

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
CENTRAL VALLEY REGION

MONITORING AND REPORTING PROGRAM NO. R5-2015-XXXX
FOR
CALIFORNIA RESOURCES PRODUCTION CORPORATION
AND NORTH KERN WATER STORAGE DISTRICT

OIL FIELD PRODUCED WATER RECLAMATION PROJECT
KERN COUNTY

This Monitoring and Reporting Program (MRP) is required pursuant to Water Code section 13267.

The Discharger shall not implement any changes to this MRP unless and until the Central Valley Water Board adopts, or the Executive Officer issues, a revised MRP. Changes to sample location shall be established with concurrence of Central Valley Water Board staff, and a description of the revised locations shall be submitted for approval by the Executive Officer.

All samples shall be representative of the volume and nature of the discharge or matrix of material sampled. All analyses shall be performed in accordance with **Standard Provisions and Reporting Requirements for Waste Discharge Requirements**, dated 1 March 1991 (Standard Provisions).

Field test instruments (such as pH) may be used provided that the operator is trained in the proper use of the instrument and each instrument is serviced and/or calibrated at the recommended frequency by the manufacturer or in accordance with manufacturer instructions.

Analytical procedures shall comply with the methods and holding times specified in the following: *Methods for Organic Chemical Analysis of Municipal and Industrial Wastewater* (EPA); *Test Methods for Evaluating Solid Waste* (EPA); *Methods for Chemical Analysis of Water and Wastes* (EPA); *Methods for Determination of Inorganic Substances in Environmental Samples* (EPA); *Standard Methods for the Examination of Water and Wastewater* (APHA/AWWA/WEF); and *Soil, Plant and Water Reference Methods for the Western Region* (WREP 125). Approved editions shall be those that are approved for use by the United States Environmental Protection Agency or the California Department of Public Health's Environmental Laboratory Accreditation Program. The Discharger may propose alternative methods for approval by the Executive Officer.

If monitoring consistently shows no significant variation in magnitude of a constituent concentration or parameter after at least 24 months of monitoring, the Discharger may request this MRP be revised to reduce monitoring frequency. The proposal must include adequate technical justification for reduction in monitoring frequency.

A glossary of terms used within this MRP is included on page 8 and an extended analytical suite for oil-field produced water (produced water) constituents is included as Table 1 on pages 9 through 11.

The Discharger shall monitor the following locations to demonstrate compliance with the requirements of this Order:

Monitoring Point Name	Monitoring Location Description
DIS-001	Discharge 001 - Location where a representative water quality sample of the CRC treated produced water can be obtained following treatment in the Section 23 treatment facility, but before discharge into any District facilities (Lerdo Canal, other canals, and/or any of the spreading basins).
DIS-002	Discharge 002 - Location where a representative water quality sample of the blended waters (produced water, and/or surface water, and/or groundwater) can be obtained downstream of the blending area in the Lerdo Canal and prior to discharge into any of the Districts Farmlands.
Monitoring wells: MW-99-0-22, MW-99-0-17, MW-99-2-4, MW-99-2-6, MW-99-2-8, MW-99-4-5, and MW-4	Eight groundwater wells and any additional wells added to the groundwater monitoring network, within the Rosedale Spreading Basin.

EFFLUENT MONITORING

The collected samples shall be representative of the volume and nature of the discharges. Time of collection of the samples shall be recorded. If the discharge is intermittent rather than continuous, then on the first day of each such intermittent discharge (but not more than twice a month), the Discharger shall monitor and record data for all of the constituents listed below, after which the frequencies of analysis given in the schedule shall apply for the duration of each such intermittent discharge.

