City of Vancouver  
Projects Branch, Engineering Services  
453 West 12th Avenue  
Vancouver, BC  
V5Y 1V4  

Attention: Mr. Mark Schwark, P.Eng.

RE: GUIDANCE FOR SOIL GAS MANAGEMENT SYSTEM  
PROPOSED CITY OF VANCOUVER BY-LAW IMPOUND LOT  
425 INDUSTRIAL AVENUE, VANCOUVER, BC

Dear Mr. Schwark:

Further to our meeting with Stantec Architecture Ltd. (“Stantec”) representatives on April 24, 2007, and your email of August 28, 2007, Golder Associates Ltd. (“Golder”) is pleased to provide design recommendations for a soil gas mitigation system for the building development proposed at a property owned by the City of Vancouver (“CoV”) located at 425 Industrial Avenue in Vancouver, BC (hereafter referred to as the “Site”).

The Golder scope of work for this project is conceptual design layout of the components of the mitigation system (e.g., vent pipes, risers, geomembrane, etc.), preliminary design specifications for subsurface components of the venting system, and preliminary design drawings. The work scope herein does not include detailed design of the mitigation system, specification of above-grade piping system and mechanical design, or the completion of technical specifications and drawings for construction purposes.
1.0 PROPERTY DESCRIPTION AND PROPOSED DEVELOPMENT

1.1 General Description

We understand that the Site is located on the north side of Industrial Avenue in the False Creek Flats area of Vancouver, BC. The Site is understood to be relatively flat, is currently undeveloped and used for general equipment and vehicle storage, and was formerly part of the Canadian National (“CN”) rail lands. The Site is 0.665 hectares in area and is legally described as a Statutory Right of Way Plan of Lot B of Lot H, District Lot 2037, Group 1, New Westminster District, Plan LMP49701.

The following Site construction drawings prepared by Stantec were referenced by Golder in preparation of this letter report:

- A100 Revision A: Site / Location Plan (August 31, 2007);
- A300 Revision A: North, East, West & South Elevations (August 31, 2007);
- A400 Revision A: Building Section (August 31, 2007);
- C001 Revision 0: Site Grading Plan (January 21, 2008);
- C002 Revision 0: Site Servicing Plan (January 21, 2008);
- C003 Revision 0: Site Servicing Details (January 21, 2008);
- M002 Revision 0: Underground / Underslab Plumbing Plan (July 17, 2007);
- S100 Revision 0: Foundation Plan (August 31, 2007); and,
- S300 Revision A: Sections – Sheet 1 (July 17, 2007).

1.2 Proposed Development

Based on the information provided to us, we understand that the proposed development for the Site is to include the following:

- The Site is intended to be developed as an impound lot (vehicle tow yard);

- The majority of the development area is to be capped with pavement (100 mm of asphalt);

- A single-storey office building (approximately 227 square metres in area) with an attached overhead canopied driveway (approximately 166 square metres in area) will be located at the southeastern corner of the Site;

- A series of open-grated catch basins and covered manholes in the open paved areas and an oil-water interceptor west of the building are to be installed in order to accommodate storm water run-off;
• The development plan does not include deep excavations on the Site, although some shallow trenching will be required for perimeter fencing and lighting, storm and sanitary sewers, water supply, fire hydrant lines, electrical lines, gas, and telephone cable lines; and,

• Limited areas of landscaping will be situated at the southern boundary of the Site on Industrial Avenue, and also possibly along Scotia Road at the western boundary.

