

Crane Co.

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AIR SAMPLING REPORT

Phoenix-Goodyear Airport North
Superfund Site Goodyear, Arizona



Infrastructure, buildings, environment

ARCADIS



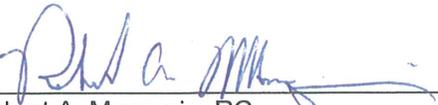

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North Superfund Site
Goodyear, Arizona


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1.0	INTRODUCTION	1
1.1	Purpose	2
1.2	Description of Sampling Operations	3
2.0	BACKGROUND	4
2.1	Site History	7
3.0	SAMPLE PROGRAM DESIGN	8
3.1	Indoor Air Sample Locations	9
3.2	Outdoor Air Sample Locations	9
3.3	Quality Assurance/Quality Control Samples	11
4.0	SAMPLE ANALYSIS	11
5.0	DATA QUALITY OBJECTIVES	12
5.1	Statement of the Problem	13
5.2	Identification of the Decisions	13
5.3.1	Conceptual Model	15
5.3.2	Building Owner / Tenant Communication	15
5.3.3	Sampling Approach	16
5.4	Decision Rules	17
5.4.1	Data Collection	17
5.4.2	Health Risks	17
6.0	MITIGATION CONSIDERATIONS	20
7.0	RESULTS AND CONCLUSIONS	20
8.0	REFERENCES	21

Tables

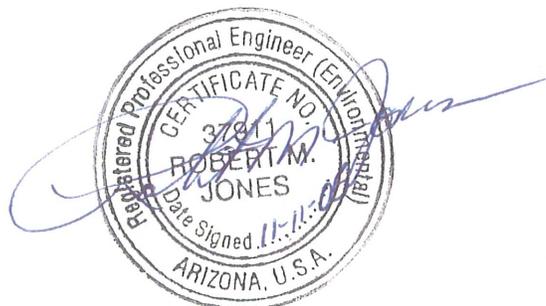
- 1 Data Quality Objectives Phoenix-Goodyear Airport North Site
- 2 Risk Assessment Tiers and Values for Noncarcinogenic Compounds
- 3 Risk Assessment Tiers and Values for Potentially Carcinogenic Compounds
- 4 Comparison of Indoor Air Sampling Results to Site-Specific Background Ambient Air
- 5 Comparisons of 2003 and 2005 TCE and PCE Indoor Air Results
- 6 Comparison of Indoor Air Results and Regional Background Data
- 7 Results for VOCs in Indoor Air and Comparison to Tier 2 and 3 Criteria

Figures

- 1 Property Location Map
- 2 Building Locations and Proposed Perimeter Air Quality Sampling Locations
- 3 Air Quality Sampling Locations – 250 North Litchfield Road
- 4 Air Quality Sampling Locations – 190 North Litchfield Road
- 5 Air Quality Sampling Locations – 140 North Litchfield Road
- 6 Background Air Sampling Locations

Appendices

- A Climate Data
- B Analytical Results
- C Data Validation Report
- D Statistical Comparison



1.0 INTRODUCTION

On behalf of Crane Co. (Crane), ARCADIS G&M, Inc. (ARCADIS) has prepared this Air Sampling Report to document the results of the air sampling operations outlined in the Final Air Sampling Workplan, which was submitted to the US Environmental Protection Agency (US EPA) on March 9, 2005. The Workplan was submitted to outline the completion of an air quality sampling investigation in the vicinity of three buildings located on property which was formerly a part of Unidynamics/Phoenix, Inc. (UPI) facility. This Final Air Sampling Workplan was developed from the Air Sampling Work Plan, submitted by Geomatrix Consultants, Inc. (Geomatrix) to US EPA on September 29, 2004, and subsequent US EPA comments dated November 18, 2004. Sampling components of this plan include indoor air quality (IAQ), perimeter outdoor, heating ventilation and air conditioning (HVAC) intake, remediation system, and background air sampling. UPI is a part of the Phoenix-Goodyear Airport, North Superfund Site (PGA-N), located in Goodyear, Arizona (Figure 1).

An initial air sampling event was conducted in September 2003. The results of the initial sampling event indicated that the concentrations of tetrachloroethene (PCE) and trichloroethylene (TCE) in indoor air were substantially below the acceptable risk based criteria. Other contaminants of concern (COCs) were analyzed, but the TCE and PCE proved to be the most prevalent and significant. The acceptable risk based criteria are Risk Based Concentrations (RBCs) which are site-specific and correspond to an acceptable level of risk (*i.e.*, either a 1×10^{-6} cancer risk or a noncarcinogenic hazard quotient of 1). RBCs were calculated using site-specific exposure parameters and US EPA recommended toxicity criteria. Additionally, the concentrations of TCE in indoor air were within the provisional health protective concentrations of 0.048 to 4.8 micrograms per cubic meter ($\mu\text{g}/\text{m}^3$) established by US EPA Region IX for indoor commercial workers.

Correspondence from the US EPA on January 27 and June 18, 2004, requested a winter air sampling event, including collection of regional air samples. According to US EPA, the purpose of the winter sampling event is to evaluate the "stack effect," temporal variations in volatile organic compound (VOC) concentrations in the buildings, and the relationship between outdoor air quality and indoor air quality. Crane responded to US EPA in a letter dated July 1, 2004, and committed to performing the winter sampling event.

1.1 Purpose

The objectives of this Report are to present air quality sampling results that can be used for the evaluation of potential risk to human health in the buildings; and to demonstrate that the procedures adhere to the uniform baseline procedures, guidelines, and quality assurance protocols designed to produce air quality data of acceptable consistency and quality. Data collected that meet the standards established in the Workplan will be considered acceptable and consistent. The field activities covered by this Report consist of the collection and analysis of representative indoor, perimeter outdoor, HVAC intake, remediation system, and background air samples.

This Report is being submitted as part of the process of evaluating the vapor intrusion pathway as it pertains to the subject buildings, through the collection of indoor air and outdoor air samples in and around each of the three buildings in question and also from locations located further from the PGA-N Site.

Outdoor air samples were collected to aid in the evaluation of potential vapor intrusion sources and to determine if outdoor air is contributing to indoor air levels of VOCs, specifically TCE in indoor air. Results of outdoor air samples will not be used “to resolve a local or regional source of compounds of concern.” Outdoor ambient air samples were collected as a reference because ambient air quality can have an effect on the quality of indoor air. Potential outdoor air contributions were identified by comparing outdoor ambient air to indoor air. The results were used to evaluate if detections of TCE in indoor air are related to: 1) subsurface migration of chemicals through the building foundation; 2) emissions from the groundwater treatment system (remediation system) located south of the buildings; and/ or 3) regional (background) sources.

The two air sampling events discussed herein provide a comprehensive data set from two seasons that are used to provide a quantitative evaluation of the potential health risk to occupants of these facilities from VOCs, which may be migrating from the subsurface at UPI. Indoor air concentrations depend on several building-specific parameters such as the operations of the HVAC system, the construction of the building, the presence of vapor barriers, chemical usage inside the building, and ambient VOC air concentrations.

1.2 Description of Sampling Operations

The activities completed under the Workplan and described in this Report consisted of four general tasks:

1. Pre-sampling tasks:

- Collecting updated information on available and non-confidential chemical use and storage from the current tenants and/or property owners through a building survey; and,
- Obtaining access for sampling.

2. Representative air sampling:

- Collected 24-hour IAQ samples from each of the three buildings;
- Collected 24-hour air samples near the air intakes of four HVACs;
- Collected 24-hour air samples from three locations representative of background air quality (see sec. 3.6.2 of the workplan);
- Collected one 24-hour air sample near the carbon polish exhaust port at the Phase I/II groundwater treatment system at the PGA-North Site;
- Collected 24-hour air samples from three locations near the perimeter of the properties; and,
- Analyze each of the air samples for COCs using US EPA Test Method TO-15 and for PCE, TCE and Vinyl Chloride using US EPA Test Method TO-15 Selective Ion Mode (SIMM).

3. Prepared and submitted a Draft Air Investigation Report to US EPA within (thirty) 30 days of receiving and reviewing the final validated analytical data (March 1, 2005).

4. Submit a Final Air Investigation Report within thirty (30) days of receipt of US EPA's comments on the Draft Air Investigation Report or within sixty (60) days of completion of the fieldwork, whichever comes later.

2.0 BACKGROUND

The former UPI facility is located on approximately 58 acres in Goodyear, Arizona, 17 miles west of Phoenix. The former UPI facility lies within the West Salt River Valley basin. Land use in the area surrounding the property is mixed. Agricultural land is found to the west, industrial property to the south, residential and commercial properties lie to the east, and commercial properties are located to the north of the site. Phoenix-Goodyear Airport, South Superfund Site (PGA-S) is located south of UPI. The main contaminants at PGA-S are TCE and chromium.

The facility was operated by UPI as a research, design, development, test and manufacturing plant of ordnance components and related electromechanical devices from 1963 through 1993. The operating business (excluding buildings and land) was sold to Pacific Scientific (PS) in April 1993. PS ran the business for approximately 18 months before operations were ceased.

Currently, there are 24 abandoned buildings onsite as well as other structures such as former storage bunkers. A water treatment plant for treatment of extracted groundwater containing chemicals of concern is operating on the southwest portion of the property. The current site layout, the buildings of concern, and perimeter air sampling locations are shown on Figure 2. According to historical records the portion of the former UPI facility where the three facilities to be investigated are located was not utilized while the facility was operational.

As noted by the US EPA, typical meteorological conditions in Phoenix metropolitan area are dominated by upslope air flows during afternoons and downslope flows during mornings. Temperatures in the summer range from 76 to 102 degrees Fahrenheit (F) and in the winter months from 42 to 69. Data on local air concentrations of TCE and PCE are available from US EPA's online database, AirData. This database provides access to ambient concentrations of pollutants in outdoor air from more than 4,000 monitoring stations owned and operated mainly by state environmental agencies (<http://www.epa.gov/air/data/geosel.html>). ARCADIS has gathered meteorological data from the National Weather Service, Daily Climatological Report (Appendix A) for the days of sampling.

General background, including a description of PGA-N, facility history and use, geology and hydrogeology, and previous investigation and remediation work are provided in Section 2.2 of the Sitewide QAPP. Further details about buildings and past facility operations are provided in the Draft Final Site Briefing Package (Geomatrix,

2003b). The Draft Final Site Briefing Package can be accessed in the technical reports section of the Project Website at <https://www.extranet.arcadis-us.com/PGANorth/default.aspx> (use the password: ARCADIS-US-EXT\eperson). Additional details regarding historical occurrence of chemicals in soil gas beneath the property are presented herein to provide context specific to the Workplan.

In 1984, a soil investigation was conducted at the property (Western Technologies, Inc., 1984a and 1984b). TCE was detected at concentrations as high as 386 milligrams per kilogram (mg/kg) in soil at depths up to 45 feet below ground surface (bgs). In 1985, a soil gas survey was conducted at the property (Dames & Moore, 1985). Shallow soil gas samples, collected from depths of 4 feet bgs, were collected at 40 locations on the property to estimate the extent of VOC-affected groundwater and to assist in selecting locations for shallow groundwater monitor wells. The greatest TCE concentrations, up to 200 micrograms per liter of air ($\mu\text{g/L}$), were detected near four dry wells and Building 16.