DISCHARGE 001 – CRC OIL FIELD PRODUCED WATER MONITORING

The Discharger shall monitor the volume and quality of the treated produced water downstream of the CRC Station 23 treatment facility and prior to discharge to any of the Districts conveyance facilities (canals, pipelines, and spreading basins) where the produced water is blended with surface water. Effluent monitoring for Discharge 001 of the treated CRC produced water shall include at least the following:

<u>Frequency</u>	<u>Constituent/Parameter</u>	<u>Units</u>	<u>Sample Type</u>
Continuous	Flow	mgd	Metered
Continuous	Electrical Conductivity	umhos/cm	Metered
Monthly	Arsenic	mg/L	Grab
Monthly	Boron	mg/L	Grab
Monthly	Chloride	mg/L	Grab

<u>Frequency</u>	<u>Constituent/Parameter</u>	<u>Units</u>	<u>Sample Type</u>
Monthly	Sodium	mg/L	Grab
Monthly	Oil and Grease	mg/L	Grab
Monthly	Total Suspended Solids	mg/L	Grab
Monthly	pH	pH Units	Grab
Quarterly	General Minerals	mg/L ¹	Grab
Quarterly	Produced Water Constituents ²	Varies	Grab

¹ mg/L or ug/L, as appropriate

² Produced water constituents are listed in Table 1 which is included on pages 9 through 11.

DISCHARGE 002 – IRRIGATION SEASON MONITORING

The Discharger shall monitor the volume and quality of the blended waters (CRC produced water, surface water, and/or groundwater) downstream of the mixing area in the Lerdo Canal and prior to discharge to the District farmlands. The overall concentration of the discharge shall be calculated based on the flow weighted average of each individual discharge to the Lerdo Canal. Effluent monitoring for Discharge 002 shall include at least the following:

<u>Frequency</u>	<u>Constituent/Parameter</u>	<u>Units</u>	<u>Sample Type</u>
Continuous	Produced Water	ac-ft	Metered
Continuous	Kern River Surface Water	ac-ft	Metered ¹
Continuous	Groundwater	ac-ft	Metered ¹
Continuous	Total Discharge	ac-ft	Calculated
Monthly	Electrical Conductivity	umhos/cm	Grab
Monthly	Arsenic	mg/L	Grab
Monthly	Boron	mg/L	Grab
Monthly	Chloride	mg/L	Grab
Monthly	Sodium	mg/L	Grab
Monthly	Total Suspended Solids	mg/L	Grab
Monthly	pH	pH Units	Grab
Quarterly	General Minerals	mg/L	Grab
Quarterly	Produced Water Constituents ²	Varies	Varies

¹. Metered or alternatively calculated by the District based on pump efficiencies or weir observations.

². Produced water constituents are listed in Table 1 which is included on pages 9 through 11.

GROUNDWATER MONITORING

The Discharger shall monitor eight groundwater wells (seven groundwater extraction wells and one first encountered groundwater monitoring well) completed in the Rosedale Spreading Basin, as shown on Attachment F. After measuring water levels and prior to collecting samples, each well shall be adequately purged to remove water that has been standing within the well screen and casing that may not be chemically representative of formation water. Depending on the hydraulic conductivity of the geologic setting, the volume removed during purging is typically from 3 to 5 volumes of the standing water

within the well casing and screen, or additionally the filter pack pore volume. Low-flow sampling techniques (purging only the volume of the dedicated tubing) can be used with prior approval from the Executive Officer.

The following wells, the locations of which are shown on Attachment F, shall be used in the required assessment.

<u>Well Number</u>	<u>Well Purpose</u>	<u>Location in Spreading Basin</u>
99-0-22	Extraction	North boundary of basin.
99-0-17	Extraction	Northwest corner of basin.
99-0-18	Extraction	East boundary of basin.
99-2-4	Extraction	North/central portion of basin.
99-2-6	Extraction	South/central portion of basin.
99-2-8	Extraction	South boundary of basin.
99-4-5	Extraction	West boundary of basin.
MW-4	Monitoring	Central Portion of basin

The Discharger shall monitor the eight wells and any additional wells installed, for the following:

<u>Frequency</u>	<u>Constituent/Parameter</u>	<u>Units</u>	<u>Sample Type</u>
Semi-Annually	Depth to Groundwater	Feet ¹	Measured
Semi-Annually	Groundwater Elevation	Feet ²	Computed
Quarterly ³	pH	pH Units	Grab
Quarterly ³	EC	umhos/cm	Grab
Quarterly ³	Arsenic	ug/L	Grab
Quarterly ³	Boron	mg/L	Grab
Quarterly ³	Chloride	mg/L	Grab
Quarterly ³	Sodium	mg/L	Grab
Quarterly ³	General Minerals	mg/L ⁴	Grab
Quarterly ³	Produced Water Constituents ⁵	Varies	Grab

1. To the nearest hundredth of a foot.

2. To the nearest hundredth of a foot above Mean Sea Level.

3. Samples shall be collected for chemical analysis from the extraction wells on a quarterly basis while in use (i.e., during dry years). Samples from groundwater monitoring wells shall be collected every quarter.

