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AZ CORP COMMISSION
DOCKET CONTROL

BEFORE THE ARIZONA CORPORATION COMMISSION

KRISTIN K. MAYES, Chairman
GARY PIERCE
PAUL NEWMAN
SANDRA D. KENNEDY
BOB STUMP

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 FILING SUMMARY TESTIMONY OF DENISE BENSUSAN

Arizona Corporation Commission
DOCKETED
JUN - 7 2010
DOCKETED BY

Denise Bensusan, through her undersigned counsel, hereby provides notice that she has this day filed the written summary testimony of Denise Bensusan in connection with the above-captioned matter.

RESPECTFULLY SUBMITTED this 7th day of June, 2010.

ARIZONA CENTER FOR LAW IN THE PUBLIC INTEREST

By [signature]
Timothy M. Hogan
202 E. McDowell Rd., Suite 153
Phoenix, Arizona 85004
Attorneys for Denise Bensusan

ORIGINAL and 13 COPIES of the foregoing filed this 7th day of June, 2010, with:

Docketing Supervisor
Docket Control
Arizona Corporation Commission
1200 W. Washington
Phoenix, AZ 85007

COPIES of the foregoing mailed this 7th day of June, 2010 to:

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SUMMARY OF TESTIMONY
Denise Bensusan

Exhibits listed at end of summary and attached.

LONG TERM NEGATIVE IMPACT OF THE HUALAPAI VALLEY BASIN: The Hualapai Valley Basin is in depletion, also known as overdraft. Well pumpage is almost 3 times the estimated groundwater recharge rate. Based on data reviewed this aquifer may have been in continuous depletion for decades. As such, Mohave Counties General Plan Policy 3.5 appropriately applies here. Section 3.5, only allows for the approval of power plants using "DRY-cooling" technology.

ANALYSIS OF ADEQUATE WATER SUPPLY: An Analysis of Adequate Water Supply was issued by the Arizona Department of Water Resources ADWR November 9th, 2007 in regard to the Red Lake Residential Development. This same report is now being depicted by HVS as an Analysis of Adequate Water Supply for the proposed Hualapai Valley Solar Power Plant HVS. This analogy is inappropriate on many levels.

- Individual Water Reports were required for each subdivision plat and/or phase of the Red Lake Residential Development. Simply put this was to allow for proof of water availability as the subdivision grew. If for instance the first phase of the development was shown to have negatively impacted the water supply then the second phase of the development would be denied a Water Report or the project would be scaled back to adjust for the lack of adequate water supply. In comparison HVS, a WET-cooled solar power plant will aggressively and immediately extract/pump millions of gallons of groundwater per day from day one of operation and will continue this practice for 30+ years. .

- The residential project was also required to create its own effluent for outdoor recreation areas and golf courses. The projected effluent creation was calculated into the Analysis of Adequate Water Supply. It takes about 1000 homes to maintain grey water for a golf course. In comparison HVS proposes to build a 35+ mile long pipeline from the City of Kingman's Hilltop Wastewater Treatment Plant HWTP and pump about 1 million gallons a day effluent to the project a small percentage of total water used. There is no neutral policing of the fresh water being pumped by HVS from the Hualapai Valley Basin. Another issue is that the pipeline just might be a pipe dream as it is not required by the Certificate of Environmental Compatibility that has been issued. HVS is only required to begin "negotiations" for wastewater with the City of Kingman within 2 years of project approval. Let's pretend that a miracle happens and the pipeline is actually built and HVS actually purchases effluent from the City of Kingman. The recharge rate to the aquifer will be drastically reduced with most of the wastewater evaporating instead of recharging. The effluent from the HTWP had been promised to be utilized on Cerbat Golf Course which utilizes UNKNOWN (estimates are MASSIVE) quantities of fresh water and has been a sticking point with activist and concerned decision makers in the area for many years. We were advised and assured by past and present officials that the HWTP would correct a long time negative impact to our water supply. The City of Kingman has now re-written its wastewater guidelines to fit with the supposed sale of wastewater to HVS instead of delivering it to the golf course(s). It's a simple and obvious trade off. They don't send the effluent to the golf course so the fresh water is still impacted by HVS water use.

- The original Analysis of Adequate Water Supply for the Red Lake Residential Development can also be used in evidence for a Water Report unless new hydrological data indicates otherwise. There are new hydrological data available that continue to show depletion in the Hualapai Basin as well as the Cone of Depression seriously impacting the area. Local experts say that the water flow has actually reversed from flowing North (into Lake Mead) to flowing South towards the City of Kingman due to the Cone of Depression. The determination may also be invalidated if the development plan or other conditions change materially prior to the filing for a Water Report. I cannot think of a more drastic material change than from a residential development to an industrial project in which solar electric generation takes place on the land. Legal availability of water has not been proven for this project and no Water Reports have been applied for.

SMART GROWTH: Long range policies established by the state of Arizona and the County of Mohave in Smart Growth Practices are not being addressed. Local guidelines and policy are being re-written to avoid legal responsibility for inappropriate decisions made. Mohave County attempts to push total responsibility for water decisions onto the state of Arizona. They believe that this will protect them from lawsuits that will start piling up as the wells continue to run dry. Every state-federal-local government agency has policy to plan for drought and natural resource preservation.

OUTSIDE AN AMA: No real protection for this community or our water supply at all. HVS's statement that IF the basin was actually in depletion that ADWR would have forced an AMA is not accurate. This is not the way that the AMA process works. They know this but they utilize whatever tactics necessary to acquire the water. Uncertainty over water will be the real cause of slowing Mohave County's Economic Growth, not requiring this group to utilize dry-cooling to produce energy!

CALIFORNIA HAS FINALLY LEARNED FROM ITS MISTAKES, THAT'S WHY HVS IS HERE: To squeeze through the cracks of lack of water regulations and protections in Mohave County.

THERE ARE COMPARABLE PROJECTS WHICH ARE GOING DRY COOLED OR HAVE ASSESSED THE ECONOMIC IMPACT OF THE SAME. HVS is inaccurate in their statement that viable information is not available.

STIMULUS FUNDING: This is a new process and the designations and definitions on what is labeled green, renewable, sustainable etc. has not been appropriately accessed nor defined at the federal level wherein most of the monies will be delivered The risks are on the backs of the American tax payer. This handful of HVS executives will become instant millionaires with the 30% cash back they will receive in 2011. All they have to do is to fast track this project through and start construction by the end of 2010.

HILLTOP WASTEWATER TREATMENT PLANT: Has a capacity of 5.1 million gallons per day BUT only takes in enough wastewater to put out 1 million gallons of water per day. Mayor Salem's growth expectations are exaggerated considering the hard economic times and the trend to conserve water have not been considered. Accurate numbers need to be utilized and the comment that ALL of Kingman would be on sewer is so outrageous and unbelievable that I am shocked that he ever made the claim.

UNITED STATES DEPARTMENT OF ENERGY: DRY- cooling is recommended by the United states Department of Energy per the United States Congress. The D.O.E. report states that there is only a SLIGHT drop in production to utilize the DRY-cooling process. Comparable projects to HVS show that "the competition" of HVS are utilizing DRY-cooled technology and as such HVS's assertion that they must produce energy via WET-cooled technology in order to be "competitive" is an inaccurate and misleading statement. What they want is a distinct advantage over every other project coming into this community and they want control and ownership of the water. This negates equal opportunities for other truly green, low footprint industry to come into our area. Other projects such as Needle Mountain Solar display respect this community and understand what protecting a finite resource such as our water supply means to the enrichment of EVERYONE'S lives and property values and not to a hand full of individuals. HVS's argument that they cannot be competitive going DRY-cooled is simply inaccurate and shows that there are other reasons for HVS's insistence of a WET-cooled plant.

RED LAKE/ VERNAL POOL: Red Lake is called Red Lake for a reason. There is water in the lake every single year for 2 to 3 months. I have lived here since 2000 and ride my horse regularly in the area. This area should be designated as a vernal pool. It is an extremely fragile desert eco system and is home to diverse and vital wildlife, plant life etc..

FLOOD CONTROL: Each year this area is increasingly flooded with torrential currents covering the roadways, lands and dwellings. The more the area is denuded the worse it gets. Winds are dangerously high and I cannot imagine 4000 more acres of denuded land concerning flooding as well as dust issues.

ARIZONA CORPORATION COMMISSION: The Arizona Corporation Commission (ACC) is required to consider the community's "master /general plan". It is time (both legally and morally) that the A.C.C. follow a community's plan to protect its natural resources and to concretely follow it own rules. Mohave County is currently re-writing its General Plan. It is my understanding that they have purposely left out any references to water.

EXHIBITS

1. Montgomery and Associates Water Resources for HVS Project Proposed Mohave County General Plan

2. Memorandum of Understanding (City of Kingman)

3. The Secret to low-water-use, high-efficiency concentrating solar

4. City of Kingman Water Adequacy Study (Final Report, May 1993)

5. USGS in cooperation with ADWR Ground-water Occurrence and Movement, 2006, and Water-level Changes in the Detrital, Hualapai, and Sacramento Valley Basins, Mohave County Arizona

6. Beacon Solar Energy Project Dry Cooling Evaluation (WorleyParsons 2008, Report # FPLS-O-LI-450-0001, http://www.energy.ca.gov/sitingcases/beacon/documents/applicant/2008-02-01_dry_cooling_evaluation_tn-49597.pdf

7. Letter to WAPA from Hualapai Tribe concerning BACT, Dry-cooled

8. Lake Mead

9. HWTP FACT SHEET

10. BRIGHTSOURCE Very comparable project to HVS DRY-cooled

11. Hydrology of the Upper Colorado River Planning Area - Groundwater (West Basins) RECHARGE RATE

12. Concentrating Solar Power Commercial Application Study: Reducing Water Consumption of Concentrating Solar Power Electricity generation Report to Congress U.S. Department of Energy, http://www.nrel.gov/csp/pdfs/csp_water_study.pdf

13. POLICY 3.5, PG 38 OF MOHAVE COUNTY GENERAL PLAN

14. Needle Mountain Power, DRY-cooled, Stirling Dish

15. Stirling Energy Systems, http://www.swrec.org/2009/documents/powerpoints/solar101csp_stirling_christensen_swrec2009.pdf

16. Solar Millennium to go DRY-cooled

EXHIBIT 1

MONTGOMERY
& ASSOCIATES
Water Resource Consultants

www.elmontgomery.com

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Scottsdale, AZ 85254

TEL 480-948-7747
FAX 480-948-8737

September 12, 2009

Nicholas S. Hont, P.E., Director
Mohave County Department of Development Services
3675 E. Andy Devine Avenue
Kingman, AZ 86401

SUBJECT: WATER RESOURCES FOR HUALAPAI VALLEY SOLAR PROJECT PROPOSED MOHAVE COUNTY GENERAL PLAN AMENDMENT

Dear Mr. Hont:

My name is William R. Victor. I am a Principal in the Arizona-based hydrogeologic and water resources consulting firm of Montgomery & Associates (M&A). I am a professional geologist licensed in Arizona, California, and Kentucky. My address and phone are on this letterhead. My firm was retained by Hualapai Valley Solar (HVS) to characterize available water resources for use by the project and to evaluate potential impacts to the aquifer from groundwater pumping for the project via wells. Please consider this letter during your evaluation of the HVS proposed amendment to the Mohave County General Plan.

ARIZONA DEPARTMENT OF WATER RESOURCES ANALYSIS

Availability of groundwater resources for the HVS project was proven in 2007 through the process of Analysis of Adequate Water Supply by the Arizona Department of Water Resources (ADWR) for the Rhodes Homes application no. 23-402285.0000. Attached hereto are: 1) the ADWR Analysis of Adequate Water Supply, dated November 9, 2007, for the proposed Rhodes Homes Red Lake development; and 2) a communication dated September 9, 2009 from Sandra Fabritz-Whitney, Assistant Director of the ADWR Water Management Division, which confirms the current status of the ADWR analysis. These documents demonstrate that 43,432.33 acre-feet per year (AF/yr) of groundwater were determined to be physically and continuously available for a 100-year period.

Based on the total acreage given in the Rhodes Homes application for the Red Lake development (36,236 acres) and the total amount of groundwater determine to be physically available for those acres (43,432.33 AF/yr), the average pro rata amount of available groundwater per acre is 1.20 AF/yr. The acreage to be acquired from Rhodes Homes by HVS within the ADWR analysis area is about 3,680 acres. Therefore, the minimum pro rata physically available groundwater for HVS based solely on acreage would be **4,416 AF/yr for 100 years** (3,680 acres x 1.20 AF/acre/yr). According to ADWR, the determination of physically available groundwater follows the property, so it is also available for any new owners of the property. For comparison, the water demand projected by HVS for its project is only **2,400 AF/yr for 30 years**.

MOHAVE COUNTY ANALYSIS AND APPROVALS

During the HVS open house meetings in the County, comments were received stating that the technology used for the HVS project should be restricted in accordance with General Plan Policy 3.5, which states that "Mohave County will only approve power plants using "dry cooling" technology when the aquifer is threatened by depletion or subsidence." Although we understand that HVS is still evaluating the merits and feasibility of dry, wet, and hybrid cooling technologies, we conclude that the conditions that would trigger Policy 3.5 do not occur at the HVS site.

To quote the ADWR website:

> "To address groundwater depletion in the state's most populous areas, the state legislature created the Groundwater Management Code in 1980 and directed ADWR to implement it. The goal of the Code is twofold: 1) to control severe groundwater depletion, and 2) to provide the means for allocating Arizona's limited groundwater resources to most effectively meet the state's changing water needs. This effort to manage Arizona's groundwater resources was so progressive that in 1986 the Code was named one of the ten most innovative programs in state and local government by the Ford Foundation and Harvard University. When granting the award, it was noted that no other state had attempted to manage its water resources so comprehensively. Accordingly, Arizona built consensus around its policy and then followed through to make it work in practice."

All of the areas of concern originally considered by ADWR are now Active Management Areas (AMAs) and had groundwater level declines of nearly 10 feet per year.

We believe the operative words in Policy 3.5 may be "when the aquifer is threatened". Without measured water level declines or land subsidence, there is no actual or perceived threat. The hydrographs shown on Figure 7 of the U.S. Geological Survey (USGS) Scientific Investigations Report 2007-5182 for well (B-27-16)33BAA (located about 4 miles north from the HVS plant site) and well (B-26-17)35AAA (located 1 mile west from the HVS plant site) indicate an **overall water level rise** in the proposed plant area during the period of record, which extends back to the 1950s and 1960s. These data demonstrate there is no current threat to the aquifer.

Another line of evidence can be made from the regulatory procedures to create a new AMA. ARS 45-412 states:

> "A. The director may designate an area which is not included within an initial active management area, pursuant to section 45-411, as a subsequent active management area if the director determines that any of the following exists:
>
> 1. Active management practices are necessary to preserve the existing supply of groundwater for future needs.
>
> 2. Land subsidence or fissuring is endangering property or potential groundwater storage capacity.
>
> 3. Use of groundwater is resulting in actual or threatened water quality degradation."

These conditions certainly do not exist in the proposed plant area. There have been no new AMAs established since the original basins.

PROJECTED IMPACTS FROM HVS GROUNDWATER PUMPING

Since 2005, M&A has conducted comprehensive groundwater studies in Hualapai Valley to evaluate the impacts of various groundwater uses. 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 volume of groundwater in storage could be properly estimated. M&A then constructed and used a complex basin-wide numerical groundwater flow model to estimate the quantity of groundwater in storage and to simulate the effects of groundwater wells on the aquifer. 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 by ADWR for use in projecting groundwater impacts. This body of work represents the most comprehensive investigative effort for the basin to date and a monetary investment in the science of the basin that very likely exceeds that of all previous studies for the basin by the USGS and ADWR combined.

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 for the area, depth, and specific yield of saturated sediments, total volume of potentially recoverable groundwater in storage in the Hualapai basin is calculated to be about 27.7 million acre-feet (AF). 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 volume of 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 15,000 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 more than 1,000 years of use at the current total rate.

Using the ADWR-approved model, M&A projected potential impacts of proposed HVS groundwater pumping on water levels and nearby wells of record. Although HVS engineering has progressed to the point where it projects a water demand of 2,400 AF/yr for its current project plan, the highest value considered during an earlier stage of engineering (3,000 AF/yr) was used in the model to be conservative and thereby overestimate the potential impacts of the final design.

Results of the HVS groundwater study indicate that projected incremental water level drawdown at the end of 30 years of continuous pumping at 3,000 AF/yr ranges from 38 feet at the HVS plant to less than 15 feet within 2 miles of the plant in any direction. Projected drawdown is less than 5 feet within about 5 miles north and 9 miles south from the plant, and rapidly decreases to less than 1 foot within about 10 miles north and 15 miles south from the plant. After 30 years of pumping, the projected incremental impact of HVS pumping is not substantial and, in fact, would be **much less than 1 foot of water level elevation change for wells in the City of Kingman, Dolan Springs, and Valle Vista areas**. For comparison, in any of the Arizona AMAs, projected drawdown in any neighboring well in the first 5 years of pumping the new well can not exceed 10 feet or the new well owner must obtain permission from the neighboring well owner. The HVS project meets this stringent AMA criterion (less than 10 feet in 5 years) at all off site wells of record.

CONCLUSIONS

Based on all this information, I conclude that:

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 more than 1,000 years of use at the current total rate (less than 15,000 AF/yr).

2. The minimum pro rata amount of annually available groundwater already set aside by ADWR for the land on which the HVS plant is sited would be nearly twice as much as HVS intends to use annually.

3. The conditions that would trigger Mohave County General Plan Policy 3.5 do not occur at the HVS site.

4. The projected impact on groundwater levels by the proposed HVS pumping would meet the stringent criteria for well impacts imposed by the State in AMAs.

5. After 30 years of pumping, the projected incremental impact of HVS pumping is not substantial and, in fact, would be much less than 1 foot of elevation change for wells in the City of Kingman, Dolan Springs, and Valle Vista areas.

If you have any questions about the concepts or information provided herein, please do not hesitate to contact me.

Sincerely,

MONTGOMERY & ASSOCIATES, INC.

William R. Victor

William R. Victor, P.G.