Additional soil sampling conducted in 1988 provided additional evidence that the dry wells were the primary source of TCE in soil and groundwater (Dames & Moore, 1988b). TCE was detected at a maximum concentration of 860 mg/kg in a soil sample collected at 41.5 feet bgs, in soil near the four dry wells west of the Main Building.

In 1989, the US EPA published the Phoenix-Goodyear Airport Remedial Investigation/Feasibility Study (US EPA, 1989b [RI/FS]). Soil sampling conducted as part of the remedial investigation identified the following VOCs in soil at the property: TCE, 1,1,1-trichloroethane (TCA), methyl ethyl ketone (MEK), acetone, isopropyl alcohol, methylene chloride, xylenes, ethylbenzene, toluene, and methanol. High concentrations of TCE, acetone, and MEK were present in soil below a depth of 35 feet bgs near the four dry wells. For soil, the RI/FS determined a soil vapor extraction system with emission controls was the preferred alternative to remove VOCs.

US EPA issued an Administrative Order in 1990, which included a provision to install a soil vapor extraction system in the vadose zone to protect underlying groundwater (US EPA Region IX, 1990). During a pilot study conducted during the design of a soil vapor extraction (SVE) system in 1992, TCE, MEK, PCE, and acetone were identified in the soil gas. No other VOCs were identified. The SVE system, which utilized thermal oxidation treatment due to the potential presence of acetone and MEK, was installed and operated from June 1994 to October 1998. During operation of the SVE system, only TCE was tracked in the effluent vapor stream. In October 1998 the SVE system was shut down for evaluation. The evaluation was necessary in part because of

problems reported during the system's operation. Following evaluation by US EPA, which incorporated community concerns regarding potential dioxin emissions, US EPA did not require the system to be restarted at that time. It was estimated that approximately 10,000 pounds of TCE were removed by the SVE system between 1994 and 1998.

In June 2002, CH2M Hill, under contract with the US EPA, implemented a sampling program to assess residual concentrations of VOCs in the soil vapor near the former dry wells. As part of that study, soil gas samples were collected from six soil vapor monitoring wells, located near the SVE wells, which had been installed as part of the SVE system monitoring, and analyzed for VOCs. TCE was detected in each of the soil gas samples. The greatest detected TCE concentration was 6,400 µg/L in the soil vapor sample collected at 50 feet bgs from soil vapor monitor well SVM-01. The lowest detected TCE concentration was 10 µg/L in the soil vapor sample collected at 27.5 feet bgs from soil vapor monitor well SVM-6. PCE was detected in one sample.

In April 2003, CH2M Hill, under contract with the US EPA, drilled and sampled soil boring B4 and B4A to assess VOCs in the soil vapor approximately 100 feet to the northwest of the building located at 140 North Litchfield Road. Soil vapor samples were collected from B4 at depths of 20, 30, 40, 50, 60, 70, and 80 feet bgs. Soil vapor samples were collected at depths of 10 and 20 feet bgs in the B4A boring, which was located 12 feet west of the initial boring. Each of the soil vapor samples was analyzed for VOCs using US EPA Test Method TO-15. Several VOCs were detected in the soil vapor samples; however, most of the chemicals appear related to a petroleum release which did not occur on the UPI property. TCE was detected in each of the soil vapor samples, with the detected TCE concentration generally decreasing from 50 feet bgs to the water table. TCE was detected at a concentration of 0.41 µg/L in the soil vapor sample collected from 10 feet bgs.

In September 2003 Geomatrix collected 20 air samples from in and around the three buildings (Geomatrix, 2003c). The Air Sampling Report can be accessed in the technical reports section of the Project Website at <https://www.extranet.arcadis-us.com/PGANorth/default.aspx> (use the password: ARCADIS-US-EXTepaperson). The samples were analyzed for select volatile COCs listed in the Record of Decision (ROD – September 26, 1989) and which are breakdown products of PCE and TCE. These include the following chemicals: PCE, TCE, 1,1-DCE, cis-1,2-DCE, trans-1,2-DCE, and vinyl chloride. The air samples were analyzed for the COCs using US EPA Test Method TO-15 and for TCE, PCE, and vinyl chloride using US EPA Test Method TO-15 Selective Ion Mode (SIMM). PCE, TCE, 1,1-DCE, cis-1,2-DCE, trans-1,2-DCE,

and vinyl chloride were not detected above the reporting limit of 0.50 parts per billion volume (ppbv). Acetone and 2-butanone (MEK) were detected in the majority of air samples collected. TCE and PCE were detected in each of the samples analyzed using US EPA Test Method TO-15 SIMM. The maximum TCE concentration detected was 85 parts per trillion volume (pptv) which equates to $0.457 \mu\text{g}/\text{m}^3$, and the maximum detected PCE concentration was 110 pptv ($0.746 \mu\text{g}/\text{m}^3$). The Geomatrix (2003c) report indicates that “detections of PCE and TCE in indoor air were substantially below acceptable risk based criteria”. Additionally, the concentrations of TCE in indoor air were within the provisional health protective concentrations of 0.048 to $4.8 \mu\text{g}/\text{m}^3$ established by US EPA Region IX for indoor commercial workers. Because the concentrations of PCE and TCE in indoor air were similar to the concentrations in outdoor air, it was determined that concentrations of PCE and TCE in indoor air are more likely related to outdoor ambient air quality rather than vapor intrusion from the subsurface.

In April 2004, ARCADIS, under contract with Crane, collected soil vapor samples from 14 soil vapor monitor well locations. Each soil vapor monitor well location has between two and five depth specific vapor sampling ports. TCE was detected in each of the soil vapor monitor wells. The greatest detected TCE concentration was $8,450 \mu\text{g}/\text{L}$ in the soil vapor sample collected at 20 feet bgs from soil vapor monitor well SVM-01. The lowest detected TCE concentration was $0.0188 \mu\text{g}/\text{L}$ in the soil vapor sample collected at 20 feet bgs from soil vapor monitor well SVM-15. PCE was detected in 12 of the soil vapor monitor well locations. The lowest detected PCE concentration was $0.0057 \mu\text{g}/\text{L}$ in the monitoring point located at 10 feet bgs in soil vapor monitor well SVM-14. The highest detected PCE concentration was $50.7 \mu\text{g}/\text{L}$ in the monitoring point located at 27.5 feet bgs in soil vapor monitor well SVM-04.

2.1 Site History

UPI had approximately 150 to 200 programs ongoing at any one time. They ranged from small-scale research (entailing a few units) to manufacturing of specialized products. Typically, the products were small items such as fuses, switches, and detonators. These products were used to activate a specialized function in a larger scale defense system. Units manufactured at UPI generally contained only a few grams of explosive or reactive chemicals. Most of the explosive/reactive components they manufactured were one half to one inch long. These were typically assembled into the appropriate housings that were then shipped off and installed (by others) as a small component of a large system. UPI did not manufacture system items. Any particular product could be worked on in several different buildings/areas.

Three buildings (Buildings 1 through 3) were constructed in 1963 when the Site was first developed. These buildings were used for offices, powder processing, ordnance assembly and testing, research labs, and shipping and receiving.

Buildings 4 through 16 were constructed between 1965 and 1966. This expansion was the result of a large expansion of business within the company, mostly due to the Vietnam War. Buildings 4, 5, and 6 were constructed for the purpose of handling smoke grenade chemicals and assembling of smoke grenades.

Powder processing was moved from Building 3 to Building 11 in 1971 and remained there until the selling of the business. Building 12 was primarily used for the blending and processing of propellants.

Buildings 17 through 21 were constructed between 1966 and 1967. Again these buildings were added to handle growth of the business. Buildings 17 and 18 were used for the testing of ordnance. Building 19 was used to store solvents, both spent and virgin. Spent solvents were not stored in Building 19 until a solvent recycling program was started in 1974.

Building 22 was constructed in 1982, and was referred to as the engineering building. Small scale ordnance loading and testing were among the operations performed in this building. The facility was closed in 1994. Since that time the buildings have not been used for industrial purposes. Most of the buildings are currently empty of the equipment used during the plant operations.

3.0 SAMPLE PROGRAM DESIGN

Based on the information gathered during their building walk-throughs and from diagrams/schematics of the buildings, Geomatrix selected IAQ sampling locations which would allow for a representative health risk to be calculated for each building. In addition, the sample locations allowed for the evaluation of potentially sensitive receptors. IAQ samples were collected, as near as possible, from the first floor of each building from the same locations as the initial summer sampling event. During the placement and retrieval of all samplers on February 9 and February 10 respectively, ARCADIS was accompanied by Mr. Alan Erickson of CH2M HILL, US EPA's oversight consultant.

3.1 Indoor Air Sample Locations

Approximate sample locations for the four samples collected at 250 North Litchfield Road are shown on Figure 3. These locations include the following areas: 1) White Tanks Physical Therapy office - in large open exercise area¹; 2) Corner Bistro - in the front area; 3) US Air Force Recruiting Office – southeast corner of reception; and, 4) Chicago Title - in break room.

Approximate sample locations for the four samples collected at 190 North Litchfield Road are shown on Figure 4. These locations include the following areas: 1) Office Area 132 - Building Safety and Engineering Section; 2) Employee break room adjacent to the Public Meeting room; 3) Finance Office Area 105; and, 4) Public Lobby Area on the north wall display cabinet.

Approximate sample locations for the five samples to be collected at 140 North Litchfield Road are shown on Figure 5. These locations include the following areas: 1) Radiology Department bookshelf near the doorway to the film viewing area¹; 2) Former Registration desk¹; 3) Doctor's Suite 101 in Medical Office Building portion¹ – south wall on medical records shelf. The former Emergency Department was no longer occupied and the HVAC system was not in operation. Based on this observation it was not deemed appropriate to place a sampler in the hallway near south end of building. Additionally, the Family Planning office¹ in the west end of the medical office building in the northwest corner of C111 was not open for business and therefore, no sampler was placed in that location.

3.2 Outdoor Air Sample Locations

Samples collected from outdoor locations are intended to provide a general over-view of the COC concentrations within the air shed at the time of the collection of the indoor air quality samples. The perimeter and background samples are provided to test for significant differences in COC concentrations in order to estimate the possibility for source specific contributors of COCs. As such, the samples will only be considered a qualitative assessment of the area air quality in terms of order of magnitude comparisons. Samples collected near the HVAC intakes will provide an indication of COC content of fresh make-up air for the building ventilation systems.

¹ Potential for sensitive receptors to be present.

Air Intake Rooftop Locations - The buildings at 250 and 190 North Litchfield Road have one air intake for the air supply system. One sample was collected adjacent to these air supply system intakes (Figure 3 and 4). The building at 140 North Litchfield Road has multiple air handling units on the roof rather than one large unit. Two rooftop air intake samples were collected from the south wing (Figure 5), as access was not available for the west wing. These outdoor air sample locations were determined based on which intakes, if any, were noted to be in operation at the time of the sampler placement.

Perimeter Air Locations – Three locations were chosen to provide for a representative sample of ambient air at the perimeter of the properties of interest. Three locations were chosen including the following areas: 1) east side of plaza toward Litchfield Road, attached to the palo verde tree between the Goodyear Financial Center and the City of Goodyear Administrative Office Facility; 2) due west of the buildings attached to the well housing of monitor well MW-7 in the general area of Boring B-1; and, 3) on the UPI facility fence southwest of 140 North Litchfield Road. These locations are depicted on Figure 2 and again on Figure 6.

Ambient Air Locations – Three locations were chosen to provide a representative sample of background air in the vicinity of the properties of interest. The following three locations were chosen: 1) Adjacent to Van Buren Street, on the north side of the road, located on the electrical switch gear directly north of 250 North Litchfield Road; 2) on the west side fence of the manufactured home facility adjacent to the railroad tracks south of Yuma Road; and, 3) at the well compound owned by Roosevelt Irrigation District (RID), located on the southwest corner of Van Buren Street and Dysart Road. These locations are depicted on Figure 6.

Remediation System Effluent Locations – One air sample was collected from on top of the City of Goodyear (COG) generator stored in the Main Treatment System (MTS) compound, approximately 25 feet northeast of the exhaust of the carbon polishing unit at the MTS (Figure 6). This sample is intended to provide a representation of the COCs which may be discharged from the facility into the air shed by the treatment plant process. Due to the possible variability of air currents in and around the main treatment system, this sample is only intended to provide a short-time overview of the COCs in the ambient air near the treatment system during the sampling period. Atmospheric mixing makes the use of the results from this sample mainly qualitative for an over-all evaluation of the ambient background air quality in the area of the PGA North Superfund Site.

It should be noted that the SVE system associated with the site is located roughly 1/8th of a mile from the subject buildings. No sample is scheduled for collection near the SVE system, primarily due to the information obtained from the normal system monitoring. System samples currently provide an estimation of COC loading to the air-shed from the soil remediation activities.

3.3 Quality Assurance/Quality Control Samples

This section discusses additional samples that were taken concurrently with the other samples to maintain an acceptable level of quality assurance. All Quality Assurance/Quality Control (QA/QC) samples were delivered to the same analytical laboratory and analyzed using the same collection, preparatory and analytical methods used for the other samples.

Field Duplicates: The minimum number of co-located duplicate samples was approximately 10% of the number of sample locations. The duplicate samples were intended to evaluate analytical variability between samples. The co-located replicated sample was obtained over the same time interval as the original sample. The replicate canisters were placed within 2 feet of the original sample, at the same elevation, and were sampled according to the same procedures described above. In addition to the ARCADIS field duplicates, CH2M HILL collected split samples at pre-selected sampling locations.

Trip Blanks: At least one trip blank sample was obtained for approximately every 10 air samples collected. The trip blanks consisted of a laboratory supplied Silonite-passivated steel canister under full vacuum. The canisters were carried with the original air samples but did not have a flow controller attached. The canisters were returned to the laboratory under full vacuum. The trip blank results are intended to verify sample integrity during field sample collection and during the transit process. No field blanks were collected due to the limited number of canisters available, in order to ensure adequate placement of required samples.

4.0 SAMPLE ANALYSIS

The air samples for analytical chemistry testing were collected in 6-liter Silonite canisters and were then transmitted to Aerotech Environmental Laboratories (AEL), of Phoenix, Arizona, under strict chain of custody. AEL is an Arizona Department of Health Services accredited analytical laboratory. The samples were analyzed for PCE, TCE, cis-1,2-DCE, trans-1,2-DCE, 1,1-DCE, and vinyl chloride, in accordance with

US EPA Method TO-15 and for PCE, TCE, and vinyl chloride using US EPA Test Method TO-15SIMM. A copy of the Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air,” using US EPA Method TO-15 is located in the Workplan Section of the project web site. A copy of AEL’s Standard Operating Procedures (SOPs) for analysis using US EPA Test Methods TO-15 and TO-15SIMM was included as Appendices C and D, respectively of the Workplan. The proposed analytical practical quantitation limits were compared to Tiers 2 and 3 screening concentrations and were deemed adequate.

The analytical report is included in Appendix B and the Data Validation Report is provided in Appendix C.

5.0 DATA QUALITY OBJECTIVES

The data quality objectives (DQO) process is a seven step approach used to develop sampling plans to collect data necessary for appropriate decision-making (US EPA, 2000). The DQO process was fully described in the Workplan and consists of the following seven steps:

1. State the problem;
2. Identify the decision(s);
3. Identify inputs to the decision;
4. Define the boundaries;
5. Develop a decision rule;
6. Specify the limits on the decision error; and
7. Optimize the sampling design/ approach.

Table 1 provides a summary of the DQO process for the air sampling that was conducted in and around the Site. Each step of the DQO process employed for the air sampling operation is summarized below.

5.1 Statement of the Problem

Operations on the UPI facility included activities that required the use of VOCs. VOCs have been detected in the onsite soil, soil-gas, and groundwater. At the June 19, 2003 joint technical meeting, US EPA requested Crane redirect the perimeter soil gas investigation and collect indoor air sampling data to evaluate the potential health risk to occupants of nearby buildings.

An initial air sampling event was conducted in September 2003. The results of the initial sampling event indicated that the concentration of PCE and TCE in indoor air were substantially below the acceptable risk based criteria. Additionally, the concentrations of TCE in indoor air quality samples were within the provisional health protective concentrations of 0.048 to 4.8 $\mu\text{g}/\text{m}^3$ established by US EPA Region IX for indoor commercial workers.

5.2 Identification of the Decisions

Data Collection

Collect data of sufficient quality and quantity in the winter pursuant to the Workplan. Based on this data set and the data collected in September 2003 and February 2005, evaluate the potential transport of chemicals migrating from the subsurface into indoor air. If the data indicate that concentrations are below action levels or background for both sampling events, then the investigation should be deemed complete. The data appear to provide sufficient information for this evaluation, therefore additional investigation should not be necessary as an additional phase of investigation.

Health Risks

The principal health risk question that this study is to address is, "Are the occupants of the three commercial buildings located at 140, 190, and 250 North Litchfield Road being exposed to indoor air concentrations of COCs at unacceptable levels?"

Volatile COCs listed in the ROD and which are breakdown products of PCE and TCE were analyzed. These include the following chemicals: PCE, TCE, 1,1-DCE, cis-1,2-DCE, trans-1,2-DCE, acetone, MEK, and vinyl chloride. This list of chemicals includes the known VOC that have been detected at the greatest frequency at UPI. The principal route of exposure evaluated as part of the Workplan is for inhalation of chemicals in indoor air which may have potentially migrated from the subsurface.

Consequently, all criteria are based on inhalation exposure and the best available data. The potential public health impacts associated with measured levels of site-related chemicals are evaluated through comparison with three tiers of data and/or criteria described below:

- Tier 1: As part of the Tier 1 evaluation of the data collected, measured Site concentrations are compared with site-specific ambient background levels, the 2003 sampling data, and regional background data to assess if indoor air concentrations are greater than local background. Indoor air and site-specific background data are tested for normality and equal variances using the Shapiro Wilks test and the Levene test. If the data failed the tests for normality and equal variance, differences between the building and background were assessed using the Wilcoxon Rank Sum test. If the data passed the tests for normality and equal variance, the two sample t-test was used to assess differences. Sampling data collected in 2003 are compared to data collected in 2005. The purpose of this analysis is to determine if the concentrations of TCE and/or PCE in indoor air were different between the two sampling events. The data are analyzed using paired sample t-test, with sample locations functioning as the grouping variable. Finally, indoor air data were compared to regional background data using information on regional average and quarterly maximum values collected from US EPA's AirData.
- Tier 2: Indoor air concentrations for non-carcinogenic compounds (i.e., acetone, 1,1,-DCE, cis-1,2-DCE, trans-1,2-DCE, and MEK) are compared with Tier 2 acceptable air concentrations proposed for interim risk management. These values are based on effects other than cancer and are available for both short and long-term exposure durations. The proposed Tier 2 values include the acute (14 day) and intermediate (15-364 day) MRLs identified by the Agency for Toxic Substances and Disease Registry (ATSDR) applicable for short to moderate exposure periods, PRGs for ambient air inhalation developed by US EPA Region 9, and RBCs for exposure in an occupational setting derived using US EPA's RfDs for 1,1-DCE, cis-1,2-DCE, trans-1,2-DCE, acetone, and MEK (Table 2). For all COC, the Tier 2 occupational RBCs are calculated using two sets of exposure assumptions: 1) central tendency exposure assumptions, which included an assumed inhalation rate of 8 m³ air/day and 6.6 years workplace exposure duration (US EPA 1997); and 2) reasonable maximum exposure assumptions derived through application of an assumed inhalation rate of 10.4 m³/day and 21.9 years (US EPA 1997).

- Tier 3: Carcinogenic chemicals (i.e., TCE, PCE, and vinyl chloride) are evaluated using RBCs for residential and occupational settings. Residential exposures are evaluated using US EPA Region 9 ambient air PRGs. Occupational RBCs are calculated for the risk range of 1×10^{-4} to 1×10^{-6} using cancer slope factors (CSFs) for inhalation and inhalation exposure assumptions for workplace air. RBCs for PCE and vinyl chloride use the current US EPA inhalation CSFs. TCE's classification as a carcinogen is under review, but is proposed as "highly likely to produce cancer in humans" (US EPA 2001). Draft CSFs for TCE are available from NCEA and CalEPA. Both these values are used in the calculation of occupational RBCs. For all COC, the Tier 3 occupational RBCs are calculated using two sets of exposure assumptions: 1) central tendency exposure assumptions, which included an assumed inhalation rate of $8 \text{ m}^3 \text{ air/day}$ and 6.6 years workplace exposure duration (US EPA 1997); and 2) reasonable maximum exposure assumptions derived through application of an assumed inhalation rate of $10.4 \text{ m}^3 \text{ /day}$ and 21.9 years (US EPA 1997). Table 3 presents the range of RBCs calculated for TCE, PCE, and vinyl chloride as well as RBCs available from US EPA Region 9. For TCE this also includes the US EPA Region 9 provisional air PRG for commercial workers.

5.3 Inputs to Decisions

This section describes the input information and data that was used to arrive at the decisions outlined above. The activities include collection of building information, identifying the locations of samples, and the collection of the air sample.

5.3.1 Conceptual Model

Indoor air VOC concentrations can be attributed to facility or occupational sources (e.g., sources attributed to building construction, operations, and occupation), potential volatilization from the subsurface into the building, and/or contributions from outdoor air. Because the buildings are less than 10 years old and industrial activities are not performed in the buildings, it is unlikely that there are significant sources of the COCs in the buildings.

5.3.2 Building Owner / Tenant Communication

Geomatrix previously collected information on the building foundation and base slab construction details, building use, and HVAC system construction and operation.

Additionally, Geomatrix, US EPA, and CH2M Hill performed a walk-through on June 23, 2003, to evaluate representative sampling locations. ARCADIS attempted to update the information on chemical usage and storage in the buildings during the placement of samplers. No significant sources of COCs were evaluated as potential occupational sources.

Geomatrix initiated property access negotiations with property owners upon review of the draft Workplan. Property owners and tenants were notified a minimum of two days prior to any sampling event. US EPA was notified fifteen (15) days prior to sampling.

5.3.3 Sampling Approach

Monthly average meteorological data was collected from a website for the month of February 2005, and more detailed meteorological data was collected from the National Weather Service Climate Data website for the two days over which the sampling occurred. These data are presented for the Goodyear, Arizona area in Appendix A. IAQ samples were collected using 6-liter Silonite canisters outfitted with time integrated flow controllers that were individually cleaned and inspected prior to pick-up at the laboratory. The flow rate was set to collect samples over a 24-hour period as described in the Workplan. The 24-hour time period was used in order to obtain data that was comparable with the 24-hour composite air samples collected in September, 2003 at the request of US EPA's Remedial Project Manager in an electronic mail dated June 26, 2003.

Samples were collected from the locations described in Section 3 above. These sample locations were selected as representative during a building walk-through with the US EPA and their contractors. Additional background air samples were collected near the PGA-S Superfund Site, near the retail shopping center located in the northwest corner of Litchfield Road and Van Buren, and near the corner of Van Buren and Dysart Road. One air sample was collected from near the exhaust from the carbon polishing unit located at the main groundwater treatment facility on site. The approximate locations which were chosen for background sampling are shown on Figure 6. The sampling locations were chosen to provide a representative set of background data to allow for calculation of health risks associated with the VOCs.

5.4 Decision Rules

5.4.1 Data Collection

If the vacuum gauge on the Silonite canister were to read less than 2 inches of Hg at the end of the sampling period (or when checked at the laboratory), then the sample would be considered a “grab” sample and used for screening purposes only. Grab sample results without detectable concentrations of analyzed compounds, specifically site COCs, will be considered invalid for risk evaluation. If the initial (pre-deployment) vacuum gauge reads less than 26 inches Hg, the canister was to be replaced prior to sample collection.

Five canisters were recorded at levels of 2 inches of mercury vacuum at the laboratory. These canisters were recorded as zero in the field, but the gages used in the field were very coarsely graded at 5 inches of mercury gradations. ARCADIS believes that the laboratory vacuum measurements tend to hold more validity than the field measurements, and therefore these measurements were relied upon to determine the reliability of the sample values from the laboratory. Therefore, all sample canisters used for the sampling event registered 2 inches of Hg or greater, as documented by the laboratory (Appendix B).

5.4.2 Health Risks

Site indoor air concentrations were compared to the Tier 1 through 3 values (Tables 2 and 3) as well as regional background data collected by US EPA. All winter sampling event analytical results can be reviewed in the analytical results included in Appendix B. The results of these comparisons are provided below.

5.4.2.1 Tier 1

In Tier 1, local background air concentrations, regional background concentrations, and the 2003 indoor air sampling results were compared to indoor air data results. In particular, the ambient air concentrations can be considered representative of the fresh make-up air within the buildings at the time of sampling. Therefore, evaluating the measured indoor air against the measured ambient air provides an opportunity to determine whether the indoor air is significantly different from the ambient conditions. Local background concentrations were estimated using data from the air samples that were collected in the immediate vicinity (e.g., local perimeter) of the three commercial

buildings and at locations outside the study area (e.g., background). These samples were collected as part of the winter sampling event. .

Table 4 presents the comparison of local background data to indoor air results. Data distribution and dispersion were tested using the Shapiro Wilks W Test and the Levene's F-Test, respectively. Depending on these factors, either the students t-test, Satterthwaites t-test, or the Wilcoxon Rank Sum (WRS) were used to compare the background and site data. The results show that indoor air concentrations are not different than ambient background air for all buildings. In no cases were indoor air concentrations significantly above ambient background for either TCE or PCE.

In addition to comparing indoor air to background air, the sampling data collected in 2003 were compared to data collected in 2005 using paired sample t-test, with sample locations functioning as the grouping variable (Table 5). This test assumes that the differences between paired samples is normally distributed. TCE concentrations for all buildings decreased between 2003 and 2005. This difference was significant for building 250 and for all buildings combined. PCE concentrations decreased in building 250 North in 2005, although this decrease was not statistically significant. Although PCE concentrations increased in all other buildings, only the change in building 190 North was found to be significant.

Finally, regional ambient air data collected by US EPA were compared to TCE and PCE indoor air results from 2003 and 2005. Table 6 presents the comparison of average and maximum values from the Site and other locations in Phoenix and Pinal County. These results show that indoor air results are similar to regional background data. In 2005, mean concentrations of PCE and TCE in indoor air are all less than regional means. Similarly, all maximum concentrations of PCE and TCE in indoor air are all less than regional maximum concentrations.

5.4.2.2 Tier 2

Noncarcinogenic compounds were compared to the Tier 2 values calculated in Table 2. As noted previously, Tier 2 values include the acute (14 day) and intermediate (15-364 day) MRLs identified by ATSDR, PRGs for ambient air inhalation developed by US EPA Region 9, and RBCs for exposure in an occupational setting derived using US EPA's RfCs for 1,1-DCE, cis-1,2-DCE, trans-1,2-DCE, acetone, and MEK (Table 2). The presence of potential onsite sensitive receptors actively undergoing physical therapy at White Tank Physical Therapy in the large open exercise area, or at the West Valley Medical Center including the family planning center, justify the use of the

Region 9 ambient air PRGs as screening criteria for indoor air samples collected at this site. As shown in Table 7, the maximum concentrations of all chemicals of interest in any building did not exceed either the occupational RBC or the US EPA Region 9 ambient air PRG at an HI of 1. Although there are no complete residential exposure scenarios at the site, the ambient air PRG is the most conservative screening benchmark available for these constituents. Therefore no additional samples from the building need to be collected to confirm the results. Since the maximum concentrations of the chemicals of interest did not exceed Tier 2 criteria, no interim measures are necessary.

5.4.2.3 Tier 3

Tier 3 RBCs include values derived for TCE, PCE, and vinyl chloride based on hypothetical cancer risks in an occupational setting as well as US EPA Region 9 PRGs (Table 3). As described previously, for TCE, PCE, and vinyl chloride, several PRGs and RBCs at the 1×10^{-6} risk level are available. These values represent a range of potential exposures including both residential and occupational. In addition, for TCE, occupational RBCs were calculated using a range of available CSFs. When selecting a PRG or RBC, the potential site exposure scenarios should be considered. Because there are no complete residential exposure pathways, residential PRGs are not applicable to the site.

As shown in Table 7, vinyl chloride was not detected in any samples including both indoor and outdoor. The detection limit of 0.013 is well below both ambient air and occupational RBCs. For TCE and PCE, concentrations in indoor air and ambient background air were compared to US EPA Region 9 ambient air PRGs, commercial PRGs, and occupational RBCs. Region 9 ambient air cancer PRGs are applicable since potentially sensitive receptors at 250 North Litchfield Road (White Tank Physical Therapy) and 140 North Litchfield Road (West Valley Emergency Center) may be exposed to impacted indoor air. As shown in Table 7, all TCE concentrations reported for both 2003 and 2005 for Buildings 250, 190, and 140 exceed the TCE ambient air PRG. Additionally, for those three buildings, more than one-half of the PCE concentrations reported in 2003 and almost all the reported concentrations of PCE in 2005 exceed the ambient air PRG for PCE. However, all TCE concentrations are below the CAL-modified PRG of $0.96 \mu\text{g}/\text{m}^3$ and the occupational RBC of $4.5 \mu\text{g}/\text{m}^3$ at the 1×10^{-6} risk level. Similarly, all PCE concentrations are less than the occupational RBC of $1.5 \mu\text{g}/\text{m}^3$ at the 1×10^{-6} risk level. These PRGs and RBCs may be more applicable as they take into consideration the actual uses of the buildings for commercial purposes. The US EPA Region 9 ambient air PRGs are calculated assuming an

individual spends 350 days per year and 30 years at the site. Because there are no individuals at the Site who meet these exposure criteria, the ambient air PRGs are not applicable and should not be used to make final regulatory decisions. Appendix D includes a description of the statistical analysis conducted regarding this data.

6.0 MITIGATION CONSIDERATIONS

As discussed in Section 5, all indoor air concentrations are below action levels associated with a 1×10^{-6} risk or an HI of 1 with the exception of TCE and PCE. Both TCE and PCE exceeded the Region 9 ambient air PRGs, although all concentrations of TCE and PCE were below the CAL-modified PRG and the occupational RBC at the 1×10^{-6} risk level (Table 7). These results indicate that no additional data collection is warranted and mitigation measures are not necessary. More importantly, all indoor air concentrations are consistent with outdoor background concentrations, as they were during the initial summer air sampling event. These findings further support the finding that vapor intrusion from the subsurface is not causing an impact to the air quality within these buildings, and mitigation measures by Crane are not required.

7.0 RESULTS AND CONCLUSIONS

This report presents the results and evaluation of indoor air and background ambient air data collected during February 2005. As described in Section 3.0, all samples were collected consistent with the approved Workplan. The indoor air results were evaluated using a three-tiered process. In Tier 1, indoor air concentrations were compared to site-specific background ambient air as well as previous indoor air sampling results using statistical methods (Tables 4 and 5). This comparison showed that indoor air concentrations are not different than site-specific background ambient air for all buildings, except PCE concentrations in 140 North which are lower compared to local background. In no cases were indoor air concentrations significantly above ambient background for either TCE or PCE. Similarly, the comparison of TCE and PCE concentrations in 2005 and 2003 indicated that TCE concentrations for all buildings decreased between 2003 and 2005. This difference was significant for building 250 and for all buildings combined. PCE concentrations decreased in building 250 North in 2005, although this decrease was not statistically significant. Although PCE concentrations increased in all other buildings, only the change in building 190 North was found to be significant.

In Tier 2, noncarcinogenic compounds were compared to noncancer criteria developed by ATSDR and occupational RBCs based on RME and CTE inhalation exposures. All

constituents were below relevant criteria at an HI of 1 (Table 7). Similarly, in Tier 3, carcinogenic chemicals (i.e., TCE, PCE, and vinyl chloride) were compared to relevant RBCs at the 1×10^{-6} risk level. The RBCs included US EPA Region 9 ambient air PRGs, occupational criteria calculated under RME and CTE exposure scenarios, and US EPA Region 9 CAL-modified PRG (for TCE only). Vinyl chloride was not detected in any indoor air samples. Although TCE concentrations exceeded the Region 9 ambient air PRGs, all TCE concentrations are below the CAL-modified PRG of $0.96 \mu\text{g}/\text{m}^3$ and the occupational RBC of $4.5 \mu\text{g}/\text{m}^3$ at the 1×10^{-6} risk level. Similarly, some PCE concentrations exceeded the Region 9 ambient air PRGs, but were less than the occupational RBC of $1.5 \mu\text{g}/\text{m}^3$ at the 1×10^{-6} risk level.

Overall, the results of the PRG and ambient background comparisons indicate that occupants in the buildings located at 140, 190, and 250 North Litchfield Road are not exposed to indoor air concentrations above acceptable levels. This finding is supported by the data which show: (1) indoor air concentrations of COCs are below commercial PRGs and occupational RBCs at a 1×10^{-6} risk level and an HI of 1 and (2) indoor air concentrations of COCs are comparable to site-specific ambient background concentrations and regional background concentrations. Although TCE and PCE concentrations exceed Region 9 ambient air PRGs, these values were calculated assuming an individual spends 350 days per year for 30 years at the Site. Because there are no individuals at the Site who meet these exposure criteria, the ambient air PRGs are not applicable and no further actions are required to address vapor intrusion issues.

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