Chapter 3
MONITORING, RECORDKEEPING AND REPORTING

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Chapter 3. Monitoring, Recordkeeping and Reporting

I. Introduction

Water quality monitoring and the subsequent recordkeeping practices are important components of a successful IFDM program. Water monitoring is performed for four main reasons:

1. Characterize water to identify changes or trends;
   - Adequate groundwater monitoring data is a required component of the Notice of Intent application that is to be filed with the Regional Water Quality Control Board (RWQCB) prior to installing the solar evaporator. The groundwater monitoring data will be used to establish the baseline information to compare subsequent data submitted by the operator.
   - Monitoring not only is required by the Notice of Intent filed with the RWQCB, it is also necessary to evaluate the IFDM system. Monitoring reports show how well the system is working, and also to help identify specific water quality problems. In addition, it will be useful to determine California Environmental Quality Act (CEQA) baseline data.
   - Initially, monitoring is useful to describe the condition of the land prior to implementing IFDM. This information can help develop a baseline against which future evaluations can be compared. The baseline analysis will be used by engineers in the design of the IFDM system.
   - Lastly, the information is used to determine whether project goals are being met and if the system is in compliance with the RWQCB regulations.
2. Identify specific water quality problems;
3. Gather information to aid in system design and securing permits; and
4. Determine whether project compliance and implementation goals are being met, and gather information for establishing baseline conditions (e.g. affected environment) under CEQA.

II. Data Quality

The quality of environmental data collected is described by its accuracy, precision, completeness, representation and comparability. Multiple factors can influence the data quality, including sampling methods, the way samples are handled and analyzed, and the way data are handled.

Quality assurance (QA) includes measures that are performed to ensure that there is minimal error and that data are valid and reliable. The two measures of QA are quality control (QC) and quality assessment.

The RWQCB may require a Quality Assurance Program Plan (QAPP) for each IFDM project. A QAPP is an important planning document for environmental data collection because it details the project management, standard operating procedures (SOPs), QA (QC and quality assessment measures), and data assessment measures that will be implemented throughout the project.

The California Environmental Protection Agency SWRCB Water Quality website, www.swrcb.ca.gov/swamp/qapp.html, outlines the sections and appendices of a Surface Water Ambient Monitoring Program (SWAMP) QAPP. The table of contents from the website can be found in the Appendix.

The California Department of Water Resources (1998) *Guidelines for Preparing Quality Assurance Project Plans* is a helpful reference for QAPP development and preparation.

III. Monitoring & Reporting Program

IFDM systems are to be designed and operated to prevent threats to water quality, fish and wildlife, and public health. Monitoring and record keeping requirements, including a groundwater monitoring schedule, data, and any other information or reporting, will be specified by the RWQCB.

A properly designed monitoring program will aid in assessing any impact of the agricultural drainage water disposal on surface and groundwater quality, fish and wildlife, and public health. State and federal laws regulate agricultural drainage water surface discharges, which may impact surface waters.

Water monitoring samples are taken from a sump at the Red Rock Ranch near Five Points.

A. Groundwater Monitoring

A person operating a solar evaporator will be required to collect adequate groundwater data. All indicator parameters and constituents of concern need to be collected from monitoring wells installed by the operator. Groundwater monitoring includes measurements for water-level depth, specific electrical conductivity, standard minerals and trace elements as specified by the RWQCB.

B. Subsurface Agricultural Drainage Water Applied to the Solar Evaporator

A station will need to be established for measurement and collection of representative samples to measure the subsurface agricultural drainage water applied to the solar evaporator. Applied water monitoring will include mean daily flow measurements, specific electrical conductivity, standard minerals and trace elements as specified by the RWQCB.

C. Solar Evaporator Subsurface Drainage System Monitoring

Solar evaporator subsurface drainage systems (tile drains) are monitored for mean daily flow and specific electrical conductivity as specified by the RWQCB.

