LEWIS AND ROCA LLP LAWYERS

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AZ CORP COMMISSION DOCKET CONTROL

BEFORE THE ARIZONA POWER PLANT AND TRANSMISSION LINE SITING COMMITTEE

IN THE MATTER OF THE APPLICATION OF HUALAPAI VALLEY SOLAR LLC, IN CONFORMANCE WITH THE REQUIREMENTS OF ARIZONA REVISED STATUTES §§ 40-360.03 AND 40-360.06, FOR A CERTIFICATE OF ENVIRONMENTAL COMPATIBILITY AUTHORIZING CONSTRUCTION OF THE HVS PROJECT, A 340 MW PARABOLIC TROUGH CONCENTRATING SOLAR THERMAL GENERATING FACILITY AND AN ASSOCIATED GEN-TIE LINE INTERCONNECTING THE GENERATING FACILITY TO THE EXISTING MEAD-PHOENIX 500kV TRANSMISSION LINE, THE MEAD-LIBERTY 345 kV TRANSMISSION LINE OR THE MOENKOPI-EL DORADO 500kV TRANSMISSION LINE.

Docket No. L-00000NN-09-0541-00151

Case No. 151

APPLICANT'S NOTICE OF FILING PREFILED DIRECT TESTIMONY AND HEARING EXHIBITS

Hualapai Valley Solar gives notice of filing its hearing exhibits, including the prefiled direct testimony of Greg Bartlett, Michael LaRow, Bill Victor, Kenda Pollio, and Michael Warner, in the above captioned matter.

Respectfully submitted this 6th day of January, 2010.

LEWIS AND ROCA LLP

Tom H. Campbell

Thomas H. Campbell
Albert H. Acken
40 N. Central Avenue
Phoenix, Arizona 85004
Attorneys for Hualapai Valley Solar LLC
(602) 262-5723 (Tel.)
(602) 734-3841

Arizona Corporation Commission
DOCKETED
JAN - 6 2010
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ORIGINAL and twenty-five (25) copies of the foregoing filed this 6th day of January, 2010, with:

The Arizona Corporation Commission
Utilities Division – Docket Control
1200 W. Washington Street
Phoenix, Arizona 85007

COPY of the foregoing hand-delivered this 6th day of January, 2010, to:

John Foreman, Chairman
Arizona Power Plant and Transmission Line Siting Committee
Office of the Attorney General
PAD/CPA
1275 W. Washington Street
Phoenix, Arizona 85007

Janice Alward, Chief Counsel
Arizona Corporation Commission
1200 W. Washington Street
Phoenix, Arizona 85007

COPY of the foregoing mailed via overnight delivery and/or served electronically this 6th day of January, 2010, to:

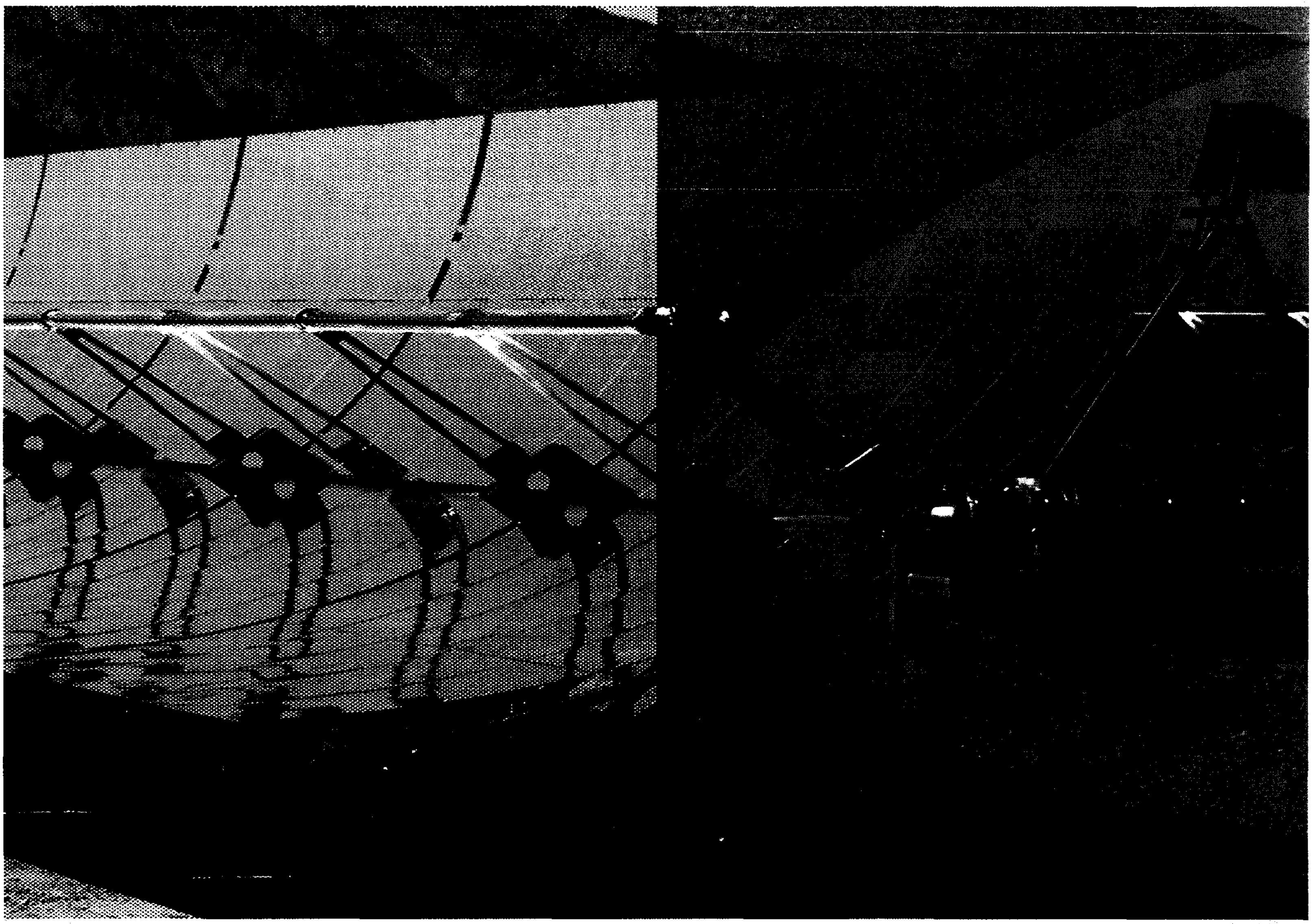
Susan A. Moore-Bayer
7656 West Abrigo Drive
Golden Valley, Arizona 86413

Denise Herring-Bensusan
c/o Crazy Horse Contry Store
8746 N. Stockton Hill Road
Kingman, Arizona 86409

Israel G. Torres
Torres Consulting and Law Group LLC
209 E. Baseline Road
Suite E-102
Tempe, Arizona 85283

Marjorie J. Haberman

hualapai valley solar™
a mohave sun power project



HEARING EXHIBITS
Hualapai Valley Solar Project
JANUARY 2010
For submittal to:
ARIZONA POWER PLANT AND TRANSMISSION LINE SITING COMMITTEE

HUALAPAI VALLEY SOLAR PROJECT
L-00000NN-09-0541-00151

HEARING EXHIBITS
Table of Contents

EXHIBIT NUMBER	DESCRIPTION
HVS-1	Application for a Certificate of Environmental Compatibility, November 23, 2009 (previously distributed in separate binder)
HVS-2	Affidavits of Publication, December 30, 2009
HVS-3	Placemat visuals
HVS-4	Greg Bartlett testimony
HVS-5	Greg Bartlett slides
HVS-6	Mike LaRow testimony
HVS-7	Mike LaRow slides
HVS-8	Bill Victor testimony
HVS-9	Bill Victor slides
HVS-10	Kenda Pollio testimony
HVS-11	Kenda Pollio slides
HVS-12	Mike Warner testimony
HVS-13	Mike Warner slides
HVS-14	City of Kingman, June 26, 2009, to Hualapai Valley Solar LLC: Letter of Intent for the Use of Effluent from the Hilltop Wastewater Treatment Plant
HVS-15	City of Kingman / Hualapai Valley Solar: Memorandum of Understanding, January 4, 2010
HVS-16	City Kingman Resolution No. 4631, September 8, 2009: A Resolution In Support of Green Energy
HVS-17	Mohave County Board of Supervisors resolutions, approved November 16, 2009; recorded November 18, 2009 Resolution No. 2009-274: Major Amendment to the Mohave County General Plan Resolution No. 2009-275: Hualapi Valley Solar Area Plan
HVS-18	Additional Correspondence (*see* list on page 2)
HVS-19	DVD with video: Hualapai Valley Solar Project
HVS-20	Arizona Department of Water Resources, November 9, 2007: Analysis of Adequate Water Supply
HVS-21	U.S. Dept. of Energy Report to Congress: Concentrating Solar Power Commercial Application Study: Reducing Water Consumption of Concentrating Solar Power Electricity Generation, 2007
HVS-22	Montgomery & Associates, Technical Memorandum: Addendum to Groundwater Flow Model for Hualapai Valley Solar Project, December 31, 2009
HVS-23	[Proposed] Certificate of Environmental Compatibility, January 4, 2010

Exhibit HVS-18: Additional Correspondence:

12/30/2009	David Jacobs, State Historic Preservation Office, to John Foreman, Chairman, Line Siting Committee
9/9/2009	Sandra Fabritz (email), ADWR, to Chris Stephens, HVS
9/8/2009	Barry Broome, Greater Phoenix Economic Council, to Mohave County Planning & Zoning
9/8/2009	Brown Drilling to Mohave County Planning & Zoning
9/8/2009	John Salem, Mayor of Kingman, to Greg Bartlett, HVS
9/8/2009	Timothy J. Troy, CB&I, to Mohave County Planning & Zoning
9/8/2009	G. Ira Wallace, Stanley Consulting, to Mohave County Planning & Zoning
9/8/2009	Ryan Weed, Coe & Van Loo Consultants, to Mohave County Planning & Zoning
9/7/2009	Sandra Port, SB Port Investments, to Nick Hont, Mohave County Development Services/ ohave County Planning & Zoning
9/7/2009	Philip G. Wisely, Wisely Engineering, to Mohave County Planning & Zoning
9/4/2009	David E. Hollingsworth, Hollingsworth Properties, to HVS
9/4/2009	Gary D. Lott, Prudential Northern Arizona Real Estate, to Mohave County Development Services/Mohave County Planning & Zoning
9/3/2009	David M. Martin, Arizona Chapter, Associate General Contractors, to Mohave County Planning & Zoning
9/3/2009	Greg Bishop, Bullhead City/Mohave Valley Association of Realtors, to Greg Bartlett, HVS
9/3/2009	Michael Chasse, Strategic Assets Group, to Mohave County Planning & Zoning
9/3/2009	Betty Moir, Keller Williams Realty, to Mohave County Planning & Zoning
9/3/2009	Richard Zepeda, Presidio Pointe Group, to Mohave County Planning & Zoning
8/31/2009	Rick Neal, Sun West Biofuels, to Nicholas S. Hont, Mohave County Development Services/Mohave County Planning & Zoning
8/2/2009	John Salem, Mayor of Kingman, to Stephen Chu, U.S. Dept. of Energy

EXHIBIT HVS-1

HVS-1

Hualapai Valley Solar
Application for CEC

In separate binder
Docketed November 23, 2009

EXHIBIT HVS-2

LEWIS AND ROCA LLP LAWYERS

ORIGINAL

BEFORE THE ARIZONA POWER PLANT AND TRANSMISSION LINE SITING COMMITTEE

IN THE MATTER OF THE APPLICATION OF HUALAPAI VALLEY SOLAR LLC, IN CONFORMANCE WITH THE REQUIREMENTS OF ARIZONA REVISED STATUTES §§ 40-360.03 AND 40-360.06, FOR A CERTIFICATE OF ENVIRONMENTAL COMPATIBILITY AUTHORIZING CONSTRUCTION OF THE HVS PROJECT, A 360 MW PARABOLIC TROUGH CONCENTRATING SOLAR THERMAL GENERATING FACILITY AND AN ASSOCIATED GEN-TIE LINE INTERCONNECTING THE GENERATING FACILITY TO THE EXISTING MEAD-PHOENIX 500kV TRANSMISSION LINE OR THE MOENKOPI-EL DORADO 500kV TRANSMISSION LINE.	Docket No. L-00000NN-09-0541-00151 Case No. 151 APPLICANT'S NOTICE OF FILING AFFIDAVITS OF PUBLICATION

NOTICE OF FILING AFFIDAVITS OF PUBLICATION

Hualapai Valley Solar LLC ("Applicant") submits the attached Affidavits of Publication of the Notice of Hearing in the above-captioned docket. The Notice of Hearing was published in the following newspapers on the corresponding dates:

The Kingman Daily Miner	December 1, 2009
The Standard	December 2, 2009

RESPECTFULLY submitted this 30th day of December, 2009.

LEWIS AND ROCA LLP

Tom Campbell

Thomas H. Campbell
Albert H. Acken
40 N. Central Avenue
Phoenix, Arizona 85007
Attorneys for Hualapai Valley Solar LLC

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2009 DEC 30 P 4: 29

AZ CORP COMMISSION
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Arizona Corporation Commission
DOCKETED

DEC 30 2009

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2132285.1

LEWIS AND ROCA LLP
LAWYERS

ORIGINAL and twenty-five (25) copies of the foregoing filed this 30th day of December, 2009, with:

The Arizona Corporation Commission
Utilities Division – Docket Control
1200 W. Washington Street
Phoenix, Arizona 85007

COPY of the foregoing mailed and served electronically this 30th day of December, 2009, to:

John Foreman, Chairman
Arizona Power Plant and Transmission Line Siting Committee
Office of the Attorney General
PAD/CPA
1275 W. Washington Street
Phoenix, Arizona 85007

Janice Alward, Chief Counsel
Arizona Corporation Commission
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Susan A. Moore-Bayer
7656 West Abrigo Drive
Golden Valley, Arizona 86413

Denise Herring-Bensusan
4811 E. Calle Bill
Kingman, Arizona 86409

Israel G. Torres, Managing Partner
Torres Consulting and Law Group LLC
209 E. Baseline Road
Suite E-102
Tempe, Arizona 85283

Betty J. Griffin

AFFIDAVIT OF PUBLICATION

Kingman Daily Miner

3015 Stockton Hill Road, Kingman, AZ 86401
web: www.kingmandailyminer.com • e-mail: legals@kingmandailyminer.com
Phone (928) 753-6397, ext. 242 • Fax (928) 753-5661
"Serving Kingman since 1882"

STATE OF ARIZONA)
County of Mohave) ss.

I, **Melinda Mauser**, being first duly sworn on her oath says:
That she is the Legals Clerk of THE KINGMAN DAILY MINER
An Arizona corporation, which owns and publishes the Miner,
a Daily Newspaper published in the City of Kingman, County of Mohave,
Arizona, that the notice attached hereto, namely,

Notice of Hearing
K0044357

Has, to the personal knowledge of affiant, **1st** day of **December, 2009**
to the **1st** day of **December, 2009** inclusive without change, interruption
or omission, amounting in **1** insertions, made of the following dates;
12/1/2009

By: ______________________
Legal Clerk, **2nd** Day of **December, 2009**

State of Arizona

County of Mohave

On this 2 day of December, 2009

Legal Clerk, whom I know personally to be
the person who signed the above document
and she proved she signed it.

____
Notary Public
My Commission Expires August 9, 2011

BEFORE THE ARIZONA POWER PLANT AND TRANSMISSION LINE SITING COMMITTEE

IN THE MATTER OF THE APPLICATION OF HUALAPAI VALLEY SOLAR LLC, IN CONFORMANCE WITH THE REQUIREMENTS OF ARIZONA REVISED STATUTES §§ 40-360.03 AND 40-360.06, FOR A CERTIFICATE OF ENVIRONMENTAL COMPATIBILITY AUTHORIZING CONSTRUCTION OF THE HVS PROJECT, A 340 MW PARABOLIC TROUGH CONCENTRATING SOLAR THERMAL GENERATING FACILITY AND AN ASSOCIATED GEN-TIE LINE INTERCONNECTING THE GENERATING FACILITY TO THE EXISTING MEAD-PHOENIX 500kV TRANSMISSION LINE, THE MEAD-LIBERTY 345kV TRANSMISSION LINE OR THE MOENKOPI-EL DORADO 500kV TRANSMISSION LINE.

Docket No.: L-00000NN-09-0541-00151

Case No. 151

NOTICE OF HEARING

A PUBLIC HEARING WILL BE HELD before the Arizona Power Plant and Transmission Line Siting Committee (Committee) regarding the Application of Hualapai Valley Solar, LLC (Applicant) for a Certificate of Environmental Compatibility to authorize construction of a 340 MW parabolic trough concentrating solar power generating facility (CSP) and an associated Gen-Tie line interconnecting the generating facility to the existing Mead-Phoenix 500kV transmission line, the Mead-Liberty 345kV transmission line, or the Moenkopi-El Dorado 500kV transmission line (collectively, the Project).

The hearing will be held at the Hampton Inn and Suites Kingman, located at 1791 Sycamore Avenue, Kingman, Mohave County, Arizona, 86409, telephone: (928) 692-0258. The hearing shall begin on Tuesday, January 12, 2010, at 9:30 a.m. and continue on Wednesday, January 13, 2010, at 9:30 a.m., and, if necessary, Thursday, January 14, 2010, at 9:30 a.m. The hearing will adjourn at approximately 5:00 p.m. on each day. Additional hearings, if necessary, will be noticed on the Project and Arizona Corporation Commission (ACC) websites.
The website for the Hualapai Valley Solar Project is: www.hualapaivalleysolar.com.
The website for the ACC is: www.azcc.gov/AZ_Power_Plant/LineSiting-Calendar.asp.

PUBLIC COMMENT MAY BE TAKEN AT THE BEGINNING OF EACH HEARING DAY OR AT OTHER TIMES DURING THE HEARING AT THE DISCRETION OF THE CHAIRMAN OF THE COMMITTEE. PUBLIC COMMENT ALSO WILL BE TAKEN IN A SPECIAL EVENING SESSION ON TUESDAY, JANUARY 12, 2010, BEGINNING AT 6:00 P.M., AT THE HAMPTON INN AND SUITES KINGMAN, LOCATED AT 1791 SYCAMORE AVENUE, KINGMAN, ARIZONA, 86409.

The Committee, at its discretion, may conduct a tour of the Project site. If so, the tour will depart from the Hampton Inn parking lot at 8:00 a.m. on Wednesday, January 13, 2010. A map and itinerary for the proposed tour will be available at the hearing and at the Hampton Inn parking lot at the time of commencement of the tour, if conducted. Members of the public may follow the Committee on the tour in their own private vehicles. During the tour the Committee may hear brief testimony at stops on the tour from one or more witnesses concerning where the stops are located, what is visible at the stops, and the relevance of the location and view to the facilities in the Application. No other discussion or deliberation concerning the Application will occur during the tour. A court reporter or recording device will record any testimony taken on the tour for transcription.

The Committee may, at its discretion, recess the hearing to a time and place to be announced during the hearing, or to be determined after the recess. The date, time and place at which the hearing will be resumed will be posted on the Project and ACC websites. **NOTE: NOTICE OF SUCH RESUMED HEARING WILL BE GIVEN; HOWEVER, PUBLISHED NOTICE OF SUCH RESUMED HEARING IS NOT REQUIRED.**

The Project is located in Mohave County, approximately 27 miles north of Kingman, Arizona, and 80 miles southeast of Las Vegas, Nevada. The 340 megawatt CSP generating facility is located entirely on private land in Sections 19, 20, 21, 28, 29, 30, and the north half of Section 31 all within Township 26 North, Range 16 West, Gila and Salt River Baseline and Meridian.

The application seeks approval of two transmission line interconnections:

Interconnection #1 Gen-Tie alignment, located entirely in Township 26 North, Range 16 West, runs from the generating facility's power block to the property boundary; then north for 1.25 miles within a 1320-foot wide corridor from the property boundary along the east boundary of Section 17 (private property) and Section 08 (BLM land); then north for 1.25 miles within a 1320-foot wide corridor along the west boundary of Section 16 (BLM land) and Section 09 (private property) until it reaches the north boundary of Section 09; then east for about 0.75 miles within a 1320-foot wide corridor along the north boundary of Section 09 (private property) until it reaches the termination in the northeast corner of Section 09 (private property). Interconnection #1 is approximately 2.75 miles in length from the generating facility property boundary and has a total ROW acreage of approximately 70 acres.

Interconnection #2 Gen-Tie alignment runs from the generating facility's power block to the property boundary; then north for 1.25 miles within a 1320-foot wide corridor from the property boundary along the east boundary of Section 17 (private property) and Section 08 (BLM land); then north for 1.25 miles within a 1320-foot wide corridor along the west boundary of Section 16 (BLM land) and Section 09 (private property) until it reaches the north boundary of Section 09; then north for one mile within a 1320-foot wide corridor through Section 04 until it reaches the west boundary of the existing Mead-Liberty 345kV transmission line corridor, which it will parallel on a generally northwest heading; from there it will run within a 2640-foot wide corridor measured from the centerline of the Mead-Liberty 345kV transmission line west of and parallel to the existing transmission line for approximately 3.5 miles, going through the northeast corner of Section 05 in Township 26 North, Range 16 West (BLM land); through Sections 32, 31, and 30 in Township 27 North, Range 16 West (BLM land); through Sections 25 (private property) and 24 (BLM land) in Township 27 North, Range 17 West; and terminate in Section 23 (private property) in Township 27 North, Range 17 West. Interconnection #2 is approximately 6.5 miles in length from the property boundary and has a total ROW acreage of approximately 160 acres.

As an alternative, the Applicant may build a 500 MW photo-voltaic (PV) generating facility. The Interconnection Gen-Tie alternatives will be the same for the PV project as for the CSP project.

Maps of the Project site and detailed information about project facilities and technology are contained in the Application, which is available for inspection at the fol lowing locations:

- Docket Control Center of the ACC Phoenix Office at 1200 West Washington Street, Suite 108, Phoenix, Arizona 85007;
- Mohave County Library - Kingman, 3269 N. Burbank Street, Kingman, Arizona 86402; 928-692-2665; and
- Lewis and Roca LLP, 40 N. Central Avenue, Suite 1900, Phoenix, Arizona 85004.

Each county and municipal government and state agency interested in the proposed Project and desiring to be a party to the proceedings shall, not less than ten days before the date set for hearing, file with the Director of Utilities, Arizona Corporation Commission, 1200 West Washington Street, Phoenix, Arizona 85007, notice of intent to be a party.

Any domestic non-profit corporation or association formed in whole or in part to promote conservation of natural beauty, to protect the environment, personal heal or other biological values, to preserve historical sites, to promote consumer interests, to represent commercial and industrial groups, or to promote the orderly development of the area in which the Project is to be located and desiring to become a party to the proceedings shall, not less than ten days before the date set fo hearing, file with the Director of Utilities, Arizona Corporation Commission, 1200 West Washington Street, Phoenix, Arizona 85007 a notice of intent to be a part

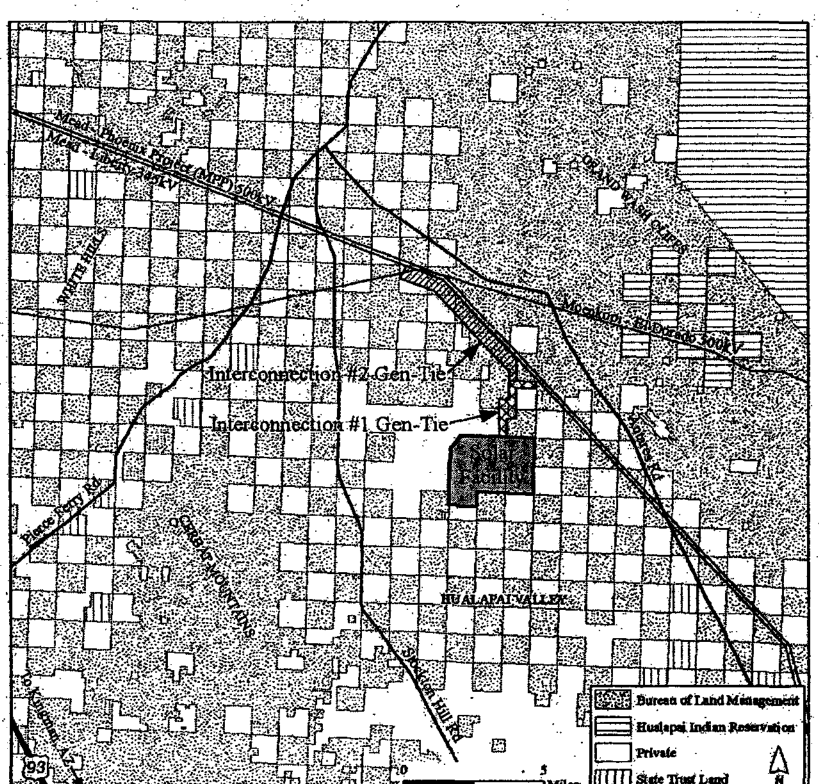
The Committee or its Chairman, at any time deemed appropriate, may make other persons parties to the proceeding.

Any person may make a limited appearance at a hearing by filing a statement in writing with Docket Control of the Arizona Corporation Commission, 1200 West Washington Street, Phoenix, Arizona 85007, and the Chairman of the Committee at 1275 West Washington Street, Phoenix, Arizona 85007, not less than five days before the date set for hearing. A person making a limited appearance shall not be a party or have the right to present testimony or cross-examine witnesses

This proceeding is governed by Arizona Revised Statutes Sections 40-360 to 40-360.13 and Arizona Administrative Code R14-3-201 to R14-3-220. No substantive communication not in the public record may be made to any member of the Committee. The written decision of the Committee will be submitted to th Arizona Corporation Commission pursuant to Arizona Revised Statutes Section 40-360.07. Any person intending to be a party to the proceedings on these mat ters before the Arizona Corporation Commission must be a party to the proceedings before the Committee.

ORDERED this 24th day of November, 2009.

/ s /_ John Foreman______________
John Foreman, CHAIRMAN
ARIZONA POWER PLANT AND TRANSMISSION
LINE SITING COMMITTEE
ASSISTANT ATTORNEY GENERAL



AFFIDAVIT OF PUBLICATION

MOHAVE COUNTY NEWSPAPERS
THE STANDARD
221 E. Beale St. Kingman, AZ 86401
Phone: (928) 753-1143 Fax: (928) 753-1312

STATE OF ARIZONA
COUNTY OF MOHAVE

I, Billie Jo Perkins, am authorized by the publisher as agent to make this affidavit of publication. Under oath, I state that the following is true and correct.

The Standard is a newspaper which is published weekly, is of general circulation, and is in compliance with Arizona Revised Statutes 10-140.34 & 39-201.A & B.

The notice will be/has been published 1 consecutive times in the newspaper listed above.

ORIGINAL

DATES OF PUBLICATION:
1) 12/2/09
2) ______
3) ______
4) ______

TYPE OF DOCUMENT: Notice of Hearing
Example: Merger between parties; name change from/to; foreign authority with a fictitious name; articles of incorporation; application for authority; articles of organization; amendment; etc.

NAME/ ACTION(FILE #): Hualapai Valley Solar

AUTHORIZED SIGNATURE:
Billie Jo Perkins
Billie Jo Perkins

SUBSCRIBED AND SWORN TO BEFORE ME ON THE 2nd DAY OF December, 2009.

NOTARY SIGNATURE: Pamela S Wanner

"OFFICIAL SEAL"
Pamela S. Wanner
Notary Public-Arizona
Mohave County
My Commission Expires 5/17/2010

NOV., 2009, BY VERA WRIGHT PEM

BEFORE THE ARIZONA POWER PLANT AND TRANSMISSION LINE SITING COMMITTEE

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ORDERED this 24th day of November, 2009.

/ s / John Foreman
John Foreman, CHAIRMAN
ARIZONA POWER PLANT AND
TRANSMISSION
LINE SITING COMMITTEE
ASSISTANT ATTORNEY GENERAL

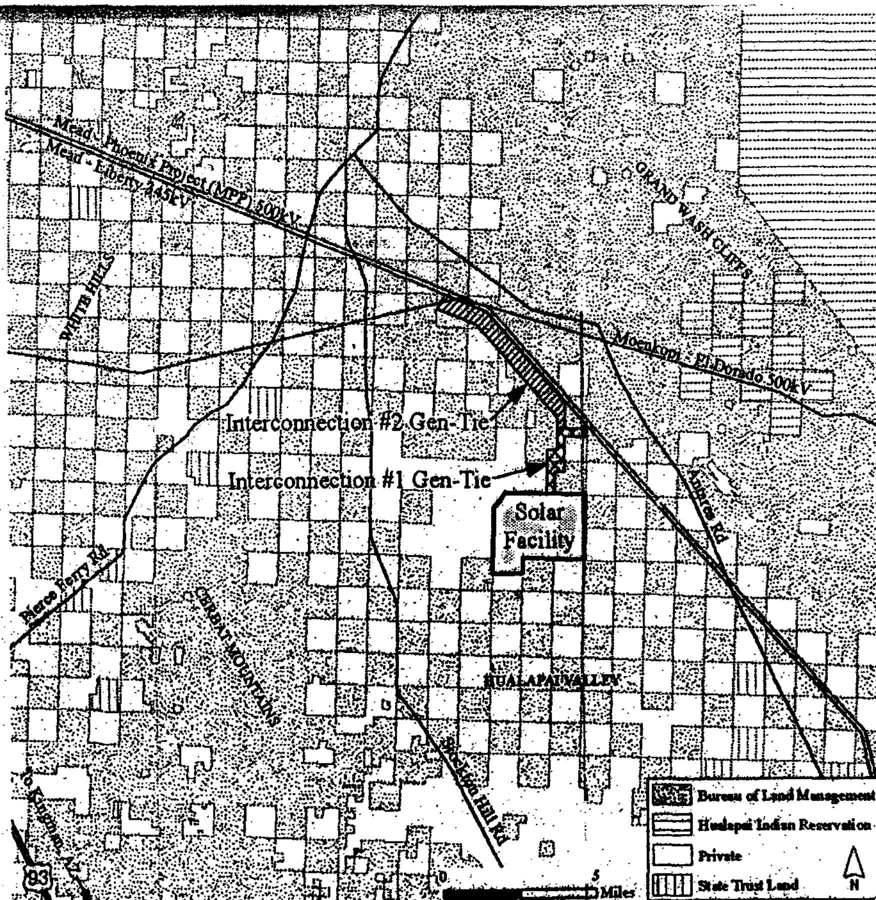
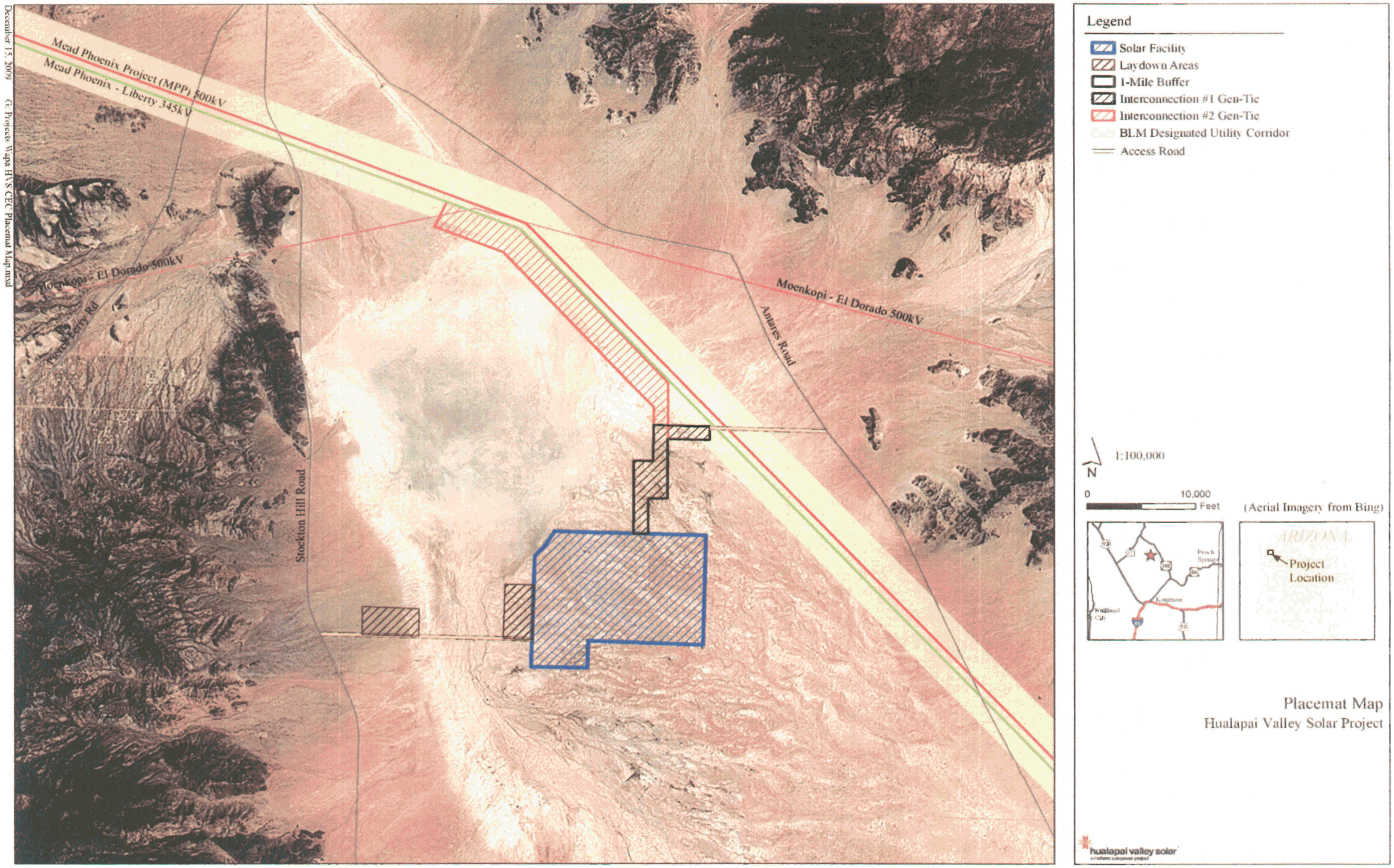


EXHIBIT HVS-3



December 15, 2009 G: Projects Wapa HVS CEC Placemat Map.mxd


Exhibit G-3
Solar Plant Rendering
Hualapai Valley Solar Project
hualapai valley solar
a mohave sun power project

EXHIBIT HVS-4

BEFORE THE ARIZONA POWER PLANT AND TRANSMISSION LINE SITING COMMITTEE

IN THE MATTER OF THE APPLICATION OF HUALAPAI VALLEY SOLAR LLC, IN CONFORMANCE WITH THE REQUIREMENTS OF ARIZONA REVISED STATUTES §§ 40-360.03 AND 40-360.06, FOR A CERTIFICATE OF ENVIRONMENTAL COMPATIBILITY AUTHORIZING CONSTRUCTION OF THE HVS PROJECT, A 340 MW PARABOLIC TROUGH CONCENTRATING SOLAR THERMAL GENERATING FACILITY AND AN ASSOCIATED GEN-TIE LINE INTERCONNECTING THE GENERATING FACILITY TO THE EXISTING MEAD-PHOENIX 500kV TRANSMISSION LINE, THE MEAD-LIBERTY 345kV TRANSMISSION LINE OR THE MOENKOPI-EL DORADO 500kV TRANSMISSION LINE.	Docket No. L-00000NN-09-0541-00151 Case No. 151 DIRECT TESTIMONY OF GREG BARTLETT

PREFILED DIRECT TESTIMONY OF GREG BARTLETT

Question 1. State your name and business address.

Answer 1. My name is Greg Bartlett and my business address is 85 Hamilton Street, Cambridge, Massachusetts 02139.

Question 2. What is your job title and what are your job responsibilities with respect to the Hualapai Valley Solar Project?

Answer 2. I am the Project Director for Hualapai Valley Solar LLC (HVS). As Project Director, I am responsible for all site-specific aspects of the Hualapai Valley Solar Project (Project) including land acquisition and preparation, public outreach, environmental and land use permitting, interconnection and transmission, strategic planning, and overall management of outside professional services.

I work closely with our Executive Director and Finance Director to prepare Power Purchase Agreement (PPA) bids; review bids from Engineering, Procurement & Construction (EPC) contractors; and secure project financing.

I am also a Managing Director and co-founder of Mohave Sun Power LLC, the parent company of Hualapai Valley Solar LLC.

Question 3. Describe your educational and professional background and experience.

Answer 3. I have Bachelor of Science and Master of Science degrees in Electrical Engineering & Computer Science from Massachusetts Institute of Technology (M.I.T.). I have more than 25 years of experience in power plant and renewable energy development. For most of my career, I have provided business development, site selection, strategic planning, fundraising, and technical services to many companies in, including:

- Mitex Inc. (Boston) – provided site selection and permitting services for small-scale hydroelectric projects.
- Sithe Energies (New York) – consulted on large-scale hydroelectric and other energy projects throughout Asia and North America.
- Global Alumina Corporation (Guinea) – provided strategic research and developed an electronic document management system for an eco-friendly bauxite mine and alumina refinery project in West Africa.
- Solar Energy Systems (New York) – led the effort to transition a large commercial photovoltaic (PV) installer company to a national PPA provider of solar electricity.
- Ecodynamics LLC (Colorado) – developed investment and planning documents for a biomass pellet furnace manufacturing company and pellet distribution network.
- True Energy LLC (San Diego) – developed a business model and investment documents to commercialize a patented portfolio of waste heat conversion technologies and apply them to solar, geothermal and cogeneration projects.
- Evaporcool LLC (Memphis) – developed a licensing model and business plan for a patented evaporative cooling retrofit for existing commercial HVAC systems.

In addition, I am a Hughes Scholar, published writer, and founder of three electronics companies. I have written business plans for more than 25 companies, created innovative licensing and royalty-based business models, established global brands, implemented strategic industry partnerships, recruited key executives, written all forms of business and technical documents, and spoken at numerous conferences.

Question 4. What is the purpose of your testimony?

Answer 4. I am going to introduce our company and Project, as well as our development team, engineering firm and key suppliers. I also will:

- review the Project site and the reasons why we feel it is an ideal utility-scale solar site.
- discuss the technology we have selected, our interconnection and transmission plans, and some of the market forces behind these decisions.
- introduce our plan to re-use wastewater to cool our solar thermal power plant, and report on the status of negotiations with the City of Kingman for purchasing the effluent.
- discuss the need for the Hualapai Valley Solar power plant, and provide a summary of the economic benefits to the state of Arizona and Mohave County.
- summarize the status of our negotiations for a PPA and review public reaction to the Project.

Question 5. What other witnesses will testify for the applicant and on what topics will they testify?

Answer 5. The other witnesses:

- Mike LaRow, our Environmental Director, will testify on permitting, engineering and technology topics.
- Bill Victor of Montgomery & Associates, our Hydrogeologist, will testify on our use of groundwater and related topics, including a review of multiple studies of the Hualapai Aquifer and the impact of our Project on that aquifer.
- Mike Warner of Transcon, our primary Environmental Consultant, will testify on environmental topics, presenting our baseline studies on air quality, biology, cultural resources, and visual resources.
- Kenda Pollio of KP Environmental, our Public Participation and Land Use Consultant, will testify on our public outreach efforts, as well as land use, recreation and noise impact topics.

Question 6. Provide background on the applicant.

Answer 6. Hualapai Valley Solar LLC (HVS) is a single-purpose company that owns and operates the Hualapai Valley Solar Project (HVS Project). Mohave Sun Power LLC is a solar power plant development company and the parent company of HVS. Beside myself, the principals of both companies are:

- **Mitchell Dong – Executive Director**

Mr. Dong is a developer and private investor, working in alternative energy and environmental industries since 1972. He has a B.A. in Economics from Harvard University.

Mr. Dong has developed 7 companies in the alternative energy space over the last 35 years, including Energy Investment Inc. (energy conservation for building owners and demand side management programs for electric utilities); Mitex Inc. (developer of hydroelectric facilities); Tellus Inc. (developer of cogeneration plants); FulCircleRecyclers Inc. (an EPA-permitted facility under the Toxic Substances Control Act that disposed of PCB-contaminated ballasts for electric utility lighting programs); Solios Asset Management LLC (manager of the Solios Energy Fund that trades electricity and the Solios Uranium Fund that invests in physical uranium); and Pythagoras Investment Management LLC (investor in energy, natural resources and environmental sectors).

- **Mike LaRow – Environmental Director**

Mr. LaRow has more than 25 years of experience managing renewable energy and other major development projects. He holds B.S. and M.S. degrees in Electrical Engineering and Computer Science from Massachusetts Institute of Technology (M.I.T.).

Mr. LaRow has provided environmental and project management services for major development projects in North America and overseas, including Mitex Inc. and Sithe Energies (managed the development of hydroelectric projects in Ohio, West Virginia, Pennsylvania, Virginia, Alabama, and Colorado, as well as utility interconnections and transmission lines for cogeneration projects in New York); San Roque Power Corporation (project manager for environmental and social aspects of the 350 MW San Roque Hydroelectric Project on Luzon Island in the Philippines); Global Alumina Corporation (project manager for environmental and social aspects of an integrated alumina refinery project consisting of a bauxite mine, alumina refinery, coal-fired power plant and port facility); and Sithe Global BioFuels (environmental project manager for oil palm plantation and mill projects in several West African countries).

- **Robert Marsh – Finance Director**

Mr. Marsh has more than 10 years of experience in investment management and energy markets. He has a B.S. in Computer Engineering and Sciences from Massachusetts Institute of Technology (M.I.T.).

Mr. Marsh has been involved in financial modeling, fund raising, structuring and management for many successful businesses, including: Galatea Associates LLC (developed settlement and related backend infrastructure systems for major investment banks including Morgan Stanley and State Street Bank); Pythagoras Investment Management LLC (managed public and private investments in energy and natural resources sectors); Solios Asset Management LLC (launched and eventually managed a portfolio of investment funds focused on energy market strategies, including electricity trading and physical uranium).

Mr. Marsh also has worked with the Federal Energy Regulatory Commission (FERC) and multiple Regional Transmission Organizations (RTOs) to establish power-marketing authority for the purpose of trading electricity.

Question 7. Please describe the principals' experience in developing power plants.

Answer 7. Power plants developed or owned by the principals of Hualapai Valley Solar include:

- Allegheny Lock & Dams 5 & 6
  - Two 15 MW facilities (30 MW total)
  - Allegheny River, Pennsylvania
  - Operating since 1988.
- Onondaga Cogeneration
  - 80 MW plant
  - Near Syracuse, New York
  - Power sales to Niagara Mohawk
  - Gas supply by Enron
  - Chas T Main, EPC contractor
  - Operating since 1993.
- Zeng Cheng Power Station
  - 88 MW HFO (heavy fuel oil) plant
  - Near Guangzhou, China

In addition, the principals of Hualapai Valley Solar have renovated existing hydroelectric power plants that were not operational, including:

- Columbia Mills
  - Near Buena Vista, Virginia
  - New bulb unit, French-made
  - 300 KW to Virginia Power
  - Operating since 1984.

- South Hill
  - Near South Hill, Virginia
  - Rehabilitation of 75-year-old turbines
  - 165 KW to Virginia Power
  - Operating since 1983.
- Bridgewater
  - Near Bridgewater, Virginia
  - Rehabilitation of 75-year-old turbines
  - 100 KW to Virginia Power
  - Operating since 1983.

Question 8. Please describe the Principals' experience in negotiating Power Purchase Agreements.

Answer 8. Principals of Hualapai Valley Solar have successfully negotiated approximately 500 MW in Power Purchase Agreements with:

- Consolidated Edison of New York
- Niagara Mohawk Power Corporation
- Central Hudson Electric and Gas
- Long Island Lighting Company
- Virginia Power.

Question 9. Do you have any other comments relevant to the Applicant's experience in the energy industry?

Answer 9. Yes, I do. For the Hualapai Valley Solar Project, HVS has assembled a team of the best engineers and suppliers in the world. All of them have substantial global utility-scale solar experience:

- Fichtner Solar – Applicant's engineering firm.

  Fichtner Solar has served in some capacity on more than half of the concentrating solar thermal (CSP) power plants in the world today, including 5 solar trough projects currently under construction:
  - Andasol 1, 2, 3 (Spain) – each is 50 MW trough with molten salt storage
  - Kuraymat (Egypt) – 150 MW Integrated Solar Combined Cycle (ISCC) with a 20 MW solar portion
  - Ani Beni Mathar (Morocco) – 470 MW ISCC with a 20 MW solar portion.

Key suppliers

In addition, HVS has long-standing relationships (*i.e.*, due diligence has been conducted by both parties, pricing proposals have been received, delivery schedules have been reviewed, etc.) with world-class suppliers, each with extensive experience in providing components for CSP power plants, including:

- Siemens Solel, Schott – collector tubes
- Flabeg, Rioglass Solar – parabolic mirrors
- SQM, Haifa, BASF – nitrate salts
- Durferrit – salt melting services

- Dow Chemical, Solutia – heat transfer fluid
- GE, Siemens, Alstom, Mitsubishi, Hitachi – steam turbine generator
- Kaiser, SAPA, Hydro Aluminum – collector frames.

Question 10. Describe the Project.

Answer 10. Hualapai Valley Solar LLC is developing the Hualapai Valley Solar Project in Mohave County, approximately 27 miles north of Kingman, Arizona, and 80 miles southeast of Las Vegas, Nevada.

Our Application seeks a Certificate of Environmental Compatibility (CEC) allowing the construction of a 340 MW concentrating solar power generating facility and two transmission line interconnections. The Project will require about 4,233 acres of land.

The Project will use proven parabolic trough solar thermal and molten salt-based thermal energy storage technology to produce electrical power using a steam turbine generator; utilities have the most experience with steam turbines. Steam to drive the steam turbine generator will be supplied from a solar steam generator. The solar steam generator receives heated heat transfer fluid from solar thermal equipment comprised of arrays of parabolic mirrors that collect energy from the sun.

The Project is designed to produce 340 MW using a single steam turbine. If project financing and Power Purchase Agreements dictate otherwise, HVS may develop the Project in two approximately 170 MW phases using two turbines. And, depending on the final design and EPC (Engineering, Procurement and Construction) contract, the Project may also use multiple turbines built in a single phase.

The Project's solar field covers more than 3,000 acres, with solar collectors mostly comprised of recyclable steel/aluminum and glass with concrete foundations.

Depending on the requirements of the power purchaser, HVS may build all or part of the Project using PV technology, utilizing the same interconnections. The PV technology would utilize crystalline silicon or thin film PV panels on single-axis trackers or fixed tilt supports.

Question 11. Please explain why HVS selected this Project site.

Answer 11. The Hualapai Valley Solar site has many characteristics that make it ideal for a utility-scale solar project:

- Incoming solar radiation (direct normal insolation or DNI) is among the highest in the world
- Elevation
- Located on remote private land with sparse vegetation
- Minimal slope with no shading effects
- Adequate water availability
- Close proximity to transmission lines minimizes the length of the required Gen-Tie – less than 3 miles from interconnection point
- Available transmission capacity in two directions – north and south
- No transmission system upgrades are required

- Proximity to roads and transportation corridors
- No state land and limited federal land required for right-of-way for roads and Gen-Tie
- Far from residential areas – nearest residence is approximately 2.5 miles away
- No active residential developments in vicinity
- Mohave County population base is of sufficient size to attract construction personnel
- Proximity to major electricity load centers and large population areas
- Good environmental characteristics:
    - No washes, FEMA floodplains or wetlands on the property
    - No particulates from autos/highways in proximity
    - No roads on the property that need to be moved
    - No desert tortoise or protected species to mitigate
    - Low impact on visual resources from paved roads and residential communities
    - No critical habitat, protected wilderness areas, or Wildlife Management Areas
    - No Areas of Critical Environmental Concern
    - No proposed national monument areas
    - No military bases in area
    - No non-attainment areas for air quality
    - Stable soils with low seismic risk.

Question 12. Please describe the Project's water usage and sources.

Answer 12. HVS anticipates that the Project will require approximately 2,400 acre-feet per year (AF/Y) on average, with approximately 2,200 AF/Y required for cooling and boiler blowdown, 130 AF/Y for mirror washing, and the remainder for potable water, steam makeup, and general use.

The anticipated use of 2,400 AF/Y is based on the current design optimization of the Project. Design and operational modifications that would not change the total installed capacity (but could increase total generation and/or shift generation to on-peak hours) could result in the consumption of a high average of 3,000 AF/Y. The decision for such an increase would be based on requirements of the power purchaser. Therefore, HVS has conducted all analyses of water usage using the highest possible estimate of 3,000 AF/Y.

HVS intends to re-use wastewater for a majority of the Project's water needs. The treated wastewater, or effluent, would be purchased from the City of Kingman and supplied by the City's new Hilltop wastewater treatment plant (WWTP) located approximately 25 miles south of the Project. Today, at the existing Hilltop WWTP, virtually all of the treated wastewater is evaporated. According to the Kingman City Manager, if HVS does not purchase the treated wastewater from the new WWTP, this evaporation process will most likely continue, as there are currently no other large industrial purchasers.

In addition to purchasing the effluent from the City of Kingman, HVS would pay for and install a pipeline from the WWTP to the Project site. Depending on the route selected, HVS estimates that the effluent pipeline would be 25 to 35 miles long. The effluent pipeline would be located in easements negotiated with the landowners and/or with the County.

In order to be competitive with other renewable energy projects bidding for the same Power Purchase Agreements, HVS has designed a state-of-the-art evaporative cooling system that re-uses wastewater and other water as much as possible.

The Project is expected to have four on-site wells to provide potable water and possibly mirror washing water. These wells will be sized such that three of them can provide for the entire Project's water needs in the event that the supply of effluent is interrupted or otherwise becomes unavailable.

If only the on-site groundwater wells are used, as Mr. Bill Victor explains in his testimony, the Project would still comply with ADWR requirements for adjacent well drawdown for an Active Management Area (AMA). You will note that Mr. Victor's analysis was conducted with the highest average water usage of 3,000 AF/Y.

Question 13. Please describe in more detail the Project's opportunity for using effluent.

Answer 13. HVS intends to re-use wastewater for a majority of the Project's water needs. The City of Kingman is constructing a new wastewater treatment plant on the site of the existing Hilltop WWTP, and HVS intends to purchase the treated wastewater, or effluent, from the City of Kingman.

The basic outline of the effluent agreement was first set forth in a non-binding Letter of Intent signed by Hualapai Valley Solar and the City of Kingman in June 2009. The Letter of Intent was approved unanimously by the Kingman City Council prior to being signed by the Mayor of Kingman, John Salem. This letter has been marked as Exhibit HVS-14.

Since that time, the City of Kingman has been developing policy and pricing guidelines for selling treated wastewater; these guidelines are a prerequisite to a definitive contract with HVS. In addition, HVS has worked closely with the City for many months to begin formulating a definitive contract, most likely a Development Agreement, for the purchase of the effluent.

HVS and the City of Kingman negotiated a binding Memorandum of Understanding (MOU), binding the City and HVS to negotiate the definitive contract in good faith. This binding MOU was executed by both parties on January 4, 2010. It has been marked as Exhibit HVS-15.

If both plants were online today, the City's good faith estimate (based on the output of the existing Hilltop WWTP) is that it could provide 1,700 AF/Y of effluent, which would reduce HVS' groundwater cooling use to 500 AF/Y. This is less water than is used by either of the two golf courses in the Kingman area.

The new Hilltop WWTP's state-of-the-art facility is designed to expand to 5,000 AF/Y of effluent output. Growth may come from population growth, North Kingman homes converting from septic tanks, and/or re-routing wastewater from older WWTPs in Kingman.

With a nominal 5% annual growth in Hilltop WWTP output for its first 3 years of operation (2011-2013), the City could be providing nearly 90% of HVS' cooling water needs when the HVS Project begins operation at the end of 2013, and 100% of its cooling needs during its third year of operation.

Since the non-binding Letter of Intent was signed on June 26, 2009, HVS and the City of Kingman have completed the following to prepare for a definitive contract:

- HVS has confirmed that the WWTP effluent quality is acceptable for use in the plant.
- HVS is developing on-site storage requirements based on deliveries from the WWTP.
- HVS has identified two possible pipeline routes and has started to survey easements.
- HVS has received budgetary quotes on installing the pipeline.
- HVS is working with City engineers to evaluate the optimal mix of treatment at the WWTP vs. treatment at the Project site.
- The City completed a policy and pricing guideline (by Brown & Caldwell). The Kingman Municipal Utilities Commission approved the guideline by a unanimous 6-0 vote in December 2009. Currently the policy and pricing guideline is before the City Council.

- A binding MOU was negotiated, reviewed by City Council in a December 2009 executive session, and approved by City Council on January 4, 2010.

Question 14. What is the Project's schedule?

Answer 14. The key Project milestones are:

- General Plan Amendment and Area Plan approved 8-0 by Mohave County Planning & Zoning Commission, September 2009
- General Plan Amendment and Area Plan approved 3-0 by Mohave County Board of Supervisors, November 2009
- Construction, begins late 2010
- Operation, expected 2013.

Question 15. What will the Project cost?

Answer 15. The cost of the Project is estimated to be $2.0-2.2 billion. The cost includes the solar collectors, steam turbine generator, transformers, water, effluent pipeline, Gen-Tie interconnection facilities, and all ancillary balance of equipment, as well as all civil works, construction labor, construction materials, engineering, interest during construction, financing fees, utility deposits, insurance, and overhead.

Question 16. With whom will the Project interconnect?

Answer 16. A BLM Utility Corridor is located approximately 1.5 miles from the Project's boundary. Two EHV transmission systems operate in this Utility Corridor: Mead Phoenix Project 500 kV and Western Area Power Administration's Mead-Peacock-Liberty 345 kV. A third transmission system, Moenkopi-Eldorado 500 kV, crosses the Utility Corridor approximately 6.5 miles from the Project's boundary.

HVS expects to interconnect to the Mead Phoenix Project 500 kV transmission system. A new switchyard, currently being designed under contract by Western Area Power Administration (Western) on behalf of the Mead Phoenix Project, will be owned by the Mead Phoenix Project and operated by Western. Western is the Operating Manager for the Mead Phoenix Project at the Project's interconnection point.

In April 2009, the Mead Phoenix Project 500 kV system was upgraded from 1,200 MW to 1,900 MW of total transmission capacity, and has available capacity to transmit the power in two directions from the Project to potential delivery points in Arizona and other states in the region.

If Western upgrades its Mead-Peacock-Liberty 345 kV transmission system through its $3.2 billion funding authority provided by the Transmission Infrastructure Program, and if our power purchaser prefers it, HVS may ultimately interconnect to the Mead-Peacock-Liberty 345 kV transmission system. Similarly, if the power purchaser prefers delivery to the Eldorado substation or to the Four Corners region, HVS may interconnect to the Moenkopi-Eldorado 500 kV transmission system.

Question 17. Please describe the Project's two interconnection options.

Answer 17. The HVS Project has two interconnection options:

- Interconnection #1 – an approximately 3-mile long transmission line that will interconnect to either the existing Mead Phoenix Project 500 kV transmission line or the existing Mead-Peacock-Liberty 345 kV transmission line at a switchyard to be built by Western; or
- Interconnection #2 – an approximately 6.5-mile long transmission line that will interconnect to the existing Mead Phoenix Project 500 kV transmission line, the existing Mead-Peacock-Liberty 34 kV transmission line, or the existing Moenkopi-Eldorado 500 kV transmission line at a switchyard to be built by Western or APS.

In our Application, both of the interconnections are referred to as the Gen-Tie. Our environmental analyses apply to both interconnections. The electrical interconnection, either 500 kV or 345 kV, as required, is the same for both the CSP Project and the PV alternative.

Question 18. Why does HVS want two interconnection options?

Answer 18. HVS continues to move forward with Interconnection #1 as the expected interconnection and the Mead Phoenix Project 500 kV system as the expected transmission system. Federal funding authority (*i.e.*, loans guaranteed by Western through the Transmission Infrastructure Program) may become available soon for Interconnection #2 and/or interconnection to the Mead-Peacock-Liberty 345 kV transmission system. HVS' power purchaser may also prefer Interconnection #2 for the ability to connect to the Moenkopi-Eldorado 500 kV transmission system.

Question 19. To whom will the company sell power generated at this facility?

Answer 19. HVS does not know at this time, but will continue to respond to Requests for Proposals for Power Purchase Agreements from several utilities in Arizona and throughout the Southwest.

Question 20. Why does the company believe that this project is needed?

Answer 20. HVS believes there is a great need for the Project. The most important reasons are:

- Arizona's Renewable Portfolio Standard (RPS), which may be increased soon
- Other Southwest state RPS requirements, such as California and Nevada; California's RPS is expected to be increased soon
- The expected launch of a National Renewable Portfolio Standard (RPS)
- The population growth and electricity demand of states in the U.S. Southwest region; for example:
    - Between 2000-2008, the population of Arizona grew 27%, compared to the U.S. average of 8%
    - Between 2000-2039, the population of Arizona is expected to double
    - Between 2000-2007, Arizona's electricity consumption increased at 3 times the U.S. rate
    - By 2025, APS has estimated that the peak electricity demand in Arizona will be 60% higher than today's level

- A 2009 report by the U.S. National Renewable Energy Lab (NREL, part of the Department of Energy) highlights California's inability to meet its renewable energy needs from in-state projects
- Senator Dianne Feinstein's efforts to create a new national monument between the Mojave National Preserve and Joshua Tree National Park (off old Route 66 between Ludlow and Needles) has resulted in some developers dropping planned renewable energy projects in the vicinity
- In 2009, NV Energy stated it would not accept out-of-state renewable energy generator projects, but reconsidered; its 2009 RFP was changed to allow out-of-state bidders
- Arizona's reliance on coal power will continue to change dramatically as new EPA requirements are mandated at coal plants:
    - The 1,580 MW Mohave Generating Station closed, resulting in Southern California Edison losing 885 MW of generation, Salt River Project losing 316 MW, NV Energy losing 221 MW, and Los Angeles Department of Water and Power losing 158 MW.
    - EPA is currently proposing $1 billion in retrofits and upgrades to the 2,250 MW Navajo Generating Station on Hopi land; the plant is run by the Salt River Project, generating power for the Central Arizona Project (CAP). Governor Jan Brewer has said that the proposed retrofit of the plant, aimed at improving air quality and visibility, could affect the power source for CAP. If or when Navajo is closed, it will result in U.S. Bureau of Reclamation losing 546 MW of generation, Salt River Project losing 488 MW, Los Angeles Department of Water and Power losing 477 MW, Arizona Public

Service losing 315 MW, NV Energy losing 254 MW, and Tucson Electric Power losing 169 MW.

- Other coal plants supplying power to Arizona residents include the San Juan Generating Station (1,800 MW), and the 46-year-old Four Corners Generating Station (2,040 MW).
- A proposed new coal plant in the Four Corners vicinity, Desert Rock (1500 MW), recently had its air quality permit recalled. Desert Rock was to sell power to APS and SRP.

- If Mohave, Navajo, Four Corners and San Juan generating stations are not operating by 2030, by our calculations, Arizona utilities would lose a total of 2,912 MW (TEP 723 MW; APS 1,088 MW; SRP 1,101 MW). If Desert Rock is added to this list, the Southwest region would lose a total of 9,170 MW.

Furthermore, the Project will help to reduce greenhouse gas emissions and reduce our country's dependence on foreign oil.

Question 21. What are the Arizona benefits from this Project?

Answer 21.

Arizona Employment and Workforce Development

According to the U.S. Bureau of Labor Statistics, between July 2008 and July 2009 the Lake Havasu City-Kingman Metropolitan Statistical Area (MSA) lost a larger percentage of jobs than all other MSAs in the U.S., ranking #369 out of 369 MSAs.

HVS is committed to using qualified Arizona contractors, consultants and professional service firms, when available. For more than 12 months now, HVS has been actively recruiting and building a qualified database of local firms, suppliers, vendors, labor organizations and potential employees, and will award our EPC (Engineering, Procurement and Construction) contract based in part on the contractor's willingness to prioritize new hires and subcontracts from within Arizona. Once HVS awards the contract, we will be delivering this database, along with our recommendations, to our EPC contractor.

HVS is also actively involved in job training programs and workforce development in Mohave County and Arizona. During the development phase of the Project, HVS has devoted time and expense establishing relationships with local, regional and state workforce development and job training initiatives. This ongoing outreach includes:

- **Arizona Workforce Development / Local Workforce Investment Board (LWIB).** HVS has initiated discussions with the Mohave-La Paz Consortium office of the Local Workforce Investment Board (LWIB) and is evaluating the application process to be considered as an Eligible Training Provider.
- **Mo-Paz Energy Careers Project / Local Workforce Investment Area (LWIA).** Recently funded by an ARRA grant, this LWIA project is creating job-specific, interactive competency models, and formulating career

pathways and specialized training opportunities. The Mo-Paz Energy Careers Project has invited HVS to become a stakeholder and provide real-world input regarding the personal and occupational skills required by HVS and other renewable energy companies. HVS is collaborating with the career and technical training community to define appropriate career paths and explore apprentice opportunities. Stakeholders are actively partnering with Mohave Community College to create programs of curriculum that encompass the necessary skills for each specific job. The goal is to train approximately one hundred people to create a fully qualified, credentialed workforce pool for the various renewable energy employers. Ten of these 100 jobs are earmarked for the HVS Project.

- **WAVE / Joint Technological Education District (JTED).** The Western Arizona Vocational Education #50 is a Joint Technical Education District with five partner high schools across two counties. The JTED includes Colorado River Union High School District (CURHSD), Kingman Unified School District (KUSD), Lake Havasu Unified School District (LHUSD), and Parker Unified School District (PUSD).

HVS has been working with WAVE since it became an official district on July 1, 2009. By helping WAVE to develop courses that will train students for jobs at HVS' solar plant, as well as many renewable energy fields, the students in career and technical education at the five participating high schools will have access to course content that goes above and beyond what is traditionally offered. In pursuing specialized work certificates and training, the students are able to graduate with marketable workforce skills and be better prepared for college. Many of the students are able to accumulate community college credit hours.

HVS has also worked with members of the JTED Board to prepare a grant application that identified renewable industries and jobs.

- **Coalition Youth Team / COYOTE**. COYOTE is a community partnership dedicated to youth development and employment. COYOTE's mission is to help youth develop into outstanding citizens who are responsible and productive members of the workforce. In fulfilling this mission, COYOTE addresses the stated needs of many community and business leaders.

  COYOTE is coordinated through the Mohave County One-Stop Center. The program builds on Workforce Investment Act (WIA) performance requirements and funding, providing work readiness skills and job placement for in-school and out-of-school (dropouts and graduates) youth ages 14-24. However, the success of COYOTE relies on community members who join with COYOTE and provide summer jobs, projects, services, and funding to sponsor youth participants in the program. HVS is a sponsor of COYOTE.

HVS will work with our EPC contractor (for the construction phase of the Project) and O&M contractor (for the operating phase of the Project) to identify anticipated training and employment opportunities for the underserved or unemployed. When feasible, we will divide the Project into smaller components to permit maximum engagement of Job Opportunities Training Program (JOTP) participants or similar program(s) that may exist in the State of Arizona.

Contractors will be required to identify:

- a listing of potential tasks to be performed by/positions to be offered to JOTP participants, and
- proof of their efforts at outreach to high schools, community colleges, universities, WorkSource Centers, and other community resources specific to identifying program participants.

Economic Impact

The economic impact of the HVS Project on Mohave County and Arizona has been estimated from many sources: Fichtner Solar's real-world experience with operating CSP plants; the experience of and research conducted by HVS; information provided by the Arizona Department of Revenue; and an independent study commissioned by the Greater Phoenix Economic Council (GPEC).

Based on these sources, it is estimated that the operating Project would have an annual economic impact of $21.8 million on Mohave County and a statewide economic impact of $22.9 million. This annual impact is comprised of:

- More than $4 million in annual property taxes
- Other state taxes
- 107 permanent jobs (supporting more than 300 people)

- 30 indirect jobs.

In addition to the annual impacts, there are many one-time and short-term impacts during the 3-year construction phase, including:

- $29.3 million in direct and indirect construction income generated in Mohave County
- $4.9 million in one-time state and local construction sales tax
- 1,500 new jobs at the peak of construction.

In addition to the above economic impacts, the Project will generate additional revenue for the City of Kingman through the purchase of treated wastewater. Given its scale, use of effluent, and potential use of biofuels as a backup fuel source, the Hualapai Valley Solar Project is expected to receive a great deal of national and international publicity. It is expected that this will bring additional revenue to Mohave County and Arizona through tourism, including visits to the Project's Visitor Center.

Mohave County and Arizona will see additional benefits from goods and services purchased for the Project, taxes generated by employment, and other taxes paid to state and local governments.

Other Arizona Benefits

The Project will add to the County's and State's experience in attracting and promoting projects that generate renewable energy, as well as industries and companies that support the development, construction and operation of these projects (*e.g.*, parabolic trough mirror suppliers). Finally, the available power interconnecting to the local electric transmission system will provide more robust and reliable electricity, and will help meet the demand for renewable energy while reducing the dependence on fossil fuels.

Question 22. What has been the public response to this Project?

Answer 22. In general, HVS has received overwhelming public support for the Project, with many balancing groundwater use against the Project's significant economic benefits (*e.g.*, jobs, property tax base, tertiary tax and revenues) to an economically depressed area. Opponents of the Project have focused on our use of groundwater.

Many elected officials, including members of the Mohave County Planning & Zoning Commission, Mohave County Board of Supervisors, and Kingman City Council, have publicly stated that they appreciated HVS' extensive public process and follow-through, answering their questions and listening to their comments, concerns and suggestions. A good example of this is our aggressive pursuit of an agreement with the City of Kingman to re-use its wastewater for our cooling water. This will significantly minimize our impact on the Hualapai Aquifer and address the biggest concern voiced throughout the public process.

HVS has been informing the public about our Project since the Project site was selected approximately one year ago. HVS has had five formal public meetings and open houses, and has delivered approximately 30 Project briefings in front of civic organizations, elected officials, state departments, etc., in Mohave County and throughout Arizona. HVS' toll-free phone number receives 5-10 calls every week, and our special "info@" email inbox receives 10-20 emails each week. HVS has also had an estimated 200 informal, one-on-one, and group meetings in and around the Kingman area, as well as throughout Arizona and the U.S.

A partial list of stakeholders briefed by HVS include:

- Senator John McCain's staff
- Senator Jon Kyl's staff
- Congressman Trent Franks, 2nd Congressional District
- U.S. Department of Energy
- Western Area Power Administration
- Bureau of Land Management
- Hualapai Nation
- Arizona Representative Lucy Mason, District 1
- Arizona Department of Water Resources
- Arizona Department of Revenue
- Arizona Department of Environmental Quality
- Arizona Game and Fish Department
- Sierra Club
- Grand Canyon Trust
- Mohave County Economic Development
- Mohave County Community Services
- Mo-Paz Energy Career Project
- Joint Technical Education District (JTED)
- Coalition Youth Team / COYOTE

- Construction Management Association of America (CMAA)
- Northern Arizona Builders Association
- Greater Phoenix Economic Council (GPEC)
- Kingman's Economic Tourism and Development Commission (ETDC)
- Bullhead City/Mohave Valley Association of Realtors
- Kingman Area Chamber of Commerce
- Bullhead Regional Economic Development Authority (BREDA)
- The Arizona Federation of Republican Women, Kingman Chapter.
- Kingman Downtown Merchants Association
- Kingman Rotary Club
- Route 66 Rotary Club
- Kingman Lions Club

HVS has received letters of support and spoken public support (*e.g.*, comments made at County Planning & Zoning Commission and Board of Supervisors hearings) from the 200-member Arizona Chapter of Associated General Contractors, Kingman's Economic Tourism and Development Commission, the Northern Arizona Builders Association, the Greater Phoenix Economic Council, the Board of Directors of the Bullhead City/Mohave Valley Association of Realtors, members of the Kingman City Council, the Mayor of Kingman, and many local businesses and civic organizations. Additional correspondence not filed with the Application is marked as Exhibit HVS-18.

In addition, the City of Kingman passed and adopted Resolution No. 4631, *A Resolution in Support of Green Energy,* on September 8, 2009. This resolution is marked at Exhibit HVS-16.

A local water utility district that draws from the same aquifer was initially concerned that HVS' use of groundwater would affect their water supply. However, they concluded that the HVS Project would have no impact on their business and spoke in support of the Project at both the Mohave County Planning & Zoning Commission and Board of Supervisors hearings.

The Hualapai Valley Solar General Plan Amendment and Area Plan were approved unanimously by both the Mohave County Planning & Zoning Commission (vote of 8-0) and the Mohave County Board of Supervisors (vote of 3-0). The approved Board of Supervisors resolutions, 2009-274 (General Plan) and 2009-275 (Area Plan), are marked as Exhibit HVS-17.

Question 23. Why did HVS include a PV option in its application?

Answer 23. The decision to use CSP or PV technology will ultimately be made by the utility that purchases the power from the HVS facility. Although no such plants are operating today, some utilities have recently, for the first time, issued PPAs for utility-scale PV plants of 100 MW or more. HVS will continue to monitor the evolving utility-scale solar market dynamics throughout the local, state and federal permitting processes so that HVS can be prepared to use the appropriate technology. Depending on the power purchaser(s), HVS may also build a combination of CSP and PV.

Although the Arizona Corporation Commission (ACC) does not currently issue Certificates of Environmental Compatibility for photovoltaic power plants, HVS has included a description of a PV alternative in light of the increased interest in PV technology by some utilities. This practice was followed in the most recent solar projects reviewed and approved by the ACC, namely NextLight and Starwood.

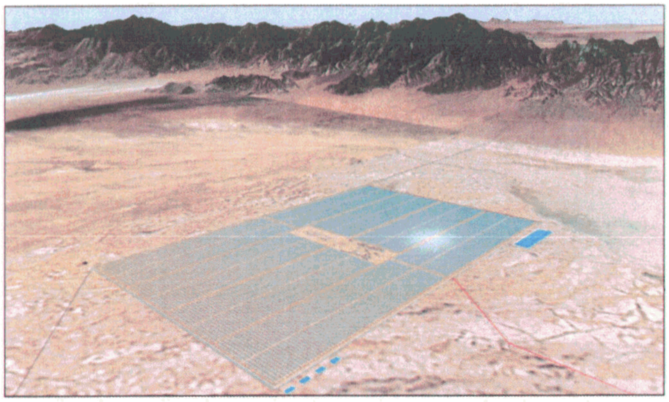
HVS requests that both interconnection alternatives be approved for use with CSP technology, PV technology, or a combination of both technologies.

Question 24. Does this conclude your testimony?

Answer 24. Yes.

EXHIBIT HVS-5

hualapai valley solar™
a mohave sun power project



Hualapai Valley Solar Project
January 2010 | LSC Hearing | Greg Bartlett

Summary of Testimony

- Introduce Company and Project Team
  - Principals
  - Engineering, key suppliers
- Describe the Project and interconnection
- Discuss water usage and sources
- Review Project need and Arizona benefits
- Discuss public response to the Project

Greg Bartlett

- Project Director – Hualapai Valley Solar
- Managing Director/cofounder – Mohave Sun Power
- Bachelors and Masters degrees in Electrical Engineering and Computer Science - Massachusetts Institute of Technology
- 25 years of experience with energy projects
- Development & project management experience
  - Solar, hydro, biomass, waste heat, energy efficiency

Experience of Principals

- Power plants developed and/or owned
  - Allegheny Lock & Dams 5 & 6
  - Onondaga Cogeneration
  - Zeng Cheng Power Station (HFO)
- Hydro power plants renovated
  - Columbia Mills; South Hill; Bridgewater
- Power Purchase Agreements (500 MW)
  - Consolidated Edison; Niagara Mohawk; Central Hudson; Long Island Lighting; Virginia Power

Experience of Extended Team

- Fichtner Solar – engineering
  - More than half of all global CSP projects; 5 in construction
  - Spain (Andasol 1, 2, 3) – each 50 MW trough + storage
  - Egypt – 150 MW ISCC (20 MW solar)
  - Morocco – 470 MW ISCC (20 MW solar)
- Key supplier relationships – global CSP leaders
  - Siemens Solel, Schott – collector tubes
  - Flabeg, Rioglass Solar – parabolic mirrors
  - SQM, Haifa, BASF – nitrate salts

Project Summary

- 4,233 acres of private land
  - 27 miles N of Kingman
  - 80 miles SE of Las Vegas
- 340 MW CSP facility
  - Parabolic trough
  - Molten salt storage system
- Two transmission line corridors

Site Summary

- Desert and elevation provide world-class DNI
- Land: remote, private, flat, no shading
- Less than 3 miles from BLM utility corridor
- Two sources of water: effluent, groundwater
- Environmentally compatible

Water Usage

- Approximately 2,400 AF/Y average, includes:
  - 2,200 AF/Y for cooling and boiler blowdown
  - Remainder: potable water, mirror-washing, etc.
- State-of-the-art evaporative cooling system
- Maximum re-use of water
- Groundwater from 4 on-site wells
- Effluent from the City of Kingman
  - Letter of Intent, June 26, 2009 [HVS-14]
  - Memorandum of Understanding, Jan. 4, 2010 [HVS-15]

The Need for the Project

- Reduce greenhouse gas emissions
- State Renewable Portfolio Standards (RPS)
- Expected launch of a National RPS
- Population growth and electricity demand
  - 2000-08: population +27%; 2000-2039: +100%
  - 2000-07: electricity consumption growing at 3 x U.S. rate
  - 2009 vs. 2025: peak demand will be 60% higher (APS)
- Uncertainty of future coal generation

Arizona Benefits

- Havasu-Kingman MSA lost greater percentage of jobs between July '08 and July '09 than any other U.S. MSA
- 12-month effort building database of Arizona contractors, suppliers, vendors, and employees
- Relationships with local, regional and state workforce development and job training initiatives:
  - AZ Workforce Development / LWIB
  - Mo-Paz Energy Careers Project (ARRA funded) / LWIA
  - WAVE / Joint Technological Education District (JTED)
  - Coalition Youth Team / COYOTE
- Add to Arizona's experience developing renewable energy, support industries, local suppliers

Arizona Benefits – Construction

- Direct and indirect construction income generated in Mohave County: $30 million
- One-time state and local construction sales tax: $5 million
- New jobs at peak of construction: 1,500
- Opportunities for local businesses to support construction workers in town and at site

Arizona Benefits – Operation

- Annual economic impact to AZ: $23 million
  - Annual property taxes: more than $4 million
  - Other state taxes
  - 107 permanent jobs, supporting more than 300 people
  - 30 indirect jobs
  - Direct salaries, local goods and service purchases, etc.
- Potential revenue to the City of Kingman for effluent
- Visitors Center will generate tourism dollars

Public Outreach & Support

- Continuous since March 2009
  - 5 formal public meetings and open houses
  - Approximately 30 briefings to civic and other organizations
- Sept. 2009 – Kingman adopted Resolution No. 4631
  - *A Resolution in Support of Green Energy* [HVS-16]
- Support from City, County, and State organizations and elected officials [HVS-18]
- General Plan Amendment/Area Plan approved by County Planning & Zoning Commission (8-0) and Board of Supervisors (3-0) [HVS-17]

EXHIBIT HVS-6

BEFORE THE ARIZONA POWER PLANT AND TRANSMISSION LINE SITING COMMITTEE

IN THE MATTER OF THE APPLICATION OF HUALAPAI VALLEY SOLAR LLC, IN CONFORMANCE WITH THE REQUIREMENTS OF ARIZONA REVISED STATUTES §§ 40-360.03 AND 40-360.06, FOR A CERTIFICATE OF ENVIRONMENTAL COMPATIBILITY AUTHORIZING CONSTRUCTION OF THE HVS PROJECT, A 340 MW PARABOLIC TROUGH CONCENTRATING SOLAR THERMAL GENERATING FACILITY AND AN ASSOCIATED GEN-TIE LINE INTERCONNECTING THE GENERATING FACILITY TO THE EXISTING MEAD-PHOENIX 500kV TRANSMISSION LINE, THE MEAD-LIBERTY 345kV TRANSMISSION LINE OR THE MOENKOPI-EL DORADO 500kV TRANSMISSION LINE.	Docket No. L-00000NN-09-0541-00151 Case No. 151 DIRECT TESTIMONY OF MICHAEL LAROW

PREFILED DIRECT TESTIMONY OF MICHAEL LAROW

Question 1. State your name and business address.