The foundation concrete slab on grade is continuous beneath the office building and attached canopied vehicle driveway. As the office building main floor is elevated approximately 1.1 metres above the finished elevation of the top of the foundation slab, a crawlspace and void are present beneath the building. A 0.73 metre high void with area approximately 3.4 metres by 14.4 metres is located beneath the proposed front queuing area. This void is expected to be filled with a suitable granular material. The crawlspace is beneath the remainder of the building and measures approximately 14.4 metres by 11.7 metres and is 0.78 metres high. This crawlspace will remain open and is proposed to be naturally ventilated with two louvered (1.0 metre by 0.46 metre) located on the west side of the building. The front and rear facade and roof-top of the canopied vehicle driveway is continuous with the office building. The western end of the vehicle driveway remains open providing natural ventilation to this area. The sanitary lines will be naturally ventilated of sewer related gases with vertical riser vent pipes.

2.0 SUMMARY OF SITE CONDITIONS

The Site has undergone a number of environmental investigations since the early to mid 1990s conducted by Golder and by others, which were either limited to the subject Site or where the subject Site was included as part of an investigation of a larger parcel of land. The Site was originally part of the CN Main Yard, and later part of a parcel owned by Costco Wholesale and then by others. We understand that the City of Vancouver is the current owner of the Site.

The primary reports considered relevant to the interpretation of environmental conditions at the Site were:

• Golder Associates Ltd., May 1993. “Scope of Environmental Assessment and Remedial Planning, 1660-1680 Station Street Property, Vancouver”. Letter report prepared for CN Real Estate. (Golder 1993);

• Golder, May 1994. “Results of Phase 2A Environmental Site Assessment, 1660 – 1680 Station Street, Vancouver, BC”. Report prepared for CN Real Estate. (Golder 1994a);
Historically, the Site was part of a tidal marsh area of False Creek, referred to as the False Creek mud flats. This area was infilled at the turn of the 20th Century to facilitate rail development. The original shoreline was located well to the east and south of the Site, and the area was raised with up to 8.5 meters (m) of dredged and/or excavated sediments to bring the surface grade up to the present elevation.

A historical review of the Site and its vicinity indicated that the area was once occupied by a variety of industrial facilities and several areas of potential environmental concern (“APECs”) were identified. These APECs included the fill materials generally placed in the area of the Site, metal rolling mills, an autobody shop, a coal and oil company, a foundry, and part of an industrial metal plant that included an underground storage tank and paint dipping area.

Environmental site assessments, including a risk assessment, were conducted for the Site, while it was part of the larger Costco property. For the purposes of this review, the conditions of the larger Costco property were considered to be representative of the conditions at 425 Industrial Avenue. The AGRA 1998 Detailed Site Investigation (“DSI”) report, representing the latest environmental site assessment report, identified the following contamination:

- Polycyclic aromatic hydrocarbon (“PAH”) concentrations in soil exceeding the BC Contaminated Sites Regulation (“CSR”) commercial land use (“CL”) standards, at depths of about 4.5 m to 5 m below grade;

- Golder, July 1994. “Results of Phase 2B Environmental Site Assessment & Remedial Planning, Lot 1 – Corner of Station St. and Industrial Avenue, Vancouver, BC”. Report prepared for CN Real Estate. (Golder 1994b);


• Copper and chromium concentrations in soil exceeding the BC CSR CL standards in two shallow soil samples;

• Elevated hydrogen sulphide and methane gas concentrations at a limited number of monitoring wells; and,

• Ammonia, metals and PAH concentrations in groundwater exceeding CSR standards for the protection of aquatic life (“AW”).

A risk assessment for the Costco property (including the Site) was subsequently conducted, and a Remediation Plan was prepared in accordance with the requirements of the CSR. These plans were approved through the issuance of an Approval-in-Principle (“AiP”) by the BC Ministry of Environment (“MoE”) in August 2000.

2.1 Summary of Historical Soil Gas Concentrations

The results of the soil gas monitoring program during the DSI (AGRA 1998a) indicated that methane was present in subsurface soils at potentially explosive levels. The explosive range for methane ranges from 5% (lower explosive limit or LEL) to 15% (upper explosive limit) in air. Methane concentrations above 15% are also potentially dangerous because of the potential for methane to be diluted by air to levels within the explosive range. The combustible gas concentrations (inferred to be methane) ranged from 12% of the LEL to greater than 100% with the highest concentration measured along the eastern boundary of the Site.

