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Contaminants in the Ogallala Aquifer at Pantex

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STAND
Technical Report 2004 – 1

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Contaminants in the Ogallala Aquifer at the Pantex Plant

by

George Rice
and
Pam Allison

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Executive Summary

Contaminants from the Pantex Plant documented to have entered the High Plains (Ogallala) Aquifer include metals, and organic and explosives compounds. This report critically examines some of the reported analyses of groundwater by the Department of Energy (DOE) and the Texas Commission on Environmental Quality (TCEQ) for the time period 1998-2003.

During the calendar year 2002 Pantex collected and analyzed groundwater samples for metals and radionuclides from 16 wells completed in the Ogallala Aquifer and 18 wells in the shallower perched aquifer. Of the wells in the Ogallala Aquifer, 51 paired-samples (filtered vs unfiltered) resulted in 1123 analytical results for 23 metals.

Of the 51 paired-samples, approximately 40% (446 of 1123) of the analytical results were not useable because of some problem with the "blanks" – an especially high number considering the costs of these analyses. Of the remaining samples, about 33% (374 of 1123) showed results below detection limits and 27% (303 of 1123) of the results provided the basis for comparing metals concentrations in filtered samples to the traditionally unfiltered groundwater samples. Approximately half of the 303 analyses suggested essentially identical results in both the filtered and unfiltered water. Most of the remaining analyses indicated reduced concentrations for the filtered samples.

During 2002 and 2003, the TCEQ co-sampled 23 Pantex wells, 13 of which are completed in the Ogallala Aquifer. A comparison of results obtained by TCEQ and Pantex indicated that metals concentrations were similar. The co-sampling program by TCEQ provides an important validation of the Pantex monitoring program as well as providing information on additional wells that need to be sampled and monitored.

A total of 770 detections of organic or explosives contaminants were reported for groundwater samples collected between July 1998 and December 2003. Of these, 51% (393 of 770) were discarded because of problems with the blanks or sampling systems. In a few cases, contaminant concentrations exceed MCL levels. Organic contaminants were detected in 43 Ogallala wells at or near the Pantex Plant. Two of the most commonly detected contaminants are acetone and toluene. Some of the highest concentrations of acetone and toluene have been found at, and down-gradient of, the Burning Grounds. Between 1954 and 1980, 150,000 to 300,000 gallons of contaminated waste oils and solvents were disposed in pits at the Burning Grounds. Detections of organics and explosives peaked in 2001 and have decreased significantly since then.

The results of the study of the data provoke the following questions:

1) Why are there such a high number of problems with blanks? How can this problem be corrected?
2) Is it reasonable to expect that water used for domestic or agricultural purposed would be filtered prior to use? If the answer is no, then the unfiltered sample analyses should be just as valid as the filtered ones.

The inconsistent use of filtered and unfiltered analyses by Pantex should be scrutinized by TCEQ, EPA, and the community – especially since Pantex based its determination of "background" on results from the potentially higher values from unfiltered samples.

Although Pantex and TCEQ continue to monitor wells in the vicinity of Pantex, the data show that Pantex has discontinued monitoring some of the wells in which contaminants were detected in the past. This fact is especially troubling given that these wells are located in areas of concern with few, if any, Ogallala wells to monitor. The reasons for discontinuing the monitoring of these wells is not known.

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1.0 Introduction

This report describes contaminants in the Ogallala Aquifer in the vicinity of the Pantex Plant, Carson County, Texas. Section 1 provides an overview of the geology, hydrology, and potential contaminant pathways. Section 2 discusses metals concentrations in groundwater. Section 3 discusses organic and explosives contaminants. The data used in this report are from groundwater samples collected and analyzed by the Department of Energy (DOE) and the Texas Commission on Environmental Quality (TCEQ). The samples were collected from 1998 through 2003[1].

1.1 The Pantex Plant

The Pantex Plant is 17 miles northeast of Amarillo, Texas. It occupies 15,940 acres in the southwestern part of Carson County (figure 1.1)[2]. During World War II the U.S. Army produced conventional shells and bombs at the plant. Since the early 1950s Pantex has been operated by the DOE and its predecessor agencies as a facility to assemble and disassemble nuclear weapons, and to fabricate and test chemical explosives.[3] The plant contains buildings and industrial structures, a wastewater treatment plant[4], landfills, waste disposal pits, borrow pits, and agricultural lands[5]. There are five playas on the plant-site. DOE also controls Pantex Lake, a playa about 2.5 miles northeast of the plant[6] (figure 1.2).

1.2 Geology and Hydrology

Pantex is underlain by four to six feet of soils. The soils are developed in the Blackwater Draw Formation, a 50 to 80 feet thick sequence of wind-deposited clays, silts, and sands[7]. It does not contain significant amounts of groundwater. The Blackwater Draw is underlain by the Ogallala Formation, a sequence of clays, silts, sands, and gravels. The thickness of the Ogallala in the vicinity of Pantex ranges from 325 to 725 feet[8]. There are two water-bearing zones in the Ogallala: a perched aquifer, and the main Ogallala Aquifer[9]. The Ogallala is underlain by the Dockum Group, a sequence of shales, siltstones, and sandstones (figure 1.3). The Ogallala Aquifer is also known as the High Plains Aquifer[10].

The perched aquifer is found at depths ranging from 260 to 290 feet below land surface. It exists because downward flowing water is impeded by a low permeability 'fine-grained zone'[11]. The average saturated thickness of water in the perched aquifer is about 14 feet and the maximum thickness is about 75 feet[12].

The Ogallala Aquifer is separated from the perched aquifer by the fine-grained zone and unsaturated sediments. The depth of the Ogallala water table ranges from 350 to 425 feet below land surface[13]. Groundwater in the Ogallala flows to the northeast (figure 1.4). Most of the water in the Ogallala beneath the plant flows in laterally from the southwest. Additional sources of recharge are leakage from the overlying perched aquifer and, where the perched aquifer is absent, directly from playas[14].

The Ogallala Aquifer is the primary source of groundwater in the Southern High Plains[15]. The City of Amarillo operates a public supply well field in the Ogallala north and northeast of Pantex. The nearest city well is about 2500 feet from the plant[16]. Landowners near the plant use water from the perched or the Ogallala aquifers for domestic and agricultural purposes, and the plant obtains its water from five on-site Ogallala wells[17].

1.3 Wastes and Potential Contaminant Pathways

In the past, industrial wastes were discharged to all the playas at Pantex[18]. Explosives, pesticides, metals, PCBs, and volatile organic compounds were discharged to playas via unlined ditches[19]. From 1942 to 1970 Pantex Lake received wastes from the Old Sewage Treatment Plant (OSTP). The OSTP treated sewage and industrial wastes[20]. Only Playa 1 continues to receive waste waters, and the wastes are treated before being discharged to the playa[21]. All the playas receive stormwater runoff[22].

Pantex contains many sites that may have released hazardous materials to the environment[23]. These include: solvent disposal trenches, a solvent evaporation pit, sludge beds, unlined burn pits, subsurface leaching beds, pesticide rinse areas, leaking under-

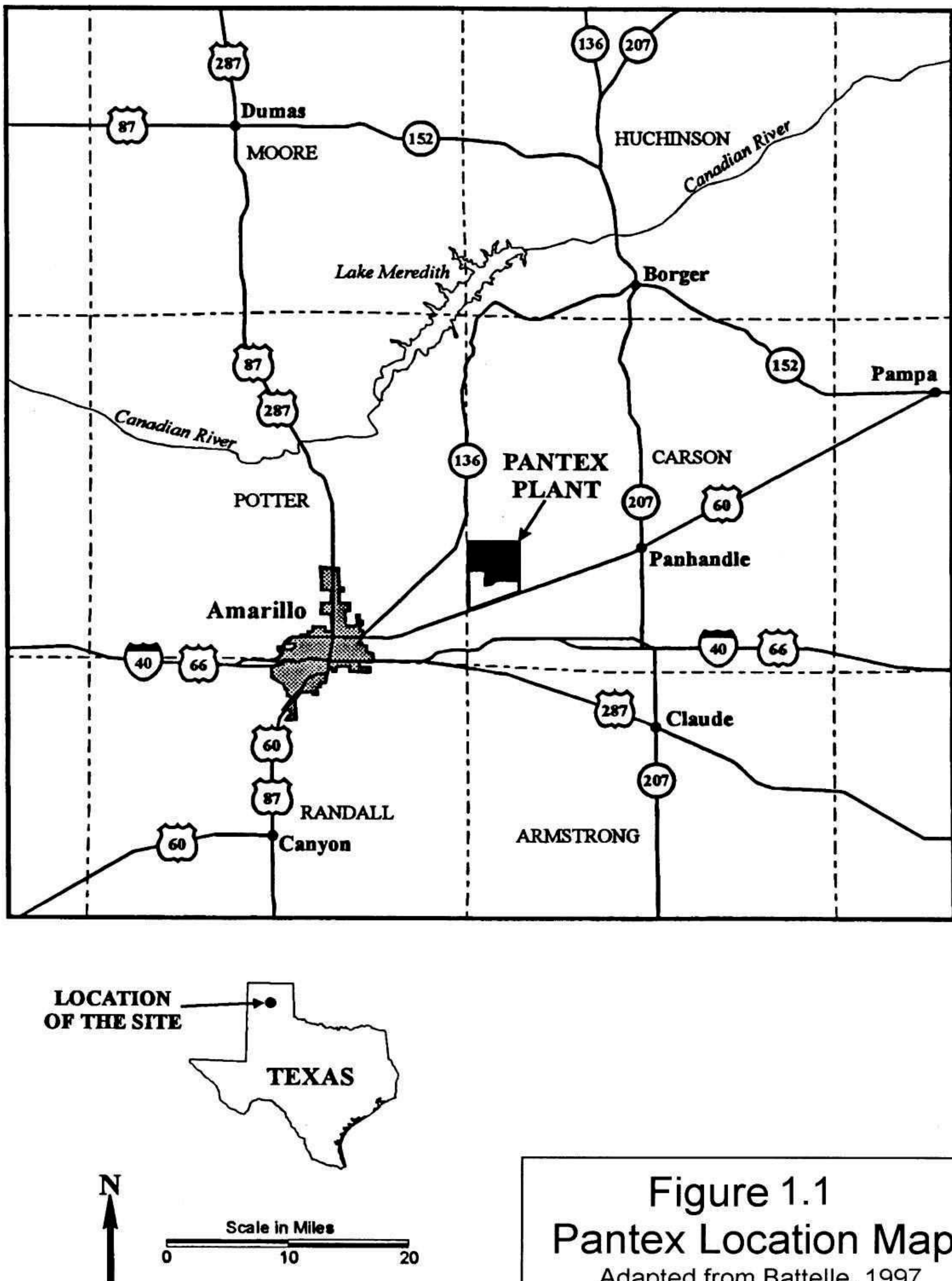

Figure 1.1
Pantex Location Map
Adapted from Battelle, 1997

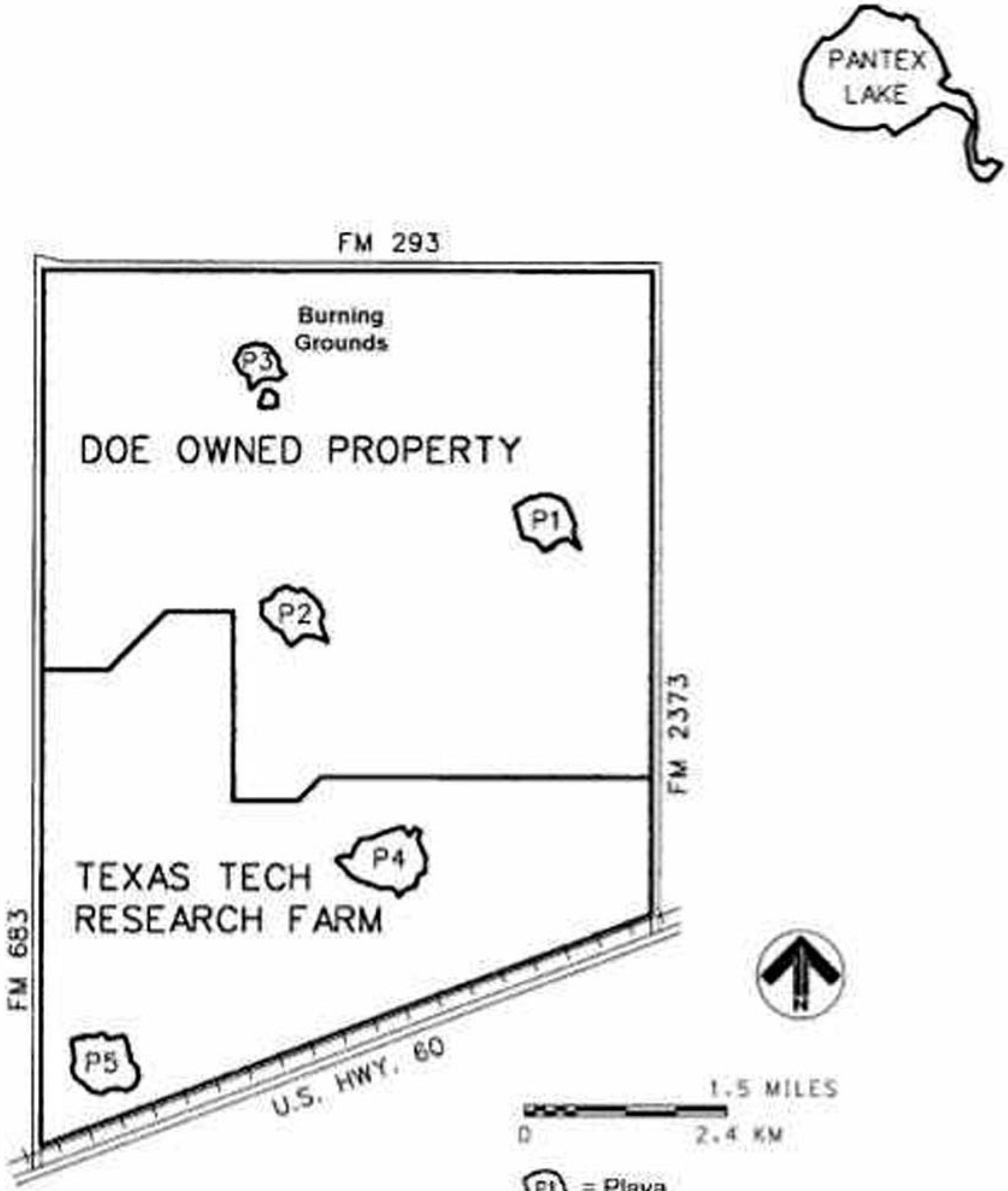

Figure 1.2
Pantex Plant Site Map
Adapted from DOE, 1998b

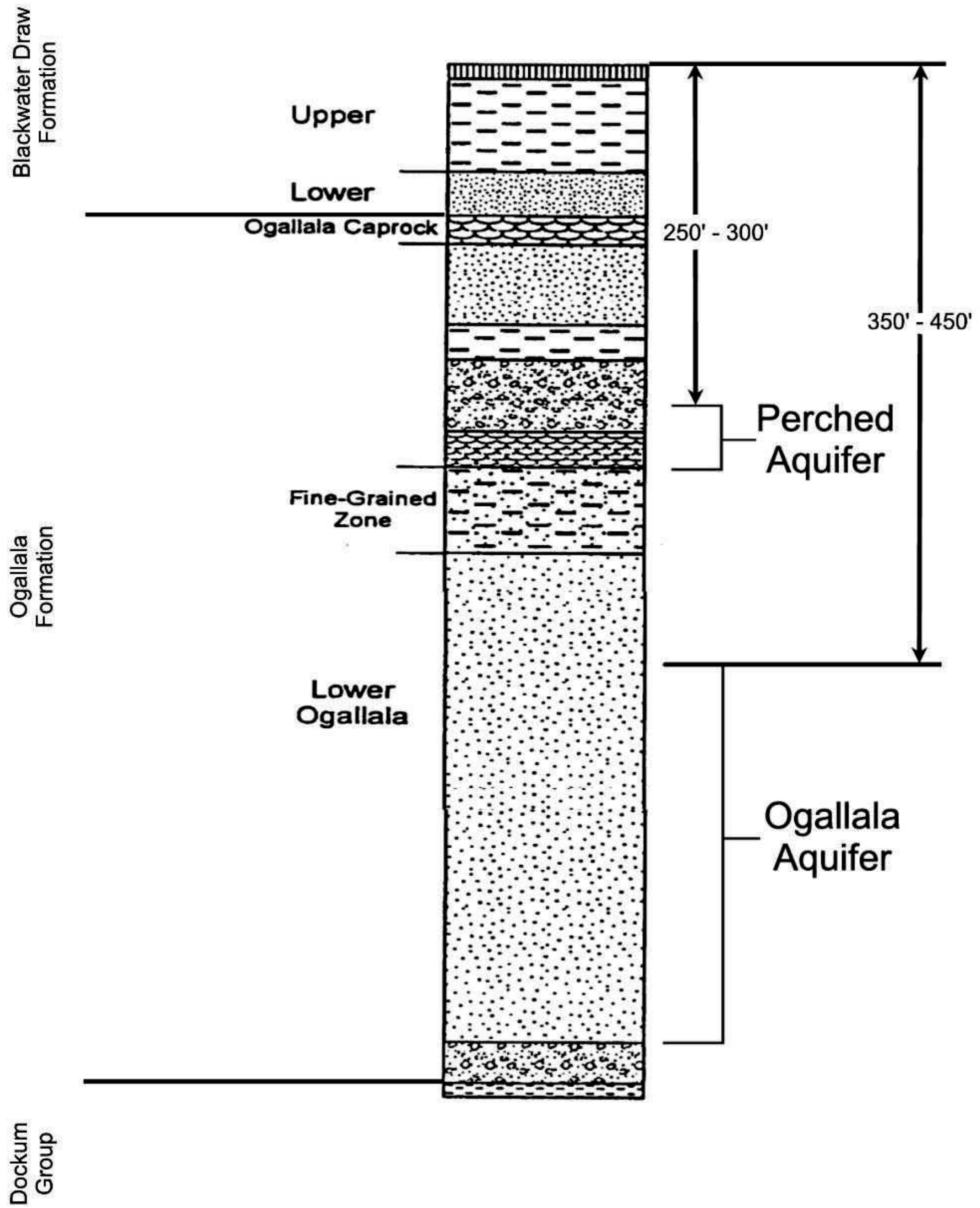

Figure 1.3
Pantex Plant, Geologic Cross Section

Adapted from Battelle, 1997

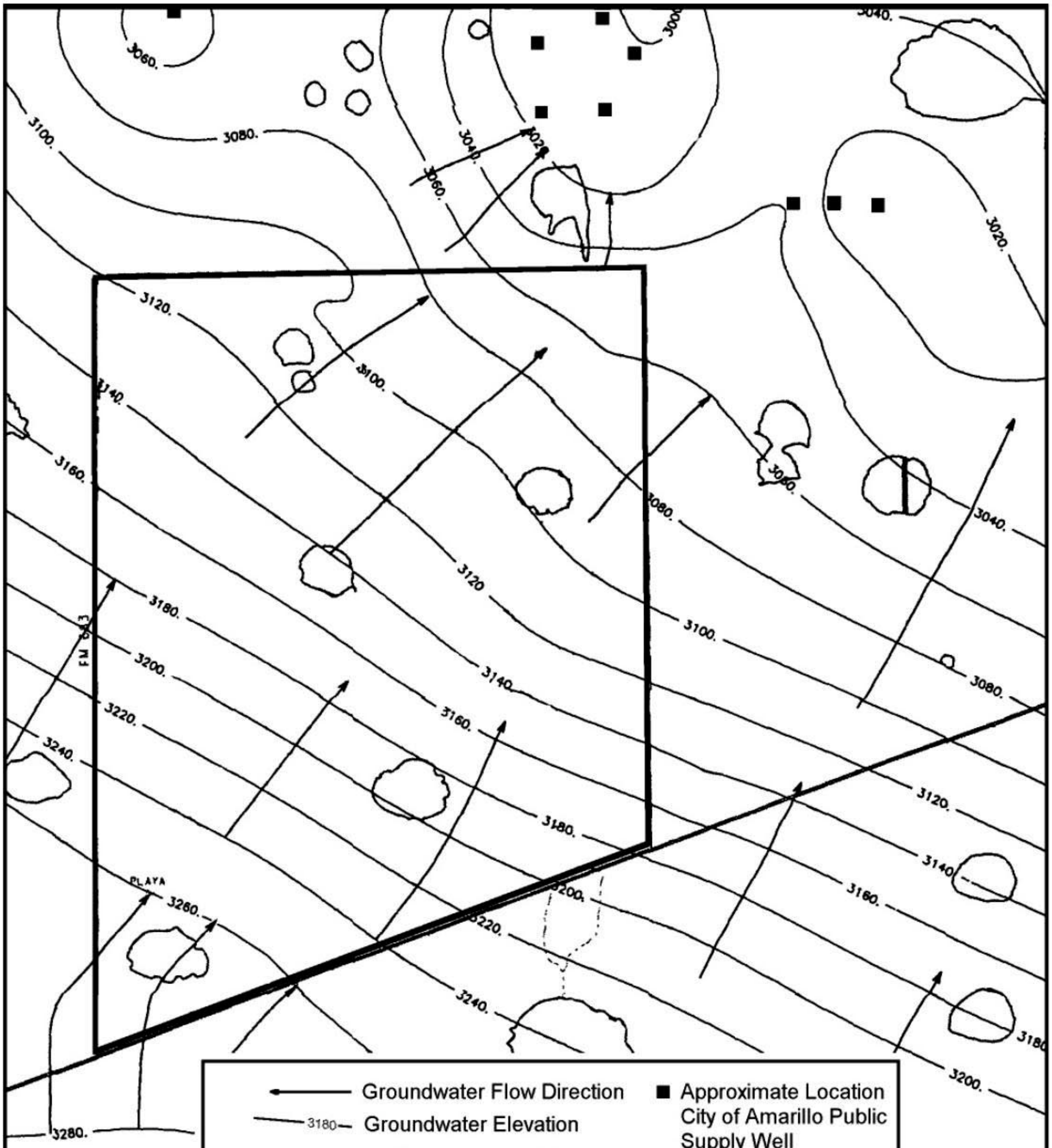

Figure 1.4
Pantex Plant
Groundwater Flow Directions in Ogallala Aquifer
Adapted from Battelle, 1997

ground storage tanks, unlined landfills, waste drum storage areas, solvent leak sites, acid spill sites, a transformer leak site, and a scrap/salvage yard[24]. Industrial effluents were discharged to unlined ditches, which flowed to the playas. Because hazardous materials have been used at Pantex for more than 50 years, it is probably not possible to identify all areas where they have been handled, stored, spilled, buried, burned, or dumped; with or without the authorization of plant officials[25].

Contaminants may enter the Ogallala by several pathways.

1. Liquid and dissolved contaminants may migrate from a surface source (e.g., solvent disposal trenches[26]) down to the perched aquifer. They may then flow through a relatively permeable portion of the fine-grained zone down to the Ogallala. In areas where the perched zone is not present[27], liquid contaminants may flow directly from the surface to the Ogallala Aquifer.

2. Contaminants may migrate as gasses. At the Burning Grounds, volatile contaminants have been found as gasses above the water table of the Ogallala. These gasses may diffuse into the aquifer[28].

3. Improperly sealed wells can serve as conduits for contaminants. Contaminants can enter a faulty well, either as liquids or gasses, and flow down to the Ogallala. This appears to have occurred at Burning Grounds well PTX01-1003[29].

Contaminants from Pantex have entered both the perched aquifer[30] and the Ogallala Aquifer. This report discusses only contaminants in the Ogallala Aquifer.

2.0 Metals Concentrations in the Ogallala Aquifer

Analyses of metals were compared in two ways: (1) DOE paired samples collected during 2002 from Ogallala wells, one of which was unfiltered and one filtered to remove sediments, and (2) between results obtained independently by the TCEQ and those paired samples from DOE Pantex.

2.1 Metals Concentrations from Filtered vs. Unfiltered Samples

During the calendar year 2002, Pantex collected and analyzed for metals and radionuclides in filtered and unfiltered groundwater samples. Fifty-one paired samples were collected from 16 wells that had been completed into the Ogallala Aquifer and 30 pairs from 18 wells in the shallower perched aquifer.

The 51 paired Ogallala samples resulted in 1123 individual analytical results for various metals. The metals included aluminum, antimony, arsenic, barium, beryllium, boron, cadmium, chromium, cobalt, copper, iron, lead, magnesium, manganese, mercury (two samples), molybdenum, nickel, selenium, silver, thallium, tin, vanadium, and zinc.

The Ogallala wells sampled (see figure 2.1), followed by the number of samples taken from that well, were:

OW-WR-46 (4 samples)
OW-WR-47 (4)
OW-WR-48 (4)
PTX01-1005 at 490 ft, 685 ft, and 806 ft (3 each depth)
PTX01-1010 (4)
PTX01-1011 (5)
PTX01-1013 (2)
PTX06-1033 (1)
PTX06-1056 (2)
PTX06-1057A (2)
PTX06-1062A (2)
PTX06-1068 (1)
PTX06-1072 (2)
PTX06-1074 (3)
PTX06-1075 (3)
PTX06-1076 (3)

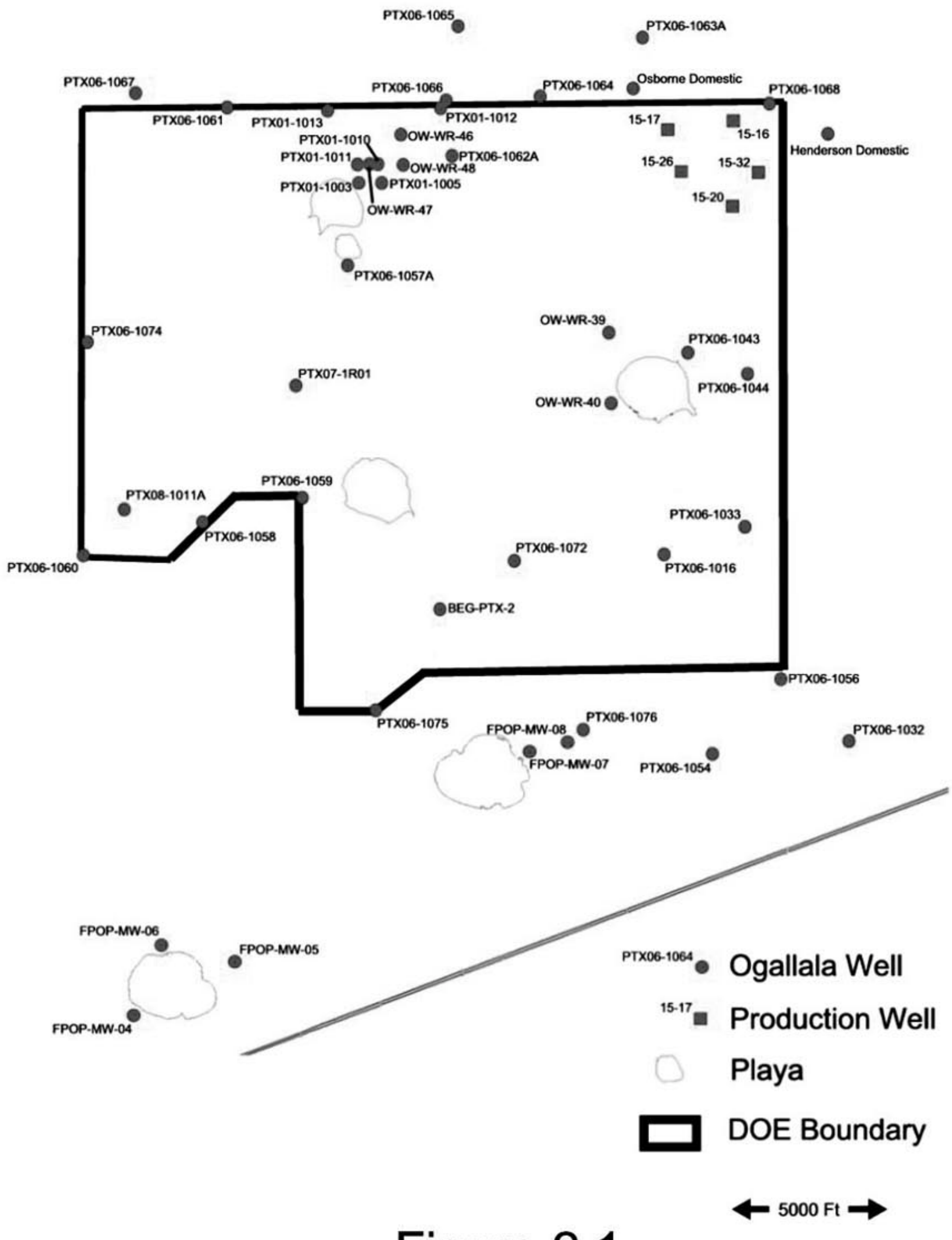

Figure 2.1
Pantex Plant
Ogallala Wells

In samples collected during the first three quarters of 2001, analytical results from Ogallala wells to the north of Pantex showed extremely high concentrations for some metals of concern. Some concentrations of metals exceeded either primary or secondary drinking water standards or action levels (table 2.1). To address and mitigate these results, Pantex undertook a project to filter sediments from the groundwater samples, so that any metals adsorbed onto the sediments would not be counted in the results.

Table 2.1 Metal concentrations in Ogallala Well PTX06-1063A sampled at 660 ft depth (08/14/2001) compared to Drinking Water Standards. PTX06-1063A is located near the City of Amarillo's municipal production well. All results are in µg/L (parts-per-billion).

Metal	PTX06-1063A	Drinking Water Standard	
Aluminum	129,000	Secondary	50-200
Chromium	145	Primary	100
Iron	117,000	Secondary	300
Lead	105	Action Level	15

The problem, however, with a broad-brush exclusion of metals adsorbed onto the sediments is the differential partition of metals between the water phase and the sediments. Also, groundwater wells improperly completed into the Dockum Group[31], which underlies the Ogallala, may be expected to produce results that have some metals with much higher concentrations adsorbed to the sediments. This situation exists because of the clay-rich character of the Dockum Group; the clays provide adsorption sites for substitution or exchange of metal ions.

An Example – Beryllium

Beryllium is an extremely dangerous metal. Because most of the Pantex on-site wells have shown no concentrations of beryllium, there would seem to be no reason to believe that beryllium in any detectable concentration is native to the Ogallala Aquifer in the vicinity of Pantex. Beryllium is known to be a contaminant from Pantex operations, and provides one example as to how the partitioning of metals between the aqueous phase and sediments works.

Analyses of samples from two wells resulted in concentrations of Beryllium not excluded due to contaminated "blanks." Both wells – PTX01-1005 and PTX06-1057A – are associated with the Burning Grounds and adjacent Firing Sites. Although none of the results in this study exceeded what Pantex has proposed as the 1.5 µg/L "background", any detected concentration of beryllium should be considered a contaminant.

The beryllium results (in µg/L or parts-per-billion) from the samples collected from each of the wells are given in the following table (Table 2.2).

Table 2.2 Beryllium Results, Unfiltered vs. Filtered. All results are in µg/L (parts-per-billion).

Ogallala Well	Date	Unfiltered Sample	Filtered Sample
PTX01-1005 (806 ft)	3/04/02	1.4	< 0.2
	4/22/02	0.501	< 0.2
	4/22/02	0.501	< 0.2
PTX06-1057A	5/06/02	0.276	< 0.2
	5/06/02	0.276	< 0.2

The origin of the beryllium would be expected to be the result of past operations at the Burning Grounds and/or Firing Sites. Although filtering the sediments from the groundwater sample removed the concentrations of beryllium from the water, the Beryllium adsorbed onto the sediments is no less a contaminant. The 1.4 ug/L result is close to the 1.5 ug/L that Pantex proposed for "background" in the Ogallala Aquifer.

Well PTX01-1005 was the nearest well down gradient from PTX01-1003, another monitoring well at the Burning Ground in which contamination was first discovered in 1999. However, PTX01-1003 was plugged in 2001 due to concerns that it may be providing a preferential pathway for contaminants to the Ogallala Aquifer at the Burning Grounds[32].

Well PTX01-1005 was plugged by Pantex some time following its last sampling date in the 4th quarter 2002, reportedly due to the damage the well received when Pantex removed the FLUTe sampling system. An equivalent, replacement monitoring well has not yet been drilled.

The FLUTe system, which provided important information about contaminants at various depths from the water column, was removed by Pantex – from this and four other Ogallala wells – without public discussion or input.

2.2 Inconsistent use of Filtered and Nonfiltered samples

Interestingly, Pantex relied upon non-filtered groundwater samples in determining "background" values for the Ogallala Aquifer in the vicinity of Pantex. In contrast, Pantex may present results from filtered groundwater samples for comparison to "background" values to determine whether the groundwater is contaminated.

Thus, should unfiltered samples result in higher concentrations for "background" and filtered samples result in higher values and be used in the comparison for identifying groundwater contamination and cleanup requirements, the ramifications could be enormous.

One argument is that only concentrations of metals in solution (in the groundwater itself) should be measured to determine contamination. If a valid argument, then this should hold true for both background concentrations and evaluating contamination. However, the origin of the contamination could have been through groundwater and, as contaminants increase in concentrations and find adsorption sites on the clay sediments, the contaminants drop out of solution.

2.2.1 Comparison of Results of Paired Samples

The results of paired samples are provided in appendix A. Of the 51 paired samples from the Ogallala Aquifer:

40% (446 of 1123) of the analytical results were not usable because of some problem with the "blanks" which are analyzed in the laboratory alongside of the actual samples. Results obtained from analyzing the blanks should contain no concentrations of the metals. In this way, the cleanliness of the bottles used to hold and transport the groundwater samples, the integrity of the laboratory equipment and protocols are evaluated with regard to each analytical result obtained. Thus, 40% is an incredibly high percentage of results of little or no use – especially considering the costs for employee time to collect and ship the samples, for laboratory analyses, and evaluating the final results.

33% (374 of 1123) of the results were below detection limits of both the filtered and unfiltered samples. This situation is to be expected (and hoped for), especially in those metals not native and considered a contaminant to the Ogallala groundwater samples. The detection limits for the metals ranged between 0.2 ug/L for beryllium to 5000 ug/L for magnesium; however, detection limits generally seemed appropriate to provide information about concentrations of the various metals.

27% (303 of 1123) of the results provided the basis for the comparison. It is important to note that a statistical test was not used in this review to determine whether pairs were the same or changed as a result of the filtering of sediments. In part, the variability of concentrations in the samples is not known, which would enable a more precise comparison of the paired samples.

Approximately half of the 303 analytical results suggested essentially identical results in both the filtered and unfiltered samples. Most of the remaining results suggested reduced concentrations in the filtered samples, with a few resulting in an increased concentration for the filtered sample. An increase in the filtered sample could be a result of removing, during the filtering, some metal that causes interference in the analysis of another metal; simply the natural variation among samples which has not been evaluated; chance; or analytical error.

It is important to note that analytical results from any two samples collected consecutively from the same well at the same time would not be expected to match identically, concentration by concentration. The variability of the concentrations for each metal in the Ogallala Aquifer samples in the vicinity of Pantex is unknown. However, having that information would allow a more accurate interpretation of sampling results. When concentrations from a single sample taken once a year are compared to that of the following year, for example, do changing concentrations over time suggest a trend, or are they, in fact, simply reflecting the variability of samples in the aquifer? This question has not been answered.

2.2.2 Conclusions

What exactly is the problem with the laboratory and the blanks?

How can Pantex resolve the problem with the blanks, in order to minimize the wasted costs of these analyses? Will Pantex do so?

