

REQUEST FOR PROPOSALS

Design/Build/Operate Services for a Pilot Solar Evaporation Pond(s) Project

Salton Sea Authority
78-401 Highway 111, Suite T
La Quinta, CA 92253-2930

September 25, 2000

OVERVIEW

The Salton Sea Authority (Authority) and the Bureau of Reclamation (Reclamation) are undertaking efforts to improve conditions at the Salton Sea (Sea), California. Our restoration objectives are:

- Maintaining the Sea as a repository of agricultural drainage from the Imperial and Coachella Valleys
- Providing a safe, productive environment for resident and migratory birds and threatened and endangered species
- Restoring recreational uses
- Maintaining a viable sport fishery
- Providing opportunities for economic development along the shoreline

The Sea is located in the southeastern desert of California and spans Riverside and Imperial Counties. The Pilot Solar Evaporation Pond Project (the Project) will be constructed near the Niland Marina (now closed) on land leased by the Salton Sea Authority. The closest communities to the project area are Bombay Beach to the north and Niland to the south.

The Sea, having a surface elevation of approximately 227 feet below sea level, is situated in a closed basin. It is sustained by inflow of drainage waters from irrigated agriculture in both the Coachella Valley to the north and the Imperial Valley to the south and by river flows from Mexico, which consist mostly of agricultural drainage and some municipal and industrial wastewater.

The Authority is a regional agency. It was formed as a Joint Powers Agency by the Coachella Valley Water District, the Imperial Irrigation District, the County of Riverside and the County of Imperial. Additional information about the Sea and restoration efforts (including draft EIS/R) is provided at www.lc.usbr.gov.

The Authority is seeking services for two aspects of the solar evaporation pond work which are described in two separate Requests For Proposals (RFPs):

Design/build/operate pilot solar evaporation ponds

Solar evaporation pond consulting services for restoration planning

This document is the “Design/Build/Operate” RFP. The “Consulting Services” RFP can be found at the following website: www.lc.usbr.gov/~saltnsea/current_rfp.html. Proposals can be made on one or both of the RFPs.

Background & Goals

Recently, the Authority hired an engineering firm to conduct a technical review and fatal flaw analysis of the proposed Salton Sea restoration alternatives. One of their recommendations was to test salt/evaporation ponds at/around the Sea.

Additionally, the Authority's work program through an appropriation through the Environmental Protection Agency included an evaporation pond pilot project.

The primary goals for a system of salt test ponds are to:

- Establish the evaporation rate of various salinity brines vs. fresh water weather pan evaporation (see appendix B for work already conducted).
- Determine the annual growth rate of solid phase salt in a crystallizer (the final harvest/disposal pond(s)).
- Determine the bulk density of salt in a crystallizer.
- Get an initial idea of seepage rate in typical soil.
- Determine the salinity at which Salton Sea brine begins making solid phase salt.
- Determine bittern characteristics. This includes a) a study to pick the optimum point to remove bittern from the crystallizer, b) the chemical composition of bittern solids and their physical nature, and c) whether bittern will evaporate to dryness.

The secondary and associated goals include:

- Determine the ability to scale-up to a larger demonstration project and/or eventually to full salt extraction needs (4-10 million tons/year).
- Determine what biological organisms are supported by the ponds.
- Determine if the ponds attract wildlife and, if so, what impact the ponds have on wildlife.
- Determine if the salt that is harvested has any market or economic value.
- Determine disposal needs for the solid phase salt and the bittern.
- Determine if the ponds can serve as a surrogate for evaluating the impacts of receding shorelines at the Sea and the resultant impact that may have on air quality.

The Authority seeks a contractor to meet the primary goals of the project but welcomes proposals that propose strategies for meeting the secondary and associated goals.

The test ponds will be located within the footprint of the existing ponds, described below, at the now flooded and hence unused Niland Marina. It is envisioned that a series of ponds would be operated for one to two years. Precipitation data for Salton Sea water is provided in Appendix B. Soils data for the site is provided in Appendix C.

Site Location/Description

Figure 1: Site Location



Access to site

The project site is located between Bombay Beach and Niland along the south side of Highway 111 (see Figure 1). The site can be accessed by going south on Niland Boat Launch Road (located just north of the U.S. border patrol checkpoint on Hwy 111). After 1.7 miles there is a dirt road (360 yards in length) on the right hand side which leads to the proposed site.