Attachments (2)

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

From: "Stephens, Chris" <CStephens@BHFS.com>
Subject: Fw: Red Lake Analysis
Date: September 9, 2009 11:41:57 AM PDT
To: <greg@mohavesun.com>

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 11:53:15 2009
Subject: Red Lake Analysis

Chris -

I am writing to confirm our discussions regarding the status of the Analysis of Adequate Water Supply No. 43-402283.0000, 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

REPRESENTATIVE LIST OF PERMITS REQUIRED TO DEVELOP A UTILITY-SCALE SOLAR THERMAL POWER PLANT

PERMIT	AGENCY	PRIMARY AUTHORITY	PUBLIC MEETINGS?
Certificate of Environmental Compatibility (CEC)	a. Arizona Power Plant and Transmission Line Siting Committee (includes ADWR and ADEQ representation) b. Arizona Corporation Commission	Authority to operate a power plant (100 MW or higher) including approval for water usage and cooling system technology; also new transmission lines (115 kV or higher)	Extensive public process, with multiple opportunities for public comments
Aquifer Protection Permit (APP)	a. Arizona Department of Environmental Quality	Design of all on-site water systems	No
Air Quality Permit	a. Arizona Department of Environmental Quality	Air quality and emissions	No
Environmental Impact Study (EIS)	a. Western Area Power Administration (lead) b. Bureau of Land Management c. Hualapai Nation, AZ Game & Fish, others	NEPA compliance, clearance under Endangered Species Act and Historic Preservation Act	Extensive public process, with multiple opportunities for public comments
Area Plan	a. Mohave County Planning & Zoning Commission b. Mohave County Board of Supervisors	Land use	Per approved Citizen Participation Plan (CPP) and County requirements
General Plan Amendment	a. Mohave County Planning & Zoning Commission b. Mohave County Board of Supervisors	Compliance with the County General Plan	Per approved Citizen Participation Plan (CPP) and County requirements
Zoning or Zoning Use Permit	a. Mohave County Planning & Zoning Commission b. Mohave County Board of Supervisors	Zoning	Per County requirements
Various	Various local, state and federal agencies	Construction, easements, ROWs, stormwater permit, permit to construct water facilities, approval to operate water facilities, etc.	Per County, state and federal requirements
System Impact Study (SIS)	a. Transmission line system owners	Available transmission capacity	No
Section 404 Permit (if required)	a. US Army Corps of Engineers	US waterways (washes, FEMA floodplains, etc.)	No

EXHIBIT 2

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 partiesParties 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 partiesParties 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 partiesParties 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 partiesParties 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

____________________ By ______________________________

Date Signed — John Salem, Mayor, Kingman Common Council

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

____________________ By ______________________________

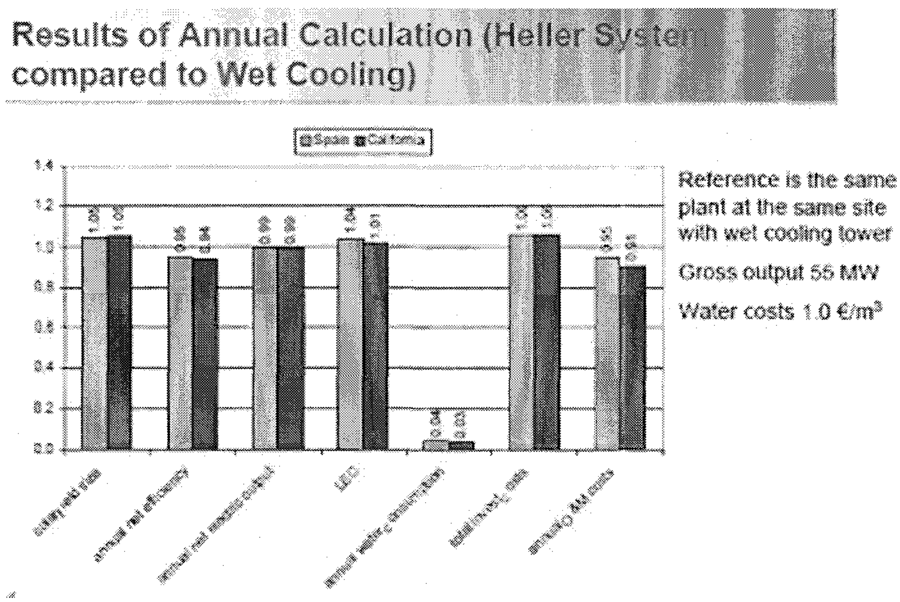
Date Signed — ~~XXXXXX, Chairman of the Board~~Its

EXHIBIT 3

The secret to low-water-use, high-efficiency concentrating solar power

April 29, 2009

Many readers have expressed interest in learning more about the water consumption of concentrating solar power and how measures to reduce it might impact system efficiency and cost. After my recent CSP post, â€œWorldâ€™s largest solar power plants with thermal storage to be built in Arizona,â€ Michael Hogan wrote in the comments (here) about a low-water-consuming cooling system he had experience with. I asked Hogan, a long-time power industry executive and currently the Power Programme Director for the European Climate Foundation (bio here), to write a longer piece for Climate Progress. Here is what he put together, with links and figures (click to enlarge).

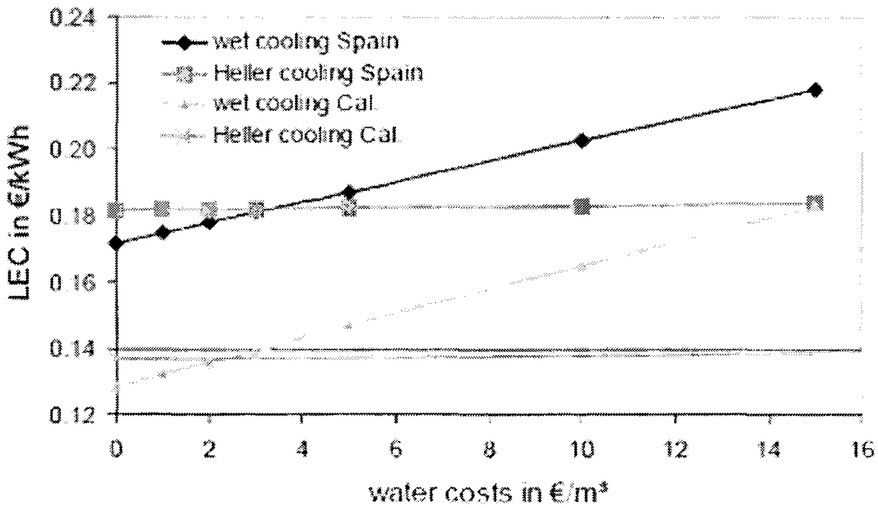


EXECUTIVE SUMMARY: **If concentrating solar power (â€œCSPâ€) is a core climate solution, indirect dry cooling systems (also known as â€œHellerâ€ systems) will be a crucial enabling technology, since large-scale CSP will be located in desert regions.** US power companies have long favored direct dry cooling systems for fossil plants, probably because of the visual impact of Heller systems. But **Heller systems have long experience in certain regions and will probably play an important role in the success of large-scale CSP. This is due to their higher efficiency, smaller footprints, quieter operation, lower maintenance, higher availability, and more flexible site layout. Heller systems can reduce water consumption in a CSP plant by 97% with minimal performance impact**. The height of the cooling towers should be less of an issue in remote desert locations, especially since the central tower in power tower facilities will be of comparable height.

Concentrating solar thermal power plants (â€œCSPâ€) have been identified a number of times in Climate Progress as a core climate solution due to their almost unique potential to replace coal as the dominant supplier of baseload and/or firm dispatchable capacity to the worldâ€™s power grids. It is said that CSP could represent 3 of the 12-14 wedges in the 450ppm solution â€“- 20-25% of global mitigation potential. I concur wholeheartedly with that view, and I applaud CP for its efforts to educate readers on the singular challenges of eliminating coal-fired power production at scale. But if CSP is a core climate solution, dry cooling technologies, and in particular Heller systems, will be a crucial enabler (see note at the end regarding the status of the name â€œHellerâ€ system).

One of the concerns often cited about CSP is water consumption, particularly because the technologyâ€™s reliance on direct normal insolation means that it is most economically located in desert regions. Because most CSP systems rely on Rankine cycle steam turbine-generators to produce electricity, they face the same requirements as fossil-fired power plants for condensing large volumes of saturated steam back into boiler feedwater. (Parabolic dish systems use Stirling or Brayton engines to produce useful energy, each of which has its own advantages and disadvantages) Where an abundant and cheap supply of water is available, the most efficient way to accomplish this is by evaporation (or â€œwet coolingâ€), which is what produces the large plume of water vapor one often sees rising from power stations. Convective cooling using ambient air (â€œdry coolingâ€) requires higher capital costs and can reduce plant performance, and thus planners of fossil plants have sought to locate them close to adequate supplies of cooling water whenever possible.

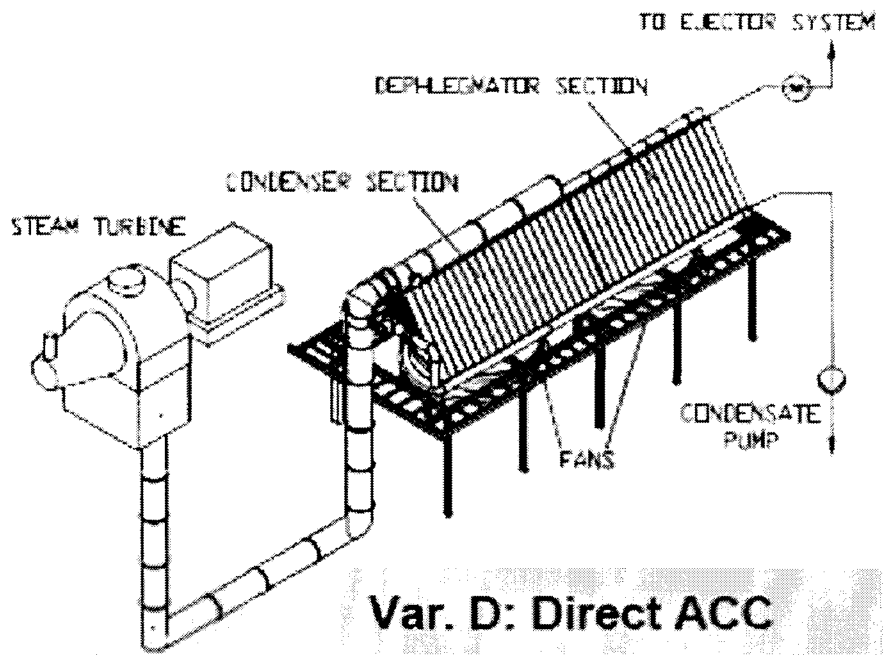
In the desert areas where CSP will thrive, the consumption of large amounts of water by conventional wet cooling systems is clearly unsustainable. Dry cooling alternatives will be required, and CSP will have to demonstrate its commercial viability despite the capital cost and performance penalties this will entail. Fortunately this is an eminently manageable problem.



[Acronyms: â€œLECâ€ = levelized electricity cost; â€œO&Mâ€ = operation & maintenance]

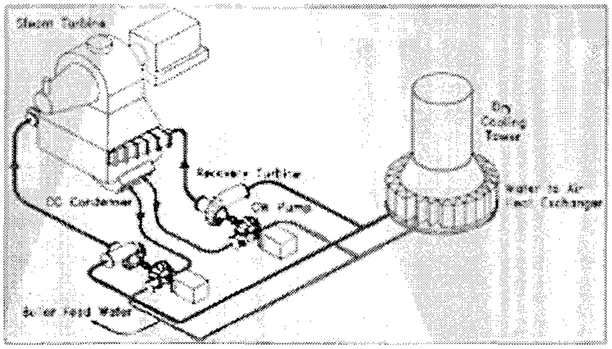
Deutsches Zentrum fur Luft- und Raumfahrt e.V. (â€œDLRâ€), a German government research agency, presented a study in 2007 comparing a particular dry cooling technology, the Heller system, with wet cooling for CSP plants in Spain and in the California desert (see figures above). Water consumption was reduced by 97%, and the performance impact was quite minimal. Indeed the impact on performance in the higher desert temperatures of California was overwhelmed by the benefits of better annual insolation. They also noted that the potentially negative impact of high daytime temperatures is mitigated by the use of thermal storage, which uses energy collected during peak daytime insolation to produce electricity when temperatures are considerably lower. One interesting aspect of the DLR study was their focus on Heller systems over more familiar (at least in the US) direct dry cooling systems, and that is worth a closer examination.

Two basic types of dry cooling systems have long been employed where necessary -â€“ â€œdirectâ€ air cooling (usually called an â€œair-cooled condenserâ€ or â€œACCâ€) and â€œindirectâ€ air cooling (often referred to as the â€œHeller systemâ€ , after Laszlo Heller, the Hungarian thermodynamics professor who pioneered this approach in the 1950s). In ACC systems, the saturated steam from the steam turbine exhaust is carried directly to a very large array of A-framed fin-tube bundles, where large mechanical fans force air over the tubes, convectively condensing the steam.

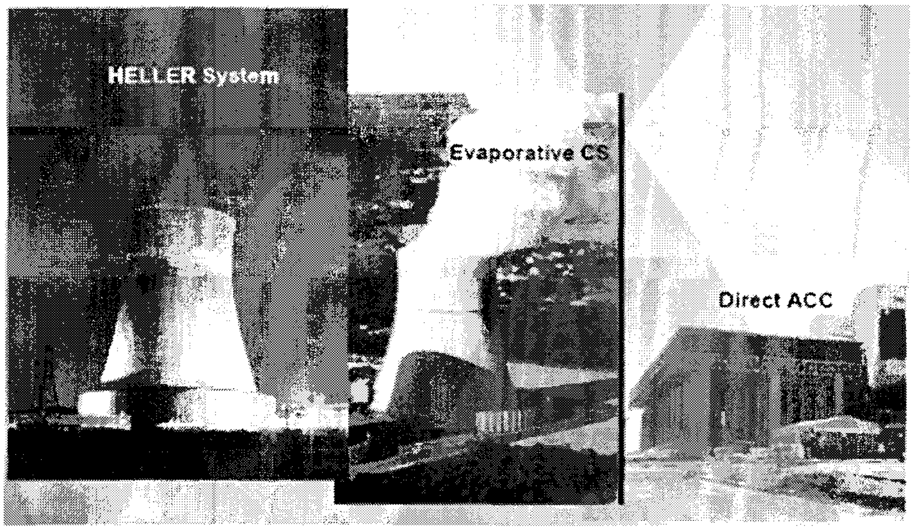


ACC system

In Heller systems, the steam is condensed by spraying water directly into the exhaust flow in a ratio of about 50:1 (called â€œdirect contact jet condensingâ€), creating a large volume of warm water, some of which is pumped back to the boiler as the working fluid and the rest of which is pumped to bundles of tubes arrayed at the base of a natural-draft hyperbolic cooling tower. The warm water circulating around the base of the tower and the cooler air at the top of the tower, combined with the towerâ€™s hyperbolic shape, stimulate a powerful updraft that draws ambient air over the tube bundles, thereby convectively cooling the water before it is returned to the condenser. Both are closed systems.



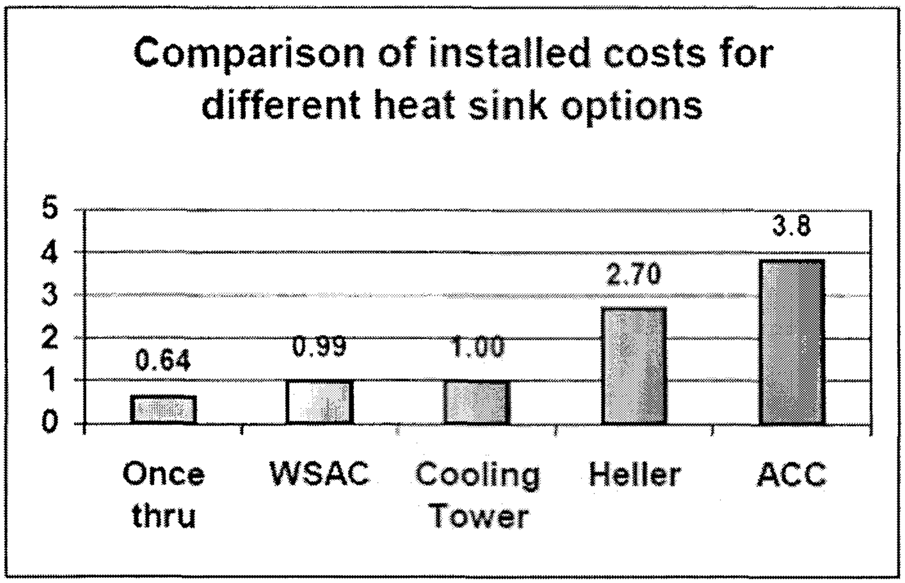
Heller system [Acronyms: â€œCWâ€ = cooling water; â€œDCâ€ = direct contact]



While the Heller system has been widely used elsewhere, there are none in the US. This is probably because the much lower auxiliary power requirements of Heller systems come with the visual impact of a large hyperbolic cooling tower (typically 150m high and 120m in base diameter), often a difficult sell given that most fossil power stations are located in the vicinity of the populated demand centers theyâ€™re intended to serve. The auxiliary power required to run an ACC system is roughly twice the power required run a Heller system, and the Heller system is considerably quieter, but these have apparently been considered prices worth paying for the lower profile (a typical ACC system can be 40m high), particularly when it was cheap coal-fired power. Simple lack of familiarity could be another factor in the hidebound world of US power utilities.

The Electric Power Research Institute has kicked off a comparative study of indirect dry cooling (due to be completed in mid 2010), on the theory that it is the most economic dry cooling solution for large-scale thermal applications. The prospect of large amounts of CSP being built in the worldâ€™s deserts calls for a reconsideration of the relative merits of these two approaches, since it would require dry cooling to be deployed in a different application and to a far larger extent than has ever been the case.

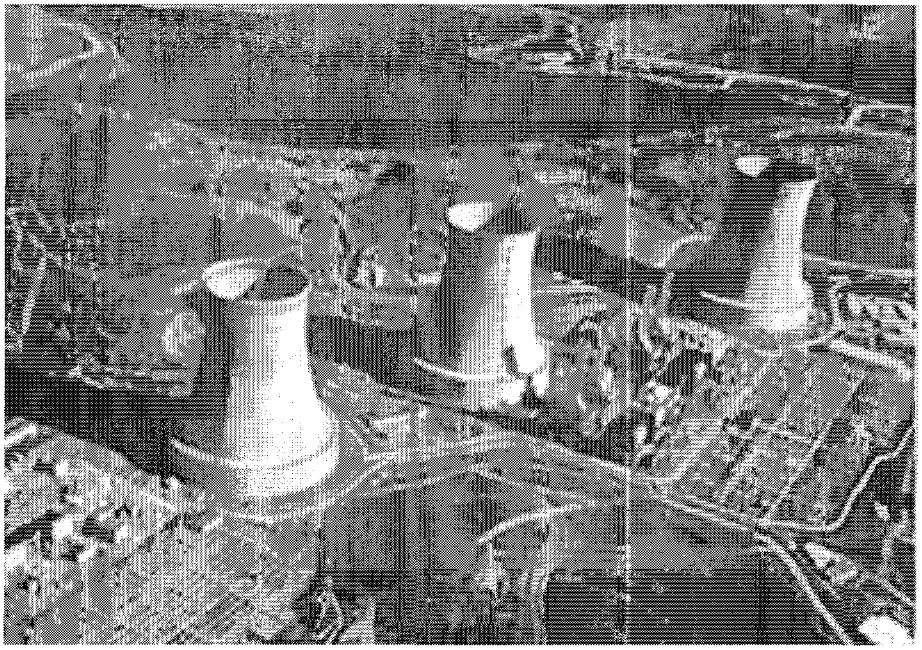
Three Bechtel engineers published a paper in 2005 (Digital Object Identifier reference DOI:10.1115/1.1839924) (originally presented at an American Society of Mechanical Engineers conference in 2002) that compared cooling technologies for combined-cycle gas power plants. They cited the following comparison of installed costs for various cooling systems, including ACC and Heller.



[Acronyms: â€œWSACâ€ â€“ wet-surface air condenser]

They also note that the footprint of an ACC system is larger than that required for a Heller system, though specific data is not offered. Overall system efficiency of a Heller system is in the range of 2% better than an ACC system. That performance improvement meant one thing in a fossil power plant in the bad old days of cheap dirty power, but when it means 2% less land area covered by solar collectors, and lower auxiliary consumption of much more costly power, it takes on a much greater significance. The same sources note that since the Heller systems are mechanically far simpler than ACC systems, maintenance is much less of an issue and system availability is significantly greater. In the remote areas where these plants will be located, and given the large land areas over which they will spread, these are far more significant considerations than they were for compact fossil power plants located close to the populations they served. Another factor noted in these sources is that an ACC must be located next to the steam turbine it serves, because of the cost of transporting saturated steam over any distance, whereas the Heller system has much more flexibility in where the cooling tower is located. This will be much more important to CSP, where one can envision clusters of power tower complexes in a given area each with its own steam turbine, than it was with fossil plants. And finally, the feature that most worked against Heller systems in US fossil plant applications â€“ visual impact â€“ should be far less of an issue in remote desert sites, especially with solar power tower complexes where the central towers will likely be of similar height.