It is unreasonable to expect that water used for domestic or agricultural purposes would be filtered prior to use – thus, the results from unfiltered sample analyses are just as telling as those from filtered ones.

How Pantex chooses to apply the data from unfiltered and filtered analyses should be carefully scrutinized by the TCEQ, EPA, and the community.

2.3 TCEQ Co-sampling of Pantex Wells

Representatives from the Texas Commission on Environmental Quality (TCEQ) periodically collect samples from some of the Pantex monitor wells. Historically, Pantex has chosen to sample the same wells at the same time as the TCEQ. The TCEQ analytical results are important because they are the only independent verification of Pantex' groundwater monitoring program.

During 2002 and 2003, the TCEQ co-sampled 23 Pantex wells. Thirteen of the wells are completed in the Ogallala Aquifer and ten in the perched aquifer. This review considers only those samples from wells in the Ogallala Aquifer.

Ogallala wells (figure 2.1) that were co-sampled by TCEQ during these years were:

- PTX01-1010
- PTX01-1012
- PTX06-1044
- PTX06-1059
- PTX06-1061
- PTX06-1062A
- PTX06-1063A (500 ft and 590 ft depths)
- PTX06-1064
- PTX06-1065
- PTX06-1066
- PTX06-1067
- PTX06-1074
- BEG-PTX-2

TCEQ analytes included 18 metals – aluminum, arsenic, barium, cadmium, calcium, chromium (total), copper, iron, lead, magnesium, manganese, mercury, nickel, potassium, selenium, silver, sodium, and zinc. However, TCEQ did not analyze for some of the metals which Pantex monitors – antimony, beryllium, boron, chromium (hexavalent), cobalt, molybdenum, thallium, tin, and vanadium. Similarly, Pantex did not analyze for calcium, mercury (for most wells), potassium, or sodium.

2.3.1 Results and Discussion

In general, the results were similar. Perhaps the most important aspect of the TCEQ co-sampling is that it actually conducts the co-sampling – providing a value to compare or contrast to those that Pantex reports. Through its co-sampling program, TCEQ also decides independently which wells to monitor. This, in itself, is of value to the community.

The analytical results for metals from the TCEQ co-sampling of Pantex Ogallala wells during the calendar years 2002 and 2003 are provided in appendix B. For ease of comparison, the TCEQ results are listed alongside the corresponding Pantex results. Organizing the data in this way, however, required that the values be entered anew. Although much care was taken to input and proofread data accurately, the opportunity for error exists.

In some cases, the detection limits were too high to be of use in some or all of the groundwater samples – such as the TCEQ analyses for arsenic, cadmium, chromium, copper, iron, lead, manganese, nickel, selenium, silver, and zinc.

Ogallala wells that have <u>not</u> been monitored during the past several years include:

OW-WR-40	*southeast of Playa 1*
PTX06-1016	*Zone 12*
OW-WR-54	*south of Playa 4*
PTX06-1054	*east of Playa 4*

2.3.2 Conclusion

The co-sampling program of TCEQ is a critical component of understanding the extent of groundwater contamination in the Ogallala Aquifer at and near Pantex.

TCEQ should continue to monitor through its co-sampling program, perhaps expanding the number of analytes and attempting to obtain results based on lower detection limits.

2.4 Failure to Continue Monitoring Ogallala Wells

Perhaps one of the more interesting outcomes of this evaluation was the discovery that several Pantex wells completed in the Ogallala Aquifer had not been sampled in years. Given the few Ogallala wells to monitor – especially when compared to the number of wells completed in the perched aquifer – it begs the question as to why Pantex chose to cease monitoring them.

The Ogallala wells that have not been monitored during the past several years are:

OW-WR-40
PTX06-1016
OW-WR-54 and
PTX06-1054.

2.4.1 OW-WR-40

This well is located southeast of Playa 1, east of Zone 4, and north of Zone 12. The most recent Pantex analytical results found for this well are from 10/07/1998. Contaminants reported from this sampling date are included in Table 2.3.

Table 2.3 Contaminants (in µg/L) in Ogallala Well OW-WR-40 sampled 10/07/1998.

Constituent/Contaminant	Concentration	Detection Limit
Chromium (Hexavalent)	10	10
1,2,3-Trichlorobenzene	1.2	1
1,2,4-Trichlorobenzene	0.85 (J)[33]	1
1,2-Dibromo-3-Chloropropane	3.2	1.5
Hexachlorobutadiene	0.66 (J)	2
Methyl Isobutyl Ketone	4.6 (J)	5
Naphthalene	3.9	1

(J) = contaminant is present, but concentration is estimated.

2.4.2 PTX06-1016

This well is the only Ogallala well located in Zone 12, the area of greatest contaminant plumes in the perched aquifer above the Ogallala Aquifer. The most recent sample was collected on 5/19/99. Contaminants are listed in Table 2.4.

Table 2.4 Contaminants detected in PTX06-1016.

Contaminant	Date	Concentration (ug/L)	Detection Limit (ug/L)
2-Nitrotoluene	5/19/99	0.24	0.1
Dibromofluoro- methane	5/19/99	44	not provided
TOX[34]	8/17/98	14 – 15.7 (3 values)	10
TOX	10/14/98	15.3 – 19.5 (4 values)	10
TOX	2/24/99	7.02 (J)	10

(J) = contamination is present, but concentration is estimated.

2.4.3 OW-WR-54 and PTX06-1054

These wells are located south and east, respectively, of Playa 4 on the property of Texas Tech. Because Pantex discharged industrial wastewater to this playa in the past and continues to discharge stormwater to this playa, it would seem important to Pantex to monitor these wells in order to determine the water quality in this area. No data for these wells have been located for the period 7/01/98 through 12/31/2003.

3.0 Organic Contaminants and Explosives

This section focuses on organic and explosive contaminants in the Ogallala Aquifer. It is based on groundwater samples collected between July 1998 and December 2003[35].

A total of 770 apparent detections of organic constituents or explosives were reported for the Ogallala groundwater samples. Of these, 393 were discarded as false positive detections because they were either (1) detected in blanks, or (2) leached from equipment used to collect groundwater samples. The remaining 377 detections are considered to be valid detections of contaminants in the Ogallala Aquifer[36]. A discussion of apparent detections and false positives is presented in Appendix C.

Organic contaminants include solvents, fuel components, and pesticides. Table 3.1 lists the organic compounds and explosives that have been detected in the Ogallala Aquifer at Pantex. Some of the contaminants were detected only a few times or in only a few wells (e.g., 1,2,3-trichlorobenzene)[37]. Other contaminants have been detected many times in many wells (e.g., toluene)[38]. The contaminants shown in table 3.1 are primarily manmade[39]. Thus, the presence of these contaminants in the Ogallala is likely the result of human activity.

In a few cases, contaminant concentrations exceed the concentration established to protect human health (e.g., MCL)[40]. However, in the great majority of cases, contaminant concentrations are well below health standards in samples collected through 2003. Contaminant concentrations are listed in Appendix D.

3.1 Contaminant Distribution

Organic contaminants or explosives have been detected in 43 Ogallala wells at and near the Pantex plant. Figure 3.1 shows the wells where one or more contaminants were detected in the Ogallala Aquifer. Appendix D contains a list of contaminant concentrations found in each well.

Two of the most commonly detected contaminants are acetone and toluene. Both of these chemicals are solvents[41]. Toluene is also a component of gasoline[42]. Their distributions and concentrations are shown in figures 3.2 and 3.3. The concentrations shown are the highest that have been detected at each well.

Some of the highest concentrations of acetone and toluene have been found at, and down gradient of, the Burning Grounds (location of Burning Grounds is shown on figure 1.2). This implies that the Burning Grounds is the primary source of these contaminants. This is consistent with what is known about the Burning Grounds. Between 1954 and 1980, 150,000 to 300,000 gallons of contaminated waste oils and solvents were disposed in pits at the Burning Grounds[43]. The pits are known to have overflowed and run into Playa 3[44]. Many contaminants, including acetone and toluene, have been detected in soils[45] at the Burning Grounds. Acetone and toluene have also been detected in soil gas at the Burning Grounds[46].

High concentrations of acetone and toluene have also been detected to the northwest of the Burning Grounds. There is no obvious source for these contaminants. Lower concentrations of acetone and toluene have been detected in wells along the upgradient (western and southern) boundaries of the plant. This indicates that some contaminants may be migrating onto Pantex from non-Pantex sources.

The Ogallala wells in which one or more explosives have been detected are shown in figure 3.4.

Table 3.1 Organic and Explosives Contaminants – Detected in Ogallala Aquifer at Pantex

Organic Contaminants			
acenaphthene	1,2,4-trichlorobenzene	methyl isobutyl ketone (4-methyl-2-pentanone)	phenanthrene
acetone	ethylbenzene	methyl ethyl ketone (2-butanone)	pentachlorophenol
aniline	isopropylbenzene (cumene)	bromomethane	bis(2-ethylhexyl) phthalate
anthracene	hexachlorobutadiene	dibromochloromethane	di-n-butyl phthalate
benzo(a)anthracene	n-butanol	dibromodifluoromethane	diethyl phthalate
bromobenzene	1,2-dichloroethane	dichlorodifluoromethane	di-n-octyl phthalate
n-butylbenzene	1,1,1-trichloroethane	chloromethane	pyrene
sec-butylbenzene	1,1,2-trichloro-1,2,2-trifluoroethane (freon-113)	methylene chloride	benzo(a)pyrene
tert-butylbenzene	cis-1,2-dichloroethene	chloroform	carbon disulfide
chlorobenzene	trichloroethene (TCE)	carbon tetrachloride	toluene
1,2-dichlorobenzene	tert-butyl methyl ether	methyl methacrylate	2-chlorotoluene
1,3-dichlorobenzene	fluoranthene	naphthalene	4-chlorotoluene
1,4-dichlorobenzene	benzo(b)fluoranthene	2-methylnaphthalene	4-isopropyltoluene (p-cymene)
1,2,4-trimethylbenzene	benzo(k)fluoranthene	1,2-dibromo-3-chloropropane	styrene
1,3,5-trimethylbenzene	fluorine	1,1-dichloropropene	tetrahydrofuran
1,2,3-trichlorobenzene	2-hexanone	isopropanol	xylenes

Table 3.1 Organic and Explosives Contaminants – Detected in Ogallala Aquifer at Pantex (continued)	
Explosives Contaminants	
HMX (octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine)	1,3-dinitrobenzene
2,6-dinitrotoluene	4-amino-2,6-dinitrotoluene
RDX (hexahydro-1,3,5-trinitro-1,3,5-triazine)	perchlorate
TNT (2,4,6-trinitrotoluene)	nitrobenzene
2-nitrotoluene	2-amino-4,6-dinitrotoluene

3.2 Contaminant Detection Trend and Remedial Actions

The number and types of organics and explosives contaminants detected from quarter to quarter cannot be precisely compared because different wells were sampled each quarter[47] and all samples were not analyzed for the same constituents[48]. Nonetheless, a general trend is apparent. The number of detections peaked in the second and third quarters of 2001. Detections have significantly declined since then. There were only four detections in all of 2003 (see figure 3.5[49]).

The decline in detections is probably due, at least in part, to the remedial actions put in place by Pantex. In 2002 DOE began operating a soil gas vapor extraction system at the Burning Grounds[50]. This system removes contaminated soil gas, reducing the amount of volatile contaminants (e.g., TCE, toluene) available for transport to the Ogallala Aquifer.

In 2001 DOE plugged Ogallala well PTX01-1003[51]. This well had a defective casing, which appears to have acted as a conduit that allowed contaminants to enter the Ogallala[52].

Since 1995 DOE has been removing contaminated water from the perched aquifer with a pump and treat system[53]. This has reduced the amount of contaminated water available to migrate from the perched aquifer to the Ogallala Aquifer.

DOE's remedial actions are not likely to affect those contaminants already in the Ogallala Aquifer. Those contaminants will continue to be transported to the northeast. As they travel, natural mechanisms will act to reduce their concentrations (e.g., biodegradation, dispersion).

The fluctuation in detections could also be due to fluctuations in the transport of contaminants to the Ogallala Aquifer. That is, contaminants may migrate as 'slugs' or 'pulses' that reach the Ogallala intermittently. If this is the case, contaminant detections may increase as additional slugs migrate down to the Ogallala.

The disappearance of contaminants from wells north of the Pantex boundary (e.g., PTX06-1063A, PTX06-1065) indicates that the source of contaminants was probably not in the immediate vicinity of these wells[54]. This disappearance is what would be expected if the contaminants were derived from an up-gradient source, such as at the Burning Grounds.

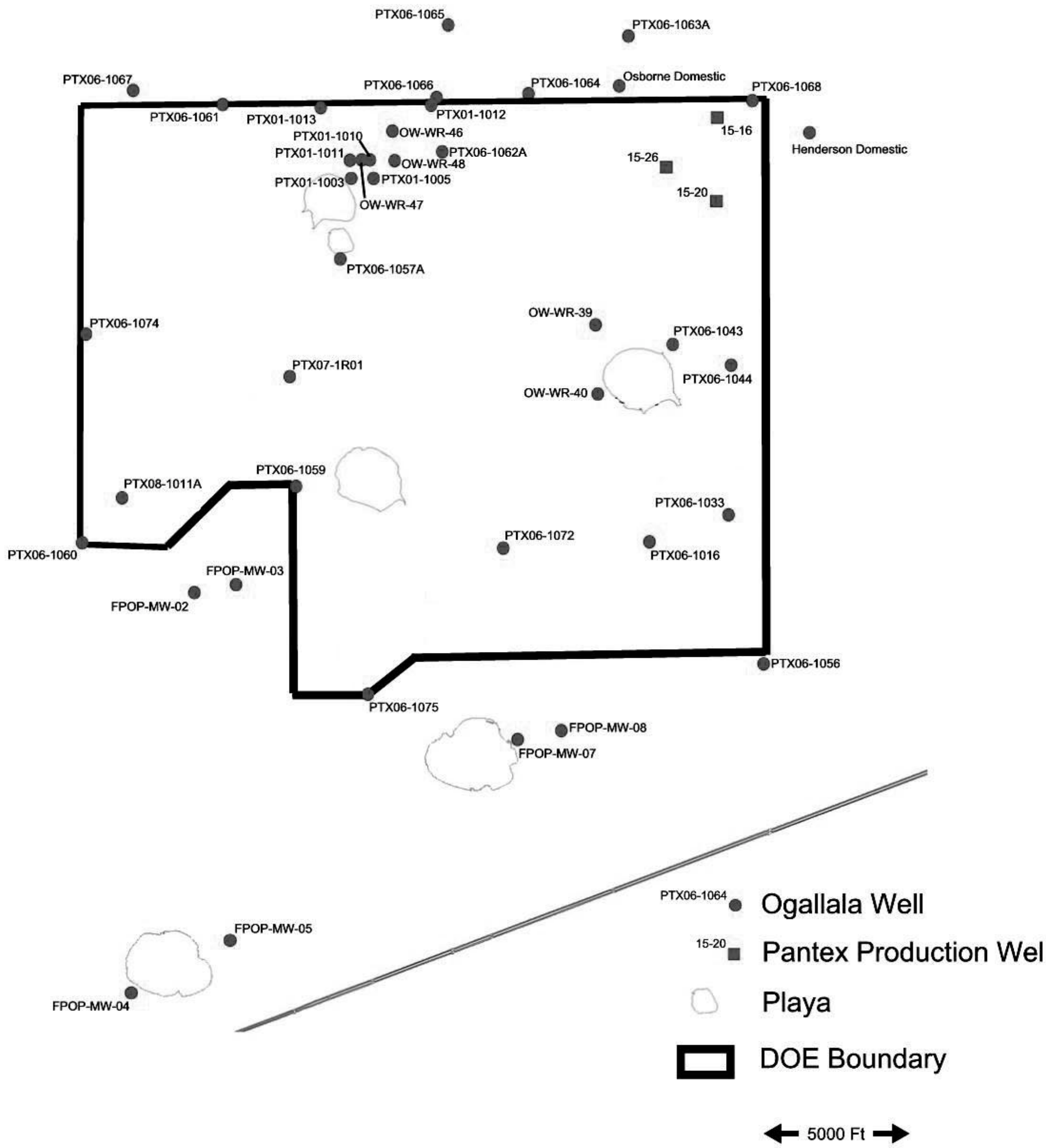

Figure 3.1
Pantex Plant
Ogallala Wells With Detections of
Organic Contaminants or Explosives

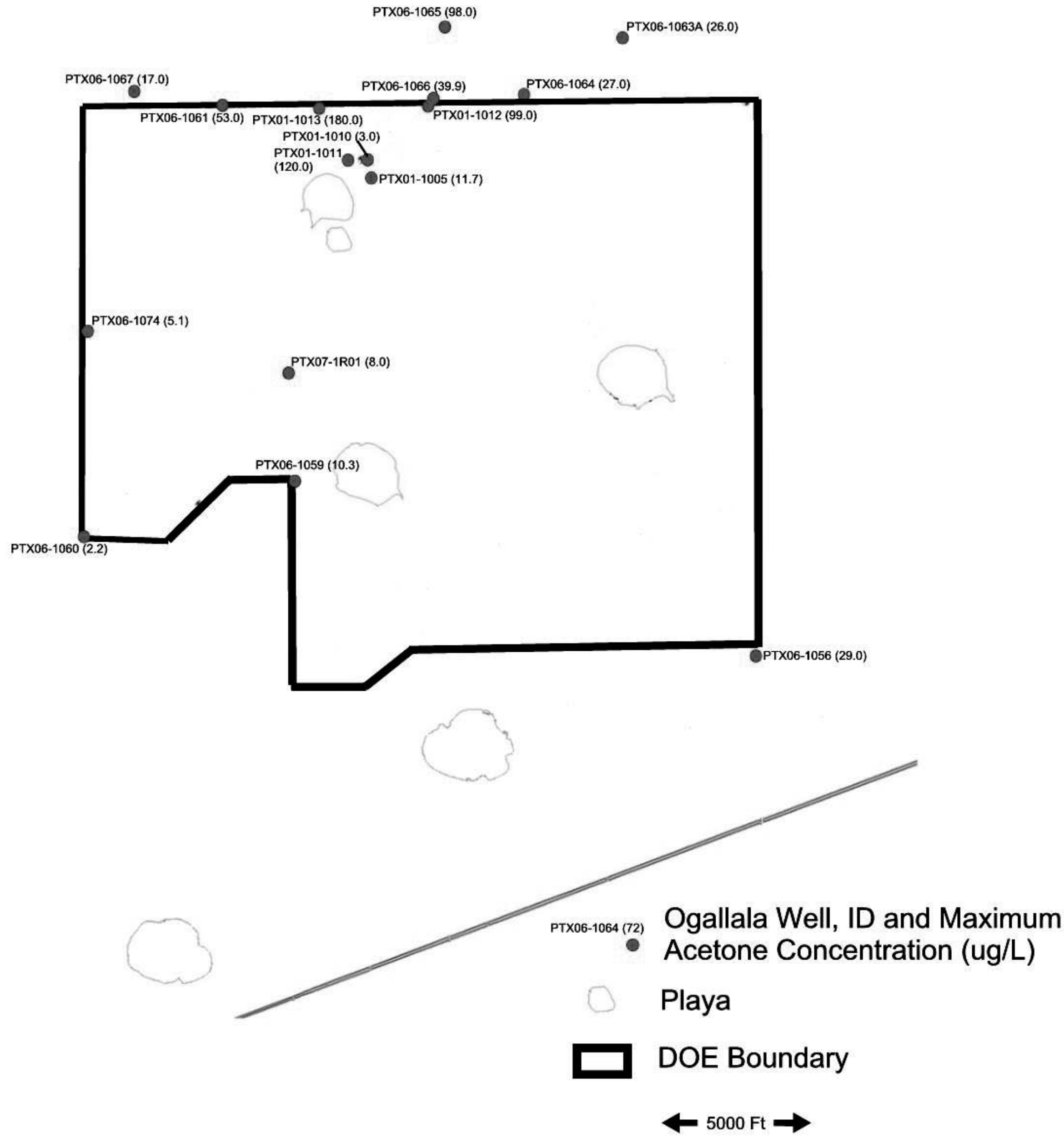

Figure 3.2
Pantex Plant
Ogallala Wells With Acetone Detections

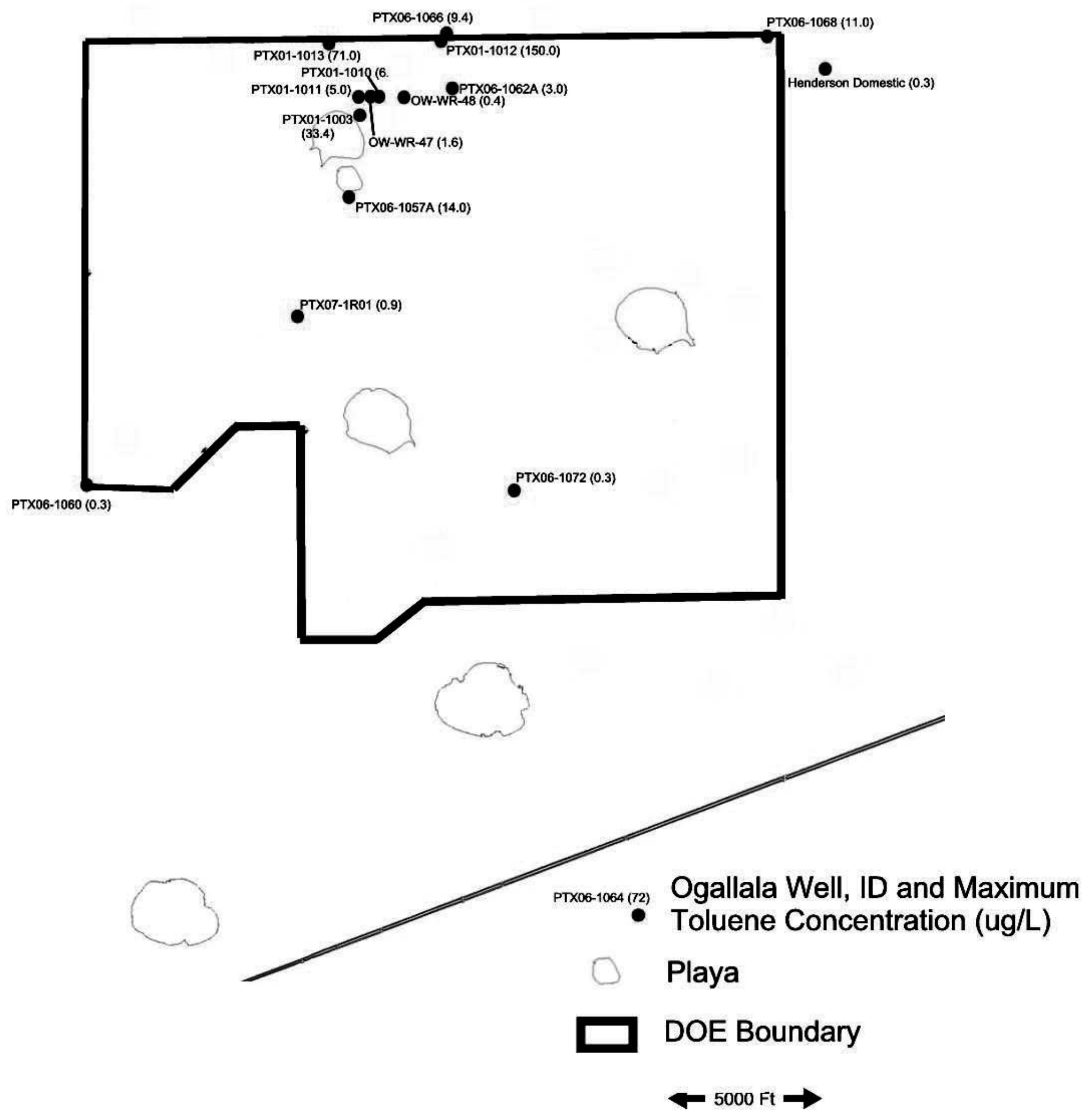

Figure 3.3
Pantex Plant
Ogallala Wells With Toluene Detections

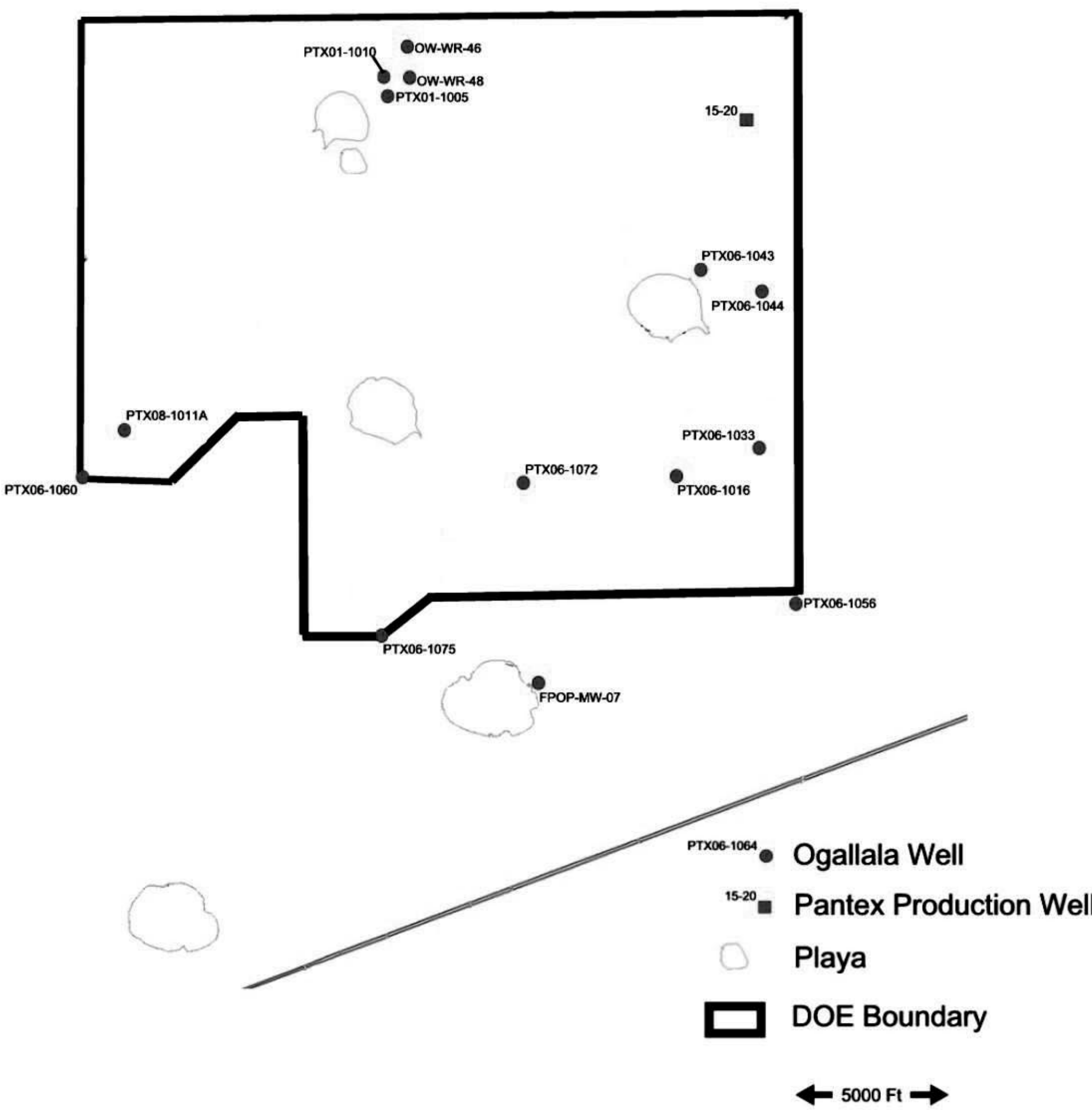

Figure 3.4
Pantex Plant
Ogallala Wells With Detections of Explosives

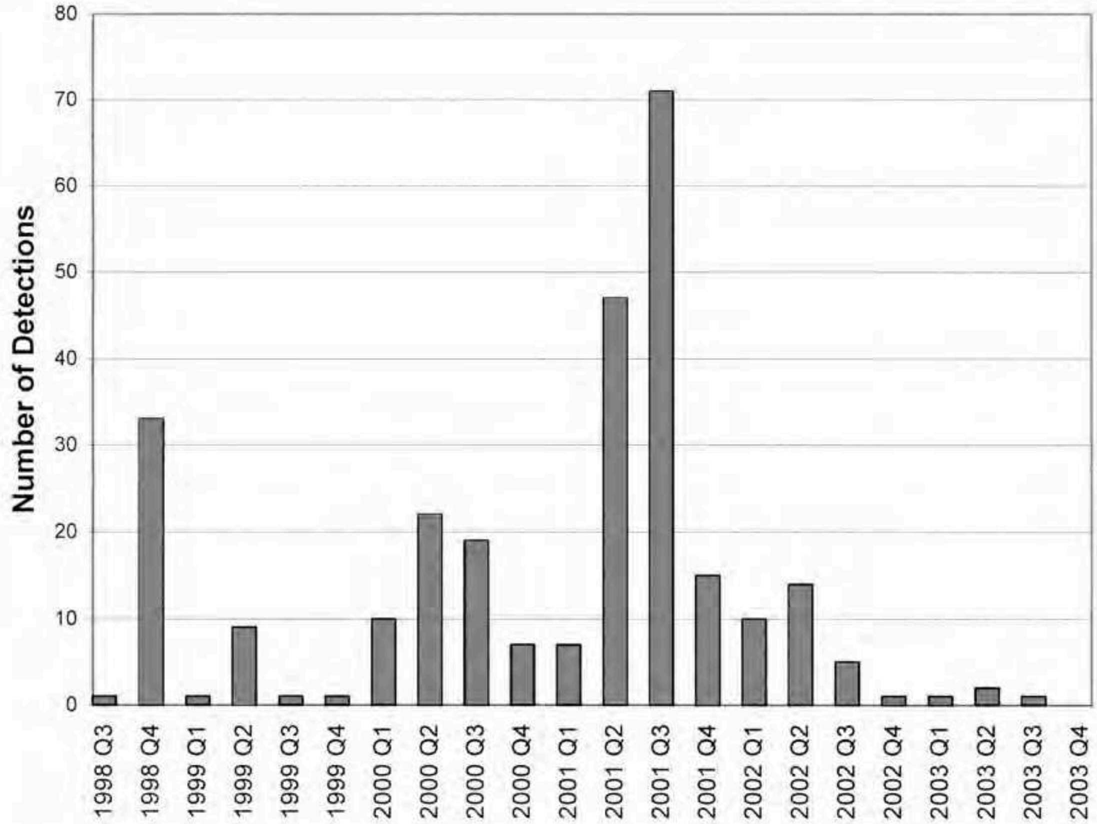

Figure 3.5
Ogallala Detections Organics and Explosives
Q3 1998 - Q4 2003

4.0 Conclusions

Contaminants from Pantex have entered the Ogallala Aquifer. The contaminants include metals and organics and explosives compounds.

Pantex should be consistent in its use of filtered and unfiltered sample results.

A high number of analyses were discarded because contaminants were detected in blanks. In at least some cases, blank contamination is avoidable (e.g., metals in laboratory blanks). Pantex should take steps to minimize this problem.

TCEQ co-sampling of Ogallala wells is a critical component of understanding the extent of groundwater contamination in the Ogallala Aquifer at and near Pantex.

Pantex has discontinued monitoring some of the wells in which contaminants have been detected. The reason for discontinuing the monitoring is not known.

The detections of organics and explosives peaked in 2001 and have decreased significantly since then. The decrease appears to be due, at least in part, to remedial actions conducted by Pantex. Although the remedial actions may have reduced the amount of contaminants entering the Ogallala, they have little or no effect on the contaminants already in the Ogallala. These contaminants will continue to be transported down gradient in the aquifer. Their concentrations will be reduced through the action of natural mechanisms such as dispersion and biodegradation.

DOE's remedial actions will probably not remove all the contaminants that may migrate down to the Ogallala. Therefore, DOE should continue to monitor the Ogallala Aquifer for the foreseeable future.

5.0 References

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6.0 Endnotes

[1] The DOE data are from quarterly reports posted on the Pantex website, and analyses of samples from the Henderson and Osborne domestic wells. The TCEQ data are from co-samples of DOE wells at and near the Pantex plant. See references.

[2] Battelle, 1997, page 5.

[3] DOE, 1998a, page 2-1.

[4] The treatment plant receives both sewage and industrial effluent. DOE, 2000b, page 2-8.

[5] DOE, 2000d, pages 2-11 and 4-2.

[6] Battelle, 1997, page 8.

[7] Battelle, 1997, page 10.

[8] Battelle, 1997, page 10.

[9] Battelle, 1997, pages 10 & 11.

[10] DOE 1998a, page 4-1.

[11] DOE, 2000c, page 1.

[12] Battelle, 1997, page 40.

[13] DOE, 2000d, page 2-5.

[14] DOE, 2000d, page C-3.

[15] DOE, 2000c, page 2.

[16] Battelle, 1999a, page 2-6.

[17] DOE, 2000d, pages 2-10 and 2-11.

[18] Battelle, 1997, page 8. The wastes discharged to playa 5 came from the Amarillo Air Base and were used as a source of irrigation water.

[19] DOE, 1999a, page 6. Stoller, 2001, page 1-49.

[20] DOE, 1998a, page 5-5.

[21] DOE, 2000d, pages 4-6 and 4-8.

[22] Battelle, 1997, page 8.

[23] Pantex contains 143 RCRA solid waste management units (SWMUs). Stoller, 2001, page 1-14.

[24] DOE, 2002c, appendix A page 1; EPA, 2000; page 2. Mason & Hanger Corporation, 1993, pages 38 - 40.

[25] The lack of information regarding past releases of hazardous materials can result in groundwater contamination where it is not expected. An example is the area southeast of Playa 1, between monitor well PTX08-1002 and the plant boundary. In response to a TNRCC comment concerning lack of groundwater information in this area, DOE stated " *It is unlikely that groundwater contamination exists in the perched aquifer in this area due to a lack of potential historic or present sources or releases (i.e., Plant production facilities and buildings, drainage ditches, etc.)".* The groundwater in this area was subsequently found to be highly contaminated with RDX (>2000 µg/L). Stoller, 2001, page 1-145 and figure 4-1.

[26] Between 1954 and 1980 150,00 to 300,000 gallons of solvents were disposed in trenches and an evaporation pit at the Burning Grounds (DOE, 2002c, appendix A page 1).

[27] Stoller, 2001, figure 2-15.

[28] BWXT, 2002a, page 5-67 and table 5.3-3; and Stoller, 2001, appendix B.

[29] DOE, 2003a, page 13; and BWXT, 2002a, page 5-56. Well PTX01-1003 has been plugged.

[30] Battelle, 1997, page 121.

[31] Rice, 2003

[32] Plugged on November 2, 2001, BWXT 2003a, page 1-3.

[33] "J" indicates contaminant present, but concentration is estimated.

[34] TOX = total organic halides.

[35] Analytical results reported in quarterly reports posted on Pantex website (DOE 1998 - 2003) and in DOE analyses of samples from the Henderson and Osborne domestic wells. See references.

[36] Cases where a contaminant was detected in duplicate samples were considered a single detection. Cases where duplicate sample results were contradictory, i.e. both detection and non-detection, were considered a detection.

[37] 1,2,3-trichlorobenzene was only found in October 1998 in three wells: OW-WR-39, OW-WR-40, and PTX06-1033.

[38] Toluene has been detected in 35 samples from 15 wells (see figure 3.3).

[39] Some of the contaminants also occur naturally. For example, naphthalene is a component of petroleum and coal. However, the presence of these contaminants at Pantex is assumed to be due to human activity.

