BORREGO SPRINGS PIPELINE FEASIBILITY STUDY

FINAL REPORT

U.S. EPA Region 9 - Tracking Number 10-430
Task H1
February 2012

Borrego Water District
806 Palm Canyon Drive
Borrego Springs, CA 92004

The Village of Borrego Springs

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EXECUTIVE SUMMARY

The village of Borrego Springs lies in the extreme northeastern portion of San Diego County and is completely surrounded by the Anza-Borrego Desert State Park. The aquifer below the unincorporated community has been in a state of overdraft since pumping began in the 1940's and is the sole source of water supply for the Valley. The term overdraft is used when a basin is extracting more water than can be naturally recharged by rain events or melting snowpack. The Valley's aquifer once boasted flowing springs and early promotional videos claimed an abundance of groundwater to pump. Water level measurements accumulated over the years paint a different picture in that the water table is falling at a rate of 3-5 feet per year in the northern portion of the Valley. To adequately address the situation, the Borrego Water District created a Groundwater Management Plan in 2002. This plan outlined the objectives required to ensure adequate future water supplies for the community.

One of the aspects of the Groundwater Management Plan includes the prospect of importing water from outside the Valley. Three possible sources had been determined by the California Department of Water Resources in a 1984 report; to the west from Lake Henshaw, to the northeast from Coachella Valley and to the southeast from the Imperial Valley. Of these three, the route to Imperial Irrigation District had the potential of delivering supplies directly from the Colorado River and was deemed the most appealing by early Plan developers. In 2009 the Borrego Water District received a grant through the efforts of Congressman Duncan D. Hunter. This State and Tribal Assistance Grant (STAG) was authorized by Congress in the amount of $267,000. A scope of work was developed by District staff and consultants in 2010. Work began on the project in late 2010. It is important to understand that this was not a construction project but a feasibility study designed to facilitate the decision making process prior to engaging in such a project. The Work Plan addressed the feasibility of three possible pipeline route alternatives, two possible water sources and detailed the environmental constraints associated with the alternatives.

Pipeline layouts were designed for routes from the terminus reservoir in Borrego Springs to water supplies in the Imperial Valley and Clark Lake. All routes were delineated along existing roadways and power line easements. The route to the southeast followed Borrego Springs Road to State Route 78, then east to the community of Ocotillo Wells. Routes were investigated east of Ocotillo Wells along State Route 78, past the Imperial County line, to the Allegretti Farm property. The route continuing east on State Route 78 then south on State Route 86S to the Carter Reservoir was abandoned after consultation with California Department of Transportation staff. The roadway along Highway 86S was widened to four-lane traffic and the existing easement cannot accommodate a water pipeline along either side. A second alternative route along the existing Imperial Irrigation District power line easement may be possible with more detailed studies, although serious considerations of the obstacles may make the project not buildable. These studies include a cultural study to determine if the route will cross Native American artifacts (the 40 foot elevation contour was the shoreline of the ancient Lake Cahuilla site), a paleontology study of rock type comparable to know archeological finds, a two-year "pre-construction" environmental

floral/fauna assessment and an extensive negotiation with the Bureau of Land Management over land use restrictions associated with the granting of an easement across protected lands. All studies will be incorporated into an environmental impact report. In addition, all routes must be evaluated in order to comply with the California Environmental Quality Act requirements. It would be very difficult for the small unincorporated village to fund a project of this magnitude and therefore unfeasible for the Borrego Water District to pursue at this time. Both Coachella Valley Water District and the Imperial Irrigation District are investigating possible areas to store water for their respective districts. These agencies have decided not to pursue the Borrego Basin as a possible site for storage due to distance from their conveyance system and the associated expense to transport the water.

The pipeline route to the northeast was designed from the easternmost existing pipeline terminus in the Borrego Water District's system to the north side of Clark Dry Lake. The route followed Palm Canyon Drive, turned north on Peg Leg Road, curved east onto the Borrego-Salton Seaway and north on the gravel Rockhouse Canyon Road. At the southern edge of the dry lakebed the route adhered to the existing disturbed land following the easement. The easement, and documents were adjusted to fit the disturbed land of the existing roadway. The project still needs a hydrogeologic investigation to determine if the basin has the potential of supplying a sustainable yield of water for the Borrego Springs community. This investigation was not an element of the work plan of the grant.

The Allegretti Farm is an agricultural venture located off State Route 78 in Imperial County. The farm overlies the Allegretti sub-basin. This area was investigated for water banking potential and its location along one of the proposed pipeline routes. The sub-basin has a shallow basin with poor quality and a deeper basin with better quality, although still not to potable standards. Preliminary hydrogeologic evaluations do not favor this site due to water quality concerns and close proximity to springs along the San Felipe and Fish Creeks. Other issues with exporting groundwater from Imperial County in compliance with the County Groundwater Ordinance make this area a poor prospect for developing a water bank.

The Imperial Irrigation District is the primary Colorado River water wholesaler in southeastern California. Water is transported through a series of open canals that traverse the Valley. One aspect of this project was to determine feasibility of utilizing this conveyance system to "wheel" water from the Colorado River to the proposed importation pipeline. "Wheeling" water is payment or other considerations for being able to transport another agency's water through an existing canal or pipeline system. Negotiations coupled with a thorough distribution system study will be needed in order to pursue this option. Irrigation return flow from the Imperial Irrigation District was dismissed as a possible water supply due to poor water quality, permitting issues and the diversion of water resources away from the Salton Sea.

This final report was produced with a combination of grant funds and District reserve funds. Work was performed by District staff and various contractors of the Borrego Water District. Conclusions from this report paint a dim picture of the Borrego Valley ever being able to build and fill a pipeline from areas studied. Based on the conclusions from this study, one

can infer that the community of Borrego Springs should concentrate on moving towards valley-wide sustainability over importation for the following reasons. The burden of the cost of building the infrastructure cannot be absorbed by the 3,400 inhabitants. The agriculture and golf course industry will not be able to afford the necessary fee that would be imposed to recharge the aquifer. If an outside source of water were to be found, the long-term security of the supply would be in question. Water storage by another agency in the Borrego Valley Aquifer stands very little chance due to the extreme costs associated with delivering and retrieving the stored water. It is possible that this fact may reverse over the coming decades as water supplies in the desert southwest become increasingly more scarce.

Indian Head Mountain

Final Report
Borrego Water District
Borrego Springs Pipeline Feasibility Study

1.0 Background

The Borrego Springs Community relies on a sole source aquifer to meet overlying water demands. This sole source supply has been in a state of overdraft, where production pumping is exceeding the natural replenishment for the past sixty years. Recent studies by the United States Geological Survey reflect that the uppermost, and most prolific of three aquifers may be exhausted in the next fifty years. Since these demands are projected to continue to exceed the natural supply to the basin, it is appropriate to seek supplemental, non-native water sources to support the long-term economic viability of the area. The Borrego Water District is the public agency tasked with providing potable water supplies to the unincorporated community of Borrego Springs and the tourist facilities associated with the Anza-Borrego Desert State Park. While the District strives to achieve local sustainability, it is also necessary to evaluate alternative pipeline routings into Borrego for delivering a water supply source. A water banking operation is also a possibility in another nearby groundwater basin (Allegretti Sub-basin). Thus, the importation of water into the area should consider not only the need to satisfy the current and near term overdraft on the basin, but should also consider the possibility of a combined importation project and a water banking operation in that sub-basin. A Federal Grant (State and Tribal Assistance Grant Program known as STAG) was obtained and funded in the FY 09 appropriations to assist in this process.

2.0 General Description of the Work

The work effort under this grant included (1) the final design of a conveyance system that is common to all conveyance alternatives, and could provide a 'bridge' supply to Borrego Valley (BV) from an area known as Clark Lake and (2) a feasibility study of extending the conveyance system along either of two alignments to the east. One alignment would be along HWY 78 to the Allegretti Sub-basin, a potential water supply source and then further east to a reservoir in the Imperial Irrigation District's system. Another alignment to be studied would be along a power line easement from a large farming operation known as Allegretti Farms to the Imperial Irrigation District (IID) distribution system.

The work under this grant also included a preliminary evaluation of the Allegretti Sub-basin as a water source for BV and for water banking operation.

The work conducted under this grant is consistent with the water supply enhancement projects described in the District's Integrated Water Resources Management Plan (March, 2009)

The work plan can be found in Appendix A.

Beavertail Cactus in Bloom

3.0 Pipeline from Borrego Springs to Clark Lake Aquifer

One of the closest areas that may yield additional water supply to the Borrego Springs area is the area to the Northeast known as Clark Dry Lake. Water samples from the northern side of the lake show that the water quality of the area is suitable for drinking water, and well pumping rates are the subject of another possible grant to address the amount of water that is available. However, the first task is to delineate the best route to obtain the water through alternative routes to the north side of the lake, and perform preliminary designs of the selected route.

BWD and its Consultants initiated an aerial photogrammetric survey from Borrego Airport (nearest point of connection to the BWD distribution system) to the 240 acre site owned by BWD. BWD then laid out a pipeline routing along existing rights-of-way to a BWD owned parcel along S22.

A site survey was conducted and a pipeline design was prepared for 33,000 lineal feet of water transmission main. This included Plan and Profile Sheets. Additionally, a Record of Survey Map for the 240 acre parcel owned by BWD was documented.

To access the north side of Clark Lake, a topographic survey was conducted along approximately 29,000 lineal feet of existing dirt road from S22 to a District owned 5 acre parcel. Easements were identified along this route. Vertical and horizontal control surveying of this route was conducted and easement documents for lands traversed by the access/pipeline easement were prepared. Finally, a Record of Survey for the 5-acre property owned North of Clark Dry Lake was prepared.

The maps associated with this task are located in Appendix B.

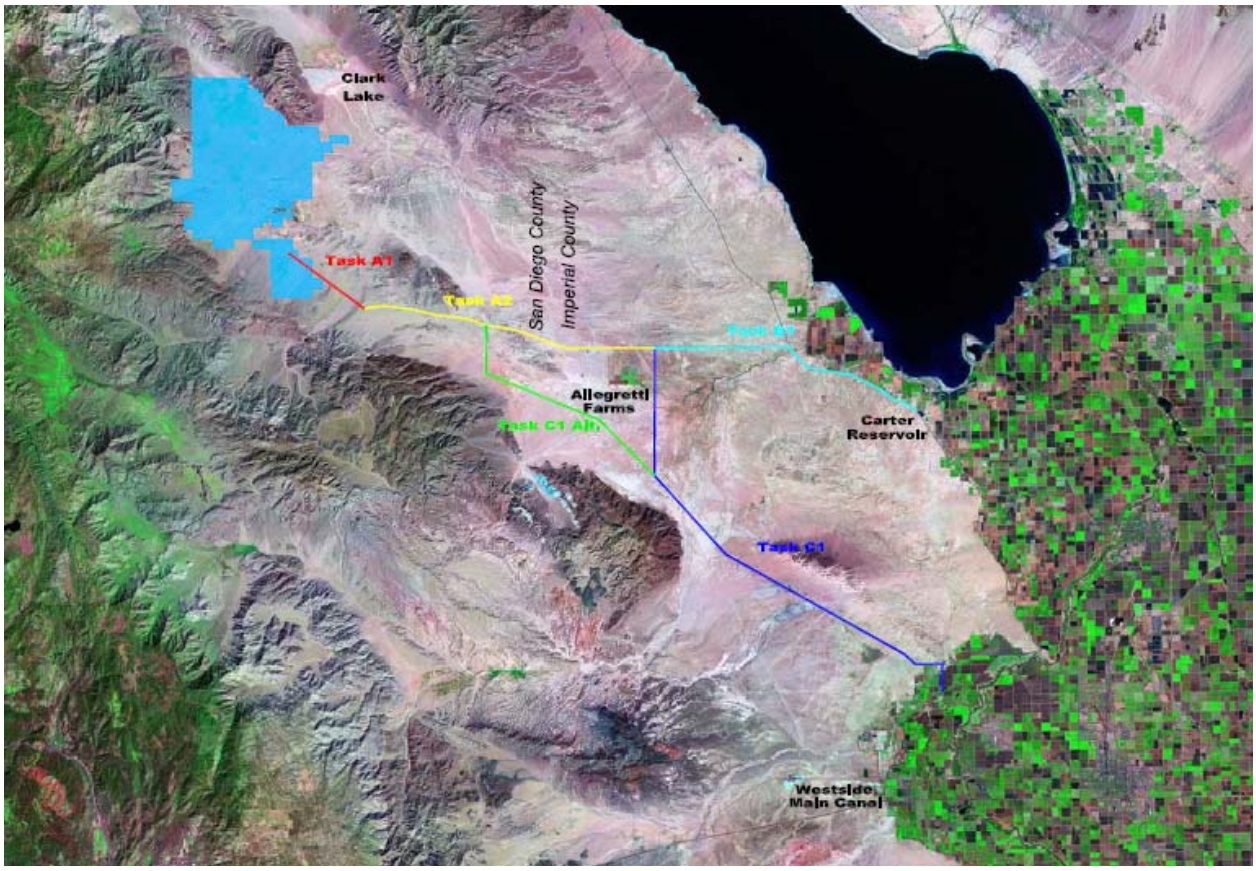
4.0 Pipeline Routes from BWD to IID

There are three general alignments investigated. Common to all of the alignments is an initial conveyance system from BV to HWY 78. This pipeline segment was designed, along with a grading plan for the terminal reservoir, under this effort. In addition, grading plans and pipeline design for the terminal reservoir have been completed, from the Rams Hill treatment plant along Borrego Springs Road to Highway 78.

This feasibility study considered several routings from BWD to IID. These are shown on Figure 1.

The red line shows the routing along Borrego Springs Road. All other routings begin at the intersection of Borrego Springs Road and SR 78. The yellow/blue route proceeds along SR 78, then travels south on SR 86 to IID's Carter Reservoir. The blue route proceeds along SR 78 and then turns south easterly of the Allegretti Farms to an existing IID power line and easement to the Westside Main Canal of IID. A variation of this routing is shown in green from Ocotillo Wells to the IID power line. This routing, i.e. the green segment was dropped from consideration in favor of a more direct and shorter route offered by the blue route.

Figure 1 Alternative Importation Pipeline Routes from Borrego to IID



Right-of-Way Permits

California Department of Transportation (Caltrans) was contacted concerning the procedure for obtaining encroachment permits for use of the area within their Right of Way (ROW). Regarding the pipeline routing along State Route 78, Caltrans has indicated that since the Borrego Water District is a public agency, BWD could apply for an encroachment permit to lay an underground pipeline along the two-lane highway right-of-way and that this right-of-way is wide enough to accommodate the installation.

The first step of the process is obtaining approved of the environmental document through the State clearinghouse. At that time, the environmental conditions will be identified. This step has not been done and will not be initiated until a route is selected and BWD decides to proceed with the pipeline.

Once the environmental document is approved, the project can apply to the planning division and begin the encroachment permit process. Plans and any special environmental provisions would be submitted.

At the time of construction, a double permit will be required, one from the contractor and one from the water district. Caltrans will then begin the construction inspection process.
The pipeline alignment section along SR 86 from the intersection of SR 78, south approximately eight miles to the Carter Reservoir, is a four-lane highway with a median strip in between the two directions of traffic. According to the Caltrans, the right-of-way is not wide enough to lay a pipeline along either side. Further, they do not permit utilities to be installed in between the lanes in the median strip. This information is considered a "fatal flaw" for a pipeline route from SR 78 to the Carter Reservoir and therefore this pipeline alternative route will be dropped from further consideration.
The report for this task can be found in Appendix C.

Conclusions:

- ROW encroachment permits can be obtained along SR 78 from Borrego Springs Road to easterly of Allegretti Farm.
- ROW encroachment permits in SR 86 cannot be obtained and thus that pipeline alignment is eliminated from further consideration.

Right of Way Easements and Property Ownership/ Borrego Springs Road SR 78 Intersection to IID Westside Main Canal

A contract was issued to Dynamic Engineering to prepare maps of Right of Way Easements and Property Ownership for the pipeline alternative along SR 78 and the IID power line to IID.

The Contractor researched and obtained the existing State Property ownership maps and public right-of-way (ROW) easements along the yellow and blue route (Figure 1) to the IID's Westside Main Canal

The Contractor investigated the existing utilities and identified any potential obstacles along this route. Maps were prepared using the County of San Diego GIS. A total of 36 maps (11"x17") at a scale of 1 inch = 500 feet and 1 inch = 1,000 feet) were prepared and submitted to BWD in September. The maps depicted the Anza Borrego Desert State Park and other public properties adjacent to the highway alignment, existing roadways, existing utilities, easements and ROW, major road intersections, bridges, stream and wash crossings. The maps also showed the proposed alignment of the pipeline along the public ROW adjacent to or within the transportation system. The total segment length in this pipeline routing is approximately 42 miles.

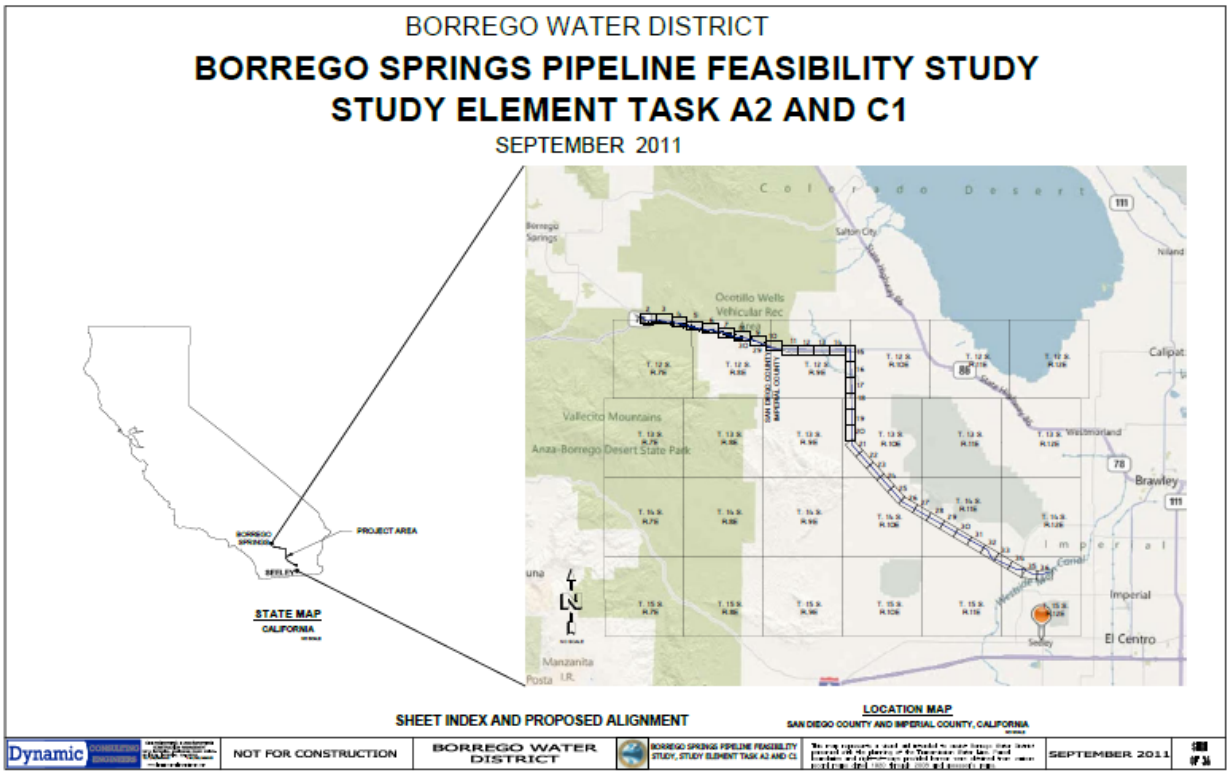
Also shown on the maps are the Anza Borrego Desert State Park and other public properties adjacent to the County of Imperial and IID easements, existing roadways, existing utilities, IID and County easements and ROW, major road intersections, any bridges and stream and wash crossings. The Contractor drove the alignment to physically locate any obstacles or potential problems. The maps were used in meetings with involved agencies as described later.

The Contractor submitted 36 sheets to BWD on 9/12/11. Only the cover sheet is shown below (Figure 2). *The full document can be found in Appendix D.*

Conclusions: A review of the maps leads to the following conclusions**:**

- Land parcels southeast of Allegretti on Fish Creek and continuing on the power line easement to the southeast may present difficult environmental obstacles that can only be addressed with more extensive evaluation.
- The route is clear according to a drive of the route.
- IID has the easement documents for the power line route.
- Most of the property is owned by BLM.

Figure 2 - Cover Sheet for Detailed ROW and Property Ownership Sheets



Picture along Pipeline Route, BLM Land, west of El Centro, CA

5.0 Environmental Issues

All State and Federal agencies have jurisdiction over lands traversed by the pipeline routings were contacted concerning their concerns. These are described in the following section of the report.

Additionally, The CEQA document was prepared for the State Clearing House but was not submitted. Upon further study and discussion with the EPA Project Officer, it was concluded that the document should not be submitted as this feasibility study and is not a construction project and no project is proposed at this time.

Anza-Borrego Desert State Park Issues

A meeting with this agency occurred on September 14, 2011. Agency attendees were Gail Sevrens, District Superintendent, Acting District Services Manager, Colorado Desert District, Jim Dice and Eric Hollenbeck of the California State Parks. The purpose was to discuss the possible environmental issues associated with the construction and operation of the Borrego Springs Importation Pipeline. Three areas of concern were identified and major concerns are indicated below. *(A memorandum report on the meeting is included in the appendix to this report – see Appendix E.)*

San Sebastian Marsh Area of Critical Environmental Concern (ACEC): Work performed in this area must adhere to the guidelines as outlined in the "Flat-tailed Horned Lizard Range wide Management Strategy", May 2003 revision.

West Mesa ACEC: Work performed in this area must adhere to the guidelines as outlined in the "Flat-tailed Horned Lizard Range wide Management Strategy", May 2003 revision.

San Felipe Creek Ecological Reserve: Issues such as construction dust control can be addressed in the environmental documents.

Additionally, paleontology sites have been located throughout the region and could be identified through geologic mapping. All know sites are located in specific rock types and are used a markers for potential areas of interest. Sites have been identified at various depths in the soil. One possible idea for mitigation from the park staff was to bury the power line at the same time with the pipelines. This issue would greatly increase the construction costs but could be addressed during the preliminary assessments with Imperial Irrigation District, the agency which owns and operates the power line.

California Department of Fish and Game (CDFG) Issues

A meeting was held on September 19, 2011, with the CDFG at which time they provided a map prepared from the California Natural Diversity Database (CNDDB). The map showed the potential sensitive plant/ animal resources that could occur within the proposed pipeline alignments. The map was not intended to capture everything; however it does provide those sensitive plant/animal occurrences on file with the CNDDB.

A review by staff in San Diego County, indicated that based the description of the project alignment and the scale provided in BWD pipeline map, staff did not feel that any portion of the pipeline alignment falls within lands managed by Region 5 and that there appears to be no potential impact on bighorn sheep from Region 5 perspective. Staff advised further contact with Region 6 (CDFG's Bermuda Dunes Office) since the alignment appears to cross some of the Department's land holdings (i.e., San Felipe Creek Ecological Reserve) covered by Region 6.

The CNDDB bubble map was superimposed upon the BWD pipeline map and is shown in the following Figure 3. The bubble map is very broad in scale, but gives general guidance on the potential sensitive species that could be encountered within the project area. Site-specific surveys that cover all plant/animal resources would be required at the time of any formal project submittal. Those surveys would obviously result in larger number of plant/animal observed than what is depicted on the map. All subsequent surveys should include the specific type(s) and amount of vegetation that would be directly impacted at the time of construction and proposed mitigation requirements under the California Environmental Quality Act.

Below is a list of plants/animals depicted on the CNDDB Map.

Plants

Brown Turbans (Malperia tenuis) http://sandiego.sierraclub.org/rareplants/158.html

Peirson's Pincushion (Chaenactis carphoclinia) http://sandiego.sierraclub.org/rareplants/052.html

Coves' Cassia (Senna covesii) http://sandiego.sierraclub.org/rareplants/222.html

Orcutt's Woody-aster (Xylorhiza orcuttii)

http://sandiego.sierraclub.org/rareplants/234.html

Animals

Supplemental information can be found on the department's wildlife species matrix link below:

Carlson's dune beetle (Anomala carlsoni)

Colorado Desert fringe-toed lizard (Uma notata)

Colorado Valley woodrat (Neotoma albigula venusta)

flat-tailed horned lizard (Phrynosoma mcallii)

leopard frog (Lithobates yavapaiensis)

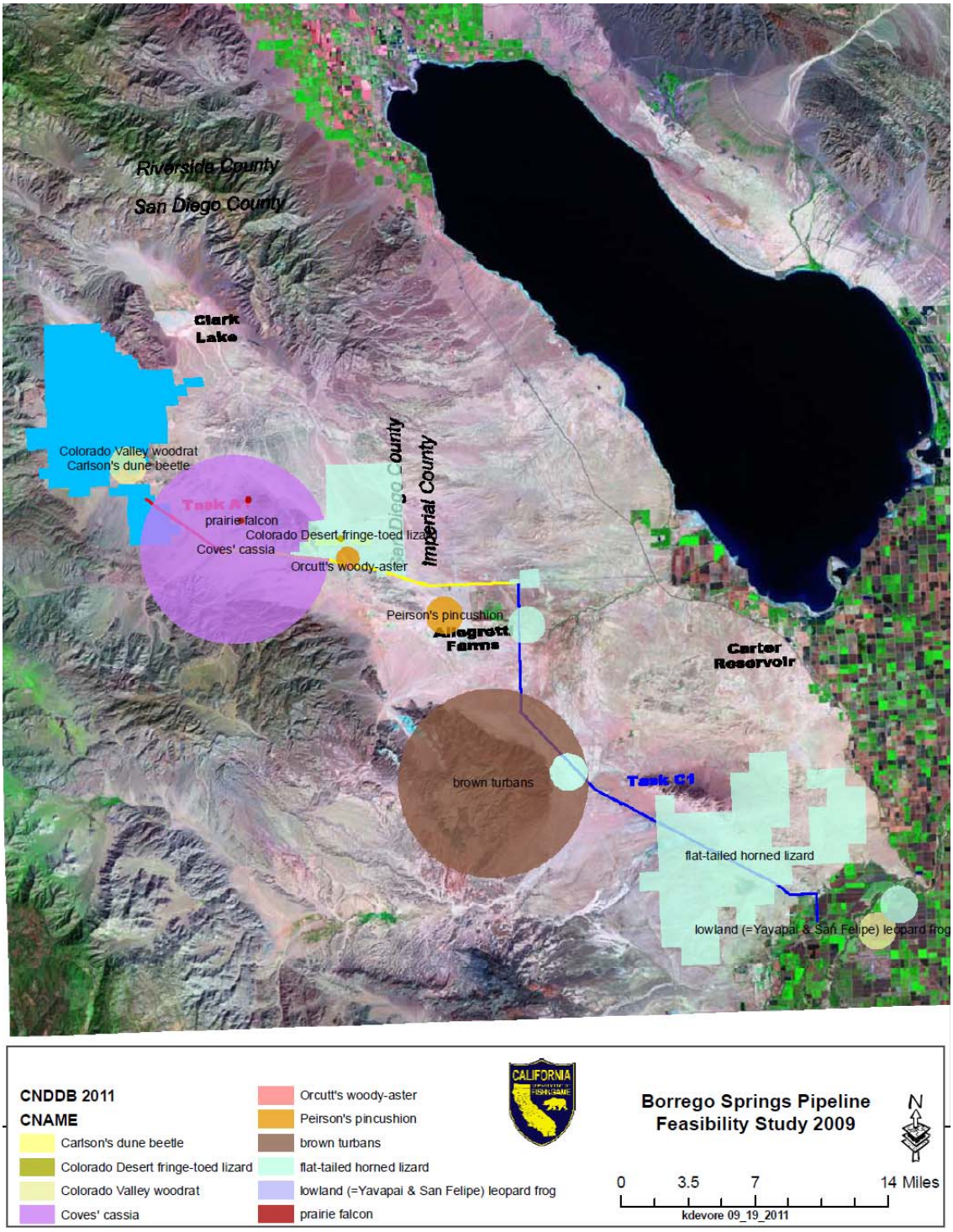
prairie falcon (Falco mexicanus)

Department of Fish and Game, Wildlife Species Matrix web link:

http://www.dfg.ca.gov/wildlife/WAP/matrix_results.asp?cnddb=cnddb&sc=1&se=1&fe=1&fep=1&ft=1&ftp=1&fd=1&fdp=1&iucn=1&blm=1&usfs=1&fws=1&cdf=1&dfg=CSC&fsc=1&xerces=1&other=1&checkall=on

Endangered Big Horn Sheep visiting a Borrego Springs Neighborhood

Figure 3 – Sensitive Plant/Animal Resources along the Pipeline Route



US Bureau of Land Management (BLM) Issues

A meeting with BLM held shortly after the close of this reporting period and included here for complete understanding of the issues from involved agencies, indicated the following:

- BLM can require a 1:6 compensation on lands disturbed. That would require the purchase of mitigation property six times larger than the area disturbed.
- Any lands that are used for military purposes must also be subject to military approval as well as the BLM.
- Archeological sites have also been located along the ancient Lake Cahuilla shoreline which corresponds to the 40' above sea level contour
- The proposed alignment crosses the San Felipe Wash which also poses environmental concerns from the endangered pupfish
- Flat-tailed horned lizard is being considered for endangered species status, which will greatly increase mitigation requirements.
- Biological and wildlife studies should begin in the early stages of the permitting process to allow for seasonal changes and to include periods of precipitation which may not be significant in certain years.
- At least two years of biological studies will be needed prior to finalizing the project.
- If the cultural survey discovers archeological sites, the pipeline will most likely be required to relocate to avoid the sites.
- There may be an Indian village along the eastern side of Allegretti Farms.
- Pipeline construction cannot hinder the free running of the off-roaders (this suggests summertime construction.)
- A 404 permit from the Corp of Engineers may be needed for crossing San Felipe Wash.
- A ‘Streambed Alteration’ permit is likely required on any stream crossing. California Fish & Game would be the issuing agency.

6.0 External Sources of Water Supply

Allegretti Sub Basin as a Source Water Supply

Description of the Allegretti Sub Basin

The Allegretti Sub-basin is located directly east and adjacent to the Salton Sea (Figure 4). The Sub-basin is situated within the Lower Borrego Valley and within Ocotillo Clark Valley (Ref. 1, basin 7-25) as defined by the California Department of Water Resources (DWR).

Boundaries of Sub Basin

DWR describes the Ocotillo Valley Ground Water Basin as a 410 square mile basin drained by San Felipe Creek. Based on the map in (Ref. 1) showing ground water basins within the Colorado Desert Hydrologic Study Area, the Ocotillo Valley Basin includes Lower Borrego Valley, both upstream and downstream of the Coyote Creek. The natural recharge is estimated at about 1,100 afy.

The Ocotillo Valley Ground Water Basin and its sub basins have not been clearly defined and data pertaining to the basin and sub basin boundaries are sparse.

The Allegretti sub basin has been defined (Ref. 6 - 8) generally as that area bounded on the southwest by the Ocotillo Badlands and the Coyote Creek fault, on the south by the Superstition Hills and the topographic divide between the Coyote Creek Fault and the Superstition Hills Fault, on the north by the San Felipe Hills Fault and the topographic divide between Tule Wash and San Felipe Creek, and on the east by the Salton Sea. For lack of a specific name designation, the ground water sub basin has been named the "Allegretti" sub basin.

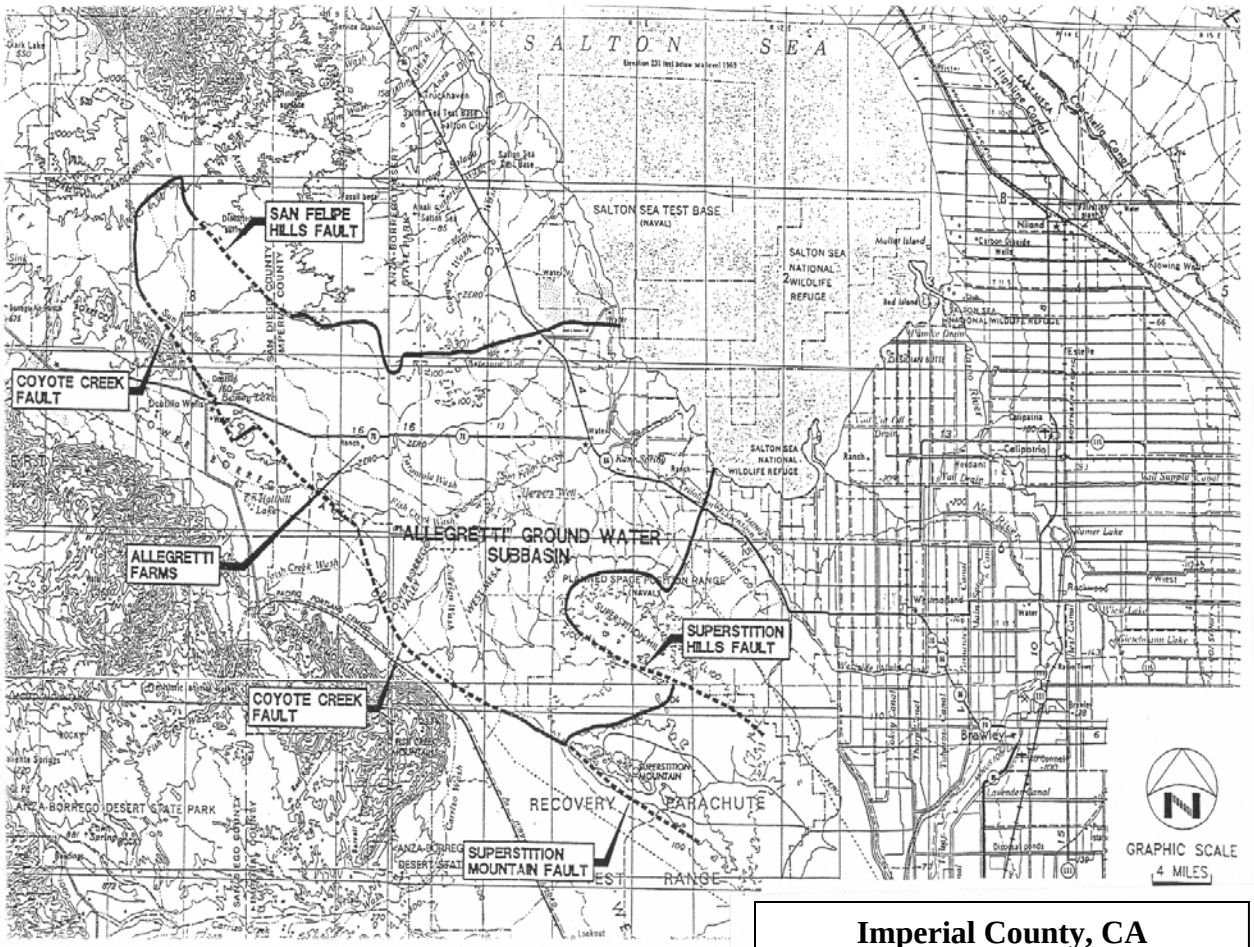


Figure 4 – Allegretti Sub-Basin

Hydrogeologic Data from Wells within the Sub Basin

Driller's well construction logs for several of the wells identified in this report are included in Appendix F.

A large farming operation, the Allegretti Farms (Farm), has developed within the sub basin a well field for its operation. Much of the data on the hydrology of the sub basin is derived from the Farm's and nearby wells. The locations of the Farm and nearby wells are shown on Figure 5. DWR and the U S Geological Survey (USGS) supplied data concerning water levels and water quality.

The Farm is located situated easterly of the Ocotillo Badlands and the northwest/southeast trending Coyote Creek Fault. The fault is northeasterly of Fish Creek Mountains and northerly of Superstition Hills.

The Coyote Creek fault appears to constitute a ground water barrier as evidenced by data contained USGS Water Resources Investigations (Ref. 10). The reports indicate ground water levels much higher, up to 100 feet, and water quality much better, 1/4th the TDS, west of Coyote Creek fault. The sub basin easterly of Coyote Creek fault, from which the Farm derives its water supply, constitutes the easterly portion of the Ocotillo Valley Ground Water Basin.

There are 13 wells within the immediate vicinity of the Farm, Allegretti Wells 1 through 7, the Jacobs abandoned domestic well within the Allegretti property and the Payne, Gann, Scholl, Steinruck, and Blu-In Park Wells west of Allegretti Farm. There are 5 wells east of Allegretti Farm, the USGS test wells (12S/11E - 18J1 and J2), Harper's Well (12S/10E – 26M), and the two Three Flags Ranch wells (12S/11E – 5 Q).

Jacobs Ranch or Ranch Oasis, the Farm predecessor, constructed the first two wells in 1953 and began farming in 1954. Jacobs Ranch constructed additional wells in 1961 (Wells 2 and 3) and in 1976 (Wells 4, 5, and 6). The Farm assumed ownership of the ranch in the early 1980's and constructed a small domestic well (Well 7) in 1982. Construction and pump discharge data pertaining to Allegretti Farm wells are shown in Table 1.

	TABLE 1 ALLEGRETTI FARMS WELL DATA							
	WELL NUMBER							
	1	2	3	4	5	6	7	SAN FELIPE
	(12S/9E-23D2)	(12S/9E-22A2)	(12S/9E-15Q)	(12S/9E-27A)	(12S/9E-23G)	(12S/9E-25D)	(12S/9E-23B)	(12S/9E-23D1)
Constructed (year)	1965	1960	1969	1976	1976	1976	1982	1953
Well Depth (feet)	675	667	1,200±	1000	1130	1000	400	580
Perforated Intervals (feet)	260-674	380-667		380-980	350-780, 930-1120	380-1000	340-400	250-565
Pump Discharge (gpm)	1,500	1,800	3,000	2,800	1,800	3,100	N/A	N/A

Water quality data for the Farm wells and nearby by wells are shown in Table 2. The available water quality record was considered sufficient to negate any further testing of the identified wells.

Area Immediately Southeast of Allegretti Farms Looking Towards Borrego Springs

Imperial County, CA

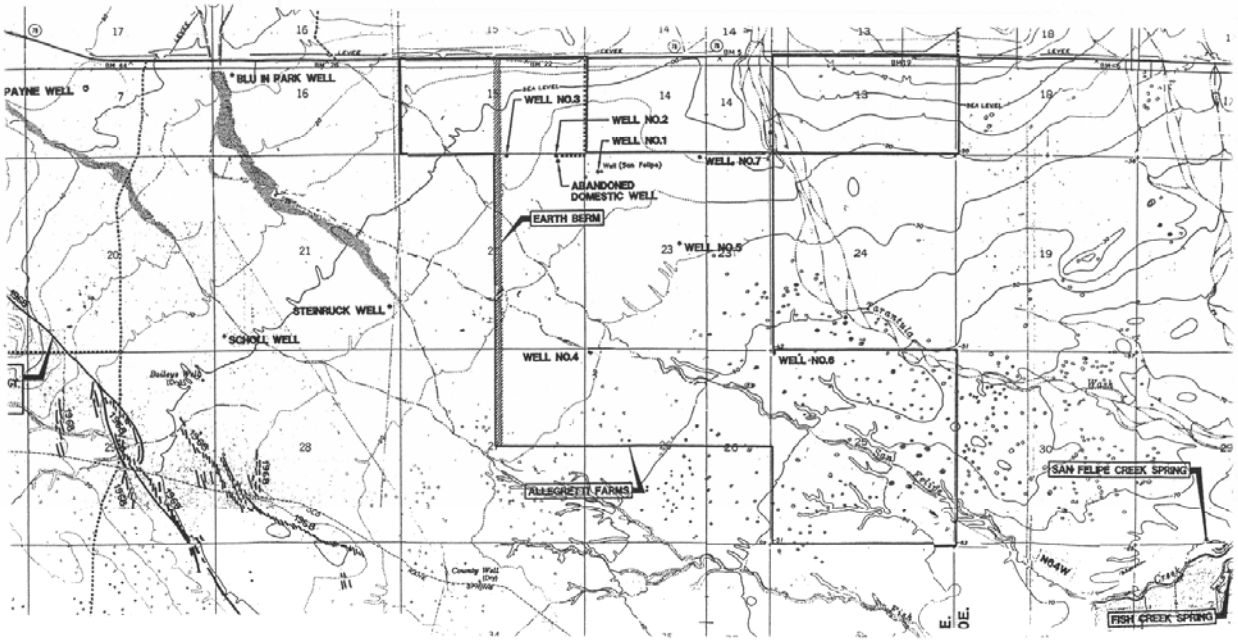


Figure 5 - Wells near the Allegretti Farms

Aquifers in the Sub Basin

A review of available well logs, construction information and well water quality suggest conclusively that there exists both a shallow and deep aquifer within the sub-basin. The USGS (Ref. 9) also substantiates this finding.

The USGS drilled two test wells in 1964 in Section 18 (12S/11E - J1 and J2). Well J1 (artesian), which was drilled to a depth of 958 feet, cased to a depth of 650 feet, and perforated from 310 to 650 feet, had a TDS of 1,420 mg/L. Well J2 (on the same site), which was drilled to a depth of 55 feet and was perforated from 35 to 55 feet, had a TDS of 8,420 mg/L. The USGS concluded that "at this locality the shallow water and deep artesian water evidently are separated by very poorly permeable deposits".

Shallow Aquifer: The Farm's existing wells extend through the shallow aquifer and the underlying aquitard and penetrate the deep aquifer; however, the original Jacobs Ranch domestic well, now abandoned, may have penetrated either aquifers or only the shallow aquifer. For the Jacobs Ranch domestic well, water level data is unavailable; however, water quality data (TDS 5,910 mg/L) indicates significant influence from the shallow aquifer. At least two (Scholl and Steinruck) of five wells situated westerly of the Farm, only penetrate or are only perforated within the shallow aquifer based on water level and water quality. Another well (Payne) penetrates and is perforated within both aquifers, but based on water level and water quality data, it derives its water supply from the deep aquifer. Well and water level data are not available for the Blu-In Park Well and the Gann Well, Gann's property being adjacent to the Payne property; however, a water quality analysis is available for the Blu-In Park well.

The static water levels measured (1995) in the Scholl Well in the southwest corner of Section 21 (12S/19E) and the Steinruck Well in the southeast comer of Section 21 were 91 and 77 feet below ground surface, respectively. The water levels are consistent with an easterly ground water gradient. The static water levels in the Farm's wells and the Payne Well to the west are about 100 feet deeper than the static water levels in the Scholl and Steinruck wells. This significant differential within a short distance appears to also indicate at least two distinct and separate aquifers, one shallow and one deep.

The water quality analyses for the Scholl Well and the Jacobs Ranch domestic well with TDS of 7,900 mg/L and 5,910 mg/L, respectively, indicate markedly higher concentrations than the Farm Wells, the Payne Well, and the Blu-In Park Well with TDS concentrations of 930 to 1,800 mg/L, 4,790 mg/L, and 1,630 mg/L, respectively. TDS concentrations of three to four times greater than the previously mentioned wells appears also confirm the existence of distinct and separate aquifers as indicated by water level differences.

Although water levels and water samples are available from the Scholl Well, the well log is not.

Higher TDS in the shallow aquifer is probably a direct result of residual salts precipitated interstitially with sediments by receding waters of Lake Cahuilla with salts being periodically leached from the soil into the shallow aquifer during infiltration and percolation of surface runoff. The shallow aquifer can be conceptualized as ground water on laterally continuous clay layers, which effectively isolate the lower, less saline aquifer from the higher TDS water above. Few drillers' logs are available to facilitate lateral extrapolation of clay beds, but the logs which are available are credible indicators of persistent clay strata in the subsurface.

Water Well in Clark Dry Lake

TABLE 2 WATER QUALTY DATA (mg/L)

Well	STATE WELL NUMBER	SAMPLE DATE	TOTAL DISSOLVED SOLIDS	Hardness	Sodium	Sulfate	Chloride
Allegretti Well No. 1	12S/9E-23D2	9/25/1962	1,650	530	381	388	628
		7/29/1963	1,740	534	409	425	645
		2/26/1965	1,687	488	380	393	574
		12/3/1969	1,724	492	387	--	568
		8/23/1991	1,673	--	370	405	630
		6/20/2002	1,400	390	360	350	500
		9/22/1995	1,790	510	390	630	61C
Allegretti Well No. 2	12S/9E-22A2	9/25/1962	1,580	486	372	388	578
		7/29/1963	1,560	442	383	400	55C
		8/15/1967	1,817	344	468	--	682
		12/3/1969	1,852	516	413	--	653
		4/18/1983	--	---	425	566	603
		8/23/1991	1,477	-	345	349	530
		9/22/1995	1,540	423	350	380	550
		6/20/2002	1,200	350	280	270	450
Allegretti Well No. 3	12S/9E-2281	8/29/1967	---	480	390	450	603
		12/2/1969	1,806	344	441	---	596
Allegretti Well No. 4	12S/9E-27A	8/29/1967	--	250	520	405	710
		4/18/1983		-	418	499	561
		11109184	---		320	310	485
		8/23/1991	1,553		355	391	528
		4/7/1993	1,548	--	370	380	54C
		9/22/1995	1,660	445	365	510	58C
Allegretti Well No. 6	12S/9E-25D	4/18/1983	---	---	258	345	348
		8/23/1991	1,243	---	258	256	490
		9/22/1995	1,200	350	256	280	500
Allegretti Well No. 7 (domestic)	128/9E-236	4/7/1982	880	217	232	240	312
		9/22/1995	930	198	245	230	410
Jacobs Abandoned Domestic Well	12S/9E-22AI	7/29/1963	5,910	1,880	1,360	1,850	2,000
Payne Well	12S/9E-17L	9/22/1995	1,790	451	455	520	800
Scholl Well	12S/19E-21N	9/22/1995	7,900	2,090	1,740	3,200	3,100
Blu-In Park Well	12S/19E-16M	9/22/1995	1,630	253	455	640	510
San Felipe Well	12S/9E-23D1	3/5/1955	1,840	602	439	412	724
San Felipe Spring		9/22/1995	14,800	3,460	3,900	5,800	5,000
Fish Creek Spring		8/21/1995	11,000	2,240	2,750	4,000	2,800
San Feiipe Creek @ Highway 86 (99)		8/21/1995	9,700	1,950	2,550	3,600	2,800

Surface Discharge of Shallow Aquifer Water to San Felipe and Fish Creek Springs

The shallow aquifer is an unconfined system. The ground water levels at the School and Steinruck wells when projected eastward, intersect the ground surface at approximately the same elevation as the springs in San Felipe and Fish Creeks in Section 32, (12S/9E).

Thus, it is reasonably certain that the spring's water emanates from the shallow aquifer.

Deep Aquifer

The deep aquifer is, according to well logs, at least partially confined. The paucity of well logs for local wells makes lateral correlation of confining clay layers difficult; however, the well logs that are available indicate persistent clay layers from 2 to approximately 200 feet below ground surface.

The Farm is the principal pumper from the deep aquifer. Westerly of the Farm, the Payne, Gann, and Blu-In Park are the only pumpers that depend on the deep aquifer and they produce small quantities of ground water for limited use, essentially dust control and landscape irrigation.

Easterly of the Farm, the Three Flags Ranch extracted ground water for irrigation purposes for a very short period of time after the property was developed in the mid-1980's. Its first ground water extraction well was constructed in 1982 and 1,000 to 1,200 acres of citrus crops were planted. Reportedly, Three Flags Ranch immediately discontinued use of the ground water in favor of Colorado River water from Imperial Irrigation District. Three Flags Ranch no longer pumps ground water from the deep aquifer, but it is allowing artesian surface water discharge.

The Farm (and its predecessors) began farming in 1954. From 1983 through 1996, excluding 1990, ground water production ranged from 3,250 afy to 6,050 af, averaging 4,400 afy during the last four years. During the 42 year period, ground water levels have declined but water quality has remained unchanged, particularly in Wells 1 through 4 where TDS has ranged between 1,500 mg/L and 1,850 mg/L. The TDS for Well 7 has ranged from 880 mg/L to 950 mg/L, about half the maximum TDS recorded in the deep aquifer and very similar to TDS in Harper's Well.

Harper's Well (12S/I0E-26M) constructed to a depth of 320 feet but perforation intervals are unknown. TDS was measured at 995 mg/L, 1,030 mg/L, and 1,030 mg/L in

1918, 1949, and 1962, respectively, indicating the well is perforated in the deep aquifer. TDS concentrations in Well 7 and Harper's Well indicate potentially better water quality in the upper levels of the deep aquifer, at least easterly of the Farm.

The Payne Well penetrates and is perforated within both the shallow and deep aquifers, indicating water extracted from the well would be a mixture of higher TDS water (shallow aquifer) and lower TDS water (deep aquifer); however, static water levels indicate water extracted from the well is water from the deep aquifer. An extraction blend of about 8% from the shallow aquifer (TDS 7,900 mg/L per Scholl Well) and about 92% from the upper levels of the deep aquifer (TDS 900 mg/L per Well 7) could account for TDS in the Payne Well being similar to TDS in the deeper Farm Wells.

The San Felipe Well, designated here as the USGS Monitoring Well, (12S/9E - 23D1) and located adjacent to Allegretti Well No. 1, was a producing well until the early 1960's, when the pumping unit was removed and it became a monitoring well. The USGS has monitored the well since 1953. Figure 6 shows the long term decline in water levels at the well.

Conclusion: The deep aquifer appears to contain groundwater suitable for most irrigation purposes but not for potable use.

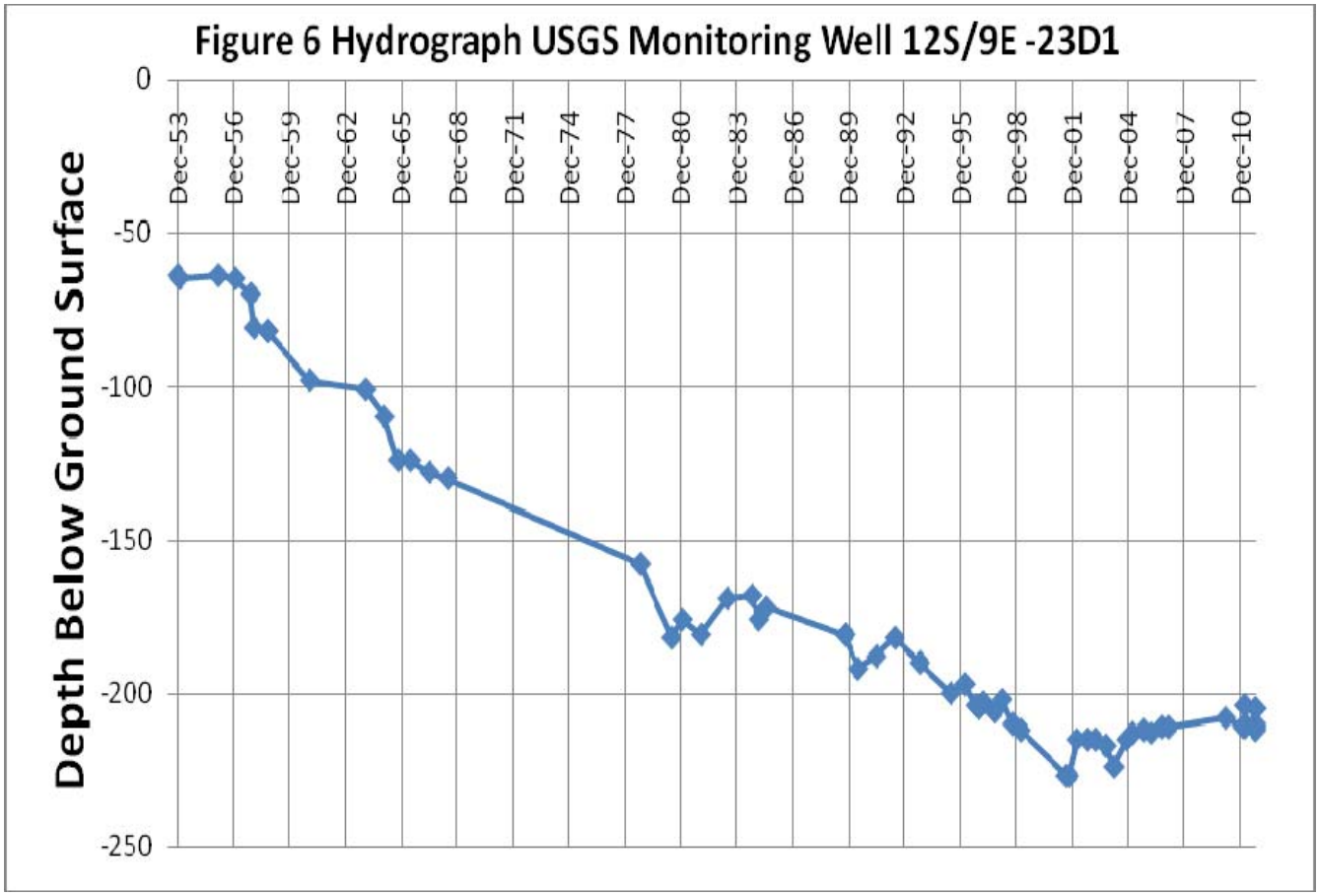
Groundwater Overdraft

2004 report (Ref. 11) using satellite information concluded that there was land subsidence at the Farm due to groundwater withdrawal. This, coupled with the long term decline in groundwater levels to about the year 2001, is evidence that the Allegretti Sub Basin was in a state of overdraft for many years. However, Figure 6 shows that the long term decline has been reversed and that water levels are slowly rising. This would indicate that the basin is no longer in overdraft.

It is uncertain why the reversal occurred, but a court decision in 2004 suggests that the Farm needed to redevelop one of their production wells but were denied that action. The following is a brief summary of the findings of the Appeals Court.

In 1994, Allegretti & Company, which owns 2,400 acres of land, filed an application for a conditional use permit to redrill an inoperable well. The well, one of several on the property, would provide water for crop production on 200 acres. Nearly three years later, the county approved the permit but with a condition limiting Allegretti’s draw of groundwater to 12,000

acre-feet per year from all wells on site." The court stated that although Allegretti has superior groundwater rights as an overlying user, those rights are restricted to reasonable beneficial use consistent with Article X, §2 of the state constitution. The court also said that Allegretti did not identify or challenge county's underlying reasons for the county's action, nor did it explain why county's limitation is in any way arbitrary and that as long as a governmental entity engages "in decision-making whose purpose is not delay for delay's sake but legitimate oversight," there is no compensable taking, the court concluded.



Storage Capacity

In 1970 a consulting firm (Ref. 5) defined the ground water basin from which Allegretti Farm derives its water supply as encompassing 150 square miles. The capacity was defined by assuming an average aquifer specific yield 20% and a thickness of 300 feet at 5,800,000 af.

Discharge to Salton Sea

Based on tests performed by the USGS, ground water discharge to the Salton Sea is estimated at about 2,240 afy (Ref. 9).

Water Banking Issues in the Sub Basin

For this analysis, it is assumed that the storage water for a water bank would be Colorado River Water (CR) with a TDS of approximately 700 mg/L, as CR water is the only available water in the region.

The development of a water bank in the Sub Basin would be difficult for several reasons. First is that surface recharge to the basin would store water in the shallow aquifer. This aquifer contains ambient water with high concentrations of salts (6,000 – 8,000 mg/L TDS). Recharge waters would gradually mix with the native waters producing water requiring substantial demineralization for the recovery phase of a water bank. Further, since it appears that the shallow aquifer is discharging to the San Felipe and Fish Creek springs, the recharged water would increase the eastward gradient toward the spring discharge and in time would be lost through increased spring discharge. The amount of increased discharge would be considered a loss of banked water thus diminishing the amount storage water available for recovery.

Since the deep aquifer is considered to be confined, the recharge of banking water must be by injection wells. Several issues must be considered: the injection pressure 'mound' at the injection well field could limit the injection amounts as higher deep aquifer water levels might cause upward leakage into the shallow aquifer. The upward seepage would reduce the amount of stored water. An injection mound would also increase the eastward gradient and accelerate the subsurface discharge to the Salton Sea. The amount of increased discharge would be considered a loss of banked water thus diminishing the amount storage water available for recovery.

Additionally, the extraction of the injected water would at some point would begin to extract a blend of the native deep groundwater (1,600 – 1,800 mg/l TDS) and to a level above the 700 mg/L concentration. This would limit the storage of bank storage water.

Further, recharge by injection would require that the water be treated to reduce the suspended solids levels to near zero in order to reduce well clogging. The treatment would be by microfiltration but would add an additional layer of expense to a water banking operation.

While the recharge of CR water would not be considered a discharge of a waste, the California Water Quality Control Board maintains authority over the discharge of any waters into the waters of the state, including ground waters. The Board's interest is in the 'non-degradation' of the ambient ground water. The recharge of CR water into the shallow or deep aquifers of the Allegretti Sub Basin having higher TDS concentrations than CR water therefore would not be problematic to the Board. However, the Board would need to consider and approve the project. A waste discharge requirement (WDR) permit would be issued by the Board.

One positive factor in developing a water bank in the sub basin is the low pumping lift that would be required to transport the bank water from the IID system to the Farm area. The IID West Side Main Canal is at an approximate elevation of 30 feet below sea level and the Allegretti Farms elevation is about 15 feet below sea level.

A major issue in any banking project is the location of the area that would beneficially use the recovered bank water. There must be sufficient beneficial use downstream from the point of entry of the banked water into the distribution system of the receiving agency. If there were insufficient demand for the water at the distribution system entry point, a pumping station and delivery pipeline would need to be constructed to deliver the water to some other location, but this would add additional costs to the banking program. No study has been made regarding this issue. However, as indicated earlier, the Allegretti Sub Basin is not an attractive location for a water bank.

Conclusion: While the Sub Basin is located near the IID water transmission system and the pumping lift from the IID system to the recharge area is small, the hydrogeologic nature of the sub basin has several major drawbacks: (1) the water quality of the shallow aquifer and its apparent hydraulic connection with the San Felipe and Fish Creek Springs would require the recharge water to be injected into the deep aquifer, (2) the quality of the deep aquifer is nearly 2 1/2 times saltier than the CR water, thus reducing the amount of recovery of the banked water

due to mixing with the native waters, (3) recharge by injection would require filtration of the injected water prior to injection and (4) the injection mound would likely cause upward leakage into the shallow aquifer as well as an increase in subsurface discharge into the Salton Sea.

For the above reasons, the Allegretti Sub Basin is considered a poor prospect for developing a water bank and is thus dropped from consideration.

Imperial County Groundwater Model

The County of Imperial contracted with a consulting firm in the 1990s to develop a numerical model of the groundwater resources in the county (Ref. 16). It is known as an Integrated Groundwater Surface Water Model (IGSM) and is finite element based. The 1995 model included a large portion of the sub-basin of interest. However, the IID staff conducting the storage and recover investigation described in Section 3.1 of this report, indicate that the model is not being used by IID to evaluate potential water banking projects. Further, their evaluation of the model is that it is basically a water balance model and not useful for storage and recovery analyses.

A verified model is a necessary tool to evaluate any water banking project. Unfortunately, the County model is not sufficiently detailed for such utilization in analyzing storage projects in the study area.

Imperial Irrigation District as a Source Water Source for Borrego Valley

Imperial Irrigation District's (IID) Storage and Recovery Investigation

In December of 2009, the IID announced the initiation of a water storage and recovery investigation to store surplus water in such times that their needs are less than their available supplies. These recharged supplies would be available for subsequent extracting and deliver into the system in years when their need exceeds their available supplies. With storage criteria established, the IID investigation proceeded to conduct a preliminary assessment of four groundwater recharge sites located in basins in or near their delivery system. Unfortunately, these sites did not include the Borrego Valley area or the Allegretti Sub-basin as neither site met the established criteria. The primary criteria included storage within IID's service area and at minimal cost.

The preliminary assessment of these four recharge sites was presented to the IID Board at a workshop on March 29, 2011. The assessment identified the opportunities and challenges of each site. The sites included East Mesa, Painted Canyon, Thomas Levy and Martinez Canyon.

The potential of recharge and groundwater storage (and water banking opportunities) of surplus Colorado River water in the Borrego Valley groundwater basin and the Allegretti Sub-basin have been presented to the management team at IID on numerous occasions (7/07, 8/08 and 1/10). Additionally, Mr. Jerry Rolwing informed the IID Board at the March meeting that the Bureau of Reclamation (BOR) was under an agreement to conduct a regional study of the water banking opportunities. Also, a citizen resident of Borrego Valley spoke in favor of including the Borrego Valley groundwater basin for further analysis.

Nonetheless, the IID did not agree to include Borrego or Allegretti for further study. They selected, for future study; the East Mesa site in Imperial County and the Painted Canyon site in Coachella Valley (Riverside County). Discussions with the IID staff indicated the following problems are associated with recharging the Borrego and Allegretti basins:

While their primary reason for not proceeding with the Borrego Basin was the lack of a pipeline to convey and recover the water they indicated that the cost to transport water to the Borrego basin is the major inhibitor. They cited an elevation difference of more than 700 feet between IID and Borrego and a distance of more than 30 miles. The cost of transportation was far more that IID considered acceptable, which is the range of $25 to $50 per af. (Preliminary estimated costs to import water into the Borrego area are about $425 per af, of which about $165/af is for energy – Ref. 12).

Groundwater Export Issues

The Allegretti sub-basin area is located within the Imperial County. The County has adopted a General Plan component which requires obtaining a license to export groundwater out of the County. Excerpts from the General Plan appear to generally prevent export of groundwater from the Imperial County, as indicated by the following sections:

> 92203.01 Exportation permit: Unless otherwise exempt, no groundwater shall be exported from the county or from the groundwater basin from which the groundwater is derived unless the operator of the exportation facility has applied for and obtained a

permit which establishes the quantity of groundwater which may be exported and the conditions on such exportation.

92203.02 Excess supply required for exportation : The commission shall not issue any permit to export water from the county or from the groundwater basin from which the groundwater is derived unless the applicant has established that there is an available supply in excess of the amount currently required for reasonable and beneficial uses within the county, and the commission determines that such export, if permitted, would not adversely affect the rights of groundwater users within the county or the groundwater basin from which the groundwater is derived. The commission shall issue permits for export for such time periods and under such other terms and conditions, including the right to reduce or suspend exports, as the commission determines appropriate.

Discussions with Imperial County will be necessary to determine if they would accept a water trade to allow for export of the water from the Allegretti Farm or some other form of compensation.

Wheeling Water through the Imperial Irrigation District System

Since the only imported water available in the region is CR water, it has been proposed that a connection to the IID system for a pipeline that would deliver CR water to the Borrego Valley be constructed. This proposed project is the subject of this study and has been conceptualized on several occasions. Routing of the pipeline to BV is discussed earlier in this report.

Conceptually, CR water is fully appropriated by several entities that have established long term rights to the CR water. Thus, in order to obtain an imported supply to BV, a contract for State Water Project (SWP) water must be obtained. That water would be exchanged through the MWD system into the CR for delivery through the IID system to some point of discharge to the proposed pipeline to BV. Thus, the conveyance of water from the CR through the All American Canal and the IID system must be evaluated for delivery capacity in those two conveyance systems.

Conceptually, the transmission of water through the All American Canal could be through the use of the capacity rights in that canal held by the City of San Diego.

The IID West Side Main Canal is the probable delivery system to an export pipeline to BV. The capacity of the canal, which has recently been increased, is 1,200 cfs.

Prior to this discussion, it should be realized that the quantity and rates of flow of water to BV are almost di minimis as compared to the flows of the IID and Coachella Valley Water District. For example, the IID water right on the CR is 3,100,000 afy.

Prior studies have estimated the need for imported water in BV at about 14,000 afy. (If this amount were delivered on continuous basis, the flow rate would be about 20 cfs.) This is the estimated current overdraft. The overdraft is considered stable in accordance with existing development restrictions.

Water Banking needs for water would be in addition to the overdraft correction amount. For example, a 100,000 af water bank would be developed over a series of years. Current thinking is that surplus waters in the SWP may occur in only 3 years in a 10 year period. Thus, the 100,000 af water bank would require roughly 33,000 af of delivery capacity in each of the three years. To this amount, the annual overdraft would need to be added bringing the total to about 50,000 af in a few years. If this were delivered on a continuous basis, the capacity flow rate would be about 70 cfs. Assuming that IID's delivery capacity during the height of the growing season might require their entire capacity, it is assumed that the BV deliveries would require about twice the 70 cfs during the irrigation off peak season. Thus, about 11% of the capacity of that canal would be need in those years. In other years, 7 of 10, the BV need would be only about 20 cfs.

While the required BV flows appear small relative to canal capacities, the IID has indicated that their system occasionally delivers at maximum rate in order to satisfy their customers and that a BV export would be treated as an additional customer, subject to the IID water delivery policies and regulations.

Conclusions: Negotiations with IID coupled with a thorough distribution system study, which should be conducted by IID, would needed in order to appropriately assess any capacity limitations and possible mitigation for the BV deliveries to occur. Appendix G.

IID Irrigation Return Flows

A potential source of water for the Borrego Valley might be the irrigation return flows emanating from the vast agricultural area of the Imperial Valley. These flows are subject to

water quality regulations of the Colorado River Basin Water Quality Control Board, Region 7 (Board). The regulations are designed to protect several Board designated beneficial uses, including Recreation 1 and 2 and Wildlife. Nonetheless, the chemical composition of these flows is typical of agricultural return flows and as such would require substantial treatment, including microfiltration, reverse osmosis and ultra-violet disinfection to meet direct drinking water standards or ground water recharge in the Borrego Valley. The water quality standards to meet the designated beneficial uses are contained in Ref. 14.

In order to obtain a right to reclaim this water, an appropriation permit would need to be obtained from the State Water Resources Control Board (State Board). These flows appear be subject to appropriation under the California Water Code, Section 1202:

> *The following are hereby declared to constitute unappropriated water:*
>
> *(a) All water which has never been appropriated and,*
>
> *(d) Water which having been appropriated or used flows back into a stream, lake or other body of water*.

Further, Section 1243 of that code states:

> *The use of water for recreation and preservation and enhancement of fish and wildlife resources is a beneficial use of water. In determining the amount of water available for appropriation for other beneficial uses, the board shall take into account, whenever it is in the public interest, the amounts of water required for recreation and the preservation and enhancement of fish and wildlife resources.*

And Section 1243.5 states:

> *In determining the amount of water available for appropriation, the board shall take into account, whenever it is in the public interest, the amounts of water needed to remain in the source for protection of beneficial uses, including any uses specified to be protected in any relevant water quality control plan established pursuant to Division 7 commencing with Section 13000) of this code.*

The return flows are an essential water supply component of the Salton Sea and are currently serving downstream beneficial uses. With Salton Sea water levels falling, it is very likely that any attempt to appropriate a portion of these return flows would be met with

opposition from several sources. The probable outcome would most likely be denial of the permit.

In the unlikely event that a permit were granted, as indicated earlier, a costly water treatment system would need to be constructed to convert the irrigation flow quality to meet drinking water standards. And, since the irrigation flow result from the application of irrigation water in the Imperial Valley, any modification to the irrigation practices, such as the development of on farm return flow recycle systems, would diminish the return flow quantities. In other words, a permit to appropriate the return flows, would not guarantee the continuation of those flows in the future. Appendix G contains a letter from U.S. Bureau of Reclamation.

Conclusion

Consequently, the prospect of obtaining Imperial Valley irrigation return flow as a potential source of water for Borrego Valley is dismissed from future consideration.

Brine Disposal

As indicated earlier in this report, the County requires a permit for ground water export and the demonstration that the proposed ground water export is in excess of the amount currently required for reasonable and beneficial uses within the county, and would not adversely affect the rights of ground water users within the county or the ground water basin from which the ground water is derived.

Figure 6, clearly indicate that the Sub Basin was in a state of overdraft until about 2001. The rise in water levels after that point appears to indicate that the basin is no longer in overdraft and that there is an excess above present needs in the basin. Such a statement is speculative and would need to be confirmed by other water level data.

However, if the Allegretti sub-basin is determined to be a feasible water supply source for BV, then a desalting facility would be needed to reduce the salinity of the deep aquifer water to meet direct potable use or for ground water recharge. It is assumed that the facility would be located on the Farm property. Thus, brine disposal alternatives would need to be developed and analyzed. The alternatives include discharge into an existing spring located east of the Farm, a pipeline from the desalting facility to the Salton Sea or the use of evaporation ponds.

Evaporation ponds would need to be double lined in order to protect ground waters. Even with the high evaporations rates in the area, evaporation ponds require large areas to be

effective. BWD's experience is that the requirement for double liners make this brine disposal alternative expensive as compared to surface discharge to nearby areas via a pipeline.

Discharge directly to the Salton Sea would require a 22 mile pipeline. A much closer discharge point would be to the San Felipe or Fish Creek Springs, a distance of about 4 miles from a desalting facility at the Farm. Table 2 includes water quality analyses at these two springs. TDS values, respectively, were 14,800 mg/L and 11,000 mg/L at these springs (sampled in 1995).

A desalting facility with an 85% recovery would produce a brine flow with a concentration (assuming an input concentration of 1,800 mg/L from the deep aquifer) of about 12,000 mg/L. Thus, the permeate quality would be compatible with the concentration of either spring water.

There are a number of environmental issues associated with a discharge to either spring. For example, the San Felipe Spring is the residence of an endangered fish, which is sensitive to chemicals that are or have been used in agricultural operations at the Farm. Since the deep aquifer appears to be confined, any agricultural chemicals that may have percolated through the soil would have been prevented from penetrating the deep aquifer by its' overlying aquitard. Further testing of the deep aquifer's water would be necessary.

Also, the permeate from the desalting facility is a waste discharge and as such is subject to permit requirements from the Colorado River Water Quality Board.

The above analysis assumes a water treatment facility located at the Farm. An alternative is the placement of the treatment facility in the BV. This would allow the deep aquifer well water to be transported and distributed with minimal treatment for landscape and recreation uses. Only the water intended for direct or indirect potable use would need the advanced treatment. The major drawback to this alternative would be the disposal of the brine flow. Costly evaporation ponds would appear to be the only reasonable disposal means. Further study of this issue would be need and is beyond the scope of this feasibility study.

Conclusions

- Brine disposal via evaporation ponds is probably cost-prohibitive.
- Brine disposal from a groundwater desalting facility could be economically accomplished by discharge to nearby streams, such as San Felipe Spring, but regulatory issues must be investigated further.

7.0 References

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8.0 List of Appendices

Appendix A - Work Plan outlines Task A-H

Appendix B - Task D1 Clark Dry Lake Pipeline Maps

Appendix C - Task A2 & B1 Report on meeting with Bureau of Land Management Staff

Appendix D - Task A1,A2,C1 & H2 Pipeline Route Maps to Imperial Irrigation District

Appendix E - Task E1 Report on meeting with Anza-Borrego Desert State park Staff

Appendix F - Task F1-12 Allegretti Report by Bill Mills

Appendix G - Task G1-5 Letter from U.S. Bureau of Reclamation on water supplies