million gallons in capacity
- Pressure Reducing Stations – three facilities
- Buried Storage Reservoir – a 40 million gallon buried storage reservoir
- Water Treatment Facility – one facility that can treat up to 110 million gallons per day
- Power Facilities – approximately 280 miles of 230-kilovolt (kV), 69-kV, and 25-kV overhead power lines, two primary electrical substations (230 to 69-kV) and four secondary substations (69 to 25-kV).

These facilities would be predominantly located on public lands managed by the BLM and primarily within designated utility corridors.

1.2.2 Subsequent Tiers - Groundwater Development Facilities

Details regarding facilities for future groundwater development, including the number and location of wells, and the specific lengths and routes of collector pipelines and distribution power lines, are presently unknown. SNWA will identify these facilities in the future, after exploratory drilling has been conducted.

SNWA has identified groundwater development areas within the four hydrographic basins in which it anticipates conducting groundwater development as part of the GWD Project (groundwater development areas). Programmatic assumptions concerning potential facilities and groundwater pumping activities have been made for the purposes of this BA analysis, including assumptions on the number of wells, lengths of pipeline and power lines, and other ancillary facilities. Thus, the effects of future groundwater development, including the long-term effects of groundwater pumping, are the subject of programmatic analysis in this BA. This treatment is consistent with the approach taken in the BLM's Draft EIS for the GWD Project (BLM, 2011). The basis for the assumptions on the future facilities was provided to the BLM and USFWS in March 2012.

Assumptions regarding future facilities that will be identified in subsequent tiers include:

- Groundwater Production wells – estimated between 71 and 88 wells
- Collector Pipelines – estimated between 96 to 254 miles of buried pipeline, between 10 to 30 inches in diameter, and associated temporary construction staging areas
- Pumping Stations – two facilities
- Power Facilities – estimated between 96 to 254 miles of 25-kV overhead distribution power lines (along collector pipeline alignments), two secondary substations, and hydroturbine energy generation (located at the pressure-reducing sites).

SNWA will submit additional ROW applications to the BLM for these groundwater development facilities when site-specific location information is known. The BLM will address these future components in subsequent tiered analyses, including Section 7 consultation as required under ESA.

SNWA is reserving capacity in the GWD Project for future use by Lincoln County, in accordance with a SNWA-Lincoln County 2006 cooperative agreement (SNWA, 2006). Of this capacity, approximately 3,000 afy is assumed to be water rights that may be permitted to SNWA in Dry Lake and Delamar valleys, which SNWA would then transfer to Lincoln County under the terms of a 2003 cooperative agreement. The SNWA future facilities assumptions listed above encompass the future facilities necessary to develop this 3,000 afy for provision to Lincoln County.

Lincoln County has not identified any specific future groundwater development facilities for the remaining capacity (approximately 21,700 afy) reserved for the County in the GWD Project (including both existing agricultural water rights and future sources to be determined, as described in Section 1.2.3, below). Because the majority of the GWD Project is located on Federal lands, additional federal ROW and associated federal authorizations would be required to tie existing or future Lincoln County water rights into the GWD Project. Thus, should Lincoln County pursue the use of the GWD Project capacity through development of future water resource projects, those projects and the facilities they would require would be subject to individual ESA Section 7 consultations.

1.2.3 Groundwater Development Volumes

The Federal Action would develop and convey both existing and new groundwater rights. This alternative has distributed pumping for a quantity of groundwater derived from SNWA's original groundwater applications based upon SNWA estimates of perennial yield in Spring, Cave, Dry Lake, and Delamar valleys (this quantity of water is more than what was approved by the Nevada State Engineer). The volumes that are included in the Federal action for the purposes of programmatic analysis in this BA are listed in (**Table 1-1**) and summarized below.

New Groundwater Rights

The Federal action considers new groundwater development of up to 83,988 afy in four hydrographic basins: Spring Valley (61,127 afy), Cave Valley (5,235 afy), Dry Lake Valley (11,584 afy), and Delamar Valley (6,042 afy). This alternative does not include groundwater development in Snake Valley. These are based on groundwater rights recently permitted to SNWA in Spring, Cave, Dry Lake, and Delamar valleys by the Nevada State Engineer (NSE) (NSE, 2012a, 2012b, 2012c, and 2012d). Opponents of the water rights and GWD project have expressed their intention to seek judicial review of the recent NSE decision. Additionally, NSE decisions will be required to authorize specific points of diversion, which also will be subject to appeal.

Existing Groundwater Rights

SNWA has purchased private property and water rights in Spring Valley. As part of the GWD Project, SNWA plans to convey 8,000 afy of existing agricultural groundwater rights in Spring Valley. Approval from the NSE would be needed to convert the type and place of use prior to allowing export of this water from Spring Valley and conveyance through the GWD Project. The NSE considers aquifer recharge from agricultural water use in his decision making, and would only permit for export the consumptive use amount. Thus, there would be no net additional groundwater removal beyond that which is already occurring under agricultural operations. Since this 8,000 afy of groundwater resource is previously appropriated and currently being used, it is considered in this BA analysis as part of the baseline conditions.

Tuffy Ranch Properties, LLC holds existing agricultural water rights in Lake Valley. The NSE issued Ruling 5918 on December 3, 2008 allowing export of up to 11,300 afy of existing agricultural water rights for municipal use in Coyote Spring Valley. The NSE determined that this quantity was the consumptively used portion of the existing water right, and there would be no increase in water use with export of the consumptive use portion from the basin. Since this 11,300 afy of groundwater resource is previously appropriated and currently being used, it is considered in this BA analysis as part of the baseline conditions. Additional Federal action associated with ROW across Federal lands would be required to develop and/or convey these future water supplies, at which time further environmental review, including ESA consultation, will occur.

Other Lincoln County

Approximately 21,700 afy of additional pipeline capacity is reserved for use by Lincoln County in the GWD Project. No water source has been identified for this capacity, nor has the county identified any timeline for development and use. Water sources may include potential transfer of existing agricultural rights or new appropriations in other groundwater basins in the area. Such transfers or new appropriations have not yet been requested by Lincoln County, and the specific quantity and source basins cannot be reasonably forecast at this time. Since no reasonable assumptions can be made regarding the source of this additional Lincoln County capacity, it has not been specifically considered in this BA as a groundwater development activity. Additional Federal action associated with ROW across Federal lands would be required to develop and/or convey these future water supplies, at which time further environmental review, including ESA consultation, will occur. A discussion on whether this is an interrelated and interdependent activity is provided in Section 2.3.

1.3 SCOPE OF THIS BA AND SECTION 7 CONSULTATION

This BA assesses the direct, indirect, and cumulative effects of the Federal action on the species federally listed as threatened or endangered (**Table 1-3**) as identified by the USFWS in a letter dated January 25, 2012 (Appendix B – USFWS Species List; USFWS, 2012), and on designated critical habitat for such species. Nine out of the 11 federally listed species identified by the USFWS are located within the Action Area.

Two species occur entirely outside of the Action Area - Yuma clapper rail and Big Springs spinedace. Model simulations and qualitative analyses indicate that effects to these species would be separated spatially and temporally from the effects of the action. These species are not

further addressed in this BA. Appendix C contains an analysis of "no effect" determinations and associated rationale.

Site-specific information concerning the effects of construction, operation, and maintenance of the Tier 1 facilities (described in Section 2.1) provide sufficient information to allow "project-level" consultation for the primary conveyance system. Accordingly, with regard to the requested ROW for the primary conveyance system, this BA will serve as the basis for the development and issuance of a BO, including an incidental take statement, covering the construction, operation, and maintenance of the primary water and power conveyance system should BLM grant the requested ROW.

Table 1-3 Threatened and Endangered Species

Species	Status	Critical Habitat
Species Within the Action Area		
Southwestern willow flycatcher *(Empidonax traillii extimus)*[1]	Endangered	Yes[2]
Desert tortoise (*Gopherus agassizii*)[3]	Threatened	Yes
White River springfish (*Crenichthys baileyi baileyi*)	Endangered	Yes
Hiko White River springfish (*Crenichthys baileyi grandis*)	Endangered	Yes
Pahrump poolfish (*Empetrichthys latos*)	Endangered	No
Pahranagat roundtail chub (*Gila robusta jordani*)	Endangered	No
White River spinedace *(Lepidomeda albivallis*)	Endangered	Yes
Moapa dace (*Moapa coriacea*)	Endangered	No
Ute ladies'-tresses (*Spiranthes diluvialis*)[1]	Threatened	No
Species Outside the Action Area and Not Addressed in this BA		
Yuma clapper rail (*Rallus longirostris yumanensis*)	Endangered	No
Big Spring spinedace (*Lepidomeda mollispinis pratensis*)	Threatened	Yes

The USFWS' species list also identified Candidate species. Because these species are not currently listed under ESA, they are not included in this BA for the purposes of formal Section 7 consultation. By agreement between BLM and the USFWS, these species are being discussed in a separate Technical Assistance document.

[1] Southwestern willow flycatcher breeding locations and Ute ladies'-tresses locations occur inside and outside of the Action Area. The locations that occur outside of the Action Area for these species are not included in this BA.

[2] USFWS issued a proposed revised designation of southwestern willow flycatcher critical habitat on August 15, 2011 (USFWS, 2011).

[3] Private lands included in the Federal action in Clark County are covered under the Clark County Multiple Species Habitat Conservation Plan. None of the private lands of the Federal action in Lincoln County are encompassed within the Southeastern Lincoln County Habitat Conservation Plan or the Coyote Springs Investment Multi-Species Habitat Conservation Plan.construction, operation, and maintenance of the primary water and power conveyance system should BLM grant the requested ROW.

This BA also identifies the likely effects of construction of future groundwater development facilities and associated groundwater withdrawal. These future effects are being considered under a programmatic analysis, for the USFWS to determine in its BO whether the action is likely to result in jeopardy to listed species, or destruction or adverse modification to designated critical habitat. That conclusion will be based upon reasonable assumptions concerning the likely location of groundwater development facilities, likely rates of groundwater withdrawal, and the groundwater development volumes described as part of the Federal action. Since site-specific information regarding the future groundwater development facilities is not available and will not be available for a significant period of time, the current consultation will not include an incidental take statement for take that may occur during construction, operation, and maintenance of such future facilities, including potential take associated with groundwater development.

BLM anticipates that when SNWA applies for additional ROWs for future facilities, BLM and USFWS will engage in additional ESA consultation, tiered to this programmatic consultation. This additional ESA consultation will include an incidental take statement, as appropriate, for such groundwater development, as well as jeopardy and/or adverse modification evaluations for both the proposed development activities and the GWD Project as a whole.

Future tiered consultations will consider the potential impacts of groundwater development facilities as they are identified and proposed for authorization and construction. Such

consultations will consider the potential direct and indirect effects of construction of the proposed facilities, as well as the potential effects of the groundwater development program considered programmatically in this consultation. The programmatic effects analysis of this consultation will be revisited and updated, as appropriate, in light of new information, such as monitoring well data and new or revised groundwater flow modeling, which is available at the time of such future consultations. This will include groundwater monitoring and other information that will be developed under the terms of the various stipulated agreements to which BLM, USFWS, and SNWA are parties. As a result, the programmatic analysis of this consultation will be continually revisited and updated throughout the construction of the GWD Project.

1.3.1 Analysis Timeframe

Due to the limited predictive capacity of the groundwater flow modeling over long timeframes, the BLM requests that the BO issued by the USFWS cover the construction, operation, and maintenance of the GWD Project for 75 years after full build out, estimated to be the year 2125. If the GWD Project is likely to continue operations beyond 75 years after full build out, consultation on the effects of the GWD Project will be reinitiated prior to the expiration of the BO.

As is described in detail in Section 3.3, groundwater flow modeling has been conducted to assist in the programmatic analysis of potential effects of groundwater pumping. Full groundwater production (full build out of the GWD Project) was assumed to be reached in the year 2050. Modeling simulations were conducted for the analysis in this document for 75 years after full build out (anticipated calendar year 2125). The model simulations assumed the full quantities of water would be continuously pumped (24 hours per day, 356 days per year), and did not assume any reduction, cessation, or re-distribution of pumping for the purposes of adaptive groundwater management.

The programmatic analysis in this BA also considers a subsequent 100-year recovery period after full build out, to ensure that the analysis adequately considers the potential response of the groundwater system. This recovery period addresses the potential for continued propagation of pumping effects beyond the 75 years after full build out (estimated 2125) addressed under this consultation. BLM selected a 100-year recovery period for analysis after considering groundwater flow model certainty and based on the results of model simulation runs of various recovery periods (see Section 3.2.1.2). This review identified that the greatest extent of effects that would impact the listed species under consultation are reached within 100 years recovery time, after which the effects retreat and moderate.

Inherent uncertainties are associated with the results of the groundwater flow modeling, due to the scarcity of available data in the region and the unavoidable generalization of geologic features that is required for model construction. Model simulations become more uncertain the further out in time they are projected, and there is little evidence to support high confidence in long-term model predictions. With respect to the regional groundwater flow model prepared for the Federal action, very little historical stress information exists concerning the groundwater flow model area, and even less information exists for the groundwater basins that would be developed under the Federal action. Additional discussion on model uncertainties and limitations is provided in Section 3.3.1.

1.3.2 Reconsultation Commitment

The BLM requests that the BO issued by the USFWS cover the construction, operation, and maintenance of the GWD Project for 75 years after full build out, estimated to be the year 2125. To ensure that the potential effects of groundwater pumping from the GWD Project are accurately identified and considered as part of this consultation, the programmatic consultation will include a commitment for reconsultation. If the GWD Project is likely to continue operations beyond 75 years after full build out, consultation on the effects of the GWD Project will be reinitiated prior to the expiration of the BO.

1.4 ORGANIZATION OF THE BIOLOGICAL ASSESSMENT

Section 1.0 Introduction: provides a brief introduction to the reasons for this BA and the Federal action, and includes the organization of the document.

Section 2.0 Project Description: describes the Federal action in detail, including construction procedures, operation and maintenance for the water and power conveyance facilities, assumptions regarding future facilities for groundwater development and groundwater pumping, and applicant-committed environmental protection measures (ACM). Interrelated and interdependent projects and water rights stipulated agreements and associated monitoring plans are also described.

Section 3.0 Description of the Action Area: describes the physical environment through which the Federal action would traverse or would otherwise affect, whether directly or indirectly. A summary of the regional groundwater flow model is included.

Section 4.0 Species Accounts: provides details of species habitat and range, species biology, and current conditions for those species and designated critical habitat having potential to be affected within the Action Area.

Section 5.0 Effects Analysis for the Federal Action: analyzes the potential direct, indirect, and cumulative effects of the Federal action to federally listed species, and effects to designated critical habitat within the Action Area. Effects of climate change are also identified.

Section 6.0 Effects Minimization: describes the measures or actions that are committed to be completed to benefit or promote the recovery of listed species that are in addition to the applicant committed measures described in Section 2.0.

Section 7.0 Conclusions: presents conclusions of the BA in terms of effects determination for listed species and critical habitat.

Section 8.0 References: lists the literature cited for this document.

Section 9.0 List of Preparers and Contacts Made: catalogues sources of information consulted while developing the BA, and provides a list of personnel involved in drafting the document.

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2.0 PROJECT DESCRIPTION

This section provides a description of the Tier 1 primary water and power conveyance facilities, along with assumptions regarding future groundwater development facilities that would be included in subsequent Section 7 consultations. **Figure 2-1** identifies a potential schedule for construction of the Federal action and the anticipated schedule for future compliance processes. This schedule is based upon current estimates; construction could be accelerated or delayed depending upon whether drought conditions on the Colorado River affect SNWA's other water supplies. The schedule is also dependent upon permitting of water rights by the NSE and granting of future ROWs by the BLM.

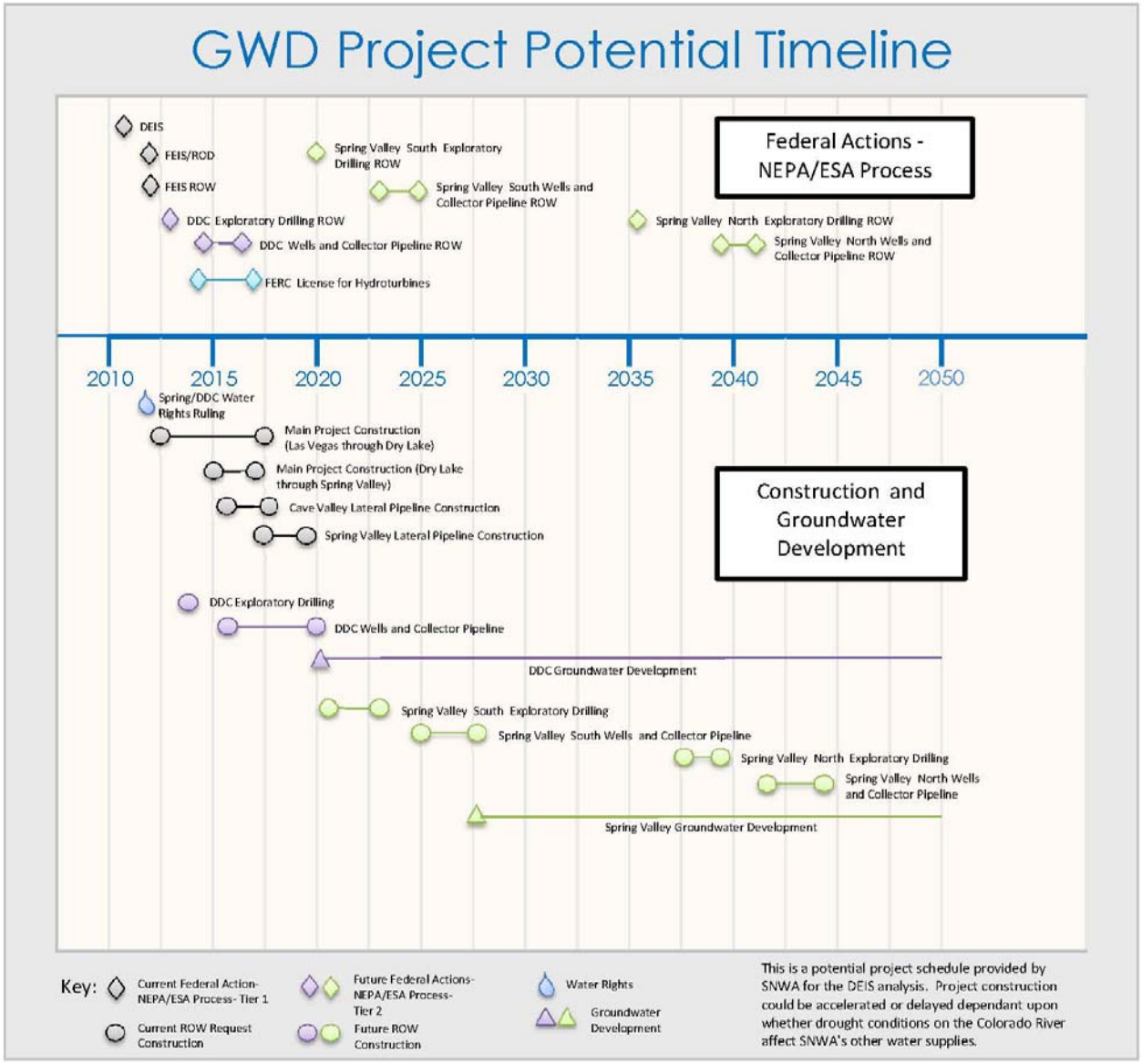

Figure 2-1 Federal Action - Potential Timeline

2.1 TIER 1 RIGHTS-OF-WAY

The ROWs necessary for construction, operation, and maintenance of the GWD Project would be located predominantly on public lands managed by the BLM. Lincoln County and White Pine County public lands are administered by the BLM Ely District Office, and Clark County public lands are managed by the BLM Southern Nevada District Office. The BLM Ely District Office manages land use pursuant to the Ely District Record of Decision and Approved Resource Management Plan (RMP) (BLM, 2008). The RMP is a public document containing—among other things—conservation and restoration measures for key biological features, functions, and species within BLM jurisdiction. BLM-managed federal lands within Clark County are managed under the Las Vegas Resource Management Plan (LVRMP) (BLM, 1998).

The ROWs for Tier 1 have been located predominantly within designated utility corridors. The only exceptions are six areas where design and construction issues dictated alternate routing. These areas are: (1) a 2-mile segment of pipeline in Las Vegas Valley, which was selected as a shorter route to avoid an area of steep topography already constrained by a highway, other utilities, and private lands; (2) a 24-mile segment of pipeline and power line in Coyote Spring Valley, which is routed along US Highway 93 to avoid an area of extremely rugged terrain that would require substantial grading and slope cuts; (3) a 10-mile segment of pipeline in northern Delamar and southern Dry Lake valleys, where the pipeline alignment follows a lower elevation grade to avoid the need for an additional pumping station; (4) a 3-mile segment in southern Spring Valley, where the pipeline and power line alignment take a shorter route to avoid a sharp angle turn that would be problematic for a pipeline; (5) a 4-mile segment north of the Southwest Intertie Project Corridor in Spring Valley, where no utility corridor is available; and (6) a 20-mile segment of power line from Spring into Steptoe valleys, where no utility corridor is available.

The Southern Nevada Public Land Management Act of 1998 (SNPLMA) directs BLM to grant ROWs to SNWA in Clark County for facilities and systems needed for the storage, treatment, transportation, or distribution of water, in accordance with the Federal Land Policy and Management Act of 1976 (FLPMA) and other applicable provisions of law. The Lincoln County Conservation, Recreation, and Development Act of 2004 (LCCRDA) established a 2,640-foot wide corridor for utilities in Lincoln and Clark counties, and mandates that the BLM grant the ROWs requested by SNWA in Clark and Lincoln counties, subject to National Environmental Policy Act (NEPA) compliance, for facilities necessary for construction and operation of a water conveyance system as depicted on the LCCRDA utility corridor map.

Table 2-1 summarizes the Tier 1 ROWs, which are displayed on **Figures 2-2 through 2-6**, and described in detail below. ROWs would be required across Federal lands managed by the BLM, state lands (Nevada National Guard in east-central Las Vegas Valley, and Steptoe Valley Wildlife Management Area), and private lands (Apex area in Las Vegas Valley, land in central Coyote Spring Valley, and land in west Caliente). **Table 2-2** summarizes land ownership of the requested ROWs.

Table 2-1 Permanent and Temporary Right-of-Way Requirements

Alignment or Facility by Land Holder	Permanent ROW (acres)	Temporary ROW (acres)
U.S. Bureau of Land Management		
Main and Lateral Pipelines	3,137	3,127
Access Roads	31	0
Pumping Stations	70	10
Regulating Tanks	16	15
Pressure-Reducing Stations	11	16
Water Treatment Facility and Buried Storage Reservoir	75	0
Power Lines	3,352	0
Primary and Secondary Electrical Substations	13	0
Pipeline Staging Areas	0	255
Nursery Areas	0	249
Borrow Pits	0	49
Subtotal BLM	*6,705*	*3,721*
Private		
Caliente Construction Support Area	121	0
230-kV Power Line – Steptoe Valley	3	0
Main Pipeline - Coyote Spring Valley	20	16
230-kV Power Line - Coyote Spring Valley	18	0
Main Pipeline – Apex Industrial Park (Las Vegas Valley)	17	17
Subtotal Private	*179*	*33*
State of Nevada		
230-kV Power Line - Wildlife Preserve	17	0
Main Pipeline, Army National Guard	13	13
Subtotal State of Nevada	*30*	*13*
PROJECT TOTALS	**6,914**	**3,767**

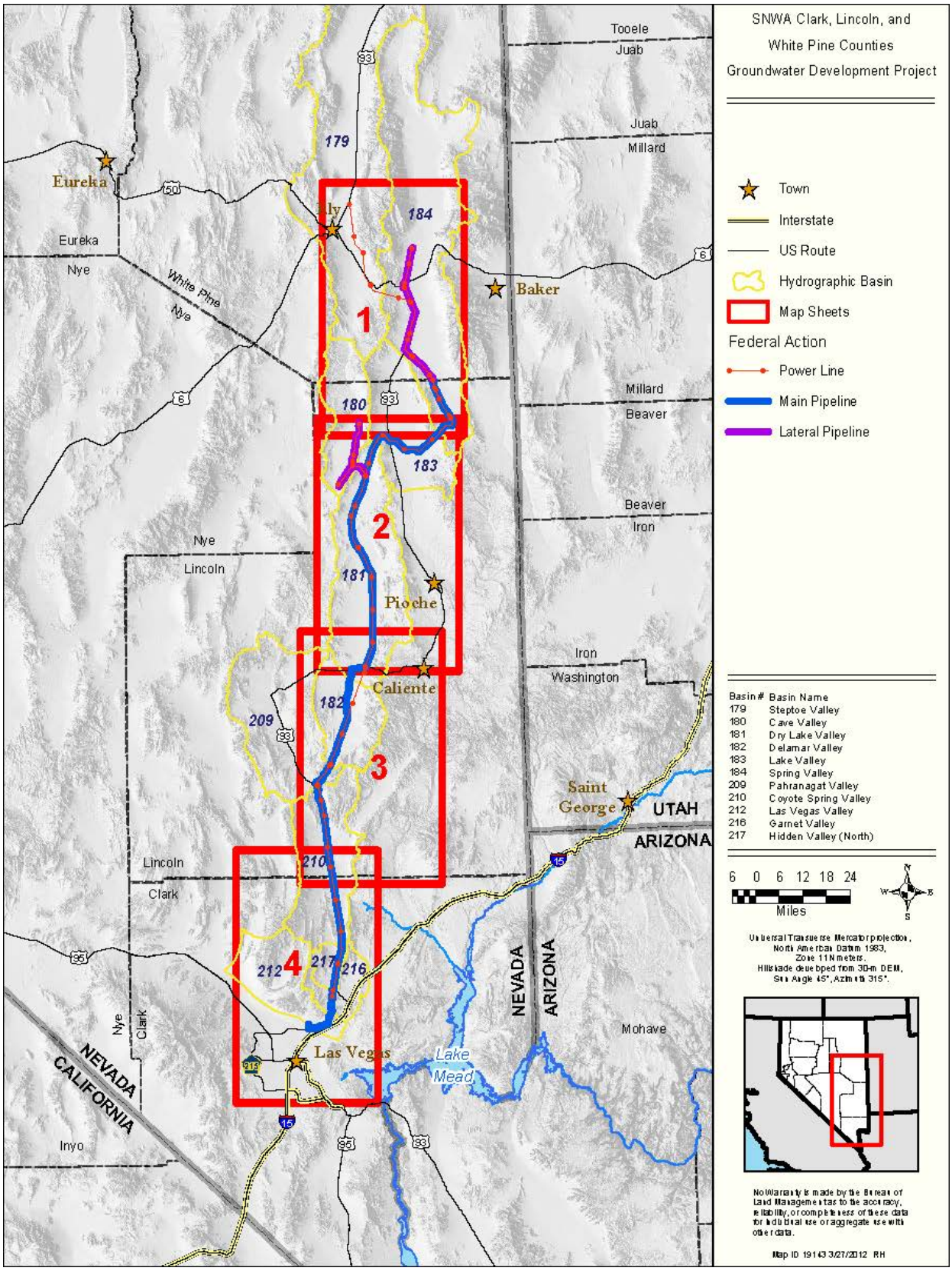

Figure 2-2 Tier 1 ROWs Key Map

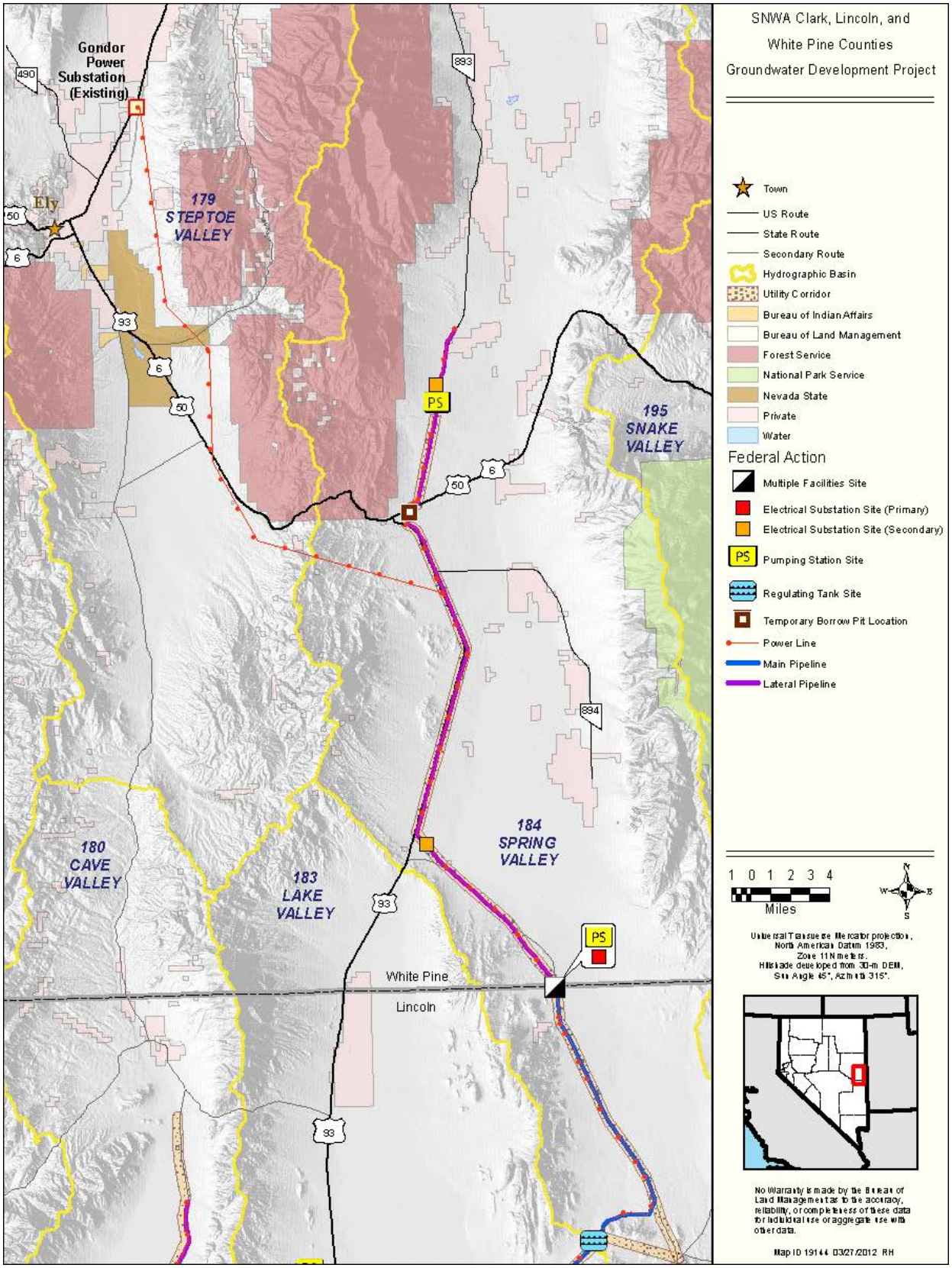

Figure 2-3 Tier 1 ROWs - Sheet 1 of 4

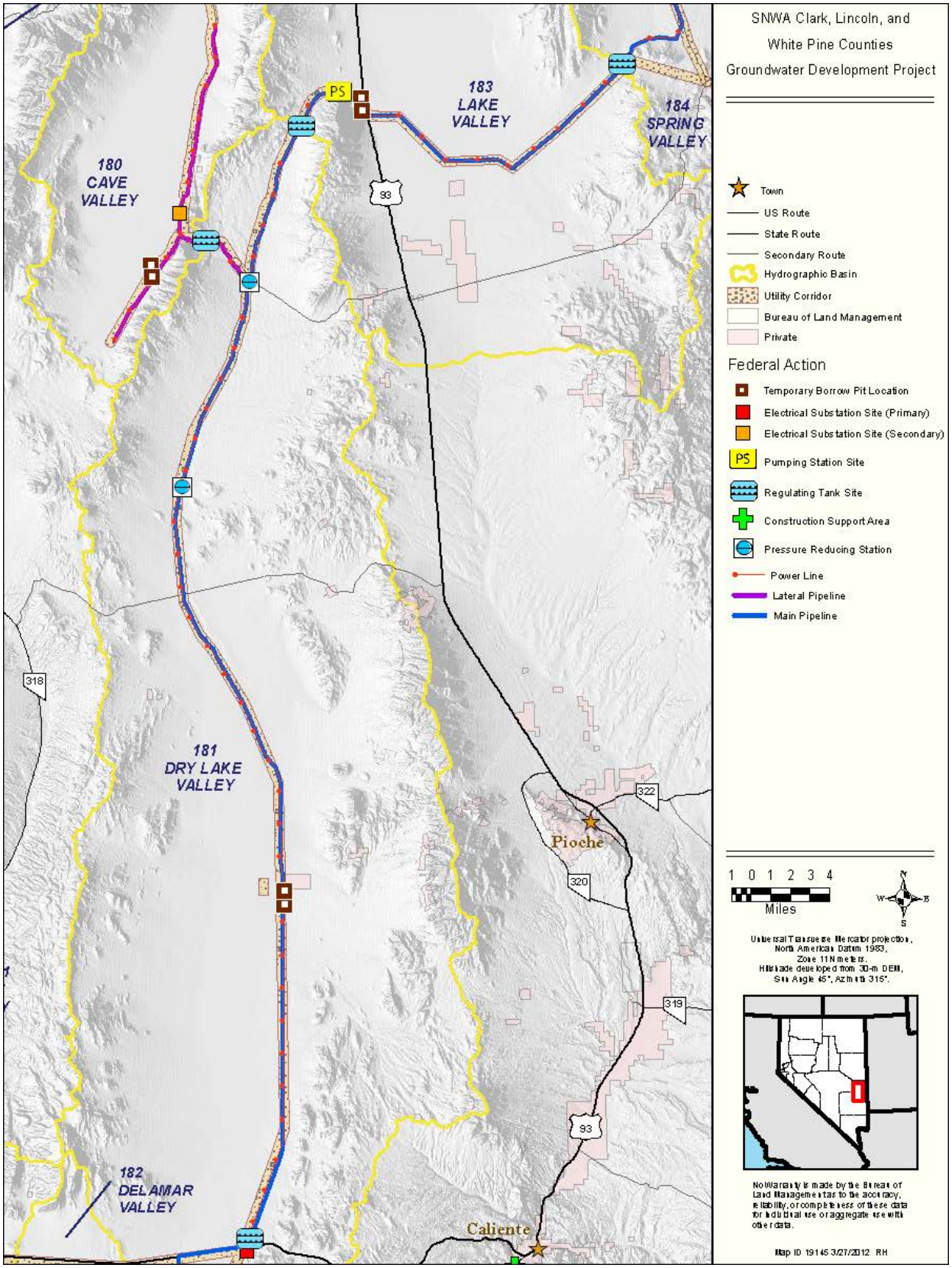

Figure 2-4 Tier 1 ROWs– Sheet 2 of 4

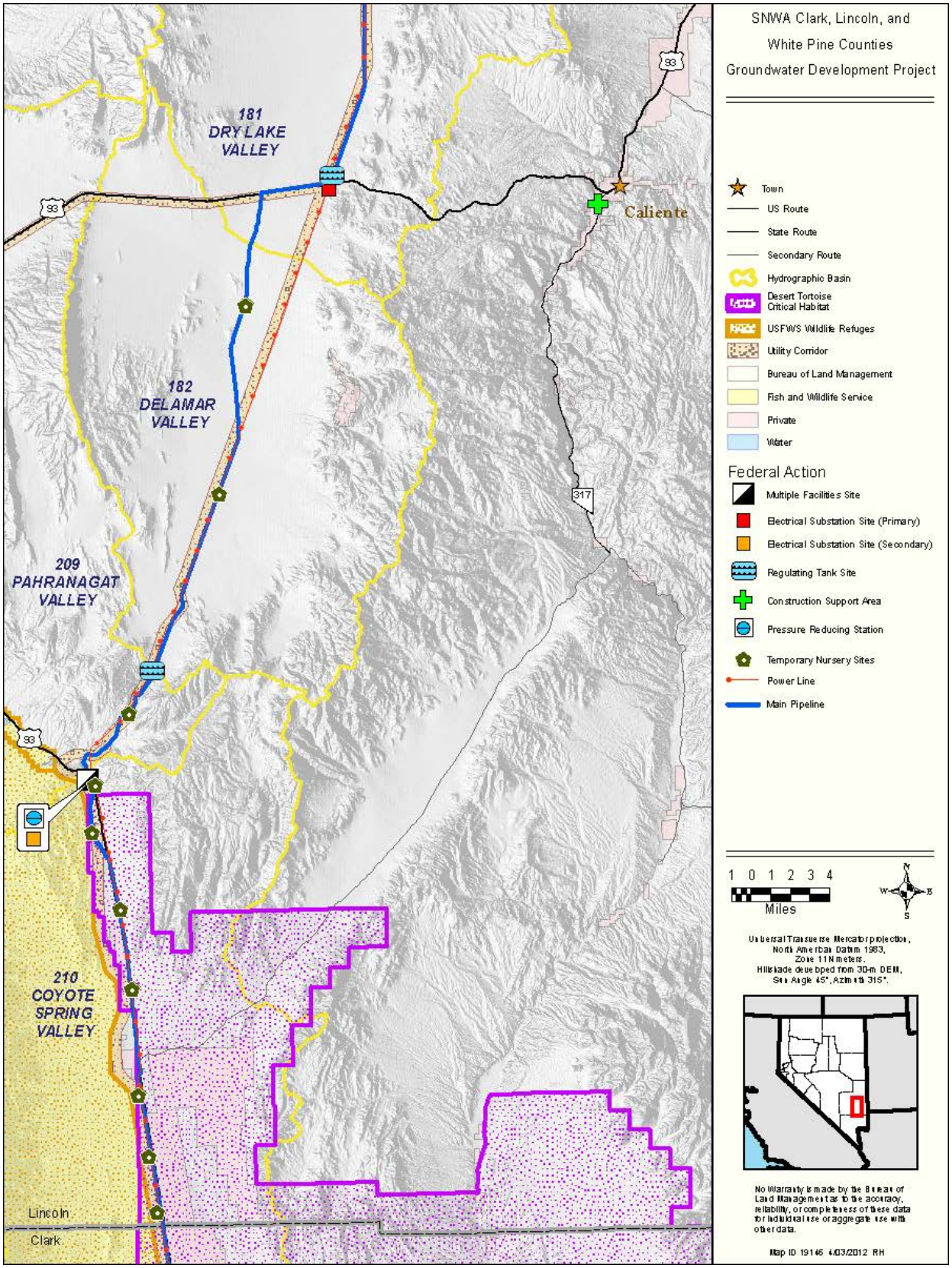

Figure 2-5 Tier 1 ROWs – Sheet 3 of 4

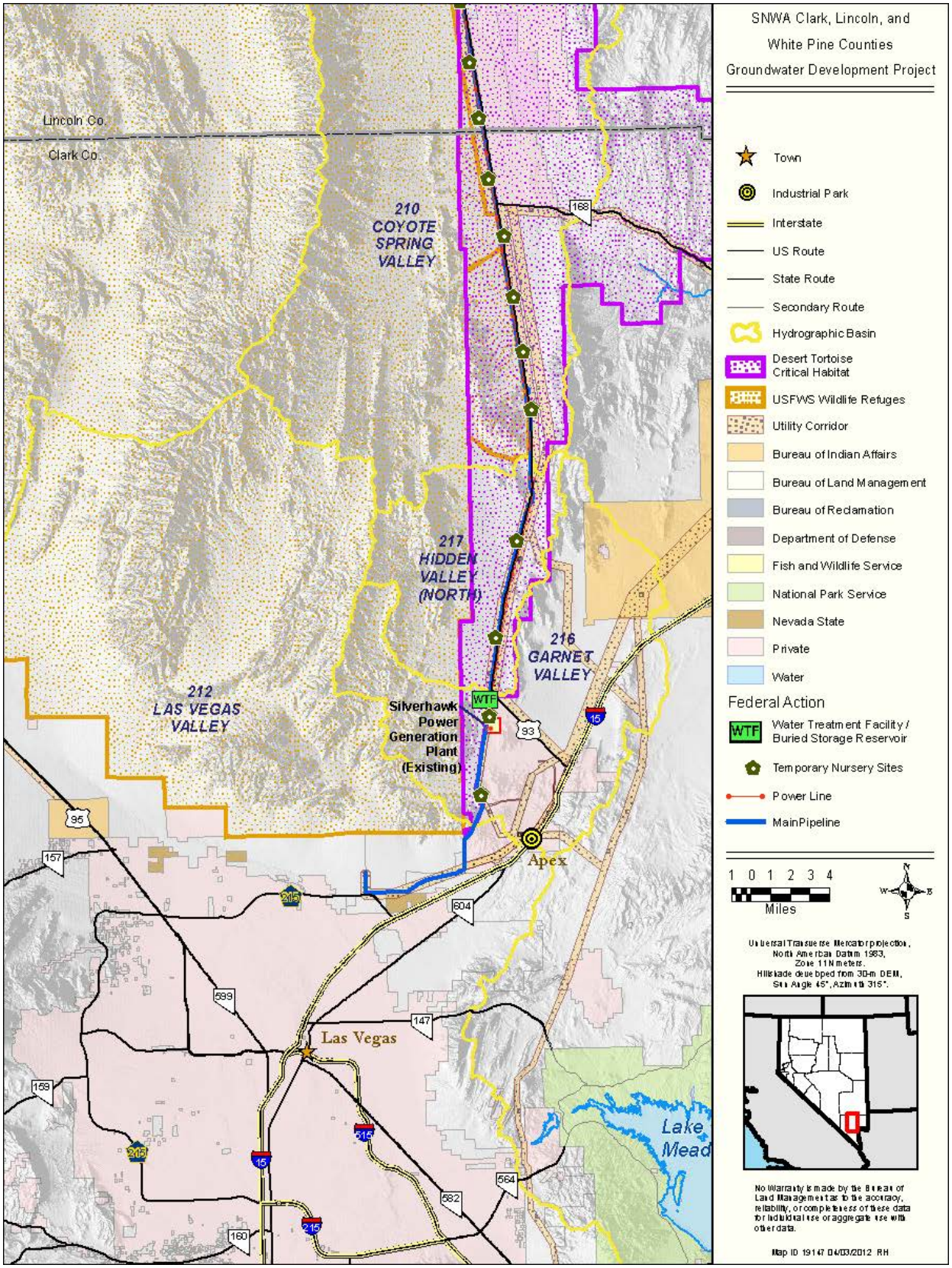

Figure 2-6 Tier 1 ROWs – Sheet 4 of 4

Table 2-2 Land Ownership for Tier 1 ROWs

	Operation (Permanent)		Construction (Temporary)	
	Acres	Percent of Total Acres	Acres	Percent of Total Acres
Bureau of Land Management	6,705	97.0	3,721	98.8
Nevada State	30	0.4	13	0.3
Private	179	2.6	33	0.9
TOTALS	**6,914**	**100**	**3,767**	**100**

The Tier 1 ROWs would include permanent (throughout operation) and temporary (during construction) uses. A permanent ROW is defined as an area of land on which permanent project facilities would be installed. A temporary ROW is defined as an area of land that is required for project construction purposes but then would revert to its previous use (i.e., no permanent facilities would be constructed on these areas).

2.1.1 Pipeline Conveyance System

A total of approximately 263 miles of buried main and lateral pipelines are part of the Federal action (**Figures 2-3 through 2-6**). **Table 2-3** lists anticipated pipeline lengths (by valley) and anticipated pipe diameters. The final diameters and lengths of the main and lateral pipelines will be determined during facility design based on detailed topography, appropriate friction coefficients, the need for operational flexibility, and the final locations of groundwater production well fields.

The main pipeline is anticipated to be between 54 and 84 inches in diameter, extending between southern Spring Valley (Hydrographic Area #184) and Las Vegas Valley. Lateral pipelines could be between 24 and 66 inches in diameter, and would extend into northern Spring and Cave valleys. All pipelines would be completely buried, with the exception of structures for air/vacuum valves, isolation valves, and drain valves, which might be partially buried or be installed with vents extending aboveground.

Air/vacuum valves are used to release air within the main and lateral pipelines and would be located at or near all high points, grade breaks on steep slopes, and long downward-sloping pipe segments. The valves would be housed in belowground or partially buried structures, with 12- to 24-inch gooseneck pipe extending approximately 2 to 3 feet above ground.

Isolation valves would be placed along the main and lateral pipelines and would stop the flow of water when in the closed position. These valves would be constructed belowground or would be partially buried, and they would be remotely monitored and controlled (Section 2.1.5).

Drain valves, used to drain the main and lateral pipelines, would be located at the lowest pipeline elevations in any segment. These valves would extend to a discharge location, such as a dry-wash channel, which typically would be lined with riprap to help avoid erosion. Valve location would be dependent upon elevation, and final locations would be determined during pipeline design after detailed topographic surveys have been completed. All valves would be located within the pipeline permanent ROW.

Table 2-3 Pipeline Characteristics

Pipeline	Valley	Pipe Diameter (inches)	Pipe Length* (miles)
Main	Spring	60-66	17
	Lake	54-66	21
	Dry Lake	54-78	66
	Delamar	60-78	23
	Pahranagat	42-72	7
	Coyote Spring	42-84	41
	Hidden (North)	66-78	12
	Garnet	60-78	7
	Las Vegas	60-78	9
Spring Lateral	Spring	42-66	38
Cave Lateral	Cave	16-30	19
	Dry Lake	16-30	3
TOTAL			**263**

*Pipe lengths are rounded to the nearest mile

There would be no permanent security fencing or other permanent access restrictions on the pipeline ROWs. Temporary security and environmental exclusion fencing would be used on pipeline segments during construction as needed.

A permanent 100-foot wide ROW plus an adjacent 100-foot wide temporary construction ROW would be required for the main and lateral pipelines. The preliminary ROW cross section, shown in **Figure 2-7**, is representative of contiguous pipeline and power line ROWs, which occur throughout the majority of the alignment.

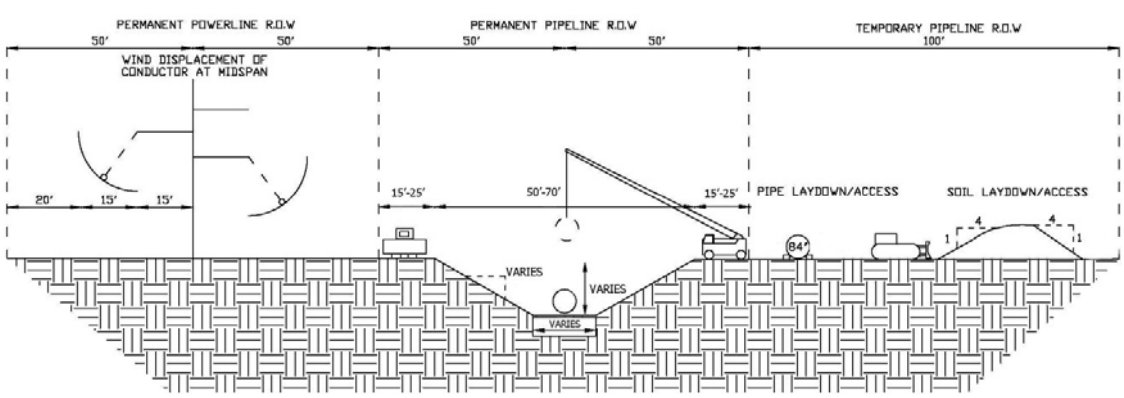

Figure 2-7 Preliminary Pipeline and Power Line ROW Cross Section *for a 84-inch Pipe*

The 100-foot wide permanent ROW for the main pipeline would accommodate a 50- to 70-foot-wide trench at the ground surface, with a slope of up to 2:1 and a depth of at least 6 feet from the ground surface to the top of the pipe. For an 84-inch pipe, this would result in a trench at least

14 feet deep. The remaining permanent and temporary ROWs would be used for excavated material storage, pipe storage before installation, movement of heavy equipment, and safe personnel workspace.

Pipeline construction also would require the following temporary construction areas:

- **Staging Areas**: These areas would be used for equipment and materials storage, construction office trailers, fuel storage, equipment maintenance, and temporary stockpiling. Temporary security fencing might be used to enclose staging areas during construction. Staging areas of 3 acres would be placed approximately every 3 miles along the pipeline ROW.
- **Caliente Construction Support Area:** This area would be used for pipe and equipment storage, temporary construction management offices, and other support activities (**Figure 2-5**). Some or all of the pipe required for construction would be fabricated at one or more existing manufacturing plants in the western U.S. and delivered by rail or truck either directly to the pipeline ROW or to the construction support area for temporary storage.
- **Temporary Plant Nursery Sites:** There are 19 nursery sites located along the pipeline alignment within Las Vegas, Garnet, Hidden (North), Coyote Spring, Pahranagat, and Delamar valleys (**Figures 2-5 and 2-6**). These sites range in size from 2 acres to 50 acres and would be used for storing cacti, yuccas, and other plants that might be salvaged from within the ROW for use in post-construction restoration.
- **Borrow Pits:** These sites would provide soil materials for bedding and backfilling of pipeline where existing soils are unsuitable. Seven potentially suitable sites have been identified (**Figures 2-3 and 2-4**). Each borrow pit is approximately 7 acres in size. Approximately half of the space would be used for the borrow pit, and the other half for processing equipment, stockpiles for processed material, and transport equipment. Each borrow pit may be excavated to a depth of approximately 15 feet. Approximately 18 million cubic feet of borrow material is anticipated to be removed from all eight pits combined if they are excavated to maximum proposed capacity. The borrow pits would be refilled with excess soils from excavated pipe trenches that are unsuitable for pipeline backfill.

Temporary construction camps may be needed for temporary housing of construction workers, depending upon construction contract phasing. The size, number, location, and amenities of the temporary camps cannot be determined until facilities are designed and a detailed construction schedule is determined. The need for temporary camps also would vary depending upon the availability of lodging and support services in nearby communities. However, it is anticipated that any camps would be located on previously disturbed private lands in and near existing communities, likely in central Lincoln County (not within desert tortoise habitat).

2.1.2 Power Transmission Facilities

There are currently no existing electrical power transmission or distribution lines within the area of the Federal action that would be sufficient to meet the needs of the GWD Project. A new 500-kV electrical transmission line (ON Line Transmission Project) is currently being constructed along the southern portion of the GWD Project alignment. However, co-location of power facilities with the ON Line Project would not be feasible because: (1) the ON Line Project does not follow the entire GWD Project power line route; (2) the ON Line Project is a high-voltage 500-kV line, with longer power pole span distances than could be used for the lower voltage being conveyed by the GWD Project (500-kV power lines require an average span of 900 to 1,600 feet); and (3) the ON Line Project's tower structures have already been designed

and are already being constructed for a 500-kV circuit, and adding other circuits after the structures have been built could affect the integrity of the structures. Therefore, construction of a separate transmission power line is identified as part of the Federal action for Tier 1. The power line would begin in the south at the Silverhawk Generating Station in the Apex Industrial Park in Garnet Valley, and would tie into the Gonder Substation in Steptoe Valley near Ely (**Figures 2-2 through 2-6**).

Construction of new power generation facilities would not be required for the Federal action. SNWA plans to obtain power from the Silverhawk Generating Station, an existing, clean-burning natural gas-fueled power plant operated by NV Energy, of which SNWA owns a 25 percent share. It is anticipated that approximately 97 megawatts or less would be necessary for operation of the Federal action, and the Silverhawk Generating Station can produce in excess of 500 megawatts. Connecting to the existing Gonder Substation (owned by Mount Wheeler Power) at the northern end of the project would provide improved reliability for system operations.

2.1.2.1 Power Lines

Power lines would include 230-kV, 69-kV, and 25-kV conductors (electrical wires). Wherever possible, multiple conductors would be strung on the same power pole. **Table 2-4** summarizes anticipated power line lengths. The 230-kV power poles would be single, steel power poles. These poles would be approximately 100 feet in height and spaced approximately 800 feet apart, depending on the terrain. The 69-kV power poles would be single, steel poles. These poles would be approximately 60 feet in height and spaced approximately 600 feet apart, depending on the terrain. The 25-kV power poles would be single, wooden poles. These poles would be approximately 50 feet in height and spaced approximately 500 feet apart, depending on terrain.

Table 2-4 Power Lines

Power Line Conductor Voltages	Total Miles
230-kV Power Line	100
25-kV Power Line	21
230-kV Power Line with 69-kV and 25-kV Underhang	46
230-kV Power Line with 69-kV Underhang	97
69-kV Power Line with 25-kV Underhang	16
TOTAL	**280**

Perch-discouraging devices will be installed on new power poles in areas identified by the BLM and USFWS as having increased predation risk to special status species from perching raptors and Corvids (birds of the crow family). Perch-discouraging devices manage where the birds perch but cannot entirely prevent perching. The 230-kV pole conductor support design discourages birds from flying between the conductors, and prevents bird injury. The proposed power lines will also be designed to be Avian Power Line Interaction Committee (APLIC) compliant. Based on APLIC recommendations, revised in 2006, adequate spacing between conductors is 8 feet or greater based on the wingspan of the female golden eagle (APLIC, 2006).

The permanent ROWs needed for the 230-kV or 69-kV power poles are 100 feet wide (**Figure 2-7**). This width is required for safety considerations to allow for displacement of the

conductors. Only a portion of the permanent ROWs would be disturbed for installation of power poles and access spur roads, where needed. The permanent ROWs needed for 25-kV power poles are 50 feet wide. Temporary ROWs for the power lines are not required because the permanent ROWs are sufficient for construction needs.

2.1.2.2 Electrical Substations

Two new primary electrical substations and four secondary electrical substations (**Table 2-5**) are required to reduce electrical voltage from the higher levels needed for long-distance conveyance down to the lower levels appropriate for operational needs. A primary substation would reduce power from 230 kV to 69 kV, and a secondary substation would further reduce power to 25 kV. Additional facility substations beyond those identified below could be located within facility sites (e.g., pumping stations, water treatment facility) to reduce power to operational levels.

Primary electrical substations require 10 acres of land, and secondary substations require 1 acre. Temporary ROWs would not be required for construction of the substations.

Table 2-5 Electrical Substations

Facility	Location
Primary Electrical Substations	Spring Valley South (this substation will be located entirely within the ROW of the Spring Valley South Pumping Station site)
	Southern Dry Lake Valley
Secondary Electrical Substations	Spring Valley North
	Spring Valley South (approximately 10 miles north of Spring Valley South Primary Electrical Substation)
	Cave Valley
	Coyote Spring Valley (this substation will be located entirely within the ROW of the Coyote Spring Valley Pressure Reduction site)

Note: See **Figures 2-3** through **2-5**

2.1.3 Other Ancillary Facilities

Ancillary facilities required include pumping stations, regulating tanks, pressure-reducing stations, a water treatment facility and buried storage reservoir, access roads, and communications facilities.

2.1.3.1 Pumping Stations

Three pumping stations would be required to move water across elevation grade changes: Spring Valley North, Spring Valley South, and Lake Valley (**Figure 2-3**). All pumping stations would be located adjacent to a main or lateral pipeline and would include:

- Utility building;
- Pumps and motors;
- Forebay (surge facility or water storage tank);

- Surge-control system;
- Instrumentation and control systems;
- Electrical facilities, including switchgear, transformers, motor-control centers, local control panels, lighting, and standby diesel generators with fuel storage tanks;
- Mechanical systems, including heating, ventilation, air conditioning, plumbing, hoists, cranes, and compressors;
- Chemical addition facilities, where needed;
- Facility electrical substation;
- Break room and restroom, with associated septic tank and leach field; and
- Site fencing and security provisions.

Pumping stations would be contained in a concrete or concrete-block building. The approximate heights of the buildings would vary between 24 and 40 feet above grade, depending on conditions such as terrain, pump size, and other environmental and equipment requirements. The sites would be partially paved, and non-paved areas would be covered with crushed gravel. Security fencing with a locked gate would enclose each site.

Each pumping station would include a diesel-powered standby generator large enough to operate one of the pumps for periods of up to 72 hours to maintain pressures in the event of a power outage. A diesel fuel storage tank for generator operation would be located aboveground at each site. The tank would meet current regulatory requirements for containment and would be equipped with monitoring equipment for leak detection.

The Spring Valley South Pumping Station would require a 60-acre permanent ROW (encompassing the 10-acre Spring Valley South Primary Electrical Substation). Temporary ROWs would not be required because sufficient on-site space exists for construction. The Spring Valley North and Lake Valley pumping stations would each require 5 acres of permanent ROW and 5 acres of temporary ROW.

2.1.3.2 Regulating Tanks

Five regulating tanks would be constructed to regulate water flow through the pipeline in the Spring, Lake, Cave, Dry Lake, and Delamar valleys (**Figures 2-4** and **2-5**). The main features at each site would be a tank, rate-of-flow control structure, and retention basin.

- The steel or concrete tanks typically are cylindrical and could be between 130 and 200 feet in diameter and 30 to 35 feet in height.
- The rate-of-flow control structure automatically would regulate flow into the tank and keep it from overflowing.
- The control structure would consist of water flow meter and valves that automatically reduce pressure and control flow.
- The valves and piping would be housed in a buried or partially buried concrete structure.
- The retention basin would be sized to contain emergency overflow in case of equipment malfunction.
- Inlet and outlet piping would connect to the pipelines and regulating tank features.
- Sites would be covered by crushed gravel for dust control, and security fencing with a locked gate would enclose each site.

The regulating tank sites in the Spring, Lake, and Cave valleys each would require 2 acres of permanent ROW and 3 acres of temporary ROW. The sites in the Dry Lake and Delamar valleys

would require 5 acres of permanent ROW because larger tanks and retention basins might be required for surge control in those areas. Additional temporary ROWs should not be required at the Dry Lake Valley and Delamar Valley sites.

2.1.3.3 Pressure-Reducing Stations

Three pressure-reducing stations would be required to reduce pressures and control flow within the pipeline as water moves from higher to lower elevations. Two stations would be located in Dry Lake Valley (**Figure 2-4**), and one would be located in northern Coyote Spring Valley (**Figure 2-5**). These facilities would maintain water pressures to the design limits within the pipelines and facilities and would mitigate the potential for pipeline rupture caused by excessive water pressure.

- These facilities would include isolation valves, pressure-reducing valves, storage tanks, and overflow basins.
- The valves would be located in a below-ground vault.
- The storage tanks would provide a discharge point for the valves to dissipate high pressures, regulation for valve opening and closing, and surge protection.
- The Coyote Spring Valley site would be occupied by three water storage tanks, as well as the 1-acre Coyote Spring Valley secondary electrical substation and maintenance building.
- Each Dry Lake Valley pressure-reducing station would require a 2-acre permanent ROW and 5-acre temporary ROW.
- The Coyote Spring Valley pressure reducing station, which has additional tanks and other facilities, would require a 7-acre permanent ROW and a 6-acre temporary ROW.

2.1.3.4 Water Treatment Facility/Buried Storage Reservoir

A water treatment facility and buried storage reservoir would be constructed in Garnet Valley (**Figure 2-6**). This location would allow treatment of the water to drinking water standards before the water enters SNWA's potable (drinking) water system via gravity flow. On-site facilities would include:

- Chemical building;
- Operations building;
- Energy dissipater;
- Rate-of-flow control structure;
- Buried storage reservoir;
- Warehouse; and
- Outdoor storage yard.

The maximum building height is anticipated to be approximately 20 to 30 feet to allow for chemical storage and overhead cranes. The sites would be partially paved, and non-paved areas would be covered with crushed gravel. The sites would be surrounded by security fencing with locked gates.

Treatment processes are anticipated to include the addition of a disinfectant (sodium hypochlorite or chlorine), corrosion inhibitor (zinc orthophosphate), and fluoride (hydrofluorosilicic acid). These treatments would be accomplished by direct injection into the main pipeline. If necessary, other treatment (e.g., arsenic removal) may be added at the water treatment facility. Until the production wells are drilled and their water quality determined, the specific treatment processes cannot be determined. Chemicals required for water treatment

would be stored in isolated tanks, either above or below ground level, in designated areas inside the chemical building. Spill containment would be provided as required by Federal, state, and local regulations. The capacity of the water treatment facility could be as much as 110 million gallons per day.

The buried storage reservoir would be a 40-million-gallon, belowground, covered concrete tank. This tank would be used to manage flow and delivery of the treated water before it enters SNWA's existing water system.

A permanent ROW of 75 acres would be required for the water treatment facility and buried storage reservoir. Additional temporary ROWs for construction would not be required.

2.1.3.5 Access Roads

Access to facilities would be required for both construction and operation. The majority of the pipeline and power line alignments are sited along or adjacent to existing roads, including paved highways and improved and unimproved dirt roads. Existing roads within the pipeline ROW would be used or improved, as necessary.

Short segments of unimproved spur roads from the primary access roads also would be required to access power pole sites. These spur road segments would be identified during design when individual pole sites are selected, and would be created by drive and crush as much as feasible.

The primary access roads would be constructed within the pipeline ROW and used for transport of equipment, materials, and personnel during construction. Access roads would be prepared at the beginning of construction, by grading, installing culverts and graveling (for improved roads). Following completion of construction, the access roads would remain for facility inspections and operations access.

At the completion of construction, asphalt paving would be installed on three road segments to allow for operational access between Highway 93 and the Spring Valley South Pumping Station, Lake Valley Pumping Station, and the water treatment facility/buried storage reservoir. The reasons for paving these three road segments are to better control dust due to frequent trips to these facilities, for delivery of maintenance and repair materials that may require heavy trucks that could deteriorate unpaved roads, and to ensure safer surface for drivers. The width of the paved and improved roads would be approximately 20 to 26 feet to allow for two lanes of traffic. Unimproved roads would be used only for power line construction and would be graded dirt roads approximately 12 feet wide. The paved road segment to the water treatment facility/buried storage reservoir would have tortoise exclusion fencing installed on each side from Highway 93 to the water treatment facility/buried storage reservoir site.

Because the access roads would be within the pipeline and power line ROWs, additional ROWs for access roads are not required, with two exceptions. For approximately 14 miles in southern Dry Lake and northern Delamar Valley, where the pipeline and power line are not contiguous, access to the power line ROW would use North and South Poleline Road. For approximately 14 miles from the Gonder Substation, the power line would use an existing adjacent power line access road. For both of these road segments, SNWA has requested a 20-foot wide permanent ROW to allow for leveling of deep ruts and minor grading, if needed.

Where the ROW parallels but would not encompass other existing access roads, SNWA would coordinate with the BLM prior to construction to determine which roads should be reclaimed.

Permanent access would be required along the entire ROW, but this access could be accomplished by using the improved access roads developed for construction within the ROW or other adjacent access roads, if available.

In addition to using the ROW access roads (both new and upgraded), construction access for personnel and material deliveries would use existing roads and highways. These include Interstate 15; U.S. Highways 93, 6, and 50; and Nevada State Highways 168, 317, 318, 319, 320, 893, 894, and 487. Several unpaved roads currently are maintained by Lincoln and White Pine counties also might be used:

- Cave Valley Road (from Ely into Cave Valley);
- Atlanta Road (from U.S. 93 to the pipeline alignment in Spring Valley);
- Stampede Road (from Pioche to the pipeline alignment in Dry Lake Valley);
- Pan American/Ely Springs Road (from Pioche to the pipeline alignment in Dry Lake Valley); and,
- Turtle Walk (from Alamo to the pipeline alignment in Delamar Valley).

Beyond normal county maintenance activities, upgrades to these roads are not anticipated, so additional ROWs would not be required.

2.1.3.6 Communications Facilities

Communications facilities would be installed concurrently with other project facilities for system operation and control, data collection, communication, and security surveillance. Communication requirements would be met through the use of fiber optics, radio systems, and possibly cellular communications equipment installed at facility sites.

Conduits for fiber-optic cables would be installed along with the pipelines. The fiber-optic cables would be installed underground, in either the pipeline trench or buried along an adjacent access road, and would be contained within the requested ROW. No additional ROW would be required.

Facility sites also may encompass radio communication facilities. Radio communication facilities include non-licensed, broad-spectrum radio to communicate between the facility and nearby wells. A radio antenna as high as 20 feet may be mounted on top of buildings or tanks on facility sites for relay of operation information from the well sites, if fiber optics facilities are not available. No additional permanent or temporary ROW would be required.

2.1.4 Construction Procedures

Standard construction techniques would be used for construction. The general construction methods and procedures are described below. The construction contracting breakdown (i.e., number of construction contracts and sequencing) will be identified during project design.

2.1.4.1 Standard Construction Methods

Some construction methods are common for all facilities. These are briefly described below.

Surveying and Staking

Prior to ground-disturbance activities, SNWA would survey and stake the ROW boundaries. In addition, environmental features requiring avoidance such as sensitive plant populations, cultural sites, or other sensitive areas would be staked and fenced as necessary, in accordance with

approved environmental measures and Federal and state environmental conditions and stipulations. Existing utility lines, culverts, and other existing features would be staked to prevent inadvertent damage during construction.

Clearing and Grading

Clearing would occur within the staked boundaries of the permanent and temporary ROWs. Clearing would include removal of materials that would interfere with construction activities, create hazards or unsafe conditions, or impair subsequent site work.

After plant salvage, topsoil would be salvaged from the ROW, except in areas where the ground would be disturbed only by driving and crushing. The top 4 inches of topsoil and remaining plant material would be windrowed along the edge of the ROW or placed in stockpiles no greater than 6 feet in height.

Following topsoil salvage, the ROW would be grubbed by removing a deep surface layer that includes stumps and roots. It would be graded as necessary to provide a level working surface for the heavy construction equipment. Grading of the ROW would most likely be conducted by a bulldozer or track hoe.

After site clearing and grading, berms and drainage ditches would be constructed to contain runoff and divert floodwaters from the construction area. The berms and ditches would be incorporated into the final grading of the facility sites, if feasible.

Site Fencing

Temporary security fencing would enclose facility construction sites (pumping stations, regulating tanks, buried storage reservoir, water treatment facility, electrical substations, and pressure-reducing stations) and temporary ROW or staging areas where materials or equipment are stored (including plant nurseries). Permanent site-security fencing would be installed around facility sites. The temporary and permanent security fencing would consist of standard 6- to 8-foot high chain-link fencing. There would not be any permanent fencing along the pipeline.

Temporary tortoise-exclusion fencing would be used in the portion of the project within desert tortoise habitat as needed. Permanent tortoise exclusion fencing would be installed along with site security fencing around aboveground facility sites within desert tortoise habitat. Temporary orange plastic snow fencing would be used to delineate construction areas not enclosed by other fencing. This will provide construction site visibility for public safety, and also will ensure construction activities stay within the authorized ROW.

Temporary wildlife fencing may be installed along segments of open trench in areas of seasonal big game movement, as coordinated with BLM and Nevada Department of Wildlife (NDOW).

Site Access

In areas where road improvements are necessary to accommodate construction traffic, the improvements would be constructed at the beginning of construction activities. Road improvements within the ROW may include grading, installation of culverts, and placement of crushed rock or other stabilization.

At the completion of construction, previously existing access roads will be restored to pre-construction conditions or better. Beneficial improvements added as part of construction, such

as culverts, may be left in place. The final width of unimproved roads would be 12 feet; improved roads would be 20 to 26 feet.

Materials Storage

The temporary staging areas and portions of the temporary ROW would be used for storage of construction equipment and building materials. Building materials may include, but are not limited to, sections of pipe, pumps, motors, concrete block, cement, reinforcing steel bars (rebar), and fill material. Smaller items such as tools, lighting fixtures, and instruments would be stored in enclosed, portable storage units. Fuel for construction equipment and water for dust control and construction uses would also be stored at the sites according to Federal, state, and local rules and regulations.

The storage areas would be fenced to secure the equipment and materials, and security at the site will be provided as necessary.

Sanitation, Water, and Power

Sanitary facilities and potable water storage would be provided for construction personnel. These facilities would consist of portable units.

Water would be required for construction activities, including dust control, pipe bedding, trench backfill compaction, and hydrostatic testing. SNWA has assumed that this water would be obtained from existing wells or exploratory wells that are available at the time of construction. A construction water supply well would be needed approximately every 10 miles along the pipeline alignment, and would need to be capable of a peak rate of 800 gallons per minute. It is estimated that between 5.5 and 8.7 million gallons of construction water would be needed for every mile of pipeline, with less water needed for dust control in wet winter conditions. SNWA anticipates that existing and future exploratory wells capable of that peak rate would likely be sufficiently available. If needed, additional temporary construction water wells would be drilled within the construction staging areas. Additional ROWs or other water supplies for construction water would not be needed.

Temporary power supply would also be required during construction at some locations, including construction office trailers, pumping station and other facility sites, and the Caliente construction support area. Electrical power would be provided by portable generators, the project electrical system, or commercial power if available. If commercial power is available, it is anticipated that temporary connections would be arranged by the individual construction contractors, within the ROW. Temporary connections may be to existing regional electrical power lines operated by the following companies: NV Energy, Inc., Lincoln County Power District, and/or Mount Wheeler Electric Company.

2.1.4.2 Pipeline Construction

Construction of the pipeline would be standard cut and cover, using an open trench. The only exceptions would be short segments of tunneling in areas of difficult topography and jack-and-bore crossings of highways and the existing Kern River natural gas pipeline.

In addition to the measures described above, the following general construction techniques would apply to pipeline construction.

Trenching

Excavators, backhoes, track hoes, or other similar equipment would be used to dig the trench. As shown on **Figure 2-7**, the pipe trench top width would normally vary from 50 to 70 feet wide, with side slopes from 0.75:1 to 2:1. This cross section may vary depending upon topography, soils, pipe diameter, or other site-specific conditions. The depth from the ground surface to the top of the pipe would be a minimum of 6 feet. Material excavated from the trench would be stockpiled adjacent to the trench.

In Pahranagat Canyon, or other areas where construction excavation may be limited due to topographic constraints, the narrow construction area may require trench boxing or other engineered trench support systems, in compliance with Occupational Safety and Health Administration (OSHA) standards.

The length of open trench segments would be managed to minimize the duration of construction disturbance. Longer stretches of open trench may be needed in some areas to keep the construction period shorter. It is not anticipated that more than 2.5 miles of individual trench segments would be open at any time.

Bedding

Engineered bedding materials would be laid in the bottom of the pipeline trench eventually extending approximately 12 inches above the invert of the pipe. These bedding materials may consist of screened or otherwise processed excavated materials or materials imported from borrow pits. Alternatively, bedding materials may be a cement-based controlled low-strength material.

Pipe Laying and Welding

Pipe sections would be transported to the construction site via truck and strung along the trench. The pipe sections would be lowered into the trench and the sections welded together. Welds would be visually inspected and tested using approved non-destructive testing methods. Welds that do not meet established specifications would be repaired or removed. Once the welds are approved, the welded joints would be tape wrapped and then mortar coated. Wrapped and coated joints would be inspected for faults or voids in the coating. Next, appurtenant structures would be affixed to the pipe.

Upper Pipe Zone Backfilling

After the pipe and bedding material have been placed in the trench, the area immediately around the upper sides of the pipe to not less than 12 inches above the top of the pipe (pipe zone) would be backfilled and compacted. Materials used for backfill would include controlled low-strength material, excavated soils, or materials imported from borrow pits that have been screened or otherwise processed. The backfill material would be crushed rock, gravel, and/or sand up to 3/8 inches in diameter.

Trench Backfill

After upper pipe zone backfilling, the remainder of the trench would be backfilled to approximately finished grade using a back hoe, track hoe, bulldozer, or similar equipment. Material that is 6 inches in diameter or less would be used as backfill. Trench backfill would meet best management practices, and be:

- Selected or processed to be clean, well-graded earth material;
- Free of excessive fine particles, vegetation, or other deleterious materials;
- Compacted in place for maximum pipeline stability; and
- Moistened or dried before backfilling to ensure optimum moisture content.

Excess soils not placed in borrow pits would be evenly distributed over the ROW. It is preliminarily estimated that the pipeline excavation would generate approximately 46 million cubic feet of soil materials. Following pipeline installation and backfill, it is estimated that re-spreading of excavated soils across the ROW could add approximately 2 to 3 inches to the ground surface. The ground surface would be graded as close as possible to pre-existing contours and to blend with adjacent land surfaces, and this increase is not anticipated to be discernable. Following grading of the ROW, vegetation restoration would be conducted in accordance with an approved Restoration Plan.

Hydrostatic Testing

Hydrostatic testing would need to be conducted to pressure test the completed pipeline. The testing would be conducted in segments, when major portions of the pipeline are completed. Water used for the hydrostatic testing is anticipated to be obtained from existing groundwater wells or other permitted sources.

Water from hydrostatic testing of individual pipeline segments would either be released into a downstream pipeline segment for continued hydrostatic testing or would be discharged through a drain valve into adjacent dry washes where the water would eventually percolate into the ground surface. Discharges into dry washes would be conducted in accordance with requirements of a State of Nevada temporary discharge permit. A diffuser or similar device would be used to reduce the potential of discharges to erode and scour dry washes. Until facility design is completed and construction phasing is determined, the specific discharge locations cannot be determined. A detailed hydrostatic testing discharge plan will be prepared and approved by the BLM prior to conducting the testing.

Hydrostatic testing for the southern portion of the project, between the Delamar regulating tank and the pipeline terminus, is anticipated to be conducted in two segments to save water and minimize the need for discharge. The first would be between the Delamar regulating tank and the buried storage reservoir, and the second would be between the buried storage reservoir and the pipeline terminus. The water used for the testing could be discharged at either the buried storage reservoir site or the terminus. If possible, the hydrostatic testing would be managed to reuse water from testing of the first segment for the second segment, thereby avoiding the need for discharge at the buried storage reservoir. Discharge at the terminus would likely be into the existing storm drain system.

Hydrostatic testing for the northern portion of the project, from the Delamar regulating tank northward, would also be conducted in segments to minimize discharges. Specific potential discharge locations cannot yet be identified, but hydrostatic testing would likely be managed by major pipeline components, as identified on the project schedule. Discharges would likely be into adjacent dry washes, where the water would eventually percolate into the ground. Because the specific discharge locations and rate and quantity of water cannot yet be determined, the areal extent and duration of water in these dry washes cannot be estimated. ACM (Section 2.2.7 and Section 6.0) will be implemented to avoid impacts to special status species or nesting migratory birds.

Special Pipeline Construction Techniques

In some areas, special pipeline construction techniques may be necessary. These are described below.

Highway and Road Crossings

The pipeline would cross U.S. Highways 93, 50, and 50/6. Jack-and-bore construction is anticipated for crossing the U.S. Highways, and may also be used to cross Nevada State Highways 894, 487, and 215 depending on Nevada Department of Transportation requirements. Jack-and-bore construction is a method for installing a casing below grade to carry the pipeline without trenching. A jack-and-bore pit approximately 100 feet long by 20 feet wide would be placed on one side of the highway (within the requested temporary or permanent ROWs) in which the boring equipment would operate. Minimum depth to the top of the pipe under highways would be 6 feet.

Standard cut and cover using an open trench would be used on all other minor paved and unpaved roads crossed by the pipeline. Open trench crossings would include establishing detours for temporary closing of roads. If no reasonable detour is feasible, at least one lane of the road being crossed would be kept open for traffic, except during brief periods when it is essential to close the entire road to install the pipe. Most trench crossings would be completed in one day.

Utility and Other Crossings

The pipeline crosses the Kern River natural gas pipeline in two places near Apex, in northeastern Clark County. Crossings would be done by jacking and boring, as described above.

There are no current railroads crossed by the pipeline.