Answer 1. My name is Michael LaRow. My business address is 20 Main Street, Acton, Massachusetts.

Question 2. What is your job title and what are your job responsibilities with respect to the Hualapai Valley Solar Project?

Answer 2. I am the Environmental Director for the Hualapai Valley Solar ("HVS") Project (the "Project"). My primary responsibility is to acquire the permits and authorizations required for construction and operation of the Project, and to coordinate with the designers and contractors to ensure that what is designed, constructed, and operated complies with the requirements of all permits and authorizations.

Question 3. Describe your educational and professional background and experience.

Answer 3. I received my Bachelors Degree and Masters Degree in electrical engineering from the Massachusetts Institute of Technology in 1982.

I am a member of the International Association for Impact Assessment.

From 1985 through 1989, I worked as a Project Manager for Mitex, Inc. and Sithe Energies in developing hydroelectric projects at existing dams in the United States. This work involved obtaining the FERC licenses (basically, the equivalent of an EIS) for the Project, coordinating the preliminary design of the facility, obtaining the power purchase agreement, purchasing land, negotiating EPC agreements, then ensuring that construction progressed smoothly.

In 1989, I started a consulting firm, Sigma Consultants, Inc., which provides project management consulting services for energy, environmental, and other projects.

From 1989 through 1991, while working at Sigma, I provided project management and environmental consulting support for the route selection, permitting, design, and land acquisition for transmission lines associated with gas-fired cogeneration projects.

From 1991 through 1997, I provided project management and environmental consulting support to the corporate predecessors of Verizon in the New England area for their underground storage tank replacement and remediation program.

From 1997 through 2000, I provided project management and environmental consulting support to the San Roque Power Company, where I was responsible for the environmental approvals and related financing aspects of the 345 MW San Roque Hydroelectric Project, a $1.2 billion earthfill dam in the Philippines.

From 2000 through 2009, I provided project management and environmental consulting support to Global Alumina Corporation for its $4+ billion dollar integrated power plant, mine, refinery, and port project.

In March 2009, I started working on the Hualapai Valley Solar Project.

Question 4. **What is the purpose of your testimony?**

Answer 4. I am going to describe the technology proposed for the Project and narrate a short video of the Project prepared by our engineers that shows the Project in its general environmental context and depicts the technologies selected. (*See* Exhibit HVS-19.) I will provide an overview of the schedule, water use, cooling technologies, land requirements, and permitting requirements for the concentrating solar power ("CSP") Project. I will then describe the photovoltaic ("PV") option.

Question 5. **Describe the Project technology**

Answer 5. The Project uses solar trough CSP technology. Basically, this technology entails concentrating the sun's thermal energy using large arrays of parabolic mirrors to heat a heat transfer fluid ("HTF") to about 740°F. This heated HTF is then used to make steam to drive a steam turbine generator and make electricity. After it gives up its heat, the 'cold' HTF (about 560°F) returns to the mirrors to be heated again and repeat the process for as long as the sun is shining. The lines of mirrors are oriented north-south so that they can tilt and follow the sun as it moves across the sky from east to west.

The Project has a thermal energy storage system ("TES") that is used to store extra heat from the HTF for later use, either when clouds obscure the sun, or before the sun rises or after it sets. The TES consists of modules of two tanks, both containing molten salts, where one tank is the 'hot' tank whose salts are at approximately 720°F and the other is the 'cold' tank with molten salts at about 550°F. When there is excess heat, the HTF, beyond what the turbine-generator can use, is diverted to the TES where it gives up its heat energy to molten salt being pumped from the 'cold' tank to the 'hot' tank. When more heat energy is required than the sun is providing, 'cold' HTF is passed through a heat exchanger where it is heated up by 'hot' molten salts being pumped from the 'hot' tank to the 'cold' tank. The heated HTF is then used to make steam and then electricity.

The Project will use a re-circulating cooling water system to condense the steam at the outlet of the turbine. This cooling water itself will be cooled using evaporative or wet cooling towers. This process will use most of the water consumed by the Project.

The video shows these as well as the other major components of the Project. The DVD containing the video is marked as Exhibit HVS-19.

Question 6. **How much water will HVS use?**

Answer 6. In an average year, HVS will use about 2,400 acre-feet of water. Of this, about 2,115 acre-feet will be lost to the atmosphere from the cooling towers, 89 acre-feet of cooling tower blow-down will be pumped to the evaporation ponds, 57 acre-feet will be required as make-up to the steam cycle, 130 acre-feet will be used for mirror washing, 14 acre-feet will be used for various other services, mostly around the power block, and 4 acre-feet will be used as potable water. Depending on the final engineering for the Project, water usage could be up to 3,000 acre-feet per year so HVS directed its hydrogeologist to study the impact of 3,000 acre-feet per year withdrawals.

Question 7. Is there sufficient groundwater for the Project?

Answer 7. Sufficient groundwater was one of the initial criteria for selecting the site. At the time, HVS believed there was adequate water because the majority of the land for the site was part of a proposed housing development that had a letter of Analysis of Adequate Water Supply from the Arizona Department of Water Resources ("ADWR") dated November 9, 2007 ("AAWS") (*See* Exhibit HVS-20.) In the AAWS, the ADWR indicated that it had determined that 43,432.33 acre-feet of groundwater in the Hualapai aquifer would be physically and continuously available for 100 years. The total area of the proposed housing development was about 36,236 acres. The Project will use about 3,680 of those acres. On a simple pro-rata basis, that would mean that the Project has about 4,416 acre-feet of groundwater available.

HVS' hydrogeologist, Bill Victor, will provide more information about the availability of water in the aquifer.

In addition to the above, based on public comments that HVS received starting with and continuing from its first public meeting on June 30, 2009, HVS has been investigating ways to minimize its use of groundwater while still keeping the Project economically competitive. The major opportunity identified is the use of effluent from the City of Kingman's Hilltop wastewater treatment facility. That facility should be able to supply 1,700-1,800 acre-feet of water per year when it comes on line in late 2010 or early 2011 and it is expected that the output from that facility will increase over the years with the growth of Kingman and increased use of the sewer system.

Question 8. Why did you not use dry cooling or hybrid dry and wet cooling?

Answer 8. Wet or evaporative cooling is a more efficient cooling method than dry or hybrid cooling. It typically has a moderate capital cost, including water supply and treatment costs, and relies on the energy lost when liquid water is converted to gas (evaporated), similar to the process used by the human body when it sweats. As proposed in this Project, evaporative cooling works by using fans to create an updraft of air inside the cooling tower. The heated water from the steam condenser is sprayed down against this updraft and the falling water is cooled in two ways; first by relatively cooler air flowing by it and second by the evaporation of a small amount of water from each falling droplet. As currently designed, the Project will use approximately 2,200 acre-feet per year in this cooling process.

As further described below, dry cooling generally has a lower energy efficiency, and higher capital and operating cost, but consumes no water. It works by blowing a very large amount of air over a radiator-like heat exchanger in order to condense the steam then cool the water. There is no direct contact between the steam or water and the air, and therefore, no evaporation. This method limits the lowest temperature that the steam can be cooled to the air temperature.

Hybrid cooling uses a combination of wet and dry cooling, with the relative amount of each cooling technology used 'tuned' to the desired outcome. It generally has the highest capital costs, due to the fact that it uses both wet and dry technologies, but depending on how it is 'tuned,' it consumes between 10 and 90 percent of the water used by evaporative cooling alone. Generally, in a water constrained situation, a hybrid system would be biased towards wet cooling during high heat periods and dry cooling during cooler periods to minimize energy and efficiency losses.

For most thermal power projects, especially solar projects in the desert southwest, dry or hybrid cooling imposes cost and performance penalties when compared to wet or evaporative cooling. In the recent Report to Congress from the U.S. Department of Energy ("DOE") titled "Concentrating Solar Power Commercial Application Study: Reducing Water Consumption of Concentrating Solar Power Electricity Generation" (the "DOE Report") the DOE states (pg 13 and 14):

> A comparison of the performance and economics of a water-cooled trough plant located in Daggett, California to an air-cooled one showed that the performance of the air-cooled system dropped off significantly at ambient air temperatures above 100°F. The air-cooled plant provided about 5% less electric energy on an annual basis than the water-cooled plant, because of reduced performance on hot summer days. The electricity cost for the air-cooled plant was 7 to 9% higher than for the water-cooled plant. Thus air cooling of a trough plant can be used to minimize water use, but at a 7 to 9% cost penalty.

While the DOE Report notes that dry cooling methods are becoming more common for thermal power plants, it states (pg 11) "[t]he disadvantages of dry cooling are higher capital costs, higher auxiliary operating power requirements, fan noise, and an overall lower plant performance, especially on hot days, when the peak power is needed most." The full report is marked as Exhibit HVS-21.

The higher capital costs of the dry or hybrid cooling primarily result from the very large volume of air and therefore number and size of fans needed to condense the steam back to water. It is important to note that this analysis includes the savings, on the dry cooling side, from not having to supply and treat water for the wet cooling towers.

The higher auxiliary operating power requirements or parasitic loads result from the increased amount of electricity consumed within the Project to operate the dry cooling system when compared to that needed to pump and treat the cooling water for a wet-cooled system.

The lower plant performance, especially on hot days, results from the fact that the amount of electric energy that can be extracted from the steam is a function of the difference in steam temperature and pressure between the input to the turbine and the output at the condenser, where the steam has been cooled and condensed back to water. This temperature and pressure at the condenser is a function of the cooling method. Dry cooling can only reduce the temperature to approach the 'dry-bulb temperature', which is what a normal thermometer measures. This means that when it is 105°F, the lowest temperature at the outlet of the turbine is 105°F. Wet cooling works like the human body which, when it sweats, and can approach much lower levels as measured by the 'wet-bulb temperature'. On hot days at the Project site, this 'wet-bulb temperature' can easily be 20-30 degrees cooler than the dry-bulb temperature.

The DOE Report (pg 12) goes on to say "[t]he most common cooling method for new power plants is evaporative cooling. This is an economical and high performing power plant cooling technique."

In order to be competitive in the current market for renewable energy, HVS, like all of the other proposed parabolic trough plants in Arizona, are proposed as wet cooled projects. HVS believes that the 7-9% levelized cost of energy penalty associated with dry cooling would prevent the Project from being competitive.

Question 9. **What is the status of the other necessary regulatory approvals?**

Answer 9. At the county level, the primary regulatory approvals are the amendment to the General Plan and approval of the Area Plan, both of which the Project received on November 16, 2009. As the Project progresses, it will apply for other county approvals, such as zoning, stormwater management, and building permits.

At the state level, in addition to the CEC, the Project will require an aquifer protection permit and an air quality permit, both issued by the Department of Environmental Quality (DEQ). HVS has prepared a draft of its Minor Source air quality permit application based on the conceptual design for the Project. HVS will prepare the aquifer protection permit application during the next stage of design. The Project will also require a well permit from the Department of Water Resources (DWR).

At the federal level, HVS is in the process of preparing an Environmental Impact Statement (EIS) with the Western Area Power Administration (Western) as the lead agency and the Bureau of Land Management (BLM) as a cooperating agency. This work is being done in coordination with the DWR, Department of Game and Fish, and State Historic Preservation Office. Other state and federal agencies, such as DEQ, Arizona Department of

Transportation, U.S. EPA, National Park Service, and U.S. Army Corps of Engineers as well as the local Indian tribes will continue to be consulted and be involved throughout the EIS process.

Question 10. How wide a right of way and corridor within which to site the right of way are you requesting?

Answer 10. HVS is requesting a 200-foot right-of-way (ROW) for its Gen-Tie line. HVS is requesting two different corridor widths within which to site that line depending on the location of the Gen-Tie relative to the existing lines. Where the Gen-Tie line parallels the existing 500 kV line, HVS has requested a 2,640-foot corridor; otherwise, HVS has requested a 1,320-foot corridor.

Question 11. What are the differences between PV and CSP?

Answer 11. While both technologies generate electricity without carbon emissions, the major differences between the CSP and PV technologies are outlined below:

- Storage: CSP has ability to store thermal energy in molten salt, which allows it to provide electrical energy for a limited time when the sun is not shining, either because the sun is behind clouds, or it is not above the horizon.
- Utility Scale Experience: CSP has experience at utility scale in U.S. since 1985 when the first portion of the SEGS project became operational in Daggett, California. Currently, SEGS I-IX plants (13.8 MW to 80 MW totaling 384 MW) are operating in California and Nevada Solar One (64 MW) in Boulder City, Nevada. The largest PV project in the US is the DeSoto Next Generation plant (25 MW) in Arcadia, Florida, which came on

line this past fall. The next largest operating PV project is at Nellis Air Force Base in Nevada (14.2 MW).

- Energy Delivery: Due to its ability to store thermal energy, CSP projects can deliver energy on a more reliable and less intermittent basis than PV, which will vary based on cloud cover.
- Water Usage: PV uses less water than CSP.
- Cost: A year ago, large-scale CSP was more cost-effective than PV, but recent additions to PV manufacturing capacity are causing PV prices to decrease significantly to the point where a kilowatt-hour of electricity from a large PV project can cost less than one from even a wet cooled CSP project.

Question 12. Please explain why HVS may build this Project using two or three generators and possibly in phases rather than a single phase with one 340 MW generator.

Answer 12. Constructing the Project using two or more generators and possibly in two phases provides a number of potential benefits and/or options. First, it provides a level of redundancy so, if one generator is down, either for planned or un-planned reasons, then the entire Project is not shut down. Second, it could allow a portion of the Project to come on line before all the construction is completed, thus allowing the Project to start generating electricity and revenues during the construction period. Finally, it allows the Project to be built in two distinct phases if utilities do not want to purchase all 340 MW initially.

Question 13. Was the CEC Application prepared by you or under your supervision.

Answer 13. Yes.

Question 14. Do you have any amendments or changes to the Application?

Answer 14. Yes, I noticed in Section 4.b.iii in the discussion of the transmission line, I need to add to the Application the following information:

- The nominal length of spans will be 1,000 feet, about the same as the existing structures.
- The maximum height of supporting structures will be 199-ft as shown in Exhibit G.
- The minimum height of conductor above ground will be about 35 feet, depending on final design criteria necessary to meet all applicable standards and codes.

Question 15. Does this conclude your testimony?

Answer 15. Yes.

EXHIBIT HVS-7

hualapai valley solar™
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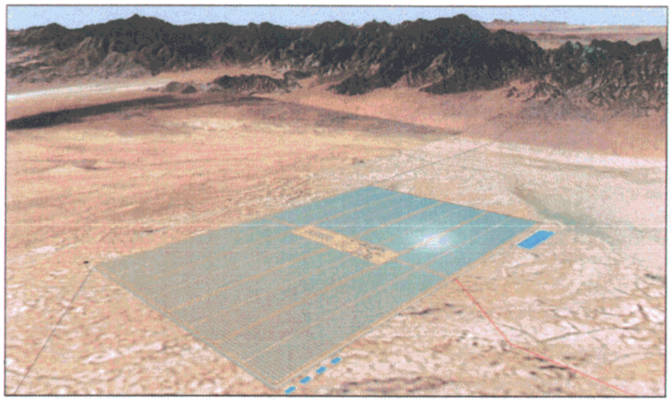


Hualapai Valley Solar Project
January 2010 | LSC Hearing | Michael LaRow

1

Michael LaRow

- Environmental Director of Hualapai Valley Solar
- Bachelors and Masters degrees in Electrical Engineering, Massachusetts Institute of Technology
- 24 years experience in energy industry
- Power plant projects in the U.S., Philippines, and Africa
- Transmission line projects in the U.S.

2

Summary of Testimony

- Description of technology
- DVD
- Dry/Hybrid cooling

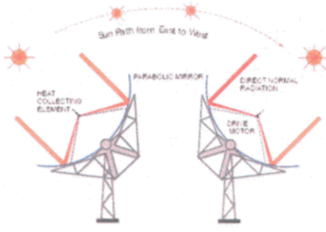
CSP Project Technology

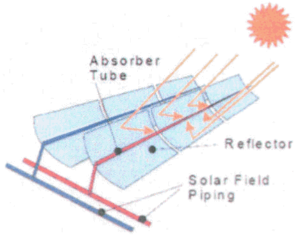
- Project layout
- Heat capture and HTF
- Rankine Cycle
- Thermal energy storage
- Cooling towers and evaporative/wet cooling
- DVD

HVS Solar Project Site Plan

5

Parabolic Trough





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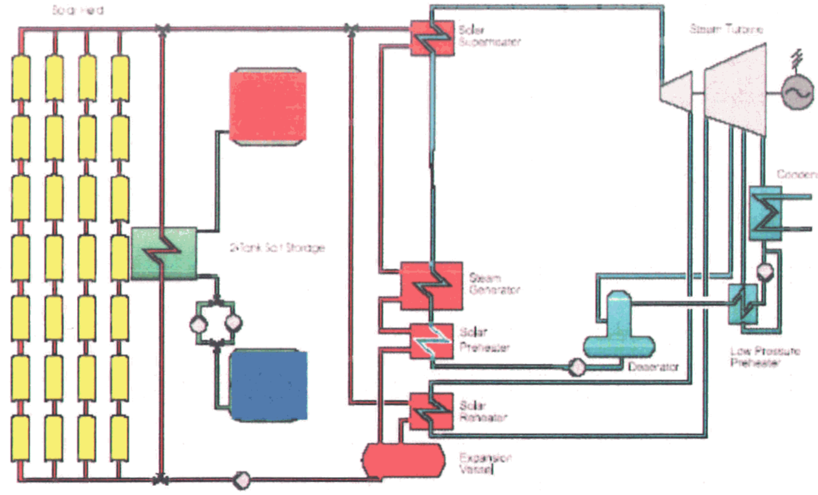
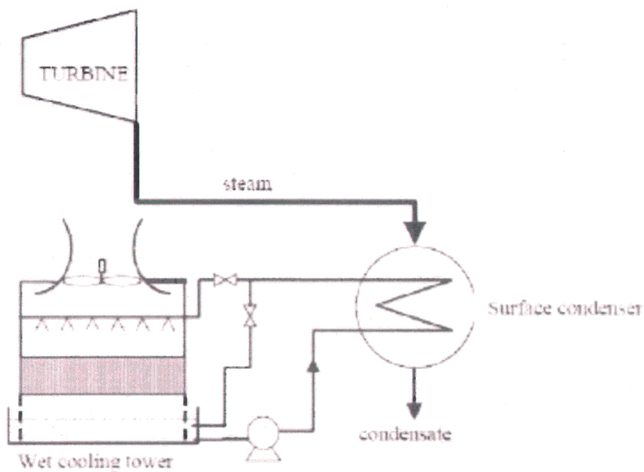
CSP Plant Schematic



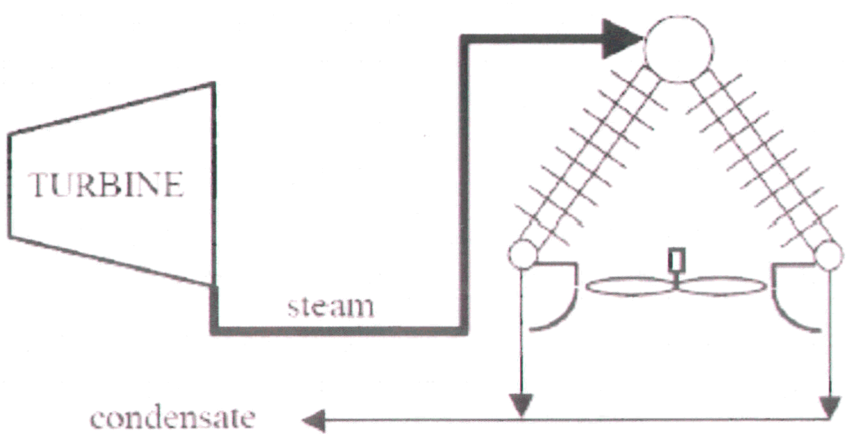
Wet Cooling System



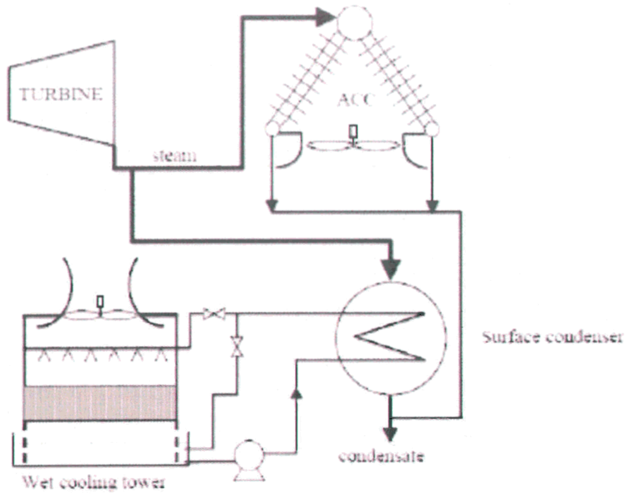
Dry/Hybrid Cooling

- Dry and hybrid cooling technologies
- Penalties of dry and hybrid cooling
  - Higher capital cost
  - More parasitic loads
  - Lower efficiency and generation
  - 7%-9% cost penalty

Dry Cooling System



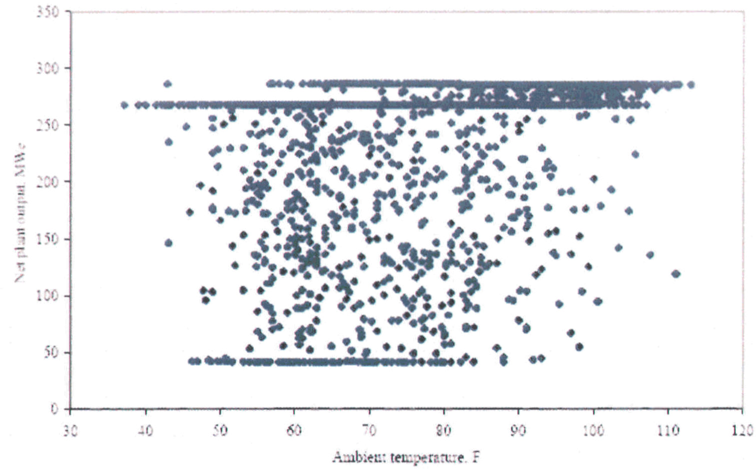
Hybrid Cooling System



Dry/Hybrid Cooling

- Dry and hybrid cooling technologies
- Penalties of dry and hybrid cooling
  - Higher capital cost
  - More parasitic loads
  - Lower efficiency and generation
  - 7%-9% cost penalty

Wet Cooling Temperature Impacts



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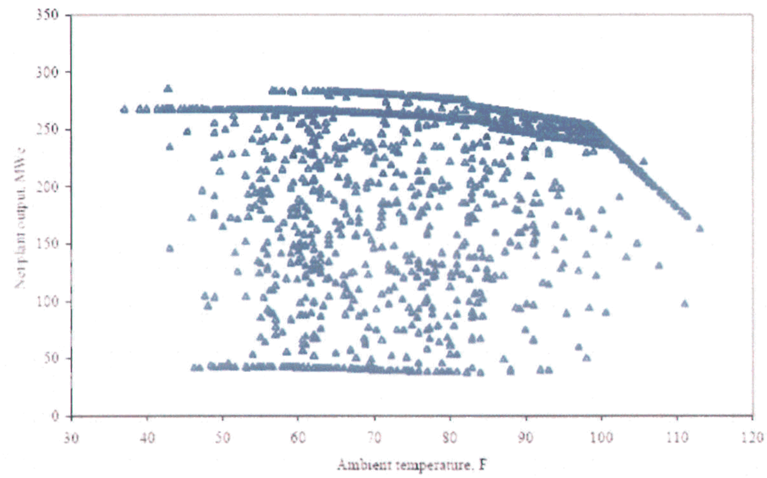
Dry Cooling Temperature Impacts



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Dry/Hybrid Cooling

- Dry and hybrid cooling technologies
- Penalties of dry and hybrid cooling
  - Higher capital cost
  - More parasitic loads
  - Lower efficiency and generation
  - 7%-9% cost penalty

EXHIBIT HVS-8

BEFORE THE ARIZONA POWER PLANT AND TRANSMISSION LINE SITING COMMITTEE

IN THE MATTER OF THE APPLICATION OF HUALAPAI VALLEY SOLAR LLC, IN CONFORMANCE WITH THE REQUIREMENTS OF ARIZONA REVISED STATUTES §§ 40-360.03 AND 40-360.06, FOR A CERTIFICATE OF ENVIRONMENTAL COMPATIBILITY AUTHORIZING CONSTRUCTION OF THE HVS PROJECT, A 340 MW PARABOLIC TROUGH CONCENTRATING SOLAR THERMAL GENERATING FACILITY AND AN ASSOCIATED GEN-TIE LINE INTERCONNECTING THE GENERATING FACILITY TO THE EXISTING MEAD-PHOENIX 500kV TRANSMISSION LINE, THE MEAD-LIBERTY 345kV TRANSMISSION LINE OR THE MOENKOPI-EL DORADO 500kV TRANSMISSION LINE.	Docket No. L-00000NN-09-0541-00151 Case No. 151 DIRECT TESTIMONY OF WILLIAM VICTOR

PREFILED DIRECT TESTIMONY OF WILLIAM VICTOR

Question 1. Please state your name and business address.

Answer 1. My name is William Victor.

My address is 5010 E. Shea Blvd., Suite D110, Scottsdale, AZ 85254.

Question 2. By whom are you employed and in what capacity?

Answer 2. I am a principal in the Arizona-based water resources consulting firm of Montgomery & Associates (M&A). My primary responsibilities are project management and senior technical oversight for various groundwater projects in the United States and South America.

Question 3. What was your role with respect to the Hualapai Valley Solar Project?

Answer 3. I served as the principal-in-charge and principal investigator for M&A. Our scope of work was to characterize available water resources in the Hualapai basin and to evaluate potential impacts from proposed groundwater use by the Hualapai Valley Solar (HVS) Project.

Question 4. Describe your educational and professional background and experience.

Answer 4. I obtained a B.S. in geology from Northern Arizona University and an M.S. in hydrology from the University of Arizona. I am also a registered professional geologist in Arizona, California, and Kentucky.

I have 30 years experience investigating hydrogeologic conditions in various environments of the United States, Mexico, and South America.

I have extensive experience demonstrating the availability of groundwater in Mohave County via the Arizona Department of Water Resources (ADWR) adequate water supply process.

Qustion 5. Please provide an overview of your testimony.

Answer 5. I will testify regarding the groundwater evaluations M&A conducted for the HVS Project and provide our findings regarding groundwater availability and projected impacts from pumping in the basin.

Question 6. What evaluations did you conduct?

Answer 6. Results of our work are given in a Technical Memorandum, dated November 16, 2009, titled ***Groundwater Flow Model for Hualapai Valley Solar Project, Mohave County, Arizona***, prepared for HVS and included as Exhibit B-1 to the CEC Application. The modeling for this memorandum was conducted in June and July 2009. An Addendum to this memorandum was prepared in December 2009 to address additional considerations for the Environmental Impact Statement (EIS) being conducted by the U.S. Department of Energy; Western Area Power Administration (Western or WAPA) and the U.S. Bureau of Land Management (BLM) for the proposed HVS interconnection across BLM land to the WAPA transmission line system. The Addendum is marked as Exhibit HVS-22.

The Addendum for the EIS incorporates updated information from ADWR on other committed demands for the basin and contains simulations for maximum cumulative impacts as determined with the EIS advisory team, which includes representatives of BLM, WAPA, National Park Service, and ADWR.

Question 7. Please provide your findings as to water adequacy for this Project and the effects of the Project on the Hualapai Valley groundwater basin.

Answer 7. Based on the evaluations conducted, I found that:

- Only a minute fraction of the groundwater stored in the Hualapai Valley groundwater basin is currently used. The volume of potentially recoverable groundwater calculated to be stored (15.8 million AF) in only the shallow part of the aquifer (above a depth of 1,200 feet below land surface) is equal to several hundred years of use at the current total rate (less than 20,000 AF/yr).
- The projected impact on groundwater levels by the proposed HVS pumping would meet the stringent criteria for impacts on existing wells imposed by ADWR in Active Management Areas (AMAs).
- After 30 years of pumping, the projected incremental impact of HVS pumping is not substantial and is much less than one foot of water level change for wells in the City of Kingman, Dolan Springs, and Valle Vista areas.
- The minimum pro rata amount of annually available groundwater already set aside by ADWR for the Rhodes Homes land on which the HVS plant is sited (4,416 AF/yr) would be nearly twice as much as HVS intends to use annually on average (2,400 AF/yr).
- There is sufficient water available in the aquifer to meet the water needs for the life of the Project without significantly impacting other existing groundwater users.

Question 8. Please describe the methodology you used to develop your findings.

Answer 8. Since 2005, M&A has conducted comprehensive groundwater studies in Hualapai Valley to evaluate the impacts of various groundwater uses. The numerical groundwater flow model developed by M&A for the Hualapai Valley was originally constructed and calibrated in 2006 and 2007. Through a several month period of critical review by ADWR staff hydrologists, including incorporation of the latest geophysical data for the basin, the model was approved in 2007 by ADWR for use in projecting groundwater impacts of proposed developments.

The Hualapai model was constructed using MODFLOW (Harbaugh and McDonald, 1996) and Groundwater Vistas, a graphical modeling interface (Rumbaugh and Rumbaugh, 2004). The model includes a steady-state simulation calibrated to match observed pre-development groundwater levels for the period from 1965 to 1970.

The transient model was calibrated to observed conditions for the period from 1971 through 2005. Results of the model calibration indicate that simulated groundwater levels compare well with observed data in most of Hualapai Valley.

Except for the area near Kingman, contours for altitude of groundwater level in winter 2005-2006 are generally similar to pre-1970 contours. This similarity indicates that the amount of groundwater removed from storage in the basin is not discernible, except near the City of Kingman wellfield.

The proposed groundwater pumping for HVS was added to the existing model to simulate the impact of the proposed facility over its projected 30-year life. Pumping rate for HVS was assumed to be 3,000 acre-feet per year (AF/yr), which is equivalent to a constant pumping rate of about 1,869 gallons per minute. This rate was the maximum estimated by HVS engineers. The current average groundwater use estimated by HVS for the Generating Facility is 2,400 AF/yr, not taking into account potential reuse of treated effluent from the City of Kingman that may become available to the Project.

We also collected information and data from several sources to input into the model. To assist with my discussion, I will refer to the slides that I prepared, which have been marked as Exhibit HVS-9.

SLIDE 6 This slide is a location map for the Hualapai groundwater basin. The Hualapai Valley is a north- to northwest-trending structural basin, separated into three sub-basins at depth by areas of relatively shallow bedrock. From south to north these sub-basins are the Kingman, Red Lake, and Gregg sub-basins. The Project is located in the Red Lake sub-basin. Length of the entire Hualapai basin is about 66 miles from north to south and the average width from east to west is about 18 miles; total area is about 1,212 square miles.

Groundwater in Hualapai Valley generally flows from the Kingman sub-basin northward beneath the Red Lake playa and over the bedrock high north of Red Lake, where it continues north through the Gregg sub-basin and eventually discharges into Lake Mead.

Groundwater discharge from the north end of the basin has been estimated to be about 3,800 AF/yr. Due to the small amount of development in the basin, groundwater recharge was assumed for the model to be the same as, and in equilibrium with, discharge. Recharge is assumed to occur chiefly along the mountain fronts and in the major washes.

SLIDE 7 This slide shows surface geology, depth to bedrock, the outline of the buried salt deposit, and lines of sections for the following slides. M&A characterized the hydrogeologic conditions based on well data, old and new geophysical surveys, and compilation and review of all available hydrogeologic data for the basin. For these studies, test wells were constructed and pumping tests were conducted for new and existing wells to characterize aquifer properties.

Data were analyzed to prepare a map of the bottom of the aquifer so that limits of the aquifer and volume of groundwater in storage could be estimated. The groundwater flow model was then used to estimate the quantity of groundwater in storage and to simulate the effects of groundwater wells on the aquifer.

Results of the M&A studies indicate the volume of groundwater in storage in the Hualapai Valley aquifer system is the largest component of the basin water budget, far exceeding either the annual volume of natural recharge to the basin or discharge of groundwater from the basin. Based on the information compiled, total volume of potentially recoverable groundwater in storage in the Hualapai basin was calculated to be about 27.7 million acre-feet (AF). This value was obtained by using the basin-wide numerical groundwater flow model to calculate the volume of sediments between the buried surface of the bedrock (or evaporite deposits where they occur) and the winter 2005-2006 groundwater surface.

Following a similar procedure, volume of potentially recoverable groundwater in storage above a depth of 1,200 feet below land surface was calculated to be about 15.8 million AF. This value is comparable to the range of volume from 10.5 to 21 million AF reported by the USGS (Gillespie and Bentley, 1971) for the saturated sediments to depths of 1,000 feet in the Red Lake area and 1,500 feet in southern Hualapai Valley.

Records indicate current groundwater use in the basin, including the City of Kingman, is less than 20,000 AF/yr. Therefore, the volume of potentially recoverable groundwater calculated to be stored in only the shallow part of the aquifer (above a depth of 1,200 feet) is equal to several hundred years of use at the current total rate.

SLIDE 8 This slide shows Section A-A' from the previous slide, and illustrates the three sub-basins, the salt deposit, and wells on which the section was based.

SLIDE 9 This slide shows water level hydrographs for several wells across the basin. The data indicate that groundwater levels in most of the basin have been relatively stable during the period of record. Some decline of water levels was measured in the Kingman sub-basin and Truxton Wash area due to active production wells in those areas. These conditions have also been reported by the U.S. Geological Survey and ADWR in recent reports.

Question 9. Please summarize the results on which your findings are based.

Answer 9. **SLIDE 10** This slide shows the projected water level drawdown in the basin due solely to HVS pumping at the end of the 30-year project life. It is the difference between the projected groundwater surfaces with and without the HVS pumping after 30 years, with the maximum pumping projected by other water users in the basin.

This simulation assumes the following future pumping for the period from 2006 through 2042:

- HVS pumping is simulated at 3,000 AF/yr.
- Future domestic well pumping is simulated at approximately 34 AF/yr.
- Simulated pumping for City of Kingman wells increases at a compounded rate of 3 percent per year, from about 9,297 AF/yr in 2006 to 27,629 AF/yr in 2042. This rate exceeds the Arizona Department of Economic Security figures for average population growth of about 2 percent per year during this period, and addresses the potential impacts of unplanned development in the Kingman sub-basin.

- Other committed demands are simulated using additional wells with total pumping of approximately 9,763 AF/yr from 2006 through 2042, which was provided by ADWR.
- Total pumping for the five proposed Rhodes Homes projects and the Mardian Ranch project is simulated to increase from about 1,628 AF/yr in 2012 to 50,459 AF/yr in 2042. This simulation assumes a 50-year build out for these large developments starting in 2012, which is assumed to be the soonest any pumping could occur due to duration of the permitting process.

Total simulated pumping in the basin increases from about 19,094 AF/yr in 2006 to 90,884 AF/yr in 2042.

These estimated pumping values are considered very conservative and are more than three times the values projected by other growth studies for the basin. For comparison, the Mohave County U.S. 93 Corridor Area Plan (June 2009) projected total groundwater use in Hualapai Valley to be only 8,839 AF/yr in 2010 (model uses 20,483 AF/yr) and 27,769 AF/yr in 2040 (model uses 86,043 AF/yr).

After 30 years of pumping, the projected incremental impact of HVS pumping is not substantial and is much less than one foot of water level change for wells in the City of Kingman, Dolan Springs, and Valle Vista areas.

Maximum projected water level decline at the HVS pumping center is about 63 feet in 2042, or an average of about 2.1 feet per year. The 20-foot water level decline contour is roughly coincident with the HVS property boundary; therefore, off-site declines in the vicinity of the plant are generally projected to be less than 20 feet in 2042, decreasing rapidly with distance from the plant.

It should be noted that, if the HVS facility is constructed and operated, ADWR has the ability to take the HVS committed demand into account when determining groundwater availability for future phases of residential developments at such time as they are proposed.

SLIDE 11 This slide shows the projected water level drawdown after 5 years due solely to pumping by HVS at 3,000 AF/yr, under the same conditions as the previous slide. The purpose of this slide is to show that the projected impacts by HVS would meet the well impact criteria on existing off-site wells imposed in AMAs, which is less than 10 feet of drawdown in the first 5 years of pumping, if it were applicable in Mohave County.

Question 10. How does your analysis compare to the recent ADWR study of the Hualapai Valley Groundwater Basin?

Answer 10. After the modeling for the Technical Memorandum was completed in July 2009, ADWR published new results in September 2009 from a geophysical investigation it conducted over the last few years. Preliminary results from this investigation were provided by ADWR to M&A in 2007 and were incorporated into the existing M&A model. The new agency report provided a depth to bedrock map and estimates of groundwater in storage. The new bedrock data were not incorporated into the M&A model for the EIS modeling addendum because it would require fundamental, time-prohibitive, changes to the construction of the model, as well as recalibration and rerunning of all simulations.

In addition, the new estimates of groundwater in storage given in the ADWR report were based on low average values of specific yield that were applied across the entire basin. Specific yield is the volume of water that would drain under gravity per unit volume of aquifer material and is dimensionless; this term is applied to unconfined or "water table" aquifers. The calibrated model uses acceptable and appropriate values based on published information and specific conditions for different areas of the basin.

SLIDE 12 This slide shows the difference between the bedrock surface used in the model and the new bedrock surface reported in September 2009 by ADWR using new results from gravity surveys. The differences between the two bedrock maps result in different values for volume of saturated sediments above the bedrock; this volume is larger where bedrock is deep and less where bedrock is shallow. The blue areas are where the model bedrock is deeper than the ADWR bedrock and the red areas are where the model bedrock is shallower than the ADWR bedrock. These differences are relatively small in the Red Lake sub-basin, where the Project is located, and larger in the Kingman and Gregg sub-basins.

In the Red Lake sub-basin, ADWR assumed a uniformly level surface of the salt deposit, whereas M&A assumed a tilted salt deposit surface based on data from four deep drill holes in the sub-basin. Therefore, as shown on the slide, the model bedrock surface is deeper on the east and shallower on the west than the new ADWR bedrock surface, although the overall volume of saturated sediments in the two interpretations is similar (about 5 percent difference).

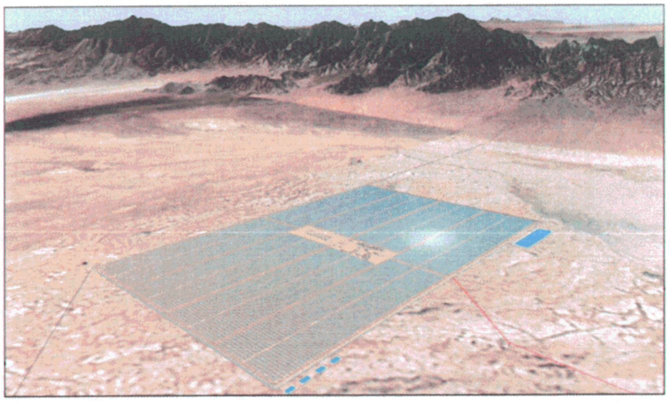
Conditions in the Red Lake sub-basin are the principal control on the model simulations for pumping at the HVS plant, and the small difference between the bedrock surfaces in that area is not believed to substantially affect projected water level drawdown due to HVS pumping.

Question 11. Does this conclude your testimony?

Answwer 11. Yes. There is sufficient water available in the aquifer to meet the water needs for the life of the Project without significantly impacting other existing groundwater users.

EXHIBIT HVS-9

hualapai valley solar™
a mohave sun power project



Hualapai Valley Solar Project
January 2010 | LSC Hearing | William Victor

1

William Victor
Montgomery & Associates

- B.S. Degree Geology, Northern Arizona Univ.
- M.S. Degree Hydrology, University of Arizona
- Registered Professional Geologist in Arizona, California, and Kentucky
- Over 30 Years Experience
- Principal investigator for hydrogeologic studies and groundwater flow modeling in Hualapai, Sacramento, and Detrital Valleys
- Extensive experience demonstrating availability of groundwater in Mohave County

2

Studies Conducted

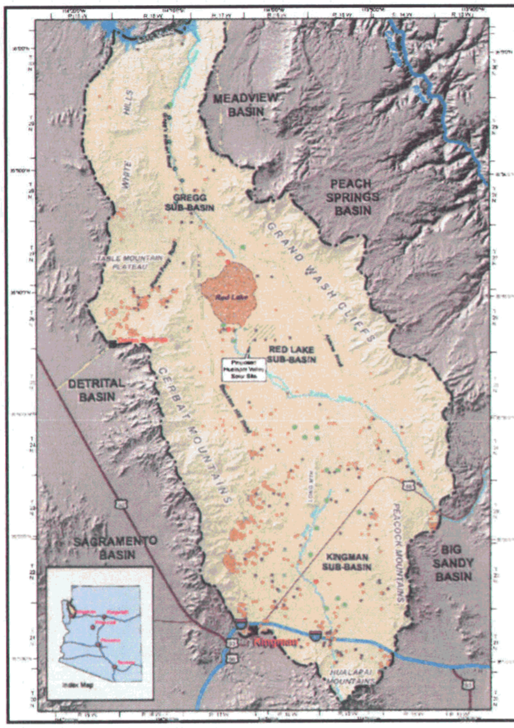
- Technical Memorandum, November 16, 2009, ***Groundwater Flow Model for Hualapai Valley Solar Project, Mohave County, Arizona*** (Exhibit B-1 to Application)
- Addendum, December 2009 (Exhibit HVS-22)

Findings

- Only a minute fraction of groundwater stored in Hualapai Valley is currently used
- Projected impacts to existing wells by the proposed HVS pumping would meet the stringent criteria imposed by the State for AMAs
- After 30 years, the projected impact of HVS pumping is not substantial and is much less than one foot of water level change in the Kingman, Dolan Springs, and Valle Vista areas
- The amount of available groundwater set aside by ADWR for the HVS site land is about twice as much as HVS intends to use annually
- There is sufficient water available in the aquifer to meet the water needs for the life of the Project without significantly impacting other existing groundwater users

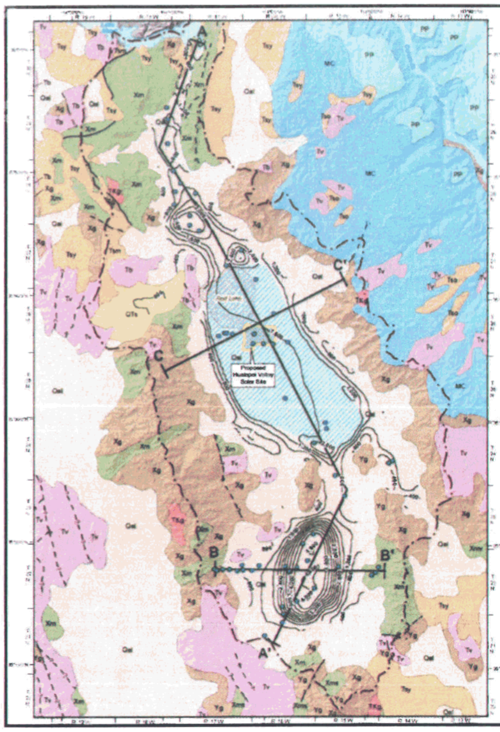
Background of Model Development

- M&A developed model in 2005-2007
- Characterized hydrogeologic conditions
  - Well data
  - Geophysical data
  - Compilation of available hydrologic and geologic data
- ADWR reviewed model over several months
  - Approved in 2007
- Same approved model used for HVS project
  - 3,000 AF/yr is high end of range of HVS water use
  - 2,400 AF/yr anticipated average use for wet-cooled CSP



Location Map

- Site location and wells
- N-NW trending structural basin
- 66 mi x 18 mi (1,212 sq. mi.)
- 3 sub-basins:
  - Kingman sub-basin (south)
  - Red Lake sub-basin
  - Gregg sub-basin (north)
- Groundwater flows north through basin
- Outflow at north end
  - 3,800 AF/yr
- Recharge = Discharge
  - Mountain fronts
  - Major washes

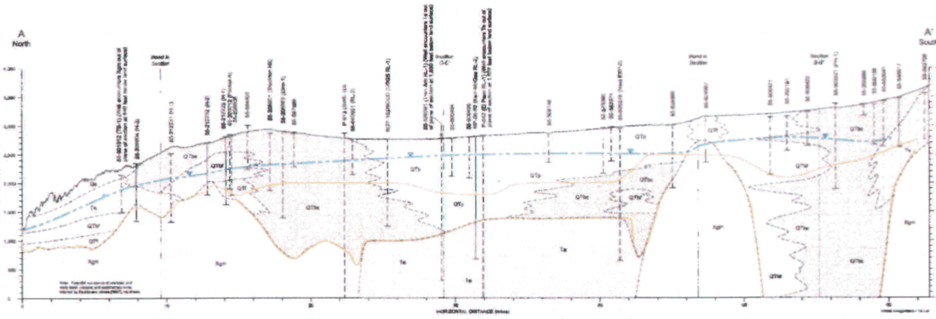


Geologic Features

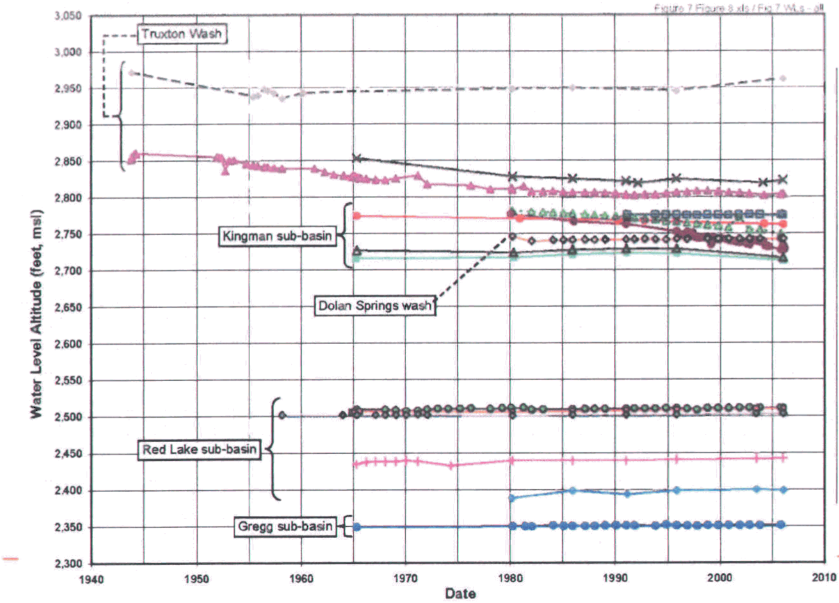
- Basin boundaries
- Site location
- Depth to bedrock contours
  - 3 sub-basins
  - Buried salt deposits
  - Aquifer boundary
- Lines of section
- Groundwater in storage
  - 27.7 million AF total (above salt in middle sub-basin)
  - 15.8 million AF above depth of 1,200 feet
  - 10.5 to 21 million AF estimated by USGS

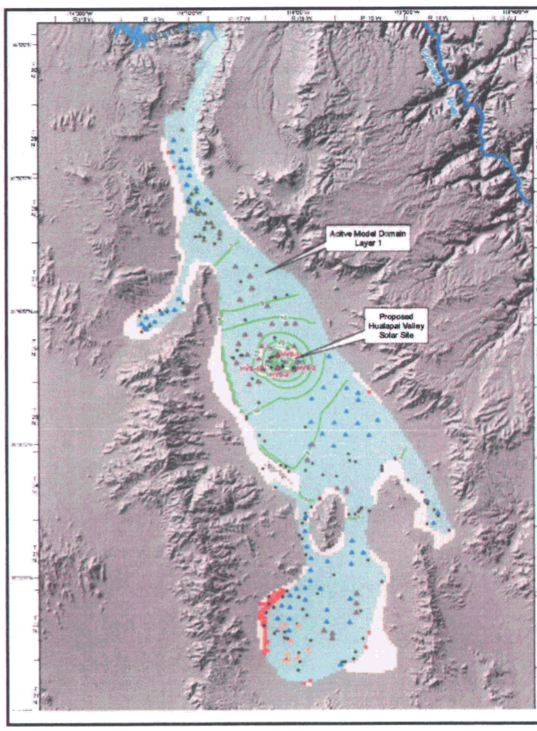
Hydrogeologic Section A – A'

- Water table
- 3 sub-basins
- Salt deposits
- Well data



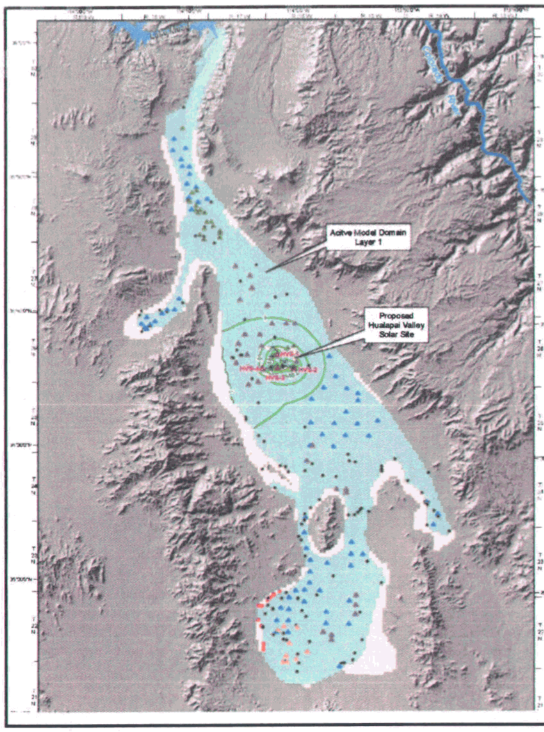
Stable Water Levels Since 1950s





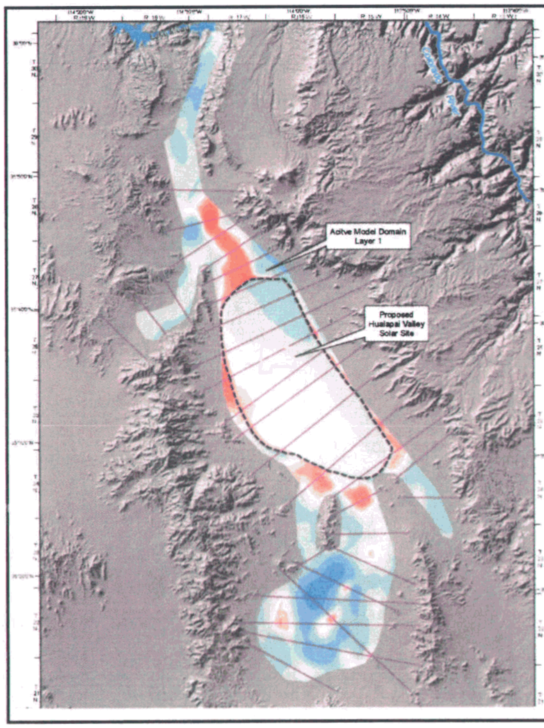
HVS-only in 2042

- Pumping simulated:
  - HVS at 3,000 AF/yr
  - Kingman 3% per year
  - Domestic = 34 AF/yr
  - OCD = 9,763 AF/yr
  - Mardian Ranch & Rhodes Homes 50-yr build out starts in 2012 (50,459 AF/yr in 2042)
  - Total (90,884 AF/yr) more than 3 times that estimated by County Plan
- Maximum drawdown at HVS site 63 ft
- Rapidly diminishing with distance
- <<1 ft drawdown in Kingman, Dolan Springs, Valle Vista
- Developers must account for HVS pumping



HVS-only in 2017

- Complies with stringent well impact criteria of AMAs for existing wells
- <10 ft drawdown in existing off-site wells in first 5 yrs of pumping



ADWR Report, Sept. 2009

- Gravity data shows new bedrock (BR) surface
- Preliminary ADWR data used in model in 2007
- Color coded
  - Blue = model BR deeper
  - Red = ADWR BR deeper
- Similar in Red Lake sub-basin, which most affects model results for HVS pumping
- Effect of differences not substantial, especially in Red Lake sub-basin (~5%)

Findings

- Only a minute fraction of groundwater stored in Hualapai Valley is currently used
- Projected impacts to existing wells by the proposed HVS pumping would meet the stringent criteria imposed by the State for AMAs
- After 30 years, the projected impact of HVS pumping is not substantial and is much less than one foot of water level change in the Kingman, Dolan Springs, and Valle Vista areas
- The amount of available groundwater set aside by ADWR for the HVS site land is about twice as much as HVS intends to use annually
- There is sufficient water available in the aquifer to meet the water needs for the life of the Project without significantly impacting other existing groundwater users

EXHIBIT HVS-10

BEFORE THE ARIZONA POWER PLANT AND TRANSMISSION LINE SITING COMMITTEE

IN THE MATTER OF THE APPLICATION OF HUALAPAI VALLEY SOLAR LLC, IN CONFORMANCE WITH THE REQUIREMENTS OF ARIZONA REVISED STATUTES §§ 40-360.03 AND 40-360.06, FOR A CERTIFICATE OF ENVIRONMENTAL COMPATIBILITY AUTHORIZING CONSTRUCTION OF THE HVS PROJECT, A 340 MW PARABOLIC TROUGH CONCENTRATING SOLAR THERMAL GENERATING FACILITY AND AN ASSOCIATED GEN-TIE LINE INTERCONNECTING THE GENERATING FACILITY TO THE EXISTING MEAD-PHOENIX 500kV TRANSMISSION LINE, THE MEAD-LIBERTY 345kV TRANSMISSION LINE OR THE MOENKOPI-EL DORADO 500kV TRANSMISSION LINE.	)	Docket No. L-00000NN-09-0541-00151 Case No. 151 DIRECT TESTIMONY OF KENDA POLLIO

PREFILED DIRECT TESTIMONY OF KENDA POLLIO

Question 1. Please state your name and business address.

Answer 1. My name is Kenda Pollio, and my business address is 2387 Montgomery Ave, Cardiff, CA 92007.

Question 2. By whom are you employed and in what capacity?

Answer 2. I am employed by kp environmental as a Principal.

Question 3. Please describe your role with respect to the Hualapai Valley Solar Project.

Answer 3. In my capacity as an American Institute of Certified Planner (AICP) and Environmental Consultant I served as the Project Planner and public process coordinator on the Hualapai Valley Solar Project (the "Project').

Question 4. Please describe your educational and professional background and experience.

Answer 4. I have a Bachelors Degree from Florida State University in Urban and Regional Planning and a Masters Degree from University of South Florida in Environmental Policy. I am a Certified planner with over 19 years of environmental consulting experience. I have worked on numerous solar projects and other power plant projects totaling over 100 transmission line and utility projects. I have recently testified before the Siting Committee on the following projects:

- <u>Solar Cases</u>
  - Case 145 Agua Caliente Solar Project
  - Case 139 Solana Solar Generating Station

- Generation Cases
  - Case 141 Coolidge Generating Station
  - Case 114 Wellton Mohawk Generating Facility
- Transmission Line and Substation Cases
  - Case 140 Solana Gen-Tie
  - Case 146 Q43 Substation
  - Case 124 Palo Verde to Pinal West 500 kV Transmission Line
  - Case 126 Pinal West to Southeast Valley 500 kV Transmission Line
  - Case 132 Desert Basin 230 kV Transmission Line
  - Case 136 Sundance to Pinal South 230 kV Transmission Line

Question 5. Please provide an overview of your testimony.

Answer 5. I am going to walk through in chronological order the public process that was undertaken for this Project. As a certified land use planner, I will walk through the CEC Application's environmental exhibits for which I was responsible including Exhibit A, Land Use; Exhibit F, Recreation; Exhibit H, Planned Uses; Exhibit I, Noise and Communication; and Exhibit J, Special Factors. I will also discuss the Mohave County General Plan Amendment that was recently approved by the County Board of Supervisors.

Question 6. Can you start by describing what you did for the public process?

Answer 6. Hualapai Valley Solar ("HVS") conducted an extensive public process for the Project that included extensive outreach efforts intent on distributing information and soliciting input from the public and interested stakeholders. Additionally, the public process was conducted in association with the

Mohave County Major Plan Amendment Process and the NEPA Scoping Process.

This public process included a number of different meeting types and venues that were held in order to gain public input and to respond to questions and comments throughout the process.

Briefing meetings were held with jurisdictional, planning entities, and elected officials to identify issues and concerns associated with the Project. These meetings laid the foundation for working together with the public and stakeholders on the Project. Additionally, Project representatives met with civic organizations and local groups. Over the past year, the Project has had over 50 briefing meetings in and around Kingman.

A Stakeholder Workshop was held to introduce the Project to key individual and organizational Stakeholders in the community, and designed to encourage stakeholders to provide input on the site development and Project issues.

Three Open Houses were held in the community. These Open Houses allowed the public at large to have informal, one-on-one discussions with Project representatives and express concerns, provide input, and receive answers to their questions. Additionally, comment forms were available. Notice of the Open Houses was provided through the local newspaper and individual mailings.

A joint Western Area Power Administration ("Western")/Bureau of Land Management ("BLM") Scoping meeting was held as part of the Project's NEPA process.

Question 7. Did you have ways or tools to engage and inform the public about the Project?

Answer 7. Yes, one of the primary goals of the public process was to identify Stakeholder and general public issues and concerns. To complete this effort, a number of tools and venues were implemented.

- A Project website was developed in order for the general public and Stakeholders to obtain information and provide comment via the website. In addition, Western has a webpage for the Project.
- The Project maintains a 1-800 number that is used to respond to questions and obtain comments from the general public.
- Artist renderings using a 3-Dimensional (3D) model of the Project was developed to provide Stakeholders and the general public a sense of the size and scale of the Project. Comment forms were utilized at meetings to take written comments.
- Project email.

Question 8. Can you walk us through the Applicant-initiated public process, in chronological order?

Answer 8. A Stakeholder Meeting was held on June 30, 2008, from 11:00 a.m. to 1:00 p.m. at the Hampton Inn in Kingman. This meeting included the city, county, state and federal agencies, utilities, school districts, regional planning agencies, and civic, educational and professional organizations.

This purpose of this meeting was to provide Project information and provide an opportunity to obtain comments from Stakeholders. A list of the invitees, the meeting invitation, the agenda, the meeting handouts, meeting sign-in sheets, the presentation, and comment forms received are included in Exhibit J-1 to the Application. Fifty-five people attended this meeting, which included a presentation followed by a question and answer exchange. Although there was a large turnout, we modified the agenda and did not break into small groups, instead staying in the larger group as the attendees preferred to continue the Q&A.

There were three Open Houses conducted in July 2009. Over 190 people attended the three Open Houses, which were held from 5:00 p.m. to 7:00 p.m. in Valle Vista, Kingman and Dolan Springs. These Open Houses allowed the general public to have informal, one-on-one discussions with Project representatives and express concerns, provide input, and receive answers to their questions. Additionally, comment forms were distributed.

The full Public Process Report for the meetings held prior to the start of the NEPA process includes notices of meetings, presentation materials and handouts, and public comment forms. This Report can be found in Exhibit J-1 to the Application.

Question 9. Were there other public meetings associated with the Project?

Answer 9. Yes, there was the County General Plan Amendment Process, which I will discuss in later testimony. This process included several public meetings where the general public was able to learn about the Project and provide public comments.

Additionally, there was the joint Western/BLM Scoping process. A Scoping meeting was held in both open house and presentation formats on October 1, 2009, from 6 p.m. to 8 p.m. at the Kingman High School Auditorium. Thirty-five people attended this meeting. Exhibit J-2 to the Application includes the Draft Scoping Report for the NEPA process.

The Applicant co-sponsored an event with the Kingman Chamber of Commerce on August 13, 2009 hoping to reach an even wider audience. HVS had a booth with information and had Project representatives available to discuss the Project. Over 300 people attended this event.

Question 10. How were these meetings noticed?

Answer 10. The Applicant used a number of methods to ensure the general public knew about the meetings where they could learn about the Project and provide comments. The Open Houses and Scoping meeting were advertised in the following manner:

- Mailer notices were sent to property owners within one mile of the Project and to the zip code within a 10-mile radius of the Project.
- Project flyers/posters were put up throughout Kingman and the Project area (e.g. Dolan Springs, Meadview, Peach Springs, Hackberry, and Valle Vista).
- The Applicant advertised in the Kingman Daily Miner and The Standard newspapers.

- Additionally, the newspapers ran multiple stories throughout this process about the Project and the meetings.
- The Scoping meeting had radio announcements and a press release.

Question 11. Describe how this hearing was noticed.

Answer 11. The hearing was noticed by publication in the *Kingman Daily Miner* on December 1, 2009, and *The Standard* on December 2, 2009. The Affidavits of Publication are marked as Exhibit HVS-2. HVS also put up a sign on the Project Site that provided information about this Committee hearing.

Question 12. Which other parts of the process were your responsibility?

Answer 12. I was the land use planner for the Project and conducted the land use studies as well as a noise study for the Project. Specifically, I prepared Exhibits A, F, H, and I to the Application.

Question 13. Let's start with Land Use and Exhibit A.

Answer 13. The Project site is under the jurisdiction of Mohave County and is entirely on private land. The access road and Gen-Tie crosses some BLM parcels. Existing land use was analyzed for the Project by conducting site visits and working with the Mohave County Planning Department. The existing land use of the Project site is vacant. The Gen-Tie will interconnect within the BLM designated utility corridor.

The Project's planned land use is under the jurisdiction of Mohave County. The Project was under a Rural Development Area (RDA) land use designation (*see* Figure A-3 in the Application). In September 2009, the

Mohave County Planning and Zoning Commission unanimously recommended approval of a Major Amendment to the Mohave County General Plan and Area Plan to change the land use designation for the Project site from a RDA land use designation to an RDA, Rural Industrial (RDA, RI) land use designation. This designation would provide compatible land use for the Project.

The Major Plan Amendment was approved by a unanimous vote of the Mohave County Board of Supervisors on November 16, 2009.

Question 14. What about Planned Land Use?

Answer 14. The Applicant analyzed planned uses within the area by reviewing Mohave County and BLM land use plans. The majority of the Project site is under option by the Applicant. This land was originally intended to be developed as a Planned Area Development (PAD). The PAD for the Red Lake Master Planned Community was approved by the County for residential development. Because of the Project, this Planned Community will not be built on the Project lands.

Other than the Red Lake Master Planned Community, there are no planned local, state, or federal developments in the vicinity of the Project and, therefore, no direct impacts to planned developments.

Question 15. What about Recreational Uses in the area?

Answer 15. The larger Mohave County region is visited by a substantial number of recreational users. However, in the area of the HVS Project there is very little recreational use. There are no Mohave County designated recreational facilities in the area of the Project. The closest recreational area is on BLM land over 13 miles away.

Question 16. Can you also summarize the noise and communication analysis for the project?

Answer 16. Noise impacts were assessed for the CSP Project because this presents the maximum noise impact. Noise generated during the construction phase of the Project would result from the operation of construction equipment and vehicles.

The nearest noise receptors, which are sparsely populated residences, are over one mile from the Project site and property boundary; and over 2.5 miles from the Power Block, which is the main source of noise during construction and operation. The impact from the Project on the sound levels in the area would be minimal. All of the operational noise sources are located within the Power Block. The Power Block will be surrounded by the Project's solar field, which will provide a buffer from the noise source to any potential receptor.

This Project is not expected to generate interference with communication signals due to its remote location. The short Gen-Tie will be one of many transmission lines in the area and will not be sited near any residences.

Question 17. Would your analysis be the same if the Project were constructed as a PV project rather than as a CSP project?

Answer 17. Yes, the impacts are similar or less.

Question 18. Would your conclusions be the same if this Project were constructed in phases?

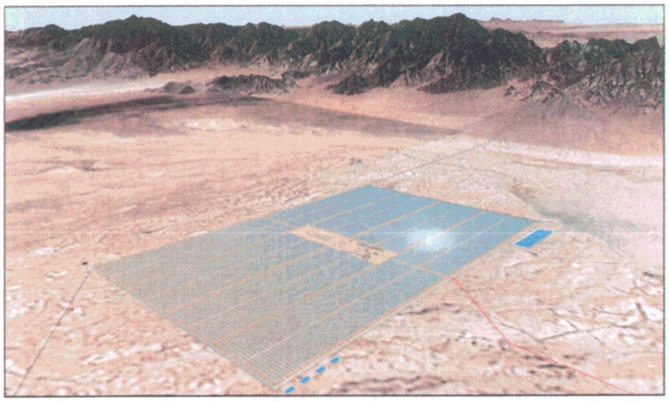
Answer 18. Yes.

Question 19. Does this conclude your testimony?

Answer 19. Yes.

EXHIBIT HVS-11

hualapai valley solar™
a mohave sun power project



Hualapai Valley Solar Project
January 2010 | LSC Hearing | Kenda Pollio

Kenda Pollio - Experience

- Bachelors Degree Urban and Regional Planning, Florida State University
- Masters Degree Environmental Planning, University of South Florida
- American Institute of Certified Planner (AICP)
- 19 Years Experience
- Several Solar Generation Projects
- Over 100 Generation and Transmission Line and Utility Projects

Kenda Pollio – Recent Cases

- Testified Before the Siting Committee

  Solar Cases
  - Case 145 Agua Caliente Solar Project
  - Case 139 Solana Generating Station

  Generation Cases
  - Case 141 Coolidge Generating Station
  - Case 114 Wellton-Mohawk Generating Facility

  Transmission Line and Substation Cases
  - Case 140 Solana Gen-Tie
  - Case 146 Q43 Substation
  - Case 124 Palo-Verde to Pinal West 500 kV Transmission Line
  - Case 126 Pinal West to Southeast Valley 500 kV Transmission Line
  - Case 132 Desert Basin 230 kV Transmission line
  - Case 136 Sundance to Pinal South 230 kV Transmission Line

Summary of Testimony

- Public Process
- Environmental Factors Considered
  - Exhibit A, Land Use
  - Exhibit F, Recreation
  - Exhibit H, Existing Plans
  - Exhibit I, Noise and Communication

Public Process

- Venues
  - Briefing Meetings
  - Stakeholder Workshop
  - Open House Meetings
  - Scoping Meetings
- Tools
  - Websites
  - 1-800 Number
  - Simulations of Project
  - Project Emails

Meetings

- Stakeholder Workshop
  - Held in Kingman on June 30, 2009
  - Over 55 Stakeholders Attended
  - Modified Format Based on Comments
- Open House Meetings
  - Three held in Valle Vista, Kingman, and Dolan Springs in July 2009
  - Over 190 people attended
- Mohave County General Plan Amendment Public Meetings
- Scoping Meeting
  - Held in Kingman in October 2009
  - Over 35 people attended

Public Process Notice

- Mailer Notices
  - Property Owners
  - Zip Code within 10 miles of Project Site
- Posters Throughout Region
- Advertisements in Newspapers
- Public Radio Announcements
- Press Release
- Newspaper Articles

Notice of Hearing Sign

Exhibit A: Land Use

- Jurisdiction and Ownership
- Existing land use
  - Vacant land
- Planned Land Use
  - Mohave County General Plan Amendment and Area Plan approved unanimously by Board of Supervisors
- Compatible Land Use

BLM Corridor Aerial View

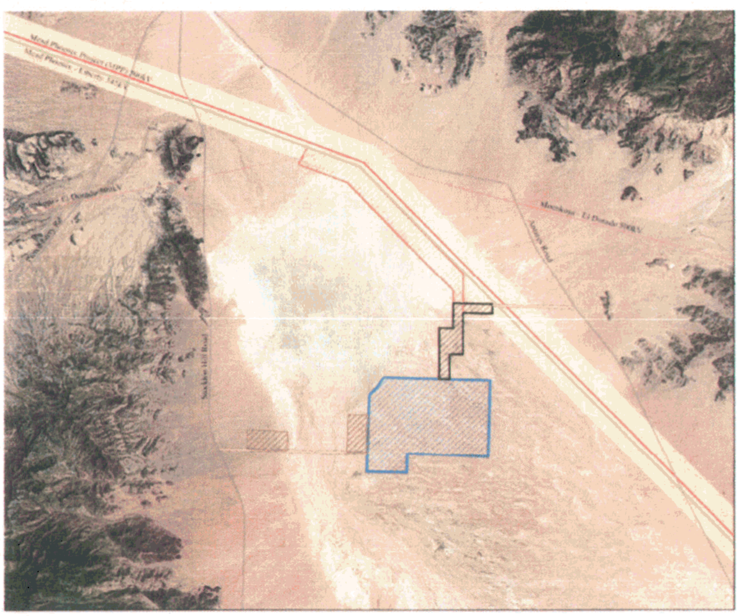


Exhibit H: Planned Uses
Exhibit F: Recreation

- Local, State and Federal Plans
  - No plans in the Project area
- Planned Private Development
  - Site was originally a PAD
  - The PAD would not be built on the Site
- No Direct Impacts to Planned Uses
- No On-site Recreation
- Closest Recreation
  - Closest Designated Recreation is over 13 miles away on BLM land
- No Recreational Impacts

Exhibit I: Noise and Communication

- Noise Impacts Assessed for CSP
- A Few Scattered Residences are Over 2.5 Miles Away from Power Block (primary noise source)
- No Discernible Noise from Project to Residences
- No Impacts to Communication Signals

EXHIBIT HVS-12

BEFORE THE ARIZONA POWER PLANT AND TRANSMISSION LINE SITING COMMITTEE

IN THE MATTER OF THE APPLICATION OF HUALAPAI VALLEY SOLAR LLC, IN CONFORMANCE WITH THE REQUIREMENTS OF ARIZONA REVISED STATUTES §§ 40-360.03 AND 40-360.06, FOR A CERTIFICATE OF ENVIRONMENTAL COMPATIBILITY AUTHORIZING CONSTRUCTION OF THE HVS PROJECT, A 340 MW PARABOLIC TROUGH CONCENTRATING SOLAR THERMAL GENERATING FACILITY AND AN ASSOCIATED GEN-TIE LINE INTERCONNECTING THE GENERATING FACILITY TO THE EXISTING MEAD-PHOENIX 500kV TRANSMISSION LINE, THE MEAD-LIBERTY 345kV TRANSMISSION LINE OR THE MOENKOPI-EL DORADO 500kV TRANSMISSION LINE.	Docket No. L-00000NN-09-0541-00151 Case No. 151 DIRECT TESTIMONY OF MICHAEL WARNER

PREFILED DIRECT TESTIMONY OF MICHAEL WARNER

Question 1. Mr. Warner, please state your name and business address.

Answer 1. My name is Michael Lloyd Warner. My business headquarters are located at 3740 East Southern Avenue, Suite 218, Mesa, Arizona.

Question 2. Mr. Warner, please describe your education and professional background and experience.

Answer 2. I have a Master's Degree in Landscape Architecture with emphasis in Environmental Planning from Utah State University, and a Bachelor's Degree in Agronomy with an emphasis in Plants and Soils from Brigham Young University. I am a member of the American Institute of Certified Planners. I have twenty years of experience working with utilities as an environmental planner, and have broad experience with permitting utility infrastructure with federal and state agencies. I have worked on permitting for more than thirty transmission lines ranging from 60 kV to 500 kV. I have testified before this Committee previously in five cases: the Sandario Transmission Line, Case 125; Carrel Interconnection, Case 129; Vail Area, Case 137; Vail to Valencia, Case 144; and Abel Moody, Case 148.

Question 3. Mr. Warner, by whom are you employed and in what capacity?

Answer 3. I am the founder and president of Transcon Environmental, Inc. I am environmental planner and project manager for the company, working mainly on utility siting and permitting projects.

Question 4. What is your role with respect to the Hualapai Valley Solar Project?

Answer 4. I am the project manager involved in preparing some of the resource studies for the CEC application. Specifically I am the sponsor of exhibits involved with the biology, cultural resources and visual resources. In addition, I am the project manager and third party contractor currently conducting the Environmental Impact Study for the Department of Energy, Western Area Power Administration (Western or WAPA) and Bureau of Land Management (BLM).

Question 5. Mr. Warner, please provide an overview of your testimony.

Answer 5. My testimony will to provide a summary explaining that the Project is compatible with various environmental resources required for examination by Arizona statute, A.R.S. § 40-360.06. Specifically, I will summarize our findings contained in Exhibits C and D to the Application, which examined sensitive and protected biological species along with common vegetation and biological species. I will explain that the Project impacts we found were relatively minor and were compatible.

I will also discuss the findings contained in Exhibit E to the Application, which examined visual and cultural resources, and similarly will present our conclusions that the Gen-Tie and Generating Facility are compatible. I will also review visual simulations prepared as part of Exhibit G to the Application, which depict views identified by federal agency staff and Hualapai Tribal representatives.

Finally, I will review part of Exhibits B and J and include a summary of analysis currently underway by federal agencies as part of compliance with the National Environmental Policy Act (NEPA)

Question 6. Mr. Warner, please describe your analysis of biological resources.

Answer 6. The Project site is within an area dominated by Mohave Desert scrub and semi-desert grassland, and is just outside of the Red Lake Playa. There are no water sources to support fish or aquatic species.

Exhibits C and D to the Application contain a summary of sensitive or special-status species and common species, respectively. There is one endangered species that has the potential to be found in the Project area. The California Condor may forage in this area. Its current known locations, however, are distant (Grand Canyon), and it is a scavenger so the lack of consistent carrion in the area wold make it an unlikely visitor.

In regards to sensitive or special-status species impacts, one BLM sensitive plant, Parish's phacelia, a low-growing annual herb, could occur near the edge or within the Red Lake Playa. However, it was not observed during onsite biological reviews. Potential impacts are considered minimal because the species was not found and would likely occur closer to the Playa, outside of the Project's planned area of disturbance. In addition, we will conduct preconstruction surveys and individuals will be avoided if possible.

BLM sensitive species observed or likely found within the Project area are the Burrowing Owl, Swanson Hawk and bats. Some Burrowing Owls may be displaced by the power plant, but the impacts will be minor because a pre-construction survey will be performed and any owls found will relocated to suitable offsite locations. Swanson Hawks use the area for foraging, but nesting and roosting sites were not observed. Bats are found in the area and likely use the area to forage. Nesting and roosting sites were not found in the area for bats.

The Project's mirrors will not have an impact on wildlife because there purpose is to direct the light and concentrate it in an area unlikely to be occupied by wildlife. The cooling ponds will not substantially impact wildlife because little supporting habitat is present and, therefore, animal frequency is expected to be low.