4. mg/L or ug/L, as appropriate.

5. Produced water constituents are listed in Table 1 which is included on pages 9 through 11.

The Discharger shall maintain its groundwater monitoring well network. The depth to groundwater under the Rosedale Spreading Basin is highly variable due to the existing groundwater recharge/extraction activities that occur in the area. If groundwater monitoring well MW-4 is dry, the District will sample two of the extraction wells set in the Rosedale Spreading Basin as an alternative.

REPORTING

All monitoring results shall be reported in **Quarterly Monitoring Reports** which are due by the first day of the second month after the calendar quarter. Therefore, monitoring reports are due as follows:

First Quarter Monitoring Report: **1 May**
Second Quarter Monitoring Report: **1 August**
Third Quarter Monitoring Report: **1 November**
Fourth Quarter Monitoring Report: **1 February**

The Central Valley Water Board has gone to a Paperless Office System. All regulatory documents, submissions, materials, data, monitoring reports, and correspondence should be converted to a searchable Portable Document Format (PDF) and submitted electronically. Documents that are less than 50MB should be emailed to: centralvalleyfresno@waterboards.ca.gov. Documents that are 50MB or larger should be transferred to a disk and mailed to the appropriate regional water board office, in this case 1685 E Street, Fresno, CA, 93706.

To ensure that your submittals are routed to the appropriate staff, the following information block should be included in any email used to transmit documents to this office:

Program: Non-15, WDID:5C15NC00206, Facility Name: California Resources Production Corporation and North Kern Water Storage District, Order: R5-2015-XXXX.

In reporting monitoring data, the Discharger shall arrange the data in tabular form so that the date, the constituents, and the concentrations are readily discernible. The data shall be summarized in such a manner that illustrates clearly, whether the Discharger complies with waste discharge requirements.

In addition to the details specified in Standard Provision C.3, monitoring information shall include the method detection limit (MDL) and the Reporting limit (RL) or practical quantitation limit (PQL). If the regulatory limit for a given constituent is less than the RL (or PQL), then any analytical results for that constituent that are below the RL (or PQL) but above the MDL shall be reported and flagged as estimated.

If the Discharger monitors any pollutant at the locations designated herein more frequently than is required by this Order, the results of such monitoring shall be included in the calculation and reporting of the values required in the Discharge Monitoring Report Form. Such increased frequency shall be indicated on the Discharge Monitoring Report Form.

Laboratory analysis reports do not need to be included in the monitoring reports; however, the laboratory reports must be retained for a minimum of three years in accordance with Standard Provision C.3.

All monitoring reports shall comply with the signatory requirements in Standard Provision B.3. All monitoring reports that involve planning, investigation, evaluation, or design, or other work requiring interpretation and proper application of engineering or geologic sciences, shall be prepared by or under the direction of persons registered to practice in California pursuant to California Business and Professions Code sections 6735, 7835, and 7835.1.

In the future, the State or Central Valley Water Board may notify the Discharger to electronically submit and upload monitoring reports using the State Water Board's California Integrated Water Quality System (CIWQS) Program Web site <http://www.waterboards.ca.gov/ciwqs/index.html> or similar system. Electronic submittal to CIWQS, when implemented, will meet the requirements of our Paperless Office System.

A. **All Quarterly Monitoring Reports** shall include the following:

Effluent reporting:

1. The results of the effluent discharges (Discharges 001 and 002) as specified on pages 2 through 3.
2. For each month of the quarter, calculation of the maximum daily flow and the monthly average flow.
3. For each month of the quarter, calculation of the 12-month rolling average EC of the discharge using the EC value for that month averaged with the EC values for the previous 11 months.

Groundwater reporting:

1. The results of groundwater monitoring specified on pages 3 and 4.
2. For each well sampled, a table showing constituent concentrations for the last five quarters, up through the current quarter.
3. A groundwater contour map based on groundwater elevations for that quarter. The map shall show the gradient and direction of groundwater flow under/around the facility and/or effluent disposal area(s). The map shall also include the locations of monitoring wells and wastewater storage and discharge areas.

B. **Annual Monitoring Report**, in addition to the above, by **1 February** of each year, the Discharger shall submit a written report to the Executive Officer containing the following:

Facility Information:

1. The names and general responsibilities of all persons in charge of wastewater handling and disposal.
2. The names and telephone numbers of persons to contact regarding the Facility for emergency and routine situations.
3. A statement certifying when the meters and monitoring instruments and devices were last calibrated, including identification of who performed the calibrations (Standard Provision C.4).
4. A statement whether the current operation and maintenance manual, and contingency plan, reflect the Facility as currently constructed and operated, and the dates when these documents were last reviewed for adequacy.
5. A summary of any changes in processing that might affect waste characterization and/or discharge flow rates.

The Discharger shall implement the above monitoring program on the first day of the month following adoption of this Order.

Ordered by: _____
PAMELA C. CREEDON, Executive Officer

(Date)

GLOSSARY

BOD ₅	Five-day biochemical oxygen demand		
CBOD	Carbonaceous BOD		
DO	Dissolved oxygen		
EC	Electrical conductivity at 25° C		
FDS	Fixed dissolved solids		
NTU	Nephelometric turbidity unit		
TKN	Total Kjeldahl nitrogen		
TDS	Total dissolved solids		
TSS	Total suspended solids		
Continuous	The specified parameter shall be measured by a meter continuously.		
24-Hour Composite	Unless otherwise specified or approved, samples shall be a flow-proportioned composite consisting of at least eight aliquots.		
Daily	Samples shall be collected every day.		
Twice Weekly	Samples shall be collected at least twice per week on non-consecutive days.		
Weekly	Samples shall be collected at least once per week.		
Twice Monthly	Samples shall be collected at least twice per month during non-consecutive weeks.		
Monthly	Samples shall be collected at least once per month.		
Bimonthly	Samples shall be collected at least once every two months (i.e., six times per year) during non-consecutive months		
Quarterly	Samples shall be collected at least once per calendar quarter. Unless otherwise specified or approved, samples shall be collected in January, April, July, and October.		
Semiannually	Samples shall be collected at least once every six months (i.e., two times per year). Unless otherwise specified or approved, samples shall be collected in April and October.		
Annually	Samples shall be collected at least once per year. Unless otherwise specified or approved, samples shall be collected in October.		
mg/L	Milligrams per liter		
mL/L	Milliliters [of solids] per liter		
µg/L	Micrograms per liter		
µmhos/cm	Micromhos per centimeter		
mgd	Million gallons per day		
MPN/100 mL	Most probable number [of organisms] per 100 milliliters		
General Minerals	Analysis for General Minerals shall include at least the following:		
	Alkalinity	Chloride	Sodium
	Bicarbonate	Hardness	Sulfate
	Calcium	Magnesium	TDS
	Carbonate	Potassium	
	General Minerals analyses shall be accompanied by documentation of cation/anion balance.		