The measurable concentrations of hydrogen sulphide gas in the headspace gas samples ranged from 200 parts per million (ppm) to greater than 1000 ppm, again with the highest concentration measured at the eastern boundary of the Site. The Workers Compensation Board of BC’s (WorkSafe BC) Workers Compensation Act (WCA) regulates that a worker’s short-term exposure limit (STEL) to hydrogen sulphide is 10 ppm.

The source of the hydrogen sulphide and methane gas is suspected to be the decomposition of organic matter bacteria present in the subsurface soils. Due to the unacceptable risk associated with hydrogen sulphide from the original risk assessment (AGRA 1998c), the remediation plan stipulated a vapour management system is required for on-Site buildings. Based on the risk assessment conducted by Golder (2006), such a vapour management system is also considered warranted to address the potential risks associated with other volatile contaminants, such as vinyl chloride and naphthalene which were detected in groundwater.
2.2 Approval-in-Principle (AiP)

The AiP (for the property identified as 1660 Station Street, but which also incorporates the current 425 Industrial Avenue property) approved the Remediation Plan developed by AGRA that was documented in their Risk Assessment and Remediation Plan report (AGRA 1998c).

The essence of the remediation plan was to leave the identified contamination in place, mitigate potentially significant exposure pathways through the use of a barrier and vapour management system, and manage the contamination should it be encountered during Site re-development.

The risk management measures, as it relates to the soil vapour management system, specified in the AiP and the Remediation Plan for the Site included the following:

- **Surface Cover** – Ground surfaces should be covered either with a low-permeability material (e.g. asphalt) or, in limited landscaped areas, with at least 0.5 m of topsoil. This is intended to prevent human or terrestrial species from contact with potentially contaminated soils, and mitigate potential contamination of worms, seeds and grasses that may be foraged by receptors (i.e., song birds). Low permeability areas will also reduce surface water infiltration rates, and thereby reduce the potential for impact to aquatic receptors in False Creek.

- **Engineered Passive Venting** – Where buildings are to be constructed on the Site, a vapour management system should be installed. This should include a sub-floor passive vapour venting system, which should be designed and approved by a professional engineer.

- **Inspection and Monitoring** – Monitoring ports will be installed as part of the vapour management system. These ports will be used for visible inspection and can be used for measurement of air concentrations, pressure and air flow rates on an annual basis.

3.0 SCOPE OF WORK

The scope of work for this project is limited solely to hydrogen sulphide and methane gas issues as they relate to potential future impacts once the Site has been paved and the building is constructed, and does not include consideration of health and safety issues during construction, potential contaminated site issues, or geotechnical considerations.
The following scope of work was conducted:

- Conducted a review of the available existing data on soil vapour for methane and hydrogen sulphide gas;

- Reviewed Site and building plans provided by Stantec with respect to the potential for migration and accumulation of hydrogen sulphide/methane in utilities, such as sumps and drains, and within the building;

- Evaluated the potential for hydrogen sulphide/methane generation and accumulation in building structures and, based on this evaluation, provided recommendations on the need for or desirability of mitigation measures;

- Prepared conceptual layout for mitigation system components and preliminary design specifications for the subsurface components of the system; and,

- Prepared a letter report that describes the results of information review, evaluation of mitigation measures, and provides preliminary design recommendations.

4.0 SOIL VAPOUR MANAGEMENT SYSTEM

The design of a gas mitigation system targets the potential hazardous accumulation of gases below buildings, within subsurface utilities and other confined spaces, if present. There are several different options for gas mitigation systems including passive venting systems, active (mechanical) venting systems using pumps, and barrier systems to reduce the potential for accumulation of gases. A combination of the above mitigation methods is warranted for the Site, as described below.