[40] MCL = Maximum Contaminant Limit, the regulatory standard established to protect human health.

[41] Harte et al., 1991, pages 198 and 415.

[42] Harte et al., 1991, page 415.

[43] DOE, 2002c, appendix A page 1; and BWXT, 2002a, page 5-21.

[44] BWXT, 2002a, page 5-21.

[45] BWXT, 2002a, table 5.1-9.

[46] BWXT, 2002a, tables 5.3- 1 and 5.3-3.

[47] For example, well OW-WR-40 was only sampled in the third and fourth quarters of 1998 (DOE, 1998 – 2003).

[48] For example, the following contaminants were detected in 1998, but no samples were analyzed for these contaminants in 2003: 2-chlorotoluene, 1,1- dichloropropene, 1,2,3-trichlorobenzene, 1,2,4-trimethylbenzene, 2-chlorotoluene, 4-chlorotoluene, bromobenzene (DOE, 1998 – 2003).

[49] For this figure, contaminants detected at more than one depth, and on the same date, were considered a single detection. This is why the total detections shown in the figure is less than the total valid detections reported in appendices C and D.

[50] BWXT, 2002a, pages 5067 and 5-68.

[51] Plugged on November 2, 2001, BWXT 2003a, page 1-3.

[52] DOE, 2003a, page 2; and BWXT, 2002a, page 5-56.

[53] DOE, 2003b, pages 6-1 and 6-2.

[54] An unremediated source at the wells would be expected to continue producing contaminants.

Appendix A
Summary of Paired Samples from Ogallala Wells, Unfiltered vs. Filtered

Metal Analyzed	# of Paired Samples	# of Paired Samples Disregarded: Unfiltered Sample	Filtered Sample	Both Samples	# of Paired Samples Both Samples Below Detection	# of Paired Samples Filtered Sample Concentration is: Reduced	Same	Higher
Aluminum	51	7	6	3	21	14	0	0
Antimony	51	3	1	10	37	0	0	0
Arsenic	51	9	6	8	19	7	1	1
Barium	51	0	0	2	0	14	30	5
Beryllium	51	0	1	0	43	7	0	0
Boron	51	0	0	3	0	3	45	0
Cadmium	51	4	1	12	33	1		
Chromium-total	51	6	11	29	2	3		
Cobalt	51	6	0	1	43	1		
Copper	51	14	5	9	16	5	2	
Iron	51	13	3	0	8	26	0	1
Lead	51	17	7	17	8	2		
Magnesium	51	0	0	0	0	14	29	8
Manganese	51	6	11	13	5	13	3	0
Mercury	2	0	0	0	2	0	0	0
Molybdenum	51	1	5	44	0	1	0	0
Nickel	51	13	6	8	18	6	0	0
Selenium	51	14	5	9	23	0	0	0
Silver	50	7	0	6	36	1	0	0
Thallium	51	10	4	24	13	0	0	0
Tin	51	4	2	2	43	0	0	0
Vanadium	51	5	0	2	0	8	36	0
Zinc	51	5	12	14	4	10	4	2
*** note below								
TOTALS	1123	144	86	216	374	136	160	17

Thus, 662 individual samples had problems with metals in the laboratory blanks and the resulting 446 pairs of samples were not useable as intended in this study -- assuming that discarding the samples due to problems with the blanks is a legitimate action

40% — 40 percent of pairs discarded for problems with the laboratory blanks

33% — 374 pairs were both below detection, so provided no information as to whether or not the metals were adsorbed to sediments.

Note: "J" and other qualified values have been included in this summary

Appendix B
Comparison of TCEQ and Pantex Results for Metals

Well ID (depth, ft)	Aquifer	Sample Date	Metal	TCEQ Result (ug/L)	Pantex Result (ug/L)
PTX01-1010	OG	20030715	ALUMINUM	<111	<100
PTX01-1012	OG	20030722	ALUMINUM	<111	39.9 B[1]
PTX06-1044	OG	20030806	ALUMINUM	<111 <111	15.1 B
PTX06-1059	OG	20030728	ALUMINUM	<111	103
PTX06-1061	OG	20030721	ALUMINUM	<111	22.3 B
PTX06-1062A	OG	20030716	ALUMINUM	<111	68.4 B
PTX06-1063A at 500ft	OG	20020520	ALUMINUM	340	234 B
PTX06-1063A at 590ft	OG	20020520	ALUMINUM	340	269
PTX06-1063A	OG	20030723	ALUMINUM	579	479
PTX06-1064	OG	20030722	ALUMINUM	<111	48.3 B
PTX06-1065	OG	20030722	ALUMINUM	<111	15.8 B
PTX06-1066	OG	20030812	ALUMINUM	<111	<100
PTX06-1067	OG	20030721	ALUMINUM	<111	42 B
PTX06-1074	OG	20030721	ALUMINUM	<111 <111	31.3 B
PTX-BEG2	OG	20030729	ALUMINUM	<111	<100
PTX01-1010	OG	20030715	ANTIMONY	NS[2]	<2
PTX01-1012	OG	20030722	ANTIMONY	NS	<2
PTX06-1044	OG	20030806	ANTIMONY	NS NS	31.3
PTX06-1059	OG	20030728	ANTIMONY	NS	<2
PTX06-1061	OG	20030721	ANTIMONY	NS	<2
PTX06-1062A	OG	20030716	ANTIMONY	NS	<2
PTX06-1063A at 500ft	OG	20020520	ANTIMONY	NS	0.14 B
PTX06-1063A at 590ft	OG	20020520	ANTIMONY	NS	0.137 B
PTX06-1063A	OG	20030723	ANTIMONY	NS	<2
PTX06-1064	OG	20030722	ANTIMONY	NS	<2
PTX06-1065	OG	20030722	ANTIMONY	NS	<2
PTX06-1066	OG	20030812	ANTIMONY	NS	<2
PTX06-1067	OG	20030721	ANTIMONY	NS	<2
PTX06-1074	OG	20030721	ANTIMONY	NS NS	<2
PTX-BEG2	OG	20030729	ANTIMONY	NS	<2
PTX01-1010	OG	20030715	ARSENIC	<111	<5
PTX01-1012	OG	20030722	ARSENIC	<111	<5
PTX06-1044	OG	20030806	ARSENIC	<111 <111	3.42 B

[1] B = result discarded because metal detected in blank.
[2] NS = not sampled

Well ID (depth, ft)	Aquifer	Sample Date	Metal	TCEQ Result (ug/L)	Pantex Result (ug/L)
PTX06-1059	OG	20030728	ARSENIC	<111	<5
PTX06-1061	OG	20030721	ARSENIC	<111	<5
PTX06-1062A	OG	20030716	ARSENIC	<111	<5
PTX06-1063A at 500ft	OG	20020520	ARSENIC	<111	5.49
PTX06-1063A at 590ft	OG	20020520	ARSENIC	<111	10.3
PTX06-1063A	OG	20030723	ARSENIC	<111	<5
PTX06-1064	OG	20030722	ARSENIC	<111	<5
PTX06-1065	OG	20030722	ARSENIC	<111	3.06
PTX06-1066	OG	20030812	ARSENIC	<111	2.35
PTX06-1067	OG	20030721	ARSENIC	<111	<5
PTX06-1074	OG	20030721	ARSENIC	<111 / <111	3.05 B
PTX-BEG2	OG	20030729	ARSENIC	<111	5.73
PTX01-1010	OG	20030715	BARIUM	197	196
PTX01-1012	OG	20030722	BARIUM	162	164
PTX06-1044	OG	20030806	BARIUM	127 / 128	126
PTX06-1059	OG	20030728	BARIUM	180	181
PTX06-1061	OG	20030721	BARIUM	150	152
PTX06-1062A	OG	20030716	BARIUM	138	143
PTX06-1063A at 500ft	OG	20020520	BARIUM	140	138
PTX06-1063A at 590ft	OG	20020520	BARIUM	192	189
PTX06-1063A	OG	20030723	BARIUM	178	184
PTX06-1064	OG	20030722	BARIUM	173	170
PTX06-1065	OG	20030722	BARIUM	143	144
PTX06-1066	OG	20030812	BARIUM	135	142
PTX06-1067	OG	20030721	BARIUM	155	165
PTX06-1074	OG	20030721	BARIUM	137 / 139	138
PTX-BEG2	OG	20030729	BARIUM	113	116
PTX01-1010	OG	20030715	BERYLLIUM	NS	<0.2
PTX01-1012	OG	20030722	BERYLLIUM	NS	<0.2
PTX06-1044	OG	20030806	BERYLLIUM	NS / NS	<0.2
PTX06-1059	OG	20030728	BERYLLIUM	NS	<0.2
PTX06-1061	OG	20030721	BERYLLIUM	NS	<0.2
PTX06-1062A	OG	20030716	BERYLLIUM	NS	<0.2
PTX06-1063A at 500ft	OG	20020520	BERYLLIUM	NS	0.041
PTX06-1063A at 590ft	OG	20020520	BERYLLIUM	NS	<0.2
PTX06-1063A	OG	20030723	BERYLLIUM	NS	<1
PTX06-1064	OG	20030722	BERYLLIUM	NS	<0.2
PTX06-1065	OG	20030722	BERYLLIUM	NS	<0.2
PTX06-1066	OG	20030812	BERYLLIUM	NS	<0.2

Well ID (depth, ft)	Aquifer	Sample Date	Metal	TCEQ Result (ug/L)	Pantex Result (ug/L)
PTX06-1067	OG	20030721	BERYLLIUM	NS	<0.2
PTX06-1074	OG	20030721	BERYLLIUM	NS NS	<0.2
PTX-BEG2	OG	20030729	BERYLLIUM	NS	<0.2
PTX01-1010	OG	20030715	BORON	NS	146
PTX01-1012	OG	20030722	BORON	NS	165
PTX06-1044	OG	20030806	BORON	NS	282
				NS	
PTX06-1059	OG	20030728	BORON	NS	157
PTX06-1061	OG	20030721	BORON	NS	128
PTX06-1063A at 500ft	OG	20020520	BORON	NS	138
PTX06-1063A at 590ft	OG	20020520	BORON	NS	144
PTX06-1063A	OG	20030723	BORON	NS	134
PTX06-1064	OG	20030722	BORON	NS	161
PTX06-1065	OG	20030722	BORON	NS	121
PTX06-1066	OG	20030812	BORON	NS	177
PTX06-1067	OG	20030721	BORON	NS	90.2
PTX06-1074	OG	20030721	BORON	NS NS	159
PTX-BEG2	OG	20030729	BORON	NS	195
PTX01-1010	OG	20030715	CADMIUM	<22.2	<1
PTX01-1012	OG	20030722	CADMIUM	<22.2	<1
PTX06-1044	OG	20030806	CADMIUM	<22.2 <22.2	0.041 B
PTX06-1059	OG	20030728	CADMIUM	<22.2	0.043 B
PTX06-1061	OG	20030721	CADMIUM	<22.2	<1
PTX06-1062A	OG	20030716	CADMIUM	<22.2	<1
PTX06-1063A at 500ft	OG	20020520	CADMIUM	<22	<1
PTX06-1063A at 590ft	OG	20020520	CADMIUM	<22	<1
PTX06-1063A	OG	20030723	CADMIUM	<22.2	<1
PTX06-1064	OG	20030722	CADMIUM	<22.2	<1
PTX06-1065	OG	20030722	CADMIUM	<22.2	<1
PTX06-1066	OG	20030812	CADMIUM	<22.2	<1
PTX06-1067	OG	20030721	CADMIUM	<22.2	<1
PTX06-1074	OG	20030721	CADMIUM	<22.2 <22.2	<1
PTX-BEG2	OG	20030729	CADMIUM	<22.2	<1
PTX01-1010	OG	20030715	CALCIUM	39600	NS
PTX01-1012	OG	20030722	CALCIUM	40900	NS
PTX06-1044	OG	20030806	CALCIUM	37500 37700	NS
PTX06-1059	OG	20030728	CALCIUM	35900	NS
PTX06-1061	OG	20030721	CALCIUM	24900	NS

Well ID (depth, ft)	Aquifer	Sample Date	Metal	TCEQ Result (ug/L)	Pantex Result (ug/L)
PTX06-1062A	OG	20030716	CALCIUM	24600	NS
PTX06-1063A at 500ft	OG	20020520	CALCIUM	44900	NS
PTX06-1063A at 590ft	OG	20020520	CALCIUM	43700	NS
PTX06-1063A	OG	20030723	CALCIUM	45200	NS
PTX06-1064	OG	20030722	CALCIUM	36600	NS
PTX06-1065	OG	20030722	CALCIUM	39600	NS
PTX06-1066	OG	20030812	CALCIUM	37500	NS
PTX06-1067	OG	20030721	CALCIUM	34900	NS
PTX06-1074	OG	20030721	CALCIUM	45600 46400	NS
PTX-BEG2	OG	20030729	CALCIUM	36400	NS
PTX01-1010	OG	20030715	CHROMIUM, HEXAVALENT	NS	<15
PTX01-1012	OG	20030722	CHROMIUM, HEXAVALENT	NS	<15
PTX06-1044	OG	20030806	CHROMIUM, HEXAVALENT	NS NS	<15
PTX06-1059	OG	20030728	CHROMIUM, HEXAVALENT	NS	<15
PTX06-1061	OG	20030721	CHROMIUM, HEXAVALENT	NS	R[3]
PTX06-1062A	OG	20030716	CHROMIUM, HEXAVALENT	NS	<15
PTX06-1063A at 500ft	OG	20020520	CHROMIUM, HEXAVALENT	NS	
PTX06-1063A at 590ft	OG	20020520	CHROMIUM, HEXAVALENT	NS	
PTX06-1063A	OG	20030723	CHROMIUM, HEXAVALENT	NS	R
PTX06-1064	OG	20030722	CHROMIUM, HEXAVALENT	NS	<15
PTX06-1065	OG	20030722	CHROMIUM, HEXAVALENT	NS	<15
PTX06-1066	OG	20030812	CHROMIUM, HEXAVALENT	NS	<15
PTX06-1067	OG	20030721	CHROMIUM, HEXAVALENT	NS	<15
PTX06-1074	OG	20030721	CHROMIUM, HEXAVALENT	NS NS	<15
PTX-BEG2	OG	20030729	CHROMIUM, HEXAVALENT	NS	<15
PTX01-1010	OG	20030715	CHROMIUM, TOTAL	<11.1	1.33 B
PTX01-1012	OG	20030722	CHROMIUM, TOTAL	<11.1	2.82 B
PTX06-1044	OG	20030806	CHROMIUM, TOTAL	34.2 59.1	70.6

[3] R = result rejected.

Well ID (depth, ft)	Aquifer	Sample Date	Metal	TCEQ Result (ug/L)	Pantex Result (ug/L)
PTX06-1059	OG	20030728	CHROMIUM, TOTAL	<11.1	1.78 B
PTX06-1061	OG	20030721	CHROMIUM, TOTAL	<11.1	3.63 B
PTX06-1062A	OG	20030716	CHROMIUM, TOTAL	<11.1	2.95 B
PTX06-1063A at 500ft	OG	20020520	CHROMIUM, TOTAL	<11	2.11
PTX06-1063A at 590ft	OG	20020520	CHROMIUM, TOTAL	<11	<5
PTX06-1063A	OG	20030723	CHROMIUM, TOTAL	<11.1	4.95 B
PTX06-1064	OG	20030722	CHROMIUM, TOTAL	<11.1	3.79 B
PTX06-1065	OG	20030722	CHROMIUM, TOTAL	<11.1	3.59 B
PTX06-1066	OG	20030812	CHROMIUM, TOTAL	<11.1	2.28 B
PTX06-1067	OG	20030721	CHROMIUM, TOTAL	<11.1	1.98 B
PTX06-1074	OG	20030721	CHROMIUM, TOTAL	<11.1 <11.1	4.42 B
PTX-BEG2	OG	20030729	CHROMIUM, TOTAL	<11.1	1.37 B
PTX01-1010	OG	20030715	COBALT	NS	<5
PTX01-1012	OG	20030722	COBALT	NS	0.61 B
PTX06-1044	OG	20030806	COBALT	NS NS	<5
PTX06-1059	OG	20030728	COBALT	NS	<5
PTX06-1061	OG	20030721	COBALT	NS	0.84 B
PTX06-1062A	OG	20030716	COBALT	NS	<5
PTX06-1063A at 500ft	OG	20020520	COBALT	NS	<5
PTX06-1063A at 590ft	OG	20020520	COBALT	NS	<5
PTX06-1063A	OG	20030723	COBALT	NS	<5
PTX06-1064	OG	20030722	COBALT	NS	<5
PTX06-1065	OG	20030722	COBALT	NS	0.909 B
PTX06-1066	OG	20030812	COBALT	NS	<5
PTX06-1067	OG	20030721	COBALT	NS	0.725 B
PTX06-1074	OG	20030721	COBALT	NS NS	31.3 B
PTX-BEG2	OG	20030729	COBALT	NS	<5
PTX01-1010	OG	20030715	COPPER	<22.2	<5
PTX01-1012	OG	20030722	COPPER	<22.2	<5
PTX06-1044	OG	20030806	COPPER	<22.2 <22.2	22
PTX06-1059	OG	20030728	COPPER	<22.2	1.74 B
PTX06-1061	OG	20030721	COPPER	<22.2	<5
PTX06-1062A	OG	20030716	COPPER	<22.2	<5
PTX06-1063A at 500ft	OG	20020520	COPPER	<22	<5
PTX06-1063A at 590ft	OG	20020520	COPPER	<22	<5
PTX06-1063A	OG	20030723	COPPER	<22.2	1.39 B
PTX06-1064	OG	20030722	COPPER	<22.2	<5
PTX06-1065	OG	20030722	COPPER	<22.2	<5

