



Environmental Strategy & Engineering

**PROJECT TECHNICAL MEMORANDUM
ENVIRONMENTAL REVIEW
528 BOSTON POST ROAD
SUDBURY, MASSACHUSETTS**

DATE: June 8, 2016

TO: William Murphy, Sudbury Health Department
Jody Kablack, Planning and Community Development Department

FROM: Michael J. Webster, P.G., L.S.P.

RE: Focused Environmental Review
Proposed Redevelopment of Raytheon Facility/Property
528 Boston Post Road

OVERVIEW OF REVIEW

GeoInsight, Inc. (GeoInsight) was retained by the Town of Sudbury (the Town) to conduct a focused review of environmental reports and conditions associated with the two contiguous properties located at 526 and 528 Boston Post Road in Sudbury, Massachusetts (the Property). The Property is approximately 50 acres in size and has been owned and occupied by the Raytheon Company (Raytheon) since 1958. Buildings located at the Property were primarily used by Raytheon for offices. Extensive research and development of microwave and radar components and manufacturing for prototype development was also performed at the Property. Chemical use reportedly included chlorinated solvents, plating chemicals, and petroleum compounds.

The Property is currently proposed for redevelopment as Meadow Walk, a mixed-use retail and residential development. The proposed redevelopment will include demolition of most of the existing buildings and construction of a mix of village-style commercial/retail space, residential apartment units, age-restricted condominium units, and senior assisted-living units. During redevelopment, the existing storm water and waste water management systems will reportedly be upgraded/improved. Meadow Walk is a private redevelopment, and is currently undergoing review by Town municipal agencies/departments. It is GeoInsight's understanding that the redevelopment project is being proposed and coordinated by National Development.

GEOINSIGHT SCOPE OF WORK

Raytheon conducted operations at the Property over a 50-year time frame. During this period, there were several releases of oil and hazardous material that were reported to the Massachusetts Department of Environmental Protection (MADEP). Two of the releases were assigned a Release

GeoInsight, Inc.
186 Granite Street, 3rd Floor, Suite A
Manchester, NH 03101-2643
Tel (603) 314-0820
Fax (603) 314-0821
www.geoinsightinc.com

GeoInsight, Inc.
One Monarch Drive, Suite 201
Littleton, MA 01460-1440
Tel (978) 679-1600
Fax (978) 679-1601
www.geoinsightinc.com

GeoInsight, Inc.
200 Court Street, 2nd Floor
Middletown, CT 06457-3341
Tel (860) 894-1022
Fax (860) 894-1023
www.geoinsightinc.com



Tracking Number (RTN) by MADEP, and subsequent activities were reportedly conducted to address characterization and remediation requirements under the Massachusetts Contingency Plan (MCP).

GeoInsight conducted a third-party review of the available environmental reports and documents associated with the Property. Our review focused upon:

- identifying the primary environmental conditions associated with the Property;
- evaluating the reasonableness and completeness of environmental characterization and remediation work completed at the Property to date, including an evaluation of significant data gaps; and
- identifying possible considerations associated with the environmental conditions of the Property and the proposed redevelopment activities.

Tasks completed during our review included a visit to observe current conditions at the Property and in the surrounding vicinity, focused review of historical environmental reports for the Property and nearby properties, review of information provided by the Town of Sudbury, and preparation of this summary memorandum.

OVERVIEW OF THE PROPERTY

The Property is an approximately rectangular 50 acres of land located on the north side of the Boston Post Road (Route 20). The short axis of the Property, which coincides with the Boston Post Road, is oriented approximately east-west. The southern half of the Property is currently occupied by two larger buildings. The eastern of the two buildings that occupy the south portion of the Property consist of Buildings No.1 and No.5, which are joined at their northern and southern walls, respectively. The westerly building consists of Buildings No.2, No.3, and No.4, which are also contiguous.

The northeast portion of the Property is occupied by asphalt-paved parking areas, a stormwater retention basin, a wastewater treatment plant (WWTP) and three wastewater leaching beds. The northwest portion of the Property is occupied by asphalt-paved parking lots, the former Boresite Building, a concrete testing tower, and a group of high-bay outbuildings referred to as the Test Area, which was reportedly used to test microwave and radar equipment.

The Property was owned and operated by Raytheon from 1958 to 2015. Prior to 1958, the Property was part of an HP Hood dairy farm. Building No.1 was constructed in the late 1950s. Building No.1 was apparently an expansion of a smaller facility referred to as the Environmental Testing Laboratory (ETL). The building was initially used for engineering and design. A machine shop was added in the 1960s and was expanded over time into an assembly area that occupied the north end of the building. Historically, a chemical storage shed was located outside the north end of Building No.1, near the north wall of current Building No.5.



An initial WWTP was originally located north of Building No.1, within the footprint of current Building No.5. The WWTP reportedly consisted of a small building, subsurface concrete vaults, and two sludge treatment beds.

The Boresite Building was constructed on the northwest portion of the Property in the late 1950s. The building was used for vehicle maintenance, light manufacturing, and storage and was served by a separate septic system located just north of the building.

Buildings No.2 and No.3 were constructed on the southwest portion of the Property in the 1960s. The buildings were connected to the initial WWTP located north of Building No.1. A portion of Building No.2 was used as a plated wire laboratory. Building No.3 was reportedly used for office space. Building No.4 was constructed in the 1970s and was primarily used for office space. At that time, a new (current) WWTP and associated leaching beds were constructed in the north portion of the Property. Building No.5 was constructed between 1984 and 1985. The building was constructed over the areas that had been the location of the initial WWTP and chemical storage area.

MASSACHUSETTS CONTINGENCY PLAN ACTIVITIES

There have been three reported releases of oil and hazardous material at the Property. Two of the releases were localized and involved petroleum products. The third release was associated with the detection of chlorinated volatile organic compounds (CVOCs) in groundwater, which is the focus of this technical memorandum.

1987 Heating Oil Release

In 1987 approximately 35 gallons of heating oil were released when an underground storage tank (UST) located near the former Boresite Building was overfilled. Subsequent remedial activities included the excavation of impacted soil to a depth of approximately 4 feet below ground surface (BGS) and the off-Property disposal of seven 55-gallon containers and 14 cubic yards of petroleum-impacted soil. Based upon a review of MADEP records, it does not appear that this release was assigned an RTN.

The 2,000-gallon heating oil UST was subsequently removed, and the building's heat source was switched to natural gas. After the UST was removed, approximately 70 cubic yards of petroleum-impacted soil was excavated and disposed off Property. The results of confirmatory soil sampling indicated that low concentrations of petroleum (124 to 330 parts per million [ppm]) remained in soils beneath and adjacent to the concrete deadman that was located at a depth of approximately 9 feet BGS in the former location of the tank. Petroleum hydrocarbons and VOCs were not detected in samples of groundwater collected from two monitoring wells that were installed in the vicinity of the former UST. MADEP personnel reportedly reviewed the sampling results, concurred that sufficient remedial actions had been completed, and concluded that the release did not need an RTN.



Release Tracking Number (RTN) 3-17106: Hydraulic Oil Spill

In 1998, approximately 15 to 20 gallons of hydraulic oil were released to a gravel and asphalt paved parking area when an aerial crane overturned to the east of Building No.1. The majority of the release was remediated using adsorbent material. Approximately 1.5 cubic yards of oil-impacted soil was excavated and disposed off-Property. The release was closed using a Class A-2 Response Action Outcome (RAO), which is a Permanent Solution under the MCP.

RTN 3-3037 and RTN 3-27243: CVOCs in Groundwater

The presence of CVOCs in groundwater at the Property was first identified in 1990 and 1991. At that time, MADEP requested groundwater characterization activities to assist with the evaluation of possible sources for CVOCs that had been detected in samples of water from the Sudbury Water District Raymond Road municipal water supply wellfield, which is located approximately 1,800 feet to the southeast of the southeast corner of the Property. Raytheon retained GZA GeoEnvironmental (GZA) to conduct the groundwater characterization activities at the Property.

Characterization Activities

Groundwater conditions at the Property have been characterized by the advancement of soil borings and installation of a network of overburden and shallow bedrock groundwater monitoring wells, multiple groundwater sampling events completed between 1990 and 2015, and the collection of groundwater hydraulic measurements. These characterization activities included:

- the installation of 28 shallow, 4 intermediate, 4 deep overburden/till, and 3 till/shallow bedrock monitoring wells;
- conducting 5 groundwater sampling and hydraulic gauging events;
- submitting groundwater samples for laboratory analyses, including analyses for VOCs, CVOCs, priority pollutant metals, and acid/base neutral extractable organics;
- collecting and analyzing soil samples for CVOCs from possible source areas;
- conducting a soil gas survey near Building No.5; and
- advancing five continuous vertical groundwater profiling borings in the northeast portion of the Property.



Summary of Groundwater Conditions

The results of historical characterization activities provided the following information regarding environmental conditions at the Property:

- soils at the Property consist of a thin layer of granular fill over stratified sand and silt, which is underlain by a thin layer of glacial till and then bedrock;
- depth to bedrock at the Property is variable and the bedrock surface appears to be undulatory; bedrock is at or near the ground surface beneath the west end of Building No.5, and was encountered at a depth of 108 feet along the northeast Property boundary;
- depth to groundwater at the Property typically ranges from 4 to 12 feet BGS;
- the direction of groundwater flow in shallow overburden is to the east; and
- the direction of groundwater flow in deep overburden near the overburden/bedrock interface in the northeast portion of the Property appears to be to the east/northeast, and may be locally controlled by the topography of the bedrock surface.

GZA identified two areas of CVOC impacts to groundwater. Low concentrations of CVOCs, primarily trichloroethene (TCE), were detected in shallow groundwater immediately north and east of Building No.5. Based upon a review of groundwater hydraulic information, these areas of impacts appear to be located near and downgradient of the former wastewater treatment plant (WWTP) and chemical storage areas that were present prior to the construction of Building No.5. Historical monitoring data have documented the attenuation of these TCE impacts over time. Initially, during 1990 and 1991, TCE was detected in groundwater samples from this area at concentrations that ranged from 6.2 to 26 parts per billion (ppb). During sampling events completed in 2007 and 2008, the concentration of TCE in this portion of the Property had decreased to single digit ppb. TCE was not detected in groundwater samples from this area during sampling events performed in 2013 and 2015.

The second area of CVOC impacts to groundwater is deeper overburden groundwater near the till/bedrock interface in the northeast portion of the Property. Low to moderate concentrations of TCE are present in the area that is bounded to the north by well GZ-10D, and to the east by wells GZ-8D and GZ-202. The impacted groundwater at these well locations is located at depths that range from 60 to 95 feet BGS. The extent of these deeper TCE impacts has not been characterized in the estimated direction of groundwater flow, which is to the east. Historical monitoring data document the attenuation of these TCE impacts from 1991 to 2008. TCE concentrations appear to have stabilized in the range of 25 to 35 ppb from 2013 to 2015.

The highest concentrations of TCE within the deeper overburden impact area are located at well GZ-10D. Well GZ-10D is located to the south of the wastewater treatment leaching beds that are located near the north central border of the Property. TCE has not historically been detected in samples of shallow groundwater obtained from monitoring wells located in the vicinity of the



leaching beds. The source for TCE within this deeper overburden CVOC impact area has not been identified.

Historically, GZA did not conduct groundwater investigation activities on the adjacent property to the east because that property is also a known CVOC release site with its own documented groundwater impacts (Former Chiswick Properties, RTN 3-0020).

1,4-Dioxane

After the majority of characterization activities were completed at the Property, MADEP identified 1,4-dioxane an emerging contaminant that was observed to commonly be associated with releases of chlorinated degreasing solvents. Groundwater samples collected at the Property were not historically analyzed for 1,4-dioxane. More recent monitoring events included focused analyses for 1,4-dioxane, as summarized below:

- September 2008: groundwater samples collected by GZA from wells GZ-6SR, GZ-8DR, GZ-10D, and GZ-17 were analyzed for 1,4-dioxane using USEPA Method 8270 Selective Ion Microscopy (SIM). Groundwater associated with these four monitoring wells had historical detections of TCE. 1,4-Dioxane was not detected in the groundwater samples from these four wells. The method reporting limit for the analyses was 0.5 ppb.

In June 2014, MADEP changed the MCP GW-1 risk characterization standard for 1,4-dioxane from 3 ppb to 0.3 ppb. In March 2015, GZA contacted the laboratory that conducted the September 2008 analyses and the laboratory was able to re-quantify the 2008 results using a 0.25 ppb minimum detection limit. 1,4-Dioxane was not detected in the four September 2008 groundwater samples at concentrations above 0.25 ppb.

- March 2015: groundwater samples collected by GZA from four wells (GZ-8DR, GZ-10D, GZ-202, and GZ-203) were analyzed for 1,4-dioxane using USEPA Method 522. 1,4-Dioxane was not detected in the groundwater samples from wells GZ-6SR and GZ-8DR. The method reporting limit for the analyses was 0.2 ppb. 1,4-Dioxane was detected in the groundwater samples from wells GZ-202 (0.21 ppb) and GZ-203 (0.22 ppb).
- March 2015: groundwater samples collected by Sanborn Head from seven monitoring wells (SH-1, SH-2, GZ-102, GZ-103, GZ-108, W-1, and W-4) were analyzed for 1,4-dioxane using USEPA Method 8260C. 1,4-Dioxane was not detected in the groundwater samples from these seven wells. The method reporting limit for the analyses was 0.25 ppb.

To date, groundwater samples from well GZ-10D, the monitoring well with the highest historical concentrations of TCE, have not been analyzed for 1,4-dioxane.



GZA 2015 Sub-Slab Soil Gas Sampling Event

To evaluate the potential presence of other localized areas of CVOC impacts beneath the Property buildings, GZA conducted a soil gas study at the Property in 2015. GZA collected sub-slab samples of soil gas from 26 locations beneath the existing Property buildings. The sub-slab soil gas samples were collected from 11 locations beneath Building No.1, four locations beneath Building No.2, one location beneath Building No.3, and 10 locations beneath Building No.5. A sub-slab soil gas sample was not obtained from beneath Building No.4 because of an equipment malfunction.

TCE was detected in four of the 26 sub-slab soil gas samples. The concentrations of TCE in three samples collected near the former WWTP in Building No.5 and the former Electronic Testing Laboratory (ETL) in Building No.1 were greater than MADEP's residential sub-slab soil gas screening value. The concentrations of TCE in one of the samples collected near the former WWTP was also greater than MADEP's commercial/industrial sub-slab soil gas screening value. Other CVOCs were not detected in the sub-slab soil gas samples at concentrations above applicable MADEP residential and commercial/industrial screening values.

Freon 11 and Freon 12 were detected in 12 of the 26 sub-slab soil gas samples. The highest concentrations of these Freon compounds were detected in samples beneath the northeast portion of Building No.1 and beneath the east portion of Building No.5. MADEP has not developed sub-slab soil gas screening values for Freon 11 and Freon 12. GZA derived conservative sub-slab soil gas screening values for Freon 11 and Freon 12 using methodology outlined in available guidance. The concentrations of Freon 11 and Freon 12 detected in the sub-slab soil gas samples were below the screening values derived by GZA.

While installing two of the vapor probes beneath Building No.2, GZA field personal noted a very faint petroleum-like odor. Therefore, these sub-slab soil gas samples were also analyzed for the full list of VOCs, including petroleum compounds. Elevated concentrations of petroleum compounds were not detected in these sub-slab soil gas samples.

Status of Current Groundwater Monitoring Activities

In November 2008, Raytheon submitted a Class C RAO for groundwater conditions. The RAO concluded that a Temporary Solution had been achieved and indicated that monitored natural attenuation and periodic groundwater monitoring would be conducted. Raytheon was unable to achieve a Permanent Solution at the Property under the MCP because the area of groundwater impacts is located within the Zone II area associated with the Sudbury Water District Raymond Road municipal water supply wellfield. To achieve a permanent solution under the MCP, TCE groundwater impacts must attenuate and be reduced to concentrations below the applicable MADEP drinking water standard, which is 5 ppb.

To satisfy requirements of the MCP, Raytheon and GZA must conduct a Periodic Review of the Temporary Solution every 5 years. The last Periodic Review was completed in 2013, and the next periodic review is due by 2018.



Environmental Due Diligence Activities

In 2015, Sanborn, Head & Associates (Sanborn Head) conducted environmental due diligence activities at the Property on behalf of National Development. As part of these environmental due diligence activities, Sanborn Head completed a Phase I Environmental Site Assessment (ESA). The Phase I ESA also included a subsurface investigation. The subsurface investigation included the advancement of 7 soil borings, collection of 6 soil samples, installation of 2 shallow monitoring wells, and collecting groundwater samples from 7 monitoring wells (the two new wells, designated SH-1 and SH-2, and five existing wells GZ-102, GZ-103, GZ-108, W-1, and W-4). Sanborn Head focused their subsurface investigation activities in the western portion of the Property, in areas that had not been previously characterized by GZA, and in two areas where historical fill material was documented to be present.

The results of Sanborn Head's investigation indicated that:

- shallow soils consisted of a 1- to 3-foot thick layer of granular fill underlain by native sand. Evidence of environmental contamination, such as visual staining, noticeable odors, or elevated headspace screening measurements, were not observed while conducting the field activities;
- soil analytical results were either not detected (VOCSs, volatile petroleum hydrocarbons [VPH], and polychlorinated biphenyls [PCBs]), or were detected at concentrations below applicable MCP RCS-1 (i.e., residential setting) reportable concentrations (extractable petroleum hydrocarbons [EPH] and select metals [chromium, lead, mercury, nickel, silver]);
- groundwater was encountered at depths ranging from 3 to 5 feet bgs;
- VOCs, VPH, EPH, select metals (chromium, lead, mercury, nickel, silver), were not detected in the groundwater samples. Physiologically available cyanide (PAC) was detected in the groundwater sample from well W-4 at a concentration of 5 ppb, below the applicable MCP RCGW-1 (i.e., drinking water) reportable concentration of 30 ppb.

The results of the Sanborn Head subsurface investigations were consistent with historical environmental information obtained at the Property.

Data Gaps/Unknowns

Based upon the results of our focused environmental review, GeoInsight identified the following data gaps with regard to environmental characterization of the Property. We focused our identification of data gaps on those that could potentially be a consideration regarding the scope of the proposed redevelopment activities.

- The source(s) for CVOCs detected in deep overburden in the northeast portion of the Property has not been identified. Investigation activities completed to date have not identified a known CVOC release area, significantly elevated concentrations of CVOCs



in groundwater that would suggest a release/source area, or sampling results that suggest the presence of separate phase solvent. The concentrations of CVOCs currently appear to be stable at levels that are 5 to 7 times higher than the applicable standard.

- Groundwater quality information has not been obtained in locations beneath Building No.5 that were historically occupied by WWTP infrastructure. The area near the former WWTP is characterized by shallow bedrock. The area near the former WWTP was also used for chemical storage. These areas are located hydraulically upgradient of the monitoring wells where CVOCs were historically detected in shallow groundwater. The area near the former WWTP may be the source area for the observed shallow groundwater impacts. In addition, the results of sub-slab soil gas sampling suggest that localized areas of CVOC impacts may be present in soil located beneath Building No.5 near the former WWTP.
- The extent of deep overburden CVOC impacts in groundwater have not been characterized off-Property to the east. This data gap does not have direct implications with regard to the proposed re-use of the Property and/or construction activities.
- Soil conditions have not been characterized near the former WWTP and chemical storage areas that were covered when Building No.5 was constructed, or beneath/near portions of the buildings where chemicals were used (such as the former plated wire laboratory, chemical receiving and storage area, former ETL, and former assembly and laboratory area). Localized areas of soil impacts may be present in these areas, and along historical drainage and WWTP lines.
- Soils have not been characterized near the separate septic system that services the former Boresite Building.
- Historical characterization activities did not include evaluation of deeper overburden groundwater quality on west and northwest portions of the Property, including the area near the former Boresite Building septic system.

CURRENT ENVIRONMENTAL CONDITIONS CONSIDERATIONS FOR PROPERTY REDEVELOPMENT

Soil:

Known historical releases/spills of oil and/or hazardous materials to soil were characterized and addressed, if necessary, by excavation and off-property disposal/treatment. Low-level petroleum impacts to soil were known to exist in the vicinity of the UST area that was excavated and removed from the former Boresite Building in 1990. Residually-impacted soils may be located in the general vicinity of the former UST. These residual soil impacts appear to be localized and are not widespread, and can be readily addressed during redevelopment activities.

CVOCs, metals, and petroleum were not detected during the limited soil sampling and characterization activities and environmental due diligence activities completed at the Property.



Because of active operations, characterization activities have not been performed to evaluate conditions beneath the existing buildings. The existing buildings, including concrete foundations and floors, are scheduled to be demolished and removed.

Building demolition, including foundations and floors, is routinely performed during redevelopment of former commercial/industrial properties. Areas where chemicals were used within the existing buildings have been documented. Construction management plans routinely include contingencies for managing and addressing possible environmental conditions that are encountered while conducting demolition activities. In addition, redevelopment projects of this scope also typically include soil management plans that describe how field activities will be monitored for the presence of environmental conditions, and how environmental conditions will be addressed if encountered. Preliminary plans developed by Sanborn Head associated with the proposed redevelopment of the Property indicate that these types of conditions will be monitored for and addressed, if encountered. Based upon information reviewed to date, there is no indication that conditions exist beneath the Property building that could not readily be addressed using the proposed approach.

Groundwater:

CVOCs were not detected in samples of groundwater obtained from shallow overburden monitoring wells during the most recent sampling events that were conducted at the Property, including the sampling events completed by GZA in March 2015 and SHA in June 2015. These results are consistent with historical monitoring data that indicated that low concentrations of CVOCs that were historically detected in shallow groundwater north and east of Building No.5 exhibited decreasing trends and had attenuated over time.

CVOCs were detected in samples of groundwater obtained from deep overburden monitoring wells located in the north portion (GZ-10D) and along the northeast border (GZ-202) of the Property. CVOCs in these two wells primarily consist of TCE, and the relative concentrations of TCE appear to have remained stable since 2008 (average concentrations of 35 ppb in well GZ-10D and 24 ppb in well GZ-202).

The primary exposure routes for contact with groundwater include ingestion, dermal contact, and inhalation. The Property is served by municipal water; as such, potential future occupants of the Property will not be exposed to Property groundwater via ingestion. The primary dermal contact with groundwater is to utility and construction workers. As further described below in the indoor air section, there may be localized areas of CVOC-impacted groundwater located beneath the existing Property buildings. Monitoring for, and addressing localized areas of groundwater contamination, is routine within the construction, utility, and redevelopment trades. Methods are available to protect construction/utility workers from impacted groundwater during redevelopment and utility work at the Property.

Another potential exposure route associated with impacted groundwater would be the future use of an irrigation well at the Property. Untreated irrigation wells should not be installed in the deeper overburden in the northeast portion of the Property. Groundwater impacts have not been detected on the western (and upgradient) portion of the Property. It is possible that an irrigation



well could be placed in a location on the west portion of the Property and would not encounter CVOC-impacted groundwater. As part of the local permitting process, water quality information is typically obtained when a proposed irrigation well is installed. It is GeoInsight's understanding that National Development plans to test the water quality of irrigation wells that are proposed for the Property, and that these tests will include CVOCs. As part of the evaluation of the possible use of on-site irrigation wells, GeoInsight notes that the concentrations of CVOCs that have historically been detected at the Property can be readily treated/removed from the water using standard and off-the-shelf technologies (such as liquid-phase carbon).

Indoor Air:

With the exception of the localized detection of Freon 11/Freon 12, CVOCs were not detected in samples of groundwater obtained from shallow overburden monitoring wells during the most recent monitoring events completed at the Property. Shallow groundwater is the typical source for vapor intrusion. Current monitoring data indicate that shallow groundwater does not represent a potential vapor intrusion threat with regard to the construction of buildings at the Property.

Shallow groundwater conditions beneath the portions of the Property that are currently occupied by buildings has not been directly characterized. Shallow groundwater conditions beneath the buildings have historically been indirectly characterized using shallow monitoring wells located adjacent to the downgradient sides of the buildings. If there was a significant release of CVOCs to groundwater beneath the buildings, the impacts would typically be observed in shallow groundwater just downgradient of the buildings. It was this network of shallow monitoring wells that identified Freon in shallow groundwater downgradient of Building No.2, and CVOCs downgradient of Building No.5 and the north end of Building No.1. As discussed above, the shallow CVOC impacts have attenuated over time and are no longer present. The Freon 11/Freon 12 impacts are localized and appear to be attenuating over time.

The soil gas survey conducted by GZA in March 2015 detected CVOCs in soil gas beneath the buildings at concentrations greater than MADEP residential screening guidelines in two locations; near the former WWTP and chemical storage area beneath Building No.5, and beneath the former ETL in Building No.1. The detected concentrations were low (within one order of magnitude of the screening guideline) and were localized (CVOCs were not detected at other soil gas sampling locations in the vicinity). These soil gas data suggest localized areas of low impacts of CVOCs to soil and/or shallow groundwater may be present beneath Building No.1 near the former ETL and beneath Building No.5 near the former WWTP and chemical storage area.

Localized areas of soil and/or shallow groundwater impacts may be encountered when the buildings are removed. Encountering such material is routine when conducting redevelopment activities at former commercial/industrial properties, and there are standard methods for addressing the soil/groundwater during construction activities. In addition, there are best management practices that can be used when designing and constructing new buildings to eliminate and control the potential vapor intrusion pathway. It is GeoInsight's understanding that Sanborn Head has developed plans for engineering best practices and methods that could be



used in the design of the new buildings to address potential vapor intrusion concerns, if conditions are encountered during Property development that indicate that such measures would be prudent or are necessary. These engineering methods, such as the use of vapor barriers and sub-slab depressurization systems, are routinely used in similar redevelopment and construction projects, and are effective at eliminating the potential exposure pathway.

Possible Impacts to Groundwater Conditions Associated with Redevelopment Activities:

Redevelopment of the Property is estimated to approximately double the daily discharge of treated wastewater to the leaching beds located at the north central portion of the Property. These beds have been operational since the facility was constructed in 1958. Questions have been raised regarding the possible impacts of the increased discharge of treated wastewater to the filter beds and to the known CVOC groundwater conditions at the Property.

On June 6, 2015, GeoInsight received a technical report prepared by Sanborn Head that summarizes the results of their evaluation of potential impacts to the groundwater conditions and the Raymond Road wellfield. GeoInsight was not able to complete a review of this report prior to completing this memorandum. GeoInsight will review the Sanborn Head report and provide comments/observations in a follow-up memorandum.

Based upon information reviewed to date, it is GeoInsight's opinion that the increased discharge to the leaching beds at the Property is not likely to have a significant deleterious impact on the known groundwater impacts associated with the Property. Relevant information that we used to support our opinion includes the following:

- increased flow of water through areas of residual CVOC impacts will promote the flushing and attenuation of impacts over time;
- shallow groundwater conditions near Building No.5 have attenuated and no longer appear to be present; as such, the area of interest with regard to this concern is deeper overburden groundwater in the northeast portion of the Property;
- the additional water discharge will occur at the same location of the historical discharge; consequently, hydraulic conditions associated with the increased discharge would not be expected to significantly deflect or alter the average direction of groundwater flow in the areas where impacts are known to be present;
- soil near the leaching beds and the northeast portion of the Property consist of a layered sequence of fine sand and silt that are considered to be glacial lakebed deposits; vertical flow of groundwater is not expected to be significant through these layered soils; much of the increased discharge of groundwater will likely be accommodated within the upper soil layers; as such, the increased discharge is not expected to significantly change hydraulic conditions in the deeper overburden;
- the leaching beds happen to be located upgradient of the deeper groundwater impacts at the Property, and known groundwater impacts between the Property and the Raymond



Road wellfield; increased discharge to the leaching beds may slightly increase the rate of groundwater flow in the areas downgradient of the beds; in essence, increased discharge to the leaching beds may slightly push existing impacts located between the Property and the Raymond Road wellfield; at the same time, the increased flow of water will flush and attenuate the existing impacts; and

- the Sudbury Water District currently treats water from the Raymond Road wellfield supply well that is located most downgradient of the Property (well No. 2) to remove CVOCs (via air stripper), and has connected the second closest well (well No. 9) to the air stripper (so that water from that well can be treated, if needed); if additional CVOCs are mobilized by the increased discharge associated with the Property redevelopment, there is infrastructure in place to address impacts if they migrate as far as the wellfield.

BUILDING MATERIALS ASSESSMENT

It is GeoInsight's understanding that the proposed redevelopment activities will include the demolition and removal of most of the existing buildings at the Property. Based upon current plans, the wastewater treatment plant and former Bore-site buildings will remain at the Property. The demolition activities will be conducted in several phases, starting with the structure that comprises Buildings No.2/3/4. The existing wastewater and storm water systems will reportedly be updated to accommodate the new Property use.

Summary of Building Material Sampling Completed to Date

National Development retained TRC Environmental (TRC) to assist with Property building condition assessments and pre-characterization of building materials. It is GeoInsight's understanding that National Development plans to retain TRC to provide hazardous building material assessment and oversight during pre-demolition abatement and demolition.

TRC has conducted several building material assessment surveys at the Property. A general overview of these surveys include the following:

- sampling of building materials focused upon current anticipated hazardous materials commonly associated with buildings of this age and the proposed demolition activities;
- testing was conducted for asbestos, lead paint, PCBs, and asbestos in caulking and mastics;
- bulk samples of suspect asbestos-containing materials (ACM) and PCBs were collected from representative and accessible interior, exterior, and roof areas; possible lead-based paint was evaluated using field screening methods;
- destructive sampling was not conducted in portions of the buildings that were occupied by active Raytheon operations;



- several hundred building material samples were collected (in triplicate for suspect ACM) and analyzed during the surveys;
- in addition to suspect materials tested, the survey identified other building components that would require special management during demolition, including electrical switchgears and transformers, chillers, air handling units, refrigerants, condensers/blowers, generators, compressors, gas cylinders and condensate tanks, fluorescent lamps and ballasts, mercury switches, thermometers/thermostats, fire extinguishers, and batteries;
- suspect ACM that were confirmed to contain asbestos include flooring, duct sealants, caulks and glazing compounds, roof materials, joint compound, cement-board, stick pin adhesives, insulation, and damp-proofing on foundations;
- screening of over 200 surfaces of gypsum, metal and concrete identified the positive presence of lead in paint of multiple metals surfaces; lead screening did not detect lead on gypsum and concrete surfaces;
- PCB at concentrations greater than 50 parts per million (ppm) were detected in interior and exterior window glazing compounds in Building No.2; testing indicated that the PCBs had not leached into surrounding masonry substrates.

Areas Not Tested

Based upon a review of available information, some areas of the Property were not evaluated or only received limited attention based upon current use at the time the surveys were completed. Some of these areas included:

- some floor layers and concrete floor that were covered by carpeting and/or office equipment;
- materials located behind some walls or internal renovation/built-out areas;
- limited testing was performed in the Beltran Building area; and
- PCB testing was not conducted in Building No.5 because it was constructed after 1985.

Based upon information provided by TRC and National Development, it is GeoInsight's understanding that these areas will be re-surveyed in the future prior to demolition after the current tenants have vacated the spaces. Information obtained from the additional surveys will reportedly be incorporated into the pre-demolition building materials abatement plans. The proposed approach is consistent with how these activities are conducted at other commercial/industrial demolition and redevelopment projects.



Based upon the information reviewed, TRC did not perform focused building material characterization activities in the limited portions of the buildings that were historically used as process areas, such as the former plating area in Building No.2, and the former ETL, chemical storage areas, and former assembly areas in Building No.1. Possible impacts to building materials and/or soil beneath the concrete floor may be encountered when demolition activities are conducted in these portions of the buildings. It is GeoInsight's understanding that Sanborn Head will develop a contingency plan and coordinate with the demolition contractor to address any such conditions that are encountered while conducting abatement and demolition work.

Overview of National Development Abatement Plans

In a letter dated April 8, 2016, TRC summarized the general scope of the building materials assessment activities that had been completed to date at the Property. The letter also described the proposed approach for addressing hazardous building materials during the building demolition and Property redevelopment activities. The handling/removal of hazardous building materials will be performed using methods that will not create a condition of air pollution or unacceptable exposures to the public or the environment. TRC expects that standard engineering controls and operating procedures, such as the use of airtight barriers or negative pressure containments, will be employed during much of the abatement work. Hazardous building and waste materials removed during abatement activities will be categorized (and tested, as needed), and properly containerized before being removed from the Property. The materials will be transported and disposed at applicable/appropriate permitted disposal facilities.

TRC and National Development indicate that hazardous building material abatement work will be conducted by licensed abatement contractors using properly trained and certified workers. TRC will provide a certified Project Manager to monitor that the abatement work is conducted according to regulations, work plans (to be approved by TRC), and applicable regulations. TRC will also prepare a final report that will compile all pertinent abatement records into one document.

Information were not reviewed or identified that would indicate that building material conditions at the Property are atypical or unusual. The types, ages, and features of the construction materials that comprise the buildings that are proposed for demolition at the Property are similar to conditions that are routinely encountered at other project sites in this region. The pre-demolition surveys performed by TRC were similar in scope to hazardous building material surveys routinely performed at other similar-sized demolition projects. Pre-demolition abatement of hazardous building materials must be performed by licensed contractors who are familiar with such settings and for whom use of control methodologies to limit potential exposure is routine. The approach that has been developed by National Development, TRC, and Sanborn Head to conduct pre-demolition abatement of hazardous buildings materials and subsequent building demolition appear to be appropriate and are consistent with general industry practices.