VAPOR INTRUSION WORKPLAN

OACSIM – United States Army Fort Monmouth
Main Post and Charles Wood Area
Oceanport, New Jersey

March 27, 2012

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1.0 INTRODUCTION

This Vapor Intrusion (VI) Workplan is submitted by Bureau Veritas North America, Inc. (Bureau Veritas) and AECOM, which along with Fort Monmouth personnel and U.S. Army Corps of Engineers representatives constitutes the Fort Monmouth Team, on behalf of Office of Assistance Chief of Staff for Installation Management United States Army Fort Monmouth (Fort Monmouth). The VI Workplan outlines the plan of action to evaluate the potential for volatile organic compounds from impacted groundwater to affect indoor air in buildings. All work proposed in this VI Workplan will be completed by Bureau Veritas North America, Inc. (Bureau Veritas), working with AECOM and under the AECOM-U.S. Army Corps of Engineers Contract No.W912DR-09-D-0019, Delivery Order 0010.

This VI Workplan has been prepared in accordance with the New Jersey Department of Environmental Protection's (NJDEP's) "Vapor Intrusion Technical Guidance," dated January 2012, (VI Guidance) and in accordance with the New Jersey Administrate Code 7:26E section 4.2, site inspections results, and other data provided by Fort Monmouth personnel.

On 22 February 2012, representatives of the Fort Monmouth Team met with the NJDEP to discuss the VI investigation. We agreed to perform the VI investigation consistent with NJDEP guidance and regulations. However, to meet the spirit and intent of collecting samples in the winter months, it was agreed that the VI Workplan will be submitted at a later date. The actual VI sampling effort was performed on 5 March 2012 through 30 March 2012.

1.1 SITE DESCRIPTION

Fort Monmouth was established in June 1917 and was originally named Camp Little Silver. The property is located in the central-eastern portion of New Jersey in Monmouth County, approximately 45 miles south of New York City, 70 miles northeast of Philadelphia, and 40 miles east of Trenton, the State Capital. The Atlantic Ocean is approximately 3 miles to the east. Fort Monmouth falls within the Boroughs of Eatontown, Oceanport, and Tinton Falls. The areas surrounding the post are characterized by a mixture of residential, commercial, and light industrial uses.

Fort Monmouth occupies approximately 1,126 acres and is currently comprised of two operational areas, the Main Post (MP) and the Charles Wood Area (CWA). The MP is generally bounded by State Highway 35 to the west, Parkers Creek to the north, the New Jersey Transit Railroad to the east, and Main Street and State Highway 71 to the south. The CWA is bounded by the Garden State Parkway to the west, Tinton Avenue to the north, Maxwell Place and the New Jersey Transit Railroad to the east, and Pine Brook to the south. The two areas are located about 2 miles from one another.

The post was closed September 15, 2011 as part of the Defense Base Realignment and Closure Act of 1990 (BRAC), Public Law 101-510 as amended. The six buildings targeted in this VI investigation, have been vacant since the closure of the post.

2.0 PHYSICAL SETTING

2.1 REGIONAL AND SITE-SPECIFIC SOILS

Regional Soils

The MP is predominantly located within the Freehold Sandy Loam – Urban Land complex (Source: United States Department of Agriculture Soil Conservation Service Soil Survey of Monmouth County

New Jersey, 1989). Typically the surface layer of the Freehold Sandy Loam – Urban Land is dark yellowish brown sandy loam approximately 9 inches thick. The subsoil is approximately 26 inches thick and is a dark brown sandy loam and sandy clay loam. Below that is brown sandy loam, the substratum is yellowish brown loamy sand to a depth of 60 inches or more. The Urban Land consists of area covered by impermeable surfaces such as roads, parking lots, buildings, etc.

The CWA is predominantly located within the Holmdel Sandy Loam – Urban Land complex (Source: United States Department of Agriculture Soil Conservation Service Soil Survey of Monmouth County New Jersey, 1989). Typically the surface layer of the Holmdel Sandy Loam – Urban Land is dark grayish brown sandy loam approximately 12 inches thick, and a yellowish brown loam to an approximate depth of 20 inches. Below that is mottled, yellowish brown sandy clay loam to an approximate depth of 38 inches. The Urban Land consists of area covered by impermeable surfaces such as roads, parking lots, buildings, etc.

Site-Specific Soils

Boring logs were not available for all areas subject to VI investigation. However, the boring logs for wells MW-5, MW-6, MW-9, and MA-16, which are located in the vicinity of Building 699 at the MP, were available. These logs indicate the presence of green, brown, and green-brown sand overlying green, green-black, and light brown silt and clay. The sand ranges in thickness from approximately three feet (at well MW-16) to at least 14 feet (at well MW-6). Therefore, the soil stratigraphy encountered in the vicinity of Building 699 is consistent with the subsoil and substratum of the Freehold Sandy Loam.

2.2 REGIONAL AND SITE-SPECIFIC GEOLOGY

Regional Geology

Both the CWA and MP are located within New Jersey's Coastal Plains Physiographic Region. This physiographic region is described as gently dipping to the southeast and ranges in age from the upper Lower Cretaceous to the Miocene. The Coastal Plains Physiographic Region is characterized by relatively flat terrain, underlain by sands and gravels of Cretaceous origin with meandering rivers which drain to the Raritan or Delaware River. Ecological features of this area include Southern mixed oak forest, Upland pine forest, Beech-oak forest, Red maple-sweet gum forest, Virginia pine successional forest, coastal white cedar swamp, hardwood swamp, emergent marshes, and freshwater tidal marsh.

Site Specific Geology

The eastern and western portions of the MP are underlain by the Red Bank formation and the Hornerstown formation, respectively. The Hornerstown formation also underlies the CWA, with the Vincentown formation located on small portion of the southwestern corner of the CWA. Sand and gravel deposits overlie these formations, interbedded with sequences of clay that act as semi-confining beds for groundwater.

2.3 REGIONAL AND SITE-SPECIFIC HYDROGEOLOGY

Regional Hydrogeology

Regionally, the MP and CWA are located within a composite confining unit. Typically silt and clay with localized sand lenses define the area. Confining units include the Shark River, Manasquan, Hornerstown, and Tinton Formations, as well as the lower part of the Red Bank Formation. Localized water table aquifers are composed of massive quartz sand outcrops of the Vincentown Formation and the upper part of the Red Bank Formation. These aquifers grade into confining units southeastward in the subsurface where the quartz sands become more glauconitic and silty. Water quality in the aquifers is generally good, but iron and manganese levels may be locally elevated. Calcium-bicarbonate type waters dominate this area.

Site-Specific Hydrogeology

Onsite depth to groundwater ranges from 2.37 feet below ground surface to 30.19 feet below ground surface, groundwater elevations at the site range from -0.45 to 54.52 feet above mean sea level.

2.4 SITE TOPOGRAPHY AND DRAINAGE

The CWA and MP are relatively flat. Stormwater drainage from the site is by sheet flow to municipal drainage systems. The site is elevated approximately 20 to 25 feet above mean sea level, based upon a 1981 Long Branch Quadrangle Topographic Map. A copy of this map is presented as Figure 1.

2.5 SURFACE WATER

The northeastern portion of the MP is bordered by Parkers Creek; the southeastern portion of the MP is bordered by Oceanport Creek. Husky Brook is located along the southern portion of the MP. The Shrewsbury River is located within 1 mile to the east of the MP. Wampam Brook is located to the south of the CWA, and an unnamed brook transverses the CWA from east to west. No other surface water bodies were identified within one mile of the CWA.

All identified surface water bodies ultimately drain into the Shrewsbury Bay, situated adjacent to the eastern edge of the MP. The Shrewsbury Bay is separated from the Atlantic Ocean by a barrier island. However, channels through the barrier island ensure hydraulic connection between Shrewsbury Bay and the Atlantic Ocean. As a result, the water in Shrewsbury Bay is tidally influenced and is brackish to saline. Water in the tributary streams to Shrewsbury Bay is also tidally influenced and is fresh water to brackish at low tide and brackish to saline at high tide.

2.6 LAND USE 1,000-FOOT RADIUS

The area surround the MP and CWA are used for both residential and commercial purposes. The following public places are located near the MP and CWA:

Main Post (MP)

- Wampam Brook Park – located to the southwest
- Old Wharf Park – located to the south at 321 E Main St Oceanport, NJ 07757
- St Dorothea's Roman Catholic Church, 240 Broad Street, Eatontown, NJ 07724-1601
- Eatontown Historical Museum 75 Broad Street, Eatontown, NJ 07724

Charles Wood Area (CWA)

- Borough of Tinton Falls 556 Tinton Avenue, Tinton Falls, NJ 07724

These areas are unlikely to be impacted by vapor intrusion from sources relating to the site based upon their distance from the source of the releases.

3.0 AREAS SUBJECT TO THE PROPOSED VAPOR INTRUSION (VI) INVESTIGATION

To determine the buildings subject to the VI investigation, the most recent eight quarters of groundwater sampling analytical data were compared to the NJDEP Vapor Intrusion Groundwater Screening Levels (GWSL) in Table 1 of the VI Guidance. The most recent groundwater sampling data available at the time this VI Workplan was prepared were the first quarter 2011 data. As such, all groundwater sampling data from the second quarter 2009 through the first quarter 2011 were compared to the GWSLs. The comparison involved only the volatile organic compound (VOC) sample fraction.

Neither dense, non-aqueous phase liquid nor light, non-aqueous phase liquid (DNAPL and LNAPL, respectively) has been encountered in any monitoring well at the Fort Monmouth site in the most recent eight rounds of synoptic groundwater level measurements. Therefore, DNAPL and LNAPL are not considered to be a source for volatile organic (VO) vapors. As such, the site conceptual models for this VI investigation are based on dissolved phase VOC impacts as the source of VO vapors.

Although scores of monitoring wells have been installed at Fort Monmouth, only eight contained one or more VOC above its respective GWSL and are within the prescribed proximity to an onsite structure. Figures 2 through 7 show the locations of these wells relative to buildings at Fort Monmouth.

Halogenated VOCs (limited at the site to chloroethane, PCE, TCE, and/or vinyl chloride) were detected in groundwater at concentrations above their respective GWSLs. As per the section 2.4.3 of the NJDEP Vapor Intrusion Guidance, a VI investigation is required at buildings within 100 feet vertically or horizontally of dissolved halogenated VOCs in excess of GWSL. Building 602 is situated within 100 feet of well M5MW16; building 699 and 700 are situated within 100 feet of well MW-9; building 1001 is situated within 100 feet of well MW05 and building 2700 is situated within 100 feet of well MW-28. The listed wells exhibited concentrations of a halogenated VOC(s) above its/their respective GWSL(s).

Petroleum-related VOCs (limited to benzene at the site) were detected in groundwater at concentrations above their respective GWSLs. As per the section 2.4.3 of the NJDEP Vapor Intrusion Guidance, a VI investigation is required at buildings within 30 feet of groundwater impacted by petroleum-related VOCs. Building 283 is situated within 30 feet of well MW02 and is subject to a VI investigation.

Based on the above, VI investigations are proposed at only Buildings 283, 602, 699, 700, 1001, and 2700. During a meeting with the NJDEP on February 23, 2012, it was noted that concerns have been raised regarding VOC concentrations in groundwater in the vicinity of Buildings 812, 1122, and 2706 as well as in areas where no buildings currently exist at Fort Monmouth. The AECOM Team has concluded that additional VI investigation is not warranted at this time, for the reasons presented below:

- Building 812 – Of the 14 wells installed solely to investigate groundwater quality in the vicinity of Building 812, wells MW04 and MW05 are the only wells where groundwater samples collected since the second quarter 2009 have contained VOCs at concentrations above their respective GWSLs. Neither well MW04 nor well MW05 is situated within 100 feet of Building 812.
- Building 1122 - Six wells were installed solely to investigate groundwater quality in the vicinity of Building 1122. All six of these wells have been sampled during at least one

groundwater monitoring event since the second quarter 2009, but none of the groundwater samples collected since that time have contained VOCs at concentrations above their GWSLs.

- Building 2706 – This building is a shed that houses heating and air conditioning infrastructure for Building 2700. Workers enter the building on an occasional basis only, and the building is not intended for extended human occupancy. The restriction on use of this building will be included in the Remedial Action Report and/or in Remedial Action Permits. Should the Building use change, the need to conduct a VI investigation at Building 2706 will be re-assessed.
- Areas where No Structures Currently Exist – Impacted groundwater is present at portions of Fort Monmouth that are without structures. The concern is that vapors may accumulate in buildings that could be constructed during redevelopment. These concerns will be addressed through engineering controls, which will be required by the Remedial Action Report and/or Remedial Action Permits. The engineering controls will be designed to prevent potential soil vapors from migrating into occupied buildings.

4.0 BACKGROUND INFORMATION AND SITE CONCEPTUAL MODELS

To the extent such information is available; this section includes information such as the building construction and floor plan, the square footage of the building footprint, the source of the groundwater impacts, any prior VI investigation results, whether active remediation of VOC-impacted groundwater is ongoing, and potential pathways for vapors to migrate into the building. Each area subject to the proposed VI investigation is addressed in a separate subsection below.

4.1 PARCEL 50, BUILDING 283

Building 283, also known as the Squire Building was initially constructed in 1935 of concrete and cinderblocks. Building 283 contains approximately 76,500 square feet of interior floor space across 2 floors, and a basement. The building was originally utilized for research laboratories and signal school training, at the time of base closure the building was used for administrative offices. The basement reportedly contains a sump which is known to take on water during heavy storm events.

A network of six groundwater monitoring wells were reviewed for the past eight quarters. Contaminants of concern in the network of groundwater monitoring wells include antimony, arsenic, benzene, beryllium, lead and thallium. In May 2009, benzene was observed at a concentration of 19.57 micrograms per liter (µg/L) at MW-2 which is in excess of the GWSL of 15 µg/L for benzene. Approximately 1,500 feet of Building 283 is located within the 30-foot radius of MW-2. The relative locations of Building 283 and well MW-2 are shown on Figure 2.

4.2 SITE M-5, BUILDING 602

Groundwater data for monitoring wells MW-10, MW-11, MW-12, MW-13, MW-14, MW-16, MW-18, MW-19, MW-20 and MW-23 was reviewed and groundwater contaminants were compared to the NJDEP GWSL. Exceedances of the NJDEP GWSL were observed for the halogenated VOCs tetrachloroethene (PCE), vinyl chloride and trichloroethene (TCE). As shown on Figure 3, at least one of these compounds was detected at a concentration above its GWSL at wells MW-11, MW-16, MW-19, MW-20, and MW-23.

No other halogenated VOC was detected at a concentration above its GWSL, and no other wells contained PCE, vinyl chloride or TCE at a concentration above its GWSL.

As halogenated VOCs exceeded their respective GWSLs, a 100-foot radius is appropriate. No buildings are situated within the 100-foot radius of wells MW-11, MW-19, MW-20, and MW-23. Building 602 is the only well situated within 100 feet of well MW-16. Based on the above, a VI investigation is proposed at Building 602.

Building 602 is situated in the western portion of the MP. This structure has one floor, is concrete slab on grade (i.e., has no basement), and has aluminum walls. Building 602 is irregularly shaped with a footprint of approximately 6,000 square feet.

As shown on Figure 3, subsurface utility lines enter the northern portion of Building 602. The location of the source area for the groundwater impacts was not available; as a result, it is conservatively assumed that the presence of these subsurface utility lines may represent a preferential pathway for vapor migration into Building 602. The locations of the utility lines were considered in proposing sub-slab and indoor air sampling locations, as documented in Section 5. Building 602 sampling methods and analytes are also proposed in Section 5.

4.3 PARCEL 52, BUILDING 699 AND BUILDING 700

Groundwater data for monitoring wells MW-1, MW-2, MW-4, MW-5, MW-6, MW-8, MW-9, MW-12, MW-15 and MW-16 was reviewed and groundwater contaminants were compared to the NJDEP GWSL. Exceedances of the NJDEP GWSL were observed for petroleum based VOCs in MW-4 and MW-6. A 30-foot radius was evaluated around MW-4 and MW-6, and no onsite structures were identified within this radius. As shown on Figures 4 and 5, PCE was identified in MW-9 and MW-16 at concentrations above its GWSL. The 100-foot radius from well MW-9 included approximately 1,200 square feet of Building 699 and approximately 400 square feet of Building 700. No buildings were within a 100-foot radius of well MW-16. As such, VI investigations are proposed at Buildings 699 and 700.

Buildings 699 and 700 are located adjacent to one another in the central portion of the MP. Building 699 is approximately rectangular, with a footprint of approximately 4,628 square feet. Building 700 is situated to the east of Building 699 and is irregularly shaped. Building construction details were not available at the time this document was prepared.

As shown on Figures 4 and 5, subsurface utility lines enter the northern and southern portions of Building 699, and enter Building 700 at several locations. The location of the source area for the groundwater impacts was not available; as a result, it is conservatively assumed that the presence of these subsurface utility lines may represent a preferential pathway for vapor migration into Buildings 699 or 700. The locations of the utility lines were considered in proposing sub-slab and indoor air sampling locations, as documented in Section 5. Building 699 and Building 700 sampling methods and analytes are also proposed in Section 5.

4.4 BUILDING 1001

Groundwater data for monitoring wells MW-1, MW-2, MW-4, MW-5, MW-6, MW-7, MW-8 and MW-14 reviewed and groundwater contaminants were compared to the NJDEP GWSL. Exceedances of the NJDEP GWSL were observed for only Vinyl Chloride and Chloroethane, as shown on Figure 6. Vinyl chloride was detected at a concentration above its GWSL only at MW-4. Chloroethane was detected at a concentration above its GWSL only at MW-5.

As both vinyl chloride and chloroethane are both halogenated VOCs, a 100-foot radius is appropriate. Only the extreme southern corner of Building 1001 lies within this radius. As such, a VI investigation is proposed at Building 1001. No other buildings are situated within 100 feet of either well.

Building 1001 is situated in the southern portion of the MP. The building is rectangular with approximate dimensions of 125 feet northwest-southeast and 80 feet northeast-southwest. The building footprint is approximately 1,000 square feet. No information was available concerning the number of levels, construction, or the presence/absence of a basement. For the purposes of this VI Workplan, the presence of a basement and a first floor was assumed, as this construction would result in the maximum number of indoor air samples.

As shown on Figure 6, subsurface utility lines enter the northeastern wall and southern corner of Building 1001. The location of the source area for the groundwater impacts was not available; as a result, it is conservatively assumed that the presence of these subsurface utility lines may represent a preferential pathway for vapor migration into Building 1001. The locations of the utility lines were considered in proposing sub-slab and indoor air sampling locations, as documented in Section 5. Building 1001 sampling methods and analytes are also proposed in Section 5.

4.5 PARCEL 15, CW-1, BUILDING 2700

Groundwater data for monitoring wells MW-26, MW-27, MW-28, MW-281, MW-282, MW-29, MW-291, MW-30, MW-31, MW-32, MW-33, MW-34, MW-35, MW-36, MW-37, MW-38, MW-39 and MW-40 was reviewed and groundwater contaminants were compared to the NJDEP GWSL. As shown on Figure 7, exceedances of the NJDEP GWSL were observed for TCE in only MW-28, MW-281 and 29. No other VOCs were detected at concentrations above their respective GWSL in any of the listed wells. Figure 7 shows the well and the building footprint.

As a halogenated VOC exceeded its GWSL, a 100 foot radius is appropriate. Building 2700 is the only building designed for human occupation that is within 100 feet of wells MW-28, MW-281, and MW-29. Wells MW-28, MW-281, and MW-29 are adjacent to one-another. Based on the above, a VI investigation is proposed at Building 2700

Building 2700, also known as the Myer Center, is situated at the CWA. The building has five floors, including a partial basement with a concrete floor. The building is irregularly shaped with a footprint of approximately 170,000 square feet, and a total of 673,500 square feet of interior floor space. In the portion of the building subject to the VI investigation, an auditorium is situated above a crawl space. The crawl space has a dirt floor and contains numerous vertical and horizontal utility pipe sections.

The source of the groundwater impacts is believed to be a wastewater lime pit known as CW-1. Through part of the 1980s, wastewater from the building was treated in wastewater lime pits CW-1 and CW-2 prior to being discharged to the CWA sewage treatment plant. CW-1 is believed to be attributable for the TCE-impacted groundwater because wells MW-28, MW-281, and MW-29 are situated near the center of CW-1. The groundwater flow direction is believed to be to the east in this area. Relative to the GWSL, groundwater impacts are horizontally delineated at wells MW-27, MW-31, MW-40, MW-25, and MW-30 (see Figure 7).

As shown on Figure 7, subsurface utility lines that run through the source area extend into Building 2700. Although unlikely, these utility lines could potentially represent preferential pathways for vapor migration into Building 2700. The presence of these utility lines was considered in proposing sub-slab and indoor air sampling locations, as documented in Section 5.

A limited VI investigation was conducted at Building 2700 in December 2007. Due to the thick (believed to be approximately two feet thick) concrete slab that forms the floor of the basement in Building 2700, near slab soil gas samples were collected. A total of 15 near-slab soil gas samples (15SG-1 through 15SG-15) were collected along the side of Building 2700 located closest to wastewater lime pit CW-1. Sample 15SG-1 was collected at a depth of approximately three feet below ground (bg), while the remaining soil gas samples were collected at depths of approximately six feet bg. Eleven of the 15 soil gas samples contained at least one halogenated VOC (PCE, TCE, and/or vinyl chloride) at a concentration above its Non-residential Soil Gas Screening Level (SGSL). The samples that did not contain one or more VOCs at concentrations above their SGSLs were 15SG-11 and 15SG-13 through 15SG-15. These sampling locations are all situated to the southeast of, and generally further from, CW-1. Soil gas sampling locations with the greatest concentrations of TCE and PCE were generally located to the northwest and north of wells MW-28, MW-281, and MW-29.

Fifteen indoor air samples were also collected in Building 2700 in December 2007. No VOCs were detected in indoor air samples at concentrations above the Non-residential indoor air screening levels (IASLs) at locations where halogenated VOCs exceeding SGSLs were detected in the near-slab samples.

To be conservative a second VI investigation is proposed at Building 2700 to confirm the December 2007 results. Building 2700 sampling locations, methods, and analytes are detailed in Section 5.

5.0 VAPOR INTRUSION (VI) INVESTIGATION WORKPLAN

The overall goal for this project is to determine whether remedial action is warranted, based on confirmation of the migration of targeted dissolved phase groundwater VOCs into indoor air. Objectives for the project include the following:

1) Developing an understanding of the interior layout of each building;
2) Assessing potential indoor sources of VO vapors;
3) Determining whether or not concentrations of targeted VOCs are above the SGSL in soil gas beneath the lowest level designed for occupation in each of the targeted buildings;
4) Determining whether or not subsurface utility lines are preferential pathways for VO vapor migration into targeted buildings;
5) Assessing indoor air quality with respect to selected VO vapors;
6) Measuring selected VO vapors in ambient (outdoor air); and,
7) Evaluating whether or not other pathways exist for dissolved phase VOCs in groundwater to migrate in vapor phase into one or more of the targeted buildings.

Activities that will be completed to meet these requirements are pre-sampling building walkthroughs, sub-slab or near-slab soil gas sampling, indoor air sampling, and ambient air sampling. Methods for completing each of the listed tasks are detailed in the subsections below.

5.1 PRE-SAMPLING BUILDING WALKTHROUGHS

Pre-sampling building walkthroughs will be conducted to meet objectives 1, 2, and to identify any sumps that may potentially be present in the targeted buildings. The AECOM Team will conduct building walkthrough evaluations approximately one week prior to initiating indoor air and ambient air sampling activities. These evaluations will include, but are not limited to, identifying household, commercial, and/or industrial products containing VOCs, an assessment of building construction, identification of potential vapor intrusion such as flooring cracks and utility pipe penetrations, and confirming the proposed sampling locations. During these building walkthroughs, the AECOM Team will utilize the NJDEP "Indoor Air Building Survey and Sampling Form" to gather and record the necessary information. The AECOM Team will also utilize portable field screening instrumentation (e.g., PID) to monitor potential sources of VOCs in proposed sampling locations. The PID will be equipped with an 11.7 electron-volt (eV) lamp, as many halogenated ethanes cannot be detected using a lamp with an ionization potential of below 11 to 11.2 eV. Although halogenated ethanes were not detected in groundwater at concentrations above their respective GWSLs, PCE and TCE can produce halogenated ethane daughter products. The PID will also be equipped with a moisture trap to minimize the potential for fouling the lamp.

If potential sources of background (i.e., indoor) sources of indoor air contamination are identified the AECOM Team will request to have Fort Monmouth staff remove the sources when feasible. If a source cannot be removed, and alternative sampling location may need to be identified (if feasible).

5.2 SUB-SLAB SOIL GAS SAMPLING

Six buildings are targeted for VI investigation activities. These buildings were selected based on proximity to groundwater impacts above the GWSL. Further, the NJDEP verbally approved the buildings for investigation. The number of soil gas sampling locations in each building footprint is indicated in Table 1. Proposed sub-slab soil gas sampling locations are shown on Figures 2 through 7. Typically, the sub-slab soil gas samples will collect soil gas from beneath the lowest slab in a building. However, given the unpaved crawl space beneath Building 2700, the sub-slab samples in that building will sample air in the crawl space. Air quality in the crawl space of Building 2700 represents the worst-case concentration of vapors that could enter indoor air above the crawl space.

All soil gas samples will be analyzed for the VOCs listed in Table 1. Each soil gas sample will be analyzed using USEPA Method Low Level TO-15 methods. Summa canisters will be submitted under a laboratory- or NJDEP-supplied chain of custody designed for vapor sampling events.

Sub-Slab Soil Gas Sampling Methods

The following method will be utilized to collect sub-slab soil gas samples. A small one-square-foot section of floor will be swept clean. A ½-inch to one-inch inner diameter hole will be drilled using a hammer drill. The borehole will be advanced through the entire thickness of the concrete slab that forms the floor of the basement. In the absence of a basement (i.e., for slab-on-grade construction), the hole will be drilled through the slab on the ground floor. After the drilling is complete, the one-square-foot area will again be swept clean.

At least six inches of Teflon or Teflon-lined tubing will be inserted through the borehole. The outer diameter of the tubing will be no more than 1/2 inch narrower than the borehole. The annular space will be sealed using non-toxic/non-VOC modeling clay (e.g., Play-DOH). The clay will also be packed around the tubing (i.e., mounded above the concrete slab).

The tubing will be attached to a Teflon "T" fitting equipped with a three-way valve. The three-way valve may be shut, may allow flow through the left branch of the "T," or may allow flow through the right branch of the "T." The left branch of the "T" will be attached to a helium meter temporarily. The right branch will be attached to a six-liter Summa canister. The canister will be equipped with a five-micron filter and a flow controller set to allow approximately 200 mL per minute.

A helium tracer gas will be used to confirm the annular seal of each soil gas sampling. A plastic shroud will be placed over the sampling apparatus described above. The three-way valve will be shut so as not to allow air flow through the system, and the helium meter will be detached from the tubing. A helium canister will be used to introduce helium into the area under the shroud. The environment under the shroud will be filled with helium until the helium meter detects between 10% and 20% helium. At that time, the helium meter will be reconnected to the left branch of the tubing, and the three-way valve will be opened to allow flow to the meter. The helium meter will check the concentration of helium in air in the tubing. If the concentration of helium is less than 10% of the helium under the shroud (i.e., between 1% and 2%), the system will be considered to be intact and without leaks. The helium canister will be shut. The three-way valve again will be shut.

The helium meter will be replaced with a multi-gas meter equipped with a moisture trap. The multi-gas meter will be equipped with a PID (11.7 eV lamp) and an oxygen sensor, at a minimum. The multi-gas meter will be used to purge the borehole of at least 3 volumes of soil gas at a maximum flow rate of 200 milliliters (mL) per minute. It is anticipated that a one-minute purge will be sufficient. Multi-gas meter readings will be recorded during the purge.

At the end of the purge, the valve will again be shut and the multi-gas meter will be disconnected. The Summa canister serial number and flow controller serial numbers will be recorded on the sampling form and Chain of Custody form. The vacuum reading on the gauge will be recorded. So long as the vacuum is at least 18 inches of mercury, the Summa canister will be considered accurate. Otherwise, the Summa canister will be replaced, the new serial numbers will be recorded, and the vacuum will again be checked.

Once a Summa canister with at least 18 inches of mercury is attached to the tubing, the Summa canister valve will be opened, the three-way valve will be opened to allow gas to flow towards the Summa canister, and the sampling start time will be recorded. The AECOM Team will remain in the vicinity of the Summa canister throughout the purge period and will check the Summa canister pressure periodically. The time and vacuum of the interim checks will be recorded on the sampling form. The purge period will be complete when the first of the following two conditions occurs: 1) the Summa canister reads between 1 and 5 inches of mercury or 2) one half hour elapses. At the end of the purge, the Summa canister valve will be shut, and the flow controller apparatus will be removed from the Summa canister. The end time for the sampling will be recorded. The tubing and related sampling equipment will be disassembled and removed from the borehole. The borehole will be sealed using hydraulic cement.

5.3 INDOOR AND AMBIENT AIR SAMPLING

Indoor air and ambient air sampling will be performed prior to initiating the soil gas sampling at each building. Indoor air sampling locations will be situated within 20 feet of sub-slab locations and will be biased towards locations where cracks or seams are observed in the concrete foundation, where sump pits or other depressed areas are observed in the concrete floor, and where utility lines penetrate the slab. Figures 2 through 7 depict approximate indoor air sampling locations, but these proposed locations are subject to change based on observations during the building walkthrough surveys. Indoor air samples will be collected either directly into a six-liter Summa canister or from tubing attached to the canister, such that the intake is at an adult’s breathing zone height (i.e., approximately three to five feet above floor level). All Summa canisters used for collecting indoor air samples will be equipped with five-micron filters and flow controllers, which will allow the canister to fill over a 24-hour period.

The Summa canister and flow controller serial numbers will be recorded. The canister valve will be opened and quickly shut. The vacuum reading on the gauge will be recorded. So long as the vacuum is at least 18 inches of mercury, the Summa canister will be used. Otherwise, the Summa canister will be replaced, the serial number will be recorded, and the vacuum will again be checked.

Once a Summa canister with a vacuum of at least 18 inches of mercury is deployed at the indoor air sampling location, the canister will be opened. The start time will be recorded. As the sampling time is to be approximately 24 hours, the AECOM Team will not be in attendance throughout the sampling period. However, the pressure gauge will be checked periodically and the vacuum and time of the interim check will be recorded on the sampling form. The sampling period will be complete when the first of the following conditions occurs: 1) the Summa canister reads between 1 and 5 inches of mercury or 2) approximately 24 hours elapses. At the end of the sampling period, the Summa canister valve will be closed and the flow controller apparatus will be detached. The end time for the sampling will be recorded.

Ambient air samples will be collected using the same methods employed in the indoor air sampling effort, except that they will be collected exterior to the targeted building. Ambient air sampling locations will be situated at least 20 feet from the targeted building's nearest door or window.

A weather station will be established adjacent to one ambient air sampling location. The weather station will be capable of measuring the temperature, pressure, and humidity. The weather station data will be recorded periodically throughout the day.

Indoor air samples and ambient air samples will be collected with as much temporal overlap as possible and prior to initiating intrusive activities associated with soil gas sampling. All indoor and ambient air samples will be analyzed for the VOCs listed in Table 1 using Low Level TO-15 methods. The Summa canister serial number and flow controller serial numbers will be recorded on the sampling form and Chain of Custody form.

5.4 DATA EVALUATION AND INTERPRETATION

Sub-slab soil gas data will be compared to Soil Gas Screening Levels (SGSL). Data from indoor air samples will be compared to Residential and Non-Residential Indoor Air Screening Levels (IASL) and Rapid Action Levels (RAL). In the event an IASL or RAL is exceeded for a targeted VOC, a weight of evidence approach will be used to determine the most likely source of the vapor. Potential sources include sub-slab soil gas, materials stored indoors that may release VOC vapors, and ambient conditions. Please note, however, all targeted buildings are currently unoccupied. Therefore, although the AECOM Team will notify the NJDEP once analytical data are available and are analyzed, the actions specified in the NJDEP's statutory and regulatory time frames do not apply.

All data generated for this project will be in accordance with the *DoD Quality Systems Manual (QSM) for Environmental Laboratories, Version 4.2, October 2010* and the *NJDEP-SRP Low Level USEPA TO-15 Method* guidance. The number and type of QA/QC samples to be collected are presented in Table 1. Test America of Burlington, Vermont which operates under laboratory certification identification number VT972. Test America of Burlington, Vermont is a nationally accredited environmental laboratory which has met the requirements of the regulations governing the certification of laboratories and environmental measurements N.J.A.C> 7:18 et. Seq and is compliant with the standards approved by The NELAC Institute.

Field duplicate samples will be collected and analyzed to assess field and laboratory precision. Duplicate samples will be collected at frequencies shown in Table 1. The sub-slab duplicate samples will be collected with intakes within approximately one inch of one another.

5.5 REPORTING

A data quality review will be performed to validate the data. The data quality review is an after-the-fact technical review of analytical data whereby the quality and usability of the data are determined based on a set of predefined criteria. Specific criteria for data quality review may include, but are not limited to: technical holding times, analysis of blanks, surrogate spike recovery, analysis of duplicates, and reported practical quantitation limits. After all the data has been compiled and evaluated, a report will be prepared by the AECOM Team and submitted to NJDEP. The report will include all sampling results and a discussion of the findings, conclusions, and recommendations.

5.6 KEY PERSONNEL

This investigation will include the following key personnel:

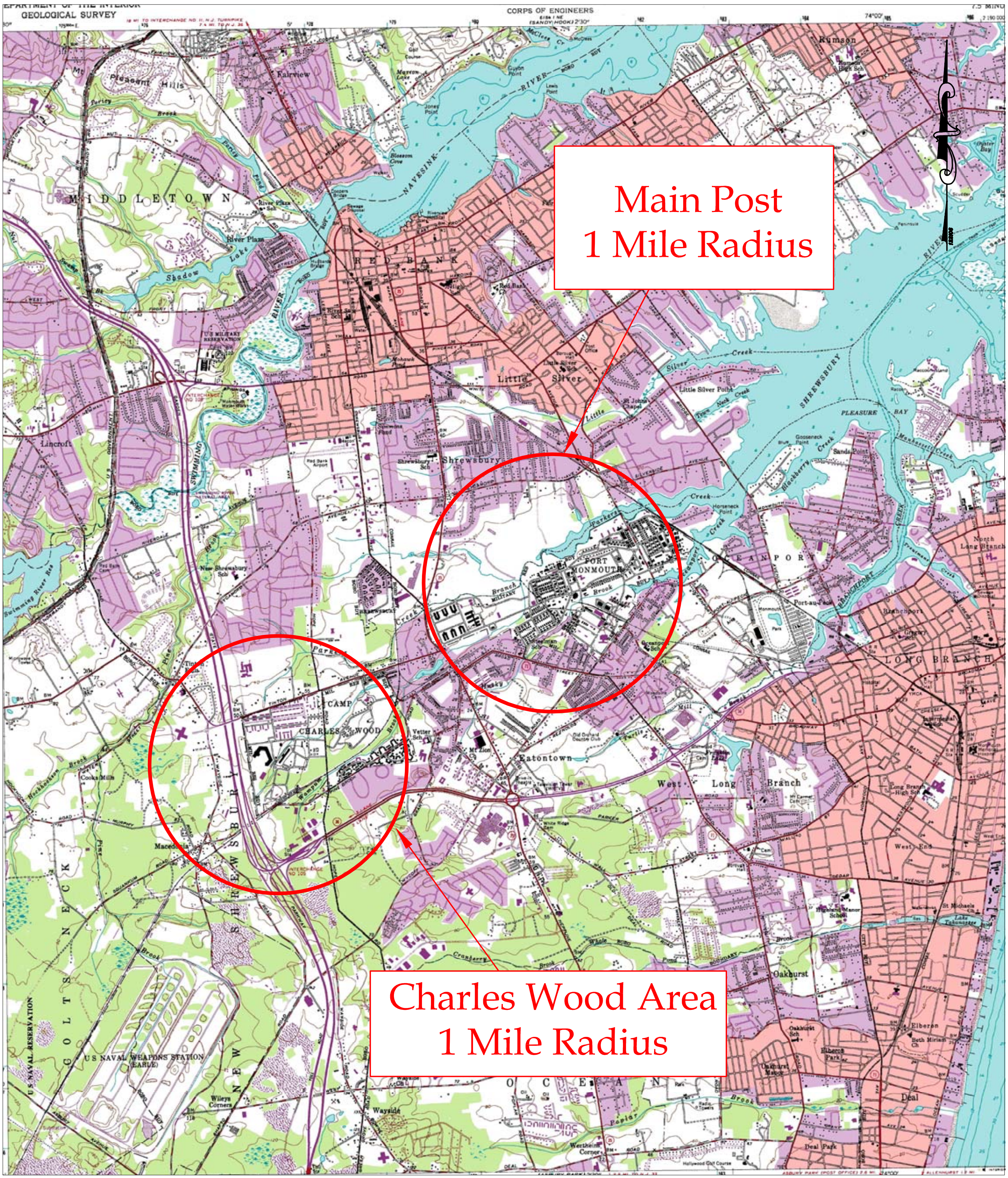
Bureau Veritas Project Manager:	Christopher J. Ostermann, 3380 Chastain Meadows Parkway Suite 300, Kennesaw, Georgia, (770) 590-6708
Bureau Veritas Field Supervisor:	Geoffrey Clark, PG, LSRP, 110 Fieldcrest Avenue 4th Floor, Edison, New Jersey, (732) 225-6040
AECOM Environment Project Manager:	Elizabeth Larsen, PG, 675 N Washington Street #300, Alexandria, VA, (703) 624-4904
Fort Monmouth Contact:	Wanda Green, PO Box 148, Oceanport, New Jersey, (732) 380-7064
USACE Personnel:	Russ Marsh, 10 South Howard Street, Baltimore, MD, (410) 962-0695 and Jim Moore, 26 Federal Plaza, New York, NY (917) 790-8230
Laboratory:	Test America, Burlington, Vermont

5.7 SCHEDULE

Activities outlined in this VI Workplan will commence upon receipt of NJDEP approval. The proposed schedule for this project is outlined below. *Note: these timeframes are only an estimate and could be delayed due to receipt of access agreements for off-Site sampling locations.*

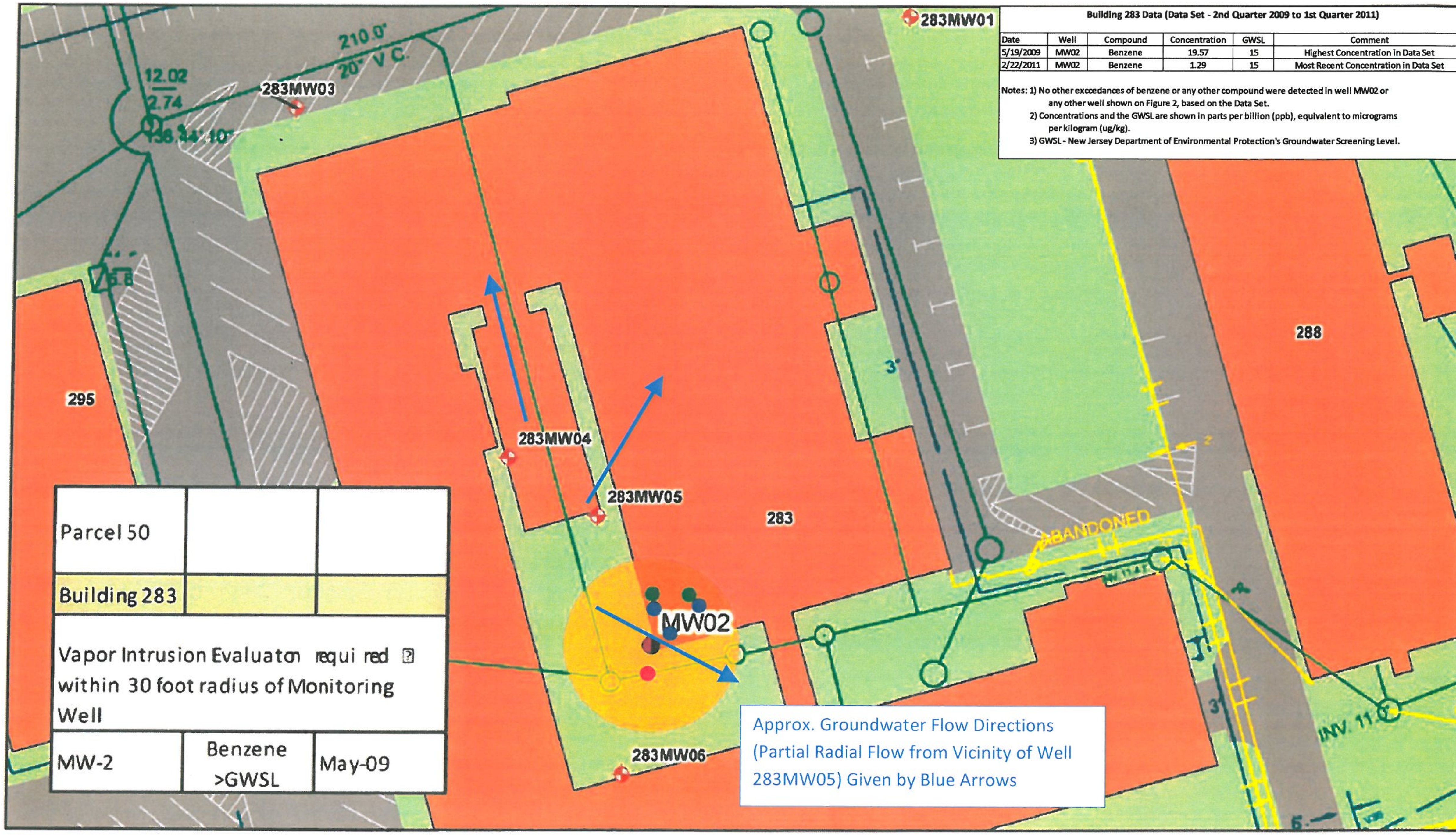
ACTIVITY	NUMBER OF BUSINESS DAYS FROM NJDEP APPROVAL
Clear Utilities, Mobilize to the Site, Complete Building Surveys, and Complete Sampling	10-15
Receive Laboratory Analytical Results	50-60
Submit Report to Fort Monmouth	70-80

FIGURES



USGS LONGBRANCH QUADRANGLE	SITE LOCATION MAP	FIGURE
0' 1,000' 2,000' 4,000'	Fort Monmouth Main Post and Charles Wood Area Oceanport, New Jersey Bureau Veritas Project No.	1

BUREAU VERITAS



Building 283 Data (Data Set - 2nd Quarter 2009 to 1st Quarter 2011)

Date	Well	Compound	Concentration	GWSL	Comment
5/19/2009	MW02	Benzene	19.57	15	Highest Concentration in Data Set
2/22/2011	MW02	Benzene	1.29	15	Most Recent Concentration in Data Set

Notes: 1) No other excedances of benzene or any other compound were detected in well MW02 or any other well shown on Figure 2, based on the Data Set.
2) Concentrations and the GWSL are shown in parts per billion (ppb), equivalent to micrograms per kilogram (ug/kg).
3) GWSL - New Jersey Department of Environmental Protection's Groundwater Screening Level.

Legend

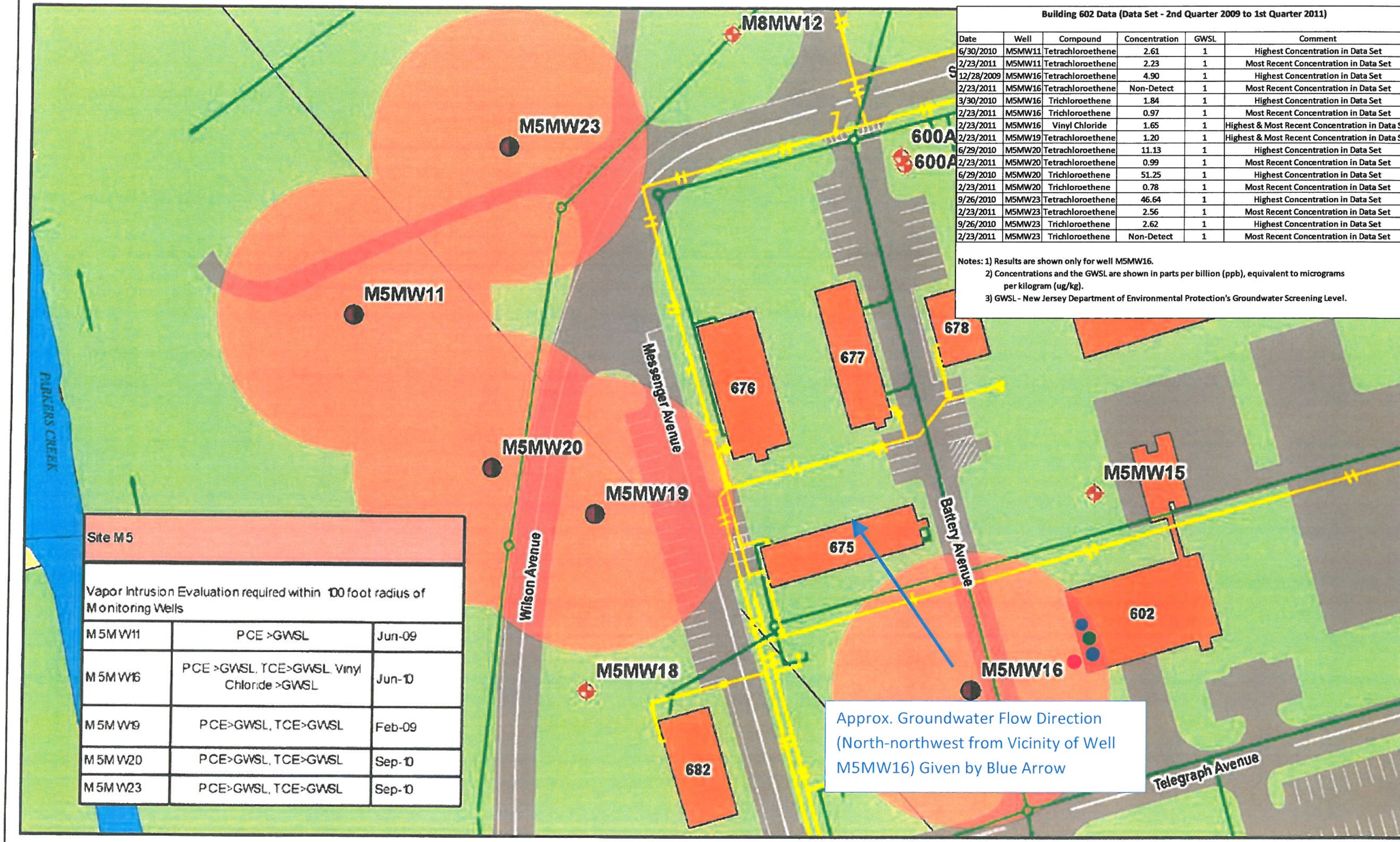
- VIE Monitoring Wells_2
- Monitoring Well
- 30' Radius
- Existing Building
- Water
- Sewer
- Gas
- Steam
- Condensate
- Roadway & Parking
- Post Boundary
- Ambient Air Sample
- Indoor Air Sample
- Sub-Slab Sample

0' 30' 60' 120'

N W E S

BUREAU VERITAS

DRAWN BY: C. Ostermann	DATE: 2-9-12	LOCATION Main Post Building 283 Sherill Avenue	TITLE Proposed Vapor Sampling Points Building 283	FIGURE 2
CHECKED BY: G. Clark	DATE: 2-9-12			
APPROVED BY: B. Munoz	DATE: 2-9-12			
BUREAU VERITAS PROJECT NO.				



Building 602 Data (Data Set - 2nd Quarter 2009 to 1st Quarter 2011)

Date	Well	Compound	Concentration	GWSL	Comment
6/30/2010	M5MW11	Tetrachloroethene	2.61	1	Highest Concentration in Data Set
2/23/2011	M5MW11	Tetrachloroethene	2.23	1	Most Recent Concentration in Data Set
12/28/2009	M5MW16	Tetrachloroethene	4.90	1	Highest Concentration in Data Set
2/23/2011	M5MW16	Tetrachloroethene	Non-Detect	1	Most Recent Concentration in Data Set
3/30/2010	M5MW16	Trichloroethene	1.84	1	Highest Concentration in Data Set
2/23/2011	M5MW16	Trichloroethene	0.97	1	Most Recent Concentration in Data Set
2/23/2011	M5MW16	Vinyl Chloride	1.65	1	Highest & Most Recent Concentration in Data Set
2/23/2011	M5MW19	Tetrachloroethene	1.20	1	Highest & Most Recent Concentration in Data Set
6/29/2010	M5MW20	Tetrachloroethene	11.13	1	Highest Concentration in Data Set
2/23/2011	M5MW20	Tetrachloroethene	0.99	1	Most Recent Concentration in Data Set
6/29/2010	M5MW20	Trichloroethene	51.25	1	Highest Concentration in Data Set
2/23/2011	M5MW20	Trichloroethene	0.78	1	Most Recent Concentration in Data Set
9/26/2010	M5MW23	Tetrachloroethene	46.64	1	Highest Concentration in Data Set
2/23/2011	M5MW23	Tetrachloroethene	2.56	1	Most Recent Concentration in Data Set
9/26/2010	M5MW23	Trichloroethene	2.62	1	Highest Concentration in Data Set
2/23/2011	M5MW23	Trichloroethene	Non-Detect	1	Most Recent Concentration in Data Set

Notes: 1) Results are shown only for well M5MW16.
2) Concentrations and the GWSL are shown in parts per billion (ppb), equivalent to micrograms per kilogram (ug/kg).
3) GWSL - New Jersey Department of Environmental Protection's Groundwater Screening Level.

Site M5

Vapor Intrusion Evaluation required within 100 foot radius of Monitoring Wells

M5MW11	PCE >GWSL	Jun-09
M5MW16	PCE >GWSL, TCE>GWSL, Vinyl Chloride >GWSL	Jun-10
M5MW19	PCE>GWSL, TCE>GWSL	Feb-09
M5MW20	PCE>GWSL, TCE>GWSL	Sep-10
M5MW23	PCE>GWSL, TCE>GWSL	Sep-10

Legend

- Vapor Intrusion Well
- Monitoring Well
- 100' Buffer Area
- Existing Building
- Water
- Sewer
- Gas
- Steam
- Condensate
- Roadway & Parking
- Water Body
- Post Boundaries

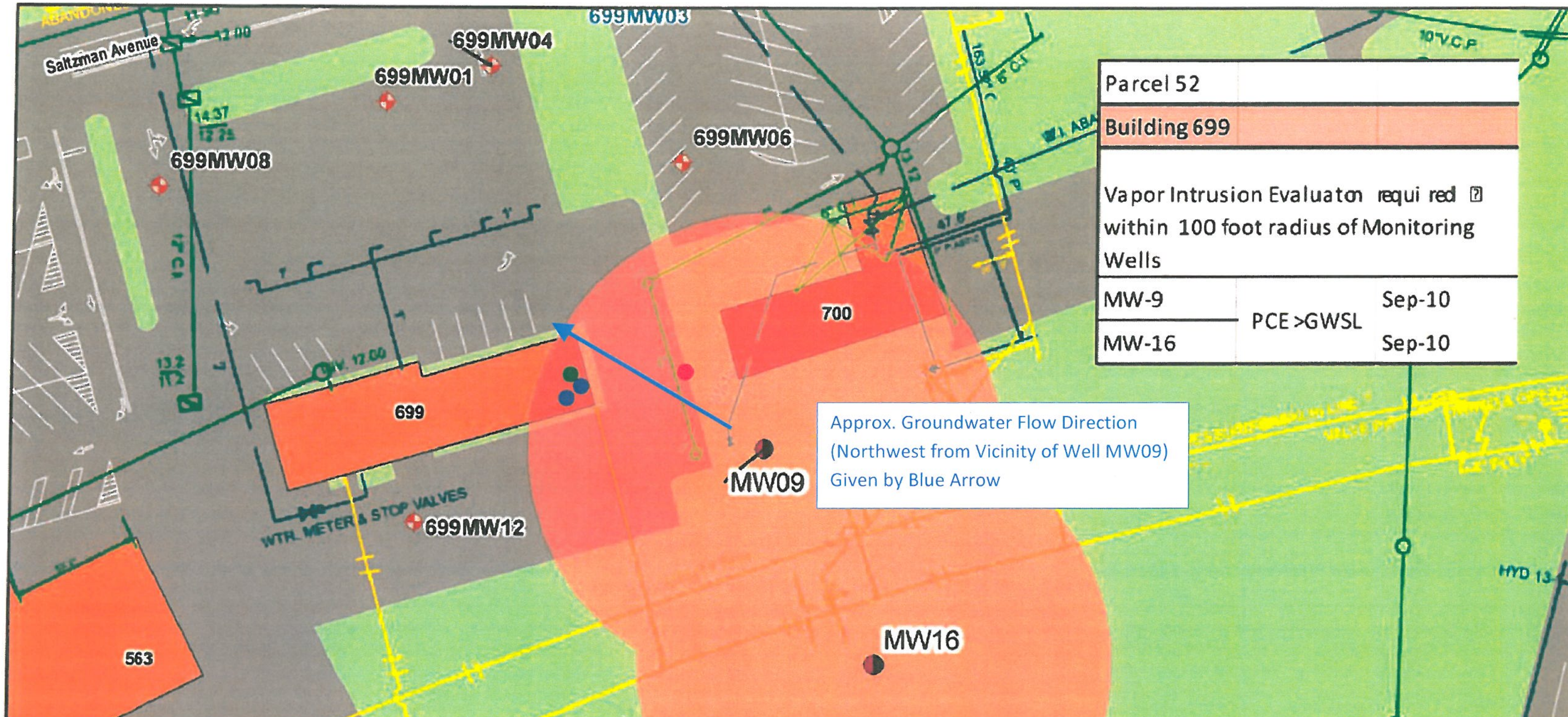
0' 50' 100' 200'

N W E S

BUREAU VERITAS 1828

DRAWN BY: C. Ostermann	DATE: 2-9-12	LOCATION	TITLE	FIGURE
CHECKED BY: G. Clark	DATE: 2-9-12	Main Post Building 602 Telegraph Avenue	Proposed Vapor Sampling Points Building 602	3
APPROVED BY: B. Munoz	DATE: 2-9-12			
BUREAU VERITAS PROJECT NO.				

M:\VI Buffers\Site M5 VIE.mxd



Building 699 Data (Data Set - 2nd Quarter 2009 to 1st Quarter 2011)

Date	Well	Compound	Concentration	GWSL	Comment
9/17/2010	MW09	Tetrachloroethene	2.32	1	HighestConcentration in Data Set
3/11/2011	MW09	Tetrachloroethene	Non-detect	1	Most Recent Concentration in Data Set
9/17/2010	MW16	Tetrachloroethene	1.71	1	Highest Concentration in Data Set
3/15/2011	MW16	Tetrachloroethene	0.59	1	Most Recent Concentration in Data Set

Notes: 1) No other exccedances of any other compound were detected in any well shown on Figure 4, based on the Data Set.
2) Concentrations and the GWSL are shown in parts per billion (ppb), equivalent to micrograms per kilogram (ug/kg).

Legend

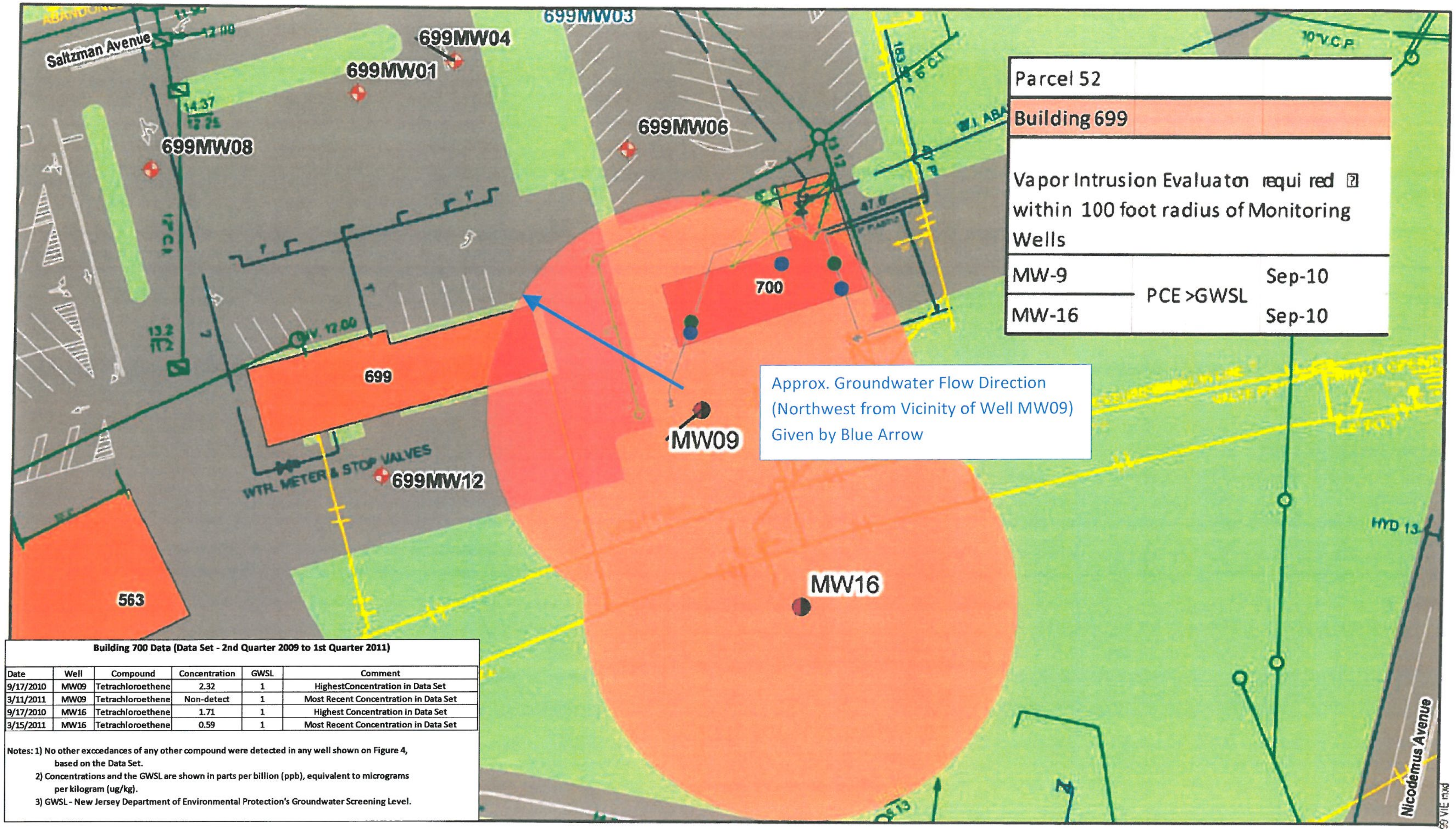
- Vapor Intrusion Well
- Monitoring Well
- 100' Buffer Area
- Existing Building
- Water
- Sewer
- Gas
- Steam
- Condensate
- Roadway & Parking
- Water Body
- Post Boundaries
- Ambient Air Sample
- Indoor Air Sample
- Sub-Slab Sample

0' 40' 80' 160'

N W E S

BUREAU VERITAS

DRAWN BY: C. Ostermann	DATE: 2-9-12	LOCATION	TITLE	FIGURE
CHECKED BY: G. Clark	DATE: 2-9-12	Main Post Building 699 Saltzman Avenue	Proposed Vapor Sampling Points Building 699	4
APPROVED BY: B. Munoz	DATE: 2-9-12			
BUREAU VERITAS PROJECT NO.				



Building 700 Data (Data Set - 2nd Quarter 2009 to 1st Quarter 2011)

Date	Well	Compound	Concentration	GWSL	Comment
9/17/2010	MW09	Tetrachloroethene	2.32	1	HighestConcentration in Data Set
3/11/2011	MW09	Tetrachloroethene	Non-detect	1	Most Recent Concentration in Data Set
9/17/2010	MW16	Tetrachloroethene	1.71	1	Highest Concentration in Data Set
3/15/2011	MW16	Tetrachloroethene	0.59	1	Most Recent Concentration in Data Set

Notes: 1) No other exccedances of any other compound were detected in any well shown on Figure 4, based on the Data Set.
2) Concentrations and the GWSL are shown in parts per billion (ppb), equivalent to micrograms per kilogram (ug/kg).
3) GWSL - New Jersey Department of Environmental Protection's Groundwater Screening Level.

Legend

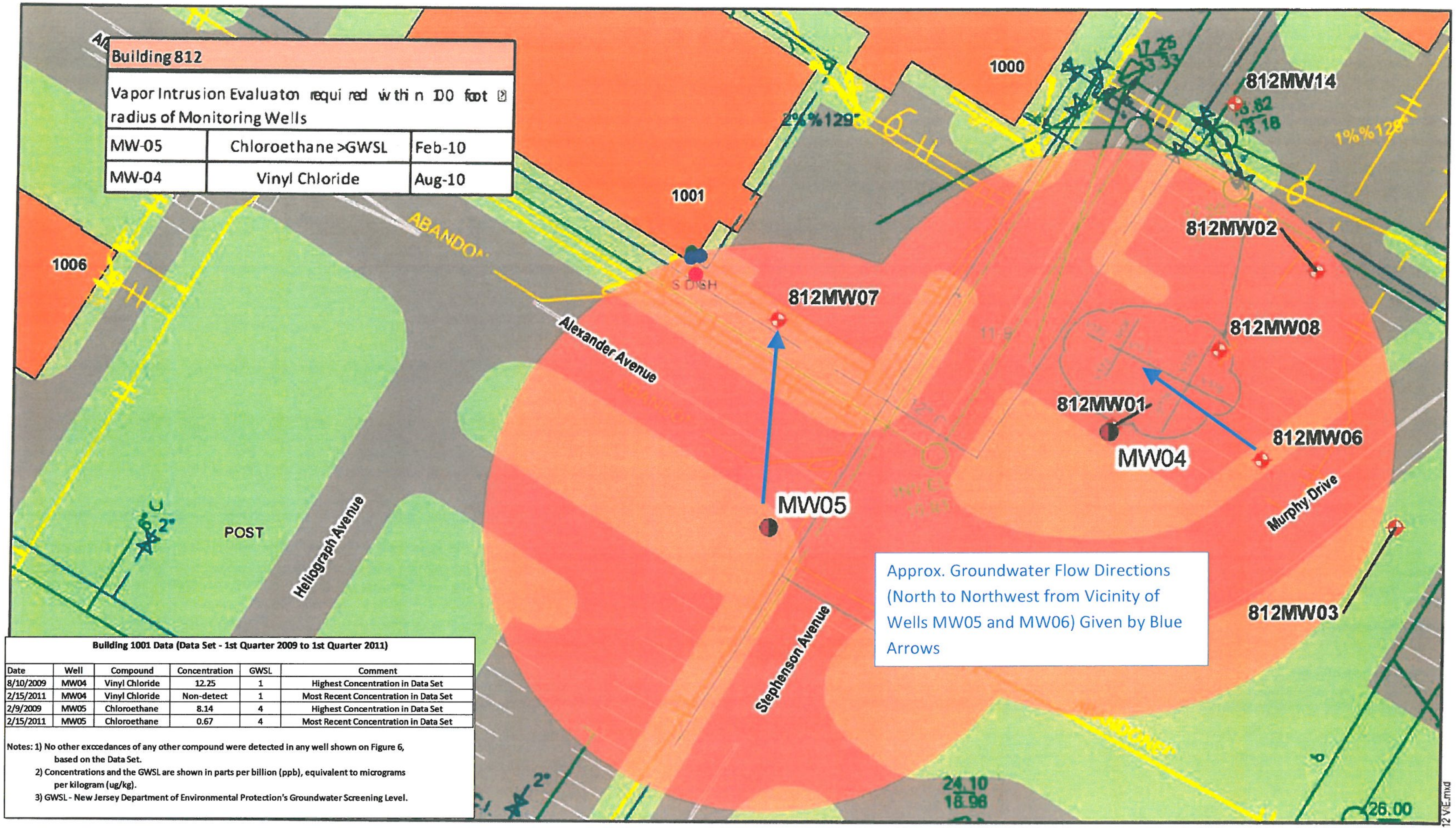
- Vapor Intrusion Well
- Monitoring Well
- 100' Buffer Area
- Existing Building
- Water
- Sewer
- Gas
- Steam
- Condensate
- Roadway & Parking
- Water Body
- Post Boundaries
- Indoor Air Sample
- Sub-Slab Sample

0' 40' 80' 160'

N S E W

BUREAU VERITAS

DRAWN BY: C. Ostermann	DATE: 2-9-12	LOCATION	TITLE	FIGURE
CHECKED BY: G. Clark	DATE: 2-9-12	Main Post Building 700 Saltzman Avenue	Proposed Vapor Sampling Points Building 700	5
APPROVED BY: B. Munoz	DATE: 2-9-12			
BUREAU VERITAS PROJECT NO.				



Building 812		
Vapor Intrusion Evaluaton required within 100 foot radius of Monitoring Wells		
MW-05	Chloroethane >GWSL	Feb-10
MW-04	Vinyl Chloride	Aug-10

Building 1001 Data (Data Set - 1st Quarter 2009 to 1st Quarter 2011)

Date	Well	Compound	Concentration	GWSL	Comment
8/10/2009	MW04	Vinyl Chloride	12.25	1	Highest Concentration in Data Set
2/15/2011	MW04	Vinyl Chloride	Non-detect	1	Most Recent Concentration in Data Set
2/9/2009	MW05	Chloroethane	8.14	4	Highest Concentration in Data Set
2/15/2011	MW05	Chloroethane	0.67	4	Most Recent Concentration in Data Set

Notes: 1) No other exccedances of any other compound were detected in any well shown on Figure 6, based on the Data Set.
2) Concentrations and the GWSL are shown in parts per billion (ppb), equivalent to micrograms per kilogram (ug/kg).
3) GWSL - New Jersey Department of Environmental Protection's Groundwater Screening Level.

Legend

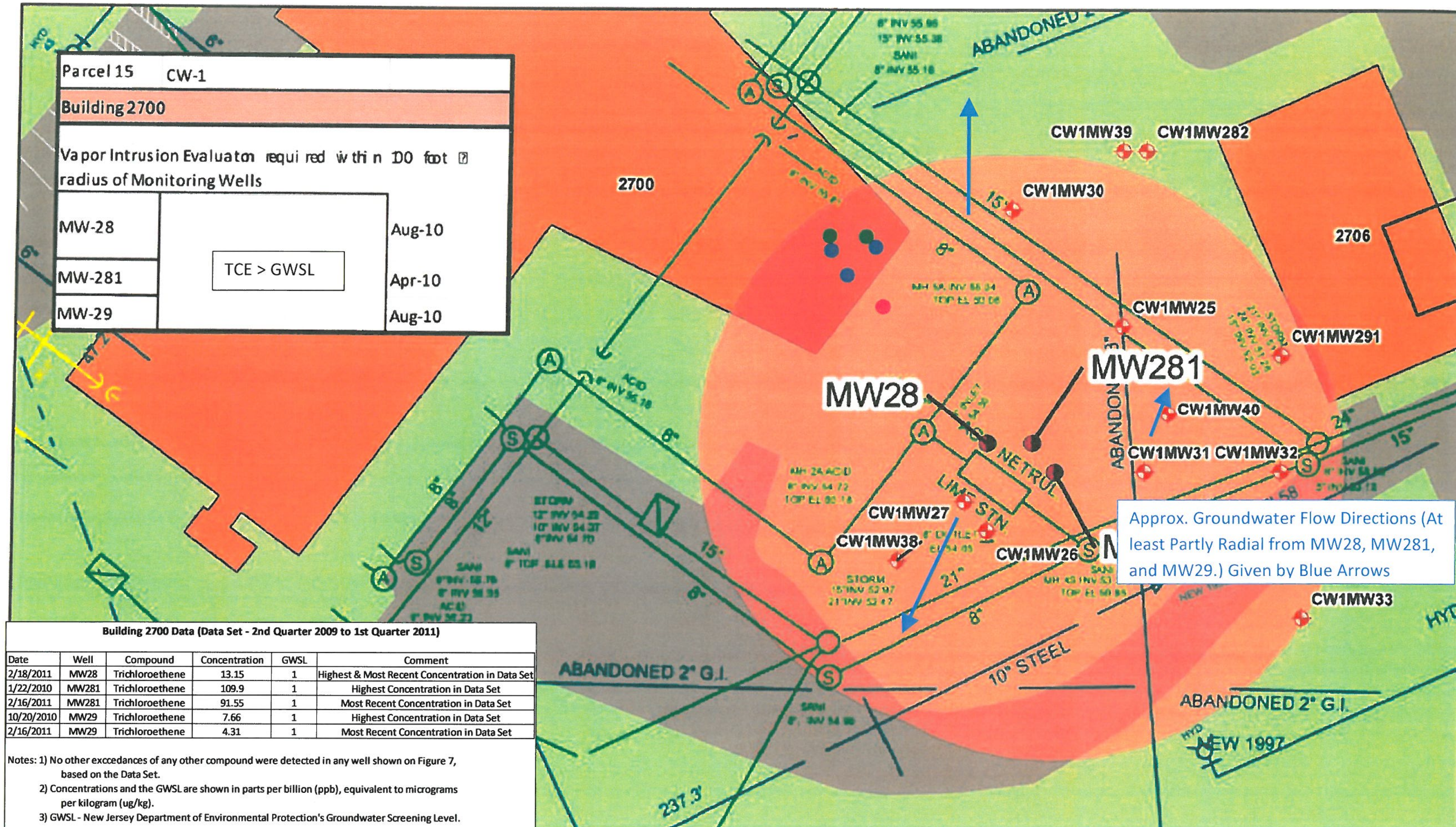
- Vapor Intrusion Well
- Monitoring Well
- 100' Buffer Area
- Existing Building
- Water
- Sewer
- Gas
- Steam
- Condensate
- Roadway & Parking
- Water Body
- Post Boundaries
- Ambient Air Sample
- Indoor Air Sample
- Sub-Slab Sample

0' 30' 60' 120'

N S E W

DRAWN BY: C. Ostermann	DATE: 2-9-12	LOCATION	TITLE	FIGURE
CHECKED BY: G. Clark	DATE: 2-9-12	Main Post Building 1001 Stephenson Avenue	Proposed Vapor Sampling Points Building 1001	6
APPROVED BY: B. Munoz	DATE: 2-9-12			
BUREAU VERITAS PROJECT NO.				

BUREAU VERITAS



Building 2700 Data (Data Set - 2nd Quarter 2009 to 1st Quarter 2011)

Date	Well	Compound	Concentration	GWSL	Comment
2/18/2011	MW28	Trichloroethene	13.15	1	Highest & Most Recent Concentration in Data Set
1/22/2010	MW281	Trichloroethene	109.9	1	Highest Concentration in Data Set
2/16/2011	MW281	Trichloroethene	91.55	1	Most Recent Concentration in Data Set
10/20/2010	MW29	Trichloroethene	7.66	1	Highest Concentration in Data Set
2/16/2011	MW29	Trichloroethene	4.31	1	Most Recent Concentration in Data Set

Notes: 1) No other exccedances of any other compound were detected in any well shown on Figure 7, based on the Data Set.
2) Concentrations and the GWSL are shown in parts per billion (ppb), equivalent to micrograms per kilogram (ug/kg).
3) GWSL - New Jersey Department of Environmental Protection's Groundwater Screening Level.

Legend

- Vapor Intrusion Well
- Monitoring Well
- 100' Buffer Area
- Existing Building
- Water
- Sewer
- Gas
- Steam
- Condensate
- Roadway & Parking
- Water Body
- Post Boundaries
- Ambient Air Sample
- Indoor Air Sample
- Sub-Slab Sample

0' 30' 60' 120'

N W E S

DRAWN BY: C. Ostermann	DATE: 2-9-12	LOCATION	TITLE	FIGURE
CHECKED BY: G. Clark	DATE: 2-9-12	Chrales Wood Area Building 2700 Corregidor Road	Proposed Vapor Sampling Points Building 2700	7
APPROVED BY: B. Munoz	DATE: 2-9-12			
BUREAU VERITAS PROJECT NO.				

BUREAU VERITAS

TABLES

Table 1
Sample Rationale Detail and Analytical Parameters

Sample Number(s)	Building Number and Property Address (Street Name)	Parcel/Site ID	Medium	Approximate Number of Square Feet Subject to Vapor Intrusion Investigation	Number of Samples Sample Method Analytical Parameters
SS-1 SS-2 SS-3 IA-1 IA-2 AA-1	Building 283 Sherill Avenue	Parcel 50	Soil Gas Indoor Air Ambient Air	1,500	3 Sub-Slab 2 Indoor Air 1 Ambient Air Summa Canister LLTO-15 Benzene
SS-4 SS-5 IA-3 AA-2	Building 602 Telegraph Avenue	Site M5	Soil Gas Indoor Air Ambient Air	1,200	2 Sub-Slab 1 Indoor Air 1 Ambient Air Summa Canister LLTO-15 List 1
SS-6 SS-7 IA-4 AA-3 AADUP-1	Building 699 Saltzman Avenue	Parcel 52	Soil Gas Indoor Air Ambient Air	1,200	2 Sub-Slab 1 Indoor Air 2 Ambient Air Summa Canister LLTO-15 List 1
SS-8 SS-9 SS-10 SSDUP-1 IA-5 IA-6 IADUP-1	Building 700 Saltzman Avenue	Parcel 52	Soil Gas Indoor Air	4,000	4 Sub-Slab 3 Indoor Air Summa Canister LLTO-15 List 1

Sample Number(s)	**Building Number and Property Address (Street Name)**	**Parcel/Site ID**	**Medium**	**Approximate Number of Square Feet Subject to Vapor Intrusion Investigation**	**Number of Samples** **Sample Method** **Analytical Parameters**
SS-11 SS-12 IA-7 AA-4	Building 1001 Saltzman Avenue	Not Provided	Soil Gas Indoor Air Ambient Air	500	2 Sub-Slab 1 Indoor Air 1 Ambient Air Summa Canister LLTO-15 List 1
SS-13 SS-14 SS-15 SSDUP-2 IA-8 IA-9 IADUP-2 AA-5 AADUP-2	Building 2700 Corregidor Road	Parcel 15	Soil Gas Indoor Air Ambient Air	3,500	4 Sub-Slab 3 Indoor Air 2 Ambient Air Summa Canister LLTO-15 List 1

Notes and Abbreviations:

SS – Sub-Slab

IA – Indoor Air

AA – Ambient Air

DUP – Duplicate

1) The analytical program requires List 1 where a halogenated VOC was detected at a concentration above its Groundwater Screening Level (GWSL). List 1 includes the following halogenated TO-15 compounds: Chloroethane; Chloromethane; 1,1-Dichloroethane; 1,2-Dichloroethane; 1,1-Dichloroethene; cis-1,2-Dichloroethene; trans-1,2-Dichloroethene; Dichloromethane; Methylene Chloride; 1,1,2,2-Tetrachloroethane; Tetrachloroethene (PCE); 1,1,1-Trichloroethane; 1,1,2-Trichloroethane; Trichloroethene (TCE); and, Vinyl Chloride.

Attachment 1

Sampling Forms

Building Evaluation Form

Address: ____ Date:_________________________

Occupant Name: __________________________________ Phone:________________________

Owner's Name: ___________________________________ Phone:________________________

Owner's Address: ____

Point of Contact: _______________________________ Phone:________________________

Contact Information: ____

Conducted By:___________________________________ Company:______________________

A. GENERAL BUILDING INFORMATION

Provides information on building construction that will be used to identify possible points of VI (including preferential pathways) and documents the rationale for selecting sample locations.
(* Denotes information used in the EPA Spreadsheet Model.)

Building Type/Use:
- ☐ Residential
- ☐ Office
- ☐ Commercial
- ☐ Industrial
- ☐ Government
- ☐ School
- ☐ Warehouse
- ☐ Other: ______________________

Number of Occupants: Adults____ Infants____ Children 1-6____ Children 6-15____

*Area of Building Footprint: _____________________ Number of Floors: _____________________

*Ceiling Height: ______________________ Building Age: _____________________

General Description of Building Construction Materials: __________________________________

____

*Foundation Type: ☐ Basement ☐ Crawl Space ☐ Slab

Foundation Materials: ☐ Poured Concrete ☐ Cinder Blocks ☐ Earthen ☐ Wood Pilings ☐ Other, specify________________________________

Foundation Wall Material:

☐ Poured Concrete ☐ Cinder Blocks ☐ Earthen ☐ Wood ☐ Stone

Draw in the Floor Plan:

If there is a basement, please answer questions in Section B.

If there is not a basement, skip to Section C.

B. BASEMENT INFORMATION

Provides information regarding VI and the potential for groundwater intrusion into basement, as well as documents human activity patterns (e.g., sleeping in the basement) that should be used to determine where samples should be collected.

(* Denotes information used in the EPA Spreadsheet Model.)

*Depth of basement or crawl space: ___________________

Is the basement finished? ☐ Yes ☐ No

Does anyone live in the basement as a primary residence or use the basement daily? ☐ Yes ☐ No

The basement is generally: ☐ Wet ☐ Dry ☐ Damp

Is there a sump in the basement? ☐ Yes ☐ No

If yes, please describe the size, the construction, where it is located and whether or not there is a sump pump and how it is activated.

____

____

____

Does the basement have cracks? ☐ Yes ☐ No

If yes, what is the PID/FID/CGI reading? ____

Does the basement have a drainage point in floor? ☐ Yes ☐ No

If yes, what is the PID/FID/CGI reading? ____

Does the basement have pipes or utility conduits through floor or outside walls? ☐ Yes ☐ No

If yes, what is the PID/FID/CGI reading? ____

Is the basement sealed with waterproof paint or epoxy coating? ☐ Yes ☐ No

Does the basement have flooring over the foundation? ☐ Yes ☐ No

If yes, what type? ☐ Tile ☐ Carpet ☐ Wood
☐ Pergo ☐ Other, specify ______________________________

Are there odors in the basement? ☐ Yes ☐ No

If yes, describe: ____

C. First Floor Information

Provides information on building construction and human activity patterns to be used to determine where samples should be collected.

What are the walls constructed of? ☐ Cinder Block ☐ Sheet Rock ☐ Paneling
☐ Other, specify ___________________________________

Is there flooring in the first floor? ☐ Yes ☐ No

If yes, what type? ☐ Tile ☐ Carpet ☐ Wood
☐ Pergo ☐ Other, specify

Are there pipes or utility conduits through the outside walls or floor? ☐ Yes ☐ No

If yes, what is the PID/FID/CGI reading? __

Are there odors on the first floor? ☐ Yes ☐ No If yes, describe _

D. SECOND FLOOR INFORMATION (if applicable)

Provides information on building construction and human activity patterns to be used to determine where samples should be collected.

What are the walls constructed of? ☐ Cinder Block ☐ Sheet Rock ☐ Paneling

☐ Other, specify ________________________________

Is there flooring in the second floor? ☐ Yes ☐ No

If yes, what type? ☐ Tile ☐ Carpet ☐ Wood

☐ Pergo ☐ Other, specify

____

Are there pipes or utility conduits through the outside walls or floor? ☐ Yes ☐ No

If yes, what is the PID/FID/CGI reading? ________________________________

Are there odors on the second floor? ☐ Yes ☐ No

If yes, describe ________________________________

E. HEATING AND VENTILATION SYSTEMS

Provides information on the type of heating and ventilation system used in the structure to help identify potential indoor and outdoor contaminant sources, as well as provides information to assist with data interpretation.

What type of heating system(s) are used in the building? (Check all that apply)

☐ Heat Pump/Furnace ☐ Hot Air Radiation
☐ Steam Radiation ☐ Unvented Kerosene Heater
☐ Wood Stove ☐ Electric Baseboard
☐ Other, specify:

____

What type of fuel(s) are used in the building? (Check all that apply)

☐ Natural Gas ☐ Electric
☐ Fuel Oil ☐ Wood
☐ Coal ☐ Solar
☐ Other, specify

____

What type of mechanical ventilation systems are present and/or currently operating in the building? (Check all that apply)

- ☐ Mechanical Fans
- ☐ Open Windows
- ☐ Individual Air Conditioning Units
- ☐ Kitchen Range Hood
- ☐ Bathroom Ventilation Fan
- ☐ Air-to-Air Heat Exchanger
- ☐ Other, specify

____

F. POTENTIAL SOURCES OF INDOOR CHEMICALS:

Helps identify typical sources of indoor air contamination that may be found in the building (including attached garages), and documents whether the item was removed from the building prior to the sampling event.

Which of these items are present in the building? (Check all that apply)

Potential VOC Source	Location of Source	Removed at least 24 hours prior to sampling (Yes/No/NA)
Paints		
Gas-powered equipment		
Gasoline storage cans		
Cleaning solvents (thinner)		
Air fresheners		
Oven cleaners		
Carpet / Upholstery cleaners		
Hairspray		
Nail polish / Polish remover		
Bathroom cleaner		
Appliance cleaner		
Furniture / Floor polish		
Mothballs		
Fuel tank		
Woodstove		
Fireplace		
Perfume / Colognes		
Hobby supplies (e.g., solvents, paints, lacquers, glues, photographic darkroom chemicals)		
Scented trees, wreaths, potpourri, etc.		

Potential VOC Source	Location of Source	Removed at least 24 hours prior to sampling (Yes/No/NA)
Polish / Wax		
Insecticide / Pesticide		
Kerosene		
Other		

G. BUILDING USE:
Provides miscellaneous information about human activities and building construction that may assist in the data interpretation and identification of indoor and outdoor contaminant sources.

Is there standing water in the building (historic or current)? ☐ Yes ☐ No

Is there water damage in the building (historic or current)? ☐ Yes ☐ No

Is there fire damage to the building? ☐ Yes ☐ No If yes, date___________________

Is there a septic system? ☐ Yes ☐ No If yes, date of system___________________________

Do one or more smokers occupy this building on a regular basis? ☐ Yes ☐ No

Has anybody smoked in the building in the last 48 hours? ☐ Yes ☐ No

Does the building have an attached garage? ☐ Yes ☐ No
If so, is a car usually parked in the garage? ☐ Yes ☐ No

Do the occupants of the building frequently have their clothes dry-cleaned? ☐ Yes ☐ No

Was recent remodeling or painting done in the building? ☐ Yes ☐ No
Date: _________________ Location: _________________ Activity:
____

Are there any pressed wood products in the building (e.g., hardwood, plywood, wall paneling, particleboard, fiberboard)? ☐ Yes ☐ No

Are there new furniture, upholstery, drapes, or other textiles in the building? ☐ Yes ☐ No
Date: _________________ Location: _________________ Item(s):
____

Has the building been treated with any insecticides/pesticides? ☐ Yes ☐ No
Chemicals used and how often they are applied?_______________________________________

____

Do any of the occupants apply pesticides/herbicides in the yard or garden? ☐ Yes ☐ No

If yes, what chemicals are used and how often are they applied?_______________________

____

Type of ground cover (e.g., grass, pavement, etc.) outside the building: ________________________

Is there a well on the property? ☐ Yes ☐ No

If yes, what is it used for and where is it screened? _______________________________

Is there any other information about the structural features of this building, the habits of its occupants or potential sources of constituent contaminants to the indoor air that may be of importance in facilitating the evaluation of the indoor air quality of the building?

____

____

____

H. OTHER POTENTIAL SOURCES OF INDOOR OR OUTDOOR AIR CONTAMINATION

Helps identify typical sources of background indoor air contamination that may be found in the building or outside the building, and includes a table to document the results of portable field screening measurements. A portable photo-ionization detector (PID) can be used to identify individual cans of solvents that should be removed prior to the sampling event or to identify VI points and help with on-site decisions regarding sample placement.

Outdoor Sources of Contamination (check all that apply):

☐ Garbage Dumpsters ☐ Heavy Motor Traffic
☐ Loading Dock In Use ☐ Construction Activities
☐ Airport Flight Path ☐ Railyard / Railcar Traffic
☐ Nearby Industries, specify ____
☐ UST/AST (gasoline / heating fuel / other, specify ______________________)

Is there a known spill or release outside or inside the building? ☐ Yes ☐ No

If yes, was it:

☐ Oil ☐ Natural Gas
☐ Kerosene ☐ Heating Oil
☐ Used Vehicle Oil ☐ Solvents
☐ Pesticide / Insecticide ☐ Other, describe__________________________

Describe any additional information about the release (amount, when it occurred, action taken to clean up, etc):

____

____

____

I. Building Screening Results (PID/FID/CGI)

Location	FID (ppm)	PID (ppm)	CGI (%)
Basement			
First Floor			
Second Floor			
Other			

PID – photo-ionization detector; FID – flame ionization detector; CGI – combustible gas indicator.

Instructions for Occupants of Building Prior to Sampling Event
(to be followed starting at least 24 hours prior to and during the sampling event)

- Operate furnace and whole house air-conditioner as appropriate for current weather conditions.
- Do not keep doors open.
- Do not use air fresheners or odor eliminators.
- Do not smoke in the house.
- Do not use wood stoves, fireplace or auxiliary heating equipment (e.g., kerosene heater).
- Do not use paints or varnishes.
- Do not use cleaning products (e.g., bathroom cleaners, furniture polish, appliance cleaners, all-purpose cleaners, floor cleaners).
- Do not use cosmetics, including hair spray, nail polish, nail polish remover, perfume, etc.
- Do not partake in indoor hobbies that use solvents.
- Do not apply pesticides.
- Do not store containers of gasoline, oil, petroleum-based or other solvents, within the house or attached garage (except for fuel oil tanks).
- Do not operate or store automobiles in an attached garage.

Chain of Custody

AECOM
675 N. Washington Street
Alexandria, Virginia 22314
Phone No. (703) 549-8728; Fax No. (703) 549-9134

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Laboratory	Project Name	Analysis	Chain of Custody No.
Test America Burlington	[60146397]		**20012** Batch Apr10
Address: **30 Community Drive**	Point of Contact / Phone No.: devon.chicoine@aecom.com		
City: **South Burlington**; State: **VT**; Zip: **05403**	Site Contact / Phone No.: elizabeth.larsen@aecom.com		

ERPIMS Information			Other Sample Information									Analysis					
LOCID	SA Code	Samp No	Sample I.D.	Date	Time Start	Time Stop	Vacuum Start	Vacuum Stop	Matrix	Flow Controller ID	Canister ID	TO15					Comment

Relinquished By / Company	Date	Time	Received By / Company	Date	Time
1. Relinquished By / Company	Date	Time	1. Received By / Company	Date	Time
2. Relinquished By / Company	Date	Time	2. Received By / Company	Date	Time
3. Relinquished By / Company	Date	Time	3. Received By / Company	Date	Time
4. Relinquished By / Company	Date	Time	4. Received By / Company	Date	Time
5. Relinquished By / Company	Date	Time	5. Received By / Company	Date	Time

Comments

DISTRIBUTION: WHITE - Stays with sample; CANARY - Returned to Client with Report; PINK - Field Copy

LEAK TESTING

Date	Time	LocID	Ambient PID	Ambient He
He in Containment Dome		Length of Probe + Tubing	Amount Purged	He from Probe after Purge
Comments				

Date	Time	LocID	Ambient PID	Ambient He
He in Containment Dome		Length of Probe + Tubing	Amount Purged	He from Probe after Purge
Comments				

Date	Time	LocID	Ambient PID	Ambient He
He in Containment Dome		Length of Probe + Tubing	Amount Purged	He from Probe after Purge
Comments				

Date	Time	LocID	Ambient PID	Ambient He
He in Containment Dome		Length of Probe + Tubing	Amount Purged	He from Probe after Purge
Comments				

Date	Time	LocID	Ambient PID	Ambient He
He in Containment Dome		Length of Probe + Tubing	Amount Purged	He from Probe after Purge
Comments				

Date	Time	LocID	Ambient PID	Ambient He
He in Containment Dome		Length of Probe + Tubing	Amount Purged	He from Probe after Purge
Comments				

Length (foot)	Volume for 1/4" ID (mL/ft)	Purge Vol (mL)
1	9.65	9.65
2	9.65	19.3
3	9.65	28.95
4	9.65	38.6
5	9.65	48.25
6	9.65	57.9
7	9.65	67.55
8	9.65	77.2
9	9.65	86.85
10	9.65	96.5

Notes:

AECOM

675 N Washington St #300
Alexandria, Virginia 22314
T 703 549-8728   F 703 549-9134

Project ______________________________ **Project Number** _______________	Sample Location:
Recorded By:	SampleID:
Date:	Sub-Slab Vapor Purge PID Reading:
Time:	Ambient PID:
Sub-Slab Sample	**Indoor Air Sample**
Regulator ID:	Regulator ID:
Canister ID:	Canister ID:
Tubing Length:	Tubing Length:
Purge Volume:	Purge Volume:
Sample Start Time:	Sample Start Time:
Initial Vacuum Guage Reading:	Initial Vacuum Guage Reading:
Sample Check Time:	Sample Check Time:
Intermediate Vacuum Guage Reading:	Intermediate Vacuum Guage Reading:
Sample End Time:	Sample End Time:
Final Vacuum Guage Reading:	Final Vacuum Guage Reading:

Notes

EQUIPMENT CALIBRATION DAILY LOG

Date:	Project Name:
Project Number:	Recorded By:

PID	Model:		Bulb:		Morning Calibration	Evening Check	Additional Calib./Check (if necessary)
	Equipment ID #:						
	Parameter	Standard	Exp. Date	Lot #	Time:	Time:	Time:
First Point Calibration	Vapor conc. (ppm)	0.0 (ambient air)	NA	NA	Initials:	Value:	
Second Point Calibration	Vapor conc. (ppm)	(isobutylene)			Initials:	Value:	

COMB. GAS/O_2 METER	Model:				Morning Calibration	Evening Check	Additional Calib./Check (if necessary)
	Equipment ID #:						
	Parameter	Standard	Exp. Date	Lot #	Time:	Time:	Time:
First Point Calibration	O2 (%)				Initials:	Value:	
	% LEL Pentane				Initials:	Value:	

WATER QUALITY METER	Model:				Morning Calibration/Check	Evening Check (one point only)	Additional Calib./Check (if necessary)
	Equipment ID #:						
	Parameter	Standard	Exp. Date	Lot #	Time:	Time:	Time:
First Point Calibration (Auto)	pH	4.00			Initials:	Value:	
	Conductivity (mS/cm)	4.49				Value:	
	Turbidity (NTU)	0				Value:	
	DO (mg/L)	8.9-9.1 (ambient air)	NA	NA		Value:	
Second Piont Calibration	pH	6.86			Initials:	Value:	
	Conductivity (mS/cm)	53.7				Value:	
	Turbidity (NTU)	100				Value:	
Third Piont Calibration	pH	9.18			Value:	Value:	
	Conductivity (mS/cm)	53.7			Value:	Value:	
	Turbidity (NTU)	100			Value:	Value:	

Additional Remarks:

____

____

____

____

____