Steep Terrain

There are areas of steep terrain along the pipeline route in the Pahranagat Canyon area. The excavated construction area may be narrowed through this stretch, and trench boxes or other structural trench support measures may be used, in compliance with OSHA standards. Other short areas of jack and bore may be needed where the pipe depth would be over 40 feet due to topography and need to maintain an adequate hydraulic profile.

Water and Wetland Crossings

There are no perennial streams that would be crossed by the pipeline. There are 117 ephemeral washes identified under USACE jurisdiction that would be crossed, impacting a total of 4.31 acres. Any disturbance of streams or wetlands would require subsequent restoration in accordance with the approved GWD Project Restoration Plan and USACE Section 404 permit requirements, as applicable.

Many desert washes and ephemeral drainages occur along the pipeline route. These washes would be crossed with typical cut and cover, open trench techniques. Erosion control measures would be implemented during and after construction to eliminate bank erosion and prevent sedimentation, in accordance with a state-approved Stormwater Pollution Prevention Plan. SNWA will also obtain a Section 404 permit and Section 401 Water Quality Certification per the requirements of the Clean Water Act of 1972 (33 U.S.C. §§ 1344 and 1341, respectively), and will comply with all permit stipulations regarding erosion control measures.

Blasting

Blasting may be necessary if caliche (a hardened deposit of calcium carbonate), or large boulders are encountered during excavation activities. There are four potential areas that may require blasting due to visible rock along the alignment. These areas include: Pahranagat Canyon (between the Coyote Spring Valley Pressure Reducing Station and the Delamar Regulating Tank); where the pipeline crosses over US 93 in the southern portion of Coyote Spring Valley to avoid hills on the west side of US 93; where the pipeline crosses over US 93 in Hidden Valley (North) to avoid hills on the west side of US 93; and along the west side of Apex Industrial Park from the water treatment facility in Garnet Valley to the southwestern corner of Apex Industrial Park in Las Vegas Valley. However, until detailed geotechnical investigations and pipeline design are completed, it is not known if any blasting would be required. If blasting is required, a Blasting Plan would be prepared and submitted for BLM approval. Qualified blasting specialists would be utilized to ensure that all blasting is conducted according to regulations and the approved plan.

Tunneling

An approximately 2-mile length of the pipeline in the Apex area of northeastern Clark County would be tunneled due to extremely steep and rugged terrain. The tunnel would be located on both BLM and private lands and is anticipated to be excavated using a tunnel boring machine. Tunnel depth may vary from less than one hundred to several hundred feet. Depending upon final design, one or more access shafts may need to be constructed from the surface to the below-ground tunnel. Soils from the tunnel excavation would be used for pipeline backfill or site grading elsewhere on the Project, and a soil disposal area is not anticipated to be needed.

Tunnels less than 500 feet long would generally be constructed using jack-and-bore techniques, and longer tunnels may require manually operated equipment or tunnel boring machines. Tunnels may be concrete lined, depending on site-specific conditions. Any required tunneling activities, including access shafts, would be conducted within the ROW.

2.1.4.3 Power Facilities Construction

Power Lines

Clearing and grading of the entire power line ROW will not be required. Following identification of specific power pole locations, temporary work areas of approximately 100 feet by 200 feet around each power pole structure would be cleared. An access road or access road spur leading from the pipeline ROW or existing roads to the pole locations would be created in areas where the pipeline and power line ROWs are not contiguous. In areas where the pipeline and power line are contiguous, an access road would also be constructed between the pipeline road and the power poles. These permanent spur roads would each be 20 feet in width, and would extend approximately 10 feet beyond each power pole to provide access for maintenance and any repairs. The roads and temporary work areas would be created by drive and crush as much as feasible.

A truck-mounted rotary auger would bore pole locations to a depth of approximately 15 feet. After hardware and insulators are installed on each pole, the poles would be erected onsite, and placed using a truck-mounted crane. Soil removed by the auger would be used to backfill the space around the pole. Excess soil cuttings would be spread around the pole site, within the

ROW. Where additional strength is needed to support a power pole, a concrete foundation may be used to reinforce a bore hole, or concrete may be used to backfill a hole after pole installation.

Conductor wires would be strung within the power pole ROW using tensioning (pulling) equipment. Tensioning equipment would require two 100-foot by 200-foot work areas, approximately 1 mile apart. A large spool of conductor wire would be mounted on a truck at one work area, and pulling equipment would be located at the other work area. In this manner, conductor wire can be pulled onto the series of power poles within the 1-mile pulling distance in a single operation. Stringing conductor wires over U.S. Highway 93, 50, and 6, and other frequently traveled roadways may require the erection of temporary guard structures to elevate conductor wires to a sufficient height to avoid traffic conflicts. Temporary guard structures would be constructed using wood poles in H-frame configuration.

After power lines are connected to substations and facilities, the lines would be energized. Electrical equipment on each power line network would be tested before it is entered into service.

Substations

Following site clearing and grading, berms and drainage ditches would be constructed to contain runoff and divert floodwaters from the substation sites. For each substation, concrete pads would be constructed for transformers. Each pad would include a curb around the perimeter for spill containment. Concrete foundations would be constructed for electrical structures. Electrical conductors would be strung using pulleys. A concrete block control building would be constructed to house controls and relay equipment.

Substations would be enclosed by security fencing, typically 8-foot high chain link, with a locked gate (desert tortoise fencing is discussed in Section 2.1.4.1). Once the substations are constructed, they would go through a testing and commissioning process, in accordance with applicable electrical industry standards, codes, and procedures.

2.1.4.4 Other Ancillary Facilities Construction

Pumping and Pressure-Reducing Stations

Following site clearing and grading, plumbing, power conduits, and other infrastructure beneath the pumping and pressure-reducing station floors would be constructed. The foundations of the structure would then be constructed, followed by the floors, walls, and roof. Mechanical and interior components would be constructed once the building is completed.

The facilities would be inspected and a certificate of occupancy issued according to required county regulations. Permanent power would be connected from the GWD Project electrical system to the facilities' electrical systems. The pumps, valves, and appurtenances within each facility would be connected to the incoming and outgoing water pipelines, and the system tested in its entirety. Temporary electrical, water, and sanitary systems not converted into permanent facilities would be removed. Final grading and site restoration of the temporary ROW would be completed in accordance with the approved Restoration Plan.

Regulating Tanks

Following site grading and leveling, the regulating tanks would be constructed of steel or concrete. Steel tanks would be built on a concrete foundation, with steel panels welded and

bolted together to form the floor, walls, and roof. Concrete tanks may be constructed in place, or pre-fabricated at a non-project location and brought to the site. Overflow pipes, drain pipes, inlet and outlet pipes, ladders, and other appurtenances would be erected at varying periods during construction.

Hydrostatic testing of the regulating tanks would be coordinated with the pipeline, as described in Section 2.1.4.2, to save water and to minimize the need for discharge. Any discharge of hydrostatic testing water would be handled as described in Section 2.1.4.2.

Water Treatment Facility/Buried Storage Reservoir

Following site clearing and grading, plumbing, power conduits and other infrastructure beneath the water treatment facility and reservoir floors would be constructed. The foundations would then be constructed, followed by the floors, walls, and roof. Ancillary components inside and outside of the facilities would be constructed once the concrete structures are constructed.

The water treatment facility mechanical and interior components would consist mainly of storage tanks for wet and dry treatment chemicals, treatment contact vessels, metering and transfer pumps, meters and gauges, and piping. The water treatment facility would be inspected and a certificate of occupancy issued according to applicable county regulations.

Hydrostatic testing of the reservoir would be coordinated with the pipeline, as described in Section 2.1.4.2, to save water and to minimize the need for discharge. Any discharge of hydrostatic testing water would be handled as described in Section 2.1.4.2.

Permanent power would be connected from the GWD Project electrical system to the water treatment facility electrical system. The internal system would be connected to the incoming and outgoing water pipelines and the system tested in its entirety. Temporary electrical, water, and sanitary systems not converted into permanent facilities would be removed. Final grading and landscaping would follow.

Access Roads

Access road construction would occur at the beginning of ancillary facility construction in the area served by the access road. All roads would first be graded to level the surface as necessary. Gravel would be applied in areas needed to maintain road conditions during construction activities. In areas of improved roads, culverts would be installed where needed, and paving applied to the identified road segments.

Public use and access on existing roads and highways would not be impeded by construction. Signs and persons with flags would be used as necessary to direct traffic in accordance with all applicable Nevada Department of Transportation, county, and local laws and ordinances.

If roads within the Project ROWs are temporarily widened for use during construction, those widened areas would be restored along with other ROW restoration. The final width of unimproved roads would be 12 feet, and improved roads including paved roads would be 20 to 26 feet in width.

Communications

Fiber optic cables would be buried in the ground in the pipe trench, adjacent to the pipeline within the project ROW. In the trench, the cable would be buried at least 6 feet deep, or buried in the ground adjacent to the trench the depth would be approximately 3 to 4 feet. The fiber

optic cables would be routed to the facilities where they would be connected to the facility communications systems.

2.1.4.5 ROW and Ancillary Facilities Construction Schedule

The anticipated construction schedule is provided in **Table 2-6**. For the purposes of environmental analysis, SNWA has identified that construction could begin as early as 2012 if projected shortage conditions on the Colorado River become a reality. In August 2009, SNWA's Board of Directors authorized staff to complete all necessary state and Federal permitting to move forward with the GWD Project in case of this eventuality. Currently, the schedule for the

Table 2-6 Preliminary Construction Schedule for the Groundwater Conveyance Facilities

Facility	Location	Anticipated Construction Start (Quarter/Year)	Anticipated Construction Finish (Quarter/Year)
Main Pipeline	South Terminus to Reservoir/WTF	Q2/2012	Q2/2016
	Reservoir/WTF to Delamar Valley RT	Q3/2013	Q3/2015
	Delamar Valley RT to Dry Lake Valley RT	Q4/2014	Q3/2016
	Dry Lake Valley RT to Muleshoe RT	Q3/2015	Q2/2017
	Muleshoe RT to Spring Valley RT	Q4/2016	Q3/2018
	Spring Valley RT to Spring South PS	Q2/2017	Q4/2018
Lateral Pipelines	Cave Valley Lateral	Q2/2016	Q2/2017
	Spring Valley South Lateral	Q2/2017	Q3/2019
	Spring Valley North Lateral	Q3/2019	Q1/2020
Pumping Stations	Lake Valley Pumping Station	Q4/2015	Q2/2017
	Spring Valley South Pumping Station	Q1/2017	Q1/2019
	Spring Valley North Pumping Station	Q4/2018	Q1/2020
Pressure-Reducing Stations	Coyote Spring Valley PRS	Q3/2013	Q1/2014
	Dry Lake Valley South PRS	Q2/2014	Q4/2014
	Dry Lake Valley North PRS	Q4/2014	Q3/2015
Buried Storage Reservoir	(on same site as Water Treatment Facility)	Q3/2014	Q4/2016
Water Treatment Facility	(on same site as Buried Storage Reservoir)	Q2/2015	Q4/2016
Power Facilities	Transmission, Distribution and Substations	Q2/2014	Q4/2018

RT – Regulating Tank
PS – Pumping Station
PRS – Pressure-Reducing Station
WTF – Water Treatment Facility Note: This schedule is intended to display the relative time periods for construction of potential pipeline construction sequences. This schedule may be deferred based upon timing of completion of environmental compliance permitting processes, and if drought conditions do not affect SNWA's other water supplies.

ROW and ancillary facilities anticipates the receipt of necessary ROW grants, permits, and applications in 2012. If drought conditions improve and do not impact SNWA's other water supplies on the Colorado River, construction may be deferred for several years. In the absence of drought conditions affecting SNWA's other water supplies, it is anticipated that construction would begin such that groundwater conveyance could begin by 2020. The regulating tanks and access roads would be constructed in conjunction with the pipelines and are not listed separately in the table.

2.1.4.6 Construction Workforce

A preliminary estimate of the peak workforce required to construct the proposed groundwater conveyance facilities is shown in **Table 2-7**. Although the specific number of construction contracts and associated contracting schedule has not yet been developed, assumptions were made based upon the preliminary construction schedule and typical construction workforce on other representative SNWA water projects. Estimates for the main pipeline and power line are shown over the entire construction period, because locations and limits of individual construction contracts have not yet been determined. The lateral pipelines and facility sites were grouped into eight general geographic regions for manageability.

Table 2-7 Estimated Peak Construction Manpower by Year

Construction by Region	Year								
	2012	2013	2014	2015	2016	2017	2018	2019	2020
Main Pipeline	5	154	332	451	364	267	130		
Main Power Line			88	89	89	89	48		
Spring North Facilities and Spring Lateral						41	42	132	71
Spring South Facilities					71	139	234	151	
Lake and Cave Facilities, Cave Lateral					72	72			
Dry Lake Facilities			45	46	32				
Delamar and Coyote Spring Facilities			99	104					
Hidden (North), Garnet, and Las Vegas Facilities		70	203	242	285				
ESTIMATED TOTAL PER YEAR	**5**	**224**	**767**	**932**	**913**	**608**	**454**	**283**	**71**

Table 2-8 Representative Construction Equipment

Equipment Type	Equipment Type
Auger drill	Generator, small
Boom truck	Generator, large
Bucket truck	Grader
Bulldozer	Haul truck
Crane	Loader
Excavator	Pick-up truck
Water truck	Plate compactor
Welding rig	Roller compactor
Fuel truck	Fork Lift
Drill Rig	Grout Plant
Tunnel Boring Machine	Conveyor System
Muck Buckets	Air Compressors
Muck Cars	Hammer Drill
Hoist	

2.1.5 Operation and Maintenance

Overall operation would be coordinated with the existing SNWA water system. On-site personnel and SNWA's remote monitoring and control system would track and manage facility functions.

2.1.5.1 Pipeline Operation

Operational activity on the pipeline would be primarily maintenance of the ROW, and inspection, repair, and cleaning of the pipeline and appurtenances. ROW maintenance may include the application of herbicides for the control of noxious and non-native invasive weeds.

Aerial and ground inspections by pipeline personnel would identify any areas of exposed pipeline and appurtenances, erosion, unauthorized ROW encroachment, or any other conditions that could present a safety hazard or require preventive maintenance or reporting. The pipeline route would likely be visually inspected at least monthly.

In the unlikely event of a system rupture or malfunction resulting in the discharge of water, pressure sensors installed on the system would detect the pressure loss, and the groundwater pumps and wells would begin an automatic, sequenced shutdown. Shutdown would be sequenced to avoid buildup of dangerous pressures in the pipelines and other facilities. Valve closing times would vary between valves but is anticipated to take approximately 15 to 25 minutes to avoid over-pressurizing the pipeline (i.e., water hammer). Alarms would sound at manned facilities along the pipeline alignment and at SNWA operations centers, triggering a plan of action to investigate the source of the problem. Depending upon location of the incident, a manned response to reach remote areas could take up to 3 hours.

The quantity of water that might be released in the unlikely event of a pipeline rupture or valve failure cannot be precisely quantified because it would depend upon the type and extent of a break, along with the location of the break within a pipeline segment and the closest isolation valves. SNWA has assumed, for a conservative analysis, that pipeline isolation valves may be

located up to 10 miles apart. Assuming an extremely unlikely but worst possible scenario of catastrophic failure with complete severing of the largest diameter pipeline over a 10-mile stretch, the maximum quantity of water that could be discharged would be 24.6 million gallons. This assumption uses a 35-minute response time (10 minutes for the system to identify the location and 25 minutes to close the nearest upstream isolation valve), and does not consider the effect of decreasing flow rate during the valve closure time period on the total discharge volume.

Herbicide application may be conducted within the ROW to treat and control for noxious and non-native invasive weed infestations. Herbicides would be selected based on the specific noxious and non-native invasive weeds, and consideration would be given to the timing of herbicide use to maximize effectiveness and reduce adverse effects. All appropriate BLM and State and Federal approvals and permits would be acquired by SNWA or its contractor prior to any herbicide application within the ROW. SNWA or its certified licensed contractor would submit a Pesticide Use Proposal to the BLM prior to the planned application of any herbicide and a Pesticide Application Record after the application of the herbicide. Herbicide application will follow label recommendations and precautions. A buffer of 50 feet will be maintained between the herbicide spraying and any jurisdictional wash or stream, and applications will not be permitted when the wind velocity is six miles per hour or greater. Localized application of herbicides would take precedence over broadcast application, where feasible. Application of herbicides in any listed species habitat will be within the confines of fenced facility sites, or upon approval of the BLM and USFWS by direct application to the target species. Any herbicide use within the ROW would be included as part of an annual report on herbicide application to the BLM, and to the USFWS if herbicide application occurred within listed species habitat.

2.1.5.2 Power Facilities Operation

The anticipated power requirements necessary to operate project facilities are listed in **Table 2-9**. The power facilities would be monitored remotely to ensure proper operation and that adequate power is available. The structures, insulators, conductors, and related hardware would be visually inspected at least annually. Substations would be visually inspected at least monthly. Additional (unscheduled) visual inspections may be carried out following severe weather or other events that could damage the facilities. Maintenance would be performed on an as-needed basis.

2.1.5.3 Other Ancillary Facilities Operation

Pumping stations, regulating tanks, and pressure reducing stations would be remotely monitored to ensure proper operation, including controlling the valves to maintain water flow through the system. Visual inspections of facilities would vary depending upon size, location, and amount of use. Pumping stations would likely be visually inspected daily, regulating tanks weekly, and pressure reducing stations two to three times per week. Routine inspections would use existing access roads and designated access roads within the ROW. No off-road or overland travel would occur for routine inspections.

Table 2-9 Anticipated Operational Power Requirements for the Groundwater Conveyance Facilities

Proposed Facilities	Power (MW)
Spring Valley North Pumping Station	3
Spring Valley South Pumping Station	9
Lake Valley Pumping Station	10
Buried Storage Reservoir	<1
Water Treatment Facility	2
Anticipated Future Groundwater Wells and Associated Facilities	31*
TOTAL	**55***

*Estimated

An integrated control system would be developed for operation of the water treatment facility, which would be coordinated with SNWA's other water supply facilities. Shifts of three to six operational personnel are anticipated to be present at the facility daily.

In addition to remote system monitoring, SNWA would conduct routine visual inspections of the regulating tanks. The tanks would likely be visually inspected weekly.

2.2 FUTURE FACILITIES AND GROUNDWATER PRODUCTION

As described in Section 1.2.2, details regarding facilities for future groundwater development, including the number and location of wells, and the specific lengths and routes of collector pipelines and distribution power lines, are presently unknown. SNWA will identify these facilities in the future, after water rights have been permitted and exploratory drilling has been conducted. However, assumptions regarding these future facilities have been developed for the purposes of this programmatic analysis. These future facilities will be subject to future ESA consultation in subsequent environmental compliance tiers. It is anticipated that the ESA compliance for these future facilities will tier to this programmatic consultation.

Not all future facilities are anticipated to require formal ESA Section 7 consultation because it is likely that some actions related to future facilities would not affect listed species (e.g., some ROWs for exploratory or monitoring wells, Federal Energy Regulatory Commission license for hydroturbines at pressure-reducing station sites). The ESA analyses may include updates to the regional groundwater flow model (described in Section 3.3), updates to a smaller sub-portion of the groundwater flow model, and/or site-specific hydrologic analyses, depending upon the availability of geologic and hydrologic information and areas of species of concern. Updates to the regional groundwater flow model or additional modeling are anticipated only if new information becomes available that would significantly improve the calibration and predictive abilities of the current model. Updates to the regional groundwater flow model will also be completed in accordance with the water rights stipulated agreements between SNWA and Department of Interior agencies (see Section 2.4).

It is assumed that future groundwater production wells, collector pipelines, distribution power facilities, and other ancillary facilities necessary to develop permitted groundwater rights and

convey the pumped groundwater to the primary conveyance facilities would be located on federal lands that are managed by the BLM. SNWA has identified groundwater development areas within the four hydrographic basins that are part of the Federal action where it anticipates conducting groundwater development (groundwater development areas), as shown in **Figure 2-8**. The future ROWs will be limited to only a small portion of the groundwater development areas.

As shown on the anticipated timeline (**Figure 2-1**), future facilities would likely be implemented in phases over approximately 35 years, thus allowing periodic and ongoing ESA consultations during the development of the GWD Project. These periodic consultations would allow for incorporation of new information and updated analyses, as more data are collected during groundwater production. Furthermore, reinitiation of consultation may occur if required pursuant to the provisions of 50 C.F.R. § 402.16 and the terms of the anticipated BO.

As a signatory to the Spring Valley and Delamar, Dry Lake, and Cave (DDC) Stipulated Agreements (Section 2.4), the USFWS is party to the ongoing monitoring, management, and mitigation processes established under those agreements, including participation in technical review panels and development and participation in biological and hydrologic monitoring plans. An Adaptive Management Plan (AMP) has also been proposed by SNWA as part of its ACM for the Federal action (Section 2.2.7 and Section 6.0). The Stipulated Agreement and AMP processes will also allow the USFWS ongoing direct involvement in the monitoring, management, and mitigation of potential adverse effects during development of the Federal action.

2.2.1 Future Groundwater Production Wells

Future groundwater production wells are anticipated to be located within the groundwater development areas (**Figure 2-8**). The wells would be located based on several factors, which include but are not limited to geology; hydrology; well interference studies; presence of wetlands; special status species and their habitats; senior water rights; proximity to roads; utility corridors; and main and lateral pipelines. Production well locations are also subject to approval by the NSE.

The actual number of production wells will depend upon the results of exploratory well drilling and individual well yields. For the purposes of programmatic analysis, it is estimated that as many as 71 to 88 groundwater production wells could be required (**Table 2-10**). These estimates of future production wells were based on the assumption that each well would have an average well yield of approximately 800 to 1,000 gallons per minute. A contingency of approximately 20 percent also was considered in the estimated number of wells because production capacity would not be known until after the wells are drilled, and it could be lower than estimated. Wells also were assumed to be located at least 1 mile apart, and could be clustered in well fields, in grids of up to four wells.

The groundwater production wells are generally anticipated to be drilled to depths between 1,000 and 2,000 feet in basin-fill and bedrock. An exploratory drilling program would be initiated to initially drill potential well sites. Pump testing would be conducted as part of exploratory well drilling to determine if the wells are suitable for groundwater production. If the wells are not suitable for groundwater production, they would either be abandoned in accordance with State of Nevada requirements, or converted to groundwater monitoring wells.

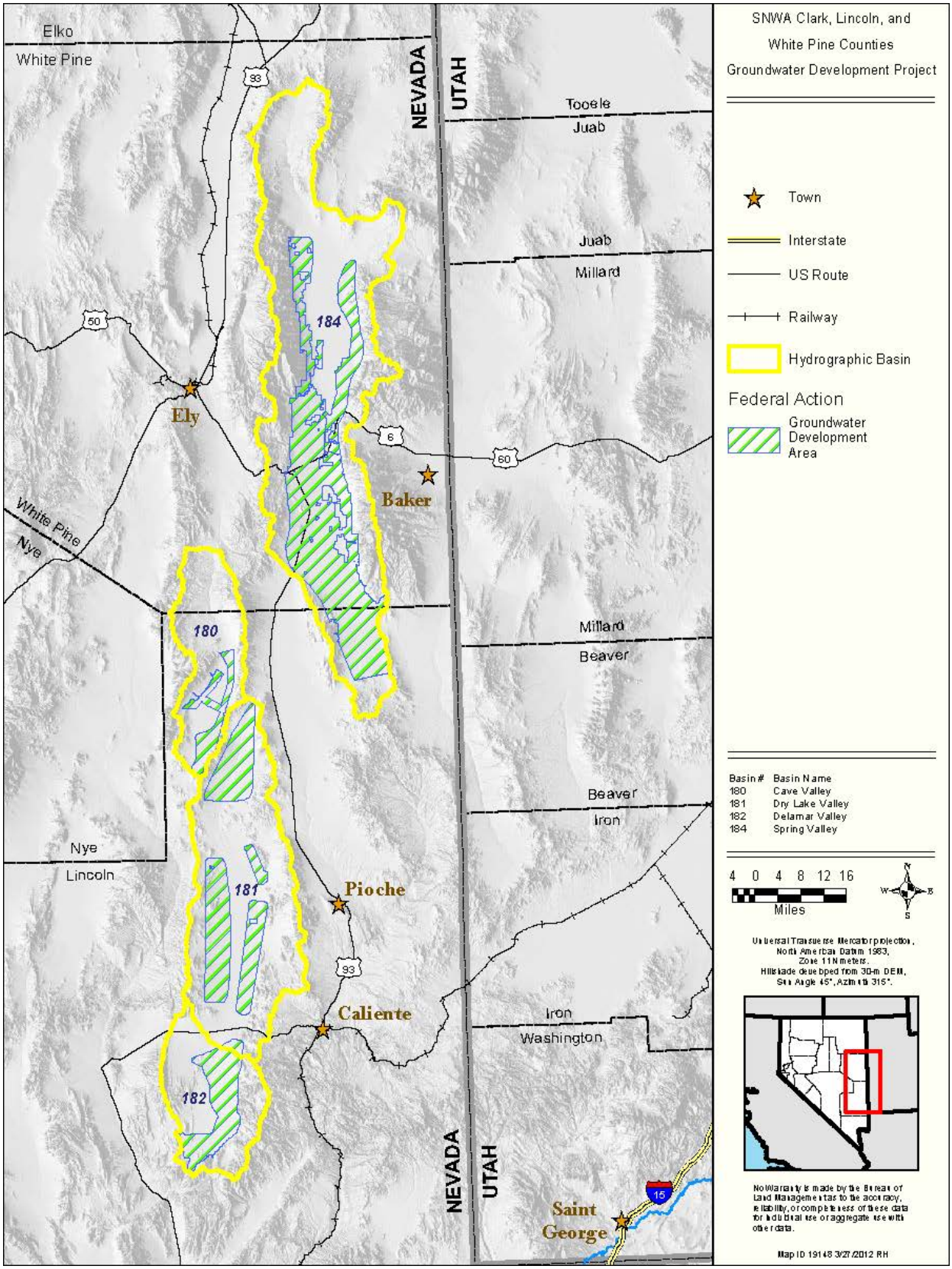

Figure 2-8 Groundwater Development Areas

If exploratory wells are determined to be suitable for groundwater production, the wells would be equipped for production. The production well pumping equipment would be housed within a concrete block or pre-cast concrete structure for protection from vandalism and the elements. Electrical facilities, heating, ventilation, air-conditioning equipment, and control facilities would be located in each structure as required.

Depending upon the water quality at each well site, groundwater treatment facilities might be required on site, in or adjacent to the well building. Potential chlorination at well sites might consist of closed systems with exchangeable canisters, which would not be refilled on site. The chlorination facilities would comply with applicable OSHA standards. If naturally occurring arsenic is present at levels that require treatment, some of the well sites also could require on-site arsenic removal. This need cannot be determined until water quality results from individual wells are available. However, if on-site arsenic treatment is required, it likely would be done through a small package plant. This process would add ferric chloride and sodium hypocholorite to precipitate the arsenic, which would then be removed using filtration. Any treatment facilities would be equipped with secondary containment in accordance with OSHA standards. Any sludge generated from the filtration would be disposed of in a permitted landfill.

Each well site is anticipated to require a permanent ROW of 1.5 acres, with an additional temporary 0.5-acre ROW for construction. Thus, approximately 107-133 acres of permanent ROW and 36-45 acres of temporary ROW may be required for future groundwater production wells (**Table 2-10**).

2.2.2 Future Collector Pipelines

Future collector pipelines would convey water from the future groundwater production wells to the proposed main and lateral pipelines. The size of these future collector pipelines would depend upon the number of wells connected to them. Currently, the collector pipelines are anticipated to range from 10 inches in diameter (where connected to a single well) up to 30 inches in diameter (where connected to more than three wells).

Because future groundwater production well sites cannot yet be identified, the sizes, routing, and distances of future collector pipelines also cannot yet be determined. However, general assumptions on the potential distances of future collector pipelines can be made based on the assumed number of future groundwater production wells (see above) and known geologic and hydrologic conditions. The estimated miles of collector pipeline per valley and associated assumptions about well clusters are presented in **Table 2-11**.

The collector pipelines would require a 50-foot wide permanent ROW and an adjacent 50-foot wide temporary ROW. A temporary construction staging area also might be required every 3 miles along the collector pipelines.

2.2.3 Future Power Facilities

Additional distribution power lines and substations would convey power to operate the future groundwater production wells and future pumping stations. Because the locations of future wells and pumping stations cannot yet be determined, the future associated power facilities cannot yet be defined.

Table 2-10 Groundwater Development Areas Permanent and Temporary Right-of-Way Requirements

Facilities	ROW	
	Permanent (Acres)[1]	Temporary (Acres)[2]
Future Groundwater Production Wells (71-88 wells)		
Spring Valley – 52 - 65	78 - 98	26 - 33
Cave Valley - 4 - 6	6 - 9	2 - 3
Dry Lake Valley - 10 - 11	15 - 17	5 - 6
Delamar Valley – 5 - 6	8 - 9	3 - 3
Subtotal	*107 - 133*	*36 - 45*
Future Collector Pipelines (96-254 miles)[3]		
Spring Valley – 39 - 102 miles	237 - 619	237 - 619
Cave Valley - 12 - 48 miles	73 - 291	73 - 291
Dry Lake Valley - 20 - 44 miles	121 - 267	121 - 267
Delamar Valley – 25 - 60 miles	152 - 364	152 - 364
Subtotal	*583 – 1,541*	*583 - 1,541*
Future Staging Areas		
Staging Areas – 32 - 85 one-acre sites	0	32 - 85
Subtotal	*0*	*32 - 85*
Future Power Facilities		
25-kV Power Line[4] (50 feet wide)	583 - 1,541	0
Dry Lake Valley 69/25-kV Substation	1	0
Delamar Valley 69/25-kV Substation	1	0
Hydroturbine Energy Recovery Facilities (3)[5]	0	0
Subtotal	*585 - 1,543*	0
Future Pumping Stations (2)		
Delamar	5	5
Dry Lake	5	5
Subtotal	*10*	*10*
TOTAL ON BLM LAND	**1,285 - 3,227**	**661 - 1,681**

[1] Based on NSE Water Right Rulings for SNWA GWD Project (March 2012)
[2] Total acres are rounded to the nearest whole number.
[3] Future access roads would be located within the pipeline ROWs; therefore, no additional ROWs are required.
[4] The distances by valley are the same as for the collector pipelines in this table.
[5] Hydroturbines would be located on pressure reducing station sites; therefore, no additional ROWs are required.

Table 2-11 Estimates for Future Collector Pipelines

Valley	Length (miles)	Wells per Cluster
Spring	39-102	4 (located 3 to 6 miles from the main or lateral pipeline)
Cave	12-48	No clustering[a] (located 3 to 8 miles from the main or lateral pipeline)
Dry Lake	20 - 44	No clustering[a] (located 2 to 4 miles from the main or lateral pipeline)
Delamar	25-60	No clustering[a] (located 5 to 10 miles from the main or lateral pipeline)
TOTAL	**96-254**	

[a] Only one well per collector pipeline, i.e., no clustering.

2.2.3.1 Power Distribution Lines

It is assumed that between 96-254 miles of 25-kV overhead distribution power lines would be required for groundwater production wells and pumping stations, routed along the future collector pipeline alignments. The ROW width of the future power lines would be 50 feet. Additional 25-kV conductors may also need to be hung on the power poles constructed as part of the GWD Project primary power supply system, as described above. The permanent ROWs for the future power lines are the same as the permanent ROWs for the future collector pipelines (**Table 2-10**).

2.2.3.2 Secondary Electrical Substations

It is also assumed that two additional 69/25-kV secondary substations may be required to provide 25 kV of electrical power to future groundwater production wells and pumping stations. The locations of these 1-acre secondary substations would depend upon the specific locations of the groundwater production wells and pumping stations. However, for the purposes of a programmatic analysis, it is assumed that an additional substation would be required in both Delamar Valley and Dry Lake Valley.

2.2.3.3 Hydroturbine Energy Recovery Facilities

Hydroturbine energy recovery facilities may be built within the pressure-reducing station sites (Section 2.1.3.3). These facilities would be below ground, with turbines placed within pipeline bypass piping. Renewable electrical power generated by the hydroturbines would be transmitted to the GWD Project or local electrical system, where it could be used by the GWD Project or added to the utility grid.

The specific locations and sizes of facilities, and quantities of power generated, cannot be determined until the final pipeline design is completed. However, the following information is provided for the purposes of a programmatic analysis. It is estimated that one or more future hydroturbine electrical generating facilities may be installed at each of the three pressure-reducing station sites that are part of the water conveyance facilities, described above in Section 2.1.3.3. Additional future ROWs are not anticipated to be required because the hydroturbines would be sited within the pressure-reducing station permanent ROWs, but the hydroturbines would require permitting through the Federal Energy Regulatory Commission.

2.2.4 Future Ancillary Facilities

2.2.4.1 Pumping Stations

Two future pumping stations would be required to convey water from some of the future groundwater production well areas into the main and lateral pipelines. Based on known topography, one pumping station in Dry Lake Valley and one in Delamar Valley might be required. These facilities would be similar to the Lake Valley pumping station (Section 2.1.3.1). Five acres of permanent ROW and 5 acres of temporary ROW would be required for each pumping station.

2.2.4.2 Access Roads

Access roads to future facilities would be located within the collector pipeline ROW. These might be either new roads or improvements to existing roads within the ROW. The road improvements could include grading, widening, and installing culverts, where needed. Gravel might be applied in some areas, if necessary, to maintain road conditions. Improved dirt roads would be 20 feet wide. No additional permanent or temporary access road ROWs should be needed because the roads would be located within the collector pipeline ROW.

2.2.4.3 Communications Facilities

Communications facilities would be installed along with groundwater production wells, collector pipelines, and other facilities for system operation and control, data collection, communication, and security surveillance. Conduits for fiber-optic cables could be installed along with the collector pipelines. The fiber-optic cables would be installed underground in either the pipeline trench or adjacent access road, and would be contained within the requested ROW. No additional ROW would be required.

2.2.5 Future Construction and Operation Procedures

Construction of future facilities would be the same as described in Section 2.1.4, with the addition of well drilling. Potential well sites would be selected based on the criteria described in Section 2.2.1. Well drilling would initially be done as part of an exploratory program, and only those wells with sufficient yields would be converted to groundwater production wells. Well drilling may take up to 30 days at each site, and may be conducted 24-hours per day and 7 days per week. Following drilling, each well would be developed to clean the borehole. Well development is estimated to take between 3 to 5 days, occur 24-hours per day, and result in discharges of approximately 500 to 3,000 gallons per minute. Aquifer testing would be conducted following well development to determine yield and production capacity. It is estimated that there may be 7 days of aquifer testing at each well, occurring 24-hours per day and 7 days per week, again discharging approximately 500 to 3,000 gallons per minute. Groundwater discharged during well development and aquifer testing would be discharged to the local drainage network, using energy dissipating equipment to reduce the potential for erosion and scour of natural drainages.

If exploratory drilling determines the well site is suitable for groundwater production, the well would be equipped for pumping. Construction activities for equipping groundwater production wells includes installation of wellhead piping, pumps, fencing, lighting (if needed), and electrical equipment. The site would be covered with gravel after construction to provide a working surface and for dust control. If the well is not suitable for groundwater production, the well

would be kept as a groundwater monitoring well, which would consist of a short segment of aboveground casing with a cap on an unfenced site. Alternatively, the well could be abandoned in accordance with State of Nevada requirements.

Operation of the future facilities would be the same as described in Section 2.1.5. Routine maintenance, monitoring and inspection of future facilities would be on the same schedule as described in Section 2.1.5, with the addition of likely weekly visual inspections for production well sites. Operational power requirements for future groundwater production wells were included in **Table 2-9**.

2.2.6 Abandonment

The BLM would grant ROW for the Federal action in accordance with FLPMA, SNPLMA, and LCCRDA. In accordance with LCCRDA and the SNPLMA, the ROW is granted in perpetuity. Termination and abandonment are not anticipated, unless exceptional circumstances should arise. In such a case, the termination and abandonment would be subject to approvals by the BLM. Termination and abandonment plans would be written in accordance with current management procedures and would be submitted to the BLM in advance of any associated actions. If the GWD Project were to be abandoned in part or in whole, the ROW would revert to the land managing agencies.

2.2.7 Applicant-Committed Environmental Protection Measures

SNWA has identified ACMs that will be implemented as part of the construction and operation of the Federal action (Section 6.0). These ACMs include design features, best management practices, monitoring, standard operating procedures, and other practices. They also include measures SNWA has previously agreed upon in stipulations or other agreements with Federal, State, or local agencies and entities, and those required by NSE permit conditions. The ACMs listed in Section 6.0 are only those pertinent to this BA and the ESA consultation for the Federal action. A broader list of ACMs is provided in SNWA (2012).

Additional ACMs will be implemented for future facilities and groundwater pumping. These include both measures specific to construction and operation of the future facilities, and measures for indirect effects of groundwater pumping (Section 6.0). The precise nature, extent, and location of water-related effects cannot yet be determined because they are contingent upon future water right decisions of the NSE and the site-specific locations of groundwater production wells. Thus, SNWA has proposed an AMP to outline a process to collect baseline data, identify environmental indicators and establish adaptive management thresholds, conduct monitoring, determine impacts, and determine strategies to avoid future impacts and minimize or mitigate those that may have occurred.

SNWA has prepared a Conceptual Adaptive Management Framework (AM Framework) to be refined and implemented during future site-specific ESA review. The AM Framework sets out a potential process for implementing practicable adaptive management measures to address adverse environmental impacts associated with SNWA groundwater withdrawals for the GWD Project, the nature, location, and extent of which are currently unknown. The AM Framework outlines the process to collect baseline data, identify environmental indicators and establish adaptive management thresholds, conduct monitoring of environmental indicators and SNWA's groundwater pumping, determine whether SNWA's groundwater pumping has likely caused or contributed to adverse environmental impacts, and if so, to determine the appropriate adaptive

management strategy to avoid future adverse environmental impacts and minimize or mitigate those that have already occurred. A suite of additional measures are also outlined which may be implemented, as needed, through the adaptive management process to address potential impacts to a variety of resources. The AM Framework is included in SNWA's list of ACMs (SNWA, 2012).

2.3 INTERRELATED AND INTERDEPENDENT ACTIVITIES

Effects analyses are performed for the Federal action, including "the effects of other activities that are interrelated or interdependent with that action" (50 C.F.R. § 402.02). Interrelated activities are defined as those that are part of a larger action and depend on the larger action for their justification. Interdependent actions are those that have no independent utility apart from the action under consideration. The USFWS uses a "but for" test for determining whether another activity is interdependent with or interrelated to the proposed action; i.e., if the other activity would not occur "but for" the proposed action, it is interrelated or interdependent (USFWS, 1998). In addition, future actions that are conditional upon the occurrence of other events (such as separate authorization or funding), have no anticipated date of implementation, and that may or may not be implemented, are not interrelated or interdependent with the proposed action. Based on these criteria, there are no interrelated or interdependent actions for the Federal action.

The development by Lincoln County of its current or future water rights, described in Section 1.2.3, is not an interrelated or interdependent action with the GWD Project because such development could occur regardless of whether the GWD Project occurred. Lincoln County has previously filed a ROW application with the BLM (subsequently withdrawn) for development and conveyance of its water right applications. This demonstrates Lincoln County's ability to develop its current or future water rights absent the GWD Project, and also demonstrates that any such future development would be a Federal action subject to ESA consultation. Similarly, the GWD Project will proceed regardless of whether Lincoln County pursues development and use of the water rights for which conveyance capacity is reserved.

For Lincoln County's 21,700 afy reserved capacity in the GWD Project, the County has not yet determined the sources of water that would be conveyed through the GWD Project, or a particular point in time at which it would intend to develop and utilize such resources. Thus, because any future water rights development by Lincoln County is currently undefined, there is no "action" to analyze at this time as interrelated or interdependent to the Federal action. At some point in the future, Lincoln County likely will identify particular water resources for conveyance by the GWD Project, and will request Federal ROWs for its development and delivery to the GWD Project as necessary. At that time, BLM would conduct consultation under ESA for those ROWs as appropriate. If the GWD Project were not to proceed, Lincoln County could develop another form of conveyance for its water, or could choose to forego development. Thus, this is not an interrelated or interdependent action.

2.4 STIPULATIONS AND AGREEMENTS

SNWA has entered into Stipulated Agreements with US Department of the Interior (DOI) bureaus and the Forest Service regarding SNWA's groundwater applications in Spring Valley hydrographic area (Spring Valley Stipulation) (Stipulation, 2006, 2011), and with DOI bureaus regarding SNWA's groundwater applications Cave, Dry Lake, and Delamar valley (DDC) hydrographic areas (DDC Stipulation) (Stipulation, 2008). The common goals of the Spring

Valley and DDC Stipulations are identified in both stipulations (Stipulation, 2006, 2008 and 2011) and the AM Framework (SNWA, 2012). The Spring Valley and DDC Stipulations contain detailed monitoring, management, and mitigation requirements, and are directly relevant to future groundwater development under subsequent tiers of the GWD Project. They thus serve as applicable standards and design criteria in accordance with USFWS draft Programmatic Consultation Guidance.

In accordance with the Spring Valley and DDC Stipulations, hydrologic and biological monitoring plans have been developed (BWG, 2009; BRT, 2011; SNWA, 2009a, 2009b), and data collection is underway. The monitoring programs are designed to be adaptive so that they can evolve in response to new information and technologies, changes in monitoring questions or goals, and changes in analytical approach, while ensuring the integrity of the long-term data record. Initial monitoring commitments as part of this adaptive approach can be found in the monitoring plans (BWG, 2009; BRT, 2011; SNWA, 2009a, 2009b), and changes to these monitoring plans are included in subsequent annual reports. A detailed list of ACMs and information about adaptive monitoring and management in accordance with the Spring Valley and DDC Stipulations are provided in SNWA (2012). A summary of key ACMs relevant to the species under consultation is provided in Section 6.0.

SNWA has also entered into two agreements regarding SNWA groundwater development in the Coyote Spring Valley hydrographic area. These agreements include: (1) a Stipulated Agreement with DOI bureaus regarding SNWA's groundwater applications in Coyote Spring Valley (Coyote Spring Valley Stipulation) (Stipulation, 2011); and (2) a Memorandum of Agreement (MOA) with USFWS, Coyote Spring Investment (CSI) LLC, the Moapa Band of Paiutes, and Moapa Valley Water District (MVWD) regarding the protection of Moapa dace in Muddy River Springs Area (Muddy River MOA, 2006). Although groundwater pumping in Coyote Spring Valley is not part of the Federal action, these agreements are relevant to this BA because of concerns regarding downgradient effects of groundwater pumping.

2.4.1 Spring Valley Stipulation

On September 8, 2006, SNWA, the USFWS, Bureau of Indian Affairs (BIA), BLM, and National Park Service (NPS) (the Parties) entered into a Stipulation for Withdrawal of Protests regarding SNWA groundwater applications 54003-54021 in Spring Valley (Stipulation, 2006). The common goals of the Parties include:

1) to manage the development of groundwater by SNWA in the Spring Valley Hydrographic Basin without causing injury to Federal water rights and/or unreasonable adverse effects to Federal resources in the Area of Interest (Upper Great Salt Lake Desert Flow System and vicinity);
2) to accurately characterize the groundwater gradient from the Spring Valley Hydrographic Basin to the Snake Valley Hydrographic Basin via Hamlin Valley;
3) to avoid any effect to Water-dependent Ecosystems (as defined in the Spring Valley Stipulation, wetlands, wet meadow complexes, springs, streams, and riparian and phreatophytic communities) and Federal resources located within the boundaries of Great Basin National Park (GBNP) from groundwater withdrawals by SNWA in the Spring Valley Hydrographic Basin; and

4) to manage the development of groundwater by SNWA in Spring Valley in order to avoid unreasonable adverse effects to Water-dependent Ecosystems and maintain the biological integrity and ecological health of the Area of Interest over the long term.

The Spring Valley Stipulation includes hydrologic and biological monitoring, management and mitigation plans describing the Parties' preferred conceptual approach for protecting Federal water rights from injury and Federal resources from unreasonable adverse effects and for avoiding any effect on Federal resources within GBNP that may be caused by SNWA withdrawals in Spring Valley. To facilitate implementation of the monitoring, management, and mitigation plans, the Stipulation establishes:

1) Technical Review Panel (TRP) consisting of representatives with hydrologic expertise from each of the Stipulation Parties;
2) Biological Working Group (BWG) consisting of representatives with biologic expertise from each of the Stipulation Parties; and
3) Executive Committee (EC) consisting of managers from each of the Stipulation Parties.

The purpose of the TRP is to carry out hydrologic monitoring, management, and mitigation requirements of the Stipulation. The TRP's responsibilities include reviewing, analyzing, and interpreting information collected under the hydrologic monitoring, management and mitigation plan; and making recommendations about monitoring, modeling, groundwater management, and mitigation to the EC. To collaboratively carry out the Common Goals of the Stipulation, the TRP and BWG share expert opinions that inform the hydrologic and biological monitoring, management and mitigation efforts under the Stipulation.

The purpose of the BWG is to develop a Biological Monitoring Plan and oversee implementation of the biological monitoring, management, and mitigation requirements of the Stipulation. If the BWG determines that an unreasonable adverse effect to a Water-dependent Ecosystem is occurring or will occur in Area of Interest, the BWG develops a recommended course of action and refer this to the EC. The BWG is also responsible for monitoring the success of avoidance or mitigation actions to carry out the Common Goals of the Stipulation.

The EC serves as a management oversight and decision-making body for the Stipulation. The purpose of the EC includes to review TRP and BWG recommendations for actions to reduce or eliminate an injury to Federal water rights and/or unreasonable adverse effects to Federal resources in the Area of Interest, and/or any effect on Federal resources within the boundaries of GBNP from groundwater withdrawals by SNWA in the Spring Valley Hydrographic Basin. In the event that the BWG and TRP cannot reach consensus, the EC seeks a negotiated resolution and implements a course of action.

Actions that SNWA may take in order to mitigate any injury to Federal Water Rights and/or unreasonable adverse effects to Federal Resources, and/or effects to Federal Resources within the boundaries of GBNP, include but are not limited to one or more of the following:

1) Geographic redistribution of groundwater withdrawals;
2) Reduction or cessation in groundwater withdrawals;
3) Provision of consumptive water supply requirements using surface and groundwater sources;
4) Augmentation of water supply for Federal water rights and Federal resources using surface and groundwater sources; and

5) Other measures as agreed to by the Parties and/or required by the State Engineer that are consistent with the Stipulation.

2.4.1.1 Spring Valley Hydrologic Monitoring and Mitigation Plan

In February 2009, the Spring Valley Hydrologic Monitoring and Mitigation Plan was approved by the EC and the NSE (SNWA, 2009a). The Hydrologic Monitoring and Mitigation Plan is designed to be consistent with the Common Goals of the Stipulation.

The Spring Valley Hydrologic Monitoring and Mitigation Plan specifies hydrologic monitoring in the following areas, in accordance with the Stipulation:

1) Spring Valley Hydrographic Basin;
2) Interbasin Groundwater Monitoring Zone, which is a stipulated area of study of groundwater flow from Spring Valley to Snake Valley via Hamlin Valley; and
3) Big Springs Creek surface water system in Snake Valley.

The Spring Valley Hydrologic Monitoring and Mitigation Plan requires that baseline hydrologic data be collected prior to SNWA groundwater withdrawal from the Spring Valley Hydrographic Basin, and that hydrologic data collection continue during groundwater withdrawal. Hydrologic monitoring efforts began in 2007 and are currently ongoing.

2.4.1.2 Spring Valley Biological Monitoring Plan

The Biological Monitoring Plan for the Spring Valley Stipulation (BWG, 2009) was approved by the EC in January 2009 and by the NSE in February 2009. The Biological Monitoring Plan for the Spring Valley Stipulation is designed to be consistent with the Common Goals of the Stipulation.

The Spring Valley Biological Monitoring Plan outlines the following goals:

1) establish baseline conditions of groundwater-influenced ecosystems within the Initial Biologic Monitoring Area (IBMA) and identify trends in indicators of the condition of these biotic communities prior to groundwater withdrawal in Spring Valley by SNWA;
2) establish the range of variability for indicators of the condition of groundwater-influenced ecosystems in the IBMA prior to groundwater withdrawal by SNWA;
3) assess the response of groundwater-influenced ecosystems to groundwater withdrawal by SNWA;
4) give early warning of unreasonable adverse effects to groundwater-influenced ecosystems in the IBMA and/or any potential adverse effects to GBNP due to groundwater withdrawal by SNWA;
5) determine if an observed or predicted response is likely attributable to SNWA's groundwater withdrawal; and
6) recommend and evaluate management actions for the purpose of maintaining or enhancing the baseline biological integrity and ecological health of the IBMA over the long term.

The Spring Valley Biological Monitoring Plan requires that 7 years of baseline biological data be collected prior to SNWA groundwater withdrawal from the Spring Valley Hydrographic Basin, and that biological data collection continue during groundwater withdrawal. Biological monitoring was conducted in 2009 and 2010. Currently, the SNWA is collecting interim data to better understand the systems, and the BWG is conducting a scientific evaluation of the

monitoring plan. Full monitoring efforts will recommence at least five years prior to SNWA groundwater withdrawal from Spring Valley.

2.4.2 Delamar, Dry Lake, and Cave Valleys Stipulation

On January 7, 2008, the Parties entered into a Stipulation for Withdrawal of Protests regarding SNWA groundwater applications 53987-53992 in DDC valleys (Stipulation, 2008). The common goals of the Parties include:

1) to manage the development of groundwater by SNWA in DDC without causing injury to Federal water rights and/or unreasonable adverse effects to Federal resources and special status species within the Area of Interest (Delamar, Dry Lake, Cave, White River, and Pahranagat valleys) as a result of groundwater withdrawals by SNWA in DDC; and
2) the above Common Goals include taking actions that protect and recover those special status species that are currently listed pursuant to the ESA and avoid listing of currently non-listed special status species.

The Stipulation includes a hydrologic and biological monitoring, management and mitigation plan for development of groundwater in the DDC. To carry out the monitoring, management and mitigation requirements outlined in this plan, the Stipulation requires the following actions:

1) creation of a Biologic Resources Team (BRT) consisting of representatives with biologic expertise from each of the Stipulation Parties;
2) expansion of duties of the TRP established by the Spring Valley Stipulation consisting of representatives with hydrologic expertise from each of the Stipulation Parties; and
3) expansion of duties of the EC established by the Spring Valley Stipulation consisting of managers from each of the Stipulation Parties.

The purpose of the TRP is to carry out hydrologic monitoring, management, and mitigation requirements of the Stipulation. The TRP's responsibilities include reviewing, analyzing, and interpreting information collected under the hydrologic monitoring, management and mitigation plan; and making recommendations about monitoring, modeling, groundwater management, and mitigation to the EC. To collaboratively carry out the Common Goals of the Stipulation, the TRP and BRT share expert opinions that inform the hydrologic and biological monitoring, management and mitigation efforts under the Stipulation.

The purpose of the BRT is to develop a Biological Monitoring Plan and oversee implementation of the biological monitoring, management, and mitigation requirements of the Stipulation. If the BRT determines, by consensus, that a predicted or measured change in groundwater levels or biological parameters would result in unreasonable adverse effect to Federal resources and/or special status species in the Area of Interest, the BRT develops a recommended course of action and refer this to the EC. The BRT is also responsible for monitoring the success of avoidance or mitigation actions to carry out the Common Goals of the Stipulation.

The purpose of the EC is to review TRP and BRT recommendations for actions to reduce or eliminate an injury to Federal water rights and/or unreasonable adverse effects to Federal resources or special status species in the Area of Interest from groundwater withdrawals by SNWA from DDC. In the event that the BRT and/or TRP cannot reach consensus, the EC seeks a negotiated resolution and implements a course of action.

The Stipulation also requires that prior to groundwater pumping for production from DDC, SNWA shall prepare a Hydrologic Management and Mitigation Operation Plan. The Operation Plan shall be used by the EC in its decision-making process.

Actions that SNWA may take in order to offset any unreasonable adverse effects to Federal resources and/or special status species within the Area of Interest, or any injury to Federal water rights include, but are not necessarily limited to:

1) Reduction or cessation of groundwater withdrawals within DDC;
2) Geographic redistribution of pumping within DDC;
3) Acquisition of real property and/or water rights dedicated to the recovery of special status species within the current and historic habitat range of each of the special status species.;
4) Augmentation of Federal water rights, Federal resources, and/or Water Dependent Ecosystems (as defined in the DDC Stipulation, those special status species habitat areas in the Area of Interest that are dependent upon groundwater levels and/or local and regional spring flows);
5) Provision of resources to restore and enhance habitat on the Pahranagat National Wildlife Refuge (NWR); and
6) Other measures as agreed to by the Parties and/or required by the NSE that are consistent with the Stipulation.

2.4.2.1 DDC Hydrologic Monitoring and Mitigation Plan

In December 2009, the Hydrologic Monitoring and Mitigation Plan for DDC was approved by the EC and the NSE (SNWA, 2009b). The DDC Hydrologic Monitoring and Mitigation Plan is designed to be consistent with the common goals of the Stipulation.

The DDC Hydrologic Monitoring and Mitigation Plan specifies hydrologic monitoring in:

1) DDC valleys hydrographic basins;
2) That portion on the White River Valley Hydrographic Basin that is south of Hardy Springs; and
3) Pahranagat Valley Hydrographic Basin, including the Pahranagat NWR.

The DDC Hydrologic Monitoring and Mitigation Plan requires baseline data be collected prior to SNWA groundwater withdrawal from DDC, and that hydrologic data collection continue during groundwater withdrawal. Hydrologic monitoring efforts conducted in accordance with the DDC Stipulation began in 2007 and are currently ongoing.

2.4.2.2 DDC Biological Monitoring Plan

In January 2011, the Biological Monitoring Plan for the DDC Stipulation (BRT, 2011) was approved by the EC. The plan was also submitted to the NSE as a water rights hearing exhibit in 2011, with the request that the plan be included as a permit condition in the NSE's Ruling on SNWA groundwater applications in DDC.

The DDC Biological Monitoring Plan outlines the following goals:

1) Describe baseline conditions of special status species and/or their habitats within the Area of Interest that may be affected by SNWA groundwater withdrawal;
2) Identify the range of variability and trends for indicators of the condition of special status species and/or their habitats;

3) Assess the response of special status species and/or their habitats with respect to hydrologic changes resulting from SNWA groundwater withdrawal;
4) Determine if an observed or predicted change in an indicator is likely attributable to SNWA groundwater withdrawal;
5) Detect and provide early warning of potential unreasonable adverse effects to Federal Resources, special status species and/or their habitat; and
6) Provide recommendations to the EC regarding potential actions and timelines to avoid and mitigate unreasonable adverse effects to Federal Resources, special status species and/or their habitat.

The DDC Biological Monitoring Plan requires that 3 years of baseline biological data be collected prior to SNWA groundwater withdrawal from DDC, and that biological data collection continue during groundwater withdrawal.

2.4.3 Coyote Spring Valley Stipulation

In July 2001, SNWA and the Las Vegas Valley Water District (LVVWD) entered into a stipulation with the U.S. Department of Interior, BLM, NPS, and USFWS, which included a Monitoring, Management, and Mitigation Plan (MMM Plan) applicable to existing and future LVVWD/SNWA permitted groundwater rights in Coyote Spring Valley (Stipulation, 2001). While groundwater development in Coyote Spring Valley is not part of the Federal action, this stipulation and associated measures are described here because of concerns regarding downgradient effects of groundwater pumping.

Goal of the Coyote Spring Valley Stipulation and MMM Plan: To manage the development of the carbonate aquifer as a water resource without causing unreasonable adverse impacts to state and federal water rights and resources.

MMM Plan Requirements:

- Establish and conduct monitoring of groundwater elevations, groundwater production, surface water and spring flows, and water quality to collect baseline data and provide for early warning of unreasonable adverse effects;
- Establish a TRP to provide a forum for the scientific and technical review of hydrologic data collected and the related interpretation of potential impacts on the flow system;
- Initiate a decision-making process and outline mitigation options for development of the carbonate aquifer groundwater in a manner that does not cause unreasonable adverse impacts based on monitoring data and the TRP.

An extensive groundwater and surface water monitoring network has been established by SNWA in collaboration with the NSE, the USFWS and other entities to monitor groundwater production, water level elevation, and spring flow discharge under the Coyote Spring Valley Stipulation (SNWA, 2005). Much of the groundwater monitoring has been on-going since the early 2000s, and most of the surface water monitoring has been on-going since 1985. Many of these efforts have been funded cooperatively by SNWA and the U.S. Geological Survey (USGS).

2.4.4 Muddy River Memorandum of Agreement

On April 20, 2006, SNWA, USFWS, CSI, the Moapa Band of Paiutes, and MVWD entered into the Muddy River MOA (Muddy River MOA, 2006), which sets forth conservation measures providing for the protection and recovery of the Moapa dace; coordination of monitoring,

management and mitigation measures; and protection of respective water rights. While groundwater development in Coyote Spring Valley is not part of the GWD Project, the MOA is described here because of concerns regarding downgradient effects of groundwater pumping under the Federal action. The commitments and conservation measures for Moapa dace under the MOA would also apply to the GWD Project in the event there were any effects from the GWD Project in the Muddy Springs area.

Goals of the Muddy River MOA: Establish conservation measures providing for the protection and recovery of the Moapa dace and its habitat; coordination of monitoring, management, and mitigation measures; and protection of the Parties' water rights.

Requirements of the Muddy River MOA:

- Establishment of the Muddy River Recovery Implementation Program;
- Dedication of the Jones water right (1.0 cubic feet per second (cfs)) to provide in-stream flow in the Apcar Stream;
- Habitat restoration and recovery measures;
- Protection of in-stream flows through the use of flow triggers at the USGS Warm Springs West gaging station which initiate incremental reductions in groundwater pumping;
- Establishment of a Hydrological Review Team; and
- Acquisition of the Warm Springs Natural Area (WSNA) as additional land and water rights for conservation.

Currently the Muddy River Recovery Implementation Program document is in draft form but is expected to be finalized by 2012. The goal of the Muddy River Recovery Implementation Program is to develop a program that would promote recovery of imperiled aquatic and avian species and assist in meeting the growing need for water by industrial and municipal water users in the Muddy River system. The requirements of the Muddy River Recovery Implementation Program include the implementation of actions that provide a positive benefit for the species covered under the Program based on priorities identified through the Recovery Action Plan, five-year strategic plan, and annual work plans.

SNWA has achieved its funding commitments listed in the MOA. SNWA provided funding for the following activities: Moapa dace restoration on Moapa Valley National Wildlife Refuge (NWR); construction of a fish barrier in the WSNA; treatment of tilapia; funding for half of the Moapa dace ecological model; and funding for the Muddy River Recovery Implementation Program. SNWA continues to participate on the Hydrologic Review Team and collaboratively implement the Muddy River Recovery Implementation Program.

2.5 BLM-RECOMMENDED MEASURES

Based on resource-specific impact analyses, the BLM provided recommended GWD Project monitoring and mitigation measures in the Draft EIS (BLM, 2011). The measures related to the Tier 1 ROW are tied to the decisions that will be made by the BLM in the Record of Decision. Measures related to future groundwater development facilities and groundwater pumping will be considered in subsequent NEPA analyses. In addition, the BLM recommended measures for consideration of implementation by other agencies that are not within the power of the BLM to enforce. Detailed BLM-recommended measures provided in the Draft EIS are subject to change with the Final EIS. A summary of key BLM-recommended measures from the Draft EIS that are relevant to the listed species under consultation is provided in Section 6.0.

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3.0 DESCRIPTION OF THE ACTION AREA

The ESA defines the "Action Area" as "all areas to be affected directly or indirectly by the federal action and not merely the immediate area involved in the action" (50 CFR § 402.02). The Action Area for the Federal action is based on (1) site-specific ROWs for Tier 1, and their associated potential direct and indirect effects; (2) groundwater development areas, and potential direct and indirect effects associated with future ROWs; and (3) areas that may be indirectly affected by groundwater drawdown or spring flow reduction after full build out plus 75 years of pumping, and 100 years of recovery (**Figure 3-1**).

3.1 TIER 1 ROWS

3.1.1 Delineation of the Action Area

The Action Area is delineated, in part, by site-specific ROWs (temporary and permanent) (**Figure 3-1**) for Tier 1 of the GWD Project. These ROWs include site-specific locations for the main and lateral pipelines, power lines, and ancillary facilities. The site-specific ROWs are described in Section 2.1.

As described in Section 2.1.4.1, temporary water supplies needed for construction would be obtained from existing or future wells approximately every 10 miles along the pipeline alignment. Because of the low volumes of groundwater pumped for construction, resting of the wells during non-working hours/days and seasons when water is not needed, and the short duration of use of each well, drawdown would be minimal and not expected to propagate measurably beyond the ROWs. Thus, the Action Area for the Tier 1 ROWs (and future groundwater development facilities below) also encompasses effects from groundwater pumping for temporary construction water.

3.1.2 Listed Species within ROWs

The desert tortoise is the only listed species within and/or adjacent to the ROWs. The species account is provided in Section 4.1.

3.1.3 Ecological Setting

Traversing eleven (11) hydrographic basins, the ROWs extend from the semiarid cold desert Great Basin Ecological Province at its northern inception to its terminus in the arid hot Mojave Desert Ecological Province, as defined by Omernik (1987). In the Great Basin Ecological Province, the northern portion of the ROW extends into southeastern Steptoe (Hydrographic Area #179), Spring (#184), Lake (#183), Cave (#180), Dry Lake (#181), and Delamar (#182) valleys, with Delamar Valley the transition zone into the Mojave Desert Ecological Province. In the Mojave Desert Ecological Province, the southern portion of the ROW extends into Delamar, southern Pahranagat (#209), Coyote Spring (#210), Hidden (North) (#217), Garnet (#216), and Las Vegas (#212) valleys, with the terminus in northeastern Las Vegas Valley.

The biological communities within the ROWs are described below. Ecological systems and plant community descriptions in the region of the ROWs are taken from the Southwest Regional GAP Project (USGS 2005) and Intermountain Flora: Vascular Plants of the Intermountain West (Cronquist et al., 1972). Soils along the ROWs are categorized by land resource areas, as defined and characterized by United States Department of Agriculture (USDA) (2006):

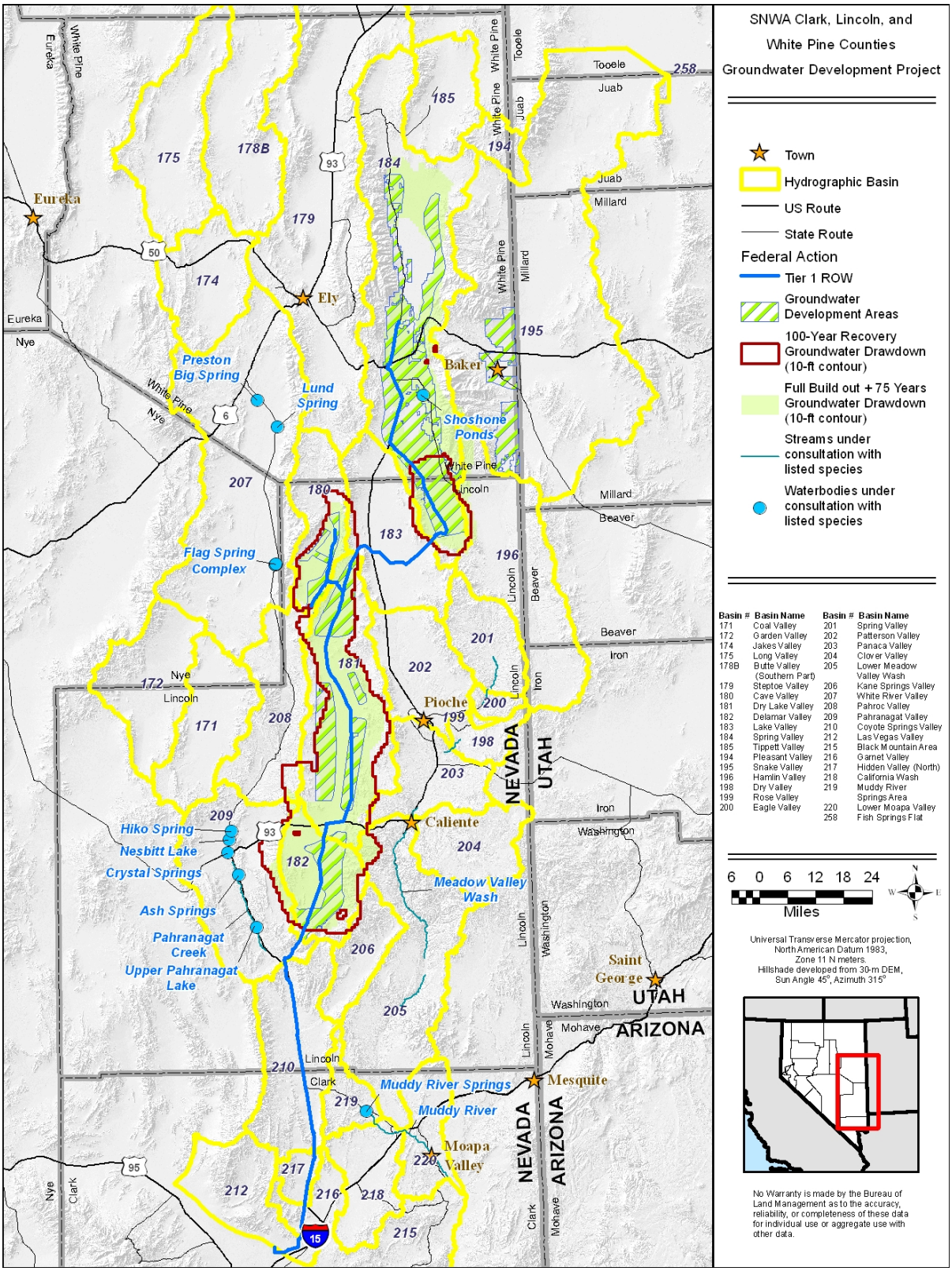

Figure 3-1 Action Area

Great Salt Lake, Central Nevada Basin and Range, Southern Nevada Basin and Range, and Mojave Basin and Range. More detailed information about the plants and wildlife documented within the ROWs are available in Wildland International (2007, 2009a, 2009b), Jones and Stokes (2005), and BLM (2011).

3.1.3.1 Great Basin Ecological Province

Soils: Steptoe, Spring, Lake, Cave, and the northern third of Dry Lake Valley are characterized by Central Nevada Basin and Range soils. The dominant soil orders are aridisols (soils that develop in dry arid ecosystems), entisols (entisols lack soil development and typically are shallow or sandy), and mollisols (mollisols have a thick, dark, fertile surface layer). Soils in these valleys generally consist mostly of alluvial fill, with cobble, gravel, and coarse sand near the mountains in the apex of the alluvial fans, and finer-textured materials located on the fan edges. High levels of calcium carbonate may be found in the soils, and soils along alluvial fans, lake plains, and flats often have high concentrations of salts and sodium.

The southern two-thirds of Dry Lake Valley and Delamar Valley are characterized by Southern Nevada Basin and Range soils. Mountains are dominated by igneous and sedimentary carbonate rocks; and the valleys consist mostly of alluvial fill composed of cobble, gravel, and coarse sand, formed near the mountains in the apex of the alluvial fans. The dominant soil orders are aridisols and entisols. They generally are very shallow to very deep, well drained or somewhat excessively drained, and loamy-skeletal or sandy-skeletal. Soils in this area commonly contain high calcium carbonate contents due to the carbonate parent materials. Soils found in sinks and playa lakes typically have high concentrations of salts and sodium.

Vegetation: The vegetation along the ROWs is described from north to south. The proposed power line ROW would begin in southeastern Steptoe Valley (no other ROW or facilities are proposed for this valley), and crosses into Spring Valley primarily through Great Basin Pinyon-Juniper Woodland. The proposed Spring Valley lateral ROW would begin in central Spring Valley, and primarily crosses Great Basin Xeric Mixed Sagebrush Shrubland along the alluvial fan-valley floor interface. Sagebrush species are typically dominant, among them big sagebrush (*Artemisia tridentata*), black sagebrush (*Artemisia nova*), bud sagebrush (*Picrothamnus desertorum*), yellow rabbitbrush (*Chrysothamnus viscidiflorus*), and rubber rabbitbrush (*Ericameria nauseosa*).

The main pipeline ROW begins in southern Spring Valley. Major ecological systems within Spring Valley are Inter-Mountain Basins Big Sagebrush Shrubland, Inter-Mountain Basins Greasewood Flat, Inter-Mountain Basins Mixed Salt Desert Scrub, and Great Basin Xeric Mixed Sagebrush Shrubland. Dominant plant species are the same as described above with the addition of greasewood (*Sarcobatus vermiculatus*).

The main pipeline and power line ROWs then cross through south-central Lake Valley. The major ecological system within this area is Inter-Mountain Basins Big Sagebrush Shrubland. Dominant plant species in Lake Valley are commonly greasewood and yellow rabbitbrush, cheatgrass (*Bromus tectorum*), gooseberryleaf globemallow (*Sphaeralcea grossulariifolia*), and herb sophia (*Descurainia sophia*).

The main pipeline and power line ROWs then extend into the northern portion of Dry Lake Valley. This portion of Dry Lake Valley experienced extensive wildfires in 2004 to 2005. The main ecological systems in northern Dry Lake Valley include Great Basin Xeric Mixed

Sagebrush Shrubland, Great Basin Pinyon-Juniper Woodland, Inter-Mountain Basins Big Sagebrush Shrubland, and Inter-Mountain Basins Mixed Salt Desert Scrub. Dominant plants species in the northern portion of Dry Lake Valley are commonly basin big sagebrush and rubber rabbitbrush along with common associates such as James' galleta grass (*Pleuraphis jamesii)*, yellow rabbitbrush, black sagebrush, Fremont's mahonia (*Mahonia fremontii*), spiny hopsage (*Grayia spinosa*) and winterfat (*Krascheninnikovia lanata)*.

The Cave Valley lateral pipeline and power line ROWs extend into the eastern portion of Cave Valley from the main pipeline ROW in northern Dry Lake Valley. The valley floor of Cave Valley in this area is a mosaic of Inter-Mountain Basins Big Sagebrush Shrubland, Inter-Mountain Basins Mixed Salt Desert Scrub, and Inter-Mountain Basins Greasewood Flat. Winterfat, green molly (*Bassia americana*), granite prickly phlox (*Linanthus pungens*), Indian ricegrass (*Achnatherum hymenoides*), and cheatgrass are common.

The main pipeline and power line ROWs continue south into the central portion of Dry Lake Valley. Invasive species such as Russian thistle (*Salsola tragus*) and cheatgrass, coupled with periodic fires and heavy grazing, have impacted the native vegetation through this region. This region is mainly characterized by Inter-Mountain Basins Mixed Salt Desert Scrub, with varying dominance of yellow rabbitbrush and spiny hopsage. Blaine's pincushion (*Sclerocactus blainei*) were observed in and near the ROW in central and south Dry Lake Valley between the elevations of 4,662 and 4,764 feet (Wildland International, 2007, 2009b). In southern Dry Lake Valley north of U.S. Highway 93, the main pipeline and power line ROWs enter an extensive area of alkali flats (Inter-Mountain Basins Playa) where soils become more basic and clay-rich in places. Dominant species here include Indian ricegrass, fourwing saltbush (*Atriplex canescens*), shadscale saltbush (*Atriplex confertifolia*), Greene's rabbitbrush (*Chrysothamnus greenei*), yellow rabbitbrush, squirreltail (*Elymus elymoides*), spiny hopsage, winterfat, and needle and thread grass (*Hesperostipa comata*).

In the southern tip of Dry Lake Valley south of U.S. Highway 93, the ROWs for the power line and pipeline are not contiguous (**Figure 2-5**). The main pipeline ROW traverses the valley bottom which is characterized predominately by Inter-Mountain Basins Semi-Desert Shrub Steppe. The power line ROW crosses Inter-Mountain Basins Big Sagebrush Shrubland and Mojave Mid-Elevation Mixed Desert Scrub. Dominant species include yellow rabbitbrush, spiny hopsage, bud sagebrush, and some native and non-native grasses depending on the severity of past disturbance.

The main pipeline and power line ROWs rejoin in central Delamar Valley. This is a transition zone into the Mojave Desert Ecological Province, described below.

3.1.3.2 Mojave Desert Ecological Province

Soils: Delamar Valley and Pahranagat Valley are characterized by Southern Nevada Basin and Range soils. Mountains are dominated by igneous and sedimentary carbonate rocks; and the valleys consist mostly of alluvial fill composed of cobble, gravel, and coarse sand, formed near the mountains in the apex of the alluvial fans. The dominant soil orders are aridisols and entisols. They generally are very shallow to very deep, well drained or somewhat excessively drained, and loamy-skeletal or sandy-skeletal. Soils in this area commonly contain high calcium carbonate contents due to the carbonate parent materials. Soils found in sinks and playa lakes typically have high concentrations of salts and sodium.

Coyote Spring, Hidden (North), Garnet, and Las Vegas valleys are characterized by Mojave Basin soils. Commonly underlain by alluvial deposits on alluvial fans and valley floors, soils in these valleys are known for having accumulations of evaporite minerals, including salts and borates from shallow subsurface flow, as well as surface flow that periodically fill the playa basins. The dominant soil orders are aridisolsand entisols. Soils are generally well drained to excessively drained, loamy-skeletal or sandy-skeletal (lacking soil horizons and rocky), and shallow to very deep. Saline and sodic soils are also common.

Vegetation: The main pipeline and power line ROWs in central to southern Delamar Valley predominantly cross Inter-Mountain Basins Mixed Salt Desert Scrub. Because Delamar Valley is in a transitional area between the Great Basin and Mojave Desert Ecological Provinces, there are a number of Mojave elements to the vegetation composition here including Joshua tree (*Yucca brevifolia*), Anderson's boxthorne (*Lycium andersonii*), smooth desert dandelion (*Malacothrix glabrata)*, Booth's evening primrose (*Camissonia boothii*), and bristly fiddleneck (*Amsinckia tessellata*). Other plants noted in the area, and considered typical of the Great Basin Ecological Province, are bud sagebrush, yellow rabbitbrush, fourwing saltbush, winterfat, greasewood, spiny hopsage, and non-natives Russian thistle and herb sophia.

Exiting Delamar Valley and moving south, the main pipeline and power line ROWs cross through the southeastern tip of Pahranagat Valley, also known as Pahranagat Canyon. This area is also a transition zone between the Great Basin and Mojave Desert Ecological Provinces. Ecological Systems in this area are a loose mix of Mojave Mid-Elevation Mixed Desert Scrub and Inter-Mountain Basins Semi-Desert Shrub Steppe at higher elevations, and Sonora-Mojave Creosotebush-White Bursage Scrub at lower elevations. Great Basin species present include yellow rabbitbrush, spiny hopsage, and winterfat. Common Mojave Desert species include creosote bush (*Larrea tridentata*), white bursage (*Ambrosia dumosa*), blackbrush (*Coleogyne ramosissima*) and Joshua tree.

The main pipeline and power line ROWs then enter Coyote Spring Valley. The predominant ecological system in this area is Sonora-Mojave Creosotebush-White Bursage Scrub, dominated by various combinations of creosote bush and white bursage, with lesser amounts of Nevada jointfir (*Ephedra nevadensis*) and Torrey's jointfir (*Ephedra torreyana*) present.