The two Gen-Tie interconnection sites have similarly low biological impacts. The Generating Facility and Gen-Tie are compatible with biological resources in the area because sensitive or protected species are not likely affected and resource protection measures, such as preconstruction surveys, and avoidance of sensitive areas, will help to reduce these impacts. In addition, common vegetation and biological species are widespread and dispersed. Impacts to common species are minor within the context of the setting.

Question 7. Mr. Warner, how did you evaluate cultural resources?

Answer 7. A Class I report summarizing the previous studies performed in the area was prepared. A summary of those findings are included in Exhibit E to the Application. A Class III pedestrian survey of the Project area is being completed by the Hualapai Tribe for all Project components.

We have worked closely with the Hualapai Tribe to evaluate impacts to areas or cultural resources considered important to the Tribe. Consultation with the Tribe is being performed pursuant to Section 106 of the National Historic Preservation Act.

The two Gen-Tie interconnections have similar low impacts on cultural resources. Corridors are planned sufficiently wide to allow placement and construction that avoids typical cultural resources found in the area. Cultural resources found at the Generating Facility site will be examined, recorded, collected, and archived according to consultation and a Programmatic Agreement between agencies and the Tribe.

Based on current findings and previous surveys, the impacts to cultural and historic resources will be low. Therefore, Project components are compatible with cultural resources.

Question 8. Mr. Warner, please describe your evaluation of visual resources.

Answer 8. A summary of the evaluation is included in Exhibit E to the Application. BLM land in the area is managed as Class IV, which allows the maximum level of modification of any management class in the BLM's Visual Resources Management program. The area is open and the nearest resident is about 2.5 miles away. Scenic areas and resources are distant; for example, Mount Tipton Wilderness Area and U.S. Highway 66, seven and fifteen miles away, respectively. Simulations were prepared for 10 Key Observation Points identified in consultation with the BLM, Western, and the Hualapai Tribe. Simulations are contained in Exhibit G to the Application.

Question 9. Mr. Warner, please describe the visual simulations.

Answer 9. The federal agencies, Hualapai Tribe, and HVS chose the locations from which these views are simulated. These observation points are places from which the Tribe is concerned about the views to the surrounding area and, in some cases, the view is considered sensitive for the Tribe. Application Exhibits G-10 through G-19 provide representative views of the Project.

Question 10. What impact will the Project have on visual resources?

Answer 10. The visual impact of the Generating Facility is low. The mirrors are designed to capture the sunlight and direct it to an area where the energy can be used. Reflection of light off-site is inefficient and therefore is avoided. The effect is that the mirror array appears from a distance like a body of water that also absorbs light. In regards to the other apparatus and power plant features, the scale of the setting and the adjacent existing transmission lines are consistent with the planned facilities in scale and texture. Finally the BLM, through its public process, has designated this area as a Class IV visual management area, which will allow the maximum level of modification to the setting. Therefore, one can expect future uses to be compatible with the planned use of the Project.

The two Gen-Tie interconnections have similar impacts. The Gen-Tie is visually compatible with the visual management objectives for the area and does not contrast with the existing setting or with the three existing extra-high voltage transmission lines that cross the valley. The Project is compatible with the visual setting.

Question 11 Mr. Warner, please identify the other environmental analyses that are being conducted for this Project.

Answer 11. Exhibit B to the Application includes reports prepared for hydrology and water quality, and air quality. In addition, although the Generating Facility and much of the Gen-Tie route will be on private land, the Project triggers the NEPA process because the Project will interconnect into the electrical transmission system managed by WAPA. BLM is considered a cooperating agency because the Gen-Tie and access roads will require a grant of right-of-way to cross some BLM land. The NEPA process commenced in September 2009 with the publication of the Notice of Intent in the Federal Register. The scoping process concluded on October 23, 2009. Exhibit J to the Application includes the draft scoping report, which provides a summary of the process used to notify agencies, tribes, organizations, and individuals about the Project. It also identifies the issues raised for further study as part of the Environmental Impact Study. The NEPA process is expected to be complete in September 2010.

Question 12. Mr. Warner, in your professional opinion, is this Project environmentally compatible?

Answer 12. Yes

Question 13. Would your conclusion be the same if the Project were constructed as a PV project rather than as a CSP project?

Answer 13. Yes, the impacts are similar or less.

Question 14. Would your conclusion be the same if this Project were constructed in phases?

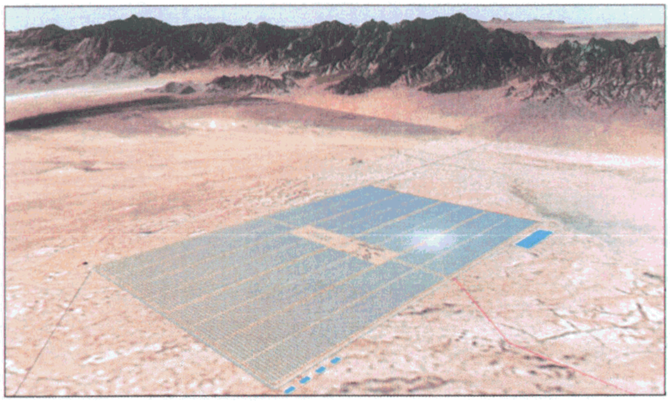
Answer 14. Yes.

Question 15: Does this conclude your testimony?

Answer 15. Yes

EXHIBIT HVS-13

hualapai valley solar™
a mohave sun power project



Hualapai Valley Solar Project
January 2010 | LSC Hearing | Michael Warner

MICHAEL L. WARNER, AICP, ASLA

- MLA Landscape Architecture/Environmental Planning, Utah State University
- BS Agronomy, Brigham Young University
- Member, American Institute of Certified Planners
- Member, American Society of Landscape Architects
- 20 years experience consulting for utilities
- Managed resource, permitting, or siting activities on more than 30 transmission lines from 60 kV to 500 kV
- Managed permitting activities on thousands of miles of utility infrastructure
- Testified before the Committee five previous times
- President of Transcon Environmental, Inc.

SUMMARY OF ANALYSIS

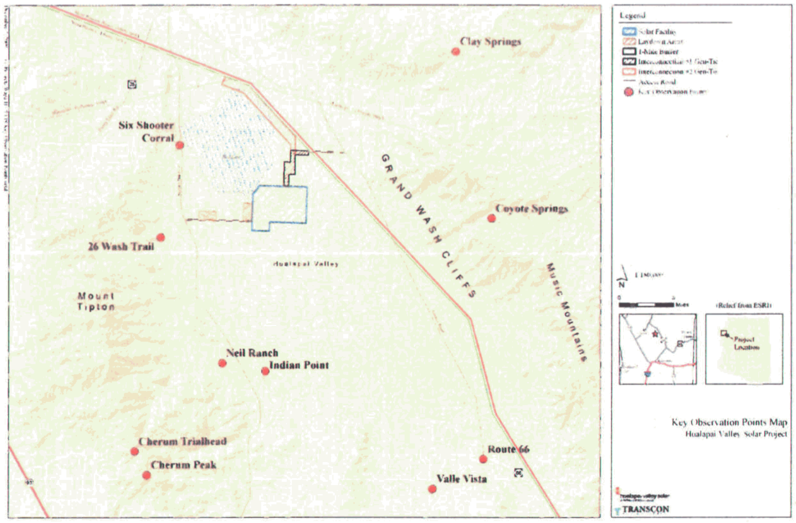
- Examined Biological and Cultural Resources
- Examined Visual Resources
- Determined Environmental Compatibility

BIOLOGICAL AND CULTURAL RESOURCES

- Red Lake Playa

- No significant biological impacts
- Class I survey conducted
- Class III pedestrian survey underway prepared by Hualapai Tribe

SCENIC AREAS AND KEY OBSERVATION POINTS



ROUTE 66

Route 66 - This view is from Route 66 looking northwest down Antares Road. The view is framed by the Music Mountains on the east and the Cerbat Mountains on the west. The simulation depicts the possible view to the northwest of the proposed project Site. The solar generating facility is located on the Hualapai Valley floor approximately 16 miles from this viewpoint.

Hualapai Valley Solar Project

Western AREA POWER ADMINISTRATION

TRANSCON

VALLE VISTA

Photo

Simulation

Valle Vista - This view is from E Concho Rd in the Valle Vista subdivision looking northwest. The view is framed by the Music Mountains to the east and the Cerbat mountains to the west. The simulation depicts the possible view to the northwest of the proposed project site. The solar generating facility is located on the Hualapai Valley floor approximately 16 miles from this viewpoint.

Hualapai Valley Solar Project

Western AREA POWER ADMINISTRATION

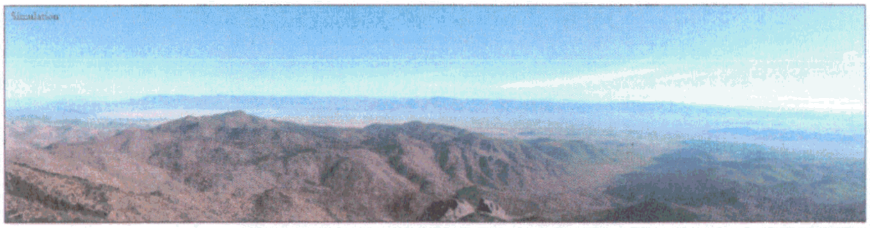
TRANSCON

7

MOUNT CHERUM SUMMIT

Photo

Simulation



Summit of Mount Cherum - This is a view from the top of Mount Cherum in the Cerbat Range. This view is looking northeast. The view extends from the foothills of the Cerbat Range across the Hualapai Valley floor to the Music Mountains. This simulation illustrates the possible view of the solar generating facility at a distance of approximately 14.5 miles.

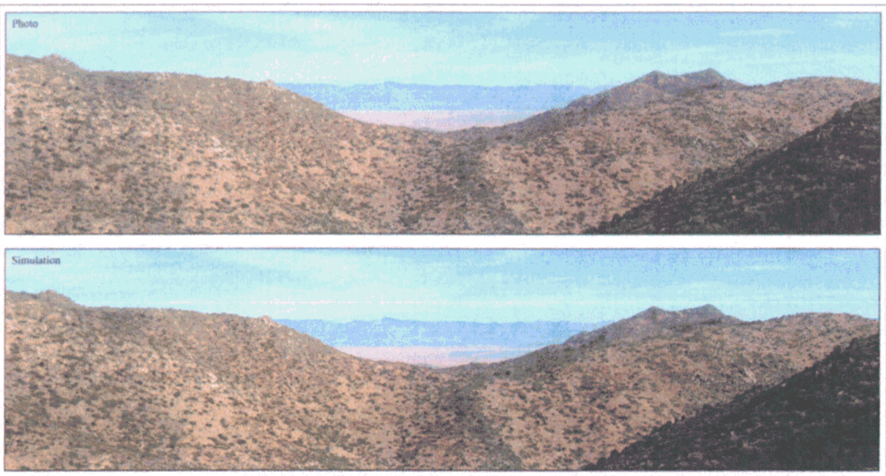
Hualapai Valley Solar Project

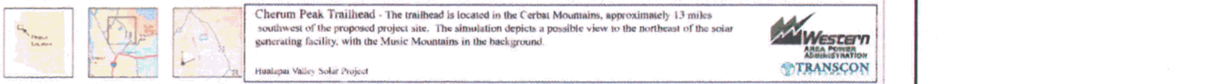
Western AREA POWER ADMINISTRATION

TRANSCON

8

MOUNT CHERUM TRAILHEAD





Cherum Peak Trailhead - The trailhead is located in the Cerbat Mountains, approximately 13 miles southwest of the proposed project site. The simulation depicts a possible view to the northeast of the solar generating facility, with the Music Mountains in the background.

Hualapai Valley Solar Project

Western AREA POWER ADMINISTRATION
TRANSCON

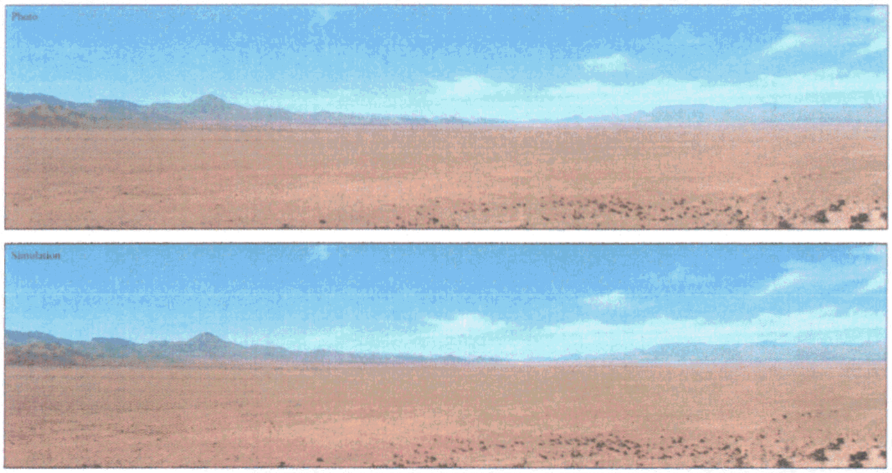
NEAL RANCH

Neil Ranch - This viewpoint at the base of the Cerbat Mountains looks northeast across the Hualapai Valley floor toward the Music Mountains. The simulation depicts a possible view of the solar generating facility from approximately 7 miles away.

Hualapai Valley Solar Project

Western AREA POWER ADMINISTRATION
TRANSCON

INDIAN POINT



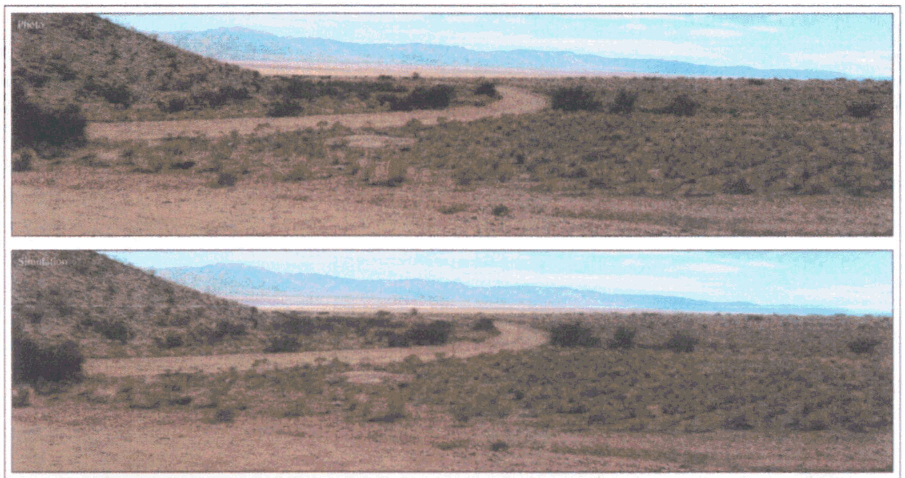
Indian Point - This view looks northeast from the south end of the Hualapai Valley floor toward the solar generating facility. This simulation depicts a possible view of the solar generating facility from approximately 7.5 miles away.

Hualapai Valley Solar Project

Western AREA POWER ADMINISTRATION

TRANSCON

26 WASH TRAIL



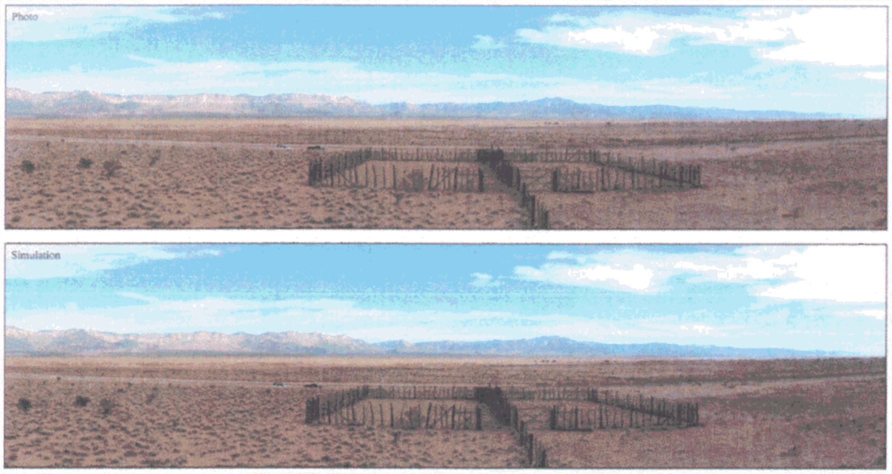
26 Mile Wash Trailhead - This viewpoint is located at the base of the Cerbat Mountains, 7 miles southwest of the proposed project site. The simulation depicts a possible view to the northeast of the solar generating faciltiy, with the Music Mountains in the background.

Hualapai Valley Solar Project

Western AREA POWER ADMINISTRATION

TRANSCON

SIX SHOOTER CORRAL



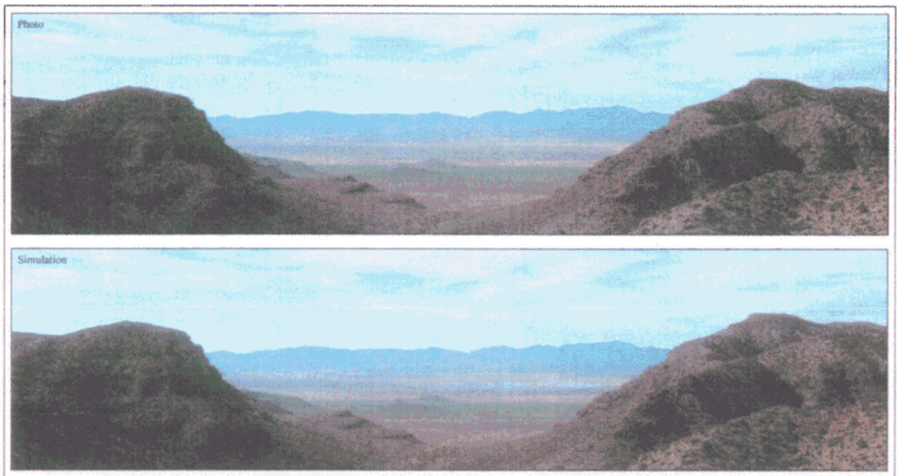
Six Shooter Corral - This viewpoint located at the base of the Cerbat Mountains, 5 miles northwest of the proposed project site. The simulation depicts a possible view to the southeast of the solar generating facility, with the Music Mountains in the background.

Hualapai Valley Solar Project

Western AREA POWER ADMINISTRATION

TRANSCON

CLAY SPRINGS



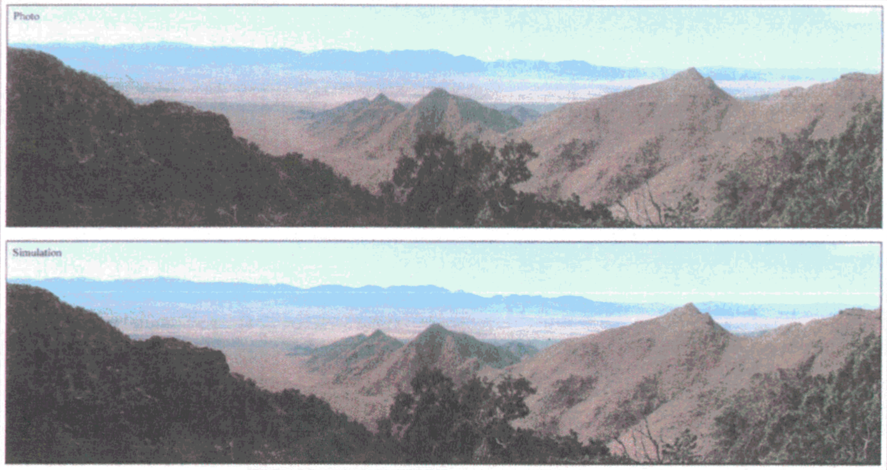
Clay Springs - This viewpoint is located near the west face of the Music Mountains, approximately 11 miles northeast of the proposed project site The simulation depicts a possible view to the southwest of the solar generating facility, located within the Hualapai Valley, and the Cerbat mountains in the background.

Hualapai Valley Solar Project

Western AREA POWER ADMINISTRATION

TRANSCON

COYOTE SPRINGS



Coyote Springs - This view is located on the west face of the Music Mountains, approximately 10 miles southeast of the proposed project site. The simulation depicts a possible view to the northwest of the solar generating facility, located within the Hualapai Valley floor, and the Cerbat Mountains in the background.

Hualapai Valley Solar Project

Western Area Power Administration

TRANSCON

SUMMARY OF COMPATIBILITY

For the Generating Facility and Gen-Tie Alignment

- The Project is consistent with existing plans of the state, local government, and public entities.
- There are no significant detrimental effects to fish, wildlife, plant life, and associated forms of life upon which they are dependent.
- There are no significant detrimental effects associated with noise emission levels and interference with communication signals.
- The Project could be constructed safely and in accordance with all applicable regulations.
- The Project would not result in significant detrimental effects to existing scenic areas, historic sites or structures, or archeological sites.
- The Project is environmentally compatible with the total environment of the Project study area.

EXHIBIT HVS-14

CITY OF KINGMAN, ARIZONA
June 26, 2009

HUALAPAI VALLEY SOLAR LLC
Attention: Greg Bartlett, Managing Director
2701 East Andy Devine Avenue – Suite 300
Kingman AZ 86401
T: 206.349.6068 F: 309.407.1598 / greg@hualapaivalleysolar.com

RE: LETTER OF INTENT FOR THE USE OF EFFLUENT FROM THE HILLTOP WASTEWATER TREATMENT PLANT

Dear Mr. Bartlett:

Hualapai Valley Solar LLC ("HVS") and the City of Kingman ("City") share a common goal: to reuse the effluent created by the City's new Hilltop Wastewater Treatment Plant ("Hilltop").

The purpose of this non-binding Letter of Intent ("LOI") is to summarize our discussions to date and to confirm our respective intentions with respect to future collaborative investigations that may result in a possible future transaction.

1. HVS intends to build and operate a solar thermal power plant ("Power Plant") on private land it has acquired approximately 27 miles north of Kingman. The Power Plant is subject to obtaining required permits and approvals at the federal, state and local level.
2. The Power Plant requires water for both construction and normal operation. Rather than rely on on-site, treated groundwater from the Hualapai Valley Aquifer, HVS could possibly use effluent (treated wastewater) from Hilltop.
3. The City would like to find a productive use of the effluent produced by the new Hilltop Wastewater Treatment Plant (5925 E. Highway 66).
4. HVS has been considering the use of Hilltop effluent for its project. Investigative meetings and discussions have been conducted with the City water department, independent power plant consultants and wastewater experts, and the engineering firm designing the Power Plant.
5. This document is a Letter of Intent to only. It is not intended to be, and shall not constitute in any way, a binding or legal agreement, or impose any legal obligation or duty on either party, until a final, definitive Agreement is negotiated and executed.
6. In no event does this LOI restrict the City from exploring options with other entities or other uses.

Based on the foregoing intentions and expectations, the parties agree as to work together in a collaborative arrangement to further investigate the technical and financial feasibility of delivering Hilltop's effluent (or a portion thereof) to HVS for use in its Power Plant project.

Very truly yours,

MAYOR JOHN SALEM
CITY OF KINGMAN, ARIZONA

City of Kingman	**Hualapai Valley Solar LLC**
John Salem	Greg Bartlett
John Salem, Mayor of Kingman	Greg Bartlett, Managing Director

EXHIBIT HVS-15

MEMORANDUM OF UNDERSTANDING

This memorandum of understanding is made and entered into on this 5th day of January, 2010, between the City of Kingman (a municipal corporation located entirely in Mohave County, Arizona) and Hualapai Valley Solar LLC (a Delaware Limited Liability Company) for the express purpose of defining and delineating the City's and Hualapai's intent to negotiate in good faith the terms listed in this memorandum.

It is the Parties' mutual intent and desire to promote and effectuate an efficient and cooperative working relationship between themselves with the understanding of the practical, administrative and political considerations involved. Neither facility has been completed nor have all permits, inspections, and other rules and regulations been fully complied with in accordance with the applicable standards.

It is the Parties' mutual understanding that the City of Kingman is in the process of updating and expanding the Hilltop Wastewater Treatment Plant (HTWWTP). This process is ongoing and substantial completion is currently scheduled for January 4, 2011. Final completion is scheduled for March 5, 2011. The City of Kingman cannot guarantee any amount of effluent or quality of effluent to Hualapai. All discussion points contained in this memorandum are conditional upon the following non-exhaustive conditions:

1. The completion of the HTWWTP.
2. The ability of the City to store and pump the effluent to the edge of the City's west property line in section 11.
3. The approval of all necessary federal, state, and local rules, regulations, and permits for the construction of the HTWWTP.
4. The approval of all necessary federal, state, and local agencies regarding the operation of the HTWWTP, the sale of effluent, and the transmission of effluent.
5. The construction of the Hualapai Solar Plant.
6. The approval of all necessary federal, state, and local rules, regulations, and permits for the construction of the Hualapai Solar Plant.
7. The approval of all necessary federal, state, and local rules, regulations, and permits necessary for the operation of the proposed Hualapai Solar Plant.
8. The approval of a final binding agreement between the Kingman City Council and Hualapai.

The Parties understand that the City desires to have a means of disposing of effluent to be produced by the HTWWTP as a byproduct in order to comply with applicable environmental laws.

It is the Parties' mutual understanding that Hualapai is desirous of a long-term commitment by the City to provide effluent. Hualapai is requesting a term in excess of 20 (twenty) years.

It is the Parties' mutual understanding that Hualapai is desirous of 100% (one-hundred percent) capacity of the effluent treated by the City. When the new plant is built, the City will have an expected capacity for 1 MGD. If Hualapai Valley Solar is desirous of more than 1 MGD, they will need to obtain additional permitting and build additional treatment capacity. Both Parties understand that the City may only provide a surplus amount of effluent. The City has determined that it must reserve an undetermined amount of effluent for compliance with federal, state, and local regulations and may declare the remaining effluent as surplus for disposal according to mutual agreement.

It is the Parties' mutual understanding that both Parties are in need of additional infrastructure to facilitate this agreement. Hualapai agrees to negotiate in good faith the design, construction, and payment of the infrastructure necessary to store and pump the effluent to the City's west property line, in section 11, if required to facilitate the terms of this memorandum of understanding.

The amount of effluent needed by Hualapai will depend upon the ultimate size of the Hualapai Solar Plant and the extent to which water cooling is used. Whether a final binding agreement is reached will depend upon whether the Parties agree upon price, term, reimbursement provisions, infrastructure obligations and all other material terms.

The Parties of this memorandum of understanding agree to sign this memorandum, to negotiate the terms in good faith that will allow the Parties to reach a mutual understanding for a final binding agreement. This memorandum is binding only in so as far as it requires good faith on both Parties to negotiate for a final agreement. If the Parties fail to reach a final binding agreement by December 31st, 2010, this memorandum of understanding will terminate.

IN WITNESS WHEREOF, the Parties have signed this memorandum of understanding on the dates set forth below.

CITY OF KINGMAN, a municipal corporation of the State of Arizona

JAN 4, 2010
Date Signed

By John Salem
John Salem, Mayor, Kingman Common Council

HUALAPAI VALLEY SOLAR LLC, a limited liability company of the State of Delaware

JAN. 4, 2010
Date Signed

By [signature]
Its Managing Director

EXHIBIT HVS-16

CITY OF KINGMAN
RESOLUTION NO. 4631

A RESOLUTION IN SUPPORT OF GREEN ENERGY

WHEREAS, the rapid decrease in the supply of conventional energy sources such as those that come from fossil fuels has caused the world to concentrate on the development of green (renewable) energy sources; and

WHEREAS, green (renewable) energy is the term used to describe sources of energy that are considered to be environmentally friendly and non-polluting, as well as constantly replenishing; and

WHEREAS, these energy sources include natural energetic processes that can be harnessed with little pollution such as anaerobic digestion, geothermal power, wind power, small-scale hydropower, solar energy, biomass power, tidal power, and wave power; and

WHEREAS, consumers, businesses, and organizations such as the City of Kingman may purchase and support green (renewable) energy in order to support further development, help reduce the environmental impacts of conventional electricity generation, and increase energy independence; and

WHEREAS, if developed further, green (renewable) energy systems can easily supplement all the energy needs of our area today and into the future, which will eliminate dependence on fossil fuels, lower costs of providing power and energy, and help in saving the environment; now therefore,

BE IT RESOLVED that Kingman stands in support of the development of local green (renewable) energy endeavors.

PASSED AND ADOPTED by the Mayor and Common Council of the City of Kingman, Arizona, the 8th day of September, 2009

ATTEST:

Deborah Francis
Deborah Francis, City Clerk

APPROVED:

John Salem
John Salem, Mayor

APPROVED AS TO FORM:

Carl Cooper, City Attorney

CITY OF KINGMAN
INCORPORATED
1952
ARIZONA

EXHIBIT HVS-17

PAGE: 1 of 7 FEE # 2009070631
B: 7634 P: 508
OFFICIAL RECORDS
OF MOHAVE COUNTY
CAROL MEIER,
COUNTY RECORDER
11/18/2009 04:10 PM Fee: $0.00
DOC TYPE: GRES
PAID BY:MOHAVE CTY BD OF SUPERVISORS

RESOLUTION NO. 2009-274

A RESOLUTION SETTING FORTH THE APPROVAL OF A MAJOR AMENDMENT TO THE MOHAVE COUNTY GENERAL PLAN FOR SECTIONS 19, 20, 28, 29, 30, AND N 1/2 OF SECTION 31, AND SECTION 21 EXCLUDING N 1/2 N 1/2 AND SE 1/4 NW 1/4 AND SW 1/4 NE 1/4 THEREOF, IN TOWNSHIP 26 NORTH, RANGE 16 WEST TO CHANGE THE LAND USE DESIGNATION FROM A RDA (RURAL DEVELOPMENT AREA) LAND USE DESIGNATION TO AN RDA, RI (RURAL DEVELOPMENT AREA, RURAL INDUSTRIAL) LAND USE DESIGNATION AND AMENDING EXHIBITS VI.4 AND VI.6 OF THE GENERAL PLAN TO MATCH, CONSISTING OF APPROXIMATELY 6.3 SQUARE MILES IN THE MOHAVE COUNTY GENERAL AREA, MOHAVE COUNTY, ARIZONA.

WHEREAS, at the regular meeting of the Mohave County Board of Supervisors held on November 16, 2009, a public hearing was conducted to determine whether approval should be granted for a major amendment to the Mohave County Plan consisting of the above-described property as requested by Hualapai Valley Solar, LLC., of Tempe, Arizona, representing, Canberra Holdings, LLC, of Las Vegas, Nevada, and

WHEREAS, the area to be amended covers some 4,160 acres of contiguous, private land surrounded by Bureau of Land Management (BLM) holdings and other private parcels. The site lies 25 miles north of the City of Kingman, between Antares and Stockton Hill Roads. The planning area is comprised of generally flat land gradually inclined toward the Truxton Wash to the southwest and the Red Lake Playa to the northwest. The surrounding land uses consist of vacant land with limited single-family dwellings on large parcels, with six homes located within six miles of the project area, and

WHEREAS, the applicant requests the major General Plan amendment to Rural Industrial to allow for the construction of a 340 mW concentrating solar power generation facility. The Mohave County General Plan currently designates the land use as a Rural Development Area, and

WHEREAS, the site is not within a fire district. The site is not served by a water system or a sewer system. The site has access to the Western Area Power Administration electric transmission grid. Access to the site will be from Highway 66, via Anatares Road and an unnamed local road to the east, and from Stockton Hill Road and an unnamed local road from the west , and

WHEREAS, the General Plan requires the Department to evaluate a) the proposal's effect on the character of the neighborhood surrounding the site, b) the proposal's compatibility with adjacent land uses, and c) the capacity of planned services and facilities to accommodate the proposed use. This site is near the Liberty-Mead high voltage transmission line allowing electricity to be delivered to the Western Area Power Administration (WAPA) power grid. Policy 10.5 states Mohave County shall use its planning and development regulations to protect residential neighborhoods from encroachment of incompatible activities or land uses which may have a negative impact on the residential living environment. Conversely, Policy 21.8 requires Mohave County to protect industrially designated areas from encroachment by incompatible uses, such as residential neighborhoods. These two policies are also designed to protect property values and discourage disinvestment, and

WHEREAS, this proposal should generate minimal traffic, create little additional noise or other emissions from the site and be buffered to the northwest by the Red Lake Playa and various sections of BLM and ranch land, and

WHEREAS, Policy 3.5 of the General Plan states that Mohave County will only approve power plants using 'dry cooling' technology when the aquifer is threatened by depletion or subsidence. Added to the General Plan under the auspices of Growing Smarter Plus (ARS 11-823.C.3), this policy is designed to ensure that projected populations, based on land uses shown in the General Plan, are served by an adequate water supply. The applicant is taking measures to reduce demand on the aquifer, and

WHEREAS, Policy 5.2 of the General Plan asks that the County should limit development impacts on environmentally sensitive areas by encouraging innovative designs and mitigation. Natural resource and biological studies are anticipated to be required as a part environmental review. Mitigation measures will be provided as required and based on the findings of these reviews, and

WHEREAS, Policy 6.4 of the General Plan asks that the County should support and encourage solar and wind energy. The amendment will allow renewable energy opportunities and opportunities for reduced carbon emissions in the generation of energy. The amendment is also in keeping the Arizona Corporation Commision's Renewable Energy Standard and Tariff rules, passed in 2006, that requires 15% of the state's energy use be derived from renewable sources, and

WHEREAS, Policy 11.7 of the General Plan states that Mohave County shall only approve requests for rezoning, special permits, the division of land, other new development proposals or public projects that are consistent with the Land Use Diagrams, the policies contained in the Land Use Element and the other Elements of this General Plan, as further set forth in the County's Development Regulations, and

WHEREAS, Policy 13.8 of the General Plan states the County shall consider proposals for rural industrial uses, if such proposed uses provide significant employment opportunities for County residents, do not require the extension of public urban services, do not require a "major source" pollution permit from Arizona Department of Environmental Quality (A.A.C. Title 18, Chapter 2, Article 101(64)), do not mine ground water and are not appropriate for location in a planned industrial area. The solar energy project may provide a maximum of approximately 1,500 jobs during the 2 to 3 year construction period and approximately 100 full-time jobs for the operational phase of the project, and

WHEREAS, Policy 21.4 of the General Plan states that Mohave County should encourage design of commercial and industrial projects that incorporate natural features of the site that use native vegetation and design themes, recycle gray-water and/or harvest rainwater, and that support use of alternative energy sources, as set forth in the Development Regulations, and

WHEREAS, Policy 36.2 of the General Plan states Mohave County should encourage the establishment and/or relocation of diverse industrial and commercial developme, and nts in identified areas of the County consistent with these uses, and

WHEREAS, Policy 36.12 of the General Plan asks Mohave County to pursue and support industries that have smaller environmental footprints as measured by their use of less water and energy resources as well as their creation of fewer emissions when compared to traditional industry. The development of the proposed solar project is anticipated to utilize waters originally planned or anticipated to be used as a part of the Red Lake development proposed American Land Management, et.al. An Analysis of Water Adequacy (File No. 43-402285), dated November 7, 2007, concluded there was sufficient water to a depth of 1,200 feet below the land surface available on a physical, continuos and legal basis to support 223,580 homes per the Arizona Department of Water Resources (ADWR) 100-year water adequacy requirements (ARS §45-108). The Arizona Department of Water Resources analysis assumes 43,432 acre-feet of ground water and 26,161 acre-feet of effluent will be required to support this number of homes each year. Of the 59 square miles evaluated in the northern Hualapai Valley, the analysis included six of the seven sections in this proposal. Assuming an even distribution of residentail building density, the 6.3 square mile project area could support 24,635 homes with 4,785 acre-feet of ground water and 2,882 acre-feet of effluent. On July 6, 2009, the City of Kingman Common Council passed a Letter of Intent which informs the applicant that effluent will be available from the City's soon-to-be upgraded Hilltop Wastewater Treatment Plant. The letter of Intent shows the City's willingness to work with the applicant in a collaborative arrangement to further investigate the technical and financial feasibility of delivering effluent to the site. The solar power plant's estimated use of water is 2,500 to 3,000 acre-feet per year, and

WHEREAS, Policy 37.1 of the General Plan notes the Land Use Element and Area Plans should identify areas designated for future commercial and industrial development, including sites for renewable energy development. Mohave County's solar resources (approximate insolation value of 7.0 kWhrs per square meter per day at the site) allows the efficient deployment of both residential and commercial-scale solar projects, and

WHEREAS, Policy 43.4 of the General Plan asks that water systems should be designed to provide for emergency water needs for fire protection, and

WHEREAS, Policy 49.4 of the General Plan states that developments should not increase runoff from the site where downstream properties will be adversely impacted by the rate of runoff. Mitigation will be provided as required to insure that site runoff meets predeveloped conditions, and

WHEREAS, Policy 50.4 of the General Plan states that the County shall require that flood control/ drainage facilities be designed and constructed to minimize the intrusion of pollutants and excess sediments into sensitive areas and onto adjoining properties, and

WHEREAS, in addition to the above policies, Policy 27.9 of the General Plan states that proposed major amendments will be analyzed for suitability and feasibility. The Board will consider the following in determining the suitability of an application as a major amendment, and

a.) The applicant must demonstrate a perceived benefit or need to the area affected by the major amendment.

b.) The applicant will need to demonstrate sufficient water availability to support at least a 100-year supply to the area as a result of any future development resulting from the amendment, and which will neither pollute nor deplete the aquifer nor drop the water table below the natural recharge coefficient.

c.) The result of the proposed major amendment should provide reasonable continuous support, access, and service, to the location of the amendment so it can be reasonably accessed. The location of development as a result of the amendment should not be so remote that stated goals and policies within predicted time development increments cannot be attained.

d.) The purpose and implementation of the amendment should be in character with the region's current land uses or any previously devised natural balance of open space and current land uses.

e.) Proposed future uses as the result of a major amendment will be expected to be environmentally compatible with their surroundings. These include ensuring that changes and development that result from the amendment will not deplete water resources, particularly from downstream uses, and that protected habitats, riparian areas, and endangered species will not be disturbed or will have approved mitigation measures, and that water and air quality shall be maintained in perpetuity using established standards and requirements.

f.) For proposed major amendments to or in all Development Areas, it will be necessary to demonstrate how future land uses and proposed development as a result of the amendment will provide a cohesive self-supporting community.

g.) For amendments in or to Urban or Suburban Development Areas, the amendment will need to describe future land use development with full infrastructure in a logical development pattern with prescribed time frames for completion or the preliminary development steps to be taken leading toward incorporation.

WHEREAS, comments from the Arizona Department of Commerce regarding the implementation of Growing Smarter law (ARS 11-821) are pending, and

WHEREAS, a review of various FEMA FIRM Panels indicates that the area contains various flood hazard areas, including the Big Sandy Wash and its tributaries, and

WHEREAS, the following described Findings of Fact are for the above-captioned item:

a. All notices have been advertised and posted according to regulations.
b. The Hualapai Valley Solar development team held three public meetings as follows:
   i. July 15, 2009, at Valle Vista Country Club, where 91 people attended.
   ii. July 16, 2009, at Kingman High School, north campus, where 65 people.
   iii. August 7, 2009, at Dolan Springs Community Center, where 42 people attended.
c. Notification for these meetings were done, via mailed invitation, based on the Mohave County Tax Assessor's data records. Mailings were sent to those living in the surrounding area.
d. In addition, a stakeholder meeting was held on June 30, 2009 at the Hampton Inn, Kingman, where 55 people attended
e. The area has multiple forms of legal access.
f. The proposed land uses will be consistent with the planned and the existing, surrounding land uses and the Mohave County General Plan pending the finding of an adequate water supply to support the project and limited grading of site to avoid impeding existing named washes and drainages.
g. Significant environmental features affecting the planning area include the adjacent washes.

WHEREAS, at the public hearing before the Mohave County Planning and Zoning Commission on September 9, 2009 and September 16, 2009 the Commission recommended APPROVAL for a Major Amendment subject to the following:

1. Sections 19, 20, 28, 29, 30, and N 1/2 of Section 31, and Section 21 excluding N 1/2 N 1/2 and SE 1/4 NW 1/4 and SW 1/4 NE 1/4 thereof, in Township 26 North, Range 16 West shall change from a RDA (Rural Development Area) land use designation to an RDA, RI (Rural Development Area, Rural Industrial) land use designation with Exhibits VI.4 and VI.6 of the General Plan amended to match as shown on Exhibit "A".

2. The applicant will provide an evaluation showing that a sufficient water supply exists in the underlying aquifers for the proposed use.

3. The Arizona Corporation Commission (ACC) Power Plant and Line Siting Committee must issue a Certificate of Environmental Compatibility for the proposed electrical generation facility at this site.

4. The applicant shall obtain Aquifer Protection Permit and Air Pollution Permit, if required by state law, from the Arizona Department of Environmental Quality (ADEQ) prior to construction.

5. A Storm Water Pollution Prevention Plan (SWPPP) will be prepared outlining methods for control of sediment and runoff during construction in accordance with National Pollutant Discharge Elimination System (NPDES) requirements.

6. The power plant will connect to the Western Area Power Administration (WAPA) transmission line or other service provider.

7. The proposed development will comply with all Federal, State and local requirements.

WHEREAS, the notice of hearing was published in The Kingman Daily Miner, a newspaper of general circulation in Kingman, Mohave County, Arizona, on November 1, 2009, and was posted on October 30, 2009, as required by Arizona Revised Statutes and the Mohave County Zoning Regulations.

NOW THEREFORE BE IT RESOLVED, that the Board of Supervisors, at their regular meeting on Monday, November 16, 2009, APPROVED this Major Amendment as recommended by the Mohave County Planning and Zoning Commission and outlined herein.

MOHAVE COUNTY BOARD OF SUPERVISORS

ATTEST

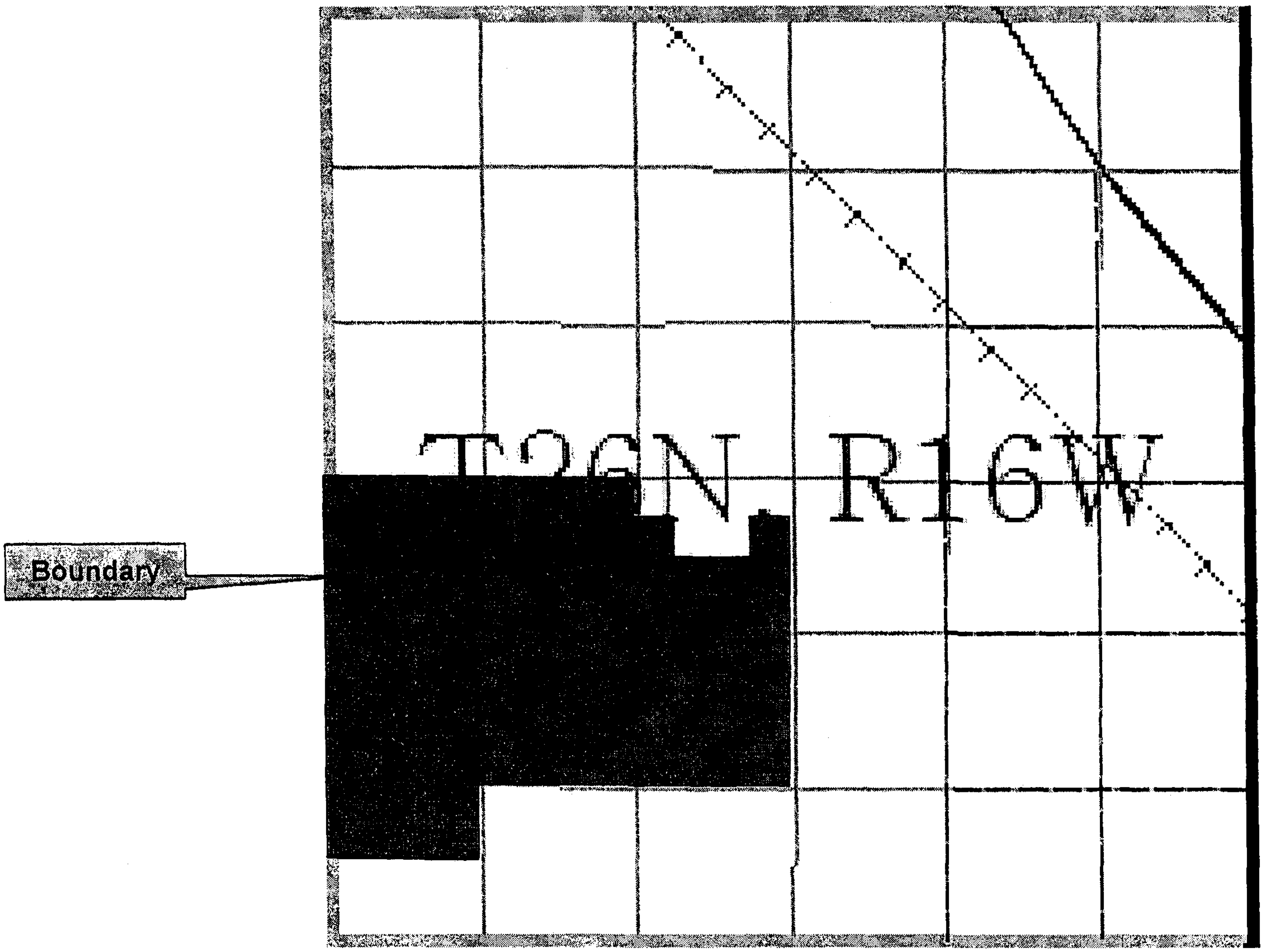
Tom Sockwell

Tom Sockwell, Chairman

Barbara Bracken

Barbara Bracken, Clerk

Exhibit "A"



Evaluation of a request for the approval of a **MAJOR AMENDMENT TO THE MOHAVE COUNTY GENERAL PLAN** for Sections 19, 20, 28, 29, 30, and N 1/2 of Section 31, and Section 21 excluding N 1/2 N 1/2 and SE 1/4 NW 1/4 and SW 1/4 NE 1/4 thereof, in Township 26 North, Range 16 West to change *the land use designation from a* RDA (Rural Development Area) land use designation to an RDA, RI (Rural Development Area, Rural Industrial) land use designation and amending Exhibits VI.4 and VI.6 of the General Plan to match, consisting of approximately 6.3 square miles in the Mohave County General Area, Mohave County, Arizona.

PAGE: 1 of 6 FEE # 2009070632
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OFFICIAL RECORDS
OF MOHAVE COUNTY
CAROL MEIER,
COUNTY RECORDER
11/18/2009 04:10 PM Fee: $0.00
DOC TYPE: GRES
PAID BY:MOHAVE CTY BD OF SUPERVISORS

RESOLUTION NO. 2009- 275

A RESOLUTION SETTING FORTH FOR THE APPROVAL OF THE HUALAPAI VALLEY SOLAR AREA PLAN CONSISTING OF PROPERTIES LOCATED IN SECTIONS 19, 20, 28, 29, AND N 1/2 OF SECTION 31, AND SECTION 21 EXCLUDING N 1/2 N 1/2 AND SE 1/4 NW 1/4 AND SW 1/4 NE 1/4 THEREOF, IN TOWNSHIP 26 NORTH, RANGE 16 WEST FOR A CONCENTRATING SOLAR POWER PLANT ON APPROXIMATELY 6.3 SQUARE MILES IN THE MOHAVE COUNTY GENERAL AREA, MOHAVE COUNTY, ARIZONA.

WHEREAS, at the regular meeting of the Mohave County Board of Supervisors held on November 16, 2009, a public hearing was conducted to determine whether approval should be granted for the adoption of the Hualapai Valley Solar Area Plan consisting of the above-described property as requested by Hualapai Valley Solar, LLC., of Tempe, Arizona, representing, Canberra Holdings, LLC, of Las Vegas, Nevada, and

WHEREAS, the area to be amended covers some 4,160 acres of contiguous, private land surrounded by Bureau of Land Management (BLM) holdings and other private parcels. The site lies 25 miles north of the City of Kingman, between Antares and Stockton Hill Roads. The planning area is comprised of generally flat land gradually inclined toward the Truxton Wash to the southwest and the Red Lake Playa to the northwest. The surrounding land uses consist of vacant land with limited single-family dwellings on large parcels, with six homes located within six miles of the project area, and

WHEREAS, the applicant requests the adoption of a new Area Plan to allow for the construction of a 340 mW concentrating solar power generation facility. The Mohave County General Plan currently designates the land use as a Rural Development Area, and

WHEREAS, the site is not within a fire district. The site is not served by a water system or a sewer system. The site has access to the Western Area Power Adminstration electric transmission grid. Access to the site will be from Highway 66, via Anatares Road and an unnamed local road to the east, and from Stockton Hill Road and an unnamed local road from the west , and

WHEREAS, the General Plan requires the Department to evaluate a) the proposal's effect on the character of the neighborhood surrounding the site, b) the proposal's compatibility with adjacent land uses, and c) the capacity of planned services and facilities to accommodate the proposed use. This site is near the Liberty-Mead high voltage transmission line allowing electricity to be delivered to the Western Area Power Administration (WAPA) power grid. Policy 10.5 states Mohave County shall use its planning and development regulations to protect residential neighborhoods from encroachment of incompatible activities or land uses which may have a negative impact on the residential living environment. Conversely, Policy 21.8 requires Mohave County to protect industrially designated areas from encroachment by incompatible uses, such as residential neighborhoods. These two policies are also designed to protect property values and discourage disinvestment, and

WHEREAS, this proposal should generate minimal traffic, create little additional noise or other emissions from the site and be buffered to the northwest by the Red Lake Playa and various sections of BLM and ranch land, and

WHEREAS, Policy 3.5 of the General Plan states that Mohave County will only approve power plants using 'dry cooling' technology when the aquifer is threatened by depletion or subsidence. Added to the General Plan under the auspices of Growing Smarter Plus (ARS 11-823.C.3), this policy is designed to ensure that projected populations, based on land uses shown in the General Plan, are served by an adequate water supply. The applicant is taking measures to reduce demand on the aquifer, and

WHEREAS, Policy 5.2 of the General Plan asks that the County should limit development impacts on environmentally sensitive areas by encouraging innovative designs and mitigation. Natural resource and biological studies are anticipated to be required as a part environmental review. Mitigation measures will be provided as required and based on the findings of these reviews, and

WHEREAS, Policy 6.4 of the General Plan asks that the County should support and encourage solar and wind energy. The amendment will allow renewable energy opportunities and opportunities for reduced carbon emissions in the generation of energy. The amendment is also in keeping the Arizona Corporation Commision's Renewable Energy Standard and Tariff rules, passed in 2006, that requires 15% of the state's energy use be derived from renewable sources, and

WHEREAS, Policy 11.7 of the General Plan states that Mohave County shall only approve requests for rezoning, special permits, the division of land, other new development proposals or public projects that are consistent with the Land Use Diagrams, the policies contained in the Land Use Element and the other Elements of this General Plan, as further set forth in the County's Development Regulations, and

WHEREAS, Policy 13.8 of the General Plan states the County shall consider proposals for rural industrial uses, if such proposed uses provide significant employment opportunities for County residents, do not require the extension of public urban services, do not require a "major source" pollution permit from Arizona Department of Environmental Quality (A.A.C. Title 18, Chapter 2, Article 101(64)), do not mine ground water and are not appropriate for location in a planned industrial area. The solar energy project may provide a maximum of approximately 1,500 jobs during the 2 to 3 year construction period and approximately 100 full-time jobs for the operational phase of the project, and

WHEREAS, Policy 21.4 of the General Plan states that Mohave County should encourage design of commercial and industrial projects that incorporate natural features of the site that use native vegetation and design themes, recycle gray-water and/or harvest rainwater, and that support use of alternative energy sources, as set forth in the Development Regulations, and

WHEREAS, Policy 36.2 of the General Plan states Mohave County should encourage the establishment and/or relocation of diverse industrial and commercial developments in identified areas of the County consistent with these uses, and

WHEREAS, Policy 36.12 of the General Plan asks Mohave County to pursue and support industries that have smaller environmental footprints as measured by their use of less water and energy resources as well as their creation of fewer emissions when compared to traditional industry. The development of the proposed solar project is anticipated to utilize waters originally planned or anticipated to be used as a part of the Red Lake development proposed American Land Management, et.al. An Analysis of Water Adequacy (File No. 43-402285), dated November 7, 2007, concluded there was sufficient water to a depth of 1,200 feet below the land surface available on a physical, continuos and legal basis to support 223,580 homes per the Arizona Department of Water Resources (ADWR) 100-year water adequacy requirements (ARS §45-108). The Arizona Department of Water Resources analysis assumes 43,432 acre-feet of ground water and 26,161 acre-feet of effluent will be required to support this number of homes each year. Of the 59 square miles evaluated in the northern Hualapai Valley, the analysis included six of the seven sections in this proposal. Assuming an even distribution of residentail building density, the 6.3 square mile project area could support 24,635 homes with 4,785 acre-feet of ground water and 2,882 acre-feet of effluent. On July 6, 2009, the City of Kingman Common Council passed a Letter of Intent which informs the applicant that effluent will be available from the City's soon-to-be upgraded Hilltop Wastewater Treatment Plant. The letter of Intent shows the City's willingness to work with the applicant in a collaborative arrangement to further investigate the technical and financial feasibility of delivering effluent to the site. The solar power plant's estimated use of water is 2,500 to 3,000 acre-feet per year, and

WHEREAS, Policy 37.1 of the General Plan notes the Land Use Element and Area Plans should identify areas designated for future commercial and industrial development, including sites for renewable energy development. Mohave County's solar resources (approximate insolation value of 7.0 kWhrs per square meter per day at the site) allows the efficient deployment of both residential and commercial-scale solar projects, and

WHEREAS, Policy 43.4 of the General Plan asks that water systems should be designed to provide for emergency water needs for fire protection, and

WHEREAS, Policy 49.4 of the General Plan states that developments should not increase runoff from the site where downstream properties will be adversely impacted by the rate of runoff. Mitigation will be provided as required to insure that site runoff meets predeveloped conditions, and

WHEREAS, Policy 50.4 of the General Plan states that the County shall require that flood control/ drainage facilities be designed and constructed to minimize the intrusion of pollutants and excess sediments into sensitive areas and onto adjoining properties, and

WHEREAS, comments from the Arizona Department of Commerce regarding the implementation of Growing Smarter law (ARS 11-821) are pending, and

WHEREAS, a review of various FEMA FIRM Panels indicates that the Area Plan contains various flood hazard areas, including the Big Sandy Wash and its tributaries, and

WHEREAS, the following described Findings of Fact are for the above-captioned item:

a. All notices have been advertised and posted according to regulations.
b. The Hualapai Valley Solar development team held three public meetings as follows:
    i. July 15, 2009, at Valle Vista Country Club, where 91 people attended.
    ii. July 16, 2009, at Kingman High School, north campus, where 65 people.
    iii. August 7, 2009, at Dolan Springs Community Center, where 42 people attended.
c. Notification for these meetings were done, via mailed invitation, based on the Mohave County Tax Assessor's data records. Mailings were sent to those living in the surrounding area.
d. In addition, a stakeholder meeting was held on June 30, 2009 at the Hampton Inn, Kingman, where 55 people attended
e. The area has multiple forms of legal access.
f. The proposed land uses will be consistent with the planned and the existing, surrounding land uses and the Mohave County General Plan pending the finding of an adequate water supply to support the project and limited grading of site to avoid impeding existing named washes and drainages.
g. Significant environmental features affecting the planning area include the adjacent washes.

WHEREAS, at the public hearing before the Mohave County Planning and Zoning Commission on September 9, 2009 and September 16, 2009 the Commission recommended APPROVAL for the adoption of the Hualapai Valley Solar Area Plan subject to the following:

1. The applicant will provide an evaluation showing that a sufficient water supply exists in the underlying aquifers for the proposed use.

2. The Arizona Corporation Commission (ACC) Power Plant and Line Siting Committee must issue a Certificate of Environmental Compatibility for the proposed electrical generation facility at this site.

3. The applicant shall obtain Aquifer Protection Permit and Air Pollution Permit, if required by state law, from the Arizona Department of Environmental Quality (ADEQ) prior to construction.

4. A Storm Water Pollution Prevention Plan (SWPPP) will be prepared outlining methods for control of sediment and runoff during construction in accordance with National Pollutant Discharge Elimination System (NPDES) requirements.

5. The power plant will connect to the Western Area Power Administration (WAPA) transmission line or other service provider.

6. The proposed development will comply with all Federal, State and local requirements.

7. Development of the Area Plan shall show sufficient progress in five (5) years. Sufficient progress is the development of the solar power generation plant. Without such progress, the solar power generation plant portion of the Area Plan will be recommended for reduction in scope or rescission.

WHEREAS, the notice of hearing was published in The Kingman Daily Miner, a newspaper of general circulation in Kingman, Mohave County, Arizona, on November 1, 2009, and was posted on October 30, 2009, as required by Arizona Revised Statutes and the Mohave County Zoning Regulations.

NOW THEREFORE BE IT RESOLVED, that the Board of Supervisors, at their regular meeting on Monday, November 16, 2009, APPROVED this adoption of the Hualapai Valley Solar Area Plan as recommended by the Mohave County Planning and Zoning Commission and outlined herein.

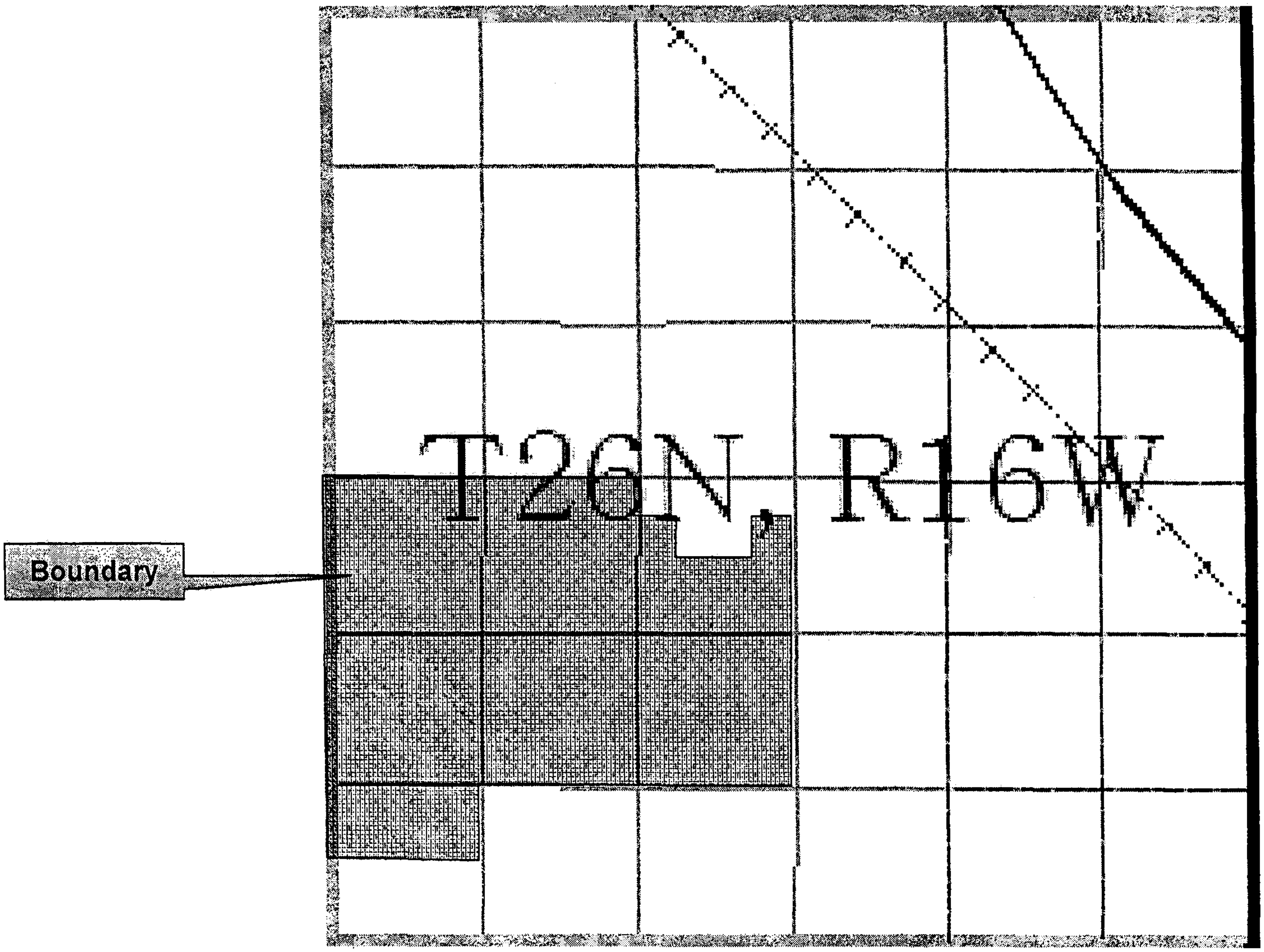
MOHAVE COUNTY BOARD OF SUPERVISORS

ATTEST

Tom Sockwell, Chairman

Barbara Bracken, Clerk

Exhibit "A"



Evaluation of a request for the approval of the **HUALAPAI VALLEY SOLAR AREA PLAN** consisting of properties located in Sections 19, 20, 28, 29, 30, and N 1/2 of Section 31, and Section 21 excluding N 1/2 N 1/2 and SE 1/4 NW 1/4 and SW 1/4 NE 1/4 thereof, in Township 26 North, Range 16 for a concentrating solar power plant, consisting on approximately 6.3 square miles in the Mohave County General Area, Mohave County, Arizona.

EXHIBIT HVS-18

Arizona State Parks

"Managing and conserving Arizona's natural, cultural and recreational resources"

December 30, 2009

L-00000NN-09-0541-00151

PAD / CPA

JAN 0 5 2010

RECEIVED

John Foreman, Chairman
Arizona Power Plant and Transmission Line Siting Committee
Office of Attorney General
1275 West Washington Street
Phoenix, AZ 85007

RE: Docket No. L-00000NN-09-0541-00151
Hualapai Valley Solar Project
State Act Consultation
SHPO-2009-1388 (75718)

Mr. Foreman:

Thank you for initiating consultation with the State Historic Preservation Office (SHPO) pursuant to A.R.S. § 41-864 regarding the application by Hualapai Valley Solar LLC for a Certificate of Environmental Compatibility for the construction of the Hualapai Valley Solar Project and an associated Gen-Tie line interconnecting the generating facility to the existing Mead-Phoenix 500kV transmission line, the Mead-Liberty 345kV transmission line, or the Moenkopi-El Dorado 500kV transmission line in Mohave County, Arizona. We have reviewed the submitted materials and offer the following comments.

The submitted documents include a map indicating the proposed transmission line alternatives will require easements across lands managed by a federal agency, the Bureau of Land Management [BLM] and permits from the federal agency Western Area Power Administration [WAPA], Department of Energy. These will trigger reviews of the undertaking by our office pursuant to the National Historic Preservation Act [Section 106 of 36 CFR Part 800]. The applicant should also be reminded that Arizona State Law requires that if human remains or burial goods are encountered during any ground-disturbing activities, even on private lands [i.e., A.R.S. § 41-865], work in the immediate vicinity must cease and the Director of the Arizona State Museum promptly notified.

We appreciate your cooperation with this office in considering the potential impacts of development on cultural resources situated in Arizona. If you have any questions or comments, please contact me at (602) 542-7140 or electronically at djacobs@azstateparks.gov.

Sincerely,

David Jacobs
Compliance Specialist/Archaeologist
State Historic Preservation Office

CC: Mike Johnson, BLM
Mary Barger, WAPA

Arizona State Parks
1300 W. Washington
Phoenix, AZ 85007

Tel & TTY: 602.542.4174
AZStateParks.com

800.285.3703 from
(520 & 928) area codes

General Fax:
602.542.4180

Director's Office Fax:
602.542.4188

From: Greg Bartlett <greg@mohavesun.com>
Subject: **Fwd: Red Lake Analysis**
Date: September 12, 2009 2:12:41 PM PDT

From: Sandra A. Fabritz <safabritz@azwater.gov>
To: Stephens, Chris
Cc: johnrgall@gmail.com <johnrgall@gmail.com>; Christine Ballard <Christine.Ballard@co.mohave.az.us>
Sent: Wed Sep 09 11:58:15 2009
Subject: Red Lake Analysis

Chris -

I am writing to confirm our discussions regarding the status of the Analysis of Adequate Water Supply No. **43-402285.0000**, issued to American Land Mgt. LLC, a South Dakota limited liability company; Desert Communities, Inc. a Nevada corp; South Dakota Conservancy, LLC a South Dakota limited liability company; Meridian Land, LLC, a Nevada limited liability company (**Red Lake**). The volume of groundwater that was demonstrated to be available for this project is 43,432.33 acre-feet per year. The actual demand of the development was assumed to be 69,593.26 acre-feet per year, with 26,160.93 acre-feet per year of effluent assumed to be available for the 100 year period.

The AAWS was issued on November 2, 2007 and is valid for 10 years from the date of issuance. The AAWS can be extended for two consecutive five year periods thereafter, if progress is being made on the development. During the term of the AAWS, the Department will consider the groundwater volume to be committed demands for all subsequent applications for adequate water supply – meaning subsequent applications must take this volume into account and demonstrate that they will not impact this volume before the Department will issue a determination of adequate water supply. This assumption will remain in place even if the property changes ownership during the term of the AAWS, unless the landowner requests that the AAWS be terminated.

If you have any questions, please feel free to contact me at 602-771-8589.

Sandra Fabritz-Whitney
Assistant Director
Water Management Division
Arizona Department of Water Resources
3550 North Central Avenue
Phoenix, AZ 85012
(602) 771-8589

GREATER PHOENIX
ECONOMIC COUNCIL

[redacted]

September 8, 2009

Mohave County Planning and Zoning
3675 E Hwy 66, Suite A
Kingman, AZ 86402-7000

To whom it may concern,

I would like to express my support for the Hualapai Valley Solar project near Red Lake in Mohave County.

Solar and renewable energy industries will play a large role in determining Arizona's economic future. The county and state will see an economic benefit from this project, as well as from subsequent projects it is likely to draw.

I encourage the Mohave County Planning and Zoning Commissioners to vote in favor of the general plan amendment and area plan.

Sincerely,

Barry Broome

Barry Broome
President and CEO

From: "Brown Drilling" <info@browndrilling.com>
Subject: **SUPPORTING HUALAPAI VALLEY SOLAR LLC**
Date: September 8, 2009 11:09:29 AM PDT
To: <greg@mohavesun.com>

September 8, 2009

Mohave County Planning and Zoning
3675 E Hwy 66, Suite A
Kingman, AZ 86402-7000

We, Brown Drilling, a commercial business of Mohave County, are in **SUPPORT** of the general plan amendment and area plan for Hualapai Valley Solar LLC. We ask that the County Planning and Zoning Commissioners vote in **FAVOR** of the general plan amendment and area plan.

Sincerely,

Brown Drilling
3375 N Bank St
Kingman, AZ 86401
928-757-1920
info@browndrilling.com

From: "John Salem" <jsalem@cityofkingman.gov>
Subject: **Letter**
Date: September 8, 2009 9:26:23 AM PDT
To: "Greg Bartlett" <greg@mohavesun.com>
4 Attachments, 241 KB Save ▾ Slideshow

I, John Salem, a resident of Mohave County, am in SUPPORT of the general plan amendment and area plan for Hualapai Valley Solar LLC. I ask that the County Planning and Zoning Commissioners vote in FAVOR of the general plan amendment and area plan. Mohave County and Kingman has the opportunity to reap the rewards of green technology and the proceeds and jobs that come with it. It appears Mohave Sun has done their homework and is working within the guidelines the community requests for smart, planned growth. Please don't let our county lose out on another valuable project! We need the planned growth, revenue and the jobs! Thank you!

City of Kingman

310 N Fourth Street | Kingman, AZ 86401 | (928) 753-5561

John Salem

John Salem
Mayor - City of Kingman
310 N Fourth St - Kingman, AZ 86401
Office: (928) 753-8102
Email: jsalem@cityofkingman.gov
Web: http://www.cityofkingman.gov

From: Timothy J Troy <TTroy@cbi.com>
Subject: **Support for Hualapai Valley**
Date: September 8, 2009 7:26:27 AM PDT
To: greg@mohavesun.com

Mohave County Planning and Zoning
3675 E Hwy 66, Suite A
Kingman, AZ 86402-7000

I, Timothy Troy, believe in the economic benefits to the state of Arizona of the Hualapai Valley Solar project near Red Lake in Mohave County. I am in SUPPORT of the general plan amendment and area plan for Hualapai Valley Solar LLC. I encourage the County Planning and Zoning Commissioners to vote in FAVOR of the general plan amendment and area plan.

The project will generate construction, operating, and maintenance jobs in the area while providing a source of clean and economic energy.

Regards,

Tim Troy
Business Development Manager
CB&I
3600 Mansell Road, Suite 230
Alpharetta, GA 30022
678-935-3665
ttroy@cbi.com

Stanley Consultants INC.

A Stanley Group Company
Engineering, Environmental and Construction Services - Worldwide

September 8, 2009

Mohave County Planning and Zoning
3675 E Hwy 66, Suite A
Kingman, AZ 86402-7000

I, George Ira Wallace, believe in the economic benefits to the Southwest US in the construction and operation of the Hualapai Valley Solar project near Red Lake in Mohave County, Arizona. The southwest is an incredible source for solar energy and the proposed location for this project meets all the requirements for such a project. I am in SUPPORT of the general plan amendment and area plan for Hualapai Valley Solar LLC. I encourage the County Planning and Zoning Commissioners to vote in FAVOR of the general plan amendment and area plan.

Sincerely,

G. Ira Wallace, P.E.
Stanley Consultants

5820 South Eastern Avenue
Las Vegas, NV 89119
(702) 765-6345
wallaceira@stanleygroup.com

Land Planning | Civil Engineering | Water Resources | Storm Water Engineering
Landscape Architecture | Land Surveying | Construction Services

September 8, 2009

Mohave County Planning and Zoning
3675 East Hwy 66
Suite A
Kingman, AZ 86402-7000

I, Ryan Weed, believe in the economic benefits to the state of Arizona of the Hualapai Valley Solar project near Red Lake in Mohave County. I am in SUPPORT of the general plan amendment and area plan for Hualapai Valley Solar LLC. I encourage the County Planning and Zoning Commissioners to vote in FAVOR of the general plan amendment and area plan.

Sincerely,

COE & VAN LOO
Consultants, Inc.

Ryan Weed, P.E.
Associate, Project Manager

4550 North 12th Street
Phoenix, AZ 85014
602-285-4730
rweed@cvlci.com

RW:cal

From: "Sandy Port" <sport@laughlinranch.com>
Subject: Hualapai Valley Solar
Date: September 7, 2009 3:09:51 PM PDT
To: <greg@mohavesun.com>

Hi Greg,
Attached is the e-mail I have sent in support of the project. I sincerely hope this helps.

Sandy Port

From: Sandy Port
Sent: Monday, September 07, 2009 3:09 PM
To: 'nick.hont@co.mohave.az.us'
Subject: Hualapai Valley Solar

I would like to present this letter of support to you for consideration to approve the project proposed by Hualapai Valley Solar on a site near Red Lake. Our company is a member of BREDA, Bullhead Regional Economic Development Authority, and we feel strongly that growth in an industry such as solar power is sorely needed in our area. We certainly can use the jobs this project would bring to the area, in general, and I am confident our area schools and city, as well as state, coffers would benefit greatly from the tax revenue generated by such an undertaking.

Again, please know that I am in support of the Hualapai Valley Solar project and I encourage the Mohave County Planning & Zoning Commission to approve such a project.

Sincerely,

Sandra Port
Broker
SB Port Investments, LLC (Laughlin Ranch)
(928) 754-7080 ext. 2

From: Philip Wisely <philipwisely@hotmail.com>
Subject: **Support of Amendment to General Plan**
Date: September 8, 2009 10:30:05 AM PDT
To: Greg Bartlet <greg@mohavesun.com>

September 7, 2009

Mohave County Planning and Zoning
3675 E Hwy 66, Suite A
Kingman, AZ 86402-7000

I Philip Wisely, a resident of Mohave County, am in SUPPORT of the general plan amendment and area plan for Hualapai Valley Solar LLC. I ask that the County Planning and Zoning Commissioners vote in FAVOR of the general plan amendment and area plan.

I believe that the use of the treated City of Kingman waste water for cooling this plant is a win-win solution for this community. It not only provides a means of cooling the plant without using groundwater, it potentially improves the future water quality of the Hualapai Valley aquifer.

Sincerely,

Philip G. Wisely, P.E.
Wisely Engineering, P.L.L.C.
6173 N. Hwy 66
Kingman, AZ 86401
email: philipwisely@hotmail.com
cell: 928-715-8246

Subject: Red Lake Solar Complex
From: "David E. Hollingsworth" <landman@citlink.net>
Date: Fri, 4 Sep 2009 08:56:46 -0700
To: <HVS@eraz.us>

To whom it may concern;
I am in total agreement with the proposed solar use on this property near Red lake. All of the infrastructure that we can possibly add into the mix at this crossroads called Kingman, AZ is extremely important for our future. When this infrastructure is green, re-uses the effulent from the City of Kingman and provides jobs it is even more critical that we support it.
David E. Hollingsworth
Broker/Owner
Hollingsworth Properties Inc.

David E. Hollingsworth <landman@citlink.net>
Owner/Broker
Hollingsworth Properties

Prudential
Northern Arizona
Real Estate

2813 E. Andy Devine, Kingman, AZ 86401

Office: 928-718-5800 Cell: 928-412-3445
E-Mail: garydlott@hotmail.com

September 4,, 2009

Mohave County Development Services
3675 E. Andy Devine Avenue
Kingman, AZ 86401

Re: Hualapai Valley Solar Plant

Dear Mr. Chairman and Members of the Planning & Zoning Commission,

As a resident and business owner in Mohave County, this letter is to serve as a letter of support of the general plan amendment for the Hualapai Valley Solar Plant. I live and work in this community and am in support of responsible, planned growth in our area. I ask that you vote in favor of it.

The proposed facility will produce a renewable resource, increase the tax base, and increase employment opportunities for our County. This is the type of industry that our County so desperately needs.

Sincerely,

Gary D. Lott, Realtor
Prudential Northern Arizona Real Estate

Since 1934

ARIZONA CHAPTER ASSOCIATED GENERAL CONTRACTORS

1825 West Adams • Phoenix, Arizona 85007 • (602) 252-3926 • Fax (602) 252-5870

September 3, 2009

Mohave County Planning and Zoning
3675 E Hwy 66, Suite A
Kingman, AZ 86402-7000

The Arizona Chapter of the Associated General Contractors believes in the economic benefits to the state of Arizona of the Hualapai Valley Solar project near Red Lake in Mohave County. I, along with our membership of approximately 200 member firms in the heavy civil construction field, am in SUPPORT of the general plan amendment and area plan for Hualapai Valley Solar LLC. I encourage the County Planning and Zoning Commissioners to vote in FAVOR of the general plan amendment and area plan.

Sincerely,

D DMMt

David M. Martin
President

Arizona Chapter Associated General Contractors
1825 W. Adams St
Phoenix, AZ 85005

602-252-3926
Email – dmartin@azagc.org

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September 3, 2009

Greg Bartlett
Project Director
Hualapai Valley Solar Project
2701 E. Andy Devine Ave., Suite 300
Kingman, AZ 86401

RE: Letter of support Hualapai Valley Solar Project

Dear Mr. Bartlett:

Our Board of Directors wishes to support the Hualapai Valley Solar Project and believe it is a viable and a much needed project for Mohave County, as it brings renewable energy to the region, jobs and tax revenue to the county. The Pro's far outweigh the Con's for this project.

