

# Risk Assessment Hilkers Cleaners

DSCA ID: DC920025  
6325 Falls of Neuse Road  
Raleigh, Wake County

## North Carolina Dry-Cleaning Solvent Cleanup Act Program

H&H Job No. DS0-88C  
August 5, 2016



SMARTER ENVIRONMENTAL SOLUTIONS

#C-1269 Engineering  
#245 Geology

**Risk-Based Corrective Action Report Forms  
for  
North Carolina Dry-Cleaning Solvent Cleanup Act  
Program**

<b>Facility Name:</b>	Hilkers Cleaners
	6325 Falls of Neuse Road, Raleigh, Wake County, North Carolina
<b>DSCA ID No.:</b>	DC920025
<b>Submittal Date:</b>	August 5, 2016
<b>Prepared By:</b>	Hart & Hickman, PC
	2923 S. Tryon Street, Suite 100, Charlotte, North Carolina 28203

DSCA ID No.: DC920025

Form/Att. No.	Description	Check box if included
<b>Risk Assessment Forms</b>		
Form 1	Protection of Groundwater Use and Surface Water Evaluation	<input checked="" type="checkbox"/>
Form 2	Cumulative Risk for Exposure Unit #1	<input checked="" type="checkbox"/>
Form 3	Cumulative Risk for Exposure Unit #2	<input checked="" type="checkbox"/>
Form 4	Cumulative Risk for Exposure Unit #3	<input type="checkbox"/>
Form 5	Cumulative Risk for Exposure Unit #4	<input type="checkbox"/>
Form 6	Cumulative Risk for Exposure Unit #5	<input type="checkbox"/>
Form 7	Cumulative Risk for Exposure Unit #6	<input type="checkbox"/>
Form 8	Summary of Risk Assessment Results and Recommendations	<input checked="" type="checkbox"/>
<b>Risk Assessment Attachments</b>		
Att. 1	Figures showing the source area, points of exposure (POE), and exposure units	<input checked="" type="checkbox"/>
Att. 2	Figure showing indoor air and sub-slab vapor data	<input checked="" type="checkbox"/>
Att. 3	Representative concentration calculations	<input checked="" type="checkbox"/>
Att. 4	Modeling documentation	<input checked="" type="checkbox"/>
Att. 5	Analytical data tables	<input checked="" type="checkbox"/>
		<input type="checkbox"/>
		<input type="checkbox"/>
		<input type="checkbox"/>
		<input type="checkbox"/>
		<input type="checkbox"/>
		<input type="checkbox"/>
		<input type="checkbox"/>

Note:

1. All maps must include a bar scale, north arrow, site name, DSCA ID No., and date.

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## Source Area Representative Concentrations

## Description of Representative Concentration Calculations:

The representative concentration used for groundwater was conservatively obtained from the maximum source groundwater contaminant concentrations detected in MW-1S over the last four sampling events. The representative concentrations used for soil were obtained from the soil samples with the maximum contaminant concentrations detected at the site. Figures that include the source area locations are included in Attachment 1. Representative concentration data tables are included as Attachment 3.

## Protection of Groundwater Use

Distance to POE for Protection of Groundwater Use: 150 (GW) 200 (soil) feet

## Explanation of POE location selection:

The POE was determined to be located at the closest downgradient property boundary where no groundwater impacts have been observed. Modeling under this scenario assumes that land use restrictions limiting the installation of water supply wells on the source property and adjacent non-source properties where groundwater impacts are present will be implemented. This property boundary is located approximately 150 ft southeast of the groundwater source and 200 ft southeast of the soil source area. Attachment 1 contains figures depicting the selected POE location.

Exceedences of SSTLs?

Source Soil YesSource Groundwater Yes

## Discussion:

The modeling results for the protection of groundwater use evaluation indicate exceedances of the site-specific target levels (SSTLs) for source groundwater and source soil. However, groundwater sampling data for the site indicate that the plume is stable and has not migrated as far as the modeling projects. The impacted soil is below the existing building. If the building were to be removed in the future, the impacted soil could become exposed modifying the current infiltration conditions at the site and potentially resulting in leaching of contamination from the soil and subsequent migration in groundwater. Therefore, it is recommended that land use controls be utilized to maintain current infiltration conditions in the area of impacted soil exceeding the SSTL. This area is depicted on Attachments 1C and 1D as the "surface cover restriction area".

## Protection of Surface Water

Distance to POE for Protection of Surface Water: 940 (GW) 910 (soil) feet

## Explanation of POE location selection:

The nearest surface water feature is a tributary to Marsh Creek located approximately 940 ft east-southeast of the groundwater source area and 910 ft east-southeast of the soil source area. This tributary is classified as a Class C surface water body.

Exceedences of SSTLs?

Source Soil YesSource Groundwater No

## Discussion:

The modeling results for the protection of surface water use indicate an exceedance for source soil. However, groundwater sampling data for the site indicate that the plume is stable and has not migrated as far as the modeling projects. The impacted soil is below the existing building. If the building were to be removed in the future, the impacted soil could become exposed modifying the current infiltration conditions at the site and potentially resulting in leaching of contamination from the soil and subsequent migration in groundwater. Therefore, it is recommended that land use controls be utilized to maintain current infiltration conditions in the area of impacted soil exceeding the SSTL. This area is depicted on Attachments 1C and 1D as the "surface cover restriction area".

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Exposure Unit: Exposure Unit #1

Cumulative Risk Evaluation

Land Use: Exposure Unit #1 is located within the source property where the former dry cleaner operated. The current land use is commercial and likely to remain commercial (property is zoned commercial), but residential use was also modeled to evaluate land use restrictions at the time of closure.

Exposure Evaluation		
Exposure Pathway	Complete	Explanation
Indoor Inhalation Pathway	<input checked="" type="radio"/> Yes <input type="radio"/> No	Impacted soil and groundwater is present, and sub-slab vapor and indoor air sampling was completed for the existing site building. This pathway is complete. A figure depicting the sub-slab vapor and indoor air sample locations and results is provided in Attachment 2.
Surficial Soil Combined Pathways	<input checked="" type="radio"/> Yes <input type="radio"/> No	Impacted surface soil is present, so this pathway is complete. A soil contaminant concentration map is included in Attachment 1.
Dermal Contact with Groundwater Pathway	<input type="radio"/> Yes <input checked="" type="radio"/> No	The DSCA Program is no longer including this pathway in their risk assessments, per Billy Meyer's 6/15/16 e-mail.

Description of Representative Concentration Calculations:

For sub-slab soil gas and indoor air, H&H conservatively used the maximum concentrations detected within the exposure unit at the site for the representative concentrations. Indoor air concentrations were used to evaluate current risk, and sub-slab soil gas were used to evaluate future risk. For soil, H&H utilized the average concentration detected in surficial soil samples (0-2 ft bgs) within the exposure unit. Please note that surficial soil is considered 0-1 ft bgs; however, shallow soil samples at the site were collected from the 0-2 ft bgs or 1-2 ft bgs interval. Review of boring logs indicates the highest PID readings were generally detected in these intervals; thus, this data is considered representative. For construction workers, H&H utilized the average concentration in all soil samples from 0-10 ft bgs collected from within the soil source area.

Results - CURRENT RISK							
EXPOSURE PATHWAY	MODELING SOURCE	RESIDENTIAL		COMMERCIAL*		CONSTRUCTION WORKER	
		Carcino-genic Risk	Hazard Index	Carcino-genic Risk	Hazard Index	Carcino-genic Risk	Hazard Index
Indoor Air Exposure Pathway	DSCA Risk Assessment Tool Kit	9.00E-06	2.17E+00	1.70E-06	5.18E-01	NA	NA
Surficial Soil Exposure Pathways	DSCA Risk Assessment Tool Kit	4.77E-07	1.33E-01	8.23E-08	2.20E-02	1.19E-07	9.32E-01
Dermal Contact with Groundwater Exposure Pathway	NA	NA	NA	NA	NA	NA	NA
Cumulative Risk		9.48E-06	2.30E+00	1.78E-06	5.40E-01	1.19E-07	9.32E-01
Target Risk Limit		1.00E-05	1	1.00E-05	1	1.00E-05	1
Risk Limit Exceeded		NO	YES	NO	NO	NO	NO

DSCA ID No.: DC920025

Exposure Unit: Exposure Unit #1

Results - FUTURE RISK							
EXPOSURE PATHWAY	MODELING SOURCE	RESIDENTIAL		COMMERCIAL*		CONSTRUCTION WORKER	
		Carcino-genic Risk	Hazard Index	Carcino-genic Risk	Hazard Index	Carcino-genic Risk	Hazard Index
Indoor Air Exposure Pathway	DSCA Risk Assessment Tool Kit	2.38E-05	6.14E+00	1.80E-06	4.87E-01	NA	NA
Surficial Soil Exposure Pathways	DSCA Risk Assessment Tool Kit	4.77E-07	1.33E-01	8.23E-08	2.20E-02	1.19E-07	9.32E-01
Dermal Contact with Groundwater Exposure Pathway	NA	NA	NA	NA	NA	NA	NA
Cumulative Risk		2.43E-05	6.27E+00	1.88E-06	5.09E-01	1.19E-07	9.32E-01
Target Risk Limit		1.00E-05	1	1.00E-05	1	1.00E-05	1
Risk Limit Exceeded		YES	YES	NO	NO	NO	NO

\* - Evaluation for commercial land use is only required if risk assessment fails for residential land use and property is not residential.

NM = Not modeled.

NC = Pathway not complete.

NA = Not applicable.

Discussion:

H&H evaluated the current and potential future risk for Exposure Unit #1 (the on-site exposure unit) using the DSCA Risk Assessment Tool Kit. For both current and future use scenarios, H&H evaluated residential, commercial, and construction worker exposure scenarios, even though the current use is commercial and the property is zoned for commercial use. For the indoor air inhalation pathway under the current use scenario, H&H utilized existing indoor air data. For future use, H&H utilized sub-slab vapor data to evaluate the indoor air inhalation pathway because indoor air concentrations could vary for alternate building construction.

The results of the risk evaluation for Exposure Unit #1 indicate residential exceedances of acceptable risk levels under current and future scenarios. These risk exceedances could be addressed by implementing a land use restriction specifying that land use for the site property be restricted to non-residential.

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Exposure Unit: Exposure Unit #2

**Cumulative Risk Evaluation**

Land Use:

Exposure Unit #2 is currently zoned commercial and likely to remain commercial (property is zoned commercial), but future residential use was also modeled to evaluate land use restrictions at the time of closure.

**Exposure Evaluation**

Exposure Pathway	Complete	Explanation
Indoor Inhalation Pathway	<input checked="" type="radio"/> Yes <input type="radio"/> No	Impacted groundwater is present, so this pathway is complete. A groundwater contaminant concentration map is included in Attachment 1.
Surficial Soil Combined Pathways	<input type="radio"/> Yes <input checked="" type="radio"/> No	Impacted surface soil is not present, so this pathway is not complete. A soil contaminant concentration map is included in Attachment 1.
Dermal Contact with Groundwater Pathway	<input type="radio"/> Yes <input checked="" type="radio"/> No	The DSCA Program is no longer including this pathway in their risk assessments, per Billy Meyer's 6/15/16 e-mail.

**Description of Representative Concentration Calculations:**

For groundwater, H&H conservatively used the maximum concentrations detected within/near the exposure unit since 2008 for the representative concentrations. Although MW-4 is not located in Exposure Unit #2, concentrations from this well were used based on proximity to the exposure unit.

**Results - CURRENT RISK**

EXPOSURE PATHWAY	MODELING SOURCE	RESIDENTIAL		COMMERCIAL*		CONSTRUCTION WORKER	
		Carcino-genic Risk	Hazard Index	Carcino-genic Risk	Hazard Index	Carcino-genic Risk	Hazard Index
Indoor Air Exposure Pathway	DSCA Risk Assessment Tool Kit	NC	NC	8.44E-08	2.27E-02	NA	NA
Surficial Soil Exposure Pathways	NC	NC	NC	NC	NC	NC	NC
Dermal Contact with Groundwater Exposure Pathway	NA	NA	NA	NA	NA	NA	NA
Cumulative Risk		0.00E+00	0.00E+00	8.44E-08	2.27E-02	0.00E+00	0.00E+00
Target Risk Limit		1.00E-05	1	1.00E-05	1	1.00E-05	1
Risk Limit Exceeded		NO	NO	NO	NO	NO	NO

DSCA ID No.: DC920025

Exposure Unit: Exposure Unit #2

Results - FUTURE RISK							
EXPOSURE PATHWAY	MODELING SOURCE	RESIDENTIAL		COMMERCIAL*		CONSTRUCTION WORKER	
		Carcino-genic Risk	Hazard Index	Carcino-genic Risk	Hazard Index	Carcino-genic Risk	Hazard Index
Indoor Air Exposure Pathway	DSCA Risk Assessment Tool Kit	3.69E-07	9.54E-02	8.44E-08	2.27E-02	NA	NA
Surficial Soil Exposure Pathways	NC	NC	NC	NC	NC	NC	NC
Dermal Contact with Groundwater Exposure Pathway	NA	NA	NA	NA	NA	NA	NA
Cumulative Risk		3.69E-07	9.54E-02	8.44E-08	2.27E-02	0.00E+00	0.00E+00
Target Risk Limit		1.00E-05	1	1.00E-05	1	1.00E-05	1
Risk Limit Exceeded		NO	NO	NO	NO	NO	NO

\* - Evaluation for commercial land use is only required if risk assessment fails for residential land use and property is not residential.

NM = Not modeled.

NC = Pathway not complete.

NA = Not applicable.

Discussion:

H&H evaluated the current and potential future risk for Exposure Unit #2 (the off-site exposure unit) using the DSCA Risk Assessment Tool Kit. For current use, H&H evaluated a commercial exposure scenario. For future use, H&H evaluated both commercial and residential exposures to evaluate the potential need for land use restrictions, even though the property is zoned for commercial use. The results of the risk evaluation for Exposure Unit #2 indicate no exceedances of acceptable risk levels under the current or future use scenarios. The risk evaluation assumes that there will be land use restrictions limiting the installation of water supply wells on properties located within Exposure Unit #2 where groundwater impacts exceed NC 2L groundwater standards. No other land use restrictions are needed.

DSCA ID No.: DC920025

Protection of Groundwater Use

Exceedences of SSTLs? Source Soil Yes Source Groundwater Yes

Protection of Surface Water

Exceedences of SSTLs? Source Soil Yes Source Groundwater No

Cumulative Risk Evaluation

Exposure Unit	Residential			Non-Residential			Construction Worker		
	Carcinogenic Risk	Hazard Index	Risk exceeded?	Carcinogenic Risk	Hazard Index	Risk exceeded?	Carcinogenic Risk	Hazard Index	Risk exceeded?
<b>CURRENT RISK</b>									
Exposure Unit #1	9.48E-06	2.30E+00	<b>YES</b>	1.78E-06	5.40E-01	<b>NO</b>	1.19E-07	9.32E-01	<b>NO</b>
Exposure Unit #2	0.00E+00	0.00E+00	<b>NO</b>	8.44E-08	2.27E-02	<b>NO</b>	0.00E+00	0.00E+00	<b>NO</b>
Exposure Unit #3	0.00E+00	0.00E+00	<b>NO</b>	0.00E+00	0.00E+00	<b>NO</b>	0.00E+00	0.00E+00	<b>NO</b>
Exposure Unit #4	0.00E+00	0.00E+00	<b>NO</b>	0.00E+00	0.00E+00	<b>NO</b>	0.00E+00	0.00E+00	<b>NO</b>
Exposure Unit #5	0.00E+00	0.00E+00	<b>NO</b>	0.00E+00	0.00E+00	<b>NO</b>	0.00E+00	0.00E+00	<b>NO</b>
Exposure Unit #6	0.00E+00	0.00E+00	<b>NO</b>	0.00E+00	0.00E+00	<b>NO</b>	0.00E+00	0.00E+00	<b>NO</b>
<b>FUTURE RISK</b>									
Exposure Unit #1	2.43E-05	6.27E+00	<b>YES</b>	1.88E-06	5.09E-01	<b>NO</b>	1.19E-07	9.32E-01	<b>NO</b>
Exposure Unit #2	3.69E-07	9.54E-02	<b>NO</b>	8.44E-08	2.27E-02	<b>NO</b>	0.00E+00	0.00E+00	<b>NO</b>
Exposure Unit #3	0.00E+00	0.00E+00	<b>NO</b>	0.00E+00	0.00E+00	<b>NO</b>	0.00E+00	0.00E+00	<b>NO</b>
Exposure Unit #4	0.00E+00	0.00E+00	<b>NO</b>	0.00E+00	0.00E+00	<b>NO</b>	0.00E+00	0.00E+00	<b>NO</b>
Exposure Unit #5	0.00E+00	0.00E+00	<b>NO</b>	0.00E+00	0.00E+00	<b>NO</b>	0.00E+00	0.00E+00	<b>NO</b>
Exposure Unit #6	0.00E+00	0.00E+00	<b>NO</b>	0.00E+00	0.00E+00	<b>NO</b>	0.00E+00	0.00E+00	<b>NO</b>
<b>Allowable Risk</b>	<b>1.0E-05</b>	<b>1</b>		<b>1.0E-05</b>	<b>1</b>		<b>1.0E-05</b>	<b>1</b>	

Recommendations

H&H completed a risk assessment for the Hilkers Cleaners site in accordance with the DSCA Program's risk assessment procedures. H&H evaluated the cumulative risk for two exposure units. Exposure Unit #1 consists of the source property where the former dry-cleaning operations were conducted and where both soil and groundwater impacts are present. Exposure Unit #2 consists of one adjacent non-source property where only impacted groundwater is present. Protection of groundwater use and protection of surface water use were also evaluated.

For the protection of groundwater use evaluation, the POE was located at the closest downgradient property boundary where groundwater impacts have not yet been observed. The property boundary is located approximately 150 feet downgradient of the groundwater source area and 200 ft downgradient of the soil source area. Attachment 1 contains figures depicting both soil and groundwater contamination in relation to the selected groundwater POE location. The representative concentration used for the groundwater source was conservatively obtained from the maximum groundwater concentration detected in MW-1S over the last four sampling events. The representative concentrations used for the soil source were the maximum concentrations detected in soil samples within the source area. The modeling results for the protection of groundwater use indicated an exceedance of SSTLs for source soil. However, site data indicate the groundwater plume is stable and groundwater impacts have not reached the POE. The impacted soil is below the existing building. If the building were to be removed in the future, the impacted soil could become exposed modifying the current infiltration conditions at the site and potentially resulting in leaching of contamination from the soil and subsequent migration in groundwater. Therefore, it is recommended that land use controls be utilized to maintain current infiltration conditions in the area of impacted soil exceeding the SSTL. This area is depicted on Attachment 1D as the "surface cover restriction area".

For the protection of surface water use evaluation, the POE was determined to be a tributary to Marsh Creek located approximately 940 feet downgradient of the groundwater source and 910 feet downgradient of the soil source. The modeling results for the protection of surface water use indicate exceedances of SSTLs for source soil. As indicated above, previous evaluation and sampling of the site has demonstrated that the contaminant plume is currently stable and impacts have not reached the POE. Therefore, no additional land use controls are recommended. The impacted soil is currently located below the existing building. If the building were to be removed in the future, the impacted soil could become exposed modifying the current infiltration conditions at the site and potentially resulting in leaching of contamination from the soil and subsequent migration in groundwater. Therefore, it is recommended that land use controls be utilized to maintain current infiltration conditions in the area of impacted soil exceeding the SSTL. This area is depicted on Attachment 1D as the "surface cover restriction area".

DSCA ID No.: DC920025

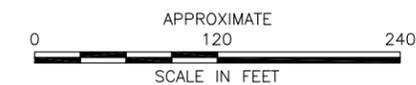
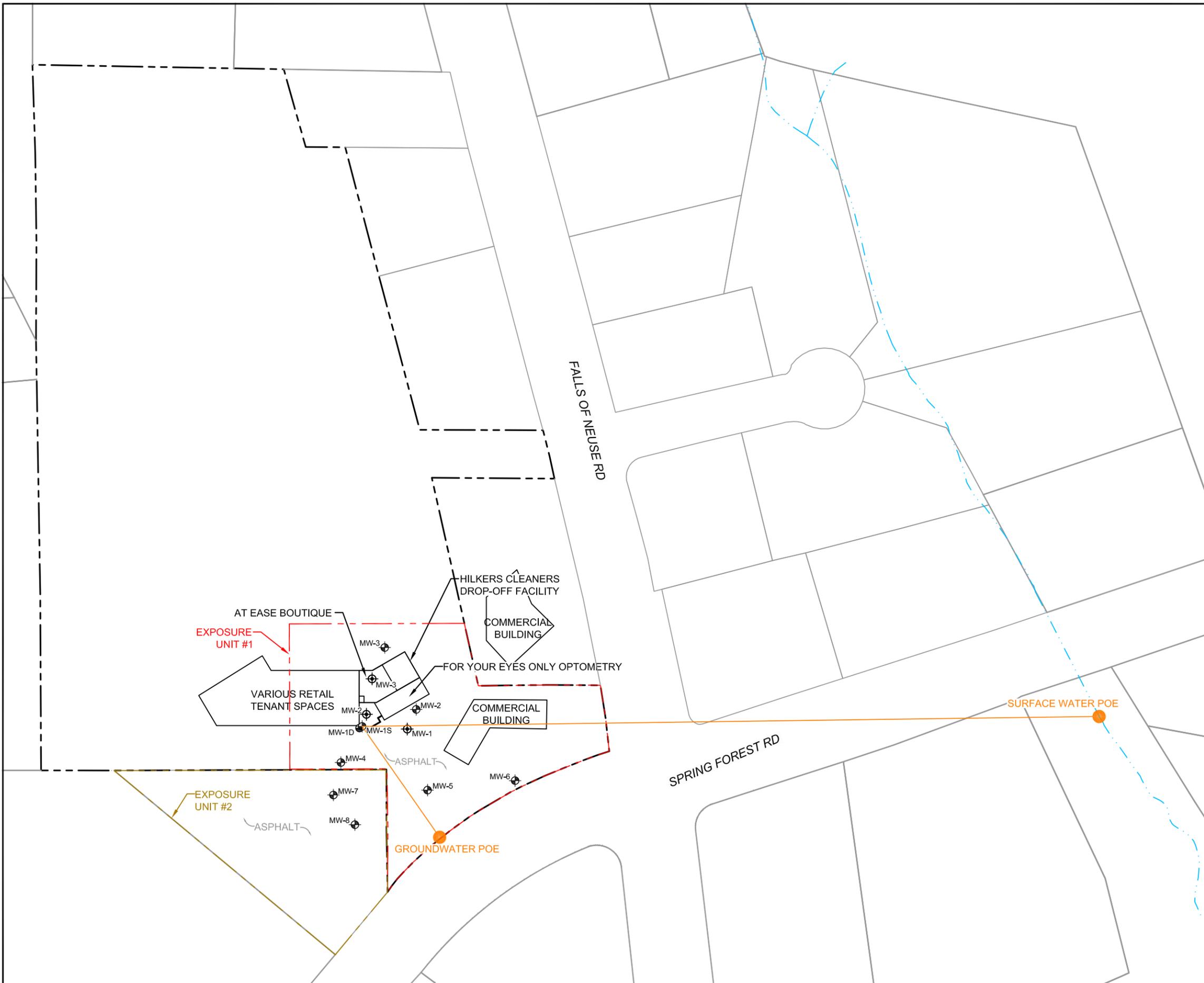
Exposure Unit #1 includes the soil and groundwater source areas and surrounding area located on the source property. The risk evaluation assumes that there will be land use restrictions limiting the installation of water supply wells on the source property located within Exposure Unit #1 where groundwater is impacted at concentrations above 2L standards. The groundwater use restriction area is depicted on Attachment 1D. H&H evaluated current and future risk scenarios for residential, commercial, and construction worker exposures to evaluate the need for land use restrictions. For the indoor air inhalation pathway under the current use scenario, H&H utilized existing indoor air data. For future use, H&H utilized sub-slab vapor data to evaluate the indoor air inhalation pathway, because indoor air concentrations could vary for alternate building construction. The results of the risk evaluation for Exposure Unit #1 indicate exceedances of acceptable risk levels under the current and future residential use scenarios. The property is currently zoned for commercial use. To address the residential risk exceedances, H&H recommends implementing a land use restriction specifying that land use for the site property be restricted to non-residential.