D. Sampling Plan

Sampling plans are written procedures that provide details on how sampling is conducted (SOPs) and are incorporated as part of the QAPP. A typical sampling plan may include details on the following:

- Sample locations (map or diagram)
- Sample type
- Sample frequency
- Number of samples
- Duration of sampling
- Sample volume
- Sample collection methods and holding times
- Equipment to be used for sample collection
- Sample containers
- Pretreatment of containers
- Type and amount of preservative to be used
- Blanks, duplicates/triplicates, spiked samples, replicates
- Chain of custody procedures
- Any other pertinent matter which will have a bearing on the quality assurance in collecting and handling samples (DWR, 1994)

E. Who will Perform the Monitoring and How?

A person knowledgeable and trained in monitoring protocols should be selected to collect representative water samples, perform specific field measurements, and prepare samples for laboratory analyses using accepted methodology.

F. What Parameters will be Measured?

All indicator parameters and constituents of concern must be identified in the sampling plan by the operator and submitted to the RWQCB for approval. The baseline sampling data will provide information to determine the constituents of concern and constituents of importance. A typical

sampling plan may measure the following constituents:

1. **Trace Elements**
   a. Selenium
   b. Boron
   c. Arsenic
   d. Molybdenum
2. **Standard Minerals**
   a. Calcium
   b. Magnesium
   c. Sodium
   d. Potassium
   e. Alkalinity
   f. Sulfate
3. **Specific Electrical Conductivity and pH**
   Water quality parameters must be measured prior to collecting samples for laboratory analysis. Field measurements are recorded for specific conductance, pH, air and water temperatures, and weather observations. Agricultural observations, such as, the type of crop and crop height are noted and submitted with the water samples to the analytical laboratory. Weather data can be found at the nearest station of DWR's California Irrigation Management Information System, CIMIS, at: www.cimis.water.ca.gov
4. **Other**
   In addition, other elements of concern may be identified from the baseline monitoring data or as required by the RWQCB. Some elements are site-specific or found in elevated concentrations in designated areas of the San Joaquin Valley.

G. Approved Laboratories

The California Environmental Laboratory Improvement Act requires that an environmental laboratory producing analytical data for California regulatory agencies (including RWQCB) must be accredited through a Department of Health Services accreditation program for environmental health laboratories. The accredited labs also are known as certified through the Environmental Laboratory Accreditation Program (ELAP).

To select an ELAP certified laboratory in your area that can perform analyses on all required constituents, you must first identify the required Field of Testing (FOT)/ Field of Accreditation (FOA) numbers. The RWQCB will determine what constituents will be required and identify the corresponding FOT/FOA numbers.

Measuring groundwater depth

- The following website shows a table of FOT/FOA numbers, brief descriptions and levels of complexity. www.dhs.cahwnet.gov/ps/ls/elap/pdf/FOT_Desc.pdf
- The following website shows a list of ELAP certified labs by county and name. To select a lab, look through the list of labs in your county and make sure that the lab that you select is accredited to perform analyses on all required FOT/FOA numbers. www.dhs.cahwnet.gov/ps/ls/elap/htm/LablistStart.htm

H. Where are the Monitoring Sites?

Monitoring sites that are accessible, easy to find and reachable in bad weather, will allow for measurements to be taken at the desired time. Assign a name and provide a description of each of the sampling locations. Develop a diagram with reference points on how to find the monitoring site.

I. When will the Monitoring Occur?

Sampling frequency will be determined by the RWQCB. In general, sampling should be frequent enough to describe all important water quality changes or trends. Initially, more frequent monitoring may be needed to establish the baseline conditions. Once established, the frequency of monitoring may be reduced by the RWQCB according to the laboratory test results.

IV. Reporting Requirements

It is important to summarize the data to clearly illustrate compliance with all applicable regulatory requirements. Arrange the data in tabular form so the required information is readily discernible. Certain technical information needs to be submitted with the monitoring report. Daily evapotranspiration values of the nearest weather station from which information is available and copies of the laboratory analyses are to be submitted as part of the report. Weather data can be found at DWR's California Irrigation Management Information System, CIMIS, at: www.cimis.water.ca.gov

Any person operating a solar evaporator should submit annual groundwater monitoring data and information at the earliest possible time, according to a schedule established by the RWQCB. The regional board shall notify the operator of each solar evaporator of the applicable submission schedule.

