



# California Regional Water Quality Control Board Lahontan Region



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**MAY 18 2007**

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**COMMENTS ON MARCH 2007 REMEDIAL INVESTIGATION REPORT AND ORDER TO SUBMIT ADDITIONAL TECHNICAL INFORMATION IN ACCORDANCE WITH SECTION 13267 OF THE CALIFORNIA WATER CODE, CITY OF BARSTOW GROUNDWATER INVESTIGATION, SAN BERNARDINO COUNTY, W DID NO. 6B360101001**

The City of Barstow submitted a Remedial Investigation Report (Report), prepared by its consultant, DPRA, to the Regional Water Quality Control Board, Lahontan Region (Water Board) on March 30, 2007. Water Board staff reviewed the Report and has determined the Report does not fully identify and characterize the extent of groundwater affected by the City of Barstow's (City's) wastewater discharges.

Although progress has been made on groundwater characterization, additional information is needed to determine the background nitrate concentration and to fully delineate the horizontal and vertical extent of the City's nitrate plume to the background concentrations. Also, it is not known how the City's plume is affected by the percolation ponds, pumping from private wells, and possible contribution from other sources.

This letter provides: I) specific comments on the Report; and, II) identifies the technical reports I am ordering the City to submit. Nothing in this Order relieves the City of its responsibility to comply with previous Orders except for the requirement to submit a Remediation Plan by June 15, 2007.

## **I. COMMENTS ON REMEDIAL INVESTIGATION REPORT**

The City's Report provides an assessment of previous investigations, contains results and findings from DPRA's January-February 2007 remedial investigation, and presents four recommendations. Our comments are organized as: A) Northern Region; B) Southern Region; C) Background and Other Factors; and, D) City's Recommendations.

*California Environmental Protection Agency*

## A. NORTHERN REGION

The Report data demonstrate the nitrate plume originated from the City's northern irrigation field and extends in an east and southeast direction about 6000 feet with the prevailing groundwater direction. The nitrate plume appears to be at least 2000 feet wide, from north to south, at Webster Road. However, the full extent of the nitrate plume has not been delineated to background concentrations. Additional water quality information is also needed in the intermediate zone in the down-gradient direction, northeast of the northern irrigation field, to determine if the nitrate plume extends below the shallow groundwater zone (i.e., deeper than 100 feet).

The Report identified the Hacienda Mobile Home Park as a potential contributor to the nitrate plume originating at the City's former northern irrigation field. Based on the data presented, the Mobile Home Park may be a nitrate source but the Mobile Home Park is cross-gradient from the northern field and there is no evidence to suggest the Mobile Home Park is the source of the high nitrate concentrations detected at the edge of the northern irrigation field.

## B. SOUTHERN REGION

The Report indicates that a nitrate plume above the drinking water standard of 10 milligrams per liter (mg/L) originated from the southern boundary of the south irrigation field. However, the full horizontal and vertical extent of the City's nitrate plume has not been delineated to background concentrations.

The predominant groundwater direction in the vicinity of the south field is to the south and east although localized groundwater mounding is indicated around the southern irrigation field and Pond 3. The localized groundwater mounding is not well defined and may have a significant effect on the nitrate plume migration.

The Report does not provide an evaluation of wastewater treatment plant discharges at the southern field and at various ponds. Changes in these discharge volumes may affect local groundwater levels, flow rates, flow directions, and nitrate concentrations in the groundwater.

## C. BACKGROUND AND OTHER FACTORS

Background nitrate conditions, potential seasonal changes in groundwater directions, potential migration from boundaries of plume(s), and possible effects from percolations ponds and pumping for private wells have not been fully evaluated. Monitoring Wells MW-1 and MW-3 appear to be the only two locations truly upgradient from the nitrate plumes, but more information is needed to properly establish the representative background nitrate concentrations, including areas upgradient and downgradient of the City's nitrate plumes. Evaluating effects of possible seasonal changes is necessary for understanding how the City's nitrate plumes may migrate and change character.

## D. CITY'S RECOMMENDATIONS

The City's Report provided four recommendations for further action. Our comments are as follows:

**Recommendation 1** – The City recommends terminating certain contractual agreements with its sampling coordinator. These contracts are between the City and its contractor, so I have no opinion on the City's recommendation.