Moving south, the main pipeline and power line ROWs cross Hidden (North) Valley and Garnet Valley. Sonora-Mojave Creosotebush-White Bursage Scrub continues to dominate the area, with species including saltbush (*Atriplex canescens, A. hymenelytra*), brittlebush (*Encelia farinosa*), and Nevada jointfir present. The power line ROW terminates in Garnet Valley at the Silverhawk Generating Station.

The main pipeline ROW continues through Garnet Valley and terminates in Las Vegas Valley, where Sonora-Mojave Creosotebush-White Bursage Scrub continues to be the predominant ecological system. This plant community is dominated by various combinations of creosote bush and white bursage, with lesser amounts of Nevada jointfir and Torrey's jointfir present. Future Tiers Groundwater Development

3.1.4 Delineation of the Action Area

3.1.4.1 Groundwater Development Areas

The Action Area is also delineated by groundwater development areas in Spring, Cave, Delamar and Dry Lake valleys (**Figure 3-1**). The specific locations for future groundwater development

facilities, including wells, collector pipelines and distribution power lines, are presently unknown and cannot be identified at this time. SNWA will identify these facilities in the future, after water rights have been permitted and exploratory drilling has been conducted. The future ROWs would occur only over a small portion of the groundwater development areas (assumptions about future wells and facilities are detailed in Section 2.2).

3.1.4.2 Groundwater Pumping Effects Areas

The Action Area is also delineated by groundwater drawdown areas and waterbodies that may be indirectly affected by groundwater pumping. Such areas of indirect effects were determined by groundwater flow model predictions of groundwater drawdown and spring flow reduction at full build out plus 75 years (anticipated calendar year 2125) and 100 years recovery (anticipated calendar year 2225). A generalized understanding of the groundwater flow system based on hydrogeological conditions was also used to identify water bodies potentially affected. Groundwater drawdown areas and waterbodies with listed species under consultation are shown in **Figure 3-1**.

To derive groundwater drawdown and spring flow reduction projections, the regional groundwater flow model (described in Section 3.3) was run twice: once with only baseline pumping (baseline run), and once with both baseline and Federal action pumping (baseline-plus-action run). The baseline run simulation results were then subtracted from the baseline-plus-action run simulation results, to derive the potential effects of the project. Using this approach, the potential groundwater pumping effects presented in this document represent the net effects of pumping under the Federal action.

The model simulations of groundwater drawdown of the water table and flow reductions (which depend on the hydraulic heads at the sources) are used to conduct risk assessments to aquatic sites and species. The simulation results provide valuable insight as to the general, long-term drawdown patterns and an indication of potential trends in spring flow that may occur from the Federal action. Considering the regional scale of the model and unavoidable uncertainty associated with model predictions, the BLM has determined that simulation results at finer resolutions than 10 foot drawdown or 5 percent flow reduction exceed the limitations of the model and should not be used for effects analyses. Furthermore, because the model does not have the level of accuracy required to predict absolute values at specific points in place or time (especially decades or centuries into the future), the 10-foot drawdown and 5 percent flow reduction thresholds are used as a frame of reference to identify areas of risk. The BLM recognizes that refinements, such as the collection of additional site-specific hydrologic information and model refinement (such as the development of embedded models in specific areas of interest) would be necessary to improve the ability to predict drawdown impacts at a more localized scale. For a complete discussion, see BLM's Draft EIS (2011, pages 3.3-86 through 3.3-92).

The BLM acknowledges that, on the ground, drawdowns of less than 10 feet could reduce flows in perennial springs or streams that are controlled by discharge from the regional groundwater flow system. Such reduced flows could potentially cause declines in the diversity and abundance of associated riparian flora and fauna, which may only be able to tolerate water declines on the order of a few feet. The BLM also acknowledges that if a spring is experiencing low flows, an additional flow reduction of less than 5 percent could potentially affect a species. However, simulation results of less than 10 foot drawdown or 5 percent flow reduction from the regional

groundwater flow model cannot be used to infer such potential effects. As discussed above, the model simulation results should not be interpreted as absolute values, and such a high level of resolution exceeds the limitations of the model and should not be used for effects analyses. In addition, on the ground, drawdowns of less than 10 feet or flow reductions of less than 5 percent can be difficult to measure and/or distinguish from natural fluctuations.

Figure 3-2 shows the groundwater drawdown areas at 75 years after full build out and after 100 years of recovery. In central Spring Valley, where there are minimal baseline pumping activities, groundwater elevation and spring flow rapidly recover. Recovery in southern Spring Valley and the DDC area is slower because baseline pumping in southern Spring Valley and Lake Valley (respectively) reduces the amount of water available in the model simulation for recovery. The drawdown areas at 75 years after full build out and 100 years recovery are shown in **Figure 3-2**, together define the maximum extent of effects of the Federal action

The USFWS requested that a "high diffusivity" groundwater flow modeling simulation be conducted to assist the USFWS in considering uncertainties associated with the regional groundwater flow model, by identifying how changes in fundamental parameters used in developing and calibrating the groundwater flow model might be reflected in projected effects of proposed ground water pumping. However, as described further in Section 3.3.2, because the high-diffusivity model run constitutes a deliberate departure from the determinations necessary to calibrate the model, the output of the high-diffusivity run is not an appropriate tool for identifying actual potential impacts of groundwater pumping. As a result, the high-diffusivity model simulations were not used to define the Action Area.

3.1.5 Listed Species within Groundwater Development and Groundwater Pumping Effects Areas

3.1.5.1 Groundwater Development Areas

There are no listed species within the identified groundwater development areas.

3.1.5.2 Groundwater Pumping Effects Areas

Table 3-1 summarizes the waterbodies with listed species under consultation. Specifically, information in **Table 3-1** presents: whether the species are within the simulated drawdown area; whether the waterbodies where the species occur have simulated flow reduction; and whether those waterbodies are specifically simulated in the groundwater flow model.

Of the 30 springs and streams specifically simulated in the regional groundwater flow model, seven are within the Action Area and contain listed species (**Table 3-1**). Five intermediate or

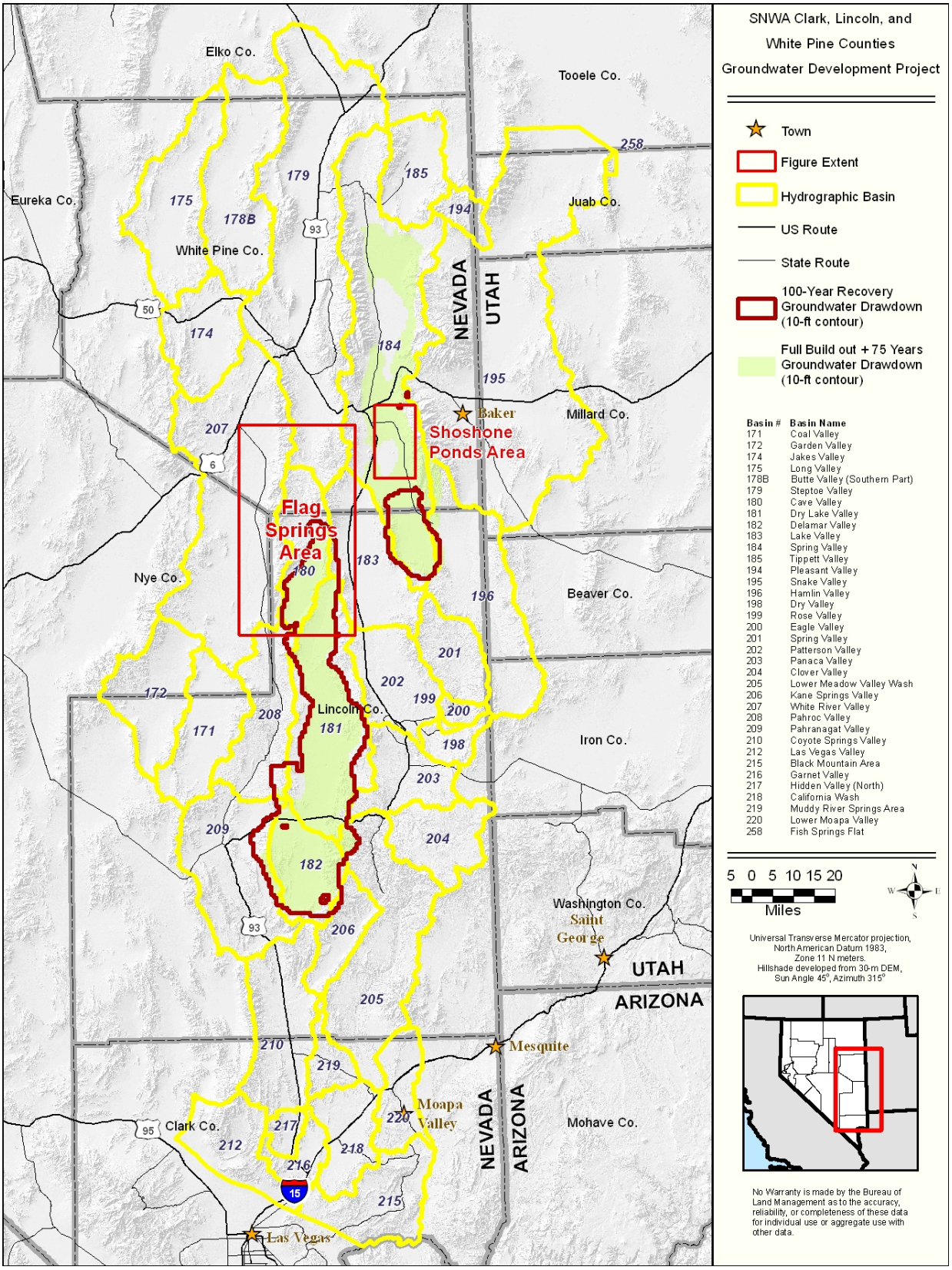

Figure 3-2 Model Simulated Drawdown Areas

Table 3-1 Waterbodies in the Action Area with Aquatic Listed Species

Surface Waterbody	Listed Species[1]	Critical Habitat	Simulated Drawdown Area	Simulated Flow Reduction	Specifically Simulated in Model[2]
Spring Valley					
Shoshone Ponds	Pahrump poolfish	No	Yes	N/A	No
White River Valley					
Preston Big Spring	White River spinedace (extirpated)	Yes	No	No	Yes
Lund Spring	White River spinedace (extirpated)	Yes	No	No	Yes
Flag Springs	White River spinedace	Yes	No	Yes	Yes
Lower Meadow Valley Wash					
Meadow Valley Wash	Southwestern willow flycatcher	No	No	N/A	No
Pahranagat Valley					
Hiko Spring	Hiko White River springfish	Yes	No	No	Yes
Crystal Springs	Southwestern willow flycatcher, Hiko White River springfish	Yes (fish); No (SWFL)	No	No	Yes
Ash Springs	White River springfish	Yes	No	No	Yes
Pahranagat Creek	Southwestern willow flycatcher, Pahranagat roundtail chub	No	No	N/A	No
Upper Lake (Pahranagat NWR)	Southwestern willow flycatcher	No[3]	No	N/A	No
Nesbitt Lake (Key Pittman WMA)	Southwestern willow flycatcher	No[3]	No	N/A	No
Muddy River Springs Area					
Muddy River springs and upper Muddy River	Moapa dace, Southwestern willow flycatcher	No	No	No	Yes

[1] Ute ladies'-tresses has never been documented in the Action Area. Potential habitat has been identified in various springs and wetlands in Spring, northern Hamlin, and southern Snake valleys (BIO-WEST, 2007b).
[2] At full build out plus 75 years and/or 100 years recovery.
[3] USFWS posted a proposed designation of revised southwestern willow flycatcher critical habitat on August 15, 2011 (USFWS, 2011a), which included newly proposed critical habitat in the Action Area. Currently, there is no designated critical habitat in the Action Area.
N/A - not applicable

local waterbodies that were not specifically represented in the groundwater flow model but are within the Action Area and contain listed species are also shown on **Table 3-1**. These springs were not able to be specifically simulated in the model due to various reasons (e.g., not a

regional spring, supplied by a perched aquifer, or a local mountain-block spring). The springs in **Table 3-1** and the predicted scenario results are discussed further in Sections 4.0 and 5.0.

There are seven listed species that occur within the Action Area in areas potentially indirectly affected by groundwater pumping: southwestern willow flycatcher, Pahrump poolfish, White River spinedace, Hiko White River springfish, Pahranagat roundtail chub, White River springfish, and Moapa dace. Although Ute ladies'-tresses (ULT) has never been documented in the Action Area, potential habitat has been identified in various springs and wetlands in Spring, northern Hamlin, and southern Snake valleys (see Section 4.1.9). Species accounts are provided in Section 4.0.

3.1.6 Ecological Setting

The ecological systems, soils and vegetation communities that occur within the groundwater development areas (discussed in Section 3.1.3), are pertinent to Spring, Cave, Dry Lake, and Delamar Valleys. Information about ecological settings within groundwater pumping effects areas relevant to the species under consultation is detailed in Section 4.0. Detailed information about the plants and wildlife documented within the groundwater drawdown basins are also available in Wildland International (2007, 2009a, 2009b), Jones and Stokes (2005), BIO-WEST, Inc. (2007a, 2007b, 2009), McLendon et al. (2011), BWG (2009), BRT (2011), SNWA (2010, 2011), and BLM (2011).

3.2 REGIONAL GROUNDWATER FLOW MODEL

SNWA developed a regional groundwater flow model, known as the Central Carbonate-Rock Province (CCRP) model (SNWA, 2008; 2009d; 2009e; 2010a; 2010b), under the guidance of a BLM technical hydrologic review team comprised of BLM hydrologists, technical expert consultants, and the USGS. The regional groundwater flow model, supporting information, and modeling simulations have been previously provided to the USFWS. The results of the groundwater flow modeling simulations are described in this BA.

The model is a transient numerical groundwater flow model using the USGS groundwater flow program MODFLOW-2000 (Harbaughet et al., 2000). The parameter-estimation code UCODE_2005 (Poeter et al., 2005) was used to assist in the calibration process. The area encompassed by the regional groundwater flow model is depicted in **Figure 3-3**. This area encompasses approximately 35 hydrologic basins and 20,688 square miles.

The model was constructed by (1) collecting baseline geologic and hydrologic data across the region, (2) developing a conceptual model of the groundwater flow system, including the definition of major hydrologic units across the region, and estimating groundwater budget components (i.e., recharge, groundwater discharge, and interbasin flow), (3) constructing a numerical model to represent the conceptual model, and (4) calibrating the model to steady-state and transient conditions. The final calibrated model was then used to simulate groundwater withdrawal. A more detailed description of model development is provided in the model reports (SNWA, 2009c; 2009d) and is provided in the BLM's Draft EIS for the GWD Project (BLM, 2011).

The BLM has also evaluated other available regional groundwater flow models which encompass portions of the Action Area. These other models, along with their limitations, are more fully described in the BLM's Draft EIS (BLM, 2011). Based upon that review, the BLM

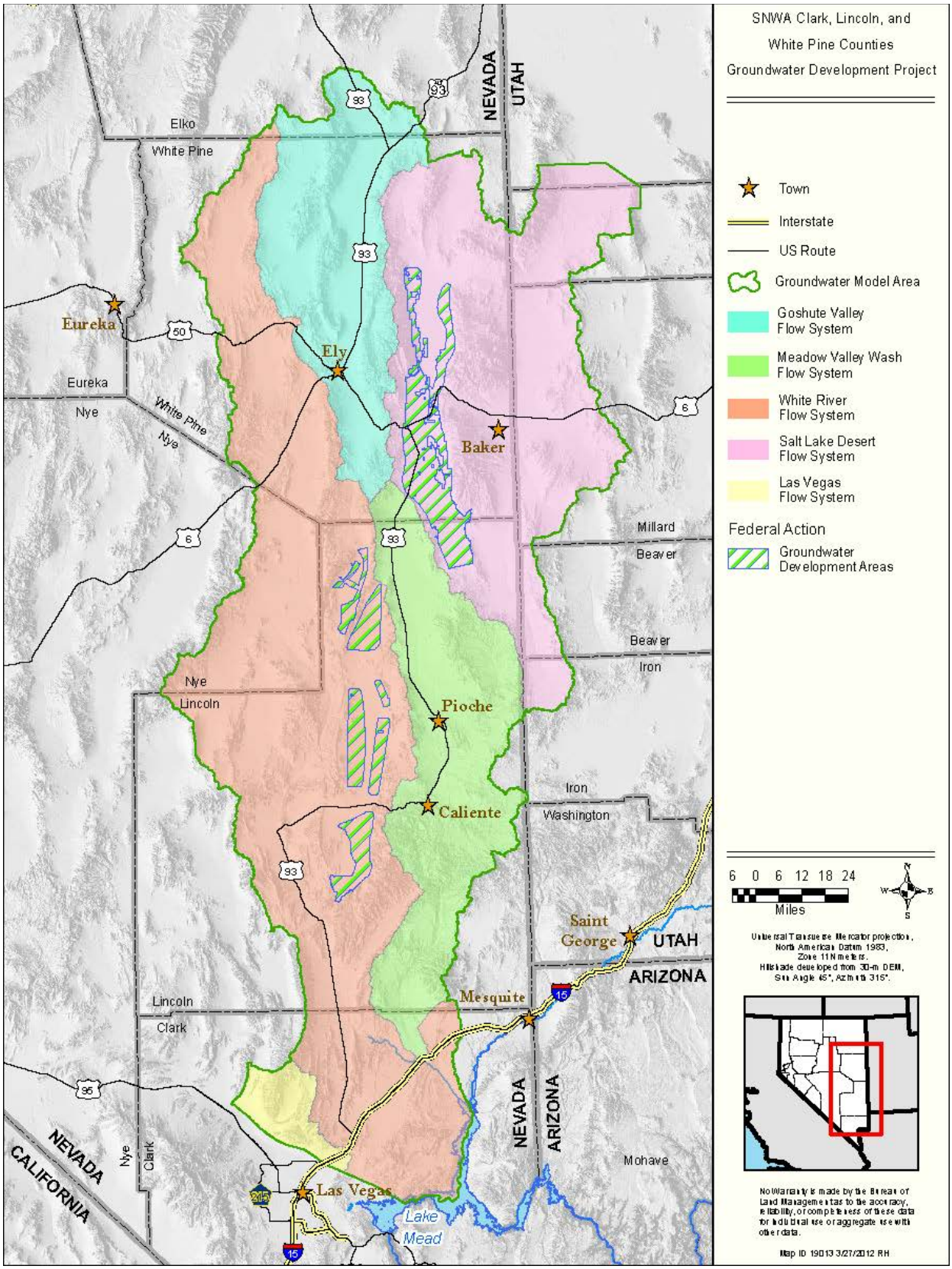

Figure 3-3 Regional Groundwater Flow Model Area

has determined that the CCRP model is currently the best available tool for evaluating effects of groundwater withdrawal from the Federal action.

Groundwater flow modeling simulations were conducted for the environmental baseline conditions. In accordance with ESA Section 7 regulations, the environmental baseline includes: (1) the past and present impacts of all Federal, state, or private actions and other human activities in an action area; (2) the anticipated impacts of all proposed Federal projects in an action area that have already undergone formal or early Section 7 consultation; and (3) the impact of State or private actions that are contemporaneous with the consultation in process (50 C.F.R. § 402.02). In addition to current and ongoing groundwater pumping, some reasonably foreseeable future groundwater use was also considered part of the environmental baseline for ESA (further described in Section 5.1.2). These future groundwater uses are actions that have undergone Section 7 consultation, but have not yet been implemented. The environmental baseline also included existing groundwater rights currently being used for agricultural operations that may be conveyed under the Federal action, as described in Section 1.2.3.

Groundwater flow modeling simulations for the Federal action were then conducted in combination with the environmental baseline. As described in Section 1.2.3, the model simulations considered pumping of a total of 83,988 afy of previously unappropriated groundwater from distributed locations within the four hydrologic basins. The groundwater flow model simulations were run for a period of continuous pumping (24 hours per day, 365 days per year) extending until 2125 (approximately 75 years after full project build out, as described in Section 1.3.1). The model simulations also included an additional 100-year recovery period out to year 2225.

In accordance with ESA Section 7 regulations, cumulative analysis would consider reasonably foreseeable future actions that would not undergo a Section 7 consultation. Because the majority of the project area is federally managed lands, most actions in the region would require federal authorization or permits and have an associated consultation under ESA. Thus, only state or private actions with reasonably foreseeable future groundwater development would be considered under this ESA cumulative analysis.

The reasonably foreseeable future groundwater uses considered agricultural water uses and permits. As provided in more detail in model technical backup to the USFWS, existing agricultural water use for basins within the groundwater flow model area is substantially less than the permitted water rights. This is likely due to a variety of factors including over appropriation of water by an applicant in hopes of being able to put it to beneficial use, improvements made in irrigation practices over time, appropriation of water for land that ultimately wasn't suitable for crop production, an appropriation of groundwater and surface-water to irrigate the same land, or issues with vested rights and combined duties. Considering this historical use pattern and the limited availability of non-federal land in the region, declining trends for agricultural water use, and NSE permit reductions that would occur if water rights were to be transferred for uses other than irrigation, it was determined that there was no imminent, inevitable, or sufficiently concrete information to suggest agricultural water user would increase into the future. Thus, the estimate for reasonably foreseeable future agricultural water uses was projected to be a continuation of the current usage rate.

Construction of a smaller sub-portion model(s) will be developed for subsequent tiers, and this may include an update to the groundwater flow model if there is new information which would

significantly improve the calibration and predictive abilities of the current model. Updates to the regional groundwater flow model will also be completed in accordance with the water rights stipulated agreements between SNWA and Department of Interior agencies (see Section 2.4).

3.2.1 Model Uncertainties and Limitations

The groundwater flow model is based on a conceptual model that represents a simplified and generalized understanding of the hydrogeologic and hydrologic conditions over a very large region. All models have limitations, and the CCRP model is no exception. Two major limitations of the model for predictive studies include: (1) a lack of reliable information regarding the hydraulic properties of faults included in the model; and (2) representation of future climate conditions. A detailed description of the uncertainties and limitations of the model are provided in the Draft EIS (Section 3.3.2.8 in BLM, 2011) and in the numerical model report (SNWA, 2009c).

The groundwater flow model's solutions are not unique, and a variation in a conceptual model may still fit observation data but result in differing predictions. The simulation results provide insight as to the general, long-term drawdown patterns and an indication of potential trends in spring flow that may occur from the proposed pumping (BLM, 2011 at pages 3.3-86 through 3.3-92). As described in the BLM's Draft EIS (BLM, 2011), given the regional scale of the model and unavoidable uncertainty associated with the model predictions (as well as other available groundwater flow models), the model does not have the level of accuracy required to predict absolute values at specific points in place or time (especially decades or centuries into the future).

Because of the regional nature of the groundwater flow model and modeling limitations, the model was designed to simulate regional springs and some selected intermediate springs. Regional springs are major discharge areas that are believed to be connected to the regional groundwater flow system. Intermediate springs are controlled by local structural features that either have to be simplified or cannot be represented in the regional-scale model. As a result, not all intermediate springs that contain listed species were capable of being simulated with the groundwater flow model, as shown in **Table 3-1**. The BLM notes that because of the regional nature of the groundwater flow model and model limitations, it is not possible to accurately predict site specific changes in flow for springs or streams, and the baseflow may not change as predicted by the model; however, the model is viewed as a useful tool for predicting flow trends (BLM, 2011).

As discussed in Section 3.2.12, considering the regional scale of the model and unavoidable uncertainty associated with model predictions, the BLM has determined that simulation results at finer resolutions than 10 foot drawdown or 5 percent flow reduction exceed the limitations of the model and should not be used for effects analyses. Furthermore, because the model does not have the level of accuracy required to predict absolute values at specific points in place or time (especially decades or centuries into the future), the 10-foot drawdown and 5 percent flow reduction thresholds are used as a frame of reference to identify areas of risk.

The BLM has concluded that the CCRP model is the currently best available tool for estimating effects of groundwater withdrawal from the Federal action. As described in Section 2.2, when future ESA consultations are conducted as part of compliance for subsequent tiers for the groundwater development facilities, the analyses will include development and/or updates to a smaller sub-portion of the model(s). It may also include updates to the model, and/or site-

specific hydrologic analysis, depending upon the availability of geologic and hydrologic information and areas or species of concern.

The USFWS requested that a "high diffusivity" groundwater flow modeling simulation be conducted to assist the USFWS in considering uncertainties associated with the regional groundwater flow model, by identifying how changes in fundamental parameters used in developing and calibrating the groundwater flow model might be reflected in projected effects. This high diffusivity model run is further described in Section 3.3.2, below.

3.2.2 High Diffusivity Model Simulation

The USFWS requested that a "high diffusivity" groundwater flow modeling simulation be conducted to assist the USFWS in considering uncertainties associated with the regional groundwater flow model. By making changes in the fundamental parameters used in developing and calibrating the groundwater flow model, and considering the associated changes in projected effects, the high diffusivity modeling simulation helps inform the uncertainties associated with the groundwater flow modeling predictions.

The regional groundwater flow model was developed based on certain assumptions concerning basic properties of the groundwater system, including assumptions concerning storage properties and hydraulic conductivity values (i.e., the volume of water that a rock will yield by gravity drainage, and the rate at which groundwater flows within the system). The model was then calibrated so that model results for current groundwater conditions matched empirical groundwater data. Calibration was accomplished by adjusting storage properties and conductivity values until predicted conditions approximated observed conditions.

The high-diffusivity run is a sensitivity-run in which hypothetical storage properties and hydraulic conductivity values were modified from those utilized in the calibrated groundwater flow model to represent a high horizontal conductivity and low specific yield. Those model adjustments result in outputs demonstrating artificially-high diffusivity. The high diffusivity causes groundwater drawdown projections to extend both further and deeper, representing an upper bound of the range of results of the selected groundwater development scenario.

The essential corollary resulting from manipulating the model to demonstrate high diffusivity is that the changes to calibrated storage and conductivity parameters inherently weaken the model's calibration, and the reliability of the model to predict groundwater drawdown effects. Based on this consideration, those parameters were modified in developing the high-diffusivity model run to the point where the calibration suffered but were not completely destroyed. The methodology used for performing this analysis is provided in the American Society for Testing and Materials, Standard guide for conducting a sensitivity analysis for a ground-water flow model application: American Society for Testing and Materials D 5611. The adequacy of the calibration was measured using standard scientific evaluations including the Sum of Square Weighted Residuals statistic, a visual comparison of the Simulated to Observed Hydraulic Heads, and comparison of the regression statistics for the hydraulic heads. Using these scientifically valid methods produced a model that was generally still calibrated, although to a lesser degree, and demonstrated an increase in the extent of projected drawdown effects. However, because the high-diffusivity model run constitutes a deliberate departure from the determinations necessary to calibrate the model, the output of the high-diffusivity run is not an appropriate tool for identifying actual potential impacts of groundwater pumping.

The high diffusivity run can be used to explain the manner in which changes to hydraulic properties could influence the spread of groundwater drawdown effects overall, and in illustrating such effects may extend further in some locations and less in others (see SNWA, 2010a, p. 5-4 through 5-7). It has value in identifying areas in which additional monitoring and management activities could be deployed to help identify the spread of impacts in those areas. It should not be used, however, to further define the level of impacts that may occur at a site specific location, and it is essential to recognize that the high-diffusivity model runs represent a deliberate departure from the calibration of the groundwater flow model.

The high diffusivity model simulations at 75 years after full build out did not show substantial differences from the calibrated model simulations. For the model-simulated springs, the high diffusivity scenario causes a shift in the initial starting value for predicted spring flow (i.e., the model-predicted approximation of current conditions). But after that, the trend in spring flow (percent flow changes) between the high diffusivity and calibrated model are generally the same. For the groundwater drawdowns, the high diffusivity simulation predicts deeper drawdowns in the GWD Project pumping basins, and expansions of the 10-foot drawdown contour into northwestern Hamlin, southeastern Steptoe, western Pahroc, and eastern Lake valleys. However, these expansions do not encompass any additional areas of listed species occurrence or habitat beyond those already described and analyzed in this BA.

3.2.3 Model Simulated Spring Flows

The numerical groundwater flow model was used to simulate changes in baseflow in selected springs and streams resulting from the proposed pumping based on the NSE water rights appropriations. The specific methods used to simulate spring and stream flow in the numerical model is provided in the model documentation (SNWA 2009b). Model-simulated changes in spring flow for springs with listed species (that were simulated with the model) are presented in **Table 3-2** (project specific) **and Table 3-3 (**aggregate). These tables also provide a comparison of the actual flow measured at the spring source and the model simulated flows for the baseline conditions (i.e. prior to project pumping).

Table 3-2 Project Specific Model-Simulated Changes in Spring Flow for Springs with Listed Species

Hydro-graphic Basin	Spring	Listed Species	Average Flow (Actual) in gpm	Model Simu-lated Average Flow (2005) in gpm	Model Flow / Actual Flow (%)	Incremental Change in Flow (%) (from No-Action)			
						Full Build Out (FBO)	75 years after FBO	100 years Recovery Period	Max. Reduc-tion Year
White River (207)	Flag Springs 3	White River spinedace[2]	969	560	58	0	-3	-4	2225
	Lund Spring	White River spinedace[2]	3,594	3,314	92	0	0	0	2225
	Preston Big Spring	White River spinedace	3,572	3,794	106	0	0	0	2225
Pahranagat Valley (209)	Ash Springs	White River springfish	6,909	7,453	108	0	0	-1	2222
	Crystal Springs	SW willow flycatcher; Hiko White River springfish	4,235	4,647	110	0	0	0	2225
	Hiko Springs	Hiko White River springfish	2,735	1,985	73	0	0	-1	2225
Muddy River Springs Area (219)	Muddy River near Moapa[1]	SW willow flycatcher; Moapa dace	20,931	15,383	73	0	0	-1	2225
Spring Valley (184)	Keegan Spring	Ute ladies'-tresses	234	63	27	-36	-75	-37	2135
Snake Valley (195)	Big Springs	Ute ladies'-tresses	4,289	1,977	46	-2	-18	-22	2185

Source: SNWA 2012

[1]Simulated using Stream Flow Routing 2 package for MODFLOW

[2]Extirpated

Table 3-3 Aggregate Model-Simulated Changes in Spring Flow for Springs with Listed Species

Hydro-graphic Basin	Spring	Listed Species	Average Flow (Actual) in gpm	Model Simu-lated Average Flow (2005) in gpm	Model Flow / Actual Flow (%)	Incremental Change in Flow (%) (from No-Action)			
						Full Build Out (FBO)	75 years after FBO	100 years Recovery Period	Max. Reduc-tion Year
White River (207)	Flag Springs 3	White River spinedace[2]	969	560	58	-1	-5	-6	2225
	Lund Spring	White River spinedace[2]	3,594	3,314	92	0	0	-1	2225
	Preston Big Spring	White River spinedace	3,572	3,794	106	-2	-5	-7	2225
Pahranagat Valley (209)	Ash Springs	White River springfish	6,909	7,453	108	-2	-2	-3	2222
	Crystal Springs	SW willow flycatcher; Hiko White River springfish	4,235	4,647	110	-1	-2	-2	2225
	Hiko Springs	Hiko White River springfish	2,735	1,985	73	-2	-3	-4	2225
Muddy River Springs Area (219)	Muddy River near Moapa[1]	SW willow flycatcher; Moapa dace	20,931	15,383	73	-37	-54	-60	2225
Spring Valley (184)	Keegan Spring	Ute ladies'-tresses	234	63	27	-40	-77	-43	2135
Snake Valley (195)	Big Springs	Ute ladies'-tresses	4,289	1,977	46	-10	-29	-35	2185

Source: SNWA 2012
[1]Simulated using Stream Flow Routing 2 package for MODFLOW
[2]Extirpated

3.3 CLIMATE CHANGE

Secretarial Order 3226 (Amendment 1) requires that the Department of Interior bureaus and agencies consider and analyze potential climate change impacts when undertaking long-range

planning exercises, setting priorities for scientific research and investigations, and/or when making major decisions affecting their environmental resources (Secretary of the Interior, 2009).

Ongoing scientific research has identified a trend of increasing global average air and ocean temperatures. Climate change, whether natural or anthropogenic, can affect hydrologic systems through changes in key weather patterns. Changes in either temperature or precipitation, or both, can have hydrologic consequences, particularly in the amount, the seasonal timing, and the elevation of snow accumulation and melt. Snowfall and snowpack are crucial components of the hydrologic system in the groundwater flow model area.

There has been no specific climate change modeling for the Action Area, or even the State of Nevada as a whole. However, there have been various regional climate change studies and global climate change modeling. Available knowledge on climate, and predicted future trends are described in the Draft EIS for the GWD Project (BLM, 2011), which is summarized below.

3.3.1 Historical Regional Climate

The climate in the Southwest and Great Basin Desert is and historically has been highly variable due to their locations with respect to atmospheric circulation patterns and complex topography. Historic precipitation and temperature events have been assessed using many types of paleoclimate indicators, including tree-ring chronologies, packrat middens, pollen records, and oxygen 18 ($\delta_{18}O$) data from sediment cores.

Based on paleoclimate records, both the Southwest and Great Basin Desert have experienced several “megadroughts” over the last millennia (Mensing et al., 2008; Benson et al., 2002; Ni et al., 2002; Herweijer et al., 2007; Sheppard et al., 2002). Megadrought is defined as a drought with the severity of present-day major droughts, but lasting 20 to 40 years. Less severe, but longer lasting droughts of 100 years or more also have been documented as occurring in the regions (Mensing et al., 2008; Benson et al., 2002; Sheppard et al., 2002). Generally, precipitation events affect both the Southwest and the Great Basin Desert simultaneously, such as the severe droughts documented in the late 1500s and 1950s (Benson et al., 2002; Ni et al., 2002; Swetnam and Betancourt, 1998), and anomalously wet periods in the 1330s, 1610s, and the 1910s-1920s (Ni, 2002; Schwinning et al., 2008).

The timing, amount, and form of precipitation are important factors for groundwater recharge rates, and temperature plays an important role in the form of precipitation. Temperature records typically have an inverse relationship to precipitation (i.e., lower temperatures during periods of higher than normal precipitation). This pattern is consistent with observed present day climate influenced by the El Nino/La Nina cycles (Jin et al., 2006; Sheppard et al., 2002; Cayan et al., 1999). Evidence suggests that multi-decade periods of warmer or cooler than normal temperatures have been increasing in their severity since the 1700s and temperature is increasing to an unprecedented extent in the last 400 years (Sheppard et al., 2002).

A historical analysis of temperature in White Pine County conducted by Redmond (2009) indicates that decadal means since the late 1990s are higher than any other decadal mean on record, with spring time temperatures rising more than other seasons. Data from 1948 to 2009 were used to analyze seasonal changes in freezing levels in White Pine County (Redmond, 2009) and spring is the season that shows the greatest rise in the freezing level. Spring time temperatures and freezing levels are important considerations for the timing and rate of spring

snowmelt and the manner that snow is converted into soil moisture, groundwater, and streamflow.

3.3.2 Predicted Future Trends

3.3.2.1 Temperature

Temperatures in North America are projected to increase with a greater than 66 percent probability (Christensen et al., 2007). Global climate models predict that temperatures in the western U.S. will increase between 36.5 and 42.8 degrees Fahrenheit (°F), relative to pre-1900 levels, over the next 100 years (Christensen et al., 2007). The largest summertime changes in North America are predicted to occur in the American Southwest. Global model predictions suggest temperatures in the Great Basin are anticipated to increase as well; however, the change in temperature is not predicted to be as large as the predicted changes in the Southwest. It is predicted that warm extremes will be more frequent and last longer (Field et al., 2007).

Redmond (2009) analyzed results from 15 different global climate models for a grid cell containing Spring Valley. The 15 global climate models all were in agreement that temperatures in Spring Valley will likely increase for all seasons relative to the 1971-2000 period. The magnitude of this increase varied by model; however, the median increase for all 15 models suggest that annual average temperature in Spring Valley will increase approximately 39.2ºF in the next century.

Monitored temperatures in valleys within the Action Area during the last 65 years generally support global climate model predictions for the Great Basin. Temperature records are widely available for much of the 20th century. Records demonstrate that annual average temperatures have increased from 1º to 4ºF in the groundwater flow model area. However, the predicted changes in maximum summer temperatures are not reflected in current trends of the annual maximum temperatures at two of the three monitoring stations. Instead, 1º to 10ºF increases in the annual average minimum temperatures are shown for all three monitoring stations over the last 65 years.

3.3.2.2 Precipitation

The confidence in precipitation predictions for the Southwest is somewhat weaker than the confidence in temperature predictions due to the complexity of circulation patterns bringing moisture to the area. Generally, global climate models predict that arid regions of the world will experience decreased precipitation levels and the Southwest is no exception (Christensen et al., 2007; Seager et al., 2007). The available moisture (precipitation minus evaporation) in the Southwest is predicted to decrease by 0.01 to 0.18 millimeters per day relative to available moisture during the period 1950-2000, with an average decrease of 0.1 millimeters per day. This change is predicted to occur sometime mid-21st century, with a quarter of the global climate models predicting this decrease over the next several decades (Seager et al., 2007). As a reference, precipitation between 1948 and 1957 (the 1950s drought) decreased by 0.13 millimeters per day, indicating that the recent year droughts may become the new baseline level of precipitation. Monitored precipitation at sites in the Great Basin region has shown an increased level of precipitation relative to the 1948-1957 drought.

The 15 global climate models analyzed in Redmond (2009) generally agreed that there will be no net annual change in precipitation in Spring Valley in the next century. However, the seasonal distribution of precipitation could potentially change. The Great Basin is suggested to be likely

to experience an increase in winter precipitation amount in the latter part of the 21st century, which may be offset by reduced precipitation in the spring and summer seasons (Redmond, 2009).

3.3.2.3 Water Availability (Combination of Precipitation and Temperature)

There is a high level of confidence that due to increasing temperatures, western mountains will experience a change in the timing, amount, and form of precipitation (Field et al., 2007). The Great Basin region might not see any change in the amount of annual precipitation (neither an increase nor decrease, which is supported by Redmond [2009]); however, water resources still could be diminished due to the higher temperatures alone (affecting evaporation, transpiration rates, etc.) (Christensen et al., 2007). The distribution of precipitation over the year is important for plant growing cycles and water availability. Generally, it is predicted (with > 66 percent probability) that summertime precipitation in the Southwest associated with the North American Monsoon System will be reduced as the circulation system is forced northward due to differences in land/sea heating (Christensen et al., 2007). How this will impact the Great Basin Desert (located to the north of the Southwest) is dependent upon how far to the north the North American Monsoon is displaced. Wintertime precipitation in the Great Basin Desert typically is in the form of snow, and the accumulation and timing of snow melt are important for ecological and economic resources. It is predicted that there will be a decline in snowpack associated with warmer temperatures due to a latter onset and earlier spring melting (Field et al., 2007). A declining snowpack already has been documented in much of the western U.S. (Miller and Piechota, 2008; Pierce et al., 2008; Jin et al., 2006; McCabe and Wolock, 1999; Regonda et al., 2005).

While there have been studies and modeling of the projected effects of climate change on temperature, precipitation, and surface water systems, there is currently insufficient information currently to reasonably predict potential effects on groundwater systems. The assumption that temperature, precipitation, and surface water changes would manifest into lower infiltration and recharge has not been substantiated. Moreover, potential effects would likely vary by geographic area. According to the U.S. Climate Change Science Program: "In contrast to the many studies that have been conducted over the last 20 years of surface water vulnerability to climate change...few studies have examined the sensitivity of groundwater systems to a changing climate" (USCCSP 2008, p. 43). In this report, the author's present work that has shown both increases and decreases to recharge as a result of climate change and then conclude:

> these studies suggest that the ability to predict the effects of climate and climate change on groundwater systems is nowhere near advanced as for surface water systems...The interaction of groundwater recharge with climate is an area that requires further research. The papers reviewed have used a variety of approaches, some of them physically based, but others have essentially "tuned" recharge in ways that do not represent the full range of mechanisms through which climate change might affect groundwater systems (USCCSP 2008, p. 145).

3.3.3 Climate Change Considerations for the Federal Action

The regional groundwater flow model used a constant average recharge from precipitation rates averaged over 30 years of historical records (PRISM normal precipitation grid) (SNWA, 2009d). This precipitation grid was used because it has a relatively fine resolution (2,625 feet) and is recognized as the best quality spatial climate data available. The 30-year PRISM data was also

used by CBO (2009) to represent historical climate patterns in the U.S. A coarser scale (2.5-mile) PRISM precipitation grid with a longer historical record exists, however, this grid does not have as much data resolution and was determined to be lesser quality for the numerical modeling. The 30-year historical record represents the best available data, and there is no other suitable quality data that could represent a long-term climatic average.

Since global climate change modeling suggests annual precipitation in the study area may remain similar to present conditions, and given the uncertainties of potential effects of climate change on groundwater systems, no separate climate change modeling simulations were performed using the groundwater flow model. This is consistent with the USFWS's policy to ensure that all scientific information used is reliable and credible (USFWS, 1998). Potential climate change variability would only further increase uncertainties associated with modeling outputs from the regional groundwater flow model.

There are efforts underway to downscale the regional climate change models in east central Nevada by the Nevada System of Higher Education, under a National Science Foundation 5-year grant (Experimental Program to Stimulate Competitive Research). This study is not anticipated to be completed until 2013. Information from this study could be incorporated into future ESA consultations for subsequent tiers.

Future tiered ESA consultations will follow Department of Interior and BLM policies related to climate change and will utilize the best scientific and commercial information available at the time of those consultations.

4.0 SPECIES ACCOUNTS

This section describes eight federally listed species and five associated designations of critical habitat, based upon the January 25, 2012 USFWS species list (USFWS, 2012; Appendix A), which occur within the Action Area (**Table 4-1**). Their species accounts are provided in Section 4.1.

Table 4-1 Federally Listed Species within the Action Area

Species[1]	Federal Status	Species Occurrence within the Action Area	Critical Habitat within the Action Area
Southwestern willow flycatcher (*Empidonax traillii extimus*)	Endangered	Pahranagat Valley, Lower Meadow Valley Wash, Muddy River Springs Area	None designated; Proposed in Pahranagat Valley[2]
Desert tortoise (*Gopherus agassizii*)	Threatened	Pahranagat Valley, Coyote Spring Valley, Lower Meadow Valley Wash, Kane Springs Valley, Hidden Valley (North), Garnet Valley, Las Vegas Valley	Coyote Spring Valley, Lower Meadow Valley Wash, Kane Springs Valley, Hidden Valley (North), Garnet Valley, Las Vegas Valley
Pahrump poolfish (*Empetrichthys latos*)	Endangered	Spring Valley	None
White River spinedace (*Lepidomeda albivallis*)	Endangered	White River Valley	White River Valley
Hiko White River springfish (*Crenichthys baileyi grandis*)	Endangered	Pahranagat Valley	Pahranagat Valley
Pahranagat roundtail chub (*Gila robusta jordani*)	Endangered	Pahranagat Valley	None
White River springfish (*Crenichthys baileyi baileyi*)	Endangered	Pahranagat Valley	Pahranagat Valley
Moapa dace (*Moapa coriacea*)	Endangered	Muddy River Springs Area	None
Ute ladies'-tresses (*Spiranthes diluvialis*)	Threatened	potential habitat in Spring Valley, northern Hamlin Valley, and southern Snake Valley[1]	None

[1] Ute ladies'-tresses has never been documented in the Action Area. Potential habitat documented in BIO-WEST, 2007b.
[2] USFWS posted a proposed designation of revised southwestern willow flycatcher critical habitat on August 15, 2011 (USFWS, 2011a), which included newly proposed critical habitat in the Action Area. Currently, there is no designated critical habitat in the Action Area.

In accordance with 50 C.F.R. § 402.02, this section includes an analysis of the environmental baseline, which includes the past and present impacts of all Federal, state, or private actions and other human activities in the Action Area. It is "an analysis of the effects of past and ongoing human and natural factors leading to the current status of the species, its habitat (including designated critical habitat), and ecosystem, within the Action Area. The environmental baseline is a 'snapshot' of a species' health at a specified point in time. It does not include the effects of the action under review in the consultation." (USFWS and NMFS, 1998). Discussion in this

section is focused to provide information relevant to formulating the BO in accordance with the ESA Consultation Handbook (USFWS and NMFS, 1998).

In accordance with 59 FR 34271, the species information provided herein is based on the best available scientific literature. Data and reports were gathered from Federal and State resource agencies, private firms, surveys conducted or commissioned by SNWA, and scientific literature. Field surveys by SNWA were developed in coordination with USFWS, BLM, and NDOW, and designed to help document baseline environmental conditions of terrestrial and aquatic species and habitats within the Action Area. Per 59 FR 34271, the information used was evaluated to ensure that it is reliable, credible, and represents the best scientific and commercial data available. Biological data and reports requested by the USFWS have been submitted as part of the administrative record.

4.1 FEDERALLY LISTED SPECIES IN THE ACTION AREA

The nine species addressed below occur within the Action Area. These species, together with presence or absence of critical habitat in the Action Area, are summarized above in **Table 4-1**.

4.1.1 Southwestern Willow Flycatcher (Empidonax traillii extimus)

4.1.1.1 Species Biology

The southwestern willow flycatcher is a small grayish-green passerine bird measuring approximately 5.75 inches. This flycatcher is a neotropical migrant that breeds in the southwestern U.S. and migrates to Mexico, Central America, and possibly northern South America during the non-breeding season (Phillips, 1948; Stiles and Skutch, 1989; Peterson, 1990; Ridgely and Tudor, 1994; Howell and Webb, 1995). Arriving on breeding grounds between early May and mid-June, the southwestern willow flycatcher breeding range includes southern California, Arizona, New Mexico, western Texas, southwestern Colorado, southern Utah, extreme southern Nevada, and extreme northwestern Mexico (Sonora and Baja) (Unitt, 1987; USFWS, 2002a). The average breeding pair will produce about two to three eggs in 4 days, egg incubation lasts 9 to 11 days, and nestlings fledge after 7 to 9 days (NDOW, 2010e). Southwestern willow flycatchers have a lifespan of 3 to 4 years.

The southwestern willow flycatcher breeds in dense riparian habitats from sea level in California to approximately 8,500 feet in Arizona and southwestern Colorado. Historical egg/nest collections and species' descriptions throughout its range describe the southwestern willow flycatcher's widespread use of willow (*Salix* spp.) for nesting (Phillips, 1948; Phillips et al., 1964; Hubbard, 1987; Unitt, 1987; San Diego Natural History Museum, 1995). Currently, southwestern willow flycatcher primarily use Geyer willow (*Salix geyeriana*), coyote willow (*Salix exigua*), Goodding's willow (*Salix gooddingii*), boxelder (*Acer negundo*), tamarisk (*Tamarix* sp.), Russian olive (*Elaeagnus angustifolio*), and live oak (*Quercus agrifolia*) for nesting. Other plant species less commonly used for nesting include: buttonbush (*Cephalanthus* sp.), black twinberry (*Lonicera involucrata*), cottonwood (*Populus* spp.), white alder (*Alnus rhombifolia*), blackberry (*Rubus ursinus*), and stinging nettle (*Urtica* spp.). Four basic vegetation communities provide southwestern willow flycatcher habitat: monotypic willow, monotypic exotic, native broadleaf dominated, and mixed native/exotic (Sogge et al., 1997). Appropriate breeding habitat may be found along rivers, streams, open water, cienegas, marshy seeps, or saturated soil where dense growth of riparian habitat occurs. Available riparian habitat within the Action Area is typically patchy and widely separated by inhospitable arid lands.

4.1.1.2 Status of the Species

The southwestern willow flycatcher was listed as endangered, without critical habitat, on February 27, 1995 (USFWS, 1995a). In 2002, a Recovery Plan for the southwestern willow flycatcher was completed (USFWS, 2002b). This plan describes the reasons for endangerment, current southwestern willow flycatcher status, addresses important recovery actions, and provides recovery goals. Recovery is based on reaching numerical and habitat-related goals for each specific Management Unit established throughout the southwestern willow flycatcher's range and establishing long-term conservation plans (USFWS, 2002b).

There are currently 288 known southwestern willow flycatcher breeding sites in California, Nevada, Arizona, Utah, New Mexico, and Colorado (all sites from 1993 to 2007 where a resident southwestern willow flycatcher has been detected) involving an estimated 1,299 territories (Durst et al., 2008). A grand total of southwestern willow flycatcher territories cannot be determined because not all sites are surveyed annually. Numbers have increased since the bird was listed and some habitat remains un-surveyed; however, after nearly a decade of intense surveys, the existing numbers are just above the upper end of Unitt's (1987) estimate of approximately 20 years ago (500-1,000 pairs).

Within the State of Nevada, southwestern willow flycatcher breeding habitat (which is the only way to document presence of this subspecies) has been confirmed in the following locations: Pahranagat Valley at Pahranagat NWR (Upper Lake), Key Pittman Wildlife Management Area (WMA) (Nesbitt Lake), Crystal Spring, and Pahranagat Creek (private land); northern Lower Meadow Valley Wash; Muddy River Springs Area at WSNA; Lower Moapa Valley at Overton Wildlife Management Area; several areas along the lower Virgin River; and Amargosa Desert at Ash Meadows National Wildlife Refuge. Breeding locations within the Action Area include those sites within: Pahranagat Valley and Lower Meadow Valley Wash (**Figure 4-1**). The Muddy River Springs Area at WSNA is also being included as a major point of discharge, i.e., the terminal discharge area for the White River Flow System. Ash Spring is the principal headwater for the Upper Lake in Pahranagat NWR and Pahranagat Creek, while Crystal Spring provides outflow outside of the summer irrigation season.

Annual surveys in Nevada have been performed by several entities including the San Bernardino County Museum, SWCA Environmental Consultants (SWCA), SNWA and NDOW (McKernan, and Braden, 1997, 1998, 1999, 2000, 2001, 2002; Braden et al., 2004; 2005, 2006, 2007, 2008; SWCA, 2005, 2006, 2007, 2009, 2010, 2011; and NDOW, 2008a; 2010e). Between 2001 and 2006, surveys at select sites in southern Nevada showed that the numbers of adults, pairs, and nests varied slightly but remained relatively constant, except for a decrease in 2003. In 2007, the number of adults detected (28) represented a 40 percent increase from 2006 counts (NDOW, 2008a). In 2009, NDOW detected a total of 27 adult resident southwestern willow flycatchers during surveys at two areas: WSNA (Muddy River Springs Area) and Key Pittman WMA (Pahranagat Valley) (NDOW, 2010e). The total was comprised of 12 pairs and three single southwestern willow flycatchers. Occupied breeding areas were detected at both the WSNA (one pair) and Key Pittman WMA (11 pairs). The 2009 survey results showed a slight decrease in bird counts from 2007, which might be attributed to the change of personnel conducting the surveys (NDOW, 2010e). On 1 July 2010, all WSNA southwestern willow flycatcher survey sites were burned in a wildfire (SWCA, 2011). At most sites, portions of the overstory and all understory vegetation was consumed by the fire.

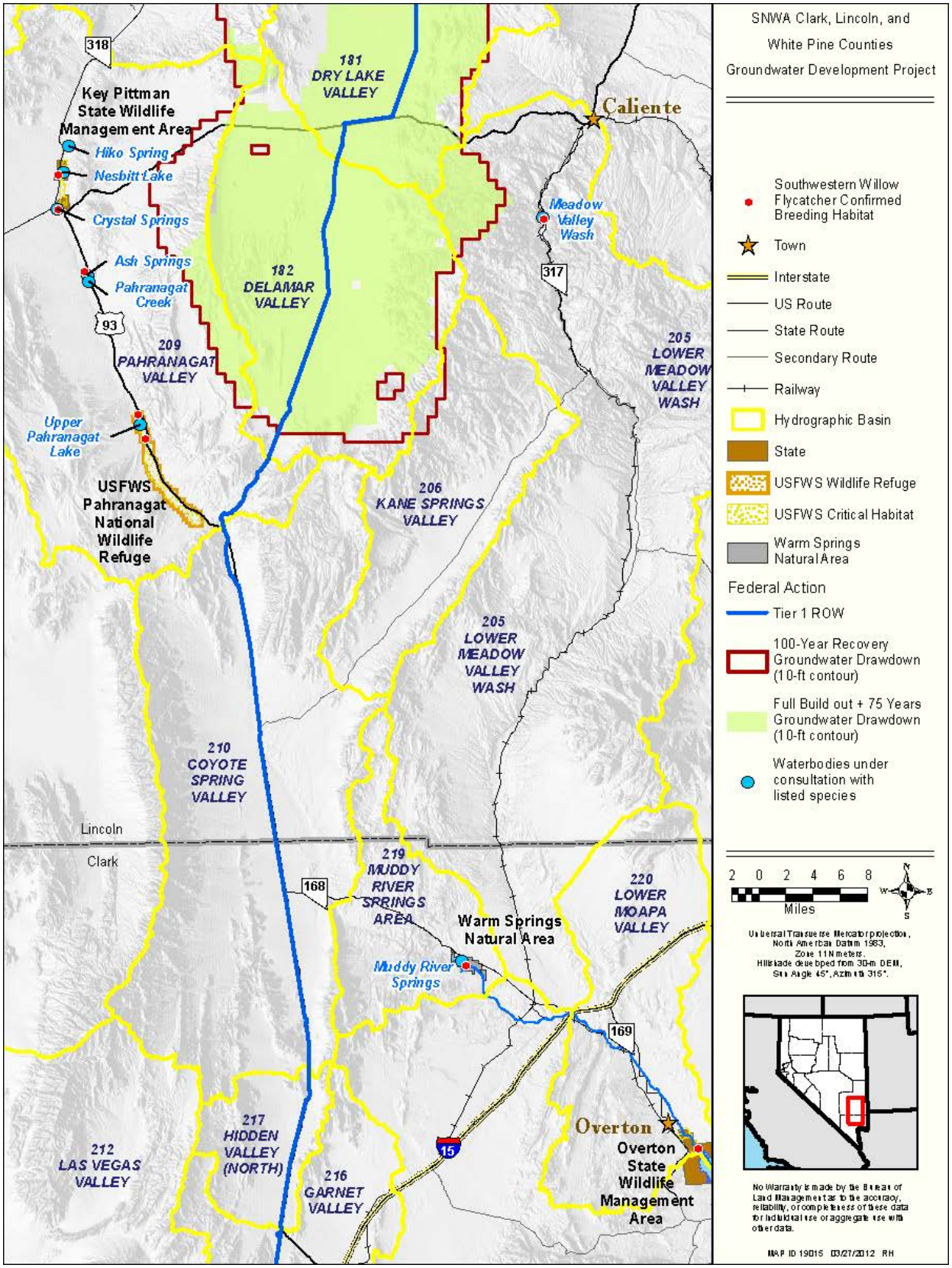

Figure 4-1 Southwestern Willow Flycatcher Breeding Habitat Locations

Although surveys were discontinued after the fire, surveys conducted prior to the wildfire had revealed the presence of five breeding adults, and two birds of unknown residency status. Preliminary results for 2011 indicate that one pair of southwestern willow flycatchers nested in an area burned by wildfire and three nestlings were banded (Pelligrini, pers. comm., 2011). In 2010, the Key Pittman WMA was inhabited by 30 adult breeding southwestern willow flycatchers, one unpaired male, and four birds of unknown residency status (SWCA, 2011).

Similarly, Pahranagat NWR had relatively high numbers of southwestern willow flycatcher and high productivity in recent years (SWCA, 2005; 2006; 2007; 2009). In 2008, SWCA detected 16 breeding southwestern willow flycatchers, as well as eight resident, unpaired males. Surveys by SWCA detected 24 adult southwestern willow flycatchers in both 2009 and 2010 at the Pahranagat monitoring sites (SWCA, 2010, 2011). In 2009, there were 20 breeding adults, one unpaired male, and three birds of unknown residency status; whereas, in 2010 there were 19 breeding adults, three unpaired males, and two birds unknown residency status.

Detections of southwestern willow flycatcher were made in the Overton WMA in Lower Moapa Valley in 2008 (SWCA, 2009, 2010, 2011). In 2009, six breeding southwestern willow flycatchers and two unpaired, resident males were detected there. Two other males in which residency could not be confirmed were also detected during this 2008 field survey effort. In 2009, there were 11 breeding adults, two unpaired males, and four birds of unknown residency status. In 2010, there were eight breeding adults, four unpaired males, and two birds of unknown residency status.

Nevada populations of southwestern willow flycatcher are considered part of the Lower Colorado Recovery Unit, which also includes portions of Arizona, New Mexico, and California. Among other criteria for delisting, the Recovery Plan gives the minimum number of breeding territories that should exist (in stable conditions) to allow declassification of this subspecies. Territories—defended areas within a breeding site—are a common metric for estimating avian populations due to birds' proclivity to respond to taped calls during breeding season. At the time of publication, the Recovery Plan listed 146 known territories, and determined that a total of 525 territories was the minimum number necessary to delist the Lower Colorado Recovery Unit (USFWS, 2002b). As of 2008, 150 territories were recorded (Durst et al., 2008). These data suggest that populations are relatively stable in the area, but it is not possible to determine at this time if they are increasing or decreasing (USFWS, 2002b).

4.1.1.3 Status of Species in the Action Area

Southwestern willow flycatcher breeding locations in the Action Area include Pahranagat NWR (Upper Lake), Key Pittman WMA (Nesbitt Lake), Crystal Spring, and Pahranagat Creek (outflow from Ash and Crystal springs; private land) in Pahranagat Valley; and northern Lower Meadow Valley (**Figure 4-1**). These breeding sites encompass a small portion of the 288 breeding sites identified from 1993-2007 across six southwestern states (Durst et al., 2008).

Pahranagat NWR had relatively high numbers of southwestern willow flycatcher and high productivity in recent years (SWCA, 2005, 2006, 2007, 2009, 2010, 2011).

Pahranagat NWR is extensively managed for the conservation of the southwestern willow flycatcher through efforts to restore, improve, and protect its habitat. Specific conservation efforts include: (1) maintaining 100 acres of cottonwood/willow riparian habitat specifically for breeding southwestern willow flycatcher and other migratory birds; (2) planting willows and

cottonwood trees on 200 acres to provide more breeding habitat for southwestern willow flycatcher; (3) continuing to help coordinate with other agencies in their surveys and research of southwestern willow flycatcher; and (4) to seek funding to develop more acreage into cottonwood/willow through restoration efforts. Annual surveys for southwestern willow flycatcher have been conducted since 1996, in compliance with requirements set forth by USFWS, which supports Pahranagat NWR conservation efforts. In addition, the 2009 Desert National Wildlife Refuge Complex Comprehensive Conservation Plan requires the preparation and implementation of a habitat restoration and management plan specific to the southwestern willow flycatcher.

Pahranagat Valley water use is primarily associated with irrigation at this time (BRT, 2011). Current local irrigation practices will likely influence hydrologic conditions at Pahranagat NWR more than distant pumping activities (Felling, pers. comm., 2008). Currently, approximately 60 percent of the water used for irrigation comes from surface water outflows from regional carbonate springs, with the remainder pumped from carbonate and basin aquifers. According to NDWR, irrigation in Pahranagat Valley in 2009 accounted for approximately 95 percent of groundwater pumpage (NDWR, 2010). Water rights held by private landowners and USFWS (for Pahranagat NWR) are currently dispersed by season. Private land owners have water rights for the irrigation season, during which time Pahranagat NWR receives tail water. During the non-irrigation season, Pahranagat NWR has a winter water right that supplies their reservoirs and the southwestern willow flycatcher habitat there. In Pahranagat NWR, water is primarily managed to support migratory waterfowl (BRT, 2011).

Key Pittman WMA is managed for the conservation of waterfowl, wetland species, and specifically the southwestern willow flycatcher. NDOW "fences the known southwestern willow flycatcher habitat in order to protect it from livestock grazing, manages water to maintain habitat, monitors the status of southwestern willow flycatchers, and is actively planting riparian plants to improve the distribution of riparian habitat." (USFWS, 2011a). Nesbitt Lake, the breeding site of southwestern willow flycatcher in Key Pittman WMA, is a managed reservoir that experiences high water fluctuations at times, including low water levels during the spring and summer. Furthermore, water is has been primarily managed to support migratory waterfowl. The draft management plan for Key Pittman WMA completed in November 2003 includes protections for the southwestern willow flycatcher.

Flooding of southwestern willow flycatcher habitat in northern Lower Meadow Valley Wash (2005 and 2010) removed some of the suitable and potential habitat. This area may currently serve as migratory habitat as well.

4.1.1.4 Threats to the Species

Within the southwestern willow flycatcher breeding range, loss of riparian and wetland habitats, degradation of riparian habitat, and climate change are primary threats to the species. Brood parasitism by brown-headed cowbirds (*Molothrus ater*) is also a major threat to nesting success. Increasing genetic isolation of existing populations, which is driven by decreasing habitat connectivity, may further threaten the species.

4.1.1.5 Status of Critical Habitat

Critical habitat for the southwestern willow flycatcher was designated on July 22, 1997 (USFWS, 1997). A correction notice was published in the Federal Register on August 20, 1997

to clarify the lateral extent of the designation (62 FR 44228). On May 11, 2001, the Tenth Circuit Court of Appeals set aside designated critical habitat in those states under the Tenth Circuit's jurisdiction (New Mexico). The USFWS subsequently set aside southwestern willow flycatcher critical habitat designation in other states until it could re-assess the economic analysis prepared during the designation.

On October 19, 2005, the USFWS redesignated southwestern willow flycatcher critical habitat (USFWS, 2005a). A total of 737 river miles across southern California, Arizona, New Mexico, southern Nevada, and southern Utah were included in the final designation. Among this critical habitat is 73.8 miles along the Virgin River (USFWS, 2005a). Critical habitat along the river is contiguous from the Washington Field diversion impoundment in Washington County, Utah, downstream through the town of Littlefield, Arizona, and ends at the upstream boundary of the Overton WMA in Clark County, Nevada.

Critical habitat contains Primary Constituent Elements (PCEs), those physical and biological features of a landscape that a species needs to survive and reproduce. PCEs for the southwestern willow flycatcher are based on:

- riparian plant species
- structure and quality of habitat
- insects for prey

A variety of river features such as broad floodplains, water, saturated soil, hydrologic regimes, elevated groundwater, fine sediments, etc. help develop and maintain these PCEs (USFWS, 2005a).

On August 15, 2011, the USFWS published proposed rules to revise the critical habitat for the southwestern willow flycatcher under the ESA (USFWS, 2011a). A total of 2,090 stream miles across California, southern Nevada, southern Utah, southern Colorado, Arizona, and New Mexico are proposed for critical habitat designation. Areas covered under the proposed rules include Clark, Lincoln, and Nye counties in Nevada. Areas in Nevada include a segment of the Pahranagat Creek that runs through Key Pittman WMA, a segment of the Pahranagat Creek that runs through Pahranagat NWR, and segments of the Muddy and Virgin Rivers that run through Overton WMA, as well as the Virgin River (USFWS, 2011a).

4.1.1.6 Status of Critical Habitat in the Action Area

No designated critical habitat for southwestern willow flycatcher currently occurs within the Action Area (**Figure 4-1**).

In the 2005 designation of critical habitat, the USFWS excluded the Key Pittman WMA from designation as critical habitat (USFWS, 2005a). The USFWS recognized that the area has been under management for wildlife since the 1960s with conservation efforts targeted towards waterfowl, wetland species, and specifically the southwestern willow flycatcher. Because of such conservation efforts, the USFWS thus found the benefits of exclusion outweighed the benefits of inclusion (USFWS, 2005a).

The USFWS also excluded the Pahranagat NWR from the 2005 designation of critical habitat (USFWS, 2005a). The USFWS noted that Pahranagat NWR was already extensively managed for the conservation of the southwestern willow flycatcher through efforts to restore, improve,

and protect its habitat. Because of such conservation efforts, the USFWS thus found the benefits of exclusion outweighed the benefits of inclusion (USFWS, 2005a).

Critical habitat has been proposed for a 3.9-mile segment of the Pahranagat Creek that runs through Key Pittman WMA and a 10.8-mile segment of the Pahranagat Creek that runs through Pahranagat NWR (USFWS, 2011a).

In the proposed rules, USFWS is considering excluding the portion of proposed critical habitat within Key Pittman WMA as a result of completed management plans under section 4(b)(2) of the ESA (USFWS, 2011a). The private land separating the two sections of Key Pittman WMA does not provide southwestern willow flycatcher habitat. There is no perennial surface water flow and only a few small isolated patches of trees, which does not provide nesting habitat and provides little and suboptimal foraging or migratory stopover habitat.

Of the 10.8 miles of proposed critical habitat that spans Pahranagat NWR, breeding has only been confirmed in a limited area around the Upper Lake, and 8.4 of the 10.8 miles is not occupied by southwestern willow flycatcher and harbors very little southwestern willow flycatcher habitat. The majority of this 8.4-mile stretch has highly modified channels with no perennial surface water flow and only a few small isolated patches of trees, which does not provide nesting habitat and provides little and suboptimal foraging or migratory stopover habitat. This lack of habitat is shown in southwestern willow flycatcher survey efforts at Pahranagat NWR, which have been conducted in the past decade almost exclusively around the Upper Lake (i.e., in appropriate habitat and known breeding locations). In 2005 and 2006, southwestern willow flycatcher surveys were conducted at a dense clump of tamarisk south of the Lower Lake (Pahranagat Salt Cedar site), but no birds were detected (SWCA, 2008). Furthermore, southwestern willow flycatcher surveys were not conducted at the Pahranagat Salt Cedar site in 2003, 2004, or 2007 because it was dry.

4.1.1.7 Threats to Critical Habitat

Threats to critical habitat include: (1) the loss of riparian and wetland habitats due to new construction; (2) modification/diversion of surface water resources; (3) existing groundwater pumping; (4) agriculture encroachment; and (5) degradation of riparian habitat through invasion of non-natives such as salt cedar. Regional drought, fire, localized flooding, and climate change have the potential to degrade the quality and quantity of available habitat on both local and regional scales.

4.1.2 Agassiz's Desert Tortoise (Gopherus agassizii)

4.1.2.1 Species Biology

Agassiz's desert tortoise (desert tortoise) is one of two recently recognized species of North American desert tortoises (Murphy et al., 2011). It is a large herbivorous reptile that can reach a length of 14 inches and a mass of 15 pounds. It is commonly found within desert scrub vegetation at elevations up to 5,500 feet (USFWS, 2011b). The desert tortoise is a long-lived species, with adults living up to 80 years, and taking up to 20 years to reach sexual maturity. Desert tortoises have home ranges of 12 to 583 acres (Harless et al., 2010). As a burrowing species, soils must be friable enough for digging burrows but firm enough that burrows do not collapse. Eggs are laid in late spring or early summer. A number of researchers have described the natural history of the species, including Berry and Burge (1984), Bury et al. (1994), Weinstein et al. (1987), and Ernst and Lovich (2009).

4.1.2.2 Status of Species

The desert tortoise is federally listed as threatened (USFWS, 1990). A Recovery Plan for the tortoise was approved by the USFWS in 1994 (USFWS, 1994). In 2011, the USFWS released a final Revised Recovery Plan to resolve key uncertainties about the threats and management of the species, thereby improving recovery potential (USFWS, 2011b). The Revised Recovery Plan was published as a living document and will implement a formal adaptive management program, which seeks to place new emphasis on understanding the synergistic effects of threats through applied research on desert tortoise demography, distribution, and habitat.

The desert tortoise occurs in the Mojave and Colorado deserts north and west of the Colorado River in southwestern Utah, southern Nevada, southeastern California, and northwestern Arizona (Murphy et al., 2011; **Figure 4-2**). The distribution depicted in **Figure 4-2** was derived from the USGS desert tortoise habitat model (USGS, 2009). In Nevada, the native range of the species is generally restricted to Clark County and those portions of Lincoln and Nye counties south of the 37th parallel and up to 4,500 feet above mean sea level.

Desert tortoise populations in Clark and Lincoln counties are primarily found on valley bottoms and bajadas, preferring creosote scrub vegetation, but also utilizing succulent scrub, cheesebush scrub, blackbush scrub, hopsage scrub, shadscale scrub, microphyll woodland, and saltbush scrub. Desert tortoises are generally present in these plant communities where there is a sufficient amount of forage species, shelter sites for protection from predators, and suitable substrate for burrowing. Tortoises occur most commonly on gently sloping terrain with soils ranging from sand to sandy gravel. However, they do occur in areas of steeper terrain, with larger rocks, in many portions of their range.

In an attempt to refine the long-term monitoring program for the tortoise, annual range-wide population monitoring using Line Distance Sampling (LDS) began in 2001. This is the first comprehensive effort undertaken to estimate densities across the range of the species (USFWS, 2007). The monitoring program is designed to detect long-term population trends, so density estimates from any brief time period (such as described here) would be expected to show only drastic declines or increases. For 2010, results of population monitoring describe tortoise density as approximately eight tortoises per square mile in the Northeastern Mojave Recovery Unit (USFWS, 2010c). In Coyote Spring Valley, the desert tortoise density was approximately nine tortoises per square mile (USFWS, 2010c).

In a critical review of desert tortoise declines prior to 1970, Bury and Corn (1995) concluded that the available evidence does not support the hypothesis of long-term, widespread, declines since European settlement of the Mojave Desert. In fact, historical accounts cited therein suggest the alternative hypothesis that populations were already depressed as a result of consumption by Native Americans and coyotes. Recent data on relatively high rates of predation by coyotes during drought years further substantiate this hypothesis (Berry, 1974; Esque et al., 2010). However, the evidence for declines since the 1970s, as a result of agricultural development,

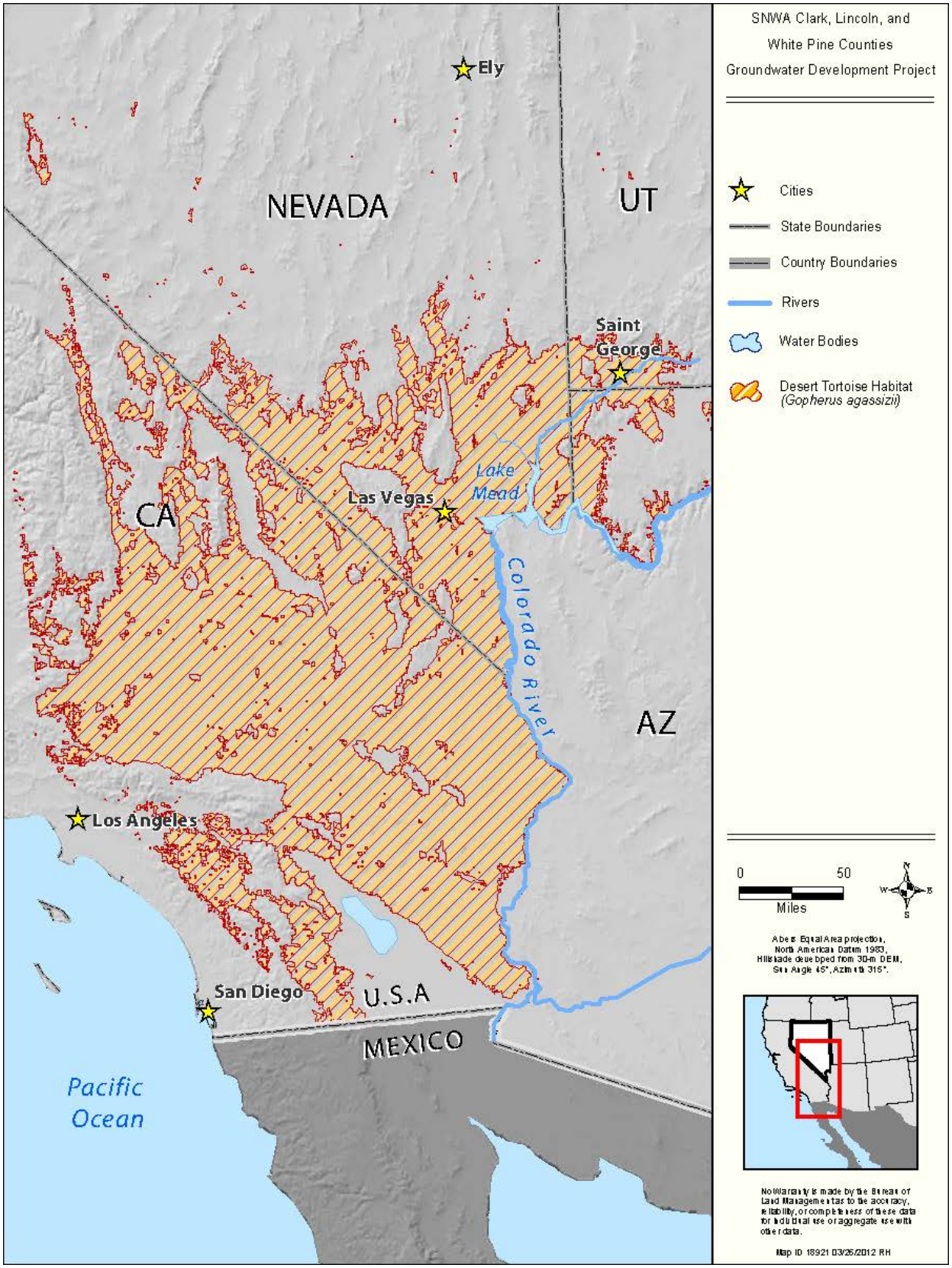

Figure 4-2 Range of Desert Tortoise

disease, off-road vehicle activity, road mortality, subsidized predators, and urbanization are uncontested (Ernst and Lovich, 2009; USFWS, 2011b). Long-term population trend analysis is ongoing, but is often regarded as only viable in the immediate vicinity of the survey plot (Tracy et al., 2004; USFWS, 2008). Trend analysis of plots through 1996 for the Northeastern Mojave RU reported no trends in tortoise density, although local declines may be obscured within the data (USFWS, 2006b). Because of statistical analyses issues with the permanent study plots (i.e., spatio-temporally non-random sampling), this sampling methodology has largely been replaced by LDS. In general, desert tortoise populations are reported to be experiencing a general decline (USFWS, 1994a; Tracy et al., 2004). Based on 2001 LDS transect data, Tracy et al. (2004) documented large areas where only dead tortoises were observed in northern Coyote Springs Valley, Nevada (Fig 4.24 in Tracy et al., 2004). In 2010, however, 43 live desert tortoises were observed during LDS surveys throughout Coyote Springs Valley (Figure 9 in USFWS, 2010c).

4.1.2.3 Status of Species in the Action Area

Desert tortoises occurrences are limited to the ROW portion of the Action Area, ranging from the southern terminus of the ROW in Las Vegas Valley to southern Pahranagat Valley (the northern tip of their range) (**Figure 4-3** and **Figure 4-4**).

SNWA contracted Wildland International and Jones and Stokes to survey the proposed and alternative GWD Project ROWs for signs of desert tortoise in 2005-2007 and 2009. The entire ROWs within desert tortoise habitat were surveyed and, at the suggestion of BLM wildlife biologists, zone of influence (ZOI) parallel belt transects were surveyed at a distance of 300 and 600 feet from ROW edges (ZOI surveys were conducted only on federal lands). Surveys were performed in accordance with the USFWS (1992a) protocol, and tortoises, burrows, pallets, nests/eggs, scat, carcasses, and tracks were recorded during the survey. **Figures 4-3** and **4-4** illustrate the locations of desert tortoise sign documented within the Action Area.

