ndep
NEVADA DIVISION OF ENVIRONMENTAL PROTECTION
protecting the future for generations

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

Brian Sandoval, Governor
Leo M. Drozdoff, P.E., Director
Colleen Cripps, Ph.D., Administrator

July 12, 2013

Irwin Kishner
Herman Kishner Trust
252 Convention Center Drive, Ste 12A
Las Vegas, NV 89109

Maryland Square Shopping Center, LLC
c/o Thomas E. Vandenburg
Dongell Lawrence Finney LLP
707 Wilshire Blvd, 45th Floor
Los Angeles, CA 90017

Maryland Square, LLC
c/o Franklin H. Levy
Lawson & Weitzen, LLP
88 Black Falcon Avenue
Boston, MA 02210

SBIC
c/o Jeffrey T. Oberman
Levin & Oberman
361 N. Canon Dr.
Beverly Hills, CA. 90210

Subject: **Draft Corrective Action Report for Groundwater**

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

Dear Messrs. Kishner, Vandenburg, Levy and Oberman:

The Nevada Division of Environmental Protection (NDEP) received the ***Draft Corrective Action Report*** (CAR) ***for Groundwater*** prepared by Tetra Tech on behalf of the Herman Kishner Trust (Trust) and Maryland Square Shopping Center, LLC (MSSC LLC), dated June 14, 2013.

The CAR provides results of the additional vertical delineation, aquifer testing, pilot testing and the screening-level human health risk assessment (HHRA). In addition, the CAR proposes remediation standards and recommends a remedial alternative.

NDEP Comments

The NDEP notes three major comments, related to (1) retention of groundwater pumping to provide hydraulic containment as a contingency, in case the primary remedy is unsuccessful in reducing concentrations of tetrachloroethylene (PCE) in groundwater under the residential neighborhood; (2) calculation of risk for the maximally exposed individual; and (3) proposed remediation standards for PCE in groundwater and indoor air. Each of these three topics is discussed briefly in the following paragraphs. **Attachment 1** provides other specific comments and **Attachment 2** provides comments on Appendix G and remediation standards for groundwater protective of residential indoor air.

(1) A pump and treat hydraulic control and disposal options including re-injection or surface water discharge should be included. This will allow this option to be fully considered as part of the Proposed Plan and Record of Decision (ROD) process.

(2) Each individual home represents an exposure unit. The NDEP notes that, of the homes sampled, the highest concentration of PCE in indoor air was 110 micrograms per cubic meter ($\mu g/m^3$); this indicates that the maximally exposed individual could be exposed to at least as much as 110 $\mu g/m^3$ PCE in indoor air, if the home has not been sampled and mitigated. The CAR needs to evaluate risk to the maximally exposed individual.

(3) The NDEP ran scenarios with the Johnson-Ettinger (J&E) model for vapor transport using the average depth to groundwater (367 and 515 centimeters [cm] below ground surface [bgs]) and average groundwater temperature (24 and 24.7 degrees Celsius [°C]), and some default parameters as presented in the CAR (Appendix G, Tables 2 and 3). The NDEP then ran additional scenarios with different lithologic layers, including the lithologic data from a geotechnical sample collected near MW-18 at 8 feet bgs (URS, 2007). The geotechnical data from sample SVB-09-08 indicated a percent water-filled porosity value of 7.9%, which most closely matched the J&E default value for a loamy sand (7.6%) soil. When this soil type was used, the back-calculated remediation standard was 58 to 63 micrograms per liter (µg/L). In addition to the modeling results, the NDEP looked at the data for the home with the highest detected level of PCE in indoor air (110 µg/m3) and compared this with data from the adjacent monitoring well, MW-25. The average concentration of PCE in MW-25 is 775 µg/L (n = 28 samples). Assuming a linear relationship, a PCE concentration of 66 µg/L in groundwater would be needed to reduce concentrations in indoor air to 9.4 $\mu g/m^3$.

In all, the NDEP's simulations and calculations produced values ranging from 22.3 to 146 µg/L for various scenarios of sand, silt/sand, clay/loamy sand, loamy sand, and sandy loam soils. The CAR needs to use site-specific data to evaluate a fuller range of potential risk, and to consider risk to the maximally exposed individual.

NDEP Requirements

The following remediation standards apply to the Maryland Square PCE Site

- Indoor Air - According to recent toxicity data and exposure levels provided by EPA (2012, available at: http://www.epa.gov/region9/superfund/prg/rsl-table.html), a concentration of **9.4 µg/m^3** represents a 1.0E-06 risk level, the remediation standard for residential inhalation exposure. The December 26, 2010 Permanent Injunction Section V requires the Corrective Action Report to not be inconsistent with the National Contingency Plan (NCP). At 40 CFR 300.430(e)(2)(i)(A)(2), the NCP requires that Preliminary Remediation Goals (PRG) be established at concentrations that achieve 10^{-6} excess cancer risk, modifying as appropriate based on exposure, uncertainty and technical feasibility factors. As no specific factors have been identified to justify modifying the PRG; the NDEP is selecting 9.4 ug/m^3 as the remediation standard for residential inhalation exposure.
- Groundwater (to indoor air) - The remediation goal for groundwater should be set at a level that represents no more than a 1.0E-06 risk level (9.4 $\mu g/m^3$) to receptors/indoor air, unless alternate cleanup goals are established due to technical impracticability or other technical factors. Based on the NDEP's modeling and

the calculation using data from MW-25, the remediation standard for PCE in groundwater in the residential neighborhood between South Maryland Parkway and Eastern Avenue is **100 µg/L**, which is an alternate concentration limit, based on residential exposure via the vapor intrusion pathway.

- Groundwater (to domestic wells) – The remediation standard for groundwater east of Eastern Avenue is **5 µg/L**, to be protective of domestic wells, unless it can be demonstrated that no such wells lie in the downgradient path of the PCE plume.

Please address the comments provided in this letter and the Attachments to this letter, and prepare a revised Corrective Action Report for Groundwater. Submit the revised report no later than **August 12, 2013**.