**Recommendation 2** – The City recommends that eleven monitoring wells should be monitored for water levels and nitrate as N on a quarterly basis. I concur that these wells should be monitored quarterly. After four consecutive quarters of monitoring, the City may propose, with appropriate justification, to discontinue monitoring any or all of these wells.

**Recommendation 3** – The City recommends that monitoring wells MW-1 through 23 and NWP-4, 5, and 6 should be monitored on a semi-annual basis for one year. While I agree these wells should be monitored, the frequency must be quarterly because seasonal trends have not yet been determined and the full extent of nitrate contamination is not known. After one year, the City may propose, with appropriate justification, to discontinue monitoring of any or all of these wells or to change the frequency of monitoring.

**Recommendation 4** – The City recommends that either 11 mg/L or 10 mg/L nitrate as N be used as the final cleanup level for the City's plume. Although 10 mg/L nitrate as N is the drinking water standard, the final cleanup level cannot be set until the City submits a complete analysis of remedial alternatives including options that result in cleanup to background.

## II. ORDER FOR INFORMATION

Pursuant to California Water Code section 13267, I am ordering the City to submit the following technical reports to the Water Board's South Lake Tahoe and Victorville offices. Investigating the groundwater quality is necessary for determining the impact of the City's discharge on water quality, public health, and beneficial uses. This information is also necessary for identifying, evaluating, and implementing remedial actions intended to protect and restore water quality and the beneficial uses of the groundwater. Enclosed with this letter is a Fact Sheet that contains information regarding submitting technical reports pursuant to California Water Code section 13267.

Each technical report described below must be prepared under the supervision of and be signed and stamped by a Professional Geologist or Professional Civil Engineer registered in California.

## A. INTERIM REMEDIATION PLAN

By June 30, 2007, submit a technical report identifying **alternatives** for remediating nitrate pollution at and above 10 mg/L in groundwater affected by the City's wastewater discharges. The Interim Remediation Plan must be based on the most current reliable site information available and should focus on actions that can be immediately taken to remediate nitrate contamination. The Interim Remediation Plan must also contain three essential elements:

1. Narrative description and ranking of a minimum of three remedial alternatives.
2. Implementation schedule for the proposed alternative.
3. Estimated time to reduce nitrate-nitrogen concentrations in groundwater to below 10 mg/L at all locations in the areas affected by the City's discharge.

## B. GROUNDWATER INVESTIGATION WORK PLAN

By June 30, 2007, submit a technical report providing a work plan to obtain the following information:

1. Identify proposed or existing wells or other methods of collecting groundwater samples necessary to establish up-gradient groundwater quality (background) not affected by the City's current and past wastewater disposal and reuse facilities.
2. Identify proposed or existing wells or other methods for collecting groundwater samples necessary to fully delineate the vertical and horizontal extent of groundwater affected by the City's wastewater discharges. This must include:  
(i) identifying any proposed new well locations or other proposed methods for collecting groundwater samples necessary to characterize groundwater quality;  
(ii) identifying any proposed new well locations or other proposed methods for collecting groundwater samples necessary to complete the horizontal and vertical characterization; and, (iii) identifying monitoring wells that have been sampled during past City groundwater investigations regarding nitrate-nitrogen contamination for re-sampling. The purpose of the proposed monitoring system is to provide adequate groundwater data necessary to fully identify and map the horizontal and vertical extent of groundwater nitrate as nitrogen (N) contamination and degradation to an interim level of 2 mg/L nitrate as N associated with the City's current and past wastewater disposal and reuse practices. Any new monitoring wells installed as part of this investigation must be sampled on the same frequency as the existing monitoring wells are sampled.

3. Identify the water quality parameters and analytical methods that will be used to characterize groundwater quality and to identify the horizontal and vertical extent of groundwater nitrate-nitrogen contamination.
4. Identify all wells and other proposed methods necessary for producing site-specific groundwater elevation data, and for fully characterizing the groundwater flow rate and direction for the areas affected by the City's nitrate plume. The purpose of establishing site-specific groundwater elevations, flow rate, and directional information is so that the City and Water Board can fully understand the transport and fate of the City's wastewater discharges and associated groundwater nitrate-nitrogen contamination.
5. Identify site-specific data necessary to evaluate any presumptive remedial alternatives and the necessary activities for obtaining such data. For example, identify data that would be necessary to indicate whether or not denitrification is a viable alternative for remediation. Another example is to identify groundwater and/or soil data that may be necessary to evaluate the feasibility of remediation of elevated nitrate sources (i.e., hot spots) within the northern irrigation field.

The report must provide the well information in a narrative format and illustrate the locations on a site map of appropriate scale that allows for easy viewing. The report must also include the City's rationale or basis for its well selections and proposed methodologies for obtaining the above-referenced data and information.

### C. REVISED REMEDIAL INVESTIGATION REPORT

By September 15, 2007, submit a technical report that provides the results from implementing the Water Board-accepted groundwater investigation work plan. This technical report must include, at a minimum, the following information:

1. Groundwater elevations from each well sampled in tabular format, and shown on a site map. Groundwater contour line intervals must be one foot in the vicinity of the south irrigation field and Pond 3. A map of depth to groundwater below ground surface in the northern region must be included.
2. Site map illustrating groundwater flow rates and directions for the area affected by the City's nitrate plumes.
3. Hydrogeologic cross sections that illustrate prevailing hydrogeologic conditions as they change throughout the study area.
4. Results of all groundwater quality analyses in tabular format.



5. Nitrate distribution maps. These maps must illustrate both vertical and horizontal distribution, and must delineate the nitrate concentration contours in 5 mg/L intervals from background concentrations to maximum concentrations. Nitrate concentration contour lines of 2 mg/L, 5 mg/L, and 10 mg/L must be delineated.

#### D. REMEDIATION PLAN

By **October 15, 2007**, submit a technical report identifying **alternatives** to establish hydraulic control of the nitrate plume and remediate nitrate contamination in groundwater affected by the City's wastewater discharges. The City must consider and evaluate alternatives that result in cleanup to background water quality conditions, the beneficial use standard and some value in between. The City must consider all beneficial uses of groundwater and the most restrictive standard for each use. If remediation to natural background concentrations is not technically or economically feasible, the City may propose a final remediation goal that is protective of beneficial uses and follows State Water Resources Control Board Resolution No. 92-49. The Remediation Plan must include, but not be limited to, the following information for each alternative:

1. Narrative description.
2. Implementation schedule.
3. Estimated time to reduce nitrate-nitrogen concentrations in groundwater to natural background concentrations at all locations in the area affected by the City's discharge.
4. Description of groundwater model(s), if any, and associated input parameters and assumptions used to predict results.
5. Cost estimates for major components.

The report must also include the City's preferred alternative, and the comparative analysis used to justify its preferred alternative. The comparative analysis must include, but not be limited to, technical feasibility, predicted effectiveness in achieving cleanup standards, and costs.

#### E. BACKGROUND, SEASONALITY, AND MIGRATION REPORT

By **August 15, 2008**, submit a technical report identifying background nitrate conditions; seasonal variability in nitrate concentrations, groundwater levels, groundwater rates and directions; and any indications that the nitrate plume is migrating over time. Identify any proposed modifications to the remediation plan (see Item D above) based upon the results in the Background, Seasonality, and Migration Report.

**F. FINAL REMEDIATION PLAN**

By **August 15, 2008**, submit a final Remediation Plan incorporating results in the Background, Seasonality, and Migration Report.

If you have any questions regarding this letter, please contact John Steude, Engineering Geologist, at (530) 542-5571, or Doug Smith, Senior Engineering Geologist at (530) 542-5453.

  
HAROLD J. SINGER  
EXECUTIVE OFFICER

Enclosure: Fact Sheet – *Requirements for Submitting Technical Reports Under Section 13267 of the California Water Code*

cc w/o encl: Pat Lendway/City of Barstow  
Scott Rose/County of San Bernardino Environmental Health Services  
Gary Vargus/DPRA  
Christina Byrne

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