

**BOARD OF COUNTY COMMISSIONERS  
CHURCHILL COUNTY, NEVADA**

**155 N. Taylor Street, Suite 110**

**Fallon, Nevada 89406**

**(775) 423-4092**

**Fax: (775) 423-7069**

**Contact Person: Pamela D. Moore, Deputy Clerk of the Board**

**E-mail: [pammoore@churchillcounty.org](mailto:pammoore@churchillcounty.org)**

**or Jacqueline A. Bauman, Deputy Clerk**

**[jbauman@churchillcounty.org](mailto:jbauman@churchillcounty.org)**

**\*\*\*\*NOTICE OF PUBLIC MEETING\*\*\*\***

***PLEASE POST***

**PLACE OF MEETING:** 155 N. Taylor Street, Commission Chambers, Suite 145,  
Fallon, Nevada

**DATE & TIME:** July 13, 2016 at 10:00 a.m.

**TYPE OF MEETING:** Special County Commissioners' Meeting

**Notes:**

- I. These meetings are subject to the provisions of Nevada Open Meeting Law (NRS Chapter 241). Except as otherwise provided for by law, these meetings are open and public.***
- II. Action will be taken on all Agenda items, unless otherwise noted.***
- III. The Agenda is a tentative schedule. The Board of County Commissioners may act upon Agenda items in a different order than is stated in this notice - so as to affect the people's business in the most efficient manner possible.***
- IV. In the interest of time, the Board of County Commissioners reserves the right to impose uniform time limits of not more than three minutes upon matters devoted to public comment.***
- V. Any statement made by a member of the Board of County Commissioners during the public meeting is absolutely privileged.***

**Agenda:**

- 1. Call to Order.**
- 2. Pledge of Allegiance.**
- 3. Public Comment:** Comment upon matters not on Agenda.
- 4. Verification of the Posting of the Agenda.**
- 5. Review and Adoption of Agenda:** Consideration and possible action to approve the



*handicapped persons desiring to attend. Persons who are disabled and require special assistance may contact the Churchill County Commission, in writing at 155 N. Taylor Street, Suite 110, Fallon, Nevada 89406, or by calling (775) 423-4092 or by calling (775) 423-4092 or the TDD Nevada Relay Number 711.*

**Procedures:**

*\*The schedule of regular meetings of the Board of County Commissioners is provided for by Title 2, Chapter 2.04, of the Churchill County Code.*

*\*The public meetings may be conducted according to rules of parliamentary procedure.*

*\* All supporting materials for this Agenda, previous Agendas, or Minutes are available by requesting a copy from the Clerk's office, 775-423-4092. During the meeting, there will be one copy available for public inspection. Additional copies are available by making the request from the Clerk's office. You are entitled to one copy of the supporting materials free of charge.*

*\*Persons providing public comment will be asked to state their name for the record.*

*\*The Board of County Commissioners reserves the right to restrict participation by persons in the public meeting where the conduct of such persons is willfully disruptive to the people's business.*

**Public Records:**

*\*Minutes of the Budget Workshop will be produced for approval by the Board at a regular meeting.*

*\* In accordance with Federal law and U.S. Department of Agriculture policy, Churchill County is prohibited from discriminating on the basis of race, color, national origin, sex, age, or disability (not all prohibited bases apply to all programs). To file a complaint of discrimination, write USDA, Director, Office of Equal Rights, 1400 Independence Avenue, S.W., Washington, D.C. 20250-9410, or call (800)795-3972 (voice), or (202)720-6382 (TDD).*

**Churchill County  
Agenda Report**

**Agenda Item:** # Item 6-A  
**Agenda Date Requested:** July 13, 2016

**Date Submitted:** July 1, 2016

**To:** Board of Churchill County Commissioners  
**From:** Chris Mahannah, Mahannah & Associates LLC  
**Subject Title:** Consideration and possible action re: Presentation and discussion regarding the Dixie Valley Groundwater Export Study.

**Type of Action Requested:** (check one)  
 Resolution  Ordinance  
 Formal Action/Motion  Other – Informational Only

**Does this action require a Business Impact Statement?**

**Recommended Board Action:** Motion to accept the Dixie Valley Groundwater Export Study

**Discussion:** Chris Mahannah, Mahannah and Associates LLC, J. Mark Spears, Project Lead with the Bureau of Land Management, and Dwight Smith, P.E. with Interflow Hydrology, will make a presentation and have discussion regarding the Dixie Valley Groundwater Export Study.

**Prepared By:** Pamela D. Moore, Deputy Clerk **Date:** July 1, 2016

**Reviewed By:** Eleanor Lockwood **Date:** 7/1/2016  
Eleanor Lockwood, Churchill County Manager

B. O'Neil **Date:** 7/1/16  
Churchill County Deputy District Attorney

Alan Kalt **Date:** 7/1/16  
Alan Kalt, Churchill County Comptroller

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**Board Action Taken:**

The submission of this agenda report by county officials is not intended, necessarily, to reflect agreement as to a particular course of action to be taken by the board; rather, the submission hereof is intended, merely, to signify completion of all appropriate review processes in readiness of the matter for consideration and action by the board.

Motion: \_\_\_\_\_

1) \_\_\_\_\_

2) \_\_\_\_\_

Aye/Nay

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_  
(Vote Recorded By)

The submission of this agenda report by county officials is not intended, necessarily, to reflect agreement as to a particular course of action to be taken by the board; rather, the submission hereof is intended, merely, to signify completion of all appropriate review processes in readiness of the matter for consideration and action by the board.

# DIXIE VALLEY STUDY

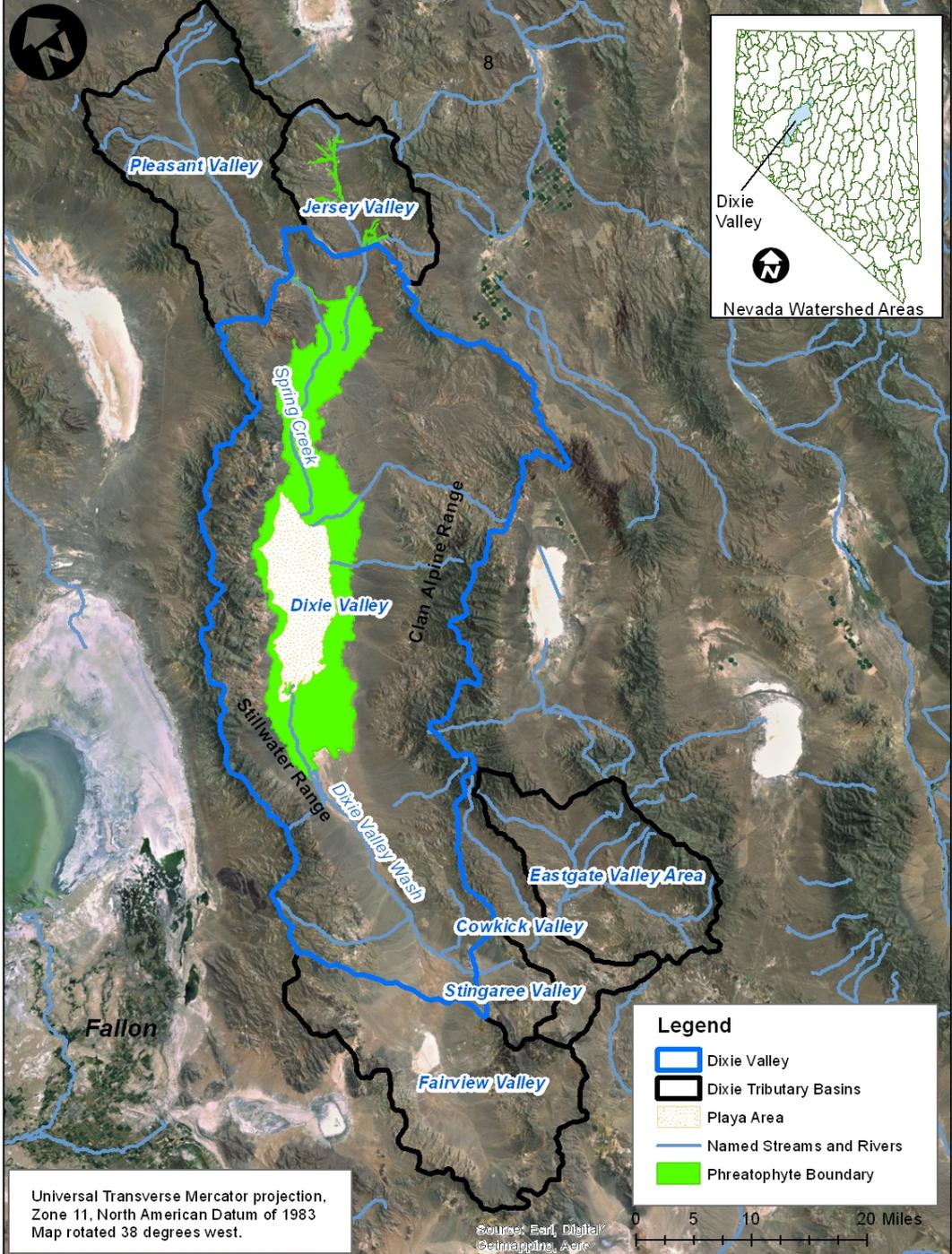
Special County Commission Meeting

13 July 2016

- Chris Mahannah, P.E. – Mahannah & Associates, LLC
- Mark Spears, P.E. – Bureau of Reclamation project lead
- Dwight Smith, P.E. – InterFlow Hydrology, Inc.

# Outline

- Introduction / Historical background
- Overview
- Study results / modeling
- Water right abstract & availability
- Next steps

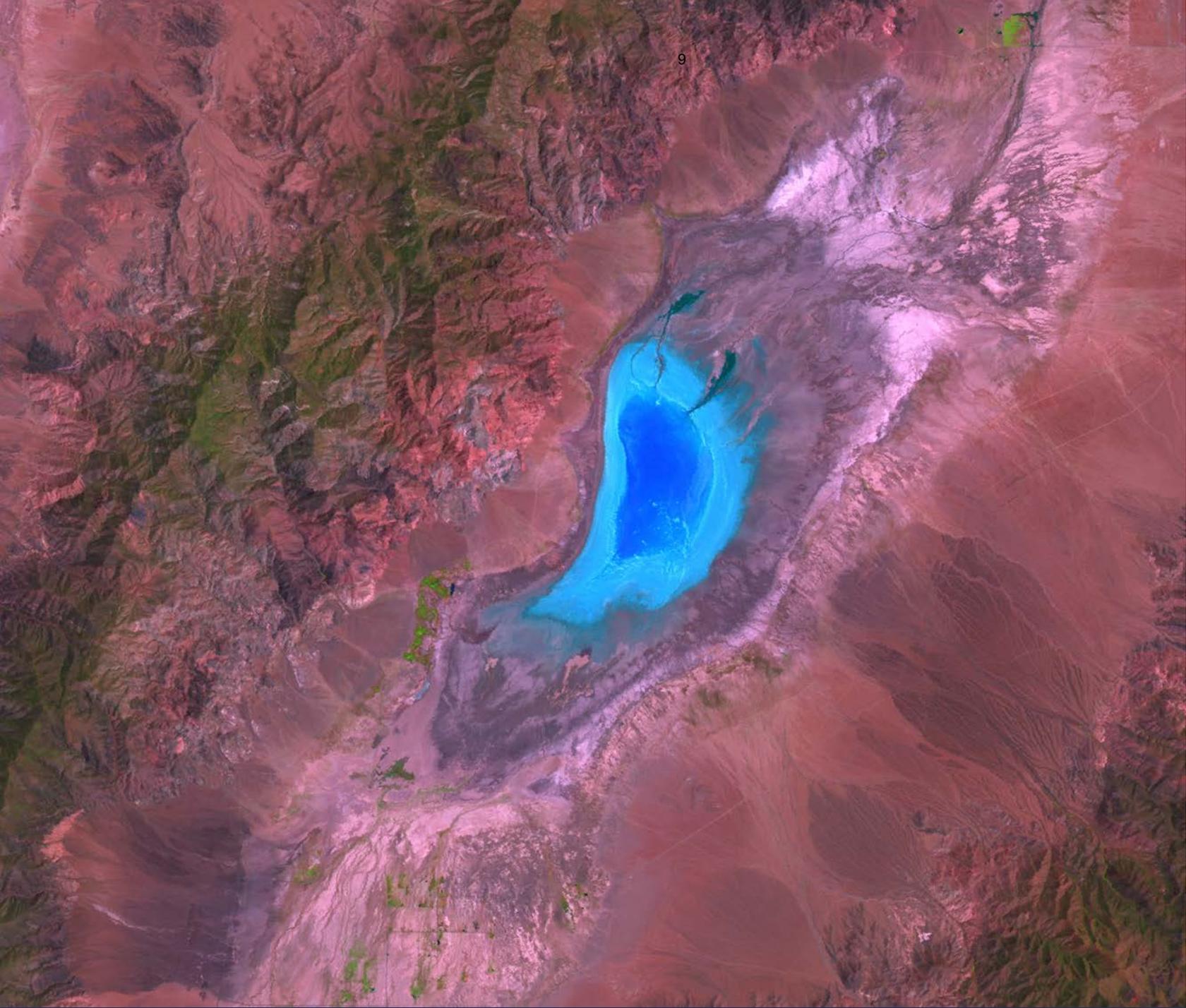


Universal Transverse Mercator projection,  
 Zone 11, North American Datum of 1983  
 Map rotated 38 degrees west.

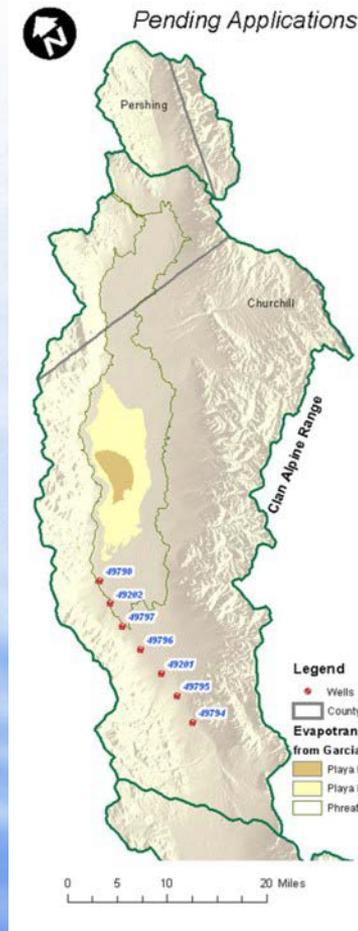
Source: Esri, Digital  
 Gointelligence, Aero

- Legend**
- Dixie Valley
  - Dixie Tributary Basins
  - Playa Area
  - Named Streams and Rivers
  - Phreatophyte Boundary





# Churchill pending applications



- 13 Applications filed in 1985-86 Seeking new appropriation of >50,000 afa
- Preliminary GS studies in '80's
- Applications quitclaimed to County in '90's
- Dixie identified as a long range municipal water supply for Lahontan Valley, independent from Truckee/Carson rivers in Churchill Co. Water Plans

# Study Authorization

- PL 110-161, Sec 208 (c): *“in consultation with the Corps of Engineers, as applicable, \$5,000,000 to study and prepare plans for the development and construction of a pipeline to convey water from Dixie Valley to Churchill County, Nevada”*
- Prior estimates for export costs by WRD & Churchill Water Plans

# Primary Study Objectives

- Quantify Perennial Yield
  - Discharge Methods (Playa & Phreatophyte areas)
- Quantify Existing Uses & Water Rights
- GW Modeling
  - Steady State & Transient State Simulations to assess impacts



# Dixie Valley Study

- ~\$5M / 5 ... 7 year study - BOR Grant
- Study Team:
  - BOR
  - USGS
  - DRI
  - State Engineer
  - Private Consultants:
    - Hydro Bio
    - Mahannah & Associates
      - InterFlow Hydrology
      - Sustainable Solutions: Dick Benoit
      - Justin Huntington, PhD