- In 2005, Jones and Stokes conducted protocol-level pedestrian surveys starting at the southern project terminus and continuing along 75 miles of the proposed ROW, including surveys in the ZOI. A total of 330 desert tortoise signs, such as carcasses, burrows, scat, and tracks were observed (Jones and Stokes, 2005).
- From 2005 to 2007, Wildland International conducted protocol-level pedestrian surveys for the alternative ROW in the Apex area and 13.6 mile route of the proposed ROW near Kane Springs in Coyote Spring Valley, including surveys in the ZOI. A total of 253 desert tortoise signs were observed (Wildland International, 2007).
- In 2009, Wildland International conducted protocol-level pedestrian surveys on approximately 36 miles of adjusted proposed ROWs between Garnet Valley and Delamar Valley, including surveys in the ZOI. A total of 82 desert tortoise signs were observed (Wildland International, 2009a).

Densities of desert tortoise within the Action Area ranged between very low (0-9 animals per square mile) and low 10-45 animals per square mile) (density categories per Karl [1980] modified from Berry and Nicholson [1984]; **Table 4-2**). In Las Vegas, Garnet, Hidden (North), and Pahranagat valleys, density was generally very low. In Coyote Spring Valley and the Apex area of Las Vegas Valley, tortoise density varied between very low and low, likely due to

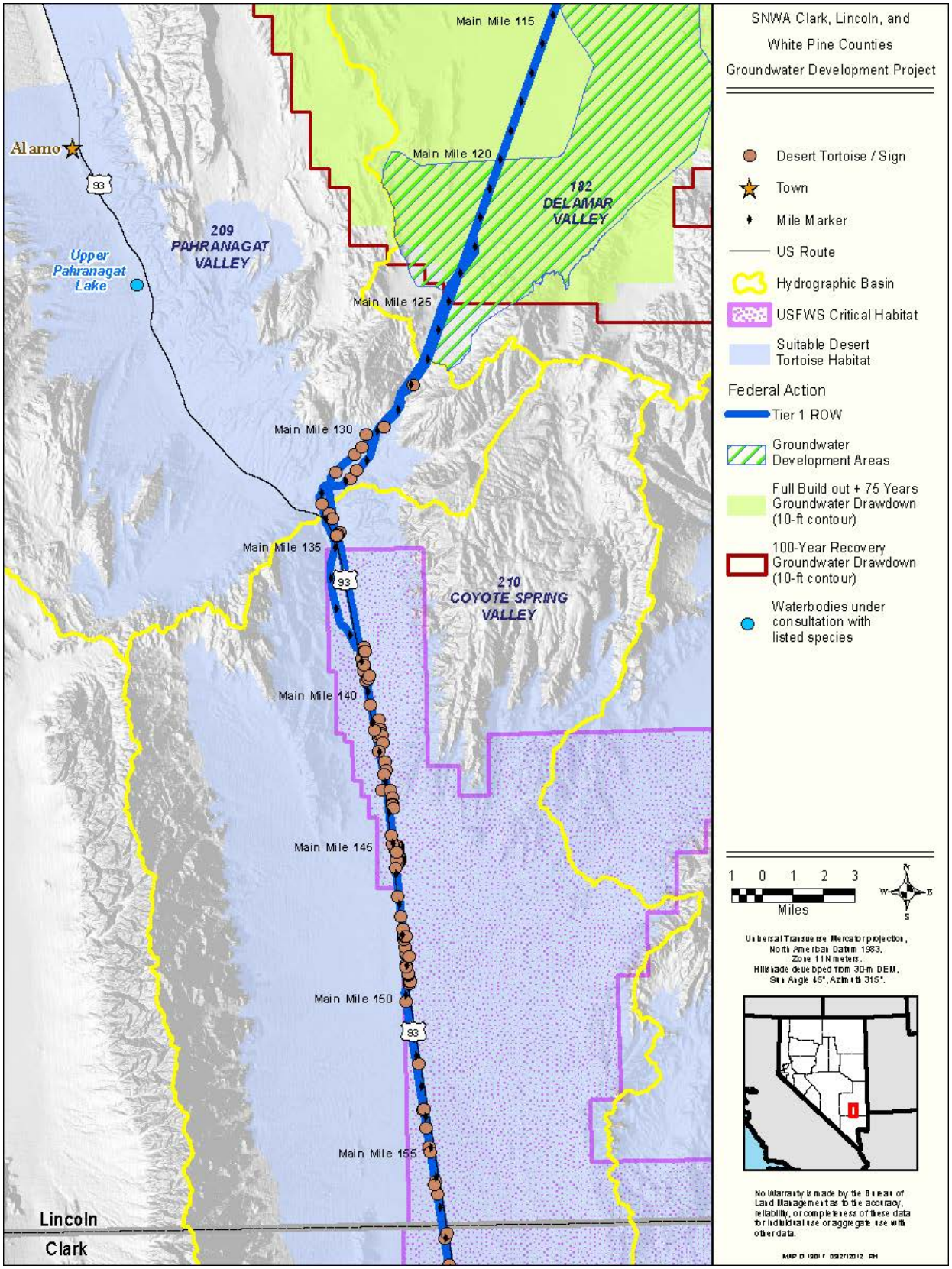

Figure 4-3 Desert Tortoise Occurrences (1 of 2 maps)

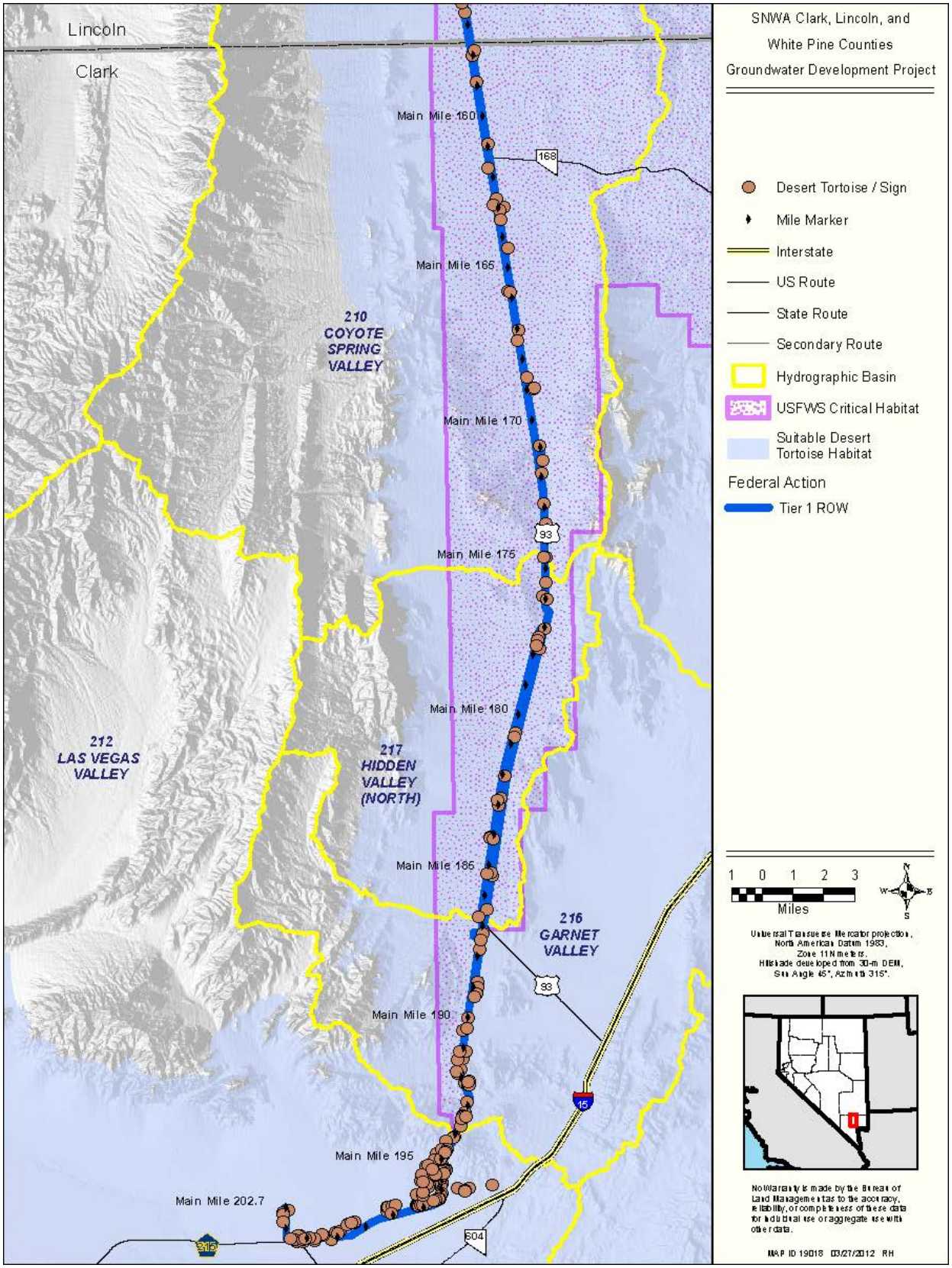

Figure 4-4 Desert Tortoise Occurrences (2 of 2 maps)

Table 4-2 Desert Tortoise Densities within the Action Area

Location (hydrographic basin, ROW mileposts)	Length in Valley (miles)	Density Category (Karl 1980)
Las Vegas Valley (Main Mile 202.7 - 194)	8	Low to Very Low
Garnet Valley (Main Mile 193.9 -186.7)	7.2	Very Low
Hidden Valley (North) (Main Mile 186.7 - 174.6)	12.1	Very Low
Coyote Spring Valley (Main Mile 175 - 172)	3	Very Low
Coyote Spring Valley* (Main Mile 171)	0.7	Low
Coyote Spring Valley* (Main Mile 171 - 162)	9	Very Low
Coyote Spring Valley* (Main Mile 162 - 150)	12	Low
Coyote Spring Valley (Main Mile 150 - 134.5)	15.5	Very Low
Transition Coyote Spring Valley to Pahranagat Valley (Main Mile 134.5 - 129.5)	5	Low
Pahranagat Canyon (Main Mile 129 - 126.9)	2.1	Very Low

*Additional areas surveyed to accommodate potential shift of proposed ROW.
Source: Jones and Stokes (2005); Wildland International (2007, 2009a).

patches of higher-quality habitat. The three primary plant communities along the ROW within desert tortoise habitat were Mojave creosote bush scrub, Mojave blackbush scrub, and Mojave wash scrub. The vast majority of tortoise observed were reported to be in good health and appeared to be free of disease (Jones and Stokes, 2005; Wildland International, 2007, 2009a).

As requested by USFWS, baseline disturbances of desert tortoise habitat were examined in detail within a 1-mile buffer area centered on the middle of the Action Area. A 0.5 mile radial distance was chosen so as to increase the likelihood of intersecting the home ranges of desert tortoises inhabiting the vicinity of the proposed ROW. Using Arc Geographic Information Systems (GIS), a 0.5 mile digitized buffer was created around the proposed ROWs within the range of desert tortoise (Las Vegas Valley terminus to southern Pahranagat Valley). GIS feature classes of 2000-2008 burns (BLM wildfire data) were clipped to the buffer polygon. Roads, utilities, and other disturbances (e.g., structures, construction sites) identified on USDA 1 Meter National Agriculture Imagery Program (NAIP) Imagery (Summer 2010) were also digitized within the buffer polygon. Any ground disturbance or clearing in the vicinity of a structure or construction site was included. The spatial data were appended and an acreage field was added and

calculated. Each feature was given the attribute of either critical habitat or non-designated habitat (non-designated habitat being that portion of potential desert tortoise habitat that lie outside of critical habitat). Non-designated desert tortoise habitat was defined by two spatial datasets: (1) BLM moderate density habitat; and (2) potential desert tortoise habitat in Clark and Lincoln Counties. Potential desert tortoise habitat includes desert tortoise habitat in Lincoln County as defined in the BLM Ely District RMP (2008), and potential habitat identified by SNWA at 4,000 ft elevation or less in Clark County. It should be noted that no portion of the proposed Tier 1 ROW in Clark County was above 4,000 ft. Acreages of disturbed and undisturbed habitat within critical and non-designated habitat were calculated for the four types of disturbances (i.e., roads, utilities, burns, and other).

Critical habitat encompassed 71 percent of the analysis area (36,911 acres), and non-designated habitat encompassed 29 percent of the analysis area (14,946 acres). Within critical habitat, baseline direct disturbances sum to 7 percent (2,434 acres) of the total critical habitat within the 0.5 mile buffer. Direct disturbances are characterized by roads (1,435 acres; 56 percent), burns (736 acres; 28 percent), and other (263 acres; 10 percent).

Within non-designated habitat, baseline direct disturbances sum to 13 percent (1,887 acres) of the total non-designated habitat within the 0.5 mile buffer. Direct disturbances are characterized by roads (1,098 acres; 61 percent), burns (91 acres; 5 percent), utilities (205 acres; 11 percent), and other (492 acres; 27 percent). With the possible exception of the burned areas, the disturbed areas no longer function as desert tortoise habitat.

The aforementioned anthropogenic disturbances were not randomly distributed within the buffer area, however. US Route 93 lies parallel to the east side of the proposed ROW for approximately 50 miles. Similarly, existing service roads lie parallel to the west side or within the proposed ROW for approximately 70 miles.

4.1.2.4 Threats to the Species

The desert tortoise appears to have suffered significant declines since the time of listing due to various factors including: disease, increased development, off-road vehicle use, predation of juvenile tortoises by ravens, wildfires, and drought (Ernst and Lovich, 2009; USFWS, 2011b). Climate change is also a threat to this species. Western Mojave populations have undergone the most severe declines (USFWS, 2008).

4.1.2.5 Status of the Critical Habitat

In September 1994, the USFWS designated approximately 6 million acres as critical habitat for what is now Agassiz's desert tortoise (59 CFR 45748; USFWS, 2011b). Using the recovery plan as a basis, six Recovery Units (RUs) were identified: the Western Mojave RU, Eastern Colorado RU, Eastern Mojave RU, Northern Colorado RU, Northeastern Mojave RU, and upper Virgin River RU. The boundaries of some of these RUs were modified in the Revised Recovery Plan (USFWS, 2011b), with the end result being that there are now only five RUs. The RUs are further subdivided into Critical Habitat Units (CHUs). Desert WMAs (DWMAs) were also identified within each RU. DWMAs were general areas identified in the 1994 Desert Tortoise Recovery Plan that had no specific legal boundaries (USFWS, 2011b). The DWMAs were formalized by the BLM, which administers them as legally designated Areas of Critical Environmental Concern (ACEC). ACECs are intended to protect important cultural and natural

resources, such as the desert tortoise. The Mormon Mesa CHU and Mormon Mesa DWMA are within the Action Area.

The PCEs of desert tortoise critical habitat are:

- Sufficient space to support viable populations within each of the six recovery units, and to provide for movement, dispersal, and gene flow;
- Sufficient quality and quantity of forage species and the proper soil conditions to provide for the growth of these species;
- Suitable substrates for burrowing, nesting, and overwintering; burrows, caliche caves, and other shelter sites;
- Sufficient vegetation for shelter from temperature extremes and predators; and
- Habitat protected from disturbance and human-caused mortality.

Based on the range-wide monitoring of desert tortoise populations, Mormon Mesa had an adult (≥ 7 inches CL) desert tortoise density of 5.5 tortoises/0.6 mile in 2010 (USFWS, 2010c). This density estimate was based on 76 tortoises observed along 807 miles of survey transects within a 374 square mile area. Interestingly, the density estimates in 2008 and 2009 were 1.9 and 7.3 tortoises/0.6 mile, respectively (USFWS, 2010h). The variability between years appears related to the significantly lower sampling effort, in terms of the number of km surveyed, in 2008.

4.1.2.6 Status of Critical Habitat in the Action Area

The Action Area intersects with the Mormon Mesa CHU (Northeastern Mojave RU), primarily within the designated LCCRDA utility corridor (**Figures 4-3** and **4-4**). The Action Area goes through the Mormon Mesa CHU in Coyote Spring Valley, Hidden Valley (North), Garnet Valley, and Las Vegas Valley. In recent years, the Northeastern RU has some of the lowest densities of desert tortoise when compared to other RUs in the range of this species (Tracy et al., 2004; USFWS, 2020h). The Action Area also intersects with the Mormon Mesa DWMA, which is similar in area to the Mormon Mesa CHU and is managed by BLM according to BLM Resource Management Plans as an ACEC.

There is no additional information available regarding the current status of the critical habitat in the Action Area.

4.1.2.7 Threats to Critical Habitat

Threats to desert tortoise critical habitat include: loss of habitat from construction projects such as roads, housing, energy development and conversion of native habitats to agriculture, in conjunction with contradictory land uses, such as livestock grazing and recreational off-road vehicle use. Other threats include wildfires and climate change (e.g., Henen et al., 1998). These threats have the potential to degrade the quality and quantity of available habitat on both local and regional scales.

4.1.3 Pahrump Poolfish (Empetrichthys latos)

4.1.3.1 Species Biology

The Pahrump poolfish is a small (up to 3 inches), egg-laying member of the family Goodeidae. It has a short, slender head and lacks a pelvic fin (USFWS, 1980). This species is omnivorous, feeding on a wide variety of available plant and animal material. Adult fish are often found in open, deeper water while juvenile fish utilize vegetated, shallow water. The species spawns

throughout the year, peaking from late May to early June, with eggs believed to be deposited on aquatic vegetation (USFWS, 1980). Although preferring warmer water temperatures (around 76°F), the species does tolerate lower and higher temperature fluctuations and can even survive under surface ice (USFWS, 1980).

4.1.3.2 Status of Species

The Pahrump poolfish was federally listed as endangered in 1967 (USFWS, 1967). This species was known only from an isolated spring on Manse Ranch, in Pahrump Valley. Prior to the failure of Manse Spring in 1975, the fish were relocated to three new refugia sites: Los Latos Pool on the Colorado River near Lake Mojave (Colorado River Valley); Corn Creek Springs in the Desert NWR (Las Vegas Valley); and the Shoshone Ponds ACEC (Spring Valley) (**Figure 4-5**). The population at Los Latos Pool was lost due to flooding in the early 1970s, and a replacement population was established at an irrigation reservoir at the Spring Mountain Ranch State Park in western Clark County in 1983 (USFWS, 2004a). Pahrump poolfish at Shoshone Ponds are within the Action Area.

The USFWS has prepared a recovery plan for the Pahrump poolfish (USFWS, 1980). The recovery plan required the establishment of three refuge populations, each of which must maintain 500 fish or more for three consecutive years, in order to downlist the species to "threatened" status. Delisting may occur should populations remain at 500 adults for another 3 years following downlisting. In both cases, these refuge habitats would need to be considered secure with continued proof of reproductive recruitment before any status changes would be pursued. The Shoshone Ponds site is one the three populations, and thus critical to the long-term conservation of the species. However, the ponds are not particularly well suited for maintaining stable population levels, and significant modification and/or replacement of the existing ponds is necessary to accomplish the goals for the recovery plan.

4.1.3.3 Status of Species in the Action Area

Pahrump poolfish at Shoshone Ponds are within the Action Area (**Figure 4-6**). The Shoshone Ponds ACEC includes three refugia ponds, a stream, and a stock pond. The ponds and stream are supplied by artesian groundwater flow. The Shoshone NDOW Well feeds three refuge ponds; of these, Pahrump poolfish occur in the Middle Pond and, prior to 2011, occurred in the North pond. Pahrump poolfish also occur in a stock pond fed by Shoshone Well #4, and in the outflow stream supplied by Shoshone Well #2. This population has exhibited sizeable fluctuations between 1989 to present (NDOW, 2010d). A population low was reached in 2003 in both refuge ponds in the Shoshone Ponds ACEC, with 89 fish in the north refuge pond and 115 fish in the middle refuge pond. Since that time, the population in the north pond peaked in 2005 with close to 800 fish, but has declined to an average estimate of 116 fish counted in August 2010 (NDOW, 2010d) and no fish in August 2011 (NDOW, 2011a). The population in the middle pond was highest in 1997 when monitoring of this pond started (approximately 1,700 fish), and has shown sizeable fluctuations since with an overall decrease in population. The middle pond had an average estimate of 579 fish in August 2010 (NDOW, 2010d) and 826 fish in August 2011 (NDOW, 2011a). The population in the stock pond has exhibited sizeable fluctuations since 1989 with the population peaking in 2002 with in excess of 6,500 fish. The stock pond had an average estimate of 3,832 fish in August 2010 (NDOW, 2010d) and 5,762 fish in August 2011 average estimate of 3,832 fish in August 2010 (NDOW, 2010d) (NDOW, 2011a).

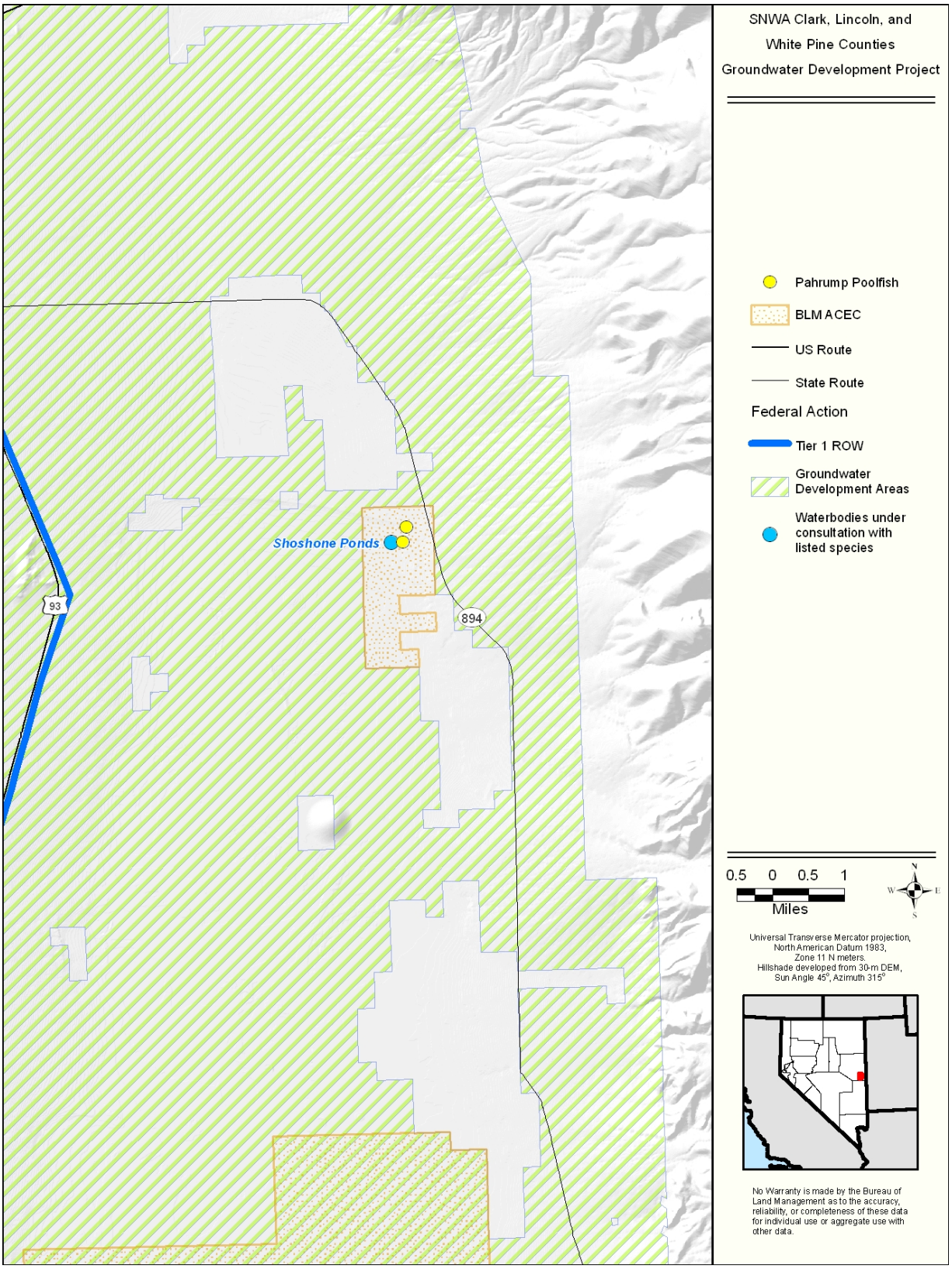

Figure 4-5 Pahrump Poolfish Occurrences & Groundwater Development Areas

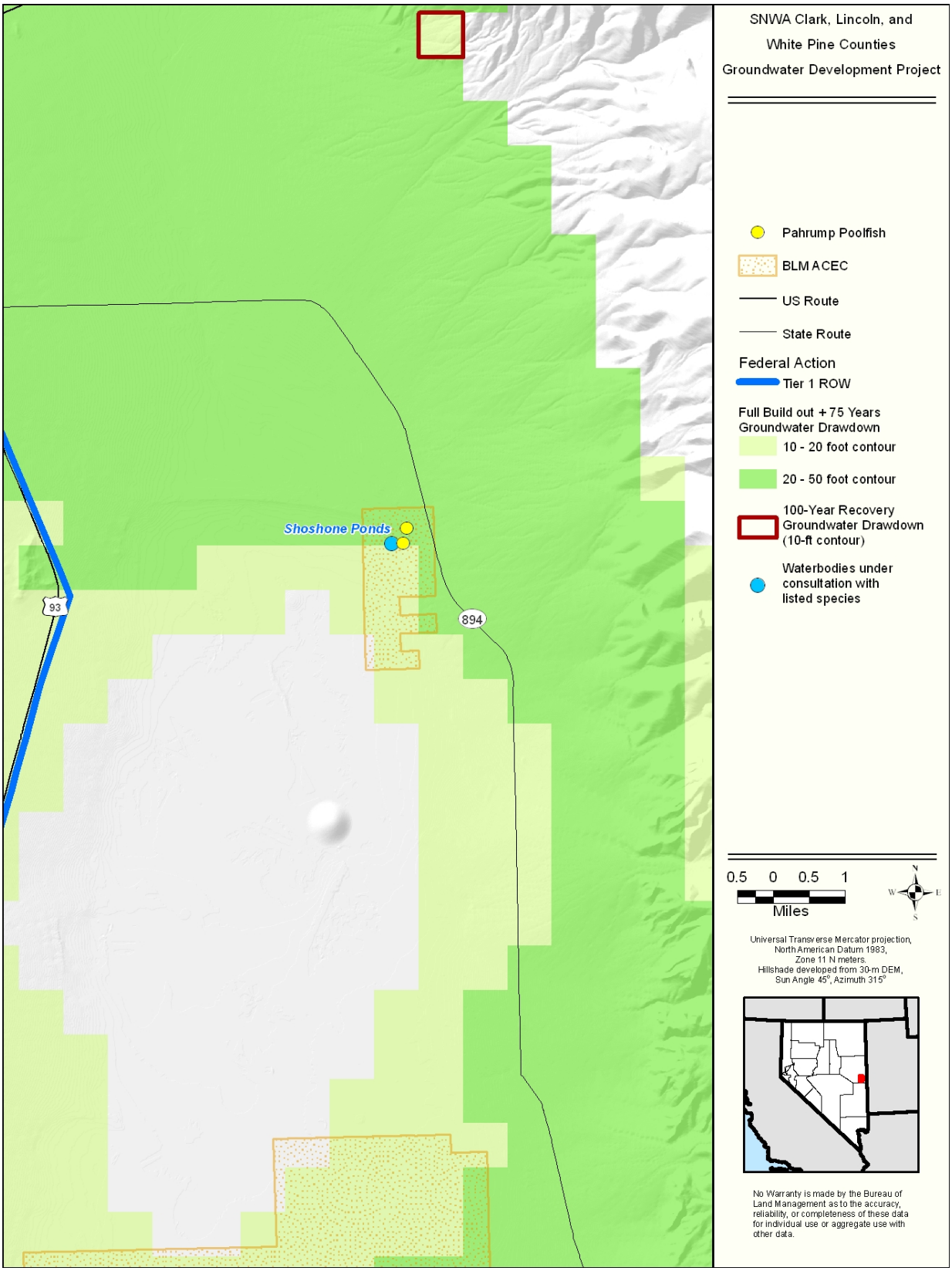

Figure 4-6 Pahrump Poolfish Occurrences & Groundwater Drawdown

The outflow stream contains an unknown number of poolfish; it is uncertain how the fish arrived in this stream and no population monitoring has occurred there. The BLM is currently undertaking several initiatives at Shoshone Ponds to benefit the Pahrump poolfish. These efforts include planned modifications to current grazing practices, with the intent of better conserving Pahrump poolfish habitat. The BLM is also planning on installing new fencing and ponds, and establishing a rotational grazing system, to enhance and protect habitat. These efforts are further described in the Ely RMP (BLM, 2008).

BLM recently completed changes to Shoshone Well #2, including a flow valve installation, in order to provide more secure and consistent water flows to the outflow stream (BLM, 2010). To allow for this work, in 2010 the BLM removed 1,179 Pahrump poolfish from the outflow stream, and placed them in the middle and north refuge ponds. The north pond received 671 salvaged fish and the middle pond received 508 fish (NDOW, 2010b).

4.1.3.4 Threats to the Species

The Corn Creek (Desert NWR), Spring Mountain Ranch State Park, and Shoshone Ponds populations appear to be relatively secure due to their remote locations and protections under the NWR, State Park and BLM ACEC. However, no poolfish were found in the north refugium pond at Shoshone Ponds ACEC in August 2011 (NDOW, 2011a), indicating an unknown threat in this pond. Major threats to the species would be failure at the man-made ponds. Climate change also represents a threat to this species.

4.1.3.5 Status of Critical Habitat

No critical habitat has been designated for this species.

4.1.4 White River Spinedace (Lepidomeda albivallis)

4.1.4.1 Species Biology

The White River spinedace is a small (up to 6 inches), spring dwelling member of the family Cyprinidae. It is characterized by its spinelike fin rays, and differs from other species in the genus by several features including the extension of melanophores below the lateral line, its larger size, and greater dorsal fin height (USFWS, 1994b). This species is found in spring habitats with clear cool water, with a temperature range of 55.4°F to 71.6°F (USFWS, 1994b), and seems to prefer shallow water (Lee et al., 1980). This species is omnivorous, feeding primarily on aquatic invertebrates along with plant material, algae, and detritus (Scoppettone et al., 2004). White River spinedace spawning has never been observed and spawning habitat requirements are unknown.

4.1.4.2 Status of Species

The White River spinedace was federally listed as endangered on September 12, 1985 (USFWS, 1985a). Historical known range consisted of the White River, Preston Big Spring, Indian Spring, Cold Spring, Nicholas Spring, Arnoldson Spring, Lund Spring, and Flag Springs in the White River Valley (USFWS, 1994b). During the 1930s and 1940s, it was common throughout this range, but by the mid-1980s could only be found in small numbers at Lund Spring and Flag Springs (USFWS, 1994b). The Lund Spring population was extirpated by 1991. Currently, this species is extant solely in Flag Springs (**Figure 4-7**).

Flag Springs Complex consists of three springs: North, Middle and South. Flag Springs-North and Middle are rheocrenes and range in depth from 8 to 30 inches (Flag Springs-North has the deeper depth) (BIO-WEST, 2007). Temperatures ranged from 60.8 to 64.4°F in Flag Springs-North and 68°F in Flag Springs-Middle during a point-in-time survey. The Flag Springs-South is a limnocrene with a depth of 16 inches, and registered a range of temperatures of 71.6 to 73.4°F during a point-in-time survey (BIO-WEST, 2007).

Flag Springs Complex is located within the Kirch WMA, which is managed by the NDOW. The property was purchased and developed to preserve wetland habitat. Grazing within Kirch WMA is limited to prescribed grazing that is used as a habitat management tool to stimulate green-up, help control the overgrowth of undesirable emergent vegetation, and to control invasive weeds. Grazing is not carried out at Flag Springs Complex proper.

Flag Springs-North, Middle and South provide the headwaters for Sunnyside Creek. NDOW relies on the Flag Springs Complex and Sunnyside Creek to maintain water for the White River spinedace. A flume and continuous monitoring instrumentation were installed on Flag Springs-Middle in 2009 cooperatively by NDOW and SNWA, and discharge at Flag Springs-North, Middle and South are monitored under the Hydrologic Monitoring and Mitigation Plan for Delamar, Dry Lake, and Cave Valleys (SNWA, 2009b) under the DDC Stipulation and through a joint funding agreement between SNWA, USGS, and NDWR. Water quality monitoring at Flag Springs-North, Middle and South is also part of the biological and hydrologic monitoring plans (SNWA, 2009b and BRT, 2011) under the DDC Stipulation.

In 1991, only 50 White River spinedace individuals were estimated to remain in the Flag Springs system (Scoppettone et al., 1992), where largemouth bass also existed. This decline continued until the spring of 1996, at which point the remaining adults were moved to an artificial pool within the Flag Springs system. The fish introduction was successful, and the population increased to 68 individuals by 1996, and to 1,573 fish by 1999 (NDOW, 2008c). A survey performed in 2009 counted 752 individual spinedace; most of which appeared to be young adults (NDOW, 2009c).

Beginning in 2004 and continuing in 2005, NDOW introduced individuals from Flag Springs into Indian Spring in an attempt to reestablish a refugium for the White River spinedace. Both of these attempts failed because there was no recruitment. The USFWS 5-Year Review for the White River spinedace, found that the Indian Springs refugium population was not viable, and no further spinedace translocations to Indian Springs are planned due to the lack of documented reproduction (USFWS, 2010d).

The USFWS has established a recovery plan for the White River spinedace (USFWS, 1994b). The goals of this plan are primarily to secure the Flag Springs population, reestablish populations in Preston Big Spring and Lund Spring, and remove largemouth bass from Sunnyside Creek and Flag Springs outflows. Not all of these goals have been met, as attempts to reestablish fish in Lund Spring have failed and no other refuge populations exist at this time. Largemouth bass have been removed from the upper portion of Flag Springs and Sunnyside Creek.

4.1.4.3 Status of Species in the Action Area

The Flag Springs population of White River spinedace occurs within the Action Area (**Figure 4-7**). As described above, in 1991, only 50 individuals were estimated to remain in the Flag

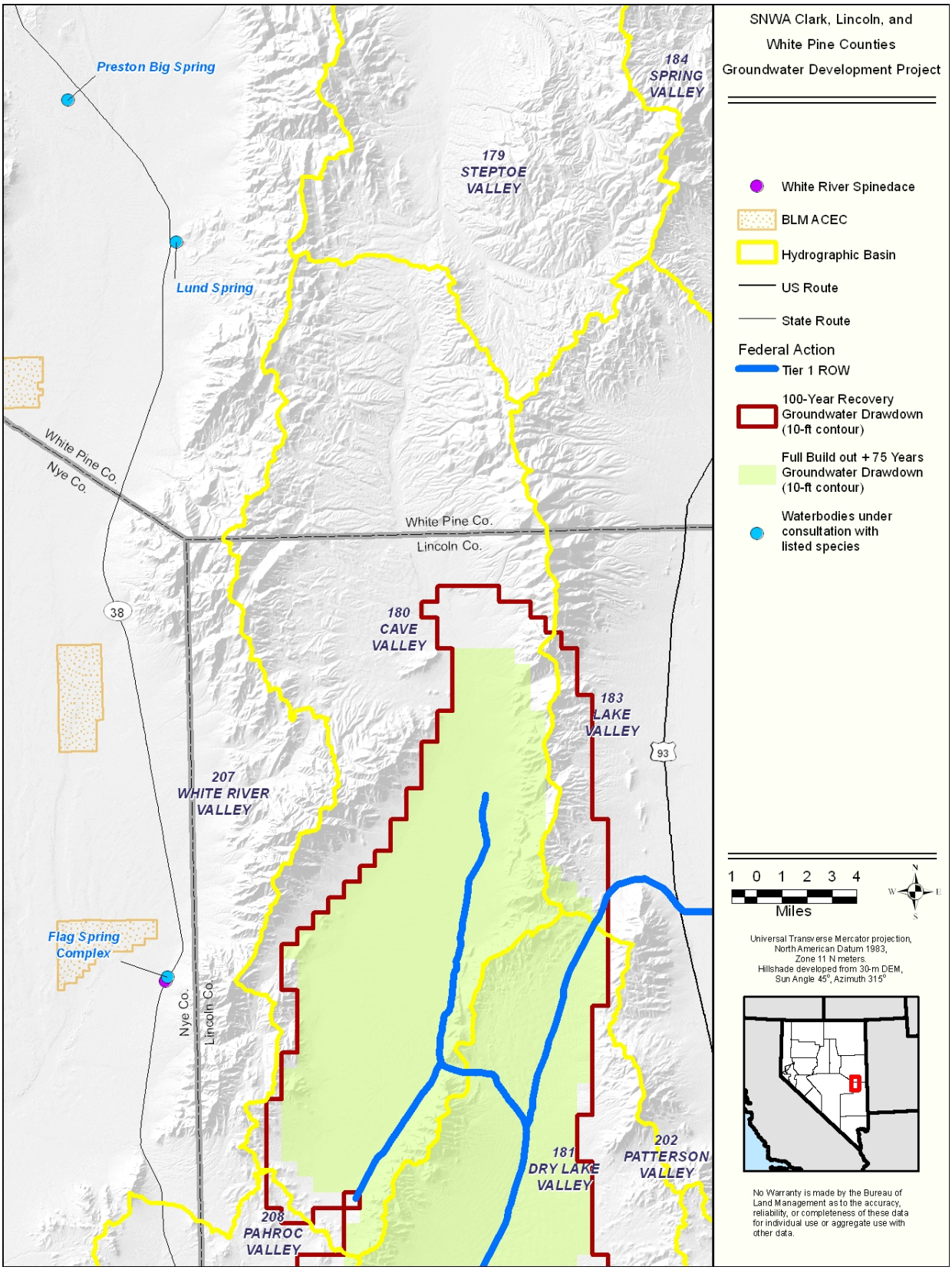

Figure 4-7 White River Spinedace Occurrences

Springs system (Scoppettone et al., 1992), where largemouth bass also existed. This decline continued until the spring of 1996, at which point the remaining adults were moved to an artificial pool within the Flag Springs system. The fish introduction was successful, and the population increased to 68 individuals by 1996, and to 1,573 fish by 1999 (NDOW, 2008c). A survey performed in 2009 counted 752 individual spinedace, most of which appeared to be young adults (NDOW, 2009c).

4.1.4.4 Threats to the Species

Major threats to the White River spinedace include competition with and predation by non-native fishes, largemouth bass (*Micropterus salmoides*); as well as, channelization of habitat and diversion of water within the spring habitats. The introduction of non-native fish may also result in the introduction of exotic parasites and diseases (Deacon, et al. 1964, Hubbs and Deacon 1964). Predation by cormorants (*Phalacrocorax* sp.) is also a significant threat to the species (NDOW, 2008d). The species current limited distribution makes it particularly vulnerable to fire, flood, or other climatic events that have the potential to degrade the quality and quantity of available habitat.

4.1.4.5 Status of the Critical Habitat

In 1985, the USFWS designated critical habitat for the White River spinedace (Fed Reg. 1985) (**Figure 4-7**). Flag Springs and its associated outflows (within the Kirch WMA) are designated as critical habitat (3.0 acres), as are the historically occupied Preston Big Spring (~ 4.0 acres) and Lund Spring (~ 1.3 acres).

The PCEs of White River spinedace critical habitat include:

- consistent high quality cool springs and outflows (55°-70°F);
- riparian areas that are essential for cover; and
- habitat for insects and other invertebrates on which the species feeds (USFWS, 1985a).

A restoration project was completed by Streamwise, Inc. in late 2009 to increase and enhance spinedace habitat in the upper sections of the Flag Springs outflows (NDOW, 2011b).

BIO-WEST (2007a) rated the disturbance at Flag Springs to be slight at the north and south springheads due to the proximity of livestock grazing and human activities (NDOW compound) and high at the middle springhead due to water diversion.

A flume and continuous monitoring instrumentation was installed on Flag Springs-Middle in 2009 cooperatively by NDOW and SNWA. Discharges at Flag Springs-North, Middle and South are monitored under the Hydrologic Monitoring and Mitigation Plan for DDC Valleys (SNWA, 2009a) under the DDC Stipulation and through a joint funding agreement between SNWA, USGS, and NDWR.

4.1.4.6 Status of Critical Habitat in the Action Area

Flag Springs' critical habitat for the White River spinedace occurs within the Action Area (**Figure 4-7**). The status of this critical habitat is discussed above.

4.1.4.7 Threats to Critical Habitat

Threats to critical habitat include the alteration of habitat associated with the use of springs for irrigation purposes (e.g., converting natural spring and marsh complexes into impoundments and

canals and development of underground irrigation pipelines). Critical habitat is also vulnerable to wildfire and flood events and climate change which have the potential to degrade the quality and quantity of available habitat.

Flag Springs are located near an NDOW compound resulting in human-related activities, which may pose a threat. Because grazing within Kirch WMA is limited to prescribed grazing that is used as a habitat management tool, grazing is likely not a threat to critical habitat within Kirch WMA.

4.1.5 Hiko White River Springfish (Crenichthys baileyi grandis)

4.1.5.1 Species Biology

The Hiko White River springfish is a small (1.5-2 inches), egg-laying member of the family Goodeidae. It is one of five subspecies of *C. baileyi*, and biologists commonly believe that it has life history and habitat requirements comparable to those of the closely related White River springfish (USFWS, 1998). It can be distinguished from the other subspecies by the larger average adult size (over 1.5 inches) and deeper coloration, and it also has more fin rays than the Ash Springs subspecies (USFWS, 1998). The Hiko White River springfish is restricted to the thermal Crystal and Hiko springs systems. Adults of this subspecies are found at varying depths but prefer deeper water, while juveniles typically are found in shallow water. This subspecies is a generalist feeder, uniquely adapted for surviving in environments of extreme temperatures and low dissolved oxygen (Hubbs and Hettler, 1964). It breeds throughout the year with most females averaging two spawning periods a year (Deacon and Minkley, 1974).

4.1.5.2 Status of Species

The Hiko White River springfish was federally listed as endangered in 1985 (USFWS, 1985c). This subspecies is endemic to Hiko and Crystal Springs and their associated outflows within Pahranagat Valley (**Figure 4-8**). In the 1940s, Hiko White River springfish were considered common at Hiko and Crystal springs, but by 1967 they had been extirpated from the Hiko Spring system due to modifications for irrigation and the introduction of largemouth bass (USFWS, 1998). Seventy springfish from Crystal Spring were reintroduced to Hiko Spring in 1984, and by 1986, the population was estimated to be 7,784. Also in 1984, fish from Crystal Spring were introduced to Blue Link Spring, Mineral County, Nevada, to establish a refuge population. This population has recovered following a 1990 crash, and the 2009 population estimate was 4,133 fish (NDOW, 2009a). Population estimates for the Crystal Spring population have ranged from 8 to 265 from 1986 to 1994, and estimates for Hiko Spring ranged from 4,367 to 11,342 (USFWS, 1998). Surveys of Hiko and Crystal springs from 2001 to 2004 found Hiko White River springfish to be declining due to the continued presence of non-native species. In response to the perceived decline, NDOW began removal of non-native species from Crystal Spring in 2002 and from Hiko Spring in 2005; these removals continue to the present time.

Recent surveys of Hiko Spring conducted by NDOW in February, May, and August of 2008 yielded counts of 678, 425, and 471 springfish, respectively. Surveys at Crystal Spring in February, May, and August of 2008 yielded counts of 324, 182, and 471 springfish, respectively (NDOW, 2008f). In 2010, 247 fish were counted in Hiko Spring and 883 fish in Crystal Spring (NDOW, 2010). The 2011 population estimates for Hiko and Crystal springs were 247 (NDOW, 2011d) and 831 (NDOW, 2011e), respectively.

The Hiko White River springfish is addressed by the same Recovery Plan as the White River springfish. Further, they share the same goals of removal of threats to the habitat and the species, and creation of three refugia populations. These goals have not been met as only one refugia population exists and the threats remain, but NDOW is continuing to remove non-native fish and crayfish from Crystal Spring and Hiko Spring in an attempt to improve springfish numbers and the refuge population at Blue Link Spring is currently thriving.

4.1.5.3 Status of Species in the Action Area

The Hiko White River springfish populations in Hiko and Crystal springs are within the Action Area. The status of species in the Action Area is discussed above.

4.1.5.4 Threats to the Species

The species continues to be threatened by habitat modification, and competition, predation, and parasitism from exotic species (USFWS, 2010g). A major threat to the Hiko White River springfish is the presence of non-native species including western mosquitofish (*Gambusia affinis*), shortfin molly (*Poecilia mexicana*), convict cichlid (*Amatitlania nigrofasciata*), largemouth bass (*Micropterus salmoides*), red swampcrayfish (*Procambarus clarkii*), and bullfrogs (*Lithobates catesbeiana*), which may prey upon springfish eggs and young and compete with them for resources. Red ludwigia (*Ludwigia* sp.), a non-native aquatic plant, is also abundant in both Hiko and Crystal springs, and may pose a threat as it provides shelter for the crayfish and other non-native species. This species is also threatened by habitat alteration and diversion of water for irrigation at both Crystal and Hiko springs and by climate change.

4.1.5.5 Status of the Critical Habitat

In 1985, the USFWS designated critical habitat for the Hiko White River springfish (**Figure 4-8**). The critical habitat designation includes Crystal and Hiko springs and their outflows, plus surrounding land areas for a distance of 50 feet from those springs and outflows.

The PCEs of Hiko White River springfish critical habitat include:

- warm water springs and their outflows;
- surrounding lands that provide vegetation for cover; and
- habitat for insects and other invertebrates of which the species feeds (USFWS, 1985c).

Both Hiko and Crystal springs have been highly modified in the past for irrigation purposes, but habitat for springfish does persist. Both systems have been invaded by crayfish and non-native red ludwigia. The removal of these non-natives is a continuing process.

Hiko Spring is used for agricultural and municipal purposes. The entire outflow stream is now captured in underground pipes and transported to nearby agricultural lands. The only surface water remaining is an impoundment at the spring source and a small marsh created by seepage from the spring pool. Crystal Spring has been modified for agricultural purposes since before European settlement. It consists of at least two individual springs; one flows from an orifice in limestone bedrock and the other from a contact between alluvium and bedrock.

4.1.5.6 Status of Critical Habitat in the Action Area

Critical habitat for the Hiko White River springfish populations in Hiko and Crystal Springs are within the Action Area. The status of this critical habitat is discussed above.

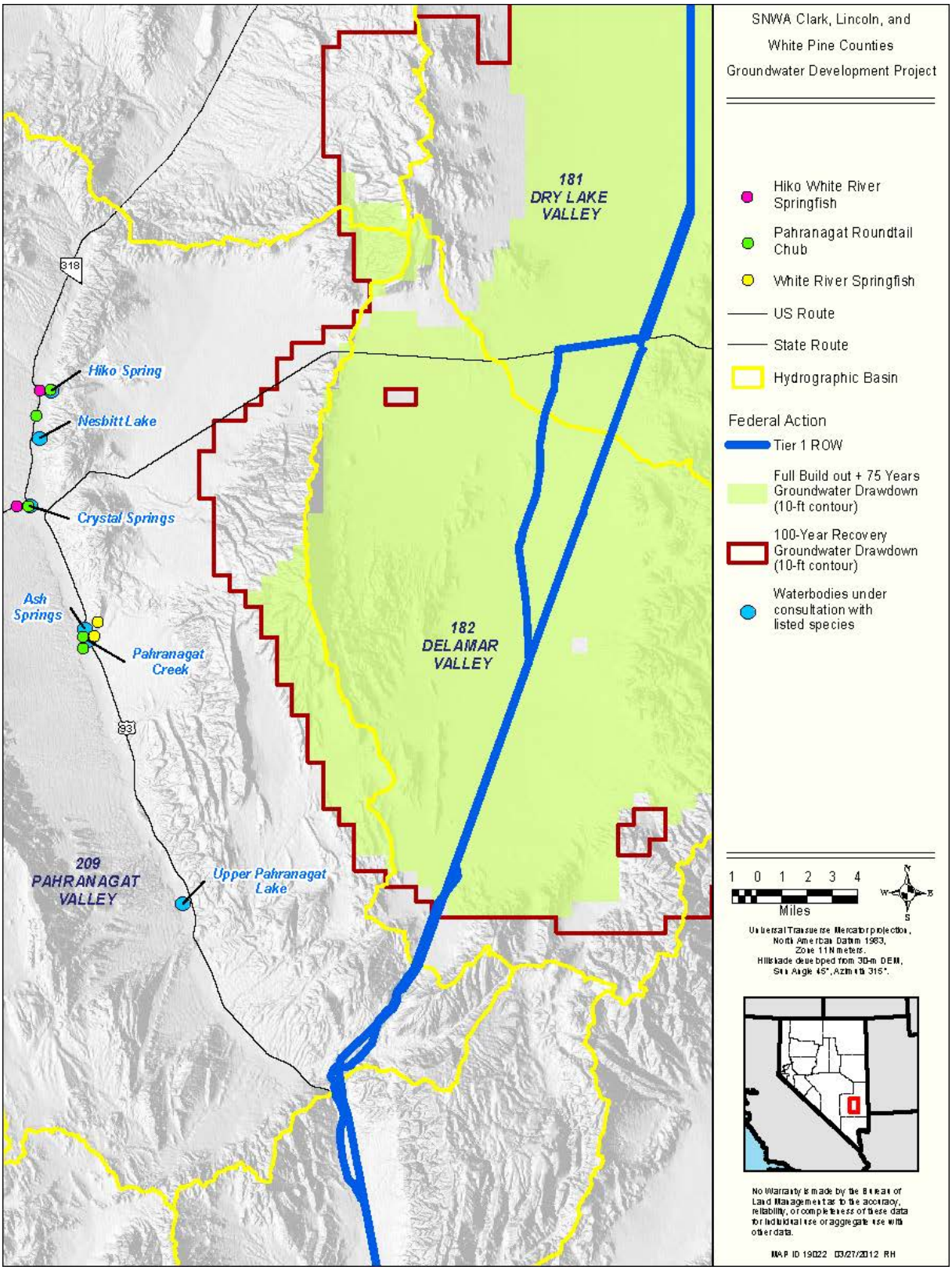

Figure 4-8 Hiko White River Springfish, Pahranagat Roundtail Chub, and White River Springfish Occurrences

4.1.5.7 Threats to Critical Habitat

Critical habitat for this species is threatened by habitat disturbance due to irrigation water diversion, recreational swimming, and invasion of red ludwigia at Crystal Springs. The entire outflow at Hiko Spring is captured by underground pipes and transported to agricultural lands, limiting habitat to an impoundment at the spring source and a small marsh created by seepage from the springpool. Climate change also represents a threat to critical habitat for this species.

4.1.6 Pahranagat Roundtail Chub (Gila robusta jordani)

4.1.6.1 Species Biology

The Pahranagat roundtail chub is a medium-sized (10 inches), stream-dwelling member of the family Cyprinidae. It resembles other subspecies of roundtail chub in the Colorado River system with an elongate body form and narrow caudal peduncle, but differs with a higher scale count above and below the lateral line (USFWS, 1998). It feeds primarily on drifting invertebrates, but also has been observed feeding on small fish (Tuttle et al., 1990). Adults appear to utilize the entire stream habitat, with a preference for areas with submerged and overhead cover, while larval and juvenile fish utilize shallow, slower water near the stream edge. Spawning activity occurs during early to mid-February, in fast water over gravel bottoms where the eggs are broadcast (USFWS, 1998). As discussed by the Pahranagat Valley Native Fishes Recovery Implementation Team (NDOW, 2008e), outside of its native habitat, this species appears to thrive in artificial pond habitat with observed growth and recruitment.

4.1.6.2 Status of Species

The Pahranagat roundtail chub was federally listed as endangered in 1970 (USFWS, 1970). The entire historic distribution and population size of this subspecies is uncertain. Historically, individuals were known from the outflows below Crystal, Hiko, and Ash springs, and in Pahranagat Creek, all located within Pahranagat Valley. This subspecies has since been eliminated from the outflows of Crystal and Hiko springs, and is now restricted to approximately 3.8 miles of Pahranagat Creek and ditch downstream of Ash Springs to the point where the creek becomes a concrete-lined ditch on the River Ranch. There is also a refuge population in a well-fed, lined pond on the Key Pittman WMA in Pahranagat Valley (**Figure 4-8**).

Habitat requirements of the Pahranagat roundtail chub are poorly understood. However, its activity is localized in protected pools where water temperatures range from 80.6°F to 86°F. The most frequently occupied pools have current velocities reaching a maximum of 0.6 feet per second. and average 0.1 feet per second, with a pH of 8.1.

Surveys conducted in 2001 indicated a severe decline in the number of individuals in Pahranagat Creek (NDOW, 2001). Subsequent surveys conducted by NDOW verified that Pahranagat roundtail chub were still present in the Pahranagat Creek system with 84 fish of varying age class observed in 2006 (NDOW, 2006). The wild population was not surveyed again until November 16, 2009 when a survey of Pahranagat Creek revealed a total of four chub in the system (NDOW, 2010a). A total of eight chub were recorded during a survey on November 30, 2011 (Guadalupe, pers. comm., 2011). The refuge population at Key Pittman WMA was also sampled in 2006 with 40 chub captured in a seine net. A brief snorkel survey of the refuge pond in 2008 found approximately 2,000 to 3,000 chub of various age classes (NDOW, 2008d).

The USFWS included a recovery plan for the Pahranagat roundtail chub as part of the Recovery Plan for the Aquatic and Riparian Species of Pahranagat Valley (USFWS, 1998). Specific downlisting criteria include: (1) maintaining perennial flow in the Pahranagat Creek; (2) restoring and maintaining habitat along the creek; (3) removing the threat of non-native species; (4) and maintaining a stable chub population within 75 percent of the Pahranagat Creek.

These goals have not been met. Access restrictions on private land hinder implementation of recovery plan measures at Crystal Spring and Ash Spring. No fish are present in Crystal Spring, nor are conditions at this spring appropriate for re-introduction of more fish. The Crystal Spring headwaters of Pahranagat Creek do not reach the outflow creek below Ash Spring during summer irrigation. A perennial flow from Crystal Spring past the Ash Spring inflow to the creek could help the recovery of the species.

In 2010, a restoration project was completed at Cottonwood Spring and the USFWS introduced approximately 1,000 Pahranagat roundtail chub to this spring (Averill-Murray, pers. comm., 2012).

4.1.6.3 Status of Species in the Action Area

The Pahranagat roundtail chub occurs in Pahranagat Creek within the Action Area. The status of species in Pahranagat Creek is discussed above.

4.1.6.4 Threats to the Species

This species is threatened by alteration of its habitat for agricultural irrigation, wildfire, grazing, the loss of riverine canopy (USFWS, 1998) and climate change. Additionally, the species is threatened by the presence of non-native fish including the convict cichlid, carp, mosquitofish, shortfin molly (*Poecilia mexicana*); as well as, bullfrogs, the oriental snail (*Malanoides sp.*), and crayfish. Convict cichlids, and the Pahranagat speckled dace (*Rhinichthys osculus velifer*), have been observed picking at chub spawning beds, presumably preying upon eggs in the Ash Springs outflow stream (USFWS, 1998).

4.1.6.5 Status of the Critical Habitat

No critical habitat has been designated for this species.

4.1.7 White River Springfish (Crenichthys baileyi baileyi)

4.1.7.1 Species Biology

The White River springfish is a small (1-2 inches), egg-laying member of the family Goodeidae. It is one of five subspecies of *C. baileyi*, and is restricted to the thermal waters of the Ash Springs system. The maximum water depth in this system is approximately 6 feet, and documented temperatures have ranged from 87.8-96.8°F (Tuttle et al., 1990). Juvenile fish use all water depths but typically prefer shallow water up to 2 feet (USFWS, 1998), while adults typically prefer deep water (Tuttle et al., 1990). This species is uniquely adapted for surviving in environments of extreme heat and low dissolved oxygen (Hubbs and Hettler, 1964), and is a generalist feeder (Williams and Williams, 1982). Spawning is believed to occur year-round with peak spawning activity from April through August (Scoppettone et al., 2004), based on observations of other springfish subspecies. The period of spawning activity may be regulated by primary productivity (plant photosynthesis) in the spring system (Schoenherr, 1981). This subspecies is distinguished from the Hiko White River springfish by having fewer fin rays, but

individuals found in the outflow stream below Ash Springs have been found to "exhibit some integration of the meristic (measurement of distinct physical characteristics) and color characteristics attributed to Hiko White River springfish" (USFWS, 1998).

4.1.7.2 Status of Species

The White River springfish was federally listed as endangered on September 27, 1985 (USFWS, 1985c). This fish is endemic to the spring pool and outflow of Ash Springs in Pahranagat Valley (**Figure 4-8**) (Tuttle et al., 1990), which is located with the Action Area. NDOW has conducted routine surveys, sampling, and habitat restoration for this species on public lands; and also handles surveys and restoration work when given access to the privately held portions of Ash Springs (the majority of suitable occupied habitat occurs on private land). Access to private land has also been granted for the purposes of mapping habitat and surveying the springs and immediate vicinity (BIO-WEST, 2007a).

This population has experienced wide fluctuation in population numbers; with estimates ranging from 1,200 to 9,800 in the 1980s (USFWS, 1998). Surveys by NDOW in the early 2000s showed the species was well distributed within available habitat, and was considered "common" (BIO-WEST 2007a), despite the presence of non-native species. In February 2007, NDOW, accessed private lands to conduct a snorkel survey and found at least 200 springfish (Hobbs, pers. comm., 2007). More recent survey counts at Ash Springs detected 478 fish (NDOW, 2009d). A snorkel survey of Ash Springs in February 2012 detected at least 1,700 White River springfish (Guadalupe, 2012). The recovery plan entitled "Recovery Plan for the Aquatic and Riparian Species of Pahranagat Valley," which includes the White River springfish, was published in 1998. The Recovery Plan objectives include removing threats to the species and its habitat, maintaining a self-sustaining fish population for a minimum of 6 years (or three complete generations), and establishing refuge populations at Dexter National Fish Hatchery, Key Pittman WMA, and Pahranagat NWR. These goals have not yet been met for the White River springfish. As discussed by the Pahranagat Valley Native Fishes Recovery Implementation Team (NDOW, 2009d), the BLM is currently considering placement of an onsite informational display to educate the public about the springfish. Habitat restoration on the publicly held portion of Ash Spring is also being considered, and potential habitat restoration measures with the current owner of the privately held portion of Ash Springs may also be pursued. There are no additional refugia populations being planned for this area. Trapping for non-native species including the shortfin molly, convict cichlid, and western mosquitofish has been conducted on a casual basis by NDOW. The USFWS is currently undergoing a 5-year review of this species (USFWS, 2007).

4.1.7.3 Status of Species in the Action Area

The White River springfish occurs within the Action Area. The status of the species in Ash Springs is discussed above.

4.1.7.4 Threats to the Species

Non-native fishes such as shortfin molly, western mosquitofish, and convict cichlids may prey upon eggs and juvenile springfish; as well as, increase competition for resources such as food and spawning sites. The red swamp crayfish is present in the system and may pose a threat as their numbers increase. Wildfire is also a potential threat as Ash Springs is surrounded by trees and other vegetation that, when burned, could introduce hazardous ash to the system.

Recreational wading in the springhead is also a threat to this species. Climate change also represents a threat to this species.

4.1.7.5 Status of the Critical Habitat

Critical habitat was designated in 1985, at the same time the species was federally listed (USFWS, 1985c). The designation encompasses Ash Springs and associated outflows including a 50-foot buffer zone of adjacent lands (**Figure 4-8**).

The PCEs of White River springfish critical habitat include:

- clean flowing spring water; and
- riparian vegetation providing shade and habitat for insects and other invertebrates on which the species feeds, and stabilizing the banks (USFWS, 1985c).

NDOW continues with efforts to remove non-native species, as previously mentioned; no other habitat restoration projects have taken place.

4.1.7.6 Status of Critical Habitat in the Action Area

Critical habitat for the White River springfish occurs within the Action Area. The status of this critical habitat is discussed above.

4.1.7.7 Threats to Critical Habitat

The primary threat to critical habitat seems to be significant habitat disturbance from such ongoing recreational uses as bathing, swimming, and washing (on publicly-owned lands only). Land management practices such as irrigation diversions on the privately held lands could also pose a threat to the species. Wildfires have the potential to degrade the quality and quantity of available habitat. Climate change also represents a threat to this species.

4.1.8 Moapa Dace (Moapa coriacea)

4.1.8.1 Species Biology

The Moapa dace is a small cyprinid fish (< 3.5 inches) in the monotypic genus *Moapa*. It occupies a variety of habitats in the Warm Spring Area, including spring pools, tributaries (spring outflows), and the main stem of the upper Muddy River (USFWS, 1996). Moapa dace spawn year round, peaking in spring followed by a smaller peak in fall. Moapa dace have been observed spawning on a sandy substrate in water depths of 6 to 7.5 inches and near-bed velocities of 1 to 3.5 inches per second. This fish prefers warm water ranging between 86°F and 89.6°F and low turbidity (Scoppettone et al., 1987). A slight current exists in most areas inhabited by the species. Native waters for this unique fish are noted to be clear, with variable bottom types in pool habitats and may be spring deposited gravels or flocculent organic/silt. In outflow streams the bottoms may be of sand, gravel, pebbles and cobbles, or mud. Cooler water in the middle and lower Muddy River are likely a natural barrier to downstream movement of Moapa dace (USFWS, 1996). The dace is omnivorous (USFWS, 1984). Juveniles are found in tributaries and occupy habitats with increasing flow velocities as they grow (USFWS, 1996).

4.1.8.2 Status of Species

The Moapa dace was federally listed as endangered by the USFWS in 1967 (USFWS, 1967). Moapa dace are endemic to a short reach (about 6 miles) of upper Muddy River habitat and

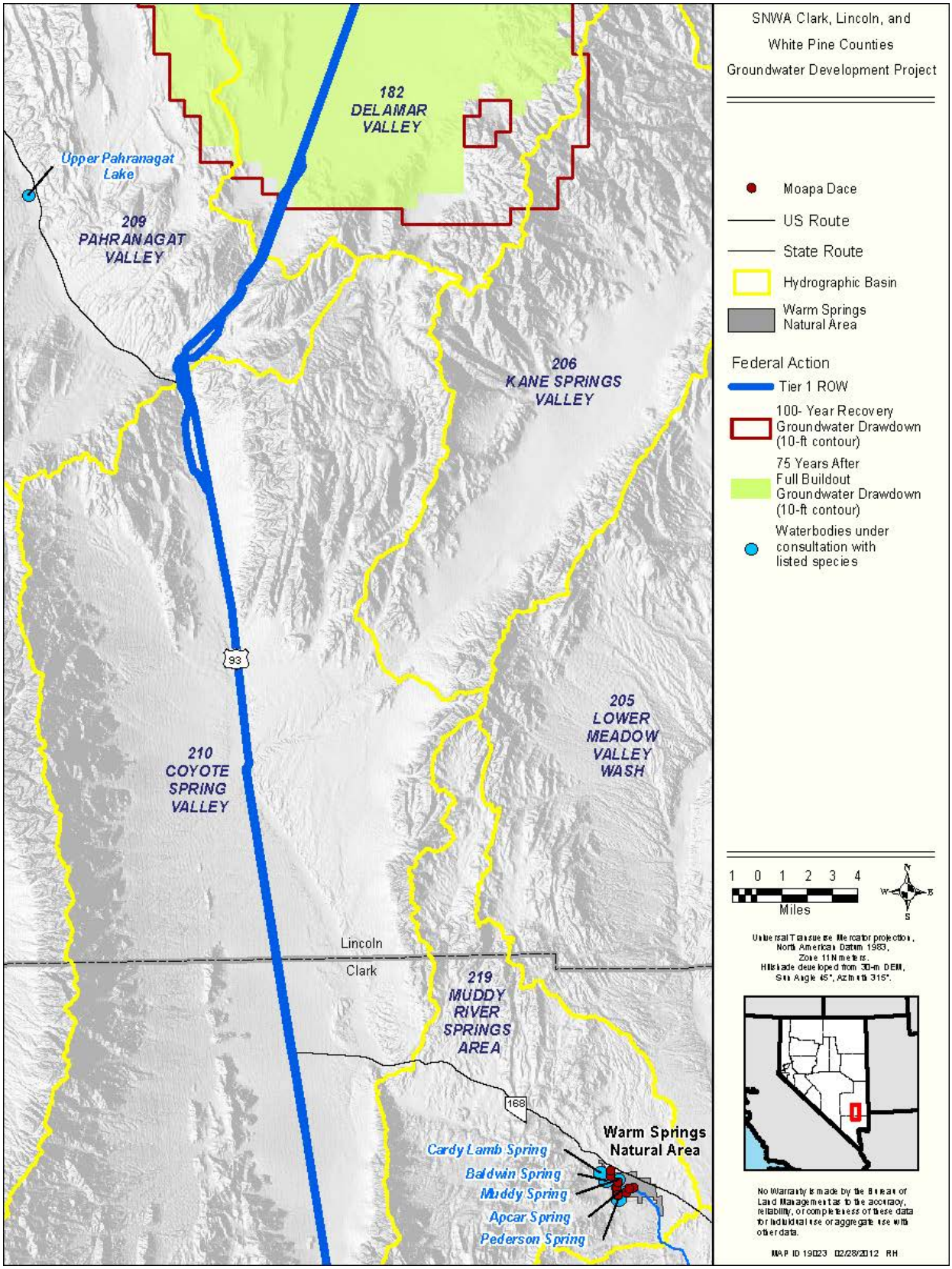

Figure 4-9 Moapa Dace Occurrences

tributary thermal spring systems within the Moapa Valley NWR (**Figure 4-9**). Historically, the fish may have occupied as many as 25 springs and 10 miles of river habitat in the Muddy River system, but they are now confined to the upper main stem of the Muddy River and five thermal spring tributaries (Cardy Lamb, Baldwin, Muddy, Apcar, and Pederson springs).

From 1984 to 1987, extensive surveys were conducted within historical Moapa dace habitat by the National Fisheries Research Center. This survey defined the current distribution of the species and population was determined to be 2,600 to 2,800 adult fish (Scoppettone et al., 1992b). More recently, the population has numbered 462 dace in August 2008 and 508 dace in August 2009 (USFWS, 2010b). A fire burned approximately 1 square mile of palm groves and grasslands in the WSNA on July 1, 2010. The fire did not spread into the Moapa Valley NWR. A dace count was conducted on August 17 and 18, 2010 and the count was 697 dace (USFWS, 2010b). Moapa dace surveys in February and August 2011 resulted in counts of 574 and 713 individuals respectively. The latest survey conducted in February 2012 resulted in a count of 654 individuals. The winter decline in numbers is a typical seasonal variation. High numbers of larval and juvenile Moapa dace were found.

Moapa dace habitat is managed under the Recovery Plan for the Rare Aquatic Species of the Muddy River Ecosystem (USFWS, 1996). Attempts to transplant this species into new habitat per the Recovery Plan have failed, and the current Moapa dace population is still well below the target population of 4,500 adults needed for reclassification (USFWS, 1996). Restoration projects are ongoing; past efforts have included habitat enhancement by strategically placing substrates, logs, and boulders to create an optimal arrangement of pools, riffle, and run habitats, and removal of non-native species (western mosquitofish and shortfin molly) and man-made structures within the Muddy River.

SNWA, USFWS, CSI, Moapa Band of Paiute Indians, and the MVWD entered into the Muddy River MOA in April 2006 "to make measureable progress toward protection and recovery of the Moapa dace and its habitat [in concert] with the operation and development of water projects for human use" (Muddy River MOA, 2006). The 2006 Muddy River MOA (described in Section 2.4.4) regulates potential pumping effects by the use of established triggers linked to specific actions that protect instream flows for aquatic wildlife, requires non-discretionary financial contributions for stream restoration, and established the Muddy River Recovery Implementation Program (USFWS, 2006c).

The Muddy River MOA established discharge trigger levels to protect in-stream flows from potential decreases in spring discharge due to groundwater pumping in Coyote Spring Valley and by MVWD in the Muddy River Springs Area (Muddy River MOA, 2006). Trigger levels were established at the Warm Springs West USGS monitoring station 09415920 (near Moapa, Nevada), which measures the flow of the highest elevation spring complex in the Muddy River Springs Area (as referenced by Mayer and Congdon, 2007), and involve sequentially reduce pumping as follows: (1) if flows decrease to between 3.0 cfs and 2.9 cfs during the pump test (either by pumping or drought), pumping will be limited to 8,050 afy; (2) if flows are between 2.9 cfs and 2.8 cfs, pumping will be restricted to 6,000 afy; (3) if flows are between 2.8 and 2.7 cfs, pumping will be restricted to 4,000 afy; and (4) pumping will be restricted to 724 afy if the average flow decreases below 2.7 cfs.

SNWA has acquired the majority of land surrounding the headwaters of the Muddy River to preserve as a Natural Area in perpetuity. The 1,220 acres of land designated as the WSNA has

been set aside for the benefit of native wildlife, especially for the preservation and restoration of aquatic endemics. The Cardy Lamb Spring complex, Baldwin Spring complex, North Fork Spring complex, and Stone Cabin Spring complex reside on the WSNA. With the acquisition of the WSNA in conjunction with the adjacent Moapa Valley NWR, only one spring complex in the entire upper Muddy River is on private land. All other spring complexes are protected from development, water diversion, and grazing. SNWA acquired an additional 6 acres bordering a section of the Apcar stream and manages that property under the same management guidelines as the WSNA.

4.1.8.3 Status of Species in the Action Area

The Moapa dace is endemic to a short reach of the upper Muddy River and tributary thermal spring systems within the Moapa Valley NWR within the action area.

4.1.8.4 Threats to the Species

The introduction of non-native species such as the shortfin molly, common carp, largemouth bass, blue tilapia (*Oreachromis aurea*), spiny soft-shelled turtles (*Apalone spinifera*), and palm trees may be negatively affecting the Moapa dace population (USFWS, 1996). Threats also include the physical destruction or alteration of habitat by wildfire, flooding, climate change, localized groundwater pumping, surface water diversions, and beaver activity have the potential to degrade the quality and quantity of available habitat.

4.1.8.5 Status of the Critical Habitat

No critical habitat has been designated for the Moapa dace.

4.1.9 Ute Ladies'-Tresses (Spiranthes diluvialis)

4.1.9.1 Species Biology

This species is a perennial, terrestrial orchid found in low- to mid-elevation wetlands and riparian zones, often where vegetation is relatively open (USFWS, 1995b). They can utilize a variety of soil conditions from moist to wet, alkaline or calcareous native meadows near streams, springs, seeps, lakeshores, or in abandoned stream meanders. ULT usually have one stem rising above ground, and thrive in full sunlight or partial shade. The flowering period is generally late July through August, producing white or ivory flowers. Because the thin green basal leaves of ULT closely resemble grass blades and other narrow-leaf plants, and the senescent flower heads blend into surrounding vegetation, ULT can only be accurately identified and counted when in flower, preferably during the peak of the bloom period (Bio-West, 2009).

Vegetation associated with ULT is variable, but its physiognomy is consistent. Canopy cover above 1.5 meters is low, while canopy cover below this height includes mixed densities of other species. The ULT orchid is commonly associated with redtop (*Agrostis gigantea*), annual paintbrush (*Castilleja* spp.), willow herb (*Epilobium* spp.), horsetail (*Equisetum* spp.), milkweed (*Asclepias* spp.), verbena (*Verbena* spp.), blue-eyed grass (*Sisyrinchium montanum*), reedgrass (*Calamagrostis* spp.), goldenrod (*Solidago* spp.), and arrowgrass (*Triglochin* spp.). The most important environmental parameter for ULT, apart from soil moisture, appears to be exposure to sunlight. ULT thrive in full sunlight or partial shade. While some plants in a few colonies are found at shady sites, they are often observed to be less than vigorous, leggy, and with seemingly low seed sets (Gecy, 1994).

4.1.9.2 Status of Species

ULT are federally listed as threatened (USFWS, 1992b). This species occurs in Colorado, Idaho, Montana, Nebraska, Utah, Washington, Wyoming, and Nevada. Originally, the species was considered limited to permanently moist areas with no significant human impacts. Since 1992, however, surveys have determined that the habitat requirements of the species are not as limiting as first believed, expanding the known range of ULT. Upon issuance of broader habitat descriptions, up to 26 new populations were found across the range of the species along irrigation canals, berms, levees, irrigated meadows, gravel and borrow pits, and other areas modified by humans (Fertig et al., 2005).

The only known ULT population in Nevada occurs at Panaca Spring (Fertig et al., 2005). The population was first discovered in 1936 near the town of Panaca in the Meadow Valley Wash drainage. Subsequently, after attempts to find the species at that location failed, the species was presumed extirpated in Nevada (USFWS, 1995b). The Panaca population was successfully rediscovered at Panaca Spring in 2005, however, with at least 75 flowering plants observed (Fertig et al., 2005). The population was again surveyed in 2007, with 31 plants in full bloom documented in two areas around Panaca Spring (BIO-WEST 2007b).

In northern Snake Valley in western Utah, ULT was documented in 1994 at Willow Spring (near the community of Callao) (USFWS, 1995b). According to the Utah Natural Heritage Program dataset, one plant was documented and collected during a four-hour survey of 240 acres on private land. Although it is possible that a population may still exist at Willow Spring, no plants have since been documented in this area.

A draft recovery plan for the ULT was prepared by the USFWS in 1995 (USFWS, 1995b), but no subsequent action has been taken to finalize the plan. The draft recovery plan focuses on understanding the distribution and size of existing populations, and goals for recovery are adaptive, based upon the results of such population studies. A discrete population goal size was not possible to give at that point, based upon the lack of knowledge of the species.

In 2004, the USFWS began a routine 5-year review of this species (USFWS, 2004b); as well as, a 90-day finding on a petition to delist the species based upon new information. At the time of listing, the entire population of ULT was estimated to be 20,500 (USFWS, 2004b). Subsequent to discovery of previously unknown populations, the population was estimated to be roughly 60,000 in 2004 (USFWS, 2004b). The USFWS will compile available information and make a determination as to the appropriate status of the species at the conclusion of the 5-year status review.

4.1.9.3 Status of Species in the Action Area

ULT has never been documented in the Action Area.

Surveys were conducted in 2006-2007 to document whether ULT plants or potential habitat exist in Spring, northern Hamlin, and southern Snake valleys. Reconnaissance surveys to evaluate potential for ULT occurrence were conducted in September 2006 at 22 sites (Spring Valley: 14 sites; northern Hamlin Valley: one site; southern Snake Valley: seven sites) (BIO-WEST, 2007b). The following year in 2007, qualified ULT surveys were conducted at 32 sites (Spring Valley: 25 sites; northern Hamlin Valley: one site; and southern Snake Valley: six sites) (BIO-WEST, 2007b). The qualified survey was conducted after visiting a sentinel site (Panaca Spring, in Panaca Valley, Nevada) twice to identify an appropriate sampling time. On July 15, two ULT

at Panaca Spring were found just beginning to flower, and on July 25 thirty-one ULT at Panaca Spring were found in full bloom. Qualified ULT surveys were then conducted in accordance with USFWS protocol (USFWS, 1992b) in Spring and southern Snake valleys between July 25 - August 1, 2007. Systematic 100 percent coverage searches for ULT were conducted at smaller spring sites and adjacent wetlands, and subsampling was employed for large spring complexes. Vegetation and environmental conditions were also assessed, and potential for ULT occurrence was evaluated. Potential habitat was ranked qualitatively using professional judgment according to wetland condition, alkalinity, canopy density, presence of ULT-associated species, grazing/herbivory, and other disturbances. Potential habitat was ranked as high (ideal conditions for ULT), moderate (less than ideal conditions but with some potential to be appropriate habitat), and low (not currently meeting ULT requirements) (BIO-WEST, 2007b). The 2007 qualified ULT survey did not detect any ULT plants in Spring or southern Snake valleys, but did rank 14 sites in Spring Valley, one site in northern Hamlin Valley, and two sites in southern Snake Valley as high or moderate potential habitat (BIO-WEST, 2007b) (**Table 4-3** and **Figure 4-10**).