Well ID (depth, ft)	Aquifer	Sample Date	Metal	TCEQ Result (ug/L)	Pantex Result (ug/L)
PTX06-1066	OG	20030812	COPPER	<22.2	<5
PTX06-1067	OG	20030721	COPPER	<22.2	2.43 B
PTX06-1074	OG	20030721	COPPER	<22.2 <22.2	1.78 B
PTX-BEG2	OG	20030729	COPPER	<22.2	4.49 B
PTX01-1010	OG	20030715	IRON	<66.6	14.3 B
PTX01-1012	OG	20030722	IRON	<66.6	22 B
PTX06-1044	OG	20030806	IRON	182 314	414
PTX06-1059	OG	20030728	IRON	<66.6	37.3 B
PTX06-1061	OG	20030721	IRON	<66.6	15.9 B
PTX06-1062A	OG	20030716	IRON	<66.6	13.6 B
PTX06-1063A at 500ft	OG	20020520	IRON	197	151
PTX06-1063A at 590ft	OG	20020520	IRON	330	339
PTX06-1063A	OG	20030723	IRON	395	352
PTX06-1064	OG	20030722	IRON	<66.6	<100
PTX06-1065	OG	20030722	IRON	<66.6	23.1 B
PTX06-1066	OG	20030812	IRON	<66.6	29 B
PTX06-1067	OG	20030721	IRON	1480	1380
PTX06-1074	OG	20030721	IRON	<66.6 <66.6	61.7 B
PTX-BEG2	OG	20030729	IRON	<66.6	<100
PTX01-1010	OG	20030715	LEAD	<10	<2
PTX01-1012	OG	20030722	LEAD	<10	0.324 B
PTX06-1044	OG	20030806	LEAD	<10 <10	0.27 B
PTX06-1059	OG	20030728	LEAD	<10	0.094 B
PTX06-1061	OG	20030721	LEAD	<10	0.106 B
PTX06-1062A	OG	20030716	LEAD	<10	0.093 B
PTX06-1063A at 500ft	OG	20020520	LEAD	<10	0.36
PTX06-1063A at 590ft	OG	20020520	LEAD	<10	0.16 B
PTX06-1063A	OG	20030723	LEAD	<10	0.525 B
PTX06-1064	OG	20030722	LEAD	<10	0.156 B
PTX06-1065	OG	20030722	LEAD	<10	0.062 B
PTX06-1066	OG	20030812	LEAD	<10	0.199 B
PTX06-1067	OG	20030721	LEAD	<10	0.43 B
PTX06-1074	OG	20030721	LEAD	<10 <10	0.092 B
PTX-BEG2	OG	20030729	LEAD	<10	0.106 B
PTX01-1010	OG	20030715	MAGNESIUM	21700	20400
PTX01-1012	OG	20030722	MAGNESIUM	23800	22700
PTX06-1044	OG	20030806	MAGNESIUM	29300 29500	29900
PTX06-1059	OG	20030728	MAGNESIUM	27200	26400

Well ID (depth, ft)	Aquifer	Sample Date	Metal	TCEQ Result (ug/L)	Pantex Result (ug/L)
PTX06-1061	OG	20030721	MAGNESIUM	24000	22800
PTX06-1062A	OG	20030716	MAGNESIUM	22600	20500
PTX06-1063A at 500ft	OG	20020520	MAGNESIUM	20900	20400
PTX06-1063A at 590ft	OG	20020520	MAGNESIUM	23700	23000
PTX06-1063A	OG	20030723	MAGNESIUM	20700	17900
PTX06-1064	OG	20030722	MAGNESIUM	26100	25800
PTX06-1065	OG	20030722	MAGNESIUM	22400	21100
PTX06-1066	OG	20030812	MAGNESIUM	19600	19700
PTX06-1067	OG	20030721	MAGNESIUM	23300	21800
PTX06-1074	OG	20030721	MAGNESIUM	24800 25300	23200
PTX-BEG2	OG	20030729	MAGNESIUM	23400	20500
PTX01-1010	OG	20030715	MANGANESE	<11.1	<5
PTX01-1012	OG	20030722	MANGANESE	<11.1	2.38 B
PTX06-1044	OG	20030806	MANGANESE	<11.1 <11.1	8.63
PTX06-1059	OG	20030728	MANGANESE	<11.1	5.58
PTX06-1061	OG	20030721	MANGANESE	<11.1	<5
PTX06-1062A	OG	20030716	MANGANESE	<11.1	6.28
PTX06-1063A at 500ft	OG	20020520	MANGANESE	78	75.1
PTX06-1063A at 590ft	OG	20020520	MANGANESE	297	298
PTX06-1063A	OG	20030723	MANGANESE	19.9	13.1 B
PTX06-1064	OG	20030722	MANGANESE	<11.1	<5
PTX06-1065	OG	20030722	MANGANESE	<11.1	<5
PTX06-1066	OG	20030812	MANGANESE	<11.1	1.78 B
PTX06-1067	OG	20030721	MANGANESE	31.3	23.6
PTX06-1074	OG	20030721	MANGANESE	<11.1 <11.1	3.24 B
PTX-BEG2	OG	20030729	MANGANESE	<11.1	<5
PTX01-1010	OG	20030715	MERCURY	<0.1	
PTX01-1012	OG	20030722	MERCURY	<0.1	
PTX06-1044	OG	20030806	MERCURY	<0.1 <0.1	
PTX06-1059	OG	20030728	MERCURY	<0.1	
PTX06-1061	OG	20030721	MERCURY	<0.1	
PTX06-1062A	OG	20030716	MERCURY	<0.1	
PTX06-1063A	OG	20030723	MERCURY	<0.1	
PTX06-1064	OG	20030722	MERCURY	<0.1	
PTX06-1065	OG	20030722	MERCURY	<0.1	
PTX06-1066	OG	20030812	MERCURY	<0.1	
PTX06-1067	OG	20030721	MERCURY	<0.1	
PTX06-1074	OG	20030721	MERCURY	<0.1 <0.1	

Well ID (depth, ft)	Aquifer	Sample Date	Metal	TCEQ Result (ug/L)	Pantex Result (ug/L)
PTX-BEG2	OG	20030729	MERCURY	<0.1	
PTX01-1010	OG	20030715	MOLYBDENUM	NS	3.9 B
PTX01-1012	OG	20030722	MOLYBDENUM	NS	3.11 B
PTX06-1044	OG	20030806	MOLYBDENUM	NS NS	3.8 B
PTX06-1059	OG	20030728	MOLYBDENUM	NS	4.35 B
PTX06-1061	OG	20030721	MOLYBDENUM	NS	5.04 B
PTX06-1062A	OG	20030716	MOLYBDENUM	NS	7.78 B
PTX06-1063A at 500ft	OG	20020520	MOLYBDENUM	NS	5.3
PTX06-1063A at 590ft	OG	20020520	MOLYBDENUM	NS	11.5
PTX06-1063A	OG	20030723	MOLYBDENUM	NS	1.73 B
PTX06-1064	OG	20030722	MOLYBDENUM	NS	3.39 B
PTX06-1065	OG	20030722	MOLYBDENUM	NS	4.38 B
PTX06-1066	OG	20030812	MOLYBDENUM	NS	4.18 B
PTX06-1067	OG	20030721	MOLYBDENUM	NS	5.05 B
PTX06-1074	OG	20030721	MOLYBDENUM	NS NS	5.24 B
PTX-BEG2	OG	20030729	MOLYBDENUM	NS	5.17 B
PTX01-1010	OG	20030715	NICKEL	<55.5	1.1 B
PTX01-1012	OG	20030722	NICKEL	<55.5	1.34 B
PTX06-1044	OG	20030806	NICKEL	<55.5 <55.5	35.9
PTX06-1059	OG	20030728	NICKEL	<55.5	1.11 B
PTX06-1061	OG	20030721	NICKEL	<55.5	1.28 B
PTX06-1062A	OG	20030716	NICKEL	<55.5	1.43 B
PTX06-1063A at 500ft	OG	20020520	NICKEL	<56	1.72
PTX06-1063A at 590ft	OG	20020520	NICKEL	<56	1.63 B
PTX06-1063A	OG	20030723	NICKEL	<55.5	1.12 B
PTX06-1064	OG	20030722	NICKEL	<55.5	<5
PTX06-1065	OG	20030722	NICKEL	<55.5	<5
PTX06-1066	OG	20030812	NICKEL	<55.5	1.87 B
PTX06-1067	OG	20030721	NICKEL	<55.5	<5
PTX06-1074	OG	20030721	NICKEL	<55.5 <55.5	<5
PTX-BEG2	OG	20030729	NICKEL	<55.5	<5
PTX01-1010	OG	20030715	POTASSIUM	6410	NS
PTX01-1012	OG	20030722	POTASSIUM	6120	NS
PTX06-1044	OG	20030806	POTASSIUM	6810 6830	NS
PTX06-1059	OG	20030728	POTASSIUM	6770	NS
PTX06-1061	OG	20030721	POTASSIUM	6200	NS
PTX06-1062A	OG	20030716	POTASSIUM	6380	NS

Well ID (depth, ft)	Aquifer	Sample Date	Metal	TCEQ Result (ug/L)	Pantex Result (ug/L)
PTX06-1063A at 500ft	OG	20020520	POTASSIUM	5860	NS
PTX06-1063A at 590ft	OG	20020520	POTASSIUM	6960	NS
PTX06-1063A	OG	20030723	POTASSIUM	5570	NS
PTX06-1064	OG	20030722	POTASSIUM	55100	NS
PTX06-1065	OG	20030722	POTASSIUM	5710	NS
PTX06-1066	OG	20030812	POTASSIUM	5440	NS
PTX06-1067	OG	20030721	POTASSIUM	5830	NS
PTX06-1074	OG	20030721	POTASSIUM	6140 6180	NS
PTX-BEG2	OG	20030729	POTASSIUM	6520	NS
PTX01-1010	OG	20030715	SELENIUM	<222	<5
PTX01-1012	OG	20030722	SELENIUM	<222	3.66 B
PTX06-1044	OG	20030806	SELENIUM	<222 <222	3.03 B
PTX06-1059	OG	20030728	SELENIUM	<222	<5
PTX06-1061	OG	20030721	SELENIUM	<222	<5
PTX06-1062A	OG	20030716	SELENIUM	<222	4 B
PTX06-1063A at 500ft	OG	20020520	SELENIUM	<222	<5
PTX06-1063A at 590ft	OG	20020520	SELENIUM	<222	<5
PTX06-1063A	OG	20030723	SELENIUM	<222	<5
PTX06-1064	OG	20030722	SELENIUM	<222	4.69 B
PTX06-1065	OG	20030722	SELENIUM	<222	<5
PTX06-1066	OG	20030812	SELENIUM	<222	3.14 B
PTX06-1067	OG	20030721	SELENIUM	<222	<5
PTX06-1074	OG	20030721	SELENIUM	<222 <222	<5
PTX-BEG2	OG	20030729	SELENIUM	<222	3.15 B
PTX01-1010	OG	20030715	SILVER	<11.1	<5
PTX01-1012	OG	20030722	SILVER	<11.1	1 B
PTX06-1044	OG	20030806	SILVER	24	50.6 B
PTX06-1059	OG	20030728	SILVER	<11.1	<5
PTX06-1061	OG	20030721	SILVER	<11.1	0.872 B
PTX06-1062A	OG	20030716	SILVER	<11.1	1.15 B
PTX06-1063A at 500ft	OG	20020520	SILVER	<11	0.65
PTX06-1063A at 590ft	OG	20020520	SILVER	<11	<5
PTX06-1063A	OG	20030723	SILVER	<11.1	<5
PTX06-1064	OG	20030722	SILVER	<11.1	<5
PTX06-1065	OG	20030722	SILVER	<11.1	0.955 B
PTX06-1066	OG	20030812	SILVER	<11.1	<5
PTX06-1067	OG	20030721	SILVER	<11.1	<5
PTX06-1074	OG	20030721	SILVER	<11.1 <11.1	3.11 B

Well ID (depth, ft)	Aquifer	Sample Date	Metal	TCEQ Result (ug/L)	Pantex Result (ug/L)
PTX-BEG2	OG	20030729	SILVER	<11.1	<5
PTX01-1010	OG	20030715	SODIUM	17700	NS
PTX01-1012	OG	20030722	SODIUM	27500	NS
PTX06-1044	OG	20030806	SODIUM	19500 19700	NS
PTX06-1059	OG	20030728	SODIUM	14200	NS
PTX06-1061	OG	20030721	SODIUM	15900	NS
PTX06-1062A	OG	20030716	SODIUM	28200	NS
PTX06-1063A at 500ft	OG	20020520	SODIUM	22600	NS
PTX06-1063A at 590ft	OG	20020520	SODIUM	26200	NS
PTX06-1063A	OG	20030723	SODIUM	17000	NS
PTX06-1064	OG	20030722	SODIUM	22700	NS
PTX06-1065	OG	20030722	SODIUM	18000	NS
PTX06-1066	OG	20030812	SODIUM	26300	NS
PTX06-1067	OG	20030721	SODIUM	17000	NS
PTX06-1074	OG	20030721	SODIUM	24000 24500	NS
PTX-BEG2	OG	20030729	SODIUM	24600	NS
PTX01-1010	OG	20030715	THALLIUM	NS	<0.5
PTX01-1012	OG	20030722	THALLIUM	NS	<0.5
PTX06-1044	OG	20030806	THALLIUM	NS NS	0.323 B
PTX06-1059	OG	20030728	THALLIUM	NS	<0.5
PTX06-1061	OG	20030721	THALLIUM	NS	<0.5
PTX06-1062A	OG	20030716	THALLIUM	NS	0.104 B
PTX06-1063A at 500ft	OG	20020520	THALLIUM	NS	0.22
PTX06-1063A at 590ft	OG	20020520	THALLIUM	NS	0.07 B
PTX06-1063A	OG	20030723	THALLIUM	NS	<0.5
PTX06-1064	OG	20030722	THALLIUM	NS	<0.5
PTX06-1065	OG	20030722	THALLIUM	NS	<0.5
PTX06-1066	OG	20030812	THALLIUM	NS	<0.5
PTX06-1067	OG	20030721	THALLIUM	NS	<0.5
PTX06-1074	OG	20030721	THALLIUM	NS NS	<0.5
PTX-BEG2	OG	20030729	THALLIUM	NS	0.272 B
PTX01-1010	OG	20030715	TIN	NS	<10
PTX01-1012	OG	20030722	TIN	NS	<10
PTX06-1044	OG	20030806	TIN	NS NS	<10
PTX06-1059	OG	20030728	TIN	NS	<10
PTX06-1061	OG	20030721	TIN	NS	<10
PTX06-1062A	OG	20030716	TIN	NS	4.55 B
PTX06-1063A at 500ft	OG	20020520	TIN	NS	<10

Well ID (depth, ft)	Aquifer	Sample Date	Metal	TCEQ Result (ug/L)	Pantex Result (ug/L)
PTX06-1063A at 590ft	OG	20020520	TIN	NS	<10
PTX06-1063A	OG	20030723	TIN	NS	<10
PTX06-1064	OG	20030722	TIN	NS	<10
PTX06-1065	OG	20030722	TIN	NS	3.67 B
PTX06-1066	OG	20030812	TIN	NS	<10
PTX06-1067	OG	20030721	TIN	NS	<10
PTX06-1074	OG	20030721	TIN	NS NS	<10
PTX-BEG2	OG	20030729	TIN	NS	<10
PTX01-1010	OG	20030715	VANADIUM	NS	11
PTX01-1012	OG	20030722	VANADIUM	NS	14.2
PTX06-1044	OG	20030806	VANADIUM	NS NS	17.3
PTX06-1059	OG	20030728	VANADIUM	NS	15.1
PTX06-1061	OG	20030721	VANADIUM	NS	13.7
PTX06-1062A	OG	20030716	VANADIUM	NS	12.1
PTX06-1063A at 500ft	OG	20020520	VANADIUM	NS	12.1
PTX06-1063A at 590ft	OG	20020520	VANADIUM	NS	11.9
PTX06-1063A	OG	20030723	VANADIUM	NS	9.79
PTX06-1064	OG	20030722	VANADIUM	NS	12.4
PTX06-1065	OG	20030722	VANADIUM	NS	13.4
PTX06-1066	OG	20030812	VANADIUM	NS	13.6
PTX06-1067	OG	20030721	VANADIUM	NS	11.6
PTX06-1074	OG	20030721	VANADIUM	NS NS	16
PTX-BEG2	OG	20030729	VANADIUM	NS	19.8
PTX01-1010	OG	20030715	ZINC	<88.8	4.21 B
PTX01-1012	OG	20030722	ZINC	<88.8	24.2
PTX06-1044	OG	20030806	ZINC	<88.8 <88.8	70.9
PTX06-1059	OG	20030728	ZINC	<88.8	19.2
PTX06-1061	OG	20030721	ZINC	<88.8	16.8
PTX06-1062A	OG	20030716	ZINC	<88.8	1.86 B
PTX06-1063A at 500ft	OG	20020520	ZINC	<89	9.2
PTX06-1063A at 590ft	OG	20020520	ZINC	<89	6.7
PTX06-1063A	OG	20030723	ZINC	<88.8	10.4
PTX06-1064	OG	20030722	ZINC	<88.8	4.07 B
PTX06-1065	OG	20030722	ZINC	<88.8	4.58 B
PTX06-1066	OG	20030812	ZINC	<88.8	5.63
PTX06-1067	OG	20030721	ZINC	184	171
PTX06-1074	OG	20030721	ZINC	<88.8 <88.8	6.28 B
PTX-BEG2	OG	20030729	ZINC	<88.8	4.68 B

Appendix C
Apparent Detections

The data reviewed for section 3 of this report contained a total of 770 apparent detections of organic constituents or explosives[1]. Of these, 393 were discarded as false positive detections because they were either 1) detected in blanks, or 2) leached from equipment used to collect groundwater samples. These potential sources of false positive detections are discussed below. The remaining 377 detections are considered to be valid detections of contaminants in the Ogallala Aquifer.

Contaminants detected in blanks

Blanks are quality control samples designed to detect false positive analyses. There are two types of blanks: field blanks and laboratory blanks.

Field blanks (e.g., trip blanks, equipment blanks, ambient conditions blanks) are designed to detect false positives introduced during collection of the samples or the transport of samples to the laboratory. For example, volatile contaminants (e.g., fuel components such as benzene or toluene) my diffuse into sample containers from the atmosphere, or, contaminated sampling equipment may contaminate the samples.

Laboratory blanks are designed to detect false positives resulting from contaminated laboratory reagents or equipment.

Of the 770 total apparent detections, 276 were discarded because they were associated with field or laboratory blanks. It should be noted that detection of a contaminant in a blank does not necessarily mean the groundwater sample was not actually contaminated. It is possible for contaminated blanks to be associated with samples that are contaminated. However, the convention is to discard sample results that are associated with contaminated blanks unless the sample concentration is significantly higher than the blank concentration.

Contaminants leached from equipment

Nine of the monitor wells installed by Pantex incorporated either FLUTe or Solinst sampling systems (see appendix D). The materials used in the FLUTe systems have been shown to leach benzene and toluene[2]. The materials used in the Solinst systems have been shown to leach benzene[3]. One hundred three detections of benzene and toluene were discarded because the samples were collected from wells equipped with FLUTe or Solinst systems.

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[1] The data are from analytical results listed in quarterly reports posted on Pantex website (DOE 1998 - 2003) and in DOE analyses of samples from the Henderson and Osborne domestic wells. See references. In this report, cases where a contaminant was detected in duplicate samples were considered a single detection. Cases where duplicate sample results were contradictory, i.e. both detection and non-detection, were considered a detection.

[2] Gilmore et al., 2002, pages 2 and 5.

[3] Gilmore et al., 2002, pages 3 and 5.

The explosive 3-nitrotoluene was detected in six samples from domestic wells north of Pantex[4]. These detections were discarded because 3-nitrotoluene was shown to be associated with the tubing used to collect the samples[5]. Eight detections of 3-nitrotoluene prior to July 2001 in other wells (e.g., PTX01-1012) were also discarded. By July 2001, DOE was aware of this problem[6] and, presumably, corrected it.

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[4] Analyses of samples from the Henderson and Osborne domestic wells. See references.
[5] DOE, 2001c.
[6] DOE, 2001c.

Appendix D
Organics and Explosives Found in Pantex Ogallala Wells
June 1998 – December 2003

Well ID[1]	Date Sample Collected	Contaminant	Concentration (μg/L)	Remarks[2]
PTX01-1003[3]				
	5/13/99	TOX[4]	6 - 8	4 values
	5/13/99	TCE[5]	**8[6]**	
	8/19/99	TCE	3.79	
	10/4/99	TCE	4.4	
	2/8/00	TCE	**5.3**	
	3/2/00	TCE	4	
	3/13/00	methylene chloride	0.60 (J)[7]	
	3/13/00	TCE	3	2 values
	3/15/00	toluene	1	2 values
	3/15/00	TCE	1	2 values
	4/18/00	carbon tetrachloride	0.15 (J) – 0.17 (J)	2 values
	4/18/00	toluene	11.3 – 33.4	4 values
	4/18/00	TCE	1.2 (J) – 6.7	5 values
	4/18/00	1,1,1- trichloro - ethane	0.4 (J) – 0.85 (J)	2 values
	7/24/00	TCE	1 – 2.3	2 values
	11/30/00	1,1,1- trichloro - ethane	1.1	
	11/30/00	toluene	10	
	11/30/00	TCE	1.8	
	3/6/01	1,1,1- trichloro - ethane	1.8 – 2.5	2 values
	4/30/01	benzo(a)-anthracene	0.12 (J)	
	4/30/01	1,1,1- trichloro - ethane	0.68 (J)	
	4/30/01	TCE	1.4 (J)	
	7/31/01	1,1,1- trichloro - ethane	0.51 (J) – 0.6 (J)	2 values
	7/31/01	Freon-113[8]	1.9 (J)	
	7/31/01	TCE	1.9 (J) - 2	2 values

Well ID	Date Sample Collected	Contaminant	Concen-tration (μg/L)	Remarks
PTX01-1005				FLUTe sampling system installed in well
	6/27/01	acetone	11.7	sample depth = 490'
	5/15/01	TNT[9]	0.2 (J)	sample depth = 685'
	6/27/01	bis(2-ethylhexyl) phthalate	0.79 (J)	sample depth = 685'
	6/27/01	acetone	10	sample depth = 685'
	4/9/01	acetone	6.2 (J)	sample depth = 806'
	6/27/01	methyl ethyl ketone[10]	3.4 (J)	sample depth = 806'
	8/21/01	acetone	3.2 (J)	sample depth = 806'
	11/7/01	2-amino-4,6-dinitrotoluene	0.22 (J)	sample depth = 806'
	3/4/02	1,3-dinitrobenzene	0.036 (PJ)[11]	sample depth = 806'
	3/4/02	2,6-dinitrotoluene	0.04 (PJ)	sample depth = 806'
	3/4/02	4-amino-2,6-dinitrotoluene	0.88 (PJ)	sample depth = 806'
	3/4/02	nitrobenzene	0.89 (PJ)	sample depth = 806'
	3/4/02	aniline	3.6 (J)	sample depth = 806'
	4/23/02	total phenols	0.91 (J)	sample depth = 490'
	4/22/02	bis(2-ethylhexyl) phthalate	2.8 (J)	sample depth = 806'
	4/23/02	bis(2-ethylhexyl) phthalate	3.6 (J)	sample depth = 490'
PTX01-1010				
	4/26/00	toluene	2 - 4	2 values
	5/9/00	acetone'	2 (J) – 3 (J)	2 values
	5/9/00	toluene	2 - 6	2 values
	11/11/01	toluene	6.5	
	2/21/02	bis(2-ethylhexyl) phthalate	2.3 (J)	
	6/10/02	2-nitrotoluene	0.12	
	6/10/02	RDX[12]	0.13 (J)	
	6/10/02	bis(2-ethylhexyl) phthalate	2.4 (J)	
	6/10/02	toluene	0.4 (J)	

Well ID	Date Sample Collected	Contaminant	Concen-tration (μg/L)	Remarks
PTX01-1011				
	6/1/00	acetone	120	
	6/1/00	toluene	5	
	8/1/02	di-n-octyl-phthalate	7.5 (J)	
PTX01-1012				Solinst sampling system installed in well, 12/00[13]
	6/1/00	acetone	48.6 - 99	6 values
	6/1/00	toluene	9.3 - 46	6 values
	6/1/00	1,2,4-trimethyl-benzene	0.35	
	6/1/00	methylene chloride	**7.3 – 7.9**[14]	3 values
	9/5/00	acetone	2.4 (J) - 84 (J)	5 values
	9/5/00	1,2,4-trimethyl-benzene	0.26 (J) – 0.29 (J)	2 values
	9/5/00	methyl isobutyl ketone[15]	2.8 (J) – 3.2 (J)	2 values
	9/5/00	methyl ethyl ketone	2.4 (J)	
	9/5/00	toluene	123 (J) – 150 (D)[16]	3 values
	9/5/00	ethylbenzene	0.14 (J)	
	4/10/01	acetone	1 (J) – 1.4 (J)	2 values, sample depth = 502'
	4/10/01	total xylenes	0.72 (J) – 0.8 (J)	2 values, sample depth = 502'
	4/10/01	acetone	1.6 (J)	sample depth = 638'
	4/10/01	total xylenes	0.71 (J)	sample depth = 638'
	4/10/01	acetone	9.3 (J)	sample depth = 719'
	4/10/01	toluene	0.41 (J)	sample depth = 719'
	4/10/01	total xylenes	0.86 (J)	sample depth = 719'
	4/10/01	acetone	10.5 (J)	sample depth = 818'
	4/10/01	methylene chloride	0.66 (J)	sample depth = 818'
	4/10/01	total xylenes	1.1 (J)	sample depth = 818'

Well ID	Date Sample Collected	Contaminant	Concen-tration (µg/L)	Remarks
PTX01-1012 (continued)	4/10/01	acetone	15.2 (J)	sample depth = 885'
	4/10/01	methylene chloride	0.64 (J)	sample depth = 885'
	4/10/01	total xylenes	0.79 (J)	sample depth = 885'
	4/24/01	total phenols	1.9 (J)	sample depth = 818'
	5/24/01	ortho-xylene	1	sample depth = 502'
	5/24/01	chloromethane	0.1 (J)	sample depth = 638'
	5/24/01	ortho-xylene	1	sample depth = 638'
	5/24/01	tert-butyl methyl ether	0.2 (J)	sample depth = 638'
	5/24/01	chloromethane	0.2 (J)	sample depth = 719'
	5/24/01	ortho-xylene	0.9 (J) - 1	2 values, sample depth = 719'
	5/24/01	tert-butyl methyl ether	0.1 (J)	sample depth = 719'
	5/24/01	chloromethane	0.1 (J)	sample depth = 818'
	5/24/01	ortho-xylene	1	sample depth = 818'
	5/24/01	tert-butyl methyl ether	0.2 (J)	sample depth = 818'
	6/14/01	total xylenes	0.68 (J) – 0.69 (J)	2 values, sample depth = 502'
	6/14/01	total xylenes	0.67 (J) – 0.71 (J)	2 values, sample depth = 638'
	6/14/01	total xylenes	0.54 (J) – 0.62 (J)	3 values, sample depth = 719'
	6/14/01	total xylenes	0.89 (J) – 0.92 (J)	2 values, sample depth = 818'
	5/24/01	methyl ethyl ketone	2 (J)	sample depth = 885'
	6/14/01	total xylenes	0.52 (J)	sample depth = 885'
	7/11/01	1,2-DCA[17]	0.9 (J)	sample depth = 502'
	7/11/01	ortho-xylene	0.7 (J)	sample depth = 502'
	7/11/01	chloromethane	0.2 (J)	sample depth = 638'
	7/11/01	tetrahydrofuran	0.7 (J)	sample depth = 638'
	7/11/01	toluene	0.1 (J)	sample depth = 638'

Well ID	Date Sample Collected	Contaminant	Concen-tration (µg/L)	Remarks
PTX01-1012 (continued)	7/11/01	ortho-xylene	0.8 (J)	sample depth = 638'
	7/11/01	1,2-DCA	0.8 (J)	sample depth = 719'
	7/11/01	chloromethane	0.1 (J)	sample depth = 719'
	7/11/01	dibromochloro-methane	0.1 (J)	sample depth = 719'
	7/11/01	toluene	0.1 (J)	sample depth = 719'
	7/11/01	ortho-xylene	0.8 (J)	sample depth = 719'
	7/11/01	tetrahydrofuran	0.7 (J)	sample depth = 818'
	7/11/01	toluene	0.1 (J)	sample depth = 818'
	7/11/01	ortho-xylene	1	sample depth = 818'
	7/11/01	1,2-DCA	0.1 (J)	sample depth = 818'
	7/11/01	chloromethane	0.2 (J)	sample depth = 818'
	7/11/01	chloromethane	0.1 (J)	sample depth = 885'
	7/11/01	methyl ethyl ketone	1 (J)	sample depth = 885'
	7/11/01	tetrahydrofuran	0.6 (J)	sample depth = 885'
	7/11/01	toluene	0.1 (J)	sample depth = 885'
	7/11/01	ortho-xylene	0.8 (J)	sample depth = 885'
	9/25/01	ortho-xylene	0.26 (J) – 0.37 (J)	3 values, sample depth = 719'
	10/10/01	chloroform	0.17 (J)	sample depth = 719'
	10/10/01	dibromochloro-methane	0.14 (J)	sample depth = 719'
	10/10/01	ortho-xylene	0.21 (J) – 0.86 (J)	6 values, sample depth = 719'
PTX01-1013				
	6/1/00	acetone	85.8 - 180	6 values
	6/1/00	toluene	4.8 (J) – 6	6 values
	6/1/00	1,2,4-trimethyl-benzene	0.32 (J) – 0.82 (J)	3 values
	6/1/00	methylene chloride	4.5 (J) – **7.9**	3 values
	6/1/00	1,3,5-trimethyl-benzene	0.3 (J)	
	6/1/00	total xylenes	0.31 (J)	
	9/13/00	acetone	4.2 (J) – 10.1	6 values

Well ID	Date Sample Collected	Contaminant	Concen-tration (µg/L)	Remarks
PTX01-1013 (continued)	9/13/00	methyl ethyl ketone	9.2 - 15	3 values
	9/13/00	methyl isobutyl ketone	3.3 (J) – 4.2	3 values
	9/13/00	toluene	27 – 71.4	6 values
	9/13/00	1,4-dichloro-benzene	0.17 (J)	
	9/13/00	ethylbenzene	0.077 (J)	
	7/10/01	toluene	0.2 (J)	sample depth = 491'
	7/10/01	toluene	0.2 (J)	sample depth = 541'
	8/26/02	toluene	0.5 (J)	
PTX06-1016				
	8/17/98	TOX	14 – 15.7	3 values
	10/14/98	TOX	15.3 – 19.5	4 values
	2/24/99	TOX	7.02 (J)	
	5/19/99	2-nitrotoluene	0.24	
	5/19/99	dibromofluoro-methane	44	
PTX06-1033				
	10/14/98	1,1-dichloro-propene	1 (J)	
	10/14/98	1,2,3-trichloro-benzene	3 (J)	
	10/14/98	1,2,4-trichloro-benzene	1.8 (J)	
	10/14/98	1,2,4-trimethyl-benzene	2.2 (J)	
	10/14/98	1,3,5-trimethyl-benzene	1.8 (J)	
	10/14/98	1,2-dichloro-benzene	2.4 (J)	
	10/14/98	1,3-dichloro-benzene	2.9 (J)	
	10/14/98	1,4-dichloro-benzene	3.1 (J)	

1Well ID	Date Sample Collected	Contaminant	Concen-tration (μg/L)	Remarks
PTX06-1033 (continued)	10/14/98	1,2-dichloroethene	1.9 (J)	
	10/14/98	2-chlorotoluene	2 (J)	
	10/14/98	4-chlorotoluene	2.5 (J)	
	10/14/98	bromobenzene	1.8 (J)	
	10/14/98	chlorobenzene	1.7 (J)	
	10/14/98	ethylbenzene	1.5 (J)	
	10/14/98	isopropylbenzene	1.3 (J)	
	10/14/98	naphthalene	1.7 (J)	
	10/14/98	styrene	1.6 (J)	
	10/14/98	total xylenes	4.9 (J)	
	10/14/98	n-butylbenzene	1.8 (J)	
	10/14/98	4-isopropyl-toluene[18]	1.6 (J)	
	10/14/98	sec-butylbenzene	1.2 (J)	
	10/14/98	tert-butylbenzene	0.94 (J)	
	5/11/99	RDX	0.35 (J)	
	5/11/99	dibromofluoro-methane	45.4	
	5/3/01	bis(2-ethylhexyl) phthalate	0.22 (J)	
PTX06-1043				
	1/25/00	carbon disulfide	1.3 (J)	
	1/25/00	perchlorate	**2.01**[19] (J)	
	5/4/00	bis(2-ethylhexyl) phthalate	2.2	
	8/3/00	di-n-butyl phthalate	2.9 (J)	
	8/3/00	diethyl phthalate	2.5 (J)	
	9/13/00	perchlorate	**6.75**	
	11/13/00	bis(2-ethylhexyl) phthalate	0.92 (J)	
	3/19/01	dichlorodifluoro-methane	0.43 (J)	
	1/30/03	2,4-dinitrotoluene	0.038 (ZJ, NJ)[20]	

Well ID	Date Sample Collected	Contaminant	Concen-tration (µg/L)	Remarks
PTX06-1044				
	5/4/00	methylene chloride	2.4 (J)	
	9/13/00	perchlorate	**5.3** (J)	
	8/1/02	2-nitrotoluene	2.7 (PX, XJ)[21]	
PTX06-1056				
	7/10/00	acetone	29 (J)	
	5/14/03	4-nitrotoluene	0.22 (X,J)[22]	
PTX06-1057A				
	7/11/01	methyl methacrylate	0.2 (J)	
	7/11/01	toluene	10 - 14	2 values
PTX06-1059				Solinst sampling system installed in well, 4/01[23]
	5/14/01	1,2,4-trichloro-benzene	0.38 (J)	sample depth = 514'
	5/14/01	total xylenes	0.67 (J)	sample depth = 514'
	6/20/01	bis(2-ethylhexyl) phthalate	4 (J)	sample depth = 514'
	6/20/01	acetone	0.94 (J) – 1 (J)	2 values, sample depth = 514'
	6/20/01	total xylenes	0.67 (J) – 0.68 (J)	2 values, sample depth = 514'
	8/22/01	acetone	10.3	
	8/22/01	ortho xylene	0.64 (J)	
PTX06-1060				
	10/18/01	toluene	0.33 (J)	
	1/23/02	2-nitrotoluene	0.065 (J)	
	1/23/02	acetone	2.2 (J)	

Well ID	Date Sample Collected	Contaminant	Concen-tration (μg/L)	Remarks
PTX06-1061				Solinst sampling system installed in well
	5/29/01	acetone	1.4 (J)	sample depth = 615'
	5/29/01	total xylenes	0.52 (J)	sample depth = 615'
	5/29/01	total phenol	1.2 (J)	sample depth = 808'
	5/29/01	acetone	53	sample depth = 808'
	5/29/01	total xylenes	0.68 (J)	sample depth = 808'
	7/26/01	ortho xylene	0.53 (J)	sample depth = 615'
	7/26/01	acetone	19 (J)	sample depth = 808'
	7/26/01	methyl ethyl ketone	5 (J)	sample depth = 808'
	7/26/01	ortho xylene	0.89 (J)	sample depth = 808'
	9/26/01	ortho xylene	0.28 (J)	sample depth = 615'
	9/26/01	acetone	1 (J)	sample depth = 808'
	9/26/01	ortho xylene	0.4 (J)	sample depth = 808'
	4/28/03	bis(2-ethylhexyl) phthalate	1.4 (J)	
PTX06-1062A				
	7/10/01	chloroform	0.2 (J)	
	7/10/01	toluene	1	
	7/10/01	chloroform	0.1 (J)	
	7/10/01	toluene	3	
	8/2/02	bis(2-ethylhexyl) phthalate	1.7 (J)	
PTX06-1063A				FLUTe sampling system installed July 2001[24]
	7/12/01	acetone (J)	26 (J)	sample depth = 500'
	7/12/01	chlorobenzene	0.2 (J)	sample depth = 500'
	7/12/01	methyl ethyl ketone	3 (J)	sample depth = 500'
	7/12/01	n-butanol	38 (J)	sample depth = 500'
	7/12/01	tert-butyl methyl ether	0.5 (J)	sample depth = 500'
	7/12/01	acetone	23 (J)	sample depth = 590'

Well ID	Date Sample Collected	Contaminant	Concen-tration (μg/L)	Remarks
PTX06-1063A (continued)	7/12/01	chlorobenzene	0.2 (J)	sample depth = 590'
	7/12/01	methyl ethyl ketone	3 (J)	sample depth = 590'
	7/12/01	n-butanol	45 (J)	sample depth = 590'
	7/12/01	tert-butyl methyl ether	0.2 (J)	sample depth = 590'
	7/12/01	acetone	15 (J)	sample depth = 660'
	7/12/01	chlorobenzene	0.2 (J)	sample depth = 660'
	7/12/01	n-butanol	41 (J)	sample depth = 660'
	7/12/01	acetone	21 (J)	sample depth = 770'
	7/12/01	chlorobenzene	0.1 (J)	sample depth = 770'
	7/12/01	methyl ethyl ketone	3 (J)	sample depth = 770'
	7/12/01	n-butanol	36 (J)	sample depth = 770'
	8/13/01	acetone	13.8	sample depth = 500'
	8/13/01	acetone	24.7	sample depth = 590'
	8/13/01	methyl ethyl ketone	2.8 (J)	sample depth = 590'
	8/14/01	chlorobenzene	0.62 (J)	sample depth = 660'
	8/14/01	methyl ethyl ketone	4.4 (J)	sample depth = 660'
	8/14/01	methyl ethyl ketone	1.5 (J)	sample depth = 770'
PTX06-1064				FLUTe sampling system installed July 2001[25]
	7/12/01	acetone	27 (J)	sample depth = 505'
	7/12/01	methyl ethyl ketone	2 (J)	sample depth = 505'
	7/12/01	TCE	0.1 (J)	sample depth = 505'
	7/12/01	n-butanol	38 (J)	sample depth = 505'
	7/12/01	tert-butyl methyl ether	0.2 (J)	sample depth = 505'
	7/12/01	2-hexanone	0.5 (J)	sample depth = 660'

Well ID	Date Sample Collected	Contaminant	Concentration (µg/L)	Remarks
PTX06-1064 (continued)	7/12/01	acetone	27 (J)	sample depth = 660'
	7/12/01	methyl ethyl ketone	3 (J)	sample depth = 660'
	7/12/01	n-butanol	60 (J)	sample depth = 660'
	7/12/01	tert-butyl methyl ether	0.2 (J)	sample depth = 660'
	7/12/01	acetone	13 (J)	sample depth = 740'
	7/12/01	n-butanol	23 (J)	sample depth = 740'
	8/9/01	methyl ethyl ketone	1.4 (J)	sample depth = 505'
	8/9/01	methyl ethyl ketone	0.98 (J)	sample depth = 740'
PTX06-1065				FLUTe sampling system installed July 2001[26]
	7/23/01	acetone	98 (J)	sample depth = 505'
	7/23/01	methyl ethyl ketone	6 (J)	sample depth = 505'
	7/23/01	n-butanol	16 (J)	sample depth = 505'
	7/23/01	tert-butyl methyl ether	0.2 (J)	sample depth = 505'
	7/23/01	2-hexanone	0.4 (J)	sample depth = 610'
	7/23/01	acetone	31 (J)	sample depth = 610'
	7/23/01	isopropanol	26 (J)	sample depth = 610'
	7/23/01	methyl ethyl ketone	5 (J)	sample depth = 610'
	7/23/01	n-butanol	70 (J)	sample depth = 610'
	7/23/01	acetone	38 (J) – 41 (J)	2 values, sample depth = 755'
	7/23/01	isopropanol	63 (J)	sample depth = 755'
	7/23/01	methyl ethyl ketone	6 (J)	sample depth = 755'
	7/23/01	methyl isobutyl ketone	0.9 (J)	sample depth = 755'
	7/23/01	n-butanol	58 (J)	sample depth = 755'
	7/23/01	isopropanol	19 (J)	sample depth = 755'
	7/23/01	n-butanol	21 (J)	sample depth = 755'

Well ID	Date Sample Collected	Contaminant	Concen -tration (μg/L)	Remarks
PTX06-1065 (continued)	8/15/01	acetone	34.3	sample depth = 505'
	8/15/01	acetone	31.2	sample depth = 610'
	8/15/01	methyl ethyl ketone	3.4 (J)	sample depth = 610'
	8/15/01	methylene chloride	1.6 (J)	sample depth = 610'
	8/15/01	acetone	20	sample depth = 755'
	8/15/01	methyl ethyl ketone	2.2 (J)	sample depth = 755'
PTX06-1066				FLUTe sampling system installed July 2001[27]. FLUTe removed 10/22/01.
	7/23/01	acetone	30 (J)	sample depth = 500'
	7/23/01	methyl ethyl ketone	3 (J)	sample depth = 500'
	7/23/01	methyl methacrylate	0.2 (J)	sample depth = 500'
	7/23/01	n-butanol	31 (J)	sample depth = 500'
	7/23/01	acetone	32 (J)	sample depth = 620'
	7/23/01	methyl ethyl ketone	5 (J)	sample depth = 620'
	7/23/01	methyl methacrylate	0.5 (J)	sample depth = 620'
	7/23/01	n-butanol	73 (J)	sample depth = 620'
	7/23/01	acetone	26 (J)	sample depth = 750'
	7/23/01	methyl ethyl ketone	4 (J)	sample depth = 750'
	7/23/01	n-butanol	72 (J)	sample depth = 750'
	7/23/01	acetone	18 (J) – 38 (J)	2 values, sample depth = 830'
	7/23/01	isopropanol	15 (J)	sample depth = 830'
	7/23/01	methyl ethyl ketone	1 (J) – 4 (J)	2 values, sample depth = 830'
	7/23/01	n-butanol	66 (J)	sample depth = 830'
	8/20/01	methyl ethyl ketone	1.6 (J)	sample depth = 500'

Well ID	Date Sample Collected	Contaminant	Concen -tration (μg/L)	Remarks
PTX06-1066 (continued)	8/20/01	methyl ethyl ketone	2 (J)	sample depth = 620'
	8/21/01	acetone	12.6	sample depth = 750'
	8/21/01	methyl ethyl ketone	2.8 (J)	sample depth = 750'
	8/21/01	acetone	16.2	sample depth = 830'
	8/21/01	methyl ethyl ketone	2.7 (J)	sample depth = 830'
	9/24/01	acetone	39.9	sample depth = 750'
	9/24/01	methyl ethyl ketone	6.5	sample depth = 750'
	10/9/01	acetone	1.34 (J) – 19.9 (J)	2 values, sample depth = 750'
	10/9/01	methyl ethyl ketone	4.51 (J)	sample depth = 750'
	11/1/01	cis-1,2-dichloroethene	0.26 (J)	sample depth = 5'
	11/1/01	toluene	0.44 (J) – 8.6	6 values, sample depth = 5'
	11/1/01	toluene	0.44 (J)	sample depth = 130'
	8/26/02	toluene	0.52 (J)	
PTX06-1067				FLUTe sampling system installed July 2001[28]
	7/12/01	chlorobenzene	0.1 (J)	sample depth = 500'
	7/12/01	2-hexanone	0.5 (J)	sample depth = 590'
	7/12/01	acetone	17 (J)	sample depth = 590'
	7/12/01	methyl ethyl ketone	3 (J)	sample depth = 590'
	7/12/01	n-butanol	85 (J)	sample depth = 590'
	7/12/01	acetone	11 (J)	sample depth = 720'
	7/12/01	isopropanol	22 (J)	sample depth = 720'
	7/12/01	2-hexanone	0.3 (J)	sample depth = 820'
	7/12/01	acetone	15 (J)	sample depth = 820'
	7/12/01	n-butanol	37 (J)	sample depth = 820'

Well ID	Date Sample Collected	Contaminant	Concen-tration (µg/L)	Remarks
PTX06-1067 (continued)	8/8/01	methyl ethyl ketone	1.4 (J)	sample depth = 500'
	8/8/01	methyl ethyl ketone	1.4 (J)	sample depth = 590'
	8/8/01	methyl ethyl ketone	2.9 (J)	sample depth = 820'
	7/21/03	diethyl phthalate	22.6	FLUTe removed?
PTX06-1068				
	7/11/01	toluene	11	sample depth = 507'
	7/11/01	toluene	11	sample depth = 577'
PTX06-1072				
	9/25/01	RDX	0.22 (J)	
	9/25/01	toluene	0.27 (J)	
	6/10/02	methylene chloride	**5.6** (J)	
PTX06-1074				
	8/5/02	acetone	5.1 (J)	
	11/14/02	bis(2-ethylhexyl) phthalate	3.3 (J)	
PTX06-1075				
	6/17/02	HMX[29]	0.1 (PJ, NJ)	
	6/17/02	bis(2-ethylhexyl) phthalate	5.6 (J)	
	2/5/03	bis(2-ethylhexyl) phthalate	1.7 (J)	
PTX07-1R01				
	5/8/00	acetone	7 (J) – 8 (J)	2 values
	9/19/00	1,4-dichloro benzene	0.21 (J)	
	5/29/01	2-methyl naphthalene	0.3 (J)	

Well ID	Date Sample Collected	Contaminant	Concen -tration (µg/L)	Remarks
PTX07-1R01 (continued)	5/29/01	acenapthylene	0.25 (J) – 0.32 (J)	2 values
	5/29/01	anthracene	0.3 (J)	
	5/29/01	benzo(a)pyrene	**1.4**[30] (J)	
	5/29/01	benzo(b) fluoranthene	0.24 (J)	
	5/29/01	benzo(k) fluoranthene	0.25 (J)	
	5/29/01	fluoranthene	0.31 (J)	
	5/29/01	fluorene	0.32 (J)	
	5/29/01	pentachlorophenol	**3.3**[31] (J)	
	5/29/01	phenanthrene	0.34 (J)	
	5/29/01	pyrene	0.3 (J)	
	5/7/02	toluene	0.92 (J)	
PTX08-1011A				
	10/27/98	TOX	5.34 (J)	
	6/2/99	RDX	0.3 (J)	
	6/2/99	TOX	5.1 (J)	
FPOP-MW-02				
	6/26/01	bis(2-ethylhexyl) phthalate	**30.8**[32]	
	6/26/01	carbon tetrachloride	0.31 (J) – 0.33 (J)	2 values
FPOP-MW-03				
	7/26/01	bis(2-ethylhexyl) phthalate	**118**	
FPOP-MW-04				
	6/27/01	bis(2-ethylhexyl) phthalate	0.92 (J) – 1.2 (J)	2 values

Well ID	Date Sample Collected	Contaminant	Concen-tration (μg/L)	Remarks
FPOP-MW-05				
	6/27/01	bis(2-ethylhexyl) phthalate	1.7 (J)	
	6/27/01	carbon disulfide	0.34 (J)	
FPOP-MW-07				
	6/28/01	4-amino-2,6-dinitrotoluene	0.3 (J)	
	6/28/01	bis(2-ethylhexyl) phthalate	**11.4** (J)	
FPOP-MW-08				
	6/28/01	bis(2-ethylhexyl) phthalate	2.5 (J)	
OW-WR-39				
	10/7/98	1,2,3-trichloro benzene	0.57 (J)	
	10/7/98	1,2-dibromo-3-chloropropane	**3.1**[33]	
	10/7/98	naphthalene	3.5	
OW-WR-40				
	10/7/98	TOX	4.84 (J)	
	10/7/98	1,2,3-trichloro benzene	1.2	
	10/7/98	1,2,4-trichloro-benzene	0.85 (J)	
	10/7/98	1,2-dibromo-3-chloropropane	**3.2**	
	10/7/98	hexachloro butadiene	0.66 (J)	
	10/7/98	methyl isobutyl ketone	4.6 (J)	
	10/7/98	naphthalene	3.9	
OW-WR-46				
	7/25/00	carbon tetrachloride	0.33 (J)	
	7/30/02	2-nitrotoluene	2.9 (PX, XJ)	

Well ID	Date Sample Collected	Contaminant	Concen -tration (µg/L)	Remarks
OW-WR-47				
	4/17/00	toluene	0.45 (J) – 1.6	2 values
	10/15/01	toluene	0.23 (J)	
OW-WR-48				
	10/1/98	TOX	6.58 (J) – 9.28 (J)	2 values
	5/12/99	TOX	8 - 12	4 values
	10/15/01	toluene	0.41 (J)	
	1/24/02	2-nitrotoluene	0.31 (XJ)	
15-16				Pantex supply well
	2/19/01	bis(2-ethylhexyl) phthalate	0.84 (J)	
15-20				Pantex supply well
	5/8/03	RDX	0.35	
15-26				Pantex supply well
	2/19/01	di-n-butyl phthalate	6.8 (J)	
	2/19/01	bis(2-ethylhexyl) phthalate	1.3	
Henderson Domestic				
	4/17/00	chlorform	0.3 (J)	
	10/30/00	chloroform	0.36 (J)	
	11/30/00	chloroform	0.43 (J)	
	12/14/00	chloroform	0.37 (J)	
	1/9/01	chloroform	0.37 (J)	
	5/3/01	chloroform	0.36 (J)	
	6/4/01	methylene chloride	0.65 (J)	

Well ID	Date Sample Collected	Contaminant	Concen -tration (μg/L)	Remarks
Henderson Domestic (continued)	6/4/01	chloroform	0.31 (J)	
	7/9/01	chloroform	0.18 (J) - 0.22 (J)	2 values
	8/6/01	chloroform	0.21 (J)	
	9/4/01	chloroform	0.19 (J)	
	9/4/01	chloromethane	0.29 (J)	
	11/5/01	chloroform	0.25 (J)	
	11/5/01	toluene	0.25 (J) - 0.29 (J)	2 values
	12/3/01	chloroform	0.36 (J)	
	1/14/02	chloroform	0.22 (J)	
	4/1/02	chloroform	0.22 (J) - 0.35 (J)	2 values
Osborne Domestic				
	6/27/00	bromomethane	1.2 (J)	

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[1] Analytical results from quarterly reports posted on Pantex website (DOE 1998 - 2003) and DOE analyses of samples from the Henderson and Osborne domestic wells. See references. The detections listed in this table are valid. They are not associated with detections in blanks or equipment that may be the source of the contaminant. See appendix A.

[2] Information on well sampling systems from SCFA, 2001, page 22; and BWXT 2002b.

[3] Well plugged in 2001 (DOE, 2003a, page 2).

[4] TOX = total organic halides.

[5] TCE = trichloroethylene.

[6] Bold values exceed a health based standard (e.g., MCL). TCE MCL = 5 μg/L (EPA 1998a).

[7] Values qualified with 'J' are estimated values. These are analytical results that are greater than the detection limit but less than the reporting limit.

[8] Freon-113 = 1,1,2-trichloro-1,2,2-trifluoroethane.

[9] TNT = 2,4,6-trinitrotoluene.

[10] methyl ethyl ketone = 2-butanone.

[11] Qualifier 'PJ' not defined in data reports.

[12] RDX = hexahydro-1,3,5-trinitro-1,3,5-triazine.

[13] BWXT, 2003a, page 2-1. All multi-port sampling systems (FLUTe and Solinst) were removed from all Ogallala wells by March 2003 (BWXT, 2003a, page 2-16).

[14] MCL for methylene chloride = 5.0 μg/L (EPA 1998a).

[15] methyl isobutyl ketone = 4-methyl-2-pentanone.

[16] Qualifier 'D' means the sample was diluted for analysis.
[17] 1,2-DCA = 1,2-dichloroethane.
[18] 4-isopropyltoluene = p-cymene.
[19] EPA is considering a health based standard for perchlorate of approximately 1 µg/L (EPA 2003a).
[20] Qualifier 'ZJ' not defined in data reports. Qualifier 'NJ' defined as either: presumptive evidence of presence of analyte, or, analyte is a 'tentatively identified compound'.
[21] Qualifiers 'PX' and 'XJ' not defined in data reports.
[22] Qualifier 'X' indicates that another qualifier is reported in the narrative.
[23] BWXT, 2003a, page 2-1. All multi-port sampling systems (FLUTe and Solinst) were removed from all Ogallala wells by March 2003 (BWXT, 2003a, page 2-16).
[24] BWXT, 2003a, page 2-1. All multi-port sampling systems (FLUTe and Solinst) were removed from all Ogallala wells by March 2003 (BWXT, 2003a, page 2-16).
[25] BWXT, 2003a, page 2-1. All multi-port sampling systems (FLUTe and Solinst) were removed from all Ogallala wells by March 2003 (BWXT, 2003a, page 2-16).
[26] BWXT, 2003a, page 2-1. All multi-port sampling systems (FLUTe and Solinst) were removed from all Ogallala wells by March 2003 (BWXT, 2003a, page 2-16).
[27] BWXT, 2003a, page 2-1.
[28] BWXT, 2003a, page 2-1. All multi-port sampling systems (FLUTe and Solinst) were removed from all Ogallala wells by March 2003 (BWXT, 2003a, page 2-16).
[29] HMX = octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine.
[30] MCL for benzo(a)pyrene = 0.2 µg/L (EPA 1998a).
[31] MCL for pentachlorophenol = 1.0 µg/L (EPA 1998a).
[32] MCL for bis(2-ethylhexyl)phthalate = 6.0 µg/L (EPA 1998a).
[33] MCL for 1,2-dibromo-3-chloropropane = 0.2 µg/L (EPA 1998a).

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