# Water rights abstract & mapping<sup>14</sup>

TABLE 1. DIXIE VALLEY (#128) UNDERGROUND WATER RIGHT DUTY ABSTRACT

APP	CHANGE APP	COUNTY	CERT	FILE DATE	STATUS	DIV RATE	USE	PERMITTED DUTY	IRR ACRES	LOW DUTY	MEDIUM DUTY	HIGH DUTY	COMMENTS	OWNER OF RECORD
						CFS		AFA	ACRES		AFA			
13267		CH	4711	2/16/1950	CER	0.0020	STK	1.10		0.00	1.10	1.10	Dyer flat well certificated 4/9/58 & not equipped or observed used for over 5 years & potentially subject to forfeiture. No forfeiture extensions filed & last coresp in DWR files is 1965.	ROSENBLUND, JUDY
13269		CH	3591	2/16/1950	CER	0.0010	STK	1.10		0.00	1.10	1.10	E. Dixie well / Grover Point well certificated 4/3/51 & not equipped or observed used for over 5 years & potentially subject to forfeiture. No forfeiture extensions filed & last coresp in DWR files is 1965.	ROSENBLUND, JUDY
17272		CH	6317	5/14/1957	CER	0.1000	IRR	18.40	4.60	0.00	16.56	16.56	Knittle well Cert for Irr on 6/23/67 but not observed used for Irr for over 5 years so possibly subject to forfeiture. Well flows to waste/riparian area. Medium & high duty based on NIWR CU & low duty assumes forfeiture. Proof of resumption of use for Irr filed 5/8/03.	UNITED STATES OF AMERICA
21690		CH	8348	12/17/1963	CER	0.6930	IRR	140.00	90.00	0.00	126.00	126.00	Navy well 47B/Robbins pond, Cert for Irr on 8/16/74 for Irr but not observed used for over 5 years so possibly subject to forfeiture. Well flows to waste/riparian/pond area. Low duty assumes forfeiture & last forfeiture extension filed on 6/30/10. DWR forfeited 220.0 afa on 10/12/11. Med & High duties assume NIWR CU.	UNITED STATES OF AMERICA
22119		PE	7744	7/17/1964	CER	5.4000	IRR	1,241.04	310.26				All duties based on NIWR CU. 22119 & 26251 are completely supplemental to eachother. TCD of 22119, 24024, 26251 & 29979 = 2,456.96 afa	B&J DAIRY, L.P.
26251		PE	7985	8/9/1971	CER	3.9930	IRR	1,241.04	310.26	2,211.26	2,211.26	2,211.26	All duties based on NIWR CU. 22119 & 26251 are completely supplemental to eachother. TCD of 22119, 24024, 26251 & 29979 = 2,456.96 afa	B&J DAIRY, L.P.
24024	22116	PE	7745	8/1/1967	CER	3.7870	IRR	1,215.92	303.98				All duties based on NIWR CU. 24024 is partially supplemental to 29979. TCD of 22119, 24024, 26251 & 29979 = 2,456.96 afa	B&J DAIRY, L.P.
29979		PE	9822	2/9/1976	CER	6.0000	IRR	2,456.96	614.24				All duties based on NIWR CU. 24024 is partially supplemental to 29979. TCD of 22119, 24024, 26251 & 29979 = 2,456.96 afa	B&J DAIRY, L.P.
24023	22121	PE	8167	8/1/1967	CER	5.4000	IRR	974.00	243.50				Lincoln farm, all duties based on NIWR CU. 24023, 29980 & 35209 are supplemental & TCD = 2,216.0 afa	LINCOLN ROBERT & SALLIE
29980		PE	9823	2/9/1976	CER	6.0000	IRR	1,288.00	322.00	1,994.40	1,994.40	1,994.40	Lincoln farm, all duties based on NIWR CU. 24023, 29980 & 35209 are supplemental & TCD = 2,216.0 afa	LINCOLN ROBERT & SALLIE
35209	29978	PE	9826	3/23/1978	CER	6.0000	IRR	2,216.00	554.00				Lincoln farm, all duties based on NIWR CU. 24023, 29980 & 35209 are supplemental & TCD = 2,216.0 afa	LINCOLN ROBERT & SALLIE
24025	22114	PE	8154	8/1/1967	CER	5.4000	IRR	1,159.20	289.80	1,043.28	1,043.28	1,043.28	All duties based on NIWR CU. Note error on Cert. 8154 showing 389.80 acres when total should be 289.8 as shown on DWR database	JAMES AND GAIL PELLANDINI, ROBERT PELLANDINI & DALE AND EILEEN KUIL
24028	22117	PE	8234	8/1/1967	CER	3.4500	IRR	801.60	200.40	721.44	721.44	721.44	All duties based on NIWR CU	JAMES AND GAIL PELLANDINI, ROBERT PELLANDINI & DALE AND EILEEN KUIL
26037	22219	CH	7897	4/7/1971	CER	1.0520	IRR	33.90	160.00	0.00	30.51	30.51	Navy well S. of Settlement, Cert for Irr on 9/1/71 for Irr but not observed used for over 5 years so possibly subject to forfeiture. Low duty assumes forfeiture & Med/High duties assume NIWR CU. DWR forfeited 606.10 afa on 10/12/11 & last forfeiture ext. filed on 6/8/10.	NAVAL AIR STATION-FALLON
27690		PE	9090	8/14/1973	CER	3.0700	IRR	162.20	40.55	145.98	145.98	145.98	All duties based on NIWR CU. 27690 & 30797 are completely supplemental to eachother	JOE SAVAL COMPANY, LLC
30797		PE	11108	11/5/1976	CER	3.2500	IRR	162.20	40.55				All duties based on NIWR CU. 27690 & 30797 are completely supplemental to eachother	JOE SAVAL COMPANY, LLC
29457		CH	9968	6/23/1975	CER	0.1330	IRR	31.90	151.10	0.00	28.71	28.71	Navy well S. of Settlement, Cert for Irr on 4/9/82 for Irr but not observed used for over 5 years so possibly subject to forfeiture. Low duty assumes forfeiture & Med/High duty assumes NIWR CU. DWR forfeited 572.5 afa on 10/12/11 & last forfeiture ext filed on 6/8/10.	NAVAL AIR STATION-FALLON
29898		CH	9733	1/7/1976	CER	0.0310	STK	22.43		22.43	22.43	22.43	Stock right, unknown if being used or subject to forfeiture	LOYD, MONTE W.
30796		PE	10763	11/5/1976	CER	4.6600	IRR	315.36	78.84	0.00	0.00	0.00	Saval Farm, Cert for Irr on 9/22/83 & not observed used for over 5 years but FI#1116 indicates its supplemental to SW & therefore not subject to forfeiture. Low, Med & High duties are shown as zero because it's supplemental to SW per FI 1116.	JOE SAVAL COMPANY, LLC
34303	26425	CH	11222	10/20/1977	CER	0.0800	IRR	32.00	13.00	0.00	28.80	28.80	Navy well w Settlement, Cert for Irr on 8/5/85 for Irr but not observed used for over 5 years so possibly subject to forfeiture. Well flows to waste/riparian area. Low duty assumes forfeiture & High/Med duty assumes NIWR. See DWR Irr dated 11/20/08 referencing forfeiture of 20.0 afa & last forfeiture ext. filed on 3/17/93	NAVAL AIR STATION-FALLON
39863		CH	10717	12/3/1979	CER	0.0070	STK	4.85		4.85	4.85	4.85	Stock right in LaPlata canyon, duty based on expansion of diversion rate	KENT, IRA H.
43553		CH	13731	4/16/1981	CER	0.4350	IND	6.73		0.00	6.73	6.73	Well W45-5 hasn't been used in Doug Brown/Terra Gen Tenure (10 years) & per remarks in permit was used for supply for drilling geo wells & then should have been abandoned. This certificated right is possibly subject to forfeiture- no forfeiture extensions filed.	TERRA GEN DIXIE VALLEY LLC

# UG water rights availability<sup>15</sup>

TABLE 5. UNDERGROUND WATER POTENTIALLY AVAILABLE FOR APPROPRIATION UNDER CHURCHILL APPLICATIONS

COMMITTED CONSUMPTIVE UG RIGHTS / VALLEY	LOW DUTY	MED DUTY	HIGH DUTY
	AFA		
Table 1. Dixie Valley (#128):	6,823	9,292	11,166
Table 2. Fairview Valley (#124):	27	39	62
Table 2. Jersey Valley (#132):	27	27	54
Total Committed Duty (#128, 124, 132):	6,878	9,359	11,281
UG Available for Appropriation:	<b>16,122</b>	<b>13,641</b>	<b>11,719</b>
Estimated Dixie/Fairview/Jersey Perennial Yield (afa) <sup>1</sup> :	23,000		

<sup>1</sup> InterFlow Hydrology, April, 2016, Simulation of Groundwater Movement & Groundwater Development Scenarios in

# Next steps:

- Ongoing monitoring: CWSD (ppt gages, weather station, water levels)
- File change applications for northern distribution
- Inventory of water rights per NRS 533.364
  - We can do but DWR paid to review
- Water right hearing: maybe per R. Felling
  - DWR will provide comments for future work/analysis before a hearing
  - Uncertainty about capture of recharge from trib basins in Dixie (may need further work on inflow from eastern basins)
  - If permits granted, due diligence starts
  - Economics, Engineering, Environmental

# Inter-basin transfer<sup>17</sup> (NRS 533.370 (3)) considerations:

- a) Justify need to import water
- b) Determine if conservation plan is needed & implemented
- c) Environmentally sound as it relates to source basin
- d) Wont limit future growth in source basin
- e) Any other factor the SEO deems relevant

# Thank<sup>®</sup> You & Questions



*Churchill County  
Water Resources Workshop  
July 13, 2016*

# *Dixie Valley Groundwater Flow Model and Pumping Simulations*

Dwight L. Smith, PE, PG  
Principal Hydrogeologist  
Interflow Hydrology, Inc.

P.O. Box 1482, Truckee, CA 96160  
(530) 582-1622 / (775) 848-2366  
[dwight.smith@interflowhydro.com](mailto:dwight.smith@interflowhydro.com)

# Goals of the Dixie Valley Numerical Flow Model

- Bring together the body of science and data into one comprehensive understanding of the groundwater flow system.
- Further examine basin perennial yield.
- Provide a tool to assess potential Churchill County pumping, including feasibility and impacts.

# Model Area and Grid

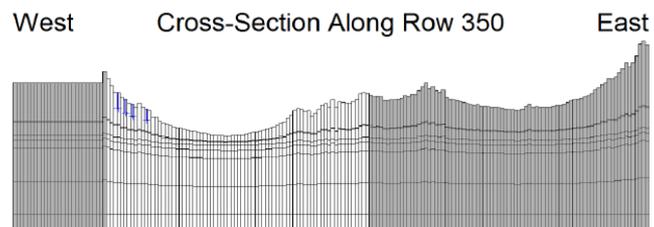
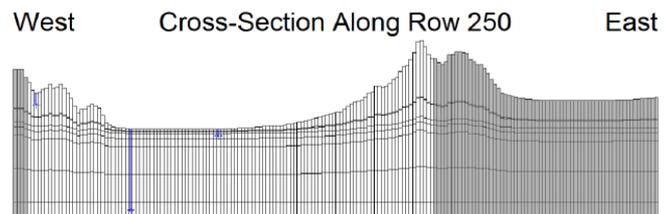
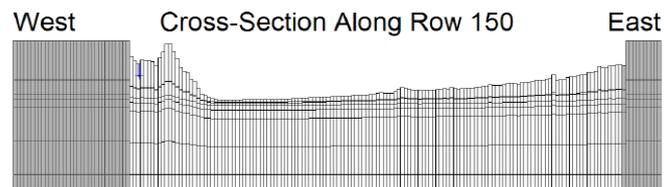
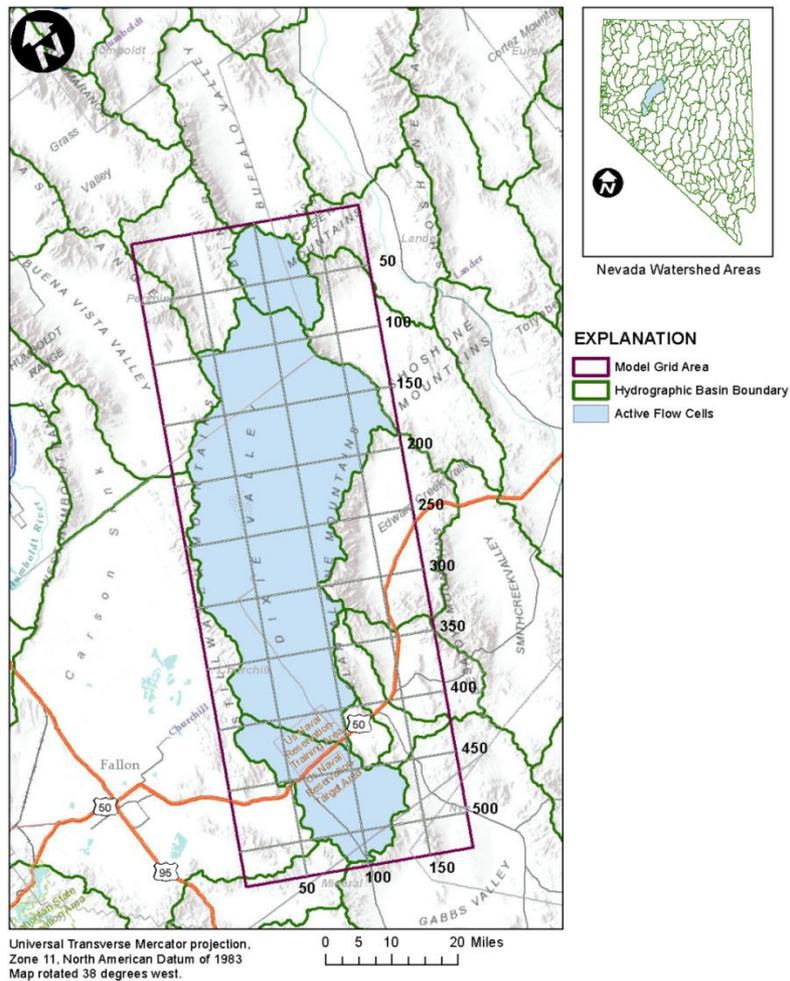
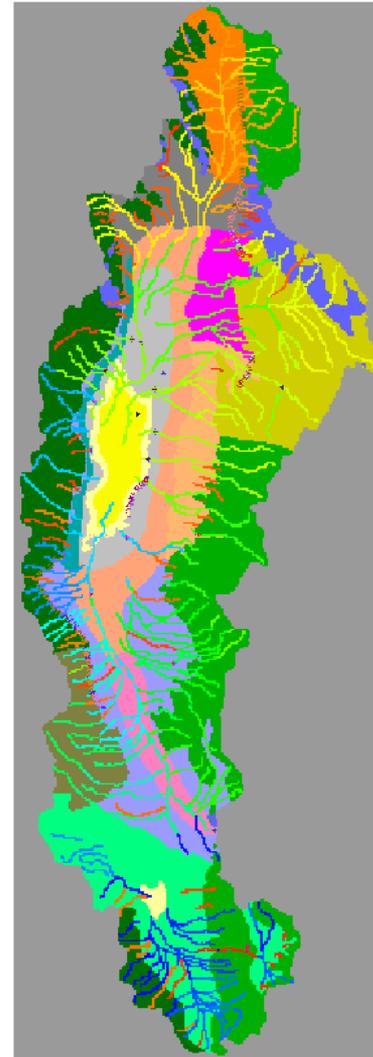


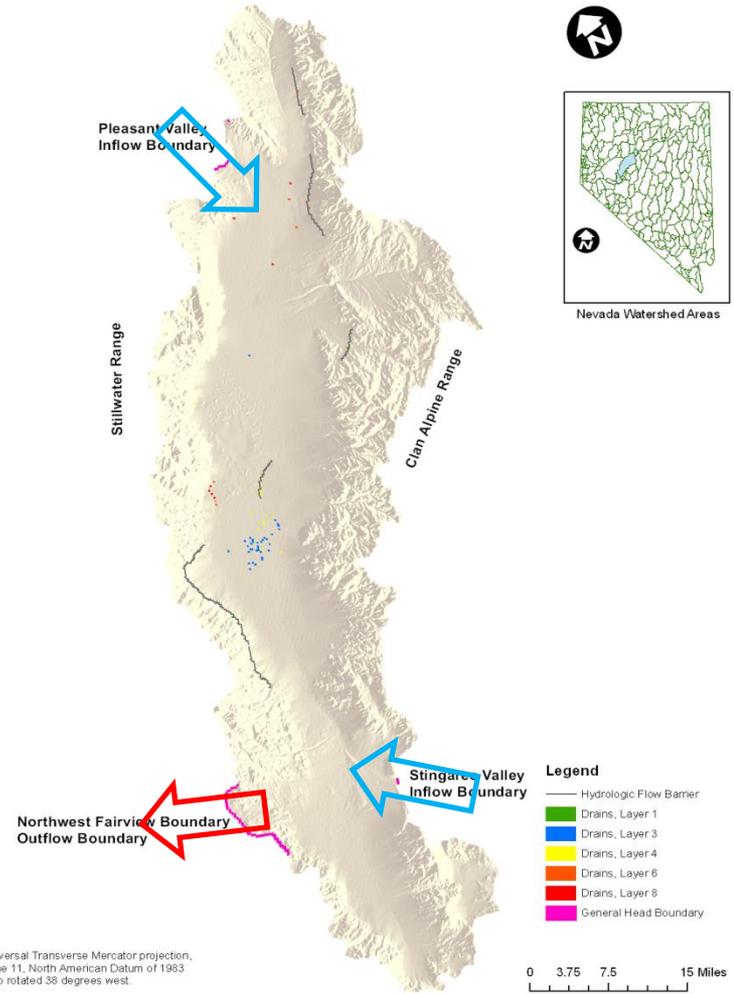
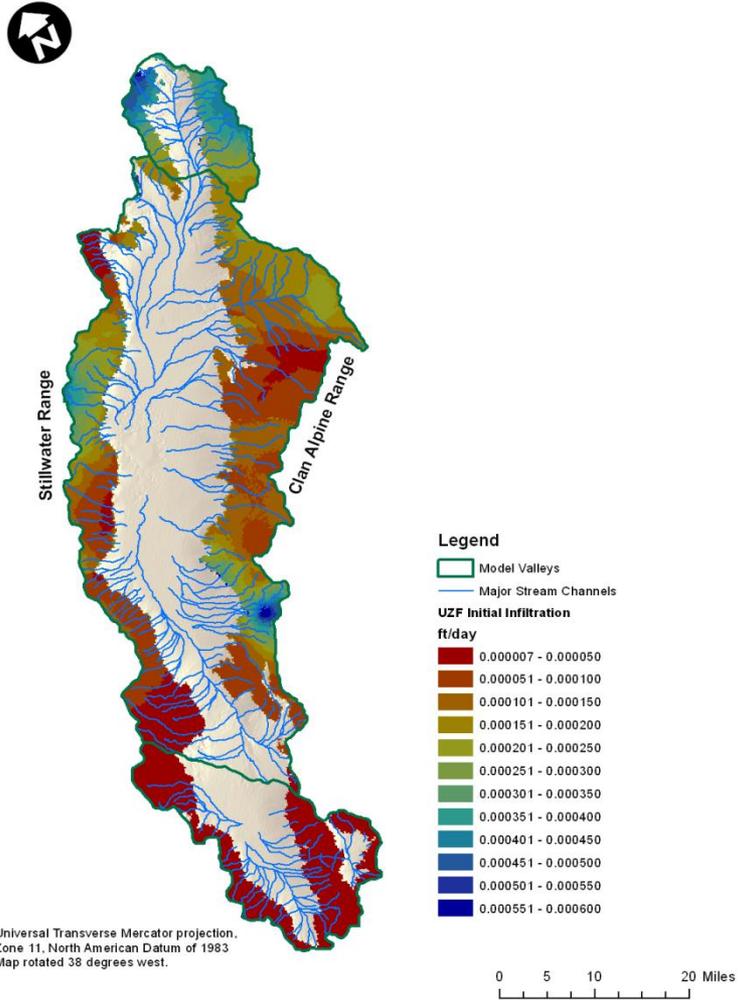
Figure 18. Vertical layering along three cross sections/rows within the model domain (vert. scale = 5x). Light grey cells are active, dark grey are inactive cells, and blue lines are wells or drains (springs).