USFWS protocol recommends that surveys be conducted annually for 3 consecutive years for any site where habitat alteration has not yet occurred following an initial approved survey (USFWS, 1992b). Thus, additional ULT surveys may be requested by the USFWS. The 2007 survey comes to a similar conclusion: "Surveys for rare plants can only confirm presence of the species in question. These surveys do not confirm absence of the rare plant at a site. Given the climatic conditions in 2007 were moderate for ULT and ULT does not bloom each year or at the same time each year, it is possible that ULT was present, but not found during the 2007 investigation. Therefore, we recommend that the areas considered to have a moderate or high potential for ULT be surveyed for an additional year. The U.S. Fish and Wildlife Service also recommends repeated sampling given the life cycle of the ULT (B. Herrmann 2007 pers. comm.)."

Data Regarding Ute Ladies'-Tresses Presence

Ute Ladies' Tresses Survey: Jul 25-Aug 1, 2007 (BIO-WEST, 2007b)
Qualified survey of 32 aquatic sites for ULT presence and habitat according to USFWS protocol. Spring Valley: 25 aquatic sites. Southern Snake Valley: 7 aquatic sites. Sentinel site (Panaca Spring) visited twice to identify appropriate sampling time. July 15: 2 ULT beginning to flower; July 25: 31 ULT documented in full bloom. Potential habitat evaluation. Rank: condition, alkalinity, canopy density, grazing/herbivory, disturbance, associated subspecies. Low potential: 15 sites (11 Spring Valley, 4 southern Snake Valley). Moderate potential: 12 sites (9 Spring Valley, 1 northern Hamlin Valley, 2 southern Snake Valley). High potential: 5 sites (5 Spring Valley, 0 southern Snake Valley). *No ULT documented.*

Table 4-3 Ute Ladies'-Tresses Presence Data and Potential Habitat

Site	ULT Survey[1]			
	Present	Potential Habitat		
		Low	Moderate	High
Spring Valley				
Blind Spring	No	▲		
E of Cleve Creek Springs (W)	No	▲		
Four Wheel Drive [4WD]	No	▲		
Layton Spring	No	▲		
N Millick Spring	No	▲		
Rock Spring	No	▲		
S Millick Spring	No	▲		
The Seep	No	▲		
Turnley/Woodsman Spring	No	▲		
Unnamed 5 Spring	No	▲		
Willow Spring	No	▲		
E of Cleve Creek Springs (E)	No		▲	
Minerva Spring Complex (2/Mid)	No		▲	
Minerva Spring Complex (3/N)	No		▲	
Shoshone (1/stock pond)	No		▲	
Shoshone (2/refuge ponds)	No		▲	
Shoshone (3/S)	No		▲	
S Bastian Spring	No		▲	
Willard Spring	No		▲	
W Spring Valley Complex (5/S)	No		▲	
Keegan Spring Complex (Mid)	No			▲
Keegan Spring Complex (S)	No			▲
Stonehouse Spring Complex	No			▲
Swallow Spring	No			▲
W Spring Valley Complex (1/N)	No			▲
Hamlin Valley				
S Little Spring	No		▲	
Snake Valley				
Big Springs	No	▲		
Big Springs Creek	No	▲		
Big Springs Pond	No	▲		
Clay Spring (N)	No	▲		
Unnamed 1 Spring N of Big	No		▲	
Unnamed 2 Spring N of Big	No		▲	

[1] 2007 qualified ULT survey (BIO-WEST, 2007b).

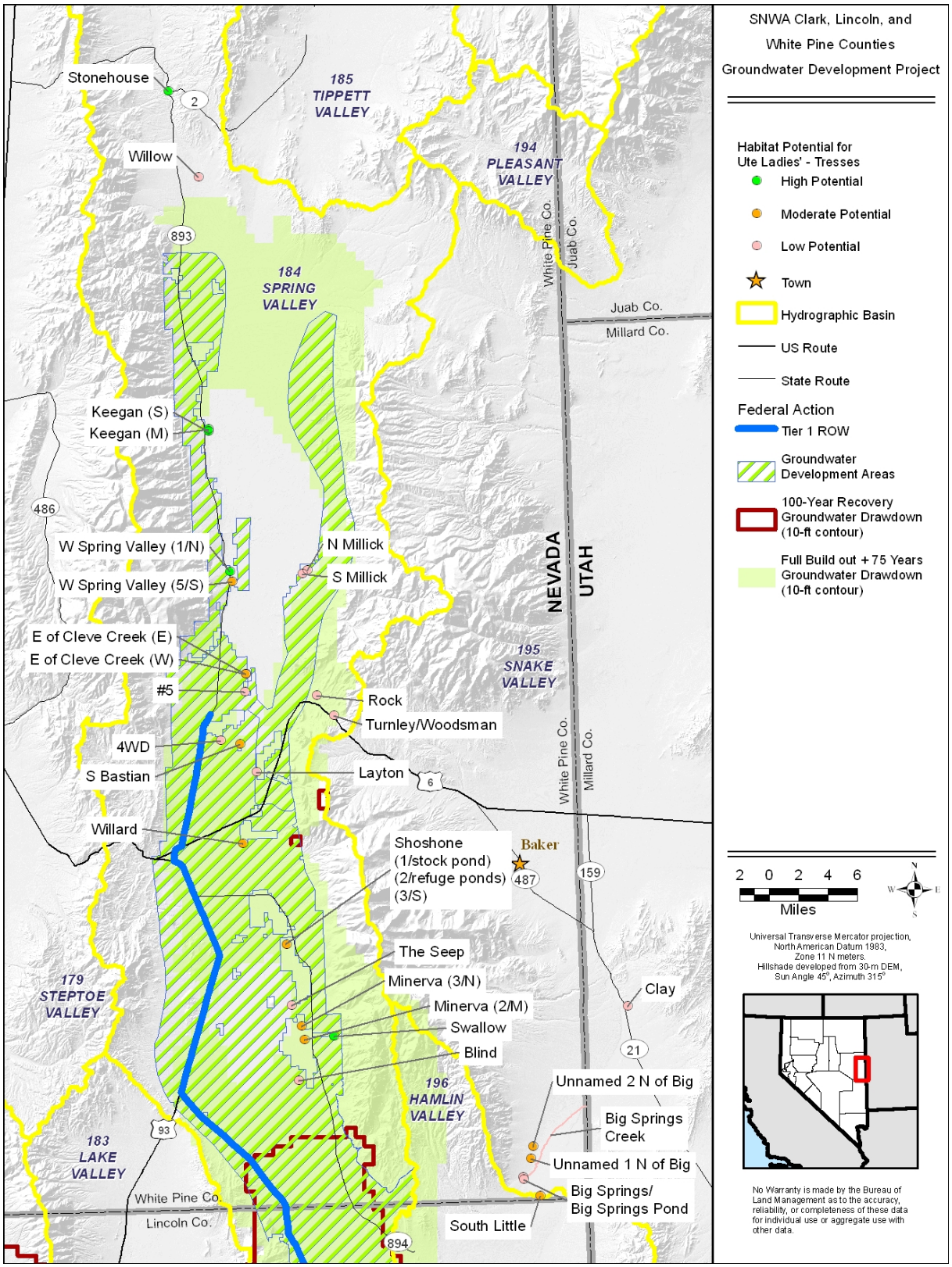

Figure 4-10 Ute Ladies'-Tresses Potential Habitat

4.1.9.4 Threats to the Species

Livestock grazing and hay mowing, agricultural conversion, water diversions, climate change, and private development are threatening this species. Recreational swimming is considered to be a threat to this plant at Panaca Spring. Competition from non-native plants and vegetation succession also appear to be widespread threats to this species.

4.1.9.5 Status of the Critical Habitat

No critical habitat has been designated for this species.

5.0 EFFECTS ANALYSIS FOR THE FEDERAL ACTION

5.1 INTRODUCTION

Section 5.0 is the analysis of the potential effects to listed species and their critical habitat in the Action Area as a result of implementation of the Federal action. Analysis of effects covers direct, indirect, and cumulative effects (including effects of interrelated and interdependent actions), and information and assumptions used to evaluate such effects. Direct, indirect, and cumulative effects are defined as follows (pursuant to Section 7 of the ESA):

- Direct effects of the Federal action occur at the same time and place. These include construction-related effects within the Tier 1 ROWs for the primary water and power conveyance facilities, and future ROWs for the groundwater development facilities, such as loss of habitat and take of listed species. Activities within the operation and maintenance phase may also have direct effects, such as increased human presence resulting in species disruptions.
- Indirect effects of the Federal action occur later in time or are further removed in distance, but are reasonably certain to occur. These include effects outside of the Tier 1 and future ROWs, such as construction-related noise and dust disruptions to listed species and their habitat. Indirect effects for this Federal action also include effects of future groundwater pumping, which may result in groundwater drawdown or spring flow reduction; thereby, indirectly affecting groundwater-dependent listed species and their habitats.
- Cumulative effects include future state or private activities that would not involve a Federal action, which are reasonably certain to occur within the Action Area (50 C.F.R. § 402.02). Since the majority of the Action Area is Federal lands, there is a very limited potential for cumulative actions.

5.1.1 Analysis Methodology

The effects analysis for the listed species included in this BA are described below, broken down by Tier 1 ROWs, groundwater development areas (future tiers ROWs), and groundwater pumping effects. Analysis is provided for direct and indirect effects of the Federal action.

A brief analysis of aggregate effects is also provided to assist the USFWS in determining whether an action is likely to jeopardize the continued existence of a species, and the final analysis of whether, given the aggregate effects, the species can be expected to both survive and recover (USFWS and NMFS, 1998, page 4-37). Aggregate effects are defined as the combination of baseline, direct, and indirect Federal action effects, and cumulative effects (USFWS and NMFS, 1998). Baseline is defined as past and present impacts of all Federal, State, or private actions, including Federal projects that have already undergone formal or early Section 7 consultation (USFWS and NMFS, 1998). As described in Section 5.1.2 below, the baseline already includes future activities that would begin prior to the Federal action in accordance with the ESA definition of baseline, and no additional cumulative actions were identified for the Federal action. Therefore, the aggregate effects sections describe the combination of baseline and Federal action effects.

As is described in detail in Section 3.3, groundwater flow modeling has been conducted to assist in the programmatic analysis of potential indirect effects of groundwater pumping. The

modeling simulation results are provided below for both 75 years after full build out, and a 100-year recovery period (see Section 3.2.1).

The groundwater flow model simulations of groundwater drawdown of the water table and flow reductions (which depend on the hydraulic heads at the sources) are used to conduct risk assessments to the listed species and their habitat within the Action Area. The simulation results provide insight as to the general, long-term, drawdown patterns and an indication of potential trends in spring flow that may occur from the proposed pumping (BLM, 2011, pages 3.3-86 through 3.3-92). As described in greater detail in Section 3.2.1.2 and in BLM's Draft EIS (2011), given the regional scale of the model and unavoidable uncertainty associated with the model predictions, the BLM has determined that simulation results at resolutions finer than 10 foot drawdown or 5 percent flow reduction exceed the limitations of the model and should not be used for effects analyses. The impact analysis presents whether listed species and habitat are within the simulated drawdown area or have simulated spring flow reduction at 75 years after full build out and 100 years recovery in accordance with these model limitations. Furthermore, because the model does not have the level of accuracy required to predict absolute values at specific points in place or time, the drawdown and flow reduction impact evaluation is limited to an identification of areas of risk, with the recognition that actual impacts to individual springs and streams distributed over this broad region cannot be determined precisely (BLM, 2011, pages 3.3-86 through 3.3-92). The water resource impact analysis is consistent with the BLM's EIS, which uses the geomorphic setting (i.e., valley floor, valley margin, and upland areas), combined with available water level data, to identify the relative risk level (high, moderate, and low) for each perennial water source within the model simulated drawdown areas (BLM, 2011 at pages 3.3-88 through 3.3-92).

5.1.2 Reasonably Foreseeable Future Uses

5.1.2.1 Tier 1 and Future ROWs

For the Tier 1 Federal action, the private and state lands encompassed within the Tier 1 ROWs were reviewed to determine if there may be any other reasonably foreseeable future activities in those areas. The private and state lands that are part of the Tier 1 ROWs include: (1) a private parcel in Caliente for construction support; (2) pipeline and power line ROW across private lands along Highway 93 in northern Coyote Spring Valley (not part of Coyote Springs Investments development); (3) pipeline ROW across private lands in the western perimeter of Apex Industrial Park in northern Las Vegas Valley; (4) pipeline ROW across State of Nevada National Guard lands in Las Vegas Valley; and (5) power line ROW in a utility corridor across State of Nevada (WMA) in Steptoe Valley. No additional private or state actions on these private and state lands have been identified or proposed. Thus, there were no cumulative activities under ESA for the Tier 1 ROWs.

For the future tiers, the only private or state lands encompassed within the groundwater development areas are lands owned by SNWA in Spring Valley. SNWA has already identified potential groundwater development on its private lands as part of the Federal action. Thus, there were no cumulative activities under ESA for the future groundwater development areas.

5.1.2.2 Groundwater Development

For future groundwater pumping, a list of reasonably foreseeable future groundwater uses was developed for the NEPA process in the model simulations report (SNWA, 2010a) and in the

BLM's Draft EIS (BLM, 2011). However, these future groundwater uses are considered environmental baseline under ESA Section 7 regulations. As described in **Table 5-1**, these future groundwater uses are either existing rights that are reasonably expected to be developed on private lands prior to the start of groundwater pumping under the Federal action, or are rights or applications that have undergone previous Section 7 consultation. Thus, these groundwater uses were included in the groundwater flow modeling conducted for this BA as part of the baseline for the Federal action. Surface waters in the region are very limited, with available surface waters having been permitted decades to over a century ago. Thus, no additional reasonably foreseeable surface water uses were considered for the cumulative analysis.

As described in Section 3.3 and provided in more detail in model technical backup to the USFWS, the reasonably foreseeable future groundwater uses considered current and potential future agricultural water uses and permits. It was determined that there was no imminent, inevitable, or sufficiently concrete information to suggest agricultural water use would increase into the future. This determination was based upon: (1) current and historical use of patters; (2) limited availability of non-federal land in the region; (3) declining trends for agricultural water use; and (4) NSE permit reductions that would occur if water rights were to be transferred for uses other than irrigation. Thus, the estimate for reasonably foreseeable future agricultural water uses was projected to be a continuation of the current usage rate and there were no reasonably certain foreseeable groundwater uses that would be considered cumulative under ESA.

Table 5-1 Reasonably Foreseeable Future Groundwater Uses

Hydrographic Basin	NEPA Cumulative Amount (afy)*	Status under ESA	Comments
Project Groundwater Development Basins			
Delamar Valley	---	---	No additional reasonably foreseeable future uses.
Dry Lake Valley	1,009	Baseline	Water rights permitted to Lincoln County, currently being developed for agriculture on private land.
Cave Valley	---	---	No additional reasonably foreseeable future uses.
Spring Valley	1,426	Baseline	Permitted irrigation rights that would be developed for agriculture on private lands prior to start of groundwater pumping under the Federal action.
Snake Valley	---	---	No additional reasonably foreseeable, future uses
Other Basins in Regional Groundwater Flow Model Area			

Hydrographic Basin	NEPA Cumulative Amount (afy)*	Status under ESA	Comments
Coyote Spring Valley	9,000	Baseline	Permitted to SNWA, Section 7 consultation completed (Biological Opinion 1-5-05-FW-536), and currently being pumped.
	4,600	Baseline	Permitted to CSI, Section 7 consultation completed (Biological Opinion 1-5-05-FW-536), and currently being pumped.
Steptoe Valley	2,046	Baseline	Permitted irrigation rights that would be developed for agriculture on private lands prior to start of groundwater pumping under the Federal action.
	8,000	Baseline	Permitted industrial water rights for a power plant that would be developed for industrial use prior to the start of groundwater pumping under the Federal action. Additional Section 7 consultation would be required for Federal ROWs for power plant.
	20	Baseline	Permitted industrial water rights that would be developed for industrial use on private land prior to the start of groundwater pumping under the Federal action.
	2,635	Baseline	Permitted mining and milling rights to Robinson Nevada Mining Co. which would be used prior to start of groundwater pumping under the Federal action.
Garden Valley	83	Baseline	Permitted irrigation rights that would be developed for agriculture on private lands prior to start of groundwater pumping under the Federal action.
	5	Baseline	Permitted industrial rights that would be developed on private lands prior to start of groundwater pumping under the Federal action.
Kane Springs Valley	1,000	Baseline	Permitted to Lincoln County/Vidler, Section 7 consultation completed as part of Kane Springs Valley Groundwater Development Project (Biological Opinion 84320-2008-F-007 and 84320-2008-I-0216).
Panaca Valley	1,240	Baseline	Permitted irrigation rights that would be developed for agriculture on private lands prior to start of groundwater pumping under the Federal action.
Clover Valley	37	Baseline	Permitted irrigation rights that would be developed for agriculture on private lands prior to start of groundwater pumping under the Federal action.

Hydrographic Basin	NEPA Cumulative Amount (afy)*	Status under ESA	Comments
	14,480	Baseline	Groundwater applications held by Lincoln County/Vidler, Section 7 consultation completed as part of Lincoln County Land Act Project (Biological Opinion 84320-2008-F-0468).
Lower Meadow Valley Wash	380	Baseline	Permitted irrigation rights that would be developed for agriculture on private lands prior to start of groundwater pumping under the Federal action.
	580	Baseline	Permitted to CSI for municipal use. Section 7 consultation would be required to obtain Federal ROWs to convey this water to either Coyote Spring Valley or Lincoln County Land Act area.
Pahranagat Valley	924	Baseline	Permitted irrigation rights that would be developed for agriculture on private lands prior to start of groundwater pumping under the Federal action.
	216	Baseline	Permitted commercial rights that would be developed on private lands prior to start of groundwater pumping under the Federal action.

*These NEPA cumulative quantities are further described in SNWA 2010b.
afy – acre-feet per year

5.2 EFFECTS OF THE FEDERAL ACTION

The scope of the effects analysis considers the actions of construction, operation, and maintenance of the Tier 1 facilities, construction, operation, and maintenance of future tier facilities, and the potential indirect effects from future groundwater pumping on listed species. Construction, operation, and maintenance of the Tier 1 and future facilities have a potential to directly affect those plant and animal species occurring within those ROWs, and indirectly affect listed plant and animal species adjacent to the ROWs. Future groundwater pumping has the potential to indirectly affect groundwater dependent plant and animal species occurring within the Action Area. GWD Project activities that may directly and indirectly affect listed species include:

- Grading of ROWs and facility construction resulting in the temporary and permanent loss of listed species' habitats;
- Clearing, grading, and excavation activities during construction resulting in noise, dust, and lighting that temporarily disturbs listed species in adjacent areas;
- Construction, operation, or maintenance vehicle traffic resulting in wildlife injury or mortality through striking of listed species that may enter the ROWs;

- Discharge of hydrostatic test water during construction resulting in erosion of adjacent areas containing listed plants and potential flooding of listed species' burrows. It could also create a water source that may result in further spread of noxious and invasive weeds, thereby affecting listed species habitats;
- Construction activities such as welding could accidentally spark wildfires that could spread off the ROWs and affect adjacent listed species habitats;
- Accidental spills of toxic or hazardous substances during construction, operation or maintenance within the ROWs which could affect listed species that come into contact with the substances;
- Increased human presence in the area resulting in temporary disturbance to listed species in adjacent areas; and
- Groundwater pumping resulting in groundwater level drawdown and reduction in spring flow to groundwater-dependent riparian, wetland, phreatophytic vegetation, and aquatic habitats occupied by listed species, which could result in the alteration of those habitats.

5.3 FEDERALLY LISTED SPECIES IN THE ACTION AREA

The federally-listed species addressed below occur within the Action Area. These species, together with presence or absence of critical habitat in the Action Area, are summarized in **Table 4-1**.

5.3.1 Southwestern Willow Flycatcher

5.3.1.1 Effects to Species

The effects analysis below is limited to southwestern willow flycatcher breeding locations within the Action Area, including Pahranagat NWR (Upper Lake), Key Pittman WMA (Nesbitt Lake), Crystal Spring, and Pahranagat Creek in Pahranagat Valley; northern Lower Meadow Valley Wash and the WSNA within the Muddy River Springs Area (**Figure 4-1**).

Tier 1 ROWs

Direct Effects: Southwestern willow flycatcher breeding sites in Pahranagat Valley, Lower Meadow Valley Wash, and Muddy River Springs Area occur approximately 6-30 miles away and in different hydrographic basins from the nearest construction support area and Tier 1 ROW (**Figure 4-1**). At these distances, the southwestern willow flycatcher would not experience direct effects such as loss of habitat due to construction and/or operation/maintenance activities.

Indirect Effects: Southwestern willow flycatcher breeding sites in Pahranagat Valley and Lower Meadow Valley Wash occur approximately 6-30 miles away and in different hydrographic basins from the nearest construction support area and Tier 1 ROW (**Figure 4-1**). Similarly, breeding sites in the Muddy River Springs Area are approximately 14 miles from the Tier 1 ROW. At these distances, the southwestern willow flycatcher would not be indirectly affected by construction-related effects such as dust, noise, traffic, hazardous or toxic material spills, or temporary construction water use.

Groundwater Development Areas

Direct Effects: Southwestern willow flycatcher breeding sites in Pahranagat Valley, Lower Meadow Valley Wash, and Muddy River Springs Area occur approximately 6-60 miles away

and in different hydrographic basins from the nearest groundwater development area (**Figure 4-1**). At these distances, the southwestern willow flycatcher would not experience direct effects such as loss of habitat due to construction and/or operation/maintenance activities.

Indirect Effects: Southwestern willow flycatcher breeding sites in Pahranagat Valley, Lower Meadow Valley Wash, and Muddy River Springs Area occur approximately 6-60 miles away and in different hydrographic basins from the nearest groundwater development area (**Figure 4-1**). At these distances, the southwestern willow flycatcher would not be indirectly affected by construction-related effects such as dust, noise, traffic, and hazardous or toxic material spills.

Groundwater Pumping Effects

Federal Action Effects:

Pahranagat Valley

Pahranagat NWR (Upper Lake), Key Pittman WMA (Nesbitt Lake), Ash and Crystal springs, and Pahranagat Creek are located over 5 miles away, and in a different hydrographic basin, from the simulated groundwater drawdown area at both 75 years after full build out and 100 years of recovery (**Figure 4-1**). As described in section 4.1.1, Ash Spring is the principal headwater for Pahranagat Creek and the Upper Lake in Pahranagat NWR, while Crystal Spring (which is also a breeding site for southwestern willow flycatcher) provides outflow outside of the summer irrigation season.

Ash, Crystal and Hiko springs were simulated in the groundwater flow model. At 75 years after full build out and 100 years recovery, the model simulates a less than 1 percent spring flow reduction, which is beyond the limitation of the model and does not identify these springs as areas of risk. The model simulated baseline flows were similar to the actual measured historic flows for Ash, Crystal, and Hiko (i.e. model simulated flows compared to actual flows: 107% at Ash Spring, 109% at Crystal Spring, and 73% at Hiko Spring) indicating that the regional model provides a reasonable representation of the baseline flow at these springs.

While some groundwater may underflow from Delamar Valley to Pahranagat Valley along the Pahranagat Shear Zone (Rowley et al., 2011), groundwater flow predominantly trends north-south in the White River Flow System (Burns and Drici, 2011). Isotopic evidence suggests that water from Delamar Valley does not contribute to Ash, Crystal, or Hiko springs, as the springs have dissimilar isotopic composition to waters in Delamar Valley (Thomas et al., 2001; Thomas and Mihevic, 2011). Ash and Crystal springs are the major water source for Pahranagat Creek and the Upper Lake in Pahranagat NWR, and Hiko Spring is a major water source for Key Pittman WMA. Furthermore, the mountain ranges located between Pahranagat Valley and Delamar Valley are composed of low hydraulic-conductivity volcanic materials and underlying carbonate rocks offset by a series of north-trending basin-range faults that likely restrict groundwater flow between areas of proposed pumping and Pahranagat Valley (Rowley et al., 2011). The presence of near-surface Neoproterozoic to Cambrian quartzites and the Indian Peak caldera complex also presumably restrict flow between Cave and Dry Lake valleys and Pahranagat Valley (Rowley et al., 2011).

It is also possible that southwestern willow flycatcher breeding sites in Pahranagat Valley may receive water that originates in Cave Valley and passes through White River Valley, as there is evidence of subsurface outflow from Cave Valley to White River Valley (see Section 5.3.4). Groundwater pumping south of the Shingle Pass fault zone in Cave Valley may draw a portion of

the groundwater away from the interbasin flow path, which would be expected to be gradual and observable by groundwater monitoring. In the case of Pahranagat Valley, the contribution of Cave Valley waters is expected to be very small with long travel times.

Several USFWS and NDOW conservation programs provide protection to southwestern willow flycatcher in Pahranagat Valley. As discussed in Section 4.1.1, local irrigation practices likely influence hydrologic conditions at Pahranagat NWR more than distant pumping activities (Felling, pers. comm., 2008). According to NDWR, irrigation in Pahranagat Valley in 2009 accounted for approximately 95 percent of groundwater pumpage in the basin (NDWR, 2010). Private land owners have water rights for the irrigation season, during which time Pahranagat NWR receives tail water. During the non-irrigation season, Pahranagat NWR has a winter water right that supplies their lakes.

As discussed in Section 4.1.1, Pahranagat NWR is extensively managed for the conservation of the southwestern willow flycatcher through efforts to restore, improve, and protect its habitat. Conservation efforts include: (1) maintaining 100 acres of cottonwood/willow riparian habitat specifically for breeding southwestern willow flycatcher and other migratory birds; (2) planting willows and cottonwood trees on 200 acres to provide more breeding habitat for southwestern willow flycatcher; (3) continuing to help coordinate with other agencies in their surveys and research of southwestern willow flycatcher; and (4) to seek funding to develop more acreage into cottonwood/willow through restoration efforts. The 2009 Desert NWR Complex Comprehensive Conservation Plan also requires the preparation and implementation of a habitat restoration and management plan specific to the southwestern willow flycatcher. For Key Pittman WMA, the area is managed for the conservation of waterfowl, wetland species, and specifically the southwestern willow flycatcher. The draft management plan for Key Pittman WMA, completed in November 2003, includes protections for the southwestern willow flycatcher. NDOW "fences the known flycatcher habitat in order to protect it from livestock grazing, manages water to maintain habitat, monitors the status of southwestern willow flycatchers, and is actively planting riparian plants to improve the distribution of riparian habitat." (USFWS, 2011a). As described in ACM B.1.1, groundwater production well sites will be selected considering the presence of special status species and their habitats. Effects to southwestern willow flycatcher in Pahranagat Valley will be avoided, minimized, and/or mitigated by way of the legally-binding DDC Stipulation (Stipulation, 2008) and associated ACMs. These ACMs include biological monitoring in Pahranagat Valley (ACM C.1.42) and working with State and Federal agencies to improve and/or expand habitat (ACMs C.2.11, C.2.12, and C.2.14).

As part of the DDC Stipulation, SNWA may monitor sites where the southwestern willow flycatcher occurs (ACM C.1.42), and is required to manage the development of groundwater by SNWA in DDC in order to avoid or mitigate unreasonable adverse effects to Federal Resources and special status species (ACM C.2.1). Ash, Crystal, and Hiko springs are currently biological and hydrologic monitoring sites under the DDC Stipulation (BRT, 2011; SNWA, 2009b), and Pahranagat Creek (including woody riparian areas) is currently a biological monitoring site (BRT, 2011). Biological and hydrologic monitoring of the regional springs also effectively monitor downstream habitats, as Ash and Crystal springs are major water sources for Pahranagat Creek. Similarly, the Upper Lake at Pahranagat NWR and Hiko spring is a major water source for Key Pittman WMA. Furthermore, annual monitoring for southwestern willow flycatcher at Pahranagat NWR and Key Pittman WMA, for which SNWA has contributed funds, has been ongoing since 1997 and 2000 (respectively) as part of the Final Recovery Plan for southwestern

willow flycatcher (USFWS, 2002b). These data will be available to the BRT for the purposes of the DDC Stipulation. Lastly, goals of the AM Framework include avoiding and minimizing potential adverse environmental impacts of SNWA groundwater withdrawals on listed species and their habitats (SNWA, 2012).

The hydrologic monitoring network and groundwater flow modeling efforts conducted under the DDC Stipulation should detect propagation of effects from SNWA groundwater withdrawal in DDC toward Pahranagat NWR (BRT, 2011, page 4-22). Specific efforts include continuous and quarterly data collection at groundwater monitoring wells situated between areas of potential groundwater export and areas of sensitive biological resources in Pahranagat Valley, and periodically-updated groundwater flow model simulations using newly-acquired data (BRT, 2011, page 4-22). Additional protection is granted to the Pahranagat NWR in the DDC Stipulation by specifying no injury to Federal Water Rights (Stipulation, 2008), which applies to surface water coming into Pahranagat NWR from the outflow of Ash and Crystal springs.

In conclusion, while potential impacts to southwestern willow flycatcher in Pahranagat Valley cannot be ruled out with 100 percent certainty, model simulations and other lines of evidence presented above indicate that any such effects are unlikely to occur.

Lower Meadow Valley Wash

The southwestern willow flycatcher breeding site in northern Lower Meadow Valley Wash is located approximately 2 miles away, and in a different hydrographic basin, from the simulated groundwater drawdown area at both 75 years after full build out and 100 years of recovery (**Figure 4-1**). Because Meadow Valley Wash is not specifically simulated in the model, there are no flow simulations at this location.

There is no evidence of hydraulic connectivity between the southwestern willow flycatcher breeding site in northern Lower Meadow Valley Wash and areas of proposed pumping. The presence of near-surface Neoproterozoic to Cambrian quartzites and the Indian Peak caldera complex create barriers to flow between Cave and Dry Lake valleys and Lake Valley (Rowley et al., 2011). Additionally, Neoproterozoic to Cambrian quartzites and shales and the Tertiary caldera complexes form an effective barrier to groundwater flow between Delamar Valley and Lake Valley (Rowley et al., 2011). In regards to Spring Valley pumping, the southern portion of the Fortification Range in northern Lake Valley is composed of volcanic rocks with low permeabilities that likely restrict groundwater flow between Spring Valley and Lake Valley (which is upstream of Lower Meadow Valley Wash) (Rowley et al., 2011). The northern portion of the Fortification Range is composed of carbonate rocks that are underlain by Chainman Shale, which is probably more than 1,000 feet thick and may also prevent interbasin groundwater flow (Rowley et al., 2011). A map in Heilweil and Brooks (2011) however, considers the northern portion of the Fortification Range to have a relative likelihood of hydraulic connection between Spring and Lake valleys. If there is a hydraulic connection, because this area is a groundwater divide, pumping stress would have to be great enough to move the divide for effects to propagate south of the Fortification Range. In the case of Lower Meadow Valley Wash, any possible contribution of Spring Valley waters would be very small with long travel times.

In conclusion, while potential impacts to southwestern willow flycatcher in Lower Meadow Valley Wash cannot be ruled out with 100 percent certainty, model simulations and other lines of evidence presented above indicate that any such effects are unlikely to occur.

Muddy River Springs Area

The southwestern willow flycatcher breeding sites in WSNA are located approximately 40 miles away, and in a different hydrographic basin, from the simulated groundwater drawdown area at both 75 years after full build out and 100 years of recovery (**Figure 4-1**).

The USGS Muddy River Near Moapa Gage 09416000 was simulated in the groundwater flow model. At 75 years after full build out and 100 years recovery, the model simulates a less than 1 percent flow reduction, which is beyond the limitation of the model and does not identify the upper Muddy River as an area of risk. The Muddy River was calibrated in the groundwater flow model to observed flows, with annual average stream discharge measurements at USGS Muddy River Near Moapa Gage 09416000 and USGS Muddy River Near Glendale Gage 09419000 treated as flow observations (SNWA, 2009c, page B-25). The model simulated baseline flows are approximately 74% of the actual historic flow at the USGS Muddy River Near Moapa Gage (see discussion under Section 5.3.8). Therefore, the regional model provides a reasonable representation of the groundwater discharge that supports the southwestern willow catcher habitat in Muddy River Springs Area.

While some groundwater from DDC may ultimately underflow to the Muddy River Springs Area, the amount of water that begins as recharge in DDC and makes its way to the Muddy River Springs Area is unknown. The waters of the upper Muddy River and tributary springs are a mixture of both local recharge and interbasin flows that travel through the White River Flow System (Kirk and Campana, 1990; Thomas et al., 1996, 2001; Thomas and Mihevic, 2007, Thomas, 2011). Water chemistry data provide evidence that it likely takes hundreds to thousands of years for water to travel from DDC to the Muddy River Springs Area (see Section 4.1.8).

Conservation measures in place for the Moapa dace, under the Muddy River MOA, include provision of minimum in-stream flows. These measures are discussed in Section 5.3.8 and Section 4.1.8.

In conclusion, while potential impacts to southwestern willow flycatcher in Muddy River Springs Area cannot be ruled out with 100 percent certainty, model simulations and other lines of evidence presented above indicate that any such effects are unlikely to occur for the foreseeable future.

Aggregate Effects:

Pahranagat Valley

In the baseline-plus-action model run simulation, Pahranagat NWR (Upper Lake), Key Pittman WMA (Nesbitt Lake), Ash and Crystal springs, and Pahranagat Creek are located over 5 miles away, and in a different hydrographic basin, from the simulated groundwater drawdown area at both 75 years after full build out and 100 years of recovery.

The baseline-plus-action model run produced spring flow simulations for Ash, Crystal and Hiko springs. At 75 years after full build out and 100 years recovery, the baseline-plus-action model run simulates a less than 2 percent spring flow reduction, which is beyond the limitation of the model and does not identify these springs as areas of risk. The model simulated baseline flows were similar to the actual measured historic flows for Ash, Crystal, and Hiko (i.e. model simulated flows compared to the actual flows: 107% at Ash Spring, 109% at Crystal Spring, and

73% at Hiko Spring) indicating that the regional model provides a reasonable representation of the baseline flow at these springs.

Potential interbasin groundwater flow and ACMs, as well as USFWS and NDOW conservation programs, are described under the analysis of indirect effects of the Federal action above.

While potential impacts to southwestern willow flycatcher in Pahranagat Valley cannot be ruled out with 100 percent certainty, model simulations and other lines of evidence presented above indicate that any such aggregate effects are unlikely to occur.

Lower Meadow Valley Wash

In the baseline-plus-action model run simulation, the breeding site in northern Lower Meadow Valley Wash is within the groundwater drawdown area at both 75 years after full build out and 100 years of recovery. Because Meadow Valley Wash is not specifically simulated in the model, there are no flow simulations at this location.

The potential for interbasin groundwater flow is provided under the analysis of indirect effects of the Federal action above.

Muddy River Springs Area

The groundwater flow modeling simulation results for changes in flow are complicated by the inability of the groundwater flow model to incorporate monitoring, management, and mitigation measures (see Section 3.3). Non-discretionary regulatory triggers, conditions and agreements are in place to protect stream flows and Moapa dace (for a detailed discussion, see Sections 2.4.4 and 4.1.8). In the absence of the minimum in-stream flow levels and other conservation measures that cannot be simulated by the groundwater flow model, the simulations for the baseline-plus-action model run predict a reduction in flow at the upper Muddy River of 42 percent at 75 years after full build out, and 50 percent at 100 years of recovery. However, as noted, this prediction is not realistic because it does not take into consideration the committed conservation measures. Moreover, baseline pumping is presumed to account for these reductions in flow because effects of the action were predicted to be less than 1 percent by the model simulation at 75 years after full build out and 100 years of recovery.

Strong protection for southwestern willow flycatcher habitat in Muddy River Springs Area is provided by: (1)regulations under Nevada water law and Order 1169; (2) committed conservation measures under the legally-binding Coyote Spring Valley Stipulation (Stipulation, 2001), Muddy River MOA (2006), and Intra-Service Programmatic BO (USFWS, 2006c); and (3) USFWS and SNWA management of the Moapa Valley NWR and the WSNA, which encompass most of the springs that coalesce to form the Muddy River. These regulations, agreements, and conservation measures are discussed in detail in Section 5.3.8 and Section 4.1.8.

Effects to the southwester willow flycatcher habitat in the upper Muddy River and tributary springs will be avoided, minimized and/or mitigated specifically by: (1) the ongoing Recovery Plan for the Rare Aquatic Species of the Muddy River Ecosystem (USFWS, 1996), which includes past and ongoing efforts improvements to Moapa dace habitat and removal of non-native species (western mosquitofish and shortfin molly) and man-made structures within the upper Muddy River; (2) the Muddy River MOA, which sets forth conservation measures providing for the protection and recovery of the Moapa dace, including minimum in-stream flow triggers; and (3) recovery actions that can be implemented on the Moapa Valley NWR and the private land that SNWA has acquired and preserved as the WSNA.

CONCLUSION: The Federal action **may affect, is not likely to adversely affect** southwestern willow flycatcher as a result of groundwater pumping.

5.3.1.2 Effects to Designated Critical Habitat

There is no designated critical habitat for the southwestern willow flycatcher within the Action Area.

5.3.1.3 Effects to Proposed Critical Habitat

USFWS has requested to conference on the potential effects to proposed southwestern willow flycatcher critical habitat. Critical habitat has been recently proposed in the Action Area along segments of the Pahranagat Creek that run through Pahranagat NWR and Key Pittman WMA (USFWS, 2011a).

As discussed in Section 4.1.1, the USFWS excluded the Pahranagat NWR and the Key Pittman WMA from designation as critical habitat in 2005 (USFWS, 2005a). The USFWS recognized that Pahranagat NWR was already extensively managed for the conservation of the southwestern willow flycatcher through efforts to restore, improve, and protect its habitat; and Key Pittman WMA has been under management for wildlife since the 1960s with conservation efforts targeted towards waterfowl, wetland species, and specifically the southwestern willow flycatcher. Because of such conservation efforts, the USFWS thus found the benefits of exclusion outweighed the benefits of inclusion for both Pahranagat NWR and the Key Pittman WMA (USFWS, 2005a). However, the USFWS is currently re-considering these areas for critical habitat designation (USFWS, 2011a).

For an analysis of potential effects to Pahranagat NWR and the Key Pittman WMA, please see Section 5.3.1.1.

CONCLUSION: The Federal action **may affect, is not likely to disturb or destroy** southwestern willow flycatcher proposed critical habitat as a result of groundwater pumping.

5.3.2 Desert Tortoise

Effects on desert tortoise habitat are described in two sections below. In Section 5.3.2.1, the desert tortoise habitat described includes all habitat that is not designated critical habitat. Desert tortoise critical habitat is described in Section 5.3.2.2.

5.3.2.1 Effects to Species

Tier 1 ROWs

Direct Effects: Construction, operation, and maintenance of the Federal action have the potential to result in take of desert tortoise and tortoise habitat. Protocol tortoise surveys conducted for the Federal action have determined that portions of the Action Area are occupied habitat for the species (**Figures 4-3** and **4-4**). A total of 3,355 acres of both critical and non-designated desert tortoise habitat were surveyed and 31 adult desert tortoises were observed. The Tier 1 ROWs would alter 2,350 acres of desert tortoise habitat, of which only 400 acres would be permanently disturbed. Survey data suggest that the combined critical and non-designated habitat would typically support 62 adult tortoises with a 95 percent confidence interval of 32-122 tortoises based on calculations performed using Table 3 of the USFWS revised guidelines (USFWS, 2009b). The disturbance of desert tortoise habitat in Clark and Lincoln counties represents

approximately 0.04 percent of tortoise habitat in Clark County and 0.17 percent of tortoise habitat in Lincoln County.

Loss of occupied tortoise habitat and take of individuals would adversely affect the tortoise. As shown on **Table 4-2** in Section 4.1.2, tortoise density estimates were found to be low (10-45 tortoise/square mile) to very low (0-9 tortoise/square mile) in the Action Area. Approximately 26 miles of the Action Area have low tortoise densities and approximately 49 miles have very low tortoise densities.

Effects to designated critical habitat are described in Section 5.3.2.2, below. The portion of the Tier 1 ROW within non-designated desert tortoise habitat is listed on **Table 5-2**. Non-designated habitat is defined by two spatial datasets: (1) BLM moderate density habitat; and (2) potential desert tortoise habitat in Clark and Lincoln Counties. Potential desert tortoise habitat includes desert tortoise habitat in Lincoln County as defined in the BLM Ely District RMP (2008), and potential habitat identified by SNWA at 4,000 ft elevation or less in Clark County. Although desert tortoises are known to inhabit higher elevations, no portions of the proposed Tier 1 ROWs exceed 4,000 ft in Clark County. Surveys for non-designated desert tortoise habitat encompassed 845 acres, with 14 adult desert tortoises observed. Construction would alter 568.5 acres of non-designated habitat on both private and public lands. However, only 155 acres would be permanently disturbed with above-ground facilities, including access roads, within non-designated habitat. Areas not permanently disturbed by construction in both Clark and Lincoln counties would be subsequently restored in accordance with an approved Restoration Plan (ACMs A.1.22 through A.1.25, A.1.69 through A.1.81, and A.2.9 through A.2.13). These acreages include habitat considered suitable for desert tortoise from the northern boundary of Delamar Valley to the terminus in Las Vegas Valley. Survey data suggest that non-designated desert tortoise habitat would typically support 28 tortoises, with a 95 percent confidence interval of 12 – 64 tortoises. Of the 568.5 acres of non-designated habitat to be altered by the project, 19.5 acres occur on private land in Clark County. No tortoises were observed on these 19.5 acres of non-designated habitat, of which only 3 acres will be permanently disturbed.

Hydrostatic testing for the southern portion of the Federal action within desert tortoise habitat is planned to be managed to avoid the need to discharge water; however, if discharge is necessary, it is anticipated only at the buried storage reservoir site in Garnet Valley (Section 2.1.4.2). ROW for hydrostatic testing has not been requested as part of the Federal action. While a specific area that may be affected by hydrostatic testing cannot be determined until facility design and a Hydrostatic Discharge Plan (ACM A.1.1) are completed, it is estimated that water discharged from testing may spread over an area of approximately 20 acres.

Construction activities, including ground clearing, grading, and excavation have the potential to cause injury or mortality to desert tortoise within the construction area. Within desert tortoise habitat, temporary tortoise exclusion fencing would be used to enclose all active construction areas (ACMs A.1.14, A.1.19); clearance surveys and monitoring would be conducted (ACMs A.5.2 through A.5.7 and A.5.16 through A.5.31).

There would be a temporary increase in vehicular traffic on existing roads and new access routes during construction activities. These activities have a potential to result in tortoise mortality through striking of tortoises entering the access routes and construction sites. ACMs on access roads, including speed limits (ACMs A.1.28 through A.1.37), avoiding or clearing cross-country vehicle travel (ACM A.1.3 and A.1.11), use of temporary and permanent tortoise exclusion

fencing (ACMs A.1.14 through A.1.16 and A.1.19), a worker education program (ACM A.1.5), and checking beneath parked vehicles (ACM A.5.32) would reduce potential tortoise injury or mortality from vehicle and equipment traffic.

Table 5-2 Tier 1 ROWs within Non-Designated Desert Tortoise Habitat

Valley (Acres of Habitat)	Total Rights-of-Way by Valley and Land Use (Acres)						
	BLM		**Private**		**State of Nevada**		
	Permanent	**Temporary**	**Permanent**	**Temporary**	**Permanent**	**Temporary**	**Total**
CLARK COUNTY							
Las Vegas Valley (636,125 acres total)	19.6	138.0	3.3	16.2	2.1	23.1	202.2
Garnet Valley (81,726 acres total)	23.2	127.8	0.0	0.0	0.0	0.0	151.0
Hidden Valley (North) (15,185 acres total)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Coyote Spring Valley (30,063 acres)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Subtotal, Clark County	42.7	265.9	3.3	16.2	2.1	23.1	353.2
Total, Permanent + Temporary	308.6		19.5		25.1		353.2
Less Previously Disturbed	27.7		0.1		2.7		30.5
Total, Clark County	*280.9*		*19.4*		*22.4*		*322.7*
LINCOLN COUNTY							
Coyote Spring Valley (75,552 acres)	16.2	65.5	0.0	0.0	0.0	0.0	81.7
Pahranagat Valley (82,701 acres total)	21.3	172.5	0.0	0.0	0.0	0.0	193.8
Subtotal, Lincoln County	37.5	238.0	0.0	0.0	0.0	0.0	275.5
Total, Permanent + Temporary	275.5		0.0		0.0		275.5
Less Previously Disturbed	7.4		0.0		0.0		7.4
Total, Lincoln County	*268.1*		*0.0*		*0.0*		*268.1*
TOTAL	**549.0**		**19.4**		**22.4**		**590.8**

* Private lands of the Tier 1 ROWs in Clark County are also included under the Clark County Multiple Species Habitat Conservation Plan. None of the private lands of the Tier 1 ROWs in Lincoln County are encompassed within the Southeastern Lincoln County Habitat Conservation Plan or the Coyote Springs Investment Multi-Species Habitat Conservation Plan.

Discharge of hydrostatic test water could have the potential to cause mortality from washout and inundation of burrows, and to temporarily alter the landscape through erosion and silt deposition. Clearance surveys would be conducted prior to planned discharges (ACM A.5.6) and measures implemented for erosion control (ACM A.1.57, A.1.58, A.1.62, and A.1.65). Stormwater during

construction activities also has the potential to erode desert tortoise habitat and flood tortoise burrows. Applicant measures have been proposed to control stormwater discharges (ACMs A.1.53 through A.1.68), which would reduce potential effects on tortoises within and adjacent to the Tier 1 ROWs.

Construction disturbance could increase the presence of noxious and invasive weeds in desert tortoise habitat. This is especially true for areas that support invasive annual grasses such as red brome (*Bromus madritensis*) and Mediterranean grass (*Schismus* spp.), as these species result in high frequency and cover of standing dead annual grass stems that create a continuous fuel bed that facilitates the spread of wildfires (Esque et al., 2003; Lovich et al., 2011). Moreover, Nagy et al. (1998) documented that the consumption of grasses by desert tortoises, including the non-native grass *S. barbatus*, resulted in a negative water balance, i.e., the tortoises lost more water than they gained while digesting it. Given the absence of research on the effects of herbicides on desert tortoises, published toxicity tests on surrogate species may constitute the best available information to analyze potential toxicological sensitivities (Willemsen and Hailey, 2001; USFWS, 2011c; EPA, 2004). The potential effects of target applications of citrus-based or other herbicides to eliminate invasive grasses must be weighed against the effects of inaction (i.e., physiological stress by consumption of non-native grasses, wildfires destroying large tracts of desert tortoise habitat). ACMs to control the spread of weeds during construction (ACMs A.1.1, A.1.26, A.1.35, and A.1.82 through A.1.89) and restoration measures (ACMs A.1.69 through A.1.81) would reduce the potential effects from noxious and invasive weeds.

Accidental release of chemicals during construction may potentially affect desert tortoises including direct mortality and loss of vegetation, although this potential is considered remote. Measures to control and clean hazardous or toxic materials during construction (ACMs A.1.43 through A.1.46) would reduce potential effects on tortoises.

Anticipated increases in human activity in the Action Area during construction may attract and concentrate predators such as ravens, crows, coyotes, and free-ranging or feral dogs, resulting in increased predation of desert tortoise (Esque et al., 2010). Predators are more likely to be attracted should trash or other anthropogenic resources be present (Esque et al., 2010). The most important predators of desert tortoises at this time are the common raven and the coyote (e.g., Boarman, 2003; Kristan and Boarman, 2003; Esque et al., 2010). Raven population increases seem to be due to increased food supplies (e.g., roadkills, landfills, trash, garbage dumps, and agricultural developments). Because ravens make frequent use of food, water, and nest-site materials provided by humans, their population increases have been tied to an increase in food and water sources, such as landfills and septic ponds (Boarman and Berry, 1995; USFWS, 1994a; Boarman, 2003; Kristan and Boarman, 2003). ACMs to control these issues have been proposed (ACMs A.1.38 through A.1.41).

Operation and maintenance activities for the Federal action, such as routine facility inspection, maintenance, and repair, have the potential to affect desert tortoise through injury, direct mortality, or loss of habitat (e.g., Boarman, 2002; Boarman and Sazaki, 2006). Measures including a worker education program, permanent desert tortoise exclusion fencing around facility sites, and general operation practices have been included in the Federal action to reduce potential effects (ACMs A.1.5, A.1.13, A.2.1 through A.2.8). Maintenance activities would also include the control of noxious and invasive weeds within permanent desert tortoise exclusion areas; as well as, along restored desert tortoise habitat within the ROW. The application of

herbicides would be subject to the approval of an Integrated Weed Management Plan and related ACMs by USFWS as discussed previously.

Indirect Effects:

Noise during construction activities could temporarily disturb desert tortoise outside of the cleared and fenced construction areas. Measures to reduce construction noise have been included in the Federal action (ACM A.9.1 through A.9.3).

Blasting within the construction ROW could indirectly disturb desert tortoises and/or affect the structural integrity of burrows outside the ROW. An ACM to survey and clear a radius area around as of yet undetermined blasting sites would reduce potential impact on tortoises (ACM A.5.34).

Dust generated by construction activities could extend beyond the boundaries of the ROW; thus, desert tortoises could be affected indirectly through impairment of forage and cover plant photosynthesis. Dust control measures have been included in the Federal action to reduce this potential (ACM A.10.1 through A.10.8).

Welding and other activities during construction may increase wildfire potential. This activity could indirectly affect tortoises outside of the ROWs due to loss of vegetation and potential direct mortality to tortoise. Measures including provisions of a fire watch and the presence of water trucks have been incorporated into the Federal action to reduce the potential for wildfire and to control wildfires before they spread from the construction area (ACM A.1.47).

Construction of power lines and other facilities have the potential to increase roosting areas for common raven (*Corvus corax*). Numerous studies document the predation by common ravens on tortoises (USFWS 1994a, 2006b, 2008b; Liebezeit and George, 2002; Boarman, 2003). Common ravens prey on young tortoise and are known to increase mortality significantly (Kristan and Boarman, 2003). The Action Area presently contains a number of power poles, buildings, and other features that serve as roosting and allow for foraging of young tortoise by ravens. Potential new perch sites would be covered with perch-deterrents (ACM A.5.8), but may still provide additional roosts for predators. The installation of additional poles in the area would result in minor additional adverse effects to the tortoise, since the area already contains a number of raven roosts, and anti-perching devices will be utilized.

Based on the desert tortoise survey data, analysis of impacts, proposed measures, and the anticipated project duration, the following take is anticipated to occur as a result of the Federal action:

1. Up to 162 adult and sub-adult desert tortoises are anticipated to be captured and relocated during construction of the project. This includes the 122 adults (i.e., the upper boundary of the 95 percent CI) plus an estimated 40 sub-adults (i.e., approximately 1/3 of the adult population upper 95 percent CI). If more tortoises need to be moved than estimated, BLM shall contact the Service to request reinitiation of consultation and determine if any additional measures are appropriate. Desert tortoises moved from harm's way are anticipated to remain in their home range as part of the affected tortoise population. It is unknown how many juvenile and hatchling desert tortoises and desert tortoise eggs would be detected, but all juvenile and hatchling desert tortoises that are detected would be

captured and relocated, and all desert tortoise eggs that are located would be excavated and relocated as per approved USFWS guidelines.

2. No more than 10 adult, sub-adult, or juvenile desert tortoises are anticipated to be accidentally killed or injured during project construction activities.
3. Following project construction, no more than 15 desert tortoise are estimated to be accidentally injured or killed during 75 years of operation and maintenance activities, including travel on access roads.
4. Although desert tortoise nests were not part of pre-project surveys, it is estimated that 10 nests may be destroyed accidentally or relocated as a result of construction of Tier 1 ROWs.

Aggregate Effects: Habitat fragmentation is considered a major contributor to population declines of the desert tortoise (Berry and Burge, 1984; Boarman and Sazaki, 2006). Roads and urban areas can form barriers to movement, and in turn, can create small genetically isolated populations (Latch et al., 2011). Such small, local populations are thought to be more susceptible to extinction than large, connected ones (Wilcox and Murphy, 1985). Habitat fragmentation however, is species and scale-dependent and the extent and pattern of fragmentation are critical parameters in determining the effect(s), or lack thereof, to a given species (Franklin et al., 2002). Habitat fragmentation for the desert tortoise is not expected to increase as a result of the Federal action (Averill-Murray, pers. comm., 2012) because: (1) the subterranean pipeline will not physically impede desert tortoise movements; (2) construction activities will be spatio-temporally restricted, relative to the mean home range size (i.e., 80 acres) and longevity of desert tortoises; (3) the 200-foot wide ROW for the pipeline will be subjected to habitat restoration efforts following construction; and (4) baseline conditions of the 0.5 mile buffer area documented that the area was previously fragmented by 50 miles of US Route 93 to the east and 70 miles of service roads to the west. It is important to note that the proposed Tier 1 ROW was situated in an existing utility corridor so as to avoid undisturbed areas in non-designated and critical desert tortoise habitat.

Groundwater Development Areas

Direct Effects: There is no desert tortoise habitat within the groundwater development areas (**Figure 4-4**). Thus, there would be no direct effects on tortoises from construction of future groundwater development facilities.

Indirect Effects: The northern limit of the range of desert tortoises is within approximately 1 mile of the southern extent of the groundwater development area in Delamar Valley (**Figures 2-8** and **4-3**). Thus, there could be indirect effects to tortoises from construction-related access, noise, blasting, dust, and wildfire sparked by construction activities. The same ACMs as applied under the Tier 1 ROWs section for these items would be implemented during construction of future ROWs under the groundwater development. Additional ACMs pertinent to drilling of groundwater wells would also be implemented (ACMs B.2.1 through B.2.4).

Groundwater Pumping Effects

Desert tortoises do not occur within the area of simulated groundwater drawdown, recovery (**Figures 3-1** and **4-3**) or spring flow reduction. Consequently, groundwater pumping will not affect desert tortoises.

CONCLUSION: The Federal action **may affect, is likely to adversely affect** desert tortoise as a result of the Tier 1 ROWs.

5.3.2.2 Effects to Designated Critical Habitat

Tier 1 ROWs

Direct Effects: The Tier 1 ROW goes through the Mormon Mesa CHU. The majority of the Tier 1 ROW within critical habitat would be within an existing utility corridor and within the designated LCCRDA utility corridor. However, approximately 9 miles would be outside of the LCCRDA corridor on the east side of US 93 in the northern portion of Coyote Spring Valley.

The Tier 1 ROW that is within desert tortoise critical habitat is listed on **Table 5-3**. The Tier 1 ROW within non-designated desert tortoise habitat is described above in Section 5.3.2.1. Surveys within desert tortoise critical habitat encompassed 2,510 acres, with 17 adult desert tortoises observed. Construction would alter 1,759 acres of critical habitat. However, only 245 acres of critical habitat will be permanently disturbed with above-ground facilities, including access roads. These acreages include critical habitat for desert tortoise in the Mormon Mesa CHU from Coyote Spring Valley to Las Vegas Valley. Areas not permanently disturbed by construction in both Clark and Lincoln counties would be subsequently restored in accordance with an approved Restoration Plan (ACMs A.1.22 through A.1.25, A.1.69 through A.1.81).

Survey data suggest that critical habitat would typically support 34 tortoises, with a 95 percent confidence interval of 17-68 tortoises. Of the 1,721 acres of critical habitat disturbed by the Tier 1 ROWs, none occur on private land in Clark County; thus, no tortoises inhabiting critical habitat on private land in Clark County will be affected.

The disturbance of desert tortoise critical habitat in Clark and Lincoln counties represents approximately 1.13 percent of critical habitat in Clark County and 0.87 percent of critical habitat in Lincoln County. The 246 acres to be permanently disturbed in Clark and Lincoln counties represents 0.0005 percent of the total 494,470 acres designated critical habitat in Nevada and 0.00004 percent of the total 6 million acre range-wide designated critical habitat (USFWS, 2011b).

PCEs in desert tortoise critical habitat could be disturbed, degraded, or destroyed by: (1) ground disturbances caused by construction; (2) erosion from hydrostatic testing discharge and stormwater; (3) spread of noxious and invasive weeds; and (4) accidental release of hazardous or toxic materials. These effects and the associated ACMs to reduce them, would be the same as described under Section 5.3.2.1.

Indirect Effects: PCEs in desert tortoise critical habitat could be indirectly affected by: (1) noise; (2) blasting; (3) dust; and (4) wildfires sparked by construction activities. These effects and the associated ACMs to reduce them would be the same as described under Section 5.3.2.1.

Groundwater Development Areas

The northern extent of desert tortoise critical habitat is located in Coyote Spring Valley approximately 6 miles south of the southern-most extent of the closest groundwater development area in Delamar Valley (**Figure 2-8** and **4-3**). Thus, desert tortoise critical habitat would not be directly or indirectly affected by construction, operation, or maintenance of future ROWs for groundwater development facilities.

Groundwater Pumping Effects

Indirect Effects: Desert tortoise critical habitat does not occur within the area of simulated groundwater drawdown (**Figures 4-3** and **4-4**) or spring flow reduction. Furthermore, because desert tortoise PCEs are not tied to groundwater and/or spring flow resources, the critical habitat for desert tortoise would not be affected by pumping effects.

CONCLUSION: The Federal action **may affect, is likely to disturb or destroy designated critical habitat** desert tortoise critical habitat as a result of the Tier 1 ROWs.

Table 5-3 Federal Action Tier 1 ROWs within Desert Tortoise Critical Habitat in Mormon Mesa CHU

Valley (Acres of Designated Critical Habitat)	**Total Rights-of-Way by Valley and Land Use (Acres)**						
	BLM		**Private**		**State of Nevada**		
	Permanent	**Temporary**	**Permanent**	**Temporary**	**Permanent**	**Temporary**	**Total**
CLARK COUNTY							
Las Vegas Valley (33 acres total)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Garnet Valley (5,362 acres total)	72.1	40.5	0.0	0.0	0.0	0.0	112.6
Hidden Valley (North) (24,398 acres total)	42.5	332.5	0.0	0.0	0.0	0.0	375.0
Coyote Spring Valley (61,210 acres)	57.5	487.4	0.0	0.0	0.0	0.0	544.9
Subtotal, Clark County	172.1	860.4	0.0	0.0	0.0	0.0	1032.5
Total, Permanent + Temporary	1032.4		0.0		0.0		1032.5
Less Previously Disturbed	7.5		0.0		0.0		7.5
Total, Clark County	*1024.9*		*0.0*		*0.0*		*1025.0*
LINCOLN COUNTY							
Coyote Spring Valley (79,712 acres)	67.3	641.2	5.3	34.6	0.0	0.0	748.4
Pahranagat Valley (0 acres)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Subtotal, Lincoln County	67.3	641.2	5.3	34.6	0.0	0.0	748.4
Total, Permanent + Temporary	708.6		39.9		0.0		748.4
Less Previously Disturbed	12.7		1.5		0.0		14.2
Total, Lincoln County	*695.9*		*38.4*		*0.0*		*734.2*
TOTAL, Critical Desert Tortoise Habitat Disturbed by GWD Project	**1720.8**		**38.4**		**0.0**		**1759.2**

5.3.3 Pahrump Poolfish

5.3.3.1 Effects to Species

Tier 1 ROWs

Direct Effects: The Pahrump poolfish population at Shoshone Ponds in Spring Valley is approximately 4 miles from the Tier 1 ROW in Spring Valley (**Figure 4-5**). At this distance, the Pahrump poolfish would not experience direct effects such as loss of habitat from construction, operation, or maintenance activities.

Indirect Effects: Due to distance from the Tier 1 ROW, Pahrump poolfish would not be indirectly affected by construction-related effects such as dust, noise, traffic, hazardous, or toxic material spills, or temporary construction water pumping.

Groundwater Development Areas

Direct Effects: The nearest groundwater development area is located approximately 0.3 mile from Shoshone ponds. At this distance, the Pahrump poolfish would not experience direct effects such as loss of habitat from construction, operation, or maintenance activities.

Indirect Effects: Shoshone Ponds is located approximately 0.3 mile from the boundary of the nearest groundwater development area. At this distance, Pahrump poolfish would not be indirectly affected by construction-related effects such as dust, noise, traffic, and hazardous or toxic material spills.

Groundwater Pumping Effects

Federal Action Effects:

The model simulates groundwater drawdown in the Shoshone Ponds area up to approximately 25 feet at 75 years after full build out (**Figure 4-6**). Groundwater elevation and spring flow rapidly recover in central Spring Valley, with nearly complete recovery (<3 feet) from groundwater drawdown at Shoshone Ponds within the 100 years of recovery period (**Figures 3-2 and 4-5B**). Because the artesian wells at Shoshone Ponds are not specifically simulated in the model, there are no flow simulations at this location.

A well log for the Shoshone NDOW Well (the source for the refuge ponds) indicates that the well was drilled in 1971 to a total depth of 441 feet below ground surface (bgs) (NDWR, 2010). Based on the lithologic log from the construction of the well, the well penetrated a number of alluvial materials including gravels, sands, and clays of varying thicknesses. The lithologic log indicated water-bearing zones from 27 to 162 feet bgs, 170 to 383 ft-bgs, and 385 to 441 feet bgs. Separating the water bearing zones were clay layers: the upper clay layer had a thickness of 8 feet, while the lower clay layer had a thickness of 2 feet. During drilling of the well, a preliminary water level of 17 feet bgs was noted on the lithologic log. This water level is likely a perched water level as the final completion of the well is open to the lowest water bearing zone only and results in artesian conditions (i.e., flowing well). In addition, the driller's log indicated evidence of high pressure water from 228 to 230 feet bgs. This suggests that in the area of the Shoshone NDOW well (the source for the refuge ponds), Shoshone Well #4 (the source for the stock pond), and Shoshone Well #2 (the source for the stream that contains Pahrump poolfish), there are likely multiple zones of confined conditions.

Fifteen water-level measurements from the USGS are available for the Shoshone NDOW Well. All of the water-level measurements correspond to a potentiometric water level that is above ground surface (ags) (i.e., the well is flowing). Recent values indicate a hydraulic head of approximately 28 feet ags.

Effects to Pahrump poolfish would depend on the interconnection between the aquifers that sustain flow in the artesian wells and the aquifers developed for production under the Federal action. It is unknown whether the aquifer(s) that supply the wells are directly connected to the aquifer to be pumped under the Federal action. If there is a connection between the regional aquifer and the aquifer(s) that supply the Shoshone wells, then groundwater drawdown could reduce flow or prevent the well from flowing naturally. Because the existing well has sufficient depth, flow to the ponds could be maintained with installation of a pump in the existing wells. Because the species is historically and currently known from areas with different water chemistry and temperatures, it is unlikely that changes in water quality from pumping the artesian well would affect the Shoshone Ponds population.

As described in ACM B.1.1, groundwater production well sites will be selected considering the presence of special status species and their habitats. Effects to Pahrump poolfish will be avoided, minimized, and/or mitigated by way of the legally-binding Spring Valley Stipulation (Stipulation, 2006) and associated ACMs. As part of the Spring Valley Stipulation, SNWA may monitor springs where Pahrump poolfish occur (ACM C.1.42), and is required to manage the development of groundwater by SNWA in Spring Valley in order to avoid or mitigate unreasonable adverse effects to Federal Resources and special status species (ACM C.2.1). Biological and hydrologic monitoring plans for the Spring Valley and DDC Stipulations currently include monitoring of northern leopard frogs in Spring and Pahranagat valleys (BWG, 2009; SNWA, 2009a). BLM mitigation measure GW-WR-5 in the EIS includes a requirement to improve the existing well or drill and equip a new well to maintain water flows to the ponds. SNWA's AM Framework also includes measures to improve use of SNWA's agricultural water rights in Spring Valley to offset changes in spring discharges (ACM C.2.15).

The Spring Valley Stipulated Agreement includes a commitment by SNWA to work to evaluate and request alternative points of diversion to pumping at a location near Shoshone Ponds (ACM C.1.4). SNWA has also installed and equipped two monitoring wells in the vicinity of Shoshone Ponds, in accordance with the Stipulated Agreement (ACM C.1.11), and is conducting ongoing hydrologic and biological monitoring at this location. The Stipulated Agreement and AMP processes will also allow the USFWS ongoing direct involvement in the monitoring, management, and mitigation of potential adverse effects during development of the Federal action.

Aggregate Effects:

In the baseline-plus-action run, the model simulates groundwater drawdown in the Shoshone Ponds area of up to approximately 33 feet at 75 years after full build out, and up to approximately 11 feet at 100 years of recovery. As discussed above, once simulated groundwater pumping under the Federal action ceases at 75 years after full build out, groundwater drawdown and spring flow reduction rapidly recovers in central Spring Valley, and groundwater drawdown at Shoshone Ponds nearly recovers (< 3 feet) within the 100-year recovery period. Therefore, the groundwater drawdown at Shoshone Ponds at 100 years of recovery results primarily from continued baseline pumping.

Because the artesian wells at Shoshone Ponds are not specifically simulated in the model, there are no flow simulations at this location.

As discussed above in detail, effects to Pahrump poolfish would depend on the interconnection between the aquifers that sustain flow in the artesian wells and the aquifers developed for production under both the Federal action and baseline activities. If there is a connection between the regional aquifer and the aquifer(s) that supply the Shoshone wells, then groundwater drawdown could reduce flow or prevent the well from flowing naturally. Because the existing well has sufficient depth, flow to the ponds could be maintained with installation of a pump in the existing wells. It is unlikely that changes in water quality from pumping the artesian well would affect the Shoshone Ponds population, because the species is historically and currently known from areas with different water chemistry and temperatures.

CONCLUSION: The Federal action **may affect, is likely to adversely affect** Pahrump poolfish as a result of future groundwater pumping.

5.3.3.2 Effects to Designated Critical Habitat

There is no designated critical habitat for the Pahrump poolfish.

5.3.4 White River Spinedace

5.3.4.1 Effects to Species

Tier 1 ROWs

Direct Effects: The White River spinedace in the Flag Springs Complex is located approximately 11 miles away and in a different hydrographic basin from the nearest Tier 1 ROW (**Figure 4-7**). At this distance, the White River spinedace at Flag Springs Complex would not experience direct effects such as loss of habitat due to construction, operation, and maintenance activities.

Indirect Effects: Due to the distance from the Tier 1 ROW, the White River spinedace at Flag Springs Complex would not be indirectly affected by construction-related effects such as dust, noise, traffic, hazardous or toxic material spills, or temporary construction water pumping.

Groundwater Development Areas

Direct Effects: The White River spinedace in the Flag Springs Complex is located approximately 4.5 miles away and in a different hydrographic basin from the nearest groundwater development area (**Figure 4-7**). At this distance, the White River spinedace at Flag Springs Complex would not experience direct effects such as loss of habitat due to construction, operation, and maintenance activities from future groundwater development facilities.

Indirect Effects: Due to the distance from the groundwater development areas, the White River spinedace would not be indirectly affected by construction-related effects such as dust, noise, traffic, and hazardous or toxic material spills.

Groundwater Pumping Effects

Federal Action Effects:

In the baseline-plus-action model run simulation using the permitted quantity of water rights, Flag Springs Complex is located approximately 5 miles away and in a different hydrographic

basin from the simulated groundwater drawdown area at 75 years after full build out; and approximately 4 miles away after 100 years of recovery (**Figure 4-7**).

As shown in **Table 3-2**, model simulated baseline flows at Flag Springs were approximately 58 percent of the actual measured historic flows at Flag Spring #3 indicating that the regional model does not replicate all of the flow at the spring. Although the model simulates less than the actual flow, the model simulations of pumping effects are still useful as a tool to indicate the relative risk to the spring complex. The model simulations predict a reduction in flow at Flag Springs Complex of 3 percent at the 75 years after full build out time frame, and a maximum of 4 percent during the 100-year recovery period. For the springs or streams with flow predictions, a simulated incremental change in flow of less than 5 percent was inferred to indicate that measureable impacts were unlikely to occur. A flow reduction of less than 5 percent would be difficult to accurately measure or distinguish from natural fluctuations and is presumed to be within the model uncertainty. Although these specific predictions should be qualified as having significant uncertainties, the model results suggest that the groundwater development is unlikely to result in a measurable flow reduction at the Flag Springs Complex during either the pumping or recovery period.

Aggregate Effects:

In the baseline-plus-action model run simulation using the permitted quantity of water rights, Flag Springs Complex is located approximately 5 miles away and in a different hydrographic basin from the simulated groundwater drawdown area at 75 years after full build out; and approximately 4 miles away after 100 years of recovery.

Baseline-plus-action model simulations predict a reduction in flow at Flag Springs Complex of 5 percent at 75 years after full build out, and 6 percent at 100 years recovery (**Table 3-3**). Although these specific predictions should be qualified as having significant uncertainties (see BA Section 5.3.4.1), the model results suggest that the groundwater development eventually could reduce flows in the Flag Springs Complex; however, the anticipated flow reductions are expected to be relatively small compared to baseline conditions. Given the level of protection afforded to the Flag Springs Complex (monitoring and mitigation requirements), it is unlikely that the Flag Springs Complex would experience a measurable reduction in flows as a result of groundwater pumping.

There is evidence of hydraulic connectivity between Cave Valley and Flag Springs Complex. Subsurface outflow from Cave Valley to White River Valley may occur through the Shingle Pass fault zone, a major geologic feature that trends southwest through the Egan Range (Burns and Drici, 2011). Furthermore, Flag Springs Complex has similar isotopic composition to springs on both the White River Valley and Cave Valley sides of the Egan Range (Burns and Drici, 2011). Predominant groundwater flow contributions to Flag Springs Complex are likely from White River Valley and northern Cave Valley, where there are no groundwater development areas. Groundwater pumping south of the Shingle Pass fault zone in Cave Valley may draw a portion of the groundwater away from the interbasin flow path, which would be expected to be gradual and observable by groundwater monitoring.

Monitoring and Mitigation Requirements. As described in ACM B.1.1, groundwater production well sites will be selected considering the presence of special status species and their

habitats. Effects to Flag Springs Complex will be avoided, minimized, and/or mitigated by way of the legally-binding DDC Stipulation (Stipulation, 2008) and associated ACMs. As part of the DDC Stipulation, SNWA may monitor springs where the Flag pyrg occurs (ACM C.1.42), and is required to manage the development of groundwater by SNWA in DDC in order to avoid or mitigate unreasonable adverse effects to Federal Resources and special status species (ACM C.2.1). Under the AM Framework (SNWA, 2012), SNWA will work with NDOW at the Flag Spring Complex to restore or enhance habitat, establish a refugium, and optimize wetlands conditions for the species (ACM C.2.8), and will purchase property and water rights to implement activities that would preserve and enhance habitat for the White River spinedace (AMC C.2.17). All three springs within Flag Springs Complex (North, Middle and South) are biological and hydrologic monitoring sites under the DDC Stipulation (BRT, 2011; SNWA, 2009b; Stipulation, 2008). Groundwater monitoring wells are located in south and central Cave Valley under the DDC Stipulation, including a deep carbonate groundwater monitoring well in Shingle Pass. This carbonate well was purposely located between the proposed pumping areas in Cave Valley and the Flag Spring Complex and Butterfield Spring in White River Valley. A BLM ROW has been granted for another carbonate monitoring well (WRV1012M) on the west side of the Egan Range northeast of Flag Springs Complex. By monitoring groundwater elevation at multiple sites between the Flag Springs Complex and the area of proposed pumping in Cave Valley, the propagation of effects can be identified and evaluated.

The BLM included two monitoring measures and one mitigation measure in the Draft EIS to minimize effects to the White River spinedace (GW-MN-AB-2, GW-MN-AB-3, and GW-AB-3, BLM, 2011, pages 3.7-48 to 3.7-49). These monitoring measures specify that SNWA will conduct spring and aquatic biology monitoring in the Flag Springs Complex and determine flow/habitat relationships for White River spinedace from field studies. Mitigation measure GW-AB-3 will identify specific protection measures during subsequent NEPA where flow changes are identified during monitoring.

The NSE included the Hydrologic Monitoring and Mitigation Plan for DDC (SNWA, 2009b) and the Biological Monitoring Plan for the DDC Stipulation (BRT, 2011) as part of the permit terms for SNWA groundwater rights in Cave Valley (NSE, 2012b at pages 169 and 170). The groundwater rights granted are conditioned upon SNWA's compliance with both plans, and any amendments to the plans that the NSE requires at a later date pursuant to his authority under Nevada law (NSE, 2012b at pages 169 and 170). In addition, the NSE Ruling requires SNWA to update a computer groundwater flow model approved by the NSE once before groundwater development begins and every five years thereafter, and provide predictive results for 10, 25 and 100 year periods (NSE, 2012b at page 170).

The NSE ruling found that the monitor well network related to SNWA groundwater applications in Cave Valley (as described in the Hydrologic Monitoring and Mitigation Plan for DDC; SNWA, 2009b) is scientifically sound and will be effective, particularly because of the spatial distribution across DDC and the White River Flow System (NSE, 2012b at page 91). The NSE also found that because the hydrologic monitoring program will be utilized in conjunction with a continually revised groundwater modeling program, there will be adequate warning of the progression of effects of groundwater pumping (NSE, 2012b at page 91). The NSE will use the groundwater flow model as a management tool to review the appropriate location of new wells,

and to monitor and manage SNWA's pumping in order to prevent impacts to existing rights and environmentally sensitive areas (NSE, 2012b at pages 91-92). The NSE also found the Biological Monitoring Plan for the DDC Stipulation (BRT, 2011) comprehensively addresses the groundwater-influenced environmental resources in DDC and adjacent basins [White River and Pahranagat valleys] (NSE, 2012b at page 141). Finally, the NSE found that the monitoring efforts and data collection in DDC and the White River Flow System [i.e., White River and Pahranagat valleys] will provide scientifically sound baseline information from which changes to the system and potential impacts can be diagnosed, assessed and addressed (NSE, 2012b at page 91).

The NSE also found that the mitigation measures listed in the Hydrologic Monitoring and Mitigation Plan for DDC (SNWA, 2009b) will be effective, and that the NSE has the authority to order any mitigation activities that may be necessary to avoid conflicts with existing rights [which includes water rights at the Flag Springs Complex] (NSE, 2012b at page 95; Nevada Revised Statues [NRS] 534.120[1]; NRS 534.110[5]).

CONCLUSION: The Federal action **may affect, is not likely to adversely affect** White River spinedace as a result of future groundwater pumping.

5.3.4.2 Effects to Designated Critical Habitat

Critical habitat for White River spinedace occurs at Flag, Lund, and Preston Big springs. Lund and Preston Big springs are currently unoccupied by White River spinedace.

Tier 1 ROWs

Direct Effects: Designated critical habitat for the White River spinedace at Flag Springs is located over 11 miles away and in a different hydrographic basin from the Tier 1 ROWs (**Figure 4-7**). Additional designated critical habitat at Lund Spring and Preston Big Spring, presently unoccupied by White River spinedace, is located more than 20 miles away and in a different hydrographic basin from the nearest Tier 1 ROWs (**Figure 4-7**). At this distance, designated critical habitat PCEs for the White River spinedace, such as loss of cover and/or food sources, would not experience direct effects due to construction, operation, and maintenance activities.

Indirect Effects: Due to the distance from the Tier 1 ROWs, there would be no indirect effects from dust, noise, traffic, hazardous or toxic material spills, or temporary construction water pumping on the critical habitat PCEs.

Groundwater Development Areas

Direct Effects: Designated critical habitat for the White River spinedace at Flag Springs complex is located approximately 4.5 miles away and in a different hydrographic basin from the nearest groundwater development area (**Figure 4-7**). Additional designated critical habitat at Lund Spring and Preston Big Spring, presently unoccupied by White River spinedace, is located more than 20 miles away and in a different hydrographic basin from the nearest groundwater development area (**Figure 4-7**). At this distance, designated critical habitat PCEs for the White River spinedace, such as loss of cover and/or food sources, would not experience direct effects due to construction, operation, and maintenance activities.

Indirect Effects: The White River spinedace critical habitat in the Flag Springs complex is located approximately 4.5 miles away and in a different hydrographic basin from the nearest groundwater development area (**Figure 4-7**). Critical habitat in Lund Spring and Preston Big Spring is located a minimum of 22 miles and 30 miles, respectively, and in a different hydrographic basin from the nearest groundwater development area (**Figure 4-7**). At this distance, designated critical habitat PCEs for this species would not be indirectly affected by construction-related effects such as dust, noise, traffic, and hazardous or toxic material spills.

Groundwater Pumping Effects

Federal Action Effects:

Flag Springs Complex

In the baseline-plus-action model run simulation using the permitted quantity of water rights, Flag Springs Complex is located approximately 5 miles away and in a different hydrographic basin from the simulated groundwater drawdown area at 75 years after full build out; and approximately 4 miles away after 100 years of recovery (**Figure 4-7**).

As shown in **Table 3-2**, model simulated baseline flows at Flag Springs were approximately 58% of the actual measured historic flows at Flag Spring #3 indicating that the regional model does not replicate all of the flow at the spring. Although the model simulates less than the actual flow, the model simulations of pumping effects are still useful as a tool to indicate the relative risk to the spring complex. The model simulations predict a reduction in flow at Flag Springs Complex of 3 percent at the 75 years after full build out timeframe, and a maximum of 4 percent during the 100 year recovery period. For the springs or streams with flow predictions, a simulated incremental change in flow of less than 5 percent was inferred to indicate that measureable impacts were unlikely to occur. A less than 5 percent reduction of flow would be difficult to accurately measure or distinguish from natural fluctuations and is presumed to be within the model uncertainty. Although these specific predictions should be qualified as having significant uncertainties, the model results suggest that the groundwater development is unlikely to result in a measurable flow reduction at the Flag Springs Complex during either the pumping or recovery period.

There is evidence of hydraulic connectivity between Cave Valley and Flag Springs Complex. Groundwater pumping south of the Shingle Pass fault zone in Cave Valley may draw a portion of the groundwater away from the interbasin flow path, which would be expected to be gradual and observable by groundwater monitoring.

For a more detailed discussion, please see above.

Effects to Flag Springs Complex will be avoided, minimized, and/or mitigated by way of the legally-binding DDC Stipulation (Stipulation, 2008), ACMs, and BLM recommended measures. These ACMs are the same as listed above.

The model simulations predict a reduction in flow at Flag Springs Complex of 3 percent at the 75 years after full build out timeframe, and a maximum of 4 percent during the 100 year recovery period. For the springs or streams with flow predictions, a simulated incremental change in flow of less than 5 percent was inferred to indicate that measureable impacts were unlikely to occur. A less than 5 percent reduction of flow would be difficult to accurately measure or distinguish from natural fluctuations and is presumed to be within the model uncertainty. Although these specific

predictions should be qualified as having significant uncertainties, the model results suggest that the groundwater development is unlikely to result in a measurable flow reduction at the Flag Springs Complex during either the pumping or recovery period.

Lund Spring and Preston Big Spring

Lund and Preston Big springs and are located approximately 17-28 miles away (respectively) and in a different hydrographic basin from the simulated groundwater drawdown area at both 75 years after full build out and 100 years of recovery (**Figure 4-7**).

At both Lund and Preston Big springs at 75 years after full build out and 100 years recovery, the model simulates a less than 1 percent spring flow reduction, which is beyond the limitation of the model and does not identify these springs as areas of risk. The model simulated baseline flows were approximately 92% of the actual average flows at Lund Spring and 106% of the actual average flows at Preston Big Springs indicating that the regional model provides a reasonable representation of the baseline flow at these springs.

There is no evidence of hydraulic connectivity between Lund and Preston Big springs and areas of proposed pumping. Lund and Preston Big springs are upstream of the Shingle Pass Fault Zone (a path of interbasin flow from Cave Valley to White River Valley; see Section 5.3.4.1), and northwest of Cave, Delamar and Dry Lake Valleys.

Based on the fact that Lund and Preston Big springs are outside the area of simulated pumping effects, and the hydrogeologic evidence that Lund and Preston Big springs are not hydraulically connected to areas of proposed pumping, no proposed pumping effects are anticipated to White River spinedace critical habitat in Lund and Preston Big springs.

Aggregate Effects:

Flag Springs Complex

In the baseline-plus-action model run simulation using the permitted quantity of water rights, Flag Springs Complex is located approximately 5 miles away and in a different hydrographic basin from the simulated groundwater drawdown area at 75 years after full build out; and approximately 4 miles away after 100 years of recovery.

Baseline-plus-action model simulations predict a reduction in flow at Flag Springs Complex of 5 percent at 75 years after full build out, and 6 percent at 100 years recovery (**Table 3-3**). Although these specific predictions should be qualified as having significant uncertainties (see BA Section 5.3.4.1), the model results suggest that the groundwater development eventually could reduce flows in the Flag Springs Complex; however, the anticipated flow reductions are expected to be relatively small compared to baseline conditions. Given the level of protection afforded to Flag Springs Complex (monitoring and mitigation requirements), it is unlikely that Flag Springs Complex will experience a measurable reduction in flows as a result of groundwater pumping.

The potential effects to White River spinedace critical habitat at Flag Springs Complex as a result of the simulated aggregate effects would be similar to that which is presented above.

Lund Spring and Preston Big Spring

In the baseline-plus-action model run simulation, Lund and Preston Big springs are outside of the simulated groundwater drawdown area at both 75 years after full build out and 100 years of

recovery. Baseline-plus-action model simulations predict a reduction in flow at Lund and Preston Big Spring of 5 percent at 75 years after full build out, and 7 percent maximum at 100 years of recovery. Because no effects of the action are anticipated to White River spinedace critical habitat in Lund and Preston Big springs, the aggregate effects of other actions are not relevant to this BA.

CONCLUSION: The Federal action **may affect, is not likely to disturb or destroy designated critical habitat** White River spinedace critical habitat as a result of future groundwater pumping.

5.3.5 Hiko White River Springfish

5.3.5.1 Effects to Species

Tier 1 ROWs

Direct Effects: Hiko White River springfish in Hiko and Crystal springs are located approximately 20 miles away and in a different hydrographic basin from the nearest Tier 1 ROW (**Figure 4-8**). At this distance, the Hiko White River springfish would not experience direct effects such as loss of habitat due to construction, operation, and maintenance activities.

Indirect Effects: Due to the distance from the Tier 1 ROWs, there would be no indirect effects from dust, noise, traffic, hazardous or toxic material spills, or temporary construction water pumping on Hiko and Crystal springs.

Groundwater Development Areas

Direct Effects: Hiko White River springfish in Hiko and Crystal springs are located approximately 16 miles away and in a different hydrographic basin from the nearest groundwater development area (**Figure 4-8**). At this distance, there would be no expected direct effects to this species from direct construction, operation, and maintenance activities.

Indirect Effects: Due to the distance from the groundwater development areas, there would be no indirect effects from construction-related activities including dust, noise, traffic, and hazardous or toxic material spills, on Hiko and Crystal springs.

Groundwater Pumping Effects

Federal Action Effects:

Hiko and Crystal springs are located over 6 miles away, and in a different hydrographic basin, from the simulated groundwater drawdown area at both 75 years after full build out and 100 years of recovery (**Figure 4-8**).

At both Hiko and Crystal springs at 75 years after full build out and 100 years recovery, the model simulates a less than 1 percent spring flow reduction, which is beyond the limitation of the model and does not identify these springs as areas of risk. The calibrated groundwater flow model was capable of nearing the observed historic spring flow at Hiko and Crystal springs. Periodic spring flow measurements at USGS Hiko Spring Site Number 373554115125201 averaged 5.3 cfs (range: 4/01-6.68 cfs) from 1990-2004, and the model simulates current spring flow at 4.4 cfs. Daily spring flow measurements at USGS Crystal Springs Gages 09415589 and 09415590 averaged 12.6 cfs (range: 2.82-18.40 cfs) from 2004-2012, and the model simulates current spring flow at 10.3 cfs. Because the starting points for spring flow are relatively accurate, there is higher confidence in the precision of spring flow predictions at these sites.

While some groundwater may underflow from Delamar Valley to Pahranagat Valley along the Pahranagat Shear Zone (Rowley et al., 2011), groundwater flow predominantly trends north-south in the White River Flow System (Burns and Drici, 2011). Isotopic evidence suggests that water from Delamar Valley is not supplying Hiko or Crystal springs, as the springs have similar isotopic composition to waters in the northern latitudes and dissimilar isotopic composition to waters in Delamar Valley (Thomas et al., 2001; Thomas and Mihevic, 2011). Furthermore, the mountain ranges located between Pahranagat Valley and Delamar Valley are composed of low hydraulic-conductivity volcanic materials and underlying carbonate rocks, and contain numerous north-trending basin-range faults that function as barriers to groundwater flow between areas of proposed pumping and Pahranagat Valley (Rowley et al., 2011). The presence of near-surface Neoproterozoic to Cambrian quartzites and the Indian Peak caldera complex also create barriers to flow between Cave and Dry Lake valleys and Pahranagat Valley (Rowley et al., 2011).

It is possible that Pahranagat Valley may receive water that originates in Cave Valley and passes through White River Valley, as there is evidence of subsurface outflow from Cave Valley to White River Valley (see Section 5.3.4). Groundwater pumping south of the Shingle Pass fault zone in Cave Valley may draw a portion of the groundwater away from the interbasin flow path, which would be expected to be gradual and observable by groundwater monitoring. In the case of Pahranagat Valley, the contribution of Cave Valley waters would be very small with long travel times.

As described in ACM B.1.1, groundwater production well sites will be selected considering the presence of special status species and their habitats. Effects to Hiko White River springfish will be avoided, minimized, and/or mitigated by way of the legally-binding DDC Stipulation (Stipulation, 2008) and associated ACMs. These ACMs include biological monitoring in Pahranagat Valley (ACM C.1.42), monitoring of spring discharge sites (ACM C.1.38 and C.1.39), and working with NDOW and private land owners at and downstream of Hiko and

Crystal springs to restore habitat and remove non-native species (ACM C.2.9 and C2.10). As part of the DDC Stipulation, SNWA may monitor sites where the Hiko White River springfish occur (ACM C.1.42), and is required to manage the development of groundwater by SNWA in DDC in order to avoid or mitigate unreasonable adverse effects to Federal Resources and special status species (ACM C.2.1). Hiko and Crystal springs are currently biological and hydrologic monitoring sites under the DDC Stipulation (BRT, 2011; SNWA, 2009b). Lastly, goals of the AM Framework include avoiding and minimizing potential adverse environmental impacts of SNWA groundwater withdrawals on listed species and their habitats (SNWA, 2012).

The hydrologic monitoring network and groundwater flow modeling efforts conducted under the DDC Stipulation should detect propagation of effects from SNWA groundwater withdrawal in DDC toward Hiko and Crystal springs (BRT, 2011, page 4-22). Specific efforts include continuous and quarterly data collection at groundwater monitoring wells situated between areas of potential groundwater export and areas of sensitive biological resources in Pahranagat Valley, and periodically-updated groundwater flow model simulations using newly-acquired data (BRT, 2011, page 4-22). Additional protection is granted to Crystal Spring by specifying no injury to Federal Water Rights (Stipulation, 2008), which applies to surface water coming into Pahranagat NWR from the outflow of Crystal Spring.

In conclusion, while potential impacts to Hiko White River springfish in Pahranagat Valley cannot be ruled out with 100 percent certainty, model simulations and other lines of evidence presented above indicate that any such effects are unlikely to occur.

Aggregate Effects:

In the baseline-plus-action model run simulation, Hiko and Crystal springs are located over 6 miles away, and in a different hydrographic basin, from the simulated groundwater drawdown area at both 75 years after full build out and 100 years of recovery.

At both Hiko and Crystal springs at 75 years after full build out and 100 years recovery, the baseline-plus-action model runs simulate a less than 3 percent spring flow reduction, which is beyond the limitation of the model and does not identify these springs as areas of risk. The calibrated groundwater flow model was capable of nearing the observed historic spring flow at Ash and Crystal springs (see discussion above), which suggests a reasonable confidence in the model spring flow predictions at these sites.

While potential impacts to Hiko White River springfish in Pahranagat Valley cannot be ruled out with 100 percent certainty, model simulations and other lines of evidence presented above indicate that any such aggregate effects are unlikely to occur.

CONCLUSION: The Federal action **may affect, is not likely to adversely affect** Hiko White River springfish as a result of future groundwater pumping.

5.3.5.2 Effects to Designated Critical Habitat

Designated critical habitat for this species includes Crystal and Hiko springs and their outflows, plus surrounding land areas for a distance of 50 feet from those springs and outflows (**Figure 4-8**).

Tier 1 ROWs

Direct Effects: Designated critical habitat for the Hiko White River springfish in Hiko and

Crystal springs is located approximately 20 miles away and in a different hydrographic basin from the nearest Tier 1 ROW (**Figure 4-8**). At this distance, designated critical habitat PCEs for the Hiko White River springfish, such as loss of cover and/or food sources, would not experience direct effects due to construction, operation, and maintenance activities.

Indirect Effects: Due to the distance from the Tier 1 ROWs, there would be no indirect effects from dust, noise, traffic, hazardous or toxic material spills, or temporary construction water pumping on critical habitat PCEs.

Groundwater Development Areas

Direct Effects: Designated critical habitat for the Hiko White River springfish critical habitat in Hiko and Crystal springs is located approximately 16 miles away and in a different hydrographic basin from the nearest groundwater development area (**Figure 4-8**). At this distance, there would be no expected direct effects to Hiko White River springfish critical habitat PCEs from construction, operation, and maintenance of future groundwater development facilities.

Indirect Effects: Due to the distance from the groundwater development areas, construction-related activities including dust, noise, traffic, and hazardous or toxic material spills would not indirectly affect the critical habitat PCEs.

Groundwater Pumping Effects

Federal Action Effects:

Hiko and Crystal springs are located over 6 miles away, and in a different hydrographic basin, from the simulated groundwater drawdown area at both 75 years after full build out and 100 years of recovery (**Figure 4-8**).

At both Hiko and Crystal springs at 75 years after full build out and 100 years recovery, the model simulates a less than 1 percent spring flow reduction, which is beyond the limitation of the model and does not identify these springs as areas of risk. As discussed above, calibrated groundwater flow model was capable of nearing the observed historic spring flow at Hiko and Crystal springs. Because the starting points for spring flow are relatively accurate, there is higher confidence in the precision of spring flow predictions at these sites.

Effects to Hiko White River springfish critical habitat will be avoided, minimized, and/or mitigated by way of the legally-binding DDC Stipulation (Stipulation, 2008), associated ACMs, and BLM recommended measures. These ACMs are the same as listed above.

While potential impacts to Hiko White River springfish critical habitat PCEs cannot be ruled out with 100 percent certainty, model simulations and other lines of evidence presented in above indicate the Federal action is unlikely to disturb or modify Hiko White River springfish critical habitat at Hiko and Crystal springs.

Aggregate Effects:

In the baseline-plus-action model run simulation, Hiko and Crystal springs are located over 6 miles away, and in a different hydrographic basin, from the simulated groundwater drawdown area at both 75 years after full build out and 100 years of recovery.

At both Hiko and Crystal springs at 75 years after full build out and 100 years recovery, the baseline-plus-action model run simulates a less than 3 percent spring flow reduction, which is beyond the limitation of the model and does not identify these springs as areas of risk. The calibrated groundwater flow model was capable of nearing the observed historic spring flow at Ash and Crystal springs (see discussion above), which suggests a reasonable confidence in the model spring flow predictions at these sites.

While potential impacts to Hiko White River springfish critical habitat PCEs cannot be ruled out with 100 percent certainty, model simulations and other lines of evidence presented above indicate that any such aggregate effects is unlikely to disturb or modify Hiko White River springfish critical habitat at Hiko and Crystal springs.

CONCLUSION: The Federal action **may affect, is not likely to disturb or destroy designated critical habitat** Hiko White River springfish critical habitat as a result of future groundwater pumping.

5.3.6 Pahranagat Roundtail Chub

5.3.6.1 Effects to Species

Tier 1 ROWs

Direct Effects: The Pahranagat roundtail chub in Pahranagat Creek and Key Pittman WMA reservoir are located approximately 17 miles away and in a different hydrographic basin from the

nearest Tier 1 ROW (**Figure 4-8**). At this distance, there would be no direct effects such as loss of habitat in Pahranagat Creek and Key Pittman WMA reservoir.

Indirect Effects: Due to the distance from the Tier 1 ROWs, the Pahranagat roundtail chub would not be indirectly affected by construction-related effects such as dust, noise, traffic, hazardous or toxic material spills, or temporary construction water pumping.

Groundwater Development Areas

Direct Effects: The Pahranagat roundtail chub in Pahranagat Creek and Key Pittman WMA reservoir are located approximately 14 miles away and in a different hydrographic basin from the nearest groundwater development area (**Figure 4-8**). At this distance, the Pahranagat roundtail chub would not experience direct effects, such as loss of habitat due to construction, operation, and maintenance activities associated with future groundwater development facilities.

Indirect Effects: Due to the distance from the groundwater development areas, there would be no indirect construction-related effects such as dust, noise, traffic, and hazardous or toxic material spills to Pahranagat Creek and Key Pittman WMA reservoir.

Groundwater Pumping Effects

Federal Action Effects:

Pahranagat Creek, the Ash, and Crystal spring headwaters, and Key Pittman WMA reservoir are located over 5 miles away and in a different hydrographic basin from the groundwater drawdown area at both 75 years after full build out and 100 years of recovery (**Figure 4-8**). As described in Section 4.1.1, Ash Spring is the principal headwater for Pahranagat Creek, while Crystal Spring provides outflow outside of the summer irrigation season. Hiko Spring is a major water source for Key Pittman WMA.

Ash, Crystal, and Hiko springs were simulated in the groundwater flow model. At 75 years after full build out and 100 years recovery, the model simulates a less than 1 percent spring flow reduction, which is beyond the limitation of the model and does not identify these springs as areas of risk. The calibrated groundwater flow model was capable of nearing the observed historic spring flow at Ash, Crystal, and Hiko springs. Daily spring flow measurements at USGS Ash Springs Gage 09415640 averaged 15.5 cfs (range: 7.2-22.0 cfs) from 2002-2012, and the model simulates current spring flow at 16.4 cfs. Daily spring flow measurements at USGS Crystal Springs Gages 09415589 and 09415590 averaged 12.6 cfs (range: 2.82-18.40 cfs) from 2004-2011, and the model simulates current spring flow at 10.3 cfs. Periodic spring flow measurements at USGS Hiko Spring Site Number 373554115125201 averaged 5.3 cfs (range: 4/01-6.68 cfs) from 1990-2004, and the model simulates current spring flow at 4.4 cfs. Because the starting points for spring flow are relatively accurate, there is higher confidence in the precision of spring flow predictions at these sites.

While some groundwater may underflow from Delamar Valley to Pahranagat Valley along the Pahranagat Shear Zone (Rowley et al., 2011), groundwater flow predominantly trends north-south in the White River Flow System (Burns and Drici, 2011). Isotopic evidence suggests that water from Delamar Valley is not supplying Ash, Crystal or Hiko springs, as these springs have similar isotopic composition to waters in the northern latitudes and dissimilar isotopic composition to waters in Delamar Valley (Thomas et al., 2001; Thomas and Mihevic, 2011). Furthermore, the mountain ranges located between Pahranagat Valley and DDC are composed of

low hydraulic-conductivity materials, underlying carbonate rocks, and north-trending basin-range faults that function as barriers to groundwater flow between areas of proposed pumping and Pahranagat Valley (Rowley et al., 2011). It is possible that Pahranagat Valley may receive water that originates in Cave Valley and passes through White River Valley, but the contribution of Cave Valley waters would be very small with long travel times. For a more detailed discussion, see Section 5.3.5.

Pahranagat Creek and Key Pittman WMA reservoir are heavily managed. The stretch of Pahranagat Creek where Pahranagat roundtail chub occur used by private landowners for irrigation, and the Key Pittman WMA reservoir experiences high water fluctuations as a result of NDOW management of their water resources.

As described in ACM B.1.1, groundwater production well sites will be selected considering the presence of special status species and their habitats. Effects to Pahranagat roundtail chub in Pahranagat Valley will be avoided, minimized, and/or mitigated by way of the legally-binding DDC Stipulation (Stipulation, 2008) and ACMs. These ACMs include biological monitoring in Pahranagat Valley (ACM C.1.42), monitoring of spring discharge sites (ACM C.1.38 and C.1.39), and working with NDOW and private land owners at and downstream of Ash, Crystal and Hiko springs to restore habitat and remove non-native species (ACM C.2.9 and C2.10).

As part of the DDC Stipulation, SNWA may monitor sites where the Pahranagat roundtail chub occurs (ACM C.1.42), and is required to manage the development of groundwater by SNWA in DDC in order to avoid or mitigate unreasonable adverse effects to Federal Resources and special status species (ACM C.2.1). Ash, Crystal and Hiko springs are currently biological and hydrologic monitoring sites under the DDC Stipulation (BRT, 2011; SNWA, 2009b), and Pahranagat Creek is currently a biological monitoring site (BRT, 2011). Biological and hydrologic monitoring of the regional springs also effectively monitors downstream habitats, as Ash and Crystal springs are major water sources for Pahranagat Creek and Hiko spring is a major water source for Key Pittman WMA. Lastly, goals of the AM Framework include avoiding and minimizing potential adverse environmental impacts of SNWA groundwater withdrawals on listed species and their habitats (SNWA, 2012).

The hydrologic monitoring network and groundwater flow modeling efforts conducted under the DDC Stipulation should detect propagation of effects from SNWA groundwater withdrawal in DDC toward Pahranagat roundtail chub sites in Pahranagat Valley (BRT, 2011, page 4-22). Specific efforts include continuous and quarterly data collection at groundwater monitoring wells situated between areas of potential groundwater export and areas of sensitive biological resources in Pahranagat Valley, and periodically-updated groundwater flow model simulations using newly-acquired data (BRT, 2011, page 4-22). Additional protection is granted to Ash and Crystal springs in the DDC Stipulation by specifying no injury to Federal Water Rights (Stipulation, 2008), which applies to surface water coming into Pahranagat NWR from outflow of Ash and Crystal springs.

While potential impacts to Pahranagat roundtail chub in Pahranagat Valley cannot be ruled out with 100 percent certainty, model simulations and other lines of evidence presented above indicate that any such impacts are unlikely to occur.

Aggregate Effects:

In the baseline-plus-action model run simulation, Pahranagat Creek, the Ash and Crystal spring headwaters, and Key Pittman WMA reservoir are located over 5 miles away and in a different hydrographic basin from the simulated groundwater drawdown area at both 75 years after full build out and 100 years of recovery.

Ash, Crystal, and Hiko springs were simulated in the groundwater flow model. At 75 years after full build out and 100 years recovery, the baseline-plus-action model run simulates a less than 3 percent spring flow reduction, which is beyond the limitation of the model and does not identify these springs as areas of risk. The calibrated groundwater flow model was capable of nearing the observed historic spring flows at Ash, Crystal and Hiko springs (see discussion under Sections 5.3.5 and 5.3.6), which suggests a reasonable confidence in the model spring flow predictions at these sites.

For a complete discussion on interbasin groundwater flow and ACMs regarding the Federal action, please see the analysis of indirect effects of the Federal action above.

While potential impacts to Pahranagat roundtail chub in Pahranagat Valley cannot be ruled out with 100 percent certainty, model simulations and other lines of evidence presented above indicate that any such aggregate effects are unlikely to occur.

CONCLUSION: The Federal action **may affect, is not likely to adversely affect** Pahranagat roundtail chub as a result of future groundwater pumping.

5.3.6.2 Effects to Designated Critical Habitat

There is no designated critical habitat for the Pahranagat roundtail chub.

5.3.7 White River Springfish

5.3.7.1 Effects to Species

Tier 1 ROWs

Direct Effects: The White River springfish in Ash Springs is located approximately 17 miles away and in a different hydrographic basin from the nearest Tier 1 ROW (**Figure 4-8**). At this distance, the White River springfish would not experience direct effects such as loss of habitat due to construction, operation, and maintenance activities.

Indirect Effects: Due to the distance from the Tier 1 ROWs, there would be no indirect effects from construction-related activities such as dust, noise, traffic, hazardous or toxic material spills, or temporary construction water pumping to Ash Springs.

Groundwater Development Areas

Direct Effects: The White River springfish in Ash Springs is located approximately 14 miles away and in a different hydrographic basin from the nearest groundwater development area (**Figure 4-8**). At this distance, the White River springfish would not experience direct effects, such as loss of habitat due to construction, operation, and maintenance activities associated with future groundwater development facilities.

Indirect Effects: Due to the distance from the groundwater development areas, there would be no indirect construction-related effects such as dust, noise, traffic, and hazardous or toxic material spills on Ash Springs.

Groundwater Pumping Effects

Federal Action Effects:

Ash Springs is located over 5 miles away, and in a different hydrographic basin, from the simulated groundwater drawdown area at both 75 years after full build out and 100 years of recovery (**Figure 4-8**).

At Ash Springs, at 75 years after full build out and 100 years recovery, the model simulates a less than 1 percent spring flow reduction, which is beyond the limitation of the model and does not identify these springs as areas of risk. The calibrated groundwater flow model was capable of nearing the observed historic spring flow at Ash Springs, discussed in Section 5.3.6.1. Because the starting point for spring flow is relatively accurate, there is higher confidence in the precision of spring flow predictions at this site.

While some groundwater may underflow from Delamar Valley to Pahranagat Valley along the Pahranagat Shear Zone (Rowley et al., 2011), groundwater flow predominantly trends north-south in the White River Flow System (Burns and Drici, 2011). Isotopic evidence suggests that water from Delamar Valley is not supplying Ash Springs, as the spring has similar isotopic composition to waters in the northern latitudes and dissimilar isotopic composition to waters in Delamar Valley (Thomas et al., 2001; Thomas and Mihevic, 2011). Furthermore, the mountain ranges located between Pahranagat Valley and DDC are composed of low hydraulic-conductivity materials, underlying carbonate rocks, and north-trending basin-range faults that function as barriers to groundwater flow between areas of proposed pumping and Pahranagat Valley (Rowley et al., 2011). It is possible that Pahranagat Valley may receive water that originates in Cave Valley and passes through White River Valley, but the contribution of Cave Valley waters would be very small with long travel times. For a more detailed discussion, see Section 5.3.5.

As described in ACM B.1.1, groundwater production well sites will be selected considering the presence of special status species and their habitats. Effects to White River springfish will be avoided, minimized, and/or mitigated by way of the legally-binding DDC Stipulation (Stipulation, 2008) and associated ACMs. These ACMs include biological monitoring in Pahranagat Valley (ACM C.1.42), monitoring of spring discharge sites (ACM C.1.38 and C.1.39), and working with NDOW and private land owners at and downstream of Ash Springs to restore habitat and remove non-native species (ACM C.2.9 and C2.10). As part of the DDC Stipulation, SNWA may monitor Ash Springs (ACM C.1.42), and is required to manage the development of groundwater by SNWA in DDC in order to avoid or mitigate unreasonable adverse effects to Federal Resources and special status species (ACM C.2.1). Ash Springs is currently biological and hydrologic monitoring sites under the DDC Stipulation (BRT, 2011; SNWA, 2009b). Lastly, goals of the AM Framework include avoiding and minimizing potential adverse environmental impacts of SNWA groundwater withdrawals on listed species and their habitats (SNWA, 2012).

The hydrologic monitoring network and groundwater flow modeling efforts conducted under the DDC Stipulation should detect propagation of effects from SNWA groundwater withdrawal in DDC toward Ash Springs (BRT, 2011, page 4-22). Specific efforts include continuous and quarterly data collection at groundwater monitoring wells situated between areas of potential groundwater export and areas of sensitive biological resources in Pahranagat Valley, and periodically-updated groundwater flow model simulations using newly-acquired data (BRT, 2011, page 4-22). Additional protection is granted to Ash Springs by specifying no injury to

Federal Water Rights (Stipulation, 2008), which applies to surface water coming into Pahranagat NWR from the outflow of Ash Springs.

While potential impacts to White River springfish cannot be ruled out with 100 percent certainty, model simulations and other lines of evidence presented above indicate that any effects are unlikely to occur.

Aggregate Effects:

In the baseline-plus-action model run simulation, Ash Springs is located over 5 miles away, and in a different hydrographic basin, from the simulated groundwater drawdown area at both 75 years after full build out and 100 years of recovery.

At Ash Springs, at 75 years after full build out and 100 years recovery, the baseline-plus-action model run simulates a less than 1 percent spring flow reduction, which is beyond the limitation of the model and does not identify these springs as areas of risk. The calibrated groundwater flow model was capable of nearing the observed historic spring flow at Ash Springs (see discussion in Section 5.3.5.1), which suggests a reasonable confidence in the model spring flow predictions at this site.

While potential impacts to White River springfish cannot be ruled out with 100 percent certainty, model simulations and other lines of evidence presented above indicate that any such aggregate effects are unlikely to occur.

CONCLUSION: The Federal action **may affect, is not likely to adversely affect** White River springfish as a result of future groundwater pumping.

5.3.7.2 Effects to Designated Critical Habitat

Tier 1 ROWs

Direct Effects: Designated critical habitat for the White River springfish in Ash Springs is located approximately 17 miles away and in a different hydrographic basin from the nearest Tier 1 ROW (**Figure 4-8**). At this distance, designated critical habitat PCEs, such as cover and/or food sources, for the White River springfish would not experience direct effects due to construction, operation, and maintenance activities.

Indirect Effects: Due to the distance from the Tier 1 ROWs, there would be no indirect effects from dust, noise, traffic, hazardous or toxic material spills, or temporary construction water pumping on critical habitat PCEs.

Groundwater Development Areas

Direct Effects: Designated critical habitat for the White River springfish in Ash Springs is located approximately 14 miles away and in a different hydrographic basin from the nearest groundwater development area (**Figure 4-8**). At this distance, designated critical habitat PCEs for the White River springfish would not experience direct effects due to construction, operation, and maintenance activities associated with future groundwater development facilities.

Indirect Effects: Due to the distance from the groundwater development areas, there would be no indirect construction-related effects such as dust, noise, traffic, and hazardous or toxic material spills on critical habitat PCEs.

Groundwater Pumping Effects

Federal Action Effects:

Ash Springs is located over 5 miles away, and in a different hydrographic basin, from the simulated groundwater drawdown area, at both 75 years after full build out and 100 years of recovery (**Figure 4-8**).

At Ash Springs, at 75 years after full build out and 100 years recovery, the baseline-plus-action model run simulates a less than 1 percent spring flow reduction, which is beyond the limitation of the model and does not identify these springs as areas of risk. The calibrated groundwater flow model was capable of nearing the observed historic spring flow at Ash Springs see discussion in Section 5.3.5.1). Because the starting point for spring flow is relatively accurate, there is higher confidence in the precision of spring flow predictions at this site.

Effects to White River springfish critical habitat will be avoided, minimized, and/or mitigated by way of the legally-binding DDC Stipulation (Stipulation, 2008), associated ACMs, and BLM recommended measures. These ACMs are the same as listed above.

While potential impacts to White River springfish critical habitat PCEs cannot be ruled out with 100 percent certainty, model simulations and other lines of evidence presented above indicate the Federal action is unlikely to disturb or modify White River springfish critical habitat at Ash Springs.

Aggregate Effects:

In the baseline-plus-action model run simulation, Ash Springs is located over 5 miles away, and in a different hydrographic basin, from the simulated groundwater drawdown area.

At Ash Springs, at 75 years after full build out and 100 years recovery, the baseline-plus-action model run simulates a less than 1 percent spring flow reduction, which is beyond the limitation of the model and does not identify these springs as areas of risk. The calibrated groundwater flow model was capable of nearing the observed historic spring flow at Ash and Crystal springs (see discussion in Section 5.3.5.1), which suggests a reasonable confidence in the model spring flow predictions at this site.

While potential impacts to White River springfish critical habitat PCEs cannot be ruled out with 100 percent certainty, model simulations and other lines of evidence presented above indicate that any such aggregate effects is unlikely to disturb or modify White River springfish critical habitat at Ash Springs.

CONCLUSION: The Federal action **may affect, is not likely to disturb or destroy designated critical habitat** White River springfish critical habitat as a result of future groundwater pumping.

5.3.8 Moapa Dace

5.3.8.1 Effects to Species

Tier 1 ROWs

Direct Effects: The Moapa dace population in the upper Muddy River is located approximately 11 miles away, and in a different hydrographic basin, from the nearest Tier 1 ROW (**Figure 4-9**).

At this distance, Moapa dace would not experience direct effects such as loss of habitat due to construction, operation, and/or maintenance activities.

Indirect Effects: Due to the distance from the Tier 1 ROWs, there would be no indirect effects from dust, noise, traffic, hazardous or toxic material spills, or temporary construction water pumping on the upper Muddy River.

Groundwater Development Areas

Direct Effects: The Moapa dace population in the upper Muddy River is located approximately 40 miles away, and in a different hydrographic basin, from the nearest groundwater development area (**Figure 4-9**). At this distance, the Moapa dace would not experience direct effects such as loss of habitat due to construction, operation, and/or maintenance activities from future groundwater development facilities.

Indirect Effects: Due to the distance from the groundwater development areas, there would be no indirect construction-related effects such as dust, noise, traffic, and hazardous or toxic material spills on the upper Muddy River.

Groundwater Pumping Effects

Federal Action Effects:

The upper Muddy River and tributary springs are located approximately 40 miles away, and in a

different hydrographic basin, from the simulated groundwater drawdown area at both 75 years after full build out and 100 years of recovery (**Figure 4-9**).

The USGS Muddy River Near Moapa Gage 09416000 was simulated in the groundwater flow model. At 75 years after full build out and 100 years recovery, the model simulates a less than 1 percent flow reduction, which is beyond the limitation of the model and does not identify the upper Muddy River as an area of risk. The calibrated groundwater flow model was capable of nearing the observed historic flow at the USGS Muddy River Near Moapa Gage. Daily flow measurements at USGS Muddy River Near Moapa Gage 09416000 averaged 33.9 cfs (range: 19.0-123 cfs) from 2002-2012, and the model simulates current flow at 27.1 cfs. Furthermore, the Muddy River was calibrated in the groundwater flow model to observed flows, with annual average stream discharge measurements at USGS Muddy River Near Moapa Gage 09416000 and USGS Muddy River Near Glendale Gage 09419000 treated as flow observations (SNWA, 2009c, page B-25). Because the model was calibrated to transient conditions and the starting points for Muddy River flow are relatively accurate, there is higher confidence in the precision of flow predictions feeding Moapa dace habitat.

While some groundwater from DDC may ultimately underflow to the Muddy River Springs Area, the amount of water that begins as recharge in DDC and makes its way to the Muddy River Springs Area is unknown. The waters of the upper Muddy River and tributary springs are a mixture of both local recharge and interbasin flows that travel through the White River Flow System (Kirk and Campana, 1990; Thomas et al., 1996, 2001; Thomas and Mihevic, 2007, and Thomas, 2011). Water chemistry data provide evidence that it likely takes hundreds to thousands of years for water to travel from DDC to the Muddy River Springs Area. The Muddy River springs contain no tritium, indicating that all of the water discharging from these warm springs was recharged before the early 1950's. Additionally, corrected Carbon-14 ages suggest

that the waters at the Muddy River springs are on the order of several thousand years old (Thomas and Mihevic, 2011).

Non-discretionary regulatory triggers and agreements are in place to protect stream flows and Moapa dace. These measures are discussed below under Aggregate Effects, as well as in Section 4.1.8.

In conclusion, while potential impacts to Moapa dace in Muddy River Springs Area cannot be ruled out with 100 percent certainty, model simulations and other lines of evidence presented above indicate that any such effects are unlikely to occur.

Aggregate Effects:

The groundwater flow modeling simulation results for changes in flow are complicated by the inability of the groundwater flow model to incorporate monitoring, management, and mitigation measures (see Section 3.3). Non-discretionary regulatory triggers, conditions and agreements are in place to protect stream flows and Moapa dace (for a detailed discussion, see Sections 2.4.4 and 4.1.8). In the absence of the minimum in-stream flow levels and other conservation measures which cannot be simulated by the groundwater flow model, the simulations for the baseline-plus-action model run predict a reduction in flow at the upper Muddy River of 42 percent at 75 years after full build out, and 50 percent at 100 years of recovery. However, as noted, this prediction is not accurate because it does not take into consideration the committed conservation measures. Moreover, baseline pumping is presumed to account for these reductions in flow because effects of the action were predicted to be less than 1 percent by the model simulation at 75 years after full build out and 100 years of recovery.

The baseline groundwater pumping in Coyote Spring Valley that is evaluated in the current groundwater flow modeling is the same existing permitted rights considered by the USFWS in the Programmatic BO (USFWS, 2006c). In that Programmatic BO, the USFWS determined that pumping of permitted groundwater rights in Coyote Spring Valley is likely to adversely affect the endangered Moapa dace (USFWS, 2006c). Specific conservation measures for Moapa dace in the Coyote Spring Valley Stipulation (Stipulation, 2001), Muddy River MOA (2006), and Intra-Service Programmatic BO (USFWS, 2006c), most notably including minimum in-stream flow triggers, provide strong protection to Moapa dace.

Because the Muddy River Springs Area is a designated basin, the NSE has authority under NRS § 534.120 to make additional rules, regulations, and orders to protect the water resources of the basin. The NSE has given Order 1169, wherein all groundwater applications in various basins, including Coyote Spring Valley and Muddy River Springs Area, are held in abeyance until additional information is gathered. As such, Order 1169 mandates that SNWA and other entities pump a portion of their existing carbonate groundwater rights in Coyote Spring Valley for a period of at least two years before the NSE would evaluate future permitting of groundwater rights. After the conclusion of the pump test, per Order 1169 the NSE will evaluate whether or not additional unallocated water is available for appropriation in Coyote Spring Valley in accordance with Nevada water law (i.e., in a manner that protects public interest, existing senior water rights, and environmental resources).

The legally-binding Coyote Spring Valley Stipulation, which was signed by SNWA and various other entities, explicitly aims to manage the development of the carbonate aquifer as a water resource without causing unreasonable adverse impacts to state and federal water rights and

resources (Stipulation, 2001). The Coyote Spring Valley Stipulation includes a hydrologic Monitoring, Management, and Mitigation (MMM) Plan applicable to existing and future permitted SNWA groundwater development in Coyote Spring Valley.

The Muddy River MOA (2006) establishes triggers linked to specific actions that protect instream flows for aquatic wildlife, requires non-discretionary financial contributions for stream restoration, and establishes the Muddy River Recovery Implementation Program (USFWS, 2006c). The goal of the Muddy River MOA is to establish conservation measures providing for the protection and recovery of the Moapa dace and its habitat; coordination of monitoring, management, and mitigation measures; and protection of the Parties' water rights. For a detailed discussion on the Muddy River MOA, please see Section 2.4.4.

The establishment of the 1,220 acre WSNA in 2007 was one of the most significant guarantees to the protection of aquatic species on the Muddy River since the establishment (1979) and expansion (1983) of the Moapa Valley NWR. Most of the springs that coalesce to form the Muddy River are on the Services' Moapa Valley NWR or the SNWA's WSNA and therefore are protected from further development. Because SNPLMA funds were used to establish the WSNA, specific non-discretionary protections and management practices regulate how the WSNA must be managed in perpetuity. Key acquisition commitments that provide guarantees to the endemic and federally endangered Moapa dace and southwestern willow flycatcher are documented in SNWA's SNPLMA Nomination Package, SNPLMA Financial Assistance Agreement, and the WSNA Property Deed, and include: restoration and/or enhancement of riparian, spring, and upland habitat; invasive fish, invertebrate, and plant management; and ownership and maintenance of the property as a natural area in perpetuity.

Effects to the Moapa dace population in the upper Muddy River and tributary springs will be avoided, minimized and/or mitigated specifically by: (1) the ongoing Recovery Plan for the Rare Aquatic Species of the Muddy River Ecosystem (USFWS, 1996), which includes past and ongoing efforts improvements to Moapa dace habitat and removal of non-native species (western mosquitofish and shortfin molly) and man-made structures within the upper Muddy River; (2) the Muddy River MOA (2006), which sets forth conservation measures providing for the protection and recovery of the Moapa dace, including minimum in-stream flow triggers; and (3) recovery actions that can be implemented on the Moapa Valley NWR and the private land that SNWA has acquired and preserved as the WSNA. In addition, as described in ACM B.1.1, groundwater production well sites will be selected considering the presence of special status species and their habitats.

CONCLUSION: The Federal action **may affect, is not likely to adversely affect** Moapa dace as a result of future groundwater pumping.

5.3.8.2 Effects to Designated Critical Habitat

There is no designated critical habitat for Moapa dace.

5.3.9 Ute Ladies'-Tresses

The following discussion focuses on the potential habitat for ULT that has been identified in Spring and southern Snake valleys (Section 4.1.9).

5.3.9.1 Effects to Potential Habitat

Tier 1 ROWs

Direct Effects: The Tier 1 ROWs have been routed to avoid springs, streams, and wetlands where ULT potential habitat occurs (**Figure 4-10**). Therefore, no direct effects are expected to ULT populations due to actions within Tier 1 ROWs.

Indirect Effects: As described in Section 3.1.1, temporary pumping for construction water use is not anticipated to propagate measurably beyond the ROWs, because of the low volumes of groundwater pumped for construction, resting of the wells during non-working hours/days and seasons when water is not needed, and the short duration of use of each well. Additionally, BLM has included mitigation measure ROW-WR-3 in the Preparation of a Construction Water Supply Plan, to identify specific local impacts and provide for mitigation if necessary. Thus, temporary pumping for construction water use is not anticipated to indirectly affect ULT potential habitat.

Groundwater Development Areas

Several springs located within the groundwater development area in Spring Valley (South Bastian Spring, East of Cleve Creek Springs (East), West Spring Valley Complex (1/North and 5/South) contain potential habitat for ULT. There are no groundwater development areas in Snake Valley under the Federal action.

Direct Effects: No direct adverse effects are predicted for ULT potential habitat, with implementation of ACMs to avoid springs, riparian/wetland areas, stream crossings, and special status species and their habitats (ACM B.1.1 and B.1.3).

Indirect Effects: Surface disturbance activities near ULT potential habitat in Spring Valley could alter habitat or water quality from construction-generated dust, sedimentation, fuel spill risks, or accidental wildfire. ACMs to reduce vehicular and traffic issues (ACMs A.1.3, A.1.11, and A.1.28 through A.1.37), control and clean hazardous or toxic materials (ACMs A.1.43 through A.1.46), control emissions and dust (ACM A.10.1 through A.10.8), and to prevent and control wildfires (ACM A.1.47), would minimize potential effects.

Groundwater Pumping Effects

<u>Spring Valley</u>

ULT potential habitats in Spring Valley that occur within the drawdown area at 75 years after full build out include: Keegan Spring Complex (Middle and South), East of Cleve Creek (East), Minerva Spring Complex (3/North and 2/Middle), Shoshone Ponds (1/stock pond, 2/refuge ponds and 3/South), South Bastian Spring, Swallow Spring, and Willard Spring (**Figure 4-10**). These areas are located in valley floor areas with relatively shallow groundwater conditions, and the relative risk of drawdown resulting from groundwater pumping to affect flow in perennial surface water sources within these areas is high (BLM, 2011). Once simulated pumping ceases at 75 years after full build out, groundwater elevation rapidly recovers in central Spring Valley, with complete recovery from groundwater drawdown at these sites within the 100 years of recovery period (**Figure 4-10**).

Of the ULT potential habitats shown in **Figure 4-10**, Keegan Spring Complex was the only site in Spring Valley specifically simulated in the model. The model simulates a 75% percent spring flow reduction at Keegan Spring Complex at 75 years after full buildout, and up to

approximately 37% percent spring flow reduction during the 100 years recovery. The model simulated baseline flows were approximately 27% of the actual measured historic flows at Keegan Spring indicating that the regional model does not replicate all of the flow at the spring. Although the model simulates less than the actual flow, the model simulations of pumping effects are still useful as a tool to indicate the relative risk to the spring complex (BLM, 2011). These simulation results suggest that a substantial change in spring flow at Keegan Spring Complex (and other springs in Spring Valley) could occur 75 years after full buildout. Actual effects to individual springs would depend upon the final location of the groundwater production wells, which could be placed further away from sites of interest to minimize effects (ACM B.1.1). When subsequent environmental compliance is conducted for specific groundwater production well locations, more detailed groundwater flow modeling and/or hydrologic analysis will further identify potential effects to these areas.

Snake Valley

All ULT potential habitats in southern Snake Valley at least 6 miles away and in a different hydrographic basin from the simulated groundwater drawdown area at both 75 years after full build out and 100 years of recovery (**Figure 4-10**).

Of the ULT potential habitats shown in **Figure 4-10**, Big Springs was the only site in Snake Valley specifically simulated in the model. At Big Springs, the model simulates a 18% percent spring flow reduction at 75 years after full buildout, and up to a maximum of 22% percent spring flow reduction during the 100 years recovery period (Table 3-2). The model simulated baseline flows were approximately 46% of the actual measured historic flows at Big Springs (Table 3-2) indicating that the regional model does not replicate all of the flow at the spring. Although the model simulates less than the actual flow, the model simulations of pumping effects are still useful as a tool to indicate the relative risk to the spring complex and potential flow trends (BLM 2011). These model results suggest that Big Springs (and other springs located in the southern portion of the Snake Valley) that may be hydraulically connected to the regional flow system could experience some reduction in flow over this timeframe.

A Southern Nevada Public Land Management Act (SNPLMA) funded project, *Evaluation of Basin-Fill Aquifers in Southern Spring and Snake Valleys and their Connection with Surface-Water Resources and with the Regional Carbonate Aquifer*, is being conducted on behalf of the USFWS, National Park Service and BLM, by scientists from the USGS and University of Nevada – Reno (UNR). The purpose of the study is to "determine the distribution and hydraulic properties of the basin-fill aquifers beneath the Spring and Snake Valleys and the carbonate-rock aquifer, and streambed properties that control the flow of water between streams and aquifers. Results from the study will aid in evaluating how pumping could affect surface-water resources important to ecosystems on Federal lands in White Pine County." (http://www.blm.gov/nv/st/en/snplma/snplma_prephase_1.html; Conservation Initiative Project, Round 8). The study includes evaluation of hydrogeologic conditions in the vicinity of Big Springs. Preliminary data generated by the study indicate that the source water for Big Springs is primarily local recharge from southern Snake Range, which flows under the Big Springs Wash area through Hamlin and Snake valleys (Ely public meeting on August 16, 2011; Presenter Dr. David Prudic, UNR). A draft report on this research should be available to the USFWS as one of the project's participating entities.

Water chemistry and water level data collected at Big Springs by SNWA is consistent with the data collected by USGS and UNR (discussed above). Water temperature, isotope, general water chemistry, and spring discharge data collected at Big Springs and groundwater level data collected in the vicinity of Big Springs, and information about the geologic setting all indicate that the Big Springs recharge source is primarily local.

There is evidence of hydraulic connectivity between southern Spring Valley and southern Snake Valley. Subsurface outflow from Spring Valley to Snake Valley may occur via Hamlin Valley through the limestone hills area (Burns and Drici, 2011). Groundwater pumping in southern Spring Valley may draw a portion of the groundwater away from the interbasin flow path, which would be expected to be gradual and observable by groundwater monitoring.

Discussion

It is anticipated that groundwater drawdown would likely affect some sites identified as ULT potential habitat by reducing flow to springs and waterbodies and lowering groundwater elevations supporting wetland habitat. While there is a general understanding of habitat requirements for ULT (e.g., wetland condition), specific limitations of the species are unknown.

To more properly determine likelihood and potential magnitude of impacts to specific ULT potential habitat sites in Spring and southern Snake Valley, additional information should be considered. Perennial water sources that are hydraulically connected to the groundwater system impacted by pumping and within the drawdown area would likely experience a reduction in baseflow (BLM, 2011). At some sites adjacent to springs in Spring Valley, there are wetlands and meadows where higher groundwater tables are supported by irrigation and diversions (e.g., Minerva Spring Complex). Other sites have a variety of water sources, such as overland flow, and perched water from nearby mountains (e.g., Keegan Spring Complex). A site that is fed solely or primarily by springs that are hydraulically connected to the area of proposed pumping will be more likely to experience a greater impact than a site that receives extensive inflows from surrounding mountains or that is supported by regular irrigation. Effects to areas that are fed by confined aquifers (e.g., Shoshone Ponds) or perched water (e.g., Cleveland Ranch springs, potentially) would depend on the interconnection between the source waters and the aquifers developed for production under Federal Action. As noted above, effects to individual springs would depend upon the final locations of the groundwater production wells, which could be placed further away from sites of interest to minimize effects (ACM B.1.1).

As described in ACM B.1.1, groundwater production well sites will be selected considering the presence of special status species and their habitats. Effects to ULT potential habitat in Spring and southern Snake valleys may be avoided, minimized, and/or mitigated by way of the legally-binding Spring Valley Stipulation (Stipulation, 2006) and associated ACMs. As part of the Spring Valley Stipulation, SNWA may monitor sites where ULT potential habitat occurs (ACM C.1.42), and is required to manage the development of groundwater by SNWA in Spring Valley in order to avoid or mitigate unreasonable adverse effects to Federal Resources and special status species (ACM C.2.1). Many of the ULT potential habitats are currently biological and hydrologic monitoring sites under the Spring Valley Stipulation (BWG, 2009; SNWA, 2009a). However, specific requirements for appropriately timed ULT protocol surveys are not included. No specific plan to monitor for ULT has been formulated at this time. In Spring Valley, SNWA will maintain wet meadow areas by modifying use of their agricultural water rights to offset changes in spring discharges (ACM C.2.15). SNWA's AM Framework also includes measures

to conduct habitat enhancement for spring snails in Snake Valley (ACM C.2.6) and to purchase property and/or obtain conservation easements on private lands to reduce grazing impacts on spring snail habitat (ACM C.2.16). SNWA's AM Framework also includes measures to improve use of SNWA's agricultural water rights in Spring Valley to offset changes in spring discharges (ACM C.2.15), and to reduce or change grazing to improve potential habitat conditions for ULT (ACM C.2.18).

The Spring Valley Stipulation requires that data be collected in an Interbasin Groundwater Monitoring Zone (Zone) to accurately characterize the groundwater gradient from Spring Valley to Snake Valley via Hamlin Valley (Stipulation, 2006). Altogether, there are 12 current or planned groundwater monitoring wells in or near the Zone. SNWA is currently monitoring five groundwater wells (four basin fill and one carbonate) in the Zone; and BLM has granted ROWs for an additional five monitoring wells (two basin fill and three carbonate) in the Zone, including one in the vicinity of Big Springs. Two additional near-zone wells (one basin fill and one carbonate) are required under the Spring Valley Stipulation between the Zone boundary and the nearest basin fill and carbonate production wells (Stipulation, 2006). By monitoring groundwater elevation at multiple sites between southern Snake Valley and the area of proposed pumping in southern Spring Valley, the propagation of effects can be identified and evaluated.

The NSE made the Hydrologic Monitoring and Mitigation Plan for DDC (SNWA, 2009b) and the Biological Monitoring Plan for the DDC Stipulation (BRT, 2011) part of the permit terms for SNWA groundwater rights in Cave Valley (NSE, 2012b). The groundwater rights granted are conditioned upon SNWA's compliance with both plans, and any amendments to the plans that the NSE requires at a later date pursuant to his authority under Nevada law (NSE, 2012b). In addition, the NSE Ruling requires SNWA to update a computer groundwater flow model approved by the NSE once before groundwater development begins and every five years thereafter, and provide predictive results for 10, 25 and 100 year periods (NSE, 2012b).

Aggregate Effects:

In the baseline-plus-action model run simulation, ULT potential habitats in Spring Valley within the drawdown area at 75 years after full build out include: Stonehouse Spring Complex, Keegan Spring Complex (Middle and South), East of Cleve Creek (East), Minerva Spring Complex (3/North and 2/Middle), Shoshone Ponds (1/stock pond, 2/refuge ponds and 3/South), South Bastian Spring, Swallow Spring, and Willard Spring (**Figure 4-10**). At 100 years recovery, ULT potential habitats in Spring Valley within the drawdown area include: Stonehouse Spring Complex, Shoshone Ponds (1/stock pond and 2/refuge ponds), and Willard Spring (**Figure 4-10**). These areas are located in valley floor areas with relatively shallow groundwater conditions, and the relative risk of drawdown resulting from groundwater pumping to affect flow in perennial surface water sources within these areas is high (BLM, 2011).

All ULT potential habitats in southern Snake Valley are located approximately 4 miles away and in a different hydrographic basin from the simulated groundwater drawdown area at both 75 years after full build out and 100 years of recovery.

The baseline-plus-action model run produced spring flow simulations for Keegan and Big Springs. At Keegan Spring Complex, the baseline-plus-action model run simulates a 77% percent spring flow reduction at 75 years after full buildout, and up to 43% percent spring flow reduction during the 100 years recovery period. The model simulated baseline flows were approximately 27% of the actual measured historic flows at Keegan Spring (Table 3-3)

indicating that the regional model does not replicate all of the flow at the spring. Although the model simulates less than the actual flow, the model simulations of pumping effects are still useful as a tool to indicate the relative risk to the spring complex (BLM, 2011). These simulation results suggest that a substantial change in spring flow at Keegan Spring Complex (and other springs located within the drawdown area and in the valley floor area in Spring Valley) could occur 75 years after full build out timeframe.

At Big Springs, the baseline-plus-action model run simulates a 29% percent spring flow reduction at 75 years after full buildout, and up to a 35% percent spring flow reduction during the 100 years recovery. The model simulated baseline flows were approximately 46% of the actual measured historic flows at Big Springs (Table 3-2) indicating that the regional model does not replicate all of the flow at the spring. Although the model simulates less than the actual flow, the model simulations of pumping effects are still useful as a tool to indicate the relative risk to the spring complex and potential flow trends (BLM 2011). These model results suggest that Big Springs (and other springs located in the southern portion of the Snake Valley) that may be hydraulically connected to the regional flow system could experience some reduction in flow over this timeframe.

Effects to individual springs would depend upon the final locations of the groundwater production wells, which could be placed further away from sites of interest to minimize effects (ACM B.1.1). When subsequent environmental compliance is conducted for specific groundwater production well locations, more detailed groundwater flow modeling and/or hydrologic analysis will further identify potential effects to these areas.

As discussed in detail above, potential effects to ULT potential habitat would depend on the hydraulic connection of the perennial water sources to the groundwater system impacted by pumping. Other factors to consider regarding likelihood and magnitude of potential impacts include the variety of water sources feeding a system (e.g., overland flow and irrigation), and perched or confined conditions.

It is anticipated that groundwater drawdown would affect some sites identified as ULT potential habitat by reducing flow to springs and waterbodies and lowering groundwater elevations supporting wetland habitat. While there is a general understanding of habitat requirements for ULT (e.g., wetland condition), specific limitations of the species are unknown.

The Spring Valley Stipulation (Stipulation, 2006) measures and associated ACMs, and monitoring and mitigation required by the NSE to avoid, minimize and mitigate potential effects would be the same as described above.

CONCLUSION: The Federal action would likely adversely modify ULT potential habitat. Thus, the Federal action **may affect, is likely to adversely affect** ULT.

5.3.9.2 Effects to Designated Critical Habitat

There is no designated critical habitat for ULT.

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6.0 EFFECTS MINIMIZATION

The GWD Project is being planned to avoid and minimize impacts on sensitive biological resources whenever possible. SNWA has identified ACMs that will be incorporated into design, construction, operation, and maintenance to minimize and mitigate the anticipated direct and indirect effects to sensitive species and habitats. The BLM has identified additional mitigation measures in the EIS for the GWD Project to reduce environmental impacts.

Many of the SNWA ACMs and BLM mitigation measures provide broad environmental benefits. A full list of the ACMs and mitigation measures is provided in SNWA's Conceptual Plan of Development (SNWA, 2011a) and BLM's Draft EIS (BLM, 2011). Listed below are only a selected list of the ACMs and mitigation measures that specifically relate to the federally listed species.

6.1 SOUTHWESTERN WILLOW FLYCATCHER

6.1.1 Tier 1 ROW

SNWA ACMs

None.

BLM Mitigation Measures

None.

6.1.2 Groundwater Development Facilities

SNWA ACMs

None.

BLM Mitigation Measures

None.

6.1.3 Groundwater Pumping

SNWA ACMs

B.1.1 Groundwater production well sites will be selected considering:

- Proximity to main and lateral pipelines
- Proximity to existing roads or utility corridors
- Suitable hydrogeologic conditions, including well yield, groundwater drawdown, and groundwater chemistry, based upon exploratory drilling
- Adequate well spacing
- Avoidance of springs, streams, and riparian/wetland areas
- Avoidance of cultural resource sites eligible for the NRHP
- The presence of special status species and their habitat.

C.1.42 Biological monitoring may include these areas within the adjacent hydrographic basins, but only to the extent that access can be obtained:

4. Monitoring of selected areas will be determined by the BRT in consultation with the TRP, for those special status species and their habitats that are most likely to be

affected as a result of SNWA's groundwater withdrawals in the DDC hydrographic basins. Monitoring locations will be determined by the BRT and may include the following areas:

a. Pahranagat Valley: Pahranagat National Wildlife Refuge, Key Pittman Wildlife Management Area, and Ash, Crystal, and Hiko Springs;

SNWA has prepared a Conceptual Adaptive Management Framework (AM Framework) to be refined and implemented during future site-specific NEPA review. The AM Framework sets out a potential process for implementing practicable adaptive management measures to address adverse environmental impacts associated with SNWA groundwater withdrawals for the GWD Project, the nature, location, and extent of which are currently unknown. The AM Framework outlines the process: (1) to collect baseline data; (2) identify environmental indicators and establish adaptive management thresholds; (3) conduct monitoring of environmental indicators and SNWA's groundwater pumping; (4) determine whether SNWA's groundwater pumping has likely caused or contributed to adverse environmental impacts, and if so; (5) to determine the appropriate adaptive management strategy to avoid future adverse environmental impacts and minimize or mitigate those that have already occurred. A suite of additional measures are outlined in Section C.2 which may be implemented, as needed, through the adaptive management process to address potential impacts, which include:

C.2.11 Work with NDOW to improve and/or expand southwestern willow flycatcher habitat on Key Pittman Wildlife Management Area.

C.2.12 Work with USFWS to improve and/or expand southwestern willow flycatcher habitat on Pahranagat National Wildlife Refuge.

C.2.14 Assist the BLM with habitat enhancement projects in Rainbow Canyon of Lower Meadow Valley Wash to improve conditions for southwestern willow flycatchers, yellow-billed cuckoo, and speckled dace.

BLM Mitigation Measures

None.

6.2 AGASSIZ'S DESERT TORTOISE

6.2.1 Tier 1 ROW

SNWA ACMs

A.1.1 SNWA will complete a detailed Plan of Development (POD) for the final project approved by the BLM. More than one POD may be developed if the project is constructed in phases. The detailed POD(s) will incorporate mitigation contained in the Record of Decision and provide detailed project design and construction specifics, including but not limited to construction contract timing and phasing, construction access roads and ROW entry points, locations of refueling and equipment maintenance, hydrostatic discharge locations, areas of fencing for special status species, and other details. The POD(s) shall contain detailed plans, including, but not limited to, those listed below. The BLM will review and approve the POD(s) prior to notice to proceed for any surface disturbance activity, and will coordinate with other agencies (NDOW, USFWS), as relevant to their agency responsibilities.

- Agency Coordination Plan – primary contacts including BLM authorized officer, SNWA, construction management, environmental compliance inspection contractor, and construction contractors; identification of reporting procedures and frequency
- Bird Conservation Strategy – measures to reduce impacts to migratory birds, bald and golden eagles, and other sensitive birds; the plan will identify measures to be implemented during construction, including the identification of critical nesting periods for bird species anticipated to be within the ROW, pre-construction surveys to be conducted for nesting raptors and migratory birds, and the construction avoidance buffer size and time duration for active raptor and migratory bird nests; the plan will also identify design features and measures to be implemented during operation, including description of design standards (see measure A.5.66), any post-construction monitoring, and adaptive measures such as marking of power lines to avoid or minimize impacts; the bird conservation strategy will be developed in coordination with the USFWS for compliance with MBTA and BGEPA.
- Blasting Plan – identification of areas where blasting may be needed, blasting procedures, control of explosives, necessary permits, pre-blasting noticing, and reporting.
- Construction Plan – construction schedule and sequencing, temporary use areas, maintenance and refueling areas, access roads, borrow pits, handling of unanticipated discoveries, best management practices, vehicle/equipment washing locations, etc.
- Construction Traffic Management Plan – measures to reduce and manage construction traffic.
- Dust Control Plan – air quality standards and permits, dust control measures, water sources, air quality monitoring, and reporting.
- Emergency Response Plan – emergency contacts, notification procedures, available resources, and emergency procedures.
- Fire Prevention Plan – measures to prevent accidental fire during all phases of construction, and initial response actions.
- Hydrostatic Discharge Plan – sources and volumes of water, discharge locations and quantities, erosion and flow control measures, necessary permits, and reporting.
- Integrated Weed Management Plan – identification of areas with noxious/invasive weeds, treatment and control measures, monitoring, and reporting.
- Mitigation Plan – summary of environmental commitments and mitigation measures, responsible parties, timing, and reporting.
- Public Information Plan – public notification measures.
- Restoration Plan – topsoil (growth medium) and vegetative cover salvage, stockpiling and replacement; plant salvage, maintenance and replacement, seeding, soil stabilization, and post-construction monitoring.
- Spill Prevention, Control, and Countermeasure Plan – procedures for storage and handling of hazardous and toxic materials, necessary permits, spill response and cleanup.

- Stormwater Pollution Prevention Plan – erosion and sediment control measures, compliance inspections and reporting.

A.1.3 All activities directly or indirectly associated with the construction, operation, and maintenance of the project on federal lands will be conducted within the authorized limits of the ROW grant. Any facility relocation, additional construction area, or other use that is not in accord with the ROW grant will not be initiated without prior written approval of the BLM. Cross-country vehicular travel outside of the ROW is prohibited, unless prior approval is obtained from the BLM.

A.1.5 A worker education program will be developed by SNWA and used during construction and operation. It will be presented to all personnel who will be onsite, including but not limited to contractors, contractors' employees, supervisors, inspectors, and subcontractors. A handout will be developed addressing environmental protection measures incorporated into the proposed project, and the responsibility of each worker in environmental protection. Each worker will be briefed on his or her environmental compliance responsibilities, provided a handout, and required to sign a certification that he or she understands and will comply with those environmental protection measures. Specifics of the program will include, but are not limited to:

- General site maintenance (i.e., trash disposal)
- Prohibiting driving off the cleared corridor or existing roads
- Importance of speed limits and other traffic regulations on access roads
- Prohibiting dogs or hunting on the construction and facility sites
- Terms and conditions of project Biological Opinion
- Desert tortoise conservation measures, including:
  - -Biology, distribution, and identification
  - -Legal status and occurrence in the project area
  - -Prevention of desert tortoise handling
  - -Checking under vehicles for desert tortoises and adhering to vehicle speed limits
  - -Purpose of desert tortoise fencing and reporting procedures for damaged fencing
  - -Reporting procedures if a desert tortoise is observed in a work area
  - -Reporting procedures if a desert tortoise injury occurs
  - -Procedure if a desert tortoise is in harms way (imminent danger)
  - -Definition of "take", consequences of harassment, and the penalties for violation of state and federal laws
- Cultural and paleontological resource identification and protection
- Noxious weed management and identification
- Prohibiting collection of wildlife, plants, or cultural/paleontological resources, unless the collection is part of a mitigation plan approved by the BLM
- Workers will receive a sticker or certificate that they have completed the training; a laminated card that can be used for reference, including applicable contact phone numbers, may also be used
- Training sessions will be held for new contractors throughout the life of the project

A.1.11 Survey crew vehicles will remain on existing roads or within the previously cleared construction ROW. If off-road travel within the designated ROW is necessary, a biologist will first clear the proposed route. In desert tortoise habitat, a BLM and USFWS approved biological monitor will accompany survey crews into the field. Off-road travel for surveying will be restricted to the ROW, and be the minimum necessary to complete the task. Survey crews traveling on foot must have attended the worker education program, but are not required to be accompanied by a biologist.

A.1.13 Permanent site security fencing will be used to enclose facility sites, including water treatment facility, buried storage reservoir, pumping stations, regulating tanks, and pressure reducing stations. This fencing will generally consist of standard 6 to 8 foot high chain-link fencing. Block walls may be constructed at some facility sites instead fencing, depending on site requirements.

A.1.14 Within desert tortoise habitat, temporary desert tortoise exclusion fencing will be used to enclose active pipeline, staging area, and facility site construction areas. The tortoise exclusion fencing may be installed with site security fencing or separately, and may be installed in phases to match construction activity; unless it is determined by the BLM authorized officer and/or the USFWS that the project area should not be fenced. In accordance with current specifications (USFWS, 2009), fencing will consist of 1-inch horizontal by 2-inch vertical galvanized welded wire, 36 inches in width. The mesh will extend at least 12 inches below ground, leaving 22-24 inches above ground. In situations where it is not feasible to bury the fence (bedrock or caliche substrate), the lower 12 inches of the fence will be bent at a 90 degree angle towards potentially approaching tortoises and covered with cobble or other suitable material to ensure that tortoise or other animals cannot dig underneath. Gates with tortoise-proof guards of no more than one-inch ground clearance will be installed at all access points. The temporary desert tortoise exclusion fencing will be maintained in place for the duration of construction, until initial restoration activities (replacement of cactus and yucca) are completed.

A.1.15 Temporary tortoise exclusion fencing will be routinely inspected and promptly repaired. During the desert tortoise active season from March 1 through October 31, the fence will be inspected at least twice daily and any repairs completed within 3 days. During the desert tortoise inactive season from November 1 through February 28/29, the fence will be inspected at least monthly and any repairs completed within 7 days. The biological monitor(s) will also inspect the fencing after major precipitation events to ensure zero ground clearance. Monitoring and maintenance will include regular removal of trash and sediment accumulation and restoration of zero ground clearance between the ground and the bottom of the fence, including re-covering the bent portion of the fence if not buried. Fencing will be removed upon termination and reclamation of the project, or when it is determined by the BLM authorized officer and USFWS that the fence is no longer necessary. The biological monitor(s) will update their daily field notes with dates of inspections and conditions found. The results will be sent to the BLM on a quarterly basis.

A.1.16 Permanent tortoise exclusion fencing will be installed along with site security fencing around the above-ground facility sites within desert tortoise habitat, including the water treatment facility/buried storage reservoir and Coyote Spring Valley pressure reducing station. In accordance with current specifications (USFWS, 2009), permanent tortoise

exclusion fencing will consist of the same fencing material as described above for temporary tortoise fencing, with the tortoise exclusion fencing being attached to the site security fencing. Permanent tortoise exclusion fencing will be inspected on an at least quarterly basis, and any repairs completed within 3 days from March 1 through October 31, and within 7 days from November 1 through February 28/29.

A.1.19 Within desert tortoise habitat, clearing will occur only within the fenced boundaries of the permanent and temporary ROWs. Clearing will include removal of materials that will interfere with construction activities, create hazards or unsafe conditions, or impair subsequent site work. Outside of the desert tortoise habitat, clearing will only occur after boundaries of the permanent and temporary ROW have been staked.

A.1.22 Boulders greater than 18 inches in diameter found on the soil surface will be moved to the edge of the ROW. This will be done carefully to leave as much of the natural patina or desert varnish on the boulders as possible. The boulders will be placed back on the ROW at the completion of construction as part of restoration activities. Boulders uncovered during construction will either be placed within the ROW if it can be done in a natural manner as part of the restoration activities or used as part of trench or borrow pit backfill.

A.1.23 For soil disturbing actions that will require reclamation, all available growth medium (topsoil) will be salvaged prior to surface disturbances. After completion of clearing and plant salvage activities, the available growth medium and remaining plant material will be windrowed along the edge of the ROW or placed in stockpiles no greater than 6 feet in height. Vegetation will be ground or chipped to a mulching consistency and stockpiled adjacent to the topsoil. Topsoil stripped from areas with different surface conditions will be stockpiled separately and later used to restore the same areas. Topsoil left in place over 120 days will be fenced and signed, and a tackifier, water, or other BLM-approved erosion control measure will be applied to prevent wind or rain erosion.

A.1.24 If a tackifier is used, it will be derived from natural organic plant sources containing no growth- or germination-inhibiting materials. The tackifier will be designed to become inactive in the soil after a period of time, so as not to otherwise affect the success of transplanting and seeding efforts. Tackifiers will be approved by BLM prior to use.

A.1.25 Stockpiled soil will be seeded with an interim seed mix if it is left for more than one growing season. The seed mix and application rate will be approved by the BLM. The seed mixture: 1) will be obtained from a BLM-approved commercial seed vendor, 2) will not include any species specifically identified by the BLM, and 3) will be certified free of plant species listed on the Nevada noxious weed list. Vegetable-based soil binders and/or hydromulch may be used on stockpiled soil to reduce seed movement and erosion.

A.1.26 For areas within the ROW where noxious and non-native invasive weed infestations are noted, topsoil and cleared vegetation will be stockpiled separately and signed, to avoid mixing with topsoil salvaged from other areas. During restoration this topsoil and cleared vegetation will be placed in the area from which it was removed. If topsoil and cleared vegetation are removed from an area with noxious weed infestations, the stockpiled topsoil will be treated with herbicides prior to seeding the area. Areas with noxious and non-native invasive weeds will be treated and/or monitored in accordance with the BLM-approved Integrated Weed Management Plan.

A.1.28 A Construction Traffic Management plan will be developed and coordinated with the BLM and other relevant state and local authorities prior to the start of construction for each major phase of the project. The plan will include measures to reduce the number of construction trips by use of car-pooling and/or construction shuttles, scheduling of work shifts and materials deliveries, designation of access routes, and other measures to minimize traffic effects. The plan will also take into account active seasons for hunting, camping, and/or other recreational activities that occur within the same time and place as each phase of construction.

A.1.29 While driving on paved roads or marked dirt roads, posted speed limits will be maintained. While driving within the construction area, on un-posted dirt roads, and within desert tortoise habitat a maximum speed limit of 25 miles per hour will be maintained to reduce dust and allow for observation and avoidance of desert tortoise, livestock, wild horses, visitors to the public land, or other wildlife in the road.

A.1.30 Public access routes within or crossing the ROW will be maintained, or detour routes will be identified, during construction activities. Detours needed for temporary road closures due to safety concerns will be established in coordination with the BLM and local authorities.

A.1.31 Signing and traffic controls will be placed well in advance of the construction area to warn motorists of detour routes available during construction.

A.1.32 Signs and persons with flags will be used within the construction area as necessary to direct traffic in accordance with all applicable Nevada Department of Transportation, county, and local rules and ordinances.

A.1.33 Designated construction entry locations into the ROW will be identified from existing roads. These entry locations will be stabilized with crushed rock underlain by geotextile filter fabric, or temporary asphalt pavement to prevent sediment from being tracked onto asphalt, concrete, or improved road surfaces and to limit other damage such as road shoulder rutting.

A.1.34 Sediment transported onto a public paved road surface by construction equipment or other vehicles will be removed immediately by shoveling and sweeping. This material will be disposed at an approved area, within the ROW. Road washing will be allowed only after the sediment is removed in the above manner.

A.1.35 Wheel washers will be installed at vehicles ingress and egress locations between unpaved roads (within the permanent and temporary ROW) and paved roads (outside the permanent and temporary ROW). Trucks and all equipment will be washed every time they leave the site. Excess dirt on the wheels, undercarriage, and bodies of trucks exiting work areas will be removed prior to allowing the trucks to exit onto paved roads, to reduce track-out of soils, debris, and invasive and noxious weeds. SNWA's Construction Inspector and the Environmental Compliance Representative will supervise and monitor use of the wheel washing stations.

A.1.36 During construction, all unpaved access roads used by construction personnel, equipment, and materials deliveries will be maintained in coordination with local county and BLM requirements. This maintenance may include use of additional road base materials to maintain road integrity.

A.1.37 At the completion of construction, previously existing access roads will be restored to pre-construction conditions or better. Improvements made for construction will be left in place. In areas of silty soils, the roads will be restored to pre-construction conditions or better.

A.1.38 Construction contractors will provide site security for equipment and materials, and to limit access to construction sites to authorized personnel. This may be accomplished through use of security personnel, signage, and/or fencing of facility sites as needed.

A.1.39 Firearms and domestic dogs will be prohibited from the ROW, except as used by authorized law enforcement personnel.

A.1.40 The ROW will be kept free from any accumulation of construction waste, trash, and debris, to reduce the attractiveness of the area to opportunistic predators such as desert kit fox, coyotes, and common ravens. Food-related trash, also including cigarettes, cigars, gum wrappers, tissue, cans, paper, and bags, will be disposed of promptly in predator-proof containers with resealable lids. Trash containers will be removed regularly (following the close of each work day). Trash, debris, and/or waste will not be buried or burned. Disposal of trash and debris will be off-site, at a State of Nevada approved sanitary landfill site. Upon construction completion, all construction refuse, including but not limited to broken equipment parts, wrapping material, cords, cables, wire, rope, strapping, twine, buckets, metal or plastic containers, and boxes will be removed from the ROW and disposed of properly.

A.1.41 Sanitary waste will be contained within portable toilet facilities. Portable toilets will be obtained by construction contractors and sited in designated locations in the construction area. The toilets will be maintained and serviced as needed for the duration of construction, and removed at the completion of construction.

A.1.43 Hazardous and toxic materials such as fuels, solvents, lubricants, and acids used during construction will be controlled to prevent accidental spills. Toxic and hazardous materials will be stored in secondary containment structures to prevent any spilled material from leaving the area. Specific areas for equipment maintenance and refueling will be designated and identified in the detailed POD(s). Vehicle and equipment refueling and hazardous materials storage will not be allowed within 100 feet of any jurisdictional wash or stream.

A.1.44 Spill cleanup kits will be available on equipment and maintained so that any spill of fuels, solvents, lubricants, or acids can be quickly cleaned up. Construction and maintenance personnel will be trained in the proper use of the spill kit materials and correct disposal procedures.

A.1.45 Any leak or accidental release of hazardous and toxic materials will be stopped immediately and cleaned up at the time of occurrence. Contaminated soils will be removed and disposed of at a State of Nevada approved landfill site.

A.1.46 Any release of hazardous and/or toxic materials in excess of a reportable quantity established by 40 CFR, Part 117 will be reported as required by the Comprehensive Environmental Response, Compensation, and Liability Act, Section 102b. A copy of any report required or requested by any federal agency or state government as a result of a reportable release or spill of any toxic substances will also be submitted to the BLM.

A.1.47 For every active phase of construction, a water truck and other fire suppression equipment such as extinguishers and shovels will be available on-site during construction. A designated individual on each construction site will be responsible for fire watch and fire suppression. For welding crews, one team member will be responsible for fire watch, in addition to the individual designated for the construction site fire watch and fire suppression. When welding at field locations, all flammable materials (i.e., brush, litter) will be cleaned for a distance of 15 feet around the area.

A.1.53 A General Permit for Stormwater Discharges Associated with Construction Activity (NVR100000) will be obtained prior to any surface disturbance that includes clearing, grading, excavation, and/or stockpiling.

A.1.54 A site specific SWPPP will be prepared and implemented for each construction contract. The SWPPP will identify all potential sources of pollution which could affect the quality of stormwater discharges from the construction site, describe the construction activities that disturb soils at the site, provide an estimate of the total disturbance area, and identify waters of the United States within 1 mile of the site. A copy of the SWPPP will be kept on site and updated as needed to manage pollutants or reflect changes in site conditions.

A.1.55 A Spill Prevention, Control and Countermeasure Plan (40 CFR 112) will be prepared and submitted to the BLM. The plan will describe measures that will be taken to properly store, handle, and prevent hazardous materials from being picked up in stormwater and transported offsite. It will also contain measures related to clean up procedures and time frames, notification procedures, and restoration efforts for the affected area.

A.1.56 Construction sequencing will be designed and scheduled to create the shortest construction window practicable and the least amount of potential stormwater runoff. Construction, cleanup, and reclamation will be sequenced to minimize the time between ground disturbance and final restoration.

A.1.57 Erosion and sediment control will be implemented using both non-structural and structural BMPs. Non-structural BMPs are methods or programs such as education, management and development practices, good housekeeping, and construction sequencing. Structural BMPs are physical devices or means for removing, reducing, retarding, or preventing targeted stormwater runoff constituents, pollutants, and contaminants from reaching receiving waters, and will be identified in the detailed POD(s).

A.1.58 Temporary erosion and sediment controls will be installed as necessary prior to initial soil disturbance activities and will be maintained throughout construction and reclamation. These controls will be designed to retain sediment on site to the maximum extent practicable. Typical erosion and sediment control BMPs include:

- Siltation or filter berms;
- Filter or silt fencing;
- Sediment barriers, e.g., sand bags, hay bales, straw wattles (straw bound into rolls or bales);
- Rock or gravel mulches, wood chip, straw and bark mulches; and
- Jute and synthetic netting.

Any hay or straw used for erosion control will be certified weed-free. Temporary erosion and sediment controls will be removed after construction and/or when they are no longer needed.

A.1.59 During construction, broken structural erosion controls will be replaced or restored as soon as practicable but before the next forecasted precipitation event. Sediment will be removed from structures when sediment reaches 50 percent of the barrier capacity.

A.1.60 For construction activities crossing a dry wash, soil and spoil stockpiles will be pushed away from jurisdictional dry washes and stored a minimum of 10 feet above the ordinary high-water mark if silt fencing is used to limit sedimentation of these areas; otherwise, stockpiles will be located 100 feet away from dry washes. All stockpiles will be kept within project ROW.

A.1.61 At a minimum, a 10-foot long vegetation buffer strip or other erosion control measure such as straw bales or wattles (certified weed free) will be maintained between the cleared ROW and an adjacent drainage high-water mark of jurisdictional drainages if the time between clearing/grading and trenching/pipe installation is expected to exceed 10 days or if a precipitation event is forecast. The length of the buffer strip will cover the disturbance length, plus an additional 10 feet on each end, or longer as determined by the construction contractor, SNWA, or the BLM, to be necessary.

A.1.62 Non-stormwater discharges, including water from pipeline and facility hydrostatic testing and trench dewatering if needed, will be directed into existing dry washes or other downstream project facilities as feasible. Best management practices such as diffusers or other energy dissipaters, straw bales (certified weed free), or minor earthwork impoundments within the ROW will be used to control the flow of water and reduce erosion. Discharges will be managed and monitored so that they do not exceed the typical 2 to 5 year flood event of the existing washes. Water used for vehicle washing and similar purposes will be contained within designated areas using berms and allowed to percolate into the ground surface.

A.1.63 Stormwater compliance inspections will be conducted by SNWA throughout construction to ensure compliance with the SWPPP and Nevada Division of Environmental Protection (NDEP) permits. Inspections will include disturbed areas of the project that have not been stabilized, material and equipment storage areas that are exposed to precipitation, all erosion and sediment control measures installed within the ROW, all structural control measures, and all locations where vehicles enter and/or exit the ROW. Inspectors will notify the construction manager to suspend or redirect work activities where requirements of the SWPPP are not being followed, and implement corrective action as required to achieve compliance. Inspection reports will be maintained on file and submitted to the BLM and NDEP upon request.

A.1.64 A Hydrostatic Discharge Plan will be submitted to the BLM for approval, prior to the start of any discharges at the completion of construction.

A.1.65 Water quality of the non-stormwater discharges will be tested prior to discharge in accordance with NDEP permit requirements. If the hydrostatic testing water is not discharged into a body of water, the water will be tested for chlorine residual. If chlorine is found, it will be treated prior to discharge in accordance with discharge permit

requirements. If the hydrostatic testing water is discharged into a water body with designated beneficial uses, the water quality standards to maintain those beneficial uses will be tested for. These standards are specific to each particular water body, and will be tested for accordingly. If there is a constituent that exceeds the water quality standard, the water will be treated in accordance with National Pollutant Discharge Elimination System permit requirements or hauled off site for disposal.

A.1.66 At the completion of construction, all non-natural berms, ditches, temporary erosion and sediment controls, bales, wattles, and other energy dissipating/filtering devices not required for protection of facilities will be removed, and drainages restored to their original form. Soils used for erosion control structures and soils captured by those structures will be utilized in the ROW for permanent facilities construction, or disposed in the borrow pits that are approved for the project. Bales, wattles, and other energy dissipating/filtering devices will be disposed of in approved trash receptacles. The ground surface will be graded to match the surrounding topography and/or slopes as closely as possible.

A.1.67 Desert washes and ephemeral drainages will be restored to pre-existing conditions. Soils will be compacted, and additional stabilization measures such as rip rap may be required to protect the facilities and prevent increased erosion in the wash. If armoring of the channel crossing with rip-rap or concrete due to high erosion potential is necessary, those areas would be identified in the POD for BLM approval.

A.1.68 Post-construction stormwater management will consist of permanent erosion control measures installed as necessary at the completion of construction to protect areas disturbed by SNWA activities. These could include vegetation restoration, tracking and matting of steep slopes to maintain stability, berming, and/or placement of riprap. Final stabilization of soil disturbed areas will be achieved when vegetation restoration is completed in accordance with the BLM-approved Restoration Plan and NDEP stormwater permit requirements.

A.1.69 A detailed Restoration Plan will be prepared and submitted to the BLM for approval prior to the start of construction. The Restoration Plan will describe reclamation and rehabilitation objectives and methods to be used, species of plants and/or seed mixture to be used, time of planting, success standards, and follow-up monitoring. Reclamation will range from re-contouring, to rehabilitation and restriction of access points, to intensive reclamation over the entire area of surface disturbance.

A.1.70 Vegetation conditions of the ROW and adjacent reference site locations will be documented in the Restoration Plan prior to construction, to establish baseline conditions for restoration. SNWA shall use the Nevada Guidelines for Successful Revegetation prepared by the Nevada Division of Environmental Protection, the BLM, and the U.S. Department of Agriculture Forest Service (or most current revision or replacement of this document) to determine if revegetation is successful, unless otherwise approved by the BLM. Restoration will focus on restoring pre-existing habitat conditions, with the exception of pinyon-juniper habitat which has encroached on sagebrush habitat within some portions of the ROW. Soil data maps from the Natural Resources Conservation Service will be used, in consultation with BLM, to determine which ecological pinyon-juniper sites will be restored to sagebrush habitat.

A.1.71 All cacti and yucca within the ROW that will be disturbed in the Mojave Desert habitat portion of the project will be salvaged, with the following exceptions:

- Cholla, including silver or golden cholla (*Opuntia echinocarpa*) and pencil cholla (*Opuntia ramosissima*), equal to or greater than 3 feet tall or less than 1 foot tall (i.e., only these species of cholla between 1 foot and less than 3 feet tall will be salvaged)
- All cacti and yucca whose vegetative mass is more than 40 percent dead (i.e., apical leaves, brown or significantly chlorotic, stems rotten or significantly desiccated, etc.)
- All cacti and yucca less than 1 foot tall (excluding barrel cactus [*Ferocactus cylindraceus*], cottontop cactus [*Echinocactus polycephalus*], and hedgehog cactus [*Echinocereus* sp.])
- All yucca, including Joshua tree (*Yucca brevifolia*), that are over 6 feet in height
- Any cacti or yucca that cannot be accessed safely due to steep slopes or very rocky areas
- All cacti and yucca not salvaged will be left on-site to become part of the vegetative mulch.

A.1.72 Within the portion of the ROW located within special designation areas (e.g., critical habitat, areas of critical environmental concern) identified in BLM Resource Management Plans or other federal policies or directives, additional shrub salvage or enhanced seed application will be conducted to enhance restoration efforts. Additional shrub salvage may be accomplished by either 1) salvaging from BLM lands within the ROW, 2) salvaging from an approved off-site harvest site, and/or 3) propagation of shrubs from native seed in an approved nursery.

A.1.73 Salvaged cacti, yucca, and shrubs will be transported to designated temporary nursery sites within the ROW until restoration activities commence. Upon approval from the BLM, salvaged vegetation may also be stored at designated off-site nurseries. Salvaged plants from the same general areas will be grouped together and identified for future replanting in the areas from which they were salvaged. All salvaged plant material will be approved by the BLM or on-site biologist prior to transplanting into the nursery sites. A list will be developed for each nursery site to verify that the quantities of plant material match what and where it was extracted.

A.1.74 Plant salvage will occur only within the permanent and temporary ROW, as indicated in Restoration Plan. Salvaging will not begin until the permanent and temporary ROW has been clearly staked and flagged. As feasible, salvage operations will not be performed during periods of high temperatures or other unfavorable environmental conditions. All salvaged plants will be documented and catalogued.

A.1.75 Prior to commencing any plant salvage operations, a Free Use Permit, Flora transportation tags, or any other required permits will be obtained to transport salvaged plants as part of restoration activities.

A.1.76 Salvaged plants will be maintained for the duration of construction activities, until replanted within the ROW as part of site restoration. Maintenance will include necessary watering and other care to ensure reasonable survival of the salvaged plants.

A.1.77 At the completion of construction, in areas where there are no above-ground facilities, permanent access roads, or facilities no less than 12 inches below the ground surface, the ground surface will be ripped to an appropriate depth based on site characteristics to help relieve compaction, to establish an adequate seed bed to provide good seed-to-soil contact, and facilitate water penetration and plant establishment. Topsoil, mulched vegetation and boulders salvaged at the start of construction will be re-spread across the ROW at the completion of construction. Boulders will be redistributed in densities and patterns similar to adjacent undisturbed areas.

A.1.78 Upon the completion of topsoil replacement, salvaged plants will be removed from the nursery sites and transplanted within the ROW, in areas not occupied by above-ground facilities or access roads. Efforts will be taken to restore plants to the same general area from which they were salvaged. Plants will be replanted in a random and non-uniform pattern, in an effort to mimic the adjacent non-disturbed native plant communities. Planting holes will be two times the size of the plant material to be transplanted and will be pre-watered. All backfill will be free of debris, foreign objects, rocks large enough to obstruct root growth or watering, and noxious weeds. As feasible, transplanting will not occur during periods of high temperatures or other unfavorable environmental conditions.

A.1.79 A comprehensive seeding program will be applied after completion of topsoil and plant replacement. The seed mix, application rate, and application method will be described in the Restoration Plan and approved by the BLM. Vegetable-based soil binders and/or hydromulch may be used on steep slopes to reduce seed movement and erosion. Seeds for restoration will be obtained from native local seed and/or a BLM-approved commercial seed vendor, and will be certified free of plant species listed on the Nevada noxious weed list or specifically identified by the BLM.

A.1.80 A final watering will be conducted approximately 2 weeks after completion of seeding, to help remove air pockets and compact soils in and around the roots of transplanted vegetation. Additional supplemental watering may be conducted, if practicable based on access, and if needed to enhance restoration.

A.1.81 Signs indicating restoration activities are being conducted may be installed where needed to deter public off-road vehicular damage to restored areas. Placement and design of signs will be coordinated with the BLM and identified in the Restoration Plan.

A.1.82 An Integrated Weed Management Plan will be prepared and submitted to the BLM for approval prior to the start of construction. The portion of the plan pertaining to restoration in listed species or technical assistance species habitat will also be submitted to the USFWS. Noxious weed control will be implemented to minimize the spread of noxious weeds during and following construction activities. All weed control efforts on BLM-administered lands will be in compliance with BLM Handbook H-9011, H-9011-1 Chemical Pest Control, H-9014 Use of Biological Control Agents of Pests on Public Lands, and H-9015 Integrated Pest Management.

A.1.83 Areas within the ROW that have pre-existing noxious weed infestations will commence to be treated with a BLM-approved control method (i.e., chemical, mechanical, and/or biological controls) two to three years prior to the start of construction activities, as feasible. If noxious weed infestations still exist within the ROW at the start of

construction, topsoil and fill will be kept segregated and not transported to other areas within the ROW.

A.1.84 Prior to the import of borrow or fill from outside the ROW, the source material location will be inspected by a qualified biologist or weed scientist to ensure it is free of noxious weeds or specifically identified in the BLM approved Integrated Weed Management Plan for the project.

A.1.85 Any hay, straw, or other organic products used during construction, restoration, operations, maintenance, or for stabilization will be certified free of plant species listed on the Nevada noxious weed list or specifically identified in the BLM approved Integrated Weed Management Plan for the project.

A.1.86 Vehicles and equipment will be cleaned with a high pressure washer prior to arrival on the ROW and prior to departure from areas of known noxious weed infestations to prevent or at least minimize the introduction or spread of noxious weeds. Cleaning efforts will concentrate on tracks, tires, and vehicle undercarriage, with special emphasis on axles, frames, cross members, motor mounts, on and underneath steps, running boards, and front bumper/brush guard assemblies. Vehicle cabs will be swept out and refuse will be disposed of in waste receptacles. Cleaning sites will be recorded using global positioning systems or other mutually acceptable equipment and provided to the BLM Weed Coordinator or designated contact person.

A.1.87 Specific vehicle washing stations will be designated within the ROW for vehicle and equipment washing. These areas will be identified in the detailed POD(s) and approved by the BLM. Cleaning areas will be monitored for growth of noxious weeds and treated accordingly.

A.1.88 SNWA or its certified licensed contractor will submit a Pesticide Use Proposal to the BLM prior to the planned application of any herbicide and a Pesticide Application Record after the planned application of the herbicide. The pesticide use proposal will identify areas of planned herbicide application for BLM use in consultation with Native American tribes, if necessary. No herbicide mixing or rinsing of containers or application equipment will occur within 100 feet of natural water sources (i.e., lakes, streams, or springs). An annual report on herbicide application on public lands within the ROW will be provided to the BLM.

A.1.89 Herbicides will not be sprayed within or around an exclusion area containing sensitive resources. These areas will be delineated with orange snow fencing during construction or by GPS data. Removal of noxious and invasive weeds in these areas shall be accomplished by alternative method(s) approved by the BLM.

A.2.1 Facility inspection and maintenance will only use established access roads, and no off-road travel will be allowed. While driving on paved roads or marked dirt roads, posted speed limits will be maintained. While driving on un-posted dirt roads, a maximum speed limit of 25 miles per hour will be maintained to reduce dust and allow for observation of desert tortoise, livestock, wild horses, or other wildlife in the road.

A.2.2 The ROW will be maintained in a clean condition, and any waste material, including human waste, trash, garbage, refuse, oil drums, petroleum products, ashes, and equipment

that may be deposited in the ROW will be disposed of promptly at a State of Nevada approved landfill site.

A.2.3 Hazardous materials at the WTF will be stored in secondary containment structures, in compliance with Clark County and Occupational Safety and Health Administration (OSHA) standards.

A.2.4 Pipelines and facilities will be equipped with pressure and flow sensors that will immediately indicate a major system failure or break. The system will begin an automatic shutdown process to isolate the affected area. Valve placement and storage capacity are planned to allow isolation of pipeline segments to minimize drainage volumes as much as possible. Personnel will be promptly mobilized to evaluate and repair any failure as quickly as possible.

A.2.5 Stormwater discharges will be managed during facility operation by conducting regular inspection and maintenance of any permanent erosion control structures. Inspections will be conducted prior to and immediately following a rain event. Maintenance will be performed on the permanent structures as needed.

A.2.6 Pipeline or other facility repairs that may be needed will be accomplished within the ROW, following all environmental requirements of this plan. If additional temporary ROW is required for pipeline or facility repair, prior written approval will be obtained from the BLM. If additional area is required for emergency repairs, such as in the case of a major system failure or break, SNWA will obtain BLM verbal or written permission prior to any disturbance outside of the permitted ROW.

A.2.7 Limit maintenance of existing roads to the existing disturbance, and perform maintenance in accordance with specifications provided by the Ely District Office in consultation with the USFWS.

A.2.8 If major infrastructure replacements or improvements are required, additional temporary ROWs may be required. Notification and prior approval for said additional temporary ROWs will be obtained from the BLM as required.

A.2.9 Vegetation restoration success will be monitored by SNWA and reported to the BLM, as defined in the approved Restoration Plan for BLM lands. Monitoring will include both qualitative and quantitative data collection and analysis. Restoration will be considered successful when the area meets a specified percentage of vegetation cover and species density compared to adjacent reference sites. Vegetation restoration success on non-BLM lands will be coordinated with the respective landowners.

A.2.10 Annual restoration monitoring reports will be submitted to the BLM for 7 years documenting post-construction monitoring, and will include but not be limited to activities conducted, current status, recommended future activities, and lessons learned. Along with the annual report in the fifth and seventh years, SNWA will include a quantitative analysis, to allow opportunity following the fifth-year report to correct any issues that may prevent restoration site release within the subsequent 2 years. If monitoring indicates that restoration is not trending towards meeting or has not met designated success criteria, the restoration activities may be revised and remedial measures implemented, subject to BLM approval. Restoration activities and annual reporting shall continue until the restoration fulfils the requirements of the BLM-

approved Restoration Plan, and SNWA receives written release from BLM. Since successful restoration may be achieved in some areas more quickly than other sites, written approval shall identify the area released.

A.2.11 In the unlikely event of a major system rupture resulting in discharge of water greater than 5,000 gallons or off-site erosion, SNWA will notify BLM and other appropriate government entities as identified in the Emergency Response Plan. SNWA will coordinate with the BLM to develop and implement incident-specific restoration measures as directed by the BLM.

A.2.12 The ROW and primary unpaved access routes used for facility inspections will be monitored for noxious weeds from the start of construction until termination of the ROW. Noxious weeds will be treated with a BLM-approved control method (i.e., chemical, mechanical, and/or biological controls) as needed. A Pesticide Use Proposal will be submitted to the BLM prior to any planned noxious weed herbicide application, and a Pesticide Application Record will be submitted after weed herbicide use. All applications of herbicides shall comply with BMPs, SOPs, and Conditions from the Vegetation Treatments Using Herbicides on BLM Lands in 17 Western States Programmatic EIS (BLM, 2007).

A.2.13 An annual report on noxious weeds conditions and control activities within the ROW will be submitted to the BLM.

A.5.2 Qualified biologists will act as biological monitors and be present on-site during project-related actions that may impact sensitive biological resources. The authorized BLM officer will approve the selected consulting firm/biologists to be used to implement the terms and conditions of the Biological Opinion or other agreements between SNWA, the BLM, and other federal or state agencies. Any biologist and/or firm not previously approved will submit a curriculum vitae and be approved by the BLM authorized officer. Other personnel may assist with implementing terms and conditions that do not involve tortoise handling, monitoring, or surveys, but only under direct field supervision of the BLM-approved biologists.

A.5.3 All necessary federal and state handling permits will be obtained and will comply with Nevada Revised Statutes (NRS) 503.597.

A.5.4 The biological monitors will be responsible for determining compliance with measures as defined by the Biological Opinion or other agreements between SNWA, the BLM, and other federal or state agencies. Biological monitors will have the authority to halt non-emergency construction activities that are not in compliance with these measures. Stop work directives will be effective long enough to remedy the immediate situation, and will be limited to the equipment and parties involved in the situation. All action of non-compliance or conditions of threat to protected species will be recorded immediately by the biological monitor and reported to SNWA. SNWA will immediately report all such action and conditions to BLM for reporting to the USFWS and/or NDOW.

A.5.5 No intentional harassment or harming of animals will be allowed. Animals found entrapped in open holes, open pipes/culverts, or excavations will be reported to the biological monitor. Before any pipe with a diameter of 3 inches or greater is buried, capped, or moved it will first be inspected for animals. If the wildlife is unable to escape

on its own, it will be moved from the construction area by the biologists, in accordance with applicable federal and state guidelines. The Environmental Compliance Representative will report to the BLM and other federal or state agencies, in accordance with permit requirements, any entrapment, death, or injury to federal or state listed threatened or endangered, or special status species.

A.5.6 Prior to discharge of water used for hydrostatic testing of the pipeline and other facilities, all appropriate discharge and biological permits will be obtained and the drainage locations will be surveyed for special status species and nesting migratory birds. BLM will be notified of any special status species or nesting migratory birds found in the drainage area, and will determine whether additional measures need to be implemented prior to the discharge, beyond those identified in project permits and any other applicable agreements or requirements between SNWA and the BLM, USFWS, or NDOW.

A.5.7 Biological resource monitoring and compliance updates will be provided to the BLM throughout the construction period for record keeping and project documentation purposes. These will include information on ongoing construction activities, monitoring, wildlife and special status species observations, species relocations, entrapped special status species, and any other pertinent biological issues. Updates may be written or oral, as agreed upon by the BLM and SNWA biologists. An annual written report will be provided to the BLM.

A.5.8 Perch discouraging devices will be installed on new power lines in areas identified by the BLM and USFWS as having increased predation risk to sensitive species from perching raptors and Corvids (birds of the crow family). Perch discouraging devices will manage where the birds perch, but cannot entirely prevent perching (APLIC, 2006).

A.5.16 Appropriate state and federal permits or letters of authorization will be acquired prior to handling desert tortoises and their parts, and prior to initiation of any activity that may require handling tortoises. Desert tortoise will only be handled by BLM and USFWS approved biologists and solely for the purpose of moving them out of harm's way. If a tortoise is found onsite during project activities, which may result in take of the tortoise (i.e., in harm's way), such activities shall cease until the tortoise moves, or is moved, out of harm's way.

A.5.17 Biologists, monitors, or anyone responsible for conducting desert tortoise monitoring or desert tortoise field activities associated with the project will complete the USFWS's Qualifications Form and submit it to the USFWS for review and approval as appropriate. The USFWS should be allowed 30 days for review and response.

A.5.18 For construction of desert tortoise exclusion fencing (measure A.1.14), the biologists will survey the fence construction area for desert tortoises and their burrows using USFWS approved protocols. If construction occurs during the desert tortoise active season (March 1 through October 31), or when temperatures and environmental conditions are conducive to tortoise activity as determined by an authorized biologist, two surveys would occur. The first survey would be conducted within 7 days prior to surface-disturbance; and the second survey would occur within 24 hours of surface disturbance. A biological monitor will remain onsite during construction of the tortoise exclusion fencing to ensure that no tortoises are harmed. If the fence is constructed during the inactive season (November 1 through February 28/29, except as noted above) when

conditions are not conducive to tortoise activity as determined by an authorized biologist, one survey would occur within 72 hours of surface disturbance. Tortoise burrows that occur immediately outside of the fence alignment that can be avoided by fence construction activities will be clearly marked to prevent crushing.

A.5.19 For areas within desert tortoise habitat not enclosed by tortoise exclusion fencing, prior to ground disturbing activities within the ROW, the biologists will survey for desert tortoises and their burrows using USFWS approved protocols. If construction occurs during the desert tortoise active season (March 1 through October 31), or when temperatures and environmental conditions are conducive to tortoise activity as determined by an authorized biologist, two surveys would occur. The first survey would be conducted within 7 days prior to surface-disturbance; and the second survey would occur within 24 hours of surface disturbance. During the inactive season (November 1 through February 28/29, except as noted above) when conditions are not conducive to tortoise activity as determined by an authorized biologist, one survey would occur within 72 hours of surface disturbance. All potential desert tortoise burrows will be examined to determine occupancy of each burrow by desert tortoises in accordance with USFWS-approved protocol.

A.5.20 For areas enclosed by tortoise exclusion fencing, clearance surveys will be conducted no more than 7 days before the start of any construction activity. These clearance surveys will follow standard USFWS protocol, to facilitate discovery of all burrows, regardless of orientation.

A.5.21 All burrows found in the construction area, whether occupied or vacant, will be excavated by the biologists and collapsed or blocked to prevent desert tortoise re-entry. All burrows will be excavated by hand, with hand tools, to allow removal of desert tortoises or desert tortoise eggs. All desert tortoise burrows, other species' burrows, and natural excavations that may be used by tortoises where the burrow end cannot be seen or occupancy cannot be determined, will be examined with a fiber-optic scope or miniature closed-circuit video probe to determine occupancy by desert tortoises.

A.5.22 All desert tortoises and desert tortoise eggs found within the construction area will be relocated by the biologists 300 to 1,000 feet from the construction area into adjacent, undisturbed habitat. Tortoises and nests that are found will be handled and moved out of harm's way by the biologists in accordance with USFWS-approved protocol. Burrows containing tortoises or nests will be excavated by hand, with hand tools, to allow removal of the tortoise or eggs. Desert tortoises moved during the tortoise inactive season or those in hibernation, regardless of date, will be placed into an adequate burrow; if one is not available, one will be constructed in accordance with Desert Tortoise Council protocol. During mild temperature periods in the spring and early fall, tortoises removed from the site may not necessarily be placed in a burrow; if not placed in a burrow, tortoises will be placed under a shrub or other shelter. Tortoises and burrows will only be relocated to federally managed lands. All burrows found in the construction area, whether occupied or vacant, will be excavated by the biologists and collapsed or blocked to prevent desert tortoise re-entry.

A.5.23 Desert tortoises moved in the winter (i.e., November 1 through February 28/29), or those in hibernation regardless of date, will be placed into an adequate burrow; if one is not

available, one will be constructed utilizing the protocol for burrows in Section B.5.f. of the USFWS-approved guidelines (same as Desert Tortoise Council protocol).

A.5.24 Tortoises found above ground will be placed under a shrub in the shade. Desert tortoises moved during inactive periods will be monitored for at least two days after placement in the new burrows to ensure their safety. The biologists will be allowed sufficient judgment and discretion to ensure that survival of the desert tortoise is likely.

A.5.25 Desert tortoises will be treated in a manner to ensure that they do not overheat, exhibit signs of overheating (e.g., gaping, foaming at the mouth, etc.), or are placed in a situation where they cannot maintain surface and core temperatures necessary to their well-being. Desert tortoises will be kept shaded at all times until it is safe to release them. No desert tortoise will be captured, moved, transported, released, or purposefully caused to leave its burrow for whatever reason when the ambient air temperature is above 95ºF. Ambient air temperature will be measured in the shade, protected from wind, at a height of 2 inches above the ground surface. No desert tortoise will be captured if the ambient air temperature is anticipated to exceed 95ºF before handling and relocation can be completed. If the ambient air temperature exceeds 95ºF during handling or processing, desert tortoises will be kept shaded in an environment that does not exceed 95ºF and the animals will not be released until ambient air temperature declines to below 95ºF.

A.5.26 Any desert tortoise found within one hour before nightfall or when ambient temperatures reach or exceed 95º F will be placed in a separate clean cardboard box and kept upright in a predator-free location under appropriately controlled temperatures to minimize stress to the desert tortoise. Each box will be used once and then disposed of properly. The desert tortoise will be released the following day in the area from which it was collected and using the procedures described above.

A.5.27 Each desert tortoise will be handled with a different pair of disposable latex gloves. After each use, the gloves will be properly discarded and a fresh set used for each subsequent desert tortoise handling.

A.5.28 If the biologists identify any desert tortoises to be at high risk for death or injury, they will contact the USFWS for translocation direction. High risk conditions may include crushed or injured limbs or shell, signs of overheating, or disease.

A.5.29 Where appropriate, restrict permitted activities from March 1 through October 31 within desert tortoise habitat.

A.5.30 BLM and USFWS approved biologists will monitor construction activities in desert tortoise habitat using techniques approved by the USFWS and BLM. The level of monitoring will depend upon whether the area is enclosed by tortoise exclusion fencing or not, and whether the activity is taking place within the tortoise active period (March 1 through October 31) or inactive period (November 1 through February 28/29).

- If any construction-related activities occur in an area not totally enclosed by tortoise exclusion fencing during the active tortoise period, a biological monitor will be assigned to each work crew or piece of ground-disturbing equipment and will clear the vehicle ingress/egress path and parking or work areas before allowing the construction activity to commence. Prior to starting operations each day, the biological monitor will inspect the following locations: around and under all

equipment and vehicles; in and around all disturbed areas including stockpiles and reject materials areas; in and around all routes of ingress and egress; and in and around all other areas where the operation might expand to during that day.

- If any construction-related activities occur in an area not totally enclosed by tortoise exclusion fencing during the inactive tortoise period, a clearance survey will be conducted (as described in measure A.5.19). Subsequent desert-tortoise monitoring will not be required, however, biological monitoring for compliance with other environmental stipulations will still occur.
- If construction activities are completely enclosed by tortoise exclusion fencing, biological monitoring will not be required other than periodic inspections of the exclusion fencing.
- For access roads outside the ROW, other than state and federal highways which are not enclosed by tortoise exclusion fencing, a biological monitor will be assigned to every 5 miles of access road during the active season.

A.5.31 If any construction pipe, culverts, or similar structures with a diameter of 2 inches or greater are stored in areas of desert tortoise habitat not enclosed by tortoise exclusion fencing, they will be inspected by a biological monitor for the presence of tortoises before the material is moved, buried, or capped. Alternatively, all such structures may be capped before being stored.

A.5.32 In desert tortoise habitat, any time a vehicle is parked in an area not enclosed by tortoise exclusion fencing, whether the engine is engaged or not, the ground around and under the vehicle will be inspected for desert tortoise prior to moving the vehicle. If a desert tortoise is observed, a biologist will be contacted to safely move the animal. If possible, the desert tortoise will be left to move on its own. If the desert tortoise does not move within 15 minutes, the desert tortoise will be removed and moved out of harm's way by the biologist. Checking under parked vehicles is also recommended, but not required, for areas enclosed by tortoise exclusion fencing.

A.5.34 In the event that blasting is required in desert tortoise habitat, a 200-foot-radius area around the blasting site would be surveyed for desert tortoises prior to blasting, using 100-percent-coverage survey techniques. All tortoises found above ground or in pallets within this 200-foot-radius of the blasting site would be moved 500 feet from the blasting site. Additionally, tortoises in burrows within 75 feet of the blasting would be placed into an artificial or unoccupied burrow 500 feet from the blasting site. This would prevent tortoises that leave their burrow upon translocation from returning to the blasting site. Tortoises in burrows at a distance of 75 to 200 feet from the blasting site would be left in their burrows. Burrow locations would be flagged and recorded using a GPS unit and burrows would be stuffed with newspapers. Immediately after blasting, newspaper and flagging would be removed. Detonation would only occur after an area has been cleared by a biologist and within a short enough time period to prevent tortoises that have been relocated from returning to the site prior to the completion of detonation. Effects of blasting on desert tortoise and their burrows shall be reported to the BLM and USFWS.

A.9.1 All construction equipment will be equipped with manufacturer's standard noise control devices (i.e., mufflers, acoustical lagging, and/or engine enclosures). All construction

equipment will be inspected at periodic intervals to ensure proper maintenance and presence of noise control devices.

A.9.2 Pumping stations will be enclosed and utilize design features to minimize operational noise levels. Pressure reducing station valves will be fully enclosed in vaults. Potential facility noise levels will be estimated during facility design, and features incorporated to minimize normal operational noise levels with an objective of 70 dBA or less at 500 feet from the facility.

A.9.3 Equipment will be operated conservatively, which means the operator will take special care not to throttle the engine excessively and will keep engine speed as low as possible. In addition, the operator will not leave the equipment running or idling needlessly.

A.10.1 Dust control permits will be obtained for each construction contract in accordance with local, county and/or state requirements. These will be a Dust Control Permit in Clark County, and a Surface Area Disturbance permit in Lincoln and White Pine Counties. The permits will contain a Dust Control Plan listing all construction activities that will occur and the BMPs that will be used to mitigate construction dust. The BMPs will include site-specific dust control measures that are based on each project soil type, specific construction activities, phases and stages. They may include:

- Watering, pre-watering to maintain moisture or to form crust,
- Applying clean gravel, paving, applying and maintaining a dust palliative or dust suppressant, covering or enclosing material,
- Covering or stabilizing soil with vegetation,
- Using phased construction,
- Limiting size of ingress and egress points,
- Limiting size of staging areas,
- Limiting vehicle speeds on the work site,
- Cessation of operations when winds make fugitive dust control difficult,
- Berming or fencing to prevent unauthorized access to disturbed areas, and
- Application of track-out controls.

A.10.2 In accordance with dust control permits, SNWA will conduct air quality readings (wind speed, emissions, etc.). The readings will occur on an as-need be basis, as defined by the appropriate permits. Generally, it is anticipated that measurements will be taken during windy periods and construction practices altered as needed to stay within attainment.

A.10.3 Any dust palliative, dust suppressant, or tackifier used within threatened and endangered species habitat or active drainages will be approved by the BLM and USFWS prior to use.

A.10.4 Operating permits will be obtained for stationary sources as necessary, such as aggregate rock handling equipment, rock crushers, conveyors, and screening equipment, which may emit particulate matter. The operating permit will be obtained from the local county and/or the state, and will include operating requirements, reporting requirements, and pollutant emission limits. Fugitive dust control measures will be used during material transfer operations, such as pre-watering, water sprays at drop points, and covered conveyors.

A.10.5 Operating permits will be obtained for combustion equipment such as stationary internal combustion engines (greater than 250 horsepower) used during construction or operation of the project. The Operating Permit will include operating requirements, reporting requirements and pollutant emission limits.

A.10.6 Active construction sites and unpaved roads used for construction will be watered daily or chemical dust suppression approved by the BLM will be applied, as needed, to maintain effective dust control.

A.10.7 In periods of excessive wind speed (sustained over 40 miles per hour), excavation and grading activities will be suspended or additional watering applied to maintain dust control.

A.10.8 Soil stockpiles will be covered, and a tackifier, water, or other BLM-approved erosion control measure will be applied as needed to maintain effective dust control.

BLM Mitigation Measures

None.

6.2.2 Groundwater Development Facilities

SNWA ACMs

B.2.1 All necessary notices, permits and waivers for drilling of wells will be submitted or obtained from the Nevada State Engineer. In accordance with Chapter 445A of NRS, a "Temporary Authorization to Discharge" Permit from NDEP will be obtained prior to hydraulic testing of groundwater wells, if applicable. Well abandonment and plugging will be in accordance with the Nevada Division of Water Resources requirements, set forth in the Nevada Administrative Code, section 534.

B.2.2 Water generated during drilling of wells will be contained in a small settling pit on-site or a tank, and then directed towards existing dry washes.

B.2.3 Hydraulic testing water from well drilling and hydrostatic testing water from collector pipelines will be directed towards existing dry washes as feasible. Best management practices such as diffusers, straw bales, or other energy dissipaters will be used to control the flow of water and reduce erosion. Discharges will be managed and monitored so that they do not exceed the typical 2 to 5 year flood event of the existing washes.

B.2.4 Lighting needed to conduct drilling or pipeline construction at night will be limited to the basic requirements to conduct the work. Lighting will be shielded, and directed down towards the site and not into surrounding areas or onto roads.

BLM Mitigation Measures

None.

6.2.3 Groundwater Pumping

SNWA ACMs

None.

BLM Mitigation Measures

None.

6.3 PAHRUMP POOLFISH

6.3.1 Tier 1 ROW

SNWA ACMs

None.

BLM Mitigation Measures

None.

6.3.2 Groundwater Development Facilities

SNWA ACMs

None.

BLM Mitigation Measures

None.

6.3.3 Groundwater Pumping

SNWA ACMs

B.1.1 Groundwater production well sites will be selected considering:

- Proximity to main and lateral pipelines
- Proximity to existing roads or utility corridors
- Suitable hydrogeologic conditions, including well yield, groundwater drawdown, and groundwater chemistry, based upon exploratory drilling
- Adequate well spacing
- Avoidance of springs, streams, and riparian/wetland areas
- Avoidance of cultural resource sites eligible for the NRHP
- The presence of special status species and their habitat.

C.1.4 SNWA will record discharge and water levels in all SNWA production wells on a continuous basis.

C.1.11 The Spring Valley Stipulation identified that SNWA, in consultation with the TRP, will construct and equip two monitoring wells in the vicinity of Shoshone Ponds. The TRP has selected the two monitoring well locations. SNWA will continuously monitor the water levels in each of the wells. SNWA will not withdraw any quantity of groundwater for beneficial use in accordance with the water right permit issued near Shoshone Ponds for a period of three years from the completion of the monitoring wells referred to in this paragraph or four years from the issuance of the permit for the SNWA carbonate-rock aquifer production well constructed closest to the Shoshone Ponds.

C.1.42 Biological monitoring may include these areas within the Delamar, Dry Lake, and Cave Valley hydrographic basins, but only to the extent that access can be obtained:

1. Biological monitoring of the valley floor and range-front springs where special status species occur, to the extent that access can be obtained. The Stipulation Parties will work to gain access to these areas to the maximum extent possible;
2. Monitoring of the water dependent ecosystems on the valley floors, to the extent that these exist;

SNWA has prepared a Conceptual Adaptive Management Framework (AM Framework) to be refined and implemented during future site-specific NEPA review. The AM Framework sets out a potential process for implementing practicable adaptive management measures to address adverse environmental impacts associated with SNWA groundwater withdrawals for the GWD Project, the nature, location, and extent of which are currently unknown. The AM Framework outlines the process to collect baseline data, identify environmental indicators and establish adaptive management thresholds, conduct monitoring of environmental indicators and SNWA's groundwater pumping, determine whether SNWA's groundwater pumping has likely caused or contributed to adverse environmental impacts, and if so, to determine the appropriate adaptive management strategy to avoid future adverse environmental impacts and minimize or mitigate those that have already occurred. A suite of additional measures are outlined in Section C.2 which may be implemented, as needed, through the adaptive management process to address potential impacts, which include:

C.2.1 In accordance with the Spring Valley and DDC Stipulations and any future water right rulings, implement actions to mitigate: injury to Federal water rights; unreasonable adverse effect to Federal resources; effects to Federal resources within Great Basin National Park; unreasonable adverse effect to special status species; impacts to existing water rights as determined by the Nevada State Engineer; conflicts with protectable interests in existing domestic wells as set forth in NRS §533.024; and/or threats that prove detrimental to the public interest or is found not to be environmentally sound, as determined by the Nevada State Engineer. These mitigation actions could include, but are not limited to:

- Geographic redistribution of groundwater withdrawals
- Reduction or cessation in groundwater withdrawals
- Provision of consumptive water supply requirements using surface and groundwater sources
- Augmentation of water supply for Federal and existing water rights and Federal resources using surface and groundwater sources
- Acquisition of real property and/or water rights dedicated to the recovery of special status species within their current and historic habitat range
- Provision of resources to restore and enhance habitat on the Pahranagat National Wildlife Refuge
- Other measures as agreed to by the Stipulation Parties that are consistent with the Stipulations and/or required by the Nevada State Engineer

BLM Mitigation Measures

GW-WR-5: Shoshone Ponds. Drawdown is likely to impact the source of water that supports important aquatic resources for Shoshone Ponds. Impacts to Shoshone Ponds that are attributable to the SNWA's groundwater pumping would be mitigated by improving the existing

well or drilling a new well, and installing a pump such that the well, pump, and water conveyance system are designed to maintain the flow to the ponds for the foreseeable future regardless of the groundwater drawdown. Any new well should be designed to pump groundwater from the same aquifer currently used as the source of water for the ponds.

6.4 WHITE RIVER SPINEDACE

6.4.1 Tier 1 ROW

SNWA ACMs

None.

BLM Mitigation Measures

None.

6.4.2 Groundwater Development Facilities

SNWA ACMs

None.

BLM Mitigation Measures

None.

6.4.3 Groundwater Pumping

SNWA ACMs

B.1.1 Groundwater production well sites will be selected considering:

- Proximity to main and lateral pipelines
- Proximity to existing roads or utility corridors
- Suitable hydrogeologic conditions, including well yield, groundwater drawdown, and groundwater chemistry, based upon exploratory drilling
- Adequate well spacing
- Avoidance of springs, streams, and riparian/wetland areas
- Avoidance of cultural resource sites eligible for the NRHP
- The presence of special status species and their habitat.

C.1.38 SNWA agrees to ensure continued monitoring of certain existing spring discharge sites selected by the TRP. The following springs are currently monitored through a funding agreement between SNWA, the Nevada Division of Water Resources, and the USGS: Flag Springs, Hot Creek Spring, Moorman Spring, Ash Springs, and Crystal Springs. SNWA will make all data gathered pursuant to this funding agreement available to all Stipulation Parties and will include the data in baseline conditions. In the event this funding agreement changes, terminates or expires, the TRP, in coordination with the BRT, will determine which sites are to be included in the monitoring network. The basis for the selection of any site and the total number of sites selected will be to meet the common goals of the DDC Stipulation. The TRP will determine the methods of spring discharge measurement and will carefully consider the use of shallow wells to avoid damage to sensitive areas. In the event the funding agreement changes, terminates or expires, SNWA agrees to continue monitoring the springs selected by the TRP either

directly or through funding of a third party. For those springs located on private land, SNWA will use its best efforts to gain access for monitoring, but SNWA will not be responsible for monitoring on private land to which it cannot gain access.

C.1.42 Biological monitoring may include these areas within the Delamar, Dry Lake, and Cave Valley hydrographic basins, but only to the extent that access can be obtained:

Biological monitoring may include these areas within the adjacent hydrographic basins, but only to the extent that access can be obtained:

4. Monitoring of selected areas will be determined by the BRT in consultation with the TRP, for those special status species and their habitats that are most likely to be affected as a result of SNWA's groundwater withdrawals in the DDC Valley hydrographic basins. Monitoring locations will be determined by the BRT and may include the following areas:

    b. White River Valley: Hot Creek, Flag, Moorman, and Hardy Springs and phreatophytic habitats that support Special Status Species in Middle and Lower White River Valley, including the Kirch Wildlife Management Area.

SNWA has prepared a Conceptual Adaptive Management Framework (AM Framework) to be refined and implemented during future site-specific NEPA review. The AM Framework sets out a potential process for implementing practicable adaptive management measures to address adverse environmental impacts associated with SNWA groundwater withdrawals for the GWD Project, the nature, location, and extent of which are currently unknown. The AM Framework outlines the process to collect baseline data, identify environmental indicators and establish adaptive management thresholds, conduct monitoring of environmental indicators and SNWA's groundwater pumping, determine whether SNWA's groundwater pumping has likely caused or contributed to adverse environmental impacts, and if so, to determine the appropriate adaptive management strategy to avoid future adverse environmental impacts and minimize or mitigate those that have already occurred. A suite of additional measures are outlined in Section C.2 which may be implemented, as needed, through the adaptive management process to address potential impacts, which include:

C.2.8 Work with NDOW at the Flag Spring Complex in White River Valley to: 1) restore or enhance habitat for White River spinedace; 2) establish refugium to ensure long term conservation of the species; and 3) develop water management procedures and improvements that would optimize wetlands conditions for the species.

C.2.17 Purchase property or water rights, obtain conservation easements, and or work with existing irrigation water right holder on private land in White River Valley to implement activities that would preserve and enhance habitat for the White River spinedace.

BLM Mitigation Measures

GWN-MN-AB-2: Spring and Aquatic Biology Monitoring. If access can be obtained, monitoring would be conducted at the following springs where pumping effects are predicted (Butterfield and Flag in White River Valley; Blind, Cleveland Ranch, North Millick, and Osborne in Spring Valley; Caine in Snake Valley; and Wambolt in Lake Valley). These springs contain special status aquatic species and are not being monitored as part of the Spring Valley Stipulated Agreement. Cross-sectional profile measurements would be taken in the springs.

Biology surveys (fish, macroinvertebrates, springsnails, and amphibians would follow methods described in the Spring Valley Stipulated Agreement. If monitoring indicates pumping effects, alternative diversion points would be considered.

GW-MN-AB-3: Flow/habitat Determination. Flow- or water level-habitat relationships will be studied in selected springs to determine minimum flow or water levels needed to support critical life stage of aquatic species in these habitats. The springs will be selected from the list being monitored as part of the Stipulated Agreements or additional waterbodies recommended for Measure GWD-MN-AB-2. It is anticipated that methods will need to be developed for spring habitats due to a general lack of studies.

6.5 HIKO WHITE RIVER SPRINGFISH

6.5.1 Tier 1 ROW

SNWA ACMs

None.

BLM Mitigation Measures

None.

6.5.2 Groundwater Development Facilities

SNWA ACMs

None.

BLM Mitigation Measures

None.

6.5.3 Groundwater Pumping

SNWA ACMs

B.1.1 Groundwater production well sites will be selected considering:

- Proximity to main and lateral pipelines
- Proximity to existing roads or utility corridors
- Suitable hydrogeologic conditions, including well yield, groundwater drawdown, and groundwater chemistry, based upon exploratory drilling
- Adequate well spacing
- Avoidance of springs, streams, and riparian/wetland areas
- Avoidance of cultural resource sites eligible for the NRHP
- The presence of special status species and their habitat.

C.1.38 SNWA agrees to ensure continued monitoring of certain existing spring discharge sites selected by the TRP. The following springs are currently monitored through a funding agreement between SNWA, the Nevada Division of Water Resources, and the USGS: Flag Springs, Hot Creek Spring, Moorman Spring, Ash Springs, and Crystal Springs. SNWA will make all data gathered pursuant to this funding agreement available to all Stipulation Parties and will include the data in baseline conditions. In the event this funding agreement changes, terminates or expires, the TRP, in coordination with the

BRT, will determine which sites are to be included in the monitoring network. The basis for the selection of any site and the total number of sites selected will be to meet the common goals of the DDC Stipulation. The TRP will determine the methods of spring discharge measurement and will carefully consider the use of shallow wells to avoid damage to sensitive areas. In the event the funding agreement changes, terminates or expires, SNWA agrees to continue monitoring the springs selected by the TRP either directly or through funding of a third party. For those springs located on private land, SNWA will use its best efforts to gain access for monitoring, but SNWA will not be responsible for monitoring on private land to which it cannot gain access.

C.1.39 SNWA will ensure biannual hydrologic monitoring of the following spring discharge sites, either directly or through funding of a third party, but SNWA will not be responsible for monitoring on private land to which it cannot gain access: Hiko Spring, Maynard Spring, and Hardy Springs Complex.

C.1.42 Biological monitoring may include these areas within the Delamar, Dry Lake, and Cave Valley hydrographic basins, but only to the extent that access can be obtained:

Biological monitoring may include these areas within the adjacent hydrographic basins, but only to the extent that access can be obtained:

4. Monitoring of selected areas will be determined by the BRT in consultation with the TRP, for those special status species and their habitats that are most likely to be affected as a result of SNWA's groundwater withdrawals in the DDC Valley hydrographic basins. Monitoring locations will be determined by the BRT and may include the following areas:

    a. Pahranagat Valley: Pahranagat National Wildlife Refuge, Key Pittman Wildlife Management Area, and Ash, Crystal, and Hiko Springs;

SNWA has prepared a Conceptual Adaptive Management Framework (AM Framework) to be refined and implemented during future site-specific NEPA review. The AM Framework sets out a potential process for implementing practicable adaptive management measures to address adverse environmental impacts associated with SNWA groundwater withdrawals for the GWD Project, the nature, location, and extent of which are currently unknown. The AM Framework outlines the process to collect baseline data, identify environmental indicators and establish adaptive management thresholds, conduct monitoring of environmental indicators and SNWA's groundwater pumping, determine whether SNWA's groundwater pumping has likely caused or contributed to adverse environmental impacts, and if so, to determine the appropriate adaptive management strategy to avoid future adverse environmental impacts and minimize or mitigate those that have already occurred. A suite of additional measures are outlined in Section C.2 which may be implemented, as needed, through the adaptive management process to address potential impacts, which include:

C.2.9 Work with NDOW and private land owners at and downstream of Hiko, Crystal and Ash Springs, as allowed, in Pahranagat Valley to conduct habitat restoration and remove non-native species to benefit Hiko White River springfish, White River springfish, and Pahranagat roundtail chub.

C.2.10 Work with the irrigation district in Pahranagat Valley to develop system efficiencies and manage water releases to benefit native fish.

BLM Mitigation Measures

None.

6.6 PAHRANAGAT ROUNDTAIL CHUB

6.6.1 Tier 1 ROW

SNWA ACMs

None.

BLM Mitigation Measures

None.

6.6.2 Groundwater Development Facilities

SNWA ACMs

None.

BLM Mitigation Measures

None.

6.6.3 Groundwater Pumping

SNWA ACMs

B.1.1 Groundwater production well sites will be selected considering:

- Proximity to main and lateral pipelines
- Proximity to existing roads or utility corridors
- Suitable hydrogeologic conditions, including well yield, groundwater drawdown, and groundwater chemistry, based upon exploratory drilling
- Adequate well spacing
- Avoidance of springs, streams, and riparian/wetland areas
- Avoidance of cultural resource sites eligible for the NRHP
- The presence of special status species and their habitat.

C.1.38 SNWA agrees to ensure continued monitoring of certain existing spring discharge sites selected by the TRP. The following springs are currently monitored through a funding agreement between SNWA, the Nevada Division of Water Resources, and the USGS: Flag Springs, Hot Creek Spring, Moorman Spring, Ash Springs, and Crystal Springs. SNWA will make all data gathered pursuant to this funding agreement available to all Stipulation Parties and will include the data in baseline conditions. In the event this funding agreement changes, terminates or expires, the TRP, in coordination with the BRT, will determine which sites are to be included in the monitoring network. The basis for the selection of any site and the total number of sites selected will be to meet the common goals of the DDC Stipulation. The TRP will determine the methods of spring discharge measurement and will carefully consider the use of shallow wells to avoid damage to sensitive areas. In the event the funding agreement changes, terminates or expires, SNWA agrees to continue monitoring the springs selected by the TRP either directly or through funding of a third party. For those springs located on private land,

SNWA will use its best efforts to gain access for monitoring, but SNWA will not be responsible for monitoring on private land to which it cannot gain access.

C.1.39 SNWA will ensure biannual hydrologic monitoring of the following spring discharge sites, either directly or through funding of a third party, but SNWA will not be responsible for monitoring on private land to which it cannot gain access: Hiko Spring, Maynard Spring, and Hardy Springs Complex.

C.1.42 Biological monitoring may include these areas within the Delamar, Dry Lake, Cave Valley hydrographic basins, but only to the extent that access can be obtained:

Biological monitoring may include these areas within the adjacent hydrographic basins, but only to the extent that access can be obtained:

4. Monitoring of selected areas will be determined by the BRT in consultation with the TRP, for those special status species and their habitats that are most likely to be affected as a result of SNWA's groundwater withdrawals in the DDC Valley hydrographic basins. Monitoring locations will be determined by the BRT and may include the following areas:

    a. Pahranagat Valley: Pahranagat National Wildlife Refuge, Key Pittman Wildlife Management Area, and Ash, Crystal, and Hiko Springs;

SNWA has prepared a Conceptual Adaptive Management Framework (AM Framework) to be refined and implemented during future site-specific NEPA review. The AM Framework sets out a potential process for implementing practicable adaptive management measures to address adverse environmental impacts associated with SNWA groundwater withdrawals for the GWD Project, the nature, location, and extent of which are currently unknown. The AM Framework outlines the process to collect baseline data, identify environmental indicators and establish adaptive management thresholds, conduct monitoring of environmental indicators and SNWA's groundwater pumping, determine whether SNWA's groundwater pumping has likely caused or contributed to adverse environmental impacts, and if so, to determine the appropriate adaptive management strategy to avoid future adverse environmental impacts and minimize or mitigate those that have already occurred. A suite of additional measures are outlined in Section C.2 which may be implemented, as needed, through the adaptive management process to address potential impacts, which include:

C.2.9 Work with NDOW and private land owners at and downstream of Hiko, Crystal and Ash Springs, as allowed, in Pahranagat Valley to conduct habitat restoration and remove non-native species to benefit Hiko White River springfish, White River springfish, and Pahranagat roundtail chub.

C.2.10 Work with the irrigation district in Pahranagat Valley to develop system efficiencies and manage water releases to benefit native fish.

BLM Mitigation Measures

None.

6.7 WHITE RIVER SPRINGFISH

6.7.1 Tier 1 ROW

SNWA ACMs

None.

BLM Mitigation Measures

None.

6.7.2 Groundwater Development Facilities

SNWA ACMs

None.

BLM Mitigation Measures

None.

6.7.3 Groundwater Pumping

SNWA ACMs

B.1.1 Groundwater production well sites will be selected considering:

- Proximity to main and lateral pipelines
- Proximity to existing roads or utility corridors
- Suitable hydrogeologic conditions, including well yield, groundwater drawdown, and groundwater chemistry, based upon exploratory drilling
- Adequate well spacing
- Avoidance of springs, streams, and riparian/wetland areas
- Avoidance of cultural resource sites eligible for the NRHP
- The presence of special status species and their habitat.

C.1.38 SNWA agrees to ensure continued monitoring of certain existing spring discharge sites selected by the TRP. The following springs are currently monitored through a funding agreement between SNWA, the Nevada Division of Water Resources, and the USGS: Flag Springs, Hot Creek Spring, Moorman Spring, Ash Springs, and Crystal Springs. SNWA will make all data gathered pursuant to this funding agreement available to all Stipulation Parties and will include the data in baseline conditions. In the event this funding agreement changes, terminates or expires, the TRP, in coordination with the BRT, will determine which sites are to be included in the monitoring network. The basis for the selection of any site and the total number of sites selected will be to meet the common goals of the DDC Stipulation. The TRP will determine the methods of spring discharge measurement and will carefully consider the use of shallow wells to avoid damage to sensitive areas. In the event the funding agreement changes, terminates or expires, SNWA agrees to continue monitoring the springs selected by the TRP either directly or through funding of a third party. For those springs located on private land, SNWA will use its best efforts to gain access for monitoring, but SNWA will not be responsible for monitoring on private land to which it cannot gain access.

C.1.42 Biological monitoring may include these areas within the Delamar, Dry Lake, Cave Valley hydrographic basins, but only to the extent that access can be obtained:

Biological monitoring may include these areas within the adjacent hydrographic basins, but only to the extent that access can be obtained:

4. Monitoring of selected areas will be determined by the BRT in consultation with the TRP, for those special status species and their habitats that are most likely to be affected as a result of SNWA's groundwater withdrawals in the DDC Valley hydrographic basins. Monitoring locations will be determined by the BRT and may include the following areas:

    a. Pahranagat Valley: Pahranagat National Wildlife Refuge, Key Pittman Wildlife Management Area, and Ash, Crystal, and Hiko Springs;

SNWA has prepared a Conceptual Adaptive Management Framework (AM Framework) to be refined and implemented during future site-specific NEPA review. The AM Framework sets out a potential process for implementing practicable adaptive management measures to address adverse environmental impacts associated with SNWA groundwater withdrawals for the GWD Project, the nature, location, and extent of which are currently unknown. The AM Framework outlines the process to collect baseline data, identify environmental indicators and establish adaptive management thresholds, conduct monitoring of environmental indicators and SNWA's groundwater pumping, determine whether SNWA's groundwater pumping has likely caused or contributed to adverse environmental impacts, and if so, to determine the appropriate adaptive management strategy to avoid future adverse environmental impacts and minimize or mitigate those that have already occurred. A suite of additional measures are outlined in Section C.2 which may be implemented, as needed, through the adaptive management process to address potential impacts, which include:

C.2.9 Work with NDOW and private land owners at and downstream of Hiko, Crystal and Ash Springs, as allowed, in Pahranagat Valley to conduct habitat restoration and remove non-native species to benefit Hiko White River springfish, White River springfish, and Pahranagat roundtail chub.

C.2.10 Work with the irrigation district in Pahranagat Valley to develop system efficiencies and manage water releases to benefit native fish.

BLM Mitigation Measures

None.

6.8 MOAPA DACE

6.8.1 Tier 1 ROW

SNWA ACMs

None.

BLM Mitigation Measures

None.

6.8.2 Groundwater Development Facilities

SNWA ACMs

None.

BLM Mitigation Measures

None.

6.8.3 Groundwater Pumping

SNWA ACMs

B.1.1 Groundwater production well sites will be selected considering:

- Proximity to main and lateral pipelines
- Proximity to existing roads or utility corridors
- Suitable hydrogeologic conditions, including well yield, groundwater drawdown, and groundwater chemistry, based upon exploratory drilling
- Adequate well spacing
- Avoidance of springs, streams, and riparian/wetland areas
- Avoidance of cultural resource sites eligible for the NRHP
- The presence of special status species and their habitat.

BLM Mitigation Measures

None.

6.9 UTE LADIES'-TRESSES

6.9.1 Tier 1 ROW

SNWA ACMs

None.

BLM Mitigation Measures

ROW-WR-3: Construction Water Supply Plan. A Construction Water Supply Plan would be provided to the BLM for approval prior to construction. The plan would identify the specific locations of water supply wells that would be used to supply water for construction of the water pipeline and ancillary facilities; identify specific groundwater aquifers that will be used; estimate effects to surface water and groundwater resources resulting from the groundwater withdrawal; define the methods of transport and delivery of the water to the construction areas; and, identify reasonable measures to reuse or conserve water. The BLM would review and approve the plan and, if necessary, include any monitoring or mitigation requirements required to minimize impacts prior to construction approval.

6.9.2 Groundwater Development Facilities

SNWA ACMs

A.1.3 All activities directly or indirectly associated with the construction, operation, and maintenance of the project on federal lands will be conducted within the authorized limits of the ROW grant. Any facility relocation, additional construction area, or other use that

is not in accord with the ROW grant will not be initiated without prior written approval of the BLM. Cross-country vehicular travel outside of the ROW is prohibited, unless prior approval is obtained from the BLM.

A.1.11 Survey crew vehicles will remain on existing roads or within the previously cleared construction ROW. If off-road travel within the designated ROW is necessary, a biologist will first clear the proposed route. In desert tortoise habitat, a BLM and USFWS approved biological monitor will accompany survey crews into the field. Off-road travel for surveying will be restricted to the ROW, and be the minimum necessary to complete the task. Survey crews traveling on foot must have attended the worker education program, but are not required to be accompanied by a biologist.

A.1.28 A Construction Traffic Management plan will be developed and coordinated with the BLM and other relevant state and local authorities prior to the start of construction for each major phase of the project. The plan will include measures to reduce the number of construction trips by use of car-pooling and/or construction shuttles, scheduling of work shifts and materials deliveries, designation of access routes, and other measures to minimize traffic effects. The plan will also take into account active seasons for hunting, camping, and/or other recreational activities that occur within the same time and place as each phase of construction.

A.1.29 While driving on paved roads or marked dirt roads, posted speed limits will be maintained. While driving within the construction area, on un-posted dirt roads, and within desert tortoise habitat a maximum speed limit of 25 miles per hour will be maintained to reduce dust and allow for observation and avoidance of desert tortoise, livestock, wild horses, visitors to the public land, or other wildlife in the road.

A.1.30 Public access routes within or crossing the ROW will be maintained, or detour routes will be identified, during construction activities. Detours needed for temporary road closures due to safety concerns will be established in coordination with the BLM and local authorities.

A.1.31 Signing and traffic controls will be placed well in advance of the construction area to warn motorists of detour routes available during construction.

A.1.32 Signs and persons with flags will be used within the construction area as necessary to direct traffic in accordance with all applicable Nevada Department of Transportation, county, and local rules and ordinances.

A.1.33 Designated construction entry locations into the ROW will be identified from existing roads. These entry locations will be stabilized with crushed rock underlain by geotextile filter fabric, or temporary asphalt pavement to prevent sediment from being tracked onto asphalt, concrete, or improved road surfaces and to limit other damage such as road shoulder rutting.

A.1.34 Sediment transported onto a public paved road surface by construction equipment or other vehicles will be removed immediately by shoveling and sweeping. This material will be disposed at an approved area, within the ROW. Road washing will be allowed only after the sediment is removed in the above manner.

A.1.35 Wheel washers will be installed at vehicles ingress and egress locations between unpaved roads (within the permanent and temporary ROW) and paved roads (outside the

permanent and temporary ROW). Trucks and all equipment will be washed every time they leave the site. Excess dirt on the wheels, undercarriage, and bodies of trucks exiting work areas will be removed prior to allowing the trucks to exit onto paved roads, to reduce track-out of soils, debris, and invasive and noxious weeds. SNWA's Construction Inspector and the Environmental Compliance Representative will supervise and monitor use of the wheel washing stations.

A.1.36 During construction, all unpaved access roads used by construction personnel, equipment, and materials deliveries will be maintained in coordination with local county and BLM requirements. This maintenance may include use of additional road base materials to maintain road integrity.

A.1.37 At the completion of construction, previously existing access roads will be restored to pre-construction conditions or better. Improvements made for construction will be left in place. In areas of silty soils, the roads will be restored to pre-construction conditions or better.

A.1.43 Hazardous and toxic materials such as fuels, solvents, lubricants, and acids used during construction will be controlled to prevent accidental spills. Toxic and hazardous materials will be stored in secondary containment structures to prevent any spilled material from leaving the area. Specific areas for equipment maintenance and refueling will be designated and identified in the detailed POD(s). Vehicle and equipment refueling and hazardous materials storage will not be allowed within 100 feet of any jurisdictional wash or stream.

A.1.44 Spill cleanup kits will be available on equipment and maintained so that any spill of fuels, solvents, lubricants, or acids can be quickly cleaned up. Construction and maintenance personnel will be trained in the proper use of the spill kit materials and correct disposal procedures.

A.1.45 Any leak or accidental release of hazardous and toxic materials will be stopped immediately and cleaned up at the time of occurrence. Contaminated soils will be removed and disposed of at a State of Nevada approved landfill site.

A.1.46 Any release of hazardous and/or toxic materials in excess of a reportable quantity established by 40 CFR, Part 117 will be reported as required by the Comprehensive Environmental Response, Compensation, and Liability Act, Section 102b. A copy of any report required or requested by any federal agency or state government as a result of a reportable release or spill of any toxic substances will also be submitted to the BLM.

A.1.47 For every active phase of construction, a water truck and other fire suppression equipment such as extinguishers and shovels will be available on-site during construction. A designated individual on each construction site will be responsible for fire watch and fire suppression. For welding crews, one team member will be responsible for fire watch, in addition to the individual designated for the construction site fire watch and fire suppression. When welding at field locations, all flammable materials (i.e., brush, litter) will be cleaned for a distance of 15 feet around the area.

A.10.1 Dust control permits will be obtained for each construction contract in accordance with local, county and/or state requirements. These will be a Dust Control Permit in Clark County, and a Surface Area Disturbance permit in Lincoln and White Pine Counties. The

permits will contain a Dust Control Plan listing all construction activities that will occur and the BMPs that will be used to mitigate construction dust. The BMPs will include site-specific dust control measures that are based on each project soil type, specific construction activities, phases and stages. They may include:

- Watering, pre-watering to maintain moisture or to form crust,
- Applying clean gravel, paving, applying and maintaining a dust palliative or dust suppressant, covering or enclosing material,
- Covering or stabilizing soil with vegetation,
- Using phased construction,
- Limiting size of ingress and egress points,
- Limiting size of staging areas,
- Limiting vehicle speeds on the work site,
- Cessation of operations when winds make fugitive dust control difficult,
- Berming or fencing to prevent unauthorized access to disturbed areas, and
- Application of track-out controls.

A.10.2 In accordance with dust control permits, SNWA will conduct air quality readings (wind speed, emissions, etc.). The readings will occur on an as-need be basis, as defined by the appropriate permits. Generally, it is anticipated that measurements will be taken during windy periods and construction practices altered as needed to stay within attainment.

A.10.3 Any dust palliative, dust suppressant, or tackifier used within threatened and endangered species habitat or active drainages will be approved by the BLM and USFWS prior to use.

A.10.4 Operating permits will be obtained for stationary sources as necessary, such as aggregate rock handling equipment, rock crushers, conveyors, and screening equipment, which may emit particulate matter. The operating permit will be obtained from the local county and/or the state, and will include operating requirements, reporting requirements, and pollutant emission limits. Fugitive dust control measures will be used during material transfer operations, such as pre-watering, water sprays at drop points, and covered conveyors.

A.10.5 Operating permits will be obtained for combustion equipment such as stationary internal combustion engines (greater than 250 horsepower) used during construction or operation of the project. The Operating Permit will include operating requirements, reporting requirements and pollutant emission limits.

A.10.6 Active construction sites and unpaved roads used for construction will be watered daily or chemical dust suppression approved by the BLM will be applied, as needed, to maintain effective dust control.

A.10.7 In periods of excessive wind speed (sustained over 40 miles per hour), excavation and grading activities will be suspended or additional watering applied to maintain dust control.

A.10.8 Soil stockpiles will be covered, and a tackifier, water, or other BLM-approved erosion control measure will be applied as needed to maintain effective dust control.

B.1.1 Groundwater production well sites will be selected considering:

- Proximity to main and lateral pipelines
- Proximity to existing roads or utility corridors
- Suitable hydrogeologic conditions, including well yield, groundwater drawdown, and groundwater chemistry, based upon exploratory drilling
- Adequate well spacing
- Avoidance of springs, streams, and riparian/wetland areas
- Avoidance of cultural resource sites eligible for the NRHP
- The presence of special status species and their habitat.

B.1.3 Collector pipeline, distribution power line, and secondary substations will be sited, as feasible:

- Along existing roads or other utility alignments
- Avoiding springs, streams, and riparian/wetland areas
- Avoiding cultural resource sites eligible for the NRHP
- Considering the presence of special status species and their habitat.

BLM Mitigation Measures

None.

6.9.3 Groundwater Pumping

SNWA ACMs

B.1.1 Groundwater production well sites will be selected considering:

- Proximity to main and lateral pipelines
- Proximity to existing roads or utility corridors
- Suitable hydrogeologic conditions, including well yield, groundwater drawdown, and groundwater chemistry, based upon exploratory drilling
- Adequate well spacing
- Avoidance of springs, streams, and riparian/wetland areas
- Avoidance of cultural resource sites eligible for the NRHP
- The presence of special status species and their habitat.

C.1.42 Biological monitoring may include these areas within the Delamar, Dry Lake, and Cave Valley hydrographic basins, but only to the extent that access can be obtained:

1. Biological monitoring of the valley floor and range-front springs where special status species occur, to the extent that access can be obtained. The Stipulation Parties will work to gain access to these areas to the maximum extent possible;
2. Monitoring of the water dependent ecosystems on the valley floors, to the extent that these exist;

SNWA has prepared a Conceptual Adaptive Management Framework (AM Framework) to be refined and implemented during future site-specific NEPA review. The AM Framework sets out a potential process for implementing practicable adaptive management measures to address adverse environmental impacts associated with SNWA groundwater withdrawals for the GWD Project, the nature, location, and extent of which are currently unknown. The AM Framework outlines the process to collect baseline data, identify environmental indicators and establish

adaptive management thresholds, conduct monitoring of environmental indicators and SNWA's groundwater pumping, determine whether SNWA's groundwater pumping has likely caused or contributed to adverse environmental impacts, and if so, to determine the appropriate adaptive management strategy to avoid future adverse environmental impacts and minimize or mitigate those that have already occurred. A suite of additional measures are outlined in Section C.2 which may be implemented, as needed, through the adaptive management process to address potential impacts, which include:

C.2.1 In accordance with the Spring Valley and DDC Stipulations and any future water right rulings, implement actions to mitigate: injury to Federal water rights; unreasonable adverse effect to Federal resources; effects to Federal resources within Great Basin National Park; unreasonable adverse effect to special status species; impacts to existing water rights as determined by the Nevada State Engineer; conflicts with protectable interests in existing domestic wells as set forth in NRS §533.024; and/or threats that prove detrimental to the public interest or is found not to be environmentally sound, as determined by the Nevada State Engineer. These mitigation actions could include, but are not limited to:

- Geographic redistribution of groundwater withdrawals
- Reduction or cessation in groundwater withdrawals
- Provision of consumptive water supply requirements using surface and groundwater sources
- Augmentation of water supply for Federal and existing water rights and Federal resources using surface and groundwater sources
- Acquisition of real property and/or water rights dedicated to the recovery of special status species within their current and historic habitat range
- Provision of resources to restore and enhance habitat on the Pahranagat National Wildlife Refuge
- Other measures as agreed to by the Stipulation Parties that are consistent with the Stipulations and/or required by the Nevada State Engineer

C.2.6 Conduct habitat enhancement for spring snails in Snake Valley by restoring natural fluvial morphology of the spring flow systems.

C.2.15 Modify use of SNWA's agricultural water rights in Spring Valley to offset changes in spring discharges needed to maintain wet meadow areas in the northwest and southeast portions of Spring Valley. This could be accomplished by changing crop production to a less water-intensive type or changing watering cycles, and then diverting the saved water to the wet meadow areas.

C.2.16 Purchase property and/or obtain conservation easements on private lands in Snake Valley to reduce grazing impacts on spring snail habitat.

C.2.18 Reduce or change grazing in wet meadows to improve habitat conditions for leopard frog, migratory birds, waterfowl, shore birds, greater sage-grouse, raptors, and bats. Wet meadows exist on the following BLM grazing allotments on which SNWA holds grazing permits: Basset Creek, McCoy Creek, Cooper Canyon, Cold Spring, John Henry Wash, Majors- Osceolla Use Area, Shingle Creek, Scotty Meadows, Murphy's Wash, South Spring Valley, and Wilson Creek- Muleshoe Use Area.

BLM Mitigation Measures

None.

Conceptual Adaptive Management Framework and Measures

Adaptive Management Concept

The US Department of Interior's NEPA regulations define adaptive management as "a system of management practices based on clearly identified outcomes and monitoring to determine whether management actions are meeting desired outcomes; and, if not, facilitating management changes that will best ensure that outcomes are met or re-evaluated" 43 C.F.R. § 46.30. "Adaptive management recognizes that knowledge about natural resource systems is sometimes uncertain." *Id*. The US Department of Interior encourages its agencies to use adaptive management, "particularly in circumstances where long-term impacts may be uncertain and future monitoring will be needed to make adjustments in subsequent implementation decisions" *Id*. § 46.145 (See also Department of Interior Adaptive Management Technical Guide, 2007); Department of Interior Manuals 522 DM 1 (Adaptive Management Implementation Policy, 516 DM 11.4.E Managing the NEPA Process – BLM), 2008. Figure 1 illustrates the basic adaptive management process.

This AM Framework recognizes the inherent uncertainties in predicting effects of withdrawing groundwater from hydrologic flow systems. The effects of groundwater withdrawals may be different than expected or may change in unexpected ways during project implementation. Additional or different avoidance, minimization, or mitigation measures (referred to hereafter as "adaptive management measures") may be required to effectively mitigate adverse environmental impacts and achieve environmental goals. The AM Framework provides an example of an adaptive management model that may be modified in subsequent tiered NEPA processes as SNWA and BLM learn more about the affected environment and effective mitigation.

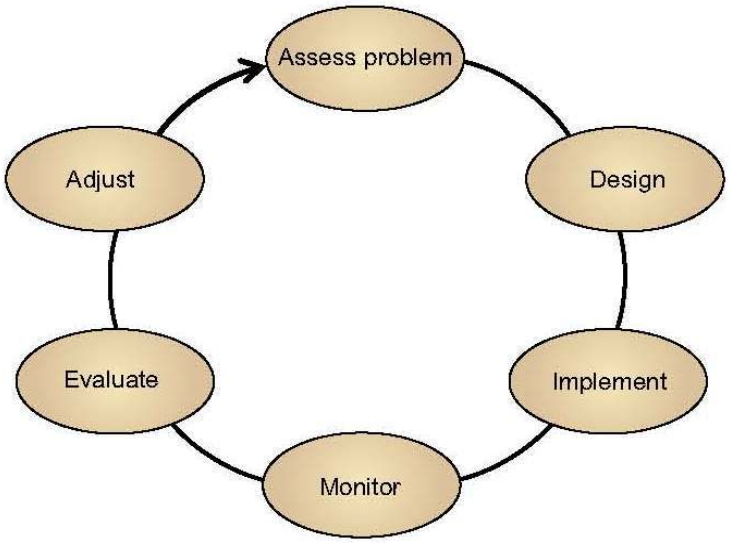

Figure 6-1 Adaptive Management Flow Diagram
Department of Interior Adaptive Management Technical Guide (2009)

This Conceptual AM Framework includes the following elements, which are described in more detail below:

- Environmental Goals and Objectives
- Baseline Data Collection and Monitoring
- Identification of Environmental Indicators and Adaptive Management Thresholds
- Monitoring Commitments
- Reporting Commitments
- Plan Implementation
- Adaptive Management Measures

Environmental Goals and Objectives

The overarching goal of this AM Framework is to provide an example of a model for adaptive management to identify and avoid, minimize, or mitigate potential adverse environmental impacts of SNWA's groundwater withdrawals which are uncertain to occur or the location, nature, and extent of which are currently unknown. The overarching goal or objective of implementing adaptive management processes for the GWD Project would be to avoid, minimize or mitigate adverse effects to natural resources. The AM Framework seeks to identify and suggest practicable adaptive management measures to address those adverse impacts to groundwater dependent ecosystems where it is feasible to do so. These measures will be refined and considered for implementation in subsequent site-specific NEPA review.

Examples of goals and objectives for subsequent development of adaptive management plans include:

- Avoid, minimize, or mitigate adverse environmental impacts to groundwater-dependent ecosystems and biological communities
- Avoid, minimize, or mitigate the effects of actions that could contribute to the need to list species as threatened or endangered under the ESA
- Avoid adverse environmental impacts that could cause jeopardy to listed species or destruction or adverse modification of designated critical habitats
- Avoid, minimize, or mitigate adverse environmental impacts to water features that support big game animals and other fish and wildlife
- Protect existing water rights holders against unreasonable adverse effects
- Avoid, minimize or mitigate degradation of visibility and air quality due to potential increases in airborne particulates and loss of surface vegetation

In the Spring Valley and DDC Stipulations, the common goals of the Parties are explicitly stated as follows:

<u>Spring Valley Stipulation</u>

- To manage the development of groundwater by SNWA in Spring Valley without causing injury to certain defined Federal Water Rights and/or unreasonable adverse effects to defined Federal Resources in the Area of Interest;
- To accurately characterize the groundwater gradient from Spring Valley to Snake Valley via Hamlin Valley;
- To avoid any effect on Federal Resources located within the boundaries of Great Basin National Park from groundwater withdrawal by SNWA in Spring Valley;

- To manage the development of groundwater by SNWA in Spring Valley in order to avoid unreasonable adverse effects to wetlands, wet meadow complexes, springs, streams, and riparian and phreatophytic communities (referred to as Water-dependent Ecosystems) and maintain the biological integrity and ecological health of the Area of Interest over the long term;
- To avoid any effects to Water-dependent Ecosystems within the boundaries of Great Basin National Park; and
- To manage the development of groundwater by SNWA in Spring Valley to avoid an unreasonable degradation of the scenic values of the visibility from Great Basin National Park due to a potential increase in airborne particulates and loss of surface vegetation which may result from groundwater withdrawals by SNWA in Spring Valley.

DDC Stipulation

- To manage the development of groundwater by SNWA in DDC without causing injury to Federal Water Rights and/or unreasonable adverse effects to Federal Resources and special status species (defined in the DDC Stipulation) within the Area of Interest as a result of groundwater withdrawals by SNWA in DDC; and
- The above common goals include taking actions that protect and recover those Special Status Species that are currently listed pursuant to the Endangered Species Act and avoid listing of currently non-listed special status species.

Per the Spring Valley and DDC Stipulations, if the BWG or BRT determines that an unreasonable adverse effect to Federal Resources and/or Special Status Species is occurring or will occur as a result of SNWA's groundwater withdrawals in Spring Valley or DDC, the BWG or BRT in consultation with the TRP are to develop a recommended course of action and refer this to the Executive Committee. Upon receiving any consensus-based recommendations from the technical teams, the Executive Committee shall seek a negotiated resolution of a course of action to eliminate or reduce such an effect through the management of SNWA's groundwater withdrawals in Spring Valley or DDC and/or the mitigation of such an effect. Procedures for consultation and decision-making are outlined in Exhibits A and B of the Spring Valley and DDC Stipulations. The BWG, BRT and TRP are also responsible for monitoring the success of avoidance or mitigation actions to carry out the common goals of the Stipulations.

Baseline Data Collection and Monitoring

Part of the conceptual adaptive management process for the GWD Project is the collection of extensive baseline data and ongoing baseline monitoring. This baseline data collection will be used to determine the natural variability of the groundwater-dependent systems. This AM Framework incorporates the baseline data collection and monitoring processes developed under the Spring Valley and DDC Stipulations and their respective biological and hydrological monitoring and mitigation plans. A minimum of 7 years of baseline biological data collection have been identified in the biological monitoring plan for the Spring Valley Stipulation. A minimum of 3 years of baseline biological data collection have been identified in the biological monitoring plan for the DDC Stipulation. If any additional baseline biological and hydrologic monitoring requirements are included in future Nevada State Engineer's rulings or orders, those elements will be added to SNWA's environmental commitments for this project.

Collection of baseline data is necessary before specific early warning thresholds can be identified. Data will be collected and reported annually (see Reporting Commitments section below). Based upon data analysis and review, and assessments of monitoring plan effectiveness, adjustments and refinements may be made to the monitoring plans.

Identifying Environmental Indicators and Establishing Adaptive Management Thresholds

Identifying Indicators

The first step in establishing an effective adaptive management process is to identify environmental indicators that can be monitored and compared over time. The Spring Valley and DDC Stipulations and respective biological and hydrological monitoring plans set out a process by which the Stipulation Parties will identify and monitor environmental indicators of groundwater-dependent systems that may be affected by groundwater withdrawals.

To provide the best opportunity for achieving the common goals of the Spring Valley Stipulation, the BWG used explicit decision-making criteria to select species, key ecological attributes and indicators, and sites to monitor. Specific species, indicators and sites detailed in the 2009 Biological Monitoring Plan for the Spring Valley Stipulation are subject to change as part of an adaptive monitoring and management approach.

- The BWG selected species to monitor based on the following criteria: (1) dependent upon a groundwater-influenced ecosystem that may be affected by SNWA groundwater withdrawal; (2) known to occur or may potentially occur in the IBMA where they rely on a groundwater-influenced ecosystem for one or more life stages; and (3) either (a) federally listed threatened or endangered species, Nevada BLM sensitive species, or Nevada- or Utah-listed species; or (b) designated by the BWG based on their ecological role in the IBMA. To provide the best opportunity to correlate species' responses with ecosystem changes that may result from SNWA groundwater withdrawal, the BWG selected species that have strong ties to aquatic groundwater-influenced ecosystems to directly monitor. Wide-ranging or migratory animals that use aquatic groundwater-influenced ecosystems are indirectly monitored via a habitat-based approach.
- The BWG selected key ecological attributes and indicators to measure based on the following criteria: (1) strongly related to the status of the groundwater-influenced ecosystem and possibly essential to its viability; (2) good indicator of ecosystem health, including those that may provide early warning of adverse impacts due to SNWA groundwater withdrawal; and, (3) reasonably feasible and efficient to measure.
- The BWG selected monitoring sites based on the following factors: presence of species to be directly monitored; habitat requirements of species to be indirectly monitored via a habitat-based approach; location relative to hydrologic monitoring; location relative to points of diversion granted in the vacated Ruling 5726 and SNWA groundwater exploratory areas; spatial coverage within the IBMA; levels of disturbance; mitigation potential; access; and possible use as a reference site.

To provide the best opportunity for achieving the common goals of the DDC Stipulation, the BRT also used explicit decision-making criteria to select species, key ecological attributes and indicators, and sites to monitor. Specific species, indicators and sites detailed in the 2011

Biological Monitoring Plan for the Delamar, Dry Lake and Cave Valley Stipulation are subject to change as part of an adaptive monitoring and management approach.

- In accordance with the DDC Stipulation, biological monitoring under the DDC Stipulation focuses on special status species. To provide the best opportunity to correlate species' responses with ecosystem changes that may result from SNWA groundwater withdrawal, the BRT selected species that have strong ties to aquatic groundwater-influenced ecosystems to directly monitor. Wide-ranging or migratory animals that use aquatic groundwater-influenced ecosystems are indirectly monitored via a habitat-based approach.
- The BRT selected key ecological attributes and indicators to measure based on the following criteria: (1) strongly related to the status or condition of the groundwater-influenced ecosystem or special status species habitat and possibly essential to its viability; (2) good indicator of ecosystem health, and may provide early warning of adverse effects resulting from SNWA groundwater withdrawal; and, (3) reasonably feasible and efficient to measure.
- The BRT used a decision-making tree to assist in selecting monitoring sites. Stepwise criteria within the decision making tree are: (1) is there a groundwater-influenced ecosystem with one or more Special Status Species at the site; if so, (2) is there reasonable potential for adverse effects from SNWA groundwater withdrawal; and if so, (3) is there a reasonable potential for attributing impact to SNWA groundwater withdrawal versus other factors. However, not all of the monitoring sites meet these criteria. Additional factors influencing site selection included best available representation of water resources in the basins, proximity to hydrologic monitoring sites, access, level of anthropogenic or natural disturbance, mitigation potential, and possible use as a reference site.

The hydrologic monitoring plans for the Spring Valley and DDC Stipulations identify a monitoring network of new and existing monitoring wells, spring and stream monitoring, and precipitation stations to provide a means to document baseline and long-term hydrologic conditions.

Any adaptive management plan implemented in future site-specific NEPA processes would incorporate the environmental indicators in the biological and hydrologic monitoring plans for the Spring Valley and DDC Stipulations. Additional environmental indicators may be identified in future monitoring plan for Snake Valley will may be incorporated and adopted as part of future implementation of an adaptive management plan.

Establishing Adaptive Management Thresholds

Each groundwater-dependent indicator has a natural range of variability, including ranges in values, rates, and frequency. What constitutes an adverse environmental impact may vary among sites, and the standards may be higher for some sites than for others. Whether an impact is outside the natural range of variability may also change over time as more information is gathered about the resource. Early warning thresholds for use in future adaptive management plans based on this AM Framework, and for compliance with the Spring Valley and DDC Stipulations, will be identified through the baseline data collection and analysis.

Early warning thresholds that are established through these processes will be adopted and incorporated into future site-specific adaptive management plans as they are considered and implemented during NEPA review. Early warning thresholds represent environmental indicators associated with adverse shifts in system conditions. During the groundwater withdrawal period, BLM and SNWA will annually review monitoring data to determine whether early warning thresholds have been reached, whether any change is likely attributable to SNWA's groundwater withdrawals for the GWD Project, and the appropriate adaptive management measure to be performed (see AM Framework Implementation section below). The adequacy of the early warning thresholds will also be periodically reviewed during the withdrawal period, to account for new information and changing conditions.

As described above, one of the common goals of the Parties to the Spring Valley and DDC Stipulations is to manage the development of groundwater by SNWA without causing unreasonable adverse effects to Federal Resources or Special Status Species. What constitutes an unreasonable adverse effect will be determined through consultation and decision-making among the Stipulation Executive Committee, BWG, BRT and TRP. A framework for describing and detecting unreasonable adverse effects to Federal resources will likely include determining ranges of variation, ecological thresholds, and acceptable ranges of variation for indicators or suites of indicators. The intent of this framework is to create a logical and transparent process for making decisions concerning unreasonable adverse effects, and enable the technical teams to recognize the potential for such an effect well enough in advance for action to be taken to prevent, minimize or mitigate its expression.

Under the DDC Stipulation, an additional Operation Plan will be developed by SNWA in cooperation with the DOI Bureaus. The Operation Plan will, in part, identify and define early warning indicators for injury to Federal water rights and unreasonable adverse effects to Federal resources and special status species, and define a range of specific mitigation actions that may be carried out if early warning indicators are reached. The TRP, in coordination with the BRT, will update the Operation Plan as necessary to ensure early warning indicators and mitigation actions are consistent with the common goals of the Stipulation.

The thresholds identified through the Stipulations processes will be adopted and applied in future adaptive management plans during site-specific NEPA review before groundwater development occurs.

Monitoring Commitments

Successful implementation of future adaptive management plans based on this AM Framework requires that adaptive management provisions be integrally linked to a reliable monitoring program. Detailed hydrologic and biological monitoring plans have been prepared as required under the Spring Valley and DDC Stipulations. The monitoring program will:

- Identify groundwater-dependent systems and other resources of concern and associated environmental indicators to be monitored (see Identifying Environmental Indicators section above);
- Detail the monitoring activities necessary to measure environmental indicators; and
- Establish a schedule for monitoring activities, including description of field methods for data collection, identification of sampling locations, identification of variables to be measured, and identification of frequency, timing, and duration of field surveys.

It is anticipated that biological and hydrologic monitoring plans will also be developed for Snake Valley upon completion of the draft Snake Valley agreements and will be adopted as part of this AM Framework. Additional monitoring commitments required for listed species may also be incorporated as a result of the Section 7 consultation process with the USFWS.

Reporting Commitments

The AM Framework contemplates that BLM will review monitoring data annually, at a minimum. SNWA will prepare detailed annual monitoring reports as identified in the biological and hydrologic monitoring plans for Spring Valley and DDC Stipulations. These monitoring reports will also serve as the basis for the reporting requirements for adaptive management plans adopted pursuant to this AM Framework. Monitoring reports produced as discussed below will be made available to the public, upon request and at BLM's discretion, after appropriate redaction of sensitive species and other information.

Prior to Groundwater Withdrawal

SNWA will file annual biological and hydrologic reports, providing the results of monitoring activities for the previous calendar year. It is anticipated that the same annual reports will be used under this AM Framework as required for future NSE water rights rulings and the Spring Valley and DDC Stipulations.

Prior to groundwater withdrawal for production for the GWD Project, the annual report(s) will include the following information:

1. Brief descriptions of the sites and indicators being monitored
2. Methodologies for data collection and data analyses
3. Summaries of data
4. Results of the data analyses
5. Interpretations of results
6. Results of any hydrologic or ecological modeling
7. Recommendations for future monitoring activities
8. Conclusions

Summaries and results will be presented for each indicator monitored, by site and overall. These summaries and results will be presented for the year covered by the report and compared to results from previous years.

At the end of this phase, SNWA will prepare a report addressing the same types of information as in the annual reports, plus an overall analysis of the data collected during the pre-withdrawal period and an interpretation of the results. This comprehensive report will substitute for the annual report in the year it is prepared. The report will include a brief description of the location and quantity of SNWA's anticipated groundwater withdrawals for the following two-year period, recommendations for early warning thresholds for implementing adaptive management measures, and recommendations for monitoring activities during the withdrawal period.

Groundwater Withdrawal Period

The AM Framework anticipates that any adaptive management plan adopted would require SNWA to continue to submit annual reports during groundwater withdrawal for production for the GWD Project. It is anticipated that the same annual reports will be used under this AM Framework as those required for future NSE water rights rulings and the Spring Valley and DDC

Stipulations. In addition to the annual reports, a comprehensive biological report will be prepared every five years in accordance with the biological monitoring plans for the Spring Valley and DDC Stipulations, to summarize all available monitoring data up to that point, along with analyses of the complete data sets and interpretations of results.

In addition to the information provided in the pre-withdrawal reports, annual reports during the groundwater production period will include:

1. The location and quantity of SNWA groundwater withdrawals that are part of the GWD Project during the preceding calendar year;
2. Summary of status of environmental goals and objectives;
3. Analysis of whether early warning indicator thresholds have been reached or whether data trends indicate early warning thresholds will likely be reached under current conditions;
4. Assessment of whether SNWA groundwater withdrawals are the likely cause of or contributor to changes in environmental indicators;
5. Description of any adaptive management measures performed during the previous year;
6. Assessment of adaptive management effectiveness and recommendations for changes to adaptive management measures;
7. A schedule of SNWA groundwater withdrawals for the following two-year period; and
8. Recommendations for adaptive management measures for the following two-year period, if necessary.

The annual reports will serve as a basis for discussion and decision regarding whether adaptive management measures should be modified or additional measures should be implemented (see Plan Implementation section below).

Plan Implementation

This AM Framework sets out the process which BLM may incorporate in future adaptive management plans after site-specific NEPA review to consider adaptive management measures as the Federal land manager responsible for the Federal action. The adaptive management decision process is displayed on Figure 2 and described in more detail below.

Prior to Groundwater Withdrawal

SNWA anticipates that future adaptive management plans will require baseline data collection and monitoring as identified under the monitoring plans described above. The baseline data will be collected for the specified minimum time periods and annual reports submitted, as required under future water rights rulings, and the Spring Valley and DDC Stipulations. The BLM and other parties to the Stipulations will review the data provided in the annual reports and meet with SNWA to address any issues regarding implementation of the monitoring plans. Meetings of the TRP, BWG/BRT, and EC for the same purposes under the Spring Valley and DDC Stipulations may fulfill the annual meeting requirement under an adaptive management plan.

Prior to groundwater production for the GWD Project, the initial thresholds for early warning indicators will be identified in site-specific adaptive management plans in accordance with the approved Stipulations' monitoring plans and any requirements of future water right rulings. Thresholds that are identified pursuant to those processes will be adopted for the purposes of any

adaptive management plans considered and implemented during future site-specific NEPA review. Thresholds that may be identified by the USFWS for listed species during Section 7 consultation will also be incorporated.

Groundwater Withdrawal Period

During groundwater withdrawal for production for the GWD Project, SNWA will continue to conduct monitoring and will provide annual reports as identified under Reporting Commitments above.

During GWD Project implementation, BLM has dual roles as: (1) the Federal land manager for the ROW grant; and (2) a member of the TRP, BWG/BRT, and EC under the Spring and DDC Stipulations. Because the threshold environmental indicators for purposes of future adaptive management plans will be the same thresholds identified under the Spring and DDC Stipulations, if the thresholds are reached, BLM will be considering potential adaptive management measures for Spring, DDC and adjacent valleys as part of the TRP, BWG/BRT, and EC pursuant to the Stipulations, as well as independently under adaptive management plans. This AM Framework sets out the process by which BLM will consider adaptive management measures as Federal land manager.

During the groundwater withdrawal period, BLM will review the data provided in the annual reports, and meet with SNWA to address any issues with implementation of the monitoring plan, determine whether early warning thresholds of environmental indicators have been reached, and determine what, if any, adaptive management measures should be taken. Meetings of the TRP, BWG/BRT, and EC for the same purposes under the Stipulations will fulfill the annual meeting requirement under any adaptive management plan. However, BLM may request additional meetings independent of the other processes.

If the annual report reveals that early warning thresholds for one or more environmental indicators have been reached, BLM will first determine based on the best available scientific information and after discussion with SNWA whether SNWA groundwater withdrawals have caused or contributed to the adverse effect. BLM will consider the location, timing, and quantity of SNWA's groundwater withdrawals; the current levels of other environmental indicators in relation to baseline conditions; results of any groundwater flow modeling; information regarding other potential non-SNWA anthropogenic contributions to the adverse effect; and other relevant information to determine whether SNWA's groundwater withdrawals are the likely cause of or a contributing factor to the adverse effect. If BLM determines that the adverse effect is not likely caused or contributed to by SNWA activity, performance of adaptive management measures is not required under an adaptive management plan, though SNWA may agree to implement voluntary action to avoid further adverse effects or improve the health of groundwater-dependent systems or other resource values.

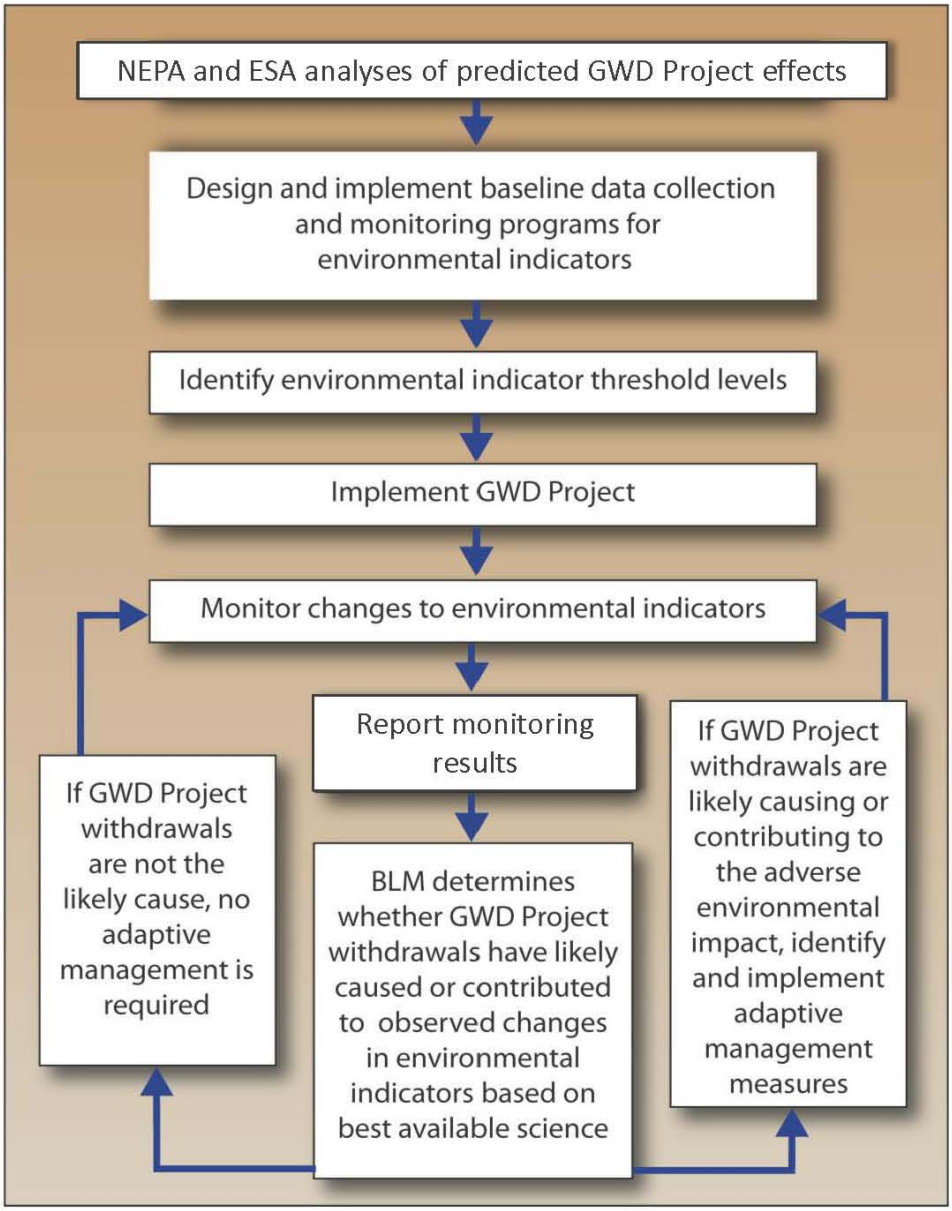

Figure 6-2 Conceptual Adaptive Management Process for GWD Project

If BLM determines that SNWA groundwater withdrawals have likely caused or contributed to the adverse effect, BLM will require that one or more adaptive management measures be taken. BLM will meet with SNWA to review options and determine the appropriate adaptive management strategy to avoid future adverse environmental impacts and minimize or mitigate those that have already occurred. In determining the appropriate adaptive management measure(s) to address the adverse environmental impact, BLM will evaluate and consider any recommendations of the TRP, BWG/BRT, and EC under the Spring and DDC Stipulations. Where ESA-listed or candidate species related adverse effects are observed, BLM will coordinate with the USFWS regarding appropriate adaptive management responses. BLM may

also choose to seek input from NDOW or any other federal, state, or local agency with specialized expertise relating to the observed adverse effect or adaptive management measures. SNWA may provide BLM with a proposal for adaptive management measures, if appropriate. BLM alone, however, will make the final determination of what adaptive management measures will be required.

When BLM requires adaptive management measure(s), SNWA will monitor environmental indicators following implementation to evaluate the success of adaptive management. Results of effectiveness of the adaptive management measure(s) will be included in subsequent annual reports. BLM will consider whether to change the mitigation strategy if monitoring indicates adaptive management measures have not been effective, or may discontinue the adaptive management measure(s) if monitoring indicates that adverse environmental impacts have not occurred or have been resolved and are not likely to recur.

In addition to the annual review process, either SNWA or BLM can request a meeting at any time if data indicates that adverse environmental impacts have occurred or are likely to occur as a result of SNWA groundwater withdrawals and immediate adaptive management measures are necessary. Conversely, SNWA and BLM may extend the period between meetings if monitoring indicates SNWA groundwater withdrawals are not causing adverse environmental impacts to groundwater-dependent systems and other resources, or adaptive management measures are effectively addressing adverse environmental impacts. SNWA may also request a meeting at any time to discuss discontinuation of adaptive management measures when no longer needed.

SNWA and BLM Plan Responsibilities

SNWA will have primary responsibility for implementing an adaptive management plan adopted pursuant to this AM Framework, including carrying out or providing sufficient funds for monitoring, reporting, and adaptive management measures. The precise cost associated with implementing adaptive management is not known at this time. SNWA is financially solvent, has an adequate bond rating, and anticipates the ability to adjust to various contingencies by adjusting rates as the project becomes operational. SNWA's responsibilities will include: (1) gathering baseline and monitoring data and maintaining databases; (2) compiling the results in annual reports; (3) assessing the effects of groundwater withdrawals and adaptive management measures; (4) identifying, in coordination with BLM, the opportunity for adaptive management measures; and (5) implementing adaptive management measures.

BLM will: (1) meet with SNWA at least annually to evaluate and discuss the annual reports, GWD Project implementation, and adaptive management measures; (2) review data and associated interpretations provided by SNWA; (3) determine whether modifications to the monitoring plans are necessary; (4) determine whether early warning thresholds have been reached; (5) determine, based on the best scientific information available, whether SNWA groundwater withdrawals have likely caused or contributed to the adverse effect; (6) identify appropriate adaptive management measures; (7) evaluate adaptive management effectiveness; and (8) determine whether to modify or implement additional adaptive management measures. BLM will maintain annual reports and decision documents regarding adaptive management measures and make those documents available to the public.

Adaptive Management Measures

If BLM determines that early warning thresholds have been reached as a result of SNWA groundwater withdrawals, SNWA will implement one or more adaptive management measures, based on specific criteria developed as part of future site-specific adaptive management plans. The adaptive management measure(s) chosen will depend on the environmental resource affected and the severity and likely cause of the observed adverse environmental impact. Additional adaptive management measures may be added, as identified in future tiered NEPA analysis for future ROWs.

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7.0 CONCLUSIONS

This section describes the potential effects to the federally listed species in the Action Area due to implementation of the Federal action. These conclusions are based on the current conditions of the species as discussed in Section 4.0, Species Accounts, and the anticipated effects to the species as described in Section 5.0, Effects Analysis for the Federal action. The ACMs described in Sections 2.2.7 and 6.0 are then applied to the effects analysis as a basis to determine the anticipated effects to the species. Summaries of the conclusions for the species in the Action Area are provided in **Table 7-1**.

Table 7-1 Federally Listed Species and Critical Habitat in the Action Area – Conclusions

Species	Conclusions
Southwestern willow flycatcher *(Empidonax traillii extimus*)	May Affect, is not likely to adversely affect
Southwestern willow flycatcher – Proposed Critical Habitat*	May Affect, is not likely to disturb or destroy proposed critical habitat
Desert tortoise (*Gopherus agassizii*)	May Affect, is likely to adversely affect
Desert tortoise – Critical Habitat	May Affect, is likely to disturb or destroy designated critical habitat
Pahrump poolfish (*Empetrichthys latos*)	May Affect, is likely to adversely affect
White River spinedace *(Lepidomeda albivallis*)	May Affect, is not likely to adversely affect
White River spinedace– Critical Habitat	May Affect, is not likely to disturb or destroy designated critical habitat
Hiko White River springfish (*Crenichthys baileyi grandis*)	May Affect, is not likely to adversely affect
Hiko White River springfish – Critical Habitat	May Affect, is not likely to disturb or destroy designated critical habitat
Pahranagat roundtail chub (*Gila robusta jordani*)	May Affect, is not likely to adversely affect
White River springfish (*Crenichthys baileyi baileyi*)	May Affect, is not likely to adversely affect
White River springfish – Critical Habitat	May Affect, is not likely to disturb or destroy designated critical habitat
Moapa dace (*Moapa coriacea*)	May Affect, is not likely to adversely affect
Ute ladies'-tresses (*Spiranthes diluvialis*)	May Affect, is likely to adversely affect

*USFWS issued a proposed revised designation of southwestern willow flycatcher critical habitat on August 15, 2011 (USFWS, 2011a).

7.1 FEDERAL LISTED SPECIES IN THE ACTION AREA

7.1.1 Southwestern Willow Flycatcher

7.1.1.1 Species

Tier 1 ROWs

Southwestern willow flycatcher breeding sites in Pahranagat Valley, Lower Meadow Valley Wash, and Muddy River Springs Area occur approximately 6-30 miles away and in different hydrographic basins from Tier 1 ROWs. At these distances, the southwestern species would not experience direct or indirect effects from Tier 1 ROWs.

Future Tiers: Groundwater Development and Groundwater Pumping

Southwestern willow flycatcher breeding sites in Pahranagat Valley, Lower Meadow Valley Wash, and Muddy River Springs Area occur approximately 6-60 miles away and in different hydrographic basins from the nearest groundwater development areas. At these distances, the species would not experience direct or indirect effects from future ROWs.

Southwestern willow flycatcher breeding sites in Pahranagat Valley are located over 6 miles away, and in a different hydrographic basin, from the simulated groundwater drawdown area at both 75 years after full build out and 100 years of recovery. At Ash and Crystal springs at 75 years after full build out and 100 years recovery, the model simulates a less than 1 percent spring flow reduction, which is beyond the limitations of the model and does not identify these springs as areas of risk. While potential impacts to southwestern willow flycatcher in Pahranagat Valley cannot be ruled out with 100 percent certainty, model simulations and other lines of evidence indicate that any such pumping effects are unlikely to occur.

The southwestern willow flycatcher breeding site in northern Lower Meadow Valley Wash is located approximately 2 miles away, and in a different hydrographic basin, from the simulated groundwater drawdown area at both 75 years after full build out and 100 years of recovery. Because Meadow Valley Wash is not specifically simulated in the model, there are no flow simulations at this location. While potential impacts to southwestern willow flycatcher in Lower Meadow Valley Wash cannot be ruled out with 100 percent certainty, model simulations and other lines of evidence indicate that any such pumping effects are unlikely to occur.

The southwestern willow flycatcher breeding sites in Muddy River Springs Area are located approximately 40 miles away, and in a different hydrographic basin, from the simulated groundwater drawdown area at both 75 years after full build out and 100 years of recovery. At USGS Muddy River Near Moapa Gage at 75 years after full build out and 100 years recovery, the model simulates a less than 1 percent flow reduction, which is beyond the limitations of the model and does not identify the upper Muddy River and tributary springs as an area of risk. While potential impacts to southwestern willow flycatcher in Muddy River Springs Area cannot be ruled out with 100 percent certainty, model simulations and other lines of evidence indicate that any such pumping effects are unlikely to occur.

CONCLUSION: The Federal action **may affect, is not likely to adversely affect** southwestern willow flycatcher as a result of groundwater pumping.

7.1.1.2 Proposed Critical Habitat

USFWS has requested to conference on the potential effects to proposed southwestern willow flycatcher critical habitat. Critical habitat has been recently proposed in the Action Area along segments of the Pahranagat Creek that run through Pahranagat NWR and Key Pittman WMA (USFWS, 2011a).

Pahranagat NWR (Upper Lake) and Key Pittman WMA (Nesbitt Lake) are located over 6 miles away, and in a different hydrographic basin, from the simulated groundwater drawdown area at both 75 years after full build out and 100 years of recovery

CONCLUSION: The Federal action **may affect, is not likely to disturb or destroy** proposed critical habitat for southwestern willow flycatcher as a result of groundwater pumping.

7.1.2 Desert Tortoise

7.1.2.1 Species

Tier 1 ROWs

Tier 1 ROWs traverse through desert tortoise occupancy areas and habitat. Construction, operation, and maintenance of the Federal action have the potential to result in direct and indirect effects and take of desert tortoise as a result of Tier 1 ROWs.

A number of ACMs are identified in Section 6.0 to reduce the effect and extent of take of tortoise in the Action Area. These include preconstruction surveys, removal of tortoise from the construction area, construction monitoring, tortoise fencing, and restoration of the temporary construction corridors.

Future Tiers: Groundwater Development and Groundwater Pumping

Desert tortoise habitat does not occur within the groundwater development areas. Thus, there would be no direct effects on tortoises from construction of future ROWs. However, the northern limit of the range of desert tortoises is within approximately 1 mile of the southern extent of the groundwater development area in Delamar Valley. Thus, there could be indirect effects to desert tortoise as a result of future ROWs.

Desert tortoise habitat does not occur within the simulated groundwater drawdown area at both 75 years after full build out and 100 years of recovery, and desert tortoises are not reliant on groundwater and/or spring flow resources. Thus, there would be no groundwater pumping effects to desert tortoise.

CONCLUSION: The Federal action **may affect, is likely to adversely affect** desert tortoise as a result of the Tier 1 ROWs.

7.1.2.2 Critical Habitat

Tier 1 ROWs

The proposed project pipeline and power line alignments would pass through the Mormon Mesa CHU; however, these alignments would be predominantly within designated utility corridors or adjacent to the existing highway. PCEs in desert tortoise critical habitat could be directly and indirectly affected as a result of Tier 1 ROWs.

ACMs are identified in Section 6.0 to reduce the effects of the Federal action on the Mormon Mesa CHU. Approximately 246 acres of USFWS designated critical tortoise habitat would be permanently developed.

Future Tiers: Groundwater Development and Groundwater Pumping

Designated critical habitat in the Mormon Mesa CHU is located approximately 6 miles south of the southern-most extent of the closest groundwater development area. Thus, desert tortoise critical habitat would not be directly or indirectly affected by future ROWs.

There is no desert tortoise critical habitat within the simulated groundwater drawdown area at both 75 years after full build out and 100 years of recovery, and critical habitat PCEs are not tied to groundwater and/or spring flow resources. Thus, there would be no groundwater pumping effects to desert tortoise critical habitat.

CONCLUSION: The Federal action **may affect, is likely to disturb or destroy designated critical habitat** desert tortoise critical habitat as a result of the Tier 1 ROWs.

7.1.3 Pahrump Poolfish

Tier 1 ROWs

The Pahrump poolfish population in Spring Valley, is approximately 4 miles away from the nearest Tier 1 ROWs. At this distance, the species would not experience direct or indirect effects from Tier 1 ROWs.

Future Tiers: Groundwater Development and Groundwater Pumping

The Pahrump poolfish population in Spring Valley is approximately 0.3 miles away from the nearest groundwater development areas. At this distance, the species would not experience direct or indirect effects from future ROWs.

The model simulates groundwater drawdown in the Shoshone Ponds area up to approximately 25 feet at 75 years after full build out (**Figure 4-6**). Groundwater elevation and spring flow rapidly recover in central Spring Valley, with nearly complete recovery (<3 feet) from groundwater drawdown at Shoshone Ponds within the 100 years of recovery period (**Figures 3-2 and 4-5B**). Because the artesian wells at Shoshone Ponds are not specifically simulated in the model, there are no flow simulations at this location.

The Pahrump poolfish habitats at Shoshone Ponds are fed by artesian wells where there are likely multiple zones of confined conditions. If there is a connection between the regional aquifer and the aquifer(s) that supply the Shoshone wells, then groundwater drawdown could reduce flow or prevent the well from flowing naturally. Flow to the ponds could be maintained with installation of pumps in the supply wells.

CONCLUSION: The Federal action **may affect, is likely to adversely affect** Pahrump poolfish as a result of future groundwater pumping.

7.1.4 White River Spinedace

7.1.4.1 Species

Tier 1 ROWs

The White River spinedace in the Flag Springs Complex is located approximately 11 miles away and in a different hydrographic basin from the nearest Tier 1 ROW. At this distance, the species would not experience direct or indirect effects from Tier 1 ROWs.

Future Tiers: Groundwater Development and Groundwater Pumping

The White River spinedace in the Flag Springs Complex is located approximately 4.5 miles away and in a different hydrographic basin from the nearest groundwater development area. At this distance, the species would not experience direct or indirect effects from future ROWs.

The model simulations predict a reduction in flow at Flag Springs Complex of 3 percent at the 75 years after full build out timeframe, and a maximum of 4 percent during the 100 year recovery period. For the springs or streams with flow predictions, a simulated incremental change in flow of less than 5 percent was inferred to indicate that measureable impacts were unlikely to occur. A less than 5 percent reduction of flow would be difficult to accurately measure or distinguish from natural fluctuations and is presumed to be within the model uncertainty. Although these specific predictions should be qualified as having significant uncertainties, the model results suggest that the groundwater development is unlikely to result in a measurable flow reduction at the Flag Springs Complex during either the pumping or recovery period.

Nevertheless, the model results suggest that the groundwater development eventually could reduce flows in the Flag Springs Complex; the anticipated flow reductions are expected to be relatively small compared to baseline conditions.

Effects to the White River spinedace in Flag Springs will be avoided, minimized and/or mitigated by way of the DDC Stipulation requirements, ACMs, and BLM recommended measures.

CONCLUSION: The Federal action **may affect, is not likely to adversely affect** White River spinedace as a result of future groundwater pumping.

7.1.4.2 Critical Habitat

Designated critical habitat for White River spinedace occurs at Flag Springs Complex and its outflows, Lund Spring, and Preston Big Spring. Lund and Preston Big springs have been unoccupied by White River spinedace for over 20 years.

Tier 1 ROWs

Designated critical habitats for the White River spinedace at Flag Springs Complex, Lund Spring, and Preston Big Spring are located 11-20 miles away and in different hydrographic basins from the Tier 1 ROWs. At these distances, the critical habitats would not experience direct or indirect effects from Tier 1 ROWs.

Future Tiers: Groundwater Development and Groundwater Pumping

Designated critical habitats for the White River spinedace at Flag Springs Complex, Lund Spring, and Preston Big Spring are located 4-20 miles away and in different hydrographic basins

from the nearest groundwater development areas. At these distances, the critical habitats would not experience direct or indirect effects from future ROWs.

The model simulations predict a reduction in flow at Flag Springs Complex of 3 percent at the 75 years after full build out timeframe, and a maximum of 4 percent during the 100 year recovery period. For the springs or streams with flow predictions, a simulated incremental change in flow of less than 5 percent was inferred to indicate that measureable impacts were unlikely to occur. A less than 5 percent reduction of flow would be difficult to accurately measure or distinguish from natural fluctuations and is presumed to be within the model uncertainty. Although these specific predictions should be qualified as having significant uncertainties, the model results suggest that the groundwater development is unlikely to result in a measurable flow reduction at the Flag Springs Complex during either the pumping or recovery period.

Nevertheless, the model results suggest that the groundwater development eventually could reduce flows in the Flag Springs Complex; the anticipated flow reductions are expected to be relatively small compared to baseline conditions.

Lund and Preston Big springs and are located approximately 17-28 miles away (respectively) and in a different hydrographic basin from the simulated groundwater drawdown area at both 75 years after full build out and 100 years of recovery (**Figure 4-6**).

At both Lund and Preston Big springs at 75 years after full build out and 100 years recovery, the model simulates a less than 1 percent spring flow reduction, which is beyond the limitation of the model and does not identify these springs as areas of risk. The model simulated baseline flows were approximately 92% of the actual average flows at Lund Spring and 106% of the actual average flows at Preston Big Springs indicating that the regional model provides a reasonable representation of the baseline flow at these springs.

Effects to the White River spinedace critical habitat in Flag Springs will be avoided, minimized and/or mitigated by way of the DDC Stipulation requirements, ACMs, and BLM recommended measures.

CONCLUSION: The Federal action **may affect, is not likely to disturb or destroy designated critical habitat** White River spinedace critical habitat as a result of future groundwater pumping.

7.1.5 Hiko White River Springfish

7.1.5.1 Species

Tier 1 ROWs

Hiko White River springfish in Hiko and Crystal springs are located approximately 20 miles away and in a different hydrographic basin from the nearest Tier 1 ROWs. At this distance, the species would not experience direct or indirect effects from Tier 1 ROWs.

Future Tiers: Groundwater Development and Groundwater Pumping

Hiko White River springfish in Hiko and Crystal springs are located approximately 16 miles away and in a different hydrographic basin from the nearest groundwater development area. At this distance, the species would not experience direct or indirect effects from future ROWs.

Hiko and Crystal springs are located over 6 miles away, and in a different hydrographic basin, from the simulated groundwater drawdown area at both 75 years after full build out and 100

years of recovery. At both Hiko and Crystal springs at 75 years after full build out and 100 years recovery, the model simulates a less than 1 percent spring flow reduction, which is beyond the limitations of the model and does not identify these springs as areas of risk. While potential impacts to Hiko White River springfish in Pahranagat Valley cannot be ruled out with 100 percent certainty, model simulations and other lines of evidence indicate that any such pumping effects are unlikely to occur.

CONCLUSION: The Federal action **may affect, is not likely to adversely affect** Hiko White River springfish as a result of future groundwater pumping.

7.1.5.2 Critical Habitat

Critical habitat for the Hiko White River springfish includes Crystal and Hiko springs and their outflows, plus surrounding land areas for a distance of 50 feet from those springs and outflows.

Tier 1 ROWs

Designated critical habitats for the Hiko White River springfish in Hiko and Crystal springs are located approximately 20 miles away and in a different hydrographic basin from the nearest Tier 1 ROWs. At this distance, the critical habitat would not experience direct or indirect effects from Tier 1 ROWs.

Future Tiers: Groundwater Development and Groundwater Pumping

Designated critical habitats for the Hiko White River springfish in Hiko and Crystal springs are located approximately 16 miles away and in a different hydrographic basin from the nearest groundwater development area. At this distance, the critical habitats would not experience direct or indirect effects from future ROWs.

Hiko and Crystal springs are located over 6 miles away , and in a different hydrographic basin, from the simulated groundwater drawdown area at both 75 years after full build out and 100 years of recovery. At both Hiko and Crystal springs at 75 years after full build out and 100 years recovery, the model simulates a less than 1 percent spring flow reduction, which is beyond the limitations of the model and does not identify these springs as areas of risk. While potential impacts to Hiko White River springfish critical habitat in Pahranagat Valley cannot be ruled out with 100 percent certainty, model simulations and other lines of evidence indicate that any such pumping effects are unlikely to occur.

CONCLUSION: The Federal action **may affect, is not likely to disturb or destroy designated critical habitat** Hiko White River springfish critical habitat as a result of future groundwater pumping.

7.1.6 Pahranagat Roundtail Chub

The Pahranagat roundtail chub occurs in Pahranagat Creek and a managed reservoir at Key Pittman WMA in Pahranagat Valley. Ash Spring is the principal headwater for Pahranagat Creek, while Crystal Spring provides outflow outside of the summer irrigation season. Hiko Spring is a major water source for Key Pittman WMA.

Tier 1 ROWs

The Pahranagat roundtail chub in Pahranagat Creek and Key Pittman WMA reservoir are located approximately 17 miles away and in a different hydrographic basin from the nearest Tier 1

ROW. At this distance, the species would not experience direct or indirect effects from Tier 1 ROWs.

Future Tiers: Groundwater Development and Groundwater Pumping

The Pahranagat roundtail chub in Pahranagat Creek and Key Pittman WMA reservoir are located approximately 14 miles away and in a different hydrographic basin from the nearest groundwater development area. At this distance, the species would not experience direct or indirect effects from future ROWs.

Pahranagat Creek, the Ash and Crystal spring headwaters, and Key Pittman WMA reservoir are located over 5 miles away and in a different hydrographic basin from the groundwater drawdown area at both 75 years after full build out and 100 years of recovery. At Ash, Crystal and Hiko springs at 75 years after full build out and 100 years recovery, the model simulates a less than 1 percent spring flow reduction, which is beyond the limitations of the model and does not identify these springs as areas of risk. While potential impacts to Pahranagat roundtail chub in Pahrangat Valley cannot be ruled out with 100 percent certainty, model simulations and other lines of evidence indicate that any such pumping effects are unlikely to occur.

CONCLUSION: The Federal action **may affect, is not likely to adversely affect** Pahranagat roundtail chub as a result of future groundwater pumping.

7.1.7 White River Springfish

7.1.7.1 Species

Tier 1 ROWs

The White River springfish in Ash Springs is located approximately 17 miles away and in a different hydrographic basin from the nearest Tier 1 ROW. At this distance, the species would not experience direct or indirect effects from Tier 1 ROWs.

Future Tiers: Groundwater Development and Groundwater Pumping

The White River springfish in Ash Springs is located approximately 14 miles away and in a different hydrographic basin from the nearest groundwater development area. At this distance, the species would not experience direct or indirect effects from future ROWs.

Ash Springs is located over 5 miles away, and in a different hydrographic basin, from the simulated groundwater drawdown area at both 75 years after full build out and 100 years of recovery. At 75 years after full build out and 100 years recovery, the model simulates a less than 1 percent spring flow reduction, which is beyond the limitations of the model and does not identify Ash Springs as an area of risk. While potential impacts to White River springfish cannot be ruled out with 100 percent certainty, model simulations and other lines of evidence indicate that any such pumping effects are unlikely to occur.

CONCLUSION: The Federal action **may affect, is not likely to adversely affect** White River springfish as a result of future groundwater pumping.

7.1.7.2 Critical Habitat

Critical habitat for the White River springfish encompasses Ash Springs and associated outflows, including a 50-foot buffer zone of adjacent lands.

Tier 1 ROWs

Designated critical habitat for the White River springfish in Ash Springs is located approximately 17 miles away and in a different hydrographic basin from the nearest Tier 1 ROW. At this distance, the critical habitat would not experience direct or indirect effects from Tier 1 ROWs.

Future Tiers: Groundwater Development and Groundwater Pumping

Designated critical habitat for the White River springfish in Ash Springs is located approximately 14 miles away and in a different hydrographic basin from the nearest groundwater development area. At this distance, the critical habitat would not experience direct or indirect effects from future ROWs.

Ash Springs is located over 5 miles away, and in a different hydrographic basin, from the simulated groundwater drawdown area at both 75 years after full build out and 100 years of recovery. At 75 years after full build out and 100 years recovery, the model simulates a less than 1 percent spring flow reduction, which is beyond the limitations of the model and does not identify Ash Springs as an area of risk. While potential impacts to White River springfish critical habitat cannot be ruled out with 100 percent certainty, model simulations and other lines of evidence indicate that any such pumping effects are unlikely to occur.

CONCLUSION: The Federal action **may affect, is not likely to disturb or destroy designated critical habitat** White River springfish critical habitat as a result of future groundwater pumping.

7.1.8 Moapa Dace

7.1.8.1 Species

Tier 1 ROWs

The Moapa dace population in the upper Muddy River and tributary springs is located approximately 11 miles away, and in a different hydrographic basin, from the nearest Tier 1 ROWs. At this distance, the species would not experience direct or indirect effects from Tier 1 ROWs.

Future Tiers: Groundwater Development and Groundwater Pumping

The Moapa dace population in the upper Muddy River and tributary springs is located approximately 40 miles away, and in a different hydrographic basin, from the nearest groundwater development area. At this distance, the species would not experience direct or indirect effects from future ROWs.

The upper Muddy River and tributary springs are located approximately 40 miles away, and in a different hydrographic basin, from the simulated groundwater drawdown area at both 75 years after full build out and 100 years of recovery. At the USGS Muddy River Near Moapa Gage at 75 years after full build out and 100 years recovery, the model simulates a less than 1 percent flow reduction, which is beyond the limitations of the model and does not identify the upper Muddy River and tributary springs as an area of risk. While potential impacts to Moapa dace cannot be ruled out with 100 percent certainty, model simulations and other lines of evidence indicate that any such pumping effects are unlikely to occur.

Under the Coyote Spring Valley Stipulation, the Muddy River MOA, and the associated BO, non-discretionary regulatory triggers and agreements are in place to protect in-stream flows and Moapa dace.

CONCLUSION: The Federal action **may affect, is not likely to adversely affect** Moapa dace as a result of future groundwater pumping.

7.1.9 Ute Ladies'-Tresses

7.1.9.1 Species

Tier 1 ROWs

The best scientific information available indicates that ULT do not occur within or near the Tier 1 ROWs.

Tier 1 ROWs have been routed to avoid springs, streams, and wetlands where ULT potential habitat occurs, and temporary construction water pumping is not anticipated to propagate measurably beyond the ROWs. Thus, ULT potential habitats are not expected to be affected by the Tier 1 ROWs.

Future Tiers: Groundwater Development and Groundwater Pumping

Surface disturbance activities could indirectly affect ULT potential habitat in Spring Valley by altering habitat or water quality. Groundwater pumping would indirectly affect ULT potential habitat in Spring and southern Snake valleys by reducing flow to springs and waterbodies and lowering groundwater elevations supporting wetland habitat. Simulation results suggest that a substantial change in spring flow at Keegan Spring Complex (and other springs in Spring Valley) could occur 75 years after full buildout. Furthermore, the model results suggest that Big Springs (and other springs located in the southern portion of the Snake Valley) that may be hydraulically connected to the regional flow system could potentially experience some reduction in flow at 75 years after full buildout.

CONCLUSION: The Federal action would likely adversely modify ULT potential habitat. Thus, the Federal action **may affect, is likely to adversely affect** ULT.

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Wildland International

Dan Malueg	Principal	Technical Reviewer

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APPENDIX A

USACE LETTER DESIGNATING LEAD AGENCY

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, SACRAMENTO
CORPS OF ENGINEERS
1325 J STREET
SACRAMENTO CA 95814-2922

RECEIVED MAR 12 2012

REPLY TO
ATTENTION OF

February 27, 2012

Regulatory Division SPK-2009-00594

Penny Woods
Bureau of Land Management
PO Box 12000
Reno, Nevada 89520-0006

Dear Ms. Woods:

This letter concerns the designation of lead Federal agency for the proposed Clark, Lincoln and White Pine Counties Groundwater Development project. The project is located in Clark, Lincoln and White Pine Counties, as shown on the Attachment 1 – Map of the proposed project.

We hereby designate Bureau of Land Management as the lead Federal agency to act on our behalf for purposes of compliance with the Section 7 of the Endangered Species Act (ESA) and Section 106 of the National Historic Preservation Act (NHPA) for Department of the Army (DA) authorization required for the Clark, Lincoln and White Pine Counties Groundwater Development project.

When you initiate consultation under Section 7 of the ESA or Section 106 of the NHPA, please include a statement indicating that we have designated Bureau of Land Management as the lead Federal agency for the project, along with a copy of this letter.

Please refer to identification number SPK-2009-00594 in any correspondence concerning this project. If you have any questions, please contact Patricia Mcqueary at 196 E Tabernacle Street Room 30, St. George, Utah 84770, email *Patricia.L.McQueary@usace.army.mil*, or telephone 435-986-3979. For more information regarding our program, please visit our website at *www.spk.usace.army.mil/regulatory.html.*

Sincerely,

Jason A. Gipson
Utah-Nevada Branch Chief
Sacramento District

Enclosure: Attachment 1: Map of project location

Cc: Lisa Luptowitz, SNWA, PO Box 99956, Las Vegas, NV 89193-9956

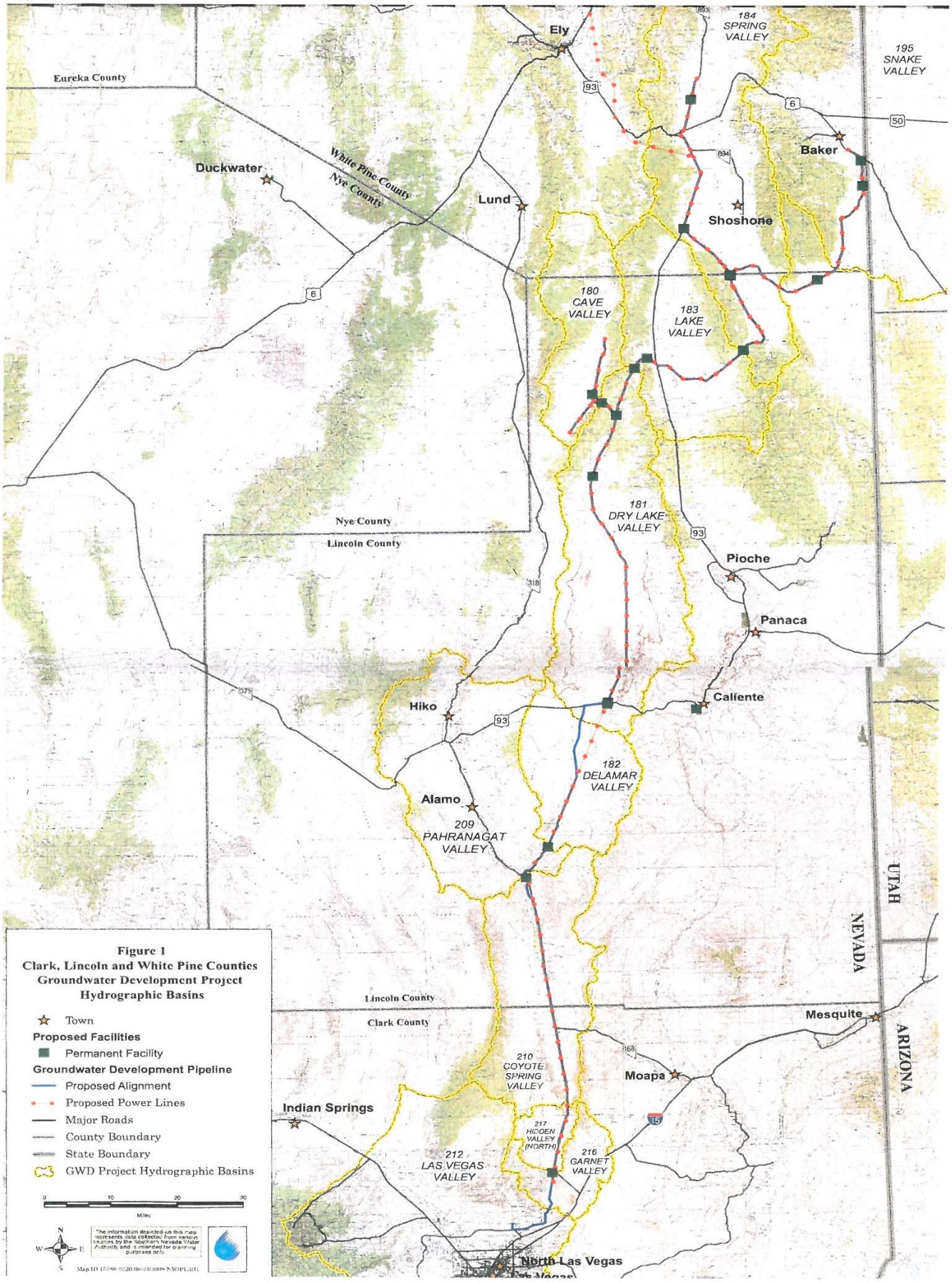

Figure 1
Clark, Lincoln and White Pine Counties Groundwater Development Project Hydrographic Basins

APPENDIX B

USFWS SPECIES LIST
JANUARY 25, 2012

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Nevada Fish and Wildlife Office
1340 Financial Blvd., Suite 234
Reno, Nevada 89502
Ph: (775) 861-6300 ~ Fax: (775) 861-6301

January 25, 2012
File No. 2011-SL-0360

Memorandum

To: Project Manager, Nevada Groundwater Projects Office, Bureau of Land Management, Reno, Nevada

From: State Supervisor, Nevada Fish and Wildlife Office, Reno, Nevada

Subject: Updated Species List for the Clark, Lincoln, and White Pine Counties Groundwater Development Project, Nevada

This responds to your letter received on July 27, 2011, requesting an updated species list for the Clark, Lincoln, and White Pine Counties Groundwater Development Project (GWD Project), located in east-central and southern Nevada. The Fish and Wildlife Service (Service) provided a species list for the GWD Project on three previous occasions: June 11, 2009 (File No. 2009-SL-0340), November 20, 2006 (File No. 1-5-07-SP-012), and May 10, 2005 (1-5-05-SP-093). Species lists are typically good for only 90 days per Service policy, but it is not necessary for long-term projects to request a new species list every 90 days. However, in 2011 we advised you that an updated species list was needed for this project due to the time elapsed since the last one was issued. We regret that it has taken so long to respond in writing to your request, but note that we have been informally consulting with the Bureau of Land Management (BLM) and the project proponent on potential impacts to endangered and threatened species since July 2011. Therefore, the contents of this memorandum have been verbally conveyed already over the last few months. This written correspondence serves to formally update the June 2009 list of endangered, threatened and candidate species and (designated/proposed) critical habitat that may be affected by the GWD Project (see Attachment A). This list fulfills the requirement of the Service to provide information on listed species pursuant to section 7(c) of the Endangered Species Act of 1973 (ESA), as amended, for projects that are authorized, funded, or carried out by a Federal agency.

We developed this species list based on our preliminary evaluation of the potential for direct, indirect, and cumulative effects to aquatic and terrestrial fauna as a consequence of implementing the proposed action identified in the June 2011 Draft Environmental Impact

TAKE PRIDE IN AMERICA

Statement (Draft EIS). As you are aware, the Service is a cooperating agency for this project. In this capacity, we have reviewed hydrologic and biological data collected by BLM, Southern Nevada Water Authority (SNWA), and others. When developing this species list, we relied on our review of the Draft EIS, model reports and documentation for the Central Carbonate-Rock Province (CCRP) groundwater flow model (developed specifically for this project), and other available models, data, and information. Given the uncertainties associated with the CCRP model predictions, as well as the programmatic (i.e., conceptual) nature of the section 7 consultation for the proposed groundwater withdrawal, we have taken an inclusive (conservative) approach to determining the potential geographic extent of project effects, and thus the species that may be affected by the proposed project. Tiered section 7 consultations for future groundwater development will provide additional opportunities to refine this species list, based on specific project-related information (e.g., the location of production wells) and (hopefully) improved predictive tools.

The Service is also concerned about potential adverse impacts to non-listed (Nevada at-risk and Utah sensitive) species as a consequence of project implementation (please refer to previously issued species lists for a description of our general concerns). Many species in the project area are dependent on groundwater-influenced ecosystems, have narrow geographic ranges, and/or are sensitive to changes in the aquatic environment, making them especially vulnerable to adverse effects arising from implementation of the GWD Project. Under 7(a)1 of the ESA, the Service encourages the formation of partnerships to conserve not only listed species, but also those species considered at-risk or sensitive at the State level as this may prevent the need for future protection under the ESA. Based on these factors, the Service issued a memorandum to BLM on April 7, 2010, requesting that the two agencies confer on potential GWD Project impacts to eight non-listed species ("technical assistance species;" File No. 2009-SL-0340.AMD). This request was the result of numerous discussions between the Service, BLM, and the project proponent about which non-listed species would benefit from technical assistance, and was based on several considerations including: 1) potential for adverse effects from project implementation, and/or 2) status of the species in the ESA listing process. Our rationale for requesting that a species be considered a "technical assistance species" is provided in our April 7, 2010 memorandum.

On November 23, 2010, BLM agreed to seek technical assistance from the Service on seven of the eight species (Appendix B), thereby providing the Service an additional opportunity to work with BLM and the project proponent on developing conservation recommendations aimed at avoiding, minimizing, and/or mitigating project impacts. Since then, there have been several meetings or conference calls to discuss the technical assistance species, including whether additional species need to be included or others dropped from the list. By way of this memorandum, we reiterate our April 2010 request to provide technical assistance on the seven previously agreed-upon technical assistance species. Based on discussions with BLM, we understand that there will be opportunities during future tiered analyses to add other technical assistance species, once future project components are known and the potential for impact to these species are better understood. These species could include least chub (*Iotichthys*

phlegethontis), yellow-billed cuckoo (*Coccyzus americanus*), Baking Powder Flat blue butterfly (*Euphilotes bernardino minuta*), and potentially others, if needed. The Service appreciates the opportunity to continue working with BLM and the project proponent to develop conservation recommendations that will avoid or minimize adverse impacts to these sensitive species.

While we defer to our April 7, 2010 memo to provide the general rationale for technical assistance on particular species, we feel it especially important to discuss one species herein. The northern leopard frog (*Lithobates* [=Rana] *pipiens*) has been the subject of several recent discussions about whether it should remain as a technical assistance species given the Services' 12-month finding (dated October 5, 2011) on a petition to list the species under the ESA. While the Service found that listing the northern leopard frog under the ESA is not warranted at this time, we acknowledged that this species appears to be absent or declining throughout much of its historic and current range in the western U.S. and western Canada. Additionally, Spring Valley in eastern Nevada appears to harbor a relatively large number of northern leopard frogs for the State, and the GWD Project could adversely impact this area as evidenced by the substantial predicted increases in depth-to-water in Spring Valley under all but the No Action alternative. Based on the potential for this project to substantially affect what is one of Nevada's few known, large populations of northern leopard frog, we continue to request that BLM include this species as a technical assistance species.

Please reference File No. 2011-SL-0360 in future correspondence concerning this species list. If you have any questions regarding this correspondence or require additional information, please contact me or Annalaura Averill-Murray at (775) 861-6300.

for: Edward D. Koch

2 Attachments

cc:

Division Manager, Environmental Resources Division, Southern Nevada Water Authority, Las Vegas, Nevada
Director, Nevada Department of Wildlife, Reno, Nevada
Director, Utah Division of Wildlife Resources, Salt Lake City, Utah
State Director, Utah State Office, Bureau of Land Management, Salt Lake City, Utah
District Manager, Southern Nevada District Office, Bureau of Land Management, Las Vegas, Nevada (attn: Mark Slaughter)

Field Manager, Schell Field Office, Bureau of Land Management, Ely, Nevada (attn: Paul Podborny)
Field Manager, Caliente Field Office, Bureau of Land Management, Caliente, Nevada (attn: Alicia Styles)
Project Leader, Fish Springs National Wildlife Refuge, U.S. Fish and Wildlife Service, Ibapah, Utah
Project Leader, Desert National Wildlife Refuge Complex, U.S. Fish and Wildlife Service, Las Vegas, Nevada (attn: Amy Lavoie)
Field Supervisor, Utah Ecological Services Office, U.S. Fish and Wildlife Service, West Valley City, Utah (attn: Amy Defreese)
Assistant Field Supervisor, Nevada Fish and Wildlife Office, U.S. Fish and Wildlife Service, Las Vegas, Nevada (attn: Brian Novosak)

ATTACHMENT A

LISTED AND CANDIDATE SPECIES AND DESIGNATED AND PROPOSED CRITICAL HABITAT THAT MAY BE AFFECTED BY THE CLARK, LINCOLN, AND WHITE PINE COUNTIES GROUNDWATER DEVELOPMENT PROJECT

File No. 2011-SL-0360
January 25, 2012

Common Name	Scientific Name	Status under ESA	Critical Habitat	
			Designated	Proposed
Birds				
Southwestern willow flycatcher	*Empidonax traillii extimus*	Endangered	Yes	Yes (Revised)
Yuma clapper rail	*Rallus longirostris yumanensis*	Endangered	No	No
Yellow-billed cuckoo (Western U.S., DPS)	*Coccyzus americanus*	Candidate	---	---
Greater sage-grouse	*Centrocercus urophasianus*	Candidate	---	---
Reptiles				
Desert tortoise (Mojave population)	*Gopherus agassizii*	Threatened	Yes	---
Fish				
White River springfish	*Crenichthys baileyi baileyi*	Endangered	Yes	---
Hiko White River springfish	*Crenichthys baileyi grandis*	Endangered	Yes	---
Pahrump poolfish	*Empetrichthys latos*	Endangered	No	No
Pahranagat roundtail chub	*Gila robusta jordani*	Endangered	No	No
White River spinedace	*Lepidomeda albivallis*	Endangered	Yes	---
Moapa dace	*Moapa coriacea*	Endangered	No	No
Big Spring spinedace	*Lepidomeda mollispinis pratensis*	Threatened	Yes	---
Least chub	*Iotichthys phlegethontis*	Candidate	---	---
Plants				
Ute ladies'-tresses	*Spiranthes diluvialis*	Threatened	No	No
Las Vegas buckwheat	*Eriogonum corymbosum* var. *nilesii*	Candidate	---	---

ATTACHMENT B

TECHNICAL ASSISTANCE SPECIES FOR THE CLARK, LINCOLN, AND WHITE PINE COUNTIES GROUNDWATER DEVELOPMENT PROJECT

File No. 2011-SL-0360
January 25, 2012

Common Name	Scientific Name	Status
Greater sage-grouse	*Centrocercus urophasianus*	Candidate for listing under ESA, BLM Sensitive Species, Utah Wildlife Species of Concern, NV Heritage At-Risk Species
Northern leopard frog	*Lithobates* [=Rana] *pipiens*	BLM Sensitive Species, NV Heritage Watch List Species
Longitudinal gland pyrg	*Pyrgulopsis anguina*	BLM Sensitive Species*, Utah Sensitive Species, NV Heritage At-Risk Species, petitioned for listing under ESA (positive 90 finding)
Flag pyrg	*Pyrgulopsis breviloba*	BLM Sensitive Species*, NV Heritage At-Risk Species, petitioned for listing under ESA (positive 90 finding)
Butterfield pyrg	*Pyrgulopsis lata*	BLM Sensitive Species*, NV Heritage At-Risk Species, petitioned for listing under ESA (positive 90 finding)
Lake Valley pyrg	*Pyrgulopsis sublata*	BLM Sensitive Species*, NV Heritage At-Risk Species, petitioned for listing under ESA (positive 90 finding)
Blaine's pincushion	*Sclerocactus blainei*	BLM Sensitive Species, NV Heritage At-Risk species

*Per the NV BLM State Office, all petitioned springsnails should be on the sensitive species list, though some do not appear on the list.

APPENDIX C

Rationale for “no effect” determinations

Appendix C: Rationale for "no effect" determinations for certain species

Species Account: Yuma clapper rail (Rallus longirostris yumanensis)

Species Biology

The Yuma clapper rail is a marsh-obligate species found in habitat dominated by cattail (*Typha latifolia*) and bulrush (*Schoenoplectus acutus*), with populations along the Colorado River in Arizona, along the Gila and Rio Grande rivers in New Mexico, on the Salton Sea in California, and on the Kern and Santa Cruz rivers in California. In Nevada, this species occupies habitat on the Muddy and Virgin rivers, in the Las Vegas Wash, and at Ash Meadows National Wildlife Refuge. This species is opportunistic in diet, depending upon habitat type utilized (USFWS, 1983). Along the Colorado River, this species feeds primarily on crayfish (*Procambarus* spp., *Oropectes* spp.) (Ohmart and Tomlinson, 1977). Breeding is from March through August, with nests built on 3 to 6 inch raised platforms of vegetation, and concealed in dense marsh vegetation (Grinnell et al., 1918). Nestlings are able to fly 63 to 70 days after hatching.

Status of the Species

The Yuma clapper rail is listed as endangered by the USFWS (USFWS, 1967), and is currently known to intermittently occupy areas along the lower Muddy and Virgin rivers in southern Nevada. Currently, four populations in these areas are being monitored: three sites all located near Overton, Nevada and another near Logandale, Nevada. The sites located along the lower Muddy River are not within the Action Area, but are within the area encompassed by the groundwater model (Figure 4-2). These populations are located at the known northern range of the species (USFWS, 2006a). Annual surveys of suitable Yuma clapper rail habitat in the Muddy and Virgin rivers have been performed by the San Bernardino County Museum (McKernan and Braden, 2001; McKernan and Carter, 2002; Rathbun and Braden, 2003; Braden et al. 2004; Braden et al., 2005; Braden etal., 2006; 2007; 2008; SWCA, 2009). Sightings of this species have fluctuated over the years at these sites, ranging from a high of 26 individuals, to a low of zero individuals (Braden et al., 2006). This fluctuation likely results, in part, from annual variations in the amount of suitable habitat present along the river, and other factors such as periodic grazing of livestock, flooding/scouring events, and droughts (SWCA, 2009). Recent survey data from 2009 (inclusive of both Muddy River and Virgin River populations) detected 12 individuals, down from a high of 19 in 2007 (SWCA, 2009). A recovery plan for the Yuma clapper rail was published by the USFWS in 1983 (USFWS, 1983). Primary objectives of this recovery plan include maintaining a minimum population of 700-1,000 individuals, carrying out programs of public conservation education, and preservation of habitat. A 5-year status review of the species conducted in 2006 (USFWS, 2006a) indicated that 75 percent of the Recovery Plan objectives had been met, and the species was considered stable (across the entire range). It was the opinion of the USFWS that delisting was not appropriate at that time.

Status of Species in the Action Area

The Yuma clapper rail does not occur within the Action Area. However, the species is included in this BA due to concerns regarding potential indirect effects of groundwater pumping under the Programmatic Action on flow of the Muddy River.

Threats to the Species

Within the range of Yuma clapper rail, loss of riparian and wetland habitats due to new construction and modification/diversion of surface water resources, and degradation of riparian habitat through invasion of non-natives such as salt cedar are primary threats to the species. Regional drought, fire, localized flooding, and climate change have the potential to degrade the quality and quantity of available habitat on both local and regional scales.

Status of the Critical Habitat

No critical habitat for the Yuma Clapper Rail has been designated.

Effects Analysis for the Federal Action for Yuma Clapper Rail

Effects to the Species

Tier 1 ROWs

Direct Effects: The occurrence of Yuma clapper rail is greater than 25 miles from the Tier 1 ROWs and in a separate hydrographic basin. Therefore, the Yuma clapper rail would not be directly affected by construction and/or operation/maintenance activities.

Indirect Effects: Yuma clapper rail occurrence is located more than 25 miles from the Tier 1 ROWs and would not be indirectly affected by construction-related effects such as dust, noise, traffic, and hazardous or toxic material spills.

Groundwater Development Areas

Direct Effects: Yuma clapper rail occurrence is located approximately 60 miles from the nearest groundwater development area and would not be directly affected by construction and/or operation/maintenance activities.

Indirect Effects: Yuma clapper rail occurrence is located approximately 60 miles from the nearest groundwater development area and would not be indirectly affected by construction related effects such as dust, noise, traffic, and hazardous or toxic material spills. Yuma clapper rail habitat lies outside of the groundwater development areas and the drawdown area (also outside the 1-foot drawdown area).

Groundwater Pumping Effects

Groundwater modeling predicts a zero percent reduction in flow in the Lower Muddy River at 75 years after full buildout. Therefore, effects should be temporally and spatially separated from the listed species.

Effects to Designated Critical Habitat

There is no designated critical habitat for the Yuma clapper rail.

Species Account: Big Springs Spinedace (Lepidomeda mollispinis pratensis)

Species Biology

The Big Springs spinedace is a small (up to 4.3 inches), spring-dwelling member of the family Cyprinidae. It is characterized by its spinelike fin rays, and differs from other members of the

genus by several features including the confinement of melanophores to the upper portion of the opercle and preopercle, and a shorter dorsal fin (USFWS, 1994c). It differs from the related Virgin River subspecies by its longer pelvic fins and dorsal fin (USFWS, 1994c). They are most likely opportunistic feeders that consume aquatic invertebrates and algae, and have a life history similar to other members of the genus.

Spawning has yet to be observed, but is believed to occur from late May to early June

(Langhorst, 1991). Within Condor Canyon, fish have been noted in areas where the water is from 1 to 3 feet deep, with floating vegetation and moderate to slow currents (Allan, 1985).

Status of Species

The Big Springs spinedace was federally listed as threatened by the USFWS on March 28, 1985 (USFWS, 1985b). This species was once thought to have occurred only in the outflow stream of Panaca Spring, Nevada, which flows into Meadow Valley Wash below Condor Canyon. The species was extirpated from the Panaca Spring outflow stream in the 1960s and was thought to be extinct. Then, in 1977, the species was found in a waterfall plunge pool within Meadow Valley Wash in Condor Canyon, where the wash is a small perennial stream, dependent on discharge from Delumes Spring to maintain volume. Presently, the species occupies the perennial stream within Condor Canyon, which includes both private and public lands. The population size of individuals in 2004 was estimated to be 2,267 (BIO-WEST, 2007a). The number of spinedace recorded during electro-fishing surveys from 2005-2008 ranged from 200-300 fish. The actual population estimate for 2008 was 1,404 spinedace (NDOW, 2008b). In 2009, 631 spinedace were captured in Condor Canyon and 100 of these were PIT (passive integrated transponder) tagged as part of a USGS movement study (NDOW, 2009b). The most recent 2010 survey of Condor Canyon documented 1,231 spinedace (NDOW, 2010c). A recovery plan has been established for the Big Springs spinedace (USFWS, 1994c). Objectives of this recovery plan are to secure and monitor habitat in Condor Canyon, establish a refugium population, and implement a public outreach program. These goals have yet to be met.

Status of Species in the Action Area

The Big Springs spinedace occurs outside the Action Area. This species is not within the drawdown area at 75 years after full buildout or 100 years recovery (also not within the potential 1-foot drawdown area).

Threats to the Species

This species has recently been threatened by wildfire in the general vicinity of Condor Canyon causing erosion and siltation in the stream channel. Another major threat to this species is the potential for a flood event that could scour the stream channel and wash fish downstream to inappropriate habitat where they could not survive. Predation by non-native crayfish (*Pacifastacus leniusculus*), rainbow trout (*Onchorynchus mykiss*), largemouth bass (*Micropterus salmoides*), western mosquitofish (*Gambusia affinis*), and bullfrogs (*Rana catesbiana*) plus clogging of the stream by cattails are also threats (USFWS, 1994c).

Status of the Critical Habitat

In 1985, the USFWS designated the Condor Canyon portion of Meadow Valley Wash as critical habitat for the Big Spring spinedace. Four stream miles of Meadow Valley Wash and 50 feet on either side of the stream bed are included in the designation. PCEs for the species include clean,

permanently flowing streams, ideally spring-fed, with deep pool areas and shallow marshy areas along the shore and the absence of non-native fishes. It is anticipated that habitat restoration efforts will take place following the conclusion of the USGS study of spinedace habitat requirements and movement within Condor Canyon that commenced in 2008 (NDOW, 2009b).

Status of Critical Habitat in the Action Area

Critical habitat for the Big Springs spinedace occurs outside the Action Area. Critical habitat for this species is not within the drawdown area (also not within the potential 1-foot drawdown area).

Threats to Critical Habitat

Critical habitat for the Big Springs spinedace has recently been threatened by wildfire in the general vicinity of Condor Canyon. Fire causes degradation of riparian habitat (i.e., lack of overstory) and erosion causing siltation in the stream channel. Siltation in the channel allows vegetation such as cattails to establish, which increases the amount of sediment deposited in the stream. Off-road use of the area poses a threat to the general health of the ecosystem. Livestock grazing also occurs in Condor Canyon.

Effects Analysis for the Federal Action for Big Springs Spinedace

Effects to Species

Tier 1 ROWs

Direct Effects: Construction of the project would occur approximately 21 miles from Condor Canyon in a separate hydrographic basin (Dry Lake Valley). At this distance, the Big Springs spinedace would not experience direct effects such as loss of habitat due to construction and/or operation/maintenance activities.

Indirect Effects: The Big Springs spinedace in the Meadow Valley Wash in Condor Canyon is located approximately 21 miles from the Tier 1 ROWs in a separate hydrographic basin (Dry Lake Valley). At this distance, Big Springs spinedace would not be indirectly affected by construction-related effects such as dust, noise, traffic, and hazardous or toxic material spills.

Groundwater Development Areas

Direct Effects: The Big Springs spinedace in the Meadow Valley Wash in Condor Canyon is located approximately 19 miles from the nearest groundwater development area in a separate hydrographic basin (Dry Lake Valley). At this distance, there would be no expected direct effects to this species from construction and/or operation/maintenance activities.

Indirect Effects: The Big Springs spinedace in the Meadow Valley Wash in Condor Canyon is located approximately 19 miles from the nearest groundwater development area in a separate hydrographic basin (Dry Lake Valley). At this distance, Big Springs spinedace would not be indirectly affected by construction-related effects such as dust, noise, traffic, and hazardous or toxic material spills. Condor Canyon is located approximately 14 miles from the extent drawdown area (and 11 miles from the 1-foot drawdown area). Thus, Big Springs spinedace would not be affected by the groundwater development areas.

Groundwater Pumping Effects

Condor Canyon is located approximately 14 miles from the extent drawdown area (and 11 miles from the 1-foot drawdown area). Thus, Big Springs spinedace would not be affected by groundwater pumping. Therefore, effects should be temporally and spatially separated from the listed species.

Effects to Designated Critical Habitat

Tier 1 ROWs

Direct Effects: Construction of the Proposed Action would occur approximately 21 miles from Condor Canyon in a separate hydrographic basin (Dry Lake Valley). At this distance, designated critical habitat PCEs would not experience direct effects such as loss of cover and/or food sources due to construction and/or operation/maintenance activities.

Indirect Effects: Construction of the Proposed Action would occur approximately 21 miles from Condor Canyon in a separate hydrographic basin (Dry Lake Valley). At this distance, critical habitat PCEs would not be indirectly affected by construction-related effects such as dust, noise, traffic, and hazardous or toxic material spills.

Groundwater Development Areas

Direct Effects: The nearest groundwater development area is located in Dry Lake Valley at a distance of approximately 19 miles west of Condor Canyon. At this distance, designated critical habitat PCEs for the Big Springs spinedace, such as loss of cover and/or food sources, would not experience direct effects due to construction and/or operation/maintenance activities.

Indirect Effects: The nearest groundwater development area is located in Dry Lake Valley at a distance of approximately 19 miles west of Condor Canyon. At this distance, designated critical habitat PCEs would not be indirectly affected by construction-related effects such as dust, noise, traffic, and hazardous or toxic material spills. Condor Canyon is located approximately 14 miles from the extent of the drawdown area (and 11 miles from the 1-foot drawdown area). Thus, critical habitat PCEs would not be affected by the Action.

Groundwater Pumping Effects

Condor Canyon is located approximately 14 miles from the extent of the drawdown area (and 11 miles from the 1-foot drawdown area). Thus, critical habitat PCEs would not be affected by the Action.