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October 8, 1996

GLL 96-346

Mr. Ray Funnell, P.Eng.  
Commissioner of Works  
City of Guelph  
City Hall  
59 Carden Street  
Guelph, Ontario  
N1H 3A1

Dear Mr. Funnell:

Re: Work Plan for the Remediation of the Former Guelph Gas Works

We understand that the City of Guelph is considering using the former Gas Works property as the site of the new Memorial Gardens Arena. One of the issues that the City wishes to consider, in making this decision, is the cost and time associated with remediating the site.

Environmental Strategies Limited, a Gartner Lee company, has previously undertaken site characterization work on this property for the City. As a result, you requested that we develop a work plan to estimate the time and cost associated with remediation of this property.

In this letter, we have subdivided the work plan activities into two phases: the development of a remediation plan; and the implementation of the remediation plan (decommissioning of the property).

Site Setting

In developing this work plan, we reviewed our files regarding the regional and local site setting, plus detailed information that we had obtained from our previous investigations of the site. Our previous investigations had included archival data, air photo interpretation, test pitting, drilling, monitoring and laboratory testing.

To assist in your review, and for your files, we have prepared a concise summary of the site setting based on our previous work, which we can provide under separate cover.

Phase 1: Development of a Remediation Plan

Given the short time frame available for development of this work plan, we decided to take a specialist team approach to this project. We first undertook a compilation and detailed review of all available information for this property, as noted above. This information was presented to the team for review and critiquing. We then reviewed the current Ontario guidelines for site decommissioning, and the other regulatory requirements that could apply. Our team then developed the work plan, time and cost estimates to remediate the site.



We have assumed in the development of this work plan that the City would assign a staff coordinator to the Arena development, including the remediation work. Also note that our cost estimates *include* project management and GST.

The current provincial guidelines place the responsibility for the development and implementation of the remediation plan on the proponent and the consultant. The MOEE takes a very hands off approach. This means that the City can proceed through this process as quickly as you are comfortable.

However, the guidelines do require public involvement. Given our knowledge of the environmental interests in Guelph, we expect that any public involvement program will have to be extensive and have provided for this in the work plan. There are three implications from this:

1. once the neighbours are aware of the existence of contaminants under their properties, the City may face legal actions;
2. local environmental interests may press the City to undertake remediation regardless of a decision to use the site for the Arena (e.g., as with the current issues surrounding the Hanlon/Wellington interchange development); and
3. the schedule and cost associated with the development of the plan and it's subsequent implementation may increase.

It is also clear that the current contamination and potential cleanup is shared by the City and Union Gas. It will be difficult to proceed separately. As a result, the City will need to bring Union Gas into the process quickly.

Taking the above into account, we believe that the first phase of this work plan will require six months to one year to complete and the consulting fees will be in the range of \$165,000 to \$320,000. The details of the work activities are described below. The schedule and budget for these work tasks are provided in Table 1.

#### Phase I Work Plan Activities

##### *1. Work Plan Finalization*

- a) Preliminary work program;
- b) refinement based on City staff comment;
- c) review and refinement with Union Gas and Developer; and
- d) review and finalization following public comment.

##### *2. Consultation with Union Gas and Arena Developer*

- a) Technical support.



3. *Data Collection*

- a) Review of GLL/ESL file material (done);
- b) review of Union Gas investigation - Canviro report; and
- c) review of City servicing and Archive materials.

4. *Agency Consultation*

- a) Technical support and meetings.

5. *Site Investigations*

- a) Delineate bedrock depression to quantify coal tar (drilling, sampling);
- b) characterize coal tar chemistry (liquid, gas, dissolved);
- c) locate underground structures/tanks and delineate hydrocarbon contamination (geophysics - ground penetrating radar, test pits, drilling, sampling);
- d) investigate service trench contamination (video camera, test pits, inspection, sampling);
- e) sediment and water quality sampling and testing (storm sewers, basement sumps, ground water monitors);
- f) surficial soil sampling and testing (footings and foundations);
- g) repair/decommission existing leaking bedrock monitor (monitor location 15); and
- h) documentation.

6. *Health Assessment*

- a) Develop approach and review with all parties;
- b) select critical contaminants, pathways, receptors;
- c) establish baseline conditions;
- d) evaluate potential health impacts; and
- e) recommend mitigation and monitoring (documentation).

7. *Development and Remediation Alternatives*

- a) Review proposed development options and identify preliminary remedial alternatives (input to site investigations);
- b) detail the alternatives following site investigation and health assessment;
- c) develop remedial technologies and cost; and
- d) recommend preferred development and remediation concept following Agency and public input.

8. *Public Involvement*

- a) Neighbours - technical support and meetings:
  - \* let neighbours know what is happening;
  - \* potential liability where staining was identified; and
  - \* response-type activity.



- b) General Public - preparation, attendance, documentation for three public meetings:

*Meeting 1:* work program  
*Meeting 2:* results of site investigation and baseline for health assessment  
*Meeting 3:* health assessment results and development/remediation options

\* coordination of technical staff

## Phase 2: Implementation of the Remedial Plan

It is difficult to predict with any certainty, the actual requirements for remediation of this site before the Phase 1 work plan outlined above is completed. However, based on your request, we have developed a conceptual remediation plan that reflects our best guess at the outcome of the process. Where there is uncertainty, we have identified the issue and provided a cost allowance.