Table 1 – Wastewater and Groundwater Monitoring				
<u>Parameters</u>	<u>Units</u>	<u>Monitoring Frequency</u>	<u>US EPA or other Method</u>	<u>Reporting Frequency</u>
<u>Groundwater Elevation</u>	feet & hundredths, MSL ¹	Quarterly		Quarterly
<u>Field Parameters</u>				
Temperature	°F ²	Quarterly		Quarterly
Electrical Conductivity	µmhos/cm ³	Quarterly		Quarterly
pH	pH units	Quarterly		Quarterly
<u>Monitoring Parameters</u>				
Total Dissolved Solids (TDS)	mg/L ⁴	Quarterly	160.1	Quarterly
Electrical Conductivity	µmhos/cm	Quarterly	120.1	Quarterly
Boron, dissolved	mg/L	Quarterly	6010B	Quarterly
<u>Standard Minerals</u>				
Alkalinity as CaCO ₃	mg/L	Quarterly	310.1	Quarterly
Bicarbonate Alkalinity as CaCO ₃	mg/L	Quarterly	310.1	Quarterly
Carbonate Alkalinity as CaCO ₃	mg/L	Quarterly	310.1	Quarterly
Hydroxide Alkalinity as CaCO ₃	mg/L	Quarterly	310.1	Quarterly
Sulfate , dissolved	mg/L	Quarterly	300.0	Quarterly
Nitrate-N, dissolved	mg/L	Quarterly	300.0	Quarterly
Calcium, dissolved	mg/L	Quarterly	6010B	Quarterly
Magnesium, dissolved	mg/L	Quarterly	6010B	Quarterly
Sodium, dissolved	mg/L	Quarterly	6010B	Quarterly
Potassium	mg/L	Quarterly	6010B	Quarterly
Chloride	mg/L	Quarterly	300.0	Quarterly
<u>PAHs</u> ⁵	µg/L ⁶	Quarterly	8270	Quarterly
<u>Total Petroleum Hydrocarbons (TPH)</u>	µg/L	Quarterly	418.1	Quarterly
<u>Volatile Organic Compounds</u>				
Full Scan	µg/L	Quarterly	8260B	Quarterly

Table 1 – Wastewater and Groundwater Monitoring				
<u>Parameters</u>	<u>Units</u>	<u>Monitoring Frequency</u>	<u>US EPA or other Method</u>	<u>Reporting Frequency</u>
<u>Stable Isotopes</u>				
Oxygen (¹⁸ O)	pCi/L ⁷	Quarterly	900.0	Quarterly
Deuterium (Hydrogen 2, ² H, or D)	pCi/L	Quarterly	900.0	Quarterly
<u>Radionuclides</u>				
Radium-226	pCi/L	Quarterly	SM ⁸ 7500-Ra	Quarterly
Radium-228	pCi/L	Quarterly	SM 7500-Ra	Quarterly
Gross Alpha particle (excluding radon and uranium)	pCi/L	Quarterly	SM 7110	Quarterly
Uranium	pCi/L	Quarterly	200.8	Quarterly
<u>Constituents of Concern</u>				
Lithium	mg/L	Quarterly	200.7	Quarterly
Strontium	mg/L	Quarterly	200.7	Quarterly
Iron	mg/L	Quarterly	200.8	Quarterly
Manganese	mg/L	Quarterly	200.8	Quarterly
Antimony	mg/L	Quarterly	200.8	Quarterly
Arsenic	mg/L	Quarterly	200.8	Quarterly
Barium	mg/L	Quarterly	200.8	Quarterly
Beryllium	mg/L	Quarterly	200.8	Quarterly
Cadmium	mg/L	Quarterly	200.8	Quarterly
Chromium (total)	mg/L	Quarterly	200.8	Quarterly
Chromium (hexavalent)	mg/L	Quarterly	7196A	Quarterly
Cobalt	mg/L	Quarterly	200.8	Quarterly
Copper	mg/L	Quarterly	200.8	Quarterly
Lead	mg/L	Quarterly	200.8	Quarterly
Mercury	mg/L	Quarterly	7470A	Quarterly

Table 1 – Wastewater and Groundwater Monitoring				
<u>Parameters</u>	<u>Units</u>	<u>Monitoring Frequency</u>	<u>US EPA or other Method</u>	<u>Reporting Frequency</u>
Molybdenum	mg/L	Quarterly	200.8	Quarterly
Nickel	mg/L	Quarterly	200.8	Quarterly
Selenium	mg/L	Quarterly	200.8	Quarterly
Silver	mg/L	Quarterly	200.8	Quarterly
Thallium	mg/L	Quarterly	200.8	Quarterly
Vanadium	mg/L	Quarterly	200.8	Quarterly
Zinc	mg/L	Quarterly	200.8	Quarterly

- ¹ Mean Sea Level
- ² Degrees Fahrenheit
- ³ Micromhos per centimeter
- ⁴ Milligrams per liter
- ⁵ Polycyclic aromatic hydrocarbons
- ⁶ micrograms per liter
- ⁷ Picocuries per liter
- ⁸ Standard Methods