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

Sincerely,

Mary A. Siders, Ph.D.
Bureau of Corrective Actions
Fax (775) 687-8335

enc(2)

ec: Greg Lovato, Bureau Chief, Bureau of Corrective Actions, NDEP, Carson City, NV
Scott Smale, Supervisor, BCA, NDEP, Carson City, NV
Todd Croft, Supervisor, BCA, NDEP, Las Vegas, NV
Carolyn Tanner, State of Nevada, Office of the Attorney General, 100 N. Carson Street, Carson City, NV
Jasmine Mehta, NDEP, Carson City, NV
Ebrahim Juma, Assistant Planning Manager ejuma@cleanwaterteam.com
Joseph R. Leedy, Principal Planner jleedy@cleanwaterteam.com
Dennis Campbell, Southern Nevada Health District campbell@snhdmail.org
Michael Houghtaling, P.E., Senior Engineer, Clark County Department of Development Services, 4701 Russell Rd, Las Vegas, NV 89118 mhoughta@co.clark.nv.us
Lynne S. Stella, Manager of Environmental Services, General Growth Properties, Inc., 110 N. Wacker Drive, Chicago, IL 60606 lynne.stella@ggp.com
Ric Jimenez, General Manager, The Boulevard Mall, 3528 S. Maryland Parkway, Las Vegas, NV 89169 ric.jimenez@ggp.com
Jeffrey R. Diver, P.C., 2S741 Crimson King Lane, Glen Ellyn, IL 60137 JeffDiver@comcast.net
David B. Kuhlman, Procopio, Cory, Hargreaves & Savitch LLP, david.kuhlman@procopio.com
Robert G. Russell, Procopio, Cory, Hargreaves & Savitch LLP, 525 B Street, Suite 2200, San Diego, CA 92101 bob.russell@procopio.com
Steven J. Parsons, Law Offices of Steven J. Parsons, 7201 W. Lake Mead Blvd., Suite 108, Las Vegas, Nevada 89128-8354 steve@sjplawyer.com

Paul G. Roberts, Vice President and General Counsel, The Interface Group proberts@tigmass.com

Jerry Tidball, Key Golf Management, Las Vegas National Golf Club kgmjerry@yahoo.com

Coy Wood, General Manager, Las Vegas National Golf Course coy@lasvegasnational.com

Tamara Williams, Clark County Community Liaison, 3900 Cambridge Suite #111, Las Vegas, NV 89119 TGW@ClarkCountyNV.gov

Peter Krasnoff, P.E., WEST, Inc., 711 Grand Avenue, Suite 220, San Rafael, CA 94901 peterk@westenvironmental.com

Lisa Medve, P.E., Tetra Tech, 518 17th Street, Suite 900, Denver, CO 80202 lisa.medve@tetratech.com

James Elliot, P.G., Tetra Tech, 5383 Hollister Ave., Suite 130, Santa Barbara, CA 93111 james.elliot@tetratech.com

Steve Bradley, CEM, Tetra Tech, 1230 Columbia Street, Suite 1000, San Diego, CA 92101 steve.bradley@tetratech.com

Andrew Stuart, Senior Project Manager, ATC Associates, 2925 E. Patrick Lane, Suite M, Las Vegas, NV 89120 andrew.stuart@atcassociates.com

cc: Joe Blagg, Project Manager, Diversified Real Estate Group, 4255 Dean Martin Rd, Ste J, Las Vegas, NV 89103

John Griffin, Kaempfer Crowell, 510 W Fourth St., Carson City NV 89703.

Jan Greben, 125 E. De La Guerra St, Ste 203, Santa Barbara, CA 93101-7204

Alexander Robertson, 32121 Lindero Canyon Rd, Ste 200, Westlake Village, CA 91361

Jan Villaire, Coordinator, Environmental Compliance, Safety & Environmental Services, 1700 Galleria Drive, Bldg C, Henderson, NV 89014

Glenn D. Phillips, The Travelers Companies, Inc., SLCU-Suite 160, 4650 Westway Park Blvd., Houston Texas 77041

ATTACHMENT 1

DRAFT CORRECTIVE ACTION REPORT FOR GROUNDWATER
Maryland Square PCE Site, NDEP Facility ID H-000086
NDEP Review Comments, July 12, 2013

GENERAL COMMENTS

Overall, the report is well organized and the information is clearly presented. The NDEP had some specific comments on materials throughout the report; however, there were several comments of larger concern.

1. **The NDEP requests that pumping of groundwater be retained as a contingency for hydraulic containment if the ISCO remedy does not succeed in sufficiently reducing concentrations of PCE and TCE in the shallow groundwater.** The evaluation of pumping tests indicated that the sustainable pumping rates and well efficiencies are low and the drawdown is limited. NDEP notes that the pumping tests were conducted at a limited number of locations and at shallow depths compared to the dimensions of the plume targeted for remediation in the area of Boulevard Mall at (approximately 500 feet wide and approximately 60 feet bgs. Low yield and drawdown means that wells need to be closely spaced to capture flow, so this is not an ideal remedy at the site. This does not mean that pumping cannot be retained as part of a contingency plan. A pump and treat hydraulic control and disposal options including re-injection or surface water discharge should be included. This will allow this option to be fully considered as part of the Proposed Plan and Record of Decision process.

2. **Risk should be calculated for the maximally exposed individual.** The exposure pathway in the residential neighborhood is inhalation of indoor air contaminated with PCE via the process of vapor intrusion. The NDEP notes that, of the homes sampled, the highest concentration of PCE in indoor air was 110 $\mu g/m^3$; this indicates that the maximally exposed individual could be exposed to at least as much as 110 $\mu g/m^3$ PCE in indoor air, if the home has not been sampled and mitigated. (Note: The home with the 110 $\mu g/m^3$ result had a mitigation system installed in 2008.) That concentration, which may not be the highest in the neighborhood because of the unknown concentrations in the homes not sampled, equates to a carcinogenic risk of 1.2E-05 and a hazard index to 2.6. Please revise the report to reflect that each home is an exposure unit and that empirical data show that indoor air at the site contains from nondetectable to 110 $\mu g/m^3$ PCE.

