Monitoring and Reporting Program R5-2013-XXXX
Appendix MRP-2

Monitoring Well Installation and Sampling Plan
and
Monitoring Well Installation Completion Report

I. Introduction

The provisions of Appendix MRP-2 are set out pursuant to the Central Valley Water Board's authority under California Water Code (CWC) section 13267. The purpose and requirements of the Management Practice Evaluation Program (MPEP) is set forth in Monitoring and Reporting Program (MRP) R5-2013-XXXX.

Implementation of the MPEP requires that the third-party develop and submit a Monitoring Well Installation and Sampling Plan (MWISP) to the Executive Officer for approval prior to installation of monitoring wells. Stipulations and required elements of the MWISP are presented in section II below.

Upon completion of any monitoring well network, the third-party shall submit to the Central Valley Water Board a Monitoring Well Installation Completion Report (MWICR) which describes the field activities performed during that phase of the work. Required elements to be included in the MWICR are presented in section III below.

II. Monitoring Well Installation and Sampling Plan

Prior to installation of groundwater monitoring wells, an MWISP and schedule prepared by, or under the direct supervision of, and certified by, a California registered civil engineer or a California registered geologist with experience in hydrogeology shall be submitted to the Central Valley Water Board for Executive Officer approval. If the third-party has chosen to rank or prioritize its high vulnerability areas, the initial MWISP must present an overview and justification for the phased approach. Separate MWISPs showing the proposed monitoring well locations are required prior to implementation of each phase (alternatively, the third-party may prepare a master MWISP covering all of the proposed phases of well installation). Installation of monitoring wells shall not begin until the Executive Officer notifies the third-party in writing that the MWISP is acceptable. The MWISP or an MWISP for the initial phase if the third-party has chosen to employ a phased approach must be submitted within 180 days after Executive Officer approval of the Management Practices Evaluation Workplan (see section IV of Monitoring and Reporting Program Order R5-2013-XXXX, "MRP").

A. Stipulations

1. All monitoring wells shall be constructed in a manner that maintains the integrity of the monitoring well borehole and prevents the well (including the annular space outside of the well casing) from acting as a conduit for waste/contaminant transport. Each monitoring well shall be appropriately designed and constructed to enable collection of representative samples of the first encountered groundwater.

2. Where applicable, the third-party shall follow state, county or local agency standards with respect to water wells and groundwater quality when constructing new wells, modifying existing wells, or destroying wells. Absent such standards, at a minimum, the third-party shall follow the

standards and guidelines described in the California Department of Water Resources' *Water Well Standards (Bulletins 74-81 & 74-90 combined)*. More stringent practices shall be implemented if needed to prevent the well from acting as a conduit for the vertical migration of waste constituents.

3. The horizontal and vertical position of each monitoring well shall be determined by a registered land surveyor or other qualified professional. The horizontal position of each monitoring well shall be measured with one-foot lateral accuracy using the North American Datum 1983 (NAD83 datum). The vertical elevations of each monitoring well, at the point where depth to groundwater shall be measured to an absolute accuracy of at least 0.5 feet and a relative accuracy between monitoring wells of 0.01 feet referenced to the North American Vertical Datum 1988 (NAVD88 datum).

4. Once the groundwater monitoring network is installed pursuant to an approved MWISP, the third-party shall sample monitoring wells for the constituents and at the frequencies as specified in the approved MPEP. Groundwater monitoring shall include monitoring during periods of the expected highest and lowest annual water table levels and be of sufficient frequency to allow for evaluation of any seasonal variations.

5. Groundwater samples from monitoring wells shall be collected as specified in an approved MWISP and in accordance with the third-party's approved QAPP.

B. MWISP Required Elements

At a minimum, the MWISP must contain all of the information listed below.

1. General Information:

   a. Topographic map showing any existing nearby (about 2,000 feet) domestic, irrigation, municipal supply, and known monitoring wells, utilities, surface water bodies, drainage courses and their tributaries/destinations, and other major physical and man-made features, as reasonably known and appropriate.

   b. Site plan showing proposed well locations, other existing wells, unused and/or abandoned wells, and major physical site structures (such as tailwater retention systems, tile-drainage systems including discharge points, chemigation and/or fertigation tanks, flood control features, irrigation canals, etc.).

   c. Rationale for the number of proposed monitoring wells, their locations and depths, and identification of anticipated depth to groundwater. This information must include an explanation of how the location, number, and depths of wells proposed will result in the collection of data that can be used to assess groundwater at farms not directly monitored by the MPEP and under a variety of hydrogeologic conditions.

   d. Local permitting information (as required for drilling, well seals, boring/well abandonment).

   e. Drilling details, including methods and types of equipment for drilling and soils logging activities. Equipment decontamination procedures (as appropriate) should be described.

   f. Health and Safety Plan.

2. Proposed Drilling Details:

    a. Drilling techniques.

    b. Well/soil sample collection and logging method(s).

