



**U. S. Department of Energy  
National Nuclear Security Administration  
Pantex Site Office  
P. O. Box 30030  
Amarillo, TX 79120-0030**



APR 27 2006

**CERTIFIED MAIL/RETURN RECEIPT REQUESTED**

Ms. Kera Bell  
Texas Commission on Environmental Quality  
P. O. Box 13087, MC-127  
Austin, TX 78711-3087

Re: U.S. DOE/National Nuclear Security Administration Pantex Plant  
TCEQ Solid Waste Registration No. 30459  
TCEQ Hazardous Waste Permit No. HW-50284  
EPA ID No. TX 4890110527  
Transmittal of Response to Texas Commission on Environmental Quality Comments on the  
*Burning Ground Human Health Risk Assessment* (April 2005)

Dear Ms. Bell:

Please reference your letter dated March 10, 2006, and the enclosed BWXT letter dated April 18, 2006, subject as above.

Enclosed are the responses addressing your comments in the referenced letter. These comments were resolved at previous Tier 1 and Focus Team meetings held February 14-15, March 29-30, and April 12, 2006, we have also enclosed a comparison of background values from the 2002 and 2004 Update to the *Risk Reduction Rule Guidance to the Pantex RFI* (RRRG). The enclosed tables correspond to the RRRG tables and can be placed in your RRRG report for your reference.

The *Burning Ground Human Health Risk Assessment Report* (April 2005) will be finalized based on TCEQ and U.S. Environmental Protection Agency (EPA) comment resolution and is scheduled for delivery to your agency in May, pending receipt of the formal EPA comments.

If you have any questions, please contact Johnnie Guelker of my staff, or Dennis Huddleston of BWXT at (806) 477-3183 or (806) 477-6508, respectively.

Sincerely,

Jerry S. Johnson  
Assistant Manager for Environmental  
& Site Engineering Programs

Enclosures

cc w/enclosures:  
J. McWilliams, TCEQ, Amarillo  
S. Ethridge, TCEQ, Austin  
C. Stone, TCEQ Austin  
C. Hueni, EPA, Dallas  
SS:FY06:115:FY06:29225:SS

cc w/o enclosures:  
J. Wang, TCEQ, Austin  
A. Lichaa, TCEQ, Austin  
J. Hepola, EPA, Dallas  
D. Eden, TCEQ, Austin

**Enclosure 1**

Response to TCEQ Comments  
On the *Burning Ground Human Health Risk Assessment* (April 2005)

TCEQ Letter dated March 10, 2006

**Response to TCEQ Comments dated March 10, 2006**  
**“Burning Ground Human Health Risk Assessment”, dated April 2005**

**I. GENERAL COMMENTS:**

1. The TCEQ clarifies that regardless of whether or not the results of the BGHHRA indicate a risk to human health, long-term monitoring (LTM) will be required to manage the uncertainties in the investigation record and risk assessment methodologies; therefore, the TCEQ has reviewed the BGHHRA from the perspective of determining what, if any, corrective measures in addition to LTM are necessary to protect human health from risks associated with releases from the Burning Ground Waste Management Group (including Playa 3). The TCEQ will not approve the use of the results of the BGHHRA as a means to justify the reduction of aspects of the LTM plan (e.g., COPCs analyzed for, frequency and duration of monitoring, number and location of monitoring wells, etc.) that are necessary to adequately manage the uncertainties in both the investigation record and risk assessment methodologies.

*As we discussed in the February 2006 Tier 1 meeting, Pantex understands that a long term monitoring (LTM) system will be established for the site, including the Burning Ground. This system and the sampling & analysis plan for monitoring will be proposed through a Corrective Measures Implementation Work Plan and an application to modify Compliance Plan No. 50824.*

2. The TCEQ requests that the following language that was previously agreed to by the Core Team be added to the BGHHRA in appropriate locations to acknowledge that COPCs have been detected in Ogallala Aquifer wells within and in the vicinity of the Burning Grounds:

“It is uncertain if more completed pathways to the Ogallala Aquifer existed historically, or exist currently. Data indicate there are non-trending sporadic hits of constituents at low, non-actionable concentrations below regulatory screening levels.”

*The agreed upon language will be added to the Final Burning Ground Human Health Risk Assessment (BGHHRA) Report.*

In addition, please remove any statements from the BGHHRA regarding stable or decreasing trends in COPC concentrations in the Ogallala Aquifer, as the TCEQ does not concur that conclusions on COPC concentrations trends can currently be made for the Ogallala Aquifer.

*No trending discussions for the Ogallala Aquifer are included in the BGHHRA Report. For assessment of the most appropriate measured concentration to use in the Ogallala groundwater analysis to be included in the revised report, Pantex will perform trending analysis as provided in the TCEQ Consistency Document. This information will not be used to provide trending discussions in the report. This information will be used to address agreements to assess uncertainty associated with potential risk from the sporadic detections of constituents in the Ogallala Aquifer, per TCEQ and EPA letters (dated July 15, 2005 and July 18, 2005, respectively) providing approval of the Groundwater RFIR.*

3. Please ensure that references in the text to data and information in tables, figures, or appendices are clearly discernable to facilitate the review of the BGHHRA.

*As agreed during the February 2006 meeting, Pantex will prepare a crosswalk of major steps in the risk assessment to detailed tables in the appendices so that the information can be easily located during review.*

4. The TCEQ requests additional discussion be included in the BGHHRA regarding COPC source removal/treatment activities that have been conducted, are currently being conducted, and/or are to be conducted to support DOE-Pantex's contention of an anticipated future reduction in detections and concentrations of COPCs in environmental media in the Burning Grounds.

*The BGHHRA does address all source removal/treatment activities that were in place or ongoing before May 2005. Additional discussion of the SVE system will be added to provide more information regarding the soil gas and residual NAPL sources modeled in the risk assessment. Other remedial actions taken after the baseline condition assessed in the BGHHRA will be addressed in an implementation report to gain final closure approval of the Burning Ground SWMUs.*

5. Please note that portions of the September 2004 "Subsurface Modeling Report" that pertain specifically to the BGHHRA were included in this review.

*No response necessary.*

## **II. SPECIFIC COMMENTS:**

### **A. Modifications/Additional Information Requested:**

1. In order to better demonstrate that the placement of the six acre exposure area grids results in an appropriate method of evaluating risk and hazard, please provide the following additional information:

- a) Please provide a more detailed description in Section 3 of the methodology, statistical analysis, and conclusions associated with hotspot evaluation. Please indicate in the discussion the hotspots that are driving the risk. The configuration of the six acre grids should allow for the most conservative evaluation of risk (i.e., a configuration that results in a grid which includes data points that result in the highest calculation of risk should be used).

*As provided and discussed at the February 2006 meeting, the detailed information for hot spot analysis and grid configuration development will be included in the Final BGHHRA Report.*

- b) Please provide risk and hazard calculations for a six-acre area that includes SWMU 52 and SWMU 47 to 51 as well as hotspots in the northern portion of Grid 18 (Grid 18 shifted to the west and slightly to the north).

*As agreed at the February 2006 meeting, this information for the requested exposure area will be included in the Final BGHHRA Report.*

Please note that deed notice is required when using an exposure area greater than ½ acre for commercial/industrial facilities.