A. Examples of Water Monitoring Plans

The following three sections are examples of water monitoring plans listing some of the possible constituents that may need to be monitored. The RWQCB will determine the constituents that you will need to be monitored on your farm.

1. Applied Water Monitoring[1]

A station shall be established for measurement and collection of representative samples to measure the subsurface agricultural drainage water applied to the solar evaporator. Applied water monitoring may include the following:

Constituents	Units Measurement	Type of Monitoring	Monitoring Frequency
Mean Daily Flow	gpd	Meter	Continuous
Specific Electrical Conductivity	µmhos/cm or dS/m	Grab	Weekly
Standard Minerals[2]	mg/L	Grab	Quarterly
Trace Elements			
Selenium	µg/L	Grab	Monthly
Boron	µg/L	Grab	Quarterly
Arsenic	µg/L	Grab	Quarterly
Chromium	mg/L	Grab	Quarterly
Molybdenum	µg/L	Grab	Quarterly
Vanadium	µg/L	Grab	Quarterly

[1] Analysis of certain constituents may require specialized field procedures (e.g. filtration and preservation) and are recommended to be performed by a qualified technician.

[2] Standard minerals may include calcium, magnesium, sodium, potassium, alkalinity and sulfate.

µg/L = micrograms per liter
mg/l = milligrams per liter
µmhos/cm = micromhos per centimeter

2. Groundwater Monitoring[1]

Shallow groundwater should be monitored for all indicator parameters and constituents of concern. Samples should be collected from the installed wells and analyzed for the following:

Constituents	Units Measurement	Type of Monitoring	Monitoring Frequency
Depth	feet (tenths)	Measured	Quarterly
Specific Electrical Conductivity	µmhos/cm or dS/m @ 25°C	Grab	Quarterly
Standard Minerals[2]	mg/L	Grab	Quarterly
Trace Elements			
Selenium	µg/L	Grab	Quarterly
Boron	µg/L	Grab	Quarterly
Arsenic	µg/L	Grab	Quarterly
Chromium	µg/L	Grab	Quarterly
Molybdenum	µg/L	Grab	Quarterly
Vanadium	µg/L	Grab	Quarterly

[1] Analysis of certain constituents may require specialized field procedures (e.g. filtration and preservation) and are recommended to be performed by a qualified technician.

[2] Standard minerals may include calcium, magnesium, sodium, potassium, alkalinity and sulfate.

3. Solar Evaporator Subsurface Drainage System (Tile Drain) Monitoring

If the solar evaporator is equiped with a subsurface drainage system, the drain should be monitored for the following:

Constituent	Units	Type of Measurement	Monitoring Frequency
Mean Daily Flow	gpd	Meter	Continuous
Specific Electrical Conductivity	µmhos/cm or dS/m @ 25°C	Grab	Quarterly

B. Biological Monitoring

If standing water or other factors known to result in potential impacts to breeding and/or feeding birds are anticipated or have been demonstrated at a given IFDM site, the RWQCB, CDFG, and/or USFWS may determine that avian monitoring is required. Adequate avian monitoring at sites typically consists of the following:

1. Timing

Biological surveys should be conducted weekly during the predicted avian breeding season, which is approximately from February 1 through August 31. During the non-breeding season, from September 1 through January 31, surveys will be conducted monthly. Monitoring should be conducted in a way that does not keep birds actively incubating eggs off of the nest during the heat of the day, since this can result in clutch failure. All wildlife monitoring will be conducted by, or under the direct supervision of, a qualified wildlife biologist with, or able to obtain, permits from the USFWS and the CDFG to collect the eggs.

Measuring conductivity

2. Survey Components

Biological surveys will consist of:

1. Bird usage in the drainage management area, which includes the solar evaporator, halophyte plots, agroforestry plot or interceptor trees, sumps (including tail water), salt-tolerant grasses and adjacent crops will be documented by a qualified wildlife biologist. Data collected will at least include, but not be limited to, bird species present, approximate numbers of each bird species present, and any mating behaviors.
2. During the nesting season (approximately February 1 through August 31), a thorough search for nests and nesting activities should be conducted by a qualified wildlife biologist in and around the solar evaporator, halophyte plots, interceptor trees, sumps, and salt-tolerant grasses. Nests will be flagged, and nest fate monitoring will include counting nests, eggs and young. If shorebird nesting occurs on-site, one recurvirostrid (avian family which includes the Black-necked Stilt and the American Avocet) egg will be randomly collected from each detected nest, with no more than a total of five random eggs from five separate nests being collected from a given IFDM site during a given nesting season, unless directed to do otherwise by USFWS and CDFG. The collected egg contents will be chemically analyzed for moisture content, total recoverable selenium, and, if necessary, the concentration of other trace elements by a USFWS-approved laboratory. The egg contents also will be assessed for embryonic deformities by a USFWS-approved laboratory. Eggs will be collected according to USFWS egg collection protocol.
3. Presence of any ponded water in or around the solar evaporator, halophyte plots, interceptor trees, salt-tolerant grasses and/or adjacent crops will be documented. An estimate of percent coverage and approximate depth of the ponded water will be noted.

4. Presence of any aquatic invertebrate species in or around the solar evaporator, halophyte plots, agroforestry plot, salt-tolerant grasses and/or adjacent crops should be documented. The type of invertebrates present should be identified to the family level, and abundance (dense, scattered, few) in each location should be noted. Presence of live algal mats in any of these designated areas should also be reported.
5. The presence or evidence of other wildlife species in or around the solar evaporator, halophyte plots, interceptor trees, salt tolerant grasses and/or adjacent crops should be documented.

3. Reporting Requirements

The results of each survey component will be submitted to the Central Valley Regional Water Quality Control Board. Results will be submitted within a week of the survey date. The weekly reports will not include results of egg analyses, since obtaining complete results usually requires several months. Survey results should be summarized in four quarterly reports. The quarterly reports should be submitted to the Board as follows:

Reporting Period	Due Date
January-March	1 May
April-June	1 August
July-September	1 November
October-December	1 February

The USFWS Sacramento Office Contaminants Division and CDFG Southern Sierra Region Office in Fresno should also receive copies of all monitoring reports.

Figure 1. EM-38 survey equipment

C. Soil Monitoring

Soil monitoring is not required, but is recommended because it enables the tracking of the progress of the IFDM system (evaluate whether soil conditions are improving or declining) and provides information for fertilizer and nutrient applications. Generally, soil testing is performed once per year to measure EC, pH, and required anions and cations. Things to consider before sampling include:

- Field area (acres/sample)
- Sampling procedure
- Sampling depth
- Timing of sampling
- Sampling tools
- Sample handling
- Information forms
- Labs

There are numerous references for soil monitoring.

D. Salinity Monitoring

EM-38 surveys are not required, but may be helpful to evaluate salinity conditions in soil over time. See Figures 1 and 2.

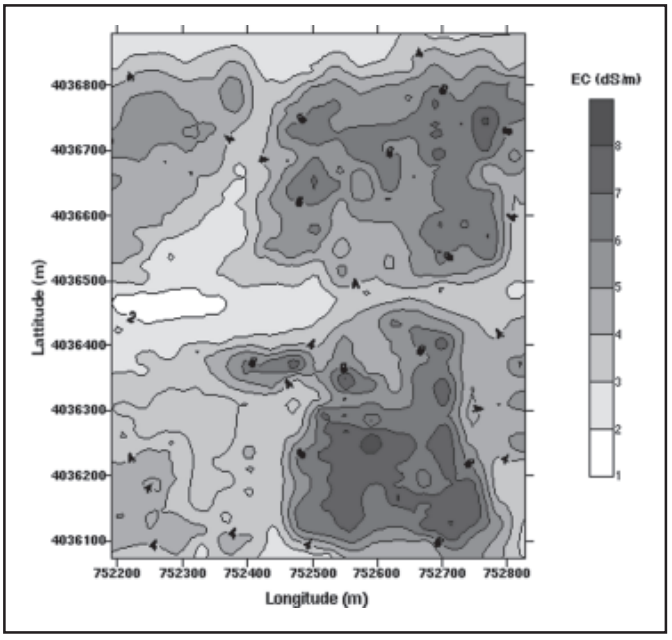

Figure 2. Salinity map created from EM-38 survey data (Values represented in this map are ECe (dS/m).

Notes: