2006 ANNUAL REPORT

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1.0 INTRODUCTION

The former Dowcraft Corporation facility in Falconer, New York has been demolished and the property sold to Jamestown Container Corporation. Jamestown Allenco, Inc, (a successor of the Dowcraft Corporation) has retained the responsibility of completing the remedial work at the Site. The remedial work consists of efforts to minimize the impact of trichloroethylene (TCE) which was released on the Site as a result of a degreaser unit. Some of the TCE has degraded into TCE breakdown components including cis-1,2-dichloroethene and vinyl chloride. The groundwater beneath the Site has been impacted by the TCE (and the breakdown components) at concentrations that exceed the New York State Department of Environmental Conservation criteria.

Interim Remedial Measures were initiated in the 1990s using pump and treat technologies to address the impacted groundwater. These measures were later replaced with an in-situ chemical oxidation remedy that was also initially implemented as an Interim Remedial Measure and subsequently accepted in the March 2003 Record of Decision as the Final Remedial Measure.

This document presents the first annual report presenting the results of the first full year of operation of the approved Final Remedial Measure as specified in the "Remedial Design/Remedial Action Work Plan and Operation, Maintenance, and Monitoring Work Plan" developed by CRA in November 2005.

2.0 SITE BACKGROUND

The former Dowcraft property, now owned by Jamestown Container Corporation, is located at 65 South Dow Street, Falconer, New York. The location of the Site is shown on Figure 2.1. The former Dowcraft property covered approximately 2.2 acres.

The property is bounded to the north and east by the Jamestown Container Corporation property and to the south by property owned by Norfolk Southern Railroad. South Dow Street is directly west of the property. The Site's monitoring program includes the Chadakoin River which borders the Jamestown Container Corporation property on the north. A Site plan is shown on Figure 2.2.

The release of TCE from the former vapor degreaser is the source of the chemicals found in the groundwater beneath the Site. Groundwater is found at a depth of approximately 10 feet below the ground level and flows in a northerly direction and discharges into the Chadakoin River. The soil through which the groundwater flows beneath the Site is primarily a sand and gravel unit that contains some silt.

The Chemicals of Concern that have been identified for the Site are:

Trichloroethylene	(TCE)
Cis-1,2-Dichloroethene	(cis-1,2-DCE)
Vinyl Chloride	(VC)

The remediation goals selected for this Site are:

- Treat the source area of groundwater contamination by oxidation of the contaminants, in place;
- Prevent exposure of human receptors to contaminated groundwater in the sand and gravel unit under the Site; and
- Prevent or mitigate, to the maximum extent practicable, Chemical of Concern migration via groundwater so that releases from the underlying sand and gravel unit to the Chadakoin River, do not exceed applicable Standards, Criteria, and Guidance Values.

3.0 2005/2006 OPERATION, MAINTENANCE, AND MONITORING WORK

Given that this is the first annual report on the operation, maintenance, and monitoring activities performed on the former Dowcraft property, the activities that were performed in 2005 have also been included to complete the documentation of Site activities. Since the issuance of the Record of Decision, the following work has been performed at the Site:

- In October 2005, a round of groundwater samples were collected from select wells.
- The "Remedial Design / Remedial Action Work Plan and Operation, Maintenance, and Monitoring Work Plan' has been finalized and was submitted to NYSDEC in November 2005.
- Injection of potassium permanganate occurred:
  - November 29 through December 2, 2005;
  - May 12, 2006; and
  - July 14, 2006.
- A monitoring report was submitted to NYSDEC on February 10, 2006 (and revised March 16, 2006).
- In November 2006, a round of groundwater samples was collected from select wells.

The following sections of this report provide further information on these activities.

3.1 GROUNDWATER MONITORING

Two rounds of groundwater samples were collected during this reporting period. The first round was conducted in October 2005 to determine the pre-injection concentrations in five of the groundwater monitoring wells around the TCE plume. The purpose of this sampling was to update the current understanding of TCE presence in the groundwater and to provide information as to the appropriate locations for planned injection of the potassium permanganate oxidizing solution. A round of groundwater elevations was also taken from all of the monitoring wells during this sampling event.

The groundwater elevation information from this sampling event is presented in Table 1. Table 2 presents the chemical concentrations measured in the five wells that were sampled. The data show that the TCE concentrations in these wells ranged between 22 and 190,000 ppb, thus necessitating another round of potassium permanganate injection. Concentrations of cis-1,2-DCE in two of these wells were also above 1,000 ppb. The concentrations of the three Chemicals of Concern in these five wells were as follows:

Well	***TCE (ppb)***	***cis-1,2-DCE (ppb)***	***VC (ppb)***
ESI-2	1,750	200	non detect
ESI-3	22	2J	non detect
PW-1	130	11	non detect
PW-2	4,000	1,400	51J
PW-3	190,000	3,000J	50J

Figures 3.1, 3.2, and 3.3 present TCE, cis-1,2-DCE, and VC concentration contour maps (respectively) of the groundwater prior to the potassium permanganate injection.

All of the samples were submitted to the H2M Laboratories in Melville, New York (a NYSDOH approved facility). The samples were analyzed using United States Environmental Protection Agency Method 8260 referenced from "Test Methods for Evaluating Solid Wastes, Physical/Chemical methods", SW-846, 3rd Edition, September 1986 (with all subsequent revisions). For the samples that were analyzed for arsenic and manganese, Method 6020 was used. The Quality Assurance/Quality Control procedures specified in the Work Plan were followed for all sampling events. The Quality Assurance/Quality Control reviews for all sampling rounds during this reporting period are provided in Appendix A. These reviews showed that the data collected were acceptable for their intended purpose.

As required, a second round of groundwater samples was to be collected six months after the potassium permanganate injection. This sampling round was conducted in November 2006 after the last of the injections was completed and included 12 groundwater monitoring wells. For this round, the metals arsenic and manganese and the general chemistry parameters nitrate and sulfate were also analyzed. The intent of this sampling program was to provide groundwater quality information indicative of conditions about six months after the potassium permanganate injections. Again, a set of groundwater elevation measurements was also taken from each of the wells.

The groundwater elevation information from this sampling event is presented in Table 1 and illustrated in Figure 3.4. The groundwater elevation data show that the gradient is still to the north toward the Chadakoin River. This is consistent with all previous rounds of groundwater level measurements.

As part of this round of sampling, a surface water sample from the Chadakoin River was also collected to assess the impact of groundwater discharge from the Site into the river. All of the Volatile Organic Compound parameters analyzed for in the river sample were non detect. This confirms the results of all of the previous investigation programs that sampled the Chadakoin River. There has been and continues to be no impact on the water quality in the river.

The chemical information obtained from the post-injection sampling event shows that the concentrations of the Site Chemicals of Concern have been substantially reduced by the injections. During this round, the concentrations of TCE ranged between non detect and 1,700 ppb compared to the pre-injection high of 190,000 ppb. The cis-1,2-DCE and VC concentrations have also been reduced. Comparable data for the five wells that had been sampled prior to the injection are provided in the following:

Well	***TCE (ppb)***	***cis-1,2-DCE (ppb)***	***VC (ppb)***
ESI-2	1,100	83	non detect
ESI-3	5J	non detect	non detect
PW-1	10	non detect	non detect
PW-2	950	230	36
PW-3	non detect	non detect	non detect

These concentrations show that the potassium permanganate injections have destroyed a considerable amount of the residual chemical presence in the groundwater. Of particular interest, the concentrations in PW-3, which is located in the vicinity of the original TCE degreaser, have been reduced to non-detect.

3.2 POTASSIUM PERMANGANATE INJECTION

This is the fourth round of potassium permanganate injections at the Site. The previous injections occurred as follows:

May 2000	5,300 lbs.
November 2000	6,600 lbs.
June 2001	6,600 lbs.
	18,500 lbs.

This fourth round of potassium permanganate injections was started in November 2005 but could not be completed prior to the onset of winter. A significant winter storm occurred on December 1, 2005 barring any further injections at that time. The injections resumed and were completed in May and July 2006. The details of the injections are as follows:

Date	*Well*	*KMnO4 Injected*	*Water Injected*
Nov. 29/05	IB-2	78 lbs.	200 gallons
	IB-3	78 lbs.	200 gallons
	IB-4	78 lbs.	200 gallons
	IB-5	78 lbs.	200 gallons
Nov. 30/05	ESI-2	450 lbs.	1,400 gallons
Nov. 30 – Dec. 1/05	PW-2	750 lbs.	2,345 gallons
Dec. 1 – 2/05	PW-3R	320 lbs.	1,000 gallons
May 12/06	ESI-7	67 lbs.	1,000 gallons
July 14/06	PW-3R	1,101 lbs	6,675 gallons
TOTALS		**3,000 lbs**	**13,220 gallons**

With the fourth injection event, a total of 21,500 pounds of potassium permanganate has been injected into the Site.

4.0 SOIL VAPOR INTRUSION ASSESSMENT

As requested by NYSDEC and NYSDOH, CRA has performed an assessment of the soil vapor intrusion potential at the Site. The full assessment is presented in Appendix B.

In summary, soil gas samples were collected at the Site in 1992. At that time, the soil gas samples were analyzed for Volatile Organic Compounds from 29 locations at depths ranging between 2 and 6 feet below the ground surface. The results for all but six of these samples were non-detect for TCE with the highest measured TCE soil gas concentration being 6.9 ppbv. Toluene was also present at one location at a concentration of 0.6 ppbv.

These samples were collected from the area around the former TCE degreaser with about one half of the sampling points being from locations that were beneath the floor slab of the then existing building.

Based upon the previous assessments, the potential for soil vapor intrusion at this Site is minimal. The following presents the reasons for this determination:

- The soil gas samples were collected at a time before any remediation for TCE was initiated at the Site. Consequently, the TCE concentrations present in the groundwater at that time were orders of magnitude higher than under the current conditions and the chemical mass was also orders of magnitude higher.
- About half of the soil gas samples were collected from locations beneath the floor slab of the building in which the TCE degreaser existed. This would have concentrated the expected concentrations in the vadose zone; but concentrations up to 6.9 ppbv were all that were present. Using this highest measured concentration in the vadose zone beneath the building, there would be no adverse affect on air quality within the building.
- The building over the vapor degreaser has been demolished and therefore no building now exists in the vicinity of the source area where the highest groundwater concentrations of TCE exist.
- The closest building is the Jamestown Container Corporation warehouse/manufacturing building. The highest concentration of TCE ever measured in the groundwater beneath this building is 180 ppb.

In order to further substantiate the above understanding of the potential for soil vapor intrusion, CRA performed an assessment of the soil gas conditions using the Johnson-Ettinger Model. To provide a current condition assessment, the most recent groundwater data from the October 2005 and November 2006 sample rounds were employed in the model. The results of this assessment show that there is minimal potential for adverse vapor intrusion into the Jamestown Container Corporation building even using the conservative assumptions employed by the Johnson-Ettinger model.

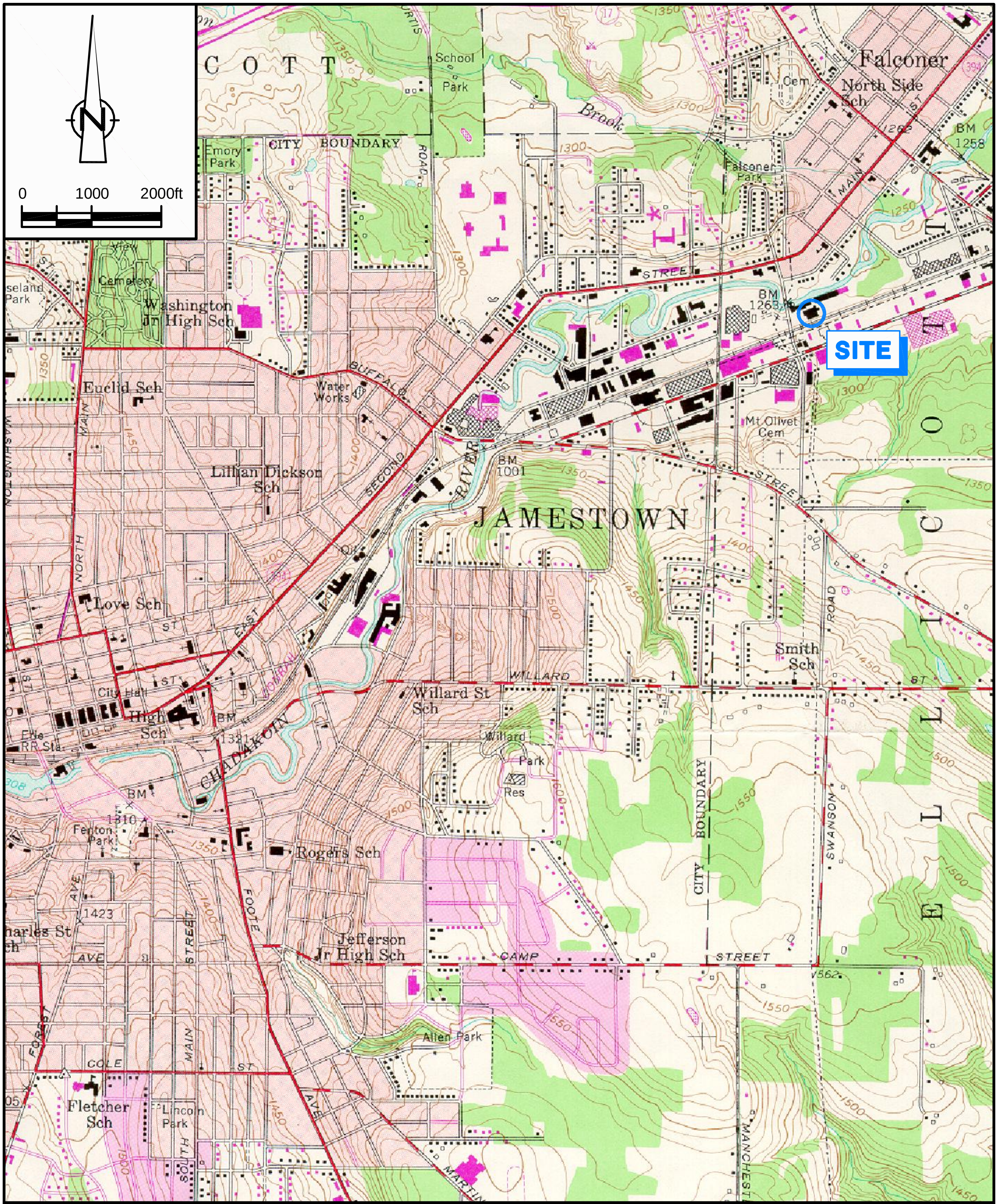
As agreed in the Work Plan, any future building construction on the Site will include provisions for soil gas controls or an assessment demonstrating that such controls are not necessary.

5.0 CONCLUSIONS AND RECOMMENDATIONS

Based upon the sampling performed during this reporting period, the following conclusions have been formulated:

- The sampling of the Chadakoin River continues to demonstrate that there is no impact of the Site groundwater conditions on the surface water quality in the river.
- The fourth round of potassium permanganate injection has successfully destroyed a considerable amount of TCE and its breakdown components, particularly in the immediate vicinity of the former TCE degreaser unit. The TCE degreaser area had the highest pre-injection concentrations. Well PW-3R is located in the vicinity of the former TCE degreaser and is the location where the largest portion of the potassium permanganate was injected. The TCE concentration at PW-3R is now non-detect.
- The concentrations of TCE and its breakdown components decreased at all of the monitoring locations following the injections.
- It will be necessary to continue monitoring to determine whether any rebound of the chemical concentrations occurs at the monitoring locations.
- There is no adverse soil vapor intrusion into the Jamestown Container Corporation building.

Based upon these conclusions, it is recommended that the results from the two semi annual sampling events planned for 2007 be completed before any further decisions are made on the need for additional injections of potassium permanganate or the ability of natural attenuation processes to meet the remediation goals for the Site.