Currently, contamination both on site and from historic site activity are generally contained and moving into the environment at a low rate. As a result, the site is not having a significant impact on the environment based on current use.

The ideal redevelopment plan, for this site, would maintain the status quo. However, this would likely place significant constraints on the proposed arena development. This would require a slab on grade construction with minimal excavation for foundations and servicing. Clearly excavations for underground parking would be precluded.

We expect, however, that through a public process the remediation plan will probably result in a requirement to provide a net environmental improvement. Therefore, we anticipate that the resulting remediation plan will likely include the following components. Our cost estimates are also included, for your information.

### Phase 2 Activities and Cost Estimates

- \* Removal of Underground Tanks.....\$5,000 - \$10,000
- \* Removal of Buried Structures (at developer's cost).....-
- \* Excavation of hydrocarbon-contaminated soils.....\$5,000
- \* Excavation and disposal of coal tar contaminated soils (5,000 tonnes) at Laidlaw ...\$1,000,000 - \$2,400,000
  - assume excavation in overburden only
  - assume Union Gas will be responsible for their own clean-up
- \* Mitigation if coal tar gases are problematic (i.e., work in a bubble).....\$100,000
- \* Disposal of excess materials from new servicing.....\$5,000 - \$10,000
  - bulk of materials can go to Eastview
- \* Controls on services (i.e., clay collars).....\$5,000



* Retaining wall replacement (variable cost - not included) .....	-
- needs hydraulic control while this is being done	
- investigate soils in and around the weep holes of the retaining wall	
* Clean-up of contamination in existing servicing and trenches .....	\$100,000
- assume clean-up of hot spots and passages only	
- assume trench 150 m long x 2 m deep x 1 m wide = 500 tonne	
* Replacement costs for servicing .....	\$100,000
* Water treatment and discharge of water in excavations (variable costs - not included) .....	-
- water control needed to keep excavations dry	
* Management of adjacent properties (costs unknown - not included) .....	-
- sump cleaning, air quality testing	
<i>Subtotal</i> .....	<i>\$1.5 - \$2.7 million</i>
* Design/approvals/sign off/tender/contract administration/inspection/ .....	10%
monitoring (added as 10%)	
<i>Subtotal</i> .....	<i>\$1.65 - \$3.0 million</i>
Add Contingency of 15% to high end of range .....	15%
<b>Total</b>	<b>\$1.6 - \$3.4 million</b>

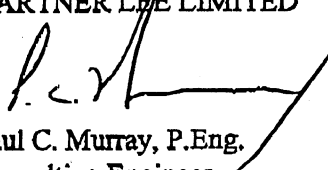
Again, we note that the above are estimates only, for planning purposes, based on the most reasonable remediation scenario that we can foresee at this time.

### Closing

We would be pleased to discuss any or all aspects of this work plan further with the City following your review. We note that this work plan may provide a useful reference even if the arena project does not proceed, since the eventual development of this property will be facing similar issues.

Also, as mentioned above, there is also a need to repair or decommission at least one of the previous ground water monitors at this site that has a leaking seal, to minimize the potential for any contaminants moving between the overburden and the bedrock. We recommend that this be done regardless of the City's decision regarding further decommissioning of the site.

Yours very truly,  
GARTNER LEE LIMITED

  
Paul C. Murray, P.Eng.  
Consulting Engineer  
Principal

PW:clc

**TABLE 1: PHASE 1 SCHEDULE AND COST ESTIMATES**  
**GUELPH GAS WORKS REMEDIATION WORK PLAN**

Project No.: 98-846

Task	1996			1997					Cost
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	
1. Work Finalization									\$5,000
2. Consultation with Union Gas and Developer									\$10,000 - \$15,000
3. Data Collection									\$10,000 - \$15,000
4. Agency Consultation									\$5,000 - \$10,000
5. Site Investigation									\$25,000 - \$60,000 (+\$25,000 contingency)
6. Health Assessment									\$40,000 - \$75,000
7. Development and Remediation Alternatives									\$20,000 - \$30,000
8. Public Involvement - General Public									\$30,000 - \$45,000
- Neighbours									\$15,000
9. Conceptual Remedial Plan									\$15,000 - \$25,000
<b>TOTAL COST ESTIMATE</b>									<b>\$165,000 - \$280,000</b> plus \$40,000 contingency <b>\$320,000 outside</b>

1998  
July 8, 1998

GLL 98-136

The City of Guelph  
Engineering Department  
City Hall, 59 Carden Street  
Guelph, ON N1H 3A1

Attention: Mr. Terry E. Hearn, P.Eng.  
Director of Engineering

Re: Former Guelph Gas Works Site and Adjacent Property

Per your request I have reviewed the various reports relating to the former Guelph Gas Works site located between Surrey Street and Fountain Street, and adjacent properties (28 Wellington Street East, and 42 and 56 Gordon Street). Recent investigations conducted on the adjacent properties have identified contamination (polynuclear aromatic hydrocarbons, total petroleum hydrocarbons and volatile organic compounds) which is similar to that observed at former coal gasification sites. This contamination has been attributed by the investigators to be caused by one or more of the following: a) migration of contaminants (dissolved phase and possibly non aqueous phase) from the former Guelph Gas Works site; b) possible placement of contaminated fill that originated at the Gas Works site; c) other off property sources; and, d) historical use of the subject property.