3. Proposed Monitoring Well Design - all proposed well construction information must be displayed on a construction diagram or schematic. For items f. through i., the vertical location of all annular materials (filter pack, seals, etc.) shall be shown and a description of the material and its method of emplacement given. The construction diagram or schematic shall accurately identify the following:

    a. Well depth.

    b. Borehole depth and diameter.

    c. Well construction materials.

    d. Casing material and diameter - include conductor casing, if appropriate.

    e. Location and length of perforation interval, size of perforations, and rationale.

    f. Location and thickness of filter pack, type and size of filter pack material, and rationale.

    g. Location, thickness, and composition of any intermediate seal.

    h. Location, thickness, and composition of annular seal.

    i. Surface seal depth and composition.

    j. Type of well cap(s).

    k. Type of well surface completion.

    l. Well protection devices (such as below-grade water-tight vaults, locking steel monument, bollards, etc.).

4. Proposed Monitoring Well Development:

    a. Schedule for development (not less than 48 hours or more than 10 days after well completion).

    b. Method of development.

    c. Method of determining when development is complete.

    d. Parameters to be monitored during development.

5. Proposed Surveying:

    a. How horizontal and vertical position of each monitoring well will be determined.

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b. The accuracy of horizontal and vertical measurements to be obtained.

6. Proposed Groundwater Monitoring: refer to Monitoring and Reporting Program Order R5-2013-XXXX and QAPP Guidelines.

III. Monitoring Well Installation Completion Report (MWICR)

Within 60 days after completion of any monitoring well network, the third-party shall submit to the Executive Officer a Monitoring Well Installation Completion Report (MWICR) prepared by, or under the direct supervision of, and certified by, a California registered civil engineer or a California registered geologist with experience in hydrogeology. In cases where monitoring wells are completed in phases or completion of the network is delayed for any reason, monitoring well construction data are to be submitted within 90 days of well completion, even if this requires submittal of multiple reports. At a minimum, the MWICR shall summarize the field activities as described below.

1. General Information:

   a. Brief overview of field activities including well installation summary (such as number, depths), and description and resolution of difficulties encountered during field program.

   b. A site plan depicting the positions of the newly installed monitoring wells, other existing wells, unused and/or abandoned wells, and major physical site structures (such as tailwater retention systems, tile-drainage systems including discharge points, chemigation and/or fertigation holding tanks, flood control features, irrigation canals, etc.).

   c. Period of field activities and milestone events (e.g., distinguish between dates of well installation, development, and sampling).

2. Monitoring Well Construction:

   a. Number and depths of monitoring wells installed.

   b. Monitoring well identification (i.e., numbers).

   c. Date(s) of drilling and well installation.

   d. Description of monitoring well locations including field-implemented changes (from proposed locations) due to physical obstacles or safety hazards.

   e. Description of drilling and construction, including equipment, methods, and difficulties encountered (such as hole collapse, lost circulation, need for fishing).

   f. Name of drilling company, driller, and logger (site geologist/engineer to be identified).

   g. As-builts for each monitoring well with the following details:

      i. Well identification.

      ii. Total borehole and well depth.

iii. Date of installation.

iv. Boring diameter.

v. Casing material and diameter (include conductor casing, if appropriate).

vi. Location and thickness of slotted casing, perforation size.

vii. Location, thickness, type, and size of filter pack.

viii. Location, thickness, and composition of any intermediate seal.

ix. Location, thickness, and composition of annular seal.

x. Surface seal depth and composition.

xi. Type of well cap.

xii. Type of surface completion.

xiii. Depth to water (note any rises in water level from initial measurement) and date of measurement.

xiv. Well protection device (such as below-grade water-tight vaults, stovepipe, bollards, etc.).

xv. Lithologic log and electric log (if conducted) of well borings

xvi. Results of all soil tests (e.g., grain size, permeability, etc.)

h. All depth to groundwater measurements during field program.

i. Field notes from drilling and installation activities (e.g., subcontractor dailies, as appropriate).

j. Construction summary table of pertinent information such as date of installation, well depth, casing diameter, screen interval, bentonite seal interval, and well elevation.

3. Monitoring Well Development:

a. Date(s) and time of development.

b. Name of developer.

c. Method of development.

d. Methods used to identify completion of development.

e. Development log: volume of water purged and measurements of temperature, pH, electrical conductivity, and any other parameters measured during and after development.

f. Disposition of development water.

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g. Field notes (such a bailing to dryness, recovery time, number of development cycles).

4. Monitoring Well Survey:

a. Identify coordinate system or reference points used.

b. Description of measuring points (e.g., ground surface, top of casing, etc.).

c. Horizontal and vertical coordinates of well casing with cap removed (measuring point where water levels are measured to nearest ± 0.01 foot).

d. Name, license number, and signature of California licensed professional who conducted survey.

e. Surveyor's field notes.

f. Tabulated survey data.

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