# Model Attributes

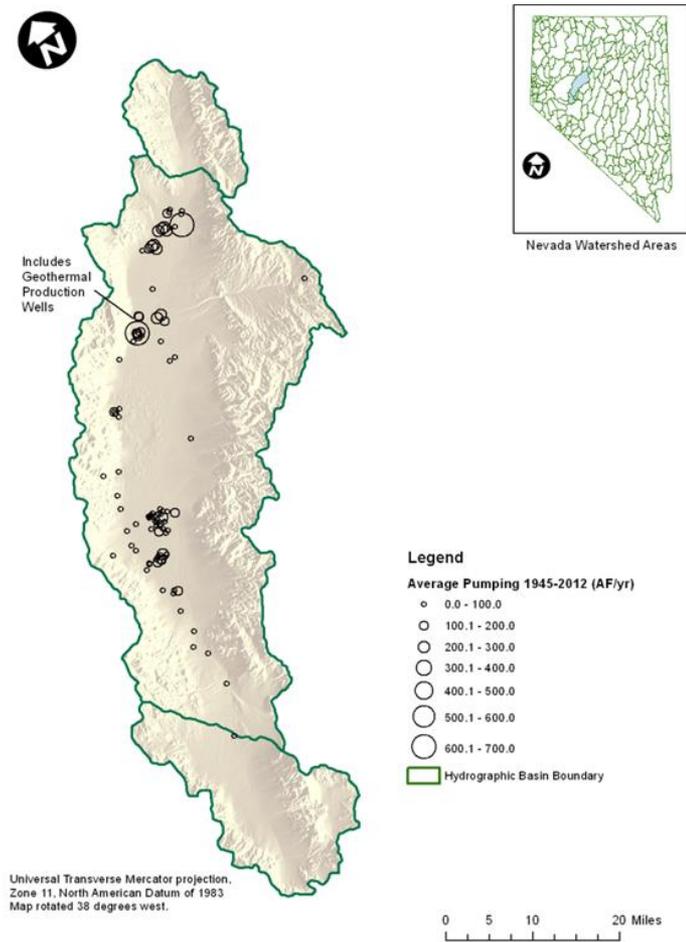
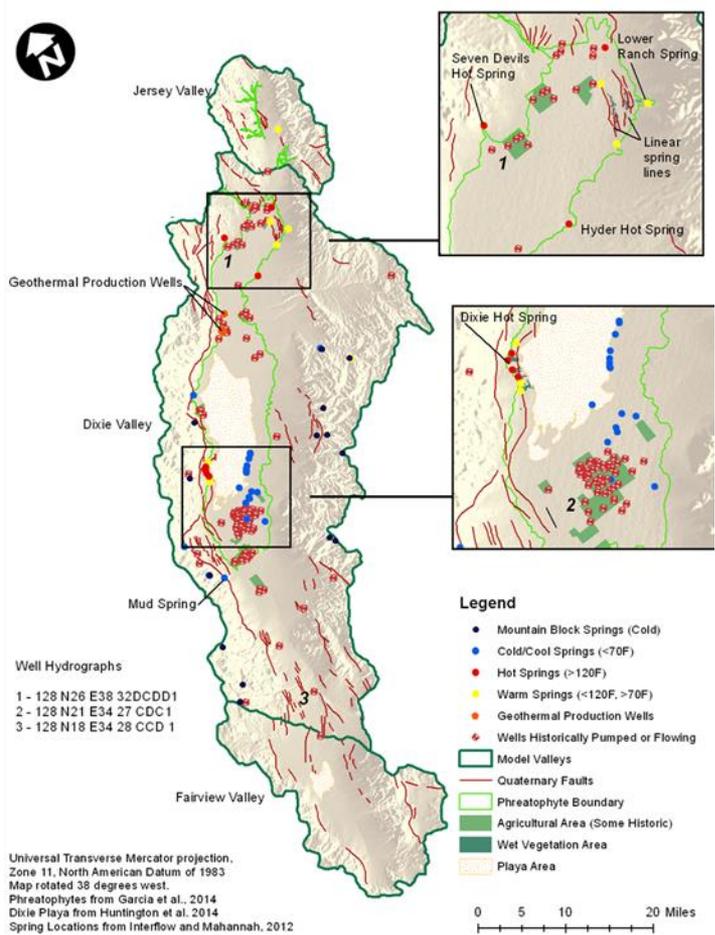
- **Boundary Conditions**
  - No Flow
  - Inflow Conditions
    - Recharge by Precipitation
    - Stream Inflow
    - Subsurface Inflow
  - Outflow Conditions
    - ET Discharge – Phreatophytes and Playa
    - Wells – Pumped and Artesian
    - Springs
    - Subsurface Basin Outflow
  - Internal Conditions
    - Streams
    - Fault Barriers
- **Hydraulic Properties**
  - Hydraulic Conductivity
  - Storage Coefficients
- **Calibration Targets**
  - Measured Groundwater Elevations
  - Measured Spring, Artesian Well and Stream Discharges
  - Total ET Discharge on Valley Floor



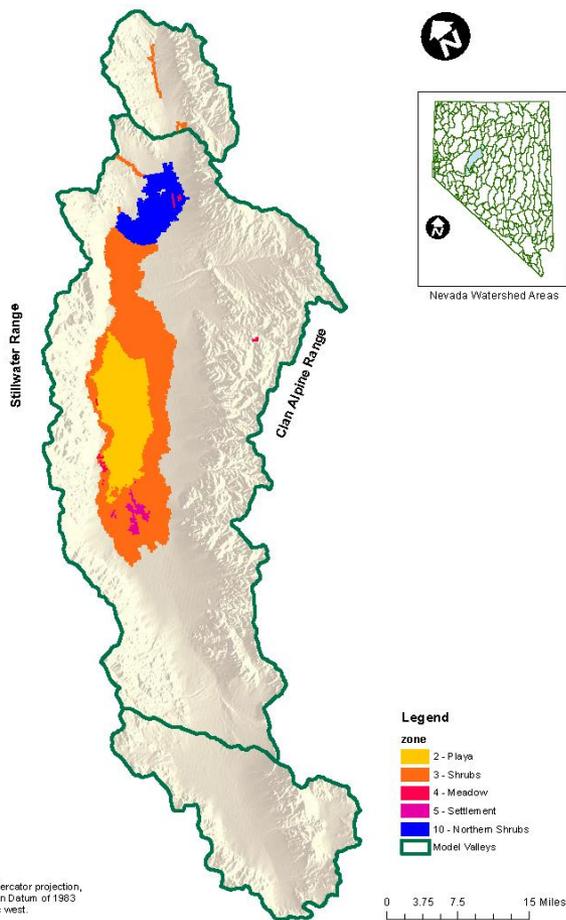
# Simulated Recharge and Inflow



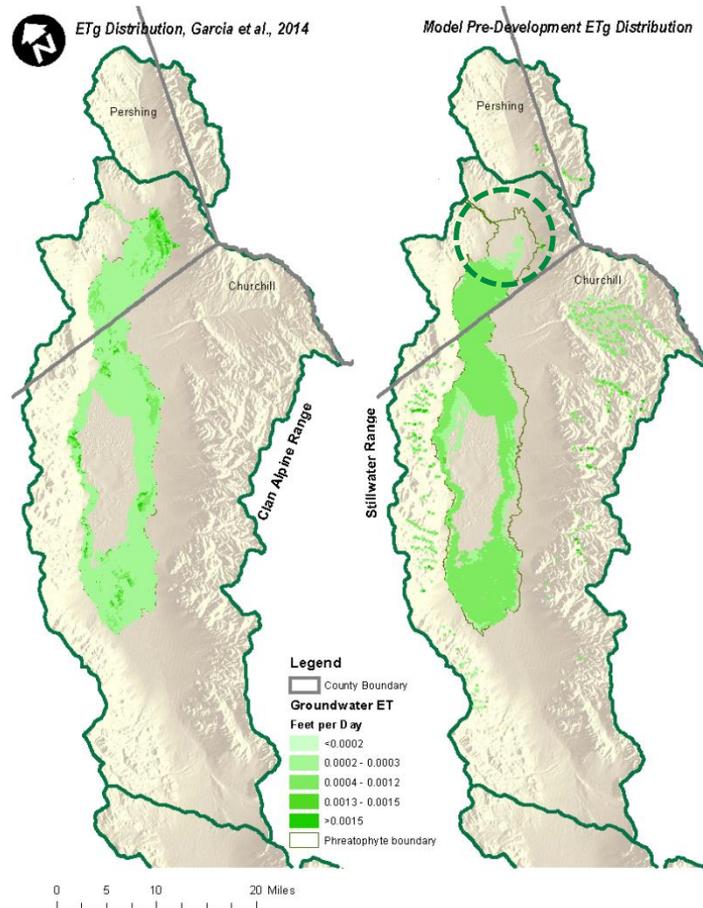
# Simulated Wells and Springs



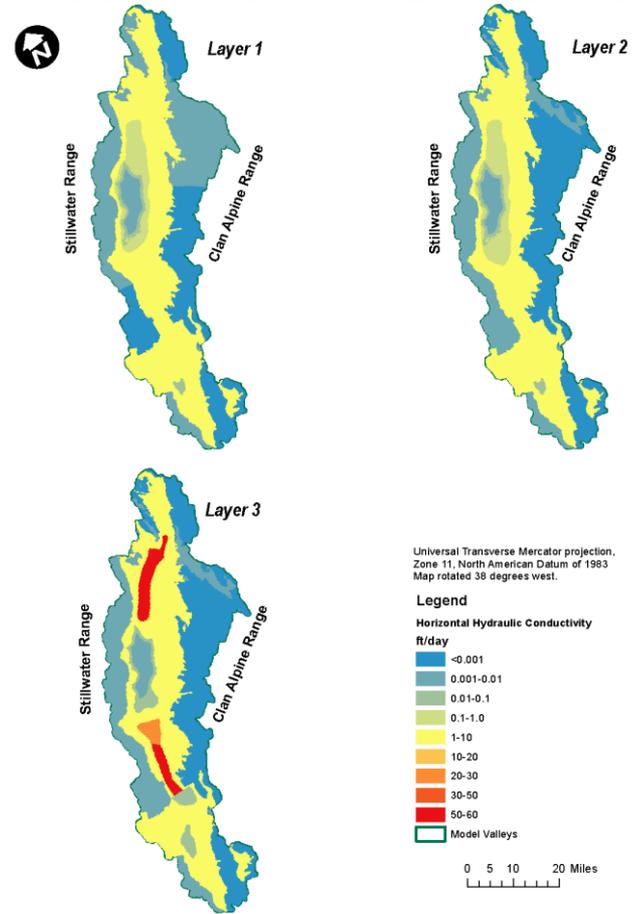
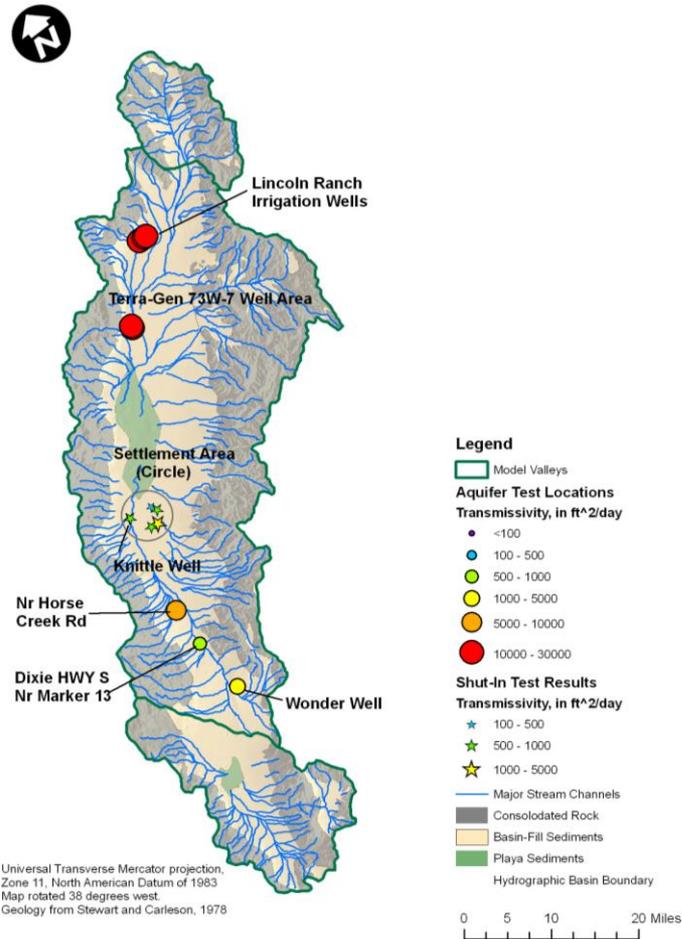
# Simulated Groundwater ET



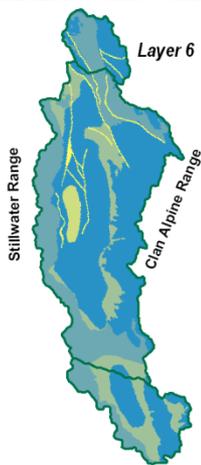
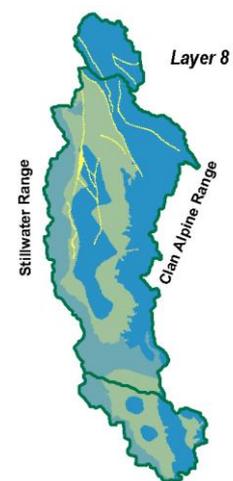
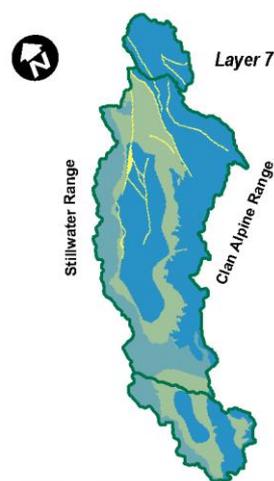
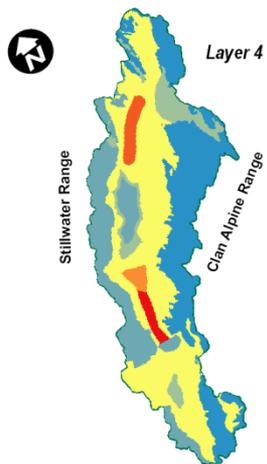
Universal Transverse Mercator projection, Zone 11, North American Datum of 1983  
Map rotated 38 degrees west.



# Hydraulic Conductivity Distribution

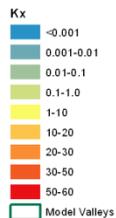


# Hydraulic Conductivity Distribution



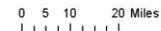
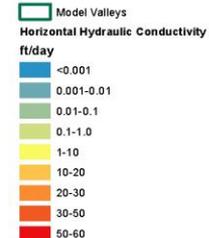
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Zone 11, North American Datum of 1983  
Map rotated 38 degrees west.

**Legend**

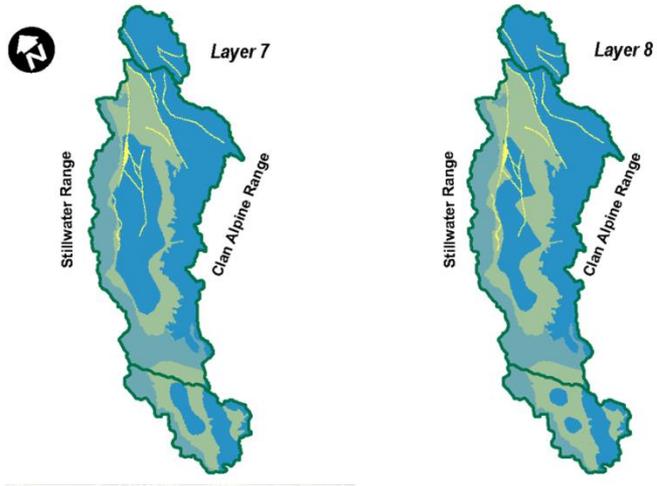


Universal Transverse Mercator projection,  
Zone 11, North American Datum of 1983  
Map rotated 38 degrees west.

**Legend**

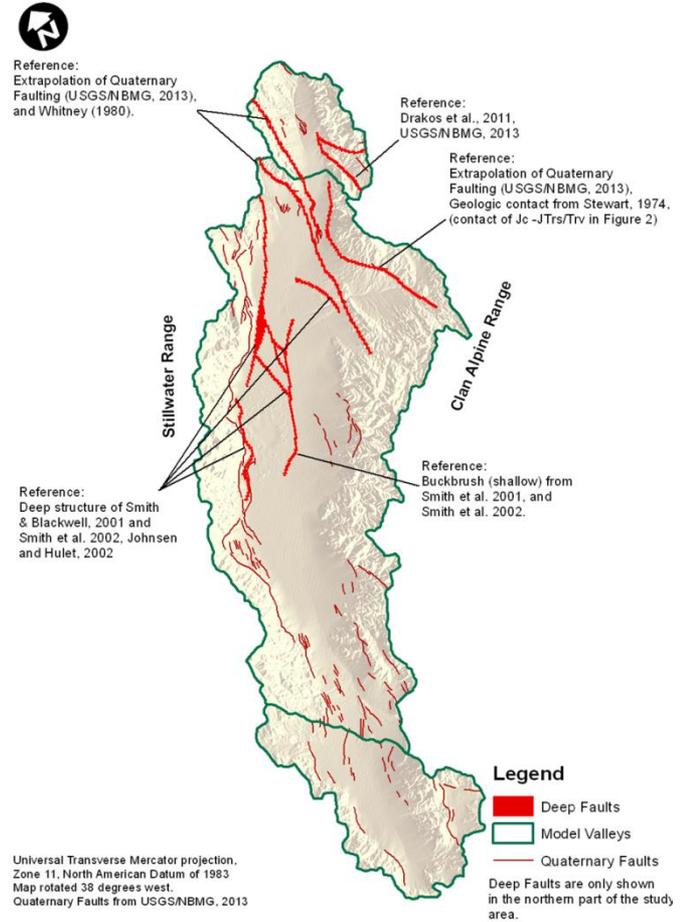
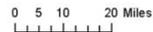
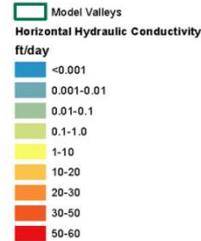


# Hydraulic Conductivity – Deep Geologic Structure



Universal Transverse Mercator projection, Zone 11, North American Datum of 1983  
Map rotated 38 degrees west.

**Legend**



# Groundwater Chemistry - TDS

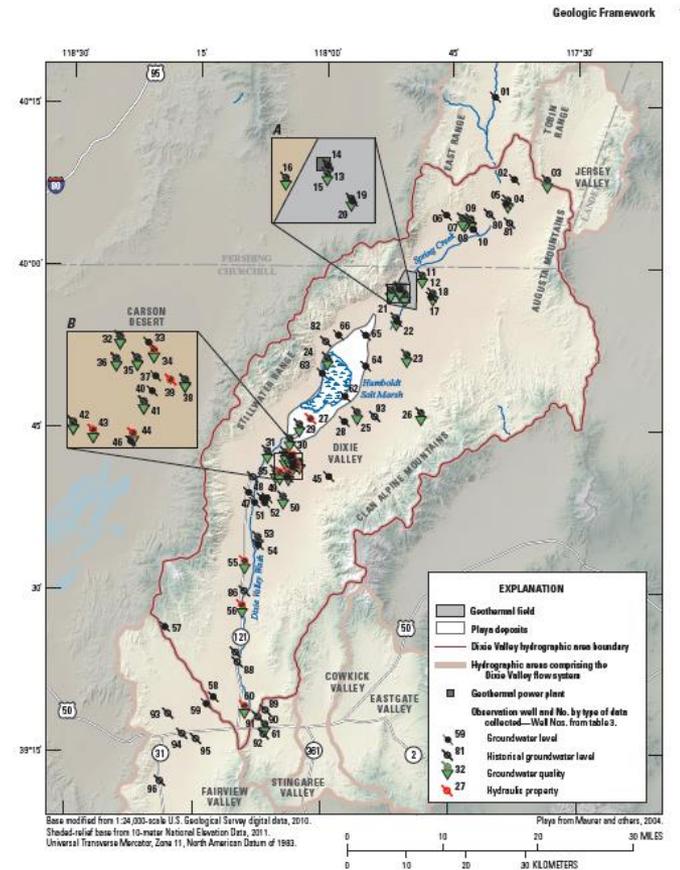
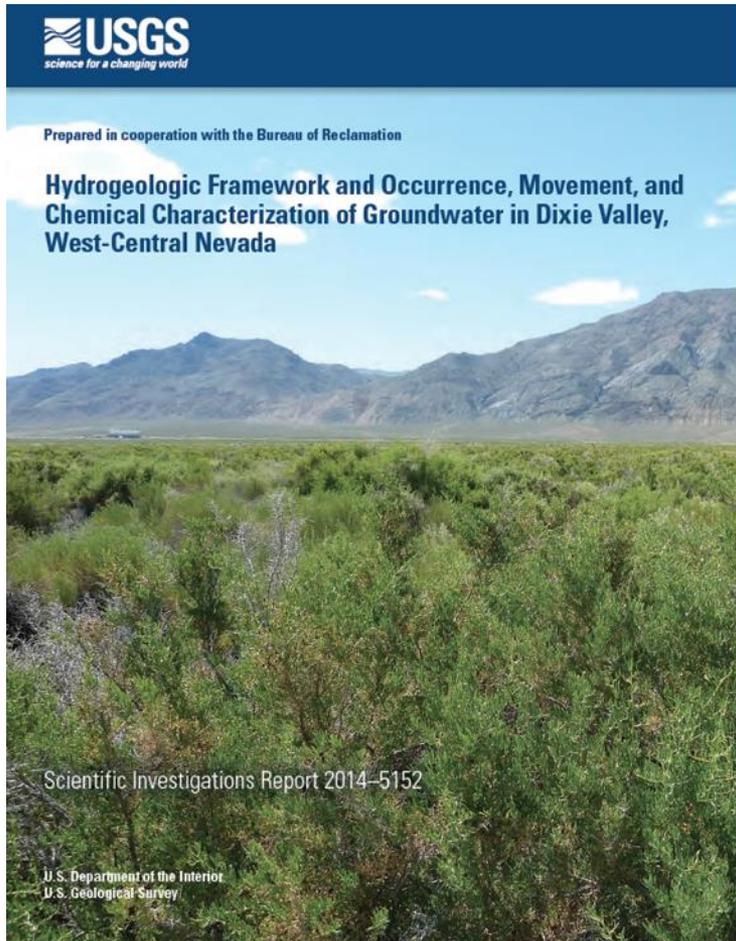
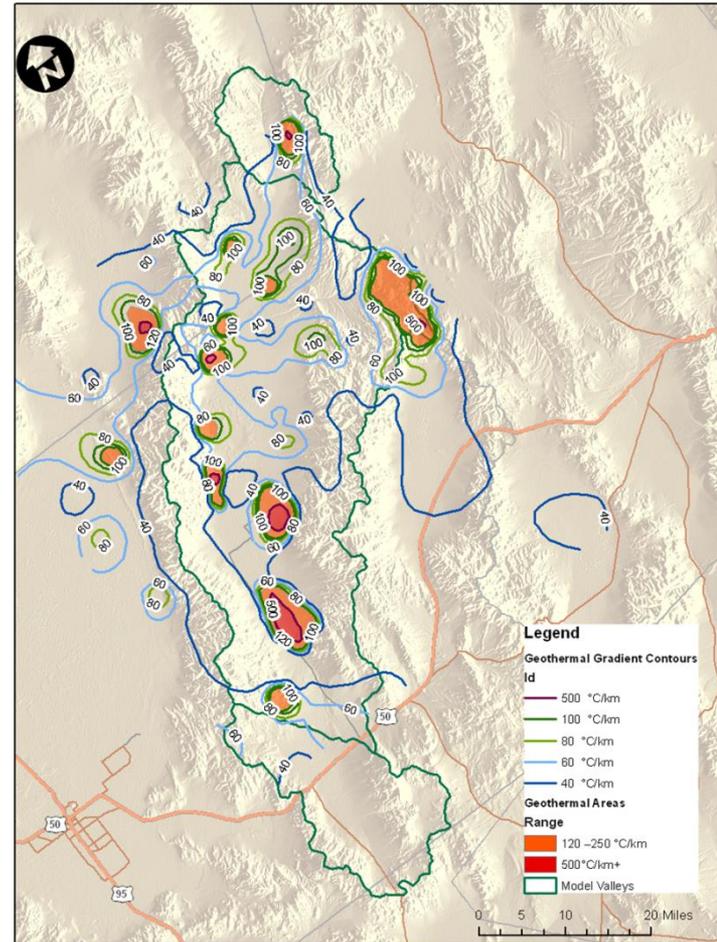
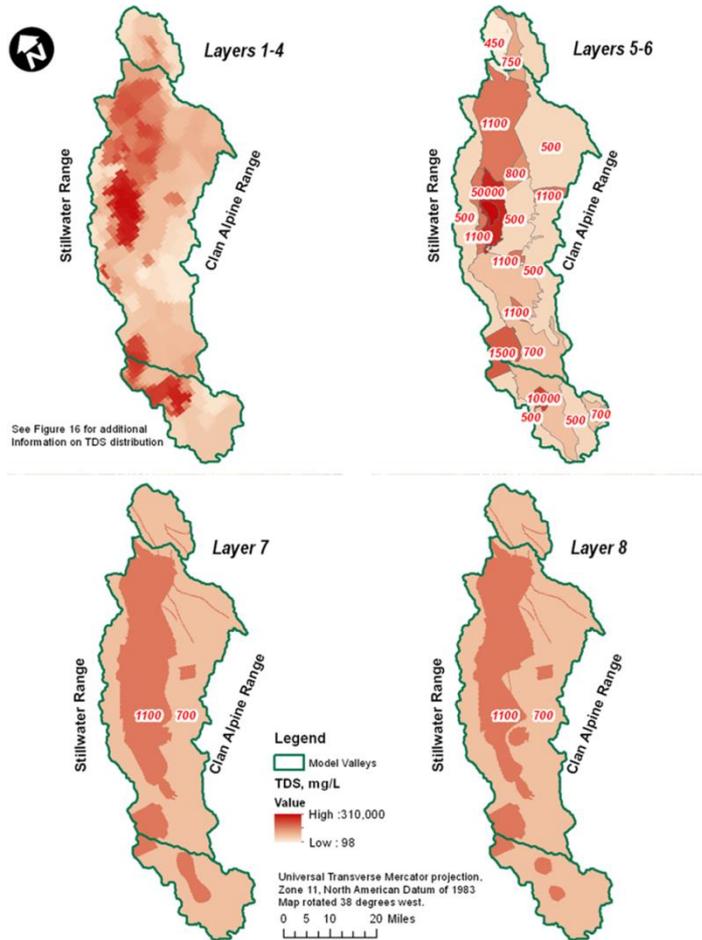
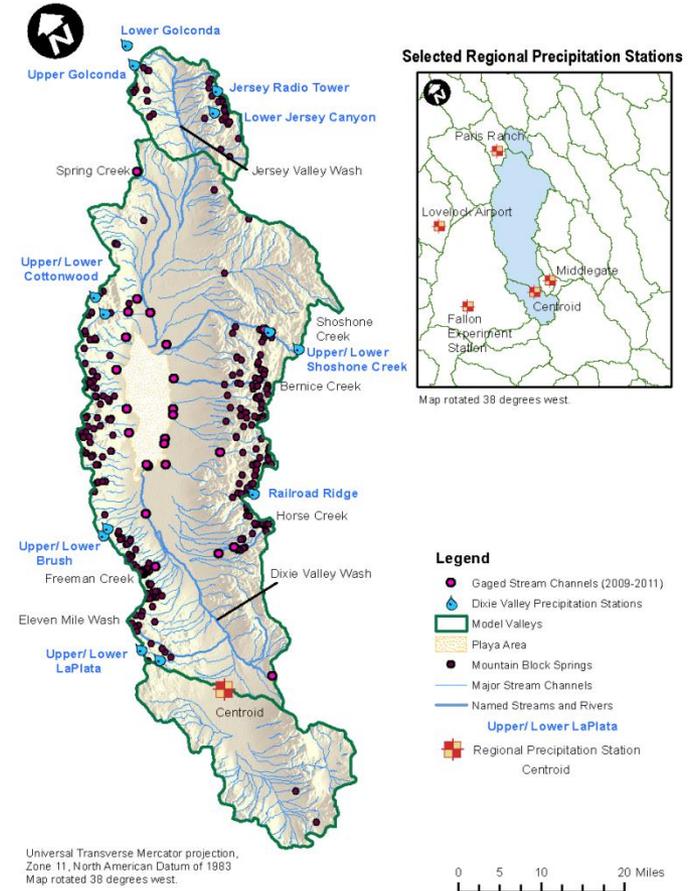
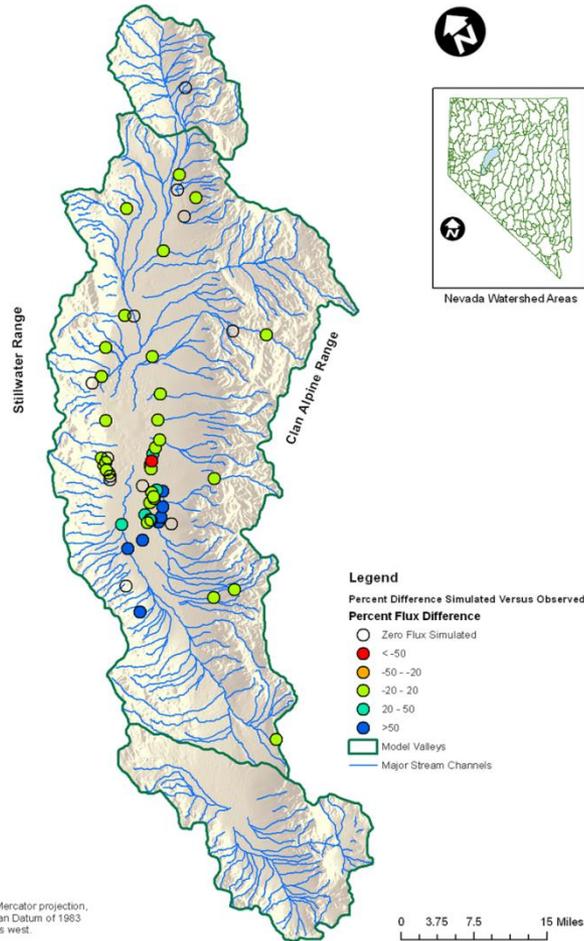


Figure 4. Data collection sites in Dixie Valley, west-central Nevada, 2009–11. Types of data collected include groundwater level (WL), historical groundwater level (HWL), groundwater quality (GW), and hydraulic properties (HP).

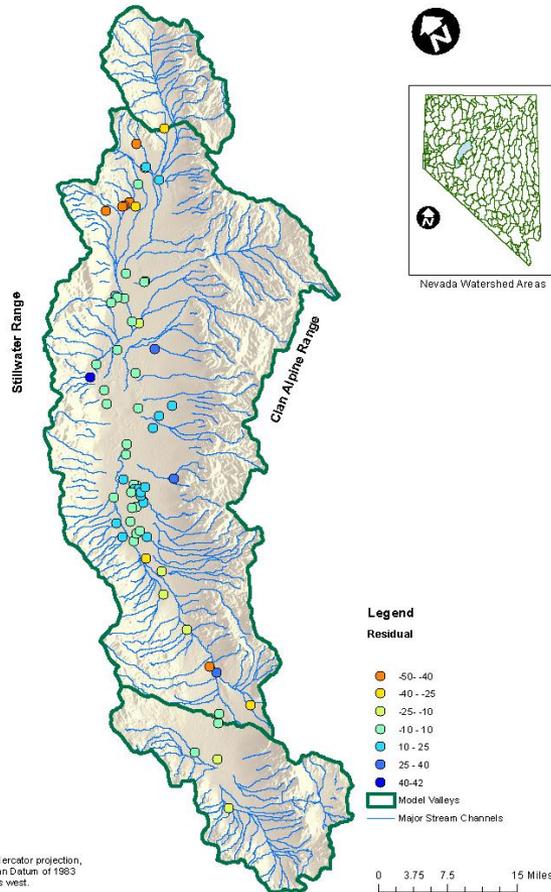
# TDS (Salinity) Represented in Model



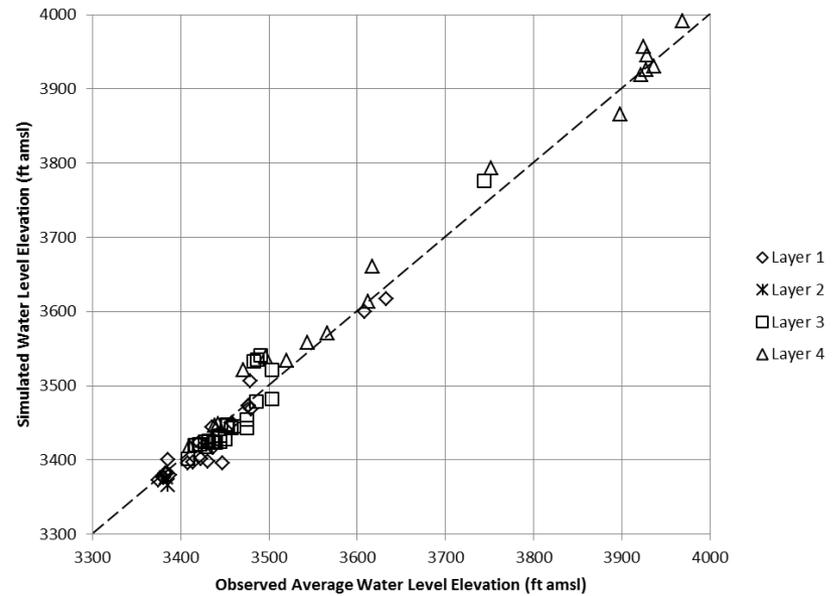
# Model Calibration to Spring and Stream Flow