SOURCE:

USGS JAMESTOWN, NEW YORK
QUADRANGLE, PHOTOREVISED 1979.

figure 2.1

SITE LOCATION MAP
FORMER DOWCRAFT CORPORATION
Falconer, New York

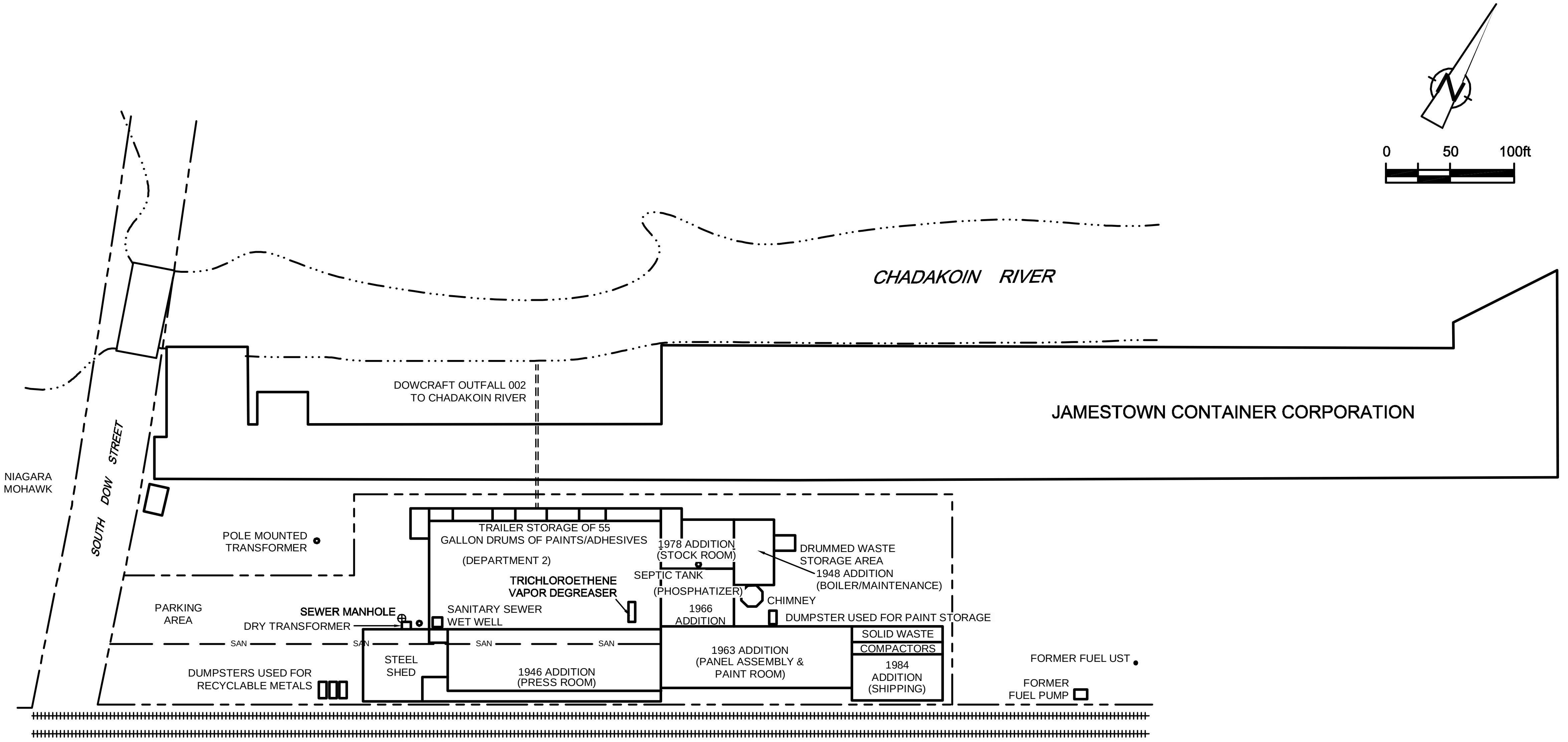
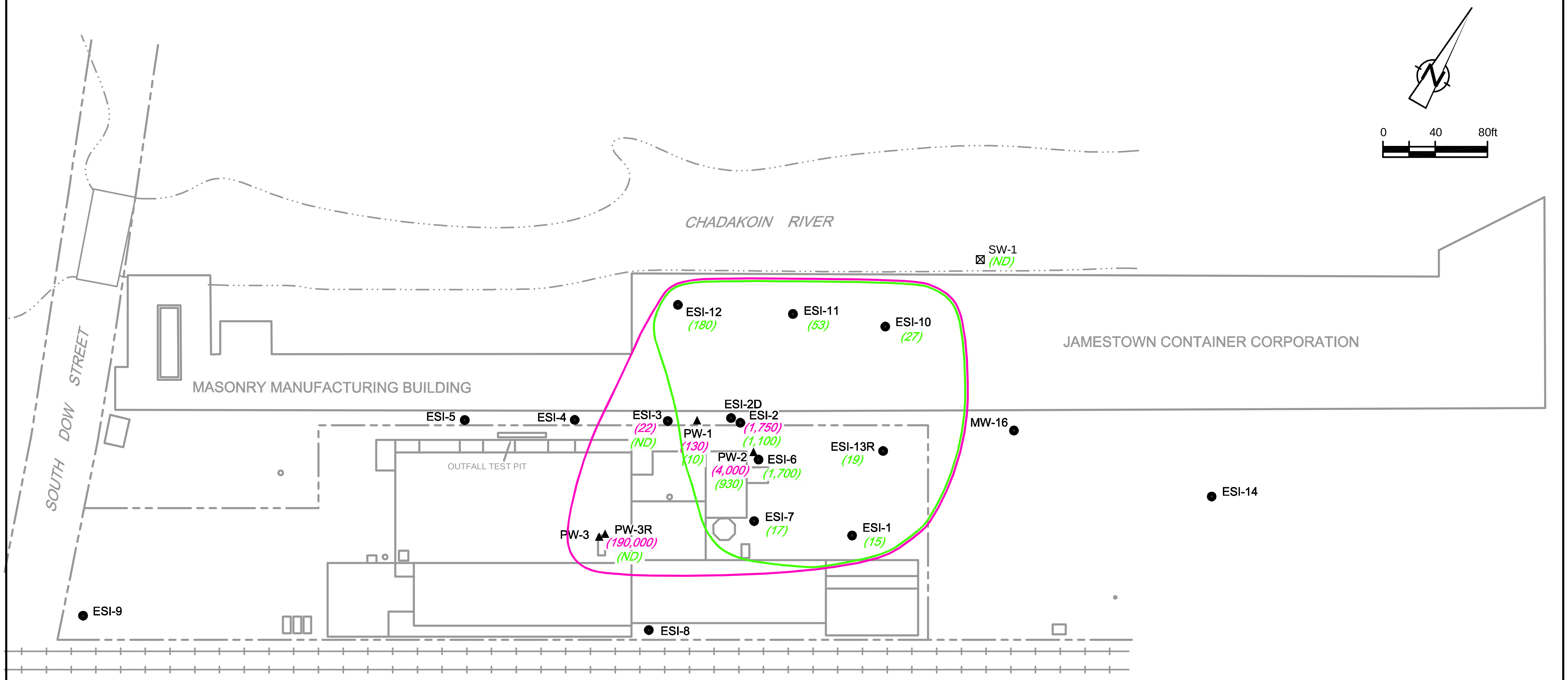


figure 2.2

SITE PLAN AND HISTORIC OPERATIONS
FORMER DOWCRAFT CORPORATION
Falconer, New York

05020-00(012)GN-WA002 FEB 12/2007



LEGEND

ESI-8 ● MONITORING WELL LOCATION

PW-3 ▲ PURGE WELL LOCATION

SW-1 ⊠ SURFACE WATER SAMPLE LOCATION

(22) TRICHLOROETHYLENE CONCENTRATION (ug/L), OCTOBER 2005

(17) TRICHLOROETHYLENE CONCENTRATION (ug/L), NOVEMBER 2006

(ND) NOT DETECTED

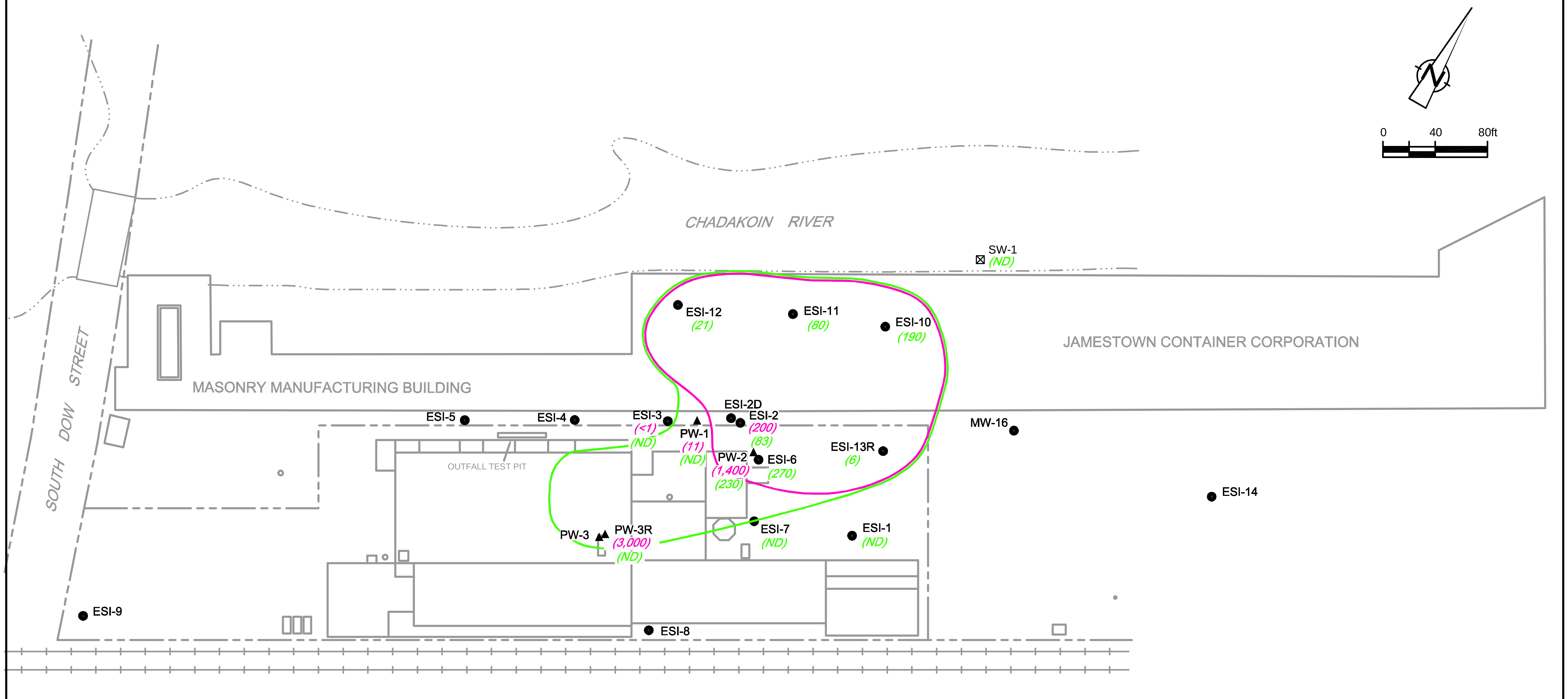
— ESTIMATED LIMIT OF TRICHLOROETHYLENE CONCENTRATIONS >5 ug/L, OCTOBER 2005

— ESTIMATED LIMIT OF TRICHLOROETHYLENE CONCENTRATIONS >5 ug/L, NOVEMBER 2006

figure 3.1

TRICHLOROETHYLENE CONCENTRATIONS
FORMER DOWCRAFT CORPORATION
Falconer, New York

05020-00(012)GN-WA003 FEB 14/2007



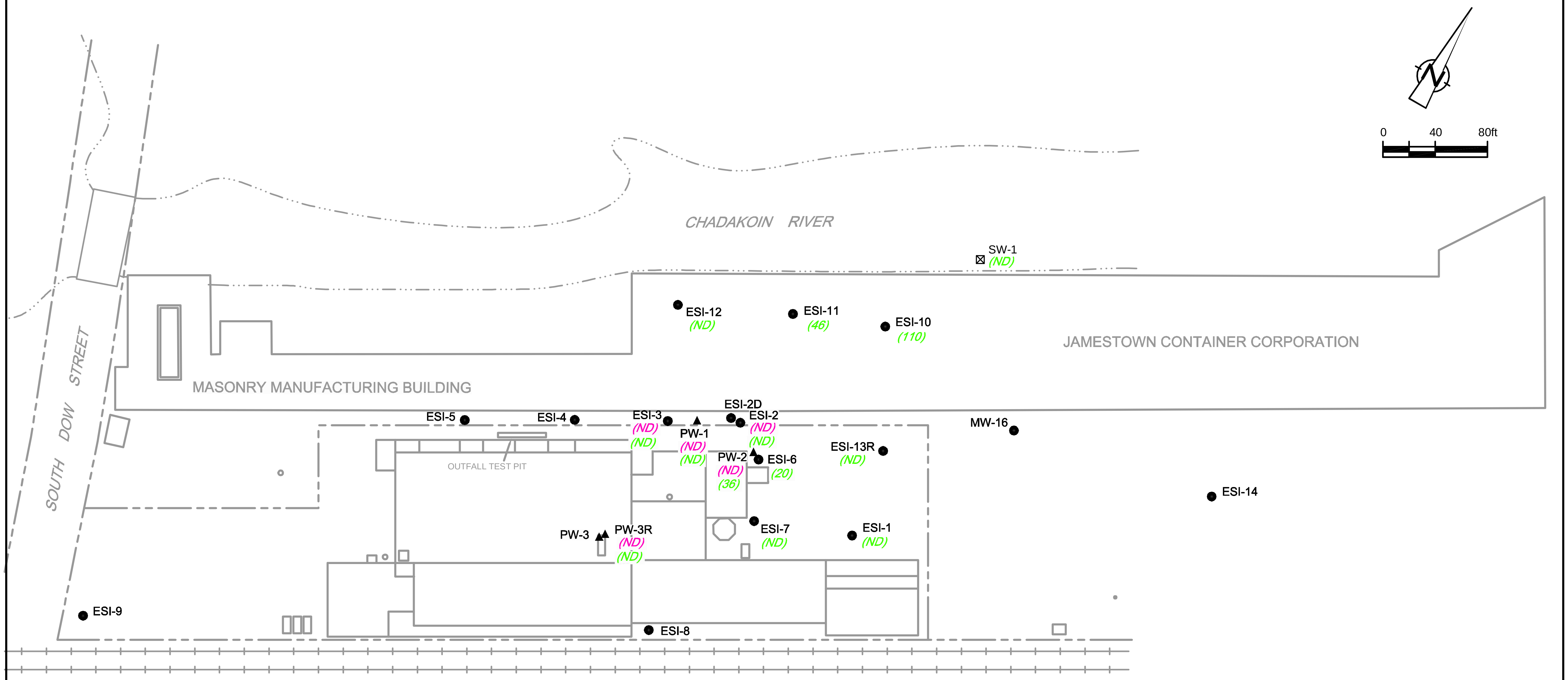
LEGEND

ESI-8 ●	MONITORING WELL LOCATION
PW-3 ▲	PURGE WELL LOCATION
SW-1 ☒	SURFACE WATER SAMPLE LOCATION
(22)	cis-1,2-DICHLOROETHENE CONCENTRATION (ug/L), OCTOBER 2005
(17)	cis-1,2-DICHLOROETHENE CONCENTRATION (ug/L), NOVEMBER 2006
(ND)	NOT DETECTED
━	ESTIMATED LIMIT OF cis-1,2-DICHLOROETHENE CONCENTRATIONS >5 ug/L, OCTOBER 2005
━	ESTIMATED LIMIT OF cis-1,2-DICHLOROETHENE CONCENTRATIONS >5 ug/L, NOVEMBER 2006

figure 3.2

cis-1,2-DICHLOROETHENE CONCENTRATIONS
FORMER DOWCRAFT CORPORATION
Falconer, New York

05020-00(012)GN-WA004 FEB 14/2007



LEGEND

ESI-8 ●	MONITORING WELL LOCATION
PW-3 ▲	PURGE WELL LOCATION
SW-1 ☒	SURFACE WATER SAMPLE LOCATION
(ND)	VINYL CHLORIDE CONCENTRATION (ug/L), OCTOBER 2005
(36)	VINYL CHLORIDE CONCENTRATION (ug/L), NOVEMBER 2006
(ND)	NOT DETECTED

figure 3.3

VINYL CHLORIDE CONCENTRATIONS
FORMER DOWCRAFT CORPORATION
Falconer, New York

05020-00(012)GN-WA005 FEB 14/2007

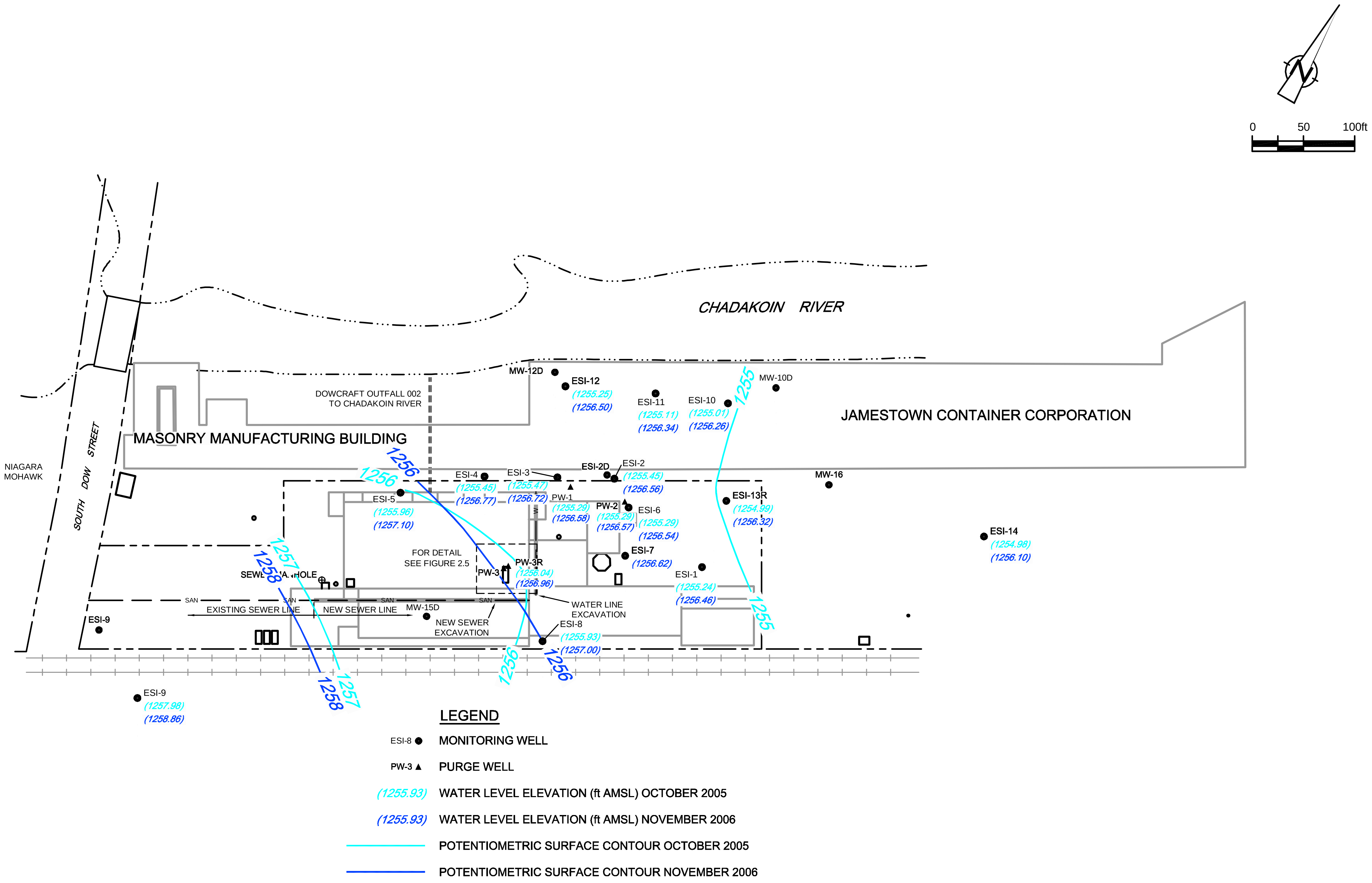


figure 3.4

GROUNDWATER ELEVATION 2005-2006
DOWCRAFT CORPORATION
Falconer, New York

05020-00(012)GN-WA006 FEB 14/2007

TABLE 1

GROUNDWATER ELEVATIONS 2005 - 2006
FORMER DOWCRAFT SITE
JAMESTOWN, NEW YORK

Well	*Top of Casing Elevation (Ft. AMSL)*	*Depth to Water October 25, 2005 (Ft. BTOC)*	*Water Elevation October 25, 2005 (Ft. AMSL)*	*Depth to Water 28-Nov-06 (Ft. BTOC)*	*Water Elevation 28-Nov-06 (Ft. AMSL)*
ESI-1	1264.17	8.93	1255.24	7.71	1256.46
ESI-2	1264.60	9.15	1255.45	8.04	1256.56
ESI-2D	1264.53	9.10	1255.43	NM	
ESI-3	1264.89	9.42	1255.47	8.17	1256.72
ESI-4	1265.06	9.61	1255.45	8.29	1256.77
ESI-5	1264.80	8.84	1255.96	7.7	1257.1
ESI-6	1264.66	9.37	1255.29	8.12	1256.54
ESI-7	1264.93	CNL		8.31	1256.62
ESI-8	1268.25	12.32	1255.93	11.25	1257
ESI-9	1265.99	8.01	1257.98	7.13	1258.86
ESI-10	1265.08	10.07	1255.01	8.82	1256.26
MW/ESI-10D	1265.17	10.12	1255.05	NM	
ESI-11	1265.09	9.98	1255.11	8.75	1256.34
ESI-12	1264.95	9.70	1255.25	8.45	1256.5
MW/ESI-12D	1264.67	9.40	1255.27	NM	
ESI-13				NM	
ESI-13R	1263.31	8.32	1254.99	6.99	1256.32
ESI-14	1262.58	7.60	1254.98	6.48	1256.1
MW/ESI-15	1265.31	CNL		NM	
MW/ESI-16	1263.40	8.51	1254.89	NM	
PW-1	1264.60	9.31	1255.29	8.02	1256.58
PW-2	1264.70	9.41	1255.29	8.13	1256.57
PW-3R	1265.04	9.00	1256.04	8.08	1256.96
IBH-1	1264.98	CNL		NM	
IBH-2	1265.00	9.43	1255.57	NM	
IBH-3	1265.14	CNL		NM	
IBH-4	1265.07	CNL		NM	
IBH-5	1265.13	CNL		NM	
RIVER BM		7.18		6.25	
River - USGS					

Notes:

Ft. AMSL	Feet Above Mean Sea Level.
Ft. BTOC	Feet Below Top of Casing.
NA	Not Applicable.
NM	Not Measured.
CNL	Cannot Locate Well
Bridge benchmark -	385.446 meter = 1,264.5866142 feet

USGS River Staff Gage Datum	1256.41	NAD29
Bridge benchmark by USGS	1264.92	NAD29

TABLE 2

ANALYTICAL RESULTS SUMMARY 2005 - 2006
GROUNDWATER MONITORING PROGRAM
DOWCRAFT CORPORATION
JAMESTOWN, NEW YORK
NOVEMBER 2006

	Sample Location:	*ESI-1*	*ESI-2*	*ESI-2*	*ESI-2*	*ESI-3*	*ESI-3*	*ESI-6*	*ESI-7*
	Sample Date:	*11/30/2006*	*10/26/2005*	*10/26/2005*	*11/29/2006*	*10/25/2005*	*11/29/2006*	*11/29/2006*	*11/30/2006*
	Sample ID:	*WG-5020-113006-KL-09*	*GW-5020-102605-KL-003*	*GW-5020-102605-KL-004*	*WG-5020-112906-KL-06*	*GW-5020-102505-KL-001*	*WG-5020-112906-KL-07*	*WG-5020-112906-KL-05*	*WG-5020-113006-KL-08*
Parameters	*Units*								
Volatile Organic Compounds									
1,1,1-Trichloroethane	µg/L	10 U	7 J	10 U	10 U	10 U	10 U	10 U	10 U
1,1,2,2-Tetrachloroethane	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
1,1,2-Trichloroethane	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
1,1-Dichloroethane	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
1,1-Dichloroethene	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
1,2,4-Trichlorobenzene	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
1,2-Dibromo-3-chloropropane (DBCP)	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
1,2-Dibromoethane (Ethylene Dibromide)	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
1,2-Dichlorobenzene	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
1,2-Dichloroethane	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
1,2-Dichloropropane	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
1,3-Dichlorobenzene	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
1,4-Dichlorobenzene	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
2-Butanone (Methyl Ethyl Ketone)	µg/L	10 U	4 J	3 J	10 U	10 U	10 U	10 U	10 U
2-Hexanone	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
4-Methyl-2-Pentanone (Methyl Isobutyl Ketone)	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Acetone	µg/L	10 U	24 U	22 U	10 U	13 U	10 U	10 U	10 U
Benzene	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Bromodichloromethane	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Bromoform	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Bromomethane (Methyl Bromide)	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Carbon disulfide	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Carbon tetrachloride	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Chlorobenzene	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Chloroethane	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Chloroform (Trichloromethane)	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Chloromethane (Methyl Chloride)	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
cis-1,2-Dichloroethene	µg/L	10 U	200	200	83	2 J	10 U	270	10 U
cis-1,3-Dichloropropene	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Cyclohexane	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Dibromochloromethane	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Dichlorodifluoromethane (CFC-12)	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Ethylbenzene	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Isopropylbenzene	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Methyl acetate	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Methyl cyclohexane	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Methyl Tert Butyl Ether	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Methylene chloride	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Styrene	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Tetrachloroethene	µg/L	10 U	3 J	4 J	3 J	10 U	10 U	6 J	10 U
Toluene	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
trans-1,2-Dichloroethene	µg/L	10 U	2 J	2 J	2 J	10 U	10 U	3 J	10 U
trans-1,3-Dichloropropene	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Trichloroethene	µg/L	15	1800	1700	1100	22	5 J	1700	17
Trichlorofluoromethane (CFC-11)	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Trifluorotrichloroethane (Freon 113)	µg/L	10 UJ	10 U	10 U	10 UJ	10 U	10 U	10 UJ	10 UJ
Vinyl chloride	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	20	10 U
Xylene (total)	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Metals									
Arsenic	µg/L	2.3 U			2.3 U		2.3 U	2.3 U	2.3 U
Manganese	µg/L	8.1 J			139		367	2330	1.5 J
General Chemistry									
Nitrate (as N)	mg/L	2.66			2.28		2.70	2.24	3.56
Sulfate	mg/L	33.0			59.5		85.0	49.0	44.5

Notes:

J - Estimated.
U - Non-detect at associated value.

TABLE 2

ANALYTICAL RESULTS SUMMARY 2005 - 2006
GROUNDWATER MONITORING PROGRAM
DOWCRAFT CORPORATION
JAMESTOWN, NEW YORK
NOVEMBER 2006

	Sample Location:	*ESI-10*	*ESI-11*	*ESI-12*	*ESI-13R*	*PW-1*	*PW-1*	*PW-1*	*PW-2*
	Sample Date:	*11/30/2006*	*11/30/2006*	*11/30/2006*	*11/30/2006*	*10/26/2005*	*11/29/2006*	*11/29/2006*	*10/26/2005*
	Sample ID:	*WG-5020-113006-KL-12*	*WG-5020-113006-KL-13*	*WG-5020-113006-KL-11*	*WG-5020-113006-KL-10*	*GW-5020-102605-KL-002*	*WG-5020-112906-KL-02*	*WG-5020-112906-KL-03*	*GW-5020-102605-KL-006*
Parameters	*Units*								
Volatile Organic Compounds									
1,1,1-Trichloroethane	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
1,1,2,2-Tetrachloroethane	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
1,1,2-Trichloroethane	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
1,1-Dichloroethane	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
1,1-Dichloroethene	µg/L	1 J	10 U	10 U	10 U	10 U	10 U	10 U	3 J
1,2,4-Trichlorobenzene	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
1,2-Dibromo-3-chloropropane (DBCP)	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
1,2-Dibromoethane (Ethylene Dibromide)	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
1,2-Dichlorobenzene	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
1,2-Dichloroethane	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
1,2-Dichloropropane	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
1,3-Dichlorobenzene	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
1,4-Dichlorobenzene	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
2-Butanone (Methyl Ethyl Ketone)	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
2-Hexanone	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
4-Methyl-2-Pentanone (Methyl Isobutyl Ketone)	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Acetone	µg/L	10 U	10 U	10 U	10 U	11 U	10 U	10 U	10 U
Benzene	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Bromodichloromethane	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Bromoform	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Bromomethane (Methyl Bromide)	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Carbon disulfide	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Carbon tetrachloride	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Chlorobenzene	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Chloroethane	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Chloroform (Trichloromethane)	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Chloromethane (Methyl Chloride)	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
cis-1,2-Dichloroethene	µg/L	190	80	21	6 J	11	10 U	10 U	1400
cis-1,3-Dichloropropene	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Cyclohexane	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Dibromochloromethane	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Dichlorodifluoromethane (CFC-12)	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Ethylbenzene	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Isopropylbenzene	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Methyl acetate	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Methyl cyclohexane	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Methyl Tert Butyl Ether	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Methylene chloride	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Styrene	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Tetrachloroethene	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	9 J
Toluene	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
trans-1,2-Dichloroethene	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	13 J
trans-1,3-Dichloropropene	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Trichloroethene	µg/L	27	53	180	19	130	10	10	4000
Trichlorofluoromethane (CFC-11)	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Trifluorotrichloroethane (Freon 113)	µg/L	10 U	10 U	10 UJ	10 UJ	10 U	10 U	10 U	10 U
Vinyl chloride	µg/L	110	46	10 U	10 U	10 U	10 U	10 U	51 J
Xylene (total)	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Metals									
Arsenic	µg/L	2.3 U	2.3 U	2.3 U	2.3 U		2.3 U	2.3 U	
Manganese	µg/L	372	1010	37.0	3.4 J		858 J	448 J	
General Chemistry									
Nitrate (as N)	mg/L	0.25	0.29	2.61	2.44		3.02	3.06	
Sulfate	mg/L	61.8	64.0	103	49.2		98.5	99.0	

Notes:

J - Estimated.
U - Non-detect at associated value.

TABLE 2

ANALYTICAL RESULTS SUMMARY 2005 - 2006
GROUNDWATER MONITORING PROGRAM
DOWCRAFT CORPORATION
JAMESTOWN, NEW YORK
NOVEMBER 2006

	Sample Location:	*PW-2*	*PW-3R*	*PW-3R*	*River*
	Sample Date:	*11/29/2006*	*10/26/2005*	*11/29/2006*	*11/30/2006*
	Sample ID:	*WG-5020-112906-KL-04*	*GW-5020-102605-KL-005*	*WG-5020-112906-KL-01*	*WS-5020-113006-KL-14*
Parameters	*Units*				
Volatile Organic Compounds					
1,1,1-Trichloroethane	µg/L	10 U	5 J	10 U	10 U
1,1,2,2-Tetrachloroethane	µg/L	10 U	10 U	10 U	10 U
1,1,2-Trichloroethane	µg/L	10 U	6 J	2 J	10 U
1,1-Dichloroethane	µg/L	10 U	11	3 J	10 U
1,1-Dichloroethene	µg/L	10 U	14	10 U	10 U
1,2,4-Trichlorobenzene	µg/L	10 U	10 U	10 U	10 U
1,2-Dibromo-3-chloropropane (DBCP)	µg/L	10 U	10 U	10 U	10 U
1,2-Dibromoethane (Ethylene Dibromide)	µg/L	10 U	10 U	10 U	10 U
1,2-Dichlorobenzene	µg/L	10 U	10 U	10 U	10 U
1,2-Dichloroethane	µg/L	10 U	2 J	10 U	10 U
1,2-Dichloropropane	µg/L	10 U	10 U	10 U	10 U
1,3-Dichlorobenzene	µg/L	10 U	10 U	10 U	10 U
1,4-Dichlorobenzene	µg/L	10 U	10 U	10 U	10 U
2-Butanone (Methyl Ethyl Ketone)	µg/L	10 U	10 U	18	10 U
2-Hexanone	µg/L	10 U	10 U	3 J	10 U
4-Methyl-2-Pentanone (Methyl Isobutyl Ketone)	µg/L	10 U	10 U	10 U	10 U
Acetone	µg/L	10 U	17 U	88	10 U
Benzene	µg/L	10 U	1 J	10 U	10 U
Bromodichloromethane	µg/L	10 U	10 U	10 U	10 U
Bromoform	µg/L	10 U	10 U	1 J	10 U
Bromomethane (Methyl Bromide)	µg/L	10 U	10 U	10 U	10 U
Carbon disulfide	µg/L	10 U	10 U	10 U	10 U
Carbon tetrachloride	µg/L	10 U	10 U	10 U	10 U
Chlorobenzene	µg/L	10 U	10 U	10 U	10 U
Chloroethane	µg/L	10 U	10 U	10 U	10 U
Chloroform (Trichloromethane)	µg/L	10 U	10 U	10 U	10 U
Chloromethane (Methyl Chloride)	µg/L	10 U	10 U	10 U	10 U
cis-1,2-Dichloroethene	µg/L	230	3000 J	10 U	10 U
cis-1,3-Dichloropropene	µg/L	10 U	10 U	10 U	10 U
Cyclohexane	µg/L	10 U	10 U	10 U	10 U
Dibromochloromethane	µg/L	10 U	10 U	10 U	10 U
Dichlorodifluoromethane (CFC-12)	µg/L	10 U	10 U	10 U	10 U
Ethylbenzene	µg/L	10 U	10 U	10 U	10 U
Isopropylbenzene	µg/L	10 U	10 U	10 U	10 U
Methyl acetate	µg/L	10 U	10 U	10 U	10 U
Methyl cyclohexane	µg/L	10 U	10 U	10 U	10 U
Methyl Tert Butyl Ether	µg/L	10 U	10 U	10 U	10 U
Methylene chloride	µg/L	10 U	10 U	10 U	10 U
Styrene	µg/L	10 U	10 U	10 U	10 U
Tetrachloroethene	µg/L	4 J	53	10 U	10 U
Toluene	µg/L	10 U	11	10 U	10 U
trans-1,2-Dichloroethene	µg/L	5 J	18 J	10 U	10 U
trans-1,3-Dichloropropene	µg/L	10 U	10 U	10 U	10 U
Trichloroethene	µg/L	930	190000	10 U	10 U
Trichlorofluoromethane (CFC-11)	µg/L	10 U	10 U	10 U	10 U
Trifluorotrichloroethane (Freon 113)	µg/L	10 U	10 U	10 U	10 U
Vinyl chloride	µg/L	36	50 J	10 U	10 U
Xylene (total)	µg/L	10 U	10 U	10 U	10 U
Metals					
Arsenic	µg/L	2.3 U		23.7	-
Manganese	µg/L	5040		85300	-
General Chemistry					
Nitrate (as N)	mg/L	1.30		0.96	-
Sulfate	mg/L	46.5		33.0	-

Notes:

J - Estimated.
U - Non-detect at associated value.

TABLE 3

FIELD PARAMETERS SUMMARY 2005 - 2006
FORMER DOWCRAFT SITE
JAMESTOWN, NEW YORK

Well ID	*Date*	*Gallons*	*Time*	*pH (s.u.)*	*Specific Conductance (mS/cm)*	*Temp. (°C)*	*Turbidity (NTU)*	*Dissolved Oxygen* (mg/L)	*Oxidation Reduction Potential (mV)*	*Total Iron (mg/L)*	*Ferrous Iron (mg/L)*
ESI-2	10/26/05	1	11:21	7.52	0.97	13.7	999	4.5			
Volume = 0.7 gal.		5	11:28	7.69	0.98	14.3	556	4.7			
		10	11:41	7.73	0.99	14.9	415	3.9			
		15	11:49	7.83	0.98	14.9	292	4.2			
		20	12:02	7.84	0.98	15.0	212	4.6			
		25	12:09	7.90	0.96	14.7	175	4.7			
		30	12:16	7.88	0.98	14.9	120	4.8			
		Sampling	12:20	8.18	0.91	14.4	999	6.2			
ESI-3	10/25/05	10	17:02	6.00	0.57	12.8	432	4.8			
Volume = 0.6 gal.		14	17:04	7.29	0.61	13.4	246	5.5			
		16	17:06	7.37	0.62	13.7	169	5.2			
		18	17:08	7.48	0.63	13.5	201	5.8			
		20	17:10	7.55	0.64	13.5	111	5.8			
		22	17:11	7.61	0.65	13.9	85	6.6			
		23	17:12	7.66	0.65	13.8	107	5.8			
		24	17:14	7.65	0.66	13.9	97	6.0			
		26	17:15	7.69	0.67	13.5	87	5.9			
		28	17:17	7.70	0.67	13.7	56	5.3			
		30	17:18	7.73	0.68	14.0	53	5.9			
		32	17:19	7.72	0.68	14.0	46	5.2			
		Sampling	17:30	7.77	0.67	13.6	206	7.1			
PW-1	10/26/05	1	11:05	7.20	0.83	13.6	104	2.4			
Volume = 16.5 gal.		2	11:10	7.33	0.86	14.1	68	2.9			
		3	11:25	7.66	0.86	14.5	448	3.6			
		4	11:36	7.75	0.88	14.9	48	3.6			
		Sampling	11:45	7.88	0.86	14.5	20	3.0			
PW-2	10/26/05	1	13:34	8.59	1.03	12.6	189	3.3			
Volume = 19.5 gal.		2	13:50	8.08	1.04	13.4	349	3.5			
		3	17:10	8.36	1.03	12.8	52	2.7			
		4	17:45	8.10	1.05	13.2	10	2.4			
		Sampling	18:00	7.97	1.05	13.4	96	2.0			

TABLE 3

FIELD PARAMETERS SUMMARY 2005 - 2006
FORMER DOWCRAFT SITE
JAMESTOWN, NEW YORK

Well ID	*Date*	*Gallons*	*Time*	*pH (s.u.)*	*Specific Conductance (mS/cm)*	*Temp. (°C)*	*Turbidity (NTU)*	*Dissolved Oxygen* (mg/L)	*Oxidation Reduction Potential (mV)*	*Total Iron (mg/L)*	*Ferrous Iron (mg/L)*
PW-3R	10/26/05	0.5	15:05	8.50	0.71	10.9	456	2.0			
Volume = 42.5 gal.		1	15:21	8.85	0.67	11.1	293	2.7			
		2	16:05	8.93	0.63	11.1	213	2.9			
		4	16:33	8.73	0.63	11.4	256	2.6			
		Sampling	16:40	9.06	0.47	12.0	842	2.6			
ESI-1	11/30/06	0-2	pre-purge to clear sediment								
Volume = 0.9 gal.		4	9:33	6.46	1.13	11.9	0	3.8	454		
		5	9:36	6.48	1.10	11.8	0	3.8	455		
		6	9:39	6.48	0.93	11.8	0	3.9	457		
		7	9:42	6.43	0.90	11.8	0	3.9	455		
		8	9:45	6.40	0.90	11.8	0	4.0	455		
			9:50	Samples collected						0	0
ESI-2	11/29/06	0-3	pre-purge to clear sediment								
Volume = 0.91 gal.		4	15:15	6.91	1.35	13.1	90	0.0	444		
		5	15:17	6.91	1.35	13.1	84	0.0	448		
		6	15:19	6.89	1.34	13.1	80	0.0	449		
		7	15:21	6.88	1.34	13.1	77	0.0	452		
		8	15:23	6.88	1.34	13.1	80	0.0	453		
		9	15:25	6.87	1.34	13.1	84	0.0	456		
		10	15:27	6.87	1.34	13.1	82	0.0	458		
		11	15:29	6.88	1.34	13.1	79	0.0	459		
			15:35	Samples collected						0.14	0.09
ESI-3	11/29/06	0-5	pre-purge to clear sediment								
Volume = 0.85 gal.		6	16:28	6.82	1.21	13.1	116	5.2	440		
		7	16:31	6.79	1.21	13.1	136	4.6	446		
		8	16:34	6.83	1.21	13.1	111	4.8	447		
		9	16:37	6.81	1.21	13.1	75	4.7	448		
		10	16:40	6.81	1.21	13.1	62	4.6	448		
			17:00	Samples collected						0.96	0.82

TABLE 3

FIELD PARAMETERS SUMMARY 2005 - 2006
FORMER DOWCRAFT SITE
JAMESTOWN, NEW YORK

Well ID	*Date*	*Gallons*	*Time*	*pH (s.u.)*	*Specific Conductance (mS/cm)*	*Temp. (°C)*	*Turbidity (NTU)*	*Dissolved Oxygen* (mg/L)	*Oxidation Reduction Potential (mV)*	*Total Iron (mg/L)*	*Ferrous Iron (mg/L)*
ESI-6	11/29/06	.75	13:42	6.96	1.26	13.6	999	0.0	457		
Volume = 0.75 gal.		2	13:45	6.89	1.26	13.5	325	0.0	454		
		2.75	13:47	6.90	1.26	13.6	123	0.0	449		
		4	13:49	6.90	1.26	13.6	66	0.0	446		
		5	13:51	6.90	1.26	13.5	49	0.0	444		
		6	13:54	6.91	1.26	13.5	34	0.0	441		
			14:10	Samples collected			23			0.17	0.14
ESI-7	11/30/06	0-2	pre-purge to clear sediment								
Volume = 0.80 gal.		3	8:32	6.41	0.63	13.5	0	3.7	549		
		4	8:37	6.43	0.63	13.5	0	3.7	539		
		5	8:42	6.54	0.62	13.5	0	3.9	523		
		6	8:46	6.55	0.63	13.5	0	3.9	513		
		7	8:51	6.59	0.64	13.5	0	4.0	498		
		8	8:56	6.63	0.65	13.5	0	4.1	489		
			9:00	Samples collected						0.06	0.05
ESI-10	11/30/06	1	12:20	6.36	0.73	14.9	16	0.0	262		
Volume = 0.9 gal.		2	12:24	6.30	0.75	14.9	0	0.0	209		
		3	12:28	6.24	0.76	14.9	0	0.0	196		
		4	12:32	6.22	0.79	14.9	0	0.0	182		
		5	12:36	6.22	0.79	14.9	0	0.0	176		
			12:40	Samples collected						0.78	0.72
ESI-11	11/30/06	0-1	pre-purge to clear sediment								
Volume = 1 gal.		2	13:00	6.30	0.84	15.4	29	0.0	56		
		3	13:02	6.34	0.85	15.4	11	0.0	51		
		4	13:04	6.36	0.85	15.4	0	0.0	45		
		5	13:06	6.37	0.85	15.4	0	0.0	40		
		6	13:08	6.38	0.86	15.4	0	0.0	30		
		7	13:10	6.39	0.86	15.4	0	0.0	26		
		8	13:12	6.39	0.86	15.4	0	0.0	21		
			13:15	Samples collected						3.08	2.12

TABLE 3

FIELD PARAMETERS SUMMARY 2005 - 2006
FORMER DOWCRAFT SITE
JAMESTOWN, NEW YORK

Well ID	*Date*	*Gallons*	*Time*	*pH* *(s.u.)*	*Specific Conductance* *(mS/cm)*	*Temp.* *(°C)*	*Turbidity* *(NTU)*	*Dissolved Oxygen* (mg/L)	*Oxidation Reduction Potential* *(mV)*	*Total Iron* *(mg/L)*	*Ferrous Iron* *(mg/L)*
ESI-12	11/30/06	1	11:50	6.64	0.96	15.2	174	2.3	408		
Volume = 0.95 gal.		2	11:53	6.60	0.98	15.1	180	1.8	415		
		3	11:55	6.58	0.98	15.1	65	1.6	417		
		4	11:57	6.58	0.98	15.1	15	1.5	420		
		5	12:00	6.59	0.98	15.1	0	1.5	422		
			12:10	Samples collected						0.78	0.65
ESI-13R	11/30/06	0-1	pre-purge to clear sediment								
Volume = 1.17 gal.		2.5	10:30	6.39	0.58	14.2	16	1.6	421		
		4	10:33	6.31	0.57	14.2	0	1.5	430		
		5.5	10:38	6.29	0.57	14.2	0	1.4	440		
		7	10:41	6.31	0.57	14.2	0	1.4	443		
			10:45	Samples collected						0	0
PW-1	11/29/06	0-7	pre-purge to clear sediment								
Volume = 21 gal.		8	10:31	6.59	1.31	13.2	269	3.1	529		
		9	10:36	6.56	1.30	13.2	215	3.0	528		
		10	10:41	6.58	1.30	13.2	200	3.0	525		
		11	10:46	6.60	1.30	13.2	158	3.0	522		
		12	10:51	6.62	1.30	13.2	135	23.0	520		
		13	10:56	6.64	1.30	13.2	120	2.9	516		
		14	11:01	6.68	1.30	13.2	90	3.0	512		
		15	11:06	6.71	1.30	13.2	88	3.0	509	1.82	0.33
			11:10	Samples collected							
PW-2	11/29/06	0-8	pre-purge to clear sediment								
Volume = 21 gal.		9.5	12:10	7.02	1.35	13.5	191	0.0	545		
		11	12:15	6.99	1.36	13.5	157	0.0	552		
		12.5	12:20	7.00	1.36	13.5	124	0.0	549		
		14	12:25	7.01	1.36	13.6	105	0.0	541		
		15.5	12:30	6.99	1.36	13.6	99	0.0	538		
		17	12:35	7.03	1.36	13.6	98	3.6	534		
		18.5	12:40	7.01	1.36	13.6	82	0.0	533		
		20	12:45	6.99	1.35	13.5	67	0.0	531	1.60	1.15
			12:50	Samples collected							

TABLE 3

FIELD PARAMETERS SUMMARY 2005 - 2006
FORMER DOWCRAFT SITE
JAMESTOWN, NEW YORK

Well ID	*Date*	*Gallons*	*Time*	*pH (s.u.)*	*Specific Conductance (mS/cm)*	*Temp. (°C)*	*Turbidity (NTU)*	*Dissolved Oxygen* (mg/L)	*Oxidation Reduction Potential (mV)*	*Total Iron (mg/L)*	*Ferrous Iron (mg/L)*
PW-3R	11/29/06	3	8:13	9.21	2.67	12.3	999	18.2	543		
Volume = 44 gal.		5.5	8:18	9.15	1.90	12.6	999	19.1	547		
		7	8:23	9.12	1.84	12.5	999	18.6	547		
		8	8:28	9.14	1.86	12.5	693	18.3	546		
		9	8:33	9.12	1.82	12.5	419	17.2	543		
		10	8:38	9.10	1.75	12.5	529	16.4	540		
		11	8:43	9.03	1.72	12.5	480	15.4	540		
		14	8:48	8.88	1.56	12.5	395	14.4	543		
		16	8:53	8.87	1.57	12.6	335	13.3	545		
		17	8:58	8.83	1.60	12.6	299	12.7	548		
		18	9:03	8.83	1.63	12.6	273	12.5	548		
		19	9:08	8.78	1.68	12.6	237	12.1	549		
		20	9:13	8.80	1.72	12.6	238	12.1	550		
		21	9:18	8.80	1.75	12.6	226	12.2	551	2.03	24.75
			9:20	samples collected							
River	11/30/06		14:15	7.72	0.25	8.9	0	11.2	192	nm	nm

Notes:

mV	Millivolts
mS/cm.	Milliseimens per centimeter
s.u.	Standard Unit.
mg/L	Milligrams/Liter.
999	Turbidity reading at maximum value on meter.
nm	not measured

APPENDIX A

QA/QC REVIEWS 2005 – 2006

CONESTOGA-ROVERS
& ASSOCIATES

2055 Niagara Falls Blvd., Suite #3
Niagara Falls, New York 14304
Telephone: (716) 297-6150 Fax: (716) 297-2265
www.CRAworld.com

MEMORANDUM

TO: Jim Kay

REF. NO.: 5020

FROM: Karen Bevilacqua/jbh/13 KB | jbh

DATE: December 8, 2005

E-Mail and Interoffice Mail

C.C.: Carol Barron

RE: **Analytical Results and QA/QC Review**
Groundwater Monitoring Program
Dowcraft Corporation
Jamestown, New York
October 2005

PREVIOUSLY TRANSMITTED
BY E-MAIL

INTRODUCTION

Six water samples were collected at the Dowcraft Site (Site) in Jamestown, New York, in October 2005. The Chain of Custody is attached.

The samples were analyzed by H2M Laboratories, Inc. (H2M) in Melville, New York for Target Compound List (TCL) volatile organic compounds (VOCs). The samples were analyzed using United States Environmental Protection Agency (USEPA) Method 8260 referenced from "Test Methods for Evaluating Solid Wastes, Physical/Chemical Methods", SW-846, 3rd Edition, September 1986 (with all subsequent revisions).

A sampling and analysis summary is presented in Table 1 and the analytical results are summarized in Table 2. The quality assurance/quality control (QA/QC) criteria by which these data have been assessed are outlined in the analytical method and the document entitled "National Functional Guidelines for Organic Data Review", October 1999. Data assessment was based on information obtained from final data sheets, blank data, duplicate results, surrogate recoveries, and spike recoveries.

QA/QC REVIEW

All samples were prepared and analyzed within the method-required holding times. All samples were properly preserved and maintained at 4°C (±2°C).

Method blanks were analyzed with the investigative samples for VOCs. All method blanks were non-detect for the compounds of interest with the exception of acetone, carbon disulfide, and trichloroethene. All associated sample results for acetone and carbon disulfide with concentrations similar to that found in the blank were qualified as non-detect (see Table 3). Sample results for trichloroethene

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were significantly higher than the concentration found in the blank and no qualification of data was necessary.

All samples, blanks, and QC samples were spiked with surrogate compounds prior to sample analysis in accordance with the organic method. All surrogate spike recoveries met the associated method criteria indicating adequate analytical efficiency.

A trip blank was collected and transported with the investigative samples for analysis as shown in Table 1. All trip blank results were non-detect for the compounds of interest with the exception of acetone, methylene chloride, and trichloroethene. All associated sample results for acetone and methylene chloride with concentrations similar to that found in the blank were qualified as non-detect (see Table 4). Sample results for trichloroethene were significantly higher than the concentration found in the blank and no qualification of data was necessary.

Blank spikes (BS) were prepared and analyzed for VOCs. All recoveries were within the laboratory control limits indicating good analytical accuracy with the exception of high recoveries for vinyl chloride and trans-1,2-dichloroethene. All associated positive sample results were qualified as estimated based on the implied high bias (see Table 5) and all non-detect results would not have been impacted.

A matrix spike/matrix spike duplicate (MS/MSD) was performed on sample GW-5020-102605-KL-002. All recoveries were within laboratory control limits indicating good analytical accuracy and precision. Trichloroethene could not be assessed as the sample concentration was significantly greater than the spiking concentration.

A field duplicate sample was collected and analyzed as shown in Table 1. All results showed good field and analytical precision.

CONCLUSION

Based on the preceding data assessment, the data presented in Table 2 were judged to be acceptable with the qualifications noted.

TABLE 1

SAMPLE COLLECTION AND ANALYSIS SUMMARY
GROUNDWATER MONITORING PROGRAM
DOWCRAFT CORPORATION
JAMESTOWN, NEW YORK
OCTOBER 2005

Sample ID	*Location ID*	*Collection Date (mm/dd/yy)*	*Collection Time (hr:min)*	*Parameters* VOCs	*Comments*
GW-5020-102505-KL-001	ESI-3	10/25/05	17:30	x	
GW-5020-102605-KL-002	PW-1	10/26/05	11:45	x	
GW-5020-102605-KL-003	ESI-2	10/26/05	12:20	x	
GW-5020-102605-KL-004	ESI-2	10/26/05	13:00	x	Field duplicate of GW-5020-102605-KL-003
GW-5020-102605-KL-005	PW-3R	10/26/05	16:40	x	
GW-5020-102605-KL-006	PW-2	10/26/05	18:00	x	
W-5020-102505-Tripblank	Trip Blank	10/25/05	--	x	Trip Blank

Notes:

-	Not applicable.
VOCs	Volatile Organic Compounds.

TABLE 2

ANALYTICAL RESULTS SUMMARY
GROUNDWATER MONITORING PROGRAM
DOWCRAFT CORPORATION
JAMESTOWN, NEW YORK
OCTOBER 2005

	Location Name:	*ESI-3*	*ESI-2*	*ESI-2*	*PW-1*	*PW-2*	*PW-3R*
	Sample Date:	*10/25/2005*	*10/26/2005*	*10/26/2005*	*10/26/2005*	*10/26/2005*	*10/26/2005*
	Sample Name:	*GW-5020-102505-KL-001*	*GW-5020-102605-KL-003*	*GW-5020-102605-KL-004* *(Field Duplicate)*	*GW-5020-102605-KL-002*	*GW-5020-102605-KL-006*	*GW-5020-102605-KL-005*
Parameters	*Units*						
Volatile Organics							
1,1,1-Trichloroethane	µg/L	10 U	7 J	10 U	10 U	10 U	5 J
1,1,2,2-Tetrachloroethane	µg/L	10 U	10 U	10 U	10 U	10 U	10 U
1,1,2-Trichloroethane	µg/L	10 U	10 U	10 U	10 U	10 U	6 J
1,1-Dichloroethane	µg/L	10 U	10 U	10 U	10 U	10 U	11
1,1-Dichloroethene	µg/L	10 U	10 U	10 U	10 U	3 J	14
1,2,4-Trichlorobenzene	µg/L	10 U	10 U	10 U	10 U	10 U	10 U
1,2-Dibromo-3-chloropropane (DBCP)	µg/L	10 U	10 U	10 U	10 U	10 U	10 U
1,2-Dibromoethane (Ethylene Dibromide)	µg/L	10 U	10 U	10 U	10 U	10 U	10 U
1,2-Dichlorobenzene	µg/L	10 U	10 U	10 U	10 U	10 U	10 U
1,2-Dichloroethane	µg/L	10 U	10 U	10 U	10 U	10 U	2 J
1,2-Dichloropropane	µg/L	10 U	10 U	10 U	10 U	10 U	10 U
1,3-Dichlorobenzene	µg/L	10 U	10 U	10 U	10 U	10 U	10 U
1,4-Dichlorobenzene	µg/L	10 U	10 U	10 U	10 U	10 U	10 U
2-Butanone (Methyl Ethyl Ketone)	µg/L	10 U	4 J	3 J	10 U	10 U	10 U
2-Hexanone	µg/L	10 U	10 U	10 U	10 U	10 U	10 U
4-Methyl-2-Pentanone (Methyl Isobutyl Ketone)	µg/L	10 U	10 U	10 U	10 U	10 U	10 U
Acetone	µg/L	13 U	24 U	22 U	11 U	10 U	17 U
Benzene	µg/L	10 U	10 U	10 U	10 U	10 U	1 J
Bromodichloromethane	µg/L	10 U	10 U	10 U	10 U	10 U	10 U
Bromoform	µg/L	10 U	10 U	10 U	10 U	10 U	10 U
Bromomethane (Methyl Bromide)	µg/L	10 U	10 U	10 U	10 U	10 U	10 U
Carbon disulfide	µg/L	10 U	10 U	10 U	10 U	10 U	10 U
Carbon tetrachloride	µg/L	10 U	10 U	10 U	10 U	10 U	10 U
Chlorobenzene	µg/L	10 U	10 U	10 U	10 U	10 U	10 U
Chloroethane	µg/L	10 U	10 U	10 U	10 U	10 U	10 U
Chloroform (Trichloromethane)	µg/L	10 U	10 U	10 U	10 U	10 U	10 U
Chloromethane (Methyl Chloride)	µg/L	10 U	10 U	10 U	10 U	10 U	10 U
cis-1,2-Dichloroethene	µg/L	2 J	200	200	11	1400	3000 J
cis-1,3-Dichloropropene	µg/L	10 U	10 U	10 U	10 U	10 U	10 U
Cyclohexane	µg/L	10 U	10 U	10 U	10 U	10 U	10 U
Dibromochloromethane	µg/L	10 U	10 U	10 U	10 U	10 U	10 U
Dichlorodifluoromethane (CFC-12)	µg/L	10 U	10 U	10 U	10 U	10 U	10 U
Ethylbenzene	µg/L	10 U	10 U	10 U	10 U	10 U	10 U
Isopropylbenzene	µg/L	10 U	10 U	10 U	10 U	10 U	10 U
Methyl acetate	µg/L	10 U	10 U	10 U	10 U	10 U	10 U
Methyl cyclohexane	µg/L	10 U	10 U	10 U	10 U	10 U	10 U
Methyl Tert Butyl Ether	µg/L	10 U	10 U	10 U	10 U	10 U	10 U
Methylene chloride	µg/L	10 U	10 U	10 U	10 U	10 U	10 U
Styrene	µg/L	10 U	10 U	10 U	10 U	10 U	10 U

TABLE 2

ANALYTICAL RESULTS SUMMARY
GROUNDWATER MONITORING PROGRAM
DOWCRAFT CORPORATION
JAMESTOWN, NEW YORK
OCTOBER 2005

	Location Name:	*ESI-3*	*ESI-2*	*ESI-2*	*PW-1*	*PW-2*	*PW-3R*
	Sample Date:	*10/25/2005*	*10/26/2005*	*10/26/2005*	*10/26/2005*	*10/26/2005*	*10/26/2005*
	Sample Name:	*GW-5020-102505-KL-001*	*GW-5020-102605-KL-003*	*GW-5020-102605-KL-004* *(Field Duplicate)*	*GW-5020-102605-KL-002*	*GW-5020-102605-KL-006*	*GW-5020-102605-KL-005*
Parameters	*Units*						
Volatile Organics							
Tetrachloroethene	μg/L	10 U	3 J	4 J	10 U	9 J	53
Toluene	μg/L	10 U	10 U	10 U	10 U	10 U	11
trans-1,2-Dichloroethene	μg/L	10 U	2 J	2 J	10 U	13 J	18 J
trans-1,3-Dichloropropene	μg/L	10 U	10 U	10 U	10 U	10 U	10 U
Trichloroethene	μg/L	22	1800	1700	130	4000	190000
Trichlorofluoromethane (CFC-11)	μg/L	10 U	10 U	10 U	10 U	10 U	10 U
Trifluorotrichloroethane (Freon 113)	μg/L	10 U	10 U	10 U	10 U	10 U	10 U
Vinyl chloride	μg/L	10 U	10 U	10 U	10 U	51 J	50 J
Xylene (total)	μg/L	10 U	10 U	10 U	10 U	10 U	10 U

Notes:

J Estimated.

U Non-detect at associated value.

TABLE 3

QUALIFIED SAMPLE RESULTS DUE TO ANALYTE CONCENTRATIONS IN THE METHOD BLANKS
GROUNDWATER MONITORING PROGRAM
DOWCRAFT CORPORATION
JAMESTOWN, NEW YORK
OCTOBER 2005

Parameter	*Analysis Date*	*Analyte*	*Blank Result*	*Sample ID*	*Sample Result*	*Qualified Result*	*Units*
Volatiles	11/03/05	Acetone	13	GW-5020-102505-KL-001	13	13 U	µg/L
				GW-5020-102605-KL-002	11	11 U	µg/L
				GW-5020-102605-KL-003	24	24 U	µg/L
				GW-5020-102605-KL-004	22	22 U	µg/L
				GW-5020-102605-KL-005	17	17 U	µg/L
				GW-5020-102605-KL-006	10	10 U	µg/L
Volatiles	11/03/05	Carbon disulfide	3J	GW-5020-102505-KL-001	2 J	10 U	µg/L
				GW-5020-102605-KL-002	1 J	10 U	µg/L

Notes:

J	Estimated.
U	Non-detect at associated value.

TABLE 4

QUALIFIED SAMPLE RESULTS DUE TO ANALYTE CONCENTRATIONS IN THE TRIP BLANK
GROUNDWATER MONITORING PROGRAM
DOWCRAFT CORPORATION
JAMESTOWN, NEW YORK
OCTOBER 2005

Parameter	*Blank Date*	*Analyte*	*Blank Result*	*Associated Sample ID*	*Sample Result*	*Sample Qualifier*	*Units*
Volatiles	10/25/05	Acetone	11	GW-5020-102505-KL-001	13	13 U	µg/L
				GW-5020-102605-KL-002	11	11 U	µg/L
				GW-5020-102605-KL-003	24	24 U	µg/L
				GW-5020-102605-KL-004	22	22 U	µg/L
				GW-5020-102605-KL-005	17	17 U	µg/L
				GW-5020-102605-KL-006	10	10 U	µg/L
Volatiles	10/25/05	Methylene chloride	5J	GW-5020-102605-KL-005	3 J	10 U	µg/L
				GW-5020-102605-KL-006	1 J	10 U	µg/L

Notes:

J	Estimated.
U	Non-detect at associated value.

TABLE 5

QUALIFIED SAMPLE RESULTS DUE TO OUTLYING BLANK SPIKE RESULTS
GROUNDWATER MONITORING PROGRAM
DOWCRAFT CORPORATION
JAMESTOWN, NEW YORK
OCTOBER 2005

Parameter	*BS Date*	*Compound*	*%Rec*	*Acceptable Limits*	*Associated Sample ID*	*Sample Results*	*Units*	*Qualifier*
Volatiles	11/03/05	Vinyl chloride	146	66-117	GW-5020-102605-KL-005	50	µg/L	J
					GW-5020-102605-KL-006	51	µg/L	J
Volatiles	11/03/05	trans-1,2-Dichloroethene	117	74-115	GW-5020-102605-KL-003	2 J	µg/L	J
					GW-5020-102605-KL-004	2 J	µg/L	J
					GW-5020-102605-KL-005	18	µg/L	J
					GW-5020-102605-KL-006	13	µg/L	J

Notes:
%Rec Percent Recovery.
BS Blank Spike.
J Estimated.

CHAIN OF CUSTODY RECORD

CONESTOGA-ROVERS & ASSOCIATES
2055 Niagara Falls Blvd., Suite 3
Niagara Falls, N.Y. 14304 (716) 297-6150

SHIPPED TO (Laboratory Name): HzM CAB
Mellville, NY

REFERENCE NUMBER: CRA526 5020
Dowcraft

SAMPLER'S SIGNATURE:

PRINTED NAME: Kevin Lynch

SEQ. No.	DATE	TIME	SAMPLE No.	SAMPLE TYPE	No. of Containers	VOC w/ TICs	PARAMETERS	REMARKS
	10/25/05	17:30	GW-5020-102505-KL-001	Water	2	2	0510295-001	
	↓		W-5020-102505-KL-Tripblank		2	2	-007	
	10/26/05	1145	GW-5020-102605-KL-002		6	6	-002	w/MS-ASD
		1220	GW-5020-102605-KL-003		2	2	-003	
		1300	GW-5020-102605-KL-004		2	2	-004	
		1640	GW-5020-102605-KL-005		2	2	-005	
	↓	1800	GW-5020-102605-KL-006	↓	2	2	-006	

Samples stored on ice overnight KL

Samples were:
Shipped ✓ or Hand Delivered ___ Airbill# ___
✓ 2. Ambient or [✓ Chilled] Temp 3.4
COC Tape was:
✓ Present on outer package Y ✓ N ___
✓ Unbroken on outer package: Y ___ N ___

TOTAL NUMBER OF CONTAINERS 18

HEALTH/CHEMICAL HAZARDS

RELINQUISHED BY: ①	DATE: 10/27/05 TIME: 1200	RECEIVED BY: ①	DATE: 10/28/05 TIME: 915
RELINQUISHED BY: ②	DATE: TIME:	RECEIVED BY: ②	DATE: TIME:
RELINQUISHED BY: ③	DATE: TIME:	RECEIVED BY: ③	DATE: TIME:

METHOD OF SHIPMENT: FedEx

WAY BILL No.

White –Fully Executed Copy
Yellow –Receiving Laboratory Copy
Pink –Shipper Copy
Goldenrod –Sampler Copy

SAMPLE TEAM:
J. Polovick
K. Lynch

RECEIVED FOR LABORATORY BY: ___
DATE: ___ TIME: ___

No N 4097

CRA526 A3

1001 (D) APR 28/97(NF) REV. 0 (F-15)

CONESTOGA-ROVERS
& ASSOCIATES

2371 George Urban Blvd.
Depew, New York 14043
Telephone: (716) 206-0202 Fax: (716) 206-0201
www.CRAworld.com

MEMORANDUM

TO:	Jim Kay	REF. NO.:	005020
FROM:	Karen Bevilacqua/jbh/14-NF	DATE:	January 23, 2007
			E-Mail and Interoffice Mail

RE: **Analytical Results and QA/QC Review**
Groundwater Monitoring Program
Dowcraft Corporation
Jamestown, New York
November 2006

PREVIOUSLY TRANSMITTED BY E-MAIL

INTRODUCTION

Fourteen (14) water samples, including one field duplicate, were collected at the Dowcraft Site (Site) in Jamestown, New York, in November 2006. Samples were submitted to H2M Laboratories, Inc. (H2M) in Melville, New York. A sample key is presented in Table 1 and the analytical parameter list, methodologies, and holding time criteria are presented in Table 2. The analytical results are summarized in Table 3. A copy of the Chain of Custody forms is attached.

The final results and supporting quality assurance/quality control (QA/QC) data were reviewed. Evaluation of the data was based on information obtained from the Chain of Custody forms, finished report forms, blank data, and recovery data from matrix and surrogate spikes. The QA/QC criteria by which the data have been assessed are outlined in the respective analytical methods and the following documents:

i) "USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review", United States Environmental Protection Agency (USEPA) 540/R-99/008, October 1999; and
ii) "USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Review", USEPA 540/R-94/013, February 1994.

QA/QC REVIEW

All samples were prepared and analyzed within the method-required holding times. All samples were properly preserved and maintained at 4°C (±2°C).

Method blanks were analyzed with the investigative samples for all parameters. All method blanks were non-detect for the compounds of interest.

All samples, blanks, and QC samples were spiked with surrogate compounds prior to sample analysis in accordance with the organic method. All surrogate spike recoveries met the associated method criteria indicating adequate analytical efficiency.

Trip blanks were collected and transported with the investigative samples for analysis as shown in Table 1. All trip blank results were non-detect for the compounds of interest with the exception of chloroform. All associated sample results with concentrations similar to the blank were qualified as non-detect (see Table 4).

Blank spikes (BS) were prepared and analyzed for all parameters. All recoveries were within the laboratory control limits indicating good analytical accuracy with the following exceptions:

i) low recoveries were observed for Freon 113. All associated sample results were qualified as estimated based on the implied low bias (see Table 5); and

ii) high recoveries were observed for bromomethane, chloroethane, methylene chloride, trans-1,2-dichloroethene, methyl-tert-butyl ether, and 1,1-dichloroethane. All associated sample results were non-detect and would not have been impacted by the implied high bias.

A matrix spike/matrix spike duplicate (MS/MSD) was performed on sample WG-5020-112906-KL-007. All recoveries were within laboratory control limits, indicating good analytical accuracy and precision.

A field duplicate sample was collected and analyzed as shown in Table 1. All results showed good field and analytical precision, with the exception of manganese. All associated sample results were qualified as estimated (see Table 6).

CONCLUSION

Based on the preceding data assessment, the data presented in Table 2 were judged to be acceptable with the qualifications noted.

TABLE 1

SAMPLE COLLECTION AND ANALYSIS SUMMARY
GROUNDWATER MONITORING PROGRAM
DOWCRAFT CORPORATION
JAMESTOWN, NEW YORK
NOVEMBER 2006

Sample ID	*Location ID*	*Collection Date (mm/dd/yy)*	*Collection Time (hr:min)*	*Analysis/Parameters* *VOCs*	*Metals (As, Mn)*	*Nitrate*	*Sulfate*	*Comments*
WG-5020-112906-KL-01	PW-3R	11/29/06	9:20	x	x	x	x	
WG-5020-112906-KL-02	PW-1	11/29/06	11:10	x	x	x	x	
WG-5020-112906-KL-03	PW-1	11/29/06	11:30	x	x	x	x	Field duplicate of WG-5020-112906-KL-02
WG-5020-112906-KL-04	PW-2	11/29/06	12:50	x	x	x	x	
WG-5020-112906-KL-05	ESI-6	11/29/06	14:10	x	x	x	x	
WG-5020-112906-KL-06	ESI-2	11/29/06	15:35	x	x	x	x	
WG-5020-112906-KL-07	ESI-3	11/29/06	17:00	x	x	x	x	MS/MSD
TB-5020-112906-KL-01	Trip Blank	11/29/06	-	x				Trip Blank
WG-5020-113006-KL-08	ESI-7	11/30/06	9:00	x	x	x	x	
WG-5020-113006-KL-09	ESI-1	11/30/06	9:50	x	x	x	x	
WG-5020-113006-KL-10	ESI-13R	11/30/06	10:45	x	x	x	x	
WG-5020-113006-KL-11	ESI-12	11/30/06	12:10	x	x	x	x	
WG-5020-113006-KL-12	ESI-10	11/30/06	12:40	x	x	x	x	
WG-5020-113006-KL-13	ESI-11	11/30/06	13:15	x	x	x	x	
WS-5020-113006-KL-14	River	11/30/06	14:15	x				
TB-5020-113006-02	Trip Blank	11/30/06	-	x				Trip Blank

Notes:

-	Not applicable.
As	Arsenic.
Mn	Manganese.
MS	Matrix Spike.
MSD	Matrix Spike Duplicate.
VOCs	Volatile Organic Compounds.

TABLE 2

ANALYTE PARAMETER LIST
GROUNDWATER MONITORING PROGRAM
DOWCRAFT CORPORATION
JAMESTOWN, NEW YORK
NOVEMBER 2006

Analytical Parameter	*Method Number*	*Holding Time Criteria*
Volatiles	USEPA 8260B (1)	14 days from collection to analysis (preserved with HCl)
Metals - Manganese/Arsenic	USEPA 6020 (1)	180 days from collection to analysis (preserved with HNO_3 pH<2)
Nitrate	USEPA 353.2 (2)	48 hours from collection to analysis
Sulfate	USEPA 300.0 (2)	28 hours from collection to analysis

Notes:

(1) "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods," 3rd Edition, November, 1986 (with all

(2) "Methods for Chemical Analysis of Water and Wastes," USEPA 600/4-79-020, March 1983.

USEPA United States Environmental Protection Agency.

TABLE 3

ANALYTICAL RESULTS SUMMARY
GROUNDWATER MONITORING PROGRAM
DOWCRAFT CORPORATION
JAMESTOWN, NEW YORK
NOVEMBER 2006

	Sample Location:	***ESI-2***	***ESI-3***	***ESI-6***	***PW-1***	***PW-1***	***PW-2***	***PW-3R***
	Sample Date:	***11/29/2006***	***11/29/2006***	***11/29/2006***	***11/29/2006***	***11/29/2006***	***11/29/2006***	***11/29/2006***
	Sample ID:	***WG-5020-112906-KL-06***	***WG-5020-112906-KL-07***	***WG-5020-112906-KL-05***	***WG-5020-112906-KL-02***	***WG-5020-112906-KL-03***	***WG-5020-112906-KL-04***	***WG-5020-112906-KL-01***
						(Duplicate)		
Parameters	***Units***							
Volatile Organic Compounds								
1,1,1-Trichloroethane	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U
1,1,2,2-Tetrachloroethane	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U
1,1,2-Trichloroethane	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	2 J
1,1-Dichloroethane	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	3 J
1,1-Dichloroethene	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U
1,2,4-Trichlorobenzene	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U
1,2-Dibromo-3-chloropropane (DBCP)	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U
1,2-Dibromoethane (Ethylene Dibromide)	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U
1,2-Dichlorobenzene	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U
1,2-Dichloroethane	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U
1,2-Dichloropropane	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U
1,3-Dichlorobenzene	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U
1,4-Dichlorobenzene	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U
2-Butanone (Methyl Ethyl Ketone)	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	18
2-Hexanone	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	3 J
4-Methyl-2-Pentanone (Methyl Isobutyl Ketone	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Acetone	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	88
Benzene	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Bromodichloromethane	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Bromoform	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Bromomethane (Methyl Bromide)	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	1 J
Carbon disulfide	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Carbon tetrachloride	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Chlorobenzene	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Chloroethane	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Chloroform (Trichloromethane)	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Chloromethane (Methyl Chloride)	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U
cis-1,2-Dichloroethene	µg/L	83	10 U	270	10 U	10 U	230	10 U
cis-1,3-Dichloropropene	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Cyclohexane	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Dibromochloromethane	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Dichlorodifluoromethane (CFC-12)	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Ethylbenzene	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Isopropylbenzene	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Methyl acetate	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Methyl cyclohexane	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Methyl Tert Butyl Ether	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Methylene chloride	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Styrene	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U

TABLE 3

ANALYTICAL RESULTS SUMMARY
GROUNDWATER MONITORING PROGRAM
DOWCRAFT CORPORATION
JAMESTOWN, NEW YORK
NOVEMBER 2006

	Sample Location:	***ESI-2***	***ESI-3***	***ESI-6***	***PW-1***	***PW-1***	***PW-2***	***PW-3R***
	Sample Date:	***11/29/2006***	***11/29/2006***	***11/29/2006***	***11/29/2006***	***11/29/2006***	***11/29/2006***	***11/29/2006***
	Sample ID:	*WG-5020-112906-KL-06*	*WG-5020-112906-KL-07*	*WG-5020-112906-KL-05*	*WG-5020-112906-KL-02*	*WG-5020-112906-KL-03* *(Duplicate)*	*WG-5020-112906-KL-04*	*WG-5020-112906-KL-01*
Parameters	*Units*							
Volatiles (Cont'd.)								
Tetrachloroethene	µg/L	3 J	10 U	6 J	10 U	10 U	4 J	10 U
Toluene	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U
trans-1,2-Dichloroethene	µg/L	2 J	10 U	3 J	10 U	10 U	5 J	10 U
trans-1,3-Dichloropropene	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Trichloroethene	µg/L	1100	5 J	1700	10	10	930	10 U
Trichlorofluoromethane (CFC-11)	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Trifluorotrichloroethane (Freon 113)	µg/L	10 UJ	10 U	10 UJ	10 U	10 U	10 U	10 U
Vinyl chloride	µg/L	10 U	10 U	20	10 U	10 U	36	10 U
Xylene (total)	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Metals								
Arsenic	µg/L	2.3 U	2.3 U	2.3 U	2.3 U	2.3 U	2.3 U	23.7
Manganese	µg/L	139	367	2330	858 J	448 J	5040	85300
General Chemistry								
Nitrate (as N)	mg/L	2.28	2.70	2.24	3.02	3.06	1.30	0.96
Sulfate	mg/L	59.5	85.0	49.0	98.5	99.0	46.5	33.0

TABLE 3

ANALYTICAL RESULTS SUMMARY
GROUNDWATER MONITORING PROGRAM
DOWCRAFT CORPORATION
JAMESTOWN, NEW YORK
NOVEMBER 2006

Sample Location:		*ESI-1*	*ESI-10*	*ESI-11*	*ESI-12*	*ESI-13R*	*ESI-7*	*River*
Sample Date:		*11/30/2006*	*11/30/2006*	*11/30/2006*	*11/30/2006*	*11/30/2006*	*11/30/2006*	*11/30/2006*
Sample ID:		*WG-5020-113006-KL-09*	*WG-5020-113006-KL-12*	*WG-5020-113006-KL-13*	*WG-5020-113006-KL-11*	*WG-5020-113006-KL-10*	*WG-5020-113006-KL-08*	*WS-5020-113006-KL-14*
Parameters	*Units*							
Volatile Organic Compounds								
1,1,1-Trichloroethane	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U
1,1,2,2-Tetrachloroethane	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U
1,1,2-Trichloroethane	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U
1,1-Dichloroethane	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U
1,1-Dichloroethene	µg/L	10 U	1 J	10 U	10 U	10 U	10 U	10 U
1,2,4-Trichlorobenzene	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U
1,2-Dibromo-3-chloropropane (DBCP)	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U
1,2-Dibromoethane (Ethylene Dibromide)	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U
1,2-Dichlorobenzene	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U
1,2-Dichloroethane	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U
1,2-Dichloropropane	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U
1,3-Dichlorobenzene	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U
1,4-Dichlorobenzene	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U
2-Butanone (Methyl Ethyl Ketone)	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U
2-Hexanone	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U
4-Methyl-2-Pentanone (Methyl Isobutyl Ketone	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Acetone	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Benzene	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Bromodichloromethane	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Bromoform	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Bromomethane (Methyl Bromide)	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Carbon disulfide	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Carbon tetrachloride	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Chlorobenzene	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Chloroethane	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Chloroform (Trichloromethane)	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Chloromethane (Methyl Chloride)	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U
cis-1,2-Dichloroethene	µg/L	10 U	190	80	21	6 J	10 U	10 U
cis-1,3-Dichloropropene	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Cyclohexane	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Dibromochloromethane	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Dichlorodifluoromethane (CFC-12)	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Ethylbenzene	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Isopropylbenzene	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Methyl acetate	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Methyl cyclohexane	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Methyl Tert Butyl Ether	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Methylene chloride	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Styrene	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U

TABLE 3

ANALYTICAL RESULTS SUMMARY
GROUNDWATER MONITORING PROGRAM
DOWCRAFT CORPORATION
JAMESTOWN, NEW YORK
NOVEMBER 2006

	Sample Location:	***ESI-1***	***ESI-10***	***ESI-11***	***ESI-12***	***ESI-13R***	***ESI-7***	***River***
	Sample Date:	***11/30/2006***	***11/30/2006***	***11/30/2006***	***11/30/2006***	***11/30/2006***	***11/30/2006***	***11/30/2006***
	Sample ID:	***WG-5020-113006-KL-09***	***WG-5020-113006-KL-12***	***WG-5020-113006-KL-13***	***WG-5020-113006-KL-11***	***WG-5020-113006-KL-10***	***WG-5020-113006-KL-08***	***WS-5020-113006-KL-14***
Parameters	***Units***							
Volatiles (Cont'd.)								
Tetrachloroethene	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Toluene	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U
trans-1,2-Dichloroethene	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U
trans-1,3-Dichloropropene	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Trichloroethene	µg/L	15	27	53	180	19	17	10 U
Trichlorofluoromethane (CFC-11)	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Trifluorotrichloroethane (Freon 113)	µg/L	10 UJ	10 U	10 U	10 UJ	10 UJ	10 UJ	10 U
Vinyl chloride	µg/L	10 U	110	46	10 U	10 U	10 U	10 U
Xylene (total)	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Metals								
Arsenic	µg/L	2.3 U	2.3 U	2.3 U	2.3 U	2.3 U	2.3 U	-
Manganese	µg/L	8.1 J	372	1010	37.0	3.4 J	1.5 J	-
General Chemistry								
Nitrate (as N)	mg/L	2.66	0.25	0.29	2.61	2.44	3.56	-
Sulfate	mg/L	33.0	61.8	64.0	103	49.2	44.5	-

Notes:

-	Not applicable.
J	Estimated.
U	Non-detect at associated value.
UJ	The analyte was not detected above the sample quantitation limit. The reported quantitation limit is an estimated quantity.

TABLE 4

QUALIFIED SAMPLE RESULTS DUE TO ANALYTE CONCENTRATIONS IN THE TRIP BLANK
GROUNDWATER MONITORING PROGRAM
DOWCRAFT CORPORATION
JAMESTOWN, NEW YORK
NOVEMBER 2006

Parameter	*Blank Date*	*Analyte*	*Blank Result*	*Associated Sample ID*	*Sample Result*	*Sample Qualifier*	*Units*
Volatiles	11/29/06	Chloroform (Trichloromethane)	1J	WG-5020-112906-KL-01	2 J	10 U	μg/L

Notes:
J Estimated.
U Non-detect at associated value.

TABLE 5

QUALIFIED SAMPLE RESULTS DUE TO OUTLYING LABORATORY FORTIFIED BLANK RESULTS
GROUNDWATER MONITORING PROGRAM
DOWCRAFT CORPORATION
JAMESTOWN, NEW YORK
NOVEMBER 2006

Parameter	*LFB Date*	*Compound*	*Recovery (percent)*	*Control Limits*	*Associated Sample ID*	*Sample Results*	*Units*	*Qualifier*
Volatiles	12/05/06	Trifluorotrichloroethane (Freon 113)	40	53-122	WG-5020-113006-KL-08	10 U	µg/L	UJ
					WG-5020-113006-KL-09	10 U	µg/L	UJ
					WG-5020-113006-KL-10	10 U	µg/L	UJ
					WG-5020-113006-KL-11	10 U	µg/L	UJ
Volatiles	12/07/06	Trifluorotrichloroethane (Freon 113)	31	53-122	WG-5020-112906-KL-04	100 U	µg/L	UJ
					WG-5020-112906-KL-05	10 U	µg/L	UJ
					WG-5020-112906-KL-06	10 U	µg/L	UJ

Notes:

LFB	Laboratory Fortified Blank.
U	Non-detect at associated value.
UJ	The analyte was not detected above the sample quantitation limit. The reported quantitation limit is an estimated value.

TABLE 6

QUALIFIED SAMPLE RESULTS DUE TO VARIABILITY IN FIELD DUPLICATE RESULTS
GROUNDWATER MONITORING PROGRAM
DOWCRAFT CORPORATION
JAMESTOWN, NEW YORK
NOVEMBER 2006

Parameter	*Analyte*	*Original Sample ID*	*Original Result*	*Duplicate Sample ID*	*Duplicate Result*	*RPD*	*Units*	*Qualifier*
Metals	Manganese	WG-5020-112906-KL-02	858	WG-5020-112906-KL-03	448	63	µg/L	J

Notes:

J	Estimated.
RPD	Relative Percent Difference.

H2M LABS, INC.

575 Broad Hollow Rd, Melville, NY 11747-5076
Tel: (631) 694-3040 Fax: (631) 420-8436

18306

EXTERNAL CHAIN OF CUSTODY

CLIENT: CRA

H2M SDG NO: CRA558

PROJECT NAME/NUMBER: Dowcraft, Jamestown, NY 5020

SAMPLERS: (signature)/Client

DELIVERABLES:

TURNAROUND TIME:

NOTES: Nitrate has short hold time.

Project Contact: Susan Scrocchi

Phone Number: 716 206-0202

PIS/Quote #

Sample Container Description →: 40 ml HCl (VOA); 40 ml H2SO4 (Nitrate); 250 ml pl. NP (Sulfate); 1 L HNO3 (Metal)

					ANALYSIS REQUESTED										
					ORGANIC							INORG.			
DATE	TIME	MATRIX	FIELD I.D.	Total No. of Containers ↓	VOA	~~BNA~~	~~Pest/PCB~~	Nitrate	Sulfate			Metal	~~CN~~	LAB I.D. NO.	REMARKS:
11/29/06	0920	Water	WG-5020-112906-KL-01	5	2			1	1			1		0612471-001	Purple color
11/29/06	1110		WG-5020-112906-KL-02	5	2			1	1			1		0612471-002	
	1130		WG-5020-112906-KL-03	5	2			1	1			1		0612471-003	
	1250		WG-5020-112906-KL-04	5	2			1	1			1		0612471-004	Sl. pink color
	1410		WG-5020-112906-KL-05	5	2			1	1			1		0612471-005	
	1535		WG-5020-112906-KL-06	5	2			1	1			1		0612471-006	
	1700		WG-5020-112906-KL-07 MS/MSD	14	6			3	3			2		0612471-007	MS/MSD
			TB-5020-112906-KL-01	1	1									0612471-008	
				45											

TB-5020-112906-01 (1)

Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
	11/29/06	1730		11/30/06	9:12
Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time

LABORATORY USE ONLY

Discrepancies Between Sample Labels and COC Record? Y or N
Explain:

Samples were:
1. Shipped ✓ or Hand Delivered ___ Airbill# ___
2. Ambient or [✓ chilled] Temp ~2.0
3. Received in good condition: [✓ Y] or N
4. Properly preserved: [✓ Y] or N ✓

COC Tape was:
1. Present on outer package: [✓ Y] or N
2. Unbroken on outer package: Y or N
3. COC record present & complete upon sample receipt: Y or N

WHITE COPY - ORIGINAL YELLOW COPY - CLIENT PINK COPY - LABORATORY

H2M LABS, INC.

575 Broad Hollow Rd, Melville, NY 11747-5076
Tel: (631) 694-3040 Fax: (631) 420-8436

18307

EXTERNAL CHAIN OF CUSTODY

CLIENT: CRA

H2M SDG NO: CRA558

PROJECT NAME/NUMBER
Dowcraft Jamestown, NY
5020

SAMPLERS: (signature)/Client
Kevin Lynch/CRA

DELIVERABLES:

TURNAROUND TIME:

NOTES: Nitrate has short hold time.

Project Contact: Susan ~~[illegible]~~ Scrocchi

Phone Number: 716 206 0202

PIS/Quote #

					ANALYSIS REQUESTED										
				Sample Container Description →	40ml HCl			40ml H2SO4	250ml pl. NP			1 L pl. HNO3			
					ORGANIC							INORG.			
DATE	TIME	MATRIX	FIELD I.D.	Total No. of Containers ↓	VOA	BNA	Pest/PCB	Nitrate	Sulfate			Metal	CN	LAB I.D. NO.	REMARKS:
11/30/06	0900	Water	WG-5020-113006-KL-08	5	2			1	1			1		0612528-001	
	0950		WG-5020-113006-KL-09	5	2			1	1			1		0612528-002	
	1045		WG-5020-113006-KL-10	5	2			1	1			1		0612528-003	
	1210		WG-5020-113006-KL-11	5	2			1	1			1		0612528-004	
	1240		WG-5020-113006-KL-12	5	2			1	1			1		0612528-005	
	1315		WG-5020-113006-KL-13	5	2			1	1			1		0612528-006	
	1415		WS-5020-113006-KL-14	2	2			—	—			—		0612528-007	Surface Water
	—		TB-5020-113006-02	1	1			—	—			—		0612528-008	
			Cooler Sealed	33											

Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
	11/30/06	1500		12/1/06	12:45
Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time

LABORATORY USE ONLY

Discrepancies Between Sample Labels and COC Record? Y or N
Explain:

Samples were:
1. Shipped ✓ or Hand Delivered ___ Airbill# ______
2. Ambient or [✓ Chilled] Temp 2.0
3. Received in good condition: [✓ Y] or N ✓
4. Properly preserved: [✓ Y] or N

COC Tape was:
1. Present on outer package: [✓ Y] or N
2. Unbroken on outer package: Y or N
3. COC record present & complete upon sample receipt: Y or N

WHITE COPY - ORIGINAL
CRA558 A11

YELLOW COPY - CLIENT

PINK COPY - LABORATORY

APPENDIX B

JOHNSON – ETTINGER MODELING OF SOIL VAPOR INTRUSION POTENTIAL

TABLE OF CONTENTS

LIST OF TABLES
(Following Text)

1.0 INTRODUCTION

This Appendix presents the Vapor Intrusion Pathway Assessment conducted in conjunction with remedial works at the Former Dowcraft Corporation facility in Falconer, New York (Site). The Vapor Intrusion Pathway Assessment involved the evaluation of potential risks to human health through the groundwater to indoor air inhalation exposure pathway related to the presence of chlorinated volatile organic compounds (VOCs) in the groundwater at the Site. The purpose of the Vapor Intrusion Pathway Assessment is to evaluate the potential for impacts to indoor air quality at the Jamestown Container Corporation building adjacent to the northern boundary of the Site. A portion of this building overlies the VOC groundwater plume that has migrated off-Site to the north toward the Chadakoin River.

Chlorinated VOCs, consisting predominantly of trichloroethene (TCE) and its degradation products, are present in groundwater as a result of historic releases from former degreasing operations at the Site. Groundwater remedial activities have been implemented at the Site, which have included groundwater extraction and, more recently, in-situ chemical oxidation treatments. The in-situ chemical oxidation is being implemented in accordance with the "*Remedial Design/Remedial Action Work Plan and Operation, Maintenance, and Monitoring Work Plan*" (Work Plan) prepared for the Site by CRA (CRA, 2005). The Vapor Intrusion Pathway Assessment supplements the evaluation of the vapor intrusion pathway that was presented in the Work Plan.

The Vapor Intrusion Pathway Assessment was conducted based on the approach applied by the United States Environmental Protection Agency (USEPA) in their document entitled, "*Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils (Subsurface Vapor Intrusion Guidance)*" (USEPA, 2002a). Initially, a screening assessment was conducted to identify potential chemicals of concern (COCs) in groundwater based on the vapor intrusion exposure pathway. COCs were identified by comparing the maximum VOC concentrations currently detected in groundwater at the Site to the generic groundwater screening criteria applicable to the Site presented in USEPA (2002a). Groundwater quality data from the October 2005 and November 2006 monitoring events were applied in the screening assessment. For the identified COCs, a Site-specific assessment was then conducted that involved the development of groundwater Site-Specific Assessment Criteria (SSAC) based on the protection of indoor air quality for the Jamestown Container Corporation building adjacent to the Site under an industrial/commercial worker exposure setting. The development of the groundwater SSAC is based on actual vadose zone soil conditions and the building configuration present at the Site.

Section 2.0 presents the screening assessment conducted to identify COCs in groundwater. The methodology applied to develop the groundwater SSAC for each COC is presented in Section 3.0. A description of the Site-specific input parameters applied in the development of the groundwater SSAC, and a summary of the groundwater SSAC results, are presented in Section 4.0. The conclusions obtained as a result of the Vapor Intrusion Pathways Assessment are presented in Section 5.0. Section 6.0 lists the references cited in this Appendix.

2.0 SCREENING FOR CHEMICALS OF CONCERN

The screening for COCs in groundwater was conducted by comparing maximum detected concentrations, or maximum analytical method detection limits (MDLs), against generic groundwater screening criteria protective of the groundwater to indoor air inhalation exposure pathway presented in USEPA (2002a; Table 2c). The applied generic screening criteria correspond to a target carcinogenic risk level of 1×10^{-6} and a target non-carcinogenic hazard level of 1.0.

Table B.1 presents the selection of COCs based on the maximum concentrations for the VOCs that are detected in groundwater at the Site, or maximum MDLs for the detected VOCs, from the two most recent groundwater monitoring events conducted at the Site in October 2005 and November 2006. The results from the October 2005 and November 2006 are considered representative of current conditions at the Site. The most recent in-situ chemical oxidation treatment at the Site took place following the October 2005 monitoring event, and the November 2006 monitoring event shows significant decreases in the detected concentrations. However, the results of the October 2005 monitoring event are included in the COC screening assessment as a conservative approach. As summarized in Table B.1, cis-1,2-dichloroethene (cDCE), tetrachloroethene (PCE), TCE, and vinyl chloride were selected as COCs due to having maximum detected concentrations greater than the generic screening criteria. Benzene, bromoform, 1,2-dichloroethane, and 1,1,2-trichloroethane were selected as COCs due to having maximum MDLs above the generic screening criteria. To further evaluate the significance of these COCs in groundwater with respect to the vapor intrusion pathway, groundwater SSAC were developed for each COC, as presented in Section 4.0. The methodology applied to develop the groundwater SSAC is presented in Section 3.0.

3.0 METHODOLOGY

The groundwater SSAC were developed using Site-specific vadose zone soil and building properties and applying the Johnson and Ettinger (1991) model (J&E Model), as implemented by USEPA (2004a). The J&E Model is a conservative screening level model that estimates the degree of attenuation occurring as volatile contaminants in soil gas migrate upwards through the vadose zone and mix with the indoor air of an overlying building. The degree of attenuation is quantified through calculation of a soil gas to indoor air attenuation factor, α, after Johnson and Etinger (1991; Equation 21). The groundwater SSAC were developed by calculating an allowable soil gas concentration just above the groundwater table that is determined from a risk-based allowable target indoor air concentration, and then converting the allowable soil gas concentration to a groundwater concentration by applying Henry's law. The allowable soil gas concentration was determined as follows:

$$\boldsymbol{C}_{sg} = \frac{\boldsymbol{C}_{air}}{\alpha}$$

Where;

$\boldsymbol{C}_{sg}$ - the allowable soil gas concentration at the groundwater table that will not result in an indoor air concentration greater than $\boldsymbol{C}_{air}$ [micrograms per cubic meter (µg/m^3)];

$\boldsymbol{C}_{air}$ - the risk-based target indoor air concentration (µg/m^3); and

α - the Site-specific calculated soil gas attenuation factor, which relates the indoor air concentration to the concentration in subsurface soil gas based on the heuristic model developed by Johnson and Ettinger (1991; Equation 21), and accounts for the advective-diffusive migration of contaminants in soil gas through the unsaturated zone soil and building foundation, followed by the mixing of the intruding vapors with building indoor air.

The groundwater SSAC are then developed from the allowable soil gas concentrations using Henry's law, as follows:

$$\boldsymbol{C}_{gw} = \frac{\boldsymbol{C}_{sg} \times (\boldsymbol{R} \times \boldsymbol{T})}{\boldsymbol{H}_L \times \boldsymbol{C}}$$

Where:

C_{gw} - the allowable groundwater SSAC that will not result in an indoor air concentration above the target indoor air concentration [micrograms per liter (µg/L)];

H_L - compound specific Henry's Law Constant (atm-m^3/mol);

T - the vadose zone temperature [Kelvin (K)];

R - Universal Gas Constant [(atm-m$^{3)}$/(mol-K)]; and

C - Units conversion factor from liters to cubic meters (1000 L/m^3).

The Site-specific soil gas attenuation factor is calculated through the application of the Johnson and Ettinger (1991) solution incorporated into a Microsoft Excel spreadsheet model developed by the USEPA (USEPA, 2004a; "GW-ADV-Feb04.xls" Version 3.1). The Site-specific compound, vadose zone soil, and building properties applied to calculate the Site-specific attenuation factor values are presented in Section 4.0.

The development of the risk-based target indoor air concentrations is presented in Table B.2. The risk-based target indoor air concentrations are calculated for an industrial/commercial worker exposure setting that is based on conservative exposure factors reported by USEPA (1989; 2002b; and 2004b). Inhalation unit risk/cancer risk factors for carcinogenic compounds and inhalation reference concentrations/reference doses were obtained from USEPA's Integrated Risk Information System (IRIS) and from USEPA's Region 9 Preliminary Remediation Goals. The target indoor air concentrations are calculated based on a carcinogenic risk level of 1×10^{-6} and a target non-carcinogenic hazard level of 1.0.

4.0 CALCULATION OF GROUNDWATER SSAC

The Site-specific input parameter values, and basis for their selection, applied in the development of the groundwater SSAC are presented in Section 4.1. The results of the groundwater SSAC development are presented in Section 4.2.

4.1 SITE-SPECIFIC INPUT PARAMETERS

The calculation of the groundwater SSAC is conducted using the methodology outlined in Section 3.0, and Site-specific soil gas attenuation factor values calculated using the J&E Model. The soil gas attenuation factor values are calculated based on chemical-specific properties and Site-specific vadose zone soil and building properties. Where Site-specific vadose zone soil properties are unavailable, conservative default values are applied consistent with the textural description of the vadose zone soils observed at the Site. Where Site-specific building properties are unavailable, default values are applied as obtained from USEPA (2002a). The chemical properties applied in the calculation of the Site-specific soil gas attenuation factors were obtained from the chemical properties database incorporated into USEPA (2004a). The applied chemical-specific properties and Site-specific vadose zone soil and building properties are described below.

Chemical Properties

Site-specific chemical properties applied in the calculation of the Johnson and Ettinger (1991) attenuation factor consist of a Henry's Law constant, a water diffusion coefficient, and an air diffusion coefficient. The chemical properties were obtained from the chemical properties database presented in USEPA (2004a). The Henry's Law constants and air diffusion coefficients, due to the strong temperature dependence of these parameters, were corrected to a vadose zone temperature of 8.3°C, which corresponds to the average annual shallow groundwater temperature in the northern portion of New York State presented in USEPA (2004a; Figure 8).

Vadose Zone Soil Properties

The vadose soils beneath the Site consist of sand and silt to clay and silt fill overlying a native sand and gravel. Beneath the Jamestown Container Corporation building, the fill extends to an average depth of 9.75 feet (2.97 meters) below the ground surface (BGS) to the underlying native sand and gravel. The average depth to groundwater beneath the Jamestown Container Corporation building is 10.9 feet (3.3 meters) based on groundwater water levels measured in shallow monitoring wells between 1993 and 2001. As a result, the vadose zone soils overlying the Jamestown Container Corporation building consist of two soil layers comprised of the fill and the native sand and gravel. Therefore, the Site-specific vadose zone soil physical properties applied in the development of the groundwater SSAC are based on the fill and the native sand and gravel, and are described below.

Fill

The soil physical properties applied for the fill consist of:

- soil moisture content, θ_m:

  A moisture content value of 6 percent is conservatively applied;
- porosity, ε_T:

  A porosity value of 30 percent is applied based on the range of porosity values for silt soils presented in Fetter (2001; Table 3.4);
- dry bulk soil density, ρ_{db}:

  A dry bulk soil density value of 1.855 grams per cubic centimeter (g/cm^3) is applied as calculated from the relationship $\rho_{db} = (1 - \varepsilon_T / 100)\rho_s$, where ρ_s = 2.65 g/cm^3 is the soil particle density; and
- hydraulic conductivity, which is converted to a vadose zone effective vapor permeability for vapor flow k_v:

  A hydraulic conductivity value of 1.6×10^{-4} centimeters per second (cm/s), is applied for the fill, which ranges in texture from sand and silt to silt and clay. This value is the average (geometric mean) hydraulic conductivity estimated from grain size analyses performed on four samples of the underlying native sand and gravel collected from monitoring well/borehole locations PW1, PW2, BH-15, and BH-16 and the Hazen permeability estimate. The application of the average hydraulic conductivity determined for the native sand and gravel unit is a conservative approach given the higher silt content of the fill. The hydraulic conductivity value is converted to an intrinsic permeability k_i. A relative vapor permeability, k_r is determined after Parker et al. (1987) for a sand soil type as implemented in USEPA (2004). The effective vapor permeability is equal to the product of k_i and k_r.

Native Sand and Gravel

The soil physical properties applied for the native sand and gravel consist of:

- soil moisture content, θ_m :

  A moisture content value of 6 percent is conservatively applied;
- porosity, ε_T :

  A porosity value of 30 percent is applied based on the range of porosity values for mixed sand and gravel presented in Fetter (2001;Table 3.4); and
- dry bulk soil density, ρ_{db} :

  A dry bulk soil density value of 1.855 g/cm^3 is applied as calculated from the relationship $\rho_{db} = (1 - \varepsilon_T / 100)\rho_s$, where ρ_s = 2.65 g/cm^3 is the soil particle density.

Building Properties

The Jamestown Container Corporation building adjacent to the Site is a large single-storey slab-on-grade building with overall approximate dimensions of 1,000 feet in length by 100 feet in width and a total height of approximately 20 feet. There are no interior floor to ceiling partitions and, in general, air is allowed to flow freely throughout the interior of the building. The groundwater plume from the Site passes beneath the central portion of the building, and the length of the building overlying the plume is approximately 250 feet [see CRA (2002; Figure 12.1)]. A partial basement underlies a small portion of the building. The basement has an approximate length of 100 feet and width of 60 feet with an approximate depth of 6 feet. The northern edge of the basement is aligned with the northern building wall and the western edge of the basement approximately coincides with monitoring well MW-10D. As such, a portion of the basement overlies the eastern-most edge of the groundwater plume beneath the building. Based on CRA's observations, access to the basement can only be gained through a hatch door. The hatch door is signed as requiring confined space entry protocols to be followed before accessing the basement. Therefore, the basement is not considered as occupied space. However, in the development of the groundwater SSAC, the basement is considered to reduce the thickness of vadose zone soil that vapors emitted from the water table might travel before entering the interior of the building. This is a conservative approach given that the basement only overlies the eastern-most edge of the groundwater plume beneath the building. As a further conservative approach, the groundwater SSAC are developed assuming that only the building volume overlying the groundwater plume is available for soil vapors entering the building to mix with indoor air. This conservatively underestimates the degree of mixing that will occur since the entire volume of indoor air within the building is connected from a ventilation perspective and is available for mixing.

The building properties applied to calculate the groundwater SSAC consist of the following:

- below grade building surface area, A_B:

  A below grade building surface area of 25,000 square feet (ft^2) [2,323 square meters (m^2)] is applied based on the building area overlying the groundwater plume of approximately 250 feet by 100 feet with slab-on-grade construction;
- building volume, V_B:

  A building volume of 500,000 cubic feet (ft^3) [14,158 cubic meters (m^3)] is applied based on the building area overlying the groundwater plume of approximately 250 feet by 100 feet with a building height of 20 feet (6.3 meters);
- building indoor air exchange rate, T_{air}:

  A building indoor air exchange rate value of 0.83 building volumes per hour is applied and is based on the default value for industrial/commercial buildings reported in the American Society for Testing and Materials (ASTM) Standard Guide in Risk-Based Corrective Action at Petroleum Release Sites (ASTM, 1995);
- foundation thickness, L_{crack}:

  A foundation thickness of 15 centimeters (6 inches) is applied and is consistent with the default value for slab-on-grade structures presented in USEPA (2002a; Appendix G);
- distance from the building floor to fill/native sand and gravel interface, $L_{T,1}$:

  The depth to the fill unit/native sand and gravel boundary beneath the building floor slab applied is 3.75 feet (1.14 meters). This value corresponds to the average depth to the fill/native sand and gravel interface of 9.75 feet (2.97 meters) beneath the building portion overlying the groundwater plume minus the basement depth of 6 feet (1.83 metres);
- distance from the fill unit/native sand and gravel interface to groundwater table, $L_{T,2}$:

  The depth from the fill unit/native sand and gravel interface to the groundwater table is 1.15 feet (0.35 meters). This value corresponds to the average below grade groundwater depth recorded beneath the building overlying the VOC groundwater plume measured between 1993 and 2001 of 10.9 feet (3.3 meters) minus the below grade depth to the fill/sand and gravel unit interface of 9.75 feet (2.97 meters);

- ratio of building crack area to building below-grade area, η :

  A ratio of 0.00038 (or 0.038 percent) will be applied consistent with the mean values for slab-on-grade structures presented in USEPA (2002a; Appendix G, Table G-3); and
- vadose zone/building pressure differential, ΔP :

  A pressure differential value of 4.0 Pascal (Pa) is applied and is based on the default value presented in USEPA (2002; Appendix G, Table G-3).

4.2 GROUNDWATER SSAC RESULTS

The groundwater SSAC results protective of the groundwater to indoor air exposure pathway for an industrial/commercial worker are presented in Table B.3. The applied chemical, vadose zone soil, and building properties are presented in Table B.3. For all COCs, the groundwater SSAC are greater than the concentrations detected beneath and immediately upgradient of the Jamestown Container Corporation building, as summarized below.

COC	*Groundwater SSAC (μg/L)*	*Maximum Detected Concentration[(1)] (μg/L)*
1,1,2-Trichloroethane	13,971	ND(10) [ESI-11 Nov. 2006]
1,2-Dichloroethane	7,138	ND(10) [ESI-11 Nov. 2006]
Benzene	14,399	ND(10) [ESI-11 Nov. 2006]
Bromoform	387,849	ND(10) [ESI-11 Nov. 2006]
cis-1,2-Dichloroethene	520,977	1,400 [PW-2 Oct. 2005]
Tetrachloroethene	1,849	ND(10) [ESI-11 Nov. 2006]
Trichloroethene	8,949	4,000 [PW-2 Oct. 2005]
Vinyl chloride	1,074	110 [ESI-10 Nov. 2006]

Note:

(1) Based on the October 2005 and November 2006 monitoring event groundwater quality results at ESI-1, ESI-2, ESI-3, ESI-4, ESI-6, ESI-10, ESI-11, ESI-12, PW-1, and PW-2 located beneath and immediately upgradient of the Jamestown Container Corporation Building.

The above comparison of the maximum detected concentrations to the groundwater SSAC demonstrates that the groundwater quality beneath and immediately upgradient of the Jamestown Container Corporation building is protective of the indoor air quality of the building. COC concentrations greater than the groundwater SSAC have been detected on the Site within the historical source area (e.g., TCE at PW-3). However, more than 10 years of groundwater monitoring has been conducted at the Site and results of this monitoring has demonstrated that the concentrations detected within the source area have not migrated to the area beneath the Jamestown Container Corporation building. As a result, the COC concentrations detected within the source area are not expected to migrate to beneath the Jamestown Container Corporation building in the future, particularly in consideration of the groundwater remediation activities that are on-going at the Site.

It is important to note that the J&E Model used to develop the groundwater SSAC incorporates several conservative assumptions. Also, there are conservative features included in the building scenario applied in the development of the groundwater SSAC. The key conservative aspects incorporated into the development of the groundwater SSAC are described below:

- the J&E Model assumes that all contaminant vapors below a building migrate vertically upward into the building and do not move laterally, or in three-dimensions, around the building to vent to the atmosphere;
- the J&E Model assumes that no contaminant vapors migrate around the sides of buildings through preferential pathways, such as granular foundation bedding material, to vent to the atmosphere;
- the Site-specific criteria are developed assuming a constant and continuous source of COCs in soil gas. Source depletion due to naturally occurring biological or chemical degradation of contaminants is not considered over the 25-year exposure duration applied to develop the target indoor air concentrations;
- the groundwater SSAC were developed considering only the building volume overlying the groundwater plume is available for soil vapors entering the building to mix with indoor air. This conservatively underestimates the degree of mixing that will occur since the entire volume of indoor air within the building is connected from a ventilation perspective and is available for mixing; and
- the groundwater SSAC were developed considering that the partial basement underlies the entire portion of the building overlying the groundwater plume when the basement only overlies the eastern-most edge of the groundwater plume.

All of the conservative aspects described above combine to produce a much higher level of exposure to COCs potentially entering indoor air than would actually occur.

5.0 CONCLUSIONS

A Vapor Intrusion Pathway Assessment was conducted where Site-specific allowable groundwater concentrations, or groundwater SSAC, were developed based on the protection of indoor air quality for the industrial/commercial use of the Jamestown Container Corporation building adjacent to the Site. The groundwater SSAC are greater than the maximum COC concentrations detected beneath and immediately upgradient of the building. The comparison of the groundwater SSAC to the maximum detected groundwater concentrations in these areas demonstrates that health risks/hazards through the indoor air inhalation exposure pathway are not present above acceptable levels.

As described in Section 4.2, the groundwater SSAC were developed through applying the J&E Model and several conservative assumptions that combine to produce a much higher level of exposure to COCs potentially entering indoor air than would actually occur. This high level of conservatism reduces the uncertainty in concluding that health risks/hazards are not present above acceptable levels through the indoor air inhalation exposure pathway at the Site.

The results of the Vapor Intrusion Pathway Assessment demonstrate that the current groundwater quality conditions present at the Site are protective of the indoor air exposure pathway for the Jamestown Container Corporation building. The current groundwater quality conditions are expected to improve due to the on-going groundwater remedial activities being conducted at the Site.

6.0 REFERENCES

ASTM, 1995. Standard Guide for Risk-Based Corrective Action Applied at Petroleum Release Sites, ASTM Designation: E1739-95, West Conshohocken, PA.

CRA, 2005. Remedial Design/Remedial Action Work Plan and Operation, Maintenance, and Monitoring Work Plan, Former Dowcraft Corporation, Falconer, New York, November.

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Fetter, C.W., 2001. Applied Hydrogeology, Fourth Edition, Prentice Hall, Upper Saddle River, N.J.

Johnson, P.C. and R.A. Ettinger, 1991. Heuristic Model for Predicting the Intrusion Rate of Contaminant Vapors into Buildings, Environmental Science and Technology, 25(8), pp. 1445-145.

Parker, J.C., R.J. Lenhard, and T. Kuppusamy, 1987. A Parametric Model for Constitutive Properties Governing Multiphase Flow in Porous Media, Water Resources Research, Vol. 23, No. 4, pp. 618-624.

USEPA, 1989. Risk Assessment Guidance For Superfund, Volume 1, Human Health Evaluation Manual, Part A OERR-EPA /540-1-89-002.

USEPA, 2002a. Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils (Subsurface Vapor Intrusion Guidance), EPA Report No. EPA530-F-02-052, November.

USEPA, 2002b. Supplemental Guidance For Developing Soil Screening Levels at Superfund Sites, OSWER 9355.4-24 , December.

USEPA, 2004a. User's Guide for Evaluating Subsurface Vapor Intrusion into Buildings (Revised), Office of Emergency and Remedial Response, Washington, DC, February 19.

USEPA, 2004b. Risk Assessment Guidance Document Volume 1, Human Health Evaluation Manual, Part E: Supplemental Guidance for Dermal Risk Assessment, EPA/540/R/99/005, July.

TABLE B.1

PRELIMINARY SCREENING OF COCs IN GROUNDWATER FOR PROTECTION OF INDOOR AIR QUALITY
VAPOR INTRUSION PATHWAY ASSESSMENT
FORMER DOWCRAFT CORPORATION SITE
FALCONER, NEW YORK

CAS Number	*Chemical*	*Maximum Detected Concentration* (1)	*Maximum Qualifer*	*Units*	*Location of Maximum Detected Concentration*	*Maximum Detection Limit*	*Units*	*USEPA Vapor Intrusion Screening Criteria* (2)	*COPC Flag*	*Rationale for Chemical Deletion or Selection* (3)
71556	1,1,1-Trichloroethane	ND	7J	µg/L	--	ND(10)	µg/L	3,100		
79005	1,1,2-Trichloroethane	ND	6J	µg/L	--	ND(10)	µg/L	5	X	DLASC
75343	1,1-Dichloroethane	11		µg/L	PW-3R (Oct. 2005)	ND(10)	µg/L	2,200		BSC
75354	1,1-Dichloroethene	14	3J	µg/L	PW-3R (Oct. 2005)	ND(10)	µg/L	190		BSC
107062	1,2-Dichloroethane	ND	2J	µg/L	--	ND(10)	µg/L	5	X	DLASC
78933	Methyl Ethyl Ketone	18	4J	µg/L	PW-3R (Nov. 2006)	ND(10)	µg/L	440,000		BSC
67641	Acetone	88		µg/L	PW-3R (Nov. 2006)	ND(24)	µg/L	225,000		BSC
71432	Benzene	ND	1J	µg/L	--	ND(10)	µg/L	5	X	DLASC
75252	Bromoform	ND	1J	µg/L	--	ND(10)	µg/L	0.0083	X	DLASC
156592	cis-1,2-Dichloroethene	1,400	3000J	µg/L	PW-2 (Oct. 2005)	ND(10)	µg/L	212	X	ASC
127184	Tetrachloroethene	53	9J	µg/L	PW-3R (Oct. 2005)	ND(10)	µg/L	5	X	ASC/DLASC
108883	Toluene	11		µg/L	PW-3R (Oct. 2005)	ND(10)	µg/L	1,500		BSC
156605	trans-1,2-dichloroethene	ND	18J	µg/L	--	ND(10)	µg/L	180		DLBSC
79016	Trichloroethene	190,000		µg/L	PW-3R (Oct. 2005)	ND(10)	µg/L	5	X	ASC/DLASC
75014	Vinyl chloride	110	51J	µg/L	PW-2 (Nov. 2006)	ND(10)	µg/L	2	X	ASC/DLASC

Notes:

(1) Based on analytical results reported for groundwater samples collected from shallow groundwater monitoring wells ESI-2, ESI-3, ESI-6, PW-1, PW-2, and PW-3R on October 25 and 26, 2005 and from monitoring wells ESI-1, ESI-2, ESI-3, ESI-6, ES-7, ESI-10, ESI-11, ESI-12, ESI-13R, PW-1, PW-2, and PW-3R on November 29 and 30, 2006.

(2) USEPA Screening Criteria protective of indoor air quality based on a target risk level of 10^6 or a target hazard index of 1 and a soil gas to indoor air attenuation factor of 0.001 presented in USEPA (2002; Table 2c).

(3) Rationale Codes:

	COC Selection Reason:	Maximum detected concentration above screening criteria ABSC)
		Maximum detection limit above screening criteria (DLASC)
	COC Deletion Reason:	Maximum detected concentration below screening criteria (BSC)
		Maximum detection limit below screening criteria (DLBSC)

J The associated value is qualified as an estimated quantity.

TABLE B.2

DERIVATION OF RISK-BASED TARGET INDOOR AIR CONCENTRATIONS FOR AN INDUSTRIAL/COMMERCIAL WORKER
VAPOR INTRUSION PATHWAY ASSESSMENT
FORMER DOWCRAFT CORPORATION SITE
FALCONER, NEW YORK

							Industrial/Commercial Worker		*Risk-Based*
Chemical of Concern (COC)	*Inhalation Unit Risk Factor, URF ($\mu g/m^3$)$^{-1}$*	*Inhalation CSF (1) 1/(mg/kg-d)*	*Sources of URF/CSF (2)*	*Inhalation RfC (mg/m^3)*	*Inhalation RfD (3) (mg/kg-d)*	*Sources of RfC/RfD (2)*	*RISK = 1.0E-06 Adult ($\mu g/m^3$)*	*HI = 1.0 Adult ($\mu g/m^3$)*	*Target Indoor Air Concentration (4) ($\mu g/m^3$)*
1,1,2-Trichloroethane	1.60E-05	5.60E-02	USEPAa	--	4.00E-03	--	7.70E-01	6.16E+01	7.70E-01
1,2-Dichloroethane	2.60E-05	9.10E-02	USEPAa	--	1.40E-03	USEPAb	4.74E-01	2.15E+01	4.74E-01
Benzene	2.20E-06	7.70E-03	USEPAa	3.00E-02	8.57E-03	USEPAa	5.60E+00	1.32E+02	5.60E+00
Bromoform	1.10E-06	3.85E-03	USEPAa	--	2.00E-02	USEPAb	1.12E+01	3.08E+02	1.12E+01
Cis-1,2-Dichloroethene	--	--	USEPAb	--	1.00E-02	USEPAb	NV	1.54E+02	1.54E+02
Tetrachloroethene	--	2.10E-02	USEPAb	--	1.00E-02	USEPAb	2.05E+00	1.54E+02	2.05E+00
Trichloroethene	--	7.00E-03	USEPAb	--	1.70E-01	USEPAb	6.16E+00	2.62E+03	6.16E+00
Vinyl chloride (adult)	4.40E-06	1.54E-02	USEPAa	1.00E-01	2.86E-02	USEPAa	2.80E+00	4.40E+02	2.80E+00

Notes :

-- = Not Available
N/A = Not Applicable
NV = No Value
(1) Inhalation Cancer Slope Factor (CSF) = Unit Risk Factor x body weight/inhalation rate x conversion factor = URF x 70 kg/20 m^3/day x 1,000 μg/mg.
(2) USEPAa: Integrated Risk Information System Database, February 6 , 2007.
USEPAb: Region 9 Preliminary Remediation Goals, October, 2004
(3) Inhalation Reference Dose (RfD) = Inhalation Reference Concentration (RfC) x Inhalation Rate/Body Weight = RfC x 20 m^3/day/ 70 kg.
(4) Risk-based target indoor air concentrations lower of the non-carcinogenic and carcinogenic value.

Industrial/Commercial Worker Exposure Assumptions

Risk-Based Indoor Air Concentration (	C_{air}	calculated	
Target Risk Level (unitless)	TR	1.00E-06	
Target Hazard Level (unitless)	THQ	1.00	
Cancer Slope Factor ((mg/kg-day)$^{-1}$)	CSF	chemical-specific	(see above)
Reference Dose Factor (mg/kg-day)	RfD	chemical-specific	(see above)
Conversion Factor (μg/mg)	CF	1000	
Exposure Frequency (days/year)	EF	250	[(5 days/week, 50 weeks/year), USEPA, 2004b]
Exposure Duration (years)	ED	25	(USEPA, 2004b)
Exposure Time Factor (hours/day)	ET	8.0	(based on typical 8 hour working day)
Body Weight (kg)	BW	70	(USEPA, 2004b)
Inhalation Rate (m^3/hour)	INR	0.83	(USEPA, 2002b)
Averaging Time - carc. (days)	ATc	25550	[(365 days for 70 years), USEPA, 1989]
Averaging Time - noncarc. (days)	ATnc	9125	[(365 days times the ED), USEPA,1989]

Exposure Equations

Carcinogenic Endpoints:

$$\text{Risk-Based } C_{air} = \frac{TR \times BW \times ATc \times CF}{CSF \times INR \times EF \times ET \times ED}$$

Non-Carcinogenic Endpoints:

$$\text{Risk-Based } C_{air} = \frac{THQ \times RfD \times BW \times ATnc \times CF}{INR \times EF \times ET \times ED}$$

Exposure Assumptions Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol. 1: Human Health Evaluation Manual, Part A OERR. EPA/540-1-89-002.
USEPA, 2002b: Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites, OSWER 9355.4-24, December 2002.
USEPA, 2004b: RAGs Volume 1, Human Health Evaluation Manual, Part E: Supplemental Guidance for Dermal Risk Assessment, EPA/540/R/99/005, July 2004.

TABLE B.3

DERIVATION OF GROUNDWATER SSAC FOR THE PROTECTION OF INDOOR AIR QUALITY
VAPOR INTRUSION PATHWAY ASSESSMENT
FORMER DOWCRAFT CORPORATION SITE
FALCONER, NEW YORK

	Chemical Properties (1)						
Chemical of Concern (COC)	*Henry's Law Constant, H_L (atm m³/mol)*	*Water Diffusion Coefficient, D^{H2O} (cm²/s)*	*Air Diffusion Coefficient, D^{air} (cm²/s)*	*Johnson & Ettinger Attenuation Factor, α* (2)	*Risk Based Target Indoor Air Concentration, C_{air}* (3) *(µg/m³)*	*Soil Gas Concentration Above Water Table, C_{sg}* (4) *(µg/m³)*	*Groundwater SSAC, C_{gw}* (5) *(µg/L)*
1,1,2-Trichloroethane	3.49E-04 (8.3° C)	4.11E-06 (25° C)	7.15E-02 (8.3° C)	3.54E-06	7.70E-01	2.17E+05	13,971
1,2-Dichloroethane	4.15E-04 (8.3° C)	4.47E-06 (25° C)	9.54E-02 (8.3° C)	3.58E-06	4.74E-01	1.32E+05	7,138
Benzene	2.45E-03 (8.3° C)	4.24E-06 (25° C)	8.07E-02 (8.3° C)	3.55E-06	5.60E+00	1.57E+06	14,399
Bromoform	1.98E-04 (8.3° C)	3.51E-06 (25° C)	1.37E-02 (8.3° C)	3.27E-06	1.12E+01	3.42E+06	387,849
cis-1,2-Dichloroethene	1.87E-03 (8.3° C)	4.05E-06 (25° C)	6.75E-02 (8.3° C)	3.53E-06	1.54E+02	4.35E+07	520,977
Tetrachloroethene	7.04E-03 (8.3° C)	4.03E-06 (25° C)	6.60E-02 (8.3° C)	3.53E-06	2.05E+00	5.81E+05	1,849
Trichloroethene (Cal EPA CSF_i/USF)	4.35E-03 (8.3° C)	4.12E-06 (25° C)	7.25E-02 (8.3° C)	3.54E-06	6.16E+00	1.74E+06	8,949
Vinyl chloride	1.63E-02 (8.3° C)	4.50E-06 (25° C)	9.72E-02 (8.3° C)	3.58E-06	2.80E+00	7.81E+05	1,074

TABLE B.3

DERIVATION OF GROUNDWATER SSAC FOR THE PROTECTION OF INDOOR AIR QUALITY
VAPOR INTRUSION PATHWAY ASSESSMENT
FORMER DOWCRAFT CORPORATION SITE
FALCONER, NEW YORK

Notes:

(1) The applied chemical properties are obtained from the chemical properties database implemented in USEPA (2004a). The Henry's Law constant and air diffusion coefficient were corrected for an average vadose zone temperature of 8.3°C. The reference temperature for the water diffusion coefficient is 25 °C and, given its weak temperature dependence, a correction to 8.3 °C was considered negligible.

(2) The soil gas attenuation factor α is based on the solution for soil gas migration to building indoor air presented in Johnson and Ettinger [1991; Equation (21)], the vadose zone and building properties listed below, and a 4 Pa pressure difference between the vadose zone and the building (ΔP) after the default value applied in USEPA (2002a) . The calculation of the soil gas attenuation factor was conducted using the Excel spreadsheet "GW-ADV-Feb04.xls"Version 3.1 developed by USEPA (2004a) and the following Site-specific vadose zone and building properties.

Vadose Zone Soil Properties:		
Fill Unit		
Moisture Content, θ_m (%)	6.0	Conservatively assumed value for the sand and silt to silt and clay fill beneath the Site.
Total Porosity, ε_T (%)	30	Conservatively assumed value based on the range of porosity values for mixed sand and gravel presented in Fetter (2001, Table 3.4).
Moisture-Filled Porosity, ε_m	0.111	Moisture-filled porosity, $\varepsilon_m = \theta_m / 100^*(\rho_{db}/\rho_w)$
Vapour-Filled Porosity, ε_v	0.189	Vapor-filled porosity, $\varepsilon_v = \varepsilon_T / 100 - \varepsilon_m$
Dry Bulk Soil Density, ρ_{db} (g/cm³)	1.855	Calculated from $\rho_{db} = (1 - \varepsilon_T/100) * \rho_s$, where $\rho_s = 2.65$ g/cm^3 is the solid particle density of sand.
Hydraulic Conductivity, K (cm/s)	1.60E-04	Conservatively assumed based on the geometric mean hydraulic conductivity estimated from the Hazen Permeability Relationship and the grain size analysis of samples of the native sand and gravel unit collected from borehole locations PW1, PW2, BH-15 and BH-16 and the finer texture (i.e., higher silt content) of the fill material beneath the Site.
Intrinsic Permeability, k_i (cm²)	2.24E-09	Intrinsic permeability, $k=K\ \mu_w / \rho_w\ g^*100$, where water density, ρ_w=999.829 kg/m^3 at 8.3°C, gravitational acceleration g=9.81 m/s^2, and the dynamic viscosity of water, μ_w=1.3741e-3 kg/ms at 8.3°C (Fetter, 2001).
Relative Vapor Permeability, k_r (cm²)	0.733	Estimated after Parker et al. (1987) for a silt soil type as implemented in USEPA (2004) to account for the reduction in permeability due to the degree of vadose zone water saturation.
Effective Vapor Permeability, k_v (cm²)	1.64E-09	Determined from $k_v=k_r{}^*k_i$.
Vadose Zone Temperature (°C)	8.3	Conservatively assumed based on the average shallow groundwater temperature for upper New York State presented in USEPA (2004; Figure 8).
Distance from building to fill/sand and gravel unit boundary, $L_{T,1}$ (m)	1.14	Based on the average below ground depth to the fill/native sand and gravel unit interface beneath the building overlying the VOC groundwater plume of 2.97 m (9.75 ft) less the partial basement floor below grade depth of 1.83 m (6 ft).
Vapor Viscosity of Air, μ_a at 8.3°C (g/cm s)	1.75E-04	Vadose zone temperature corrected vapor viscosity as implemented in USEPA (2004a).
Sand and Gravel Unit		
Moisture Content, θ_m (%)	6.0	Conservatively assumed value for the native sand and gavel beneath the Site.
Total Porosity, ε_T (%)	30	Conservatively assumed value based on the range of porosity values for sand deposits presented in Fetter (2001, Table 3.4).
Moisture-Filled Porosity, ε_m	0.111	Moisture-filled porosity, $\varepsilon_m = \theta_m / 100^*(\rho_{db}/\rho_w)$
Vapour-Filled Porosity, ε_v	0.189	Vapor-filled porosity, $\varepsilon_v = \varepsilon_T / 100 - \varepsilon_m$
Dry Bulk Soil Density, ρ_{db} (g/cm³)	1.855	Calculated from $\rho_{db} = (1 - \varepsilon_T/100) * \rho_s$, where $\rho_s = 2.65$ g/cm^3 is the mineral particle density.
Distance from fill/sand and gravel unit boundary to groundwater table, $L_{T,2}$ (m)	0.33	Based on the average below grade groundwater depth recorded beneath the building overlying the VOC groundwater plume between 1993 and 2001 of 3.3 m (10.9 ft) less thebelow grade depth to the fill/sand and gravel unit interface of 2.97 m (9.75 ft).
Building Properties		
Below-Grade Area of Building Surfaces, A_B (m²)	2,323	Based on the building area overlying the VOC groundwater plume footprint dimensions of 76.2 m by 30.5 m (250 ft by 100 ft) and assuming slab-on-grade construction.
Building Volume, V_B (m^3)	14,158	Based on the building area overlying the VOC groundwater plume footprint dimensions of 76.2 m by 30.5 m (250 ft by 100 ft) and assuming slab-on-grade construction with ceiling height of 6.3 m (20 ft).
Building Air Exchange Rate, T_{air} (1/hr)	0.83	Default industrial/commercial building enclosed-space air exchange rates reported in ASTM (1995).
Ratio of Crack Area to Below-Grade Area, h (%)	0.038	Default value for slab-on-grade structures presented in USEPA (2002a; Appendix G).
Foundation Thickness, L_{crack} (cm)	15	Assumed based on a slab-on-grade floor thickness of 15 cm (6 in).

(3) The risk-based target indoor air concentrations developed for an industrial/commercial worker presented in Table B.2.

(4) The building-specific soil gas criteria beneath the existing on-Site Building is calculated from $C_{sg}=C_{air}/\alpha$.

(5) The equilibrium groundwater concentration was calculated from the soil gas criteria using Henry's Law; $C_{gw}=C_{sg}{}^*(T^*R)/H_L$ where T is the vadose temperature in degrees Kelvin and the universal gas constant R is 8.206E-05 atm m ^{3}/mol K.