*The exposure area size will be included in the deed record for all units closing to RRS 3.*

2. The Playa Management Unit (PMU) for Playa 3 was excluded from the risk assessment based on current restricted access (fence) and current use of the area as an impact zone for a firearms training range. 30 TAC §335.553(b)(2) states that a baseline risk assessment should be prepared which describes the potential adverse effects under both current and future conditions caused by the release of contaminants in the absence of any actions to control or mitigate the release. Please include the PMU for Playa 3 in the evaluation of risk and hazard in the BGHHRA. Contingent

upon TCEQ approval, a larger exposure area size may be used if appropriate considering current and potential receptor activity patterns within the PMU.

*The approach to evaluation of a standard industrial worker was resolved through teleconferences held March 2 and March 7. The approach that was agreed upon was documented in an e-mail to the Tier 1 Team dated April 3, 2005. Per agreement, a standard industrial worker scenario will be applied to the fenced areas within the playa area, to correspond to current worker patterns. A hotspot analysis will also be performed to evaluate the need for special consideration within the deed record.*

3. In Figure 2-3, the title indicates perched aquifer water levels are depicted; however, the contour lines reflect elevations. As such, the locations where the perched aquifer saturated thickness decrease to zero feet can be connected to form a contour line (i.e., a line of equal elevation). As a result, the groundwater contours should not intersect this line as shown on this figure; instead, the groundwater contours should be parallel to it. Please revise this figure accordingly.

*The reviewer is correct in stating that the line depicting the extent of perched saturation is a contour line of zero saturated thickness. Therefore, contours of perched saturated thickness should not intersect the extent of saturation line. However, contours of perched water table elevation (shown on this figure) are independent of saturated thickness; and therefore may intersect the line depicting the extent of saturation. For this reason, no revision is necessary.*

4. Section 4.1.3 indicates that time-series data from wells at or near the burning ground were analyzed for concentration trends, and it was determined that all trends were stable or decreasing. This conclusion is the basis for limiting the evaluation of groundwater data in the BGHHRA to data collected from 1<sup>st</sup> quarter 2002 through 4<sup>th</sup> quarter 2003. Please identify the wells used in this evaluation, and provide the results of the trend analyses (e.g., in a chart format) to support the assertion that COPC concentrations in the perched aquifer are stable or decreasing.

*The information is included in Appendix C, Section C.5.3. The only well evaluated for trends in the perched was PTX01-1001, where elevated concentrations of perchlorate and TCE were identified. The chart depicting the perchlorate and TCE trends is included as Figure C-16, and the data are included in the Appendix E data disk. The 2-year dataset depicted in Figure C-16 captured the initial appearance, peak, and subsequent decline in concentrations of this well's COPCs. Additional information about previous sampling results for perchlorate and TCE is provided in Sections 10.2.6 and 10.2.9.5 of the Groundwater RFIR included in the Reference Documents section at the end of this report. As provided in response to Comment 12 below, a complete perched groundwater dataset for the Burning Ground wells will be included as an electronic attachment with the Appendix E data. PTX01-1001, Appendix Section C.5.3, and the complete perched groundwater electronic dataset will be referenced in Section 4.1.3 for the reviewer.*

5. Section 4.1.1 discusses that soil sample data collected during the investigation phase are removed from the COPC evaluation data set at locations where permanent soil removal has occurred. At these locations, confirmation soil sample data are used in place of the investigation data. Please specify in the BGHHRA the investigation soil sample results that were removed from the data set and the confirmation soil sample results that were included in the data set.

*The Burning Ground RFIR, completed in March 2002, documents the concentrations remaining in place at the Burning Ground following soil excavations. The same soil data set used in the RFIR was also used in the BGHHRA. Although some in situ bioremediation efforts have been implemented since the RFIR, soil data evaluated in the BGHHRA for these areas have not changed from the RFIR. Additional wording will be provided in the revised report to clarify that the soil data sets for the HHRA are based on the data sets used in the RFIR.*

*The only data used to represent the effects of source reduction since submittal of the Burning Ground RFIR are soil gas concentrations collected in 2004 following 2 years of SVE operation.*

6. Playa 3 sediments should be evaluated similar to soils in terms of suspension and airborne transport as burning ground workers and offsite residents may be downwind of the playa. As such, the resuspension and inhalation of COPCs in dry playa sediments should be considered a complete, or potentially complete, exposure pathway.

*Measured soil/sediment concentrations at Playa 3 are substantially lower than concentrations found within the Burning Ground, and are below the RRS 2 SAI Industrial MSCs for all COPCs. Measured concentrations in Playa 3 are protective of a worker directly working in the playa for 250 days/year for 25 years; therefore, offsite air impacts are negligible because air concentrations decrease as the COPCs move toward the fence line. Additionally, the cumulative offsite impacts for the atmospheric pathway already modeled for the Burning Ground are negligible; therefore, additional risk from Playa 3 would not appreciably add to the offsite risk. No further air modeling is planned for the Playa 3 area; however, a qualitative discussion of the soil concentrations in Playa 3 compared to the Burning Ground soils will be included to support the exclusion of Playa 3 from the air modeling.*

7. An evaluation of the results obtained from modeling associated with the soil gas-to-air or soil gas-to-groundwater pathways are being deferred until the following issues are resolved:
  - a) Calculated acceptable soil gas levels (ASGLs) are used in the BGHRA to screen soil gas contaminants from the risk assessment. This methodology incorporates the use of TCEQ Effects Screening Levels (ESLs) to address human health risk associated with volatilization of soil gas-to-air and migration of soil gas-to-groundwater. ESLs may not be appropriate for use in the risk assessment as they do not distinguish between the noncarcinogenic and carcinogenic effects of COPCs and do not address the issue of potential cumulative effects. Please re-evaluate the use of ESLs in the risk assessment and determine if they are deficient for all or just certain COPCs. Please refer to the 1993 RRR and Consistency Document for appropriate toxicity factors and equations to address inhalation risk, as necessary.

*The ASGLs will be recalculated using the inhalation unit risk factors and inhalation reference concentrations provided in the TCEQ tox/chem/phys tables for the Risk Reduction Rule, as provided on the TCEQ website. The target risk concentration for screening will be based on a risk level of  $1.0E-06$  or an HQ of 0.1, consistent with the development of other risk-based screening values by TCEQ.*

- b) Soil gas data evaluated in the BGHRA include data collected for the Burning Ground RCRA Facility Investigation Report (RFIR) and data collected in early 2004. Data collected in early 2004 were collected while the soil vapor extraction (SVE) system was inactive for 18 days for maintenance. TCEQ is uncertain as to the reliability of these samples to be representative of current conditions. Please provide either justification that a period of 18 days is a sufficient amount of time to account for any potential rebound in COPC soil gas concentrations, or preferably, include soil gas data collected more recently than 2004 in the BGHRA to represent current conditions. A discussion of how the potential for rebound in COPC soil gas concentrations is accounted for must substantiate the use of any soil gas data collected after SVE treatment.

*The historical source of soil gas at the Burning Ground was the disposal of waste solvents in an unlined pit and landfill. Over many years, VOCs diffused away from these source areas to form the soil gas plumes defined in the Burning Ground RFIR. An SVE system began operation in 2002 and has remediated the soil gas plumes. However, residual NAPL impacts persist directly beneath the former Solvent Evaporation Pit. No*

*soil gas monitoring points are located directly beneath the former Solvent Evaporation Pit; therefore, data from the SVE system were used to represent the residual NAPL. Because the primary remaining source is the residual NAPL, the potential for rebound of soil gas was evaluated in the HHRA using subsurface fate and transport models to address COPCs in residual NAPL above the caliche caprock. The modeling demonstrated that some rebound will occur over time; however, the concentrations do not present a future risk for the soil gas-to-air or soil gas-to-groundwater pathways. Therefore, use of newer soil gas data will not provide a different risk estimate.*

*Below the caliche caprock, rebound of soil gas concentrations is caused by partitioning of VOCs dissolved in pore water to soil gas. Because the Ogallala formation materials are highly permeable, rebound of soil gas to equilibrium concentrations occurs rapidly, and the 18-day waiting period was sufficient for collection of representative soil gas concentrations. Soil gas data are documented in Section 4.1.2, and soil gas modeling is presented in Sections 5.1.1.2 and C.5.5*

- c) The TCEQ does not concur with the deletion of COPCs from further evaluation in the risk assessment due solely to decreasing concentrations of soil gas in SVE wells or sporadic detections. 30 TAC §335.553(b)(2) states that a baseline risk assessment should be prepared which describes the potential adverse effects under both current and future conditions caused by the release of contaminants in the absence of any actions to control or mitigate the release; therefore, current concentrations of COPCs in soil gas must be considered in the risk assessment.

*The continued operation of an SVE system at the Burning Ground as an engineering control was not used to remove COPCs from further evaluation in the risk assessment. However, operation of the SVE system since March 2002 has remediated large areas previously impacted by soil gas and has resulted in a substantial reduction of the mass of volatile contaminants present beneath the Burning Ground. Therefore, data collected through operation of the SVE system, such as decreasing VOC concentrations in extraction well effluent, has been used along with soil gas analytical data collected in February 2004 to determine which soil gas COPCs should be retained for modeling. In the absence of continued SVE, future concerns are related only to residual NAPL beneath the former Solvent Evaporation Pit. Therefore, modeling focused on COPCs associated with residual NAPL. Based on evaluation of the SVE system data, toluene, TCE, and 1,1,1-trichloroethane were identified as components of a residual NAPL in the shallow zone and were evaluated using a fate and transport model.*

*Operational data from the SVE system, supported by analytical soil gas data collected in 2004, indicate SVE has successfully remediated soil gas in the intermediate zone. Four intermediate zone soil gas COPCs were removed from consideration on this basis even though some concentrations were above the ASGL<sub>GW</sub>. Nevertheless, Pantex will address the few soil gas COPCs that were removed in Section 4.4.2.2 in revisions to the uncertainty analysis. Since these very low detections will not drive a risk at the Plant boundary, quantitative modeling is not necessary to determine the potential risk from these low-level concentrations.*

*One soil gas COPC was not addressed due to the lack of toxicity criteria. This COPC will also be addressed in the uncertainty analysis by comparison to a surrogate compound.*

- d) In previous RFIRs, the pathway from soil gas-to-groundwater was considered complete if soil gas was detected at concentrations at which groundwater would be impacted for at least two consecutive sampling ports. Please clarify if COPCs were deleted from further evaluation in the risk assessment based on this methodology. The TCEQ does not concur

with this methodology due to the migratory nature of soil gas and the observation that soil gas (and contamination in general) often does not follow a truly vertical path.

*The methodology used in the RFIR was not applied in the HHRA. If any sample exceeded the screening criteria, then the soil gas COPC was evaluated further. The exceptions are noted in the response to Comment 7.c above, and will be addressed as an uncertainty.*

- e) Please provide a graphical summary of the complete extent of three-dimensional distribution of mobile and residual NAPL above and below the FGZ beneath the Burning Ground that lead to the design and subsequent installation of the SVE system.

*A graphical summary of the extent of residual NAPL impacts at the Burning Ground was not prepared as part of the SVE system design. Because of the detections of VOCs in the Ogallala Aquifer, the SVE system was installed to quickly address the apparent source of VOCs in the drinking water aquifer. Knowledge of the soil gas and the presence of residual NAPL has progressed through the investigation, design of the SVE system, and operation of the SVE system. The results of an extensive investigation to characterize volatile organic compound (VOC) sources at the Burning Ground, including process knowledge/history of solvent use at the Solvent Evaporation Pit and SWMU 39 (landfill trench), soil gas concentrations, and a Partitioning Interwell Tracer Test at the SEP, were documented in the Burning Grounds Waste Management Group Final RCRA Facility Investigation Report (RFIR) (BWXT, 2002), the Phase 3 Conceptual Model Report for Burning Grounds Soil Gas Surveying and VOC Source Term Investigation (Stoller, 2001), and the Addendum to the Phase 3 Conceptual Model Report (CMR) (BWXT, 2003). The Burning Ground RFIR and Phase 3 CMR both presented a set of findings based on investigation activities to characterize potential VOC sources at the Burning Ground. These findings changed significantly as a result of new information obtained from site activities that occurred after release of the Phase 3 CMR; therefore, the Addendum to the Phase 3 CMR was prepared to document the results of the additional investigations and update the findings and conclusions of the Phase 3 CMR.*

*Regarding the migration of NAPL beneath the former Solvent Evaporation Pit (SEP), the conclusions of the Phase 3 CMR stated that a NAPL mixture of toluene, TCE, Freon 113, and other constituents (i.e., acetone and methylene chloride) has migrated more than 250 ft below ground surface (bgs) to potentially as deep as the FGZ at a depth of about 295 ft bgs. In the Addendum to the Phase 3 CMR, this conclusion was revised to state that toluene, TCE, Freon 113, and other constituents have migrated more than 250 ft bgs in the gaseous phase and that results of a partitioning interwell tracer test (PITT) indicated the presence of residual NAPL in the shallow zone above the caliche caprock. The revised conclusion also stated that observed gas-phase VOC concentrations in the intermediate zone (i.e., below the caliche caprock and above the FGZ) are similar to concentrations observed in the shallow zone, thereby suggesting the presence of residual NAPL in this zone.*

*Data collected through operation of the SVE system support the finding that residual NAPL is present above the caliche caprock. Although the Phase 3 CMR Addendum Report indicated that NAPL might be present in the intermediate zone, SVE data indicate residual NAPL impacts below the caliche caprock were more limited than previously estimated (i.e., not deeper than about 180 ft bgs) and have been remediated by SVE. No NAPL impacts have been indicated or observed beneath the FGZ. The risk assessment includes conclusions drawn from the SVE system operation.*

- f) Apparent font/printer driver problems resulted in an error associated with printing the units symbol for COPC vapor concentrations and prohibit proper assessment of their

values (Secs C.5.3, C.5.5.2, C.5.6.1 and C.5.6.2; Subject Report). Please reconcile this problem.

*The final corrections will be provided in the Final BGHHRA Report. Corrected pages were provided at the February 14-15, 2006 meeting to allow review of the material.*

8. Please include a discussion of the COPC screening methodology for non-detects in Section 4.0 (COPC Evaluation).

*As agreed at the February 2006 meeting, the process for COPC screening will be better defined in the introduction to Section 4 in the Final BGHHRA Report.*

9. The pesticide endosulfan is not listed on Table 4-1 (Complete List of Soil, Groundwater, and Surface Water COPCs at the Burning Ground and Playa 3); however, endosulfan was identified in surface/subsurface soil and shallow ditch soil in the Burning Ground RFIR as a COPC at concentrations above RRS1. Please include endosulfan in the COPC evaluation. (The TCEQ notes that endosulfan was inadvertently not listed in the TCEQ Burning Ground RFIR conditional approval letter.)

*The isomers of endosulfan (alpha and beta endosulfan) and the degradation product (endosulfan sulfate) of technical grade endosulfan were addressed in the BGHHRA individually and cumulatively. Evaluation of the isomers and degradation product is consistent with the TCEQ approval letter and evaluates the impact of total endosulfan.*

10. Please provide the following information regarding the use of soil screening levels derived from synthetic precipitate leaching procedure (SPLP) measurements:
  - a) Include a discussion of all laboratory procedures and protocols associated with the SPLP analyses.
  - b) Specify in the text of Section 4.2.1.5 (Theoretical Maximum Soil Concentrations for Passing SPLP) the COPCs that were eliminated from further evaluation in the risk assessment via comparison of maximum detected soil concentrations to Pantex-Wide TMSCs to pass SPLP.
  - c) For the COPCs that were eliminated from further evaluation in the risk assessment via comparison of maximum detected soil concentrations to Pantex-Wide TMSCs to pass SPLP, include in Appendix F (and reference in the text of Section 4.2.1.5) a separate table showing all the TMSCs calculated for each COPC in each soil type. This table will facilitate demonstrating that the most conservative TMSC was used for comparison to maximum soil COPC concentrations.
  - d) Include a reference to Table F-5 (COPC Evaluation for Modeling of Burning Ground Soil-to-Groundwater Pathway) in Section 4.2.1.5.

*The TMSC screen will be removed from the Final BGHHRA Report. Pantex will conservatively remove this screen for the upland areas and carry the COPCs forward for fate and transport evaluation for interplaya areas. Pantex will also remove the TMSC screen for evaluation of the soil-to-groundwater pathway for Playa 3 because no COPCs were eliminated using the TMSC evaluation for this pathway.*

*These comments will be considered for the finalization of the Site-Wide HHRA Report. Full documentation of the TMSC will be included in that report.*

11. For COPCs with soil RRS 1 values updated or added in the March 2004 update to the "Risk Reduction Rule Guidance to the Pantex Plant RFI, April 2002", please also provide in Table F-1 (RRS 1 Values for Evaluation of Naturally Occurring COPCs) in Appendix F the previous soil RRS 1 values prior to the March 2004 update. This will facilitate demonstrating that the most conservative background values were used for comparison to maximum soil COPC concentrations.

*Pantex has included the comparison table as an attachment to this response to comments, but believes that including it in the report would add confusion.*

12. Please make the following changes to Table F-9 (COPC Evaluation for Perched Groundwater):

- a) Specify the COPCs whose analytical results from filtered groundwater samples were used in the groundwater COPC evaluation, and include the supporting documentation (e.g., filtered vs. non-filtered results, field turbidity measurements, filter size, etc.) to justify the use of the analytical results from the filtered samples.

*Information will be provided in the appendix tables where filtered sample results were used to remove a COPC from further consideration in the Final BGHHRA Report.*

- b) Add a footnote to the column entitled, "Maximum Detected Concentration (mg/L)" that indicates that the concentrations reported in the column are the maximum detected during years 2002 and 2003.

*Footnote will be added in the Final BGHHRA Report.*

- c) Please include columns (or generate a separate table) that report the highest concentrations of each COPC detected over the course of their sampling and analysis in the burning ground (as opposed to during 2002-2003), along with their associated sample location and date.

*The requested information will be added as an electronic attachment as part of the Appendix E data in the Final BGHHRA Report.*

13. Section 5.1.1.2.1. states, "...the soil-to-groundwater pathway is incomplete, and no future EPCs were calculated for the Ogallala Aquifer via this pathway." This statement is apparently based on the results of subsurface modeling that indicates that it would take "...on the order of thousands of years..." for water to infiltrate to the equivalent depth of the perched groundwater. Please include a sensitivity analysis discussion regarding the effects of using different interplaya recharge rates in the FEHM model. The TCEQ clarifies that the soil-to-groundwater pathway is a complete migration pathway.

*Pantex will perform a sensitivity analysis of different interplaya recharge rates in the FEHM model. The sensitivity analysis will be provided in Section 7, Uncertainties in the Final BGHHRA Report.*

14. Please compare the  $K_s$  values used in the calibrated modeling of VOC migration beneath the solvent evaporation pit (SEP) in the "Phase 3 Conceptual Model Report for Burning Grounds Soil Gas Surveying and Volatile Organic Compound (VOC) Source Term Investigation, DOE Pantex Plant, Amarillo, Texas" report (BWXT Pantex, September 24, 2001) to their equivalents used in the FEHM modeling in the BGHHRA. Please also include in either the BGHHRA or the "Subsurface Modeling Report for the U.S. Department of Energy / National Nuclear Security Administration, Pantex Plant, Amarillo, Texas" report (BWXT Pantex, September 2004) a detailed description regarding how the conductivity values used in FEHM were developed to account for the secondary permeability effects attributed to macroporosity features.

*K<sub>s</sub> values used in the FEHM modeling for the BGHHRA Report were much greater (by four to six orders of magnitude) than those used in the Phase 3 Conceptual Model Report (September 2001). A K<sub>s</sub> value of 0.00005 ft/day was reported for the Blackwater Draw Formation in the 1996 Burning Ground RFIR (USACE, 1996). This value was increased to 0.005 ft/day for the modeling documented in the Phase 3 Conceptual Model Report. For the FEHM modeling used for the BGHHRA, K<sub>s</sub> ranged from 0.49 to 10 ft/day; thus, the K<sub>s</sub> values used in the FEHM modeling are more conservative.*

*In "Spatial Variability in Unsaturated Flow beneath Playa and Adjacent Interplaya Settings and Implications for Contaminant Transport, Southern High Plains, Texas," Scanlon et al. (1997) contains the statement that the primary control on unsaturated flow is surface ponding of water; therefore, preferential flow through macroporosity features is much more important where ponded conditions occur. Low water fluxes in interplaya settings suggest that contaminant transport in these areas should be negligible, regardless of the presence of macroporosity features. Because the FEHM modeling was specifically applied to interplaya areas with low recharge, the effects of secondary permeability were not included. A sensitivity analysis of hydraulic conductivity will be included in the final report to demonstrate that flow in interplaya areas is insensitive to variations in K.*

15. Please include a table in Appendix F that shows the result of each step in the analysis depicted in Figure 5.1 (Flow Chart for Fate and Transport Analysis of Soil-To-Groundwater COPCs). The table should include all comparison criteria used in the analysis, including the following: soil concentrations, soil-pore water K<sub>d</sub> values, the source for each K<sub>d</sub> value, RBSV<sub>GW</sub>'s, the calculated pore-water concentrations, concentrations after application of DAF, whether or not the samples are above perched groundwater, etc. The table should clearly indicate the steps at which COPCs were removed from further consideration in the analysis.

