

Phase 3 Results

5.1 Sample Results

Samples were collected at Facilities 16, 18, 811, 836, 864, and 919 to address data gaps identified during Phases 1 and 2 of the investigation. The analytical results for these samples are presented in Tables 5-1 through 5-8. As these tables show, several VOCs were detected in subslab soil gas, indoor air, and outdoor air. Concentrations detected in subslab soil vapor, indoor air, and outdoor air were generally similar (not indicative of a subslab source), except at Facilities 18 and 811, which are located over or near non-aqueous phase liquid (NAPL) plumes. Only a few analytes were detected at concentrations exceeding their respective industrial subslab and indoor air RBCs.

Several of the buildings sampled during Phase 3 were located adjacent to groundwater plumes and did not completely overlie the groundwater plumes. At these buildings, subslab probes were preferentially located near the edge of the buildings to be more conservative by being in closer proximity to the groundwater plumes. However, VOC concentrations in subslab samples collected near the building edges may be diluted by ambient air mixing with the subslab soil vapor (referred to as “edge effects”) and consequently lower than VOC concentrations in the center of the building (assuming an equal distribution of groundwater contamination beneath the building). This may result in an underestimation of subslab soil vapor VOC concentrations. However, in this case, the exterior of the buildings sampled were paved (limiting interaction with the atmosphere). Thus, significant edge effects at the buildings sampled were not expected. In addition, groundwater VOC concentrations were highest at the building edges (groundwater VOC contamination was not evenly distributed beneath the buildings). Evaluation of potential VI risk at each of the buildings included collection of indoor air and preferential pathway samples in addition to the subslab samples.

The analytical results for each facility are discussed individually below.

5.1.1 Facility 16

Table 5-1 summarizes the results of the Phase 3 sampling at Facility 16, located at Site SS016. Figure 4-1 illustrates the Phase 3 sample locations within the facility. This facility overlies the Site SS016 VOC plume (primarily TCE). Figure 6-5 depicts the facility’s location relative to the current TCE groundwater plume. A separate ERP investigation is being performed at the adjacent Facility 18 (primary source of the Site SS016 TCE plume) to better characterize the source area. Preliminary results of the investigation indicate the presence of dense non-aqueous phase liquid (DNAPL) (primarily TCE) in the source area. Investigation results indicate that the DNAPL source area is a catch basin located approximately 15 feet south of Facility 18 (adjacent to Facility 16). The catch basin is approximately 110 feet southwest of Facility 16.

Three indoor air samples were collected (two within the main hangar and one within a utility vault). The utility vault sample was collected to evaluate preferential pathways. A subslab sample was collected near and concurrent with the Indoor Main Hangar 1 location (see Figure 4-1). Although the subslab sample was collected near the edge of the building, close to the groundwater plume, significant edge effects were not anticipated because the ground around the exterior of the building is paved, limiting interaction with the atmosphere. The pavement along the south side of the building (where the subslab sample was located), is particularly thick because it is part of the parking apron for aircraft.

A concurrent outdoor air sample was also collected. The outdoor sample, which was shared with Facility 18, was located approximately 150 feet north of Facility 18, upgradient and cross-wind to the groundwater plume. In addition to the samples collected by CH2M HILL, EPA collected a split sample in the utility vault at this facility; EPA split sampling results are presented in Table 5-8.

TCE is the primary groundwater COC at Site SS016, and it was detected at all three indoor sample locations at Facility 16 (both main hangar locations and the utility vault preferential pathway sample) as well as the outdoor air sample. All of the detections were below the industrial indoor air RBC. The highest indoor air TCE concentration was detected in the utility vault preferential pathway sample. The concentration detected was 0.0906 ppbv, an order of magnitude below the industrial indoor air RBC (1.15 ppbv). The preferential pathway detection was approximately an order of magnitude higher than the TCE concentration detected in the breathing zone outside of the utility vault (0.00993 J ppbv), which was essentially the same concentration as the outdoor air sample (0.00978 J ppbv). TCE was also detected in the subslab sample at a concentration of 21.2 ppbv, below the industrial RBC of 57.4 ppbv. Assuming all of the TCE detected in indoor air was because of a subslab source (rather than ambient conditions); the attenuation factor of TCE between the subslab (21.2 ppbv) and indoor air (0.0646 J ppbv) is approximately 1 in 300. If the measured subslab concentration were diluted because of edge effects, the subslab concentration in the interior of the building may be higher and the attenuation of VOCs between subslab and indoor air may be greater than 1 in 300.

Three chemicals were detected in indoor air at concentrations exceeding applicable industrial RBCs at Facility 16: chloroform, naphthalene, and 1,2-dibromoethane (EDB). Of these, only chloroform is a groundwater COC at Site SS016. Chloroform was detected in indoor air at a concentration slightly exceeding the industrial RBC at the Main Hangar 1 location; it was detected at a concentration of 0.152 ppbv. The industrial indoor air RBC is 0.108 ppbv. Chloroform was detected at a similar concentration (0.21 J ppbv) in the subslab sample. If the source of chloroform detected within the facility was subslab, the subslab concentration would be expected to be much higher than what was measured (as indicated by the 1-in-300 attenuation factor calculated for TCE). In addition, the chloroform concentration detected in the utility vault preferential pathway sample was an order of magnitude below the industrial indoor air RBC. Chloroform was also detected in the outdoor air sample at a concentration of 0.0128 J ppbv.

The maximum chloroform concentration detected during groundwater sampling conducted at the site by the Groundwater Sampling and Analysis Program (GSAP) in 2008 through June 2009 was 7.4 micrograms/liter ($\mu\text{g}/\text{L}$) (CH2M HILL, 2009a, 2009b). The maximum contaminant level (MCL) for chloroform in groundwater is 80 $\mu\text{g}/\text{L}$ and the groundwater

screening level is 20 µg/L. Based on recent groundwater analytical results and similarities in chloroform concentrations between indoor air, subslab, and outdoor air, groundwater does not appear to be the source of chloroform detected within the facility during Phase 3. Because this is an industrial facility, located in an industrialized portion of the Base, detections of VOCs in indoor air are expected. The presence of chloroform may be due to using bleach as a cleaning product at the facility.

Naphthalene, which is not a Site SS016 groundwater COC, was detected at concentrations of 0.364 and 0.894 ppbv at sample locations Indoor Hangar 1 and Indoor Hangar 2, respectively. These concentrations exceeded the industrial indoor air RBC of 0.0687. Naphthalene was also detected in the subslab sample at a concentration similar to the indoor air concentration (0.54 J ppbv) and in the outdoor air sample at a concentration of 0.125 ppbv. Naphthalene may be present in ambient air at Travis AFB because it is generated by burning wood, tobacco, and fossil fuels, and used as a moth repellent and in deodorant blocks used in restrooms.

1,2-EDB, which is not a Site SS016 groundwater COC, was detected at a concentration of 0.00722 J ppbv within the utility vault at Facility 16, slightly exceeding the industrial indoor air RBC of 0.0026 ppbv. 1,2-EDB was not detected in the Main Hangar 2 sample, which was located in the breathing zone near the utility vault. 1,2-EDB was not detected in groundwater sampling conducted at the site by the GSAP in 2008 through June 2009 (CH2M HILL, 2009a, 2009b). 1,2-EDB is used as an additive to leaded fuel and is used as a fumigant.

The Phase 3 sampling at Facility 16 indicates that the Site SS016 groundwater plume does not pose a significant VI risk at this facility. TCE, which is the primary COC in the groundwater plume, was detected in all three indoor air samples and subslab sample, but at concentrations below the industrial RBCs. The indoor sampling locations included a preferential pathway sample (the utility vault). TCE was also detected in the outdoor sample. Thus, the TCE concentrations detected within the facility may be at least partially due to ambient conditions. The ratio of indoor air to subslab TCE concentrations indicates an attenuation factor of no less than 1 in 300 (an attenuation factor of 1 in 50 was used to calculate the subslab industrial RBCs). Other VOCs detected in indoor air were detected at concentrations similar to subslab and ambient concentrations and do not appear to be associated with groundwater sources.

In addition, analytical results from the utility vault indicate that preferential pathways do not pose a significant VI risk at the facility. No Site SS016 groundwater COCs were detected at concentrations exceeding indoor air RBCs in the utility vault.

5.1.2 Facility 18

Table 5-2 summarizes the results of the Phase 3 sampling at Facility 18, located at Site SS016. Figure 4-2 illustrates the Phase 3 sample locations within the facility. This facility is the primary source of and overlies the Site SS016 groundwater plume. Figure 6-5 depicts the facility's location relative to the current TCE groundwater plume. As previously mentioned, preliminary results of an ongoing investigation to better characterize the SS016 source area indicate the presence of DNAPL (primarily TCE) in the source area. Investigation results indicate that the DNAPL source area is a catch basin located approximately 15 feet south of Facility 18.

Three indoor air samples were collected at Facility 18 (one within an office, one within the Tank Room or main storage room, and one at a shower drain). The shower drain sample was collected at floor level to evaluate preferential pathways. A subslab sample was collected near and concurrent with the office location (see Figure 4-2), in the southern portion of the building where it overlies the groundwater plume. Although the subslab sample was collected near the edge of the building, closest to the groundwater plume and suspected DNAPL source, significant edge effects were not anticipated because the ground around the exterior of the building is paved, limiting interaction with the atmosphere. The pavement along the south side of the building (where the subslab sample was located), is particularly thick because it is part of the parking apron for aircraft. A generator shed abuts the facility along the edge of the building where the subslab probe is located, further limiting interaction with the atmosphere.

A concurrent outdoor air sample was also collected. The outdoor sample (shared with Facility 16) was located approximately 150 feet north of Facility 18, upgradient of the groundwater plume and cross-wind to the site. In addition to the samples collected by CH2M HILL, EPA collected a split sample in the restroom; EPA split sampling results are presented in Table 5-8.

Seven chemicals were detected at concentrations exceeding applicable indoor air and/or subslab industrial RBCs at Facility 18: 1,4-dichlorobenzene (DCB); methylene chloride; naphthalene; TCE; 1,2,4-trimethylbenzene; benzene; and ethylbenzene. Of these, only 1,4-DCB; benzene; and TCE are groundwater COCs at Site SS016.

TCE is the primary groundwater COC at Site SS016. TCE was detected at concentrations exceeding industrial RBCs only in the office samples. Both the office indoor air and subslab sample concentrations exceeded their respective RBCs. TCE was detected at a concentration of 1.33 ppbv in the office indoor air sample, slightly exceeding the indoor air industrial RBC of 1.15 ppbv. The concentration detected indoors is approximately a 10^{-6} risk, at the low end of EPA's risk management range of 10^{-6} to 10^{-4} . However, TCE was detected in the subslab sample at a concentration of 508,000 ppbv, exceeding the subslab industrial RBC (57.4 ppbv) by several orders of magnitude. The subslab sample was located near and collected concurrently with the office indoor air sample. These samples were located at the southwestern corner of the building, closest to the Site SS016 source area. TCE appears to be greatly attenuated from the subslab to the building interior (attenuation factor of approximately 1 in 300,000). However, TCE concentrations within the office did slightly exceed RBCs (although within risk management range), and the elevated subslab TCE concentrations indicate there is a significant risk of VI in the future because of the groundwater plume and the presence of DNAPL near this facility.

1,4-DCB was detected at concentrations exceeding the industrial indoor air RBC (0.179 ppbv) in the sample collected in the office, the tank room (or main storage room), and at the shower drain. The maximum concentration detected was 0.669 ppbv, in the tank room. 1,4-DCB was not detected in the subslab sample that was collected in the office; however, the reporting limit for 1,4-DCB was increased significantly for the subslab sample because of the dilutions performed to report the elevated TCE concentration. 1,4-DCB was also detected in the outdoor air sample at a concentration of 0.0129 J ppbv. The maximum 1,4-DCB concentration detected during groundwater sampling conducted at the site by the GSAP in 2008 through

June 2009 was 24 µg/L (CH2M HILL, 2009a, 2009b). The MCL for 1,4-DCB in groundwater is 5 µg/L, and the groundwater screening level is 95 µg/L.

Benzene was detected at a concentration of 0.694 µg/L in the restroom sample, slightly exceeding the industrial indoor air RBC of 0.502 ppbv. EPA collected a split sample within the restroom; the benzene result reported by EPA was 0.096 ppbv (below the RBC and similar to the outdoor air concentration; refer to Table 5-8). Benzene was detected in the outdoor sample at a concentration of 0.0774 J ppbv. The maximum benzene concentration detected during groundwater sampling conducted at the site by the GSAP in 2008 through June 2009 was 0.3 µg/L (CH2M HILL, 2009a, 2009b). The MCL for benzene in groundwater is 1 µg/L, and the groundwater screening level is 48 µg/L. The groundwater plume does not appear to be the source of benzene detected within the restroom.

In addition to TCE, methylene chloride, which is not a groundwater COC at Site SS016, was also detected at an elevated concentration (33,400 ppbv) in the subslab sample, exceeding the subslab industrial RBC of 370 ppbv by two orders of magnitude. However, methylene chloride was not detected in the indoor air sample collected within the office. The large difference between the subslab and indoor air methylene chloride concentrations, similar to the TCE results, suggests a large attenuation factor for the building slab. The maximum methylene chloride concentration detected during groundwater sampling conducted at the site by the GSAP in 2008 through June 2009 was 17 µg/L. The MCL for methylene chloride in groundwater is 5 µg/L, and the groundwater screening level is 1,500 µg/L.

Naphthalene, which is not a groundwater COC at Site SS016, was detected at concentrations exceeding the indoor air industrial RBC (0.687 ppbv) in all three indoor air samples. It was detected at a concentration of 0.371 ppbv in the office sample, at 0.0957 ppbv in the tank room sample, and at 23 ppbv in the shower drain sample. Naphthalene was not detected in the subslab sample; however, because of dilutions, the reporting limit for naphthalene was considerably higher in the subslab sample. Naphthalene was detected in the outdoor sample at a concentration of 0.125 ppbv. The elevated naphthalene concentration detected in the shower drain may be due to use of naphthalene in deodorant blocks used in restrooms.

Ethylbenzene and 1,2,4-trimethylbenzene, which are not groundwater COCs at Site SS016, were detected at concentrations exceeding indoor air industrial RBCs in the shower drain sample. Ethylbenzene was detected at a concentration of 2.12 ppbv (the RBC is 1.089 ppbv) and 1,2,4-trimethylbenzene was detected at a concentration of 10.8 ppbv (the RBC is 6.32 ppbv). Both ethylbenzene and 1,2,4-trimethylbenzene were detected in the outdoor air sample. Ethylbenzene was detected at a concentration of 0.075 J ppbv and 1,2,4-trimethylbenzene was detected at a concentration of 0.179 J ppbv. Ethylbenzene and 1,2,4-trimethylbenzene were not detected in groundwater sampling conducted at the site by the GSAP in 2008 through June 2009 (CH2M HILL, 2009a, 2009b).

The Phase 3 sampling at Facility 18 indicates that the Site SS016 groundwater plume poses a significant future VI risk at this facility. TCE is the primary groundwater COC at Site SS016. While TCE concentrations detected within the facility were either below the industrial RBC or were on the low end of EPA's risk management range (approximately 10^{-6}), and data show significant attenuation through the slab, the elevated subslab TCE concentration indicates there is a significant future risk of VI if building foundation conditions change in the future. However, the facility is currently used for storage and is not routinely occupied.

Despite the proximity of the facility to the DNAPL source area, analytical results from the shower drain indicate preferential pathways do not pose a significant VI risk at the facility. TCE, which is the primary groundwater COC, was detected at a concentration below the industrial indoor air RBC in the preferential pathway sample. The only Site SS016 groundwater COC detected at concentrations exceeding industrial RBCs in the restroom sample was benzene. The benzene concentration reported from the split sample collected by EPA was below the RBC. Benzene concentrations detected in groundwater at the site in 2008 and 2009 were below the MCL (1 µg/L) and groundwater screening level (48 µg/L), and thus the groundwater plume does not appear to be the source of benzene detected in this sample.

5.1.3 Facility 811

Table 5-3 summarizes the results of the Phase 3 sampling at Facility 811, an aircraft hangar located within the WIOU at Site SD034. This facility is the source of a floating product (Stoddard solvent) plume, which is located on the western edge of the building. Use of Stoddard solvent to clean aircraft is ongoing within the facility. One subslab sample was collected at this facility (see Figure 4-3). The subslab sample location was near the Stoddard solvent plume but over 15 feet from the edge of the building. In addition, the area surrounding the facility is paved, thus no significant edge effects are expected. Indoor air samples were not collected at this facility because of the open nature of the facility and the ongoing use of Stoddard solvent within the facility.

Three chemicals, benzene, TCE, and PCE, were detected at concentrations exceeding the subslab industrial RBCs. All three of these chemicals are groundwater COCs at Site SD034. Benzene was detected at a concentration of 33.2 ppbv (subslab RBC is 25.1 ppbv); TCE was detected at a concentration of 146 ppbv (subslab RBC is 57.4 ppbv); and PCE was detected at a concentration of 16.1 ppbv (subslab RBC is 15.1 ppbv). In addition, total petroleum hydrocarbon as gasoline (TPH-G) was reported at a concentration of 111 µg/L, or approximately 26,684 ppbv (assuming an average molecular weight of 100 for TPH-G). No RBC was developed for TPH-G although this TPH-G concentration exceeds the Bay Area RWQCB industrial environmental screening level (ESL) for TPH-G in shallow soil gas (7,380 ppbv) by approximately four times. This ESL is generic and does not take into account the composition of the TPH-G.

Currently, no significant risk of VI exists at this building because it is a hangar that is kept open during working hours. The hangar doors are large enough to allow airplanes inside the hangars, and while the hangar doors are open, the hangar is not considered an enclosed space. However, because of the presence of the floating product plume, if usage of the building changes or a new building is built above the floating product plume, there may be the potential for VI risk.

5.1.4 Facility 919

Table 5-4 summarizes the results of the Phase 3 sampling at Facility 919, located in the WIOU, within Site SD037. This facility is a vehicle repair shop, and consequently has large doors that remain open during working hours to allow vehicles to enter. This facility is located adjacent to a small TCE plume. Three indoor air samples were collected (one within an office, one within the restroom, and one within the mechanical room), two subslab

samples were collected (one paired with the office indoor air sample, the other in the northwestern portion of the building), and one outdoor sample was collected (see Figure 4-4). The restroom and mechanical room samples were collected to evaluate preferential pathways. In addition to the samples collected by CH2M HILL, EPA collected split samples at the paired office and subslab sample locations; EPA split sampling results are presented in Table 5-8.

TCE is the primary groundwater COC in the plume adjacent to Facility 919. TCE was not detected at concentrations exceeding industrial RBCs in any sample. No VOCs exceeded indoor air industrial RBCs in the sample collected in the office, which is representative of working conditions within the building. No VOC concentrations exceeded subslab RBCs in either of the subslab samples. The sample results from the two subslab sampling locations were very similar (less than an order of magnitude difference in the concentrations detected) and do not indicate a large spatial variability (Table 5-5). Although the subslab samples were collected near the edge of the building, nearest to the groundwater plume, significant edge effects were not anticipated because the ground around the exterior of the building is paved, limiting interaction with the atmosphere.

Two chemicals, chloroform and naphthalene, were detected at concentrations exceeding their RBCs in indoor air. Chloroform concentrations exceeded the indoor air RBC only in the restroom sample, where it was detected at a concentration of 0.167 ppbv; the indoor air industrial RBC is 0.108 ppbv. The presence of chloroform in the restroom may be due to use of bleach as a cleaning agent. Chloroform is not a groundwater COC in the WIOU and was not detected in either subslab sample. Chloroform was detected in the outdoor sample location at a concentration of 0.0061 J ppbv. The maximum chloroform concentration detected during groundwater sampling conducted at the site by the GSAP in 2008 through June 2009 was 7.2 µg/L, which is below the MCL of 80 µg/L and groundwater screening level of 20 µg/L (CH2M HILL, 2009a, 2009b).

Naphthalene exceeded the indoor air RBC only in the mechanical room sample, where it was detected at a concentration of 0.21 ppbv (the RBC is 0.0687 ppbv). Naphthalene was detected in the subslab samples at a maximum concentration of 0.44 J (below the subslab RBC of 3.43 ppbv). Naphthalene was also detected in the outdoor air sample at a concentration of 0.0291 J ppbv. Naphthalene was identified as a groundwater COC at Site SD037; however, routine monitoring for the chemical was discontinued because it was not detected at concentrations exceeding the MCL (20 µg/L) in the GSAP monitoring. Naphthalene may be present in ambient air in the vicinity of Facility 919 because it is generated by burning tobacco and fossil fuels. Because the facility is a vehicle repair shop, several large military vehicles were running in and around the facility at the time the Phase 3 samples were collected. Occupants of the building were also observed smoking in and around the facility during sampling.

Both the mechanical room and the restroom were sampled to investigate preferential pathways and are not considered representative of an exposure scenario for an industrial worker. No chemicals were detected at concentrations exceeding industrial RBCs in the office space breathing zone or within the subslab samples. Phase 3 sample results indicate the groundwater plume near building 919 does not pose a significant VI risk.

5.1.5 Facility 836

Table 5-6 summarizes the results of the Phase 3 sampling at Facility 836, located in the WIOU, within Site SD037. This facility overlies the main WIOU TCE groundwater plume. These indoor air samples were collected and analyzed by EPA. One indoor air and one subslab sample had previously been collected at this building during Phase 1 sampling to support the development of a site-specific attenuation factor. No VOCs were detected at concentrations exceeding industrial RBCs during the Phase 1 sampling.

During Phase 3, three indoor air samples were collected (one within an office, one within the break room at the floor drain, and one within the mechanical room at a floor drain). Both of the floor drain samples were collected at floor level (not in the breathing zone), and their purpose was to evaluate preferential pathways. Figure 4-5 illustrates the sample locations.

Only one chemical, 1,2-dichloroethane (DCA) was detected at concentrations exceeding indoor air RBCs. The 1,2-DCA concentrations exceeded industrial RBCs only in the sample collected from the office, where it was detected at a concentration of 0.57 ppbv (the RBC is 0.116 ppbv). 1,2-DCA was not detected in the outdoor sample or in the mechanical room floor drain sample. 1,2-DCA was detected at a concentration of 0.028 J ppbv in the break room floor drain sample. During the Phase 1 sampling, 1,2-DCA was detected at a concentration of 0.029 ppbv within the office, which was an order of magnitude higher than the concentration detected in the subslab (0.0014 ppbv), which indicates an indoor source rather than a subslab source. While 1,2-DCA is a groundwater COC at Site SD037, the maximum 1,2-DCA concentration detected during groundwater sampling conducted at the site by the GSAP in 2008 through June 2009 was 0.72 µg/L, which slightly exceeds the MCL of 0.5 µg/L (CH2M HILL, 2009a, 2009b) but is well below the groundwater screening level of 57 µg/L. Thus the groundwater plume does not appear to be the source of 1,2-DCA detected in the office sample.

TCE, which is the primary groundwater COC in the underlying groundwater plume, was not detected in any of the three samples collected at the facility, although two of the sample locations targeted preferential pathways. The results of samples collected at this facility indicate the groundwater plume underlying Facility 836 does not pose a significant VI risk to the facility. In addition, sample results indicate preferential pathways do not pose a significant risk at the facility.

5.1.6 Facility 864

Table 5-7 summarizes the results of the Phase 3 sampling at Facility 864, located in the WIOU, within Site SD037. This facility overlies the main WIOU TCE groundwater plume. These indoor air samples were collected and analyzed by EPA. One indoor air and one subslab sample had previously been collected at this building during Phase 1 sampling to support the development of a site-specific attenuation factor. No VOCs were detected at concentrations exceeding industrial RBCs during the Phase 1 sampling.

During Phase 3, three indoor air samples were collected (one within the main warehouse room, one near an electrical conduit located at the north end of the facility, and one at the restroom shower drain). The samples located at the shower drain and near the electrical conduit were collected to evaluate preferential pathways. Figure 4-6 illustrates the sample locations.

Only one chemical, chloroform, was detected at concentrations exceeding RBCs. Chloroform concentrations exceeded RBCs only in the sample collected near the electrical conduit, where it was detected at a concentration of 20 ppbv. The industrial RBC for chloroform is 0.108 ppbv. Chloroform was not detected in the outdoor air sample or in the sample collected in the main warehouse room. Chloroform was detected at a low level (0.03 ppbv) in the restroom sample.

Chloroform is not a Site SD037 groundwater COC. The maximum chloroform concentration detected during groundwater sampling conducted at the site by the GSAP in 2008 through June 2009 was 7.2 µg/L, which is below the MCL of 80 µg/L (CH2M HILL, 2009a, 2009b) and the groundwater screening level of 20 µg/L. Thus the groundwater plume does not appear to be the source of chloroform detected in the sample collected near the electrical conduit. In addition, sample results indicate preferential pathways do not pose a significant risk at the facility.

5.2 Conclusions of Phase 3 Sampling

The key conclusions of the Phase 3 field investigation are summarized below:

- With the exception of the sites where DNAPL or light-non-aqueous phase liquid (LNAPL) are present (Sites SD034 and SS016), there is little indication of significant VI risk under current or future industrial usage. A few VOCs (typically those that were not groundwater COCs) were detected at concentrations exceeding applicable industrial RBCs. However, the subslab and indoor air concentrations of the primary groundwater COC (TCE) did not exceed applicable RBCs except at the facilities adjacent to or overlying DNAPL or LNAPL plumes.
- Except for Sites SD034 and SS016, the VOCs detected at concentrations exceeding applicable industrial RBCs do not appear to be due to VI from the underlying or adjacent groundwater plume. This is because the VOCs detected at concentrations exceeding RBCs were not groundwater COCs at the site and/or were detected at very low concentrations in groundwater during recent groundwater monitoring events (2008–2009), and the primary groundwater COC (TCE) was either not detected in indoor air and subslab samples or detected at low concentrations below applicable RBCs.
- Subslab concentrations at Sites SD034 and SS016 (Facility 18) indicate potentially significant future VI risk at these sites, although VI risk under current conditions is not significant.
- Because the facilities investigated are used for industrial purposes and/or located within the industrial portion of Travis AFB, detections of VOCs in indoor air are expected. VOCs are also emitted by several products typically used in office environments, such as paints, cleaning supplies, furnishings, office equipment, carpet, glues, adhesives, and permanent markers.
- During Phase 3 sampling, several indoor air samples were collected specifically to assess preferential pathways. The data from these samples are useful for evaluating whether drains, utility corridors, or other open areas in the foundation have the potential for causing localized areas of elevated indoor air concentrations. The preferential pathway sample results indicate that preferential pathways do not pose a significant VI risk at

Travis AFB. In the preferential pathway samples, groundwater COCs were either not detected at concentrations exceeding indoor air RBCs or were detected at concentrations similar to those detected in outdoor air. The primary groundwater COC (TCE) was not detected at concentrations exceeding indoor air RBCs in any preferential pathway sample.

TABLE 5-1

Analytes Detected at Facility 16 During Phase 3

Vapor Intrusion Assessment Report, Travis Air Force Base, California

Analyte	Indoor Air		Indoor Air		Subslab		Subslab		Outdoor Air	
	Concentration (ppbv)	Flag	RBC (ppbv)	Flag	Concentration (ppbv)	Flag	RBC (ppbv)	Flag	Concentration (ppbv)	Flag
Main Hangar 1 (breathing zone)										
1,1,2-TCA	0.00916	J	0.141		ND		7.056		0.00658	J
1,1-DCA	ND		1.90		ND		95.08		ND	
1,1-DCE	ND		80.0		ND		4,000		ND	
1,2,4-Trichlorobenzene	ND		2.43		0.19	J	120		0.00751	J
1,2,4-Trimethylbenzene	1.36		6.32		1.16	J	320		0.179	J
1,2-DCA	0.0123	J	0.116		ND		5.81		0.017	J
1,2-DCB	ND		140		0.12	J	7,000		ND	
1,2-Dichloropropane	ND		0.260		ND		13.0		0.00989	J
1,2-Dichlorotetrafluoroethane	0.012	J	19,000		ND		950,000		0.0157	J
1,2-EDB	ND		0.0026		ND		0.130		ND	
1,3,5-Trimethylbenzene	0.314	J	5.30		0.35	J	260		0.0413	J
1,3-DCB	ND		NA		0.13	J	NA		0.00612	J
1,4-DCB	0.0105	J	0.179		0.21	J	8.97		0.0129	J
Acetone	11.9		59,000		34.1		3,000,000		7.44	
Benzene	0.168		0.502		0.28	J	25.08		0.0774	J
Bromodichloromethane	ND		0.049		ND		2.47		ND	
Bromomethane	ND		5.67		ND		280		ND	
Carbon tetrachloride	0.101		0.134		ND		6.68		0.0741	
Chlorobenzene	ND		980		ND		49,000		ND	
Chloroethane	ND		17,000		ND		850,000		0.0486	J
Chloroform	0.152		0.108		0.21	J	5.40		0.0128	J
Chloromethane	0.287	J	3.29		0.62	J	160		0.534	
cis-1,2-DCE	0.367	J	NA		ND		NA		ND	
cis-1,3-Dichloropropene	ND		NA		ND		NA		ND	
Dichlorodifluoromethane	0.373	J	180		ND		9,000		0.484	J
Ethylbenzene	0.345		1.09		0.44	J	54.5		0.0975	J
Hexachlorobutadiene	ND		0.053		0.12	J	2.63		ND	
m,p-Xylene	1.43	J	NA		1.81	J	NA		3.9	J
MEK	2.01		7,500		4.2		380,000		0.965	J
Methylene chloride	ND		7.48		ND		370		ND	
MIBK	0.22	J	3200		0.54	J	160,000		0.11	J
MTBE	ND		13.04		ND		650		ND	
Naphthalene	0.364		0.0687		0.54	J	3.43		0.125	
n-Hexane	0.094	J	880		0.27	J	44,000		ND	

TABLE 5-1

Analytes Detected at Facility 16 During Phase 3

Vapor Intrusion Assessment Report, Travis Air Force Base, California

Analyte	Indoor Air		Indoor Air		Subslab		Subslab		Outdoor Air	
	Concentration (ppbv)	Flag	RBC (ppbv)	Flag	Concentration (ppbv)	Flag	RBC (ppbv)	Flag	Concentration (ppbv)	Flag
o-Xylene	0.593	J	690		0.74	J	35,000		0.0639	J
Styrene	0.0343	J	950		ND		48,000		0.0185	J
TCE	0.0646	J	1.15		21.2		57.4		0.00978	J
Tetrachloroethylene	0.0073	J	0.302		0.46	J	15.1		0.0202	
Toluene	1.07	J	350		1.84	J	18,000		1.95	J
trans-1,2-DCE	0.309	J	65.6		0.49	J	3,300		ND	
trans-1,3-Dichloropropene	ND	NA			ND		NA		ND	
Trichlorofluoromethane	0.216	J	550		0.3	J	28,000		0.249	J
Trichlorotrifluoroethane	0.0658	J	17,000		ND		850,000		0.0767	J
Vinyl chloride	ND		1.09		ND		54.3		ND	
Main Hangar 2 (breathing zone)										
1,1,2-TCA	ND		0.141		NA		7.056		0.00658	J
1,1-DCA	ND		1.90		NA		95.08		ND	
1,1-DCE	ND		80.0		NA		4,000		ND	
1,2,4-Trichlorobenzene	0.0357	J	2.43		NA		120		0.00751	J
1,2,4-Trimethylbenzene	0.171	J	6.32		NA		320		0.179	J
1,2-DCA	0.0137	J	0.116		NA		5.81		0.017	J
1,2-DCB	ND		140		NA		7000		ND	
1,2-Dichloropropane	ND		0.260		NA		13.0		0.00989	J
1,2-Dichlorotetrafluoroethane	0.0177	J	19,000		NA		950,000		0.0157	J
1,2-EDB	ND		0.0026		NA		0.130		ND	
1,3,5-Trimethylbenzene	0.0535	J	5.30		NA		260		0.0413	J
1,3-DCB	ND		NA		NA		NA		0.00612	J
1,4-DCB	0.00579	J	0.179		NA		8.97		0.0129	J
Acetone	2.69		59,000		NA		3,000,000		7.44	
Benzene	0.101		0.502		NA		25.08		0.0774	J
Bromodichloromethane	ND		0.049		NA		2.47		ND	
Bromomethane	ND		5.67		NA		280		ND	
Carbon tetrachloride	0.0919		0.134		NA		6.68		0.0741	
Chlorobenzene	0.00647	J	980		NA		49,000		ND	
Chloroethane	ND		17,000		NA		850,000		0.0486	J
Chloroform	0.0213		0.108		NA		5.40		0.0128	J
Chloromethane	0.595		3.29		NA		160		0.534	
cis-1,2-DCE	ND	NA			NA		NA		ND	
cis-1,3-Dichloropropene	ND	NA			NA		NA		ND	

TABLE 5-1

Analytes Detected at Facility 16 During Phase 3

Vapor Intrusion Assessment Report, Travis Air Force Base, California

Analyte	Indoor Air		Indoor Air		Subslab		Outdoor Air	
	Concentration (ppbv)	Flag	RBC (ppbv)	Flag	Concentration (ppbv)	Flag	RBC (ppbv)	Concentration (ppbv)
Dichlorodifluoromethane	0.556	J	180		NA		9,000	0.484
Ethylbenzene	0.097	J	1.09		NA		54.5	0.0975
Hexachlorobutadiene	ND		0.053		NA		2.63	ND
m,p-Xylene	0.393	J	NA		NA		NA	3.9
MEK	0.414	J	7,500		NA		380,000	0.965
Methylene chloride	ND		7.48		NA		370	ND
MIBK	0.152	J	3200		NA		160,000	0.11
MTBE	0.071	J	13.04		NA		650	ND
Naphthalene	0.894		0.0687		NA		3.43	0.125
n-Hexane	0.0826	J	880		NA		44,000	ND
o-Xylene	0.18	J	690		NA		35,000	0.0639
Styrene	0.0229	J	950		NA		48,000	0.0185
TCE	0.00993	J	1.15		NA		57.4	0.00978
Tetrachloroethylene	0.0148	J	0.302		NA		15.1	0.0202
Toluene	1.94	J	350		NA		18,000	1.95
trans-1,2-DCE	ND		65.6		NA		3,300	ND
trans-1,3-Dichloropropene	ND		NA		NA		NA	ND
Trichlorofluoromethane	0.283	J	550		NA		28,000	0.249
Trichlorotrifluoroethane	0.0865	J	17,000		NA		850,000	0.0767
Vinyl chloride	ND		1.09		NA		54.3	ND
Utility Vault (preferential pathway)								
1,1,2-TCA	ND		0.141		NA		7.056	0.00658
1,1-DCA	ND		1.90		NA		95.08	ND
1,1-DCE	ND		80.0		NA		4,000	ND
1,2,4-Trichlorobenzene	0.0143	J	2.43		NA		120	0.00751
1,2,4-Trimethylbenzene	0.206	J	6.32		NA		320	0.179
1,2-DCA	0.0149	J	0.116		NA		5.81	0.017
1,2-DCB	ND		140		NA		7,000	ND
1,2-Dichloropropane	0.00935	J	0.260		NA		13.0	0.00989
1,2-Dichlorotetrafluoroethane	0.0147	J	19,000		NA		950,000	0.0157
1,2-EDB	0.00722	J	0.0026		NA		0.130	ND
1,3,5-Trimethylbenzene	0.0586	J	5.30		NA		260	0.0413
1,3-DCB	0.00701	J	NA		NA		NA	0.00612
1,4-DCB	0.00611	J	0.179		NA		8.97	0.0129
Acetone	5		59,000		NA		3,000,000	7.44

TABLE 5-1

Analytes Detected at Facility 16 During Phase 3

Vapor Intrusion Assessment Report, Travis Air Force Base, California

Analyte	Indoor Air		Indoor Air		Subslab		Outdoor Air	
	Concentration (ppbv)	Flag	RBC (ppbv)	Flag	Concentration (ppbv)	Flag	RBC (ppbv)	Concentration (ppbv)
Benzene	0.0861	J	0.502		NA		25.08	0.0774
Bromodichloromethane	ND		0.049		NA		2.47	ND
Bromomethane	ND		5.67		NA		280	ND
Carbon tetrachloride	0.0819		0.134		NA		6.68	0.0741
Chlorobenzene	ND		980		NA		49,000	ND
Chloroethane	ND		17,000		NA		850,000	0.0486
Chloroform	0.0193		0.108		NA		5.40	0.0128
Chloromethane	0.547		3.29		NA		160	0.534
cis-1,2-DCE	ND	NA			NA		NA	ND
cis-1,3-Dichloropropene	ND	NA			NA		NA	ND
Dichlorodifluoromethane	0.466	J	180		NA		9,000	0.484
Ethylbenzene	0.0965	J	1.09		NA		54.5	0.0975
Hexachlorobutadiene	ND		0.053		NA		2.63	ND
m,p-Xylene	0.243	J	NA		NA		NA	3.9
MEK	1.22	J	7500		NA		380,000	0.965
Methylene chloride	ND		7.48		NA		370	ND
MIBK	0.215	J	3200		NA		160,000	0.11
MTBE	ND		13.04		NA		650	ND
Naphthalene	0.145		0.0687		NA		3.43	0.125
n-Hexane	ND		880		NA		44,000	ND
o-Xylene	0.101	J	690		NA		35,000	0.0639
Styrene	0.0276	J	950		NA		48,000	0.0185
TCE	0.0996	J	1.15		NA		57.4	0.00978
Tetrachloroethylene	0.00519	J	0.302		NA		15.1	0.0202
Toluene	1.93	J	350		NA		18,000	1.95
trans-1,2-DCE	ND		65.6		NA		3,300	ND
trans-1,3-Dichloropropene	ND	NA			NA		NA	ND
Trichlorofluoromethane	0.242	J	550		NA		28,000	0.249
Trichlorotrifluoroethane	0.0785	J	17000		NA		850,000	0.0767
Vinyl chloride	ND		1.09		NA		54.3	ND

Notes:

Bolded values = Concentrations exceeded applicable RBC.

J flag = Result is greater than or equal to the method detection limit and less than the practical quantitation limit, or analyte concentration is an estimated value.

DCA = dichloroethane

MIBK = methyl isobutyl ketone

ppbv = part(s) per billion by volume

DCB = dichlorobenzene

MTBE = methyl tert-butyl ether

RBC = risk-based concentration

DCE = dichloroethene

NA = not applicable

TCA = trichloroethane

EDB = dibromoethane

ND = not detected

TCE = trichloroethene

MEK = 2-Butanone

TABLE 5-2

Analytes Detected at Facility 18 During Phase 3

Vapor Intrusion Assessment Report, Travis Air Force Base, California

Analyte	Indoor Air		Indoor Air RBC (ppbv)	Subslab		Subslab RBC (ppbv)	Outdoor Air	
	Concentration (ppbv)	Flag		Concentration (ppbv)	Flag		Concentration (ppbv)	Flag
Office (breathing zone)								
1,1,2-TCA	ND	0.141		ND		7.056	0.00658	J
1,1-DCA	ND	1.90		ND		95.08	ND	
1,1-DCE	ND	80.0		ND		4000	ND	
1,2,4-Trichlorobenzene	0.0172	J	2.43	ND	120		0.00751	J
1,2,4-Trimethylbenzene	1.26		6.32	ND	320		0.179	J
1,2-DCA	0.0106	J	0.116	ND	5.81		0.017	J
1,2-DCB	0.964	J	140	ND	7000		ND	
1,2-Dichloropropane	ND	0.260		ND		13.0	0.00989	J
1,2-Dichlorotetrafluoroethane	0.0187	J	19000	ND	950000		0.0157	J
1,2-EDB	ND	0.0026		ND		0.130	ND	
1,3,5-Trimethylbenzene	0.318	J	5.30	ND	260		0.0413	J
1,3-DCB	0.377	J	NA	ND	NA		0.00612	J
1,4-DCB	0.483		0.179	ND	8.97		0.0129	J
Acetone	4.06		59000	ND	3000000		7.44	
Benzene	0.139		0.502	ND	25.08		0.0774	J
Bromodichloromethane	ND	0.049		ND		2.47	ND	
Bromomethane	ND	5.67		ND		280	ND	
Carbon tetrachloride	0.0886		0.134	ND		6.68	0.0741	
Chlorobenzene	ND	980		ND		49000	ND	
Chloroethane	ND	17000		ND		850000	0.0486	J
Chloroform	0.0155	J	0.108	ND	5.40		0.0128	J
Chloromethane	0.516		3.29	ND	160		0.534	
cis-1,2-DCE	0.422	J	NA	125000		NA	ND	
cis-1,3-Dichloropropene	ND	NA		ND		NA	ND	
Dichlorodifluoromethane	0.502	J	180	ND	9000		0.484	J
Ethylbenzene	0.687		1.09	ND	54.5		0.0975	J
Hexachlorobutadiene	ND	0.053		ND		2.63	ND	
m,p-Xylene	2.82	J	NA	ND	NA		3.9	J
MEK	0.459	J	7500	ND	380000		0.965	J
Methylene chloride	ND	7.48		33400		370	ND	

TABLE 5-2

Analytes Detected at Facility 18 During Phase 3

Vapor Intrusion Assessment Report, Travis Air Force Base, California

Analyte	Indoor Air		Indoor Air RBC (ppbv)	Subslab		Subslab RBC (ppbv)	Outdoor Air	
	Concentration (ppbv)	Flag		Concentration (ppbv)	Flag		Concentration (ppbv)	Flag
MIBK	0.0617	J	3200	ND	160000		0.11	J
MTBE	ND	13.04		ND		650	ND	
Naphthalene	0.371		0.0687	ND	3.43		0.125	
n-Hexane	ND	880		ND		44000	ND	
o-Xylene	1.09	J	690	ND	35000		0.0639	J
Styrene	0.222	J	950	ND	48000		0.0185	J
TCE	1.33		1.15	508000		57.4	0.00978	J
Tetrachloroethylene	0.011	J	0.302	ND	15.1		0.0202	
Toluene	0.459	J	350	ND	18000		1.95	J
trans-1,2-DCE	ND	65.6		2140	J	3300	ND	
trans-1,3-Dichloropropene	ND	NA		ND		NA	ND	
Trichlorofluoromethane	0.283	J	550	ND	28000		0.249	J
Trichlorotrifluoroethane	0.0808	J	17000	ND	850000		0.0767	J
Vinyl Chloride	ND		1.09	ND		54.3	ND	
Tank Room (breathing zone)								
1,1,2-TCA	ND	0.141		NA		7.056	0.00658	J
1,1-DCA	ND	1.90		NA		95.08	ND	
1,1-DCE	ND	80.0		NA		4000	ND	
1,2,4-Trichlorobenzene	0.0193	J	2.43	NA		120	0.00751	J
1,2,4-Trimethylbenzene	0.326	J	6.32	NA		320	0.179	J
1,2-DCA	0.0172	J	0.116	NA		5.81	0.017	J
1,2-DCB	1.36	J	140	NA		7000	ND	
1,2-Dichloropropane	0.0331	0.260		NA		13.0	0.00989	J
1,2-Dichlorotetrafluoroethane	0.0158	J	19000	NA		950000	0.0157	J
1,2-EDB	ND	0.0026		NA		0.130	ND	
1,3,5-Trimethylbenzene	0.0973	J	5.30	NA		260	0.0413	J
1,3-DCB	0.531	J	NA	NA		NA	0.00612	J
1,4-DCB	0.669		0.179	NA		8.97	0.0129	J
Acetone	2.53		59000	NA		3000000	7.44	
Benzene	0.101		0.502	NA		25.08	0.0774	J
Bromodichloromethane	ND	0.049		NA		2.47	ND	

TABLE 5-2

Analytes Detected at Facility 18 During Phase 3

Vapor Intrusion Assessment Report, Travis Air Force Base, California

Analyte	Indoor Air		Indoor Air RBC (ppbv)	Subslab		Subslab RBC (ppbv)	Outdoor Air	
	Concentration (ppbv)	Flag		Concentration (ppbv)	Flag		Concentration (ppbv)	Flag
Bromomethane	ND	5.67		NA		280	ND	
Carbon tetrachloride	0.0909		0.134	NA		6.68	0.0741	
Chlorobenzene	ND	980		NA		49000	ND	
Chloroethane	ND	17000		NA		850000	0.0486	J
Chloroform	0.0147	J	0.108	NA		5.40	0.0128	J
Chloromethane	0.513		3.29	NA		160	0.534	
cis-1,2-DCE	0.0257	J	NA	NA		NA	ND	
cis-1,3-Dichloropropene	ND	NA		NA		NA	ND	
Dichlorodifluoromethane	0.505	J	180	NA		9000	0.484	J
Ethylbenzene	0.621		1.09	NA		54.5	0.0975	J
Hexachlorobutadiene	ND	0.053		NA		2.63	ND	
m,p-Xylene	2.66	J	NA	NA		NA	3.9	J
MEK	0.5	J	7500	NA		380000	0.965	J
Methylene chloride	ND		7.48	NA		370	ND	
MIBK	0.0992	J	3200	NA		160000	0.11	J
MTBE	ND	13.04		NA		650	ND	
Naphthalene	0.0957		0.0687	NA		3.43	0.125	
n-Hexane	0.0781	J	880	NA		44000	ND	
o-Xylene	0.953	J	690	NA		35000	0.0639	J
Styrene	ND	950		NA		48000	0.0185	J
TCE	0.264		1.15	NA		57.4	0.00978	J
Tetrachloroethylene	0.0209		0.302	NA		15.1	0.0202	
Toluene	1.96	J	350	NA		18000	1.95	J
trans-1,2-DCE	ND	65.6		NA		3300	ND	
trans-1,3-Dichloropropene	ND	NA		NA		NA	ND	
Trichlorofluoromethane	0.299	J	550	NA		28000	0.249	J
Trichlorotrifluoroethane	0.0896	J	17000	NA		850000	0.0767	J
Vinyl Chloride	ND		1.09	NA		54.3	ND	

TABLE 5-2

Analytes Detected at Facility 18 During Phase 3

Vapor Intrusion Assessment Report, Travis Air Force Base, California

Analyte	Indoor Air		Indoor Air RBC (ppbv)	Subslab		Subslab RBC (ppbv)	Outdoor Air	
	Concentration (ppbv)	Flag		Concentration (ppbv)	Flag		Concentration (ppbv)	Flag
Shower Drain (preferential pathway)								
1,1,2-TCA	ND	0.141		NA		7.056	0.00658	J
1,1-DCA	ND	1.90		NA		95.08	ND	
1,1-DCE	ND	80.0		NA		4000	ND	
1,2,4-Trichlorobenzene	0.0325	J	2.43	NA		120	0.00751	J
1,2,4-Trimethylbenzene	10.8		6.32	NA		320	0.179	J
1,2-DCA	ND	0.116		NA		5.81	0.017	J
1,2-DCB	1.23	J	140	NA		7000	ND	
1,2-Dichloropropane	ND	0.260		NA		13.0	0.00989	J
1,2-Dichlorotetrafluoroethane	0.0416	J	19000	NA		950000	0.0157	J
1,2-EDB	ND	0.0026		NA		0.130	ND	
1,3,5-Trimethylbenzene	2.14		5.30	NA		260	0.0413	J
1,3-DCB	0.454	J	NA	NA		NA	0.00612	J
1,4-DCB	0.551		0.179	NA		8.97	0.0129	J
Acetone	3.97		59000	NA		3000000	7.44	
Benzene	0.694		0.502	NA		25.08	0.0774	J
Bromodichloromethane	ND	0.049		NA		2.47	ND	
Bromomethane	0.155	J	5.67	NA		280	ND	
Carbon tetrachloride	0.0988		0.134	NA		6.68	0.0741	
Chlorobenzene	ND	980		NA		49000	ND	
Chloroethane	ND	17000		NA		850000	0.0486	J
Chloroform	0.0217		0.108	NA		5.40	0.0128	J
Chloromethane	ND	3.29		NA		160	0.534	
cis-1,2-DCE	0.3	J	NA	NA		NA	ND	
cis-1,3-Dichloropropene	ND	NA		NA		NA	ND	
Dichlorodifluoromethane	0.337	J	180	NA		9000	0.484	J
Ethylbenzene	2.12		1.09	NA		54.5	0.0975	J
Hexachlorobutadiene	ND	0.053		NA		2.63	ND	
m,p-Xylene	8.49		NA	NA		NA	3.9	J
MEK	4.69		7500	NA		380000	0.965	J
Methylene chloride	ND		7.48	NA		370	ND	

TABLE 5-2

Analytes Detected at Facility 18 During Phase 3

Vapor Intrusion Assessment Report, Travis Air Force Base, California

Analyte	Indoor Air		Indoor Air RBC (ppbv)	Subslab		Subslab RBC (ppbv)	Outdoor Air	
	Concentration (ppbv)	Flag		Concentration (ppbv)	Flag		Concentration (ppbv)	Flag
MIBK	0.88	J	3200	NA		160000	0.11	J
MTBE	ND	13.04		NA		650	ND	
Naphthalene	23		0.0687	NA		3.43	0.125	
n-Hexane	0.0958	J	880	NA		44000	ND	
o-Xylene	3.61		690	NA		35000	0.0639	J
Styrene	ND	950		NA		48000	0.0185	J
TCE	0.649		1.15	NA		57.4	0.00978	J
Tetrachloroethylene	0.028	J	0.302	NA		15.1	0.0202	
Toluene	3.43		350	NA		18000	1.95	J
trans-1,2-DCE	ND	65.6		NA		3300	ND	
trans-1,3-Dichloropropene	ND	NA		NA		NA	ND	
Trichlorofluoromethane	0.227	J	550	NA		28000	0.249	J
Trichlorotrifluoroethane	0.0807	J	17000	NA		850000	0.0767	J
Vinyl Chloride	ND		1.09	NA		54.3	ND	

Notes:

J Flag: Result is greater than or equal to the method detection limit and less than the practical quantitation limit, or analyte concentration is an estimated value.

Bolded Values = concentrations exceeded applicable RBC

DCA = dichloroethane
DCB = dichlorobenzene
DCE = dichloroethene
EDB = ethylene dibromide
MEK = 2-butanone
MIKB = methyl isobutyl ketone

MTBE = methyl tert-butyl ether
NA = not applicable
ND = not detected
ppbv = part(s) per billion by volume
RBC = risk-based concentration
TCA = trichloroethane

TABLE 5-3

Analytes Detected at Facility 811 During Phase 3

Vapor Intrusion Assessment Report, Travis Air Force Base, California

Analyte	Subslab Concentration (ppbv)	Flag	Subslab RBC (ppbv)
Subslab			
1,1,2-TCA	ND	7.056	
1,1-DCA	8.52		95.08
1,1-DCE	3.36		4,000
1,2,4-Trichlorobenzene	ND	120	
1,2,4-Trimethylbenzene	1.95	J	320
1,2-DCA	ND	5.81	
1,2-DCB	ND	7,000	
1,2-Dichloropropane	ND	13.0	
1,2-Dichlorotetrafluoroethane	ND	950,000	
1,2-EDB	ND	0.130	
1,3,5-Trimethylbenzene	ND	260	
1,3-DCB	ND	NA	
1,4-DCB	ND	8.97	
Acetone	33.3		3,000,000
Benzene	33.2		25.08
Bromodichloromethane	ND	2.47	
Bromomethane	ND	280	
Carbon tetrachloride	ND		6.68
Chlorobenzene	ND	49,000	
Chloroethane	ND	850,000	
Chloroform	ND	5.40	
Chloromethane	ND	160	
cis-1,2-DCE	79.6		NA
cis-1,3-Dichloropropene	ND	NA	
Dichlorodifluoromethane	ND	9,000	
Ethylbenzene	3.36		54.5
Hexachlorobutadiene	ND	2.63	
m,p-Xylene	19.3		NA
MEK	6.61		380,000
Methylene chloride	1.65	J	370
MIBK	ND	160,000	
MTBE	33.9		650
Naphthalene	ND	3.43	
n-Hexane	5.07		44,000
o-Xylene	6.19		35,000
Styrene	ND	48,000	
TCE	146		57.4

TABLE 5-3

Analytes Detected at Facility 811 During Phase 3

Vapor Intrusion Assessment Report, Travis Air Force Base, California

Analyte	Subslab Concentration (ppbv)	Flag	Subslab RBC (ppbv)
Tetrachloroethylene	16.1		15.1
Toluene	1.93	J	18,000
trans-1,2-DCE	7.77		3,300
trans-1,3-Dichloropropene	ND	NA	
Trichlorofluoromethane	ND	28,000	
Trichlorotrifluoroethane	ND	850,000	
Vinyl chloride	8.69		54.3
TPH-gasoline	26,684*		NA

*Estimated concentration assuming a TPH-gasoline molecular weight of 100

Notes:

Bolded Values = concentrations exceeded applicable RBC

J flag = Result is greater than or equal to the method detection limit and less than the practical quantitation limit, or analyte concentration is an estimated value.

DCA = dichloroethane

DCB = dichlorobenzene

DCE = dichloroethene

EDB = dibromoethane

MEK = 2-Butanone

MIBK = methyl isobutyl ketone

MTBE = methyl tert-butyl ether

NA = not applicable

ND = not detected

ppbv = part(s) per billion by volume

RBC = risk-based concentration

TCA = trichloroethane

TCE = trichloroethene

TABLE 5-4

Analytes Detected at Facility 919 During Phase 3

Vapor Intrusion Assessment Report, Travis Air Force Base, California

Analyte	Indoor Air		Indoor Air		Subslab		Subslab		Outdoor Air	
	Concentration (ppbv)	Flag	RBC (ppbv)	Flag	Concentration (ppbv)	Flag	RBC (ppbv)	Flag	Concentration (ppbv)	Flag
Office (breathing zone)										
1,1,2-TCA	ND		0.141		ND		7.056		ND	
1,1-DCA	ND		1.9		ND		95.08		ND	
1,1-DCE	ND		80		ND		4,000		0.0019	J
1,2,4-Trichlorobenzene	ND		2.43		ND		120		ND	
1,2,4-Trimethylbenzene	0.905	J	6.32		0.79	J	320		0.176	J
1,2-DCA	0.0148	J	0.116		ND		5.81		0.00653	J
1,2-DCB	ND		140		ND		7,000		ND	
1,2-Dichloropropane	ND		0.26		ND		13.0		0.00988	J
1,2-Dichlorotetrafluoroethane	0.0126	J	19,000		ND		950,000		0.00552	J
1,2-EDB	ND		0.0026		ND		0.130		ND	
1,3,5-Trimethylbenzene	0.176	J	5.3		ND		260		0.0395	J
1,3-DCB	ND		NA		ND		NA		ND	
1,4-DCB	0.0479		0.179		0.11	J	8.97		0.106	
Acetone	21.9	J	59000		24.2		3,000,000		2.85	
Benzene	0.231		0.502		0.18	J	25.08		ND	
Bromodichloromethane	ND		0.049		ND		2.47		ND	
Bromomethane	0.0426	J	5.67		ND		280		0.00651	J
Carbon tetrachloride	0.112		0.134		ND		6.68		0.0191	J
Chlorobenzene	ND		980		ND		49,000		ND	
Chloroethane	0.0534	J	17,000		ND		850,000		ND	
Chloroform	0.0299	J	0.108		ND		5.40		0.0061	J
Chloromethane	0.507	J-	3.29		0.5	J	160		0.0394	J
cis-1,2-DCE	ND		NA		ND		NA		ND	
cis-1,3-Dichloropropene	ND		NA		ND		NA		0.00999	J
Dichlorodifluoromethane	0.489	J	180		ND		9,000		0.144	J
Ethylbenzene	0.242		1.09		0.29	J	54.5		0.185	
Hexachlorobutadiene	ND		0.053		ND		2.63		ND	
m,p-Xylene	1.23	J	NA		1.16	J	NA		0.573	J
MEK	2.32	J	7500		4.83		380,000		ND	
Methylene chloride	ND		7.48		ND		370		98.3	J
MIBK	0.222	J	3200		0.41	J	160,000		0.37	J
MTBE	ND		13.04		ND		650		5.06	
Naphthalene	0.0147	J	0.0687		0.38	J	3.43		0.0291	J
n-Hexane	ND		880		ND		44,000		6.78	

TABLE 5-4

Analytes Detected at Facility 919 During Phase 3

Vapor Intrusion Assessment Report, Travis Air Force Base, California

Analyte	Indoor Air		Indoor Air		Subslab		Subslab		Outdoor Air	
	Concentration (ppbv)	Flag	RBC (ppbv)	Flag	Concentration (ppbv)	Flag	RBC (ppbv)	Flag	Concentration (ppbv)	Flag
o-Xylene	0.466	J	690		0.43	J	35,000		0.199	J
Styrene	0.0479	J	950		ND		48,000		0.21	J
TCE	0.0662	J	1.15		0.66	J	57.4		0.0238	J
Tetrachloroethylene	0.0133	J	0.302		2.14		15.1		0.00965	J
Toluene	0.735	J	350		1.29	J	18,000		1.13	J
trans-1,2-DCE	ND		65.6		ND		3,300		0.00274	J
trans-1,3-Dichloropropene	ND		NA		ND		NA		ND	
Trichlorofluoromethane	0.253	J	550		0.28	J	28,000		0.0763	J
Trichlorotrifluoroethane	0.0657	J	17,000		ND		850,000		0.0212	J
Vinyl chloride	ND		1.09		ND		54.3		ND	
Subslab 2 (northwestern location)										
1,1,2-TCA	NA		0.141		ND		7.056		ND	
1,1-DCA	NA		1.9		ND		95.08		ND	
1,1-DCE	NA		80		ND		4,000		0.0019	J
1,2,4-Trichlorobenzene	NA		2.43		ND		120		ND	
1,2,4-Trimethylbenzene	NA		6.32		1.14	J	320		0.176	J
1,2-DCA	NA		0.116		ND		5.81		0.00653	J
1,2-DCB	NA		140		ND		7,000		ND	
1,2-Dichloropropane	NA		0.26		ND		13.0		0.00988	J
1,2-Dichlorotetrafluoroethane	NA		19,000		ND		950,000		0.00552	J
1,2-EDB	NA		0.0026		ND		0.130		ND	
1,3,5-Trimethylbenzene	NA		5.3		0.31	J	260		0.0395	J
1,3-DCB	NA		NA		ND		NA		ND	
1,4-DCB	NA		0.179		0.16	J	8.97		0.106	
Acetone	NA		59,000		14.9		3,000,000		2.85	
Benzene	NA		0.502		0.21	J	25.08		ND	
Bromodichloromethane	NA		0.049		ND		2.47		ND	
Bromomethane	NA		5.67		ND		280		0.00651	J
Carbon tetrachloride	NA		0.134		ND		6.68		0.0191	J
Chlorobenzene	NA		980		ND		49,000		ND	
Chloroethane	NA		17,000		ND		850,000		ND	
Chloroform	NA		0.108		ND		5.40		0.0061	J
Chloromethane	NA		3.29		ND		160		0.0394	J
cis-1,2-DCE	NA		NA		ND		NA		ND	
cis-1,3-Dichloropropene	NA		NA		ND		NA		0.00999	J

TABLE 5-4

Analytes Detected at Facility 919 During Phase 3

Vapor Intrusion Assessment Report, Travis Air Force Base, California

Analyte	Indoor Air		Indoor Air		Subslab		Outdoor Air	
	Concentration (ppbv)	Flag	RBC (ppbv)	Concentration (ppbv)	Flag	RBC (ppbv)	Concentration (ppbv)	Flag
Dichlorodifluoromethane	NA		180	ND		9,000	0.144	J
Ethylbenzene	NA		1.09	0.33	J	54.5	0.185	
Hexachlorobutadiene	NA		0.053	ND		2.63	ND	
m,p-Xylene	NA		NA	1.37	J	NA	0.573	J
MEK	NA		7,500	2.15		380,000	ND	
Methylene chloride	NA		7.48	ND		370	98.3	J
MIBK	NA		3,200	ND		160,000	0.37	J
MTBE	NA		13.04	ND		650	5.06	
Naphthalene	NA		0.0687	0.44	J	3.43	0.0291	J
n-Hexane	NA		880	ND		44,000	6.78	
o-Xylene	NA		690	0.58	J	35,000	0.199	J
Styrene	NA		950	ND		48,000	0.21	J
TCE	NA		1.15	2.8		57.4	0.0238	J
Tetrachloroethylene	NA		0.302	ND		15.1	0.00965	J
Toluene	NA		350	1.37	J	18,000	1.13	J
trans-1,2-DCE	NA		65.6	ND		3,300	0.00274	J
trans-1,3-Dichloropropene	NA		NA	ND		NA	ND	
Trichlorofluoromethane	NA		550	0.29	J	28,000	0.0763	J
Trichlorotrifluoroethane	NA		17,000	ND		850,000	0.0212	J
Vinyl chloride	NA		1.09	ND		54.3	ND	
Restroom (breathing zone, preferential pathway)								
1,1,2-TCA	ND		0.141	NA		7.056	ND	
1,1-DCA	ND		1.9	NA		95.08	ND	
1,1-DCE	ND		80	NA		4,000	0.0019	J
1,2,4-Trichlorobenzene	0.138	J	2.43	NA		120	ND	
1,2,4-Trimethylbenzene	0.266	J	6.32	NA		320	0.176	J
1,2-DCA	0.0143	J	0.116	NA		5.81	0.00653	J
1,2-DCB	ND		140	NA		7,000	ND	
1,2-Dichloropropane	0.0247	J	0.26	NA		13.0	0.00988	J
1,2-Dichlorotetrafluoroethane	0.0137	J	19,000	NA		950,000	0.00552	J
1,2-EDB	ND		0.0026	NA		0.130	ND	
1,3,5-Trimethylbenzene	0.0648	J	5.3	NA		260	0.0395	J
1,3-DCB	ND		NA	NA		NA	ND	
1,4-DCB	0.173		0.179	NA		8.97	0.106	
Acetone	5.35		59,000	NA		3,000,000	2.85	

TABLE 5-4

Analytes Detected at Facility 919 During Phase 3

Vapor Intrusion Assessment Report, Travis Air Force Base, California

Analyte	Indoor Air		Indoor Air		Subslab		Outdoor Air	
	Concentration (ppbv)	Flag	RBC (ppbv)	Flag	Concentration (ppbv)	Flag	RBC (ppbv)	Concentration (ppbv)
Benzene	0.374		0.502		NA		25.08	ND
Bromodichloromethane	ND		0.049		NA		2.47	ND
Bromomethane	0.0343	J	5.67		NA		280	0.00651 J
Carbon tetrachloride	0.0989		0.134		NA		6.68	0.0191 J
Chlorobenzene	ND		980		NA		49,000	ND
Chloroethane	ND		17,000		NA		850,000	ND
Chloroform	0.167		0.108		NA		5.40	0.0061 J
Chloromethane	0.538	J	3.29		NA		160	0.0394 J
cis-1,2-DCE	0.287	J	NA		NA		NA	ND
cis-1,3-Dichloropropene	ND		NA		NA		NA	0.00999 J
Dichlorodifluoromethane	0.493	J	180		NA		9,000	0.144 J
Ethylbenzene	0.13	J	1.09		NA		54.5	0.185
Hexachlorobutadiene	ND		0.053		NA		2.63	ND
m,p-Xylene	0.652		NA		NA		NA	0.573 J
MEK	0.674	J	7,500		NA		380,000	ND
Methylene chloride	ND		7.48		NA		370	98.3 J
MIBK	0.201	J	3200		NA		160,000	0.37 J
MTBE	ND		13.04		NA		650	5.06
Naphthalene	ND		0.0687		NA		3.43	0.0291 J
n-Hexane	0.479	J	880		NA		44,000	6.78
o-Xylene	0.227	J	690		NA		35,000	0.199 J
Styrene	ND		950		NA		48,000	0.21 J
TCE	0.967		1.15		NA		57.4	0.0238 J
Tetrachloroethylene	0.0268	J	0.302		NA		15.1	0.00965 J
Toluene	0.857	J	350		NA		18,000	1.13 J
trans-1,2-DCE	ND		65.6		NA		3,300	0.00274 J
trans-1,3-Dichloropropene	ND		NA		NA		NA	ND
Trichlorofluoromethane	0.24	J	550		NA		28,000	0.0763 J
Trichlorotrifluoroethane	0.0702	J	17,000		NA		850,000	0.0212 J
Vinyl chloride	ND		1.09		NA		54.3	ND
Mechanical Room (breathing zone, preferential pathway)								
1,1,2-TCA	0.0384		0.141		NA		7.056	ND
1,1-DCA	ND		1.9		NA		95.08	ND
1,1-DCE	ND		80		NA		4,000	0.0019 J
1,2,4-Trichlorobenzene	ND		2.43		NA		120	ND

TABLE 5-4

Analytes Detected at Facility 919 During Phase 3

Vapor Intrusion Assessment Report, Travis Air Force Base, California

Analyte	Indoor Air		Indoor Air		Subslab		Outdoor Air		
	Concentration (ppbv)	Flag	RBC (ppbv)	Flag	Concentration (ppbv)	Flag	RBC (ppbv)	Concentration (ppbv)	
1,2,4-Trimethylbenzene	0.977	J	6.32		NA		320	0.176	J
1,2-DCA	0.0171	J	0.116		NA		5.81	0.00653	J
1,2-DCB	ND		140		NA		7,000	ND	
1,2-Dichloropropane	0.0167	J	0.26		NA		13.0	0.00988	J
1,2-Dichlorotetrafluoroethane	0.019	J	19,000		NA		950,000	0.00552	J
1,2-EDB	ND		0.0026		NA		0.130	ND	
1,3,5-Trimethylbenzene	0.195	J	5.3		NA		260	0.0395	J
1,3-DCB	ND		NA		NA		NA	ND	
1,4-DCB	0.0825		0.179		NA		8.97	0.106	
Acetone	18.3	J	59,000		NA		3,000,000	2.85	
Benzene	0.252		0.502		NA		25.08	ND	
Bromodichloromethane	ND		0.049		NA		2.47	ND	
Bromomethane	0.0538	J	5.67		NA		280	0.00651	J
Carbon tetrachloride	0.108		0.134		NA		6.68	0.0191	J
Chlorobenzene	ND		980		NA		49,000	ND	
Chloroethane	0.0961	J	17,000		NA		850,000	ND	
Chloroform	0.021	J	0.108		NA		5.40	0.0061	J
Chloromethane	0.531	J-	3.29		NA		160	0.0394	J
cis-1,2-DCE	0.0197	J	NA		NA		NA	ND	
cis-1,3-Dichloropropene	ND		NA		NA		NA	0.00999	J
Dichlorodifluoromethane	0.501	J	180		NA		9,000	0.144	J
Ethylbenzene	0.221		1.09		NA		54.5	0.185	
Hexachlorobutadiene	ND		0.053		NA		2.63	ND	
m,p-Xylene	1.22	J	NA		NA		NA	0.573	J
MEK	2.85	J	7,500		NA		380,000	ND	
Methylene chloride	ND		7.48		NA		370	98.3	J
MIBK	0.282	J	3200		NA		160,000	0.37	J
MTBE	ND		13.04		NA		650	5.06	
Naphthalene	0.21		0.0687		NA		3.43	0.0291	J
n-Hexane	0.281	J	880		NA		44,000	6.78	
o-Xylene	0.432	J	690		NA		35,000	0.199	J
Styrene	0.0504	J	950		NA		48,000	0.21	J
TCE	0.0631	J	1.15		NA		57.4	0.0238	J
Tetrachloroethylene	0.00674	J	0.302		NA		15.1	0.00965	J
Toluene	0.951	J	350		NA		18,000	1.13	J

TABLE 5-4

Analytes Detected at Facility 919 During Phase 3

Vapor Intrusion Assessment Report, Travis Air Force Base, California

Analyte	Indoor Air		Indoor Air		Subslab		Outdoor Air	
	Concentration (ppbv)	Flag	RBC (ppbv)	Flag	Concentration (ppbv)	Flag	RBC (ppbv)	Concentration (ppbv)
trans-1,2-DCE	ND		65.6		NA		3,300	0.00274
trans-1,3-Dichloropropene	0.0789	J	NA		NA		NA	ND
Trichlorofluoromethane	0.311	J	550		NA		28,000	0.0763
Trichlorotrifluoroethane	0.0694	J	17,000		NA		850,000	0.0212
Vinyl chloride	0.0145	J	1.09		NA		54.3	ND

Notes:

Bolded values = concentrations exceeded applicable RBC

J flag = Result is greater than or equal to the method detection limit and less than the practical quantitation limit, or analyte concentration is an estimated value.

DCA = dichloroethane

DCB = dichlorobenzene

DCE = dichloroethene

EDB = dibromoethane

MEK = 2-Butanone

MIBK = methyl isobutyl ketone

MTBE = methyl tert-butyl ether

NA = not applicable

ND = not detected

ppbv = part(s) per billion by volume

RBC = risk-based concentration

TCA = trichloroethane

TABLE 5-5
 Comparison of Facility 919 Subslab Sample Results
 Vapor Intrusion Assessment Report, Travis Air Force Base, California

Analyte	Subslab Location 1 (Paired with Office)		Subslab Location 2		Subslab RBC (ppbv)
	Concentration (ppbv)	Flag	Concentration (ppbv)	Flag	
Subslab					
1,1,2-TCA	ND	ND			7.056
1,1-DCA	ND	ND			95.08
1,1-DCE	ND		ND		4,000
1,2,4-Trichlorobenzene	ND	ND			120
1,2,4-Trimethylbenzene	0.79	J	1.14	J	320
1,2-DCA	ND	ND			5.81
1,2-DCB	ND	ND			7000
1,2-Dichloropropane	ND	ND			13.0
1,2-Dichlorotetrafluoroethane	ND	ND			950,000
1,2-EDB	ND	ND			0.130
1,3,5-Trimethylbenzene	ND	0.31		J	260
1,3-DCB	ND	ND			NA
1,4-DCB	0.11	J	0.16	J	8.97
Acetone	24.2		14.9		3,000,000
Benzene	0.18	J	0.21	J	25.08
Bromodichloromethane	ND	ND			2.47
Bromomethane	ND	ND			280
Carbon tetrachloride	ND		ND		6.68
Chlorobenzene	ND	ND			49,000
Chloroethane	ND	ND			850,000
Chloroform	ND	ND			5.40
Chloromethane	0.5	J	ND	160	
cis-1,2-DCE	ND	ND			NA
cis-1,3-Dichloropropene	ND	ND			NA
Dichlorodifluoromethane	ND	ND			9,000
Ethylbenzene	0.29	J	0.33	J	54.5
Hexachlorobutadiene	ND	ND			2.63
m,p-Xylene	1.16	J	1.37	J	NA
MEK 4.83			2.15		380,000
Methylene chloride	ND		ND		370
MIBK 0.41		J	ND		160,000
MTBE ND			ND		650
Naphthalene	0.38	J	0.44	J	3.43
n-Hexane	ND	ND			44,000

TABLE 5-5
 Comparison of Facility 919 Subslab Sample Results
Vapor Intrusion Assessment Report, Travis Air Force Base, California

Analyte	Subslab Location 1 (Paired with Office)		Subslab Location 2		Subslab RBC (ppbv)
	Concentration (ppbv)	Flag	Concentration (ppbv)	Flag	
o-Xylene	0.43	J	0.58	J	35,000
Styrene	ND	ND			48,000
TCE	0.66	J	2.8		57.4
Tetrachloroethylene	2.14		ND	15.1	
Toluene	1.29	J	1.37	J	18,000
trans-1,2-DCE	ND	ND			3,300
trans-1,3-Dichloropropene	ND	ND			NA
Trichlorofluoromethane	0.28	J	0.29	J	28,000
Trichlorotrifluoroethane	ND	ND			850,000
Vinyl chloride	ND		ND		54.3

Notes:

Bolded values = concentrations exceeded applicable RBC

J flag = Result is greater than or equal to the method detection limit and less than the practical quantitation limit, or analyte concentration is an estimated value.

DCA = dichloroethane

DCB = dichlorobenzene

DCE = dichloroethene

EDB = dibromoethane

MEK = 2-Butanone

MIBK = methyl isobutyl ketone

MTBE = methyl tert-butyl ether

NA = not applicable

ND = not detected

ppbv = part(s) per billion by volume

RBC = risk-based concentration

TCA = trichloroethane

TCE = trichloroethene

TABLE 5-6

Analytes Detected at Facility 836 During Phase 3

Vapor Intrusion Assessment Report, Travis Air Force Base, California

Analyte	Indoor Air Concentration (ppbv)	Flag	Indoor Air RBC (ppbv)	Outdoor Air Concentration (ppbv)	Flag	Outdoor Air Concentration (ppbv)	Flag
Mechanical Room (floor drain, preferential pathway)							
1,1,1-Trichloroethane	ND		4,100	ND		ND	
1,1,2-Trichloro-1,2,2-trifluoroethane	0.071		17,000	0.066		0.066	
1,1-DCA	ND		1.902	ND		ND	
1,1-DCE	ND		80	ND		ND	
1,2-DCA	ND		0.116	ND		ND	
1,2-Dichloropropane	ND		0.260	ND		ND	
Benzene	0.088		0.502	0.045	J	0.045	J
Carbon tetrachloride	0.085		0.134	0.083		0.083	
Chloroform	0.031	J	0.108	ND	ND		
cis-1,2-DCE	ND		NA	ND		ND	
Styrene	0.042	J	950	ND	ND		
PCE	ND		0.302	ND		ND	
TCE	ND		1.147	ND		ND	
Vinyl chloride	ND		1.087	ND		ND	
Office (breathing zone)							
1,1,1-Trichloroethane	ND		4,100	ND		ND	
1,1,2-Trichloro-1,2,2-trifluoroethane	0.068		17,000	0.066		0.066	
1,1-DCA	ND		1.902	ND		ND	
1,1-DCE	ND		80	ND		ND	
1,2-DCB	ND		140	ND		ND	
1,2-DCA	0.57		0.116	ND	ND		
1,2-Dichloropropane	ND		0.260	ND		ND	
Benzene	0.16		0.502	0.045	J	0.045	J
Carbon tetrachloride	0.083		0.134	0.083		0.083	
Chloroform	0.029	J	0.108	ND	ND		
cis-1,2-DCE	ND		NA	ND		ND	
Styrene	0.067		950	ND	ND		
PCE	ND		0.302	ND		ND	
TCE	ND		1.147	ND		ND	
Vinyl chloride	ND		1.087	ND		ND	

TABLE 5-6
 Analytes Detected at Facility 836 During Phase 3
Vapor Intrusion Assessment Report, Travis Air Force Base, California

Analyte	Indoor Air		Indoor Air		Outdoor Air		Outdoor Air	
	Concentration (ppbv)	Flag	RBC (ppbv)	Flag	Concentration (ppbv)	Flag	Concentration (ppbv)	Flag
Breakroom (floor drain, preferential pathway)								
1,1,1-Trichloroethane	ND		4,100		ND		ND	
1,1,2-Trichloro-1,2,2-trifluoroethane	0.071		17,000		0.066		0.066	
1,1-DCA	ND		1.902		ND		ND	
1,1-DCE	ND		80		ND		ND	
1,2-DCB	ND		140		ND		ND	
1,2-DCA	0.028	J	0.116		ND	ND		
1,2-Dichloropropane	ND		0.260		ND		ND	
Benzene	0.086		0.502		0.045	J	0.045	J
Carbon tetrachloride	0.083		0.134		0.083		0.083	
Chloroform	0.051		0.108		ND	ND		
cis-1,2-Dichloroethene	ND		NA		ND		ND	
Styrene	0.087		950		ND	ND		
PCE	ND		0.302		ND		ND	
TCE	ND		1.147		ND		ND	
Vinyl chloride	ND		1.087		ND		ND	

Notes:

Bolded values = concentrations exceeded applicable RBC

J flag = Result is greater than or equal to the method detection limit and less than the practical quantitation limit, or analyte concentration is an estimated value.

DCA = dichloroethane

DCB = dichlorobenzene

DCE = dichloroethene

NA = not applicable

ND = not detected

PCE = tetrachloroethene

ppbv = part(s) per billion by volume

RBC = risk-based concentration

TCE = trichloroethene

TABLE 5-7

Comparison of Facility 864 Subslab Sample Results
 Vapor Intrusion Assessment Report, Travis Air Force Base, California

Analyte	Indoor Air Concentration (ppbv)	Flag	Indoor Air RBC (ppbv)	Outdoor Air Concentration (ppbv)	Flag
Electrical Conduit (breathing zone, preferential pathway)					
1,1,1-TCA	ND		4,100	ND	
1,1,2-Trichloro-1,2,2-trifluoroethane	0.069		17,000	0.066	
1,1-DCA	ND		1.902	ND	
1,1-DCE	ND		80	ND	
1,2-DCB	ND		140	ND	
1,2-DCA	0.026	J	0.116	ND	
1,2-Dichloropropane	ND		0.260	ND	
Benzene	0.19		0.502	0.045	J
Carbon tetrachloride	0.1		0.134	0.083	
Chloroform	20		0.108	ND	
cis-1,2-Dichloroethene	ND	NA		ND	
Styrene	0.03	J	950	ND	
PCE	ND		0.302	ND	
TCE	ND		1.147	ND	
Vinyl chloride	ND		1.087	ND	
Restroom (shower drain, preferential pathway)					
1,1,1-TCA	ND		4,100	ND	
1,1,2-Trichloro-1,2,2-trifluoroethane	0.07		17,000	0.066	
1,1-DCA	ND		1.902	ND	
1,1-DCE	ND		80	ND	
1,2-DCB	ND		140	ND	
1,2-DCA	0.036	J	0.116	ND	
1,2-Dichloropropane	ND		0.260	ND	
Benzene	0.38		0.502	0.045	J
Carbon tetrachloride	0.086		0.134	0.083	
Chloroform	0.03	J	0.108	ND	
cis-1,2-DCE	ND	NA		ND	
Styrene	0.043	J	950	ND	
PCE	ND		0.302	ND	
TCE	0.028	J	1.147	ND	
Vinyl chloride	ND		1.087	ND	

TABLE 5-7

Comparison of Facility 864 Subslab Sample Results
 Vapor Intrusion Assessment Report, Travis Air Force Base, California

Analyte	Indoor Air Concentration (ppbv)	Flag	Indoor Air RBC (ppbv)	Outdoor Air Concentration (ppbv)	Flag
Main Room (breathing zone)					
1,1,1-TCA	ND		4,100	ND	
1,1,2-Trichloro-1,2,2-trifluoroethane	0.068		17,000	0.066	
1,1-DCA	ND		1.902	ND	
1,1-DCE	ND		80	ND	
1,2-DCB	ND		140	ND	
1,2-DCA	0.037	J	0.116	ND	
1,2-Dichloropropane	ND		0.260	ND	
Benzene	0.24		0.502	0.045	J
Carbon tetrachloride	0.082		0.134	0.083	
Chloroform	ND		0.108	ND	
cis-1,2-Dichloroethene	ND		NA	ND	
Styrene	0.032	J	950	ND	
PCE	ND		0.302	ND	
TCE	0.065		1.147	ND	
Vinyl chloride	ND		1.087	ND	

Notes:

Bolded values = concentrations exceeded applicable RBC

J flag = Result is greater than or equal to the method detection limit and less than the practical quantitation limit, or analyte concentration is an estimated value.

DCA = dichloroethane

DCB = dichlorobenzene

DCE = dichloroethene

NA = not applicable

ND = not detected

PCE = tetrachloroethene

ppbv = part(s) per billion by volume

RBC = risk-based concentration

TCA = trichloroethane

TCE = trichloroethene

TABLE 5-8
 EPA Split Sample Results
 Vapor Intrusion Assessment Report, Travis Air Force Base, California

Analyte	Concentration (ppbv)	Flag	Indoor Air RBC (ppbv)	Subslab RBC (ppbv)
Facility 16 Utility Vault (preferential pathway)				
1,1,1-Trichloroethane	ND		4,100	210,000
1,1,2-Trichloro-1,2,2-trifluoroethane	0.065		17,000	850,000
1,1-Dichloroethane	ND		1.902	95.08
1,1-Dichloroethene	ND		80	4,000
1,2-Dichlorobenzene	ND		140	7,000
1,2-Dichloroethane	ND		0.116	5.81
1,2-Dichloropropane	ND		0.260	13.0
Benzene	0.071		0.502	25.1
Carbon tetrachloride	0.083		0.134	6.68
Chloroform	ND		0.108	5.40
cis-1,2-Dichloroethene	ND		NA	NA
Styrene	ND		950	48,000
Tetrachloroethene	ND		0.302	15.1
Trichloroethene	0.072		1.15	57.4
Vinyl chloride	ND		1.09	54.3
Facility 18 Shower Drain (preferential pathway)				
1,1,1-Trichloroethane	ND		4,100	210,000
1,1,2-Trichloro-1,2,2-trifluoroethane	0.069		17,000	850,000
1,1-Dichloroethane	ND		1.902	95.08
1,1-Dichloroethene	ND		80	4,000
1,2-Dichlorobenzene	0.93		140	7,000
1,2-Dichloroethane	ND		0.116	5.81
1,2-Dichloropropane	ND		0.260	13.0
Benzene	0.096		0.502	25.1
Carbon tetrachloride	0.088		0.134	6.68
Chloroform	0.025	J	0.108	5.40
cis-1,2-Dichloroethene	0.3		NA	NA
Styrene	0.3		950	48,000
Tetrachloroethene	ND		0.302	15.1
Trichloroethene	0.51		1.15	57.4
Vinyl chloride	ND		1.09	54.3

TABLE 5-8
 EPA Split Sample Results
 Vapor Intrusion Assessment Report, Travis Air Force Base, California

Analyte	Concentration (ppbv)	Flag	Indoor Air RBC (ppbv)	Subslab RBC (ppbv)
Facility 919 Office (breathing zone)				
1,1,1-Trichloroethane	ND		4,100	210,000
1,1,2-Trichloro-1,2,2-trifluoroethane	0.07		17,000	850,000
1,1-Dichloroethane	ND		1.902	95.08
1,1-Dichloroethene	ND		80	4,000
1,2-Dichlorobenzene	ND		140	7,000
1,2-Dichloroethane	ND		0.116	5.81
1,2-Dichloropropane	ND		0.260	13.0
Benzene	0.19		0.502	25.1
Carbon tetrachloride	0.09		0.134	6.68
Chloroform	0.045	J	0.108	5.40
cis-1,2-Dichloroethene	ND		NA	NA
Styrene	0.058		950	48,000
Tetrachloroethene	0.036	J	0.302	15.1
Trichloroethene	ND		1.15	57.4
Vinyl chloride	ND		1.09	54.3
Facility 919 Subslab 1				
1,1,1-Trichloroethane	0.28		4,100	210,000
1,1,2-Trichloro-1,2,2-trifluoroethane	0.12		17,000	850,000
1,1-Dichloroethane	ND		1.902	95.08
1,1-Dichloroethene	ND		80	4,000
1,2-Dichlorobenzene	ND		140	7,000
1,2-Dichloroethane	ND		0.116	5.81
1,2-Dichloropropane	ND		0.260	13.0
Benzene	0.13		0.502	25.1
Carbon tetrachloride	0.073		0.134	6.68
Chloroform	ND		0.108	5.40
cis-1,2-Dichloroethene	ND		NA	NA
Styrene	ND		950	48,000
Tetrachloroethene	1.5		0.302	15.1
Trichloroethene	0.065		1.15	57.4
Vinyl chloride	ND		1.09	54.3

Notes:

No concentrations exceeded applicable RBCs

J flag = Result is greater than or equal to the method detection limit and less than the practical quantitation limit, or analyte concentration is an estimated value.

NA = not applicable

ND = not detected

Vapor Intrusion Evaluation

This section presents a VI evaluation for each of the ERP sites. As outlined in Section 1, the CSMs were reviewed; the most recent groundwater data were screened against the groundwater RBCs presented in Section 2; and the shallow soil gas, slab, and indoor air data collected during Phases 1 and 3 were screened against the applicable site-specific RBCs presented in Section 2. Available data were used to identify sites with no significant VI risk as well as sites with the potential for significant VI impacts.

6.1 Conceptual Site Model

The CSM for Travis AFB was presented in the Work Plan (CH2M HILL, 2008) and was confirmed by field investigation (Figure 6-1). As described in the Work Plan, the primary sources of VOCs at Travis AFB are releases of liquid chemicals from past waste management and disposal practices. VOCs released at the surface have migrated to groundwater, resulting in groundwater VOC plumes. The most prevalent groundwater COC at the Base is TCE. Results of the Phase 1 soil gas sampling indicate that VOC contaminated groundwater is a secondary contaminant source to the vadose zone. Partitioning of VOCs from groundwater and subsequent migration through the vadose zone has resulted in VOCs in soil gas above the groundwater plumes.

Phase 1 of the investigation also confirmed the nature of the vadose zone lithology, which consists primarily of low permeability clay interfingering with lenses of more permeable sands and silty sands. Vadose zone soils were too fine grained and impermeable to collect soil gas samples at 16 of the 85 planned sample locations. The WIOU area and Site FT004 were the areas where the most impermeable soils were encountered. The fine-grained lithology reduces the mobility of VOCs in soil gas.

VOC concentrations (based on TCE as an indicator compound) detected in soil gas during the Phase 1 investigation were consistent with or less than modeled predictions that were presented in the Work Plan. Concentrations detected in soil gas were relatively low, with few exceedances of industrial SSG RBCs at Sites FT004, DP039, and the WIOU. Site SS029 had the most industrial SSG RBC exceedances, and the VOC soil gas concentrations at this site were consistent with J&E modeled concentrations.

During the Phase 3 investigation, the distribution of VOCs detected in slab and preferential pathway samples did not suggest that utilities intersecting the plume are acting as conduits for the migration of soil gas contamination. Per the Interstate Technology and Regulatory Council (ITRC) (2007), "Most buildings have subsurface utility penetrations, so their presence alone is not considered preferential." VOC concentrations detected in slab and indoor air samples targeting preferential pathways were not higher than anticipated, and did not indicate utility corridors were allowing contaminated soil gas to migrate beneath the building at higher concentrations than would be expected based on the location of the building in relation to the groundwater plume. Concentrations of the primary

groundwater COCs detected within the preferential pathway samples were below industrial indoor air RBCs.

Table 6-1 presents CSM summaries for the individual ERP sites addressed by this VI assessment (Sites FT004, FT005, LF006, LF007, LF008, SS015, SS016, SS029, SS030, SD031, ST032, SD033, SD034, SS035, SD036, SD037, DP039, and SD043). Figures 6-2 through 6-10 illustrate the distribution of the primary site COC in groundwater at these sites in 2Q09.

6.2 Evaluation of Sites with Groundwater VOC Concentrations below Screening Levels

In the Work Plan (CH2M HILL, 2008), several ERP sites were removed from further evaluation of the VI pathway because VOC concentrations in groundwater were less than groundwater screening levels. Results of the Phase 1 investigation were used to verify that the groundwater screening levels developed for Travis AFB were appropriate and health-protective (as described in Section 2). The most recent available groundwater data from the 2008–2009, GSAP (CH2M HILL, 2009b) were compared with the groundwater screening levels, and groundwater concentrations remain below residential and industrial screening levels at all of the sites designated for no further investigation. Sites at which current VOC concentrations were less than both residential and industrial groundwater screening levels included Sites FT005, LF007, LF006, LF008, SS030, SD031, and SD043. With the exception of offbase Sites LF007 and SS030, both current and future VI risk is considered insignificant at these sites because VOC concentrations in groundwater remain below residential and industrial screening levels. Groundwater remediation is ongoing at these sites, thus an increase in groundwater VOC concentrations is not expected at these sites; in fact, groundwater VOC concentrations are expected to continue to decrease.

Available groundwater data collected from Sites LF007 and SS030 indicate that the VI pathway is incomplete under current conditions because there are no buildings in the vicinity of the groundwater plumes and Site LF007 is overlain by a large vernal pool. However, future risk for VI is uncertain at Sites LF007 and SS030 because groundwater data gaps pertaining to the extent of contamination remain. Groundwater VOC concentrations exceeding the residential screening levels are not expected at Sites LF007 and SS030 given the current understanding of the distribution of contamination. The data gaps remaining at Sites LF007 and SS030 are in downgradient portions of the plumes where VOC concentrations are expected to be less than in the source areas (VOC concentrations are below the groundwater screening levels in the source areas). The remaining groundwater data gaps will not be addressed by this VI assessment. Additional investigation to define the nature and extent of groundwater contamination at Site SS030 is currently under way through a separate ERP field effort. Data collected at Site SS030 to date indicate groundwater VOC concentrations are below screening levels. Additional investigation at Site LF007 will be performed as a separate ERP field effort once access restrictions have been addressed. Groundwater data collected during these investigations will be reviewed against the groundwater screening levels presented in Section 2 to evaluate future VI risk at these sites.

6.3 Evaluation of Sites with Groundwater VOC Concentrations Exceeding Screening Levels

The following ERP sites have groundwater VOC concentrations exceeding screening levels: Sites FT004, SS015, SS016, SS029, ST032, SD033, SD034, SS035, SD036, SD037, and DP039. This section summarizes the data collected during the VI investigation at each site and provides an evaluation of VI risk. Table 6-2 lists existing buildings and facilities located in the vicinity of groundwater plumes exceeding industrial groundwater screening levels, their current uses, and VI investigation results. In addition to screening individual chemicals in shallow soil gas against RBCs that were based on site-specific attenuation factors (discussed in Section 2.3), the cumulative cancer risk for each shallow soil gas sampling location was also evaluated. Table 6-3 provides a summary of location-specific cumulative cancer risk and hazard index estimates for the shallow soil gas sample locations.

6.3.1 Site FT004

The most recent distribution of TCE in groundwater (2Q09) at Site FT004 is depicted on Figure 6-2. Shallow soil gas sampling was performed at Site FT004 during Phase 1 of the investigation (Figure 3-1). The vadose zone was too impermeable to collect four out of the nine soil gas samples planned at Site FT004. Low permeability soil reduces the potential for VI from the subsurface to buildings. The samples that were successfully collected included those located over portions of the plume with the highest VOC concentrations. Successful sample collections at locations SB706x04 and SB701x04 are located near wells MW266x04 and MW131x04, which have the highest VOC concentrations detected at the site. While only one sample collection in the southern portion of the plume was successful (SB706x04), as previously stated, this location is over an area of the plume with the highest VOC concentrations. Therefore, the successful locations provided adequate coverage of the VOC plume.

TCE soil gas concentrations did exceed the industrial SSG RBC at one location (SB706x04), which is within the 100- $\mu\text{g}/\text{L}$ TCE groundwater plume (Figure 3-1) and in an area where the highest VOC concentrations are detected in groundwater at the site. TCE was detected at a concentration of 1,740 ppbv in the shallow soil gas sample at this location, three times the industrial SSG RBC for TCE (570 ppbv). This exceedance is below the 1×10^{-5} industrial cancer risk for TCE. TCE concentrations detected at all other locations were less than 100 ppbv. No other chemicals detected exceeded the industrial SSG RBCs. In addition, the cumulative industrial cancer risk was less than 1×10^{-5} , and the industrial hazard index was less than 1 at all Site FT004 sample locations.

TCE concentrations exceeded the residential SSG RBC (22.8 ppbv) at all five of the locations. The exceedances were below the 1×10^{-5} residential cancer risk for TCE at all locations except SB706x04. Naphthalene exceeded the residential SSG RBC at one location (SB700x29). The concentration detected was 2.9 J ppbv, which is approximately two times the residential SSG RBC.

Currently, no significant VI risk exists from exposure to VOCs because buildings do not exist at the site (the VI pathway is incomplete). Soil gas concentrations exceeded industrial SSG RBCs at only one location, and the exceedance (TCE) was only three times the SSG RBC

(less than 1×10^{-5} industrial cancer risk). Thus comparison of available data with RBCs indicates there is insignificant potential risk from VI for future industrial uses. However, residential SSG RBCs were exceeded at all of the soil gas locations, which indicates a potentially unacceptable risk associated with VI for future residential uses in areas where groundwater concentrations may remain above the groundwater screening levels. Therefore mitigation measures or land use controls will need to be used to address the potential for unacceptable VI risk associated with future residential land uses.

6.3.2 Site SS015

Although groundwater VOC concentrations at Site SS015 exceeded industrial groundwater screening levels (CH2M HILL, 2009b), no further investigation of this site was performed. The groundwater plume at Site SS015 is limited in extent and largely overlain by Facility 554, which was constructed in 2004. Prior to construction of this facility, the Air Force recognized the potential for VI at this site and opted to mitigate, as a pre-emptive measure, by constructing Facility 554 with a vapor barrier and passive vent system. The most recent distribution of TCE in groundwater (2Q09) at Site SS015 is depicted on Figure 6-8.

An indoor air sample was collected at Facility 554 by the AFIOH on May 14, 2008. The sample was analyzed for VOCs by Method TO 15. The analytical results for the AFIOH field effort are provided in Appendix A of this report. VOCs detected included PCE; 1,1,1-trichloroethane (TCA); 1,2-DCA; chloroform; and carbon tetrachloride (TCE and cis-1,2-dichloroethene [DCE], primary groundwater COCs, were not detected). Of the VOCs detected, PCE; 1,2-DCA; and carbon tetrachloride were detected at similar concentrations compared with outdoor samples collected during Phase 1 of this VI investigation and appear to be representative of ambient conditions. The two other VOCs detected (1,1,1-TCA and chloroform) are not groundwater COCs. The presence of these VOCs is unlikely to be related to VI based on the construction of the building (vapor barrier and passive vent system), the similarity between indoor and outdoor air concentrations, and the inconsistency with groundwater COCs. None of the indoor air VOC concentrations at Facility 554 exceeded the industrial indoor air RBCs. Mitigation and/or land use controls will be used at this site to address VI concerns for both industrial and residential uses until groundwater concentrations decline to levels below VI screening levels.

Recently, concentrations of cis-1,2-DCE and vinyl chloride have been increasing significantly in groundwater at this site. Concentrations of both chemicals exceed 1,000 $\mu\text{g/L}$. This is due to a vegetable oil injection treatability study that was performed at the site in 2000–2001. The objective of the treatability study was to enhance biodegradation of the primary site COCs (PCE and TCE). Cis-1,2-DCE and vinyl chloride are daughter products of the biodegradation of PCE and TCE, and are expected to increase temporarily as PCE and TCE degrade. When the biodegradation is completed, cis-1,2-DCE and vinyl chloride degrade to ethane/ethane, which do not pose a health risk. However, because cis-1,2-DCE and vinyl chloride concentrations in groundwater beneath the facility are increasing, an indoor air monitoring program will be established at this facility to monitor the continued efficacy of the vapor barrier and passive vent system.

6.3.3 Site SS016

Site SS016 is located on the flightline. Because of the negative impact on the Base mission and the restrictions for drilling on and adjacent to the flightline, shallow soil gas samples were not collected at Site SS016 over the plume or at buildings adjacent to the plume during Phase 1. However, during Phase 3, subslab, indoor air, and outdoor air samples were collected at two facilities (16 and 18) closest to the groundwater plume and DNAPL source area (Figures 4-1 and 4-2). Facilities 16 (former maintenance shop) and 18 (former degreasing facility, currently used as a storage area) are within 100 feet of the 100- $\mu\text{g}/\text{L}$ TCE plume. A DNAPL source area (primarily TCE) was identified approximately 15 feet south of Facility 18 during an ongoing Site SS016 investigation. The most recent distribution of TCE in groundwater (2Q09) at Site SS016 is depicted on Figure 6-5. Figure 6-5 also shows the location of Facilities 16 and 18 in relation to the groundwater plume.

The results and conclusions of the Phase 3 sampling at Site SS016 are discussed in Section 5. The Phase 3 sampling at Facility 16 indicates that the Site SS016 groundwater plume does not pose a significant VI risk at this facility. However, the results of the Phase 3 sampling conducted at Facility 18 indicate the Site SS016 groundwater plume and nearby DNAPL source area pose a significant future VI risk at Facility 18. While indoor air TCE concentrations were either below industrial indoor air screening levels or at the low end of EPA's risk management range (approximately 10^{-6}), TCE was detected in the subslab sample at a concentration of 508,000 ppbv, exceeding the subslab industrial RBC (57.4 ppbv) by several orders of magnitude. Therefore, while there is not a significant VI risk under current conditions at Facility 18, there is a potentially significant future VI risk if the building foundation conditions change in the future. The results of the preferential pathway samples at both Facilities 16 and 18 indicate that preferential pathways do not pose a significant VI risk at Site SS016. TCE was not detected at concentrations exceeding RBCs in any sample collected at Facility 16; thus VI risk at this site is a function of proximity to the DNAPL source area.

Phase 3 sampling results indicate a potential unacceptable risk from VI for future industrial or residential uses in areas at Site SS016 where groundwater concentrations remain above the groundwater screening levels. Mitigation measures or land use controls will be used to address VI risk associated with future land uses.

6.3.4 Site SS029

The most recent distribution of TCE in groundwater (2Q09) at Site SS029 is depicted on Figure 6-4. Shallow soil gas sampling was performed at Site SS029 during Phase 1 of the investigation (Figure 3-2). All 15 planned soil gas samples were successfully collected. This was the site with the most industrial SSG RBC exceedances (primarily TCE and PCE), all of which were located within 100 feet of the 100- $\mu\text{g}/\text{L}$ TCE groundwater plume. Industrial SSG RBCs were exceeded at locations SB709x29, SB711x29, SB715x29, SB716x29, SB718x29, SB719x29, and SB720x29. TCE exceeded the industrial SSG RBC at locations SB709x29, SB716x29, SB718x29, SB719x29, and SB720x29. The maximum TCE concentration detected was 5,420 ppbv at location SB716x29, and TCE concentrations also exceeded 1,000 ppbv at locations SB709x29 and SB718x29. The exceedances were less than 10 times the industrial SSG RBCs and are therefore below the 1×10^{-5} industrial cancer risk for TCE. PCE exceeded the industrial SSG RBC at locations SB711x29 and SB715x29. The maximum PCE concentration detected was 251 ppbv, less than two times the industrial SSG RBC. One other

chemical, 1,2-dibromomethane, exceeded industrial SSG RBCs at Site SS029. It was detected at a concentration of 3.18 J ppbv at location SB711x29; this exceedance is less than three times the industrial SSG RBC. The cumulative industrial cancer risk was less than or equal to 1×10^{-5} , and the industrial hazard index was less than 1 at all SS029 sample locations. Thus for current and future industrial use, the VI exposure pathway is considered insignificant.

The residential SSG RBCs were exceeded at all but one (SB714x29) of the Site SS029 sampling locations, and the exceedances were greater than 10 times the residential SSG RBC at nine of the locations (residential cancer risk in the 1×10^{-5} to 1×10^{-4} range for these individual chemicals). Several chemicals detected exceeded residential SSG RBCs (Table 3-2). Thus there is a potential unacceptable VI risk at Site SS029 for residential use in the areas overlying the groundwater plume where groundwater concentrations exceed the screening levels. The most recent distribution of TCE in groundwater (2Q09) at Site SS029 is depicted on Figure 6-4.

There is one building, Facility 1130, located at Site SS029. Soil gas concentrations at location SB721x29, collected adjacent to this building, did not exceed industrial SSG RBCs. In addition, this building is a communication transmitter and not used as office space. Equipment maintenance and testing is periodically performed inside the building and lasts approximately 2 hours. Therefore, the industrial SSG RBCs based on full-time worker exposure are conservative for actual exposure conditions. An indoor air sample was collected at Facility 1130 by AFIOH on May 14, 2008. The sample was analyzed for VOCs by Method TO 15. No VOCs exceeded the industrial indoor air RBCs. The analytical data collected during the AFIOH field effort is provided in Appendix A.

Based on the shallow soil gas results and building usage, there is no significant current risk from VI at Site SS029 because shallow soil gas concentrations in the vicinity of the one existing building are below industrial RBCs. As described in Section 2, the industrial RBCs were calculated assuming a person works in the building over a period of 25 years, 250 days per year, and 8 hours per day. In addition, future VI risk for the entire site is considered insignificant for industrial scenarios because the cumulative industrial cancer risk was less than or equal to 1×10^{-5} , and the industrial hazard index was less than 1 at all Site SS029 shallow soil gas sample locations. Thus, for current and future industrial use, the VI exposure pathway is considered insignificant.

However, soil gas results indicate a potential unacceptable risk from VI for future residential uses at Site SS029 in areas where groundwater concentrations remain above the groundwater screening levels. Therefore, mitigation measures or land use controls will be used to address VI risk associated with future residential land uses.

6.3.5 Site ST032

VOC concentrations (primarily benzene) exceeded the industrial groundwater screening levels at Site ST032. Site ST032 consists of two open grassy areas surrounded by runway and taxiway pavement (Figure 6-5). There are no buildings in the vicinity of Site ST032; therefore, there is no current potentially complete pathway for indoor air exposure. Because of the impact on the Base mission, no further investigation was performed at this site. VI concerns will be addressed at this site by mitigation measures and/or land use controls for both industrial and residential uses until groundwater concentrations decline to levels below VI screening levels.

6.3.6 WIOU (Sites SD033, SD034, SS035, SD036, SD037)

The WIOU Sites SD033, SD034, SS035, SD036, and SD037 are addressed together because of their proximity and similarity of site conditions and remedial solutions. VOC contamination from these sites has commingled to form a large VOC groundwater plume in the industrialized area of Travis AFB. The most recent distribution of TCE in groundwater (2Q09) in the WIOU is depicted on Figure 6-6.

Shallow soil gas sampling was performed at the WIOU during Phase 1 of the investigation. Twenty-six of the 44 planned soil gas samples were successfully collected. The successful sample locations included those located above the portions of the plume with the highest VOC concentrations. The successful sample locations provide adequate coverage of the WIOU VOC plume to evaluate SSG VOC concentrations above and within 100 feet of the VOC plume. At 12 of the sample locations, the formation was too impermeable to collect a sample. Low permeability soil reduces the likelihood of significant VI impacts. At five of these locations, water entered the line during sampling, indicating the capillary fringe was encountered (sample depths of 8 to 9 feet bgs), and soil gas samples were not collected at these locations.

The distribution of TCE detected in soil gas depicted on Figure 3-3 indicates that although TCE concentrations in groundwater exceeded 1,000 µg/L in some portions of the groundwater plume, concentrations of TCE in soil gas were generally very low (less than 10 ppbv). Successful sample locations included those over the highest groundwater concentrations. VOC concentrations in soil gas samples collected at all but one location were below industrial SSG RBCs (Table 3-2), indicating a low potential for significant VI concerns. TCE concentrations detected in soil gas did not exceed industrial SSG RBCs in the WIOU. The maximum TCE concentration detected in soil gas was 464 ppbv at location SB749x36 (the industrial SSG RBC for TCE is 540 ppbv).

In the WIOU, only one location had a soil gas concentration exceeding the industrial SSG RBC. 1,2-Dichloropropane was detected at a concentration of 252 ppbv at location SB782x37, which is located in the center of the 100-µg/L TCE WIOU groundwater plume. The industrial SSG RBC is 130 ppbv. This exceedance is below the 1×10^{-5} industrial cancer risk for 1,2-dichloropropane. In addition, the cumulative industrial cancer risk was less than 1×10^{-5} and the industrial hazard index was less than 1 at all WIOU sample locations. 1,2-dichloropropane is not a groundwater COC in the WIOU. The residential SSG RBCs were exceeded at 13 of 26 successful WIOU sampling locations, and the exceedances were greater than 10 times the RBC at 6 of the locations (residential cancer risk in the 1×10^{-5} to 1×10^{-4} range for these individual chemicals). Several chemicals exceeded the residential SSG RBCs (Table 3-2).

During Phase 1 sampling, subslab, indoor air, and outdoor samples were collected concurrently at Facilities 836 and 864 in order to support the development of a site-specific attenuation factor. These facilities were selected because they were the buildings closest to the WIOU 100-µg/L TCE groundwater plume that were not scheduled to be demolished. VOC concentrations detected within these facilities were similar to those detected in the outdoor sample (background concentrations) and did not exceed the industrial indoor air RBCs. EPA also collected samples within Facility 836 on July 31, 2008. EPA samples focused on preferential pathways, thus the samples were collected in the restroom (at a floor drain

and within the breathing zone). TCE, the primary groundwater COC, was not detected in the preferential pathway samples collected by EPA. No VOCs exceeded industrial indoor air RBCs. In addition to the samples collected during this VI investigation, an indoor air sample was collected at Facility 836 by AFIOH on May 14, 2008. The sample was analyzed for VOCs by Method TO 15. No VOCs exceeded the industrial indoor air RBCs. The analytical data collected during the AFIOH and EPA field efforts are provided in Appendix A.

Although Phase 1 sampling results did not indicate significant VI risk at either of these facilities, EPA requested additional sampling of Facilities 836 and 864 during Phase 3. The results and conclusions of the Phase 3 sampling at these facilities are discussed in Section 5. The Phase 3 sampling results at these two facilities indicate that the groundwater plume beneath these facilities does not pose a significant VI risk. In addition, Phase 3 sample results indicate preferential pathways do not pose a significant risk at either facility.

Additional investigation was performed during Phase 3 at two WIOU facilities, 811 and 919, to address remaining data gaps. Soil gas samples were planned near each of these buildings, but sample collection was not successful. Facility 919 is located adjacent to a small groundwater plume where TCE concentrations in groundwater exceed 100 µg/L. The capillary fringe was encountered at location SB760x37, and a sample was not collected. A Stoddard solvent floating product plume is located adjacent to Facility 811 (the source of the plume), Site SD034. An attempt to collect a soil gas sample (SB727x34) above the Stoddard solvent plume was made, but the formation was too impermeable. The results and conclusions of the Phase 3 sampling at these two facilities are discussed in Section 5. Phase 3 sample results indicate the groundwater plume near Facility 919 does not pose a significant VI risk.

Currently, there is no risk of VI at Facility 811 because it is a hangar that is kept open during working hours. The hangar doors are large enough to allow airplanes inside the hangars, and while the hangar doors are open, the hangar is not considered an enclosed space. However, because of the presence of the floating product plume and VOC subsurface concentrations exceeding industrial subsurface RBCs, if usage of the facility changes or a new facility is constructed above the floating product plume, there may be significant VI risk as long as the floating product remains.

A few of the Phase 1 soil gas sampling locations near two other facilities (810 and 818) were unsuccessful. A soil gas sample (SB731x35) was attempted adjacent to Facility 818 to confirm a historical TCE concentration in soil gas near monitoring well pair MW02x35 and MW818x35. The formation was too impermeable to collect the soil gas sample. The TCE plume has been greatly reduced in this area since the initial field screening soil gas sampling was performed in 1995 (because of ongoing groundwater extraction and treatment), and this building is now more than 100 feet away from the plume. The monitoring wells adjacent to this building were sampled during the November 2008 GSAP event to confirm that VOC concentrations at Site SD035 (where Facility 818 is located) have declined below groundwater screening levels. All VOC concentrations detected were below industrial groundwater screening levels and MCLs (CH2M HILL, 2009b).

A soil gas sample (SB724x33) was also attempted on the western side of Facility 810 to confirm another historical detection of TCE in soil gas but was unsuccessful because water entered the sampling line, indicating the capillary fringe had been encountered (9 feet bgs).

Soil boring SB725x33, located on the eastern side of the facility was successful; VOC concentrations were below industrial SSG RBCs. This facility is also now located more than 100 feet away from the WIOU VOC plume. Groundwater analytical data for MW810M1x37 (located on the western side of the facility near the historical TCE detection in soil gas) collected during the November 2008 GSAP event were reviewed and confirm that TCE concentrations in groundwater have decreased to less than the screening levels in this area. No VOCs detected in the groundwater sample exceeded industrial groundwater screening levels.

With the exception of Facility 811, which overlies a floating product plume, VI investigation in the WIOU indicates the WIOU groundwater plume does not present a significant VI risk for industrial usage. Soil gas concentrations exceeded industrial SSG RBCs at only one location; and the exceedance (1,2-dichloropropane) was only twice the SSG RBC (less than 1×10^{-5} industrial cancer risk). In addition, the cumulative industrial cancer risk was less than 1×10^{-5} , and the industrial hazard index was less than 1 at all WIOU sample locations. Comparison of available data with RBCs indicates there is not significant potential risk from VI for future industrial uses. Indoor, subslab, and preferential pathway samples collected at facilities within the WIOU also indicate a low risk from the VI pathway. However, residential SSG RBCs were exceeded at half of the soil gas locations sampled, and there is a potential risk from VI for future residential uses in the WIOU in areas where groundwater concentrations remain above the groundwater screening levels. Therefore, mitigation measures or land use controls will be used to address VI risk associated with future residential land uses.

6.3.7 Site DP039

Shallow soil gas sampling was performed at Site DP039 during Phase 1 of the investigation (Figure 3-4). All 18 soil gas samples planned for this site were successfully collected. One of these was a subslab sample collected beneath Facility 755, which has since been demolished. The most recent distribution of TCE in groundwater (2Q09) at Site DP039 is depicted on Figure 6-9.

TCE concentrations exceeded industrial SSG RBCs at two locations (SB766x39 and SB779x39), located within the 100- $\mu\text{g}/\text{L}$ TCE groundwater plume. The maximum TCE concentration detected was 2,120 ppbv at location SB766x39, which overlies the portion of the plume where TCE concentrations exceed 1,000 $\mu\text{g}/\text{L}$. This exceedance is below the 1×10^{-5} industrial cancer risk for TCE. No other chemical exceeded industrial SSG RBCs. In addition, the cumulative industrial cancer risk was less than 1×10^{-5} , and the industrial hazard index was less than 1 at all Site DP039 sample locations. Residential SSG RBCs were exceeded at 11 of the sampling locations, and several chemicals exceeded the residential SSG RBCs. Three of the exceedances were greater than 10 times the residential SSG RBCs (residential cancer risk in the 1×10^{-5} to 1×10^{-4} range for these individual chemicals).

At the time the Phase 1 investigation was performed, two buildings overlaid the Site DP039 100- $\mu\text{g}/\text{L}$ TCE groundwater plume: Facility 755 and Facility 888; however, Facility 755 was demolished in 2009. During Phase 1, subslab, indoor air, and outdoor samples were collected concurrently at Facility 755 in order to support the development of a site-specific attenuation factor. Although Facility 755 was on the demolition list, it was selected for sampling because it is one of the few buildings at Travis AFB directly overlying a

groundwater plume where VOC concentrations exceed groundwater screening levels. Thus it may be considered a worst-case scenario at the Base. VOC concentrations detected within the facility were similar to those detected in the outdoor sample (ambient concentrations) and did not exceed the industrial indoor air RBCs. Based on the VOC concentrations detected below and within the facility (less than industrial RBCs), the potential risk from the VI pathway was insignificant at Facility 755.

Two shallow soil gas samples were collected adjacent to Facility 888; industrial SSG RBCs were not exceeded at either location. Therefore, soil gas results do not indicate significant risk from the VI pathway at this facility for industrial usage. In addition, Facility 888 is currently a locked warehouse supply facility and is typically unoccupied.

Shallow soil gas samples were collected adjacent to Facilities 866 and 869, which are beyond the 100- $\mu\text{g}/\text{L}$ TCE groundwater plume. Because utilities to these buildings cross through the Site DP039 plume, shallow soil gas samples were collected near the buildings to evaluate whether utilities were acting as a conduit for soil gas contamination to migrate beyond the groundwater plume. Industrial SSG RBCs were not exceeded at either location.

Industrial SSG RBCs were not exceeded near any building at Site DP039, and there is therefore no significant current risk from the VI pathway at Site DP039. In addition, the cumulative industrial cancer risk was less than 1×10^{-5} , and the industrial hazard index was less than 1 at all Site DP039 shallow soil gas sample locations. Thus for current and future industrial use, the VI exposure pathway is considered insignificant.

However, soil gas results indicate a potential unacceptable risk from VI for future residential uses at Site DP039 in areas where groundwater concentrations remain above the groundwater screening levels. Therefore, mitigation measures or land use controls will be used to address VI risk associated with future residential land uses.

6.4 Uncertainty Discussion

The primary sources of uncertainty in this VI assessment are temporal and spatial variation in VOC concentrations, and the attenuation factors used to develop the RBCs.

6.4.1 Temporal Variability

Groundwater and soil gas results were the primary data compared against screening levels to support the evaluation of whether or not a site poses a VI risk. Groundwater data collected from 2006 through 2009 were compared with the groundwater screening levels to identify sites requiring further investigation. Groundwater data were collected semiannually (November to December and May to June); therefore, temporal variability in groundwater concentrations has been accounted for and presents a limited uncertainty.

Phase 1 soil gas data were collected during June/July; therefore, no empirical analysis of the temporal variability of the soil gas can be performed. However, the soil gas data were collected during the summer when concentrations were expected to be the highest based on the assumption that as the water table falls there is an increased flux of VOCs from groundwater to the vadose zone. In addition, soil gas samples were collected immediately above the water table where EPA (<http://iavi.rti.org/WorkshopsAndConferences.cfm>)

anticipates maximum concentrations and reduced temporal variability because vapors are in equilibrium with the source (groundwater), and seasonal factors (e.g., temperature, precipitation, changes in barometric pressure) have a reduced impact. Therefore, the acknowledged temporal uncertainty associated with soil gas results is not anticipated to change the conclusions of this VI assessment.

Indoor air samples were collected at Facilities 836 and 864 both in July 2008 (Phase 1) and July 2009 (Phase 3). Both sets of samples were collected in the summer; however, the samples were collected a year apart. Sample results in both cases were similar and did not indicate significant VI risk.

6.4.2 Spatial Variability

VOC concentrations in groundwater, shallow soil gas, subslab soil gas, and to some extent, indoor air, vary spatially. The groundwater monitoring network at Travis AFB is robust, and the data set provided by routine monitoring provides a good understanding of the spatial distribution of VOCs in groundwater. Soil gas samples were collected over four groundwater plumes to evaluate the spatial distribution. Soil gas sample locations targeted both areas of high and low groundwater VOC concentrations. Soil gas samples were also collected over different geographical areas of the Base (northern, western, and southern areas). Although there were limited instances when scheduled soil gas samples were not collected because of practical constraints (e.g., moisture in the sampling train, tight/fine-grained soils), this occurred infrequently, did not exhibit a significant spatial pattern, and there were an adequate number of nearby samples to prevent these occurrences from becoming significant data gaps.

In Phase 1, subslab and indoor air samples collected to support the development of a site-specific attenuation factor used to calculate RBCs were collected at three different buildings, overlying two different groundwater plumes. One paired subslab/indoor air sample location was selected for each building. Although spatial variability in subslab and indoor air concentrations is acknowledged, subslab probes were installed in areas overlying or in closest proximity to the groundwater plume based on a review of the groundwater results and building use/history. Building foundations at Travis AFB typically consist of a high permeability gravel layer overlain by a concrete slab, and thus large variations in subslab concentrations are not expected. The variability of indoor air results is generally minimal (e.g., a factor of 3 to 5 [<http://iavi.rti.org/WorkshopsAndConferences.cfm>]) and indoor air sampling locations were assumed to be representative of building conditions based on adequate air circulation within the building (either due to small building size or operation of an HVAC system).

Phase 3 indoor and subslab sampling results were consistent with these assumptions. Phase 3 sampling included multiple indoor air sampling locations, including preferential pathways. Indoor air sampling results were not highly variable within the facilities, even with the inclusion of preferential pathway samples. At Facility 919, two subslab locations were sampled, and VOC concentrations at the two locations were within the same order of magnitude and did not indicate a large variation of VOC concentrations beneath the facility slab.

6.4.3 Attenuation Factors

Attenuation factors from groundwater to indoor air may vary by orders of magnitude. The attenuation factor must account for the various uncertainties inherent in a VI assessment; therefore, conservative (i.e., health-protective) attenuation factors were used in this VI evaluation.

In accordance with the multiple lines of evidence approach used in this investigation, both modeling and empirical data were used to develop a site-specific attenuation factor. Modeled results were compared with soil gas, subslab, and indoor air data. At all but one location (where modeled and measured results were comparable) the model overestimated measured soil gas and subslab concentrations. This is likely due to the use of a sandy loam as the soil type in the model, which was selected as a conservative assumption. The vadose zone lithology at Travis AFB is primarily low permeability silts and clays interfingered with lenses of more permeable sands and silty sands.

Paired subslab and indoor air samples at three facilities (755, 836, and 864) during Phase 1 were used to evaluate attenuation through the slab into the building. Subslab to indoor air attenuation factors calculated ranged from 1 in 1,000 to 1 in 50. Because of the low subsurface source strength (the maximum TCE concentration detected beneath a slab was 9.9 ppbv) and indoor air concentrations similar to outdoor/background concentrations, these attenuation factors for subslab to indoor air are likely to be biased high (i.e., conservative or health-protective). The most conservative of these measured subslab soil gas-to-indoor air attenuation factors (1 in 50) was selected for use in the development of the site-specific SSG RBCs. The paired subslab and indoor air samples collected at facilities during Phase 3 indicated that the 1-in-50 attenuation factor is conservative; attenuation factors of 1 in 300 to 1 in 300,000 were calculated from the Phase 3 data.

The site-specific SSG RBCs for developed industrial/commercial use are based on an attenuation factor of 1 in 500 (using a 1-in-10 attenuation factor from shallow soil gas to subslab soil gas and a 1-in-50 attenuation factor from subslab soil gas to indoor air). This shallow soil gas attenuation factor is more conservative than the generic attenuation factor of 1 in 1,000 presented in the DTSC's VI guidance for existing slab-on-grade commercial buildings (DTSC, 2005b).

6.5 Summary

Table 6-4 summarizes the results of the VI investigation and conclusions of the VI evaluation. Groundwater will continue to be monitored at the ERP sites until cleanup levels determined in the Basewide Groundwater ROD are met. Development of the groundwater cleanup levels will include consideration of the VI groundwater screening levels presented in this report.

TABLE 6-1
 ERP Site CSM Summaries
 Vapor Intrusion Assessment Report, Travis Air Force Base, California

Site	Site Designation	Site Description	Remedial Actions	Groundwater COCs	NAPL Present?	Lithology	Approximate Depth to Groundwater (feet bgs)	Buildings Overlying Plume?
FT004	FTA-3	Site FT004 covers approximately 20 acres in the northeastern portion of Travis AFB and consists of the former FTA 3. Waste fuel, oils, and solvents were burned at this site during fire training exercises from 1953 to 1962. The site is now an unused, open field. VOCs and metals have been identified as groundwater COCs.	Groundwater contamination is currently addressed by a groundwater extraction and treatment IRA. The extraction system has been shut down and is currently undergoing a rebound study. The current distribution of the primary groundwater contaminant, TCE, is depicted on Figure 6-2. Soil remediation took place as described in the NEWIOU Soil, Sediment, and Surface Water ROD (Travis AFB, 2006).	TCE cis-1,2-DCE 1,2-DCA chloroform bromodichloromethane 1,1-DCE vinyl chloride 1,4-DCB bis(2-ethylhexyl)phthalate nickel	No	Alluvium overlying sedimentary bedrock. Alluvium consists of primarily silt and clay with discontinuous sand lenses present.	10 to 15	No
FT005	FTA-4	Site FT005 covers approximately 30 acres in the southeastern portion of Travis AFB. The site includes the former FTA 4, used for fire training exercises from 1962 through approximately 1987. From 1962 until the early 1970s, waste fuels, oils, and solvents were burned at the site during training exercises. From the early 1970s until FTA 4 was closed, only waste fuels were burned. VOCs, SVOCs, and metals have been identified as groundwater COCs. PCBs, metals, PAHs, dioxins, and pesticides have been identified in the soil at Site FT005.	Groundwater contamination is currently addressed by a groundwater extraction and treatment IRA. The extraction system has been shut down and is currently undergoing a rebound study. The current distribution of TCE is depicted on Figure 6-4.	TCE 1,2-DCA cis-1,2-DCE chloroform bromodichloromethane bis(2-ethylhexyl)phthalate nickel	No	Alluvium overlying sedimentary bedrock. Alluvium consists of primarily silt and clay with discontinuous sand lenses present. Low permeability silts and clays dominate from 10 to 20 feet bgs. Relatively permeable sands and silts dominate below the water table (20 feet bgs).	15 to 20	No
LF006	Landfill 1	Landfill 1 was a burn-and-fill landfill operated from 1943 to 1950 that covered approximately 17 acres in the northeastern portion of Travis AFB. Materials disposed of and burned consisted primarily of general refuse, such as wood, glass, and construction debris, although some disposal of industrial wastes was reported. VOCs and fuels have been identified as groundwater COCs. No COCs have been identified for soil.	Groundwater contamination is currently addressed by monitored natural attenuation. The current distribution of the primary groundwater contaminant, TCE, is depicted on Figure 6-3. NFA for soil is documented in the Final NOU RI (Radian, 1995).	1,1-DCE TCE TPH-G TPH-D	No	Alluvium overlying sedimentary bedrock. The near surface alluvium consists of primarily silts and clays to depths of 10 to 37 feet bgs. More permeable sands are encountered above the bedrock.	9 to 15	No
LF007	Landfill 2	Site LF007 is former Landfill 2 and occupies approximately 73 acres in the northeastern portion of Travis AFB. The landfill is currently the site of the base CAMU. The landfill was operated in a trench-and-cover method beginning in the early 1950s through 1974. The landfill was used primarily for the disposal of general refuse, such as wood, glass, and construction debris. From the early 1950s until 1964, a portion of the eastern part of the landfill was used for storage of excess and waste materials, including oils, hydraulic fluid, and solvents for resale or disposal. VOCs, PCBs, dioxins, and SVOCs have been identified as groundwater COCs. Contaminants identified in soil at Site LF007 include PAHs, PCBs, SVOCs, and metals.	Groundwater contamination is currently addressed by a combination of groundwater extraction and treatment (offbase groundwater contamination) and monitored natural attenuation (onbase groundwater contamination) IRA. The current distribution of the primary groundwater contaminant, TCE, is depicted on Figure 6-2. Soil contamination has been addressed by a combination of excavation and Land Use Controls as determined in the NEWIOU Soil, Sediment, and Surface Water ROD (Travis AFB, 2006).	1,1-DCA 1,1-DCE 1,2-DCA 1,2-dichloropropane 1,4-dichlorobenzene benzene chlorobenzene TCE vinyl chloride bis(2-ethylhexyl)phthalate PCBs 2,3,7,8-tetrachlorodibenzo-p-dioxin	No	Original lithology consists of alluvium overlying sedimentary bedrock. Alluvium consists of primarily silt and clay with discontinuous sand lenses. Municipal waste and backfill materials are also present (a few feet to 20 feet thick). Backfill consists of clayey silt, sand and gravel, and organic matter.	7 to 10	No

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LF008	Landfill 3	Site LF008 comprises approximately 1 acre within the northern portion of Bunker A (Weapons Storage Area) in the western portion of the Base. Site LF008 consists of multiple burial trenches used to dispose of approximately 30 cubic yards of pesticide containers during the 1970s. The unlined burial trenches were covered with fill soil. In 2003, all of the trenches within Site LF008 were completely excavated, and the debris was shipped offsite. During investigations and the excavation, no evidence was found that contaminants other than pesticides and herbicides were disposed of at the site. Pesticides have been identified as groundwater COCs.	Groundwater contamination is currently addressed by a groundwater extraction and treatment IRA. The extraction system has been shut down and is currently undergoing a rebound study. The current distribution of the primary groundwater contaminant, alpha-chlordane, is depicted on Figure 6-10. Soil remediation took place as described in the Soil ROD for the WABOU (Travis AFB, 2002).	aldrin alpha-chlordane heptachlor heptachlor epoxide	No	Site LF008 overlies a ridge composed of weathered Tahema Formation materials. The upper 10 feet consists primarily of sandy silt and silty sand with layers of sandy clay. The deeper stratigraphy consists of interbedded sands and silty sands with some clay.	20 to 35	No
SS015	Solvent Spill Area and Facilities 808, 1832, and 552	Site SS015 is in the northwestern part of the EIOU and consists of the SSA and Facilities 550 and 552. The SSA covers approximately 1.4 acres east of Facility 550 in an area previously used for stripping paint from aircraft. The site was an open grassy plot adjacent to an asphalt driveway and Facility 552. Facility 552 consisted of a fenced, bermed, concrete pad constructed in 1964 that was used as a temporary hazardous waste collection point. Stored wastes include paint, chromic acid, and solvents generated during aircraft maintenance operations at Facility 550 (Weston, 1995). Facility 550 contained a corrosion control facility where aircraft parts and support equipment were treated and painted. A metals processing shop in Facility 550 used plating solutions containing cadmium. Facility 1832 is a 15,000-gallon OWS that received liquids generated at a wash rack on the aircraft parking apron. In 1992, a new hazardous waste accumulation facility was constructed at the site. In 2004, Facilities 550 and 552 were demolished to construct a POL military compound consisting of an office building, a fuel truck maintenance facility, and a large concrete truck parking area. The POL building was constructed with a vapor barrier and passive vent system to protect the building from potential vapor intrusion from the underlying groundwater plume. VOCs, SVOCs, and metals have been identified as groundwater COCs. The contaminant identified in soil is cadmium.	A treatability study was conducted at Site SS015 to evaluate the effectiveness of using vegetable oil to enhance the biodegradation of VOCs in groundwater. The study, completed in March 2003, showed localized degradation of VOCs. The current distribution of the primary groundwater contaminant, TCE, is depicted on Figure 6-8. The interim groundwater remedy selected for Site SS015 is a monitored natural attenuation assessment. The soil contamination (cadmium) is being addressed by Land Use Controls as determined in the NEWIOU Soil, Sediment, and Surface Water ROD (Travis AFB, 2006).	1,2-DCA cis-1,2-DCE TCE PCE vinyl chloride bis(2-ethylhexyl)phthalate nickel	No	Alluvium overlying sedimentary bedrock. Alluvium consists of primarily silt and clay with discontinuous sand lenses present.	7 to 10	Yes (vapor barrier and passive vent system in place)
SS016	Oil Spill Area; Facilities 11, 13/14, 20, 42/1941, and 139/144; and the SSRW	Site SS016 is in the central portion of Travis AFB and consists of the OSA; Facilities 11, 13/14, 20, 42/1941, and 139/144; and the SSRW. The OSA covers approximately 7 acres north of Facility 16. The OSA originally encompassed an area where waste oil had reportedly been spilled or disposed of on a grassy area. The area is now paved. Oil spills, degreasing operations, leaking OWSs, equipment maintenance and repair, aircraft washing, hazardous waste storage, vehicle maintenance, storm water runoff, and a wash rack are the principal contamination sources in these areas. Chemicals handled include lubricating oils, hydraulic fluid, solvents, and water-containing solutions of these chemicals. VOCs, SVOCs, and metals have been identified as groundwater COCs. PAHs and PCBs were identified as soil contaminants.	Groundwater contamination is currently addressed by a groundwater extraction and treatment IRA. The current distribution of the primary groundwater contaminant, TCE, is depicted on Figure 6-5. Soil contamination has been addressed by Land Use Controls as determined in the NEWIOU Soil, Sediment, and Surface Water ROD (Travis AFB, 2006).	1,4-DCB 1,2-DCA 1,1-DCE benzene cis-1,2-DCE chloroform TCE PCE vinyl chloride bromodichloromethane bis(2-ethylhexyl)phthalate nickel	DNAPL suspected	Alluvium overlying sedimentary bedrock. Alluvium consists of primarily silt and clay with discontinuous sand lenses present.	7 to 15	Yes

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SS029	MW329x29 Area	Site SS029 consists of approximately 5.5 acres around MW329x29 in the southern part of Travis AFB, just south of the runway. VOCs have been identified as groundwater COCs; no source for the groundwater contamination has been identified. Soils contain low levels of metals, VOCs, and SVOCs.	Groundwater contamination is currently addressed by a groundwater extraction and treatment IRA. The current distribution of the primary groundwater contaminant, TCE, is depicted on Figure 6-4. No action is the selected remedial alternative to address the soil at this site, as determined in the NEWIOU Soil, Sediment, and Surface Water ROD (Travis AFB, 2006).	1,1-DCE 1,2-DCA benzene chloroform cis-1,2-DCE TCE vinyl chloride	No	Alluvium overlying sedimentary bedrock. Low permeability silts and clays present from 10 to 30 feet bgs. Relatively permeable sands and silts (up to 20 feet thick) dominate below the upper clay layer. A lower clay layer ranging in thickness from 0 to 25 feet underlies the sandy layer.	10 to 20	Yes
SS030	MW269x30 Area	Site SS030 covers approximately 1.6 acres around MW269x30, near the southern base boundary. The site is adjacent to a radar facility (Facility 1125); however, historical aerial photographs do not indicate any staining in the area or activities that may have been the source of contamination. Possible sources include a leachfield and/or surface disposal of TCE. VOCs and metals have been identified as groundwater COCs. Soils contain low levels of metals, VOCs, and SVOCs.	Groundwater contamination is currently addressed by a groundwater extraction and treatment IRA. The current distribution of the primary groundwater contaminant, TCE, is depicted on Figure 6-4. No action is the selected remedial alternative to address the soil at this site, as determined in the NEWIOU Soil, Sediment, and Surface Water ROD (Travis AFB, 2006).	1,2-DCA bromodichloromethane chloroform TCE nickel	No	Alluvium overlying sedimentary bedrock. Low permeability silts and clays present to approximately 20 feet bgs. Relatively permeable sands and silts (up to 20 feet thick) dominate below the upper clay layer. A lower clay layer ranging in thickness from 0 to 25 feet underlies the sandy layer.	12 to 20	No
SD031	Facility 1205	Building 1205 is a diesel generator maintenance and repair facility located within the northeastern portion of the WIOU. It was constructed in 1957 and includes a wash rack and OWS. The facility has handled oils, antifreeze, and solvents since 1957. VOCs and metals have been identified as groundwater COCs. No COCs have been identified for soil.	Groundwater contamination is currently addressed by a groundwater extraction and treatment IRA. The IRA goals for the groundwater extraction system have been achieved at this site; the system has been shut down and is currently undergoing a rebound study. The current distribution of the primary groundwater contaminant, TCE, is depicted on Figure 6-2. NFA for soil is documented in the Final East EIOU RI (Weston, 1995).	1,1-DCE 1,2-DCA benzene carbon tetrachloride chloroform cis-1,2-DCE TCE vinyl chloride nickel	No	Alluvium overlying sedimentary bedrock. Alluvium consists of primarily silt and clay with discontinuous sand lenses present.	8 to 14	No
ST032	MW107x32 Area and MW246x32 Area	The MW246x32 and MW107x32 area is in the southern portion of Site ST032, also known as the Plume B area, on the flightline. The area consists of grassy, open areas between a runway and an abandoned taxiway. Land use is severely restricted because of the proximity of the runway. MW107x32 and MW246x32 are located in the area of the SSRW. VOCs, metals, and fuels have been identified as groundwater COCs. Metals, SVOCs, and VOCs were identified in soil.	The LNAPL is addressed by free product removal. Passive hydroskimmers were used for free product removal and were removed in 2002 because product recovery had reached low asymptotic levels. No measurable amounts of floating product have been noted at the site since the removal of the hydroskimmers. Because the only COCs now detected in groundwater at the site are fuel related, this site has been removed from the ERP and placed in the POCO program. Soil contamination has been addressed by Land Use Controls as determined in the NEWIOU Soil, Sediment, and Surface Water ROD (Travis AFB, 2006).	1,1-DCE benzene TCE xylenes bis(2-ethylhexyl)phthalate	LNAPL (fuel)	Alluvium overlying sedimentary bedrock. Alluvium consists of primarily silt and clay with discontinuous sand lenses present.	8 to 15	No

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 Vapor Intrusion Assessment Report, Travis Air Force Base, California

Site	Site Designation	Site Description	Remedial Actions	Groundwater COCs	NAPL Present?	Lithology	Approximate Depth to Groundwater (feet bgs)	Buildings Overlying Plume?
SD033	Storm Sewer System II, Facilities 810 and 1917, South Gate Area, and West Branch of Union Creek	Site SD033 includes the west branch of Union Creek, parts of Storm Sewer System II (previously called Storm Sewer System B), Facilities 810 and 1917, the area around the South Gate, and Outfall II. These facilities are included as one site because past activities at these locations have been identified as possible contaminant sources for Storm Sewer System II. The Air Force used these areas to handle storm water runoff, fuel transport, aircraft maintenance, and aircraft wash down, including wash racks and OWSs. Chemicals used in these areas include fuels, lubricating oil, hydraulic fluids, chlorinated solvents, and soap solutions. The Air Force constructed Facility 1917 in 1956, and the facility is no longer in use. Facility 810 was constructed in 1955 and is currently used for aircraft maintenance. VOCs and fuels were identified as groundwater COCs. VOCs, SVOCs, and metals were identified in sediment at Site SD033. Metals were identified in Site SD033 soils.	Groundwater contamination is currently addressed by a groundwater extraction and treatment IRA. Groundwater at this site is commingled with contamination from other WIOU sites. A single groundwater extraction system has been designed to address the commingled WIOU plume. The current distribution of the primary groundwater contaminant, TCE, is depicted on Figure 6-6. A combination of excavation, Land Use Controls, and no action are remedial alternatives selected to address the sediment and soil at this site, as determined in the NEWIOU Soil, Sediment, and Surface Water ROD (Travis AFB, 2006).	1,1-DCE 1,1-DCA cis-1,2-DCE TCE TPH-G TPH-D	No	Alluvium overlying sedimentary bedrock. Alluvium consists of primarily silt and clay with discontinuous sand and gravel lenses present.	10 to 15	Yes
SD034	Facility 811	Site SD034 encompasses Facility 811 and includes an indoor wash rack that is used to wash aircraft. Chemicals used at this facility include acids, solvents, antifreeze, and the Stoddard solvent PD-680. VOCs, SVOCs, and fuels have been identified as groundwater COCs. Soils contain low levels of fuels.	Groundwater contamination is currently addressed by a groundwater extraction and treatment IRA. Groundwater at this site is commingled with contamination from other WIOU sites. A single groundwater extraction system has been designed to address the commingled WIOU plume. In addition to dissolved VOC contamination, floating product (Stoddard solvent) is present at Site SD034. Floating product is currently being addressed by passive hydroskimmers. The area impacted by floating product is shown on Figure 6-7. No action is the selected remedial alternative to address the soil at this site, as determined in the NEWIOU Soil, Sediment, and Surface Water ROD (Travis AFB, 2006).	1,1-DCE benzene cis-1,2-DCE TCE PCE vinyl chloride Stoddard solvent (PD-680) TPH-G TPH-D bis(2-ethylhexyl)phthalate	LNAPL (Stoddard solvent)	Alluvium overlying sedimentary bedrock. Alluvium consists of primarily silt and clay with discontinuous sand and gravel lenses present.	5 to 10	Yes
SS035	Facilities 818 and 819	Site SS035 contains Facilities 818 and 819 and includes a wash area, an OWS, and sump, a hydraulic lift, storage area, and hazardous materials accumulation area. VOCs and fuels were identified as groundwater COCs. Soils contain low levels of PCBs and metals.	Groundwater contamination is currently addressed by a groundwater extraction and treatment IRA. Groundwater at this site is commingled with contamination from other WIOU sites. A single groundwater extraction system has been designed to address the commingled WIOU plume. The current distribution of the primary groundwater contaminant, TCE, is depicted on Figure 6-6. No action is the selected remedial alternative to address the soil at this site, as determined in the NEWIOU Soil, Sediment, and Surface Water ROD (Travis AFB, 2006).	TCE TPH-D	No	Alluvium overlying sedimentary bedrock. Alluvium consists of primarily silt and clay with discontinuous sand and gravel lenses present.	11 to 15	Yes

TABLE 6-1
 ERP Site CSM Summaries
 Vapor Intrusion Assessment Report, Travis Air Force Base, California

Site	Site Designation	Site Description	Remedial Actions	Groundwater COCs	NAPL Present?	Lithology	Approximate Depth to Groundwater (feet bgs)	Buildings Overlying Plume?
SD036	Facilities 872, 873, and 876	Site SD036 includes Facilities 872, 873, and 876. The site, while mostly paved, is surrounded by buildings and is situated in an active area of the Base. These facilities were constructed as multiuse shops, which have included a wash rack and an OWS. Current uses of the facilities include paint shops, electrical shops, landscape maintenance, paint mixing, and paint accumulation. Chemicals used include cleaning solutions, grease, degreasers, hydraulic oils and fluids, PD-680, pesticides, paints, and solvents. The Air Force constructed the shops in 1953, and they are still in use. VOCs and fuel have been identified as groundwater COCs. Soils contain low levels of fuels.	Groundwater contamination is currently addressed by a groundwater extraction and treatment IRA. Groundwater at this site is commingled with contamination from other WIOU sites. A single groundwater extraction system has been designed to address the commingled WIOU plume. The current distribution of the primary groundwater contaminant, TCE, is depicted on Figure 6-6. No action is the selected remedial alternative to address the soil at this site, as determined in the NEWIOU Soil, Sediment, and Surface Water ROD (Travis AFB, 2006).	1,1-DCE 1,2-DCA benzene bromodichloromethane cis-1,2-DCE TCE PCE vinyl chloride TPH-G TPH-D	No	Alluvium overlying sedimentary bedrock. Alluvium consists of primarily silt and clay with discontinuous sand and gravel lenses present.	8 to 15	Yes
SD037	Sanitary Sewer (includes Facilities 837, 838, 981, 919; the Area G Ramp; and Ragsdale/V Area)	Site SD037 contains Sanitary Sewer System Facilities 837/838, 919, 977, 981; Ragsdale/V Area; and the Area G Ramp. These facilities are involved in handling domestic and industrial wastewater, aircraft maintenance, heavy equipment maintenance, air cargo, vehicle washing, fuel transport, and waste accumulation. Chemicals used and handled in these areas include wastewater, oils, hydraulic fluids, fuels, transformer fluids, and chlorinated solvents. The Air Force began operating these Facilities in the 1940s and continues operations to the present day. VOCs, SVOCs, and fuels have been identified as groundwater COCs. PAHs, fuels, SVOCs, and metals have been identified in soil at the site.	Groundwater contamination is currently addressed by a groundwater extraction and treatment IRA. Groundwater at this site is commingled with contamination from other WIOU sites. A single groundwater extraction system has been designed to address the commingled WIOU plume. The current distribution of the primary groundwater contaminant, TCE, is depicted on Figure 6-6. A combination of Land Use Controls and no action are the remedial alternatives selected to address the soil at this site, as determined in the NEWIOU Soil, Sediment, and Surface Water ROD (Travis AFB, 2006).	1,1-DCE 1,2-DCA benzene bromodichloromethane carbon tetrachloride chloromethane cis-1,2-DCE TCE PCE vinyl chloride TPH-G TPH-D bis(2-ethylhexyl)phthalate naphthalene	No	Alluvium overlying sedimentary bedrock. Alluvium consists of primarily silt and clay with discontinuous sand and gravel lenses present.	7 to 20	Yes
DP039	Building 755	Site DP039 consists of a former rock-filled acid neutralization sump approximately 65 feet west of Building 755, in the central portion of the Base. Until 1978, a pipeline ran from a sink drain within Building 755 to the sump. Since 1968, Building 755 has been the location of the Battery and Electric Shop. Before 1978, battery acid solutions and chlorinated solvents reportedly were discharged into the Building 755 sink and drained to the sump. This practice was discontinued in 1978, when the pipeline was dismantled and reconnected to the sanitary sewer line. In July 1993, the sump was removed and disposed of offbase. The sump was 8 feet long, 8 feet wide, and 4 feet deep. The sump area was lined with visqueen and backfilled with clean soil. VOC concentrations historically detected in groundwater at the site suggested the presence of DNAPL. However, no DNAPL was found during site investigations or excavation of the sump. The current VOC concentrations in groundwater are not indicative of DNAPL. VOCs have been identified as groundwater COCs. Lead is the contaminant identified as a soil COC.	Groundwater contamination is currently addressed by a bioreactor, which was installed in the source area in 2008, replacing the groundwater extraction and treatment system. A phytoremediation treatability study is ongoing at the site. In addition, a biobarrier will be installed in the downgradient portion of the plume in 2010. The current distribution of the primary groundwater contaminant, TCE, is depicted on Figure 6-9. Land use and access restrictions are the remedial alternatives selected to address the soil at this site, as determined in the Soil ROD for the WABOU (Travis AFB, 2002).	1,1-DCE 1,2-DCA 1,1,1-TCA acetone bromodichloromethane methylene chloride PCE TCE	No	Alluvium overlying sedimentary bedrock. Alluvium consists of clays, silts, and sands with little or no horizontal continuity of layers. Relatively permeable sands and silty/clayey sand encountered range from 2 to 5 feet thick and are not extensive.	7 to 25	Yes

TABLE 6-1
 ERP Site CSM Summaries
 Vapor Intrusion Assessment Report, Travis Air Force Base, California

Site	Site Designation	Site Description	Remedial Actions	Groundwater COCs	NAPL Present?	Lithology	Approximate Depth to Groundwater (feet bgs)	Buildings Overlying Plume?
SD043	Building 916	Building 916 is an emergency electrical power facility. The diesel-powered generators inside the building sit above a cellar, or sump area, that also houses sump pumps. Prior to 1991, spilled diesel fuel from the generators and wash water were pumped out of the building through one of four pipes. The pipes discharged onto small concrete spillways constructed for erosion control. From the spillways, wastewater flowed down the side-slope and into a drainage channel. There had been a fenced and graveled electrical transformer area on the southwestern corner of the building. This area contained three liquid-filled transformers on top of a concrete pad. In 1992, one of the transformers developed a leak onto the concrete pad and ground surface. The Base removed the transformers and pad in 1993. VOCs have been identified as groundwater COCs. PCBs were detected in site soil.	Groundwater contamination is currently addressed by a groundwater extraction and treatment IRA. Groundwater at this site is commingled with contamination from WIOU sites. A single groundwater extraction system has been designed to address the commingled WIOU/WABOU plume. Land use and access restrictions are the remedial alternatives selected to address the soil at this site, as determined in the Soil ROD for the WABOU (Travis AFB, 2002).	TCE	No	Alluvium overlying sedimentary bedrock. Alluvium consists of primarily silt and clay with discontinuous sand and gravel lenses.	9 to 10	Yes

Notes:

AFB = Air Force Base
 bgs = below ground surface
 CAMU = Corrective Action Management Unit
 COC = chemical of concern
 DCA = dichloroethane
 DCB = dichlorobenzene
 DCE = dichloroethene
 DNAPL = dense non-aqueous phase liquid
 EIOU = East Industrial Operable Unit
 ERP = Environmental Restoration Program
 FTA = fire training area
 IRA = interim remedial action
 LNAPL = light non-aqueous phase liquid
 NAPL = non-aqueous phase liquid
 NEWIOU = North East West Industrial Operable Unit
 NFA = No Further Action
 NOU = North Operable Unit

OSA = Oil Spill Area
 OWS = oil/water separator
 PAH = polycyclic aromatic hydrocarbon
 PCB = polychlorinated biphenyl
 POL = petroleum, oil, and lubricants
 POCO = petroleum only contaminated
 RI = remedial investigation
 ROD = record of decision
 SSA = Solvent Spill Area
 SSRW = storm sewer right-of-way
 SVOC = semivolatile organic compound
 TCE = trichloroethene
 TPH-D = total petroleum hydrocarbon, diesel
 TPH-G = total petroleum hydrocarbon, gasoline
 VOC = volatile organic compound
 WABOU = West/Annexes/Basewide Operable Unit
 WIOU = West Industrial Operable Unit

TABLE 6-2

Facilities in the Vicinity of Groundwater or Shallow Soil Gas VOC Concentrations Exceeding Screening Levels

Vapor Intrusion Assessment Report, Travis Air Force Base, California

ERP Site	Facility Number	Use	Notes	Sampling Results	VI Assessment Results
SS015	554	POL compound with office building	Has vapor barrier and passive vent system.	None collected because of mitigation measure in place. Indoor air sample was collected by AFIOH. VOC concentrations detected were similar to ambient and did not exceed industrial indoor air RBCs.	<p>VI risk at this site will continue to be addressed by mitigation until groundwater concentrations decline below screening levels.</p> <p>Because of increasing groundwater VOC concentrations, an indoor air monitoring program will be established at this facility to monitor the continued efficacy of the vapor barrier and passive vent system.</p>
SS016	16	Former Maintenance Shop; currently used for storage	Facility no longer in use as a maintenance shop; used for storage only. Unoccupied except when supplies are being moved.	Subslab, indoor air, and outdoor air samples collected during Phase 3. TCE, which is the primary COC in the groundwater plume, was only detected in a preferential pathway sampling point (the utility vault), and the concentration within the utility vault was below industrial indoor air RBCs.	The Phase 3 sampling at Facility 16 indicates that the Site SS016 groundwater plume does not pose a significant VI risk at this facility. This facility is not routinely occupied.
	18	Former Degreasing Facility; currently used for storage	Facility no longer in use as a maintenance shop; used for storage only. Unoccupied except when supplies are being moved. Southern edge of building is approximately 15 feet from a suspected DNAPL source (TCE).	Subslab, indoor air, and outdoor air samples collected during Phase 3. TCE is the primary groundwater COC, and TCE concentrations detected within the facility do not indicate significant current VI risk (they were either below RBCs or within EPA's risk management range). However, the elevated subslab TCE concentration indicates the potential for significant future VI risk.	The Phase 3 sampling at Facility 18 indicates that the Site SS016 groundwater plume does not currently pose a significant VI risk at this facility. The facility is currently used for storage and is not routinely occupied. Indoor air VOC concentrations were within risk management levels. However, the elevated TCE concentration detected subslab indicates a potential for significant VI risk in the future if building usage changes such that the attenuation through the slab is reduced.

TABLE 6-2

Facilities in the Vicinity of Groundwater or Shallow Soil Gas VOC Concentrations Exceeding Screening Levels
Vapor Intrusion Assessment Report, Travis Air Force Base, California

ERP Site	Facility Number	Use	Notes	Sampling Results	VI Assessment Results
SS016 (cont'd)	1001	Test Cell	Unoccupied and on demolition list.	None collected because of proximity to flightline. Indoor air sample was collected by AFIOH. VOC concentrations detected were similar to ambient and did not exceed industrial indoor air RBCs.	Facility is no longer in use and will be demolished. VI pathway incomplete.
SS029	1130	Communication Transmitter	Unoccupied except when maintenance or equipment testing is being performed.	Collected one soil gas sample (SB721x29; did not exceed industrial SSG RBCs). Indoor air sample was collected by AFIOH. VOC concentrations detected were similar to ambient and did not exceed industrial indoor air RBCs.	Soil gas and indoor air concentrations below industrial RBCs, and facility occupied only during maintenance or equipment testing for periods of approximately 2 hours. Insignificant VI risk.
WIOU	New Hangar	Aircraft Hangar	Replaces former Facilities 834, 835, 839, and 840, which were demolished.	Collected three soil gas samples (SB739x37, SB740x37, SB782x37); did not exceed industrial SSG RBCs except for 1,2-dichloropropane at SB782x37. 1,2-dichloropropane was detected at a concentration of 252 ppbv (the industrial SSG RBC is 130 ppbv). This exceedance is below the 1×10^{-5} industrial cancer risk for 1,2-dichloropropane. In addition, the cumulative industrial cancer risk was less than 1×10^{-5} . 1,2-dichloropropane is not a groundwater COC.	The facility is an aircraft hangar, which remains open to allow aircraft to park. It is not an enclosed space. In addition, shallow soil gas results indicate insignificant VI risk.
	801	Water Pumping Station	Not an occupied space.	Collected one soil gas sample (SB728x34); did not exceed industrial SSG RBCs.	Facility is beyond the current VOC plume. Soil gas concentrations are below industrial SSG RBCs, and facility is unoccupied. Insignificant VI risk.

TABLE 6-2

Facilities in the Vicinity of Groundwater or Shallow Soil Gas VOC Concentrations Exceeding Screening Levels

Vapor Intrusion Assessment Report, Travis Air Force Base, California

ERP Site	Facility Number	Use	Notes	Sampling Results	VI Assessment Results
WIOU (cont'd)	806	Open Repair Shop	Construction completed.	Collected one soil gas sample (SB729x34); did not exceed industrial SSG RBCs.	Facility is beyond the current VOC plume. Soil gas concentrations below industrial SSG RBCs. Insignificant VI risk.
	810	Maintenance Shop		Two soil gas samples planned (SB724x33 and SB725x33) to confirm historical TCE soil gas concentrations. Soil gas concentrations at SB725x33 did not exceed industrial SSG RBCs. Unable to collect SB724x33. Well near proposed boring SB724x33, sampled during the November 2008 GSAP, confirms current groundwater concentrations are below screening levels.	This Facility is now over 100 feet away from the TCE plume. Soil gas concentrations below industrial SSG RBCs. Insignificant VI risk.
	811	Maintenance Shop	Overlies Stoddard solvent floating product plume. Stoddard solvent is still used to wash planes in the facility. The control measure is to keep hangar doors open while cleaning the planes.	Unable to collect proposed soil gas sample SB727x34 (formation too impermeable). Collected subslab sample above the floating product plume. COC concentrations (benzene, TCE, and PCE) exceeded industrial subslab RBCs.	Currently, there is not a significant risk of VI at this building because it is a hangar that is kept open during working hours. However, because of the presence of the floating product plume, if usage of the building changes or a new building is built above the floating product plume, there may be significant VI risk.
	818	Maintenance Shop	The facility is a hangar, which is often open; the doors cannot be closed when planes are worked on because they block the doors.	Unable to collect soil gas sample proposed (SB731x35) to confirm historical TCE soil gas concentrations (formation too impermeable). Wells near proposed boring SB724x33, sampled during the November 2008 GSAP, confirm current groundwater concentrations are below screening levels.	This Facility is now over 100 feet away from the TCE plume. Insignificant VI risk.

TABLE 6-2

Facilities in the Vicinity of Groundwater or Shallow Soil Gas VOC Concentrations Exceeding Screening Levels
Vapor Intrusion Assessment Report, Travis Air Force Base, California

ERP Site	Facility Number	Use	Notes	Sampling Results	VI Assessment Results
WIOU (cont'd)	819	Maintenance Shop		Collected one soil gas sample (SB730x35), concentrations below industrial SSG RBCs.	Soil gas concentrations in the vicinity of the building below industrial SSG RBCs. Insignificant VI risk.
	828	Security Force Operations Administration	Has been demolished.	None collected because facility was on demolition list. Indoor air sample was collected by AFIOH, VOC concentrations detected were similar to ambient and did not exceed industrial indoor air RBCs.	No VI risk; building no longer exists.
	836	Squadron Operations Administration (parts storage)		Collected indoor, subslab, and outdoor samples. AFIOH also collected one indoor air sample. Indoor VOC concentrations were similar to outdoor air concentrations, and subslab VOC concentrations were very low. Insignificant VI risk.	Indoor and subslab samples indicate insignificant VI risk.
	841	Maintenance Shop (CTK C-5 Maintenance)	On demolition list.	None collected because facility is on demolition list. Soil gas sampling results above the plume did not exceed RBCs in the vicinity of this facility.	The facility will be demolished. This facility is over 100 feet away from the 100-µg/L TCE plume. Insignificant VI risk.
	842	Storage	On demolition list.	None collected because facility is on demolition list. Soil gas sampling results above the plume did not exceed RBCs in the vicinity of this facility.	The facility will be demolished. This facility is over 100 feet away from the 100-µg/L TCE plume. Insignificant VI risk.
	843	Auxiliary Power Unit	On demolition list.	None collected because facility is on demolition list. Soil gas sampling results above the plume did not exceed SSG RBCs in the vicinity of this facility.	Facility will be demolished. This facility is over 100 feet away from the 100-µg/L TCE plume. Insignificant VI risk.

TABLE 6-2

Facilities in the Vicinity of Groundwater or Shallow Soil Gas VOC Concentrations Exceeding Screening Levels

Vapor Intrusion Assessment Report, Travis Air Force Base, California

ERP Site	Facility Number	Use	Notes	Sampling Results	VI Assessment Results
WIOU (cont'd)	844	Shop	On demolition list.	Collected one soil gas sample (SB754x34); did not exceed industrial SSG RBCs.	Facility will be demolished. This facility is over 100 feet away from the 100-µg/L TCE plume. Insignificant VI risk.
	845	Fiberglass Shop	On demolition list.	Collected one soil gas sample (SB755x37); did not exceed industrial SSG RBCs.	Facility will be demolished. Soil gas concentrations below industrial SSG RBCs. Insignificant VI risk.
	846	Aircraft Generator Shop	On demolition list.	None collected because facility is on demolition list. Soil gas sampling results above the plume did not exceed RBCs in the vicinity of this facility.	Facility will be demolished. This facility is over 100 feet away from the 100-µg/L TCE plume. Insignificant VI risk.
	847	Maintenance Dock	On demolition list.	Collected one soil gas sample (SB755x37); did not exceed industrial RBCs.	Facility will be demolished. This facility is over 100 feet away from the 100-µg/L TCE plume. Insignificant VI risk.
	848	Compressed Air Building (Snack Shack)	On demolition list.	None collected because building is on demolition list. Soil gas sampling results above the plume did not exceed RBCs in the vicinity of this facility.	Facility will be demolished. Soil gas sampling results above the plume did not exceed RBCs in the vicinity of this facility. Insignificant VI risk.
	861	Warehouse Supply Facility		Unable to sample proposed boring location SB737x37 (capillary fringe encountered). Soil gas samples collected above the plume in the vicinity of this facility were below industrial SSG RBCs.	Facility is over 100 feet from the 100-µg/L TCE plume. Insignificant VI risk.

TABLE 6-2

Facilities in the Vicinity of Groundwater or Shallow Soil Gas VOC Concentrations Exceeding Screening Levels

Vapor Intrusion Assessment Report, Travis Air Force Base, California

ERP Site	Facility Number	Use	Notes	Sampling Results	VI Assessment Results
WIOU (cont'd)	864	Maintenance Shop		Collected indoor, subslab, and outdoor samples. Indoor VOC concentrations were similar to outdoor air concentrations and subslab VOC concentrations were very low.	Indoor and subslab samples indicate insignificant VI risk.
	871	Maintenance Shop	On demolition list.	None collected because facility is on demolition list.	Facility will be demolished. Shallow soil gas results over the WIOU groundwater plume indicate insignificant VI risk.
	872	Civil Engineering Paved Ground Facility	On demolition list.	Unable to sample proposed boring location SB763x37 (formation too impermeable).	Facility will be demolished. Facility is over 100 feet from the 100-µg/L TCE plume. Insignificant VI risk.
	886	Storage Shed (BCE chlorine storage)	Not an occupied space. On demolition list.	None collected because facility is on demolition list.	Facility will be demolished and is not an occupied space. Insignificant VI risk.
	887	Storage Cover Facility	Facility open on one side; not an enclosed space.	Unable to sample proposed boring location SB748x36 (encountered capillary fringe).	Over 100 feet from 100-µg/L TCE plume. Not an enclosed space; the VI pathway is incomplete.
	891	Gas Vaporizer Facility		None collected because facility is located over 100 feet from 100-µg/L TCE plume.	Over 100 feet from 100-µg/L TCE plume. Insignificant VI risk.
	893	Administration Trailer	On demolition list.	Collected one soil gas sample (SB793x37); did not exceed industrial SSG RBCs.	Facility will be demolished. Soil gas concentrations below industrial SSG RBCs. Insignificant VI risk.
	894	Administration Trailer	On demolition list.	Collected one soil gas sample (SB752x37); did not exceed industrial SSG RBCs.	Facility will be demolished. Soil gas concentrations below industrial SSG RBCs. Insignificant VI risk.
	919	Vehicle Maintenance Shop		Collected shallow soil gas, subslab, indoor air, and outdoor air samples. Indoor VOC concentrations were similar to outdoor air concentrations, and subslab VOC concentrations were very low.	Indoor and subslab samples indicate insignificant VI risk.

TABLE 6-2

Facilities in the Vicinity of Groundwater or Shallow Soil Gas VOC Concentrations Exceeding Screening Levels
Vapor Intrusion Assessment Report, Travis Air Force Base, California

ERP Site	Facility Number	Use	Notes	Sampling Results	VI Assessment Results
WIOU (cont'd)	972	Vehicle Service Rack		None collected because rack is located over 100 feet from 100-µg/L TCE plume.	Over 100 feet from 100-µg/L TCE plume. Insignificant VI risk.
	1821	Fire Protection Water Storage	Not an occupied space.	None collected because it is not an occupiable space.	Not an occupiable space. VI pathway incomplete.
DP039	741	Open Storage	Not enclosed space.	None collected, not an enclosed space.	Not an enclosed space. VI pathway incomplete.
	755	Maintenance Shop	Has been demolished.	Collected one subslab (SB764x39), one indoor air sample, and one outdoor air sample to support development of a site-specific attenuation factor. Indoor VOC concentrations were similar to outdoor air concentrations, and subslab VOC concentrations were low.	Facility no longer exists. Sampling results did not indicate a significant VI risk.
	866	Storage Cover Facility	Facility open on one side; not an enclosed space.	Collected one soil gas sample (SB777x39); did not exceed industrial RBCs.	Not an enclosed space. Soil gas concentrations below industrial SSG RBCs. Insignificant VI risk.
	869	Skate Rink	Has been demolished.	Collected one soil gas sample (SB778x39); did not exceed industrial SSG RBCs.	Facility no longer exists. Sampling results did not indicate a significant VI risk.
	888	Warehouse Supply Facility		Collected two soil gas samples (SB775x39 and SB776x39). Concentrations did not exceed industrial SSG RBCs).	Facility locked and typically unoccupied (used for storage). Soil gas concentrations below industrial SSG RBCs. Insignificant VI risk.

TABLE 6-2

Facilities in the Vicinity of Groundwater or Shallow Soil Gas VOC Concentrations Exceeding Screening Levels
Vapor Intrusion Assessment Report, Travis Air Force Base, California

Notes:

µg/L = microgram(s) per liter

AFIOH = Air Force Institute of Occupational Health

BCE = base civil engineer

COC = chemical of concern

DNAPL = dense non-aqueous phase liquid

EPA = U.S. Environmental Protection Agency

ERP = Environmental Restoration Program

GSAP = Groundwater Sampling and Analysis Program

PCE = tetrachloroethene

POL = petroleum, oil, and lubricants

RBC = risk-based concentration

SSG RBC = shallow soil gas risk-based concentration

TCE = trichloroethene

VI = vapor intrusion

VOC = volatile organic compound

WIOU = West Industrial Operable Unit

TABLE 6-3

Summary of Location-specific Cumulative Cancer Risk and Hazard Index Estimates for Shallow Soil Gas Sample Locations
Vapor Intrusion Assessment Report, Travis Air Force Base, California

Site	Location	Residents Exposed to Soil Vapor through Indoor Air		Indoor Workers Exposed to Soil Vapor through Indoor Air		Risk Drivers
		Cummulative Cancer Risk (unitless)	Hazard Index (unitless)	Cummulative Cancer Risk (unitless)	Hazard Index (unitless)	
FT004	SB700x04	2.E-06	0.009	9.E-08	0.0005	TCE
	SB700x04FD	4.E-06	0.05	2.E-07	0.003	Naphthalene, TCE
	SB701x04	2.E-06	0.01	9.E-08	0.0004	TCE
	SB702x04	2.E-06	0.01	7.E-08	0.0006	TCE
	SB703x04	2.E-06	0.004	7.E-08	0.0002	TCE
	SB706x04	8.E-05	0.2	3.E-06	0.01	TCE
SS029	SB709x29	4.E-05	0.07	2.E-06	0.004	TCE
	SB710x29	2.E-06	0.02	1.E-06	0.01	TCE
	SB710x29FD	3.E-06	0.03	1.E-07	0.001	TCE
	SB711x29	1.E-04	0.8	4.E-06	0.05	1,2-EDB, PCE
	SB712x29	1.E-05	0.02	5.E-07	0.001	TCE, 1,2-EDB, chloroform
	SB713x29	1.E-05	0.02	4.E-07	0.002	TCE, 1,2-EDB
	SB714x29	3.E-06	0.06	1.E-07	0.003	TCE, chloroform
	SB715x29	6.E-05	0.5	3.E-06	0.03	PCE, TCE, 1,2-DCA
	SB716x29	3.E-04	0.5	1.E-05	0.03	TCE, PCE
	SB717x29	3.E-05	0.2	1.E-06	0.01	PCE, 1,2-DCA, 1,1,2-TCA
	SB717x29FD	2.E-06	0.02	9.E-08	0.0009	1,1,2-TCA, naphthalene
	SB718x29	1.E-04	0.3	5.E-06	0.02	TCE, PCE
	SB719x29	3.E-05	0.06	1.E-06	0.004	TCE
	SB720x29	3.E-05	0.06	1.E-06	0.004	TCE
	SB721x29	3.E-06	0.03	1.E-07	0.001	TCE
	SB722x29	2.E-05	0.04	8.E-07	0.002	TCE
SB723x29	2.E-06	0.03	7.E-08	0.002	TCE	

TABLE 6-3

Summary of Location-specific Cumulative Cancer Risk and Hazard Index Estimates for Shallow Soil Gas Sample Locations
Vapor Intrusion Assessment Report, Travis Air Force Base, California

Site	Location	Residents Exposed to Soil Vapor through Indoor Air		Indoor Workers Exposed to Soil Vapor through Indoor Air		Risk Drivers
		Cummulative Cancer Risk (unitless)	Hazard Index (unitless)	Cummulative Cancer Risk (unitless)	Hazard Index (unitless)	
WIOU	SB730x35	3.E-05	0.5	1.E-06	0.02	Benzene, naphthalene
	SB730x35FD	2.E-05	0.2	6.E-07	0.007	Benzene
	SB732x37	4.E-07	0.001	2.E-08	0.00007	Chloroform
	SB733x37	2.E-06	0.06	9.E-08	0.003	Chloroform, benzene
	SB739x37	5.E-07	0.01	2.E-08	0.0005	Benzene
	SB740x37	8.E-06	0.09	3.E-07	0.005	1,2-EDB
	SB740x37FD	3.E-06	0.05	1.E-07	0.002	Benzene
	SB741x37	5.E-05	0.2	2.E-06	0.01	1,1,2,2-Tetrachloroethane, 1,2-EDB, naphthalene
	SB742x37	2.E-07	0.0003	1.E-08	0.00002	Chloroform
	SB747x37	1.E-06	0.01	4.E-08	0.0007	Naphthalene
	SB751x37	2.E-06	0.03	9.E-08	0.002	PCE
	SB752x37	1.E-06	0.02	4.E-08	0.001	Chloroform
	SB753x37	4.E-07	0.0006	2.E-08	0.00003	Chloroform
	SB755x37	9.E-06	0.06	4.E-07	0.003	Chloroform
	SB756x37	3.E-06	0.03	1.E-07	0.002	PCE
	SB757x37	3.E-07	0.003	1.E-08	0.0002	TCE
	SB758x37	1.E-06	0.006	5.E-08	0.0003	Chloroform
	SB759x37	9.E-06	0.06	3.E-07	0.004	PCE, Chloroform
	SB761x37	9.E-07	0.009	4.E-08	0.0005	Chloroform
	SB782x37	8.E-05	2.8	3.E-06	0.1	1,2-Dichloropropane, 1,2-DCA
	SB749x36	3.E-05	0.07	9.E-07	0.004	TCE, vinyl chloride
	SB762x36	7.E-06	0.02	4.E-07	0.001	1,1,2,2-Tetrachloroethane, chloroform
	SB726x34	8.E-06	0.2	3.E-07	0.008	Naphthalene
	SB728x34	2.E-06	0.007	7.E-08	0.0004	Chloroform, PCE
	SB725x33	1.E-05	0.02	6.E-07	0.001	Chloroform
	SB754x33	1.E-06	0.01	4.E-08	0.0007	PCE, chloroform

TABLE 6-3

Summary of Location-specific Cumulative Cancer Risk and Hazard Index Estimates for Shallow Soil Gas Sample Locations
Vapor Intrusion Assessment Report, Travis Air Force Base, California

Site	Location	Residents Exposed to Soil Vapor through Indoor Air		Indoor Workers Exposed to Soil Vapor through Indoor Air		Risk Drivers
		Cummulative Cancer Risk (unitless)	Hazard Index (unitless)	Cummulative Cancer Risk (unitless)	Hazard Index (unitless)	
DP039	SB765x39	9.E-07	0.01	4.E-08	0.0005	Chloroform
	SB766x39	9.E-05	0.2	4.E-06	0.01	TCE
	SB767x39	6.E-06	0.01	3.E-07	0.0005	TCE
	SB768x39	6.E-06	0.03	3.E-07	0.001	Chloroform, 1,1,2,2-tetrachloroethane
	SB769x39	1.E-06	0.04	4.E-08	0.002	Chloroform
	SB770x39	2.E-07	0.005	1.E-08	0.0002	Chloroform
	SB770x39FD	2.E-07	0.0004	7.E-09	0.00002	Chloroform
	SB771x39	6.E-06	0.04	2.E-07	0.003	PCE
	SB772x39	3.E-06	0.01	1.E-07	0.0004	Chloroform
	SB773x39	1.E-05	0.3	5.E-07	0.01	Naphthalene
	SB774x39	5.E-06	0.02	2.E-07	0.001	1,1,2,2-Tetrachloroethane
	SB775x39	5.E-07	0.0002	2.E-08	0.00001	Chloroform
	SB776x39	3.E-06	0.02	1.E-07	0.001	TCE
	SB777x39	3.E-06	0.10	1.E-07	0.005	TCE
	SB778x39	4.E-07	0.005	2.E-08	0.0003	Chloroform
	SB779x39	4.E-05	0.07	2.E-06	0.005	TCE
	SB780x39	1.E-06	0.03	4.E-08	0.001	Chloroform
	SB780x39	8.E-07	0.003	3.E-08	0.0002	Chloroform
	SB781x39	3.E-06	0.01	1.E-07	0.0007	Chloroform

Notes:

DCA = dichloroethane
EDB = dibromoethane
TCA = trichloroethane
TCE = trichloroethene

TABLE 6-4
 Summary of Vapor Intrusion Risk Evaluation
 Vapor Intrusion Assessment Report, Travis Air Force Base, California

Site	Groundwater VOC Screening Result	Site-specific SSG RBC Screening Result	Indoor Air and/or Subslab RBC Screening Result	Potentially Significant ^a VI Risk with Current Use?	Potentially Significant ^b VI Risk for Future Use?
FT004 (onbase)	Exceeds residential and industrial screening levels.	Exceeded industrial SSG RBCs at one sampling location and residential SSG RBCs at all five locations.	No buildings present at site. No indoor air or subslab samples collected.	No. No buildings are present at site; VI pathway is incomplete.	<p>Industrial: No. SSG concentrations exceeded the industrial SSG RBCs at only one location. TCE was the only VOC that exceeded the SSG RBC, and the exceedance was less than the 1×10^{-5} industrial cancer risk for TCE. In addition, the cumulative industrial cancer risk was less than 1×10^{-5}, and the industrial hazard index was less than 1 at all Site FT004 sample locations.</p> <p>Residential: Yes. SSG concentrations exceeded residential SSG RBCs at all sampling locations. In areas where groundwater concentrations exceed residential screening levels, there is a potentially significant VI risk for residential usage. Mitigation measures or land use controls will be described in the upcoming Basewide Groundwater ROD to manage VI risk for residential future use scenarios in areas where groundwater concentrations continue to exceed residential screening levels.</p>
FT005 (offbase)	Does not exceed residential or industrial screening levels.	No shallow soil gas samples collected.	No buildings present at site. No indoor air or subslab samples collected.	No. Groundwater concentrations are below residential and industrial screening levels, and no buildings are present at site. VI pathway is incomplete.	No. Groundwater concentrations are below residential and industrial screening levels.

TABLE 6-4
 Summary of Vapor Intrusion Risk Evaluation
Vapor Intrusion Assessment Report, Travis Air Force Base, California

Site	Groundwater VOC Screening Result	Site-specific SSG RBC Screening Result	Indoor Air and/or Subslab RBC Screening Result	Potentially Significant^a VI Risk with Current Use?	Potentially Significant^b VI Risk for Future Use?
LF006 (onbase)	Does not exceed residential or industrial screening levels.	No shallow soil gas samples collected.	No buildings present at site. No indoor air or subslab samples collected.	No. Groundwater concentrations are below residential and industrial screening levels, and no buildings are present at site. VI pathway is incomplete.	No. Groundwater concentrations are below residential and industrial screening levels.
LF007 (offbase)	Does not exceed residential or industrial screening levels.	No shallow soil gas samples collected.	No buildings present at site. No indoor air or subslab samples collected.	No. Groundwater concentrations are below residential and industrial screening levels, and no buildings are present at site. VI pathway is incomplete.	Uncertain. The downgradient extent of offbase groundwater contamination has not been completely defined. The extent of offbase groundwater contamination will be investigated under a separate ERP field effort. Groundwater concentrations detected in this investigation will be compared with screening levels to evaluate VI risk.
LF008 (onbase)	Does not exceed residential or industrial screening levels.	No shallow soil gas samples collected.	No buildings present at site. No indoor air or subslab samples collected.	No. Groundwater concentrations are below residential and industrial screening levels and no buildings present at site. VI pathway is incomplete.	No. Groundwater concentrations are below residential and industrial screening levels.

TABLE 6-4
 Summary of Vapor Intrusion Risk Evaluation
Vapor Intrusion Assessment Report, Travis Air Force Base, California

Site	Groundwater VOC Screening Result	Site-specific SSG RBC Screening Result	Indoor Air and/or Subslab RBC Screening Result	Potentially Significant^a VI Risk with Current Use?	Potentially Significant^b VI Risk for Future Use?
SS015 (onbase)	Exceeds residential and industrial screening levels.	No shallow soil gas samples collected.	AFIOH collected an indoor air sample in Facility 554 in May 2008. None of the indoor air VOC concentrations at Facility 554 exceeded the industrial indoor air RBCs.	No. Potential for VI has been mitigated; the existing building was constructed with a vapor barrier and passive vent system. However, VOC concentrations in groundwater beneath the building are increasing; therefore, routine indoor air monitoring will be performed to evaluate continued performance of the vapor barrier and passive vent system.	Yes. In areas where groundwater concentrations exceed screening levels, there is a potential for VI for both residential and industrial usage. Mitigation measures or land use controls will continue to be used to manage VI risk for future use scenarios in areas where groundwater concentrations continue to exceed screening levels.
SS016 (onbase)	Exceeds residential and industrial screening levels.	No shallow soil gas samples collected.	TCE concentrations exceeded indoor air and subslab RBCs at Facility 18, which is located 15 feet from a suspected DNAPL source area. Indoor air and subslab sampling at Facility 16 indicates that the Site SS016 groundwater plume does not pose a significant VI risk at this facility. TCE concentrations did not exceed industrial RBCs in samples collected at this facility.	No. The DNAPL source and groundwater plume do not present a significant VI risk at Facility 18, based on indoor air results. Only TCE concentrations slightly exceeded industrial indoor air RBCs. In addition, indoor air and subslab samples collected at adjacent Facility 16 did not indicate significant VI risk.	Yes. In areas where groundwater concentrations exceed screening levels, there is a potential for VI for both residential and industrial usage, particularly in the immediate vicinity of the DNAPL source area (Facility 18). In addition, exceedances of subslab screening levels indicate potential for significant VI risk if building foundation conditions change in the future. Mitigation measures or land use controls will be described in the upcoming Basewide Groundwater ROD to manage VI risk for future use scenarios.

TABLE 6-4
 Summary of Vapor Intrusion Risk Evaluation
 Vapor Intrusion Assessment Report, Travis Air Force Base, California

Site	Groundwater VOC Screening Result	Site-specific SSG RBC Screening Result	Indoor Air and/or Subslab RBC Screening Result	Potentially Significant ^a VI Risk with Current Use?	Potentially Significant ^b VI Risk for Future Use?
SS029 (onbase)	Exceeds residential and industrial screening levels.	Exceeded industrial SSG RBCs at 7 sampling locations and residential SSG RBCs at 14 locations.	AFIOH collected an indoor air sample at Facility 1130 in May 2008. No VOCs exceeded the industrial indoor air RBCs.	No. The single building at the site is not routinely occupied. Soil gas concentrations adjacent to the building are below industrial SSG RBCs. VOC concentrations in indoor air sample are below industrial RBCs. Insignificant VI risk.	Industrial: No. The cumulative industrial cancer risk was less than or equal to 1×10^{-5} and the industrial hazard index was less than 1 at all Site SS029 sample locations. Residential: Yes. The residential SSG RBCs were exceeded at all but one of the Site SS029 sampling locations; and the exceedances were greater than 10 times the residential SSG RBC at nine of the locations (residential cancer risk in the 1×10^{-5} to 1×10^{-4} range for these individual chemicals). Mitigation measures or land use controls will be described in the upcoming Basewide Groundwater ROD to manage VI risk for future residential use scenarios in areas where groundwater concentrations continue to exceed residential screening levels.
SS030 (offbase)	Does not exceed residential or industrial screening levels.	No shallow soil gas samples collected.	No buildings present at site. No indoor air or subslab samples collected.	No. Groundwater concentrations are below residential and industrial screening levels, and no buildings are present at site. VI pathway is incomplete.	Uncertain. The extent of offbase groundwater contamination has not been defined. The extent of offbase groundwater contamination is currently being investigated under a separate ERP field effort. Groundwater concentrations detected in this investigation will be compared with screening levels to evaluate VI risk. Data collected to date indicate groundwater concentrations are below screening levels.

TABLE 6-4
 Summary of Vapor Intrusion Risk Evaluation
Vapor Intrusion Assessment Report, Travis Air Force Base, California

Site	Groundwater VOC Screening Result	Site-specific SSG RBC Screening Result	Indoor Air and/or Subslab RBC Screening Result	Potentially Significant^a VI Risk with Current Use?	Potentially Significant^b VI Risk for Future Use?
SD031 (onbase)	Does not exceed residential or industrial screening levels.	No shallow soil gas samples collected.	No buildings present at site. No indoor air or subslab samples collected.	No. Groundwater concentrations are below residential and industrial screening levels, and no buildings are present at site. VI pathway is incomplete.	No. Groundwater concentrations are below residential and industrial screening levels.
ST032 (onbase)	Exceeds residential and industrial screening levels.	No shallow soil gas samples collected.	No buildings present at site. No indoor air or subslab samples collected.	No. No buildings present at site. VI pathway incomplete.	Yes. In areas where groundwater concentrations exceed screening levels, there is a potential for VI for both residential and industrial usage. Mitigation measures or land use controls will continue to be used to manage VI risk for future use scenarios in areas where groundwater concentrations continue to exceed screening levels.

TABLE 6-4
 Summary of Vapor Intrusion Risk Evaluation
 Vapor Intrusion Assessment Report, Travis Air Force Base, California

Site	Groundwater VOC Screening Result	Site-specific SSG RBC Screening Result	Indoor Air and/or Subslab RBC Screening Result	Potentially Significant ^a VI Risk with Current Use?	Potentially Significant ^b VI Risk for Future Use?
WIOU Sites SD033, SS035, SD036, SD037 (onbase)	Exceeds residential and industrial screening levels.	Exceeded industrial SSG RBCs at one sampling location and residential SSG RBCs at 13 locations.	Indoor air and subslab VOC concentrations below industrial RBCs or not indicative of groundwater source.	No. Few buildings directly overlie groundwater plume. Soil gas, indoor air, and subslab data in and near existing buildings do not indicate significant VI risk.	<p>Industrial: No. SSG concentrations exceeded the industrial SSG RBCs at only one location. 1,2-dichloropropane was the only VOC that exceeded, and the exceedance was less than the 1×10^{-5} industrial cancer risk for this chemical. In addition, the cumulative industrial cancer risk was less 1×10^{-5}, and the industrial hazard index was less than 1 at all WIOU sample locations. Indoor air (including preferential pathway samples) and subslab data in existing buildings do not indicate significant VI risk.</p> <p>Residential: Yes. SSG concentrations exceeded residential SSG RBCs at half of the sampling locations. In areas where groundwater concentrations exceed residential screening levels, there is a potentially significant VI risk for residential usage. Mitigation measures or land use controls will be described in the upcoming Basewide Groundwater ROD to manage VI risk for residential future use scenarios in areas where groundwater concentrations continue to exceed residential screening levels.</p>

TABLE 6-4
 Summary of Vapor Intrusion Risk Evaluation
 Vapor Intrusion Assessment Report, Travis Air Force Base, California

Site	Groundwater VOC Screening Result	Site-specific SSG RBC Screening Result	Indoor Air and/or Subslab RBC Screening Result	Potentially Significant ^a VI Risk with Current Use?	Potentially Significant ^b VI Risk for Future Use?
WIOU Site SD034 (onbase)	Exceeds residential and industrial screening levels.	No shallow soil gas samples collected.	Subslab PCE, TCE, and benzene concentrations exceed industrial RBCs.	No. Facility 811 is a hangar with large doors to allow aircraft to enter. The hangar doors remain open during working hours; therefore, the facility is not an enclosed space. The floating product plume consists of Stoddard solvent, use of which is ongoing within the facility. Current use of the facility does not pose a significant VI risk.	Yes. The presence of the floating product (Stoddard solvent) plume poses a potentially significant VI risk for both residential and industrial usage. Mitigation measures or land use controls will continue to be used to manage VI risk for future use scenarios.
DP039 (onbase)	Exceeds residential and industrial screening levels.	Exceeded industrial SSG RBCs at two sampling locations and residential SSG RBCs at 11 locations.	Indoor air and subslab VOC concentrations at former Facility 755 below industrial RBCs.	No. Soil gas concentrations adjacent to the buildings overlying the groundwater plume are below industrial SSG RBCs. Indoor air and subslab VOC concentrations at former Facility 755 also below industrial RBCs. Insignificant VI risk.	Industrial: No. The cumulative industrial cancer risk was less than or equal to 1×10^{-5} and the industrial hazard index was less than 1 at all Site DP039 sample locations. Residential: Yes. Residential SSG RBCs were exceeded at 11 of the sampling locations, and several chemicals exceeded the residential SSG RBCs. Three of the exceedances were greater than 10 times the residential SSG RBCs (residential cancer risk in the 1×10^{-5} to 1×10^{-4} range for these individual chemicals). Mitigation measures or land use controls will be described in the upcoming Basewide Groundwater ROD to manage VI risk for future residential use scenarios in areas where groundwater concentrations continue to exceed residential screening levels.

TABLE 6-4
 Summary of Vapor Intrusion Risk Evaluation
Vapor Intrusion Assessment Report, Travis Air Force Base, California

Site	Groundwater VOC Screening Result	Site-specific SSG RBC Screening Result	Indoor Air and/or Subslab RBC Screening Result	Potentially Significant ^a VI Risk with Current Use?	Potentially Significant ^b VI Risk for Future Use?
SD043 (onbase)	Does not exceed residential or industrial screening levels.	No shallow soil gas samples collected.	No buildings present at site. No indoor air or subslab samples collected.	No. Groundwater concentrations are below residential and industrial screening levels, and no buildings are present at site. VI pathway is incomplete.	No. Groundwater concentrations are below residential and industrial screening levels.

^aFor these conclusions, “potentially significant VI risk with current use” is defined as VOC concentrations are below site-specific RBCs, cumulative risks for VOCs are within EPA’s risk management range of 10^{-6} to 10^{-4} , and hazard indexes are less than 1, or the pathway is incomplete.

^bFor these conclusions, “potentially significant future VI risk with future use” VOC concentrations exceed RBCs, cumulative risks are greater than EPA’s risk management range of 10^{-6} to 10^{-4} , or hazard indexes exceed the threshold of 1, and the pathway is potentially complete.

Notes:

Groundwater at these sites will continue to be monitored until remediation goals are met.

AFIOH = Air Force Institute of Occupational Health

DNAPL = dense non-aqueous phase liquid

EPA = U.S. Environmental Protection Agency

ERP = Environmental Restoration Program

PCE = tetrachloroethene

RBC = risk-based concentration

SSG = shallow soil gas

TCE = trichloroethene

VI = vapor intrusion

VOC = volatile organic compound

WIOU = West Industrial Operable Unit

(ITRC, 2007)

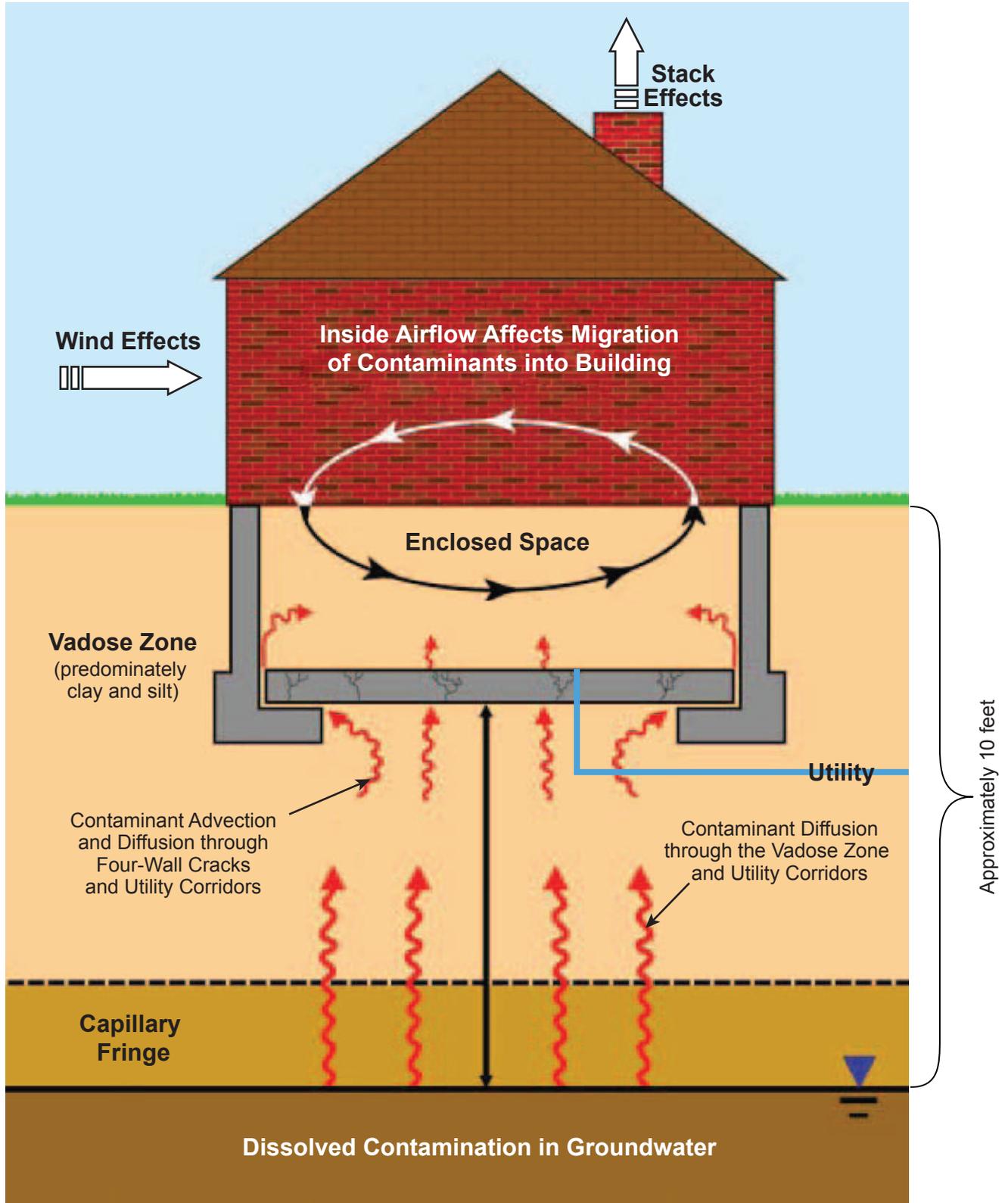
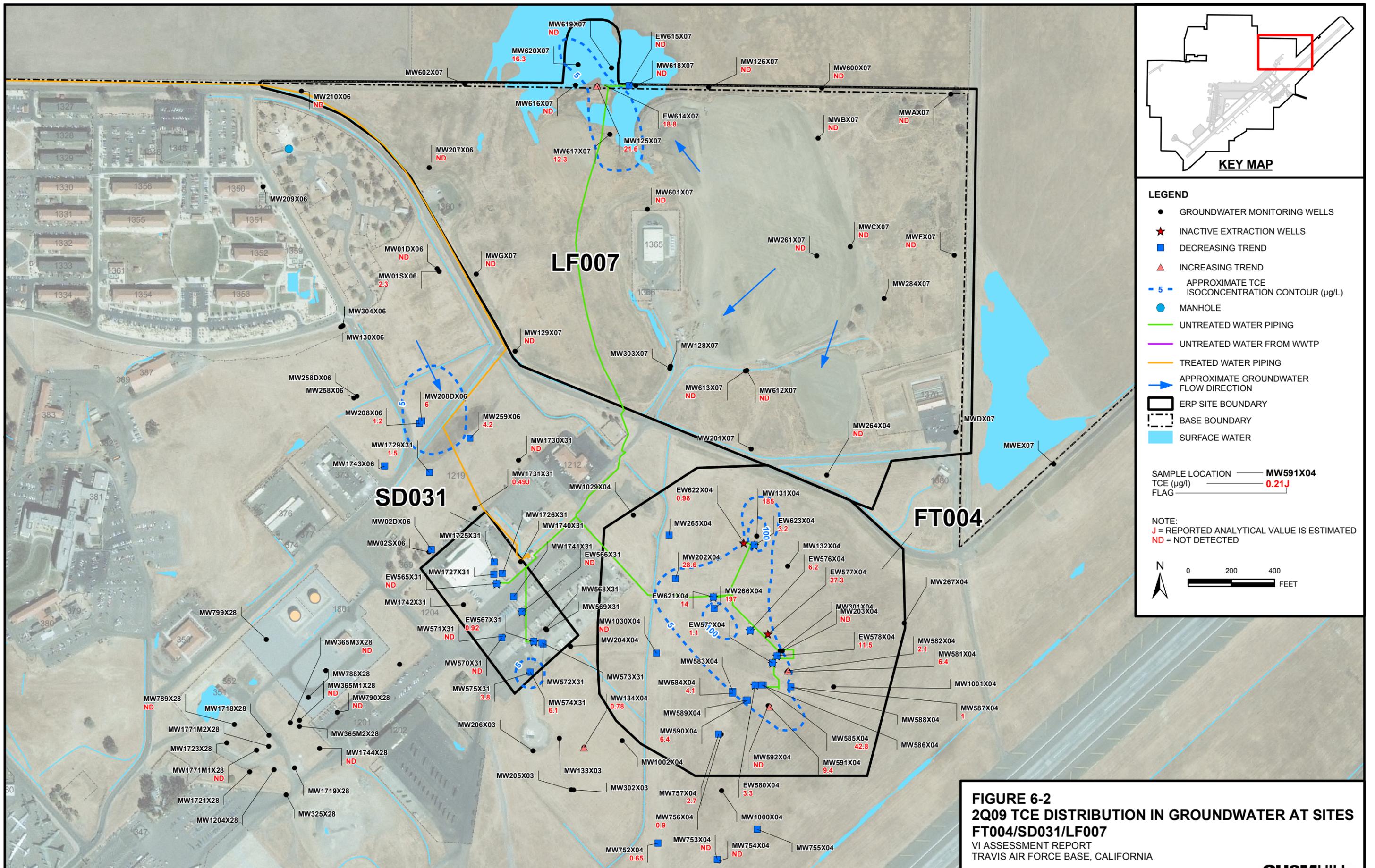
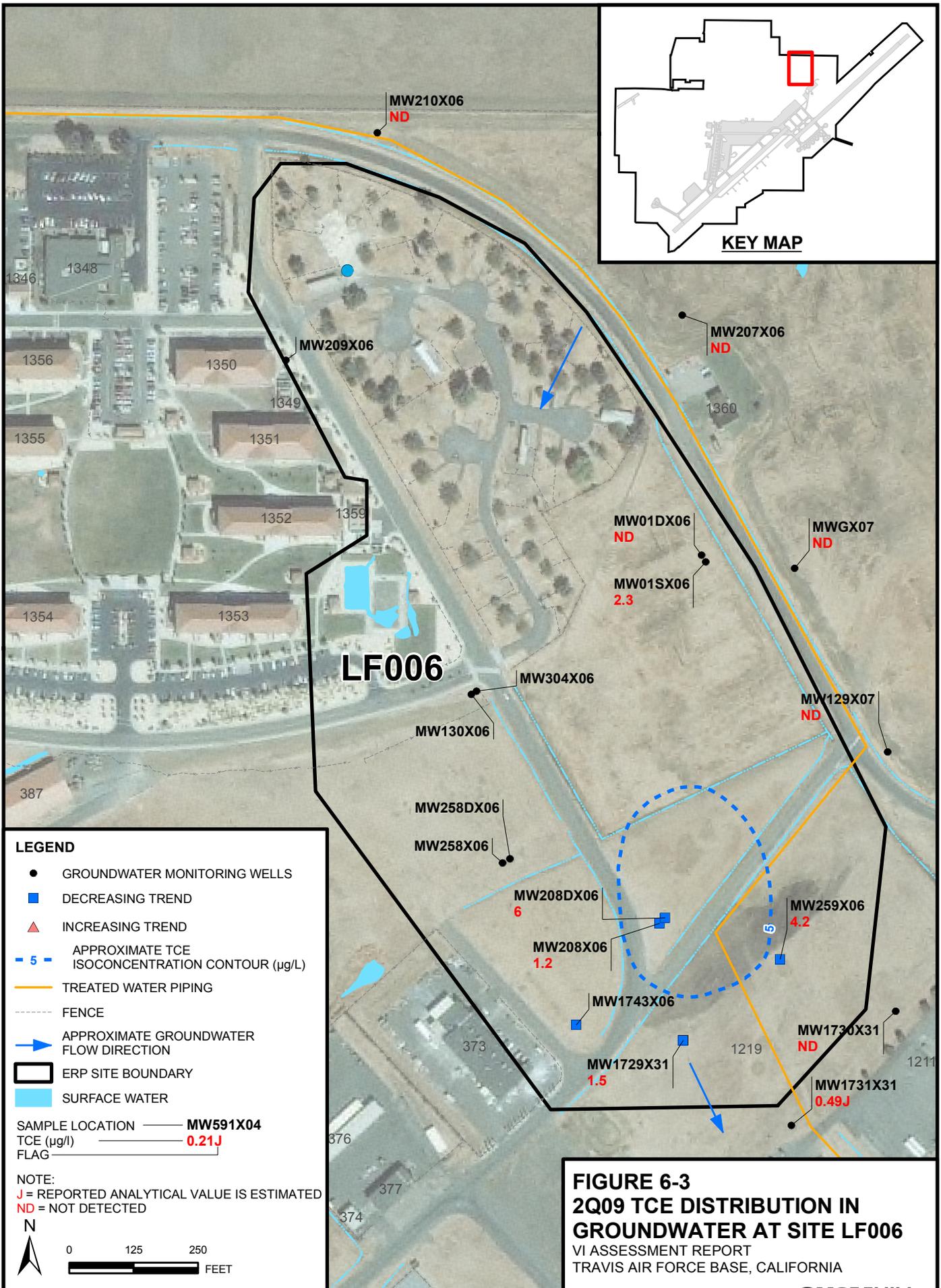


FIGURE 6-1
GENERAL CONCEPTUAL SITE MODEL
VI ASSESSMENT REPORT
TRAVIS AIR FORCE BASE, CALIFORNIA





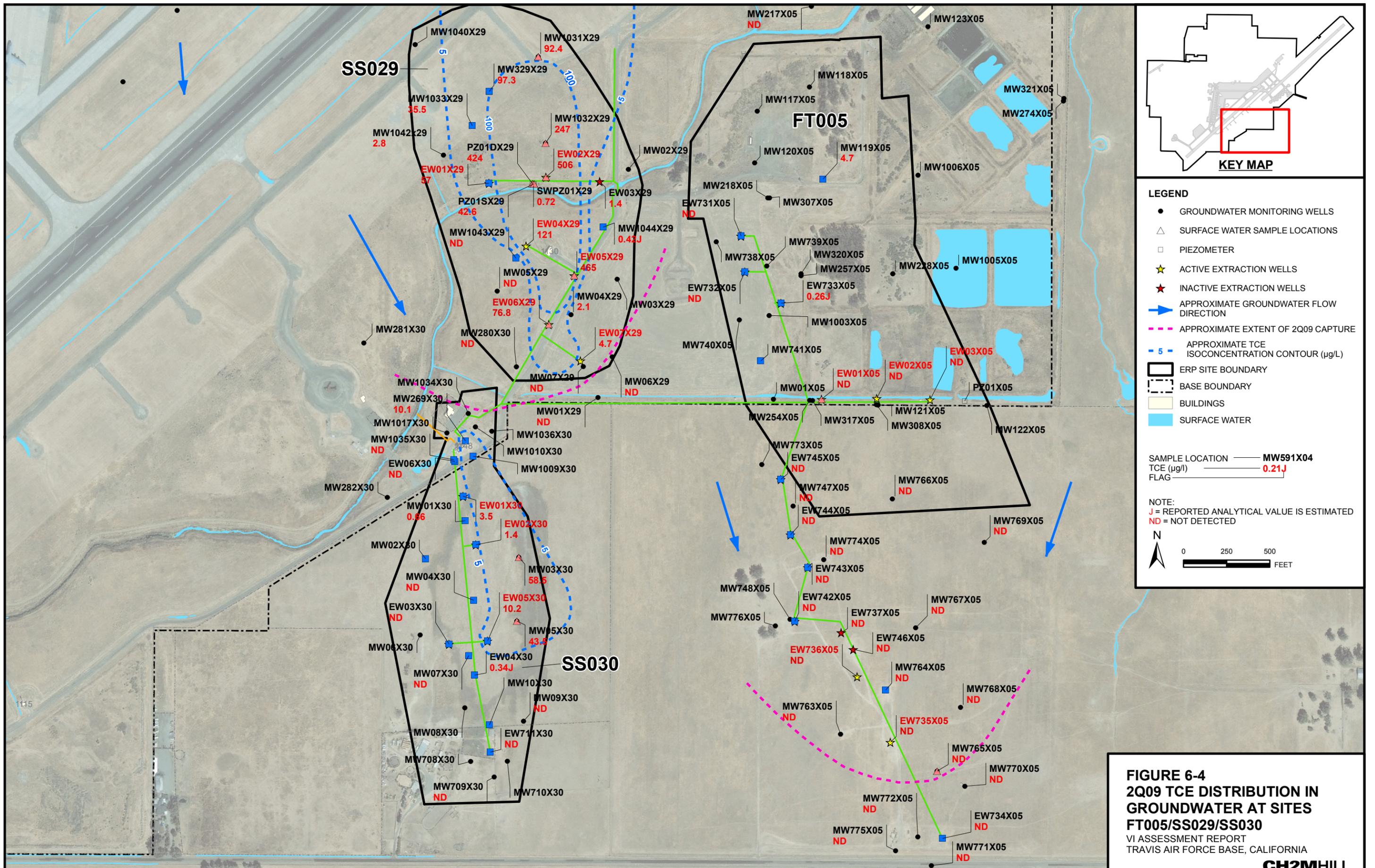
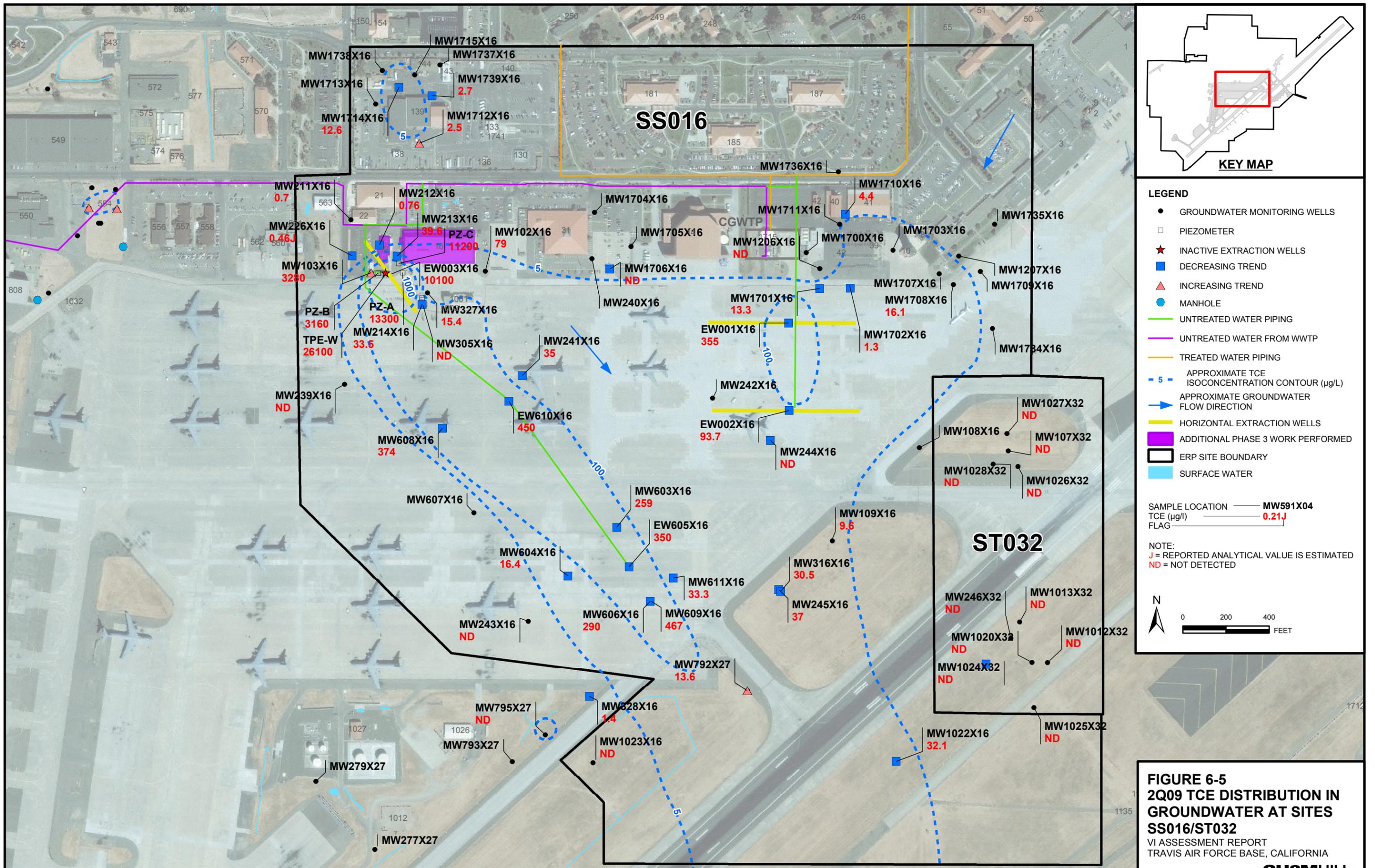


FIGURE 6-4
2Q09 TCE DISTRIBUTION IN
GROUNDWATER AT SITES
FT005/SS029/SS030
VI ASSESSMENT REPORT
TRAVIS AIR FORCE BASE, CALIFORNIA



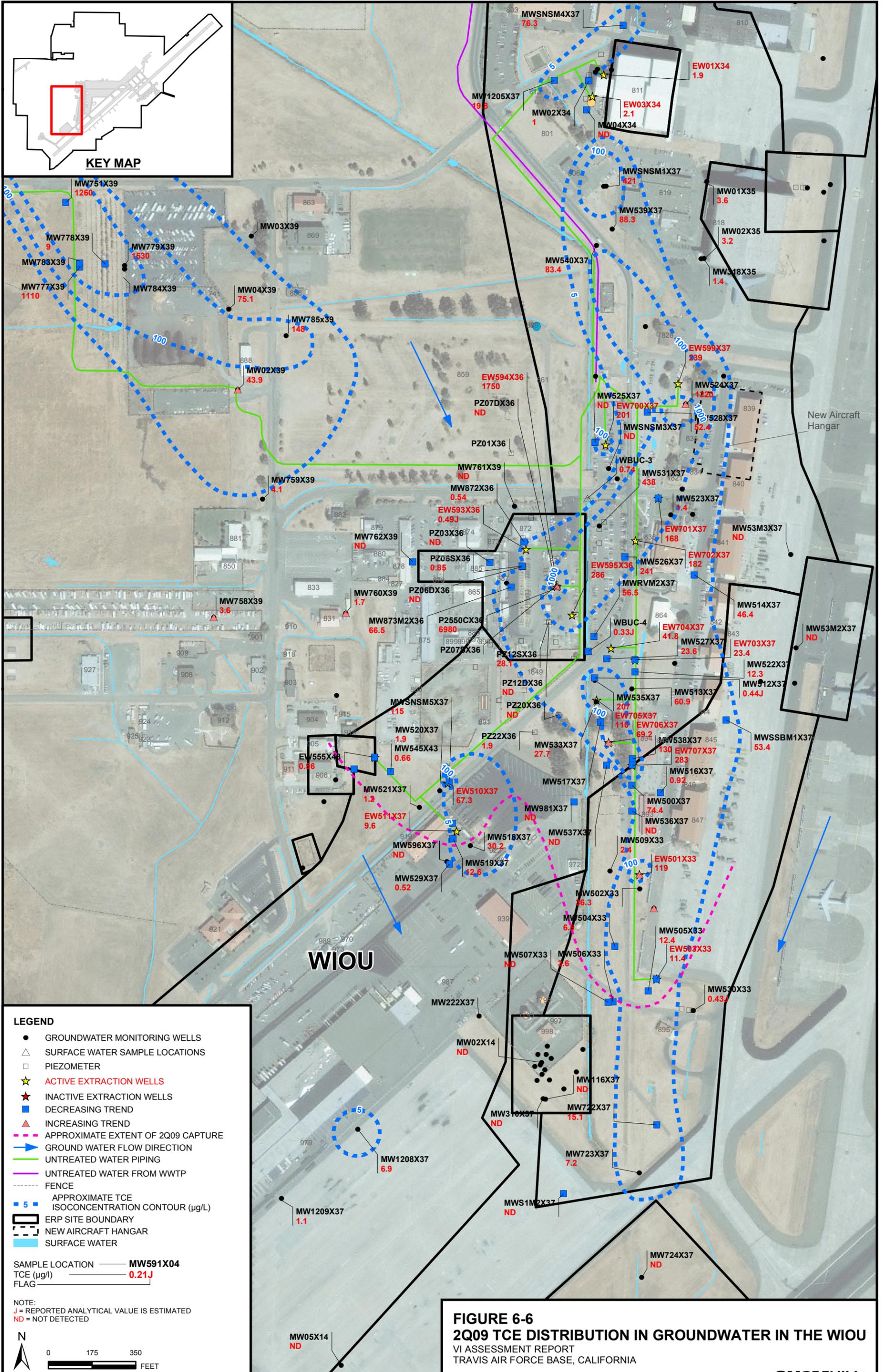
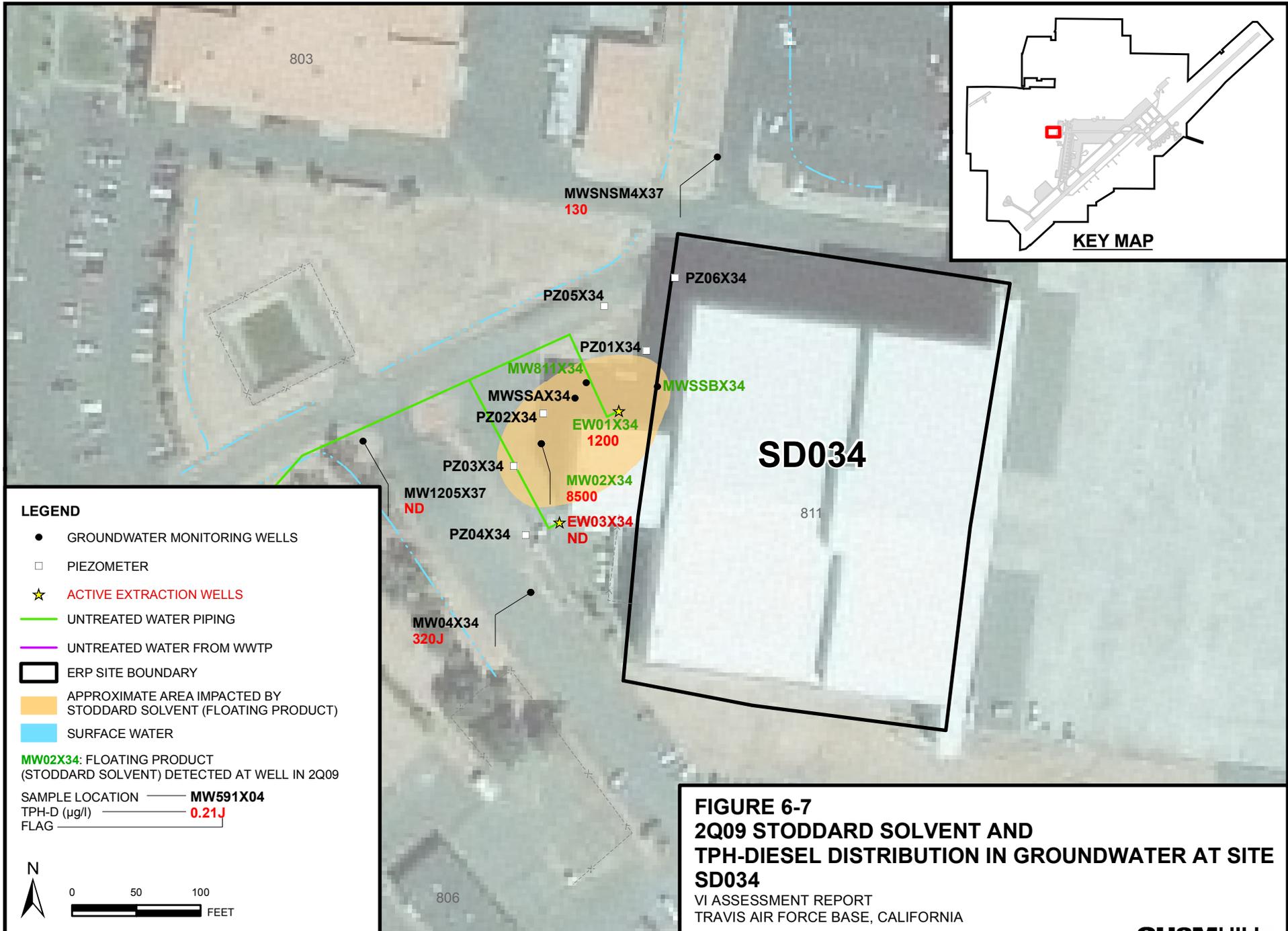
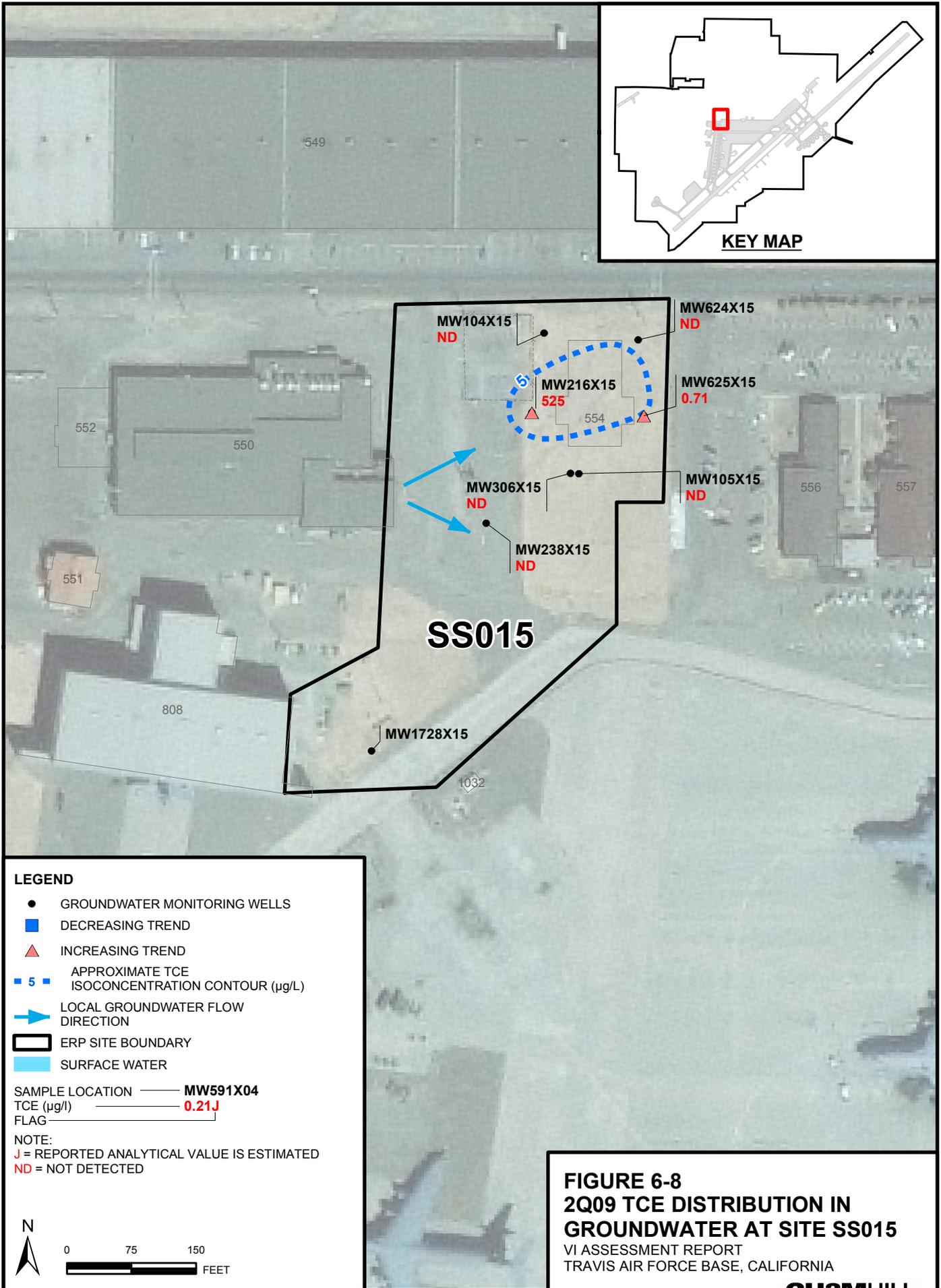


FIGURE 6-6
2Q09 TCE DISTRIBUTION IN GROUNDWATER IN THE WIOU
 VI ASSESSMENT REPORT
 TRAVIS AIR FORCE BASE, CALIFORNIA





LEGEND

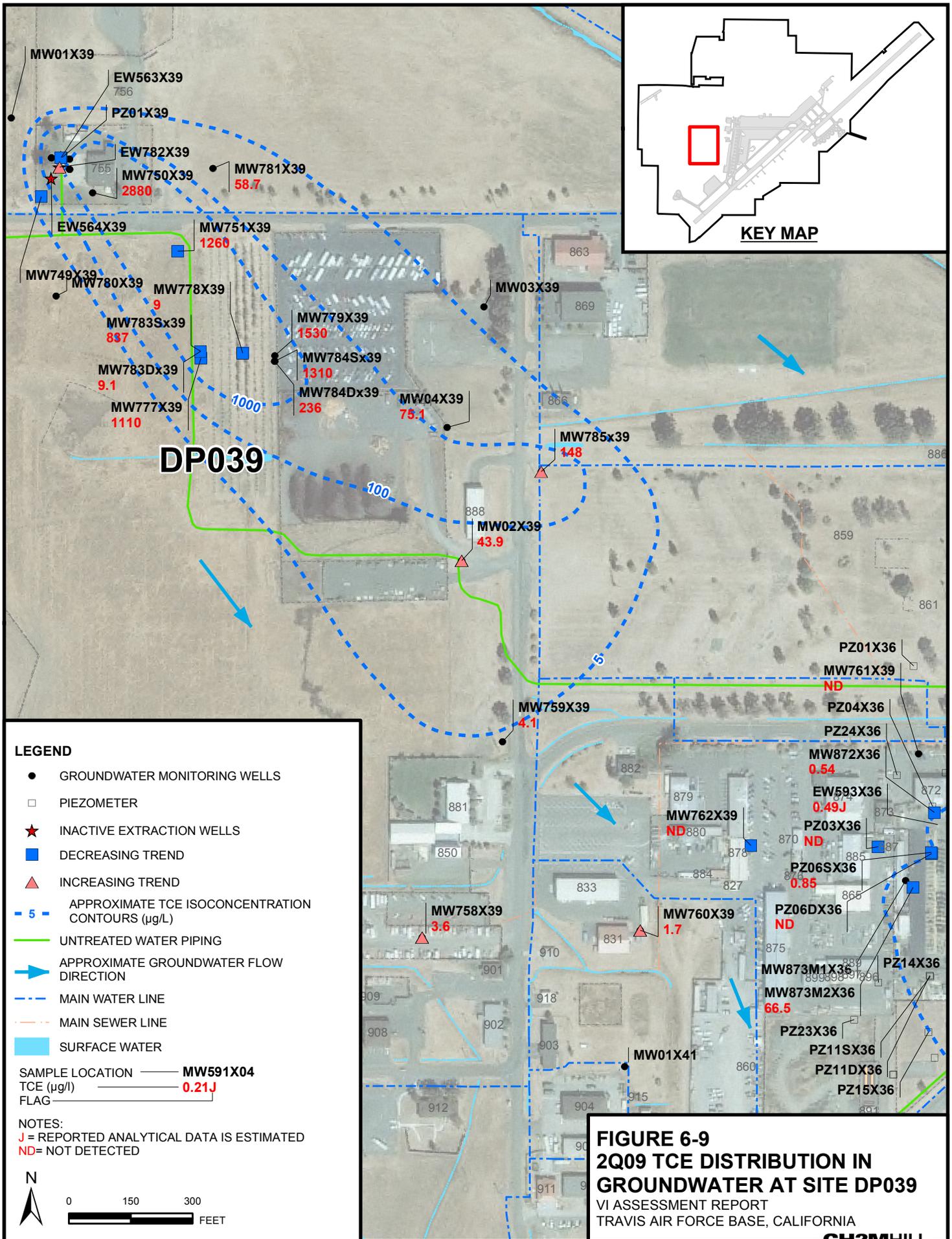
- GROUNDWATER MONITORING WELLS
- DECREASING TREND
- ▲ INCREASING TREND
- 5 ■ APPROXIMATE TCE ISOCONCENTRATION CONTOUR (µg/L)
- ➔ LOCAL GROUNDWATER FLOW DIRECTION
- ▭ ERP SITE BOUNDARY
- ▭ SURFACE WATER

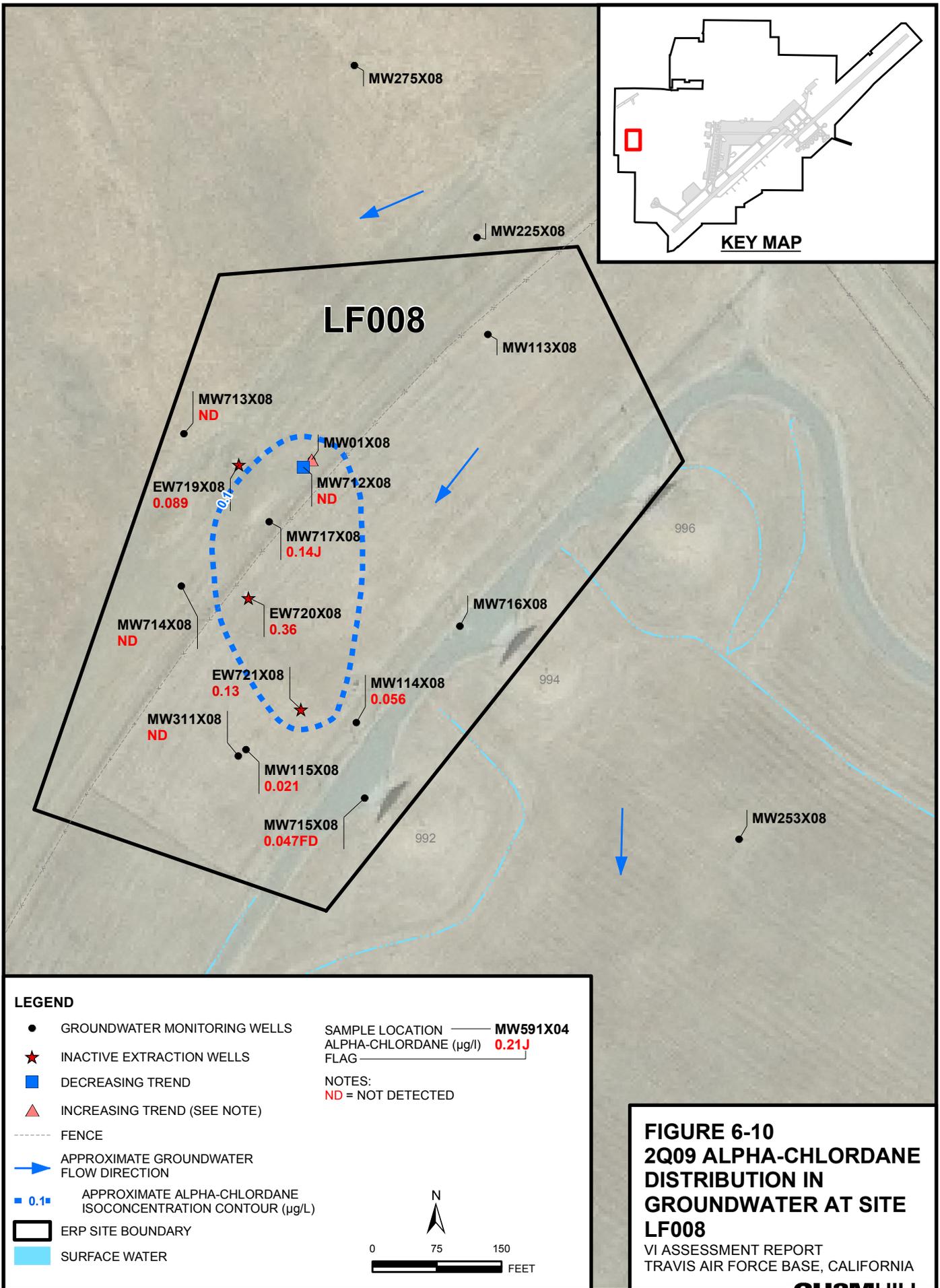
SAMPLE LOCATION ——— MW591X04
 TCE (µg/l) ——— 0.21J
 FLAG ———

NOTE:
 J = REPORTED ANALYTICAL VALUE IS ESTIMATED
 ND = NOT DETECTED



FIGURE 6-8
2Q09 TCE DISTRIBUTION IN
GROUNDWATER AT SITE SS015
 VI ASSESSMENT REPORT
 TRAVIS AIR FORCE BASE, CALIFORNIA





Conclusions

7.1 VI Assessment Conclusions

The key conclusions of the VI assessment are summarized below:

Selection of Groundwater Screening Levels and Site Specific RBCs

- Based on a comparison of modeled to measured soil gas concentrations performed in the Work Plan (CH2M HILL, 2008), the groundwater screening levels presented in the Work Plan are appropriate for screening. In fact, of the sites where soil gas samples were collected (Sites FT004, SS029, SD037, and DP039) the groundwater model overestimated the soil gas concentrations by one to three orders of magnitude. The model accurately predicted soil gas concentrations at Site FT004. The groundwater screening levels presented in the Work Plan were therefore selected as the site-specific groundwater screening levels.
- The shallow soil gas and subslab soil gas screening levels presented in the Work Plan have been replaced by site-specific RBCs that were developed using data gathered during Phase 1 of this investigation. The primary difference between the Work Plan shallow soil gas and subslab screening levels and the site-specific RBCs is that for industrial scenarios an attenuation factor of 1 in 50 (instead of 1 in 10) from subslab to indoor air was used.

VI Risk Evaluation Results

- Groundwater sites screened out in the Work Plan are considered to have insignificant risk of VI under both residential and industrial scenarios because groundwater concentrations remain below site-specific screening levels (Sites FT005, LF006, LF008, SD031, and SD043). No further VI investigation is needed at the sites screened out in the Work Plan.
- There is no current significant VI risk at Sites LF007 and SS030 because the VI pathway is incomplete at these sites. There are no buildings in the vicinity of the groundwater plumes. However, future risk for VI is uncertain at Sites LF007 and SS030 because groundwater data gaps pertaining to the extent of contamination remain. Because of access restrictions, these sites will be investigated in a separate field effort.
- There is no current significant risk from the VI pathway at Sites FT004, SS029, ST032, DP039, and WIOU Sites SD033, SS035, SD036, and SD037. This is because either there are no buildings present (Sites FT004 and ST032) or shallow soil gas concentrations, subslab concentrations, and indoor air concentrations are below site-specific industrial SSG RBCs (SS029, SD033, SS035, SD036, SD037, and DP039).
- There is no current significant risk from the VI pathway at Site SD034, Facility 811 because the facility is a hangar that is open during working hours and it is not

considered an enclosed space. However, because of the presence of a Stoddard solvent floating product plume and VOC subslab concentrations exceeding industrial subslab RBCs, if usage of the facility changes or a new facility is constructed above the floating product plume, there is potential for significant future VI risk as long as the floating product remains.

- The Site SS016 groundwater plume and nearby DNAPL (TCE) source area does pose a significant future VI risk at Facility 18, although data indicate there is not a significant current VI risk at the facility. The building is used for storage and not routinely occupied, thus there are currently no receptors. However, because of the elevated TCE concentration detected in the subslab sample collected at this facility, if building foundation conditions change in the future, there could be significant VI risk at this facility. To ensure that the exposure pathway between contaminated soil gas beneath Facility 18 and potential receptors remains incomplete, Travis AFB will institute a land use control at the facility to limit its use for storage purposes only. This control has been coordinated with the base real estate office and will be documented in the base general plan and eventually in the final Basewide Groundwater Record of Decision.
- The Site SS016 groundwater plume does not pose a significant VI risk at Facility 16, located adjacent to Facility 18. TCE, which is the primary COC in the groundwater plume, was not detected at concentrations exceeding applicable industrial indoor air or subslab RBCs.
- The groundwater plume at Site SS015 is limited in extent and largely overlain by Facility 554, which was constructed in 2004. Prior to construction of this facility, the Air Force recognized the potential for VI at this site and opted to mitigate, as a pre-emptive measure, by constructing Facility 554 with a vapor barrier and passive vent system. Recently, concentrations of cis-1,2-DCE and vinyl chloride have been increasing significantly in groundwater at this site, exceeding 1,000 µg/L. Because VOC concentrations in groundwater are increasing, an indoor air monitoring program will be established at this facility to monitor the continued efficacy of the vapor barrier and passive vent system.
- With the exception of the sites where DNAPL or LNAPL are present (Sites SD034 and SS016), there is little indication of significant VI risk under current or future industrial usage. A few VOCs (typically those that were not groundwater COCs) were detected at concentrations exceeding applicable industrial RBCs. However, the subslab and indoor air concentrations of the primary groundwater COC (TCE) did not exceed applicable industrial RBCs except at the facilities adjacent to or overlying DNAPL or LNAPL plumes.

Preferential Pathway Evaluation Results

- During Phase 3 sampling, several indoor air samples were collected specifically to assess preferential pathways. The data from these samples are useful for evaluating future land use scenarios, in addition to current VI risk. The preferential pathway sample results indicate preferential pathways do not pose a significant VI risk at Travis AFB. In the preferential pathway samples, groundwater COCs were either not detected at concentrations exceeding indoor air RBCs or were detected at concentrations similar to

those detected in outdoor air. The primary groundwater COC (TCE) was not detected at concentrations exceeding indoor RBCs in any preferential pathway sample.

Addressing Potential VI Risk

- Land use controls and/or mitigation measures will be described in the upcoming Basewide Groundwater ROD to address potential future residential and industrial use as needed.

7.2 EPA Conclusions

The EPA has reviewed the data in this report and has drawn the following conclusions:

- For some buildings the VI pathway was demonstrated to be complete (why in particular is unknown) and;
- While some soil-gas levels were at levels of concern, actual measured concentrations indoors were in or below the risk range for industrial use. Therefore, institutional controls shall be added for all the areas above the groundwater screening levels to include notification for new industrial construction and any change in land-use to residential.

SECTION 8

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