Borrego WATER DISTRICT

**February 8, 2001**

**TO:** Policy Committee Members
Groundwater Management Study

**FROM:** Tom Weber, General Manager

**POLICY COMMITTEE MEETING**

On Friday, February 2, the Technical Committee of the Groundwater Management Study approved the Technical Report. It is now the responsibility of the Policy Committee to review that report, particularly the alternatives outlined in Part V, and prepare recommendations to the Board of the BWD as to whether there should be a Groundwater Management Plan and what components it should encompass.

Upon receiving this recommendation, the Board of the BWD will hold public hearings on adopting a plan and the components to be included. If a tentative plan is adopted, it will undergo environmental assessment as required by the California Environmental Quality Act. When that review is completed, the Board will hold hearings on approval of the environmental documents and the plan.

A meeting of the Policy Committee to discuss its recommendation regarding adopting a plan and possible components is scheduled for:

**Friday, February 23rd at 2 PM**
**Palm Canyon Resort conference room**
**Borrego Springs**

I want to emphasize that it is not the purpose of the Policy Committee to review the Technical Report and suggest changes to its content, but to use it as an information source for making recommendations to the Board of Directors of the BWD regarding whether they should adopt a Groundwater Management Plan or not, and if so, what components it should contain. Those components may be based upon those alternatives identified in Part V of the report or on additional ideas developed by the committee or received in public input.

**CC: BWD Board Members**

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# *BORREGO WATER DISTRICT*

# GROUNDWATER MANAGEMENT STUDY

## Report of the Technical Committee

**February 2, 2001**

# BORREGO WATER DISTRICT

## GROUNDWATER MANAGEMENT STUDY

### Report of the Technical Committee

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BORREGO WATER DISTICT
GROUNDWATER MANAGEMENT STUDY
Report of the Technical Committee
January 2001

## EXECUTIVE SUMMARY

This report has three basic purposes: First, to present the findings of various studies that have been completed about the Borrego Valley aquifer in a form that can be understood by the general public; second, to make certain projections about the future possible use of the aquifer and its impacts and, third, to outline and evaluate various alternatives presented to the committee for solving the overdraft problem. The report was prepared by the staff and consultants of the Borrego Water District and knowledgeable local residents under the oversight of the Technical Committee. The information in the report comes from various studies and reports prepared on the aquifer over the last twenty years by federal, state and county agencies and private consulting firms and individuals.

The groundwater management study was undertaken at the direction of the Board of Directors of the Borrego Water District. This action was in response to local concerns over the overdrafting of the aquifer and the recorded drop in water levels in valley wells. The aquifer has an estimated 4,800 acre-feet (one acre-foot is one acre of land covered with water to one foot of depth) of inflow annually from rain in the adjacent mountains. However, it is estimated that occupants of the valley are currently using approximately 22,300 acre-feet of water a year. Seventy percent of this (15,590 acre-feet) is used by approximately 4,000 acres of agriculture, twenty percent (4,435 acre-feet) by golf courses and commercial landscaping and the remaining ten-percent (2,272-acre feet) by residential and commercial uses. This is creating an estimated overdraft of 17,500 acre-feet a year. The County of San Diego staff has been monitoring wells in the valley for nearly twenty years and report an average annual drop in well water levels of two feet a year.

The overdraft does not create an immediate emergency situation as the aquifer is estimated to have 1,686,210 acre-feet or more of usable water remaining in it – nearly 100 years life at current levels of use. There will be substantial increases in extractions prior to that time, however. Even at current levels of usage, half of the water in the upper and middle aquifers will be depleted in as few as 35 years. This will result in additional pumping cost and the necessity for new wells as the water level drops.

Unlike some desert states, water law in California gives the overlying landowners the right to the groundwater under their property. The water district primarily owns the water rights under certain residential areas as those rights were retained by the original developer and

assigned to the Borrego Springs Water Company, which was acquired by the water district in 1997.

California law also offers little authority for managing a groundwater basin. The current study has been undertaken under what is commonly referred to as AB 3030 (Assembly Bill 3030) which was enacted by the legislature in 1992. The intent was for water districts to obtain the voluntary agreement of large water users regarding how much groundwater they would extract and how much they would rely upon purchasing imported water. Borrego is probably unique in that it is trying to use this legislation to do groundwater planning even though it is an isolated basin that has no access or right to any imported water, neither Colorado River water nor Northern California water.

Under AB 3030, the District has two years in which to adopt a plan. The program was approved by the District Board of Directors in November 1999. A technical committee of knowledgeable state, county and local staff and private individuals was created to oversee the study. This report by that body will go to a policy committee who will review the information and alternatives and make a recommendation or recommendations to the Board of Directors of the Borrego Water District which will then hold public hearings regarding adopting a plan. If adopted, certain provisions of such a plan are subject to a referendum by local property owners. As an alternative to this planning approach, some local residents recommended going directly to a lawsuit to adjudicate water rights. The District Board and counsel felt that such a step was confrontational and too expensive for such a small district as a first step and that AB 3030 offered a more practical option to solve the overdraft problem.

Proposed solutions to the overdraft are outlined in Part Five of the report. The first class of alternatives identifies and evaluates projects to obtain additional water from either state projects or other areas outside of the basin. The cost of the transmission and infrastructure facilities to obtain water from state projects would be enormous in comparison with current water costs. Also, there is no additional water available as these projects are already over-subscribed. Obtaining water from adjacent areas such as San Felipe Creek, Clark Dry Lake and Ocotillo Wells is possible but also has extreme limitations. There is only limited water and, in most cases it is of poor quality. Also, the facilities to transmit and treat it would be extremely expensive. Recharging the valley through check dams and infiltration ponds is not judged to have much impact. The use of reclaimed water also would only have minimal impact.

The second class of alternatives identifies ways to reduce water use in the valley and preserve the remaining supply. Reduction is certainly possible with residential, commercial and golf course use but these uses only account for 25 to 30 percent of the valley's water use. Conservation in agriculture seems very difficult and would still have only a minor impact. Limiting the expansion of farmland and eventually fallowing some existing farmland is probably the only way to have a major impact. To limit the expansion of agricultural uses it would be necessary for the County Board of Supervisors to take action as they are the local government and land use authority for this unincorporated area. Over

the last 30 years they have placed limits on urban expansion in various areas under their jurisdiction, but never on the conversion of land to agriculture due to its adverse impact upon groundwater resources.

Limiting the expansion of agriculture would limit the increase in the depletion, but for a long-term solution it would also be necessary to fallow land, which involves acquiring the land or the water rights.

The various alternatives and combination of alternatives are explained and described in Part Five of this report.

# PART ONE: INTRODUCTION

## 1.1 THE PURPOSE OF THE REPORT

This report presents the findings of the Groundwater Management Technical Committee regarding its study of the Borrego Valley aquifer. The purpose of the report is as follows:

> *First*, to present the findings of various studies that have been completed on the aquifer in a manner that is understandable to a broad spectrum of the public.
>
> *Second*, to make certain projections regarding the future use of the aquifer and the impact of that use.
>
> *Third*, to outline and evaluate various alternatives presented to the committee for replacing or reducing the overdraft of the aquifer.

The information is presented to assist the members of the Policy Committee of the Groundwater Management Study, and the general public, in making judgements about groundwater use in the Valley. The facts presented in this document will be utilized to draw conclusions about whether a groundwater management program is needed or even possible at this time and, if so, what alternatives might be recommended to the Board of Directors of the Borrego Water District for such a program. The information is intended to be presented in a form that is understandable to the general public. For those wanting more technical data, an appendix of technical information is included, and also, the original reports are available at the Borrego Water District office.

Further, in terms of making decisions about the future, it is not the intent of this report to make specific selections among possible alternatives, but rather to present the information necessary for decision-making by others.

## 1.2 HOW THIS REPORT WAS PREPARED

This report was prepared by compiling technical studies and monitoring data collected over the past 50 years. The data was generated from a variety of sources including the United States Geological Survey, The California Department of Water Resources, Dr. David Huntley - Professor of Geology at San Diego State University, John Peterson - Hydrogeologist with the County of San Diego Department of Planning and Land Use, Agbabian Associates, Steve Smiley - a local farmer and member of the Technical Committee, Mark Jorgensen - a local ecologist, the Borrego Springs Park Community Services District and the Borrego Water District.

Borrego resident Jack Laughlin, an engineer with experience in water management programs, developed the original work program and report concept.

The writing of the report was a collaborative effort by consultants and staff of the Borrego Water District and Borrego Springs residents with technical knowledge. This includes BWD Engineer Linden Burzell, General Manager Tom Weber, Engineering Technician, Jerry Rolwing and District Counsel, Fritz Stradling. Borrego Valley residents with technical knowledge that assisted in writing the report included Clark Shimeall, a retired professor of geology, Tim Giles, a local hydrogeologist and Joan Rosen, an individual with extensive experience in public participation programs. Judith Cook, Assistant General Manager, and Eleanor Shimeall, BWD Director Elect, did the final proof-reading and editing.

## PART TWO: THE PLANNING APPROACH

### 2.1 THE REASON FOR THE GROUNDWATER MANAGEMENT STUDY

**Planning for the Future**

For approximately fifty years, groundwater levels in the Borrego Valley have been dropping in response to a continuing overdraft of the aquifer, which is the valley's sole source of water other than the very sparse rainfall. Based upon the results of studies over the last twenty years, there is no immediate crisis. The most commonly accepted figures for storage, use and inflow indicate that at the current level of usage, the usable groundwater supply could last approximately 100 years. The cost of extracting water will increase greatly throughout that time frame as the water levels decline. Also, it is projected that even with current levels of use, one-half of the water in the upper and middle aquifers will be depleted in 35 years.

*Current levels of usage, however, will not remain static.* California is projected to have a 30 percent increase in population within the next twenty-five years. That will result in an urban population of over 20 million within a few hours drive of the Borrego Valley. Coachella Valley is a projected growth area. With that level of urbanization in the state, living in Borrego will be even more desirable as a refuge from urban pressures. The Borrego Valley has nearly 5,000 unused residential lots either improved or approved for future development. There are also large areas of vacant land designated with density appropriate for multi-family units and mobilehome parks. Even with very low-density land use designations, a complete build-out would accommodate approximately 25,000 population.

California's growth will take place while the water resources of the state, for both urban and agricultural uses, are being reduced. Northern California water transfer is being reduced for environmental reasons. Access to Colorado River water must be reduced from 5.2 million-acre feet to 4.4 million-acre feet as California has been relying upon using that portion of Arizona's allocation not used by Arizona in the past. That overuse is no longer possible due to the growth in Arizona and the construction of the Central Arizona Project which can now transfer Colorado River water to the state's urban areas.

Borrego will not only experience pressure for urban development, but it could also experience pressure for conversion of more land to agriculture. As people coming to California do not want to live in urban high rises and urban areas do not want such conversions, much of the future growth in California will take place on agricultural land where low density development is possible and water resources are available. This is already happening in the northern San Joaquin Valley and in the Coachella Valley. Both the increases in water prices, particularly in coastal agricultural areas, and the conversion of land from agriculture to urban uses throughout the state, will create pressure for the

conversion of existing raw land in Borrego to agriculture. In the Borrego Valley, agricultural land is cheap and water is available just for the cost of pumping and maintaining the well. As an example of the possible change, within the last year one of the largest agricultural nurseries in Thermal purchased over 1,000 acres of mainly fallow farmland in the Borrego Valley. The conversion of just this one ownership to agriculture will result in a 25 percent increase in agricultural land use in the valley and a nearly 50 percent increase in the overdraft of the basin's water supply. A great deal of land remains available for such conversion.

Therefore, there is a need to act now to plan for the future use of the valley's groundwater resource. With such planning, the Borrego Valley can have a more reliable source of water than the rest of Southern California, which is dependent upon the annual snow pack in the Sierras. Without it, the area will be depleted of its only source of water in the coming decades.

This study has been undertaken to provide local citizens and the Board of the Borrego Water District with an understanding of the existing conditions and of possible future scenarios and secondly, to identify various courses of action that may be considered to prevent the situation from becoming a crisis as growth continues.

## Trends from the Past

Even without the impact of the projected California growth, water resources have declined in the Borrego Valley since World War II when major agriculture and residential uses were introduced. As an example of the change of the last fifty years, in a recent article in the Borrego Sun, a former resident of "Old Borego", located in the southern end of the valley, stated that in the early 1960s the water level in their well was at 16 feet below ground level except when the Di Giorgio Corporation irrigated its extensive grape vineyards in the northern area of the Valley. Water levels at this general location are now approximately 100 feet below ground level. Water levels in wells throughout the valley monitored by San Diego County over the last twenty years show an average drop of two feet a year. Figure 1 depicts water level hydrographs over the past 55 years and water level data collected by John Peterson, San Diego County Department of Planning and Land Use can be found in Appendix "A."

Agriculture has always been and remains the single largest water user in the valley. The current agricultural activity, consisting primarily of lemon and grapefruit groves, palm nurseries and potato farms, uses approximately 70 percent of the groundwater extracted each year. There are also four golf courses in the valley which use approximately 20 percent of the extracted groundwater uses. Urban development (sometimes called municipal use), consisting of approximately 1,500 developed residential lots, mobile home and recreational vehicle parks, hotels and commercial developments, uses the remaining 10 percent of the extracted water.

All these uses are dependent upon the remaining, accumulated groundwater in the aquifer and its replenishment in the form of inflow of runoff from rainfall in the surrounding mountains. The inflow from all the surrounding areas is estimated by the US Geological Survey as approximately 4,800 acre-feet per year (one acre-foot equals approximately 326,000 gallons, or one acre of land filled to one foot of water). The total annual groundwater used by agriculture, golf courses and urban development is projected at 22,000 acre-feet per year. That annual difference of about 17,000 acre-feet of water comes from extracting water accumulated in the underground aquifer over millions of years. The remaining reserve of water in the aquifer, which is not precisely known, has been estimated as approximately 1.6 million acre-feet of "usable water". Whatever the amount, it is known that the water levels are dropping substantially and that trend will increase with any type of growth – urban or agriculture.

Based upon these figures, if there was no additional development of agriculture or urban uses the life of the aquifer would be approximately 95 years. However, even a partial build-out of the remaining approved or existing golf courses and residential lots in the valley and a minimal addition of only 1,000 more acres of agriculture will result in a 100 percent increase in the overdraft and a reduction in the life span of the aquifer by several decades depending upon the rate of the development. That fact has led to an increased call in recent years for groundwater management planning. Past estimates projected a current life of approximately 125 years but those estimates depended upon extracting water from the lower or deepest strata of the aquifer. That lower aquifer is now viewed as an extremely low rate production zone due to the types of soils within it. Total calculations for the life of the aquifer are further explained in Appendix "E".

## Past Studies

Since the early 1980s there have been extensive studies and monitoring of the aquifer conducted by county, state and federal agencies. Over the last decade the Borrego Water District has explored adjacent areas to determine the availability of new groundwater resources separate from the Borrego Valley aquifer – water that could be piped into the valley to off-set the overdraft. Therefore, substantial studies and information exist about the technical facts of the aquifer and adjacent areas, but it has not been used to create a single report understandable to the general public or a comprehensive groundwater management plan for the valley.

Until 1997 the Borrego Water District encompassed only the eastern half of the valley, much of which is undeveloped land, and, therefore, it could not undertake a valley-wide planning effort. In April 1997 the District acquired the Borrego Springs Water Company which served the western, residential area of the valley. This action expanded the District's boundaries to a geographical base sufficient to consider undertaking a basin-wide groundwater management study. The boundaries of the Borrego Water District now cover approximately two-thirds of the privately held land in the valley. The major excluded areas

are the Borrego Sink, the whole south slope area west of the Deep Well Trails subdivision and the Borrego Springs Country Club property including Club Circle. The Borrego Springs Country Club, referred to as the Cameron Project, and the adjoining Club Circle area are served by a separate governmental entity, the Borrego Springs Park Community Service District, that provides water and sewer service in that area. See Figure 2.

## 2.2 THE LEGAL FRAMEWORK FOR THE STUDY

### Groundwater Ownership in the Borrego Valley

In the Borrego Valley the overlying property owners own the groundwater under their land except for a portion of the area subdivided for residential development. That area consists of approximately 2,800 acres out of the 55,000 acres in the valley. Most of the residential areas were subdivided by a single company, The Borrego Springs Development Corporation. It retained the water rights under the land and assigned them to the Borrego Springs Water Company of which it was a principal owner. When the assets of that private company were acquired by the Borrego Water District in April 1997, it also acquired those water rights. The Borrego Water District is also the overlying property owner on other parcels of land in the valley where it has wells.

Certain significant areas of the valley are thought to have limited or no groundwater under them because they overlie only the lower aquifer, which does not yield water readily as does the upper and middle aquifers. The most significant location for this is the Rams Hill Country Club which obtains most of its water from wells located in a more central area of the valley that are either owned by the Borrego Water District or, in the case of one major well, by Rams Hill and operated under contract by the Borrego Water District.

### California Water Law Relative to Groundwater

Counsel for the Borrego Water District, Fritz Stradling of the firm of Stradling, Yocca, Carlson and Rauth has provided the following explanation of groundwater law in California:

*CALIFORNIA WATER LAW RELATIVE TO GROUND WATER by BWD Counsel*

Since California became a state on September 9, 1850, there have been hundreds of legal decisions and statutes regarding the use of water and water rights. This is a brief overview of some of the legal considerations regarding the use of ground water or what the courts define as "percolating water". The laws may be applied differently in a variety of factual situations. It is not the intent of this section to relate the application of the laws to the various services in the Borrego Valley.

The courts have generally recognized three types of water rights, (i) pueblo water rights, (ii) riparian water rights and (iii) percolating water rights. The pueblo water right is the right of a city to take water as a successor of a Spanish or Mexican pueblo and to use the water occurring within the old pueblo limits for the use of the inhabitants of the city. Two cities that have such pueblo rights are the City of Los Angeles and the City of San Diego. Riparian water rights are the right of a riparian landowner (a landowner whose land abuts a stream) to take water from a stream for use on his or her lands. A stream is water

flowing through a known and defined channel, whether on the surface or on the subsurface of the ground. Percolating water is a vast mass of water confined in a basin, which does not form a part of a body of the flow, surface or subterranean, of any stream.

Although there has not to my knowledge been an adjudication of whether waters in Borrego Valley are riparian or percolating, it is generally conceded that the waters are percolating waters and not riparian waters. The court in *Katz v. Walkushaw* 141 Cal 116 (1903) described the existence of percolating water in a manner which mirrors the facts in the Borrego Valley. "It is quite manifest that this body (if it can be so styled) of percolating water cannot be called an underground watercourse to which riparian rights can attach, unless we are prepared to abolish all distinction between percolating water and the water flowing in streams with known or ascertainable banks which confine the water to definite channels. All rain-water which falls upon the hills and mountain-sides which does not flow off at once as surface water is absorbed and percolates down in the same way to the valley below."

The early view of the doctrine of percolating water rights was that the water was part of the land and belonged to the owner of land who could use or remove and control the water to the extent as any other part of the soil. At that time water was capable of assignment and of reservation in the grant of the land. *In 1903, this concept was modified in the Katz case. In that case, the court established the doctrine of correlative rights which afforded to each owner of land overlying a percolating water supply a right to the reasonable beneficial use of the water of that supply on or in connection with his overlying land with such right of use being equal to the similar rights of all other owners of land overlying the same ground water supply. In the event of an insufficiency of water for the requirements of all of the overlying landowners, the water may be apportioned among them by a court decree. If there is surplus water in the ground basin, more than the overlying landowners can put to a reasonable and beneficial use on their property, the surplus water may be appropriated by another entity, including a public water district, and be taken away from the overlying lands by the appropriator to be used on non-overlying lands.*

The foregoing legal concepts were clearly set forth in a case called *Pasadena v. Alhambra* 33 Cal (2d) 908 (1929). The law of percolating water rights can best be explained by summarizing the portion of the decision in that case, as described in "*The Hutchin's California Law of Water Rights*".

> "An overlying owner or any other person having a legal right to ground water may take only such amount as he reasonably needs for beneficial purposes and public interest requires that there be the greatest number of beneficial uses which the supply can yield. Water may be appropriated for beneficial uses subject to those who have a lawful priority. Any water not needed for the reasonable beneficial uses of those having prior rights is excess or surplus water and may be appropriated on privately owned land for non-overlying uses, such as devotion to a public use or exportation beyond the basin or watershed. It is the policy of the State to foster the beneficial use of water and discourage waste, and when there is a

surplus the holder of prior rights may not enjoin its appropriation. Proper overlying use is paramount and the right of an appropriator, being limited to the amount of the surplus, must yield to that of the overlying owner in the event of a shortage, unless the appropriator has gained prescriptive rights through the taking of nonsurplus waters. As between appropriators the one first in time is the first in right, and a prior appropriator is entitled to all the water he needs up to the amount that he has taken in the past, before a second appropriator may take any. Prescriptive rights are not acquired by the taking of surplus or excess water, since no injunction may issue against the taking and the appropriator may take the surplus without giving compensation; however, both overlying owners and appropriators are entitled to the protection of the courts against any substantial infringement of their rights in water which they reasonably and beneficially need. Accordingly, an appropriative taking of water which is not surplus is wrongful and may ripen into a prescriptive right where the use is open and notorious, hostile and adverse to the original owner, continuous and uninterrupted for the statutory period of five years, and under claim of right."

Applying the law of that case to the Borrego Valley ground water basin (the "Basin"), you would say that each and every landowner that has land overlying the Basin has a right to pump water from that Basin for the reasonable and beneficial use of that water on the owners lands. Any person that does not have land that overlies the Basin and pumps water to his land from the Basin is an appropriator of that water. However, as noted in the *Pasadena* case, an appropriator can only appropriate surplus water and as there is an overdraft in the Basin, can an appropriator take water out of the Basin even though all of the present owners of land overlying the Basin have a sufficient amount of water to meet their water needs? It should be noted that the law recognizes that landowners overlying a basin who are not presently using the water do not lose the right to take water from the basin for use on their land.

When a party talks about bringing an action for the adjudication of a basin, he or she is asking the court to allocate the quantities of water in the basin to the various landowners overlying a basin where there is not a sufficient amount of water to meet the needs of all of those landowners. In an adjudication a court may also determine the rights of an appropriator and the rights of a proscriptor. These legal proceedings may be taken to safeguard a percolating water supply once a surplus ceases to exist and may restrain any additional user beyond the point of safe yield. Where the safe yield is less than the present and prospective needs of the overlying lands, the overlying owners are entitled to relief for protection to the extent of their individually declared rights and for protection against any exportation of the water that would unduly increase the cost or lower the ground water level below the danger point. We have seen in the past that adjudications may be necessary in certain circumstances, however, they usually take many years to reach a judgment and are expensive to conduct. Such was the case of the recent decision in *City of Barstow v. Mojave Water Agency* where it took over two years of negotiations among the water users and thereafter eight years of litigation. There is an article in Appendix "B" regarding the Mojave case. It is for this reason that the Borrego Water District is pursuing the adoption

of an AB 3030 plan to safeguard and supplement the water supply in the Basin for the benefit of the overlying landowners and the residents within the watershed.

*For additional information on Water Rights, refer to Appendix N.*

## AB 3030 Planning Approach

In 1992 the State Legislature passed Assembly Bill 3030 (AB3030 of that year) and it was signed into law by Governor Wilson as sections 10750 through 10756 of the California Water Code. It is basically an effort to provide a planning tool for water districts where the users, primarily agricultural interest, rely upon groundwater as a major source of their water supply. The major criticism of this planning program is that it substantially relies upon voluntary cooperation. The recommendations can be overturned by the vote of a majority of the landowners. Voting is based solely upon the value of the land one owns, not including the improvements or residence. In that sense it was designed primarily for agricultural districts. Its basic intent is to get these large water users to agree upon a formula for using underground water and then resort to purchasing imported water for their needs above that level. Borrego, of course, currently has no access or right to imported water. As far as is known, the provisions of AB 3030 have never been used as a planning tool for a district that has no alternative source of water supply other than groundwater. However, no other planning tool is available at this time.

*Counsel for the Borrego Water District has provided the following analysis of the AB 3030 legislation as a planning tool:*

### *ANALYSIS of AB 3030 by BWD Legal Counsel*

Pursuant to AB 3030 (enacted in 1992), the legislature established (Part 2.75 of Division 6, commencing at Section 10750 of the Water Code of the State of California) (the "Code") a means for a local agency to adopt or implement a groundwater improvement plan or groundwater management program (herein referred to as the "AB 3030 Plan"). A local agency is any public agency that provides water service to all or a portion of its service area, which includes a groundwater basin. The Borrego Water District (the "District") would be the logical local agency to instigate a groundwater management plan.

Before the District can adopt a resolution of intention to draft a groundwater management plan, it must hold a public hearing. The hearing must be noticed by two publications, once a week for two successive weeks, in a newspaper of general circulation in the District. The Borrego Water District Board of Directors at its October 27, 1999, meeting ordered notice of the hearing to be held at its meeting on November 22, the notice was published in the "San Diego Union," the major daily newspaper serving the area, on November 3rd and November 10th. It was also published in articles in the "Borrego Sun," the local bi-monthly newspaper, in 1999.

At the hearing, all persons desiring to be heard were heard and at the conclusion of the hearing the Board adopted the Resolution of Intention, Resolution No. 99-11-1, to draft a groundwater management plan. The Resolution of Intention was published twice a week for two successive weeks. The District is now preparing the groundwater management plan, which must be completed within two years. When the groundwater plan is completed, a hearing is held on the groundwater management plan and if not protested, the District should make an initial study pursuant to the California Environmental Quality Act. This initial study will determine if it is appropriate at this stage of the proceedings to prepare an Environmental Impact Report or if a Negative Declaration is sufficient. This analysis should be completed prior to the hearing on the groundwater plan. A hearing is called, noticed and held on the groundwater management plan. If at the conclusion of the hearing the Board of Directors does not receive protests by a majority of the landowners (representing 50% of the assessed land subject to the groundwater management plan) the groundwater management plan may be adopted.

Assuming that a groundwater management plan is approved, what authority does the District have to implement the plan? The District may adopt rules and regulations (Section 10753.8). The District can not make a binding determination of water rights of any person or entity (Section 10753.8). *Section 10753.8 implies that the District can limit or suspend extractions of producers if replenishment programs or other alternative sources of water are not available. As there is no alternate source of water for Borrego, it would follow that the District has the authority to limit or suspend water extractions. However, we question the authority of the District to enforce such a limitation or suspension of extractions against a producer that does not agree to such limitation.*

To finance a groundwater management plan, the District may fix and collect fees and assessments. Section 10754.2 provides that the local agency may impose "equitable annual fees." We are not sure how the District will determine what is an equitable fee. Before the District may fix a fee or levy an assessment, it must be authorized to do so by a majority of the votes cast at an election. The code does not prescribe who votes at such an election. We are not certain who would vote to establish fees. It is argued that it would be a registered voter vote with a majority vote able to approve the fees. Would it be the registered voters only residing in the District or would it be all resident voters in the groundwater basin?

In regard to assessments, the Code provides that such assessments shall be "based on the amount of groundwater extracted from the groundwater basin within the area included in the groundwater management plan." This would suggest an assessment for each producer based on the amount of water produced. Is the assessment on producers of special benefit to the producers assessed or are these assessments of a general benefit to the community? The way this question is answered may result in making it impractical for a local agency to levy such an assessment if the assessment is considered to be of special benefit to the producers. We believe that any assessment would have to be approved by a majority of producers voting prior to the conclusion of a hearing on the assessment as provided in Proposition 218 (Article XIIID of the California Constitution). The votes

would be weighted according to the proportional obligation of the affected property. If only the producers vote, would they vote to make such an assessment. If the assessment is of general benefit, it may not be an assessment, as Proposition 218 provides that "only special benefits are assessable . . ."

Section 10754 of the Water Code of the State of California provides that a local agency that adopts a groundwater management plan has the authority of a water replenishment district pursuant to Part 4 (commencing within Section 60220) of Division 18 of the Water Code and may fix and collect fees and assessments for groundwater management in accordance with Part 6 (commencing at Section 60300) of said Division 18 (the "Act"). Part 6 of the Act gives a water replenishment district the authority to levy a replenishment assessment to purchase water for the replenishment of groundwater. This replenishment assessment is similar to the replenishment assessment that can be levied by the Orange County Water District. Although the District, if it adopts a groundwater management plan, has the authority to use the provisions of a water replenishment district can the District levy a replenishment assessment (an assessment on the producers of water for each acre-foot of groundwater to be produced in the ensuing year) which is not used to purchase replenishment water, especially when there is no replenishment water available?

The Act does not require a vote to levy replenishment assessments. If the replenishment assessment is not a special benefit assessment, Proposition 218 would not require a vote, however, if it is a general benefit assessment, does Proposition 218 now prohibit the levy of a general assessment pursuant to the Act?

The Act seems to provide that a replenishment assessment can only be levied to purchase replenishment water yet a water replenishment district has the power for the purpose of replenishing the groundwater to (a) buy and sell water, (b) exchange water, (c) distribute water to persons in exchange for ceasing or reducing groundwater extractions, (d) spread, sink and inject water into the underground, (e) store, transport, recapture, reclaim, purify, treat or otherwise manage and control water for the beneficial use of persons or property within the district and (f) build the necessary works to achieve ground water replenishment. More research needs to be done to determine if the replenishment assessment can be expended for any of the above purposes. As an alternative to seeking legislation to amend the California Water District Law to provide for the levy of a water production assessment that can be used for any purpose (see below), we may consider legislation to amend the Act to accomplish the District's objective.

*The advantages of an AB 3030 plan are: (i) provides a vehicle for the District to formulate a groundwater management plan, (ii) can involve entities and private parties overlying the groundwater basin outside the District, (iii) provides a means of establishing fees (which may be equivalent to a pump tax) and assessments, and (iv) provides for agreements between the District and producers and the District and the Services District. The disadvantages seem to be (i) no authority over the adjudication of water rights, (ii) uncertainty as to the method and enforceability to fix and collect fees and levy and collect assessments, (iii) question of the authority of the District to enforce the implementation of a*

*groundwater management plan, especially on non-participating producers, and (iv) no control over use of land within the groundwater basin.*

*This is the end of counsel's legal analysis.*

## 2.3 THE PLANNING PROGRAM FOR THE STUDY

### Planning Program Approved by the Borrego Water District Board of Directors

After several months of discussion, all of which was reported in the "Borrego Sun", and the required two public hearings, the Board of Directors of the Borrego Water District voted unanimously on November 22, 1999, to undertake a two-year groundwater management study as the basis for consideration of adopting a groundwater management plan for the Borrego Valley. At least one member of the community, a retired attorney with experience in water issues, had presented arguments for proceeding to litigation to establish water rights in the valley. This approach was felt to be too confrontational as a first step as well as too lengthy and expensive. Final adoption of the planing approach was done through approval of Resolution No 99-11-01 which states that the District will undertake a groundwater management study under the provisions of AB 3030 and that the study will be done under the direction of a Technical Committee to determine the content of such a planning program and that recommendation for such a committee will be considered at the Board meeting in December, 1999.

At the December meeting, a report from the District's General Manager proposed creating two oversight committees:

First, a Policy Committee to be made up of lay persons representing various interest and geographical areas of the community with the responsibility of setting overall policy direction for the study and ultimately making recommendation to the BWD Board of directors regarding updating a plan.

Second, a Technical Committee to be made up of people from the community and public agencies who are knowledgeable in the subject to develop and recommend the work program and to provide technical assistance and guidance.

This approach was adopted by the Board of Directors.

The Board of Directors also voted to have the Policy Committee adopt a goal for the study at its first meeting. At that meeting held on February 11, 2000 the following goal was adopted:

> *The goal of this study is to provide a long-range groundwater management plan for the Borrego Valley that will minimize the overdrafting of the aquifer and enhance the recharge capabilities while providing a dependable supply of water*

*for the reasonable growth of the valley. This plan should do so in a manner that is equitable to the current users of the aquifer and economically feasible for future users.*

***Oversight Committees for the Study***

As stated, in order to guide this study, two oversight committees were created:

THE TECHNICAL COMMITTEE:

First, a Technical Committee was appointed consisting of public agency employees and private citizens with technical knowledge useful to the study. Its mission is to develop and present the information needed for decision-making. It is not to make decisions about a management program, but rather to develop the background information as thoroughly and accurately as possible, and to define the alternatives, so that a local citizens group, representative of the valley and community, can make recommendations to the Board of the District on the feasibility and content of a possible management plan.

Membership on the Technical Committee was drawn from persons of technical background who have expressed an interest in the local situation, also San Diego County and state technical persons who agreed to serve and finally the water district's own staff and consultants. The group was voted on by the Board of Directors of the District and then, consistent with the Administrative Code for the District, the appointment of the Chairman of this committee was left to the President of the water district. President Roger Anderson appointed Sam Fortiner, a Director on the District Board, to serve as Chairman. Mr. Fortiner is one of the original farmers in the valley, he has served on the water district board since its earliest days and he is known for his historic knowledge of the wells and water issues in the valley.

The total membership of the Technical Committee is as follows:

Sam Fortiner: Chairman — Farmer and member of the BWD Board
Linden R. Burzell, Engineer
Fritz Stradling, General Counsel

Public Agencies:
- Carl Hauge, California Department of Water Resources
- Peter Martin, USGS, Water Resources Division
- John Peterson, San Diego County Department of Planning and Land Use

Agricultural Representatives:
- Steve Smiley, Manager, Seley Ranch
- Others as willing to serve

Golf Course Communities:
Robert Zierden, General Manager, Borrego Springs Park CSD
Bob Moore, Superintendent, de Anza Desert Country Club

Local Residents with Technical Backgrounds:
Clark Shimeall, retired geology professor

Borrego Water District Staff:
Tom Weber, General Manager
Jerry Rolwing, Engineering Technician

Major contributions to the study were made by Jack Laughlin, engineer, who served on the Technical Committee and did much of the work in preparing the work program and the outline for this report. He resigned when he retired, as he would not be able to attend meetings.

THE POLICY COMMITTEE:

Second, a Policy Committee was also created to guide the work of the Technical Committee and to evaluate the information and planning alternatives developed by the Technical Committee as a basis for making recommendations to the Board of the Directors of the Borrego Water District. The Borrego Water District Board has the ultimate responsibility for adopting a plan. The Policy Committee was appointed by the BWD Board based upon an effort to obtain wide community input and to include those in the community who had expressed strong interest in the study. As President of the Board, Roger Anderson assumed the Chairmanship of this committee.

The total membership of the Policy Committee is as follows:

Roger Anderson: Chairman President of the Board of the BWD, 1997-2001

Borrego Springs Park Community Services District:
Tom Coffey, Member of the Board
Bob Zinser, Member of the Board

Borrego Springs Sponsor Group (Community Planning Group):
Don Robidoux

Vision 2000 & Borrego Springs Community Association
Dr. John Strong

Borrego Business Person:
Kathy King

De Anza Golf Estates Resident:
Bob Reniers

Public Agencies:
Tina Townsend, Anza Borrego Desert State Park

Leo "Rik" Henrikson, a retired, prominent San Diego attorney with a background in water law, was a leading proponent of the study and a member of the committee until he passed away in the summer of 2000.

## A Chronology of the Planning Effort

The planning effort began in January 2000. Much of the planning effort involved researching, updating and organizing the information that has been developed over the last twenty years through private and public studies. This information was organized, evaluated and updated by the Technical Steering Committee for presentations to the Technical and Policy Committees.

Between February 11, 2000 and September 15, 2000 there were 4 meetings of the Technical and Policy Committees, in February, March, June and September. All meetings were noticed and well publicized in the local newspaper and were open to the public. Due to the isolation of the Borrego Valley and the fact that many residents live here only part time, it was determined quite early in the study that it was necessary to rely upon a Steering Committee to guide most of the Technical Work and maintain communication with those outside of the valley preparing parts of the study. That Steering Committee consisted of Chairman Fortiner, BWD General Manager Tom Weber, BWD Chief Engineer Lin Burzell and local geologist Clark Shimeall. Until he resigned from the planning effort due to personal demands on his time, the effort was greatly aided by the work of local resident, Jack Laughlin.

Originally, the Technical Committee and the Policy Committee had separate meetings on the same day. It was subsequently found to be to the advantage of both to have everyone attend the Technical Committee meeting and then have a short meeting of the Policy Committee, afterward, to discuss matters of interest to the committee and to take votes on direction for the study.

## The Technical Objectives of the Study

The first objective for the Technical Committee was to review all of the pertinent reports and data available on the Borrego Valley aquifer, water inflow and water use in order to determine the aquifer's life if water use continued at the present rate or at a projected increased use. This information came primarily from the public and private studies prepared over the last twenty years and the increased monitoring and mapping that the

District and County has undertaken in recent years. Also, new information was presented by San Diego State University graduate students who have been studying the valley as part of their thesis work. There was a need to update, organize and evaluate all this information so that it could be used as a basis for preparing projections of the aquifer's life under various scenarios.

The second objective was to identify and evaluate various projects that could be undertaken to increase the quantity of water available or to reduce water use so that one or more combinations of projects or procedures could be utilized to achieve a better balance of water use with water availability. It was particularly important to identify the cost and the specific beneficiary of these alternative projects and programs in order for the Policy Committee and BWD Board to make valid judgements. The proposals that were evaluated came from the BWD Board, members of the Technical Committee, the Policy Committee and the public. The study attempted to evaluate all proposals presented without prejudice.

## The Scope of the Study

The study covers the entire Borrego Valley groundwater basin as described in the United States Geological Survey Report 82-255 (1982). The Study also evaluated the feasibility of obtaining water from outside the area for importation into the Borrego Valley to supplement the natural recharge.

## PART THREE: THE BORREGO VALLEY AQUIFER

### 3.1 THE PHYSICAL CHARACTERISTICS OF THE VALLEY AND THE AQUIFER

The Borrego Valley is a desert area located in the northeastern corner of San Diego County. It is immediately east of the Peninsular Range of mountains that separate the more temperate coastal plain from the desert. It is separated from the Salton Sea, thirty miles to the east at the northern end of the Imperial Valley, by eroded land known as the Borrego Badlands. It is separated from the Coachella Valley to the north by the Santa Rosa Mountain chain. See Figure 3.

In terms of understanding groundwater issues in the Borrego Valley, there are three geographic areas to be considered. First is the valley, or more properly valley floor, which is defined by mountains and canyons on the north, west and south and by the Borrego Badlands to the east. Second is the drainage basin which includes the valley and the surrounding mountains from which runoff from rainfall in the mountains is drained into the valley and aquifer via canyons and other natural features. Coyote Canyon, at the northwest end of the valley, is the most significant drainage feature. Third is the aquifer, which contains the groundwater and underlies a portion of the valley and may extend well beyond it in a southeast direction.

The Borrego Valley is not technically a valley in the scientific term as it was not created by a river but by tectonic uplifts of the areas to the west and other geologic factors. This is also true of California's great Central Valley. The word "valley", however, is the common reference of the area. The valley runs in a north-south direction for about 11 miles and in an east-west direction for about 6-1/2 miles. It includes an estimated 55,000 acres of privately held land with the remaining area of the valley being within the Anza Borrego Desert State Park. Borrego Valley Road is the approximate dividing line between the western half of the valley and the eastern half. The western half is developed with residential and agricultural uses. The eastern half is primarily open land including the Borrego Sink, the lowest area of the valley to which all natural drainage is directed. As much as 8,000 acres around the Borrego Sink is the site of a mesquite bosque or woodland, some of which has been a protected feature under County of San Diego land use regulations. This eastern half also includes the airport, some agricultural land north of it, Old Borego, the original settlement area, La Casa del Zorro and the Ram's Hill Country Club. Most of the Ram's Hill project will remain open space as only about 600 acres of the 3,000 acres are designated for development. Therefore, a substantial portion of this half of the valley is and will remain in undeveloped open space. A large portion of the northern end of the valley, within Coyote Canyon, is now state parkland and will, therefore, remain undeveloped.

The valley, or actually valley floor, is part of a much larger drainage basin that extends several miles to the northeast and southwest. In the north it includes all the mountains around Coyote Canyon up to the community of Anza in Riverside County. Likewise, in a southwest direction it extends several miles as it includes the drainage area of San Felipe Creek including The Narrows and Scissors Crossing. In contrast, to the east, the drainage basin does not extend much beyond the area of the valley's private land holdings as the Badlands drains toward the Salton Sea and not into this basin. (See Figure 4)

Rainfall in the drainage basin has augmented the groundwater in the aquifer and provides the recharge. The valley floor receives about six inches of annual rainfall and the mountains about sixteen inches. Intermittent streams enter the valley through canyons. In 1945 the USGS reported that the groundwater basin was being operated under steady-state conditions. By the mid-1950's it was in an overdraft situation due to the introduction of large-scale agriculture in the valley.

The Borrego Valley Basin is filled with up to 2,400 feet of poorly consolidated to unconsolidated sediments resting on the basement granite. The USGS Report 82-855 identified an upper, middle and lower aquifer (material that stores, transmits and yields significant amounts of water to wells and/or springs). The alluvial sediments filling the basin originated by the weathering action of the rocks in the surrounding mountains. Stream flows then carried the resulting gravels, sands, silts and clay particles into the basin, depositing them in an orderly progression with the larger material (gravels and sands) settling out first and the smaller materials (silts and clay particles) being carried farther into the basin before settling out. Climatological conditions at the time of transportation and deposition considerably influenced the spatial extent of such deposits. The technical committee studies did not uncover differences sufficient to alter the USGS model. Appendix "C" details recent well information.

The USGS analysis of the distribution of the three aquifers indicates that the upper aquifer, which currently supplies most of the groundwater used, is thickest in the northern part of the basin and thins to extinction in the southeastern area. The middle aquifer is thickest toward the central portion of the valley adjacent to the Coyote Creek fault and thins toward the Valley's western edge. The lower aquifer is thinnest in the northwest and thickens and becomes dominant aquifer toward the southeast.

Basically, the amount of water available for use, as well as the ease of recovery decreases from the upper to the lower zones. On the basis of one recent well, the County's analysis suggests that in some locations, an increased volume and yield may be found at a greater depth than expected.

In general, the water quality is good, with a total dissolved solids content of less than 500 parts per million (ppm). There are several pockets of water in the aquifer where nitrates are above 45 ppm, the maximum safe concentration. Several wells in the Borrego Valley have been taken out of service because some of the high nitrate water moved laterally as the

water level dropped. The Borrego Water District ID-4 wells 1 & 4, and the Roadrunner Mobile Home Park well are good examples of this phenomenon.

## 3.2 ADJACENT GROUNDWATER SOURCES

Three adjacent sources were investigated to see if additional water could be found in close proximity to the Borrego Valley. The first area is Clark Dry Lake, which lies just to the east of the Coyote Creek Fault near the Peg Leg Smith monument on the Borrego-Salton Seaway (county highway S-22). The second area is San Felipe Creek, which lies to the southeast of the Borrego Sink area and could possibly be part of the Borrego Valley aquifer. The third area is near Ocotillo Wells, designated as the lower Borrego Valley and continuing east of the Imperial County line. All three of these projects have the potential to supplement the water supply of the Borrego Valley; however, the export of water from these areas will undoubtedly impact the natural resources of their respective regions. See Figure 4.

### Clark Lake Basin

Clark Dry Lake lies to the northeast of the Borrego Springs, separated from the Borrego Valley by the Coyote Creek Fault. The land area comprises approximately 13,000 acres. The area has two small ranches, a historical rock house and an abandoned gravel operation. Once the site of an astronomy telescope, the majority of the area is now under the control of the Anza-Borrego Desert State Park.

This small basin is formed geologically similar (block faulting) to and contains sediments similar to the Borrego Valley basin. Subsurface data below the total depths of wells is sketchy at best, and is open to interpretation. The sediments are thought to be in a wedge shape with the thinnest edge along the western edge of the valley and the thickest edge along the northwest-southeast trending fault at the eastern side of the valley. The basin has produced limited amounts of water for individual landowners of the area. The Borrego Water District drilled an exploration hole, which located some production of saline water.

### San Felipe Creek

The San Felipe Creek collects surface water (and possibly fracture-flow groundwater) from rainfall and snowpack runoff in the mountains to the west of Borrego Springs. This drainage meanders in a southerly direction through San Felipe Valley. As that valley intersects state highway 78, the creek turns east passing through Tamarisk Grove Campground and The Narrows, then veers north across the Texas Dip to the eastern edge of the Borrego Valley near the original Borrego spring. At this point the drainage collects the overflow from the Borrego Valley then traverses easterly through the desert to Ocotillo Wells, before emptying in to the Salton Sea.

The area near the Texas Dip and southeasterly thereof (westerly portion of Lower Borrego Valley) is of interest because the underlying lower aquifer is relatively deep and is subject to recharge from San Felipe Creek. An 850 foot deep test well drilled in 1995 by the District confirmed the depth of the formation and that it was saturated. The pump test, however, indicated that the formation was typical of the tight lower aquifer and that completed wells would be relatively low capacity (200 –300 gpm) and also that it would require many wells, widely spread in order to extract a significant quantity of water.

**Ocotillo Wells and South and East to the Allegretti Farms area in Imperial County**

The small community of Ocotillo Wells lies in the northeastern extremity of San Diego County, adjacent to the Ocotillo Wells State Vehicular Recreation Area. On the southern end of the area is Split Mountain and the U.S. Gypsum quarry. The central portion of the valley is dotted with individual home sites and several small recreation vehicle parks, each with their own domestic water well.

Geologically, this area sometimes is referred to as the Lower Borrego Valley. It is situated between Borrego Mountain (with granitic material exposed) and the granitic Vallecitos Mountains on the south. Sediments found in this narrow trough were largely derived from the alluvial fans along the Vallecitos Mountain front and, according to some knowledgeable geologists, were also deposited from the stream flow of the ancestral San Felipe Creek drainage. It seems unlikely that the underlying thickness of sediments would be very great, maybe in the order of 800 to 1,000 feet. The action of the creek flowing down the trough was probably predominantly erosional, not depositional. In an east-southeast direction from Ocotillo Wells, the thickness of sediments should increase gradually toward the Salton trough to about 20,000 feet. Groundwater in the area is found mainly in shallow (250' deep) wells, which produce sufficient water for individual dwellings.

The area three miles south and seven miles east of Ocotillo Wells owned by the Allegretti Farms has very high capacity wells (2,000 gpm+); the water produced is of low quality (2,000 ppm TDS). This area has a long history of farming alfalfa. The water produced should be suitable for golf courses, landscape irrigation and irrigated agriculture. (See Appendix "I")

## 3.3 SUMMARY OF PREVIOUS STUDIES AND REPORTS

Studies of the valley's groundwater have occurred as early as 1909. In the 1950s and 1960s there were limited studies of water use, estimated recharge and water in storage by private and public entities. The first major study of the Borrego Valley aquifer that received any widespread distribution occurred in the early 1980s in response to concerns about the impact that the proposed Rams Hill Country Club project might have on the valley's groundwater resources. At that time there were strong feelings among many non-technical

people that golf courses and residential development were the main uses impacting groundwater resources in the valley. That study was funded by the Di Giorgio Corporation, the developer of Rams Hill, and county and federal agencies. The study was undertaken by the United States Geological Survey and concentrated on determining the form of the aquifer and the amount of usable water that it might contain. It was to be Part I of the three part study. At this time the San Diego County hydrologist also began to monitor water levels in non-operating wells throughout the valley, a study that has continued into the present. The Borrego Water District monitored water levels in its operating wells.

Phase I of the valley study concentrated on collecting data and analyzing geological factors to produce information for a groundwater model that could project the impact of development and other factors on the resource. Their report, USGS H82-855, was published in 1982.

In 1984 the California Department of Water Resources developed and published a report on the feasibility and costs of bringing in Colorado River and Northern California water to the valley. That was updated for the current study and is included in the appendices.

In 1988 the USGS published its report on the development of a groundwater flow model (Phase II) that could analyze historic and future impacts of water usage on the valley's resources. The model was never put into operation.

Additional minor studies and reports were prepared in response to land development proposals. Two hydrogeologists (Henderson and Netto) have underway the development of a MOD flow model which, if completed and placed in operation, could be made available in the future for use by the District to track progress or lack of progress in controlling groundwater levels.

**Summary of Major Basin Studies and Reports**

1982 – "Water Resources of Borrego Valley and Vicinity, California, Phase I – Definition of Geologic and Hydrogeologic Characteristics of Basin" Open-File Report 82-855 issued by the United States Geological Survey.

June 1984 – "Borrego Valley Water Management Plan" issued by the California Department of Water Resources in cooperation with San Diego County.

1988 – "Water Resources of Borrego Valley and Vicinity, San Diego County, California: Phase 2 – Development of a Ground-Water Model. Water-Resources Investigations Report 87-4199

1996 – Geophysical Studies by Agbabian Associates.

**Additional Studies and Monitoring Programs**

1909 – United States Geological Survey report by Mendenhall

1915 - United States Geological Survey report by Waring

1923 - United States Geological Survey report by Brown including "watering places in and surrounding Borrego Valley

1954 - United States Geological Survey and the California Department of Water Resources report on well data by Burnham

1968 – Reconnaissance geologic map and data collected subsequent to Burnham by Moyle

1968 and 1972 – U.S. Bureau of Reclamation report estimating recharge, recoverable water in storage and average annual water level decline in Borrego Valley

March 1983 – Draft version "Preliminary Evaluation of Annual Recharge to the Borrego Valley Ground Water Basin" Technical Information Record issued by the California Department of Water Resources by Kenneth Hatai.

1993 – Review of the two U.S. Geological Survey Reports (82-855 and 87-4199) by Dr. David Huntley, Professor of Geological Studies at San Diego State University.

1980-2000 – Ongoing monitoring of Borrego Valley static water levels by John Peterson, Hydrogeologist with the County of San Diego Department of Planning and Land Use.

Yet to be published – San Diego State University graduate thesis on the Borrego Valley Aquifer by Henderson and Nettle.

## 3.4 THE BASIN'S GROUNDWATER

**Estimates of the Annual Inflow into the Basin**

The 1988 USGS report has stated the basin's annual recharge to be approximately 4,800 acre-feet per year. An additional 300-500 acre feet per year might be expected through catchment basins in exceptionally wet years. The source of this recharge flow comes primarily from three major drainages; Coyote Creek (65%), Borrego Palm Canyon and San Felipe Creek (35% combined). Although all three sources have been used to monitor flow into the valley at one time or another, only Borrego Palm Canyon is presently being gauged through a joint venture of the USGS and the Borrego Water District. It is also believed that the basin could be losing some water down Borrego Sink Wash at the southeasterly corner of the valley into San Felipe Creek. The 1982 USGS report estimated that further upstream the subsurface flow from San Felipe Creek into Borrego Valley was approximately 32 acre-

feet per year. The USGS gauging station data is included in the Appendix "D" of the report.

## Estimates of the Annual Groundwater Use and the Overdraft

In the twenty year period from 1978 to 1998, during which the County monitored local wells, urban water uses have increased 400%, agricultural water uses (which began with a much greater base) 250% and golf course and general landscaping by 220%. During this same twenty-year period the rate of decline in water levels has increased from less than one foot per year to over two feet per year on average and in some locations as much as three feet a year (the original Borrego Springs well in the town center).

Based upon metering and water use, in 1999 the Borrego Water District defined the annual water usage of the valley to be 17,500 acre-feet. The 1982 USGS Report 82-855 concluded that *"between 1945 and 1980 water levels in wells have declined as much as 100 feet locally and water withdrawn from the basin exceeded recharge by 330,000 acre-feet."* The report also established an amount of groundwater storage in the aquifer. The 1988 USGS Report 87-4199 refined and updated earlier figures. In 1993, Dr. David Huntley, professor of geology at San Diego State University and John Peterson, San Diego County Department of Planning and Land Use, established from the USGS data that the amount of water in storage was 1,900,500 acre-feet (upper aquifer – 809,000 acre-feet; middle aquifer – 1,090,600 acre-feet). The annual use varies according to water withdrawn from the aquifer by residential, golf courses, agriculture and natural vegetation (transpiration). When this usage is greater than the amount of recharge, the aquifer is considered in overdraft. Historically, the Borrego Valley aquifer has been in an overdraft situation every year since 1945. See Appendix "E" for more technical data.

## Water Use Calculations

Water use by both the Borrego Water District (including Rams Hill Golf Course) and the Borrego Springs Park Community Service District (including Club Circle Golf Course) are metered and included in the appendix. Other golf course usage has been estimated by area of irrigated turf. Agricultural usage has been calculated by determining irrigated acreage from infrared aerial photography dated 1996. These acreages, the crop type and a standard water use by crop type were used to calculate water use. It was determined that citrus groves (both lemon and grapefruit) use approximately six acre-feet per acre, nursery and palm groves use approximately four acre-feet per acre and potato fields, which are a winter crop and are rotated every three years use approximately two acre-feet per acre. This calculation is in Appendix "F". Private domestic and air ranch usage have minimal irrigation and have been estimated by amount of domestic use.

## 1999 BORREGO VALLEY WATER USE IN ACRE-FEET

| AREA | MUNICIPAL | AGRICULTURE | GOLF COURSE & LANDSCAPE | TOTAL |
|---|---|---|---|---|
| B.W.D. ID-1&3 | 420 | | 1,494 | 1,914 |
| B.W.D. ID-4 | 1,723 | | 191 | 1,914 |
| B.S.P.C.S.D. | 75 | | 1,000 | 1,075 |
| Roadrunner Club G.C. | | | 750 | 750 |
| DeAnza C.C. | | | 1,000 | 1,000 |
| Agricultural Wells | 4 | 15,590 | | 15,594 |
| Borrego Air Ranch | 10 | | | 10 |
| Other Private Wells | 40 | | | 40 |
| **TOTAL:** | **2,272** | **15,590** | **4,435** | **22,297** |

NOTE: "municipal" and "domestic" are terms used to refer to urban uses. Borrego Springs is not an incorporated municipality, but an unincorporated community of San Diego County. "ID" refers to "Improvement District". The Borrego Water District has four improvement districts each representing a new service area added to the district. ID 1 covers Ram's Hill water, sewer and flood control. ID 2 included the sewer line extended from the treatment plant at Ram's Hill to the Palm Canyon Resort and all the properties along it that may connect to it from Palm Canyon Resort to La Casa del Zorro. ID 3 includes water service for Rancho Borrego, La Casa del Zorro and Deep Well Trails. ID 4 includes water service for the area acquired from the Borrego Springs Water Company and is basically the area from Indian Head Ranch south to Ocotillo Heights and west from the Park Headquarters to the Roadrunner Club.

## HISTORICAL BORREGO VALLEY WATER USE IN ACRE-FEET

| YEAR | MUNICIPAL | AGRICULTURAL | GOLF COURSE & LANDSCAPE | TOTAL |
|---|---|---|---|---|
| 1950* | 170 | 11,435 | 190 | 11,795 |
| 1958* | 225 | 22,455 | 790 | 23,470 |
| 1962* | 265 | 13,455 | 1,725 | 15,820 |
| 1968* | 475 | 7,260 | 1,720 | 9,455 |
| 1972* | 530 | 5,320 | 2,270 | 8,120 |
| 1978* | 600 | 5,705 | 2,050 | 8,355 |
| 1980** | 430 | 10,600 | 2,100 | 13,130 |
| 1999*** | 2,272 | 15,590 | 4,435 | 22,297 |

* Applies water use from PRC Toups Engineering
** Applies water use from USFS, US Census and DWR population, land use and water use data
*** Applies water use data complied by Borrego Water District using records of metered water use for municipal purposes, inspection of irrigated acreage and reports from golf course operators.

### The Impact of Declining Groundwater Levels on the Valley's Wells

The 1982 USGS Report 82-855 states that in 1946, Taylor and Taylor Engineering produced a map depicting 36 wells in the Valley. In 1953, the USGS visited 133 wells, indicating an increase of about 100 wells over the course of seven years. Today, the agricultural area (predominantly north of Henderson Canyon Road) operates approximately 50 wells. Golf courses operate approximately eight wells for irrigation. Domestic water supplies for the Borrego Springs Park Community Service District and the Borrego Water District are pumped from 14 wells. Individual domestic wells total in the neighborhood of 50. The area between Henderson Canyon Road and Palm Canyon Drive contains a number of old irrigation wells currently not in production.

The Groundwater Technical Committee recognizes the serious nature of the problem of groundwater overdraft. The Committee agrees that if there is no groundwater management or controls on water use, the water levels will continue to drop. More wells will fail due to the intrusion of high nitrate concentrations and there will be progressive failures due to the water level dropping below the bottom of existing wells.

High nitrate ($NO_3$) levels in the groundwater have been showing up in valley wells for some time now. There are basically three sources of the contamination; agricultural fertilizer, domestic septic tanks and naturally occurring due to decomposing vegetation. As pumping levels drop, the radius of influence expands – drawing groundwater from closer to the surface into the pumping zone. Historically, this problem has been solved by drilling a new well in the same area, and by lowering the perforation zone to a lower point in the aquifer.

By far, the largest impact on production wells from the declining water table is the increased well operating expense. For every 10 feet drop in the pumping level, well operators can count on an additional 3% in operating costs. As energy costs continue to climb, this percent will also climb proportionally. In addition, older wells in the Valley were constructed based on a much higher pumping level than currently exists. These wells are generally less deep and the perforation zones tend to get left "high and dry" as the water level drops below the area of the well which allows water to enter the casing.

The current forecast is that the upper and middle aquifer will continue to drop at a rate of approximately 2.5 feet per year. By 2034, the upper and middle aquifer will be 50% depleted and the pump lift will be increased by (34 x 2.5 ft/yr) 85 feet. The increased lift will add over 25% to the present costs for pumping. An additional drop of 85 feet in the water level will cause a number of wells to fail because the water level will be too low to enter the existing perforations. Each new replacement well would cost approximately $100,000 based on today's construction costs.

## The Impact of Declining Groundwater Levels on the Valley's Natural Environment

Plant and animal life can adapt to change when it occurs gradually. But what happens when this change is not so gradual? As the valley's pumping wells continue to draw down the water level, the de-watered portion of the aquifer readily accepts more water to infiltrate into the ground. Water, which historically has pooled on the surface is now limited or in some cases, disappeared completely, forcing wildlife to higher elevations away from their native habitat.

Plants like the native mesquite extend their taproots into the water table (reported up to 150 feet). The area known as the Borrego Sink was once abundant with mesquite, but every year there is more evidence that these adaptable trees are dying of thirst. The water level is simply dropping quicker than their growing rate can accommodate. In addition, plant life serves an important purpose as ground cover. As the surface plant life diminishes, more soil is left uncovered and is free to blow with the wind, creating dust storms. This aspect is covered in more detail in a report by Mark Jorgensen, a local ecologist, in Appendix "G" of this report.

## Estimates of the Basin's Holding Capacity and Remaining Groundwater

The Borrego Valley basin has three levels of strata and three aquifers. The upper and middle aquifers consist of porous materials such as sands and gravel from which groundwater is easily extracted.

Based on USGS Report 87-4199 and subsequent studies by Dr. David Huntley and John Peterson, the quantity of water in the Borrego Valley upper and middle aquifer was approximately 2,131,000 in 1945 before there was any significant development or water extraction. By 1979, it was determined that the accumulated overdraft had reduced the water in storage to 1,900,500 acre-feet. These calculations were carried forward to 1999 at which time the water remaining was calculated to be approximately 1,685,000 acre-feet. Using the present rate of overdraft of 17,500 acre-feet per year the upper and middle aquifers will be one-half depleted in the year 2034 and fully depleted by the year 2095 if the present rate of use remains unchanged. The remaining water in the lower aquifer would be difficult and costly to extract because of its very low (3%) specific yield and very low specific capacity (5 gpm/ft. of drawdown or less). This time frame is based upon existing water use. Changes in land use would change these calculations. See Appendix "E" for the full calculations.

Geophysical studies were conducted by Agbabian Associates in late 1995 and early 1996. Their stated purpose was *"to generate a model of depth to groundwater and basement."* The area surveyed is located in the extreme northwest corner of the Borrego Valley basin and extends only a limited distance (Henderson Canyon Road) toward the south. The electromagnetic soundings and seismic refraction surveys were conducted primarily to map depth to groundwater, while the gravity survey mapped the depth to crystalline basement/bedrock. The combined electromagnetic and refraction work along with the known groundwater elevations from "main station," "oasis" and a well located 1.2 km southeast of "main well" were used to generate several maps. All of these wells have been monitored by the county. Figure 2 of their report is a contour map of groundwater elevations and figure 3 is a contour map of depth to groundwater. Figures from this report are featured in Appendix "H."

The gravity data was used to generate a model of depth to granitic basement. The resulting basement contour map shows two distinct basins in the surveyed area. These are separated by a bedrock ridge, which trends southeast-northwest. Along the north side of the surveyed area, the two basins merge into a singular trough, which parallels the Coyote Creek fault and has an apex extending up into Coyote canyon.

Appendix "H" also contains an illustrated cross section of the above gravity survey which has been superimposed on a cross section of the area taken from the USGS report 82-855. As noted, the depth to the basement ridge located by the gravity survey is not significantly different than that profiled in the USGS report. Significant difference is noted in the depth to basement of the two areas paralleling the ridge. Our limited data suggests an increased thickness of sediments in the two troughs of some 600-800 feet. There are no wells that

penetrate into these two deep basins, hence, we do not know the compositions of the sediments or the quantity or quality of water in those formations. A more thorough idea of the existence of the two basins and the basement ridge can most easily be gained by extending gravity surveys to the south of the currently mapped area. A second alternative would be to program any well to be drilled in the trough area to a total depth sufficient to check the existence of the trough. Such a well, properly monitored, could provide sediment data as well as quality and quantity of water for that location.

## 3.5 ISSUES OF GROUNDWATER QUALITY

The groundwater throughout the Borrego Valley is generally good to excellent in quality. The Borrego Water District wells average less than 500 parts per million (ppm) total dissolved solids. To put that in perspective, Colorado River water is in the 700-ppm (TDS) range. Any water source above 1,000 ppm is considered non-potable. See Appendix "I" for water quality data. The data indicates that there has been no serious degradation to the water quality. All wells that service domestic customers are constructed to minimize surface water contamination.

The Valley has no serious contamination problems at this time. Area gasoline stations are the only real industrial contamination risk in the community. The Regional Water Quality Control Board has inspected the two abandoned stations and the three existing stations are centrally located in the town center, away from any production wells. Water quality samples have not detected MTBE (Methyl Tertiary – Butyl Ether), the gasoline additive intended to clean up the air that has contaminated groundwater basins in many urban areas.

There have been serious local problems in the past due to elevated concentrations of Total Dissolved Solids (TDS) and nitrate ($NO_3$). Pockets of low quality water have moved toward active wells and the water becomes unsuitable for use in the domestic water system. This is not a reversible situation. The following examples of this situation have been documented:

**Roadrunner Club Well, 1010 Palm Canyon Drive**
**(W ½ of section 33, T10S, R6E):**

Approximately 20 years ago, the Roadrunner Club provided its own irrigation water, as well as its own domestic water to its residents. Over a period of a few months, the concentration of $NO_3$ increased rapidly and exceeded the 45-ppm concentration level allowed for drinking water. The solution was to extend the Borrego Springs Water Company system to the Roadrunner Club from the public water system (Now the Borrego Water District) and have the Roadrunner Club distribute it to the residents of the park. The golf course and landscaping are served from privately operated wells, which have high $NO_3$ concentrations.

**Borrego Springs Water Company Well #1, 2475 Stirrup Road**
**(W ½ of SE ¼ section 32 T10S, R6E):**

In the late 1960's the original Borrego Springs Water Company well became contaminated and the water was unsuitable for domestic water service because of high nitrates. It was taken out of service and thereafter used only for construction water. Today the well serves as a monitor well.

**Di Giorgio Wells 11, 14 and 15 Borrego Valley Road, north of Henderson Canyon Road**
**(Sw ¼ of section 15 and NE ¼ of section 22 T10S, R6E):**

These three wells all pumped high quality water in the 1960's. By 1985 when the wells were being used for the Roadrunner Tree Nursery, the water quality had deteriorated as follows:

| WELL NUMBER | TDS (ppm) | $NO_3$ (ppm) |
|---|---|---|
| Well 11 | 1,770 | 180 |
| Well 14 | 1,650 | 195 |
| Well 15 | 1,820 | 120 |

The water produced from wells in this area is of such very low quality that it is not suitable for use as drinking water.

## PART FOUR: FUTURE DEMANDS ON THE AQUIFER

### 4.1 REVIEW OF CURRENT SITUATION

The current demands (1999 water usage) on groundwater as identified earlier are as follows:

15,590 acre-feet per year for Agriculture
4,435 acre-feet per year for Golf Courses and landscape irrigation
2,272 acre-feet per year for Urban Uses (residential, commercial, resort)

This water demand is generated by approximately 4,000 acres of agriculture, some of it such as the potato fields, only uses water periodically. The urban water use comes from the existing commercial development and approximately 1,500 residences, again probably less than half are occupied year around.

### 4.2 FACTORS EFFECTING POTENTIAL WATER USES

**Future Urban Development**

The Borrego Valley consists of approximately 55,000 acres of privately held land. Less than 25 percent of this area has been subdivided into potential residential lots of five acres or less or have a specific plan approved for future development (Rams Hill, The Borrego Country Club and Roadrunner Mobile Home Park). The staff of the Technical Committee did attempt to count all the existing or approved subdivided lots under five acres and approved mobile home parks assuming that those could constitute potential residential lots. There are also existing mobile home parks and RV parks that have long-term residents. We then separated the lots with residential uses on them from the lots not yet utilized. We concluded that there are approximately 6,659 lots or mobilehome sites, existing or approved under specific plans, that could be built upon of which only about 2,000 are currently built upon or used for mobile homes. This means that about 30 percent of the available home sites are currently being used. In addition there are 1,000 RV spaces that exist or have been approved for development which would add an additional 2,000 population in the winter season. If there were total buildout of these home sites, the total population using the current generation factor of 2.3 residents per household would be around 19,000 even if no more new developments were approved. The County of San Diego Department of Planning and Land Use projects that even the new lower density designation being proposed in the GPA 2020 program would allow a valley population of approximately 25,000 if there were total buildout. Total buildout is unlikely, but a realistic future valley population could reach 15,000 or more.

The next question in regard to urban growth is how fast will it take place. Over the last 20 years, the water agencies in the valley have experienced an overall average of 40 additional connections a year – residential and commercial. Some of these involved large building spurts such as Rams Hill. When Rams Hill was under construction, it was projected that the financial break-even point for a large-scale project required the sale of 100 units or lots per year. Similar projects in the Palm Desert area were averaging 300 units per year. The factors that limit growth in the Borrego Valley are access, lack of commercial development and the fact that most homes involve custom construction. As commercial and health care facilities generally require a minimum population of approximately 15,000, the primary factors limiting growth will most likely remain in effect until the valley has a much larger population. That would suggest a continuation of relatively slow urban growth. Conversely, the factors that cause growth in this relatively isolated, retirement and resort community are economic prosperity and the lack of a similar life-style in other locales. With California projecting to have a 30 percent increase in population over the next 25 years, there could be an increased demand for homes in this area, as it becomes more desirable. Second or weekend homebuyers do not necessarily require or demand all the urban services of primary home locations.

There is little commercial development at the present time, but a population of 15,000 would attract chain stores and restaurants and their existence would attract a greater population and more of a year-round population. It can be concluded that with such growth the valley would probably use four or five times more water for urban uses even without approving any additional major subdivisions except those within the approved specific planning areas of Rams Hill, Borrego Springs Country Club and Roadrunner Mobile Home Park.

## Future Golf Courses

The valley currently has three regulation 18-hole courses and two small 9-hole courses (Club Circle and Roadrunner). Both Rams Hill and the Borrego Springs Country Club have specific plan approval for an additional 18-hole course and Roadrunner has approval for an additional nine-hole course. If these new courses were added with improved irrigation systems and the existing golf course improved their systems and reduced the size of the their fairways, the additional courses could probably be accommodated with less than 25 percent increase in water use for all golf courses. In order to maintain turf in the desert, it takes 7 feet of water per year. In Arizona and some other locations water use has been restricted to 4.5 acre-feet per year. The typical action taken is to reduce the area irrigated. If a traditional 18-hole golf course had 95-100 acres of irrigated turf, the irrigated area is being reduced to 75-85 acres of turf. It is estimated that currently there are 130 acres of irrigated turf at the De Anza Country Club and that there are 150 acres of irrigated turf at Ram's Hill.

## Future Agriculture

Agriculture, like manufacturing, requires an ability to produce a product that is economically competitive. Agriculture in Borrego is to a great extent dependent upon the price of pumping water. Pump drives can either be electric or diesel. The costs of those two sources of power have a major influence on the economic viability of farming in Borrego. The issue being, can the water be pumped at a price competitive with that from subsidized water projects. Farming anywhere is also dependent upon foreign competition. In the past Borrego had flower farms. Expansion of this activity in Columbia, South America, and shipping by air eliminated that product. In the 1980s when the environmental impact report was written for Rams Hill it was projected that agriculture would die out due to its competitive disadvantage. It has survived and there has even been the introduction of new products such as row crops and potatoes.

Due to climatic conditions, and now economic factors, citrus probably has limited potential for expansion. However, an agricultural nursery in Thermal purchased over 1,000 acres last year so there may be a new product opening up. If agriculture uses seven acre-feet of water for every acre planted, then every 340 additional acres added to agriculture will use as much water as all urban uses do at the present time. In effect, every 340 acres of agriculture is a new Borrego Springs. The Borrego Valley has a great deal of vacant land. If there is no urban growth to occupy it, then it must either go into agriculture or remain a tax burden for the owner. Agriculture also has the potential of further limiting the amount of usable water by impacting the quality of the water due to the introduction of fertilizers. This is particularly prevalent in desert areas where it is necessary to flush out salt build-up by using additional water.

The Anza Borrego Foundation, whose purpose is to acquire land for the State Park, has purchased potential agricultural land adjacent to Henderson Canyon Road to preserve wildflower areas. This purchase of land in the Valley floor is done, however, only when the price of the land is very low.

Due to the slow rate of urbanization and the ability to limit golf courses through County action, the expansion or contraction of agricultural land will be the basic factor in determining the impact on the groundwater supply.

## 4.3 GROWTH AND ITS IMPACT ON THE AQUIFER

If estimates of the usable water in the aquifer are accurate and the current level of water use continues the overdraft will substantially deplete all water supplies in about 95 years. Build out of 75 percent of the allowed residential lots and the addition of 1,000 more acres of agriculture, an increase of 25 percent, would reduce that to approximately 52 years depending upon the rate of the growth. (See Appendix "E") The expansion of urban water

use and golf courses can be controlled under current land use regulations. The County of San Diego, which is the local land use regulating agency for the Borrego Valley, currently has no regulations regarding expansion of agricultural uses.

## PART FIVE: ALTERNATIVE PROGRAMS FOR GROUNDWATER MANAGEMENT

The Technical Committee has evaluated the existing reports on the Borrego Valley and its aquifers and has concluded that the evidence of groundwater overdraft is clear and adequate for policy makers to make a judgment as the best course for groundwater management.

The following described projects seem to be the best opportunities available for use in groundwater management.

***Programs to Increase Water Supply***

### 5.1 OBTAINING IMPORTED WATER FROM CALIFORNIA WATER PROJECTS

In 1984 the California Department of Water Resources issued a report entitled "Borrego Valley Water Management Plan." Part of this report detailed three options for importing water into the valley. The cost analysis reflected only the construction of the conveyance system and did not include any figures on the cost or availability of the water supply. One source originated from the Metropolitan Water District of Southern California via San Diego County (Escondido-Borrego). The second source originated from the Coachella Valley Water District via the northern edge of the Salton Sea in Riverside County (Oasis-Borrego). And the third source originated from the Imperial Irrigation District via southern edge of the Salton Sea in Imperial County (Westside-Borrego). As part of our 2000 Groundwater Management Program, Mr. Carl Hauge of the State Department of Water Resources updated the costs associated with conveying water from these sources. These costs for these conveyance systems are as follows:

| | |
|---|---|
| Escondido-Borrego - | $7,675 per acre-foot (untreated water) |
| Oasis-Borrego - | $3,039 per acre-foot (untreated water) |
| Westside-Borrego - | $3,228 per acre-foot (untreated water) |

For comparison the current water rate for treated water delivered by the Borrego Water District is $439 per acre-foot.

The costs associated with actually purchasing the water are not included and the water is not likely to be available due to existing over-allocations of the State's water supplies. Appendix "J" details these costs. In addition, all imported water must be treated to meet drinking water standards. A plant to accommodate this volume will add approximately$20 million to the startup costs.

## 5.2 OBTAINING WATER FROM ADJACENT SOURCES

The Borrego Water District began exploring for additional water sources outside of the main basin in the mid-1990's. The first exploratory well was drilled east of San Felipe Creek near the intersection of Borrego Springs Road and state highway 78. Pump tests performed on this well indicated that the formation was too tight to provide much flow. The second test well was drilled on the District's 240-acre property near Clark Dry Lake, east of the Coyote Creek Fault on the Borrego-Salton Seaway. This test well indicated good yield, but the water was saline and not suitable for drinking water. With the aid of U.S. Filter (one of world's largest water service companies), costs were researched to desalt and convey 2,800 acre-feet per year to the District's distribution system. The cost associated with this project reached $1,220 per acre-foot. It also required a large brine basin that would eventually need to be "cleaned up". As the exploration effort continued, it was discovered that large volumes of water were being pumped for the alfalfa fields of Allegretti Farms, located east of Ocotillo Wells, some four miles east of San Diego County near the Imperial County boundary line. Although not suitable for drinking water, this source could yield 6,000 acre-feet per year for irrigated agriculture, at an estimated cost of $668 per acre-foot plus the costs of acquiring the right to the water. The reports for these studies can be found in Appendix "K."

## 5.3 PROGRAMS TO ENHANCE RECHARGE IN THE VALLEY

By letter dated July 24, 2000, Robert Zinser (a Board member of the Borrego Springs Park Community Service District and member of the Policy Committee) urged the Borrego Water District to give consideration to the repair and maintenance of existing infiltration ponds in the Valley's stream channels and to attempt to obtain funding from the County of San Diego for this function. The eleven existing sites were visited and studied. This report can be viewed in Appendix "L." The evaluation of the existing structures indicated that they were generally sound and required some maintenance. In particular, the bottom surface of the ponds should be scarified to improve infiltration rates for better efficiency.

The infiltration ponds and their operation were discussed briefly during a subcommittee meeting in September. Some Committee members were concerned with the development of hardpan or caliche in the stream channels with intermittent flow, which result in low infiltration rates. Mr. Carl Hauge's comment was that he is of the opinion that water will not move through unsaturated zones (approximately 150 feet) to saturated zones unless there is a continuous supply of water that keeps it moving.

The consensus seems to be that if you judge the observed total amount of time that water is running in the stream channels past the existing ponds and the rate of that flow, it would be very infrequent to have a year where more that one or two thousand acre feet of additional water could be infiltrated. Wet years occur very infrequently, hence it would be difficult to accurately estimate the benefits that would result by improving the infiltration ponds. Our

judgement is that the average increase would be limited to between 300 and 500-acre feet per year.

The prudent path to follow seems to be to attempt to have the County of San Diego maintain these structures. If that request fails and the community wants the Borrego Water District to undertake the responsibility it requires further study to ascertain the following:

1. Actual cost of maintenance
2. Who will pay
3. What are the right-of-way problems working on private property
4. What is the potential liability if the District is maintaining the dams and a flood breaches the dam which floods downstream property

***Programs to Reduce Groundwater Usage***

## 5.4 USE OF RECLAMED WATER FOR IRRIGATION PURPOSES

### Water Available for Reuse

Currently, most of the domestic water used in Borrego homes is processed through septic tanks, which discharge the effluent underground where it may seep back into the aquifer. A small portion of the existing homes and businesses are served by sewers (Rams Hill, Borrego Springs Country Club, Club Circle and limited portions of the town center.) If planning policies are changed and the existing lots and developments such as the Roadrunner Mobile Home Park are added to the sewer system, it may be possible to develop a significant quantity of reclaimed water. If a population of 18,000 persons is provided with sewer service, the quantity of reclaimed water that will be produced and the costs should be determined.

### Quantity of Reclaimed Water That Can be Made Available for Reuse

The Borrego Water District's records indicate that there are approximately 500 Equivalent Dwelling Units (EDU's) of sewer service connected to its Ram's Hill Reclamation Plant. Average summer and fall flows are in the 15,000 to 20,000 gallons per day (gpd) range; winter and spring flows are in the 30,000 to 40,000 gpd range. Approximately 30 acre-feet of sewage flow reaches the treatment plant each year. A population of 18,000 would increase the EDU's to approximately 7,200, or about 14.4 times the current flows. Accordingly, the summer and fall flows should be in the 200,000 to 300,000 gpd range and the winter and spring flows will be in the 400,000 to 600,000 gpd range. In order to process this quantity of sewage flow it will be necessary to triple the size of the treatment plant and also activate the unused filters and disinfection equipment which are not now in service.

The quantity of reclaimed water produced in acre-feet will average .77 ac.ft./day in the summer and fall and 1.53 ac.ft./day in the winter and spring. Water demands on the Ram's Hill Golf Course reach 5 ac.ft./day in the summer and fall and averages about 2 ac.ft./day in the winter. Therefore, the reclaimed water produced by an expanded plant will supply about 75% of the golf course demand in the winter and about 16% of the golf course demand in the summer. The total acre-feet delivered from an expanded treatment plant would be about 425 acre-feet per year.

**Cost of Facilities Required to Provide 425 acre feet per year**

The estimated cost to extend the trunk and lateral sewers together with the Capital and Operating Costs are listed below:

| | |
|---|---|
| Capital Cost: | |
| a. 36,000 feet of 8" and 10" laterals @ $30/ft. | $1,080,000 |
| b. 30,000 feet of 12" trunk sewers @ $50/ft. | $1,500,000 |
| c. 1 pump station | $80,000 |
| d. Increase Treatment Plant capacity (.25 mgd to .75 mgd) | $4,750,000 |
| Total Estimated Capital Cost: | $7,410,000 |
| Annual Operating Cost: | |
| a. Operation labor and material | $300,000 |
| b. Electrical, cost of pumping | $45,000 |
| c. Debt service (20-year bond $8,200,000 @ 6.5% int.) | $745,000 |
| Total Operating Cost: | $1,090,000 |
| Annual Cost per EDU: $1,090,000/6,000 units served | $182/year/EDU |

Cost per acre-foot = $1,090,000 / 425 = $2,656.00/ac.ft.

NOTE: This reclamation project would also offset the need for about 5,000 new septic tanks that would be required for individual homeowners and small businesses. The 5,000 new septic tanks may cost as much as $2,500 each for a total cost of $12,500,000; hence, the overall installation of sewers and treatment plant expansion seems to be cost effective if indeed 5,000 homes will be constructed on existing or new lots.

## 5.5 VOLUNTARY WATER CONSERVATION MEASURES

**Water Conservation Options**

Many water agencies in the State of California have found that voluntary conservation can be helpful in reducing water demand. Certainly the Borrego Water District can offer programs that will educate local residents to conserve water by limiting use of water to

wash off sidewalks and pavement, by limiting the time in showers, by repairing dripping faucets and leaks in pipelines, etc. Landscape irrigation use, too, can be reduced if the operators are encouraged to implement water saving measures. Lastly, water conservation measures in agricultural irrigation could help if there is currently overuse of water in crop production.

As urban water use in this valley constitutes 10% of the water use, voluntary conservation measures may be most important in bringing about better awareness of the importance of the overdraft issue. During several recent drought periods in California, it was common practice for restaurants to bring water to customers only on request and in many hotels they still have notices that daily change of bed linen requires extra water use and will be done only upon request. Voluntary conservation measures such as these and the educational programs that go with them would seem to be in order even if in total they only contribute a minor addition to solving the problem.

**Programs for Local Residents**

As identified at the beginning of this section, voluntary programs for local citizens may not have a major role in overall reduction of water use, but they can have a very significant role in bringing the issue before the public. The Borrego Water District already distributes a number of informational items such as a ruler that has holes that show how much water a drip uses. The District also provides material to school programs. Additional items that may be considered include the following:

1. New style, three-tier billing on water bills with more information. For example, tip of the month (to reduce consumption) such as "did you know that by letting the water run while brushing your teeth, shaving or washing, you can waste 3-5 gallons a minute," or "If you are going to purchase a new washing machine, a side loader will save you water and money!"

2. Resorts, Inns and Motels
    a. Bathroom signs, reminders: "This is a desert. Water is precious!"
    b. Develop water saving linens and laundry programs.
    c. Use low-flush toilet conversions and install low-flow faucets and showerheads. (These are free in some water districts.)

3. Schools:
    a. Volunteer speakers, clown presentations, poster contests.
    b. Teacher guides and special help for possibilities in the science curriculum
    c. Water Day, special events.
    d. Bathroom signage and reminders.

4. Newspaper ads every month in the Borrego "Sun" showing % of water used compared to last year at the same time, rain and recharge, tip of the month.

5. Newspaper ads every month in the Borrego "Sun" showing % of water used compared to last year at the same time, rain and recharge, tip of the month.

6. Xeriscape: (low water use landscaping)
    a. Demo garden with drought tolerant plants.
    b. Garden tours of local homes featuring a xeriscape plan.
    c. Helpful information sheets on irrigation systems, time of day to water and additional resources

7. Large Community Sign (thermometer or water battle or Borrego basin placed on new District office grounds depicting aquifer use and indicating conservation progress. Sort of a "how are we doing" reminder that we are all in this together.

8. Agriculture: Appropriate crops, appropriate technology (irrigation techniques evaluated to minimize evaporation like mulching, drip irrigation as opposed to sprinklers, etc.)

9. Resource library and an information rack at the new District office with pamphlets and hints on demonstrations and devices in English and Spanish.

**Use of Heavy Mulch in Agriculture**

One form of water conservation that is beyond simple reduction in water use is that of applying heavy mulch in orchards. The desert heat causes high rates of evaporation that some recent experiments suggest may be reduced significantly by mulching.

In order to evaluate this possible modification to orchard management, it will be necessary to determine the optimum depth of mulch , the cost of application, and any adverse impacts such as reducing fruit size or changing taste. As farmers are businessmen it will also be necessary to evaluate the quantity of water saved as compared with the cost.

Dr. Gary Bender, Farm Advisor for the County of San Diego, is preparing proposals for grants to set up field trail plots to obtain more information on the value of mulching.

**Changes in Agricultural Products**

One option that may be most effective in limiting agricultural water use, but most difficult to implement is changing the type of agricultural products grown in the Borrego Valley. Farmers, however, respond to the market. At one time alfalfa was a major crop in the valley. Flowers were also an early crop until that market was taken over by growers in South America. Now there is a changing international market in terms of citrus crops. Low water use crops could be promoted through an informational program, but changing from one crop to another is really dependent upon economic factors with the cost of pumping

water being one of those factors. As the water levels drop, the cost of pumping will increase and it may be necessary to change crops to complete. Whether the new crops will be less intense water users is still an open issue. A report by Steve Smiley of the Technical Committee can be found in Appendix "M."

## 5.6 REDUCTION IN WATER USE THROUGH GOVERNMENTAL REGULATION AND PROGRAMS

### Use of County Land Use Authority to Limit the Expansion of Agriculture

Historically, conversion of land to agriculture has been allowed by right on all land in California, but that is not the practice in desert states such as Nevada and Arizona. The County of San Diego, which serves as the local government for all the unincorporated areas, is currently undertaking a major multi-year planning program to develop a new general plan and new community plans for the unincorporated area of the county and its 24 community or sub-regional planning areas. Borrego Springs is a part of this effort called General Plan Amendment 2020. It is meant to be a land use plan for the next 25 years although as can be told by the date 2020 it is somewhat delayed in completion.

It has been suggested by Borrego residents concerned with groundwater overdrafting that it is time that the County planning department began to recognize that the desert, and other areas outside of the service area of imported water, have special needs. Undeveloped land in these areas cannot simply be designated for conversion to agricultural uses by right as though there are no negative impacts to such change.

Historically the concern of all planning agencies in San Diego County, including the County Department of Planning and Land Use has been solely on how to regulate or accommodate urban growth. That remains the primary concern of the current planning studies.

Those who emphasize the need for County consideration of "Back County" needs stress that overdrafting of groundwater resources is an additional major concern that must be addressed in these areas. In the late 1970s the County did adopt a special land use designation for the Borrego Valley that prohibited the conversion of land to large-scale developments until there were adequate studies of the groundwater issues. That triggered the original studies of the valley in the early 1980 when the Di Giorgio Corporation, developers of Rams Hill, helped fund the USGS study and private studies of the valley aquifer and groundwater supply. Those private studies identified that agriculture, not urban development was the major user of water, but incorrectly projected that economic factors would cause its demise thereby saving the aquifer from any adverse impacts.

The Borrego Springs Sponsor Group, the County's officially designated planning advisory group for the valley, has considered proposals from members to recommend to the County planning department that it develop special designations for the unused land of the valley

that would prohibit the conversion of such land to agriculture as a right. This concept would allow the expansion of agricultural development only by major use permit. The issuance of a major use permit is done by the Planning Commission in a public hearing. The major use permit would require an environmental review as part of the process. A proposal presented to the Sponsor Group recommended that such environmental review include proof that the conversion of raw land to agriculture would not have adverse impacts on groundwater supplies, groundwater quality and air quality from blowing dust associated with the operation or the land after agriculture is abandoned. The Sponsor Group has asked the Board of Supervisors to adopt such a measure until a groundwater management program is in effect.

Another proposal has been that in place of designating land in Borrego for agricultural land, the planning department designate all undeveloped land outside of the Country Town boundary (the area proposed for future urban uses) as a category such as Desert Estate.

The designation of Desert Estate would allow the division of the land into large estates such as 10 or 20 acres, but would be accompanied with a design control applied at the time of subdividing the land that would only allow non-native plants on a limited portion of each lot, adjacent to the residence. The existing agricultural areas could continue as a non-conforming use, but raw land could not be converted to agriculture. The intent is to give undeveloped land in the valley a future economic use that does not involve high water use such as for agriculture. It is based upon the premises that it is likely that in the next 25 years there will be a market for such estate lots in the valley. Members of the Sponsor Group have been concerned that if widespread development took place under this designation it could lead to the destruction of the open space appearance of the valley. Some have referred to it as promoting a look of Temecula in the Borrego Valley.

A third proposal that was approved by the Sponsor Group and sent to the County, but rejected by County staff, was to designate the existing agricultural area north of Henderson Canyon as the only area in the Valley to be considered for conversion to a future golf course community. The idea was that the demand for an additional golf course community would probably be a reality in the next 25 years. If such a development were located in areas presently designated and used for agriculture, it would greatly reduce the use of water as well as give the farmers some economic reason to sell their land. Staff felt that designating such a large area, almost as large as Rams Hill's 3000 acres, for a future development even at the Rams Hill overall density of one unit per two acres, would require that all roads in the central and northern areas of valley be sized to this potential future use. That would require that the existing road system be designated for expansion, something the County wants to avoid.

It has also been suggested that the County should be requested to adopt an ordinance to prohibit any additional wells without a use permit. This concept of using land use authority to limit wells has been promoted at water agency conferences by one noted land use attorney who is concerned about the weakness of enforcement provisions in AB 3030 planning efforts.

**Require Future Developments to Grant all Water Rights to the BWD as a Condition of Receiving Urban Water Services**

Historically in this valley, it has been the practice of large-scale developments to obtain their domestic water service from one of the water agencies and maintain private wells for landscaping and golf courses. For example, the de Anza estates are all on public water, but the golf course has its own wells. Roadrunner Park has the same provision and will continue it with its expansion, although the County has limited the amount of private water they can use on their new golf course. If the water needs exceed that limit, they must buy the water from the BWD. That is an effort to create an economic incentive to limit water use on the new golf course. Rams Hill has no significant water under it, but has a provision with the BWD to allow it to use the BWD pipelines to transmit water from a well it constructed in the valley for purposes of watering the golf course. For this use, they are required to buy 20 percent of the monthly water use on the golf course from the BWD. They currently buy nearly 40 percent annually.

Any development must supply their own water or obtain a permit from the serving water agency. In most of the valley this is the Borrego Water District. The District could obtain additional control over water rights and the use of water by requiring that any future subdivision sign over its water rights in order to obtain water service from the district. Water rights underlying the original subdivision in Borrego Springs were retained by the developer and assigned to the Borrego Springs Water Company. Those rights were acquired by the Borrego Water District when it purchased the assets of the BSWC. So the precedent has been established in the valley, but has not followed with later subdivisions or large-scale projects such as Roadrunner, De Anza and Rams Hill.

**BWD Adopts A Water Pricing Structure to Penalize Heavy Water Users**

A step beyond voluntary, but still in that area would be to adopt revised price structures to promote voluntary reduction in water use. This has been done in other districts in California. Reduction in water use is promoted by having an ascending scale. For example, the first 500 cu. ft. could be priced at $1.00 per 100 cubic feet (the current rate in Borrego) and all water in excess of 500 cu. ft. at $1.25 per 100 cubic feet or there could be other increases. To make such an ascending water rate acceptable, it is recommended that any money raised by this means should be used for groundwater management studies or the acquisition of land that has a high water use, such as agricultural lands.

However, when residential and commercial uses only account for ten percent of the water use as they do in the Borrego valley, a reduction by such users has limited affect on the overall overdraft. An additional step in terms of pricing is to apply a rate structure on all pumped well water, either in a water use tax or assessment based upon the quantity of water pumped. This will contribute to reducing golf course and agricultural uses, but unless the

money raised is used to assist the heavy users in changing from such heavy use, it may be seen as simply punitive. For example, to avoid the punitive aspect, it could be used to acquire water rights or purchase land with heavy water use.

## Pay Farmers to Not Farm

Farm publications have presented the concept that perhaps the major product that farmers have to sell is not the items grown on their land, but the water under it. If this concept were used in the Borrego Valley, the BWD would not buy water, but rather pay farmers not to use the water under their land so that the aquifer is not depleted. It would be less expensive to initiate than buying the land or water rights, but would have to have some end time period or it would become very costly over time.

## Acquisition of Agricultural Land For Fallowing

Ultimately for a groundwater management program to have a significant impact there must be a reduction in the major water use, which is water used for agricultural purposes. Those agricultural users have the right to the underlying groundwater with certain limitations. One way to reduce that use would be to apply a water use fee, or as it is sometimes called an extraction tax, and use the revenue it generates to acquire farmland and fallow it.

Currently those who pump water from the Borrego Valley aquifer incur costs in the range of $100.00 per foot. The BWD consultants have prepared various studies to show how this could be applied. The following examples illustrate how such a plan could be implemented:

Assumptions:

1. All water users in the basin would pay the same unit price for water pumped (water use fee).

2. The water use fee will be used to buy acreage currently using water for irrigation of crops.

3. Land acquisition would start with purchases of land, which are lowest in cost or that used the most water. Land costs would average approximately $8,000/acre.

**Water Sales and Land Purchases and Resulting Water Use:**
**Alternative No. 1** (Pay as you go plan: purchase land for fallowing from increased water charges):

**Year 1:** Water Pumped

| | Acre-Feet | |
|---|---|---|
| Domestic Use: | 2,300 | |
| Agriculture: | 16,000 | Used on 4,300 acres; average = 3.72 ac.ft./ac. |
| Golf Courses: | 4,400 | |
| Total: | 22,700 ac.ft. x water use fee $100/ac.ft. = $2,270,000 | |

**Year 2:** Purchase 375 acres for $2,270,000 ($6,050/ac.)
This will reduce water use by 1,395 acre-feet.

| | |
|---|---|
| Domestic Use: | 2,300 |
| Agriculture: | 14,605 |
| Golf Courses: | 4,400 |
| Total: | 21,305 ac.ft. x water use fee $110/ac.ft. = $2,343,550 |

**Year 3:** Purchase 375 acres for $2,343,550 ($6,249/ac.)
This will reduce water use by 1,395 acre-feet.

| | |
|---|---|
| Domestic Use: | 2,300 |
| Agriculture: | 13,210 |
| Golf Courses: | 4,400 |
| Total: | 19,910 ac.ft. x water use fee: $120/ac.ft. = $2,389,200 |

**Year 4:** Purchase 375 acres $2,389,200 ($6,371/ac.)
This will reduce water use by 1,395 acre-feet.

| | |
|---|---|
| Domestic Use: | 2,300 |
| Agriculture: | 10,420 |
| Golf Courses: | 4,400 |
| Total: | 18,515 ac.ft. x water use fee: $130/ac.ft. = $2,406,950 |

**Year 5:** Purchase 375 acres for $2,406,950 ($6,419/ac.)
This will reduce water use by 1,395 acre-feet

| | |
|---|---|
| Domestic Use: | 2,300 |
| Agriculture: | 10,420 |
| Golf Courses: | 4,400 |
| Total: | 17,120 ac.ft. x water use fee: $150/ac.ft. = $2,568,000 |

**Year 6:** Purchase 375 acres for $2,568,000 ($6,848/ac.)
This will reduce water use by 1,395 acre-feet.

| | |
|---|---|
| Domestic Use: | 2,300 |
| Agriculture: | 9,125 |
| Golf Courses: | 4,400 |
| Total: | 15,825 ac.ft. x water use fee: $175/ac.ft. = $2,769,375 |

**Year 7:** Purchase 350 acres for $2,769,375 ($7,912/ac.)
This will reduce water use by 1,303 acre-feet.

| | |
|---|---|
| Domestic Use: | 2,300 |
| Agriculture: | 7,823 |
| Golf Courses: | 4,400 |
| Total: | 14,523 ac.ft. x water use fee: $200/ac.ft. = $2,904,600 |

**Year 8:** Purchase 320 acres for $2,904,600 ($9,077/ac.)
This will reduce water use by 1,190 acre-feet. Also assume that the higher pump tax has caused a 10% reduction in water use by domestic and golf courses.

| | |
|---|---|
| Domestic Use: | 2,070 |
| Agriculture: | 6,633 |
| Golf Courses: | 3,560 |
| Total: | 12,263 ac.ft. x water use fee: $220/ac.ft. = $2,697,860 |

**Year 9:** Purchase 320 acres for $2,697,860 ($8,431/ac.)
This will reduce water use by 1,190 acre-feet.

| | |
|---|---|
| Domestic Use: | 2,070 |
| Agriculture: | 5,443 |
| Golf Courses: | 11,073 ac.ft. x water use fee: $240/ac.ft. = $2,657,520 |

**Year 10:** Purchase 320 acres for $2,657,520 ($8,305/ac.)
This will reduce water use by 1,190 acre-feet.

| | |
|---|---|
| Domestic Use: | 2,070 |
| Agriculture: | 4,253 |
| Golf Courses: | 3,560 |
| Total: | 9,883 ac.ft. x water use fee: $250/ac.ft. = $2,470,750 |

**Year 11:** Purchase 300 acres for $2,470,750 ($8,236/ac.)
This will reduce water use by 1,116 acre-feet.

| | |
|---|---|
| Domestic Use: | 2,070 |
| Agriculture: | 3,137 |
| Golf Courses: | 8,767 ac.ft. x water use fee: $275/ac.ft. = $2,410,925 |

After 11 years the water use will have decreased by over 60%, at a cost of $36,000,000. The process could be carried on to its planned conclusion, until land purchases would no longer be required.

**Analysis of the Effects of Alternative No. 1 on User's Costs**

1. Individual home owner on one-third acre lot using one-half of an acre-foot of water per year in ID-4.
   a. Current Cost:

| | |
|---|---|
| ¾" Service Charge | $199.00 |
| Water Rate: one-half ac.ft. = 218 Ccf x $.905/Ccf | $196.00 |
| Annual Cost | $396.00 |

   b. Cost with Water Use Tax of $100/ac.ft.

| | |
|---|---|
| Service Charge | $199.00 |
| Current Water Rate: | $196.00 |
| Water Use fee on one-half ac.ft. (0.5 x $100) | $ 50.00 |
| Annual Cost: | $445.00 |

2. Citrus Grower with a private well irrigating 20 acres using 5 ac.ft./acre/year = 100 ac.ft/year
   a. Current Cost:

| | |
|---|---|
| No Service Charge | $ 0 |
| Pumping Cost: ($100/ac.ft.) | $10,000 |
| Annual Cost: | $10,000 |

   b. Cost with Water Use Fee of $100/ac.ft.

| | |
|---|---|
| No Service Charge | $ 0 |
| Pumping Cost: ($100/ac.ft.) | $10,000 |
| Water Use Fee: 100 ac.ft. @ $100/ac.ft. | $10,000 |
| Annual Cost: | $20,000 |

   An increase of $10,000 per year or a 100 % increase

3. Rams Hill Golf Course using 1,300 ac.ft./year
   a. Current Cost:

| | |
|---|---|
| Service Charge: | $ 2,400 |
| Well 12 water: 650 ac.ft. x $100 | $ 65,000 |
| BWD water: 650 ac.ft. x $349 | $226,850 |
| Annual Cost: | $294,250 |

b. Cost with Water Use Fee of $100/ac.ft./year

| | |
|---|---|
| Service Charge: | $ 2,400 |
| Well 12 water: 650 ac.ft. x $100 | $ 65,000 |
| BWD water: 650 ac.ft x $349 | $226,850 |
| Water Use Fee: 1,300 x $100 | $130,000 |
| Annual Cost: | $424,250 |

An increase of $130,000/year or a 44% increase.

*Analysis of the Programs*

## 5.7 THE COSTS AND BENEFITS OF PROGRAMS THAT IMPORT WATER

### Importing Water from the San Diego County Water Authority

**Costs:** $7,675 per acre-foot to build the pipeline, plus necessity of paying back taxes to both the San Diego County Water Authority and the Metropolitan Water District.

**Who would benefit:** All Borrego Valley Water Users.

**Who would pay:** All Users.

**Problems:** Water supply already over-allocated and is too expensive to be realistic.

### Importing Water from Coachella Valley Irrigation District

**Costs:** $3,039 per acre-foot to build the pipeline. This water would have to be treated; hence, the cost of building and operating a treatment plant must be added to these figures.

**Who would benefit:** All Borrego Valley Users.

**Who would pay:** All Users.

**Problems:** Water supply at source is over-allocated.

### Importing Water from Imperial Irrigation District

**Costs:** $3,228 per acre-foot to build the pipeline. This water would have to be treated; hence, the cost of building and operating a water treatment plant must be added to these costs.

**Who would benefit:** All Borrego Users.

**Who would pay:** All Users.

**Problems:** Water supply at source is over-allocated.

**Importing Water from Clark Dry Lake**

**Costs:** $1,220 per acre-foot to build the pipeline, construct production wells and desalinate for irrigation purposes.

**Who would benefit:** All Borrego Valley Users.
**Who would pay:** All users.

**Problems:** The rejected brine must be disposed of or evaporated. The evaporation ponds, approximately 150 acres, must be lined, which is a costly process. The open ponds will be costly to maintain, blowing salt may cause air quality problems. The resource may not be able to sustain pumping at 4,000 acre-feet per year indefinitely.

**Importing Water from Ocotillo Wells and South and East to Allegretti Farms.**

**Costs:** $668 per acre-foot to build the pipeline and construct production wells. Existing landowners would have to be mitigated for the decline of their water levels.

**Who would benefit:** All Borrego Users.

**Who would pay:** All Users.

**Problems:** Water quality will not be suitable for drinking water; it will be delivered to golf courses and agricultural irrigators. The Regional Water Quality Control Board may be concerned with the long-term effect of importing lower quality water into the Borrego Valley than that which currently exists.

## 5.8 EVALUATING THE COSTS OF VARIOUS ALTERNATIVE COMBINATIONS

The Borrego Water District and all landowners in the Borrego Valley have numerous options in developing a groundwater management plan. This study reviewed several projects, which could increase the available water supply; however, each project is costly and none of the options fully solve the groundwater overdraft. The scarcity of water in this region is such that any successful plan must include ways to reduce current water use, including fallowing of irrigated agricultural lands as part of the solution.

The Technical Committee report describes eleven projects which were considered that would either bring in more water to the Borrego Valley, reduce existing water use by conservation methods, reclaim sewage, enhance infiltration in existing stream channels, or fallow irrigated agricultural lands. This discussion of options is an attempt to compare selected combinations from the eleven projects or methods of solving the problem. Each option has been structured to solve the 17,000 acre-foot annual overdraft.

I. Consideration of projects which involve importation of Colorado River Water. All of these projects result in water costs in excess of $3,000 per ac.ft. with capital costs in excess of $170,000,000. These are projects that cover only the facilities required to deliver untreated water. The DWR reports that there is no indication that there is a willing seller available that would sell the water even if Borrego could afford to construct the facilities. If a Colorado River water transportation facility is constructed, the required treatment plant necessary to filter and disinfect the water to make it potable would cost an additional $20,000,000.

II. Consider a combination of the following projects:

| | | Water Produced Acre Feet | Capital Cost | Annual Operating Cost |
|---|---|---|---|---|
| a. | Clark Lake Wells & Desalting Facility: | 2,800 | $25,000,000 | $3,416,210 |
| b. | Water Development S & E of Ocotillo Wells: | 6,000 | $31,500,000 | $4,010,500 |
| c. | Reduction of Irrigation/Mulching: | 2,000 | Unk. | Unk. |
| d. | Reduction of Use by Golf Course to 3000 AF/yr: | | Unk. | Unk. |
| e. | Enhanced Infiltration: | 500 | Unk. | Unk. |
| f. | Fallowing: using bond financing: | 5,290 | $11,376,000 | $1,073.894 |
| | Total Costs: | | $67,876,000 | $8,500,604 |

Resulting Aquifer Inflow:

| | | |
|---|---|---|
| Natural Inflow (average): | = | 4,800 ac.ft. |
| Enhanced Infiltration | = | 500 ac.ft. |
| Plus Project Water: | | |
| Clark Lake Wells: | = | 2,800 ac.ft. |
| Ocotillo Wells: | = | 6,000 ac.ft. |
| Total Water Available/yr: | = | 14,100 ac.ft. |

Resulting Water Use/yr:

| | | |
|---|---|---|
| Municipal: | = | 2,800 ac.ft. |
| Golf courses/landscaping | = | 3,000 ac.ft. |

| | | |
|---|---|---|
| Current Agriculture: | = | 15,590 ac.ft. |
| Less mulch savings | = | -2,000 ac.ft. |
| Less fallowing | = | -5,290 ac.ft. |
| Remaining agricultural use | = | 8,300 ac.ft. |
| TOTAL USE | = | 14,100 ac.ft. |

The water use would be in balance with available water under this scenario.

Estimated Cost to Construct this Combination of Projects:

**Assumptions:**

- The cost to purchase irrigated acreage with permanent plantings would average = $8,000/acre
- Average Water use per acre: = 3.72 ac.ft.
- Lands to be purchased to save 5,290 ac.ft. ÷ 3.72 = 1,422 acres
- Cost of land for fallowing: assume sale of bonds to finance property for fallowing: Annual debt service for bond issue @ 7% for 20 years = $1,073,894/yr.

**Total Annual Cost:**

| | | |
|---|---|---|
| Pumped water cost (4,800 + 500) = 5,300 ac.ft. x 100 ac.ft. | = | $ 530,000 |

**Project Operational Cost including debt service:**

| | | |
|---|---|---|
| Clark Lake Wells and Desalting Facility: | = | $3,416,210 |
| Water Dev/Ocotillo Wells Project: | = | $4,010,500 |
| Annual Cost to purchase land to fallow: | = | $1,073,894 |
| Average Cost of Water: $8,500,605 ÷ 14,100 ac.ft. | = | $602.87/ac.ft. * |

*Plus whatever costs are incurred to achieve savings in water use on existing crops plus the cost of maintaining the infiltration ponds to enhance the rate of infiltration.

III. Consider a combination of the following projects:

| | Water Produced Acre-Feet | Capital Cost | Annual Operating Cost |
|---|---|---|---|
| a. Water Development S & E of Ocotillo Wells: | 6,000 | $31,500,000 | $4,010,500 |
| b. Reduction of Irrigation by Mulching: | 2,000 | Unk. | Unk. |
| c. Reduction of Use by golf courses to 3,000 AF/yr: | | Unk. | Unk. |
| d. Enhanced Infiltration: | 500 | Unk. | Unk. |
| e. Fallowing: | 8,090 | $17,400,000 | $1,648,000 |
| | | $48,900,000 | |

Resulting Aquifer Inflow/yr:

| | | |
|---|---|---|
| Natural Inflow: | = | 4,800 |
| Enhanced infiltration | = | 500 |
| Plus project water dev. | | |
| S & E of Ocotillo Wells | = | 6,000 |
| Total Water Available | = | 11,300 ac.ft. |

Resulting Water Use/yr:

| | | |
|---|---|---|
| Municipal | = | 2,800 ac.ft. |
| Golf course/landscaping | = | 3,000 ac.ft. |

| | | |
|---|---|---|
| Current Agriculture | = | 15,590 |
| Less mulching: | | -2,000 |
| Less fallowing: | | -8,090 |
| Remaining Agricultural Use | = | 5,500 ac.ft. |
| TOTAL USE | = | 11,300 ac.ft. |

The water use would be in balance with available water under this plan.

Estimated Cost to Implement this Combination of Projects:

| | | |
|---|---|---|
| Assumptions: Cost of purchasing irrigate acreage | = | $8,000/acre |
| Average Water Use per acre | = | 3.72 ac.ft. |
| Lands to be Purchased to save 8,090 ac.ft. annually | = | 8,090 ÷ 3.72 = 2,175 acres |
| Cost of land for fallowing: | = | $17,400,000 |

Annual Debt Service to support bond issue of $17,400,000 @ 7% interest for 20 years = $1,648,000

Total Annual Cost:

| | | |
|---|---|---|
| Pumped Water (5,300 x 100) | = | $ 530,000 |
| Operational & Debt: | | |
| Service – Ocotillo Wells Project: | = | $4,010,500 |
| Fallowing Project: Debt Service: | = | $1,648,000 |
| TOTAL | = | $6,188,500 |

Average Cost of Water $6,188,500 ÷ 11,300 ac.ft. = $547.65/ac.ft.

IV. Consider a Plan which depends almost exclusively on land fallowing:

| | | Water Produced | Capital Cost | Operation Cost |
|---|---|---|---|---|
| a. Reduction of Use by Golf Courses to 2,500 ac.ft. | | | Unk. | Unk. |
| b. Enhanced Infiltration: | = | 500 AF | Unk. | Unk. |
| c. Fallowing: | = | 15,590 | $33,600,000 | |

Resulting Aquifer Inflow/year:

| | | |
|---|---|---|
| Natural Inflow: | = | 4,800 |
| Enhanced Infiltration | = | 500 |
| Water Available | = | 5,300 ac.ft. |

Resulting Water Use:

| | | |
|---|---|---|
| Municipal | = | 2,800 |
| Golf courses/landscaping | = | 2,500 |
| Total Water Use | = | 5,300 ac.ft. |

The water use would be in balance with available water under this scenario; however, there would be no agricultural irrigation. The cost of acquiring all of the irrigated agriculture plus any other potential farmland which could claim a right to use their water rights is not known. If the cost for all of the existing irrigated land averaged $8,000/acre and the acreage involved was 4,200 acres the cost would be $33,600,000.

The annual debt service on a $33,600,000 bond issue @ 7% interest for 20 years would be $3,171,800.

Total annual cost:

| | | |
|---|---|---|
| Pumped water 5,300 ac.ft. x 100 | = | $ 530,000 |
| Fallowing project debt service | = | $3,171,800 |
| TOTAL COST | = | $3,701,800 |

Average cost of water $3,701,800 ÷ 5,300 = $698.45/ac.ft.

**BORREGO WATER DISTRICT**
**Water Management Program**
**Phase 1 Technical Committee Activities**
***Issue Date: 3/24/2000***

| Task No. | Description | Assigned To |
|---|---|---|
| | | |
| **1.1** | **Completion of Mapping and Databases** | |
| 1.1.1 | Mapping | |
| | Borrego Valley Aquifer | |
| | Watershed and key boundaries | BWD/ABDSP |
| | Well locations | BWD/DPLU |
| | Current land use | BWD |
| | Projected land use | BWD/DPLU |
| | Clark Valley Aquifer | |
| | Watershed and key boundaries | BWD/ABDSP |
| | Potential wellfield area | BWD |
| | San Felipe Creek drainage area | |
| | Watershed and key boundaries | BWD |
| | Potential wellfield area | BWD |
| | Ocotillo Wells groundwater resource | |
| | Key boundaries and current land use | BWD |
| | Potential wellfield area | BWD |
| | Printing of maps | BWD |
| | Display of maps at BWD | BWD |
| | | |
| 1.1.2 | Database | |
| | Domestic water use - historical and present | BWD |
| | Golf course water use - historical and present | BWD/GCC |
| | Agricultural water use - historical and present | BWD/AC |
| | Well location and status | BWD/DPLU |
| | Static well levels | BWD/DPLU |
| | Well-specific water quality | BWD |
| | Rainfall in watershed | BWD/USGS/CO/ABDSP |
| | Surface water flow | BWD/USGS |
| | Printing of key database information | BWD |
| | | |
| **1.2** | **Review of Groundwater Resources** | |
| 1.2.1 | Update Characteristics of Borrego Valley Aquifer | |
| | Review USGS/DWR reports | VOL-GEOL |
| | Review data subsequent to USGS reports | VOL-GEOL/BWD/USGS |
| | Static well level measurements | |
| | Logs of new wells | |
| | Agbabian geophysical reports | |
| | | |

| Task No. | Description | Assigned To |
|---|---|---|
| | Update assumptions for: | VOL-GEOL/BWD/USGS |
| | Water storage and extraction characteristics | |
| | Recharge rate | |
| | Outflow rate | |
| | Water consumed by vegetation | |
| | Confirm aquifer assumptions with agencies | BWD |
| | USGS | |
| | County | |
| | DWR | |
| | Establish current ranges of accuracy for aquifer assumptions | BWD/USGS/DPLU/DWR |
| | Evaluate existing and projected water quality | VOL-GEOL/BWD-ENGR/USGS |
| | Identify ecological impacts of declining water table | ABDSP/VOL-ECOL |
| | Current impacts | |
| | Potential future impacts | |
| | Identify additional study needs | TEAM |
| | | |
| 1.2.2 | Characterize Clark Valley Aquifer | VOL-GEOL/BWD-ENGR/USGS |
| | Review well drilling and testing data | |
| | Review geophysical data | |
| | Review water quality data | |
| | Estimate probable storage and extraction characteristics | |
| | Estimate probable recharge rate | |
| | Establish range of accuracy for assumptions | |
| | Identify additional information needs | |
| | | |
| 1.2.3 | Characterize San Felipe Creek Drainage | VOL-GEOL/BWD-ENGR/USGS |
| | Review well drilling and testing data | |
| | Review water quality data | |
| | Estimate probable storage and extraction characteristics | |
| | Estimate probable recharge rate | |
| | Establish range of accuracy for assumptions | |
| | Identify additional information needs | |
| | | |
| 1.2.4 | Characterize Ocotillo Wells Aquifer | VOL-GEOL/BWD-ENGR/USGS |
| | Review available data | |
| | Estimate probable storage and extraction characteristics | |
| | Estimate probable recharge rate | |
| | Establish range of accuracy for assumptions | |
| | Identify additional information needs | |
| | | |
| 1.2.5 | Characterize Other Possible Groundwater Sources | VOL-GEOL/BWD-ENGR/USGS |
| | | |
| 1.2.6 | Prepare Summary Report on Groundwater Resources | VOL-GEOL/BWD-ENGR |

| Task No. | Description | Assigned To |
|---|---|---|
| **1.3** | **Analysis of Water Use and Land Use Alternatives** | |
| 1.3.1 | Develop water use and water cost model | VOL-ENGR/BWD |
| | | |
| 1.3.2 | Identify limitations and key legal tasks for implemention of AB3030 | BWD-GC |
| | | |
| 1.3.3 | Develop projection of future water use under current patterns | BWD/DPLU/SUBCOMMITTEES |
| | Projected water use with completion of planned projects | |
| | Projected water use with continued current growth patterns | |
| | Projected impacts on capacity and life of Borrego Valley Aquifer | |
| | | |
| 1.3.4 | Evaluate Water Conservation Options | |
| | Domestic water conservation | BWD |
| | Golf course water conservation | BWD/GC |
| | Agricultural water conservation | BWD/AC |
| | Reclamation and reuse | BWD-ENGR/RWQCB |
| | | |
| 1.3.5 | Evaluate Supplemental Water Supplies | |
| | Enhanced recharge options and cost | BWD/ABDSP/VOL-GEOL/DWR |
| | Dams | |
| | Retention basins | |
| | Imported Colorado River options and water cost | BWD/DWR/VOL-ENGR |
| | Imperial Irrigation District | |
| | Coachella Irrigation District | |
| | Other | |
| | Imported groundwater options and water cost | BWD/ABDSP/VOL-GEOL/VOL-ENGR |
| | Clark Valley | |
| | San Felipe Creek | |
| | Ocotillo Wells area | |
| | Other | |
| | Other supplemental water supply options and cost | BWD/ABDSP/VOL-GEOL/VOL-ENGR |
| | Key financial, legal and environmental issues | BWD-GC/ABDSP/Other |
| | | |
| 1.3.6 | Evaluate Alternative Land Use Options | |
| | Options for changes to existing land use | BWD/Subcommittees |
| | Options for changes to future land use | BWD/Subcommittees |
| | Key legal, financial and environmental issues | BWD-GC/BWD/ABDSP |
| | Review land use options with County | BWD/BWD-GC/DPLU |
| | | |
| | | |
| | | |

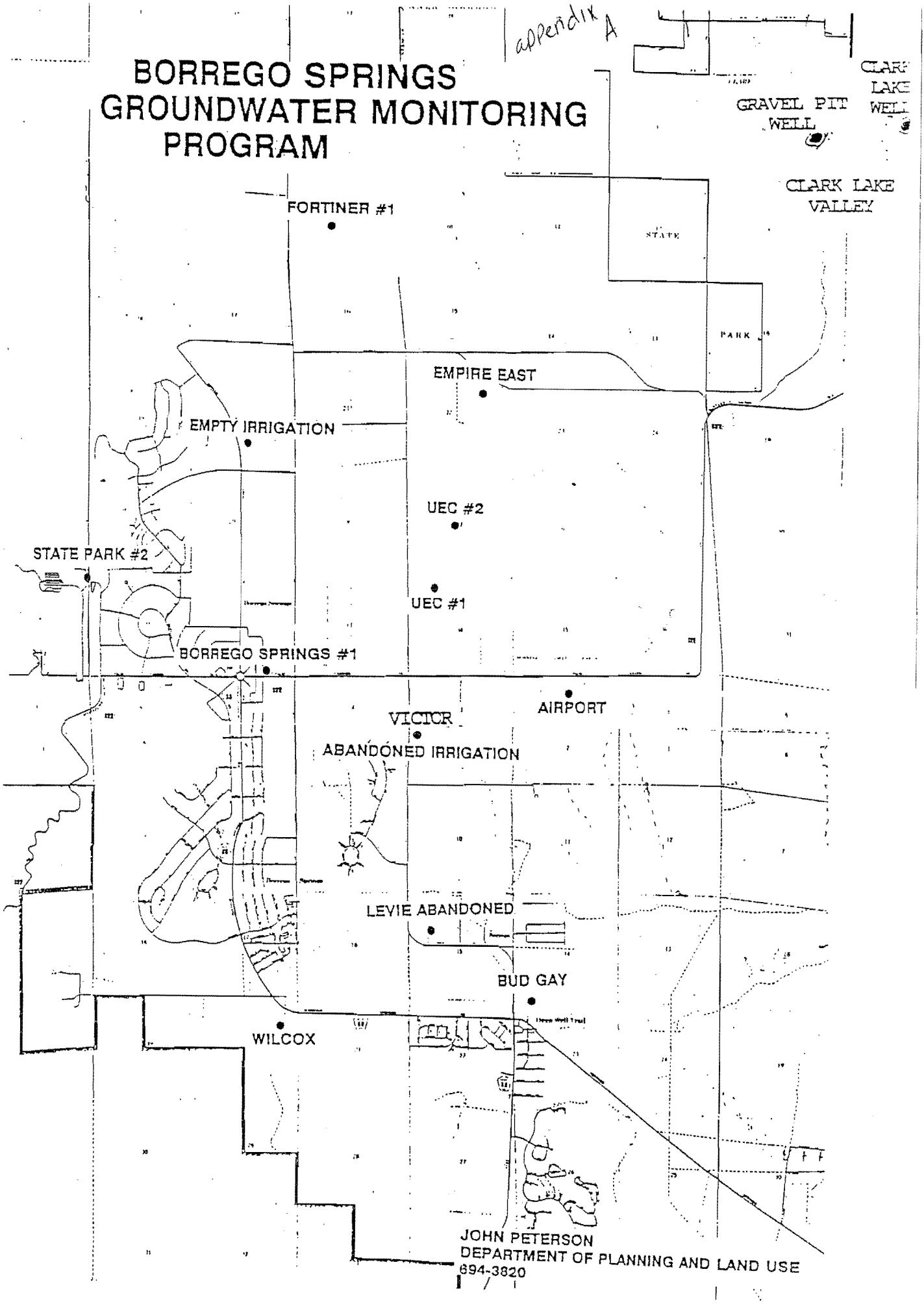
| Task No. | Description | Assigned To |
|---|---|---|
| | | |
| 1.3.7 | Evaluate Combined Water Use Schemes | |
| | Water use vs. water supply | BWD/BWD-ENGR/VOL-ENGR |
| | Water cost impacts | BWD/BWD-ENGR/VOL-ENGR |
| | Best combination of alternatives for AB3030 implementation | |
| | | |
| 1.3.8 | Prepare Summary Report on Water Use and Water Supply Options | TEAM |
| | | |
| | ***Assignment Codes:*** | |
| | ABDSP: Anza Borrego Desert State Park | |
| | BWD-ENGR: BWD District Engineer | |
| | BWD-GC: BWD General Counsel | |
| | BWD: Borrego Water District Staff | |
| | CO: San Diego County other than Department of Planning and Land Use | |
| | DPLU: San Diego County Department of Planning and Land Use | |
| | DWR: California Department of Water Resources | |
| | RWQCB: State Regional Water Quality Control Board | |
| | USGS: United States Geological Survey | |
| | VOL-ECOL: Volunteer Ecologist | |
| | VOL-ENGR: Volunteer Engineer | |
| | VOL-GEOL: Volunteer Geologist | |
| | VOL-GCC: Volunteer Golf Course Committee | |
| | VOL-AC: Volunteer Agricultural Committee | |

# Technical Appendices

Appendix A: Static Water Level Hydrographs and Water Use Tables
Appendix B: Article on the Mojave Case
Appendix C: Well Drilling Information and Geotechnical Studies 1985-2000
Appendix D: U.S.G.S. Gauging Station Data
Appendix E: Projected Life of the Borrego Valley Aquifer
Appendix F: Agricultural Land Uses
Appendix G: Effects on Native Environment due to Declining Water Levels (Mark Jorgensen)
Appendix H: Figures from the Agbabian Report (Clark Shimeall)
Appendix I: Historical Water Quality
Appendix J: Updated Costs for Projects to Import Water to Borrego Valley (Carl Hauge)
Appendix K: Reports on Importing Water from Adjacent Basins (L. R. Burzell)
Appendix L: Catchment Basin Study (Jerry Rolwing)
Appendix M: Improving Farming Techniques (Steve Smiley)
Appendix N: Water Rights Law

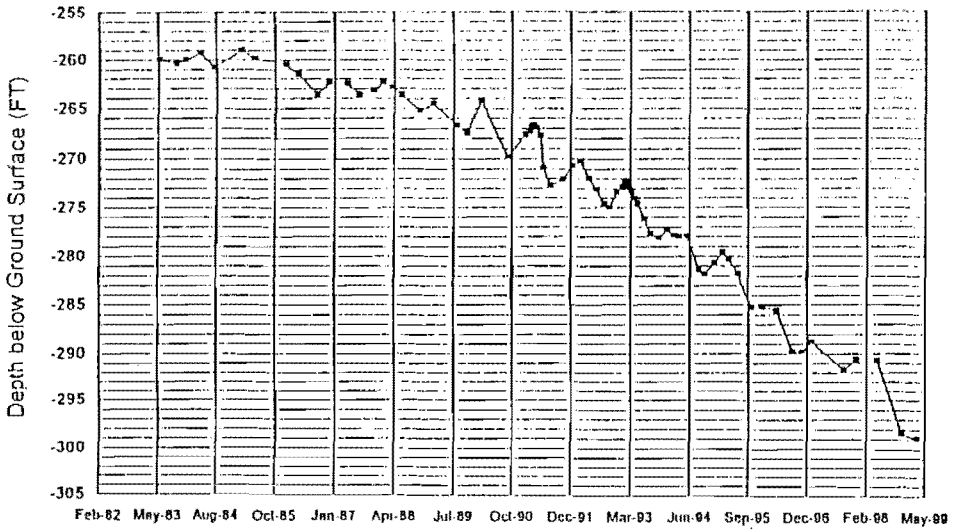
appendix A

# BORREGO SPRINGS GROUNDWATER MONITORING PROGRAM




JOHN PETERSON
DEPARTMENT OF PLANNING AND LAND USE
694-3820

## Borrego Valley
Fortiner Well

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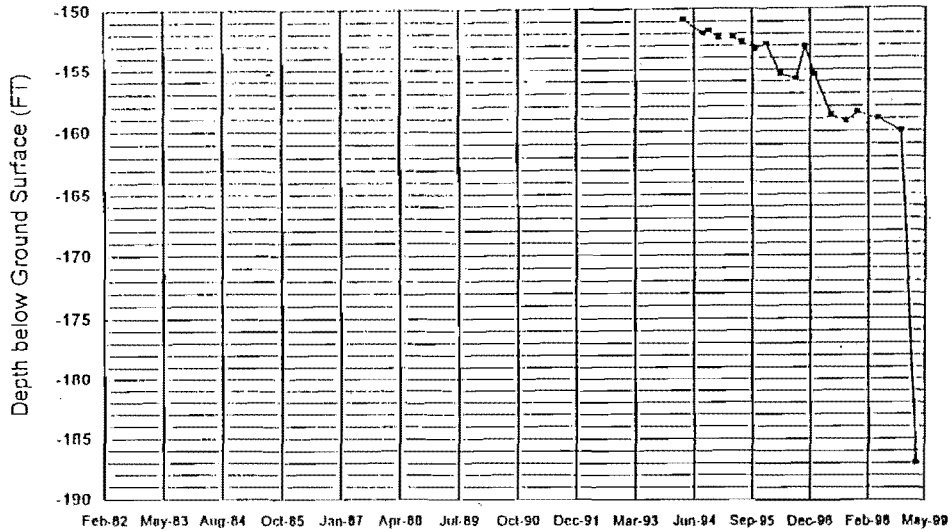
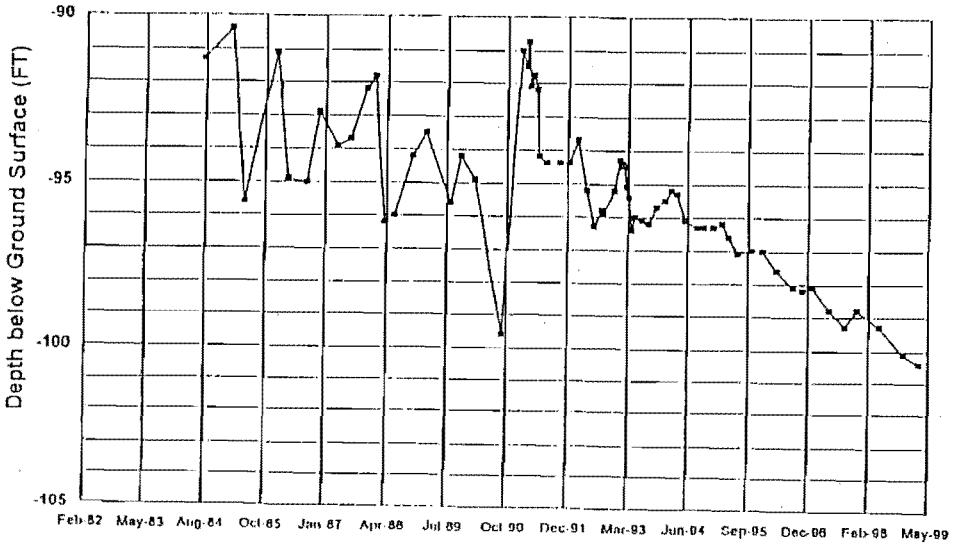
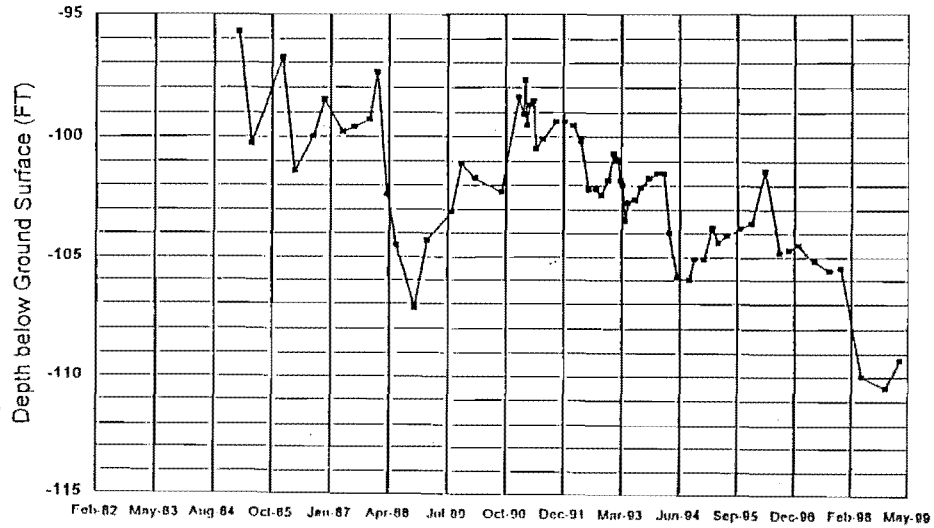
Agi Empire (East) Well



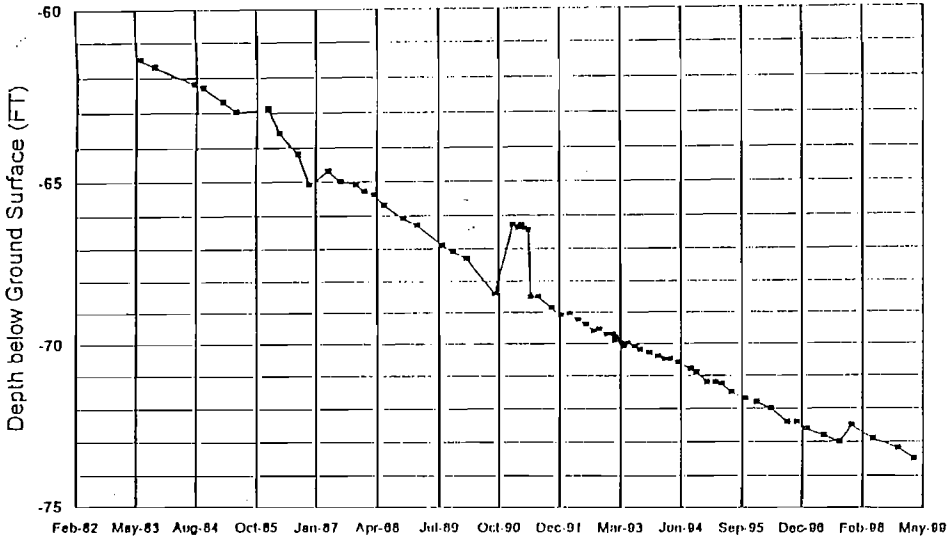

## Borrego Valley
UEC #1 South Well



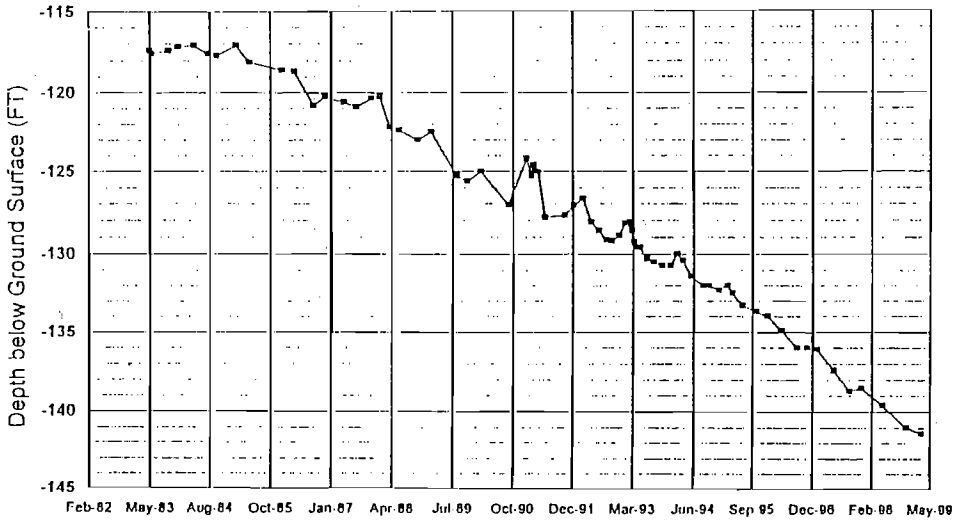

## Borrego Valley
UEC #2 North Well



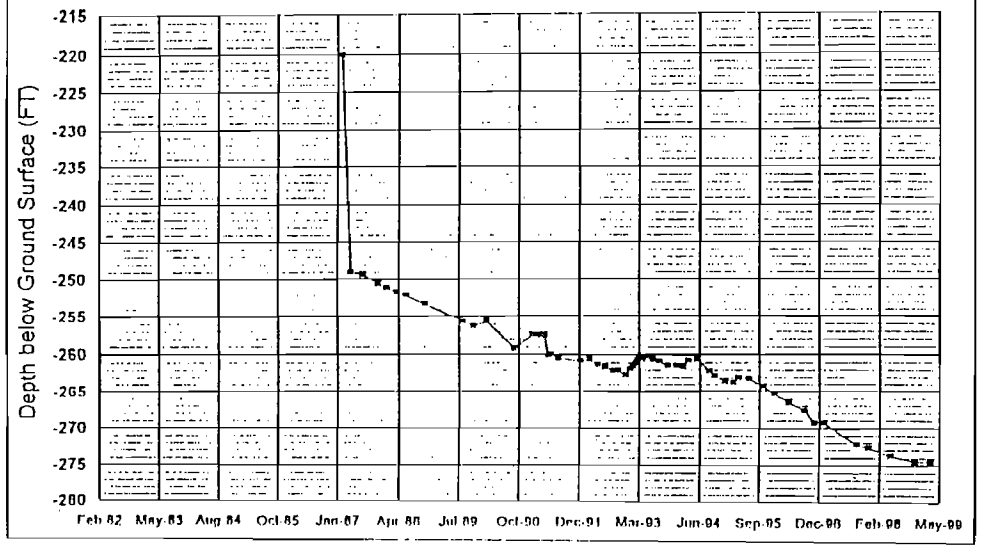
## Borrego Valley
Victor Well



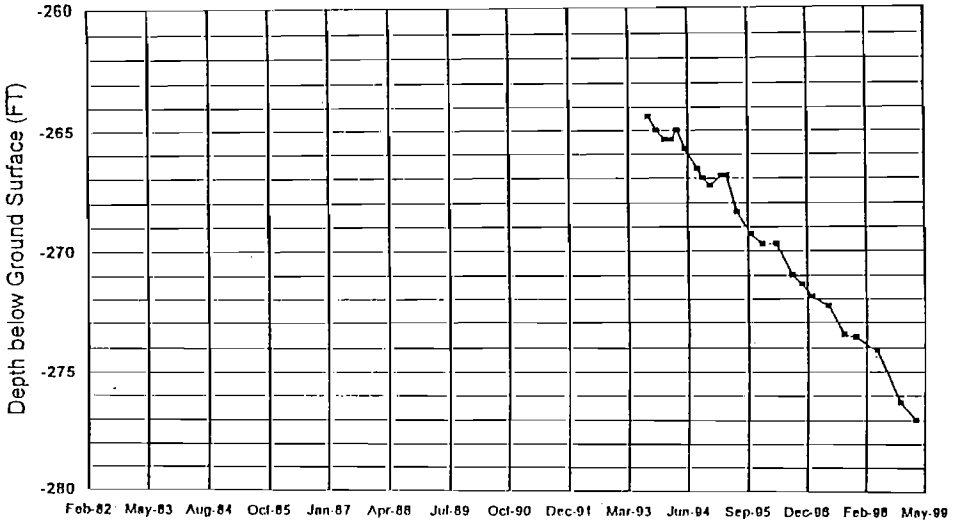

## Borrego Valley
Borrego Springs Well




## Borrego Valley
State Park Well #2




## Borrego Valley
Wilcox Well

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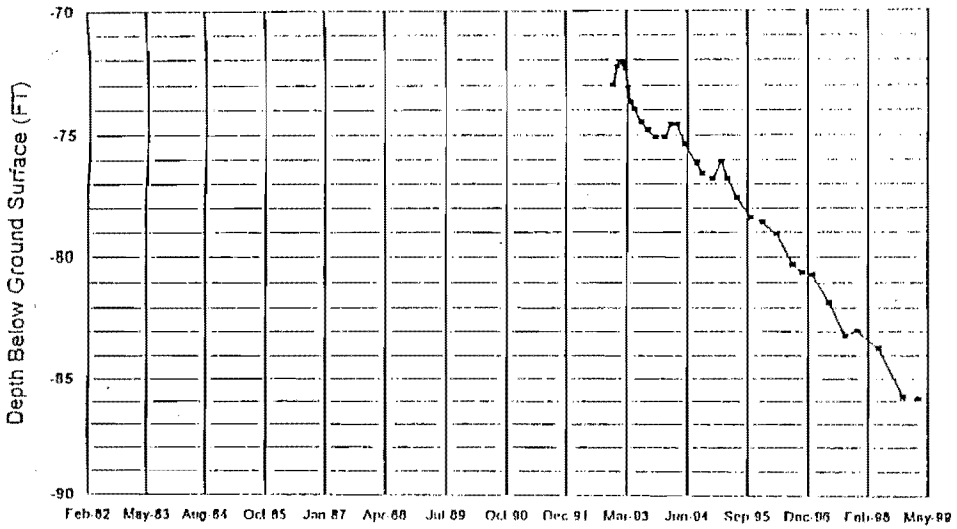
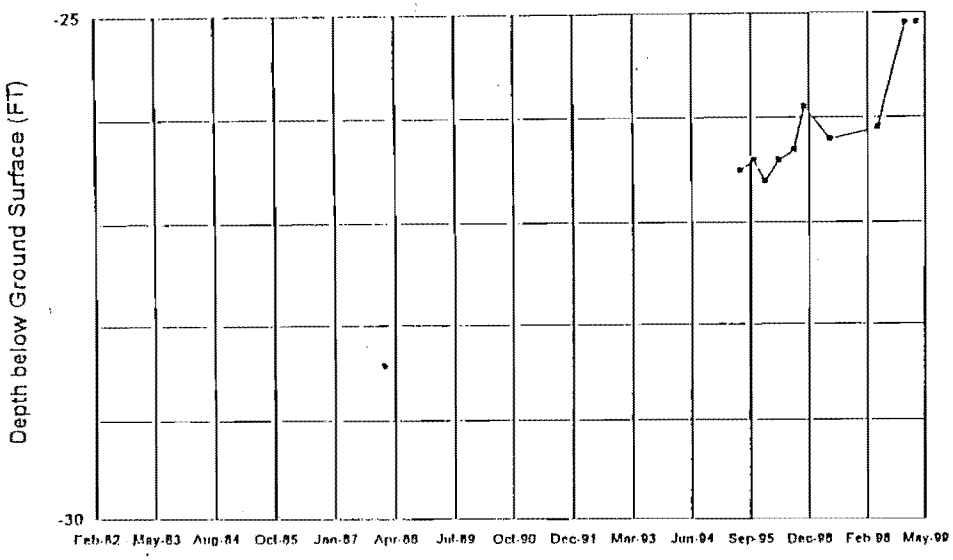
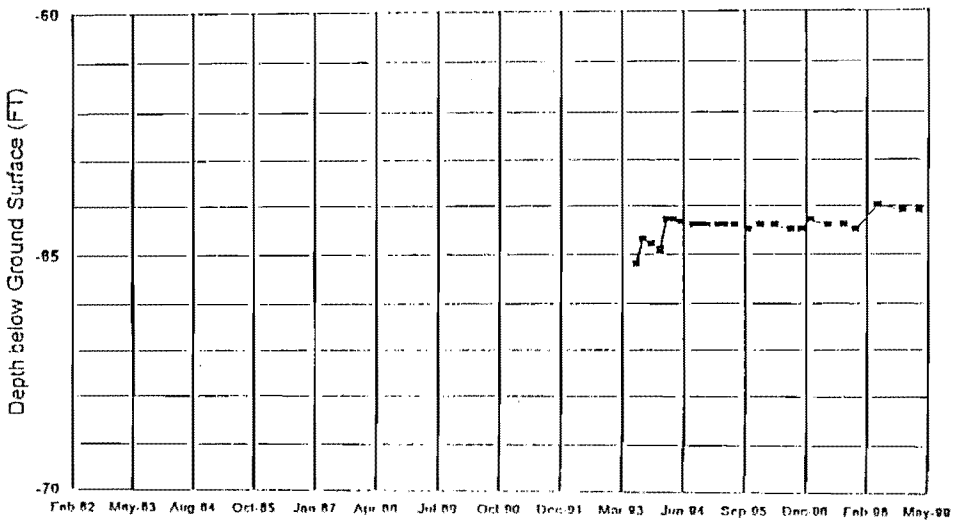
## Borrego Valley
Airport Well



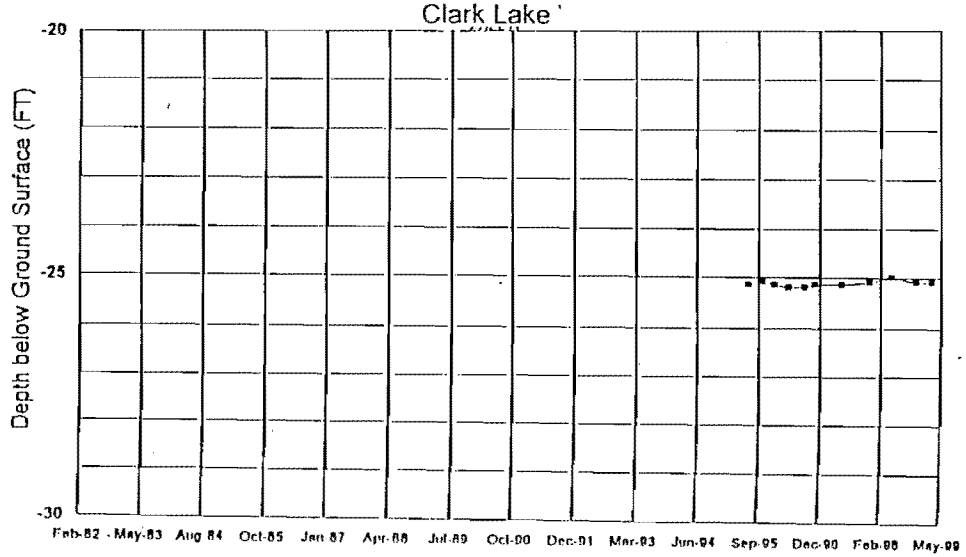

## Borrego Valley
Clark Lake Well




## Borrego Valley
Bud Gay Well

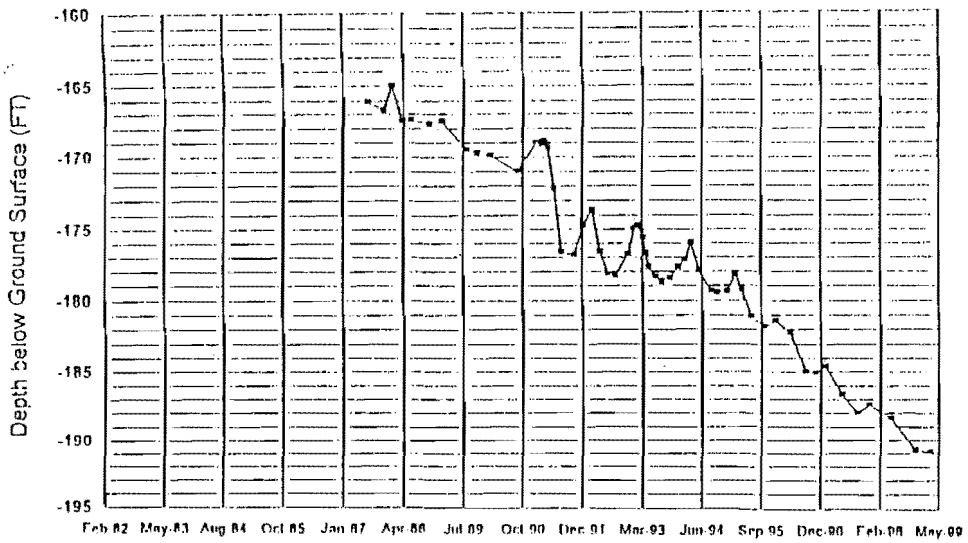



## Borrego Valley
Gravel Pit Well
Clark Lake



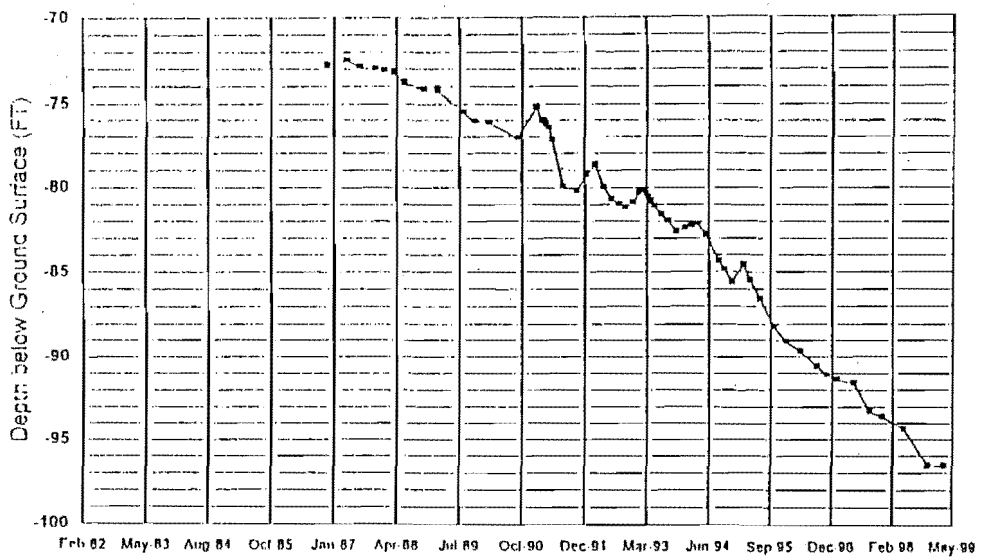
# Borrego Valley

Empty Well




# Borrego Valley

Levie Well

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# WATER LEVELS

## BORREGO VALLEY

Elevations in Feet Above Sea Level

| Well | Ground Elev. | Original Static Level | USGS Static [redacted] | Static Water Elevations Static Water Level ( ) 1987 | 1991 | 1993 | 1997 | 1998 | 1999 | [redacted] |
|---|---|---|---|---|---|---|---|---|---|---|
| 1. Well No. 1: BWD 11S/06E-25A01 | 532 | 479 (53) | 460 (72) | 467 (65) | 452 (80) | 466 (66) | 471.3 (60.7) | 472.7 (59.3) | (58.1) | (59.9) |
| 2. Well No. 2: BWD 11S/06E-25C01 | 578 | 486 (92) | 475 (103) | 418 (160) | 420 (158) | 425 (153) | 461.4 (116.6) | 467.10 (110.9) | (108.0) | (113.2) |
| 3. Well No. 8: BWD 11S/06E-22J01 | 523 | 473 (50) | 475 (48) | 418 (105) | 367 (156) | 428.4 (94.6) | 446.3 (76.7) | 450.7 (72.3) | (74.7) | (67.1) |
| 4. Well No. 10: BWD 11S/06E-22D05 | 595 | 465 (130) | 465 (130) | 408 (187) | 377 (218) | 417.4 (177.6) | 414.8 (180.2) | 418.3 (176.7) | (179.2) | (178.8) |
| 5. Well No. 12: BWD 11S/06E-16A01 | 530 | 443 (87) | 445 (85) | 440 (90) | 452 (78) | 444.8 (85.2) | 423.0 (107.0) | 419.6 (110.4) | (114.2) | (116.0) |
| 6. Well No. 16: BWD 11S/06E-16N01 | 620 | 447 (173) | - | - | 444 (176) | 442 (178) | 421.6 (198.4) | 417.8 (202.2) | (203.7) | (210.1) |
| 7. Paddock Well 11S/06E-22A04 | 535 | 390 (145) | - | 398 (137) | 195 (340) | N/A | N/A | 441.0 (94.0) | N/A | N/A |
| 8. Triangle Well 11S/06E-22A06 | 534 | - | 465 (169) | 382 (152) | 412 (122) | 421.6 (112.4) | N/A | 444.2 (89.8) | (86.5) | (85.5) |
| 9. La Casa Well 11S/06E-23F01 | 536 | 451 (85) | 465 (71) | 391 (145) | 410 (126) | 417.4 (118.6) | N/A | 442.9 (93.1) | (90.8) | (89.9) |
| 10. Well No. 1: ID4 10S/06E-32Q01 | 579 | 468 (111) | 462 (117) | 459 (120) | 451 (128) | 451 (128) | N/A | 439.9 (139.1) | | |
| 11. Well No. 2: ID4 11S/06E-07K02 | 725 | 472 (253) | 454 (271) | 459 (266) | 455 (270) | 448.2 (276.8) | 436.3 (288.7) | 434.8 (290.2) | (292.1) | (294.6) |
| 12. Well No. 3: ID4 10S/06E-20D01 | 661 | 469 (192) | 470 (191) | 457 (204) | 449 (212) | 437 (224) | 434.5 (226.5) | 428.0 (233.0) | (236.0) | (229.9) |
| 13. Well No. 4: ID4 10S/06E-29K02 | 595 | 467 (128) | 460 (135) | 463 (132) | 455 (140) | 439.4 (155.6) | 490 (105.0) | 481.9 (113.1) | (164.0) | (165.8) |
| 14. Well 5 (Palm Cyn) 10S/06E-33Q01 | 550 | 460 (90) | 458 (92) | 460 (90) | 439 (111) | 434 (116) | N/A | N/A | N/A | N/A |
| 15. Well No. 10 ID4 11S/06E-18L01 | 803 | 433 (370) | - | - | 427 (376) | 420 (383) | 410.8 (392.2) | 387.9 (415.1) | (415.5) | (417.7) |
| 16. Well No. 11 ID4 T10S/R6E-32 DOIS | 618 | 456 (162) | - | - | - | - | 449.0 (169.0) | 445.4 (172.6) | (175.7) | (179.4) |
| 17. Well No. 18: ID4 10S/06E-18J01 | 735 | - | - | 507.0 (228) | 499.0 (236) | 491.0 (244) | 481.6 (253.4) | 477.7 (257.3) | (260.9) | (264.8) |
| 1. Wilcox Well | | (246) | | | | | | | | (280.5) |

Revised 11/3/00 (File No. 3.120)

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# 1999
# Borrego Valley Water Use
# In Acre Feet

| | Municipal | Agriculture | Golf Courses & Landscape Irr. | Total |
|---|---|---|---|---|
| BWD ID 1, ID3 And Ram's Hill: | 420° | 0 | 1494° | |
| BWD ID 4: | 1,723° | 0 | 191° | |
| BSPCSD: | 75°° | 0 | 1,000°° | |
| Road Runner Club G.C.: | 0 | 0 | 750°° | |
| DeAnza CC G.C.: | 0 | 0 | 1,000°° | |
| Agricultural Wells: | 4* | 15,590* | ____ | |
| Borrego Air Ranch: | 10°° | 0 | 0 | |
| Other Private Wells: | 40°° | 0 | 0 | |
| TOTAL: | 2,272 | 15,590 | 4,435 | 22,297 |

Items marked ° are based on metered production from wells and engineered calculations.

Items marked * have been calculated from the acreage of planted crops based on aerial maps and field inspection.

Items marked °° were estimates based on general knowledge of the existing conditions. The agencies contacted replied that this estimate was very close.

BWD/waterop/water use 1999

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# 1998
# Borrego Valley Water Use
# In Acre Feet

| | Municipal | Agriculture | Golf Courses & Landscape Irr. | Total |
|---|---|---|---|---|
| BWD ID 1, ID3 And Ram's Hill: | 432° | 0 | 1516° | |
| BWD ID 4: | 1,780° | 0 | 198° | |
| Estimated BSPCSD: | 75 | 0 | 1,000°° | |
| Road Runner Club G.C.: | 0 | 0 | 750°° | |
| DeAnza CC G.C.: | 0 | 0 | 1,000°° | |
| Agricultural Wells: | 4* | 14,500* | | |
| Borrego Air Ranch: | 10°° | 0 | 0 | |
| Other Private Wells: | 40 | 0 | 0 | |
| TOTAL: | 2,341 | 14,500 | 4,464 | 21,305 |

Items marked ° are based on metered usage or engineered calculations.

Items marked * have been calculated from the acreage of planted crops based on aerial maps and field inspection.

Items marked °° were estimates based on general knowledge of the existing conditions. The agencies contacted replied that this estimate was very close.

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# Borrego WATER DISTRICT

Improvement Districts 1 and 3
Historical Water Use
In Acre Feet

| Year | Well 1 | Well 2 | Well 8 | Well 10 | Well 12 | Well 16 | ID 3 Wells | Total |
|---|---|---|---|---|---|---|---|---|
| 1983 | Start Up Year for Ram's Hill | | | | | | | |
| 1984 | 38.00 | 48.00 | 450.00 | 695.00 | - | - | 130.00 ** | 1,361 ** |
| 1985 | 1.40 | 35.34 | 407.09 | 600.78 | 316.90 | - | 141.00 * | 1,503 |
| 1986 | 0.01 | 0.01 | 387.88 | 578.75 | 354.13 | - | 153.00 * | 1,474 |
| 1987 | 99.76 | 75.32 | 337.92 | 656.55 | 317.56 | - | 144.00 ** | 1,631 |
| 988 | 168.99 | 87.95 | 374.53 | 784.42 | 755.60 | - | 144.00 ** | 2,315 |
| 89 | 223.01 | 104.68 | 333.45 | 329.38 | 794.16 | - | 144.00 ** | 1,929 |
| 1990 | 85.51 | 61.66 | 305.88 | 451.11 | 942.39 | - | 144.00 * | 1,991 |
| 1991 | 63.94 | 64.43 | 373.30 | 544.02 | 961.04 | 6.96 | 140.00 ** | 2,154 |
| 1992 | 231.50 | 3.60 | 153.11 | 25.35 | 570.06 | 974.05 | 0.00 | 1,958 |
| 1993 | 125.84 | 0.00 | 45.57 | 81.27 | 556.20 | 1,145.20 | 0.00 | 1,954 |
| 1994 | 168.59 | 0.00 | 39.10 | 24.85 | 523.29 | 971.61 | 0.00 | 1,727 |
| 1995 | 3.77 | 18.58 | 34.46 | 55.88 | 557.06 | 1,072.59 | 0.00 | 1,742 |
| 1996 | 24.67 | 15.15 | 2.80 | 101.91 | 652.41 | 1,027.72 | 0.00 | 1,825 |
| 1997 | 36.87 | 26.76 | 73.85 | 120.09 | 577.66 | 977.21 | 0.00 | 1,812 |
| 1998 | 21.39 | 20.56 | 41.28 | 88.03 | 722.68 | 1,054.58 | 0.00 | 1,949 |
| 1999 | 30.67 | 33.70 | 55.37 | 137.44 | 732.43 | 924.68 | 0.00 | 1,914 |
| TOTAL | 1,323.92 | 595.74 | 3,415.59 | 5,274.83 | 9,333.57 | 8,154.60 | 1,140.00 | 29,238.00 |

* Delivered water based on individual meters plus 20% to provide for water losses

** Estimated use based on partial records

WD/waterop/histwat

P.O. Box 1870, 2427 Stirrup Rd., Borrego Springs. CA 92004 • 760-767-5806 • FAX 760-767-5994

appendix B

# The Mojave River Basin Decision

by Sue McClurg

*Priority: the right to precedence over others in obtaining, buying, or doing something* – *Webster's New World College Dictionary*

First in time, first in right has long served as one guiding principle of water law in California. Simply put, this priority system generally holds that the first person to claim water and use it has a right superior to subsequent claims. In times of shortage, it is the most junior of water rights holders who must cut back use first.

In recent years, ever-growing urban and agricultural water demands and environmental regulatory restrictions on water systems have prompted some to call for a different approach to water rights; one of equitable apportionment in which all users – regardless of priority – "share the pain" of the disparity between supply and demand.

The importance of water rights was affirmed in a California Supreme Court ruling issued August 22 in *City of Barstow v. Mojave Water Agency*.

In its unanimous ruling, written by Justice Ming W. Chin, the state Supreme Court found that "water right priority has long been the central principle in California water law." Justices then determined that while a court can impose a "physical solution to achieve a practical allocation of water to competing interests, the solution's general purpose cannot simply ignore the priority rights of the parties asserting them."

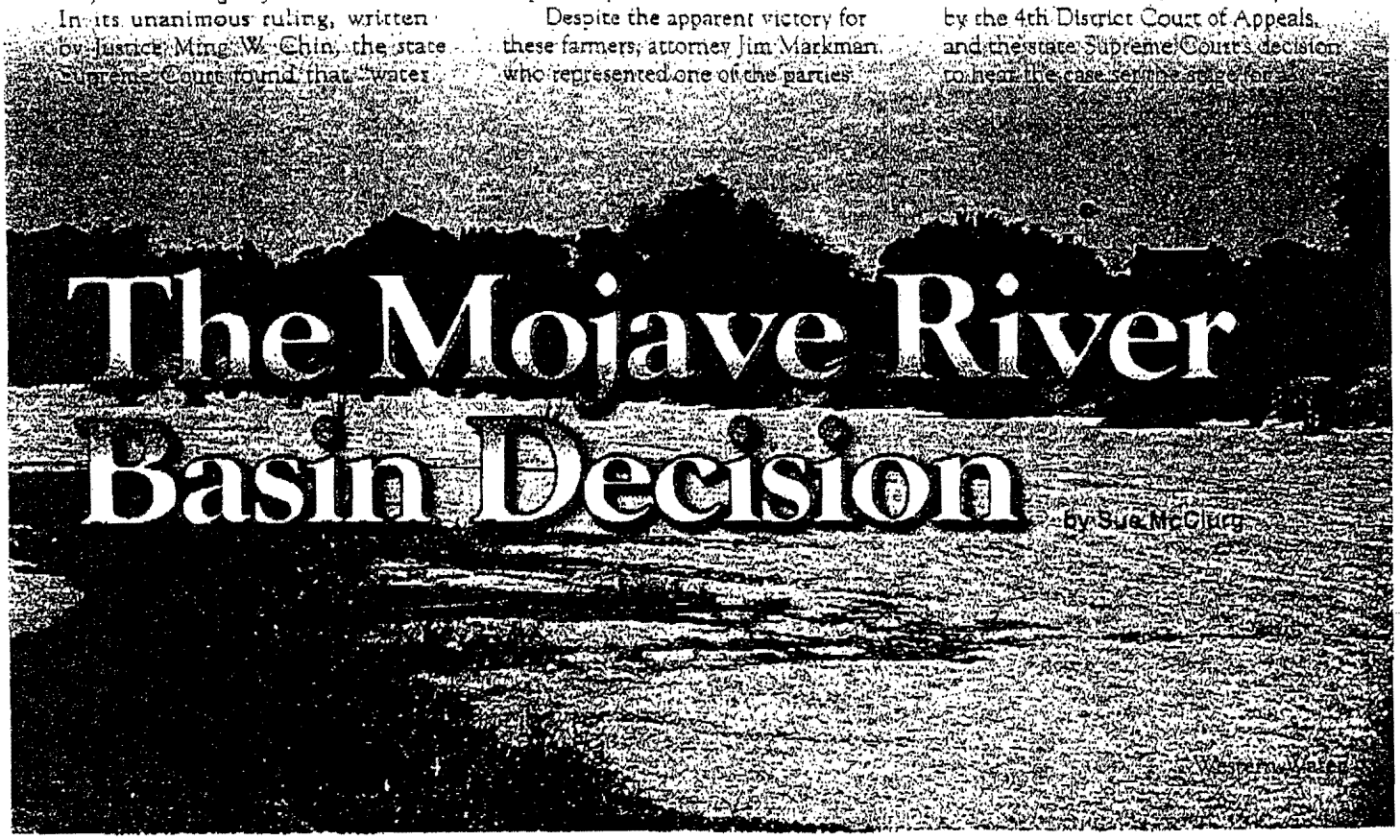
It was the state Supreme Court's first major water rights decision since the 1983 landmark ruling on the public trust doctrine (see page 12). Some view the Mojave ruling as a victory for senior water rights holders in not only the Mojave River Basin, but throughout the state.

"The Supreme Court affirmed that the priority system in California is alive and well. Essentially, equitable apportionment is dead," said attorney Robert Dougherty. Dougherty represented the seven farmers (the Cardozo Group) who contested a Mojave River Basin groundwater pumping plan imposed by a lower court.

Despite the apparent victory for these farmers, attorney Jim Markman, who represented one of the parties (the city of Hesperia) that endorsed the groundwater management plan, does not see the state Supreme Court's opinion as a defeat. "I think everyone won," he said. "They all accomplished what they set out to do. We do have groundwater management in the Mojave River Basin and the farmers have convinced the court that the physical solution can't be imposed on them because of their overlying rights."

The Mojave River Basin adjudication is complex, with many layers of legal issues. Its foundation, however, offered a straightforward question: Can a judge require groundwater users to comply with a management plan based on a formula of universal cutbacks but without establishing individual pumping limits?

The trial court said yes: It approved a negotiated settlement to reduce groundwater overdraft that did not include a well-by-well determination of who had rights to pump what amount, and imposed it on all users – even those who had not agreed to the settlement. That decision was rejected by the 4th District Court of Appeals, and the state Supreme Court's decision to hear the case set the stage for a



Western Water

judgment with the potential for far-reaching impact.

"The Supreme Court ruling is far more significant for what it didn't do," said Brian Gray, a professor of law at the University of California's Hastings College of Law. "It did not uphold the trial court, which would have turned water rights in California upside down."

The significance of the state Supreme Court's *possible* decision is why so many other farming organizations and cities – many with senior rights – filed amicus briefs as the case moved from the trial court to the appellate court to the state Supreme Court.

Many believed the pending decision could hold ramifications for the ongoing Bay-Delta water rights hearings before the State Water Resources Control Board (State Board). In recent years, the State Board has expressed interest in an "equitable apportionment" approach to resolving competition over the Delta's water in which all users – not just the junior water rights holders – would be asked to cut back their diversions.

"In a general sense, the ruling could have implications for the State Board and Bay-Delta water rights hearings," said Ed Tiedemann, of Kronick, Moskovitz, Tiedemann and Girard. "It gets away from the idea of equitable apportionment, which the State Board has tended to favor in its 'share the pain' approach to Delta water quality standards."

But attorney Art Kidman, who represented the city of Barstow, argues that the decision does not rule out equitable apportionment as long as water rights are taken into consideration first. "The doctrine of equitable apportionment may be OK," he said, "but first you have to adjudicate the priorities of the rights. The trial court's equitable apportionment in *Mojave* did not define those overlying rights. If it had done that first, then it could have gone on to a number of possible methods of applying reasonable use, equitable apportionment and a physical solution."

The state Supreme Court ruling resolved many outstanding questions related to groundwater management in the Mojave River Basin, located in the rapidly growing High Desert region east of Los Angeles. But not all the implications of the ruling for the Mojave Basin are clear at this point: several issues raised by the case will return to the trial court judge for disposition. How those issues are decided could lead to further legal wrangling. As for the ruling's statewide impact, questions linger.

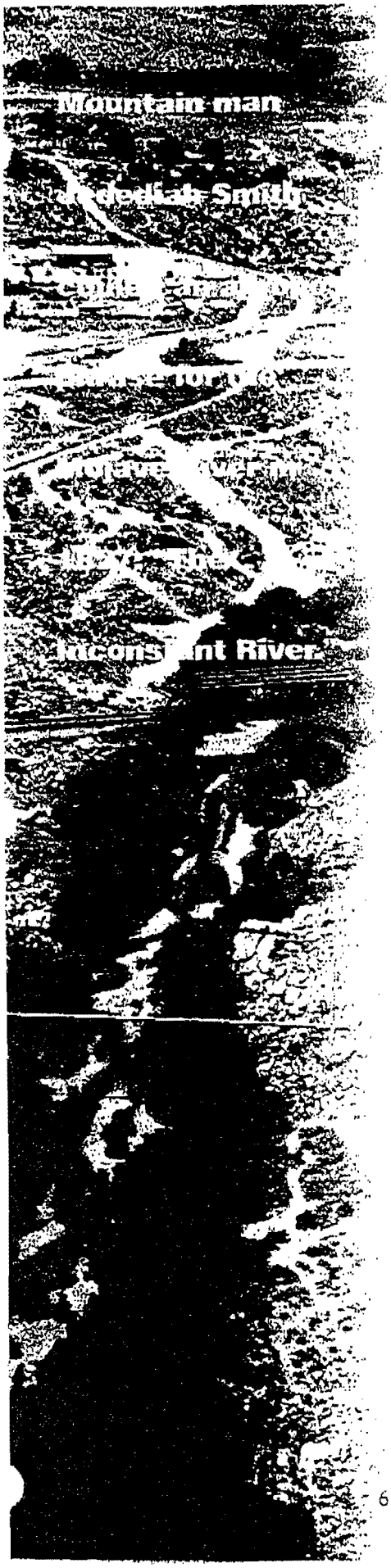
The legal system is known for its slow, methodical approach to change, and, at times, the most important impact of a case can rest on the meaning of one sentence or one footnote in an intricate ruling. Already, there is interest in a phrase contained in footnote 13 in the Mojave ruling and what it may mean in future water rights cases.

The footnote discusses implications of a 1979 ruling, *Re Waters of Long Valley Creek Stream System*. In *Long Valley*, the state Supreme Court found that while unexercised riparian rights, in most circumstances, were not lost by non-use, such an unexercised right could be assigned a lower priority in a streamwide settlement compared to active appropriative and riparian rights. Footnote 13 suggests that such a principle could be applied to overlying groundwater rights, concluding with this sentence: "If Californians expect to harmonize water shortages with a fair allocation of future use, courts should have some discretion to limit the future groundwater use of an overlying owner who has exercised the water right, and reduce to a reasonable level the amount the overlying user takes from an overdrafted basin."

Some attorneys, such as Markman, theorize that this footnote would allow for a reduction in an unexercised groundwater right – especially in an overdrafted basin like the Mojave. "Agricultural pumping alone in the

**A groundwater overdraft solution "cannot simply ignore the priority rights of the parties asserting them."**

**– California Supreme Court**




lower subarea would consume the safe yield of the Mojave Basin," he said. "Remember, at the time we started the case we had some 250,000 people living in this area in these small towns and cities. For those of us who had to serve water to them, you don't have a choice. You can't just say, 'Well, it's too expensive, we'll stop serving the people.' You have to find a way to serve water to the people."

Other attorneys do not believe the footnote is that significant; believing its call to reduce extractions "to a reasonable level" refers only to the state Constitution's existing Article X, Section 2, which requires that all water resources must be put to beneficial use. This, they say, simply means this clause applies to all users – including those who hold overlying groundwater rights.

This issue of *Western Water* discusses the Mojave River Basin case, its background and history, the proposed physical solution, and what the state Supreme Court Mojave opinion may mean for the Mojave Basin and the rest of California. Many of the quotes were drawn from the American Ground Water Trust's September 29 conference in Anaheim, which included a panel discussion of the Mojave adjudication. For more background information, please refer to the Foundation's newly revised *Layperson's Guide to Water Rights Law* and the *Layperson's Guide to Groundwater*.

## Background

The headwaters of the Mojave River originate in the San Bernardino Mountains, where rain and snow runoff give rise to the West Fork of the Mojave River and Deep Creek. These two waterways join together to form the Mojave River in a foothill area called The Forks. From this point, the 100-mile-long Mojave River flows north through the communities of Victorville and Helendale before turning east where it flows through Barstow and Afton, ending in the desert region of Soda Dry Lake.

In the Mojave River Basin, the groundwater aquifers and the surface water stream act as one water source, with the river recharging the basin and groundwater discharging in several places to provide surface flows in the river. Mountain man Jedediah Smith coined an apropos phrase for the Mojave River in 1827: "The Inconstant River" noting how it flows above ground in some places and below ground in others.

Encompassing some 3,600 square miles, the Mojave River Basin is about the size of Connecticut. It is divided into five hydrologic subareas: the Alto, Centro, Baja, Oeste and Este basins. Because these basins are interconnected, some of the surface in-flow to one basin is out-flow from another. Average annual precipitation in this arid region is between 4 and 10 inches, and the groundwater basin serves as the only local water source for residents in this part of San Bernardino County, north of the San Bernardino Mountains.

The Mojave Desert served as one of the overland migration routes for early California settlers. The first roads were built in the 1850s and by the 1860s, some 2,000 wagons were hauling freight across the desert. Early development in this region centered on agricultural production, particularly in the Victor Valley. Water diversions to irrigate orchards, grapes and alfalfa took their toll and by the 1950s, according to the California Department of Water Resources (DWR), the Mojave River Basin had begun to experience overdraft. (Overdraft of a groundwater basin results when extractions outpace either natural or artificial recharge over a period of several years.)

Yet this was also the time of an urban boom for Mojave Desert towns such as Apple Valley and Hesperia. Competition for water among agricultural and industrial users heightened and growth in Victor Valley led to a short-lived order halting growth and development in 1960; an order rejected by a local court.

Supplemental water was viewed as the answer. In DWR's 1957 State Water Plan, the Mojave Desert was identified as one area to be served by what is now the State Water Project (SWP). Regional officials, in turn, took steps to control overdraft through the formation of the Mojave Water Agency (MWA) on July 21, 1960. Its mission called for the MWA to "do any and every act necessary" so that sufficient water would be available for any present or future beneficial use of the lands and inhabitants within the agency's jurisdiction.

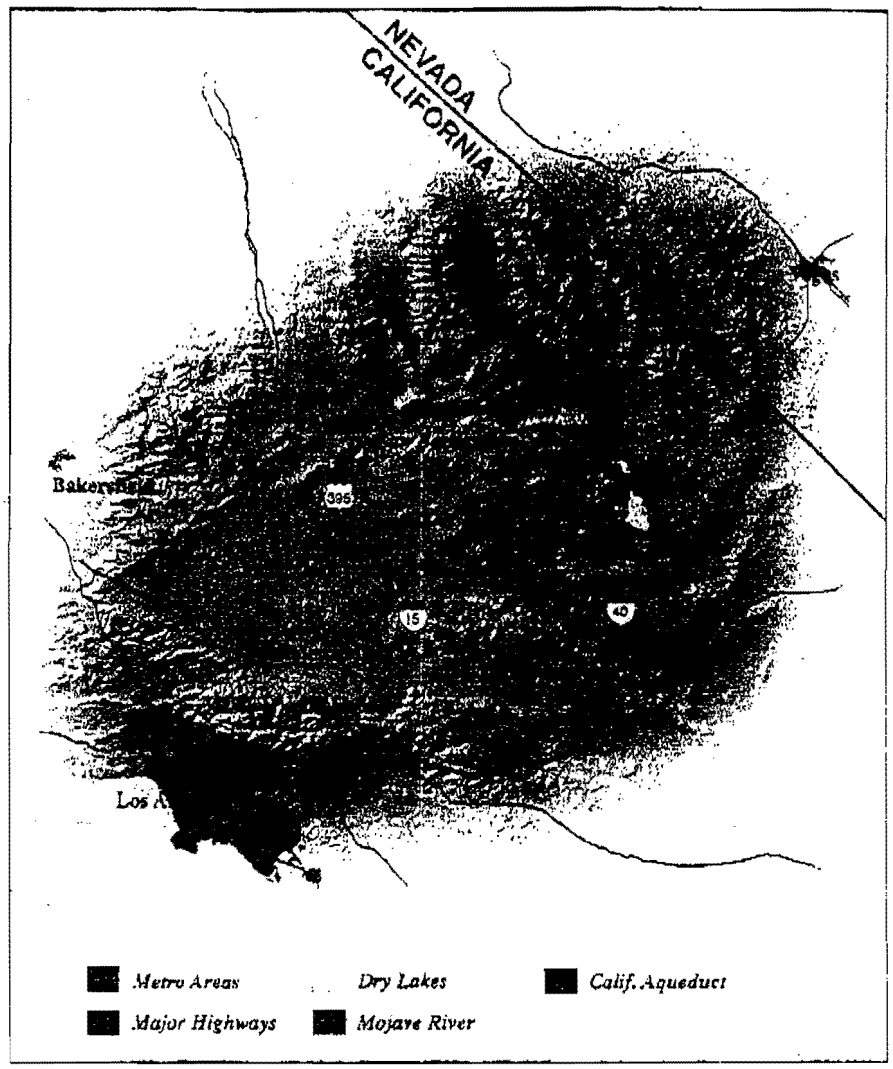
## Groundwater Overdraft

By the 1960s, it was obvious that the Mojave River Basin was in serious overdraft. To balance water use and supply, the MWA initiated its first effort to determine who had rights to what water through an adjudication, filed in court in 1964. Through this legal process, a court can assign specific water rights to specific water users and can compel the cooperation of pumpers who might otherwise refuse to limit their pumping.

Watermasters often are assigned to ensure that pumping conforms to the limits defined by the court's decision. There are 16 other adjudicated basins in California, mostly located in southern California, including the Central Basin, Main San Gabriel Basin and Chino Basin.

With more expensive surface water expected to arrive in the region in 1972 through the SWP, MWA officials believed it was imperative to establish rights to the existing water, in part so that new water users who did not have old rights would bear a higher burden of the costs to import SWP surface supplies. (Regular delivery of SWP water did not begin until 1991; deliveries were delayed in large part because there were no delivery or storage facilities. As a state water contractor, the MWA is entitled to an annual allotment of 75,800 acre-feet of water from the SWP.)

The MWA took steps to initiate adjudication by hiring a special




counsel in March 1964. The agency conducted a series of community meetings and forums, and undertook a number of studies of the area's groundwater use and recharge. Adjudication as the best way to manage the region's groundwater, however, was never fully endorsed by all parties. And amid questions of whether upstream users would benefit as much as downstream users from such a process, the initial Mojave River Basin adjudication collapsed in the mid-1970s.

Groundwater overdraft in the region continued through the 1980s as Los Angeles commuters poured into ever-farther outlying communities in search of more affordable housing. Population in the Mojave River Basin

area reached approximately 293,550 in 1995, compared to 6,000 in 1930. Based on growth rates developed by the Southern California Association of Governments, population within the MWA service area is expected to increase to about 544,000 by 2015.

Because the Mojave River Basin's five hydrologic subareas are linked, downstream users' groundwater supplies are affected by upstream withdrawals. Such was the case for the city of Barstow, lying downstream of the fast-developing communities of Adelanto, Hesperia, Victorville and Apple Valley (the Victor Valley area).

In 1990, Barstow and the Southern California Water Co. sued (*City of Barstow et al. v. City of Adelanto et al.*) in an attempt to secure a specific amount of groundwater – 30,000 acre-feet annually – against any future upstream development in the Victor Valley area. The complaint, filed in San Bernardino County Superior Court, also called for the MWA to fulfill its statutory authority to obtain and provide supplemental water for use within the Mojave River Basin area.

## The Physical Solution

The MWA filed a cross-complaint in 1991 requesting a determination of water rights in the basin to end the overdraft – launching the second attempt at adjudication of the basin. The cross-complaint effectively expanded the adjudicated area to include areas downstream of Barstow, and the areas now known as the Este and Oeste Subareas (the Lucerne and El Mirage Basins), which are adjacent to and hydrologically connected to the Mojave River Basin (Alto), which includes the Victor Valley area.

The court ordered that the litigation be placed on hold to give parties time to negotiate a settlement and develop a "physical solution" to the groundwater overdraft. With that order, a Mojave Basin adjudication committee composed of attorneys and engineers was established to gather data and draft a stipulated judgment and physical solution.

After two years of negotiations, the committee submitted a draft physical solution to the court. Rather than focusing on a well by well determination of who used how much water and whose rights were paramount, the committee favored an equitable apportionment in which all major users would be asked to cut back their water use.

The draft physical solution required that each subarea within the Mojave Basin provide a specific quantity of water to the adjoining downstream subarea. No limits were placed on what people could withdraw, but each was allotted a certain quantity called a "base annual production allowance" (free production allowance) based on the greatest amount of water used between 1986 and 1990. Users were to reduce that amount by 20 percent in 5 percent increments over five years. They were free to pump more than that, but water pumped in excess of this amount was subject to fees, which would be used to pay for imported SWP water. An alternative for those who pumped

## Glossary

**Adjudicate** –To determine rights by a lawsuit in court.
**Appropriative Right** – A right based on physical control of water and since 1914, a state-issued permit or license for its beneficial use.
**Correlative** – Having a mutual or reciprocal relation; the existence of one necessarily implies the existence of the other.
**Prescriptive Rights** – Water use rights gained by trespass or unauthorized use that ripen into a title – on a par with rights to land gained through adverse possession. To perfect the right, the use of water must be adverse, hostile, open and continuous for five consecutive years against a private water rights holder.
**Reasonable and Beneficial Use** – A state constitutional requirement (Article X, Section 2) that all water resources must be put to beneficial use, preventing waste or unreasonable use or unreasonable method of use.
**Safe Yield** – Rate of extraction that does not deplete a groundwater basin over time.

more than their free production allowance was to purchase additional water from someone else, establishing a market mechanism in the Mojave River Basin.

At the core of the stipulated agreement was a plan to develop a funding mechanism to buy SWP water and balance supply with use. "The stipulated judgment had to be negotiated in such a way that the ag people wouldn't leave the room," Markman said, explaining that the parties tried to make it more attractive for ag users to transfer water to the cities and allow for a slow, gradual reduction in the "free production" allowance; starting with 100 percent of production and ending with 80 percent of historic use.

"We went forward with the idea of saying, 'We are going to present this stipulated judgment as an equitable approach. We are not going to assert prescriptive rights. Court, this is equitable to everybody. It's not going to impair anybody's rights'," he said.

Superior Court Judge E. Michael Kaiser ordered all parties in the basin who pumped more than 10 acre-feet a year to stipulate to (agree to) the physical solution, fight it, or accept it by default. More than 200 parties stipulated to the solution, which went into effect October 1, 1993. Kaiser subsequently held a trial in 1995 to adjudicate the rights of those who refused to stipulate to this solution – the city of Adelanto, Jess Ranch Water Co., and the alfalfa and dairy farmers who became known as the Cardozo Group.

Five main issues were set to be determined during this trial: the characterization of the water rights; the priority, if any; the uses of the water; whether those uses were reasonable; and the amount of reasonable and beneficial use.

Although the Cardozo Group initially argued that they held riparian rights because they pumped water from an underground river (the Mojave), they ultimately relied on overlying groundwater rights – the right to pump

## Groundwater Case Law

In California, groundwater provides about 25-30 percent of the state's water supply in normal years and as much as 60 percent in critically dry years. In spite of this, California has neither a comprehensive groundwater management plan nor a permit process to regulate groundwater withdrawal. There are, however, several judicial decisions that provide general parameters for this area.

The first is *Katz v. Walkinshaw*. This 1903 state Supreme Court ruling determined that a rule of reasonable use must be applied to groundwater use. *Katz* also established the concept of an overlying right in which all property owners above a common aquifer possess a shared right to reasonable use of the groundwater aquifer. Overlying users could no longer take unlimited quantities of groundwater without regard to the needs of others.

Subsequently, courts established that groundwater may be appropriated by pumping and the resource transported for use on non-overlying land. However, no permit procedure exists to regulate such groundwater appropriations. Appropriators of groundwater possess a right subordinate to an overlying right. If a groundwater basin is adjudicated, and all reasonable and beneficial overlying rights are satisfied and sufficient surplus groundwater exists, the claim of an appropriator will be allowed by the court under most circumstances. Among themselves, appropriators are subject to "first in time, first in right."

For chronically overdrafted groundwater basins, the state Supreme Court developed the doctrine of mutual prescription in 1949 in *Pasadena v. Alhambra*. The court decided that various users, including overlyers and appropriators, had acquired prescriptive rights – rights to infringe upon the established water rights by means of trespass or unauthorized taking. Each was awarded a proportional share of the basin supply. The total extraction amount was limited to a basin's "safe yield." Rights to use the groundwater were based upon demonstrated use in the last five years of pumping.

This decision resulted in a "race to the pumphouse" as groundwater users of other overdrafted basins attempted to pump maximum quantities of water to increase their five-year pumping record prior to potential litigation and to maximize their eventual adjudicated entitlements.

The state Supreme Court in *Los Angeles v. San Fernando* in 1975 undercut its decision in *Pasadena* by holding that the water rights of public entities, such as city governments, could not be prescripted although public and private entities may prescript against private entities. A number of other legal changes were made which many felt made it more difficult to use the *Pasadena* "mutual prescription" theory. Some of these restraints, in turn, appear to have been eased through the court's recent Mojave ruling.

water that underlies their property – as the basis of their case.

Under California water law, groundwater and surface water are treated as two separate resources. Post-1914 surface water use is subject to a permitting process overseen by the State Board. Subsurface flow moves through the sands and gravels under or next to a stream channel. Subsurface flow in a known and definite subterranean stream is considered to be part of the stream and is subject to the same riparian and appropriative rights that guide the use of the stream itself. Although such subsurface flow is regulated by the State Board, case law presumes that if water comes out of a well, it is percolating groundwater, which is not subject to State Board jurisdiction.

Kaiser determined that the water at issue in *Mojave* was groundwater. In his January 1996 ruling, he upheld the physical solution for all users, contending that the constitutional mandate of reasonable and beneficial use dictates an equitable apportionment of all water rights when a river basin is in overdraft. The court found that it was unnecessary to adjudicate individual legal water rights, concluding that the proposed physical solution would be fair and equitable to non-stipulating farmers and would best satisfy the use priority – that domestic use has highest priority, followed by irrigation – in Water Code section 106.

The city of Adelanto agreed to be bound by the terms of the judgment following the trial, but the Cardozo Group appealed, arguing that the physical solution was invalid because it did not recognize their preexisting and paramount water rights under California water law. Jess Ranch Water Co. also appealed.

The city of Barstow, the MWA and other parties who signed the stipulation contended that the Cardozo Group had not proven they had any water rights that the judgment adversely affected and that any water rights these farmers did possess were limited by the Constitution's reasonable and beneficial use doctrine.

The 4th District Court of Appeals sided with the farmers, and, ultimately, so did the state Supreme Court. "Case law simply does not support applying an equitable apportionment to water use claims unless all claimants have correlative rights; for example, when parties establish mutual prescription," Justice Chin wrote in the Court's decision.

"This is a lesson of what can happen to farmers who don't fight," Dougherty said. "If more farmers had joined and fought to preserve their water rights, we would have had an adjudication, not a stipulation. I urge farmers to fight if they get involved in a water war."

Proponents of the physical solution acknowledge that a full adjudication might have resolved these issues and forestalled this lengthy legal battle. "This case never would have happened if the Mojave Water Agency or some other agency had funded an investigation of the 7,000 wells in the Mojave River Basin, well by well, by well," Markman said

**Bed and Banks**

The question of subsurface flow or percolating groundwater is pending in another California groundwater basin, and Californians are watching closely to see what determination will be made by the State Water Resources Control Board (State Board). At issue is the definition of water in two basins along the San Luis Rey River in northern San Diego County. In particular, a draft State Board decision would determine that all water in Pauma and Pala basins is part of "a subterranean stream flowing in known and definite channel." Such a determination would mean that the underground water is no longer percolating groundwater.

Thus, landowners would lose the right to pump their correlative share of safe yield. Instead, what is now considered groundwater would be defined as surface water and would fall under jurisdiction of the State Board. Such a change could be beneficial to smaller pumpers (provided they have senior rights to the water) by protecting them from larger pumpers. Conversely, smaller pumpers could be injured because they lack the financial resources to go through the allocation process. Overall, for groundwater users in those two basins – and groundwater users around the state – the precedent set by such a ruling could create significant changes in California's historic groundwater law.

"But nobody was going to spend the time and the millions of dollars necessary to investigate each well. The question was, do you go ahead and try to get a plan negotiated by which you can manage the resource? Or do you walk away and let the guy with the deepest well and the most money to spend pump until the other people can't pump anymore? I think what's really important is what now, not what if."

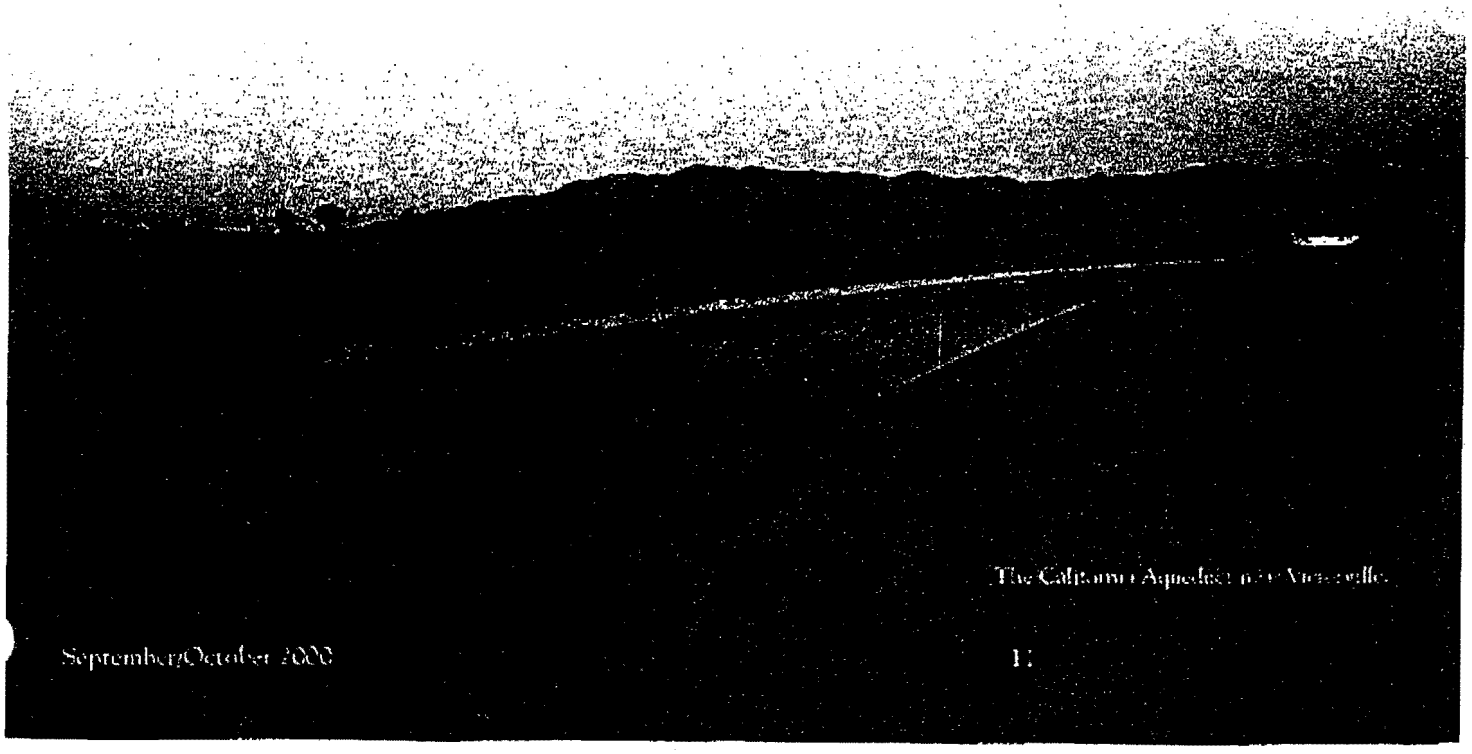
## What Now?

In the aftermath of the state Supreme Court's ruling, attorney Bill Brunick, who represented the MWA, believes some of the parties that signed the stipulated agreement will now try to back out, at which point, he will recommend the MWA Board of Directors oppose any such efforts.

Another issue pending for MWA board members is what to do with the estimated 6,000 well owners who pump less than 10 acre-feet a year. These parties were purposely left out of the stipulated agreement after the agency spent $400,000 to $500,000 trying to serve them, before determining the lack of data and sheer number of these users would prove cost prohibitive to the adjudication. "My advice to the board regarding these minimal producers will be to ask the judge to agree to leave them alone," Brunick said, "but allow for aerial surveys by the MWA to ensure they are not pumping more than 10 acre-feet." Whether the judge will allow that remains to be seen.

Overdraft of the Mojave River Basin remains the paramount issue, and Brunick maintains that the Cardozo Group must still reduce its pumping. "We are mining the groundwater," he said. "That's why we started with the first adjudication and then this more recent plan."

According to Brunick, research conducted by the MWA determined that the Mojave Basin's long-term average annual water supply from local, natural sources is 75,000 acre-feet. Net supply, however, is only 50,900 acre-feet after outflow (8,200 acre-feet) and consumption by riparian plants (16,000 acre-feet) are taken into account. Total water production rights in the basin, however, are about 280,000 acre-feet per year. Of that, about 90,000 acre-feet (31 percent) goes to the municipalities while agriculture has production rights to about 195,000 acre-feet. Brunick maintains that since the Mojave Basin's safe yield is only 50,000 acre-feet, the overlying users such as the



The California Aqueduct near Victorville.

Construction of new 71-mile distribution pipeline.

Cardozo Group must reduce their use by some 76 percent. This is one issue, though, that will be decided by the trial court.

"In my opinion, the farmers who stipulated are better off under the judgment than under the analysis that is required by the state Supreme Court's ruling," he said. "If you believe what the Supreme Court said is correct, the mere fact that they are relying on overlying rights in an overdrafted basin does not give them the right to pump down that basin. Whether the trial court judge will accept this type of approach, I don't know, but I think this is what the Supreme Court is saying."

Brunick said he will recommend to the MWA board that they pursue a correlative rights judgment against the Cardozo Group. As it stands now, these growers' production rights are about 6,000 acre-feet per year. Under the Mojave River Basin stipulated agreement, they would have had to reduce that by 20 percent to about 4,800 acre-feet. Under Brunick's interpretation of safe yield and correlative rights, the farmers would be left with only 1,200 acre-feet.

Dougherty disagreed, arguing that his clients are located along the river where there is no overdraft. "The Cardozo appellants are either all along the river or in the Hinkley Valley ... and have never had a problem getting water from their wells," he said. As for Brunick's suggestion that they be cut back to 25 percent of their historic use, while other farmers who signed the stipulated agreement receive 80 percent, Dougherty said the rulings by the state Supreme Court and the appellate court determined the Cardozo Group's water use is reasonable and beneficial and protected their right to pump all the water they can put to such use.

As for new users, Brunick said additional legal action may be necessary to ensure that people who own land but have not pumped groundwater before pay their fair share of the cost of alleviating the basin's overdraft. "My recommendation is if they have not pumped, we have to bring a lawsuit against them and have the public entities declare prescription against any new uses and new pumping," he said. "If the new users want to sign on to the stipulation, then they can farm. But the problem is it's more expensive water; it won't be $30 to $40 an acre-foot, it will be $150 to $160 an acre-foot."

Even as they face these issues, the MWA continues to implement the regional water management plan it was required to develop by Judge Kaiser. At the heart of that plan is construction of a new, 71-mile pipeline that will allow the agency to directly deliver SWP water from the California Aqueduct to downstream areas such as Barstow. Historically, the only way to get imported water to downstream areas was to release it into the Mojave River from the state-owned Lake Silverwood reservoir, but much of the flow was pumped out by groundwater users before it reached downstream areas. Construction on the pipeline began in 1997 and has been completed to areas near the city of Barstow. The MWA also is in the process of constructing additional groundwater recharge basins along different portions of the river to help recharge the groundwater aquifer

**Jess Ranch**

Although the state Supreme Court upheld the appellate court's ruling on most issues involved in the Mojave River Basin adjudication, it did reject the Jess Ranch Water Co.'s bid to increase its total transferable water under the stipulated agreement from approximately 7,500 acre-feet to about 19,000 acre-feet. The trial court made this same finding, based on the fact that the higher amount of water was not used for agricultural production, but for aquaculture (trout production). The water used for trout rearing had a low consumptive use, and Judge Kaiser determined that much of this water was cycled through the trout farm and returned to the Mojave River, where it was pumped out by other users. Jess Ranch had wanted the right to sell this water; the trial court determined that it must continue returning this water to the river. The appellate court had sided with Jess Ranch.

Jess Ranch asked the state Supreme Court to rehear this matter, but the justices refused. The case will now return to the trial court for final resolution.

and use SWP water to reduce the overdraft.

"Everybody needs to realize that they all contribute to the problem," said Valerie Wiegenstein, the staff member who manages the watermaster function for the MWA.

The Mojave River Basin ruling was the first major state Supreme Court ruling on water since the landmark public trust doctrine ruling in 1983, *National Audubon Society v. Superior Court*. In that decision, the court found that reconsideration and curtailment of longstanding water rights (the Los Angeles Department of Water and Power's diversion rights to Mono Lake tributaries) were authorized if necessary to protect the public trust, including the water rights of tributaries of navigable waters. The necessity of protecting the public trust was to be determined by balancing the value and cost of instream water needs against the benefits and costs of diversions.

In the Mojave River Basin ruling, the state Supreme Court was careful to note that "our decision in no way limits the administrative authority of the State Water Resources Control Board, nor does it affect the State Board's authority over surface waters."

Still, attorney Kevin O'Brien, who filed an amicus brief on behalf of the Northern California Water Association, said this recent decision "suggests that the pendulum has swung back in favor of the recognition and protection of water rights priorities." He added, "while the Mojave decision is ostensibly narrow in its applicability, the court's emphatic and unanimous rejection of the invitations to further erode water right priorities will likely have implications in other water allocation contests throughout California."

How much of an impact the ruling will have on water rights disputes and groundwater adjudications in other parts of the state remains unclear

For his part, Markman believes the decision strengthens the argument in favor of adjudication, despite this ruling, if that adjudication includes a quantification of users' water rights. Only with a quantified right, he contends, is a groundwater pumper's right really secure.

"I think there will be adjudications post-*Mojave*. First of all, there is no other alternative except to let the resource get pumped, pumped, pumped until the guy can't afford to pump anymore and stops," he said. "And agricultural interests may have more reason to adjudicate than the municipal purveyors. The cities and other purveyors have a rate base. They're going to find some way to keep serving water. What can ag do to ensure it can continue to produce?

"Ag has two specters hanging over it," Markman continued. "One is that if there is an overdraft of the basin, the agricultural user can be prescribed against. Second, new agriculture can come along and dilute his portion of safe yield, or throw the basin into overdraft. People need to be quantified. I can't believe you can manage groundwater resources in California unless all the producers at a given point in time can be quantified and those that haven't produced don't get to come on with an after-the-fact paramount right.

"If you can't do that, all of you out there in the water resources business can forget about planning because all of you – agriculture and municipalities – are subject to a 'Johnny-Come-Later' producer who sets up a farming operation."

When it comes to finding water for the state's growing municipalities, Dougherty offered this cautionary note. "For cities and others who are appropriators it is better not to depend on an overdrafted basin to support your growth because you may find that you are not able to use that water if somebody takes you to court," he said. "You better make sure the developer brings his water with him – particularly if you are in an overdrafted basin." ❖

**"Everybody needs to realize that they all contribute to the problem."**

**– Valerie Wiegenstein, Mojave Water Agency**

Appendix C

# Well Drilling Information and Geotechnical Studies: 1985 - 2000

October 19, 2000

There has been some additional data collected since the USGS and DWR completed their reports on the Borrego Valley in the early 1980s which should be considered.

The Borrego Water District accepted from the developer at Ram's Hill Well 16, which serves Improvement District No. 1. The District drilled a test well east of San Felipe Creek near Highway 78 on its 30 acre parcel purchased from Dr. Nel and it also drilled a test hole near Clark Lake north of Highway S22. A research firm, Agbabian Associates, drilled several test holes and performed geophysical studies in the extreme north west corner of the Borrego Valley to determine the depth to groundwater and depth to basement. Lastly, the Borrego Water District acquired Well No. 11 when it purchased the Borrego Springs Water Company.

Well 16. Location: SW1/4 of Section 16 T11S, R6E SBM. Test hole depth = 705 ft.; Q = 1,500 gpm. ; Specific Capacity = 40 gpm/ft; Static Water Level = 210 ft; TDS = 310 ppm.

The test hole did not reach basement rock at 705 ft; the formation was loose fine to coarse grey-white sand. There was no evidence that the test hole penetrated into the middle or lower aquifers at 705 ft. depth.

Test Well. Location: District 30 acre Dr. Nel property. NE 1/4 of SW 1/4 of Section 3T12S, R7E SBM. Test hole depth = 850 ft.; Well depth = 844 ft.; 5" steel casing. Specific Capacity = 2 gpm/ft.; Q = 50 gpm; Static Water Level = 249 ft.; TDS = 198 ppm.

The well driller stated that the test hole reached bedrock at 850 ft. The formation was sticky clay, occasional streaks of some sand, cemented sand. The drilling became hard rough drilling at 835 ft.

Clark Lake Test Hole. Location: NE 1/4 of NE 1/4 of Section 16 TIOS, R7E SBM. Test hole depth = 1,174 ft; Sample taken at approx,. depth of 1,100 ft. Estimated Static Water Level = 150 ft.; Approximate TDS = 5,200 ppm

The test hole did notreach bedrock. The location of this well is outside the Borrego Valley Aquifer.

Well 11. Location: NW 1/4 of NW 1/4 of Section 32, T10S R6E SBM. Test hole Depth = 800 ft.; Well depth = 770 ft.; Q = 1,500 gpm; Specific Capacity = 130 gpm/ft.; Static Water Level = 179 ft.; TDS = 387 ppm.

The well driller was instructed to drill to bedrock. He stopped at 800 ft. when the drilling was rough and slow. The formation appeared to be very good to 770 ft. which could be classified as upper level aquifer using the USGS designation.

Agbabian Report.

Geologist Clark Shimeall reviewed the Agbabian data as described in the attached report. Agbabian's study covered approximately four square miles in the northwesterly portion of the Borrego Valley aquifer. Mr. Shimeall's comparison of the Agbabian data to the USGS data for this specific location identified two troughs with increased thickness of some 600-800 ft. which were not picked up by the USGS gravity survey. There are no existing wells into these deeper

sediments, hence we are not able to determine if they hold recoverable high quality water.

After reviewing the additional data that has resulted from new wells drilled and the work done by Agbabian, the Technical Committee judgment is that there is not sufficient information to make quantitative changes in the USGS conclusions as to the quantity of recharge or the storage capacity of the Borrego Valley Aquifer. The Agbabian study, Wells 11 and 16 all seem to indicate some extension of the upper level aquifer to somewhat greater depths than depicted by the USGS. The test well on the Dr. Nel property and the many other existing wells east of Borrego Valley Road appear to indicate the general extent of the lower level aquifer where both specific capacity and specific yield are very low, all is identified in the USGS reports.

The test hole drilled near Clark Lake bed revealed a very much different formation than occurs in the Borrego Valley. This formation lies northeast of the Coyote Creek Fault; the dissolved mineral content of the water is very high and that water does not seem to be interconnected across the fault with the Borrego Valley aquifer where water quality is very good.

Appendix D

July 16, 2000

To: Tom Weber, General Manager
From: L.R. Burzell, District Engineer

Subject: Groundwater Management - Borrego Valley
Stream Flow Records

Background: The quantity of stream flow reaching the floor of the Borrego Valley is the principle source of replacement to the groundwater basin. For a number of years the United States Geological Survey (USGS) installed and maintained stream gaging stations in the United States as a public service. Over time, with tighter and tighter budgets, the USGS gradually cut back on this service. Many stream gaging stations have been discontinued and some are being operated only if a local agency cooperates with the USGS by paying one half the annual operating cost.

At the present time the only active stream gaging station in the Borrego Valley is the one on Borrego Palm Canyon Creek. The Borrego Water District shares the annual operating cost of about $15,000 per year with the USGS. The Coyote Creek Station was washed out by a flood some six years ago and is not likely to be replaced due to the cost and restrictions placed on the USGS by the Anza Borrego Desert State Park.

Close observations by your District Engineer and numerous agencies and other engineers indicate that only Coyote Creek and Borrego Palm Canyon Creek regularly provide surface flow to the Borrego Valley aquifer. Other normally dry creek channels occasionally provide small quantities of stream flow during flash flooding or during wet winters when rainfall levels are considerably above normal. One other inflow to the Borrego Valley is subsurface groundwater flow from San Felipe Creek. The USGS Study Report 82-855 determined the subsurface inflow from San Felipe Creek to be approximately 31.8 acre-feet per year.

My conclusion is that approximately 90% of all of the inflow that reaches the Borrego Valley comes from Coyote Creek and Palm Canyon Creek.

Measured and Calculated Inflow to Borrego Valley From USGS Data

Table A attached hereto shows the measured inflow to the Borrego Valley (bold face) from the USGS records for Coyote and Palm Canyon Creeks. The records on Coyote Creek cover the period 1983/84 to 1991/92. The records for Palm Canyon Creek cover the period from 1977/78 to the present except for the year 1993/94. During the nine years that both stream gaging stations were operating, Coyote Creek averaged 2.58 times greater runoff than did Palm Canyon Creek. If we assume that the factor of 2.58 represents a ratio that is applicable over time both past and future, we can calculate the combined runoff of the two creeks for those years when we had recorded flow for only one of the creeks.

Table A shows the calculated inflow to the Borrego Valley based on the available direct measured inflows plus estimated inflow extrapolated using the parameters described above.

D

# Table A

## Calculated Replenishment Stream Flow to Borrego Valley
## Water Year October through September

| Year | Palm Canyon | Coyote Creek | 10% from Other Sources | Calculated Total |
|---|---|---|---|---|
| 1977/78 | **662** | 1,708 | 237 | 2,607 |
| 1978/79 | **2,340** | 6,037 | 838 | 9,215 |
| 1979/80 | **5,530** | 14,267 | 1,980 | 21,777 |
| 1980/81 | **1,370** | 3,535 | 491 | 5,396 |
| 1981/82 | **1,310** | 3,380 | 469 | 5,159 |
| 1982/83 | **4,720** | 12,178 | 1,690 | 18,588 |
| 1983/84 | **1,720** | **3,140** | 486 | 5,346 |
| 1984/85 | **1,040** | **3,280** | 432 | 4,752 |
| 1985/86 | **943** | **2,690** | 363 | 3,996 |
| 1986/87 | **529** | **2,080** | 261 | 2,870 |
| 1987/88 | **472** | **1,840** | 231 | 2,543 |
| 1988/89 | **260** | **1,090** | 135 | 1,485 |
| 1989/90 | **170** | **625** | 80 | 875 |
| 1990/91 | **589** | **715** | 130 | 1,434 |
| 1991/92 | **475** | **516** | 99 | 1,090 |
| 1992/93 | **3,810** | 9,830 | 1,364 | 15,004 |
| 1993/94 | **n/a** | n/a | n/a | n/a |
| 1994/95 | **1,490** | 3,844 | 533 | 5,867 |
| 1995/96 | **309** | 797 | 111 | 1,217 |
| 1996/97 | **297** | 766 | 106 | 1,169 |
| 1997/98 | **1,560** | 4,025 | 559 | 6,144 |
| 1998/99 | **311** | 802 | 111 | 1,224 |
| | | | Total: | **117,757** acre-ft |

Tewnty-One Year Average Calculated Replenishment: **5,607** acre-ft/year

Appendix E

**Appendix "E"**

**Projected Life of the Borrego Valley Aquifer**
December 7, 2000

USGS Report No. 87-4199 provided a groundwater flow model of the Borrego Valley aquifer. This report was a supplement to USGS Report No. 82-855. Annual recharge from stream flow was stated to be 4,800 ac.ft./yr. The specific yield of the upper, middle and lower aquifers was computed to be 14%, 7% and 3% respectively.

In 1993, Dr. David Huntley worked with John Peterson of the San Diego County Planning Department using the USGS data and determined that there was 809,000 ac.ft. of water in the upper aquifer and 1,090,600 ac.ft. of water in the middle aquifer for a total storage of 1,900,500 ac.ft. as of the end of 1979.

The calculated accumulated depletion in 1999 totaled 445,500 ac.ft. In 1999 the annual rate of depletion was determined to be 17,500 ac.ft./yr. At this rate of depletion one-half of the upper and middle aquifer would be depleted in 35 years (2034) and the balance of the stored water would be depleted in 96 years (2095). The remaining water in the lower aquifer would be difficult and costly to extract because of its very low (3%) specific yield and very low specific capacity (5 gpm/ft. of drawdown or less).

If there is no groundwater management plan and development continues (thereby allowing construction of new homes and businesses on existing lots and on other lands which have been approved for development, together with some additional agricultural expansion) the Borrego Water District has estimated that the annual overdraft may increase from the present 17,500 to 33,500 ac.ft./yr. in the next ten years. Based on this forecast for the rate of growth in annual overdrafts, the upper and middle aquifers would be depleted by one-half in 21 years (2020) and the balance of the storage in the upper and middle aquifers would be depleted in 53 years (2052).

When the upper and middle aquifers are depleted, any remaining operating wells must be drilled into the deeper lower aquifer where production rates will be much lower and pumping costs much higher. Borrego Water District ID 1 Wells 1 and 2 are located exclusively in the lower aquifer or Palm Springs Formation. These wells can be operated only intermittently in the 200-gpm range with an annual production of less than 100 ac.ft./yr. The Borrego Water District's existing wells in the upper and middle aquifer typically produce more than 1,000 ac.ft/yr. with specific capacities in the range of 50 to 135 gpm per foot of drawdown.

References:


1. USGS Report No. 87-4199
2. Professor David Huntley's letter dtd January 26, 1993 to the San Diego County Board of Supervisors
3. Borrego Water District's 1999 Determination of Annual Rate of Depletion
4. Borrego Water District's Report to Customers, Spring 2000
5. Borrego Water District Well Production Records

LRB 12/6/00 E

# CALCULATION OF THE PROJECTED LIFE OF THE BORREGO VALLEY AQUIFER

I. REFER to 1982 and 1987 USGS REPORTS — BASIN RECHARGE = 4,800 ac-ft/yr
Specific YIELD OF THE BASIN, UPPER, MIDDLE AND LOWER AQUIFERS
= 14%, 7% and 3%

II REFER to DR. DAVID HUNTLEY LTR TO SAN DIEGO COUNTY BOARD OF SUPERVISORS DTD 1/26/93

a. Rate of ANNUAL OVERDRAFT OF THE BASIN IN 1992 = 11,274 AC FT/yr

b ACCUMULATED DEPLETION 1945–1979 = 231,000 AC ft

c WATER IN STORAGE IN UPPER AND MIDDLE AQUIFER IN 1979 = 1,900,500 AC FT

III BORREGO WATER DISTRICT DETERMINATION THAT THE 1999 OVERDRAFT WAS 17,500 ACFT/YR

IV TOTAL CAPACITY OF THE UPPER AND MIDDLE PORTIONS OF THE AQUIFER IN 1945

WATER IN STORAGE IN 1979 = 1,900,500 ACFT
ACCUMULATED OVERDRAFT to 1979 = 231,000 ACFT
1945 CAPACITY OF BASIN = 2,131,500 AC FT

V DEPLETION 1979–1992

BASIN OVERDRAFT IN 1979 = 6,200 AC FT/YEAR (from ltr 1/26/93)
BASIN " " 1992 = 11,274 " " " " "
17,474 ÷ 2 = 8737 AC FT/yr X 13 yrs

TOTAL DEPL 13 YEARS = 113 581 AC FT.

VI DEPLETION 1992–1999

OVERDRAFT 1992 = 11274
" 1999 = 17,500
28,774 ÷ 2 = 14,387 X 7 yrs

TOTAL DEPL. 7 yrs = 100,709 AC FT

VII WATER IN STORAGE AND TOTAL DEPLETION 1999

STORAGE IN 1979 = 1,900,500
less DEPL 79 to 92 – 113,581
less DEPL 92 to 99 – 100,709

WATER IN STORAGE 1999 1,686,210 AC FT

AT YEAR 1999 – TOTAL DEPLETION 45–79 = 231,000
DEPLETION 79–92 = 113,581
" 92–99 = 100,709

TOTAL DEPLETION 1945 to 1999 445,290 AC FT.

E

VIII DETERMINATION WHEN THE UPPER AND MIDDLE AQUIFERS WILL BE HALF DEPLETED

STORAGE IN 1945 = 2,130,500 AC FT ONE HALF = 1,065,250 AC F

| | | |
|---|---|---|
| less Accumulated overdraft | 45/79 | 231,000 |
| " " " | 79/92 | 113,581 |
| " " " | 92/99 | 100,709 |
| Remaining Storage | 1999 | 1,685,210 AC FT |

one half of storage in 1945 = 1,065,250
DEPLETION 1945-1999 − 445,290

REMAINING STORAGE 1999 619,960 ÷17,500 AC FT/yr
= 35.4 YEARS FROM 1999

STORAGE WOULD BE ONE HALF DEPLETED IN 1999 + 35 YEARS = 2034

YEAR STORAGE WOULD BE FULLY DEPLETED

REMAINING ONE HALF OF STORAGE = 1,065,250 AC FT ÷17,500 = 60.9 yrs
YEAR STORAGE WOULD BE DEPLETED = 2034 + 60.9 = 2095

IX CONSIDERATION OF AQUIFER LIFE IF WATER USE CONTINUES TO INCREASE FOR 10 YEARS REACHING A TOTAL OVERDRAFT OF 33,500 AC FT/YR BY THE YEAR 2009.

ASSUMED AVERAGE ANNUAL OVERDRAFT OF 25,500 AC FT/YR FOR the 10 YR PERIOD 1999 to 2009

ADDITIONAL DEPLETION 1999 to 2009 = 25,500 AC FT/YR X 10
= 255,000 AC FT.

TOTAL DEPLETION BY 1999 from PP VII = 445,290
DEPLETION 99/09 255,000
TOTAL DEPLETION BY 2009 700,290 AC FT

ONE HALF OF STORAGE = 1,065,250 AC FT
LESS DEPLETION TO 2009 700,290
364,960 ÷ 33,500 AC FT/yr
= 11 YEARS

ON THIS BASIS THE ~~MIDDLE~~ UPPER AND MIDDLE AQUIFERS WOULD BE ONE HALF DEPLETED BY 2009 + 11 YEARS OR YEAR 2020

THE REMAINING ONE HALF OF THE AQUIFER WOULD BE DEPLETED
1,065,250 ÷ 33,500 = 31.8 YEARS SAY 32 YEARS
OR THE YEAR 2020 + 32 = YEAR 2052

Appendix F



## BORREGO VALLEY AGRICULTURAL LAND

| REF. # | OWNER | APN | CITRUS ACRES | NURSERY/PALM ACRES | POTATO ACRES | PRIME VACANT ACRES |
|---|---|---|---|---|---|---|
| 1 | Jensen | 140-010-03 | 80 | | | |
| | | 140-010-06 | 80 | | | |
| | | 140-010-09 | 80 | | | |
| | | 140-070-22 | 110 | | | |
| | | 140-130-01 | 77.9 | | | |
| | | 140-130-43 | 66.34 | | | |
| 2 | Jones | 140-070-23 | 50 | | | |
| 3 | Burnand | 140-010-10 | 70 | | | |
| | | 140-070-02 | 154 | | | |
| 4 | Bauer | 140-010-08 | 120 | | | |
| | | 140-010-11 | 136.94 | | | |
| | | 140-070-17 | 40 | | | |
| | | 140-070-18 | 38.56 | | | |
| 5 | Nors | 140-030-03 | 159.75 | | | |
| | | 140-030-05 | | | | 156.94 |
| | | 140-110-18 | 36.97 | | | |
| 6 | Fortiner | 140-070-05 | 40 | | | |
| | | 140-070-11 | 9.62 | | | |
| | | 140-070-19 | 78.56 | | | |
| | | 140-070-31 | 80.86 | | | |
| 7 | Seley | 140-070-14 | 80 | | | |
| | | 140-070-16 | 120 | | | |
| | | 140-090-04 | 140 | | | |
| 8 | Dunlap | 140-070-15 | 80 | | | |
| | | 140-070-20 | 39.24 | | | |
| | | 140-070-28 | 58 | | | |
| 9 | Chapple | 140-070-27 | 20 | | | |
| | | 140-110-14 | 74.5 | | | |
| 10 | Sommerville | 140-110-15 | 74.93 | | | |
| | | 140-110-16 | 38.6 | | | |
| 11 | Humblet | 140-110-17 | 19.3 | | | |
| | | 140-110-31 | | | | 57.94 |
| | | 140-070-07 | | | | 80 |
| 12 | Ellis | 140-110-19 | | 37.5 | | |
| | | 140-110-20 | | 37.5 | | |
| | | 140-110-24 | | 37.41 | | |
| | | 140-290-04 | | 5 | | |
| | | 140-290-05 | | 60 | | |
| | | 140-290-08 | | 76.79 | | |
| 13 | Waardenburg | 140-110-21 | | 10 | | |
| 14 | Gibbs | 140-130-34 | | 3 | | |
| | | 140-130-35 | | 3 | | |
| | | 140-130-36 | | 3 | | |
| | | 140-130-38 | | 3 | | |
| 15 | Lebec | 140-130-45 | 85.22 | | | |
| 16 | Cocopah | 140-130-28 | | 200 | | |
| | | 141-030-26 | | 40 | | |
| | | 141-030-27 | | 41.88 | | |
| | | 140-130-23 | | | | 29.53 |
| | | 140-290-02 | | | | 618.25 |
| | | 141-030-31 | | | | 188.46 |
| 17 | Agri Empire | 140-290-06 | | | 152.47 | |
| | | 140-290-10 | | | 214.21 | |
| | | 140-320-16 | | | 71.41 | |
| | | 140-320-19 | | | 429.59 | |
| 18 | Pecoff | 141-210-04 | | | | 74.37 |
| | | 141-210-05 | | 30 | | |
| | | 141-030-14 | | 45 | | |
| 19 | Hogan | 141-030-28 | | 20 | | |
| 20 | Dedes | 141-160-47 | | 15 | | |
| 21 | Haddad | 141-030-35 | | | 63.58 | |
| 22 | Gaillard | 140-070-29 | | | | 40 |
| 23 | Oso | 140-070-29 | | | | 78.34 |
| 24 | Antel | 140-070-03 | | | | 19.12 |
| | | 140-070-10 | | | | 9.62 |
| | | 140-070-24 | | | | 19.24 |
| | **ACREAGE TOTALS** | | **2,339.29** | **668.08** | **931.26** | |
| | **ACREAGE TOTALS, less 10%** | | **2,105.36** | **601.27** | **838.13** | **1,371.81** |
| | | | **@ 6 AF/Yr** | **@ 4 AF/Yr** | **@ 2 AF/Yr every 3 years** | |
| | **WATER USAGE TOTALS** | | **12,632.17** | **2,405.09** | **553.17** | |
| | **TOTAL IRRIGATED LAND** | | **3,544.77** | **Acres** | | |
| | **TOTAL WATER USAGE** | | **15,590.42** | **Acre Feet per Year** | | |

Appendix G

**Mark C. Jorgensen**
**Box 7**
**Borrego Springs, CA 92004**
**767-5311 W 767-3662 H**

**January 13, 1998**

**Jack Laughlin**
**Box 626**
**Borrego Springs, CA 92004**

Jack:

As part of your consensus gathering effort among those concerned with water resources in Borrego Valley, you and I met in late summer of 1997. We discussed possible future impacts of water overdraft on natural resources of the state park. I told you I would put together some thoughts on what I feel may occur to various natural features surrounding Borrego Valley if the current trend of overdraft continues.

I will give you my ideas in the form of general "scoping" concepts which need to be addressed in any plan which will be formulated to safeguard the water resources of the Borrego Valley. Four categories will be addressed in my comments:

1) surface and subsurface water resources
2) native plant communities
3) native resident and migratory wildlife
4) human needs for water

## Water Resources

The obvious resource is the water table(s) within and adjacent to the Borrego Valley. As the water levels have dropped over the last 35 years I've been watching it, there has been a noticeable die-off of mesquite trees throughout the east and southeast margins of the valley. Apparently the water table has dropped faster than the mesquite can put its roots down--even though the mesquite is documented to have the deepest roots of any tree in the world, reported at about 150 feet.

My opinion is that studies need to consider what impacts falling water levels will have on the following water sources: Coyote Creek in Lower Willows, Palm Creek in Lower Borrego Palm Canyon, Tubb Canyon Spring and Middle Spring in Tubb Canyon, and if water is drawn from the San Felipe Corridor consideration needs to be given to San Felipe Creek in Sentenac Canyon, and Angelina Spring in Grapevine Canyon.

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**Coyote Creek**

Coyote Creek has been recorded by USGS and DWR as the number one water source delivering water to the Borrego Valley Aquifer. If massive quantities of water continue to be drafted from the north end of Borrego Valley, one would expect the average terminus of the surface waters of Coyote Creek to retreat up-canyon toward Lower Willows. In my days of observation, the surface flow of Coyote Creek has always been down-canyon from the present USGS gauging station at what we call the Second Crossing. I have never seen Coyote Creek dry at this point. If overdraft continues I would expect surface flow to retreat further up-canyon in drought years and every summer season. If and when this occurs there will be grave consequences to the native riparian plant community and associated wildlife which is directly tied to the riparian habitat. The Lower Willows area has been designated as a Significant Natural Area under the California Department of Fish & Game's Natural Diversity Data Base program.

The plant and animal impacts expected to occur will be discussed in the sections of this letter dealing with those specific subjects.

**Borrego Palm Canyon**

According to DWR, Palm Canyon is second only to Coyote Creek in significance when it comes to replenishment of the Borrego Valley Aquifer. Known for many years for its native groves of California fan palms and abundant wildlife, Palm Canyon stands to be negatively impacted by future aquifer overdraft. This area has been designated as a Significant Natural Area by the California Department of Fish & Game. As with Coyote Creek, the surface waters of Palm Creek disappear into the alluvium at various distances from the canyon mouth depending upon recent precipitation and summer temperatures. This creek has been known to flow all the way through Borrego Valley during heavy rainfall episodes, and has flowed to De Anza Country Club through several summer seasons following heavy rainfall years. The health and vigor of the First Palm Grove would be expected to suffer in the future under the continued scenario of overdraft.

**Tubb Canyon**

Two springs within Tubb Canyon are of concern to me, one in the park and one on private property. Middle Spring is on State Park property, and where it leaves the park, is piped off to the homes in lower Tubb Canyon. Evidence in Tubb Canyon below Middle Spring shows that a verdant riparian corridor, studded with scores of mature cottonwood trees was destroyed when the water was usurped by the private landowner in the early 1960's. It is conceivable that continued serious impacts to the Tubb Canyon resources will result from valley water overdraft. Middle Spring is one of the most important watering sources for the Peninsular bighorn sheep remaining in the United States.

The lowest spring in Tubb Canyon, known as Tubb Canyon Spring, is on or very near the valley floor. This spring will be very interesting to watch over the next few years as the water table in the valley continues its decline. Tubb Canyon also caries the Significant Natural Area designation of CDF&G.

**Sentenac Canyon, Grapevine Canyon, and Clark Valley**

According to the USGS reports of the mid-1980's, the San Felipe Creek drainage is in an aquifer separate from that of Borrego Valley. This apparently has caused some to look to this aquifer for future water resources. Should water be drawn from San Felipe Creek, one would expect impacts to occur upstream in Sentenac Canyon and the adjacent areas of Grapevine Canyon. Sentenac is an extremely important nesting habitat for the least Bell's vireo which will be described later in this letter. Similarly, if drafting of water takes place in Clark Valley, it could be expected to rapidly effect the water table there. The mesquite bosque and dune complexes on the margin of the playa would be adversely affected if significant amounts of water were removed from the local aquifer.

## Native Plant Communities

Several plant communities are or will be negatively impacted by overdraft of the Borrego Valley, San Felipe Creek, and Clark Valley aquifers. Those communities include mesquite bosque; California fan palm; smoke tree/desert willow/ironwood; and cottonwood/willow woodland. The mesquite bosque, fan palm oasis, and desert riparian communities have been designated as Sensitive Habitats by the Department of Fish & Game and several specific sites in Anza-Borrego have been designated as Significant Natural Areas. These designations show the significance of our desert region in the context of conservation in the State of California.

**Mesquite Bosque**

The most widespread plant community effected by aquifer overdraft is the mesquite bosque community. The decline of this plant system has been apparent for several years, especially in the lowest elevation portions of the valley, such as the Borrego Sink, and eastern Borrego Valley south and east of the Borrego Airport. As mentioned, this species has the deepest roots known in the plant world, yet still cannot keep pace with the decline of the water table. Mesquite are well known for stabilizing sandy soils, for creating dune complexes, for creating and recycling nitrogen into the soil, and for providing excellent wildlife habitat for birds, insects, and mammals.

The loss of this species from the valley floor will lead to increased soil loss, soil desiccation, increased surface temperatures, nutrient loss, and a decrease in overall biodiversity.

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**California Fan Palm**

This rich oasis species would be vulnerable if the flow of Borrego Palm Canyon were altered. In an average low rainfall summer season, the flow of surface water in Palm Canyon is reduced up-canyon to the First Grove. There is always water available to the palms and to bighorn sheep in the First Grove. Should this supply of water be decreased even by a small amount, the consequences to the palms could be significant.

Currently an infestation of exotic African fountain grass and tamarisk trees is being addressed by the park's riparian restoration team. Should the water availability in Palm Canyon be stressed, these two exotic species could gain a stronger foothold.

**Smoke Tree/Desert Willow/Ironwood**

This woodland community is found in Coyote Canyon and San Felipe Creek. It is my opinion that even slight alterations in the average amount of subsurface water could bring about great changes in this plant system. Root zones, channel stabilization, nutrient cycling, seed dispersal strategies, and associated wildlife communities have evolved for thousands of years. Abrupt changes in water availability could have profound effects.

**Cottonwood/Willow**

Several areas hold representatives of this community; Sentenac Canyon, Lower Willows, Tubb Canyon and Grapevine Canyon. Both of these species are extremely sensitive to changes in the water table. Cottonwoods have been known to die in a matter of a couple of months when starved for water, and willows may die in a couple of weeks when deprived of moisture.

The willow growth is known to be vital for the nesting success of many migratory song birds such as the least Bell's vireo and Southwest willow flycatcher, both Federally listed species.

## Native Resident and Migratory Wildlife

**Peninsular Bighorn Sheep**

This animal is found from the San Jacinto Mountains, along the Peninsular Range into Baja California. Within the U.S. this subspecies is Federally Proposed as an Endangered Population. In less than twenty years the population estimate for this species has declined from about 1,200 to 280 within the United States. The park estimate is about 200 animals.

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Water is a critical resource for the desert bighorn. This animal's habitat has already been so severely reduced by human encroachment, that it cannot afford any further reduction in water availability or habitat. Bighorn venture away from water sources between November and April, but during warm periods will usually be within a mile or two of reliable water.

It is essential to the future well-being of the Peninsular bighorn that all water sources currently available to them are maintained or improved. Palm Canyon, Coyote Canyon, and Tubb Canyon are considered critical habitat. Listing of this bighorn population is pending approval by Secretary of the Interior, Bruce Babbitt.

**Least Bell's Vireo**

This Federally and State listed Endangered Species is closely tied to healthy riparian habitat. Usually this species nests in emergent willows, often among stands of cottonwood, mesquite, and mule fat. Nests are often located hanging over water or very close to water, usually at a height of less than four feet off the ground. Vireos and other migratory songbirds are subject to nest parasitism by the non-native brown-headed cowbird. Since about 1985 the park has sponsored a program of cowbird removal throughout critical nest sites in the north and central portions of the state park. When vireo research began in the in the mid-1980's there were less than thirty nesting territories documented. In 1996 there were over 90 territories in the Borrego Desert.

In the statewide range of the least Bell's vireo, it is thought that about 95% of its original riparian habitat has been destroyed by development, agriculture, grazing, and overdrafting of local aquifers. Any reduction in available surface flows in the local drainages described here would directly impact the riparian growth available for nesting, foraging, and cover necessary for least Bell's vireo and many other species of songbirds.

**Amphibians**

Since all amphibians require open water for reproductive success, the amount of surface flow in local drainages is critical. Overdrafting of local aquifers will ultimately effect the integrity of natural stream courses and surface pools. Overdraft is expected to result in an upstream migration of surface flow, thereby reducing the amount of habitat available to all species of native amphibians. Species common to the canyons around Borrego Valley are the red spotted toad, California toad, California tree frog, and the Pacific tree frog. In the 1980's, the Endangered desert slender salamander was discovered in the park on the east slope of the Santa Rosa Mountains, just four miles northeast of Clark Valley. This salamander is known from only three restricted locations in the world--all within the Santa Rosa Mountains. Each location of this salamander is comprised of only a few square yards of isolated and undisturbed riparian area. Desiccation of such an area would be disastrous to a species so dependent upon moisture for its survival. Although not yet discovered in the immediate area of Borrego Valley,

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the desert slender salamander is a good example of the fragility of this desert ecosystem and the scant knowledge of plant and animal species located here--both those previously described and those yet to be discovered.

## Human Needs for Water

It is obvious that humans will have increasing needs for water resources in the future. Residents, tourists, businesses, golf courses, and agriculture all will continue to compete for limited amounts of water. If agriculture and golf courses continue in their thirst for an increased proportion of the water budget, residents and businesses will be stressed for adequate high quality water. If residents and business people are not assured of quality water from the Borrego Valley Aquifer, the livelihood and future of this community will be in jeopardy.

It is often assumed by many in Borrego that if the supply of water from local groundwater runs out, there will surely be a supply secured elsewhere and imported to Borrego Valley. This may not be the case for several reasons. Economics will play a major role in precluding the importation of water from outside the valley. Where would future supplies come from? Are there unallocated supplies to draw from the Colorado River system? Would future water pipelines be directed along current highway right-a-ways? Would they be planned across state park lands, two-thirds of which is designated State Wilderness and the remaining one-third in State Park status? What is the future for grapefruit and lemons when weighed against a finite resource such as a town's water supply. Will more golf courses be allowed in the Borrego Valley, when each course consumes over 1 million gallons of ground water per day? Recycling of irrigation water for golf courses sounds good, but where does this water get recycled from? Where's the residential base to create a supply of water to recycle? We in Borrego Springs are at a critical juncture. Will the town, the county, and the state develop a sound management plan for ground water, or will the water table continue at its current rate of decline of 1-2 feet per year until there is no more to draw from the deep reaches of the Borrego Aquifer?

## DISCUSSION

According to what I have been able to gather from research performed in Borrego Valley by USGS, DWR, and the County of San Diego, the water table is dropping at an alarming rate throughout the aquifer. My understanding is that in the north sector of the valley where citrus production consumes large amounts of water, the water in wells is declining at about two feet per year. In non-agricultural areas of the valley the decline of water is about one foot per year. Another alarming revelation is that virtually no recovery has been recorded in these wells, even in years of abundant rainfall such as 1993. In January of 1993, 8.78 inches was received, the most ever recorded here in a single month, the equivalent of 130% of the annual average.

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It seems to me the hope or dream of recovery of this aquifer is a fallacy. All we can hope to do at this point is slow down or halt the overdraft. Nature has provided the people of Borrego Springs a beautiful place to live and work, but we are not living within our means. The water account is being severely overdrawn and the average citizen living and working here is not responsible for over 90% of this overdraft. The concept of implementing water conservation within the home or backyard will not even begin to solve Borrego's water problem. We residents could halt water use completely and not have an appreciable effect on the decline of the water table.

The decline of the Borrego Valley Aquifer will have impacts beyond the environmental effects described in this opinion paper. Not only will the decline have profound impacts on desert and riparian plant communities, but loss of these vegetative resources will result in increased soil loss throughout the valley, and large-scale loss of nutrients. Loss of ground cover will result in an increase of airborne particulate matter, resulting in more frequent widespread dust storms. Thus, not only will the quality of life decline for native plants and animals, but also for the residents and tourists of Borrego Valley.

The big challenge in the coming months and years will be to reign in the tremendous consumption of water resources by agriculture and golf courses, while finding a balance which will allow us to pursue our livelihoods within the resources nature has provided this valley. Certainly, we have no choice but to find a solution, to gain consensus, and to implement a regional water management plan.

Sincerely,

Mark

Mark C. Jorgensen
Borrego Springs

Appendix H

INFORMATION FROM GEOTECHNICAL STUDIES

Geophysical studies were conducted by Agbabian Assoc in late 1995 and early 1996.Their stated purpose was " to generate a model of depth to groundwater and basement". The area surveyed is located in the extreme north-west corner of the Borrego Springs basin and extends only a limited distance toward the south.

The electromagnetic soundings and seismic refraction surveys were conducted primarily to map depth to groundwater , while the gravity survey mapped the depth to crystalline basement/bedrock.

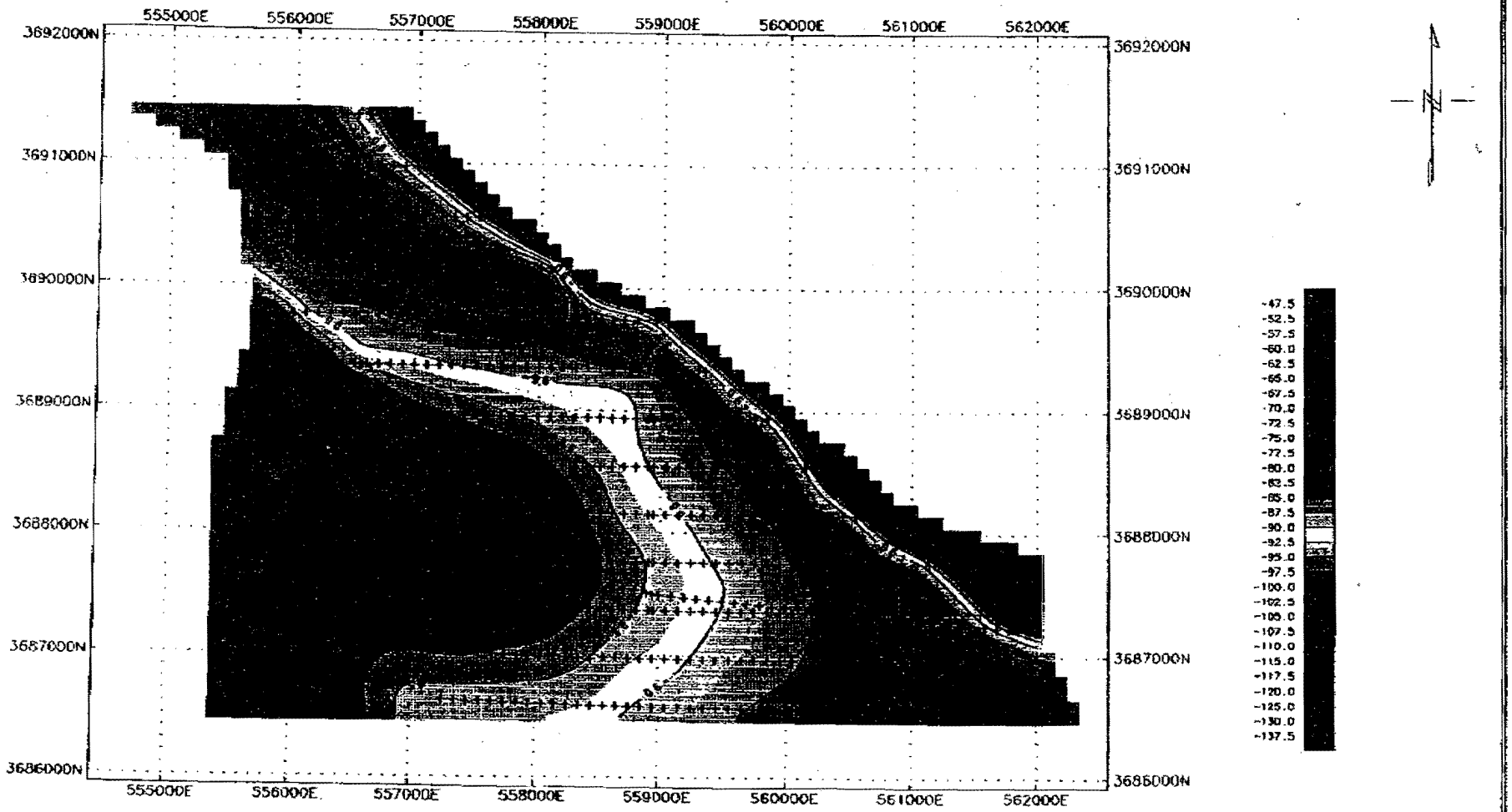
The combined Elecromagnetic and Refraction work along with the known groundwater elevations from Main station, Oasis, and a well located 1.2 km southeast of Main well() were used to generate several maps. All these wells have been monitored by the county. Fig.2 of their report is a contour map of groundwater elevation and Fig. 3 is a contour map of depth to groundwater. Copies of these two figures are not included in this report. These two maps could be helpful in predicting depth to groundwater for future wells drilled in the surveyed area.

The gravity data was used to generate a model of depth to crystalline basement. The resulting basement contour map shows two distinct basins in the surveyed area. These are separated by a bedrock ridge which trends southeast-northwest . Along the north side of the surveyed area, the two basins merge into a singular trough which parallels the Coyote Creek fault and has an apex extending up into Coyote canyon.

Figure. illustrates a cross-section of the above gravity survey which has been superimposed on a cross section of the area taken from the USGS report 82-855 , their first study of the Borrego Basin. As noted, the depth to the basement ridge located by the gravity survey isn't significantly different than that profiled in the GS report.

Significant difference is noted in the depth to basement of the two areas parelleling the ridge. Our limited data suggests an increased thickness of sediments in the two troughs of some 600-800 ft. Lack of well penetration in both basins precludes suggesting the composition of the sediments and or suggestions about quality and quantity of water contained.

A more thorough idea of the existence of the two basins and the basement ridge can most easily be gained by extended gravity surveys to the south of the currently mapped area. A A second alternative would be to program any well to be drilled in the trought area to a total depth sufficient to check the existence of the trough. Such a well , properly monitored , could provide sediment data as well as quality and quantity of water for that location.




CONTOUR INTERVAL: 5 METERS

NOTE: COORDINATES ARE IN UNIVERSAL TRANSVERSE MERCATOR GRID SYSTEM - ZONE 11, NAD 27

Scale 1:32000

500 0 500 1000 1500

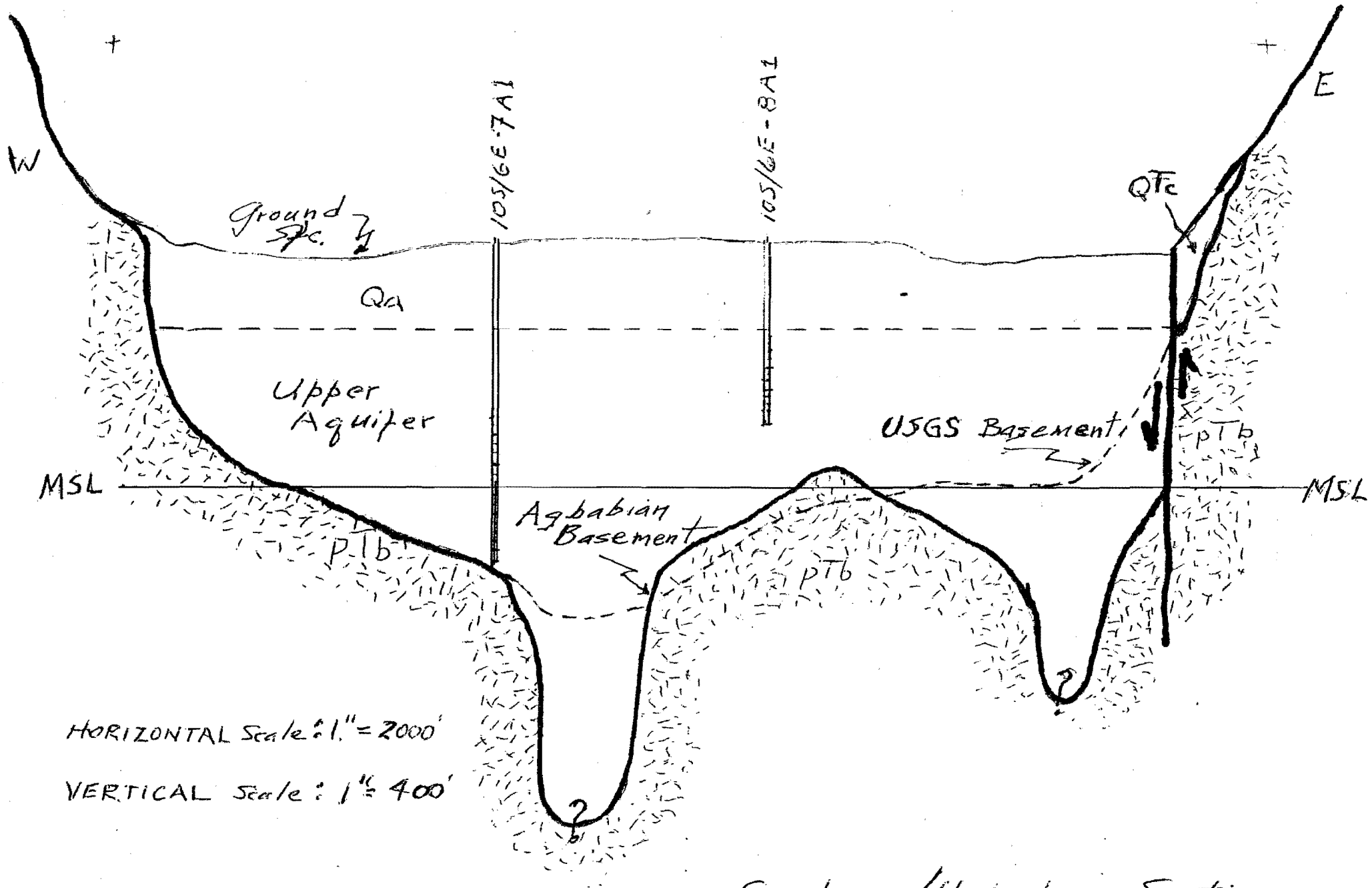
(metres)

FIGURE 3
CONTOUR MAP
GROUNDWATER DEPTH

Upper Borrego Valley
San Diego County, California

*Agbobian Associates*

#




Geologic/Hydrologic Section

Borrego Valley Basin

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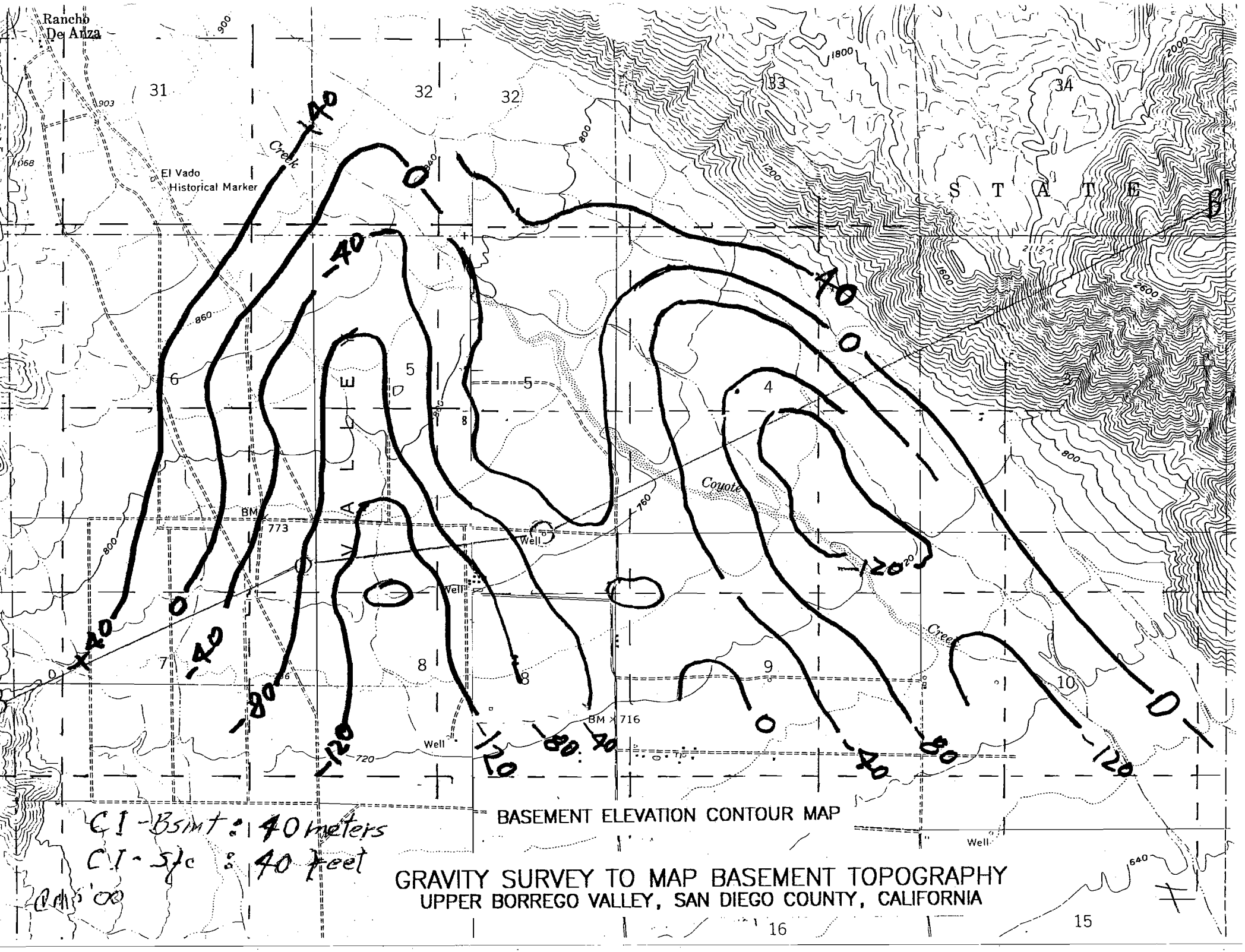
CMS-00



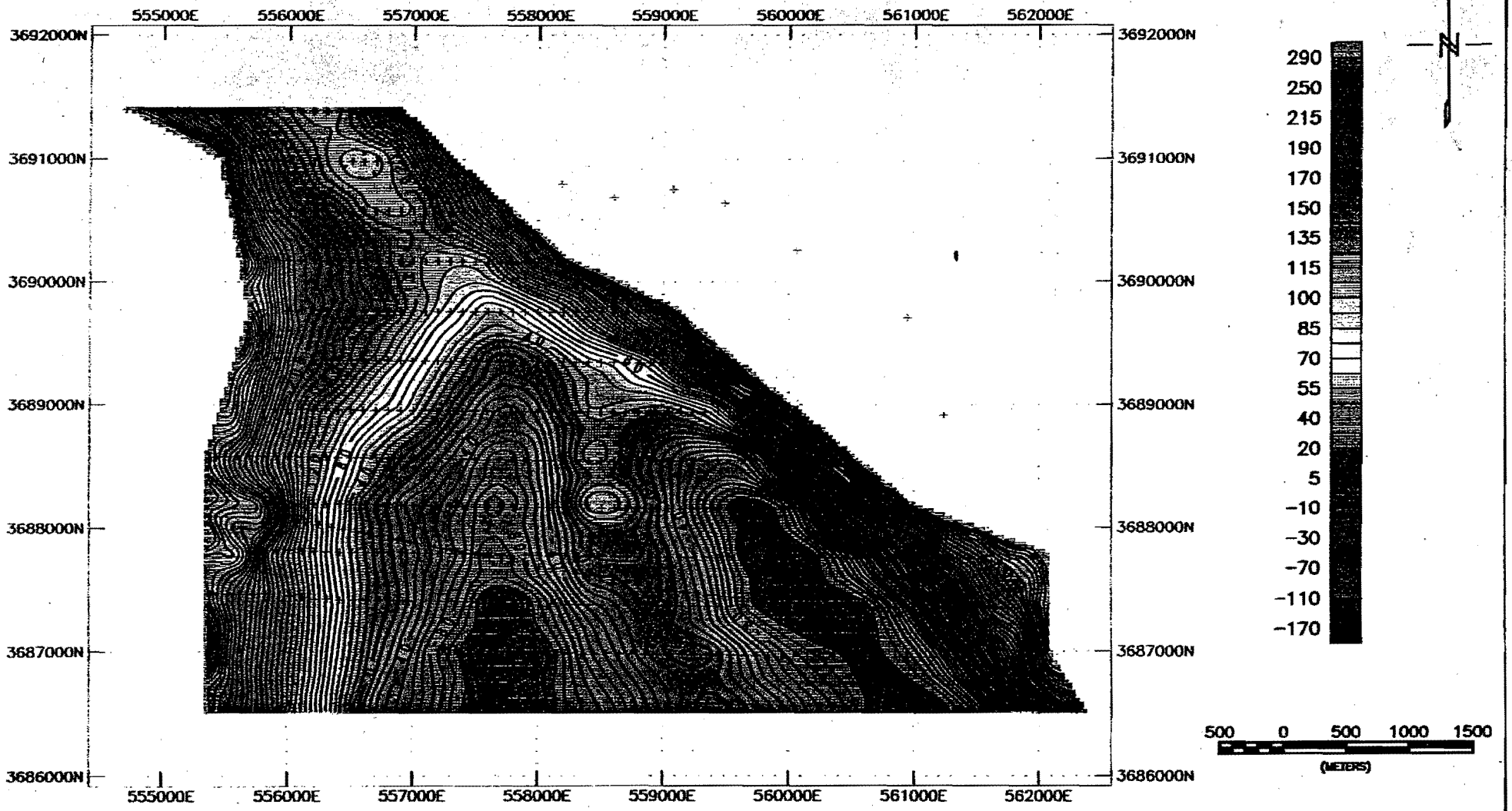

BASEMENT ELEVATION CONTOUR MAP

CI - Bsmt : 40 meters

CI - Sfc : 40 feet

GRAVITY SURVEY TO MAP BASEMENT TOPOGRAPHY
UPPER BORREGO VALLEY, SAN DIEGO COUNTY, CALIFORNIA

# BASEMENT ELEVATION CONTOUR MAP




CONTOUR INTERVAL: 10 METERS

+ GRAVITY STATION

NOTES

1) COORDINATES ARE IN UNIVERSAL TRANSVERSE MERCATOR GRID SYSTEM – ZONE 11, NAD 27
2) ELEVATIONS ARE IN METERS ABOVE MEAN SEA LEVEL

## GRAVITY SURVEY TO MAP BASEMENT TOPOGRAPHY
## UPPER BORREGO VALLEY, SAN DIEGO COUNTY, CALIFORNIA

Appendix I

# Water Quality Data

The table below lists all the drinking water contaminants that we detected from September 1998 through December 31, 1999. The presence of these contaminants in the water does not necessarily indicate that the water poses a health risk. The State requires us to monitor for certain contaminants less than once per year because the concentrations of these contaminants are not expected to vary significantly from year to year. Some of the data, though representative of the water quality, is more than one year old.

**Terms and abbreviations used below:**

- **Public Health Goal** (PHG): The level of a contaminant in drinking water below which there is no known or expected risk to health. PHG's are set by the California Environmental Protection Agency.
- **Maximum Contaminant Level Goal** (MCLG): The level of a contaminant in drinking water below which there is no known or expected risk to health. MCLG's are set by the U.S. Environmental Protection Agency.
- **Maximum Contaminant Level** (MCL): The highest level of a contaminant that is allowed in drinking water. Primary MCL's are set as close to the PHG's (or MCLG's) as is economically and technologically. Secondary MCL's are set to protect the odor, taste, and appearance of drinking water.
- **Regulatory Action Level** (AL): The concentration of a contaminant which, when exceeded, triggers treatment or other requirement that a water system must follow.
- **Primary Drinking Water Standards (PDWS):** MCL's for contaminants that affect health along with their monitoring and reporting requirements, and water treatment requirements.
- **Secondary Drinking Water Standards (SDWS):** MCL's for contaminants that affect taste, odor, or appearance of the drinking water. Contaminants with SDWS's do not affect the health at the MCL levels.
- **n/a:** not applicable; **nd:** not detectable at testing limit; **ppb:** parts per billion or micrograms per liter; **ppm:** parts per million or milligrams per liter; **pCi/l:** picocuries per liter (a measure of radiation)

**Sampling to detect the presence of Coliform Bacteria in the distribution system**

| Chemical or constituent | MCL | PHG (MCLG) | Level Detected | Range of Detections | Sample Date | Typical Source of Contaminant |
|---|---|---|---|---|---|---|
| Total Coliform Bacteria For Imported Water | 5.0% | (0) | 0 | 0 | 1999 | Naturally present n the environment |

| | MCL | PHG (MCLG) | ID1/ID3 Range | ID1/ID3 Average | ID4 Range | ID4 Average | Sample Date | Typical Source of Contaminant |
|---|---|---|---|---|---|---|---|---|
| **Inorganic Contaminants:** | | | | | | | | |
| Aluminum (ppm) | 1.0 | 0 | 0.13-0.19 | 0.17 | ND – 0.28 | 0.19 | 9/98 | Erosion of natural deposits |
| Arsenic (ppb) | 50 | 0 | ND – 2 | 0.5 | ND | ND | 9/98 | Erosion of natural deposits |
| Barium (ppm) | 1.0 | 2 | ND – 0.10 | 0.025 | ND - .42 | .08 | 9/98 | Erosion of natural deposits |
| Flouride (ppm) | 2 | 1 | .37 - .55 | .47 | .16 – 1.09 | .51 | 9/98 | Erosion of natural deposits |
| Nitrate (as NO3) (ppm) | 45 | 45 | 2.24 - 7.1 | 4.71 | 1.71 – 10.6 | 4.81 | 9/98 | Leaching from fertilizer & Leaching from septic tanks Erosion of natural deposits |
| Selenium (ppb) | 50 | 50 | ND | ND | ND – 26 | 5 | 9/98 | Erosion of natural deposits |
| **Secondary Standards and Additional Constituents Analyzed:** | | | | | | | | |
| Chloride (ppm) | 500 | 0 | 42.7 – 72.5 | 63.85 | 33 – 165.7 | 77.2 | 9/98 | |
| Iron (ppb) | 300 | 0 | ND – 210 | 87.5 | ND | ND | 9/98 | |
| Sulphate (ppm) | 500 | 0 | 67.6 – 106 | 81.1 | 28.4 – 253 | 171 | 9/98 | |
| Zinc (ppm) | 5.0 | 0 | ND | ND | ND – 0.24 | .04 | 9/98 | |
| Total Dissolved Solids (ppm) | 1000 | 0 | 268 – 411 | 344 | 312 - 604 | 499 | 9/98 | |
| Sodium (ppm) | N/A | | 71.3 – 118 | 88.4 | 52.2 – 162 | 100 | 9/98 | |
| Hardness (ppm) | N/A | | 58.0 – 640 | 212.5 | 119 – 228 | 173 | 9/98 | |

| Radionuclides: | MCL | PHG (MCLG) | Range of Detection | Sample Date | Typical Source of Contamination |
|---|---|---|---|---|---|
| Gross Alpha Activity (ID1 & 3) | 15 | 0 | .15 – 2.28 | 1999 | Erosion of natural deposits |
| Gross Alpha Activity (ID4) | 15 | 0 | .65 – 6.65 | 1999 | Erosion of natural deposits |
| Gross Beta Activity (ID1 & 3) | 50 | 0 | 3.22 – 4.82 | 1998 | Erosion of natural deposits |
| Gross Beta Activity (ID4) | 50 | 0 | 2.69 – 10.66 | 1998 | Erosion of natural deposits |

**Testing Rules for Lead and Copper** require that the District conduct laboratory tests of the concentrations of lead and copper in the water from taps inside selected homes within our service area. The most recent testing cycle was in 1998 when eleven samples were taken.

| Parameter | Units | AL | MCLG | 90th Percentile of 11 Samples ID 1/ID 3 | 90th Percentile of 11 Samples ID 4 | Action Level Sites | Typical Source of Contamination |
|---|---|---|---|---|---|---|---|
| Copper (Cu) | mg/l | 1.3 | 1.3 | .07 | .26 | 0 | Internal corrosion of household pipes |
| Lead (Pb) | ug/L | 15 | 0 | N/D | N/D | 0 | Internal corrosion of household pipes |

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# 1998 BORREGO WATER DISTRICT ANNUAL WATER QUALITY REPORT

Primary Standards - Mandatory Health-Related Standards Established by the State of California, Department of Health Services.

| PARAMETER | UNITS | STATE MCL | DLR | MCLG or (PHG) | ID 1 / ID 3 GROUNDWATER RANGE | ID 1 / ID 3 GROUNDWATER AVERAGE | ID 4 GROUNDWATER RANGE | ID 4 GROUNDWATER AVERAGE |
|---|---|---|---|---|---|---|---|---|
| **INORGANIC CHEMICALS** | | | | | | | | |
| Aluminum | mg/l | 1.0 | 0.05 | NONE | 0.13-0.19 | 0.17 | ND-0.28 | 0.19 |
| Arsenic | mg/l | 0.05 | 0.002 | NONE | ND-0.002 | 0.0005 | ND | ND |
| Barium | mg/l | 1.0 | 0.1 | 2 | ND-0.10 | .025 | ND-.42 | .08 |
| Cadmium | mg/l | 0.005 | 0.001 | 0.005 | ND | ND | ND | ND |
| Chromium | mg/l | 0.05 | 0.01 | 0.1 | ND | ND | ND | ND |
| Fluoride** | mg/l | 2.0 | 0.1 | (1) | .37-.55 | .47 | .16-1.09 | .51 |
| Lead | mg/l | .015 | 0.005 | (0.002) | ND | ND | ND | ND |
| Mercury | mg/l | 0.002 | 0.001 | 0.002 | ND | ND | ND | ND |
| Nitrate (as Nitrogen $NO_3$) | mg/l | 45 | 2 | (45) | 2.24-7.1 | 4.71 | 1.71-10.6 | 4.81 |
| Selenium | mg/l | 0.05 | 0.005 | 0.05 | ND | ND | ND-0.026 | .005 |
| Silver | mg/l | 0.1 | 0.01 | NONE | ND | ND | ND | ND |
| **RADIOACTIVITY** | | | | | | | | |
| Gross Alpha Activity | pCi/l | 15 | 1 | NONE | 0.56-3.46 | 1.95 | 2.01-6.33 | 3.81 |
| Gross Beta Activity | pCi/l | 50 | 4 | NONE | 3.22-4.82 | 3.82 | 2.69-10.66 | 6.66 |

## Secondary Standards — Aesthetic Standards Established by the State of California, Department of Health Services

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Color | Units | 15 | N/A | NONE | ND-8 | 4 | ND | ND |
| Odor-Threshold | Units | 3 | N/A | NONE | ND-17 | .4 | ND | ND |
| Chloride | mg/l | 250 | N/A | NONE | 42.7-72.5 | 63.85 | 33-165.7 | 77.2 |
| Copper | mg/l | 1.0 | N/A | NONE | ND | N/D | ND | ND |
| Foaming Agents (MBAS) | mg/l | 0.5 | N/A | NONE | ND | N/D | ND | ND |
| Iron | mg/l | 0.3 | 0.1 | NONE | ND-.0.21 | 0.0875 | ND | ND |
| Manganese | mg/l | 0.05 | 0.05 | 0.02 | ND | N/D | ND | ND |
| Sulfate | mg/l | 250 | 0.5 | NONE | 67.6-1.06 | 81.1 | 28.4-253 | 171 |
| Zinc | mg/l | 5.0 | 0.05 | NONE | ND | N/D | ND-0.24 | 0.04 |
| Total Dissolved Solids | mg/l | 1000 | N/A | NONE | 268-411 | 344 | 312-604 | 499 |

## Additional Constituents Analyzed

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| pH | Units | No Standard | | | 8.08-8.27 | 8.19 | 7.32-7.78 | 7.56 |
| Hardness (CaCO3) | mg/l | " | | | 58.0-640 | 212.50 | 119-228 | 173 |
| Sodium | mg/l | " | | | 71.3-118 | 88.4 | 52.2-162 | 100 |
| Calcium | mg/l | " | | | 16.2-24.1 | 21.4 | 40.0-73.6 | 58.6 |
| Magnesium | mg/l | " | | | ND-3.8 | 2.13 | 1.7-11.7 | 6.4 |

**Key**

| | | |
|---|---|---|
| MCL | = | Maximum Contaminant Level |
| DLR | = | Detection Limit for Reporting Purposes; set by DHS |
| MCLG | = | Maximum Contaminant Level Goal |
| PHG | = | Public Health Goal |
| Mg/l | = | milligrams per liter (parts per million) |
| PC/l | = | pico Curies per liter |
| * | = | Tested weekly and results submitted to DHS monthly |
| ** | = | Flouride Standard depends on temperature |
| ND | = | Not detected |
| N/A | = | Not applicable |

EVERY DROP IS PRECIOUS

# 1998 BORREGO WATER DISTRICT ANNUAL WATER QUALITY REPORT

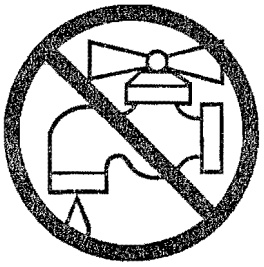
Primary Standards - Mandatory Health-Related Standards Established by the State of California, Department of Health Services.

| PARAMETER | UNITS | STATE MCL | DLR | MCLG or (PHG) | ID 1 / ID 3 GROUNDWATER | ID 4 GROUNDWATER |
|---|---|---|---|---|---|---|
| **MICROBIOLOGICAL** | | | | | | |
| **Coliform Positive Samples** | >1 | >1 | N/A | ZERO | 0 | 0 |
| **ORGANIC CHEMICALS** | | | | | | |
| **Total Trihalomethanes (TTHM's)** | mg/l | 0.100 | 0.0005 | NONE | ND | ND |
| Endrin | mg/l | 0.002 | 0.0001 | 0.002 | ND | ND |
| Lindane | mg/l | 0.0002 | 0.0002 | 0.0002 | ND | ND |
| Methoxychlor | mg/l | 0.04 | 0.01 | 0.04 | ND | ND |
| Toxaphene | mg/l | 0.003 | 0.001 | 0 | ND | ND |
| 2,4-D | mg/l | 0.07 | 0.01 | (0.07) | ND | ND |
| 2,4,5-TP Silvex | mg/l | 0.05 | 0.001 | 0.05 | ND | ND |
| Atrazine | mg/l | 0.003 | 0.001 | 0.003 | ND | ND |
| Bentazon | mg/l | 0.018 | 0.002 | NONE | ND | ND |
| Benzene | mg/l | 0.001 | 0.0005 | 0 | ND | ND |
| Carbon Tetrachloride | mg/l | 0.0005 | 0.0005 | 0 | ND | ND |
| Carbofuran | mg/l | 0.018 | 0.005 | 0.04 | ND | ND |
| Chlordane | mg/l | 0.0001 | 0.0001 | (0.00003) | ND | ND |
| 1,2-Dibromo-3-chloropropane | mg/l | 0.0002 | 0.00001 | 0 | ND | ND |
| 1,4-Dichlorobenzene | mg/l | 0.005 | 0.0005 | (0.006) | ND | ND |
| 1,1-Dichloroethane | mg/l | 0.005 | 0.0005 | NONE | ND | ND |
| 1,2-Dichloroethane | mg/l | 0.0005 | 0.0005 | 0 | ND | ND |
| cis-1,2-Dichloroethylene | mg/l | 0.006 | 0.0005 | 0.07 | ND | ND |
| trans-1,2-Dichloroethylene | mg/l | 0.01 | 0.0005 | 0.1 | ND | ND |
| 1,1-Dichloroethene | mg/l | 0.006 | 0.0005 | .007 | ND | ND |
| 1,2-Dichloropropane | mg/l | 0.005 | 0.0005 | 0 | ND | ND |
| 1,3-Dichloropropene | mg/l | 0.0005 | 0.0005 | NONE | ND | ND |
| Di(2-ethylhexyl)phthalate | mg/l | 0.004 | 0.003 | (0.012) | ND | ND |
| Ethylbenzene | mg/l | 0.7 | 0.0005 | (0.3) | ND | ND |
| Ethylene Dibromide | mg/l | 0.00002 | 0.00002 | 0 | ND | ND |
| Glyphosate | mg/l | 0.7 | 0.025 | (1) | ND | ND |
| Heptachlor | mg/l | 0.00001 | 0.00001 | 0 | ND | ND |
| Heptachlor Epoxide | mg/l | 0.00001 | 0.00001 | 0 | ND | ND |
| Molinate | mg/l | 0.02 | 0.002 | NONE | ND | ND |
| Monochlorobenzene | mg/l | 0.07 | 0.0005 | 0.1 | ND | ND |
| Simazine | mg/l | 0.004 | 0.001 | 0.004 | ND | ND |
| 1,1,2,2-Tetrachloroethane | mg/l | 0.001 | N/A | N/A | ND | ND |
| Tetrachloroethylene (PCE) | mg/l | 0.005 | 0.0005 | 0 | ND | ND |
| Thiobencarb | mg/l | 0.07 | 0.001 | NONE | ND | ND |
| 1,1,1-Trichloroethane | mg/l | 0.200 | 0.0005 | 0.200 | ND | ND |
| 1,1,2-Trichloroethane | mg/l | 0.005 | 0.0005 | 0.003 | ND | ND |
| Trichloroethylene (TCE) | mg/l | 0.005 | 0.0005 | 0 | ND | ND |
| Trichlorofluoromethane (Freon 11) | mg/l | 0.15 | 0.005 | (0.7) | ND | ND |
| 1,1,2-Trichloro-1,2,2-Trifluoroethane | mg/l | 1.2 | N/A | N/A | ND | ND |
| Vinyl Chloride (Cloroethene) | mg/l | 0.0005 | 0.0005 | 0 | ND | ND |
| Xylenes | mg/l | 1.750 | 0.0005 | (1.800) | ND | ND |

## *How to Read the Chart*

When reading the tables under Parameter, you will find the name of each dissolved mineral or compound tested. Under Units you will find "mg/l"; this is milligrams of each dissolved compound per liter of water. The Maximum Contaminant Level is the maximum level of a contaminant allowed in drinking water. DLR is the detection limit for reporting purposes as set by the Department of Health Services. MCLG or PHG is the goal set by the California Environmental Protection Agency for levels of contaminants below which there is no known risk to health. Under "Groundwater" we have listed the average results of the tests of the water from the wells which serve you. "ND" means not detected (See definitions, page 4)

One mg/l is commonly referred to a 1 part per million. If you were concerned about a particular parameter such as selenium, the Maximum Contaminant Level allowed is .05mg/l which is 5/100 of one part per million or 50 parts per billion. For comparison, a part per billion is roughly equivalent to one cent in ten million dollars or one minute in two thousand years, or one inch in sixteen thousand miles. By referring to the chart you will see that Borrego is much below the maximum concentrations allowed.



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| well number | date | alkalinity - total | alkalinity - hydroxide | alkalinity - carbonate |
|---|---|---|---|---|
| ID1-1 | 6/6/72 | 92 | 0 | 0 |
| ID1-1 | 3/17/88 | 78 | 0 | 0 |
| ID1-10 | 9/26/72 | 80 | 0 | 0 |
| ID1-10 | 3/17/88 | 87 | 0 | 0 |
| ID1-10 | 5/22/91 | 86.7 | 0 | 0 |
| ID1-10 | 12/28/94 | 99.3 | 0 | 0 |
| ID1-12 | 3/17/88 | 51 | 0 | 0 |
| ID1-12 | 5/22/91 | 56.1 | 0 | 0 |
| ID1-12 | 12/28/94 | 64.6 | 0 | 0 |
| ID1-12 | 9/8/98 | 60 | 0 | 0 |
| ID1-16 | 2/25/97 | 88 | 0 | 0 |
| ID1-2 | 7/10/72 | 110 | 0 | 0 |
| ID1-2 | 2/8/83 | 186 | 0 | 0 |
| ID1-2 | 3/17/88 | 140 | 0 | 2.4 |
| ID1-8 | 10/10/72 | 150 | 0 | 0 |
| ID1-8 | 3/17/88 | 0 | 0 | 0 |
| ID1-8 | 5/22/91 | 140 | 0 | 0 |
| ID1-8 | 12/28/94 | 140.2 | 0 | 0 |
| ID4-1 | 6/23/75 | 110 | 0 | 0 |
| ID4-10 | 6/19/89 | 229.6 | 0 | 24 |
| ID4-10 | 6/11/91 | 201.2 | 0 | 0 |
| ID4-10 | 12/28/94 | 176.4 | 0 | 0 |
| ID4-10 | 9/8/98 | 180.6 | 0 | 0 |
| ID4-11 | 5/17/95 | 139.4 | 0 | 0 |
| ID4-11 | 9/8/98 | 136.2 | 0 | 0 |
| ID4-18 | 6/18/84 | 138.2 | 0 | 0 |
| ID4-18 | 12/9/85 | 142.6 | 0 | 0 |
| ID4-18 | 6/11/91 | 150.6 | 0 | 0 |
| ID4-18 | 12/28/94 | 131.3 | 0 | 0 |
| ID4-18 | 9/8/98 | 124 | 0 | 0 |
| ID4-2 | 5/19/75 | 120 | 0 | 0 |
| ID4-2 | 3/31/80 | 98 | 0 | 0 |
| ID4-2 | 2/4/83 | 117 | 0 | 0 |
| ID4-2 | 12/9/85 | 110.6 | 0 | 0 |
| ID4-2 | 6/11/91 | 110.4 | 0 | 0 |
| ID4-2 | 12/28/94 | 111.5 | 0 | 0 |
| ID4-2 | 9/8/98 | 111 | 0 | 0 |
| ID4-3 | 5/19/75 | 58 | 0 | 0 |
| ID4-3 | 3/31/80 | 43 | 0 | 0 |
| ID4-3 | 2/4/83 | 49 | 0 | 0 |
| ID4-3 | 12/9/85 | 141.7 | 0 | 0 |
| ID4-3 | 6/11/91 | 48.9 | 0 | 0 |
| ID4-3 | 12/28/94 | 50.5 | 0 | 0 |
| ID4-3 | 9/8/98 | 46.2 | 0 | 0 |
| ID4-4 | 5/19/75 | 121 | 0 | 0 |
| ID4-4 | 7/17/79 | 70 | 0 | 0 |
| ID4-4 | 9/26/79 | 80 | 0 | 0 |

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| alkalinity - bicarbonate | calcium | chloride | conductance, specific | copper | hardness | iron |
|---|---|---|---|---|---|---|
| 112 | 10 | 100 | 900 | 0 | 50 | 0.84 |
| 95.2 | 54.4 | 170 | 1316 | 0.059 | 178 | 0.022 |
| 98 | 24 | 52 | 530 | 0 | 65 | 0.48 |
| 106.1 | 19 | 49.5 | 491 | 0.24 | 57 | 0.05 |
| 105.7 | 0 | 36.9 | 456 | 0 | 0 | 0 |
| 121.1 | 13.1 | 37 | 435 | 0 | 38.5 | 0 |
| 62.2 | 17.8 | 41.5 | 477 | 0.275 | 51 | 0.065 |
| 68.4 | 32.3 | 40.3 | 467 | 0 | 81 | 0 |
| 78.9 | 21.7 | 40 | 470 | 0 | 67 | 0 |
| 73.2 | 21.8 | 42.7 | 498 | 0 | 640 | 0 |
| 110 | 20 | 66 | 570 | 0 | 64 | 0 |
| 134 | 8 | 80 | 575 | 0 | 44 | 2.1 |
| 227 | 0 | 38 | 630 | 0.01 | 0 | 0.33 |
| 165.9 | 1.5 | 59 | 573 | 0.207 | 3.8 | 0.022 |
| 183 | 6 | 52 | 550 | 0 | 15 | 0.09 |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 170.8 | 57 | 53.4 | 557 | 0 | 14 | 0 |
| 171 | 16.4 | 78.1 | 670 | 0 | 75 | 0.1 |
| 134 | 68 | 69 | 770 | 0 | 215 | 0.1 |
| 231.3 | 85.2 | 162 | 1063 | 0 | 275 | 0 |
| 245.5 | 80 | 155.4 | 947 | 0 | 257 | 0.19 |
| 215.2 | 63.9 | 154.1 | 945 | 0 | 210 | 0 |
| 220.3 | 72 | 165.7 | 943 | 0 | 228 | 0 |
| 170 | 69 | 41.2 | 624 | 0 | 218 | 0.11 |
| 166.2 | 63.2 | 44.3 | 623 | 0 | 191 | 0 |
| 168.6 | 81.7 | 54 | 898 | 0 | 236.7 | 0.41 |
| 173.9 | 72 | 58.2 | 869 | 0.03 | 204.8 | 0 |
| 183.7 | 83.7 | 59.1 | 970 | 0 | 262 | 0 |
| 160.2 | 67.3 | 56 | 968 | 0 | 211 | 0 |
| 151.3 | 73.6 | 61.7 | 952 | 0 | 220 | 0 |
| 146 | 32 | 108 | 770 | 0 | 98 | 0.02 |
| 120 | 34 | 99 | 760 | 0 | 120 | 0.04 |
| 143 | 38 | 105 | 800 | 0 | 109 | 0 |
| 134.9 | 39.2 | 102 | 752 | 0 | 116 | 0 |
| 134.7 | | 98.8 | 781 | | 122 | |
| 136 | 38.4 | 94.6 | 811 | 0 | 112 | 0 |
| 135.4 | 40 | 95.9 | 818 | 0 | 119 | 0 |
| 70 | 42 | 64 | 980 | 0 | 117 | 0.04 |
| 53 | 40 | 68 | 1000 | 0 | 105 | 0.08 |
| 58 | 48 | 60 | 1050 | 0 | 133 | 0 |
| 172.9 | 73.1 | 59.4 | 868 | 0 | 220.4 | 0 |
| 59.7 | 62.6 | 62.6 | 1090 | 0 | 162 | 0 |
| 61.7 | 77.9 | 66.5 | 1205 | 0 | 210 | 0 |
| 56.4 | 61.2 | 62.8 | 1090 | 0 | 160 | 0 |
| 148 | 83 | 60 | 790 | 0 | 263 | 0 |
| 85 | 40 | 47 | 550 | 0 | 120 | 0.08 |
| 98 | 41 | 22 | 520 | 0 | 140 | 0 |

I

| magnesium | manganese | ph | sodium | solids, dissolved | sulfate | sulfonated detergent - MBAS |
|---|---|---|---|---|---|---|
| 6.1 | 0 | 8.3 | 186 | 560 | 197 | 0 |
| 10 | 0.001 | 8.04 | 208 | 724 | 311 | 0.02 |
| 1.2 | 0 | 8.3 | 90 | 352 | 105 | 0 |
| 2.6 | 0.001 | 7.72 | 77 | 252 | 73 | 0.01 |
| 0 | 0 | 7.77 | 74.9 | 274 | 63 | 0 |
| 1.3 | 0 | 7.74 | 75.5 | 260 | 50.7 | 0 |
| 1.7 | 0.001 | 7.23 | 73 | 242 | 104 | 0.03 |
| 0 | 0 | 8.3 | 69.5 | 292 | 105 | 0 |
| 1.8 | 0 | 7.96 | 64.9 | 290 | 101 | 0 |
| 1.8 | 0 | 8.22 | 71.3 | 268 | 106 | 0 |
| 3 | 0 | 8.1 | 87 | 330 | 66 | 0 |
| 5.8 | 0 | 8 | 106 | 400 | 60 | 0 |
| 0 | 0 | 7.86 | 0 | 496 | 39 | 0 |
| 0 | 0.003 | 8.54 | 132 | 290 | 51 | 0.02 |
| 0 | 0 | 8.3 | 115 | 364 | 49 | 0 |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 8.46 | 110 | 328 | 47 | 0 |
| 1.9 | 0 | 7.78 | 115 | 400 | 81.4 | 0 |
| 11 | 0 | 8.09 | 77 | 484 | 125 | 0 |
| 15.1 | 0 | 8.19 | 118.1 | 629 | 66 | 0 |
| 14.18 | 0 | 7.74 | 96.9 | 529 | 17 | 0 |
| 12.2 | 0 | 7.6 | 119 | 528 | 26 | 0 |
| 11.7 | 0 | 7.32 | 97.6 | 516 | 28.4 | 0 |
| 11.1 | 0 | 8.45 | 57.3 | 396 | 125 | 0 |
| 8 | 0 | 7.55 | 52.2 | 387 | 114 | 0 |
| 11 | 0.08 | 7.04 | 98 | 594 | 237 | 0 |
| 15 | 0 | 7.96 | 110 | 562 | 246 | 0.05 |
| 12.55 | 0 | 7.61 | 104.7 | 617 | 253 | 0 |
| 10.2 | 0 | 7.37 | 114 | 617 | 254 | 0 |
| 8.8 | 0 | 7.43 | 110 | 604 | 253 | 0 |
| 4.4 | 0 | 7.89 | 126 | 460 | 86 | 0 |
| 8.5 | 0 | 7.3 | 120 | 460 | 114 | 0.02 |
| 3.2 | 0 | 7.56 | 130 | 454 | 124 | 0.01 |
| 5.7 | 0 | 7.9 | 0 | 428 | 110 | 0.03 |
| 5.52 | | 7.48 | 112 | 453 | 82 | |
| 3.9 | 0 | 7.62 | 126 | 474 | 119 | 0 |
| 4.4 | 0 | 7.6 | 116 | 476 | 133 | 0 |
| 3.6 | 0 | 8.21 | 166 | 640 | 321 | 0 |
| 1.2 | 0 | 7.22 | 182 | 650 | 360 | 0.05 |
| 2.9 | 0 | 7.16 | 163 | 622 | 366 | 0 |
| 15 | 0 | 8.02 | 108 | 572 | 248 | 0.02 |
| 1.21 | 0 | 7.32 | 155.9 | 684 | 368 | 0 |
| 0 | 0 | 7.2 | 181 | 808 | 433 | 0 |
| 1.7 | 0 | 7.78 | 162 | 701 | 379 | 0 |
| 13 | 0 | 7.76 | 59 | 508 | 127 | 0 |
| 4.9 | 0.05 | 8.14 | 62 | 244 | 99 | 0 |
| 9 | 0 | 7.84 | 57 | 360 | 129 | 0 |

I

| zinc | color, visual | odor | turbity | arsenic | barium | cadmium | chromium, total | fluoride | lead |
|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.8 | 0 |
| 0.019 | 0 | 0 | 0 | 0.005 | 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.78 | 0 |
| 0.008 | 0 | 0 | 0 | 0.01 | 0 | 0 | 0.002 | 0.57 | 0 |
| 0 | 0 | 0 | 0.27 | 0 | 0 | 0 | 0 | 0.54 | 0.006 |
| 0 | 0 | 0 | 0.32 | 0.002 | 0 | 0 | 0 | 0.46 | 0 |
| 0.012 | 0 | 0 | 0 | 0.007 | 0 | 0 | 0 | 0.45 | 0 |
| 0 | 0 | 0 | 0.14 | 0 | 0 | 0 | 0 | 0.5 | 0 |
| 0 | 0 | 0 | 0.27 | 0.003 | 0 | 0 | 0 | 0.47 | 0 |
| 0 | 0 | 0 | 0.24 | 0.002 | 0 | 0 | 0 | 0.37 | 0 |
| 0 | 0 | 0 | 0.13 | 0.002 | 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| 0.01 | 0 | 0 | 0 | 0.002 | 0 | 0 | 0 | 0.51 | 0 |
| 0.019 | 0 | 0 | 0 | 0.004 | 0 | 0 | 0 | 0.61 | 0 |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1.1 | 0 |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 | 0.011 | 0 | 0 | 0 | 1.05 | 0 |
| 0 | 3 | 0 | 0.52 | 0.0005 | 0.11 | 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.72 | 0 |
| 0 | 0 | 0 | 0 | 0.01 | 0.26 | 0 | 0 | 0.59 | 0.007 |
| 0 | 3 | 0 | 0.24 | 0 | 0 | 0 | 0 | 0.35 | 0 |
| 0 | 0 | 0 | 0.06 | 0 | 0.46 | 0 | 0 | 0.4 | 0 |
| 0 | 0 | 0 | 0 | 0 | 0.42 | 0 | 0 | 0.38 | 0 |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.29 | 0 |
| 0 | 0 | 0 | 0.21 | 0 | 0 | 0 | 0 | 0.2 | 0 |
| 0 | 0 | 0 | 0 | 0.005 | 0 | 0 | 0 | 1.2 | 0 |
| 0 | 2 | 0 | 0.06 | 0 | 0 | 0 | 0 | 1.1 | 0 |
| 0 | 3 | 0 | 0.25 | 0 | 0 | 0 | 0 | 0.68 | 0 |
| 0 | 0 | 0 | 0.2 | 0 | 0 | 0 | 0 | 1.03 | 0 |
| 0 | 0 | 0 | 0.12 | 0 | 0 | 0 | 0 | 0.85 | 0 |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.85 | 0 |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1.4 | 0 |
| 0.01 | 0 | 0 | 0 | 0.002 | 0 | 0 | 0 | 1.3 | 0 |
| 0 | 2 | 0 | 0.03 | 0.003 | 0 | 0 | 1.27 | 0 | 0 |
| | | | 0.13 | | 0.12 | 0 | 0 | 1.16 | 0 |
| 0 | 0 | 0 | 0.93 | 0.003 | 0 | 0 | 0 | 1.21 | 0 |
| 0 | 0 | 0 | 0 | 0 | 0.1 | 0 | 0 | 1.09 | 0 |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.55 | 0 |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.82 | 0 |
| 0.01 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.7 | 0 |
| 0 | 1 | 0 | 0.06 | 0 | 0 | 0 | 0 | 1.1 | 0 |
| 0 | 0 | 0 | 0.12 | 0 | 0 | 0 | 0 | 0.42 | 0 |
| 0 | 0 | 0 | 0.26 | 0 | 0 | 0 | 0 | 0.63 | 0 |
| 0.24 | 0 | 0 | 0.11 | 0 | 0 | 0 | 0 | 0.38 | 0 |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.47 | 0 |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.11 | 0 |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.18 | 0 |

I

| mercury | nitrogen, nitrate | selenium | silver | aluminum | radioactivity, alpha | radioactivity, beta |
|---|---|---|---|---|---|---|
| 0 | 0.5 | 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0 | 0.42 | 0 | 0 | 0 | 0 | 0 |
| 0 | 1.3 | 0 | 0 | 0 | 0.5 | 2.7 |
| 0 | 1.47 | 0 | 0 | 0.06 | 0 | 0 |
| 0 | 7.14 | 0 | 0 | 0.09 | 0 | 0 |
| 0 | 0.44 | 0 | 0 | 0 | 0.9 | 2.9 |
| 0 | 0.42 | 0 | 0 | 0 | 0 | 4.27 |
| 0 | 2.21 | 0 | 0 | 0.06 | 0 | 0 |
| 0 | 2.24 | 0 | 0 | 0.13 | 0.56 | 3.22 |
| 0 | 4 | 0 | 0 | 0 | 0 | 0 |
| 0 | 1.5 | 0 | 0 | 0 | 0 | 0 |
| 0 | 4.7 | 0 | 0 | 0 | 0 | 0 |
| 0 | 4.2 | 0 | 0 | 0 | 0.6 | 1.4 |
| 0 | 0.89 | 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0 | 1.29 | 0 | 0 | 0 | 0.53 | 0 |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0 | 39 | 0 | 0 | 0 | 0 | 0 |
| 0 | 1.7 | 0 | 0 | 0 | 0 | 0 |
| 0 | 1.49 | 0 | 0 | 0 | 0 | 0 |
| 0 | 10.7 | 0 | 0 | 0.07 | 0 | 0 |
| 0 | 10.6 | 0 | 0 | 0.26 | 2.08 | 6.34 |
| 0 | 0.96 | 0 | 0 | 0.11 | 0 | 0 |
| 0 | 1.71 | 0 | 0 | 0.24 | 7.91 | 4.19 |
| 0 | 0.12 | 0 | 0 | 0 | 0 | 0 |
| 0 | 0.34 | 0 | 0 | 0 | 0 | 0 |
| 0 | 0.18 | 0.007 | 0 | 0 | 0 | 0 |
| 0 | 1.46 | 0 | 0 | 0.08 | 0 | 0 |
| 0 | 2.23 | 0.005 | 0 | 0.28 | 6.33 | 9.93 |
| 0 | 6.3 | 0 | 0 | 0 | 0 | 0 |
| 0.0005 | 4.3 | 0 | 0 | 0 | 0 | 0 |
| 0.001 | 5.8 | 0 | 0 | 0 | 0 | 0 |
| 0 | 1.6 | 0 | 0 | 0 | 0 | 0 |
| 0 | 1.32 | 0.005 | 0 | 0 | 0 | 0 |
| 0 | 5.61 | 0 | 0 | 0.06 | 0 | 0 |
| 0 | 5.1 | 0 | 0 | 0.17 | 3.16 | 2.69 |
| 0 | 1.8 | 0 | 0 | 0 | 0 | 0 |
| 0.0005 | 0.66 | 0 | 0 | 0 | 0 | 0 |
| 0 | 2 | 0 | 0 | 0 | 0 | 0 |
| 0 | 0.36 | 0 | 0 | 0 | 0 | 0 |
| 0 | 0.85 | 0.016 | 0 | 0 | 0 | 0 |
| 0 | 10.1 | 0.011 | 0 | 0.11 | 0 | 0 |
| 0 | 5.22 | 0.26 | 0 | 0 | 2.01 | 10.66 |
| 0 | 2.2 | 0 | 0 | 0 | 0 | 0 |
| 0 | 3 | 0 | 0 | 0 | 0 | 0 |
| 0 | 3.5 | 0 | 0 | 0 | 0 | 0 |

I

| well number | date | alkalinity - total | alkalinity - hydroxide | alkalinity - carbonate |
|---|---|---|---|---|
| ID4-4 | 3/31/80 | 67 | 0 | 0 |
| ID4-4 | 2/4/83 | 95 | 0 | 0 |
| ID4-4 | 12/9/85 | 77.76 | 0 | 0 |
| ID4-4 | 6/11/91 | 83.1 | 0 | 0 |
| ID4-4 | 12/28/94 | 269.3 | 0 | 0 |
| ID4-4 | 9/8/98 | 95.6 | 0 | 0 |
| ID4-5 | 6/11/91 | 41.1 | 0 | 0 |
| ID4-5 | 12/28/94 | 271.6 | 0 | 0 |
| ID4-7 | 3/12/80 | 157 | 0 | 0 |
| ID4-7 | 2/4/83 | 143 | 0 | 0 |
| ID4-8 | 12/10/54 | 0 | 0 | 0 |
| ID4-8 | 2/4/83 | 115 | 0 | 0 |
| LA CASA | 3/19/84 | 139.2 | 0 | 0 |
| LA CASA | 5/22/91 | 111.6 | 0 | 0 |
| RB-1 | 3/20/84 | 117.8 | 0 | 0 |
| RB-CTNWD | 3/19/84 | 99.6 | 0 | 0 |
| TRIANGLE | 10/29/80 | 140 | 0 | 0 |
| TRIANGLE | 4/4/81 | 36 | 0 | 0 |
| TRIANGLE | 5/22/91 | 107.6 | 0 | 0 |

I

| alkalinity - bicarbonate | calcium | chloride | conductance, specific | copper | hardness | iron |
|---|---|---|---|---|---|---|
| 82 | 32 | 33 | 500 | 0 | 86 | 0.06 |
| 116 | 43 | 33 | 560 | 0 | 130 | 0 |
| 94.87 | 39.2 | 34.84 | 512 | 0 | 114 | 0 |
| 101.3 | 39.8 | 31.8 | 537 | 0 | 120 | 0 |
| 328.5 | 36.7 | 31.6 | 553 | 0 | 100 | 0 |
| 116.6 | 41.6 | 33 | 541 | 0 | 120 | 0 |
| 50.1 | 30 | 49.8 | 126 | 0 | 83 | 0.88 |
| 331.4 | 41.7 | 59.7 | 719 | 0.1 | 105 | 1.8 |
| 192 | 94 | 84 | 1150 | 0 | 306 | 0.05 |
| 174 | 60 | 71 | 1130 | 0 | 297 | 0.26 |
| 107 | 176 | 117 | 1664 | 0 | 592 | 0.1 |
| 141 | 13 | 63 | 260 | 0 | 42 | 0.01 |
| 169.9 | 77.5 | 189.1 | 1092 | 0 | 210 | 0.03 |
| 136.2 | 60.8 | 102.4 | 694 | 0 | 86 | 0.32 |
| 143.7 | 63.9 | 163.5 | 1070 | 0.02 | 194.8 | 0.39 |
| 121.5 | 40.8 | 85.2 | 655 | 0 | 131.9 | 0 |
| 0 | 98 | 284 | 1351 | 0 | 318 | 0.5 |
| 36 | 74 | 362 | 1400 | 0 | 234 | 0 |
| 131.3 | 32.3 | 101 | 673 | 0 | 89 | 1.24 |

I

| magnesium | manganese | ph | sodium | solids, dissolved | sulfate | sulfonated detergent - MBAS |
|---|---|---|---|---|---|---|
| 1.7 | 0 | 7.68 | 0 | 322 | 127 | 0.04 |
| 5.6 | 0 | 7.46 | 62 | 310 | 147 | 0 |
| 5 | 0 | 7.82 | 69 | 326 | 132 | 0.03 |
| 4.82 | 0 | 7.97 | 63 | 317 | 102 | 0 |
| 3.1 | 0 | 7.8 | 67.1 | 348 | 122 | 0 |
| 3.9 | 0 | 7.73 | 62.4 | 312 | 120 | 0 |
| 1.83 | 0 | 8.1 | 111.9 | 435 | 204 | 0 |
| 0 | 0 | 7.46 | 85.5 | 440 | 150 | 0 |
| 17 | 0.02 | 7.42 | 118 | 704 | 297 | 0.01 |
| 36 | 0.02 | 7.39 | 103 | 780 | 302 | 0 |
| 37 | 0 | 7.2 | 130 | 592 | 564 | 0 |
| 2.2 | 0 | 7.63 | 95 | 260 | 59 | 0 |
| 9.5 | 0 | 7.12 | 128 | 572 | 84 | 0.01 |
| 2.19 | 0.02 | 7.92 | 102.4 | 510 | 67 | 0 |
| 9 | 0 | 7 | 135 | 580 | 96 | 0.01 |
| 4.4 | 0 | 7.12 | 80 | 340 | 51 | 0.01 |
| 16 | 0.1 | 7.3 | 156 | 861 | 130 | 0 |
| 12 | 0.55 | 6.6 | 148 | 826 | 100 | 0 |
| 1.83 | 0.05 | 7.81 | 95 | 368 | 61 | 0 |

I

| zinc | color, visual | odor | turbity | arsenic | barium | cadmium | chromium, total | fluoride | lead |
|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.94 | 0 |
| 0 | 0 | 0 | 0 | 0.002 | 0 | 0 | 0 | 0.29 | 0 |
| 0 | 2 | 0 | 0.04 | 0.005 | 0 | 0 | 0 | 0.41 | 0 |
| 0 | 0 | 0 | 0.06 | 0 | 0 | 0 | 0 | 0.18 | 0 |
| 0 | 0 | 0 | 0.002 | 0 | 0 | 0 | 0 | 0.33 | 0 |
| | 0 | 0 | 0.31 | 0 | 0 | 0 | 0 | 0.16 | 0 |
| 0 | 0 | 0 | 0.8 | 0.014 | 0 | 0 | 0 | 0.48 | 0 |
| 0 | 0 | 0 | 0 | 0.002 | 0 | 0 | 0 | 0.65 | 0.011 |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1.1 | 0 |
| 0.01 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1.1 | 0 |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 | 0.01 | 0 | 0 | 0 | 0.73 | 0 |
| 0.02 | 3 | 0 | 0.28 | 0 | 0 | 0 | 0 | 0.48 | 0 |
| 0 | 3 | 0 | 0 | 0 | 0.11 | 0 | 0.01 | 0.45 | 0 |
| 0.02 | 5 | 0 | 6.2 | 0 | 0 | 0 | 0 | 0.51 | |
| 0 | 2 | 0 | 0.15 | 0 | 0 | 0 | 0 | 0.54 | 0 |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.18 | 0 |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0 | 8 | 0 | 0.72 | 0 | 0.11 | 0 | 0.01 | 0.54 | 0 |

I

| mercury | nitrogen, nitrate | selenium | silver | aluminum | radioactivity, alpha | radioactivity, beta |
|---|---|---|---|---|---|---|
| 0.0005 | 3.5 | 0 | 0 | 0 | 0 | 0 |
| 0 | 4.3 | 0 | 0 | 0 | 0 | 0 |
| 0 | 0.86 | 0.002 | 0 | 0 | 0 | 0 |
| 0 | 0.91 | 0 | 0 | 0 | 0 | 0 |
| 0 | 4.05 | 0 | 0 | 0.06 | 0 | 0 |
| 0 | 4.05 | 0 | 0 | 0.18 | 7.39 | 6.17 |
| 0 | 0.52 | 0 | 0 | 0.18 | 0 | 0 |
| 0 | 6.31 | 0 | 0 | 0.69 | 0 | 0 |
| 0.0002 | 4.2 | 0 | 0 | 0 | 0 | 0 |
| 0 | 1.7 | 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0 | 8.1 | 0 | 0 | 0 | 0 | 0 |
| 0 | 1.2 | 0 | 0 | 0 | 0 | 0 |
| 0 | 1.47 | 0 | 0 | 0.05 | 2.29 | 0 |
| 0 | 1.5 | 0 | 0 | 0 | 0 | 0 |
| 0 | 1.8 | 0 | 0 | 0 | 0 | 0 |
| 0 | 2.7 | 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0 | 1.6 | 0.006 | 0 | 0.04 | 0 | 9.01 |

I

# AGRI SERVICE

Water Analysis Results

May 6, 1999

Sam Fortiner
P.O. Box 67
Borrego Springs, CA 92004

**Lab Number: 20269**
**Date Submitted: 4-28-99**

Allegretti Farm
water

| | Results |
|---|---|
| **pH, units** | 7.2 |
| **ECe, mmhos/cm** | 3.0 |
| **Calcium, me/l** | 6.9 |
| **Magnesium, me/l** | 2.5 |
| **Sodium, me/l** | 20.1 |
| **Chloride, me/l** | 21.7 |
| **Carbonate-Bicarbonate, me/l** | 2.2 |
| **Boron, ppm** | 0.6 |
| **Sodium Adsorption Ratio** | 9.3 |
| **Sodium Adsorption Ratio, adjusted** | 18.6 |
| **Nitrate-N, ppm** | 1.8 |

If you should have any questions, please feel free to contact us at any time.

Sincerely,

Mary Mataya, Agronomist
AGRI SERVICE

Based on a conversion factor of 640 the TDS is approximately 1920 ppm, sodium is approximately 462 ppm and Chloride is 770 ppm.

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(760) 727-5451 Fax (760) 727-0784

Appendix J

# COSTS UPDATED TO 2000

The costs in Tables 17, 18, and 19 have been updated to reflect estimated costs for the specified projects if they were to be constructed in 2000. The tables were obtained from the report *Borrego Valley Water Management Plan* published by California Department of Water Resources in 1984. See Tab 8, first blue index page in the *Borrego Water District Groundwater Management Study Technical Work Book*, February 2000.

The cost of each project was published by U.S. Bureau of Reclamation in 1968 in *Inland Basins Projects, Borrego Valley, California*. Cost indexes used to update the estimates were obtained from *Construction Cost Trends* published by U.S. Bureau of Reclamation. Older indexes are available in USBR publications. Recent indexes are available on the internet at:
http://www.usbr.gov/tsc/cost_trend.html.

In the USBR report the cost of each project was amortized over a period of 50 years at an interest rate of 12 percent. The estimates in this March 2000 update amortized the cost over a 20 year period at an interest rate of 9 percent to reflect up to date financing.

Carl Hauge
Department of Water Resources
916-327-8861; fax 916-327-1648
chauge@water.ca.gov

J

TABLE 17
UPDATED ESTIMATED CONSTRUCTION COST OF DEVELOPMENT PLANS

| Plan of development | Conveyance system | Total construction cost,* 1968 | USBR construction cost ratio** | Total construction cost, 2000 | Annual cost 2000 |
|---|---|---|---|---|---|
| Plan A | Escondido-Borrego | $53,402,000 | 227/47 | $309,504,357 | $34,045,479 |
| | Oasis-Borrego | $30,122,000 | 227/47 | $174,579,421 | $19,203,736 |
| | Westside-Borrego | $33,427,000 | 227/47 | $193,734,357 | $21,310,779 |
| Plan B | Westside-Borrego | $50,523,000 | 227/47 | $292,818,409 | $32,210,025 |

*U.S. Bureau of Reclamation, "Inland Basins Projects, Borrego Valley, California", Region 3, Reconnaissance Investigations, June 1968, p. 45.
**U.S. Bureau of Reclamation, "Construction Cost Trends". January 1968 index was about 47 and March 2000 index stood at about 227.
***Annual cost was obtained by amortizing project over 20 years at an interest rate of 9%,

TABLE 18
UPDATED ESTIMATED OPERATION, MAINTENANCE AND REPLACEMENT + POWER COSTS OF DEVELOPMENT PLANS

| Plan of development | Conveyance system | USBR annual OM&R* 1968 | USBR machinery & equipment cost ratio** | Updated annual OM&R 2000 | USBR annual power cost* | Power cost index** | Annual power cost 2000 |
|---|---|---|---|---|---|---|---|
| Plan A | Escondido-Borrego | $318,000 | 239/48 | $1,583,375 | $1,980,000 | 0.0930/0.0087 | $21,165,517 |
| | Oasis-Borrego | $87,000 | 239/48 | $433,188 | $267,000 | 0.0930/0.0087 | $2,854,138 |
| | Westside-Borrego | $45,000 | 239/48 | $224,063 | $220,000 | 0.0930/0.0087 | $2,351,724 |
| Plan B | Westside-Borrego | $152,000 | 239/48 | $756,833 | $4,004,000 | 0.0930/0.0087 | $42,801,379 |

*U.S. Bureau of Reclamation, "Inland Basins Projects, Borrego Valley, California", Region 3, Reconnaissance Investigations, June 1968, p. 45.
**U.S. Bureau of Reclamation, "Construction Cost Trends".
***Electrical rates: approximately $0.0087 per kilowatthour in 1968 and $0.0930 per kilowatthour in 2000, per conservation with California Energy Commission.

TABLE 19

UPDATED COSTS FOR PROJECTS TO IMPORT

WATER TO BORREGO VALLEY*

| (1) Plan of development | (2) Conveyance system route | (3) Construction cost | (4) Annualized Construction cost 9 percent 20 years | (5) Annual OM&R cost | (6) Annual power cost | (7) (4)+(5)+(6) Total annual cost | (8) Annual water delivered acre-feet | (9) (7)/(8) Unit cost, $/acre-foot |
|---|---|---|---|---|---|---|---|---|
| Plan A | Escondido-Borrego | $309,504,357 | $34,045,479 | $1,583,375 | $21,165,517 | $56,794,437 | 7,400 | $7,675 |
| | Oasis-Borrego | $174,579,421 | $19,203,736 | $433,188 | $2,854,138 | $22,491,062 | 7,400 | $3,039 |
| | Westside-Borrego | $193,734,357 | $21,310,779 | $226,063 | $2,351,724 | $23,888,566 | 7,400 | $3,228 |
| Plan B | Westside-Borrego | $292,818,409 | $32,210,025 | $756,833 | $42,801,379 | $75,768,237 | 184,000 | $412 |

*Costs were updated to March 2000. Cost does not include the cost of buying water from wholesalers such as MWDSD or IID.

4

Appendix K

# Borrego WATER DISTRICT

October 11, 2000

TO: Sam Fortiner, Chairman
Groundwater Management Technical Committee

FROM: L. R. Burzell, District Engineer

SUBJECT: Clark Lake Wells - Reverse Osmosis Project – Revised Estimate of Costs

This project was based on pumping approximately 4,000-acre feet of water annually from the Borrego Water District's 240-acre parcel located south and east of Clark Lake on Highway S22. The water quality is poor with a Total Dissolved Solids concentration of approximately 5,200-ppm, hence, treatment is required.

The plan is to pump the water to a treatment plant site located northeast of the Peg Leg Monument where it will be desalted with a reverse osmosis plant. U. S. Filter engineers have provided capital and operating cost information for the desalting unit. One important change is that U.S. Filter's system must reject 30% of the pumped water due to the high salt content of the well water. This will result in 2,700 to 2,800 acre-feet per year of product water and a rejected brine of 1,200 to 1,300 acre-feet, which must be evaporated.

In order to evaporate 1200 to 1300 acre-feet per year in Borrego, where the evaporation rate is approximately 100 inches per year, the evaporation pond surface area must be increased to 150 acres. The increased cost of constructing 150 acres of pond with approved geo-membrane lining adds significantly to the construction cost which is now estimated to be approximately $22,000,000.

Based on these changes wherein the plant is only 70% efficient and we provide for the expansion of the area of the brine ponds, the resulting estimated cost of the water increases to $1,220 per acre-foot.

It does not seem feasible to pump more than 4,000 acre-feet per year due to the limited drainage area, which supports this aquifer. Also, the quantity of product water is now less than 20% of the current overdraft, hence, it does not solve the overdraft problem.

P.O. Box 1870, 2427 Stirrup Rd., Borrego Springs, CA 92004 • 760-767-5806 • FAX 760-767-5994

K

LRB
5/16/00
Revised 10/10/00

# ESTIMATED COST OF THE CLARK LAKE WELLS, DESALTING FACILITY AND DISTRIBUTION SYSTEM

## I. CAPITAL COST - PRODUCTION AND TRANSMISSION FACILITIES

| | | |
|---|---|---|
| a. | 5 Wells, 12" diameter, 800 ft in depth @ $90,000 each = | $ 450,000 |
| b | 2500 ft of 8" pipeline @ 20—/ft | 50,000 |
| c | 1300 ft of 10 " @ 30—/ft | 39,000 |
| d | 1300 ft of 12" " @ 36—/ft | 46,800 |
| e | 12,400 ft of 14" " @ 41/ft | 508,400 |
| f | 5 Submersible 150 HP pumps with starters, controls & appurt @ $45,000 | 225,000 |
| g | Electrical Service | |
| | (1) Overhead ext. in Highway 522 9,000 ft @ $3.00/ft | 27,000 |
| | (2) Underground on site 6,500, @ $14/ft | 91,000 |
| h. | .5 MG bolted steel tank for forebay storage for Treatment Plant | 125,000 |
| i | Engineering, Environmental review and Admin. | 250,000 |
| | TOTAL | $ 1,812,200 |

## II. CAPITAL COST OF Treatment Plant and POND FOR Waste brine Evaporation

| | | |
|---|---|---|
| a. | Desalting Facility (U.S. Filter costs plus installation) to be supplied by U.S. Filter and MISCO | $ 1,500,000 |
| b | 150 acres waste brine evaporation ponds (See design page for details | $16.250,000 |
| c | Engineering, construction supervision and Admin | 400,000 |
| | TOTAL | $ 18,150,000 |

## III. Capital Cost of Distrubition system and intertie to existing water systems

| | | |
|---|---|---|
| a. | Booster Pump from Treatment facility | $ 125,000 |
| b | Pipelines - Northerly Route 2,800 ft of 12" pipeline @ 36— | 98,000 |
| | 26,500 ft of 10" " @ 30— | 795,000 |
| c | " - Southerly Route 20,300 ft of 10" " @ 30 | 609,000 |
| d | Engineering and Administration | 180,000 |
| | TOTAL | 1,807,000 |
| | GRAND TOTAL | $ 21,769,200. |

## IV Estimated Legal fees / Underwriting Costs / Reserve funds 3,000,000

$ 24,769,200

Rev. 8/16/00

# ESTIMATED ANNUAL COST TO OPERATE THE Rev#2 10/10/00

K

## CLARK LAKE WELLS, DESALTING FACILITY AND DISTRIBUTION SYSTEM

### I. PRODUCTION FACILITY

| | | | |
|---|---|---|---|
| a | Electrical Energy | 3,485,000 Kwhr x $0.08/kwhr = | 278,000 |
| b | Labor | 400 hours @ 25/hr | 10,000 |
| | | TOTAL | 288,000 |

### II. DESALTING AND WASTE BRINE FACILITY

| | | | |
|---|---|---|---|
| a | Electrical Energy | 5,000,000 Kwhr x $0.08/kwhr | 400,000 |
| b | Maintenance of Equipment | | 75,000 |
| c | Labor | 365 days @ 250/day | 91,250 |
| d. | Consulting Service | | 25,000 |
| | (U.S. Filter Study shows $579,700/yr) | TOTAL | 591,250 |

### III. DISTRIBUTION FACILITY

| | | | |
|---|---|---|---|
| a | Electrical Energy | 2,517,000 Kwhr x 0.08/kwhr | 201,000 |
| b | Labor | 400 hrs @ 25 | 10,000 |
| | | TOTAL | 211,000 |

GRAND TOTAL 1,090,250

### IV. Debt Service

Assume bonded Indebtedness of $25,000,000 at 7.0% for 20 yrs

Semi annual debt service = 1,162,980

Annual debt service 2,325,960

Annual Operating Budget $3,416,210

Cost Per Ac Ft = $3,416,210 ÷ 2800 Ac ft = $1,220./Ac ft

K

LRB
5/11/00
Rev. 10/10/00

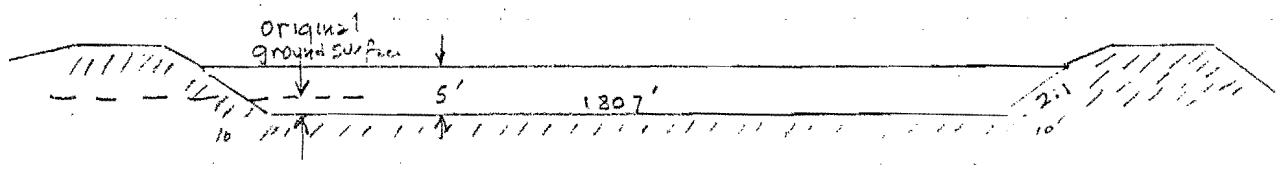
# CLARK LAKE WELLS, DESALTING FACILITY STUDY
## CALCULATION OF THE COST OF THE BRINE EVAPORATION POND

ASSUME:

a. 5,200 mg/L groundwater
b. Production rate 3,000 gpm operated for 300 days/yr will produce 3975 ac ft/yr
c. Plant effic. = 70% – reject brine = .3 x 3975 = 1,192 ac ft/yr
d. Surface evaporation rate = 8.25'/yr
e. Required surface area = 1192 ÷ 8.25 = 145 acres*

Brine Evaporation Pond Configuration
MAKE 3 – 50 Acre ponds

EXCAVATE to 2.5 ft depth, use spoil for berm
Approx. Quantity of excavation = 2.5 x 150 ac x 43560 ÷ 27 = 605,000 c.y
Surface to be lined, 150 acres x 43,560 ft²/Ac = 6,534,000 ft²




Estimated Cost:

| | | |
|---|---|---|
| a. | purchase 160 acres @ $1,200/ac | = 96,000 |
| b | Excavation and embankment 605,000 c.y @ 2.00/cy | = 1,210,000 |
| c | Lining 6,534,000 ft² @ $2.28/ft² | = 14,944,000 |
| | | $ 16,250,000. |

o Lining material, use double liner material, polypropalene (.045") geomembrane suggested by C.W Neal Corp

* 5,200 ppm water will produce 5,200 x 2.72 = 14,100 lbs of salt/Ac ft
If the salt residue weighs 125/ft³, 1 Ac ft of water will produce 113 ft³ of salt,
3975 Ac ft/yr will produce 449,175 ft³ or 10.3 Ac ft of salt/yr
If the 150 ac of pond holds 750 Ac ft, the ponds would have a life of approx. 750 ÷ 10.3 = 73 years. If the solid salts cannot be left in the ponds arrangements must be made to haul it to an approved dump.

K

July 24, 2000

TO: Groundwater Management Technical Committee

FROM: L. R. Burzell, District Engineer
Borrego Water District

SUBJECT: A Study of Water Development South and East of Ocotillo Wells and East to the Allegretti Farms in Imperial County

**Background**

The staff was directed to size this project to provide 6,000-acre feet per year. The study site was expanded to include the Allegretti Farms area because the groundwater basin in the area south of Ocotillo Wells did not appear to include good wells in the 500 gpm capacity range or larger or sufficient basin storage to support an export project of 6,000 acre feet per year. The well driller who drilled the wells on the Allegretti Farms property reported that those wells were high producers, testing in the 2,000 gpm range and they have been producing large quantities of water for a number of years.

**Proposed Pipeline Route**

A route was selected along section lines and existing rights of way running westerly from Allegretti farms through open undeveloped property approximately 1.5 miles south of Highway 78. The route proceeds through a valley, which appears to be suitable for some additional wells where the water quality may be better than that produced on the Allegretti Farms. After proceeding westerly for approximately eight miles the proposed route turns northerly along a section line one mile west of Split Mountain road to an intersection with Highway 78. The route then continues westerly along Highway 78 for a distance of five and one half miles, thence northwesterly along Borrego Springs Road to Ram's Hill and beyond all as shown on the attached maps.

There does not appear to be any direct contact with any of the lands of the Anza Borrego Desert State Park that could cause a conflict with that agency.

**Water Quality**

The water produced by this project will be suitable for irrigation of crops, landscaping and golf course irrigation. It will not be suitable for use in the domestic water system because of its high total dissolved solids concentration.

K

## Hydraulics of the System

The anticipated pumping level on the Allegretti Farm wells is 120 feet below sea level. The delivery system hydraulic grade must be 920 feet in order to serve Ram's Hill Golf Course and to deliver water to the northerly portion of the Borrego Valley. The friction loss in the easterly eight miles of the transmission system will be about 103 feet. In order to maintain the system pressure in the well field at 200 psi or less it will be necessary to have a storage tank and booster pumping plant at an elevation of about 244 feet.

In order to avoid constructing more than one booster pump station, I have proposed to install high head pumps at elevation 244 feet that will complete the lift to Ram's Hill tanks. The indicated pressure in the 24" transmission pipeline at the booster pump discharge will be approximately 339 psi which is relatively high but manageable because the 24" pipeline will be welded steel and it can be designed to operate safely at this pressure.

## System Capital Cost, Operating Cost and Forecast of Unit Cost of Water Produced

The estimated cost of the project is $28,610,000. The project will require about a $31,500,000 bond issue to cover funding of the cost plus required reserves. The annual debt service and the operating costs will be about $4,000,000 per year. If the production can be maintained at 6,000 acre feet per year the cost of the water produced will be about $668.42 per acre-foot.

I have attached a copy of my worksheets, which will be reviewed by Clark Shimeall and Jack Laughlin, and any of the other committee members who have time to go into more detail. All committee members are urged to comment on this report prior to it being finalized.

## Repayment Plans which could be implemented

There are numerous possible formulas to provide funds to pay for new water projects; one such plan is to have a pump tax for all pumpers. Current pumping costs are about $100.00 per acre-foot. Approximately 21,000 acre-feet is being pumped each year. The indicated cost of the Ocotillo Wells water is $4,000,000 per year for 6,000 acre-feet of water. Based on current water use, if 6,000 acre-feet of new water was introduced, the water pumped from the aquifer would decrease to 15,000 acre-feet annually.

In order to provide for the annual cost of the new project it would be necessary to have a pump tax; one formula would be to charge as follows:

**Case I:**

| | | | |
|---|---|---|---|
| a. | Users of project water 6,000 ac.ft. x $100/ac.ft. | = | $ 600,000 |
| b. | Pump tax 15,000 ac.ft. x $226.67/ac.ft. | = | $3,400,000 |
| | | | $4,000,000 |

K

This formula allows the heavy agricultural users and golf courses to use 6,000 acre-feet of lower quality water for about the same costs they have now. All other users would be paying about three times as much as they do now.

Any number of variations for financing the project can be devised, for example, if the charge for project water was increased to $200/ac.ft., the formula would work out as follows:

**Case II:**

| | | | |
|---|---|---|---|
| a. | Project water 6,000 ac.ft. x $200/ac.ft. | = | $1,200,000 |
| b. | Pump tax 15,000 ac.ft. x $186.67/ac.ft. | = | $2,800,000 |
| | | | $4,000,000 |

It should be noted that those who pump water will have the combined costs of pumping ($100/ac.ft.) plus the pump tax ($186.67/ac.ft.), so for Case II water costs for project water users would be $200/ac.ft. and pumpers would be paying $286.67/ac.ft.

LRB 7/17/00

K

# A Study of Water Development South and East of Ocotillo Wells and East to the Allegretti Farms in Imperial County — Project Goal 6,000 Acft/year

## I. CAPITAL COST

a. 12 wells 12" in diameter 600 ft in depth @ $80,000 ea. = $960,000.

TRANSMISSION SYSTEM

b. 24" pipe 16.8 mi x 5280'/mi x $140./ft = 12,419,000

20" pipe 9.25 mi x 5280'/mi x $115/ft = 5,617,000

18" pipe 3.0 mi x 5,280/mi x $100/ft = 1,584,000

16" pipe 1.5 mi x 5,280'/mi x $85/ft = 673,000

14" pipe 2.0 mi x 5,280'/mi x $72/ft = 760,000

c. Collection System

12" pipe 3.0 mi x 5280'/mi x $60/ft = 950,000

8" pipe 6.0 mi x 5280'/mi x $25/ft = 792,000

d. Pumping Plants, starters, controls, electrical service

12 Pumping Plants H.P. Vertical Turbine with appurtances @ 60,000 ea = $720,000

3 Booster Pumps 300 HP ea with appurtances @ 60,000 = 180,000

e. 1.5 MG Steel Tank = 450,000

f. Electrical Service, All Overhead SDG&E Co & IID. facilities 35,000 ft @ 3.00/ft = 105,000

g. Land Aquisition for easements, well sites and water rights

1,000 acres @ 1,000/ac = $1,000,000

easements and rights of way – 100 acres @ 1,000/ac = 100,000

h. Engineering, surveying administration = 2,000,000

ESTIMATED TOTAL CONSTRUCTION COST $28,310,000

## II. Preliminary Studies

a. Research of ownership of property, existing water use, water quality and engineering support for the environmental review $ 50,000

b. Environmental Impact Report $ 250,000

Estimated cost to get approval to proceed. $ 300,000

## III. Recommended Borrowing = $31,500,000

LRB 7/18/00

K

# ESTIMATED ANNUAL COST TO OPERATE THE WATER DEVELOPMENT PROJECT SOUTH AND EAST OF OCOTILLO WELLS AS FAR EAST AS THE ALLEGRETTI FARMS IN IMPERIAL COUNTY

## ANNUAL COSTS

I PRODUCTION WELLS

a Electrical Energy 10,295,000 Kwhr/yr @ $.09/Kwhr = $926,600

b Operational labor = 150,000

c. Pump & Control system maintenance = 30,000

Annual Production Cost = $1,106,600

II Debt SERVICE

a Assumed level of financing $31,500,000 including required reserve fund, for 20 yrs at 6.5%

Semi annual payment = 1,426,950

Annual Payment = $2,853,900

III ADMINISTRATION

a Administration / legal = $ 50,000

IV TOTAL ANNUAL COSTS = $4,010,500

V COST PER Acft $4,010,500 ÷ 6,000 Ac ft/yr = $668.42/Ac ft

LRB 7/18/00

K

## Pumping Lift and Total Dynamic Head on pumps AND Pumping Cost

I. Est Pumping level Allegretti Farms = 120 ft below sea level

Est Delivery elev. at Rams Hill Country Club 920 ft.

Total lift = 120 + 920 = 1040 feet from Allegretti Farms

II. Friction loss by Pipeline Reach + TDH

a. Allegretti Farms to end of 20" pipeline
6.0 miles x 5280 ft = 31,680 ft  Q = 4000, $H_f$ = 2.4 ft/1000  $H_f$ = 76.0 ft

b. End of 20" pipeline to NW Corn. Sec. 21  4500 gpm = 6.48 MGD
2.7 mile x 5280 ft = 14,256 ft  Q = 4,500  $H_f$ = 1.25 ft/1000  $H_f$ = 17.8 ft

c. N.W. Corn. Sect 16, T12S, R8E Elev. 280
1.0 miles x 5280 = 5,280 ft  Q = 5,000 gpm  $H_f$ = 1.5 ft/1000  $H_f$ = 5.3 ft

TDH at wells in Allegretti Farms = Lift (120 + 244) + $H_f$ 99.1 = 463 ft  $H_f$ = 99.1 ft

d. Tank site at elev. 244 ft ±

e. 13.15 miles x 5,280 = 69,432 ft  Q = 5000 gpm  $H_f$ = 1.5 ft/1000  $H_f$ = 104.1 ft
to T.O to Tank R

TDH on booster pumps at tank = Lift (920 − 244) + $H_f$ 104.1 = 780 ft = 339 psi ✓

System pressure at Allegretti farms = Lift (244 + 501 G.L) + $H_f$ = 99.1 ft/1000 = 463 = 170 psi ✓

f. for power consumption TDH = Lift 1040 feet + $H_f$ (99.1 + 104.1) = 1243.2 ft
Individual Pumps Wells pumping to Tank at Elev 244 ft plus
Booster pumps pumping to Tank elev. 920 ft.

III. Annual production = 6,000 Ac ft — Pumping Cost for Electrical Energy
Plant Capacity = 5000 gpm = 11.16 cfs = 22.1 Ac ft/day
5000 ÷ 22.1 = 226.25 days = 5,430 hours oper. time/yr

$$Kw = \frac{BHP \times .746}{M.E.} = \frac{gpm \times Head}{3960 \times .65} \times \frac{.746}{.95} = \frac{5000 \times 1243.2}{3960 \times .65} \times \frac{.746}{.95} = 1896 \text{ Kw}$$

Kw hr = Kw x hr = 1896 x 5,430 hr. = 10,295,000 Kw hr/yr

Annual Power Cost = Kw hr/yr x power rate
= 10,295,000 x .09/Kw hr = $926,600/yr

7/19/00

K

## Water Quality

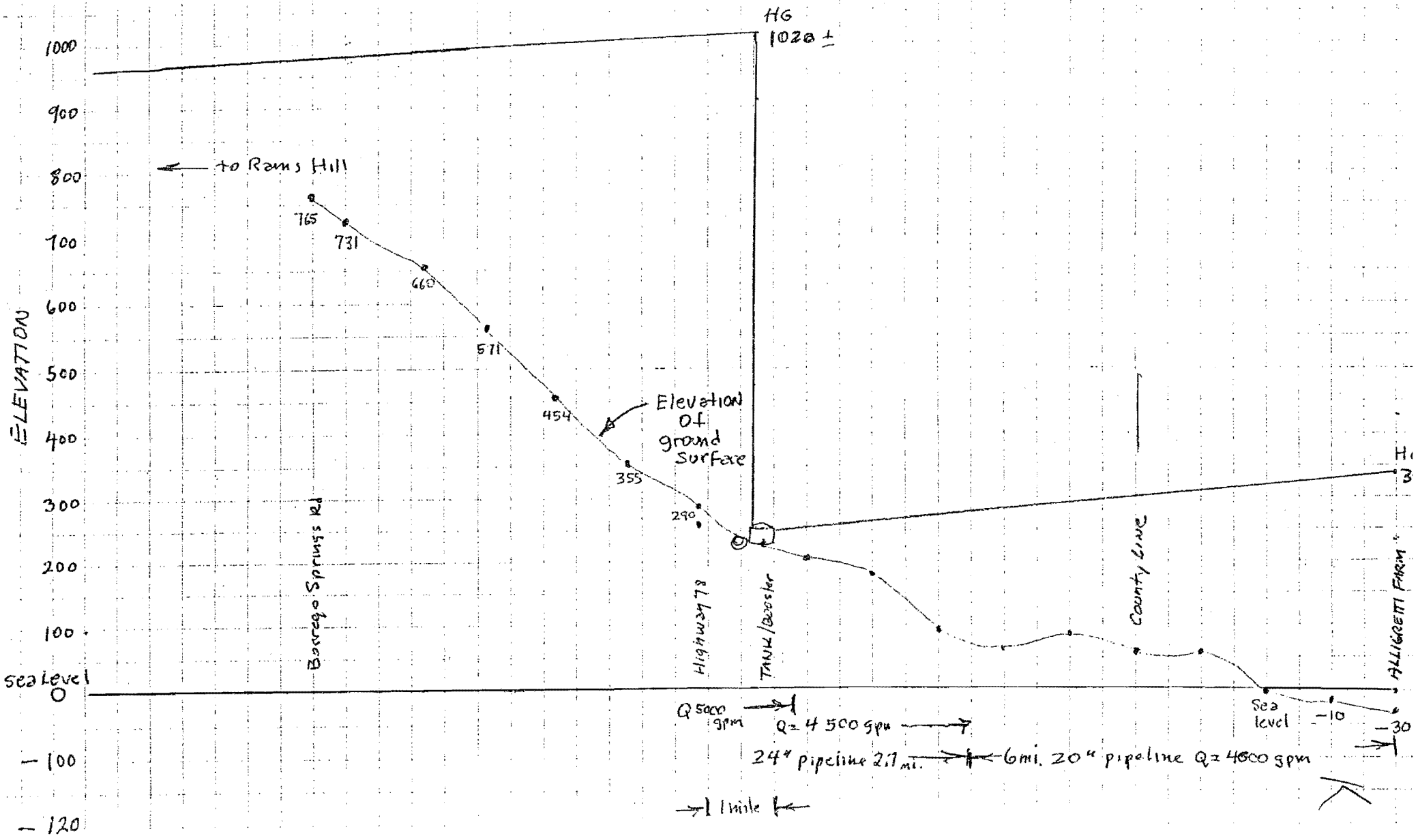
Limited information is available on water quality. We know that in the vicinity of the intersection of Borrego Springs Rd and Highway 76 the water quality is very good (TDS 198) We have general knowledge that the water quality is lower in the Ocotillo Wells area east and west of Split Mountain Rd. The quality of the water east of the Imperial County line continues to decline as we approach sea level. (Gann Well TDS 1523) (Allegretti Farms TDS 1,920)

For the purposes of this report it must be concluded that the blend of water pumped in the Ocotillo Wells area and thence southerly and easterly to the Allegretti Farms area will exceed 1,000 ppm of Total Dissolved Solids hence it must be kept separate from the drinking water system and used only for irrigation of crops, landscaping and golf courses.

## Delivery Points

Based on the information available and a project size which will produce 6,500 acft/yr it seems logical to plan a delivery system that will bring the water to the existing golf courses and to the large agricultural plantings. Some smaller landscaped areas may be served if and when they install separate irrigation systems. Based on this premise the project system considered in this study will include wells, pumps and pipelines commencing in the Ocotillo Wells and Allegretti Farms vicinity entering the Borrego Valley via Highway 78 and Borrego Springs Road. The first delivery point will be the Ranc Hill Golf Course thence northerly to the Borrego Springs Park Community Service District (Country Club) thence continuing northerly and westerly via the Roadrunner Club, DeAnza Country Club and on to the agricultural area. If the agricultural and golf course irrigators work together on scheduling 6,000 acft of irrigation water could be delivered under this plan to offset the use of local high quality groundwater.

# Profile of Hydraulic Grade from Allegretti Farm Westerly to Borrego Springs Rd.



Appendix L

**Borrego Water District – Groundwater Management Program**

# EXISTING CATCHMENT BASINS AND DIVERSION STRUCTURES

**TUBB CANYON: (1) 2700-Ft. Diversion dam with (2) small deflection dams**

A) 650 Ft. (of 2700 Ft.) and the two deflection dams located on parcel: APN 197-280-14, owned by LaJolla Industries, 7598 Eads Ave. LaJolla, CA 92037
B) 500 Ft. (of 2700 Ft.) located on parcel: APN 198-320-33, owned by Mustonen and Wood Family Trust, 756 Amiford Dr. San Diego, CA 92107
C) 1550 Ft. (of 2700 Ft.) located on parcel: APN 198-320-28, owned by Borrego Vista, 5480 Baltimore Dr. #106 La Mesa, CA 91942

**DRY CANYON: (3) Retention dams**

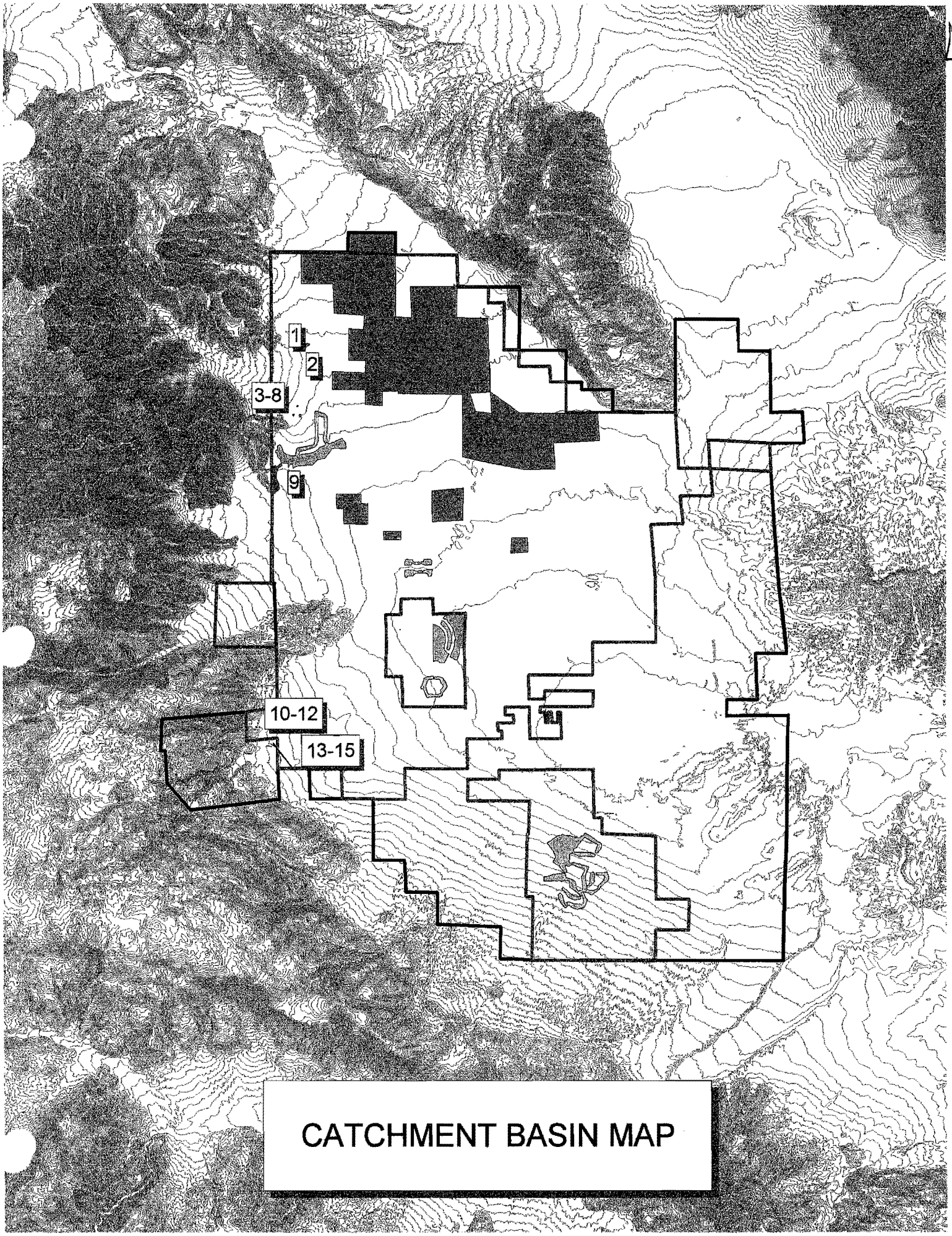
(3) retention dams located on parcel: APN 197-280-15, owned by Frank H. and Nancy L. Porter, 14761 County Line Rd. Chagrin Falls, OH 44022

**HENDERSON CANYON: (8) Retention dams/basins**

A) (2) 700 Ft. retention dams/basins at Indian Head Ranch, (1) approximately 2 acres and (1) approximately 0.5 acres located on parcel: APN 140-110-06, owned by Avery Family Governance Trust, P.O. Box 540 Borrego Springs, CA 92004
B) (4) retention dams/basins at De Anza Country Club located on parcel: APN 140-280-31, owned by Donald Bartels etal, 69 Laauwe Ave. Wayne, NJ 07470

**PALM CANYON: (1) 3000-Ft. Debris basin**

A) Approximately 12 acres (of 24 acres) located on parcel: APN 141-080-33, owned by Perry Burnand Jr. and Raymond Burnand, 4407 Manchester Ave. #201 Encinitas, CA 92024
B) Approximately 8 acres (of 24 acres) located on parcel: APN 141-080-18, owned by Beverly Burnand, 4407 Manchester Ave. #201 Encinitas, CA 92024
C) Approximately 4 acres (of 24 acres) located on parcel: APN 141-080-25, owned by De Anza Desert Country Club, P.O. Box 120 Borrego Springs, CA 92004




CATCHMENT BASIN MAP

# ESTIMATED CATCHMENT BASIN VOLUME CALCULATIONS

## *Coyote Canyon - Indian Head Ranch*

| BASIN # | DAM LENGTH (FT) | AREA (SF) | DEPTH (FT) | STORAGE CAPACITY (AF) |
|---|---|---|---|---|
| 1 | 700 | 90,000 | 3 | 6.20 |
| 2 | 700 | 20,000 | 3 | 1.38 |

## *Henderson Canyon - De Anza C.C.*

| BASIN # | DAM LENGTH (FT) | AREA (SF) | DEPTH (FT) | STORAGE CAPACITY (AF) |
|---|---|---|---|---|
| 3 | 155 | 6,300 | 4 | 0.58 |
| 4 | 200 | 7,000 | 4 | 0.64 |
| 5 | 200 | 6,800 | 3 | 0.47 |
| 6 | 365 | 12,300 | 3 | 0.85 |
| 7 | 250 | 8,200 | 3 | 0.56 |
| 8 | 570 | 26,250 | 3 | 1.81 |

## *Palm Canyon - De Anza C.C.*

| BASIN # | DAM LENGTH (FT) | AREA (SF) | DEPTH (FT) | STORAGE CAPACITY (AF) |
|---|---|---|---|---|
| 9 | 3,000 | 1,042,000 | 4 | 95.68 |

## *Dry Canyon*

| BASIN # | DAM LENGTH (FT) | AREA (SF) | DEPTH (FT) | STORAGE CAPACITY (AF) |
|---|---|---|---|---|
| 10 | 250 | | | Diversion |
| 11 | 200 | 7,370 | 3 | 0.51 |
| 12 | 150 | 5,750 | 3 | 0.40 |

## *Tubb Canyon*

| BASIN # | DAM LENGTH (FT) | AREA (SF) | DEPTH (FT) | STORAGE CAPACITY (AF) |
|---|---|---|---|---|
| 13 | 450 | | | Diversion |
| 14 | 350 | | | Diversion |
| 15 | 2,700 | | | Diversion |
| **TOTALS:** | **10,240** | **1,231,970** | | **109.07** |

Appendix M

# REPORT TO THE GROUNDWATER MANAGEMENT TECHNICAL COMMITTEE

Steven Smiley, Agricultural Representative
18 October 2000

## Introduction

This is an initial report on what role agriculture might play in reducing the degree of aquifer overdrafting we are experiencing in the Borrego Valley. It should be mentioned that these thoughts cannot claim to represent a consensus of opinion among the farmers in this community. Such a consensus may indeed be impossible to achieve. Moreover, the ideas expressed should not be construed as recommendations for any specific action. Rather, they are intended to bring up aspects to be considered in the overall design and implementation of the Groundwater Management Plan.

In my opinion, there are three basic ways in which the amount of water consumed by agriculture in this valley can be reduced. They are:

- Increase irrigation efficiency
- Retire/Fallow non-productive, non-profitable acreage
- Encourage conversion to less water intensive crops

## Irrigation Efficiency

The rationale behind increasing irrigation efficiency is that with a more uniform and accurate application of water to a crop, there is no need to "over irrigate" certain areas of a block to ensure that no areas go "under irrigated". This implies that one must know with a fair degree of confidence, how one's irrigation system is performing. There is a service available in this area which will scientifically analyze irrigation systems for uniformity and efficiency and make recommendations for improvement if warranted. This service is free for any San Diego county grower through the Agricultural Water Management Program of the Mission Resource Conservation District.

Once an irrigation system is brought up to a high level of uniformity and efficiency, it must be properly operated and maintained. Methods and tools to do this range from old fashioned common sense to high tech access to information. The key to all of this is firstly, knowing what to do, then doing it consistently and diligently. Maximizing the efficiency by which agriculturists utilize water will not by itself solve the overdraft problem, but it can certainly contribute to reducing the overdraft.

M



Fallowing Acreage

There are few things as senseless as wasting expensive energy to extract precious water to put on a crop which is going to lose money. However, this is a highly sensitive area and it may cause a lot of hard feelings if handled tactlessly. After all, most farmers have put in years of hard work and lots of money to build up their operations. Some growers, even though they may have lost money for years, may not be ready to give up. Even those that are, may not be willing to let their land go except for a very high price. Another obvious question is: Where will the money come from to compensate the owners of fallowed land? It would probably be prohibitive for the water district to actually buy the land but perhaps a program modeled after the old Land Bank program could be initiated whereby landowners are paid a nominal amount not to extract water. Maybe some form of attractive property tax exemptions could be made to inactivated farmland.

Less Water Intensive Crops

For obvious reasons, most crops grown in the Borrego Valley require vast amounts of water. However, there are more arid-adapted plants which could be grown in this area and which would require significantly less water. On the downside, most of these alternative crops are either experimental or have poorly developed markets. Examples are jojoba, guayule, neem and moringa among others. Of all of these, jojoba is probably the best risk as it has an established market and many of the technical problems of growing and harvesting the crop were worked out in the 1980s and 90s.

It will not be an easy proposition to convince farmers to take a risk on new experimental crops because they are, by nature, of a fairly conservative mind set. Incentives will need to be devised to encourage such risk taking. Perhaps an exemption from any future use tax on water might be offered to growers that plant certain water thrifty crops.

Conclusion

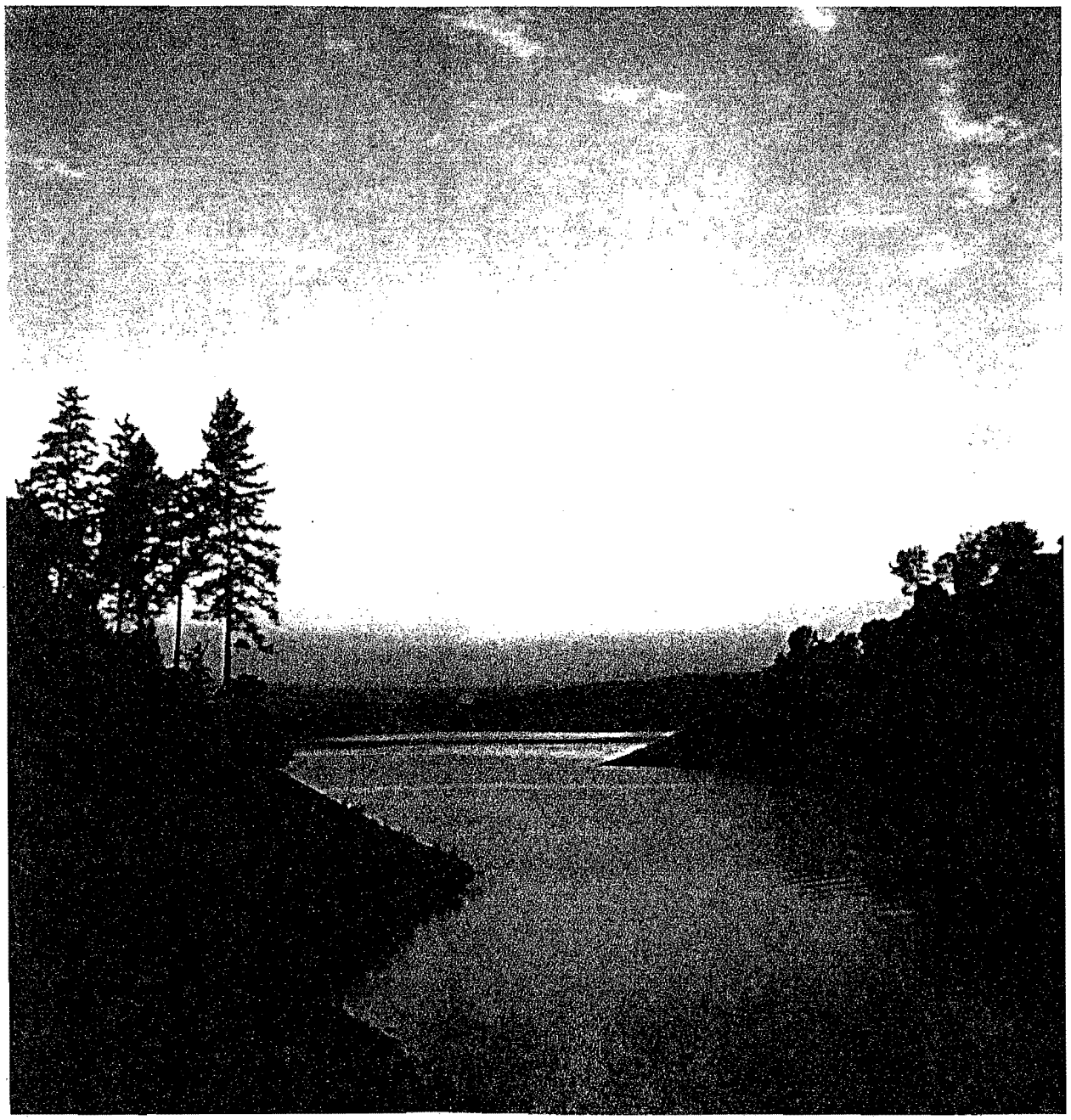
The challenges entailed in confronting the problem of the overdrafting of the aquifer in the Borrego Springs area are monumental and daunting. There are basic individualistic and societal issues involved. Agriculture can and should play a role in the process, but careful consideration should be given to the sensitivity of the issue for farmers. Otherwise, the polarization and divisiveness which could result, would only confound the problem.

Appendix N

LAYPERSON'S GUIDE TO

# Water Rights Law

*Prepared by the Water Education Foundation*



# Groundwater

In the West, groundwater supplies a large portion of water supply, the use of which significantly increases during times of drought. In some areas, a much greater portion of groundwater is extracted than is recharged, causing serious overdraft problems and a host of accompanying ills. These range from lower water tables and increased energy costs for pumping, to land subsidence, poor water quality caused by contamination from intrusion of sea water or other contaminants, and a reduction in the storage capacity of some basins.

The vast majority of California's groundwater resource – percolating groundwater – is unregulated. Among the Western states, there is a wide variation as to the power to regulate groundwater. California leads the nation in groundwater use with Texas in second place. These two, however, are the only Western states without statewide groundwater regulation. In California, groundwater provides about 25-30 percent of the state's water supply in normal years and as much as 60 percent in critically dry years. In spite of this, California has neither a comprehensive groundwater management plan nor a permit process to regulate groundwater withdrawal.

Attempts to develop groundwater regulations have often been defeated by formidable opposition from users who fear pumping restrictions. There have been, however, a number of judicial decisions that provide general parameters for this area.

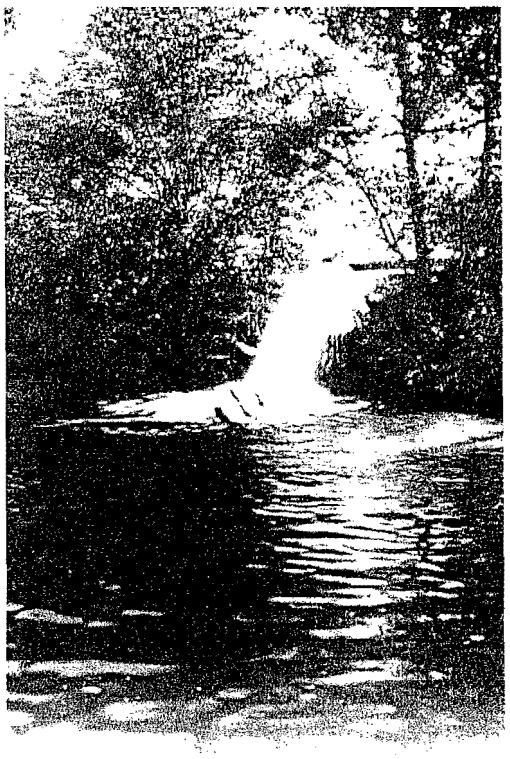
After California was admitted to the Union in 1850, it followed the English groundwater rights system of essentially unregulated groundwater pumping. In 1903, the state Supreme Court decided the case of *Katz v. Walkinshaw*, which found the English system of unconstrained pumping incompatible with the state's dry climate. The court decided that a rule of **reasonable use** must be applied to groundwater use.

The *Katz* case also established the concept of an **overlying right** in which all property owners above a common aquifer possess a shared right to reasonable use of the groundwater aquifer. Overlying rights, which are paramount to other rights, are based on ownership and are analogous to riparian use rights. Like riparians, these property owners' water rights are deemed **correlative** to other overlying owners drawing from the same aquifer, regardless of the date withdrawals were begun. Overlying users could no longer take unlimited quantities of groundwater without regard to the needs of others.

Subsequently, courts established that groundwater may be appropriated by pumping and the resource transported for use on non-overlying land. However, no permit procedure exists to regulate such groundwater appropriations. The appropriator's use of groundwater is unlikely to be disturbed unless another groundwater user feels threatened and goes to court, or unless the extraction of groundwater produces problems, such as subsidence, which induce local government regulation or court action.

Appropriators of groundwater possess a right subordinate to an overlying right. If a groundwater basin is adjudicated, and all reasonable and beneficial overlying rights are satisfied and sufficient surplus groundwater exists, the claim of an appropriator will be allowed by the court under most circumstances. Among themselves, appropriators are subject to "first in time, first in right."

For chronically overdrafted groundwater basins, the California Supreme Court developed the doctrine of **mutual prescription** in 1949 in *Pasadena v. Alhambra*. The court decided that various users, including overlyers and appropriators, had acquired prescriptive rights – rights to infringe upon the established water rights by means of trespass or unauthorized taking. These prescripters were awarded a proportional share of the basin supply. The total extraction amount was limited to a basin's "safe yield." Rights to use the groundwater were based upon demonstrated use in the last five years of pumping.



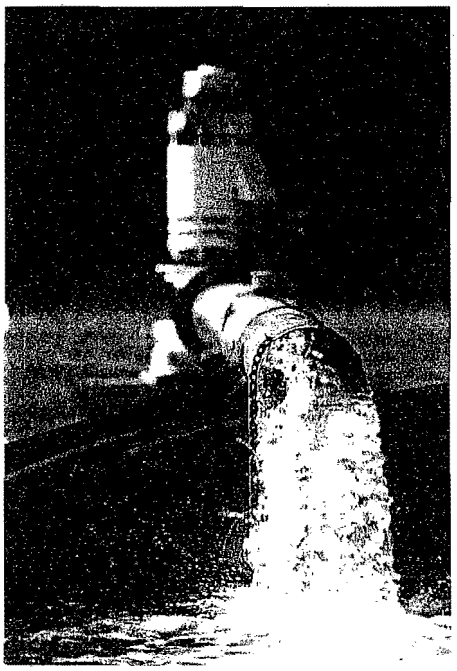
*Groundwater supplies about 25-30 percent of California's water needs.*

This decision resulted in a "race to the pumphouse" as groundwater users of other overdrafted basins attempted to pump maximum quantities of water to increase their five-year pumping record prior to potential litigation and to maximize their eventual adjudicated entitlements.

The California Supreme Court in *Los Angeles v. San Fernando* (1975) undercut its decision in *Pasadena* by holding that the water rights of public entities, such as city governments, could not be prescripted although public and private entities may prescript against private entities. A number of other legal changes were made which may make it more difficult to use the *Pasadena* "mutual prescription" theory.

## Pumping Limitations

Groundwater withdrawals in California are regulated only on a limited basis. Attempts to implement groundwater regulations have been vigorously opposed by overlying land owners, particularly agricultural interests, who object to pumping restrictions, and by local water districts that oppose oversight. Pumping can be controlled 1) where groundwater basins have been adjudicated (adjudication establishes the rights of the affected parties); 2) where the Legislature has granted a local water district authority to monitor, tax or regulate groundwater; and 3) where groundwater management districts or counties have adopted relevant ordinances. More than a dozen basins in California have undergone adjudication to control the rate of extraction. Overdraft of groundwater also can be limited by the State Board to protect water quality from irreparable injury.



*Though an important source of the state's water supply, California laws regarding percolating groundwater remain hazy.*

Protecting groundwater resources at the local level has increased prominently in recent years. For example, in the western Mojave Desert in 1993, after nearly 40 years of overdraft, parties representing more than 90 percent of the water users agreed to (or did not contest) a proposed Riverside County superior court judgment quantifying their water rights to the Mojave River Basin, an area the size of Connecticut. The judgment required the parties to pay for a program to buy supplemental water and established a "physical solution" for transferring water rights among the parties when a groundwater basin is overdrafted.

A trial was held in 1995 for a group of farmers who refused to stipulate to the solution but it was eventually determined that the physical solution should apply to all. An appeals court, however, reversed the judgment in 1998 ruling that the physical solution did not produce "equitable apportionment" and that overlying landowners have a right to use their correlative right to groundwater as long as it is put to reasonable and beneficial use on their overlying land.

In 2000, the California Supreme Court largely sided with the farmers and appellate court in the case of *City of Barstow v. Mojave Water Agency*. In the eyes of some, the decision reinforced that existing overlying groundwater rights holders are superior to the process of equitable apportionment through a mandated physical solution, thus remaining steadfast to traditional water rights law. Some argue that water rights law has moved in some instances to a "share the pain" solution to water shortages i.e. everyone sacrifices something so that all can benefit. However, the Mojave case clearly illustrates an affirmation of historic water law and adherence to the priority of overlying landowner rights.

Regulatory attempts to control groundwater extraction continue to be controversial. Agricultural and urban interests, which have locked horns on groundwater management for years, continue to be at odds. In the agriculturally rich Salinas Valley in Monterey County, decades of overdraft has caused salt water to invade the aquifer. In 1993, when salt water was detected in groundwater less than two miles away from the city of Salinas' municipal wells, the State Board called for aggressive local measures to protect against sea water intrusions.

In response, the county passed a series of ordinances that restricted groundwater pumping, mandated water conservation measures, required farmers to install water meters, and set pumping charges. A coalition of agricultural interests brought suit to overturn the ordinances on grounds that they violated the California Environmental Quality Act. The superior court blocked implementation of the ordinances, and the county rescinded them. The State Board then began assessing whether to step in and regulate the pumping under its authority to protect water quality against irreparable injury.

Under state legislation passed in 1992, AB 3030 (Water Code 10750), local entities may voluntarily develop groundwater management plans in unregulated basins. By 1998, about 150 water agencies had initiated AB 3030 plans, and seven agencies had adopted plans. However, developing a groundwater plan under AB 3030 is purely voluntary and in some instances, groundwater management plans have faced formidable opposition.

The Santa Maria Valley Conservation District in Santa Barbara County and Eastern Municipal Water District in Riverside County voted in 1993 to adopt groundwater plans under AB 3030. After two years of effort, the Santa Maria plan has not gone forward because farmers and urban water users were unable

to agree on the plan's goals. And at Eastern, agricultural interests held up the plan because of fears of pumping restrictions and pump taxes.

In addition to developing AB 3030 plans, counties may adopt ordinances to protect groundwater. Several counties have adopted ordinances principally to protect against overdraft from out-of-county exports. In late 1994, an appellate court in the case of *Baldwin v. Tehama County* upheld the authority of counties and cities to regulate groundwater.

Tehama County in 1992 enacted an ordinance to protect groundwater resources by restricting groundwater extraction from new wells and requiring permits for out of county transfers. Two farmers who owned land in Tehama and wanted to pump groundwater for their out-of-county farms sued to invalidate the ordinance. Their main contention was that the county's authority over groundwater was preempted by state law.

The superior court agreed with the farmers and struck down the ordinance, but the county appealed the decision. In the first decision of its kind, the appellate court ruled that cities and counties have authority to regulate groundwater under their police power (California Constitution, Article XI, section 7). This decision may provide greater impetus to cities and counties to manage their groundwater resources. However, there is still uncertainty regarding the authority of counties and cities over local water districts, which is an ongoing turf battle.

Currently, groundwater users throughout California are awaiting action by the State Board regarding the definition of water in two basins along the San Luis Rey River in northern San Diego County. In particular, a draft State Board decision would determine that all water in Pauma and Pala basins is part of "a subterranean stream flowing in known and definite channel."

Such a determination would mean that the underground water is no longer "percolating groundwater." Thus, landowners would lose the right to pump their correlative share of safe yield. Instead, what is now considered groundwater would be defined as surface water and would fall under jurisdiction of the State Board. Such a change could be beneficial to smaller pumpers (provided they have senior rights to the water) by protecting them from larger pumpers. Conversely, smaller pumpers could be injured because they lack the financial resources to go through the allocation process. Overall, for groundwater users in those two basins (and groundwater users around the state), the precedent set by such a ruling could create significant changes in California's historic groundwater laws.

*Groundwater pumping can be controlled through adjudication, legislative permission for a local water district authority to monitor, tax or regulate groundwater, or by groundwater management districts or counties that have adopted ordinances.*

## Groundwater Adjudication

Adjudication is the process by which a court can assign specific water rights to groundwater users in a specific basin. By doing so, a court can limit pumping to a safe yield and compel the cooperation of pumpers who might otherwise refuse to limit their pumping.

So far in California, 16 basins (most of which are in southern California) have been adjudicated. These include the Smith River system near the Oregon border; the Santa Margarita Rive watershed; Central Basin; West Coast Basin; Upper Los Angeles River Area (San Fernando); Raymond Basin; Main San Gabriel Basin; Cummings Basin; Tehachapi Basin; Warren Valley Basin; Chino Basin; Cucamonga Basin; Puente Basin; Mojave River Basin; the San Bernardino Basin; and the San Paula Basin.