I should note that as a senior executive of the private power company InterGen in the late 1990s I oversaw the deployment of a Heller system on our 2,400 MW gas-fired combined cycle plant in Adapazari, Turkey (see below), which is still the worldâ€™s largest installation of an indirect dry cooling system and continues to work extremely well. I trace my enthusiasm for the technology to that personal experience.



One final note on the term â€œHellerâ€ system. A German engineering company, GEA, appears to own the trademark rights to the name â€œHellerâ€, which they acquired when the bought EGI, the Hungarian company that commercialized indirect dry cooling systems. Indirect dry cooling is a generic technical solution that is often referred to as â€œthe Heller systemâ€. I have no affiliation with GEA.

Share

Print

EXHIBIT 4

1993 City of Kingman Water Adequacy STUDY

the groundwater in this area is the low water-level elevation compared to that of the City service area and the water-level elevations in Upper Hualapai Valley. Thus farther consideration of Sacramento Valley does not appear to be warranted at this time.

SUMMARY AND CONCLUSIONS

Although recharge to the groundwater in the Upper Hualapai Valley and Golden Valley is relatively small, there are large amounts of groundwater in storage in both of the valleys. Although most existing wells in the Upper Hualapai Valley are not more than 1,000 feet deep, deeper wells are possible. Well depths up to 2,000 feet deep should be considered. (Water levels in Upper Hualapai Valley have been declining from about one to two feet per year in recent decades.) The present overdraft in the Upper Hualapai Valley is estimated to be about 4,000 acre-feet per year. There is an estimated 2.2 million acre-feet of groundwater in storage in this valley above a depth of 1,000 feet. Much of this water is believed to be of suitable quality so as to not require treatment prior to use for public supply. Chromium contents in water for some City wells have exceeded the MCL of 0.05 mg/l. However, the new EPA MCL for chromium has been raised to 0.10 mg/l. Water from the City wells has had chromium contents below this revised MCL. An additional 2.0 million acre-feet of groundwater below a depth of 1,000 feet in the valley is considered recoverable. However much of this deeper water could require treatment for removal of some chemical constituents prior to use

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for public supply. The most favorable hydrogeologic areas for future groundwater development are in or near inferred buried stream channel deposits, as previously reported by Thiele (1968). Because of relatively deep water levels, the Upper Hualapai Valley has considerable potential for storage of imported water. There was space above the water table in 1991 for more than 5 million acre-feet of water.

In Golden Valley, a number of wells are from 1200 to 1500 feet deep. In 1991, depth to water ranged from about 600 to more than 900 feet deep, and generally increased to the north. Water-level declines have averaged about one foot per year in recent decades in or near the Cyprus well field, and elsewhere little change is apparent. The quality of most of the groundwater in Golden Valley is believed to be suitable for public supply. The most hydrogeologically favorable area for development of groundwater for public supply is in T20N/R18W. However, water-level elevations in this area are almost 1,000 feet lower than in Upper Hualapai Valley near the airport. The Upper Hualapai Valley is a more hydrogeologically favorable area for development of groundwater for the City of Kingman.

REFERENCES

Anderson-Nelson, Inc., 1991, "Water Adequacy Study for the Valley Pioneers Water Company's Franchise Area", Golden Valley, Arizona.

Cella Barr Associates, 1990, "Geohydrologic Study for the Kingman-Red Lake Sub-Area of the Hualapai Basin", prepared for the City of Kingman, 64 p.

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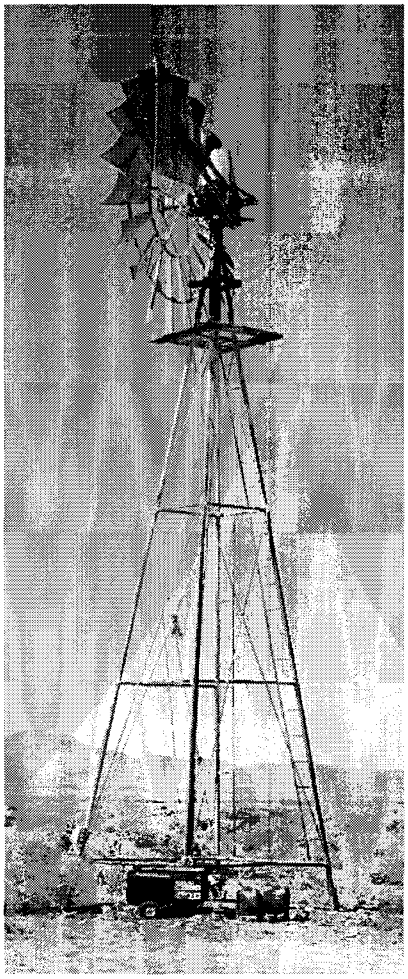
EXHIBIT 5

USGS
science for a changing world

Prepared in cooperation with the

ARIZONA DEPARTMENT OF WATER RESOURCES

Ground-Water Occurrence and Movement, 2006, and Water-Level Changes in the Detrital, Hualapai, and Sacramento Valley Basins, Mohave County, Arizona




Scientific Investigations Report 2007–5182

U.S. Department of the Interior
U.S. Geological Survey

Ground-Water Occurrence and Movement, 2006, and Water-Level Changes for the Detrital, Hualapai, and Sacramento Valley Basins, Mohave County, Arizona

By David W. Anning, Margot Truini, Marilyn E. Flynn, and William H. Remick[1]

Abstract

Ground-water levels for water year 2006 and their change over time in Detrital, Hualapai, and Sacramento Valley Basins of northwestern Arizona were investigated to improve the understanding of current and past ground-water conditions in these basins. The potentiometric surface for ground water in the Basin-Fill aquifer of each basin is generally parallel to topography. Consequently, ground-water movement is generally from the mountain front toward the basin center and then along the basin axis toward the Colorado River or Lake Mead. Observed water levels in Detrital, Hualapai, and Sacramento Valley Basins have fluctuated during the period of historic water-level records (1943 through 2006). In Detrital Valley Basin, water levels in monitored areas have either remained the same, or have steadily increased as much as 3.5 feet since the 1980s. Similar steady conditions or water-level rises were observed for much of the northern and central parts of Hualapai Valley Basin. During the period of historic record, steady water-level declines as large as 60 feet were found in wells penetrating the Basin-Fill aquifer in areas near Kingman, northwest of Hackberry, and northeast of Dolan Springs within the Hualapai Valley Basin. Within the Sacramento Valley Basin, during the period of historic record, water-level declines as large as 55 feet were observed in wells penetrating the Basin-Fill aquifer in the Kingman and Golden Valley areas; whereas small, steady rises were observed in Yucca and in the Dutch Flat area.

Introduction

Detrital, Hualapai, and Sacramento Valley Basins are broad, intermountain desert basins in Mohave County, northwestern Arizona, and are home to residents in the City of Kingman and several rural communities (fig. 1). The spatial extent of these basins is defined by the Arizona Department of Water Resources' (ADWR) ground-water basin boundaries. Ground water is the primary source of water in these basins and is essential for many economic and cultural activities. As in many parts of the western United States, population growth in these basins is substantial. From 2000 to 2005, the population of Kingman grew from 20,100 to 25,900 — an increase of 29 percent (Arizona Department of Economic Security, 2006). During the same time period, the population of Mohave County increased by 21 percent. Management of the available ground-water resources in these basins, guided by a comprehensive scientific understanding of the area's natural resources, can help the growing communities to meet their water needs in a sustainable manner.

In 2005, the U.S. Geological Survey (USGS) began hydrogeologic investigations in the Detrital, Hualapai, and Sacramento Valley Basins in cooperation with ADWR as part of the Rural Watershed Initiative Program. The program, which was established by the State of Arizona and is managed by the ADWR, includes 17 areas throughout rural parts of the State. The overall objective of this investigation is to improve the understanding of the hydrogeologic systems of Detrital, Hualapai, and Sacramento Valley Basins. This investigation will be accomplished by:

- Evaluating current and past conditions of ground-water levels and ground-water movement.
- Evaluating ground-water quality for key water uses.
- Developing a better understanding of the extent and lithology of geologic units and structures, and their relation to the storage and movement of ground water.
- Developing improved estimates for ground-water budget terms, including recharge, discharge, and total water in storage.
- Establishing a hydrologic-monitoring network to detect and characterize changes in aquifer conditions.
- Informing the hydrologic community and basin residents about hydrologic conditions.

[1]Hydrologist, Arizona Department of Water Resources

Physical and Hydrogeologic Setting

Detrital, Hualapai, and Sacramento Valley Basins are three large, distinct northwest-southeast trending alluvial basins in northwestern Arizona (fig. 1). The valley floors of Detrital and Hualapai Valley Basins generally slope downward to the north, and the valley floor of Sacramento Valley Basin generally slopes downward to the south. Valley-floor elevations range from about 3,500 ft near Kingman, Arizona, to about 500 ft at the mouth of Sacramento Wash. Mountain crests typically are more than 1,000 ft above the valley floors, and in the case of the Hualapai Mountains, the crest is as much as 5,500 ft above the floor of Sacramento Valley.

The climate of the basins is arid to semiarid with maximum daily temperatures in the valley floors typically ranging from 90 to 110°F during the summer, and from 50 to 70°F during the winter (Western Regional Climate Center, 2005). Average annual precipitation on the valley floors ranges from about 5 to 10 in. (Western Regional Climate Center, 2005) whereas precipitation in the mountains is as much as 16 in. and is strongly correlated to elevation (Western Regional Climate Center, 2007). The valley floors generally are covered with sparse desert vegetation owing to the hot temperatures and little precipitation. Moderate to thick stands of shrubs and trees cover mountain slopes and peaks in the higher elevations where temperatures are cooler and precipitation is greater.

The structural basins of Detrital, Hualapai, and Sacramento Valley Basins were formed during the Basin and Range disturbance, during which mountain ranges and basins were formed on adjacent sides of high-angle normal faults (Scarborough and Pierce, 1978). The bedrock of the mountains that separate the valleys consists of volcanic, granitic, metamorphic, and consolidated sedimentary rocks (pl. 1). Where unfractured, bedrock is relatively impermeable compared to the basin fill and can form a barrier to ground-water movement where it separates adjacent Basin-Fill aquifers. Fractured bedrock, however, can form water-bearing zones and allow ground water to flow from one area to another. The structural basins of Detrital, Hualapai, and Sacramento Valley Basins contain unconsolidated and semi-consolidated sediments that range in thickness from thin veneers along the mountain fronts to more than 5,000 ft in parts of each basin (Freethey and others, 1986). This basin-fill material is divided into older, intermediate, and younger alluvium (Gillespie and Bentley, 1971).

Older alluvium is stratigraphically the oldest and deepest deposit, and consists of moderately consolidated fragments of rocks eroded from the surrounding mountains in a silty-clay or sandy matrix (Gillespie and Bently, 1971). Older alluvium generally corresponds to units mapped as QTs and Tsy in plate 1. The sediments are moderately consolidated, and the grain size decreases from boulder- and pebble-size fragments in the fanglomerate near the mountains to coarse sand and interbedded clay and silt in the basin center (Gillespie and Bentley, 1971). Each basin has large areas of older alluvium where the sediments are primarily fine grained (Freethey and others, 1986). In the northern part of the Detrital Valley Basin and central part of Hualapai Valley Basin, massive evaporite deposits occur in the older alluvium (Gillespie and Bentley, 1971; Laney, 1973; Freethey and others, 1986). In the northern parts of Detrital and Hualapai Valley Basins, clastic sediments, limestone, and basalt flows of the Muddy Creek Formation (Laney, 1973; Laney, 1977) are included in the older alluvium and correspond to units mapped as Tsy in plate 1.

The intermediate alluvium contains boulder- to pebble-size fragments in the fanglomerates near the mountains and gravel, sand, and silt in the middle of the valleys (Gillespie and Bently, 1971). Intermediate alluvium generally corresponds to the units mapped as Qo in plate 1. In contrast to the older alluvium, the intermediate alluvium generally is less consolidated and the thickness of the intermediate alluvium is on the order of a few hundred feet rather than a few thousand feet (Gillespie and Bently, 1971).

The younger alluvium consists of Holocene and Pleistocene weakly consolidated piedmont, stream, and playa deposits. Younger alluvium generally corresponds to units mapped as Qy and Q in plate 1. Younger alluvium is less thick than the intermediate and older alluvium (Gillespie and Bently, 1971). In the northern parts of Detrital and Hualapai Valley Basins, the younger alluvium contains the Chemehueve Formation, which consists of locally derived alluvial fan material from nearby mountains and silt, sand, and clay transported by the Colorado River (Laney, 1973; Laney, 1977). The Chemehueve Formation overlays the older alluvium (Laney, 1973; Laney, 1977) and generally corresponds to units mapped as Q in plate 1.

Water-saturated sediments that fill the structural basins in the Detrital, Hualapai, and Sacramento Valley Basins form the principal aquifer and for consistency in this report will be referred to as the Basin-Fill aquifer. The older alluvium is the principal aquifer in the Detrital, Hualapai, and Sacramento Valley Basins (Gillespie and Bentley, 1971; Laney, 1973; and Dillenburg, 1987). The intermediate alluvium and younger alluvium are above the water table in most areas of all three basins (Gillespie and Bentley, 1971; Remick, 1981; Dillenberg, 1987; and Rascona, 1991).

Water-bearing zones occur in volcanic, granitic, metamorphic, and consolidated sedimentary rocks in parts of the mountain that surround the margins of all three valleys (Gillespie and Bentley, 1971; Laney, 1977). Volcanic rocks (Tb and Tv in plate 1), divided into younger and older volcanic rocks by Gillespie and Bentley (1971), crop out along the mountain fronts bordering Detrital, Hualapai, and Sacramento Valleys and in the Kingman area. These volcanic rocks are also interbedded with older alluvium in places in Hualapai and Sacramento Valleys (Gillespie and Bentley, 1971). The older volcanic rocks are mostly a thick sequence of andesite and latite flows and tuff beds, while the younger volcanic rocks are mostly basalt flows, basaltic and andesitic flows and tuff, and rhyolitic tuff (Gillispie and Bentley, 1971). In the Kingman area, volcanic rocks are locally permeable near two fault zones, and ground-water stored in the fractures is used as part of the municipal water supply and for many domestic

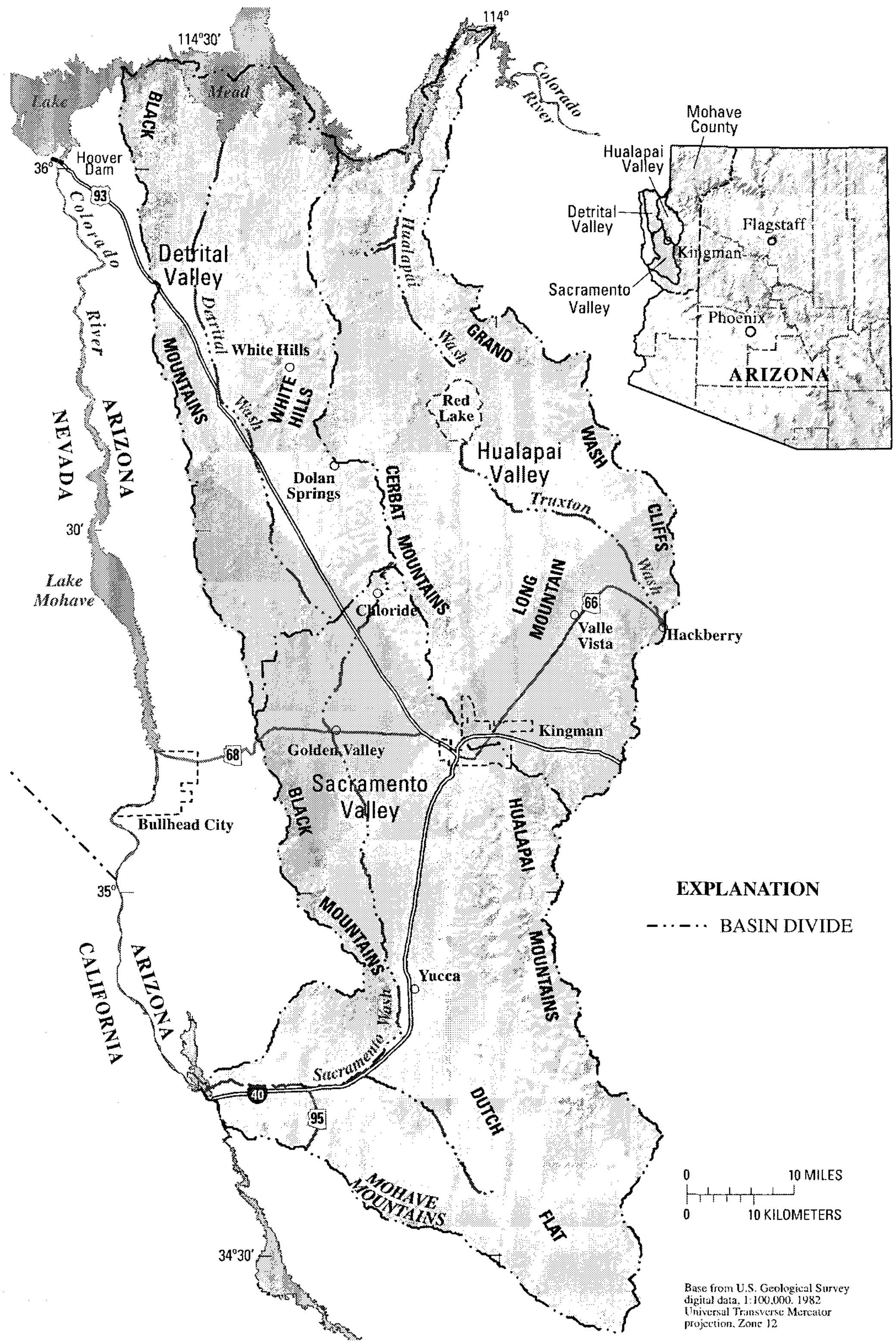


Figure 1. Physiography and location of Detrital, Hualapai, and Sacramento Valley Basins, Mohave County, Arizona.

wells (Gillespie and Bentley, 1971). Ground water stored in consolidated sediments and granitic and metamorphic rocks serves as a water supply in some areas, especially where rocks are faulted, fractured, and weathered (Gillespie and Bently, 1971; Remick, 1981; Dillenberg, 1987; and Rascona, 1991). Several springs issue from these consolidated rocks, and in some cases the springs serve as water supplies for livestock and wildlife.

The combined annual ground-water withdrawal for the three valleys was about 6,600 acre-ft in 1991, almost all of which was from Hualapai and Sacramento Valleys (Tadayon, 2005). By 2000, withdrawals had nearly doubled to about 11,000 acre-ft (Tadayon, 2005). The ground-water withdrawals were used primarily for municipal, domestic, and industrial uses and to a lesser extent for livestock and agriculture.

Purpose and Scope

As noted in the Introduction section, one of the objectives of this investigation is to describe ground-water levels and their change over time in the Detrital, Hualapai, and Sacramento Valley Basins of northwestern Arizona in order to improve the understanding of current and past conditions in the ground-water systems in these basins. The purpose of this report is to document (1) depth to water and ground-water altitude data measured during water year 2006 for wells in the Detrital, Hualapai, and Sacramento Valley Basins, (2) the potentiometric surface of the Basin-Fill aquifers and the ground-water movement in these basins, and (3) long-term changes in ground-water levels over time in these basins.

Approach and Data

Measurements of ground-water levels in 306 wells were collected during water year 2006 (October 1, 2005, through September 30, 2006) to develop a potentiometric surface map of the Basin-Fill aquifers in the Detrital, Hualapai, and Sacramento Valley Basins. These data were supplemented with water-level measurements collected from 24 wells, from October through December of 2006, to aide in the development of the potentiometric-surface map. The distribution of the combined 330 water-level measurements by basin is 67 wells in Detrital Valley Basin, 100 wells in Hualapai Valley Basin, and 163 wells in Sacramento Valley Basin. Where available, driller's logs were examined to determine the representative aquifer or water-bearing zone (basin fill, crystalline, limestone, or volcanic rock) in each well.

Long-term water-level changes were assessed by using two analysis methods. The first method was to visually examine trends apparent in ground-water level hydrographs for wells that had 10 or more water-level measurements that spanned a minimum of 10 years. Within the study area, 35 wells met these analysis criteria. Water-level and time scales for the 35 hydrographs were made consistent to facilitate comparison of trends by well.

The second method of analyzing long-term trends in water-level changes was to examine net water-level changes that were computed for individual wells. Net water-level changes were computed by subtracting the water-levels measured during a particular time period from the water-levels measured in 2006. Net water-level changes were interpreted as indicating declines for values less than -1.0 ft, no change for values between -1.0 ft and 1.0 ft, and increases for values greater than 1.0 ft. The analysis examined net water-level changes in the three basins for the following three time periods: (1) water year 1996, which had data for 116 wells; (2) water years 1979–80, which had data for 64 wells; and (3) 1964–65, which had data for 28 wells. These were the most data-rich periods for comparison of 2006 and previous years' water levels for the three basins. More net water-level change data were available for wells in the Hualapai and Sacramento Valley Basins than for wells in the Detrital Valley Basin.

Depth-to-water data usually are measured in the field to one-tenth or one-hundredth of a foot, and they are reported in the appendixes (available only online at http://pubs.usgs.gov/sir/2007/5182/appendixes/) to one-tenth of a foot. On plate 1, depth-to-water data are listed to the nearest foot to ease visual analysis of data. Net water-level change data are computed from depth-to-water data, and therefore, are also reported to the tenth of a foot in the appendixes. Water-level altitude data are computed from the depth-to-water data and the altitude of the well on the land surface. The well altitude typically is taken from a topographic map, which generally has 20-ft altitude contours. Assuming the well location is correct, the well-altitude data typically have an accuracy of about 1–10 ft, and, therefore, reported in the appendixes and on plate 1 to the nearest foot.

Previous studies have reported ground-water conditions in Detrital, Hualapai, and Sacramento Valley Basins (table 1). Much of the water-level data used in the net water-level change analysis were reported by these studies. Water-level and well-location data presented in this report are tabulated in appendixes 1–4. These data are available on request from the USGS National Water Information System and the ADWR Ground Water Site Information databases.

Ground-Water Levels and Movement, Water Year 2006

Ground-water altitudes in water-bearing zones of volcanic, granitic, metamorphic, and consolidated sedimentary rocks in the mountains typically are higher than ground-water altitudes of nearby wells in the Basin-Fill aquifer and indicate the potential for ground-water movement from the basin margins towards the Basin-Fill aquifers in the basins. The flow path through these consolidated rock units and the hydraulic connection to the Basin-Fill aquifer is dependant on the location and density of fractures within the rock units. In the Basin-Fill aquifer, ground-water movement is through sedi-

Table 1. Summary of previous ground-water investigations in Detrital, Hualapai, and Sacramento Valley Basins, Mohave County, Arizona.
[X, data or information included in report; — data or information not included or a minor part of report]

Report about investigation results	Primary study period	Basin(s) in study area	Types of data or information presented in report					
			Well data, including water-levels	Spring data	Ground-water chemistry data	Well hydro-graphs	Potentio-metric surface map	Hydro-geologic information
Gillespie and others (1966)	Generally through 1965	Hualapai, Sacra-mento, and north-ern part of Big Sandy	X	X	X	X	X	—
Gillespie and Bently (1971)	Generally through 1967	Hualapai and Sac-ramento	X	X	X	X	X	X
Laney (1973)	Generally through 1979	Northern part of Detrital	X	X	X	—	—	X
Laney (1977)	Generally through 1979	Northern part of Hualapai	X	X	X	—	—	X
Pfaff and Clay (1981)	1979	Sacaramento	X	X	X	X	X	—
Remick (1981)	1980	Hualapai and parts of adjacent areas	X	X	X	X	X	—
Dillenburg (1987)	1987	Detrital	X	X	X	—	X	—
Rascona (1991)	1990	Sacaramento	X	X	X	X	X	—

ment pore-spaces along paths from the mountain front towards the basin center, and then along the basin axis north to Lake Mead or south to the Colorado River. The potentiometric surface of the Basin-Fill aquifer in the three basins is characterized by areas with flat gradients altering with areas with steep gradients, which may reflect different hydraulic conductivities and (or) cross-sectional areas of the aquifer in each area.

Ground-water altitudes in the Basin-Fill aquifer along the axis of Detrital Valley Basin range from greater than 2,200 ft in the southern part of the basin to less than 1,300 ft in the northern part of the basin near Lake Mead (pl. 1). At the northern end of Detrital Valley, Lake Mead onlaps rock units of the Basin-Fill aquifer. Laney (1977) and data from the few wells in this area suggest that water levels in the aquifer in this area fluctuate with the water level in the lake. Depth-to-water measurements range from less than 100 ft below land surface in the mountains and near Lake Mead, to as much as 984 ft below land surface in the southern part of the basin.

The potentiometric surface of the Basin-Fill aquifer in the southern part of the Detrital Valley Basin is relatively flat, and ground-water altitudes range from 2,220 to 2,249 ft. Ground-water altitudes less than 2,100 ft in wells in the northern part of T. 26 N., R. 20 W. indicate that flow in the southern part of Detrital Valley Basin generally is towards the north (pl. 1). Ground-water altitudes of 2,097, 2,141, and 2,154 ft in three wells in T. 23 N., R. 18 W. of the adjacent Sacramento Valley Basin, however, indicate a potential for some flow southward across the basin boundary (pl. 1). A ground-water divide that separates northward flow and southward flow occurs in the southern part of Detrital Valley Basin or at the basin boundary with Sacramento Valley Basin. However, the exact location of the ground-water divide cannot be determined because of the lack of ground-water altitude data near the basin boundary, and because the range in water-level altitudes qualitatively is not substantially greater than the uncertainty of water-level altitude data.

Near the community of White Hills, wells having ground-water altitudes between 3,001 and 3,023 ft indicate potential for ground-water movement northwestward from this area toward Detrital Wash. Ground-water in these wells comes from the Basin-Fill aquifer and from water-bearing units in crystalline rocks (pl. 1); and the similar ground-water altitudes indicate a hydraulic connection between these hydrogeologic units. Similar hydraulic connections occur elsewhere in Detrital Valley Basin, as well as parts of Hualapai and Sacramento Valley Basins.

In 2003, deep drilling in sec. 25, T. 27 N., R. 21 W. of the Detrital Valley Basin revealed the presence of a water-bearing zone beneath the primary water-bearing zone in the Basin-Fill aquifer. This lower zone occurs at a depth of about 1,380 ft below land surface. At this well site, driller's logs indicate that the lower water-bearing zone (1) consists of alluvial sediments interbedded with volcanic flows, (2) is separated from the upper water-bearing zone by about 800 ft of non water-bearing clay and gypsum, and (3) is confined with about 1,000 ft of pressure head at the time of drilling. Since the time this well was drilled, a small number of additional wells have been completed in the lower water-bearing zone in the same vicinity. Water-level altitudes are higher in the lower water-bearing zone than in the upper, primary water-bearing zone and range from 2,074 to 2,195 ft. The lateral extent of the lower water-bearing zone is unknown, however, well-log data from test holes indicate the clay and gypsum layer may extend across the northern two-thirds of the basin, and therefore, the lower water-bearing zone may be present in that area as well.

The northern part of Detrital Valley Basin generally lacks wells for defining ground-water levels and movement in detail. A comparison of water levels from wells in T. 29 N., R. 21 W. and those in wells near Lake Mead, however, indicate ground-water movement is towards the north and that the gradient, about 60 ft/mi, is steep in this area compared to the central and southern parts of the basin.

Ground-water altitudes in the Basin-Fill aquifer along the axis of Hualapai Valley Basin range from greater than 2,700 ft in the southern part of the valley to less than 1,900 ft in the northern part of the valley (pl. 1). Although there are no water-level data available for the area adjacent to Lake Mead in Hualapai Valley Basin, ground-water altitudes are probably comparable to lake elevations, as is the case in Detrital Valley Basin. Depth-to-water measurements range from less than 100 ft below land surface in the mountains, to as much as 959 ft below land surface in the southern part of the basin.

In the southern part of Hualapai Valley Basin, ground-water altitude data indicate the presence of a cone of depression in T. 22 N., R. 16 W., northeast of Kingman (pl. 1). While ground water in that area flows towards the cone of depression, ground-water movement near Valle Vista is northward to the east of Long Mountain. Ground water likely flows northward on the western side of Long Mountain as well, however, flow is through granitic, metamorphic, and volcanic rocks and the overlying basin fill in that area. The water-level altitude in a well in sec. 2 of T. 22 N., R. 16 W. was 2,808 ft (pl. 1), and may mark the northern end of the cone of depression. The well was drilled as a monitoring site for the City of Kingman's sewage-treatment facility, and the elevated water-level altitude may also reflect mounding of water from recharge occurring at the facility.

Ground water flows into the central part of Hualapai Valley Basin from the southern part and also from the area where Truxton Wash enters the basin near Hackberry (pl. 1). The potentiometric surface in the central part of Hualapai Valley Basin, which contains Red Lake, is relatively flat with a gradient of about 7 ft per mile and ground-water altitudes between 2,514 and 2,402 ft. The area contributing surface flow into Red Lake playa is a closed basin and retains flow as a result of a low topographic divide near Pierce Ferry Road. Ground-water in the central part of Hualapai Valley Basin, however, flows north underneath the topographic divide.

Ground water flows into the northern part of Hualapai Valley Basin from the central part and also from a small valley northeast of Dolan Springs (pl. 1). Ground-water flows north towards Lake Mead. Similar to conditions in the Detrital Valley Basin, the potentiometric-surface gradient in northern Hualapai Valley Basin, about 39 feet per mile, is much steeper than in the southern and central parts of the basin.

Ground-water altitudes for the Basin-Fill aquifer along the axis of Sacramento Valley Basin range from greater than 2,100 ft in the northern part of the basin to less than 500 ft in the southern part of the basin near the Colorado River (pl. 1). Depth-to-water measurements range from less than 100 ft below land surface in the mountains and along Sacramento Wash near the Colorado River, to as much as 1,229 ft below land surface in the northern part of the basin.

Ground-water movement in Sacramento Valley Basin north of Yucca (T. 17 N., R. 18 W.) generally is toward the basin center and south along the basin axis. Ground-water altitude data indicate that the potentiometric-surface gradient is relatively steep from the Santa Claus area to Golden Valley, about 55 ft per mile, and relatively shallow from Golden Valley to Yucca, about 11 ft per mile. The ground-water altitude of 2,479 ft for a well in T. 23 N., R. 18 W. is elevated compared to the altitude of water in nearby wells also developed in the Basin-Fill aquifer. This difference in water levels was also present in 1990 (Rascona, 1991).

The potentiometric-surface gradient in the Dutch Flat area is relatively flat with a large area containing several wells with ground-water altitudes of about 1,400 ft. Ground-water movement in Dutch Flat is northwestward toward Sacramento Wash, near the Buck Mountains, and then primarily westward towards the Colorado River. The potentiometric surface gradient is relatively steep from the area near the Buck Mountains to the Colorado River, about 45 ft per mile.

Long-Term Water-Level Changes

Water levels from 1943 through 2006 in the Detrital, Hualapai, and Sacramento Valley Basins have fluctuated in some areas and remained steady in other areas. Long-term water-level changes were evaluated from selected ground-water level data (appendixes 3 and 4) collected during this period for selected wells throughout the study area. The analy-

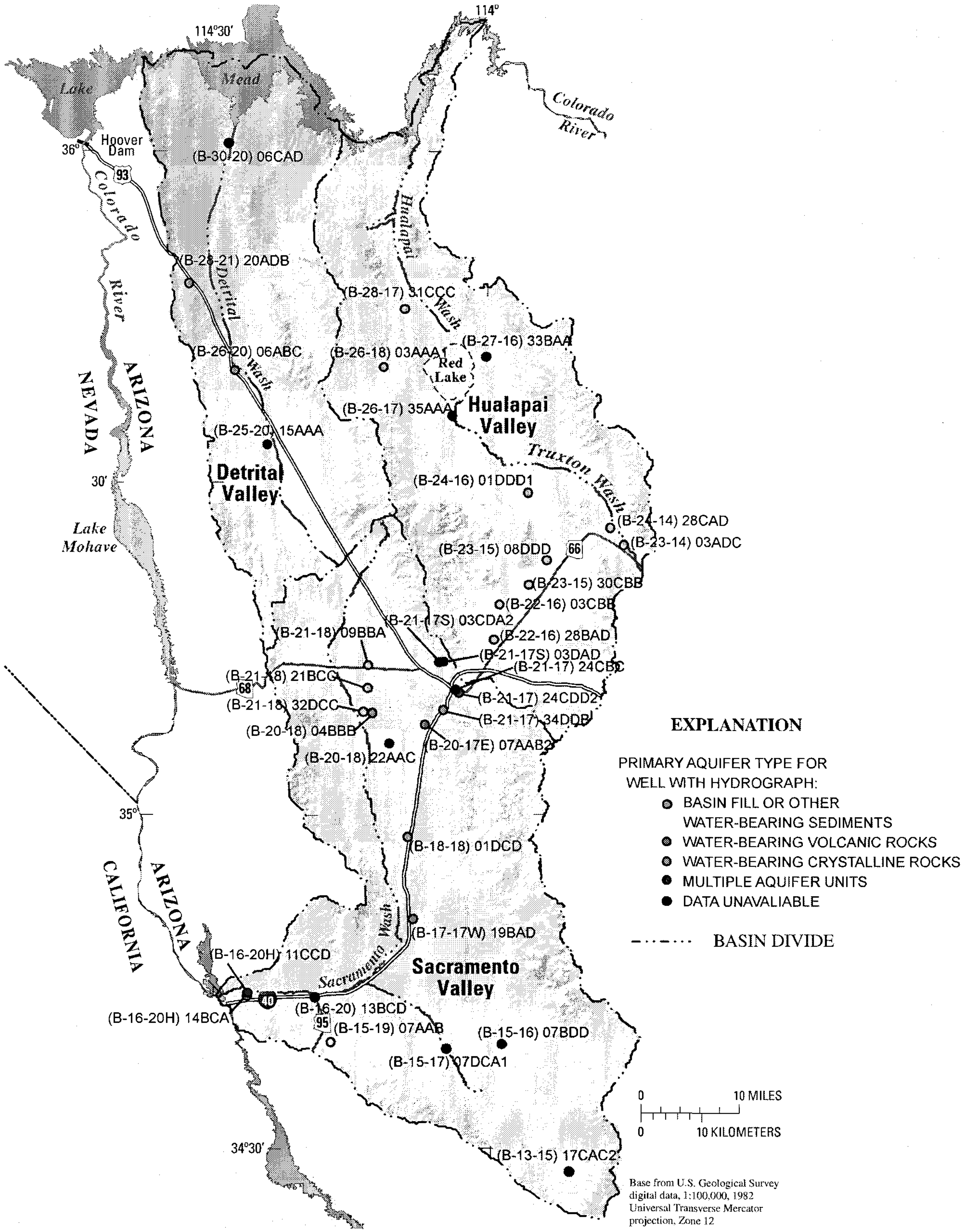


Figure 2. Location of wells with hydrographs, Detrital, Hualapai, and Sacramento Valley Basins, Mohave County, Arizona.

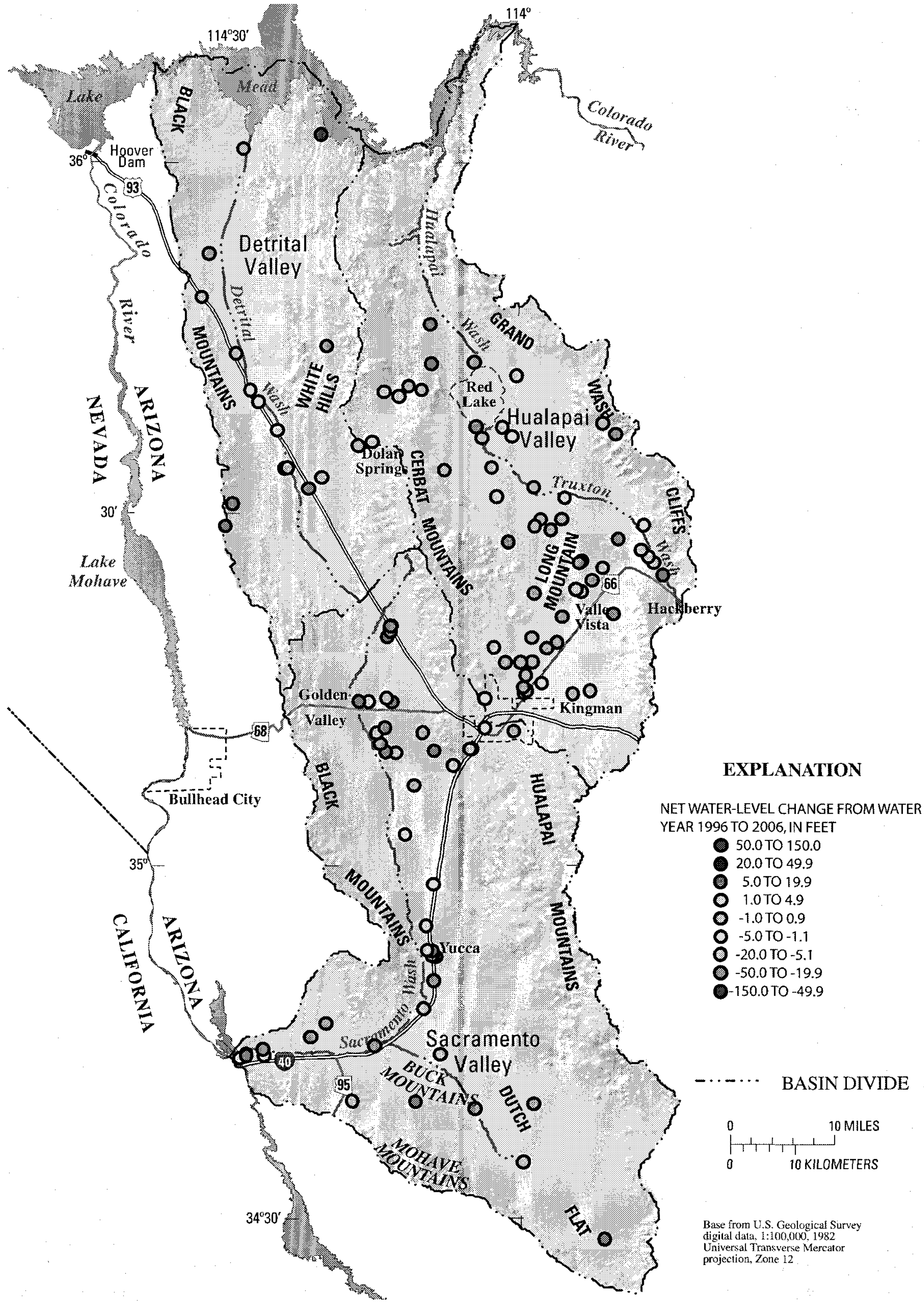


Figure 3. Net water-level change from water year 1996 to 2006 for selected wells, Detrital, Hualapai, and Sacramento Valley Basins, Mohave County, Arizona.

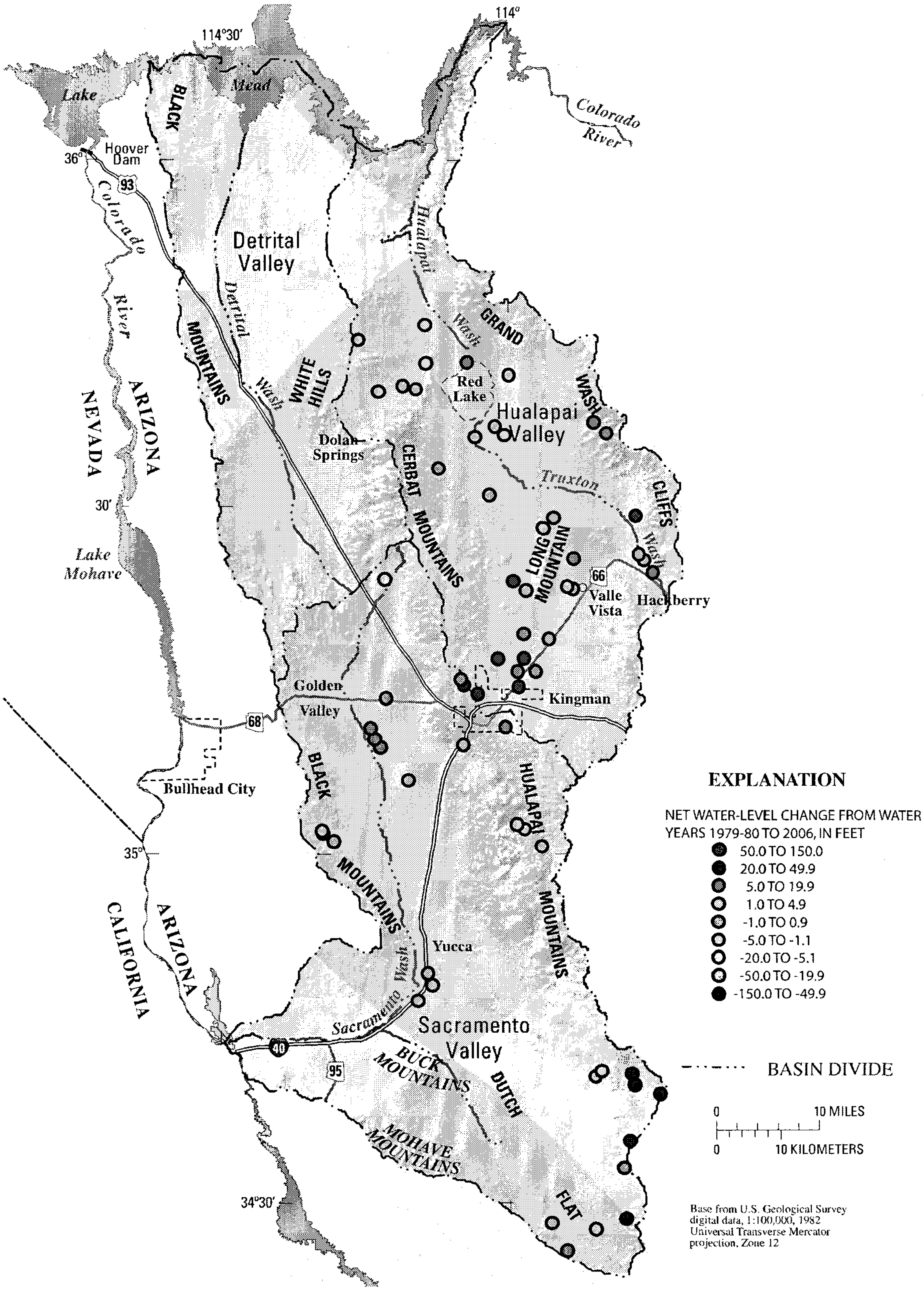


Figure 4. Net water-level change from water years 1979–80 to 2006 for selected wells, Detrital, Hualapai, and Sacramento Valley Basins, Mohave County, Arizona.

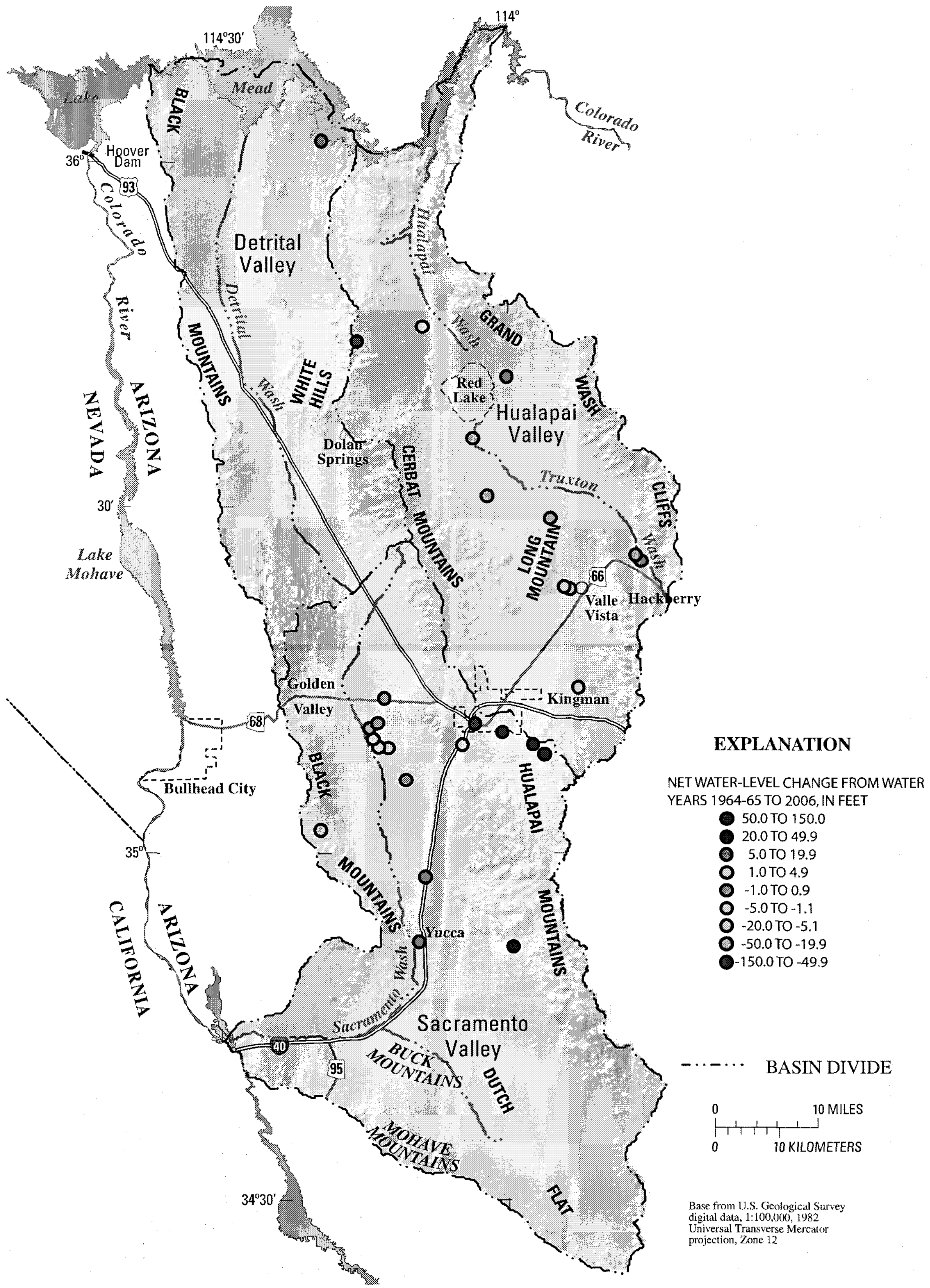


Figure 5. Net water-level change from water years 1964–65 to 2006 for selected wells, Detrital, Hualapai, and Sacramento Valley Basins, Mohave County, Arizona.

sis includes evaluation of hydrographs of selected data for 35 wells (fig. 2; appendix 4) and evaluation of net water-level change data for periods between 1996 and 2006 (fig. 3; appendix 3), 1979–80 and 2006 (fig. 4; appendix 3); and 1964–65 and 2006 (fig. 5; appendix 3).

With some exceptions, water levels generally have remained the same or have risen since the 1980s in areas monitored in the Detrital Valley Basin. Three of the four wells with hydrographs [(B-28-21)20ADB, (B-26-20)06ABC, and (B-25-20)15AAA] indicate water levels have gradually increased as much as 3.5 ft during their period of record, which began in the early to mid-1980s (fig. 6). The fourth hydrograph, for well (B-30-20)06CAD, indicates water levels have remained about the same at the well. Net water-level changes in 12 wells from 1996 to 2006 indicated either no change, or increasing water levels by as much as 11.8 ft (fig. 3, table 2). In four wells, however, net water-level changes for this period decreased, the largest decrease being -66.7 ft for a well near Lake Mead (fig. 3, table 2). This large decrease, in part, is likely due to a decrease in lake levels of about 54 ft that occurred during the same time period (Bureau of Reclamation, 2007). For many of the wells, water-level changes from 1996 to 2006 were small, between declines of 0.9 ft and rises of 2.0 ft, as indicated by the 25th and 75th percentiles for net water-level change (table 2). Net water-level change data were available for only one well for 1964–65 to 2006, which was an increase of 6.2 ft (fig. 5).

Long-term water-level changes vary for different areas in Hualapai Valley Basin. Summary statistics for the three net water-level change periods for the three basins indicate that the most extreme changes observed, a 134.8 ft decline and a 107.8 ft rise, were for two wells in Hualapai Valley Basin for 1979–80 to 2006 (table 2). These two wells are completed in fractured volcanic and granitic rocks, and the large fluctuations are likely due to low storage coefficients associated with

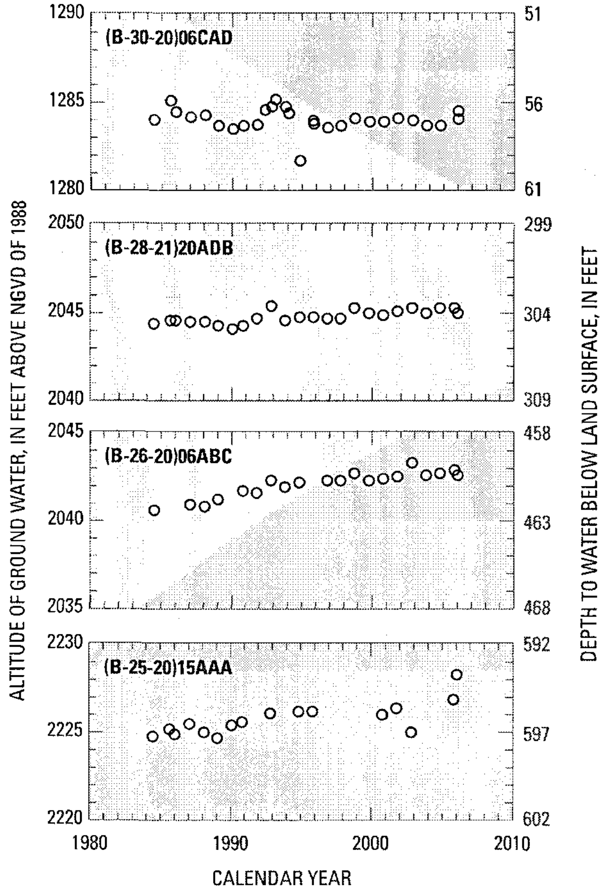


Figure 6. Hydrographs of water levels in selected wells of Detrital Valley Basin, Mohave County, Arizona.

Table 2. Summary statistics for net water-level change from water years 1996 to 2006, 1979–80 to 2006, and 1964–65 to 2006 for selected wells in Detrital, Hualapai, and Sacramento Valley Basins, Mohave County, Arizona.

Period	Number of wells	Summary statistics for net water-level change, in feet					
		Minimum	25th percentile	Mean	Median	75th percentile	Maximum
Detrital Valley Basin							
1996 to 2006	16	-66.7	-0.9	-4.9	1.0	2.0	11.8
Hualapai Valley Basin							
1996 to 2006	55	-34.8	-8.5	-4.4	-0.6	1.4	16.3
1979–80 to 2006	34	-134.8	-8.7	-7.6	-3.9	2.5	107.8
1964–65 to 2006	11	-30.5	-11.8	-3.4	1.2	3.0	28.0
Sacramento Valley Basin							
1996 to 2006	45	-8.2	-0.3	1.2	0.5	2.4	18.8
1979–80 to 2006	30	-38.1	0.6	6.9	3.1	12.1	47.8
1964–65 to 2006	16	-52.7	-16.5	-0.9	-4.5	14.6	43.7

water-bearing consolidated-rocks. For many of the wells, however, water-level changes for the three periods were small and between declines of 11.8 ft and rises of 3.0 ft, as indicated by the 25th and 75th percentiles for net water-level change (table 2).

For the area north of Long Mountain, hydrographs (fig.7) for wells (B-28-17)31CCC, (B-27-16)33BAA, (B-26-18)03AAA1, (B-26-17)35AAA, and (B-24-16)01DDD1 generally indicate small, steady water-level increases of up to about 8.0 ft over the span of their hydrographs—all of which extend from 2006 to 1980, and one of which extends back to 1958. With a few exceptions, net water-level changes for 1996–2006, 1979–80 to 2006, and 1964–65 to 2006 indicate either no change or rising water levels for most wells in this same area (figs. 3–5). For 1996 to 2006 and 1979–80 to 2006, however, net water-level changes in four wells northeast of Dolan Springs indicate declining water levels (figs. 3 and 4).

Hydrographs and net water-level changes for the area north of Hackberry show some significant water-level declines, although some water-level rises do occur. The hydrograph for (B-24-14)28CAD shows a steady decline of about 60 ft from 1944 to 1991 and fluctuating water levels thereafter (fig. 7). The hydrograph for (B-23-14)03ADC shows about a 40 ft decline from 1944 to the mid-1950s, followed by a net rise of 25 ft to 2006 (fig. 7). Wells in this area with net water-level change data also show a mix of water-level declines and rises (figs. 3–5).

Hydrographs and net water-level changes for the Hualapai Valley Basin south of Long Mountain generally indicate that water levels are remaining the same or declining. While the hydrograph for (B-23-15)30CBB shows steady water-level conditions for 1990 to 2006, hydrographs for (B-22-16)03CBB and (B-22-16)28BAD show steady water-level declines of about 34 and 50 ft, respectively, from 1980 to 2006 (fig. 7). Net water-level changes for most wells in this area also indicate declining or unchanging water levels for all three periods (figs. 3–5). These water-level declines are consistent with the cone of depression in the potentiometric surface that was previously discussed for the southwestern part of this area near Kingman.

Long-term water-level changes vary for different areas in Sacramento Valley Basin. For many of the wells, water-level changes during the three periods were small and between declines of 16 ft and rises of 15 ft, as indicated by the 25th and 75th percentiles for net water-level change (table 2). In the Kingman area of the Sacramento Valley Basin, hydrographs for wells (B-21-17)03DAD and (B-21-17)03CDA2 show sharp declines of 12 and 55 ft, respectively, from 1943 to the mid-1950s (fig. 8). Although the wells are near each other, these water-level changes may vary as a result of different storage coefficients for the rock in which they are completed. Hydrographs show an overall decline of about 10 ft from 1944 to 1978 in well (B-21-17)24CDD2, and an additional 18-ft decline from 1978 to 2006 in nearby well (B-21-17)24CBC; both wells are completed in volcanic rocks. Well (B-21-17)34DDB is down-gradient of the four previously mentioned wells in the Kingman area and is completed in the basin fill; the hydrograph for this well shows a relatively steady water level (fig. 8). Net water-level changes for wells in the Kingman area of Sacramento Valley are mixed, however, the declines are smaller than those observed to the northwest in Hualapai Valley (figs. 3–5).

In the north-central part of Sacramento Valley Basin near Golden Valley, hydrographs for wells (B-21-18)32DCC and (B-20-18)04BBB show water levels generally declined about 30 ft from 1964 to the mid-1970s and then generally rose about 15 ft by 2006 (fig. 8). Net water-level changes in nearby wells are consistent with this pattern for all 3 periods (figs. 3–5). Net water-level changes for 1964–65 to 2006 indicate declines ranging between 5.0 and 50 ft for 7 wells in this area (fig. 5). The hydrograph for (B-20-18)22AAC shows a steady decline in water level from 1964 to about 1990 and a fairly steady water level through 2006 (fig. 8).

In the Yucca and Dutch Flat areas, hydrographs for (B-18-18)01DCD, (B-17-17W)19BAD, (B-15-16)07BDD, (B-15-17)07DCA1, and (B-13-15)CAC2, which extend from at least 1986 to 2006 (fig. 8), show small, steady rises in water levels over time. Net water-level changes in these areas are small for 1996–2006, generally between declines of 5.0 ft and rises of 5.0 ft (fig. 3). Net water-level change data in these areas for 1979–80 to 2006 indicate rising or unchanging water levels in all but two wells (fig. 4).

In the southern part of Sacramento Valley Basin, west of the Buck Mountains, hydrographs show fluctuating water levels, with the lowest water levels typically occurring between 1990 and 2000, and a vaguely defined decline during the period of record (fig. 8). Net water-level changes for wells in this area indicate unchanging conditions or declines of less than 5.0 ft for 1996–2006 (fig. 3).

Summary

Ground-water levels for water year 2006 and their change over time in the Detrital, Hualapai, and Sacramento Valley Basins of northwestern Arizona were examined in this study. The potentiometric surface is generally parallel to topography, and ground-water movement is generally from the mountain front toward the basin center and then along the basin axis toward the Colorado River or Lake Mead. Water levels observed over time in Detrital, Hualapai, and Sacramento Valley Basins have fluctuated from 1943 through 2006. Small water-level rises, typically less than 5.0 ft, were found to occur for recent decades in parts of all three basins. Water-level declines, however, were found in the Kingman area, an area northwest of Hackberry, an area northeast of Dolan Springs, and in the Golden Valley area.

EXHIBIT 6

WorleyParsons 2008 Report # FPLS-0-LI-450-0001
Beacon Solar Energy Project
Dry Cooling Evaluation

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[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:

<u>Parabolic Trough Plant: 1450 psig / 710 F / 710 F Rankine cycle</u>

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	

<u>Central Receiver Plant: 1850 psig / 950 F / 950 F Rankine cycle</u>

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.

5% reduction in gross output 70F - 108F

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

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)

Tim Hogan

From: Denise Bensusan@hughes.net [denisebensusan@hughes.net]
Sent: Sunday, June 06, 2010 11:14 AM
To: HOGAN
Subject: Fw: Beacon Solar?

I wanted to verify that Beacon Solar is REQUIRED to use recycled or effluent to go wet cooled! SEE BELOW

----- Original Message -----
From: Chetalo, Frank
To: Denise Bensusan@hughes.net
Sent: Sunday, June 06, 2010 10:52 AM
Subject: RE: Beacon Solar?

Denise,

Our permit requires us to only use recycled or effluent water for cooling.

From: Denise Bensusan@hughes.net [mailto:denisebensusan@hughes.net]
Sent: Saturday, June 05, 2010 10:00 PM
To: Chetalo, Frank
Subject: Re: Beacon Solar?

If recycled or effluent water is not available will you be allowed to go wet-cooled????? THANKS :)

> ----- Original Message -----
> **From:** Chetalo, Frank
> **To:** Russell, Meg ; 'denisebensusan@hughes.net' ; Busa, Scott
> **Sent:** Saturday, June 05, 2010 5:59 PM
> **Subject:** RE: Beacon Solar?
>
> Denise,
>
> Beacon Solar is currently being permitted as a wet-cooled solar thermal power plant.
> The plant has the option to use recycled water obtained from the city of Californa City or the town of Rosamond for cooling purposes.
>
> Please contact me should you have any further questions.
>
> Frank Chetalo
> Solar Development
> 561-691-7277
>
> ---
>
> **From:** Russell, Meg
> **Sent:** Tuesday, June 01, 2010 6:07 PM
> **To:** 'denisebensusan@hughes.net'; Chetalo, Frank; Busa, Scott
> **Subject:** Re: Beacon Solar?
>
> Frank/Scott,
>
> Can you address Denise's question?
> Best regards,
> Meg

Meg E. Russell
Project Manager
NextEra Energy Resources LLC
Ofc: 561.304.5609
Cell: 561.301.9617

From: Denise Bensusan@hughes.net <denisebensusan@hughes.net>
To: Russell, Meg
Sent: Tue Jun 01 13:20:18 2010
Subject: Beacon Solar?

Hi meg,

Could you tell me if Beacon Solar will indeed be a DRY-cooled solar power plant?

Thank You,

Denise
Denise Bensusan

CONTACT INFO:
denisebensusan@hughes.net
http://speakoutarizona.com/
Main: 928-692-6933
Fax: 928-692-6993

"The world is not dangerous because of those who do harm, but because of those who look at it without doing anything." - Albert Einstein
" Never doubt that a small group of thoughtful, committed citizens can change the world; indeed, it's the only thing that ever has." - Margaret Mead in response to Robert Moses revitalization plan for Lower Manhattan.

Please consider the environment before printing this email.

Denise
Denise Bensusan

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"The world is not dangerous because of those who do harm, but because of those who look at it without doing anything." - Albert Einstein
" Never doubt that a small group of thoughtful, committed citizens can change the world; indeed, it's the only thing that ever has." - Margaret Mead in response to Robert Moses revitalization plan for Lower Manhattan.

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EXHIBIT 7

The Great Spirit created Man and Woman in his own image. In doing so both were created as equals. Both depending on each other in order to survive. Great respect was shown for each other; in doing so, happiness and contentment was achieved then, as it should be now.

The connecting of the Hair makes them one person: for happiness or contentment cannot be achieved without each other.

The Canyons are represented by the purples in the middle *ground. where the people were* created. These canyons are Sacred, and should be so treated at all times

The Reservation is pictured to represent the land that is ours, treat it well.

The Reservation is our heritage and the heritage of our children yet unborn. Be good to our land and it will continue to be good to us.

The Sun is the symbol of life, without it nothing is possible - plants don't grow - there will be no life - nothing. The Sun also represents the dawn of the Hualapai people. Through hard work, determination and education, everything is possible and we are assured bigger and brighter days ahead.

The Tracks *in the middle represent the coyote* and other animals which were here before us.

The Green around the symbol are pine trees, representing our name Hualapai - PEOPLE OF THE TALL PINES -

Hualapai Tribal Nation

Department of Planning & Economic Development

P.O. Box 179/941 Hualapai Way, Peach Springs, Arizona 86434

Phone (928) 769-2216 Ext. 104 • Fax (928) 769-1063

hualapaiplanning@citlink.net

Comments; Department of Energy-Western Area Power Administration-Phoenix Arizona, August 24-09

Re: Hualapai Solar-340 megawatt –concentrated solar-wet cooled- Kingman Arizona area

Traditionally the Tribe has always been conscientious environmental stewards of their ancestral land and this includes the whole Hualapai Valley that this project is proposed in. The impacts and Cultural Concerns of the Power Plant are described by the Hualapai Tribe T.H.P.O.

Environmental and long term impacts to this style of project are also a concern. While solar energy is the absolute best energy source for meeting Federal mandates and State Renewable Energy Portfolio Standards, the water consumption required in this full wet cooled power plant is irresponsible to approve when dry cooled or hybrid technology is available to use with minimal energy production loss. All Federal Agencies including the Hualapai Tribe are required to use B.A.C.T., Best Available Current Technology including L.E.E.D., Leadership Energy Environmental Design, in deploying new capital projects. The Hualapai Tribe has exceeded L.E.E.D.in many cases and continues to excel in complying with responsible Environment Design and local Environmental stewardship.

The United States Congress requested of U.S. Department of Energy a, "Concentrating Solar Power Commercial Application Study: Reducing Water Consumption of Concentrating Solar Power Electricity Generation". Please reference this whole 24 page report , page 5 last paragraph "Air cooling [dry] 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." The document is designed to enlighten and empower agencies to understand that we can embrace the new solar technology and still be responsible stewards to our Natural Resources, including the protection of the unnecessary waste of our valuable underground water resources .Please require this applicant to use the Department of Energy's recommendations in Air cooling technology that are part of current water conservation measures. By not requiring them to be dry cooled is like allowing a new car to be built without a catalytic converter because it will get better gas mileage. We simply do not do that anymore. Please recognize that in the Mohave County General Plan, policy requires dry cooling for power plants within its County and it violates some Arizona State law to give approval action against a County Plan. All energy projects when looked at from and especially from a N.E.P.A. perspective have this responsibility.

The Hualapai Tribe has asked the applicant to participate in a regional area transmission interconnect meeting to consider best benefits for all new planned projects in the area, including and especially renewable projects. Four new projects are proposed in the immediate area including the Hualapai Tribes proposed 150 megawatt wind farm. We have not heard back from them on this and believe it is significantly important to have this regional collaborative planning to consider joint cost saving and good regional long range energy development planning. We request these meeting for this planning be part of the approval process and be administered by W.A.P.A with reasonable accountability and benefits marked.

.

We thank you for the opportunity to give this input and look forward to the exciting new times in this paradigm shift to new clean renewable energy development .

Respectfully Submitted

Jack Ehrhardt

Jack Ehrhardt Director

EXHIBIT 8

Jun. 01, 2009

Lake level trigger for pipeline project

Another 23-foot drop would bring water authority action

By HENRY BREAN
LAS VEGAS REVIEW-JOURNAL

Opponents of a proposed pipeline to tap groundwater across eastern Nevada now have one more way to fight the project: Pray for the drought to end on the Colorado River.

For the first time, the Southern Nevada Water Authority has established a direct link between its multibillion-dollar pipeline project and the shrinking water level at Lake Mead.

Actually it's more than a link; it's a trigger.

If Lake Mead's elevation falls another 23 feet, the water authority board will be asked to give the official go-ahead to construct the pipeline.

The lake trigger is the newest addition to the authority's Water Resource Plan, which plots how the valley's wholesale water supplier expects to keep local taps running amid unprecedented drought on the Colorado.

Board members have already approved the pipeline concept and signed off on ongoing efforts to secure water rights and environmental permits, but they have never actually voted to build the project.

That decision will come if, or perhaps when, the surface of Lake Mead sinks to elevation 1,075, a low-water mark not seen since 1937 when the reservoir was being filled for the first time.

Water authority General Manager Pat Mulroy doesn't know when the trigger point might be reached.

Current projections by the U.S. Bureau of Reclamation call for Lake Mead to remain above 1,075 for the next two years at least. The closest it is expected to come is in July, when the reservoir is projected to slip below elevation 1,092 for the first time since March 1965.

The problem, Mulroy said, is that bureau projections are based on average flow, and the Colorado has been anything but average over the past 10 years.

Between 1999 and 2008, the river has seen about 66 percent of its normal inflow, most of which comes from melting snow in the Rocky Mountains. Over that same period, lakes Mead and Powell, the two largest man-made reservoirs in the United States, lost about half their total volume.

Elevation 1,075 could arrive quickly if the drought deepens, Mulroy warned. "It could be next year."

The trigger point was set at 1,075 to give the agency enough time to reach its closest groundwater holdings in rural Nevada, Mulroy said.

If the lake level falls to 1,050 feet above sea level, the authority will be forced to shut down one of the two intakes it uses to draw about 90 percent of the valley's drinking water from the reservoir.

The surface of Lake Mead now stands about 1,098 feet above sea level. The last time it was that low was April 1965, when much of the Colorado River's flow was being withheld upstream to fill Lake Powell for the first time.

Mulroy said it will take about three years to build a pipeline from Las Vegas to Delamar and Dry Lake valleys, the first two Lincoln County basins from which groundwater will be drawn.

From there, the pipeline is expected to push into Cave Valley in Lincoln County and Spring Valley in White Pine County.

The authority also has applied for permits in Snake Valley that would allow it to pump more than 16 billion gallons of groundwater a year, enough to serve about 100,000 average Las Vegas homes. A state hearing on those applications is tentatively set for September 2011.

The groundwater project is expected to take 10 to 15 years to build, Mulroy said.

When it is done, the network of pipes, pumps and reservoirs is expected to stretch about 300 miles north and cost between $2 billion and $3.5 billion, according to authority cost estimates now several years old.

Opponents of the project expect the scheme to cost billions of dollars more and deliver less water than the authority expects. Some fear that large-scale groundwater pumping in the arid valleys of eastern Nevada would threaten wildlife and the livelihoods of ranchers and farmers.

The authority's 2009 Water Resource Plan, which the board adopted on May 21, calls for Las Vegas to eventually tap 134,000 acre-feet of groundwater a year from eastern Nevada.

The plan calls for that water -- enough for almost 270,000 homes -- to be put to use by 2020, though it "may be needed sooner if drought conditions persist or intensify," the document states.

Critics argue that the drought is used as a smokescreen for the pipeline's real purpose: to fuel unfettered development in Southern Nevada.

Bob Fulkerson is executive director of the Progressive Leadership Alliance of Nevada, an advocacy group that has come out against the groundwater development project. He said the new trigger point seems "arbitrary" and a little suspicious to him.

"It could be just a Trojan Horse to allow more unrestrained growth in Las Vegas," Fulkerson said.

"If there's going to be a trigger, why not a trigger for curbing irresponsible water waste and growth?"

Of course, authority board members could always vote not to build the pipeline when the time comes.

Mulroy said the board's decision will come down to a question of risk, as in can the community risk losing access to some of its Lake Mead supply before the pipeline goes on line.

Elevation 1,075 is significant for another reason. It is the legal threshold for a shortage on the Colorado River, a federal designation that would force Nevada and Arizona to reduce the amount of water they pull from the river.

Nevada's share of such a shortage would be 13,000 acre-feet a year, roughly the amount used by 26,000 average households. Arizona would be shorted more than 10 times that amount.

Water authority officials long have said the pipeline is not about sustaining growth, but protecting the community from extended drought on the Colorado River.

In that respect, the new trigger point seems like good news for even the pipeline's staunchest opponents. It means the project might never be built so long as the river rebounds and Lake Mead remains above 1,075.

Mulroy isn't optimistic about that. As chief of the agency charged with keeping water flowing to Las Vegas, she gets paid to plan with pessimism.

"If we can avoid building it, we won't build it," Mulroy said of the pipeline. "But we haven't had a lot of luck on the Colorado River lately."

Contact reporter Henry Brean at hbrean @reviewjournal.com or 702-383-0350.

EXHIBIT 9

ADEQ
Arizona Department of Environmental Quality

Fact Sheet

Aquifer Protection Permit #P-106051
Place ID 987, LTF 48583
Hilltop Tertiary Wastewater Treatment Plant

The Arizona Department of Environmental Quality (ADEQ) proposes to issue the Aquifer Protection Permit for the subject facility that covers the life of the facility, including operational, closure, and post-closure periods unless suspended or revoked pursuant to A.A.C. R18-9-A213. This document gives pertinent information concerning the issuance of the permit. The requirements contained in this permit will allow the permittee to comply with the two key requirements of the Aquifer Protection Program: 1) meet Aquifer Water Quality Standards at the Point of Compliance; and 2) demonstrate Best Available Demonstrated Control Technology (BADCT). The purpose of BADCT is to employ engineering controls, processes, operating methods or other alternatives, including site-specific characteristics (i.e., local subsurface geology) to reduce discharge of pollutants to the greatest degree achievable before they reach the aquifer, or to keep pollutants from reaching the aquifer.

I. FACILITY INFORMATION

Name and Location

Name of Permittee:	City of Kingman
Mailing Address:	3700 East Andy Devine Avenue Kingman, AZ 86041
Facility Name and Location:	Hilltop Tertiary Wastewater Treatment Plant 5925 East Highway 66 Kingman, Arizona 86401 Mohave County

Regulatory Status

An APP Application for this facility was received by ADEQ on September 22, 2008. At the time of permit issuance, there are no active Notices of Violation (NOVs) for this facility.

Facility Description

The City of Kingman is authorized to operate Hilltop Tertiary Wastewater Treatment Plant (WWTP), a 1.0 million gallons per day (mgd) facility. This facility will apply tertiary treatment to a portion of the secondary treated effluent produced by Hilltop WWTP, which operates under APP No. P-100611. The Hilltop Tertiary WWTP treatment process will use tertiary filters, a chlorine disinfection system, and an effluent pump station.

Hilltop Tertiary WWTP effluent will be beneficially reused under a valid reclaimed water permit. Any effluent not delivered for beneficial reuse will be discharged to the Hilltop WWTP equalization basin, where it will be mixed with secondary treated effluent for discharge under APP No. P-100611. The mixed effluent will either be discharged to Mohave Wash by Hilltop WWTP under a valid Arizona Pollutant Discharge Elimination System (AZPDES) permit (No. AZ0025844), or pumped to the Hilltop WWTP wetlands and surface infiltration basins.

It is important to note that there is no direct connection between the pipe delivering tertiary treated wastewater from Hilltop Tertiary WWTP (P-106051) to Hilltop WWTP (P-100611) and the Hilltop WWTP AZPDES outfall to Mohave Wash. In other words, it is not physically possible for a separate stream of tertiary treated effluent to be discharged to Mohave Wash.

Hilltop Tertiary WWTP will produce reclaimed water meeting Class A+ Reclaimed Water Standards (A.A.C. R18-11, Article 3) that may be delivered for beneficial use under a valid reclaimed water permit under A.A.C. R18-9, Article 7. Reclaimed water delivered for beneficial reuse will be disinfected by chlorination.

The depth to groundwater is approximately 415 to 490 feet below the ground surface, and the direction of groundwater flow is to the south-southwest.

Hilltop Tertiary WWTP is designed and constructed according to plans approved by the ADEQ APP and Reuse Unit.

II. BEST AVAILABLE DEMONSTRATED CONTROL TECHNOLOGY (BADCT)

Hilltop Tertiary WWTP is designed to meet the treatment performance criteria for new facilities as specified in R18-9-B204.

III. HYDROGEOLOGIC SETTING

Geology

The Site is located within and along the southern edge of the Hualapai Valley. The Hualapai Valley is an elongated, north-south trending alluvial basin. The Cerbat Mountains bound the Hualapai Valley on the west and the Music Mountains and Grand Wash Cliffs bound the valley on the east. Mohave Wash, an ephemeral wash, begins in and drains north of Kingman, then flows northward parallel with the Hualapai axis, through the Hilltop Tertiary WWTP property. Mohave Wash eventually drains into Red Lake, which is mostly dry.

Surface elevations across the Hualapai Valley range from 7,150 feet above mean sea level (amsl) in the Cerbat Mountains to approximately 3,100 feet amsl in the valley floor and 6,500 feet amsl in the Grand Wash Cliffs. The Hualapai Valley floor generally slopes downward toward the north. The Site is located just east of the gently sloping alluvial fan that extends from the base of the Cerbat Mountains. Surface elevations across the Site range from approximately 3,230 to 3,240 feet amsl.

Hydrology

The Hualapai Valley marks the transition between the Mohave Desert and the Colorado Plateau. The valley is bounded on the west by the Cerbat and White mountains, on the east by the Grand Wash Cliffs and Music Mountains, on the south by the Peacock and Hualapai mountains, and on the north by Lake Mead. The Hualapai Valley groundwater basin, which covers 1,820 square miles, is not within an Active management Area, as designated by the Arizona Department of Water Resources (ADWR).

The bedrock of the mountains that bound the valley consists of granitic, metamorphic, sedimentary, and volcanic rocks. In most areas, the bedrock is relatively impermeable compared to the basin fill and forms a barrier to the groundwater movement in the basin-fill aquifer. The thickness of the basin-fill sediments in the Hualapai Valley ranges from a thin veneer along the mountain fronts to more than 5,000 feet in the center of the valley. In the vicinity of the Hilltop Tertiary WWTP, the thickness of the basin-fill sediments is between 1,000 and 5,000 feet.

The basin fill in the Hualapai Valley is divided into three separate hydrologic units: older, intermediate, and younger alluvium. The older alluvium is the deepest deposit and consists of moderately consolidated fragments of rocks eroded from the surrounding mountains in a silty-clay or sandy matrix. In the southern portion of the Hualapai Valley groundwater basin, the unit is interbedded with volcanic rocks. Massive evaporite deposits occur in the older basin fill in the northern portion of the Hualapai Valley. The older alluvium is the principal aquifer in the Hualapai Valley. The intermediate alluvium consists of coarse grained sands, silts, and clays. The maximum thickness of the intermediate unit in the center of the basin is on the order of a few hundred feet. Well yields are dependable along the margins of the valley, where the unit intersects the water table. The intermediate alluvium is dry in the central part of the valley. The younger alluvium consists mainly of the pediment, stream and playa sediments, primarily silts, sands and gravel. In the northern portion of the valley, the younger alluvium also includes clastic sediments, limestone and basalt flows. The thickness of this unit in most areas of the valley is less than 50 feet.

The general groundwater flow direction in the Hualapai Valley is from the mountain to the center of the valley, then northward. Groundwater flows under the playa at Red Lake and finally enters the Colorado River at the upper end of Lake Mead. Outflow of groundwater from the Hualapai Valley is estimated to be between 2500 and 4,000 acre-feet per year.

The major source of groundwater recharge in the Hualapai Valley is streambed infiltration, estimated at 3,000 to 4,000 acre-feet per year. The main source of groundwater discharge is groundwater pumpage, mostly for stock and domestic uses by valley ranches and settlements. According to ADWR information, there are 6 wells located within ½- mile radius of Hilltop Tertiary WWTP, which consist of one domestic well and five (5) monitor wells. Depth to groundwater in monitor well MW-1 is approximately 490 feet below ground surface (bgs), whereas the depth to groundwater in MW-2 is approximately 415 feet bgs.

Based on the drilling log for MW-1, the lithology beneath the WWTP consists of medium to fine grained alluvial sediments (sandy clay) from the ground surface to 19 feet bgs. From 19 feet to approximately 460 feet bgs, sediments consist of "fairly hard conglomerate with clay" to "cemented conglomerate". A 50 foot thick clay layer ("clay with some rock") was encountered between 460 and 510 feet bgs. From 510 feet to the bottom of the bore hole, at 685 feet bgs, the sediments are describes as "conglomerate, some clay". The lithology in MW-2 shows "clay" from ground surface to 180 feet bgs, and "clay gravels" from 180 to 850 feet bgs.

IV. STORM WATER/SURFACE WATER CONSIDERATIONS

Hilltop Tertiary WWTP is located within the Hualapai Valley, which covers 1,820 square miles and marks the transition between the Mohave Desert and the Colorado Plateau. Lake Mead and the Colorado River form the Hualapai Valley's northern boundary, which is approximately 54 miles due north of the Site. There are no perennial streams within the Hualapai Valley; however, there are several ephemeral washes, which flow only in response to regionally extensive winter storms or summer thunderstorms.

A topographic divide separates the northern and southern portions of the Hualapai Valley. Truxton Wash, which originates outside of the Hualapai Valley, flows westward into the southern part of the valley into a dry lake bed (Red Lake). Mohave Wash begins in north Kingman, at the eastern edge of the foothills of the Cerbat Mountains. The wash, when it has water, flows north of Kingman, parallel with Hualapai Valley axis, through the WWTP site. The main stream channel of the Mohave Wash becomes poorly defined once it reaches the center of the Hualapai Valley, north of Long Mountain. There are no uses, no natural riparian habitats or wetlands along the Mohave Wash, and there are no designated Wild and Scenic Rivers within Mohave County.

As shown on the Flood Insurance Rate Map (FIRM), the WWTP is located within zones B and C. Zones B and C are low to moderate risk areas. According to the Federal Emergency Management Agency (FEMA), these zones are defined as areas outside the 1-percent annual chance floodplain, areas of 1% annual chance sheet flow flooding where average depths are less than 1 foot, areas of 1% annual chance stream flooding where the contributing drainage area is less than 1 square mile, or areas protected from the 1% annual chance flood by levees. No Base Flood Elevations or depths are shown within this zone.

V. COMPLIANCE WITH AQUIFER WATER QUALITY STANDARDS

Depth-to-groundwater in the vicinity of this facility is approximately 415 to 490 feet below land surface and the effluent is expected to meet Aquifer Water Quality Standards (AWQS) at the point of discharge. Most of the effluent is expected to be used for beneficial reuse and only the excess not needed for beneficial reuse will be discharged to Hilltop WWTP.

Monitoring and Reporting Requirements

Discharge monitoring and reclaimed water monitoring are required at this facility. Groundwater monitoring is not required except as a contingency action, because all of the effluent will either be reused under a valid reclaimed water permit, or be discharged under the APP for Hilltop WWTP (P-100611). Flow will be measured at a flow meter located upstream of the tertiary filters. Sampling for all other parameters will be conducted downstream of the chlorine contact basin.

Sampling Point No.	Sampling Point Identification	Latitude	Longitude
1	Flow meter located upstream of the tertiary filter	35° 17' 58" N	113° 57' 00" W
2	Downstream of the chlorine contact basin	35° 17' 59" N	113° 57' 03" W

To ensure that site operations do not violate Aquifer Water Quality Standards at the point of compliance, the permittee shall monitor the effluent daily for flow rate and *E. coli*, monthly for total nitrogen, quarterly for metals and indicator parameters, and semi-annually for volatile and semi-volatile organic compounds (see Section 4.2, Table IA in the permit).

To ensure that site operations do not violate the Reclaimed Water Quality Standards for the beneficial use of Class A+ reclaimed water, the permittee shall monitor the reclaimed water daily for flow rate, turbidity, and *E. coli*, monthly for total nitrogen, and on a monthly/suspended basis for enteric virus (see Section 4.2, Table IB in the permit).

Facility inspection and operational monitoring shall be performed on a routine basis (see Section 4.2, Table III in the permit).

Point of Compliance (POC)

The location of the POC is determined by an analysis of the Pollutant Management Area (PMA), the Discharge Impact Area (DIA), and locations and uses of groundwater wells in the area. The POC location is selected to protect off-site uses of groundwater, to verify BADCT performance, and to allow early detection of potential impact from facility discharges.

The PMA is described in ARS §49-244 as the limit projected in the horizontal plane of the area on which pollutants are or will be placed. The PMA includes horizontal space taken up by any liner, dike or other barrier designed to contain pollutants in the facility. If the facility contains more than one discharging activity, the PMA is delineated by an imaginary line circumscribing the several discharging activities. The PMA for this facility coincides with the site boundaries and includes the tertiary treatment process.

The discharge impact area (DIA) is defined by ARS §49-201.13. The DIA means the potential aerial extent of pollutant migration, as projected on the land surface, as the result of a discharge from a facility. The DIA for this facility coincides with the PMA and the site boundaries and includes the tertiary treatment process.

The hazardous/non-hazardous Point of compliance (POC) for Hilltop Tertiary WWTP is located as follows:

POC #	Descriptive Location	Latitude	Longitude
1	Directly north of the end of the discharge pipe to Hilltop WWTP	35° 17'58.40" N	113° 57'00.39" W

Groundwater monitoring is not required at the point of compliance, except as a contingency action.

VI. COMPLIANCE SCHEDULE

For each compliance schedule item listed below, the permittee must submit the required information, including a cover letter, to the Groundwater Section. A copy of the cover letter must also be submitted to the ADEQ Water Quality Compliance Section.

Description	Due by:
The permittee shall submit a signed, dated, and sealed Engineer's Certificate of Completion in a format approved by the Department that confirms that the facility is constructed according to the Department-approved design report or plans and specifications, as applicable.	Prior to discharging under this permit and within 90 days after completion of construction.

VII. OTHER REQUIREMENTS FOR ISSUING THIS PERMIT

Technical Capability

The City of Kingman has demonstrated the technical competence necessary to carry out the terms and conditions of the permit in accordance with A.R.S. § 49-243(N) and A.A.C. R18-9-A202(B). The WWTP was designed as per the design report prepared and stamped, dated, and signed (sealed) by Nancy Ash, (Professional Engineer), Brown and Caldwell Inc. dated September 16, 2008 and subsequent sealed submittals that served as additions to the design report. The permittee is expected to maintain technical capability throughout the life of the facility.

Financial Capability

The City of Kingman has demonstrated financial capability under A.R.S. § 49-243(N) and A.A.C. R18-9-A203(1) and (2). The estimated dollar amount demonstrated for financial capability is $414,600.00. The permittee is expected to maintain financial capability throughout the life of the facility.

Zoning Requirements

Hilltop Tertiary WWTP has been properly zoned for the permitted use and the permittee has complied with all zoning ordinances in accordance with A.R.S. § 49-243(O) and A.A.C. R18-9-A201(B)(3).

VIII. ADMINISTRATIVE INFORMATION

Public Notice (A.A.C. R18-9-108(A))

The public notice is the vehicle for informing all interested parties and members of the general public of the contents of a draft permit or other significant action with respect to a permit or application. The aquifer protection program rules require that permits be public noticed in a newspaper of general circulation within the area affected by the facility or activity and provide a minimum of 30 calendar days for interested parties to respond in writing to ADEQ. The basic intent of this requirement is to ensure that all interested parties have an opportunity to comment on significant actions of the permitting agency with respect to a permit application or permit.

The public notice for this permit was published in the *Kingman Daily Miner* on March 11, 2010 under Public Notice No. EWP 09540

Public Comment Period (A.A.C. R18-9-109(A))

The Department shall accept written comments from the public before a significant permit amendment is made. The written public comment period begins on the publication date of the public notice and extends for 30 calendar days. After the closing of the public comment period, ADEQ is required to respond to all significant comments at the time a final permit decision is reached or at the same time a final permit is actually issued.

Public Hearing (A.A.C R18-9-109(B))

A public hearing may be requested in writing by any interested party. The request should state the nature of the issues proposed to be raised during the hearing. A public hearing will be held if the Director determines there is a significant amount of interest expressed during the 30-day public comment period, or if significant new issues arise that were not considered during the permitting process.

A public hearing was deemed to be unnecessary for this permit.

IX. ADDITIONAL INFORMATION

Additional information relating to this permit may be obtained from:

Arizona Department of Environmental Quality
Water Quality Division - Groundwater Section - APP and Reuse Unit
Attn: Bob Manley
1110 West Washington Street, Mail Code 5415B-3
Phoenix, Arizona 85007
Phone: (602) 771-4498

EXHIBIT 10

Tim Hogan

From: Saved by Windows Internet Explorer 8
Sent: Thursday, May 13, 2010 5:11 PM
Subject: BrightSource Energy | Ivanpah
Attachments: ATT00277.css; ATT00280.css; ATT00283.css; ATT00286.css; ATT00292.css; ATT00295.css; ATT00298.gif; ATT00301.png; ATT00304.dat; ATT00307.dat; ATT00310.dat; ATT00313.dat; ATT00316.dat; ATT00319.dat; ATT00322.dat; ATT00325.dat; ATT00328.png; ATT00331.png; ATT00334.png; ATT00337.png; ATT00340.dat; ATT00343.dat; ATT00346.dat; ATT00349.dat; ATT00352.dat; ATT00355.dat

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BrightSource Energy

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Ivanpah Solar Power Complex â€“ Ivanpah, California

BrightSource is currently developing its first solar power complex in Californiaâ€™s Mojave Desert. The Ivanpah Solar Power Complex will be located in Ivanpah, approximately 50 miles northwest of Needles, California, and about five miles from the California-Nevada border. The complex will generate enough electricity to power more than 140,000 homes and reduce carbon dioxide (CO2) emissions by more than 400,000 tons per year.

Project Details

View Larger Map

The approximately 400 megawatt Ivanpah Solar Power Complex will consist of three separate plants and provide electricity to PG&E and Southern California Edison. Commencement of construction on the first plant is scheduled for the second half of 2010, following permitting review by the California Energy Commission and the Department of Interiorâ€™s Bureau of Land Management. The first plant is scheduled to come online in mid-2012.

Project Overview

- An approximately 400 megawatt solar complex using mirrors to focus the power of the sun on solar receivers atop power towers.
- The complex is comprised of three separate plants to be built in phases between 2010 and 2013, and will use BrightSource Energyâ€™s Luz Power Tower (LPT) technology.
- The electricity generated by all three plants is enough to serve more than 140,000 homes in California during the peak hours of the day.
- Located approximately 4.5 miles southwest of Primm, Nevada, in the desert on federal land managed by the Bureau of Land Management.
- When constructed, Ivanpah will be the first large-scale solar thermal project built in California in nearly two decades and the largest in the world.
- The Ivanpah Solar Energy Generating System will nearly double the amount of commercial solar thermal electricity produced in the US today.

Economic Benefits

Construction Jobs:	1,000 at peak of construction
Permanent Jobs:	86
State and Local Tax Benefits:	$400 million*
Total Construction Wages:	$250 million
Total Employee Earnings:	$650 million*
	**Based on 30 year plant life cycle*

Environmental Benefits

- Avoids 400,000 tons of CO_2 emissions per year; the equivalent of removing 70,000 cars off the road annually.
- Employs a closed-loop dry-cooling technology, which reduces water use by 90 percent. Will use 100 acre feet per year, the equivalent of 300 homesâ€™ annual water usage; and nearly 25 times less water than competing technologies.
- Cuts major air pollutants by 85% compared to new natural gas-fired power plants.
- Technology places individual mirrors onto metal poles that are driven into the ground, reducing the need for extensive land grading and using far fewer concrete pads than other technologies.

Labor-friendly Project

In December 2009, BrightSource Energyâ€™s engineering partner, Bechtel, signed a project labor agreement with the State Building and Construction Trades Council of California (SBCTC), and the Building & Construction Trades Council of San Bernardino and Riverside Counties to provide qualified, skilled craft workers for the Ivanpah project.

World Class Partners

The Ivanpah project will provide power under a 1,300 megawatt contract for Southern California Edison and a 1,310 megawatt contract with Pacific Gas and Electric company. When completed, the Ivanpah Solar Energy Generating System will nearly double the amount of commercial solar thermal electricity produced in the US today.

BrightSource has partnered with Bechtel, the worldâ€™s premier engineering, construction and project management firm, as the engineering, procurement and construction (EPC) contractor for the Ivanpah Solar Electricity Generating System. In addition, Bechtel Enterprises, the project development and financing arm of the Bechtel organization, will become an equity investor in all of the Ivanpah solar power plants.

The Ivanpah project has received a conditional commitment for a more than $1.3 billion loan guarantee by the US Department of Energy (DOE) to help fund this project. The loan is part of the DOEâ€™s Title XVII loan guarantee program, which was started in 2005 under the Energy Policy Act, to support commercially viable technology in addition to innovative renewable energy technology.

In December 2008, BrightSource signed an agreement with Siemens for the largest ever solar-powered steam turbine generator for the Ivanpah project.

Projects

- Ivanpah
- SEDC

Ivanpah Fast Facts

Download

Community Voices

Local community leaders and labor speak in support of Ivanpah. Watch the videos

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Media Inquiries: 510-250-8162

EXHIBIT 11

Tim Hogan

From: Saved by Windows Internet Explorer 8
Sent: Saturday, June 05, 2010 6:39 AM
Subject: Upper Colorado River Planning Area Hydrology - Groundwater
Attachments: ATT00219.css; ATT00234.dat; ATT00237.dat; ATT00240.dat; ATT00243.dat; ATT00246.dat; ATT00249.dat; ATT00252.dat

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Hydrology of the Upper Colorado River Planning Area - Groundwater (West Basins

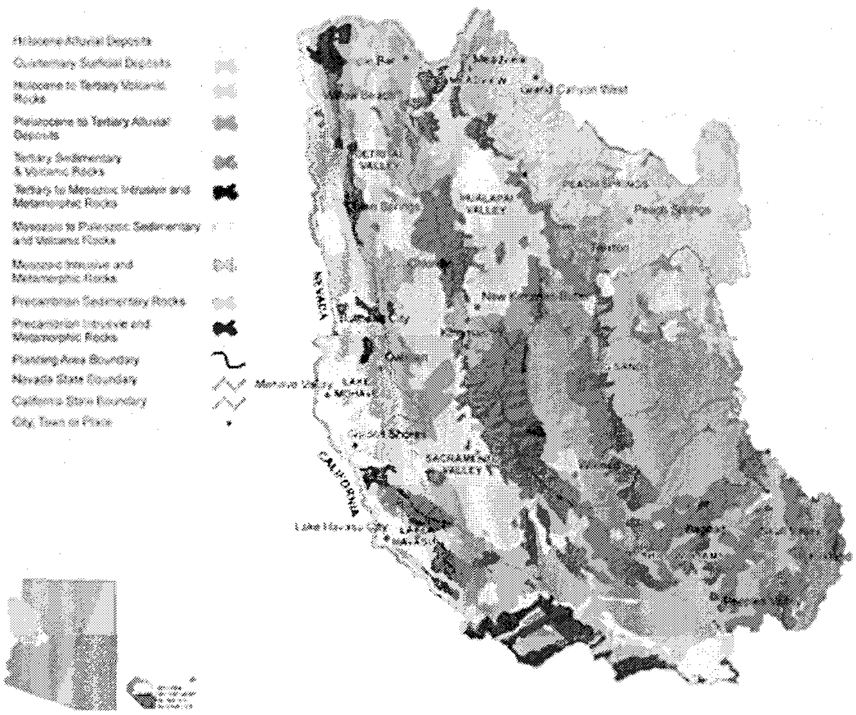


Figure 4.0-4 Surface Geology of the Upper Colorado River Planning Area

The Upper Colorado River Planning is characterized by semi-arid to alluvial basins with few per streams. Anderson, Freethey and (1992) divided the alluvial basi south-central Arizona into cate based on similar hydrologic and ge characteristics. These categories useful in describing general hydr characteristics. Although their area does not match the Departn groundwater basins exactly, the Colorado River Planning Area is inc in their study area with the except the Peach Springs Basin. Four categories identified by Anderso represented in the planning area ar discussed below: **West**, **Colorado** **Highland** and **Southeast**.

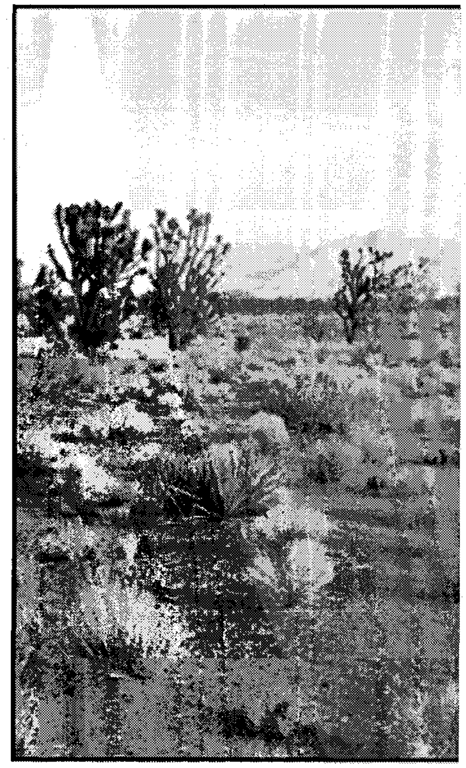
As shown in **Figure 4.0-4**, ther extensive outcrops of sedimentar volcanic rocks of varying throughout the planning area. areas of basin-fill covered by alluvi surficial deposits are found in western part of the planning primarily in the West basins.

West Basins

The West basins include the **Detrital Valley**, **Hualapai Valley**, and **Meadview** basins, most **Sacramento Valley Basin** and part of the **Bill Williams Basin** (see **Figure 4.0-2**). Ground inflow and outflow are small and there is almost no stream baseflow. These basins c extensive areas of basin fill deposits that comprise the primary groundwater bearin (aquifer).

Detrital Valley Basin

The Detrital Valley Basin is characterized by a relatively long valley whose floor slopes from 3,400 feet at the southern boundary to around 1,200 feet at Lake Mead. Groundwater occurs mostly in basin-fill material and in alluvial deposits along mountain washes. Intermediate and younger basin fill are above the water table in most areas, consequently the older basin fill aquifer is the primary water supply. In the northern part of the basin, the basin fill includes clastic (weathered) sediments, limestone, and basalt flows of the Muddy Creek and Chemehueve Formations. There are extensive evaporate deposits in the older alluvium in the northern part of the basin (Anning and others, 2007). Depth to bedrock may exceed 6,000 feet at the deepest point. A clay unit may extend from 600 to 1,400 feet below land surface (bls) in the central portions of the basin, which acts as an impediment to groundwater flow and reduces the amount of recoverable groundwater due to its low specific yield. The areal extent of this unit is not well known due to lack of data (Mason and others, 2007). Groundwater flow direction is north toward Lake Mead. At the northern end of Detrital Valley water from Lake Mead infiltrates to the basin-fill aquifer and near by groundwater levels fluctuate with the levels. Depth to water may be less than 100 feet bls in this area (Anning and others, 2007).



Detrital Valley Basin. The estimated volu
recoverable groundwater to a depth of 1,2
bls ranges from about 1.48 to 3.94 ma

Groundwater recharge is estimated at 1,000 AFA. Groundwater discharge is to springs and relatively small well withdrawals for municipal purposes. The volume of recoverable ground to a depth of 1,200 feet bls is estimated to range from about 1.48 to 3.94 maf (Maso others, 2007). The median well yield in measured wells is generally 35 gpm or less (**Tabl 5**). As shown in **Figure 4.3-6**, groundwater levels were relatively stable in wells measu 1990-91 and 2003-04, although water-level measurements for different time periods show term declines in an area northeast of Dolan Springs (Anning and others, 2007). Water qua suitable for most purposes although concentrations of radionuclides and arsenic that e drinking water standards have been measured at wells throughout the basin. (**Table 4 Figure 4.3-9**).

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Hualapai Valley Basin

The Hualapai Valley Basin trends north-northwest and is about 60 miles long, stretching fro Hualapai Mountains to Lake Mead. The basin has relatively deep, sediments divided into units. The younger basin fill includes recent streambed deposits in Hualapai Valley and all along mountain canyons. This unit yields relatively small volumes of water to stock domestic wells. The intermediate basin fill, which is composed of coarse-grained sands, silt clays, is a dependable aquifer only along the valley margins where the unit intersects the table. As with other basins in this category, the older basin fill is the primary water su Similar to the Detrital Valley Basin located to the west, older basin fill in the northern part valley includes clastic sediments, limestone and basalt flows of the Muddy Creek Chemehueve Formations. Volcanic rocks are interbedded with the older basin fill in the sou part of the basin and yield water for municipal and domestic purposes. Groundwater flow the central part of the basin from the south and along Truxton Wash near Hackberry (**Figur 6**). Surface water collects in the Red Lake playa bear the center of the basin, wh groundwater flows to the north underneath the topographic divide near Pierce Ferry (Anning and others, 2007).

Groundwater recharge comes primarily from streambed infiltration and is estimated at 2,0 3,000 AFA (**Table 4.4-4**). Groundwater discharge is to several major springs and from rela large volumes of well pumpage for municipal use by Kingman. The well pumpage is are a three times the estimated groundwater recharge rate. Groundwater in storage estimates widely from 3 to 21 maf. Median reported well yields are relatively high at 900 gpm (**Tabl 4**). In the central and northern part of the basin groundwater levels were relatively stal rising between 1990-91 and 2003-04 while water levels were declining in the southern p the basin (**Figure 4.4-6**). Water-level measurements over longer time periods show fluctu water levels in the basin with long-term declines found in the area northwest of Hack (Anning and others, 2007). Groundwater is highly mineralized in some areas nea mountains and near Red Lake. Chromium has been detected in some wells in the basin.

Top

Meadview Basin

The relatively small Meadview Basin is characterized by a valley formed by Grapevine Wa the north, and a highland area, Grapevine Mesa in the south. The basin floor slopes towarc Mead from an elevation of about 4,400 feet to 1,400 feet. The main aquifer occurs in the M Creek Formation which contains three units. The upper limestone unit yields water to sp and shallow wells. The middle sandstone unit has a high clay content that limits its abil transmit water. The lower unit is a conglomerate with high hydraulic conductivity. Mos development has been in this lower unit. Groundwater flow is from south to north, foll Grapevine Wash.

Groundwater recharge is relatively small, about 4,000 AFA, due to low rainfall and evaporation rates. Groundwater discharge is to springs and a relatively small volur municipal well pumpage. Groundwater in storage is estimated at 1.0 maf or less. The m measured well yield is 33 gpm (**Table 4.7-5**). There is little water level monitoring in the Available data show water levels as deep as 931 feet bls in the southern part of the basi declines of more than 15 feet have been measured in a well in the vicinity of Meadview c the period 1990-91 and 2003-04 (**Figure 4.7-6**). Groundwater quality is generally good basin, with elevated concentrations of radionuclides measured primarily in or near granitic (ADEQ, 2005).

Colorado River, Sacramento Valley Basin. Groundwater recharge is from infiltration of runoff in washes and along mountain fronts, except in the vicinity of the Colorado River where infiltration of river water is the main source of recharge.

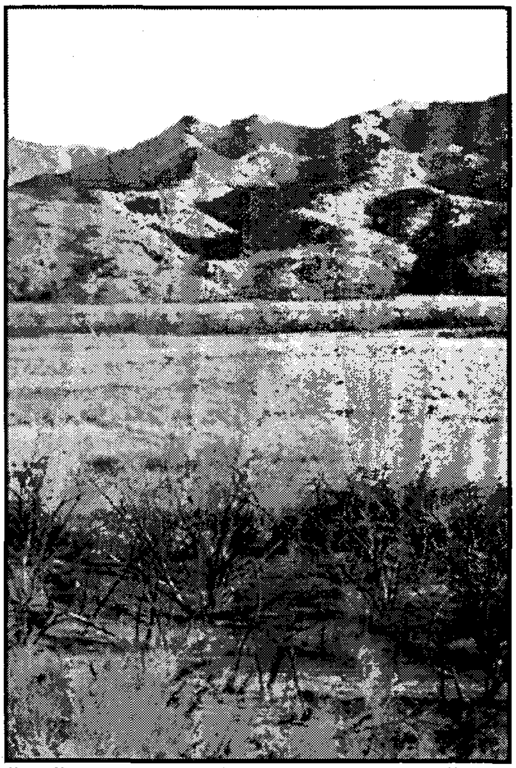
Sacramento Valley Basin

Sloping alluvial fans extend from surrounding mountains t north-south trending valley floor of the Sacramento V Basin. The valley floor generally slopes to the south elevation ranging from more than 8,400 feet at Hualapai to about 500 feet where Sacramento Wash enters the Colo River. Older basin fill is the principal aquifer in the basin. T are fractured and faulted volcanic rocks in the vicini Kingman that separate this basin from the Hualapai V Basin. Water stored in the fractures is used as part o municipal water supply for Kingman and for domestic wells fractured granite aquifer beneath the community of Chlor insufficient to meet its needs and water must be hauled Kingman. Groundwater flow is toward the center o Sacramento Valley and west to the Colorado River.

Groundwater recharge is from infiltration of runoff in washes and along mountain fronts, e in the vicinity of the Colorado River where infiltration of river water is the main sou recharge. Groundwater recharge is estimated at 1,000 to 4,000 AFA. Groundwater discha to a number of springs and from municipal and industrial well pumpage. Groundwater in st estimates range from 7 to 14 maf. Recent investigations using a range of specific yield v estimated 3.6 to 9.5 maf of groundwater in storage to a depth of 1,200 feet bls (Conwa Ivanich, 2008). Median well yields are between 100 and about 170 gpm (**Table 4.** Groundwater levels may be relatively deep with depths greater than 500 feet measur several locations. Water levels declined in measured wells in the vicinity of Kingman and e Topock between 1990-91 and 2003-04 (**Figure 4.9-6**). Water-level measurements over l time periods show fluctuating water levels in the basin with long-term declines in the Kin area and Golden Valley area (Anning and others, 2007).

Groundwater quality is generally good in the basin except along the base of the mountains waters of high mineral content are common. A study conducted by ADEQ found water q exceedences in the majority of sample sites in three areas: near the town of Chloride; central and southern Hualapai Mountains; and near the town of Topock (ADEQ, 1 Concentrations of radionuclides in Chloride town wells have exceeded Safe Drinking Wat maximum contaminant levels (City of Kingman, 2003).

Top



Bill Williams River, Bill Williams Basin. Well Yields may exceed 2,000 gpm along the Bill Williams River.

Bill Williams Basin (western portion)

Anderson, Freethey and Tucci (1992) categorized most western portion of the Bill Williams Basin as a "West" which generally corresponds to the Alamo Reservoir and Peak sub-basins (see **Figure 4.2-6**). The area in the v of the Colorado River is influenced by infiltration of water. Groundwater in the western part of the basin c primarily in recent stream alluvium and basin fill. The v bearing ability of these units varies within the basin. stream alluvium consists of gravel, sand and silt along t Williams River and its major tributaries. The main v bearing unit is the basin fill, which is more than 5,00 thick in the Bullard Wash-Date Creek Area southeast of Lake State Park. Groundwater flow is toward the Bill Wi drainage.

Groundwater recharge is from streamflow and mountain precipitation and is estimated at 32,000 AFA for the basin. From 10 to 23 maf of groundwater is estimat storage. There is little groundwater development i western portion of the basin and relatively little ground level data (see **Figure 4.2-6**). Available water level data stable water levels. Well yields may exceed 2,000 gpm the Bill Williams River. Arsenic and fluoride concentr that exceed drinking water standards have been rep

EXHIBIT 12

EXHIBIT 13

Key Water Issues

Colorado River Water. The quality of water in Lakes Mead, Mohave and Havasu must be maintained to continue attracting tourists to the County. While many other jurisdictions have an impact on the Colorado River, Mohave County's economy and water supplies are so directly linked to the lakes and river that the County has a vital interest in preventing their contamination.

Groundwater Quality. To ensure the viability of its continued use, the quality of area groundwater should be monitored regularly. Key recharge areas in the mountains and bajadas should be protected from development activities that degrade water quality. The effects of urban runoff and septic systems effluent on groundwater quality should be minimized. Mohave County's updated Areawide Water Quality Management Plan ("208" Plan) is a tool to maintain watershed health.

Water Availability. Information on the use and availability of water should be monitored. While there appears to be enough water to meet anticipated demands in the rapidly urbanizing parts of the County for the next 40 to 50 years, long term water planning throughout the County will require better information than is currently available. Development of a Countywide water budget that identifies water supplies and demands for identified groundwater basin subareas will enable the County to use its water resources most efficiently.

Water Quantity and Quality Goals and Policies

Goal 3: To preserve the quantity and quality of water resources, in perpetuity, through out the County.

Policy 3.1 Mohave County should cooperate with ADEQ, local water suppliers, and other agencies to maintain a water budget that inventories the quantity and quality of the County's water resources, identifies how those resources are being used, and monitors commitments for future water use.

Policy 3.2 The County should support programs to monitor groundwater quality and well levels.

Policy 3.3 Mohave County should encourage the efficient use of water resources through educational efforts.

Policy 3.4 New water intensive uses such as golf courses and man-made lakes shall require the use of treated effluent where and when available.

Policy 3.5 Mohave County will only approve power plants using "dry cooling" technology when the aquifer is threatened by depletion or subsidence

EXHIBIT 14

DRY-COOLED

Needle Mountain

Major solar power plant proposed

By DAVE HAWKINS

SPECIAL TO THE LAS VEGAS REVIEW-JOURNAL

KINGMAN, Ariz. — A solar power plant being billed as the largest in the United States is being proposed for a site outside Lake Havasu City, Ariz.

Lake Havasu-based Needle Mountain Power LLC wants to build on a 10,300-acre site near the junction of Interstate 40 and State Route 95, which had been proposed for the master-planned community of Sterling.

The massive plant would cost $5 billion to $6 billion to build and could generate up to 1,200 megawatts of electricity, according to consulting engineer Michael Clinton. By comparison, the solar array on 140 acres of Nellis Air Force Base land generates 15 megawatts. Needle Mountain Power has an option to purchase the property pending approvals of various permits.

"I really believe the permits are the significant issues," Clinton said. "But I think we're positioned to where our permitting process is going to be far less complex than any of the others that are out there today."

The ability to connect to the Western Arizona Power Administration transmission lines that cross the parcel is a plus, he said, because it minimizes need for the type of environmental study needed if the connection line had to travel across public or private lands. The company plans to use photovoltaic and other water-friendly technology that should reduce opposition to the project, he said.

Mohave County Supervisor Buster Johnson said the plant will offer construction jobs, operating jobs and an increased tax base.

"The size of it is obviously a feather in the cap for Mohave County and the state of Arizona, if we're able to get this plant located here," Johnson said.

EXHIBIT 15

SES Stirling Energy Systems

Stirling Energy Systems

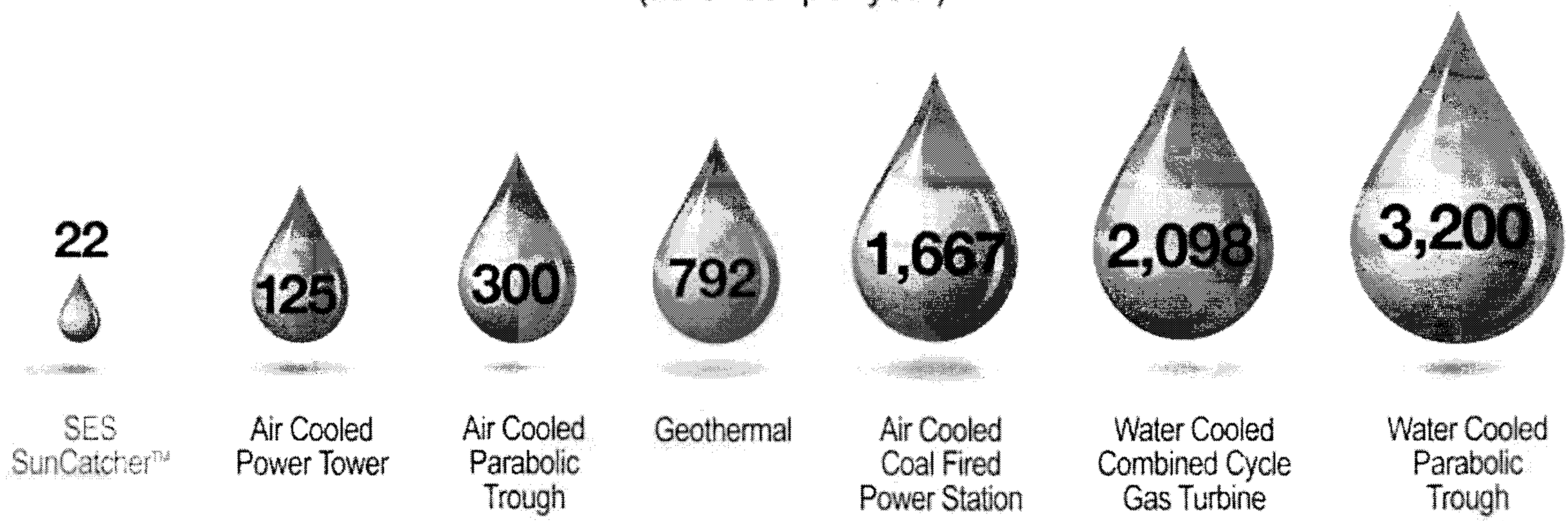
Southwest Renewable Energy Conference

September 10, 2009

Water Use

SunCatcher™ Plant Water Usage vs. Other Technologies

Amount of Water Required for a 500MW Plant
(acre feet per year)



Source: Public Filings

SunCatcher™ - Zero Water Use for Power Production

EXHIBIT 16

Solar Millennium To Use Dry-Cooling Tech For Nevada CSP Plants

in News Departments > Projects & Contracts
by SI Staff on Tuesday 17 November 2009

Solar Trust of America LLC, an integrated industrial solar solutions company operating in the southwestern U.S., says its U.S. project development arm, Solar Millennium LLC, will utilize advanced dry-cooling technology for its two proposed solar thermal power plants being developed by the company in the Amargosa Valley outside Las Vegas.

The company is currently working under a memorandum of understanding signed with NV Energy for development and construction of one or two 242 MW concentrating solar power (CSP) plants to be located 90 miles northwest of Las Vegas.

The decision to employ dry-cooling technology follows extensive due diligence that took into account environmental and ecological considerations, including wetlands and wildlife habitats, water conservation and land usage, and state and federal government renewable energy initiatives and policies, the company says.

Following a series of local public hearings and ongoing discussions with regulatory authorities and environmental groups, it was determined that dry-cooling was in the best interests of the Amargosa Valley community and its economic development plans.

SOURCE: Solar Millennium

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Tim Hogan

From: Saved by Windows Internet Explorer 8
Sent: Sunday, June 06, 2010 9:48 AM
Subject: Pahrump Valley Times - Nye County's Largest Newspaper Circulation
Attachments: ATT00413.gif; ATT00416.dat; ATT00419.dat; ATT00422.dat; ATT00425.dat; ATT00428.dat; ATT00431.dat

Pahrump Valley Times
Nye County's Largest Newspaper Circulation
CURRENT WEATHER: Clear, 90°

Jun. 04, 2010

SOLAR MILLENIUM

Development agreement for project OK'd

By MARK WAITE
PVT

TONOPAH -- A development agreement with Solar Millenium for the construction of two, 232-megawatt, solar power plants in Amargosa Valley was approved unanimously by the Nye County Commission Tuesday.

The enthusiastic endorsement by members of the Pahrump business community trumped the objections of Amargosa Valley activist John Bosta, who said the approval was premature. Bosta said the U.S. Bureau of Land Management completed a draft environmental impact statement and is in the process of preparing the final EIS.

Attorney Mark Fiorentino, representing Solar Millenium, said the project will provide clean, renewable energy for more than 150,000 Nevada homes. Solar Millenium will provide employment for up to 1,300 construction workers followed by 180 full-time operating workers, he said.

The company will pay wages and benefits in excess of $600 million over 30 years, as well as $60 million in sales and property tax during construction and $14 million in property taxes in the first year of the operation of both 232-megawatt units, Fiorentino said.

The $3.2 million in tax revenue per year includes $1.18 million apiece for Nye County and the Nye County School District, according to a summary provided by Fiorentino. He said Solar Millenium will use dry cooling technology to use 90 percent less water; provide a landscaped buffer from residences on Sandy Lane; provide $20,000 each for law enforcement and medical services; improve Valley View Boulevard; utilize environmentally-friendly buildings and make reasonable efforts to hire county residents.

Commissioner Joni Eastley had questions about a power purchase agreement with a major utility. Fiorentino said the company was still working on it.

Eastley asked about water, a key concern by Amargosa Valley residents.

"We are going to acquire some additional water in that basin and hold it in trust while we work out a plan with federal and state agencies while we continue to monitor water use out there," Fiorentino said.

Commissioner Lorinda Wichman asked who would be responsible for keeping track of the project. Darrell Lacy, director of the Nye County nuclear waste project office, said the planning director would.

Bosta said Solar Millenium provided much more in contributions in a solar power project planned in Ridgecrest, Calif. The company plans to build one, 250-megawatt, solar power plant there, he said.

Bosta said Solar Millenium is providing $350,000 for Hazmat and emergency medical services for the county fire departments in California and $100,000 per year for the county to use in the fire departments as they wish.

Bosta said the company admitted in the draft EIS there was a potential for a fire and a danger of explosions. He said the tax base touted in promoting the project is based on the selling price of a product.

"You are not getting the money that is entitled to our community and our county. You're selling us cheap. You're getting us crumbs," Bosta said.

Bosta said the development agreement doesn't talk about flood control. Eastley pointed to a clause in the agreement in which Solar Millenium agreed to submit a drainage study. Bosta said that was all verbal at this point.

But Amargosa Valley Town Board Chairman Jan Cameron said she appreciated the work Solar Millenium has done with the town board in drafting the agreement.

"There are still some concerns. John voiced his. Others are concerned this project is occurring in the heart of Amargosa, which is a valid concern. We know of no other project that is located in such proximity to the heart of a community," Cameron said. She added, "There still is a great deal of concern about moving Farm Road."

Cameron said her community is pleased about the potential jobs and training for the volunteer fire department. But she mentioned there is a concern the project will come within 700 feet of homes on Sandy Lane; the Amargosa Valley area plan suggested a quarter-mile buffer, or 1,320 feet.

Vern Van Winkle, owner of KPVM-TV, said the Solar Millenium project could give the county energy independence.

Karen Clayton, vice-president of First International Bank, said it would be a great boost for the community.

Dan Rodriguez, executive director of the Pahrump Valley Chamber of Commerce, applauded Solar Millenium for offering to use local products and services. He said the jobs will cause people to spend more money locally.

"It's going to start a momentum for renewable energy and with the situation that's going on in the Gulf region with the oil spill, I think this is the open door for us to grab renewable energy and be part of that growth," Rodriguez said.

The Pahrump Chamber has offered to provide supplier lists and service lists to Solar Millenium, Rodriguez said. Eastley suggested the newly-formed Amargosa Valley Chamber do the same.

Jim Mutton, adjunct instructor at Great Basin College, said Solar Millenium is only the first of other solar energy projects in the works.

"It appears Solar Millenium is working as a partner to the community to minimize any impacts this would have. They also partnered with the college, Great Basin College, to provide any training and curricula we will need with the project," Mutton said.

An impatient Nye County Commission Chairman Gary Hollis wanted to shorten the debate. He asked a couple of speakers, like Van Winkle and Mutton, to shorten their comments and just respond whether they supported the project.

Fiorentino mentioned Cameron's support for the agreement, a passionate advocate of Amargosa Valley.

"We reached agreement on some issues and some we didn't. The agreement isn't perfect. There are some conditions we'd rather not do," he said. "Probably we did a pretty good job negotiating through the issues."

Commissioner Butch Borasky's only comment was a complaint the state of Nevada would grant sizeable abatements reducing the amount of county revenues from the renewable energy project.

The only added condition was a request by Eastley to submit any future plans to both the Amargosa Valley planning committee as well as the Nye County Planning Department.