After hearing the presentation to our board, the board unanimously agreed to support the project in any way we can.

Board of Directors:
Greg Bishop, President
Mike Fahey, President-elect
Jennifer Deschacht, Past President
Betty Moir, Vice President
Gabe Corral, Secretary
Sandy Port, Treasurer
Chris Deschacht, Director
Diane Komaneck, Director
Dave Rich, Director
DeeDee Schwab, Director
Tamra Sprague, Director
John Sullivan, Director

Sincerely,

Greg Bishop
President, Oh behalf of the Board of Directors

From: "mchasse@strategicassetsgroup.com" <mchasse@strategicassetsgroup.com>
Subject: **General Amendment Support**
Date: September 7, 2009 10:35:03 AM PDT
To: "greg@mohavesun.com" <greg@mohavesun.com>

September 3, 2009

Mohave County Planning and Zoning
3675 E Hwy 66, Suite A
Kingman, AZ 86402-7000

I, Michael Chasse, believe in the economic benefits to the state of Arizona of the Hualapai Valley Solar project near Red Lake in Mohave County. I have seen numerous solar project presentations for Arizona and find the Hualapai Valley Solar project to be one of the most encouraging for power generation and job creation. I am in SUPPORT of the general plan amendment and area plan for Hualapai Valley Solar LLC. I encourage the County Planning and Zoning Commissioners to vote in FAVOR of the general plan amendment and area plan.

Sincerely,

Michael Chasse

Michael Chasse
President, Designated Broker
Strategic Assets Group, LLC
10401 E. McDowell Mt. Ranch Rd, Suite 2-112
Scottsdale, Arizona 85255
480-664-8833 Office
480-664-8808 Fax
602-300-8202 Cell
mchasse@strategicassetsgroup.com

KELLER WILLIAMS.
REALTY

Sept. 3, 2009

This letter is to let you know that I am in support of the Hualapai Valley Solar project. I feel the project is a healthy project for us to bring to Mohave County. It should bring new jobs as well as substantial tax revenues to our county, just to name a few of the benefits.

Mohave Sun Power has been working diligently and responsibly, developing the project near Red Lake for nearly a year. I would like to see our county leaders come out in support of this worthwhile project and make the recommendation that the Mohave County Planning and Zoning commission approve to move forward.

Sincerely,

Betty Moir

Betty Moir, Realtor

River Cities Specialists
BETTY MOIR
2440Adobe Rd, Ste 106, Bullhead City, AZ 86442
Direct 928-716-4361 Office 928-704-2568 Fax 928-704-2579
bettymoir@realtor.com www.bullhead-homes.com

Richard Zepeda
Commercial Real Estate

Presidio Pointe Group

September 3, 2009

Mohave County Planning and Zoning
3675 E Hwy 66, Suite A
Kingman, AZ 86402-7000

I, Richard Zepeda, believe in the economic benefits to the state of Arizona of the Hualapai Valley Solar project near Red Lake in Mohave County. I am in SUPPORT of the general plan amendment and area plan for Hualapai Valley Solar LLC. I encourage the County Planning and Zoning Commissioners to vote in FAVOR of the general plan amendment and area plan.

With your support, Hualapai Valley Solar can become the first solar plant in Arizona to come on line. Being the first and Worlds largest Solar / Thermal power plant will bring immeasurable benefits to Arizona, the City of Kingman and Mohave County.

Sincerely,

Richard Zepeda
President
PRESIDIO POINTE GROUP
R.ZEPEDA@COX.NET
520-603-7330
14685 S. Avenida Cucana
Sahuarita, Arizona 85629

SUN WEST
BIOFUELS LLC

August 31, 2009

Mohave County Development Services
3675 East Andy Devine Avenue
Kingman, AZ 86401

ATTN: Nicholas S. Hont P.E.

RE: HUALAPAI VALLEY SOLAR

Mr. Hont:

This letter is to serve as a LETTER OF SUPPORT for the proposed 340MW solar power plant (Hualapai Valley Solar project) to be located 27 miles north of Kingman at the Red Lake area.

As I am sure you are aware, this proposed solar plant is a potential customer of ours. Our industry will be the first of hopefully many support industries for this solar plant to locate in Mohave County.

Sun West Biofuels and Hualapai Valley Solar are both dedicated to renewable energy and the future economic growth of Mohave County. We feel this proposed facility and renewable industry as a whole are positive for Mohave County.

We feel that the proactive steps that Hualapai Valley Solar has taken to address public concern and protect natural resources, such as using effluent vs. groundwater and biodiesel vs. fossil fuel are reflective of the types of businesses we want in this county.

Sincerely,

Rick Neal
Managing Director
Sun West Biofuels

City of Kingman

310 NORTH FOURTH STREET • KINGMAN • ARIZONA • 86401 • (928)753-5561
www.cityofkingman.gov

August 12, 2009

The Honorable Steven Chu
U.S. Department of Energy
1000 Independence Avenue SW
Washington, DC 20585

Dear Mr. Secretary,

I am writing in support of the Section 1703 loan guarantee program application of Hualapai Valley Solar LLC ("Hualapai Solar"), a project of Mohave Sun Power LLC, under the Innovative Energy Efficiency, Renewable Energy and Advanced Transmission and Distribution Technologies solicitation. The company submitted their application to the Department of Energy ("DOE") on February 26, 2009.

Given the Hualapai Solar project's potential impact on the economy of the U.S. Southwest – including a significant number of new, green jobs created during construction and operation of the plant – I am requesting that this application be evaluated as quickly as possible.

Hualapai Solar is developing what today would be the world's largest solar power plant, in the Hualapai Valley in northwest Arizona. They are using solar thermal parabolic trough technology that has been in use for over twenty years. The $2.1 billion, 340 MW solar thermal plant will supply enough clean, green electricity to power more than 120,000 homes. Hualapai Solar has already applied for county and state permits, and has held a number of public open houses in the community.

Hualapai Solar has also been taking action to accommodate community concerns over the use of groundwater at the plant. The Kingman City Council recently approved a Letter of Intent with the company to investigate the use of effluent from a new City wastewater treatment plant in lieu of groundwater. The treatment plant could provide as much as 80% of the company's water needs. The company is also investigating the feasibility of using biofuels from a proposed biofuels plant in Mohave County as a backup fuel source, eliminating fossil fuels from the plant altogether.

With the support of the DOE loan guarantee program funds, this project will generate more than 1,500 jobs at its peak during the 3-year construction phase, and provide more than 100 permanent jobs for the operation and maintenance of the plant. These jobs do not include the secondary jobs created by the firms supplying services to the company. An independent study has concluded that the project will result in an annual economic impact of more than $20 million annually to Mohave County and the state of Arizona.

By receiving the requested loan amounts, Hualapai Solar will be able to accelerate the start date of the project and begin impacting the local economy immediately.

Sincerely,

John Salem

Mayor John Salem

EXHIBIT HVS-19

Compact Disc

-Application for Certificate of Environmental Compatibility

Hualapai Valley Solar LLC

<u>TO REVIEW SEE DOCKET SUPERVISOR</u>

DOCKET
L-00000NN-09-0541-00151

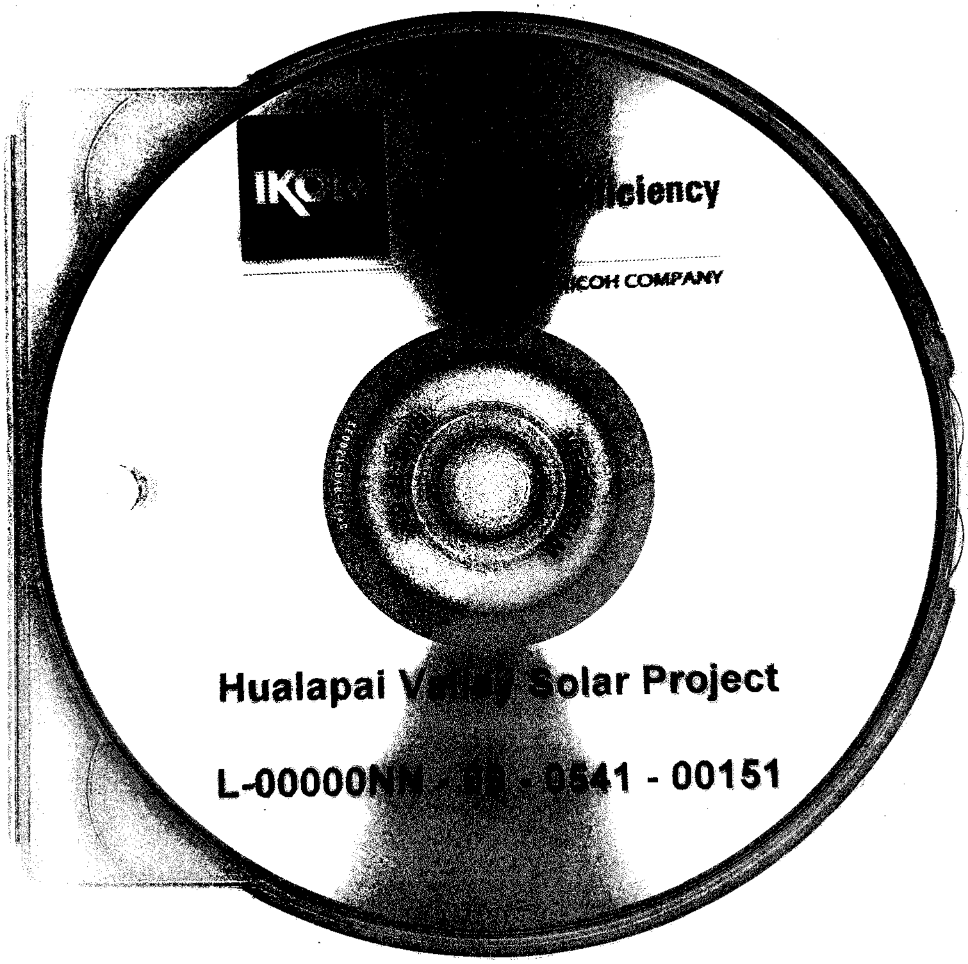

Hualapai Valley Solar Project
L-00000NN - 0541 - 00151

EXHIBIT HVS-20

ARIZONA DEPARTMENT OF WATER RESOURCES
Office of Assured and Adequate Water Supply
3550 North Central Ave., Phoenix, Arizona 85012
Telephone (602) 771-8585
Fax (602) 771-8689

Janet Napolitano
Governor

Herbert R. Guenther
Director

ANALYSIS OF ADEQUATE WATER SUPPLY

November 9, 2007

File Number:	43-402285.0000
Development:	Red Lake
Location:	Township 25 North, Range 17 West, Sections 1, 3, 5, 7, 9, 15, 17, 18, 19, 21, 28, 29, 30, 31 Township 26 North, Range 16 West, Sections 5, 7, 17, 18, 19, 20, 28, 29, 30, 31 Township 26 North, Range 17 West, Sections 3, 5, 7, 9, 13, 14, 16, 17, 19, 21, 23, 24, 25, 26, 27, 29, 31, 33 Township 26 North, Range 18 West, Sections 13, 23, 25, 31, 35 Township 27 North, Range 16 West, Section 31 Township 27 North, Range 17 West, Sections 1, 3, 13, 17, 19, 21, 23, 25, 29, 31, 35 Township 28 North, Range 17 West, Sections 23, 25, 27, 35 Mohave County, Arizona
Land Owner:	American Land Management, L.L.C., a South Dakota limited liability company; Desert Communities, Inc., a Nevada corporation; South Dakota Conservancy, L.L.C., a South Dakota limited liability company and Meridian Land, L.L.C., a Nevada limited liability company

The Arizona Department of Water Resources has evaluated the Analysis of Adequate Water Supply application for Red Lake pursuant to A.A.C. R12-15-712. The proposed development includes 210,700 single-family residential lots and 12,880 multi-family housing units. There are approximately 4,416 acres of non-residential uses such as elementary schools, high schools, 2 golf courses, common areas and parks. The applicant is going to rely on effluent water for the exterior water demand. Conclusions of the review are indicated below based on the adequate water supply criteria referenced in A.R.S. § 45-108 and A.A.C. R12-15-712.

- **Physical, Continuous, and Legal Availability of Water for 100 Years**
  On the basis of the Department's review, the Department has determined that 43,432.33 acre-feet per year of groundwater and 26,160.93 acre-feet per year of effluent will be **physically and continuously available**, which is equivalent to the annual estimated water demand for the development of 69,593.26 acre-feet per year. The application did not include a Notice of Intent to Serve form with the application. Therefore, **legal availability** of the water is not considered proven. Applications for Water Reports that follow the Analysis of Adequate Supply will need to reference this letter. Individual Notices of Intent to Serve will be required for each application for a Water Report.

- **Adequate Water Quality**
  This requirement will be evaluated according to the criteria in A.A.C. R12-15-719 at the time an application for a Water Report is filed. Prior to preparing an application for a Water Report, the Office of Assured Water Supply may be contacted for further guidance.

- **Financial Capability of the Owner to Construct the Necessary Distribution System**
  This requirement will be evaluated according to the criteria in A.A.C. R12-15-720 at the time an application for a Water Report is filed. Prior to preparing an application for a Water Report for an individual subdivision plat, the Office of Assured Water Supply may be contacted for further guidance.

The term of this Analysis of Adequate Water Supply is ten years from the date of this letter and may be renewed upon request, subject to approval by the Department. Throughout the term of this determination, the Department, when reviewing other requests for adequate water supply in the area, will consider the projected demand of this development. The demand projected for this development assumes that the conservation measures the applicant has identified to the Department will be required for the homes in this development, including the effluent use requirements for public parks, large turf areas and golf courses and low water use landscaping on the property. Additionally, it must be noted that based upon the limited hydrogeologic data available for the proposed development area, the amount of groundwater that may be physically available to 1,200 feet below land surface for this project may be limited. As additional hydrogeologic data becomes available, applications for Water Reports and the determination of physical availability in this analysis may be affected by that additional data.

Prior to obtaining plat approval by the local platting authority and approval of the public report by the Department of Real Estate, a Water Report must be obtained for each subdivision plat. The findings of this Analysis of Adequate Water Supply may be used to demonstrate that groundwater and treated effluent supplies are physically available for at least 100 years for purposes of an application for Water Report, unless new hydrogeologic data indicates otherwise. Applications for Water Reports that follow the Analysis of Adequate Supply will need to reference this letter. This determination may be invalidated if the development plan or other conditions change materially prior to filing for a Water Report.

Questions may be directed to the Office of Assured/Adequate Water Supply at (602) 771-8585.

Sandra Fabritz-Whitney

Sandra Fabritz-Whitney, Assistant Director
Water Management Division

cc: Greg Wallace, Errol L. Montgomery & Associates, Inc.
Office of Assured and Adequate Water Supply
Nicole Swindle, Legal Division
Joan Card, Assistant Director, Arizona Department of Environmental Quality
Steve Olea, Assistant Director, Arizona Corporation Commission
Roy Tanney, Assistant Director, Arizona Department of Real Estate
Karl Taylor, Director, Subdivisions Division, Mohave County Planning and Zoning

EXHIBIT HVS-21

Concentrating Solar Power Commercial Application Study:
Reducing Water Consumption of Concentrating Solar Power Electricity Generation

Report to Congress

U.S. Department of Energy

This report is being disseminated by the Department of Energy. As such, the document was prepared in compliance with Section 515 of the Treasury and General Government Appropriations Act for Fiscal Year 2001 (Public Law 106-554) and information quality guidelines issued by the Department of Energy. Though this report does not constitute "influential" information, as that term is defined in DOE's information quality guidelines or the Office of Management and Budget's Information Quality Bulletin for Peer Review (Bulletin), the study was reviewed internally prior to publication.

Table of Contents

Executive Summary

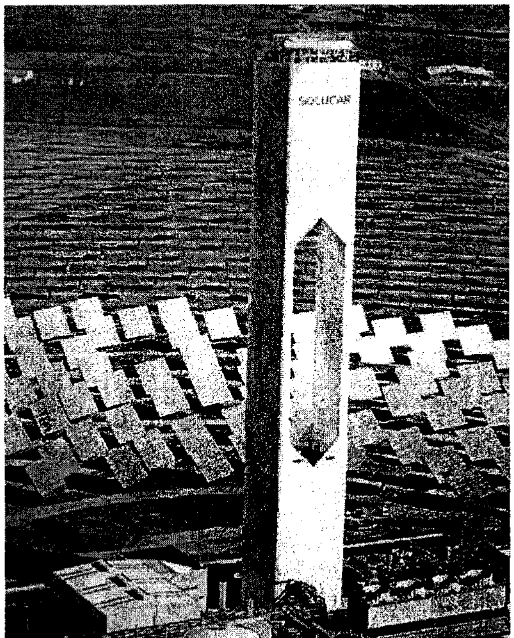
This report has been prepared in response to section 603(b) of the Energy Independence and Security Act of 2007, (Pub. L. No. 110-140), which states that *"...the Secretary of Energy shall transmit to Congress a report on the results of a study on methods to reduce the amount of water consumed by concentrating solar power systems."*

Because of the huge solar resource available in the Southwest United States, utilities are showing increasing interest in the deployment of concentrating solar power (CSP) plants to meet the requirements of state renewable portfolio standards. The Federal government is also encouraging the development of CSP plants through a 30% investment tax credit.

This report discusses potential methods to reduce water consumption associated with CSP. Four main concentrating solar power technologies are described in this report: parabolic troughs, linear Fresnel, power towers, and dish/engine. Parabolic troughs are the most commercially available technology. Linear Fresnel and power tower technologies are presently being planned as commercial plants, but none have yet been built in the U.S. The first three of these technologies use the heat collected from the sun to power conventional Rankine steam cycles, similar to those used for coal and nuclear plants. Steam cycle power plants require cooling to function (cooling is needed to condense the steam and complete the cycle). This cooling can be provided via water cooling, air cooling or a combination. Dish/engine systems use sunlight to power a small engine at the focal point. Stirling cycle engines using hydrogen as the working fluid are typically employed in dish/engine systems. These are air-cooled and only require water for mirror washing.

Water cooling for thermoelectric power plants is accomplished using two methods: once-through cooling and recirculating evaporative cooling. Once-through cooling withdraws large volumes (23,000 to 27,000 gal/MWh) from a body of water and returns it to that source at an elevated temperature, which causes additional evaporative loss from that body of water. Recirculating evaporative cooling withdraws a lesser amount (500 to 650 gal/MWh for an equivalent plant) but consumes most of the water directly through evaporation.[1] It should be noted that once-through cooling may be restricted in use for new thermoelectric power plants based on concerns with the potential aquatic environmental impact of such systems.[2]

Air cooling rejects the heat of the steam cycle directly to the air. A fossil power plant using this technology withdraws water only for the steam cycle blowdown and domestic water uses, which amount to less than 10% of the consumption of an evaporative cooled plant.[3]



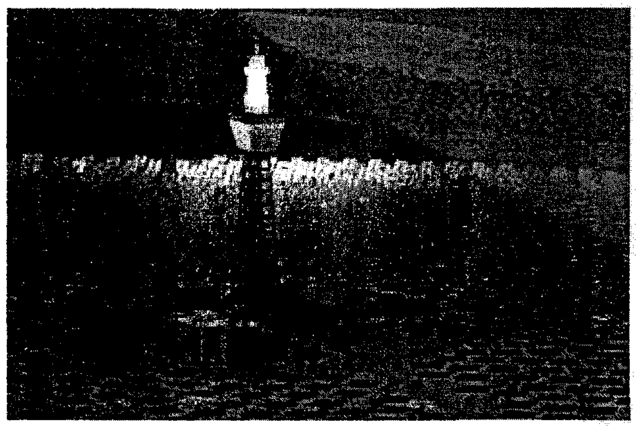
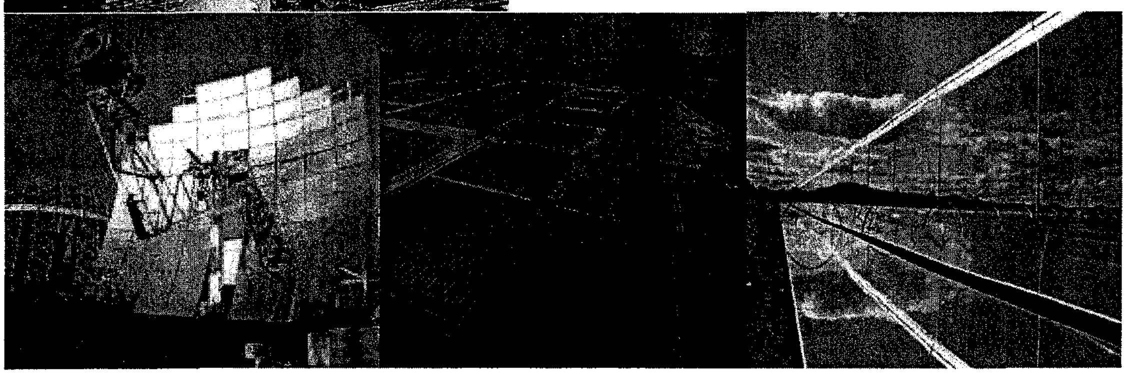


Figure 1: Above, power tower pilot project, pioneered in the U.S. (Barstow, CA) and (left) commercial unit under development by Abengoa called PS10, an 11 MW plant in Sevilla Spain (photo credit: Abengoa Solar). Bottom left, Stirling Dish/Engine, Center SEGS trough plants, Right, Compact Linear Fresnel Reflector.



As with fossil and nuclear power plants, water cooling is generally more economical than air cooling for CSP plants because water cooling has a lower capital cost and higher thermal efficiency, and it maintains consistent efficiency levels year-round. In contrast, air cooling has reduced effectiveness when the air temperature is high. In the current commercial CSP plants, water is required to condense steam, provide make-up water for the steam cycle, and for mirror washing. The regions where CSP is most effective are those that have many hours of direct sunlight; these places often have relatively little water. Supplying water from more distant sources or purifying low quality water for CSP systems that use conventional water cooling can then increase costs. This report discusses various options by which CSP systems can operate efficiently with significantly less water consumption than they consume today.

The majority of new fossil power plants use evaporative water cooling to reject the steam cycle heat. A typical coal plant or nuclear plant consumes 500 gallons of water per MWh (gal/MWh) of electricity generated.[1, 3] This is similar to the water consumption by a power tower. A combined-cycle natural gas plant consumes about 200 gal/MWh.[4] A water-cooled parabolic trough plant consumes about 800 gal/MWh. Of this, 2% is used for mirror washing.[5] Dish/engine systems only require water for mirror washing (approximately 20 gal/MWh).

To address water limitations and environmental regulations, air cooling can be used for new thermoelectric power plants, which eliminates over 90% of the water usage.[6] The typical dry-cooled plant routes turbine exhaust steam directly to finned tubes on air-cooled condensers. A study of a dry-cooled parabolic trough plant located in the Mojave Desert concluded that dry cooling would provide 5% less electric energy on an annual basis and increase the cost of the produced electricity by 7 to 9%.[7] However, the results are location-specific. For example, air cooling at a site in New Mexico would increase the cost of electricity by only 2% because maximum daytime temperatures are considerably lower there than in the Mojave Desert.[8]

The performance penalty of using air cooling also varies by technology. One study projected the annual electric output of a trough plant to drop by 4.6%, whereas that of a power tower to drop by only 1.3%. A simple model analysis estimates the differences between trough and tower technology using dry cooling will only differ by 0.5%.[9] The economic consequences will vary with climate which impacts the cooling system performance, water conditions which affects the cost of water treatment for an evaporative cooling tower, and depend on the premium value of delivered electricity during peak demand consequent with high ambient temperatures. One study showed that the net present value of an air-cooled CSP plant can be improved by using a larger collector field which offsets the lower steam cycle efficiency resulting in higher power output during peak summer hours.[10]

Hybrid wet/dry cooling systems use some combination of wet and dry cooling to reduce water consumption. Several recent plants built to conserve water have used a parallel cooling system (PCS), which uses both an air cooler (typically smaller than that use for air-cooled-only plant) and a small wet cooling tower operating in parallel for use during the summer.[11] In hot weather, the steam exiting the turbine is split with one portion routed to the air-cooled condenser and the other stream routed to the water cooled condenser with heat rejection to an evaporative cooling tower. A model study for a parabolic trough CSP power plant, showed this reduces water consumption 50% with only a 1% drop in annual electrical energy output, or 85% with only a 3% drop in output. For the latter case, the levelized electricity cost would increase about 5% compared to a water-cooled plant, or somewhat less than the cost penalty estimated for a direct dry cooling plant.[12]

Air cooling and wet/dry hybrid cooling systems offer highly viable alternatives that could reduce the total water usage of steam-generating CSP plants by 80 to 90% at a penalty in electricity cost in the neighborhood of 2 to 10%, depending on plant location and other assumptions.[13] The penalty for linear Fresnel designs has not yet been analyzed, but is expected to be somewhat higher than for troughs because of its lower operating temperature. Conversely, power towers would have a lower cost penalty because of their higher operating temperature. Additional research and development (R&D) and field experience should further decrease the need for water and help achieve cost penalties closer to the lower ends of these ranges.

Introduction

This report has been prepared in response to the Energy Independence and Security Act of 2007 (Pub. L. No. 110-140), section 603(b), which states:

> *"(b) Water Consumption- Not later than 6 months after the date of the enactment of this Act, the Secretary of Energy shall transmit to Congress a report on the results of a study on methods to reduce the amount of water consumed by concentrating solar power systems."*

Water consumption is an issue with concentrating solar power plants because they are most cost effective in locations where the sun is most intense, which in turn often corresponds to places like the Mojave Desert where there is little water. As shown in Figure 2, the Southwestern United States has excellent solar resources and is coincident with high demand centers. Solar energy is the largest available renewable energy resource in the Southwest region; it is so widespread that Concentrating Solar Power (CSP) projects covering 1.4% of southwestern land could potentially generate as much power as used in the entire U.S.[14] California, for example, has excellent solar resources in the southern part of the state. The issue of the availability of water in this rapidly growing area, however, has caused California to place restrictions on power plant water use. [15] Other Southwestern states may also eventually impose restrictions on the amount of water available for use by power plants.

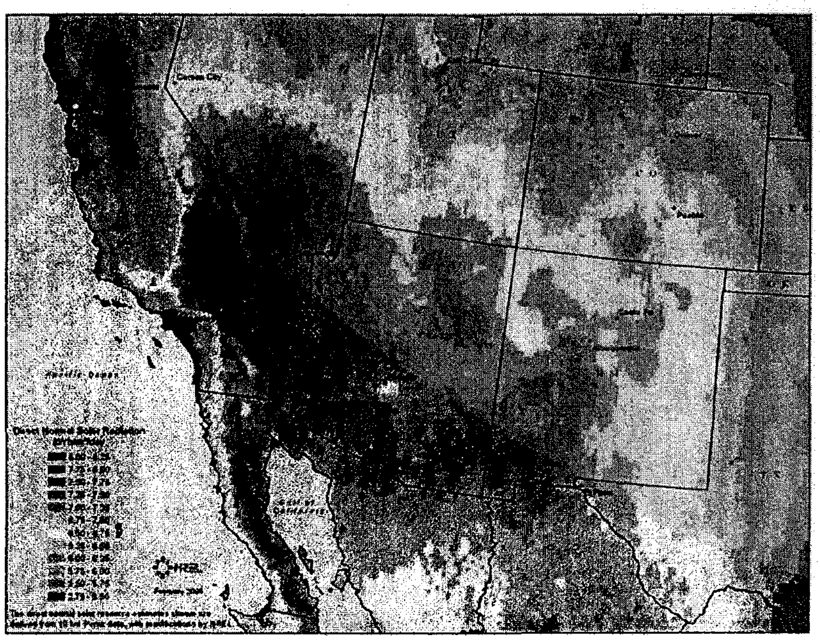


Figure 2: Solar Intensity in the Southwest

This report attempts to identify concerns regarding water consumption for CSP, presents information on the water requirements of electrical power generation, and discusses technologies that address water use in the context of CSP power generation.

Peak power demand, particularly in California, Nevada and Arizona, is approaching system capacity and growing rapidly. It is expected that renewable energy sources will increasingly be tapped to meet market and regulatory demands. Many of the Southwestern states have established renewable portfolio standards (RPS) that encourage the development of technologies like CSP. RPS requirements now exist in 26 states and the District of Colombia, as shown in Figure 3.

Figure 3: State Renewable Portfolio Standard requirements (Union of Concerned Scientists)

CSP power plants employing parabolic trough technology have been performing reliably on a commercial scale in the Southwestern United States for more than 15 years.[16] Currently there are over 400 MW of generating capacity installed that are producing electricity on a utility scale, and there are power purchase agreements signed to construct an additional 4,000 MW over the next decade. Some of the benefits of CSP technology is that it can provide power during peak demand periods. Problems of solar intermittency can be overcome with thermal storage or hybridization with natural gas, allowing plants to dispatch power to the grid into the evening hours.

All of the existing commercial CSP power plants in the U.S. are parabolic trough systems that use a Rankine steam cycle to convert their thermal energy to electricity. This part of the solar plant, referred to as the power block, is similar to that used by coal, natural gas, and nuclear power plants. These power plants achieve the highest efficiencies when they are water-cooled. All operating CSP plants in the U.S. employ evaporative water cooling. The use of water for power plants is becoming constrained.[17] For the CSP industry, there is a strong incentive to investigate alternative cooling approaches that minimize the use of water. The most promising of those approaches will be discussed later in this report.

Concentrating Solar Power Technologies

There are four primary CSP plant designs – solar trough, linear Fresnel, power tower, and dish/engine. All designs use a small amount of water for mirror washing.[18] The first three of these technologies operate a steam cycle and require some water for steam makeup and, when they are water-cooled, require a substantial amount of water for heat rejection in a similar way as do water-cooled fossil and nuclear plants.[19] The Rankine steam cycle is typical of what is employed in a fossil fueled power plant. Utility managers are thus familiar with the power-generating portion of these plants. Thermal storage can be integrated with these three systems, to enhance dispatchability, allowing the solar plant to produce electricity into the night to meet peak demand periods.

Parabolic Troughs

Parabolic trough systems concentrate solar radiation, specifically direct normal insolation (DNI), onto a receiver tube located along the focal line of a single-axis tracking parabolically curved, trough-like reflector. Heat transfer fluid flowing through the receiver tube absorbs the thermal energy. The heat is collected and used to generate steam which is produces electricity by a Rankine cycle turbine-generator. Trough systems can be hybridized (natural gas can be burned to produce steam when the sun isn't shining) or can use thermal storage to dispatch power to meet utility peak load requirements (Figure 4).

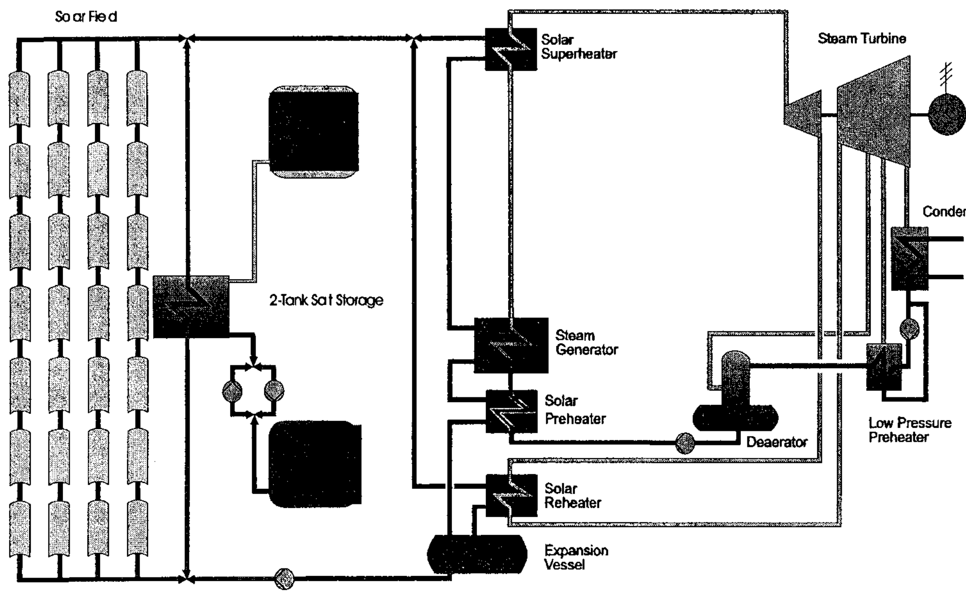


Figure 4: Parabolic trough system schematic

The operating temperature of trough plants is limited by the thermal property of the heat transfer fluid (HTF) that is suitable for pumping through miles of piping in the solar field. In typical applications, oil flowing through the receiver tube is heated to about 390°C and used to boil water to produce steam. The resulting steam is used in a Rankine power cycle and expanded through a turbine connected to an electric generator. As with any steam cycle, the exhaust steam is cooled and condensed back to liquid water to be recirculated in the cycle. The condensers can be either water-cooled or air-cooled, or a hybrid combination. Parabolic trough systems are the most developed and commercially tested technology and have operated at a capacity of 350 MW in the Mojave Desert for over 15 years. A new 64 MW trough plant was recently built near Las Vegas (Figures 5 and 6). A number of large trough projects are being planned in the Southwestern U.S.

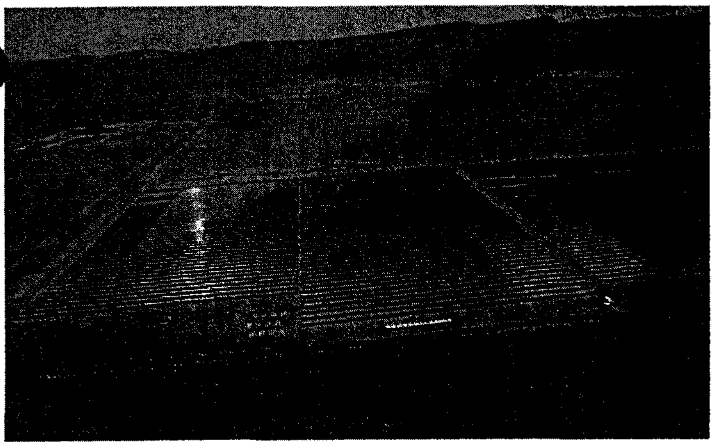


Figure 5: 64 MW Nevada Solar 1 Solar Plant

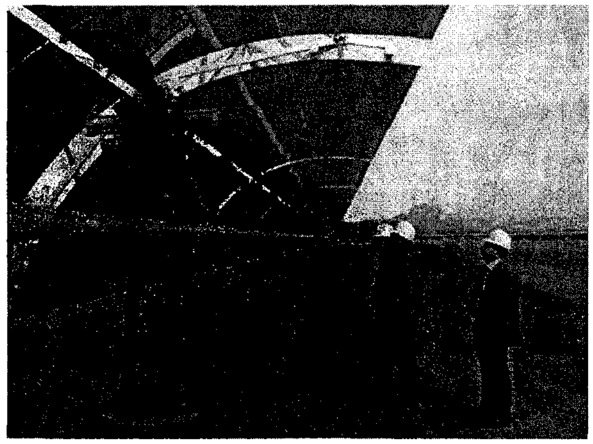


Figure 6, Nevada Solar 1 solar collector

Linear Fresnel

This technology (see Figure 7) is a line-focus technology similar to troughs in that it consists of reflectors that track the sun in one axis and focus the beam radiation onto fluid-carrying receiver tubes. The difference is that it uses a series of ground-mounted mirrors, and the receiver tube is elevated above the mirrors and fixed. The optical efficiency is lower than that of troughs, but this technology offers the promise of cost savings and reduced land use, associated with the tight spacing and ground location of the mirrors and a fixed receiver. A current design being marketed employs water directly in the receiver tubes where it is boiled at about 50 bars of pressure (50 times atmospheric pressure) to produce saturated steam at 535°F, which powers a steam cycle. Another proposes to use molten salt in the receiver tube. As of yet, there are no commercially operating power-generating systems employing this technology, but some are planned.

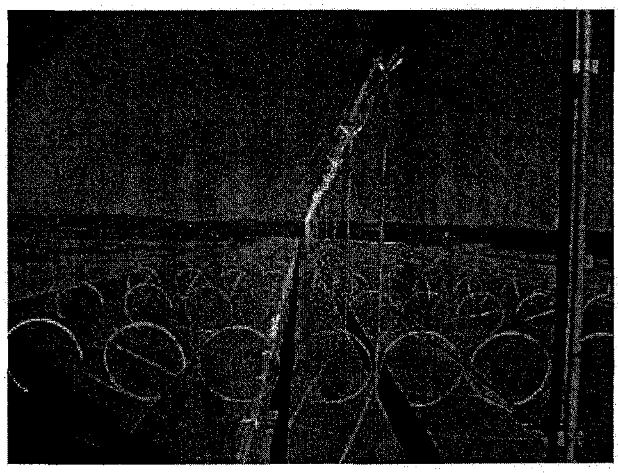


Figure 7: Linear Fresnel collector (Ausra)

Power Towers

Power towers utilize a field of tracking mirrors, called heliostats, which reflect the sun's rays to a receiver located on top of a tall, centrally located tower (see Figure 8). The solar energy is absorbed by pressurized water or molten salt working fluid flowing through the receiver.

The operating temperature is higher than for line-focus collectors (parabolic troughs and linear Fresnel) but lower than for a dish (see below). Power towers can be coupled with a molten salt energy storage system, allowing energy to be stored at 1050°F. When needed, hot salt is removed from the storage tank and used to generate steam to drive a conventional Rankine steam-turbine power block. A 10 MW power tower has been built in Spain (where three more are under development, one of which is slated to have sixteen-hour molten salt storage), and another is under development in South Africa. Like other collectors that provide heat to a Rankine steam cycle, heat rejection is needed to condense the steam, and this can be air or water cooling, or a hybrid. Some studies have found that this technology has potential for lower costs than line-focus collectors, but this is only for large plant sizes. Because of their higher operating temperatures, the performance of tower systems is somewhat less affected by the higher condenser temperatures associated with dry cooling than line focus technologies.

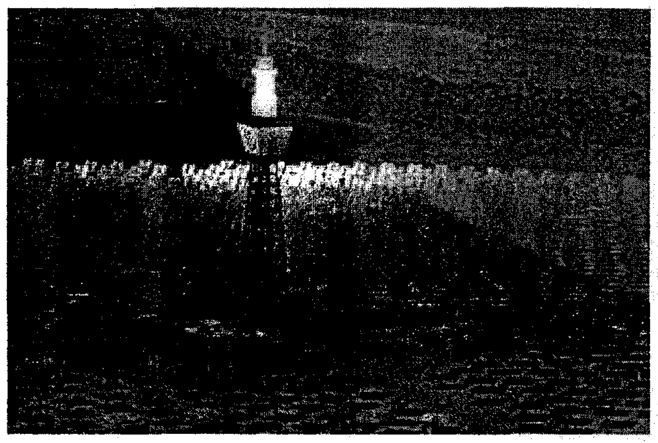


Figure 8: 10 MW power tower pilot project, Barstow, CA

Dish/Engine Systems

As shown in Figure 9, this concept uses a field of individual parabolic-shaped dish reflectors that each focus sunlight onto an engine/generator that uses the Stirling thermodynamic cycle to directly produce electricity without producing steam. Because it tracks the sun in two axes, it captures the maximum amount of direct (or beam) solar radiation throughout the day. Because of its high concentration ratio, it can achieve very high temperatures (about 1452°F) and high efficiencies, converting over 30% of the sunlight to electrical energy.[20] Individual dish/engine units currently range from 1 to 25 kW in size. Power plants of any size can be built by installing fields of these systems. They can also be installed on uneven land.

Figure 9: Prototype 150 kW dish/Stirling power plant at Sandia National Laboratory

There are no commercial dish installations yet, but two large systems are being planned for southern California. Efforts are underway to minimize the cost and maximize the reliability of the Stirling engines. The engines are air-cooled. Their high operating temperatures allow high efficiencies without water cooling, and no water is needed other than for mirror cleaning. From a water use perspective, dishes are well suited for operation in regions with minimal available water.

However, unlike the other CSP technologies discussed here, this technology does not easily lend itself to thermal storage, and so these systems are designed to provide electricity only when the sun is shining. This is a disadvantage to utility scale production in markets where firm generation is required and when the peak load period extends into the evening hours.[21]

Comparison of Water Usage for Different CSP Cooling Options

Because of water limitations, dry cooling and hybrid wet/dry cooling systems are being implemented and considered for both fossil and CSP generating plants. The technical challenges and performance limitations facing CSP are comparable to those of new fossil and nuclear power generating plants.

Dry cooling methods are increasingly common for thermal power plants. The disadvantages of dry cooling are higher capital costs, higher auxiliary operating power requirements, fan noise, and an overall lower plant performance, especially on hot days, when the peak power is needed most.[22] The relative cost impact to CSP is similar to that of fossil power plants.

In a Rankine steam cycle, heat is input at a high temperature (the source temperature) and rejected at a low temperature (the sink temperature). The difference between the heat input and the heat rejected is the work done by the turbine. The efficiency of the cycle (the ratio of the turbine work done to the heat input) is a function of the difference between the source and sink temperatures. Lowering the sink temperature will in general increase the cycle efficiency.

An air-cooled plant will operate at a lower efficiency than a water-cooled plant. Plants that heat the steam to a higher temperature will be less susceptible to changes in the sink temperature. Thus the performance of power tower which operates at a higher steam temperature will be penalized less by air cooling than current trough plants or linear Fresnel designs. Dry cooling when employed for any of these plants will reduce water consumption to zero for the heat rejection system of a Rankine power system, requiring only a minimal amount of water for boiler blowdown, mirror washing and miscellaneous domestic plant uses. A dry-cooled trough plant requires about 80 gal/MWh for cycle makeup and mirror washing.[23] This compares to a wet-cooled plant that requires 800 gal/MWh.[5]

Based on thermodynamic principles, a water-cooled linear Fresnel reflector plant which generates steam directly in the heat collection tube, is estimated to require somewhat more water than a trough plant owing to its lower operating temperature and reduced cycle efficiency (greater heat rejection per MWh of electricity). Conversely, a power tower with a conventional Rankine cycle would presumably use somewhat less water, approximately 600 gal/MWh similar to a coal plant, by virtue of its higher operating temperature and efficiency.

Hybrid wet-dry systems have been used which allow the plant to maintain design or near-design performance, albeit at a higher cost for the cooling system (compared to water cooling), while having much lower water usage than a wet evaporative cooling system.

Once-through Water Cooling

Once-through water cooling returns all of the withdrawn water to the source. Although it does not consume any water in the cooling process, it does increase the temperature and hence the evaporation rate from the body of water. This cooling method is limited in application and is not typically available for a solar power plant. It is also becoming more restricted in California, for example, because of the potential environmental consequences of returning water at an elevated temperature to the environment, and potential mortality of aquatic life due to impingement where the fish are trapped against the intake structure and entrainment, which means organisms are pulled through the cooling system.[24]

Evaporative Water Cooling

The most common cooling method for new power plants is evaporative cooling. This is an economical and high performing power plant cooling technique. The waste heat energy dissipated from the power plant is rejected to the air via evaporation of the cooling water. Typically the evaporation takes place in a cooling tower. This method consumes a considerable amount of water. On a national average, the amount of water consumption of all thermal power generation, using both once-through and evaporative cooling, is approximately 470 gal/MWh.[25]

The water treatment chemicals and minerals contained in the water being evaporated become concentrated over time, which requires a portion of the cooling water to be drained to remove particulates and salts. This discharge (called "blowdown") is a potential source of environmental hazard due to the high concentrations of salts. Also, some concern must be given to water with treatment chemicals which drifts into the ambient air and can be source of PM10 (particulates less than 10 microns in diameter) pollution, which is restricted by regulations.[26]

Parabolic trough power plants in production today use evaporative water cooling and consume roughly the same amount of water as a coal-fired or nuclear power plant, using recirculating evaporative cooling. A typical parabolic trough plant with wet cooling uses about 800 gal/MWh (780 for evaporation and water make-up, and 20 for mirror washing). These values compare to 500 gal/MWh for a stand-alone steam plant and 200 gal/MWh for a combined-cycle natural gas plant.[1, 3, 4]

Dry Cooling

Dry cooling is becoming more prevalent in new power plants because of various state and federal water limitations. Dry cooling uses very little water. All of the waste heat from the power plant is rejected to the air. However, a significant temperature difference is needed to provide adequate heat exchange, and so the condenser temperature is about 30-50 F higher than the ambient air temperature. This results in a higher condensate temperature on hotter days which, in turn, raises the condenser pressure causing the steam turbine to be less efficient, see Figure 10. Dry cooling systems are more expensive and result in lower plant thermal efficiency, especially in hot climates and on hot days—typically when and where peak power is most in need.[27]

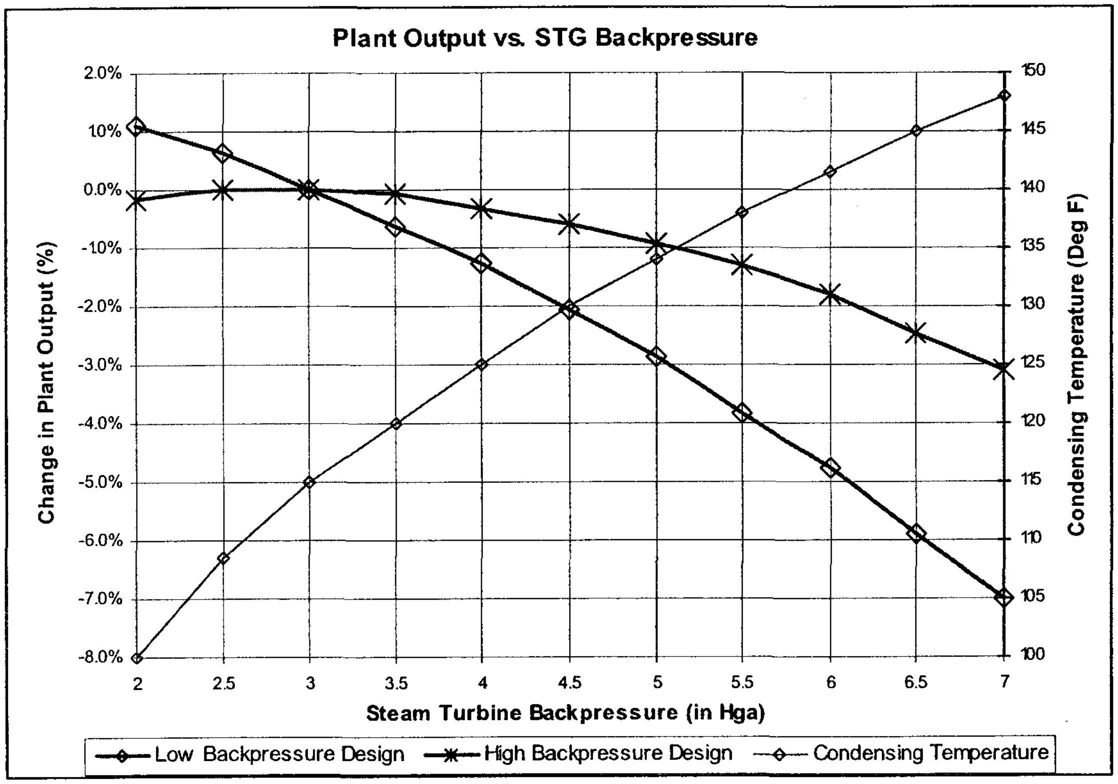


Figure 10: Plant output as a function of condensing temperature and turbine back pressure for a dry cooled plant optimized for low and high back pressure conditions

With dry cooling, the most straightforward way to minimize water use is to route exhaust steam directly to air-cooled condensers (ACCs). Typically the steam passes through an array of tubes and air is blown by a fan across the array. These systems can require considerable fan power.

A comparison of the performance and economics of a water-cooled trough plant located in Daggett, California to an air-cooled one showed that the performance of the air-cooled system dropped off significantly at ambient air temperatures above 100°F.[28] The air-cooled plant provided about 5% less electric energy on an annual basis than the water-cooled plant, because of reduced performance on hot summer days. The electricity cost for the air-cooled plant was 7 to 9% higher than for the water-cooled plant. Thus air cooling of a trough plant can be used to minimize water use, but at a 7 to 9% cost penalty.

It is important to note that the impact of air cooling on levelized electricity cost depends on plant location. Air cooling of a trough plant located in New Mexico, for example, is estimated to raise the cost of electricity by only about 2% because the highest daytime temperatures at the site are significantly lower than those in the Mojave Desert.[29]

An analysis of a 250 MW plant design in Daggett, California looked at the performance penalties of dry cooling for both a parabolic trough power plant producing 700°F steam and a power tower plant producing 1000°F steam.[30] It showed a 5% performance penalty for a trough plant and less than a 2% penalty in the power tower plant. The study concluded that the drop in annual electric output for an air-cooled trough plant is 4.6% compared to 1.3% for the power tower. But the report also looked at the impact during the hottest 1% of the operating hours. For those hours, the air-cooled trough plant suffered a 17.6% drop in performance, whereas the power tower plant suffered a 6.3% drop in performance. If electricity is priced very high during those periods, the financial impact could be significant. Regarding capital costs, the study found that a dry cooling system costs about 3 times that of a water-cooling system.

Lower temperature plants will have an inherent thermodynamic performance penalty. In a separate study, a model comparison of a 700°F and a 1000°F steam plant indicated that the performance degradation at a high ambient temperature (110°F) would be 14% and 13% respectively.[30] When plotted over the range of temperatures for Daggett, California, the annual MWh output would be about 0.5% less for the trough plant using dry cooling.

Another study concluded that if the solar field is increased in size to offset the reduced steam cycle efficiency, the resulting net present value (NPV) impact is less than if the solar field is unchanged.[10] The increased solar field allows for higher steam production to offset the higher backpressure during high ambient temperature periods.

No analyses are yet available for a linear Fresnel system. Current designs operate at a lower temperature than a trough plant; therefore, one would expect a somewhat greater performance penalty from dry cooling.

<u>Hybrid Wet/Dry Cooling</u>

Hybrid wet/dry cooling systems can be divided into two broad categories: those aimed at plume abatement and those aimed at reducing water consumption. Plume abatement involves reducing the water vapor plume from a wet cooling tower to eliminate its appearance or to avoid winter icing on nearby roads. It is generally not an issue at CSP plants, which are typically located in dry, remote areas. Of greater interest for CSP plants are hybrid designs that reduce water consumption compared to wet cooled plants and enhance performance in warm weather compared to dry-cooled plants. Hybrid systems typically either involve separate dry and wet units that operate in parallel or use water to evaporatively cool the air going to the air-cooled condenser.

The parallel cooling system is shown in Figure 11. Here a dry cooling system is the primary heat rejection system, and it consumes no water. The dry cooling system is used exclusively for the majority of the time. On hot days, its performance is enhanced by routing a portion of the steam leaving the turbine to a separate wet cooling system which is only rejecting a portion of the total waste heat. By reducing the load on the air-cooled condenser, the dry unit can bring the condensing steam temperature closer to the design condenser temperature on hotter days. A hybrid system uses a fraction of the water that a traditional wet cooling system would use, and the turbine performance can be maintained at or close to design conditions. Such a system would have a small wet cooling tower and would typically have a smaller air-cooled condenser than an air-cooled plant. Although it is more expensive than a water-cooled plant, it should be less expensive than an air-cooled plant.[10]

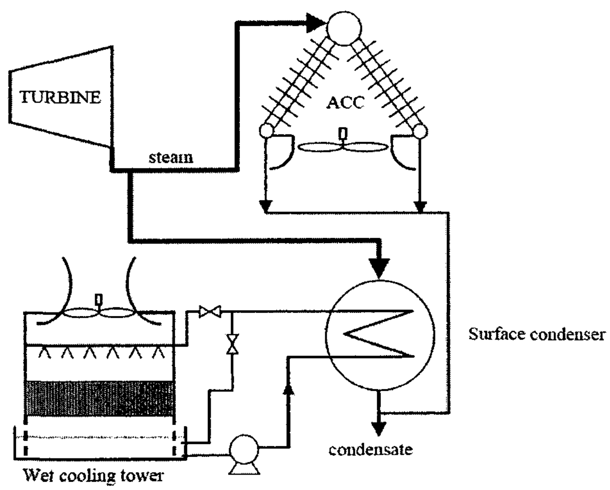


Figure 11: Hybrid wet/dry parallel cooling system (PCS)

An analysis was performed to compare the parallel cooling system design to simple dry and wet cooling for a parabolic trough plant in the Southwestern United States.[31] For the wet-cooled runs, plant performance was found to be relatively independent of ambient temperature. For the dry-cooled cases, performance dropped off at temperatures above 100°F. For various hybrid cases over 97% of the performance can be obtained with only 10% of the water usage and 99% of the performance can be obtained at half the water usage. Figure 12 provides a graphical summary of performance of the PCS plant as a function of how much water is used. The data points are labeled by the operating pressure of the condenser that the cooling system can maintain at design conditions. A larger wet section of the hybrid cooling system will consume more water, but can maintain a lower backpressure and hence higher annual power output. The design operating condenser pressures of the various hybrid systems are expressed in inches of mercury absolute (in

HgA). One inch of mercury absolute is approximately equal to 0.5 psia. Each of the data points is expressed as a fraction of the value for the wet-cooled plant.

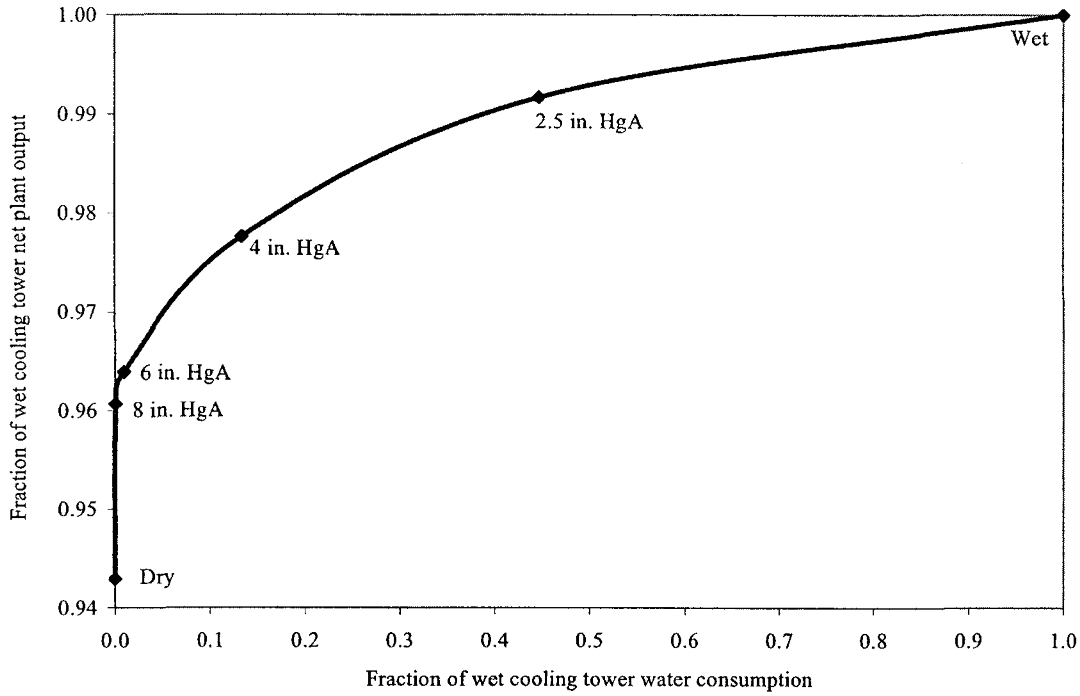


Figure 12: Power plant output as a fraction of the output for an evaporatively cooled plant vs. the fraction of water consumed.

Table 1: Net Present Value for Alternative Cooling Technologies relative to Wet Cooling.[32]

	Dry Cooling Technology		Hybrid Cooling Technology	
	Same Solar Field Size	Solar Field Size Increased	Same Solar Field Size	Solar Field Size Increased
Annual Net Generation Impact relative to Wet Cooling (MWh)	-45,162	0	-27,756	0
Annual Revenue Impact relative to Wet Cooling	-$6,774,350	$0	-$4,163,410	$0
O&M Net Present Value (NPV) relative to Wet Cooling [b]	$12,980,000	$12,980,000	$5,870,000	$5,870,000
Generation Revenue NPV Relative to Wet Cooling	-$63,860,000	$0	-$39,250,000	$0
Capital Expenses Relative to Wet Cooling [a]	$20,497,000	$73,497,000	$12,930,500	$43,930,500
Total NPV Impact relative to Wet Cooling	-$71,100,000	-$60,100,000	-$46,300,000	-$38,000,000
LCOE Impact increase over Wet Cooling ($ / kWh)	.014	.011 [d]	.009	.007 [d]
Estimated Water Consumption [c]	43 gal/MWh		338 gal/MWh	

a The capital costs show in the table include cooling equipment, boiler feed water pumps, HTF pumps, and solar field addition for the case where the solar field size is increased.

b O&M Expenses include water treatment, operating, and water pumping costs

c Wet Cooling water consumption compares at 865 gal/MWh. From Tables 6 and 7 of reference 32.
d LCOE adjusted by adding increased annual revenue over constant solar field size.

Table 1 gives a financial comparison of an air cooled condenser (dry), and (hybrid) ACC parallel with a wet cooling tower, relative to evaporative cooling tower (wet). Costs of each system including capital equipment, installation, water treatment, solar field, and operation and maintenance (O&M), were considered along with the estimated performance and revenue based on historical climatology data and current value for power generated in the southern California area.

If there is water available, the PCS is a water-saving alternative. On the other hand, both a wet and dry cooling system will have to be maintained and the wet system may be cycled in and out of operation These two facts will increase the maintenance costs of the cooling system.

Table 2 summarizes the amount of water presently consumed by power plants throughout the U.S. and the options available to CSP for reducing water consumption.

Table 2: Comparison of consumptive water use of various power plant technologies using various cooling methods

Technology	Cooling	Gallons / MWhr	Perform. Penalty*	Cost Penalty**	Reference
Coal / Nuclear	Once-Through	23,000 – 27,000***			1, 3
	Recirculating	400 - 750			1, 3
	Air Cooling	50 - 65			1, 3
Natural Gas					
	Recirculating	200			4
Power Tower	Recirculating	500 - 750			(estm.)
	Combination Hybrid Parallel	90-250	1-3%	5%	10, 11
	Air Cooling	90	1.3%		9
Parabolic Trough	Recirculating	800			5
	Combination Hybrid Parallel	100-450	1-4%	8%	7, Appx. A
	Air Cooling	78	4.5-5%	2-9%	6, 9
Dish / Engine					
	Mirror Washing	20			5
Fresnel	Recirculating	1000			(estm.)

For using a less water intensive cooling technique:
* = Annual energy output loss is relative to the most efficient cooling technique.
** = Added cost to produce the electricity.

***= Majority of this amount is returned to the source but at an elevated temperature.

Alternate and Future Technologies

Another type of hybrid system evaporatively cools the air-cooled condenser on those hot days when the air cooler cannot maintain low condenser pressures. This method currently has limited commercial use. The air approaching the air-cooled condenser is cooled by water spray nozzles or by passing the air through wetted media. It is also possible to directly deluge the finned heat transfer tubes in the air coolers with a flow of water.

Performance and economic modeling of a 30 MW air-cooled parabolic trough plant near Daggett, California was done to evaluate the impact of spray nozzles for pre-cooling the air.[33] The analysis showed that water cooling is more economical over a wide range of electricity prices and water costs. Water cooling is generally favored whenever water is available because of the high cost of electricity associated with trough plants. Compared to water cooling, the spray cooling decreased annual water consumption by 32% (from 856 gal/MWh to 584 gal/MWh) and decreased the annual electric output by 3.6%. With this performance imact, economic benefit would be realized only if the cost of water was over $13 per 1000 gal at an electricity price of $0.10 per kWh. Typical municipal water costs are around $4.00 per 1000 gallons, and may be lower if degraded water is used. The water-cooled system showed over 4% more cash flow than the air-cooled system.

Another option is to use an indirect air-cooling system called a Heller cycle. In this design, the air-cooled condensers are replaced by a combination of a direct contact condenser and an array of water-to-air heat exchangers. Condensate is cooled by passing the water through the air-to-water heat exchangers, and the cooled water is then used to condenser the steam in a direct contact condenser. (This direct contact condenser can be a conventional design or can be an advanced design using a structured packing approach patented by NREL.) The Heller cycle might provide LECa reduction in levelized electricity cost compared to an air-cooled plant, but the costs would depend on plant size and they are too uncertain to come to a conclusion at this time.[34]

Current research and development are exploring new technologies which, if realized, could improve efficiencies while reducing water use. Advanced high-temperature heat transfer fluids, for example, could eliminate the thermodynamic performance penalties of dry cooling on trough and linear Fresnel systems. Advanced power towers are being designed for higher operating temperatures that could allow the use of gas turbines instead of steam turbines, possibly eliminating the need for cooling water.[35]

Summary

Utilities are showing increasing interest in the deployment of concentrating solar power plants to meet the requirements of state renewable electricity standards. Dish systems which already use air cooled engines, need only water for mirror cleaning. Troughs, linear Fresnel, and power towers use the heat of the sun to power conventional Rankine steam cycles. As with fossil and nuclear-power plants, water cooling is preferred to minimize cost and maximize cycle efficiency. However, there are concerns about mounting water shortages and air pollution associated with evaporative cooling towers. Analyses indicate that the use of either direct or indirect dry cooling can eliminate over 90% of the water consumed in a water-cooled concentrating solar power plant. However, a combination of a reduction in power output and the added cost of the air cooling equipment is estimated to add roughly 2 to 10% to the cost of generating electricity, depending on the plant location and other assumptions. The use of hybrid parallel wet/dry coolers is estimated to reduce the energy cost penalty to below that of air cooling alone while still saving about 80% of the water compared to a water-cooled plant.

References

[1] National Energy Technology Laboratory (2006). Estimating Freshwater Needs to Meet Future Thermoelectric Generation Requirements. DOE/NETL-2006/1235. pp. D-1 and F-2. Note the values provided in this text are an approximation of the national averages for coal fired supercritical and subcritical with wet FGD. The ranges for water consumption of coal fired plants are estimated from the box plots on p F-1 and F-2 to be between 400 and 800 gal / MWh. The averaged surveyed values for power plants nationwide, listed by plant type, cooling method, and FGD method is on page D-1.

[2] The Resources Agency of California. (September 2, 2003). Background information and staff recommendation on power plant water use. Memorandum from CEC to Integrated Energy Policy Report Committee.

[3].U.S. Department of Energy (December, 2006). Energy Demands on Water Resources. Report to Congress on the Interdependency of Energy and Water. P. 38 Table V-1.

		Water intensity (gal/MWh$_e$)			
Plant-type	Process	Steam Condensing		Other Use	
Steam		Withdrawal	Consumption	Withdrawal	Consumption
Coal	Mining				5–74
	Slurry			110–230	30–70
Fossil/ biomass/ waste	OL Cooling	20,000–50,000	~300	~30**	
	CL Tower	300–600	300–480		
	CL Pond	500–600	~480		
	Dry	0	0		
Nuclear	Mining and Processing				45–150
Nuclear	OL Cooling	25,000–60,000	~400	~30**	
Nuclear	CL Tower	500–1,100	400–720		
Nuclear	CL Pond	800–1,100	~720		
Nuclear	Dry	0	0		
Geothermal Steam	CL Tower	~2000	~1400	Not available	
Solar trough	CL Tower	760–920	760–920	8**	
Solar tower	CL Tower	~750	~750	8**	
Other					
Natural Gas	Supply				~11
Natural Gas CC	OL Cooling	7,500–20,000	100	7–10**	
	CL Tower	~230	~180		
	Dry	0	0		
Coal IGCC*	CL Tower	~250	~200	7–10 + 130 (process water)**	
Hydro-electric	Evaporation				4500 (ave)

Mining of coal consumes 0.07 to 0.26 billion gallons per day

Thermo-electric power generation withdraws 136 billion gallons per day and consumes 3.3 billion gallons per day

OL = Open loop cooling, CL = Closed Loop Cooling, CC = Combined Cycle
*IGCC = Integrated Gasification Combined-Cycle, includes gasification process water
Other Use includes water for other cooling loads such as gas turbines, equipment washing, emission treatment, restrooms, etc.
**References did not specify whether values are for withdrawal or consumption.

The general calculation for estimating water consumption of a typical thermal power plant is as follows. Given a steam turbine net efficiency of 37%, the heat rejection per MWh will be:

$$3.412\text{x}10^6 \text{ btu/MWh x } [(1/37\%)-1] = 5.81 \text{ x}10^6 \text{ BTU/hr}$$

Assume 90% of heat is rejected by latent heat of evap, latent heat capacity of water to be 1000 BTU/lb, and water density of 8.33 lb/gal:

$$5.81 \text{ x}10^6 \text{ BTU/hr x } 90\% \text{ / } (1000 \text{ BTU/lb x } 8.33 \text{ lb/gal}) = 628 \text{ gal/MWh evaporation}$$

[4] DOE (2006). p. 38 Table V-1 and NETL (2006) p. D-1.
From the calculation above (Endnote 3), approximate water consumption rate for a combined cycle plant is 630 gal (170/500) = 255 gal / MWh plus aux loads.
In the table of NETL(2006) p. D-1, natural gas combined cycle (NGCC) plants with recirculating cooling consume on average 130 gal / MWh. The surveyed ranges of NGCC consumption rates are not provided.

[5] Cohen, G. E., Kearney, D. W., & Kolb, G. J. (1999). Final Report on the Operation and Maintenance Improvement Program for Concentrating Solar Power Plants. Usage listed is raw water usage and assumed to be withdrawal rate. Consumption rate approximated from 90% of the withdrawal rate. p. 30-31

[6] WorleyParsons. *Wet and Dry Cooling Options for a 250 MW Thermal Plant.*

[7] WorleyParsons. (2008). FPLE - Beacon Solar Energy Project: Dry Cooling Evaluation. WorleyParsons Report No. FPLS-0-LI-450-0001. WorleyParsons Job No. 52002501.

[8] *New Mexico Central Station Solar Power: Summary Report.* EPRI, Palo Alto, CA, PNM Resources, Inc., Albuquerque, NM, El Paso Electric Co., El Paso, TX, San Diego Gas & Electric Co., San Diego, CA, Southern California Edison Co., Rosemead, CA, Tri-State Generation & Transmission Association, Inc., Westminster, CO, and Xcel Energy Services, Inc., Denver, CO: 2008. 1016342.. p. 5-7.

[9] WorleyParsons. *Wet and Dry Cooling Options for a 250 MW Thermal Plant.*

and

GateCycle models for parabolic trough and central receiver plants which use air cooled condensers compared the relative performance at 70 F and 108 F for the two plant designs as follows:

Parabolic Trough Plant: 1450 psig / 710 F / 710 F Rankine cycle

70	F ambient temperature	108	F ambient temperature
139.5	MWe gross plant output	119.9	MWe gross plant
0.374	gross cycle efficiency	0.321	gross cycle efficiency
0.082	bar condenser pressure	0.250	bar condenser pressure
	0.860	hot day output / design day output	
	0.860	hot day efficiency / design day efficiency	

Central Receiver Plant: 1850 psig / 950 F / 950 F Rankine cycle

70	F ambient temperature	108	F ambient temperature
139.9	MWe gross plant output	121.7	MWe gross plant
0.412	gross cycle efficiency	0.361	gross cycle efficiency
0.082	bar condenser pressure	0.252	bar condenser pressure
	0.870	hot day output / design day output	
	0.875	hot day efficiency / design day efficiency	

Nominally, both plants show a 5 percent reduction in gross output and gross efficiency if the ambient temperature increases from the design point of 70 F to a hot day temperature of 108 F.

This is not a completely representative set of annual performance analyses, and the auxiliary energy demands of the pumps and fans are not included here. However, the trends in the above figures indicate a performance penalty for a parabolic trough plant compared to a tower plant is not as significant as shown in the above reference.

[10] WorleyParsons. (2008). FPLE - Beacon Solar Energy Project: Dry Cooling Evaluation. WorleyParsons Report No. FPLS-0-LI-450-0001. WorleyParsons Job No. 52002501. Table 8.

[11] PAC SYSTEM® Installation List
GEA Power Cooling Systems, LLC
143 Union Blvd., suite 400
Lakewood, CO 80228
Telephone: (303) 987-0123

Station Owner (A/E)	Size (MWe)	Steam Flow (Lb/Hr)	Turbine BP (in HgA)	Design Temp (Deg F)	Year	Remarks
Exeter Energy L. P. Project	30	196,000	2.9	75	1989	(W-T-E)
Streeter Generating Station	40	246,000	3.5	50	1993	(Combined Cycle)
Tucuman Power Station	150	1150000	5	99	1997	(Combined Cycle)
Grumman	13	105700	5.4	59	1997	(Combined Cycle)
SEMASS WTE Facility	54	407500	3.5	59	1999	(W-T-E)

Goldendale Energy Project	110	678000	4.5	90	2000	(Combined Cycle)
Comanche, Unit 3	750	3374300	3.73	97	2006	(Coal Fired)
Afton Generating Station	100	594981	5	98	2006	(Combined Cycle)

[12] Appendix A.

[13] Kelly, B. (2006). *Nexant Parabolic Trough Solar Power Plant Systems Analysis; Task 2 Comparison of Wet and Dry Rankine Cycle Heat Rejection.* National Renewable Energy Laboratory, NREL/SR-550-40163 and

Appendix A.

[14] From NREL analysis– selecting the best land area, CSP projects could provide about 11,000,000 MW or 26,400,000 GWh. To put this in context, the entire U.S. uses about 4,000,000 GWh per year. Thus, on 9.2 percent of the southwestern land CSP projects could generate over 6 times the power needed by the U.S. This means that on less than 1.5 percent of the land in the southwest, CSP projects could theoretically generate as much energy as the country uses.

State	Total Land Area (mi^2)	Land Area – Best for CSP projects (mi^2)	Solar Capacity (MW)	Solar Generation Capacity (GWh)
AZ	113,600	13,613	1,742,461	4,121,268
CA	156,000	6,278	803,647	1,900,786
CO	103,700	6,232	797,758	1,886,858
NV	109,800	11,090	1,419,480	3,357,355
NM	121,400	20,356	2,605,585	6,162,729
TX	261,900	6,374	815,880	1,929,719
UT	82,200	23,288	2,980,823	7,050,242
Total	948,600	87,232	11,165,633	26,408,956

Land area deemed "best" for CSP is from an analysis that has no primary use today, excludes land with a slope greater than 1 percent, does not count sensitive lands, and has a solar resource of 6.75 kWh/m2/day. Solar capacity assumes 5 acres/MW and a 27 percent annual capacity factor.

[15] The Resources Agency of California. (September 2, 2003). Background information and staff recommendation on power plant water use. Memorandum from CEC to Integrated Energy Policy Report Committee.

[16] Cohen, Kearney & Kolb (1999)

[17] CEC, California Energy Commission (2002). Comparison of Alternate Cooling Technologies for California Power Plants: Economic, Environmental and Other Tradeoffs, Public Interest Energy Research, 500-02-079F, February 2002.. pp. 1-1 – 1-3.

[18] *US DOE Solar Technologies Program Multi-Year Plan 2008-2012*

[19] National Renewable Energy Laboratory. Parabolic Trough FAQ's. Mirror washing use is approximately 20 gal/MWh. March 22, 2008 from: http://www.nrel.gov/csp/troughnet/faqs.html#water

[20] Sandia National Laboratory (February 12, 2008). Sandia, Stirling Energy Systems set new world record for solar-to-grid conversion efficiency. News release retrieved March 30, 2008 from: http://www.sandia.gov/news/resources/releases/2008/solargrid.html

[21] WorleyParsons. (2008). FPLE - Beacon Solar Energy Project: Dry Cooling Evaluation. WorleyParsons Report No. FPLS-0-LI-450-0001. WorleyParsons Job No. 52002501.

[22]. Kelly, B. (2006). *Nexant Parabolic Trough Solar Power Plant Systems Analysis; Task 2 Comparison of Wet and Dry Rankine Cycle Heat Rejection.* National Renewable Energy Laboratory, NREL/SR-550-40163

[23] WorleyParsons (2008). P 15 and 16 show the water requirements for a dry cooled plant of 79 acre-ft per year and the corresponding annual energy production of 557,365 MWh.

[24] California Energy Commission (2001), Environmental Performance Report of California's Electric Generation Facilities. P700-01-001, July 2001. P. 39

[25] Torcellini, P.; Long, N.; Judkoff, R. (2003). *Consumptive Water Use for U.S. Power Production.* NREL/TP-550-33905.

[26] USEPA. AP-42. Compilation of Air Pollutant Emission Factors. Ch 13. Retrieved from : http://www.epa.gov/ttn/chief/ap42/ch13/final/c13s04.pdf

[27] Maulbetsch, J. S., and M. N. DiFilippo. 2006. *Cost and Value of Water Use at Combined-Cycle Power Plants.* California Energy Commission, PIER Energy-Related Environmental Research. CEC-500-2006-034.

[28] Kelly, B. (2007). *Comparison of Wet and Dry Rankine Cycle Heat Rejection.* Nexant, Inc. A Bechtel-Affiliated Company. San Francisco, California.

[29] *New Mexico Central Station Solar Power: Summary Report.* EPRI, Palo Alto, CA, PNM Resources, Inc., Albuquerque, NM, El Paso Electric Co., El Paso, TX, San Diego Gas & Electric Co., San Diego, CA, Southern California Edison Co., Rosemead, CA, Tri-State Generation & Transmission Association, Inc., Westminster, CO, and Xcel Energy Services, Inc., Denver, CO: 2008. 1016342.. p. 5-7

[30] WorleyParsons. *Wet and Dry Cooling Options for a 250 MW Thermal Plant..*

and

Provided by Bruce Kelly (email correspondence):
GateCycle models for parabolic trough and central receiver plants which use air cooled condensers compared the relative performance at 70 F and 108 F for the two plant designs as follows:

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139.9	MWe gross plant output	121.7	MWe gross plant
0.412	gross cycle efficiency	0.361	gross cycle efficiency
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Nominally, both plants show a 5 percent reduction in gross output and gross efficiency if the ambient temperature increases from the design point of 70 F to a hot day temperature of 108 F.

This is not a completely representative set of annual performance analyses, and the auxiliary energy demands of the pumps and fans are not included here. However, the trends in the above figures indicate a performance penalty for a parabolic trough plant compared to a tower plant is not as significant as shown in the above reference.

[31] Appendix A.

[32] WorleyParsons. (2008). FPLE - Beacon Solar Energy Project: Dry Cooling Evaluation. WorleyParsons Report No. FPLS-0-LI-450-0001. WorleyParsons Job No. 52002501. pp. 15-17, Tables 6, 7 and 8.

[33] Morris, P., Maulbetsch, J.S., DiFilippo, M.N. (2005). Spray Enhancement of ACC Performance at Crockett Cogeneration Plant. CEC/EPRI Advanced Cooling Strategies/Technologies Conference. Sacramento, CA.

[34] "Engineering and Economic Assessment of Advanced Air-Cooling Technologies for Steam-Rankine Power Systems," by Bharathan, et al.

The study compares a conventional air-cooled plant to a Heller cycle. The total capital cost of the Heller cycle components was $10.5 million compared to the ACC cost of $7.1 million. They claim the Heller cycle allows some performance improvement due to lower condenser pressures (less back pressure on the turbine), especially on hot days when the cooling water circulation rate can be increased. Table 5.4 (pg. 49) shows an overall economic advantage for Heller due to an improvement in the heat rate. But on pg. 50, they refer to the reduced condenser pressure in the Heller cycle and conclude, "However, the overall economics of this advantage are uncertain because of the lack of domestic capital and operating costs and performance information for this type of steam condensing system."

[35] Angelino, G., Invernizzi, C. Binary conversion cycles for concentrating solar power technology, Solar EnergyIn Press, Corrected Proof, , Available online 20 February 2008. Retrieved from: (http://www.sciencedirect.com/science/article/B6V50-4RW9H0T-1/1/378ad00ada48ff5adcae3196f76d937a)

and

Heller P., Pfander M., Denk T., Tellez F., Valverde A., Fernandez J., Ring A.
Test and evaluation of a solar powered gas turbine system (2006) Solar Energy, 80 (10), pp. 1225-1230. Retrieved from Science Direct Database

Appendix A

Concentrating Solar Power Commercial Application Study:

Reducing Water Consumption of Concentrating Solar Power Electricity Generation

Further analysis stemming from the study conducted in the reference 1 of this Appendix, also referenced in footnote 13 of the main report evaluated the impact of hybrid cooling.

[13]Kelly, B. (2006). *Nexant Parabolic Trough Solar Power Plant Systems Analysis; Task 2 Comparison of Wet and Dry Rankine Cycle Heat Rejection.* National Renewable Energy Laboratory, NREL/SR-550-40163

1. Introduction

The plant design parameters used for this analysis are as follows:

- 274 MWe gross plant output
- Two Rankine cycles, each with a nominal gross rating of 137 MWe
- Two collector fields, each with an aperture area of 1,030,000 m^2
- Two thermal storage systems, each with a nominal capacity of 1,096 MWht. The storage capacity is sufficient to operate the Rankine cycle at full load for 3 hours, and the energy from storage is dispatched such that the Rankine cycle is operated at full load for the fewest number of hours each day (i.e., no load shifting)
- The 30-year solar radiation and weather file for Barstow, California is assumed to be applicable for A Southwest desert site
- The design point for the wet heat rejection system is assumed to be as follows: 2.5 in. HgA condenser pressure; 104 °F dry bulb temperature; and 64 °F wet bulb temperature.
- The design point for the dry heat rejection system is assumed to be as follows: 2.7 in. HgA turbine exhaust pressure; 2.5 in. HgA condenser pressure; and 70 °F dry bulb temperature. The 0.2 in. HgA difference between the turbine exhaust pressure and the condenser pressure is the pressure loss in the steam duct between the exhaust flange and the condenser inlet. The 70 °F dry bulb temperature is the result of the 2006 optimization study on wet and dry heat rejection systems (reference 1).

Three heat rejection systems were evaluated:

1) A wet system, including mechanical draft cooling towers, a surface condenser, vacuum pumps, circulating water pumps, underground circulating water pipes, a water treatment system for cooling tower makeup, and an evaporation pond for the cooling tower blowdown. A schematic diagram of the system is shown in Figure 1.

2) A dry system, including an air cooled condenser and vacuum pumps. A schematic diagram is illustrated in Figure 2.

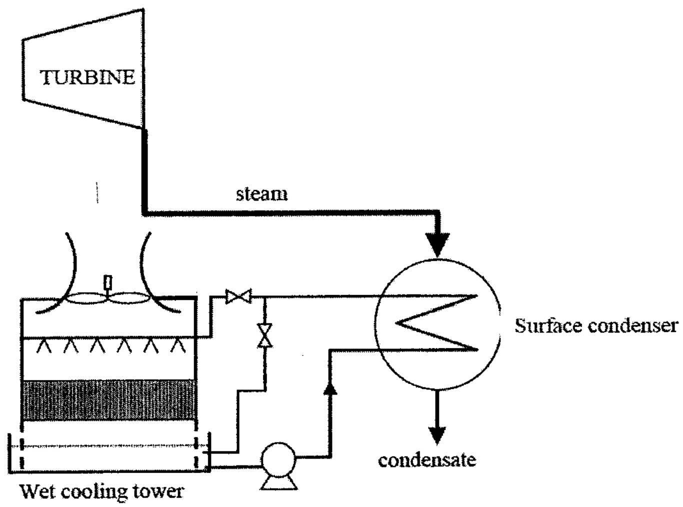

Figure 1 Schematic Diagram of Wet Heat Rejection System

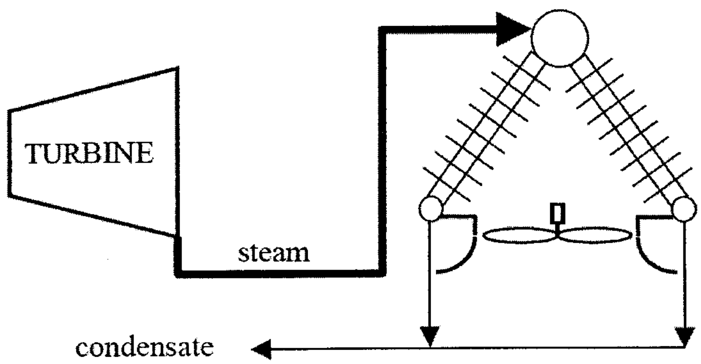

Figure 2 Schematic Diagram of Dry Heat Rejection System

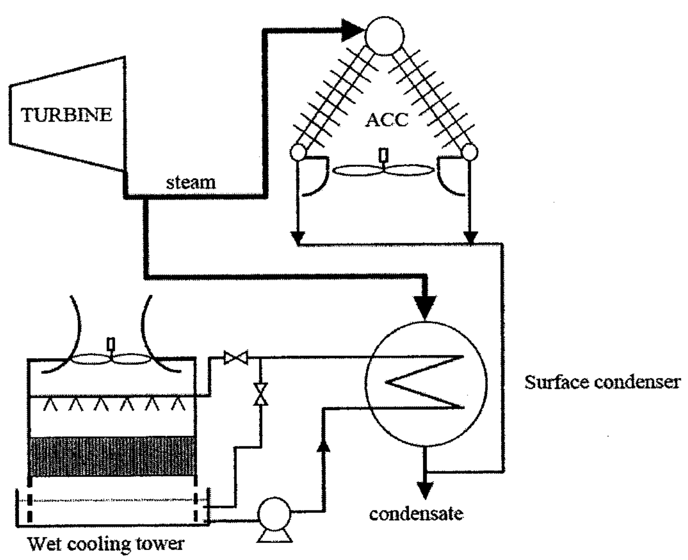

Figure 3 Schematic Diagram of Hybrid Heat Rejection System

3) A hybrid system, which uses an air cooled condenser in parallel with a wet, mechanical draft cooling towers. A schematic diagram of the equipment arrangement is shown in Figure 3. On high ambient temperature days, the wet system is placed in service. A portion of the turbine exhaust condenses on the surface condenser, and the balance of the flow is condensed in the air cooled condenser. The reduced thermal demand on the air cooled condenser allows a closer approach to the dry bulb temperature, which results in a lower turbine exhaust pressure than achieved with a dry system alone. The hybrid system consists of an air cooled condenser, vacuum pumps, and all of the equipment associated with the wet system, but with smaller equipment capacities than required in Item 1.

The hybrid cooling study was conducted through the following steps:

- Six performance models were developed of a 137 MWe Rankine cycle using the GateCycle program [Reference 2]; one for wet heat rejection, one for dry heat rejection, and four for hybrid heat rejection. The hybrid cases included equipment sizes sufficient to maintain maximum condenser pressures of 2.5, 4.0, 6.0, and 8.0 in. HgA throughout the year

- Calculations of the thermal output from the collector field, and the thermal input to the steam generator, were developed for each hour of the year

- For each of the 3,421 hours of solar operation each year, the thermal input to the steam generator, and the ambient temperatures, were used to calculate the steam flow rates, gross electric output, and auxiliary electric power requirements for the cooling tower fans and Rankine cycle pumps. The results were exported to an Excel file, from which the annual gross and net outputs and efficiencies were calculated.

- Capital cost estimates were developed for each of the 6 heat rejection systems.

- Operating cost estimates for the makeup water treatment system for the wet and the hybrid heat rejection systems were developed.

2. Power Plant Design

The performance model for the Rankine cycle, various design parameters for the heat rejection systems, are discussed in the following sections.

2.1 Rankine Cycle

The Rankine cycle design follows a conventional, single reheat design with 5 closed and 1 open extraction feedwater heaters. The main steam pressure and temperature are 1,465 lb_f/in^2 and 703 °F, respectively, and the reheat steam temperature is 703 °F. For all of the heat rejection cases, the design condenser pressure is 2.5 in. HgA.

2.2 Wet Heat Rejection

The wet heat rejection system is based on conventional, mechanical draft cooling towers. The principal design parameters include the following:

- 104 °F design dry bulb temperature; 10 percent relative humidity
- 10 °F cooling water approach to 64 °F wet bulb temperature
- 20 °F circulating water temperature range
- 224 MWt duty
- 6 cycles of concentration

The cooling tower consists of 10 cells, each with a 125 bhp fan. The circulating water flow rate is a nominal 76,000 gpm, and the makeup water flow rate is 1,930 gpm. Of the makeup water flow, 83 percent is to compensate for evaporation losses, 13 percent for blowdown, and 4 percent for drift losses.

The circulating water system includes the following:

- Two 50 percent capacity pumps, each rated at 38,000 gpm and driven by a 750 bhp electric motor
- A surface condenser, with a nominal area of 160,000 ft^2
- Supply and return circulating water pipes, with a diameter is 60 inches. The distance from the cooling towers to the surface condenser is assumed to be 200 feet.

2.3 Dry Heat Rejection

The dry heat rejection system is based on a mechanical draft, air cooled condenser. The principal design parameters include the following:

- 109 °F steam condensing temperature at 70 °F dry bulb temperature (39 °F initial temperature difference)
- 2 °F condensate subcooling at condenser outlet
- 224 MWt duty

The cooling tower consists of 15 bays, each with a 300 bhp fan. The condensing section is fabricated from oval carbon steel tubes, with aluminum fins. The total heat transfer area, including the tubes and the fins, is approximately 5,250,000 ft2.

A series of adjustments to the GateCycle operating logic were made under the following conditions:

1) For the dry heat rejection system, there are approximately 230 hours each year in which the combination of thermal input from the collector field and the ambient temperature would normally result in turbine exhaust pressures above the maximum allowable value of 8 in. HgA. For these hours, the thermal input to the steam generator is successively reduced in increments of 0.5 percent until the exhaust pressure decreases to 8 in. HgA. The annual thermal energy which cannot be converted to electric energy during these hours is recorded.

2) For the dry heat rejection system, condenser pressures below 1 in. HgA are possible on cold days, or on warm days with a small solar thermal input. To reduce the auxiliary electric demand during these hours, cooling towers fans are stopped in groups of 6 until the condenser pressure rises to at least 1 in. HgA.

3) For the wet heat rejection system, condenser pressures below 1 in. HgA are possible on cold days, or on warm days with a small solar thermal input. To reduce the auxiliary electric demand during these hours, cooling towers fans are stopped in succession until the condenser pressure rises to at least 1 in. HgA.

2.4 Hybrid Heat Rejection

The required duty of the wet cooling tower in a hybrid system to achieve the desired condenser pressure of 2.5, 4, 6, or 8 in. HgA throughout the year is a function of the ambient temperature distribution and the parallel performance of the wet cooling tower and the air cooled condenser during the summer. The required duties are determined by means of an annual simulation of the plant performance, discussed below in Section 3.3.

3. Annual Performance Calculations

The performance of the Rankine cycle is a function of the thermal input to the steam generator, and the ambient temperature. To estimate the annual performance of the plant, the following calculations were performed:

1) A weather file was compiled for a Southwest desert site, listing for each hour of the year, the dry bulb temperature, relative humidity, and direct normal solar radiation.

2) For each hour of the year, the thermal output from the collector field was calculated by the Excelergy computer program, as discussed below.

3) The dry bulb temperature, the relative humidity, and the thermal input from the collector field were exported to the GateCycle program. The program calculated the steam turbine expansion efficiencies, exhaust losses, gross electric output, and the auxiliary electric loads for the cooling tower fans, the feedwater pump, the condensate pump, and if applicable, the circulating water pumps. For the wet and the hybrid heat rejection systems, the makeup water flow to the cooling tower was also calculated. The calculations were repeated for each of the 3,421 hours each year in which thermal energy was available from either the collector field or the thermal storage system.

4) Annual sums were developed for the following parameters: thermal energy supplied to the Rankine cycle; gross plant output; fan electric energy; pump electric energy; and net electric output. From these values, annual gross and net Rankine cycle efficiencies were developed.

The thermal output from the collector field is calculated using the Excelergy program. The program, under development by the National Renewable Energy Laboratory over the past 10 years, models the performance of parabolic trough collector fields and, if applicable, the associated Rankine cycle. The model calculates the following:

- Month of the year, day of the month, hour of the day, and time before noon

- Each of the following angles: solar declination; sun elevation; sun azimuth; and collector incidence. From the collector incidence angle, an incidence angle modifier was calculated to account for the reflected flux which misses the end of the heat collection element during the midday hours

- Each of the following optical efficiencies: solar field availability; structure tracking error and twist; mirror reflectivity; geometric accuracy; mirror reflectivity, mirror cleanliness factor; and the following factors for the heat collection elements: dust on glass envelope; bellows shading; envelope transmissivity; and absorber tube absorbtivity

- Heat collection element thermal losses, including emissivity as a function of fluid temperature, and allowances for lost vacuum and lost glass envelopes

- Gross field thermal output, by multiplying the following: collector area; collector optical efficiency; and heat collection element thermal efficiency

- Net field thermal output, by multiplying the gross output by 0.9805 to account for thermal losses from the field piping

- Auxiliary electric loads for the heat transport fluid circulation pumps and the collector drive motors.

The program generates a file, of the field's net thermal output for each hour of the year.

3.1 Wet Heat Rejection

From the 3,421 hourly performance calculations, a plot of the net electric output as a function of the ambient temperature for the wet heat rejection system is shown in Figure 4. The annual net electric output for the complete 250 MWe plant is estimated to be 846,200 MWhe, and the net Rankine cycle efficiency is estimated to be 36.6 percent.

As expected, the net output is essentially independent of the ambient temperature. The effect can be traced to the low relative humidity, and consequently low wet bulb temperatures, on summer days in the desert.

A majority of the data points are concentrated in the net electric output range of 270 to 280 MWe. This is a reflection of the excellent direct normal radiation at A Southwest desert site, plus the availability of energy from the thermal storage system, which maintains the Rankine cycle at, or close to, full load. Data points are not shown for net outputs below 40 MWe, as the minimum turbine output is assumed to be 15 percent of the design output.

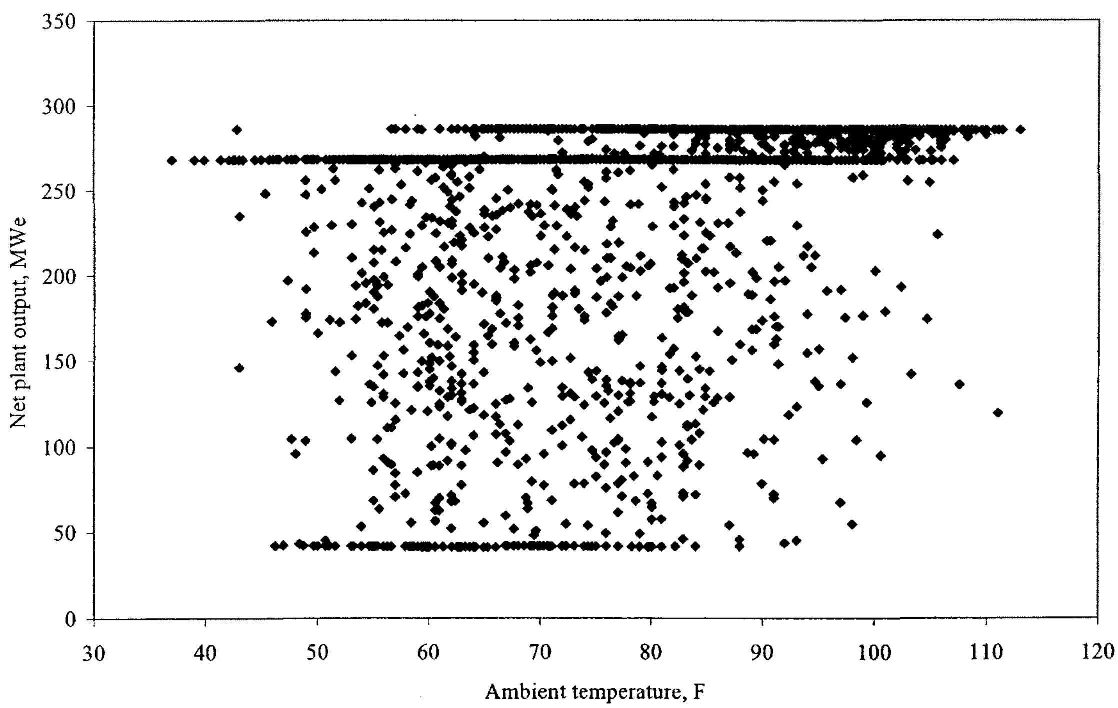

Figure 4 Net Plant Output as a Function of Ambient Temperature; Wet Heat Rejection

3.2 Dry Heat Rejection

A plot of the net electric output as a function of the ambient temperature for the dry heat rejection system is shown in Figure 5. The annual net electric output for the complete 250 MWe plant is estimated to be 797,900 MWhe, and the net Rankine cycle efficiency is estimated to be 34.8 percent.

For ambient temperatures between 40 °F and 100 °F, the condenser pressure increases as the dry bulb increases, and the net plant output shows a gradual decrease. However, for ambient temperatures above 100 °F, the condenser cannot simultaneously condense the design point steam flow rate and provide a condenser pressure below 8 in. HgA. As a result, the steam flow rate must be reduced to ensure the condenser pressure remains with limits. During the one hour of the year with the highest temperature (113 °F), the plant output must be restricted to about 165 MWe.

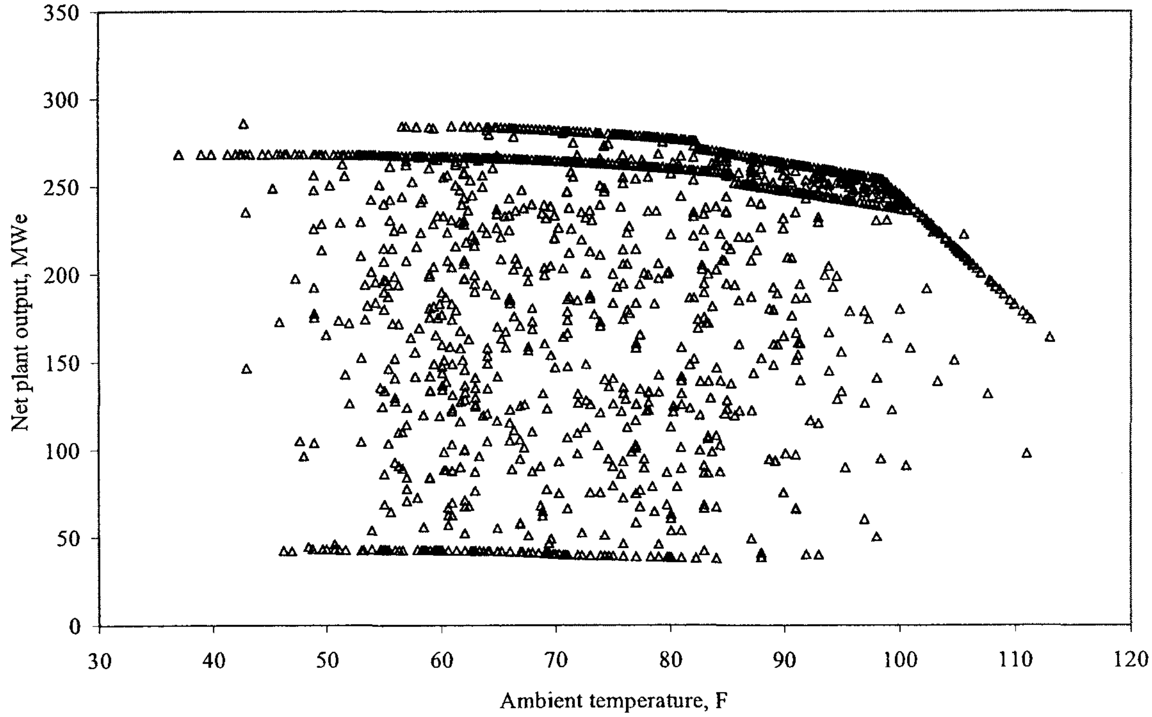

Figure 5 Net Plant Output as a Function of Ambient Temperature; Dry Heat Rejection

As with the wet cooling tower plot, data points in Figure 5 are not shown for net outputs below 40 MWe, the minimum turbine output which is 15 percent of the design output.

3.3 Hybrid Heat Rejection

For the purposes of the study, the following wet cooling tower duties in each 125 MWe plant have been selected for the hybrid tower designs:

2.5 in HgA: 130 MWt; 4 in. HgA: 80 MWt;
6 in. HgA: 45 MWt; and 8 in. HgA: 15 MWt.

3.4 Annual Performance Summary

A plot of the net plant output (as a fraction of the wet tower plant output) as a function of the wet cooling tower water consumption (as a fraction of the water consumption of the wet cooling tower case) is shown in Figure 6. As might be expected, the largest incremental gains occur with the first water used; i.e., switching from a dry system to the 8 in. HgA hybrid system increases the net output by 8,300 kWhe per ton of water consumed. As the water consumption is increased, the performance improvements become smaller; i.e., switching from the 2.5 in. HgA hybrid system to the wet cooling tower increases the net output by only 5 kWhe per ton of water consumed.

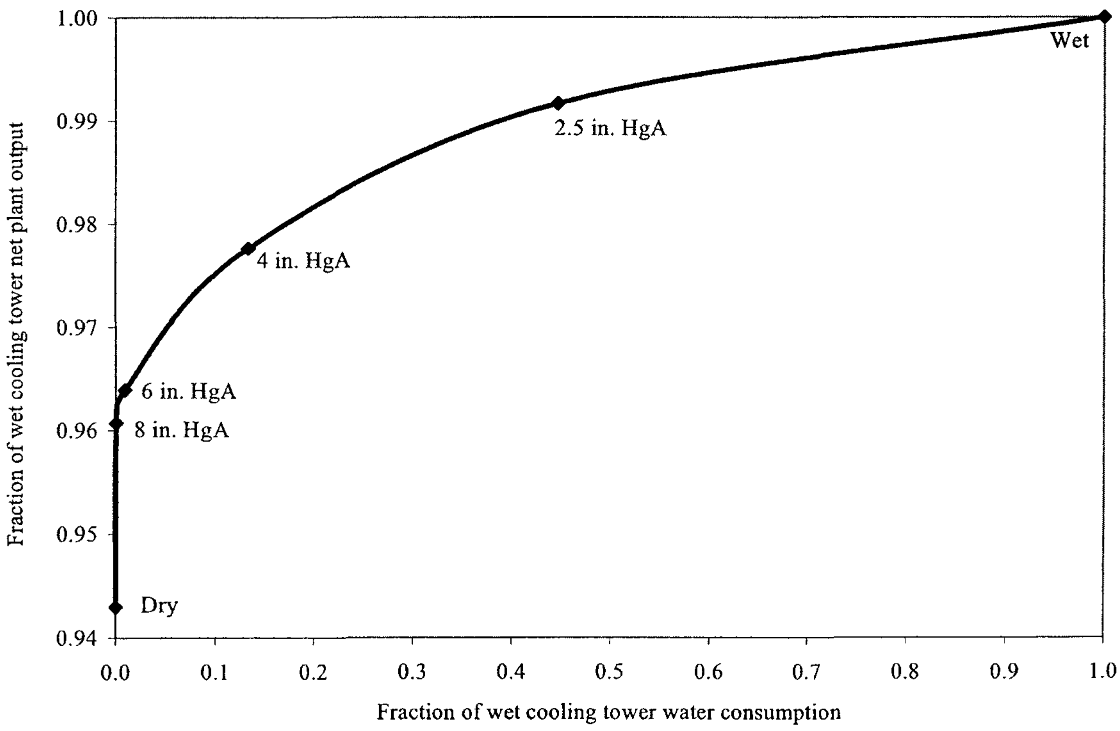

Figure 6 Net Plant Output as a Function of Wet Cooling Tower Water Consumption

The annual plant performance for the 6 cooling tower options is summarized in Table 1. Three trends can be noted, as follows:

- The gross and the net plant outputs both increase as the water consumption increases
- The pump energy demand is the highest for the wet cooling tower, and lowest for the air cooled condenser, due to the demands of the circulating water pumps
- The hybrid cases use the same air cooled condenser as the dry cooling tower case; thus, the fan energies for the hybrid cases are the sum of the fan energies for the dry case plus a portion of the fan energies for the wet cooling tower.

Table 1 Summary of Annual Plant Performance

	Gross turbine, MWhe	Pump power, MWhe	Fan power, MWhe	Net turbine, MWhe	Gross efficiency	Net efficiency	Makeup water, tons
Wet	875,199	19,157	8,956	846,161	0.379	0.366	2,705,132
Hybrid: 2.5 in. HgA	871,459	15,468	24,082	839,099	0.377	0.363	1,207,521
Hybrid: 4 in. HgA	858,196	13,702	19,601	827,234	0.372	0.358	360,998
Hybrid: 6 in. HgA	848,014	13,045	19,477	815,626	0.367	0.353	25,020
Hybrid: 8 in. HgA	845,290	13,002	19,390	812,903	0.366	0.352	1,803
Dry	827,262	12,977	16,413	797,872	0.361	0.348	0

6. References

1) "Task 2 - Comparison of Wet and Dry Rankine Cycle Heat Rejection", Midwest Research Institute/ National Renewable Energy Laboratory Subcontract Number LDC-5-55014-01, Technical Support for Parabolic Trough Solar Technology, Nexant Inc. (San Francisco, California), July 2006

2) GateCycle Program, Version 5.34, GE Enter Software, Inc. and the Electric Power Research Institute

EXHIBIT HVS-22

MONTGOMERY
& ASSOCIATES
Water Resource Consultants

Technical Memorandum

December 31, 2009

Prepared for:
Hualapai Valley Solar LLC

Addendum to Groundwater Flow Model for Hualapai Valley Solar Project

Mohave County, Arizona

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MONTGOMERY
& ASSOCIATES

DECEMBER 2009
TECHNICAL MEMORANDUM

ADDENDUM TO GROUNDWATER FLOW MODEL FOR HUALAPAI VALLEY SOLAR PROJECT MOHAVE COUNTY, ARIZONA

Prepared for:

HUALAPAI VALLEY SOLAR LLC

Prepared by:

MONTGOMERY & ASSOCIATES

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ARIZONA U.S.A.
Expires 09/30/2010

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& ASSOCIATES

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MONTGOMERY
& ASSOCIATES

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Figure

LIST OF ABBREVIATIONS

ADWR	Arizona Department of Water Resources
AF	acre-feet
AF/yr	acre-feet per year
BLM	U.S. Bureau of Land Management
bls	below land surface
CSP	concentrating solar power
EIS	Environmental Impact Statement
feet msl	feet above mean sea level
gpm	gallons per minute
HVS	Hualapai Valley Solar LLC
M&A	Montgomery & Associates
NPS	National Park Service
USGS	U.S. Geological Survey
WAPA	Western Area Power Administration of the U.S. Department of Energy

MONTGOMERY
& ASSOCIATES

DECEMBER 2009
TECHNICAL MEMORANDUM

ADDENDUM TO GROUNDWATER FLOW MODEL FOR HUALAPAI VALLEY SOLAR PROJECT MOHAVE COUNTY, ARIZONA

CONCLUSIONS

This technical memorandum is an Addendum to the Montgomery & Associates (M&A) technical memorandum dated November 16, 2009, and titled ***Groundwater Flow Model for Hualapai Valley Solar Project Mohave County, Arizona***. The principal conclusions from this investigation include:

1. Only a minute fraction of the groundwater stored in the Hualapai Valley groundwater basin is currently used. The volume of potentially recoverable groundwater calculated to be stored (15.8 million AF) in only the shallow part of the aquifer (above a depth of 1,200 feet below land surface) is equal to several hundred years of use at the current total rate (less than 20,000 AF/yr).

2. The projected impact on groundwater levels by the proposed HVS pumping would meet the stringent criteria for impacts on existing wells imposed by the State in Arizona Active Management Areas.

3. After 30 years of pumping, the projected incremental impact of HVS pumping is not substantial and is much less than 1 foot of water level change for wells in the City of Kingman, Dolan Springs, and Valle Vista areas.

4. The minimum pro rata amount of annually available groundwater already set aside by ADWR for the Rhodes Homes land on which the HVS plant is sited (4,416 AF/yr) would be nearly twice as much as HVS intends to use annually on average (2,400 AF/yr).

5. There is sufficient water available in the aquifer to meet the water needs for the life of the HVS Project without significantly impacting other existing groundwater users.

MONTGOMERY
& ASSOCIATES

DECEMBER 2009
TECHNICAL MEMORANDUM

ADDENDUM TO
GROUNDWATER FLOW MODEL FOR
HUALAPAI VALLEY SOLAR PROJECT
MOHAVE COUNTY, ARIZONA

INTRODUCTION

This technical memorandum is an Addendum to the Montgomery & Associates (M&A) technical memorandum dated November 16, 2009, and titled ***Groundwater Flow Model for Hualapai Valley Solar Project, Mohave County, Arizona*** (M&A, 2009). M&A prepared this Addendum under contract to Hualapai Valley Solar LLC (HVS) to address specific issues considered for the Hualapai Valley Solar Project Environmental Impact Statement (EIS). This EIS is being prepared by the U.S. Department of Energy (Western Area Power Administration or WAPA) with the U.S. Bureau of Land Management (BLM) participating as a cooperating agency. The proposed HVS thermal solar power plant is located southeast from Red Lake, Mohave County, Arizona.

The EIS is expected to address WAPA's proposed action of building a new substation and interconnecting the proposed HVS Project to WAPA's transmission system, as well as BLM's proposed actions of granting rights-of-way to HVS for the transmission line and associated access roads, and any other Project components crossing Federal lands, and to amend one of WAPA's existing rights-of-way to build a substation. It is anticipated that WAPA and BLM will also consider no-action alternatives along with other reasonable alternatives to the proposed Federal actions within the EIS, as appropriate. The potential environmental impacts of HVS constructing, operating, and maintaining a 340-megawatt solar-powered generating facility, consisting of a solar field, power block, thermal energy storage system, transmission line, temporary lay-down areas, and other ancillary facilities are also expected to be considered within the EIS. Results from the groundwater flow modeling conducted by M&A are provided to assist decision makers in assessing the significance of potential impacts to groundwater levels in the Hualapai Valley groundwater basin due to planned pumping to supply the proposed HVS thermal solar power plant.

The groundwater modeling investigations reported by M&A (2009) were conducted in June and July 2009, and were focused on projecting the incremental impact due solely to the HVS Project pumping groundwater at the upper end of the range of possible demand rates. The EIS is considering HVS groundwater demands as well as cumulative impacts; therefore, the Addendum incorporates updated information from Arizona Department of Water Resources (ADWR) on other committed demands for the basin and contains simulations for a range of HVS pumping rates as well as maximum cumulative impacts as determined with the EIS advisory group, which includes representatives of BLM, WAPA, National Park Service (NPS), and ADWR. This Addendum provides a series of new tables and illustrations showing results from the additional model simulations. This effort also provided the opportunity to consider new results from additional gravity surveys conducted in Hualapai Valley that were reported by ADWR in September 2009 (ADWR, 2009b), after completion of the modeling for M&A (2009).

BACKGROUND ON MODEL

Beginning in 2005, M&A has conducted comprehensive groundwater studies in Hualapai Valley to evaluate the impacts of various groundwater uses. The basin-wide numerical groundwater flow model developed by M&A for Hualapai Valley was originally constructed and calibrated in 2006 and 2007, and included the latest geophysical data available for the basin at that time. After a several month period of critical review by ADWR, the model was approved in 2007 by ADWR for use in projecting groundwater impacts of proposed developments. Details of the model construction and previous use were reported by M&A (2006 and 2007).

Construction of the model was based on available hydrogeologic data for Hualapai Valley, including: pumping test results, lithologic logs, and other data for wells; geophysical data; results from previous investigations in the basin; and results from modeling studies conducted for similar alluvial basins in Arizona. The Hualapai model was constructed using MODFLOW (Harbaugh and McDonald, 1996) and Groundwater Vistas, a graphical modeling interface (Rumbaugh and Rumbaugh, 2004).

The proposed groundwater pumping for HVS was added to the existing model to simulate the impact of the proposed facility over its projected 30-year life. Maximum average pumping rate for HVS was assumed to be 3,000 acre-feet per year (AF/yr), which is equivalent to a constant pumping rate of about 1,869 gallons per minute (gpm). This rate was the upper end of the range of possible pumping rates estimated by HVS engineers. Based on further plant design evaluation, the current average groundwater use estimated by HVS for the wet-cooling alternative is 2,400 AF/yr, not taking into account potential reuse of treated effluent from the City of Kingman that may become available to the Project. Feasibility of using this distant source of treated effluent at the HVS site is being evaluated by HVS. Results from these modeling investigations were reported by M&A (2009). This

Addendum to M&A (2009) presented herein provides results from additional model simulations for three levels of HVS groundwater demand, updated other committed demands, and maximum cumulative demands.

The Hualapai Valley model is calibrated to simulate pre-development equilibrium conditions in the 1965 to 1970 timeframe and past transient groundwater conditions for the period from 1971 through 2005. Simulations for future transient conditions begin in year 2006 and extend to the desired future year. Past transient conditions for the 1971 through 2005 period were dominated by groundwater withdrawals for the City of Kingman. For this Addendum, future transient conditions are impacted by committed groundwater withdrawals for the City of Kingman, domestic wells, assumed other committed demands, and proposed groundwater withdrawals for the HVS plant during the 30-year period from 2013 through 2042.

COLORADO RIVER ACCOUNTING SURFACE

Wilson and Owen-Joyce (1994, p. v) define the "accounting surface" that is administered by the U.S. Bureau of Reclamation for the Colorado River corridor as follows:

> "The accounting surface represents the elevation and slope of the unconfined static water table in the river aquifer outside the flood plain and the reservoirs of the Colorado River that would exist if the river were the only source of water to the river aquifer. The accounting surface was generated by using profiles of the Colorado River and water-surface elevations of reservoirs, lakes, marshes, and drainage ditches."

Further, Wilson and Owen-Joyce (1994, p. 6) establishes the following criteria to determine if wells impact the Colorado River subflow:

> **Wells that impact the river subflow:** "Wells that have a static water-level elevation equal to or below the accounting surface are presumed to yield water that will be replaced by water from the river."

> **Wells that do not impact the river subflow:** "Wells that have a static water-level elevation above the accounting surface are presumed to yield water that will be replaced by water from precipitation and inflow from tributary valleys."

There are several factors that ensure none of the existing production wells or wells proposed by the HVS Project in the Hualapai basin will impact the river subflow using these criteria. Only the extreme northern limit of the basin lies inside the accounting surface for Hualapai Valley. In addition, altitude of the groundwater table at all of the wells listed in the well inventory given by M&A (2009; Appendix B) is several hundred feet above the accounting surface. The data given below are for one of the northernmost wells in the basin. These data demonstrate that the well is outside the accounting surface; therefore, all wells south of this well are also outside the accounting surface.

CADASTRAL LOCATION	WELL NAME	WELL DEPTH (feet, bls)	LAND SURFACE ALTITUDE (feet, msl)	GROUNDWATER LEVEL DATE MEASURED	GROUNDWATER LEVEL DEPTH (feet, bls)	GROUNDWATER LEVEL ALTITUDE (feet, msl)	ACCOUNT-ING SURFACE ALTITUDE (feet, msl)	FEET ABOVE ACCOUNT-ING SURFACE
B(29-18) 01cca	TB-1	531	2,155	02/23/06	250	1,905	1205	695

Lastly, the accounting surface is deeper than the projected 30-year water level in the aquifer at any of the wells proposed by the HVS Project. Therefore, wells used to withdraw groundwater for the Project are not wells that would impact the Colorado River, according to criteria established by Wilson and Owen-Joyce (1994).

NEW INFORMATION

BEDROCK ALTITUDE AND SPECIFIC YIELD

In September 2009, ADWR published a report providing results of additional gravity survey data collected for the Hualapai Valley groundwater basin (ADWR, 2009b). The purpose of the ADWR report was to estimate groundwater in storage in Hualapai Valley by calculating the volume of saturated sediments between the groundwater level surface and the bedrock altitude surface, and selecting a range of specific yield values for the basin. Specific yield is the volume of water that would drain under gravity per unit volume of aquifer material and is dimensionless; this term is applied to unconfined or "water table" aquifers.

Bedrock Altitude

The M&A (2007 and 2009) modeled bedrock surface was approved by ADWR in 2007. Construction of this surface in the model was based on well logs and previously published data for gravity and seismic geophysical surveys conducted in Hualapai Valley, together with preliminary results from the new ADWR gravity survey provided to M&A in 2007 for the northern part of Hualapai Valley.

The ADWR (2009b) groundwater level surface and salt deposit extent are comparable to the 2005-2006 groundwater level surface and salt deposit extent from the M&A (2007 and 2009) groundwater model. The ADWR (2009b) bedrock altitude surface varies from the M&A (2007 and 2009) groundwater model as shown on **Figure 1**. The ADWR gravity survey interpretation did not represent the Red Lake sub-basin salt deposit as bedrock, whereas the M&A (2007 and 2009) groundwater model simulates the salt deposit as a no-flow bedrock unit. Therefore, to provide an appropriate comparison on **Figure 1** with the M&A (2007 and 2009) modeled bedrock surface, the ADWR (2009b) bedrock surface was modified to include the top of the salt deposit as bedrock.

The differences between the two bedrock surfaces are color coded on **Figure 1**. Deep shades of blue indicate areas where the M&A bedrock is significantly deeper than the ADWR bedrock. Deep shades of red indicate areas where the M&A bedrock is significantly shallower than the ADWR bedrock. The white and lighter pastel shades of blue and red indicate areas where the differences are smaller.

It is important to note that projections of water level impact by the proposed HVS pumping are almost entirely controlled by the hydrogeologic conditions in the Red Lake sub-basin. The differences shown on **Figure 1** between the two bedrock surface interpretations in the Red Lake sub-basin are small; the calculated difference in volume of saturated sediments to a depth of 1,200 feet below land surface (bls) is only about 5 percent. The apparent differences shown on **Figure 1** in this sub-basin are caused chiefly by the fact that the M&A modeled surface of the salt deposit is tilted downward to the east based on data from four deep drill holes, whereas ADWR (2009) assumed a uniformly level surface of the salt deposit. Therefore, the east side of the sub-basin has blue shades and the west side has red shades.

The new bedrock data were not incorporated into the M&A model for this modeling Addendum because it would require fundamental, time-prohibitive, changes to the construction of the model, as well as recalibration and rerunning of all simulations.

Specific Yield

Published aquifer test data that can be used to estimate specific yield for this basin are not currently available. However, estimates from other comparable basins or previous investigations from this basin can be used to determine an appropriate range of specific yield values for Hualapai Valley. ADWR (2009b) provided a table of estimated volumes of groundwater in storage above depths of 1,200 feet, 1,500 feet, and 2,000 feet bls, while assuming average specific yield values of 3, 6, or 8 percent for the entire Hualapai Valley groundwater basin. This range of specific yield values is in the lower part of the range of values reported for the basin.

The specific yield of aquifer materials for the Basin and Range region is summarized in the literature to typically range from 10 to 15 percent, but may range from 3 to 25 percent in a specific basin (Anderson and others, 1990). In terms of general hydrostratigraphic units: 1) the estimated specific yield for lower basin fill (i.e., older alluvium) is 10 percent or less; and 2) the specific yield for upper basin fill (i.e., intermediate and younger alluvium) commonly ranges from 10 to 15 percent, but may range from 3 to 25 percent within a basin, depending on location (Anderson and others, 1992). In many alluvial basins, specific yield is estimated to be smaller in the center of the basin, where fine-grained deposits are abundant, and is estimated to be larger along the basin margins, where coarser sediments predominate. The average specific yield of various lithologic facies found in the Basin and Range region was summarized by Anderson (1995) as follows: coarse-grained facies (stream alluvium) range from 15 to 25 percent; intermediate-grained facies range from 5 to 25 percent; and fine-grained facies range from less than 1 percent to 10 percent. The intermediate-grained facies comprise the principal aquifer in most basins; both the fine-grained and intermediate-grained facies may be found in upper and lower basin-fill units. Freethey and Anderson (1986) reviewed modeling studies for alluvial groundwater basins in the region and concluded that transient groundwater models for basins with aerially extensive fine-grained facies typically require a specific yield of between 5 and 13 percent for successful calibration.

The specific yield of sediments in the Hualapai Valley groundwater basin has been estimated by other investigators to range from 5 to 15 percent basin-wide, depending on aquifer lithology in the area considered. Gillespie and Bentley (1971) estimated the average specific yield of older alluvium to be between 5 and 10 percent for the entire basin; the specific yield of other aquifer materials in the basin was not estimated because older alluvium comprises the principal aquifer in the basin. However, lesser volumes of groundwater are stored in the volcanic rocks near Kingman, which were discussed in general terms as having a relatively low specific yield. Cella Barr Associates (1990) estimated the total volume of available groundwater in the Hualapai Valley by dividing the basin into three regions and assigning a specific yield value for each region based on review of available drillers logs: specific yield from Kingman to Long Mountain was estimated to be 10 percent; specific yield from Long Mountain to Red Lake was estimated to be 12 percent; and specific yield from Red Lake to Pierce Ferry Road was estimated to be 5 percent. Additional estimates for specific yield were incorporated into a numerical groundwater flow model, which was developed for the northern part of Hualapai Valley from Red Lake to the Gregg sub-basin, inclusive (Clear Creek Associates and Golder Associates, 2006). The conceptual basis for this model was a division of the aquifer into three sub-units: the Upper Basin Fill Unit, having an estimated specific yield of 15 percent; the Lacustrine Unit with an estimated specific yield of 8 percent; and the Lower Basin Fill Unit, also having an estimated specific yield of 15 percent. The Upper Basin Fill Unit corresponds to the "younger and intermediate" alluvium of Gillespie and Bentley (1971), and the Lower Basin Fill Unit is equivalent to older alluvium. The Lacustrine Unit is described as a "sequence of silts, fine sands, and limestones" having a maximum thickness of 150 feet that grades downward into Lower Basin Fill Unit south from Red Lake and pinches out north from Red Lake.

Specific yield values used in each area and layer of the calibrated M&A (2007 and 2009) groundwater flow model were selected based on a conceptual model of the basin that included available data and published estimates on: aquifer parameters; well logs; geophysical surveys; and dominant lithologies of basin-fill sediments. Specific yield was decreased from model layer 1 (upper layer) to model Layer 2 over most of the basin to account for aquifer compaction. In addition, the model calibration process itself was used to adjust the specific yield values, as reasonable and necessary, to match model output with measured groundwater levels in the basin, which is a primary criterion for calibration. Therefore, the model input values for specific yield are believed to be acceptable and appropriate for the basin. Model values for specific yield were 2 percent for the volcanic deposits, 8 percent for the playa deposits, and 10 and 12 percent for the remainder of the basin-fill deposits. Average model specific yield was 9.86 percent (M&A, 2009).

Based on the selection of specific yield values, different volumes of groundwater in storage in the Hualapai Valley groundwater basin were estimated by M&A (2007 and 2009) and ADWR (2009b). Using an average specific yield of 9.86 percent, the M&A model calculated about 15.8 million acre-feet (AF) of groundwater in storage above a depth of 1,200 feet bls in the entire basin. If the groundwater model had assumed an average specific yield of 8 percent, the calculated volume of groundwater in storage above 1,200 feet bls would be about 12.6 million AF. Using a specific yield of 8 percent, ADWR (2009b) calculated about 10.1 million AF of groundwater in storage above a depth of 1,200 feet bls, or about 20 percent less than the volume calculated by the M&A model for that specific yield. Most of this difference is due to the difference in depth to bedrock in the Kingman and Gregg sub-basins (**Figure 1**), which does not significantly affect the projection of impacts from proposed HVS pumping. These volumes compare with the range of 10.5 million to 21 million AF estimated by Gillespie and Bentley (1971) for the saturated sediments to depths of 1,000 feet bls in the Red Lake area and 1,500 feet bls in southern Hualapai Valley.

For the purpose of comparison, using an average specific yield of 8 percent in the Red Lake sub-basin, where the HVS Project is proposed, the M&A model calculated about 7.7 million AF of groundwater in storage above a depth of 1,200 feet bls. The corresponding volume calculated using the ADWR (2009b) bedrock surface in the Red Lake sub-basin is about 7.3 million AF, or about 5 percent less than the volumes calculated by the model.

PUMPING RATES

Pumping rates for simulations of the future transient conditions in this Addendum include: new information from ADWR on other committed groundwater demands in the basin; updating of assumptions for City of Kingman area groundwater demand; and a range of assumptions for HVS groundwater demand to address the estimated average and high-end demand for a concentrating solar power (CSP) facility with wet-cooling and the estimated average demand for a photovoltaic solar power facility.

Other Committed Demands

Pumping rates for simulations of the past transient groundwater conditions from 1971 through 2005 remain unchanged from the M&A (2007 and 2009) groundwater model approved by ADWR; these rates are given in **Table 1**. As part of ADWR requirements for the 2007 groundwater model submission, any analyses of adequate or inadequate water supply issued by ADWR were to be included as simulated pumping wells in the basin for all transient future (predictive) simulations. At that time, ADWR recommended that the pumping rate for the other committed demand should be a total of 3,893 AF/yr. This future demand was represented in the M&A model as seven wells identified and located in the application for

Mardian Ranch (Clear Creek Associates and Golder Associates, 2006) and seven additional wells each pumping 300 AF/yr. Locations for the seven additional wells were not specified by ADWR; therefore, model locations for these wells were selected in the Red Lake sub-basin, where the majority of the simulated pumping for the proposed Rhodes Homes developments occurs.

In October 2009, ADWR provided a new table giving the annual water demand for all of the other committed demands in the basin, located by the specific townships, ranges, and sections where the demands should simulated in the model. The total updated pumping for the other committed demand, excluding pumping for the City of Kingman, Mardian Ranch, and the five Rhodes Homes developments, is 9,763 AF/yr. For each committed demand, if the associated land comprised more than one section, the demand was divided equally among the sections listed. The locations and pumping rates for the simulated other committed demand wells are shown on **Figure 2** and given in **Table 2**. In many instances, the locations of the other committed demand provided by ADWR were outside the active model domain. Many of these wells are potentially completed in bedrock and are not pumping from the alluvial aquifer. However, to allow the demand to be simulated and provide a conservatively large estimate of total pumping from the alluvial aquifer, all of these well locations were moved into the active model domain. **Figure 2** shows the original locations of all wells and the adjusted locations used in the M&A groundwater model. The updated other committed demands are included in all of the simulations for this Addendum.

City of Kingman

Also as part of ADWR requirements for the 2007 groundwater model submission, the simulated City of Kingman demand for the predictive simulations was equal to the 2005 Designation of Adequate Water Supply for the City. The simulated City pumping increased from 9,297 AF/yr in 2006 to 12,076 AF/yr in 2014, and remained constant from 2014 through

2042. ADWR recently reported that the total City of Kingman pumping in 2008 was 8,720 AF (personal communication from R. Obenshain of ADWR, November 23, 2009). The M&A (2007 and 2009) groundwater model simulated a total demand of 9,992 AF for the City in 2008, or about 15 percent more than was reported.

To provide a more conservative projection of water demand in the City of Kingman area for this Addendum, estimates of population growth were reviewed and the future water demand for the City was simulated to increase at the rate of 3 percent per year to account for unplanned growth in the Kingman sub-basin. Projections reported by ADWR (2009a) indicate an average population growth rate in Hualapai Valley of about 1.9 percent through 2030. Data from the Arizona Department of Economic Security, reported by the Arizona Department of Commerce (2006), indicate an average population growth rate in Hualapai Valley of about 2.0 percent through 2042. Therefore, a 3 percent growth rate provides a large safety factor of 50 percent to account for unplanned growth.

For this Addendum, the City of Kingman pumping is simulated as 12,076 AF in 2014 and increasing thereafter at a rate of 3 percent per year until 2042, when pumping is simulated as 27,629 AF. Simulated pumping rates are given on **Table 2**. The updated City of Kingman well demands are included in all of the simulations for this Addendum.

Hualapai Valley Solar

The M&A (2009) model simulated HVS wells pumping at a total rate of 3,000 AF/yr from 2013 through 2042, which is the end of the projected 30-year life of the plant. This rate represents the high-end demand for a concentrating solar power (CSP) facility with wet-cooling. For this addendum, the EIS advisory group requested that HVS groundwater pumping also be simulated at an average annual rate of 2,400 AF/yr for a CSP facility with wet-cooling, and at an average annual rate of 30 AF/yr for a photovoltaic solar power facility. If City of

Kingman treated effluent becomes available and feasible for HVS use, it is estimated to reduce the groundwater demand of the plant by about 1,800 AF/yr. It should be noted that the minimum pro rata amount of annually available groundwater already set aside by ADWR for the Rhodes Homes land on which the HVS plant is sited (4,416 AF/yr) would be nearly twice as much as HVS intends to use annually on average (2,400 AF/yr).

UPDATED MODEL SIMULATIONS

BASE CASE SIMULATION

The Base Case groundwater model simulation for this Addendum is derived from the M&A (2009) groundwater model with updated simulated future pumping rates through the year 2042. The pumping rates are shown on **Tables 1 and 2**, and reflect the new information from ADWR on other committed groundwater demands in the basin and updated assumptions for City of Kingman area groundwater demand, as discussed in the previous sections, but exclude any pumping by HVS, Mardian Ranch, or Rhodes Homes. All other model parameters remain unchanged from the M&A (2009) model.

HVS SIMULATIONS

For these simulations, HVS pumping at four hypothetical onsite production wells is added to the Base Case at total rates of 3,000 AF/yr, 2,400 AF/yr, and 30 AF/yr for the 30-year period from 2013 through 2042. For each simulation, the HVS pumping is distributed equally among the four production wells. HVS pumping regimens for these simulations are given in **Table 3**.

MAXIMUM CUMULATIVE IMPACTS SIMULATION

The largest committed groundwater demands in Hualapai Valley are for the Mardian Ranch master planned community and the Rhodes Homes Peacock Highlands, Peacock Vistas, Hafley Ranch, Nugent Ranch, and Red Lake master planned communities. These proposed developments received letters of Analysis of Adequate Water Supply from ADWR in 2007 for a total of 81,373 AF/yr of groundwater for 100 years to supply 283,993 new single-family homes and 44,317 new multi-family homes. It is not known how or when these projects and the associated water use will be phased in, or how the current economic conditions may delay the projects. For perspective, the unused committed demand for these projects over the last two years since ADWR issued its analyses far exceeds the entire 30-year water demand for the HVS Project, yet no homes have been built. In any event, if the HVS facility is constructed and operated, ADWR has the ability to take the HVS committed demand into account when determining groundwater availability for future phases of these developments at such time as they are proposed.

In addition, similar letters of Analysis of Adequate Water Supply issued by ADWR from 2005 to 2007 to developers account for a total of 19,495 AF/yr of groundwater to build 40,495 single-family homes and 10,498 multi-family homes in Detrital Valley, and a total of 13,500 AF/yr of groundwater to build 31,202 single-family homes and 12,775 multi-family homes in northern Sacramento Valley. All these developments combined far exceed the projected population growth for Mohave County.

Based on the foregoing considerations, the EIS advisory group agreed to define the Maximum Cumulative Impacts simulation for Hualapai Valley as the Base Case with HVS pumping at 3,000 AF/yr and the Mardian and Rhodes Homes projects phasing in over a 50-year build out period. It is assumed that, even if they started immediately, none of the master planned communities could complete the permitting process and begin significant groundwater use before 2012. Therefore, these communities are simulated to phase in at a constant rate over the 50-year period from 2012 through 2061. **Table 4** gives the simulated pumping regimens for the Maximum Cumulative Impacts simulation.

For Mardian Ranch, total simulated pumping increases from 229 AF/yr in 2012 to 7,104 AF/yr in 2042. For Peacock Highlands, total simulated pumping increases from 269 AF/yr in 2012 to 8,333 AF/yr in 2042. For Peacock Vistas, total simulated pumping increases from 64 AF/yr in 2012 to 1,991 AF/yr in 2042. For Hafley Ranch, total simulated pumping increases from 84 AF/yr in 2012 to 2,601 AF/yr in 2042. For Nugent Ranch, total simulated pumping increases from 113 AF/yr in 2012 to 3,501 AF/yr in 2042. For the Red Lake development, total simulated pumping increases from 869 AF/yr in 2012 to 26,928 AF/yr in 2042 **(Table 4)**.

To demonstrate how conservative the projected increase in Hualapai Valley groundwater use is for the Maximum Cumulative Impacts simulation, the values in **Table 4** were compared against the projections given on page 61 of the Water Resources Element of the Mohave County Development Services Department U.S. 93 Corridor Plans (Mohave County, 2009).

	Mohave County (2009) Projections for Hualapai Valley		M&A Model Projections		Ratio of Groundwater Use
Year	Population	Groundwater Use * (AF/yr)	Population *	Groundwater Use (AF/yr)	(M&A Model/County)
2008	---	8,720 **	---	19,788	2.3
2010	44,193	8,839	102,415	20,483	2.3
2020	67,973	13,595	209,325	41,865	3.1
2030	100,031	20,006	315,505	63,101	3.2
2040	138,843	27,769	430,215	86,043	3.1

* Based on 0.2 AF/yr per capita (Mohave County, 2009)

** From personal communication with R. Obenshain of ADWR, November 23, 2009; not from Mohave County

The projected groundwater use values in **Table 4** are more than three times the values projected by the County growth study for the basin after 30 years of HVS pumping and are, therefore, very conservative. For example, Mohave County (2009) projected total groundwater use in Hualapai Valley to be only 27,769 AF/yr in 2040, whereas the model uses 86,043 AF/yr.

GROUNDWATER MODEL RESULTS

Projected results of groundwater simulations are shown on **Figures 3a through 7d** and are summarized in **Table 5**. For these figures, the edge of the dark grey area of the basin represents the edge of the bedrock outcrop area. The tan-colored areas are inactive model cells where the underlying alluvial aquifer material was unsaturated in 1971 and throughout the simulation. The blue-colored area is the saturated part of the aquifer at the ending time of the simulation. Red-colored model cells are areas where the underlying alluvial aquifer material was unsaturated in 1971, but became dewatered, or "dry" cells sometime during the simulation period from 1971 through 2042.

BASE CASE SIMULATION

A contour map of projected groundwater level altitude for the Base Case simulation at the end of 2042 is shown on **Figure 3a**. A contour map of projected groundwater level decline (drawdown) for the Base Case at the end of 2042 is shown on **Figure 3b**. For the Base Case simulation, for the period from 2013 through 2042, the simulated model water balance projects a decrease in aquifer storage of 850,688 AF, based on a total simulated recharge volume of 113,990 AF, a total simulated pumped volume of 851,630 AF, and a total outflow volume via the Lake Mead constant head cells of 113,048 AF. Simulated discharge at the constant head cells decreases from 3,804 AF/yr in 2013 to 3,688 AF/yr in 2042.

HVS AT 3,000 AF/YR

Contour maps for projected groundwater level altitudes and projected drawdown at the end of 2042 for the simulation assuming HVS pumping at 3,000 AF/yr are shown on **Figures 4a and 4b**, respectively. Projected drawdown at the end of 2042 due solely to HVS pumping at 3,000 AF/yr is shown on **Figure 4c**. The drawdown shown on **Figure 4c** was calculated by subtracting the drawdown for the Base Case simulation from the total drawdown for this HVS simulation shown on **Figure 4b**. The maximum drawdown due to HVS pumping is 62 feet and occurs at the HVS plant site **(Table 5)**. Projected drawdown at the end of 2017 due solely to HVS pumping at 3,000 AF/yr is shown on **Figure 4d**. The purpose of **Figure 4d** is to show that the projected impacts by HVS would meet the well impact criteria on existing off-site wells imposed in Active Management Areas, which is less than 10 feet of drawdown in the first 5 years of pumping, if it were applicable in Mohave County.

For this simulation, for the period from 2013 through 2042, the simulated model water balance projects a decrease in aquifer storage of 940,702 AF, based on a total simulated recharge volume of 113,990 AF, a total simulated pumped volume of 941,621 AF, and a total outflow volume via the Lake Mead constant head cells of 113,071 AF. Simulated discharge at the constant head cells decreases from 3,804 AF/yr in 2013 to 3,688 AF/yr in 2042.

HVS AT 2,400 AF/YR

Contour maps for projected groundwater level altitudes and projected drawdown at the end of 2042 for the simulation assuming HVS pumping at 2,400 AF/yr are shown on **Figures 5a and 5b**, respectively. Projected drawdown at the end of 2042 due solely to HVS pumping at 2,400 AF/yr is shown on **Figure 5c**. The drawdown shown on **Figure 5c** was calculated by subtracting the drawdown for the Base Case simulation from the total drawdown for this HVS simulation shown on **Figure 5b**. The maximum drawdown due to HVS pumping is 50 feet and occurs at the HVS plant site **(Table 5)**.

For this simulation, for the period from 2013 through 2042, the simulated model water balance projects a decrease in aquifer storage of 922,704 AF, based on a total simulated recharge volume of 113,990 AF, a total simulated pumped volume of 923,623 AF, and a total outflow volume via the Lake Mead constant head cells of 113,071 AF. Simulated discharge at the constant head cells decreases from 3,804 AF/yr in 2013 to 3,688 AF/yr in 2042.

HVS AT 30 AF/YR

Contour maps for projected groundwater level altitudes and projected drawdown at the end of 2042 for the simulation assuming HVS pumping at 30 AF/yr are shown on **Figures 6a and 6b**, respectively. Projected drawdown at the end of 2042 due solely to HVS pumping at 30 AF/yr is shown on **Figure 6c**. The drawdown shown on **Figure 6c** was calculated by subtracting the drawdown for the Base Case simulation from the total drawdown for this HVS simulation shown on **Figure 6b**. The maximum drawdown due to HVS pumping is 0.6 foot and occurs at the HVS plant site **(Table 5)**.

For this simulation, for the period from 2013 through 2042, the simulated model water balance projects a decrease in aquifer storage of 851,584 AF, based on a total simulated recharge volume of 113,990 AF, a total simulated pumped volume of 852,525 AF, and a total outflow volume via the Lake Mead constant head cells of 113,048 AF. Simulated discharge at the constant head cells decreases from 3,804 AF/yr in 2013 to 3,688 AF/yr in 2042.

MAXIMUM CUMULATIVE IMPACTS SIMULATION

Contour maps for projected groundwater level altitudes and projected drawdown at the end of 2042 for the Maximum Cumulative Impacts simulation are shown on **Figures 7a and 7b**, respectively. Projected drawdown at the end of 2042 due solely to HVS pumping at 3,000 AF/yr is shown on **Figure 7c**. The drawdown shown on **Figure 7c** was calculated by subtracting the drawdown for the Maximum Cumulative Impacts simulation without HVS pumping from the total drawdown shown on **Figure 7b**. The maximum drawdown due to HVS pumping is 63 feet and occurs at the HVS plant site **(Table 5)**. Projected drawdown at the end of 2017 due solely to HVS pumping at 3,000 AF/yr is shown on **Figure 7d**. The purpose of **Figure 7d** is to show that the projected impacts by HVS would meet the well impact criteria on existing off-site wells imposed in Active Management Areas, which is less than 10 feet of drawdown in the first 5 years of pumping, if it were applicable in Mohave County.

Results of the Maximum Cumulative Impacts simulation show that four model cells become dewatered along the edge of the groundwater model domain within the Red Lake sub-basin whether HVS is pumping or not. For this simulation, for the period from 2013 through 2042, the simulated model water balance projects a decrease in aquifer storage of 1,746,354 AF, based on a total simulated recharge volume of 113,990 AF, a total simulated pumped volume of 1,747,337 AF, and a total outflow volume via the Lake Mead constant head cells of 113,060 AF. Simulated discharge at the constant head cells decreases from 3,804 AF/yr in 2013 to 3,682 AF/yr in 2042.

BURRO SPRING

A concern raised by NPS is the potential impact to the quantity or quality of water that discharges from Burro Spring, located near the mouth of Spring Canyon which drains into Spring Cove on Lake Mead. NPS indicates that the spring may be used by wildlife and discharges continuously at an estimated rate of 15 to 35 gpm. Recent visits to this spring by NPS and the U.S. Geological Survey to obtain water samples for laboratory chemical and isotopic analyses indicate that the spring discharges from fractured bedrock, but could potentially be supported by groundwater in nearby alluvial deposits via interconnected fractures (personal communication from G. Karst of NPS, December 18, 2009). The spring lies in the transition zone between the Colorado Plateau and the Basin and Range Physiographic Provinces, where geologic and structural features are complex. Therefore, even though the spring is in the general area of discharge from the Hualapai Valley groundwater system to Lake Mead, the source of the small discharge from this spring is uncertain.

The Hualapai Valley groundwater model developed by M&A is designed to simulate basin-wide impacts in the alluvial aquifer and, therefore, is not designed to directly assess potential impacts to the small individual springs at Lake Mead, which are located in bedrock areas outside the model domain. Projecting impacts to springs discharging a few tens of gpm in a basin discharge area of 3,000 to 4,000 AF/yr (1,860 to 2,480 gpm) would require a model of high local resolution with the ability to analyze both porous media and fractured rock aquifer systems. Much more detailed information on the local hydrology and geology in the discharge area would be necessary to construct such a model, which is beyond the scope of this Addendum.

The present model can project water level change in the alluvial aquifer near Burro Spring due to groundwater pumping in the aquifer. For the alluvial aquifer in the active model cell nearest to Burro Spring, the M&A model projects 0.00 feet of groundwater level decline due to proposed pumping by HVS after 30 years of pumping (year 2042) for any of the simulations described herein. The simulated impacts from proposed HVS pumping are not projected to reach that part of the groundwater basin after 30 years of pumping. Therefore, it can be concluded that the proposed pumping at HVS would not impact Burro Spring over the proposed life of the Project.

SUMMARY OF CONSERVATIVE ASSUMPTIONS

Assumptions made in this Addendum to provide conservative projections of potential impacts include:

1. In many instances, the locations of the other committed demand provided by ADWR were outside the active model domain. Many of these wells are potentially completed in bedrock and are not pumping from the alluvial aquifer. However, to allow the demand to be simulated and provide a conservatively large estimate of total pumping from the alluvial aquifer, all of these well locations were moved into the active model domain. **Figure 2** shows the original locations of all wells and the adjusted locations used in the M&A groundwater model. The updated other committed demands are included in all of the simulations for this Addendum.

2. As part of ADWR requirements for the M&A (2007) groundwater model, the simulated City of Kingman demand for the predictive simulations was equal to the 2005 Designation of Adequate Water Supply for the City. The simulated City pumping increased from 9,297 AF/yr in 2006 to 12,076 AF/yr in 2014. ADWR recently reported that the total City of Kingman pumping in 2008 was only 8,720 AF (personal communication from R. Obenshain of ADWR,

November 23, 2009). The M&A (2007 and 2009) groundwater model simulated a total demand of 9,992 AF for the City in 2008, or about 15 percent more than was reported.

3. To provide a more conservative projection of water demand after 2014 in the City of Kingman area for this Addendum, estimates of population growth were reviewed and the future water demand for the City was simulated to increase at the rate of 3 percent per year to account for unplanned growth in the Kingman sub-basin. Projections reported by ADWR (2009a) indicate an average population growth rate in Hualapai Valley of about 1.9 percent through 2030. Data from the Arizona Department of Economic Security, reported by the Arizona Department of Commerce (2006), indicate an average population growth rate in Hualapai Valley of about 2.0 percent through 2042. Therefore, a 3 percent growth rate provides a large safety factor of 50 percent to account for unplanned growth.

4. The projected groundwater use values for the Maximum Cumulative Impact simulation given in **Table 4** are more than three times the values projected by the Mohave County (2009) growth study for the basin after 30 years of HVS pumping and are, therefore, very conservative. For example, Mohave County (2009) projected total groundwater use in Hualapai Valley to be only 27,769 AF/yr in 2040, whereas the model uses 86,043 AF/yr.

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MONTGOMERY
& ASSOCIATES

TABLES

TABLE 1. SUMMARY OF SIMULATED GROUNDWATER PUMPING FOR 1971 THROUGH 2005

			LOCATION COORDINATES*		SIMULATED ANNUAL PUMPING RATE, IN ACRE-FEET																																			
CADASTRAL LOCATION OR MODEL WELL NAME	REGISTRY NUMBER OR WELL OWNER	COMPLETION DATE	EASTING (feet)	NORTHING (feet)	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Existing Kingman-Area Production Wells:																																								
B(22-16) 28BDA	55-504272	12/3/1982	429,661.93	1,551,625.34	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	119.9	239.8	359.6	479.5	599.4	719.2	839.1	959.	1,078.9	1,198.8	1,318.6	1,438.5	1,558.4	1,678.2	1,798.1	1,918.	2,037.9	2,157.8	2,277.6	2,397.5	2,517.4	2,637.2	2,757.1	2,877.
B(22-16) 29AAA	55-576713	2/6/1991	427,046.37	1,559,011.43	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	75.5	151.1	226.6	302.1	377.7	453.2	528.7	604.3	679.8	755.3	830.9	906.4	981.9	1,057.5	1,133.
B(22-16) 32DDD	55-591289	06/14/2002	427,107.05	1,542,867.93	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	414.	828.	1,242.	1,656.
B(22-16) 33CDC	55-612665	1/1/1971	428,915.42	1,542,632.77	0.	26.7	53.5	80.2	107.	133.7	160.5	187.2	213.9	240.7	267.4	294.2	320.9	347.7	374.4	401.1	427.9	454.6	481.4	508.1	534.9	561.6	588.3	615.1	641.8	668.6	695.3	722.1	748.8	775.5	802.3	829.	855.8	882.5	909.3	936.
B(22-16) 33BCD	55-612666	1/1/1966	428,423.19	1,545,561.39	0.	14.5	29.	43.5	58.1	72.6	87.1	101.6	116.1	130.6	145.1	159.7	174.2	188.7	203.2	217.7	232.2	246.7	261.3	275.8	290.3	304.8	319.3	333.8	348.3	362.9	377.4	391.9	406.4	420.9	435.4	449.9	464.5	479.	493.5	508.
B(22-16) 15CCC	55-612657	10/10/1974	433,097.36	1,558,693.87	0.	0.	0.	0.	16.1	32.1	48.2	64.3	80.3	96.4	112.4	128.5	144.6	160.6	176.7	192.8	208.8	224.9	240.9	257.	273.1	289.1	305.2	321.3	337.3	353.4	369.4	385.5	401.6	417.6	433.7	449.8	465.8	481.9	497.9	514.
B(22-16) 21BBD	55-612658	1/1/1972	417,388.83	1,558,090.68	0.	0.	37.7	75.4	113.1	150.8	188.5	226.2	263.9	301.6	339.3	377.1	414.8	452.5	490.2	527.9	565.6	603.3	641.	678.7	716.4	754.1	791.8	829.5	867.2	904.9	942.6	980.3	1,018.1	1,055.8	1,093.5	1,131.2	1,168.9	1,206.6	1,244.3	1,282.
B(22-16) 27DDD	55-612667	3/28/1968	437,966.65	1,547,764.62	0.	0.2	0.3	0.5	0.7	0.9	1.	1.2	1.4	1.5	1.7	1.9	2.1	2.2	2.4	2.6	2.7	2.9	3.1	3.3	3.4	3.6	3.8	3.9	4.1	4.3	4.5	4.6	4.8	5.	5.1	5.3	5.5	5.7	5.8	6.
B(22-16) 34CBC	55-612664	4/5/1978	433,103.11	1,544,172.84	0.	0.	0.	0.	0.	0.	0.	0.	1.4	2.7	4.1	5.4	6.8	8.1	9.5	10.9	12.2	13.6	14.9	16.3	17.6	19.	20.4	21.7	23.1	24.4	25.8	27.1	28.5	29.9	31.2	32.6	33.9	35.3	36.6	38.
Total Annual Pumping					0.	41.4	120.6	199.7	294.9	390.1	485.3	580.5	677.	773.6	870.1	966.7	1,183.1	1,399.6	1,616.	1,832.4	2,048.8	2,265.3	2,481.7	2,698.1	2,914.6	3,206.5	3,498.5	3,790.5	4,082.4	4,374.4	4,666.3	4,958.3	5,250.3	5,542.2	5,834.2	6,126.2	6,832.1	7,538.1	8,244.	8,950.
Existing Domestic Wells:																																								
B(21-15) 05BBB-R		9/20/2001	453,618.86	1,542,558.22	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.25	0.25	0.25	0.25	0.25
B(21-16) 03CCA		4/5/2005	433,690.64	1,538,238.31	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.25
B(21-16) 03BAB		3/26/2006	434,362.30	1,542,180.10	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
B(22-15) 09CAA		6/7/2002	461,394.12	1,565,882.48	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.25	0.25	0.25	0.25
B(22-15) 19CBB		1/1/1982	448,678.32	1,555,517.86	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(22-15) 23CCD-R		1/1/1965	462,777.00	1,553,272.99	0.	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(22-15) 33BBB		2/12/1957	459,537.57	1,547,194.93	0.	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(22-15) 33DBD-R		9/12/2000	458,785.59	1,544,117.84	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.25	0.25	0.25	0.25	0.25	0.25
B(22-15) 33CCC-R		3/10/2002	454,954.75	1,542,710.36	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.25	0.25	0.25	0.25
B(22-16) 02ABD		3/12/2005	441,669.65	1,573,161.94	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.25
B(22-16) 03CBA		12/11/1979	433,192.69	1,571,463.52	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(22-16) 03CBB		6/30/1980	433,103.49	1,571,234.44	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(22-16) 05DBA		1/1/1980	425,840.28	1,571,262.33	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(22-16) 06DBA		11/26/2005	419,571.40	1,571,278.47	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.25
B(22-16) 07ADD		4/9/1974	421,925.07	1,568,607.28	0.	0.	0.	0.	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(22-16) 07DAA		10/17/1987	422,006.92	1,566,304.53	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(22-16) 07DCC		8/4/2002	418,486.97	1,564,025.44	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.25	0.25	0.25	0.25
B(22-16) 07ABD		4/1/2005	418,554.71	1,567,981.44	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.25
B(22-16) 10CAA		10/15/2005	435,070.71	1,565,952.09	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.25
B(22-16) 15CCC		10/4/1974	433,064.30	1,556,775.28	0.	0.	0.	0.	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(22-16) 15AAB		1/1/1980	437,046.87	1,563,300.73	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(22-16) 15CCC		6/11/1983	433,097.36	1,558,693.87	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(22-16) 15CCA		11/30/1998	432,804.28	1,559,288.10	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(22-16) 17DDD		7/5/2002	427,046.37	1,559,011.43	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.25	0.25	0.25	0.25
B(22-16) 17DDD		7/12/2002	427,128.23	1,558,708.48	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.25	0.25	0.25	0.25
B(22-16) 19BAA		6/1/1973	417,388.63	1,558,090.68	0.	0.	0.	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(22-16) 20CBC		11/10/1997	422,509.65	1,554,755.79	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(22-16) 20DAA		6/8/2002	427,126.38	1,555,418.54	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.25	0.25	0.25	0.25
B(22-16) 20CBC		5/10/2004	422,509.65	1,554,755.79	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.25	0.25
B(22-16) 26BAC		6/1/1957	439,052.32	1,551,906.20	0.	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(22-16) 27DDD		11/15/1973	437,966.65	1,547,764.62	0.	0.	0.	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(22-16) 28BBA		11/30/1998	428,528.92	1,552,472.26	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(22-16) 28CDA		11/21/2000	429,763.96	1,551,624.33	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.25	0.25	0.25	0.25	0.25	0.25
B(22-16) 28BDA		2/2/2001	429,661.93	1,551,625.34	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.25	0.25	0.25	0.25	0.25
B(22-16) 29AAA		10/5/1990	427,127.56	1,552,774.73	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(22-16) 29AAA		11/30/1996	417,706.93	1,558,016.86	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(22-16) 29AAA		9/8/2004	427,032.32	1,552,765.44	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.25	0.25
B(22-16) 32DDD		1/1/2006	427,107.05	1,542,867.93	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
B(22-16) 32DDD		1/1/2006	427,107.05	1,542,867.93	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
B(22-16) 33BCD		6/15/1973	428,423.19	1,545,561.39	0.	0.	0.	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(22-16) 33CDC		10/7/1974	428,915.42	1,542,632.77	0.	0.	0.	0.	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(22-16) 33CCD		8/10/2002	428,432.42	1,542,862.03	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.25	0.25	0.25	0.25
B(22-16) 34CBC		11/9/1980	433,103.11	1,544,172.84	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(22-16) 34BCA		8/30/2000	433,711.43	1,546,134.44	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.25	0.25	0.25	0.25	0.25	0.25
B(23-14) 03ADD		4/17/1998	500,771.52	1,603,443.78	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(23-14) 05AAA-R		12/11/1989	490,498.24	1,605,974.78	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(23-15) 14CCC-R		11/15/1973	464,089.39	1,588,937.91	0.	0.	0.	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(23-15) 30CBB		12/5/1979	448,789.88	1,581,966.99	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(23-15) 35BAB-R		1/5/2004	470,715.84	1,579,426.29	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.25	0.25
B(23-16) 03BBD		11/18/2005	433,813.76	1,604,912.95	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.25
B(23-16) 09ADA-R		6/1/1973	432,662.82	1,599,432.82	0.	0.	0.	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(23-16) 09DAB-R		12/5/1979	434,010.10	1,597,850.42	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(23-16) 15BDB-R		2/2/1973	435,819.14	1,590,655.68	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.25	0.25	0.25
B(23-16) 33CCC-R		1/25/2003	427,763.14	1,573,962.95	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.25	0.25	0.25
B(24-14) 09CBB-R		10/9/2002	490,609.66	1,629,620.69	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.25	0.25	0.25	0.25
B(24-14) 19ABD-R		9/12/2002	487,697.17	1,620,524.38	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.25	0.25	0.25	0.25
B(24-14) 28DBC		4/6/1997	493,625.97	1,612,680.26	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(24-14) 29AAB		1/1/1980	489,837.55	1,616,091.20	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(24-14) 29BAD-R		2/2/1996	490,535.83	1,615,201.77	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(24-14) 29AAA		1/16/1997	490,801.14	1,616,422.02	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(24-14) 29ABA		3/16/2005	489,375.94	1,616,248.45	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.25
B(24-14) 29BBA		1/12/2006	489,276.58	1,616,643.77	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
B(24-14) 33AAD		2/1/1998	495,494.73	1,610,011.67	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(24-15) 01BCC		5/23/2004	475,325.46	1,635,586.68	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.25	0.25
B(24-15) 05CBD		11/30/1998	454,830.45	1,634,126.05	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(24-15) 05BBC		10/28/2004	454,176.26	1,637,115.94	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.25	0.25
B(24-15) 05DAC		4/19/2005	457,540.87	1,633,633.24	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.25
B(24-15) 11CBB-R		1/1/1980	469,507.62	1,629,714.74	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(24-15) 11BCA-R		1/12/1990	469,408.79	1,630,675.11	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(24-15) 11BAA-R		2/15/2006	469,368.49	1,631,954.58	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
B(24-15) 13ADA-R		1/1/1980	461,373.79	1,625,770.73	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(24-15) 18BBB		11/30/1998	446,817.21	1,626,626.06	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(24-15) 27CCC-R		1/3/2006	464,201.18	1,611,549.40	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
B(24-15) 28DDD-R		1/26/1978	464,099.20	1,611,470.53	0.	0.	0.	0.	0.	0.	0.	0.	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(24-15) 28CCA		1/1/1980	460,111.65	1,612,117.28	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(24-15) 28CAC		4/13/2004	460,775.67	1,612,782.01	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.25	0.25
B(24-15) 32BBD		7/20/1981	454,979.40	1,609,710.87	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(24-15) 32ACA		4/11/1982	457,710.14	1,609,636.82	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(24-15) 33BBB		1/6/1975	459,159.94	1,610,946.70	0.	0.	0.	0.	0.	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(24-16) 07CAA-R		1/1/1980	415,445.13	1,629,396.81	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(24-16) 08BDB-R		1/1/1978	423,469.17	1,631,010.34	0.	0.	0.	0.	0.	0.	0.	0.	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(24-16) 08DCA-R		1/1/1980	427,235.02	1,628,444.45	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(24-16) 08ACA		10/9/1989	425,924.90	1,630,692.41	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(24-16) 10CAA		9/1/2001	434,778.40	1,629,057.90	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.25	0.25	0.25	0.25	0.25
B(24-16) 10AAA		9/6/2001	437,937.46	1,632,357.60	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.25	0.25	0.25	0.25	0.25
B(24-16) 11DDD		6/4/1985	442,630.53	1,627,231.45	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(24-16) 19ADC		3/15/2001	421,375.18	1,621,012.62	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.25	0.25	0.25	0.25	0.25

MONTGOMERY & ASSOCIATES

TABLE 1. SUMMARY OF SIMULATED GROUNDWATER PUMPING FOR 1971 THROUGH 2005

CADASTRAL LOCATION OR MODEL WELL NAME	REGISTRY NUMBER OR WELL OWNER	COMPLETION DATE	LOCATION COORDINATES* EASTING (feet)	NORTHING (feet)	SIMULATED ANNUAL PUMPING RATE, IN ACRE-FEET 1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
B(24-16) 26ABA-R		8/30/2002	441,531.11	1,616,275.03	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.25	0.25	0.25	0.25
B(24-16) 26CDB-R		12/6/2005	437,859.46	1,612,537.96	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.25
B(24-16) 34DDB-R		1/1/1980	435,082.10	1,606,829.26	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(24-16) 34CAD		1/1/1980	435,134.26	1,607,557.52	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(24-16) 34BDA		9/6/2001	435,141.41	1,609,539.01	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.25	0.25	0.25	0.25	0.25
B(25-16) 23BBB		3/23/2001	434,235.72	1,646,906.04	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.25	0.25	0.25	0.25	0.25
B(25-16) 30CCB		7/13/1995	413,479.28	1,644,629.72	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(26-16) 31ACB		12/8/2005	415,927.62	1,641,953.28	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.25
B(25-17) 13AAA		6/10/2001	412,901.88	1,659,375.50	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.25	0.25	0.25	0.25	0.25
B(25-17) 23BCA-R		2/2/1981	407,440.27	1,652,614.88	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(25-17) 23BDD-R		1/1/2006	407,566.39	1,651,757.29	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
B(26-16) 16AA		5/12/2001	419,460.26	1,669,106.40	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.25	0.25	0.25	0.25	0.25
B(26-16) 26C		3/7/2000	436,265.00	1,676,575.21	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.25	0.25	0.25	0.25	0.25	0.25
B(26-16) 27ABD		4/20/1995	400,403.18	1,679,477.52	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(26-16) 28DDC		3/20/1993	427,993.74	1,675,479.60	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(26-16) 29BBB		2/6/1991	418,627.70	1,680,298.27	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(26-16) 29BBB		1/27/1992	417,300.93	1,679,805.91	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(26-16) 29DDD		7/15/1992	423,296.65	1,675,604.45	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(26-16) 29DDD		12/15/1992	423,236.87	1,676,462.20	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(26-16) 30DDD		8/31/1999	418,168.70	1,675,506.58	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(26-17) 23CCC		2/1/1970	404,148.15	1,680,707.03	0.	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(26-17) 23CDD		9/20/1999	405,015.51	1,680,773.94	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(26-17) 23CBB		11/4/1999	402,586.76	1,682,936.45	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(26-17) 25BBB		2/16/1999	408,802.93	1,696,894.51	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(26-17) 27ACA		10/1/1956	401,088.27	1,679,401.21	0.	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(26-17) 35AAA		1/1/1959	409,755.10	1,670,152.84	0.	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(26-18) 01BDB-R		7/20/1990	377,549.70	1,703,827.30	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.25
B(26-18) 03BDB		1/1/1980	367,283.84	1,700,289.67	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(26-18) 03ADD		12/19/2005	370,582.36	1,699,617.87	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.25
B(26-18) 05DBB-R		11/2/1989	369,005.29	1,699,731.37	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(26-18) 05DCB		8/26/2004	356,034.76	1,697,701.84	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.25	0.25
B(26-18) 09CAD		1/1/1980	362,656.01	1,693,056.79	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(26-18) 09DBC		6/12/1981	363,317.67	1,693,051.39	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(26-18) 17AAC		6/25/1981	359,340.52	1,690,427.64	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(27-16) 26CBD		2/20/1995	424,467.67	1,708,683.85	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(27-16) 29CCD		1/1/1993	419,166.43	1,707,352.53	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(27-17) 05ADC		1/1/1980	391,064.18	1,731,253.77	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(27-17) 05ADC		10/20/1980	391,067.37	1,731,257.14	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(27-17) 13ABD		1/17/1994	410,230.32	1,721,801.94	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(27-17) 23CAC		10/20/1977	403,317.66	1,714,251.10	0.	0.	0.	0.	0.	0.	0.	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(28-16) 07ADD		6/1/1966	389,164.88	1,749,712.73	0.	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(28-17) 31DDD		10/5/1957	386,463.26	1,733,906.05	0.	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(28-17) 31CCC		1/1/1963	382,470.05	1,734,343.00	0.	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(28-17) 31AAA		12/11/1979	388,481.23	1,738,521.58	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(28-18) 13DCB		6/1/1957	379,200.74	1,750,387.40	0.	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(28-18) 13CDA		1/1/1980	378,705.30	1,750,393.15	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(29-18) 01CCC		8/3/1979	375,607.77	1,792,432.26	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Total Annual Pumping					0.	2.52	2.52	3.77	4.53	4.78	4.78	5.03	5.53	6.79	10.82	11.62	12.33	12.58	12.58	12.83	12.83	13.08	13.08	13.84	14.59	14.84	15.6	16.1	16.35	17.11	17.36	18.11	19.87	20.88	21.89	24.15	25.66	27.17	28.93	31.95
Simulated Other Committed Demand (OCD) Wells:																																								
B(23-16) 29-R	Amatista Acres, Sunward Hol Rn	1/1/2007	442,853.62	1,575,898.89	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
B(23-15) 11-R	Arizona West Tract 1112	1/1/2007	461,908.63	1,592,696.82	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
B(22-17) 11-R	Cedar Ridge Estates	1/1/2007	423,794.49	1,561,792.41	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
B(22-17) 14-R	Cedar Ridge Estates	1/1/2007	423,723.30	1,556,479.27	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
B(22-17) 12-R	Cerbat Ranches Unit 1	1/1/2007	429,082.69	1,561,771.85	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
B(22-17) 01-R	Cerbat Water Company	1/1/2007	429,051.91	1,567,101.64	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
B(22-17) 12-R	Cerbat Water Company	1/1/2007	429,082.69	1,561,771.85	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
B(22-17) 13-R	Cerbat Water Company	1/1/2007	429,039.67	1,556,472.83	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
B(23-17) 36-R	Cerbat Water Company	1/1/2007	429,149.97	1,572,363.64	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
B(23-16) 31-R	Esmeralda Acres/Sunward Hol	1/1/2007	435,989.22	1,570,642.83	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
B(22-17) 13-R	Fountain Hills Estates	1/1/2007	429,039.67	1,556,472.83	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
B(22-15) 05	Greater Kingman Industrial Park	1/1/2007	456,442.34	1,571,495.01	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
B(22-15) 17	Greater Kingman Industrial Park	1/1/2007	456,439.75	1,560,933.10	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
B(22-15) 05	Greater Kingman Industrial Park	1/1/2007	456,442.34	1,571,495.01	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
B(22-15) 17	Greater Kingman Industrial Park	1/1/2007	456,439.75	1,560,933.10	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
B(23-16) 07-R	Hillview Ranches	1/1/2007	436,272.15	1,594,647.84	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
B(22-16) 12	Hualapai Vista Estates, Tract 3811	1/1/2007	445,971.17	1,566,236.49	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
B(22-16) 13	Hualapai Vista Estates, Tract 3811	1/1/2007	445,954.43	1,560,958.45	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
B(28-17) 09-R	Joshua Park Unit #1	1/1/2007	387,245.72	1,751,655.19	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
B(28-17) 09-R	Joshua Park Unit 1	1/1/2007	382,286.66	1,756,611.21	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
B(28-17) 09-R	Joshua Park Unit No. 1	1/1/2007	383,277.69	1,750,099.39	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
B(28-17) 09-R	Joshua Park Unit No. 1	1/1/2007	380,424.37	1,748,760.62	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
B(22-17) 11-R	Lake Juniper	1/1/2007	423,794.49	1,561,792.41	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
B(22-17) 14-R	Lake Juniper	1/1/2007	423,723.30	1,556,479.27	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
B(22-17) 11-R	Lake Juniper Estates	1/1/2007	423,794.49	1,561,792.41	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
B(22-17) 14-R	Lake Juniper Estates	1/1/2007	423,723.30	1,556,479.27	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
B(25-15) 03-R	Lake Mead Rancheros	1/1/2007	457,647.73	1,665,160.76	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
B(25-15) 19	Lake Mead Rancheros	1/1/2007	447,311.50	1,651,448.34	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
B(25-15) 21	Lake Mead Rancheros	1/1/2007	457,901.41	1,651,439.33	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
B(25-15) 27	Lake Mead Rancheros #1-12	1/1/2007	463,162.22	1,646,121.18	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
B(25-15) 29	Lake Mead Rancheros #1-12	1/1/2007	452,598.20	1,646,153.47	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
B(25-15) 31	Lake Mead Rancheros #1-12	1/1/2007	447,285.88	1,640,870.50	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
B(25-15) 31	Lake Mead Rancheros Unit 10	1/1/2007	447,285.88	1,640,870.50	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
B(25-15) 13-R	Lake Mead Rancheros, Unit 1	1/1/2007	466,935.35	1,653,113.34	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
B(25-15) 05	Lake Mead Rancheros, Units 3, 8, 14, 16	1/1/2007	452,638.42	1,667,278.65	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
B(25-15) 09	Lake Mead Rancheros, Units 3, 8, 14, 16	1/1/2007	457,892.29	1,661,994.51	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

MONTGOMERY & ASSOCIATES

TABLE 1. SUMMARY OF SIMULATED GROUNDWATER PUMPING FOR 1971 THROUGH 2005

CADASTRAL LOCATION OR MODEL WELL NAME	REGISTRY NUMBER OR WELL OWNER	COMPLETION DATE	LOCATION COORDINATES* EASTING (feet)	NORTHING (feet)	SIMULATED ANNUAL PUMPING RATE, IN ACRE-FEET 1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
B(25-15) 17	Lake Mead Rancheros, Units 3, 8, 14, 16	1/1/2007	452,605.32	1,656,712.06	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
B(25-15) 27	Lake Mead Rancheros, Units 3, 8, 14, 16	1/1/2007	463,162.22	1,646,121.18	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
B(28-18) 13	Lake Mead Ranchos Unit 2	1/1/2007	379,056.14	1,752,060.79	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
B(28-18) 11-R	Lake Mead Ranchos Unit 3	1/1/2007	376,022.26	1,756,338.07	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
B(28-18) 01	Lake Mead Ranchos Unit 4	1/1/2007	379,110.22	1,762,678.80	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
B(28-18) 01	Lake Mead Ranchos Unit 4	1/1/2007	379,110.22	1,762,678.80	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
B(29-18) 23	Lake Mead Ranchos Unit 7	1/1/2007	371,578.80	1,778,531.55	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
B(29-18) 23	Lake Mead Ranchos Unit 7	1/1/2007	371,578.80	1,778,531.55	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
B(29-18) 27-R	Lake Mead Ranchos, Unit 6	1/1/2007	371,227.57	1,773,403.29	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
B(26-18) 01-R	Lake Mohave Ranchos	1/1/2007	375,806.20	1,708,097.00	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
B(26-18) 03	Lake Mohave Ranchos	1/1/2007	368,271.69	1,699,300.35	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
B(26-18) 05-R	Lake Mohave Ranchos	1/1/2007	361,291.93	1,697,359.24	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
B(26-18) 07-R	Lake Mohave Ranchos	1/1/2007	359,122.53	1,694,357.83	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
B(26-18) 09	Lake Mohave Ranchos	1/1/2007	362,984.35	1,694,046.01	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
B(26-18) 11-R	Lake Mohave Ranchos	1/1/2007	370,527.10	1,700,838.30	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
B(26-18) 13-R	Lake Mohave Ranchos	1/1/2007	373,984.00	1,701,187.90	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
B(26-18) 15-R	Lake Mohave Ranchos	1/1/2007	366,237.30	1,695,569.10	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
B(26-19) 25-R	Lake Mohave Ranchos	1/1/2007	360,476.90	1,692,654.70	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
B(26-19) 25-R	Lake Mohave Ranchos, Unit 6	1/1/2007	361,537.00	1,692,056.40	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
B(29-19) 27-R	Mead-O-Rama #2	1/1/2007	376,972.11	1,774,424.25	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
B(29-18) 35-R	Mead-O-Rama #3	1/1/2007	375,043.42	1,769,300.83	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
B(29-17) 31-R	Mead-O-Rama #4	1/1/2007	378,835.99	1,765,991.94	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
B(29-18) 35-R	Mead-O-Rama Unit No. 3	1/1/2007	375,663.08	1,766,134.85	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
B(20-15) 06-R	Pinion Pines Estates #2	1/1/2007	452,872.94	1,541,717.19	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
B(22-17) 12-R	Quail Valley Estates	1/1/2007	428,082.69	1,561,771.85	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
B(25-16) 01	Realsite Arizona Ranchettes Units 1,3,4,6,7,8, and 9	1/1/2007	442,081.65	1,667,315.63	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
B(25-16) 11	Realsite Arizona Ranchettes Units 1,3,4,6,7,8, and 9	1/1/2007	436,792.73	1,662,037.17	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
B(25-16) 23	Realsite Arizona Ranchettes Units 1,3,4,6,7,8, and 9	1/1/2007	436,764.26	1,651,462.12	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
B(25-16) 25	Realsite Arizona Ranchettes Units 1,3,4,6,7,8, and 9	1/1/2007	442,027.75	1,646,164.85	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
B(26-16) 35	Realsite Arizona Ranchettes Units 1,3,4,6,7,8, and 9	1/1/2007	436,735.36	1,640,906.01	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
B(26-15) 19-R	Realsite Arizona Ranchettes Units 1,3,4,6,7,8, and 9	1/1/2007	444,210.74	1,681,625.11	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
B(26-15) 31	Realsite Arizona Ranchettes Units 1,3,4,6,7,8, and 9	1/1/2007	447,351.05	1,672,578.48	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
B(23-17) 23-R	Red Wing Canyon Estates	1/1/2007	445,736.73	1,568,185.02	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
B(24-14) 27-R	Shadow Mountain Acres Unit Two & Three	1/1/2007	490,002.40	1,616,900.52	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
B(24-14) 35-R	Shadow Mountain Acres Unit Two & Three	1/1/2007	495,276.11	1,611,616.53	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
B(23-14) 03-R	Sunny Highlands Estates, Tract 1132, Phase 1-20 Lots	1/1/2007	493,344.61	1,606,771.94	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
B(23-16) 09-R	Sunnyvale Acres, Sunward Ho! Ranches #2	1/1/2007	435,207.66	1,601,657.54	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
B(23-16) 33-R	Sunrise Mountain Estates	1/1/2007	431,949.26	1,575,490.35	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
B(23-16) 19-R	Sunward Ho! Ranches	1/1/2007	438,210.53	1,584,157.55	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
B(23-16) 30-R	Sunward Ho! Ranches	1/1/2007	436,006.36	1,575,922.23	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
B(23-16) 31-R	Sunward Ho! Ranches	1/1/2007	435,989.22	1,570,642.83	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
B(23-16) 33-R	Sunward Ho! Ranches	1/1/2007	438,213.59	1,579,201.89	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
B(23-16) 30-R	Sunward Ho! Ranches Turquesa Acres	1/1/2007	436,006.36	1,575,922.23	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
B(23-16) 18-R	Toro Acres, Sunward Ho! #2	1/1/2007	438,213.12	1,589,426.29	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
B(23-16) 19-R	Toro Acres, Sunward Ho! #2	1/1/2007	438,210.53	1,584,157.55	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
B(23-15) 15-R	Valle Vista	1/1/2007	456,586.45	1,587,379.30	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
B(23-15) 10-R	Valle Vista #1A,3A	1/1/2007	456,612.41	1,592,653.10	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
B(23-15) 15-R	Valle Vista #1A,3A	1/1/2007	456,586.45	1,587,379.30	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
B(23-15) 03-R	Valle Vista Unit 2 Tract 1200, Lots 860, 861, 999, 1078,1709, 1631, and 1907	1/1/2007	456,616.99	1,597,947.49	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
B(24-16) 34	Valle Vista Unit 3- Tract 1204	1/1/2007	435,465.93	1,606,549.29	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
B(22-16) 05-R	Zafiro Acres-Sunward Ho Ranches	1/1/2007	425,495.38	1,567,541.86	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
Total Annual Pumping					0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
Annual Grand Total					0.	43.9	123.1	203.5	289.4	384.9	490.1	585.5	682.8	780.4	881.	978.5	1,195.5	1,412.1	1,628.8	1,845.3	2,061.7	2,278.3	2,494.8	2,712.	2,929.2	3,221.4	3,514.1	3,806.8	4,098.8	4,391.3	4,683.7	4,976.4	5,270.1	5,563.1	5,856.1	6,150.3	6,858.8	7,565.2	8,273.	8,981.9

* = *Location coordinates are State Plane, U.S. feet, Arizona West, North American Datum 1927*

"-R" = Relocated Well. Well is located in the Hualapai Valley, but outside the active area for model. Well was relocated to the nearest active cell.

MONTGOMERY & ASSOCIATES

TABLE 2. SUMMARY OF SIMULATED GROUNDWATER PUMPING FOR 2006 THROUGH 2042, UPDATED BASE CASE

CADASTRAL LOCATION OR MODEL WELL NAME	REGISTRY NUMBER OR WELL OWNER	COMPLETION DATE	LOCATION COORDINATES* EASTING (feet)	NORTHING (feet)	SIMULATED ANNUAL PUMPING RATE, IN ACRE-FEET 2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042
Existing Kingman-Area Production Wells:																																									
B(22-16) 28BDA	55-504272	12/3/1982	429,681.93	1,551,626.34	2,988.6	3,100.3	3,212.	3,323.6	3,435.3	3,546.9	3,658.6	3,770.2	3,881.9	3,998.3	4,118.3	4,241.8	4,369.1	4,500.1	4,635.1	4,774.2	4,917.4	5,064.9	5,216.9	5,373.4	5,534.6	5,700.6	5,871.7	6,047.8	6,229.2	6,416.1	6,608.6	6,806.9	7,011.1	7,221.4	7,439.	7,661.2	7,891.	8,127.8	8,371.6	8,622.7	8,881.4
B(22-16) 29AAA	55-576713	2/6/1991	427,046.37	1,559,011.43	1,177.	1,220.9	1,264.9	1,308.9	1,352.8	1,396.8	1,440.8	1,484.8	1,528.7	1,574.6	1,621.8	1,670.5	1,720.6	1,772.2	1,825.4	1,880.1	1,936.5	1,994.6	2,054.6	2,116.1	2,179.6	2,245.	2,312.3	2,381.7	2,453.2	2,526.7	2,602.5	2,680.6	2,761.	2,843.9	2,929.2	3,017.1	3,107.6	3,200.8	3,296.8	3,395.7	3,497.6
B(22-16) 32DDD	55-591269	08/14/2002	427,107.05	1,542,867.93	1,720.3	1,784.5	1,848.8	1,913.1	1,977.3	2,041.6	2,105.9	2,170.1	2,234.4	2,301.4	2,370.5	2,441.6	2,514.6	2,590.3	2,668.	2,748.	2,830.5	2,915.4	3,002.8	3,092.9	3,185.7	3,281.3	3,379.7	3,481.1	3,585.6	3,693.1	3,803.9	3,918.	4,035.6	4,156.6	4,281.3	4,409.8	4,542.1	4,678.3	4,818.7	4,963.3	5,112.1
B(22-16) 33CDC	55-612665	1/1/1971	428,916.42	1,542,832.77	972.3	1,008.6	1,045.	1,081.3	1,117.6	1,153.9	1,190.3	1,226.6	1,262.9	1,300.8	1,339.8	1,380.	1,421.4	1,464.1	1,508.	1,553.2	1,599.8	1,647.8	1,697.3	1,748.2	1,800.6	1,854.6	1,910.3	1,967.6	2,026.6	2,087.4	2,150.	2,214.5	2,281.	2,349.4	2,419.9	2,492.5	2,567.3	2,644.3	2,723.6	2,805.3	2,889.5
B(22-16) 33BCD	55-612668	1/1/1968	428,423.19	1,545,561.39	527.7	547.4	567.1	586.9	606.6	626.3	646.	665.7	685.4	706.	727.2	749.	771.5	794.6	818.4	843.	868.3	894.3	921.2	948.8	977.3	1,006.6	1,036.8	1,067.9	1,099.9	1,132.9	1,166.9	1,201.9	1,238.	1,275.1	1,313.3	1,352.7	1,393.3	1,435.1	1,478.2	1,522.5	1,568.2
B(22-16) 15CCC	55-612657	10/10/1974	433,097.36	1,556,693.87	533.9	553.9	573.8	593.8	613.7	633.7	653.6	673.6	693.5	714.3	735.8	757.8	780.6	804.	828.1	853.	878.5	904.9	932.	960.	988.8	1,018.5	1,049.	1,080.5	1,112.9	1,146.3	1,180.7	1,216.1	1,252.6	1,290.2	1,328.9	1,368.7	1,409.8	1,452.1	1,495.7	1,540.5	1,586.7
B(22-16) 21BBD	55-612658	1/1/1972	417,388.83	1,568,090.66	1,331.7	1,381.5	1,431.3	1,481.	1,530.8	1,580.5	1,630.3	1,680.	1,729.8	1,781.7	1,835.1	1,890.2	1,946.9	2,005.3	2,065.4	2,127.4	2,191.2	2,257.	2,324.7	2,394.4	2,466.2	2,540.2	2,616.4	2,694.9	2,775.8	2,859.	2,944.8	3,033.2	3,124.2	3,217.9	3,314.4	3,413.8	3,516.3	3,621.7	3,730.4	3,842.3	3,957.6
B(22-16) 27DDD	55-612667	3/28/1968	437,966.65	1,547,764.62	6.2	6.5	6.7	6.9	7.2	7.4	7.6	7.9	8.1	8.3	8.6	8.9	9.1	9.4	9.7	10.	10.3	10.6	10.9	11.2	11.5	11.9	12.3	12.6	13.	13.4	13.8	14.2	14.6	15.1	15.5	16.	16.5	17.	17.5	18.	18.5
B(22-16) 34CBC	55-612664	4/5/1976	433,103.11	1,544,172.84	39.5	41.	42.4	43.9	45.4	46.8	48.3	49.8	51.3	52.8	54.4	56.	57.7	59.4	61.2	63.1	65.	66.9	68.9	71.	73.1	75.3	77.6	79.9	82.3	84.7	87.3	89.9	92.6	95.4	98.2	101.2	104.2	107.4	110.6	113.9	117.3
Total Annual Pumping					9,287.3	9,644.7	9,992.	10,339.3	10,686.7	11,034.	11,381.3	11,728.7	12,076.	12,438.3	12,811.4	13,195.8	13,591.6	13,999.4	14,419.4	14,852.	15,297.5	15,756.4	16,229.1	16,716.	17,217.5	17,734.	18,266.	18,814.	19,378.4	19,959.8	20,558.6	21,175.3	21,810.6	22,464.9	23,138.9	23,833.	24,548.	25,284.5	26,043.	26,824.3	27,629.
Existing Domestic Wells:																																									
B(21-15) 05BBB-R		9/20/2001	455,616.96	1,542,658.22	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(21-16) 03CCA		4/5/2006	433,690.64	1,536,236.31	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(21-16) 03BAB		3/28/2006	434,362.30	1,542,180.10	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(22-15) 09CAA		8/7/2002	461,394.12	1,565,682.48	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(22-15) 19CBB		1/1/1982	446,678.32	1,656,817.86	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(22-15) 23CCD-R		1/1/1966	462,777.00	1,653,272.69	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(22-15) 33BBB		3/12/1987	459,537.67	1,547,194.93	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(22-15) 33DBD-R		8/12/2000	468,766.59	1,544,117.84	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(22-15) 33CCC-R		3/10/2002	454,954.76	1,542,710.36	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(22-16) 02ABD		3/12/2006	441,689.65	1,573,181.94	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(22-16) 03CBA		12/11/1979	433,192.69	1,571,483.62	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(22-16) 03CBB		6/30/1980	433,103.49	1,571,234.44	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(22-16) 05DBA		1/1/1980	425,640.28	1,571,282.33	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(22-16) 06DBA		11/26/2005	419,571.40	1,571,278.47	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(22-16) 07ADD		4/9/1974	421,925.07	1,566,607.26	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(22-16) 07DAA		10/17/1987	422,008.92	1,566,304.53	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(22-16) 07DCC		6/4/2002	418,466.97	1,564,025.44	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(22-16) 07ABD		4/1/2005	419,554.71	1,567,961.44	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(22-16) 10CAA		10/15/2005	435,070.71	1,565,952.09	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(22-16) 15CCC		10/4/1974	433,064.30	1,558,775.26	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(22-16) 15AAB		1/1/1980	437,046.87	1,563,300.73	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(22-16) 15CCC		6/11/1963	433,097.36	1,558,693.87	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(22-16) 15CCA		11/30/1998	432,604.26	1,559,286.10	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(22-16) 17DDD		7/5/2002	427,046.37	1,559,011.43	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(22-16) 17DDD		7/12/2002	427,128.23	1,558,708.48	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(22-16) 19BAA		6/1/1973	417,388.83	1,558,090.68	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(22-16) 20CBC		11/10/1997	422,609.85	1,554,755.79	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(22-16) 20DAA		8/8/2002	427,126.38	1,555,418.54	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(22-16) 20CBC		6/10/2004	422,609.88	1,554,766.79	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(22-16) 26BAC		6/1/1987	439,052.32	1,551,908.20	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(22-16) 27DDD		11/15/1973	437,966.68	1,547,764.62	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(22-16) 28BBA		11/30/1998	428,626.92	1,552,472.26	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(22-16) 28CDA		11/21/2000	429,763.96	1,551,624.33	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(22-16) 28BDA		2/2/2001	429,681.93	1,551,626.34	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(22-16) 29AAA		10/5/1990	427,127.56	1,562,774.73	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(22-16) 29AAA		11/30/1998	417,706.93	1,558,016.86	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(22-16) 29AAA		9/8/2004	427,032.32	1,562,766.44	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(22-16) 32DDD		1/1/2006	427,107.05	1,542,867.93	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(22-16) 32DDD		1/1/2006	427,107.06	1,542,867.93	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(22-16) 33BCD		6/16/1973	428,423.19	1,545,561.39	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(22-16) 33CDC		10/7/1974	428,916.42	1,542,832.77	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(22-16) 33CCD		9/10/2002	428,432.42	1,542,682.03	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(22-16) 34CBC		11/9/1990	433,103.11	1,544,172.84	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(22-16) 34BCA		8/30/2000	433,711.43	1,546,134.44	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(23-14) 03ADD		4/17/1996	500,771.62	1,603,443.76	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(23-14) 05AAA-R		12/11/1989	490,496.24	1,606,974.76	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(23-15) 14CCC-R		11/18/1973	464,069.39	1,566,937.91	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(23-15) 30CBB		12/5/1979	448,789.86	1,561,966.99	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(23-15) 36BAB-R		1/6/2004	470,715.84	1,579,426.29	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(23-16) 03BBD		11/16/2005	433,813.76	1,604,912.95	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(23-16) 09ADA-R		6/1/1973	432,682.82	1,599,432.62	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(23-16) 09DAB-R		12/5/1979	434,010.10	1,597,850.42	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(23-16) 15BDB-R		2/2/1973	436,819.14	1,590,655.66	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(23-16) 33CCC-R		1/25/2003	427,763.14	1,573,962.96	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(24-14) 09CBB-R		10/9/2002	490,809.66	1,629,620.89	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(24-14) 19ABD-R		9/12/2002	487,897.17	1,620,324.38	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(24-14) 28DBC		4/6/1997	493,625.97	1,612,680.26	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(24-14) 29AAB		1/1/1980	489,837.56	1,616,091.20	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(24-14) 29BAD-R		2/2/1996	490,535.63	1,615,201.77	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(24-14) 29AAA		1/16/1997	490,601.14	1,616,422.02	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(24-14) 29ABA		3/16/2005	489,376.94	1,616,248.45	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(24-14) 29BBA		1/12/2006	489,276.58	1,616,643.77	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(24-14) 33AAD		2/1/1986	495,494.73	1,610,011.67	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(24-15) 01BCC		6/23/2004	476,326.46	1,635,566.64	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(24-15) 05CBD		11/30/1996	464,830.46	1,634,126.06	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(24-15) 05BBC		10/26/2004	464,176.26	1,637,116.94	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(24-15) 05DAC		4/19/2005	467,640.67	1,633,633.24	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(24-15) 11CBB-R		1/1/1980	469,507.82	1,629,714.74	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(24-15) 11BCA-R		1/12/1990	469,408.79	1,630,676.11	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(24-15) 11BAA-R		2/16/2006	469,365.49	1,631,954.96	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(24-15) 13ADA-R		1/1/1980	481,373.79	1,626,770.73	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(24-15) 18BBB		11/30/1998	448,917.21	1,626,626.06	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(24-15) 27CCC-R		1/3/2006	464,201.19	1,611,549.40	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(24-15) 28DDD-R		1/26/1978	464,099.20	1,611,470.53	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(24-15) 28CCA		1/1/1980	460,111.65	1,612,117.26	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(24-15) 28CAC		4/13/2004	460,778.67	1,612,782.01	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(24-15) 32BBD		7/20/1981	454,979.40	1,609,710.67	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(24-15) 32ACA		4/11/1982	457,710.14	1,608,836.62	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(24-15) 33BBB		1/6/1975	459,159.94	1,610,946.70	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(24-16) 07CAA-R		1/1/1980	416,448.13	1,629,306.61	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(24-16) 08BDB-R		1/1/1978	423,489.17	1,631,010.34	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(24-16) 08DCA-R		1/1/1980	427,236.02	1,628,444.45	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(24-16) 08ACA		10/9/1989	425,924.90	1,630,692.41	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(24-16) 10CAA		9/1/2001	434,778.40	1,629,057.90	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(24-16) 10AAA		9/6/2001	437,937.48	1,632,357.60	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(24-16) 11DDD		6/4/1985	442,830.53	1,627,231.46	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(24-16) 19ADC		3/15/2001	421,375.18	1,621,012.62	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(24-16) 26ABA-R		8/30/2002	441,831.11	1,616,275.03	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(24-16) 26CDB-R		12/6/2005	437,659.48	1,612,537.96	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(24-16) 34DDB-R		1/1/1980	435,082.10	1,606,629.26	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(24-16) 34CAD		1/1/1980	436,134.26	1,607,557.52	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(24-16) 34BDA		9/6/2001	436,141.41	1,609,539.01	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(25-16) 23BBB		3/23/2001	434,235.72	1,646,906.04	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(25-16) 30CCB		7/13/1995	413,479.26	1,644,629.72	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(25-16) 31ACB		12/8/2006	415,927.62	1,641,853.28	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(25-17) 13AAA		5/10/2001	412,901.88	1,659,375.50	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(25-17) 23BCA-R		2/2/1981	407,440.27	1,652,614.88	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(25-17) 23BDD-R		1/1/2006	407,586.39	1,651,757.29	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(26-16) 16AA		5/12/2001	419,460.26	1,689,105.40	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25

TABLE 2. SUMMARY OF SIMULATED GROUNDWATER PUMPING FOR 2006 THROUGH 2042, UPDATED BASE CASE

CADASTRAL LOCATION OR MODEL WELL NAME	REGISTRY NUMBER OR WELL OWNER	COMPLETION DATE	LOCATION COORDINATES* EASTING (feet)	NORTHING (feet)	SIMULATED ANNUAL PUMPING RATE, IN ACRE-FEET 2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042
B(26-16) 26C		3/7/2000	435,265.00	1,676,575.21	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(26-16) 27ABD		4/20/1996	400,403.16	1,679,477.52	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(26-16) 28DDC		3/20/1993	427,993.74	1,675,479.60	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(26-16) 29BBB		2/8/1991	418,827.70	1,680,298.27	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(26-16) 29BBB		1/27/1992	417,300.93	1,679,606.91	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(26-16) 29DDD		7/15/1992	423,296.65	1,675,604.46	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(26-16) 29DDD		12/15/1992	423,236.87	1,676,462.20	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(26-16) 30DDD		8/31/1999	416,166.70	1,676,506.58	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(26-17) 23CCC		2/1/1970	404,146.15	1,680,707.03	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(26-17) 23CDD		9/20/1999	405,015.51	1,680,773.94	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(26-17) 23CBB		11/4/1999	402,586.76	1,682,936.45	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(26-17) 25BBB		2/16/1999	406,802.93	1,698,894.81	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(26-17) 27ACA		10/1/1968	401,068.27	1,679,401.21	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(26-17) 35AAA		1/1/1959	409,756.10	1,670,152.84	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(26-18) 01BDB-R		7/20/1990	377,649.70	1,703,627.30	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(26-18) 03BDB		1/1/1980	367,283.64	1,700,269.67	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(26-18) 03ADD		12/19/2005	370,682.36	1,699,617.67	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(26-18) 06DBB-R		11/2/1969	369,005.29	1,699,731.37	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(26-18) 06DCB		8/28/2004	358,034.76	1,697,701.84	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(26-18) 09CAD		1/1/1980	362,658.01	1,693,055.79	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(26-18) 09DBC		6/12/1961	363,317.67	1,693,081.39	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(26-18) 17AAC		6/25/1961	359,340.52	1,690,427.64	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(27-16) 28CBD		2/20/1996	424,467.67	1,706,663.66	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(27-16) 29CCD		1/1/1993	419,166.43	1,707,352.53	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(27-17) 05ADC		1/1/1980	391,064.16	1,731,263.77	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(27-17) 05ADC		10/20/1980	391,067.37	1,731,267.14	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(27-17) 13ABD		1/17/1994	410,230.32	1,721,801.94	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(27-17) 23CAC		10/20/1977	403,317.86	1,714,251.10	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(28-16) 07ADD		5/1/1966	389,154.88	1,749,712.73	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(28-17) 31DDD		10/5/1957	386,463.26	1,733,906.05	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(28-17) 31CCC		1/1/1963	382,470.06	1,734,343.00	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(28-17) 31AAA		12/11/1979	386,461.23	1,738,621.66	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(28-18) 13DCB		6/1/1957	379,200.74	1,750,367.40	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(28-18) 13CDA		1/1/1980	378,708.30	1,750,393.15	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(29-18) 01CCC		8/3/1979	375,607.77	1,792,432.26	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Total Annual Pumping					33.71	33.71	33.71	33.71	33.71	33.71	33.71	33.71	33.71	33.71	33.71	33.71	33.71	33.71	33.71	33.71	33.71	33.71	33.71	33.71	33.71	33.71	33.71	33.71	33.71	33.71	33.71	33.71	33.71	33.71	33.71	33.71	33.71	33.71	33.71	33.71	33.71
Simulated Other Committed Demand (OCD) Wells:																																									
B(23-16) 29-R	Amalaia Acres, Sunward Hol Rn	1/1/2007	442,853.62	1,875,898.99	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7
B(23-16) 11-R	Arizona West Tract 1112	1/1/2007	461,908.63	1,592,666.82	81.7	81.7	81.7	81.7	81.7	81.7	81.7	81.7	81.7	81.7	81.7	81.7	81.7	81.7	81.7	81.7	81.7	81.7	81.7	81.7	81.7	81.7	81.7	81.7	81.7	81.7	81.7	81.7	81.7	81.7	81.7	81.7	81.7	81.7	81.7	81.7	81.7
B(22-17) 11-R	Cedar Ridge Estates	1/1/2007	423,794.49	1,561,792.41	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4
B(22-17) 14-R	Cedar Ridge Estates	1/1/2007	423,723.30	1,556,479.27	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4
B(22-17) 12-R	Cerbat Ranches Unit 1	1/1/2007	429,062.89	1,561,771.88	71.1	71.1	71.1	71.1	71.1	71.1	71.1	71.1	71.1	71.1	71.1	71.1	71.1	71.1	71.1	71.1	71.1	71.1	71.1	71.1	71.1	71.1	71.1	71.1	71.1	71.1	71.1	71.1	71.1	71.1	71.1	71.1	71.1	71.1	71.1	71.1	71.1
B(22-17) 01-R	Cerbat Water Company	1/1/2007	429,051.91	1,567,101.84	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5
B(22-17) 12-R	Cerbat Water Company	1/1/2007	429,062.89	1,561,771.88	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5
B(22-17) 13-R	Cerbat Water Company	1/1/2007	429,039.67	1,556,472.83	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5
B(23-17) 36-R	Cerbat Water Company	1/1/2007	429,149.97	1,572,363.64	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5
B(23-16) 31-R	Esmeralda Acres/Sunward Hot	1/1/2007	435,989.22	1,570,642.83	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4
B(22-17) 13-R	Fountain Hills Estates	1/1/2007	429,039.67	1,556,472.83	16.	16.	16.	16.	16.	16.	16.	16.	16.	16.	16.	16.	16.	16.	16.	16.	16.	16.	16.	16.	16.	16.	16.	16.	16.	16.	16.	16.	16.	16.	16.	16.	16.	16.	16.	16.	16.
B(22-15) 08	Greater Kingman Industrial Park	1/1/2007	456,442.34	1,571,496.01	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7
B(22-15) 17	Greater Kingman Industrial Park	1/1/2007	456,439.76	1,560,933.10	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7
B(22-15) 05	Greater Kingman Industrial Park	1/1/2007	456,442.34	1,871,496.01	39.2	39.2	39.2	39.2	39.2	39.2	39.2	39.2	39.2	39.2	39.2	39.2	39.2	39.2	39.2	39.2	39.2	39.2	39.2	39.2	39.2	39.2	39.2	39.2	39.2	39.2	39.2	39.2	39.2	39.2	39.2	39.2	39.2	39.2	39.2	39.2	39.2
B(22-15) 17	Greater Kingman Industrial Park	1/1/2007	456,439.76	1,560,933.10	39.2	39.2	39.2	39.2	39.2	39.2	39.2	39.2	39.2	39.2	39.2	39.2	39.2	39.2	39.2	39.2	39.2	39.2	39.2	39.2	39.2	39.2	39.2	39.2	39.2	39.2	39.2	39.2	39.2	39.2	39.2	39.2	39.2	39.2	39.2	39.2	39.2
B(23-16) 07-R	Hillview Ranches	1/1/2007	436,272.15	1,594,647.84	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
B(22-16) 12	Hualapai Vista Estates, Tract 3811	1/1/2007	448,971.17	1,566,236.49	8.	8.	8.	8.	8.	8.	8.	8.	8.	8.	8.	8.	8.	8.	8.	8.	8.	8.	8.	8.	8.	8.	8.	8.	8.	8.	8.	8.	8.	8.	8.	8.	8.	8.	8.	8.	8.
B(22-16) 13	Hualapai Vista Estates, Tract 3811	1/1/2007	448,964.43	1,560,956.45	8.	8.	8.	8.	8.	8.	8.	8.	8.	8.	8.	8.	8.	8.	8.	8.	8.	8.	8.	8.	8.	8.	8.	8.	8.	8.	8.	8.	8.	8.	8.	8.	8.	8.	8.	8.	8.
B(28-17) 09-R	Joshua Park Unit #1	1/1/2007	387,245.72	1,751,656.19	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7
B(28-17) 09-R	Joshua Park Unit 1	1/1/2007	382,266.66	1,756,811.21	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5
B(28-17) 09-R	Joshua Park Unit No. 1	1/1/2007	383,277.69	1,750,099.39	25.7	25.7	25.7	25.7	25.7	25.7	25.7	25.7	25.7	25.7	25.7	25.7	25.7	25.7	25.7	25.7	25.7	25.7	25.7	25.7	25.7	25.7	25.7	25.7	25.7	25.7	25.7	25.7	25.7	25.7	25.7	25.7	25.7	25.7	25.7	25.7	25.7
B(28-17) 09-R	Joshua Park Unit No. 1	1/1/2007	380,424.37	1,748,760.62	31.3	31.3	31.3	31.3	31.3	31.3	31.3	31.3	31.3	31.3	31.3	31.3	31.3	31.3	31.3	31.3	31.3	31.3	31.3	31.3	31.3	31.3	31.3	31.3	31.3	31.3	31.3	31.3	31.3	31.3	31.3	31.3	31.3	31.3	31.3	31.3	31.3
B(22-17) 11-R	Lake Juniper	1/1/2007	423,794.49	1,561,792.41	4.	4.	4.	4.	4.	4.	4.	4.	4.	4.	4.	4.	4.	4.	4.	4.	4.	4.	4.	4.	4.	4.	4.	4.	4.	4.	4.	4.	4.	4.	4.	4.	4.	4.	4.	4.	4.
B(22-17) 14-R	Lake Juniper	1/1/2007	423,723.30	1,556,479.27	4.	4.	4.	4.	4.	4.	4.	4.	4.	4.	4.	4.	4.	4.	4.	4.	4.	4.	4.	4.	4.	4.	4.	4.	4.	4.	4.	4.	4.	4.	4.	4.	4.	4.	4.	4.	4.
B(22-17) 11-R	Lake Juniper Estates	1/1/2007	423,794.49	1,561,792.41	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3
B(22-17) 14-R	Lake Juniper Estates	1/1/2007	423,723.30	1,556,479.27	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3
B(25-15) 03-R	Lake Mead Rancheros	1/1/2007	467,647.73	1,668,160.76	1,342.5	1,342.5	1,342.5	1,342.5	1,342.5	1,342.5	1,342.5	1,342.5	1,342.5	1,342.5	1,342.5	1,342.5	1,342.5	1,342.5	1,342.5	1,342.5	1,342.5	1,342.5	1,342.5	1,342.5	1,342.5	1,342.5	1,342.5	1,342.5	1,342.5	1,342.5	1,342.5	1,342.5	1,342.5	1,342.5	1,342.5	1,342.5	1,342.5	1,342.5	1,342.5	1,342.5	1,342.5
B(25-16) 19	Lake Mead Rancheros	1/1/2007	447,311.30	1,651,446.34	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5
B(25-16) 21	Lake Mead Rancheros	1/1/2007	457,901.41	1,651,439.33	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5
B(25-16) 27	Lake Mead Rancheros #1-12	1/1/2007	463,162.22	1,646,121.16	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7
B(25-16) 29	Lake Mead Rancheros #1-12	1/1/2007	452,596.20	1,646,163.47	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7
B(25-16) 31	Lake Mead Rancheros #1-12	1/1/2007	447,265.66	1,640,670.50	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7
B(25-16) 31	Lake Mead Rancheros Unit 10	1/1/2007	447,265.66	1,640,670.50	15.3	15.3	15.3	15.3	15.3	15.3	15.3	15.3	15.3	15.3	15.3	15.3	15.3	15.3	15.3	15.3	15.3	15.3	15.3	15.3	15.3	15.3	15.3	15.3	15.3	15.3	15.3	15.3	15.3	15.3	15.3	15.3	15.3	15.3	15.3	15.3	15.3
B(25-15) 13-R	Lake Mead Rancheros, Unit 1	1/1/2007	466,936.35	1,663,113.34	48.3	48.3	48.3	48.3	48.3	48.3	48.3	48.3	48.3	48.3	48.3	48.3	48.3	48.3	48.3	48.3	48.3	48.3	48.3	48.3	48.3	48.3	48.3	48.3	48.3	48.3	48.3	48.3	48.3	48.3	48.3	48.3	48.3	48.3	48.3	48.3	48.3
B(25-15) 06	Lake Mead Rancheros, Units 3, 8, 14, 16	1/1/2007	462,638.42	1,667,278.65	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1
B(25-15) 09	Lake Mead Rancheros, Units 3, 8, 14, 16	1/1/2007	467,892.29	1,661,994.81	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1
B(25-15) 17	Lake Mead Rancheros, Units 3, 8, 14, 16	1/1/2007	452,605.32	1,656,712.06	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1
B(25-15) 27	Lake Mead Rancheros, Units 3, 8, 14, 16	1/1/2007	463,162.22	1,646,121.16	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1
B(28-18) 13	Lake Mead Ranchos Unit 2	1/1/2007	379,066.14	1,762,060.79	39.9	39.9	39.9	39.9	39.9	39.9	39.9	39.9	39.9	39.9	39.9	39.9	39.9	39.9	39.9	39.9	39.9	39.9	39.9	39.9	39.9	39.9	39.9	39.9	39.9	39.9	39.9	39.9	39.9	39.9	39.9	39.9	39.9	39.9	39.9	39.9	39.9
B(28-18) 11-R	Lake Mead Ranchos Unit 3	1/1/2007	378,022.28	1,758,336.07	35.	35.	35.	35.	35.	35.	35.	35.	35.	35.	35.	35.	35.	35.	35.	35.	35.	35.	35.	35.	35.	35.	35.	35.	35.	35.	35.	35.	35.	35.	35.	35.	35.	35.	35.	35.	35.
B(28-18) 01	Lake Mead Ranchos Unit 4	1/1/2007	379,110.22	1,762,676.60	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
B(28-18) 01	Lake Mead Ranchos Unit 4	1/1/2007	379,110.22	1,762,676.60	192.3	192.3	192.3	192.3	192.3	192.3	192.3	192.3	192.3	192.3	192.3	192.3	192.3	192.3	192.3	192.3	192.3	192.3	192.3	192.3	192.3	192.3	192.3	192.3	192.3	192.3	192.3	192.3	192.3	192.3	192.3	192.3	192.3	192.3	192.3	192.3	192.3
B(29-18) 23	Lake Mead Ranchos Unit 7	1/1/2007	371,578.60	1,776,531.65	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
B(29-18) 23	Lake Mead Ranchos Unit 7	1/1/2007	371,578.60	1,776,531.66	222.	222.	222.	222.	222.	222.	222.	222.	222.	222.	222.	222.	222.	222.	222.	222.	222.	222.	222.	222.	222.	222.	222.	222.	222.	222.	222.	222.	222.	222.	222.	222.	222.	222.	222.	222.	222.
B(29-18) 27-R	Lake Mead Ranchos, Unit 6	1/1/2007	371,227.57	1,773,403.29	180.9	180.9	180.9	180.9	180.9	180.9	180.9	180.9	180.9	180.9	180.9	180.9	180.9	180.9	180.9	180.9	180.9	180.9	180.9	180.9	180.9	180.9	180.9	180.9	180.9	180.9	180.9	180.9	180.9	180.9	180.9	180.9	180.9	180.9	180.9	180.9	180.9
B(26-18) 01-R	Lake Mohave Ranchos	1/1/2007	375,606.20	1,706,097.00	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1
B(26-18) 03	Lake Mohave Ranchos	1/1/2007	368,271.69	1,699,300.36	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1
B(26-18) 05-R	Lake Mohave Ranchos	1/1/2007	361,291.93	1,697,359.24	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1
B(26-18) 07-R	Lake Mohave Ranchos	1/1/2007	359,122.53	1,694,357.83	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1
B(26-18) 09	Lake Mohave Ranchos	1/1/2007	362,984.35	1,694,046.01	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1
B(26-18) 11-R	Lake Mohave Ranchos	1/1/2007	370,527.10	1,700,836.30	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1

TABLE 2. SUMMARY OF SIMULATED GROUNDWATER PUMPING FOR 2006 THROUGH 2042, UPDATED BASE CASE

CADASTRAL LOCATION OR MODEL WELL NAME	REGISTRY NUMBER OR WELL OWNER	COMPLETION DATE	LOCATION COORDINATES* EASTING (feet)	NORTHING (feet)	SIMULATED ANNUAL PUMPING RATE, IN ACRE-FEET 2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042
B(26-18) 13-R	Lake Mohave Ranchos	1/1/2007	373,984.00	1,701,167.90	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1
B(26-18) 16-R	Lake Mohave Ranchos	1/1/2007	365,237.30	1,696,569.10	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1
B(26-19) 25-R	Lake Mohave Ranchos	1/1/2007	360,476.90	1,692,664.70	24.1	24.1	24.1	24.1	24.1	24.1	24.1	24.1	24.1	24.1	24.1	24.1	24.1	24.1	24.1	24.1	24.1	24.1	24.1	24.1	24.1	24.1	24.1	24.1	24.1	24.1	24.1	24.1	24.1	24.1	24.1	24.1	24.1	24.1	24.1	24.1	24.1
B(26-19) 25-R	Lake Mohave Ranchos, Unit 6	1/1/2007	361,537.00	1,692,056.40	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8
B(29-19) 27-R	Mead-O-Rama #2	1/1/2007	376,972.11	1,774,424.25	86.6	86.6	86.6	86.6	86.6	86.6	86.6	86.6	86.6	86.6	86.6	86.6	86.6	86.6	86.6	86.6	86.6	86.6	86.6	86.6	86.6	86.6	86.6	86.6	86.6	86.6	86.6	86.6	86.6	86.6	86.6	86.6	86.6	86.6	86.6	86.6	86.6
B(29-18) 35-R	Mead-O-Rama #3	1/1/2007	375,043.42	1,769,300.83	55.2	55.2	55.2	55.2	55.2	55.2	55.2	55.2	55.2	55.2	55.2	55.2	55.2	55.2	55.2	55.2	55.2	55.2	55.2	55.2	55.2	55.2	55.2	55.2	55.2	55.2	55.2	55.2	55.2	55.2	55.2	55.2	55.2	55.2	55.2	55.2	55.2
B(29-17) 31-R	Mead-O-Rama #4	1/1/2007	378,836.99	1,766,891.94	172.7	172.7	172.7	172.7	172.7	172.7	172.7	172.7	172.7	172.7	172.7	172.7	172.7	172.7	172.7	172.7	172.7	172.7	172.7	172.7	172.7	172.7	172.7	172.7	172.7	172.7	172.7	172.7	172.7	172.7	172.7	172.7	172.7	172.7	172.7	172.7	172.7
B(29-16) 35-R	Mead-O-Rama Unit No. 3	1/1/2007	375,663.06	1,768,134.85	1,250.7	1,250.7	1,250.7	1,250.7	1,250.7	1,250.7	1,250.7	1,250.7	1,250.7	1,250.7	1,250.7	1,250.7	1,250.7	1,250.7	1,250.7	1,250.7	1,250.7	1,250.7	1,250.7	1,250.7	1,250.7	1,250.7	1,250.7	1,250.7	1,250.7	1,250.7	1,250.7	1,250.7	1,250.7	1,250.7	1,250.7	1,250.7	1,250.7	1,250.7	1,250.7	1,250.7	1,250.7
B(20-16) 06-R	Pinion Pines Estates #2	1/1/2007	462,872.94	1,641,717.19	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2
B(22-17) 12-R	Quail Valley Estates	1/1/2007	429,062.69	1,561,771.85	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7
B(25-16) 01	Realsite Arizona Ranchettes Units 1,3,4,6,7,8, and 9	1/1/2007	442,061.66	1,667,316.83	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4
B(25-16) 11	Realsite Arizona Ranchettes Units 1,3,4,6,7,8, and 9	1/1/2007	436,792.73	1,662,037.17	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4
B(25-16) 23	Realsite Arizona Ranchettes Units 1,3,4,6,7,8, and 9	1/1/2007	436,764.26	1,651,462.12	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4
B(25-16) 25	Realsite Arizona Ranchettes Units 1,3,4,6,7,8, and 9	1/1/2007	442,027.75	1,646,164.85	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4
B(25-16) 35	Realsite Arizona Ranchettes Units 1,3,4,6,7,8, and 9	1/1/2007	436,735.38	1,640,906.01	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4
B(26-15) 19-R	Realsite Arizona Ranchettes Units 1,3,4,6,7,8, and 9	1/1/2007	444,210.74	1,661,626.11	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4
B(26-15) 31	Realsite Arizona Ranchettes Units 1,3,4,6,7,8, and 9	1/1/2007	447,361.05	1,672,876.46	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4
B(23-17) 23-R	Red Wing Canyon Estates	1/1/2007	445,736.73	1,588,186.02	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8
B(24-14) 27-R	Shadow Mountain Acres Unit Two & Three	1/1/2007	490,002.40	1,616,900.52	18.2	18.2	18.2	18.2	18.2	18.2	18.2	18.2	18.2	18.2	18.2	18.2	18.2	18.2	18.2	18.2	18.2	18.2	18.2	18.2	18.2	18.2	18.2	18.2	18.2	18.2	18.2	18.2	18.2	18.2	18.2	18.2	18.2	18.2	18.2	18.2	18.2
B(24-14) 35-R	Shadow Mountain Acres Unit Two & Three	1/1/2007	496,276.11	1,611,616.63	18.2	18.2	18.2	18.2	18.2	18.2	18.2	18.2	18.2	18.2	18.2	18.2	18.2	18.2	18.2	18.2	18.2	18.2	18.2	18.2	18.2	18.2	18.2	18.2	18.2	18.2	18.2	18.2	18.2	18.2	18.2	18.2	18.2	18.2	18.2	18.2	18.2
B(23-14) 03-R	Sunny Highlands Estates, Tract 1132, Phase 1-20 Lots	1/1/2007	493,344.61	1,606,771.94	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4
B(23-16) 09-R	Sunnyvale Acres, Sunward Ho! Ranches #2	1/1/2007	435,207.66	1,601,667.64	8.8	8.8	8.8	8.8	8.8	8.8	8.8	8.8	8.8	8.8	8.8	8.8	8.8	8.8	8.8	8.8	8.8	8.8	8.8	8.8	8.8	8.8	8.8	8.8	8.8	8.8	8.8	8.8	8.8	8.8	8.8	8.8	8.8	8.8	8.8	8.8	8.8
B(23-16) 33-R	Sunrise Mountain Estates	1/1/2007	431,949.28	1,676,490.36	9.8	9.8	9.8	9.8	9.8	9.8	9.8	9.8	9.8	9.8	9.8	9.8	9.8	9.8	9.8	9.8	9.8	9.8	9.8	9.8	9.8	9.8	9.8	9.8	9.8	9.8	9.8	9.8	9.8	9.8	9.8	9.8	9.8	9.8	9.8	9.8	9.8
B(23-16) 19-R	Sunward Ho! Ranches	1/1/2007	438,210.83	1,664,157.65	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1
B(23-16) 30-R	Sunward Ho! Ranches	1/1/2007	436,006.36	1,575,922.23	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1
B(23-16) 31-R	Sunward Ho! Ranches	1/1/2007	436,989.22	1,670,642.63	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1
B(23-16) 33-R	Sunward Ho! Ranches	1/1/2007	438,213.69	1,579,201.69	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1
B(23-16) 30-R	Sunward Ho! Ranches Turquoise Acres	1/1/2007	436,006.36	1,675,922.23	13.7	13.7	13.7	13.7	13.7	13.7	13.7	13.7	13.7	13.7	13.7	13.7	13.7	13.7	13.7	13.7	13.7	13.7	13.7	13.7	13.7	13.7	13.7	13.7	13.7	13.7	13.7	13.7	13.7	13.7	13.7	13.7	13.7	13.7	13.7	13.7	13.7
B(23-16) 18-R	Toro Acres, Sunward Ho! #2	1/1/2007	438,213.12	1,589,426.29	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1
B(23-16) 19-R	Toro Acres, Sunward Ho! #2	1/1/2007	438,210.83	1,584,157.85	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1
B(23-15) 16-R	Valle Vista	1/1/2007	456,586.45	1,587,379.30	3,267.4	3,267.4	3,267.4	3,267.4	3,267.4	3,267.4	3,267.4	3,267.4	3,267.4	3,267.4	3,267.4	3,267.4	3,267.4	3,267.4	3,267.4	3,267.4	3,267.4	3,267.4	3,267.4	3,267.4	3,267.4	3,267.4	3,267.4	3,267.4	3,267.4	3,267.4	3,267.4	3,267.4	3,267.4	3,267.4	3,267.4	3,267.4	3,267.4	3,267.4	3,267.4	3,267.4	3,267.4
B(23-15) 10-R	Valle Vista #1A,3A	1/1/2007	456,612.41	1,592,653.10	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6
B(23-15) 15-R	Valle Vista #1A,3A	1/1/2007	456,586.45	1,587,379.30	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6
B(23-15) 03-R	Valle Vista Unit 2 Tract 1200, Lots 860, 861, 999, 1078, 1709, 1631, and 1907	1/1/2007	466,616.99	1,697,947.49	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8
B(24-16) 34	Valle Vista Unit 3- Tract 1204	1/1/2007	436,466.93	1,608,849.29	3.9	3.9	3.9	3.9	3.9	3.9	3.9	3.9	3.9	3.9	3.9	3.9	3.9	3.9	3.9	3.9	3.9	3.9	3.9	3.9	3.9	3.9	3.9	3.9	3.9	3.9	3.9	3.9	3.9	3.9	3.9	3.9	3.9	3.9	3.9	3.9	3.9
B(22-16) 05-R	Zafiro Acres-Sunward Ho Ranches	1/1/2007	425,495.38	1,567,541.86	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7
Total Annual Pumping					9,762.7	9,762.7	9,762.7	9,762.7	9,762.7	9,762.7	9,762.7	9,762.7	9,762.7	9,762.7	9,762.7	9,762.7	9,762.7	9,762.7	9,762.7	9,762.7	9,762.7	9,762.7	9,762.7	9,762.7	9,762.7	9,762.7	9,762.7	9,762.7	9,762.7	9,762.7	9,762.7	9,762.7	9,762.7	9,762.7	9,762.7	9,762.7	9,762.7	9,762.7	9,762.7	9,762.7	9,762.7
Annual Grand Total					19,093.7	19,441.1	19,788.4	20,135.7	20,483.1	20,830.4	21,177.7	21,525.1	21,872.4	22,234.7	22,607.8	22,992.2	23,386.	23,795.9	24,215.8	24,648.3	25,093.9	25,551.8	26,028.6	26,512.4	27,013.8	27,530.4	28,062.4	28,610.4	29,174.6	29,756.2	30,355.	30,971.7	31,607.	32,261.3	32,935.5	33,629.4	34,344.4	35,080.9	35,839.4	36,620.7	37,425.4

* = Location coordinates are State Plane, U.S. feet, Arizona West, North American Datum 1927

"-R" = Relocated Well. Well is located in the Hualapai Valley, but outside the active area for model. Well was relocated to the nearest active cell.

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MONTGOMERY & ASSOCIATES

TABLE 3. SUMMARY OF SIMULATED GROUNDWATER PUMPING FOR 1971 THROUGH 2042, HUALAPAI VALLEY SOLAR PROJECT WELLS

SIMULATED PRODUCTION WELL NAME	LOCATION COORDINATES*		SIMULATED ANNUAL PUMPING RATE, IN ACRE-FEET				
	EASTING (feet)	NORTHING (feet)	1971-2012	2013-2042 BASE CASE	2013-2042 HVS@3,000	2013-2042 HVS@2,400	2013-2042 HVS@30
HVS-1	420,783.01	1,681,611.30	0.	0.	750.	600.	7.5
HVS-2	428,419.53	1,675,427.92	0.	0.	750.	600.	7.5
HVS-3	420,975.06	1,675,524.34	0.	0.	750.	600.	7.5
HVS-4	414,087.02	1,675,179.39	0.	0.	750.	600.	7.5
Total Annual Pumping			**0.**	**0.**	**3,000.**	**2,400.**	**30.**
TOTAL SIMULATED PUMPING IN BASIN IN 2042			**--**	**37,425.4**	**40,425.4**	**39,825.4**	**37,455.4**

* = Location coordinates are State Plane, U.S. feet, Arizona West, North American Datum 1927

MONTGOMERY & ASSOCIATES

TABLE 4. SUMMARY OF SIMULATED GROUNDWATER PUMPING FOR 1971 THROUGH 2042, MAXIMUM CUMULATIVE IMPACTS

CADASTRAL LOCATION OR MODEL WELL NAME	REGISTRY NUMBER OR WELL OWNER	COMPLETION DATE	LOCATION COORDINATES* EASTING (feet)	NORTHING (feet)	SIMULATED ANNUAL PUMPING RATE, IN ACRE-FEET 2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042
Existing Kingman-Area Production Wells:																																									
B(22-16) 28BDA	55-504272	12/3/1982	429,881.93	1,551,625.34	2,988.6	3,100.3	3,212.	3,323.8	3,435.3	3,546.9	3,658.6	3,770.2	3,881.9	3,993.5	4,118.3	4,241.6	4,369.1	4,500.1	4,635.1	4,774.2	4,917.4	5,064.9	5,216.9	5,373.4	5,534.6	5,700.6	5,871.7	6,047.8	6,229.2	6,416.1	6,608.6	6,806.9	7,011.1	7,221.4	7,438.	7,661.2	7,891.	8,127.8	8,371.6	8,622.7	8,881.4
B(22-16) 29AAA	55-576713	2/6/1991	427,046.37	1,559,011.43	1,177.	1,220.9	1,264.9	1,308.9	1,352.8	1,396.8	1,440.8	1,484.8	1,528.7	1,574.6	1,621.8	1,670.5	1,720.6	1,772.2	1,826.4	1,880.1	1,936.6	1,994.6	2,054.6	2,116.1	2,179.6	2,245.	2,312.3	2,381.7	2,453.2	2,526.7	2,602.5	2,680.6	2,761.	2,843.9	2,929.2	3,017.1	3,107.6	3,200.8	3,296.8	3,395.7	3,497.6
B(22-16) 32DDD	55-591289	6/14/2002	427,107.05	1,542,867.93	1,720.3	1,784.5	1,848.8	1,913.1	1,977.3	2,041.6	2,105.9	2,170.1	2,234.4	2,301.4	2,370.5	2,441.6	2,514.8	2,590.3	2,668.	2,748.	2,830.5	2,915.4	3,002.8	3,092.9	3,185.7	3,281.3	3,379.7	3,481.1	3,585.6	3,693.1	3,803.9	3,918.	4,035.6	4,156.6	4,281.3	4,409.8	4,542.1	4,678.3	4,818.7	4,963.3	5,112.1
B(22-16) 33CDC	55-612665	1/1/1971	428,915.42	1,542,832.77	972.3	1,008.6	1,045.	1,081.3	1,117.6	1,153.9	1,190.3	1,226.6	1,262.9	1,300.8	1,339.8	1,380.	1,421.4	1,464.1	1,508.	1,553.2	1,599.8	1,647.8	1,697.3	1,748.2	1,800.6	1,854.6	1,910.3	1,967.6	2,026.6	2,087.4	2,150.	2,214.5	2,281.	2,349.4	2,419.9	2,492.5	2,567.3	2,644.3	2,723.6	2,805.3	2,889.5
B(22-16) 33BCD	55-612666	1/1/1968	428,423.19	1,546,561.39	527.7	547.4	567.1	586.9	606.6	626.3	646.	665.7	685.4	706.	727.2	749.	771.5	794.6	818.4	843.	868.3	894.3	921.2	948.8	977.3	1,006.6	1,036.8	1,067.9	1,099.9	1,132.9	1,166.9	1,201.9	1,238.	1,275.1	1,313.3	1,352.7	1,393.3	1,435.1	1,478.2	1,522.5	1,568.2
B(22-16) 15CCC	55-612657	10/10/1974	433,097.36	1,558,893.87	533.9	553.9	573.8	593.8	613.7	633.7	653.6	673.6	693.5	714.3	735.8	757.8	780.6	804.	828.1	853.	878.5	904.9	932.	960.	988.8	1,018.5	1,049.	1,080.5	1,112.9	1,146.3	1,180.7	1,216.1	1,252.6	1,290.2	1,328.9	1,368.7	1,409.8	1,452.1	1,495.7	1,540.5	1,586.7
B(22-16) 21BBD	55-612658	1/1/1972	417,388.83	1,558,090.68	1,331.7	1,381.5	1,431.3	1,481.	1,530.8	1,580.5	1,630.3	1,680.	1,729.8	1,781.7	1,835.1	1,890.2	1,946.9	2,005.3	2,065.4	2,127.4	2,191.2	2,257.	2,324.7	2,394.4	2,466.2	2,540.2	2,616.4	2,694.9	2,775.8	2,859.	2,944.8	3,033.2	3,124.2	3,217.9	3,314.4	3,413.8	3,516.3	3,621.7	3,730.4	3,842.3	3,957.6
B(22-16) 27DDD	55-612667	3/28/1968	437,866.65	1,547,764.62	6.2	6.5	6.7	6.9	7.2	7.4	7.6	7.9	8.1	8.3	8.6	8.9	9.1	9.4	9.7	10.	10.3	10.6	10.9	11.2	11.6	11.9	12.3	12.6	13.	13.4	13.8	14.2	14.6	15.1	15.5	16.	16.5	17.	17.5	18.	18.5
B(22-16) 34CBC	55-612664	4/5/1978	433,103.11	1,544,172.84	39.5	41.	42.4	43.9	45.4	46.9	48.3	49.8	51.3	52.8	54.4	56.	57.7	59.4	61.2	63.1	65.	66.9	68.9	71.	73.1	75.3	77.6	79.9	82.3	84.7	87.3	89.9	92.6	95.4	98.2	101.2	104.2	107.4	110.6	113.9	117.3
Total Annual Pumping					9,297.3	9,644.7	9,992.	10,339.3	10,686.7	11,034.	11,381.3	11,728.7	12,076.	12,438.3	12,811.4	13,195.8	13,591.6	13,999.4	14,419.4	14,852.	15,297.5	15,756.4	16,229.1	16,716.	17,217.5	17,734.	18,266.	18,814.	19,378.4	19,959.8	20,558.6	21,175.3	21,810.6	22,464.9	23,138.9	23,833.	24,548.	25,284.5	26,043.	26,824.3	27,629.
Existing Domestic Wells:																																									
B(21-15) 06BBB-R		9/20/2001	453,618.96	1,542,558.22	0.25	0.25	0.25	0.25	0.26	0.25	0.26	0.25	0.25	0.26	0.25	0.25	0.25	0.25	0.25	0.26	0.26	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.26	0.26	0.26	0.25	0.26	0.25	0.25	0.25	0.25	0.25	0.26	0.26	0.25
B(21-16) 03CCA		4/5/2005	433,690.84	1,538,238.31	0.25	0.25	0.25	0.25	0.26	0.26	0.25	0.25	0.25	0.26	0.25	0.25	0.26	0.25	0.26	0.26	0.25	0.25	0.25	0.25	0.25	0.26	0.26	0.25	0.26	0.26	0.25	0.26	0.26	0.26	0.26	0.25	0.25	0.25	0.25	0.26	0.25
B(21-16) 03BAB		3/26/2006	434,362.30	1,542,180.10	0.25	0.26	0.25	0.26	0.25	0.26	0.25	0.25	0.25	0.26	0.25	0.26	0.25	0.25	0.25	0.26	0.25	0.25	0.25	0.25	0.26	0.26	0.26	0.25	0.26	0.25	0.25	0.25	0.25	0.26	0.25	0.25	0.25	0.26	0.26	0.25	0.25
B(22-15) 09CAA		8/7/2002	461,394.12	1,565,882.48	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.26	0.25	0.25	0.25	0.25	0.25	0.26	0.26	0.26	0.25	0.26	0.25	0.26	0.26	0.25	0.26	0.26	0.26	0.25	0.25	0.25	0.25	0.26	0.25	0.25	0.25	0.25	0.25	0.25	0.26
B(22-15) 19CBB		1/1/1982	448,678.32	1,555,517.86	0.25	0.25	0.25	0.25	0.26	0.25	0.25	0.25	0.26	0.26	0.25	0.25	0.26	0.25	0.26	0.25	0.26	0.25	0.26	0.26	0.26	0.26	0.25	0.26	0.25	0.26	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(22-15) 23CCD-R		1/1/1965	462,777.00	1,553,272.99	0.25	0.25	0.26	0.25	0.25	0.25	0.25	0.25	0.26	0.26	0.25	0.26	0.25	0.25	0.26	0.25	0.25	0.25	0.26	0.26	0.26	0.25	0.25	0.25	0.26	0.25	0.26	0.25	0.26	0.25	0.25	0.25	0.25	0.25	0.26	0.25	0.25
B(22-15) 33BBB		2/12/1957	459,537.57	1,547,194.93	0.26	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
B(22-15) 33DBD-R		9/12/2000	458,785.69	1,544,117.84	0.25	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
B(22-15) 33CCC-R		3/10/2002	454,954.75	1,542,710.36	0.26	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
B(22-16) 02ABD		3/12/2005	441,689.65	1,573,161.94	0.26	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
B(22-16) 03CBA		12/11/1979	433,192.69	1,571,483.52	0.25	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
B(22-16) 03CBB		6/30/1980	433,103.49	1,571,234.44	0.25	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
B(22-16) 05DBA		1/1/1980	425,840.28	1,571,262.33	0.25	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
B(22-16) 06DBA		11/26/2006	419,671.40	1,571,279.47	0.26	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
B(22-16) 07ADD		4/9/1974	421,925.07	1,566,807.26	0.25	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
B(22-16) 07DAA		10/17/1987	422,008.92	1,566,304.53	0.25	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
B(22-16) 07DCC		8/4/2002	418,486.87	1,564,025.44	0.25	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
B(22-16) 07ABD		4/1/2006	419,554.71	1,567,981.44	0.25	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
B(22-16) 10CAA		10/16/2006	436,070.71	1,568,952.09	0.26	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
B(22-16) 15CCC		10/4/1974	433,084.30	1,558,775.28	0.26	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
B(22-16) 15AAB		1/1/1980	437,046.87	1,583,200.73	0.26	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
B(22-16) 15CCC		8/11/1983	433,097.38	1,558,893.87	0.26	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
B(22-16) 16CCA		11/30/1998	432,904.29	1,559,298.10	0.28	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
B(22-16) 17DDD		7/5/2002	427,046.37	1,559,011.43	0.26	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
B(22-16) 17DDD		7/12/2002	427,128.23	1,558,708.48	0.25	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
B(22-16) 19BAA		6/1/1973	417,388.83	1,558,090.68	0.25	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
B(22-16) 20CBC		11/10/1997	422,509.86	1,554,755.79	0.25	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
B(22-16) 20DAA		8/8/2002	427,126.38	1,555,418.54	0.25	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
B(22-16) 20CBC		5/10/2004	422,509.85	1,554,755.79	0.25	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
B(22-16) 26BAC		8/1/1957	439,052.32	1,551,909.20	0.25	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
B(22-16) 27DDD		11/15/1973	437,986.85	1,547,764.62	0.25	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
B(22-16) 28BBA		11/30/1998	428,529.82	1,552,472.26	0.25	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
B(22-16) 28CDA		11/21/2000	429,763.98	1,551,624.33	0.25	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
B(22-16) 28BDA		2/2/2001	429,681.93	1,551,626.34	0.26	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
B(22-16) 29AAA		10/5/1990	427,127.58	1,552,774.73	0.26	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
B(22-16) 29AAA		11/30/1998	417,706.93	1,558,018.88	0.25	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
B(22-16) 29AAA		8/8/2004	427,032.32	1,552,765.44	0.26	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
B(22-16) 32DDD		1/1/2006	427,107.05	1,542,867.93	0.26	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
B(22-16) 32DDD		1/1/2006	427,107.05	1,542,867.93	0.25	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
B(22-16) 33BCD		8/15/1973	428,423.19	1,546,561.39	0.25	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
B(22-16) 33CDC		10/7/1974	428,915.42	1,542,832.77	0.25	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
B(22-16) 33CCD		9/10/2002	428,432.42	1,542,862.03	0.26	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
B(22-16) 34CBC		11/9/1990	433,103.11	1,544,172.84	0.25	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
B(22-16) 34BCA		8/30/2000	433,711.43	1,546,134.44	0.26	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
B(23-14) 03ADD		4/17/1998	500,771.52	1,603,443.78	0.25	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
B(23-14) 05AAA-R		12/11/1989	490,496.24	1,605,974.78	0.25	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
B(23-15) 14CCC-R		11/15/1973	464,099.39	1,589,937.91	0.25	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
B(23-15) 30CBB		12/5/1979	448,799.88	1,581,966.99	0.25	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
B(23-15) 36BAB-R		1/6/2004	470,715.84	1,579,426.29	0.25	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
B(23-16) 03BBD		11/18/2005	433,913.76	1,604,912.95	0.25	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
B(23-16) 09ADA-R		6/1/1973	432,882.82	1,599,432.82	0.25	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
B(23-16) 09DAB-R		12/5/1979	434,010.10	1,597,850.42	0.26	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
B(23-16) 15BDB-R		2/2/1973	435,819.14	1,590,856.88	0.25	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
B(23-16) 33CCC-R		1/25/2003	427,763.14	1,573,982.95	0.25	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
B(24-14) 09CBB-R		10/9/2002	490,509.86	1,629,870.69	0.25	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
B(24-14) 19ABD-R		9/12/2002	487,897.17	1,620,524.36	0.26	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
B(24-14) 28DBC		4/8/1997	493,625.97	1,612,680.26	0.25	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
B(24-14) 29AAB		1/1/1980	489,837.55	1,616,091.20	0.25	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
B(24-14) 29BAD-R		2/2/1996	490,535.83	1,615,201.77	0.25	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
B(24-14) 29AAA		1/16/1997	490,801.14	1,616,422.02	0.25	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
B(24-14) 29ABA		3/15/2005	489,375.84	1,616,249.45	0.25	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
B(24-14) 29BBA		1/12/2006	489,279.59	1,616,843.77	0.25	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
B(24-14) 33AAD		2/1/1998	495,494.73	1,610,011.67	0.25	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
B(24-15) 01BCC		5/23/2004	475,325.46	1,635,586.68	0.25	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
B(24-15) 05CBD		11/30/1998	454,830.45	1,634,126.05	0.26	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
B(24-15) 05BBC		10/26/2004	454,178.26	1,637,115.94	0.25	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
B(24-15) 05DAC		4/19/2005	457,540.67	1,633,633.24	0.25	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
B(24-15) 11CBB-R		1/1/1980	469,807.82	1,629,714.74	0.25	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
B(24-15) 11BCA-R		1/12/1990	469,408.79	1,630,675.11	0.25	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
B(24-15) 11BAA-R		2/15/2006	469,388.49	1,631,954.58	0.25	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
B(24-15) 13ADA-R		1/1/1980	481,373.79	1,626,770.73	0.26	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
B(24-15) 18BBB		11/30/1998	448,917.21	1,626,626.06	0.25	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
B(24-15) 27CCC-R		1/3/2006	464,201.18	1,611,549.40	0.25	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
B(24-15) 28DDD-R		1/26/1978	464,099.20	1,611,470.53	0.26	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
B(24-15) 28CCA		1/1/1980	460,111.85	1,612,117.28	0.25	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
B(24-15) 28CAC		4/13/2004	460,775.67	1,612,782.01	0.25	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
B(24-15) 32BBD		7/20/1981	454,979.40	1,609,710.87	0.25	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
B(24-15) 32ACA		4/11/1982	457,710.14	1,609,836.82	0.25	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
B(24-15) 33BBB		1/6/1975	459,159.94	1,610,946.70	0.26	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
B(24-16) 07CAA-R		1/1/1980	415,445.13	1,629,398.81	0.25	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
B(24-16) 08BDB-R		1/1/1978	423,469.17	1,631,010.34	0.25	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
B(24-16) 08DCA-R		1/1/1980	427,235.02	1,628,444.45	0.25	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
B(24-16) 08ACA		10/9/1989	425,924.90	1,630,692.41	0.26	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
B(24-16) 10CAA		9/1/2001	434,778.40	1,629,057.90	0.25	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
B(24-16) 10AAA		9/6/2001	437,937.46	1,632,357.60	0.25	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
B(24-16) 11DDD		6/4/1985	442,830.53	1,627,231.45	0.26	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
B(24-16) 19ADC		3/15/2001	421,375.18	1,621,012.62	0.26	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
B(24-16) 26ABA-R		8/30/2002	441,531.11	1,616,275.03	0.25	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
B(24-16) 26CDB-R		12/6/2005	437,859.48	1,612,537.96	0.25	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
B(24-16) 34DDB-R		1/1/1980	435,082.10	1,606,829.26	0.25	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
B(24-16) 34CAD		1/1/1980	435,134.26	1,607,557.52	0.25	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
B(24-16) 34BDA		9/6/2001	435,141.41	1,609,639.01	0.26	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
B(25-16) 23BBB		3/23/2001	434,235.72	1,646,906.04	0.25	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
B(25-16) 30CCB		7/13/1995	413,479.26	1,644,629.72	0.25	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
B(25-16) 31ACB		12/6/2006	415,927.62	1,641,953.28	0.25	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
B(25-17) 13AAA		5/10/2001	412,901.88	1,659,375.50	0.25	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
B(25-17) 23BCA-R		2/2/1981	407,440.27	1,652,814.88	0.25	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
B(25-17) 23BDD-R		1/1/2006	407,586.39	1,651,757.28	0.25	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
B(26-16) 16AA		5/12/2001	419,460.26	1,689,105.40	0.25	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
B(26-16) 28C		3/7/2000	436,266.00	1,676,575.21	0.25	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
B(26-16) 27ABD		4/20/1995	400,403.18	1,679,477.52	0.25	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
B(26-16) 28DDC		3/20/1993	427,993.74	1,675,479.80	0.26	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

MONTGOMERY & ASSOCIATES

TABLE 4. SUMMARY OF SIMULATED GROUNDWATER PUMPING FOR 1971 THROUGH 2042, MAXIMUM CUMULATIVE IMPACTS

CADASTRAL LOCATION OR MODEL WELL NAME	REGISTRY NUMBER OR WELL OWNER	COMPLETION DATE	LOCATION COORDINATES* EASTING (feet)	LOCATION COORDINATES* NORTHING (feet)	SIMULATED ANNUAL PUMPING RATE, IN ACRE-FEET 2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042
B(26-16) 29BBB		2/6/1991	418,627.70	1,680,296.27	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(26-16) 29BBB		1/27/1992	417,300.93	1,679,805.91	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(26-16) 29DDD		7/15/1992	423,296.65	1,675,604.45	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(26-16) 29DDD		12/15/1992	423,238.87	1,676,462.20	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(26-16) 30DDD		8/31/1999	416,166.70	1,675,506.58	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(26-17) 23CCC		2/1/1970	404,148.15	1,680,707.03	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(26-17) 23CDD		9/20/1999	405,015.51	1,680,773.84	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(26-17) 23CBB		11/4/1999	402,566.76	1,682,936.45	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(26-17) 25BBB		2/16/1999	405,802.93	1,696,894.61	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(26-17) 27ACA		10/1/1966	401,068.27	1,679,401.21	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(26-17) 35AAA		1/1/1959	409,765.10	1,670,152.84	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(26-18) 01BDB-R		7/20/1990	377,549.70	1,703,827.30	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(26-18) 03BDB		1/1/1980	367,263.64	1,700,289.67	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(26-18) 03ADD		12/19/2005	370,582.36	1,699,617.87	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(26-18) 05DBB-R		11/2/1989	359,005.29	1,699,731.37	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(26-18) 05DCB		6/25/2004	358,034.76	1,697,701.84	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(26-18) 08CAD		1/1/1980	362,655.01	1,693,065.79	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(26-18) 09DBC		6/12/1981	363,317.67	1,693,061.39	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(26-18) 17AAC		6/25/1981	359,340.52	1,690,427.64	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(27-16) 28CBD		2/20/1995	424,467.87	1,709,663.66	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(27-16) 29CCD		1/1/1993	419,166.43	1,707,352.53	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(27-17) 05ADC		1/1/1980	391,064.18	1,731,253.77	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(27-17) 06ADC		10/20/1980	391,067.37	1,731,257.14	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(27-17) 13ABD		1/17/1994	410,230.32	1,721,801.94	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(27-17) 23CAC		10/20/1977	403,317.86	1,714,251.10	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(28-16) 07ADD		5/1/1968	389,154.88	1,749,712.73	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(28-17) 31DDD		10/6/1957	388,463.26	1,733,906.05	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(28-17) 31CCC		1/1/1963	382,470.05	1,734,343.00	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(28-17) 31AAA		12/11/1979	386,481.23	1,738,521.56	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(28-18) 13DCB		6/1/1957	379,200.74	1,750,387.40	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(28-18) 13CDA		1/1/1980	378,705.30	1,750,393.15	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B(29-18) 01CCC		8/3/1979	375,607.77	1,792,432.26	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Total Annual Pumping					33.71	33.71	33.71	33.71	33.71	33.71	33.71	33.71	33.71	33.71	33.71	33.71	33.71	33.71	33.71	33.71	33.71	33.71	33.71	33.71	33.71	33.71	33.71	33.71	33.71	33.71	33.71	33.71	33.71	33.71	33.71	33.71	33.71	33.71	33.71	33.71	33.71
Simulated Other Committed Demand (OCD) Wells:																																									
B(23-16) 29-R	Amalista Acres, Sunward Hol Rn	1/1/2007	442,853.62	1,575,898.89	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7
B(23-15) 11-R	Arizona West Tract 1112	1/1/2007	461,908.83	1,592,656.82	81.7	81.7	81.7	81.7	81.7	81.7	81.7	81.7	81.7	81.7	81.7	81.7	81.7	81.7	81.7	81.7	81.7	81.7	81.7	81.7	81.7	81.7	81.7	81.7	81.7	81.7	81.7	81.7	81.7	81.7	81.7	81.7	81.7	81.7	81.7	81.7	81.7
B(22-17) 11-R	Cedar Ridge Estates	1/1/2007	423,794.49	1,561,792.41	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4
B(22-17) 14-R	Cedar Ridge Estates	1/1/2007	423,723.30	1,556,479.27	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4
B(22-17) 12-R	Cerbat Ranches Unit 1	1/1/2007	429,082.69	1,561,771.85	71.1	71.1	71.1	71.1	71.1	71.1	71.1	71.1	71.1	71.1	71.1	71.1	71.1	71.1	71.1	71.1	71.1	71.1	71.1	71.1	71.1	71.1	71.1	71.1	71.1	71.1	71.1	71.1	71.1	71.1	71.1	71.1	71.1	71.1	71.1	71.1	71.1
B(22-17) 01-R	Cerbat Water Company	1/1/2007	429,051.91	1,567,101.84	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5
B(22-17) 12-R	Cerbat Water Company	1/1/2007	429,082.69	1,561,771.85	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5
B(22-17) 13-R	Cerbat Water Company	1/1/2007	429,039.87	1,556,472.83	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5
B(23-17) 36-R	Cerbat Water Company	1/1/2007	429,149.97	1,572,363.64	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5	220.5
B(23-16) 31-R	Esmeralda Acres/Sunward Hol	1/1/2007	436,989.22	1,570,842.83	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4
B(22-17) 13-R	Fountain Hills Estates	1/1/2007	429,039.87	1,556,472.83	16.	16.	16.	16.	16.	16.	16.	16.	16.	16.	16.	16.	16.	16.	16.	16.	16.	16.	16.	16.	16.	16.	16.	16.	16.	16.	16.	16.	16.	16.	16.	16.	16.	16.	16.	16.	16.
B(22-15) 05	Greater Kingman Industrial Park	1/1/2007	456,442.34	1,571,496.01	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7
B(22-15) 17	Greater Kingman Industrial Park	1/1/2007	456,439.75	1,560,933.10	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7
B(22-15) 05	Greater Kingman Industrial Park	1/1/2007	456,442.34	1,571,496.01	39.2	39.2	39.2	39.2	39.2	39.2	39.2	39.2	39.2	39.2	39.2	39.2	39.2	39.2	39.2	39.2	39.2	39.2	39.2	39.2	39.2	39.2	39.2	39.2	39.2	39.2	39.2	39.2	39.2	39.2	39.2	39.2	39.2	39.2	39.2	39.2	39.2
B(22-15) 17	Greater Kingman Industrial Park	1/1/2007	456,439.75	1,560,933.10	39.2	39.2	39.2	39.2	39.2	39.2	39.2	39.2	39.2	39.2	39.2	39.2	39.2	39.2	39.2	39.2	39.2	39.2	39.2	39.2	39.2	39.2	39.2	39.2	39.2	39.2	39.2	39.2	39.2	39.2	39.2	39.2	39.2	39.2	39.2	39.2	39.2
B(23-16) 07-R	Hillview Ranches	1/1/2007	436,272.15	1,594,647.84	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
B(22-16) 12	Hualapai Vista Estates, Tract 3811	1/1/2007	445,971.17	1,566,236.49	8.	8.	8.	8.	8.	8.	8.	8.	8.	8.	8.	8.	8.	8.	8.	8.	8.	8.	8.	8.	8.	8.	8.	8.	8.	8.	8.	8.	8.	8.	8.	8.	8.	8.	8.	8.	8.
B(22-16) 13	Hualapai Vista Estates, Tract 3811	1/1/2007	445,964.43	1,560,966.45	8.	8.	8.	8.	8.	8.	8.	8.	8.	8.	8.	8.	8.	8.	8.	8.	8.	8.	8.	8.	8.	8.	8.	8.	8.	8.	8.	8.	8.	8.	8.	8.	8.	8.	8.	8.	8.
B(28-17) 09-R	Joshua Park Unit #1	1/1/2007	387,245.72	1,751,655.19	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7
B(28-17) 09-R	Joshua Park Unit 1	1/1/2007	382,286.66	1,756,811.21	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5
B(28-17) 09-R	Joshua Park Unit No. 1	1/1/2007	383,277.69	1,750,099.39	25.7	25.7	25.7	25.7	25.7	25.7	25.7	25.7	25.7	25.7	25.7	25.7	25.7	25.7	25.7	25.7	25.7	25.7	25.7	25.7	25.7	25.7	25.7	25.7	25.7	25.7	25.7	25.7	25.7	25.7	25.7	25.7	25.7	25.7	25.7	25.7	25.7
B(28-17) 09-R	Joshua Park Unit No. 1	1/1/2007	380,424.37	1,746,760.62	31.3	31.3	31.3	31.3	31.3	31.3	31.3	31.3	31.3	31.3	31.3	31.3	31.3	31.3	31.3	31.3	31.3	31.3	31.3	31.3	31.3	31.3	31.3	31.3	31.3	31.3	31.3	31.3	31.3	31.3	31.3	31.3	31.3	31.3	31.3	31.3	31.3
B(22-17) 11-R	Lake Juniper	1/1/2007	423,794.49	1,561,792.41	4.	4.	4.	4.	4.	4.	4.	4.	4.	4.	4.	4.	4.	4.	4.	4.	4.	4.	4.	4.	4.	4.	4.	4.	4.	4.	4.	4.	4.	4.	4.	4.	4.	4.	4.	4.	4.
B(22-17) 14-R	Lake Juniper	1/1/2007	423,723.30	1,556,479.27	4.	4.	4.	4.	4.	4.	4.	4.	4.	4.	4.	4.	4.	4.	4.	4.	4.	4.	4.	4.	4.	4.	4.	4.	4.	4.	4.	4.	4.	4.	4.	4.	4.	4.	4.	4.	4.
B(22-17) 11-R	Lake Juniper Estates	1/1/2007	423,794.49	1,561,792.41	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3
B(22-17) 14-R	Lake Juniper Estates	1/1/2007	423,723.30	1,556,479.27	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3
B(25-15) 03-R	Lake Mead Rancheros	1/1/2007	467,647.73	1,665,180.76	1,342.5	1,342.5	1,342.5	1,342.5	1,342.5	1,342.5	1,342.5	1,342.5	1,342.5	1,342.5	1,342.5	1,342.5	1,342.5	1,342.5	1,342.5	1,342.5	1,342.5	1,342.5	1,342.5	1,342.5	1,342.5	1,342.5	1,342.5	1,342.5	1,342.5	1,342.5	1,342.5	1,342.5	1,342.5	1,342.5	1,342.5	1,342.5	1,342.5	1,342.5	1,342.5	1,342.5	1,342.5
B(25-15) 19	Lake Mead Rancheros	1/1/2007	447,311.50	1,651,448.34	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5
B(25-15) 21	Lake Mead Rancheros	1/1/2007	457,901.41	1,651,439.33	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5
B(25-15) 27	Lake Mead Rancheros #1-12	1/1/2007	463,162.22	1,646,121.18	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7
B(25-15) 29	Lake Mead Rancheros #1-12	1/1/2007	452,598.20	1,646,153.47	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7
B(25-15) 31	Lake Mead Rancheros #1-12	1/1/2007	447,285.88	1,640,870.50	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7	209.7
B(25-15) 31	Lake Mead Rancheros Unit 10	1/1/2007	447,285.88	1,640,870.50	15.3	15.3	15.3	15.3	15.3	15.3	15.3	15.3	15.3	15.3	15.3	15.3	15.3	15.3	15.3	15.3	15.3	15.3	15.3	15.3	15.3	15.3	15.3	15.3	15.3	15.3	15.3	15.3	15.3	15.3	15.3	15.3	15.3	15.3	15.3	15.3	15.3
B(25-15) 13-R	Lake Mead Rancheros, Unit 1	1/1/2007	466,835.36	1,653,113.34	48.3	48.3	48.3	48.3	48.3	48.3	48.3	48.3	48.3	48.3	48.3	48.3	48.3	48.3	48.3	48.3	48.3	48.3	48.3	48.3	48.3	48.3	48.3	48.3	48.3	48.3	48.3	48.3	48.3	48.3	48.3	48.3	48.3	48.3	48.3	48.3	48.3
B(25-15) 05	Lake Mead Rancheros, Units 3, 8, 14, 16	1/1/2007	452,638.42	1,667,278.65	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1
B(25-15) 09	Lake Mead Rancheros, Units 3, 8, 14, 16	1/1/2007	457,892.29	1,661,994.51	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1
B(25-15) 17	Lake Mead Rancheros, Units 3, 8, 14, 16	1/1/2007	462,606.32	1,656,712.06	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1
B(25-15) 27	Lake Mead Rancheros, Units 3, 8, 14, 16	1/1/2007	463,162.22	1,646,121.18	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1
B(28-18) 13	Lake Mead Ranchos Unit 2	1/1/2007	379,056.14	1,752,060.79	39.9	39.9	39.9	39.9	39.9	39.9	39.9	39.9	39.9	39.9	39.9	39.9	39.9	39.9	39.9	39.9	39.9	39.9	39.9	39.9	39.9	39.9	39.9	39.9	39.9	39.9	39.9	39.9	39.9	39.9	39.9	39.9	39.9	39.9	39.9	39.9	39.9
B(28-18) 11-R	Lake Mead Ranchos Unit 3	1/1/2007	378,022.28	1,758,338.07	35.	35.	35.	35.	35.	35.	35.	35.	35.	35.	35.	35.	35.	35.	35.	35.	35.	35.	35.	35.	35.	35.	35.	35.	35.	35.	35.	35.	35.	35.	35.	35.	35.	35.	35.	35.	35.
B(28-18) 01	Lake Mead Ranchos Unit 4	1/1/2007	379,110.22	1,762,678.80	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
B(28-18) 01	Lake Mead Ranchos Unit 4	1/1/2007	379,110.22	1,762,678.80	192.3	192.3	192.3	192.3	192.3	192.3	192.3	192.3	192.3	192.3	192.3	192.3	192.3	192.3	192.3	192.3	192.3	192.3	192.3	192.3	192.3	192.3	192.3	192.3	192.3	192.3	192.3	192.3	192.3	192.3	192.3	192.3	192.3	192.3	192.3	192.3	192.3
B(29-18) 23	Lake Mead Ranchos Unit 7	1/1/2007	371,678.60	1,778,531.65	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
B(29-18) 23	Lake Mead Ranchos Unit 7	1/1/2007	371,678.60	1,778,531.65	222.	222.	222.	222.	222.	222.	222.	222.	222.	222.	222.	222.	222.	222.	222.	222.	222.	222.	222.	222.	222.	222.	222.	222.	222.	222.	222.	222.	222.	222.	222.	222.	222.	222.	222.	222.	222.
B(29-18) 27-R	Lake Mead Ranchos, Unit 6	1/1/2007	371,227.57	1,773,403.29	180.9	180.9	180.9	180.9	180.9	180.9	180.9	180.9	180.9	180.9	180.9	180.9	180.9	180.9	180.9	180.9	180.9	180.9	180.9	180.9	180.9	180.9	180.9	180.9	180.9	180.9	180.9	180.9	180.9	180.9	180.9	180.9	180.9	180.9	180.9	180.9	180.9
B(26-18) 01-R	Lake Mohave Ranchos	1/1/2007	375,806.20	1,706,097.00	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1
B(26-18) 03	Lake Mohave Ranchos	1/1/2007	366,271.69	1,699,300.35	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1
B(26-18) 05-R	Lake Mohave Ranchos	1/1/2007	361,291.83	1,697,359.24	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1
B(26-18) 07-R	Lake Mohave Ranchos	1/1/2007	359,122.53	1,694,357.83	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1
B(26-18) 09	Lake Mohave Ranchos	1/1/2007	362,984.35	1,694,046.01	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1
B(26-18) 11-R	Lake Mohave Ranchos	1/1/2007	370,527.10	1,700,836.30	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1
B(26-18) 13-R	Lake Mohave Ranchos	1/1/2007	373,984.00	1,701,167.50	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1
B(26-18) 15-R	Lake Mohave Ranchos	1/1/2007	365,237.30	1,696,569.10	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1
B(26-19) 25-R	Lake Mohave Ranchos	1/1/2007	360,476.90	1,692,654.70	24.1	24.1	24.1	24.1	24.1	24.1	24.1	24.1	24.1	24.1	24.1	24.1	24.1	24.1	24.1	24.1	24.1	24.1	24.1	24.1	24.1	24.1	24.1	24.1	24.1	24.1	24.1	24.1	24.1	24.1	24.1	24.1	24.1	24.1	24.1	24.1	24.1

TABLE 4. SUMMARY OF SIMULATED GROUNDWATER PUMPING FOR 1971 THROUGH 2042, MAXIMUM CUMULATIVE IMPACTS

CADASTRAL LOCATION OR MODEL WELL NAME	REGISTRY NUMBER OR WELL OWNER	COMPLETION DATE	LOCATION COORDINATES* EASTING (feet)	NORTHING (feet)	SIMULATED ANNUAL PUMPING RATE, IN ACRE-FEET 2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042
B(28-19) 25-R	Lake Mohave Ranchos, Unit 6	1/1/2007	361,537.00	1,692,056.40	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8
B(29-19) 27-R	Mead-O-Rama #2	1/1/2007	376,872.11	1,774,424.25	86.6	86.6	86.6	86.6	86.6	86.6	86.6	86.6	86.6	86.6	86.6	86.6	86.6	86.6	86.6	86.6	86.6	86.6	86.6	86.6	86.6	86.6	86.6	86.6	86.6	86.6	86.6	86.6	86.6	86.6	86.6	86.6	86.6	86.6	86.6	86.6	86.6
B(29-18) 35-R	Mead-O-Rama #3	1/1/2007	375,043.42	1,769,300.63	55.2	55.2	55.2	55.2	55.2	55.2	55.2	55.2	55.2	55.2	55.2	55.2	55.2	55.2	55.2	55.2	55.2	55.2	55.2	55.2	55.2	55.2	55.2	55.2	55.2	55.2	55.2	55.2	55.2	55.2	55.2	55.2	55.2	55.2	55.2	55.2	55.2
B(29-17) 31-R	Mead-O-Rama #4	1/1/2007	374,835.99	1,765,991.94	172.7	172.7	172.7	172.7	172.7	172.7	172.7	172.7	172.7	172.7	172.7	172.7	172.7	172.7	172.7	172.7	172.7	172.7	172.7	172.7	172.7	172.7	172.7	172.7	172.7	172.7	172.7	172.7	172.7	172.7	172.7	172.7	172.7	172.7	172.7	172.7	172.7
B(29-18) 35-R	Mead-O-Rama Unit No. 3	1/1/2007	375,663.06	1,766,134.66	1,250.7	1,250.7	1,250.7	1,250.7	1,250.7	1,250.7	1,250.7	1,250.7	1,250.7	1,250.7	1,250.7	1,250.7	1,250.7	1,250.7	1,250.7	1,250.7	1,250.7	1,250.7	1,250.7	1,250.7	1,250.7	1,250.7	1,250.7	1,250.7	1,250.7	1,250.7	1,250.7	1,250.7	1,250.7	1,250.7	1,250.7	1,250.7	1,250.7	1,250.7	1,250.7	1,250.7	1,250.7
B(20-15) 06-R	Pinion Pines Estates #2	1/1/2007	452,872.84	1,641,717.19	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2
B(22-17) 12-R	Quail Valley Estates	1/1/2007	429,042.89	1,581,771.65	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7
B(25-16) 01	Realsite Arizona Ranchettes Units 1,3,4,6,7,8, and 9	1/1/2007	442,061.66	1,687,315.63	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4
B(25-16) 11	Realsite Arizona Ranchettes Units 1,3,4,6,7,8, and 9	1/1/2007	436,792.73	1,662,037.17	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4
B(25-16) 23	Realsite Arizona Ranchettes Units 1,3,4,6,7,8, and 9	1/1/2007	436,764.26	1,651,462.12	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4
B(25-16) 26	Realsite Arizona Ranchettes Units 1,3,4,6,7,8, and 9	1/1/2007	442,027.76	1,646,164.66	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4
B(25-16) 35	Realsite Arizona Ranchettes Units 1,3,4,6,7,8, and 9	1/1/2007	436,736.38	1,640,905.01	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4
B(26-15) 19-R	Realsite Arizona Ranchettes Units 1,3,4,6,7,8, and 9	1/1/2007	444,210.74	1,681,625.11	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4
B(26-15) 31	Realsite Arizona Ranchettes Units 1,3,4,6,7,8, and 9	1/1/2007	447,351.06	1,672,676.46	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4
B(23-17) 23-R	Red Wing Canyon Estates	1/1/2007	445,736.73	1,588,185.02	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8
B(24-14) 27-R	Shadow Mountain Acres Unit Two & Three	1/1/2007	490,002.40	1,616,900.62	18.2	18.2	18.2	18.2	18.2	18.2	18.2	18.2	18.2	18.2	18.2	18.2	18.2	18.2	18.2	18.2	18.2	18.2	18.2	18.2	18.2	18.2	18.2	18.2	18.2	18.2	18.2	18.2	18.2	18.2	18.2	18.2	18.2	18.2	18.2	18.2	18.2
B(24-14) 35-R	Shadow Mountain Acres Unit Two & Three	1/1/2007	495,276.11	1,611,616.63	18.2	18.2	18.2	18.2	18.2	18.2	18.2	18.2	18.2	18.2	18.2	18.2	18.2	18.2	18.2	18.2	18.2	18.2	18.2	18.2	18.2	18.2	18.2	18.2	18.2	18.2	18.2	18.2	18.2	18.2	18.2	18.2	18.2	18.2	18.2	18.2	18.2
B(23-14) 03-R	Sunny Highlands Estates, Tract 1132, Phase 1-20 Lots	1/1/2007	493,344.51	1,606,771.94	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4
B(23-16) 09-R	Sunnyvale Acres, Sunward Hot Ranches #2	1/1/2007	436,207.88	1,601,657.64	8.8	8.8	8.8	8.8	8.8	8.8	8.8	8.8	8.8	8.8	8.8	8.8	8.8	8.8	8.8	8.8	8.8	8.8	8.8	8.8	8.8	8.8	8.8	8.8	8.8	8.8	8.8	8.8	8.8	8.8	8.8	8.8	8.8	8.8	8.8	8.8	8.8
B(23-16) 33-R	Sunrise Mountain Estates	1/1/2007	431,849.28	1,676,490.35	9.8	9.8	9.8	9.8	9.8	9.8	9.8	9.8	9.8	9.8	9.8	9.8	9.8	9.8	9.8	9.8	9.8	9.8	9.8	9.8	9.8	9.8	9.8	9.8	9.8	9.8	9.8	9.8	9.8	9.8	9.8	9.8	9.8	9.8	9.8	9.8	9.8
B(23-16) 19-R	Sunward Hot Ranches	1/1/2007	438,210.53	1,664,157.56	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1
B(23-16) 30-R	Sunward Hot Ranches	1/1/2007	436,006.36	1,576,922.23	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1
B(23-16) 31-R	Sunward Hot Ranches	1/1/2007	436,989.22	1,670,642.83	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1
B(23-16) 33-R	Sunward Hot Ranches	1/1/2007	438,213.59	1,679,201.89	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1
B(23-16) 30-R	Sunward Hot Ranches Turquoise Acres	1/1/2007	436,006.36	1,676,922.23	13.7	13.7	13.7	13.7	13.7	13.7	13.7	13.7	13.7	13.7	13.7	13.7	13.7	13.7	13.7	13.7	13.7	13.7	13.7	13.7	13.7	13.7	13.7	13.7	13.7	13.7	13.7	13.7	13.7	13.7	13.7	13.7	13.7	13.7	13.7	13.7	13.7
B(23-16) 18-R	Toro Acres, Sunward Hot #2	1/1/2007	438,213.12	1,669,426.29	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1
B(23-16) 19-R	Toro Acres, Sunward Hot #2	1/1/2007	438,210.53	1,664,167.56	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1
B(23-15) 15-R	Valle Vista	1/1/2007	456,686.45	1,667,378.30	3,267.4	3,267.4	3,267.4	3,267.4	3,267.4	3,267.4	3,267.4	3,267.4	3,267.4	3,267.4	3,267.4	3,267.4	3,267.4	3,267.4	3,267.4	3,267.4	3,267.4	3,267.4	3,267.4	3,267.4	3,267.4	3,267.4	3,267.4	3,267.4	3,267.4	3,267.4	3,267.4	3,267.4	3,267.4	3,267.4	3,267.4	3,267.4	3,267.4	3,267.4	3,267.4	3,267.4	3,267.4
B(23-15) 10-R	Valle Vista #1A,3A	1/1/2007	456,612.41	1,682,653.10	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6
B(23-15) 16-R	Valle Vista #1A,3A	1/1/2007	456,686.45	1,667,379.30	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6
B(23-15) 03-R	Valle Vista Unit 2 Tract 1200, Lots 860, 861, 999, 1076,1709, 1631, and 1907	1/1/2007	456,616.99	1,597,947.49	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8
B(24-16) 34	Valle Vista Unit 3- Tract 1204	1/1/2007	435,465.93	1,608,649.29	3.9	3.9	3.9	3.9	3.9	3.9	3.9	3.9	3.9	3.9	3.9	3.9	3.9	3.9	3.9	3.9	3.9	3.9	3.9	3.9	3.9	3.9	3.9	3.9	3.9	3.9	3.9	3.9	3.9	3.9	3.9	3.9	3.9	3.9	3.9	3.9	3.9
B(22-16) 05-R	Zafiro Acres-Sunward Ho Ranches	1/1/2007	425,496.38	1,567,541.86	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7
Total Annual Pumping					9,762.7	9,762.7	9,762.7	9,762.7	9,762.7	9,762.7	9,762.7	9,762.7	9,762.7	9,762.7	9,762.7	9,762.7	9,762.7	9,762.7	9,762.7	9,762.7	9,762.7	9,762.7	9,762.7	9,762.7	9,762.7	9,762.7	9,762.7	9,762.7	9,762.7	9,762.7	9,762.7	9,762.7	9,762.7	9,762.7	9,762.7	9,762.7	9,762.7	9,762.7	9,762.7	9,762.7	9,762.7
Simulated Production Wells (Meridian Ranch):																																									
Elno #1		1/1/2012	386,356.66	1,733,095.24	0.	0.	0.	0.	0.	0.	8.1	16.1	24.2	32.3	40.3	48.4	56.5	64.6	72.6	80.7	88.8	96.8	104.9	113.	121.	129.1	137.2	145.2	153.3	161.4	169.5	177.5	185.6	193.7	201.7	209.8	217.9	225.9	234.	242.1	250.1
Stockton Well		1/2/2012	366,356.69	1,738,095.18	0.	0.	0.	0.	0.	0.	8.1	16.1	24.2	32.3	40.3	48.4	56.5	64.6	72.6	80.7	88.8	96.8	104.9	113.	121.	129.1	137.2	145.2	153.3	161.4	169.5	177.5	185.6	193.7	201.7	209.8	217.9	225.9	234.	242.1	250.1
Pocket Well		1/3/2012	379,356.64	1,760,165.96	0.	0.	0.	0.	0.	0.	8.1	16.1	24.2	32.3	40.3	48.4	56.5	64.6	72.6	80.7	88.8	96.8	104.9	113.	121.	129.1	137.2	145.2	153.3	161.4	169.5	177.5	185.6	193.7	201.7	209.8	217.9	225.9	234.	242.1	250.1
MR-1		1/4/2012	376,356.06	1,763,361.58	0.	0.	0.	0.	0.	0.	8.1	16.1	24.2	32.3	40.3	48.4	56.5	64.6	72.6	80.7	88.8	96.8	104.9	113.	121.	129.1	137.2	145.2	153.3	161.4	169.5	177.5	185.6	193.7	201.7	209.8	217.9	225.9	234.	242.1	250.1
MR-2		1/5/2012	382,356.64	1,765,196.95	0.	0.	0.	0.	0.	0.	3.2	6.5	9.7	12.9	16.1	19.4	22.6	25.8	29.	32.3	35.5	38.7	42.	45.2	48.4	51.6	54.9	58.1	61.3	64.6	67.8	71.	74.2	77.5	80.7	83.9	87.1	90.4	93.6	96.8	100.1
MR-3		1/6/2012	384,356.76	1,746,142.07	0.	0.	0.	0.	0.	0.	3.2	6.5	9.7	12.9	16.1	19.4	22.6	25.8	29.	32.3	35.5	38.7	42.	45.2	48.4	51.6	54.9	58.1	61.3	64.6	67.8	71.	74.2	77.5	80.7	83.9	87.1	90.4	93.6	96.8	100.1
MR-4		1/7/2012	389,356.66	1,741,112.17	0.	0.	0.	0.	0.	0.	8.1	16.1	24.2	32.3	40.3	48.4	56.5	64.6	72.6	80.7	88.8	96.8	104.9	113.	121.	129.1	137.2	145.2	153.3	161.4	169.5	177.5	185.6	193.7	201.7	209.8	217.9	225.9	234.	242.1	250.1
MR-5		1/8/2012	387,356.70	1,741,112.16	0.	0.	0.	0.	0.	0.	8.1	16.1	24.2	32.3	40.3	48.4	56.5	64.6	72.6	80.7	88.8	96.8	104.9	113.	121.	129.1	137.2	145.2	153.3	161.4	169.5	177.5	185.6	193.7	201.7	209.8	217.9	225.9	234.	242.1	250.1
MR-6		1/9/2012	393,356.61	1,737,089.26	0.	0.	0.	0.	0.	0.	8.1	16.1	24.2	32.3	40.3	48.4	56.5	64.6	72.6	80.7	88.8	96.8	104.9	113.	121.	129.1	137.2	145.2	153.3	161.4	169.5	177.5	185.6	193.7	201.7	209.8	217.9	225.9	234.	242.1	250.1
MR-7		1/10/2012	393,356.61	1,736,083.26	0.	0.	0.	0.	0.	0.	8.1	16.1	24.2	32.3	40.3	48.4	56.5	64.6	72.6	80.7	88.8	96.8	104.9	113.	121.	129.1	137.2	145.2	153.3	161.4	169.5	177.5	185.6	193.7	201.7	209.8	217.9	225.9	234.	242.1	250.1
MR-8		1/11/2012	393,356.59	1,734,071.29	0.	0.	0.	0.	0.	0.	8.1	16.1	24.2	32.3	40.3	48.4	56.5	64.6	72.6	80.7	88.8	96.8	104.9	113.	121.	129.1	137.2	145.2	153.3	161.4	169.5	177.5	185.6	193.7	201.7	209.8	217.9	225.9	234.	242.1	250.1
MR-9		1/12/2012	428,356.46	1,665,766.86	0.	0.	0.	0.	0.	0.	54.9	109.7	164.6	219.5	274.3	329.2	384.1	439.	493.8	548.7	603.6	658.4	713.3	768.2	823.	877.9	932.8	987.7	1,042.6	1,097.4	1,152.3	1,207.1	1,262.	1,316.9	1,371.7	1,426.6	1,481.5	1,536.4	1,591.2	1,646.1	1,701.
MR-10		1/13/2012	426,356.61	1,664,760.86	0.	0.	0.	0.	0.	0.	54.9	109.7	164.6	219.5	274.3	329.2	384.1	439.	493.8	548.7	603.6	658.4	713.3	768.2	823.	877.9	932.8	987.7	1,042.6	1,097.4	1,152.3	1,207.1	1,262.	1,316.9	1,371.7	1,426.6	1,481.5	1,536.4	1,591.2	1,646.1	1,701.
MR-11		1/14/2012	380,356.86	1,754,189.94	0.	0.	0.	0.	0.	0.	3.2	6.5	9.7	12.9	16.1	19.4	22.6	25.8	29.	32.3	35.5	38.7	42.	45.2	48.4	51.6	54.9	58.1	61.3	64.6	67.8	71.	74.2	77.5	80.7	83.9	87.1	90.4	93.6	96.8	100.1
MR-12		1/15/2012	382,356.80	1,748,164.03	0.	0.	0.	0.	0.	0.	8.1	16.1	24.2	32.3	40.3	48.4	56.5	64.6	72.6	80.7	88.8	96.8	104.9	113.	121.	129.1	137.2	145.2	153.3	161.4	169.5	177.5	185.6	193.7	201.7	209.8	217.9	225.9	234.	242.1	250.1
MR-13		1/16/2012	386,356.74	1,745,136.10	0.	0.	0.	0.	0.	0.	3.2	6.5	9.7	12.9	16.1	19.4	22.6	25.8	29.	32.3	35.5	38.7	42.	45.2	48.4	51.6	54.9	58.1	61.3	64.6	67.8	71.	74.2	77.5	80.7	83.9	87.1	90.4	93.6	96.8	100.1
MR-14		1/17/2012	390,356.66	1,736,101.20	0.	0.	0.	0.	0.	0.	8.1	16.1	24.2	32.3	40.3	48.4	56.5	64.6	72.6	80.7	88.8	96.8	104.9	113.	121.	129.1	137.2	145.2	153.3	161.4	169.5	177.5	185.6	193.7	201.7	209.8	217.9	225.9	234.	242.1	250.1
MR-15		1/18/2012	384,356.70	1,736,077.20	0.	0.	0.	0.	0.	0.	8.1	16.1	24.2	32.3	40.3	48.4	56.5	64.6	72.6	80.7	88.8	96.8	104.9	113.	121.	129.1	137.2	145.2	153.3	161.4	169.5	177.5	185.6	193.7	201.7	209.8	217.9	225.9	234.	242.1	250.1
MR-16		1/19/2012	383,356.77	1,745,136.07	0.	0.	0.	0.	0.	0.	3.2	6.5	9.7	12.9	16.1	19.4	22.6	25.8	29.	32.3	35.5	38.7	42.	45.2	48.4	51.6	54.9	58.1	61.3	64.6	67.8	71.	74.2	77.5	80.7	83.9	87.1	90.4	93.6	96.8	100.1
MR-17		1/20/2012	382,356.78	1,746,142.05	0.	0.	0.	0.	0.	0.	6.5	12.9	19.4	25.8	32.3	38.7	45.2	51.6	58.1	64.6	71.	77.5	83.9	90.4	96.8	103.3	109.7	116.2	122.7	129.1	135.6	142.	148.5	154.9	161.4	167.8	174.3	180.7	187.2	193.7	200.1
Total Annual Pumping					0.	0.	0.	0.	0.	0.	229.2	458.3	687.5	916.7	1,145.8	1,375.	1,604.1	1,833.3	2,062.5	2,291.6	2,520.8	2,750.	2,979.1	3,208.3	3,437.5	3,666.6	3,895.8	4,124.9	4,354.1	4,583.3	4,812.4	5,041.6	5,270.8	5,499.9	5,729.1	5,958.3	6,187.4	6,416.6	6,645.7	6,874.9	7,104.1
Simulated Production Wells (Rhodes Homes Development):																																									
M-PH1		1/1/2007	448,765.60	1,553,396.06	0.	0.	0.	0.	0.	0.	34.5	69.	103.5	138.	172.5	207.	241.5	276.	310.5	345.	379.5	414.	448.5	483.	517.5	552.	586.5	621.	655.5	690.	724.5	759.	793.5	828.	862.5	897.	931.5	966.	1,000.5	1,035.	1,069.5
M-PH2		1/1/2007	448,808.08	1,565,455.89	0.	0.	0.	0.	0.	0.	34.5	69.	103.5	138.	172.5	207.	241.5	276.	310.5	345.	379.5	414.	448.5	483.	517.5	552.	586.5	621.	655.5	690.	724.5	759.	793.5	828.	862.5	897.	931.5	966.	1,000.5	1,035.	1,069.5
M-PH3		1/1/2007	444,828.80	1,556,604.14	0.	0.	0.	0.	0.	0.	55.1	110.2	165.3	220.4	275.5	330.6	385.7	440.8	495.9	551.	606.1	661.2	716.3	771.4	826.5	881.6	936.7	991.8	1,046.9	1,102.	1,157.1	1,212.2	1,267.3	1,322.4	1,377.5	1,432.6	1,487.7	1,542.8	1,597.9	1,653.	1,708.1
M-PH4		1/1/2007	459,317.10	1,573,906.57	0.	0.	0.	0.	0.	0.	55.1	110.2	165.3	220.4	275.5	330.6	385.7	440.8	495.9	551.	606.1	661.2	716.3	771.4	826.5	881.6	936.7	991.8	1,046.9	1,102.	1,157.1	1,212.2	1,267.3	1,322.4	1,377.5	1,432.6	1,487.7	1,542.8	1,597.9	1,653.	1,708.1
M-PH5		1/1/2007	459,288.61	1,566,353.91	0.	0.	0.	0.	0.	0.	55.1	110.2	165.3	220.4	275.5	330.6	385.7	440.8	495.9	551.	606.1	661.2	716.3	771.4	826.5	881.6	936.7	991.8	1,046.9	1,102.	1,157.1	1,212.2	1,267.3	1,322.4	1,377.5	1,432.6	1,487.7	1,542.8	1,597.9	1,653.	1,708.1
M-PH6		1/1/2007	459,330.73	1,566,238.00	0.	0.	0.	0.	0.	0.	34.5	69.	103.5	138.	172.5	207.	241.5	276.	310.5	345.	379.5	414.	448.5	483.	517.5	552.	586.5	621.	655.5	690.	724.5	759.	793.5	828.	862.5	897.	931.5	966.	1,000.5	1,035.	1,069.5
Total Annual Pumping					0.	0.	0.	0.	0.	0.	268.8	537.6	806.4	1,075.2	1,344.	1,612.8	1,881.6	2,150.4	2,419.2	2,688.	2,956.8	3,225.6	3,494.4	3,763.2	4,032.	4,300.8	4,569.6	4,838.4	5,107.2	5,376.	5,644.8	5,913.6	6,182.4	6,451.2	6,720.	6,988.8	7,257.6	7,526.4	7,795.2	8,064.	8,332.8
M-PV1		1/1/2007	453,665.20	1,619,960.98	0.	0.	0.	0.	0.	0.	64.2	128.5	192.7	256.9	321.2	385.4	449.6	513.9	578.1	642.4	706.6	770.8	835.1	899.3	963.5	1,027.8	1,092.	1,156.2	1,220.5	1,284.7	1,348.9	1,413.2	1,477.4	1,541.6	1,605.9	1,670.1	1,734.3	1,798.6	1,862.8	1,927.1	1,991.3
Total Annual Pumping					0.	0.	0.	0.	0.	0.	64.2	128.5	192.7	256.9	321.2	385.4	449.6	513.9	578.1	642.4	706.6	770.8	835.1	899.3	963.5	1,027.8	1,092.	1,156.2	1,220.5	1,284.7	1,348.9	1,413.2	1,477.4	1,541.6	1,605.9	1,670.1	1,734.3	1,798.6	1,862.8	1,927.1	1,991.3
M-HR1		1/1/2007	449,111.25	1,621,629.99	0.	0.	0.	0.	0.	0.	42.	83.9	125.9	167.8	209.8	251.7	293.7	335.7	377.6	419.6	461.5	503.5	545.4	587.4	629.4	671.3	713.3	755.2	797.2	839.1	881.1	923.1	965.	1,007.	1,048.9	1,090.9	1,132.8	1,174.8	1,216.8	1,258.7	1,300.7
M-HR2		1/1/2007	463,519.96	1,621,427.67	0.	0.	0.	0.	0.	0.	42.	83.9	125.9	167.8	209.8	251.7	293.7	335.7	377.6	419.6	461.5	503.5	545.4	587.4	629.4	671.3	713.3	755.2	797.2	839.1	881.1	923.1	965.	1,007.	1,048.9	1,090.9	1,132.8	1,174.8	1,216.8	1,258.7	1,300.7
Total Annual Pumping					0.	0.	0.	0.	0.	0.	83.9	167.8	251.7	335.7	419.6	503.5	587.4	671.3	755.2	839.1	923.1	1,007.	1,090.9	1,174.8	1,258.7	1,342.6	1,426.6	1,510.5	1,594.4	1,678.3	1,762.2	1,846.1	1,930.	2,013.9	2,097.9	2,181.8	2,265.7	2,349.6	2,433.5	2,517.4	2,601.3
M-NR1		1/1/2007	437,898.10	1,641,020.23	0.	0.	0.	0.	0.	0.	56.5	112.9	169.4	225.9	282.3	338.8	395.3	451.7	508.2	564.7	621.1	677.6	734.1	790.6	847.	903.5	960.	1,016.4	1,072.9	1,129.4	1,185.8	1,242.3	1,298.8	1,355.2	1,411.7	1,468.2	1,524.6	1,581.1	1,637.6	1,694.	1,750.5
M-NR2		1/1/2007	436,431.63	1,634,012.83	0.	0.	0.	0.	0.	0.	56.5	112.9	169.4	225.9	282.3	338.8	395.3	451.7	508.2	564.7	621.1	677.6	734.1	790.6	847.	903.5	960.	1,016.4	1,072.9	1,129.4	1,185.8	1,242.3	1,298.8	1,355.2	1,411.7	1,468.2	1,524.6	1,581.1	1,637.6	1,694.	1,750.5
Total Annual Pumping					0.	0.	0.	0.	0.	0.	112.9	225.8	338.8	451.7	564.7	677.6	790.6	903.5	1,016.4	1,129.4	1,242.3	1,355.2	1,468.2	1,581.1	1,694.	1,807.	1,919.9	2,032.9	2,145.8	2,258.7	2,371.6	2,484.6	2,597.5	2,710.5	2,823.4	2,936.3	3,049.3	3,162.2	3,275.1	3,388.1	3,501.
M-RL1		1/1/2012	407,181.27	1,661,263.33	0.	0.	0.	0.	0.	0.	49.8	99.6	149.3	199.1	248.9	298.7	348.4	398.2	448.	497.8	547.5	597.3	647.1	696.9	746.6	796.4	846.2	896.	945.7	995.5	1,045.3	1,095.1	1,144.8	1,194.6	1,244.4	1,294.2	1,343.9	1,393.7	1,443.5	1,493.3	1,543.
M-RL2		1/2/2012	402,311.44	1,677,499.36	0.	0.	0.	0.	0.	0.	49.8	99.6	149.3	199.1	248.9	298.7	348.4	398.2	448.	497.8	547.5	597.3	647.1	696.9	746.6	796.4	846.2	896.	945.7	995.5	1,045.3	1,095.1	1,144.8	1,194.6	1,244.4	1,294.2	1,343.9	1,393.7	1,443.5	1,493.3	1,543.
M-RL3		1/3/2012	417,971.36	1,696,697.76	0.	0.	0.	0.	0.	0.	49.8	99.6	149.3	199.1	248.9	298.7	348.4	398.2	448.	497.8	547.5	597.3	647.1	696.9	746.6	796.4	846.2	896.	945.7	995.5	1,045.3	1,095.1	1,144.8	1,194.6	1,244.4	1,294.2	1,343.9	1,393.7	1,443.5	1,493.3	1,543.
M-RL4		1/4/2012	415,564.06	1,703,900.67	0.	0.	0.	0.	0.	0.	49.8	99.6	149.3	199.1	248.9	298.7	348.4	398.2	448.	497.8	547.5	597.3	647.1	696.9	746.6	796.4	846.2	896.	945.7	995.5	1,045.3	1,095.1	1,144.8	1,194.6	1,244.4	1,294.2	1,343.9	1,393.7	1,443.5	1,493.3	1,543.
M-RL5		1/5/2012	405,944.28	1,690,460.13	0.	0.	0.	0.	0.	0.	49.8	99.6	149.3	199.1	248.9	298.7	348.4	398.2	448.	497.8	547.5	597.3	647.1	696.9	746.6	796.4	846.2	896.	945.7	995.5	1,045.3	1,095.1	1,144.8	1,194.6	1,244.4	1,294.2	1,343.9	1,393.7	1,443.5	1,493.3	1,543.
M-RL6		1/6/2012	424,383.91	1,695,841.70	0.	0.	0.	0.	0.	0.	49.8	99.6	149.3	199.1	248.9	298.7	348.4	398.2	448.	497.8	547.5	597.3	647.1	696.9	746.6	796.4	846.2	896.	945.7	995.5	1,045.3	1,095.1	1,144.8	1,194.6	1,244.4	1,294.2	1,343.9	1,393.7	1,443.5	1,493.3	1,543.
M-RL7		1/7/2012	413,616.64	1,674,781.24	0.	0.	0.	0.	0.	0.	49.8	99.6	149.3	199.1	248.9	298.7	348.4	398.2	448.	497.8	547.5	597.3	647.1	696.9	746.6	796.4	846.2	896.	945.7	995.5	1,045.3	1,095.1	1,144.8	1,194.6	1,244.4	1,294.2	1,343.9	1,393.7	1,443.5	1,493.3	1,543.
M-RL9		1/8/2012	428,385.19	1,695,906.06	0.	0.	0.	0.	0.	0.	49.8	99.6	149.3	199.1	248.9	298.7	348.4	398.2	448.	497.8	547.5	597.3	647.1	696.9	746.6	796.4	846.2	896.	945.7	995.5	1,045.3	1,095.1	1,144.8	1,194.6	1,244.4	1,294.2	1,343.9	1,393.7	1,443.5	1,493.3	1,543.
M-RL10		1/9/2012	413,592.64	1,665,332.01	0.	0.	0.	0.	0.	0.	49.8	99.6	149.3	199.1	248.9	298.7	348.4	398.2	448.	497.8	547.5	597.3	647.1	696.9	746.6	796.4	846.2	896.	945.7	995.5	1,045.3	1,095.1	1,144.8	1,194.6	1,244.4	1,294.2	1,343.9	1,393.7	1,443.5	1,493.3	1,543.

TABLE 4. SUMMARY OF SIMULATED GROUNDWATER PUMPING FOR 1971 THROUGH 2042, MAXIMUM CUMULATIVE IMPACTS

CADASTRAL LOCATION OR MODEL WELL NAME	REGISTRY NUMBER OR WELL OWNER	COMPLETION DATE	LOCATION COORDINATES* EASTING (feet)	LOCATION COORDINATES* NORTHING (feet)	SIMULATED ANNUAL PUMPING RATE, IN ACRE-FEET 2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042
M-RL11		1/10/2012	407,481.04	1,675,700.84	0.	0.	0.	0.	0.	0.	49.8	99.6	149.3	199.1	248.9	298.7	348.4	398.2	448.	497.8	547.6	597.3	647.1	696.9	746.6	796.4	846.2	896.	945.7	995.6	1,045.3	1,095.1	1,144.8	1,194.6	1,244.4	1,294.2	1,343.9	1,393.7	1,443.5	1,493.3	1,543.
M-RL12		1/11/2012	406,552.93	1,711,876.16	0.	0.	0.	0.	0.	0.	49.8	99.6	149.3	199.1	248.9	298.7	348.4	398.2	448.	497.8	547.6	597.3	647.1	696.9	746.6	796.4	846.2	896.	945.7	995.6	1,045.3	1,095.1	1,144.8	1,194.6	1,244.4	1,294.2	1,343.9	1,393.7	1,443.5	1,493.3	1,543.
M-RL13		1/12/2012	403,229.61	1,706,365.12	0.	0.	0.	0.	0.	0.	49.8	99.6	149.3	199.1	248.9	298.7	348.4	398.2	448.	497.8	547.6	597.3	647.1	696.9	746.6	796.4	846.2	896.	945.7	995.6	1,045.3	1,095.1	1,144.8	1,194.6	1,244.4	1,294.2	1,343.9	1,393.7	1,443.5	1,493.3	1,543.
M-RL14		1/13/2012	407,389.23	1,717,249.32	0.	0.	0.	0.	0.	0.	49.8	99.6	149.3	199.1	248.9	298.7	348.4	398.2	448.	497.8	547.6	597.3	647.1	696.9	746.6	796.4	846.2	896.	945.7	995.6	1,045.3	1,095.1	1,144.8	1,194.6	1,244.4	1,294.2	1,343.9	1,393.7	1,443.5	1,493.3	1,543.
M-RL15		1/14/2012	403,070.49	1,686,321.71	0.	0.	0.	0.	0.	0.	49.8	99.6	149.3	199.1	248.9	298.7	348.4	398.2	448.	497.8	547.6	597.3	647.1	696.9	746.6	796.4	846.2	896.	945.7	995.6	1,045.3	1,095.1	1,144.8	1,194.6	1,244.4	1,294.2	1,343.9	1,393.7	1,443.5	1,493.3	1,543.
M-RL16		1/15/2012	412,471.12	1,669,166.64	0.	0.	0.	0.	0.	0.	34.4	68.7	103.1	137.4	171.8	206.2	240.5	274.9	309.2	343.6	378.	412.3	446.7	481.	515.4	549.8	584.1	618.5	652.8	687.2	721.6	755.9	790.3	824.6	859.	893.4	927.7	962.1	996.4	1,030.8	1,065.2
M-RL17		1/16/2012	412,503.67	1,679,722.97	0.	0.	0.	0.	0.	0.	34.4	68.7	103.1	137.4	171.8	206.2	240.5	274.9	309.2	343.6	378.	412.3	446.7	481.	515.4	549.8	584.1	618.5	652.8	687.2	721.6	755.9	790.3	824.6	859.	893.4	927.7	962.1	996.4	1,030.8	1,065.2
M-RL18		1/17/2012	412,694.12	1,690,696.44	0.	0.	0.	0.	0.	0.	34.4	68.7	103.1	137.4	171.8	206.2	240.5	274.9	309.2	343.6	378.	412.3	446.7	481.	515.4	549.8	584.1	618.5	652.8	687.2	721.6	755.9	790.3	824.6	859.	893.4	927.7	962.1	996.4	1,030.8	1,065.2
M-RL19		1/18/2012	400,784.77	1,721,474.67	0.	0.	0.	0.	0.	0.	34.4	68.7	103.1	137.4	171.8	206.2	240.5	274.9	309.2	343.6	378.	412.3	446.7	481.	515.4	549.8	584.1	618.5	652.8	687.2	721.6	755.9	790.3	824.6	859.	893.4	927.7	962.1	996.4	1,030.8	1,065.2
M-RL20		1/19/2012	420,521.01	1,674,601.13	0.	0.	0.	0.	0.	0.	34.4	68.7	103.1	137.4	171.8	206.2	240.5	274.9	309.2	343.6	378.	412.3	446.7	481.	515.4	549.8	584.1	618.5	652.8	687.2	721.6	755.9	790.3	824.6	859.	893.4	927.7	962.1	996.4	1,030.8	1,065.2
Total Annual Pumping					0.	0.	0.	0.	0.	0.	868.7	1,737.3	2,606.	3,474.6	4,343.3	5,212.	6,080.6	6,949.3	7,817.9	8,686.6	9,555.2	10,423.9	11,292.6	12,161.2	13,029.9	13,898.5	14,767.2	15,635.8	16,504.5	17,373.2	18,241.8	19,110.6	19,979.1	20,847.8	21,716.5	22,585.1	23,453.8	24,322.4	25,191.1	26,059.8	26,928.4
Simulated Production Wells (Hualapai Valley Solar Project):																																									
HVS-1		1/1/2013	420,763.01	1,681,811.30	0.	0.	0.	0.	0.	0.	0.	750.	750.	750.	750.	750.	750.	750.	750.	750.	750.	750.	750.	750.	750.	750.	750.	750.	750.	750.	750.	750.	750.	750.	750.	750.	750.	750.	750.	750.	750.
HVS-2		1/2/2013	424,419.63	1,676,427.92	0.	0.	0.	0.	0.	0.	0.	750.	750.	750.	750.	750.	750.	750.	750.	750.	750.	750.	750.	750.	750.	750.	750.	750.	750.	750.	750.	750.	750.	750.	750.	750.	750.	750.	750.	750.	750.
HVS-3		1/3/2013	420,976.08	1,676,624.34	0.	0.	0.	0.	0.	0.	0.	750.	750.	750.	750.	750.	750.	750.	750.	750.	750.	750.	750.	750.	750.	750.	750.	750.	750.	750.	750.	750.	750.	750.	750.	750.	750.	750.	750.	750.	750.
HVS-4		1/4/2013	414,087.02	1,676,179.39	0.	0.	0.	0.	0.	0.	0.	750.	750.	750.	750.	750.	750.	750.	750.	750.	750.	750.	750.	750.	750.	750.	750.	750.	750.	750.	750.	750.	750.	750.	750.	750.	750.	750.	750.	750.	750.
Total Annual Pumping					0.	0.	0.	0.	0.	0.	0.	3,000.	3,000.	3,000.	3,000.	3,000.	3,000.	3,000.	3,000.	3,000.	3,000.	3,000.	3,000.	3,000.	3,000.	3,000.	3,000.	3,000.	3,000.	3,000.	3,000.	3,000.	3,000.	3,000.	3,000.	3,000.	3,000.	3,000.	3,000.	3,000.	3,000.
Annual Grand Total					19,093.7	19,441.1	19,788.4	20,135.7	20,483.1	20,830.4	22,805.4	27,780.5	29,755.5	31,745.5	33,746.4	35,758.4	37,782.	39,817.4	41,885.1	43,925.4	45,998.7	48,085.3	50,185.7	52,300.3	54,429.5	56,573.7	58,733.4	60,909.1	63,101.3	65,310.3	67,536.8	69,781.3	72,044.3	74,326.3	76,627.9	78,949.8	81,292.5	83,656.7	86,042.9	88,451.9	90,884.3

* = Location coordinates are State Plane, U.S. feet, Arizona West, North American Datum 1927

"-R" = Relocated Well. Well is located in the Hualapai Valley, but outside the active area for model.
Well was relocated to the nearest active cell.

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TABLE 5. RESULTS OF SIMULATED IMPACT FROM HUALAPAI VALLEY SOLAR PUMPING

SIMULATION	AFTER 5 YEARS OF PUMPING AT HVS				AFTER 30 YEARS OF PUMPING AT HVS			
	MAXIMUM DRAWDOWN AT HVS SITE (ft)	MAXIMUM DRAWDOWN DUE TO HVS (ft)	AREA INSIDE 1 FOOT CONTOUR DUE TO HVS (mi^2)	AREA INSIDE 10 FOOT CONTOUR DUE TO HVS (mi^2)	MAXIMUM DRAWDOWN AT HVS SITE (ft)	MAXIMUM DRAWDOWN DUE TO HVS (ft)	AREA INSIDE 1 FOOT CONTOUR DUE TO HVS (mi^2)	AREA INSIDE 10 FOOT CONTOUR DUE TO HVS (mi^2)
Base Case	< 1	---	---	---	5	---	---	---
HVS at 3,000 AF/yr	47	47	60.5	6.3	66	62	202.5	56.7
HVS at 2,400 AF/yr	38	38	54.2	4.4	54	50	188.8	38.8
HVS at 30 AF/yr	< 1	0.5	0	0	6	0.6	0	0
Maximum Cumulative	50	47	59.2	6.3	158	63	194.3	55.5

Abbreviations:

AF/yr = Acre-feet per year
HVS = Hualapai Valley Solar
ft = feet
mi^2 = square miles

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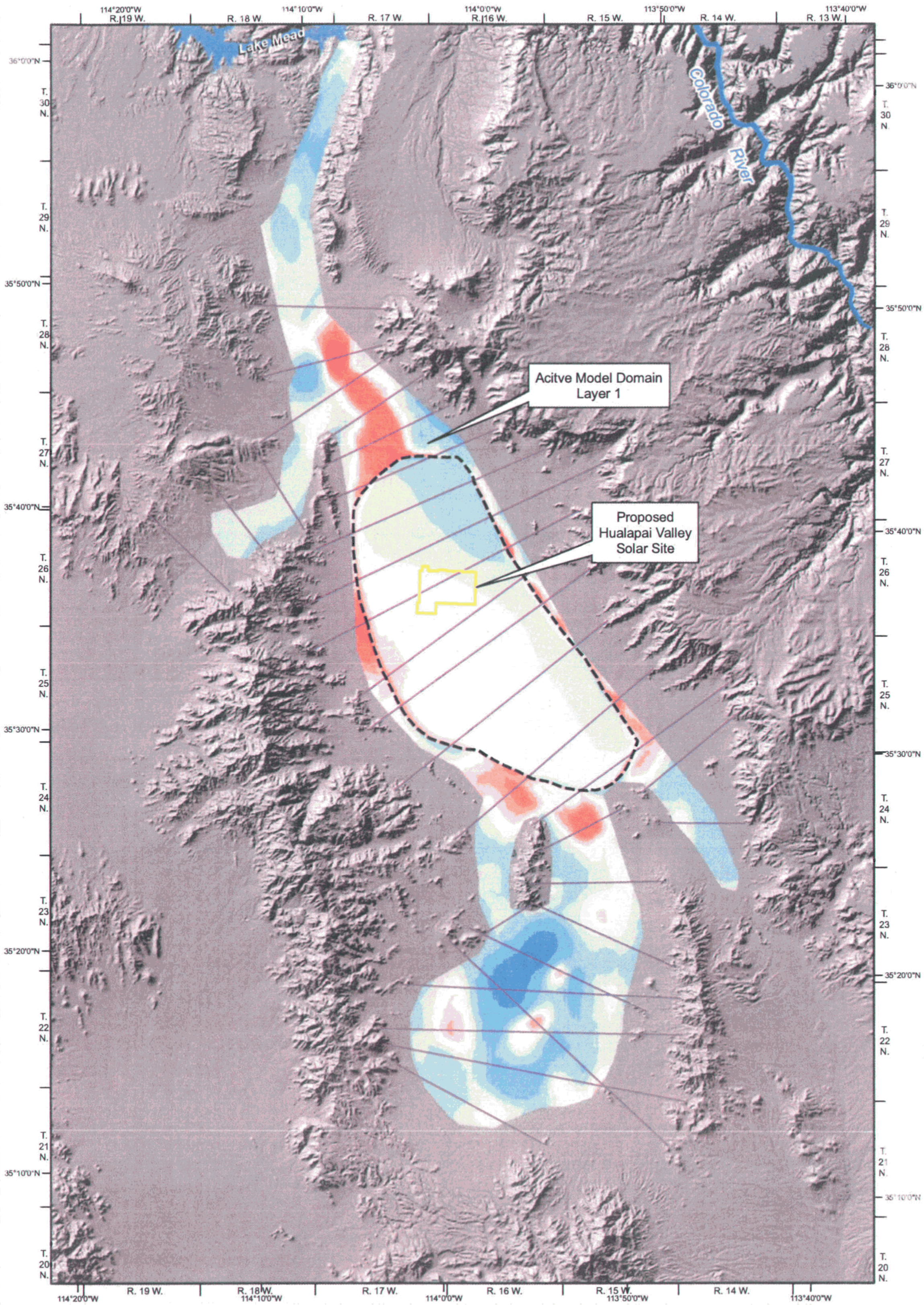
& ASSOCIATES

ILLUSTRATIONS



EXPLANATION

Bedrock Difference*

-2,945 - -2,000	-49 - 50
-1,999 - -1,000	51 - 250
-999 - -500	251 - 500
-499 - -250	501 - 1,000
-249 - -50	1,001 - 2,921

*Difference values in feet.
Blues indicate M&A bedrock is lower than ADWR.
Reds indicate M&A bedrock is higher than ADWR

ADWR Gravity Profiles
HVS Site Boundary
Salt Formation Extent

0 1 2 3 4 5
Miles

N

HUALAPAI VALLEY
MOHAVE COUNTY, ARIZONA

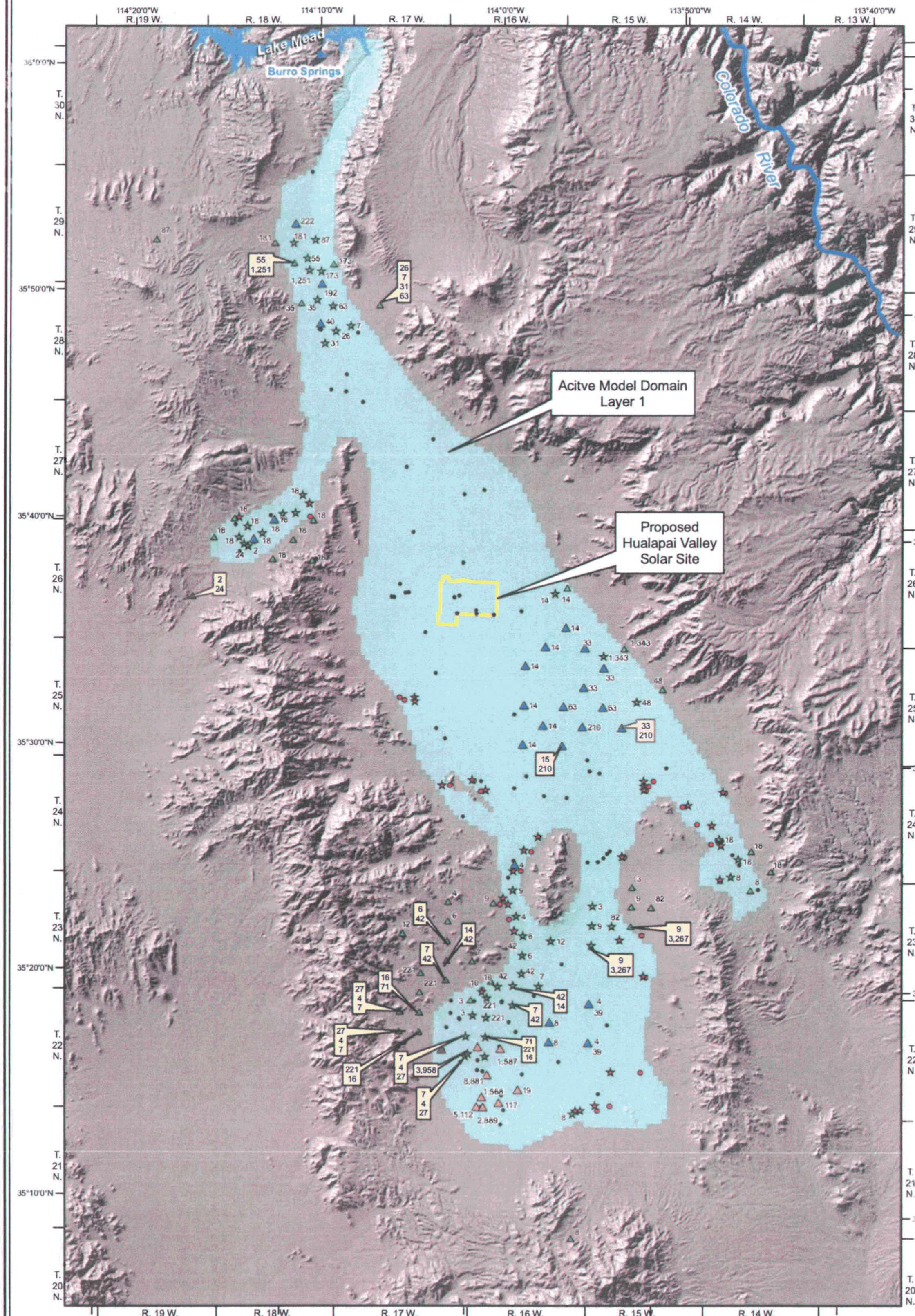
SIMULATED BEDROCK ALTITUDE
COMPARED WITH ADWR
GRAVITY SURVEY, 2009

MONTGOMERY & ASSOCIATES

2009

FIGURE 1

GIS/1326/02/UpdatesDec09/BedrockComparison_Formatted.mxd/11Dec09



EXPLANATION

Simulated Wells in Groundwater Model and Maximum Pumping Rate, in AF/yr

- 5,112 City of Kingman
- 3,958 City of Kingman Relocated, Original Location
- 3,958 City of Kingman Relocated, New Location*
- 42 Other Committed Demand
- 221 Other Committed Demand Relocated, Original Location
- 221 Other Committed Demand Relocated, New Location*
- Domestic Well
- Domestic Well Relocated, Original Location
- Domestic Relocated, New Location*

*Well relocated within active model domain to ensure pumping is accounted for in model simulations

0 1 2 3 4 5
Miles

N

HUALAPAI VALLEY
MOHAVE COUNTY, ARIZONA

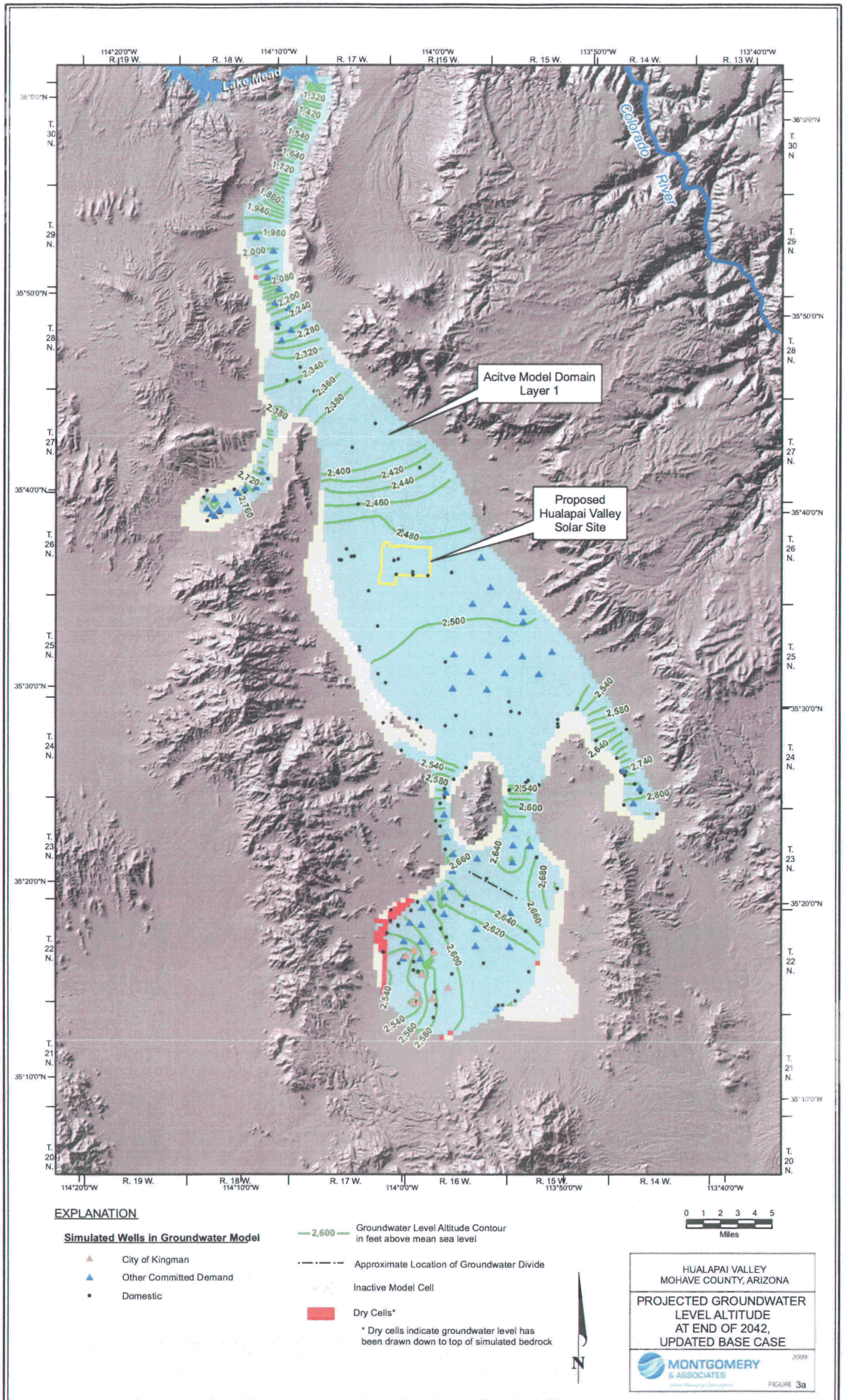
SIMULATED PUMPING
FOR UPDATED BASE CASE

MONTGOMERY & ASSOCIATES

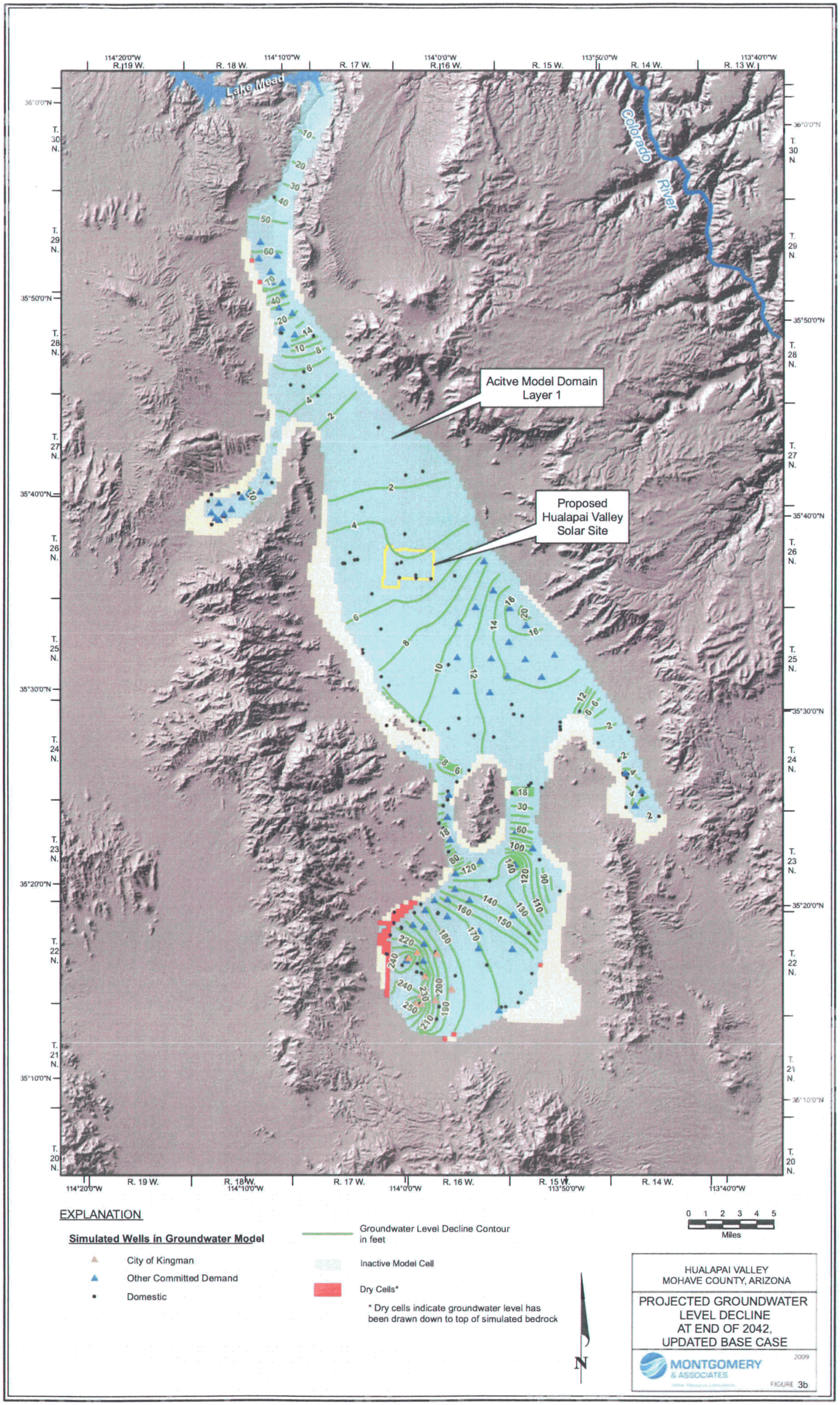
2009

FIGURE 2

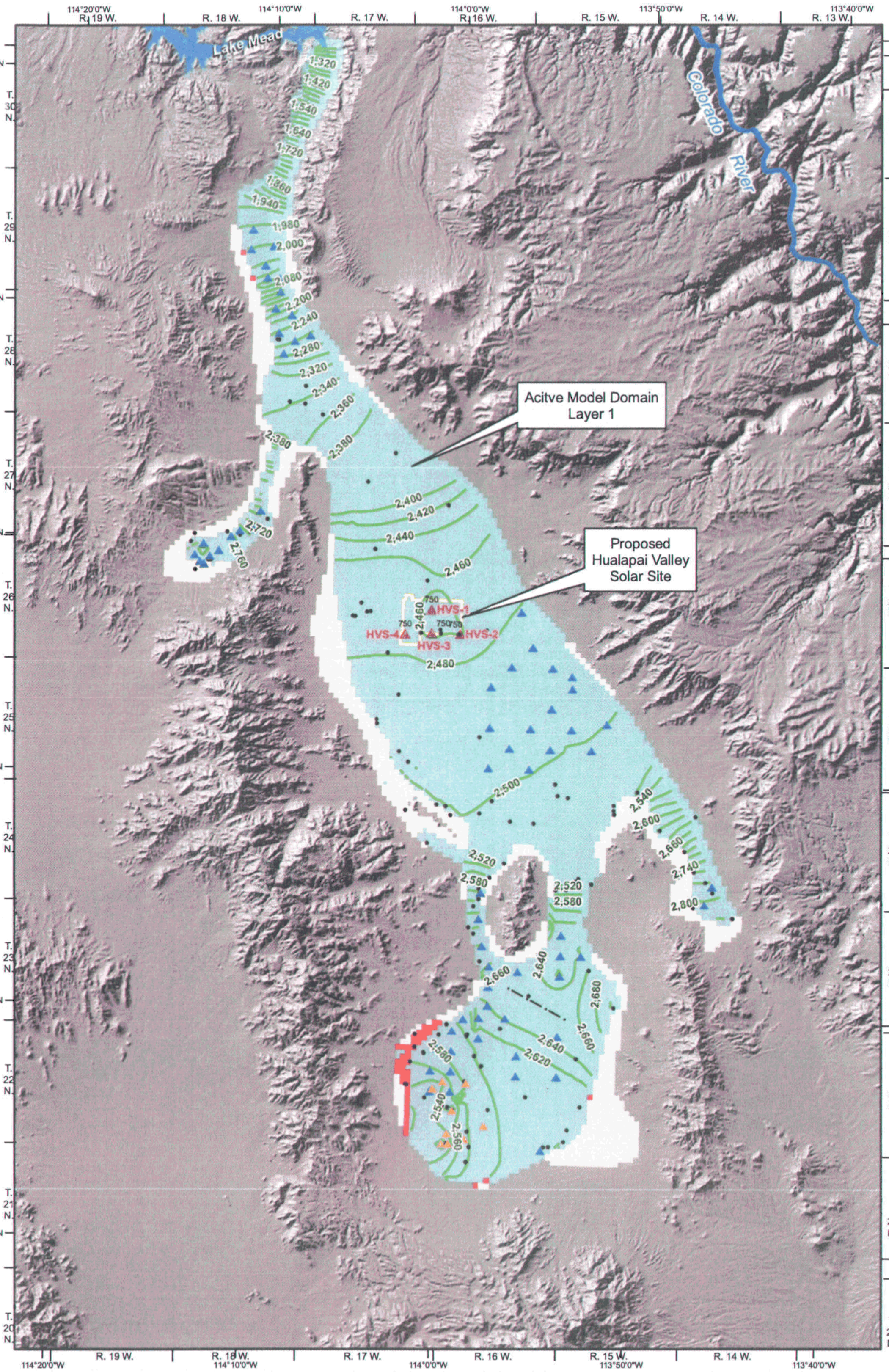
GIS/1326/02/UpdatesDec09/WellLocation.mxd/14Dec09



GIS/1326/02/UpdatesDec09/BaseCase_a.mxd/14Dec09



GIS/1326/02/UpdatesDec09/BaseCase_b.mxd/14Dec09



EXPLANATION

Simulated Wells in Groundwater Model

750 ▲ Hualapai Valley Solar Pumping Rate, in AF/yr

▲ City of Kingman

▲ Other Committed Demand

• Domestic

—2,600— Groundwater Level Altitude Contour in feet above mean sea level

Approximate Location of Groundwater Divide

Inactive Model Cell

Dry Cells*

* Dry cells indicate groundwater level has been drawn down to top of simulated bedrock

0 1 2 3 4 5
Miles

N

HUALAPAI VALLEY
MOHAVE COUNTY, ARIZONA

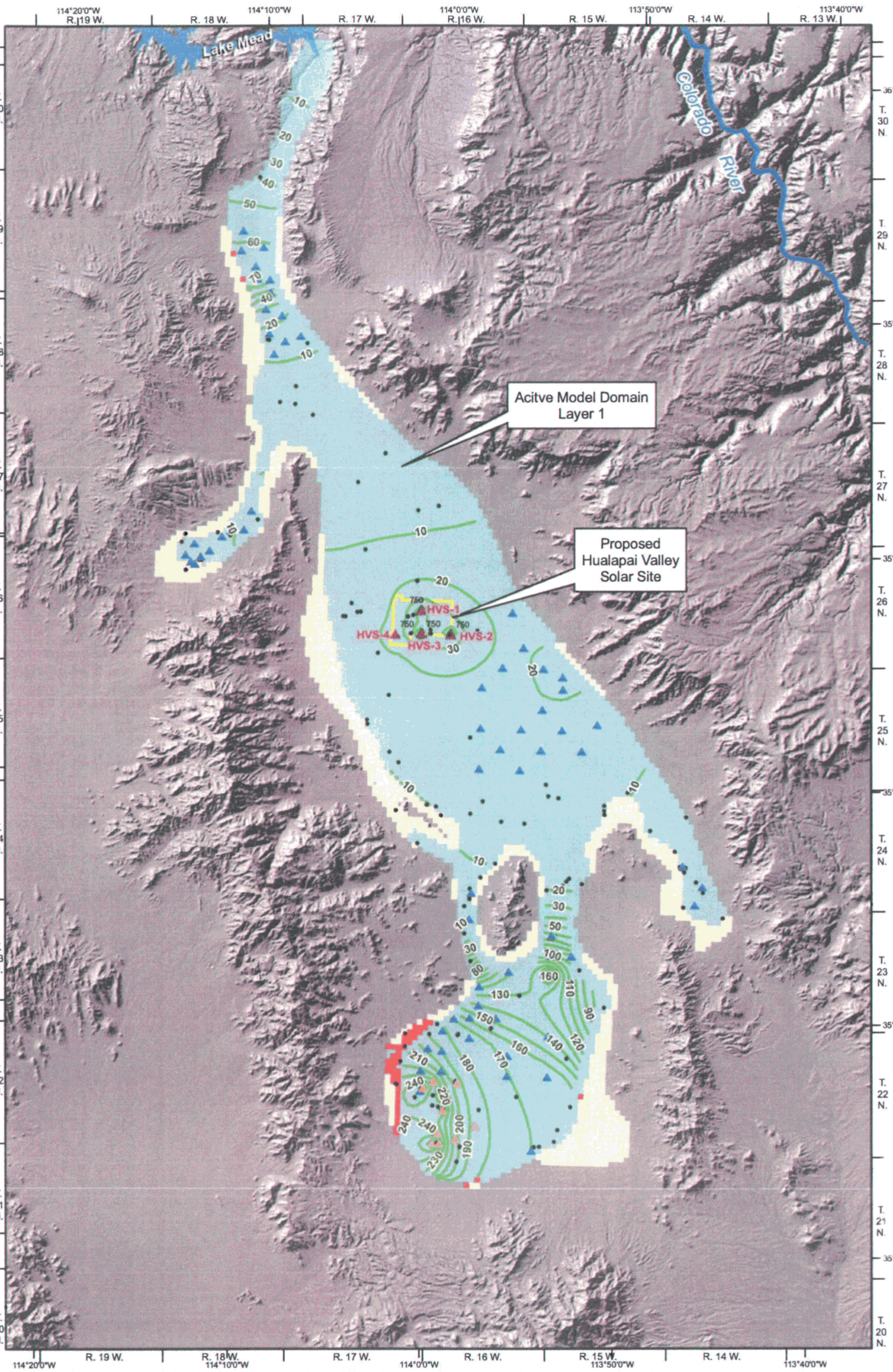
PROJECTED GROUNDWATER LEVEL ALTITUDE AT END OF 2042, HVS AT 3,000 AF/yr

MONTGOMERY & ASSOCIATES

2009

FIGURE 4a

GIS/1326/02/UpdatesDec09/HVS3000_a.mxd/15Dec09



EXPLANATION

Simulated Wells in Groundwater Model

- 750 ▲ Hualapai Valley Solar Pumping Rate, in AF/yr
- ▲ City of Kingman
- ▲ Other Committed Demand
- • Domestic

—10— Groundwater Level Decline Contour in feet (maximum decline on HVS site = 66 feet)

Inactive Model Cell

Dry Cells*

* Dry cells indicate groundwater level has been drawn down to top of simulated bedrock

0 1 2 3 4 5
Miles

N

HUALAPAI VALLEY
MOHAVE COUNTY, ARIZONA

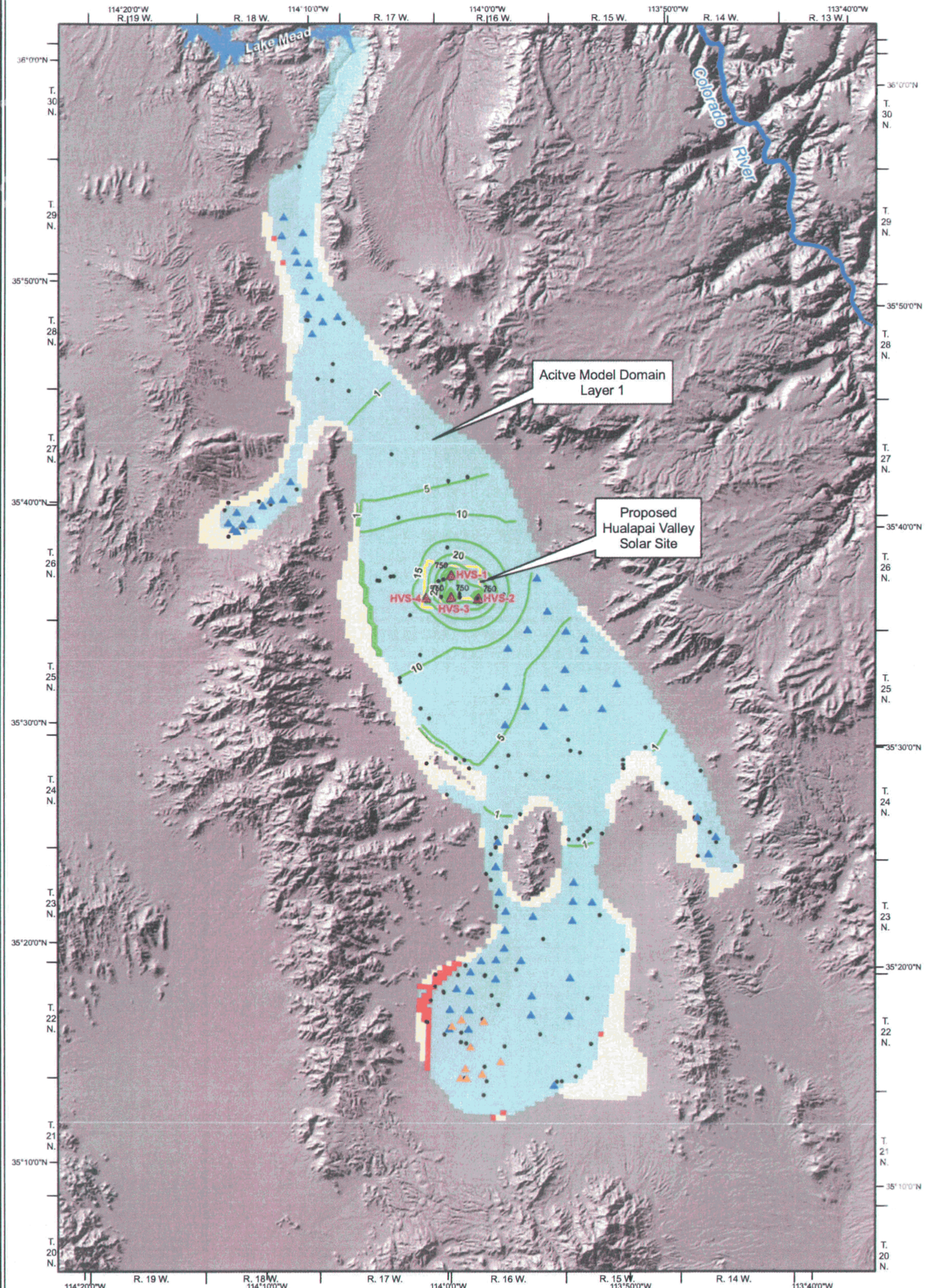
PROJECTED GROUNDWATER LEVEL DECLINE AT END OF 2042, HVS AT 3,000 AF/yr

MONTGOMERY & ASSOCIATES

2009

FIGURE 4b

GIS/1326/02/UpdatesDec09/HVS3000_b.mxd/15Dec09



EXPLANATION

Simulated Wells in Groundwater Model

750 ▲ Hualapai Valley Solar Pumping Rate, in AF/yr

▲ City of Kingman

▲ Other Committed Demand

• Domestic

5 Groundwater Level Decline Contour Due Solely to HVS pumping, in feet (maximum decline = 62 feet)

Inactive Model Cell

Dry Cells*

* Dry cells indicate groundwater level has been drawn down to top of simulated bedrock

0 1 2 3 4 5
Miles

N

HUALAPAI VALLEY
MOHAVE COUNTY, ARIZONA

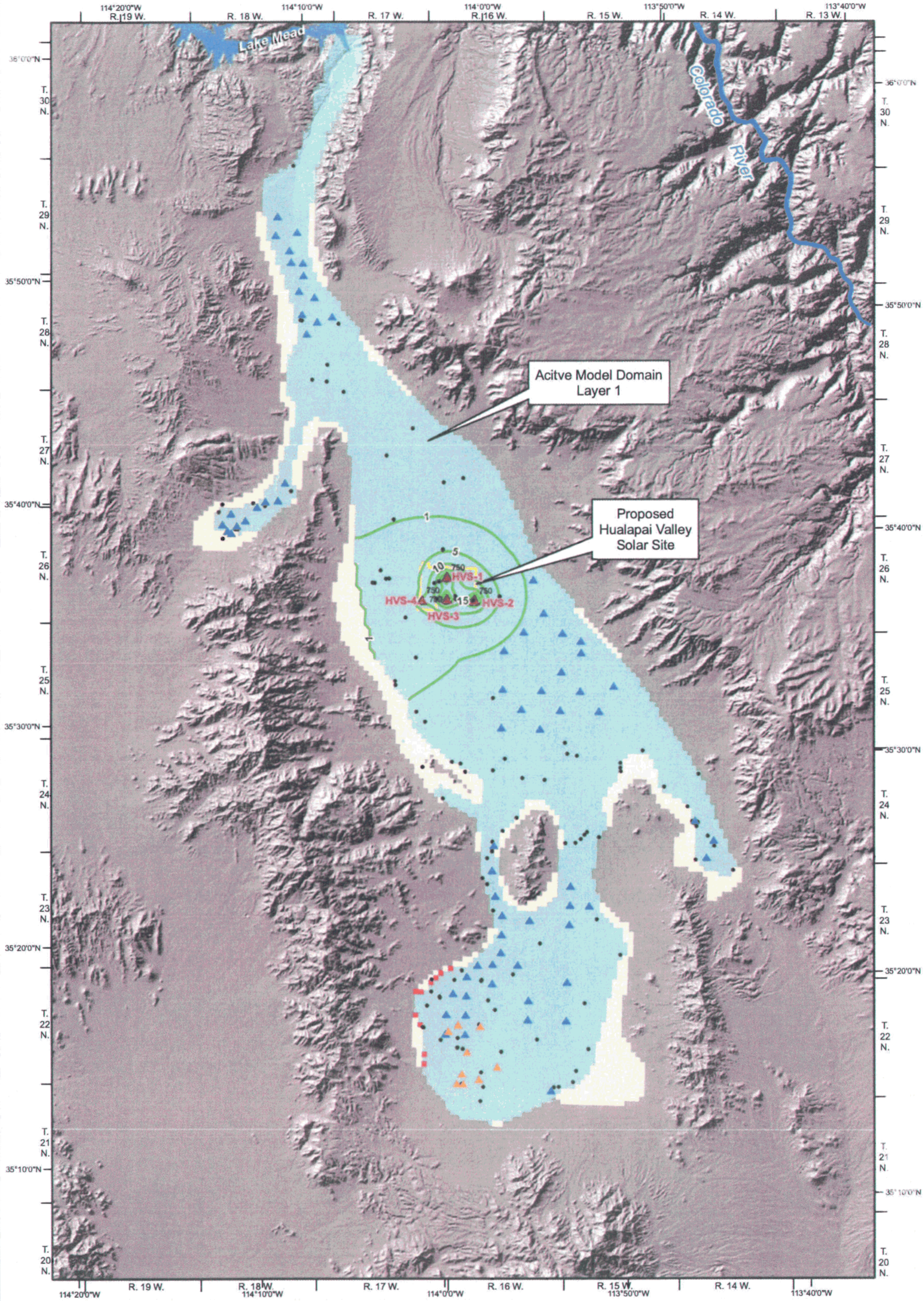
PROJECTED GROUNDWATER LEVEL DECLINE DUE TO HVS AT END OF 2042, HVS AT 3,000 AF/yr

MONTGOMERY & ASSOCIATES

2009

FIGURE 4c

GIS/1326/02/UpdatesDec09/HVS3000_c.mxd/11Dec09



EXPLANATION

Simulated Wells in Groundwater Model

750 ▲ Hualapai Valley Solar Pumping Rate, in AF/yr

▲ City of Kingman

▲ Other Committed Demand

• Domestic

— 5 — Groundwater Level Decline Contour Due Solely to HVS Pumping, in feet (maximum decline = 47 feet)

Inactive Model Cell

Dry Cells*

* Dry cells indicate groundwater level has been drawn down to top of simulated bedrock

0 1 2 3 4 5
Miles

N

HUALAPAI VALLEY
MOHAVE COUNTY, ARIZONA

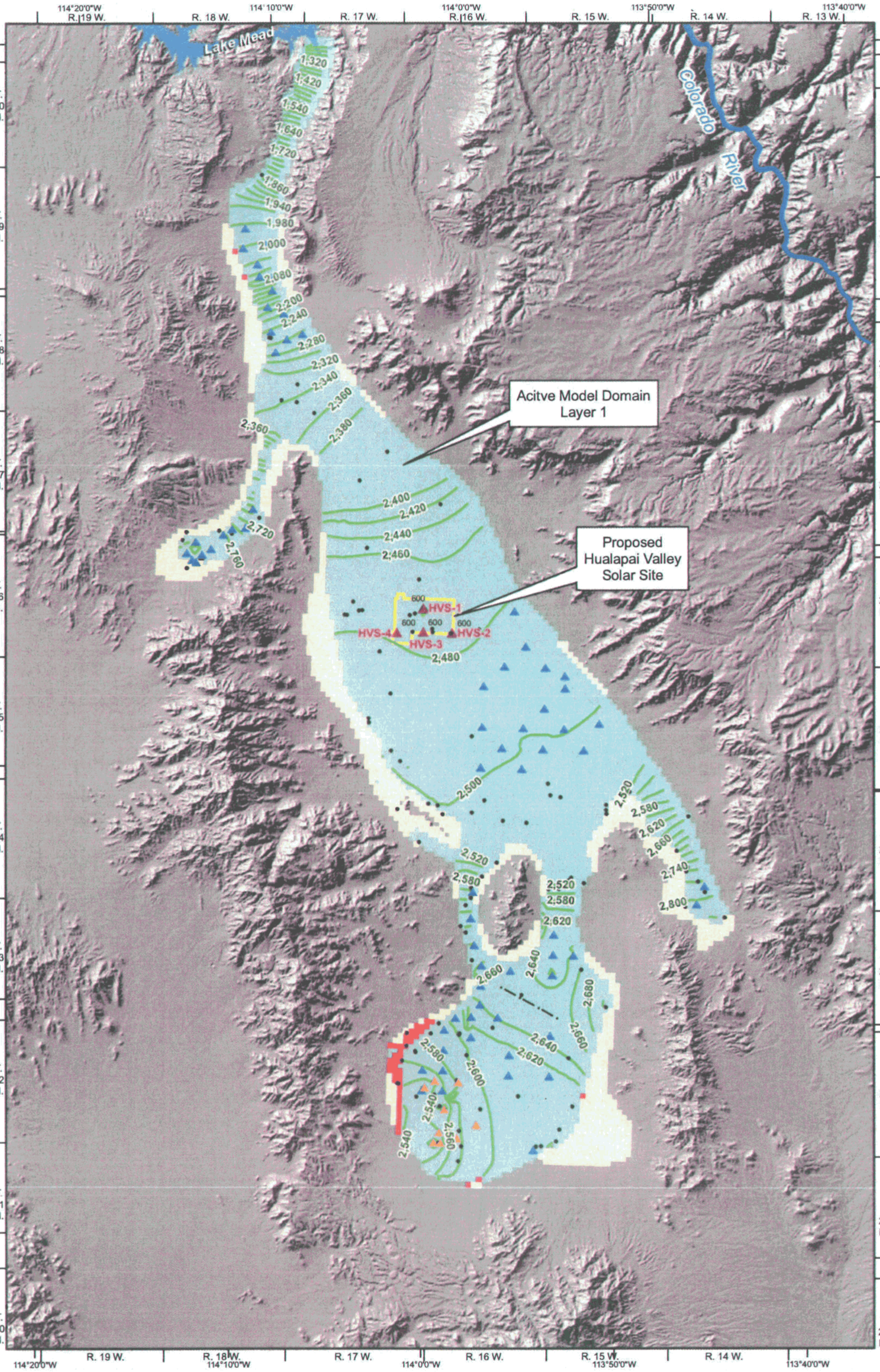
PROJECTED GROUNDWATER LEVEL DECLINE DUE TO HVS AT END OF 2017, HVS AT 3,000 AF/yr

MONTGOMERY & ASSOCIATES

2009

FIGURE 4d

GIS/1326/02/UpdatesDec09/HVS3000_d.mxd/15Dec09



EXPLANATION

Simulated Wells in Groundwater Model

- 600 ▲ Hualapai Valley Solar Pumping Rate, in AF/yr
- ▲ City of Kingman
- ▲ Other Committed Demand
- • Domestic

—2,600— Groundwater Level Altitude Contour in feet above mean sea level

—·—·— Approximate Location of Groundwater Divide

Inactive Model Cell

Dry Cells*

* Dry cells indicate groundwater level has been drawn down to top of simulated bedrock

0 1 2 3 4 5
Miles

N

HUALAPAI VALLEY
MOHAVE COUNTY, ARIZONA

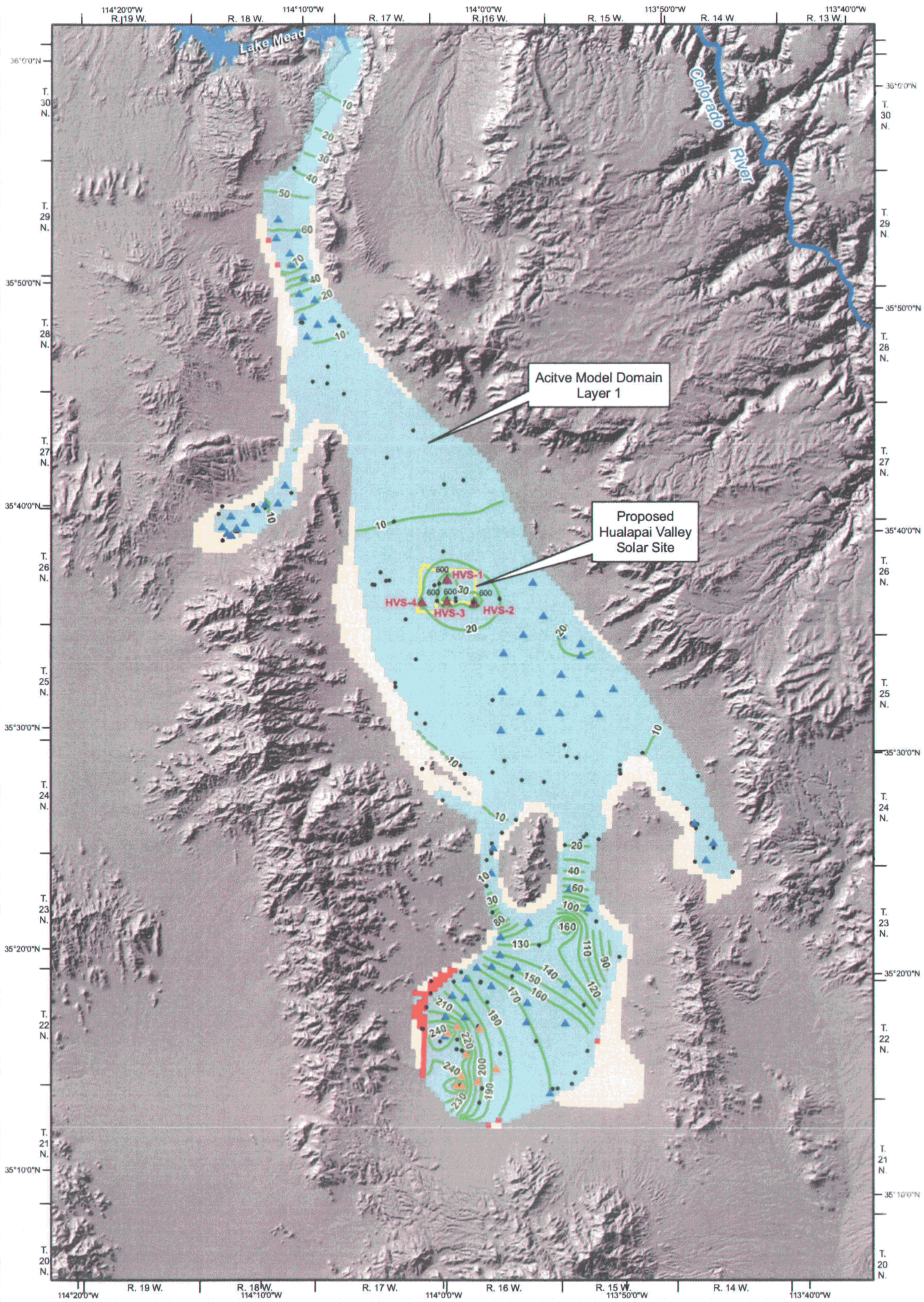
PROJECTED GROUNDWATER LEVEL ALTITUDE AT END OF 2042, HVS AT 2,400 AF/yr

MONTGOMERY & ASSOCIATES

2009

FIGURE 5a

GIS/1326/02/UpdatesDec09/HVS2400_a.mxd/15Dec09



EXPLANATION

Simulated Wells in Groundwater Model

- 600 ▲ Hualapai Valley Solar Pumping Rate, in AF/yr
- ▲ City of Kingman
- ▲ Other Committed Demand
- • Domestic

—10— Groundwater Level Decline Contour in feet (maximum decline on HVS site = 54 feet)

Inactive Model Cell

Dry Cells*

* Dry cells indicate groundwater level has been drawn down to top of simulated bedrock

0 1 2 3 4 5
Miles

N

HUALAPAI VALLEY
MOHAVE COUNTY, ARIZONA

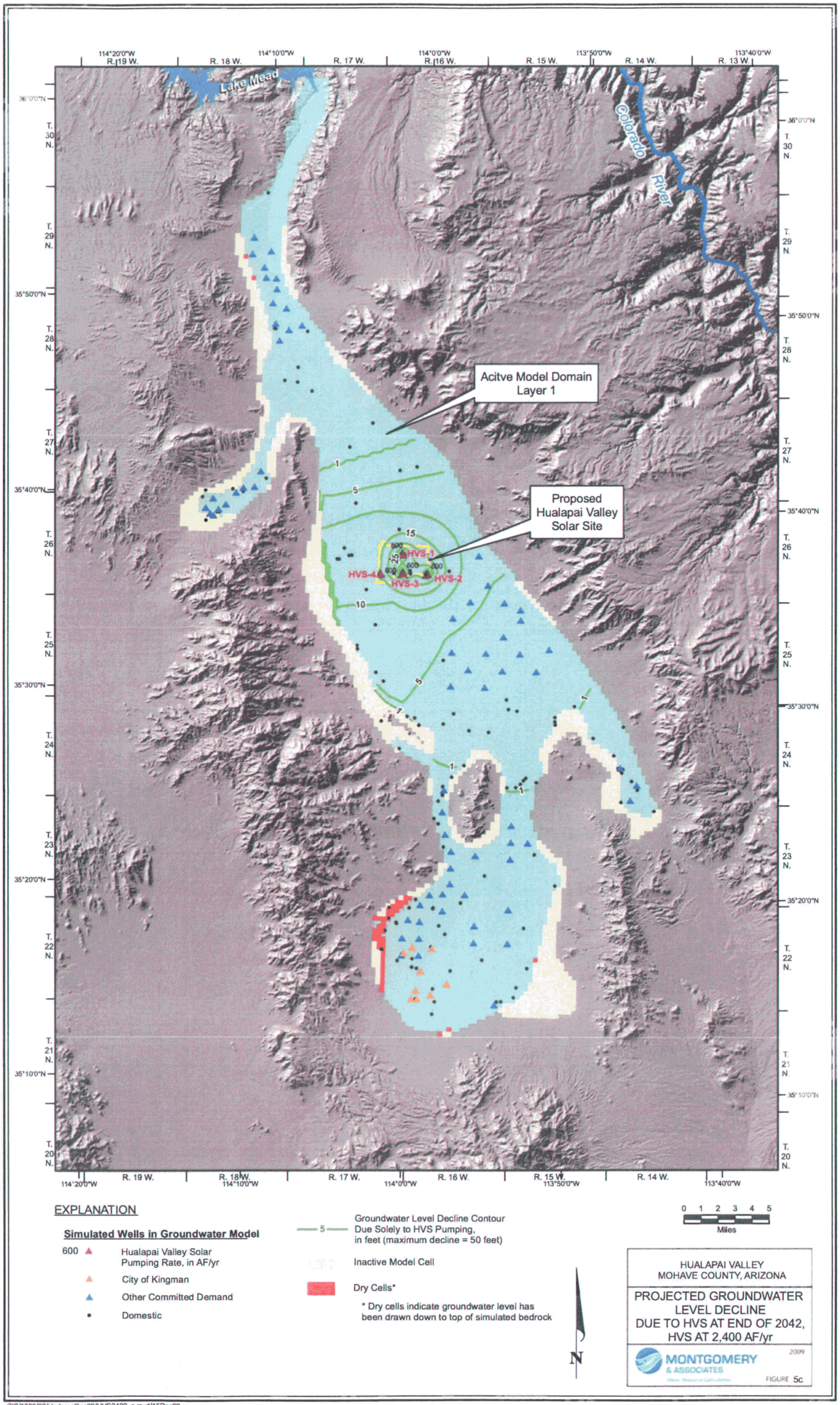
PROJECTED GROUNDWATER LEVEL DECLINE AT END OF 2042, HVS AT 2,400 AF/yr

MONTGOMERY & ASSOCIATES

2009

FIGURE 5b

GIS:\1326\02\UpdatesDec09\HVS2400_b.mxd/15Dec09



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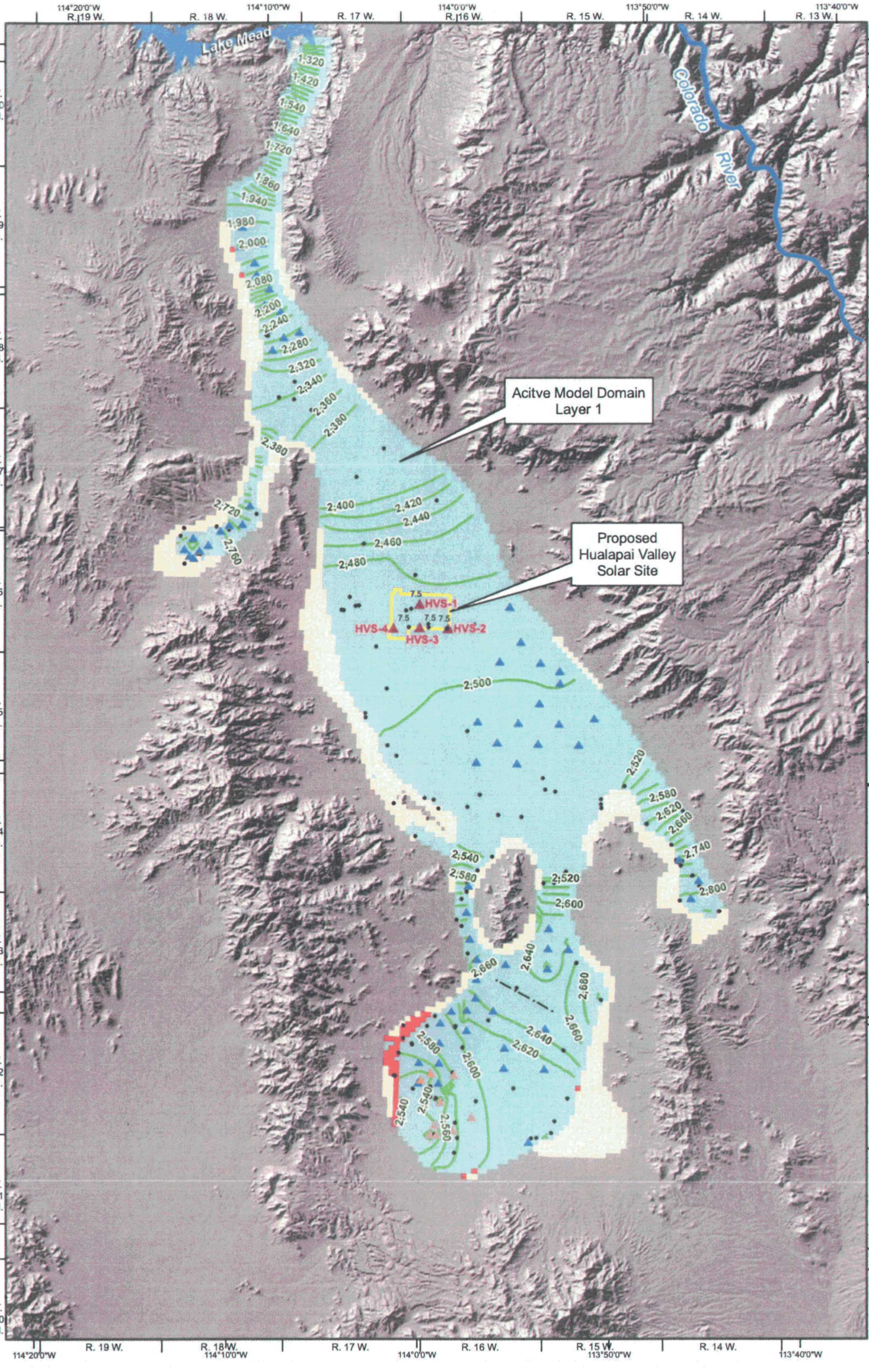


EXPLANATION

Simulated Wells in Groundwater Model

- 7.5 Hualapai Valley Solar Pumping Rate, in AF/yr
- City of Kingman
- Other Committed Demand
- Domestic

2,600 Groundwater Level Altitude Contour in feet above mean sea level

Approximate Location of Groundwater Divide

Inactive Model Cell

Dry Cells*

* Dry cells indicate groundwater level has been drawn down to top of simulated bedrock

0 1 2 3 4 5 Miles

N

HUALAPAI VALLEY
MOHAVE COUNTY, ARIZONA

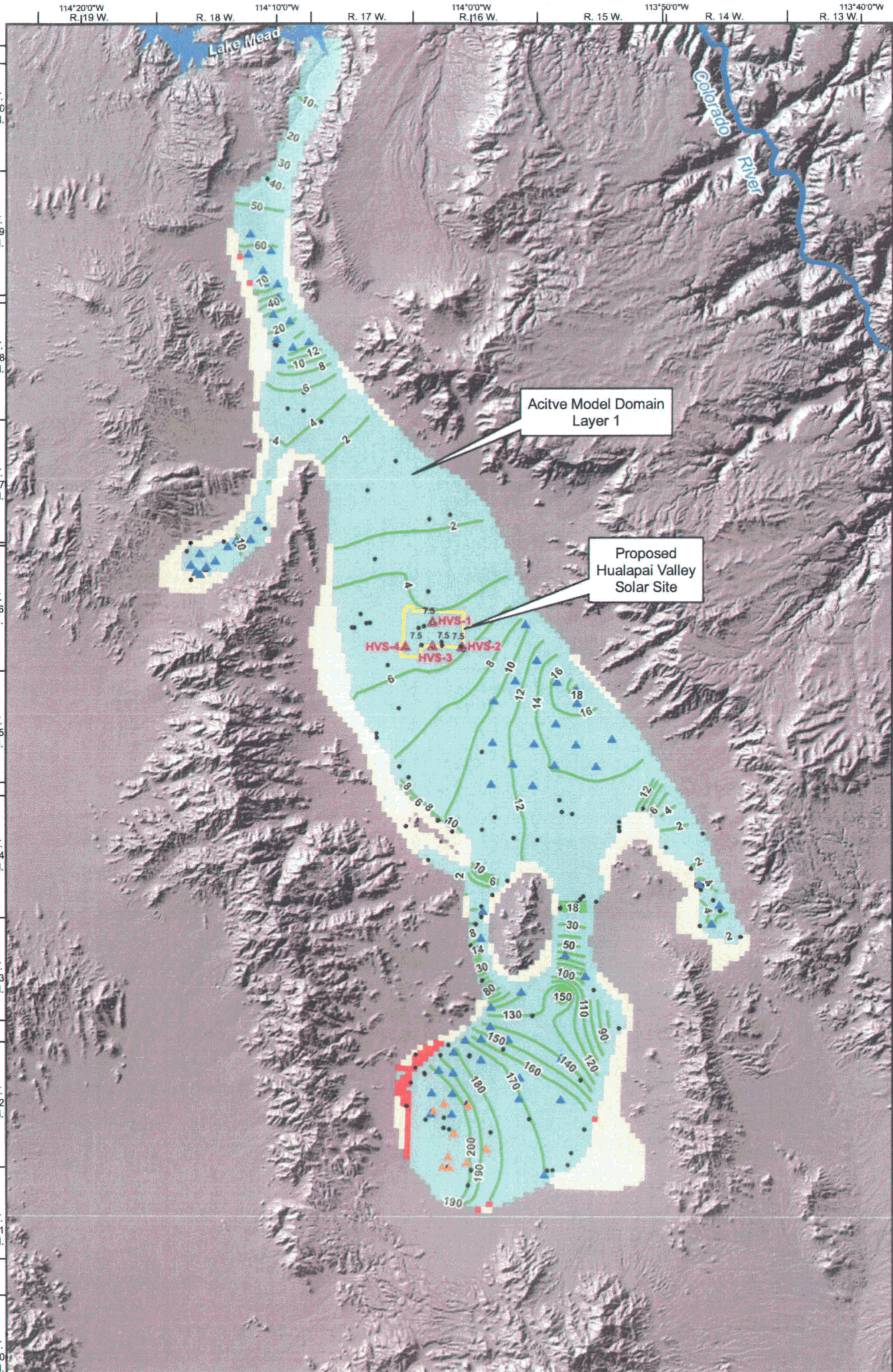
PROJECTED GROUNDWATER LEVEL ALTITUDE AT END OF 2042, HVS AT 30 AF/yr

MONTGOMERY & ASSOCIATES

2009

FIGURE 6a

GIS/1326/02/UpdatesDec09/HVS30_s.mxd/14Dec09



EXPLANATION

Simulated Wells in Groundwater Model

- 7.5 ▲ Hualapai Valley Solar Pumping Rate, in AF/yr
- ▲ City of Kingman
- ▲ Other Committed Demand
- • Domestic

—10— Groundwater Level Decline Contour in feet (maximum decline on HVS site = 6 feet)

Inactive Model Cell

Dry Cells*

* Dry cells indicate groundwater level has been drawn down to top of simulated bedrock

0 1 2 3 4 5
Miles

N

HUALAPAI VALLEY
MOHAVE COUNTY, ARIZONA

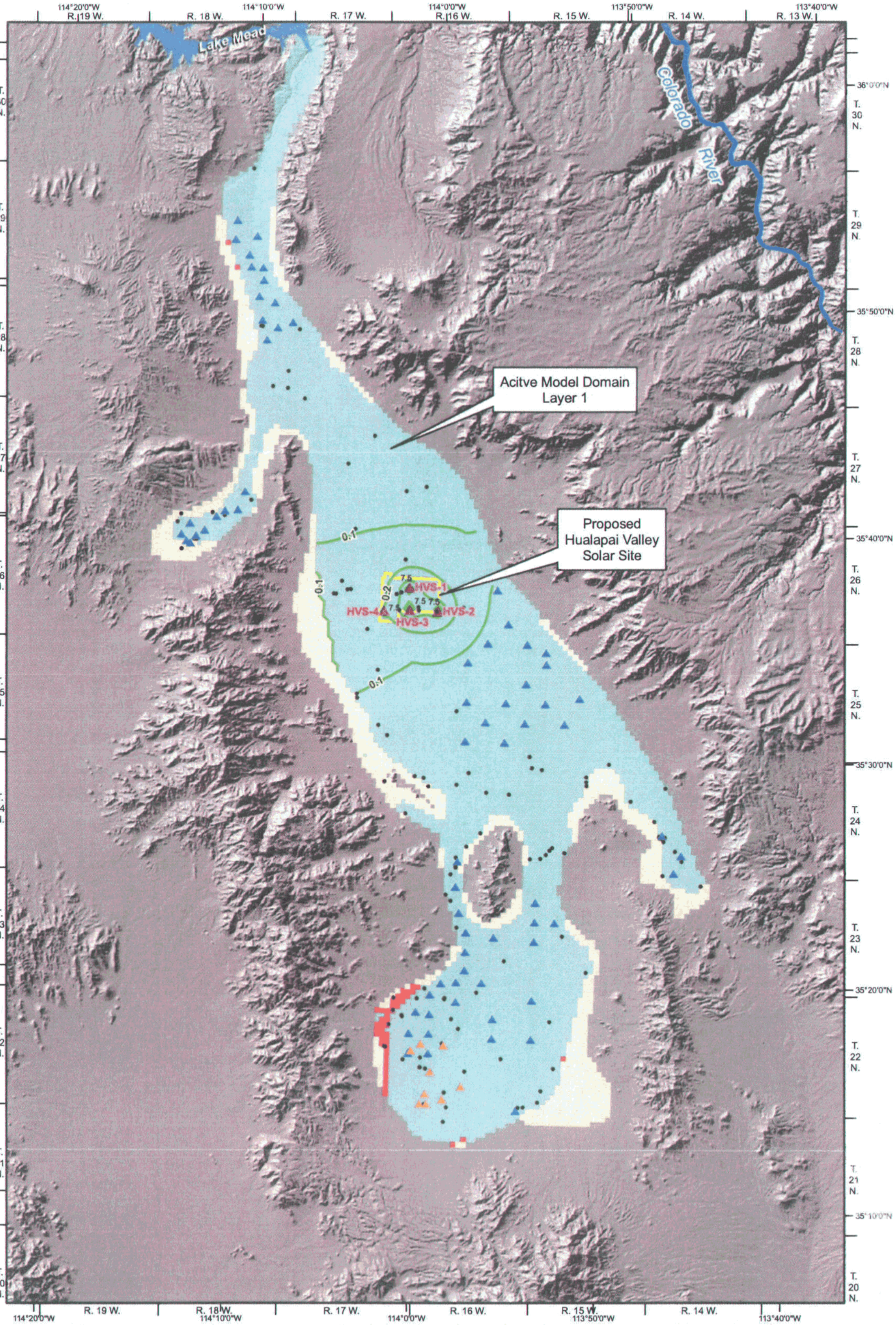
PROJECTED GROUNDWATER LEVEL DECLINE AT END OF 2042, HVS AT 30 AF/yr

MONTGOMERY & ASSOCIATES

2009

FIGURE 6b

GIS/1326/02/UpdatesDec09/HVS30_b.mxd/14Dec09



EXPLANATION

Simulated Wells in Groundwater Model

- 7.5 ▲ Hualapai Valley Solar Pumping Rate, in AF/yr
- ▲ City of Kingman
- ▲ Other Committed Demand
- • Domestic

0.1 Groundwater Level Decline Contour Due Solely to HVS Pumping, in feet (maximum decline = 0.6 feet)

Inactive Model Cell

Dry Cells*

* Dry cells indicate groundwater level has been drawn down to top of simulated bedrock

HUALAPAI VALLEY
MOHAVE COUNTY, ARIZONA

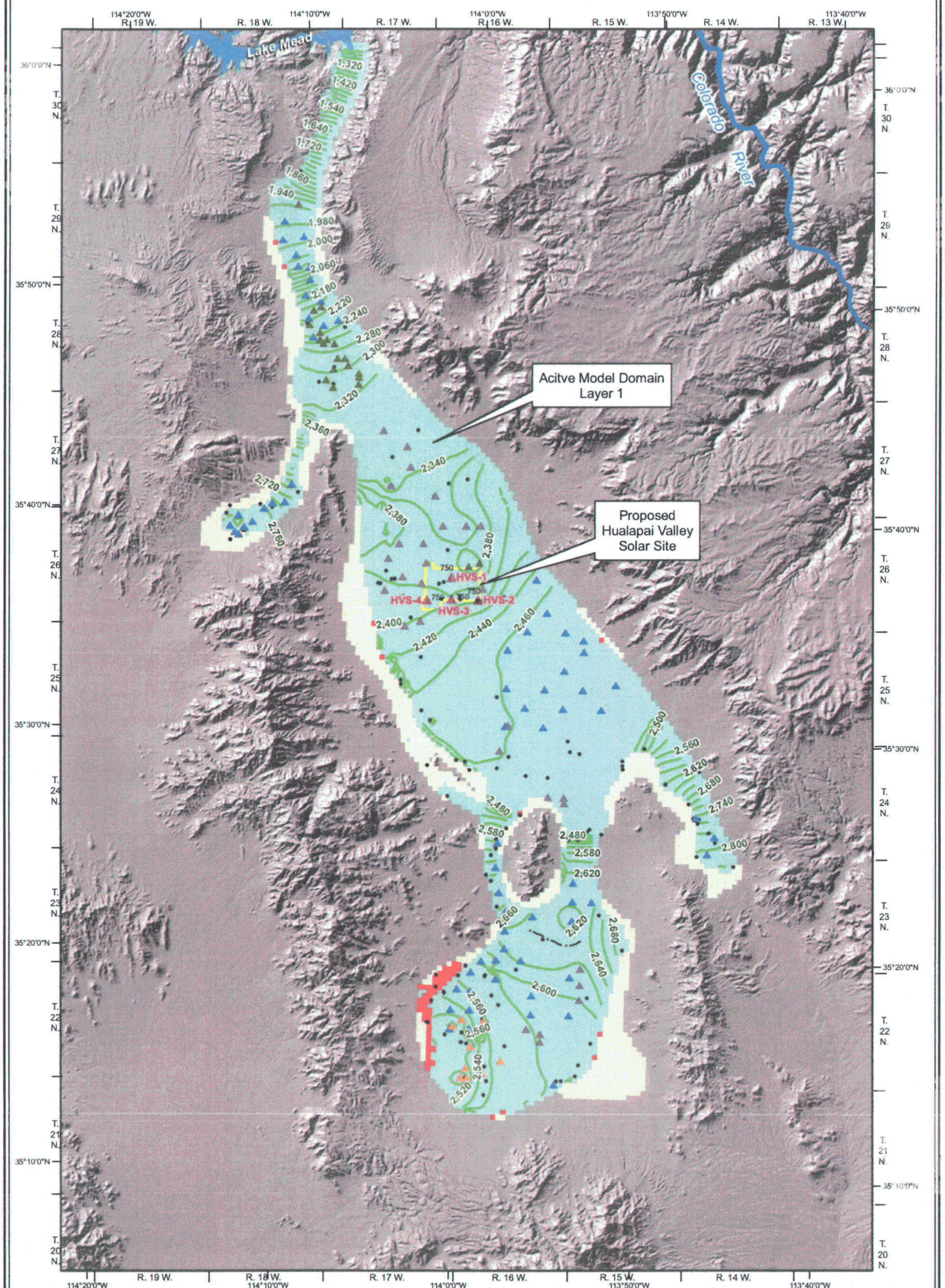
PROJECTED GROUNDWATER LEVEL DECLINE DUE TO HVS AT END OF 2042, HVS AT 30 AF/yr

MONTGOMERY & ASSOCIATES

2009

FIGURE 6c

GIS/1326/02/UpdatesDec09/HVS30_c.mxd/15Dec09



EXPLANATION

Simulated Wells in Groundwater Model

- 750 ▲ Hualapai Valley Solar Pumping Rate, in AF/yr
- ▲ Rhodes Homes at Red Lake
- ▲ Mardian Ranch
- ▲ City of Kingman
- ▲ Other Committed Demand
- • Domestic

2,600 Groundwater Level Altitude Contour in feet above mean sea level

Approximate Location of Groundwater Divide

Inactive Model Cell

Dry Cells*

* Dry cells indicate groundwater level has been drawn down to top of simulated bedrock

0 1 2 3 4 5
Miles

N

HUALAPAI VALLEY
MOHAVE COUNTY, ARIZONA

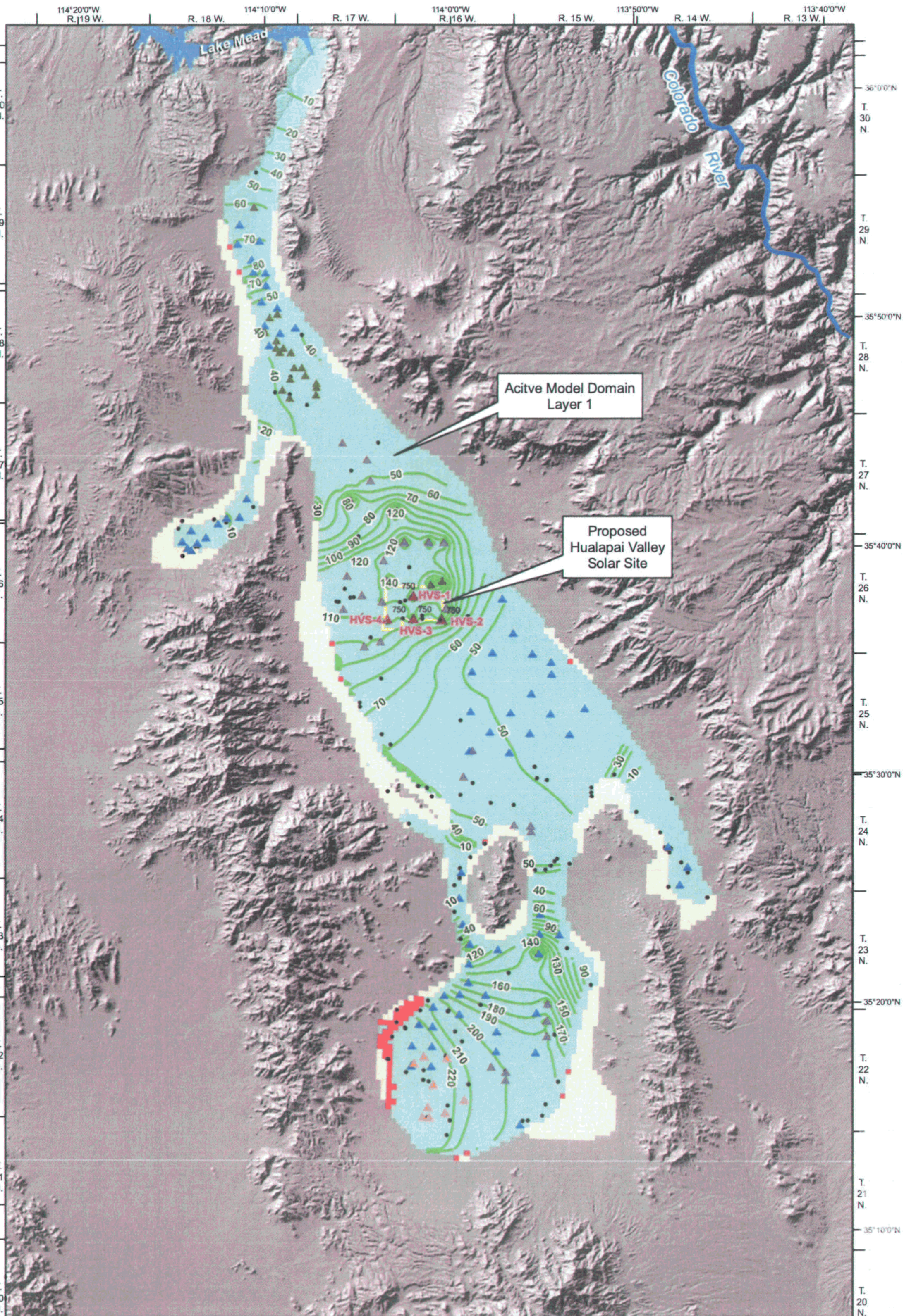
PROJECTED GROUNDWATER LEVEL ALTITUDE AT END OF 2042, MAXIMUM CUMULATIVE IMPACTS

MONTGOMERY & ASSOCIATES

2009

FIGURE 7a

GIS/1326/02/UpdatesDec09/RM_HVS3000_a.mxd/23Dec09



EXPLANATION

Simulated Wells in Groundwater Model

750 ▲ Hualapai Valley Solar Pumping Rate, in AF/yr

▲ Rhodes Homes at Red Lake

▲ Mardian Ranch

▲ City of Kingman

▲ Other Committed Demand

• Domestic

—10— Groundwater Level Decline Contour in feet (maximum decline on HVS site = 158 feet)

Inactive Model Cell

Dry Cells*

* Dry cells indicate groundwater level has been drawn down to top of simulated bedrock

0 1 2 3 4 5
Miles

N

HUALAPAI VALLEY
MOHAVE COUNTY, ARIZONA

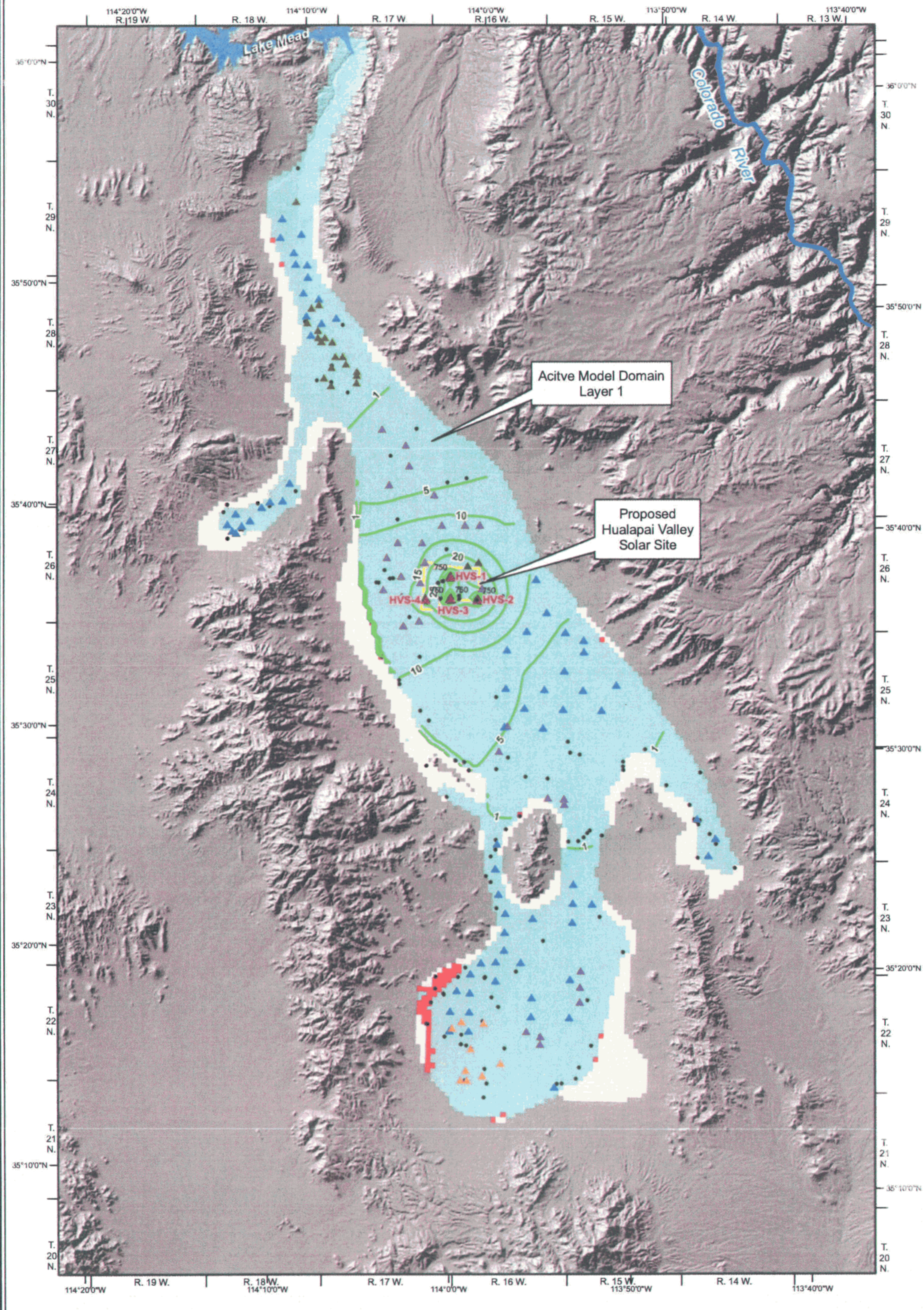
PROJECTED GROUNDWATER LEVEL DECLINE AT END OF 2042, MAXIMUM CUMULATIVE IMPACTS

MONTGOMERY & ASSOCIATES

2009

FIGURE 7b

GIS/1326/02/UpdatesDec09/RM_HVS3000_b.mxd/23Dec09



EXPLANATION

Simulated Wells in Groundwater Model

750 ▲ Hualapai Valley Solar Pumping Rate, in AF/yr

▲ Rhodes Homes at Red Lake

▲ Mardian Ranch

▲ City of Kingman

▲ Other Committed Demand

• Domestic

—5— Groundwater Level Decline Contour Due Solely to HVS pumping, in feet (maximum decline = 63 feet)

Inactive Model Cell

Dry Cells*

* Dry cells indicate groundwater level has been drawn down to top of simulated bedrock

0 1 2 3 4 5
Miles

N

HUALAPAI VALLEY
MOHAVE COUNTY, ARIZONA

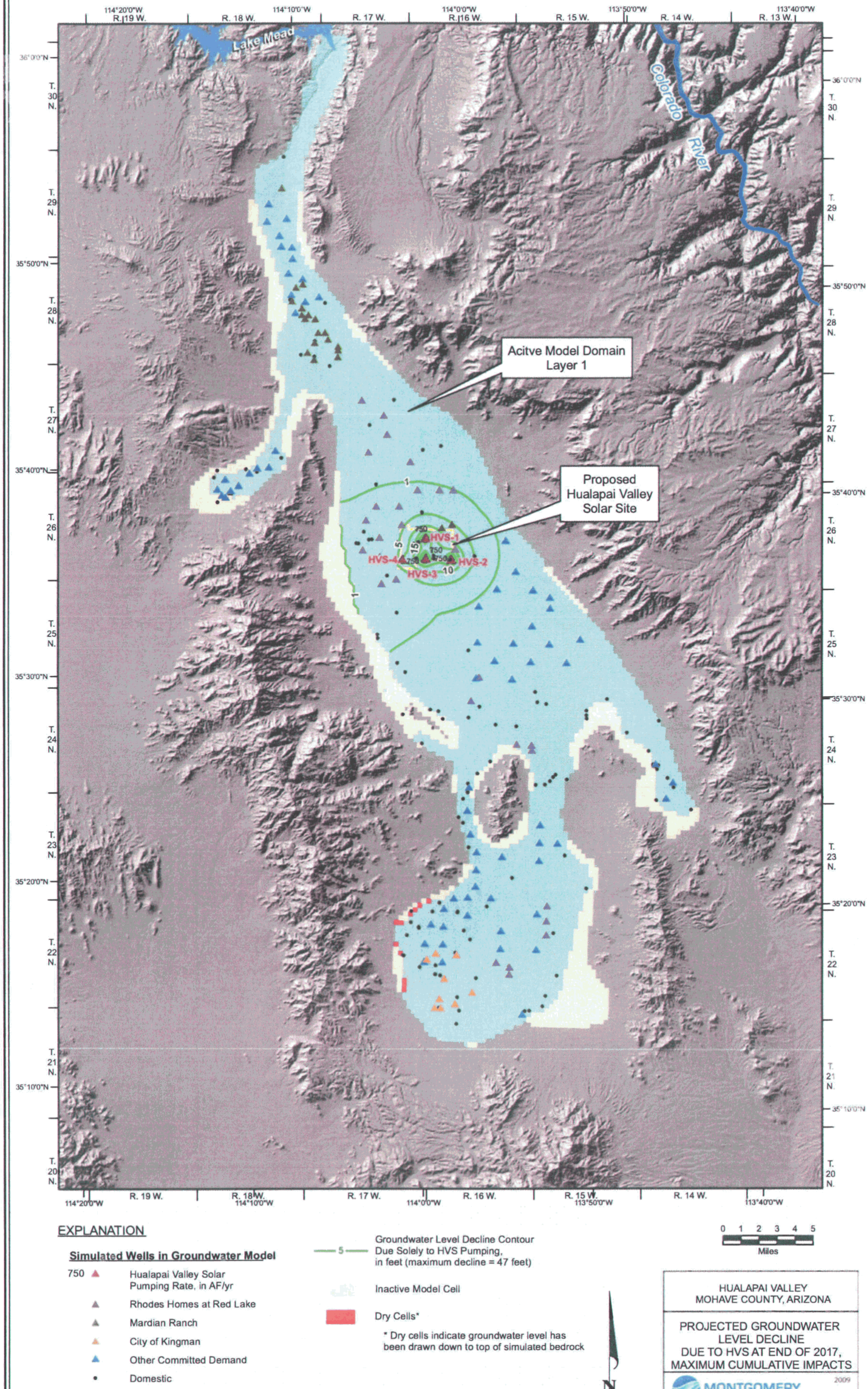
PROJECTED GROUNDWATER LEVEL DECLINE DUE TO HVS AT END OF 2042, MAXIMUM CUMULATIVE IMPACTS

MONTGOMERY & ASSOCIATES

2009

FIGURE 7c

GIS/1326/02/UpdatesDec09/RM_HVS3000_c.mxd/23Dec09



HUALAPAI VALLEY
MOHAVE COUNTY, ARIZONA

PROJECTED GROUNDWATER LEVEL DECLINE DUE TO HVS AT END OF 2017, MAXIMUM CUMULATIVE IMPACTS

MONTGOMERY & ASSOCIATES

2009

FIGURE 7d

GIS/1326/02/UpdatesDec09/RM_HVS3000_d.mxd/23Dec09

EXHIBIT HVS-23

BEFORE THE ARIZONA POWER PLANT AND TRANSMISSION LINE SITING COMMITTEE

IN THE MATTER OF THE APPLICATION OF HUALAPAI VALLEY SOLAR LLC, IN CONFORMANCE WITH THE REQUIREMENTS OF ARIZONA REVISED STATUTES §§ 40-360.03 AND 40-360.06, FOR A CERTIFICATE OF ENVIRONMENTAL COMPATIBILITY AUTHORIZING CONSTRUCTION OF THE HVS PROJECT, A 340 MW PARABOLIC TROUGH CONCENTRATING SOLAR THERMAL GENERATING FACILITY AND AN ASSOCIATED GEN-TIE LINE INTERCONNECTING THE GENERATING FACILITY TO THE EXISTING MEAD-PHOENIX 500kV TRANSMISSION LINE, THE MEAD-LIBERTY 345kV TRANSMISSION LINE OR THE MOENKOPI-EL DORADO 500kV TRANSMISSION LINE.	Docket No.: L-00000NN-09-0541-00151 Case No. 151

CERTIFICATE OF ENVIRONMENTAL COMPATIBILITY

Pursuant to notice given as provided by law, the Arizona Power Plant and Transmission Line Siting Committee (the "Committee") held a public hearing on January 12 through January 14, 2009, in Kingman, Arizona, in conformance with the requirements of Arizona Revised Statutes ("A.R.S.") §§40-360, *et seq.*, for the purpose of receiving evidence and deliberating on the Application of Hualapai Valley Solar LLC ("Applicant") for a Certificate of Environmental Compatibility ("Certificate") in the above-captioned case (the "Project").

The following members and designees of members of the Committee were present at one or more of the hearing days for the evidentiary presentations and for the deliberations:

John Foreman	Chairman, Designee for Arizona Attorney General, Terry Goddard
Paul Rasmussen	Designee for Director, Arizona Department of Environmental Quality

David Eberhart	Designee for Chairman, Arizona Corporation Commission
Jessica Youle	Designee for Director, Energy Office, Arizona Department of Commerce
Greg Houtz	Designee for Director, Arizona Department of Water Resources
Jeff McGuire	Appointed Member
William Mundell	Appointed Member
Patricia Noland	Appointed Member
Michael Palmer	Appointed Member
Michael Whalen	Appointed Member
Barry Wong	Appointed Member

The Applicant was represented by Thomas H. Campbell and Albert H. Acken, of the law firm of Lewis and Roca LLP. Denise Herring-Bensusan and Susan A. Moore-Bayer requested intervention in this proceeding.

At the conclusion of the hearings, the Committee, having received the Application, the appearances of the parties, the evidence, testimony and exhibits presented at the hearings, and being advised of the legal requirements of A.R.S. §§40-360 to 40-360.13, upon motion duly made and seconded, voted _____ to grant the Applicant this Certificate of Environmental Compatibility (Case No. 151) for the Project as set forth in the Application.

The Project consists of an up to 340 MW concentrated solar power ("CSP") generating facility, with biofuel, light fuel oil or natural gas co-firing, and a 345kV or 500kV transmission line (the "Gen-Tie"). The Project is located in Mohave County, approximately 27 miles north of Kingman, Arizona, and 80 miles southeast of Las Vegas, Nevada. The generating facility is located entirely on private land in Sections 19, 20, 21, 28, 29, 30, and the north half of Section 31 all within Township 26 North, Range 16 West, Gila and Salt River Baseline and Meridian.

The Gen-Tie will interconnect the CSP generating facility (and/or a photovoltaic generating facility built on the site approved for the CSP generating facility) to the regional transmission grid using one of two approved alignments:

Interconnection #1 Gen-Tie alignment, located entirely in Township 26 North, Range 16 West, runs from the generating facility's power block to the property boundary; then north for 1.25 miles within a 1320-foot wide corridor from the property boundary along the east boundary of Section 17 and Section 08; then north for 1.25 miles within a 1320-foot wide corridor along the west boundary of Section 16 and Section 09 until it reaches the north boundary of Section 09; then east for about 0.75 miles within a 1320-foot wide corridor along the north boundary of Section 09 until it reaches the termination in the northeast corner of Section 09. Interconnection #1 is approximately 2.75 miles in length from the generating facility property boundary.

Interconnection #2 Gen-Tie alignment runs from the generating facility's power block to the property boundary; then north for 1.25 miles within a 1320-foot wide corridor from the property boundary along the east boundary of Section 17 and Section 08 ; then north for 1.25 miles within a 1320-foot wide corridor along the west boundary of Section 16 and Section 09 until it reaches the north boundary of Section 09; then north for one mile within a 1320-foot wide corridor through Section 04 until it reaches the west boundary of the existing Mead-Liberty 345kV transmission line corridor, which it will parallel on a generally northwest heading; from there it will run within a 2640-foot wide corridor measured from the centerline of the Mead-Liberty 345kV transmission line west of and parallel to the existing transmission line for approximately 3.5 miles, going through the northeast corner of Section 05 in Township 26 North, Range 16 West; through Sections 32, 31, and 30 in Township 27 North, Range 16 West ; through Sections 25 and 24 in Township 27 North, Range 17 West; and terminate in Section 23 in Township 27 North, Range 17 West. Interconnection #2 is approximately 6.5 miles in length from the property boundary.

The transmission structure heights will not exceed 199 feet and will occupy a right of way ("ROW") width up to a maximum of 200 feet.

A general location map of the Project is set forth in **Exhibit A**.

CONDITIONS

This Certificate is granted upon the following conditions:

1. The conditions shall apply to the Applicant, its successor(s), and assignee(s).

2. The Applicant shall obtain all approvals and permits required by the United States, the State of Arizona, the County of Mohave, and any other governmental entities having jurisdiction necessary to construct the Project.

3. The Applicant shall comply with all existing applicable statutes, ordinances, master plans and regulations of the State of Arizona, the County of Mohave, the United States, and any other governmental entities having jurisdiction, including but not limited to the following:

(a) all applicable land use regulations;

(b) all applicable zoning stipulations and conditions, including but not limited to landscaping and dust control requirements;

(c) all applicable water use, discharge and/or disposal requirements of the Arizona Department of Water Resources and the Arizona Department of Environmental Quality;

(d) all applicable noise control standards;

(e) all applicable regulations and permits governing storage and handling of chemicals and petroleum products;

(f) all other applicable federal and state regulations and standards.

4. Applicant may utilize groundwater for electrical generation and related uses associated with construction and commercial operation of the Project. The Applicant shall make good faith efforts to acquire effluent from the City of Kingman to meet a majority of the water needs for the Project.

5. If any archaeological, paleontological or historical site or object that is at least fifty years old is discovered on state, county or municipal land during the construction or operation of the solar generating facility and transmission line, the Applicant or its representative in charge shall promptly report the discovery to the Director of the Arizona State Museum, and in consultation with the Director, shall immediately take all reasonable steps to secure and maintain the preservation of the discovery as required by A.R.S. § 41-844.

6. If human remains and/or funerary objects are encountered on private land during the course of any ground-disturbing activities relating to the construction or operation of the solar generating facility and transmission line, the Applicant shall cease work on the affected area of the Project and notify the Director of the Arizona State Museum as required by A.R.S. § 41-865.

7. The Applicant shall comply with the notice and salvage requirements of the Arizona Native Plant Law (A.R.S. §§ 3-901 *et seq.*) and shall, to the extent feasible, minimize the destruction of native plants during the construction and operation of the solar generating facility and transmission line.

8. This authorization to construct this Project (which may be constructed in two phases) shall expire unless the solar generating facility and transmission line is capable of operation within seven years from the date the Certificate is approved by the Commission. However, prior to expiration, the Applicant may request that the Commission extend this time limitation.

9. In the event that the Project requires an extension of the term of this Certificate prior to completion of construction, Applicant shall use reasonable means to notify all landowners and residents within one mile of the Project corridor as depicted on Exhibit A, all persons who made public comment at this proceeding, and all parties to this proceeding of the request and the date, time and place of the hearing in which the Commission will consider the request for extension.

10. The Applicant shall make every reasonable effort to identify and correct, on a case-specific basis, all complaints of interference with radio or television signals from operation of the transmission lines and related facilities addressed in this Certificate. The Applicant shall maintain written records for a period of five years of all complaints of radio or television interference attributable to operation, together with the corrective action taken in response to each complaint. All complaints shall be recorded to include notations on the corrective action taken. Complaints not leading to a specific action or for which there was no resolution shall be noted and explained. Upon request, the written records shall be provided to the Staff of the Commission.

11. Within 120 days of the Commission decision granting this Certificate, Applicant will post a sign at the plant site. The sign shall be no smaller than a normal roadway sign and shall advise:

(a) That the site has been approved for the construction of Project facilities;
(b) The expected date of completion of the Project facilities;
(c) A phone number for public information regarding the Project;
(d) The name of the Project;
(e) The name of the Applicant; and
(f) The website of the Project.

12. Applicant shall design the transmission line to incorporate reasonable measures to minimize impacts to raptors.

13. Applicant shall use non-specular conductor and non-reflective surfaces for transmission line structures.

14. Before construction on this Project may commence, the Applicant shall file a construction mitigation and restoration plan ("Plan") with ACC Docket Control. Where practicable, the Plan shall specify the Applicant's plans for construction access and methods to minimize impacts to wildlife and to minimize vegetation disturbance outside of the Project right-of-way particularly in drainage channels and along stream banks. Applicant shall re-vegetate, unless waived by the landowner, native areas of construction disturbance to its preconstruction state outside of the power-line right of way after construction has been completed. The Plan shall

specify the Applicant's plans for coordination with the Arizona Game and Fish Department and the State Historic Preservation Office. The Applicant shall use existing roads for construction and access where practicable and the Plan shall specify the manner in which the applicant makes use of existing roads.

15. Applicant shall follow regulatory requirements of the Arizona Game and Fish Department of the United States Fish and Wildlife Service for handling contacts during the construction and operation of the Project with any species designated as endangered. Applicant also shall follow regulatory requirements for handling contacts with any species of greatest conservation need as designated by the Arizona Game and Fish Department. If no regulatory requirements exist, the Applicant shall use reasonable care to avoid any harm to individuals of the designated species. If the avoidance of harm to individuals is not possible, the Applicant shall contact the Arizona Game and Fish Department and the United States Fish and Wildlife Service to obtain any appropriate permits and guidance for removing the individual members of the species contacted from the area of the Project.

16. With respect to the Project, Applicant shall participate in good faith in state and regional transmission study forums to coordinate transmission expansion plans related to the Project and to resolve transmission constraints in a timely manner.

17. The Applicant shall provide copies of this Certificate to the Mohave County Planning Department, the City of Kingman, the Arizona State Land Department, the State Historic Preservation Office, and the Arizona Game and Fish Department.

18. Prior to the date construction commences on this Project, the Applicant shall provide known homebuilders and developers within one mile of the center line of the Certificated route and solar facility, the identify, location, and a pictorial depiction of the type of power line and solar facility being constructed, accompanies by a written description, and encourage the developers and homebuilders to include this information in the developers' and homebuilders' homeowners' disclosure statements.

19. Applicant will follow the most current Western Electricity Coordinating Council/North American Electric Reliability Corporation Planning standards as approved by the Federal Energy Regulatory Commission, and National Electrical Safety Code construction standards.

20. The Applicant shall submit a self-certification letter annually, identifying progress made with respect to each condition contained in the Certificate, including which conditions have been met. Each letter shall be submitted to the docket control of the Arizona Corporation Commission by December 1, 2010, and annually thereafter. Attached to each certification letter shall be documentation explaining how compliance with each condition was achieved. Copies of each letter along with the corresponding documentation shall be submitted to the Arizona Attorney General and Department of Commerce Energy Office. The requirement for the self-certification shall expire on the date the Project is placed into operation.

21. Within sixty (60) days of the Commission decision granting this Certificate, the Applicant shall make good faith efforts to commence discussions with private landowners, on whose property the Project corridor is located, to identify the specific location for the Project right-of-way and placement of poles.

22. The Applicant shall expeditiously pursue reasonable efforts to work with private landowners on whose property the Project right-of-way will be located, to mitigate the impacts of the location, construction, and operation of the Project on private land.

FINDINGS OF FACT AND CONCLUSIONS OF LAW

This Certificate incorporates the following findings of fact and conclusions of law:

1. The Project aids the state in meeting the need for an adequate, economical and reliable supply of renewable electric power.

2. The conditions placed on the Project in the Certificate by the Committee effectively minimize the impact of the Project on the environment and ecology of the state.

3. The Project is in the public interest because the Project's contribution to meeting the need for an adequate, economical and reliable supply of renewable electric power outweighs the minimized impact of the Project on the environment and ecology of the state.

DATED this ____ day of ______________ 2010.

THE ARIZONA POWER PLANT AND TRANSMISSION LINE SITING COMMITTEE

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John Foreman, Chairman