My review focused on two issues, namely whether the contamination detected on the adjacent properties originated at the Gas Works site and if this is the case, what measures can be taken by the City of Guelph to control or prevent future movement of contamination from its property.

To place the issues into their proper context, this letter presents a summary of background information on the Guelph Gas Works site including a characterization of the waste and contamination found at the site, and a summary of the geology and hydrogeology of the area. The major findings on the adjacent properties are provide for completeness.

## **1. Former Guelph Gas Works Site**

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### **1.1 Site History and Existing Use of Property**

The former Guelph Gas Works occupied a property of about 1 ha located on Fountain Street between Wyndham, Surrey and Gordon streets. The Gas Works operated from 1871 to about 1957, when it was shut down and dismantled. Based on an old insurance map (c. 1911, copy attached), the Gas Works consisted of office and process buildings, three (3) gas holding tanks, and coal and coke storage sheds. Below ground structures exhumed in 1987, included building and tank foundations, a network of passageways connecting

buildings, and former storm and sanitary drains. No information is available on whether the four underground storage tanks shown in the 1911 drawing, have been removed. The tanks were not identified in a geophysical survey conducted by Gartner Lee Limited in 1986 and it is presumed that they have been removed.

The City of Guelph owns the eastern portion of the property and Union Gas Limited owns the southwestern portion of the property. The City owned property is currently in use as a parking lot. Union Gas maintains an office and service yard on its property.

## 1.2 Scope of Previous Investigations

The Guelph Gas Works Site has been assessed by Intera Technologies Ltd. (1986), Gartner Lee Limited and its subsidiary Environmental Strategies Limited (between 1986 and 1990), and CH2M Hill Engineering Limited (1989). A summary of the investigations follows.

**Intera Technologies Ltd. (Intera):** Intera was retained by the Ontario Ministry of the Environment in 1986 to identify and assess the potential environmental impact of former manufactured gas plants waste sites in Ontario. The Guelph Gas Works Site is one of 41 gas plant sites identified by Intera. Much of the early information available on the site is from the Intera inventory.

The Guelph Gas Works was reportedly a *carburetted water gas facility* that used coal and oil as feed stock. Waste and by products of the gas manufacturing process include tars, tar sludges and liquors, ammonia liquors, spend iron oxide (gas purifying agent), ash slag, cinders, dust, and off grade coal/coke. Coal tars and waste ammonia were stored in buried tanks. Tar residues at the former plants are typically found in tanks, pipelines from gas processing and purifying area to tanks and base of gas holders.

The primary constituents of the waste which represent a residual hazard and/or environmental concern are:

- |                       |   |
|-----------------------|---|
| Coal Tar Derivatives: | Polynuclear Aromatic Hydrocarbons<br>Light Aromatic Hydrocarbons (Benzene, Toluene, Ethylbenzene, Xylenes)<br>Phenols |
| Iron Oxide:           | Sulphur<br>Cyanide<br>Ammonia compounds   |
| General Waste:        | coal and coke fragments<br>ash, slag and cinders  |



**Environmental Strategies Limited (Gartner Lee):** The Gartner Lee investigation of the City of Guelph owned property entailed a review of historical information on the site, a geophysical survey, advancement of boreholes (total of 17), installation of monitoring wells (total of 12), shallow excavations (total of three) for sewer bedding inspection, inspections of the basements of four buildings located south of Surrey Street to check for unusual odours or seepages and soil, sediment, surface water and groundwater sampling. The locations of the boreholes and monitoring wells are shown in the attached Figure A (Figure 1, Environmental Strategies 1990 report). Three of the boreholes/wells (one well nest and a single well) were installed immediately south of Surrey Street and an additional three boreholes/wells (same configuration) were installed immediately north of Wellington Street. Ten of the boreholes were completed in bedrock and the remaining nine in overburden. The soil, sediment and water samples were analyzed for general contaminant indicators (phenols, un-ionized ammonium, oil and grease, and total cyanide), metals, polynuclear aromatic hydrocarbons (PAHs), and volatile organic compounds (VOCs).

**CH2M Hill Engineering Limited (CH2M Hill):** Union Gas Limited retained CH2M Hill in 1989 to conduct an investigation of its property. The investigation entailed the advancement of boreholes (total of seven), installation of monitoring wells (total of four), shallow excavation (total of three test pits), collection of waste, soil and groundwater samples, and air quality monitoring. The borehole/well locations are shown in the attached Figure B (Figure 3, CH2M Hill 1990 report). The waste samples were analyzed for coal tar acids and PAHs. The soil and water samples were analyzed for general indicators, major/minor ions, metals, the VOCs benzene, toluene, ethylbenzene and xylenes, coal tar acids and PAHs.

For discussion purposes the boreholes/wells installed on the City of Guelph property are assigned the prefix COG and those on the Union Gas property the prefix UG.

### 1.3 Waste and Contaminant Characteristics

**Waste Characteristics:** Waste (coal cinders, slag, and coal tar), construction debris (brick fragments, concrete, wood, glass and plastic), and discoloured and potentially contaminated fill were encountered in most of the boreholes and test pits completed on the City of Guelph and Union Gas properties. The coal tar is described as a viscous black substance or residue with a strong creosol odour. In one borehole, COGBH15, the tar occurred as an emulsion in the groundwater.

The coal tars while relatively immiscible, will leach phenols, PAHs and aromatic hydrocarbons. The tar is denser than water and will tend to move downward through fractured and porous media, leaving a stain or residue. Coal tar saturated fill was observed at several locations on both properties. Some of the fractures at COGBH15 were stained or contained a black tar like material.

Based on CH2M Hill's detailed characterization of the coal tar, the primary constituents are cresols (o, m and p), phenols and PAHs. The contaminants are present in the soil/fill below the south east corner of the property in the area of the former gas holder and along the east boundary of the property. The concentrations are significant enough to render the residue and contaminated fill as hazardous (CH2M Hill, 1990). Union Gas has not investigated the extent of migration beyond the limits of its property.

On the City of Guelph owned property, the major portion of the coal tar residue is within a bedrock depression at the southwest corner of the property. Coal tars are also expected to extend beneath Surrey Street and have been detected in the bedding beneath an abandoned sewer along Surrey Street.

CH2M Hill estimated that there is approximately 2,246 m<sup>3</sup> of waste/contaminated fill below the Union Gas property that would need to be disposed of at either a hazardous waste landfill or a municipal landfill. The volume of waste/contaminated fill at the City of Guelph property has not been estimated.

**Groundwater:** Soluble constituents of the coal tar (PAHs and phenols), ammonia, cyanide, the organic indicators (TOC and COD) and aromatic hydrocarbons (benzene, toluene, ethylbenzene and xylenes) have been detected in groundwater samples collected from the monitoring wells installed on the City of Guelph and Union Gas properties. Ammonia and cyanide, specific indicators of groundwater affected by coal gasification plants, are leached from the spent iron oxide which was used to refine the coal gas prior to distribution. The ammonia is also a degradation product of cyanide. The processing of the gas occurred on the City's portion of the property and the bulk of any oxide residue would be expected to be on this property.

The light aromatic hydrocarbons are a leachable constituent of the coal tar and are also found in most petroleum products. The c1911 drawing of the gas plant shows four underground storage tanks located in the northwest corner of the City of Guelph property. The log for borehole COGBH10 installed in the immediate area of these tanks, notes the presence of a distinct gasoline odour at the overburden bedrock contact. This borehole was not completed as a monitoring well and no chemistry is available for this location. While the c1911 tanks are thought to have held coal tar, it is possible that other tanks containing gasoline may have been installed in this area in later years. It should be noted that the c1911 drawing shows a coal/wood yard immediately north of Fountain Street (formerly Waterloo Street). The Guelph Police Department office currently occupies the property. According to correspondence in the City's files, *black soil with a peculiar odour* was detected in 1989 during the construction of an addition to the Guelph Police Building. Subsequent analysis of this soil identified the presence of PAHs. No aromatic hydrocarbons were noted.

Aromatic hydrocarbons were detected at elevated concentrations in samples from all of the monitoring wells installed on the Union Gas property including the wells (UGBH1 and UGBH6) installed along the northern property boundary. Although the source of the hydrocarbon has not been clearly identified, it is postulated by CH2M Hill that the source is upgradient from the Union Gas property (possible former underground tanks on the City property).

For information purposes, underground storage tanks are present or were formerly located on properties to the north, west and south of the gas plant. These tanks may contribute to the aromatic hydrocarbon contamination detected on the Union Gas and adjacent properties.

DOC and COD are indicators of organic contamination and their presence in the groundwater at elevated levels is expected.

*Surface Water and Sediment:* Environmental Strategies (Gartner Lee) collected samples from the storm sewer underlying Surrey Street and from the Speed River. Phenols an indicator of coal tar contamination, was detected in the storm sewer sample. PAHs were not detected.

Surface water and sediment samples were collected from the Speed River at two sewer outfalls, the catchments of which encompass the gas plant site. With regard to the surface water samples, cyanide was the only site indicator that was detected.

PAHs and oil and grease were detected in the sediment at concentrations representative of background levels.

## **1.4 Physical Setting**

### **1.4.1 Topography and Drainage**

The ground surface slopes to the south east from a high of about 317 mASL along Fountain Street to a low of about 309 mASL along the Speed River. Much of the area is paved and/or covered with buildings. Drainage is provided by catch basins and storm sewers. The storm sewers direct runoff to the Speed River.

### **1.4.2 Geology and Hydrogeology**

The interpretation of the geologic and hydrogeologic setting presented herein is summarized from the consultant reports available for the gas plant site and adjacent properties.

The area is for the most part underlain by granular fill and sandy glacial materials, which in turn are underlain by the dolostone. Below the City owned property the overburden thickness varies from 1.2 m (central area) to 5.4 m (southwest corner). The 5.4 m value corresponds to what appears to be a closed depression in the bedrock. It is not known whether this feature is manmade or natural. The depression is infilled with a fine to coarse sand which is saturated with coal tar.

The overburden thickness below the Union Gas property ranges from about 0.91 m at UGBH2 (auger refusal) to 2.68 m at UGBH4. Off-site the overburden thickness varies from about 1.8 m to 2.8 m near Gordon Street to 1.4 m immediately north of Wellington Street.

The overburden stratigraphy over most of the area is fairly uniform typically consisting from surface to depth, of a surface treatment of asphalt or concrete, crushed rock base, fill(sand and gravel with variable content of silt, brick and concrete fragments and msc. debris), and native sand, gravel and silt. At many locations (generally north of Surrey Street the entire overburden sequence is described as fill). At other locations (south of Surrey Street and along Gordon Street) the fill is underlain by a thin layer of silt and peat and native sand and gravel.

The bedrock from regional mapping and the description in the borehole logs is assumed to be the Guelph Formation. The bedrock is described as grey to yellow to white, vuggy and fossiliferous with variable porosity. The upper portion is fractured and weathered. RQD values reported by CH2M Hill are variable with poor recovery noted at UGBH3 and good recovery at UCBH5. Fractures in COGBH15 contained a black tar-like material.

The water table is within about 2.5 m of surface within the study area. Groundwater flow in the shallow subsurface is south towards the Speed River. Based on the water level data for the well nests COGBH12 and COGBH15, the hydraulic gradient in the bedrock is downward.

## **2. Surrounding Properties**

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### **2.1 28 Wellington Street East**

This rectangular (70 m by 28 m) property has frontage on and is accessible from both Surrey Street and Wellington Street. The one story structure, formerly used as a restaurant and currently vacant, is located on the property. A majority of the property is paved (asphalt) and represented the parking lot. Landscaped areas are present at the entrances to the property.

The 28 Wellington Street East property has been examined by Jacques Whitford Environment Limited (Phase I and Phase II Environmental Investigations conducted in April/May 1997) and Trow Consulting Engineers Ltd. (Phase II Environmental Site Assessment in October 1997). A summary of the investigations follows. It should be noted that the discussion of the primary findings of the Jacques Whitford Environment Limited (JWEL) investigation is summarized from my earlier letter dated February 9, 1997.

#### **2.1.1 Jacques Whitford Environmental Limited Investigation**

**Background:** Jacques Whitford Environment Limited conducted a Phase I Environmental Investigation of the subject property in April 1997 on behalf of Peter Mitges Holdings Limited. Based on past use of this property (spring axle works/metal fabrication and vehicle repair/sales) and historical land use on adjacent properties (fuel storage and former coal gas production/storage), JWEL recommended that a Phase II Subsurface Investigation be performed. The Phase II investigation undertaken in May 1997, involved the advancement of three shallow borings, installation of two monitoring wells (in two of the borings), and the collection and analysis of soil and groundwater samples. Two of the borings referred to as JWELBH1 and JWELBH2 are located at the north end of the property immediately south of Surrey Street. Borehole JWELBH2 (west corner) appears to have been installed in the general vicinity of COGBH14. The third borehole (JWELBH3) was completed near the southeast corner of the property. A location plan from the JWEL report (Dwg. No. 2) is attached as Figure C.

**Findings:** The stratigraphy as described in the JWEL report consists of a thin layer of asphalt, which is underlain by sand and gravel fill and in-turn by dolostone bedrock. The thickness of the overburden ranges from 2.0 m at JWELBH1 to 4.3 m at JWELBH3.

Volatile organic vapours described as a slight petroleum odour, were noted at borehole (JWELBH3) located at the southeast side of the property. No liquid petroleum hydrocarbons or petroleum staining were observed at the three borehole locations. Petroleum hydrocarbon (TPH, gas/diesel and heavy oil) and polynuclear aromatic hydrocarbon (PAH) contamination was detected in a soil sample collected from JWELBH1 at a depth of 1.8 m. The concentrations of selected PAHs and TPH exceeded their applicable guideline values. Aromatic hydrocarbons (benzene, ethylbenzene, toluene and xylenes) and TPH (gas/diesel) indicative of petroleum contamination and PAHs were also detected in a groundwater sample from JWELBH1. Of these parameters, benzene, ethylbenzene, TPH and several PAHs exceeding their applicable guideline values. TPHs were detected in the soil sample from JWELBH2 but generally at low concentrations. Benzene and toluene were detected in the groundwater sample from JWELBH3, with benzene exceeding its applicable guideline value.

The consultant, JWEL, concluded that the contaminants detected in JWELBH1 (TPH, volatile organics and PAHs) and JWELBH2 (TPH) are likely associated with the historical presence of the coal gasification plant which was located northwest of the subject property. The benzene observed in the groundwater sample from JWELBH3 is attributed to former underground storage tanks located north of the subject property (currently occupied by Wendy's Restaurant). According to the Phase I assessment, the Wendy's Restaurant property was formerly occupied by a car dealership. Although the tanks were reportedly removed in the 1970s, no reports are available documenting their removal or any restoration activities that may have been undertaken.

### 2.1.2 Trow Consulting Engineers Ltd. Investigation

**Background:** Trow Consulting Engineers Ltd. (Trow) was retained by National Life Assurance Company of Canada to perform a Phase II Environmental Site Assessment of the subject property in the late summer/fall of 1997. The scope of work for this investigation involved the clearance of underground utilities, a geophysical survey (ground penetrating radar), advancement of five (5) boreholes and one (1) probe hole, installation of three (3) monitoring wells and the collection of soil and groundwater samples. Groundwater samples were also collected from two of the JWEL wells (JWELBH1 and JWELBH3). The soil and groundwater samples were analyzed for PAHs, VOCs, TPH and metals. For discussion purposes the boreholes are referred to as TCBH1 through TCBH5, and the probe hole as TCPH1. The locations of the various boreholes/wells are shown in Figure D (Dwg No. 2 from Trow report).

**Findings:** Although the geophysical survey provided little useful data, the borehole logs are detailed and provide a good description of the fill and native material. The site is blanketed by fill consisting of a surface treatment of asphalt and about 1.1 m to 1.5 m of sand and gravel containing brick fragments, fly ash and coal waste. The fill is locally described as being stained (black), having a visible sheen and solvent or petroleum odour. A layer of silt/peat was identified below the fill in TCBH4 and TCBH5. Native sand and gravel were identified in TCBH1, TCBH2 and TCBH3 immediately below the fill and in TCBH4 below the silt/peat. Auger refusal interpreted as bedrock, was reported at depths ranging from 2 m at Surrey Street to 3.8 m at Wellington Street. Overall the geologic description is more comprehensive than that in the JWEL Phase II report.

The water table was detected within 2 m of ground surface in the three wells which were installed. Groundwater flow is interpreted to be in a southerly direction.

No VOCs or TPH were detected in the soil samples that were collected from the boreholes completed on site. PAHs were detected in samples from TCBH1, TCBH2, TCBH4 and TCBH5 with the highest concentrations noted in TCBH1. Borehole TCBH1 as noted, is located at the south end of the property near Wellington Street. The concentrations of the individual parameters were below their applicable guideline values.

With regard to the groundwater analyses, a number of VOCs were detected including chloromethane (TCBH1 and TCBH3), vinyl chloride (TCBH3 and TCBH4) acetone (TCBH4), t-1,2-dichloroethene (TCBH3), cis-1,2-dichloroethene (TCBH1), MEK (TCBH1 and TCBH3), 1,2-dichloroethane (TCBH1 and JWELBH1), trichloroethene (JWELBH1), 1,2-dichloropropene (TCBH1, TCBH3 and TCBH4), tetrachloroethene (TCBH1), and xylenes (TCBH1 and JWELBH1). With the exception of xylene, these VOCs have not previously been detected either at the gas plant site or in samples collected from subject property. The highest VOC concentrations were observed in TCBH3 with vinyl chloride and 1,2-dichloropropene detected at concentrations exceeding the applicable guidelines. The sample from TCBH1 also contained 1,2-dichloroethane and 1,2-dichloropropene at concentrations above their applicable guidelines. It is noted that no VOCs were detected in the duplicate sample from TCBH4.

Various PAHs were detected in groundwater samples collected from TCBH4, JWELBH1 and JWELBH3. Only benzo(a)pyrene and acenaphthylene were detected at concentrations at or exceeding the applicable guidelines.

Lead was detected in groundwater samples from TCBH3 and JWELBH1 at concentrations exceeding applicable criteria. Copper was detected in JWELBH3 at a concentration exceeding its criterion. It is noted there is no reference to the samples having been filtered in the field. The lead and copper may therefore be related to the particulate matter in the sample (i.e. digestion of particulates by acid used for sample preservation).

Based on the findings, Trow concluded that the contamination encountered in TCBH3 was from an upgradient source namely the Gas Works Site. The contamination detected in JWELBH3 was attributed to the former underground storage tank on the property to the east. Trow notes that the analytical results for its samples bear no resemblance to the samples collected by JWEL.

### 2.1.3 Discussion

**JWEL Report:** Although the contaminants detected at JWELBH1 are similar to those observed at former coal gasification plant site particularly the PAHs, it would be premature to conclude that the contamination is caused by migration from the Gas Works Site. As indicated in the JWEL report, the historical land use of the subject property was industrial. Further, the site is covered with asphalt (potential source of PAHs) and the overburden is primarily fill (source is unknown). It is possible that the fill on the subject property was sourced from the Gas Works Site or from some other site. It is also possible that the petroleum hydrocarbons originated on site and the PAHs are from an off-site source.

With regard to the benzene contamination detected at JWELBH3, it may be associated with former activities (fuel storage) on the property to the north. If this is the case, it is possible that there may be considerable residual contamination in the subsurface below the neighbouring property.

The consultant recognizes that it is presently not possible to establish the source(s) of contamination with any degree of certainty and has recommended that additional studies be conducted to better define the nature and extent of the petroleum hydrocarbon and PAH contamination.