Site description / current condition

The selected site contains two empty square ponds (roughly 8' deep) approximately 140' along each side. A 7' high chain link fence (good condition) encloses the ponds for a total area of 190' x 360' (1.6 acres). Presently there is no gate in place.

The existing ponds (Figures 2 and 3) were part of the sewage treatment system at the Niland Marina (operated by Imperial County) which operated from 1964 to 1976. The

effluent from two toilets and shower facilities was pumped up to these oxidation ponds. An intake system, pump station (Figure 5) and 4" PVC piping were once in place. Recent testing showed that the PVC line (1100' in length) from the ponds to the pump station is in good working condition with no evidence of leaks or blockages. The suction line from the pump station to the Sea could not be found and is assumed damaged due to shoreline erosion. The current estimated distance from the pump station to the Sea would be 300-500' depending on the route taken. It should be noted that the area southwest of the site has been subject to the Sea's encroachment and hence equipment travel over this soft surface may be challenging (Figure 4).

An Imperial Irrigation District weather station is located approximately 1 mile south southeast of the project location. This standard weather station has collected temperature, wind, humidity & evaporation data for decades. At present the station is visited weekly. All data will be available to the selected contractor.

Figures 2: Existing ponds



Figure 3: Existing ponds



Figure 4: Terrain toward the Sea



Note evidence of debris from previous flooding washed right up to the pond berm/fence. Land between the Sea and the ponds is saturated and difficult to travel over.

Figure 5: Defunct pump station



Project logistical needs

Proposers that do not possess construction capability are encouraged to contact local contractors in the area. There are several firms in the Coachella and Imperial Valleys that have experience in building irrigation ponds and other similar structures.

Salton Sea water supply

Proposers may utilize a number of options to supply water from the lake. The distance to the Sea is estimated at 1400 feet. Possible methods include: a) temporary piping/hoses to the Sea, b) utilize 1100' of existing piping described above and run new suction/supply lines to the Sea, c) transport water by tanker truck and store/dispense from on-site tanks and d) other means to be developed by proposers. Note that direct access to the Sea along Niland Boat Launch Road is blocked in a short section due to flooding/silting. Road buildup in this 200' section (Figure 6) will likely be necessary.

Figure 6: Flooded portion of Niland Boat Launch Road taken from the shoreline (firm ground)



Power supply

Power lines exist along the Niland Marina Road but at present are not in service. If the lines/poles are in working order (appear to be in excellent condition), the estimated cost to provide power to the existing pond site (per IID Power Dept – the area’s provider) is \$22,000. The Contractor can choose to utilize this source of power and budget accordingly with an allowance for usage charges, or provide power by other means such as a generator/solar battery system.

It is uncertain whether power could be supplied to the shoreline area (e.g. for pumping) due to the saturated soil conditions and the proneness to flooding.

Other

Provide office trailer, bottled water, latrines, outdoor lighting as necessary. Also the site needs to be secured.

Meteorological station

The contractor may utilize the existing station described above or propose the construction and installation of an on-site station if deemed necessary or desirable.

Site selection

The 1.6 acre fenced site was chosen for its: representative soil conditions, proximity to the potential full scale ponds, and disturbed nature which will simplify the environmental permitting requirements. As well, the site is owned by a member agency which has provided the property to the Authority.

If the selected site does not your program requirements, the Authority encourages submittal of a proposal with your land needs clearly stated. Alternative sites may be available but will likely be subject to more comprehensive environmental review.

Permitting Considerations

It is anticipated that proposals which: a) utilize the existing enclosed pond area, b) require only minimal road repair/build up and c) employ temporary piping or water trucks for Salton Sea water input would be categorically exempt under the California Environmental Quality Act and hence only a 30 day review period would be needed. Proposals requiring a larger footprint or permanent intake structures would likely be subject to a review/permitting process in excess of 90 days.

It is likely that a Report of Waste Discharge will be submitted to the Regional Water Quality Control Board. However, a Waste Discharge Permit may not be necessary. The description of the project for this report will be prepared by the contractor.

This pilot project will provide invaluable information to the restoration effort and therefore designed to produce results in the shortest feasible timeframe.

Site Visit

The site is presently open to public access and therefore can visited at any time. Caution should be taken when approaching the shoreline areas due to the soft ground conditions.

There will be a site visit planned for [Wednesday, October 4th at 10AM](#) (call Rob Renke at the Salton Sea Authority 760 564-4888 to confirm). Authority staff will be on hand to answer specific questions. Questions received and answers provided will be posted at www.lc.usbr.gov/~saltnsea/current_rfp.html.

Proposal Requirements

The proposal shall include the following:

- 1) Introduction/Overview
Introducing the team and its members' qualifications and roles
- 2) Approach
Identify your approach to the project including any innovative design, construction or operation strategies. Describe the number, size and configuration of ponds you propose. Describe the data that will be generated and the frequency and form that it will be reported.
- 3) Schedule
Provide a GANTT chart or equivalent to describe the estimated elapsed time to design the project, to complete construction, and to complete operation.
- 4) Budget
Provide a lump-sum cost as well as breakdown per the following table:

Cost Breakdown		
Item	Description	Amount
1	Design Ponds and Pumping Systems and On-Site Electrical (also include preparation of project description for permitting purposes)	
2	Construct Ponds, Pumping Systems, Feedwater System & On-Site Electrical	
3	Operate Facility	
4	Data Collection Systems & Reporting	
5	Furnish & Install Office Trailer, Bottled Water & Latrines, as necessary	
6	Other costs, if needed	

- 5) California Registered Civil Engineer
Provide the name(s) of the project engineer(s) (required to be registered in California).
- 6) Non-Collusion Affidavit
Provide a non-collusion affidavit in a form provided by the Authority (see Appendix A).

The proposal should not include extraneous promotional materials. Such materials can be included as an Appendix.

Proposals will be accepted no later than 5:00 p.m. (P.S.T.) on [October 26th](#), 2000. They should be addressed to:

Tom Kirk
Executive Director
Salton Sea Authority
78-401 Highway 111, Suite T
La Quinta, CA 92253

Submit seven, unbound, proposals. Proposals will be evaluated with respect to: team experience/qualifications, quality of the proposal, innovation, cost/value, and elapsed time to design/construct.

Funding for this work program comes from a grant issued through the U.S. Environmental Protection Agency. The Authority encourages small, minority and women-owned businesses to submit proposals.

The Authority reserves the right to reject any or all proposals, to waive any informality or irregularity in any proposal received, and to be the sole judge of the merits of the respective proposals received. The Authority is not required to award a contract based on the lowest cost proposal. The award will be made, if at all, based upon the best interests of the restoration project.

Questions may be directed in writing to Rob Renke at rrenke@salton-sea.dst.ca.us or via fax to (760) 564-5288. Questions and any responses will be posted at www.lc.usbr.gov/~saltnsea/current_rfp.html.

The Contractor will be expected to sign the Authority's standard Design-Build Agreement Form and associated contract documents. The RFP does not contain the contract documents. However, some of the key contractual provisions which may impact your proposed budget are outlined in the section below.

Legal Requirements

The following is a summary of legal requirements which may impact your proposal and budget:

- 1. Buy American** (Section 31.36(c)(5) of 40 C.F.R. 31)
In accordance with Section 215 of the Clean Water Act (33 U.S.C. 1251 *et seq.*) and implementing EPA regulations, the Contractor agrees that preference will be given to domestic construction materials by the contractor, subcontractors, material suppliers and other suppliers in the performance of this contract.
- 2. Prevailing Wages**

Proposers are advised that this Contract is a public work for purposes of the California Labor Code, which requires payment of prevailing wages. The successful proposer must comply with applicable provisions of state law.

3. Substitution for Retentions

Proposers are advised that if awarded this Contract they will be permitted, at their request and expense and in accordance with Section 22300 of the California Public Contract Code, to substitute securities equivalent to monies withheld by the Authority to ensure performance under the Contract.

4. Performance and Payment Bonds

The successful proposer will be required to furnish, prior to the award of the Contract, a Performance Bond and a Payment (Material and Labor) Bond, each in an amount equal to one hundred percent (100%) of the Contract Price (as provided in the Agreement Form). Only bonds executed by admitted Surety insurers, as defined in Code of Civil Procedure § 995.120, with a current A.M. Best's rating no less than A:VIII and satisfactory to the Authority shall be accepted.

5. Liquidated Damages.

Pursuant to Government Code Section 53069.85, Contractor shall pay to the Authority, as fixed and liquidated damages, the sum of **\$100** for each and every calendar day of delay beyond the established facility start-up date established pursuant to the Contract. Liquidated damages may be deducted from any payments or other funds owing to contractor, including progress payments, the final payment and retentions. There is no early completion bonus.

6. Insurance.

Coverage & Limits: Coverage shall have limits and be at least as broad as the latest version of the following: **General Liability.** Insurance Services Office Commercial General Liability coverage (occurrence form CG 0001). \$1,000,000 per occurrence for bodily injury, personal injury and property damage. If Commercial General Liability Insurance or other form with a general aggregate limit is used, either the general aggregate limit shall apply separately to this project/location or the general aggregate limit shall be twice the required occurrence limit.

Automobile Liability. Insurance Services Office Business Auto Coverage form number CA 0001, code 1 (any auto). \$1,000,000 per accident for bodily injury and property damage.

Workers' Compensation and Employers' Liability. Workers' Compensation insurance as required by the State of California and Employer's Liability Insurance. Workers' compensation limits as required by the Labor Code of the State of California. Employers Liability limits of \$1,000,000 per accident for bodily injury or disease.

Insurance Endorsements: The insurance policies shall contain the following provisions, or Contractor shall provide endorsements on forms supplied or approved by the Authority to add the following provisions to the insurance policies: **General Liability.** (1) The Authority, the Imperial Irrigation District and Imperial County and its officials, officers, employees, agents and volunteers shall be covered as additional insureds with respect to the Work or operations performed by or on behalf of the Contractor, including materials, parts or equipment furnished in connection with such Work; and (2) the insurance coverage shall be primary insurance as respects the Authority, Imperial Irrigation District and Imperial County and their officials, officers, employees, agents and volunteers, or if excess, shall stand in an unbroken chain of coverage excess of the Contractor's scheduled underlying coverage. Any insurance or self-insurance maintained by the Authority or its officials, officers, employees, agents or volunteers shall be excess of the Contractor's insurance and shall not be called upon to contribute with it in any way. **Automobile Liability.** (1) The Authority, Imperial Irrigation District and Imperial County and their officials, officers, employees, agents and volunteers shall be covered as additional insureds with respect to the operation, maintenance, use, loading or unloading of any auto owned, leased, hired or borrowed by the Contractor or for which the Contractor is responsible; and (2) the insurance coverage shall

be primary insurance as respects the Authority, Imperial Irrigation District and Imperial County and their officials, officers, employees, agents and volunteers, or if excess, shall stand in an unbroken chain of coverage excess of the Contractor's scheduled underlying coverage. Any insurance or self-insurance maintained by the Authority or its officials, officers, employees, agents and volunteers shall be excess of the Contractor's insurance and shall not be called upon to contribute with it in any way. **Workers' Compensation and Employers Liability Coverage.** The insurer shall agree to waive all rights of subrogation against the Authority and its officials, officers, employees, agents and volunteers for losses paid under the terms of the insurance policy which arise from work performed by the Contractor. **All Coverages.** Each insurance policy required by this Contract shall be endorsed to state that: (1) coverage shall not be canceled, materially changed or reduced in amount except after thirty (30) days prior written notice by certified mail, return receipt requested, has been given to the Authority ; and (2) any failure to comply with reporting or other provisions of the policies, including breaches of warranties, shall not affect coverage provided to the Authority or its officials, officers, employees, agents and volunteers.

Separation of Insureds; No Special Limitations: All insurance required by this Section shall contain standard separation of insureds provisions. In addition, such insurance shall not contain any special limitations on the scope of protection afforded to the Authority, Imperial Irrigation District, Imperial County or their officials, officers, employees, agents and volunteers.

Professional Liability Insurance: All architects, engineers, consultants or design professionals retained or used by Contractor shall also procure and maintain, for a period of one (1) year following completion of the Contract, errors and omissions liability insurance with a limit of not less than \$1,000,000 per claim. This insurance shall be endorsed to include all contractual liability.

Acceptability of Insurers: Insurance is to be placed with insurers with a current A.M. Best's rating no less than A:VIII, licensed to do business in California, and satisfactory to the Authority .

Verification of Coverage: Contractor shall furnish Authority with original certificates of insurance and endorsements effecting coverage required by this Contract. The Authority reserves the right to require complete, certified copies of all required insurance policies, at any time.

Subcontractors: All subcontractors shall meet the same insurance requirements. In addition, Contractor shall include all Subcontractors as insureds under its policies or shall furnish separate certificates and endorsements for each Subcontractor.

7. Work Product.

All Project Documents, as defined in the Agreement Form Modification, shall be and remain the property of the Authority. Although the official copyright in all Project Documents shall remain with the Contractor or other applicable subcontractors or consultants, the Project Documents shall be the property of Authority, whether or not the work for which they were made is executed or completed. Contractor grants to Authority the right to use and reuse all or part of the Project Documents, at Authority's sole discretion with no additional compensation to Contractor, for the construction of all or part of this Project. Authority shall be able to use or reuse the Project Documents for their intended purposes or to otherwise complete this Project, if necessary, without risk of liability to the Authority. However, any use or reuse by Authority of the Project Documents on any project other than this Project, without employing the services of Contractor, shall be at Authority's own risk. Contractor shall be responsible and liable for its Project Documents, pursuant to the terms of this Contract, only with respect to the condition of the Project Documents at the time they are provided to the Authority upon completion, suspension, abandonment or termination of the Contract. Contractor shall not be responsible or liable for any revisions to the Project Documents made by any party other than Contractor, a party for whom

the Contractor is legally responsible or liable, or anyone approved by the Contractor. The Contract creates a non-exclusive and perpetual license for Authority to copy, use, modify or reuse any and all Project Documents and any intellectual property rights therein. All Project Documents, either created by or provided to Contractor in connection with the performance of this Contract, shall be held confidential by Contractor to the extent they are not subject to disclosure pursuant to the Public Records Act or other applicable law. All Project Documents shall not, without the written consent of Authority, be used or reproduced by Contractor for any purposes other than the performance of this Contract.

Appendix A: Non-Collusion Affidavit

In accordance with Title 23 United States Code Section 112 and California Public Contract Code 7106, the proposer declares that the proposal is not made in the interest of, or on behalf of, any undisclosed person, partnership, company, association, organization, or corporation; that the proposal is genuine and not collusive or sham; that the proposer has not directly or indirectly induced or solicited any other proposer to put in a false or sham proposal, and has not directly or indirectly colluded, conspired, connived, or agreed with any proposer or anyone else to put in a sham proposal, or that anyone shall refrain from submitting a proposal; that the proposer has not in any manner, directly or indirectly, sought by agreement, communication, or conference with anyone to fix the proposal price of the proposer or any other proposer, or communication, or conference with anyone to fix the proposal price, or of that of any other proposer, or to secure any advantage against the public body awarding the contract of anyone interested in the proposed contract; that all statements contained in the proposal are true; and, further, that the proposer has not, directly or indirectly, submitted his or her proposal price or any breakdown thereof, or the contents thereof, or divulged information or data relative thereto, or paid, and will not pay, any fee to any corporation, partnership, company association, organization, proposal/bid depository, or to any member or agent thereof to effectuate a collusive or sham proposal.

Signature

Typed or Printed Name

Subscribed and sworn before me
This ____ day of _____, 2000

Notary Public in and for
the State of California

Appendix B: Precipitation Data

SALT PRECIPITANT ANALYSIS

Date Reported: 12/21/99

<u>Constituent</u>	<u>Result</u>	<u>Method</u>	<u>RL</u>
Calcium	0.42%	EPA 6010	0.01
Magnesium	2.50%	EPA 6010	0.01
Sodium	25.00%	EPA 6010	0.01
Potassium	0.49%	EPA 6010	0.01
Total Alkalinity	180.00mg/kg	SM 2320 B	20.00
Hydroxide	NDmg/kg	SM 2320 B	20.00
Carbonate	91.00mg/kg	SM 2320 B	20.00
Bicarbonate	NDmg/kg	SM 2320 B	20.00
Sulfate	15.60%	EPA 9056	0.05
Chloride	37.00%	EPA 9056	0.05
Nitrate-Nitrogen	ND%	EPA 9056	0.05
Total Organic Carbon	0.12%	SM 5310 B	0.10
Lithium	62.00mg/kg	EPA 6010	10.00
Strontium	170.00mg/kg	EPA 6010	10.00
Antimony	NDmg/L	EPA 6010	0.50
Arsenic	NDmg/L	EPA 6010	0.50
Barium	NDmg/L	EPA 6010	0.50
Beryllium	NDmg/L	EPA 6010	0.50
Cadmium	NDmg/L	EPA 6010	0.50
Hexavalent Chromium	NDmg/L	EPA 7196	0.50
Total Chromium	NDmg/L	EPA 6010	0.50
Cobalt	NDmg/L	EPA 6010	0.50
Copper	NDmg/L	EPA 6010	0.50
Lead	NDmg/L	EPA 6010	0.50
Molybdenum	NDmg/L	EPA 6010	0.50
Nickel	NDmg/L	EPA 6010	0.50
Selenium	NDmg/L	EPA 6010	0.50
Silver	NDmg/L	EPA 6010	0.50
Thallium	NDmg/L	EPA 6010	0.50
Vanadium	NDmg/L	EPA 6010	0.50
Zinc	NDmg/L	EPA 6010	0.50
Arsenic	0.20mg/L	EPA 6020	0.10
Barium	NDmg/L	EPA 6020	0.10

Cadmium	NDmg/L	EPA 6020	0.05
Total Chromium	NDmg/L	EPA 6020	0.10
Lead	NDmg/L	EPA 6020	0.10
Mercury	NDmg/L	EPA 6020	0.01
Selenium	0.57mg/L	EPA 6020	0.05
Silver	NDmg/L	EPA 6020	0.10

Notes:

ND = None Detected at RL (Reporting Limit). RL units same as result.

Reports reported on as received basis.

Analysis performed on CA WET extract (Title 22 sec. 66261APXII)

Analysis performed on TCLP extract (EPA Method 1311).

The Bureau of Reclamation is in the process of completing a series (based on different temperatures) of evaporation/precipitant experiments. If the results are available prior to the close of this RFP, the findings will be posted at www.lc.usbr.gov/~saltsea/current_rfp.html. Proposers are encouraged to check the website periodically for this information and any questions and answers.

Appendix C: Soils Report

ENGINEERING GEOLOGIC DATA- INPUT FOR DESIGN SOLAR EVAPORATION PONDS FRINK ROAD, ADJACENT TO THE SALTON SEA

Provided by the U.S. Bureau of Reclamation

Physiographic description from August 10, 2000 site inspection

The existing ponds are contained within a rectangular area of about 180 by 340 feet. The long dimension of the ponds is oriented about 275 degrees azimuth. This is five degrees north of due west. There are two main ponds that divide the pond area about in the middle of the long dimension of the area for the ponds. There are two smaller ponds, one in each of the main ponds. These smaller ponds are joined at the south corners of the ponds where the larger ponds are joined.

The ground surface area at the existing ponds is essentially flat with a very slight dip toward the west and the Salton Sea. Drainages or small arroyos in the project area are typically less than one foot deep. The arroyo about 100 feet east of the existing ponds is about 18 inches deep.

The embankment from the ponds was constructed from local material obtained from within the area of the ponds. There is no surface evidence of the material being borrowed from outside of the area of the ponds. From the ground surface outside the ponds, the embankment is about 3.0 to 3.5 feet high. From within the ponds the embankment is about 6 foot high in the east main pond and about 7 feet high in the west main pond.

Within the embankment for the pond, there are pipes, with associated valve structure, and concrete for regulating the oxidation wastewater treatment system. Indented in the concrete is a date of 1979.

General geologic conditions of the proposed IID solar ponds area

The existing IID ponds are founded in late Quaternary-age Lake Cahuilla (lakebed) deposits. The lakebed deposits consist of alternating beds of fat clay, lean clay, silt and sand that slope gently toward the Salton Sea. Radiocarbon age dating of the last main stages of the prehistoric Lake Cahuilla is well documented and indicates the lake to have existed until about 1500 years ago. The most recent major hydrologic event was a series of uncontrolled inflow of floodwater of the Colorado River into the Salton Trough during 1905 to 1907. This formed the present day Salton Sea. As the Colorado River water flowed into the Salton basin, the water became saline by mixing with the constituents in the dry salt flat and lakebed deposits.

U. S. Department of Agriculture soil description of the proposed IID solar ponds area

The Soil Conservation Service Soil Survey mapped the surface deposits of the lakebed deposits at the proposed IID solar pond area as Imperial silty clay, saline. Most of the areas within this soil are idle. The Imperial soil in the proposed project area is strongly saline and extremely difficult to reclaim because of the present technology being slow and expensive. Reclamation requires closely spaced tile drains and long periods of leaching. Even then, this soil has to be handled with special care to prevent resalinization. The survey describes the plasticity of the Imperial soil; "Alfalfa stands are difficult to maintain because of temporary anaerobic conditions after irrigation and heaving of the taproot from the soil's shrink-well action. The soil is sticky and difficult to remove from carrots and onions." Also, the soil survey describes the Imperial soil as containing the clay mineral "montmorillonitic (calcareous)."

Engineering geologic conditions from the August 10, 2000 site inspection

The existing ponds are founded within clay of the lakebed deposits that are also referred to as Imperial soil in the proposed project area. Two hand auger holes were completed. One hand auger hole HAH-1-IIDSEP was completed in the middle of the east main pond. Hand auger hole HAH-2-IIDSEP was completed about 75 feet south of the gate valve that is in the middle and the southern portion of the pond embankment. The soil samples from the hand auger holes were field classified according to the Unified Soils Classification System.

HAH-1-IIDSEP

0.0 to 1.0 foot- FAT CLAY (CH); About 95% highly plastic fines, no dilatancy, high toughness, high dry strength; about 5% fine sand; maximum size, fine sand; dry; whitish brown, moderate effort to hand auger; strong reaction with HCL.

1.0 to 1.5 feet- FAT CLAY (CH); About 100% highly plastic fines, no dilatancy, high toughness, high dry strength; trace fine sand; maximum size, fine sand; dry; yellow brown, difficult to hand auger; strong reaction with HCL.

1.5 to 4.0 feet- FAT CLAY (CH); About 100% highly plastic fines, no dilatancy, high toughness, vary high dry strength; trace fine sand; maximum size, fine sand; dry; dark brown; difficult to hand auger; strong reaction with HCL.

Note: Soil samples from 0.0 to 1.0 foot are disturbed and may have been deposited during the use of the pond or from erosion of the pond embankment during rainstorms. The soil sample from 1.0 to 1.5 feet was in situ and has a yellowish tint that may have been stained from ponding activities. Soil samples from 1.5 to 4.0 feet were recovered as irregular shards to about 2 inches long with polished curved sides that were formed by the hand auger action.

HAH-2-IIDSEP

0.0 to 1.0 foot- FAT CLAY (CH); About 95% highly plastic fines, no dilatancy, high toughness, very high dry strength; about 5% fine sand; trace medium sand; maximum size, medium sand; dry; brown; difficult to hand auger, strong reaction with HCL.

1.0 to 2.5 feet- FAT CLAY (CH); About 100% highly plastic fines, no dilatancy, high toughness, very high dry strength; trace fine sand; maximum size, fine sand; dry, brown, difficult to hand auger, strong reaction with HCL.

Note: All in-situ material. Two samples were analyzed in the interval from 1.0 to 4.0 feet. Field logging results are identical for both samples. Auger encountered something very hard at a depth of 2.5 feet and the hole could not be advanced any further.

Water for the proposed project area

Surface water

The proposed project area is essentially flat with a slight dip toward the Salton Sea to the west. Drainages or small arroyos in the project area are typically less than 1-foot deep. The arroyo about 100 feet east of the existing ponds is about 18 inches deep.

Evidence of driftwood, pumice, and fish skeletons in the proposed project area indicates that water from the Salton Sea extends to the proposed project area. With the existing ponds oriented with the long axis about 5 degrees north of west, the water from the Salton Sea inundates the area surrounding the western half of the existing pond area.

Ground water

Ground water investigations in similar lakebed deposits, on the western edge of the Salton Sea at the Navy Test Base, indicate measured total dissolved concentrations averaging about 10,000 milligrams per liter (mg/l). This indicates that the ground water is not potable and does not meet the criteria for agricultural uses.

About 350 feet south of the ponds and toward the Salton Sea is a thin salt crust on the ground surface. The soil is moist under the salt crust. With the alkali deposits being so close to and not much higher in elevation than the Salton Sea, surface moisture would normally indicate a shallow ground-water table.

No ground water or moist conditions were encountered in the hand auger holes. Both hand auger holes extended below the elevation of the moist conditions under the salt crust. Due to the material for the embankment being borrowed from within the ponds, HAH-1-IIDSEP was collared about 3 feet below the original ground surface and extended to a depth of 4 feet. This makes the bottom of the auger hole stratigraphically about 7 feet below the original ground surface and below the surface level of the Salton Sea.

The dry condition of the soil samples obtained in the proposed project area and the moist conditions of the soil below the alkali deposit south of the proposed project area indicate that the ground water from the Salton Sea cannot travel through the clay in the lakebed deposits. The clay within the lakebed deposits is considered an aquitard with associated low permeability.

Summary of engineering geologic conditions for constructing solar ponds

As discussed above, the proposed project area is founded in lakebed deposits from previous Salton Seas. The lakebed deposits consist of alternating beds of fat clay, lean clay, silt, and sand that slope gently toward the Salton Sea. In the project area, from the ground surface to a depth of about 7 feet, the lakebed deposits consist of mostly fat clay with some lean clay.

The soil survey describes the clay in the Imperial soil as, "montmorillonitic (calcareous)." There are probably other clay minerals present in the Imperial soil.

Hydraulic conductivity of the lakebed deposits varies from extremely low in the fat clays to high in the sandy areas. In the proposed project area, investigation indicates that there are lean and fat clays occurring in the uppermost about 7 feet of the stratigraphic section. Generally, vertical seepage through the lakebed deposits is expected to be orders of magnitude less than the horizontal flow. This is also true within the sand units where there are thin fine-grained laminae present. Vertical conductivity is increased in areas where there are sand filled fractures existing in the lakebed deposits.

The permeability of the fat and lean clay portions of the lakebed deposits is low. To a minor degree, water from the Salton Sea will penetrate clay during ponding. Due to the lakebed deposits being saline from the evaporation of the previous and current seas, evaporating salt water from the Salton Sea in the proposed ponds probably is not a concern. Any salt accumulated in the lakebed deposits can be removed by excavation at the conclusion of the proposed test when the rest of the salt is removed. Any water seeping into the lakebed deposits will return to the Salton Sea.

Excavation for constructing solar ponds will be by common methods. The most saline and clayey soil samples soften readily with water and are workable for construction purposes.

The ground surface, in the proposed project area, is essentially flat with a slight dip toward the Salton Sea and is suitable for pond construction.

There is the possibility of a large seismic event and associated surface ground rupture occurring within the proposed project area. The San Andreas occurs near the proposed project area. The exact location is inferred. The beach deposits from the last high levels of Lake Cahuilla that are dated at about 1500 years old, and have not been disturbed by faulting activities.

Documents used to prepare the report

1. Geologic Map of California, Salton Sea Sheet, Scale 1:250,000, State of California, Division of Mines and Geology, 1967 (Fifth printing, 1992).
2. Soil Survey of Imperial County California, Imperial Valley Area; United States Department of Agriculture Soil Conservation Service in cooperation with the University of California, Agricultural Experiment Station and Imperial Irrigation District; 1981.
3. Geohydrologic Reconnaissance of the Imperial Valley, California, Geological Survey Professional Paper 486 – K, 1975.
4. Bechtel National, Inc. performed extensive work in collecting data and evaluating the hazardous waste conditions of the Salton Sea Test Base resulting in multiple voluminous reports. The report used for the report is The Removal Site Evaluation Report, Final Technical Memorandum, dated June 18, 1998.
5. Reclamation's Denver Office's Geophysics, Paleohydrology and Seismotectonics Group completed two analyses for the Salton Sea Project. They are the Preliminary Seismic Hazard Assessment for the Salton Sea Project, dated September 1999; and the Uniform Hazard Response Spectra for the Salton Sea Project, dated December 23, 1999.