Exposure Unit #2 includes one adjacent non-source property where only groundwater impacts are present. The risk evaluation assumes that there will be land use restrictions limiting the installation of water supply wells on the property located within Exposure Unit #2 where groundwater is impacted at concentrations above 2L standards. The groundwater use restriction area is depicted on Attachment 1D. H&H evaluated the current and potential future risk for Exposure Unit #2 (the off-site exposure unit) using the DSCA Risk Assessment Tool Kit. For both current and future use, H&H evaluated residential and commercial scenarios. The results of the risk evaluation for Exposure Unit #2 indicate no exceedances of acceptable risk levels under the current or future use scenarios. Thus, no additional land use restrictions are needed.

**ATTACHMENTS 1A-1D**  
**RISK ASSESSMENT FIGURES**

**LEGEND**

- SITE PROPERTY BOUNDARY
- ADJACENT PARCEL BOUNDARY
- SOURCE PROPERTY BOUNDARY
- FORMER HILKERS CLEANERS
- WATER FEATURE
- ⊕ MONITORING WELL LOCATION
- ⊕ TEMPORARY MONITORING WELL LOCATION
- DEEP MONITORING WELL LOCATION
- POINT OF EXPOSURE



<b>TITLE</b> EXPOSURE UNITS & POE LOCATIONS MAP	
<b>PROJECT</b> HILKERS CLEANERS DSCA ID: DC920025 6325 FALLS OF NEUSE ROAD RALEIGH, WAKE COUNTY	
<b>hart hickman</b> SMARTER ENVIRONMENTAL SOLUTIONS	2923 South Tryon Street-Suite 100 Charlotte, North Carolina 28203 704-586-0007(p) 704-586-0373(f) License # C-1269 / #C-245 Geology
DATE: 9-27-16	REVISION NO. 0
JOB NO. DS0-88	ATTACHMENT NO. 1A

S:\AAA-Master Projects\DSCA - DSO\DSO-88 Hilkers\Reports\Risk Assessment\_10-2015\Figures\Exposure Units & POE Locations.dwg, ATT 1A, 9/27/2016 8:56:50 AM, zbarlow

**LEGEND**

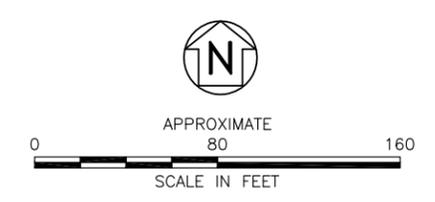
- SITE PROPERTY BOUNDARY
- ADJACENT PARCEL BOUNDARY
- SOURCE PROPERTY BOUNDARY
- FORMER HILKERS CLEANERS
- MONITORING WELL LOCATION
- TEMPORARY MONITORING WELL LOCATION
- DEEP MONITORING WELL LOCATION
- 391.5 GROUNDWATER ELEVATION CONTOUR (FT MSL)
- INFERRED GROUNDWATER FLOW DIRECTION
- MAXIMUM EXTENT OF PCE IN GROUNDWATER
- GROUNDWATER SOURCE AREA

SAMPLE ID

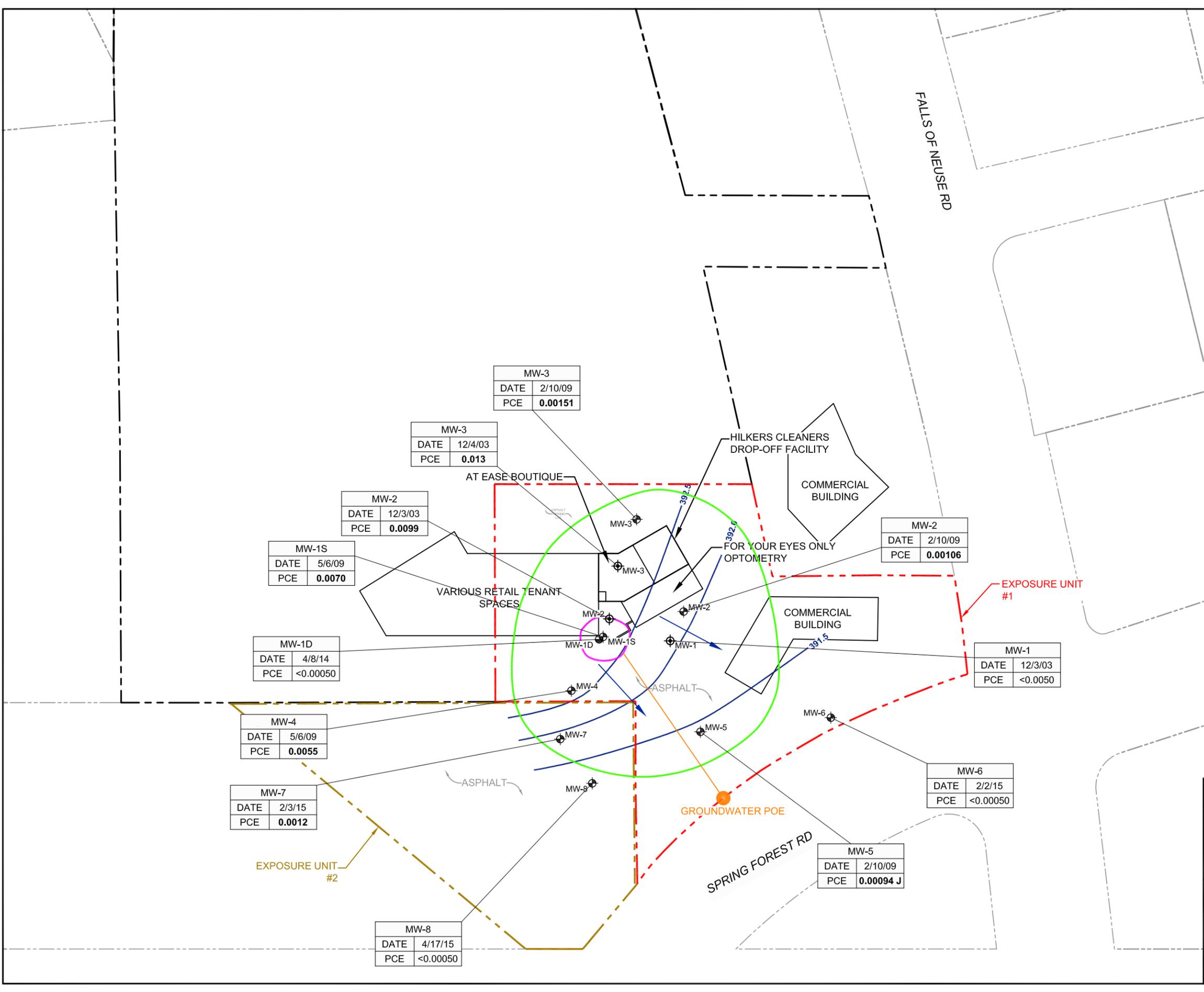
MW-1	
DATE	12/3/03
PCE	<0.0050

CONSTITUENT

MAXIMUM CONCENTRATION DETECTED (mg/L) (BOLD EXCEEDS DSCA TIER I RBSLs)



TITLE	<b>GROUNDWATER CONTAMINANT CONCENTRATION MAP</b>	
PROJECT	<b>HILKERS CLEANERS</b> <b>DSCA ID: DC920025</b> 6325 FALLS OF NEUSE ROAD RALEIGH, WAKE COUNTY	
		2923 South Tryon Street-Suite 100 Charlotte, North Carolina 28203 704-586-0007(p) 704-586-0373(f) License # C-1269 / #C-245 Geology
DATE:	8-3-16	REVISION NO. 0
JOB NO.	DS0-88	ATTACHMENT NO. 1B



MW-3	
DATE	2/10/09
PCE	<b>0.00151</b>

MW-3	
DATE	12/4/03
PCE	<b>0.013</b>

MW-2	
DATE	12/3/03
PCE	<b>0.0099</b>

MW-1S	
DATE	5/6/09
PCE	<b>0.0070</b>

MW-1D	
DATE	4/8/14
PCE	<0.00050

MW-4	
DATE	5/6/09
PCE	<b>0.0055</b>

MW-7	
DATE	2/3/15
PCE	<b>0.0012</b>

MW-8	
DATE	4/17/15
PCE	<0.00050

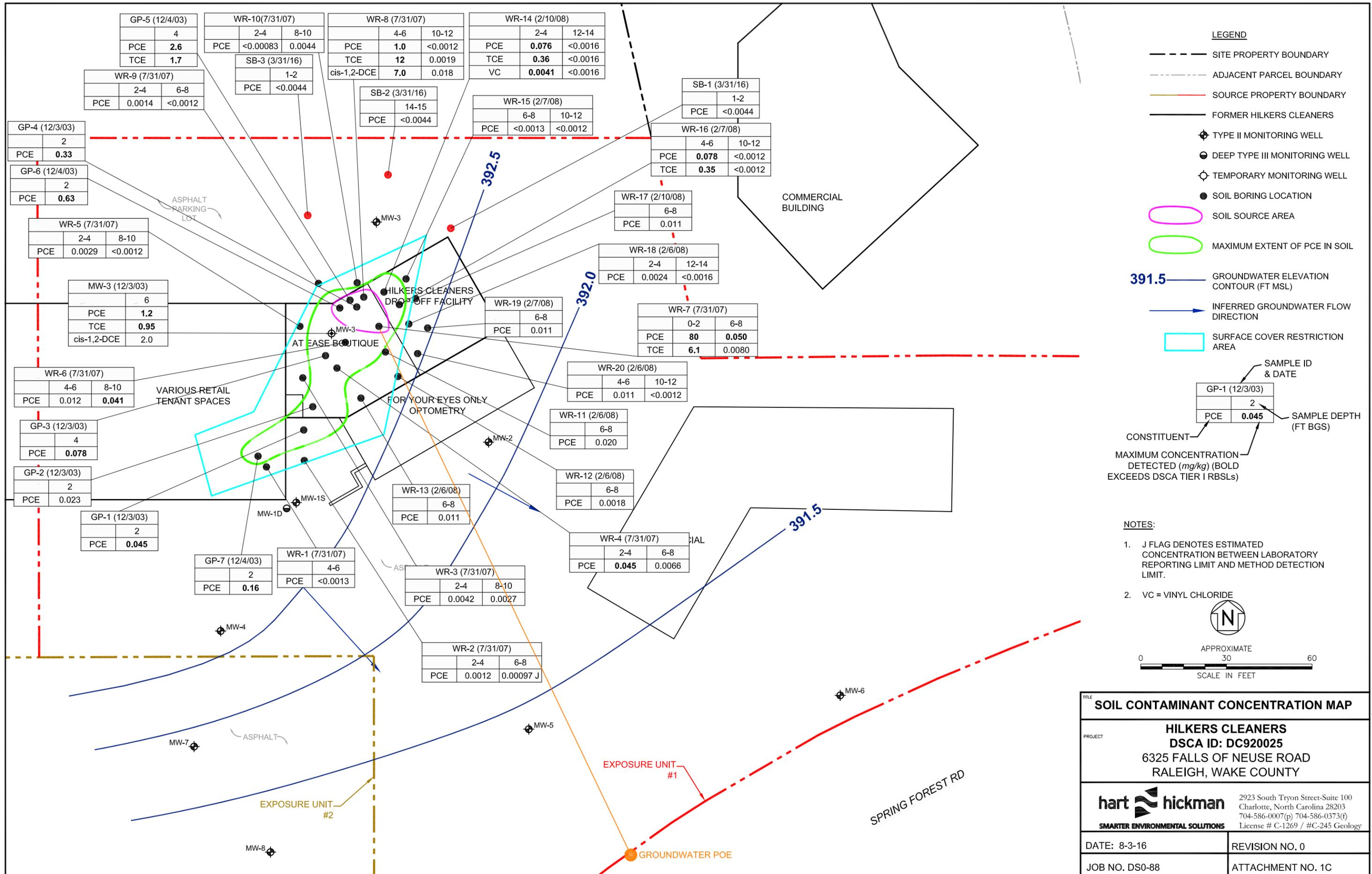
MW-2	
DATE	2/10/09
PCE	<b>0.00106</b>

MW-1	
DATE	12/3/03
PCE	<0.0050

MW-6	
DATE	2/2/15
PCE	<0.00050

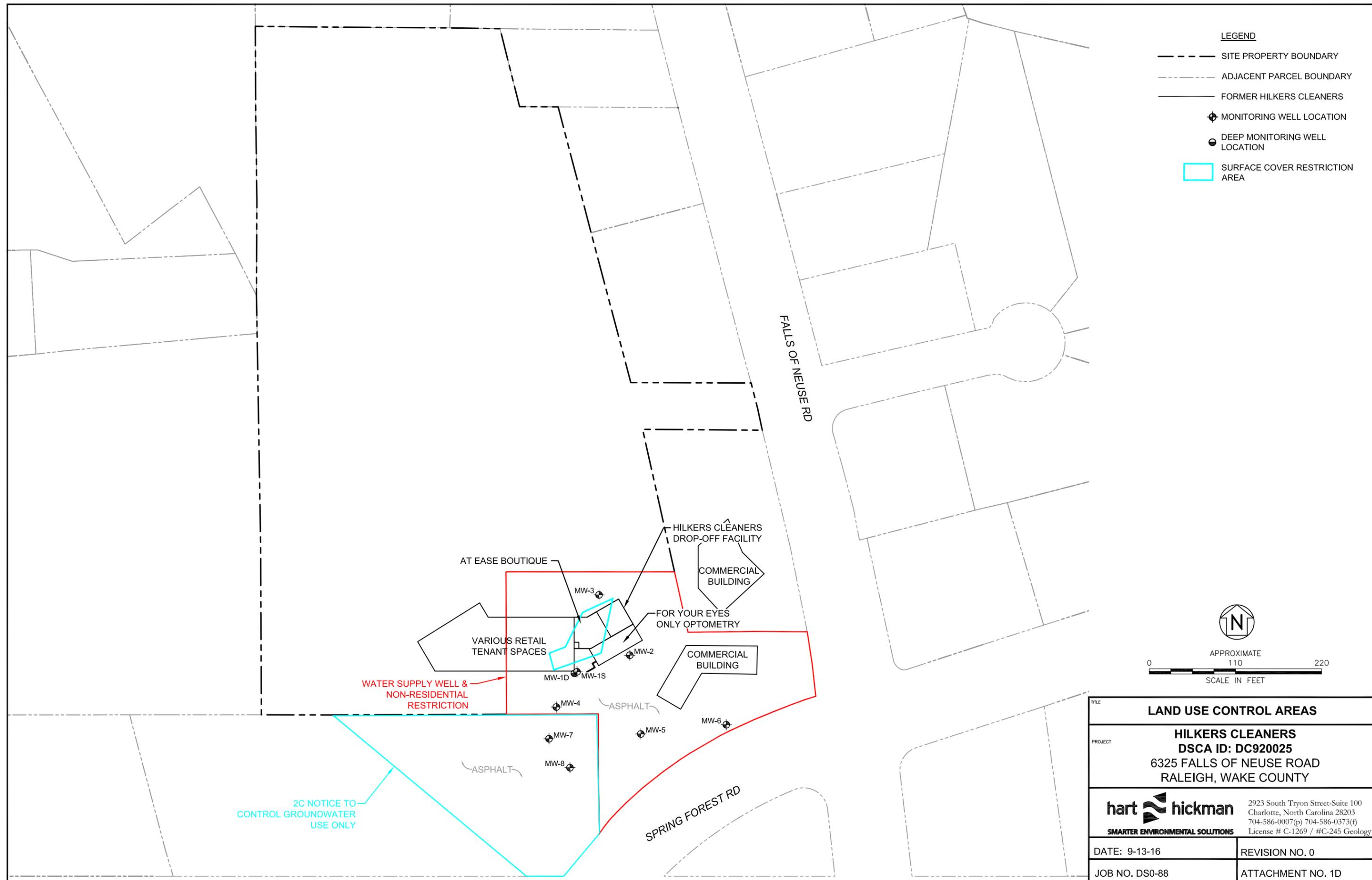
MW-5	
DATE	2/10/09
PCE	<b>0.00094 J</b>

\\h1501\hart\hickman\local\masterfiles\AAA-Master Projects\DS0-88 Hilkers\Reports\Risk Assessment\10-2015\Figures\Groundwater Contaminant Concentration Map.dwg, ATT: 1B, 8/3/2016 3:00:22 PM, zbarfaw



**LEGEND**

- SITE PROPERTY BOUNDARY
- - - ADJACENT PARCEL BOUNDARY
- FORMER HILKERS CLEANERS
- ⊕ MONITORING WELL LOCATION
- DEEP MONITORING WELL LOCATION
- SURFACE COVER RESTRICTION AREA

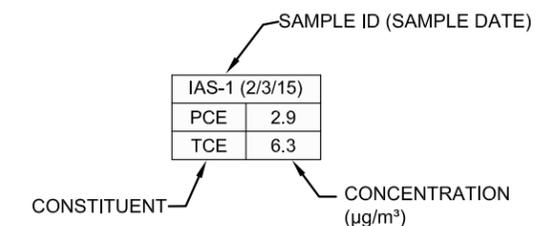


<b>TITLE</b>		<b>LAND USE CONTROL AREAS</b>	
<b>PROJECT</b>		<b>HILKERS CLEANERS</b> <b>DSCA ID: DC920025</b> 6325 FALLS OF NEUSE ROAD RALEIGH, WAKE COUNTY	
 <b>SMARTER ENVIRONMENTAL SOLUTIONS</b>		2923 South Tryon Street-Suite 100 Charlotte, North Carolina 28203 704-586-0007(p) 704-586-0373(f) License # C-1269 / #C-245 Geology	
DATE: 9-13-16	REVISION NO. 0		
JOB NO. DS0-88	ATTACHMENT NO. 1D		

**ATTACHMENT 2**  
**INDOOR AIR AND SUB-SLAB VAPOR MAP**

**LEGEND**

- SITE PROPERTY BOUNDARY
- ADJACENT PARCEL BOUNDARY
- SOURCE PROPERTY BOUNDARY
- FORMER HILKERS CLEANERS
- ⊕ TYPE II MONITORING WELL
- DEEP TYPE III MONITORING WELL
- ▲ SUB-SLAB VAPOR SAMPLE
- ⊗ AIR SAMPLE



**NOTES:**

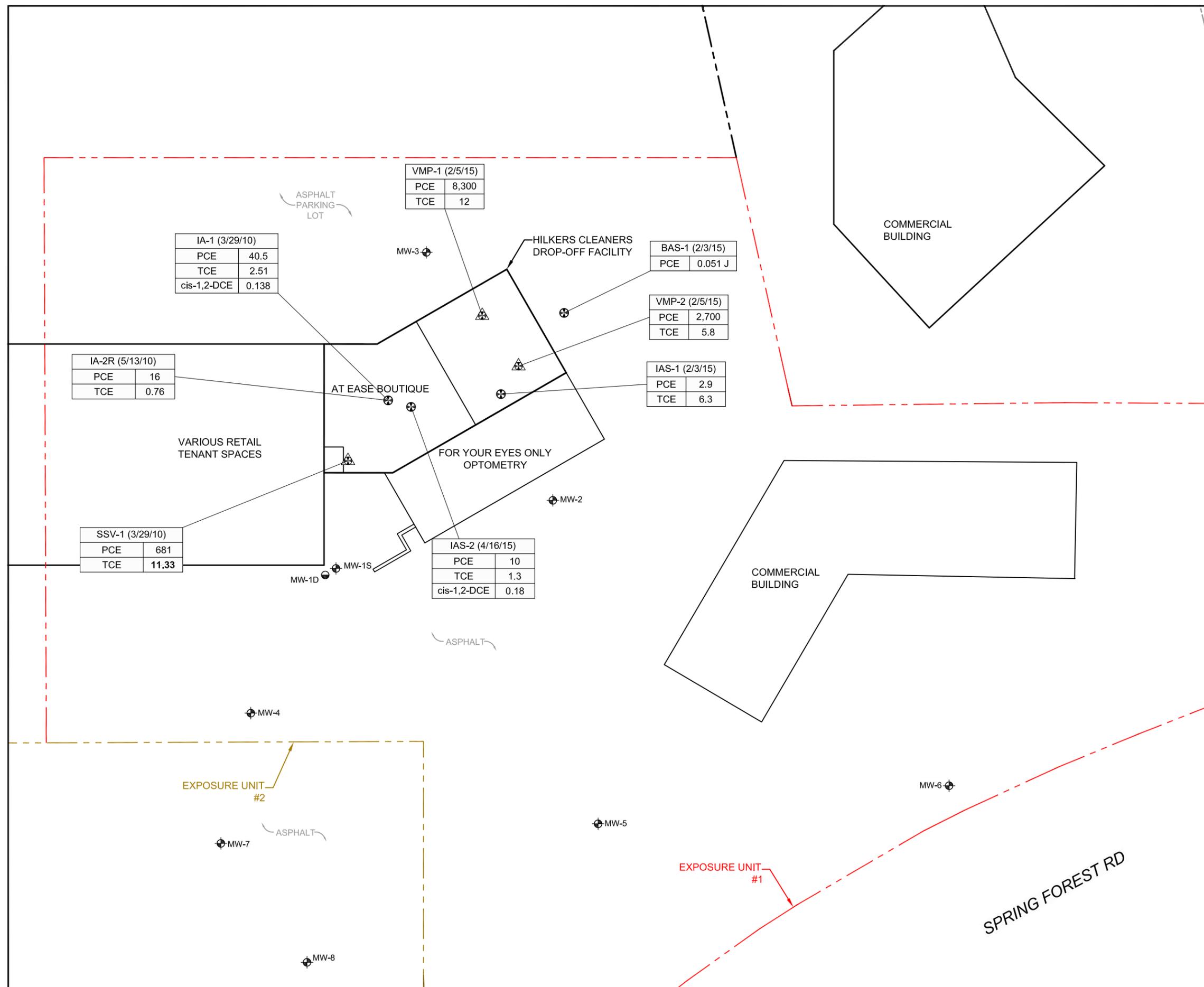
1. PCE = TETRACHLOROETHYLENE  
TCE = TRICHLOROETHYLENE  
cis-1,2-DCE = cis-1,2-DICHLOROETHYLENE
2. SAMPLES IA-1, IA-2R, & SSV-1 WERE COLLECTED BY WITHERS & RAVENEL.
3. ONLY DETECTED DRY-CLEANING RELATED CONSTITUENTS ARE SHOWN ON FIGURE.



APPROXIMATE  
SCALE IN FEET

0      30      60

<b>TITLE</b> INDOOR AIR & SUB-SLAB VAPOR CONTAMINANT CONCENTRATION MAP	
<b>PROJECT</b> HILKERS CLEANERS DSCA ID: DC920025 6325 FALLS OF NEUSE ROAD RALEIGH, WAKE COUNTY	
	2923 South Tryon Street-Suite 100 Charlotte, North Carolina 28203 704-586-0007(p) 704-586-0373(f) License # C-1269 / #C-245 Geology
DATE: 8-3-16	REVISION NO. 0
JOB NO. DS0-88	ATTACHMENT NO. 2



IA-1 (3/29/10)	
PCE	40.5
TCE	2.51
cis-1,2-DCE	0.138

VMP-1 (2/5/15)	
PCE	8,300
TCE	12

BAS-1 (2/3/15)	
PCE	0.051 J

VMP-2 (2/5/15)	
PCE	2,700
TCE	5.8

IAS-1 (2/3/15)	
PCE	2.9
TCE	6.3

IA-2R (5/13/10)	
PCE	16
TCE	0.76

SSV-1 (3/29/10)	
PCE	681
TCE	11.33

IAS-2 (4/16/15)	
PCE	10
TCE	1.3
cis-1,2-DCE	0.18

\\hfs01\hart\hickman\local\masterfiles\AAA-Master Projects\DSCA - DS0\DS0-88 Hilkers\Reports\Risk Assessment 10-2015\Figures\Indoor Air & Sub-Slab Vapor Contaminant Concentration Map.dwg, ATT 2, 8/3/2016 3:02:28 PM, zbarlow

**ATTACHMENT 3**  
**REPRESENTATIVE CONCENTRATIONS**

**Table 1**  
**Representative Concentrations for Groundwater**  
**Groundwater Source Area**  
**Hilkers Cleaners, Raleigh, North Carolina**  
**DSCA ID DC920025**

Groundwater Sampling Point	Sampling Date (mm/dd/yy)	cis-1,2-Dichloroethylene	Tetrachloroethylene
		mg/L	
MW-1S	08/01/07	0.0010	0.010
	02/20/08	<0.0010	0.0032
	05/21/08	<0.0010	0.00325
	10/23/08	<0.0010	0.00312
	02/10/09	0.00141	0.00323
	05/06/09	0.0015	0.0033
	04/08/14	<0.00050	0.0010
	02/03/15	0.00074	0.0070
<b>Representative Concentration</b>		<b>0.0015</b>	<b>0.0070</b>

**Table 2**  
**Representative Concentrations for Soil**  
**Soil Source Area**  
**Hilkers Cleaners, Raleigh, North Carolina**  
**DSCA ID DC920025**

Sample ID	Depth [feet bgs]	Sampling Date (mm/dd/yy)	cis-1,2-Dichloroethylene	Tetrachloroethylene	Toluene	Trichloroethylene
			mg/kg			
GP-4-2'	2	12/03/03	0.016	<b>0.33</b>	<0.0026	0.042
GP-5-4'	4	12/04/03	1.1	<b>2.6</b>	<0.0027	<b>1.7</b>
GP-6-2'	2	12/04/03	0.20	<b>0.63</b>	<0.0041	0.055
WR-7	0-2	07/31/07	<1.2	<b>80</b>	<1.2	<b>6.1</b>
	6-8	07/31/07	0.038	<b>0.050</b>	0.0019	0.0080
WR-8	4-6	07/31/07	<b>7.0</b>	<b>1.0</b>	<0.12	<b>12</b>
	10-12	07/31/07	0.018	<0.0012	0.0012J	0.0019
<b>Representative Concentration</b>			<b>7.0</b>	<b>80</b>	<b>0.0019</b>	<b>12</b>

Note:

1. There was a low detection of methylene chloride (0.0050 mg/kg) in GP-6; however, methylene chloride is not considered constituents of concern for the site and was not included in the representative concentration calculations

**Table 3**  
**Representative Concentrations for Surficial Soil**  
**Exposure Unit #1**  
**Hilkers Cleaners, Raleigh, North Carolina**  
**DSCA ID DC920025**

Sample ID	Depth [feet bgs]	Sampling Date (mm/dd/yy)	cis-1,2-Dichloroethylene	Tetrachloroethylene	Trichloroethylene
			mg/kg		
GP-1-2'	1-2	12/03/03	<0.0030	<b>0.045</b>	<0.0030
GP-2-2'	1-2	12/03/03	<0.0028	0.023	<0.0028
GP-4-2'	1-2	12/03/03	0.016	<b>0.33</b>	0.042
GP-6-2'	1-2	12/04/03	0.20	<b>0.63</b>	0.055
GP-7-2'	1-2	12/04/03	<0.0035	<b>0.16</b>	<0.0035
WR-7	0-2	07/31/07	<1.2	<b>80</b>	<b>6.1</b>
<b>Representative Concentration</b>			<b>0.14</b>	<b>13.53</b>	<b>1.03</b>

Note:

1. There were low detections of methylene chloride and acetone in GP-7; however, these are not considered constituents of concern for the site and were not included in the representative concentration calculations
2. Representative concentrations are calculated as the average concentration. For non-detect values, half of the laboratory reporting limit was used to calculate the average.

**Table 4**  
**Representative Concentrations for Indoor Air**  
**Exposure Unit #1 - Current Use**  
**Hilkers Cleaners, Raleigh, North Carolina**  
**DSCA ID DC920025**

Sample ID	Sampling Duration	Sampling Date (mm/dd/yy)	cis-1,2-Dichloroethylene	Tetrachloroethylene	Trichloroethylene
			μg/m <sup>3</sup>		
IA-1	8h	03/29/10	0.138	40.5	2.51
IA-2R	14d	05/13/10	<0.12C	16.0	0.76
IAS-2	7h	04/16/15	0.18	10.0	1.30
<b>Representative Concentration</b>			<b>0.18</b>	<b>40.5</b>	<b>2.51</b>

**Table 5**  
**Representative Concentrations for Sub-Slab Soil Gas**  
**Exposure Unit #1 - Future Use**  
**Hilkers Cleaners, Raleigh, North Carolina**  
**DSCA ID DC920025**

Sample ID	Type of Sample	Sampling Duration	Sampling Date (mm/dd/yy)	Tetrachloroethylene	Trichloroethylene
				$\mu\text{g}/\text{m}^3$	
SSV-1	Sub-Slab Soil Gas	0.5h	3/29/10	681	11.334
VMP-1		31 min	2/5/15	8,300	12
VMP-2		32 min	2/5/15	2,700	5.8
<b>Representative Concentration</b>				<b>8,300</b>	12

**Table 6**  
**Representative Concentrations for Soil**  
**Exposure Unit #1 - Construction Worker**  
**Hilkers Cleaners, Raleigh, North Carolina**  
**DSCA ID DC920025**

Sample ID	Depth [feet bgs]	Sampling Date (mm/dd/yy)	cis-1,2-Dichloroethylene	Tetrachloroethylene	Toluene	Trichloroethylene
			mg/kg			
GP-4-2'	2	12/03/03	0.016	0.33	<0.0026	0.042
GP-5-4'	4	12/04/03	1.1	2.6	<0.0027	1.7
GP-6-2'	2	12/04/03	0.20	0.63	<0.0041	0.055
WR-7	0-2	07/31/07	<1.2	80	<1.2	6.1
	6-8	07/31/07	0.038	0.050	0.0019	0.0080
WR-8	4-6	07/31/07	7.0	1.0	<0.12	12
<b>Representative Concentration</b>			1.5	14.1	0.11	3.3

Notes:

1. There was a low detection of methylene chloride (0.0050 mg/kg) in GP-6; however, methylene chloride is not considered constituents of concern for the site and was not included in the representative concentration calculations
2. Representative concentrations are calculated as the average concentration for the samples listed in the table. For non-detect values, half of the laboratory reporting limit was used to calculate the average.

**Table 7**  
**Representative Concentrations for Groundwater**  
**Exposure Unit #2**  
**Hilkers Cleaners, Raleigh, North Carolina**  
**DSCA ID DC920025**

Groundwater Sampling Point	Sampling Date (mm/dd/yy)	Tetrachloroethylene
		mg/L
MW-4	02/20/08	0.0033
	05/21/08	0.00615
	10/23/08	<0.0010
	02/10/09	0.00521
	05/06/09	0.0055
	04/09/14	0.0025
	02/03/15	0.0023
MW-7	02/03/15	0.0012
MW-8	04/17/15	<0.00050
<b>Representative Concentration</b>		<b>0.0055</b>

**ATTACHMENT 4**  
**MODELING DOCUMENTATION**

**SOURCE GROUNDWATER**

**Risk Assessment Toolkit**  
**for**  
**North Carolina Dry-Cleaning Solvent Cleanup Act**  
**Program**

<b>DSCA Site Name:</b>	Hilkers Cleaners
<b>DSCA Site Address:</b>	6325 Falls of Neuse Road, Raleigh, Wake County, North Carolina
<b>DSCA ID No.:</b>	DC920025
<b>Exposure Unit:</b>	Groundwater Source
<b>Submittal Date:</b>	August 5, 2016
<b>Prepared By:</b>	Hart & Hickman, PC
	2923 S. Tryon Street, Suite 100, Charlotte, North Carolina 28203

DSCA ID No.: DC920025

Exposure Unit: Groundwater Source

Form No.	Description	Check box if included
<b>Section 1: General Forms</b>		
Form 1A	Exposure Factors and Target Risks	<input checked="" type="checkbox"/>
Form 1B	Fate and Transport Parameters	<input checked="" type="checkbox"/>
Form 1C	Chemicals of Concern	<input checked="" type="checkbox"/>
Form 1D	Soil Representative Concentration Table	<input type="checkbox"/>
Form 1E	Groundwater Representative Concentration Table	<input checked="" type="checkbox"/>
Form 1F	Air and Soil Gas Representative Concentration Table	<input type="checkbox"/>
Form 1G	Summary	<input checked="" type="checkbox"/>
<b>Section 2: Residential Exposure Forms</b>		
Form 2A	Soil Ingestion	<input type="checkbox"/>
Form 2B	Soil Dermal	<input type="checkbox"/>
Form 2C	Soil Outdoor Inhalation	<input type="checkbox"/>
Form 2D	Indoor Air	<input type="checkbox"/>
Form 2E	Soil Gas to Indoor Air	<input type="checkbox"/>
Form 2F	Groundwater to Indoor Air	<input type="checkbox"/>
Form 2G	Groundwater Dermal	<input type="checkbox"/>
<b>Section 3: Non-Residential Exposure Forms</b>		
Form 3A	Soil Ingestion	<input type="checkbox"/>
Form 3B	Soil Dermal	<input type="checkbox"/>
Form 3C	Soil Outdoor Inhalation	<input type="checkbox"/>
Form 3D	Indoor Air	<input type="checkbox"/>
Form 3E	Soil Gas to Indoor Air	<input type="checkbox"/>
Form 3F	Groundwater to Indoor Air	<input type="checkbox"/>
Form 3G	Groundwater Dermal	<input type="checkbox"/>
<b>Section 4: Construction Worker Exposure Forms</b>		
Form 4A	Soil Ingestion	<input type="checkbox"/>
Form 4B	Soil Dermal	<input type="checkbox"/>
Form 4C	Soil Outdoor Inhalation	<input type="checkbox"/>
Form 4D	Groundwater Dermal	<input type="checkbox"/>
<b>Section 5: Protection of Groundwater Use/Surface Water Forms</b>		
Form 5A	Protection of Groundwater Use--Source Groundwater	<input checked="" type="checkbox"/>
Form 5B	Protection of Groundwater Use--Source Soil	<input type="checkbox"/>
Form 5C	Protection of Surface Water--Source Groundwater	<input checked="" type="checkbox"/>
Form 5D	Protection of Surface Water--Source Soil	<input type="checkbox"/>
Form 5E	Protection of Groundwater Use--Source Groundwater (Backward Mode)	<input type="checkbox"/>
Form 5F	Protection of Groundwater Use--Source Soil (Backward Mode)	<input type="checkbox"/>
Form 5G	Protection of Surface Water--Source Groundwater (Backward Mode)	<input type="checkbox"/>
Form 5H	Protection of Surface Water--Source Soil (Backward Mode)	<input type="checkbox"/>

DSCA ID No.: DC920025

Exposure Unit: Groundwater Source

Exposure Parameter	Residential Child	Residential Adult	Commercial	Construction Worker
Lifetime (LT) (years)	70	70	70	70
Averaging Time (AT) (days/yr)	365	365	365	365
Body Weight (BW) (kg)	15	80	80	80
Exposure Duration (ED) (yr)	6	20	25	1
Exposure Frequency (EF) (d/yr)	350	350	250	250
Exposure Time (hr)	24	24	8	8
Skin Surface Area (SA) (cm <sup>2</sup> )	2373	6032	3527	3527
Soil Adherence Factor (AF) (mg/cm <sup>2</sup> )	0.2	0.07	0.12	0.3
Soil Ingestion Rate (IRS) (mg/day)	200	100	100	330
Incidental Dermal Contact with Groundwater Pathway				
Exposure Frequency (EF) (d/yr)	90	90	90	350
Exposure Time (hr)	1	1	1	1
Event Frequency (EV) (events/day)	1	1	1	1

Note: Construction worker averaging time and skin surface area values have been updated to match the values recommended in the EPA June 2015 Regional Screening Level updates. Note that these values do not match the values specified in the May 2015 NC DSCA Program Risk Assessment Guidance. These values will be updated in the guidance document at the time of the next future guidance document update.

**Target Health Risk Limits**

Target Cancer Risk  
Target Hazard Index

Individual

1.00E-06
0.2

Cumulative

1.00E-05
1

DSCA ID No.: DC920025

Exposure Unit: Groundwater Source

Provide justification for the fate and transport parameters used.

Parameter	Default Value	Site Specific Value	Justification
Distance to Protection of Groundwater Point of Exposure (feet)	0	150	The groundwater POE was selected as the closest property boundary of the groundwater plume extents, approximately 150 ft from the groundwater source area
Distance to Protection of Surface Water Point of Exposure (feet)	0	940	A tributary to Marsh Creek is the closest downgradient surface water body.
Depth to Base of Affected Soils ( $d_s$ ) (cm)	1244	366	Impacted soil is assumed to a depth of approximately 12 ft bgs, based on the results of site assessment activities.
Length of Affected Soil Parallel to Assumed GW Flow Direction (L) (cm)	500	457	The estimated length of the soil source area is approximately 15 ft in the direction of groundwater flow.
Vadose Zone Volumetric Water Content ( $\theta_w$ ) (unitless)	0.15 (soil to outdoor air pathway)	0.15	The default value was used.
	0.3 (soil to groundwater pathway)	0.3	The default value was used.
Vadose Zone Volumetric Air Content ( $\theta_a$ ) (unitless)	0.28 (soil to outdoor air pathway)	0.28	The default value was used.
	0.13 (soil to groundwater pathway)	0.13	The default value was used.
Total Porosity (n) (unitless)	0.43	0.43	The default value was used.
Dry Bulk Density ( $\rho_b$ ) (kg/L)	1.5	1.5	The default value was used.
Net Infiltration Estimate (I) (cm/yr)	66	29.2	In accordance with DSCA guidance, an estimated infiltration rate of 28.2 cm/yr was used, which is 25% of the average annual precipitation (46 inches/yr).

DSCA ID No.: DC920025

Exposure Unit: Groundwater Source

Provide justification for the fate and transport parameters used.

Parameter	Default Value	Site Specific Value	Justification
Fraction Organic Carbon (foc)	0.006 (soil to outdoor air pathway)	0.006	The default value was used.
	0.002 (soil leaching to groundwater pathway)	0.002	The default value was used.
Hydraulic Conductivity (K) (cm/d)	690	690	H&H estimated the hydraulic conductivity based on published data for known soil types (silty sand) from Heath (USGS WS Paper 2220).
Hydraulic Gradient (i)	0.01	0.011	Calculated from most recent (June 2015) site-wide potentiometric map.
Aquifer Thickness ( $d_a$ ) (cm)	1500	1500	The default value was used, since the thickness of the site aquifer was not determined during site assessment activities.
Plume Thickness at Source ( $S_d$ ) (cm)	200	200	The default value was used.
Plume Width at Source ( $S_w$ ) (cm)	4,500	4,500.0	The default value was used.
Plume Thickness at GW/SW Discharge ( $\delta_{sw}$ ) (cm)	200	200	The default value was used.
Plume Width at GW/SW Discharge ( $W_{gsw}$ ) (cm)	4,500	4,500.0	The default value was used.
Surface Water Flowrate at GW/SW Discharge ( $cm^3/d$ )	0	0	The default value was used.

DSCA ID No.: DC920025

Exposure Unit: Groundwater Source

**Select Chemicals of Concern**

Put an "X" in the first column to select a chemical of concern.

	CAS Number	Chemical Name
X	156-59-2	Dichloroethylene, 1,2-cis-
X	127-18-4	Tetrachloroethylene

DSCA ID No.: DC920025

Exposure Unit: Groundwater Source

Groundwater Representative Concentration Table

CAS Number	Chemical Name	Groundwater Pathways (concentrations are in mg/L)		
		Dermal	Indoor Inhalation	Protection of Groundwater Use/Surface Water
156-59-2	Dichloroethylene, 1,2-cis-			1.50E-03
127-18-4	Tetrachloroethylene			7.00E-03

DSCA ID No.: DC920025

Distance to Protection of Groundwater POE 150 feet

CAS #	Chemical Name:	Source Groundwater Concentration (mg/L)	2L Standard (mg/L)	Groundwater Concentration at POE (mg/L)	Concentration Exceeds 2L Standard?
156-59-2	Dichloroethylene, 1,2-cis-	0.0015	0.07	0.000479204	NO
127-18-4	Tetrachloroethylene	0.007	0.0007	0.002236284	<b>YES</b>

DSCA ID No.: DC920025

Distance to Protection of Surface Water POE 940 feet

CAS #	Chemical Name:	Source Groundwater Concentration (mg/L)	2B Standard (mg/L)	Surface Water Concentration at POE (mg/L)	Concentration Exceeds 2B Standard?
156-59-2	Dichloroethylene, 1,2-cis-	0.0015	4.9	2.00471E-05	NO
127-18-4	Tetrachloroethylene	0.007	0.0033	9.35533E-05	NO

NA = Not applicable because no 2B Standard entered.

**Summary of Risk Assessment Results**

**Form 1G**

**DSCA ID No.: DC920025**

**Exposure Unit: Groundwater Source**

Pathway	Residential			Non-Residential			Construction Worker		
	Carcinogenic Risk	Hazard Index	Risk exceeded?	Carcinogenic Risk	Hazard Index	Risk exceeded?	Carcinogenic Risk	Hazard Index	Risk exceeded?
<b>SURFICIAL SOIL COMBINED PATHWAYS</b>									
Soil Ingestion	0.00E+00	0.00E+00	NO	0.00E+00	0.00E+00	NO	0.00E+00	0.00E+00	NO
Soil Dermal	0.00E+00	0.00E+00	NO	0.00E+00	0.00E+00	NO	0.00E+00	0.00E+00	NO
Soil Outdoor Inhalation	0.00E+00	0.00E+00	NO	0.00E+00	0.00E+00	NO	0.00E+00	0.00E+00	NO
Surficial Soil Combined Pathways	0.00E+00	0.00E+00	NO	0.00E+00	0.00E+00	NO	0.00E+00	0.00E+00	NO
<b>INDOOR INHALATION EXPOSURE PATHWAY</b>									
Indoor Air	0.00E+00	0.00E+00	NO	0.00E+00	0.00E+00	NO	NA	NA	NA
Soil Gas to Indoor Air	0.00E+00	0.00E+00	NO	0.00E+00	0.00E+00	NO	NA	NA	NA
Groundwater to Indoor Air	0.00E+00	0.00E+00	NO	0.00E+00	0.00E+00	NO	NA	NA	NA
<b>DERMAL CONTACT WITH GROUNDWATER EXPOSURE PATHWAY</b>									
Groundwater Dermal	0.00E+00	0.00E+00	NO	0.00E+00	0.00E+00	NO	0.00E+00	0.00E+00	NO
<b>Allowable Risk</b>	<b>1.0E-05</b>	<b>1</b>		<b>1.0E-05</b>	<b>1</b>		<b>1.0E-05</b>	<b>1</b>	

**Protection of Groundwater Use**

Exceedences of SSTLs? Source Soil No Source Groundwater Yes

**Protection of Surface Water**

Exceedences of SSTLs? Source Soil No Source Groundwater No

**SOURCE SOIL**

**Risk Assessment Toolkit**  
**for**  
**North Carolina Dry-Cleaning Solvent Cleanup Act**  
**Program**

<b>DSCA Site Name:</b>	Hilkers Cleaners
<b>DSCA Site Address:</b>	6325 Falls of Neuse Road, Raleigh, Wake County, North Carolina
<b>DSCA ID No.:</b>	DC920025
<b>Exposure Unit:</b>	Soil Source
<b>Submittal Date:</b>	August 5, 2016
<b>Prepared By:</b>	Hart & Hickman, PC
	2923 S. Tryon Street, Suite 100, Charlotte, North Carolina 28203

**DSCA ID No.: DC920025**

**Exposure Unit: Soil Source**

<b>Form No.</b>	<b>Description</b>	<b>Check box if included</b>
<b>Section 1: General Forms</b>		
Form 1A	Exposure Factors and Target Risks	<input checked="" type="checkbox"/>
Form 1B	Fate and Transport Parameters	<input checked="" type="checkbox"/>
Form 1C	Chemicals of Concern	<input checked="" type="checkbox"/>
Form 1D	Soil Representative Concentration Table	<input checked="" type="checkbox"/>
Form 1E	Groundwater Representative Concentration Table	<input type="checkbox"/>
Form 1F	Air and Soil Gas Representative Concentration Table	<input type="checkbox"/>
Form 1G	Summary	<input checked="" type="checkbox"/>
<b>Section 2: Residential Exposure Forms</b>		
Form 2A	Soil Ingestion	<input type="checkbox"/>
Form 2B	Soil Dermal	<input type="checkbox"/>
Form 2C	Soil Outdoor Inhalation	<input type="checkbox"/>
Form 2D	Indoor Air	<input type="checkbox"/>
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Form 2F	Groundwater to Indoor Air	<input type="checkbox"/>
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<b>Section 3: Non-Residential Exposure Forms</b>		
Form 3A	Soil Ingestion	<input type="checkbox"/>
Form 3B	Soil Dermal	<input type="checkbox"/>
Form 3C	Soil Outdoor Inhalation	<input type="checkbox"/>
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Form 3E	Soil Gas to Indoor Air	<input type="checkbox"/>
Form 3F	Groundwater to Indoor Air	<input type="checkbox"/>
Form 3G	Groundwater Dermal	<input type="checkbox"/>
<b>Section 4: Construction Worker Exposure Forms</b>		
Form 4A	Soil Ingestion	<input type="checkbox"/>
Form 4B	Soil Dermal	<input type="checkbox"/>
Form 4C	Soil Outdoor Inhalation	<input type="checkbox"/>
Form 4D	Groundwater Dermal	<input type="checkbox"/>
<b>Section 5: Protection of Groundwater Use/Surface Water Forms</b>		
Form 5A	Protection of Groundwater Use--Source Groundwater	<input type="checkbox"/>
Form 5B	Protection of Groundwater Use--Source Soil	<input checked="" type="checkbox"/>
Form 5C	Protection of Surface Water--Source Groundwater	<input type="checkbox"/>
Form 5D	Protection of Surface Water--Source Soil	<input checked="" type="checkbox"/>
Form 5E	Protection of Groundwater Use--Source Groundwater (Backward Mode)	<input type="checkbox"/>
Form 5F	Protection of Groundwater Use--Source Soil (Backward Mode)	<input type="checkbox"/>
Form 5G	Protection of Surface Water--Source Groundwater (Backward Mode)	<input type="checkbox"/>
Form 5H	Protection of Surface Water--Source Soil (Backward Mode)	<input type="checkbox"/>

DSCA ID No.: DC920025

Exposure Unit: Soil Source

Exposure Parameter	Residential Child	Residential Adult	Commercial	Construction Worker
Lifetime (LT) (years)	70	70	70	70
Averaging Time (AT) (days/yr)	365	365	365	365
Body Weight (BW) (kg)	15	80	80	80
Exposure Duration (ED) (yr)	6	20	25	1
Exposure Frequency (EF) (d/yr)	350	350	250	250
Exposure Time (hr)	24	24	8	8
Skin Surface Area (SA) (cm <sup>2</sup> )	2373	6032	3527	3527
Soil Adherence Factor (AF) (mg/cm <sup>2</sup> )	0.2	0.07	0.12	0.3
Soil Ingestion Rate (IRS) (mg/day)	200	100	100	330
Incidental Dermal Contact with Groundwater Pathway				
Exposure Frequency (EF) (d/yr)	90	90	90	350
Exposure Time (hr)	1	1	1	1
Event Frequency (EV) (events/day)	1	1	1	1

Note: Construction worker averaging time and skin surface area values have been updated to match the values recommended in the EPA June 2015 Regional Screening Level updates. Note that these values do not match the values specified in the May 2015 NC DSCA Program Risk Assessment Guidance. These values will be updated in the guidance document at the time of the next future guidance document update.

**Target Health Risk Limits**

Target Cancer Risk  
Target Hazard Index

Individual

1.00E-06
0.2

Cumulative

1.00E-05
1

DSCA ID No.: DC920025

Exposure Unit: Soil Source

Provide justification for the fate and transport parameters used.

Parameter	Default Value	Site Specific Value	Justification
Distance to Protection of Groundwater Point of Exposure (feet)	0	200	The groundwater POE was selected as the closest property boundary of the groundwater plume extents, approximately 150 ft from the groundwater source area
Distance to Protection of Surface Water Point of Exposure (feet)	0	910	A tributary to Marsh Creek is the closest downgradient surface water body.
Depth to Base of Affected Soils ( $d_s$ ) (cm)	1244	366	Impacted soil is assumed to a depth of approximately 12 ft bgs, based on the results of site assessment activities.
Length of Affected Soil Parallel to Assumed GW Flow Direction (L) (cm)	500	457	The estimated length of the soil source area is approximately 15 ft in the direction of groundwater flow.
Vadose Zone Volumetric Water Content ( $\theta_w$ ) (unitless)	0.15 (soil to outdoor air pathway)	0.15	The default value was used.
	0.3 (soil to groundwater pathway)	0.3	The default value was used.
Vadose Zone Volumetric Air Content ( $\theta_a$ ) (unitless)	0.28 (soil to outdoor air pathway)	0.28	The default value was used.
	0.13 (soil to groundwater pathway)	0.13	The default value was used.
Total Porosity (n) (unitless)	0.43	0.43	The default value was used.
Dry Bulk Density ( $\rho_b$ ) (kg/L)	1.5	1.5	The default value was used.
Net Infiltration Estimate (I) (cm/yr)	66	29.2	In accordance with DSCA guidance, an estimated infiltration rate of 29.2 cm/yr was used, which is 25% of the average annual precipitation (46 inches).

DSCA ID No.: DC920025

Exposure Unit: Soil Source

Provide justification for the fate and transport parameters used.

Parameter	Default Value	Site Specific Value	Justification
Fraction Organic Carbon (foc)	0.006 (soil to outdoor air pathway)	0.006	The default value was used.
	0.002 (soil leaching to groundwater pathway)	0.002	The default value was used.
Hydraulic Conductivity (K) (cm/d)	690	690	H&H estimated the hydraulic conductivity based on published data for known soil types (silty sand) from Heath (USGS WS Paper 2220).
Hydraulic Gradient (i)	0.01	0.011	Calculated from most recent (June 2015) site-wide potentiometric map.
Aquifer Thickness ( $d_a$ ) (cm)	1500	1500	The default value was used, since the thickness of the site aquifer was not determined during site assessment activities.
Plume Thickness at Source ( $S_d$ ) (cm)	200	200	The default value was used.
Plume Width at Source ( $S_w$ ) (cm)	4,500	4,500.0	The default value was used.
Plume Thickness at GW/SW Discharge ( $\delta_{sw}$ ) (cm)	200	200	The default value was used.
Plume Width at GW/SW Discharge ( $W_{gsw}$ ) (cm)	4,500	4,500.0	The default value was used.
Surface Water Flowrate at GW/SW Discharge ( $cm^3/d$ )	0	0	The default value was used.

DSCA ID No.: DC920025

Exposure Unit: Soil Source

**Select Chemicals of Concern**

Put an "X" in the first column to select a chemical of concern.

	CAS Number	Chemical Name
X	156-59-2	Dichloroethylene, 1,2-cis-
X	127-18-4	Tetrachloroethylene
X	108-88-3	Toluene
X	79-01-6	Trichloroethylene

DSCA ID No.: DC920025

Exposure Unit: Soil Source

**Soil Representative Concentration Table**

CAS Number	Chemical Name	Soil Pathways (concentrations are in mg/kg)			
		Ingestion	Dermal	Outdoor Inhalation	Protection of Groundwater Use/Surface Water
156-59-2	Dichloroethylene, 1,2-cis-				7.00E+00
127-18-4	Tetrachloroethylene				8.00E+01
108-88-3	Toluene				1.90E-03
79-01-6	Trichloroethylene				1.20E+01

DSCA ID No.: DC920025

Distance to Protection of Groundwater POE 200 feet

CAS #	Chemical Name:	Source Soil Concentration (mg/kg)	2L Standard (mg/L)	Groundwater Concentration at POE (mg/L)	Concentration Exceeds 2L Standard?
156-59-2	Dichloroethylene, 1,2-cis-	7	0.07	0.410569999	<b>YES</b>
127-18-4	Tetrachloroethylene	80	0.0007	3.206173972	<b>YES</b>
108-88-3	Toluene	0.0019	0.6	4.98513E-05	NO
79-01-6	Trichloroethylene	12	0.003	0.610901637	<b>YES</b>

DSCA ID No.: DC920025

Distance to Protection of Surface Water POE 910 feet

CAS #	Chemical Name:	Source Soil Concentration (mg/kg)	2B Standard (mg/L)	Surface Water Concentration at POE (mg/L)	Concentration Exceeds 2B Standard?	Calculated Soil Screening Level (mg/kg)
156-59-2	Dichloroethylene, 1,2-cis-	7	4.9	0.026782574	NO	0.067820074
127-18-4	Tetrachloroethylene	80	0.0033	0.209147263	YES	1.070013068
108-88-3	Toluene	0.0019	0.011	3.25193E-06	NO	2.42133E-05
79-01-6	Trichloroethylene	12	0.03	0.03985074	YES	0.142283762

NA = Not applicable because no 2B Standard entered.

**Summary of Risk Assessment Results**

**Form 1G**

**DSCA ID No.: DC920025**

**Exposure Unit: Soil Source**

Pathway	Residential			Non-Residential			Construction Worker		
	Carcinogenic Risk	Hazard Index	Risk exceeded?	Carcinogenic Risk	Hazard Index	Risk exceeded?	Carcinogenic Risk	Hazard Index	Risk exceeded?
<b>SURFICIAL SOIL COMBINED PATHWAYS</b>									
Soil Ingestion	0.00E+00	0.00E+00	NO	0.00E+00	0.00E+00	NO	0.00E+00	0.00E+00	NO
Soil Dermal	0.00E+00	0.00E+00	NO	0.00E+00	0.00E+00	NO	0.00E+00	0.00E+00	NO
Soil Outdoor Inhalation	0.00E+00	0.00E+00	NO	0.00E+00	0.00E+00	NO	0.00E+00	0.00E+00	NO
Surficial Soil Combined Pathways	0.00E+00	0.00E+00	NO	0.00E+00	0.00E+00	NO	0.00E+00	0.00E+00	NO
<b>INDOOR INHALATION EXPOSURE PATHWAY</b>									
Indoor Air	0.00E+00	0.00E+00	NO	0.00E+00	0.00E+00	NO	NA	NA	NA
Soil Gas to Indoor Air	0.00E+00	0.00E+00	NO	0.00E+00	0.00E+00	NO	NA	NA	NA
Groundwater to Indoor Air	0.00E+00	0.00E+00	NO	0.00E+00	0.00E+00	NO	NA	NA	NA
<b>DERMAL CONTACT WITH GROUNDWATER EXPOSURE PATHWAY</b>									
Groundwater Dermal	0.00E+00	0.00E+00	NO	0.00E+00	0.00E+00	NO	0.00E+00	0.00E+00	NO
<b>Allowable Risk</b>	<b>1.0E-05</b>	<b>1</b>		<b>1.0E-05</b>	<b>1</b>		<b>1.0E-05</b>	<b>1</b>	

Protection of Groundwater Use

Exceedences of SSTLs? Source Soil Yes Source Groundwater No

Protection of Surface Water

Exceedences of SSTLs? Source Soil Yes Source Groundwater No

**EXPOSURE UNIT #1**

**Risk Assessment Toolkit**  
**for**  
**North Carolina Dry-Cleaning Solvent Cleanup Act**  
**Program**

<b>DSCA Site Name:</b>	Hilkers Cleaners
<b>DSCA Site Address:</b>	6325 Falls of Neuse Road, Raleigh, Wake County, North Carolina
<b>DSCA ID No.:</b>	DC920025
<b>Exposure Unit:</b>	Exposure Unit #1
<b>Submittal Date:</b>	August 5, 2016
<b>Prepared By:</b>	Hart & Hickman, PC
	2923 S. Tryon Street, Suite 100, Charlotte, North Carolina 28203

**DSCA ID No.: DC920025**

**Exposure Unit: Exposure Unit #1**

Form No.	Description	Check box if included
<b>Section 1: General Forms</b>		
Form 1A	Exposure Factors and Target Risks	<input checked="" type="checkbox"/>
Form 1B	Fate and Transport Parameters	<input checked="" type="checkbox"/>
Form 1C	Chemicals of Concern	<input checked="" type="checkbox"/>
Form 1D	Soil Representative Concentration Table	<input checked="" type="checkbox"/>
Form 1E	Groundwater Representative Concentration Table	<input type="checkbox"/>
Form 1F	Air and Soil Gas Representative Concentration Table	<input checked="" type="checkbox"/>
Form 1G	Summary	<input checked="" type="checkbox"/>
<b>Section 2: Residential Exposure Forms</b>		
Form 2A	Soil Ingestion	<input checked="" type="checkbox"/>
Form 2B	Soil Dermal	<input checked="" type="checkbox"/>
Form 2C	Soil Outdoor Inhalation	<input checked="" type="checkbox"/>
Form 2D	Indoor Air	<input checked="" type="checkbox"/>
Form 2E	Soil Gas to Indoor Air	<input checked="" type="checkbox"/>
Form 2F	Groundwater to Indoor Air	<input type="checkbox"/>
Form 2G	Groundwater Dermal	<input type="checkbox"/>
<b>Section 3: Non-Residential Exposure Forms</b>		
Form 3A	Soil Ingestion	<input checked="" type="checkbox"/>
Form 3B	Soil Dermal	<input checked="" type="checkbox"/>
Form 3C	Soil Outdoor Inhalation	<input checked="" type="checkbox"/>
Form 3D	Indoor Air	<input checked="" type="checkbox"/>
Form 3E	Soil Gas to Indoor Air	<input checked="" type="checkbox"/>
Form 3F	Groundwater to Indoor Air	<input type="checkbox"/>
Form 3G	Groundwater Dermal	<input type="checkbox"/>
<b>Section 4: Construction Worker Exposure Forms</b>		
Form 4A	Soil Ingestion	<input type="checkbox"/>
Form 4B	Soil Dermal	<input type="checkbox"/>
Form 4C	Soil Outdoor Inhalation	<input type="checkbox"/>
Form 4D	Groundwater Dermal	<input type="checkbox"/>
<b>Section 5: Protection of Groundwater Use/Surface Water Forms</b>		
Form 5A	Protection of Groundwater Use--Source Groundwater	<input type="checkbox"/>
Form 5B	Protection of Groundwater Use--Source Soil	<input type="checkbox"/>
Form 5C	Protection of Surface Water--Source Groundwater	<input type="checkbox"/>
Form 5D	Protection of Surface Water--Source Soil	<input type="checkbox"/>
Form 5E	Protection of Groundwater Use--Source Groundwater (Backward Mode)	<input type="checkbox"/>
Form 5F	Protection of Groundwater Use--Source Soil (Backward Mode)	<input type="checkbox"/>
Form 5G	Protection of Surface Water--Source Groundwater (Backward Mode)	<input type="checkbox"/>
Form 5H	Protection of Surface Water--Source Soil (Backward Mode)	<input type="checkbox"/>

DSCA ID No.: DC920025

Exposure Unit: Exposure Unit #1

Exposure Parameter	Residential Child	Residential Adult	Commercial	Construction Worker
Lifetime (LT) (years)	70	70	70	70
Averaging Time (AT) (days/yr)	365	365	365	365
Body Weight (BW) (kg)	15	80	80	80
Exposure Duration (ED) (yr)	6	20	25	1
Exposure Frequency (EF) (d/yr)	350	350	250	250
Exposure Time (hr)	24	24	8	8
Skin Surface Area (SA) (cm <sup>2</sup> )	2373	6032	3527	3527
Soil Adherence Factor (AF) (mg/cm <sup>2</sup> )	0.2	0.07	0.12	0.3
Soil Ingestion Rate (IRS) (mg/day)	200	100	100	330
Incidental Dermal Contact with Groundwater Pathway				
Exposure Frequency (EF) (d/yr)	90	90	90	350
Exposure Time (hr)	1	1	1	1
Event Frequency (EV) (events/day)	1	1	1	1

Note: Construction worker averaging time and skin surface area values have been updated to match the values recommended in the EPA June 2015 Regional Screening Level updates. Note that these values do not match the values specified in the May 2015 NC DSCA Program Risk Assessment Guidance. These values will be updated in the guidance document at the time of the next future guidance document update.

**Target Health Risk Limits**

Target Cancer Risk  
Target Hazard Index

	Individual	Cumulative
Target Cancer Risk	1.00E-06	1.00E-05
Target Hazard Index	0.2	1

DSCA ID No.: DC920025

Exposure Unit: Exposure Unit #1

Provide justification for the fate and transport parameters used.

Parameter	Default Value	Site Specific Value	Justification
Distance to Protection of Groundwater Point of Exposure (feet)	0	200	The groundwater POE was selected as the closest property downgradient (southeast) of the source area.
Distance to Protection of Surface Water Point of Exposure (feet)	0	910	The surface water POE was selected as a tributary to Marsh Creek, the closest surface water body to the source area.
Depth to Base of Affected Soils ( $d_s$ ) (cm)	1244	366	Impacted soil is assumed to a depth of approximately 12 ft bgs, based on the results of site assessment activities.
Length of Affected Soil Parallel to Assumed GW Flow Direction (L) (cm)	500	457	The estimated length of the soil source area is approximately 15 ft in the direction of groundwater flow.
Vadose Zone Volumetric Water Content ( $\theta_w$ ) (unitless)	0.15 (soil to outdoor air pathway)	0.15	The default value was used.
	0.3 (soil to groundwater pathway)	0.3	The default value was used.
Vadose Zone Volumetric Air Content ( $\theta_a$ ) (unitless)	0.28 (soil to outdoor air pathway)	0.28	The default value was used.
	0.13 (soil to groundwater pathway)	0.13	The default value was used.
Total Porosity (n) (unitless)	0.43	0.43	The default value was used.
Dry Bulk Density ( $\rho_b$ ) (kg/L)	1.5	1.5	The default value was used.
Net Infiltration Estimate (I) (cm/yr)	66	29.2	In accordance with DSCA guidance, an estimated infiltration rate of 29.2 cm/yr was used, which is 25% of the average annual precipitation (46 inches/year).

DSCA ID No.: DC920025

Exposure Unit: Exposure Unit #1

Provide justification for the fate and transport parameters used.

Parameter	Default Value	Site Specific Value	Justification
Fraction Organic Carbon (foc)	0.006 (soil to outdoor air pathway)	0.006	The default value was used.
	0.002 (soil leaching to groundwater pathway)	0.002	The default value was used.
Hydraulic Conductivity (K) (cm/d)	690	690	H&H estimated the hydraulic conductivity based on published data for known soil types (silty sand) from Heath (USGS WS Paper 2220).
Hydraulic Gradient (i)	0.01	0.011	Calculated from most recent (June 2015) site-wide potentiometric map.
Aquifer Thickness ( $d_a$ ) (cm)	1500	1500	The default value was used, since the thickness of the site aquifer was not determined during site assessment activities.
Plume Thickness at Source ( $S_d$ ) (cm)	200	200	The default value was used.
Plume Width at Source ( $S_w$ ) (cm)	4,500	4,500.0	The default value was used.
Plume Thickness at GW/SW Discharge ( $\delta_{sw}$ ) (cm)	200	200	The default value was used.
Plume Width at GW/SW Discharge ( $W_{gsw}$ ) (cm)	4,500	4,500.0	The default value was used.
Surface Water Flowrate at GW/SW Discharge ( $cm^3/d$ )	0	0	The default value was used.

DSCA ID No.: DC920025

Exposure Unit: Exposure Unit #1

**Select Chemicals of Concern**

Put an "X" in the first column to select a chemical of concern.

	CAS Number	Chemical Name
X	156-59-2	Dichloroethylene, 1,2-cis-
X	127-18-4	Tetrachloroethylene
X	79-01-6	Trichloroethylene

DSCA ID No.: DC920025

Exposure Unit: Exposure Unit #1

**Soil Representative Concentration Table**

CAS Number	Chemical Name	Soil Pathways (concentrations are in mg/kg)				Protection of Groundwater Use/Surface Water
		Ingestion	Dermal	Outdoor Inhalation		
156-59-2	Dichloroethylene, 1,2-cis-	1.40E-01	1.40E-01	1.40E-01		
127-18-4	Tetrachloroethylene	1.35E+01	1.35E+01	1.35E+01		
79-01-6	Trichloroethylene	1.03E+00	1.03E+00	1.03E+00		

DSCA ID No.: DC920025

Exposure Unit: Exposure Unit #1

## Air and Soil Gas Representative Concentration Table

CAS Number	Chemical Name	Soil Gas and Air (concentrations are in ug/m <sup>3</sup> )	
		Soil Gas	Indoor Air
156-59-2	Dichloroethylene, 1,2-cis-		1.80E-01
127-18-4	Tetrachloroethylene	8.30E+03	4.05E+01
79-01-6	Trichloroethylene	1.20E+01	2.51E+00

DSCA ID No.: DC920025

Exposure Unit: Exposure Unit #1

All concentrations are in mg/kg.

CAS #	Chemical Name:	Soil Concentration (mg/kg)	Ingestion SL @ TCR = 1E-06	Ingestion SL @ THQ = 0.2	Calculated Carcinogenic Risk	Calculated Non-Carcinogenic Hazard Quotient
156-59-2	Dichloroethylene, 1,2-cis-	0.14		3.13E+01		0.0009
127-18-4	Tetrachloroethylene	13.53	3.31E+02	9.39E+01	4.09E-08	0.0288
79-01-6	Trichloroethylene	1.03	8.78E+00	7.82E+00	1.17E-07	0.0263

Cumulative:	1.58E-07	0.06
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DSCA ID No.: DC920025

Exposure Unit: Exposure Unit #1

All concentrations are in mg/kg.

CAS #	Chemical Name:	Soil Concentration (mg/kg)	Dermal SL @ TCR = 1E-06	Dermal SL @ THQ = 0.2	Calculated Carcinogenic Risk	Calculated Non-Carcinogenic Hazard Quotient
156-59-2	Dichloroethylene, 1,2-cis-	0.14		-		
127-18-4	Tetrachloroethylene	13.53		-		
79-01-6	Trichloroethylene	1.03		-		

Cumulative:	0.00E+00	0.00
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Note: Calculated soil dermal contact risks for chemicals with no dermal absorption factor are considered negligible. The calculated risk and hazard quotient columns on the calculator will be blank for this scenario. Most volatile organic compounds fall into this category. Therefore, calculated risks for most volatile organic compounds will be blank.

DSCA ID No.: DC920025

Exposure Unit: Exposure Unit #1

All concentrations are in mg/kg.

CAS #	Chemical Name:	Soil Concentration (mg/kg)	Inhalation SL @ TCR = 1E-06	Inhalation SL @ THQ = 0.2	Calculated Carcinogenic Risk	Calculated Non-Carcinogenic Hazard Quotient
156-59-2	Dichloroethylene, 1,2-cis-	0.14				
127-18-4	Tetrachloroethylene	13.53	1.15E+02	8.91E+01	1.17E-07	0.0304
79-01-6	Trichloroethylene	1.03	5.11E+00	4.46E+00	2.02E-07	0.0462
Cumulative:					3.19E-07	0.08

DSCA ID No.: DC920025

Exposure Unit: Exposure Unit #1

All concentrations are in  $\mu\text{g}/\text{m}^3$ 

CAS #	Chemical Name:	Indoor Air Concentration ( $\mu\text{g}/\text{m}^3$ )	Target Indoor Air Conc. for Carcinogens @ TCR = 1E-06	Target Indoor Air Conc. for Non-Carcinogens @ THQ = 0.2	Calculated Carcinogenic Risk	Calculated Non-Carcinogenic Hazard Quotient
156-59-2	Dichloroethylene, 1,2-cis-	0.18				
127-18-4	Tetrachloroethylene	40.5	1.08E+01	8.34E+00	<b>3.75E-06</b>	<b>0.9709</b>
79-01-6	Trichloroethylene	2.51	4.78E-01	4.17E-01	<b>5.25E-06</b>	<b>1.2034</b>

Cumulative:	9.00E-06	<b>2.17</b>
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DSCA ID No.: DC920025

Exposure Unit: Exposure Unit #1

All concentrations are in ug/m<sup>3</sup>

CAS #	Chemical Name:	Soil Gas Concentration (ug/m <sup>3</sup> )	Calculated Indoor Air Concentration (ug/m <sup>3</sup> )	Target Indoor Air Conc. for Carcinogens @ TCR = 1E-06	Target Indoor Air Conc. for Non-Carcinogens @ THQ = 0.2	Calculated Carcinogenic Risk	Calculated Non-Carcinogenic Hazard Quotient
156-59-2	Dichloroethylene, 1,2-cis-						
127-18-4	Tetrachloroethylene	8300	249	1.08E+01	8.34E+00	<b>2.31E-05</b>	<b>5.9692</b>
79-01-6	Trichloroethylene	12	0.36	4.78E-01	4.17E-01	7.53E-07	0.1726

Cumulative:	<b>2.38E-05</b>	<b>6.14</b>
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DSCA ID No.: DC920025

Exposure Unit: Exposure Unit #1

All concentrations are in mg/kg.

CAS #	Chemical Name:	Soil Concentration (mg/kg)	Ingestion SL @ TCR = 1E-06	Ingestion SL @ THQ = 0.2	Calculated Carcinogenic Risk	Calculated Non-Carcinogenic Hazard Quotient
156-59-2	Dichloroethylene, 1,2-cis-	0.14		4.67E+02		0.0001
127-18-4	Tetrachloroethylene	13.53	1.56E+03	1.40E+03	8.69E-09	0.0019
79-01-6	Trichloroethylene	1.03	7.11E+01	1.17E+02	1.45E-08	0.0018
Cumulative:					2.32E-08	0.00

DSCA ID No.: DC920025

Exposure Unit: Exposure Unit #1

All concentrations are in mg/kg.

CAS #	Chemical Name:	Soil Concentration (mg/kg)	Dermal SL @ TCR = 1E-06	Dermal SL @ THQ = 0.2	Calculated Carcinogenic Risk	Calculated Non-Carcinogenic Hazard Quotient
156-59-2	Dichloroethylene, 1,2-cis-	0.14				
127-18-4	Tetrachloroethylene	13.53				
79-01-6	Trichloroethylene	1.03				

Cumulative:	0.00E+00	0.00
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Note: Calculated soil dermal contact risks for chemicals with no dermal absorption factor are considered negligible. The calculated risk and hazard quotient columns on the calculator will be blank for this scenario. Most volatile organic compounds fall into this category. Therefore, calculated risks for most volatile organic compounds will be blank.

DSCA ID No.: DC920025

Exposure Unit: Exposure Unit #1

All concentrations are in mg/kg.

Higher of mass limit and standard VF equations

CAS #	Chemical Name:	Soil Concentration (mg/kg)	Inhalation SL @ TCR = 1E-06	Inhalation SL @ THQ = 0.2	Calculated Carcinogenic Risk	Calculated Non-Carcinogenic Hazard Quotient
156-59-2	Dichloroethylene, 1,2-cis-	0.14				
127-18-4	Tetrachloroethylene	13.53	5.04E+02	3.74E+02	2.69E-08	0.0072
79-01-6	Trichloroethylene	1.03	3.19E+01	1.87E+01	3.22E-08	0.0110

Cumulative:	5.91E-08	0.02
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DSCA ID No.: DC920025

Exposure Unit: Exposure Unit #1

All concentrations are in ug/m<sup>3</sup>

CAS #	Chemical Name:	Indoor Air Concentration (ug/m <sup>3</sup> )	Target Indoor Air Conc. for Carcinogens @ TCR = 1E-06	Target Indoor Air Conc. for Non-Carcinogens @ THQ = 0.2	Calculated Carcinogenic Risk	Calculated Non-Carcinogenic Hazard Quotient
156-59-2	Dichloroethylene, 1,2-cis-	0.18				
127-18-4	Tetrachloroethylene	40.5	4.72E+01	3.50E+01	8.59E-07	<b>0.2312</b>
79-01-6	Trichloroethylene	2.51	2.99E+00	1.75E+00	8.39E-07	<b>0.2865</b>

Cumulative:	1.70E-06	0.52
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DSCA ID No.: DC920025

Exposure Unit: Exposure Unit #1

All concentrations are in ug/m<sup>3</sup>

CAS #	Chemical Name:	Soil Gas Concentration (ug/m <sup>3</sup> )	Calculated Indoor Air Concentration (ug/m <sup>3</sup> )	Target Indoor Air Conc. for Carcinogens @ TCR = 1E-06	Target Indoor Air Conc. for Non-Carcinogens @ THQ = 0.2	Calculated Carcinogenic Risk	Calculated Non-Carcinogenic Hazard Quotient
156-59-2	Dichloroethylene, 1,2-cis-						
127-18-4	Tetrachloroethylene	8300	83	4.72E+01	3.50E+01	<b>1.76E-06</b>	<b>0.4737</b>
79-01-6	Trichloroethylene	12	0.12	2.99E+00	1.75E+00	4.01E-08	0.0137

Cumulative:	1.80E-06	0.49
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**Summary of Risk Assessment Results**

**Form 1G**

**DSCA ID No.: DC920025**

**Exposure Unit: Exposure Unit #1**

Pathway	Residential			Non-Residential			Construction Worker		
	Carcinogenic Risk	Hazard Index	Risk exceeded?	Carcinogenic Risk	Hazard Index	Risk exceeded?	Carcinogenic Risk	Hazard Index	Risk exceeded?
<b>SURFICIAL SOIL COMBINED PATHWAYS</b>									
Soil Ingestion	1.58E-07	5.61E-02	NO	2.32E-08	3.75E-03	NO	3.06E-09	6.22E-03	NO
Soil Dermal	0.00E+00	0.00E+00	NO	0.00E+00	0.00E+00	NO	0.00E+00	0.00E+00	NO
Soil Outdoor Inhalation	3.19E-07	7.66E-02	NO	5.91E-08	1.82E-02	NO	4.96E-08	3.84E-01	NO
Surficial Soil Combined Pathways	4.77E-07	1.33E-01	NO	8.23E-08	2.20E-02	NO	5.26E-08	3.90E-01	NO
<b>INDOOR INHALATION EXPOSURE PATHWAY</b>									
Indoor Air	9.00E-06	2.17E+00	YES	1.70E-06	5.18E-01	NO	NA	NA	NA
Soil Gas to Indoor Air	2.38E-05	6.14E+00	YES	1.80E-06	4.87E-01	NO	NA	NA	NA
Groundwater to Indoor Air	0.00E+00	0.00E+00	NO	0.00E+00	0.00E+00	NO	NA	NA	NA
<b>DERMAL CONTACT WITH GROUNDWATER EXPOSURE PATHWAY</b>									
Groundwater Dermal	0.00E+00	0.00E+00	NO	0.00E+00	0.00E+00	NO	0.00E+00	0.00E+00	NO
<b>Allowable Risk</b>	<b>1.0E-05</b>	<b>1</b>		<b>1.0E-05</b>	<b>1</b>		<b>1.0E-05</b>	<b>1</b>	

**Protection of Groundwater Use**

Exceedences of SSTLs? Source Soil   No   Source Groundwater   No  

**Protection of Surface Water**

Exceedences of SSTLs? Source Soil   No   Source Groundwater   No

**EXPOSURE UNIT #1**  
**CONSTRUCTION WORKER**

**Risk Assessment Toolkit**  
**for**  
**North Carolina Dry-Cleaning Solvent Cleanup Act**  
**Program**

<b>DSCA Site Name:</b>	Hilkers Cleaners
<b>DSCA Site Address:</b>	6325 Falls of Neuse Road, Raleigh, Wake County, North Carolina
<b>DSCA ID No.:</b>	DC920025
<b>Exposure Unit:</b>	Exposure Unit #1 - Construction Worker
<b>Submittal Date:</b>	August 5, 2016
<b>Prepared By:</b>	Hart & Hickman, PC
	2923 S. Tryon Street, Suite 100, Charlotte, North Carolina 28203

**DSCA ID No.: DC920025**

**Exposure Unit: Exposure Unit #1 - Construction Worker**

Form No.	Description	Check box if included
<b>Section 1: General Forms</b>		
Form 1A	Exposure Factors and Target Risks	<input checked="" type="checkbox"/>
Form 1B	Fate and Transport Parameters	<input checked="" type="checkbox"/>
Form 1C	Chemicals of Concern	<input checked="" type="checkbox"/>
Form 1D	Soil Representative Concentration Table	<input checked="" type="checkbox"/>
Form 1E	Groundwater Representative Concentration Table	<input type="checkbox"/>
Form 1F	Air and Soil Gas Representative Concentration Table	<input type="checkbox"/>
Form 1G	Summary	<input checked="" type="checkbox"/>
<b>Section 2: Residential Exposure Forms</b>		
Form 2A	Soil Ingestion	<input type="checkbox"/>
Form 2B	Soil Dermal	<input type="checkbox"/>
Form 2C	Soil Outdoor Inhalation	<input type="checkbox"/>
Form 2D	Indoor Air	<input type="checkbox"/>
Form 2E	Soil Gas to Indoor Air	<input type="checkbox"/>
Form 2F	Groundwater to Indoor Air	<input type="checkbox"/>
Form 2G	Groundwater Dermal	<input type="checkbox"/>
<b>Section 3: Non-Residential Exposure Forms</b>		
Form 3A	Soil Ingestion	<input type="checkbox"/>
Form 3B	Soil Dermal	<input type="checkbox"/>
Form 3C	Soil Outdoor Inhalation	<input type="checkbox"/>
Form 3D	Indoor Air	<input type="checkbox"/>
Form 3E	Soil Gas to Indoor Air	<input type="checkbox"/>
Form 3F	Groundwater to Indoor Air	<input type="checkbox"/>
Form 3G	Groundwater Dermal	<input type="checkbox"/>
<b>Section 4: Construction Worker Exposure Forms</b>		
Form 4A	Soil Ingestion	<input checked="" type="checkbox"/>
Form 4B	Soil Dermal	<input checked="" type="checkbox"/>
Form 4C	Soil Outdoor Inhalation	<input checked="" type="checkbox"/>
Form 4D	Groundwater Dermal	<input type="checkbox"/>
<b>Section 5: Protection of Groundwater Use/Surface Water Forms</b>		
Form 5A	Protection of Groundwater Use--Source Groundwater	<input type="checkbox"/>
Form 5B	Protection of Groundwater Use--Source Soil	<input type="checkbox"/>
Form 5C	Protection of Surface Water--Source Groundwater	<input type="checkbox"/>
Form 5D	Protection of Surface Water--Source Soil	<input type="checkbox"/>
Form 5E	Protection of Groundwater Use--Source Groundwater (Backward Mode)	<input type="checkbox"/>
Form 5F	Protection of Groundwater Use--Source Soil (Backward Mode)	<input type="checkbox"/>
Form 5G	Protection of Surface Water--Source Groundwater (Backward Mode)	<input type="checkbox"/>
Form 5H	Protection of Surface Water--Source Soil (Backward Mode)	<input type="checkbox"/>

DSCA ID No.: DC920025

Exposure Unit: Exposure Unit #1 - Construction Worker

Exposure Parameter	Residential Child	Residential Adult	Commercial	Construction Worker
Lifetime (LT) (years)	70	70	70	70
Averaging Time (AT) (days/yr)	365	365	365	365
Body Weight (BW) (kg)	15	80	80	80
Exposure Duration (ED) (yr)	6	20	25	1
Exposure Frequency (EF) (d/yr)	350	350	250	250
Exposure Time (hr)	24	24	8	8
Skin Surface Area (SA) (cm <sup>2</sup> )	2373	6032	3527	3527
Soil Adherence Factor (AF) (mg/cm <sup>2</sup> )	0.2	0.07	0.12	0.3
Soil Ingestion Rate (IRS) (mg/day)	200	100	100	330
Incidental Dermal Contact with Groundwater Pathway				
Exposure Frequency (EF) (d/yr)	90	90	90	350
Exposure Time (hr)	1	1	1	1
Event Frequency (EV) (events/day)	1	1	1	1

Note: Construction worker averaging time and skin surface area values have been updated to match the values recommended in the EPA June 2015 Regional Screening Level updates. Note that these values do not match the values specified in the May 2015 NC DSCA Program Risk Assessment Guidance. These values will be updated in the guidance document at the time of the next future guidance document update.

**Target Health Risk Limits**

Target Cancer Risk  
Target Hazard Index

Individual

1.00E-06
0.2

Cumulative

1.00E-05
1

DSCA ID No.: DC920025

Exposure Unit: Exposure Unit #1 - Construction Worker

Provide justification for the fate and transport parameters used.

Parameter	Default Value	Site Specific Value	Justification
Distance to Protection of Groundwater Point of Exposure (feet)	0	200	The groundwater POE was selected as the closest property downgradient (southeast) of the source area.
Distance to Protection of Surface Water Point of Exposure (feet)	0	910	The surface water POE was selected as a tributary to Marsh Creek, the closest surface water body to the source area.
Depth to Base of Affected Soils ( $d_s$ ) (cm)	1244	366	Impacted soil is assumed to a depth of approximately 12 ft bgs, based on the results of site assessment activities.
Length of Affected Soil Parallel to Assumed GW Flow Direction (L) (cm)	500	457	The estimated length of the soil source area is approximately 15 ft in the direction of groundwater flow.
Vadose Zone Volumetric Water Content ( $\theta_w$ ) (unitless)	0.15 (soil to outdoor air pathway)	0.15	The default value was used.
	0.3 (soil to groundwater pathway)	0.3	The default value was used.
Vadose Zone Volumetric Air Content ( $\theta_a$ ) (unitless)	0.28 (soil to outdoor air pathway)	0.28	The default value was used.
	0.13 (soil to groundwater pathway)	0.13	The default value was used.
Total Porosity (n) (unitless)	0.43	0.43	The default value was used.
Dry Bulk Density ( $\rho_b$ ) (kg/L)	1.5	1.5	The default value was used.
Net Infiltration Estimate (I) (cm/yr)	66	29.2	In accordance with DSCA guidance, an estimated infiltration rate of 29.2 cm/yr was used, which is 25% of the average annual precipitation (46 inches/year).

DSCA ID No.: DC920025

Exposure Unit: Exposure Unit #1 - Construction Worker

Provide justification for the fate and transport parameters used.

Parameter	Default Value	Site Specific Value	Justification
Fraction Organic Carbon (foc)	0.006 (soil to outdoor air pathway)	0.006	The default value was used.
	0.002 (soil leaching to groundwater pathway)	0.002	The default value was used.
Hydraulic Conductivity (K) (cm/d)	690	690	H&H estimated the hydraulic conductivity based on published data for known soil types (silty sand) from Heath (USGS WS Paper 2220).
Hydraulic Gradient (i)	0.01	0.011	Calculated from most recent (June 2015) site-wide potentiometric map.
Aquifer Thickness ( $d_a$ ) (cm)	1500	1500	The default value was used, since the thickness of the site aquifer was not determined during site assessment activities.
Plume Thickness at Source ( $S_d$ ) (cm)	200	200	The default value was used.
Plume Width at Source ( $S_w$ ) (cm)	4,500	4,500.0	The default value was used.
Plume Thickness at GW/SW Discharge ( $\delta_{sw}$ ) (cm)	200	200	The default value was used.
Plume Width at GW/SW Discharge ( $W_{gsw}$ ) (cm)	4,500	4,500.0	The default value was used.
Surface Water Flowrate at GW/SW Discharge ( $cm^3/d$ )	0	0	The default value was used.

DSCA ID No.: DC920025

Exposure Unit: Exposure Unit #1 - Construction Worker

## Select Chemicals of Concern

Put an "X" in the first column to select a chemical of concern.

	CAS Number	Chemical Name
X	156-59-2	Dichloroethylene, 1,2-cis-
X	127-18-4	Tetrachloroethylene
X	108-88-3	Toluene
X	79-01-6	Trichloroethylene

DSCA ID No.: DC920025

Exposure Unit: Exposure Unit #1 - Construction Worker

**Soil Representative Concentration Table**

CAS Number	Chemical Name	Soil Pathways (concentrations are in mg/kg)				Protection of Groundwater Use/Surface Water
		Ingestion	Dermal	Outdoor Inhalation		
156-59-2	Dichloroethylene, 1,2-cis-	1.50E+00	1.50E+00	1.50E+00		
127-18-4	Tetrachloroethylene	1.41E+01	1.41E+01	1.41E+01		
108-88-3	Toluene	1.10E-01	1.10E-01	1.10E-01		
79-01-6	Trichloroethylene	3.30E+00	3.30E+00	3.30E+00		

DSCA ID No.: DC920025

Exposure Unit: Exposure Unit #1 - Construction Worker

All concentrations are in mg/kg.

CAS #	Chemical Name:	Soil Concentration (mg/kg)	Ingestion SL @ TCR = 1E-06	Ingestion SL @ THQ = 0.2	Calculated Carcinogenic Risk	Calculated Non-Carcinogenic Hazard Quotient
156-59-2	Dichloroethylene, 1,2-cis-	1.5		1.42E+03		0.0002
127-18-4	Tetrachloroethylene	14.1	1.18E+04	7.08E+03	1.20E-09	0.0004
108-88-3	Toluene	0.11		5.66E+04		0.0000
79-01-6	Trichloroethylene	3.3	5.39E+02	3.54E+01	6.13E-09	0.0186

Cumulative Risk:	7.32E-09	0.02
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DSCA ID No.: DC920025

Exposure Unit: Exposure Unit #1 - Construction Worker

All concentrations are in mg/kg.

CAS #	Chemical Name:	Soil Concentration (mg/kg)	Dermal SL @ TCR = 1E-06	Dermal SL @ THQ = 0.2	Calculated Carcinogenic Risk	Calculated Non-Carcinogenic Hazard Quotient
156-59-2	Dichloroethylene, 1,2-cis-	1.5				
127-18-4	Tetrachloroethylene	14.1				
108-88-3	Toluene	0.11				
79-01-6	Trichloroethylene	3.3				

Cumulative:	0.00E+00	0.00
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Note: In the evaluation of the dermal contact exposure pathway, chemicals (typically VOC's ) without a dermal absorption factor make a negligible contribution to calculated risk. Thus if no dermal absorption factor is available for a specific chemical (concentration) all other columns will be blank. Note: Calculated soil dermal contact risks for chemicals with no dermal absorption factor are considered negligible. The calculated risk and

DSCA ID No.: DC920025

Exposure Unit: Exposure Unit #1 - Construction Worker

All concentrations are in mg/kg.

Higher of mass limit and standard VF

CAS #	Chemical Name:	Soil Concentration (mg/kg)	Inhalation SL @ TCR = 1E-06	Inhalation SL @ THQ = 0.2	Calculated Carcinogenic Risk	Calculated Non-Carcinogenic Hazard Quotient
156-59-2	Dichloroethylene, 1,2-cis-	1.5				
127-18-4	Tetrachloroethylene	14.1	6.21E+02	1.85E+01	2.27E-08	0.1528
108-88-3	Toluene	0.11		4.21E+03		0.0000
79-01-6	Trichloroethylene	3.3	3.71E+01	8.68E-01	8.90E-08	<b>0.7600</b>

Cumulative:	1.12E-07	0.91
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**Summary of Risk Assessment Results**

**Form 1G**

**DSCA ID No.: DC920025**

**Exposure Unit: Exposure Unit #1 - Construction Worker**

Pathway	Residential			Non-Residential			Construction Worker		
	Carcinogenic Risk	Hazard Index	Risk exceeded?	Carcinogenic Risk	Hazard Index	Risk exceeded?	Carcinogenic Risk	Hazard Index	Risk exceeded?
<b>SURFICIAL SOIL COMBINED PATHWAYS</b>									
Soil Ingestion	4.18E-07	1.24E-01	NO	5.55E-08	8.30E-03	NO	7.32E-09	1.93E-02	NO
Soil Dermal	0.00E+00	0.00E+00	NO	0.00E+00	0.00E+00	NO	0.00E+00	0.00E+00	NO
Soil Outdoor Inhalation	7.68E-07	1.80E-01	NO	1.31E-07	4.28E-02	NO	1.12E-07	9.13E-01	NO
Surficial Soil Combined Pathways	1.19E-06	3.04E-01	NO	1.87E-07	5.11E-02	NO	1.19E-07	9.32E-01	NO
<b>INDOOR INHALATION EXPOSURE PATHWAY</b>									
Indoor Air	0.00E+00	0.00E+00	NO	0.00E+00	0.00E+00	NO	NA	NA	NA
Soil Gas to Indoor Air	0.00E+00	0.00E+00	NO	0.00E+00	0.00E+00	NO	NA	NA	NA
Groundwater to Indoor Air	0.00E+00	0.00E+00	NO	0.00E+00	0.00E+00	NO	NA	NA	NA
<b>DERMAL CONTACT WITH GROUNDWATER EXPOSURE PATHWAY</b>									
Groundwater Dermal	0.00E+00	0.00E+00	NO	0.00E+00	0.00E+00	NO	0.00E+00	0.00E+00	NO
<b>Allowable Risk</b>	<b>1.0E-05</b>	<b>1</b>		<b>1.0E-05</b>	<b>1</b>		<b>1.0E-05</b>	<b>1</b>	

**Protection of Groundwater Use**

Exceedences of SSTLs? Source Soil   No   Source Groundwater   No  

**Protection of Surface Water**

Exceedences of SSTLs? Source Soil   No   Source Groundwater   No

**EXPOSURE UNIT #2**

**Risk Assessment Toolkit**  
**for**  
**North Carolina Dry-Cleaning Solvent Cleanup Act**  
**Program**

<b>DSCA Site Name:</b>	Hilkers Cleaners
<b>DSCA Site Address:</b>	6325 Falls of Neuse Road, Raleigh, Wake County, North Carolina
<b>DSCA ID No.:</b>	DC920025
<b>Exposure Unit:</b>	Exposure Unit #2
<b>Submittal Date:</b>	August 5, 2016
<b>Prepared By:</b>	Hart & Hickman, PC
	2923 S. Tryon Street, Suite 100, Charlotte, North Carolina 28203

DSCA ID No.: DC920025

Exposure Unit: Exposure Unit #2

Form No.	Description	Check box if included
<b>Section 1: General Forms</b>		
Form 1A	Exposure Factors and Target Risks	<input checked="" type="checkbox"/>
Form 1B	Fate and Transport Parameters	<input checked="" type="checkbox"/>
Form 1C	Chemicals of Concern	<input checked="" type="checkbox"/>
Form 1D	Soil Representative Concentration Table	<input type="checkbox"/>
Form 1E	Groundwater Representative Concentration Table	<input checked="" type="checkbox"/>
Form 1F	Air and Soil Gas Representative Concentration Table	<input type="checkbox"/>
Form 1G	Summary	<input checked="" type="checkbox"/>
<b>Section 2: Residential Exposure Forms</b>		
Form 2A	Soil Ingestion	<input type="checkbox"/>
Form 2B	Soil Dermal	<input type="checkbox"/>
Form 2C	Soil Outdoor Inhalation	<input type="checkbox"/>
Form 2D	Indoor Air	<input type="checkbox"/>
Form 2E	Soil Gas to Indoor Air	<input type="checkbox"/>
Form 2F	Groundwater to Indoor Air	<input checked="" type="checkbox"/>
Form 2G	Groundwater Dermal	<input type="checkbox"/>
<b>Section 3: Non-Residential Exposure Forms</b>		
Form 3A	Soil Ingestion	<input type="checkbox"/>
Form 3B	Soil Dermal	<input type="checkbox"/>
Form 3C	Soil Outdoor Inhalation	<input type="checkbox"/>
Form 3D	Indoor Air	<input type="checkbox"/>
Form 3E	Soil Gas to Indoor Air	<input type="checkbox"/>
Form 3F	Groundwater to Indoor Air	<input checked="" type="checkbox"/>
Form 3G	Groundwater Dermal	<input type="checkbox"/>
<b>Section 4: Construction Worker Exposure Forms</b>		
Form 4A	Soil Ingestion	<input type="checkbox"/>
Form 4B	Soil Dermal	<input type="checkbox"/>
Form 4C	Soil Outdoor Inhalation	<input type="checkbox"/>
Form 4D	Groundwater Dermal	<input type="checkbox"/>
<b>Section 5: Protection of Groundwater Use/Surface Water Forms</b>		
Form 5A	Protection of Groundwater Use--Source Groundwater	<input type="checkbox"/>
Form 5B	Protection of Groundwater Use--Source Soil	<input type="checkbox"/>
Form 5C	Protection of Surface Water--Source Groundwater	<input type="checkbox"/>
Form 5D	Protection of Surface Water--Source Soil	<input type="checkbox"/>
Form 5E	Protection of Groundwater Use--Source Groundwater (Backward Mode)	<input type="checkbox"/>
Form 5F	Protection of Groundwater Use--Source Soil (Backward Mode)	<input type="checkbox"/>
Form 5G	Protection of Surface Water--Source Groundwater (Backward Mode)	<input type="checkbox"/>
Form 5H	Protection of Surface Water--Source Soil (Backward Mode)	<input type="checkbox"/>

DSCA ID No.: DC920025

Exposure Unit: Exposure Unit #2

Exposure Parameter	Residential Child	Residential Adult	Commercial	Construction Worker
Lifetime (LT) (years)	70	70	70	70
Averaging Time (AT) (days/yr)	365	365	365	365
Body Weight (BW) (kg)	15	80	80	80
Exposure Duration (ED) (yr)	6	20	25	1
Exposure Frequency (EF) (d/yr)	350	350	250	250
Exposure Time (hr)	24	24	8	8
Skin Surface Area (SA) (cm <sup>2</sup> )	2373	6032	3527	3527
Soil Adherence Factor (AF) (mg/cm <sup>2</sup> )	0.2	0.07	0.12	0.3
Soil Ingestion Rate (IRS) (mg/day)	200	100	100	330
Incidental Dermal Contact with Groundwater Pathway				
Exposure Frequency (EF) (d/yr)	90	90	90	350
Exposure Time (hr)	1	1	1	1
Event Frequency (EV) (events/day)	1	1	1	1

Note: Construction worker averaging time and skin surface area values have been updated to match the values recommended in the EPA June 2015 Regional Screening Level updates. Note that these values do not match the values specified in the May 2015 NC DSCA Program Risk Assessment Guidance. These values will be updated in the guidance document at the time of the next future guidance document update.

**Target Health Risk Limits**

Target Cancer Risk  
Target Hazard Index

Individual

1.00E-06
0.2

Cumulative

1.00E-05
1

DSCA ID No.: DC920025

Exposure Unit: Exposure Unit #2

Provide justification for the fate and transport parameters used.

Parameter	Default Value	Site Specific Value	Justification
Distance to Protection of Groundwater Point of Exposure (feet)	0	200	The groundwater POE was selected as the closest property downgradient (southeast) of the source area.
Distance to Protection of Surface Water Point of Exposure (feet)	0	910	The surface water POE was selected as a tributary to Marsh Creek, the closest surface water body to the source area.
Depth to Base of Affected Soils ( $d_s$ ) (cm)	1244	366	Impacted soil is assumed to a depth of approximately 12 ft bgs, based on the results of site assessment activities.
Length of Affected Soil Parallel to Assumed GW Flow Direction (L) (cm)	500	457	The estimated length of the soil source area is approximately 15 ft in the direction of groundwater flow.
Vadose Zone Volumetric Water Content ( $\theta_w$ ) (unitless)	0.15 (soil to outdoor air pathway)	0.15	The default value was used.
	0.3 (soil to groundwater pathway)	0.3	The default value was used.
Vadose Zone Volumetric Air Content ( $\theta_a$ ) (unitless)	0.28 (soil to outdoor air pathway)	0.28	The default value was used.
	0.13 (soil to groundwater pathway)	0.13	The default value was used.
Total Porosity (n) (unitless)	0.43	0.43	The default value was used.
Dry Bulk Density ( $\rho_b$ ) (kg/L)	1.5	1.5	The default value was used.
Net Infiltration Estimate (I) (cm/yr)	66	29.2	In accordance with DSCA guidance, an estimated infiltration rate of 29.2 cm/yr was used, which is 25% of the average annual precipitation (46 inches/year).

DSCA ID No.: DC920025

Exposure Unit: Exposure Unit #2

Provide justification for the fate and transport parameters used.

Parameter	Default Value	Site Specific Value	Justification
Fraction Organic Carbon (foc)	0.006 (soil to outdoor air pathway)	0.006	The default value was used.
	0.002 (soil leaching to groundwater pathway)	0.002	The default value was used.
Hydraulic Conductivity (K) (cm/d)	690	690	H&H estimated the hydraulic conductivity based on published data for known soil types (silty sand) from Heath (USGS WS Paper 2220).
Hydraulic Gradient (i)	0.01	0.011	Calculated from most recent (June 2015) site-wide potentiometric map.
Aquifer Thickness ( $d_a$ ) (cm)	1500	1500	The default value was used, since the thickness of the site aquifer was not determined during site assessment activities.
Plume Thickness at Source ( $S_d$ ) (cm)	200	200	The default value was used.
Plume Width at Source ( $S_w$ ) (cm)	4,500	4,500.0	The default value was used.
Plume Thickness at GW/SW Discharge ( $\delta_{sw}$ ) (cm)	200	200	The default value was used.
Plume Width at GW/SW Discharge ( $W_{gsw}$ ) (cm)	4,500	4,500.0	The default value was used.
Surface Water Flowrate at GW/SW Discharge (cm <sup>3</sup> /d)	0	0	The default value was used.

<b>Chemicals of Concern</b>	<b>Form 1C</b>
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DSCA ID No.: DC920025
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Exposure Unit: Exposure Unit #2
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<b>Select Chemicals of Concern</b>
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Put an "X" in the first column to select a chemical of concern.

	CAS Number	Chemical Name
<input checked="" type="checkbox"/>	127-18-4	Tetrachloroethylene

DSCA ID No.: DC920025

Exposure Unit: Exposure Unit #2

Groundwater Representative Concentration Table

CAS Number	Chemical Name	Groundwater Pathways (concentrations are in mg/L)		
		Dermal	Indoor Inhalation	Protection of Groundwater Use/Surface Water
127-18-4	Tetrachloroethylene		5.50E-03	

DSCA ID No.: DC920025

Exposure Unit: Exposure Unit #2

Groundwater concentrations are in ug/L. Air concentrations are in ug/m<sup>3</sup>.

CAS #	Chemical Name:	Groundwater Concentration (ug/L)	Calculated Indoor Air Concentration (ug/m <sup>3</sup> )	Target Indoor Air Conc. for Carcinogens @ TCR = 1E-06	Target Indoor Air Conc. for Non-Carcinogens @ THQ = 0.2	Calculated Carcinogenic Risk	Calculated Non-Carcinogenic Hazard Quotient
127-18-4	Tetrachloroethylene	5.5	3.9799672	1.08E+01	8.34E+00	3.69E-07	0.0954

Cumulative:	3.69E-07	0.10
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DSCA ID No.: DC920025

Exposure Unit: Exposure Unit #2

Groundwater concentrations are in ug/L. Air concentrations are in ug/m<sup>3</sup>.

CAS #	Chemical Name:	Groundwater Concentration (ug/L)	Calculated Indoor Air Concentration (ug/m <sup>3</sup> )	Target Indoor Air Conc. for Carcinogens @ TCR = 1E-06	Target Indoor Air Conc. for Non-Carcinogens @ THQ = 0.2	Calculated Carcinogenic Risk	Calculated Non-Carcinogenic Hazard Quotient
127-18-4	Tetrachloroethylene	5.5	3.9799672	4.72E+01	3.50E+01	8.44E-08	0.0227

Cumulative:	8.44E-08	0.02
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**Summary of Risk Assessment Results**

**Form 1G**

**DSCA ID No.: DC920025**

**Exposure Unit: Exposure Unit #2**

Pathway	Residential			Non-Residential			Construction Worker		
	Carcinogenic Risk	Hazard Index	Risk exceeded?	Carcinogenic Risk	Hazard Index	Risk exceeded?	Carcinogenic Risk	Hazard Index	Risk exceeded?
<b>SURFICIAL SOIL COMBINED PATHWAYS</b>									
Soil Ingestion	0.00E+00	0.00E+00	NO	0.00E+00	0.00E+00	NO	0.00E+00	0.00E+00	NO
Soil Dermal	0.00E+00	0.00E+00	NO	0.00E+00	0.00E+00	NO	0.00E+00	0.00E+00	NO
Soil Outdoor Inhalation	0.00E+00	0.00E+00	NO	0.00E+00	0.00E+00	NO	0.00E+00	0.00E+00	NO
Surficial Soil Combined Pathways	0.00E+00	0.00E+00	NO	0.00E+00	0.00E+00	NO	0.00E+00	0.00E+00	NO
<b>INDOOR INHALATION EXPOSURE PATHWAY</b>									
Indoor Air	0.00E+00	0.00E+00	NO	0.00E+00	0.00E+00	NO	NA	NA	NA
Soil Gas to Indoor Air	0.00E+00	0.00E+00	NO	0.00E+00	0.00E+00	NO	NA	NA	NA
Groundwater to Indoor Air	3.69E-07	9.54E-02	NO	8.44E-08	2.27E-02	NO	NA	NA	NA
<b>DERMAL CONTACT WITH GROUNDWATER EXPOSURE PATHWAY</b>									
Groundwater Dermal	0.00E+00	0.00E+00	NO	0.00E+00	0.00E+00	NO	0.00E+00	0.00E+00	NO
<b>Allowable Risk</b>	<b>1.0E-05</b>	<b>1</b>		<b>1.0E-05</b>	<b>1</b>		<b>1.0E-05</b>	<b>1</b>	

**Protection of Groundwater Use**

Exceedences of SSTLs? Source Soil   No   Source Groundwater   No  

**Protection of Surface Water**

Exceedences of SSTLs? Source Soil   No   Source Groundwater   No

**ATTACHMENT 5**  
**ANALYTICAL DATA TABLES**

**Analytical Data Tables**  
**for**  
**North Carolina Dry-Cleaning Solvent Cleanup Act Program**

<b>Facility Name:</b>	Hilkers Cleaners
	6325 Falls of Neuse Road, Raleigh, Wake County, North Carolina
<b>DSCA ID No.:</b>	DC920025
<b>Submittal Date:</b>	August 5, 2016
<b>Prepared By:</b>	Hart & Hickman, PC
	2923 South Tryon Street, Suite 100, Charlotte, North Carolina 28203

**DSCA ID No.: DC920025**

<b>Table/ Att. No.</b>	<b>Description</b>	<b>Check box if included</b>
<b>Tables</b>		
Table 1	Site Chronology	<input checked="" type="checkbox"/>
Table 2	Analytical Data for Soil	<input checked="" type="checkbox"/>
Table 3	Analytical Data for Sub-slab Gas	<input checked="" type="checkbox"/>
Table 4	Analytical Data for Soil Gas	<input type="checkbox"/>
Table 5	Analytical Data for Indoor and Outdoor Air	<input checked="" type="checkbox"/>
Table 6	Monitoring Well Construction Data	<input checked="" type="checkbox"/>
Table 7	Groundwater Elevation Data	<input checked="" type="checkbox"/>
Table 8	Analytical Data for Groundwater	<input checked="" type="checkbox"/>
Table 9	Analytical Data for Surface Water	<input type="checkbox"/>
Table 10	Water Well(s) Survey Data	<input type="checkbox"/>
Table 11	Analytical Data for Water Supply Well(s)	<input type="checkbox"/>
Table 12	Analytical Data for Natural Attenuation Parameters	<input checked="" type="checkbox"/>
<b>Attachments</b>		
Att. 1	Site map showing location(s) of soil boring(s).	<input type="checkbox"/>
Att. 2	Soil contaminant concentration maps showing the concentration at each sampling point.	<input type="checkbox"/>
Att. 3	Soil isoconcentration maps.	<input type="checkbox"/>
Att. 4	Site map showing location(s) of monitoring well(s).	<input type="checkbox"/>
Att. 5	Well completion diagrams and records of construction submitted to state.	<input type="checkbox"/>
Att. 6	Groundwater gradient map for each sampling event.	<input type="checkbox"/>
Att. 7	PCE concentration map showing the concentration at each sampling point and isoconcentration map. However, if there are significant plumes for other dry-cleaning contaminants, contaminant concentration maps for each chemical of concern should be included.	<input type="checkbox"/>
Att. 8	Groundwater concentration trend plots.	<input type="checkbox"/>
Att. 9	Map showing location(s) of surface water sample(s) (if applicable).	<input type="checkbox"/>
Att. 10	Surface water concentration map showing the concentration at each sampling point (if applicable).	<input type="checkbox"/>
Att. 11	USGS Quad map with plotted water well location(s) within the 1,500 foot and 0.5 mile radii of the site (if applicable).	<input type="checkbox"/>
Att. 12	Site map showing location(s) of monitoring well(s) for natural attenuation paramete	<input type="checkbox"/>
Att. 13	Site map showing location(s) of indoor air, outdoor air, or soil gas samples.	<input type="checkbox"/>
Att. 14	Air and soil gas concentration map showing the concentration at each sampling point.	<input type="checkbox"/>
Att. 15	Signed laboratory analytical reports including chain-of custody and quality assurance/quality control (QA/QC) documentation (only if not previously submitted).	<input type="checkbox"/>
Att. 16		<input type="checkbox"/>
Att. 17		<input type="checkbox"/>
Att. 18		<input type="checkbox"/>
Att. 19		<input type="checkbox"/>
Att. 20		<input type="checkbox"/>
Att. 21		<input type="checkbox"/>

**Note:**

1. All maps must include a bar scale, north arrow, site name, DSCA ID No., and date.

**Table 1: Site Chronology****ADT 1****DSCA ID No.: DC920025****Chronology of Events**

Date	Instructions: Brief description of all significant events that have occurred since a problem was suspected at the facility. Commence with the first date a problem was suspected and continue through the most recent activity described in the current report.
1985-2003	Hilker's Cleaners conducted dry-cleaning operations at the site. In 2003, dry-cleaning operations were relocated to another facility. Hilker's Cleaners maintains a drop-off/pick-up store in a one of the three tenant spaces that was formerly occupied by the dry-cleaning operations.
November 8, 2002	A Phase II ESA was completed by Property Solutions, Inc. The assessment included the collection of six soil samples (SS-B-1 through SS-B-6) inside and outside of the Hilker's facility. Concentrations of tetrachloroethene (PCE) above standards were discovered in the soil.
December 11, 2002	A Phase I Environmental Site Assessment (ESA) was completed by Blackstone Consulting. Hilker's Cleaners was operational and considered a Recognized Environmental Concern (REC).
December 2003	A Phase II ESA was completed by Professional Service Industries. The assessment included the collection of eight soil samples (GP-1 through GP-7, and MW-3) and the installation and sampling of three temporary groundwater monitoring wells (MW-1 through MW-3) at the Hilker's Cleaners facility. Soil and groundwater samples contained PCE concentrations above NC standards. The assessment activities and results were documented in a Phase II ESA report dated January 7, 2004.
January 11, 2005	The site is certified into the DSCA Program.
March 2007	Withers & Ravenel, Inc. (W&R) conducted Prioritization Assessment (PA) activities at the site which included a 1,500 foot receptor survey. On April 11, 2007, W&R submitted a PA Report to the DSCA Program.
July 2007	W&R conducted additional assessment activities at the site. The assessment included the installation and sampling of ten soil borings (WR-1 through WR-10), three type-II permanent monitoring wells (MW-1S, MW-2, and MW-3) and one type-III permanent monitoring well (MW-1D). On September 12, 2007, W&R submitted a Report of Additional Subsurface Investigation to the DSCA Program.
February 2008	W&R conducted additional assessment activities at the site. The assessment included the installation and sampling of ten soil borings (WR-11 through WR-20) and three type-II permanent monitoring wells (MW-4 through MW-6). W&R also sampled the existing monitoring wells (MW-1S, MW-1D, MW-2, and MW-3). On March 14, 2008, W&R submitted an Assessment Report to the DSCA Program
May 2008, October 2008, February 2009, & May 2009	W&R conducted groundwater sampling events at the site which included monitoring wells MW-1, MW-2, MW-5, and MW-7 through MW-11. On June 12, 2008, November 18, 2008, March 12, 2009, and June 1, 2009, W&R submitted Groundwater Monitoring Reports to the DSCA Program documenting the assessment activities.
March 2010	W&R conducted vapor intrusion assessment activities which included collecting one sub-slab soil gas sample (SSV-1) and one indoor air sample (IA-1) from inside the "At Ease Boutique" tenant space, where the former dry-cleaning facility operated. On April 23, 2010, W&R submitted an Indoor air and Sub-Slab Vapor Analysis report to the DSCA Program.
May 2010	W&R conducted vapor intrusion assessment activities which included the collection of a confirmation indoor air sample (IA-2R) from inside the "At Ease Boutique" tenant space. On June 7, 2010, W&R submitted a Results of Confirmation Indoor Air Sample Analysis report to the DSCA Program.
April 2014	Hart & Hickman, PC (H&H) conducted a site-wide groundwater monitoring event to evaluate current groundwater concentrations at the site. On June 24, 2014, H&H submitted a Groundwater Monitoring Report to the DSCA Program documenting the sampling event.
February 2015	H&H conducted vapor intrusion assessment activities at the former Hilker Cleaners. The assessment activities included the collection of one indoor air sample and two sub-slab soil gas samples. The results of the vapor intrusion assessment were submitted to the DSCA program on July 30, 2015
January through June 2015	In January 2015, H&H installed monitoring well MW-7 to further delineate the groundwater plume at the site. Following installation, H&H collected groundwater samples from MW-1S, MW-2, MW-3, MW-4, MW-5, MW-6, and MW-7. During sampling, it was observed that MW-7 contained a small amount of water. Thus, H&H installed an additional monitoring well (MW-8) in April 2015 and subsequently sampled MW-8. In June 2015, H&H gauged water levels in all existing site monitoring wells. On August 3, 2015, H&H submitted a report to the DSCA Program documenting the monitoring well installation and groundwater sampling activities.

**Table 1: Site Chronology****ADT 1****DSCA ID No.: DC920025****Chronology of Events**

Date	Instructions: Brief description of all significant events that have occurred since a problem was suspected at the facility. Commence with the first date a problem was suspected and continue through the most recent activity described in the current report.
December 2015	H&H completed a risk assessment for the site to evaluate the potential for site closure. Based on the risk assessment, H&H recommends site closure with land use restrictions on the source property restricting the installation of water supply wells and restricting the property to non-residential use. H&H also recommends a 2C notice on the adjacent property to the south restricting the use of groundwater due to impacts above 2L standards.
March 2015	On March 31, 2016, H&H conducted soil assessment activities at the former Hilker Cleaners to delineate soil impacts in the vicinity of monitoring well MW-3. The assessment activities included the advancement of six soil borings and the analysis of three soil samples. On May 18, 2016, H&H submitted a brief letter report to the DSCA Program documenting the soil sampling activities at the site.
July 2016	H&H submitted an updated risk assessment incorporating the March 2016 soil data.

**Table 2: Analytical Data for Soil**

**DSCA ID No.: DC920025**

Sample ID	Depth [feet bgs]	Sampling Date (mm/dd/yy)	Benzene	cis-1,2-Dichloroethylene	Ethylbenzene	Methyl tert-butyl ether (MTBE)	Naphthalene	Tetrachloroethylene	Toluene	trans-1,2-Dichloroethylene	Trichloroethylene	Vinyl chloride	Xylenes (total)	Methylene Chloride	Acetone	p-Isopropyltoluene	Dichlorodifluoromethane	Styrene	2-Butanone	Carbon Disulfide	1,4-Dichlorobenzene	n-Propylbenzene
			[mg/kg]																			
GP-1-2'	2	12/03/03	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<b>0.045</b>	<0.0030	<0.0030	<0.0030	<0.0061	<0.0030	<b>0.0035</b>	<b>0.070</b>	<0.0030	<0.0061	<0.0030	<0.061	NA	<0.0030	<0.0030
GP-2-2'	2	12/03/03	<0.0028	<0.0028	<0.0028	<0.0028	<0.0028	<b>0.023</b>	<0.0028	<0.0028	<0.0028	<0.0057	<0.0085	<b>0.0032</b>	<0.057	<0.0028	<0.0057	<0.0028	<0.057	NA	<0.0028	<0.0028
GP-3-4'	4	12/03/03	<0.0031	<0.0031	<0.0031	<0.0031	<0.0031	<b>0.078</b>	<0.0031	<0.0031	<b>0.061</b>	<0.0061	<0.0092	<0.0031	<0.061	<0.0031	<0.0061	<0.0031	<0.061	NA	<0.0031	<0.0031
GP-4-2'	2	12/03/03	<0.0026	<b>0.016</b>	<0.0026	<0.0026	<0.0026	<b>0.33</b>	<0.0026	<0.0026	<b>0.042</b>	<0.0052	<0.0078	<0.0026	<0.052	<0.0026	<0.0052	<0.0026	<0.052	NA	<0.0026	<0.0026
GP-5-4'	4	12/04/03	<0.0027	<b>1.1</b>	<0.0027	<0.0027	<0.0027	<b>2.6</b>	<0.0027	<0.0027	<b>1.7</b>	<0.0055	<0.0082	<0.0027	<0.055	<0.0027	<0.0055	<0.0027	<0.055	NA	<0.0027	<0.0027
GP-6-2'	2	12/04/03	<0.0041	<b>0.20</b>	<0.0041	<0.0041	<0.0041	<b>0.63</b>	<0.0041	<0.0041	<b>0.055</b>	<0.0083	<0.0124	<b>0.0050</b>	<0.083	<0.0041	<0.0083	<0.0041	<0.083	NA	<0.0041	<0.0041
GP-7-2'	2	12/04/03	<0.0035	<0.0035	<0.0035	<0.0035	<0.0035	<b>0.16</b>	<0.0035	<0.0035	<0.0035	<0.0070	<0.0105	<b>0.018</b>	<b>0.11</b>	<0.0035	<0.0070	<0.0035	<0.070	NA	<0.0035	<0.0035
MW-3-6'	6	12/03/03	<0.0027	<b>2.0</b>	<0.0027	<0.0027	<0.0027	<b>1.2</b>	<b>0.034</b>	<b>0.047</b>	<b>0.95</b>	<0.0053	<0.0080	<b>0.015</b>	<b>1.1</b>	<b>0.88</b>	<0.0053	<0.0027	<0.053	NA	<0.0027	<0.0027
WR-1	4-6	07/31/07	<0.0013	<0.0013	<0.0013	<0.0013	<0.0013	<0.0013	<b>0.0015</b>	<0.0013	<0.0013	<0.0013	<0.0038	<0.0013	<b>0.015</b>	<0.0013	<0.0013	<0.0013	<0.0063	<0.0063	<0.0013	<0.0013
	10-12	07/31/07	<0.0011	<0.0011	<0.0011	<0.0011	<0.0011	<0.0011	<0.0011	<0.0011	<0.0011	<0.0011	<0.0034	<0.0011	<0.0057	<0.0011	<0.0011	<0.0011	<0.0057	<0.0057	<0.0011	<0.0011
WR-2	2-4	07/31/07	<0.00095	<0.00095	<0.00095	<0.00095	<0.00095	<b>0.0012</b>	<b>0.00090J</b>	<0.00095	<0.00095	<0.00095	<0.00266	<0.00095	<0.0047	<0.00095	<0.00095	<0.00095	<0.0047	<0.0047	<0.00095	<0.00095
	6-8	07/31/07	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<b>0.00097J</b>	<b>0.0011J</b>	<0.0012	<0.0012	<0.0012	<0.0033	<0.0012	<0.0059	<0.0012	<0.0012	<0.0012	<0.0059	<0.0059	<0.0012	<0.0012
WR-3	2-4	07/31/07	<0.0013	<0.0013	<0.0013	<0.0013	<0.0013	<b>0.0042</b>	<0.0013	<0.0013	<0.0013	<0.0013	<0.0037	<0.0013	<0.0066	<0.0013	<b>0.013</b>	<0.0013	<0.0066	<0.0066	<0.0013	<0.0013
	8-10	07/31/07	<0.0015	<0.0015	<b>0.0030</b>	<0.0015	<0.0015	<b>0.0027</b>	<b>0.0029</b>	<0.0015	<0.0015	<0.0015	<0.0041	<0.0015	<b>0.013</b>	<0.0015	<b>0.29E</b>	<b>0.0031</b>	<0.0073	<0.0073	<0.0015	<0.0015
WR-4	2-4	07/31/07	<0.0013	<0.0013	<0.0013	<0.0013	<0.0013	<b>0.052</b>	<b>0.0013</b>	<0.0013	<b>0.0017</b>	<0.0013	<0.0039	<0.0013	<0.0065	<0.0013	<0.0013	<0.0013	<0.0065	<0.0065	<0.0013	<0.0013
	6-8	07/31/07	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	<b>0.0066</b>	<b>0.0024</b>	<0.0015	<0.0015	<0.0015	<0.0045	<0.0015	<0.0075	<0.0015	<0.0015	<0.0015	<0.0075	<0.0075	<0.0015	<0.0015
WR-5	2-4	07/31/07	<0.0011	<0.0011	<0.0011	<0.0011	<0.0011	<b>0.0029</b>	<b>0.0016</b>	<0.0011	<0.0011	<0.0011	<0.0032	<0.0011	<0.0053	<0.0011	<0.0011	<0.0011	<0.0053	<0.0053	<0.0011	<0.0011
	8-10	07/31/07	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<b>0.0030</b>	<0.0012	<0.0012	<0.0012	<0.0012	<0.0036	<0.0012	<b>0.012</b>	<0.0012	<0.0012	<0.0012	<0.0060	<0.0060	<0.0012	<0.0012
WR-6	4-6	07/31/07	<0.00093	<b>0.012</b>	<0.00093	<0.00093	<0.00093	<b>0.012</b>	<b>0.00086J</b>	<b>0.010</b>	<b>0.0018</b>	<0.00093	<0.00283	<0.00093	<b>0.099</b>	<b>0.057</b>	<0.00093	<0.00093	<b>0.0074</b>	<0.0046	<0.00093	<0.00093
	8-10	07/31/07	<0.0011	<b>0.0056</b>	<0.0011	<0.0011	<0.0011	<b>0.041</b>	<0.0011	<b>0.0049</b>	<b>0.0025</b>	<0.0011	<0.0034	<0.0011	<b>0.070</b>	<b>0.016</b>	<0.0011	<0.0011	<0.0056	<b>0.0066</b>	<0.0011	<0.0011
WR-7	0-2	07/31/07	<1.2	<1.2	<1.2	<1.2	<1.2	<b>80</b>	<1.2	<1.2	<b>6.1</b>	<1.2	<3.6	<1.2	<5.9	<1.2	<1.2	<1.2	<5.9	<5.9	<1.2	<1.2
	6-8	07/31/07	<0.00087	<b>0.038</b>	<0.00087	<0.00087	<0.00087	<b>0.050</b>	<b>0.0019</b>	<0.00087	<b>0.0080</b>	<0.00087	<0.00257	<0.00087	<0.0044	<0.00087	<0.00087	<0.00087	<0.0044	<0.0044	<0.00087	<0.00087
WR-8	4-6	07/31/07	<0.12	<b>7.0</b>	<0.12	<0.12	<0.12	<b>1.0</b>	<0.12	<0.12	<b>12</b>	<0.12	<0.37	<0.12	<0.62	<0.12	<0.12	<0.12	<0.62	<0.62	<0.12	<0.12
	10-12	07/31/07	<0.0012	<b>0.018</b>	<0.0012	<0.0012	<0.0012	<0.0012	<b>0.0012J</b>	<0.0012	<b>0.0019</b>	<0.0012	<0.0037	<0.0012	<0.0062	<0.0012	<0.0012	<0.0012	<0.0062	<0.0062	<0.0012	<0.0012

**Table 2: Analytical Data for Soil**

**DSCA ID No.: DC920025**

Sample ID	Depth [feet bgs]	Sampling Date (mm/dd/yy)	Benzene	cis-1,2-Dichloroethylene	Ethylbenzene	Methyl tert-butyl ether (MTBE)	Naphthalene	Tetrachloroethylene	Toluene	trans-1,2-Dichloroethylene	Trichloroethylene	Vinyl chloride	Xylenes (total)	Methylene Chloride	Acetone	p-Isopropyltoluene	Dichlorodifluoromethane	Styrene	2-Butanone	Carbon Disulfide	1,4-Dichlorobenzene	n-Propylbenzene
			[mg/kg]																			
WR-9	2-4	07/31/07	<0.00098	<0.00098	<0.00098	<0.00098	<0.00098	<b>0.0014</b>	<0.00098	<0.00098	<0.00098	<0.00098	<0.00298	<0.00098	<b>0.028</b>	<0.00098	<0.00098	<0.00098	<0.0049	<0.0049	<0.00098	<0.00098
	6-8	07/31/07	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<b>0.0011</b>	<0.0012	<0.0012	<0.0012	<0.0036	<0.0012	<0.0061	<0.0012	<0.0012	<0.0012	<0.0061	<0.0061	<0.0012	<0.0012
WR-10	2-4	07/31/07	<0.00083	<b>0.022</b>	<0.00083	<0.00083	<0.00083	<0.00083	<b>0.016</b>	<b>0.00080</b>	<b>0.0084</b>	<0.00083	<0.00253	<0.00083	<0.0041	<0.00083	<0.00083	<0.00083	<0.0041	<0.0041	<0.00083	<0.00083
	8-10	07/31/07	<0.0010	<b>0.012</b>	<0.0010	<0.0010	<0.0010	<b>0.0044</b>	<b>0.0012</b>	<0.0010	<b>0.0023</b>	<0.0010	<0.0031	<0.0010	<b>0.057</b>	<0.0010	<0.0010	<0.0010	<0.0052	<b>0.0022</b>	<0.0010	<0.0010
WR-11	6-8	02/06/08	<0.0012	<b>0.0031</b>	<0.0012	<0.0012	<0.0059	<b>0.020</b>	<0.0059	<0.0012	<b>0.019</b>	<0.0012	<0.0035	<0.0059	<b>0.13</b>	<b>0.065</b>	<0.0059	<0.0012	<0.0012	NA	<0.0012	<0.0012
	12-14	02/06/08	<0.0014	<0.0014	<0.0014	<0.0014	<0.0072	<0.0014	<0.0072	<0.0014	<0.0014	<0.0014	<0.0043	<0.0072	<0.072	<0.0014	<0.0072	<0.0014	<0.0014	NA	<0.0014	<0.0014
WR-12	6-8	02/06/08	<0.0012	<0.0012	<0.0012	<0.0012	<0.0061	<b>0.0018</b>	<0.0061	<0.0012	<0.0012	<0.0012	<0.0037	<0.0061	<0.061	<0.0012	<0.0061	<0.0012	<0.0012	NA	<0.0012	<0.0012
	10-12	02/06/08	<0.0016	<0.0016	<0.0016	<0.0016	<0.0079	<0.0016	<0.0079	<0.0016	<0.0016	<0.0016	<0.0047	<0.0079	<0.079	<0.0016	<0.0079	<0.0016	<0.0016	NA	<0.0016	<0.0016
WR-13	6-8	02/06/08	<0.0012	<0.0012	<0.0012	<0.0012	<0.0061	<b>0.011</b>	<0.0061	<0.0012	<0.0012	<0.0012	<0.0037	<0.0061	<0.061	<0.0012	<0.0061	<0.0012	<0.0012	NA	<0.0012	<0.0012
	12-14	02/06/08	<0.0013	<0.0013	<0.0013	<0.0013	<0.0064	<0.0013	<0.0064	<0.0013	<0.0013	<0.0013	<0.0038	<0.0064	<0.064	<0.0013	<0.0064	<0.0013	<0.0013	NA	<0.0013	<0.0013
WR-14	4-6	02/10/08	<0.0013	<b>1.1</b>	<0.0013	<0.0013	<b>0.0090</b>	<b>0.076</b>	<0.0067	<b>0.0099</b>	<b>0.36</b>	<b>0.0041</b>	<0.0040	<0.0067	<0.067	<0.0013	<0.0067	<0.0013	<0.013	NA	<0.0013	<0.0013
	12-14	02/10/08	<0.0016	<b>0.0029</b>	<0.0016	<0.0016	<0.0080	<0.0016	<0.0080	<0.0016	<0.0016	<0.0016	<0.0048	<0.0080	<0.080	<0.0016	<0.0080	<0.0016	<0.0016	NA	<0.0016	<0.0016
WR-15	6-8	02/10/08	<0.0013	<0.0013	<0.0013	<0.0013	<0.0066	<0.0013	<0.0066	<0.0013	<0.0013	<0.0013	<0.0013	<0.0066	<0.066	<0.0013	<0.0066	<0.0013	<0.0013	NA	<0.0013	<0.0013
	10-12	02/10/08	<0.0012	<0.0012	<0.0012	<0.0012	<0.0063	<0.0012	<0.0063	<0.0012	<0.0012	<0.0012	<0.0012	<0.0063	<0.063	<0.0012	<0.0063	<0.0012	<0.0012	NA	<0.0012	<0.0012
WR-16	4-6	02/07/08	<0.0013	<b>0.20</b>	<0.0013	<0.0013	<0.0067	<b>0.078</b>	<0.0067	<0.0013	<b>0.35</b>	<0.0013	<0.0040	<0.0067	<0.067	<0.0013	<0.0067	<0.0013	<0.0013	NA	<0.0013	<0.0013
	10-12	02/07/08	<0.0012	<b>0.0052</b>	<0.0012	<0.0012	<0.0062	<0.0012	<0.0062	<0.0012	<0.0012	<0.0012	<0.0037	<0.0062	<0.062	<0.0012	<0.0062	<0.0012	<0.0012	NA	<0.0012	<0.0012
WR-17	6-8	02/10/08	<0.0013	<b>0.0016</b>	<0.0013	<0.0013	<0.0066	<b>0.011</b>	<0.0066	<0.0013	<b>0.0074</b>	<0.0013	<0.0039	<0.0066	<0.066	<0.0013	<0.0066	<0.0013	<0.0013	NA	<0.0013	<0.0013
	12-14	02/10/08	<0.0012	<0.0012	<0.0012	<0.0012	<0.0062	<0.0012	<0.0062	<0.0012	<0.0012	<0.0012	<0.0037	<0.0062	<0.062	<0.0012	<0.0062	<0.0012	<0.0012	NA	<0.0012	<0.0012
WR-18	6-8	02/06/08	<0.0012	<b>0.083</b>	<0.0012	<0.0012	<0.0060	<b>0.0024</b>	<0.0060	<b>0.0023</b>	<b>0.0044</b>	<0.0012	<0.0036	<0.0060	<0.060	<0.0012	<0.0060	<0.0012	<0.0012	NA	<0.0012	<0.0012
	12-14	02/06/08	<0.0016	<b>0.0041</b>	<0.0016	<0.0016	<0.0080	<0.0016	<0.0080	<0.0016	<0.0016	<0.0016	<0.0048	<0.0080	<0.080	<0.0016	<0.0080	<0.0016	<0.0016	NA	<0.0016	<0.0016

**Table 2: Analytical Data for Soil**

**DSCA ID No.: DC920025**

Sample ID	Depth [feet bgs]	Sampling Date (mm/dd/yy)	Benzene	cis-1,2-Dichloroethylene	Ethylbenzene	Methyl tert-butyl ether (MTBE)	Naphthalene	Tetrachloroethylene	Toluene	trans-1,2-Dichloroethylene	Trichloroethylene	Vinyl chloride	Xylenes (total)	Methylene Chloride	Acetone	p-Isopropyltoluene	Dichlorodifluoromethane	Styrene	2-Butanone	Carbon Disulfide	1,4-Dichlorobenzene	n-Propylbenzene
			[mg/kg]																			
WR-19	6-8	02/07/08	<0.0014	<0.0014	<0.0014	<0.0014	<0.0072	<b>0.011</b>	<0.0072	<0.0014	<b>0.0040</b>	<0.0014	<0.0043	<0.0072	<0.072	<0.0014	<0.0072	<0.0014	<0.0014	NA	<0.0014	<0.0014
	12-14	02/07/08	<0.0011	<0.0011	<0.0011	<0.0011	<0.0057	<0.0011	<0.0057	<0.0011	<0.0011	<0.0011	<0.0034	<0.0057	<0.057	<0.0011	<0.0057	<0.0011	<0.0011	NA	<0.0011	<0.0011
WR-20	4-6	02/06/08	<0.0012	<0.0012	<0.0012	<0.0012	<0.0063	<b>0.011</b>	<0.0063	<0.0012	<0.0012	<0.0012	<0.0038	<0.0063	<0.063	<0.0012	<0.0063	<0.0012	<0.0012	NA	<b>0.020</b>	<0.0012
	10-12	02/06/08	<0.0012	<0.0012	<b>0.0028</b>	<0.0012	<0.0061	<0.0012	<0.0061	<0.0012	<0.0012	<0.0012	<b>0.0050</b>	<0.0061	<0.0061	<0.0012	<0.061	<0.0012	<0.0012	NA	<0.0012	<b>0.0019</b>
SB-1	1-2	03/31/16	<0.0028	<0.0044	<0.0044	<0.0087	<0.0087	<0.0044	<0.0044	<0.0044	<0.0044	<0.0044	<0.013	<0.0044	<b>0.041 J</b>	<0.0044	<0.0044	<0.0044	<0.087	NA	<0.0044	<0.0044
SB-2	14-15	03/31/16	<0.0028	<0.0044	<0.0044	<0.0087	<0.0087	<0.0044	<0.0044	<0.0044	<0.0044	<0.0044	<0.013	<0.0044	<b>0.0052 J</b>	<0.0044	<0.0044	<0.0044	<0.087	NA	<0.0044	<0.0044
SB-3	1-2	03/31/16	<0.0028	<0.0044	<0.0044	<0.0087	<0.0087	<0.0044	<0.0044	<0.0044	<0.0044	<0.0044	<0.013	<0.0044	<b>0.025 J</b>	<0.0044	<0.0044	<0.0044	<0.087	NA	<0.0044	<0.0044
DSCA Tier 1 RBSL			0.034	1.1	51	0.18	1.6	0.023	29	1.5	0.067	0.00079	36	0.006	42	NE	210	5.7	29	13	0.42	NE

Notes:

- 1. Bold** exceeds DSCA Tier 1 RBSL.
- NA = not analyzed; NE = not established
- J denotes estimated concentration between laboratory reporting limit and method detection limit.
- E = estimated value above the calibration range of the instrument

**Table 2(1): Analytical Data for Soil (User Specified Chemicals)**

**ADT 2(1)**

DSCA ID No.: DC920025																			
Sample ID	Depth [feet bgs]	Sampling Date (mm/dd/yy)	1,2,4-Trimethylbenzene	1,3,5-Trimethylbenzene															
			[mg/kg]																
GP-1-2'	2	12/03/03	<0.0030	<0.0030															
GP-2-2'	2	12/03/03	<0.0028	<0.0028															
GP-3-4'	4	12/03/03	<0.0031	<0.0031															
GP-4-2'	2	12/03/03	<0.0026	<0.0026															
GP-5-4'	4	12/04/03	<0.0027	<0.0027															
GP-6-2'	2	12/04/03	<0.0041	<0.0041															
GP-7-2'	2	12/04/03	<0.0035	<0.0035															
MW-3-6'	6	12/03/03	<0.0027	<0.0027															
WR-1	4-6	07/31/07	<0.0013	<0.0013															
	10-12	07/31/07	<0.0011	<0.0011															
WR-2	2-4	07/31/07	<0.00095	<0.00095															
	6-8	07/31/07	<0.0012	<0.0012															
WR-3	2-4	07/31/07	<0.0013	<0.0013															
	8-10	07/31/07	<0.0015	<0.0015															
WR-4	2-4	07/31/07	<0.0013	<0.0013															
	6-8	07/31/07	<0.0015	<0.0015															
WR-5	2-4	07/31/07	<0.0011	<0.0011															
	8-10	07/31/07	<0.0012	<0.0012															
WR-6	4-6	07/31/07	<0.00093	<0.00093															
	8-10	07/31/07	<0.0011	<0.0011															
WR-7	0-2	07/31/07	<1.2	<1.2															
	6-8	07/31/07	<0.00087	<0.00087															
WR-8	4-6	07/31/07	<0.12	<0.12															
	10-12	07/31/07	<0.0012	<0.0012															

**Table 2(1): Analytical Data for Soil (User Specified Chemicals)**

**ADT 2(1)**

DSCA ID No.: DC920025																				
Sample ID	Depth [feet bgs]	Sampling Date (mm/dd/yy)	1,2,4-Trimethylbenzene	1,3,5-Trimethylbenzene																
			[mg/kg]																	
WR-9	2-4	07/31/07	<0.00098	<0.00098																
	6-8	07/31/07	<0.0012	<0.0012																
WR-10	2-4	07/31/07	<0.00083	<0.00083																
	8-10	07/31/07	<0.0010	<0.0010																
WR-11	6-8	02/06/08	<0.0012	<0.0012																
	12-14	02/06/08	<0.0014	<0.0014																
WR-12	6-8	02/06/08	<0.0012	<0.0012																
	10-12	02/06/08	<0.0016	<0.0016																
WR-13	6-8	02/06/08	<0.0012	<0.0012																
	12-14	02/06/08	<0.0013	<0.0013																
WR-14	4-6	02/10/08	<0.0013	<0.0013																
	12-14	02/10/08	<0.0016	<0.0016																
WR-15	6-8	02/10/08	<0.0013	<0.0013																
	10-12	02/10/08	<0.0012	<0.0012																
WR-16	4-6	02/07/08	<0.0013	<0.0013																
	10-12	02/07/08	<0.0012	<0.0012																
WR-17	6-8	02/10/08	<0.0013	<0.0013																
	12-14	02/10/08	<0.0012	<0.0012																
WR-18	6-8	02/06/08	<0.0012	<0.0012																
	12-14	02/06/08	<0.0016	<0.0016																

**Table 2(1): Analytical Data for Soil (User Specified Chemicals)**

**ADT 2(1)**

**DSCA ID No.: DC920025**

Sample ID	Depth [feet bgs]	Sampling Date (mm/dd/yy)	1,2,4-Trimethylbenzene	1,3,5-Trimethylbenzene																
			[mg/kg]																	
WR-19	6-8	02/07/08	<0.0014	<0.0014																
	12-14	02/07/08	<0.0011	<0.0011																
WR-20	4-6	02/06/08	<0.0012	<0.0012																
	10-12	02/06/08	0.010	0.0019																
SB-1	1-2	03/31/16	<0.0044	<0.0044																
SB-2	14-15	03/31/16	<0.0044	<0.0044																
SB-3	1-2	03/31/16	<0.0044	<0.0044																
DSCA Tier 1 RBSL			45	NE																

Notes:  
 1. **Bold** exceeds DSCA Tier 1 RBSL.  
 2. NA = not analyzed; NE = not established  
 3. J denotes estimated concentration between laboratory reporting limit and method detection limit.  
 4. E = estimated value above the calibration range of the instrument

**Table 3: Analytical Data for Sub-slab Gas**

**DSCA ID No.: DC920025**

Sample ID	Depth [inches bgs]	Slab Thickness [inches]	Sampling Duration <sup>1</sup>	Sampling Date (mm/dd/yy)	Benzene	cis-1,2-Dichloroethylene	Ethylbenzene	Methyl tert-butyl ether (MTBE)	Naphthalene	Tetrachloroethylene	Toluene	trans-1,2-Dichloroethylene	Trichloroethylene	Vinyl chloride	Xylenes (total)	Isopropyl Alcohol					
					[µg/m <sup>3</sup> ]																
SSV-1	N/A	N/A	0.5h	3/29/10	NA	<0.340	NA	NA	NA	681	NA	<0.340	11.334	<0.129	NA	3.96					
VMP-1	6	4	31 min	2/5/15	NA	<0.15	NA	NA	NA	<b>8,300</b>	NA	<0.15	12	<0.091	NA	NA					
VMP-2	6	4	32 min	2/5/15	NA	<0.17	NA	NA	NA	2,700	NA	<0.16	5.8	<0.10	NA	NA					
DWM Non-Residential Soil Gas Screening Levels					--	NE	--	--	--	3500	--	5,260	175	2790	--	NE					

Notes:

- 1. Bold** concentrations exceed Division of Waste Management (DWM) Non-Residential Soil Gas Screening Levels (January 2014)
- 2. NE** = not established; **N/A** = not available





**Table 5(2): Additional Data for Indoor and Outdoor Air**

**ADT 5(2)**

**DSCA ID No.: DC920025**

Is dry-cleaning facility at the site:  Operating  Pick-up Only  Abandoned  
If facility is operating, solvents used are:  Perc  Petroleum  Green Earth  Other

For the active or former dry-cleaning space, describe the type and location of the air handling/HVAC unit (for example - a shared unit supplying two adjacent spaces; unit located on the roof):

Hilkers Cleaners - individual HVAC system

For any other indoor spaces tested, describe the type and location of the air handling/HVAC unit (for example - a shared unit supplying two adjacent spaces; unit located on the roof):

At Ease Boutique - individual HVAC system

For any indoor air spaces tested, describe the current use of the space (for example - an ABC liquor store adjacent to the dry-cleaner, a residence approximately 200 feet from the dry-cleaner, etc.):

At Ease Boutique - a clothing store where the former Hilkers Cleaners facility operated. Located adjacent to the present Hilkers Cleaners drop-off facility

Attachment:

Sampling location map that indicates where all indoor air samples were collected. The map should clearly indicate the names/types of businesses and residence names sampled and in the vicinity of the subject site that may be of concern.



**Table 6: Monitoring Well Construction Data****ADT 6****DSCA ID No.: DC920025**

Well ID	Date Installed (mm/dd/yy)	Number of Samples	Well Depth [feet]	Well Diameter [inch]	Screen Interval [feet]	Status (Active/Inactive)
MW-1S	07/23/07	8	33	2	18-33	Active
MW-1D	07/23/07	7	70	1	65-70	Active
MW-2	07/20/07	8	35	2	20-35	Active
MW-3	07/23/07	8	34	2	19-34	Active
MW-4	02/08/08	7	34	2	24-34	Active
MW-5	02/08/08	7	34	2	24-34	Active
MW-6	02/08/08	7	32	2	22-32	Active
MW-7	1/30/15	1	30	2	15-30	Active
MW-8	4/13/15	1	38	2	23-38	Active

**Table 7: Groundwater Elevation Data****ADT 7****DSCA ID No.: DC920025**

Groundwater Sampling Point	Sampling Date (mm/dd/yy)	TOC Elevation [feet]	Depth to Water [feet bgs]	Groundwater Elevation [feet]	Depth to NAPL [feet bgs]	NAPL Thickness [feet]	Corrected* Groundwater Elevation [feet]
MW-1S	07/31/07	418.08	25.30	392.78	N/A	N/A	N/A
	05/21/08		26.11	391.97	N/A	N/A	N/A
	10/23/08		26.57	391.51	N/A	N/A	N/A
	05/06/09		25.88	392.20	N/A	N/A	N/A
	04/08/14		26.61	391.47	N/A	N/A	N/A
	02/02/15		26.28	391.80	N/A	N/A	N/A
	06/15/15		25.36	392.72	N/A	N/A	N/A
MW-1D	07/31/07	418.09	25.43	392.66	N/A	N/A	N/A
	05/21/08		26.25	391.84	N/A	N/A	N/A
	10/23/08		26.67	391.42	N/A	N/A	N/A
	05/06/09		26.02	392.07	N/A	N/A	N/A
	04/08/14		26.76	391.33	N/A	N/A	N/A
	02/02/15		26.38	391.71	N/A	N/A	N/A
	06/15/15		25.56	392.53	N/A	N/A	N/A
MW-2	07/31/07	415.57	23.69	391.88	N/A	N/A	N/A
	05/21/08		24.31	391.26	N/A	N/A	N/A
	10/23/08		24.81	390.76	N/A	N/A	N/A
	05/06/09		24.07	391.50	N/A	N/A	N/A
	04/08/14		24.65	390.92	N/A	N/A	N/A
	02/02/15		24.37	391.20	N/A	N/A	N/A
	06/15/15		23.55	392.02	N/A	N/A	N/A
MW-3	07/31/07	419.00	26.09	392.91	N/A	N/A	N/A
	05/21/08		26.77	392.23	N/A	N/A	N/A
	10/23/08		27.24	391.76	N/A	N/A	N/A
	05/06/09		26.54	392.46	N/A	N/A	N/A
	04/08/14		27.20	391.80	N/A	N/A	N/A
	02/02/15		26.81	392.19	N/A	N/A	N/A
	06/15/15		26.02	392.98	N/A	N/A	N/A
MW-4	05/21/08	418.32	26.39	391.93	N/A	N/A	N/A
	10/23/08		26.85	391.47	N/A	N/A	N/A
	05/06/09		26.17	392.15	N/A	N/A	N/A
	04/08/14		26.93	391.39	N/A	N/A	N/A
	02/02/15		26.55	391.77	N/A	N/A	N/A
	06/15/15		25.64	392.68	N/A	N/A	N/A

**Table 7: Groundwater Elevation Data****ADT 7****DSCA ID No.: DC920025**

Groundwater Sampling Point	Sampling Date (mm/dd/yy)	TOC Elevation [feet]	Depth to Water [feet bgs]	Groundwater Elevation [feet]	Depth to NAPL [feet bgs]	NAPL Thickness [feet]	Corrected* Groundwater Elevation [feet]
MW-5	05/21/08	413.50	22.76	390.74	N/A	N/A	N/A
	10/23/08		23.29	390.21	N/A	N/A	N/A
	05/06/09		22.53	390.97	N/A	N/A	N/A
	04/08/14		23.07	390.43	N/A	N/A	N/A
	02/02/15		22.83	390.67	N/A	N/A	N/A
	06/15/15		22.03	391.47	N/A	N/A	N/A
MW-6	05/21/08	408.52	17.94	390.58	N/A	N/A	N/A
	10/23/08		18.50	390.02	N/A	N/A	N/A
	05/06/09		17.77	390.75	N/A	N/A	N/A
	04/08/14		18.08	390.44	N/A	N/A	N/A
	02/02/15		18.12	390.40	N/A	N/A	N/A
	06/15/15		17.39	391.13	N/A	N/A	N/A
MW-7	02/02/15	420.20	29.48	390.72	N/A	N/A	N/A
	06/15/15		28.61	391.59	N/A	N/A	N/A
MW-8	04/17/15	418.75	27.73	391.02	N/A	N/A	N/A
	06/15/15		27.35	391.40	N/A	N/A	N/A

Note: Top of casing (TOC) elevations for MW-1S/D through MW-6 surveyed by Withers & Ravenel in July 2007 and updated in February 2008. The elevations for MW-7 and MW-8 were surveyed by Bateman Civil Survey Company in May 2015.

**Table 8: Analytical Data for Groundwater**

DSCA ID No.: DC920025																			
Groundwater Sampling Point	Sampling Date (mm/dd/yy)	Benzene	cis-1,2-Dichloroethylene	Ethylbenzene	Methyl tert-butyl ether (MTBE)	Naphthalene	Tetrachloroethylene	Toluene	trans-1,2-Dichloroethylene	Trichloroethylene	Vinyl chloride	Xylenes (total)	Chloroform	1,2,4-Trimethylbenzene	1,3,5-Trimethylbenzene				
		[mg/L]																	
Permanent Monitoring Wells																			
MW-1S	08/01/07	<0.0010	0.0010	<0.0010	<0.0010	<0.0010	0.010	0.00043J	<0.0010	<0.0010	<0.0010	<0.0030	<0.0050	<0.0010	<0.0010				
	02/20/08	<0.0010	<0.0010	<0.0010	<0.0010	<0.0050	0.0032	<0.0050	<0.0010	<0.0010	<0.0010	<0.0030	<0.0010	<0.0010	<0.0010				
	05/21/08	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.00325	<0.0010	<0.0010	<0.0010	<0.0010	<0.0030	<0.0010	<0.0010	<0.0010				
	10/23/08	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.00312	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010				
	02/10/09	<0.0010	0.00141	<0.0010	<0.0010	<0.0010	0.00323	<0.0010	<0.0010	<0.0010	<0.0010	<0.0030	0.00343	<0.0010	<0.0010				
	05/06/09	<0.0010	0.0015	<0.0010	<0.0010	<0.0050	0.0033	<0.0050	<0.0010	<0.0010	<0.0010	<0.0030	<0.0050	<0.0010	<0.0010				
	04/08/14	<0.00050	<0.00050	<0.00050	<0.00050	<0.0010	0.0010	<0.00050	<0.00050	<0.00050	<0.00050	<0.0015	0.012	<0.00050	<0.00050				
	02/03/15	<0.0005	0.00074	<0.00050	<0.00050	<0.0010	0.0070	<0.00050	<0.00050	<0.0005	<0.00050	<0.0015	0.011	<0.00050	<0.00050				
MW-1D	08/01/07	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0030	<0.0010	<0.0010	<0.0010				
	02/20/08	<0.0010	<0.0010	<0.0010	<0.0010	<0.0050	<0.0010	<0.0050	<0.0010	<0.0010	<0.0010	<0.0030	<0.0010	<0.0010	<0.0010				
	05/21/08	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0030	<0.0010	<0.0010	<0.0010				
	10/23/08	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010				
	02/10/09	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0030	<0.0010	<0.0010	<0.0010				
	05/06/09	<0.0010	<0.0010	<0.0010	<0.0010	<0.0050	<0.0010	<0.0050	<0.0010	<0.0010	<0.0010	<0.0030	<0.0050	<0.0010	<0.0010				
	04/08/14	<0.00050	<0.00050	<0.00050	<0.00050	<0.0010	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.0015	0.0026	<0.00050	<0.00050				
MW-2	08/01/07	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0010	0.00059J	<0.0010	<0.0010	<0.0010	0.00053J	0.00052J	0.00039J	<0.0010				
	02/20/08	<0.0010	<0.0010	<0.0010	<0.0010	<0.0050	<0.0010	<0.0050	<0.0010	<0.0010	<0.0010	<0.0030	<0.0010	<0.0010	<0.0010				
	05/21/08	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0030	0.00196	<0.0010	<0.0010				
	10/23/08	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.00184	<0.0010	<0.0010				
	02/10/09	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.00106	<0.0010	<0.0010	<0.0010	<0.0010	<0.0030	0.00618	<0.0010	<0.0010				
	05/06/09	<0.0010	<0.0010	<0.0010	<0.0010	<0.0050	<0.0010	<0.0050	<0.0010	<0.0010	<0.0010	<0.0030	0.0052	<0.0010	<0.0010				
	04/08/14	<0.00050	<0.00050	<0.00050	<0.00050	<0.0010	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.0015	0.0050	<0.00050	<0.00050				
	02/02/15	<0.00050	<0.00050	<0.00050	<0.00050	<0.0010	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.0015	0.0060	<0.00050	<0.00050				

**Table 8: Analytical Data for Groundwater**

DSCA ID No.: DC920025																			
Groundwater Sampling Point	Sampling Date (mm/dd/yy)	Benzene	cis-1,2-Dichloroethylene	Ethylbenzene	Methyl tert-butyl ether (MTBE)	Naphthalene	Tetrachloroethylene	Toluene	trans-1,2-Dichloroethylene	Trichloroethylene	Vinyl chloride	Xylenes (total)	Chloroform	1,2,4-Trimethylbenzene	1,3,5-Trimethylbenzene				
		[mg/L]																	
MW-3	08/01/07	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.00041J	<0.0010	<0.0010	<0.0010	<0.0010	<0.0030	<b>0.0026</b>	0.0012	0.00049J				
	02/20/08	<0.0010	<0.0010	<0.0010	<0.0010	<0.0050	<b>0.0014</b>	<0.0050	<0.0010	<0.0010	<0.0010	<0.0030	<0.0010	<0.0010	<0.0010				
	05/21/08	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0030	<b>0.00470</b>	<0.0010	<0.0010				
	10/23/08	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<b>0.00184</b>	<0.0010	<0.0010				
	02/10/09	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<b>0.00151</b>	<0.0010	<0.0010	<0.0010	<0.0010	<0.0030	<b>0.00708</b>	<0.0010	<0.0010				
	05/06/09	<0.0010	<0.0010	<0.0010	<0.0010	<0.0050	<b>0.0012</b>	<0.0050	<0.0010	<0.0010	<0.0010	<0.0030	<b>0.0065</b>	<0.0010	<0.0010				
	04/08/14	<0.00050	<0.00050	<0.00050	<0.00050	<0.0010	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.0015	<b>0.018</b>	<0.00050	<0.00050				
02/03/15	<0.00050	<0.00050	<0.00050	<0.00050	<0.0010	<b>0.0013</b>	<0.00050	<0.00050	<0.00050	<0.00050	<0.0015	<b>0.020</b>	<0.00050	<0.00050					
MW-4	02/20/08	<0.0010	<0.0010	<0.0010	<0.0010	<0.0050	<b>0.0033</b>	<0.0050	<0.0010	<0.0010	<0.0010	<0.0030	<0.0010	<0.0010	<0.0010				
	05/21/08	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<b>0.00615</b>	<0.0010	<0.0010	<0.0010	<0.0010	<0.0030	<0.0010	<0.0010	<0.0010				
	10/23/08	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010				
	02/10/09	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<b>0.00521</b>	<0.0010	<0.0010	<0.0010	<0.0010	<0.0030	<b>0.00169</b>	<0.0010	<0.0010				
	05/06/09	<0.0010	<0.0010	<0.0010	<0.0010	<0.0050	<b>0.0055</b>	<0.0050	<0.0010	<0.0010	<0.0010	<0.0030	<0.0050	<0.0010	<0.0010				
	04/09/14	<0.00050	<0.00050	<0.00050	<0.00050	<0.0010	<b>0.0025</b>	<0.00050	<0.00050	<0.00050	<0.00050	<0.0015	<b>0.0059</b>	<0.00050	<0.00050				
02/03/15	<0.00050	<0.00050	<0.00050	<0.00050	<0.0010	<b>0.0023</b>	<0.00050	<0.00050	<0.00050	<0.00050	<0.0015	<b>0.0088</b>	<0.00050	<0.00050					
MW-5	02/20/08	<0.0010	<0.0010	<0.0010	<0.0010	<0.0050	<0.0010	<0.0050	<0.0010	<0.0010	<0.0010	<0.0030	<0.0010	<0.0010	<0.0010				
	05/21/08	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0030	<b>0.00132</b>	<0.0010	<0.0010				
	10/23/08	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010				
	02/10/09	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<b>0.00094J</b>	<0.0010	<0.0010	<0.0010	<0.0010	<0.0030	<b>0.00323</b>	<0.0010	<0.0010				
	05/06/09	<0.0010	<0.0010	<0.0010	<0.0010	<0.0050	<0.0010	<0.0050	<0.0010	<0.0010	<0.0010	<0.0030	<0.0050	<0.0010	<0.0010				
	04/09/14	<0.00050	<0.00050	<0.00050	<0.00050	<0.0010	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.0015	<b>0.0052</b>	<0.00050	<0.00050				
02/02/15	<0.00050	<0.00050	<0.00050	<0.00050	<0.0010	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.0015	<b>0.0052</b>	<0.00050	<0.00050					
MW-6	02/20/08	<0.0010	<0.0010	<0.0010	<0.0010	<0.0050	<0.0010	<0.0050	<0.0010	<0.0010	<0.0010	<0.0030	<b>0.017</b>	<0.0010	<0.0010				
	05/21/08	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0030	<b>0.0174</b>	<0.0010	<0.0010				
	10/23/08	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<b>0.00962</b>	<0.0010	<0.0010				
	02/10/09	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0030	<b>0.00864</b>	<0.0010	<0.0010				
	05/06/09	<0.0010	<0.0010	<0.0010	<0.0010	<0.0050	<0.0010	<0.0050	<0.0010	<0.0010	<0.0010	<0.0030	<b>0.0053</b>	<0.0010	<0.0010				
	04/09/14	<0.00050	<0.00050	<0.00050	<0.00050	<0.0010	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.0015	<b>0.00090</b>	<0.00050	<0.00050				
02/02/15	<0.00050	<0.00050	<0.00050	<0.00050	<0.0010	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.0015	<b>0.00100</b>	<0.00050	<0.00050					

**Table 8: Analytical Data for Groundwater**

DSCA ID No.: DC920025																				
Groundwater Sampling Point	Sampling Date (mm/dd/yy)	Benzene	cis-1,2-Dichloroethylene	Ethylbenzene	Methyl tert-butyl ether (MTBE)	Naphthalene	Tetrachloroethylene	Toluene	trans-1,2-Dichloroethylene	Trichloroethylene	Vinyl chloride	Xylenes (total)	Chloroform	1,2,4-Trimethylbenzene	1,3,5-Trimethylbenzene					
		[mg/L]																		
MW-7	02/03/15	<0.00050	<0.00050	<0.00050	<0.00050	<0.0010	<b>0.0012</b>	<0.00050	<0.00050	<0.00050	<0.00050	<0.0015	<b>0.0027</b>	<0.00050	<0.00050					
MW-8	04/17/15	<0.00050	<0.00050	<0.00050	<0.00050	<0.0010	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.0015	<b>0.0096</b>	<0.00050	<0.00050					
Temporary Monitoring Wells																				
MW-1	12/03/03	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050					
MW-2	12/03/03	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<b>0.0099</b>	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050					
MW-3	12/04/03	<0.0050	0.011	<0.0050	<0.0050	<0.0050	<b>0.013</b>	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050					
DSCA Tier 1 RBSL or NC 2L Standard		0.001	0.07	0.003	0.02	0.004	0.0007	0.6	0.076	0.001	0.00003	0.094	0.00073	0.0058	0.40					
Notes:																				
1. <b>Bold</b> exceeds DSCA Tier 1 RBSL (or NC 2L standard, if not established).																				
2. NA = not analyzed.																				
3. J = estimated concentration between the laboratory reporting limit and method detection limit																				

**Table 12: Analytical Data for Natural Attenuation Parameters**

DSCA ID No.: DC920025																
Sample ID	Sampling Date (mm/dd/yy)	Dissolved oxygen (DO)	Nitrate	Sulfate	Major Cations	Methane	Ferrous Iron	Oxidation reduction potential (ORP)	Alkalinity	Chloride (optional)	Conductivity	pH	Temperature	Total organic carbon (TOC)	Ethane	Ethene
	Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mV	mg/L	mg/L	µs/cm <sup>2</sup>	std unit	° C	mg/L	mg/L	mg/L
MW-1S	08/01/07	4.55	3.3	<20	NA	<0.001	0	209	211.34	20	NA	4.75	NA	NA	<0.002	<0.002
	04/08/14	2.48	NA	NA	NA	NA	NA	316.7	NA	NA	49	4.98	20.55	NA	NA	NA
	02/03/15	3.79	NA	NA	NA	NA	NA	312.6	NA	NA	57	4.92	15.30	NA	NA	NA
MW-1D	04/08/14	3.83	NA	NA	NA	NA	NA	281.0	NA	NA	36	5.78	19.97	NA	NA	NA
MW-2	08/01/07	2.67	1.7	<20	NA	0.004	0	41	317.00	35	NA	4.78	NA	NA	0.001J	<0.002
	04/08/14	2.61	NA	NA	NA	NA	NA	327.6	NA	NA	75	4.80	21.08	NA	NA	NA
MW-3	08/01/07	3.30	1.0	<20	NA	0.002	0	124	528.34	20	NA	5.06	NA	NA	<0.002	<0.002
	04/08/14	2.66	NA	NA	NA	NA	NA	254.9	NA	NA	45	5.08	20.17	NA	NA	NA
	02/03/15	2.96	NA	NA	NA	NA	NA	275.2	NA	NA	36	4.95	11.47	NA	NA	NA
MW-4	04/09/14	NA	NA	NA	NA	NA	NA	267.9	NA	NA	44	4.90	20.93	NA	NA	NA
	02/03/15	5.10	NA	NA	NA	NA	NA	310.8	NA	NA	39	4.88	14.44	NA	NA	NA
MW-5	04/09/14	3.75	NA	NA	NA	NA	NA	247.4	NA	NA	68	5.01	21.82	NA	NA	NA
	02/02/15	3.55	NA	NA	NA	NA	NA	312.5	NA	NA	60	4.89	13.46	NA	NA	NA
MW-6	04/09/14	3.26	NA	NA	NA	NA	NA	219.9	NA	NA	69	5.21	21.02	NA	NA	NA
	02/02/15	3.74	NA	NA	NA	NA	NA	280.5	NA	NA	60	5.29	18.03	NA	NA	NA
MW-8	04/17/15	2.81	NA	NA	NA	NA	NA	148.5	NA	NA	70	5.67	23.03	NA	NA	NA

Notes:  
 1. NA = not analyzed.  
 2. J = estimated concentration between the laboratory reporting limit and method detection limit

**Table 12(1): Analytical Data for Natural Attenuation Parameters (User Specified Parameters)**

**DSCA ID No.: DC920025**

Sample ID	Sampling Date (mm/dd/yy)	Carbon Dioxide	Nitrite	Sulfide												
	Units	mg/L	mg/L	mg/L												
MW-1S	08/01/07	75	<0.10	<1.0												
	04/08/14	NA	NA	NA												
	02/03/15	NA	NA	NA												
MW-1D	04/08/14	NA	NA	NA												
MW-2	08/01/07	115	0.023J	<1.0												
	04/08/14	NA	NA	NA												
MW-3	08/01/07	90	0.013J	<1.0												
	04/08/14	NA	NA	NA												
	02/03/15	NA	NA	NA												
MW-4	04/09/14	NA	NA	NA												
	02/03/15	NA	NA	NA												
MW-5	04/09/14	NA	NA	NA												
	02/02/15	NA	NA	NA												
MW-6	04/09/14	NA	NA	NA												
	02/02/15	NA	NA	NA												
MW-8	04/17/15	NA	NA	NA												

Notes:  
 1. NA = not analyzed.  
 2. J = estimated concentration between the laboratory reporting limit and method detection limit