



STATE OF NEVADA  
Department of Conservation & Natural Resources  
DIVISION OF ENVIRONMENTAL PROTECTION

Brian Sandoval, Governor  
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December 4, 2013

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SBIC  
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Subject: **Third Quarter 2013 Groundwater Monitoring and Sampling Report**

Facility: Al Phillips the Cleaner (former)  
3661 S. Maryland Parkway  
Las Vegas, Nevada  
Facility ID: **H-000086**

Dear Messrs. Kushner, Swickard, Levy and Oberman:

The Nevada Division of Environmental Protection (NDEP) received the **Third Quarter 2013 Groundwater Monitoring and Sampling Letter Report** prepared by Cardno ATC Associates, Inc. (Cardno ATC) on behalf of the Herman Kushner Trust (Trust) and Maryland Square Shopping Center, LLC (MSSC LLC), dated October 25, 2013 and received in hard copy on October 28, 2013.

### Overview of Reported Results

The Third Quarter Report provides the analytical data for groundwater samples collected from 36 individual, multi-level, and nested wells across the site. Three new monitoring wells were installed and sampled (MW-41, MW-42 and MW-43); these wells provide data that further constrain the known extent of the tetrachloroethylene (PCE) plume to the north and to the east.

Perhaps the most notable result reported in the Third Quarter Report, was the sudden and significant change in the concentration of PCE in well MW-19I and the MW-19D series of nested wells (MW-19-D1, MW-19D2 and MW-19D3). Well MW-19I is located close to the nested wells of the MW-19D series and was designed and used as a pumping well as part of the vertical delineation and pilot testing phase. All these wells are near the injection point used during the in situ chemical oxidation (ISCO) pilot testing.



Potassium permanganate injections (nearly 20,000 gallons injected between March 11 through 20, 2013) were performed as part of the pilot testing on the eastern parking lot of the Mall. Data are in the table below.

Well	Well Location	Screen Depth	Pre-test PCE Levels	Post-test PCE Levels
MW-19	15 ft upgradient of injection	19 to 34 ft	1,000 µg/L	520 to 840 µg/L
MW-19I	25 ft downgradient of injection	30 to 50 ft	700 µg/L	0.50 µg/L
MW-19D1	10 ft crossgradient of injection	31 to 51 ft	300 µg/L	690 to 990 µg/L
MW-19D2	10 ft crossgradient of injection	60 to 70 ft	170 µg/L	<0.50 µg/L
MW-19D3	10 ft crossgradient of injection	92 to 102 ft	0.50 µg/L	710 µg/L

µg/L = micrograms per liter

The above data for the MW-19D series of nested wells suggest two possibilities: (1) the permanganate injections (nearly 20,000 gallons injected from 20 to 60 ft bgs, over 8 days, at pressures of as much as 30 pounds per square inch [psi]) displaced the PCE-contaminated groundwater from the shallow zone and pushed the contamination to the deeper zone (>90 ft below ground surface [bgs]) of the shallow groundwater system, or (2) the well seals in the nested well failed, allowing contaminated groundwater to flow along a preferential pathway and down into the deeper well (MW-19D3), which is screened at 92 to 102 ft bgs.

To evaluate which of the above scenarios is the dominant cause of the dramatic and sudden increase in PCE concentrations (from 0.50 to 710 µg/L) in the deep well, MW-19D3 (92 to 102 ft screen), the NDEP requests that a tracer study be performed in which a tracer solution is injected into the shallow well, MW-19D1, at a pressure equivalent to the injection pressures used during the permanganate pilot study (i.e., as much as 30 psi).

The NDEP notes that any in-situ technology involving injection also involves displacement of a volume of groundwater equal to the volume of injectate. Injection runs the risk of spreading the contaminated groundwater into previously clean areas or zones. This is one of the concerns at any site where in-situ injection technologies are used, and one of the reasons the NDEP required that a groundwater extraction technology be retained as a possible remedy for the Maryland Square PCE Site.

Analysis of metals (arsenic, manganese, chromium and hexavalent chromium) in groundwater samples collected downgradient of the pilot testing area in the eastern mall parking lot shows that concentrations of arsenic appear largely unaffected by the ISCO testing, whereas concentrations of manganese appear to remain above pre-test levels in wells downgradient of the permanganate injection well; concentrations of unspeciated chromium appear to have declined after an initial spike (hexavalent chromium could not be measured in wells containing high concentrations of potassium permanganate).

Wells downgradient of the PulseOx (peroxide-activated ozone) pilot testing likewise showed little change in the concentrations of arsenic, however, concentrations of chromium and hexavalent chromium increased by as much as two orders of magnitude and remain elevated over pre-test concentrations. In particular, concentrations of hexavalent chromium remain high (as much as 120 µg/L) in third-quarter samples collected from some wells.

Results from the Mann-Kendall trend test (see Table 2 and Appendix C) indicate that concentrations of PCE appear to be decreasing in many wells across the site. However, the report shows increasing or generally upward trends in concentration for several wells close to the source area (MW-7, MW-5, MW-6 and MW-3), and for some wells near the golf course (MW-27, MW-31, MW-37 and MW-38).

## NDEP Requirements

The report recommends “*continuing to evaluate PCE concentrations in MW-19D, which may require abandonment.*” The NDEP requests that a tracer test be performed to evaluate the integrity of the wells seals in the nested wells, MW-19D1, MW-19D2 and MW-19D3, or that the Trust propose another method to test integrity of the well seals in this set of nested wells.

The report also recommends continued monitoring and sampling of the site monitoring wells; the NDEP concurs with this recommendation, but the NDEP would be open to suggestions to modify the sampling frequency at monitoring wells across the site. Please provide proposed modifications at your convenience, and the NDEP will review and respond to your proposed modifications to the sampling frequency. Monitoring should focus on collecting those data that are needed to assess effectiveness of the groundwater remedy and demonstrate plume stability (or not). Provide these recommendations, along with justifications for modifying sampling frequency, in the next quarterly report or in a separate letter to the NDEP.

The NDEP requests that vertical gradients be calculated where possible, depending on well locations and well screen depths. Provide results of these calculations in the next quarterly report.

The Fourth Quarter 2013 Groundwater Monitoring Report is due by **January 31, 2014**.

If you have any questions or require additional information regarding this letter, contact me by telephone at (775) 687-9496 or e-mail at [msiders@ndep.nv.gov](mailto:msiders@ndep.nv.gov)

Sincerely,



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