
Lahontan Regional Water Quality Control Board

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COMMENTS ON MANGANESE INVESTIGATION TECHNICAL REPORT, PACIFIC GAS AND ELECTRIC (PG&E), HINKLEY COMPRESSOR STATION, SAN BERNARDINO COUNTY

This letter provides the Water Board comments to PG&E's Manganese Investigation Technical Report evaluating byproducts in groundwater from in-situ corrective actions. This letter also requests PG&E submit additional technical information and reports.

Background

Lahontan Water Board staff has reviewed PG&E's November 19, 2013 Manganese Investigation Technical Report (Report) in response to Investigative Order No. R6V-2013-0026. The Report, prepared by Arcadis, contains sampling data from 16 new and 149 existing monitoring wells in the In-situ Remediation Zone (IRZ) and initial results from two tracer tests. In-situ remediation is being conducted to convert hexavalent chromium dissolved in groundwater to solid trivalent chromium. Based upon the data collected, the Report states that manganese generated from IRZ activities moves in the direction of groundwater flow and attenuates with distance. The Report concludes that manganese is contained within the project area and is not migrating towards private domestic wells. Intermittent manganese detections in the deep zone of the upper aquifer and in nearby domestic wells is cited as being indicative of background conditions.

The Report also describes the start of tracer tests in July 2013 in the Source Area and the South Central Reinjection Area (SCRIA). In the first three months of monitoring, tracer was detected in only one monitoring well in the IRZ area. This information suggests there are no preferential groundwater flow cross gradient from the IRZ injection points. PG&E will continue to collect tracer test data and report that information in future IRZ quarterly monitoring reports.

The Report makes two recommendations: replace nine IRZ injection wells that are no longer effective and modify the sampling frequency of the IRZ monitoring program. Ethanol injection wells are clogged from biofouling which is limiting the amount of chromium remediation in the Source Area. The Report recommends replacing the injection wells with new wells over a period of 12 to 15 months. Since data in the

Report verify that manganese has not migrated out of the project area, the Report states a reduced sampling frequency from quarterly to annual for certain monitoring wells (137 out of 245) is warranted. Lastly, Appendix A2 discusses the manganese extraction system and concludes manganese in groundwater is being effectively contained from further migration.

COMMENTS

Manganese

The Water Board agrees with the Report's preliminary conclusion that manganese concentrations at and greater than 390 parts per billion¹ (ppb) are contained within the project boundaries described in the Notice of Applicability dated July 7, 2010. Manganese is detected in monitoring wells in three areas: Source Area, Central Area, and SCRIA. The largest manganese plume is concentrated mostly in the shallow zone of the upper aquifer in the Central Area and extends approximately 2,200 feet to the northwest. Monitoring well data along with preliminary tracer test data do not indicate that manganese concentrations above 390 ppb have migrated from the project area or cross gradient to groundwater flow.

The Water Board however is not completely convinced that intermittent manganese detections in the deeper zone of the upper aquifer reflect background conditions. Rather, some manganese detections could be from IRZ reactions that have been pulled downward into the deeper zone of the upper aquifer by pumping from nearby water supply wells. For instance, manganese detected up to 100 ppb in MW-177D, located on the western property line of the compressor station, may be influenced by the combined pumping of domestic wells 02-02A and 02-02B, located within 1,000 feet. Furthermore, manganese detected at 80 ppb in MW-17D, located near the southern compressor station property line, could be influenced by pumping from multiple nearby compressor station water supply wells (but not shown on figures) that are screened in the upper aquifer. The results of the tracer tests should shed more light on whether nearby water supply wells are causing manganese detections in directions contrary to the groundwater flow direction.

Furthermore, manganese created from IRZ activities potentially threatens other water supply wells. Manganese concentrations up to 310 ppb were detected in monitoring wells MW-155D, SA-MW-16S, and SA-MW-27S, all located near the western chromium plume boundary. Such concentrations could signify past migration towards nearby water supply wells along Mountain View Road. Manganese above the drinking water standard of 50 ppb poses a threat to water supplies from domestic wells 34-38 and 34-50. However, some domestic wells that previously detected manganese levels are no longer in use. Domestic well 35-04, located within 1,600 feet of a monitoring well having manganese detection, is now an inactive well and no longer in use. Once again, the results of the tracer tests should help in the evaluation of groundwater movement.

¹ The manganese criteria of 390 ppb in Board Order R6V-2008-0014 is the baseline concentration (not background) in groundwater following in-situ pilot testing.

Tracer Tests

The Water Board agrees that the three months of tracer data collected is limited and not complete enough to make any conclusions at this time. Therefore, the Water Board will review the results of the completed tracer test anticipated in summer or fall 2014. In the meantime, quarterly IRZ monitoring reports required by Investigative Order No. R6V-2013-0026 shall describe tracer detections during that quarterly sampling, how the detections compare to past quarters, and provide interpretation of the results.

The Water Board however is also interested in the detection of fluorescein dye in groundwater prior to the start of the July 2013 tracer tests. While the Report mentions the detection of fluorescein dye in one monitoring well (4.96 ppb in SC-MW-32S) before the start of tracer testing, it failed to mention fluorescein detection in a second monitoring well. Table 6 shows that 13.5 ppb fluorescein was also detected in monitoring well SA-SM-10S on June 19, 2013. The Report attributes the detection of fluorescein in baseline sampling to historic fluorescein injections at the site. Yet, no details of those historic injections were provided. The Water Board understood from past technical reports that fluorescent dyes dilute with time and had disappeared from groundwater. Therefore, we need additional information and more details about "historic fluorescein injections" conducted at the site to explain the two detections seen in baseline sampling.

Other Byproducts

While the Report does not discuss byproducts other than manganese, the Fourth Quarter 2013 In-situ Remediation Monitoring Report does. The Monitoring Report states that arsenic was detected above the criteria of 13 ppb in just one monitoring well within the IRZ project area during quarterly sampling. Similarly, the Monitoring Report states that iron was detected above the criteria of 471 ppb in two monitoring wells within the IRZ project area during quarterly sampling. Byproducts exceeding their respective criteria were not found outside the project area. This information indicates that arsenic and iron are not a migration risk or potential health hazard for nearby domestic wells.

COMMENTS ON RECOMMENDATIONS

1. Replacing Injection Wells

Appendix A2 in the Report discusses the replacement of nine IRZ injection wells in the Source Area that are no longer effective due to biofouling. A schedule shows a timeline of approximately 12 to 15 months to complete the design, installation, and pipeline construction. The Water Board concurs with replacement of the proposed injection wells to improve efficiency or return efficiency to original conditions of chromium remediation. We consider this to be a maintenance action within the permitted project area under Board Order R6V-2008-0014.

Water Board staff has also determined the amount of and distance of chromium remediation from IRZ activities that has occurred to date is less than had been predicted in models submitted in the past. For example, monitoring data from the Fourth Quarter 2013 Groundwater Monitoring Report shows that chromium concentrations have significantly increased in Source Area monitoring well SA-MW-05D from 4,300 ppb to

7,300 ppb hexavalent chromium. This monitoring well is located near one of the injection wells to be replaced. Based on recent data from SA-MW-05D and other locations and modified operations of the IRZ activities, we are requiring that PG&E provide updated information to the 2010 Feasibility Study and Addenda that predicted site-wide chromium cleanup to less than 50 ppb within 6 years. Updated information may include a revised/updated groundwater model run or other technical justification to support a current prediction for chromium cleanup. Estimates should include dates to obtain site-wide chromium cleanup to below 50 ppb, and cleanup to below 10 ppb.

Furthermore, Water Board staff requests that additional injection wells (expanded IRZ activities), besides the nine that are proposed, be installed to improve remediation in areas not adequately addressed by existing IRZ actions. For instance, chromium concentrations greater than 100 ppb are not being remediated in the southwest area of the shallow zone in the Source Area. Chromium concentrations greater than 1,000 ppb in the deep zone of the SCRIA reflect only limited remediation. Therefore, PG&E should evaluate and develop a plan to add injection wells in the Source Area either west of SA-SM-07S or SA-SM-08S to address this deficiency. New or replacement injection wells are also needed near SC-IW-24, -25, -26 and at closer distances between injection wells than currently exist in the SCRIA. Since these areas are within the permitted project area of Board Order R6V-2008-0014 (General Permit) and on compressor station property, no new board orders will be required for implementation of these recommendations.

In the Report, PG&E proposed injection well replacement within 15 months. We question the length of time scheduled to obtain biological clearances since the location of activities is within areas previously disturbed. Additionally, the five month time for design seems excessive since existing injection well systems are in operation. However, since we are requesting additional injection wells be constructed, we will accept the PG&E schedule. Therefore, the Water Board will expect the project consisting of proposed and additional injection wells to be completed and in operation by **May 15, 2015**. This deadline may be proposed in a new cleanup and abatement order anticipated to be issued in late 2014, along with a deadline for a project completion technical report.

2. Reduced Monitoring Program

The Water Board has reviewed PG&E's request to reduce the monitoring frequency of wells in the IRZ project area. We believe that certain wells within the interior of the IRZ area can be reduced in frequency, so long as they are not near areas where injection wells will be replaced. Yet, we do not believe it is prudent to reduce the sampling frequency for monitoring wells along the southern, western, and northern chromium and manganese plume boundaries, at least until the tracer tests are completed and the results do not indicate chromium or byproduct migration. The table enclosed to this letter shows the revised monitoring program for the IRZ project area that Water Board staff will propose to the Water Board Executive Officer in an amended Monitoring and Reporting Program (MRP), (anticipated in April 2014). Until the amended MRP is issued, PG&E is required to continue the current monitoring program in place.

REQUESTS FOR ADDITIONAL INFORMATION

Cleanup and Abatement Order R6V-2008-0002, amended, requires PG&E to continue implementing full-scale in-situ corrective actions in the Source and Central Areas of the plume to remediate elevated chromium concentrations in groundwater.

In conjunction with Cleanup and Abatement Order R6V-2008-0002, amended, and Investigative Order R6V-2013-0026, submit the following additional information to the Water Board:

1. Continued quarterly IRZ monitoring reports that describe tracer detections during that quarterly sampling, how the detections compare to past quarters, and provide interpretation of the results.
2. In the First Quarter 2014 IRZ Monitoring Report **due by April 15, 2014**, discuss past data and the history of fluorescein dye injections in the Source Area. The discussion shall provide an explanation for pre-July 2013 fluorescein detections in SC-MW-32S and SA-SM-10S. The report shall also describe and/or estimate the fate and transport of this historic fluorescein from the likely injection point. Provide sampling results for monitoring wells located to the north and northwest (downgradient flow direction) of SC-MW-32S and SA-SM-10S.
3. **On June 1, 2014 and December 1, 2014**, submit status reports on the replacement and additional new IRZ injection wells in the Source Area and SCRIA as discussed above in this letter. The reports shall describe in detail all tasks completed, on-going, and planned for the project. The reports shall use site maps showing plume boundaries of chromium concentrations of 3.1 ppb, 10 ppb, 50 ppb, and 500 ppb Cr6/CrT, existing monitoring wells, and planned monitoring wells. The June 1, 2014 report shall contain a narrative on improvements to current maintenance activities for injection well rehabilitation. This narrative shall describe the method and manner of maintenance actions, frequency of maintenance actions, character (constituents and volume) of waste water from injection wells, fate of waste water, and how these actions are an improvement from past maintenance actions.
4. **By July 1, 2014**, describe the results from a 2014 updated groundwater model run evaluating cleanup effectiveness. The model results shall provide an updated estimate for site-wide chromium cleanup time to achieve less than 50 ppb, and the time to achieve less than 10 ppb based upon the chromium cleanup projects permitted to date and including those anticipated to be permitted over the next 18 months. Water Board staff will evaluate this information when developing interim cleanup requirements to be proposed in a draft cleanup and abatement order later this year. Without updated modeling information and estimated cleanup times, the Water Board would have to rely on the timeframes given in the 2010 Feasibility Study and addenda for setting deadlines concerning interim chromium cleanup goals.

Shery Bilbrey
PG&E

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If you should have any questions about this request, please contact me at (530) 542-5436 or Lauri.Kemper@waterboards.ca.gov or Lisa Dernbach at (530) 542-5424 or ldernbach@waterboards.ca.gov.



Lauri Kemper, P.E.
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Enclosure: Revised Monitoring Program Table

cc: PG&E Hinkley Lyris List (and web posting)
PG&E Technical Mail List
Danielle Starring, PG&E
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LSD/adw/T: PG&E Mn invest resp and request
File Under: WDID (VVL) 6B369107001

TABLE 1

IRZ AREA MONITORING PROGRAM

PACIFIC GAS AND ELECTRIC COMPANY HINKLEY COMPRESSOR STATION

Sentry Monitoring Network (Quarterly)	Dose Response Wells (Quarterly)	Performance Monitoring Wells (Semiannually)	Performance Monitoring Wells (Annually)	Removed from Program
CA-MW-301	CA-MW-101D	CA-MW-101D	CA-MW-109S	CA-MW-101
CA-MW-312D	CA-MW-107D	CA-MW-102D	CA-MW-201	CA-MW-102S
CA-MW-313	CA-MW-108D	CA-MW-103D	CA-MW-202	CA-MW-103
CA-MW-412S	CA-MW-109D	CA-MW-104D	CA-MW-203	CA-MW-106S
CA-MW-412D		CA-MW-104S	CA-MW-204S	CA-MW-107S
CA-MW-501S	PMW-03	CA-MW-105	CA-MW-305	
CA-MW-501D	PMW-05	CA-MW-105D	CA-MW-306S	
CA-MW-506S		CA-MW-106D	CA-MW-307S	
CA-MW-510D	SA-SM-01S	CA-MW-108S	CA-MW-307D	
CA-MW-511	SA-SM-01D	CA-MW-110	CA-MW-308	
CA-MW-601	SA-SM-02S	CA-MW-204D	CA-MW-309	
CA-MW-602	SA-SM-08D	CA-MW-302S	CA-MW-311	
CA-MW-603		CA-MW-302D	CA-MW-314	
		CA-MW-303S	CA-MW-315S	
MW-03A		CA-MW-303D	CA-MW-316	
MW-11B		CA-MW-304	CA-MW-317S	
MW-17		CA-MW-306D	CA-MW-402D	
MW-20		CA-MW-310S	CA-MW-403S	
MW-36		CA-MW-310D	CA-MW-403D	
MW-38B		CA-MW-315D	CA-MW-404D	
MW-39D		CA-MW-317D	CA-MW-405S	
MW-67A		CA-MW-401	CA-MW-407	
MW-67B		CA-MW-402S	CA-MW-409S	
MW-73S		CA-MW-404S	CA-MW-411D	
MW-73D		CA-MW-405D	CA-MW-503D	
MW-74		CA-MW-406	CA-MW-508S	
MW-75S		CA-MW-408	CA-MW-509	
MW-75D		CA-MW-409D	CA-MW-510S	
MW-78S		CA-MW-410		
MW-155S		CA-MW-411S	MW-01	
MW-155D		CA-MW-502	MW-06	
MW-177D		CA-MW-503S	MW-11A	
MW-178S		CA-MW-504	MW-12B	
MW-178D		CA-MW-505	MW-13	
MW-179D		CA-MW-506D	MW-16	
MW-180RS		CA-MW-507		
MW-180RD		CA-MW-508D	PMW-06	
MW-182S				
MW-182D		MW-04	PT2-MW-08	
MW-183S		MW-14A		
MW-183D		MW-14S	SA-MW-02D	
		MW-17D	SA-MW-03S	
PMW-05		MW-18	SA-MW-03D	
PT1-MW-04		MW-38A	SA-MW-05S	
PT2-MW-10		MW-39	SA-MW-09D	
		MW-46	SA-MW-13D	
SA-MW-01S		MW-61	SA-MW-15S	

TABLE 1

SA-MW-02S		MW-78D	SA-MW-21S	
SA-MW-05D		MW-177S	SA-MW-22S	
SA-MW-06S		MW-179S	SA-MW-22D	
SA-MW-07S		MW-181S		
SA-MW-07D		MW-181D	SA-SM-01D	
SA-MW-08D			SA-SM-02D	
SA-MW-09S		PMW-02	SA-SM-03S	
SA-MW-10D		PMW-04	SA-SM-03D	
SA-MW-11S			SA-SM-04S	
SA-MW-12S		PT1-MW-01	SA-SM-05S	
SA-MW-13S		PT2-MW-09	SA-SM-06D	
SA-MW-16S		PT2-MW-11	SA-SM-07S	
SA-MW-16D			SA-SM-07D	
SA-MW-17S		SA-MW-01D	SA-SM-08S	
SA-MW-18S		SA-MW-04S	SA-SM-09D	
SA-MW-20D		SA-MW-04D	SA-SM-10S	
SA-MW-25S		SA-MW-06D	SA-SM-10D	
SA-MW-25D		SA-MW-08S	SA-SM-11S	
SA-MW-26S		SA-MW-10S		
SA-MW-26D		SA-MW-11D	SC-MW-17	
SA-MW-27S		SA-MW-12D	SC-MW-21D	
SA-MW-27D		SA-MW-14S	SC-MW-22S	
SA-MW-28D		SA-MW-14D	SC-MW-22D	
		SA-MW-15D	SC-MW-23S	
SA-SM-02S		SA-MW-17D	SC-MW-23D	
SA-SM-08D		SA-MW-18D	SC-MW-26S	
		SA-MW-20S	SC-MW-32S	
SC-MW-01S		SA-MW-21D	SC-MW-38S	
SC-MW-01D		SA-MW-24S		
SC-MW-02S		SA-MW-24D		
SC-MW-02D			X-11	
SC-MW-03S		SA-SM-06S	X-15	
SC-MW-03D		SA-SM-09S	X-16	
SC-MW-04S		SA-SM-11D		
SC-MW-04D				
SC-MW-05D		SC-MW-05S		
SC-MW-06S		SC-MW-07D		
SC-MW-06D		SC-MW-08S		
SC-MW-07S		SC-MW-08D		
SC-MW-09D		SC-MW-09S		
SC-MW-10S		SC-MW-14S		
SC-MW-10D		SC-MW-15S		
SC-MW-11S		SC-MW-16S		
SC-MW-11D		SC-MW-17D		
SC-MW-12S		SC-MW-21S		
SC-MW-12D		SC-MW-32D		
SC-MW-13S		SC-MW-38D		
SC-MW-13D				
SC-MW-14D		X-10		
SC-MW-15D		X-12		
SC-MW-16D		X-17		
SC-MW-26D				
X-13				