**Trow Report:** The chemistry presented in the Trow report is substantially different from that documented by JWEL and not representative of contamination from coal gas plants. Specifically, the primary contaminants identified in groundwater samples collected from the wells are chlorinated solvents. These volatile compounds have not previously been detected at the Guelph Gas Works Site. While it is recognized that the chemistry for the Gas Works Site dates back to the late 1980s and no recent information is available for this site, we are not aware of any land use changes that could cause this contamination. During a recent site visit (April 24, 1998) however, I noted the presence of a

machine/automobile parts shop immediately north of the Union Gas property. The solvents are often used in auto parts cleaning. A gas vent was observed along the east wall suggesting that an underground tank may be present (or was formerly present) on the property.

Trow reported the presence of flyash, organics, brick and coal fragments, and/or coal tar waste in the fill. These inclusions have been noted in most of the borings that have been advanced on the Gas Works property and other adjacent properties and appear to be endemic to the fill that has been placed in the area.

With regard to contaminants considered typical or representative of the Gas Works Site, only the PAHs benzo(a)pyrene and acenaphthylene were detected. These PAHs were observed in a groundwater sample from JWELBH1. This monitoring well is located immediately south of Surrey Street. Both parameters were previously detected by JWEL at this location in soil samples from the boring and in groundwater samples from the well.

## 2.2 42 and 56 Gordon Street

**Background:** Information on this property is presented in the V.A. Wood (Guelph) Incorporated report titled *Geotechnical Investigation, Phase II Environmental Audit, 42 and 56 Gordon Street* (August 1995). V. A. Wood (Guelph) Incorporated, referred to herein as Wood, was retained by Hocala Properties.

The properties referred to as 42 Gordon Street and 56 Gordon Street are each occupied by single story commercial buildings with a plan area of about 1,000 square metres. The latter property was at one time a service station. Both properties are used by car rental agencies.

A Phase I assessment was previously completed by Agra Earth and Environmental Limited (Agra) on the 56 Gordon Street property in June 1995. I have not reviewed the Agra report. As indicated in the Wood report, Agra identified the following areas of concern:

- 1) two underground gasoline storage tanks which had been associated with the service station operation;
- 2) an underground diesel fuel tank which had been located to the east of the building;
- 3) a 500 gallon above ground tank (belonging to 42 Gordon Street), which currently sits on the west side of the site; and,
- 4) a coal gasification plant operated from 1871 to 1957 on the site adjacent to this property to the north.



Based on these concerns, Agra recommended that a subsurface investigation be completed.

Enclosure 1 of the Wood report (attached as Figure E) shows the former locations of various tanks including a heating oil tank, refuse oil storage tank, fuel tanks. An above ground fuel tank (presumably still present) is also shown in this figure. The location of the diesel fuel tank noted by Agra is not indicated. It is possible that this is the refuse oil storage tank shown in Figure E.

The Wood investigation involved the advancement of eight (8) boreholes, installation of two (2) monitoring wells and the collection of soil/fill and groundwater samples (locations in Figure E attached). The soil samples were analyzed for the list of parameters on the MOE's Clean Up Guidelines (Phyto). This list includes general indicators such as pH and electrical conductivity, metals, TKN (as nitrogen), oil and grease, TPH and Benzene, Toluene, Ethylbenzene and Xylenes (BTEX) and VOCs. The groundwater samples were analyzed for BTEX. For discussion purposes the boreholes/wells are referred to as WBH1 through WBH8.

**Finding:** All boreholes except WBH2 encountered a surface pavement of asphalt over a crushed limestone base. A layer of coarse sand and gravel (presumably native soil) was detected below the pavement at WBH1 and WBH3, and in WBH2. Fill was encountered below the pavement in WBH5, WBH6, WBH7 and WBH8. The fill is a mixture of sand and gravel. A "trace of organics" was noted in WBH6, WBH7 and WBH8. The boreholes were advanced to refusal on presumed bedrock at depths up to 2.4 m.

The water table was encountered in WBH2 at an assumed reference elevation of 98 m and in WBH8 at 95.7 m. Based on these two values, shallow groundwater flow is towards the east.

A Gastechtor was used to screen the samples collected from the boreholes. Positive results were noted in the borehole logs for WBH7 between 2.3 m to 2.4 m and WBH8 approximately 1.0 m and 2.0 m.

For the soil samples, all chemical parameters are below or within the range of values specified in the cleanup guidelines which are currently in effect, namely the Table A soil criteria. TPH and BTEX were detected in the two deep soil samples from WBH8 suggesting a possible localized source of aromatic hydrocarbons. Borehole WBH8 is located near the north east property boundary that is shared with Union Gas. It is noted that the former heating oil tank was located about 10 m to the west of this borehole.

With regard to the two groundwater samples (WBH2 and WBH8), TPH (extractable) was detected in the sample from WBH8 at a concentration of 21.6 mg/L. The criteria value is 1,000 ug/L (1 mg/L). TPH (purgable) the indicator of light aromatic hydrocarbon was detected at trace levels. No BTEX or other VOCs were detected in the water samples.

Wood did not attributed the TPH (extractable) contamination to a particular source but suggested that it may be from the former Gas Works site because of its proximity to the Union Gas property. Wood recommends that a subsurface investigation of the Union Gas property be conducted to determine its potential to impact 56 Gordon Street.