A gas mitigation system consisting of a passive venting system and geomembrane barrier is recommended based on the elevated hydrogen sulphide and methane concentrations present at the Site. The recommended mitigation and management measures for gases are as follows:

- Construction of a passive soil gas venting system across the Site, including below the building foundation and asphalt paved parking areas, consisting of subsurface perforated piping within a gravel layer that is connected to vertical risers. Select vertical risers terminating at the building roof-top will be connected to wind turbines (Figure 1);

- Placement of a low permeability geomembrane below the office building foundation including sumps and pits, if present;
- Construction of utility trench dams to reduce the potential for migration of underground gases to migrate to below the buildings within the utility trench backfill;

- Post-construction monitoring of gas concentrations, prior to occupancy; and,

- Development of confined space entry procedures.

The sections below provide a conceptual design, followed by a preliminary design providing specifications for the above measures, and recommendations for post-construction monitoring and confined space entry procedures.

### 4.1 Soil Gas Collection and Ventilation System (Office Building)

A soil gas mitigation system design for the Site, presented herein, consists of a passive soil gas collection and venting system constructed below the building foundation slab. The design concept is for a network of perforated PVC pipes to be placed in a bed of gravel (drain rock) beneath the concrete foundation slab (Figure 1). Gases that enter the gravel and pipes are vented by a network of perforated collection pipes below the building slab, connected to non-perforated header pipes. The header pipes are vented via several riser pipes extending to above the roof level of the building.

A passive venting system is designed to function by making use of natural density (i.e., stack effect), pressure and diffusion gradients. To enhance venting, selected headers and risers are connected to wind turbines. It is also recommended that the venting system be designed to be provisionally active to enable possible future retro-fit through connection to roof-top blower units, if future monitoring indicated an active system is warranted. The below building vent pipe layout is designed to facilitate active venting with approximately equal number and alternating passive air entry pipes and active air exit pipes, which are connected to the wind turbines and provisionally to an active ventilation system. While suggested locations for above-grade risers are provided, the design and routing of the above-grade pipes to facilitate connection to wind turbines and provisionally to mechanical units is the responsibility of City of Vancouver’s architect and mechanical engineer.

### 4.2 Soil and Utilities Ventilation System (Parking Lot Area)

General venting of the parking would naturally occur through landscaped areas and cracks in the pavement. It is our understanding that the Site (i.e., outside of buildings) is to be paved with minimal landscaped areas and thus there is the potential for accumulation of gases below the pavement. Gases that accumulate below pavement may migrate toward the building constructed on-site or off-site in areas where pavement
extends to the edge of the property line. Thus, it is recommended that vent pipe laterals be also installed below the pavement (Figure 2). Perforated pipes should be located a minimum of 500 mm below ground surface, and as such would be relatively economical to install (no additional fill material would be required). These riser pipes would terminate at the perimeter fence line. The elevation of the top of the pipes along fences should be a minimum of 3 metres above ground surface.

Additionally, there is a significant potential for gas build up within near-surface soils and migration into subsurface utilities. Measures to vent utilities include vent pipes from utilities (e.g., covered manholes, electrical junction boxes or oil-water separator sump) that are connected to the vertical risers in the parking lot areas.

5.0 GEOMEMBRANE BELOW THE OFFICE BUILDING FOUNDATION

A low permeability PVC geomembrane with a nominal 30 mil (0.8 mm) thickness (Layfield “PVC 30” or equivalent approved by the Engineer) is recommended to be installed below the office building foundation to minimize the potential for migration of gases into the building.

The specifications for the geomembrane are as follows:

- Meet or exceed ASTM D3083, Standard Specifications for Flexible Poly (Vinyl Chloride) Plastic Sheeting for Pond, Canal, and Reservoir Lining;

- All seams shall be overlapped a minimum of 50 mm and solvent or heat bonded to be impervious, capable of passing an air lance test (ASTM D4437), and have a seam strength in peel adhesion (ASTM D413) of at least 10 lbs/inch or a film tear bond. All solvent and/or heat bonding in the field shall be conducted in accordance with manufacturer’s specifications. A minimum of two trial seams per day shall be constructed on a separate piece of geomembrane (i.e., not used below building) and then tested in the field for peel adhesion;

- The geomembrane and protective geotextile shall be continuous beneath the building and extend a minimum of two metres from the centreline of the western building wall. Only water and sewer pipes and pile caps shall penetrate the geomembrane. All other services shall enter above the geomembrane;

- All penetrations must be sealed including pipe, ducting, rebar and wire penetrations using the approved manufacturer sealant for penetrations. For pipe penetrations, a prefabricated pipe boot and mechanical connection to the pipe shall be installed (Figure 3);
- Immediately prior to placing concrete, repair all rips, punctures, holes, and tears in geomembrane in accordance with manufacturer’s recommendations. Ensure that all surfaces to be solvent bonded are thoroughly cleaned and completely dry. All patches shall have rounded corners and shall extend a minimum of 100 mm (4 inches) beyond the damaged area; and,

- A protective geotextile shall be placed directly on top of the geomembrane prior to pouring of concrete. The geotextile shall consist of a non-woven needle punched polypropylene geotextile having a minimum weight of 4 oz/sq yd (Layfield “LP-4” or equivalent approved by the Engineer).

6.0 GEOMEMBRANE LINER BELOW PITS AND SUMPS

Based on our knowledge, pits and sumps will not be constructed beneath the building. However, a provisional specification is provided herein for installation of a geomembrane below pits and sumps, if constructed below the at-grade portion of the building. A low permeability liner should be constructed below any pits and sumps below the building foundation. The liner shall consist of a supported PVC geomembrane with a nominal 30 mil (0.8 mm) thickness (Layfield “HAZGARD 250 supported” or equivalent approved by the Engineer). The installation procedure shall be as follows:

- Laying the geomembrane flat below the outline of the pit;
- Extending the geomembrane 500 mm beyond the extent of the pit;
- Constructing the concrete floor and walls of the pit;
- Placing a separate geomembrane along the walls of the pit that is mechanically anchored to the concrete, but that is capable of withstanding up to 300 mm settlement of subgrade soils around the pit; and,
- Creating a minimum 300 mm wide solvent weld to join the two geomembrane sheets at the base of the wall.

Alternatively, the geomembrane could be pre-fabricated to the dimensions of the pit/sump. The geomembrane should be installed and anchored to the concrete in accordance with the manufacturer’s recommendations. All seams should be bonded to be impervious capable of passing an air lance test (ASTM D4437), and have a seam strength to peel adhesion (ASTM D413) of at least 10 lbs/inch or a film tear bond. All other specifications provided in Section 3.1 above should be followed.
6.1 Utilities Trench Dams

Utility trench dams should be installed as a precautionary measure to reduce the potential for gases to migrate to beneath the building foundation from outside of the building through the relatively permeable trench backfill of utility lines that enter to below the building (e.g., water, sewer, plumbing, phone, electrical, cable, gas). A relatively impermeable dam or plug constructed of compacted bentonite (5%)-soil mixture, sand-cement slurry, or equivalent, should be installed in all utility trenches that are backfilled with sand or other permeable material during the installation of utility lines.

6.2 Post-construction Monitoring of Gas Concentrations

The recommended post-construction air monitoring consists of measurement of gas concentrations (hydrogen sulphide, methane, carbon dioxide and oxygen) at the following locations:

- Monitoring ports on vent pipes.
- Spot measurements of air at various locations inside the building.
- Utilities or other confined spaces where gases could accumulate (e.g., drains, sumps, manholes, as applicable).

The first monitoring round should be conducted after construction of the building are complete, but before building occupancy. Quarterly monitoring thereafter is recommended for the first year. The scope and frequency of the monitoring program should be reviewed after construction of the buildings is complete (prior to occupancy) and after the first year of monitoring has been completed.

The monitoring should also include visual inspection of the foundations for cracks and water ingress, accessible parts of the vent pipe system (e.g., cleanouts, riser pipes, wind turbines), and lids to sumps, if present. Appropriate steps should be taken to repair any damage that is noted.

The monitoring scope should be re-visited after the first monitoring round (pre-building occupancy) has been completed.

6.3 Development of Confined Space Entry Procedures

Procedures for confined space entry must be developed that take into consideration the potential for gases to be present in manholes, sumps, pits and all other confined spaces.
It is important to recognize that confined space entry does not necessarily mean physical entry into the space but activities that may occur near to the space such as opening of lids to manholes and sumps. Gas monitoring is part of confined space entry procedures. The development of confined space procedures is beyond the scope of work for this project. Golder could assist with development of confined space procedures, if desired.

7.0 PRELIMINARY DESIGN SPECIFICATION

A preliminary design specification for the venting system is provided. The design should be reviewed by City of Vancouver’s architect and mechanical engineer to ensure that all applicable codes and permit requirements are met.

The preliminary design for below-grade components of the soil gas venting system are provided in Figures 1 and 2, which presents a plan layout of the vent piping, and Figure 3, which presents typical details. The preliminary specification for below-grade components are as follows:

- Lateral Pipes shall be 100 mm in diameter and shall consist of PVC – DWV according to CSA B181.2;

- Where designated, perforations in the PVC pipe shall consist of three circular 10 mm diameter holes drilled at a 120 degree circumferential spacing with no rotation. Horizontal spacing shall be 100 mm (Figure 3, Detail 4);

- Lateral Pipes shall have a minimum 0.5% slope away from the risers and/or headers; where permitted by building slab design;

- Lateral Pipes shall be hung from the underside of the concrete building slab using carbon steel hangers which are adjustable for proper grading;

- Pipe hangers shall be Grinnell “Figure 65”, “Figure 120” type light weight U-bolt clevis or equivalent approved by the Engineer. Maximum pipe hanger spacing for pipes shall be 15 feet (4.57 m). The ends of the U-bolt shall be either bent over, or completed with a hex nut over reinforcing in the concrete building slab; and,

- The Lateral Pipes shall be placed within a Venting Gravel Bed, which shall consist of a minimum thickness of 200 mm depth and 9.5 mm clean, “clear” rounded gravel conforming to the following gradations for Torpedo Gravel as designated by the Master Municipal Specifications (June 2006).
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- A protective geotextile sock shall be placed over the pipes in the parking lot areas to protect the piping during the application of asphalt. The geotextile sock shall consist of a non-woven needle punched polypropylene geotextile having a minimum weight of 4 oz/sq yd (Layfield “LP-4” or equivalent approved by the Engineer);

- Pipe Cleanouts shall be constructed at the end of designated Lateral Pipes; and,

- The suggested locations for pipe risers are shown on Figures 1 and 2.

The preliminary conceptual design for above-grade components of the gas venting system is provided below. A detailed design should be prepared by City of Vancouver’s architect and mechanical engineer.

- The air inlet and exit pipe risers should be a minimum 150 mm (6 inches) in diameter, except the one air inlet riser pipe located on the west side of the building. This riser pipe should be a minimum of 200 mm (8 inches);

- The penetration of risers through the slab should be sealed (see Figure 3);

- Air exit risers should terminate a minimum of 1 m above roof eaves, and a minimum of 3 m from windows, doors, air intakes or other openings to the building;

- Air inlet risers should terminate a minimum of 3 metres above ground surface;

- Air exit risers should be connected to wind turbine;

- The recommended wind turbine is a wind operated rotary ventilator ARTIS Model No. GRV6, or alternate approved by the Engineer;
• The air inlet risers should be terminated to prevent rainwater ingress (i.e., rain cap or goose-necked);

• A sampling port should be installed on each air exit riser in an accessible location. The sampling ports should be 12.5 mm diameter ball valve and nipple, or alternate approved by the Engineer. The sampling port should have a threaded, leak-free connection to the riser pipe; and,

• The design should include measures needed to convert the passive system to active system, if needed.