*The requested information, with the exception of the source of each K<sub>d</sub> value, is included in the electronic table provided with Appendix C. The Final BGHHRA Report will provide sources for each K<sub>d</sub> value in this table. Because Appendix F provides summary tables for the COPC evaluation, modeling results are more appropriately included with Appendix C.*

16. If a dilution attenuation factor (DAF) approach is relied upon to eliminate COPCs from additional fate and transport modeling in the BGHHRA, then the TCEQ will allow the use of a default DAF<sub>EPA</sub> value of 10. This DAF<sub>EPA</sub> is to be applied to COPCs evaluated for the soil-to-groundwater migration pathway and perched aquifer-to-Ogallala Aquifer migration pathway. The TCEQ does not approve the EPA default DAF<sub>EPA</sub> of 20 and the proposed site-specific DAF<sub>0</sub> of 75 currently used in the BGHHRA, based on the following:
  - a) The EPA default DAF<sub>EPA</sub> of 20 is applicable to sites up to ½ acre, and sites ½ to 30 acres in size are considered protective of groundwater using the EPA default DAF<sub>EPA</sub> value of 10. Since the areal extent of Playa 3 greatly exceeds the ½ acre intended limit for use of the EPA default DAF<sub>EPA</sub> value of 20, the more appropriate 30 acre EPA default DAF<sub>EPA</sub> value of 10 should be applied.
  - b) The use of the proposed site-specific DAF<sub>0</sub> of 75 is inappropriate as it assumes complete mixing throughout the 320 ft saturated thickness instantaneously beneath the burning ground.

*As discussed at the February Tier 1 Team Meeting, Pantex will conservatively apply a DAF<sub>EPA</sub> of 10 for the Playa 3 soil-to-groundwater migration pathway and perched groundwater-to-Ogallala Aquifer migration pathway. In addition, a sensitivity analysis on the interplaya recharge rate will be provided to assess the upland areas (see response to comment 13).*

17. Section C.5.3 (Perched Groundwater-to-Ogallala Groundwater Assessment) states, "... perched groundwater does not represent a potential complete exposure pathway ...". The TCEQ understands this statement to mean that there is not a potential for exposure to COPCs via ingestion of the perched groundwater because the perched groundwater is believed to be limited in extent on-site; however, please clarify the text in this section to indicate that the perched groundwater-to-Ogallala groundwater is a complete migration pathway.

*TCEQ's understanding is consistent with the February discussions. However, Pantex only agrees that the hydraulic pathway is considered complete. As agreed through RFIR discussions, long-term monitoring will be needed to address any uncertainty with the contaminant migration potential for the perched groundwater-to-Ogallala Aquifer pathway.*

18. Based on reported COPC concentrations in the Ogallala Aquifer, the two-dimensional groundwater flow model apparently underestimates groundwater velocities significantly and cannot account for off-site contamination travel times. As such, additional technical review of the model is deferred.

*Newer sampling information has been provided to TCEQ to demonstrate that previous offsite Ogallala detections were caused by the use of multi-level low flow sampling devices (i.e., FLUTE™ and Solinst Waterloo™), rather than by migration of contaminants from Pantex. Pantex believes the modeled travel times are consistent with hydraulic data collected from the Ogallala Aquifer and that the agreement to assess RRS 1 exceedances in the Ogallala data is a conservative evaluation of the potential for risk given that absolute knowledge of the fate and transport of the constituents associated with legacy releases is unattainable.*

19. The TCEQ recommends that a fully calibrated three-dimensional groundwater fate and transport model be developed for the Ogallala Aquifer whose domain should include the entire saturated thickness of the Ogallala Aquifer upgradient of the Burning Ground and extending downgradient to encompass the entirety of the Amarillo water production well field to the extent of its hydraulic influence in all directions. The domain for such a model may extend to encompass the Site-Wide domain should the Site-Wide Human Health Risk Assessment indicate a similar connection between the perched groundwater and the Ogallala Aquifer.

*Three-dimensional subsurface fate and transport models have been developed to assess the potential for migration of COPCs in perched groundwater to the Ogallala Aquifer in the areas south and east of Zone 12 and the travel pathways and timelines in the Ogallala Aquifer. This information will be provided in the forthcoming Sitewide HHRA and the CMS, and will be useful for decisions needed to design and implement the LTM network.*

## **B. Clarifications Requested:**

1. In the conceptual site model (CSM) in Figure 2-6, taken from the Groundwater RFIR, dioxins/furans are omitted from the inter-playa pathways for industrial surface soil and the Blackwater Draw Formation. In the Groundwater RFIR, dioxins/furans are included in these pathways. Please clarify this discrepancy.

*The CSM will be updated to include the dioxins/furans. Please note, the BGHHRA includes evaluation of the dioxins/furans.*

2. Please clarify the difference between wells PTX01-1001 and PTX01-1001A (i.e., are they the same well?).

*Review of the report did not identify the referenced label. PTX06-1001A is referenced in Table C-3. Only one well exists with the PTX01-1001 identifier.*

3. Please clarify if the COPC evaluation for direct exposure uses duplicate sample results or sample results that were “discarded” as anomalous (i.e, due to possible laboratory or sampling error) in the respective RFIRs.

*When two results existed for the same sample (same location and depth), the highest concentration was conservatively retained for evaluation in the BG HHRA. This approach includes the use of duplicates, composites vs. grab samples, and the use of “twinned” data.*

**Enclosure 2**

Background Comparison Tables for the  
*Risk Reduction Rule Guidance to the Pantex RFI*  
BWXT Pantex 2002 and Updated March 2004

Table 3-1. RRS 1 for Upland Area Surface Soil (0 to 2 feet)

Analyte	N 2002/ 2004	Percent Detected in Background 2002/2004	Distribution Statistic Type <sup>a</sup>	Maximum Detected Concentration (mg/kg) 2002/2004	PQL for Soil (mg/kg)	2002 UTL (mg/kg)	2002 RRRG Selected RRS 1 Concentration (mg/kg)	New RRS 1 2004 RRRG Update
Aluminum	18	100	Normal	3.1E+04	1.0E+01	3.4E+04	3.4E+04	NC
Antimony	18/17	11/9	Nonparametric	1.3E+01/6.8E+00	1.0E+00	1.3E+01	1.3E+01	6.8E+00
Arsenic	18	100	Lognormal	9.7E+00	1.0E+00	1.1E+01	1.1E+01	NC
Barium	18	100	Normal	1.7E+02	5.0E-01	1.9E+02	1.9E+02	NC
Beryllium	18	100	Lognormal	1.6E+00	1.5E-01	1.7E+00	1.7E+00	NC
Boron	18	100	Lognormal	1.5E+01	2.5E+00	1.9E+01	1.9E+01	NC
Cadmium	18	28	Nonparametric	1.3E+00	2.5E-01	1.3E+00	1.3E+00	No Change
Chromium	18	100	Normal	2.6E+01	5.0E-01	2.8E+01	2.8E+01	NC
Chromium VI	18	0	Nonparametric	---	5.0E-01	---	5.0E-01	NC
Cobalt	18	100	Normal	9.5E+00	5.0E-01	1.0E+01	1.0E+01	NC
Copper	18	100	Normal	1.5E+01	5.0E-01	1.6E+01	1.6E+01	NC
Lead	18	100	Nonparametric	1.8E+01	1.0E+00	1.8E+01	1.8E+01	NC
Manganese	18	100	Nonparametric	4.6E+02	5.0E-01	4.6E+02	4.6E+02	NC
Mercury	18	22	Nonparametric	1.4E-02	2.5E-02	1.4E-02	2.5E-02	NC
Molybdenum	18	78	Normal	2.8E+00	2.5E+00	2.9E+00	2.9E+00	NC
Nickel	18	100	Normal	1.9E+01	1.5E+00	2.0E+01	2.0E+01	NC
Selenium	18	94	Lognormal	4.3E+00	1.0E+00	6.2E+00	6.2E+00	No Change
Silver	18	0	Nonparametric	---	5.0E-01	---	5.0E-01	NC
Strontium	18	100	Lognormal	4.2E+01	2.5E-01	4.4E+01	4.4E+01	NC
Thallium	18	28	Nonparametric	1.9E+01	2.0E+00	1.9E+01	1.9E+01	NC
Vanadium	18	100	Normal	5.2E+01	5.0E-01	5.4E+01	5.4E+01	NC
Zinc	18	100	Normal	6.4E+01	1.0E+00	7.0E+01	7.0E+01	NC

--- Not detected in background samples

N - Number of background samples in UTL data set

NC = No change required by TCEQ comment, the 2002 value is used as the background

PQL - Practical Quantitation Limit

RRS - Risk Reduction Standard

UTL - Upper Tolerance Level

<sup>a</sup> Based on application of the Shapiro-Wilk test to untransformed and log-transformed data (at a 0.05 significance level).

**Shaded 2002 RRS 1 values are based on the PQL**

Compounds required to have high values removed from the original data set

Compounds that required a justification for the inclusion of high values identified by TCEQ - Justification provided in Appendix B, Table B7.1-1. The 2002 background is used as the background.

Table 3-2. RRS 1 for Drainage Area Surface Soil (0 to 2 feet)

Analyte	N 2002/ 2004	Percent Detected in Background 2002/2004	Distribution Statistic Type <sup>a</sup> 2002/2004	Maximum Detected Concentration (mg/kg) 2002/2004	PQL for Soil (mg/kg)	2002 UTL (mg/kg)	2002 RRRG Selected RRS 1 Concentration (mg/kg)	New RRS 1 2004 RRRG Update
Aluminum	30	100	Lognormal	4.0E+04	1.0E+01	3.9E+04	3.9E+04	NC
Antimony	38/37	24/22	Nonparametric	1.6E+01/9.8E+00	1.0E+00	1.6E+01	1.6E+01	9.8E+00
Arsenic	38/37	100	Nonparametric/ Normal	2.3E+01/1.1E+01	1.0E+00	2.3E+01	2.3E+01	1.1E+01
Barium	38/37	100	Nonparametric/ Lognormal	6.4E+02/2.2E+02	5.0E-01	6.4E+02	6.4E+02	2.3E+02
Beryllium	38	100	Lognormal	2.3E+00	1.5E-01	2.2E+00	2.2E+00	NC
Boron	30	100	Normal	1.8E+01	2.5E+00	1.9E+01	1.9E+01	NC
Cadmium	38	29	Nonparametric	9.7E-01	2.5E-01	9.7E-01	9.7E-01	NC
Chromium	38	100	Lognormal	3.1E+01	5.0E-01	2.9E+01	2.9E+01	NC
Chromium VI	38/37	3	Nonparametric	4.4E-01	5.0E-01	4.4E-01	5.0E-01	5.0E-01
Cobalt	38/37	100	Nonparametric/ Normal	3.6E+01/1.2E+01	5.0E-01	3.6E+01	3.6E+01	1.2E+01
Copper	38	100	Lognormal	2.2E+01	5.0E-01	2.2E+01	2.2E+01	NC
Lead	38	100	Nonparametric	3.0E+01	1.0E+00	3.0E+01	3.0E+01	No Change
Manganese	38/37	100	Nonparametric/ Normal	3.4E+03/6.1E+02	5.0E-01	3.4E+03	3.4E+03	6.3E+02
Mercury	38	61	Lognormal	1.1E+00	2.5E-02	3.2E-01	3.2E-01	NC
Molybdenum	30	83	Normal	3.6E+00	2.5E+00	3.3E+00	3.3E+00	NC
Nickel	38/37	100	Nonparametric	3.3E+01/2.6E+01	1.5E+00	3.3E+01	3.3E+01	2.6E+01
Selenium	38	84	Lognormal	4.8E+00	1.0E+00	8.6E+00	8.6E+00	No Change
Silver	38	3	Nonparametric	6.4E-01	5.0E-01	6.4E-01	6.4E-01	NC
Strontium	38	100	Lognormal	7.2E+01	2.5E-01	7.2E+01	7.2E+01	NC
Thallium	38	32	Nonparametric	1.7E+01	2.0E+00	1.7E+01	1.7E+01	NC
Vanadium	38	100	Lognormal	5.5E+01	5.0E-01	5.2E+01	5.2E+01	NC
Zinc	38	100	Lognormal	9.5E+01	1.0E+00	9.0E+01	9.0E+01	NC

N - Number of background samples in UTL data set

NC = No change required by TCEQ comment, the 2002 value is used as the background

PQL - Practical Quantitation Limit

RRS - Risk Reduction Standard

UTL - Upper Tolerance Limit

<sup>a</sup> Based on application of the Shapiro-Wilk test to untransformed and log-transformed data (at a 0.05 significance level).

Shaded 2002 RRS 1 values are based on the PQL

Compounds required to have high values removed from the original data set

Compounds that required a justification for the inclusion of high values identified by TCEQ - Justification provided in Appendix B,

Table B7.1-1. The 2002 background is used as the background.

Table 3-3. RRS 1 for Playa Area Surface Soil (0 to 2 feet)

Analyte	N 2002/ 2004	Percent Detected in Background 2002/2004	Distribution Statistic Type <sup>a</sup> 2002/2004	Maximum Detected Concentration (mg/kg) 2002/2004	PQL for Soil (mg/kg)	2002 UTL (mg/kg)	2002 RRRG Selected RRS 1 Concentration (mg/kg)	New RRS 1 2004 RRRG Update
Aluminum	30	100	Lognormal	4.4E+04	1.0E+01	4.8E+04	4.8E+04	NC
Antimony	30	27	Nonparametric	1.2E+01	1.0E+00	1.2E+01	1.2E+01	NC
Arsenic	30	100	Lognormal	1.5E+01	1.0E+00	1.6E+01	1.6E+01	NC
Barium	30/29	100	Nonparametric	1.9E+03/4.4E-02	5.0E-01	1.9E+03	1.9E+03	4.4E+02
Beryllium	30	100	Lognormal	2.1E+00	1.5E-01	2.4E+00	2.4E+00	NC
Boron	30	97	Normal	2.0E+01	2.5E+00	1.9E+01	1.9E+01	NC
Cadmium	30	43	Nonparametric	1.2E+00	2.5E-01	1.2E+00	1.2E+00	NC
Chromium	30	100	Lognormal	3.4E+01	5.0E-01	3.5E+01	3.5E+01	NC
Chromium VI	30	0	Nonparametric	---	5.0E-01	---	5.0E-01	NC
Cobalt	30/29	100	Nonparametric	5.2E+01/2.4E+01	5.0E-01	5.2E+01	5.2E+01	2.4E+01
Copper	30	100	Lognormal	2.5E+01	5.0E-01	2.6E+01	2.6E+01	NC
Lead	30	100	Lognormal	3.1E+01	1.0E+00	3.1E+01	3.1E+01	NC
Manganese	30/28	100	Nonparametric/ Lognormal	9.3E+03/7.8E+02	5.0E-01	9.3E+03	9.3E+03	7.5E+02
Mercury	30	30	Nonparametric	4.0E-02	2.5E-02	4.0E-02	4.0E-02	NC
Molybdenum	30	73	Nonparametric	3.8E+00	2.5E+00	3.8E+00	3.8E+00	NC
Nickel	30	100	Nonparametric	4.6E+01	1.5E+00	4.6E+01	4.6E+01	No Change
Selenium	30/29	80	Nonparametric	1.3E+01/8.2E+00	1.0E+00	1.3E+01	1.3E+01	8.2E+00
Silver	30	3	Nonparametric	1.4E+00	5.0E-01	1.4E+00	1.4E+00	No Change
Strontium	30	100	Normal	5.1E+01	2.5E-01	5.4E+01	5.4E+01	NC
Thallium	30/29	33/31	Nonparametric	3.0E+01/1.8E+01	2.0E+00	3.0E+01	3.0E+01	1.8E+01
Vanadium	30	100	Lognormal	7.1E+01	5.0E-01	6.6E+01	6.6E+01	No Change
Zinc	30	100	Lognormal	1.0E+02	1.0E+00	1.1E+02	1.1E+02	NC
<i>Metal High-end Values Identified from Table B-9, Appendix B</i>								
Sulfate	30	97	Nonparametric	1.1E+02	NA	1.1E+02	1.1E+02	No Change

--- Not detected in background samples

N - Number of background samples in UTL data set

NC = No change required by TCEQ comment, the 2002 value is used as the background

PQL - Practical Quantitation Limit

RRS - Risk Reduction Standard

UTL - Upper Tolerance Limit

<sup>a</sup> Based on application of the Shapiro-Wilk test to untransformed and log-transformed data (at a 0.05 significance level).

**Shaded 2002 RRS 1 values are based on the PQL**

Compounds required to have high values removed from the original data set

Compounds that required a justification for the inclusion of high values identified by TCEQ - Justification provided in Appendix B, Table B7.1-1. The 2002 background is used as the background.

Table 3-4. RRS 1 for Subsurface (Blackwater Draw Formation) and Surface (Borrow-fill) Soil

Analyte	N 2002/ 2004	Percent Detected in Background 2002/2004	Distribution Statistic Type <sup>a</sup> 2002/2004	Maximum Detected Concentration 2002/2004 (mg/kg)	PQL for Soil (mg/kg)	2002 UTL (mg/kg)	2002 RRRG Selected RRS 1 Concentration (mg/kg)	New RRS 1 2004 RRRG Update
Aluminium	25	100	Normal	2.5E+04	1.0E+01	2.4E+04	2.4E+04	NC
Antimony	24/22	33/27	Nonparametric	1.7E+02	1.0E+00	1.7E+02	1.7E+02	1.7E+02
Arsenic	24	92	Normal	9.5E+00	1.0E+00	1.0E+01	1.0E+01	NC
Barium	24	100	Lognormal	7.8E+02	5.0E-01	1.0E+03	1.0E+03	NC
Beryllium	24	79	Lognormal	3.1E+00	1.5E-01	2.9E+00	2.9E+00	NC
Boron	25	100	Lognormal	3.1E+00	2.5E+00	5.1E+00	5.1E+00	NC
Cadmium	25	100	Normal	4.0E-01	2.5E-01	4.1E-01	4.1E-01	NC
Chromium	24	100	Nonparametric	6.9E+01	5.0E-01	6.9E+01	6.9E+01	NC
Chromium VI	24	4	Nonparametric	3.7E-01	5.0E-01	3.7E-01	5.0E-01	NC
Cobalt	24	100	Nonparametric	3.2E+01	5.0E-01	3.2E+01	3.2E+01	NC
Copper	24	92	Lognormal	3.6E+01	5.0E-01	3.7E+01	3.7E+01	NC
Lead	24	100	Normal	1.5E+01	1.0E+00	1.5E+01	1.5E+01	NC
Manganese	25	100	Lognormal	6.0E+02	5.0E-01	6.0E+02	6.0E+02	No Change
Mercury	24	83	Nonparametric	1.1E-01	2.5E-02	1.1E-01	1.1E-01	NC
Molybdenum	25	100	Lognormal	1.8E+00	2.5E+00	1.7E+00	2.5E+00	NC
Nickel	24	100	Nonparametric	5.3E+01	1.5E+00	5.3E+01	5.3E+01	NC
Selenium	24	33	Nonparametric	4.3E+00	1.0E+00	4.3E+00	4.3E+00	NC
Silver	24	25	Nonparametric	2.3E+00	5.0E-01	2.3E+00	2.3E+00	NC
Strontium	24	100	Nonparametric	6.9E+02	2.5E-01	6.9E+02	6.9E+02	NC
Thallium	24/23	25/22	Nonparametric	1.0E+02	2.0E+00	1.0E+02	1.0E+02	1.0E+02
Tin	25	100	Nonparametric	5.3E+00	1.0E+00	5.3E+00	5.3E+00	NC
Uranium	25	100	Lognormal	1.6E+00	---	1.6E+00	1.6E+00	NC
Vanadium	24	100	Nonparametric	1.5E+02	5.0E-01	1.5E+02	1.5E+02	NC
Zinc	24	100	Nonparametric	1.6E+02	1.0E+00	1.6E+02	1.6E+02	NC

--- No PQL developed

N - Number of background samples in UTL data set

NC = No change required by TCEQ comment, the 2002 value is used as the background

PQL - Practical Quantitation Limit

RRS - Risk Reduction Standard

UTL - Upper Tolerance Limit

<sup>a</sup> Based on application of the Shapiro-Wilk test to untransformed and log-transformed data (at a 0.05 significance level).

**Shaded 2002 RRS 1 values are based on the PQL**

Compounds required to have high values removed from the original data set

Compounds that required a justification for the inclusion of high values identified by TCEQ - Justification provided in Appendix B, Table B7.1-1. The 2002 background is used as the background.

Table 3-5. RRS 1 for Subsurface (Ogallala Formation) Soil

Analyte	N 2002/ 2004	Percent Detected in Background 2002/2004	Distribution Statistic Type <sup>a</sup> 2002/2004	Maximum Detected Concentration (mg/kg) 2002/2004	PQL for Soil (mg/kg)	2002 UTL (mg/kg)	2002 RRRG Selected RRS 1 Concentration (mg/kg)	New RRS 1 2004 RRRG Update
Aluminum	15	100	Lognormal	1.8E+04	1.0E+01	2.6E+04	2.6E+04	NC
Antimony	19/18	21/17	Nonparametric	2.9E-01	1.0E+00	2.9E-01	1.0E+00	1.0E+00
Arsenic	19	100	Lognormal	9.5E+00	1.0E+00	1.3E+01	1.3E+01	NC
Barium	16	100	Lognormal	3.8E+02	5.0E-01	8.8E+02	8.8E+02	No Change
Beryllium	19	100	Nonparametric	1.1E+00	1.5E-01	1.1E+00	1.1E+00	NC
Boron	15	80	Lognormal	6.4E+00	2.5E+00	3.4E+01	3.4E+01	NC
Cadmium	19	58	Nonparametric	1.3E-01	2.5E-01	1.3E-01	2.5E-01	NC
Chromium	19	100	Lognormal	2.3E+01	5.0E-01	2.9E+01	2.9E+01	No Change
Chromium VI	4	0	Nonparametric	---	5.0E-01	---	5.0E-01	NC
Cobalt	19/17	100	Nonparametric/ Lognormal	1.4E+01/7.8E+00	5.0E-01	1.4E+01	1.4E+01	7.3E+00
Copper	19	95	Lognormal	1.9E+01	5.0E-01	3.0E+01	3.0E+01	NC
Lead	19	100	Lognormal	1.8E+01/1.1E+01	1.0E+00	1.9E+01	1.9E+01	1.4E+01
Manganese	15	100	Lognormal	4.9E+02/3.1E+02	5.0E-01	5.9E+02	5.9E+02	2.7E+02
Mercury	19	21	Nonparametric	7.2E-02	2.5E-02	7.2E-02	7.2E-02	NC
Molybdenum	15	87	Lognormal	8.3E-01	2.5E+00	1.7E+00	2.5E+00	NC
Nickel	19	100	Lognormal	2.5E+01/1.5E+01	1.5E+00	2.9E+01	2.9E+01	1.6E+01
Selenium	19	89	Lognormal	4.4E-01	1.0E+00	8.6E-01	1.0E+00	NC
Silver	19	58	Nonparametric	6.2E-02	5.0E-01	6.2E-02	5.0E-01	NC
Strontium	12	100	Lognormal	1.7E+02/1.2E+02	2.5E-01	3.6E+02	3.6E+02	2.6E+02
Thallium	19	68	Lognormal	1.6E+00	2.0E+00	2.9E+01	2.9E+01	NC
Tin	8	100	Normal	3.4E+00	1.0E+00	3.4E+00	3.4E+00	NC
Vanadium	19	100	Nonparametric/ Lognormal	6.4E+01/3.7E+01	5.0E-01	6.4E+01	6.4E+01	3.6E+01
Zinc	19	100	Lognormal	6.1E+01/5.3E+01	1.0E+00	8.0E+01	8.0E+01	6.4E+01
<i>Metal High-end Values Identified from Table B-9, Appendix B<sup>b</sup></i>								
Lithium	8/7	87/86	Nonparametric	2.0E+01/4.2E+00	NA	2.00E+01	2.00E+01	4.20E+00
Magnesium	15	100	Lognormal	9.7E+03	NA	1.3E+04	1.3E+04	1.3E+04

--- Not detected in background samples

N - Number of background samples in UTL data set

NC = No change required by TCEQ comment, the 2002 value is used as the background

NA - Not available

<sup>a</sup> Based on application of the Shapiro-Wilk test to untransformed and log-transformed data (at a 0.05 significance level).

<sup>b</sup> All metals analyzed within a full-suite analysis were included in the appendix to the RRRG, however, a few metals were not used in evaluation of potential contaminants at Pantex and were not included in the main tables within the report. The metal data were reported in the appendix, for completeness.

**Shaded 2002 RRS 1 values are based on the PQL**

Compounds required to have high values removed from the original data set

Compounds that required a justification for the inclusion of high values identified by TCEQ - Justification provided in Appendix B, Table B7.1-1. The 2002 background is used as the background.

PQL - Practical Quantitation Limit

RRS - Risk Reduction Standard

UTL - Upper Tolerance Level

Table 3-6. RRS 1 Ogallala Aquifer Near Pantex Plant

Analyte	N 2002/ 2004	Percent Detected in Background 2002/2004	Distribution Statistic Type <sup>a</sup> 2002/2004	Maximum Detected Concentration (mg/kg) 2002/2004	PQL for Soil (mg/kg)	2002 UTL (mg/kg)	2002 RRRG Selected RRS 1 Concentration (mg/kg)	New RRS 1 2004 RRRG Update
Aluminum	26	31	Nonparametric	3.3E-01	1.0E-01	3.3E-01	3.3E-01	NC
Antimony	26	4	Nonparametric	2.0E-03	1.5E-02	2.0E-03	1.5E-02	NC
Arsenic	196	75	Nonparametric	1.2E-02	5.0E-03	1.2E-02	1.2E-02	NC
Barium	196	98	Nonparametric	8.9E-01	5.0E-03	8.9E-01	8.9E-01	NC
Beryllium	26	4	Nonparametric	7.0E-05	1.5E-03	1.0E-04	1.5E-03	NC
Boron	26	100	Normal	1.8E-01	2.5E-02	1.9E-01	1.9E-01	NC
Cadmium	196	9	Nonparametric	2.0E-03	2.5E-03	2.0E-03	2.5E-03	NC
Chromium	196	67	Nonparametric	3.2E-02	5.0E-03	3.2E-02	3.2E-02	No Change
Chromium VI	5	0	Nonparametric	---	1.0E-02	---	1.0E-02	NC
Cobalt	26	0	Nonparametric	---	5.0E-03	---	5.0E-03	NC
Copper	196	88	Nonparametric	1.2E-01	1.0E-02	1.2E-01	1.2E-01	NC
Lead	196	80	Nonparametric	1.4E-02	1.0E-02	1.4E-02	1.4E-02	NC
Manganese	196	62	Nonparametric	1.6E-02	5.0E-03	1.6E-02	1.6E-02	NC
Mercury	181	39	Nonparametric	3.0E-03	2.5E-04	3.0E-03	3.0E-03	NC
Molybdenum	26	38	Nonparametric	3.7E-02	1.0E-02	3.7E-02	3.7E-02	NC
Nickel	26	15	Nonparametric	6.0E-03	1.5E-02	6.0E-03	1.5E-02	NC
Selenium	196	45	Nonparametric	1.1E-02	1.0E-02	1.1E-02	1.1E-02	NC
Silver	185	7	Nonparametric	1.0E-04	5.0E-03	1.0E-04	5.0E-03	NC
Strontium	26	100	Normal	1.1E+00	2.5E-03	1.1E+00	1.1E+00	NC
Thallium	26	23	Nonparametric	3.4E-02	2.0E-03	3.4E-02	3.4E-02	NC
Vanadium	24	100	Nonparametric	3.5E-02	5.0E-03	3.5E-02	3.5E-02	NC
Zinc	193	83	Nonparametric	2.3E-01	1.5E-02	2.3E-01	2.3E-01	NC

Metal High-end Values Identified from Table C-3-1, Appendix C<sup>b</sup>

Lithium	170/168	99	Nonparametric	4.3E-01/6.5E-02	NA	4.3E-01	4.3E-01	6.5E-02
Magnesium	195	99	Nonparametric	2.9E-01	NA	2.9E-01	2.9E-01	2.9E-01

--- Not detected in background samples

MCL - Maximum Contaminant Level

N - Number of background samples in UTL data set

NC = No change required by TCEQ comment , the 2002 value is used as the background

<sup>a</sup> Based on application of the Shapiro-Wilk test to untransformed and log-transformed data (at a 0.05 significance level).

<sup>b</sup> All metals analyzed within a full-suite analysis were included in the appendix to the RRRG, however, a few metals were not used in evaluation of potential contaminants at Pantex and were not included in the main tables within the report. The metal data were reported in the appendix, for completeness.

**Shaded 2002 RRS I values are based on the PQL**

Compounds required to have high values removed from the original data set

Compounds that required a justification for the inclusion of high values identified by TCEQ - Justification provided in Appendix B, Table B7.1-1. The 2002 background is used as the background.

PQL - Practical Quantitation Limit

RRS - Risk Reduction Standard

UTL - Upper Tolerance Limit