   The indoor air sample containing 110 $\mu g/m^3$ PCE was collected from a home directly adjacent to well MW-25, which (as of March 2013) contained an average concentration of 775 $\mu g/L$ PCE (n = 28). Assuming a linear relationship between PCE concentrations in groundwater and indoor air, a groundwater remediation goal of 66 $\mu g/L$ PCE would be needed to achieve 9.4 $\mu g/m^3$ in indoor air. Please note this relationship in the report, as it applies to uncertainty.

3. **The report proposes a remediation standard of 276 µg/L, developed through use of the EPA's spreadsheets for the J&E model.** The NDEP ran the J&E model using the parameters specified in Table G-2 of the CAR and was able to reproduce the results, including the 276 $\mu g/L$ value. The NDEP accepts use of average depth to groundwater and average temperature of groundwater; however the one variable that is poorly constrained is lithology. The NDEP's simulations using site-specific data in the J&E model showed a range of protective concentrations for PCE in groundwater from 22.3 to 146 $\mu g/L$, compared to the range of 221 to 338 $\mu g/L$ presented in the CAR. This significant difference in calculated values highlights the difficulty of using the J&E model to back-calculate a remediation

standard for groundwater that is protective of indoor air for the maximally exposed individual. The moisture content of the soil types controls to a large degree, the predicted concentrations. (Note: The NDEP's specific comments on Appendix G address this issue; see Attachment 2).

Please discuss in more detail, the issue of uncertainty related to the heterogeneous lithology at the site and how model results are affected. Based on NDEP's simulations and calculations using site-specific data, the NDEP has selected a PCE concentration of **100 µg/L** for groundwater.

SPECIFIC COMMENTS

1. Section 1.1, second paragraph, first sentence states that "*Historical discharge of PCE at the former dry cleaners facility was discovered during a due diligence ESA (NDEP 2012b), and was reported on November 29, 2000, via the NDEP spill reporting hotline.*"

   Please cite the source document, which is an August 22, 2000 report by Converse that was received July 25, 2001 by the NDEP. The Converse report is available at http://ndep.nv.gov/pce/record/2001-07-25.pdf

2. Section 2.2.3, second-to-last paragraph states that the "*...estimates of K are consistent with the results of slug tests conducted in a number of wells, including MW-13, MW-19, and MW-20, as summarized in Section 3.1.3.*" The NDEP notes that consistency of the pumping tests with the slug tests performed in 2003/2004 (Converse 2004 http://ndep.nv.gov/pce/record/2004-03-26-a.pdf) provides confidence in estimated rate of contaminant transport. No change to the document is requested.

3. Section 2.2.3, last paragraph states that "*the advective velocity of dissolved PCE is expected to range from 30 to 70 ft/yr. Section 3.2.1 further discusses groundwater seepage velocity and PCE transport*" The NDEP notes there is no Section 3.2.1 in the draft CAR. Please revise the document to reference the correct section.

4. Section 3.0, first paragraph, first sentence states "*...available on-line at NDEP's website (http://ndep.nv.gov/pce/maryland_reports.htm and http://ndep.nv.gov/pce/refines.)*" The NDEP notes that first link is fine, but the latter is incorrect and it is unclear what link it was supposed to be. Please revise accordingly.

5. Section 3.2, first paragraph, last sentence states that "*However, about midway through the residential neighborhood, probably because of golf course irrigation, the PCE plume broadens, widening along its northern edge to become about 1,000 feet wide by the time the plume reaches the western edge of the golf course. (Figure 3).*" The NDEP requests that the report provide data and analysis to support this statement.

6. Section 5.1, first sentence. Please note that "Adopted Regulation R189-08" has been codified. Please change all references to R189-08 to NAC 445A.22725

7. Section 5.1 discusses CAOs and remediation goals, stating the following CAOs from the CAP:
   - *Protect human health by reducing inhalation exposure to PCE and daughter products emanating from groundwater containing PCE concentrations above the remediation goals.*
   - *Remediate shallow groundwater where PCE concentrations exceed the remediation goal for groundwater to protect indoor air.*

   Section 5.1 continues: "*Groundwater at the site is not a source of drinking water due to poor water quality; however, groundwater is considered "waters of the state," and regulations require "no degradation" of waters of the state. State records show that domestic water supply wells exist east of Eastern Avenue, more than 6,300 feet from the source area, and some of these wells are screened as shallow as 30 ft bgs (NDEP*

2012a)…" and "*The GW CAP, in conjunction with the IA/WW Work Plan, determined that domestic wells within the described plume boundaries should be identified. Therefore, an additional CAO applies:*

- ***"Execute appropriate action to ensure PCE does not exceed risk-based standards in domestic water supply wells."***

On this latter bullet, the NDEP notes that the risk-based standard for PCE in groundwater must be the MCL of **5 µg/L**, as dictated by NAC 445A22735. Please revise the text accordingly.

8. Section 5.2, last paragraph states that "*An indoor air remediation goal for PCE of 42 µg/m^3 will be used to verify that the groundwater remediation goal is protective of the VI to indoor pathway. This remediation goal is based on a noncancer HI of 1. The indoor air remediation goal applies to houses between the eastern parking lot of Boulevard Mall and Eastern Avenue.*"

   The remediation standard for indoor air needs to be established for a 1.0E-06 carcinogenic risk, which is the "point of departure" and which EPA has determined to be 9.4 µg/m^3 for PCE in residential indoor air. Use of a different value requires establishment of an alternate remediation goal. The NDEP's interim-action goal of 32 µg/m^3 was based on a carcinogenic risk of 1.0E-04, based on EPA's toxicological data that were available in 2007, when the interim-action level was set. The 42 µg/m^3 corresponds to a carcinogenic risk of 4.5E-06 (4.5 excess cancers per million people) and a hazard index of one (EPA, 2012). Please revise the CAR accordingly.