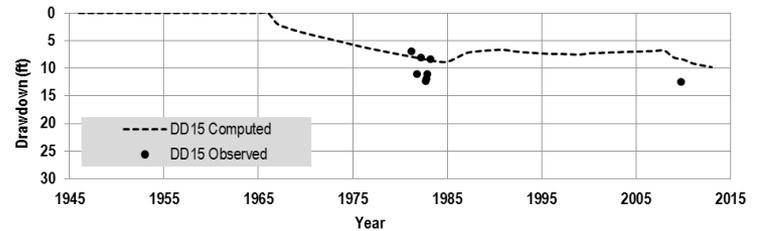
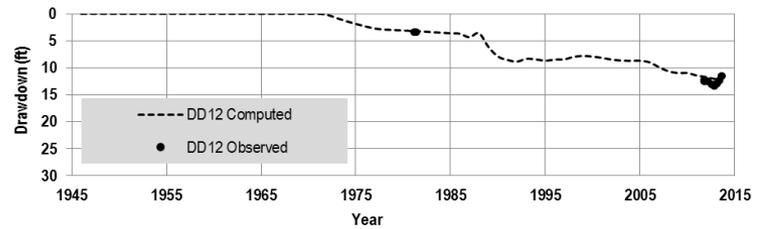
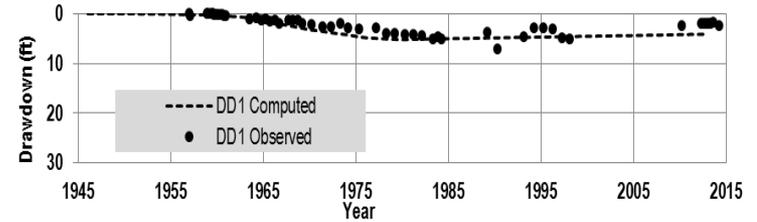
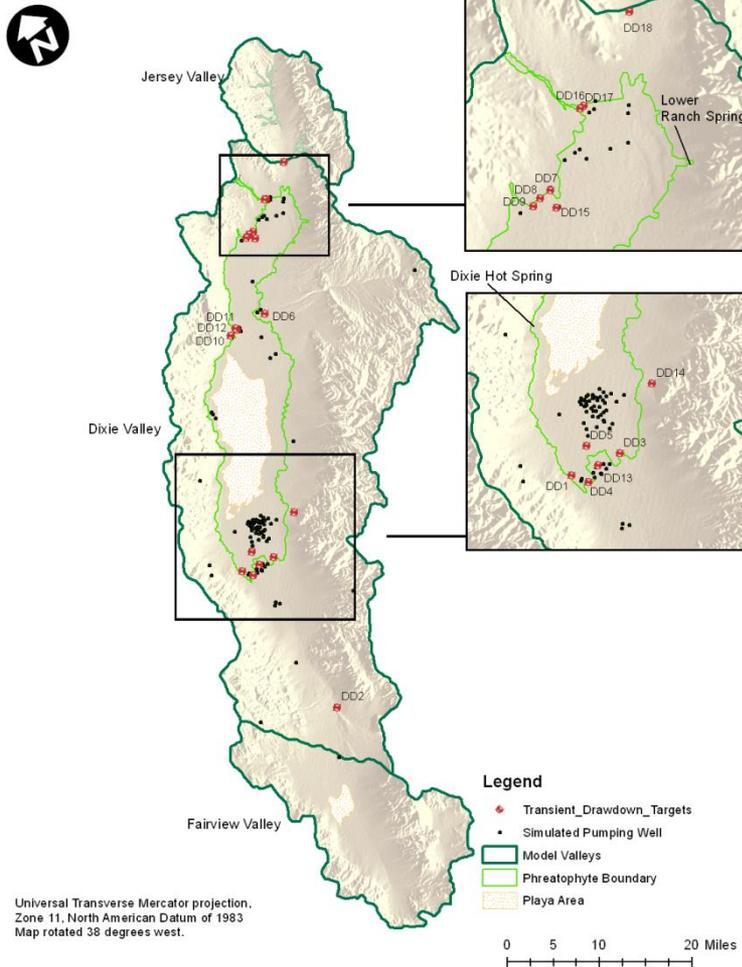
# Model Calibration to Study Period Measured Static Water Levels



Universal Transverse Mercator projection,  
Zone 11, North American Datum of 1983  
Map rotated 38 degrees west.



# Model Calibration to Historical Water Level Changes



# Model Calibration to Water Budget Components

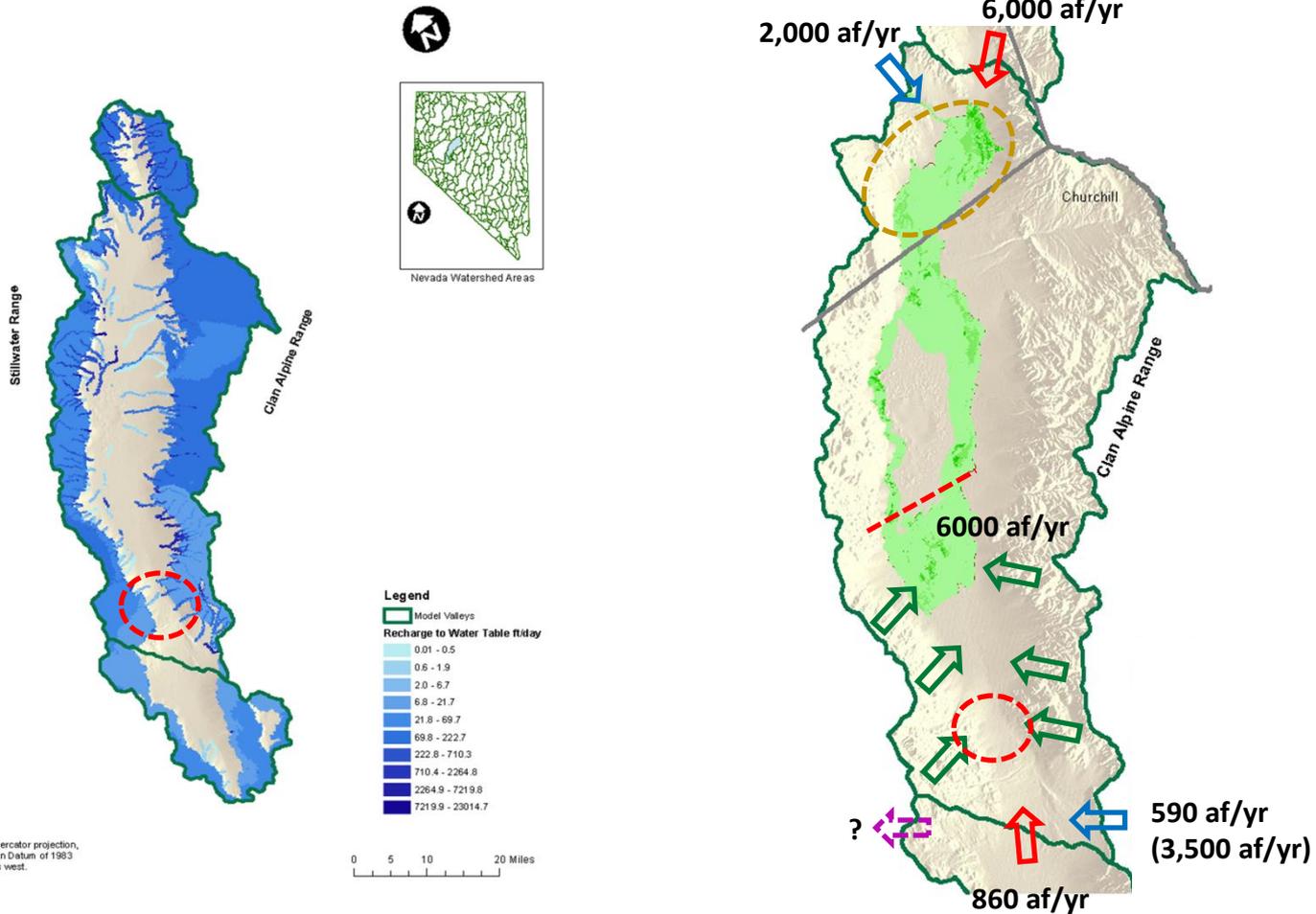
## Current Conditions - Transient

Parameter	Estimated in Conceptual Model (af/yr)	Calibrated Model Quantity* (af/yr)
<b>Inflows</b>		
Recharge by Precipitation ( $MF_{rch} + AF_{rch}$ )	17,900	25,376
Subsurface Inflow:		
Pleasant ( $Q_{Pleasant}$ )	1,000	2,005
Cowkick-Eastgate-Stingaree ( $Q_{Eastern\ Valleys}$ )	1,000 – 3,500	590
<b>Total Inflows</b>	19,900 – 22,400	27,972
Transitional Storage Withdrawal to Support Pumping		5,181
<b>Total Inflows including Transitional Storage**</b>		33,152
<b>Outflows</b>		
Valley Floor Phreatophyte ET - Total ( $ET_g$ )	19,000	19,304
Playa Discharge ( $E_g$ )	≤1,800	475
Mountain-block $ET_g$	--	3,859
Subsurface Outflow (Fairview to Carson Desert)	--	33
Pumping:		
Agriculture ( $Q_{Ag} + Q_{Aug}$ )	4,118	5,859
Geothermal Pressure Augmentation Water	2,023	3,555
Deep Geothermal Reservoir Net Fluid Depletion ( $Q_{Geotherm}$ )	3,555	3,555
<b>Total Outflows**</b>	30,500	33,085

## Predevelopment – Steady State

Parameter	Calibrated Model Quantity (af/yr)
<b>Total Simulated Recharge (<math>MF_{rch} + AF_{rch}</math>)</b>	<b>25,147</b>
Recharge – direct infiltration of precipitation	10,152
Recharge – infiltration of stream flow	14,995
Dixie Valley Portion	18,102
Fairview Valley Portion	857
Jersey Valley Portion	6,185
<b>Subsurface Inflow</b>	<b>2,585</b>
Pleasant ( $Q_{Pleasant}$ )	1,995
Deep Inflow	1,050
Shallow Inflow	945
Cowkick-Eastgate-Stingaree ( $Q_{Eastern\ Valleys}$ )	590
<b>Total Inflows*</b>	<b>27,732</b>
<b>Phreatophyte ET - Total (<math>ET_g</math>)</b>	
Mountain-Block $ET_g$	3,863
Valley Floor $ET_g$	23,104
Dixie Valley	23,104
Jersey Valley	0
Fairview Valley	0
<b>Subsurface Outflow</b>	<b>33</b>
Fairview to Carson Desert ( $Q_{CD}$ )	33
<b>Playa Discharge (<math>E_g</math>)</b>	<b>741</b>
<b>Total Outflow*</b>	<b>27,741</b>

# Southern-Northern Recharge Allocation / Model Calibration Challenge

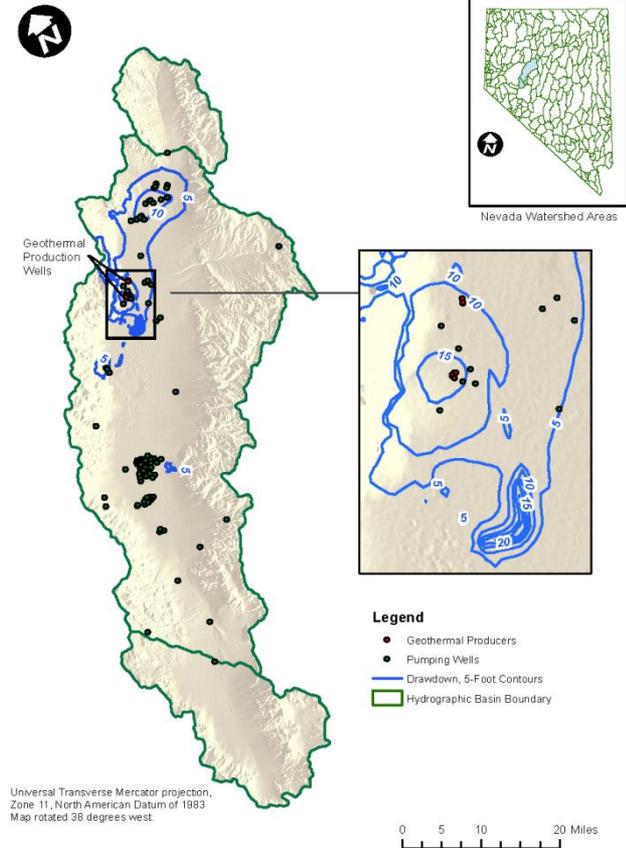
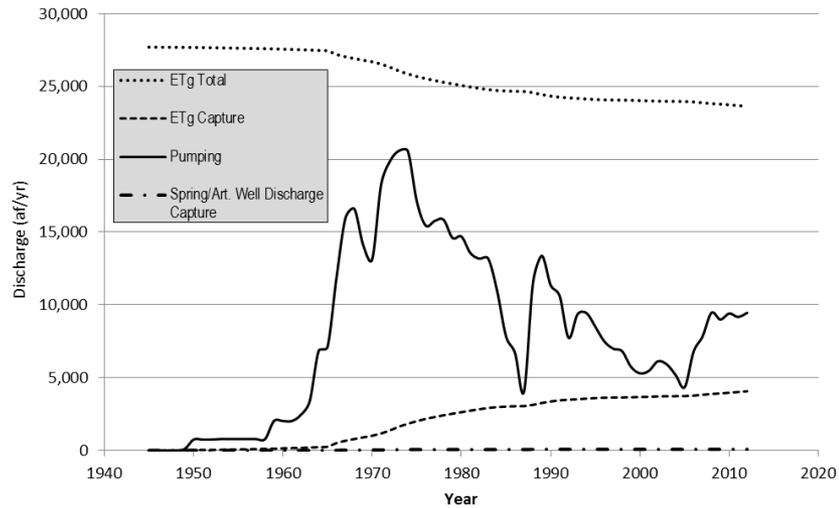


Universal Transverse Mercator projection, Zone 11, North American Datum of 1983. Map rotated 35 degrees west.

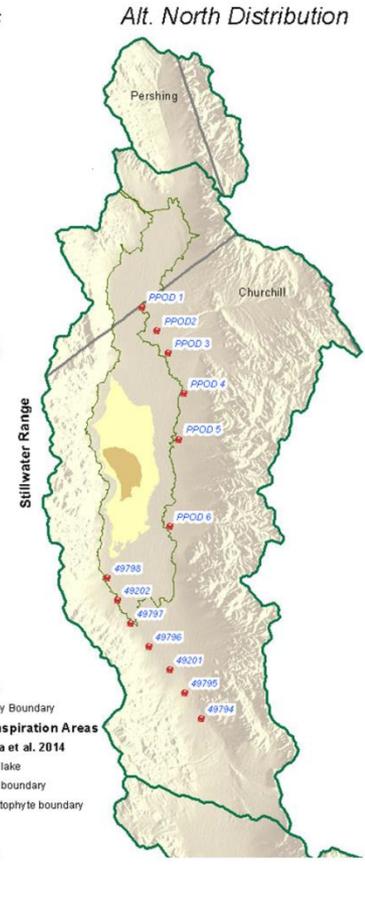
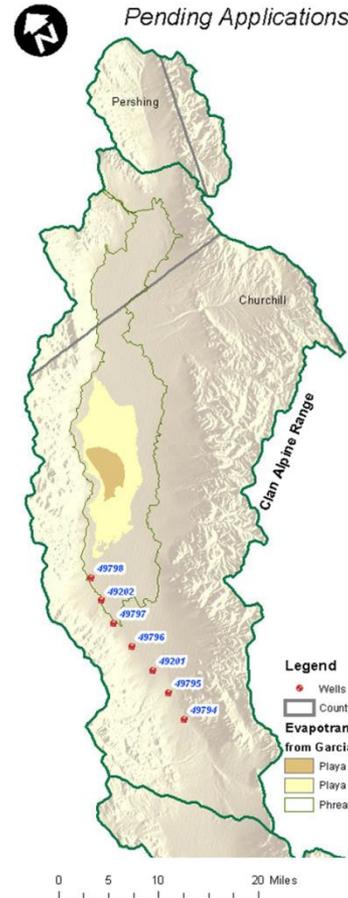
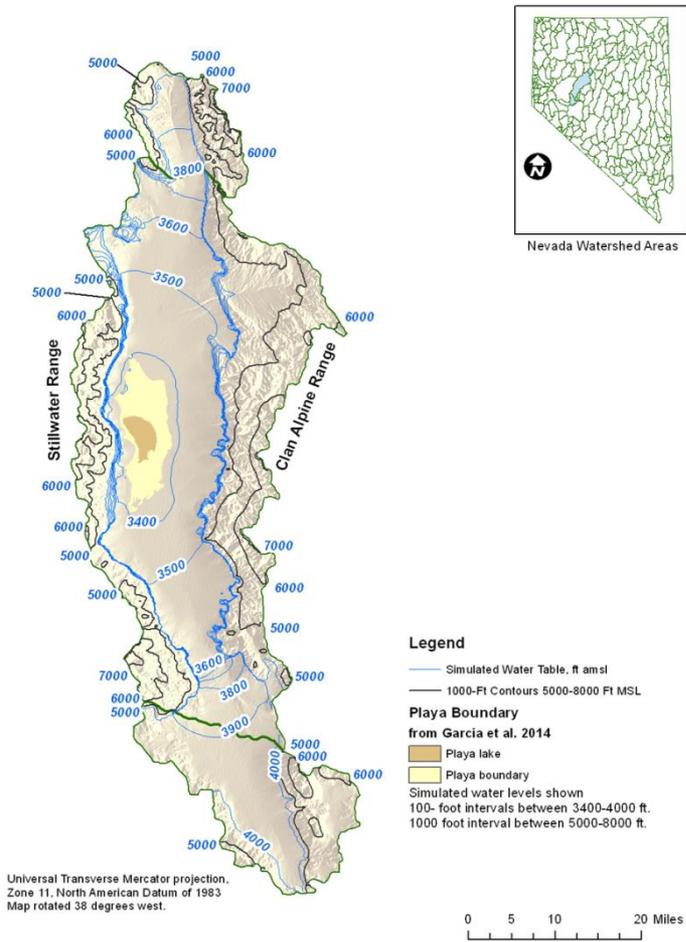
# Notable Areas of Model Uncertainty

