INITIAL VAPOR INTRUSION ASSESSMENT

FOR
PHOENIX-GOODYEAR AIRPORT (SOUTH)
SUPERFUND SITE
GOODYEAR, ARIZONA

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List of Acronyms

EPA	United States Environmental Protection Agency
GAC	Goodyear Aerospace Corporation
GTRC	Goodyear Tire and Rubber Company
HVAC	heating, ventilation and air conditioning
LATA	Los Alamos Technical Associates, Inc.
LM	Lockheed Martin
OU	operable unit
PGAS	Phoenix-Goodyear Airport-South Superfund Site
ppbv	parts per billion by volume
RBC	risk-based concentration
TCE	trichloroethene
µg/L	micrograms per liter
$\mu g/m^3$	micrograms per cubic meter
VOC	volatile organic compounds

1. Introduction

The United States Environmental Protection Agency (EPA) conducted a five-year review of the remedial actions implemented at the Phoenix-Goodyear Airport South (PGAS) Superfund Site (Site), located in Goodyear, Arizona (Figure 1-1) in 2005. One issue raised during the five-year review process is that a vapor intrusion assessment has not been performed at the Site, despite the historical presence of volatile organic compounds (VOCs), including trichloroethene (TCE), in shallow soils and soil vapor. As a follow-up to the five-year review report findings, EPA has worked with Goodyear Tire and Rubber Company (GTRC), the primary responsible party for the Site, to conduct an initial vapor intrusion assessment. The purpose of the initial vapor intrusion assessment was to evaluate if there was the potential for vapor intrusion, and if so, to decide on the next steps.

This report documents the findings of a Site inspection conducted in April 2007. The report is organized as follows:

Section 2: Site Background – includes background information on soil vapor conditions at the Site.

Section 3: Site Inspection – includes a description of the Site inspection, including ventilation and future sampling issues.

Section 4: Summary and Recommendations – includes a review of the key findings and recommendations for additional work.

Section 5: References – includes documents referenced in preparing this report.

2. Site Background

The following information is from the Five-Year Review Report for Phoenix-Goodyear Airport (South) Superfund Site, Goodyear, Arizona (EPA, 2005), and has been modified slightly with updated information and reorganization for this report.

The Phoenix Goodyear Airport site was listed on the National Priorities List in September 1983 as the Litchfield Airport Area Superfund Site. After the airport property was transferred to the City of Phoenix, the site was renamed the Phoenix-Goodyear Airport Area Superfund Site. Later, the site was divided into two parts: Phoenix-Goodyear Airport-North (PGAN) and Phoenix-Goodyear Airport-South (PGAS).

Goodyear Aerospace Corporation (GAC), now GTRC, purchased the facility located at 101 South Litchfield Road in 1949 and operated on the airport property until 1968, and adjacent to (east of) the airport property until 1987. The adjacent facility remains in use by Lockheed Martin (LM) and others under ownership by JRC Goodyear, LLC. The plant was involved in the development and manufacturing of aerospace related products including electronics equipment such as radar; transparent products such as aircraft and automobile windshields; and structural components such as MX missile transporter and aluminum-skinned shelters. Former operations at the facility, which generated hazardous waste, were primarily metal treatment processes such as plating, degreasing and etching. The manufacturing facility used solvents and acids and generated metal sludges, waste solvents and waste acids from the metal treatment operations.

The central issue at the Site is contamination of groundwater with VOCs, particularly TCE, and chromium. The Site previously included two groundwater operable units (OU) and one soil OU. The groundwater OUs were OU 2 (also known as the Section 16 OU), which is for shallow groundwater (Subunit A), and OU 6 (also known as the Subunit B/C OU). These two OUs have undergone remedial activities that started in 1990 (Subunit A) and 1994 (Subunit B/C). The soil OU (OU 1), which contained VOCs and chromium, has been remediated at PGAS and no further monitoring activities are presently being conducted. For VOCs in soil, the remediation standards were determined based on concentrations that were protective of groundwater. The potential for vapor intrusion into nearby buildings was not evaluated during prior remediation activities

2.1 Soil Vapor Extraction and Vadose Zone Modeling

As described in the Five-Year Review Report (EPA, 2005), several efforts were made to determine which areas of the Site would be most suited for SVE treatment. Soil or soil gas analytical data from different polygonal areas of the Site were used to predict the effect on TCE concentrations in groundwater below the polygons. In May 1992, a conservative total mass dissolution test was run on 143 polygons, of which 80 polygons failed, that is, were predicted to impact groundwater with TCE concentrations greater than 5 micrograms per liter (µg/L). The VLEACH model and a mixing cell model were then run on these 80 polygons, resulting in 14 polygons failing. Additional field data were collected in 1992 and

1993. Additional modeling took place, resulting in the selection of five polygons, which required remediation using SVE. The polygon numbers were 27A, 79, 84, 92, and 96.

The SVE system was modular and consisted of five major components: extraction wells and piping; vapor inlet system; vapor treatment system; vacuum extraction module; and electrical control system and power distribution module (Metcalf and Eddy, 1993). The number of extraction wells varied from one to three for each polygon. Flow from each well was piped through the vapor inlet system, which removed liquid from the inlet air and provided the opportunity to blend ambient air into the vapor stream to reduce the vapor concentration to below 25 percent of the Lower Explosive Limit, if needed. Off gases were treated with two 2,000-pound vapor-phase granular activated carbon vessels installed in series and then vented to the atmosphere.

Polygon 79 was the first to be treated with the SVE system. The SVE system, using four extraction wells to remove VOCs from the soil, operated at Polygon 79 from September 1993 through January 1994. After monitoring rebound concentrations, the polygon was officially closed by EPA on September 3, 1994 (Metcalf and Eddy, 1995a). The same SVE system was moved to Polygon 84 in 1994, and operated between late 1994 and early 1995. The Polygon 84 system used three extraction wells to remove VOCs from the soil. Confirmation samples were collected on June 15, 1995, and the polygon was approved for closure (Metcalf and Eddy, 1995b).

In late 1995, the SVE system was moved to collectively address Polygons 27A, 92, and 96. A total of seven extraction wells were installed to remove VOCs from the soil: three in Polygon 96, three in Polygon 92 and one in Polygon 27A. The system operated from March 1996 through April 1998. Air sparging was used to further reduce contamination in these three polygons and two adjoining polygons, numbered 81 and 100, between May 1996 and April 1998. During the operation of the SVE and air sparging systems at these five polygons, 1,768 pounds of VOCs were removed from the soil and groundwater. The impact to TCE concentrations in groundwater predicted by VLEACH modeling ranged from 6 µg/L in Polygon 27A to 27 µg/L in Polygon 96 prior to SVE treatment. After the treatment, the VLEACH-predicted impact to TCE groundwater concentrations was less than 1 µg/L for each of the polygons (Ogden Environmental and Energy Services, 1999).

In summary, five polygon areas were determined through VLEACH and mixing cell modeling to require vadose zone remediation. The SVE actions were employed between 1993 and 1998 to remove contaminant mass from the vadose zone in these five polygons. Rebound monitoring took place and confirmation soil gas samples were collected from each polygon to support closure modeling. All five polygons were approved for closure by EPA (Metcalf and Eddy, 1995a and Ogden Environmental, 1999).

As part of the prior SVE work, there is no record of a vapor intrusion assessment in the vicinity of the buildings located near the polygons. However, residual TCE concentrations may present a risk to indoor air quality. For example, active commercial and/or manufacturing buildings overlie portions of Polygons 79 and 84, which contained TCE in shallow soil gas (13 to 16 feet below grade level) at levels up to 9,200 parts per billion by volume (ppbv) and 1,100 ppbv respectively, according to rebound monitoring conducted after cessation of SVE at these polygons (Metcalf and Eddy, 1994 and 1995b). In addition, there may be areas near or beneath buildings that were not remediated with SVE that may

contain TCE at levels that do not necessarily pose a threat to groundwater as determined by VLEACH modeling, but may pose a threat to indoor air quality. Therefore, an evaluation of vapor intrusion potential was deemed necessary by EPA.

2.2 Vapor Intrusion Modeling

The Five-Year Review Report (EPA, 2005) recommended an assessment of the vapor intrusion potential at the Site. In 2006, Los Alamos Technical Associates, Inc. (LATA) prepared a memorandum that summarized the calculation of the risk-based concentration (RBC) of TCE in soil gas at a target cancer risk of $1x10^{-5}$ (LATA, 2006). These values were determined using the Johnson and Ettinger Model (J&E Model), with some input values from Site-specific data and others from model defaults.

The range of RBC for TCE was determined to be $3.25x10^3$ micrograms per cubic meter ($\mu g/m^3$) to $1.40x10^4$ $\mu g/m^3$ (3.25 µg/L to 14.0 µg/L) depending on the soil type. Based on soil gas data from 1993 through 1999, six polygons were identified as having concentrations of TCE that exceeded the RBC. These polygons were 69, 70, 74, 79, 99 and 153. The locations of these polygons, as well as nearby buildings potentially impacted by vapor intrusion, are shown in Figure 2-1.

Additional modeling was performed (LATA, 2006) on these polygons using polygon-specific information, such as actual building size, soil type and sampling depth for each building in each polygon. This more detailed modeling exercise demonstrated that none of the polygons exceeded the RBC for TCE. In reviewing the LATA memorandum, EPA disagreed with the modeling approach and some of the assumptions incorporated into the model, and requested a Site inspection to identify areas and buildings of potential concern.

3. Site Inspection

A Site inspection was conducted on April 17, 2007 with representatives from EPA, Arizona Department of Environmental Quality, GTRC, JRC Goodyear, and facility managers for the various buildings inspected. Based on a prior review of available data, EPA decided to inspect several buildings each on the airport property and the adjacent former GAC industrial property, now occupied by LM and others. Prior to the inspection, the property owners completed building data collection checklists provided in advance by EPA. In general, the inspection included visual observations of the location, use, and the heating, ventilation and air conditioning (HVAC) system configuration for each building. Important building details, as described below, were provided by facility managers on the checklists and/or during the inspection.

3.1 Airport Property

The Phoenix Goodyear Airport and the buildings immediately adjacent to the airport are owned and operated by the City of Phoenix. The only polygon identified as a current area of potential concern for vapor intrusion in the immediate airport area is Polygon 99. Buildings 104, 53, 54 and 55 are near Polygon 99, and were the subject of the inspection.

3.1.1 Airport Building 104

Building 104 houses the training center, flight control center, administrative offices, and cafeteria of the Airline Training Center Arizona, Inc. The main portion of Building 104 is typical single-story commercial office space constructed in 1969 (Photo 1). In 1989, the building was renovated and a two story addition was added to the northern portion of the building. The southwestern portion of the building houses the administrative offices and the flight control center. The southeastern portion of the building houses the cafeteria. The central portion of the building is cubical space surrounded by conference rooms. The northern addition to the building is an open atrium surrounded by two floors of classrooms with additional office space on the second floor. The configuration of the atrium is shown in Photo 2. There are approximately 110 full-time employees. Administrative staff occupy the building five days a week. Flight students are on six-month rotations and occupy the building seven days a week.

Photo 1 – Building 104 exterior.

Photo 2 – Building 104 interior atrium.

Ventilation

Ventilation in the main portion of the building is provided by approximately 15 HVAC package units. Most of the units are Carrier Model 50TJQ012. These units should be capable of providing 4,100 cubic feet per minute of conditioned air. Most of the package units have outdoor air intakes; however, the fresh air dampers are either closed, or only slightly open, as shown in Photos 3 and 4. Additionally, it was noted that the HVAC units only operate when cooling or heating is required. Some offices have additional cooling units installed; however, make-up air is not provided to these units. The northern addition has a modern air handling system with fresh air intake on the roof of the second floor. Due to logistical constraints, the make-up air for this system could not be verified. The building also has an exhaust fan for the restrooms, which was functioning. Based on a smoke test, it appeared that the main building was under a slight negative pressure. Many areas of the building appear to be under ventilated, including the back offices and the lobby. Overall, the main part of the building is expected to have a very low air exchange rate (lower than included in the J&E Model calculations for vapor intrusion).

Sampling Considerations

It appears that no solvents or chemicals that could interfere with indoor air testing are used or stored in this building. The building is used up to 24 hours a day for flight lessons and the administrative staff work from approximately 8 a.m. to 5 p.m. Representative sampling could include 24-hour integrated samples or 8 to 12-hour samples. Because the ventilation is only used upon demand, air exchange may be the lowest during the temperate times of year (October, November, March, and April); therefore, representative sampling of only the winter and summer may not completely represent this time period. No preferential pathways were identified (it was noted that interior storage/computer rooms had ventilation).

Photo 3 – Typical HVAC system, Building 104.

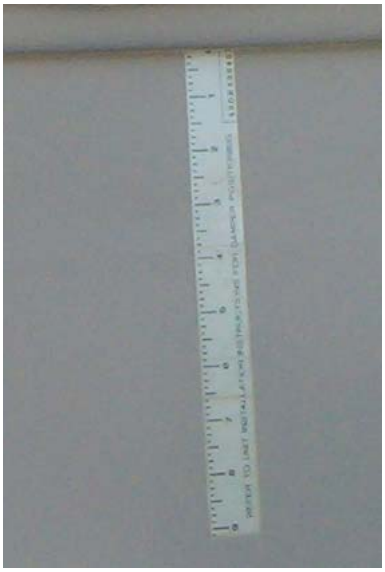

Photo 4 – Detail of HVAC showing the air damper closed.

Discussion

Building 104, as currently configured, appears to have the potential for buildup of subsurface vapors if significant vapor intrusion is occurring. There are several options for this building. Because the ventilation system is capable of providing sufficient outdoor air to meet City of Goodyear ventilation requirements, increasing make-up air could be recommended to the City of Phoenix and the tenants and implemented without significant upfront costs. If the owner or tenants are unwilling to take on the additional expense required by additional ventilation, indoor air should be sampled. If the tenants agree to provide additional ventilation, EPA should consider whether it is preferable to sample prior to and after additional ventilation is provided, or just after the ventilation is improved. The main reservation with only sampling after the ventilation is improved is that there is no certainty that this level of ventilation will continue into the future. Because the building is directly above Polygon 99, it is prudent to sample this building regardless of whether modifications to the HVAC system are made.

3.1.2 Airport Building 55

Building 55 is an older, two-story barracks currently used as a laundry and maintenance area. The barracks appear to be vacant. Only about half of the ground floor is currently being used. One employee works full-time in this building and several others are in and out during the day. The building has a small basement/mechanical room under the portion of the building being utilized. The area being used includes an active laundry, a restroom used for storing recycling, and a maintenance room.

Ventilation

There is no fresh air ventilation system in this building. There is one large HVAC unit, used during warm and hot weather, which does not have make-up air. Fresh air comes in through doors and windows; this may be limited during hot times of the year. Overall, the

ventilation in the building is poor and probably considerably less than the value used as a default for J&E Modeling.

Sampling Considerations

There is some maintenance being conducted in Building 55, and there could be possible sources of VOCs; however, no chlorinated solvents were noted during the inspection. The basement and restroom areas have significant potential for preferential vapor intrusion pathways and vapor buildup, and would be preferred locations for pathway samples. The laundry area is occupied during normal working hours, therefore 8 or 10-hour samples would be appropriate.

Discussion

Building 55 is south of Polygon 99; however, the current conditions of the building are conducive to vapor intrusion and vapor buildup. Because the building is occupied by one full-time employee, sampling is recommended. If the building is renovated to become additional dormitories, it is recommended that a central ventilation system be installed for the common areas (See Buildings 53 and 54).

3.1.3 Airport Buildings 53 and 54

Buildings 53 and 54 are former barracks that have been converted to dormitories. These buildings are two stories each with dormitories on both floors and common areas on the first floor. Students are on six-month rotations and are on-site seven days a week. Although these buildings are occupied by students on a 24-hour basis, individual students split their time between the dormitories and the administrative/classroom building. As with Building 55, each of these buildings has a small basement/mechanical room.

Photo 5 – Building 53 dormitory room.

Photo 6 – Building 53 common area.

Ventilation

It was indicated that these buildings are ventilated only by HVAC units provided in each dormitory room (Photo 5). The amount of fresh air provided to each room and the building as a whole varies depending on the air demand by individual residents. There is no ventilation for the common areas; however, an air vent is apparent in the ceiling of the common area (Photo 6). The air in the common areas appeared to be "stale." Overall,

ventilation in these buildings is not ideal, and is probably much less than the value used as a default in the J&E Model.

Sampling Considerations

These buildings are located off the boundaries of Polygon 99, with Building 54 significantly south of Polygon 99. Building 53 is closer to Polygon 99 and a better choice for sampling. It is unlikely that any VOCs exist in these buildings that would interfere with sampling. The basement is a potential preferential pathway that could be sampled. If sampling is conducted it is recommended that rooms and common areas above the basement are included in the sampling program. Sampling could be limited to the first floor. These buildings are candidates for 24-hour integrated samples to be representative of exposure by residents.

Discussion

Ideally, these buildings would have a central HVAC unit, which provides sufficient air exchange to the common areas. Even with such a system, there would still be the potential for low air exchange rates in individual rooms. It may be advisable to sample dormitory rooms and common areas on the first floor of Building 53. If these samples show elevated levels of Site compounds, additional sampling may be warranted.

3.2 Former Goodyear Aerospace Industrial Area

The industrial area consists of former hangars, warehouses, office buildings, and other industrial buildings. LM continues to operate in some of the former buildings occupied by its heritage corporation Loral Space Systems. Recently, LM sold the industrial park to an investment group, JRC Goodyear, who leases the property to LM and other tenants. The polygons of concern, 69, 70, 74, 79, and 153 cover much of the southwestern portion of this property. Based on this, EPA identified five buildings for inspection walk-throughs: Buildings 1/2, 16, 76, 78, and 86.

3.2.1 Lockheed Martin Building 86

Building 86 is a single story commercial building occupied by LM. The building overlies Polygons 69 and 70. The building was constructed in the 1940s and renovated in the 1980s. The building is divided into office space, workshops, shipping and receiving, and a computer laboratory. There are approximately 100 full-time employees, plus six to eight janitorial staff. Shipping and receiving is located in the northwestern corner of the building. A machine shop is located in the southwestern corner of the building. The office space is located in the north central portion of the building and in the southeastern corner. The computer laboratory is in the eastern central portion of the building. Along the east side of the building is a large, unoccupied, and unventilated mechanical room (Photos 7 and 8).

Photo 7 – Floor drain in mechanical room.

Photo 8 – Mechanical room with utilities entering main building.

Ventilation

Most of Building 86 is ventilated by a central air handling system with eight air intakes on the roof (Photos 9 and 10). The building is configured to provide 10 percent make-up air and a significant volume of re-circulated air. It was indicated that this building has 24-hour ventilation. The main part of the building appears to have significant positive pressure and appears to meet or exceed City of Goodyear ventilation requirements (and J&E Model assumptions). The computer laboratory has an under-floor ventilation system. The offices in the southeastern corner of the building are on a separate air handling system, which does not provide make-up air. The building maintenance supervisor indicated he was unaware of this and committed to add make-up air to these units. There is also an additional HVAC unit in the southwestern corner of the building, which was recently installed and did not provide make-up air at the time of the inspection. LM has indicated that make-up air has been added to this unit since the inspection. The mechanical room is not ventilated and there is potential for vapors to buildup in this room. This room could also be a source for vapors coming into adjacent rooms.

Sampling Considerations

There may be limited use of VOCs in Building 86; however, it is not expected this will interfere with sampling for Site-related compounds of concern. If the building is sampled, it is recommended that the computer laboratory, southeastern offices, and an area adjacent to the mechanical room be sampled. A sample could be collected in the mechanical room to determine if this area is a preferential pathway for vapors to enter the building. Prior to deciding if 8-10 or 24-hour samples would be most representative, building use patterns should be further evaluated.

Photo 9 – Building 86 air handler.

Photo 10 – Building 86 HVAC unit.

Discussion

Building 86 has sufficient fresh air ventilation for most of the building. As noted above, however, there are several areas of the building which have a higher likelihood of vapor intrusion. Because the building overlies two polygons, it should be sampled to confirm that there is no significant vapor intrusion.

3.2.2 Lockheed Martin Building 76

Building 76 is a former hangar being used as a LM warehouse building. The building overlies parts of Polygons 74 and 153. There are no employees regularly working in this building. There are several interior structures not currently being used, but could be occupied as offices or work areas in the future.

Photo 11 – Building 76.

Photo 12 – Interior structure within Building 76.

Ventilation

Ventilation is provided by large rollup doors, which are left open (Photo 11). One of the unoccupied interior structures has a non-functional HVAC system, which is interior to the main building.

Sampling Considerations

No chemicals appear to be used or stored in Building 76. There is a potential for vapors to build up in the unventilated enclosed interior structures. Because there is currently no regular occupancy, sampling would serve to demonstrate the potential for future exposure to vapor intrusion.

Discussion

Building 76 has several areas where vapors could build up. These areas should be sampled prior to occupancy. There is a potential for future occupancy, especially if LM discontinues its lease of this building.

3.2.3 Buildings 78 and 16

Building 78 is a former spray booth and Building 16 is a former hangar/warehouse/ industrial building. Building 78 is just off of Polygon 79 and Building 16 overlies part of Polygon 79. Building 78 is connected to the south-end of Building 16. Building 78 and most of Building 16 comprise a warehouse for Cavco Industries, Inc. (Cavco), a manufacturer of mobile homes. Cavco also leases significant additional industrial, warehouse, and office space in adjacent buildings. The remainder of Building 16 is occupied by a manufacturer of chrome automobile rims.

Photo 13 – CAVCO warehouse, Building 16

Photo 14 – Rim manufacturer, Building 16

Ventilation

Ventilation is provided by open warehouse doors (Photo 13).

Sampling Considerations

Building 78 and the Cavco portion of Building 16 appear to have significant passive ventilation. The northern portion of Building 16 (where the rim manufacturer is located) appears to have slightly greater potential for vapors to build up; however, there could be interfering chemicals in use at this location. A chemical inventory was not taken, as the tenants were not present at the time of the inspection.

Discussion

Due to the various uses of these buildings, it is not recommended that sampling be conducted at the present time. If the tenants or uses of these buildings change, the need for sampling should be re-evaluated.

3.2.4 Building 1/2

Building 1/2 is a former hangar/warehouse. The building is very large, approximately 500+ feet on each side (roughly 300,000 square feet), and has multiple tenants and several interior buildings within the building. EPA's inspection focused on the portion of the building overlying Polygons 79 and 153. EPA walked though the southwestern portion of the building and four interior structures: two occupied by Galaxy Corporation, one occupied by Cavco, and one occupied by Adapto Corporation. Much of Building 1/2 is used for storage; however, significant portions are also used for manufacturing, and a small amount of space is devoted to offices.

Photo 15 – Building 1/2 exterior.

Ventilation

The main portion of the building is passively ventilated by doors and windows. Cooling for the main part of the building is provided by evaporative coolers (Photo 16). Interior buildings have their own HVAC systems. None of the interior building's HVAC systems appeared to currently have make-up air. For several portions of these buildings, it was clear that as older HVACs broke down, they were replaced by systems without make-up air (Photos 18 and 19). Ventilation in the main part of the building appeared to be generally good; however, due to the size of the building, it is unclear if there is sufficient passive ventilation in all parts of the building.

Photo 16 – Building 1/2 evaporative cooler.

Photo 17 – Building 1/2 interior.

Photo 18 – Older HVAC unit with makeup air.

Photo 19 - Newer HVAC unit.

Sampling Considerations

Some of the manufacturing processes in this building may use significant quantities of VOCs. The interior buildings do not appear to have sufficient ventilation and should be sampled to determine if subsurface vapors are present at significant levels. There is a possibility of vapor intrusion and buildup into the main portion of the building and sampling this area would also provide background data for samples collected in the interior portion of the buildings.

Discussion

Building 1/2 has areas with a high potential for vapors to build up. However, because of the size of the building and its multiple uses, there is the possibility that data obtained from within the main space of the building will be inconclusive. Indoor air samples should be collected from the enclosed office spaces that overlie Polygons 79 and 153.

4. Summary and Recommendations

The Site inspection generated both situational observations of the Site characteristics and specific challenges to the J&E Model used to assess the potential for vapor intrusion. The primary issues identified during the Site inspection were:

1. Most of the HVAC units do not provide fresh make-up air to building interiors. A notable exception to this is LM Building 86. Although some areas of Building 86 did not receive make-up air at the time of the inspection, most of the building did receive adequate fresh air.
2. The lack of make-up air creates exchange rates that are much lower than those used in the J&E Model, indicating that the model underestimated the potential for buildup of vapors inside buildings.
3. Other buildings, such as Building 76, are either passively ventilated or unoccupied, reducing the potential for exposure to vapors. These buildings may need to be re-evaluated if their uses or configurations change in the future.
4. Some of the buildings may be under a slight negative pressure, which could draw vapors into the buildings.
5. Use of HVAC systems varies during the year, including cooling during the summer, heating during the winter, and minimal use during fall and spring. The air exchange rates likewise vary depending on the amount of HVAC use and the amount of make-up air.
6. The configuration of HVAC systems for older buildings to include make-up air is not enforceable, so any solution or assessment must not rely on HVAC adjustments. In addition, some building occupants control their own ventilation and may not maintain fresh air intake.
7. Building 1/2 was modeled as a single structure, but it is actually made up of several smaller spaces within the large hangar building. The different types of occupied spaces require more detailed modeling than has been performed to date.

A Vapor Intrusion Sampling Work Plan (Work Plan) should be generated to describe required procedures that would further the understanding of vapor intrusion issues at the Site. The Work Plan should include a sampling program based on Site conditions, including building size, use and occupancy; current HVAC configuration and use; seasonal variation in HVAC use; and other factors.

5. References

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