9. Table 5-1 provides "Remediation Goals to Protect Residential Indoor Air." Please see NDEP comments on Appendix G, Calculation of Remediation Goals for Groundwater and revise the CAR accordingly.

10. Section 5.3, first and second sentences state that "*State records show that domestic wells may exist east of Eastern Avenue. There is potential for some domestic wells to be in hydraulic communication with contaminated shallow groundwater,* ***but there is currently no evidence of such.***" The NDEP notes that there "is no evidence" because the existence and current use of these wells has not been verified and there are no data for water samples from these wells. Please delete the phrase in bold-face font

11. Section 5.3, mid-paragraph (also Table 5-2). "*The risk-based remediation goal of 9.7 µg/L of PCE in groundwater was determined based on an increased incidence of cancer less than 1E-06 and a noncancer HI less than 1.*" The NDEP notes that the MCL is still set at 5.0 µg/L for PCE and **NAC 445A22735(1)(b)** requires that the MCL be used. The remediation goal for PCE in groundwater east to protect downgradient domestic wells is 5.0 µg/L, not 9.7 µg/L. Please revise the CAR accordingly.

12. Section 6.0, Evaluation of Corrective Action Alternatives. The NDEP acknowledges that the efficiency of the wells is low, and that numerous closely spaced wells would be required to capture groundwater flow across a transect of the plume. However, although pumping has challenges due to the low yield and limited drawdown and radius of influence, this option needs to remain as a contingency option. Please revise the text accordingly.

13. Section 7.0, Recommended Corrective Action. The second sentence states that "*ISCO will be implemented using one or more of the following chemicals: sodium or potassium permanganate, ozone, and/or hydrogen peroxide.*" The NDEP notes that, as written, this sentence states that permanganate, ozone, or hydrogen peroxide will be used. The current text is incorrect if what is meant is that "(1) sodium or potassium permanganate or (2) ozone with or without hydrogen peroxide, will be used."

The NDEP notes a relatively recent publication (Stroo et al, ES&T, May, 2012) that evaluated remedies for chlorinated ethenes and found that "*ISCO is attractive because it provides rapid in situ destruction, but rebound and incomplete treatment have been consistent problems. ISCO has been marginally successful for chloroethene source treatment. Key limitations have been delivery difficulties, frequent concentration rebounds following treatment, and relatively high costs.*" NDEP notes that these are important points to consider during remedy selection, design, and performance monitoring, and requests that the CAR be revised to include a description of these limitations.

14. Section 7.3, Compliance Monitoring proposes the following for compliance monitoring:

    (1) Defines compliance wells as "*monitoring wells within the compliance areas where a COC has been detected above its remediation goal during any of the last four monitoring events.*" (Currently, this includes wells MW-18, MW-23, MW-25, MW-26, MW-27, MW-32, MW-38, and MW-39).

    The NDEP concurs with the listed wells as compliance wells for the remediation standard determined to be sufficiently protective of indoor air, but requests that MW-19 and MW-36 be included.

    (2) Lists monitoring parameters as "*COCs, dissolved metals, anions, and geochemical field parameters.*"

    The NDEP concurs with the COCs, geochemical field parameters, and any constituents as required by the UIC or other permits.

    (3) Specifies that "*After corrective action starts, compliance wells will be monitored quarterly for 2 years, semiannually for 2 years, and annually thereafter. Monitoring frequency at a well will not be decreased if concentration of a COC trends upward in that well. Similarly, if concentration of a COC trends upward during annual or semi-annual monitoring, monitoring frequency will be doubled.*"

    The NDEP concurs with the proposed monitoring frequencies and conditions for monitoring.

    (4) States that "*Indoor air will be monitored as approved by the NDEP under the existing program, and the properties to be monitored will be determined in consultation with the NDEP.*"

    The NDEP concurs with the proposed for monitoring indoor air.

    NDEP notes that during remedial design, additional data points and process data are likely to be proposed or required as part of monitoring the operational performance of the remedy. The CAR should be revised to briefly describe the need for this additional operational performance monitoring, which is distinct from monitoring achievement of remedial action objectives.

15. Section 7.4, Domestic Water Supply Wells. As noted earlier, **NAC 445A.22735(1)(b)** requires the MCL of 5.0 µg/L be used as the action level.

16. Section 7.6, Confirmation of Cleanup. States that "*Cleanup will have been achieved when COC concentrations in groundwater and indoor air remain below their remediation goals for four consecutive monitoring events after ISCO stops. Assumedly, ISCO will stop when ozone injection stops, or when the concentration of sodium or potassium permanganate in compliance wells has been below 1 mg/L for 1 year.*" The NDEP concurs with this proposal.

17. Section 7.7 Deep Groundwater Protection. *"A video survey of irrigation well PW-1 at the Las Vegas National Golf Club revealed damage to the well casing. In its present condition, this well acts as a conduit for contamination of deep groundwater. Therefore, the well owner will be required to repair this well, or plug and abandon it in accordance with NAC 534.427, so that it no longer threatens groundwater quality."* The NDEP notes that although **NAC 534.427(3)(b)(5)** states that "*The well tends to cause contamination of the groundwater aquifer.*" Discussions between NDEP and DWR staff have indicated that this statute has not been used as envisioned here, but it seems applicable in the case of golf course irrigation well, PW-1. This use of NAC 534.427(3)(b)(5) is subject to DWR determination and it cannot necessarily be assumed it would apply as stated in the text.

18. Section 7.8, Interim Protection of Indoor Air Proposes annual indoor air monitoring and installation of additional SSD systems as needed. NDEP concurs with continuation of annual indoor air sampling and continuation of the SSD systems until concentrations of PCE and TCE in groundwater are reduced such that they no longer pose a threat to residents via the VI pathway. The NDEP also notes that the responsible party must also provide maintenance of the systems.

19. Section 7.9, Access and Permitting states that access agreements with property owners are needed, as are UIC permits with BWPC and construction/hazardous material permits with Clark County. The NDEP concurs and notes that obtaining such may take considerable time, so access and permits should be requested well in advance of when they are needed.

COMMENTS – FIGURES

20. Figure 1. Please find another way to depict this (and fade out the background some). This figure looks like a plume map, so please draw a squared-off box outline rather than the plume-shaped outline now shown. Actually, something like Figure 20 would be more suitable; just draw boxes around "Source and Nonresidential," "Residential VI Compliance," and "Residential Well Compliance" areas.

21. Figure 3. Please draw with a 5 µg/L boundary, not a 9.7 µg/L boundary. As noted in the specific comments above, **NAC 445A.22735(1)**(b) requires that the MCL of 5.0 µg/L be used as the action level. Additionally, the line depicting the remediation goal (276 µg/L proposed in the CAR), may have to be altered, depending on the remediation goal selected.

22. Cross Sections, Figures 5, 6, and 7. Just a suggestion, but lithologic information depicted on cross sections is generally easier to follow if there is a "color theme" associated with soil texture. That is, finer-grained materials are shown in shades of greens and blues, whereas sands are shown in shades of yellows and oranges, and coarser (gravels) are shown in shades of pink. The color palette then runs from cool to warmer (finer grained to coarser grained).

23. Figure 7, Cross Section C-C' There seems to be a green color in MW-19D1/D2/D3 that isn't in the key. What does this color mean?

24. Figure 19, Groundwater Elevation over Time. Some wells show the annual fluctuation related to golf course irrigation. Please review adequacy of existing data and provide an evaluation of whether drawdown from pumping or infiltration from irrigation is the dominant factor in the fluctuation of the water table.

COMMENTS - Appendix B – Aquifer Testing Report (pg 158 in pdf)

25. This section concludes that "*within the test areas, PCE migration rate with groundwater is likely to range from 30 to 70 ft/yr*" and that "*Estimates of hydraulic parameters obtained from the aquifer tests can be used for interpretation of the pilot tests, and for support of groundwater modeling applications and risk assessments.*" The NDEP concurs with these conclusions.

26. The NDEP notes that estimates of hydraulic conductivity from pumping tests conducted for the CAP validate the slug test results (Converse, 2004).

27. The NDEP has no additional comments on Appendix B.

COMMENTS-Appendix F – Screening Level Human Health Risk Assessment for Residential Indoor Air

28. Appendix F, Section 1, Introduction, paragraphs 1 and 2 contain text that the NDEP previously marked for revision in the preliminary draft HHRA. Please go back to those comments and red-lined text and revise this section accordingly. The discussions of liability and who owned what when are not relevant to the risk assessment.

    The Maryland Square Tetrachloroethene (PCE) Site is east of downtown Las Vegas, Nevada. Shallow groundwater at the Site contains a PCE plume that extends from the location of the former dry cleaners (Al Phillips the Cleaners), in the former Maryland Square Shopping Center (Figure 1), to approximately 6,000 feet east (downgradient), just east of Eastern Avenue (Figure 2). This plume of PCE-contaminated groundwater extends beneath the Paradise Palms residential neighborhood, more than 1,000 feet downgradient from the source area (Figure 2).

29. Appendix F, Section 1, third paragraph, last sentence. Revise to state that "The former dry-cleaning business operated from 1969 to 2000.

30. Appendix F, Section 1, 4th paragraph. Revise; the soil gas study was **not** performed to delineate the extent of PCE in groundwater.

    A series of environmental investigations has taken place at the property and off site in downgradient areas from 2000 to the present. On-site investigations of soil and groundwater beneath the property delineated the extent of PCE-contaminated soil and established the boundary of the contaminated groundwater on and immediately adjacent to the property. Groundwater investigations conducted off the property have delineated the approximate extent of PCE contamination in the shallow groundwater. A soil-gas study was performed in 2007 to assess whether the contaminated groundwater was producing PCE vapors that accumulated in the subsurface environment.

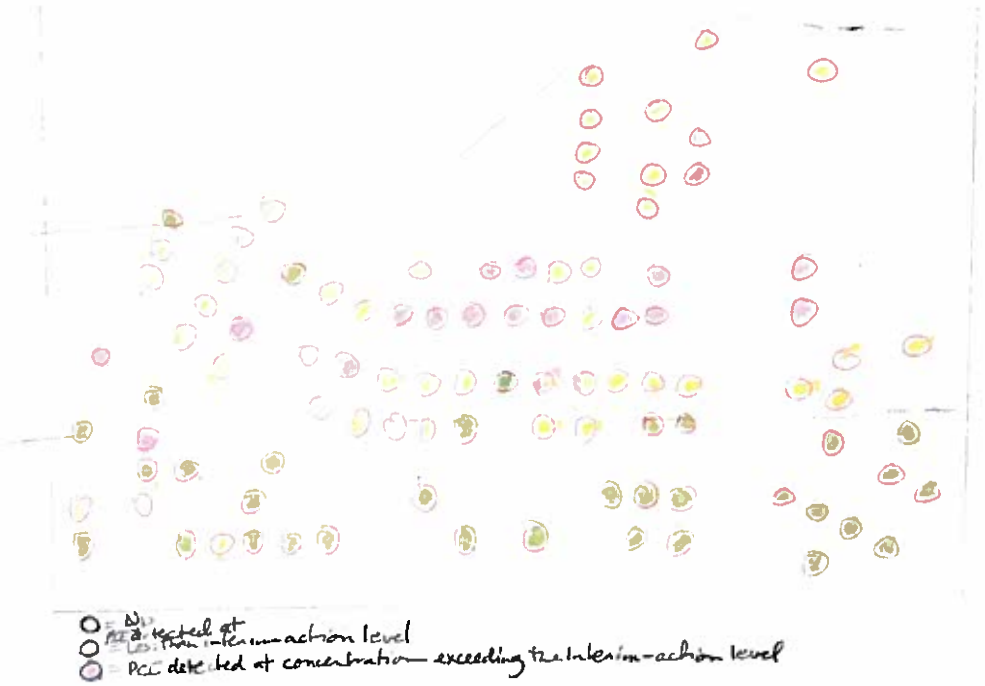
31. Appendix F, Section 1, page 2, second complete paragraph states that "*During July and August, 2010, NDEP and the Attorney General worked on drafting an injunction that would satisfy the U.S. District Court.*" This should be rephrased to include the citizen plaintiffs, who initially submitted a proposed injunction on June 30, 2010. This June 30 proposed injunction was rejected by the Court, and the Court sent all parties back to redraft a new proposed injunction. Ultimately, the proposed injunction submitted by the Nevada AG was the version selected and approved by the Court on December 27, 2010.

32. Appendix F, Section 2.1.1, Data from Samples of Indoor Air. The classification scheme with 8 groups is very difficult to follow. Please consider preparing a table that simply shows the following: (1) quantitative risk for houses within 100 ug/L contour with detected PCE, (2) quantitative risk for houses outside the 100 ug/L contour with detected PCE, and (3) qualitative risk for houses not sampled, but within the 100 ug/L contour. The table could present the range of estimated risks for each of these three groups. The 8-group analysis may be maintained as is in the detailed analysis, but for management purposes, it would be instructive to have the ranges of risk for the three groups outlined above.

33. Appendix F, Section 2.2.2. The NDEP notes that Figure 4 is essentially a flow chart. An idealized graphic of the CSM for a vapor intrusion site with a plume of contaminated groundwater, and showing source, transport pathway and receptor, is available on NDEP's website at: http://ndep.nv.gov/pce/graphic/vi_process_csm_figure.pdf

34. Appendix F, Section 2.4, last paragraph notes that "*the averaging time for addressing noncancer health effects for residents is equal to the exposure duration (in years) times 365 days per year (that is, 10,950 days), as recommended by EPA (1989, 2012).*"

35. Appendix F, Figure 3. The NDEP requests modifying this figure with just the results "floating in space" (i.e., take away street and property boundaries) in order to preserve homeowner privacy (see example sketch below). This figure should ignore which homes have SSD systems and use the highest concentration of PCE detected in indoor air to group data into one of three groups: green = PCE not detected in indoor air; yellow = PCE detected at concentration less than the interim-action level of 32 µg/m^3; and pink = PCE detected at concentration exceeding the interim-action level; home mitigation system offered to property owner.



EDITORIAL COMMENTS

1. Correct formatting of Table 2-1-1.

2. Section 3.0, complete first paragraph, states that "*Elements of the conceptual site model (CSM) have been provided in a series of reports prepared for the site and are available on-line at NDEP's website...These reports develop the CSM based on additional information collected for site geology, hydrogeology, and the vertical delineation of PCE in groundwater throughout the course of this investigation during summer 2012 and winter-spring 2013.*"

   The reference to "these reports" is vague because it seems to refer to the previous "series of reports," but then switches to "summer 2012 and winter-spring 2013." Additionally, the NDEP's Maryland Square website has contained a figure depicting the VI process, showing source, transport, and exposure within a home. This constitutes a preliminary CSM, with additional information provided in site reports. Also suggest a short definition of a CSM. See suggested text below:

   A conceptual site model (CSM) describes the contaminant source, mechanism of transport, and exposure pathway at a contaminated site. A preliminary CSM was developed in the early stages of Maryland Square investigation, and has been periodically refined and updated as more information has been collected. The NDEP's website for the Maryland Square PCE Site provides a simplified figure showing the vapor intrusion process and how chemicals released in one place migrated in groundwater to affect homes more than 1,000 feet from the source area (http://ndep.nv.gov/pce/graphic/vi_process_csm_figure.pdf). This CSM figure, as well as previous reports describing details of site investigations are available on-line at NDEP's website (http://ndep.nv.gov/pce/maryland_reports.htm). Additional information collected for site geology, hydrogeology, and the vertical delineation of PCE in groundwater throughout the course of the investigations and pilot testing during summer 2012 and winter-spring 2013 are used here to further refine the CSM for the Maryland Square PCE Site.

3. Section 3.2, second and third paragraphs. Suggest a subsection, because paragraph 3 does not naturally progress out of paragraph 2. Perhaps the following subsections would help direct the reader's attention:

   3.2.1 – History of Groundwater Investigations at the Site

   3.2.2 – Migration of the PCE Plume

   3.2.3 – Estimate of PCE Mass

4. Section 4.1.1, first paragraph, first sentence. Take the first sentence and move it to the end of the paragraph. The second sentence is really your topic sentence; it immediately tells the reader the most critical point; that "*None of the houses in the quantitative evaluation had an estimated potential incremental cancer risk exceeding the 1 in 10,000 (1E-04) action level.*"

5. Section 4.1.2, first paragraph, first sentence. Take the first sentence and move it to the end of the paragraph. The second sentence is really your topic sentence; it immediately tells the reader the most critical point that "*No houses had an estimated noncancer hazard greater than the action level of 1.*"

ATTACHMENT 2

APPENDIX G – CALCULATION OF REMEDIATION GOALS FOR GROUNDWATER
DRAFT CORRECTIVE ACTION REPORT FOR GROUNDWATER
Maryland Square PCE Site, NDEP Facility ID -000086
NDEP Review Comments, July 12, 2013

1. Appendix G, Section 1.2, bullet 1 states "*...as amended under Adopted Regulation R189-08.*"

The NDEP notes that this regulation has been codified; **please update with the correct reference, NAC 445A.22725**, (also see NAC 445A.22735 through 22745 for additional information).

2. Appendix G, page 2, first paragraph states "*The first step identified potential regulatory standards potentially applicable to a release to groundwater from a property. Groundwater is "waters of the state," (NRS 445A.415) and NDEP asserts that regulations require "no degradation" of waters of the state (NDEP 2011a). However, Section 14 of Revised Proposed [and adopted] Regulation R189-08, issued by the NDEP Bureau of Corrective Actions, prescribes the criteria required to conclude corrective action activity, that relies, in part, on source control; interruption to, or remediation of, exposure pathways; and the likely use of groundwater.*"

Please update with the correct reference, NAC 445A.22725, (also see NAC 445A.22735 through 22745 for additional information). The statute allows an owner/operator to "*submit a written request for exemption from the provisions of subsection 1*" and states that the "*Director **may** grant the request" **if*** a number of conditions are fulfilled to the satisfaction of the NDEP.

3. Appendix G, Page 2, second paragraph, last sentence states "*An MCL, or other drinking water standard, is not appropriate for the shallow groundwater at the Site because shallow groundwater is not used as a domestic water supply and naturally occurring shallow groundwater quality is so poor it is not a potential source of drinking water.*"

The NDEP notes that the Division of Water Resources (DWR) database shows domestic wells located in the downgradient area east of Eastern Avenue. Unless can be demonstrated otherwise, these wells require protection from the migrating plume, at a concentration equivalent to the MCL for PCE (5 µg/L), with Eastern Avenue as the compliance boundary.

4. Appendix G, Page 2, third and fourth paragraphs. The text states that excess carcinogenic risk less than 1.0E-06 and a noncancer HI less than 1 is considered "acceptable." **The NDEP concurs.**

5. Appendix G, Section 1.2.1, page 4. Bullets in this section include the following model assumptions:
   - Contamination is homogeneously distributed in the contaminated groundwater.
   - Contamination does not undergo chemical or biological transformations between the source and the air.
   - Contamination is homogeneously distributed through the indoor air in a house.

The NDEP notes the following for the Maryland Square PCE Site:
- The concentration of PCE in groundwater is likely to be more homogenously distributed than the concentration of PCE in subsurface vapors, but lithologic heterogeneity is high in the subsurface

- The chemical conditions at the site are consistent with the assumption that PCE does not undergo chemical or biological transformations between the groundwater and indoor air, because PCE degrades anaerobically.
- Most homes in the neighborhood are single-story, slab-on-grade homes. Unless homeowners keep some interior doors closed, the air inside the home should be fairly well-mixed.

Please include in Section 1.2.1, a discussion of how appropriate these assumptions are for the Maryland Square PCE Site.

6. Appendix G, Section 1.2.2. The first paragraph states that average depth to groundwater and average groundwater temperature at well MW-18 were used in the J&E model to generate the proposed remediation standard of 276 µg/L for PCE.

   The third paragraph notes that "*the boring log for MW-18 and geologic cross section for the site are not completely consistent*" and that "*the cross section (Figure 2) was used for identifying the soil strata, because it resulted in more protective assumptions for soil type. The input parameters used in the J&E model to calculate the remediation goals, along with the rationale for selection of the inputs, are provided in Table 2.*"

For the proposed remediation of **276 µg/L**, Table 2 shows that an average depth to groundwater of 12 ft bgs was used in the J&E model, along with parameters for a layer of sand and an underlying layer of silt. The NDEP notes that the thickness of the silt layer at the water table is constrained in the model to be at least the thickness of the capillary zone; this results in a lack of flexibility to adjust the thickness of silt layer above the water table to a value less than 164 cm (capillary zone in default table is 163.04 cm for silt). If the same thicknesses of sand and silt are used in the model, but the layers are reversed (i.e., 164 cm silt overlying 203 cm sand), the resulting PCE concentration in groundwater that is protective of indoor air is **24.9 µg/L**. This significant difference highlights the difficulty of using the J&E model to back-calculate a remediation standard for groundwater that is protective of indoor air for the maximally exposed individual. The moisture content of the various soil types controls to a large degree, the predicted concentrations. **Please see following NDEP discussion and calculations that address the issue of remediation standards back-calculated using the J&E model and revise the CAR accordingly**.

7. Appendix G, Section 1.2.3, "Uncertainties in the Remediation Goal," first paragraph states "*The primary uncertainty in the J&E Model is the assumption that chemical concentrations in groundwater are not decreased by transport of the chemical to the surface. The J&E Model ignores attenuating factors, such as hydrolysis, photolysis, and biological degradation that reduce the contaminant concentration migrating to indoor air. For these reasons, the model serves as a protective screening tool for assessing potential indoor air concentrations and risks*"

In the case of PCE at the Maryland Square site, these assumptions of the J&E model are likely true at the Maryland Square PCE Site. Site-specific conditions are not conducive to biological degradation and there is no evidence of biological degradation (i.e., only limited amounts of degradation products in some samples). The low levels of TCE detected in some samples may reflect initial impurities in the PCE used for dry cleaning. Additionally, the ATSDR Toxicological profile for PCE states that "*Existing evidence indicates that tetrachloroethylene does not readily transform in water. Mass balance experiments in a sand aquifer showed that the amount of tetrachloroethylene recovered at the end of migration through the aquifer was essentially the same as that added (Roberts et al. 1986). Studies of photolysis and hydrolysis conducted by Chodola et al.*

(1989) demonstrated that photolysis did not contribute substantially to the transformation of tetrachloroethylene. Chemical hydrolysis appeared to occur only at elevated temperature in a high pH (9.2) environment, and even then, at a very slow rate." **Please indicate that the model assumptions are likely correct for the Maryland Square PCE Site, or provide discussion why they are not.**

8. Section 1.2.3 continues, "*In addition, the J&E Model is not able to account for spatial variability in the concentrations of subsurface vapors, caused by* ***heterogeneities in the subsurface materials*** *and other factors such as preferential pathways that can result in spatial variability in indoor air concentrations. Additionally, the" model is not able to adjust for building-specific characteristics or occupants' activities that affect building ventilation, further adding uncertainty associated with temporal variability in indoor air concentrations. These factors could result in the model over- or underestimating the actual attenuation factor between the subsurface concentration and the indoor air concentration.*"

The NDEP agrees that there is significant uncertainty that makes predicting the extent of VI in any one home difficult. Building-specific characteristics (homes in the residential neighborhood are semi-custom homes built in the 1960s and 1970s) and occupants' activities may play a larger role in contributing to uncertainty than do hydrolysis, photolysis and biological degradation. **Revise the reportto state that large uncertainties exist due to the heterogeneous lithology of the geologic deposits across the site.**

9. **Appendix G, Section 1.2.4, Table 3. Table 3** provides the different risk-based concentrations developed using the J&E model, using the parameters provided in Table 2 and modifying one parameter at a time to evaluate model sensitivity to each parameter change.

In the sensitivity scenarios presented in Table 3 of the CAR, parameters modified for well MW-18 included depth to groundwater, temperature of groundwater and lithology (changing a silt/sand lithology to 367 cm silt). These modifications altered the risk-based concentration for groundwater from the proposed standard of 276 µg/L, producing a range from **221 to 338 µg/L**, as presented in Table 3 of the CAR. However, other modifications to soil type, as well as geotechnical data from 2007, were not used to develop other scenarios.

The NDEP was able to reproduce the numbers for the model output shown in Table 3 of the CAR. However, the NDEP then ran the J&E model for other possible scenarios of soil types, and using site-specific geotechnical data; this produced remediation standards protective of indoor air that ranged from **22.3 to 146 µg/L.**

The NDEP notes that the groundwater remediation standard needs to be protective of the maximally exposed individual. Not all homes within the VI area of concern have been sampled, and changes in occupants or occupant behavior, as well as any modifications to the structure or remodeling of the home, may alter the extent of VI at homes that were previously sampled. This means that there could be unacceptable exposure in unsampled homes, which lack mitigation systems. Because of the uncertainty discussed here (and shown in the modified **Table 3** below), a remediation standard of 276 µg/L is not convincingly protective for the maximally exposed individual within the residential neighborhood.

The NDEP also looked at the data for the home with the highest detected level of PCE in indoor air (110 $\mu g/m^3$) and compared this with data from the adjacent monitoring well, MW-25. The average concentration of PCE in MW-25 is 775 µg/L (n = 28 samples). Assuming a linear relationship, a PCE concentration of 66 µg/L in groundwater would be needed to reduce concentrations in indoor air to 9.4 $\mu g/m^3$. Construction of this particular home may be facilitating vapor transport; yet another uncertainty in the J&E modeling

The modified version of Table 3 shows the order-of-magnitude range of back-calculated using site data.

Table 3. Sensitivity of Calculated Risk-based Groundwater Concentration to Input Parameters

Scenario	Soil Type	Depth to Groundwater (cm)	Groundwater Temperature (°C)	Risk-based Groundwater Concentration (µg/L)	Change in Value
MW-18 averages (Remediation Goal)	203 cm Sand/ 164 cm Silt	367	24.7	**276**	--
MW-18 averages, change in soil type	367 cm Silt/Silt	367	24.7	**317**	+15%
MW-18 averages, minimum depth to groundwater	203 cm Sand/ 164 cm Silt	266	24.7	**274**	-1%
MW-18 averages, maximum groundwater temperature	203 cm Sand/ 164 cm Silt	367	29.3	**221**	-20%
MW-25 averages (well closest to highest indoor air concentrations)	582 cm Silt/Silt	582	24.0	**338**	+22%
All MWs within 100 µg/L PCE plume in residential area, averages (except MW-18 soil type)	351 cm Sand/ 164 cm Silt	515	24.0	**290**	+5%
MW-18 averages, but with soil type as sand/sand	367 cm Sand/Sand	367	24.7	22.3	-92%
MW-18 averages, but with soil type reversed	203 cm Silt / 164 cm Sand	367	24.7	24.9	-91%
MW-18 averages, but with soil type reversed, min sand	349 cm Silt / 18 cm Sand	367	24.7	24.9	-91%
All MWs within 100 µg/L PCE plume in residential area, averages, but 497 cm silt overlying 18 cm sand	497 cm Silt / 18 cm Sand	515	24	35.8	-87%
MW-18 averages, with all Sandy Loam soil	367 cm Sandy Loam	367	24.7	135	-51%
All MWs within 100 µg/L PCE plume in residential area, averages, Sandy Loam	515 cm Sandy Loam	515	24	146	-47%
All MWs within 100 µg/L PCE plume in residential area, averages, Loamy Sand	515 cm Loamy Sand	515	24	58	-79%
MW-18 averages, using site-specific geotechnical data for SVB-09-08, % soil moisture = 7.9%, = LS soil	150 cm Clay/ 217 cm Loamy Sand	367	24.7	63	-77%

The NDEP notes that all the risk-based values shown in Table 3 exceed the EPA's VISL of 13 µg/L for PCE in groundwater protective of residential indoor air. Site geotechnical data from ***Off-site Soil Vapor Assessment Report*** (URS, 2007); see: http://ndep.nv.gov/pce/doc/ms_soil_vapor_assessment_report_4-07.pdf

cm – centimeter, °C – degrees Celsius, µg/L – micrograms per liter, % - percent

NDEP DETERMINATION OF A REMEDIATION STANDARD FOR GROUNDWATER THAT IS PROTECTIVE OF RESIDENTIAL INDOOR AIR

The distribution of PCE concentrations in groundwater, soil vapor and indoor air serves to emphasize the degree of unpredictability associated with estimating risk for any individual home at a VI site.

The J&E User's Guide (EPA, 2003) states that "Of the soil-dependent properties, the soil moisture parameters clearly are of critical importance for the attenuation value calculations" and that "The soil moisture content has an exponential effect on the rate of vapor diffusion." In fact, Section 1.2.4.1 correctly noted that "Soil moisture parameters are of critical importance for the calculations."

The remediation standards back-calculated using the J&E model range from **22.3 to 338 µg/L**, and all can be supported by some form of site data. Acknowledging this range and the uncertainties due to lithology and home-related factors, the NDEP specifies use of **100 µg/L** as the remediation goal for groundwater under the residential neighborhood west of Eastern Avenue.