- Magnitude of Southern Inflow to Dixie Valley
  - 3,500 af/yr as derived by water budget difference from the Stinagree-Cowkick-Eastgate basins (Huntington, 2016) – 1963 reconnaissance estimate is 6,000 af/yr
  - Simulated in model is 600 af/yr
- Aquifer Transmissivity in southern basin constriction near Horse Creek
- Potential for unidentified significant groundwater outflow from Fairview-Dixie to Carson Desert

# Use of the Calibrated Flow Model

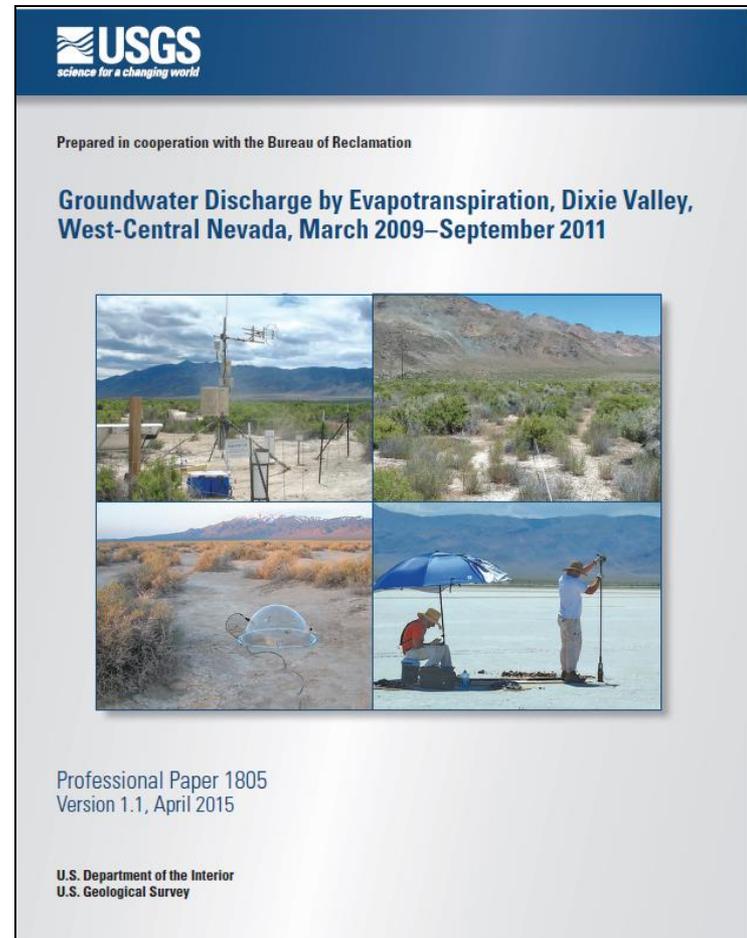


# Use of the Calibrated Flow Model



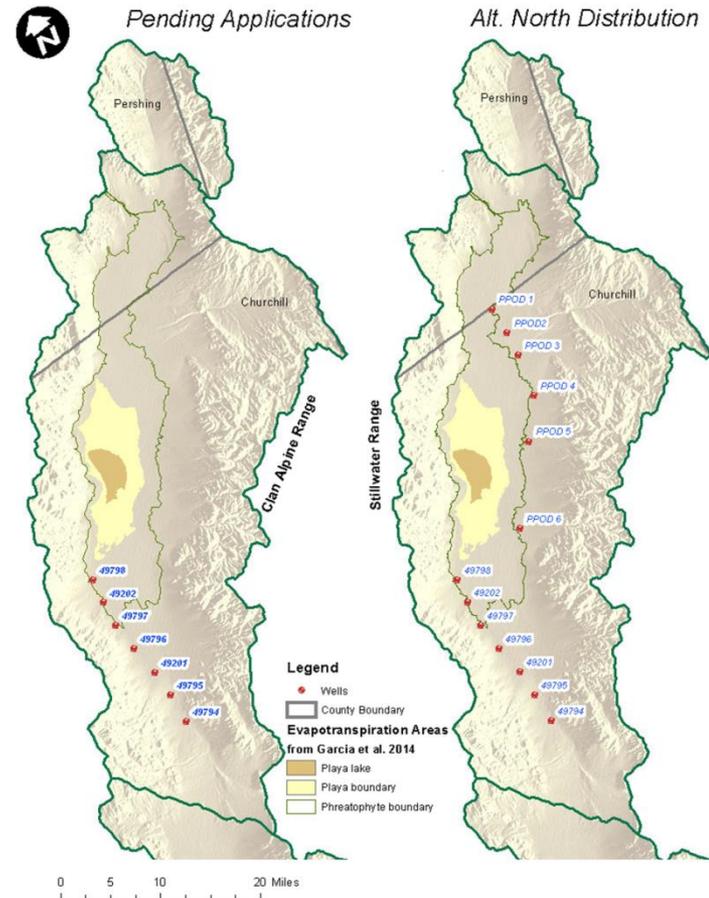
# Dixie Valley – Updated Perennial Yield Estimate

- Best Available Estimate of Perennial Yield = **23,000 af/yr**
  - Consistent with the USGS (Garcia, et al, 2015) estimates for pre-development ET (20,400 af/yr ET, 23,000 af/yr with playa)
  - Consistent with Huntington (2016) estimates for current conditions ET (18,700 – 20,000 af/yr, without playa).
  - Greater than the BOR (Eckhardt, 2016) estimates for current conditions (12,200 af/yr without playa).
  - Mid-range of the estimates made by Harrill and Hines (1995) of 17,000 to 28,000 af/yr (including playa).
  - Greater than Cohen and Everett (1963) estimate of 16,000 af/yr (including playa).

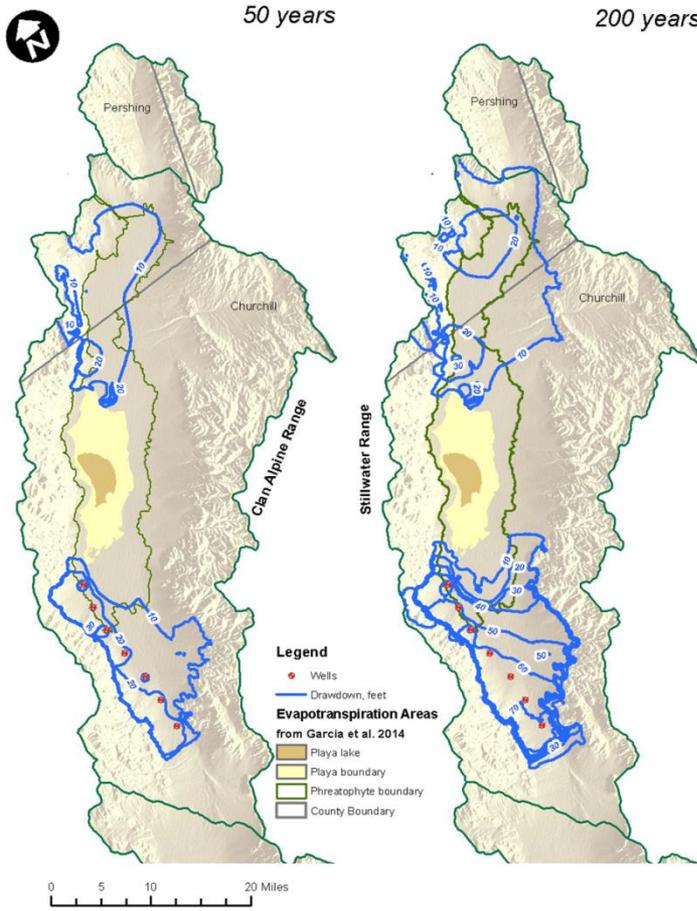


# Simulated Churchill County Pumping

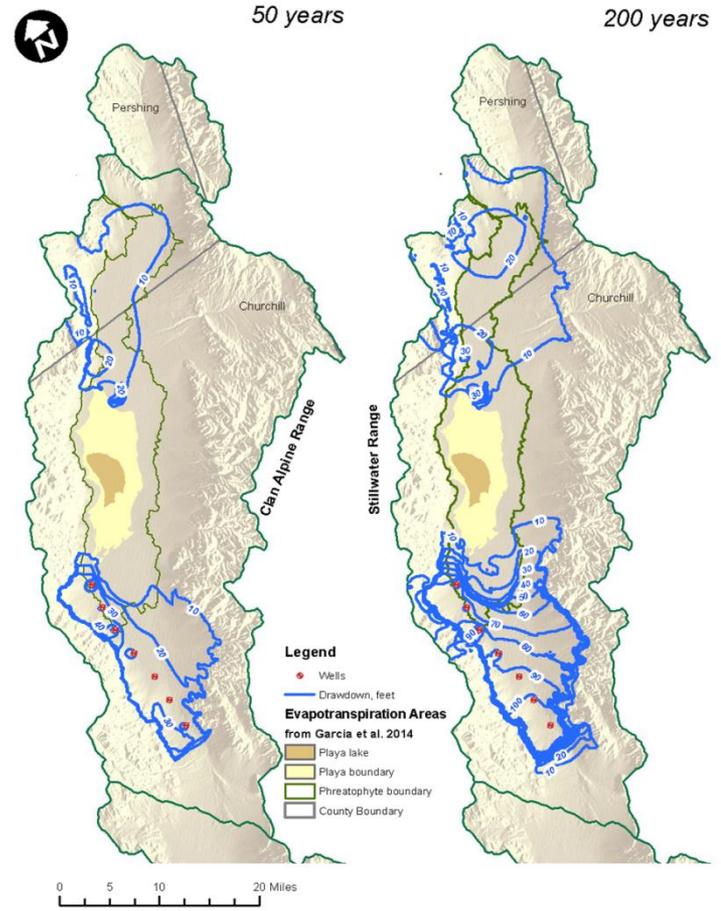
- Two distributions of wells
  - 7 wells at southern points of diversion for pending water right applications
  - Plus 6 wells east and northeast of playa
- Two Pumping Rates (based on potentially available water rights by Chris Mahannah)
  - 11,250 af/yr
  - 15,600 af/yr
- Pumping rates distributed evenly amongst wells
- Pumping simulated for 200 years into the future, commencing in year 2022
- Existing (2012) pumping assumed to remain constant into the future.



# Predicted Drawdown – Southern Pumping Distribution

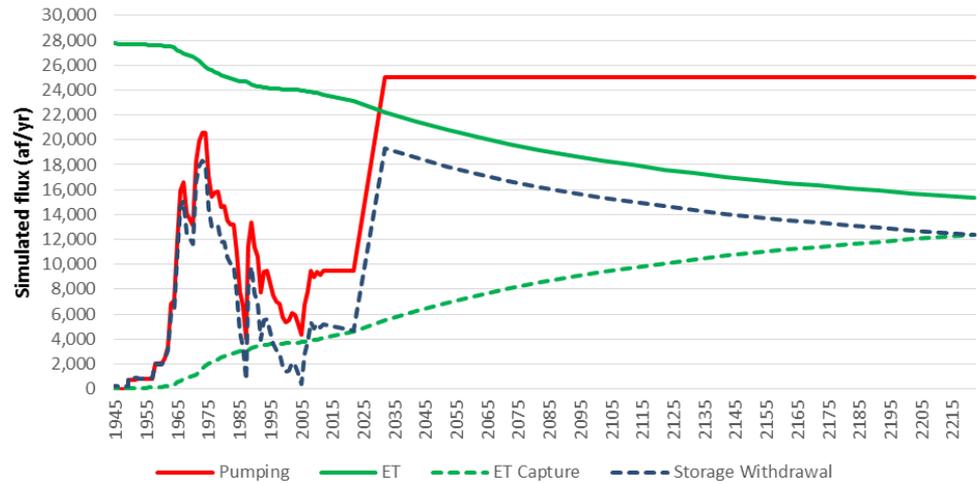
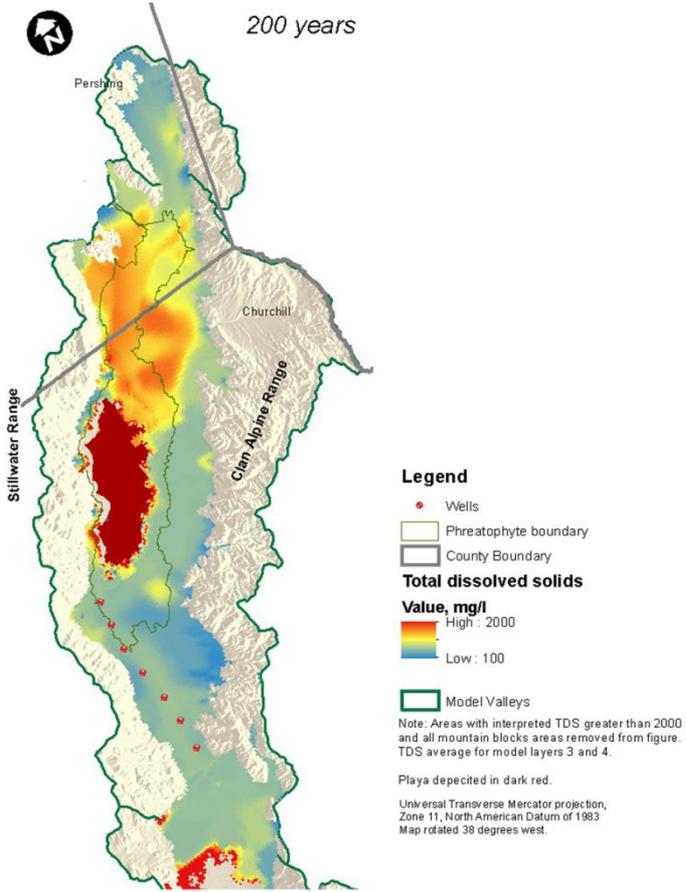


11,250 af/yr



15,600 af/yr

# Summary of Southern Pumping Distribution

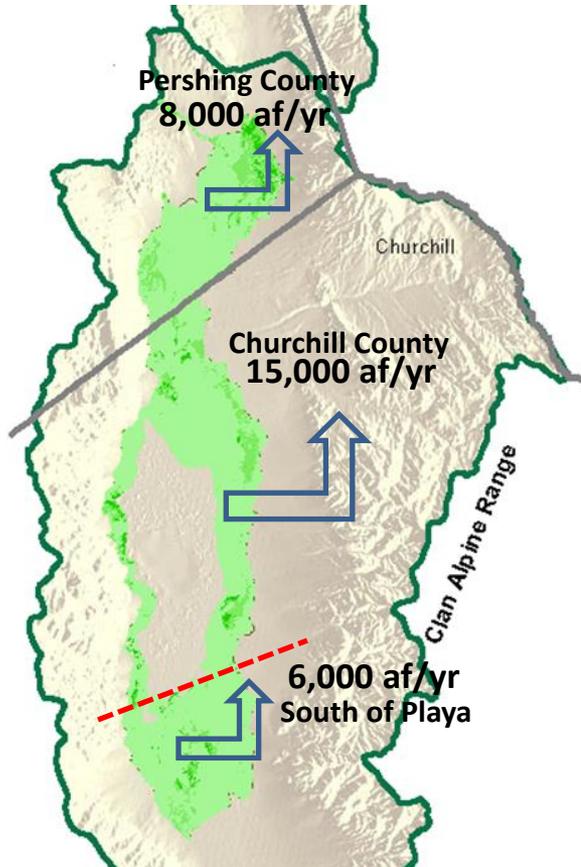


# Notable Areas of Model Uncertainty

- Water Chemistry at Simulated Pumping Wells
- Aquifer Transmissivity at Simulated Pumping Wells

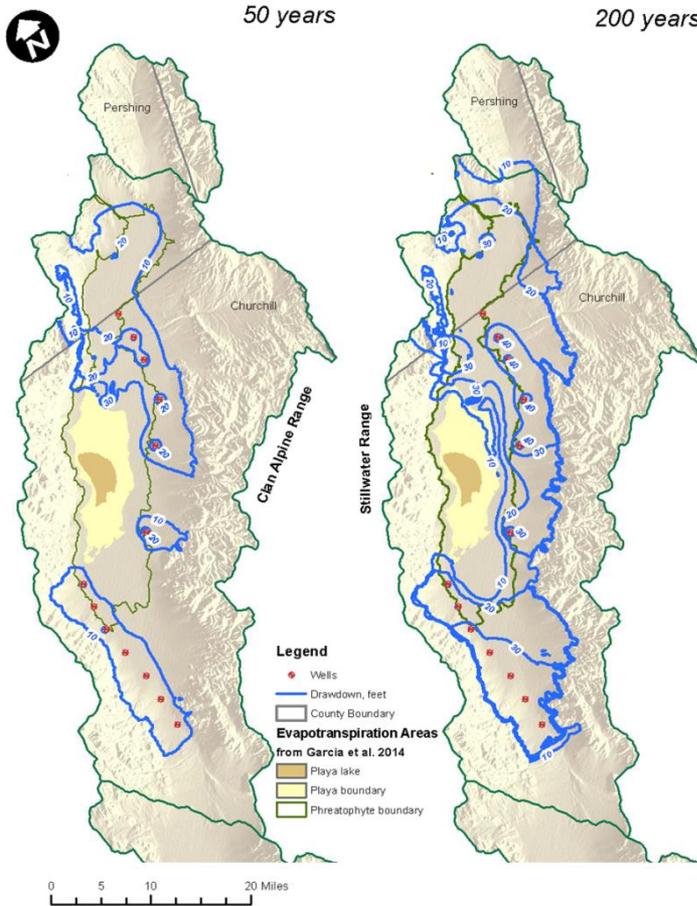
**Note:** Model simulated drawdown represents a regional aquifer response – not drawdown within the pumping wells, which may be approximately twice the regional aquifer simulated drawdown. Pumping water levels in wells will be dependent on aquifer transmissivity at the well and well efficiency.

# Geographic Distribution of ETg

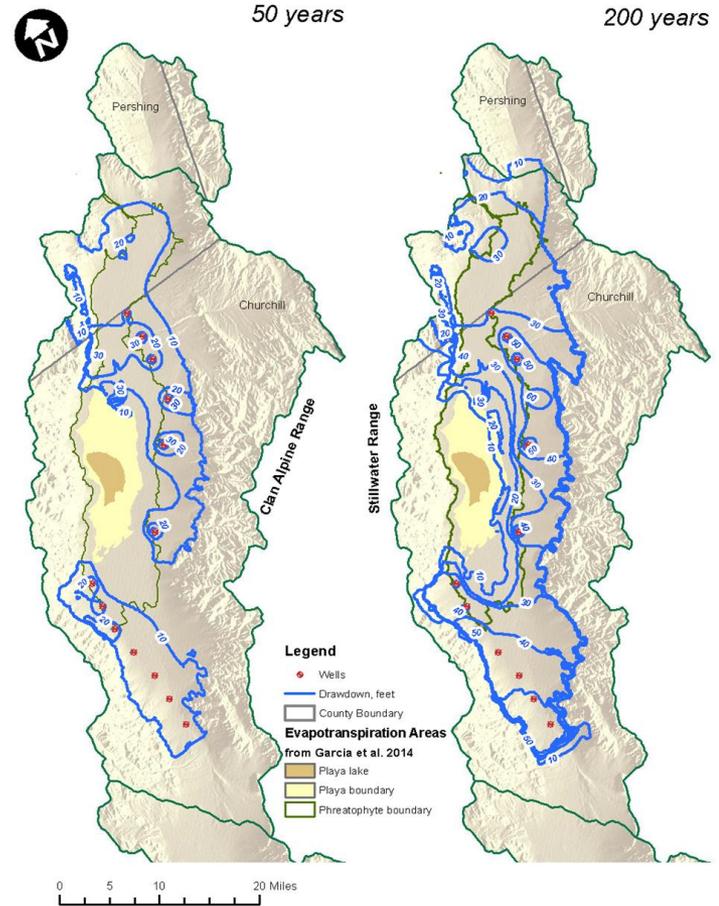


- Has implications for achieving long-term equilibration to simulated Churchill County pumping.
- Potentially a variable for new appropriations (SNWA Spring Valley Appeals)

# Predicted Drawdown – Northern Pumping Distribution

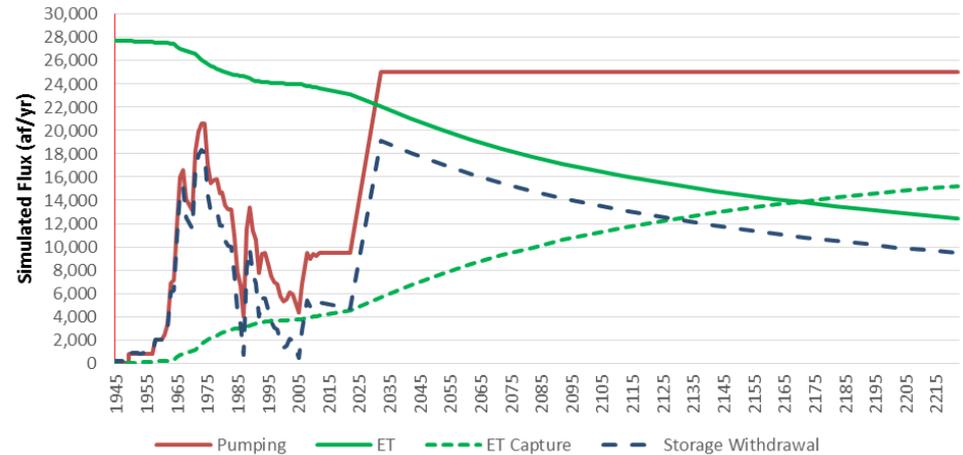
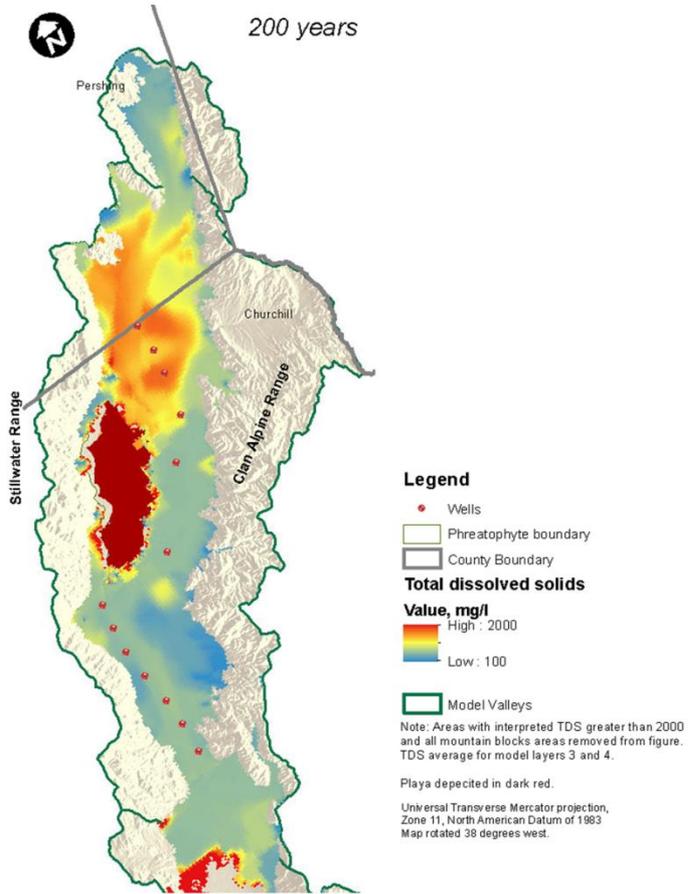


11,250 af/yr

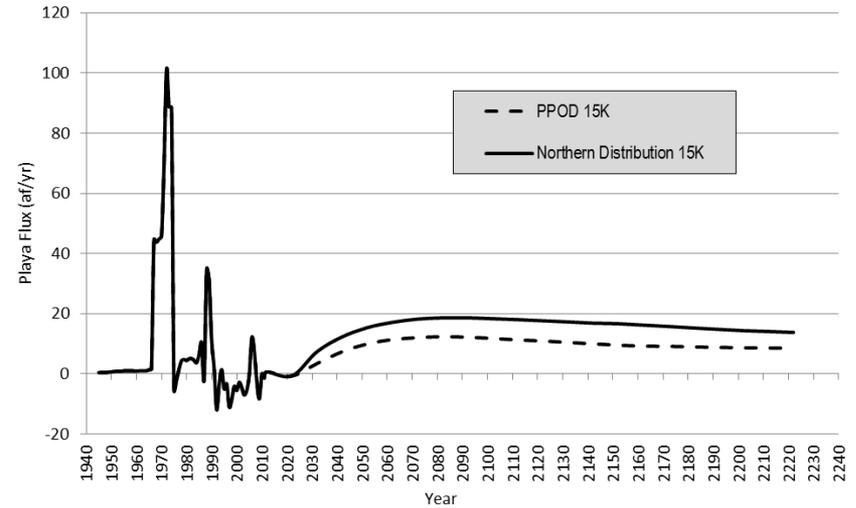
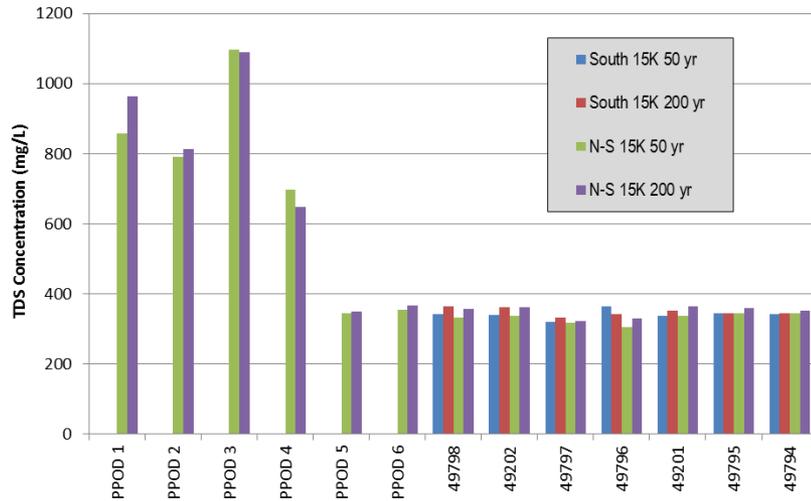


15,600 af/yr

# Summary of Northern Pumping Distribution



# Simulated Wellfield Salinity and Playa Brine Outflow



# Summary of Modeled Pumping Scenarios

- Southern Pumping Scenario:
  - At existing water right points of diversion.
  - Aquifer drawdown will be 45 to 55 feet within wellfield at 11,250 af/yr.
  - Aquifer drawdown will be 70 to 100 feet with the wellfield at 15,600 af/yr.
  - Combined wellfield TDS concentration is predicted at 325 mg/L at the start of pumping, increasing to 370 mg/L in 200 years.
  - ETg capture at year 200 is 46-50% of total pumped.
  
- Northern Pumping Scenario:
  - Includes 6 new points of diversion.
  - Aquifer drawdown will be 25 to 50 feet within wellfield at 11,250 af/yr.
  - Aquifer drawdown will be 35 to 70 feet within the wellfield at 15,600 af/yr.
  - Combined wellfield TDS concentration predicted at 490 mg/L, increasing to 530 mg/L in 200 years.
  - ETg capture at year 200 is 60-64% of the total pumped.
  
- Levels of simulated drawdown appear feasible over the period of time simulated, and water salinity (TDS) appears acceptable.

# Notable Pumping Scenario Impacts and Precautions

- Artesian wells in the Settlement will cease to flow within a two to five decades of pumping.
- Southern cold springs near the playa and Settlement may cease to flow, but more significant thermal springs, such as Dixie Hot Spring, are not predicted to be impacted.
- After 200 years, pumping withdrawals are still partially dependent on withdrawal from aquifer storage. Equilibrated conditions have not been reached within the 200 year simulation period and drawdown trends will continue.
- Total blended water salinity (TDS) is predicted to remain acceptable – however, northern wells may individually exceed drinking water standards. Other drinking water parameters such as arsenic and fluoride may require treatment to achieve drinking water standards. These parameters are not modeled. Specific well site water quality data are not available at this time.

# *Questions*

Dwight L. Smith, PE, PG  
Principal Hydrogeologist  
Interflow Hydrology, Inc.

P.O. Box 1482, Truckee, CA 96160  
(530) 582-1622 / (775) 848-2366  
[dwight.smith@interflowhydro.com](mailto:dwight.smith@interflowhydro.com)

**Churchill County  
Agenda Report**

**6 - B**

**Agenda Item: #** \_\_\_\_\_  
**Agenda Date Requested:** July 13, 2016

**Date Submitted:** July 1, 2016

**To:** Board of Churchill County Commissioners  
**From:** Chris Mahannah, Mahannah & Associates LLC  
**Subject Title:** Consideration and possible action re: Presentation and discussion regarding Churchill County's water projects and water resources.

**Type of Action Requested:** (check one)  
 Resolution  Ordinance  
 Formal Action/Motion  Other – Informational Only

**Does this action require a Business Impact Statement?**

**Recommended Board Action:** Motion to direct appropriate actions related to water projects or water resources

**Discussion:** Chris Mahannah, Mahannah and Associates LLC, and County Manager Lockwood will make a presentation and lead discussions related to Churchill County's water projects and water resources.

**Prepared By:** Pamela D. Moore, Deputy Clerk **Date:** July 1, 2016

**Reviewed By:** Eleanor Lockwood **Date:** 7/1/2016  
Eleanor Lockwood, Churchill County Manager

B. D. [Signature] **Date:** 7/1/16  
Churchill County Deputy District Attorney

[Signature] **Date:** 7/1/16  
Alan Kait, Churchill County Comptroller

The submission of this agenda report by county officials is not intended, necessarily, to reflect agreement as to a particular course of action to be taken by the board; rather, the submission hereof is intended, merely, to signify completion of all appropriate review processes in readiness of the matter for consideration and action by the board.

-----  
Board Action Taken:

Motion: \_\_\_\_\_

1) \_\_\_\_\_

2) \_\_\_\_\_

Aye/Nay

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_  
(Vote Recorded By)

The submission of this agenda report by county officials is not intended, necessarily, to reflect agreement as to a particular course of action to be taken by the board; rather, the submission hereof is intended, merely, to signify completion of all appropriate review processes in readiness of the matter for consideration and action by the board.

# **MAHANNAH & ASSOCIATES, LLC**

**Contract Renewal (FY17-19)  
&  
Projects Update**

**Churchill County Commission Meeting**

**15 June 2016**

# Projects

1. General Water Resource / Rights Consulting <sup>1</sup>
2. Implement Water Resource Protection Policy <sup>1</sup>
3. *Lahontan Valley Water Level Monitoring* <sup>2</sup>
4. *Geothermal Reviews* <sup>2</sup>
5. *Dixie Valley Study* <sup>2</sup>
6. *Dixie Valley Ongoing Monitoring* <sup>2</sup>

<sup>1</sup> *General Contract*

<sup>2</sup> *Funded from other sources*

# General Water Resource / Water Rights

## (Exhibit A – Scope of Services)

1. Filing Permanent & Temp. Applications & WR Maps w/ State Engineer
2. Water Rights Administration:
  1. Filing Proofs / Extensions
  2. Abstract of Title / Reports of Conveyance
  3. Water Right Surveying
  4. Payment of fees (~\$6-10K/yr)
  5. Water Banking Agreement Negotiation & Mapping
3. Water Resource Planning / Monitoring
  1. Implement Water Plan(s)
  2. Coordination w/ others (TCID, CWSD, USFWS, USGS, State Engineer, Upstream Interests)
  3. Wild Goose Farm Monitoring, Well Drilling, Pump Design
  4. General Geothermal Project Permitting, Terms, Requirements, Regulation
  5. Dixie Valley Ongoing Monitoring
  6. Tasks as requested by County Manager, Planning, Commission
4. CWSD
  1. Water User & Technical Committee group representative for Churchill County

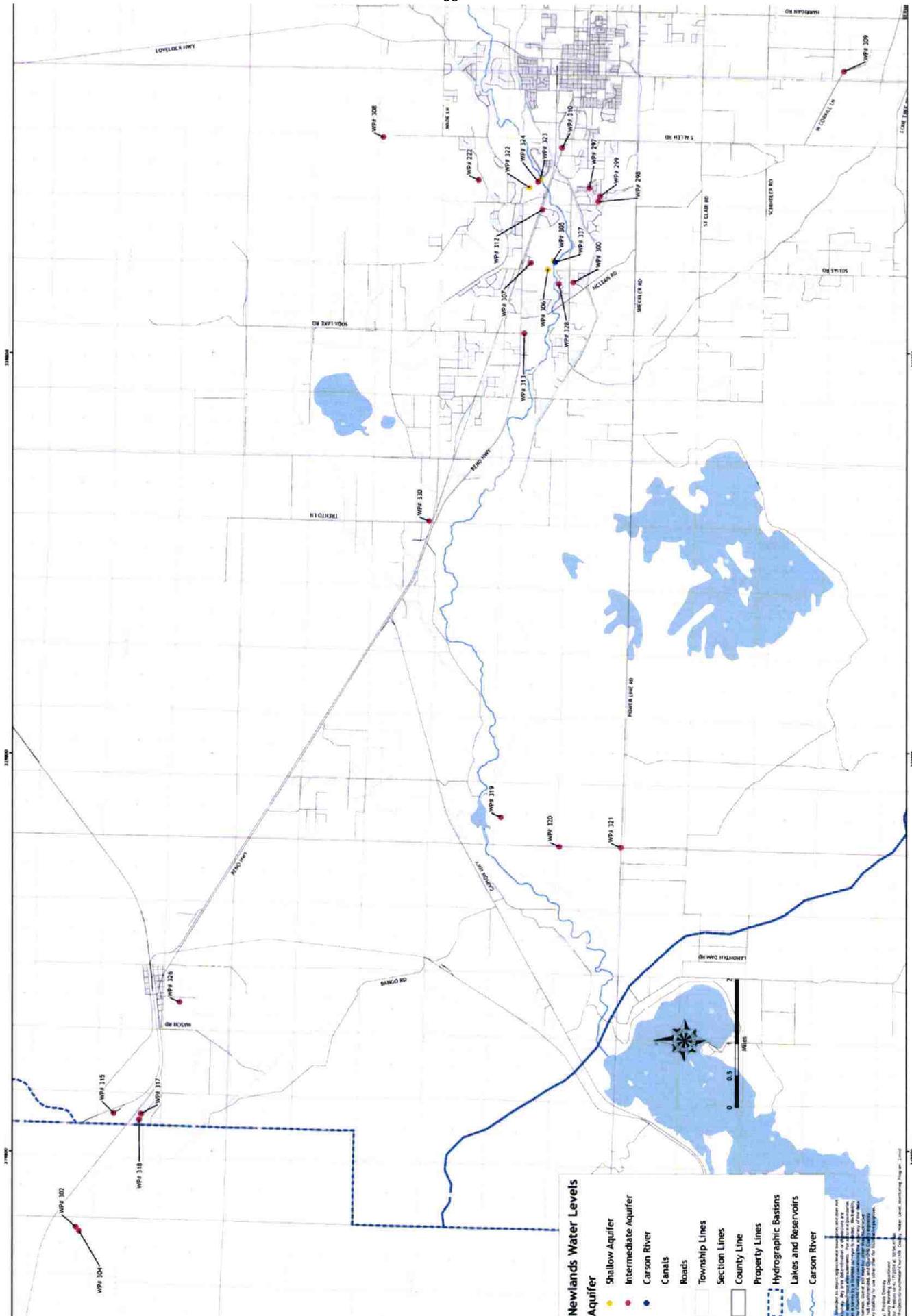
# Implement Water Resource Protection Policy (Exhibit A – Scope of Services)

1. Review Monthly Water Right Applications filed with State Engineer
2. Recommend Applications for Protest
3. Protest Preparation & Filing
4. Protest Negotiation & Resolution
5. Water Right Hearing:
  1. Conduct Field work & studies as needed
  2. Prepare / Provide Expert Witness Testimony before State Engineer
  3. Assist in Brief/Motion preparation
  4. Assist in Appeals
6. Coordination with Churchill DA / Outside Counsel
7. Updates to County Manager / Commissioners

## Lahontan Water Level Monitoring

- Inter-Local Contract #2015-8 with CWSD
- \$60K
- 3 year ongoing effort: July, 2015 – June 2018
- Ongoing effort – seek additional CWSD funding ~January 2018





**Newlands Water Levels**

- Aquifer**
  - Shallow Aquifer
  - Intermediate Aquifer
  - Carson River
- Canals
- Roads
- Township Lines
- Section Lines
- County Line
- Property Lines
- Hydrographic Basins
- Lakes and Reservoirs
- Carson River

Map prepared by the Newlands Project Office, U.S. Army Corps of Engineers, in cooperation with the Bureau of Reclamation, U.S. Department of the Interior. The map shows the location of wells and the aquifers they are monitoring. The map is for informational purposes only and does not constitute a warranty of any kind. The map is subject to change without notice. The map is not to be used for any other purpose. The map is the property of the U.S. Army Corps of Engineers and is not to be reproduced without the written permission of the U.S. Army Corps of Engineers. The map is dated 11/17/2014. The map is prepared by the Newlands Project Office, U.S. Army Corps of Engineers, in cooperation with the Bureau of Reclamation, U.S. Department of the Interior. The map shows the location of wells and the aquifers they are monitoring. The map is for informational purposes only and does not constitute a warranty of any kind. The map is subject to change without notice. The map is not to be used for any other purpose. The map is the property of the U.S. Army Corps of Engineers and is not to be reproduced without the written permission of the U.S. Army Corps of Engineers. The map is dated 11/17/2014.

# Geothermal Reviews – SUP Compliance

*(paid by industry)*

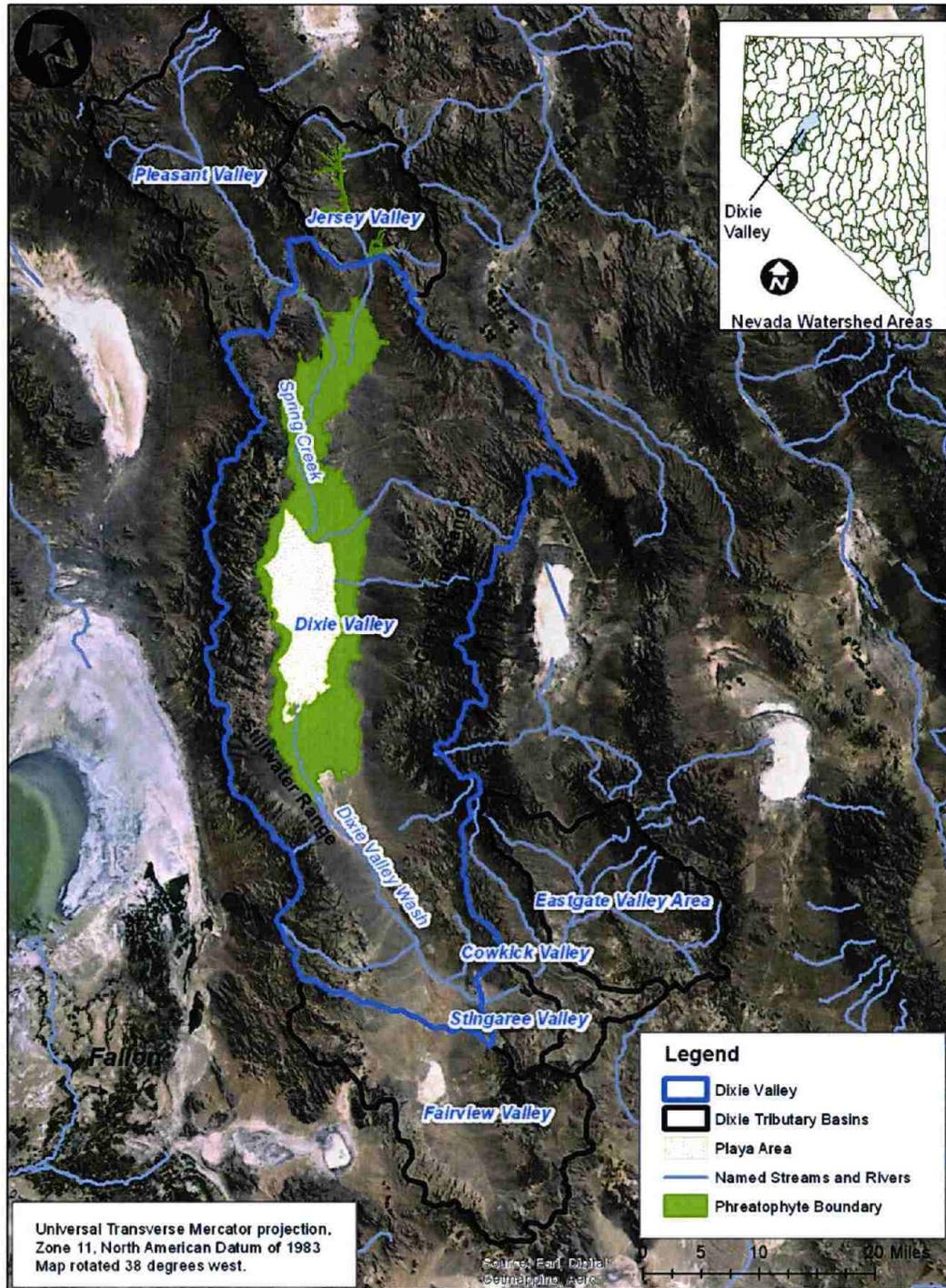
- **Enel – Stillwater**
  - 2008: Negotiated a Monitoring Plan
  - Base Line Report & various other geothermal report reviews
  - Annual MP Review & Recommendations to PC
  - 2014: New Monitoring Plan negotiated
- **Gradient – Patua**
  - 2013: Negotiated a Monitoring Plan
  - 2014: Baseline Report
  - 2015: Monitoring Report in progress



# Dixie Valley Study- Complete!

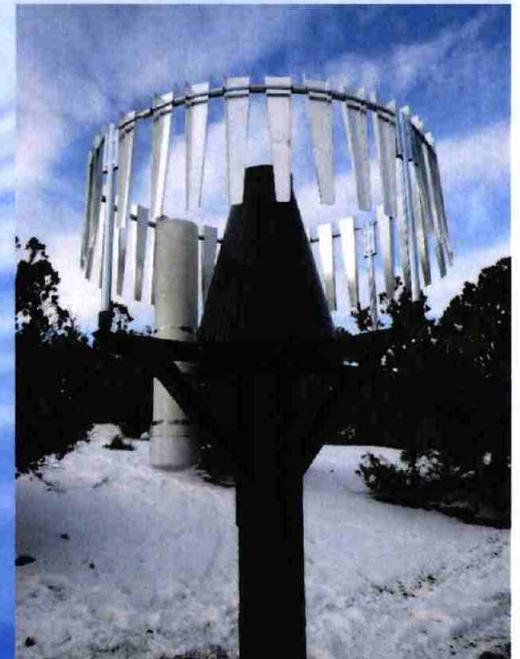
- ~\$5M / 5...7 year study - BOR Grant
- Study Team:
  - BOR
  - USGS
  - DRI
  - State Engineer
  - Private Consultants:
    - Hydro Bio
    - Mahannah & Associates
      - InterFlow Hydrology
      - Sustainable Solutions: Dick Benoit
      - Justin Huntington, PhD





## Primary Study Objectives

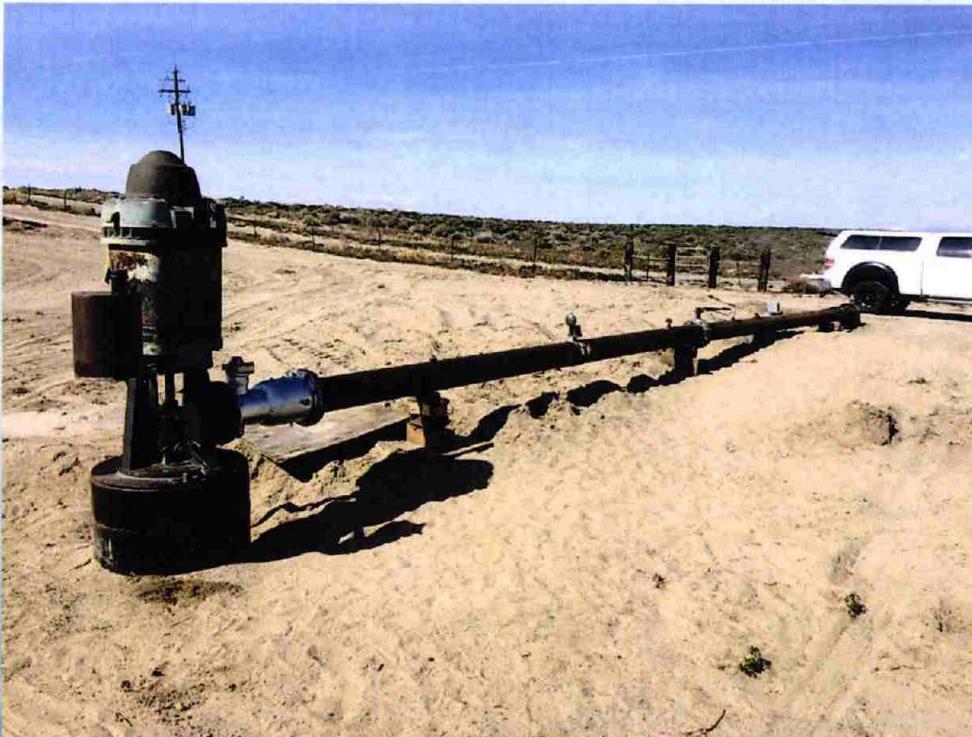
- Quantify & Update Perennial Yield Estimates
  - Discharge Methods (Playa & Phreatophyte areas)
- Quantify Existing Uses & Water Rights
- GW Modeling
  - Steady State/Transient State & Pumping Simulations to assess impacts
- Commissioner Workshop: 7/13/16
- CWSD Contract 2016-10 for ongoing monitoring
  - \$70K, FY16-18
    - Water level monitoring
    - High altitude precip gage maintenance
    - Weather station maintenance



# Wildgoose Well Replacement



# Wildgoose Maintenance / Metering



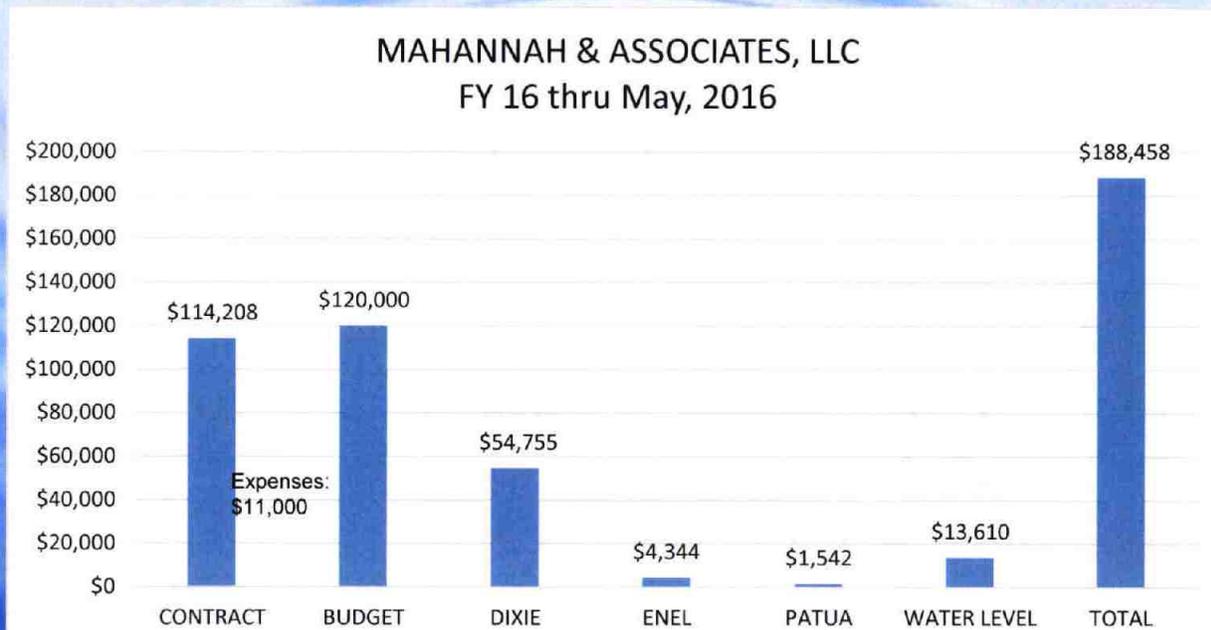
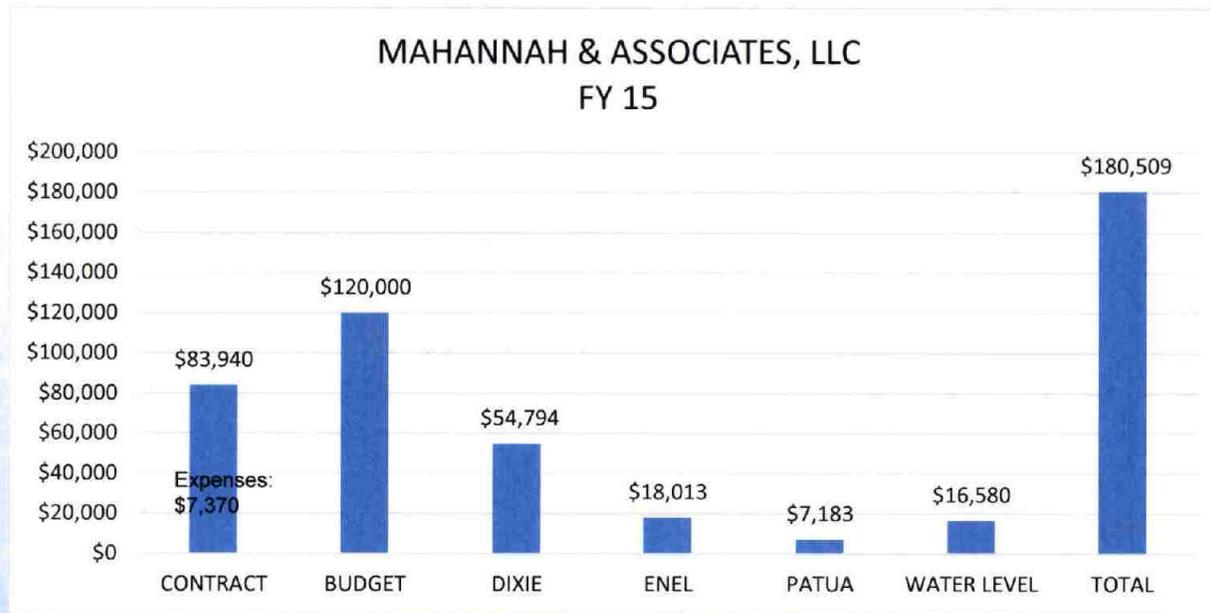
# Issues/Legislation facing State Engineer

*“what do you call a guy with a short term memory? Anything you want! – Please don’t let one ‘average’ winter give you short term memory to the effects of the previous four drought years” – Jason King, State Engineer*

- Conjunctive use of GW/SW
- Adjudication modernization, sunset for filing vested claims
- Revisions/clarifications to water law
- Possibly waiving ‘use it or lose it’ in over appropriated basins in times of drought
- Exemptions for small scale precipitation capture (rain barrels)
- Other drought resilient enhancement ideas?
- Dealing with climate change
- Dr. Young – Australian model for water marketing / shares in over appropriated basins

**Economy is recovering, home/water prices escalating, growth –  
Expect pressure on water resources**

# Budgets



Request Professional Services Contract  
Renewal with  
Mahannah & Associates, LLC  
not to exceed \$120k/year  
for FY17-19

*~8% increase in Fee Schedule <sup>1</sup>  
& no contract amount increase*

<sup>1</sup> Fee schedule hasn't been adjusted for four (4) years



Thank You