8.0 LIMITATIONS AND USE OF REPORT

This report was prepared for the exclusive use of City of Vancouver and is limited solely to methane and hydrogen sulphide gas issues as they relate to potential future impacts once the building is constructed, and does not include consideration of health and safety issues during construction, potential contaminated site issues, or geotechnical considerations.

The report is based on data and information collected during investigations conducted by Golder Associates Ltd.’s personnel and the review of documents prepared by others as listed in this report. It is based solely on the conditions of the subject property at the time of the site investigation conducted by AGRA (1998), as described in the report entitled “Detailed Site Investigation, Costco Wholesale Site, Station Street and Industrial Avenue, Vancouver, BC”. Soil gas conditions may vary with location, time, sampling methodology, analytical techniques and other factors. Golder Associates Ltd. makes no warranty, expressed or implied, and assumes no liability with respect to the use of the information contained in this report at the subject Site, or any other site, for other than its intended purpose.

Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. Golder Associates Ltd. accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

If new information is discovered in the future, Golder Associates Ltd. should be requested to re-evaluate the conclusions of this report and provide amendments as required prior to any reliance upon the information presented herein.
9.0 CLOSURE

We trust this information meets your current requirements. Should you have any questions regarding the information presented herein, please do not hesitate to contact the undersigned.

Yours very truly,

GOLDER ASSOCIATES LTD.

ORIGINAL SIGNED
Charito Cañero, P.Eng.
Environmental Engineer

Reviewed by:

ORIGINAL SIGNED
Ian Hers, P.Eng., Ph.D.
Associate, Senior Environmental Engineer

CC/IH/cap
Attachments

cc: Golder Associates Ltd. – Jim Laidlaw
    Stantec – Hal Owens
LEGEND

- Air Intake (I) Vertical Riser Pipe
  Connected to Rain Cap (3 m)
- Air Exit (E) Vertical Pipe
  Connected to Sampling Port
  and Wind Turbine at roof-top
- Clean-outs
- Perforated Pipe
- Non-Perforated Pipe

REFERENCE

1) Base Plan provided by Stantec Consulting Ltd. Drawing M-002 r.0 dated January 23, 2008.

CITY OF VANCOUVER NEW BY-LAW IMPOUND LOT
425 INDUSTRIAL AVENUE, VANCOUVER, BC

BUILDING PIPING LAYOUT
SOIL VAPOUR MANAGEMENT SYSTEM

FIGURE 1
LEGEND

- Vertical Riser Pipe (3.0m)
- Connected to Rain Cap
- CO Clean-outs valves at bottom of riser pipes
- Perforated Pipe
- Non-Perforated Pipe

REFERENCE
1) Base Plan provided by Stantec Consulting Ltd. Drawing C-002 dated January 21, 2008.
LATERAL PIPES
SLOTTED PVC PIPE
NON PERFORATED PVC PIPE
GEOMEMBRANE LINER
CONCRETE
200 mm
DETAIL 1
RISER WITH SAMPLING PORT
NTS

DETAIL 2
CLEAN-OUT DETAIL (TYPICAL)
NTS

DETIAL 3
SAMPLING PORT
NTS

DETIAL 4
SLAB CROSS SECTION (TYPICAL)
NTS

DETAIL 5
VERTICAL PIPE PENETRATION DETAIL
NTS

CITY OF VANCOUVER
NEW BY-LAW IMPOUND LOT
425 INDUSTRIAL AVENUE, VANCOUVER, B.C.

TYPICAL DETAILS OF SOIL VAPOUR MANAGEMENT SYSTEM

FIGURE 3