*Discussion:* Low level petroleum hydrocarbon contamination has been detected in soil samples from two boreholes (WBH7 and WBH8) advanced on 56 Gordon Street property in the vicinity of former storage tanks. TPH (extractable) was detected in the groundwater sample from WBH8 at a concentration in excess of the applicable Table A criterion. Although Wood has suggested an off-site source namely the former Gas Works Site, it is equally plausible that the contamination originated on-site given its past use as a service station.

It is noted that BTEX were not detected in the groundwater. These aromatic hydrocarbons are primary indicators of contamination from the Gas Works Site. Considering their mobility, I would expect these parameters to have been groundwater. TPH (extractable) is not particularly mobile suggesting a more localized source.

### **3. Conclusions and Recommendations**

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The former Guelph Gas Works Site has been implicated as one of the possible sources of the contamination detected on the 26 Wellington Street and 56 Gordon Street properties. This is because many of the contaminants (PAHs and light aromatic hydrocarbons) are similar to those detected on the former Guelph Gas Works Site. It should however be noted that these organic compounds are common constituents of petroleum products and their occurrence can also be attributed to the current and past use and/or storage of petroleum, vehicle maintenance activities, etc. on other properties. Further, the chlorinated compounds detected in the groundwater at 26 Wellington Street by Trow have not previously been observed in any samples collected in the area and the source of these compounds remains unknown.

To properly evaluate this issue, it will be necessary to: a) collect additional information on current and past land use in the general area to identify other possible sources of contamination; and, b) update the hydrogeologic and chemical data base for the Guelph Gas Works Site to develop a better understanding of the potential for this site to impact adjacent property.

The information on the Guelph Gas Works site is relatively dated having been collected between 1986 and 1990. The information on the adjacent properties is more recent having been collected between 1995 (42 & 56 Gordon Street) and 1997(28 Wellington Street). For the Gas Works Site, I would expect that the natural processes of biological and chemical degradation, and the continued leaching of the coal tar and iron oxide residuals would have reduced contaminant concentrations to some extent. This reduction is a slow process and is certainly not complete, as the recent chemical data for the

adjacent downgradient properties would indicate. The coal tar residuals therefore represent a source of soluble chemical constituents (specifically the aromatic hydrocarbons) that will continue to move away from the site unless controlled. Other contaminant sources are known to exist in the area, however my and the City's knowledge of these sources and historical land use in the area in general, is lacking.

Any action taken to control the contaminant source requires updated information on the distribution of the contaminants and groundwater flow patterns. Ideally, it would be desirable to obtain this information using the existing wells that were installed on the City's, Union Gas and other adjacent properties. Unfortunately, considering the age of the wells and the active use of these properties, I expect that many of the wells have been damaged or destroyed, and are no longer available. Further, the implementation of any investigation assumes the co-operation of Union Gas and other adjacent property owners, which may not be forthcoming.

An investigation to obtain the necessary information would likely involve the following tasks:

- assemble additional information on land use in the area and possible sources of contamination;
- locate and assess the condition of the existing wells, and undertake necessary repairs;
- identify appropriate locations for any new boreholes/wells and clear services;
- advance boreholes to collect fill/soil samples for analysis;
- install monitoring wells, develop the wells and survey elevations;
- measure water levels and sample select existing and new wells; and
- analyze samples for chemical parameters considered to be indicators of waste.

The product of this work program will be a detailed report which identifies potential sources of contamination in the general area, and evaluates the likely effects of contaminant releases from these sources as well as the former Guelph Gas Works Site. A remedial action plan will be developed in draft, for discussion purposes.

Depending on the condition and availability of existing wells and the co-operation of adjacent property owners, the estimated cost to complete the recommended work program may range from \$26,600 to \$46,000. The basis for this range in cost follows:

Task	Assumptions	Estimated Cost Range	
		Low	High
1. Land use inventory and inspection of properties	task completed by Guelph Engineering/Planning Departments, with input from consultant, co-operation of property owners	\$600	\$1,2
2. Assess condition of existing wells	co-operation of property owners, undertake repairs to wells if warranted	\$1,350	\$3,3

3a. Install replacement wells	5 to 10 monitoring wells to be installed, developed and surveyed	\$8,800	\$17,600
3b. Analyze soil samples	submit 5 to 10 soil samples collected during well installation for analysis of PAHs and volatile organic compounds (VOCs)	\$500	\$1,000
4. Measure water levels	15 to 20 wells available for use	\$1,200	\$1,800
5. Sample wells	10 to 15 groundwater samples collected and analyzed for PAHs, VOCs, cyanide and ammonia	\$4,400	\$6,000
6. Disposal Cost	cost for disposal of soil and purge water not included		
7. Reporting	compile all data, develop draft remedial action plan	\$8,000	\$12,000
Estimated Cost With GST		\$26,600	\$46,000

In closing, it is important to recognize that, regardless of the source, the contamination which has been detected in the groundwater represents a potential threat to the City of Guelph's groundwater supply. Any efforts taken to reduce the contaminant mass either through physical removal of the source such as any leaking tanks, contaminated soil/fill, waste, etc. combined with measures to control the contaminant plume, will benefit both the City and the adjacent land owners.

I trust this letter addresses your requirements at this time. Feel free to call if you have any questions.

Yours very truly,  
GARTNER LEE LIMITED

Gunther H. Funk, B.Sc.  
Senior Hydrogeologist

GHF: